DHIS2 User guide

2.30

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DHIS2 Documentation Team

Revision HEAD@a85285c

2018-03-13 20:54:47
Version 2.30

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About this guide

The DHIS2 documentation is a collective effort and has been developed by the development team and users. While the guide strives to be complete, there may be certain functionalities which have been omitted or which have yet to be documented. This section explains some of the conventions which are used throughout the document.

DHIS2 is a browser-based application. In many cases, screenshots have been included for enhanced clarity. Shortcuts to various functionalities are displayed such as **Data element** > **Data element group**. The ">" symbol indicates that you should click **Data element** and then click **Data element group** in the user interface.

Different styles of text have been used to highlight important parts of the text or particular types of text, such as source code. Each of the conventions used in the document are explained below.

Note

A note contains additional information which should be considered or a reference to more information which may be helpful.

Tip

A tip can be a useful piece of advice, such as how to perform a particular task more efficiently.

Important

Important information should not be ignored, and usually indicates something which is required by the application.

Caution

Information contained in these sections should be carefully considered, and if not heeded, could result in unexpected results in analysis, performance, or functionality.

Warning

Information contained in these sections, if not heeded, could result in permanent data loss or affect the overall usability of the system.

```
Program listings usually contain some type of computer code.
They will be displayed with a shaded background and a different font.
```

Commands will be displayed in bold text, and represent a command which would need to be executed on the operating system or database.

Links to external web sites or cross references will be displayed in blue text, and underlined like this..

Bibliographic references will displayed in square brackets like this [Store2007]. A full reference can be found in the bibliography contained at the end of this document.

Chapter 1. Getting started - help to navigate the user guide

What do you want to do?		Link to documentation	Related app(s)
Enter data	Enter aggregate data	Using the Data Entry app	**Data Entry**
	Enter data for a program without registration (event program)	Using the Event Capture app	**Event Capture**
	Enter data for a program with registration (tracker program)	Using the Tracker Capture app	**Tracker Capture**
Analyze and visualize data	Analyze data in a table	Analyze data in pivot tables	**Pivot Table**
	Visualize data in a chart	Using the Data Visualizer app	**Data Visualizer**
	Visualize data in a map	Using the GIS app	**GIS**
	Visualize data in a better map	Using the Maps app	**Maps**
	Analyze data in two types of reports.	Using the Event Reports app	**Event Report**
	Visualize program data in a chart	Using the Event Visualizer app	**Event Visualizer**
	Create a dashboard	Manage dashboards	**Dashboard**
Control data quality		Control data quality	**Data Quality**
Manage users and authorities	Create or edit users, user roles or user groups	Manage users, user roles and user groups	**Users**
	Look up all user authorities	Appendix A. User authorities	**Users**
	Visualize statistics about how users work with the **Dashboard**, **Pivot Table**, **GIS**, **Event Visualizer**, **Data Visualizer** and **Event Reports** apps	Visualize usage statistics	**Usage Analytics**
Customize the user interface	Change your account preferences	Set user account preferences	-
Configure metadata	Create metadata, for example	Configure metadata	**Maintenance**

What do you want to do?		Link to documentation	Related app(s)
	organisation units and data elements		
	Create metadata to use in an event or a tracker program	Configure programs in the Maintenance app	**Maintenance**
Configure the system	Look up all system settings	Appendix B. System settings	**System Settings**
	Perform database maintenance	Data administration	**Data Administration**
	Set up metadata synchronization between a central instance and multiple local instances	Configure metadata synchronization	**System Settings** **Data Administration**
	Configure data approval	Data approval	**System Settings**
	Configure data and metadata import or export	Import and export data and metadata	**Import-Export**
	Learn more about sharing of objects	About sharing of objects	-
	Import coordinates and configure the **GIS** app	Configure the GIS app Manage legends Manage external map layers	**Maintenance**
	Set up report functionality	Configure report functionality	-
Learn about event and tracker programs	Create a program	Configure programs in the Maintenance app Configure programs in the Programs/ Attributes app (legacy app)	**Maintenance** **Program**
	Enter data for a program with registration (tracker program)	Using the Tracker Capture app	**Tracker Capture**
	Enter data for a program without registration (event program)	Using the Event Capture app	**Event Capture**
	Visualize data from a program in a chart	Using the Event Visualizer app	**Event Visualizer**

What do you want to do?		Link to documentation	Related app(s)
	Analyze data from a program in two types of reports	Using the Event Reports app	**Event Report**
Learn more about DHIS2	What is DHIS2?	What is DHIS2?	-
	Learn about the DHIS2 data dimensions	Data dimensions in DHIS2	-

Chapter 2. What is DHIS2?

After reading this chapter you will be able to understand:

- What is DHIS2 and what purpose it serves with respect to health information systems (HIS)?
- What are the major technological considerations when it comes to deploying DHIS2, and what are the options are for extending DHIS2 with new modules?
- What is the difference between patient based and aggregate data?
- What are some of the benefits and challenges with using Free and Open Source Software (FOSS) for HIS?

2.1. DHIS2 Background

DHIS2 is a tool for collection, validation, analysis, and presentation of aggregate and patient-based statistical data, tailored (but not limited) to integrated health information management activities. It is a generic tool rather than a pre-configured database application, with an open meta-data model and a flexible user interface that allows the user to design the contents of a specific information system without the need for programming. DHIS2 is a modular web-based software package built with free and open source Java frameworks.

DHIS2 is open source software released under the BSD license and can be obtained at no cost. It runs on any platform with a Java Runtime Environment (JRE 7 or higher) installed.

DHIS2 is developed by the Health Information Systems Programme (HISP) as an open and globally distributed process with developers currently in India, Vietnam, Tanzania, Ireland, and Norway. The development is coordinated by the University of Oslo with support from NORAD and other donors.

The DHIS2 software is used in more than 40 countries in Africa, Asia, and Latin America, and countries that have adopted DHIS2 as their nation-wide HIS software include Kenya, Tanzania, Uganda, Rwanda, Ghana, Liberia, and Bangladesh. A rapidly increasing number of countries and organisations are starting up new deployments.

The documentation provided herewith, will attempt to provide a comprehensive overview of the application. Given the abstract nature of the application, this manual will not serve as a complete step-by-step guide of how to use the application in each and every circumstance, but rather will seek to provide illustrations and examples of how DHIS2 can be implemented in a variety of situations through generalized examples.

Before implementing DHIS2 in a new setting, we highly recommend reading the DHIS2 Implementation Guide (a separate manual from this one), also available at the main DHIS2 website.

2.2. Key features and purpose of DHIS2

The key features and purpose of DHIS2 can be summarised as follows:

- Provide a comprehensive data management solution based on data warehousing principles and a modular structure which can easily be customised to the different requirements of a management information system, supporting analysis at different levels of the organisational hierarchy.
- Customisation and local adaptation through the user interface. No programming required to start using DHIS2 in a new setting (country, region, district etc.).
- Provide data entry tools which can either be in the form of standard lists or tables, or can be customised to replicate paper forms.

- Provide different kinds of tools for data validation and improvement of data quality.
- Provide easy to use - one-click reports with charts and tables for selected indicators or summary reports using the design of the data collection tools. Allow for integration with popular external report design tools (e.g. JasperReports) to add more custom or advanced reports.
- Flexible and dynamic (on-the-fly) data analysis in the analytics modules (i.e. GIS, PivotTables,Data Visualizer, Event reports, etc).
- A user-specific dashboard for quick access to the relevant monitoring and evaluation tools including indicator charts and links to favourite reports, maps and other key resources in the system.
- Easy to use user-interfaces for metadata management e.g. for adding/editing datasets or health facilities. No programming needed to set up the system in a new setting.
- Functionality to design and modify calculated indicator formulas.
- User management module for passwords, security, and fine-grained access control (user roles).
- Messages can be sent to system users for feedback and notifications. Messages can also be delivered to email and SMS.
- Users can share and discuss their data in charts and reports using Interpretations, enabling an active information-driven user community.
- Functionalities of export-import of data and metadata, supporting synchronisation of offline installations as well as interoperability with other applications.
- Using the DHIS2 Web-API , allow for integration with external software and extension of the core platform through the use of custom apps.
- Further modules can be developed and integrated as per user needs, either as part of the DHIS2 portal user interface or a more loosely-coupled external application interacting through the DHIS2 Web-API.

In summary, DHIS2 provides a comprehensive HIS solution for the reporting and analysis needs of health information users at any level.

2.3. Use of DHIS2 in HIS: data collection, processing, interpretation, and analysis.

The wider context of HIS can be comprehensively described through the information cycle presented in Figure 1.1 below. The information cycle pictorially depicts the different components, stages and processes through which the data is collected, checked for quality, processed, analysed and used.

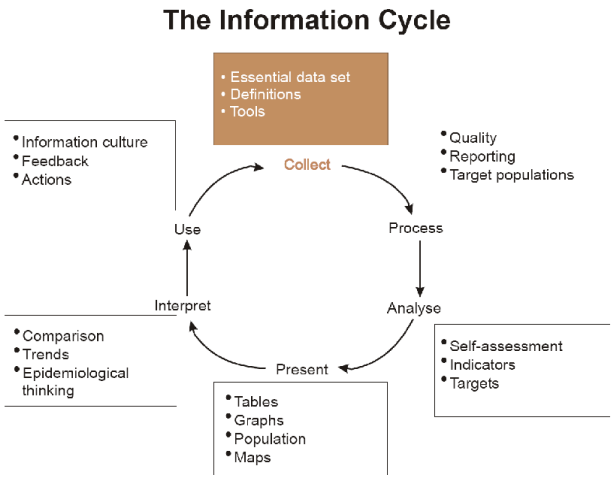


Figure 2.1. The health information cycle

DHIS2 supports the different facets of the information cycle including:

- Collecting data.
- Running quality checks.
- Data access at multiple levels.
- Reporting.
- Making graphs and maps and other forms of analysis.
- Enabling comparison across time (for example, previous months) and space (for example, across facilities and districts).
- See trends (displaying data in time series to see their min and max levels).

As a first step, DHIS2 serves as a data collection, recording and compilation tool, and all data (be it in numbers or text form) can be entered into it. Data entry can be done in lists of data elements or in customised user defined forms which can be developed to mimic paper based forms in order to ease the process of data entry.

As a next step, DHIS2 can be used to increase data quality. First, at the point of data entry, a check can be made to see if data falls within acceptable range levels of minimum and maximum values for any particular data element. Such checking, for example, can help to identify typing errors at the time of data entry. Further, user can define various validation rules, and DHIS2 can run the data through the validation rules to identify violations. These types of checks help to ensure that data entered into the system is of good quality from the start, and can be improved by the people who are most familiar with it.

When data has been entered and verified, DHIS2 can help to make different kinds of reports. The first kind are the routine reports that can be predefined, so that all those reports that need to be routine generated can be done on a click of a button. Further, DHIS2 can help in the generation of analytical reports through comparisons of for example indicators across facilities or over time. Graphs, maps, reports and health profiles are among the outputs that DHIS2 can produce, and these should routinely be produced, analysed, and acted upon by health managers.

2.4. Technical background

2.4.1. DHIS2 as a platform

DHIS2 can be perceived as a platform on several levels. First, the application database is designed ground-up with flexibility in mind. Data structures such as data elements, organisation units, forms and user roles can be defined completely freely through the application user interface. This makes it possible for the system to be adapted to a multitude of locale contexts and use-cases. We have seen that DHIS2 supports most major requirements for routine data capture and analysis emerging in country implementations. It also makes it possible for DHIS2 to serve as management system for domains such as logistics, labs and finance.

Second, due to the modular design of DHIS2 it can be extended with additional software modules or through custom apps. These software modules/apps can live side by side with the core modules of DHIS2 and can be integrated into the DHIS2 portal and menu system. This is a powerful feature as it makes it possible to extend the system with extra functionality when needed, typically for country specific requirements as earlier pointed out.

The downside of the software module extensibility is that it puts several constraints on the development process. The developers creating the extra functionality are limited to the DHIS2 technology in terms of programming language and software frameworks, in addition to the

constraints put on the design of modules by the DHIS2 portal solution. Also, these modules must be included in the DHIS2 software when the software is built and deployed on the web server, not dynamically during run-time.

In order to overcome these limitations and achieve a looser coupling between the DHIS2 service layer and additional software artifacts, a REST-based API has been developed as part of DHIS2. This Web API complies with the rules of the REST architectural style. This implies that:

- The Web API provides a navigable and machine-readable interface to the complete DHIS2 data model. For instance, one can access the full list of data elements, then navigate using the provided URL to a particular data element of interest, then navigate using the provided URL to the list of data sets which the data element is a member of.
- (Meta) Data is accessed through a uniform interface (URLs) using plain HTTP requests. There are no fancy transport formats or protocols involved - just the well-tested, well-understood HTTP protocol which is the main building block of the Web today. This implies that third-party developers can develop software using the DHIS2 data model and data without knowing the DHIS2 2specific technology or complying with the DHIS2 design constraints.
- All data including meta-data, reports, maps and charts, known as resources in REST terminology, can be retrieved in most of the popular representation formats of the Web of today, such as XML, JSON, PDF and PNG. These formats are widely supported in applications and programming languages and gives third-party developers a wide range of implementation options.

2.4.2. Understanding platform independence

All computers have an Operating System (OS) to manage it and the programs running it. The operating system serves as the middle layer between the software application, such as DHIS2, and the hardware, such as the CPU and RAM. DHIS2 runs on the Java Virtual Machine, and can therefore run on any operating system which supports Java. Platform independence implies that the software application can run on ANY OS - Windows, Linux, Macintosh etc. DHIS2 is platform independent and thus can be used in many different contexts depending on the exact requirements of the operating system to be used.

Additionally, DHIS2 supports three major database management systems systems (DBMS). DHIS2 uses the Hibernate database abstraction framework and is compatible with the following database systems: PostgreSQL, MySQL and H2. PostgreSQL and MySQL are high-quality production ready databases, while H2 is a useful in-memory database for small-scale applications or development activities.

Lastly, and perhaps most importantly, since DHIS2 is a browser-based application, the only real requirement to interact with the system is with a web browser. DHIS2 supports most web browsers, although currently either Google Chrome, Mozilla Firefox or Opera are recommended.

2.4.3. Deployment strategies - online vs offline

DHIS2 is a network enabled application and can be accessed over the Internet, a local intranet as well as a locally installed system. The deployment alternatives for DHIS2 are in this chapter defined as i) offline deployment ii) online deployment and iii) hybrid deployment. The meaning and differences will be discussed in the following sections.

2.4.3.1. Offline Deployment

An off-line deployment implies that multiple standalone off-line instances are installed for end users, typically at the district level. The system is maintained primarily by the end users/district health officers who enters data and generate reports from the system running on their local server. The system will also typically be maintained by a national super-user team who pay

regular visits to the district deployments. Data is moved upwards in the hierarchy by the end users producing data exchange files which are sent electronically by email or physically by mail or personal travel. (Note that the brief Internet connectivity required for sending emails does not qualify for being defined as on-line). This style of deployment has the obvious benefit that it works when appropriate Internet connectivity is not available. On the other side there are significant challenges with this style which are described in the following section.

- **Hardware:** Running stand-alone systems requires advanced hardware in terms of servers and reliable power supply to be installed, usually at district level, all over the country. This requires appropriate funding for procurement and plan for long-term maintenance.
- **Software platform:** Local installs implies a significant need for maintenance. From experience, the biggest challenge is viruses and other malware which tend to infect local installations in the long-run. The main reason is that end users utilize memory sticks for transporting data exchange files and documents between private computers, other workstations and the system running the application. Keeping anti-virus software and operating system patches up to date in an off-line environment are challenging and bad practices in terms of security are often adopted by end users. The preferred way to overcome this issue is to run a dedicated server for the application where no memory sticks are allowed and use an Linux based operating system which is not as prone for virus infections as MS Windows.
- **Software application:** Being able to distribute new functionality and bug-fixes to the health information software to users are essential for maintenance and improvement of the system. Relying on the end users to perform software upgrades requires extensive training and a high level of competence on their side as upgrading software applications might a technically challenging task. Relying on a national super-user team to maintain the software implies a lot of traveling.
- **Database maintenance:** A prerequisite for an efficient system is that all users enter data with a standardized meta-data set (data elements, forms etc). As with the previous point about software upgrades, distribution of changes to the meta-data set to numerous off-line installations requires end user competence if the updates are sent electronically or a well-organized super-user team. Failure to keep the meta-data set synchronized will lead to loss of ability to move data from the districts and/or an inconsistent national database since the data entered for instance at the district level will not be compatible with the data at the national level.

2.4.3.2. Online deployment

An on-line deployment implies that a single instance of the application is set up on a server connected to the Internet. All users (clients) connect to the on-line central server over the Internet using a web browser. This style of deployment is increasingly possible due to increased availability in (mobile) Internet coverage globally, as well as readily available and cheap cloud-computing resources. These developments make it possible to access on-line servers in even the most rural areas using mobile Internet modems (also referred to as *dongles*).

This on-line deployment style has huge positive implications for the implementation process and application maintenance compared to the traditional off-line standalone style:

- **Hardware:** Hardware requirements on the end-user side are limited to a reasonably modern computer/laptop and Internet connectivity through a fixed line or a mobile modem. There is no need for a specialized server for each user, any Internet enabled computer will be sufficient. A server will be required for on-line deployments, but since there is only one (or several) servers which need to be procured and maintained, this is significantly simpler (and cheaper) than maintaining many separate servers is disparate locations. Given that cloud-computing resources continue to steadily decrease in price while increasing in computational power, setting up a powerful server in the cloud is far cheaper than procuring hardware.
- **Software platform:** The end users only need a web browser to connect to the on-line server. All popular operating systems today are shipped with a web browser and there is no special requirement on what type or version. This means that if severe problems such

as virus infections or software corruption occur one can always resort to re-formatting and installing the computer operating system or obtain a new computer/laptop. The user can continue with data entry where it was left and no data will be lost.

- **Software application:** The central server deployment style means that the application can be upgraded and maintained in a centralized fashion. When new versions of the applications are released with new features and bug-fixes it can be deployed to the single on-line server. All changes will then be reflected on the client side the next time end users connect over the Internet. This obviously has a huge positive impact for the process of improving the system as new features can be distributed to users immediately, all users will be accessing the same application version, and bugs and issues can be sorted out and deployed on-the-fly.
- **Database maintenance:** Similar to the previous point, changes to the meta-data can be done on the on-line server in a centralized fashion and will automatically propagate to all clients next time they connect to the server. This effectively removes the vast issues related to maintaining an upgraded and standardized meta-data set related to the traditional off-line deployment style. It is extremely convenient for instance during the initial database development phase and during the annual database revision processes as end users will be accessing a consistent and standardized database even when changes occur frequently.

This approach might be problematic in cases where Internet connectivity is volatile or missing in long periods of time. DHIS2 however has certain features which requires Internet connectivity to be available only part of the time for the system to work properly, such as offline data entry. In general however, DHIS2 does require Internet connectivity of some sort, but this is increasingly an easy problem to solve even in remote locations.

2.4.3.3. Hybrid deployment

From the discussion so far one realizes that the on-line deployment style is favourable over the off-line style but requires decent Internet connectivity where it will be used. It is important to notice that the mentioned styles can co-exist in a common deployment. It is perfectly feasible to have on-line as well as off-line deployments within a single country. The general rule would be that districts and facilities should access the system on-line over the Internet where sufficient Internet connectivity exist, and off-line systems should be deployed to districts where this is not the case.

Defining decent Internet connectivity precisely is hard but as a rule of thumb the download speed should be minimum 10 Kbyte/second for the client and at least 1 MBit/sec (dedicated) bandwidth for the server.

In this regard mobile Internet modems which can be connected to a computer or laptop and access the mobile network is an extremely capable and feasible solution. Mobile Internet coverage is increasing rapidly all over the world, often provide excellent connectivity at low prices and is a great alternative to local networks and poorly maintained fixed Internet lines. Getting in contact with national mobile network companies regarding post-paid subscriptions and potential large-order benefits can be a wort-while effort. The network coverage for each network operator in the relevant country should be investigated when deciding which deployment approach to opt for as it might differ and cover different parts of the country.

2.4.3.4. Server hosting

The on-line deployment approach raises the question of where and how to host the server which will run the DHIS2 application. Typically there are several options:

1. Internal hosting within the Ministry of Health
2. Hosting within a government data centre
3. Hosting through an external hosting company

The main reason for choosing the first option is often political motivation for having “physical ownership” of the database. This is perceived as important by many in order to “own” and

control the data. There is also a wish to build local capacity for server administration related to sustainability of the project. This is often a donor-driven initiatives as it is perceived as a concrete and helpful mission.

Regarding the second option, some places a government data centre is constructed with a view to promoting and improving the use and accessibility of public data. Another reason is that a proliferation of internal server environments is very resource demanding and it is more effective to establish centralized infrastructure and capacity.

Regarding external hosting there is lately a move towards outsourcing the operation and administration of computer resources to an external provider, where those resources are accessed over the network, popularly referred to as “cloud computing” or “software as a service”. Those resources are typically accessed over the Internet using a web browser.

The primary goal for an on-line server deployment is provide long-term stable and high-performance accessibility to the intended services. When deciding which option to choose for server environment there are many aspects to consider:

1. Human capacity for server administration and operation. There must be human resources with general skills in server administration and in the specific technologies used for the application providing the services. Examples of such technologies are web servers and database management platforms.
2. Reliable solutions for automated backups, including local off-server and remote backup.
3. Stable connectivity and high network bandwidth for traffic to and from the server.
4. Stable power supply including a backup solution.
5. Secure environment for the physical server regarding issues such as access, theft and fire.
6. Presence of a disaster recovery plan. This plan must contain a realistic strategy for making sure that the service will be only suffering short down-times in the events of hardware failures, network downtime and more.
7. Feasible, powerful and robust hardware.

All of these aspects must be covered in order to create an appropriate hosting environment. The hardware requirement is deliberately put last since there is a clear tendency to give it too much attention.

Looking back at the three main hosting options, experience from implementation missions in developing countries suggests that all of the hosting aspects are rarely present in option one and two at a feasible level. Reaching an acceptable level in all these aspects is challenging in terms of both human resources and money, especially when compared to the cost of option three. It has the benefit that is accommodates the mentioned political aspects and building local capacity for server administration, on the other hand can this be provided for in alternative ways.

Option three - external hosting - has the benefit that it supports all of the mentioned hosting aspects at a very affordable price. Several hosting providers - of virtual servers or software as a service - offer reliable services for running most kinds of applications. Example of such providers are Linode and Amazon Web Services. Administration of such servers happens over a network connection, which most often anyway is the case with local server administration. The physical location of the server in this case becomes irrelevant as that such providers offer services in most parts of the world. This solution is increasingly becoming the standard solution for hosting of application services. The aspect of building local capacity for server administration is compatible with this option since a local ICT team can be tasked with maintaining the externally hosted server, but with not being burdened with worrying about power supply and bandwidth constraints which usually exist outside of major data centres.

An approach for combining the benefits of external hosting with the need for local hosting and physical ownership is to use an external hosting provider for the primary transactional system,

while mirroring this server to a locally hosted non-critical server which is used for read-only purposes such as data analysis and accessed over the intranet.

2.5. Difference between Aggregated and Patient data in a HIS

Patient data is data relating to a single patient, such as his/her diagnosis, name, age, earlier medical history etc. This data is typically based on a single patient-health care worker interaction. For instance, when a patient visits a health care clinic, a variety of details may be recorded, such as the patient's temperature, their weight, and various blood tests. Should this patient be diagnosed as having "Vitamin B 12 deficiency anaemia, unspecified" corresponding to ICD-10 code D51.9, this particular interaction might eventually get recorded as an instance of "Anaemia" in an aggregate based system. Patient based data is important when you want to track longitudinally the progress of a patient over time. For example, if we want to track how a patient is adhering to and responding to the process of TB treatment (typically taking place over 6-9 months), we would need patient based data.

Aggregated data is the consolidation of data relating to multiple patients, and therefore cannot be traced back to a specific patient. They are merely counts, such as incidences of Malaria, TB, or other diseases. Typically, the routine data that a health facility deals with is this kind of aggregated statistics, and is used for the generation of routine reports and indicators, and most importantly, strategic planning within the health system. Aggregate data cannot provide the type of detailed information which patient level data can, but is crucial for planning and guidance of the performance of health systems.

In between the two you have case-based data, or anonymous "patient" data. A lot of details can be collected about a specific health event without necessarily having to identify the patient it involved. Inpatient or outpatient visits, a new case of cholera, a maternal death etc. are common use-cases where one would like to collect a lot more detail that just adding to the total count of cases, or visits. This data is often collected in line-listing type of forms, or in more detailed audit forms. It is different from aggregate data in the sense that it contains many details about a specific event, whereas the aggregate data would count how many events of a certain type, e.g. how many outpatient visits with principal diagnosis "Malaria", or how many maternal deaths where the deceased did not attend ANC, or how many cholera outbreaks for children under 5 years. In DHIS2 this data is collected through programs of the type single event without registration.

Patient data is highly confidential and therefore must be protected so that no one other than doctors can get it. When in paper, it must be properly stored in a secure place. For computers, patient data needs secure systems with passwords, restrained access and audit logs.

Security concerns for aggregated data are not as crucial as for patient data, as it is usually impossible to identify a particular person to a aggregate statistic . However, data can still be misused and misinterpreted by others, and should not be distributed without adequate data dissemination policies in place.

2.6. Free and Open Source Software (FOSS): benefits and challenges

Software carries the instructions that tell a computer how to operate. The human authored and human readable form of those instructions is called source code. Before the computer can actually execute the instructions, the source code must be translated into a machine readable (binary) format, called the object code. All distributed software includes the object code, but FOSS makes the source code available as well.

Proprietary software owners license their copyrighted object code to a user, which allows the user to run the program. FOSS programs, on the other hand, license both the object and the source code, permitting the user to run, modify and possibly redistribute the programs. With

access to the source code, the users have the freedom to run the program for any purpose, redistribute, probe, adapt, learn from, customise the software to suit their needs, and release improvements to the public for the good of the community. Hence, some FOSS is also known as free software, where “free” refers, first and foremost, to the above freedoms rather than in the monetary sense of the word.

Within the public health sector, FOSS can potentially have a range of benefits, including:

- Lower costs as it does not involve paying for prohibitive license costs.
- Given the information needs for the health sector are constantly changing and evolving, there is a need for the user to have the freedom to make the changes as per the user requirements. This is often limited in proprietary systems.
- Access to source code to enable integration and interoperability. In the health sector interoperability between different software applications is becoming increasingly important, meaning enabling two or more systems to communicate metadata and data. This work is a lot easier, and sometimes dependent on the source code being available to the developers that create the integration. This availability is often not possible in the case of proprietary software. And when it is, it comes at a high cost and contractual obligations.
- FOSS applications like DHIS2 typically are supported by a global network of developers, and thus have access to cutting edge research and development knowledge.

Chapter 3. Managing dashboards

3.1. About dashboards

Dashboards are intended to provide quick access to different analytical objects (maps, charts, reports, tables, etc) to an individual user. Dashboards can also be shared with user groups.

Example 3.1.

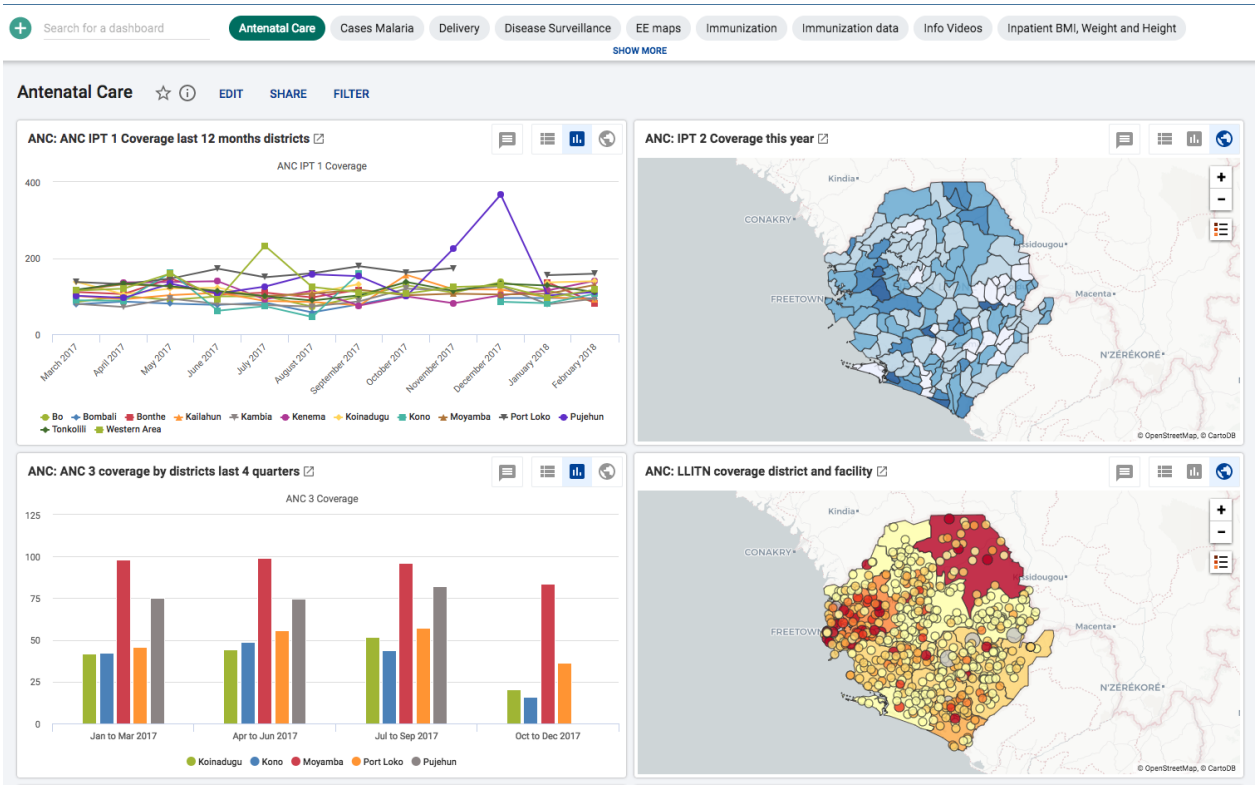
A user or administrator could create a dashboard called "Antenatal care" which might contain all relevant information on antenatal care. This dashboard could then be shared with the user group called "ANC control", which might consist of all users of the ANC control program. All users within this group would then be able to view the same dashboard.

3.2. Dashboard and control bar

Dashboards have a title, description, and any number of dashboard items. The dashboard items can be of many different types, including charts, maps, reports, tables, resources, messages, and text items. Above the dashboard is the control bar, which shows all your available dashboards, including a dashboard search field, and a **+** button for creating a new dashboard.

The dashboard has two modes: view and edit/create. When you first log in to DHIS2, your most recently used dashboard will be displayed in view mode, if you are on the same computer as you were previously. If you are using a different computer, then the first starred dashboard will be displayed. if there are no starred dashboards, then the first dashboard will be displayed. Starred dashboards always show first in the dashboard list.

The screenshot below shows a dashboard called "Antenatal Care", which has been populated with charts and maps.



3.2.1. Searching in the list of dashboards

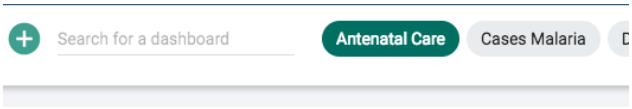
You can search for a specific dashboard using the search field in the upper left of the control bar entitled “Search for a dashboard”. The search is case insensitive, and as you type, the list of dashboards will filter down to those that match your search text.

3.2.2. Customizing the height of the control bar

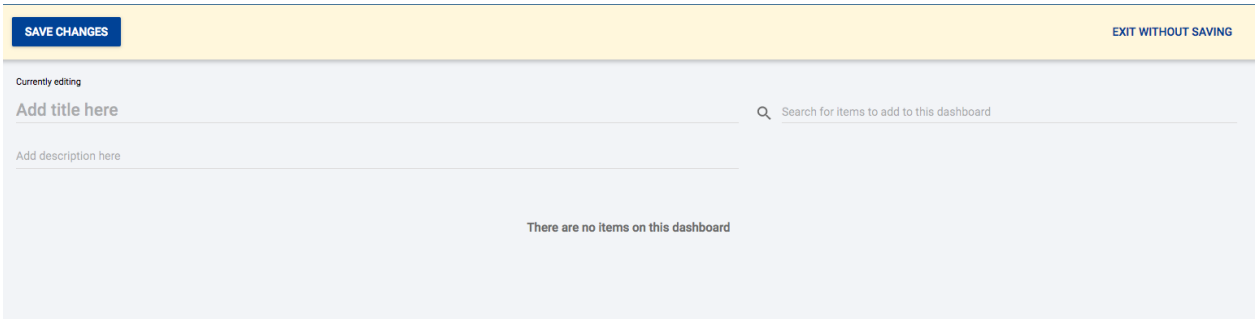
You can set a specific height for the dashboards control bar by down-clicking and dragging the bottom edge of the control bar. When you finish dragging, the new height will be set. Clicking on **SHOW MORE** will expand the control bar to its maximum height (10 "rows"). Clicking on **SHOW LESS** will reset the height to your customized height.

3.3. Creating a dashboard

To create a new dashboard, click the green **+** button in the left corner of the control bar to go into create mode. Add a title in the title field, and optionally a description in the description field.



Create mode:

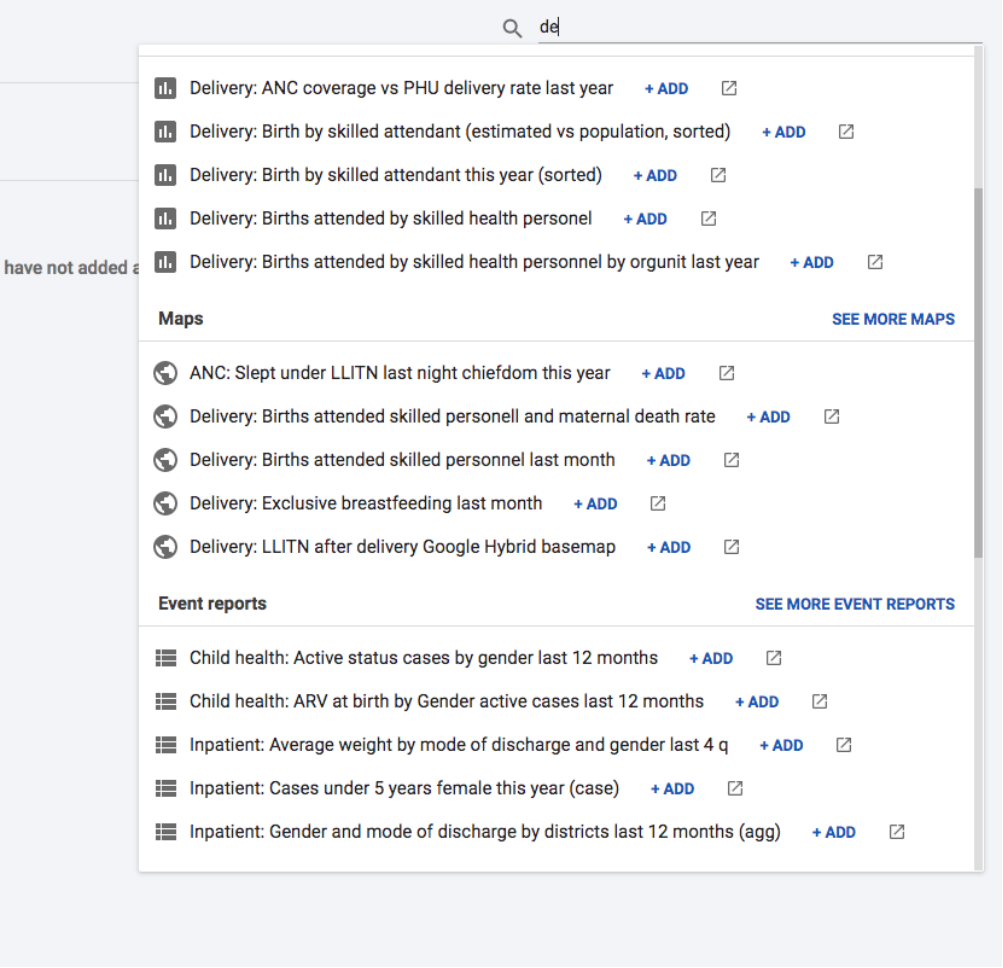


3.3.1. Adding items to the dashboard

Add items to the dashboard by searching from the item selector in the upper right part of the dashboard area. Available items include:

- Pivot tables
- Charts
- Maps
- Event reports
- Event charts
- Report
- Resources
- Apps
- Email
- Text boxes
- Spacer

The list of items in the dropdown initially displays the first 5 available from each category, based on the search text you enter. Email, text boxes and spacer items are also found in the dropdown. To view more items, click on **SEE MORE**, and the list for that type will be extended to 15 items. If you still do not find the item you want, try typing a more specific search text.

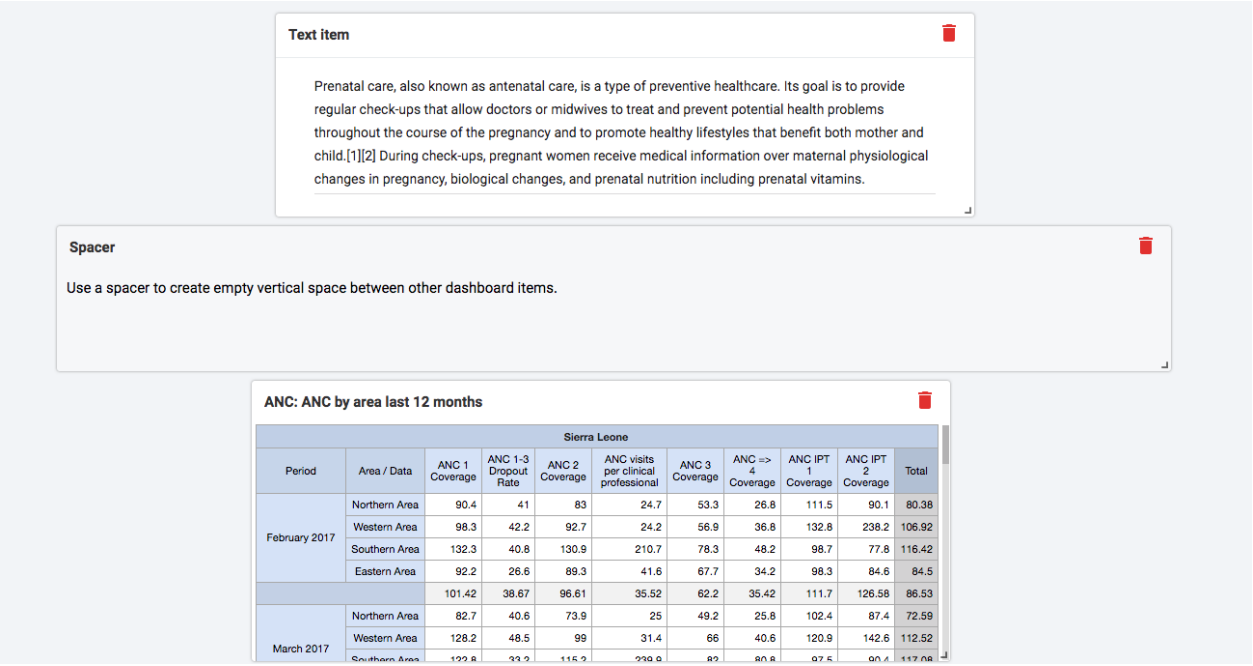


Once you select an item, it will be added to the top left position of the dashboard. The added items can be moved using the mouse by down-clicking on the item and dragging it to the desired position. It can also be resized with the mouse by down-clicking on the drag handle in the lower right corner of the item and dragging to the desired size.

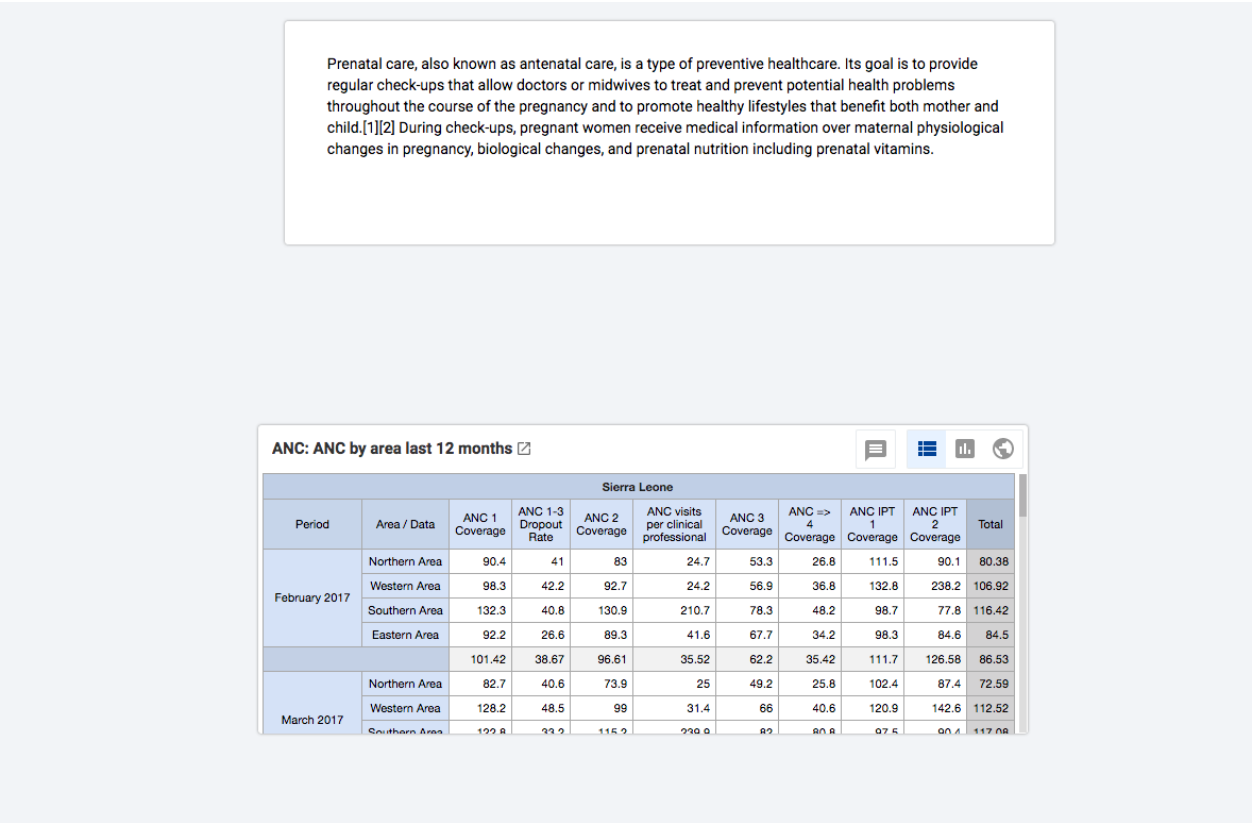
3.3.1.1. Spacer items

The dashboard is configured with the "anti-gravity" setting for positioning items. This means that items will "rise" upwards until they run into another item. In order to force empty vertical space between items (like an empty row), you can add spacer items to the dashboard. They are only visible in edit/create mode. In view mode, they are not displayed, but take up the defined space.

Spacer in edit/create mode:



Spaceer in view mode:



3.3.2. Removing items

Remove items by clicking on the red trash can at the upper right of the item. Be aware that because of the "anti-gravity" setting in the dashboard, when you remove an item, the items that are positioned below the removed item will "rise" upwards.

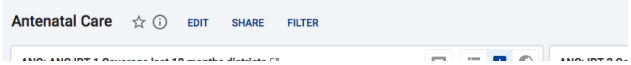
3.3.3. Saving the dashboard

When creating or editing a dashboard, changes are only saved when you click **SAVE CHANGES** button in the dashboard edit bar at the top of the page. If you don't want to save your changes,

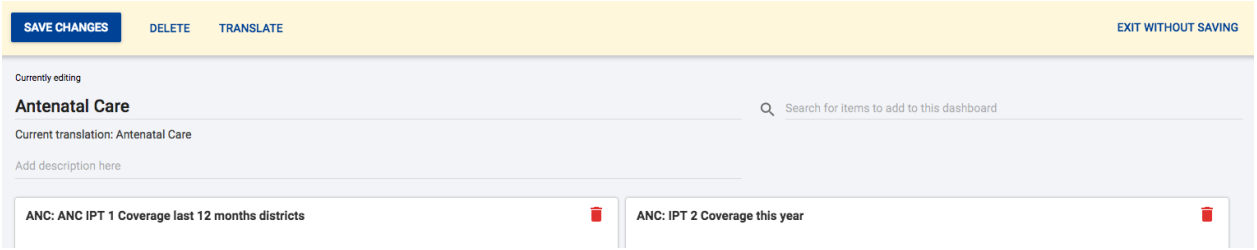
click the **EXIT WITHOUT SAVING** button to the upper right. You will then be returned to view mode with the dashboard you were previously viewing.

3.4. Editing an existing dashboard

If you have access rights to edit the currently active dashboard, there will be an **EDIT** button to the right of the dashboard title in view mode. Click on this button to enter edit mode.

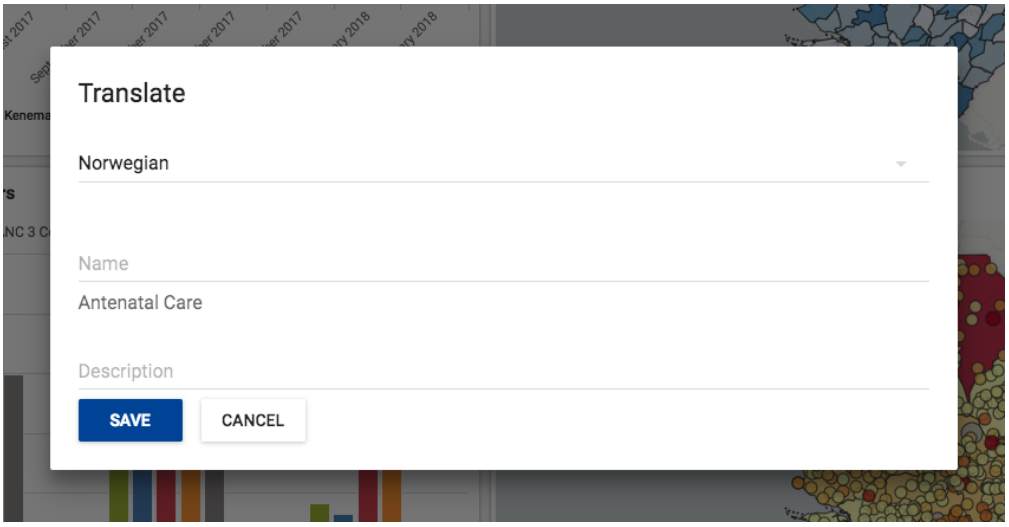


Refer to the above section about creating dashboards for information on adding and removing items to the dashboard.



3.4.1. Translating dashboard title and description

You can add translations for dashboard title and description while in edit mode. The dialog provides a list of languages to translate to, and shows the original dashboard title underneath the name input field.



1. Click on the **TRANSLATE** button located above the dashboard
2. Select the language you wish to add a translation for.
3. Add the title and/or description, and click **SAVE**

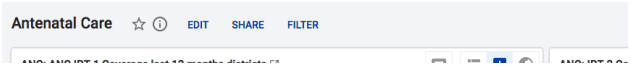
3.4.2. Deleting a dashboard

If you have access to delete the dashboard, then there will be a **DELETE** button located above the dashboard, when in edit mode. A confirmation dialog will first be displayed to confirm that you want to delete the dashboard.

3.5. Viewing a dashboard

When in view mode, you can toggle showing the description, star a dashboard, apply a dashboard filter, and share the dashboard with other users and groups

To view the description, click on the **i** button to the right of the title

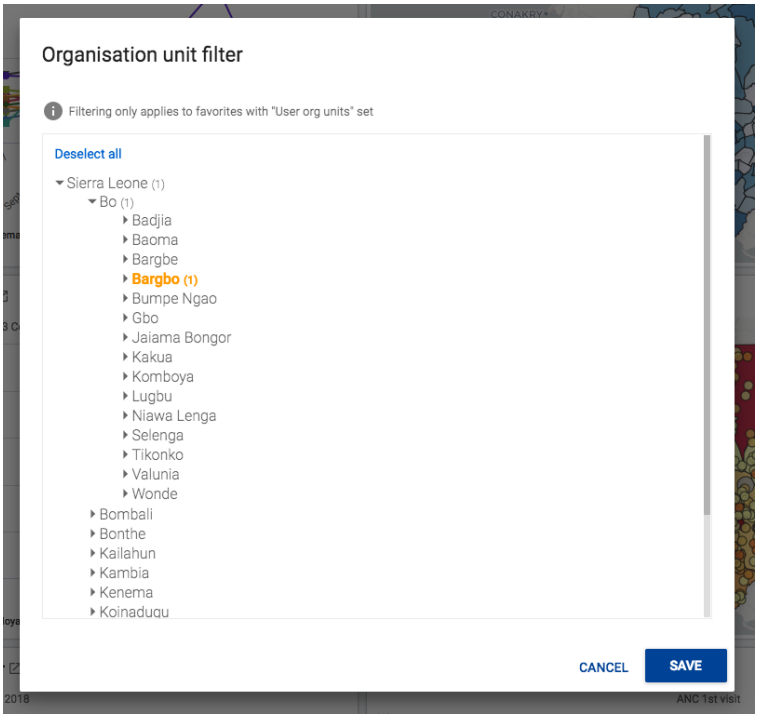


3.5.1. Starred dashboards

Your starred dashboards are listed first in the list of dashboards. To star a dashboard, click on the star button to the right of the title. When the star is “filled”, that means the dashboard is starred. Starring a dashboard only applies to you, not other users.

3.5.2. Filtering a dashboard

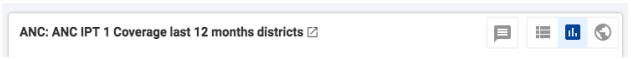
To filter the dashboard by organisation unit, click on the **FILTER** button to the right of the dashboard title. Select the organisation units you want to apply to the dashboard. This only affects you, no other users. The only dashboard items that are impacted by the organisation unit filter are visualization items (pivot table, chart, map) that have their organisation unit configured to "User org unit". If you reload the dashboard, the filter will be cleared.



3.5.3. Dashboard items with charts, pivot tables and maps

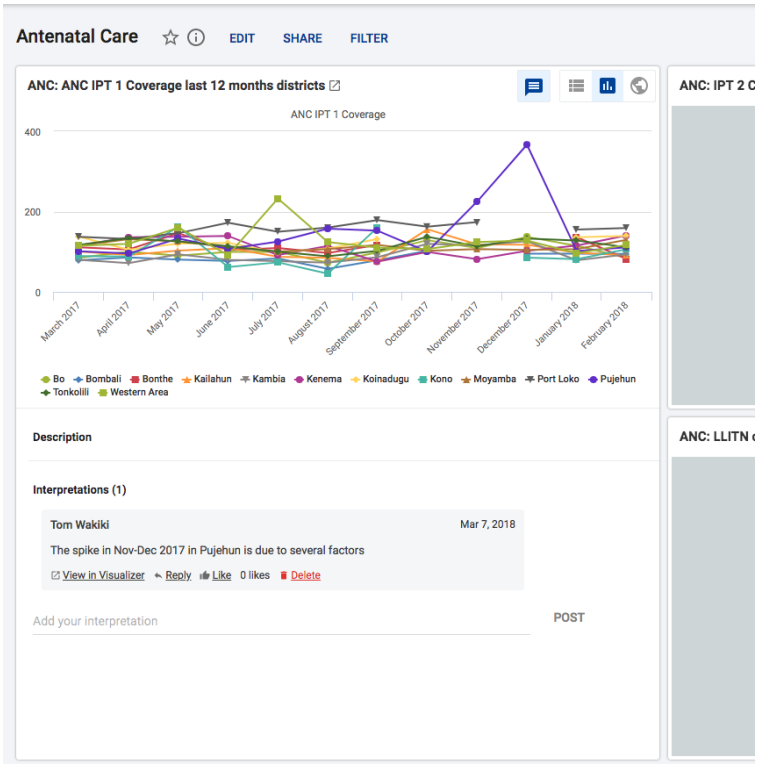
3.5.3.1. Switching between visualizations

Dashboard items showing charts, pivot tables and maps can be toggled between these visualizations. Click on the buttons in the upper right corner of the item to toggle between visualizations.



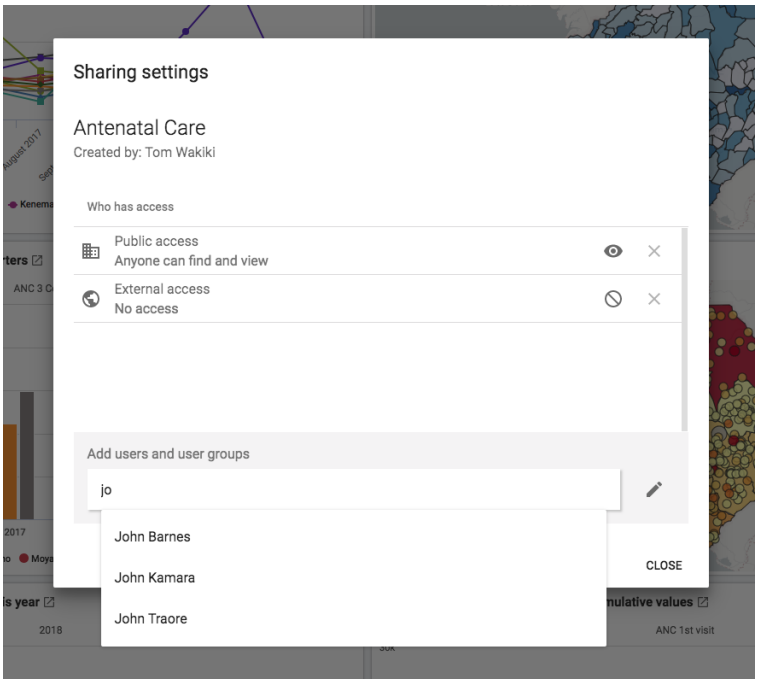
3.5.4. Interpretations

You can write interpretations for the chart, pivot table, map, event report, and event chart items. Click on the interpretations button , and the item will be expanded vertically underneath to show the interpretations and replies. You can like an interpretation, reply to an interpretation, and add your own interpretation. You can delete your own interpretations and replies, and if you have moderator access, you can delete others' interpretations.



3.5.5. Sharing a dashboard

In order to share a dashboard with user groups, click on the **SHARE** button to the right of the dashboard title to display the dashboard sharing settings options. To share the dashboard with specific users or user groups, type in the name in the input field to add them to the dashboard sharing settings



All dashboards have two sharing groups set by default.

- External access (without login)

  This option, when selected, provides access to the dashboard as an external resource. This is useful for when you are creating an external web portal but would like to call information from a dashboard you have made internally within DHIS2. By default, this option is not selected.
- Public access (with login)

  This option allows the selected dashboard to be pushed to all users within your DHIS2 instance. This can also be hidden from public view by selecting the "None" option, which is the default option for new dashboards.

User groups that have been added manually can be assigned two types of permissions within the dashboard

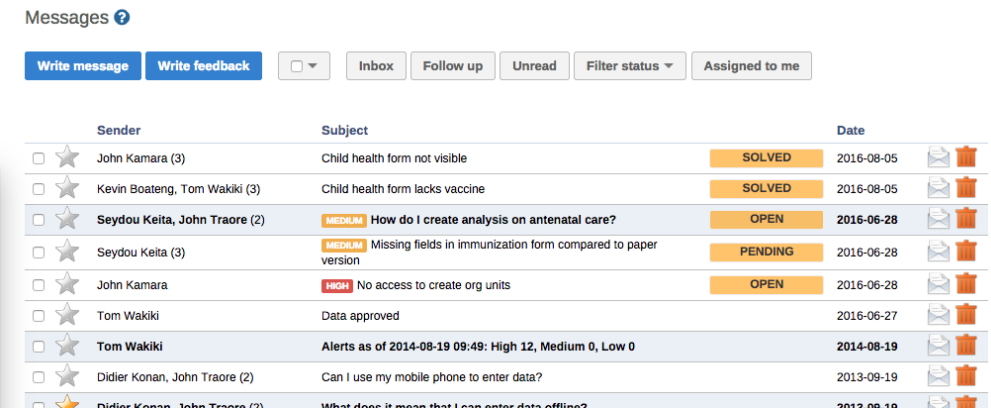
- Can view

  Provides the user group with view only rights to the dashboard.
- Can edit and view

  Allows the user groups to edit the dashboard in addition to viewing it. Editing allows for altering the layout, resizing and removing items, renaming/deleting the dashboard etc.

Chapter 4. Messaging

4.1. About messages and feedback messages



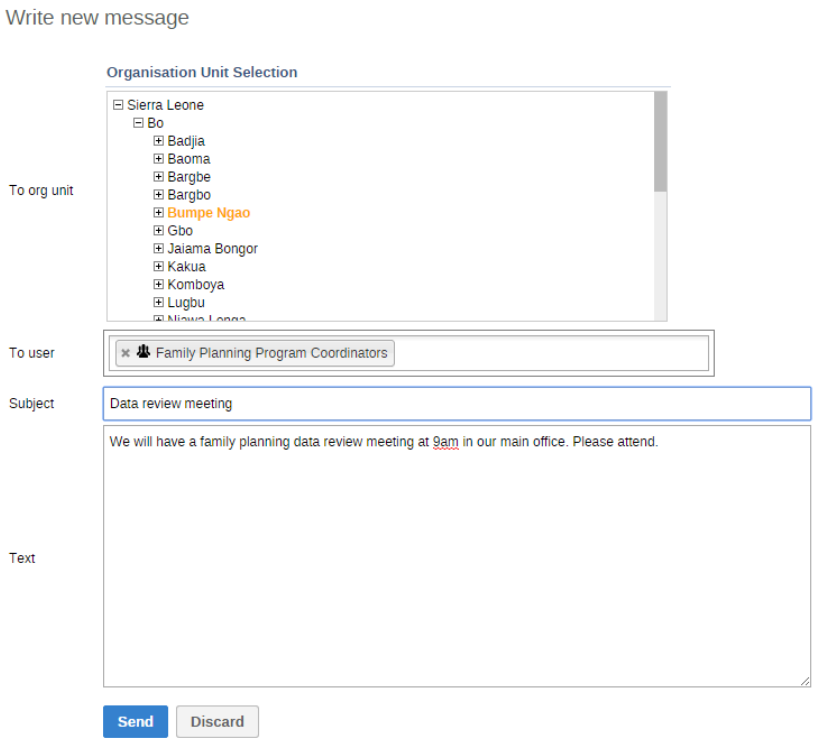
Within DHIS2 you can send messages and feedback messages to users, user groups and organisation units. When you send a feedback message, it is routed to a particular user group. If you're a member of this user group, you've access to feedback handling tools. You can for example set the status of an incoming feedback to "Pending" while you're waiting for information.

In addition to the user-to-user and feedback messages, depending on your configuration the system will also send you system-generated messages. These messages could be triggered by different events, including system or background job failures and validation analysis results. Feedback handling tools are also available for validation results and the priority will be set to the importance of the validation rule violated.

Note

Messages and feedback messages are not sent to users' e-mail addresses, the messages only appear within DHIS2.

4.2. Create a message



1. From the **Dashboard**, click **Messages**.
2. Click **Write message**.
3. Define who you want to receive the message. You can send a message to organisation units, users and user groups.
   - In the **To org unit** field, select the organisation units or group of organisation units you want to send the message to.
   - In the **To user** field, select the users or user groups you want to send the message to.
4. Type a subject and a message.
5. Click **Send**.

4.3. Read a message

1. From the **Dashboard**, click **Messages**.
2. Click a message.

   If the message is part of a conversation, you'll see all messages in this conversation.

4.4. Create a feedback message

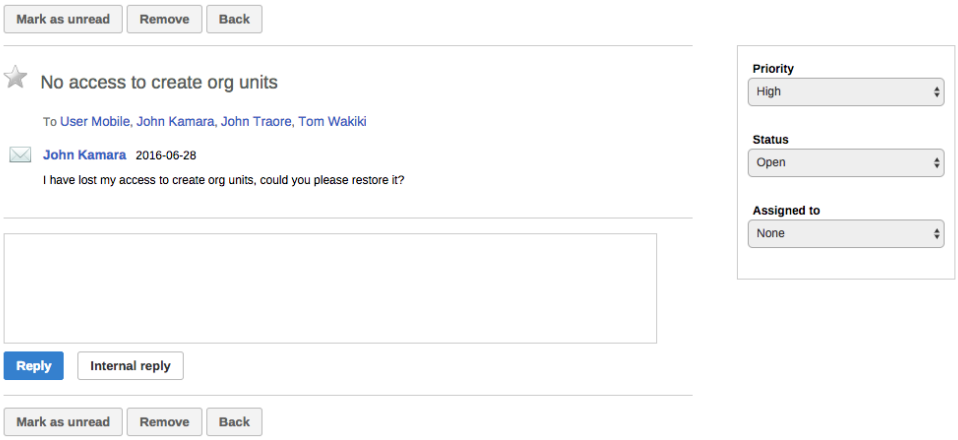
1. From the **Dashboard**, click **Write feedback**.
2. Type a subject and a feedback message.
3. Click **Send**.

   The feedback message will appear in all of the specified users' inboxes.

4.5. Manage feedback messages

Note

You'll only see feedback messages and have access to the feedback handling tools if you are a member of the user group that is set up to handle feedback messages.



You'll receive feedback messages to your **Messages** inbox. For feedback messages you've the following options in addition to the messages options:

Table 4.1. Feedback handling tools

Function	Description
Priority	You can mark a feedback message with different priorities: **None**, **Low**, **Medium** or **High**. Setting the priority makes it easier to keep track of which feedback message you need resolved first, and which feedback messages that can wait.
Status	All feedback messages get the status **Open** when created. To keep track of existing feedback messages, you can change the status to **Pending**, **Invalid** or **Solved**. You can filter feedback messages in your inbox based on their status. This makes it easier to switch between feedback messages and normal messages.

Function	Description
Assigned to	You can assign a feedback message to any member of the user group that is set up to handle feedback messages. **None** means that you haven't assigned a user to the feedback message.
Internal reply	When you work in a feedback handling team you might want to discuss the feedback before sending an answer to the sender. You can keep this discussion in the same message conversation as the feedback itself. To send a reply that within the feedback handling user group, click **Internal reply**.

4.6. Configure feedback message function

To configure the feedback message function, you must:

1. Create a user group (for example "Feedback message recipients") that contains all the users who should receive feedback messages.
2. Open the **System Settings** app and click **General** > **Feedback recipients** and select the user group you created in the previous step.

Chapter 5. Using the Data Entry app

5.1. About the Data Entry app

The **Data Entry** app is where you manually enter aggregated data in DHIS2. You register data for an organisation unit, a period, and a set of data elements (data set) at a time. A data set often corresponds to a paper-based data collection tool. You configure the data sets in the **Maintenance** app.

A data set can have both section and custom forms

If a data set has both a section form and a custom form, the system displays the custom form during data entry. Users who enter data can't select which form they want to use. In web-based data entry the order of display preference is:

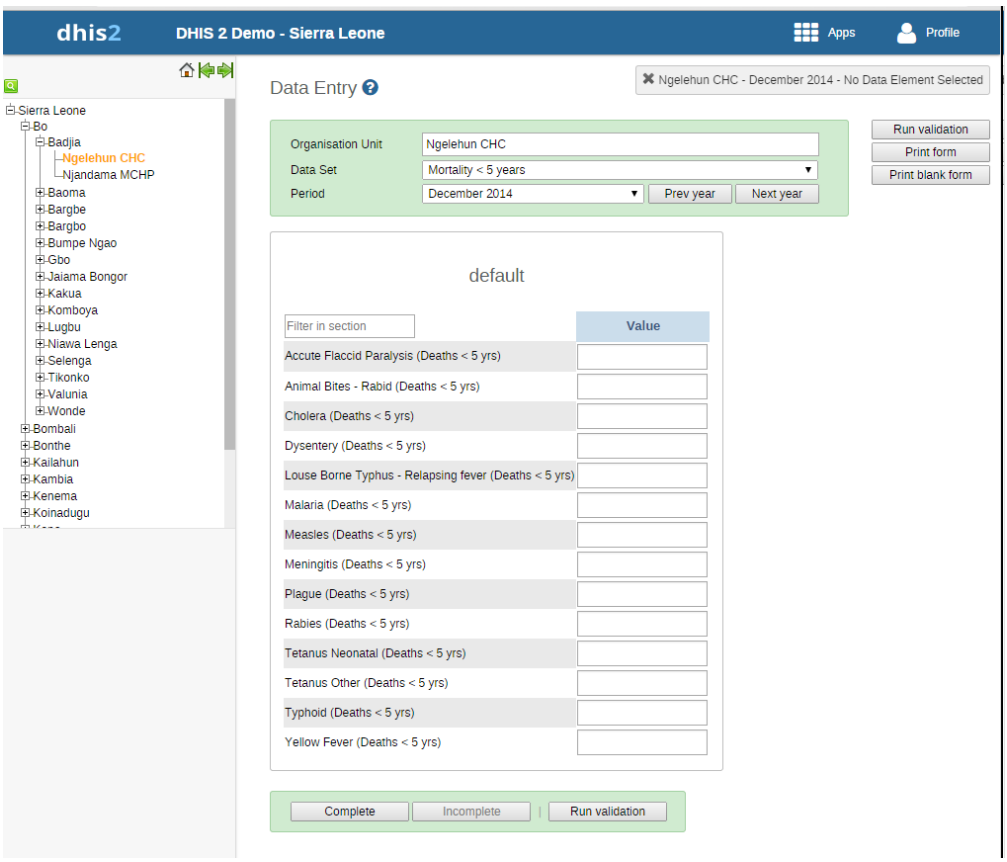
1. Custom form (if it exists)
2. Section form (if it exists)
3. Default form

Mobile devices do not support custom forms. In mobile-based data entry the order of display preference is:

1. Section form (if it exists)
2. Default form

When you close an organisation unit, you can't register or edit data to this organisation unit in the **Data Entry** app.

5.2. Enter data in a data entry form



1. Open the **Data Entry** app.
2. In the organisation unit tree to the left, select an organisation unit.
3. Select a **Data set**.
4. Select a **Period**.

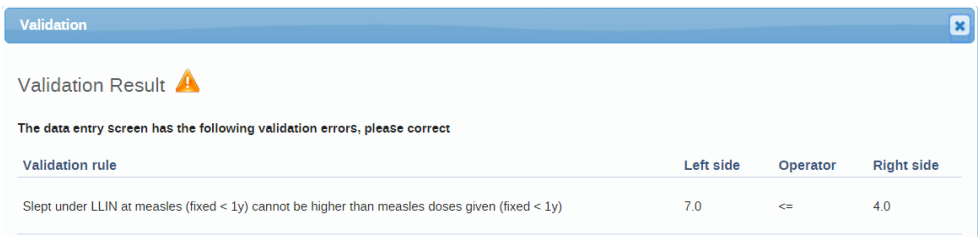
   The available periods are controlled by the period type of the data set (reporting frequency). You can jump a year back or forward by clicking **Prev year** or **Next year**.

   ## Note

   Depending on how you've configured the data entry form, you might have to enter additional information before you can open the date entry form. This can for example be a project derived from a category combination.

5. Enter data in the data entry form.
   - A green field means that the system has saved the value.
   - A grey field means that the field is disabled and you can't enter a value. The cursor will automatically jump to the next open field.
   - To move to the next field, press the Tab key or the Down Arrow key.
   - To move back to the previous field, press Shift+Tab or the Up Arrow key.
   - If you type in an invalid value, for example a character in a field that only accepts numeric values, you'll get a pop-up that explains the problem and the field will be coloured yellow (not saved) until you have corrected the value.
   - If you have defined a minimum maximum value range for the field and you enter a value that is outside this range, you'll get a pop-up message that says the value is out of range. The value remains unsaved until you've changed the value or updated the value range and then re-entered the value.
6. When you've filled in the form, click **Run validation** in the top right corner or below the data entry form.

   All validation rules which involves data elements in the current data entry form (data set) are then run against the new data. If there are no violations of the validation rules, you'll see a message saying *The data entry screen successfully passed validation*. If there are validation violations, they will be presented in a list.



7. (Optional) Correct validation violations.

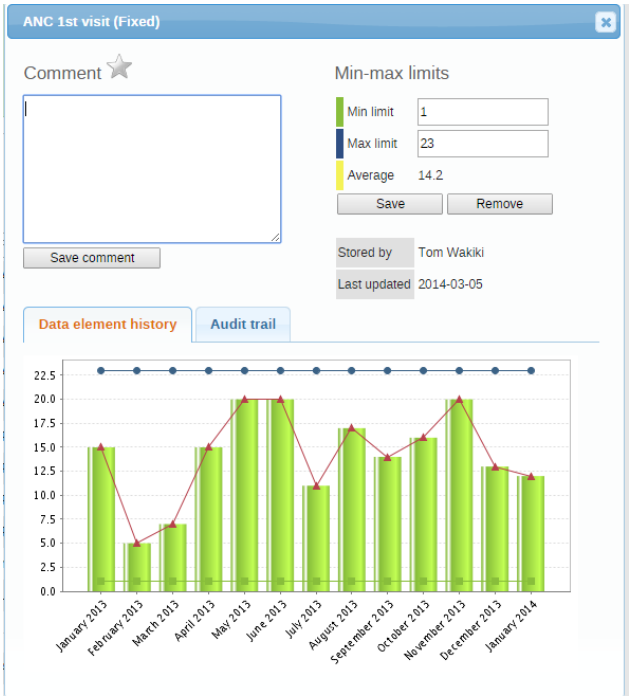
   ## Note

   Zero (0) will delete the value if the data element has been configured to not store zeros.

8. When you've corrected errors and you're done with data entry, click **Complete**.

   The system uses this information when generating completeness reports for district, county, province or the national level.

5.3. Mark a data value for follow-up



If you for example have a suspicious value that you need to investigate further, you can keep it the system, but mark it for follow-up. In the **Data Quality** app you can then run a follow-up analysis to view and correct all marked values.

1. Open the **Data Entry** app.
2. Open an existing data entry form.
3. Double-click the field with the value you want to mark for follow-up.
4. Click the star icon.

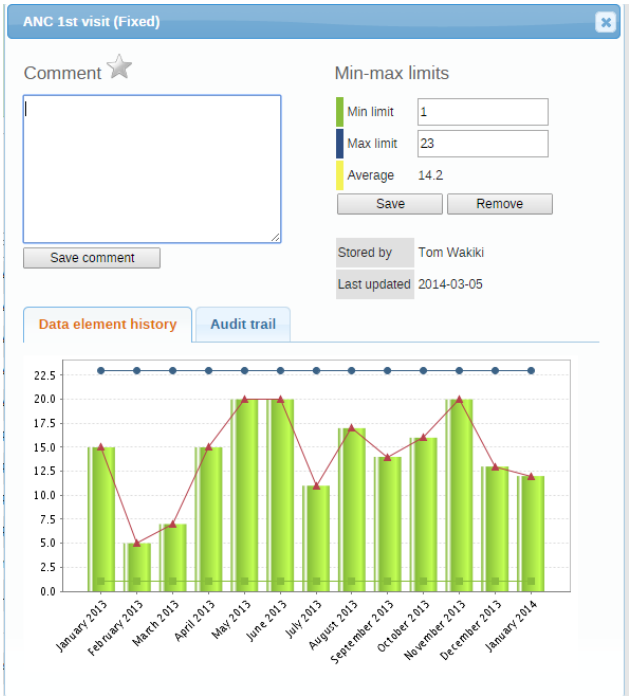
5.4. Edit data values in a completed data entry form

1. Open the **Data Entry** app.
2. Open an existing data entry form.
3. Click **Incomplete**.
4. Change the relevant data values.

> **Note**
>
> Zero (0) will delete the value if the data element has been configured to not store zeros,

5. Click **Complete**.

5.5. Display a data value's history



You can display the last 12 values registered for a field.

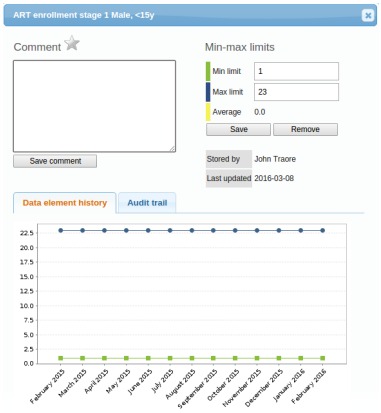
1. Open the **Data Entry** app.
2. Open an existing data entry form.
3. Double-click the field with the value you want to view the history for.
4. Click **Data element history**.

5.6. Display a data value's audit trail

The audit trail allows you to view other data values which have been entered prior to the current value. The audit trail also shows when the data value was altered and which user who made the changes.

1. Open the **Data Entry** app.
2. Open an existing data entry form.
3. Double-click the field with the value you want to view the audit trail for.
4. Click **Audit trail**.

5.7. Create minimum maximum value range manually



1. In the **Data Entry** app, open a data entry form.
2. Double-click the field for which you want to set the minimum maximum value range.
3. Enter **Min limit** and **Max limit**.
4. Click **Save**.

   If values don't fall within the new value range the next time you enter data, the data entry cell will appear with an orange background.
5. (Optional) Type a comment to explain the reason for the discrepancy, for example an event at a facility which may have generated a large number of clients.
6. (Optional) Click **Save comment**.

Tip

Click the star icon to mark the value for further follow-up.

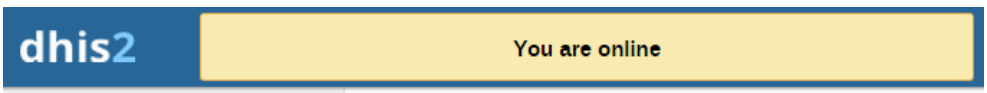
5.8. Enter data offline

The **Data Entry** app works even if you don't have a stable Internet connection during data entry. When you don't have an internet connection, the data you enter is saved to your local computer. When the Internet connection is back, the app will push the data to the server. The total bandwidth usage is reduced since data entry forms no longer are retrieved from the server for each rendering.

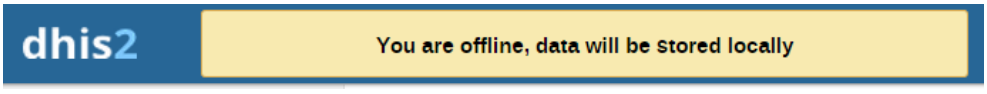
Note

To use this functionality, you must login to the server while you've an Internet connection.

- When you're connected to the Internet, the app displays this message at the top of the data entry form:

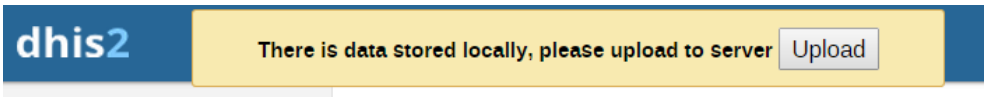


- If your Internet connection breaks during data entry, the app detects it and displays this message:



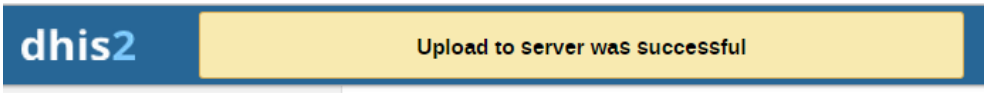
Now your data will be stored locally. You can continue to enter data as normal.

- Once you have entered all necessary data and the app detects that the Internet connection is back, you'll see this message:

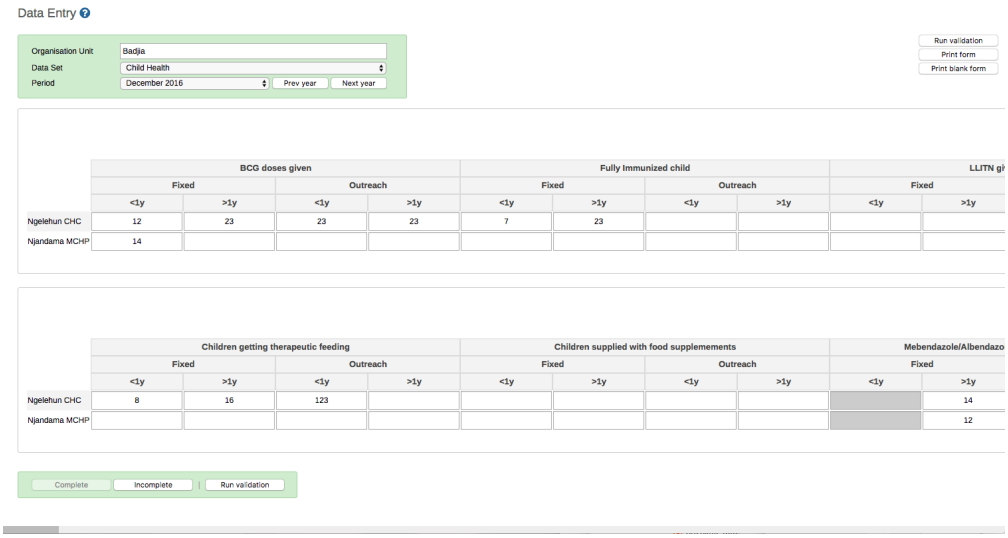


Click **Upload** to synchronize data with the server.

- When the data has successfully synchronized with the server, you'll see this confirmation message:



5.9. Enable multi-organisation unit data entry



It can be useful to enter data for multiple organisation units in the same data entry form, for instance if there are few data elements in the form and a huge number of organisation units in the hierarchy. In that case, you can enable multi-organisation unit data entry.

Note

Multi-organisation unit data entry only works for section forms.

1. Open the **System Settings** app.
2. Select **Enable multi-organisation unit forms**.
3. In the **Data Entry** app, select the organisation unit immediately above the organisation unit you want to enter data for in the organisation unit hierarchy.

   Data elements will appear as columns and organisation units as rows in the form.

Note

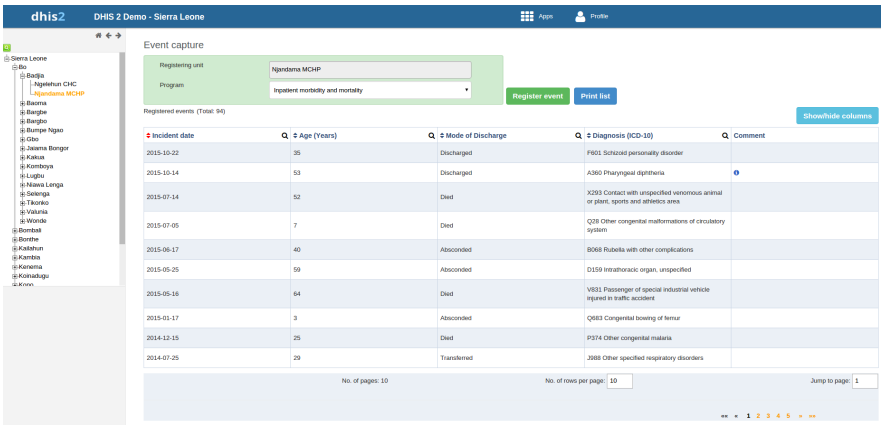
The data entry forms should still be assigned to the facilities that you actually enter data for, that is the organisation units now appearing in the form.

5.10. See also

- Control data quality
- Manage data sets and data entry forms
- Using the Maintenance app

Chapter 6. Using the Event Capture app

6.1. About the Event Capture app



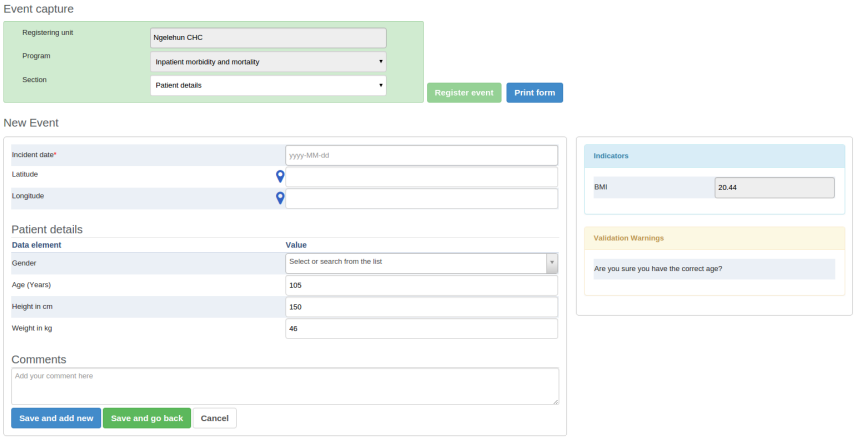
In the **Event Capture** app you register events that occurred at a particular time and place. An event can happen at any given point in time. This stands in contrast to routine data, which can be captured for predefined, regular intervals. Events are sometimes called cases or records. In DHIS2, events are linked to a program. The **Event Capture** app lets you select the organisation unit and program and specify a date when a event happened, before entering information for the event.

The **Event Capture** app works online and offline. If the Internet connectivity drops, you can continue to capture events. The events will be stored locally in your web browser (client). When connectivity has returned, the system will ask you to upload the locally stored data. The system then sends the data to the server where the data is stored.

Note

If you close the web browser while in offline mode, it is not possible to reopen a new web browser window and continue the working session. However the data will still be saved locally and can be uploaded to the server the next time the machine is online and the you have logged into the server.

- You only see programs associated with the organisation unit you've selected and programs you've access to view through your user role.
- Both skip-logic and validation error/warning messages are supported during registration.
- When you close an organisation unit, you can't register or edit events to this organisation unit in the **Event Capture** app. You can still view and filter the event list and view the details of an event.
- On-the-fly indicator expression evaluation is supported. If a program has indicators defined for it and the moment all values related to the indicator expression are filled, the system will calculate indicator and display the result.



- **Sorting:** this can be done by clicking the sorting icon of each column header. A red sorting icon implies the current sorting column. However, the sorting functionality works only within the page displayed. Currently, it is not possible to do sorting from serverside.
- **Filtering:** this is done by clicking the small search icon shown to the right of each column header. Clicking them provides an input field to type a filtering criteria. The system starts applying the filter the moment a user starts to type. During filtering it is possible to define start and end dates for date type data elements and lower and upper limits for number types. Server side filtering is not-support at the moment.

6.2. Register an event

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   You'll only see programs associated with the selected organisation unit and programs you've access to through your user role.
4. Click **Register event**.
5. Select a date.
6. Fill in the required information.

   If the program's program stage is configured to capture GPS coordinate, you can enter the coordinates in two ways:

   - Enter values directly in corresponding fields.
   - Choose a location in a map. The map option also displays polygons and points that are defined for organisation units.
7. Click **Save and add new** or **Save and go back**.

6.3. Edit an event

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click the event you want to modify and select **Edit**.

5. Modify the event details and click **Update**.

6.4. Edit events in grid

The **Edit in grid** function allows you to edit a selected event within the table but only those columns (data elements) visible in the grid. If you need more columns, use **Show/hide columns** to specify which columns should be displayed in the list.

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click the event you want to modify and select **Edit in grid**.
5. Modify the event details.
6. Click on another event to close the edit mode.

6.5. Share events in edit mode

You can share an event in edit mode via its web address.

1. Open the **Event Capture** app.
2. Open the event you want to share in edit mode.
3. Copy the URL.

   Make sure that the URL contains "event" and "ou" (organisation unit) parameters.
4. Paste the URL in the sharing method of your choice, for example an e-mail or a message within DHIS2.

   If you're not logged in to DHIS2 when you click the link, you'll be asked to do so and then taken to the dashboard.

6.6. View an event audit history

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click an event and select **Audit history**.

6.7. Delete an event

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click an event and select **Remove**.
5. Click **Remove** to cocnfirm the deletion.

6.8. Modify an event list's layout

You can select which columns to show or hide in an event list. This can be useful for example when you have a long list of data elements assigned to a program stage. Once you've modified the layout, it's saved on your user profile. You can have different layouts for different programs.

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click the **Show/hide columns** icon.
5. Select the columns you want to display and click **Close**.

6.9. Print an event list

1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click **Print list**.

6.10. Download an event list

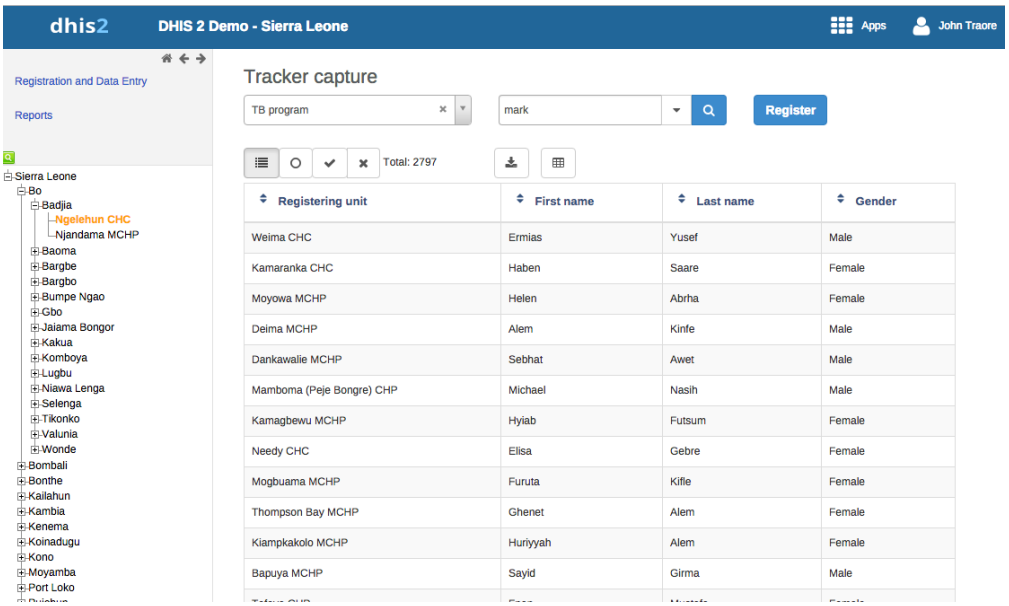
1. Open the **Event Capture** app.
2. Select an organisation unit.
3. Select a program.

   All events registered to the selected program show up in a list.
4. Click the **Downlad** icon and select a format.

   You can download an event list in XML, JSON or CSV formats.

Chapter 7. Using the Tracker Capture app

7.1. About the Tracker Capture app

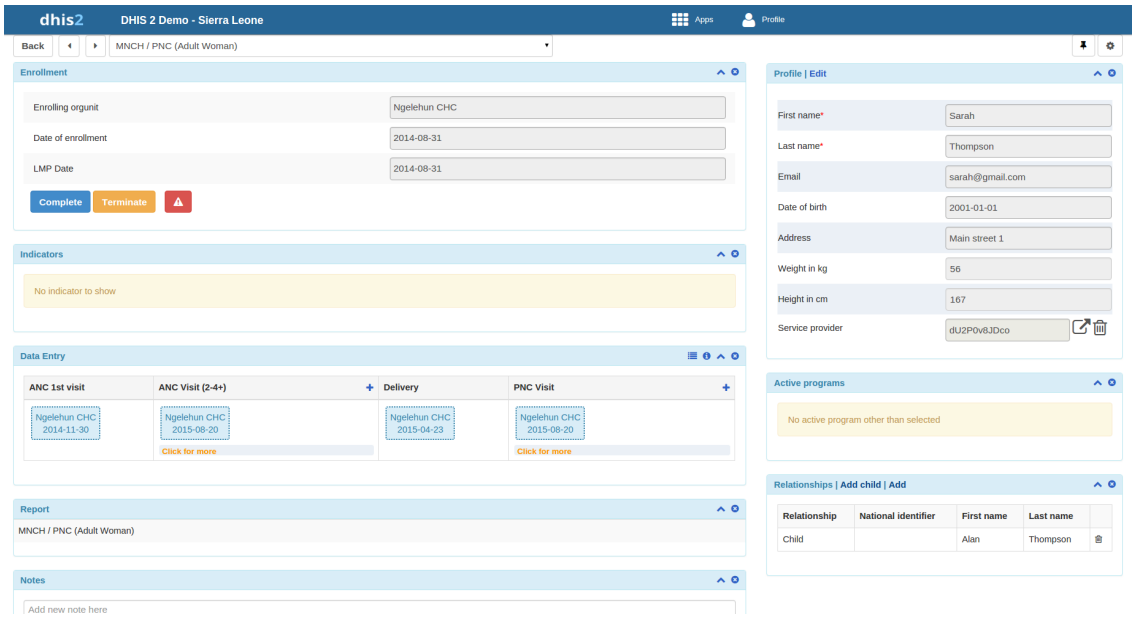


The **Tracker Capture** app is an advanced version of the **Event Capture** app.

- **Event Capture**: handles single events *without* registration
- **Tracker Capture**: handles multiple events (including single event) *with* registration.
- You capture event data for a registered tracked entity instance (TEI).
- You only see programs associated with the organisation unit you've selected and programs you've access to view through your user role.
- The options you see in the search and register functions depend on the program you've selected. The program attributes control these options. The attributes also decide the columns names in the TEI list.

  If you don't select a program, the system picks default attributes.
- Both skip-logic and validation error/warning messages are supported during registration.
- When you close an organisation unit, you can't register or edit events to this organisation unit in the **Tracker Capture** app. You can still search for TEIs and filter the search results. You can also view the dashboard of a particular TEI.

7.2. About tracked entity instance (TEI) dashboards



You manage a TEI from the TEI's dashboard in the **Tracker Capture** app.

- The dashboard consist of widgets. Drag and drop the widgets to place them in the order and in the position you want.
- Click the pin icon to stick the right column of widgets to a fix position. This is useful especially during data entry.

  Example 7.1.

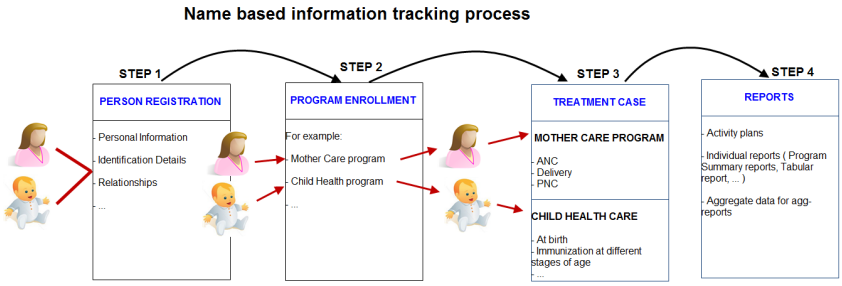
  If you have many data elements or big form to fill in, stick the right widget column. Then all the widgets you've placed in the right column remain visible while you scroll in the data entry part.

- Any indicator defined for the program you've selected will have its value calculated and displayed in the **Indicators** widget.
- Navigation:
  - **Back**: takes you back to the search and registration page
  - Previous and next buttons: takes you to the previous or next TEI dashboard in the TEI search results list
  - **Other programs** field: if the TEI is enrolled in other programs, they're listed here. Click a program to change the program for which you enter data for the selected TEI. When you change programs, the content in the widgets change too.

7.3. Workflow

Example 7.2.

Working process of Mother and child health program



1. Create new or find existing TEI.

   You can search on defined attributes, for example name or address.

2. Enroll TEI in a program.

3. Based on the services of the program by the time, the app creates an activity plan for the TEI.

4. The TEI is provided with various services depending on the program. All services are recorded.

5. Use information about the individual cases to create reports.

7.4. Create a TEI and enroll it in a program

You can create a TEI and enroll that TEI to a program in one operation:

1. Open the **Tracker Capture** app.

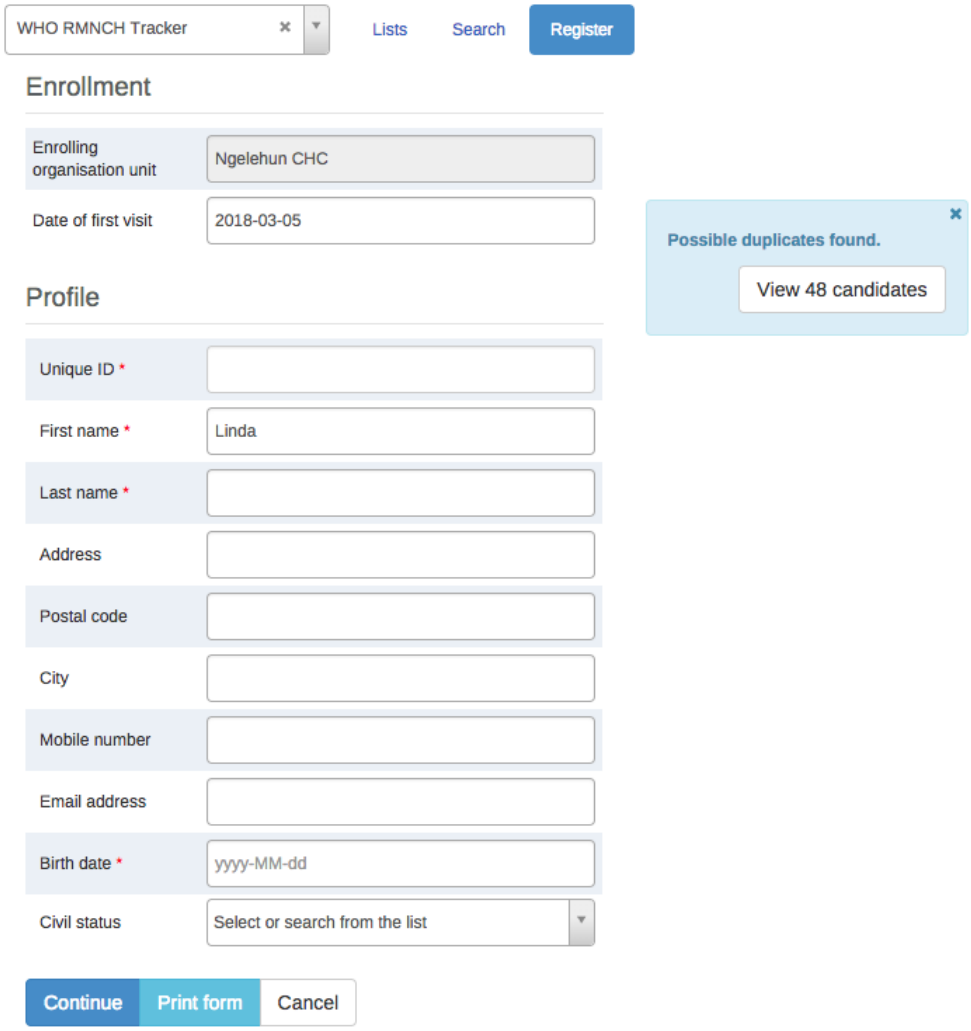
2. In the organisation unit tree in the left hand pane, select an organisation unit.

3. Select a program.

4. Click **Register**.

5. Fill in the required information.

6. If searching for program is configured, a background search will be performed on searchable fields to help you prevent registering duplicates. If there is any matching TEIs, a blue box will be displayed on the right side of the form with the possibility to view these matching TEIs.



If there is any matching TEIs, click **Continue** to review possible duplicates before registering a new one.

If there is no matching TEIs, click **Save and continue** or **Save and add new**

- **Save and continue**: completes the registration and opens the registered TEI's dashboard
- **Save and add new**: completes the registration but stays on the same page. Use this option when you want to register and enroll one TEI after another without enter data.

(img integrated search)

7.5. Open an existing TEI dashboard

There are multiple ways to find a TEI: Using the "Lists" which is predefined lists in the current selection, or "Search" for global lookup.

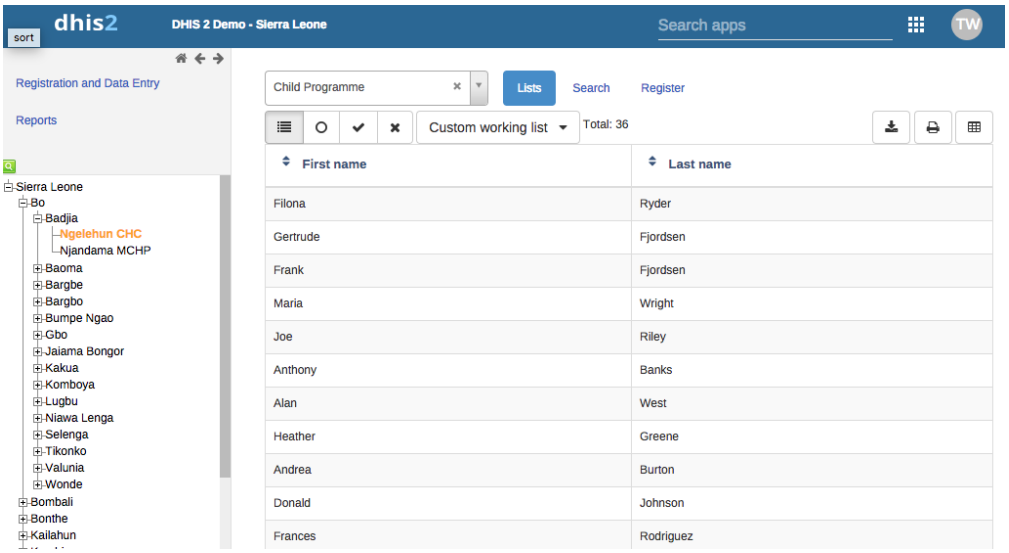
7.5.1. Lists

Lists is used to find and display TEIs in the selected organisation unit and program.

1. Open Tracked Capture app
2. In the organisation unit tree in the left hand pane, select an organisation unit
3. Select a program
4. Click the "Lists" button if not already selected

If not configured, a set of predefined lists will be available:

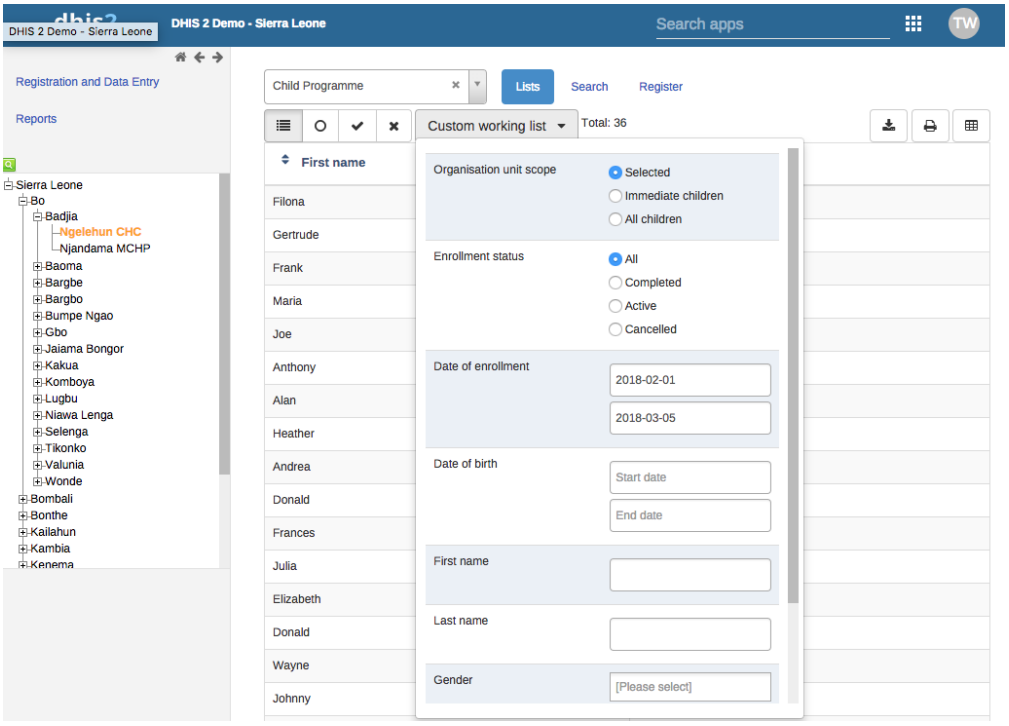
1. Any TEI with any enrollment status
2. TEIs with an active enrollment of the current program
3. TEIs with a completed enrollment of the current program
4. TEIs with a cancelled enrollment of the current program



You can select which columns to show or hide in the lists for each program. This will be saved in your user settings.

1. Click the **grid** icon button
2. Check the columns you want to include
3. Click **Save**

There is also an option to create a custom working list with own filters. This can be used to create custom lists on the fly.



Lists can also be downloaded or printed.

7.5.2. Search

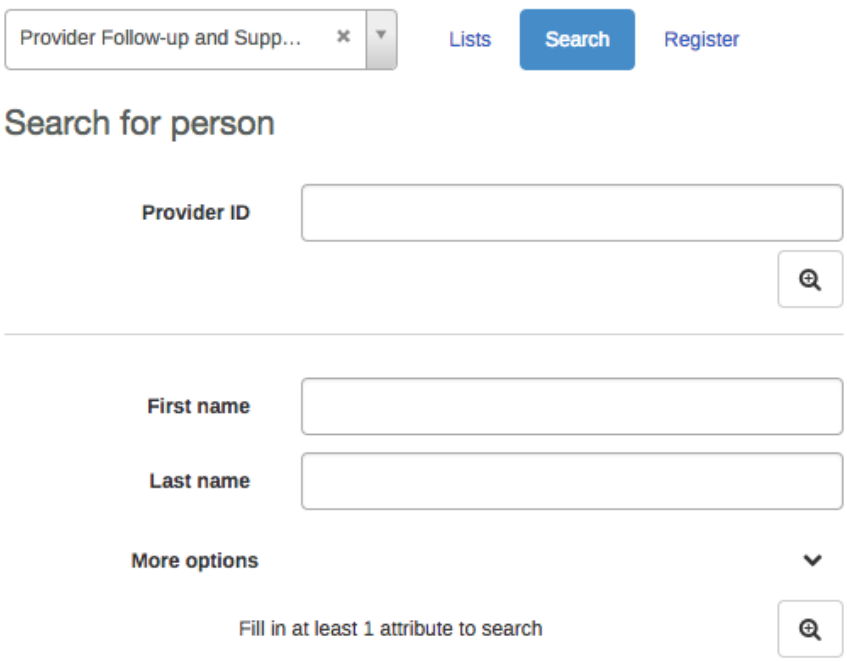
Search is used to search for TEIs in the organisation units the user has search access to. This can be used if you want to find a TEI, but you dont know which organisation unit or program the TEI was enrolled in. There are two ways of doing this: With and without a program context. Searchable fields needs to be configured. For configuring searching with program context, this is done individually for each program in the program maintenance app. For configuring searching without a program context, this is done individually for each tracked entity type in the tracked entity type maintenance app.

Searching without a program context:

1. Open **Tracker Capture app**
2. Click the **Search** button
3. Searchable fields will be displayed in groups. Unique attributes is only individually searchable. Non-unique attributes can be combined.
4. Fill in search criteria and click the **search** icon button.

Searching with a program context:

1. Open **Tracker Capture app**
2. Select an organisation unit which has the program you wish to search in
3. Select the program
4. Click the **Search** button
5. Searchable fields will be displayed in groups. Unique attributes is only individually searchable. Non-unique attributes can be combined.
6. Fill in search criteria and click the **search** icon button



After the search has been done, you will be presented with the search result. Whats displayed depends on the outcome of the search.

For unique attribute search:

- If no matching TEI found, you will get the possibility to open the registration form.
- If the TEI was found in the selected organisation unit, the TEI dashboard will automatically open.
- If the TEI was found in outside the selected organisation unit, you will get the possibility to open the TEI.

For non-unique attributes search:

- If no matching TEI's found, you will get the possibility to open the registration form.
- If matching TEI's found, you can either click on any TEI in the result list, or open the registration form.
- If a too large number of matches was found, you will be prompted to refine your search criteria

When choosing to open the registration form, the search values will automatically be filled into the registration form.

7.6. Enroll an existing TEI in a program

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. Select a program.
4. In the **Enrollment** widget, click **Add new**.
5. Fill in the required information and click **Enroll**.

7.7. Enter event data for a TEI

7.7.1. Widgets for data entry

In a TEI dashboard, you enter event data in the **Timeline Data entry** or **Tabular data entry** widgets.

Table 7.1. Data entry widgets in the Tracker Capture app

Widget name	Description
Timeline Data entry	For data entry using either default or custom forms. Depending on program definition, in particular program stages, events will be displayed in a timely fashion. Clicking on any of them displays the corresponding data entry. If a stage needs new event, a plus icon is displayed for new event creation. To proceed with data entry, it is mandatory to have event date. Once an event date is specified it is not possible to change due date. The assumption is that by specifying event date, the event has already taken place. If the event hasn't occurred yet, it is possible to change due date - this is

Widget name	Description
	effectively doing nothing but rescheduling. The buttons at the bottom help to change the status of a selected event. Another key feature from this widget is addition of multiple notes for an event. Normally data recording is through data elements, however there are cases where it is necessary to record additional information or comments. This is where the notes section comes handy. However it is not possible to delete a note. The idea is notes are more like log books. Both skip-logic and validation error/warning messages are supported during data entry. Also included in the Timeline Data entry is the option to compare your data entry to previous entries. This can be enabled by clicking the "Switch to compare form" button (Two sheets of paper) in the top right corner of the Timeline Data entry widget.
Tabular data entry	For tabular-style data entry. The widget displays the list of program stages as left-hand side labels. Events will be listed in table for repeatable program stage, and allows for in-line edits of event data values.

7.7.2. Creating an event

You can create an event for a TEI by:

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Timeline Data entry** or **Tabular data entry** widget, click the **+**-button.
4. Select a **Programstage** and set a **Report date**.
5. Click **Save**.

7.7.3. Schedule an event

You can shedule an event for a future date by:

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Timeline Data entry** or **Tabular data entry** widget, click the **Calendar** icon.
4. Select a **Programstage** and set a **Schedule date**.
5. Click **Save**.

7.7.4. Refer an event

Sometimes it might be nessascary to refer a patient to a different **Organisation unit**. To refer a TEI:

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Timeline Data entry** or **Tabular data entry** widget, click the **Arrow** icon.

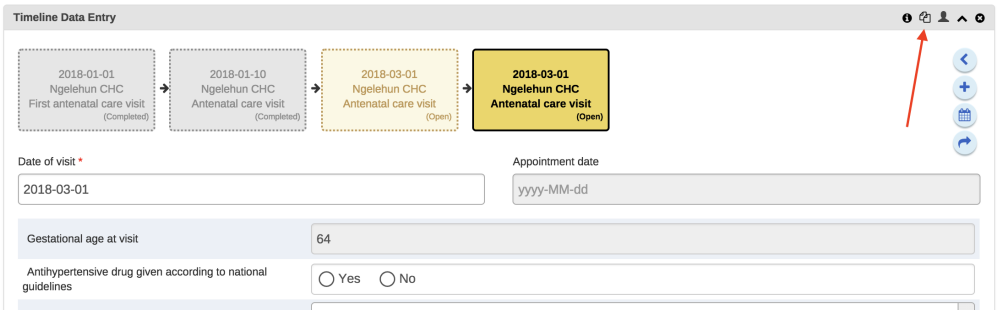
4. Select a **Programstage**, **Organisation unit** and set a **Report date**.
5. Click either **One-time referral** which will only refer TEI for one single event or **Move permanently** which will move TEI and all its future events permantly to the selected **Organisation Unit**.

7.7.5. Compare events

Sometimes it can be helpful to see data from previous events when entering data for a new event. This can be achived by:

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Timeline Data entry** widget, click the **two pages** icon (as seen in the image below).

> **Note**
>
> *Note that this will only work for events that are repeatable.*



7.8. Manage a TEI's enrollments

7.8.1. Deactivate a TEI's enrollment

If you deactivate a TEI dashboard, the TEI becomes 'read-only'. You can't enter data, enroll the TEI or edit the TEI's profile.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Enrollment** widget, click **Deactivate**.
4. Click **Yes** to confirm.

7.8.2. Activate a TEI's enrollment

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Enrollment** widget, click **Activate**.
4. Click **Yes** to confirm.

7.8.3. Mark TEI's enrollment as complete

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Enrollment** widget, click **Complete**.

4. Click **Yes** to confirm.

7.8.4. Reopen completed enrollment

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Enrollment** widget, click **Reopen**.
4. Click **Yes** to confirm.

7.8.5. Display TEI's enrollment history

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Profile** widget, click the **Audit history** icon.

7.8.6. Create a TEI enrollment note

An enrollment note is useful to record information about for example why an enrollment was cancelled.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Notes** widget, type your note and click **Add**.

7.9. Send a message to a TEI

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Messaging** widget and select **SMS** or **E-mail**.
4. Enter the required contact information.

   If the TEI's profile contains an e-mail address or a phone number, these fields are filled in automatically.
5. Type a message.
6. Click **Send**.

7.10. Mark a TEI for follow-up

You can use mark a TEI's enrollment for follow-up and then use this status as a filter when you create **Upcoming events** and **Overdue events** reports. This can be useful for example to monitor high-risk cases during a pregnancy program.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Enrollment** widget, click the **Mark for follow-up** icon.

7.11. Edit a TEI's profile

You edit a TEI's profile or tracked entity attributes in the **Profile** widget.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Profile** widget, click **Edit**.
4. Modify the profile and click **Save**.

7.12. Add a relationship to a TEI

You can create a relationship from one TEI to another, for example linking a mother and a child together or a husband and a wife. Depending on how the relationship type is configured, the relative can inherit attributes.

Example 7.3. Mother-Child relationship

Assume there are two programs: Antenatal care for the mother and Immunization for the child. If first name, last name and address attributes are required for both programs, it is possible to configure last name and address attributes as inheritable. Then during child registration, there is no need to enter these inheritable attributes. You can add them automatically based on the mother's value. If you want to have a different value for the child, you can override the automatically generated value.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the **Relationships** widget, and click **Add**.
4. Select a relationship type.
5. Search for the relative and select it.
6. Click **Save**.

7.13. Share a TEI dashboard

You can share a TEI dashboard via its web address.

1. Open the **Tracker Capture** app.
2. Open the dashboard you want to share.
3. Copy the URL.

   Make sure that the URL contains "tei", "program" and "ou" (organisation unit) parameters.
4. Paste the URL in the sharing method of your choice, for example an e-mail or a message within DHIS2.

   If you're not logged in to DHIS2 when you click the link, you'll be asked to do so and then taken to the dashboard.

7.14. Deactivate a TEI

If you deactivate a TEI, the TEI becomes 'read-only'. Data associated with the TEI is not deleted.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the top right corner, click the button > **Deactivate**.

4. Click **Yes** to confirm.

7.15. Activate a TEI

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the upper top corner, click the button > **Activate**.
4. Click **Yes** to confirm.

7.16. Delete a TEI

Warning

When you delete a TEI, you delete all data associated with the TEI.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. In the top right corner, click the button > **Delete**.
4. Click **Yes** to confirm.

7.17. Configure the TEI dashboard

7.17.1. Show or hide widgets

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. Click the **Settings** icon, and select **Show/hide widgets**.
4. Select the widgets you want to show or hide.
5. Click **Close**.

7.17.2. Save the dashboard's layout as default

You can save the dashboard's layout as default for a program.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. Click the **Settings** icon, and select **Save dashboard layout as default**.

7.17.3. Lock dashboard's layout

If you are the **administrator** you have the option of locking the layout of the dashboard for all users.

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. Organize the widgets to the desired layout and save it as default (see section above).

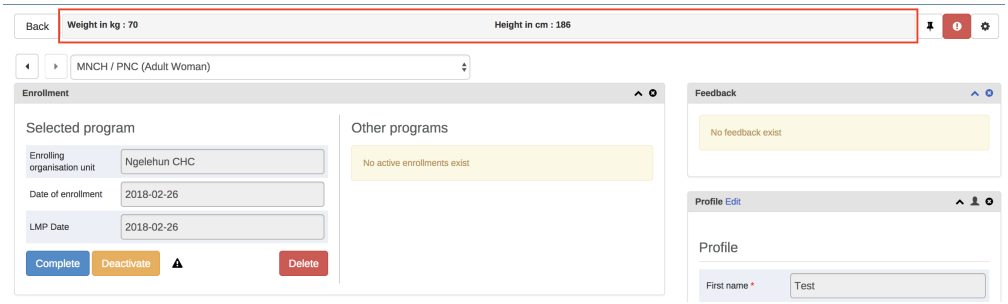
4. Click the **Settings** icon, and select **Lock layout for all users**.

Users will still be able to reorganize the widgets temporarily, but the layout will be reset to the admin's saved layout after page refresh. The remove widget buttons will be hidden when the dashboard layout is locked.

7.17.4. Top bar

The top bar can be a helpful tool to see important data in a quick and easy way. To start using the top bar:

1. Open the **Tracker Capture** app.
2. Open an existing TEI dashboard.
3. Click the **Settings** icon, and select **Top bar settings**.
4. Click **Activate top bar** and click the data you would like to display in the top bar.



7.18. Create reports

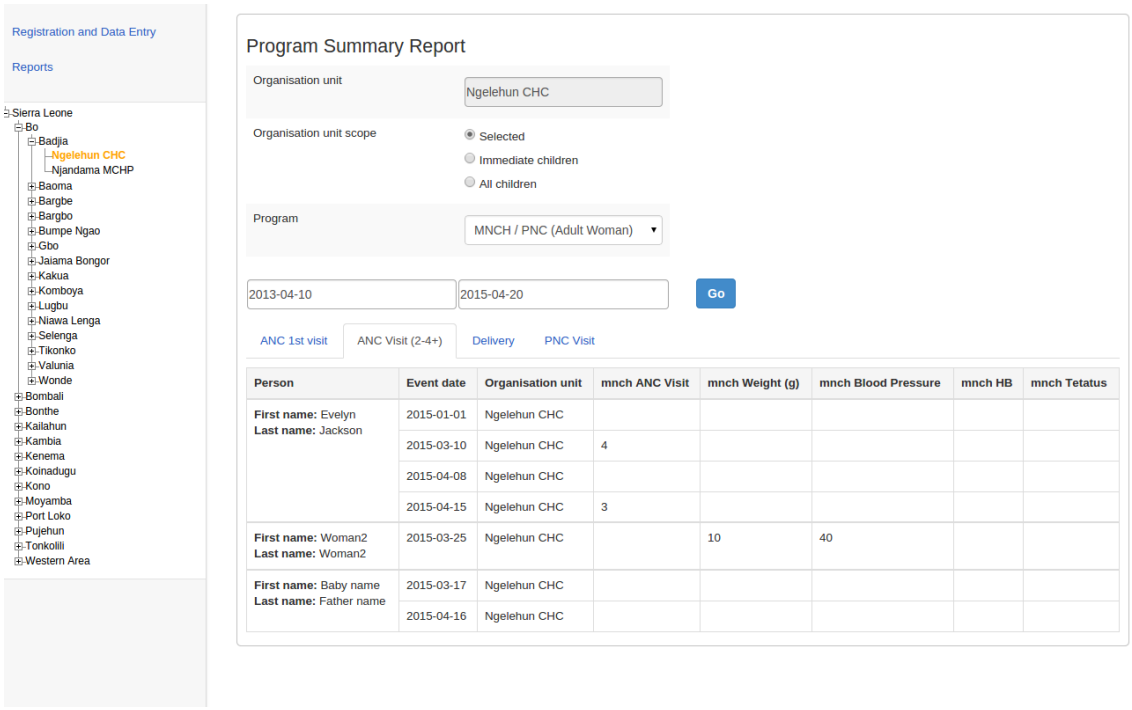
1. Open the **Tracker Capture** app.
2. Click **Reports**.
3. Select a report type.

Table 7.2. Report types in the Tracker Capture app

Report type	Description
Program summary	A summary report for a particular program, organisation unit and time frame. The report consist of a list of TEIs and their records organised based on program stages.
Program statistics	A statistics report for a particular program. The report provides for example an overview of drop-outs or completion rates in a given time frame at a particular organisation unit.
Upcoming events	A tabular report showing tracked entity instances and their upcoming events for a selected program and time. You can sort the columns and search the values. Show/hide operations are possible on the columns. You can also export the table to Microsoft Excel.
Overdue events	A list of events for a selected program. The report displays a list of TEIs and their events that are not completed on time. You can

Report type	Description
	sort the columns and search the values You can also export the table to Microsoft Excel.

Example 7.4. Program summary report



The summary report displays a list of TEIs and their records for "MNCH/PNC (Adult Woman)" program. The records are organized in the form of tabs where each tab is a program stage. The columns in the table are data elements which are configured to be displayed in reports under program stage definition.

Chapter 8. Analyze data in pivot tables

8.1. About the Pivot Table app

With the **Pivot Table** app, you can create pivot tables based on all available data dimensions in DHIS2. A pivot table is a dynamic tool for data analysis which lets you summarize and arrange data according to its dimensions. Examples of data dimensions in DHIS2 are:

- data dimension itself (for example data elements, indicators and events)
- periods (representing the time period for the data)
- organisation hierarchy (representing the geographical location of the data)

From these dimensions you can freely select *dimension items* to include in the pivot table. You can create additional dimensions in DHIS2 with the group set functionality. This allows for different aggregation pathways, such as aggregation by "Partner" or facility type.

A pivot table can arrange data dimensions on *columns*, *rows*, and as *filters*. When you place a data dimension on columns, the pivot table will display one column per dimension item. If you place multiple data dimensions on columns, the pivot table displays one column for all combinations of the items in the selected dimensions. When you place a data dimension on rows, the pivot table displays one row per dimension item in a similar fashion. The dimensions you select as filters will not be included in the pivot table, but will aggregate and filter the table data based on the selected filter items.

Constraints and tips

- You must select at least one dimension on columns or rows.
- You must include at least one period.
- Data element group sets and reporting rates can't appear in the same pivot table.
- A pivot table can't contain more than the maximum number of analytic records which have been specified in the system settings. The maximum number of records could also be constrained by the maximum RAM which is available to your browser. Consider making smaller tables instead of one table which displays all of your data elements and indicators together.
- The **Pivot Table** app supports drill-down and up for periods and organisation unit. This means that you can for example drill down from yearly periods to quarters, months and weeks inside a pivot table. You can also drill down from the global organisation unit to countries, provinces and facilities.

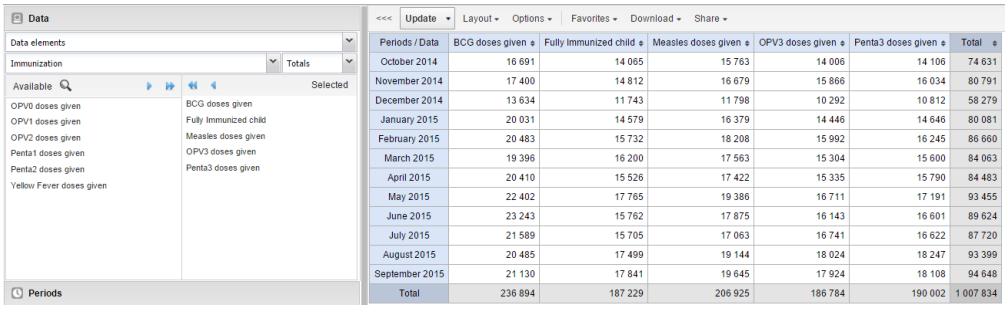
8.2. Create a pivot table

1. Open the **Pivot Table** app.
2. In the menu to the left, select the dimension items you want to analyse, for example data elements or indicators.
3. Click **Layout** and arrange the data dimensions as columns, rows and filters.

   You can keep the default selection if you want.
4. Click **Update**.

Example 8.1. Example pivot table with data elements as columns and periods as rows.

In this example, indicators are listed as columns and periods as rows.



Periods / Data	BCG doses given	Fully Immunized child	Measles doses given	OPV3 doses given	Penta3 doses given	Total
October 2014	16 691	14 065	15 763	14 006	14 106	74 631
November 2014	17 400	14 812	16 679	15 866	16 034	80 791
December 2014	13 634	11 743	11 798	10 292	10 812	58 279
January 2015	20 031	14 579	16 379	14 446	14 646	80 081
February 2015	20 483	15 732	18 208	15 992	16 245	86 660
March 2015	19 396	16 200	17 563	15 304	15 600	84 063
April 2015	20 410	15 526	17 422	15 335	15 790	84 483
May 2015	22 402	17 765	19 386	16 711	17 191	93 455
June 2015	23 243	15 762	17 875	16 143	16 601	89 624
July 2015	21 589	15 705	17 063	16 741	16 622	87 720
August 2015	20 485	17 499	19 144	18 024	18 247	93 399
September 2015	21 130	17 841	19 645	17 924	18 108	94 648
Total	236 894	187 229	206 925	186 784	190 002	1 007 834

8.2.1. Select dimension items

The left menu lists sections for all available data dimensions. From each section you can select any number of dimension items. As an example, you can open the section for data elements and select any number of data elements from the available list. You can select an item by marking it and clicking on the arrow in the section header or simply double-clicking on the item. Before you can use a data dimension in your pivot table you must at least select one dimension item. If you arrange a dimension as columns or rows but do not select any dimension items, the dimension is ignored.

You must choose at least one data dimension type to create a pivot table. The available types are described in this table:

Table 8.1. Data dimension types

Data dimension type	Definition	Examples
Indicators	An indicator is a calculated formula based on data elements.	Coverage of immunization across a specific district.
Data elements	Represents the phenomenon for which data has been captured.	Number of malaria cases; number of BCG doses given.
Data sets	A collection of data elements grouped for data collection. You can select : • **Reporting rates**: the percentage of actual reports compared to the expected number of reports • **Reporting rates on time**: the reporting rates based on timely form submissions. A timely submission must happen within a number of days after the reporting period. • **Actual reports**: the actual number of reports • **Actual reports on time**: the actual number of reports based on timely form submissions. A timely submission must happen	Reporting rates for immunization and morbidity forms.

Data dimension type	Definition	Examples
	within a number of days after the reporting period. • **Expected reports**: the number of expected reports based on organisation units where the data set and the reporting frequency has been assigned.	
Event data items	A data element that is part of a program representing events that have been captured.	Average weight and height for children in a nutrition program.
Program indicators	A calculated formula based on data elements in a program representing events.	Average BMI score for children in a nutrition program.

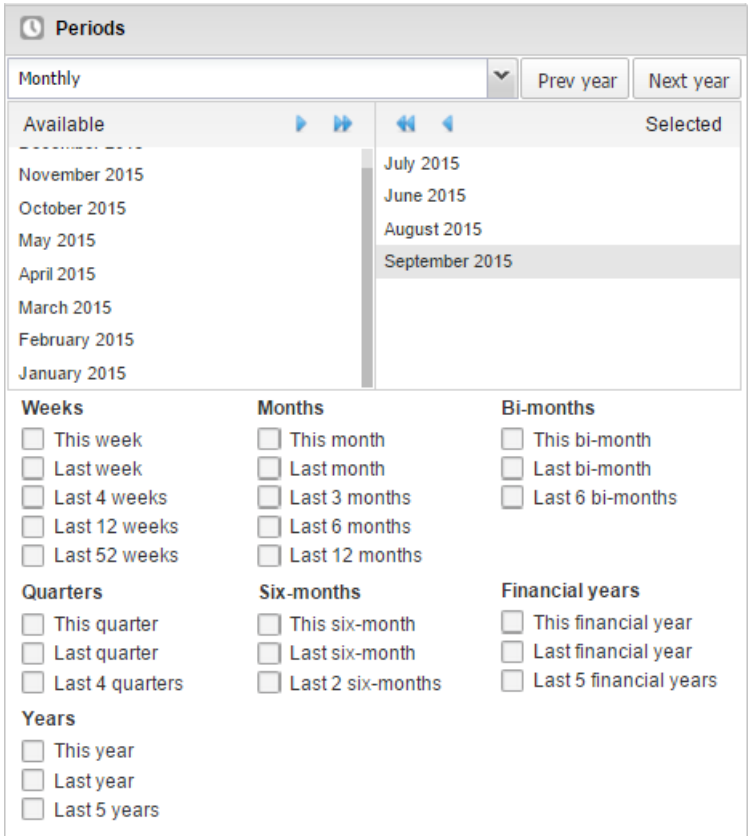
You can combine these dimensions to display for example aggregate data with reporting rates, or event data items together with program indicators, all in the same pivot tables. For the "data element" data dimension, you are also able to select "Totals" and "Details", which will allow you to view different category combination options together on the same pivot table.

For the period dimension you can choose between using fixed periods or relative periods. An example of a fixed period is "January 2012". To select fixed periods start by selecting a period type from the period type list. You can then select periods from the list of available periods.

Relative periods are periods relative to the current date. Examples of relative periods are "Last month", "Last 12 months", "Last 5 years". Relative periods can be selected by ticking the check-boxes next to each period. The main advantage of using relative periods is that when you save a pivot table favorite, it will stay updated with the latest data as time goes by without the need for constantly updating it.

For the organisation unit dimension you can select any number of organisation units from the hierarchy. To select all organisation units below a specific parent organisation unit, right click and click "Select all children". To manually select multiple organisation units, click and hold the **Ctrl** key while clicking on organisation units. You can tick "User org unit", "User sub-units" or "User sub-x2-units" in order to dynamically insert the organisation unit or units associated with your user account. This is useful when you save a pivot table favorite and want to share it with other users, as the organisation units linked with the other user's account will be used when viewing the favorite.

Selection of fixed and relative periods.



Dynamic dimensions can consist of organisation unit group sets, data element group sets, or category option group sets which have been configured with the type of "Disaggregation". Once the group sets have been configured, they will be come available in the pivot tables, and can be used as additional analysis dimensions, for instance to analyse aggregate data by Type of organisation unit or Implementing partner. Dynamic dimensions work the same as fixed dimensions.

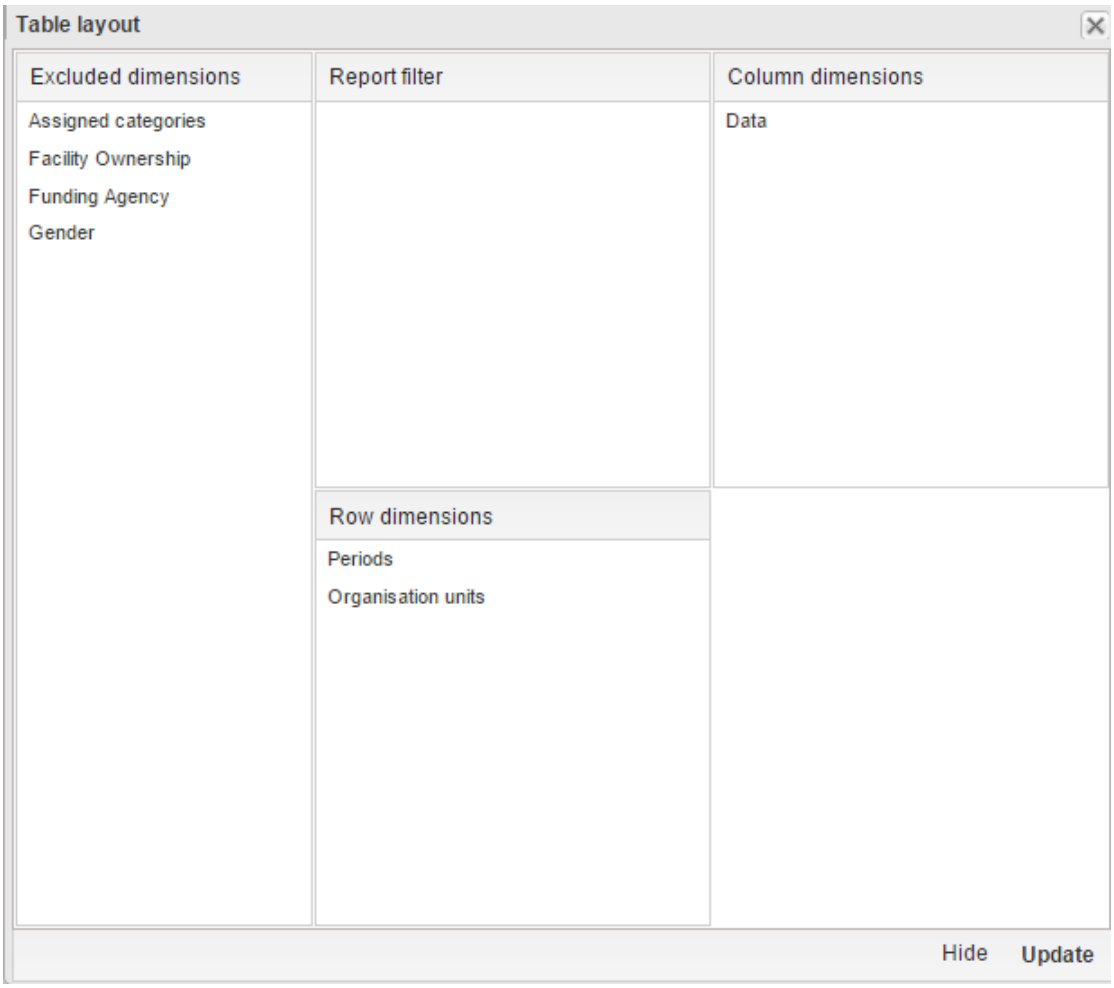
Tip

Some dynamic dimensions may contain many items. This can cause issues with certain browsers due to the length of the URL when many dimension members are selected. A special "All" check box is available for dynamic dimensions, which allows you to include all available dimensions implicitly in your pivot table, without specifying each and every dimension member.

8.2.2. Modify pivot table layout

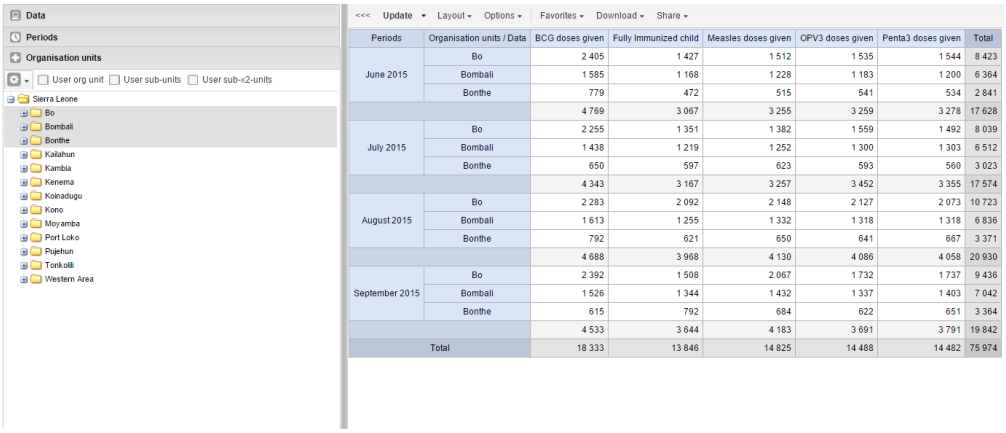
After selecting data dimensions it is time to arrange your pivot table. Click "Layout" in the top menu to open the layout screen. In this screen you can position your data dimensions as table columns, rows or filters by clicking and dragging the dimensions from the dimensions list to the respective column, row and filter lists. You can set any number of dimensions in any of the lists. For instance, you can click on "Organisation units" and drag it to the row list in order to position the organisation unit dimension as table rows. Note that indicators, data elements and data set reporting rates are part of the common "Data" dimension and will be displayed together in the pivot table. For instance, after selecting indicators and data elements in the left menu, you can drag "Organisation Unit" from the available dimensions list to the row dimension list in order to arrange them as rows in the pivot table.

The table layout screen.



After you have set up your pivot table you can click "Update" to render your pivot table, or click "Hide" to hide the layout screen without any changes taking effect. Since we in our example have selected both the period and organisation unit dimension as rows, the pivot table will generate all combinations of the items in these dimensions and produce a table like this:

Pivot table where organisation units and periods are repeated on rows.



Periods	Organisation units / Data	BCG doses given	Fully immunized child	Measles doses given	OPV3 doses given	Penta3 doses given	Total
June 2015	Bo	2 405	1 427	1 512	1 535	1 544	8 423
	Bombali	1 585	1 168	1 228	1 183	1 200	6 364
	Bonthe	779	472	515	541	534	2 841
		4 769	3 067	3 255	3 259	3 278	17 628
July 2015	Bo	2 255	1 351	1 382	1 559	1 492	8 039
	Bombali	1 438	1 219	1 252	1 300	1 303	6 512
	Bonthe	650	597	623	593	560	3 023
		4 343	3 167	3 257	3 452	3 355	17 574
August 2015	Bo	2 283	2 092	2 148	2 127	2 073	10 723
	Bombali	1 613	1 255	1 332	1 318	1 318	6 836
	Bonthe	792	621	650	641	667	3 371
		4 688	3 968	4 130	4 086	4 058	20 930
September 2015	Bo	2 392	1 508	2 067	1 732	1 737	9 436
	Bombali	1 526	1 344	1 432	1 337	1 403	7 042
	Bonthe	615	792	684	622	651	3 364
		4 533	3 644	4 183	3 691	3 791	19 842
Total		18 333	13 846	14 825	14 488	14 482	75 974

8.3. Change the display of your pivot table

1. Open the **Pivot Table** app.
2. Create a new pivot table or open a favorite.
3. Click **Options**.

4. Set the options as required.

Table 8.2. Pivot table options

Option		Description
Data	**Show column totals** **Show row totals**	Displays total values in the table for each row and column, as well as a total for all values in the table.
	Show column sub-totals **Show row sub-totals**	Displays subtotals in the table for each dimension. If you only select one dimension, subtotals will be hidden for those columns or rows. This is because the values will be equal to the subtotals.
	Show dimension labels	Shows the dimension names as part of the pivot tables.
	Hide empty rows	Hides empty rows from the table. This is useful when you look at large tables where a big part of the dimension items don't have data in order to keep the table more readable.
	Hide empty columns	Hides empty columns from the table. This is useful when you look at large tables where a big part of the dimension items don't have data in order to keep the table more readable.
	Skip rounding	Skips the rounding of data values, offering the full precision of data values. Can be useful for finance data where the full dollar amount is required.
	Aggregation type	The default aggregation operator can be over-ridden here, by selecting a different aggregation operator. Some of the aggregation types are **Count**, **Min** and **Max**.
	Number type	Sets the type of value you want to display in the pivot table: **Value**, **Percentage of row** or **Percentage of column**. The options **Percentage of row** and**Percentage of column** mean that you'll display values as percentages of row total or percentage of column total instead of the aggregated value. This is useful when you want to see the contribution of data elements,

Option		Description
		categories or organisation units to the total value.
	Measure criteria	Allows for the data to be filtered on the server side. You can instruct the system to return only records where the aggregated data value is equal, greater than, greater or equal, less than or less or equal to certain values. If both parts of the filter are used, it's possible to filter out a range of data records.
Events	**Include only completed events**	Includes only completed events in the aggregation process. This is useful for example to exclude partial events in indicator calculations.
Organisation units	**Show hierarchy**	Shows the name of all ancestors for organisation units, for example "Sierra Leone / Bombali / Tamabaka / Sanya CHP" for Sanya CHP. The organisation units are then sorted alphabetically which will order the organisation units according to the hierarchy. When you download a pivot table with organisation units as rows and you've selected **Show hierarchy**, each organisation unit level is rendered as a separate column. This is useful for example when you create Excel pivot tables on a local computer.
Legend	**Apply legend**	Applies a legend to the values. This mean that you can apply a colour to the values. Select **By data item** to color the table cells individually according to each data element or indicator. You configure legends in the **Maintenance** app.
	Style	Colors the text or background of cells in pivot tables based on the selected legend.

Option		Description
		You can use this option for scorecards to identify high and low values at a glance.
Style	**Display density**	Controls the size of the cells in the table. You can set it to **Comfortable**, **Normal** or **Compact**. **Compact** is useful when you want to fit large tables into the browser screen.
	Font size	Controls the size of the table text font. You can set it to **Large**, **Normal** or **Small**.
	Digit group separator	Controls which character to separate groups of digits or "thousands". You can set it to **Comma**, **Space** or **None**.
General	**Table title**	Type a title here to display it above the table.
Parameters (for standard reports only)	**Note** You create standard reports in the **Reports** app. In the **Pivot Table** app you set which parameters the system should prompt the user for.	
	Reporting period	Controls whether to ask user to enter a report period.
	Organisation unit	Controls whether to ask user to enter an organisation unit.
	Parent organisation unit	Controls whether to ask user to enter a parent organisation unit.
	Include regression	Includes a column with regression values to the pivot table.
	Include cumulative	Includes a column with cumulative values to the pivot table.
	Sort order	Controls the sort order of the values.
	Top limit	Controls the maximum number of rows to include in the pivot table.

5. Click **Update**.

8.4. Manage favorites

Saving your charts or pivot tables as favorites makes it easy to find them later. You can also choose to share them with other users as an interpretation or display them on the dashboard.

You view the details and interpretations of your favorites in the **Pivot Table**, **Data Visualizer**, **Event Visualizer**, **Event Reports** apps. Use the **Favorites** menu to manage your favorites.

8.4.1. Open a favorite

1. Click **Favorites** > **Open**.
2. Enter the name of a favorite in the search field, or click **Prev** and **Next** to display favorites.
3. Click the name of the favorite you want to open.

8.4.2. Save a favorite

1. Click **Favorites** > **Save as**.
2. Enter a **Name** and a **Description** for your favorite.
3. Click **Save**.

8.4.3. Rename a favorite

1. Click **Favorites** > **Rename**.
2. Enter the new name for your favorite.
3. Click **Update**.

8.4.4. Write an interpretation for a favorite

An interpretation is a link to a resource with a description of the data at a given period. This information is visible in the **Dashboard** app. To create an interpretation, you first need to create a favorite. If you've shared your favorite with other people, the interpretation you write is visible to those people.

1. Click **Favorites** > **Write interpretation**.
2. In the text field, type a comment, question or interpretation. You can see this information in the **Dashboard** app.
3. Search for a user group that you want to share your favorite with, then click the **+** icon.
4. Change sharing settings for the user groups you want to modify.
   - **Can edit and view**: Everyone can view and edit the object.
   - **Can view only**: Everyone can view the object.
   - **None**: The public won't have access to the object. This setting is only applicable to **Public access**.
5. Click **Share**.

8.4.5. Create a link to a favorite

1. Click **Favorites** > **Get link**.
2. Select one of the following:
   - **Open in this app**: You get a URL for the favorite which you can share with other users by email or chat.
   - **Open in web api**: You get a URL of the API resource. By default this is an HTML resource, but you can change the file extension to ".json" or ".csv".

8.4.6. Delete a favorite

1. Click **Favorites** > **Delete**.
2. Click **OK**.

8.4.7. View interpretations based on relative periods

To view interpretations for relative periods, such as a year ago:

1. Open a favorite with interpretations.
2. Click **>>>** in the top right of the workspace.
3. Click an interpretation. Your chart displays the data and the date based on when the interpretation was created.To view other interpretations, click them.

8.5. Download data from a pivot table

8.5.1. Download table layout data format

To download the data in the current pivot table:

1. Click **Download**.
2. Under **Table layout**, click the format you want to download: Microsoft Excel, CSV or HTML.

   The data table will have one column per dimension and contain names of the dimension items.

   Tip

   When you download a pivot table with organisation units as rows and you've selected **Show hierarchy** in **Table options**, each organisation unit level is rendered as a separate column. This is useful for example when you create Excel pivot tables on a local computer.

Tip

You can create a pivot table in Microsoft Excel from the downloaded Excel file.

8.5.2. Download plain data source format

You can download data in the current pivot table in JSON, XML, Excel, and CSV as plain data formats with different identification schemes (ID, Code, and Name). The data document uses identifiers of the dimension items and opens in a new browser window to display the URL of the request to the Web API in the address bar. This is useful for developers of apps and other client modules based on the DHIS2 Web API or for those who require a plan data source, for instance for import into statistical packages.

To download plain data source formats:

1. Click **Download**.
2. Under **Plain data source**, click the format you want to download.

Table 8.3. Available formats

Format	Action	Description
JSON	Click **JSON**	Downloads JSON format based on ID property. You can also download JSON format based on **Code** or **Name** property.
XML	Click **XML**	Downloads XML format based on ID property. You can also download XML format based on **Code** or **Name** property.

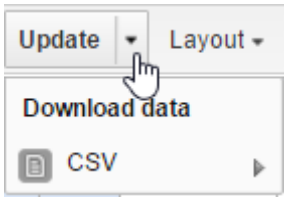
Format	Action	Description
Microsoft Excel	Click **Microsoft Excel**	Downloads XML format based on ID property. You can also download Microsoft Excel format based on **Code** or **Name** property.
CSV	Click **CSV**	Downloads CSV format based on ID property. You can also download CSV format based on **Code** or **Name** property.
JRXML	Put the cursor on **Advanced** and click **JRXML**	Produces a template of a Jasper Report which can be further customized based on your exact needs and used as the basis for a standard report in DHIS2.
Raw data SQL	Put the cursor on **Advanced** and click **Raw data SQL**	Provides the actual SQL statement used to generate the pivot table. You can use it as a data source in a Jasper report, or as the basis for an SQL view.

8.5.3. Download a CSV format without rendering data in the web browser

You can download data in CSV format directly without rendering the data in the web browser. This helps to reduce any constraints in the system settings that has been set with regards to the maximum number of analytic records. This lets you download much larger batches of data that you can use for later offline analysis.

To download data in CSV format without first rendering data in the web browser:

1. Click the arrow beside **Update**.



2. Click **CSV** to download the format based on ID property.

   The file downloads to your computer.

Tip

You can also download CSV format based on **Code** or **Name** property.

8.6. Embed a pivot table in an external web page

Certain analysis-related resources in DHIS2, like pivot tables, charts and maps, can be embedded in any web page by using a plug-in. You will find more information about the plug-ins in the Web API chapter in the *DHIS2 Developer Manual*.

To generate a HTML fragment that you can use to display the pivot table in an external web page:

1. Click **Embed**.
2. Click **Select** to highlight the HTML fragment.

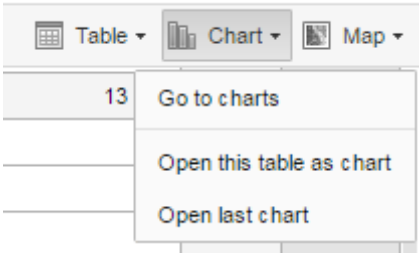
8.7. Visualize pivot table data as a chart or a map

When you have made a pivot table you can switch between pivot table, chart and map visualization of your data.

8.7.1. Open a pivot table as a chart

1. Click **Chart** > **Open this table as chart**.

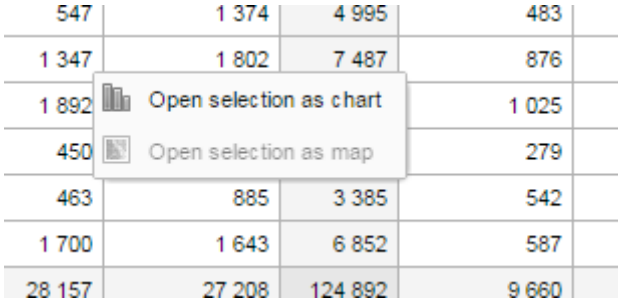
   Your current pivot table opens as a chart.



8.7.2. Open a pivot table selection as a chart

If you want to visualize a small part of your pivot table as a chart you can click directly on a value in the table instead opening the whole table.

1. In the pivot table, click a value.



2. To verify the selection, hold the cursor over **Open selection as chart**. The highlighted dimension headers in the table indicate what data will be visualized as a chart.
3. Click **Open selection as chart**.

8.7.3. Open a pivot table as a map

1. Click **Chart** > **Open this table as map**

   Your current pivot table opens as a map.

8.7.4. Open a pivot table selection as a map

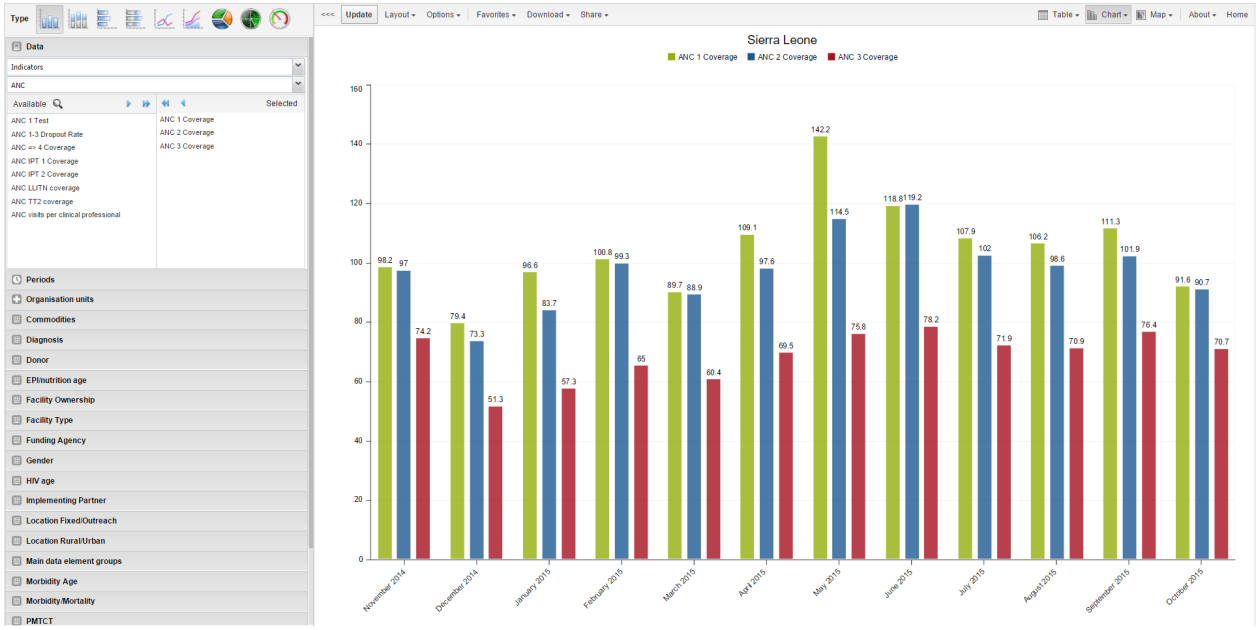
1. In the pivot table, click a value.

   A menu displays.
2. Click **Open selection as map**.

   Your selection opens as a map.

Chapter 9. Using the Data Visualizer app

9.1. About the Data Visualizer app



With the **Data Visualizer** app, you can select content, for example indicators, data elements, periods and organisation units, for an analysis. The app works well over poor Internet connections and generates charts in the web browser.

Constraints and tips

- Hide and show individual data series in the chart by clicking directly on the series label in the chart. They appear either at the top or to the right of the chart.
- Click the triple left-arrow button on the top centre menu. This collapses the left side menu and gives more space for the chart. You can get the menu back by clicking on the same button again.

9.2. Create a chart

1. Open the **Data Visualizer** app and select a chart type.
2. In the menu to the left, select the metadata you want to analyse. You must select one or more elements from all of the three dimensions - data (indicators, data elements, reporting rates), periods (relative, fixed) and organisation units (units or groups).

   ### Note

   If you've access to the system settings, you can change the default period type under **General settings > Default relative period for analysis.**

   Last 12 Months from the period dimension and the root organisation unit are selected by default.
3. Click **Layout** and arrange the dimensions.

   You can keep the default selection if you want.
4. Click **Update**.

9.3. Select a chart type

The **Data Visualizer** app has nine different chart types, each with different characteristics. To select a chart type:

1. In **Chart type**, click the chart type you need.

Table 9.1. Chart types

Chart type	Description
Column chart	Displays information as vertical rectangular columns with lengths proportional to the values they represent. Useful when you want to, for example, compare performance of different districts.
Stacked column chart	Displays information as vertical rectangular columns, where bars representing multiple categories are stacked on top of each other. Useful when you want to, for example, display trends or sums of related data elements.
Bar chart	Same as column chart, only with horizontal bars.
Stacked bar chart	Same as stacked column chart, only with horizontal bars.
Line chart	Displays information as a series of points connected by straight lines. Also referred to as time series. Useful when you want to, for example, visualize trends in indicator data over multiple time periods.
Area chart	Is based on line chart, with the space between the axis and the line filled with colors and the lines stacked on top of each other. Useful when you want to compare the trends of related indicators.
Pie chart	Circular chart divided into sectors (or slices). Useful when you want to, for example, visualize the proportion of data for individual data elements compared to the total sum of all data elements in the chart.
Radar chart	Displays data on axes starting from the same point. Also known as spider chart.
Speedometer chart	Semi-circle chart which displays values out of 100 %. Also referred to as a gauge chart.

2. Click **Update**.

9.4. Select dimension items

A dimension refers to the elements which describe the data values in the system. There are three main dimensions in the system:

- Data: Includes data elements, indicators and datasets (reporting rates), describing the phenomena or event of the data.
- Periods: Describes when the event took place.
- Organisation units: Describes where the event took place.

The Data Visualizer app lets you use these dimensions completely flexible in terms of appearing as series, categories and filter.

Note

You can select dimension items in different ways:

- Double-click a dimension item name.
- Highlight one or several dimension items and click the single-arrow.
- To select all dimension items in a list, click the double-arrow.
- To clear dimension items, use the arrows or double-click the names in the **Selected** list.

9.4.1. Select indicators

The Data Visualizer app can display any number of indicators and data elements in a chart. You can select both indicators and data elements to appear together in the same chart, with their order of appearance the same as the order in which they are selected.

1. Click **Data** and select **Indicators**.
2. Select an indicator group.

   The indicators in the selected group appear in the **Available** list.
3. Select one or several indicators by double-clicking the name.

   The indicator moves to the **Selected** list.

9.4.2. Select data elements

The Data Visualizer app can display any number of indicators and data elements in a chart. You can select both indicators and data elements to appear together in the same chart, with their order of appearance the same as the order in which they are selected.

1. Click **Data** and select **Data elements**.
2. Select a data element group.

   The data elements in the selected group appear in the **Available** list.
3. Select one or several data elements by double-clicking the name.

   The data element moves to the **Selected** list.

9.4.3. Select reporting rates

The Data Visualizer app can display reporting rates in a chart, by itself or together with indicators and data elements. Reporting rates are defined by data sets.

1. Click **Data** and select **Reporting rates**.

   The reporting rates appear in the **Available** list.
2. Select one or several reporting rates by double-clicking the name.

   The reporting rate moves to the **Selected** list.

9.4.4. Select fixed and relative periods

1. Click **Periods**.

2. Select one or several periods.

   You can combine fixed periods and relative periods in the same chart. Overlapping periods are filtered so that they only appear once.

   - Fixed periods: In the **Select period type** box, select a period type. You can select any number of fixed periods from any period type.
   - Relative periods: In the lower part of the **Periods** section, select as many relative periods as you like. The names are relative to the current date. This means that if the current month is March and you select **Last month**, the month of February is included in the chart.

9.4.5. Select organisation units

1. Click **Organisation units**.
2. Click the gearbox icon.
3. Select a **Selection mode** and an organisation unit.

   There are three different selection modes:

   Table 9.2. Selection modes

Selection mode	Description
Select organisation units	Lets you select the organisation units you want to appear in the chart from the organization tree. Select **User org unit** to disable the organisation unit tree and only select the organisation unit that is related to your profile. Select **User sub-units** to disable the organisation unit tree and only select the sub-units of the organisation unit that is related to your profile. Select **User sub-x2-units** to disable the organisation unit tree and only select organisation units two levels down from the organisation unit that is related to your profile. This functionality is useful for administrators to create a meaningful "system" favorite. With this option checked all users find their respective organisation unit when they open the favorite.
Select levels	Lets you select all organisation units at one or more levels, for example national or district level. You can also select the parent organisation unit in the tree, which makes it easy to select for example, all facilities inside one or more districts.
Select groups	Lets you select all organisation units inside one or several groups and parent organisation units at the same time, for example hospitals or chiefdoms.

4. Click **Update**.

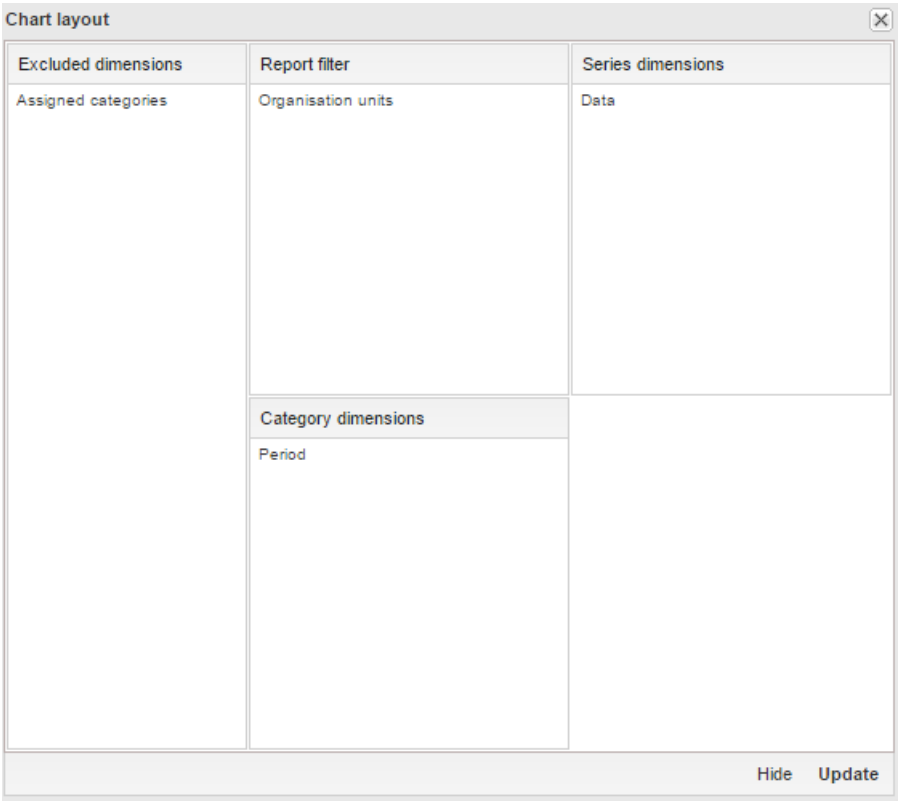
9.4.6. Select additional dimension items

Depending on the settings for your organisation unit group sets and data element group sets, you can select additional dimension items from the left menu.

Here you can add dimension items such as age, sex, etc. without having to add them as detailed data element selections. This is useful when you want to separate these categories in your analysis.

The additional dimension items you select are available in **Chart layout** as dimensions.

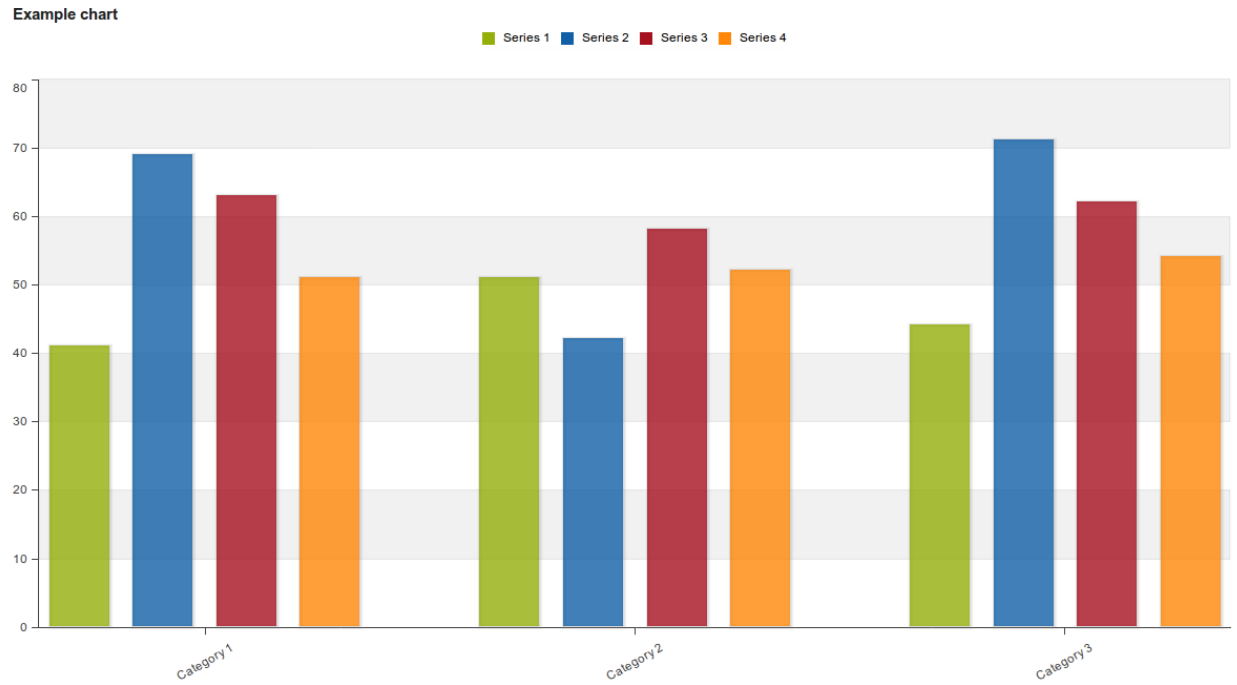
9.5. Select series, category and filter



You can define which dimension of the data you want to appear as series, category and filter.

1. Click **Layout**.
2. Drag and drop the dimensions to the appropriate space. Only one dimension can be in each section.
3. Click **Update**.

Example 9.1. Chart illustrating the concepts of series, categories and filter



- Series: A series is a set of continuous, related elements (for example periods or data elements) which you want to visualize in order to emphasize trends or relations in its data.
- Categories: A category is a set of elements (for example indicators or organisation units) for which you want to compare its data.
- Filter: The filter selection will filter the data displayed in the chart. Note that if you use the data dimension as filter, you can only specify a single indicator or data set as filter item, whereas with other dimension types you can select any number of items.

9.6. Change the display of your chart

1. Click **Options**.
2. Set the options as required.

Table 9.3. Chart options

Option		Description
Data	**Show values**	Shows the values above the series in the chart.
	Use 100% stacked values	Displays 100 % stacked values in column charts.
	Use cumulative values	Displays cumulative values in line charts.
	Hide empty categories	Hides the category items with no data from the chart. **None**: doesn't hide any of the empty categories **Before first**: hides missing values only before the first value

Option		Description
		After last: hides missing values only after the last value **Before first and after last**: hides missing values only before the first value and after the last value **All**: hides all missing values This is useful for example when you create column and bar charts.
	Trend line	Displays the trend line which visualizes how your data evolves over time. For example if performance is improving or deteriorating. Useful when periods are selected as category.
	Target line value/title	Displays a horizontal line at the given domain value. Useful for example when you want to compare your performance to the current target.
	Base line value/title	Displays a horizontal line at the given domain value. Useful for example when you want to visualize how your performance has evolved since the beginning of a process.
	Sort order	Allows you to sort the values on your chart from either low to high or high to low.
	Aggregation type	Defines how the data elements or indicators will be aggregated within the chart. Some of the aggregation types are **By data element**, **Count**, **Min** and **Max**.
Events	**Include only completed events**	Includes only completed events in the aggregation process. This is useful when you want for example to exclude partial events in indicator calculations.
Axes	**Range axis min/max**	Defines the maximum and minimum value which will be visible on the range axis.
	Range axis tick steps	Defines the number of ticks which will be visible on the range axis.
	Range axis decimals	Defines the number of decimals which will be used for range axis values.
	Range axis title	Type a title here to display a label next to the range axis (also referred to as the Y axis). Useful when you

Option		Description
		want to give context information to the chart, for example about the unit of measure.
	Domain axis title	Type a title here to display a label below the domain axis (also referred to as the X axis). Useful when you want to give context information to the chart, for example about the period type.
Style	**No space between columns/bars**	Removes the space between the columns or bars in the chart. Useful for displaying the chart as an EPI curve.
General	**Hide chart legend**	Hides the legend and leaves more room for the chart itself.
	Hide chart title	Hides the title (default or custom) of your chart.
	Chart title	Type a title here to display a custom title above the chart. If you don't enter a title, the default title is displayed.
	Hide chart subtitle	Hides the subtitle of your chart.
	Chart subtitle	Type a subtitle here to display a custom subtitle above the chart but below the title. If you don't enter a subtitle, no subtitle is displayed in the chart.

3. Click **Update**.

9.7. Manage favorites

Saving your charts or pivot tables as favorites makes it easy to find them later. You can also choose to share them with other users as an interpretation or display them on the dashboard.

You view the details and interpretations of your favorites in the **Pivot Table**, **Data Visualizer**, **Event Visualizer**, **Event Reports** apps. Use the **Favorites** menu to manage your favorites.

9.7.1. Open a favorite

1. Click **Favorites** > **Open**.
2. Enter the name of a favorite in the search field, or click **Prev** and **Next** to display favorites.
3. Click the name of the favorite you want to open.

9.7.2. Save a favorite

1. Click **Favorites** > **Save as**.
2. Enter a **Name** and a **Description** for your favorite.
3. Click **Save**.

9.7.3. Rename a favorite

1. Click **Favorites** > **Rename**.
2. Enter the new name for your favorite.
3. Click **Update**.

9.7.4. Write an interpretation for a favorite

An interpretation is a link to a resource with a description of the data at a given period. This information is visible in the **Dashboard** app. To create an interpretation, you first need to create a favorite. If you've shared your favorite with other people, the interpretation you write is visible to those people.

1. Click **Favorites** > **Write interpretation**.
2. In the text field, type a comment, question or interpretation. You can see this information in the **Dashboard** app.
3. Search for a user group that you want to share your favorite with, then click the **+** icon.
4. Change sharing settings for the user groups you want to modify.
   - **Can edit and view**: Everyone can view and edit the object.
   - **Can view only**: Everyone can view the object.
   - **None**: The public won't have access to the object. This setting is only applicable to **Public access**.
5. Click **Share**.

9.7.5. Create a link to a favorite

1. Click **Favorites** > **Get link**.
2. Select one of the following:
   - **Open in this app**: You get a URL for the favorite which you can share with other users by email or chat.
   - **Open in web api**: You get a URL of the API resource. By default this is an HTML resource, but you can change the file extension to ".json" or ".csv".

9.7.6. Delete a favorite

1. Click **Favorites** > **Delete**.
2. Click **OK**.

9.7.7. View interpretations based on relative periods

To view interpretations for relative periods, such as a year ago:

1. Open a favorite with interpretations.
2. Click **>>>** in the top right of the workspace.
3. Click an interpretation. Your chart displays the data and the date based on when the interpretation was created.To view other interpretations, click them.

9.8. Download a chart as an image or a PDF

After you have created a chart you can download it to your local computer as an image or PDF file.

1. Click **Download**.
2. Under **Graphics**, click **Image (.png)** or **PDF (.pdf)**.

   The file is automatically downloaded to your computer. Now you can for example embed the image file into a text document as part of a report.

9.9. Download chart data source

You can download the data source behind a chart in JSON, XML, Excel, CSV, JXRML or Raw data SQL formats with different identification schemes (ID, Code, and Name). The data document uses identifiers of the dimension items and opens in a new browser window to display the URL of the request to the Web API in the address bar. This is useful for developers of apps and other client modules based on the DHIS2 Web API or for those who require a plan data source, for instance for import into statistical packages.

To download plain data source formats:

1. Click **Download**.
2. Under **Plain data source**, click the format you want to download.

Table 9.4. Available formats

Format	Action	Description
JSON	Click **JSON**	Downloads JSON format based on ID property. You can also download JSON format based on **Code** or **Name** property.
XML	Click **XML**	Downloads XML format based on ID property. You can also download XML format based on **Code** or **Name** property.
Microsoft Excel	Click **Microsoft Excel**	Downloads Microsoft Excel format based on ID property. You can also download Microsoft Excel format based on **Code** or **Name** property.
CSV	Click **CSV**	Downloads CSV format based on ID property. You can also download CSV format based on **Code** or **Name** property.
JRXML	Put the cursor on **Advanced** and click **JRXML**	Produces a template of a Jasper Report which can be further customized based on your exact needs and used as the basis for a standard report in DHIS 2.
Raw data SQL	Put the cursor on **Advanced** and click **Raw data SQL**	Provides the actual SQL statement used to generate the data visualization. You can use it as a data source in a Jasper report, or as the basis for a SQL view.

9.10. Embed charts in any web page

Certain analysis-related resources in DHIS2, like pivot tables, charts and maps, can be embedded in any web page by using a plug-in. You will find more information about the plug-ins in the Web API chapter in the *DHIS2 Developer Manual*.

To generate a HTML fragment that you can use to display the chart in an external web page:

1. Click **Share** > **Embed in web page**.

   The **Embed in web page** window opens.
2. Click **Select** to highlight the HTML fragment.

9.11. Open a chart as a pivot table or as a map

- Open a **Chart** and click **Chart** or click **Map**.

Chapter 10. Using the GIS app

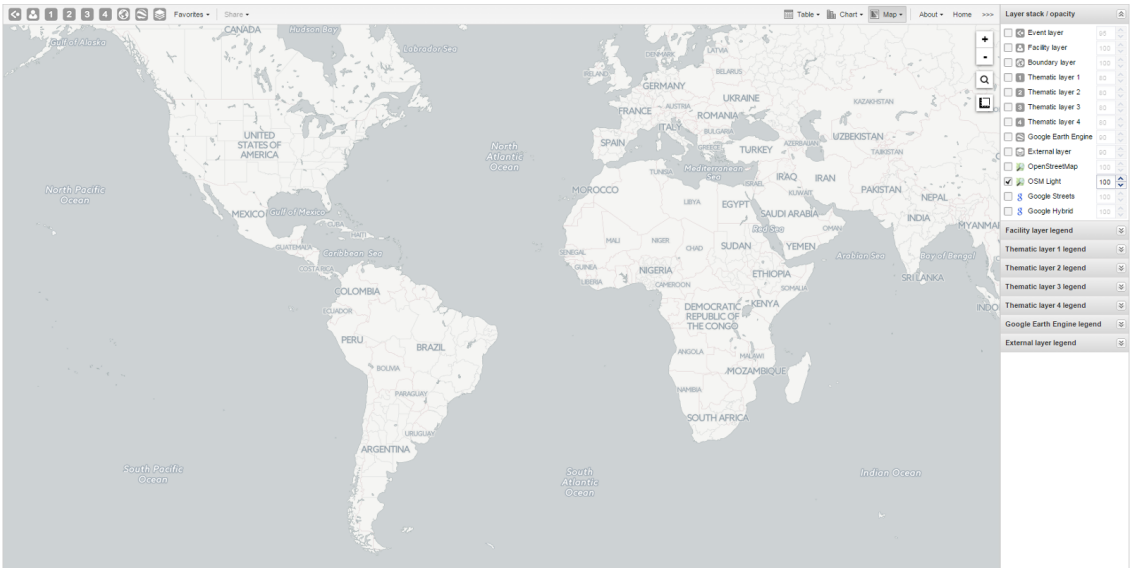
10.1. About the GIS app

With the GIS app you can overlay multiple layers and choose among different base maps. You can create thematic maps of areas and points, view facilities based on classifications, and visualize catchment areas for each facility. You can add labels to areas and points, and search and filter using various criteria. You can move points and set locations on the fly. Maps can be saved as favorites and shared with other people.

Note

To use predefined legends in the **GIS** app, you need to create them first in the **Maintenance** app.

Here's an overview of the GIS app workspace



- The icons in the top left of the workspace represent the map layers. They are the starting point of the **GIS** app.
- The panel on the right side of the workspace shows an overview of the layers:
  - The default base map is OSM Light. It's selected by default. If you're online you'll also see OpenStreetMap, Google Streets and Google Hybrid. You can use these maps as background maps and layers. Switch between them by selecting or clearing the checkbox.
  - If you want to increase or reduce the opacity of a layer, use the up and down arrows for the selected layer.
  - Use the map legends when you create a thematic map. A legend explains the link between values and colors on your map.
- **Zoom to content** automatically adjusts the zoom level and map center position to put the data on your map in focus.
- To view information for an event, simply click the event.
- Right-click to display the longitude and latitude of the map.

10.2. Create a new thematic map

You use four vector layers to create a thematic map. The workflow for creating a new thematic map is:

1. In the **Apps** menu, click **GIS**.

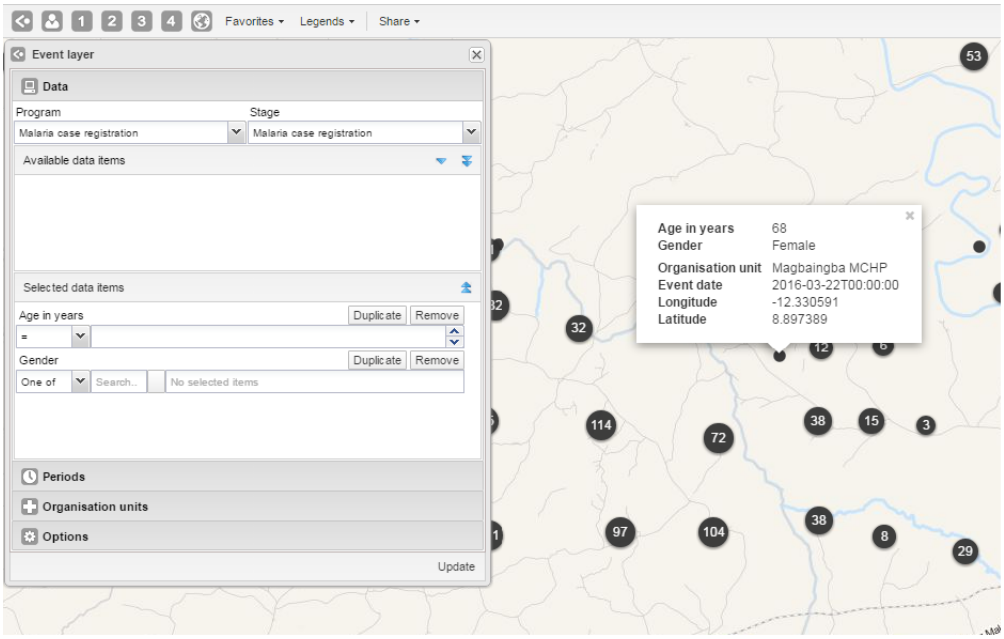
   The **DHIS2 GIS** window opens.
2. In the top menu, click a layer you want to add to the map.
   - Event layer
   - Facility layer
   - Boundary layer
   - Thematic layer 1 - 4
3. Click **Edit layer** and select the parameters you need..
4. Click **Update**.

10.3. Manage event layers

The event layer displays the geographical location of events registered in the DHIS2 tracker. Provided that events have associated GPS coordinates, you can use this layer to drill down from the aggregated data displayed in the thematic layers to the underlying individual events or cases.

You can also display aggregated events at the facility or at the boundary level. You do this through a thematic layer using event data items. This is useful when you only have the coordinates for the Org Unit under which the events are recorded.

Event layer



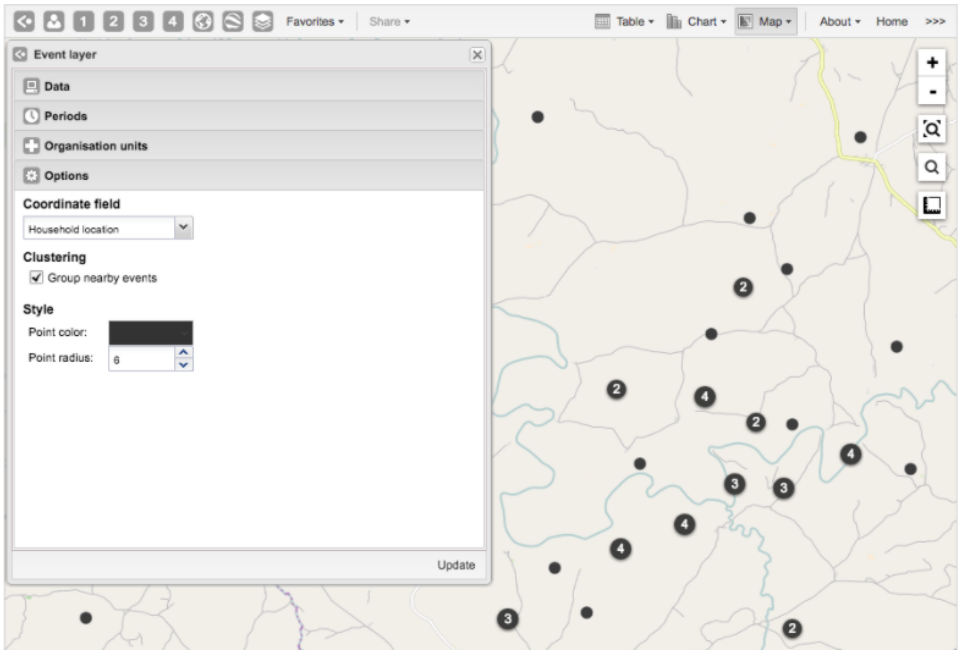
10.3.1. Create or modify event layer

1. In the top menu, click the event layer icon.
2. Click **Edit layer**.
3. Select a program and then select a program stage.

   If there is only one stage available for the selected program, the stage is automatically selected. A list of data elements and attributes will appear in the **Available data items** panel.
4. Select any data element or attribute from this list as part of your query.

- To select you can either double-click a data element or (multi) select and use the single-arrow downward button. The double-arrow button will select all data elements in the list. All selected data elements will get their own row in the **Selected data items**.
- For data elements of type text you will get two choices: **Contains** implies that the query will match all values which contains your search value, and **Is exact** implies that only values which is completely identical to your search query will be returned.
- For data elements of type option set, you can select any of the options from the drop down box by using the down-wards arrow or by start typing directly in the box to filter for options.

5. In the **Periods** section, select the time span for when the events took place. You can select either a fixed period or a relative period.
   - Fixed period: In the **Period** field, select **Start/end dates** and fill in a start date and an end date.
   - Relative period: In the **Period** field, select one of the relative periods, for example **This month** or **Last year**.
6. In the **Organisation units** section, select the organisation units you want to include in the query.
7. In the **Options** section, you can:
   - Select a value from the **Coordinate field** for the positions shown on the map. By default, "Event location" is selected. Depending on the data elements or attributes that belong to a program, other coordinates such as "Household position" are available.



   - Select or clear **Clustering** to group nearby events.
   - Go to **Style** to select a color for the cluster points or change the radius of clusters (between 1 and 20).

   Clustering if you want to group nearby events and change the style of the cluster points.
8. Click **Update**.

10.3.2. Turn off cluster

By default events are clustered in a map. You can turn off this function to display all events separately.

1. In the top menu, click the event layer icon.
2. Click **Edit layer**.
3. Click **Options**.

4. Clear **Group nearby events** check box.
5. Click **Update**.

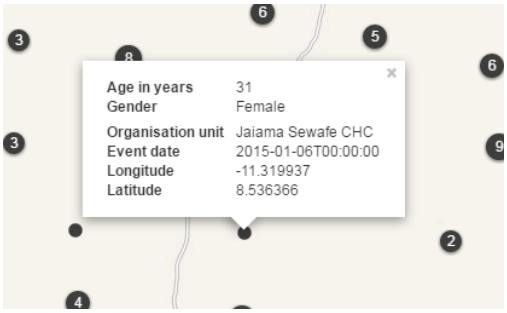
10.3.3. Modify cluster style

1. In the top menu, click the event layer icon.
2. Click **Edit layer**.
3. In the **Options** section, change the **Point color** and **Point radius**.
4. Click **Update**.

10.3.4. Modify information in event pop-up windows

For events in a cluster map, you can modify the information displayed in the event pop-up window.

Pop-up window with event information



1. Open the **Programs / Attributes** app.
2. Click **Program**.
3. Click the program you want to modify and select **View program stages**.
4. Click the program stage name and select **Edit**.
5. Scroll down to the **Selected data elements** section.
6. For every data element you want to display in the pop-up window, select corresponding **Display in reports**.
7. Click **Update**.

10.3.5. Clear event layer

To clear all data in a map:

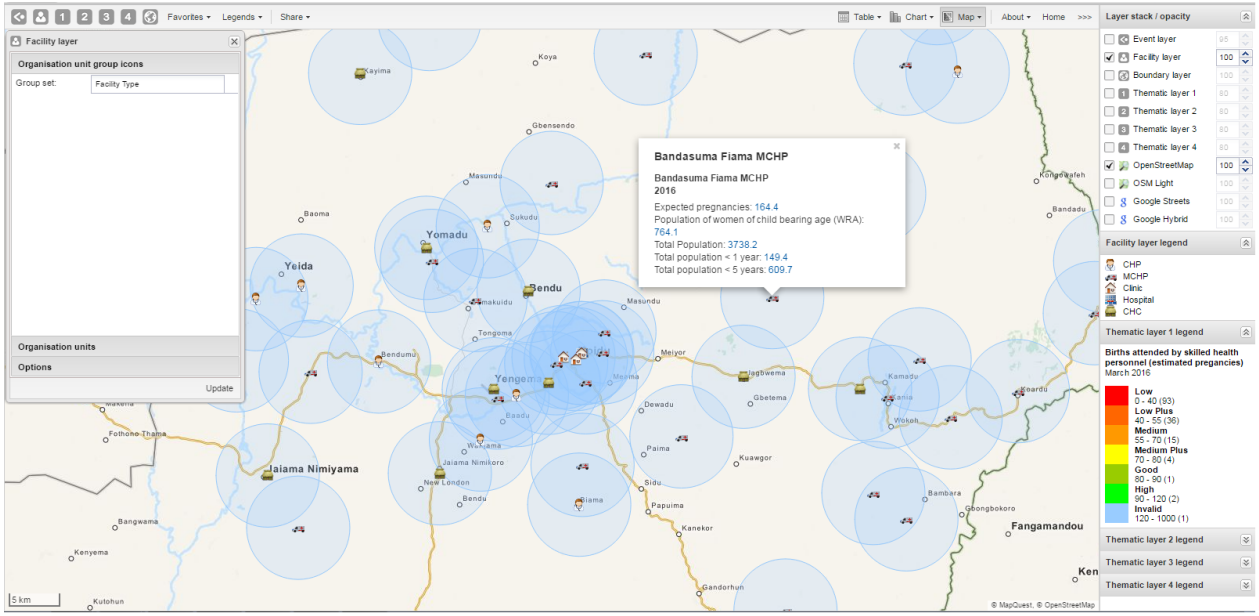
1. In the top menu, click the event layer icon.
2. Click **Clear**.

10.4. Manage facility layers

The facility layer displays icons that represent types of facilities. Polygons do not show up on the map, so make sure that you select an organisation unit level that has facilities.

A polygon is an enclosed area on a map representing a country, a district or a park. In GIS, a polygon is a shape defined by one or more rings, where a ring is a path that starts and ends at the same point.

Facility layer



10.4.1. Create or modify a facility layer

1. In the top menu, click the facility layer icon.
2. Click **Edit layer**.
3. In the **Organisation unit group icons** section, select a **Group set**.
4. In the **Organisation units** section, select one or several organisation units.
5. In the **Options** section, select if you want to show labels and if so, how they look.
6. In the **Options** section, select if you want to display a circle with a certain radius around each facility.
7. Click **Update**.

10.4.2. Search for an organisation unit

To locate an organisation unit in the map:

1. In the top menu, click the facility layer icon.
2. Click **Search**.

   The **Organisation unit search** dialog box opens.
3. In the text field, type the name of the organisation unit you are looking for or click a name in the list.

   The organisation unit is highlighted in the map.

10.4.3. Clear facility layer

To clear all data in a facility layer:

1. In the top menu, click the facility layer icon.
2. Click **Clear**.

10.5. Manage facilities in a layer

You can have facilities in **Facility**, **Boundary** and **Thematic** layers.

10.5.1. Relocate a facility

1. Right-click a facility and click **Relocate**.
2. Put the cursor in the new location.

   The new coordinate is stored permanently. This cannot be undone.

10.5.2. Swap longitude and latitude of a facility

1. Right-click a facility and click **Swap long/lat**.

   This is useful if a user inverted latitude and longitude coordinates when creating the organisation unit.

10.5.3. Display facility information

You can view organisation unit information set by the administrator as follows:

Table 10.1. View organisation unit information

Function	Action
View information for the current period	1. Click a facility.
View information for a selected period	1. Right-click a facility and click **Show information**. 2. In the **Infrastructural data** section, select a period. **Note** You configure the displayed infrastructural data in the **System Settings** app.

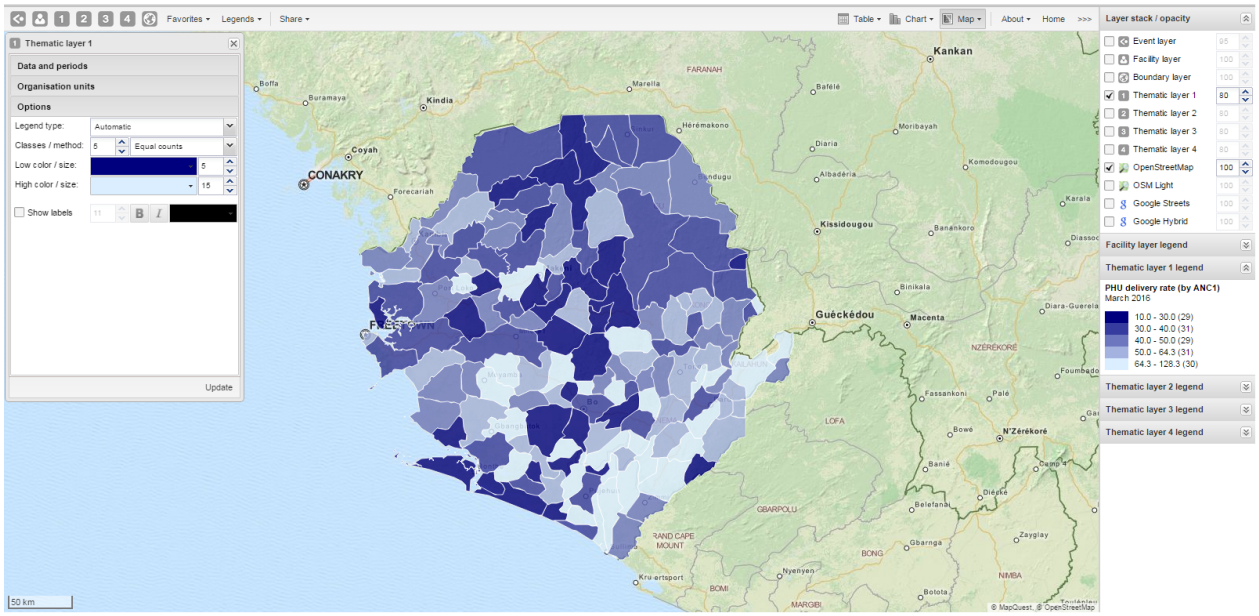
10.6. Manage thematic layers 1- 4

There are four thematic layers in the GIS app. With these layers panels you can use your data for thematic mapping. Select your desired combination of indicator/data element, and period. then the organisation unit level. If your database has coordinates and aggregated data values for these organisation units, they will appear on the map.

Note

You must refresh the DHIS2 analytics tables to have aggregated data values available.

Example of a thematic map



10.6.1. Create or modify a thematic layer

1. In the top menu, click the icon of the thematic layer you want to create or modify.
2. Click **Edit layer**.
3. In the **Data and periods** section, select the data and periods you want to display.
4. In the **Organisation units** section, select one or several organisation units.
5. In the **Options** section, go to **Legend type** and select Automatic or Predefined.

   - Automatic legend types means that the application will create a legend set for you based on your what method, number of classes, low color and high color you select. Method alludes to the size of the legend classes.

     Set to Equal intervals they will be “highest map value – lowest map value / number of classes”.

     Set to Equal counts the legend creator will try to distribute the organisation units evenly.

     The legend appears as an even gradation from the start color to the end color.
   - If you have facilities in your thematic layer, you can set the radius for maximum and minimum values by changing the values in the **Low color / size** and **High color size** boxes.
6. In the **Options** section, select if you want to show labels and if so, how they look.
7. In the Options panel, select an aggregation type. See also Aggregation operators.
8. Click **Update**.

10.6.2. Filter values in a thematic layer

Thematic layer 1-4 menu have a **Filter** option in addition to the boundary layer menu options. It lets you apply value filters to the organisation units on the map. The filter is removed when you close the filter window.

To filter values in a thematic layer:

1. In the top menu, click the icon of thematic layer you want to create or modify.
2. Click **Filter...**.
3. Modify the **Greater than** and **And/or lower than** values.

4. Click **Update**.

10.6.3. Search for an organisation unit

To locate an organisation unit in a thematic layer:

1. In the top menu, click the relevant thematic layer icon.
2. Click **Search**.

   The **Organisation unit search** dialog box opens.
3. In the text field, type the name of the organisation unit you are looking for or click a name in the list.

   The organisation unit is highlighted in the map.

10.6.4. Navigate between organisation hierarchies

When there are visible organisation units on the map, you can easily navigate up and down in the hierarchy without using the level/parent user interface.

1. Right-click one of the organisation units.
2. Select **Drill up** or **Drill down**.

   The drill down option is disabled if you are on the lowest level or if there are no coordinates available on the level below. Vice versa goes for drilling up.

10.6.5. Clear thematic layer

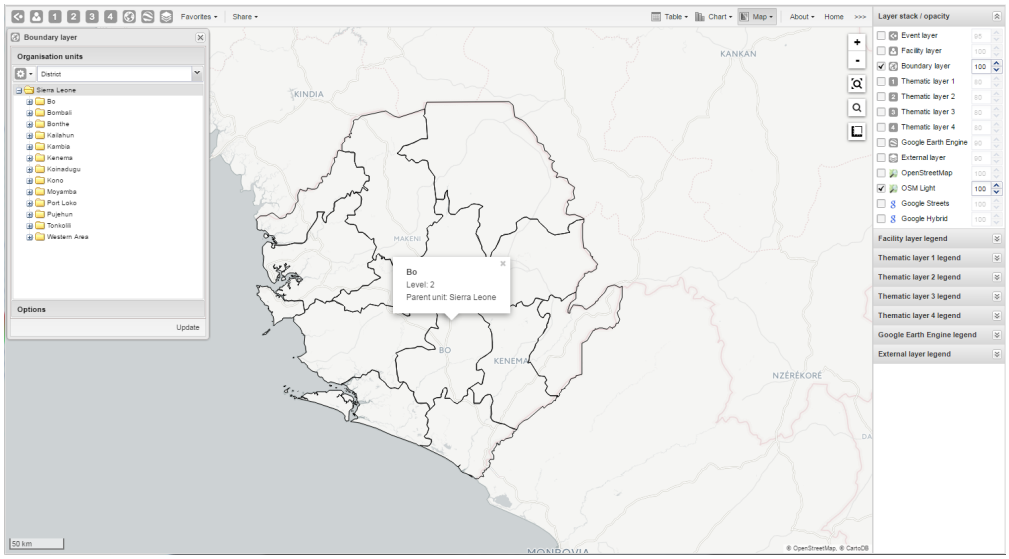
To clear all data in a thematic layer:

1. In the top menu, click the relevant thematic layer icon.
2. Click **Clear**.

10.7. Manage boundary layers

The boundary layer displays the borders and locations of your organisation units. This layer is useful if you are offline and don't have access to background maps.

Boundary layer



10.7.1. Create or modify boundary layers

1. In the top left menu, click the boundary layer icon.
2. Click **Edit layer**.
3. In the **Organisation units** section, select one or several organisation units.

   You can select the organisation units you want to show on the map by selecting a level and a parent. That means "show all organisations units at this level that are children of this parent".
4. In the **Options** section, select if you want to show labels and if so, how they look.
5. Click **Update**.

10.7.2. Search for organisation units

To locate an organisation unit on the map:

1. In the top menu, click the boundary layer icon.
2. Click **Search**.

   The **Organisation unit search** dialog box opens.
3. In the text field, type the name of the organisation unit you are looking for or click a name in the list.

   The organisation unit is highlighted in the map.

10.7.3. Navigate between organisation hierarchies

When there are visible organisation units on the map, you can easily navigate up and down in the hierarchy without using the level/parent user interface.

1. Right-click one of the organisation units.
2. Select **Drill up** or **Drill down**.

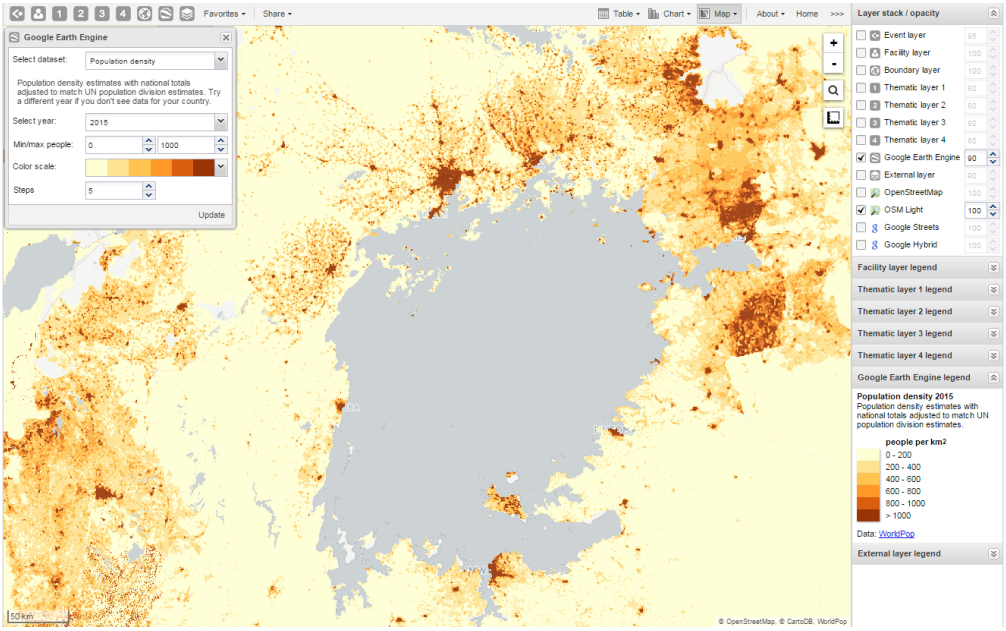
   The drill down option is disabled if you are on the lowest level or if there are no coordinates available on the level below. The same applies when you are drilling up.

10.7.4. Clear boundary layer

To clear data in a boundary layer:

1. In the top menu, click the boundary layer icon.
2. Click **Clear**.

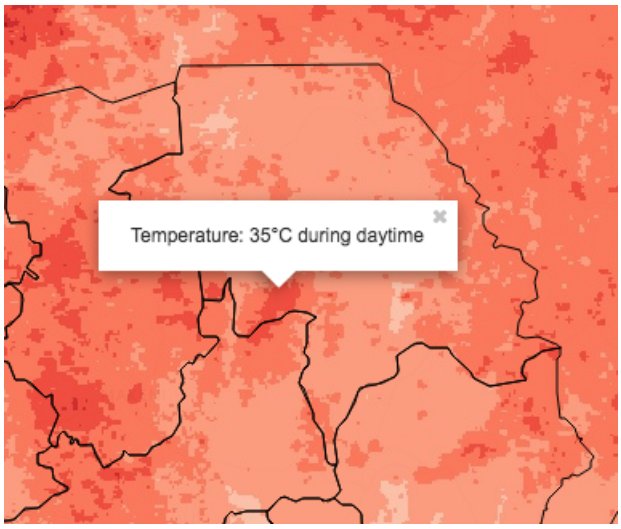
10.8. Manage Earth Engine layer



The Google Earth Engine layer lets you display satellite imagery and geospatial datasets from Google's vast catalog. This layer is useful in combination with thematic and event layers to enhance analysis. The following layers are supported:

- Elevation: Metres above sea level
- Nighttime lights: Lights from cities, towns, and other sites with persistent lighting, including gas flares (from 2013)
- Population density: Population in 100 x 100 m grid cells (from 2010)
- Temperature, population and land cover at any location.

Right-click on the layers to view more information, for example temperature and elevation.



10.8.1. Create or modify an Earth Engine layer

1. In the top menu, click the **Google Earth Engine** layer icon.
2. Select a data set, for example "Elevation".
3. Select **Min / max value**.

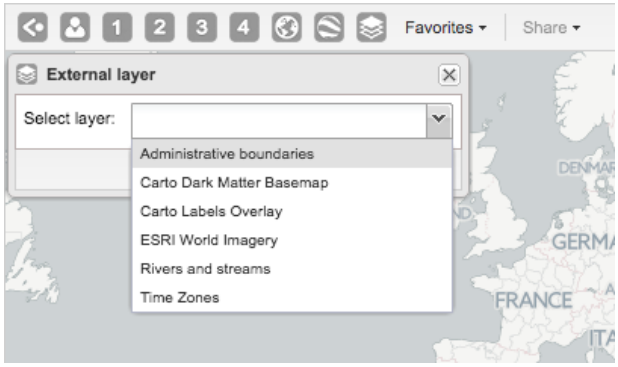
The meaning of these values depend on which data set you've selected.

4. Select a **Color scale**.
5. Select the number of **Steps**.

   The number of steps means the number of distinct colors in the color scale.
6. Click **Update**.

10.9. Add external map layers

1. In the top menu, click the **External layer** icon.
2. Click **Edit** to add a new layer.
3. Select a layer from the list.



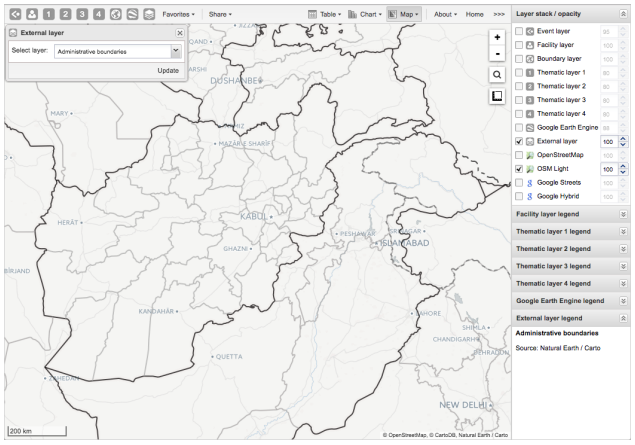
4. Click **Update**.

   To remove a layer, click **Clear**.

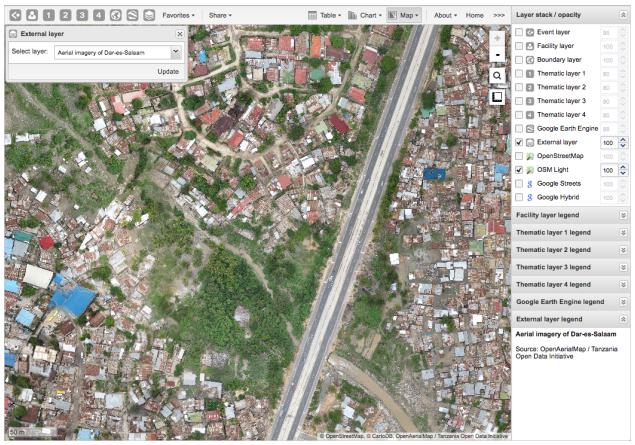
   To hide a layer, go to the **Layer stack/opacity** menu pane and clear the **External layer** checkbox.

Here are some examples of external layers:

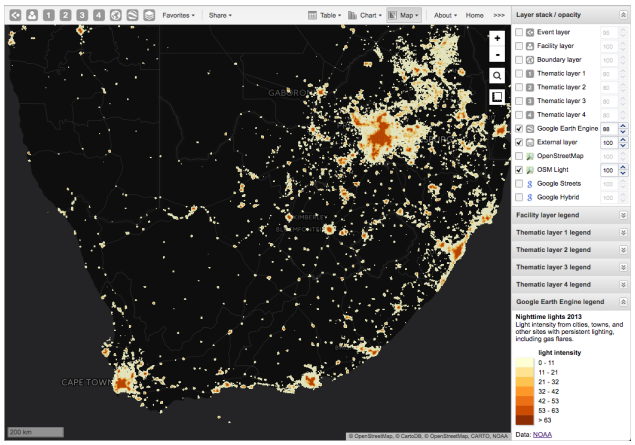
Example 1: First-order administrative boundaries



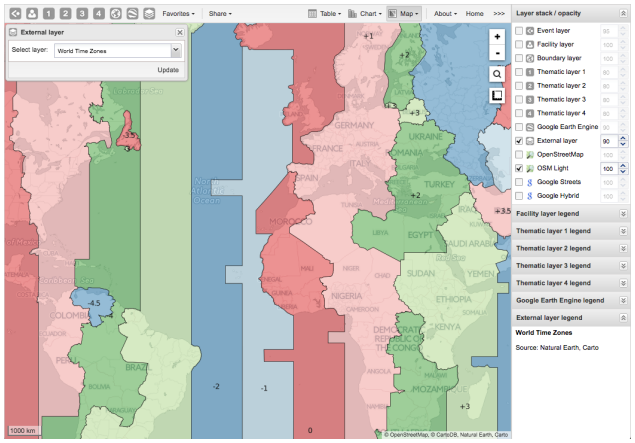
Example 2: Aerial imagery of Dar-es-Salaam



Example 3: Dark basemap with nighttime lights from Google Earth Engine



Example 4: World time zones

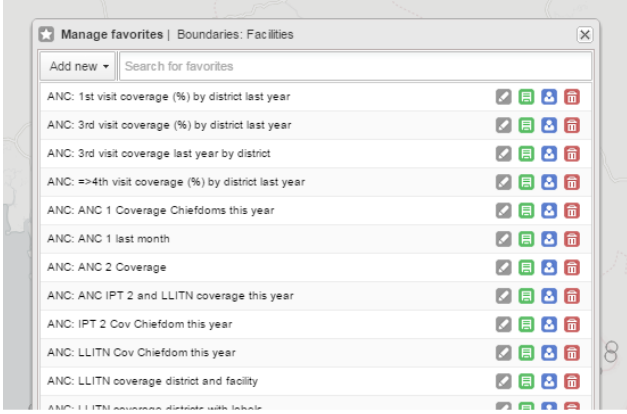


Note

To define external map layers, see the Maintenance app documentation.

10.10. Manage map favorites

Favorite maps



Saving your maps as favorites makes it easy to restore them later. It also gives you the opportunity to share them with other users as an interpretation or put it on the dashboard. You can save all types of layers as a favorite. A favorite always opens with the default background map.

10.10.1. Save a map as a favorite

When you have created a map it is convenient to save it as a favorite:

1. Click **Favorites**.

   The **Manage favorites** dialog box opens.
2. Click **Add new**.

   The **Create new favorite** dialog box opens.
3. In the text field, type the name you want to give your pivot table.
4. Click **Create**.

   Your favorite is added to the list.

10.10.2. Open a favorite

1. Click **Favorites**.

   The **Manage favorites** dialog box opens.
2. Find the favorite you want to open. You can either use **Prev** and **Next** or the search field to find a saved favorite. The list is filtered on every character that you enter.
3. Click the name.

10.10.3. Rename a favorite

1. Click **Favorites**.

   The **Manage favorites** dialog box opens.
2. Find the favorite you want to rename.

   You can either use **Prev** and **Next** or the search field to find a saved favorite.
3. Click the grey rename icon next to the favorite's name.

   The **Rename favorite** dialog box favorite opens.

4. Type the new name and click **Update**.

10.10.4. Overwrite a favorite

To save the current map to an existing favorite (overwrite):

1. Click **Favorites**.

   The **Manage favorites** dialog box opens.
2. Find the favorite you want to overwrite.

   You can either use **Prev** and **Next** or the search field to find a saved favorite.
3. Click the green overwrite icon next to the favorite's name.
4. Click **OK** to confirm that you want to overwrite the favorite.

10.10.5. Share a map interpretation

For certain analysis-related resources in DHIS2, you can share a data interpretation. An interpretation is a link to the relevant resource together with a text expressing some insight about the data.

To create an interpretation of a map and share it with all users of the system:

1. Open or create a favorite map.
2. Click **Share** > **Write interpretation**.

   The **Write interpretation** dialog box opens.
3. In the text field, type a comment, question or interpretation.
4. Click **Share**.

   The dialog box closes automatically. You can see the interpretation on the **Dashboard**.

10.10.6. Modify sharing settings for a favorite

After you have created a map and saved it as a favorite, you can share the favorite with everyone or a user group. To modify the sharing settings:

1. Click **Favorites**.
2. Find the favorite you want to share.

   You can either use **Prev** and **Next** or the search field to find a saved favorite.
3. Click the blue share icon next to the favorite's name.
4. In the text box, enter the name of the user group you want to share your favorite with and click the **+** icon.

   The chosen user group is added to the list of recipients.

   Repeat the step to add more user groups.
5. If you want to allow external access, select the corresponding box.
6. For each user group, choose an access setting. The options are:
   - None
   - Can view
   - Can edit and view
7. Click **Save**.

10.10.7. Delete a favorite

1. Click **Favorites**.

   The **Manage favorites** dialog box opens.
2. Find the favorite you want to delete.

   You can either use **Prev** and **Next** or the search field to find a saved favorite.
3. Click the red delete icon next to the favorite's name.
4. Click **OK** to confirm that you want to delete the favorite.

10.11. Save a map as an image

1. Take a screenshot of the map with the tool of your choice.
2. Save the screenshot in desired format.

10.12. Embed a map in an external web page

Certain analysis-related resources in DHIS2, like pivot tables, charts and maps, can be embedded in any web page by using a plug-in. You will find more information about the plug-ins in the Web API chapter in the *DHIS2 Developer Manual*.

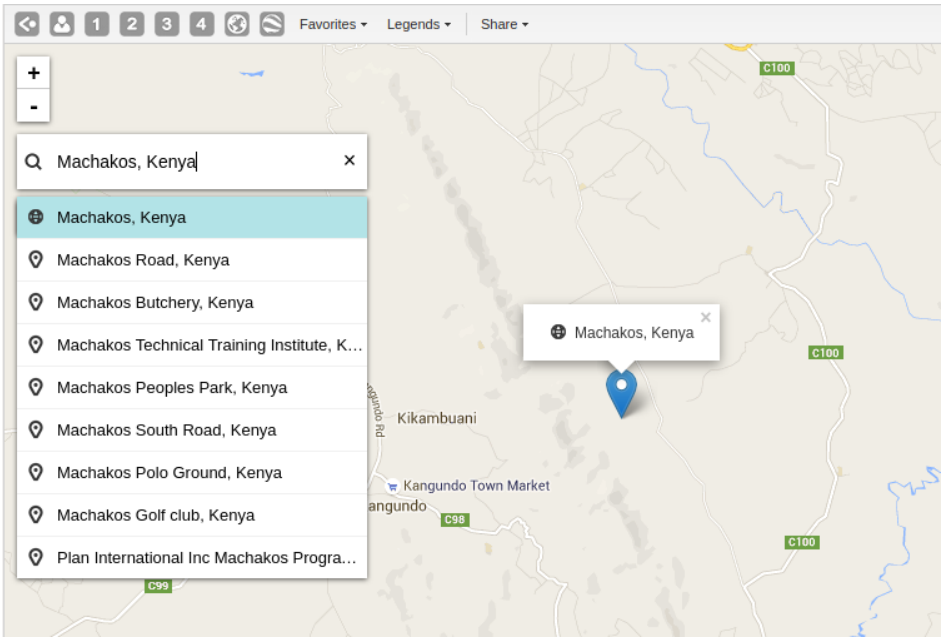
To generate a HTML fragment that you can use to display the map in an external web page:

1. Click **Share** > **Embed in web page**.

   The **Embed in web page** window opens.
2. Click **Select** to highlight the HTML fragment.

10.13. Search for a location

The place search function allows you to search for almost any location or address. The place search is powered by the Mapzen mapping platform. This function is useful in order to locate for example sites, facilities, villages or towns on the map.



1. On the left side of the GIS window, click the magnifier icon.

2. Type the location you're looking.

   A list of matching locations appear as you type.
3. From the list, select a location. A pin indicates the location on the map.

10.14. Measure distances and areas in a map

1. In the upper left part of the map, put the cursor on the **Measure distances and areas** icon and click **Create new measurement**.
2. Add points to the map.
3. Click **Finish measurement**.

10.15. Get the latitude and longitude at any location

Right-click a map and select **Show longitude/latitude**. The values display in a pop-up window.

10.16. View a map as a pivot table or chart

When you have made a map you can switch between pivot table, chart and map visualization of your data. The function is inactive if the data the map is based on cannot render as a chart or table.

10.16.1. Open a map as a chart

1. Click **Chart** > **Open this map as chart**.

   Your current map opens as a chart.

10.16.2. Open a map as a pivot table

1. Click **Chart** > **Open this map as table**.

   Your current map opens as a pivot table.

10.17. See also

- Manage legends

Chapter 11. Using the Maps app

11.1. About the Maps app

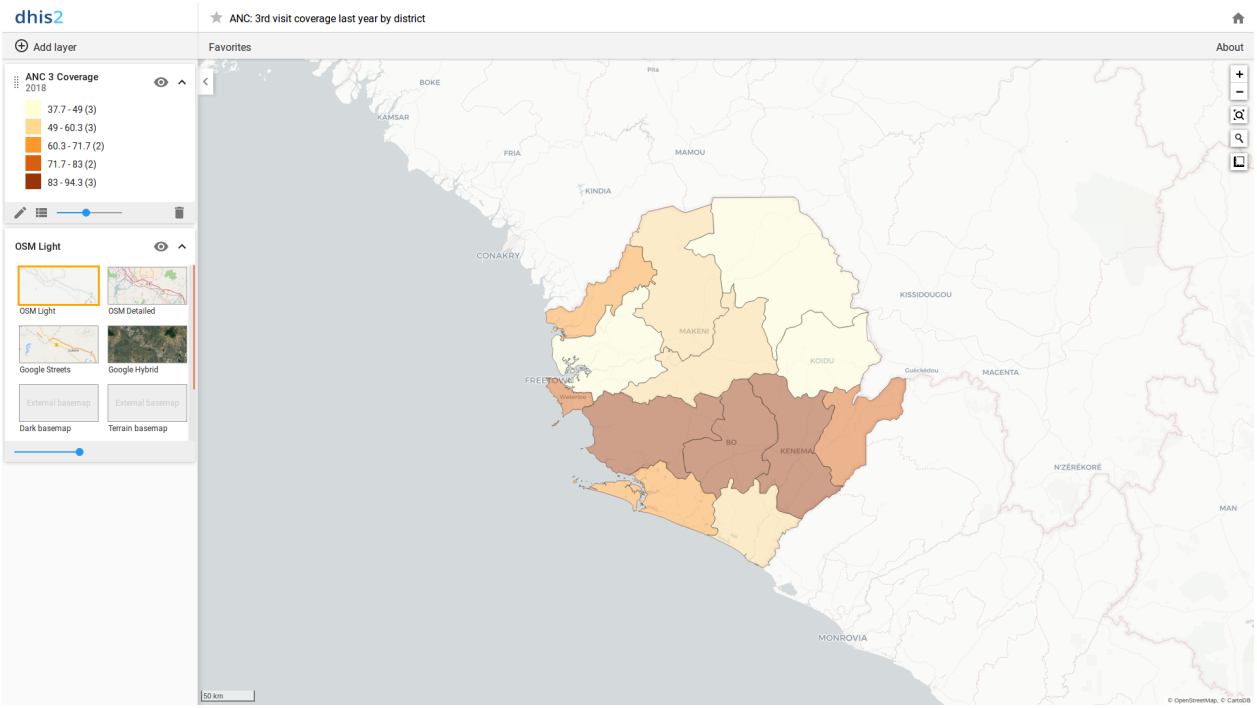
The Maps App is introduced in release 2.29 and serves as a replacement of the GIS App offering a more intuitive and user-friendly interface.

With the Maps app you can overlay multiple layers and choose among different base maps. You can create thematic maps of areas and points, view facilities based on classifications, and visualize catchment areas for each facility. You can add labels to areas and points, and search and filter using various criteria. You can move points and set locations on the fly. Maps can be saved as favorites and shared with other users and groups.

Note

To use predefined legends in the **Maps** app, you need to create them first in the **Maintenance** app.

Here's an overview of the Maps app workspace



- The **layer panel** on the left side of the workspace shows an overview of the layers for the current map:
  - As layers are added, using the (+) Add layer button, they are arranged and managed in this panel.
  - The **basemap** is always shown in the panel. The default basemap is OSM Light and is selected by default. OpenStreetMap Detailed, Google Streets and Google Hybrid are also available. You can use these maps as background maps and layers. Switch between them by selecting the desired image.
  - The small arrow button to the right of the layer panel, at the top, allows the panel to be hidden or shown.

- The **Favorites** button near the top left allows you to save and open maps:

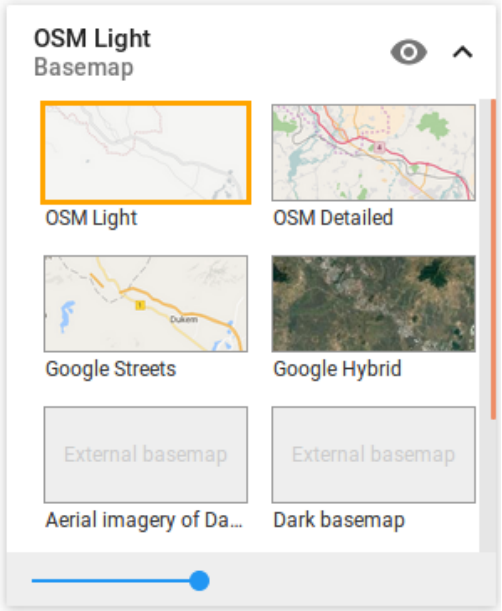
  New will clear any existing map layers to create a new thematic map.

Open	will display a **Favorites** dialog to select an existing thematic map. Favorites can also be renamed, shared and deleted through the Favorites dialog. *The title of the current favorite is displayed in the header bar above the Favorites button.*
Save	will save any changes to the current favorite.
Save as	will save the current thematic map as a new favorite.
Write interpretation	will open a dialog where an interpretation for the current favorite can be written.
Get link	will provide a direct link and API link to the current favorite.

- The **+** and **-** buttons on the map allow you to zoom in and out of the map respectively. The mouse scroll wheel can also be used for altering the zoom.
- **Zoom to content** (bounded magnifying glass symbol) automatically adjusts the zoom level and map center position to put the data on your map in focus.
- **Search** (magnifying glass symbol) allows searching for and jumping to a location on the map.
- The **ruler** button allows you to find the distance between two locations on the map.
- To view information for an event, simply click the event.
- Right-click on the map to display the longitude and latitude of that location.
- The home icon on the top right of the workspace will take you back to the DHIS2 dashboard.
- The About button will display system version information.

Basemaps

Basemap layers are represented by layer *cards* in the layer panel such as:



Along the top of the basemap card from left to right are:

- The title of the selected basemap
- An eye symbol for toggling the visibility of the layer
- An arrow symbol to collapse and expand the basemap card

In the middle of the basemap card is the list of available basemaps. The current basemap is highlighted.

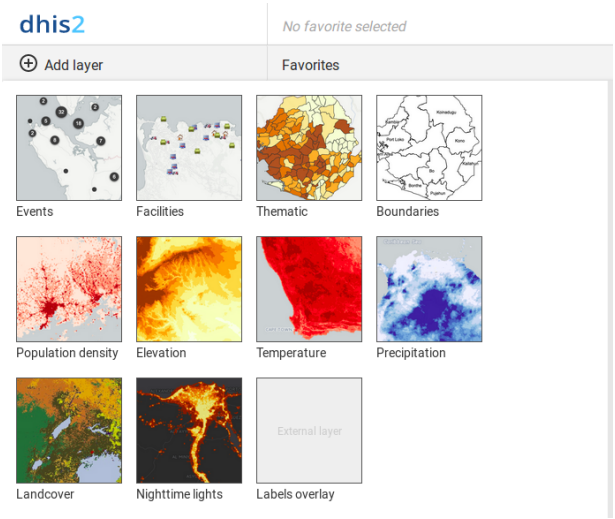
Along the bottom of the basemap card is:

- A slider for modifying the layer transparency

11.2. Create a new map

You can create a new thematic map by adding one or more different layers in the **DHIS2 Maps** app.

1. In the **Apps** menu, click **Maps**. The **DHIS2 Maps** window opens.
2. Click the (+) Add layer button in the top left. You are presented with the layer selection dialog:



3. Select a layer to add to the current map. Possible options are:

   Events

   Facilities

   Thematic

   Boundaries

   In addition, there are several layers provided by Google Earth Engine and other services:

   Population density

   Elevation

   Temperature

   Precipitation

   Landcover

   Nighttime lights

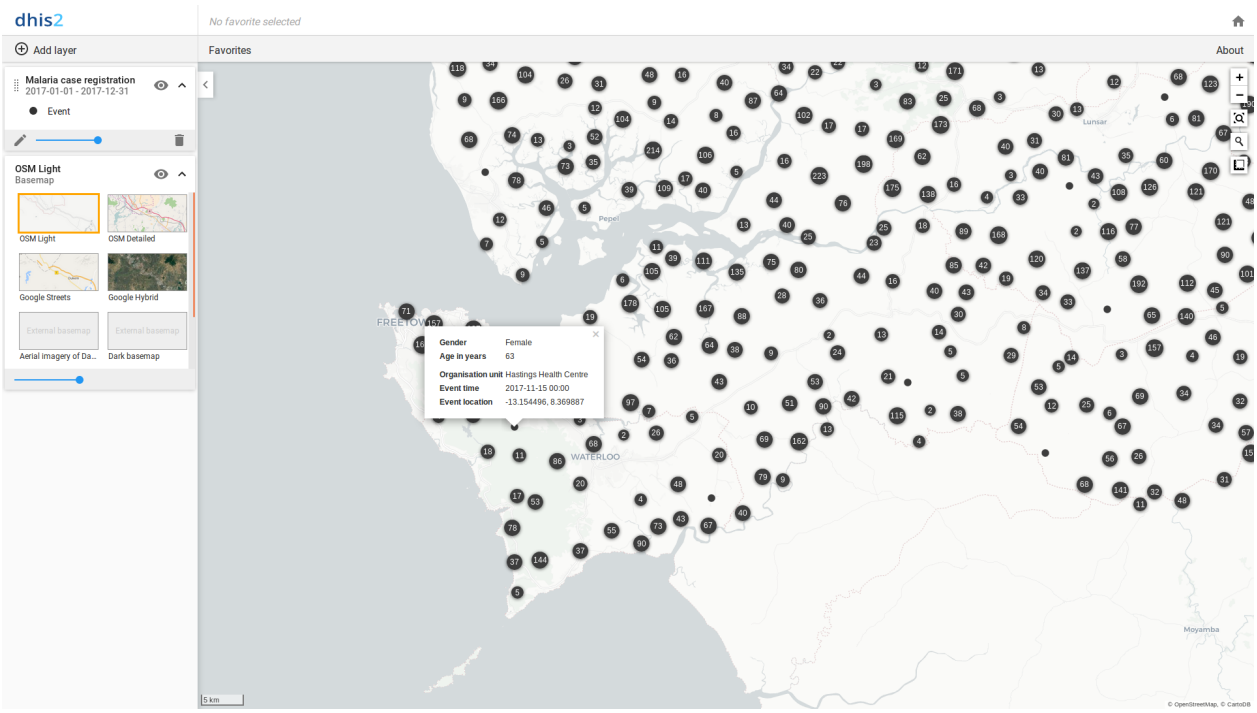
   Labels overlay is an external layer defined in the database used for the above example

11.3. Manage event layers

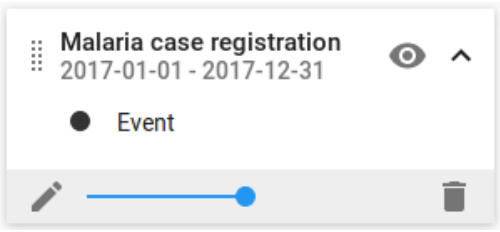
The event layer displays the geographical location of events registered in the DHIS2 tracker. Provided that events have associated GPS coordinates, you can use this layer to drill down from the aggregated data displayed in the thematic layers to the underlying individual events or cases.

You can also display aggregated events at the facility or at the boundary level. You do this through a thematic layer using event data items. This is useful when you only have the coordinates for the Org Unit under which the events are recorded.

Example of an event layer



Event layers are represented by layer *cards* in the layer panel such as:



Along the top of the event card from left to right are:

- A grab field to allow dragging and re-ordering layers with the mouse
- The title and period associated with the layer
- An eye symbol for toggling the visibility of the layer
- An arrow symbol to collapse and expand the event card

In the middle of the event card is a legend indicating the styling of the layer.

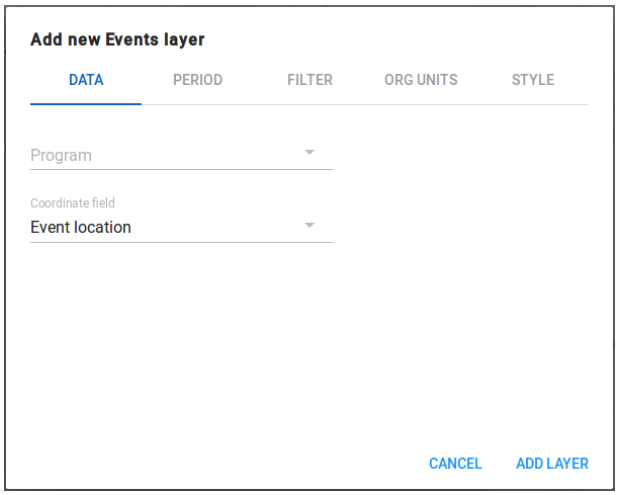
Along the bottom of the event card from left to right are:

- An edit (pencil) button to open the layer configuration dialog
- A slider for modifying the layer transparency
- A delete (trash can) icon to remove the layer from the current thematic map.

11.3.1. Create an event layer

To create an event layer, choose **Events** on the **Add layer** selection. This opens the Events layer configuration dialog.

1. In the **DATA** tab:

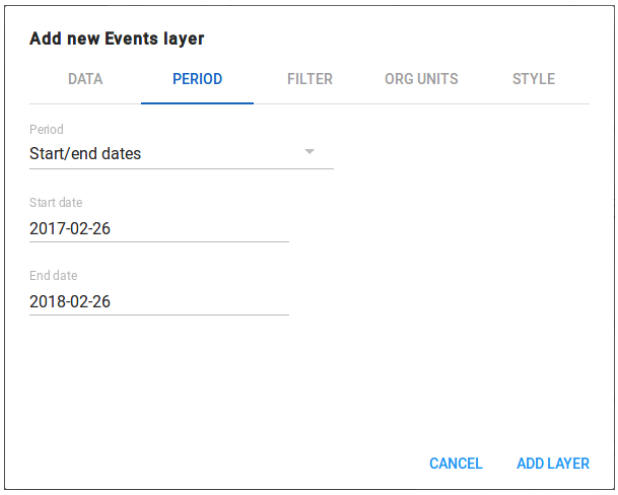


- Select a program and then select a program stage. The **Stage** field is only shown once a program is selected.

  If there is only one stage available for the selected program, the stage is automatically selected.

- Select a value from the **Coordinate field** for the positions shown on the map. By default, "Event location" is selected. Depending on the data elements or attributes that belong to a program, other coordinates such as "Household position" are available.

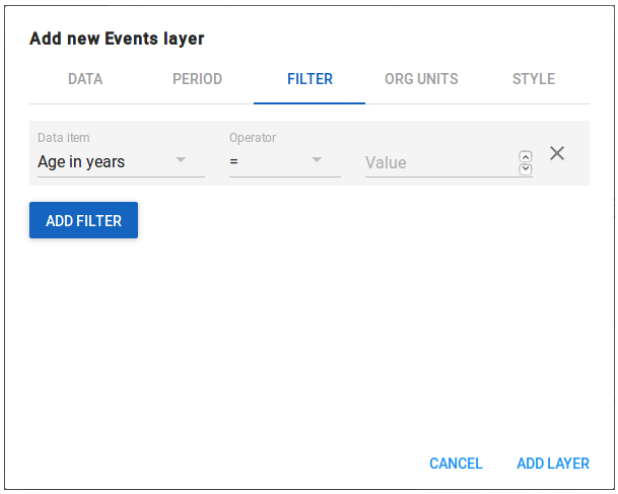
2. In the **PERIOD** tab



- select the time span for when the events took place. You can select either a fixed period or a relative period.

Fixed period	In the **Period** field, select **Start/end dates** and fill in a start date and an end date.
Relative period	In the **Period** field, select one of the relative periods, for example **This month** or **Last year**.

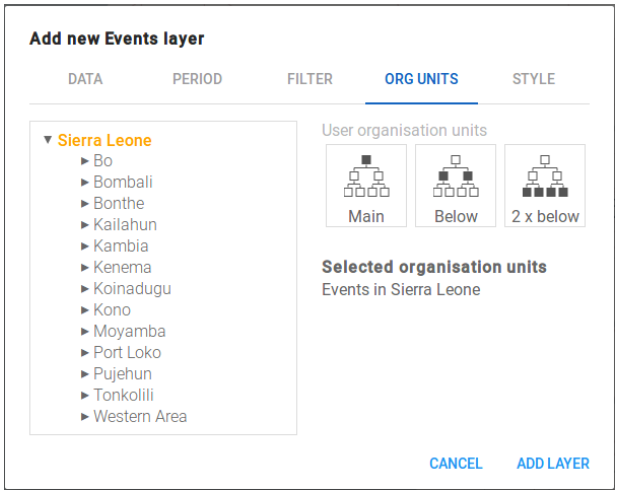
3. In the **FILTER** tab:



- Click ADD FILTER and select an available data item to add a new filter to the data set.
  - For data item of type *text* you will get two choices: **Contains** implies that the query will match all values which contains your search value, and **Is exact** implies that only values which is completely identical to your search query will be returned.
  - For data item of type *option set*, you can select any of the options from the drop down box by using the down-wards arrow or by start typing directly in the box to filter for options.

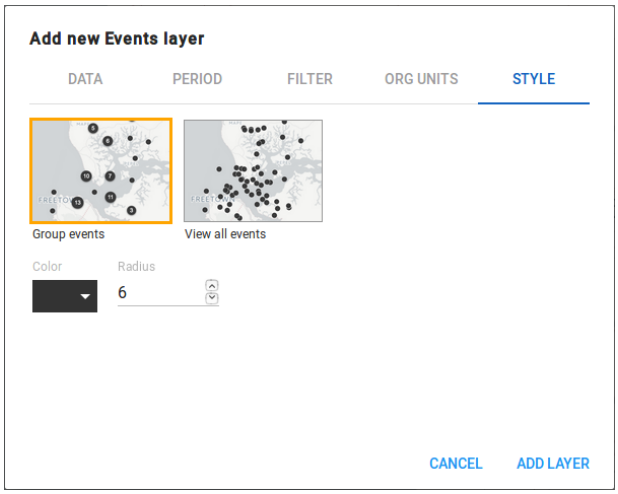
  Multiple filters may be added. Click the X on the far right of the filter to remove it.

4. In the **ORG UNITS** tab:



- Select the organisation units you want to include in the layer. It is possible to select either
  - One or more specific organisation units, or
  - A relative level in the organisation unit hierarchy, with respect to the user. By selecting a **User organisation unit** the map data will appear differently for users at different levels in the organisation unit hierarchy.

5. In the **STYLE** tab:



- Select **Group events** to group nearby events, or **View all events** to display events individually.
- Select a color for the event or cluster points.
- Select the radius (between 1 and 20) for grouped events; also known as **clusters**.

6. Click **ADD LAYER**.

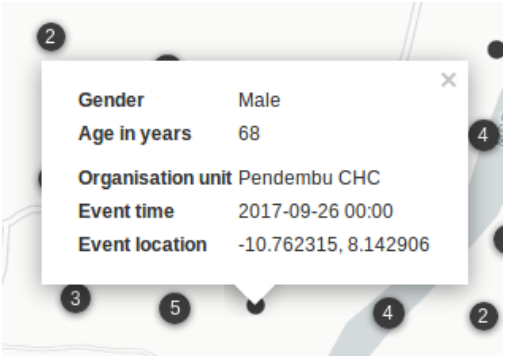
11.3.2. Modify an event layer

1. In the layer panel, click the edit (pencil) icon on the event layer card.
2. Modify the setting on the DATA, PERIOD, FILTER, ORG UNIT and STYLE tabs as desired.
3. Click **UPDATE LAYER**.

11.3.3. Modify information in event pop-up windows

For events in a cluster map, you can modify the information displayed in the event pop-up window.

Pop-up window with event information



1. Open the **Programs / Attributes** app.
2. Click **Program**.
3. Click the program you want to modify and select **View program stages**.
4. Click the program stage name and select **Edit**.
5. Scroll down to the **Selected data elements** section.
6. For every data element you want to display in the pop-up window, select corresponding **Display in reports**.
7. Click **Update**.

11.3.4. Clear event layer

To clear all event layer data in a map:

1. In the layer panel, click the delete (trash can) icon on the event layer card.

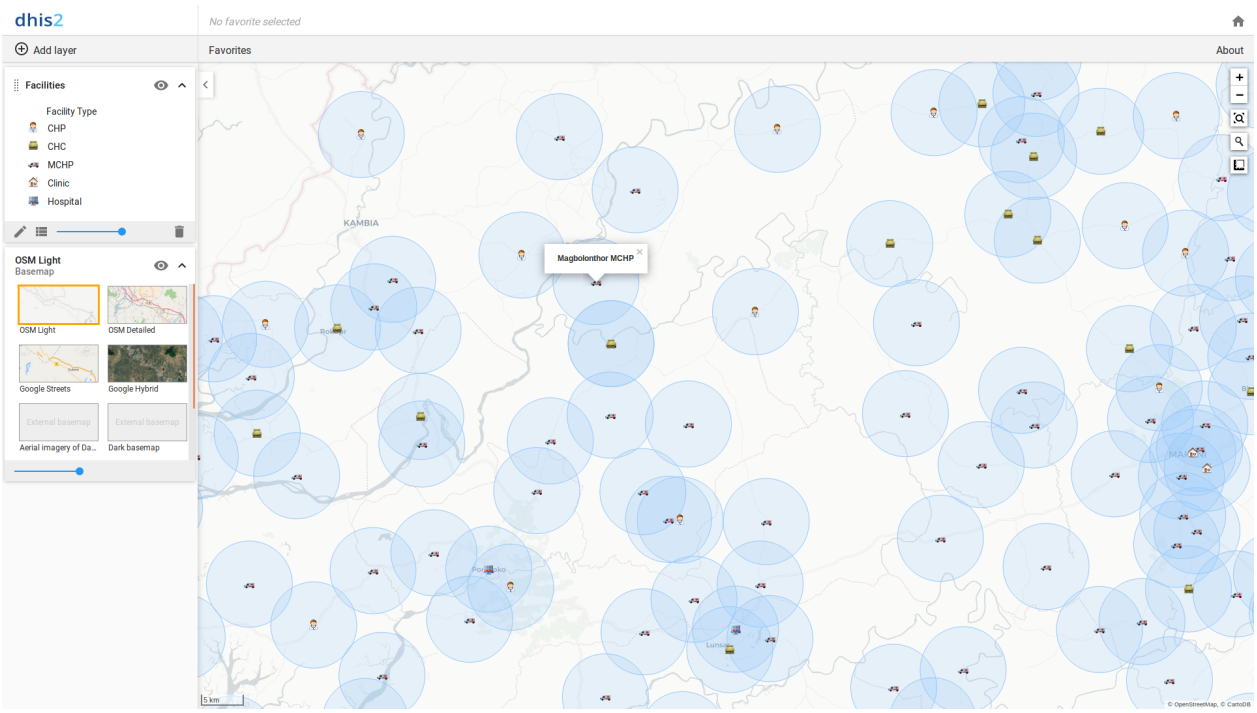
   The layer is removed from the current map.

11.4. Manage facility layers

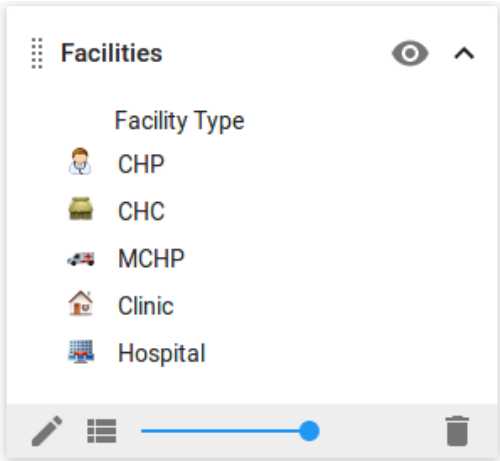
The facility layer displays icons that represent types of facilities. Polygons do not show up on the map, so make sure that you select an organisation unit level that has facilities.

A polygon is an enclosed area on a map representing a country, a district or a park.

Example of a facility layer



Facility layers are represented by layer *cards* in the layer panel such as:



Along the top of the facilities card from left to right are:

- A grab field to allow dragging and re-ordering layers with the mouse
- The **Facilities** title

- An eye symbol for toggling the visibility of the layer
- An arrow symbol to collapse and expand the facilities card

In the middle of the facilities card is a legend indicating the group set representation.

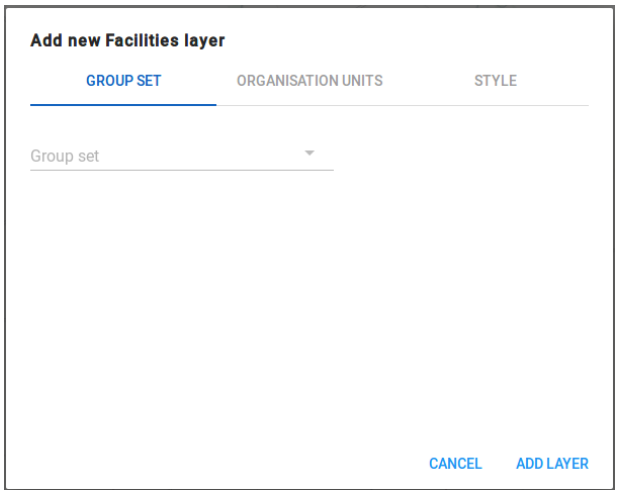
Along the bottom of the facilities card from left to right are:

- An edit (pencil) button to open the layer configuration dialog
- A **data table** toggle button to show or hide the data table associated with the layer
- A slider for modifying the layer transparency
- A delete (trash can) icon to remove the layer from the current thematic map.

11.4.1. Create a facility layer

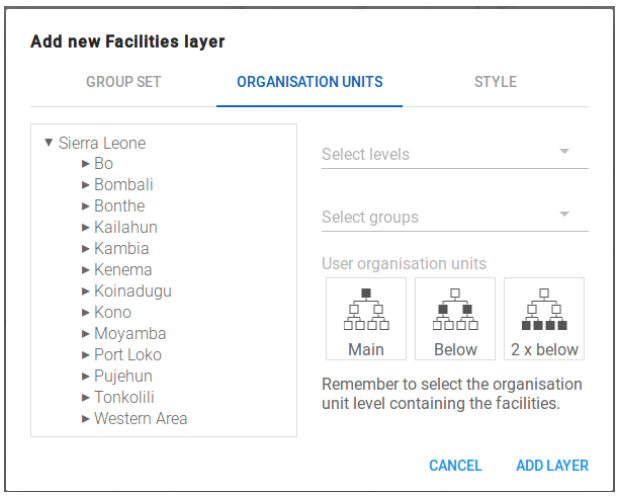
To create facility layer, choose **Facilities** on the **Add layer** selection. This opens the Facility layer configuration dialog.

1. In the **GROUP SET** tab:



- Select a **Group set** from the list of organisation unit group sets defined for your DHIS2 instance.

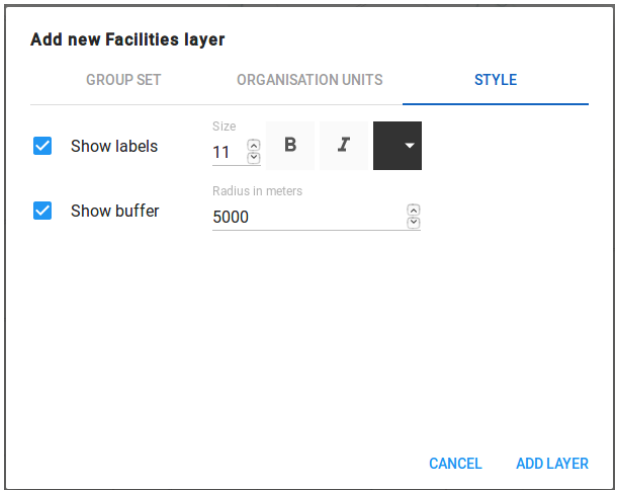
2. In the **ORGANISATION UNITS** tab



- select the organisation unit level(s) and/or group(s) from the selection fields on the right hand side.
- Select the organisation units you want to include in the layer. It is possible to select either
  - One or more specific organisation units, or

- A relative level in the organisation unit hierarchy, with respect to the user. By selecting a **User organisation unit** the map data will appear differently for users at different levels in the organisation unit hierarchy.

3. In the **STYLE** tab:



- select any styling you wish to apply to the facilities.

  Show labels — Allows labels to be shown on the layer. Font size, weight and color can be modified here.

  Show buffer — Allows a visual buffer to be displayed on the layer around each facility. The radius of the buffer can be modified here.

4. Click **ADD LAYER**.

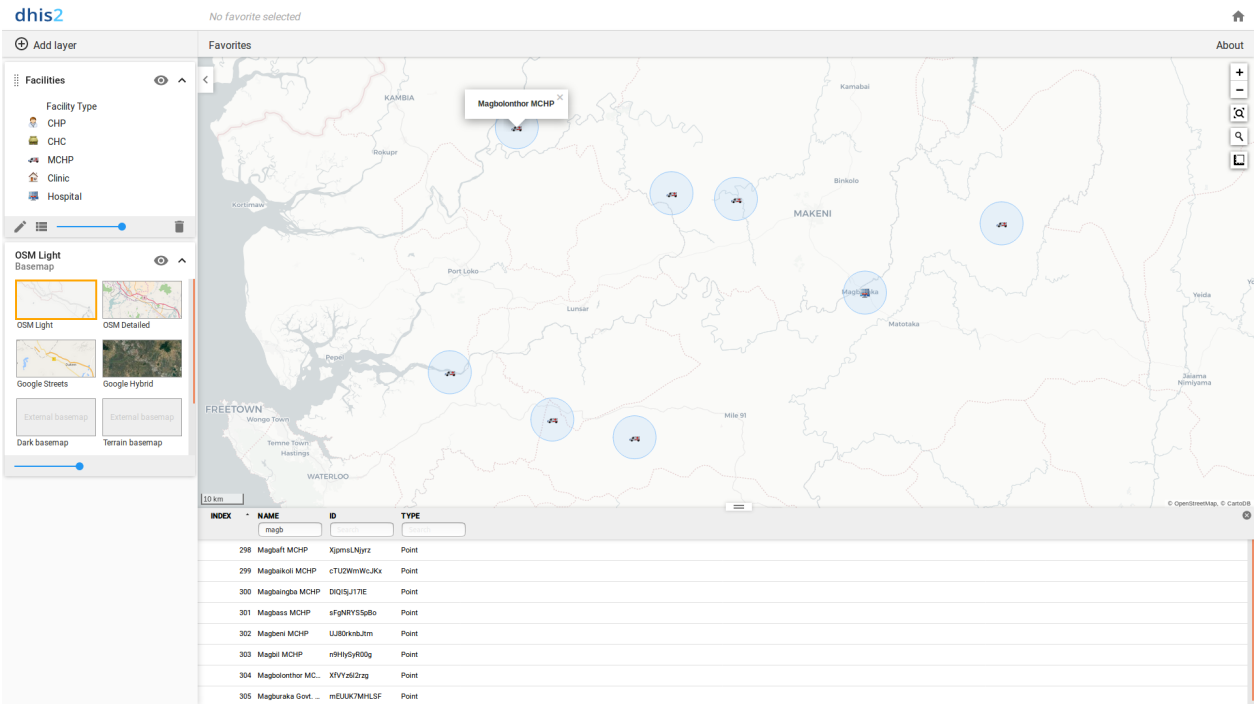
11.4.2. Create or modify a facility layer

1. In the layer panel, click the edit (pencil) icon on the facility layer card.
2. Modify the setting on the GROUP SET, ORGANISATION UNITS and STYLE tabs as desired.
3. Click **UPDATE LAYER**.

11.4.3. Filter values in a facility layer

Facility layers have a **data table** option that can be toggled on or off from the facility layer card.

Example of a faciltiy layer showing the data table



The data table displays the data forming the facility layer.

- clicking on a title will sort the table based on that column; toggling between ascending and descending.
- entering text or expressions into the filter fields below the titles will apply those filters to the data, and the display will adjust according to the filter. The filters are applied as follows:

  NAME filter by name containing the given text

  ID filter by IDs containing the given text

  TYPE filter by GIS display types containing the given text

Note

Data table filters are temporary and are not saved with the map layers as part of the favourite.

11.4.4. Search for a facility

The NAME filter field in the data table provides an effective way of searching for individual facilities.

11.4.5. Remove facility layer

To clear all data in a facility layer:

1. In the layer panel, click the delete (trash can) icon on the facility layer card.

   The layer is removed from the current map.

11.4.6. Manage facilities in a layer

You can have facilities in **Facility**, **Boundary** and **Thematic** layers.

11.4.6.1. Relocate a facility

1. Right-click a facility and click **Relocate**.
2. Put the cursor in the new location.

   The new coordinate is stored permanently. This cannot be undone.

11.4.6.2. Swap longitude and latitude of a facility

1. Right-click a facility and click **Swap longitude/latitude**.

   This is useful if a user inverted latitude and longitude coordinates when creating the organisation unit.

11.4.6.3. Display facility information

You can view organisation unit information set by the administrator as follows:

Table 11.1. View organisation unit information

Function	Action
View information for the current period	1. Click a facility.
View information for a selected period	1. Right-click a facility and click **Show information**. 2. In the **Infrastructural data** section, select a period. **Note** You configure the displayed infrastructural data in the **System Settings** app.

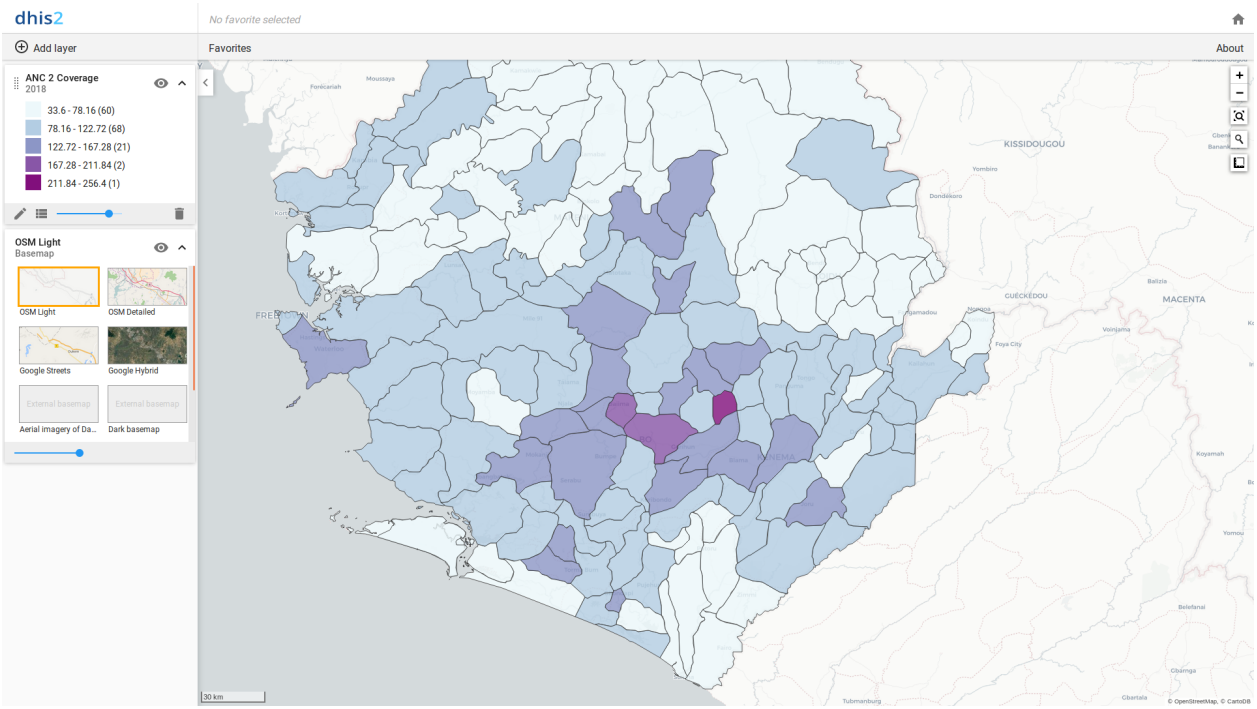
11.5. Manage thematic layers

Thematic maps represent spatial variation of geographic distributions. Select your desired combination of indicator/data element, period and organisation unit level. If your database has coordinates and aggregated data values for these organisation units, they will appear on the map.

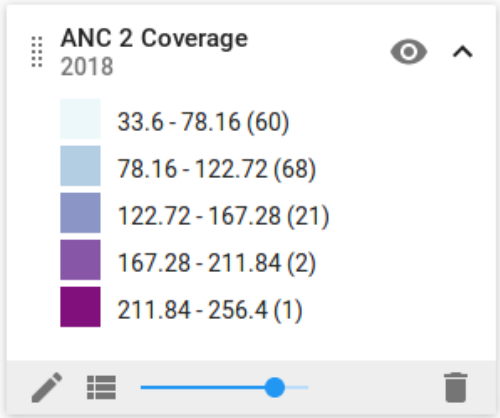
Note

You must refresh the DHIS2 analytics tables to have aggregated data values available.

Example of a thematic map



Thematic layers are represented by layer *cards* in the layer panel such as:



Along the top of the thematic card from left to right are:

- A grab field to allow dragging and re-ordering layers with the mouse
- The title and period associated with the layer
- An eye symbol for toggling the visibility of the layer
- An arrow symbol to collapse and expand the thematic card

In the middle of the thematic card is a legend indicating the value ranges displayed on the layer.

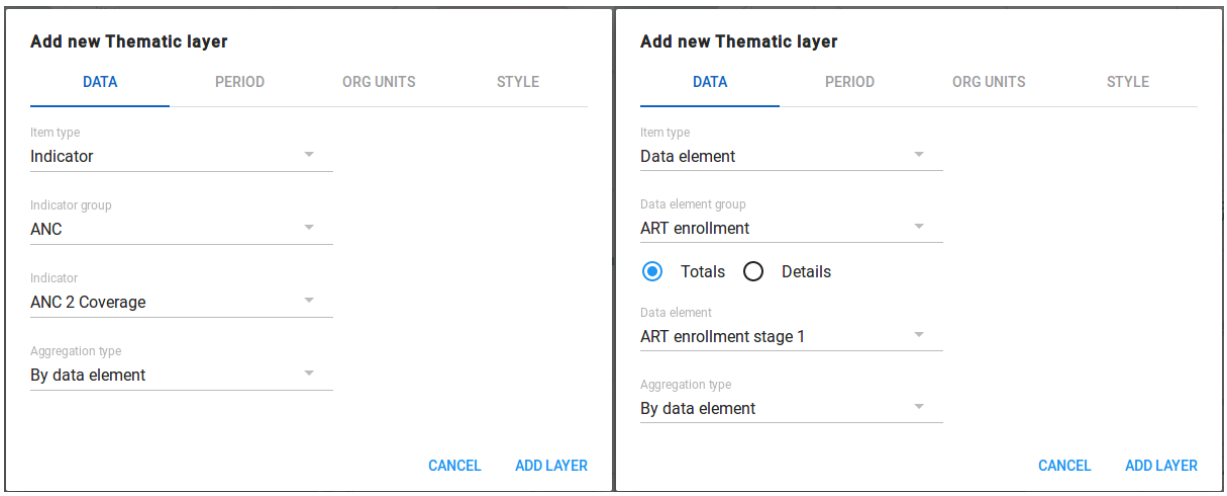
Along the bottom of the thematic card from left to right are:

- An edit (pencil) button to open the layer configuration dialog
- A **data table** toggle button to show or hide the data table associated with the layer
- A slider for modifying the layer transparency
- A delete (trash can) icon to remove the layer from the current thematic map.

11.5.1. Create a thematic layer

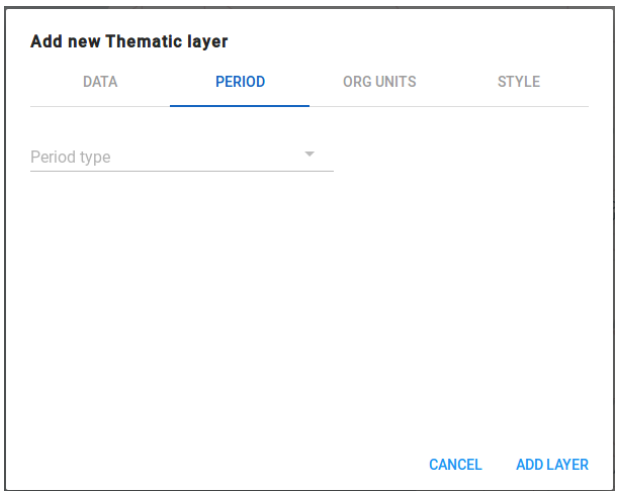
To create an event layer, choose **Thematic** on the **Add layer** selection. This opens the Events layer configuration dialog.

1. In the **DATA** tab:



- Select a data type and then select respectively the group and the target element. The available fields depend on the type of item selected.
- Select a value from the **Aggregation type** field for the data values to be shown on the map. By default, "By data element" is selected. Alternative values are: Count; Average; Sum; Standard deviation; Variance; Min; Max. See also Aggregation operators.

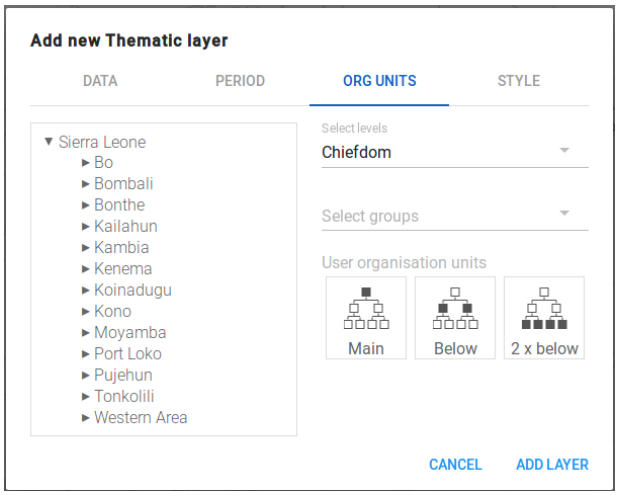
2. In the **PERIOD** tab



- select the time span over which the thematic data is aggregated. You can select either a fixed period or a relative period.

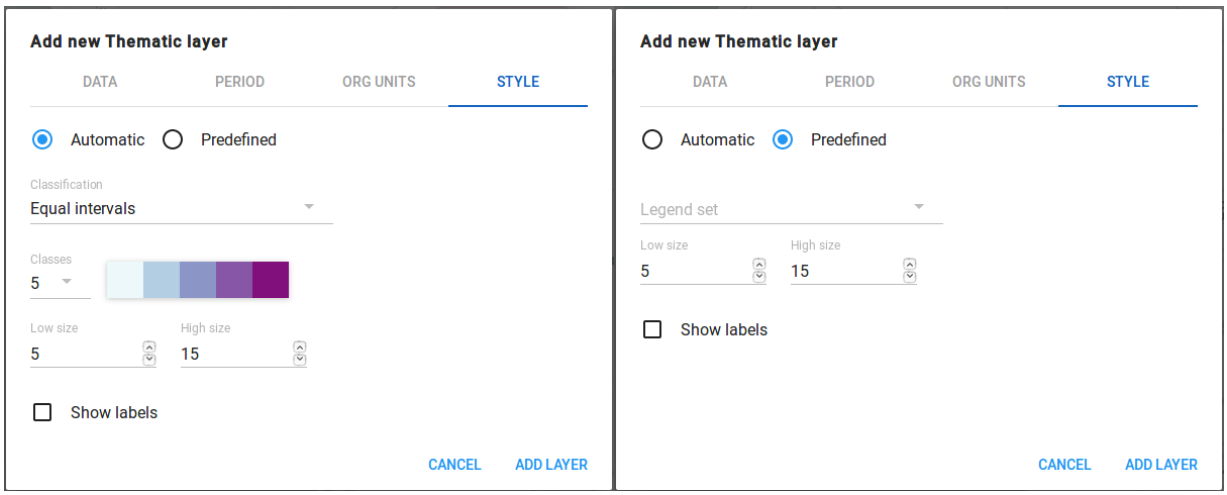
Fixed period	In the **Period type** field select period length, then select the target in the **Period** field.
Relative period	In the **Period type** field select **Relative**, then select one of the relative periods, for example **This month** or **Last year**, in the **Period** field.

3. In the **ORG UNITS** tab:



- Select the organisation units you want to include in the layer. It is possible to select either
  - One or more specific organisation units, or
  - A relative level in the organisation unit hierarchy, with respect to the user. By selecting a **User organisation unit** the map data will appear differently for users at different levels in the organisation unit hierarchy.

4. In the **STYLE** tab:



- Select either **Automatic** or **Predefined** legend.
  - Automatic legend types means that the application will create a legend set for you based on your what method, number of classes, low color and high color you select. Method alludes to the size of the legend classes. Set to

    Equal intervals — the range of each interval will be **highest data value - lowest data value / number of classes**

    Equal counts — the legend creator will try to distribute the organisation units evenly.
  - If you have facilities in your thematic layer, you can set the radius for minimum and maximum values by changing the values in the **Low size** and **High size** boxes respectively.

5. Click **ADD LAYER**.

11.5.2. Modify a thematic layer

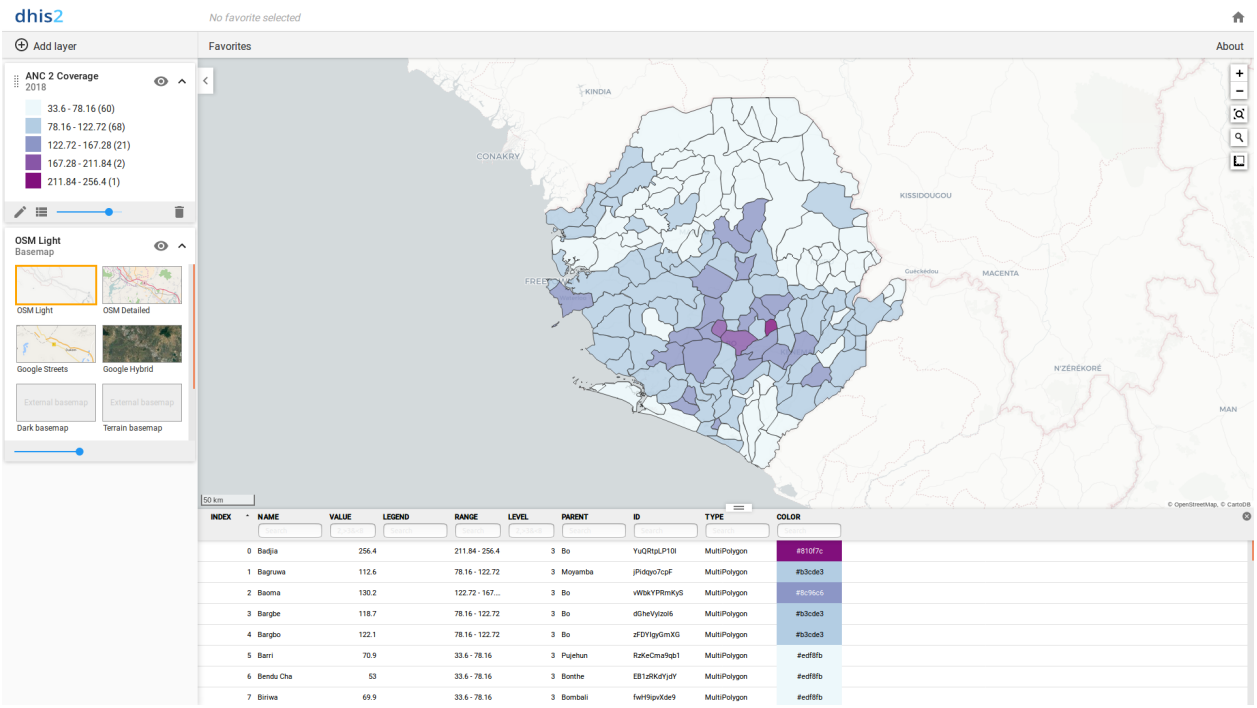
1. In the layer panel, click the edit (pencil) icon on the thematic layer card.
2. Modify the setting on the DATA, PERIOD, ORG UNITS and STYLE tabs as desired.

3. Click **UPDATE LAYER**.

11.5.3. Filter values in a thematic layer

Thematic layers have a **data table** option that can be toggled on or off from the thematic layer card.

Example of a thematic map showing the data table

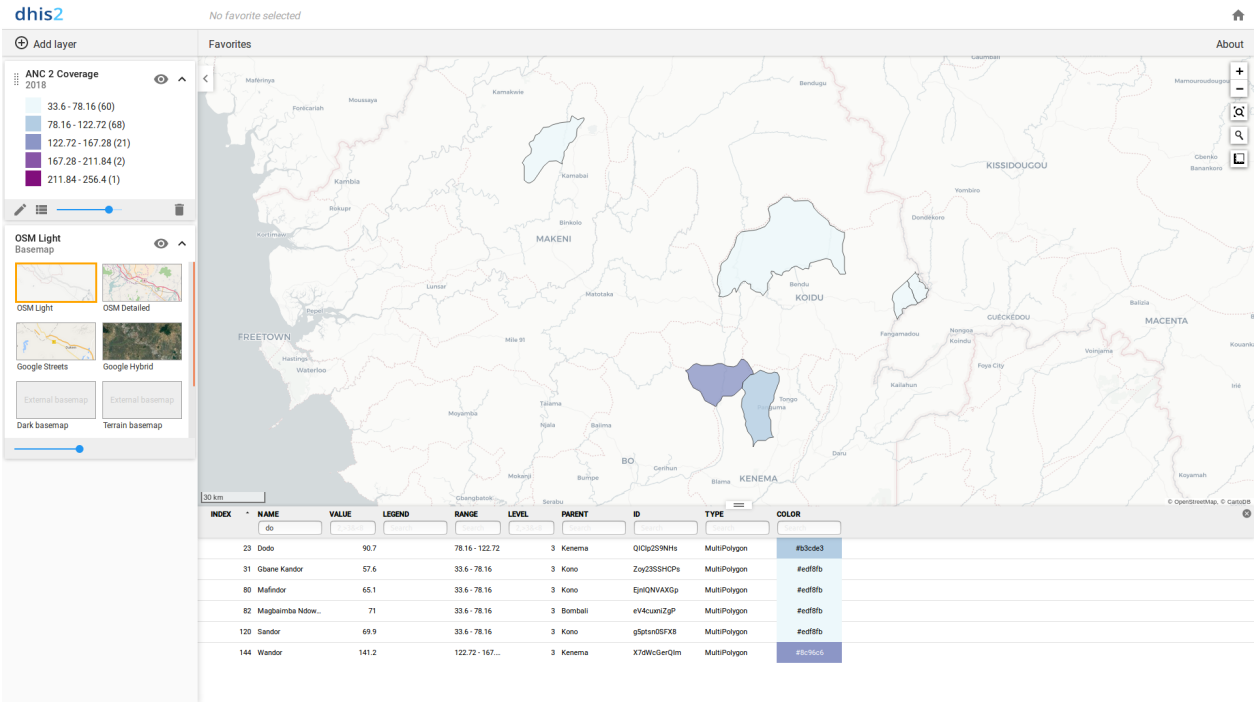


The data table displays the data forming the thematic layer.

- clicking on a title will sort the table based on that column; toggling between ascending and descending.
- entering text or expressions into the filter fields below the titles will apply those filters to the data, and the display will adjust according to the filter. The filters are applied as follows:

NAME	filter by name containing the given text
VALUE	filter values by given numbers and/or ranges, for example: 2,>3&<8
LEGEND	filter by legend containing the given text
RANGE	filter by ranges containing the given text
LEVEL	filter level by numbers and/or ranges, for example: 2,>3&<8
PARENT	filter by parent names containing the given text
ID	filter by IDs containing the given text
TYPE	filter by GIS display types containing the given text
COLOR	filter by color names containing the given text

Example of filtering by name in the data table



Note

Data table filters are temporary and are not saved with the map layers as part of the favourite.

11.5.4. Search for an organisation unit

The NAME filter field in the data table provides an effective way of searching for individual organisation units.

11.5.5. Navigate between organisation hierarchies

When there are visible organisation units on the map, you can easily navigate up and down in the hierarchy without using the level/parent user interface.

1. Right-click one of the organisation units.
2. Select **Drill up one level** or **Drill down one level**.

   The drill down option is disabled if you are on the lowest level or if there are no coordinates available on the level below. Likewise the drill up option is disabled from the highest level.

11.5.6. Remove thematic layer

To clear all data in a thematic layer:

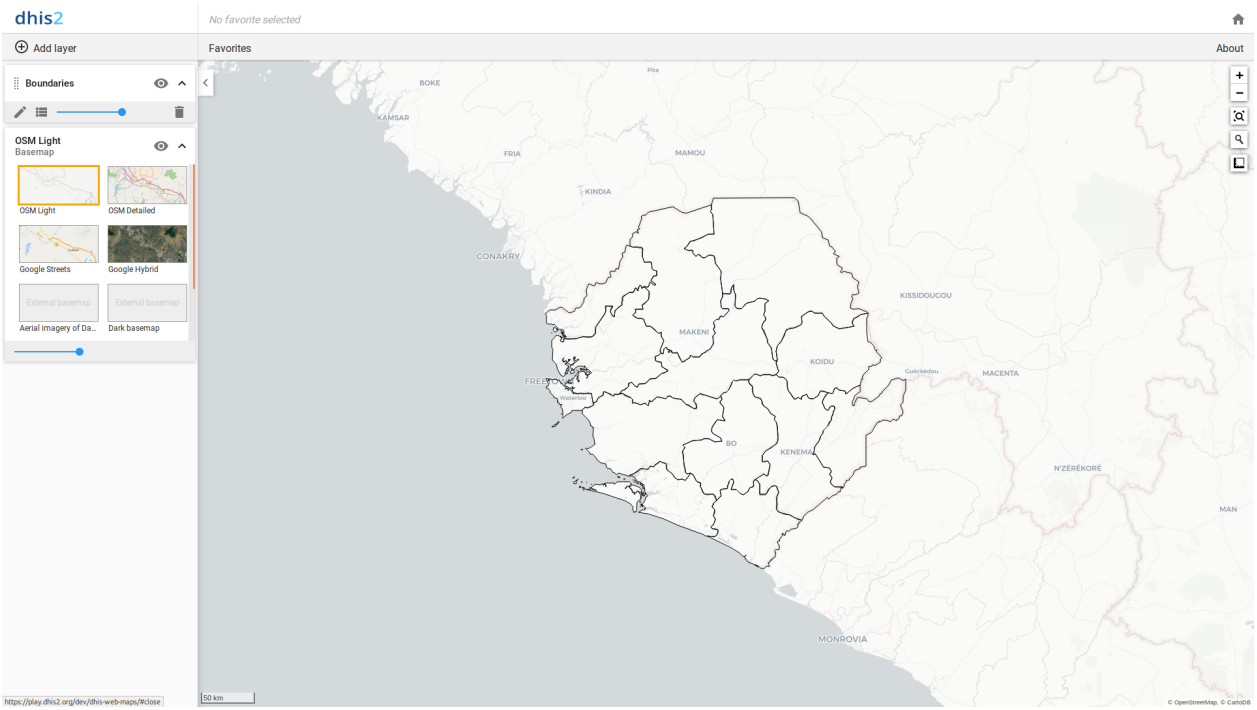
1. In the layer panel, click the delete (trash can) icon on the thematic layer card.

   The layer is removed from the current map.

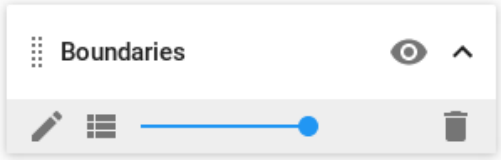
11.6. Manage boundary layers

The boundary layer displays the borders and locations of your organisation units. This layer is particularly useful if you are offline and don't have access to background maps.

Boundary layer



Boundary layers are represented by layer *cards* in the layer panel such as:



Along the top of the boundary card from left to right are:

- A grab field to allow dragging and re-ordering layers with the mouse
- The **Boundaries** title
- An eye symbol for toggling the visibility of the layer
- An arrow symbol to collapse and expand the boundary card

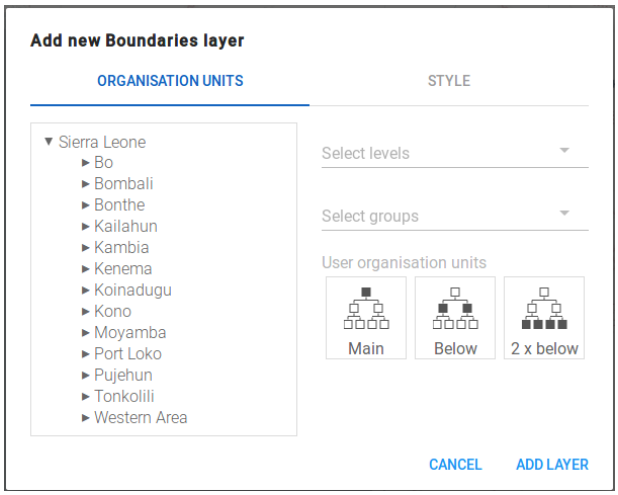
Along the bottom of the boundary card from left to right are:

- An edit (pencil) button to open the layer configuration dialog
- A **data table** toggle button to show or hide the data table associated with the layer
- A slider for modifying the layer transparency
- A delete (trash can) icon to remove the layer from the current thematic map.

11.6.1. Create a boundary layer

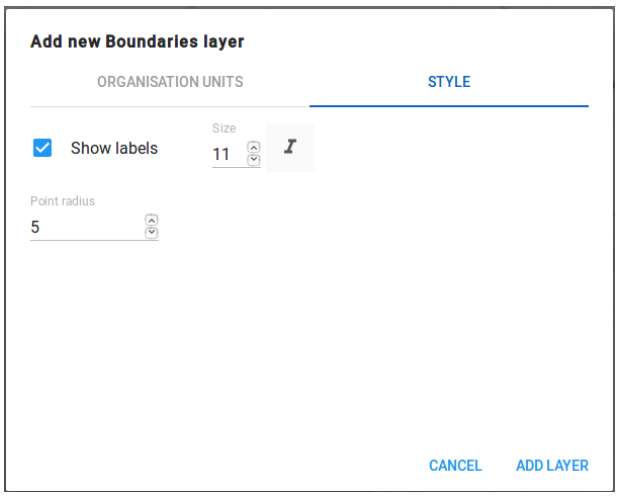
To create boundary layer, choose **Boundaries** on the **Add layer** selection. This opens the Boundary layer configuration dialog.

1. In the **ORGANISATION UNITS** tab



- select the organisation unit level(s) and/or group(s) from the selection fields on the right hand side.
- Select the organisation units you want to include in the layer. It is possible to select either
  - One or more specific organisation units, or
  - A relative level in the organisation unit hierarchy, with respect to the user. By selecting a **User organisation unit** the map data will appear differently for users at different levels in the organisation unit hierarchy.

2. In the **STYLE** tab:



- select any styling you wish to apply to the boundaries.

Show labels	Allows labels to be shown on the layer. Font size and weight can be modified here.
Point radius	Sets the base radius when point type elements, such as facilities, are presented on the boundary layer.

3. Click **ADD LAYER**.

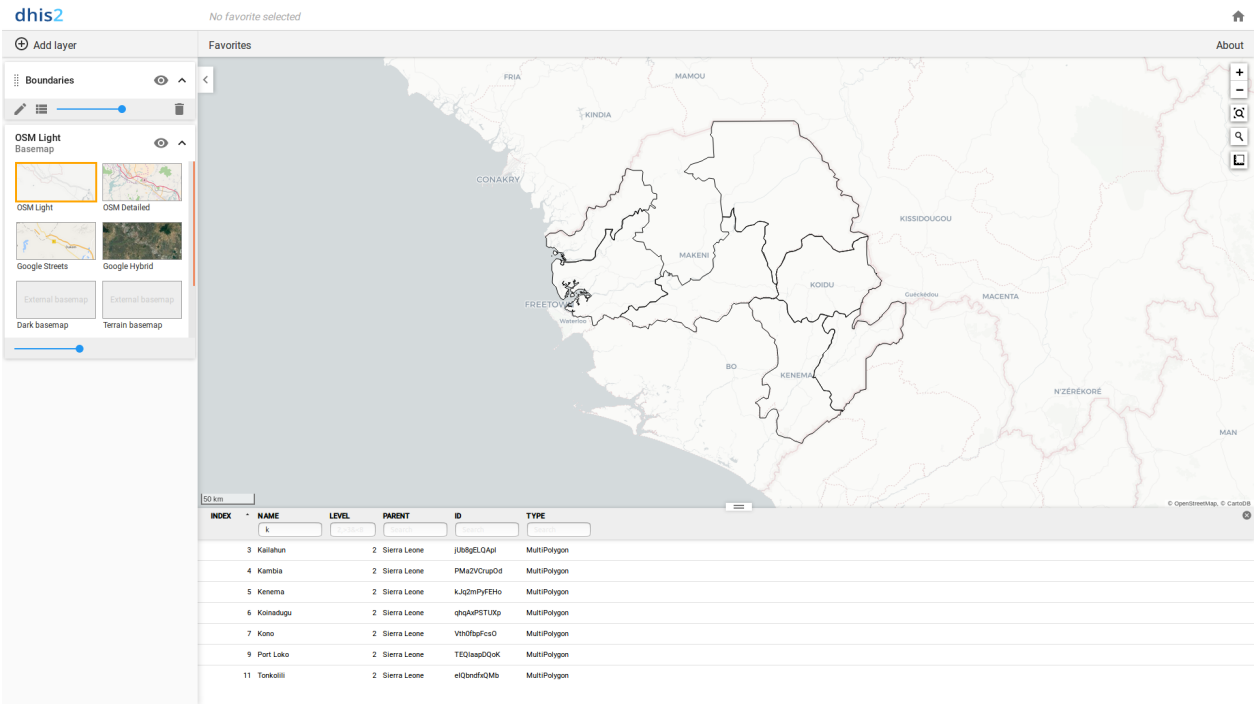
11.6.2. Modify a boundary layer

1. In the layer panel, click the edit (pencil) icon on the boundary layer card.
2. Modify the setting on the ORGANISATION UNITS and STYLE tabs as desired.
3. Click **UPDATE LAYER**.

11.6.3. Filter values in a boundary layer

Boundary layers have a **data table** option that can be toggled on or off from the boundary layer card.

Example of a boundary layer showing the data table



The data table displays the data forming the boundary layer.

- clicking on a title will sort the table based on that column; toggling between ascending and descending.
- entering text or expressions into the filter fields below the titles will apply those filters to the data, and the display will adjust according to the filter. The filters are applied as follows:

NAME	filter by name containing the given text
LEVEL	filter level by numbers and/or ranges, for example: 2,>3&<8
PARENT	filter by parent names containing the given text
ID	filter by IDs containing the given text
TYPE	filter by GIS display types containing the given text

Note

Data table filters are temporary and are not saved with the map layers as part of the favourite.

11.6.4. Search for an organisational unit

The NAME filter field in the data table provides an effective way of searching for individual organisational units displayed in the boundary layer.

11.6.5. Navigate between organisation hierarchies

You can modify the target of the boundary layer in the hierarchy without using the level/parent user interface.

1. Right-click one of the boundaries.
2. Select **Drill up one level** or **Drill down one level**.

   The drill down option is disabled if you are on the lowest level. Likewise the drill up option is disabled from the highest level.

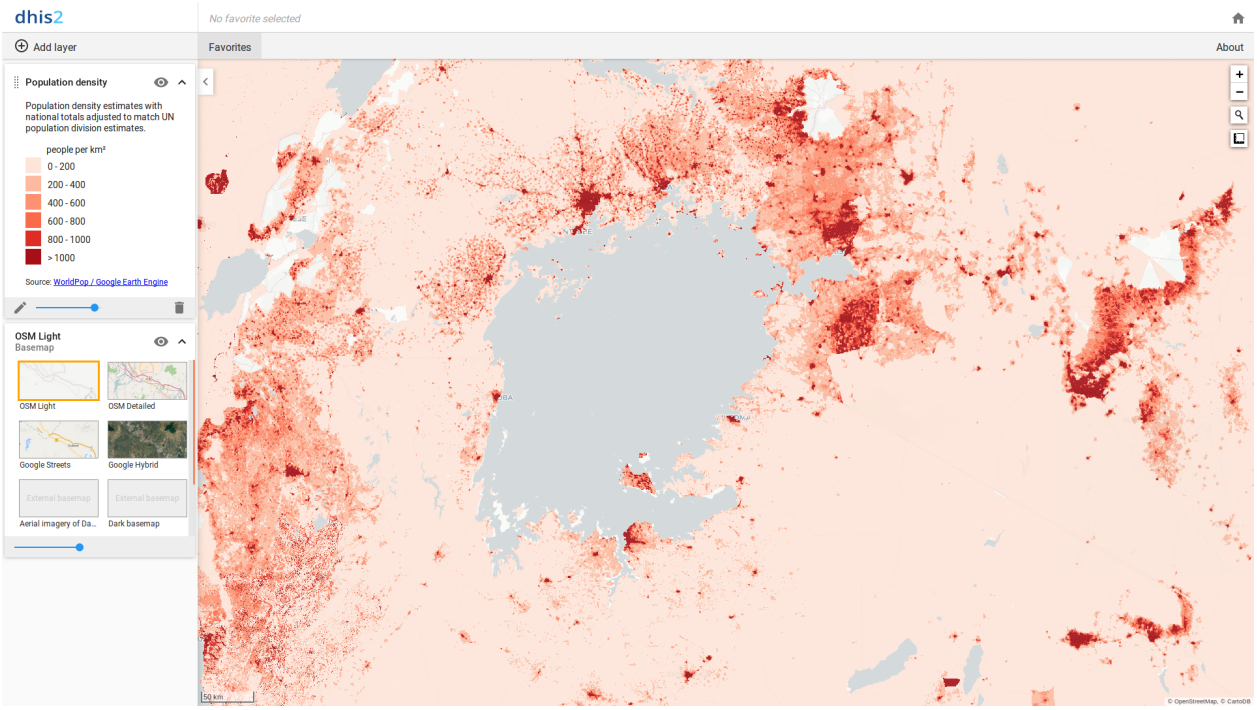
11.6.6. Remove boundary layer

To clear all data in a boundary layer:

1. In the layer panel, click the delete (trash can) icon on the boundary layer card.

   The layer is removed from the current map.

11.7. Manage Earth Engine layer



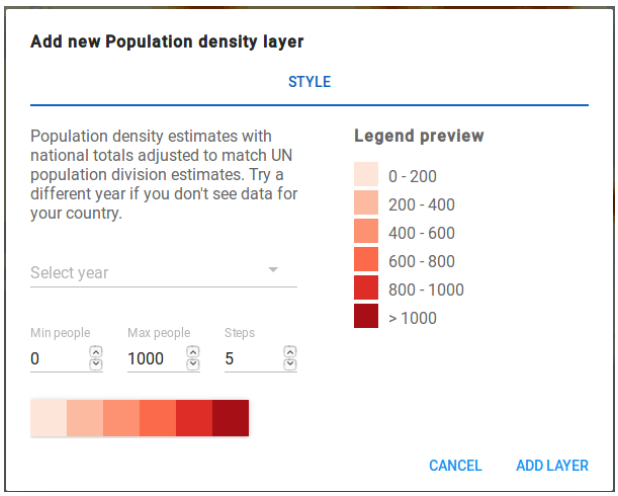
The Google Earth Engine layer lets you display satellite imagery and geospatial datasets from Google's vast catalog. These layers is useful in combination with thematic and event layers to enhance analysis. The following layers are supported:

- Population density estimates with national totals adjusted to match UN population division estimates. Population in 100 x 100 m grid cells (from 2010).
- Elevation above sea-level. You can adjust the min and max values so it better representes the terrain in your region.
- Temperature: Land surface temperatures collected from satellite. Blank spots will appear in areas with a persistent cloud cover.
- Precipitation collected from satellite and weather stations on the ground. The values are in millimeters within 5 days periods. Updated monthly, during the 3rd week of the following month.
- Land cover: 17 distinct landcover types collected from satellites.
- Nighttime lights: Lights from cities, towns, and other sites with persistent lighting, including gas flares (from 2013).

11.7.1. Create an Earth Engine layer

To create an Earth Engine layer, choose the desired layer from the **Add layer** selection. This opens the layer configuration dialog.

1. In the **STYLE** tab



   - Modify the parameters specific to the layer type.
   - Adjust the legend range, steps and colors, as desired.

2. Click **ADD LAYER**.

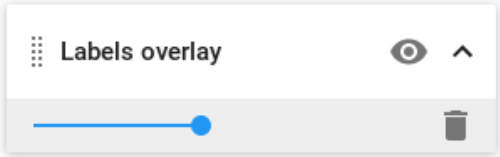
11.8. Add external map layers

External map layers are represented as either:

Basemaps These are available in the **basemap** card in the layers panel and are selected as any other basemap.

Overlays These are available in the **Add layer** selection. Unlike basemaps, overlays can be placed above or below any other overlay layers.

Overlay layers are represented by additional layer *cards* in the layer panel such as:



Along the top of the overlay card from left to right are:

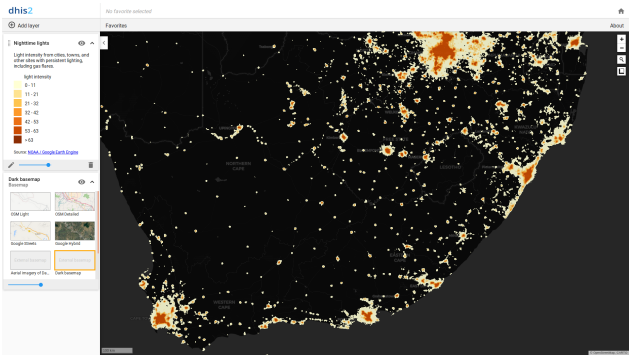
- A grab field to allow dragging and re-ordering layers with the mouse
- The title of the external map layer
- An eye symbol for toggling the visibility of the layer
- An arrow symbol to collapse and expand the overlay card

Along the bottom of the overlay card from left to right are:

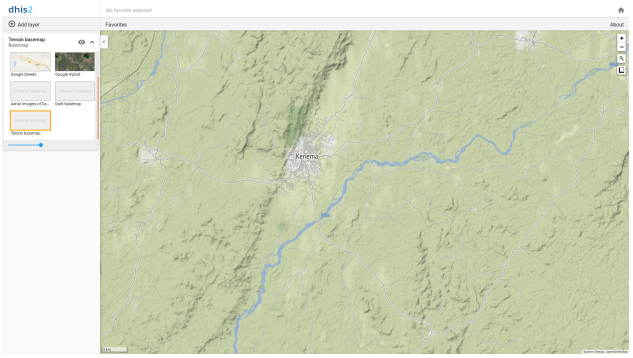
- A slider for modifying the layer transparency
- A delete (trash can) icon to remove the layer from the current thematic map.

Here are some examples of external layers:

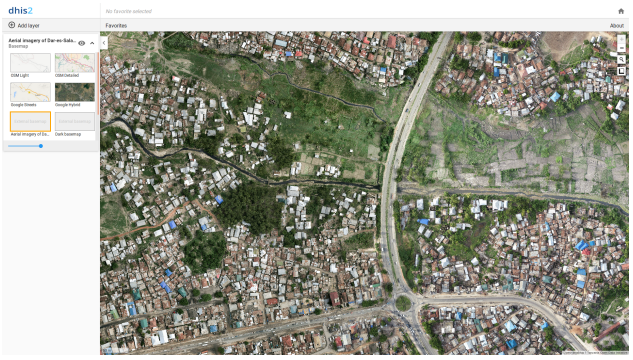
Example 1: Dark basemap with nighttime lights from Google Earth Engine



Example 2: Terrain basemap



Example 3: Aerial imagery of Dar-es-Salaam



Note

To define external map layers, see the Section 20.14, “Manage external map layers”.

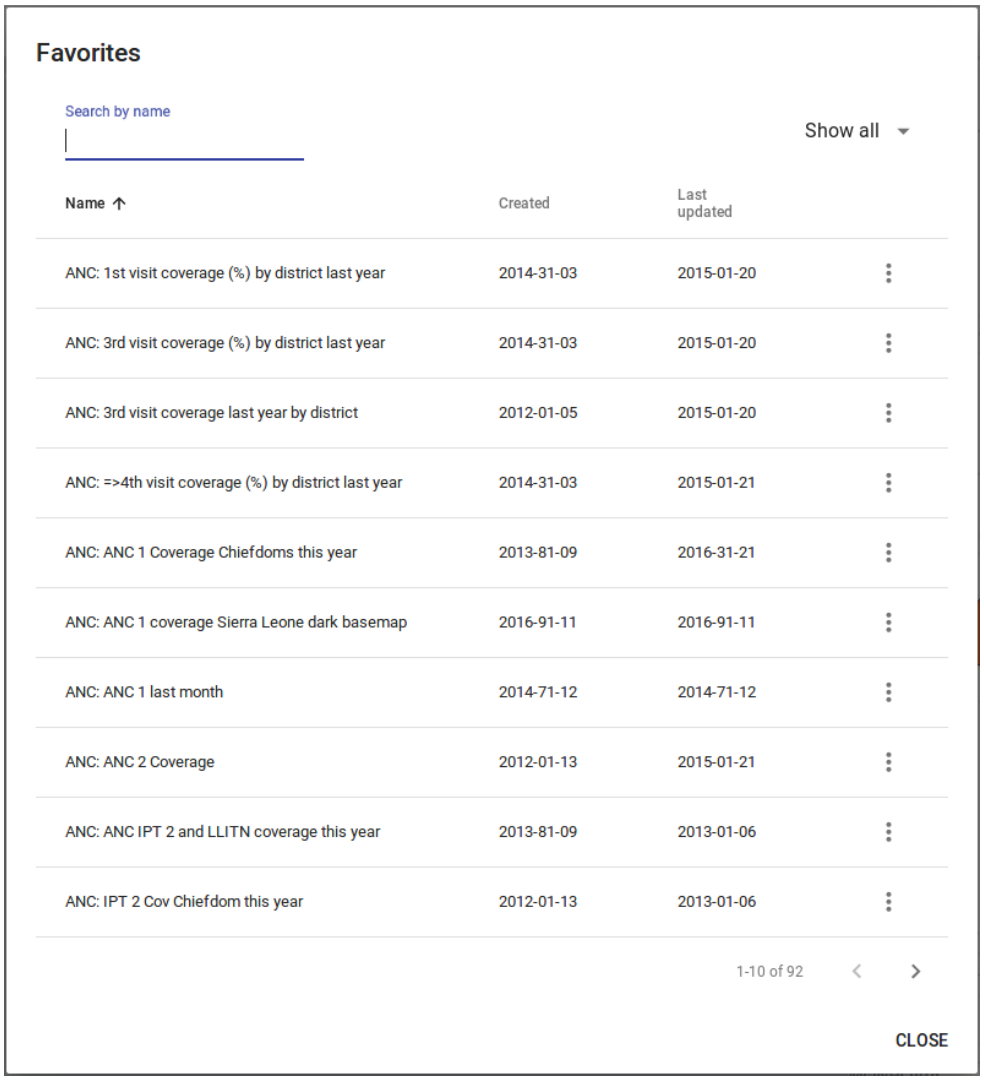
11.9. Manage map favorites

Saving your maps as favorites makes it easy to restore them later. It also gives you the opportunity to share them with other users as an interpretation or put it on the dashboard. You can save all types of layer configurations as a favorite.

11.9.1. Open a favorite

1. Select **Open** from the **Favorites** menu.

   The **Favorites** dialog box opens.



2. Find the favorite you want to open. You can either use **<** and **>** or the search field to find a saved favorite. The list is filtered on every character that you enter.
3. Click the name to open that favorite.

11.9.2. Save a map as a new favorite

When you have created a map it is convenient to save it as a favorite:

1. Select **Save as** from the **Favorites** menu.

   The **Save as new favorite** dialog box opens.
2. In the text field, type the name you want to give your map favorite.
3. Click **SAVE**.

   Your favorite is added to the list.

11.9.3. Overwrite the current favorite

Select **Save** from the **Favorites** menu.

11.9.4. Rename a favorite

1. Select **Open** from the **Favorites** menu.

   The **Favorites** dialog box opens.

2. Find the favorite you want to rename.

   You can either use **<** and **>** or the search field to find a saved favorite.
3. Click the more options icon (three dots) at the right of the favorite row, and select **Rename**.

   The **Rename favorite** dialog box opens.
4. Edit the name and/or description.
5. Click **SAVE**.

   The favorite is updated.

11.9.5. Delete a favorite

1. Select **Open** from the **Favorites** menu.

   The **Favorites** dialog box opens.
2. Find the favorite you want to delete.

   You can either use **<** and **>** or the search field to find a saved favorite.
3. Click the more options icon (three dots) at the right of the favorite row, and select **Delete**.

   A confirmation dialog is displayed.
4. Click **DELETE** to confirm that you want to delete the favorite.

11.9.6. Modify sharing settings for a favorite

After you have created a map and saved it as a favorite, you can share the favorite with everyone or a user group. To modify the sharing settings:

1. Select **Open** from the **Favorites** menu.

   The **Favorites** dialog box opens.
2. Find the favorite you want to share.

   You can either use **<** and **>** or the search field to find a saved favorite.
3. Click the more options icon (three dots) at the right of the favorite row, and select **Share**.

   The **Sharing settings** dialog box opens.
4. In the text box, search for the name of the user or group you want to share your favorite with and select it.

   The chosen user or group is added to the list of recipients.

   Repeat the step to add more user groups.
5. If you want to allow external access, select the corresponding box.
6. For each user group, choose an access setting. The options are:
   - None (for default groups only, as they cannot be removed)
   - Can view
   - Can edit and view
7. Click **CLOSE** to close the dialog.

11.9.7. Share a map interpretation

For certain analysis-related resources in DHIS2, you can share a data interpretation. An interpretation is a link to the relevant resource together with a text expressing some insight about the data.

To create an interpretation of a map and share it with all users of the system:

1. Select **Write interpretation** from the **Favorites** menu.

   The **Write interpretation** dialog box opens.

2. In the text field, type a comment, question or interpretation.
3. Click **SAVE**.

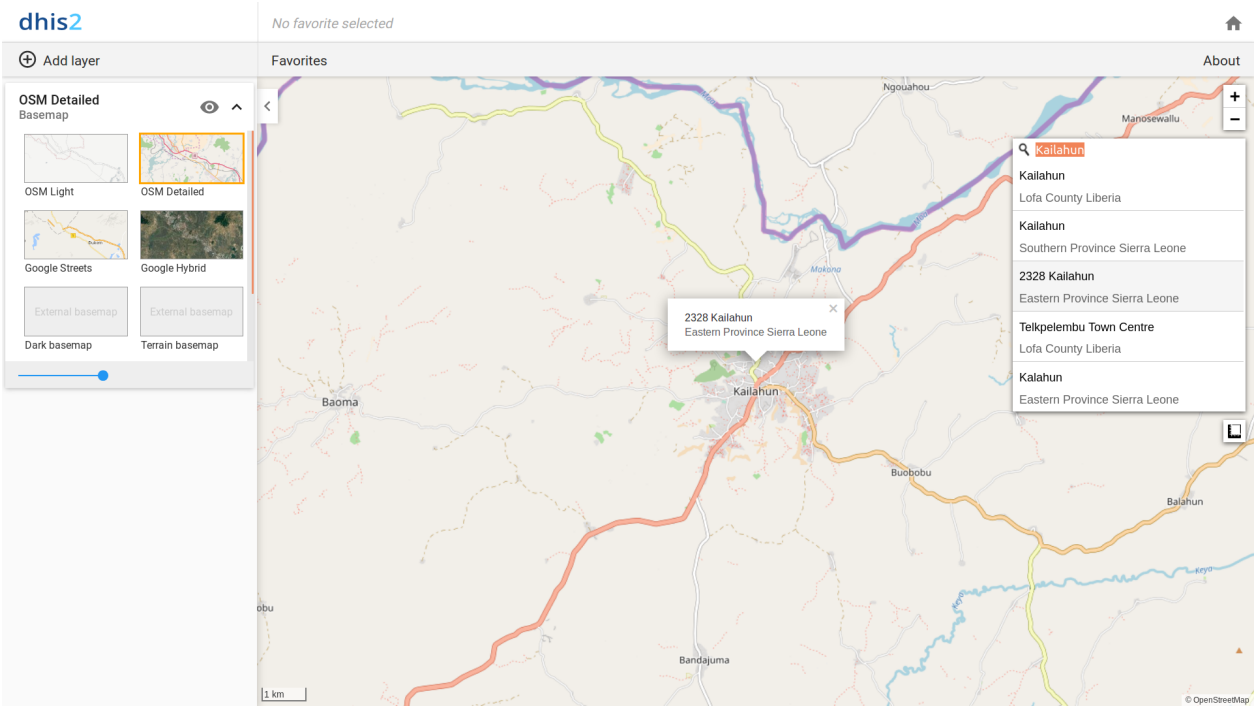
   The dialog box closes automatically. You can see the interpretation on the **Dashboard**.

11.10. Save a map as an image

1. Take a screenshot of the map with the tool of your choice.
2. Save the screenshot in desired format.

11.11. Search for a location

The place search function allows you to search for almost any location or address. This function is useful in order to locate for example sites, facilities, villages or towns on the map.



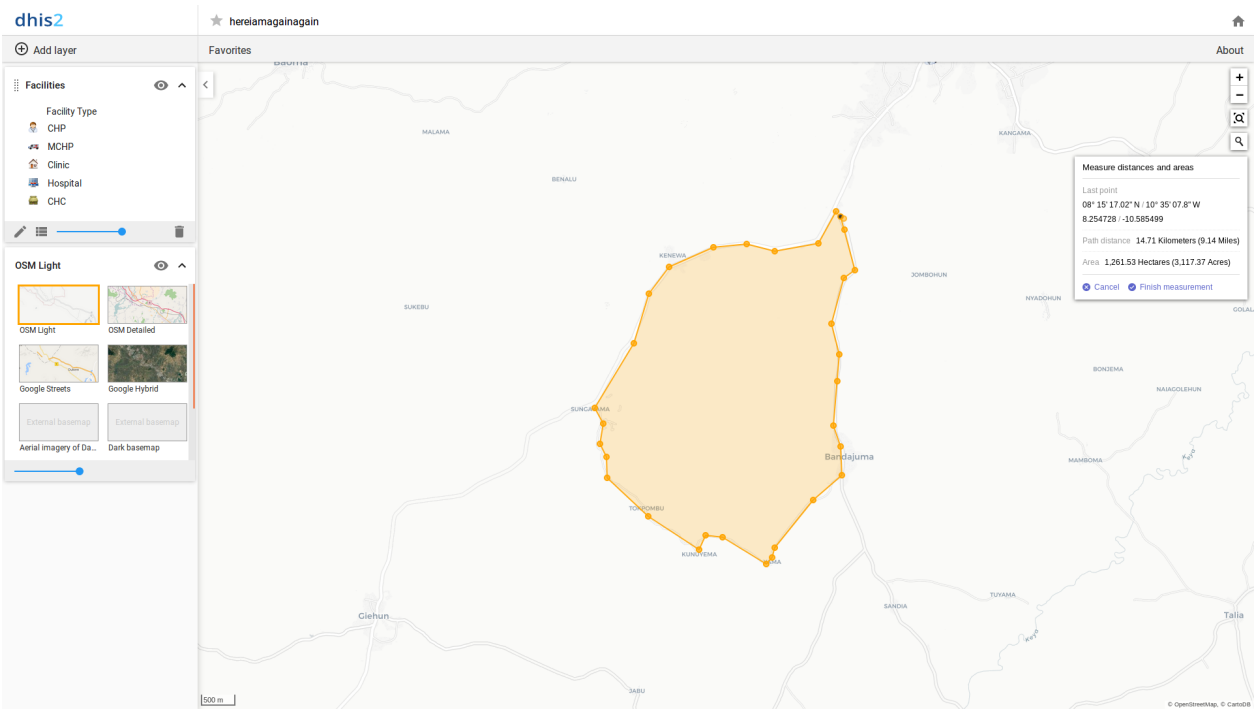
1. On the right side of the Maps window, click the magnifier icon.
2. Type the location you're looking.

   A list of matching locations appear as you type.

3. From the list, select a location. A pin indicates the location on the map.

11.12. Measure distances and areas in a map

1. In the upper left part of the map, put the cursor on the **Measure distances and areas** (ruler) icon and click **Create new measurement**.
2. Add points to the map.
3. Click **Finish measurement**.



11.13. Get the latitude and longitude at any location

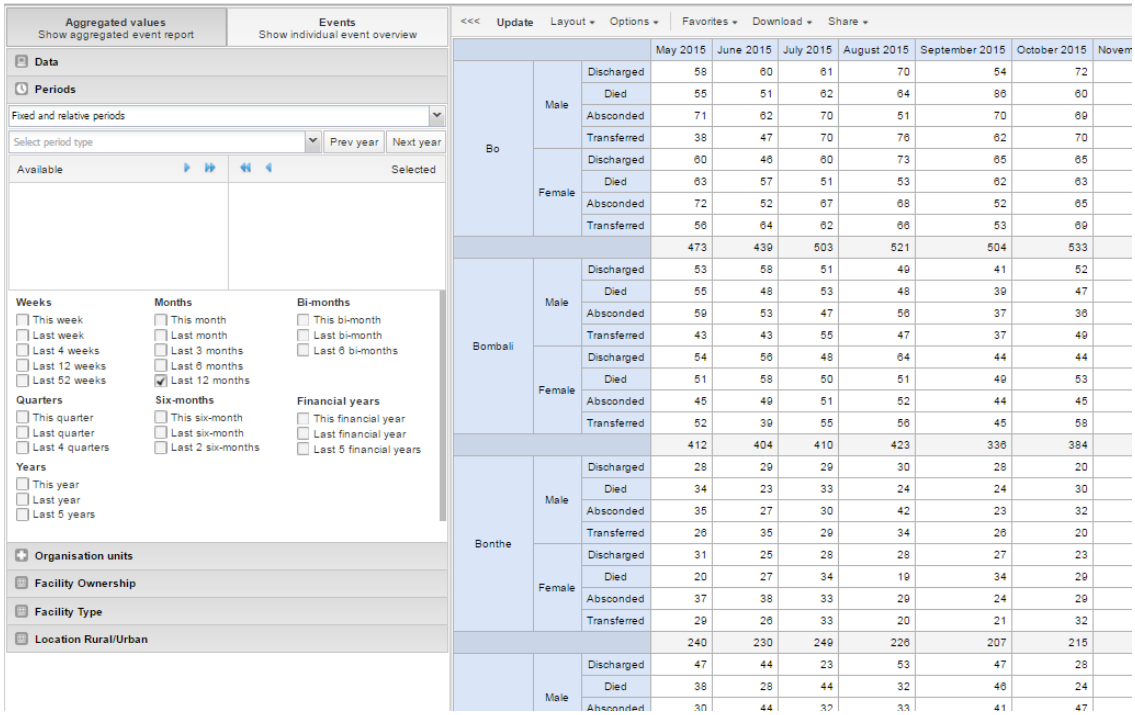
Right-click a point on the map and select **Show longitude/latitude**. The values display in a pop-up window.

11.14. See also

- Manage legends

Chapter 12. Using the Event Reports app

12.1. About the Event Reports app



With the **Event Report**s app you can analyse events in two types of reports:

- Aggregated event reports: Pivot table-style analysis with aggregated numbers of events

  By selecting **Aggregated values** from the top-left menu you can use the **Event Reports** app to create pivot tables with aggregated numbers of events. An event report is always based on a program. You can do analysis based on a range of dimensions. Each dimension can have a corresponding filter. Dimensions can be selected from the left-side menu.

- Individual event reports: Lists of events

  By selecting **Events** from the top-left menu you can use the **Event Reports** app to make searches or queries for events based on a flexible set of criteria. The report will be displayed as a table with one row per event. Each dimension can be used as a column in the table or as a filter. Each dimension can have a criteria (filter). Data elements of type option set allows for "in" criteria, where multiple options can be selected. Numeric values can be compared to filter values using greater than, equal or less than operators.

12.2. Create an event report

1. Open the **Event Reports** app.
2. Select **Aggregated values** or **Events**.
3. In the menu to the left, select the meta data you want to analyse.
4. Click **Layout** and arrange the dimensions.

   You can keep the default selection if you want.
5. Click **Update**.

12.3. Select dimension items

An event report is always based on a program and you can do analysis based on a range of dimensions. For programs with category combinations, you can use program categories and category option group sets as dimensions for tables and charts. Each dimension item can have a corresponding filter.

1. Select data elements:
   a. Click **Data**.
   b. Select a program and a program stage.

      The data elements associated with the selected program are listed under **Available**. Each data element acts as a dimension.

   c. Select the data elements you need by double-clicking their names.

      Data elements can be filtered by type (Data elements, Program attributes, Program indicators) and are prefixed to make them easily recognizable.

      After selecting a data element, it is visible under **Selected data items**.

   d. (Optional) For each data element, specify a filter with operators such as "greater than", "in" or "equal" together with a filter value.
2. Select periods.
   a. Click **Periods**.
   b. Select one or several periods.

      You have three period options: relative periods, fixed periods and start/end dates. You can combine fixed periods and relative periods in the same chart. You cannot combine fixed periods and relative periods with start/end dates in the same chart. Overlapping periods are filtered so that they only appear once.

      - Fixed periods: In the **Select period type** box, select a period type. You can select any number of fixed periods from any period type. Fixed periods can for example be "January 2014".
      - Relative periods: In the lower part of the **Periods** section, select as many relative periods as you like. The names are relative to the current date. This means that if the current month is March and you select **Last month**, the month of February is included in the chart. Relative periods has the advantage that it keeps the data in the report up to date as time goes.
      - Start/end dates: In the list under the **Periods** tab, select **Start/end dates**. This period type lets you specify flexible dates for the time span in the report.
3. Select organisation units.
   a. Click **Organisation units**.
   b. Click the gearbox icon.
   c. Select a **Selection mode** and an organisation unit.

      There are three different selection modes:

      Table 12.1. Selection modes

Selection mode	Description
Select organisation units	Lets you select the organisation units you want to appear in the chart from the organization tree.
	Select **User org unit** to disable the organisation unit tree and only select the organisation unit that is related to your profile.

Selection mode	Description
	Select **User sub-units** to disable the organisation unit tree and only select the sub-units of the organisation unit that is related to your profile. Select **User sub-x2-units** to disable the organisation unit tree and only select organisation units two levels down from the organisation unit that is related to your profile. This functionality is useful for administrators to create a meaningful "system" favorite. With this option checked all users find their respective organisation unit when they open the favorite.
Select levels	Lets you select all organisation units at one or more levels, for example national or district level. You can also select the parent organisation unit in the tree, which makes it easy to select for example, all facilities inside one or more districts.
Select groups	Lets you select all organisation units inside one or several groups and parent organisation units at the same time, for example hospitals or chiefdoms.

4. Click **Update**.

12.4. Select series, category and filter

You can define which data dimension you want to appear as columns, rows and filters in the pivot table. Each data element appears as individual dimensions and can be placed on any of the axes.

Note

Data elements of continuous value types (real numbers/decimal numbers) can only be used as filters, and will automatically be positioned as filters in the layout dialog. The reason for this is that continuous number cannot be grouped into sensible ranges and used on columns and rows.

1. Click **Layout**.
2. Drag and drop the dimensions to the appropriate space.
3. Click **Update**.

12.5. Change the display of your table

You can customize the display of an event report.

1. Click **Options**.
2. Set the options as required. Available options are different between aggregated event reports and individual event reports.

Table 12.2. Event reports options

Option		Description	Available for report type
Data	**Show column totals**	Displays totals at the end of each column in the pivot table.	Aggregated event report
	Show column sub-totals	Displays sub-totals for each column in the pivot table.	Aggregated event report
	Show row totals	Displays totals at the end of each row in the pivot table.	Aggregated event report
	Show row sub-totals	Displays sub-totals for each row in the pivot table.	Aggregated event report
	Show dimension labels	Displays labels for dimensions.	Aggregated event report
	Hide empty rows	Hides empty rows in the pivot table.	Aggregated event report
	Hide n/a data	Hides data tagged as N/A from the chart.	Aggregated event report
	Include only completed events	Includes only completed events in the aggregation process. This is useful when you want for example to exclude partial events in indicator calculations.	Aggregated event report Individual event report
	Limit	Sets a limit of the maximum number of rows that you can display in the table, combined with a setting for showing top or bottom values.	Aggregated event report
	Output type	Defines the output type. The output types are **Event**, **Enrollment** and**Tracked entity instance**.	Aggregated event report
	Program status	Filters data based on the program status: **All**, **Active**, **Completed** or **Cancelled**.	Aggregated event report
	Event status	Filters data based on the event status: **All**, **Active**, **Completed**, **Scheduled**, **Overdue** or **Skipped**.	Aggregated event report
Organisation units	**Show hierarchy**	Includes the names of all parents of each organisation unit in labels.	Aggregated event report
Style	**Display density**	Controls the size of the cells in the table. You can set it to **Comfortable**, **Normal** or **Compact**.	Aggregated event report Individual event report

Option		Description	Available for report type
		Compact is useful when you want to fit large tables into the browser screen.	
	Font size	Controls the size of the table text font. You can set it to **Large**, **Normal** or **Small**.	Aggregated event report Individual event report
	Digit group separator	Controls which character to separate groups of digits or "thousands". You can set it to **Comma**, **Space** or **None**.	Aggregated event report Individual event report

3. Click **Update**.

12.6. Download chart data source

You can download the data source behind an event report in HTML, JSON, XML, Microsoft Excel or CSV formats.

1. Click **Download**.
2. Under **Plain data source**, click the format you want to download.

Table 12.3. Available formats

Format	Description
HTML	Creates HTML table based on selected meta data
JSON	Downloads data values in JSON format based on selected meta data
XML	Downloads data values in XML format based on selected meta data
Microsoft Excel	Downloads data values in Microsoft Excel format based on selected meta data
CSV	Downloads data values in CSV format based on selected meta data

12.7. Manage favorites

Saving your charts or pivot tables as favorites makes it easy to find them later. You can also choose to share them with other users as an interpretation or display them on the dashboard.

You view the details and interpretations of your favorites in the **Pivot Table**, **Data Visualizer**, **Event Visualizer**, **Event Reports** apps. Use the **Favorites** menu to manage your favorites.

12.7.1. Open a favorite

1. Click **Favorites** > **Open**.
2. Enter the name of a favorite in the search field, or click **Prev** and **Next** to display favorites.
3. Click the name of the favorite you want to open.

12.7.2. Save a favorite

1. Click **Favorites** > **Save as**.
2. Enter a **Name** and a **Description** for your favorite.
3. Click **Save**.

12.7.3. Rename a favorite

1. Click **Favorites** > **Rename**.
2. Enter the new name for your favorite.
3. Click **Update**.

12.7.4. Write an interpretation for a favorite

An interpretation is a link to a resource with a description of the data at a given period. This information is visible in the **Dashboard** app. To create an interpretation, you first need to create a favorite. If you've shared your favorite with other people, the interpretation you write is visible to those people.

1. Click **Favorites** > **Write interpretation**.
2. In the text field, type a comment, question or interpretation. You can see this information in the **Dashboard** app.
3. Search for a user group that you want to share your favorite with, then click the **+** icon.
4. Change sharing settings for the user groups you want to modify.
   - **Can edit and view**: Everyone can view and edit the object.
   - **Can view only**: Everyone can view the object.
   - **None**: The public won't have access to the object. This setting is only applicable to **Public access**.
5. Click **Share**.

12.7.5. Create a link to a favorite

1. Click **Favorites** > **Get link**.
2. Select one of the following:
   - **Open in this app**: You get a URL for the favorite which you can share with other users by email or chat.
   - **Open in web api**: You get a URL of the API resource. By default this is an HTML resource, but you can change the file extension to ".json" or ".csv".

12.7.6. Delete a favorite

1. Click **Favorites** > **Delete**.
2. Click **OK**.

12.7.7. View interpretations based on relative periods

To view interpretations for relative periods, such as a year ago:

1. Open a favorite with interpretations.
2. Click **>>>** in the top right of the workspace.
3. Click an interpretation. Your chart displays the data and the date based on when the interpretation was created.To view other interpretations, click them.

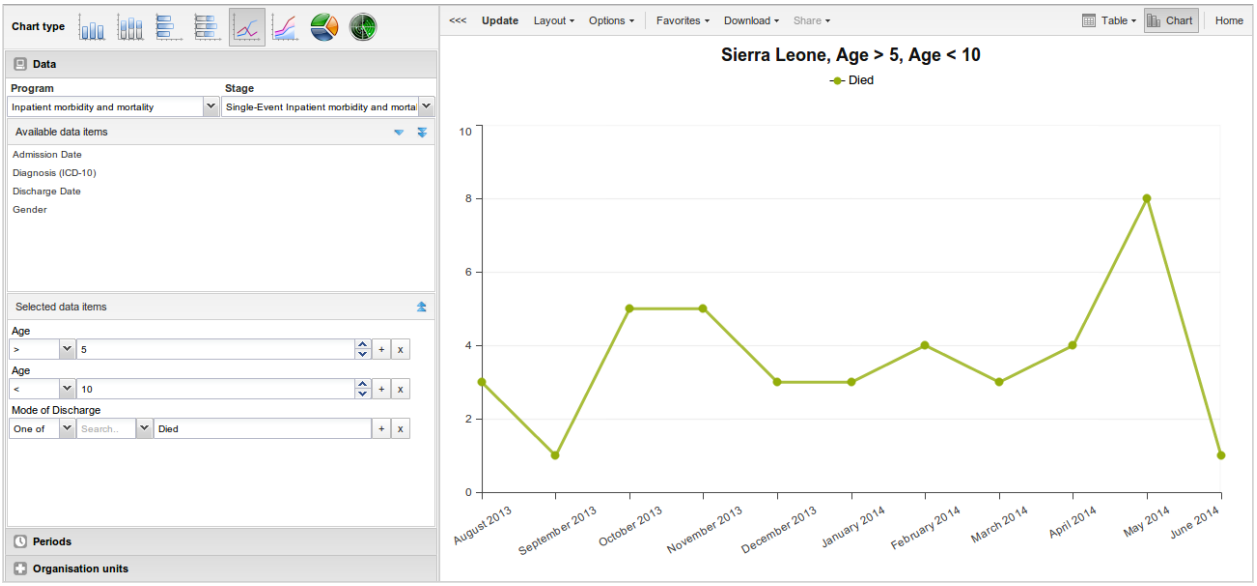
12.8. Visualize an event report as a chart

When you have made an event report you can open it as a chart:

Click **Chart** > **Open this chart as table**.

Chapter 13. Using the Event Visualizer app

13.1. About the Event Visualizer app



With the **Event Visualizer** app, you can create charts based on event data.

13.2. Create a chart

1. <Open the **Event Visualizer** app and select a chart type.
2. In the menu to the left, select the meta data you want to analyse.
3. Click **Layout** and arrange the dimensions.

   You can keep the default selection if you want.
4. Click **Update**.

13.3. Select a chart type

The **Event Visualizer** app has eight different chart types, each with different characteristics. To select a chart type:

1. In **Chart type**, click the chart type you need.

Table 13.1. Chart types

Chart type	Description
Column chart	Displays information as vertical rectangular columns with lengths proportional to the values they represent. Useful when you want to, for example, compare performance of different districts.
Stacked column chart	Displays information as vertical rectangular columns, where bars representing multiple categories are stacked on top of each other.

Chart type	Description
	Useful when you want to, for example, display trends or sums of related data elements.
Bar chart	Same as column chart, only with horizontal bars.
Stacked bar chart	Same as stacked column chart, only with horizontal bars.
Line chart	Displays information as a series of points connected by straight lines. Also referred to as time series. Useful when you want to, for example, visualize trends in indicator data over multiple time periods.
Area chart	Is based on line chart, with the space between the axis and the line filled with colors and the lines stacked on top of each other. Useful when you want to compare the trends of related indicators.
Pie chart	Circular chart divided into sectors (or slices). Useful when you want to, for example, visualize the proportion of data for individual data elements compared to the total sum of all data elements in the chart.
Radar chart	Displays data on axes starting from the same point. Also known as spider chart.

2. Click **Update**.

13.4. Select dimension items

An event chart is always based on a program and you can do analysis based on a range of dimensions. For programs with category combinations, you can use program categories and category option group sets as dimensions for tables and charts. Each dimension item can have a corresponding filter. You select dimension items from the left-side menu.

1. Select data elements:
   a. Click **Data**.
   b. Select a program and a program stage.

      The data elements associated with the selected program are listed under **Available**. Each data element acts as a dimension.

   c. Select the data elements you need by double-clicking their names.

      Data elements can be filtered by type (Data elements, Program attributes, Program indicators) and are prefixed to make them easily recognizable.

      After selecting a data element, it is visible under **Selected data items**.

   d. (Optional) For each data element, specify a filter with operators such as "greater than", "in" or "equal" together with a filter value.
2. Select periods.
   a. Click **Periods**.
   b. Select one or several periods.

      You have three period options: relative periods, fixed periods and start/end dates. You can combine fixed periods and relative periods in the same chart. You cannot combine fixed

periods and relative periods with start/end dates in the same chart. Overlapping periods are filtered so that they only appear once.

- Fixed periods: In the **Select period type** box, select a period type. You can select any number of fixed periods from any period type. Fixed periods can for example be "January 2014".
- Relative periods: In the lower part of the **Periods** section, select as many relative periods as you like. The names are relative to the current date. This means that if the current month is March and you select **Last month**, the month of February is included in the chart. Relative periods has the advantage that it keeps the data in the report up to date as time goes.
- Start/end dates: In the list under the **Periods** tab, select **Start/end dates**. This period type lets you specify flexible dates for the time span in the report.

3. Select organisation units.

   a. Click **Organisation units**.

   b. Click the gearbox icon.

   c. Select a **Selection mode** and an organisation unit.

   There are three different selection modes:

   Table 13.2. Selection modes

Selection mode	Description
Select organisation units	Lets you select the organisation units you want to appear in the chart from the organization tree. Select **User org unit** to disable the organisation unit tree and only select the organisation unit that is related to your profile. Select **User sub-units** to disable the organisation unit tree and only select the sub-units of the organisation unit that is related to your profile. Select **User sub-x2-units** to disable the organisation unit tree and only select organisation units two levels down from the organisation unit that is related to your profile. This functionality is useful for administrators to create a meaningful "system" favorite. With this option checked all users find their respective organisation unit when they open the favorite.
Select levels	Lets you select all organisation units at one or more levels, for example national or district level. You can also select the parent organisation unit in the tree, which makes it easy to select for example, all facilities inside one or more districts.
Select groups	Lets you select all organisation units inside one or several groups and parent organisation units at the same time, for example hospitals or chiefdoms.

4. Click **Update**.

13.5. Select series, category and filter

You can define which data dimension you want to appear as series, category and filter. Each data element appears as individual dimensions and can be placed on any of the axes. Series and category panels can only have one dimension at the time.

Note

Data elements of continuous value types (real numbers/decimal numbers) can only be used as filters, and will automatically be positioned as filters in the layout dialog. The reason for this is that continuous number cannot be grouped into sensible ranges and used on columns and rows.

1. Click **Layout**.
2. Drag and drop the dimensions to the appropriate space. Only one dimension can be in each section.
3. Click **Update**.

13.6. Change the display of your chart

You can customize the display of an event report.

1. Click **Options**.
2. Set the options as required.

Table 13.3. Chart options

Option		Description
Data	**Show values**	Displays values as numbers on top of each series.
	Use 100% stacked values	Displays 100 % stacked values in column charts.
	Use cumulative values	Displays cumulative values in line charts.
	Hide n/a data	Hides data tagged as N/A from the chart.
	Include only completed events	Includes only completed events in the aggregation process. This is useful when you want for example to exclude partial events in indicator calculations.
	Hide empty categories	Hides the category items with no data from the chart. **None**: doesn't hide any of the empty categories **Before first**: hides missing values only before the first value **After last**: hides missing values only after the last value

Option		Description
		Before first and after last: hides missing values only before the first value and after the last value **All**: hides all missing values This is useful for example when you create column and bar charts.
	Trend line	Displays the trend line which visualizes how your data evolves over time. For example if performance is improving or deteriorating. Useful when periods are selected as category.
	Target line value/ title	Displays a horizontal line and title (optional) at the given domain value. Useful for example when you want to compare your performance to the current target.
	Base line value/title	Displays a horizontal line and title (optional) at the given domain value. Useful for example when you want to visualize how your performance has evolved since the beginning of a process.
	Sort order	Allows you to sort the values on your chart from either low to high or high to low.
	Output type	Defines the output type. The output types are **Event**, **Enrollment** and**Tracked entity instance**.
	Program status	Filters data based on the program status: **All**, **Active**, **Completed** or **Cancelled**.
	Event status	Filters data based on the event status: **All**, **Active**, **Completed**, **Scheduled**, **Overdue** or **Skipped**.
Axes	**Range axis min/max**	Defines the maximum and minimum value which will be visible on the range axis.
	Range axis tick steps	Defines the number of ticks which will be visible on the range axis.
	Range axis decimals	Defines the number of decimals which will be used for range axis values.
	Range axis title	Type a title here to display a label next to the range axis (also referred to as the Y axis). Useful when you want to give context information to

Option		Description
		the chart, for example about the unit of measure.
	Domain axis title	Type a title here to display a label below the domain axis (also referred to as the X axis). Useful when you want to give context information to the chart, for example about the period type.
General	**Hide chart legend**	Hides the legend and leaves more room for the chart itself.
	Hide chart title	Hides the title (default or custom) of your chart.
	Chart title	Type a title here to display a custom title above the chart. If you don't enter a title, the default title is displayed.
	Hide chart subtitle	Hides the subtitle of your chart.
	Chart subtitle	Type a subtitle here to display a custom subtitle above the chart but below the title. If you don't enter a subtitle, no subtitle is displayed in the chart.

3. Click **Update**.

13.7. Download a chart as an image or a PDF

After you have created a chart you can download it to your local computer as an image or PDF file.

1. Click **Download**.
2. Under **Graphics**, click **PNG (.png)** or **PDF (.pdf)**.

   The file is automatically downloaded to your computer. Now you can for example embed the image file into a text document as part of a report.

13.8. Download chart data source

You can download the data source behind a chart in HTML, JSON, XML, Microsoft Excel or CSV formats. The data document uses identifiers of the dimension items and opens in a new browser window to display the URL of the request to the Web API in the address bar. This is useful for developers of apps and other client modules based on the DHIS2 Web API or for those who require a plan data source, for instance for import into statistical packages.

To download plain data source formats:

1. Click **Download**.
2. Under **Plain data source**, click the format you want to download.

Table 13.4. Available formats

Format	Description
HTML	Creates HTML table based on selected meta data

Format	Description
JSON	Downloads data values in JSON format based on selected meta data
XML	Downloads data values in XML format based on selected meta data
Microsoft Excel	Downloads data values in Microsoft Excel format based on selected meta data
CSV	Downloads data values in CSV format based on selected meta data

13.9. Manage favorites

Saving your charts or pivot tables as favorites makes it easy to find them later. You can also choose to share them with other users as an interpretation or display them on the dashboard.

You view the details and interpretations of your favorites in the **Pivot Table**, **Data Visualizer**, **Event Visualizer**, **Event Reports** apps. Use the **Favorites** menu to manage your favorites.

13.9.1. Open a favorite

1. Click **Favorites** > **Open**.
2. Enter the name of a favorite in the search field, or click **Prev** and **Next** to display favorites.
3. Click the name of the favorite you want to open.

13.9.2. Save a favorite

1. Click **Favorites** > **Save as**.
2. Enter a **Name** and a **Description** for your favorite.
3. Click **Save**.

13.9.3. Rename a favorite

1. Click **Favorites** > **Rename**.
2. Enter the new name for your favorite.
3. Click **Update**.

13.9.4. Write an interpretation for a favorite

An interpretation is a link to a resource with a description of the data at a given period. This information is visible in the **Dashboard** app. To create an interpretation, you first need to create a favorite. If you've shared your favorite with other people, the interpretation you write is visible to those people.

1. Click **Favorites** > **Write interpretation**.
2. In the text field, type a comment, question or interpretation. You can see this information in the **Dashboard** app.
3. Search for a user group that you want to share your favorite with, then click the **+** icon.
4. Change sharing settings for the user groups you want to modify.
   - **Can edit and view**: Everyone can view and edit the object.
   - **Can view only**: Everyone can view the object.

- **None**: The public won't have access to the object. This setting is only applicable to **Public access**.

5. Click **Share**.

13.9.5. Create a link to a favorite

1. Click **Favorites** > **Get link**.
2. Select one of the following:
   - **Open in this app**: You get a URL for the favorite which you can share with other users by email or chat.
   - **Open in web api**: You get a URL of the API resource. By default this is an HTML resource, but you can change the file extension to ".json" or ".csv".

13.9.6. Delete a favorite

1. Click **Favorites** > **Delete**.
2. Click **OK**.

13.9.7. View interpretations based on relative periods

To view interpretations for relative periods, such as a year ago:

1. Open a favorite with interpretations.
2. Click **>>>** in the top right of the workspace.
3. Click an interpretation. Your chart displays the data and the date based on when the interpretation was created.To view other interpretations, click them.

13.10. Visualize a chart as a pivot table

When you have made a chart you can open it as a pivot table:

Click **Chart** > **Open this chart as table**.

Chapter 14. Control data quality

14.1. About data quality checks

The **Data Quality** app contains tools to validate the accuracy and reliability of the data in the system. You can verify the data quality with the help of validation rules and various statistical checks. Data quality has different dimensions including:

Dimension	Description
Correctness	Data should be within the normal range for data collected at that facility. There should be no gross discrepancies when compared with data from related data elements.
Completeness	Data for all data elements for all reporting organisation units should have been submitted.
Consistency	Data should be consistent with data entered during earlier months and years while allowing for changes with reorganization, increased work load, etc. and consistent with other similar facilities.
Timeliness	All data from all reporting organisation units should be submitted at the appointed time.

You can verify data quality in different ways, for example:

- At point of data entry, DHIS2 can check the data entered to see if it falls within the minimum maximum value ranges of that data element (based on all previous data registered).
- By defining validation rules, which can be run once the user has finished data entry. The user can also check the entered data for a particular period and organization unit(s) against the validation rules, and display the violations for these validation rules.
- By analysing data sets, that is, examine gaps in the data.
- By data triangulation, that is, comparing the same data or indicator from different sources.

14.2. Validation rule analysis

14.2.1. About validation rule analysis

A validation rule is based on an expression which defines a relationship between data element values. The expression forms a condition which should assert that certain logical criteria are met.

The expression consist of:

- a left side
- a right side
- an operator

Example 14.1.

A validation rule could assert that "Suspected malaria cases tested" >= "Confirmed malaria cases".

The validation rule analysis tests validation rules against the data registered in the system. Validation violations are reported when the condition defined in the validation rule expression is not met, which means when the condition is false.

You can configure a validation rule analysis to automatically send out information about validation violations to selected user groups. These messages are called *validation notifications* and you create them in the **Maintenance** app. Validation notifications are sent via the internal DHIS2 messaging system.

14.2.2. Workflow

1. In the **Maintenance** app, create validation rules and validation rule groups.
2. (Optional) In the **Maintenance** app, create validation notifications.
3. Run the validation rule analysis, either automatically or manually.
   - In the **Data Administration** app, you schedule the validation rule analysis to run automatically for all validation rules included in one or several validation notifications. After the system has run the analysis, you'll see the validation violations (if any) in the validation notifications sent via the internal DHIS2 messaging system.
   - In the **Data Quality** app, you run the validation rule analysis manually for selected validation rules. After the analysis process has finished, you'll see a list of validation violations (if any).

14.2.3. Schedule a validation rule analysis to run automatically

Note

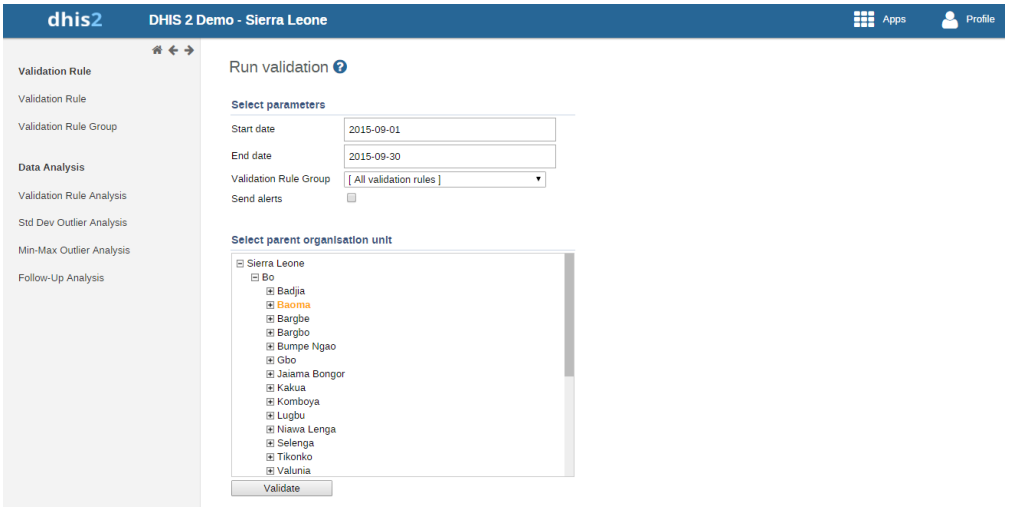
Only validation rules that are included in one or several validation notifications will be a part of the validation rule analysis. If there's no corresponding validation notification for a validation rule, the system has nowhere to send the validation violations.

Note

While running validation rule analysis automatically, any results not already persisted, will be persisted during this run. Persisted results can currently only be accessed trough the api.

1. Verify that you have created all the validation rules, validation rule groups and validation notifications you need.
2. Open the **Data Administration** app and click **Scheduling**.
3. If scheduling is active, click **Stop**.
4. In the **Data monitoring** section, select **All daily**.
5. Click **Start**.

14.2.4. Run a validation rule analysis manually



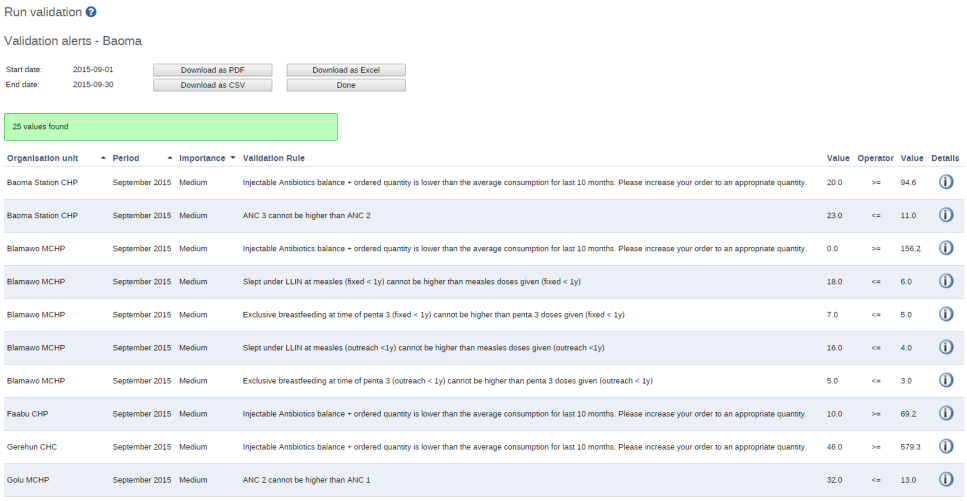
1. Verify that you have created all the validation rules, validation rule groups and validation notifications you need.
2. Open the **Data Quality** app and click **Validation rule analysis**.
3. Select **Start date** and **End date**.
4. Select which **Validation rule group** you want to include in the analysis.

   You can select all validation rules or all validation rules from a single validation rule group.
5. (Optional) Select **Send notifications** to trigger validation notifications.

> **Note**
>
> If you want to send out validation notifications, you must first create them in the **Maintenance** app.

6. (Optional) Select *Persist new results* to persist any non-persisted results found during the analysis
7. Select a **Parent organisation unit**.
8. Click **Validate**.

   The analysis process duration depends on the amount of data that is being analysed. If there are no violations of the validation rules, you'll see a message saying *Validation passed successfully*. If there are validation violations, they will be presented in a list.



9. (Optional) Click the show details icon to get more information about a validation violation. In the pop-up window you'll find information about the data elements included in the validation

rules and their corresponding data values. You can use this information to identify the source of the validation rule violation.

10(Optional) Click **Download as PDF**, **Download as Excel** or **Download as CSV** to download the validation violations list in PDF, Excel or CSV formats.

14.2.5. See also

- Manage validation rules
- Data Administration app

14.3. Standard deviation outlier analysis

14.3.1. About standard deviation outlier analysis

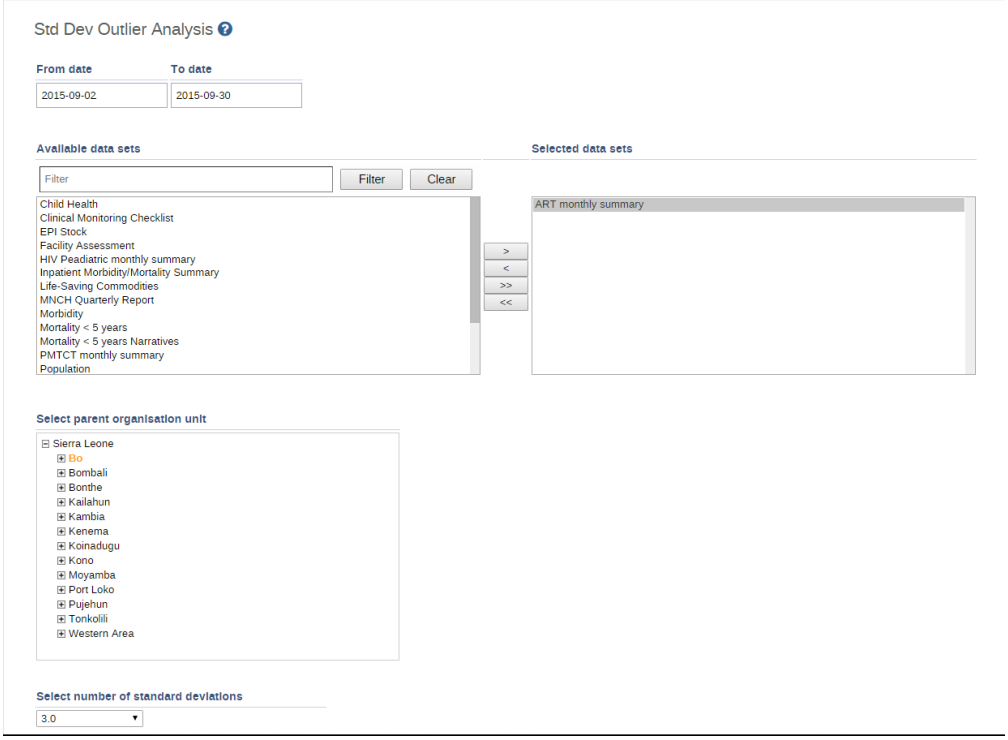
The standard deviation outlier analysis identifies values that are numerically distant from the rest of the data. The analysis is based on the standard normal distribution. The system calculates the average, based on values since the beginning of time, for one particular combination of organisation unit, data element, category option combination and attribute option combination. Outliers can occur by chance but often indicate a measurement error or a heavy-tailed distribution which leads to very high numbers. You should investigate measurement errors and try to correct them before you discard them from the analysis.

Warning

It's not recommended to use tools or interpretations that assume a normal distribution for heavy-tailed distributions.

For example: the standard deviation outlier analysis is not an appropriate tool when you expect huge seasonal variations in the data.

14.3.2. Run a standard deviation outlier analysis



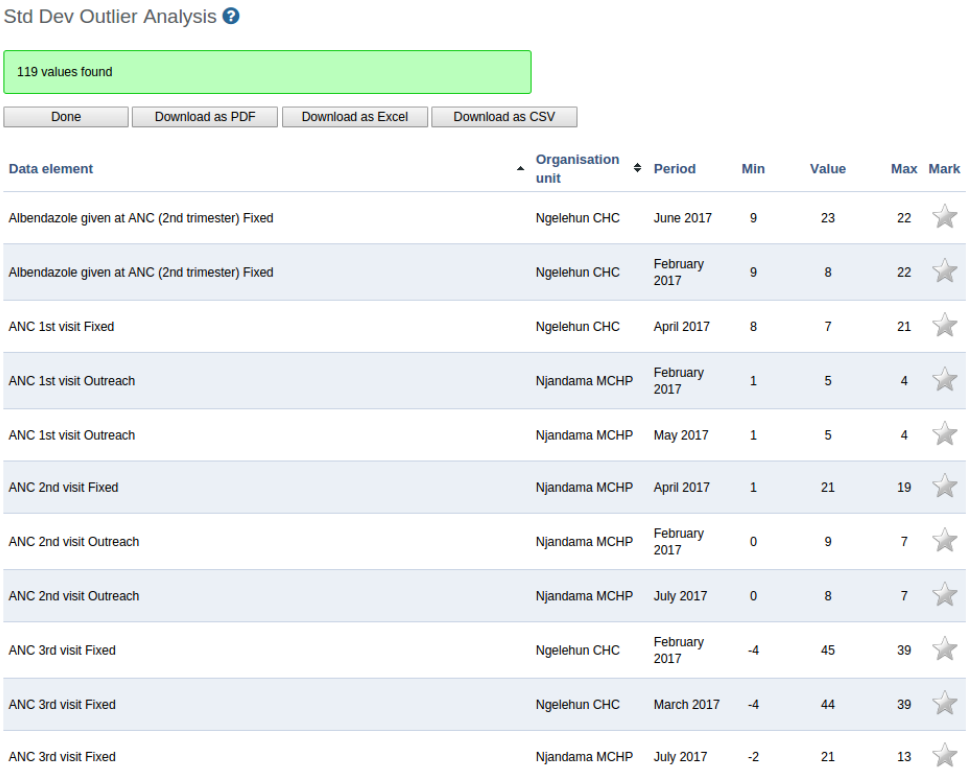
1. Open the **Data Quality** app and click **Std dev outlier analysis**.

2. Select **From date** and **To date**.
3. Select data set(s).
4. Select **Parent organisation unit**.

   All children of the organisation unit will be included. The analysis is made on raw data "under" the parent organisation unit, not on aggregated data.
5. Select a number of standard deviations.

   This refers to the number of standard deviations the data is allowed to deviate from the mean before it is classified as an outlier.
6. Click **Start**.

   The analysis process duration depends on the amount of data that is being analysed. If there are standard deviations outliers, they will be presented in a list.


Std Dev Outlier Analysis

119 values found

Done | Download as PDF | Download as Excel | Download as CSV

Data element	Organisation unit	Period	Min	Value	Max	Mark
Albendazole given at ANC (2nd trimester) Fixed	Ngelehun CHC	June 2017	9	23	22	
Albendazole given at ANC (2nd trimester) Fixed	Ngelehun CHC	February 2017	9	8	22	
ANC 1st visit Fixed	Ngelehun CHC	April 2017	8	7	21	
ANC 1st visit Outreach	Njandama MCHP	February 2017	1	5	4	
ANC 1st visit Outreach	Njandama MCHP	May 2017	1	5	4	
ANC 2nd visit Fixed	Njandama MCHP	April 2017	1	21	19	
ANC 2nd visit Outreach	Njandama MCHP	February 2017	0	9	7	
ANC 2nd visit Outreach	Njandama MCHP	July 2017	0	8	7	
ANC 3rd visit Fixed	Ngelehun CHC	February 2017	-4	45	39	
ANC 3rd visit Fixed	Ngelehun CHC	March 2017	-4	44	39	
ANC 3rd visit Fixed	Njandama MCHP	July 2017	-2	21	13	

   For each outlier, you'll see the data element, organisation unit, period, minimum value, actual value and maximum value. The minimum and maximum values refer to the border values derived from the number of standard deviations selected for the analysis.

Tip

Click the star icon to mark an outlier value for further follow-up.

14.3.3. Modify a standard deviation outlier value

You can modify an outlier value directly in the analysis result list:

1. In the value column, click inside the field that contains the value you want to change.
2. Enter a value and then navigate away from that field either by clicking tab or anywhere outside the field.

   The system provides an alert if the value is still outside the defined minimum and maximum values, but the value will be saved in any case. The field will have a red background color if the value is outside the range, and a green if inside.

14.4. Minimum maximum outlier analysis

14.4.1. About minimum maximum value based outlier analysis

You can verify the data quality at the point of data entry by setting a minimum maximum value range for each data element. You create the value ranges manually or generate them automatically.

The auto-generated minimum maximum value range is suitable only for normally distributed data. DHIS2 will determine the arithmetic mean and standard deviation of all values for a given data element, category option, organisation unit and attribute combination. Then the system will calculate the minimum maximum value range based on the **Data analysis std dev factor** specified in the **System Settings** app.

For data which is highly-skewed or zero inflated (as is often the case with aggregate data), the values which DHIS2 auto-generates may not provide an accurate minimum maximum value range. This can lead to excessive false violations, for example if you analyse values related to seasonal diseases.

Note

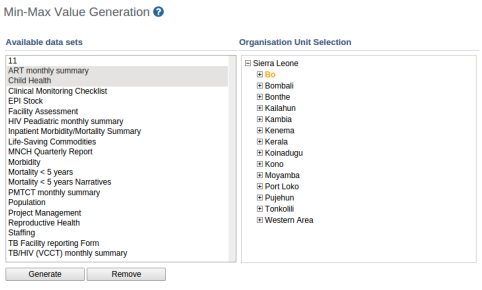
Minimum maximum value ranges are calculated across all attribute combination options for a given data element, category option and organisation unit combination.

14.4.2. Workflow

1. Create a minimum maximum value range, either automatically or manually.
   - In the **Data Administration** app, you generate value ranges automatically.
   - In the **Data Entry** app, you set value ranges manually for each field.
2. In the **Data Quality** app, run the **Min-max outlier analysis**.

14.4.3. Configure a minimum maximum outlier analysis

14.4.3.1. Create minimum maximum value range automatically



Note

Auto-generated minimum maximum value ranges can be useful for many situations, but it's recommended to verify that the data is actually normally distributed prior to using this function.

You generate minimum maximum value ranges calculated by data set in the **Data Administration** app. The new value ranges override any value ranges that the system has calculated previously.

1. Set the **Data analysis std dev factor**:
   a. Open the **System Settings** app, and click **General**.

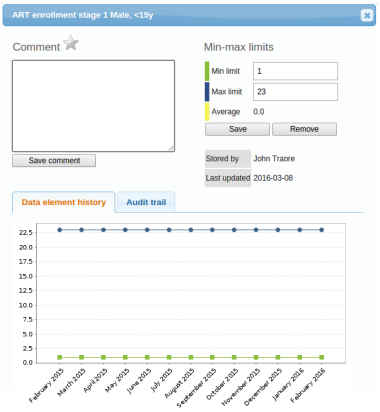
b. In the **Data analysis std dev factor** field, enter a value.

This sets the number of standard deviations to use in the outlier analysis. The default value is 2. A high value will catch less outlier values than a low value.

2. Open the **Data Administration** app and click **Min-max value generation**.
3. Select data set(s).
4. Select an **Organisation unit**.
5. Click **Generate**.

New minimum maximum value ranges for all data elements in the selected data sets for all organisation units (including descendants) of the selected organisation units are generated.

14.4.3.2. Create minimum maximum value range manually



1. In the **Data Entry** app, open a data entry form.
2. Double-click the field for which you want to set the minimum maximum value range.
3. Enter **Min limit** and **Max limit**.
4. Click **Save**.

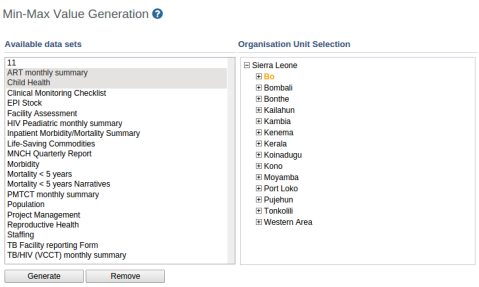
If values don't fall within the new value range the next time you enter data, the data entry cell will appear with an orange background.

5. (Optional) Type a comment to explain the reason for the discrepancy, for example an event at a facility which may have generated a large number of clients.
6. (Optional) Click **Save comment**.

Tip

Click the star icon to mark the value for further follow-up.

14.4.3.3. Delete minimum maximum value range

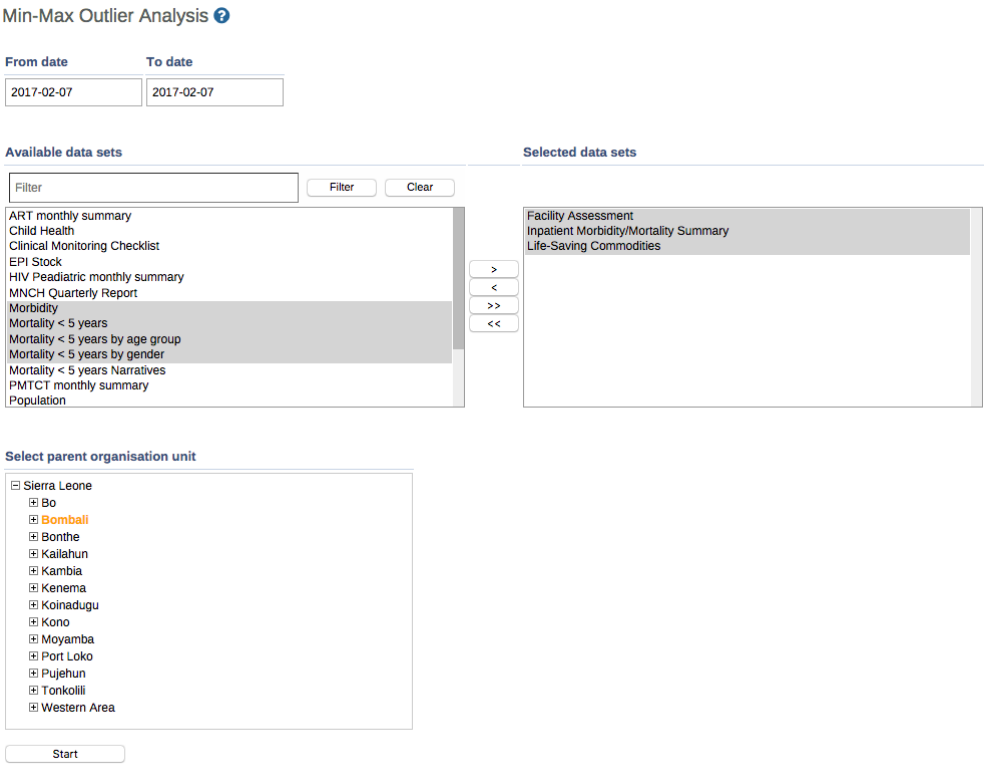


You can permanently delete all minimum maximum value ranges for selected data sets and organisation units in the **Data Administration** app.

1. Open the **Data Administration** app and click **Min-max value generation**.

2. Select data set(s).
3. Select an **Organisation unit**.
4. Click **Remove**.

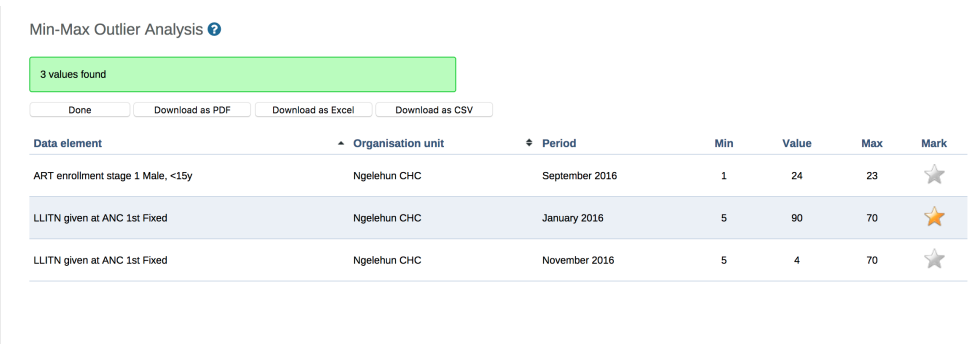
14.4.4. Run a minimum maximum outlier analysis



1. Verify that you've created minimum maximum value ranges.
2. Open the **Data Quality** app and click **Min-max outlier analysis**.
3. Select **From date** and **To date**.
4. Select which data set(s) you want to include in the analysis.
5. Select **Parent organisation unit**.

   All children of the organisation unit will be included. The analysis is made on raw data "under" the parent organisation unit, not on aggregated data.
6. Click **Start**.

   The analysis process duration depends on the amount of data that is being analysed. If there are validation violations, they will be presented in a list.



7. (Optional) Click **Download as PDF**, **Download as Excel** or **Download as CSV** to download the list in PDF, Excel or CSV formats.

Tip

Click the star icon to mark the value for further follow-up.

14.5. Follow-up analysis

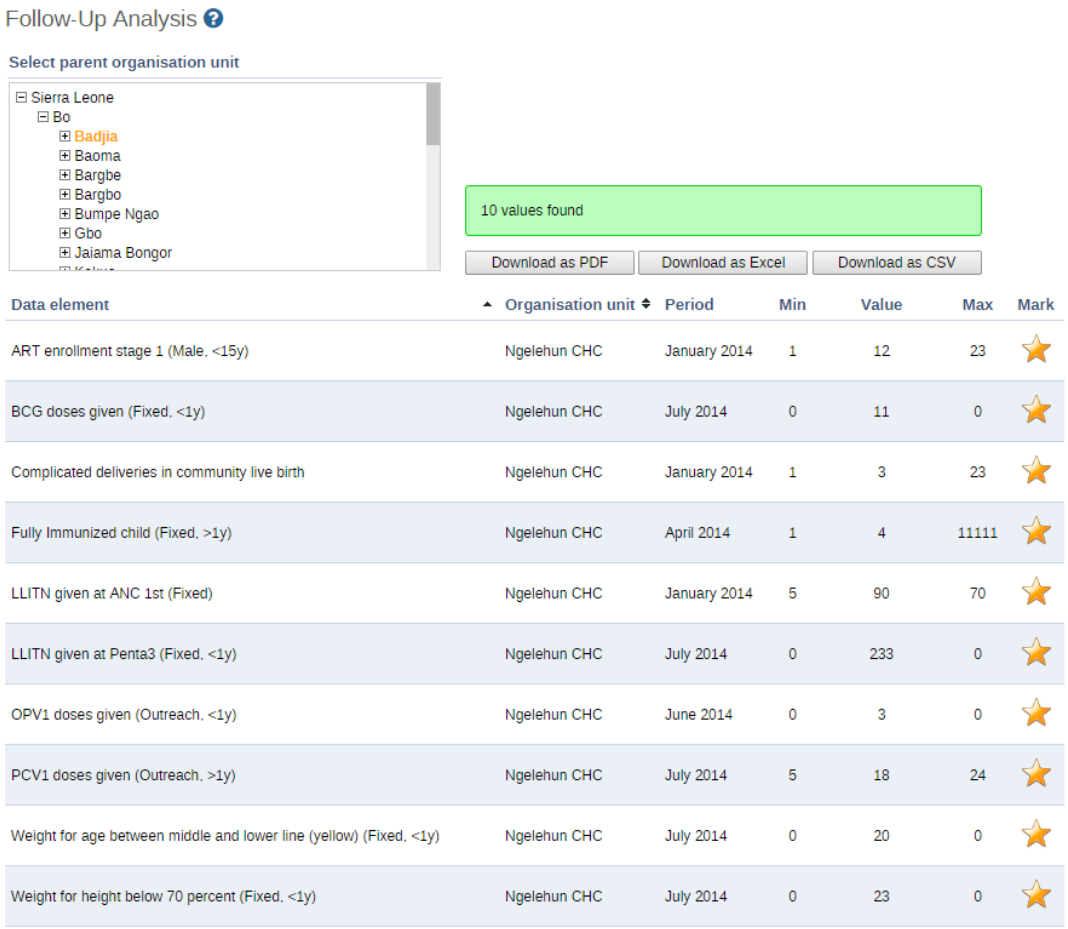
14.5.1. About follow-up analysis

The follow-up analysis creates a list of all data values marked for follow-up. You can mark a data value for follow-up in the **Data Entry** app and in the result list you get from a standard deviation outlier or minimum maximum outlier analysis.

14.5.2. Create list of data values marked for follow-up

1. Open the **Data Quality** app and click **Follow-up analysis**.
2. Select an **Organisation unit**.

   The analysis process duration depends on the amount of data that is being analysed. If there are data values marked for follow-up, they will be presented in a list.



Data element	Organisation unit	Period	Min	Value	Max	Mark
ART enrollment stage 1 (Male, <15y)	Ngelehun CHC	January 2014	1	12	23	
BCG doses given (Fixed, <1y)	Ngelehun CHC	July 2014	0	11	0	
Complicated deliveries in community live birth	Ngelehun CHC	January 2014	1	3	23	
Fully Immunized child (Fixed, >1y)	Ngelehun CHC	April 2014	1	4	11111	
LLITN given at ANC 1st (Fixed)	Ngelehun CHC	January 2014	5	90	70	
LLITN given at Penta3 (Fixed, <1y)	Ngelehun CHC	July 2014	0	233	0	
OPV1 doses given (Outreach, <1y)	Ngelehun CHC	June 2014	0	3	0	
PCV1 doses given (Outreach, >1y)	Ngelehun CHC	July 2014	5	18	24	
Weight for age between middle and lower line (yellow) (Fixed, <1y)	Ngelehun CHC	July 2014	0	20	0	
Weight for height below 70 percent (Fixed, <1y)	Ngelehun CHC	July 2014	0	23	0	

3. (Optional) Click **Download as PDF**, **Download as Excel** or **Download as CSV** to download the validation violations list in PDF, Excel or CSV formats.

Tip

Click the star icon to remove the follow-up tag from the data value.

Chapter 15. Data approval

DHIS2 has an optional feature that allows authorized users to approve data that has been entered. It allows data to be reviewed and approved at selected levels in the organisation unit hierarchy, so the approval follows the structure of the hierarchy from lower levels to higher levels.

Data is approved for a combination of (a) period, (b) organisation unit and (c) workflow. Data may be approved for the organisation unit for which it is entered, as well as for higher-level organisation units to which the data is aggregated. As part of system settings, you can choose the organisation unit level(s) at which data is approved. It can be approved at higher levels only after it has been approved for all that organisation unit's descendants at lower levels for the same workflow and period. When you approve a workflow, it approves data for any data sets that have been assigned to that workflow.

After a period, organisation unit and workflow combination has been approved, data sets associated with that workflow will be locked for that period and organisation unit, and any further data entry or modification will be prohibited unless it is first un-approved.

For example, the following diagram illustrates that data has already been approved for organisation units C and D, for a given period and workflow. It may now be approved for organisation unit B for the same period and workflow. But it is not ready to be approved for organization unit A. Before it can be approved for organisation unit A, it must be approved for B, and for any other children of organisation unit A, for that period and workflow.

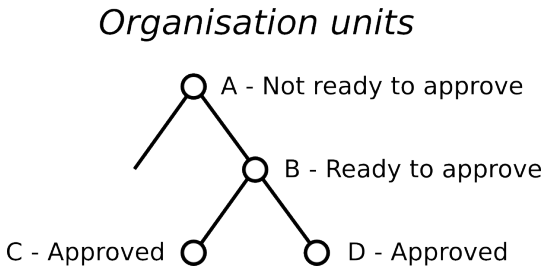
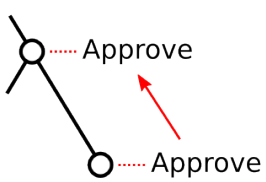


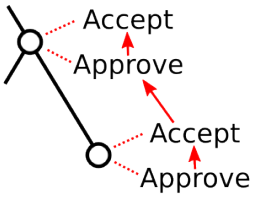
Figure 15.1. Approving at organisation units

15.1. Approving and accepting

DHIS2 supports two different types of approval processes: either a one-step process where the data is approved at each level, or a two-step process where data is first approved and then accepted at each level. This is illustrated in the following diagram:



1 step per approval level:
- Approve



2 steps per approval level:
- Approve
- Accept

Figure 15.2. Approving and accepting

In the one-step process, data is approved at one level, and then approved at the next higher level. Until it is approved at the next higher level, it may be unapproved at the first level. (For

example, if the data was approved my mistake, this allows the approver to undo their mistake.) Once the data is approved at the next higher level, it may not be unapproved at the lower level unless it is first unapproved at the higher level.

In the two-step process, data is approved at one level, and then the approval is accepted at the same level. This acceptance is done by a user who is authorized to approve data at the next higher level. Once the data is accepted, it may not be changed or unapproved unless it is first *unaccepted*.

The two-step process is not required by DHIS2. It is an optional step for a user reviewing data at the next higher level. It has the benefit of locking the acceptance from the level below, so reviewer does not have to worry that the data could be changing from below while it is being reviewed. It can also be used by the higher-level user to keep track of which lower-level data has already been reviewed.

Two-step process can be activated by checking **Acceptance required before approval** in SystemSettings app under General section.

15.2. Authorities for approving data

To approve data, you must be assigned a role containing one of these authorities:

- **Approve data** - You may approve data for the organisation unit(s) to which you are assigned. Note that this authority does not allow you to approve data for lower-levels below the organisation unit(s) to which you are assigned. This is useful to separate the users authorized to approve at one level from the users authorized to approve at levels below.
- **Approve data at lower levels** - Allows you to approve data for all lower levels below the organisation units assigned to you. This is useful if, for example, you are a district-level user whose role includes approving the data for all the facilities within that district, but not for the district itself. If you are assigned this as well as the *Approve data* authority, you may approve data at the level of the organisation unit(s) to which you have been assigned, and for any level below.
- **Accept data at lower levels** - Allows you to accept data for the level just below the organisation unit(s) assigned to you. This authority can be given to the same users as approve data. Or it may be given to different users, if you want to have some users who accept data from the level below, and a different set of users who approve data to go up to the next level above.

15.3. Configuring data approval

In the *Maintenance app* section under *Data approval level* you can specify the levels at which you want to approve data in the system. Click the Add new button on this page and select the organisation unit level at which you want approvals. It will be added to the list of approval settings. You may configure the system for approving data at every organisation unit level, or only at selected organisation unit levels.

Note that when you add a new approval level, you may optionally choose a Category option group set. This feature is discussed later in this chapter.

Also in maintenance under *Data approval workflow*, you can define the workflows that will be used for approving data. Each workflow can be associated with one or more approval levels. Any two workflows may operate at all the same approval levels as each other, some of the same and some different levels, or completely different levels.

If you want data for a data set to be approved according to a workflow, then assign the workflow to the data set when you add or edit the data set. If you do not want data for a data set to be

subject to approval, then do not assign any workflow to that data set. For data sets that you want to approve at the same time as each other, assign them to the same workflow. For data sets that you want to approve independently, assign each data set to its own workflow.

On the *System Approval Settings* page, you may select the option *Hide unapproved data in analytics* to hide unapproved data in reports, pivot table, data visualizer and GIS. If this option is checked, unapproved data will be hidden from users assigned to higher-level organisation units compared to where approval is required. Users who are assigned to organisation units where data is ready for approval can still view the data, as can users assigned to higher-level organisation units if they have the *Approve data at lower levels* authority. If this option is not checked, then all data is shown whether approved or not.

15.4. Data visibility

If the option *Hide unapproved data in analytics* is enabled, data will be hidden from viewing by users associated with higher levels. When determining whether a data record should be hidden for a specific user, the system associates a user with a specific approval level and compares it to the level to which the data record has been approved up to. A user is associated with the approval level which matches the level of the organisation unit(s) she is linked to, or if no approvel level exists at that level, the next approval level linked to an organisation unit level below herself. A user will be allowed to see data which has been approved up to the level immediately below her associated approval level. The rationale behind this is that a user must be ablet to view the data that has been approved below so that she can eventually view and approve it herself.

Note that if the user has been granted the *View unapproved data* or the *ALL* authority she will be able to view data irrespective of the approval status.

Lets consider the following example: There are four organisation unit levels, with approval levels associated with level 2 and 4. *User A* at country level (1) gets associated with approval level 1 since the approval level exists at the same level as the organisation unit level. *User B* gets associated with approval level 2 since there is no approval level directly linked to her organisation unit level and approval level 2 is the immediate level below. *User C* gets associated with approval level 2. *User D* is below all approval levels which implies that she can see all data entered at or below her organisation unit level.

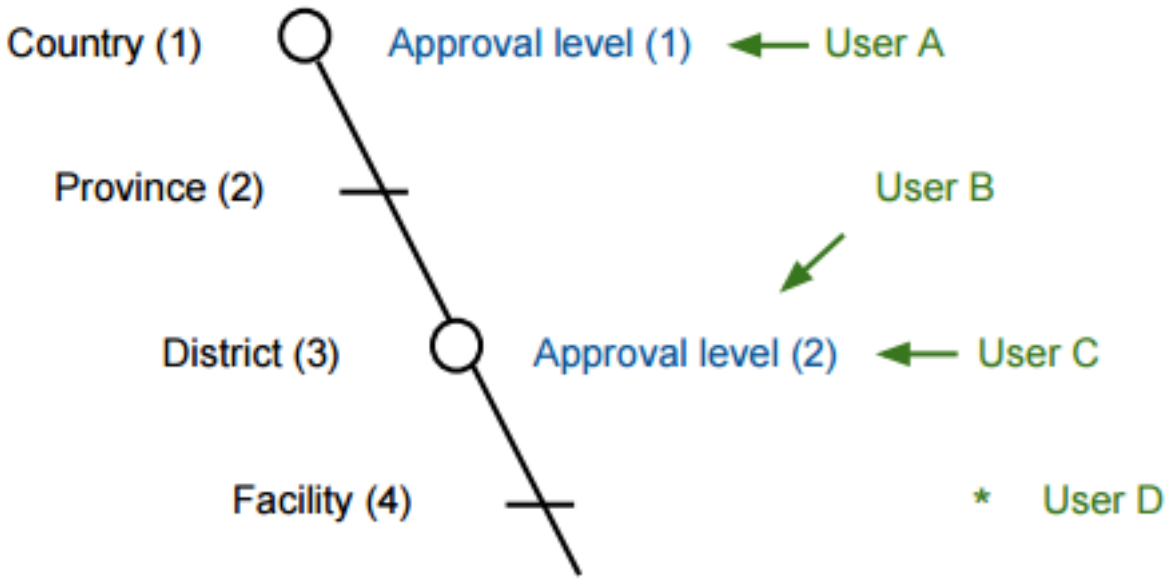


Figure 15.3. Hiding of unapproved data

Using this example, lets consider some scenarios:

- Data is entered at facility level: Only *User D* can see the data, as the data has not yet been approved at all.
- Data is approved by *User D* at facility level: Data becomes visible to User C and User B, as the data is now approved at their level.
- Data is approved by *User C* at district level: Data becomes visible to User A, as data is now approved at the level immediately below herself.

15.5. Approving data

To approve data, go to *Reports* and choose *Data Approval*. When this report shows data that is configured for approval, it shows the approval status of the data in the report. The approval status will be one of the following:

- **Waiting for lower level org units to approve** - This data is not yet ready to be approved, because it first needs to be approved for all the child organisation units to this organisation unit, for the same workflow and period.
- **Ready for approval** - This data may now be approved by an authorized user.
- **Approved** - This data has already been approved.
- **Approved and accepted** - This data has already been approved, and also accepted.

If the data you are viewing is in an approval state that can be acted upon, and if you have sufficient authority, one or more of the following actions will be available to you on the *Data Approval* form:

- **Approve** - Approve data that has not yet been approved, or that was formerly approved and has been unapproved.
- **Unapprove** - Return to an unapproved state data that has been approved or accepted.
- **Accept** - Accept data that has been approved.
- **Unaccept** - Return to an unaccepted (but still approved) state data that has been accepted.

In order to unapprove data for a given organisation unit, you must have the authority to approve data for that organisation unit or to approve data for a higher-level organisation unit to which that data is aggregated. The reason for this is as follows: If you are reviewing data for approval at a higher organisation unit level, you should consider whether the data at lower organisation units are reasonable. If all lower-level data looks good, you can approve the data at the higher level. If some lower-level data looks suspect, you can unapprove the data at the lower level. This allows the data to be reviewed again at the lower level, corrected if necessary, and re-approved up through the organisation unit levels according to the hierarchy.

15.6. Approving by category option group set

When defining an approval level, you specify the organisation unit level at which data will be approved. You may also optionally specify a category option group set. This is useful if you are using category option groups to define additional dimensions of your data, and you want approvals to be based on these dimensions. The following examples illustrate how this can be done within a single category option group set, and by using multiple category option group sets.

15.6.1. Approving by one category option group set

For example, suppose you define a category option group set to represent NGOs who serve as healthcare partners at one or more organisation units. Each category option group within

this set represents a different partner. The category option group for Partner 1 may group together category options (such as funding account codes) that are used by that partner as a dimension of the data. So data entered by Partner 1 is attributed to a category option in Partner 1's category option group. Whereas data entered by partner 2 is attributed to a category option in Partner 2's category option group:

Table 15.1. Example Category Option Groups

Category option group set	Category option group	Category options
Partner	Partner 1	Account 1A, Account 1B
Partner	Partner 2	Account 2A, Account 2B

Each partner could enter data for their accounts independently of the other, for the same or different workflows, at the same or different facilities. So for example, data can be entered and/or aggregated at the following levels for each partner, independently of each other:

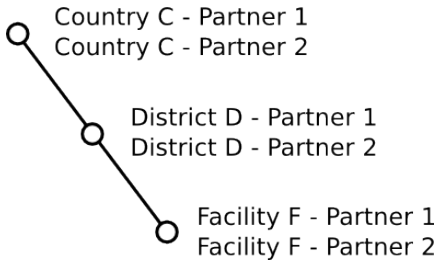


Figure 15.4. Example category option groups

Tip

You can use the sharing feature on category options and category option groups to insure that a user can enter data (and/or see data) only for certain category options and groups. If you don't want users to see data that is aggregated beyond of their assigned category options and/or category option groups, you can assign *Selected dimension restrictions for data analysis*, when adding or updating a user.

You can optionally define approval levels for partner data within any or all of these organisation unit levels. For example, you could define any or all of the following approval levels:

Table 15.2. Example Category Option Group Set approval levels

Approval level	Organisation unit level	Category option group set
1	Country	Partner
2	District	Partner
3	Facility	Partner

15.6.2. Approving by multiple category option group sets

You can also define approval levels for different category option group sets. To continue the example, suppose that you have various agencies that manage the funding to the different partners. For example, Agency A funds accounts 1A and 2A, while Agency B funds accounts 1B and 2B. You could set up category option groups for Agency A, and Agency B, and make them both part of a category option group set called Agency. So you would have:

Table 15.3. Example Multiple Category Option Group Sets

Category option group set	Category option group	Category options
Partner	Partner 1	Account 1A, Account 1B
Partner	Partner 2	Account 2A, Account 2B
Agency	Agency A	Account 1A, Account 2A
Agency	Agency B	Account 1B, Account 2B

Now suppose that at the country level, you want each partner to approve the data entered by that partner. Once this approval is done, you want each agency to then approve the data from accounts that are managed by that agency. Finally, you want to approve data at the country level across all agencies. You could do this by defining the following approval levels:

Table 15.4. Example Multiple Category Option Group Set approval levels

Approval level	Organisation unit level	Category option group set
1	Country	
2	Country	Agency
3	Country	Partner

Note that multiple approval levels can be defined for the same organisation unit level. In our example, Partner 1 would approve country-wide data at approval level 3 from category options Account 1A and Account 1B. Next, Agency A would approve country-wide data at approval level 2 from category options Account 1A (after approval by Partner 1) and Account 2A (after approval by Partner 2.) Finally, after approval from all agencies, country-wide data can be approved at approval level 1 across all category options. Note that approval level 1 does not specify a category option group set, meaning that it is for approving data across all category options.

This example is meant to be illustrative only. You may define as many category option groups as you need, and as many approval levels as you need at the same organisation unit level for different category option group sets.

If you have multiple approval levels for different category option group sets at the same organisation unit level, you may change the approval ordering in the *Settings* section, under *System Approval Settings*. Just click on the approval level you wish to move, and select *Move up* or *Move down*. If you have an approval level with no category option groups set, it must be the highest approval level for that organisation unit level.

Chapter 16. Using reporting functionality

16.1. Reporting functionality in DHIS2

The reporting module in DHIS2 provides a range of reporting alternatives, and this section will explain how to use them to view and analyse data. Another section explains how to configure and set up the various reporting tools.

Standard reports: Standard reports are built on pivot tables, but are more advanced in its design allowing for more cosmetics and styles. These reports can also combine multiple tables and charts in the same report and be made available as one-click reports that are very easy to use. These reports can be downloaded as PDF files which makes them ideal for printing as well as sharing offline.

Dataset reports: Dataset reports are simply a printer friendly way to look at the data entry forms with either raw or aggregated data (over time or place). The design used in data entry will be used also in the data set reports. This will work only for data sets that has a custom data entry form set up.

Dashboard: The fastest way to view your data. The dashboard can display up to four updated charts as well as shortcuts to your favourite reports, report tables, and map views. Each user can configure a personal dashboard.

Data Visualizer: Do flexible visualizations of your data as charts and data tables. Any number of indicators and data elements can be included. Several chart types are available, such as column, stacked column, line, area and pie charts. The charts can be saved in order to be easily retrieved later and can also be put on your personal dashboard. Charts can be downloaded as image and PDF files to your local computer.

Orgunit distribution reports: These reports are generated off the orgunit group set information and can show what types (and how many of each type) of health facilities that are located in a given area (any level in the hierarchy). These reports are automatically generated and display the information in both tables and charts, and downloads in PDF, excel, and CSV are available.

Reporting rate summary: These reports provide a nice overview of how many facilities that have submitted their data for a given dataset and period. Here you can get both the counts and the percentages showing the reporting rate for all or single data sets.

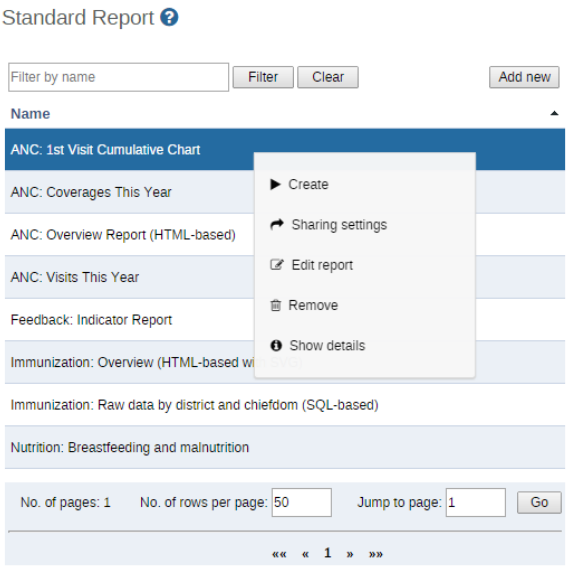
Web-based pivot tables: The built in pivot table tool is a web-based tool to display indicator data by orgunit and period in a typical pivot table view and allows for pivoting manipulations of the tables. It allows for large amounts of data to be downloaded offline for analysis as well.

GIS: Present and analyse your data using thematic maps. You can view both data elements and indicators and given that you have coordinates for all your orgunits you can drill down the hierarchy and view maps for all levels from country polygons to facility points. See the separate chapter on GIS for more details. All the map information is built into DHIS2 and all you need to do is to register coordinates for your organisation units and the maps will be available.

16.2. Using standard reports

You access the available reports by navigating to Apps->Reports. In the report menu in the left bar, click Standard Report. A list of all pre-defined reports will appear in the main window.

Standard reports



You run/view a report by clicking on the name of the report and then selecting "Create" from the contextual menu. If there are any pre-defined paramaters, you will see a report parameter window where you must fill in the values needed for orgunit and/or reporting month, depending on what has been defined in the underlying report table(s). Click on "Get Report" when you are ready. The report will either appear directly in your browser or be available as a PDF file for download, depending on your browser settings for handling PDF files. You can save the file and keep it locally on your computer for later use.

16.3. Using dataset reports

Dataset reports are printer friendly views of the data entry screen filled with either raw or aggregated data. These are only available for data sets that have custom data entry forms and not for default or section forms.

You can access data set reports from Apps->Reports.

A Criteria window will appear where you fill in the details for your report:

Dataset: The data set you want to display.

Reporting period: The actual period you want data for. This can be aggregated as well as raw periods. This means that you can ask for a quarterly or annual report even though the data set is collected monthly. A data set's period type (collection frequency) is defined in data set maintenance. First select the period type (Monthly, Quarterly, Yearly etc.) in the drop down next to Prev and Next buttons, and then select one of the available periods from the dropdown list below. Use Prev and Next to jump one year back or forward.

Use data for selected unit only: Use this option if you want a report for an orgunit that has children, but only want the data collected directly for this unit and not the data collected by its children. If you want a typical aggregated report for an orgunit you do not want to tick this option.

Reporting Organisation unit: Here you select the orgunit you want the report for. This can be at any level in the hierarchy as the data will be aggregated up to this level automatically (if you do not tick the option above).

When you are done filling in the report criteria you click on "Generate". The report will appear as HTML in a printer-friendly format. Use the print and save as functions in the browser to print or save (as HTML) the report.You can also export the data set report in Excel and PDF formats.

16.4. Using resources

The resource tool allows you to upload both files from your local computer to the DHIS server and to add links to other resources on the Internet through URLs. If cloud storage is configured for your system, resources will be saved there.

To create a new resource:

1. Open the **Reports** app and click **Resource**.
2. Click **Add new**.
3. Enter a **Name**.
4. Select a **Type**: **Upload file** or **External URL**.
5. Click **Save**.

16.5. Using reporting rate summary

Access the reporting rate summary from the Apps->Reports menu. Reporting rate summaries will show how many datasets (forms) that have been submitted by organisation unit and period. There are two methods available to calculate reporting rates (completeness):

- Based on complete data set registrations. A complete data set registration refers to a user marking a data entry form as complete, typically by clicking the complete button in the data entry screen, hereby indicating to the system that she considers the form to be complete. This is i.e. a subjective approach to calculating completeness.
- Based on compulsory data element: You can define any number of data elements in a data set to be compulsory. This implies that data values must be captured for all data elements which have been marked as compulsory in order for the data set to be considered complete. This is i.e. an objective approach to calculating completeness.

The reporting rate summary will for each row show a range of measures:

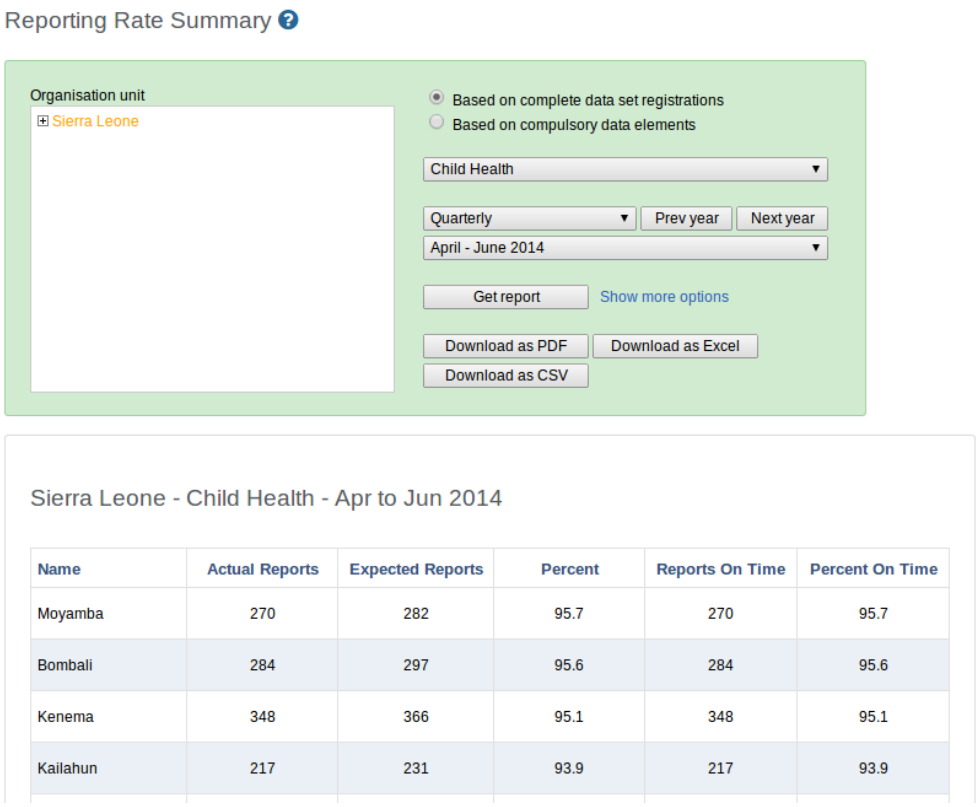
- Actual reports: Indicates the number of data entry complete registrations for the relevant data set.
- Expected reports: Indicates how many data entry complete registrations are expected. This number is based on the number of organisation units the relevant data set has been assigned to (enabled for data entry).
- Percent: The percentage of reports registered as complete based on the number expected.
- Reports on time: Same as actual reports, only reports registered as complete within the maximum number of days after the end of the reporting period. This number of days after reporting period can be defined per data set in the data set management.
- Percent on time: Same as percentage, only reports registered as complete on time used as numerator.

To run the report you can follow these steps:

- Select an orgunit from the tree.
- Select one of the completeness methods to use to calculate the reporting rates.

  Select all or one data set. All will give you a report with all data sets for the selected organisation unit. A single data set will give you a report with completeness for all children of the selected organisation unit.
- Select a period type and a period from the list of available periods for that period type. Move back/forward one year by using the prev/next buttons.
- The report will then be rendered. Change any of the parameters above and the report will be updated automatically.

Reporting rate summary



Name	Actual Reports	Expected Reports	Percent	Reports On Time	Percent On Time
Moyamba	270	282	95.7	270	95.7
Bombali	284	297	95.6	284	95.6
Kenema	348	366	95.1	348	95.1
Kailahun	217	231	93.9	217	93.9

16.6. Using organisation unit distribution reports

You can access the Orgunit Distribution reports from the left side menu in the Apps->Reports.

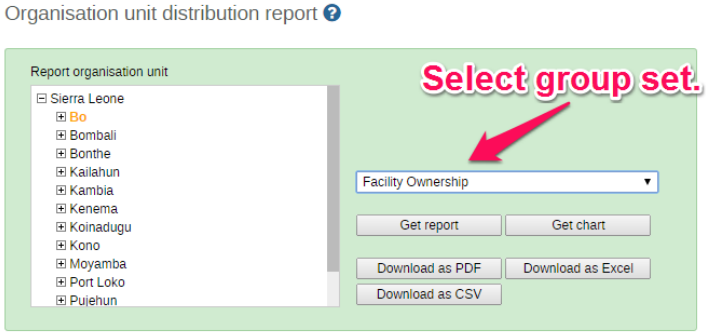
Orgunit distribution reports are reports that show how the orgunits are distributed on various properties like type and ownership, and by geographical areas.

The result can be presented in a table-based report or in a chart.

Running a report:

To run a report first select an orgunit in the upper left side orgunit tree. The report will be based on orgunits located under the selected orgunit. The select the orgunit group set that you want to use, typically these are Type, Ownership, Rural/Urban, but can be any user-defined orgunit group set. The you can click on either Get Report to get the table-based presentation or Get chart to get the same result in a chart. You can also download other format such as PDF, Excel and CSV.

Orgunit distribution report



16.7. Generate analytics tables

DHIS2 generates database tables which the system then uses as basis for various analytics functions. These tables are also valuable if you write advanced SQL reports. In the **Reports** app, you can execute the tables immediately or schedule them to be executed at regular intervals. This means that you can refresh recent analytics on demand and see updated pivot tables without waiting for all of the past years data to re-process.

Note

You can also generate the tables through the web API. This task is typically performed by a system administrator.

1. Open the **Reports** app and click **Analytics**.
2. Select the parts of the analytics process you want to skip:
   - **Skip generation of resource tables**
   - **Skip generation of aggregate data and completeness data**
   - **Skip generation of event data**
   - **Skip generation of enrollment data**
3. Select **Number of last years of data to include**.
4. Click **Start export**.

Chapter 17. Set user account preferences

In **User settings**, you can change the display language of DHIS2 and the language of the database. The database language is the translated content of the metadata, such as data elements and indicators. You can also choose a display style, and enable or disable SMS and email notifications. If you wish to, you can choose to display a short name, such as "Joe" in the analysis modules, rather than your full name.

In **User profile**, you can add personal information to your profile such as your email address, mobile phone number, date of birth and more. When you send messages, the person receiving the message can see these profile details.

In **Account settings**, you can reset your password.

Chapter 18. Manage users, user roles and user groups

18.1. About user management

Multiple users can access DHIS2 simultaneously and each user can have different authorities. You can fine-tune these authorities so that certain users can only enter data, while others can only generate reports.

- You can create as many users, user roles and user groups as you need.
- You can assign specific authorities to each user.
- You can create multiple user roles each with their own authorities.
- You can assign user roles to users to grant the users the corresponding authorities.
- You can assign each user to organisation units. Then the user can enter data for the assigned organisation units.

Table 18.1. User management terms and definitions

Term	Definition	Example
Authority	A permission to perform one or several specific tasks	Create a new data element Update an organisation unit View a report
User	A person's DHIS2 user account	admin traore guest
User role	A group of authorities	Data entry clerk System administrator Antenatal care program access
User group	A group of users	Kenya staff Feedback message recipients HIV program coordinators

You manager users, user roles and user groups in the **Users** app.

Table 18.2. Objects in the Users app

Object type	Available functions
User	Create, edit, clone, disable, assign search organisation units, display by organisation unit, delete and show details
User role	Create, edit, share, delete and show details
User group	Create, edit, join, leave, share, delete and show details

18.1.1. About users

Each user in DHIS2 must have a user account which is identified by a user name. You should register a first and last name for each user as well as contact information, for example an email address and a phone number.

It is important that you register the correct contact information. DHIS2 uses this information to contact users directly, for example sending emails to notify users about important events. You can also use the contact information to share for example dashboards and pivot tables.

A user in DHIS2 is associated with an organisation unit. You should assign the organisation unit where the user works.

Example 18.1.

When you create a user account for a district record officer, you should assign the district where he/she works as the organisation unit.

The assigned organisation unit affects how the user can use DHIS2:

- In the **Data Entry** app, a user can only enter data for the organisation unit she is associated with and the organisation units below that in the hierarchy. For instance, a district records officer will be able to register data for her district and the facilities below that district only.
- In the **Users** app, a user can only create new users for the organisation unit she is associated with in addition to the organisation units below that in the hierarchy.
- In the **Reports** app, a user can only view reports for her organisation unit and those below. (This is something we consider to open up to allow for comparison reports.)

An important part of user management is to control which users are allowed to create new users with which authorities. In DHIS2, you can control which users are allowed to perform this task. The key principle is that a user can only grant authorities and access to data sets that the user itself has access to. The number of users at national, province and district level are often relatively few and can be created and managed by the system administrators. If a large proportion of the facilities are entering data directly into the system, the number of users might become unwieldy. It is recommended to delegate and decentralize this task to the district officers, it will make the process more efficient and support the facility users better.

18.1.2. About user roles

A user role in DHIS2 is a group of authorities. An authority means the permission to perform one or more specific tasks.

Example 18.2.

A user role can contain authorities to create a new data element, update an organisation unit or view a report.

A user can have multiple user roles. If so, the user's authorities will be the sum of all authorities and data sets in the user roles. This means that you can mix and match user roles for special purposes instead of only creating new ones.

A user role is associated with a collection of data sets. This affects the **Data Entry** app: a user can only enter data for the data sets registered for his/her user role. This can be useful when, for example, you want to allow officers from health programs to enter data only for their relevant data entry forms.

Recommendations:

- Create one user role for each position within the organisation.
- Create the user roles in parallel with defining which user is doing which tasks in the system.

- Only give the user roles the exact authorities they need to perform their job, not more. Only those who are supposed to perform a task should have the authorities to perform it.

18.1.3. About user groups

A user group is a group of users. You use user groups when you set up sharing of objects or notifications, for example push reports or program notifications.

See also:

Sharing

Manage program notifications

Mange push reports

18.2. Workflow

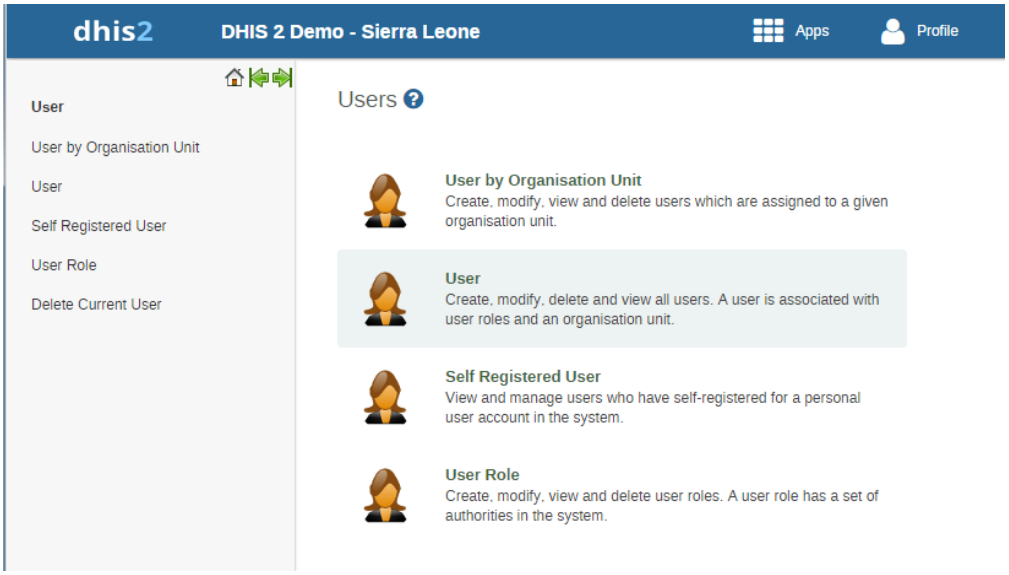
1. Define the positions you need for your project and identify which tasks the different positions will perform.
2. Create roughly one user role for each position.
3. Create users.
4. Assign user roles to the users.
5. Assign the users to organisation units.
6. Assign data sets to the user role.
7. (Optional) Group users in user groups.

Tip

For users to be able to enter data, you must add them to both a data set and an organisational unit level.

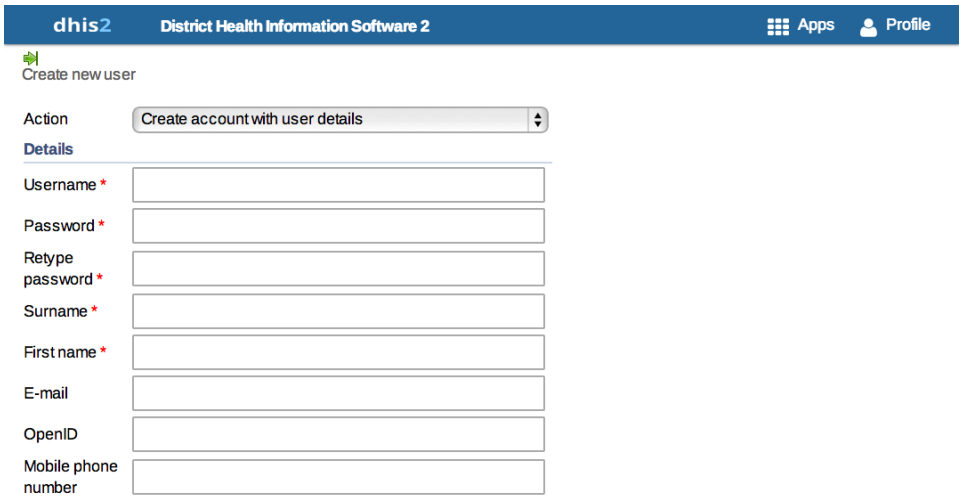
18.3. Manage users

18.3.1. Create a user



1. Open the **Users** app and click **User**.

2. Click **Add new**.
3. Select whether you want to fill in all the personal user information, or invite the user by email to complete the rest of the user information:
   - **Create account with user details**

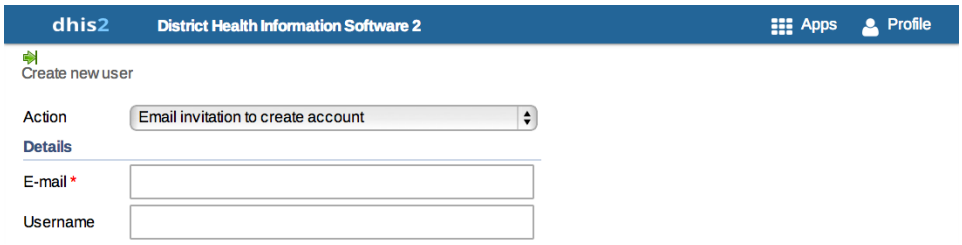


     Choose this option if you would like to enter all the details of the new user such as name, password, etc.

     Enter the following information: user name, password, surname, first name, email, OpenID account (if any) and mobile phone number (if any).

     After you've created the user, the account is ready for the user to use with the user name and password that you provide.

   - **Email invitation to create account**



     Choose this option if you want to send an invitation by email to the user. Then she/he must return to DHIS2 and finish setting up their user account. The account that the user finishes setting up will be limited according to how you configure the account.

     ### Note

     You may not select this option to create an account with "critical" system authorities such as All, Scheduling Administration, Perform maintenance tasks, Merge organisation units, Eliminate duplicate data elements, SQL View Management, Change system settings, and List, Add or Delete user roles.

     In order to use this feature "Enable email message notifications" in SystemSettings -> Messaging should be checked.

     Enter the email address to which the invitation should be sent. If you want to, you may also enter the user name that the account will have. If you leave the user name empty, then the user may choose their own user name when they respond to the invitation (as long as it is not taken already for another user.)

     After you've created the user, the system sends two emails to the address you provided. One contains a unique web link by which the user can return to the system and activate

their account by entering the rest of their user information. The other email contains a unique code that they must enter into the system in order to complete the registration, after following the link in the first email. The user must finish setting up the account within three months, after that the invitation becomes invalid.

4. Select an **Interface language**.

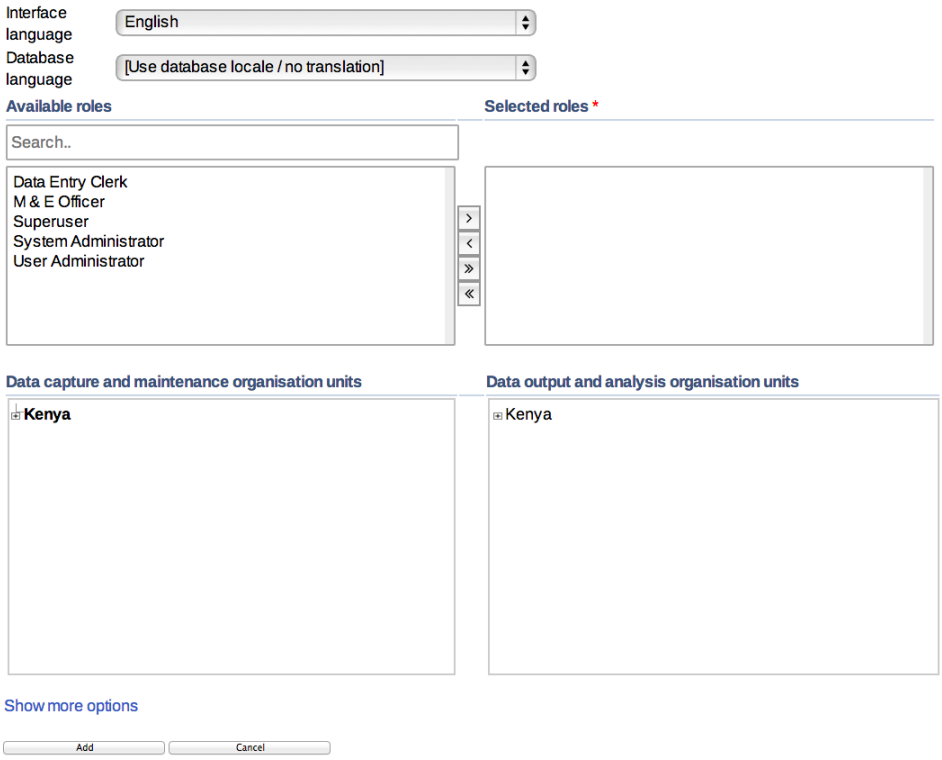
   You can select a language into which fixed elements of the DHIS2 user interface have been translated.

5. Select a **Database language**.

   You can select a language into which implementation-supplied items have been translated in the database, for example data element names or organisation unit level names.

6. In the **Available roles** section, double-click the user roles you want to assign to the user.

7. Select **Data capture and maintenance organisation units**.



   The data capture and maintenance organisation units control for which organisation units the user can do data entry. You must assign at least one data capture and maintenance organisation unit to each user.

   Users will have access to all sub-organisation units of the assigned organisation units. For example, if you've assigned a user to a district which has several facilities contained in the district, the user would have access to the district's data, as well as all of the facilities contained within the district.

8. (Optional) Select **Data output and analysis organisation units**.

   The data output and analysis organisation units controls for which organisation units the user can view aggregated data in the analytics apps, for example the **Pivot Table** and **GIS** apps. You can assign any number of data output and analysis organisation units to a user.

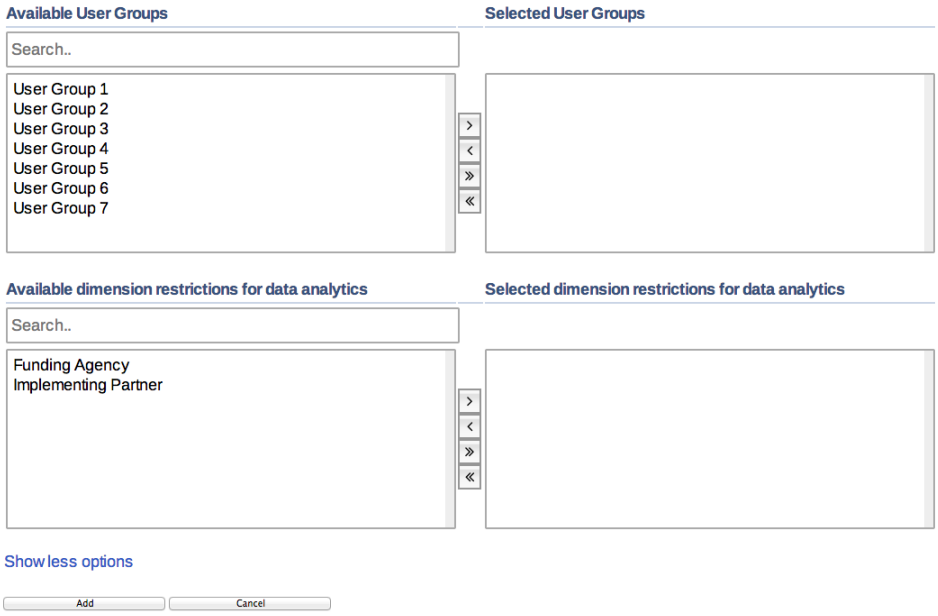
   Users will have access to all sub-organisation units of the assigned organisation units. You shouldn't select the descendants of an organisation unit which you have already selected. For example, if you've assigned the user to a district, you shouldn't select the facilities within that district.

Note

Assigning data output and analysis organisation units organisation units is optional. If you don't specify any organisation unit, the user will have access to the full organisation unit hierarchy for viewing aggregated data. As with the data capture organisation units, *you should not select descendant organisation units of a unit which you have already selected*.

In several places in the analytics apps, you can select "user organisation unit" for the organisation unit dimension. This mechanism will first attempt to use the data view organisation units linked to the current user. If not found, it will use the data capture and maintenance organisation units. If the user has been assigned to multiple organisation units, the use of "user organisation unit" may result in unpredictable behavior.

9. Click **Show more options**.



10. (Optional) In the **Available user groups** section, double-click the user groups you want to assign to the user.
11. (Optional) In the **Available dimension restrictions for data analytics** section, double-click the dimensions you want to assign to the user.

    You can restrict the values the user sees in data analytics apps by selecting dimensions that will restrict the user's view.

    Example 18.3.

    Let's say you have defined *Implementing Partner* as a category option group set, and you have shared with this user only one or more specific implementing partners (category option groups). If you want to make sure that the user does not see totals in analytics that include values from other groups, assign *Implementing Partner* to the user. This insures that any data visible to the user through the analytics apps will be filtered to select only the Implementing Partner category option group(s) which are visible to the user.

12. Click **Add**.

18.3.2. Edit user objects

1. Open the **Users** app and find the type of user object you want to edit.

2. In the object list, click the relevant object and select **Edit**.
3. Modify the options you want.
4. Click **Save**.

18.3.3. Disable users

You can disable a user. This means that the user's account is not deleted, but the user can't log in or use DHIS2.

1. Open the **Users** app and click **User**.
2. In the list, click the relevant user and select **Disable**.
3. Click **OK** to confirm.

18.3.4. Display a user's profile

1. Open the **Users** app and click **User**.
2. In the list, click the relevant user and select **Profile**.

18.3.5. View users by organisation unit

You can view all users that have been assigned to a particular organisation unit.

1. Open the **Users** app and click **User by organisation unit**.
2. In the left-hand organisation unit tree, click an organisation unit.

   A list of users which have been assigned to this organisation unit is displayed.

18.3.6. Assign search organisation units to users

1. Open the **Users** app and click **User**.
2. In the object list, click the relevant user and select **Assign search org units**.
3. Click the organisation units you want the user to be able to search in.
4. Click **Save**.

18.3.7. Delete current user

You can delete the user that is currently logged into the system.

1. Open the **Users** app and click **Delete current user**.
2. Enter your password and click **Delete**.

18.3.8. Clone users

1. Open the **Users** app and click **User**.
2. In the object list, click the relevant user and select **Replicate**.
3. Enter a new user name and password for the cloned user account.
4. Click **Replicate**.
5. In the object list, click the user you just created and click **Edit**.

6. Modify the options you want.
7. Click **Save**.

18.3.9. Change user password

The following rules apply when you create a new password:

- Password must contain at least one special character, that is any character other then alphabets and digit numbers.
- Password must contain at least one upper case character.
- Password must contain at least one digit number.
- Password can not contain user's user name or email address.
- Password can not contain generic words for example *system*, *admin*, *user*, *login*, *manager* etc.
- Password can not be one of the previous 24 passwords the user has used.

  This doesn't apply in case a super user resets the password for another user.
- Password must contain more than minimum number of characters.

  ### Note

  You can configure the minimum number of characters: Open the **System Settings** app and click **Access** > **Minimum characters in password**.
- Password can not contain more than 40 characters

To change a user's password:

1. Open the **Users** app and click **User**.
2. In the object list, click the relevant user and select **Edit**.
3. Enter a new password and retype it.
4. Click **Save**.

18.3.10. Delete user objects

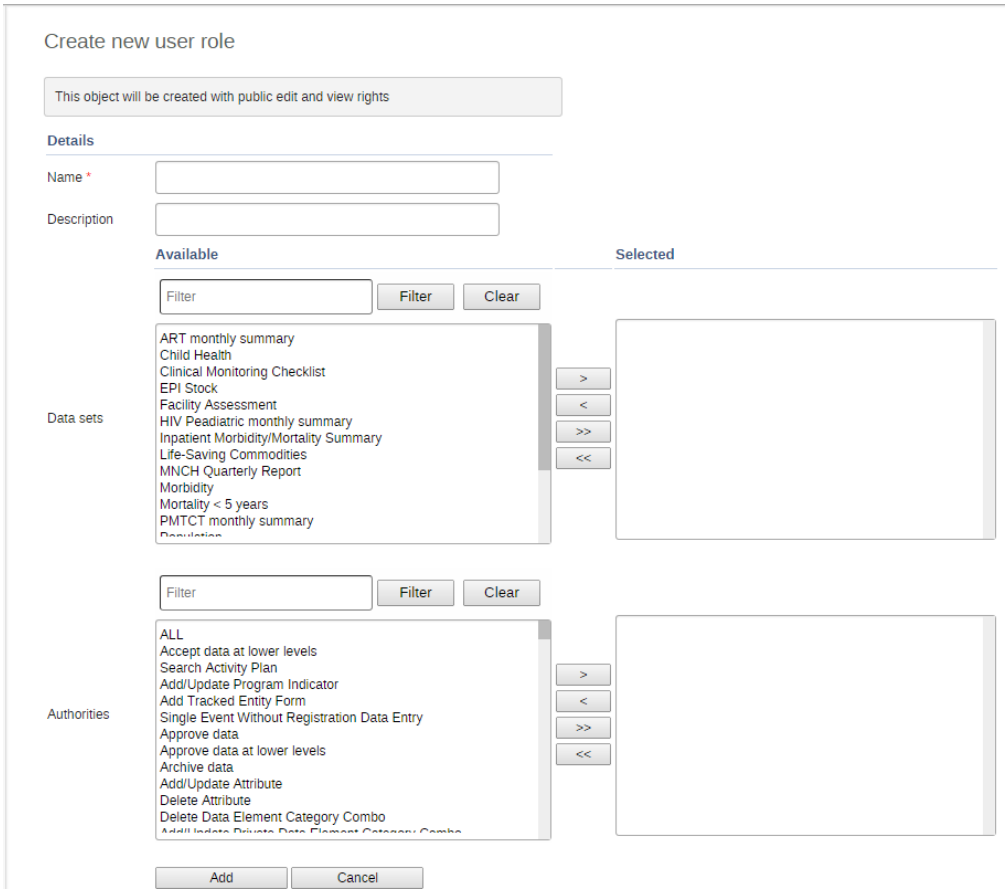
1. Open the **Users** app and find the type of user object you want to delete.
2. In the object list, click the relevant object and select **Remove**.
3. Click **OK** to confirm.

18.3.11. Display details of user objects

1. Open the **Users** app and find the type of user object you want to view.
2. In the object list, click the relevant object and select **Show details**.

18.4. Manage user roles

18.4.1. Create a user role



1. Open the **Users** app and click **User role**.
2. Click **Add new**.
3. Enter a **Name**, for example "Super user" or "Admin user".
4. Enter a **Description**.
5. In the **Data sets** section, double-click the data sets you want the user role to have access to.
6. In the **Programs** section, double-click the programs you want the user role to have access to.
7. **Authorities** section, double-click the authorities you want to give to the user role.
8. Click **Add**.

Tip

You can select multiple data sets, programs or authorities:

- One by one: press the Ctrl key and click the items one by one, then click the right arrow.
- In a series: press the Shift key and select the first and last item in the series, then click the right arrow.

18.4.2. Edit user objects

1. Open the **Users** app and find the type of user object you want to edit.
2. In the object list, click the relevant object and select **Edit**.
3. Modify the options you want.
4. Click **Save**.

18.4.3. Delete user objects

1. Open the **Users** app and find the type of user object you want to delete.
2. In the object list, click the relevant object and select **Remove**.
3. Click **OK** to confirm.

18.4.4. Display details of user objects

1. Open the **Users** app and find the type of user object you want to view.
2. In the object list, click the relevant object and select **Show details**.

18.4.5. Change sharing settings for user objects

1. Open the **Users** app and find the type of user object you want to modify.
2. In the object list, click the relevant object and select **Sharing settings**.
3. (Optional) Search for a user group and select it, then click the plus icon. The user group is added to the list.
4. (Optional) Select **External access (without login)**.
5. Change the settings for the user groups you want to modify.
   - **None**
   - **Can view**: Everyone in the user group can view the object
   - **Can edit and view**: Everyone in the user group can view and edit the object
6. Click **Save**.

18.5. Manage user groups

18.5.1. Create a user group

1. Open the **Users** app and click **User group**.
2. Click **Add new**.
3. In the **Name** field, type the name of the user group.
4. In the **Available users** section, double-click the users you want to add to the user group.
5. In the **Available user groups** section, double-click the user groups you want to add to the user group.
6. Click **Add**.

18.5.2. Join user groups

1. Open the **Users** app and click **User group**.
2. In the list, click the relevant user group and select **Join group**.

18.5.3. Leave user groups

1. Open the **Users** app and click **User group**.
2. In the list, click the relevant user group and select **Leave group**.

18.5.4. Edit user objects

1. Open the **Users** app and find the type of user object you want to edit.
2. In the object list, click the relevant object and select **Edit**.

3. Modify the options you want.
4. Click **Save**.

18.5.5. Delete user objects

1. Open the **Users** app and find the type of user object you want to delete.
2. In the object list, click the relevant object and select **Remove**.
3. Click **OK** to confirm.

18.5.6. Display details of user objects

1. Open the **Users** app and find the type of user object you want to view.
2. In the object list, click the relevant object and select **Show details**.

18.5.7. Change sharing settings for user objects

1. Open the **Users** app and find the type of user object you want to modify.
2. In the object list, click the relevant object and select **Sharing settings**.
3. (Optional) Search for a user group and select it, then click the plus icon. The user group is added to the list.
4. (Optional) Select **External access (without login)**.
5. Change the settings for the user groups you want to modify.
   - **None**
   - **Can view**: Everyone in the user group can view the object
   - **Can edit and view**: Everyone in the user group can view and edit the object
6. Click **Save**.

18.6. Enable support for OpenID

DHIS2 supports the OpenID standard, which allows third party login using a OpenID provider, for more information see http://openid.net. To create a custom OpenID URL for a user name you can visit this URL and log in with your OpenID provider: http://openid-provider.appspot.com.

To enable support for OpenID in DHIS2, you must:

1. **Set your OpenID provider**: This can be done inside system settings, under "Access". Here you can set both the OpenID provider, and also the label to display on the login page to login with this provider (defaults to Login with OpenID).
2. **Set the OpenID identifier on the user**: For every user that should be able to login with his OpenID identifier, you will need to set this on the user itself. This can be done in user management, under the email field, there is not a field called *OpenID* which can be used to fill in the OpenID identifier.

18.7. Decentralize user management

DHIS2 supports a concept for user management referred to as *managed users* which allows to explicitly define which users should be allowed to manage or modify which users. To "manage a user" implies that you can see and modify that user. The basic concept for user management is that you can see and modify users which you have been granted all of the authorities; in other words you can modify users which have a subset of your own authorities. The managed users concept gives you greater control over this.

The managed users concept allows you to define which users should be able to manage which users. This is configured through user groups and memberships within such groups. A user group can be configured to be allowed to manage other user groups from the standard add and update user interface. The effect is that a specific user can manage all users which are members of user groups which can be managed by a user group that the user is member of. In other words, users can be managed by all members of user groups which are managing user groups they are member of.

To enable this concept you should grant users the authority to "Add/update users within managed groups", and *not* grant access to the standard "Add/update users" authority. An implication of the managed users concept is that when creating a user with the "Add/update users within managed groups" only, the user must be made a member of at least one user group that the current user can manage. If not, the current user would lose access to the user being created immediately. This is validated by the system.

When granted the "Add/update users within managed groups" authority, the system lets a user add members to user groups for which she has read-only access to. The purpose of this is to allow for decentralized user management. You may define a range of user groups where other users may add or remove members, but not remove or change the name of the group.

18.8. Example: user management in a health system

In a health system, users are logically grouped with respect to the task they perform and the position they occupy.

1. Define which users should have the role as system administrators. They are often part of the national HIS division and should have full authority in the system.
2. Create roughly one user role for each position.

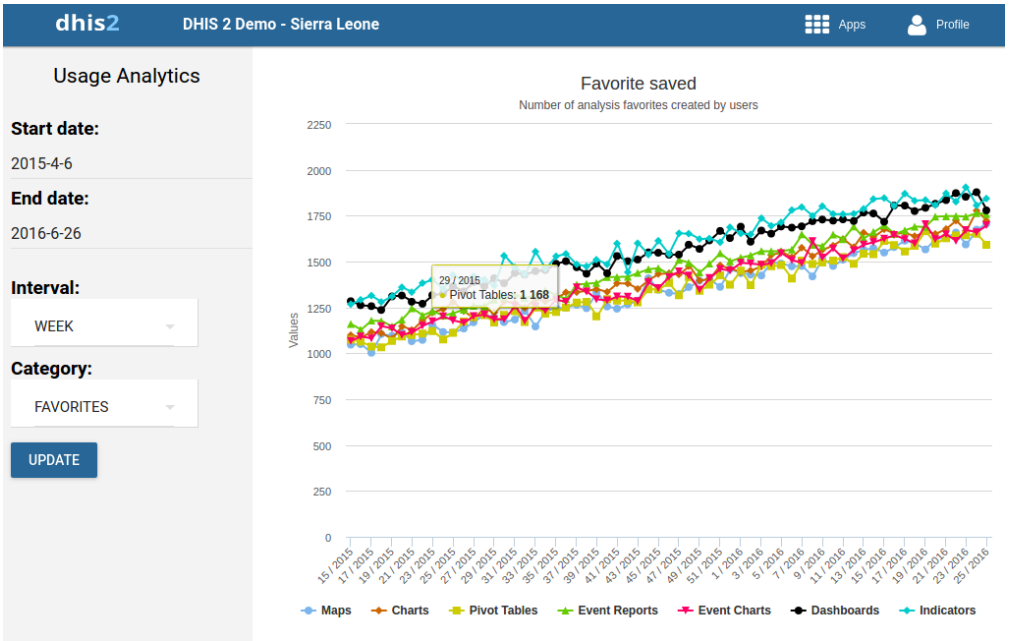
Examples of common positions are:

Position	**Typical tasks**	**Recommended authorities**	**Comment**
System administrators	Set up the basic structure (metadata) of the system.	Add, update and delete the core elements of the system, for example data elements, indicators and data sets.	Only system administrators should modify metadata. If you allow users outside the system administrators team to modify the metadata, it might lead to problems with coordination. Updates to the system should only be performed by the administrators of the system.
National health managers Province health managers	Monitor and analyse data	Access to the reports module, the **GIS**, **Data Quality** apps and the dashboard.	Don't need access to enter data, modify data elements or data sets.

Position	Typical tasks	Recommended authorities	Comment
National health information system division officers (HISO) District health records and information officers (DHRIO) Facility health records and information officers (HRIO)	Enter data that comes from facilities which are not able to do so directly Monitor, evaluate and analyse data	Access to all the analysis and validation apps Access to the **Data Entry** app.	-
Data entry clerks	-	-	-

Chapter 19. Visualize usage statistics

19.1. About the Usage Analytics app



The **Usage Analytics** app lets you visualize statistics on how users are working with the **Dashboard**, **Pivot Table**, **GIS**, **Event Visualizer**, **Data Visualizer** and **Event Reports** apps within DHIS2. With this statistics you can answers questions such as:

- How many times people have loaded charts, pivots tables and dashboards?
- How many favorites have users created?
- How many users that are logging in versus total number of users?
- What are the most viewed favorites?

19.2. Create a usage analytics graph

1. Open the **Usage Analytics** app.
2. Select a **Start date** and **End date**.
3. Select an **Interval**: day, week month or year.
4. Select a **Category**.

   There are five analytics categories:

   - **Favorite views**: Provides the number of times various types of favorites have been viewed, such as charts, pivot tables and dashboards, over time. This analysis lets you switch between all types of favorites, the total across all types and the average number of views.
   - **Favorites**: Provides the number of favorites which have been created and stored in the system over time.
   - **Users**: Provides the number of active as well as total number of users over time.
   - **Top favorites**: Shows the most viewed favorites in the system by type.
   - **Data values**: Provides the number of data values stored in the system over time.
5. Click **Update**.

Chapter 20. Configure metadata

20.1. About the Maintenance app

In the **Maintenance** app you configure all the metadata objects you need to collect and analyze data:

- Categories
- Data elements
- Data sets and data entry forms
- Indicators
- Organisation units
- Program metadata: tracked entity, tracked entity attribute and relationship type
- Validation rules
- Attributes
- Constants
- Options sets
- Legends
- Predictors
- Push reports
- External map layers

Note

The functions you have access to depend on your user role's access permissions.

20.2. Manage categories

20.2.1. About categories

Categories are typically a concept, for example "Gender", "Age" or "Disease Status". Data elements such as "Number of cases of confirmed malaria" are often broken into smaller component parts to determine, for example, the number of confirmed malaria cases of particular age groups.

Use categories to disaggregate data elements into individual components. You can also use categories to assign metadata attributes to all data recorded in a specific dataset, such as "Implementing partner" or "Funding agency."

Example 20.1. Three age categories

Create three categories: "Under 1", "1-5" and "Over 5". Assign them as categories to the data element. This creates three separate fields for this data in the data entry forms:

- Number of confirmed malaria cases (Under 1)
- Number of confirmed malaria cases (1-5)

- Number of confirmed malaria cases (Over 5)

Without categories, you would have had to create each of the data elements listed above separately.

In the **Maintenance** app, you manage the following and category objects:

Table 20.1. Category objects in the Maintenance app

Object type	Available functions
Category option	Create, edit, clone, share, delete, show details and translate
Category	Create, edit, clone, share, delete, show details and translate
Category combination	Create, edit, clone, share, delete, show details and translate
Category option combination	Edit and show details
Category option group	Create, edit, clone, share, delete, show details and translate
Category option group set	Create, edit, clone, share, delete, show details and translate

20.2.2. Workflow

1. Create all category options.
2. Create categories composed by the multiple category options you've created.
3. Create category combinations composed by either one or multiple categories.
4. Create data elements and assign them to a category combination.

20.2.3. Create or edit a category option

When possible, recycle category options. For instance, there might be two categories which might share a particular category option (for example <1 year of age). When creating the categories, this category option could be reused. This is important if particular category options (or category option combinations) that need to be analyzed together.

1. Open the **Maintenance** app and click **Category** > **Category option**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Short name**
   c. **Start date**
   d. **End date**
4. Select organisation units and assign them.

> **Tip**
>
> You can automatically select all organisation units that belong to an organisation unit level or organisation unit group, for example "Chiefdom" or "Urban. To do this:
>
> Select an **Organisation unit level** or **Organisation unit group** and click **Select**.

5. Click **Save**.

20.2.4. Create or edit a category

When you have created all category options for a particular category, you can create that category.

1. Open the **Maintenance** app and click **Category** > **Category**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Code**
   c. **Data dimension type**

      A category either be of type "Disaggregation" or "Attribute". For disaggregation of data elements, you select **Disaggregation**. The data dimension type "Attribute" allows the category to be used to assign a combination of categories to data recorded through a data set.

   d. **Data dimension**

      If you select **Data dimension**, the category will be available to the analytics as another dimension, in addition to the standard dimensions of "Period" and "Organisation unit".
4. Select category options and assign them.
5. Click **Save**.

20.2.5. Create or edit a category combination

Category combinations lets you combine multiple categories into a related set.

Example 20.2. Category combination

You can disaggregate the data element "Number of new HIV infections" into the following categories:

- HIV Service: "Other", "PMTCT", "TB"
- Gender: "Male", "Female"

In this example, there are two levels of disaggregation that consist of two separate data element categories. Each data element category consist of several data element category options.

In DHIS2, different data elements are disaggregated according to a common set of categories. By combining these different categories into a category combination and assigning these combinations to data elements, you can apply the appropriate disaggregation levels quickly to a large number of data elements.

1. Open the **Maintenance** app and click **Category** > **Category combination**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Code**
   c. **Data dimension type**
   d. **Skip category total in reports**
4. Select categories and assign them.
5. Click **Save**.

20.2.6. Create or edit a category option group

You can group and classify category options by using category option groups. The main purpose of the category option group set is to add more dimensionality to your captured data for analysis in for example the **Pivot table** or **Data Visualizer** apps.

Example 20.3. Category options groups and group sets

In a system, data is collected by "projects", where projects is modeled as category options. The system must be able to analyse data based on which donor that supports the project. In this case, create a category option group set called "Donor". Each donor can be created as a category option group, where each category option / project is put in the appropriate group. In the data analysis applications, the "Donor" group set will appear as a data dimension, while each donor appear as dimension items, ready to be included in reports.

To create a category option group:

1. Open the **Maintenance** app and click **Category** > **Category option group**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Short name**: Define a short name for the data element.
   c. **Code**
   d. **Data dimension type**
4. Select **Category options** and assign them.
5. Click **Save**.

20.2.7. Create or edit a category option group set

You can group category option groups in category option group sets. The main purpose of the category option group set is to add more dimensionality to your captured data for analysis in for example the **Pivot table** or **Data Visualizer** apps.

1. Open the **Maintenance** app and click **Category** > **Category option group set**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Description**
   c. **Data dimension**
   d. **Data dimension type**
4. Select **Category option groups** and assign them.
5. Click **Save**.

20.2.8. Use category combinations for data sets

When categories and category combinations have the data dimension type "Attribute", they can apply a common set of attributes to a related set of data values contained in a data set. When category combinations are used as a attribute, they serve as another dimension (similar to "Period" and "Organisation unit") which you can use in your analysis.

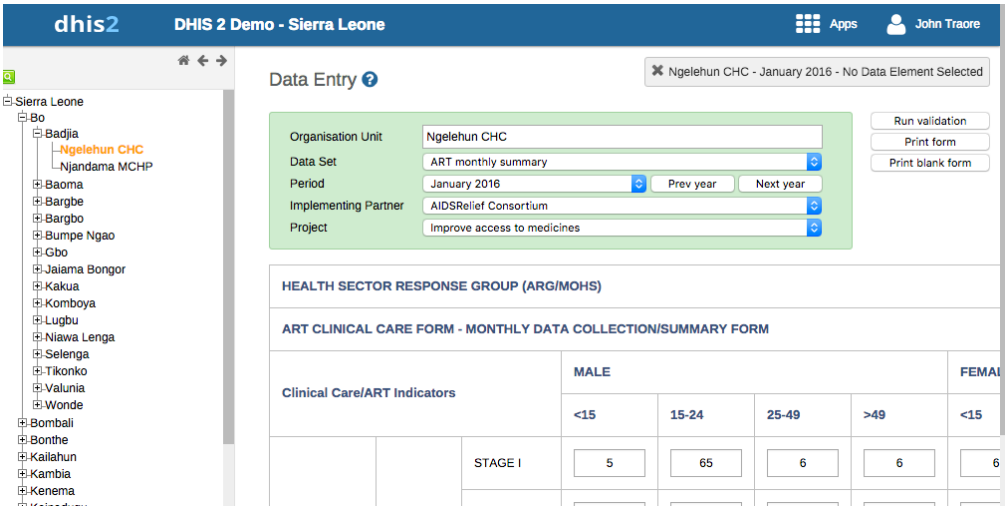
Example 20.4. Use category combination for a data set

Suppose that a NGO is providing ART services in a given facility. They would need to report each month on the "ART monthly summary", which would contain a number of data elements.

The NGO and project could potentially change over time. In order to attribute data to a given NGO and project at any point in time, you need to record this information with each data value at the time of data entry.

1. Create two categories with the data dimension type "Attribute": "Implementing partner" and "Projects".
2. Create a category combination with the data dimension type "Attribute": "Implementing partners and projects".
3. Assign the categories you've created to the category combination.
4. Create a data set called "ART monthly summary" and select the "Implementing partners and projects" category combination.

When you enter data in the **Data entry** app, you can select an "Implementing partner" and a "Project". Each recorded data value, is assigned a specific combination of these categories as an attribute. These attributes (when specified as a dimension) can be used in the analysis applications similar to other dimensions, for example the period and organisation unit.



20.2.9. Assign a code to a category option combination

You can assign a code to category option combinations. This makes data exchange between DHIS2 and external systems easier. The system creates the category option combinations automatically.

1. Open the **Maintenance** app and click **Category** > **Category option combination**.
2. In the list, find the object you want to modify.
3. Click the options menu and select **Edit**.
4. Enter a code.
5. Click **Save**.

20.2.10. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.2.11. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.2.12. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.2.13. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.2.14. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

> **Tip**
>
> To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

> **Tip**
>
> If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.3. Manage data elements

20.3.1. About data elements

Data elements are the base of DHIS2. Data elements define what is actually recorded in the system, for example number of immunisations or number of cases of malaria.

Data elements such as "Number of cases of confirmed malaria" are often broken into smaller component parts to determine, for example, the number of confirmed malaria cases of particular age groups.

In the **Maintenance** app, you manage the following data elements objects:

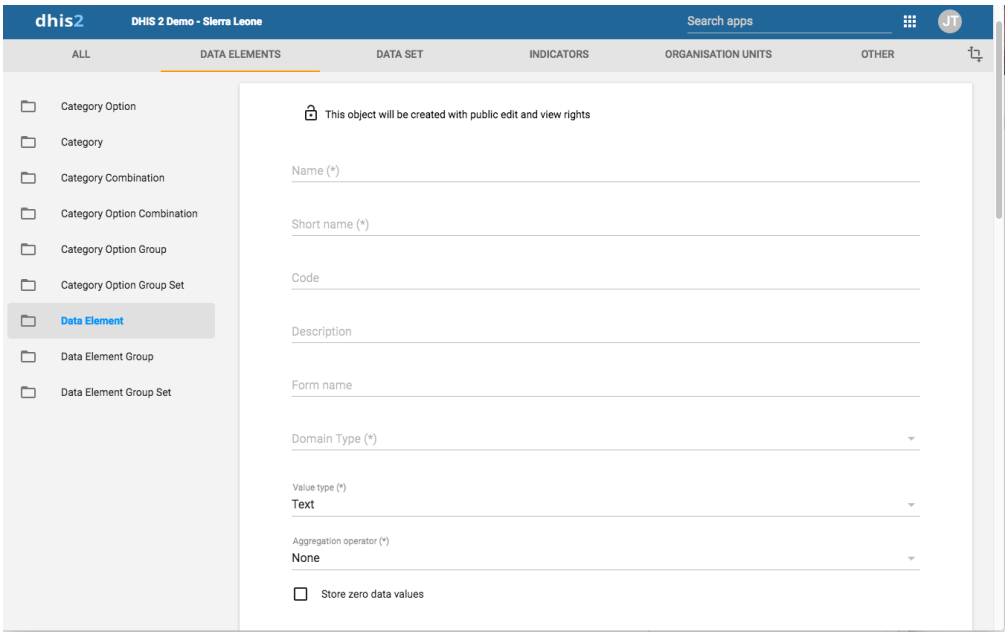
Table 20.2. Data element objects in the Maintenance app

Object type	Available functions
Data element	Create, edit, clone, share, delete, show details and translate
Data element group	Create, edit, clone, share, delete, show details and translate
Data element group set	Create, edit, clone, share, delete, show details and translate

20.3.2. Workflow

1. Create all category options.
2. Create categories composed by the multiple category options you've created.
3. Create category combinations composed by either one or multiple categories.
4. Create data elements and assign them to a category combination.

20.3.3. Create or edit a data element



1. Open the **Maintenance** app and click **Data elements** > **Data element**.
2. Click the add button.
3. In the **Name** field, define the precise name of the data element.

   Each data element must have a unique name.
4. In the **Short name** field, define a short name for the data element.

   Typically, the short name is an abbreviation of the full data element name. This attribute is often used in reports to display the name of the data element, where space is limited.
5. (Optional) In the **Code** field, assign a code.

   In many countries data elements are assigned a code.
6. In the **Description** field, type a description of the data element. Be as precise as possible and include complete information about how the data element is measured and what its purpose is.
7. In the **Form name** field, type an alternative name of the data element. This name can be used in either section or automatic data entry forms. The form name is applied automatically.
8. In the **Domain type** field, select whether the data element is an aggregate or tracker type of data element.
9. In the **Value type** field, select the type of data that the data element will record.

Table 20.3. Value types

Value type	Description
Age	-
Coordinate	A point coordinate specified as longitude and latitude in decimal degrees. All coordinate should be specified in the format "-19.23 , 56.42" with a comma separating the longitude and latitude.
Date	Dates rendered as calendar widget in data entry.

Value type	Description
Date & time	Is a combination of the **DATE** and **TIME** data elements.
Email	Email.
File	A file resource where you can store external files, for example documents and photos.
Image	A file resource where you can store photos. Unlike the **FILE** data element, the **IMAGE** data element can display the uploaded image directly in forms.
Integer	Any whole number (positive and negative), including zero.
Letter	A single letter.
Long text	Textual value. Renders as text area with no length constraint in forms.
Negative integer	Any whole number less than (but not including) zero.
Number	Any real numeric value with a single decimal point. Thousands separators and scientific notation is not supported.
Percentage	Whole numbers inclusive between 0 and 100.
Phone number	Phone number.
Positive integer	Any whole number greater than (but not including) zero.
Positive of zero integer	Any positive whole number, including zero.
Organisation unit	Organisation units rendered as a hierarchy tree widget. If the user has assigned "search organisation units", these will be displayed instead of the assigned organisation units.
Unit interval	Any real number greater than or equal to 0 and less than or equal to 1.
Text	Textual value. The maximum number of allowed characters per value is 50,000.
Time	Time is stored in HH:mm format. HH is a number between 0 and 23 mm is a number between 00 and 59
Tracker associate	Tracked entity instance. Rendered as dialog with a list of tracked entity instances and a search field.

Value type	Description
Username	DHIS 2 user. Rendered as a dialog with a list of users and a search field.
Yes/No	Boolean values, renders as drop-down lists in data entry.
Yes only	True values, renders as check-boxes in data entry.

10. In the **Aggregation type** field, select the default aggregation operation that will be used on the data element.

    Most data elements should have the **Sum** operator. This includes all data elements which should be added together. Other data elements, such as staffing levels, should be set to use the **Average** operator, when values along the time dimension should not be added together, but rather averaged.

    Table 20.4. Aggregation operators

Aggregation operator	Description
Average	Average the values in both the period as and the organisation unit dimensions.
Average (sum in organisation unit hierarchy)	Average of data values in the period dimension, sum in the organisation unit dimensions.
Count	Count of data values.
Min	Minimum of data values.
Max	Maximum of data values.
None	No aggregation is performed in any dimension.
Sum	Sum of data values in the period and organisation unit dimension.
Standard deviation	Standard deviation (population-based) of data values.
Variance	Variance (population-based) of data values.

11. If you want to save zeros for a particular reason, select **Store zero data values**. By default, DHIS2 does not store zeros entered in the data entry module.
12. In the **URL** field, enter a link to an in-depth description of the data element.

    For example a link to a metadata repository or registry that contains detailed technical information about the definition and measurement of the data element.
13. In the **Category combination** field, define which category combination the data element should have. This is also known as the "disaggregation".
14. Select an **Option set**.

    Option sets are predefined lists of options which can be used in data entry.
15. Select an **Option set for comments**.

    Option sets for comments are predefined lists of options which can be used to specify standardized comments for data values in data entry.
16. Assign one or multiple **Legends**.

    Legends are used in for example the **GIS** app to display certain data elements with certain icons.

17. Set the **Aggregation levels** to allow the data element to be aggregated at one or more levels:

    a. In the left pane, select the levels you want to assign to the data element.

    b. Click the right arrow to assign the aggregation levels.

    By default, the aggregation will start at the lowest assigned organisation unit. If you for example select "Chiefdom", it means that "Chiefdom", "District", and "National" aggregates use "Chiefdom" (the highest aggregation level available) as the data source, and PHU data will not be included. PHU data will still be available for the PHU level, but not included in aggregations to the levels above.

    If you select both "District" and "Chiefdom", it means that the "District" and "National" level aggregates use District data as their source, "Chiefdom" will use Chiefdom, and "PHU" will use PHU.

18. If applicable, enter custom attributes values, for example **Classification** or **Collection method**.

    > **Note**
    >
    > You create custom attributes in the **Maintenance** app: **Other** > **Attributes**.

19. If applicable, select compulsory data element group sets, for example **Main data element group** or **Tracker-based data**.

    > **Note**
    >
    > You'll only see data element group sets in this form if you've created them and set them to **Compulsory**.
    >
    > You create data element group sets in the **Maintenance** app: **Data element** > **Date element group set**.

20. Click **Save**.

20.3.4. Create or edit a data element group

Data element groups lets you classify related data elements into a common theme. For example, two data elements "Measles immunisation" and "BCG Immunisation" might be grouped together into a data element group "Childhood immunisation".

To create a data element group:

1. Open the **Maintenance** app and click **Data elements** > **Data element group**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Short name**
   c. **Code**
4. Select data elements and assign them.
5. Click **Save**.

20.3.5. Create or edit a data element group set

Data element group sets allows you to categorise multiple data element groups into a set. The system uses data element group sets during analysis and reporting to combine similar data element groups into a common theme. A data element group can be part of multiple data element group sets.

1. Open the **Maintenance** app and click **Data elements** > **Data element group set**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Code**
   c. **Description**
   d. **Compulsory**
   e. **Data dimension**
4. Select data element groups and assign them.

   Available data element groups are displayed in the left panel. Data element groups that are currently members of the data element group set are displayed in the right hand panel.
5. Click **Save**.

20.3.6. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.3.7. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.3.8. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.3.9. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.3.10. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.4. Manage data sets and data entry forms

20.4.1. About data sets and data entry forms

All data entry in DHIS2 is organised in data sets. A data set is a collection of data elements grouped together for data entry and data export between instances of DHIS2. To use a data set to collect data for a specific organisation unit, you must assign the organisation unit to the

data set. Once you have assigned the data set to an organisation unit, that data set is available in the **Data entry** app. Only the organisation units that you have assigned the data set to can use the data set for data entry.

A category combination can link to both data elements and data sets. If you use a category combination for a data set, the category combinations is applicable for the whole form. This means that you can use categories to capture information which is common to an entire form, for example the name of the a project or grant. When a data set is linked to a category combination, those categories will be displayed as drop-down boxes in the **Data entry** app. Data captured in the form will then be linked to the selected category options from those drop-down boxes. For information about how to create categories and category combinations, see section "Manage data elements and categories". Make sure that you set the type of categories and category combinations to "Attribute".

Example 20.5. Categories for data sets

An scenario for when categories are useful is when you need to capture a data entry form for a implementing partner organisation and a project. In that case:

1. Create category options and categories for all partner organisations and projects and link them in a new category combination.
2. Assign the category combination to the data set (form) for which you need to capture this information.

   When opening this data set in data entry module, the partner organisation and project categories will automatically be rendered as drop-down boxes, allowing you to select a specific implementing partner organisation and project before continuing to do data entry.

You create and edit data sets in the **Maintenance** app. Here you define, for example, which data elements you want to include in the data set and the data collection frequency.

You enter data in the **Data entry** app. The **Data entry** app uses data entry forms to display the data sets. There are three types of data entry forms:

Table 20.5. Data entry form types

Data entry form type	Description
Default form	Once you have assigned a data set to an organisation unit, a default form is created automatically. The default form is then available in the **Data entry** app for the organisation units you have assigned it to. A default form consist of a list of the data elements belonging to the data set together with a column for inputting the values. If your data set contains data elements with a non-default category combination, for example age groups or gender, additional columns are automatically created in the default form based on the different categories. If you use more than one category combination you get multiple columns in the default form with different column headings for the options.
Section form	If the default form doesn't meet your needs, you can modify it to create a section form. Section forms give you more flexibility when it comes to using tabular forms. In a section form you can, for example, create multiple tables with subheadings and disable (grey out) cells in a table.

Data entry form type	Description
	When you have added a section form to a data set, the section form is available in the **Data entry** app.
Custom form	If the form you want to design is too complicated for default or section forms, you can create a custom form. A custom form takes more time to create than a section form, but you have full control over the design. You can, for example, mimic an existing paper aggregation form with a custom form. This makes data entry easier, and should reduce the number incorrectly entered data elements. When you have added a custom form to a data set, the custom form is available in the **Data entry** app.

A data set can have both section and custom forms

If a data set has both a section form and a custom form, the system displays the custom form during data entry. Users who enter data can't select which form they want to use. In web-based data entry the order of display preference is:

1. Custom form (if it exists)
2. Section form (if it exists)
3. Default form

Mobile devices do not support custom forms. In mobile-based data entry the order of display preference is:

1. Section form (if it exists)
2. Default form

In the **Maintenance** app, you manage the following data set objects:

Table 20.6. Data set objects in the Maintenance app

Object type	Available functions
Data set	Create, assign to organisation units, edit, share, delete, show details and translate Edit compulsory data elements Add and remove multiple data sets to organisation units at once
Section form	Create, edit and manage grey fields
Section	Change display order, delete and translate
Custom form	Create, edit and script

20.4.2. Workflow

You need to have data elements and categories to create data sets and data entry forms.

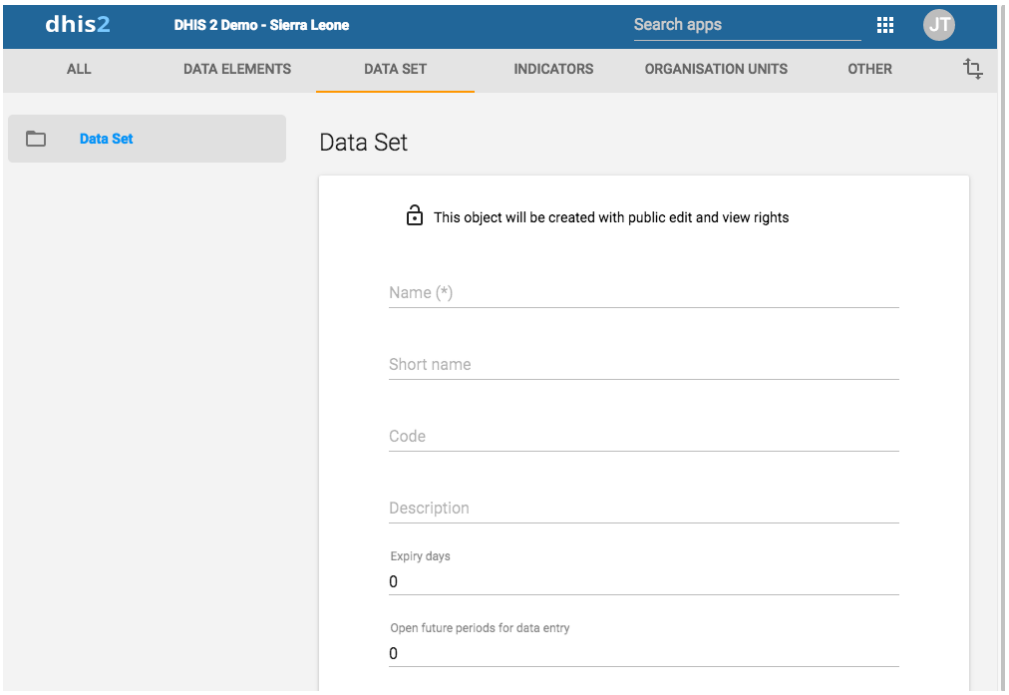
1. Create a data set.
2. Assign the data set to organisation units.

A default form is created automatically.

3. Create a section form or a custom form.

   Now you can register data in the **Data entry** app.

20.4.3. Create or edit a data set



1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. Click the add button.
3. In the **Name** field, type the precise name of the data set.
4. In the **Short name** field, define a short name for the data set.

   Typically, the short name is an abbreviation of the full data set name. This attribute is often used to display the name of the data set where space is limited.
5. (Optional) In the **Code** field, assign a code.
6. In the **Description** field, type a description of the data set.
7. Enter the number of **Expiry days**.

   The number of expiry days controls for how long it should be possible to enter data in the **Data entry** app for this data set. Expiry days refer to the number of days after the end date of the selected data entry period where the data entry form should be open for entry. After the number of days has expired, the data set will be locked for further entry.

   You can set manual exceptions to this using the lock exception functionality in the **Data Administration** app.

   > **Note**
   >
   > To allow data entry into all possible historical time periods, set the number of expiry days to zero.
8. If you want it to be possible to enter data for future periods, type the number of periods in the **Open future periods for data entry** field.

   The value is the number of future periods which are available for data entry.

Example 20.6. Open future periods for data entry

For a monthly data set a value of 2 allows you to enter data for 2 months in advance. This is useful for, by example, population, target and planning data.

9. In the **Days after period to qualify for timely submission** field, type the number of days in which data can be entered to be considered reported on time.

   To verify the number of timely reports submitted, go to **Reports** > **Reporting rate summary**.

10. Select a **Period type**.

    The period type defines the frequency of reporting for the particular data set. The frequency can for example be daily, quarterly or yearly.

11. Select a **Category combination** to assign it to the data set.

Tip

Click **Add new** to create category combinations that you're missing. In the form that opens, create the category combinations you need. When you're done, click **Refresh values**.

12. In the **Complete notification recipients** list, select a user group that should receive a message when the data set is marked as complete in the **Data Entry** app.

    The message is delivered through the DHIS2 messaging system.

13. If you want the user who entered the data to receive a message when the data set is marked as complete in the **Data entry** app, select **Send notification to completing user**.

    The message is delivered through the DHIS2 messaging system.

14. If applicable, select, a **Data approval workflow**.

15. If you want it to be possible to use the data set within the Java mobile DHIS 2 application, select **Enable for Java mobile client**.

16. If you want it to be mandatory to fill all values for a data element in data entry if one or more values have been filled, select **All fields for data elements required**.

    This means that if you enter one data value for a data element in an entry field (that is for a category option combination), then you must enter data for all fields belonging to that data element (that is all category option combinations).

17. If you want it to be possible to mark a data entry form as complete only if the validation of that form is successful, select **Complete allowed only if validation passes**.

    If you select this option, you can't mark the form as complete if validation fails.

18. If you want it to be mandatory that any missing values require a comment to justify their absence, select **Missing values requires comment on complete**.

19. (Optional) Assign one or multiple **Legends**.

20. If applicable, select **Skip offline**.

    This option controls whether this data entry form should be downloaded and saved in the user's web browser. Normally you shouldn't select **Skip offline**. This is the default setting. If you have big forms which are rarely used you can consider selecting this option to speed up initial loading in the data entry module.

21. If applicable, select **Data element decoration**

If you select this option, descriptions of data elements render in call-outs in downloaded data sets in offline mode in the **Data entry** app.

22. If applicable, select **Render sections as tabs**.

    This option is only applicable for section forms. The option allows you to render each section as a tab horizontally above the data set. This is useful for long data sets as it allows appropriate sections to be selected quickly without going through the entire form.

23. If applicable, select **Render vertically**.

    This option is only applicable for section forms.

24. Select data elements and assign them.

    You can override the category combination for each selected data set by clicking on the gear icon above the list of selected data elements. This allows you to utilize a specific category combination (disaggregation) within the current data set instead of the category combination associated directly with the data element itself.

25. Select indicators and assign them.

26. In the organisation unit tree, select the organisation units you want to assign the data set to.

> **Tip**
>
> - Click **Organisation unit level** to select all organisation units that belong to a certain organisation level.
> - Click **Organisation unit group** to select all organisation units that belong to a certain organisation unit group.

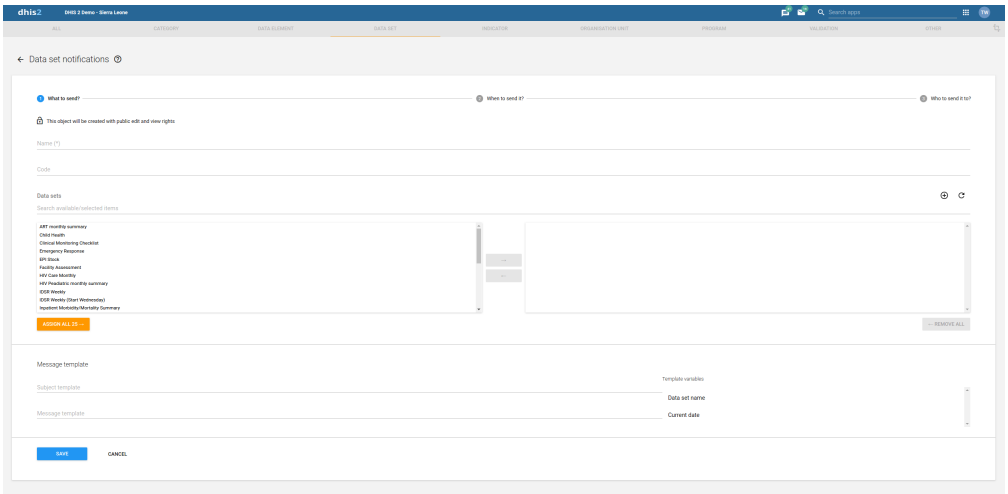
27. Click **Save**.

You can now use the data set in the **Data Entry** app for the organisation units that you have assigned to and for periods according to the selected frequency (period type).

20.4.4. Create or edit Data set Notification

1. Open the **Maintenance** app and click **Data set** > **Data set notification**.
2. Click the add button.

20.4.4.1. What to send?



1. In the **Name** field, type the precise name of the data set notification.
2. (Optional) In the **Code** field, assign a code.

3. Enter **Data sets**.

   These data sets will be associated to this notification. Incase any of them is completed for a certain period and organisation unit, notification will be generated by the system.

   ## Note

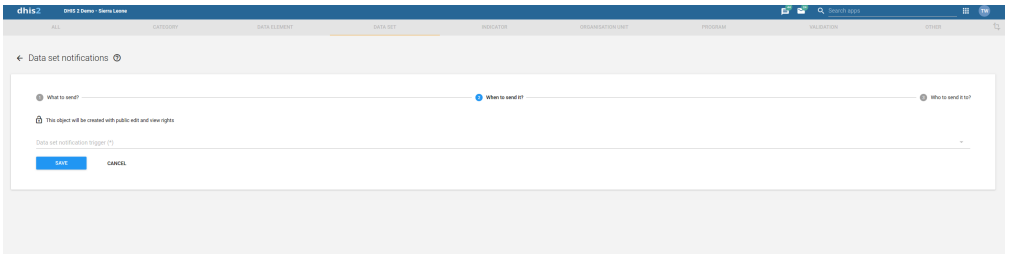
   Nothing will happen if no data set is selected

4. In **Message template** section there are two parameters.
   - **Subject template** subject of the notification sent in notification. It can have values from the list of variables avaiable on the right side.
   - **Message template** actual message sent in notification. It can have values from the list of variables avaiable on the right side.

   ## Note

   Subject is only relevant in case of Email and internal DHIS-2 messages. It is ignored in case of SMS.

20.4.4.2. When to send?

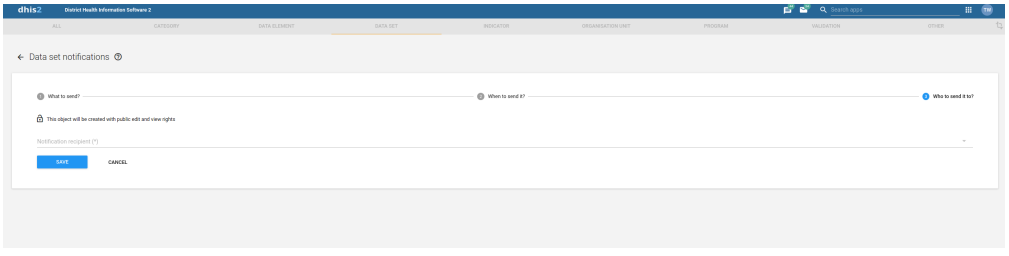


1. **Data set notification trigger** field determine when to send notification.
   - **Data Set Completion** will trigger notification as soon as data set is completed.
   - **Schedule Days** will schedule notificaton based on number days relative to scheduled date. Schedule date will be decided by Period associated with Data set.
     - **Send notification as** provides two different types of notifications
       - **Collective summary** send notification in summary mood
       - **Single notification** sends notification in sinlge mood

   ## Note

   Send notification as option is only available in case of scheduled notification. This option is set to default which is **Single notification** in case of completion notification

20.4.4.3. Who to send?



1. **Notification recipient** field determine recipients of the notification.
   - **Organisation Unit contact** will send notification to contact assigned to organisation unit which the data has been collected from.
   - **UserGroup** will send notification to all the member of the selected UserGroup.

Note

An internal DHIS-2 message will be sent in case if recipient is UserGroup. Moreover user will also receive SMS/EMAIL if phone number and email address exist for that user and SMS/EMAIL notifications are enabled in SystemSettings

20.4.5. Override data elements' category combinations in a data set

You can override which category combination to use for a data element within the context of a data set. This means that a data element can use different category combinations within different data sets. This is useful when you want to reuse a data element since you don't have to replicate the data element to allow multiple category combinations.

Example 20.7.

If different regions within your organisation unit hierarchy use different disaggregations, or if the disaggregations change over time, you can represent this by creating different data sets with the appropriate category combinations.

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to modify.
3. Click the options menu and select **Edit**.
4. Go to the data elements section and click the spanner icon.
5. Select new category combinations and click **Close**.
6. Click **Save**.

20.4.6. Edit compulsory data elements in a data set

You can add or remove data elements which will be marked as compulsory during data entry.

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to edit.
3. Click the options menu and select **Edit compulsory data elements**.
4. Assign the compulsory data elements.
5. Click **Save**.

20.4.7. Download default data forms in PDF format

You can download a default data from in PDF format for offline data entry.

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the object you want to download.
3. Click the options menu and select **Get PDF for data entry**.

20.4.8. Manage section forms

20.4.8.1. Create a section form

Section forms are separated automatically by data element category combinations, which produce a spreadsheet like data entry form for each section.

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to create a section form for.
3. Click the options menu and select **Manage sections**.
4. Click the add button.
5. (Optional) In the **Name** field, type the name of the section.
6. (Optional) In the **Description** field, type a description of the section.
7. (Optional) To display totals for rows in the section form during data entry, select **Show row totals**.
8. (Optional) To display totals for columns in the section form during data entry, select **Show column totals**.
9. Assign data elements to the section:

   a. (Optional) Select a **Category combination filter**.

   ## Note

   You can only use one category combination per section.

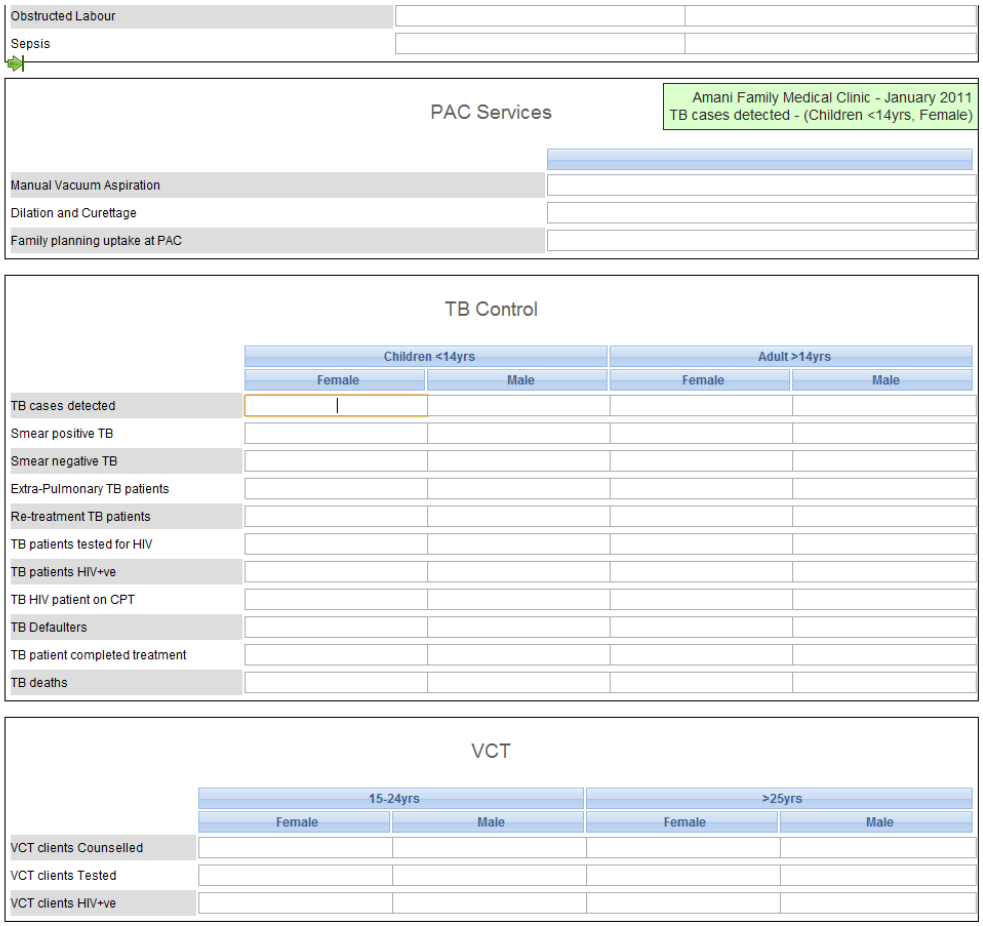
Option	Description
None	Displays all data elements that don't have a category combination.
<No filter>	Displays all data elements.

   b. Select data elements and assign them.
10. (Optional) Sort the data elements within the section by using the up and down arrows to the left of the assigned data elements field.
11. Click **Save**.
12. Repeat add section steps for each section you want to have in your section form.

In the **Data Entry** app you can now use the section form. The section form appears automatically when sections are available for the selected data set. Data sets which have section forms will automatically display the section form.

Example 20.8. Section form example

Note how each data element category has been separated into a separate section, and a data entry table has been automatically generated by the system. Use of section forms in combination with data element categories can drastically reduce the amount of time which is required to create data entry forms for data sets.



Obstructed Labour		
Sepsis		

PAC Services

Amani Family Medical Clinic - January 2011
TB cases detected - (Children <14yrs, Female)

Manual Vacuum Aspiration	
Dilation and Curettage	
Family planning uptake at PAC	

TB Control

	Children <14yrs		Adult >14yrs	
	Female	Male	Female	Male
TB cases detected				
Smear positive TB				
Smear negative TB				
Extra-Pulmonary TB patients				
Re-treatment TB patients				
TB patients tested for HIV				
TB patients HIV+ve				
TB HIV patient on CPT				
TB Defaulters				
TB patient completed treatment				
TB deaths				

VCT

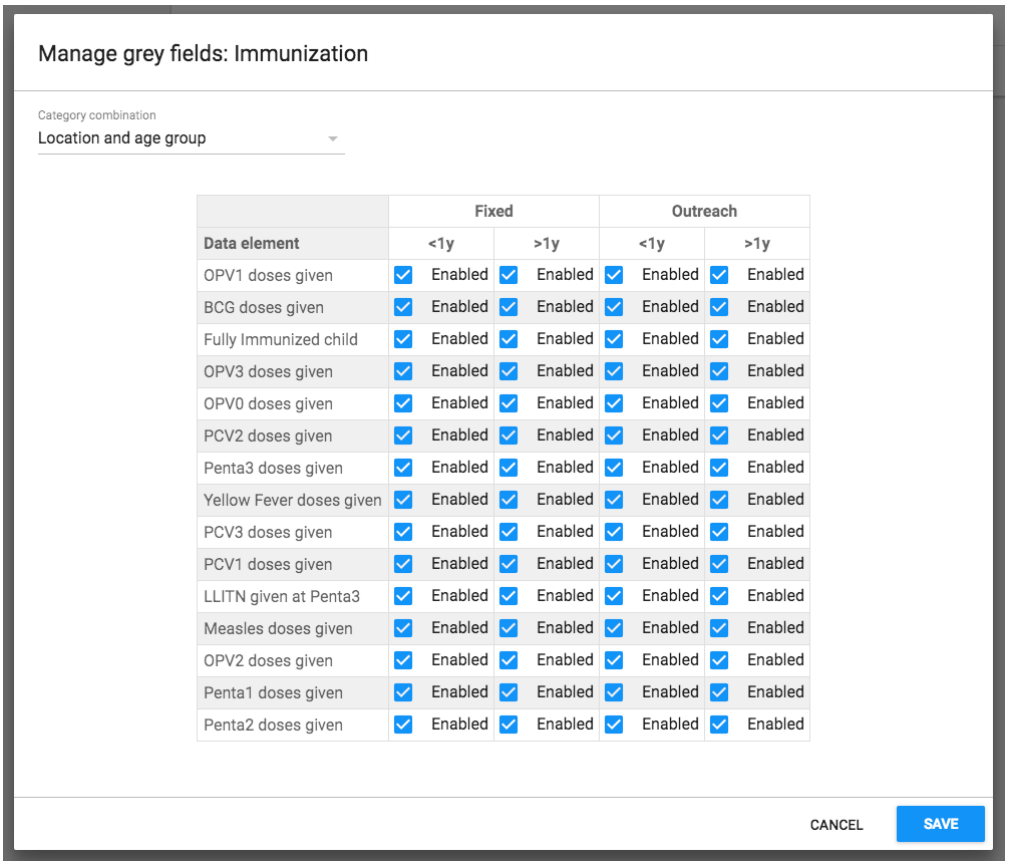
	15-24yrs		>25yrs	
	Female	Male	Female	Male
VCT clients Counselled				
VCT clients Tested				
VCT clients HIV+ve				

20.4.8.2. Edit a section form

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to edit the section form for.
3. Click the options menu and select **Manage sections**.
4. In the list, find the section you want to edit.
5. Click the options menu and select **Edit**.
6. Edit the section and click **Save**.
7. Repeat edit section steps for each section you want to edit.

20.4.8.3. Manage grey fields in a section form

You can disable data elements and category options for data entry. That means it won’t be possible to enter data into these fields during data entry.



1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to edit the section form for.
3. Click the options menu and select **Manage sections**.
4. In the list, find the section you want to edit.
5. Click the options menu and select **Manage grey fields**.
6. Select which fields you want to disable.

> **Note**
>
> If you've sections that contain data elements assigned to multiple category combinations, switch between the category combinations to view all fields.

7. Click **Save**.

20.4.8.4. Change section display order in a section form

You can control in which order sections are displayed in a section form.

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to edit the section form for.
3. Click the options menu and select **Manage sections**.
4. In the list, find the section you want to move.
5. Click the options menu and select **Move up** or **Move down**.

If the section you want to move is the first or last section in the list, you'll only see one of the move options.

20.4.8.5. Delete a section in a section form

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to edit the section form for.

3. Click the options menu and select **Manage sections**.
4. In the list, find the section you want to delete.
5. Click the options menu and select **Delete**.

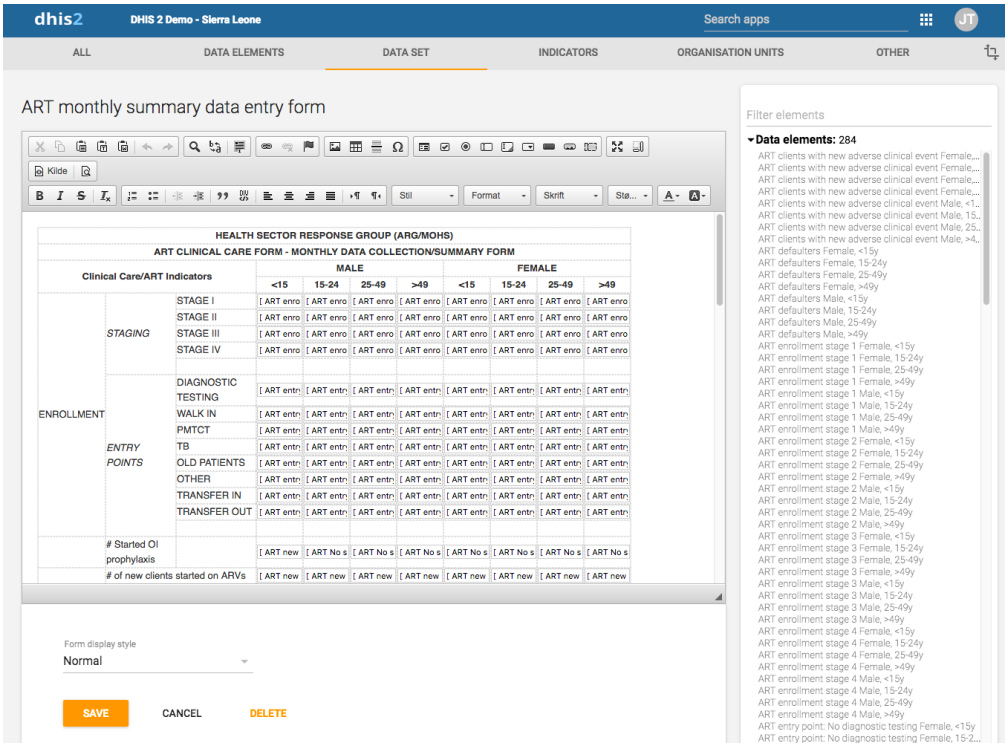
20.4.8.6. Translate a section in a section form

1. Open the **Maintenance** app and click **Data set** > **Data set**.
2. In the list, find the data set you want to edit the section form for.
3. Click the options menu and select **Translate**.
4. Select a locale.
5. Enter the required information.
6. Click **Close**.

20.4.9. Manage custom forms

20.4.9.1. Create a custom form

You design custom forms in a built-in WYSIWYG HTML editor. If you select **Source**, you can paste HTML code directly in the editing area. For a complete guide on how to use the editor, refer to http://docs.ckeditor.com/.



To create a custom form:

1. Open the **Maintenance** app and click **Data set**.
2. In the list, find the data set you want to add a custom form to.
3. Click the options menu and select **Design data entry form**.
4. In the editing area, create the custom form.
   - Double-clik on a object in the left-hand list to insert it in the form.
   - If you already have the HTML code for your form, click **Source** and paste the code.
5. Select a **Form display style**.
6. Click **Save**.

20.4.9.2. Scripting in custom forms

In custom data entry form you can use JavaScript to create dynamic behavior and customizations. As an example, you can hide form sections based on specific user input for data elements, or show specific information when a form loads.

20.4.9.2.1. Events

The DHIS2 data entry module provides a range of events which you can register for and use to perform actions at certain times. The events are registered on the document element. The jQuery event object and the data set identifier are always the first two arguments provided to the callback functions. The table below provides an overview of the events and when they are triggered.

Table 20.7. Data entry events

Key	Description	Arguments
dhis2.de.event.formLoaded	Triggered after the data entry form is rendered, but before data values are set in entry fields.	Event | Data set ID
dhis2.de.event.dataValuesLoaded	Triggered after data values are set in entry fields.	Event | Data set ID
dhis2.de.event.formReady	Triggered when the data entry form is completely rendered and loaded with all elements.	Event | Data set ID
dhis2.de.event.dataValueSaved	Triggered when a data value is saved successfully.	Event | Data set ID | Data value object
dhis2.de.event.completed	Triggered when a data set is successfully marked as complete.	Event | Data set ID | Complete registration object
dhis2.de.event.uncompleted	Triggered when a data set is successfully marked as incomplete.	Event | Data set ID
dhis2.de.event.validationSuccess	Triggered when validation is done and there were no violations.	Event | Data set ID
dhis2.de.event.validationError	Triggered when validation is done and there were one or more violations.	Event | Data set ID
dhis2.ou.event.orgUnitSelected	Triggered when one or more organisation units are selected in the org unit web tree.	Event | Org unit IDs | Org unit names | Sub org unit IDs

To register for an event:

```
<script type="text/javascript">

dhis2.util.on( 'dhis2.de.event.formReady', function( event, ds ) {
  console.log( 'The form with id: ' + ds + ' is loaded!' );
} );

dhis2.util.on( 'dhis2.de.event.dataValueSaved', function( event, ds, dv ) {
  console.log( 'Data value: ' + dv.value + ' was saved with data element: ' + dv.de );
} );

dhis2.util.on( 'dhis2.de.event.completed', function( event, ds, cr ) {
  console.log( 'Form was completed for org unit: ' + cr.ou );
```

```
} );

</script>
```


Note

Be careful to only use "namespaced" events like the ones in the example above and not general ones like "click" as the dhis2.util.on method will unregister the event first.

If your function only applies to certain data sets you can use the supplied data set identifier and shortcut your function for unwanted data sets like this:

```
dhis2.de.on( 'dhis2.de.event.validationSuccess', function( event, ds ) {
  if ( $.inArray( ds, ['utXOiGbEj14', 'Re7qzHEThSC'] ) == -1 ) {
    return false;
  }
  console.log( 'Form with id: ' + ds + ' validated successfully!' );
} );
```

The identifiers of the input fields in the data entry form is on the format described below. This format can be used to select the input fields in your script and perform actions on them:

```
<dataelementid>-<optioncomboid>-val
```

Since the data set identifier is provided for all events a feasible alternative is to utilize the "files" Web API resource and keep your callback functions in a single file, where you let the JavaScript code take action based on which data set is currently loaded.

20.4.9.2.2. Functions

The DHIS2 data entry module contains JavaScript API functions which can be accessed from custom data entry forms.

dhis2.de.api.getSelections: This function returns a JavaScript object which contains properties for all dimensions with corresponding values for the identifiers of the selected options. It contains properties for "ds" (data set), "pe" (period), "ou" (organisation unit) and identifiers for all data set categories.

An example response looks like this:

```
{
 +  ds: "lyLU2wR22tC",
 +  pe: "201605",
 +  ou: "g8upMTyEZGZ",
 +  LFsZ8v5v7rq: "CW81uF03hvV",
 +  yY2bQYqNt0o: "yMj2MnmNI8L"
 +}
```

Example JavaScript usage of this function:

```
var sel = dhis2.de.api.getSelections();
 +var orgUnit = sel["ou"];
 +var partner = sel["LFsZ8v5v7rq"];
```

20.4.10. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.4.11. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.4.12. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.4.13. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

> **Tip**
>
> If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.5. Manage indicators

20.5.1. About indicators

An indicator is a formula that can consist of multiple data elements, constants, organisation unit group counts and mathematical operators. The indicator consist typically of a numerator and denominator. You use indicators to calculate coverage rates, incidence and other values that are a result of data element values that have been entered into the system. Calculated totals do not have a denominator.

> **Note**
>
> You never enter indicators directly in DHIS2, you calculate them.

An indicator formula can consist of mathematical operators, for example plus and minus, and of the following elements:

Table 20.8. Indicator formula

Formula element	Type	Description
Constant	Component	Constants are numerical values which remain the same for all indicator calculations. This is useful in order to have a single place to change values that might change over time. Constants are applied AFTER data element values have been aggregated.
Data elements	Component	Data elements are substituted by the data value captured for the data element.
Days	Operator	"Days" is special operator that always provides the number of days for a given indicator calculation. For example: if you want to calculate the "Percentage of time vaccine refrigerator was

Formula element	Type	Description
		non-functional", you could define the numerator as: ("Days-"Number of days vaccine refrigerator was available"")/"Days" If the fridge was available 25 days in June, the indicator would be calculated as: (30-25/25)*100 = 17 % If you want to calculate the total for Quarter 1, the number of days ("Days") would be: 31+28+31 = 90 The "Days" parameter will always be the number of days in the period of interest.
Organisation unit counts	Component	You can use organisation unit groups in formulas. They will be replaced by the number of organisation units in the group. During aggregation, the organisation units in the group will be intersected with the part of the organisation unit hierarchy being requested. This lets you use the number of public facilities in a specific district in indicators. This is useful for example when you create facility infrastructure surveys and reports.
Programs	Component	Click **Programs** and select a program to view all data elements, attributes and indicators related to a specific program. The program components you include in your formula will have a program tag assigned to them.

In the **Maintenance** app, you manage the following indicator objects:

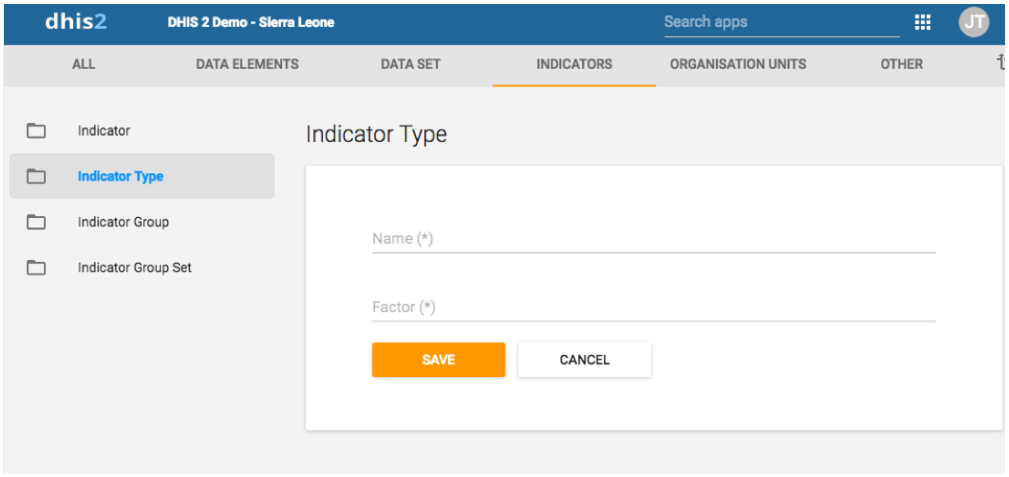
Table 20.9. Indicator objects in the Maintenance app

Object type	Available functions
Indicator	Create, edit, clone, share, delete, show details and translate
Indicator type	Create, edit, clone, delete, show details and translate
Indicator group	Create, edit, clone, share, delete, show details and translate
Indicator group set	Create, edit, clone, share, delete, show details and translate

20.5.2. Workflow

1. Create indicator types.
2. Create indicators.
3. Create indicator groups.
4. Create indicator group sets.

20.5.3. Create or edit an indicator type



Indicator types define a factor that is applied during aggregation. Indicator values that are calculated during a data mart export or report table generation process will appear properly formatted, and will therefore not require an additional multiplier (for example 100 in the case of percents) for the values to appear correctly formatted.

Note

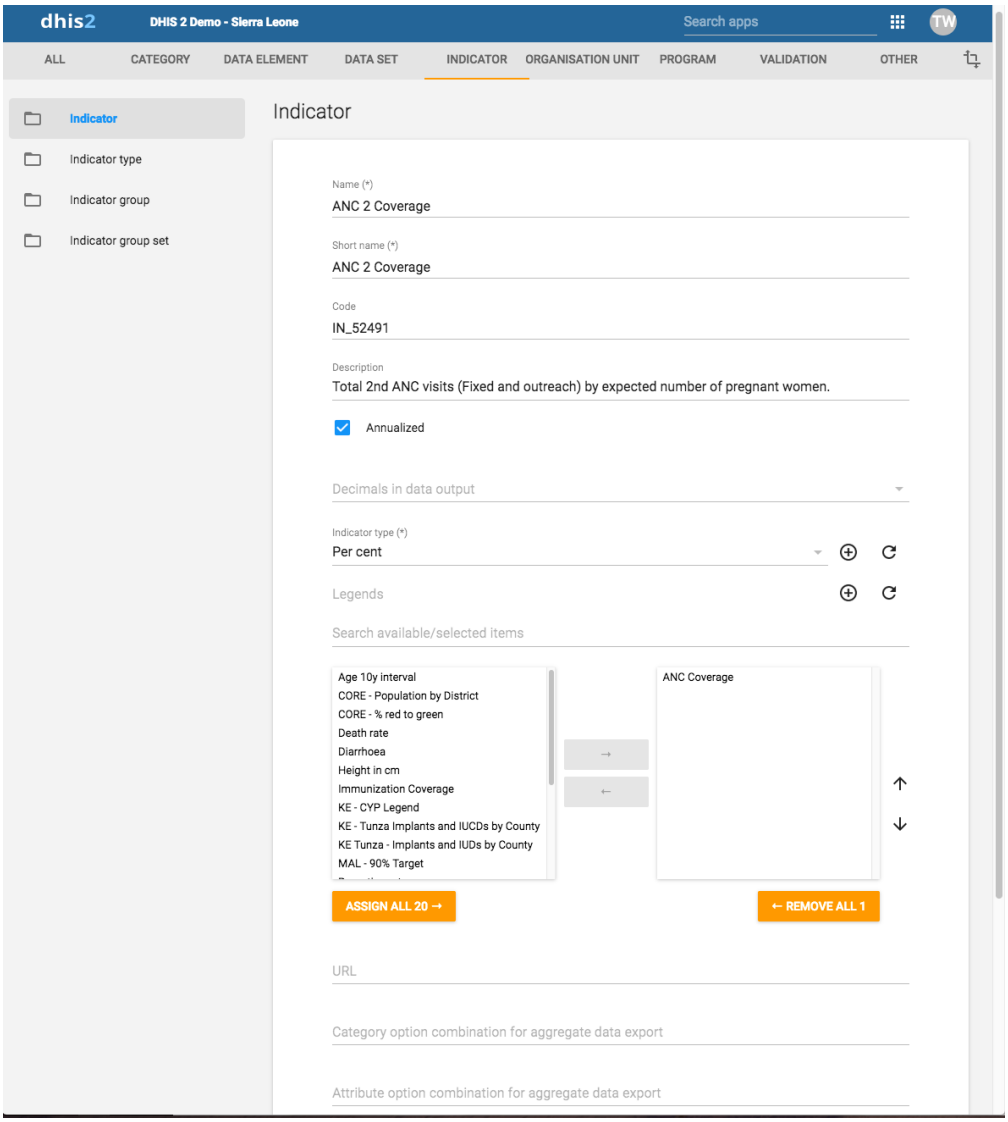
As of version 2.4 of DHIS2, the "Calculated data element" object has been deprecated. Instead, you can create a calculated data element by creating an indicator type with a factor of "1" and by setting the "Number" option to "Yes". The effect of setting the "Number" option to "Yes" will be that the indicator will effectively not have a denominator. You will therefore only be able to define a numerator, which will serve as the formula of the calculated data element.

1. Open the **Maintenance** app and click **Indicator** > **Indicator type**.
2. Click the add button.
3. In the **Name** field, type the name of the indicator type, for example "Per cent", "Per thousand", "Per ten thousand".

4. Type a **Factor**.

   The factor is the numeric factor that will be multiplied by the indicator formula during the calculation of the indicator.
5. Click **Save**.

20.5.4. Create or edit an indicator



1. Open the **Maintenance** app and click **Indicator** > **Indicator**.
2. Click the add button.
3. In the **Name** field, type the full name of the indicator, for example "Incidence of confirmed malaria cases per 1000 population".
4. In the **Short name** field, type an abbreviated name of the indicator, for example "Inc conf. malaria per 1000 pop".

   The short name must be less than or equal to 25 characters, including spaces.
5. (Optional) In the **Code** field, assign a code.

   In many countries indicators are assigned a code.
6. In the **Description** field, type a brief, informative description of the indicator and how it is calculated.
7. If you want to apply an annualization factor during the calculation of the indicator, select **Annualized**.

Typically, an annualized indicator's numerator is multiplied by a factor of 12, and the denominator is for instance a yearly population figure. This allows for monthly coverage values to be calculated with yearly population figures.

8. Select the number of **Decimals in data output**.
9. Select an **Indicator type**.

   This field determines a factor that will automatically be applied during the calculation of the indicator. Possible choices are determined by the indicator types. For example, a "Percent" indicator will automatically be multiplied by a factor of 100 when exported to the data mart, so that it will display as a percentage.

10. (Optional) Assign one or multiple **Legends**.
11. In the **URL** field, enter a link, for example a link to an indicator registry, where a full metadata description of the indicator can be made available.
12. (Optional) Enter a **Category option combination for aggregate data export.**.

    You use this setting to map aggregated data exported as raw data to another server. Typically you do this type of data exchange mapping when you want to create anonymous aggregated data from patient data recorded in programs (event data).

13. (Optional) Enter an **Attribute option combination for aggregate data export.**.

    You use this setting to map aggregated data exported as raw data to another server. Typically you do this type of data exchange mapping when you want to create anonymous aggregated data from patient data recorded in programs (event data).

14. If applicable, enter custom attributes values, for example **Classification** or **Collection method**.

Note

You create custom attributes in the **Maintenance** app: **Other** > **Attributes**.

15. Click **Edit numerator**.
    a. Type a clear description of the numerator.
    b. Define the numerator by double-clicking components in the right-hand field. The components then appears as part of the formula in the left-hand field. Add mathematical operators by double-clicking the icons below the left-hand field.

       You formula must be mathematically valid. This includes correct use of parentheses when necessary.

    c. Click **Done** to save all changes to the numerator.
16. Click **Edit denominator**.
    a. Type a clear description of the denominator.
    b. Define the denominator by double-clicking components in the right-hand field. The components then appears as part of the formula in the left-hand field. Add mathematical operators by double-clicking the icons below the left-hand field.

       You formula must be mathematically valid. This includes correct use of parentheses when necessary.

    c. Click **Done** to save all changes to the denominator.
17. If applicable, select compulsory indicator group sets, for example **Human resources**.

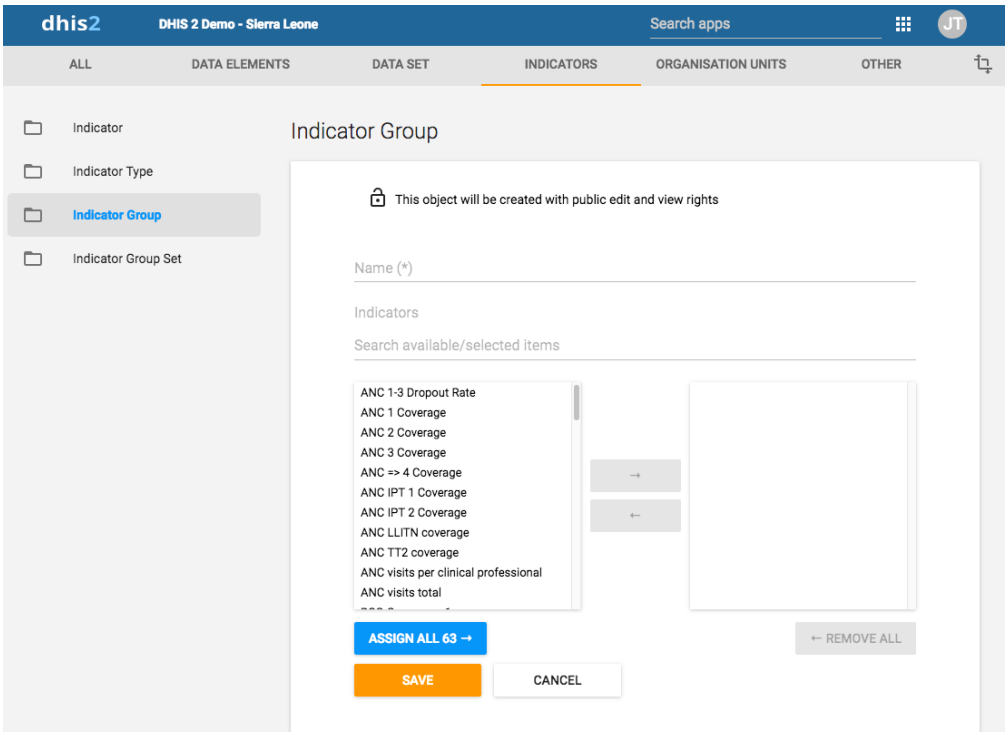
Note

You'll only see indicator group sets in this form if you've created them and set them to **Compulsory**.

You create indicator group sets in the **Maintenance** app: **Indicator** > **Indicator group set**.

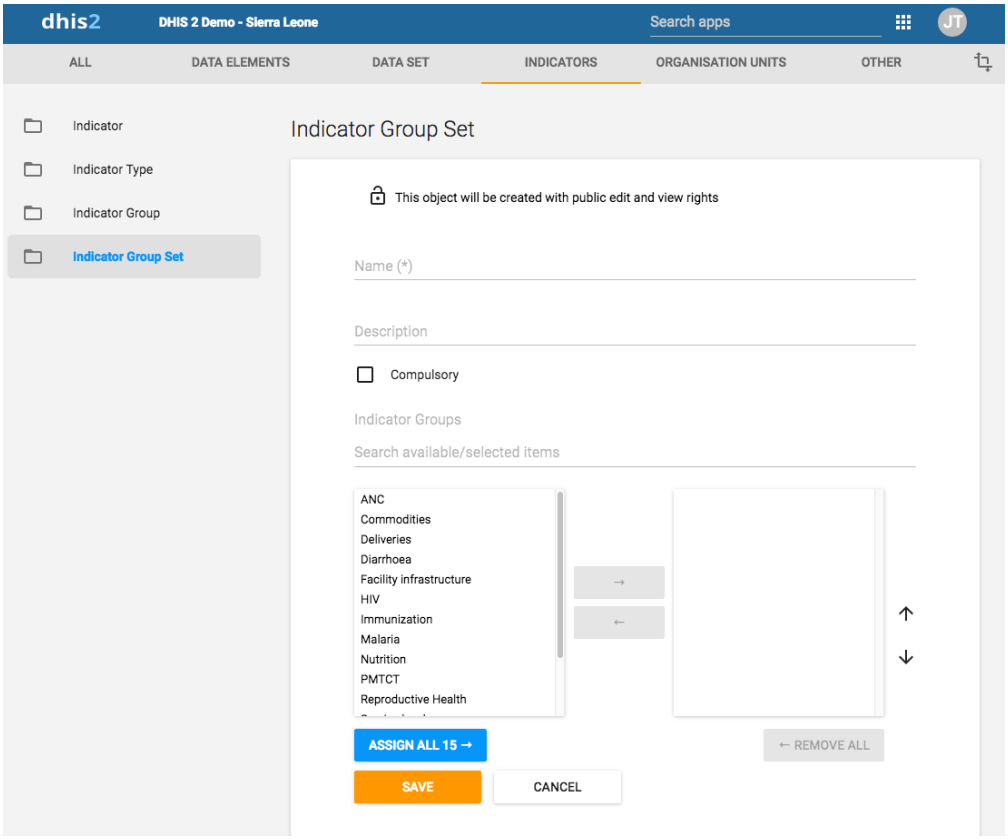
18Click **Save**.

20.5.5. Create or edit an indicator group



1. Open the **Maintenance** app and click **Indicator** > **Indicator group**.
2. Click the add button.
3. Type a name.
4. Select indicators and assign them.
5. Click **Save**.

20.5.6. Create or edit an indicator group set



Indicator group sets create combined groups of similar indicators. For example, you might have a group of indicators called "Malaria" and "Leishmaniasis". Both of these groups could be combined into a group set called "Vector-borne diseases". Indicator groups sets are used during analysis of data to combine similar themes of indicators.

1. Open the **Maintenance** app and click **Indicators** > **Indicator group**.
2. Click the add button.
3. Fill in the form:
   a. **Name**
   b. **Description**
   c. **Compulsory**
4. Select indicator groups and assign them.

   Available indicator groups are displayed in the left panel. Indicator groups that are currently members of the indicator group set are displayed in the right hand panel.
5. Click **Save**.

20.5.7. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.5.8. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.5.9. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.5.10. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.

2. In the object list, click the options menu and select **Show details**.

20.5.11. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.6. Manage organisation units

In this section you will learn how to:

- Create a new organisation unit and build up the organisation unit hierarchy
- Create organisation unit groups, group sets, and assign organisation units to them
- Modify the organisation unit hierarchy

20.6.1. About organisation units

The organisation unit hierarchy defines the organisation structure of DHIS2, for example how health facilities, administrative areas and other geographical areas are arranged with respect to each other. It is the "where" dimension of DHIS2, similar to how periods represent the "when" dimension.

The organisation unit hierarchy is built up by parent-child relations. In DHIS2, each of these nodes is an organisation unit. A country might for example have eight provinces, and each province might have a number of districts as children. Normally, the lowest levels consist of facilities where data is collected. Data collecting facilities can also be located at higher levels, for example national or provincial hospitals. Therefore, you can create skewed organisation trees in DHIS2.

- You can only have one organisation hierarchy at the same time.
- You can have any number of levels in a hierarchy.

  Typically national organisation hierarchies in public health have four to six levels.

- You can create additional classifications by using organisation groups and organisation group sets.

  For example to create parallel administrative boundaries to the health care sector.
- It is recommended to use organisation unit groups to create a non-geographical hierarchy.
- An organisation unit can only be a member of a single organisation unit group within an organisation unit group set.
- An organisation unit group can be part of multiple organisation unit group sets.
- The organisation unit hierarchy is the main vehicle for data aggregation on the geographical dimension.
- When you close an organisation unit, you can't register or edit events to this organisation unit in the **Event Capture** and **Tracker Capture** apps.

Changing the organisation unit hierarchy

You can change the organisation unit hierarchy after you've created it, even organisation units that collect data. However, DHIS2 always uses the latest hierarchy for data aggregation. So if you change the hierarchy, you loose the temporal representation of the hierarchy across time.

Example 20.9.

District A is sub-divided into District B and District C. Facilities which belonged to District A are reassigned to District B and C. Any historical data, which you entered before the split occurred, is still registered as belonging to District B and C, not to the obsolete District A.

In the **Maintenance** app, you manage the following organisation unit objects:

Table 20.10. Organisation unit objects in the Maintenance app

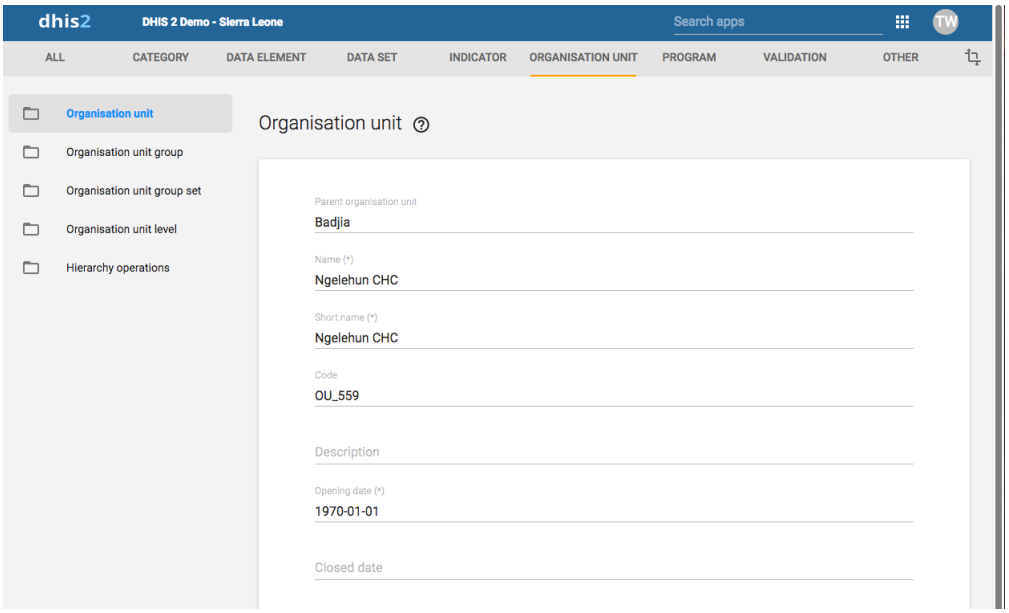
Object type	Available functions
Organisation unit	Create, edit, clone, delete, show details and translate
Organisation unit group	Create, edit, clone, share, delete, show details and translate
Organisation unit group set	Create, edit, clone, share, delete, show details and translate
Organisation unit level	Edit and translate
Hierarchy operations	Move organisation units

20.6.2. Workflow

The recommended workflow is:

1. Create organisation units.
2. Create organisation unit groups.
3. Create organisation unit group sets.

20.6.3. Create or edit an organisation unit



You add organisation units to the hierarchy one by one, either as a root unit or as a child of a selected organisation unit. You can only have one root unit.

1. Open the **Maintenance** app and click **Organisation unit** > **Organisation unit**.
2. Click the add button.
3. Select which organisation unit your new organisation unit will belong to:
   a. Click **Parent organisation unit**.
   b. In the organisation unit tree, locate the parent organisation unit and select it. Your selection is marked in yellow.

   > **Tip**
   >
   > Click the arrows to expand the organisation unit tree.

   c. Click **Select**.
4. Enter a **Name** of the organisation unit.

   Each organisation unit must have an unique name.
5. Enter a **Short name** for the organisation unit.

   Typically, the short name is an abbreviation of the full organisation unit name. This attribute is often used in reports to display the name of the organisation unit, where space is limited.
6. (Optional) Assign a **Code**.

   In many countries organisation units are assigned a code.
7. (Optional) Type a **Description** of the organisation unit.
8. Select an **Opening date**.

   The opening dates control which organisation units that existed at a point in time, for example when analysing historical data.
9. If applicable, select a **Closed date**.
10. In the **Comment** field, enter any additional information that you would like to add.
11. (Optional) In the **URL** field, enter a link to an external web site that has additional information about the organisation unit.

12 Enter contact information:

- Contact person
- Address
- E-mail
- Phone number

13 (Optional) Enter **Latitude** and **Longitude**.

You must have latitude and longitude values to create maps in the **GIS** app. Then your organisation units can be represented as points on a map, for example a health facility. Without this information, the **GIS** app will not work.

It might be more efficient to import coordinates later as a batch job for all organisation units using the **Import-Export** app. You also use the **Import-Export** app to create polygons. A polygon is an organisation unit that represent an administrative boundary.

14 If applicable, select **Data sets** and assign them.

Note

You control whether a user should be able to assign data sets to an organisation unit in the **System Settings** app:

Open the **System Settings** app, click **Access** and select **Allow assigning object to related objects during add or update**.

15 If applicable, enter custom attributes values, for example **HR identifier**.

Note

You configure the custom attributes in the **Maintenance** app:

Open the **Maintenance** app and click **Other** > **Attribute**.

16 Click **Save**.

20.6.4. Create or edit an organisation unit group

Organisation unit groups allow you to classify related organisation units into a common theme. You can for example group all organisation units that are hospitals in an **Hospital** group.

1. Open the **Maintenance** app and click **Organisation unit** > **Organisation unit group**.
2. Click the add button.
3. Fill in the form:
   a. **Name**: Provide a precise, unique and descriptive name for the organisation unit group.
   b. **Short name**: The short name should be less than 25 characters. Typically, the short name is an abbreviation of the full organisation unit name. This attribute is used in certain places in DHIS2 where space is limited.
   c. **Code**
   d. **Symbol**: Select a symbol which will be used to display the organisation unit (points only) when the layer is displayed in the **GIS** app.
4. In the organisation tree, click the organisation units you want to add to the organisation unit group.

   You can locate an organisation unit in the tree by expanding the branches (click on the arrow symbol), or by searching for it by name.

   The selected organisation units display in orange.

5. Click **Save**.

20.6.5. Create or edit an organisation unit group set

Organisation unit group sets allows you to create additional classifications of organisation units. The group sets create new dimensions so that you can make a more detailed data analysis. You an easily filter, organise or aggregate data by groups within a group set.

- You can have any number of organisation unit group sets.
- The default organisation unit group sets are **Type** and **Ownership**.
- An organisation unit can only be a member of a single organisation unit group within an organisation unit group set.
- An organisation unit group can be part of multiple organisation unit group sets.
- You can define whether an organisation unit group set is compulsory or not, which will affect the completeness of the data. Compulsory means that all organisation units must be member of a group in that group set.

Data completeness

In the **Data integrity** part of the **Data administration** app you can verify if you've accidentally assigned the same organisation unit to multiple groups within the same group set. In this app you also find information about organisation units that are not members of a compulsory organisation unit group set.

1. Open the **Maintenance** app and click **Organisation unit** > **Organisation unit group set**.
2. Click the add button.
3. Fill in:
   a. **Name**: Provide a precise name for the organisation unit group set.
   b. **Code**
   c. **Description**: Describe what the organisation unit group set measures or captures.
4. If you want all organisation units to be members of a group within the group set, select **Compulsory**.
5. (Optional) Select **Data dimension**.
6. (Optional) Select **Include subhierarchy in analytics**.

   If you select this, a sub-organisation unit will inherit the organisation unit group property from its closest "parent" organisation unit. Any property on the sub-organisation unit will override the inherit value.

   If an organisation unit have no associated organisation unit group, the organisation unit can inherit its closest parent's organisation unit group. If none of the parent organisation unit groups have an organisation unit group for a given org unit group set, the result will still be "blank", but if at least one parent has an organisation unit group, sub-organisation unit will inherit it.

   include subhierarchy in analytics" is enabled, which means the org units inherit their closest parents org unit group IF the org unit is white (no org unit group associated with it).
7. Select organisation unit groups and assign them.

   In the left-hand list, you find the available organisation unit groups. Use the arrows to move selected groups between the two lists.

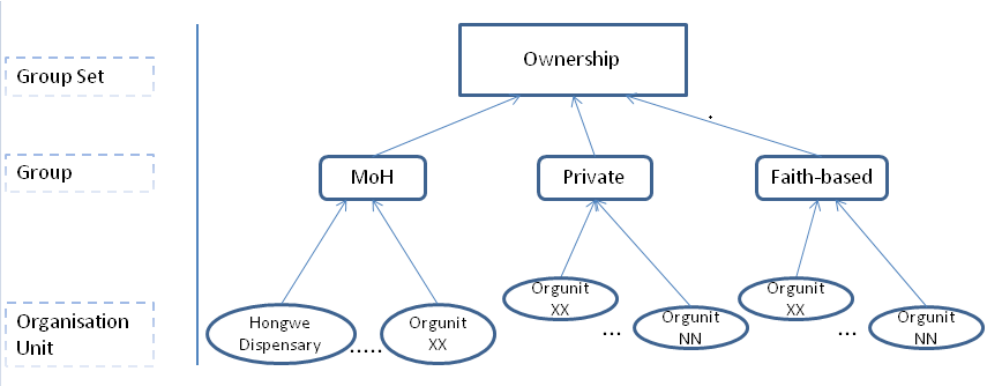
If there are no organisation unit groups in the left-hand list, click **Add new**. In the form that opens, create the organisation units group you need. When you're done, click **Refresh values**.

Note

An organisation unit can only be a member of a single organisation unit group within an organisation unit group set.

8. Click **Save**.

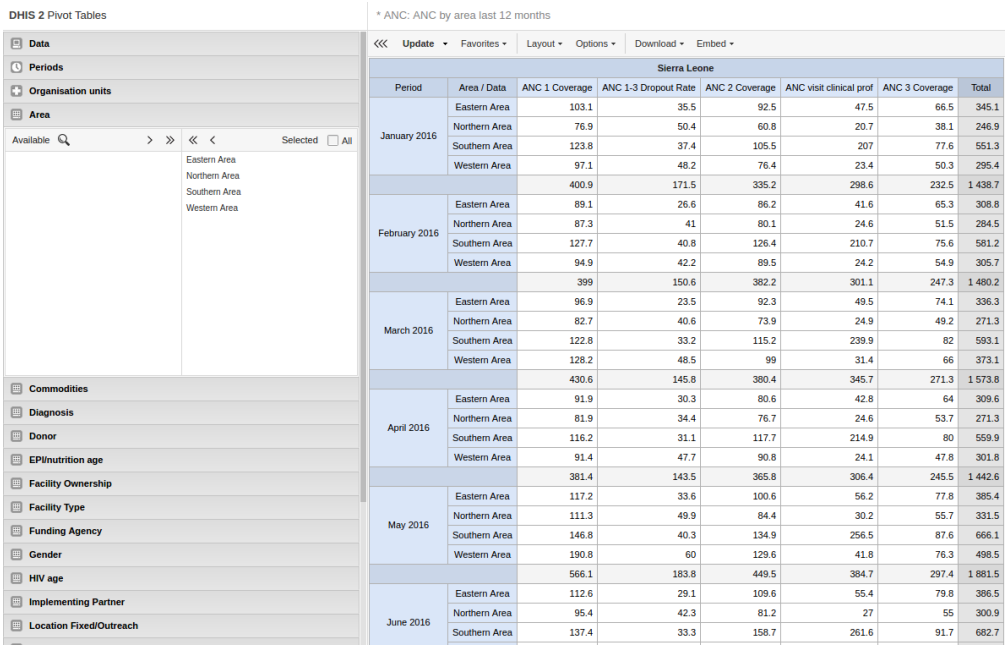
Example 20.10. Classify facilities based on ownership

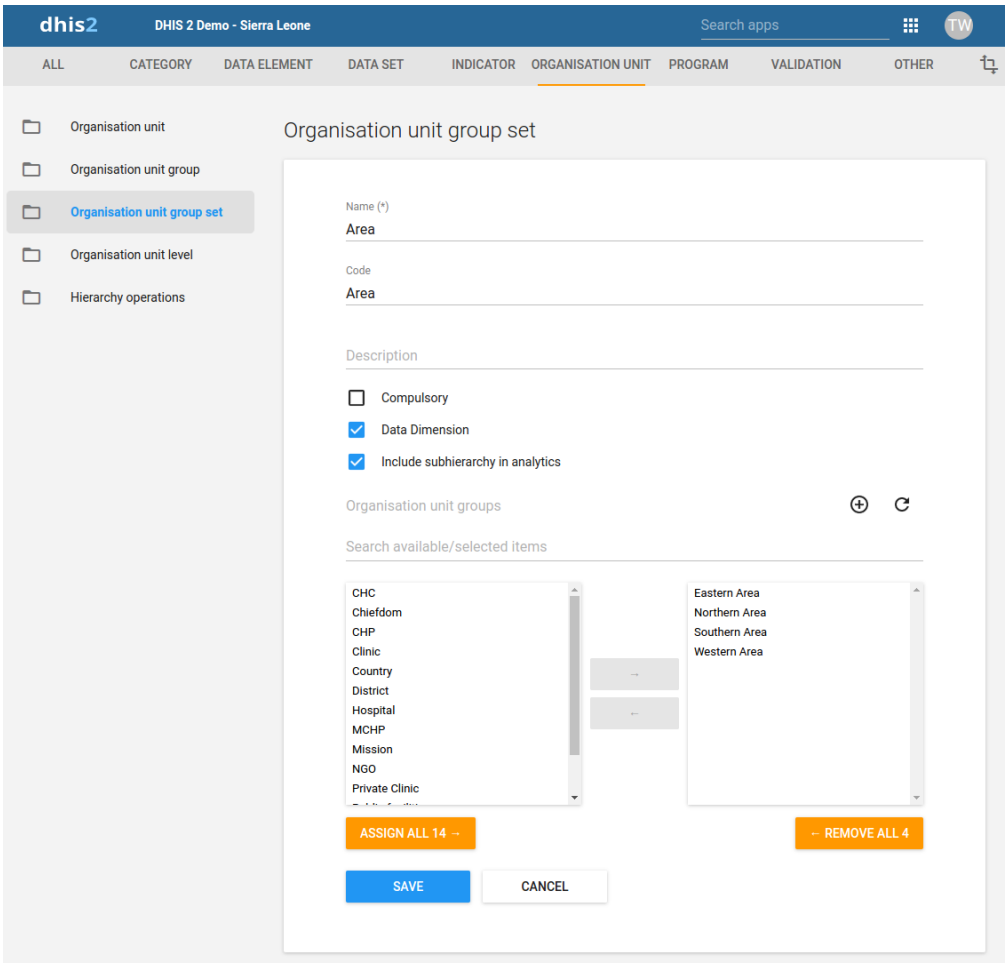


You want to analyse data based on the ownership of the facilities. All facilities have an owner so you need to make sure that all organisation units get this classification. To do that you can use the **Compulsory** option:

1. Create a group for each ownership type, for example "MoH", "Private" and "Faith-based".
2. Assign all facilities in the database to one of these groups.
3. Create an organisation unit group set called "Ownership" and select **Compulsory**.
4. Assign the organisation unit groups "MoH", "Private" and "Faith-based" to the "Ownership" organisation group set.

Example 20.11. Create parallel dynamic administrative organisation unit structure





Group you organisation unit in two ways and aggregate data on these two parallel hierarchies

Use to aggregate data (only in analytics apps)

An additional setting to the organisation unit group set, creates a dynamic "membership" to a organisation unit group set.

You don't change the organisation unit hierarchy

Scalable and dynamic

Dynamic inclusion of hierarchy

Dynamic additional classification

20.6.6. Assign names to organisation unit levels

When you add children to an organisation unit, DHIS2 automatically creates a new organisation unit level if necessary. The system also assigns a generic name to this level, for example "Level 5". You can replace the generic name with a contextual name, for example "Country", "Province", "District" or "Health Facility". DHIS2 uses the contextual names anywhere levels are referred to, for example in the **GIS** app.

1. Open the **Maintenance** app and click **Organisation unit** > **Organisation unit level**.

   The loading time of the list depends on the depth of the organisation unit hierarchy tree.

2. For the organisation unit levels you want to modify, type a name.
3. Select the number of offline levels.

Note

You configure the default value in the **System Settings** app:

Open the **System Settings** app, click **General** and select a level in the **Max offline organisation unit levels** list.

4. Click **Save**.

20.6.7. Move organisation units within a hierarchy

You can move organisation units within in the hierarchy by changing the parent of a selected organisation unit.

1. Open the **Maintenance** app and click **Organisation unit** > **Hierarchy operations**.
2. In the left-hand hierarchy tree, select the organisation unit(s) you want to move.

Note

If the selected organisation unit is has sub-organisation units, all of them move to the new parent organisation unit.

3. In the right-hand hierarchy tree, select which organisation unit you want to move the selected organisation unit(s) to.
4. Click **Move x organisation units**, where x stands for the number of organisation units you have selected.

   Your changes are immediately reflected in the left-hand side hierarchy tree.

20.6.8. Close an organisation unit

When you close an organisation unit, you can't register or edit events to this organisation unit in the **Event Capture** and **Tracker Capture** apps.

1. Open the **Maintenance** app and click **Organisation unit** > **Organisation unit**.
2. In the object list, click the options menu and select **Edit**.
3. Select a **Closed date**.
4. Click **Save**.

20.6.9. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.6.10. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.6.11. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.6.12. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.6.13. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these

elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.7. [Work in progress] Manage validation rules

20.7.1. About validation rules

A validation rule is based on an expression. The expression defines a relationship between data element values. The expression forms a condition with certain logical criteria.

The expression consists of:

- A left side
- A right side
- An operator

Example 20.12.

A validation rule asserting that the total number of vaccines given to infants is less than or equal to the total number of infants.

In the **Maintenance** app, you manage the following validation rule objects:

Table 20.11.

Object type	What you can do
Validation rule	Create, edit, clone, delete, show details, and translate
Validation rule group	Create, edit, clone, delete, share, show details, and translate
Validation notification	Create, edit, clone, delete, show details, and translate

20.7.1.1. About sliding windows

You can use sliding windows to group data *across multiple periods* as opposed to selecting data for *a single period*. Sliding windows have a size, that is to say, the number of days to cover, a starting point and an end point. The example below shows disease surveillance data:.

- The data in the orange section, selects data based on the current period. There is a threshold, which is calculated once for each week or period, and this is shown in the "Result" section.
- The data in the blue section is the sliding window. It selects data from the past 7 days. The "Result" shows the total number of confirmed cases of a disease.
- The validation rule makes sure users are notified when the total number of cases breaks the threshold for the period.

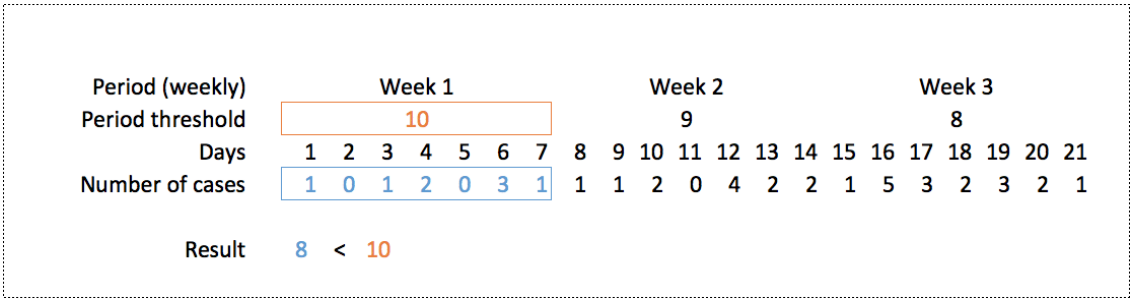


Table 20.12. Different behavior of validation rules

With sliding windows	Without sliding windows
Used only for event data.	Used for event data and aggregate data.
Data selection is based on a fixed number of days (periodType).	Data selection is always based on a period.
The position of the sliding window is always *relative to* the period being compared.	Data is always selected for the *same period* as the period being compared.

See also: How to use sliding windows when you're Creating or editing a validation rule.

20.7.1.2. About validation rule groups

A validation rule group allows you to group related validation rules. When you run a *validation rule analysis*, you can choose to run all of the validation rules in your system, or just the validation rules in one group.

20.7.1.3. About validation notifications

You can configure a validation rule analysis to automatically send notifications about validation errors to selected user groups. These messages are called *validation notifications*. They are sent via the internal DHIS2 messaging system.

You can send validation rule notifications as individual messages or as message summaries. This is useful, for example, if you want to send individual messages for high-priority disease outbreaks, and summaries for low-priority routine data validation errors.

20.7.2. Create or edit a validation rule

1. Open the **Maintenance** app and click **Validation** > **Validation rule**.
2. Click the add button.
3. Type a **Name**.

   The name must be unique among the validation rules.
4. (Optional) In the **Code** field, assign a code.
5. (Optional) Type a **Description**.
6. Select an **Importance**: **High**, **Medium** or **Low**.

7. Select a **Period type**.
8. Select an **Operator**: **Compulsory pair**, **Equal to**, **Exclusive pair**, **Greater than**, **Greater than or equal to** or **Not equal to**.

   The **Compulsory pair** operator allows to require that data values must be entered for a form for both left and right sides of the expression, or for neither side. This means that you can require that if one field in a form is filled, then one or more other fields must also be filled.

   The **Exclusive pair** allows to assert that if any value exist on the left side then there should be no values on the right side (or vice versa). This means that data elements which compose the rule on either side should be mutually exclusive from each other, for a given time period / organisation unit /attribute option combo.
9. Create the left side of the expression:
   a. Click **Left side**.
   b. Select **Sliding window** if you want to view data relative to the period you are comparing. See also About validation rules.
   c. Select a **Missing value strategy**. This selection sets how the system evaluates a validation rule if data is missing.

Option	Description
Skip if any value is missing	The validation rule will be skipped if any of the values which compose the expression are missing. This is the default option. Always select this option you use the **Exclusive pair** or **Compulsory pair** operator.
Skip if all values are missing	The validation rule will be skipped only if all of the operands which compose it are missing.
Never skip	The validation rule will never be skipped in case of missing data, and all missing operands will be treated effectively as a zero.

   d. Type a **Description**.
   e. Build an expression based on the available data elements, program objects, organisation units, counts and constants.

      In the right pane, double-click the data objects you want to include in the expression. Combine with the mathematical operators located below the left pane.
   f. Click **Save**.
10. Create the right side of the expression:
   a. Click **Right side**.
   b. Select a **Missing value strategy**. This selection sets how the system evaluates a validation rule if data is missing.

Option	Description
Skip if any value is missing	The validation rule will be skipped if any of the values which compose the expression are missing. This is the default option. Always select this option you use the **Exclusive pair** or **Compulsory pair** operator.

Option	Description
Skip if all values are missing	The validation rule will be skipped only if all of the operands which compose it are missing.
Never skip	The validation rule will never be skipped in case of missing data, and all missing operands will be treated effectively as a zero.

c. Select **Sliding window** if you want to view data relative to the period you are comparing. See also About validation rules.

d. Type a **Description**.

e. Build an expression based on the available data elements, program objects, organisation units, counts and constants.

In the right pane, double-click the data objects you want to include in the expression. Combine with the mathematical operators located below the left pane.

f. Click **Save**.

11. (Optional) Choose which **Organisation unit levels** this rule should be evaluated for. Leaving this empty will cause the validation rule to be evaluated at all levels.

12. (Optional) Click **Skip this rule during form validation** to avoid triggering this rule while doing data entry

13. Click **Save**.

20.7.3. Create or edit a validation rule group

1. Open the **Maintenance** app and click **Validation** > **Validation rule group**.
2. Click the add button.
3. Type a **Name**.
4. (Optional) In the **Code** field, assign a code.
5. (Optional) Type a **Description**.
6. Double-click the **Validation rules** you want to assign to the group.
7. Click **Save**.

20.7.4. Create or edit a validation notification

1. Open the **Maintenance** app and click **Validation** > **Validation notification**.
2. Click the add button.
3. Type a **Name**.
4. (Optional) In the **Code** field, assign a code.
5. Select **Validation rules**.
6. Select **Recipient user groups**.
7. (Optional) Select **Notify users in hierarchy only**.

If you select this option, the system will filter the recipient users. (The system derives the recipient users from the recipient user groups.) The filter is based on which organisation unit the recipient user belongs to. The users linked to organisation units which are ancestors of

the organisation unit where the violation took place will receive validation notifications. The system will ignore other users and these users won't receive validation notifications.

8. Create the message template:

   a. Create the **Subject template**.

      Double-click the parameters in the **Template variables** field to add them to your subject.

   b. Create the **Message template**.

      Double-click the parameter names in the **Template variables** field to add them to your message.

9. Click **Save**.

20.7.5. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.7.6. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.7.7. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.7.8. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.7.9. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

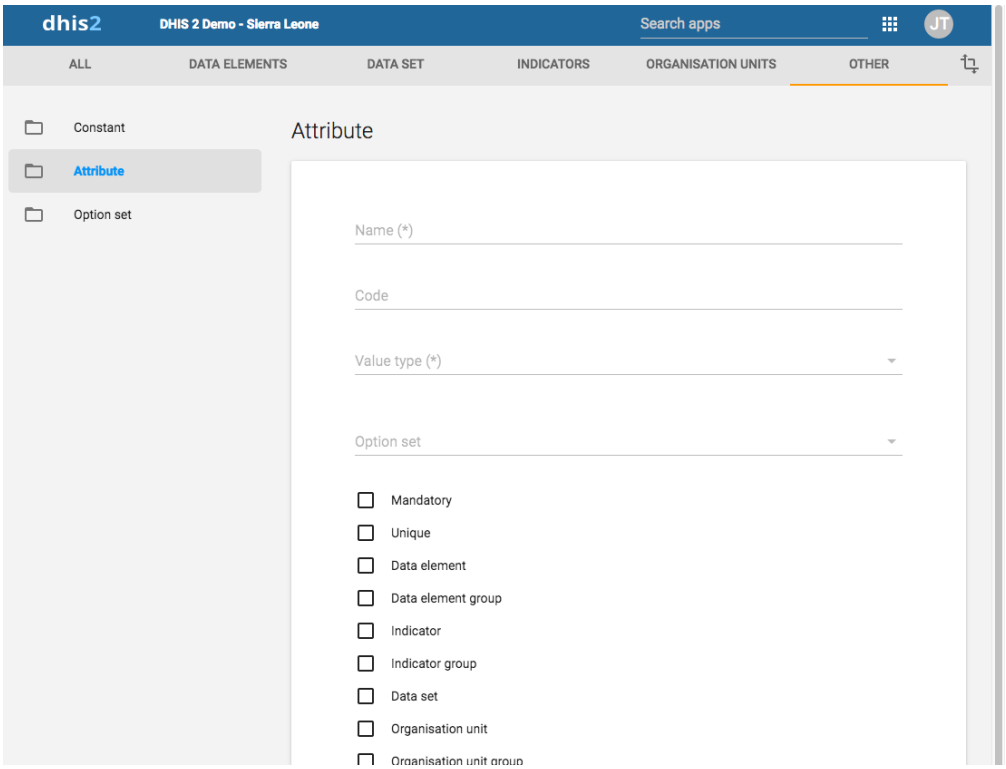
If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.8. Manage attributes

20.8.1. About attributes

You can use metadata attributes to add additional information to metadata objects. In addition to the standard attributes for each of these objects it may be useful to store information for additional attributes, for example the collection method for a data element.



In the **Maintenance** app, you manage the following attribute objects:

Table 20.13. Attribute objects in the Maintenance app

Object type	Available functions
Attribute	Create, edit, clone, delete, show details and translate

20.8.2. Create or edit an attribute

1. Open the **Maintenance** app and click **Attribute**.
2. Click the add button.
3. In the **Name** field, type the name of the attribute.

   Each attribute must have a unique name
4. (Optional) In the **Code** field, assign a code.
5. Select a **Value type**.

   If the value supplied for the attribute does not match the value type you will get a warning.
6. Select an **Option set** .
7. Select the options you want, for example:
   - Select **Mandatory** if you want an object to always have the dynamic attribute.
   - Select **Unique** if you want the system to enforce that values are unique for a specific object type.
8. Click **Save**.

   The dynamic attribute is now available for the objects you assigned it to.

20.8.3. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.8.4. Delete metadata objects

> **Note**
>
> You can only delete a data element and other data element objects if no data is associated to the data element itself.

> **Warning**
>
> Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.8.5. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.8.6. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

> **Tip**
>
> To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

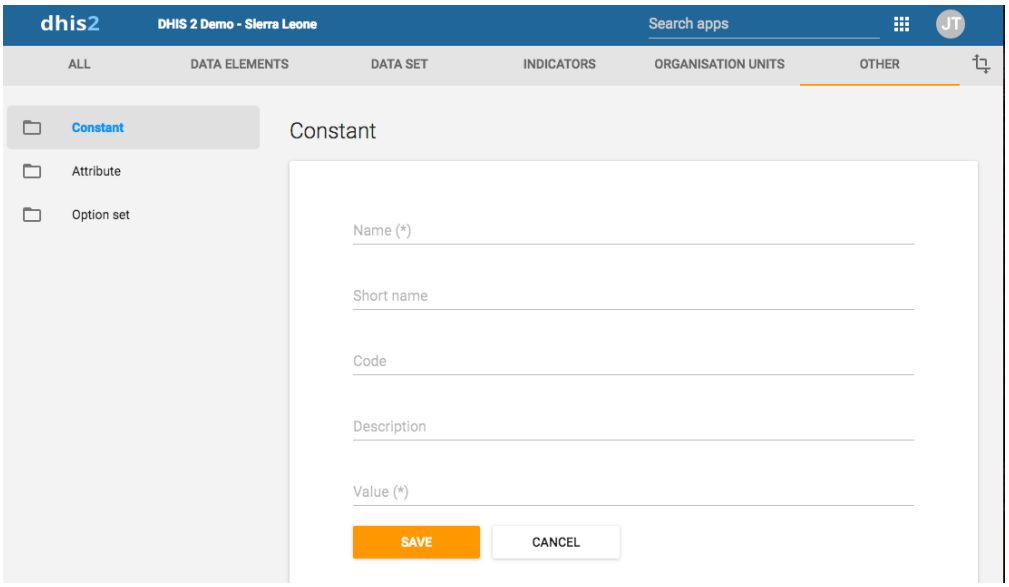
> **Tip**
>
> If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.9. Manage constants

20.9.1. About constants

Constants are static values which can be made available to users for use in data elements and indicators. Some indicators, such as "Couple year protection rate" depend on constants which usually do not change over time.



In the **Maintenance** app, you manage the following constant objects:

Table 20.14. Constant objects in the Maintenance app

Object type	Available functions
Constant	Create, edit, clone, share, delete, show details and translate

20.9.2. Create or edit a constant

1. Open the **Maintenance** app and click **Other** > **Constant**.
2. Click the add button.
3. In the **Name** field, type the name of the constant.
4. (Optional) In the **Short name** field, type an abbreviated name of the constant.
5. (Optional) In the **Code** field, assign a code.
6. In the **Description** field, type a brief, informative description of the constant.
7. In the **Value** field, define the constant's value.
8. Click **Save**.

   The constant is now available for use.

20.9.3. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.

4. Click **Save**.

20.9.4. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.9.5. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.9.6. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.

2. In the object list, click the options menu and select **Show details**.

20.9.7. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.10. Manage option sets

20.10.1. About option sets

Option sets provide a pre-defined drop-down (enumerated) list for use in DHIS2. You can define any kind of options.

Example 20.13.

An option set called "Delivery type" would have the options: "Normal", "Breach", "Caesarian" and "Assisted".

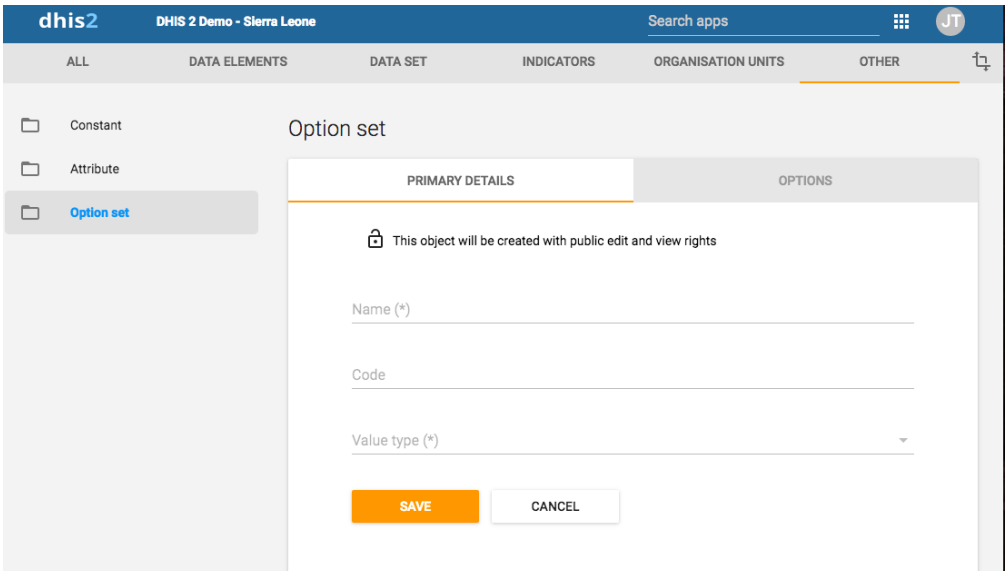


Table 20.15. Option set objects in the Maintenance app

Object type	Available functions
Option set	Create, edit, clone, share, delete, show details and translate

20.10.2. Create or edit an option set

Important

Option sets must have a code as well as a name. You can change the names but you can't change the codes. Both names and codes of all options must be unique, even across different option sets.

1. Open the **Maintenance** app and click **Other** > **Option set**.
2. Click the add button.
3. In the **Primary details** tab, define the option set:
   a. In the **Name** field, type the name of the constant.
   b. In the **Code** field, assign a code.
   c. Select a **Value type**.
   d. Click **Save**.
4. For each option you need, perform the following tasks:
   a. Click the **Options** tab.
   b. Click the add button.
   c. Type a **Name** and a **Code**.
   d. Sort the options by name, code/value or manually.
   e. Click **Save**.

20.10.3. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.10.4. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.10.5. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.10.6. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.10.7. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.11. Manage legends

20.11.1. About legends

You can create, edit, clone, delete, show details and translate legends to make the maps you're setting up for your users meaningful. You create maps in the **GIS** app.

Note

Continuous legends must consist of legend items that end and start with the same value, for example: 0-50 and 50-80. Do not set legend items like this: 0-50 and 51-80. This will create gaps in your legend.

20.11.2. Create or edit a legend

Note

It is not allowed to have gaps in a legend.

It is not allowed to have overlapping legend items.

1. Open the **Maintenance** app and click **Other** > **Legend**.
2. Click the add button.
3. In the **Name** field, type the legend name.
4. (Optional) In the **Code** field, assign a code.
5. Create the legend items you want to have in your legend:
   a. Select **Start value** and **End value**.
   b. Select **Number of legend items**.
   c. Select a color scheme.
   d. Click **Create legend items**.

Tip

Click the options menu to edit or delete a legend item.

6. (Optional) Add more legend items:
   a. Click the add button.
   b. Enter a name and select a start value, an end value and a color.
   c. Click **OK**.
7. (Optional) Change the color scales.
   a. Click the colour scale to view a list of color scale options, and select a color scale.

b. To customize a color scale, click the add button. In the **Edit legend item** dialog, click the color scale button and handpick colors, or enter your color values.

8. Click **Save**.

Example 20.14. Vaccination coverage legends

Table 20.16.

Legend item	Start value	End value
Low bad	0	50
Medium	50	80
High good	80	100
Too high	100	1000

20.11.3. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.11.4. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

20.11.5. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.11.6. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.11.7. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.11.8. Assign a legend to indicator or data element

You can assign a legend to an indicator or a data element in the **Maintenance** app, either when you create the object or edit it. When you then select the indicator or data element in the **GIS** app, the system automatically selects the assigned legend.

20.11.9. See also

- Using the GIS app

20.12. Manage predictors

20.12.1. About predictors

A predictor tells DHIS2 how to generate a data value based on data values from past periods and/or the period of the data value. It defines which past periods to sample, and how to combine the data to produce a predicted value. A predictor always generates an aggregate data value, but the past data values used to calculate the predicted value may come from aggregate data, event data, or both.

A simple use of predictors would be to copy a past period data value into a new period, for example into the next month, or into the same quarter in the next year. A more complex use of predictors would be for disease surveillance, to predict what value would be expected in a given week or month of the year, based on previous data values. A validation rule could then be used to see how the actual value compares with the expected (predicted) value.

You can specify the organisation unit level(s) for which a predictor will generate values. For example in disease surveillance you can use one predictor to give the expected value at each local facility, given the amount of variation you would expect at a single facility, while using a different predictor to estimate the value you would expect summed over all facilities in a district, given the (smaller) proportional variation that you would expect when adding up the values for all facilities in the district. You could also define additional predictors at any higher levels of the organisation unit hierarchy, where you might expect different proportions of variation. Alternatively, you can define a single predictor for all these levels and use the standard deviation function to determine what amounts of deviation were measured at each level.

In the **Maintenance** app, you manage the following predictor objects:

Table 20.17. Predictor objects in the Maintenance app

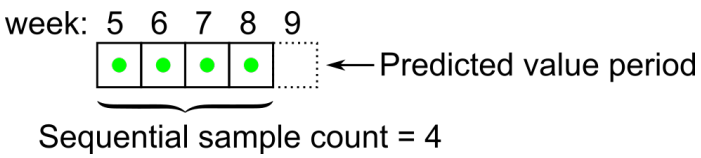
Object type	Available functions
Predictor	Create, edit, clone, delete, show details and translate

20.12.2. Sampling past periods

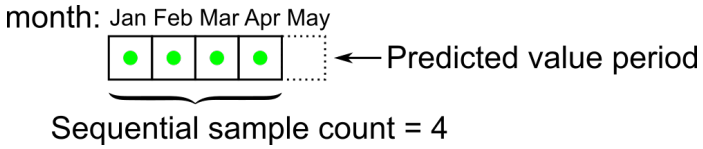
Predictors can generate data values for periods that are in the past, present, or future. These values are based on data sampled from periods before the predicted period, and/or data from the predicted period. When you use data sampled from past periods (periods before the predicted period), several parameters determine the choice of which past periods to sample from:

20.12.2.1. Sequential sample count

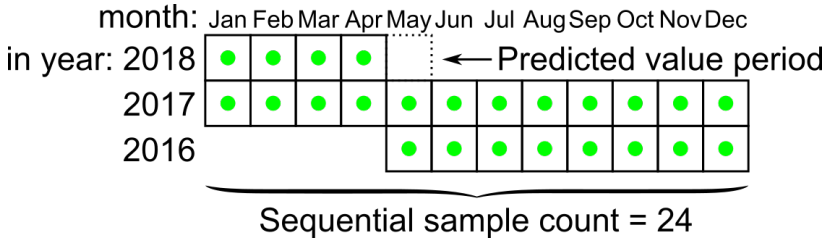
A predictor's *Sequential sample count* gives the number of immediate prior periods to sample. For example, if a predictor's period type is *Weekly* and the *Sequential sample count* is 4, this means to sample four prior weeks immediately preceding the predicted value week. So the predicted value for week 9 would use samples from weeks 5, 6, 7, and 8:



If a predictor's period type is *Monthly* and the *Sequential sample count* is 4, this means to sample four prior months immediately preceding the predicted value month. So the predicted value for May would use samples from weeks January, February, March, and April:



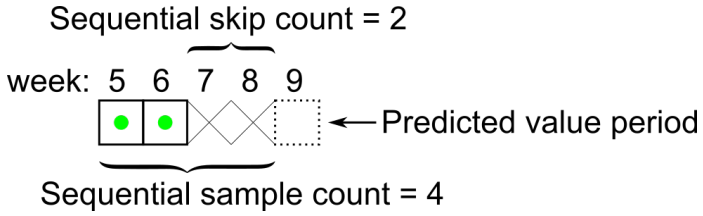
The *Sequential sample count* can be greater than the number of periods in a year. For example, if you want to sample the 24 months immediately preceding the predicted value month, set the *Sequential sample count* to 24:



20.12.2.2. Sequential skip count

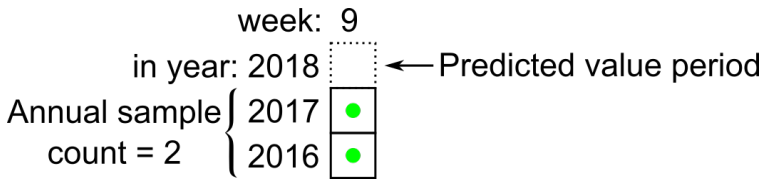
A predictor's *Sequential skip count* tells how many periods should be skipped immediately prior to the predicted value period, within the *Sequential sample count*. This could be used, for instance, in outbreak detection to skip one or more immediately prededing samples that might in fact contain values from the beginning of an outbreak that you are trying to detect.

For example, if the *Sequential sample count* is 4, but the *Sequential skip count* is 2, then the two samples immediately preceding the predicted period will be skipped, resulting in only two periods being sampled:



20.12.2.3. Annual sample count

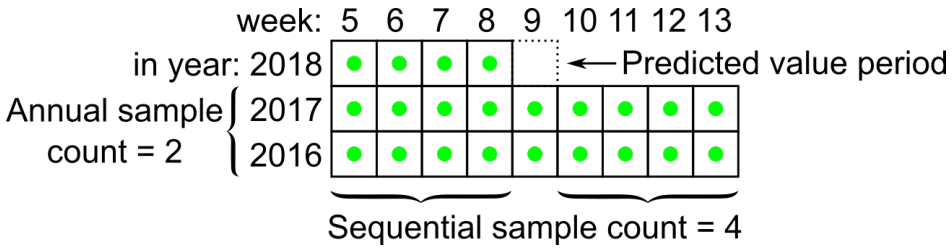
A predictor's *Annual sample count* gives the number of prior years for which samples should be collected at the same time of year. This could be used, for instance, for disease surveillance in cases where the expected incidence of the disease varies during the year and can best be compared with the same relative period in previous years. For example, if the *Annual sample count* is 2 (and the *Sequential sample count* is zero), then samples would be collected from periods in the immediately preceding two years, at the same time of year.



20.12.2.4. Sequential and annual sample counts together

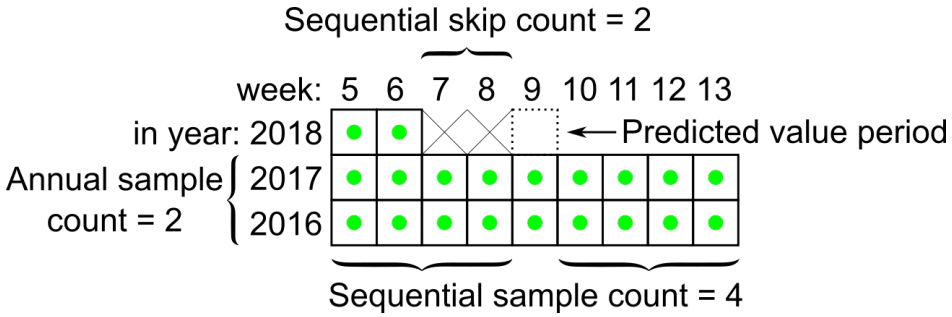
You can use the sequential and annual sample counts together to collect samples from a number of sequential periods over a number of past years. When you do this, samples will be collected in prior years during the period at the same time of year as the predicted value period, and also in previous years both before and after the same time of year, as determined by the *Sequential sample count* number.

For example, if the *Sequential sample count* is 4 and the *Annual sample count* is 2, samples will be collected from the 4 periods immediately preceding the predicted value period. In addition samples will be collected in the prior 2 years for the corresponding period, as well as 4 periods on either side:

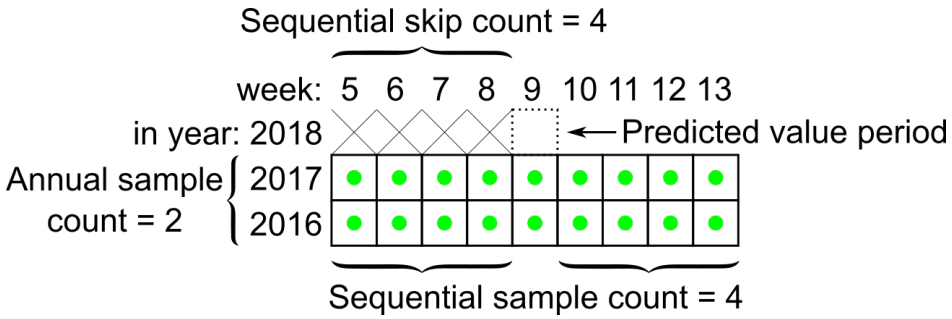


20.12.2.5. Sequential, annual, and skip sample counts together

You can use the *Sequential skip count* together with the sequential and annual sample counts. When you do this, the *Sequential skip count* tells how many periods to skip in the same year as the predicted value period. For example, if the *Sequential sample count* is 4 and the *Sequential skip count* is 2, then the two preiods immediatly preceding the predicted value period period will be skipped, but the two periods before that will be sampled:



If the *Sequential skip count* is equal to or greater than the *Sequential sample count*, then no samples will be collected for the year containing the predicted value period; only periods from past years will be sampled:

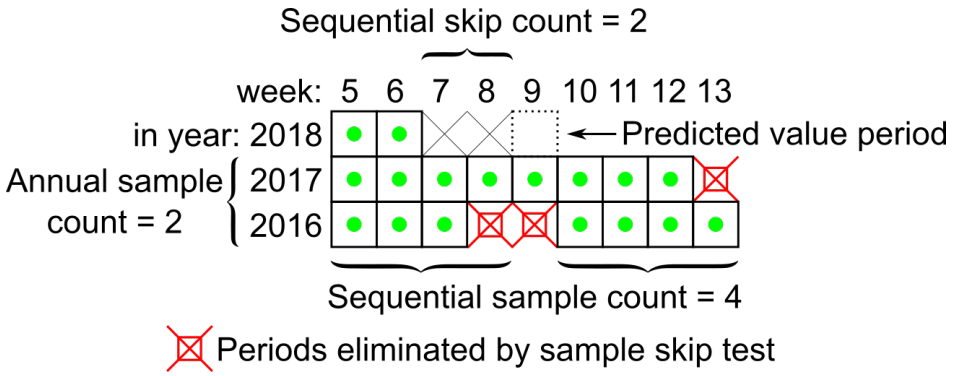


20.12.2.6. Sample skip test

You can use the *Sample skip test* to skip samples from certain periods that would otherwise be included, based on the results of testing an expression within those periods. This could be used, for instance, in disease outbreak detection, where the sample skip test could identify previous disease outbreaks, to exclude those samples from the prediction of a non-outbreak baseline expected value.

The *Sample skip test* is an expression that should return a value of true or false, to indicate whether or not the period should be skipped. It can be an expression that tests any values in the preiovus period. For example, it could test for a data value that was explicitly entered to indicate that a previous period should be skipped. Or it could compare a previously predicted value for a period with the actual value recorded for that period, to determine if that period should be skipped.

Any periods for which the *Sample skip test* is *true* will not be sampled. For example:



20.12.3. Create or edit a predictor

1. Open the **Maintenance** app and click **Other** > **Predictor**.
2. Click the add button.
3. In the **Name** field, type the predictor name.
4. (Optional) In the **Code** field, assign a code.
5. (Optional) Type a **Description**.
6. Select an **Output data element**. Any value generated by this predictor is stored as a value of this data element. The value is rounded according to the value type of the data element: If the value type is an integer type, the predicted value is rounded to the nearest integer. For all other value types, the number is rounded to four significant digits. (However if there are more than four digits to the left of the decimal place, they are not replaced with zeros.)
7. Select a **Period type**.
8. Assign one or more organisation unit levels. The ouput value will be assigned to an organisation unit at this level (or these levels). The input values will come from the organisaiton unit to which the output is assigned, or from any level lower under the output organisation unit.
9. Create a **Generator**. The generator is the expression that is used to calculate the predicted value.
   a. Type a **Description** of the generator expression.
   b. Enter the generator expression. You can build the expression by selecting data elements for aggregate data, or program data elements, attributes or indicators. Organisation unit counts are not yet supported.

      To use sampled, past period data, you should enclose any items you select in one of the following aggregate functions:

Aggregate function	Means
AVG	Average (mean) value
COUNT	Count of the data values
MAX	Maximum value
MEDIAN	Median value
MIN	Minimum value
STDDEV	Standard deviation
SUM	Sum of the values

      Any items inside an aggregate function will be evaluated for all sampled past periods, and then combined according to the formula inside the aggregate function. Any items

outside an aggregate function will be evaluated for the period in which the prediction is being made.

You can build more complex expressions by clicking on (or typing) any of the elements below the expression field: ( ) * / + - Days. Constant numbers may be added by typing them. The Days option inserts [days] into the expression which resolves to the number of days in the period from which the data came.

You can also use the following functions in your expression, either inside or containing aggregate functions, or independent of them:

Function	Means
IF(test, valueIfTrue, valueIfFalse)	Evaluates **test** which is an expression that evaluates to a boolean value -- see **Boolean expression notes** below. If the test is **true**, returns the **valueIfTrue** expression. If it is **false**, returns the **valueIfFalse** expression.
ISNULL(item)	Returns the boolean value **true** if the **item** is null (missing), otherwise returns **false**. The **item** can be any selected item from the right (data element, program data element, etc.).

Boolean expression notes: A boolean expression must evaluate to **true** or **false**. The following operators may be used to compare two values resulting in a boolean expression: <, >, !=, ==, >=, and <=. The following operators may be used to combine two boolean expressions: && (logical and), and || (logical or). The unary operator ! may be used to negate a boolean expression.

Generator expression examples:

Generator expression	Means
SUM(#{FTRrcoaog83.tMwM3ZBd7BN})	Sum of the sampled values of data element FTRrcoaog83 and category option combination (disaggregation) tMwM3ZBd7BN
AVG(#{FTRrcoaog83}) + 2 * STDDEV(#{FTRrcoaog83})	Average of the sampled values of of data element FTRrcoaog83 (sum of all disaggregations) plus twice its standard deviation
SUM(#{FTRrcoaog83}) / SUM([days])	Sum of all sampled values of data element FTRrcoaog83 (sum of all disaggregations) divided by the number of days in all sample periods (resulting in the overall average daily value)
SUM(#{FTRrcoaog83}) + #{T7OyqQpUpNd}	Sum of all sampled values of data element FTRrcoaog83 plus the value of data element T7OyqQpUpNd in the period being predicted for
1.2 * #{T7OyqQpUpNd}	1.2 times the value of data element T7OyqQpUpNd in the period being predicted for

Generator expression	Means
IF(ISNULL(#{T7OyqQpUpNd}), 10, 20)	If the data element T7OyqQpUpNd is null, then 10, otherwise 20.

10. (Optional) Create a **Sample skip test**. The sample skip test tells which previous periods if any to exclude from the sample.
    a. Type a **Description** of the skip test.
    b. Enter the sample skip test expression. You can build the expression by selecting data elements for aggregate data, or program data elements, attributes or indicators. Organisation unit counts are not yet supported. As with the generator function, you may click on (or type) any of the elements below the expression field: ( ) * / + - Days. The functions IF() and ISNULL() as described above may also be used.

       The expression must evaluate to a boolean value of **true** or **false**. See **Boolean expression notes** above.

       Skip test expression examples:

Skip test expression	Means
#{FTRrcoaog83} > #{M62VHgYT2n0}	The value of data element FTRrcoaog83 (sum of all disaggregations) is greater than the value of data element M62VHgYT2n0 (sum of all disaggregations)
#{uF1DLnZNlWe} > 0	The value of data element uF1DLnZNlWe (sum of all disaggregations) is greater than the zero
#{FTRrcoaog83} > #{M62VHgYT2n0} || #{uF1DLnZNlWe} > 0	The value of data element FTRrcoaog83 (sum of all disaggregations) is greater than the value of data element M62VHgYT2n0 (sum of all disaggregations) or the value of data element uF1DLnZNlWe (sum of all disaggregations) is greater than the zero

11. Enter a **Sequential sample count** value.

    This is for how many sequential periods the calculation should go back in time to sample data for the calculations.

12. Enter an **Annual sample count** value.

    This is for how many years the calculation should go back in time to sample data for the calculations.

13. (Optional) Enter a **Sequential skip count** value.

    This is how many sequential periods, immediately preceding the predicted value period, should be skipped before sampling the data.

14. Click **Save**.

20.12.4. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.

4. Click **Save**.

20.12.5. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.12.6. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.12.7. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.13. Manage push reports

20.13.1. About push reports

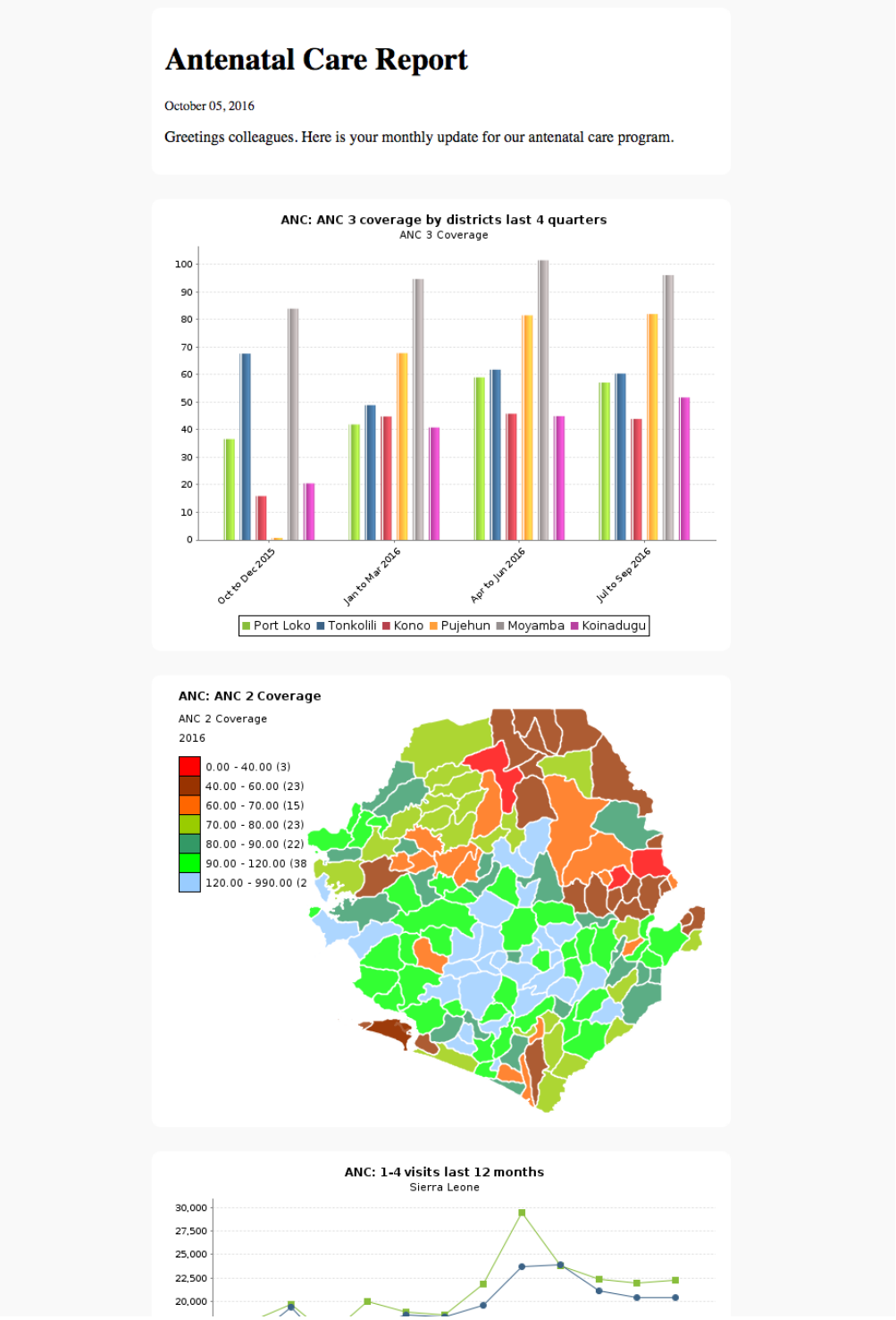
Push reports allows you to increase awareness and usage of data analysis by sending reports with charts, tables and maps directly to users e-mail addresses.

- A push report gets its content from existing dashboards.
- A push report lists the dashboard items in the same order as on the dashboard.
- A push report can only contain dashboard items with charts, maps or tables.
- You create the push report and its schedule in the **Maintenance** app.
- The **Title** and **Message** parameters you set up in the **Maintenance** app, are included in each report. The **Name** you give the report is not included in the report. Instead, the name is used to identify the push analysis object in the system. This way a report can be named one thing, and the title of the report can be another.
- When you run a push report job, the system compiles a list of recipients from the user groups you've selected. The system then generates a report for each member of the selected user groups. Each of the dashboard items are generated specifically for each user. This means that the data included in the report reflects the data the user has access to. All users could therefore get the same report (if all the data is "static") or custom reports (if all the data is "dynamic"), or a combination of the two.
- Push reports are sent by e-mail to the recipients, not through the internal DHIS2 messaging system. If a user doesn't have a valid e-mail, or if the job fails, no e-mails are sent. In this case, the problem is logged on the server.

Note

The data generated in the push reports is public so verify that you don't include any sensitive data.

Example 20.15. Push report



In the **Maintenance** app, you manage the following push reports objects:

Table 20.18. Push reports objects in the Maintenance app

Object type	Available functions
Push analysis	Create, edit, clone, delete, show details, translate, preview and run

20.13.2. Create or edit a push report

1. Open the **Maintenance** app and click **Other** > **Push analysis**.
2. Click the add button.

3. In the **Name** field, type the name of the scheduled report.

   This name is not included in the report e-mail. Instead, the name is used to identify the push analysis object in the system.
4. (Optional) In the **Code** field, assign a code.
5. Add a report **Title**.

   This title is included in the report e-mail.
6. (Optional) Add a **Message**.

   This message is included in the report e-mail.
7. Select a **Dashboard** to base the report on.
8. Select and assign the user groups you want to send the report to.
9. Select a **Scheduling frequency**: **Daily**, **Weekly** or **Monthly**.

   > **Note**
   >
   > If you schedule a push report to "Monthly" and "31", the scheduled report job will not run if the month has less than 31 days.
10. (Optional) Select **Enable** to activate the push report job.

    The job won't run until you activate it.
11. Click **Save**.

20.13.3. Preview push reports

1. Open the **Maintenance** app and click **Other** > **Push analysis**.
2. In the push report list, locate the push report you want to preview.
3. Click the options menu and select **Preview**.

   A preview of the push report opens in a new window.

20.13.4. Run push report jobs

1. Open the **Maintenance** app and click **Other** > **Push analysis**.
2. In the push report list, locate the push report you want to run.
3. Click the options menu and select **Run now**.

   The push report job runs immediately.

20.13.5. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.13.6. Delete metadata objects

> **Note**
>
> You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.13.7. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.13.8. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

20.14. Manage external map layers

20.14.1. About external map layers

You can customize GIS by including map layers from various sources and combine them with your own data in DHIS2. DHIS2 supports common map service formats such as Web Map Service (WMS), Tile Map Service (TMS) and XYZ tiles.

20.14.2. Create or edit an external map layer

Note

DHIS 2 only supports the Web Mercator projection (EPSG:3857) so make sure that the external service supports this projection.

Table 20.19. External map layer objects in the Maintenance app

Object type	Available functions
External map layer	Create, edit, clone, delete, show details and translate

1. Open the **Maintenance** app and click **Other** > **External map layer**.
2. Click the add button.
3. In the **Name** field, type a name that describes the content of the external map layer.

   This is the name you'll see in the **GIS** app.
4. (Optional) In the **Code** field, assign a code.
5. Select a **Map service** format.

   DHIS2 supports three common map service formats:
   - Web Map Service (WMS)

     Image format: PNG format allows layers to be transparent, JPG format offers better compression and is often faster to load.

     Layers: A WMS can contain several individual layers, and you can specify which you want to include (comma separated). Refer to the WMS GetCapabilities document to see the available layers.
   - Tile Map Service (TMS)
   - XYZ tiles (can also be used for WMTS)
6. Enter the **URL** to the map service.

   ### Note

   XYZ and TMS URLs must contain placeholders {}, for example: http://{s}.tile.osm.org/{z}/{x}/{y}.png.
7. (Optional) Enter **Source** of the map layers. The field can contain HTML tags if you want to link to the source.

   When you use an external map service it is important to highlight where the data comes from.
8. Select a **Placement**:
   - **Bottom - basemap**: For the GIS app, this places the external map layer above other DHIS2 base maps but below the thematic map layers. For the Maps app, this makes the external map layer selectable as the base map (i.e. as an alternative to the DHIS2 base maps).
   - **Top - overlay**: For the GIS app, this places the external map layer above the thematic map layers but below facility and event data layers. For the Maps app, this allows the external map to be added from the Add Layer selection and placed anywhere above the base map.
9. (Optional) Add a legend.

   You can add a legend in two ways:
   - Select a predefined **Legend** to describe the colors of the map layer.

     ### Tip

     Click **Add new** to create legends that you're missing. In the form that opens, create the legends you need. When you're done, click **Refresh values**.
   - Enter a link to an external image legend in **Legend image URL**.

     These are often provided for WMS. See under LegendURL in the WMS GetCapabilites document.

10Click **Save**.

20.14.3. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

20.14.4. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

20.14.5. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

20.14.6. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.

5. Click **Save**.

20.15. Edit multiple object groups at once

The **Metadata group editor** in the **Maintenance** app allows you to edit multiple object groups at the same time. You can edit the following objects types:

Table 20.20. Object types in the Metadata group editor

Object type	Available functions
Category option	
Category option group	
Data element	Add one data element to multiple data element groups Remove one data element from multiple data element groups
Data element group	Add multiple data elements to one data element group Remove multiple data elements from one data element group
Indicator	Add one indicator to multiple indicator groups Remove one indicator from multiple indicator groups
Indicator group	Add multiple indicators to one indicator group Remove multiple indicators from one indicator group

20.15.1. Edit multiple objects in an object group

1. Open the **Maintenance** app and click **Metadata group editor**.
2. Click **Manage items in group**.
3. Select an object group type, for example **Indicator groups**.
4. Select an object group, for example **HIV**.
5. In the left-hand list, select the object(s) you want to add to the object group and click the right arrow.
6. In the right-hand list, select the object(s) you want to remove from the object group and click the left arrow.

20.15.2. Edit an object in multiple object groups

1. Open the **Maintenance** app and click **Metadata group editor**.
2. Click **Manage groups for item**.
3. Select an object type, for example **Indicators**.
4. Select an object, for example **ANC LLITN coverage**.
5. In the left-hand list, select the objects group(s) you want to add the object to and click the right arrow.

6. In the right-hand list, select the object group(s) you want to remove the object from and click the left arrow,

Chapter 21. Configure programs in the Maintenance app

21.1. About programs

Traditionally, public health information systems have been reporting aggregated data of service provision across its health programs. This does not allow you to trace the people provided with these services. In DHIS2, you can define your own programs with stages. These programs are a essential part of the "tracker" functionality which lets you track individual records. You can also track other ‘entities’ such as wells or insurances. You can create two types of programs:

Table 21.1. Program types

Program type	Description	Examples of use
Event program	Single event *without* registration program (anonymous program or SEWoR) Anonymous, individual events are tracked through the health system. No person or entity is attached to these individual transactions. Has only one program stage.	To record health cases without registering any information into the system. To record survey data or surveillance line-listing.
Tracker program	Single event *with* registration program (SEWR) An entity (person, commodity, etc.) is tracked through each individual transaction with the health system Has only one program stage. A tracked entity instance (TEI) can only enroll in the program once.	To record birth certificate and death certificate.
	Multi events *with* registration program (MEWR) An entity (person, commodity, etc.) is tracked through each individual transaction with the health system	Mother Health Program with stages as ANC Visit (2-4+), Delivery, PNC Visit.

Program type	Description	Examples of use
	Has multiple program stages.	

To create a program, you must first configure several types of metadata objects. You create these metadata objects in the **Maintenance** app or the **Program / Attributes** (legacy) app.

Table 21.2. Program metadata objects in the Maintenance app

Object type	Description	Available functions
Event program	A program to record single event without registration	Create, edit, share, delete, show details and translate
Program indicator	An expression based on data elements and attributes of tracked entities which you use to calculate values based on a formula.	Create, edit, share, delete, show details and translate
Program rule	Allows you to create and control dynamic behavior of the user interface in the **Tracker Capture** and **Event Capture** apps.	Create, edit, delete, show details and translate
Program rule variable	Variables you use to create program rule expressions.	Create, edit, delete, show details and translate
Relationship type	Defines the relationship between tracked entity A and tracked entity B, for example mother and child.	Create, edit, clone, delete, show details and translate
Tracked entity	Types of entities which can be tracked through the system. Can be anything from persons to commodities, for example a medicine or a person. A program must have one tracked entity. To enrol a tracked entity instance into a program, the tracked entity of an entity and tracked entity of a program must be the same. **Note** A program must be specified with only one tracked entity. Only tracked entity as same as the tracked entity of program can enroll into that program.	Create, edit, clone, delete, show details and translate

Object type	Description	Available functions
Tracked entity attribute	Used to register extra information for a tracked entity. Can be shared between programs.	Create, edit, clone, share, delete, show details and translate

Table 21.3. Program metadata objects in the Program / Attributes app

Object type	Description	Available functions
Program	A program consist of program stages.	Create, edit, share, delete, assign to organisation units, show details and translate
Program stage	A program stage defines which actions should be taken at each stage.	Create, edit, change sort order, delete, show details and translate
Program stage section	N/A	Create, edit, change sort order, delete, show details and translate
Program indicator group	A group of program indicators	Create, edit, delete, show details and translate
Validation rule	A validation rule is based on an expression which defines a relationship between data element values.	Create, edit and delete
Program notification	Automated message reminder Set reminders to be automatically sent to enrolled tracked entity instances before scheduled appointments and after missed visits.	Create, edit and delete
Program stage notification	-	Create, edit and delete
Design custom registration form	-	-

21.2. Configure event programs in the Maintenance app

21.2.1. About event programs

Single event *without* registration programs are called event programs. You configure them in the **Maintenance** app. Event programs can have three types of data entry forms:

Table 21.4. Types of data entry forms for event programs

Form type	Description
Basic	Lists all data elements which belong to the program. You can change the order of the data elements.

Form type	Description
Section	A section groups data elements. You can then arrange the order of the sections to create the desired layout of the data entry form.
Custom	Defines the data entry form as HTML page.

Note

- Custom forms takes precedence over section forms if both are present.
- If no custom or section form are defined, the basic form will be used.
- The Android apps only supports section forms.

You can create *program notifications* for event programs. The notifications are sent either via the internal DHIS2 messaging system, via e-mail or via text messages (SMS). You can use program notifications to, for example, send an automatic reminder to a tracked entity 10 days before a scheduled appointment. You use the program's tracked entity attributes (for example first name) and program parameters (for example enrollment date) to create a notification template. In the **Parameters** field, you'll find a list of available tracked entity attributes and program parameters.

21.2.2. Workflow: Create an event program

1. Enter the event program details.
2. Assign data elements.
3. Create data entry form(s): **Basic**, **Section** or **Custom**.
4. Assign the program to organisation unit(s).
5. Create program notification(s).

21.2.3. Create or edit an event program

21.2.3.1. Enter event program details

1. Open the **Maintenance** app and click **Program** > **Program**.
2. Click the add button.
3. Enter program details, then click next.

Field	Description
Name	The name of the program.
Short name	A short name of the program. The short name is used as the default chart or table title in the analytics apps.
Description	A detailed description of the program.
Version	The version of the program. This is used for example when people collect data offline in an Android implementation. When they go online and synchronize their metadata, they should get the latest version of the program.
Category combination	The category combination you want to use. The default setting is **None**.
Data approval workflow	The data approval workflow you want to use. The default setting is **No value**.

Field	Description
Completed events expiry date	Defines the number of days for which you can edit a completed event. This means that when an event is completed and the specified number of expiry days has passed, the event is locked. **Example 21.1.** If you set "Completed events expiry days" to 10", an event is locked ten days after the completion date. After this date you can no longer edit the event.
Expiry period type **Expiry days**	The expiry days defines for how many days after the end of the previous period, an event can be edited. The period type is defined by the expiry period type. This means that when the specified number of expiry days has passed since the end date of the previous period, the events from that period are locked. **Example 21.2.** If you set the expiry type to "Monthly" and the expiry days to "10" and the month is October, then you can't add or edit an event to October after the 10th of November.

4. Click next.

21.2.3.2. Assign data elements

1. Click **Assign data elements**.
2. In the list of available items, double-click the data elements you want to assign to the event program.
3. (Optional) For each data element, add additional settings:

Setting	Description
Compulsory	The value of this data element must be filled into data entry form before you can comple the event.
Allow provided elsewhere	Specify if the value of this data element comes from other facility, not in the facility where this data is entered.
Display in reports	Displays the value of this data element into the single event without registration data entry function.
Date in future	Will allow user to select a date in future for date data elements.
Render option as radio	Displays a radio button in the data entry form. It's only possible to use for option sets.

4. Click next.

21.2.3.3. Create data entry forms

The data entry forms decide how the data elements will be displayed to the user in the **Event Capture** app.

1. Click **Create data entry form**.
2. Click **Basic**, **Section** or **Custom**.
3. To create a **Basic** data entry form: Drag and drop the data elements in the order you want.
4. To create a **Section** data entry form:
   a. Click the add button and enter a section name.
   b. Click the section so it's highlighted by a black line.
   c. Add data elements by clicking the plus sign next to the data elements' names.
   d. Repeat above steps until you've all the sections you need.
   e. Change the section order: click the options menu, then drag the section to the place you want.
5. To create a **Custom** data entry from: Use the WYSIWYG editor to create a completely customized form. If you select **Source**, you can paste HTML code directly in the editing area. You can also insert images for example flags or logos.
6. Click next.

21.2.3.4. Assign organisation units

1. Click **Assign organisation units**.
2. In the organisation tree, double-click the organisation units you want to add to the program to.

   You can locate an organisation unit in the tree by expanding the branches (click on the arrow symbol), or by searching for it by name. The selected organisation units display in orange.
3. Click next.

21.2.3.5. Create program notifications

1. Create the message you want to send:
   a. Click **What to send?**.
   b. Enter a **Name**.
   c. Create the **Subject template**: Double-click the parameters in the **Template variables** field to add them to your subject.

   Note

   The subject is not included in text messages.

   d. Create the **Message template**: Double-click the parameter names in the **Template variables** list to add them to your message.

   Example 21.3.

   Dear A{w75KJ2mc4zz}, You're now enrolled in V{program_name}.
2. Define *when* you want to send the message:
   a. Click **When to send it?**.
   b. Select a **Notification trigger**.

Notification trigger	Description
Program stage completion	The program stage notification is sent when the program stage is completed

Notification trigger	Description
Days scheduled (due date)	The program stage notification is sent XX number of days before or after the due date You need to enter the number of days before or after the scheduled date that the notification will be send.

3. Define *who* you want to send the message to:
   a. Click **Who to send it to?**.
   b. Select a **Notification recipient**.

Notification recipient	Description
Tracked entity instance	Receives program notifications via e-mail or text message. To receive a program notification, the recipient must have an e-mail address or a phone number attribute.
Organisation unit contact	Receives program notifications via e-mail or text message. To receive a program notification, the receiving organisation unit must have a registered contact person with e-mail address and phone number.
Users at organisation unit	All users registered to the selected organisation unit receive program notifications via the internal DHIS2 messaging system.
User group	All members of the selected user group receive the program notifications via the internal DHIS2 messaging system
Program	TBA

   c. Click **Save**.
4. Repeat above steps to create all the program notifications you need.
5. Click **Save**.

Note

You configure when the program notifications are sent in the **Data Administration** app > **Scheduling** > **Program notifications scheduler**.

- Click **Run now** to send the program notifications immediately.
- Select a time and click **Start** to schedule the program notifications to be send at a specific time.

21.2.4. Reference information: Program notification parameters

Table 21.5. Program notification parameters to use in program notifications

Notification type	Variable name	Variable code
Program	Current date	`V{current_date}`

Notification type	Variable name	Variable code
	Days since enrollment date	`V{days_since_enrollment_date}`
	Enrollment date	`V{enrollment_date}`
	Incident date	`V{incident_date}`
	Organisation unit name	`V{org_unit_name}`
	Program name	`V{program_name}`
Program stage	Current date	`V{current_date}`
	Days since due date	`V{days_since_due_date}`
	Days until due date	`V{days_until_due_date}`
	Due date	`V{due_date}`
	Organisation unit name	`V{org_unit_name}`
	Program name	`V{program_name}`
	Program stage name	`V{program_stage_name}`

21.3. Configure tracker programs in the Maintenance app

Note

From release 2.27, you create event programs (programs without registration) in the **Maintenance** app. You still create tracker programs (programs with registration) in the **Program / Attributes** app.

21.4. Configure program indicators

21.4.1. About program indicators

Program indicators are expressions based on data elements and attributes of tracked entities which can be used to calculate values based on a formula. Program indicators consist of an aggregation type, an analytics type, an expression and a filter.

Program indicators are evaluated based on the assigned aggregation type, expression and filter. The order of evaluation is:

1. The *filter* will filter the events which become part of the evaluation/aggregation routine.
2. The *expression* will be evaluated per event.
3. All evaluated expression values will be *aggregated* according to the aggregation type of the program indicator.

Table 21.6. Program indicator components

Program rule component	Description
Aggregation type	The aggregation type determines how the program indicator will be aggregated. The following aggregation types are available: • Average • Average (number) • Average (number, disaggregation)

Program rule component	Description
	• Average (sum in organisation unit hierarchy) • Average (sum of numbers) • Average (sum of numbers, disaggregation) • Average (Yes/No) • Count • Custom The "custom" aggregation type allows you to specify the aggregation type in-line in the expression. All other aggregation types are applied to the entire expression. Using the "custom" aggregation type might lead to an exception of the order of evaluation described above where individual parts of the expression can be evaluated and aggregated, as opposed to the entire expression being evaluated prior to aggregation. • Default • Max • Min • None • Standard deviation • Sum • Variance
Analytics type	The available analytics types are *event* and *enrollment*. The analytics type defines whether the program indicator is calculated based on events or program enrollments. This has an impact on what type of calculations can be made. • Events implies a data source where each event exists as an independent row. This is suitable for performing aggregations such as counts and sums. • Enrollments implies a data source where all events for a single enrollment is combined on the same row. This allows for calculations which can compare event data from various program stages within a program enrollment.
Analytics period boundaries	Defines the boundaries for the program indicator calculation. The boundaries determine which events or enrollments gets included in aggregations, always relative

Program rule component	Description
	to the aggregate reporting period start and end. When creating the program indicator, the default boundaries will get preselected based on analytics type. • For analytics type *event*, the default boundaries will be configured to encapsulate any events with an event date after the reporting period starts and before the reporting period ends. • For analytics type *enrollment*, the default boundaries will encapsulate all enrollments with an enrollment date after the reporting date starts and before the reporting period ends. In addition, the default enrollment program indicator evaluates the newest event for all program stages regardless of date. It is possible to change the upper and lower boundaries to include a longer or shorter period relative to the reporting period, or delete one of the boundaries - in effect returing all data before or after a certiain period. It is also possible to add more constraints, for example to make an enrollment program indicator only include event data up to a given point in time. • Boundary target: Can be *incident date*, *event date* or *enrollment date*. Designates what is being constrained by the boundary. • Analytics period boundary type: Defines wether the boundary is a end boundary - starting with "before...", or a start boundary - "after...". Also defines whether the boundary relates to the end of the aggregate reporting period or the start of the aggregate reporting period. • Offset period by amount: In some cases, for example cohort analytics, the boundary should be offset relative to the aggregate reporting period when running pivots and reports. The offset period by amount is used to move the current boundary either back(negative) or forward(positive) in time. The amount and period type together will determine how big the offset will be. An example can be when making a simple enrollment cohort porgram indicator for a 1 year cohort, it might be enough to offset each boundary of the program indicator with "-1" and "Years" • Period type: See above. Can be any period, e.g. *Weekly* or *Quarterly*.

Program rule component	Description
Expression	The expression defines how the indicator is being calculated. The expression can contain references to various entities which will be substituted with a related values when the indicator is calculated: • Data elements: Will be substituted with the value of the data element for the time period and organisation unit for which the calculation is done. Refers to both program stage and data element. • Attributes: Will be substituted with the value of the attribute for the person / tracked entity for which the calculation is done. • Variables: Will be substituted with special values linked to the program, including incident date and date of enrollment for the person, current date and count of values in the expression for the time period and organisation unit for which the calculation is done. • Constants: Will be substituted with the value of the constant. The expression is a mathematical expression and can also contain operators. For single event programs and tracker programs with analytics type *event*, the expression will be evaluated *per event* , then aggregated according to its aggregation type. For tracker programs with analytics type *enrollment*, the expression will be evaluated *per enrollment*, then aggregated according to its aggregation type.
Filter	The filter is applied to events and filters the data source used for the calculation of the indicator. I.e. the filter is applied to the set of events before the indicator expression is being evaluated. The filter must evaluate to either true or false. It filter is applied to each individual event. If the filter evaluates to true then the event is included later in the expression evaluation, if not it is ignored. The filter can, in a similar way as expressions, contain references to data elements, attributes and constants. The program indicator filter can in addition use logical operators. These operators can be used to form logical expressions which ultimately evaluate to either true or false.

Program rule component	Description
	For example you can assert that multiple data elements must be a specific value, or that specific attributes must have numerical values less or greater than a constant.

In the **Maintenance** app, you manage the following program indicator objects:

Object type	Available functions
Program indicator	Create, edit, clone, share, delete, show details and translate
Program indicator group	Create, edit, clone, share, delete, show details and translate

21.4.2. Create or edit a program indicator

Note

A program indicator belongs to exactly one program.

1. Open the **Maintenance** app and click **Indicator** > **Program indicator**.
2. Click the add button.
3. Select a **Program** and enter:
   - **Name**
   - **Short name**
   - **Code**
   - **Description**
4. Select number of **Decimals in data output**.
5. Select an **Aggregation type**.
6. Select a if you want to **Display in form**.
7. Assign one or multiple **Legend**s.
8. (Optional) Enter a **Category option combination for aggregate data export**.
9. (Optional) Enter an **Attribute option combination for aggregate data export**.
10. Create the expression.
    a. Click **Edit expression**.
    b. Create the expression based on mathematical operators and the attributes, variables and constants listed to the right.
11. Create the filter.
    a. Click **Edit filter**.
    b. Create the expression based on mathematical operators and the attributes, variables and constants listed to the right.
12. Click **Save**.

21.4.3. Create or edit a program indicator group

1. Open the **Maintenance** app and click **Indicator** > **Program indicator group**.
2. Click the add button.
3. Enter **Name** and **Code**.
4. In the list of available program indicators, double-click the program indicators you want to assign to your group.
5. Click **Save**.

21.4.4. Reference information: Expression and filter examples per value type

The table below shows examples of how to write expressions and filters for different data element and attribute value types:

Table 21.7. Expression and filter examples per value type

Value types	Example syntax
Integer Negative integer Positive or zero integer Positive integer Number Percentage	Numeric fields, can be used for aggregation as an expression, or in filters: `#{mCXR7u4kNBW.K0A4BauXJDl} >= 3`
Yes/No Yes only	Boolean fields. Yes is translated to numeric 1, No to numeric 0. Can be used for aggregation as an expression, or in filters: `#{mCXR7u4kNBW.Popa3BauXJss} == 1`
Text Long text Phone number Email	Text fields. Can be checked for equality in filters: `#{mCXR7u4kNBW.L8K4BauIKsl} == 'LiteralValue'`

Date
Age
	Date fields. Most useful when combined with a d2:daysBetween function, which produces a number that can be aggregated as an expression or used in filters:
	`d2:daysBetween(#{mCXR7u4kNBW.JKJKBausssl},V{enrol > 100`
	Can also directly be checked for equality in filters:
	`#{mCXR7u4kNBW.JKJKBausssl} == '2011-10-28'`

Date
Age
	Date fields. Most useful when combined with a d2:daysBetween function, which produces a number that can be aggregated as an expression or used in filters:
	`d2:daysBetween(#{mCXR7u4kNBW.JKJKBausssl},V{enrol > 100`
	Can also directly be checked for equality in filters:
	`#{mCXR7u4kNBW.JKJKBausssl} == '2011-10-28'`

21.4.5. Reference information: Functions, variables and operators to use in program indicator expressions and filters

Example 21.4.

An expression that includes both attributes, data elements and constants looks like this:

```
(A{GPkGfbmArby} + #{mCXR7u4kNBW.NFkjsNiQ9PH}) * C{bCqvfPR02Im}
```

Example 21.5.

An expression which uses the custom aggregation type and hence can use inline aggregation types looks like this:

```
(sum(#{mCXR7u4kNBW.K0A4BauXJDl} * #{mCXR7u4kNBW.NFkjsNiQ9PH}) /
 sum(#{mCXR7u4kNBW.NFkjsNiQ9PH})) * 100
```

Note how the "sum" aggregation operator is used inside the expression itself.

21.4.5.1. Functions to use in a program indicator expression or filter

The program indicator expression and filter support a range of functions. The functions can be applied to data elements and attributes:

Table 21.8. Functions to use in a program indicator expression or filter

Function	Arguments	Description
d2:hasValue	(object)	Returns true if the data element/attribute has a value. Can be used in filters to distinguish between the number 0 and no value, and to distinguish between exlicit "No" and no selection for a Yes/No field.
d2:minutesBetween	(datetime, datetime)	Produces the number of minutes between two data elements/attributes of type "date and time". The static datetime format is 'yyyy-MM-dd hh:mm'.
d2:daysBetween	(date, date)	Produces the number of days between two data elements/attributes of type date. The static date format is 'yyyy-MM-dd'.
d2:weeksBetween	(date, date)	Produces the number of full weeks between two data elements/attributes of type date. The static date format is 'yyyy-MM-dd'.
d2:monthsBetween	(date, date)	Produces the number of full months between two data elements/attributes of type date. The static date format is 'yyyy-MM-dd'.
d2:yearsBetween	(date, date)	Produces the number of full years between two data elements/attributes of type date. The static date format is 'yyyy-MM-dd'.
d2:condition	(boolean-expr, true-val, false-val)	Evaluates the conditional expression and if true returns the true value, if false returns the false value. The conditional expression must be quoted.
d2:zing	(number)	Evaluates the data element/attribute of type number to zero if the value is negative, otherwise to the value itself.

Function	Arguments	Description
d2:oizp	(number)	Evaluates the data element/attribute of type number to one if the value is zero or positive, otherwise to zero.
d2:zpvc	(object, [,object, object,...])	Returns the number of numeric zero and positive values among the given object arguments. Can be provided any number of arguments.

Example 21.6.

A filter that uses the "hasValue" function looks like this: this:

```
d2:hasValue(#{mCXR7u4kNBW.NFkjsNiQ9PH})
```

Example 21.7.

An expression that uses the "zing" and "oizp" functions looks like this:

```
d2:zing(A{GPkGfbmArby}) + d2:oizp(#{mCXR7u4kNBW.NFkjsNiQ9PH}))
```

Example 21.8.

An expression that uses the "daysBetween" function looks like this:

```
d2:daysBetween(#{mCXR7u4kNBW.k8ja2Aif1Ae},'2015-06-01')
```

Example 21.9.

An expression that uses the "condition" function looks like this:

```
d2:condition('#{mCXR7u4kNBW.NFkjsNiQ9PH} > 100',150,50)
```

Example 21.10.

An expression that uses the "zpvc" function looks like this:

```
d2:zpvc(A{GPkGfbmArby}),#{mCXR7u4kNBW.NFkjsNiQ9PH}),4,-1)
```

21.4.5.2. Variables to use in a program indicator expression or filter

The program indicator expression and filter support a range of variables:

Table 21.9. Variables to use in a program indicator expression or filter

Variable	Description
event_date	The date of when the event took place.
due_date	The date of when an event is due.
incident_date	The date of the incidence of the event.
enrollment_date	The date of when the tracked entity instance was enrolled in the program.
enrollment_status	Can be used to include or exclude enrollments in certain statuses. **Example 21.11.** When calculating the hemoglobin improvement/deterioration throughout a pregnancy, it might make sense to only consider completed enrollments. If non-completed enrollments is not filtered

Variable	Description
	out, these will represent half-finished ANC followups, where the final improvement/deterioration is not yet established.
current_date	The current date.
value_count	The number of non-null values in the expression part of the event.
zero_pos_value_count	The number of numeric positive values in the expression part of the event.
event_count	The count of events (useful in combination with filters).
enrollment_count	The count of enrollments (useful in combination with filters).
tei_count	The count of tracked entity instances (useful in combination with filters).
program_stage_name	Can be used in filters for including only certain program stages in a filter for tracker programs. Uses the name of the program stage: `V{program_stage_name} == 'ANC first visit'`
program_stage_id	Can be used in filters for including only certain program stages in a filter for tracker programs. Uses the unique identifier of the program stage: `V{program_stage_id} == 'YPSSfbmAtt1'`

Example 21.12.

An expression that uses the "value count" variable looks like this:

```
(#{A03MvHHogjR.a3kGcGDCuk6} + #{A03MvHHogjR.wQLfBvPrXqq}) / V{value_count}
```

Example 21.13.

An expression that uses the "event_date" and "incident_date" variables looks like this:

```
d2:daysBetween(V{incident_date},V{event_date})
```

21.4.5.3. Operators to use in a program indicator filter

Table 21.10. Operators to use in a program indicator filter

Operator	Description
and	Logical AND
or	Logical OR
==	Equal to
!=	Not equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to

These operators can be used to form logical expressions which ultimately evaluate to either true or false. For example you can assert that multiple data elements must be a specific value, or that specific attributes must have numerical values less or greater than a constant.

Example 21.14.

A filter that uses both attributes and data elements looks like this:

```
A{cejWyOfXge6} == 'Female' and #{A03MvHHogjR.a3kGcGDCuk6} <= 2
```

Tip

DHIS2 is using the JEXL library for evaluating expressions which supports additional syntax beyond what is covered in this documentation. See the reference at the project home page to learn how you can create more sophisticated expressions

21.5. Configure program rules

21.5.1. About program rules

Program rules allows you to create and control dynamic behavior of the user interface in the **Tracker Capture** and **Event Capture** apps. During data entry, the program rules expressions are evaluated each time the user interface is displayed, and each time a data element is changed. Most types of actions will take effect immediately when the user enters values in the **Tracker Capture** and **Event Capture** apps.

Table 21.11. Program rule components

Program rule component	Description
Program rule action	Each program rule contains one or multiple actions. These are the behaviors that are triggered in the user interface when the expression is true. Actions will be applied at once if the expression is true, and will be reverted if the expression is no longer true. There are several types of actions and you can have several actions in one program rule.
Program rule expression	Each program rule has a single expression that determines whether the program rule actions should be triggered, if the expression evaluates to true. If the expression is true the program rule is in effect and the actions will be executed. If the expression is false, the program rule is no longer in effect and the actions will no longer be applied. You create the expression with standard mathematical operators, custom functions, user-defined static values and program rule variables. The program rule variables represent attribute and data element values which will be evaluated as part of the expression.
Program rule variable	Program rule variables lets you include data values and attribute values in program rule expressions. Typically, you'll have to create one or several program rule variables before creating a program rule. This is because program rules expressions usually contain at least one data element or attribute value to be meaningful.

Program rule component	Description
	The program rule variables are shared between all rules in your program. When you create multiple program rules for the same program, these rules will share the same library of program rule variables.

In the **Maintenance** app, you manage the following program rule objects:

Object type	Available functions
Program rule	Create, edit, clone, delete, show details and translate
Program rule variable	Create, edit, clone, share, delete, show details and translate

21.5.2. Workflow

1. In the **Maintenance** app, create program rule variable(s) if needed.
2. In the **Maintenance** app, create the program rule:
   a. Enter the program rule details.
   b. Create the program rule expression.
   c. Define the program rule actions.
3. In the **Tracker Capture** or **Event Capture** apps, verify that the program rule behaves as expected.

21.5.3. Create or edit a program rule variable

1. Open the **Maintenance** app and click **Program** > **Program rule variable**.
2. Click the add button.
3. Select a **Program** and enter a **Name**.
4. Select if you want to **Use code for option set**.

   This option is only effective when the data element or tracked entity attribute is connected to an option set. If you don't select this option, the program rule variable will be populated with the option set's name. If you select the option, the program rule variable will be populated with the option set's code instead.
5. Select a **Source type** and enter the required information.

   Depending on the source type, you'll have to select, for example, a **Program stage, Data element** or **Tracked entity attribute**.

   The source types determine how the program rule variable is populated with a value.

Source type	Description
Data element from the newest event for a program stage	This source type works the same way as **Data element from the newest event in the current program**, except that it only evaluates values from one program stage. This source type can be useful in program rules where the same data element is used in several program stages, and a rule needs to evaluate the newest data value from within one specific stage.

Source type	Description
Data element from the newest event in the current program	This source type is used when a program rule variable needs to reflect the newest known value of a data element, regardless of what event the user currently has open. This source type is populated slightly differently in **Tracker Capture** and **Event Capture** apps: **Tracker Capture**: the program rule variable will be populated with the newest data value collected for the given data element within the enrollment. **Event Capture**: the program rule variable will be populated with the newest data value found within the 10 newest events in the same organisation unit. The newest data value is determined with event date.
Data element in current event	Program rule variables with this source type will contain the data value from the same event that the user currently has open. This is the most commonly used source type, especially for skip logic (hide actions) and warning/error rules.
Data element from previous event	Program rule variables with this source type will contain the value from a specified data element from a previous event. Only older events is evaluated, not including the event that the user currently has open. This source type is commonly used when a data element only should be collected once during an enrollment, and should be hidden in subsequent events. Another use case is making rules for validating input where there is an expected progression from one event to the next - a rule can evaluate whether the previous value is higher/lower and give a warning if an unexpected value is entered. This source type is populated slightly differently in **Tracker Capture** and **Event Capture** apps: **Tracker Capture**: the program rule variable will be populated with the newest data value collected for the given data element within the enrollment - but only

Source type	Description
	evaluating the events that comes before the current event date. **Event Capture**: the program rule variable will be populated with the newest data value collected within the 10 events preceding the current event date - not including the current event. The newest data value is determined with event date.
Calculated value	TBA
Tracked entity attribute	Populates the program rule variable with a specified tracked entity attribute for the current enrollment. Use this is the source type to create program rules that evaluate data values entered during registration. This source type is also useful when you create program rules that compare data in events to data entered during registration. This source type is only used for tracker programs (programs with registration).

6. Click **Save**.

21.5.4. Create or edit a program rule

Note

A program rule belongs to exactly one program.

1. Open the **Maintenance** app and click **Program** > **Program rule**.
2. Click the add button.
3. Enter the program rule details. These fields are not shown to the end user, they are only meant for the program administrator.
   - **Program**
   - **Name**
   - **Description**
   - **Priority**

   Example 21.15.

   Let's say you have 16 program rules in your program. You configure the program rules with the following priority settings:

   - Priority 1 for program rule A
   - Priority 2 for program rules B - K
   - No priority for program rules L - P

   Result: the system runs the program rules in the following order:

   a. Program rule A

b. Program rules B - K (you can't find out or configure in which order the system runs these program rules)

c. Program rules L - P.

4. Click **Enter program rule expression** and create the program rule expression with the help of variables, functions and operators.

5. Click **Define program rule actions** and create the actions executed when the expression is true.

   a. Click the add button, select an **Action** and enter the required information.

   Depending on the action type, you'll have to perform different types of settings. For some action types, you must also enter free text or create expressions.

Action type	Required settings	Description
Assign value	**Data element to assign value to** **Program rule variable to assign value to** **Expression to evaluate and assign**	Used to help the user calculate and fill out fields in the data entry form. The idea is that the user shouldn’t have to fill in values that the system can calculate, for example BMI. When a field is assigned a value, the user sees the value but the user can't edit it. Example from Immunization stock card i Zambia: The data element for vaccine stock outgoing balance is calculated based on the data element for incoming stock balance minus the data elements for consumption and wastage. Advanced use: configure an 'assign value' to do a part of a calculation and then assign the result of the calculation to a program rule variable. This is the purpose with the "Calculated value" program rule variable.
Display text	**Display widget** **Static text** **Expression to evaluate and display after static text**	Used to display information that is not an error or a warning, for example feedback to the user. You can also use this action to display important information, for example

Action type	Required settings	Description
		the patient's allergies, to the user.
Display key/value pair	**Display widget** **Key label** **Expression to evaluate and display as value**	Used to display information that is not an error or a warning. Example: calculate number of weeks and days in a pregnancy and display it in the format the clinician is used to see it in. The calculation is based on previous recorded data.
Error on complete	**Data element to display error next to** **Tracked entity attribute to display error next to** **Static text** **Expression to evaluate and display after static text**	Used whenever you've cross-consistencies in the form that must be strictly adhered to. This action prevents the user from continuing until the error is resolved. This action differs from the regular **Show error** since the error is not shown until the user tries to actually complete the form. If you don't select a data element or a tracked entity attribute to display the error next to, make sure you write a comprehensive error message that helps the user to fix the error.
Hide field	**Data element to hide** **Tracked entity attribute to hide** **Custom message for blanked field**	Used when you want to hide a field from the user. **Custom message for blanked field** allows you to define a custom message displayed to the user in case the program rule hides and blanks out the field after the user typed in or selected a value. If a hide field action hides a field that contains a value, the field will always removed. If no message is defined, a standard message will be displayed to alert the user.

Action type	Required settings	Description
Hide section	**Program stage section to hide**	TBA
Hide program stage	**Program stage to hide**	Used when you want to hide a program stage section from the user.
Make field mandatory	**Data element to make mandatory** **Tracked entity attribute to make mandatory**	TBA
Show error	**Data element to display error next to** **Tracked entity attribute to display error next to** **Static text** **Expression to evaluate and display after static text**	Used whenever there are rules which must strictly be adhered to. The show error action prevents the user from continuing until the error is resolved. Such a strict validation should only be used when it's certain that the evaluated expression is never true unless the user has made a mistake in data entry. It's mandatory to define a message that is shown to the user when the expression is true and the action is triggered. You can select which data element or tracked entity attribute to link the error to. This will help the user to fix the error. In case several data elements or attributes are involved, select the one that is most likely that the user would need to change.
Show warning	**Data element to display warning next to** **Tracked entity attribute to display warning next to** **Static text** **Expression to evaluate and display after static text**	Used to give the user a warning about the entered data, but at the same time to allow the user to save and continue. You can use warnings to help the user avoid errors in the entered data, while at the same time allow the user to consciously disregard the

Action type	Required settings	Description
		warnings and save a value that is outside preset expectations. **Static text** defines the message shown to the user when the expression is true and the action is triggered. You can select which data element or tracked entity attribute to link the error to. This will help the user to fix the error. In case several data elements or attributes are involved, select the one that is most likely that the user would need to change.
Warning on complete	**Data element to display warning next to** **Tracked entity attribute to display warning next to** **Static text** **Expression to evaluate and display after static text**	Used to give the user a warning if he/she tries to complete inconsistent data, but at the same time to allow the user to continue. The warning is shown in a dialog when the user completes the form. **Static text** defines the message shown to the user when the expression is true and the action is triggered. This field is mandatory. You can select which data element or tracked entity attribute to link the error to. This will help the user to fix the error. If you don't select a data element or a tracked entity attribute to display the error next to, make sure you write a comprehensive error message that helps the user to fix the error.
Send Message	**Message template to send**	Send Message triggers a notification based on provided message

Action type	Required settings	Description
		template. This action will be taken at event/ enrollment **completion.** Message template will be parsed and variables will be substituted with actual values.

b. Click **Save**.

c. (Optional) Repeat above steps to add more actions.

6. Click **Save**.

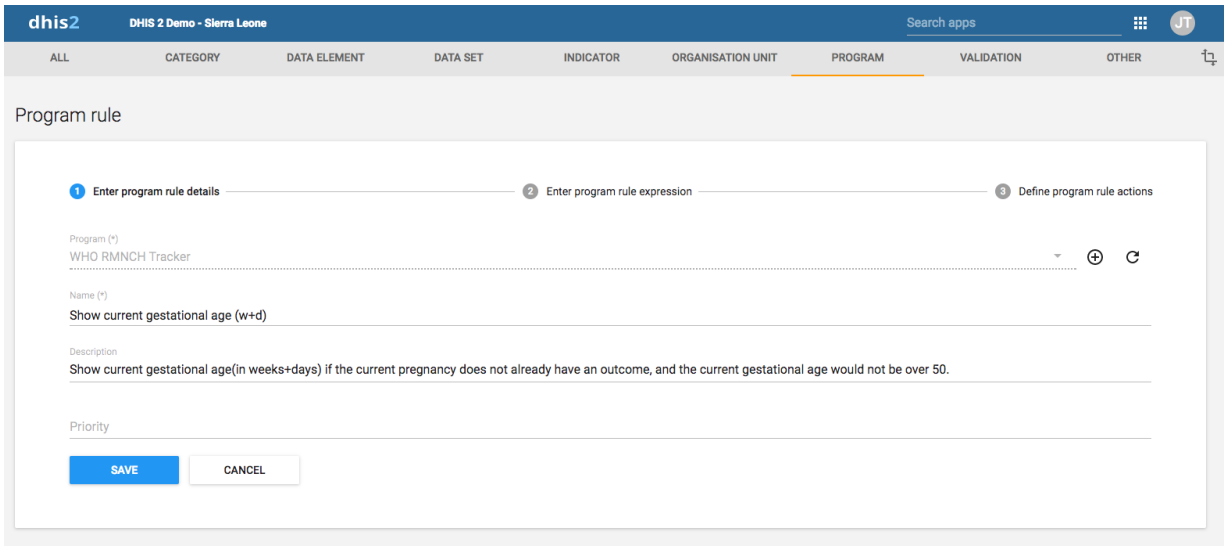
21.5.5. Example: Program rules

> **Note**
>
> You can view all examples on the demo server: https://play.dhis2.org/dev/dhis-web-maintenance/#/list/programSection/programRule

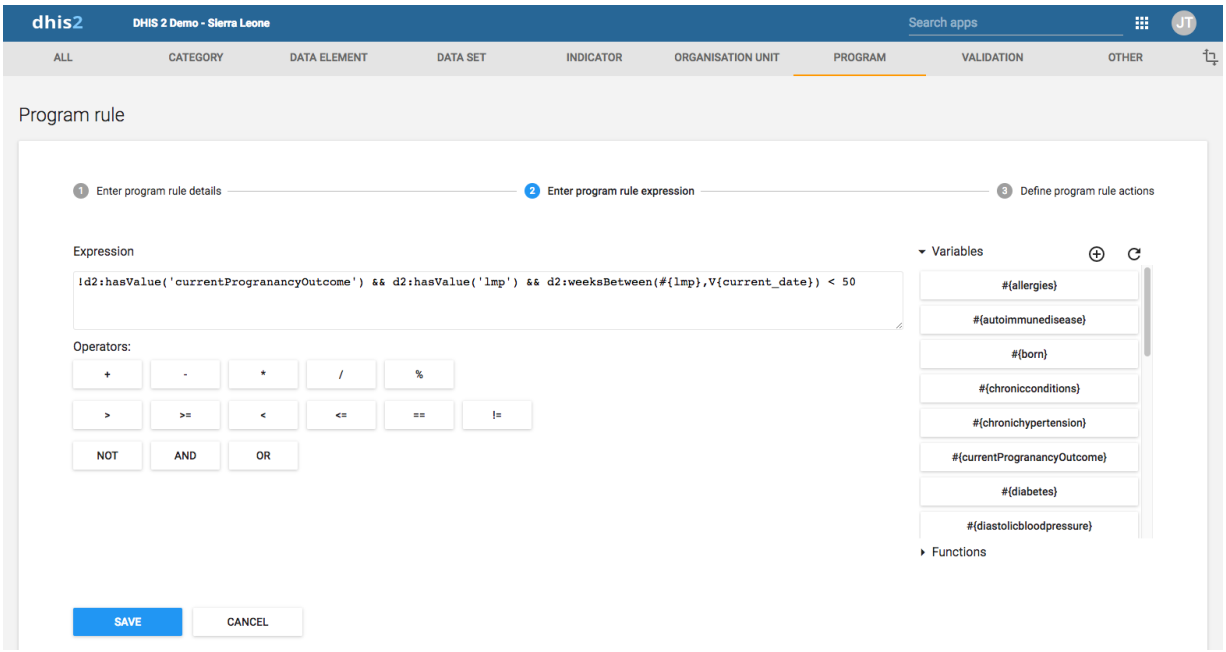
Example 21.16. Display key/value pair

This example shows how to configure a program rule which calculate number of weeks and days in a pregnancy and display the result in the format the clinician is used to see it in. The calculation is based on previous recorded data.

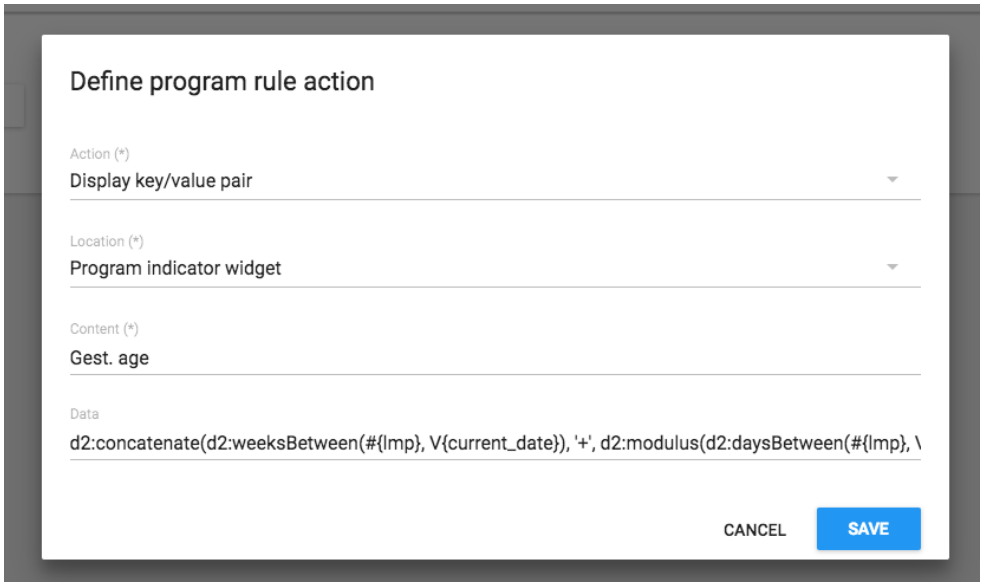
1. **Program rule details**



2. **Program rule expression**



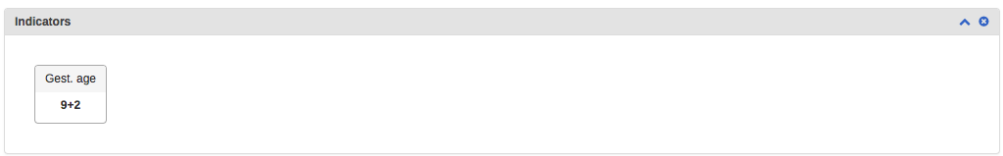
3. **Program rule action**



The full expression in the **Data** field:

```
d2:concatenate(d2:weeksBetween(#{lmp}, V{current_date}), '+',
d2:modulus(d2:daysBetween(#{lmp}, V{current_date}), 7))
```

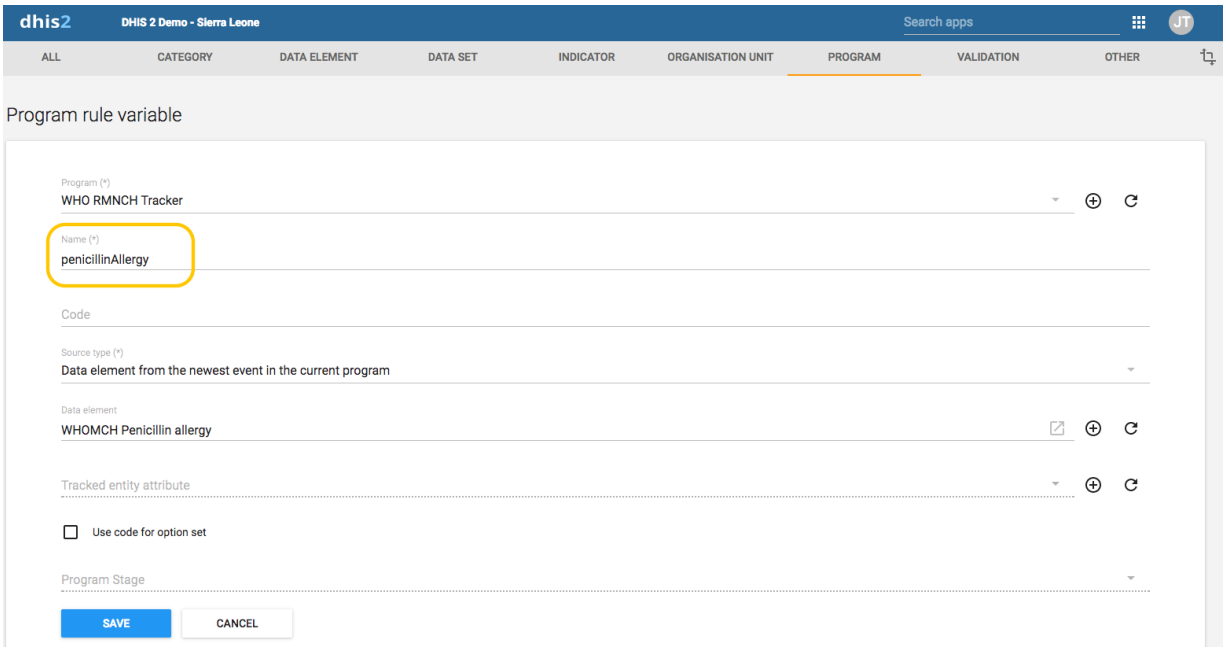
Result of program rule in Tracker Capture or Event Capture apps:



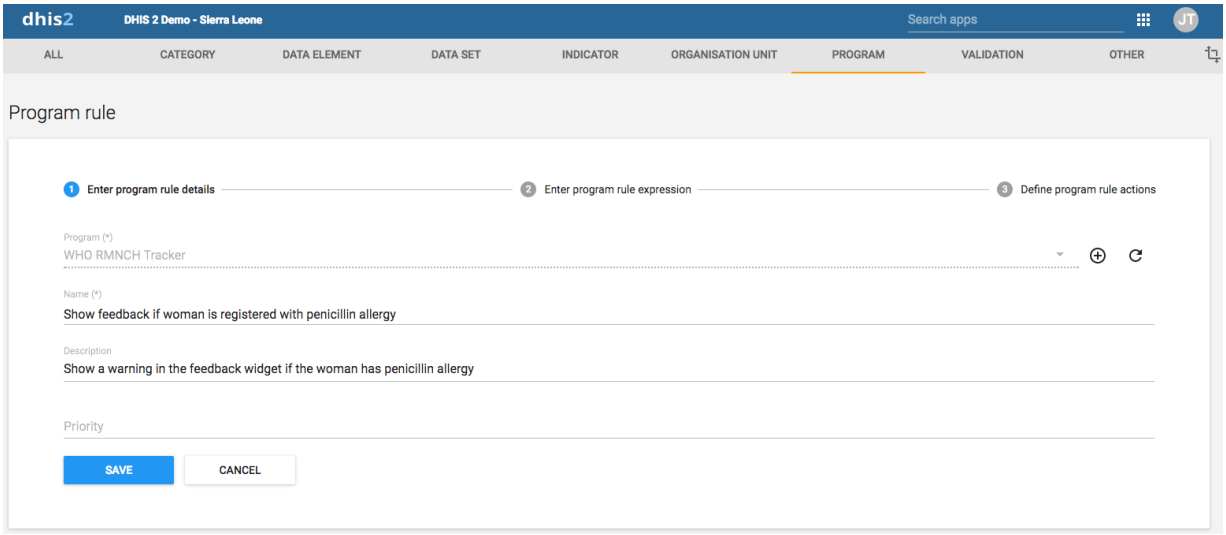
Example 21.17. Show display text in Feedback widget

This example shows how to configure a program rule to display text in the Feedback widget in the **Tracker Capture** app.

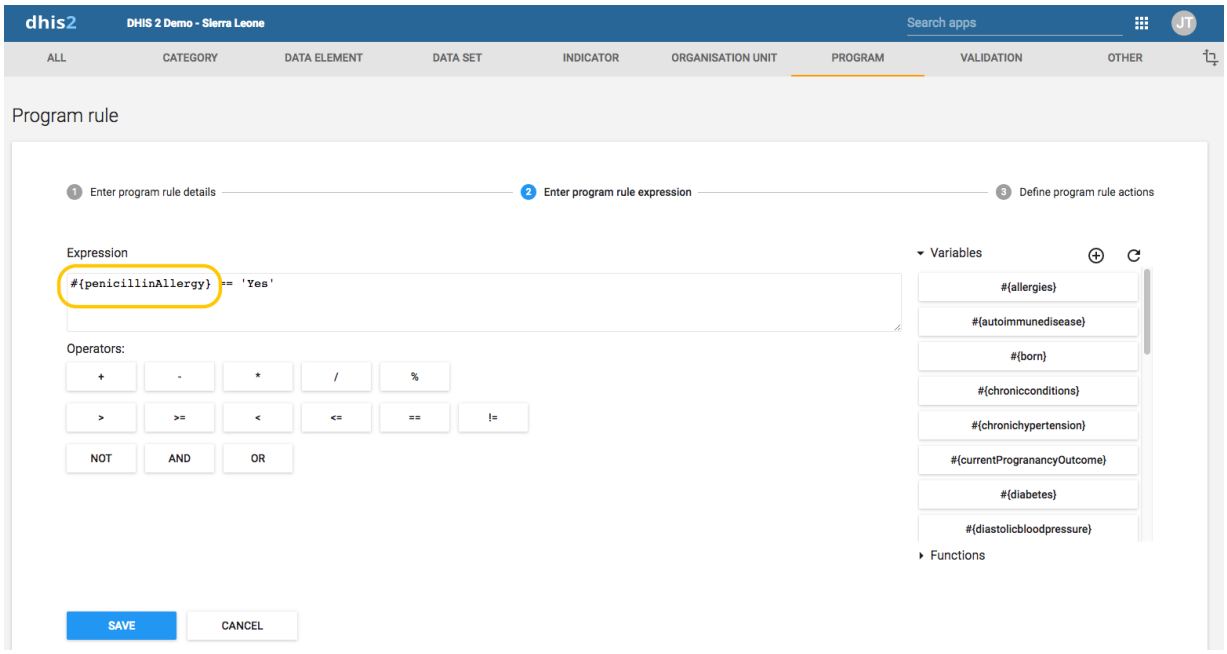
1. **Program rule variable**



2. **Program rule details**

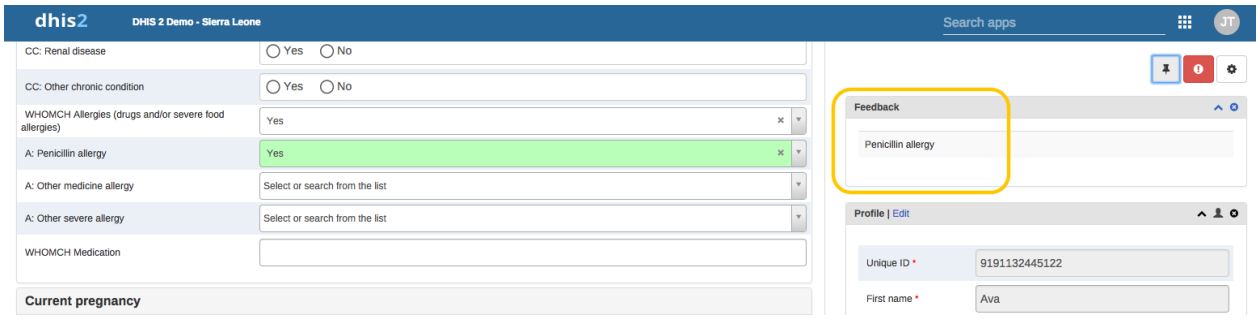


3. **Program rule expression**



4. **Program rule action**

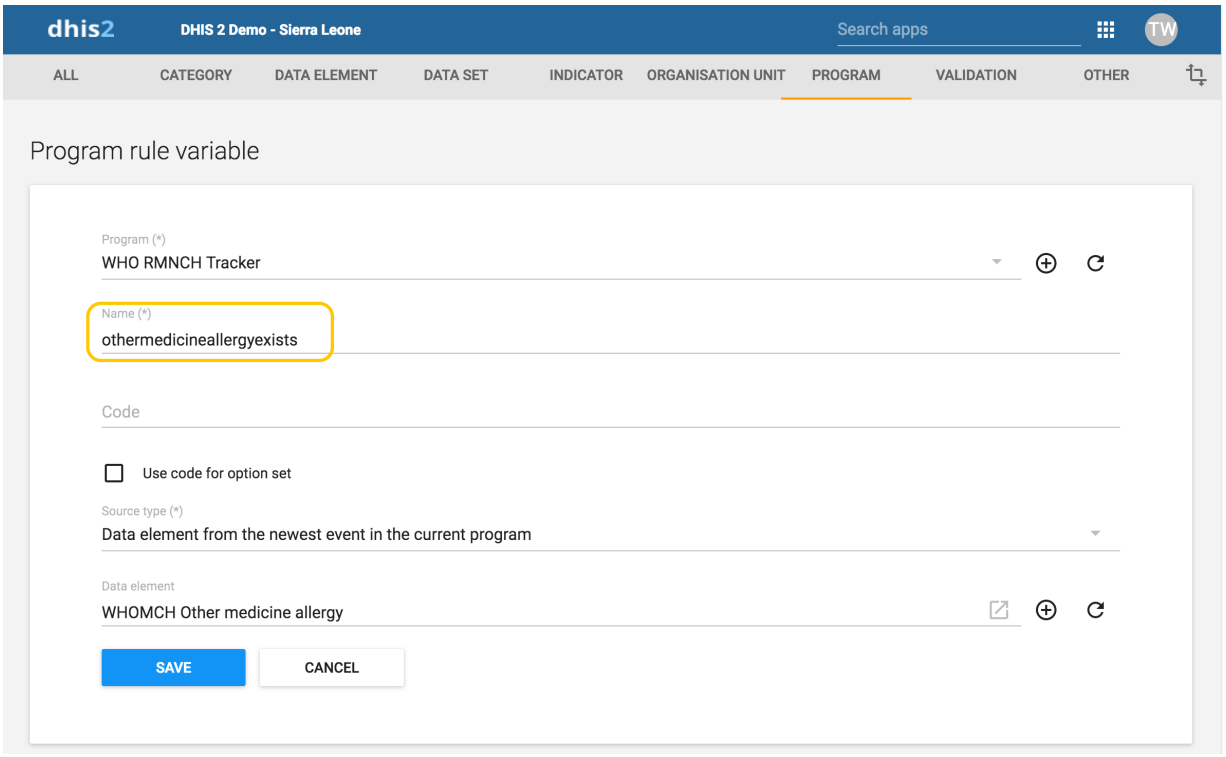
Result of program rule in Tracker Capture or Event Capture apps:



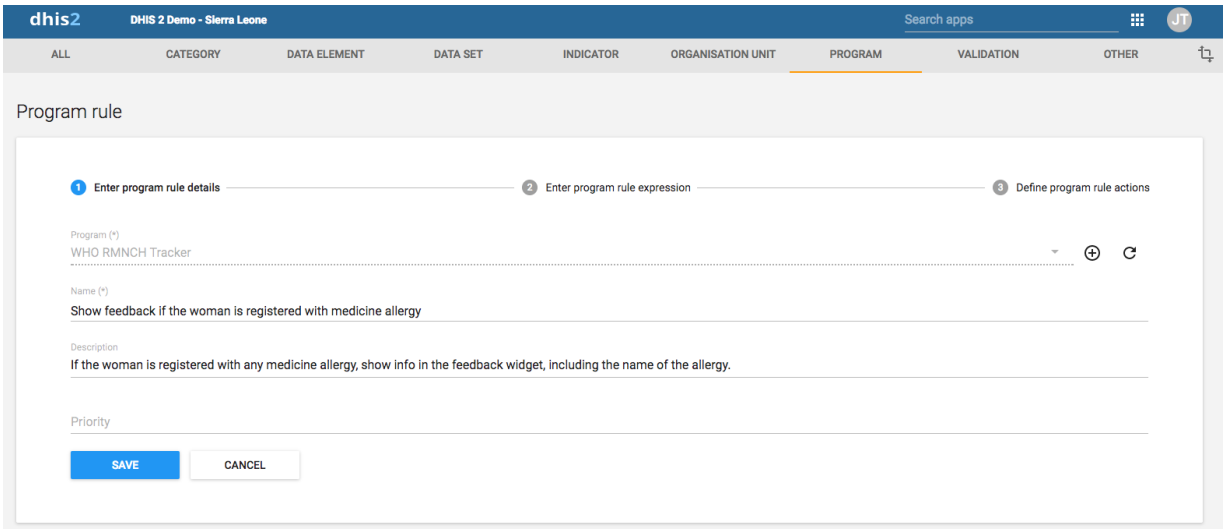
Example 21.18. Show information from first program stage in Feedback widget

This example shows how to configure a program rule to always display certain data in the Feedback widget in the **Tracker Capture** app. This is useful when you want to make sure that vital data, for example medicine allergies, is always visible.

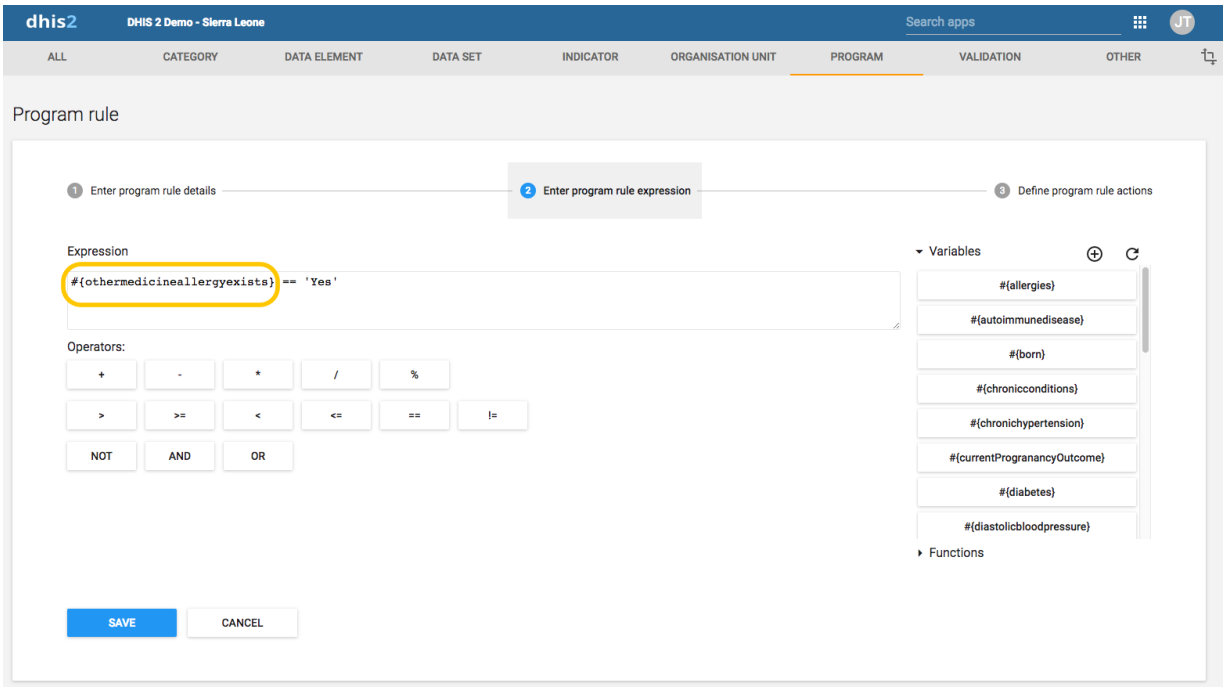
1. **Program rule variable**



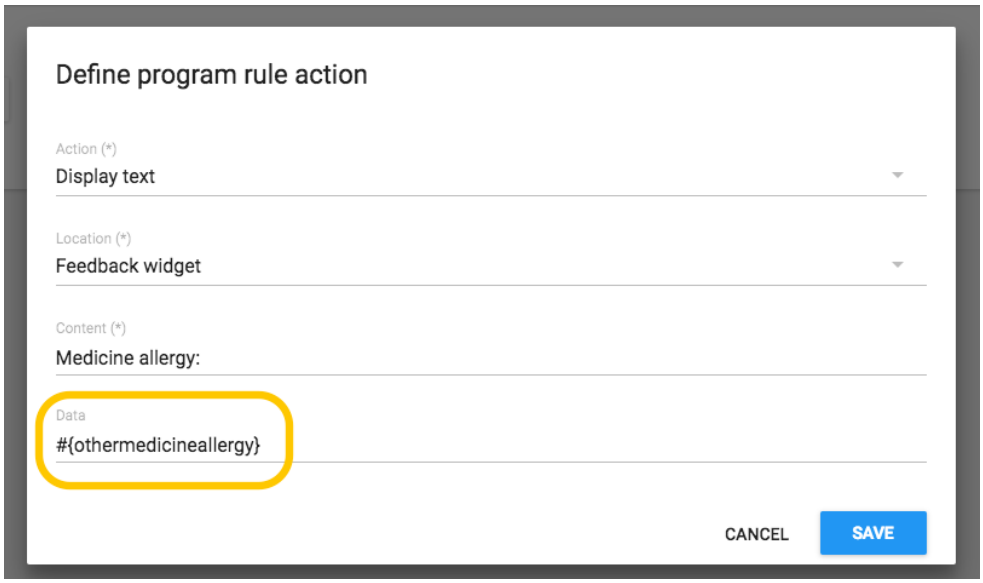
2. **Program rule details**



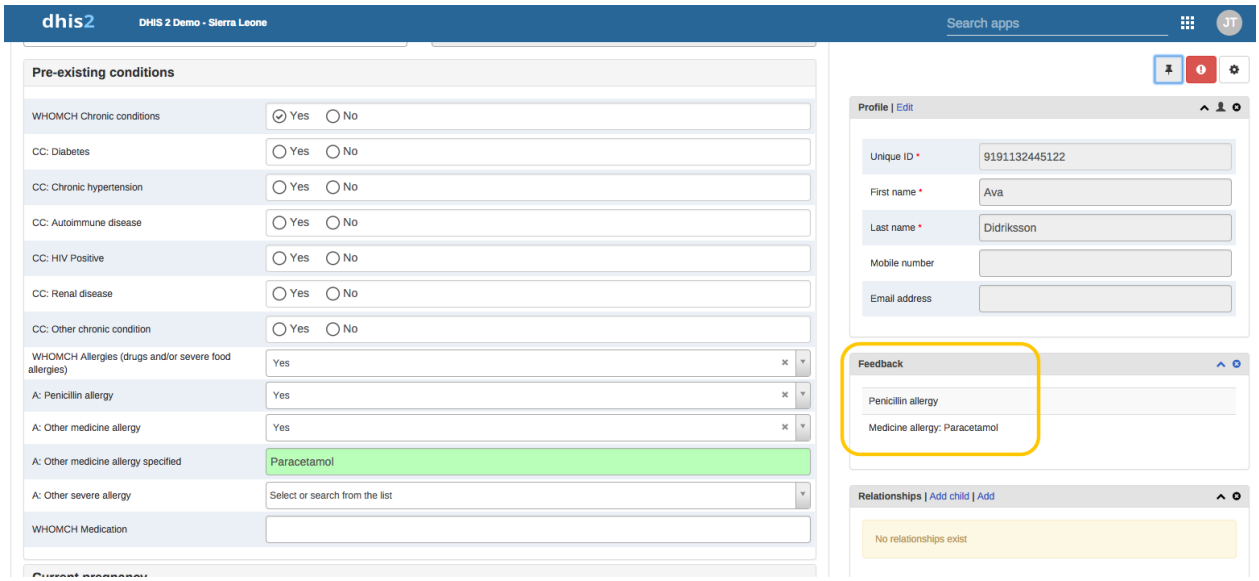
3. **Program rule expression**



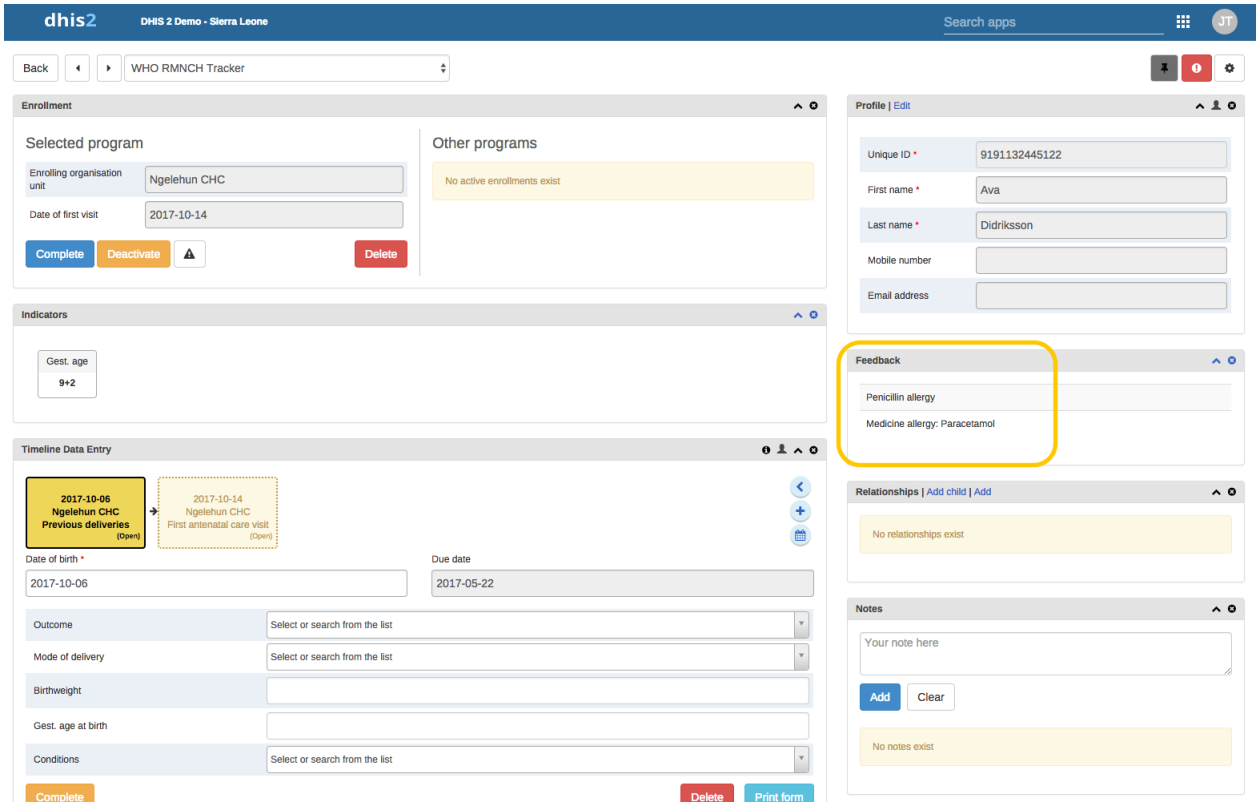
4. **Program rule action**



Medicine allergies recorded in first program stage in the Tracker Capture app:



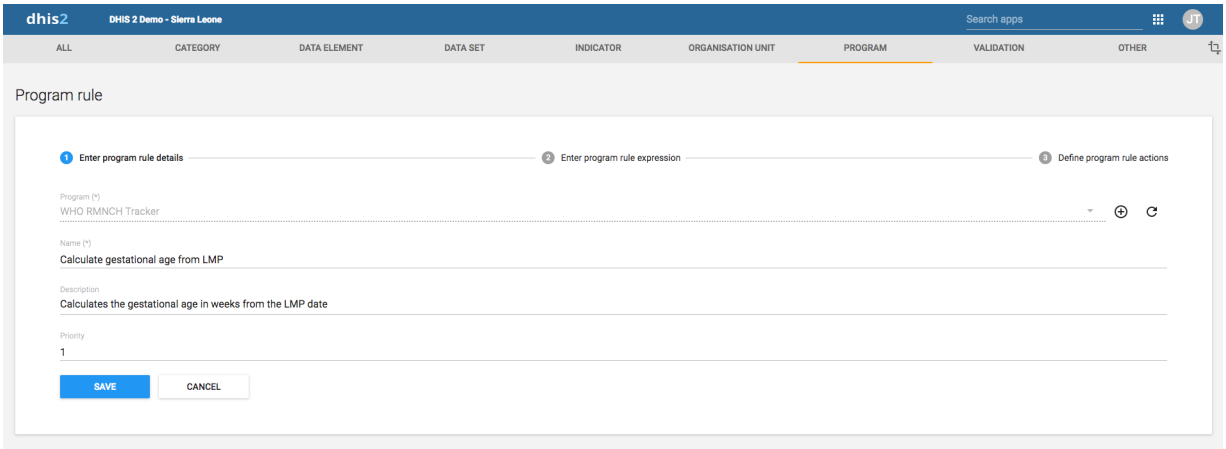
Result of program rule in the Tracker Capture app:



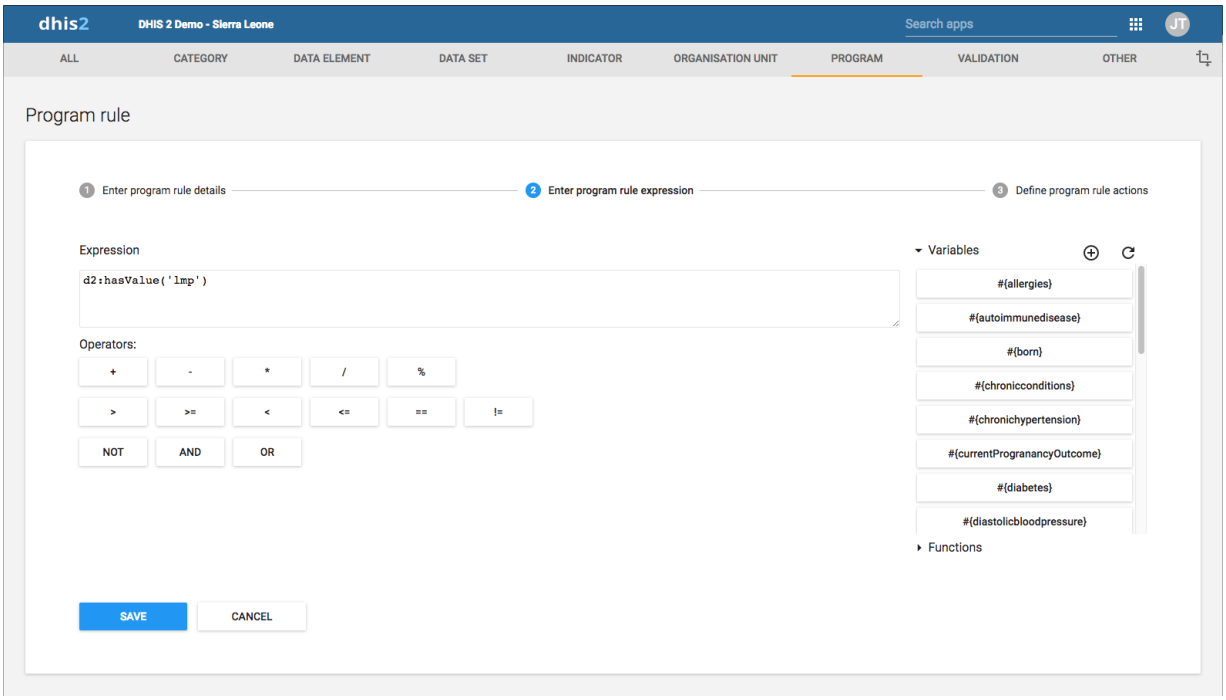
Example 21.19. Calculate gestational age in weeks at visit

By using a program rule of type "Assign value" you can calculate the "Gestational age at visit" value and fill it in the data entry form. You configure the program rule to calculate "Gestational age at visit" based on either "LMP date" or "Ultrasound estimated due date".

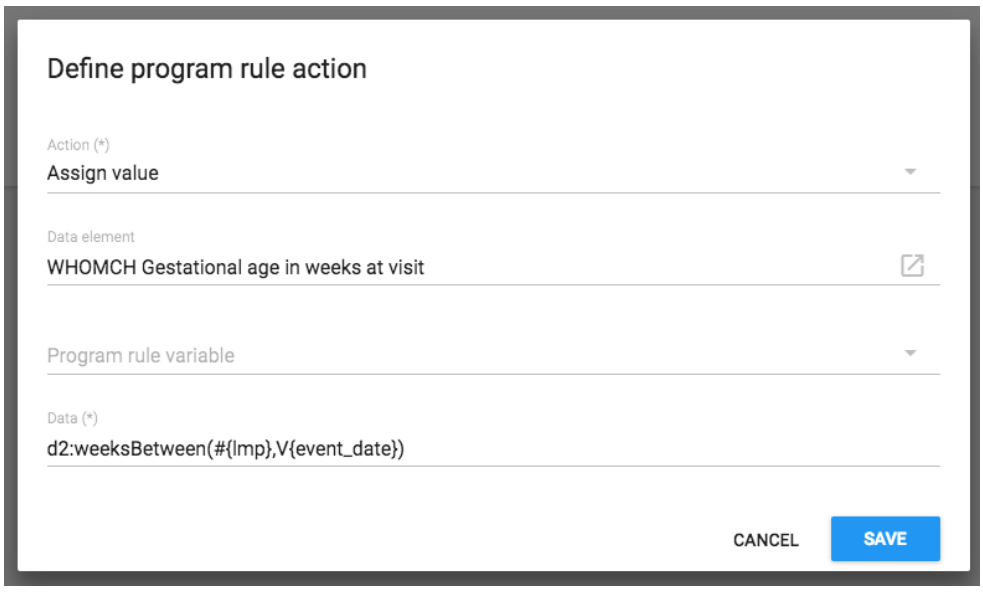
1. **Program rule details**



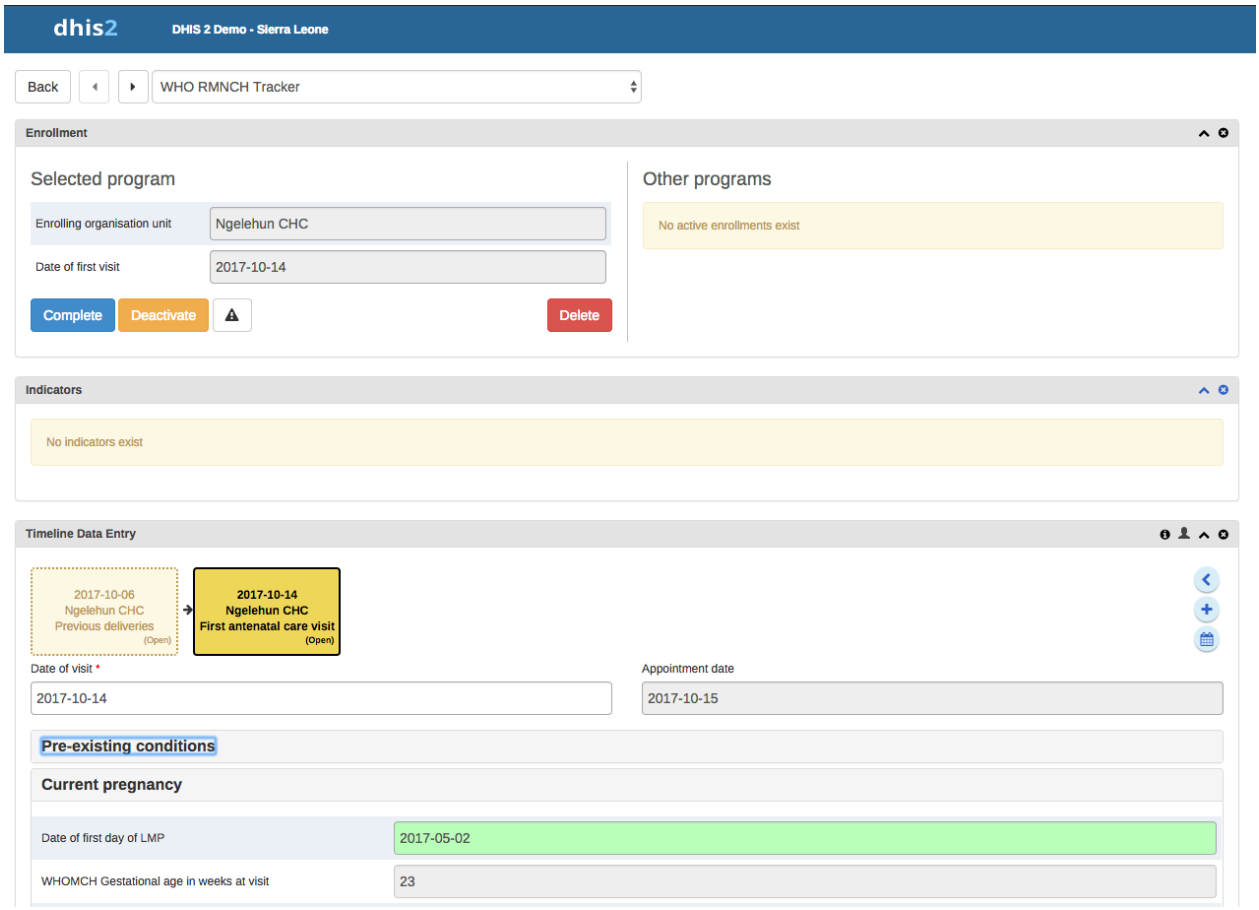
2. **Program rule expression**



3. **Program rule action**



Result of program rule in Tracker Capture or Event Capture apps:



21.5.6. Reference information: Operators and functions to use in program rule expression

Tip

You can nest functions within each other and with subexpressions to form more complex conditions. An example that produces the gestational age in weeks, based on last menstrual date:

```
d2:floor( d2:daysBetween(#{lastMenstrualDate},V{event_date}) / 7 )
```

Tip

The source type will determine how the d2: function calls will evaluate a (sourcefield) parameter.

Example: where #{hemoglobinCurrent} is set to source type **Data element in current event**. The following function call with evaluate whether hemoglobin is entered in the current event.

```
d2:hasValue( 'hemoglobinCurrent' )
```

Example: where #{hemoglobin} is set to source type **Data element from the newest event in the current program**. The following function call with evaluate whether there exists a value for the hemoglobin in any event in the enrollment.

```
d2:hasValue( 'hemoglobin' )
```

Example: where #{hemoglobinPrevious} is set to source type **Data element from previous event** . The following function call with evaluate whether there exists a value for the hemoglobin among the events preceding the current event.

```
d2:hasValue( 'hemoglobinPrevious' )
```

Table 21.12. Possible operators to use in a program rule expression

Operator	Description
+	Add numbers together
-	Subtract numbers from each other
*	Multiply two numbers
/	Divide two numbers
%	The modulus of two numbers
&&	Logical AND. True only when the expression on the left and right side is true. The left and right side can be yes/no, yes only or a subexpression in parenthesis.
||	Logical OR. True when either the expression on the left or the expression on the right side is true. The left and right side can be yes/no, yes only or a subexpression in parenthesis.
>	Left number greater than right number
>=	Left number greater than or equal to right number
<	Left number less than right number
<=	Left number less than or equal to right number.
==	Left side equal to right side. Supports numbers, text, yes/no and yes only.
!=	Left side not equal to right side. Supports numbers, text, yes/no and yes only.
!	Negates the following value. Can be used for yes/no, yes only or a sub-expression in parenthesis.
()	Parenthesis is used to group sub-expressions.

Table 21.13. Custom functions to use in a program rule expression

Function	Arguments	Description
d2:ceil	(number)	Rounds the input argument **up** to the nearest whole number. Example: `d2:ceil(#{hemoglobinValue})`
d2:floor	(number)	Rounds the input argument **down** to the nearest whole number. An example producing the number of weeks the woman is pregnant. Notice that the subexpression #{gestationalAgeDays}/7 is evaluated before the floor function is executed: `d2:floor(#{gestationalAgeDays}/7)`
d2:round	(number)	Rounds the input argument to the nearest whole number.

Function	Arguments	Description
d2:modulus	(number,number)	Produces the modulus when dividing the first with the second argument. An example producing the number of days the woman is into her current pregnancy week: `d2:modulus(#{gestationalAgeDays},7)`
d2:zing	(number)	Evaluates the argument of type number to zero if the value is negative, otherwise to the value itself.
d2:oizp	(number)	Evaluates the argument of type number to one if the value is zero or positive, otherwise to zero.
d2:concatenate	(object, [,object, object,...])	Produces a string concatenated string from the input parameters. Supports any number of parameters. Will mainly be in use in future action types, for example to display gestational age with d2:concatenate('weeks','+','gestationalageDays').
d2:daysBetween	(date, date)	Produces the number of days between the first and second argument. If the second argument date is before the first argument the return value will be the negative number of days between the two dates. The static date format is 'yyyy-MM-dd'. Example, calculating the gestational age(in days) of a woman, based on the last menstrual period and the current event date: `d2:daysBetween(#{lastMenstrualDate},V{event_date})`
d2:weeksBetween	(date, date)	Produces the number of full weeks between the first and second argument. If the second argument date is before the first argument the return value will be the negative number of weeks between the two dates. The static date format is 'yyyy-MM-dd'.
d2:monthsBetween	(date, date)	Produces the number of full months between the first and second argument. If the second argument date is before the first argument the return value will be the negative number of months between the two dates. The static date format is 'yyyy-MM-dd'.
d2:yearsBetween	(date, date)	Produces the number of years between the first and second argument. If the second argument date is before the first argument the return value will be the negative number of years between the two dates. The static date format is 'yyyy-MM-dd'.
d2:addDays	(date, number)	Produces a date based on the first argument date, adding the second argument number of days.

Function	Arguments	Description
		An example calculating the pregnancy due date based on the last menstrual period: `d2:addDays(#{lastMenstrualDate},283)`
d2:count	(sourcefield)	Counts the number of values that is entered for the source field in the argument. The source field parameter is the name of one of the defined source fields in the program - see example Example usage where #{previousPregnancyOutcome} is one of the source fields in a repeatable program stage "previous pregnancy": `d2:count('previousPregnancyOutcome')`
d2:countIfValue	(sourcefield,text)	Counts the number of matching values that is entered for the source field in the first argument. Only occurrences that matches the second argument is counted. The source field parameter is the name of one of the defined source fields in the program - see example. Example usage where #{previousPregnancyOutcome} is one of the source fields in a repeatable program stage "previous pregnancy". The following function will produce the number of previous pregnancies that ended with abortion: `d2:countIfValue('previousPregnancyOutcome','Abortion')`
d2:countIfZeroPos	(sourcefield)	Counts the number of values that is zero or positive entered for the source field in the argument. The source field parameter is the name of one of the defined source fields in the program - see example. Example usage where #{fundalHeightDiscrepancy} is one of the source fields in program, and it can be either positive or negative. The following function will produce the number of positive occurrences: `d2:countIfZeroPos('fundalHeightDiscrepancy')`
d2:hasValue	(sourcefield)	Evaluates to true of the argument source field contains a value, false if no value is entered. Example usage, to find if the source field #{currentPregnancyOutcome} is yet filled in: `d2:hasValue('currentPregnancyOutcome')`
d2:zpvc	(object, [,object, object,...])	Returns the number of numeric zero and positive values among the given object

Function	Arguments	Description
		arguments. Can be provided with any number of arguments.

d2:validatePattern	(text, regex-pattern)	Evaluates to true if the input text is an exact match with the supplied regular expression pattern. The regular expression needs to be escaped.
		
		Example expression, triggering actions if a number is not on the pattern 9999/99/9:
		
		`!d2:validatePattern(A{nrc},'\\d{6}\/\\d{2}\/\\d')`
		
		Example expression, triggering actions that if the address is not consisting of letters or white spaces, then a white space, then a number:
		
		`!d2:validatePattern(A{registrationAddress},'[\\w ]+ \\d+')`
		
		Example, triggering actions if a name contains any numbers:
		
		`!d2:validatePattern(A{name},'[^\\d]*')`
		
		Example expression, triggering actions if a mobile number contains the illegal number sequence 555:
		
		`d2:validatePattern(A{mobile} ,'.*555.*')`

d2:left	(text, num-chars)	Evaluates to the left part of a text, num-chars from the first character. The text can be quoted or evaluated from a variable: `d2:left(#{variableWithText}, 3)`
d2:right	(text, num-chars)	Evaluates to the right part of a text, num-chars from the last character. The text can be quoted or evaluated from a variable: `d2:right(#{variableWithText}, 2)`
d2:substring	(text, start-char-num, end-char-num)	Evaluates to the part of a string specified by the start and end character number. Example expression: `d2:substring(#{variableWithText}, 1, 3)` If the #{variableWithText} in the above example was 'ABCD', then the result of the evaluation would be 'BC'
d2:split	(text, delimiter, element-num)	Split the text by delimiter, and keep the nth element(0 is the first).

Function	Arguments	Description
		The text can be quoted or evaluated from a variable, the delimiter must be quoted: `d2:split(#{variableWithText}, '-', 1)` Note: comma delimiter(,) is not supported.
d2:length	(text)	Find the length of a string. Example: `d2:length(#{variableWithText})`

Table 21.14. Standard variables to use in program rule expressions

Variable	Type	Description
V{current_date}	(date)	Contains the current date whenever the rule is executed. Example expression: `d2:daysBetween(#{symptomDate},V{current_date}) < 0`
V{event_date}	(date)	Contains the event date of the current event execution. Will not have a value at the moment the rule is executed as part of the registration form.
V{due_date}	(date)	This variable will contain the current date when the rule is executed. Note: This means that the rule might produce different results at different times, even if nothing else has changed.
V{event_count}	(number)	Contains the total number of events in the enrollment.
V{enrollment_date}	(date)	Contains the enrollment date of the current enrollment. Will not have a value for single event programs.
V{incident_date}	(date)	Contains the incident date of the current enrollment. Will not have a value for single event programs.
V{enrollment_id}	(string)	Universial identifier string(UID) of the current enrollment. Will not have a value for single event programs.
V{event_id}	(string)	Universial identifier string(UID) of the current event context. Will not have a value at the moment the rule is executed as part of the registration form.
V{orgunit_code}	(string)	Contains the code of the orgunit that is linked to the current enrollment. For single event programs the code from the current event orgunit will be used instead.

Variable	Type	Description
		Example expression to check wether orgunit code starts with WB_: `d2:left(V{orgunit_code},3) == 'WB_'`

21.6. Configure relationship types

21.6.1. About relationship types

A relationship type defines the relationship between tracked entity A and tracked entity B, for example mother and child.

21.6.2. Create or edit a relationship type

1. Open the **Maintenance** app and click **Program** > **Relationship type**.
2. Click the add button.
3. Type a **Name** of the relationship type.
4. (Optional) Assign a **Code**.
5. In the **A is to B** field, enter a description of which relationship tracked entity A has to tracked entity B, for example mother.
6. In the **B is to A** field, enter a description of which relationship tracked entity B has to tracked entity A, for example child.
7. Click **Save**.

21.7. Configure tracked entities

21.7.1. About tracked entities

A tracked entity is a types of entities which can be tracked through the system. It can be anything from persons to commodities, for example a medicine or a person.

A program must have one tracked entity. To enrol a tracked entity instance into a program, the tracked entity of an entity and tracked entity of a program must be the same.

Tracked entity attributes are used to register extra information for a tracked entity. Tracked entity attributes can be shared between programs.

21.7.2. Create or edit a tracked entity attribute

1. Open the **Maintenance** app and click **Program** > **Tracked entity attribute**.
2. Click the add button.
3. In the **Name** field, type the tracked entity attribute name.
4. (Optional) Type a **Short name**.
5. (Optional) In the **Code** field, assign a code.
6. (Optional) Type a **Description**.

7. Select an **Option set**.
8. In the **Value type** field, select the type of data that the tracked entity attribute will record.

Table 21.15. Value types

Value type	Description
Age	-
Coordinate	A point coordinate specified as longitude and latitude in decimal degrees. All coordinate should be specified in the format "-19.23 , 56.42" with a comma separating the longitude and latitude.
Date	Dates render as calendar widget in data entry.
Date & time	-
E-mail	-
File	A file resource where you can store external files, for example documents and photos.
Image	Similar to File, but restricted to images.
Integer	Any whole number (positive and negative), including zero.
Letter	-
Long text	Textual value. Renders as text area in forms.
Negative integer	Any whole number less than (but not including) zero.
Number	Any real numeric value with a single decimal point. Thousands separators and scientific notation is not supported.
Percentage	Whole numbers inclusive between 0 and 100.
Phone number	
Positive integer	Any whole number greater than (but not including) zero.
Positive of zero integer	Any positive whole number, including zero.
Organisation unit	-
Unit interval	Any real number greater than or equal to 0 and less than or equal to 1.
Text	Textual value. The maximum number of allowed characters per value is 50,000.
Time	Time is stored in HH:mm format. HH is a number between 0 and 23 mm is a number between 00 and 59
Tracker associate	-

Value type	Description
Username	This will be populated with the username of the user which performs data entry automatically during the data entry process.
Yes/No	Boolean values, renders as drop-down lists in data entry.
Yes only	True values, renders as check-boxes in data entry.

9. Select an **Aggregation type**.

Table 21.16. Aggregation operators

Aggregation operator	Description
Average	Average the values in both the period as and the organisation unit dimensions.
Average (sum in organisation unit hierarchy)	Average of data values in the period dimension, sum in the organisation unit dimensions.
Count	Count of data values.
Min	Minimum of data values.
Max	Maximum of data values.
None	No aggregation is performed in any dimension.
Sum	Sum of data values in the period and organisation unit dimension.
Standard deviation	Standard deviation (population-based) of data values.
Variance	Variance (population-based) of data values.

10. Select **Unique** to specify that the values of the tracked entity attribute is unique.

    There are two options for the unique setting:

    - **Entire system**: The values of the tracked entity attribute can duplicate with values which belong to other tracked entity attributes. But the values in this tracked entity attribute must not duplicate.

      Select **Automatically generated** to allow automatic generation of the tracked entity attribute value. When the generate setting is selected on, an optional field for specifying pattern also displays. This field should contain a pattern based on the TextPattern syntax. When the value is automatically generated, it will be unique for this attribute for the entire system. See the TextPattern section for more information on how it works.
    - **Organisation unit**: The values of the tracked entity attribute must not duplicate in the same organisation unit.

11. Select **Inherit** to registry a new entity for relationship with an available entity, all inherit entity attribute values of the entity will be pre-filled in the registration form.
12. (Optional) Select **Confidential**.

    This option is only available if you have configured encryption for the system.
13. (Optional) Select **Display in list without program**.
14. (Optional) Assign one or multiple **Legends**.
15. Click **Save**.

21.7.3. Create or edit a tracked entity type

1. Open the **Maintenance** app and click **Program** > **Tracked entity type**.
2. Click the add button or an already exsisting **tracked entity type**.
3. Type a **Name** of the tracked entity.
4. (Optional) Enter a **Description** of the tracked entity.
5. (Optional) Enter a **Minimum number of attributes required to search**. This specifies the amount of attributes that need to be filled out in order to be able to search for this **tracked entity type** in a *global search*. See Configure Search for more information.
6. (Optional) Enter a **Maximum number of tracked entity instances to return in search**. This specifies the amount of tracked entity instances that will be returned in a *global search*. See Configure Search for more information.
7. (Optional) Add **Tracked entity type attributes**. This is used to configure search, see Configure Search for more information.
8. (Optional) Enter an **Alternative name** of the tracked entity.
9. Click **Save**.

21.8. Configure search

Users can be given search organisation units, which makes it possible to search for tracked entity instances outside their data capture organisation units.

Searching can be done either in the context of a program, or in the context of a tracked entity type. To be give users the option of searching in the context of a program, it is necessary to configure which of the programs tracked entity attributes is searchable. To give users the option of searching in the context of a tracked entity type, you will have to configure which of the tracked entity type attributes is searchable.

21.8.1. Configure search for tracker program

To be able to search with a program, you will have to make some of the program attributes searchable. Unique program attributes will always be searchable.

1. Open **Program app**
2. Open or create a tracker program
3. Go to **Attributes**
4. If you have no attributes, add one
5. Set the attribute searchable

Searchable program attributes will assigned to a search group.

- Unique group. One group per unique program attribute. Unique attributes cannot be combined with other program attributes in a search. The result from the search can only be 0 or 1 tracked entity instance.
- Non-unique group. This group contains all non-unique program attributes and makes it possible to combine multiple attributes in a search.

There are two limits that can be set for a program search, as part of the **Program** configuration.

- Minimum number of attributes required to search: This property defines how many of the non-unique attributes that must be entered before a search can be performed.

- Maximum number of tracked entity instances to return: This property defines the maximum number of results a user will get in her search. If a too large number of tracked entity instances is found, the user must provide a more specific search.

21.8.2. Configure search for tracked entity type

Note

TET = Tracked entity type

To be able to search without a program, you will have to make some of the TET attributes searchable. Unique TET attributes will always be searchable.

1. Open **Tracked entity type app**
2. Open a Tracked entity type
3. If the TET has no attributes, add one
4. Set the attribute searchable

Searchable TET attributes will assigned to a search group.

- Unique group. One group per unique TET attribute. Unique attributes cannot be combined with other TET attributes in a search. The result from the search can only be 0 or 1 tracked entity instance.
- Non-unique group. This group contains all non-unique TET attributes and makes it possible to combine multiple attributes in a search.

There are two limits that can be set for a TET search

- Minimum number of attributes required to search: This property defines how many of the non-unique attributes that must be entered before a search can be performed.
- Maximum number of tracked entity instances to return: This property defines the maximum number of results a user will get in her search. If a too large number of tracked entity instances is found, the user must provide a more specific search.

21.8.3. Configure search organisation units for a user

To be able to search in other organisation units than the users data capture organisation units, the user must be assigned with search organisation units. Giving a user a search organisation unit will also give it access to search in all children of that organisation unit.

1. Open **Users app**
2. Click on a user
3. Open **Assign search organisation units**
4. Select organisation units
5. Click **Save**

21.9. Clone metadata objects

Cloning a data element or other objects can save time when you create many similar objects.

1. Open the **Maintenance** app and find the type of metadata object you want to clone.
2. In the object list, click the options menu and select **Clone**.
3. Modify the options you want.
4. Click **Save**.

21.10. Delete metadata objects

Note

You can only delete a data element and other data element objects if no data is associated to the data element itself.

Warning

Any data set that you delete from the system is irrevocably lost. All data entry forms, and section forms which may have been developed will also be removed. Make sure that you have made a backup of your database before deleting any data set in case you need to restore it at some point in time.

1. Open the **Maintenance** app and find the type of metadata object you want to delete.
2. In the object list, click the options menu and select **Delete**.
3. Click **Confirm**.

21.11. Change sharing settings for metadata objects

You can assign different sharing settings to metadata objects, for example organisation units and tracked entity attributes. These sharing settings control which users and users groups that can view or edit a metadata object.

Some metadata objects also allows you to change the sharing setting of data entry for the object. These additional settings control who can view or enter data in form fields using the metadata.

Note

The default setting is that everyone (**Public access**) can find, view and edit metadata objects.

1. Open the **Maintenance** app and find the type of metadata object you want to modify.
2. In the object list, click the context menu and select **Sharing settings**.
3. (Optional) Add users or user groups: search for a user or a user group and select it. The user or user group is added to the list.
4. Change sharing settings for the access groups you want to modify.
   - **Can edit and view**: The access group can view and edit the object.
   - **Can view only**: The access group can view the object.
   - **No access** (only applicable to **Public access**): The public won't have access to the object.
5. Change data sharing settings for the access groups you want to modify.
   - **Can capture data**: The access group can view and capture data for the object.
   - **Can view data**: The access group can view data for the object.
   - **No access**: The access group won't have access to data for the object.
6. Click **Close**.

21.12. Display details of metadata objects

1. Open the **Maintenance** app and find the type of metadata object you want to view.
2. In the object list, click the options menu and select **Show details**.

21.13. Translate metadata objects

DHIS2 provides functionality for translations of database content, for example data elements, data element groups, indicators, indicator groups or organisation units. You can translate these elements to any number of locales. A locale represents a specific geographical, political, or cultural region.

Tip

To activate a translation, open the **System Settings** app, click > **Appearance** and select a language.

1. Open the **Maintenance** app and find the type of metadata object you want to translate.
2. In the object list, click the options menu and select **Translate**.

Tip

If you want to translate an organisation unit level, click directly on the **Translate** icon next to each list item.

3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

Chapter 22. Configure programs in the Programs/Attributes app (legacy app)

Changes in how you configure programs from version 2.27

- You create program indicators and program rules in the **Maintenance** app. It's no longer possible to create program indicators and program rules in the legacy **Program / Attributes** app.
- You can create event programs (programs without registration) in the **Maintenance** app. The old version of this functionality is also available in the legacy **Program / Attributes** app.

22.1. About programs

There are three type of programs:

- Multi events with registration program (MEWR):

  Used for programs with many stages, for example Mother Health Program with stages such as ANC Visit (2-4+), Delivery, PNC Visit.

- Single event with registration program (SEWR):

  Used for birth certificate and death certificate. This type of programs have only one stage. An TEI just can enroll into the program one time.

- Single event without registration program (anonymous program or SEWoR):

  Used for saving health cases without registering any information into the system. This type of programs have only one stage.

A program must be specified with only one tracked entity. Only tracked entity as same as the tracked entity of program can enroll into that program.

A program needs several types of metadata that you create in the **Program / Attributes** and **Maintenance** apps.

Table 22.1. Program metadata objects in the Program / Attributes app

Object type	Description	Available functions
Program	A program consist of program stages.	Create, edit, share, delete, assign to organisation units, show details and translate
Program stage	A program stage defines which actions should be taken at each stage.	Create, edit, change sort order, delete, show details and translate
Program stage section	N/A	Create, edit, change sort order, delete, show details and translate
Program indicator group	A group of program indicators	Create, edit, delete, show details and translate
Validation rule	A validation rule is based on an expression which defines	Create, edit and delete

Object type	Description	Available functions
	a relationship between data element values.	
Program notification	Automated message reminder Set reminders to be automatically sent to enrolled tracked entity instances before scheduled appointments and after missed visits.	Create, edit and delete
Program stage notification	-	Create, edit and delete
Design custom registration form	-	-

Table 22.2. Program metadata objects in the Maintenance app

Object type	Description	Available functions
Event program	A single event without registration program	Create, edit, share, delete, show details and translate
Program indicator	An expression based on data elements and attributes of tracked entities which can be used to calculate values based on a formula.	Create, edit, share, delete, show details and translate
Program rule	Allows you to create and control dynamic behavior of the user interface in the **Tracker Capture** and **Event Capture** apps.	Create, edit, delete, show details and translate
Relationship type	Defines the relationship between tracked entity A and tracked entity B, for example mother and child.	Create, edit, clone, delete, show details and translate
Tracked entity	Types of entities which can be tracked through the system. Can be anything from persons to commodities, for example a medicine or a person. A program must have one tracked entity. And entity registered must be specified an tracked entity. To enrol a tracked entity instance into a program, the tracked entity of an entity and tracked entity of a program must be the same.	Create, edit, clone, delete, show details and translate
Tracked entity attribute	Used to register extra information for a tracked entity.	Create, edit, clone, share, delete, show details and translate

Object type	Description	Available functions
	Can be shared between programs.	

To learn how you create program metadata in the Maintenance app, see Configure programs in the Maintenance app

22.2. Manage programs

22.2.1. Create a program

1. Open the **Program / Attributes** app and click **Program**.
2. Click **Add new**.
3. Enter program details:
   a. Enter a program **Name**.
   b. Enter a **Short name**.
   c. Enter a **Description** of the program.
   d. Select a **Type**.
   e. Select a **Tracked entity**.
   f. Select a **Combination of categories**.
   g. Select a **Data approval workflow**.
   h. Select if you want to **Display front page list**.
   i. Select if **First stage appears on registration page**.
   j. Enter number of **Completed events expiry days**.

      Defines the number of days for which you can edit a completed event. This means that when an event is completed and the specified number of expiry days has passed, the event is locked.

      Example 22.1.

      If you set "Completed events expiry days" to 10", an event is locked ten days after the completion date. After this date you can no longer edit the event.

   k. Select an **Expiry period type** and enter number of **Expiry days**.

      The expiry days defines for how many days after the end of the previous period, an event can be edited. The period type is defined by the expiry period type. This means that when the specified number of expiry days has passed since the end date of the previous period, the events from that period are locked.

      Example 22.2.

      If you set the expiry type to "Monthly" and the expiry days to "10" and the month is October, then you can't add or edit an event to October after the 10th of November.
4. Enter enrollment details:
   a. Select if you want to **Allow future enrollment dates**.
   b. Select if you want to **Allow future incident dates**.
   c. If you want a tracked entity to be able to enroll only once in a program, select **Only enroll once (per tracked entity instance lifetime)**

      This setting is useful for example in child vaccination or post-mortem examination programs where it wouldn't make sense to enroll a tracked entity more than once.

d. Select if you want to **Show incident date**.

This setting allows you to show or hide the incident date field when a tracked entity enroll in the program.

e. Enter a **Description of incident date**.

Example 22.3.

- In an immunization program for child under 1 year old, the incident date is the child's birthday,
- In a maternal program, the incident date is the date of last menstrual period.

f. Enter a **Description of enrollment date**.

Example 22.4.

The date when a tracked entity is registered to the system.

g. Select if you want to **Capture coordinates**.

5. Enter relationship shortcut details:

a. Select a **Relationship** type.

Example 22.5.

When a baby is born, you can register the baby and enroll him/her into the Child program from the "Delivery" event of the mother. After that, create a relationship as Mother/Child for this mother and the baby.

b. Enter a **Shortcut link label**.

The shortcut link label is displayed in Relation tab in the tracked entity instance (TEI) dashboard.

c. Select **Who is the new relative to the existing entity?**.

d. Select the **Program for new relative to be enrolled in**.

Specify a program that new relatives of the tracked entity will be enrolled in

6. Select if you want to **Skip generation of events that are overdue (before enrollment date)**.

When a tracked entity enrolls into the program, the events corresponding to the program stages are created. If you select this field, the system will not generate overdue events.

7. Assign tracked entity attributes.

a. In the list of **Available attributes**, double-click the attributes you want to assign to the program.

b. For each assigned attribute, review the settings. You can select:

- Display in list

This is the required field. Verify that at least one attribute has this property.

- Mandatory
- Date in future

8. Click **Add**.

22.2.2. Assign a program to organisation units

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to modify and select **Assign program to organisation units**.
3. Select organisation units.

4. Click **Save**.

22.2.3. Edit programs

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to modify and select **Edit**.
3. Modify the options you want.
4. Click **Update**.

22.2.4. Change sharing settings for programs

To set the authority for sharing a program:

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to modify and select **Sharing settings**.
3. (Optional) Add a user group:
   a. Search for a user group and select it.
   b. Click the plus icon.

   The user group is added to the list.
4. (Optional) If you want to allow external access, select **External access (without login)**.
5. Change the settings for the user groups you want to modify.
   - **None**: The program is private. Only the user who created it can see and use it.
   - **Can view**: Everyone in the user group can view the program.
   - **Can edit and view**: Everyone in the user group can view and edit the program.
6. Click **Save**.

22.2.5. Delete programs

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **Remove**.
3. Click **OK** to confirm.

22.2.6. Display programs

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **Show details**.

22.2.7. Translate program names

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **Translate**.
3. Select a locale.
4. Type a **Name**, **Short name** and **Description**.
5. Click **Save**.

22.3. Manage program stages

22.3.1. About program stages

A program consist of program stages. A program stage defines which actions should be taken at each stage.

22.3.2. Create a program stage

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to add a program stage to and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.
3. Click **Add new**.
4. Enter program stage details:
   a. Enter a **Name**.
   b. Enter a **Description**.
   c. In the **Scheduled days from start** field, enter the minimum number of days to wait for starting the program stage.
5. Enter repeatable program stage details.
   a. Specify if the program stage is **Repeatable** or not.
   b. Select a **Period type**.
   c. Enter **Standard interval days**.

      The number of days to repeat the repeatable program stage.
   d. Clear **Display generate event box after completed** if you don't want to display *Create new event box* to create new event for a repeatable stage after you click *Complete* for an event of the stage in data entry form. This field is select by default.
6. Enter form details.

Table 22.3.

Option	Action
Auto-generate event	Clear check box to prevent creating an event of this program stage automatically when a entity enroll in the program.
Open data entry form after enrollment	Select check box to automatically open the event of this stage as soon as the entity has enrolled into the program.
Report date to use	If you have selected the **Open data entry form after enrollment** check box, also select a **Report date to use**: **Date of incident** or **Date of enrollment**. This is the date used as report date for an event that has been opened automatically. If the **Report date to use** is selected as one of those two ('incident date'/'enrollment date'), in Dashboard, the 'Report date' of the event will be set as one of those two.

Option	Action
Block entry form after completed	Select check box to block the entry form after completion of the event of this stage. This means that the data in the entry form can't be changed until you reset the status to incomplete.
Ask user to complete program when stage is completed	Select check box to trigger a pop-up which asks the user if he/she wants to create the event of next stage.
Ask user to create new event when stage is complete	Select check box to trigger a pop-up which asks the users if he/she wants to create a new event of this stage when an event of this stage is completed. This property is active only if you have selected **Repeatable**.
Generate events by enrollment date	Check on it for auto-generating due dates of events from program-stages of this program based on the enrollment date. If it is not checked, the due dates are generated based on incident date.
Capture coordinates	Select check box to capture an event's coordinates. Many types of events may be recorded at a facility or be *owned-by* a health worker at a facility, but actually take place somewhere in the community.
Complete allowed only if validation passes	Select check box to enforce that an event created by this program stage is only completed when all validation rules have passed.
Pre-generate event UID	Select check box to pre-generate unique event id numbers.
Description of report date	Type a description of the report date. This description is displayed in the case entry form.

7. Assign data elements:

   a. In the list of **Available data elements**, double-click the data elements you want to assign to the program stage.

   b. For each assigned data element, review the properties. You can select:

   Table 22.4.

Option	Description
Compulsory	The value of this data element must be filled into data entry form before completing the event.
Allow provided elsewhere	Specify if the value of this data element comes from other facility, not in the facility where this data is entered.

Option	Description
Display in reports	Display the value of this data element into the single event without registration data entry function.
Date in future	Allow to select a date in future for date data elements.

8. Click **Add**.

22.3.3. Create a program stage section

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to add a program stage section to and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.
3. Click a program stage and select **Section management**.
4. Click **Add new**.
5. Enter a program stage section **Name**.
6. In the list of **Available data elements**, double-click the data elements you want to assign to the program stage section.
7. In the list of **Available indicators**, double-click the indicators you want to assign to the program stage section.
8. Click **Add**.

22.3.4. Change program stage sort order

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.
3. Click **Sort order**.
4. Modify the order of the program stages with the up and down arrows.
5. Click **Save**.

22.3.5. Change program stage section sort order

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.
3. Click a program stage and select **Section management**.
4. Click **Sort order**.
5. Modify the order of the program stage sections with the up and down arrows.
6. Click **Save**.

22.3.6. Edit program stages

1. Open the **Program / Attributes** app and click **Program**.

2. Click the relevant program and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.

3. Click the program stage you want to modify and select **Edit**.
4. Modify the options you want.
5. Click **Update**.

22.3.7. Display program stages

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.

3. Click the program stage you want to display and select **Show details**.

22.3.8. Translate program stages

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.

3. Click the program stage you want to modify and select **Translate**.
4. Select a locale.
5. Type a **Name**.
6. Click **Save**.

22.4. Manage program notifications

22.4.1. About program notifications

You can create program notifications for programs with registration and their program stages. The notifications are sent either via the internal DHIS2 messaging system, via e-mail or via text messages (SMS). You can use program notifications to, for example, send an automatic reminder to a tracked entity 10 days before a scheduled appointment. You use the program's tracked entity attributes (for example first name) and program parameters (for example enrollment date) to create a notification template.

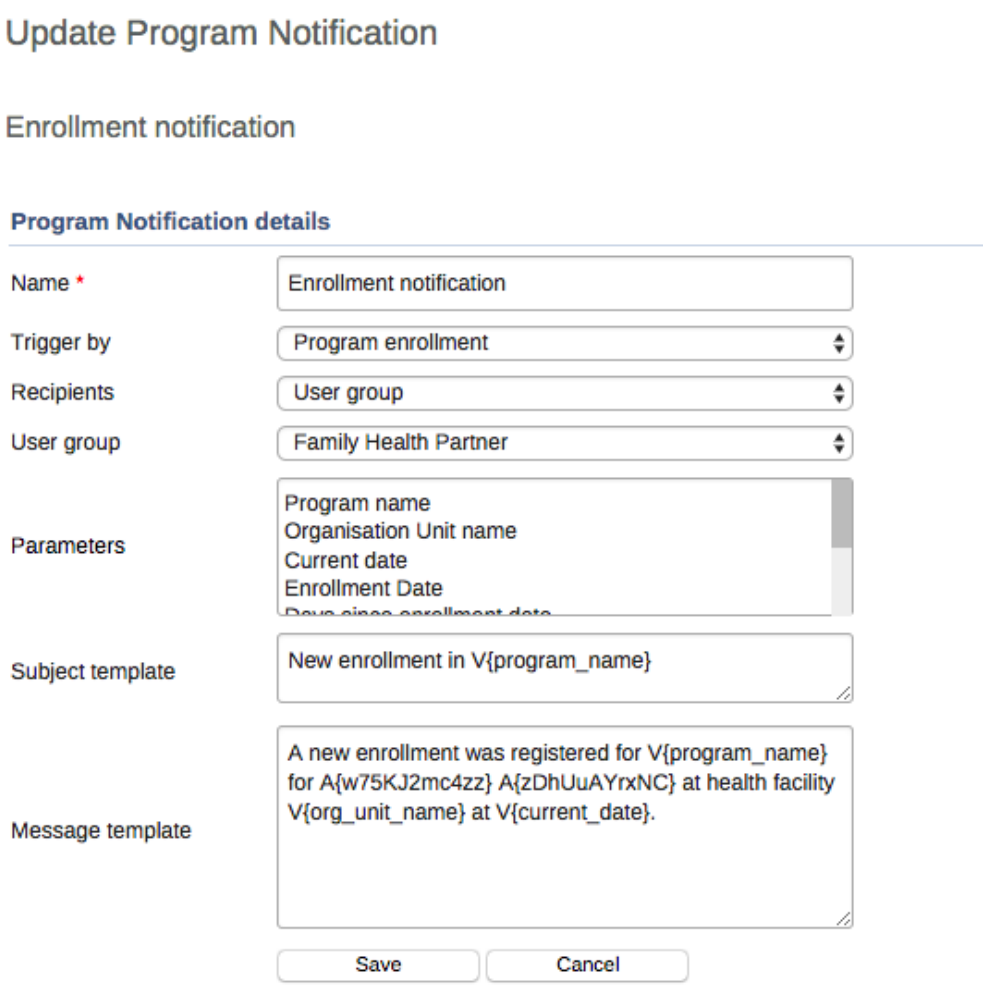
In the **Parameters** field, you'll find a list of available tracked entity attributes and the following program parameters:

Table 22.5.

Notification type	Variable name	Variable code
Program	Current date	`V{current_date}`
	Days since enrollment date	`V{days_since_enrollment_date}`
	Enrollment date	`V{enrollment_date}`
	Incident date	`V{incident_date}`

Notification type	Variable name	Variable code
	Organisation unit name	`V{org_unit_name}`
	Program name	`V{program_name}`
Program stage	Current date	`V{current_date}`
	Days since due date	`V{days_since_due_date}`
	Days until due date	`V{days_until_due_date}`
	Due date	`V{due_date}`
	Organisation unit name	`V{org_unit_name}`
	Program name	`V{program_name}`
	Program stage name	`V{program_stage_name}`

22.4.2. Create a program notification



1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **View program notifications**.

   A list of existing program notifications for the selected program opens. If the program doesn't have any program notifications, the list is empty.
3. Click **Add new**.
4. Enter a **Name**.
5. In the **Trigger by** field, select what should trigger the notification.

Table 22.6.

Trigger	Description	Note
Program enrollment	The program notification is sent when the TEI enrols in the program.	-
Program completion	The program notification is sent when the program of TEI is completed	-
Days scheduled (incident date)	The program notification is sent XX number of days before or after the incident date	You need to enter the number of days before or after the scheduled date that the notification will be send.
Days scheduled (enrollment date)	The program notification is sent XX number of days before or after the enrollment date	You need to enter the number of days before or after the scheduled date that the notification will be send.

6. In the **Recipients** field, select who should receive the program notification.

Table 22.7.

Recipient type	Description	Note
Tracked entity instance	Receives program notifications via e-mail or text message.	To receive a program notification, the recipient must have an e-mail address or a phone number attribute.
Organisation unit contact	Receives program notifications via e-mail or text message.	To receive a program notification, the receiving organisation unit must have a registered contact person with e-mail address and phone number.
Users at organisation unit:	All users registered to the selected organisation unit receive program notifications via the internal DHIS2 messaging system.	-
User group	All members of the selected user group receive the program notifications via the internal DHIS2 messaging system	-

7. Create the **Subject template**.

   Double-click the parameters in the **Parameters** field to add them to your subject.

Note

The subject is not included in text messages.

8. Create the **Message template**.

Double-click the parameter names in the **Parameters** field to add them to your message.

Example 22.6.

Dear A{w75KJ2mc4zz}, You're now enrolled in V{program_name}.

9. Click **Save**.

Note

You configure when the program notifications are sent in the **Data Administration** app > **Scheduling** > **Program notifications scheduler**.

- Click **Run now** to send the program notifications immediately.
- Select a time and click **Start** to schedule the program notifications to be send at a specific time.

22.4.3. Create a program stage notification

1. Open the **Program / Attributes** app and click **Program**.
2. Click the relevant program and select **View program stages**.
3. Click the relevant program stage and select **View program stage notifications**.

   A list of existing program stage notifications for the selected program stage opens. If the program stage doesn't have any program stage notifications, the list is empty.
4. Click **Add new**.
5. Enter a **Name**.
6. In the **Trigger by** field, select what should trigger the notification.

Table 22.8.

Trigger	Description	Note
Program stage completion	The program stage notification is sent when the program stage is completed	-
Days scheduled (due date)	The program stage notification is sent XX number of days before or after the due date	You need to enter the number of days before or after the scheduled date that the notification will be send.

7. In the **Recipients** field, select who should receive the program stage notification. You can select:

Table 22.9.

Recipient type	Description	Note
Tracked entity instance	Receives program notifications via e-mail or text message.	To receive a program stage notification, the recipient must have an e-mail address or a phone number attribute.
Organisation unit contact	Receives program notifications via e-mail or text message.	To receive a program stage notification, the receiving organisation unit must have a registered contact person

Recipient type	Description	Note
		with e-mail address and phone number. The system selects the same organisation unit as where the event took place.
Users at organisation unit:	All users registered to the selected organisation unit receive program notifications via the internal DHIS2 messaging system.	-
User group	All members of the selected user group receive the program notifications via the internal DHIS2 messaging system	-

8. Create the **Subject template**.

   Double-click the parameter names in the **Parameters** field to add them to your subject.

   Note

   The subject is not included in text messages.

9. Create the **Message template**.

   Double-click the parameter names in the **Parameters** field to add them to your message.

   Example 22.7.

   Dear A{w75KJ2mc4zz}, please come to your appointment the V{due_date}.

10. Click **Save**.

Note

You configure when the program stage notifications are sent in the **Data Administration** app > **Scheduling** > **Program notifications scheduler**.

- Click **Run now** to send the program notifications immediately.
- Select a time and click **Start** to schedule the program notifications to be send at a specific time.

22.5. Manage custom registration forms

22.5.1. About program custom registration forms

You can create custom registration form for each available program in system or for normal registration form which is used to register any entity without having program information and this entity can enroll into a certain program after that.

Note

Check on *Auto save registration form* check box in *Design tracked entity form* to save the custom registration form to being designed automatically.

22.5.2. About program stage data entry forms

A program stage has three types of data entry forms:

1. *Custom data entry form*: Define a data entry form as HTML page. Click on the program stage which you would like and select to define custom data entry form. The system supports to define a custom entry form with multi stages. So this form can be re-used in other stages of the same program.
2. *Section data entry form*: Group some data elements which belong to the program stage as sections and display data elements by each section. Click on the program stage which you would like and select *Section management* link to define section data entry form.
3. *Default data entry form*: List all data elements which belong to the program stage.

22.5.3. Create a custom program registration form

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to add a custom registration form to and select **Design custom registration form**.
3. Enter a **Name**.
4. Create the form in the built-in WYSIWYG HTML editor. If you select **Source**, you can paste HTML code directly in the editing area. You can also insert images.
5. Click **Save**.

22.5.4. Create a program stage data entry form

1. Open the **Program / Attributes** app and click **Program**.
2. Click the program you want to add a program stage data entry form to and select **View program stages**.

   A list of existing stages for the selected program opens. If the program doesn't have any program stages, the list is empty.
3. Click the program stage you want to add a program stage entry form to and select **Design data entry form**.
4. Enter a **Name**.
5. Create the form in the built-in WYSIWYG HTML editor. If you select **Source**, you can paste HTML code directly in the editing area. You can also insert images.
6. Click **Save**.

Chapter 23. About sharing of objects

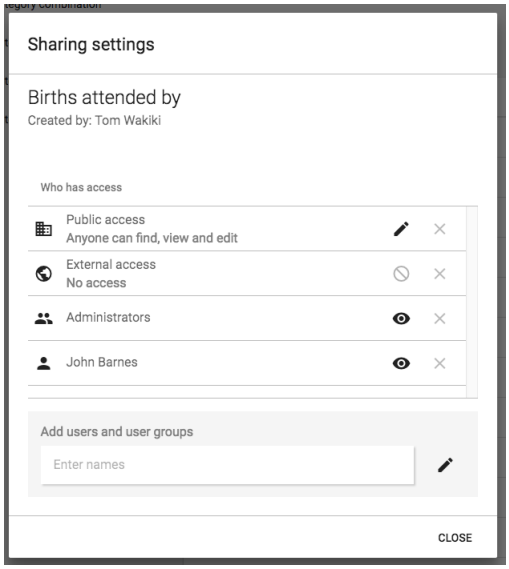
This chapter discusses the sharing of entities feature in DHIS2.

23.1. Sharing of objects

Many objects in DHIS2, like reports, charts, maps and indicators, can be shared. DHIS supports sharing of metadata or sharing of data. Sharing of metadata means making an object, like a report, available for reading or modification to a group of users or to everyone. Sharing of data means making the actual data captured available to others, and controlling who can capture that kind of data. For instance for reports, the sharing dialog can be opened by clicking on the "Sharing settings" button next to each report in the list. Implementers can use this feature to allow access to certain objects to only certain user groups. Users can use the feature to decide who they would like to share objects (such as pivot tables, charts, dashboards, etc) with.

If sharing is supported for a particular class of objects, a dialog will be available called "Sharing settings", usually available by clicking on the name of the object or in the analytics tools, through an icon (Share with other people). Once you have accessed the sharing settings for the object you wish to share, a dialog similar to the one below will be shown.

The new sharing dialog



You can share your report with everyone or with a number of user groups. "External access" can be enabled to allow this resource to be shared with everyone, including users which cannot logon to DHIS2. This is useful for sharing public resources with external systems. Note, that if objects are shared externally, then they are visible to anyone who has access to the URL which provides the resource without any login credentials.

Next to "Public access" you can choose your public access option under "METADATA": "No access", "Can view only" or "Can edit and view", and under "DATA": "No access", "Can view data", "Can capture data". Public access refers to users which are logged into the system. Edit also implies deleting the report.

To share with a group, simply start typing the name of the group and the "Search for user groups" input field and select your desired group. Click on the "+" icon next to the input field to share with that group. For each group you can set an access option, similar to public access.

Sharing with a user group implies that all users in that group will get access to the shared object. To create a user group you can go to the dashboard module and click on "Groups".

This will lead you to the list of groups where you can click "Add new" in the top right corner. Creating user groups is open for everyone from the dashboard module.

23.2. Metadata sharing and access control

The objects which support metadata sharing are indicator, indicator group, indicator group set, data dictionary, data set, program, standard report, resource, report table, chart, map and user group. Out of those objects, report table, chart, map and user group are open for everyone to create privately. Private means that the objects are available only to yourself or potentially to a number of user groups if you choose to share the object. These objects are referred to as "open" objects and can be created by all users. The remaining objects require that your user account has the authority to create them. These objects are referred to as "non-open" objects.

A user can be granted the authority to create publicly accessible objects or privately accessible objects. In order to create a publicly accessible object (available for viewing or editing by anyone) your user account must have the authority to do so. As an example, to create a publicly accessible chart, your user must have the "Create public chart" authority granted. The authority to create private objects applies only to non-open objects. For example, to allow a user to create indicators which will only be accessible to that user and not to everyone, the user can be issued with the "Create private indicator" authority.

Sharing a non-open object with another person and let her edit the object requires that the person's user account has the authority for updating that type of objects granted. For instance, if you want to let another person edit your indicator, that person's user account must have the "Update indicator" authority granted. This does not apply for open objects.

When you create a new object it will automatically become viewable for everyone if your user account has the authority to create public objects. As an example, if you create a standard report and you have the "Create public standard report" authority granted, the report will become viewable for everyone. If you do not have that authority granted the report will be viewable only to yourself. After you have created an object, you may navigate to the "Sharing settings" dialog and set your desired access control level.

If you need a user account which is able to view absolutely all objects you can create a user role with the "ALL" authority and assign a user to that role. If you need to switch between a "complete" view of objects and a "personal" view of objects it is recommended to create two user accounts, one assigned with the "ALL" authority and one without.

23.3. Metadata sharing applied

The metadata sharing functionality is useful in several scenarios. One use-case is setting up a DHIS2 instance for a global organisation with operations in multiple countries. Typically the organisation has a set of global data sets, indicators and reports which should apply to all countries, while all countries will have the need for country-specific data sets, indicators and reports. In this scenario the following approach could work:

- Set up one user group for global personnel.
- Set up a user group for personnel in each country.
- Create global data sets and reports, make them viewable for everyone and editable for the global user group only.
- Create country-specific data sets and reports, make them viewable and editable for the country user group and the global user group only.

This way, the global indicators and reports could be viewed and analysed by everyone, but maintained by the global user group only. The country-specific data sets, indicators and reports could be viewed and maintained by the country and global personnel, without being visible or impacting the system for other countries in the organisation.

A similar approach could work for a scenario with a donor, multiple funding agencies and implementing partners in a country, where user groups could be set up for each of those entities. That way each implementing partner could create and share their reports within their organisation without affecting or allowing access to others. Reports could also be shared with supervisors and funding agencies at the end of reporting periods.

Another use-case is a country department of health with multiple health programs. Typically there is a need for having general reports and charts for the department while allowing the health programs to develop specific reports and charts for internal use. This can be achieved by creating user groups for each health program. Later, when developing reports and charts, these can be made viewable and editable to the program user group only. This way the reports will not be visible to other programs and users. This is beneficial because the reports are kept internal to the program and because the visible list of reports of other users are kept shorter and more relevant.

23.4. Data sharing and access control

The objects which support data sharing are data set, tracked entity type, program and program stage. The purpose of data sharing is to control which users can capture data, and which users can see the data captured.

23.4.1. Data sharing for event based programs

Applies to the object types of tracked entity type, program and program stage. When working with single event programs in event capture, a user will have to possess the "DATA:Can view data" sharing level to see the program and its data. Without this sharing level, the program and its data will not be visible to the user. When working with tracker programs in tracker capture, the user will need to have "DATA:Can view data" to both the tracked entity type and program. In case of a tracker program, the user will also need "DATA:Can view data" on each program stage individually to be able to see the data within the program. To capture data the user needs the "DATA:Can capture data" sharing level.

Note

To see and capture data for a program, a data capture user also needs to report for an organisaction unit to where the program has been assigned.

Table 23.1. Data sharing for tracker programs

Object type	Can view data	Can capture data	Comment
Tracked entity type	• Search for tracked entities with this tracked entity type. • See tracked entity type attribute values for this tracked entity type.	• Edit visible tracked entity attributes for tracked entity instances of this type. • Register/create new tracked entity instances of this type. • Delete tracked entity instances of this type. • Deactivate/reactivate tracked entity instances of this type.	

Object type	Can view data	Can capture data	Comment
Program	• Search for tracked entities within this program. • See tracked entity attributes specific to this program. • See enrollment details for the program. • See notes for the enrollment.	• Enroll into the program. • Edit enrollment details for the program. • Complete/reopen enrollments into the program. • Add notes for the program. • Edit relationships for the program. • Send message to tracked entity instance. • Delete enrollments in the program.	Both "Can view data" and "Can capture data" also requires the user to have "Can view data" for the tracked entity type.
Program stage	• See the program stage and its events and data within an enrollment. • See the program stage notes.	• Add/schedule/refer a new event within the program stage. • Complete/reopen the events within the program stage. • Edit tracked entity data values within events in the program stage. • Add notes for events in the program stage. • Delete events in the program stage.	Both "Can view data" and "Can capture data" also requires the user to have "Can view data" for the program and the tracked entity type.

Table 23.2. Data sharing for single event programs

Object type	Can view data	Can capture data	Comment
Program	• See list of events within the program. • See tracked entity data values for events in the program.	• Add new events into the program. • Edit data for events in the program. • Delete events in the program.	

23.4.2. Data sharing for data sets

Applies to the object types of data set. When working with data sets, the user will need to have "DATA:Can capture data" to both see and capture data in the data set.

Note

To see and capture data for a data set, a data capture user also needs to report for an organisaction unit to where the data set has been assigned.

Table 23.3. Data sharing for data sets

Object type	Can view data	Can capture data	Comment
Data set	• See data for the data set.	• Add/edit data sets.	

Chapter 24. Data Administration

The data administration module provides a range of functions to ensure that the data stored in the DHIS2 database is integral and that the database performance is optimised. These functions should be executed on a regular basis by a data administrator to ensure that the quality of the data stored is optimal.

24.1. Data integrity

DHIS2 can perform a wide range of data integrity checks on the data contained in the database. Identifying and correcting data integrity issues is extremely important for ensuring that the data used for analysis purposes is valid. Each of the data integrity checks that are performed by the system will be described, along with general procedures that can be performed to resolve these issues.

24.1.1. Data elements without data set

Each data element must be assigned to a data set. Values for data elements will not be able to be entered into the system if a data element is not assigned to a data set. Choose Maintenance->Datasets->Edit from the main menu and then add the "orphaned" data element to the appropriate data set.

24.1.2. Data elements without groups

Some Data Elements have been allocated to several Data Element Groups. This is currently not allowed, because it will result in duplication of linked data records in the analytics record sets that provide aggregated data. Go to Maintenance -> Data Element Groups to review each Data Element identified and remove the incorrect Group allocations.

24.1.3. Data elements violating exclusive group sets

Some data elements have been allocated to several data element groups that are members of the same data element group set. All group sets in DHIS2 are defined as exclusive, which means that a data element can *only* be allocated to *one* data element group within that group set. Go to Maintenance -> Data elements and indicators ->Data element groups to review each data element identified in the integrity check. Either remove the data element from all groups except the one that it should be allocated to, or see if one of the groups should be placed in a different group set.

24.1.4. Data elements in data set but not in form or sections

Data elements have been assigned to a data set, but have not been assigned to any sections of the data set forms. All data sets which use section forms, should generally have all data elements in the data set assigned to exactly one section of the dataset.

24.1.5. Data elements assigned to data sets with different period types

Data elements should not be assigned to two separate data sets whose period types differ. The recommended approach would be to create two separate data elements (for instance a monthly and yearly data element) and assign these to respective datasets.

24.1.6. Data sets not assigned to organisation units

All data sets should be assigned to at least one organisation unit.

24.1.7. Sections with invalid category combinations

Data sets which use section forms should only have a single category combination within each section. This violation could result from assigning a data element to a section, but then changing the category combination of this data element at a later point in time.

24.1.8. Indicators with identical formulas

Although this rule will not affect data quality, it generally does not make sense to have two indicators with the exact same definition. Review the identified indicators and their formulas and delete or modify any indicator that appears to be the duplicate.

24.1.9. Indicators without groups

All data elements and indicators must be assigned to at least one group, so these Indicators need to be allocated to their correct Data Element and Indicator Group. From the main menu, go to Data elements/Indicators -> Indicator Groups, and allocate each of the `Orphaned` indicators to its correct group.

24.1.10. Invalid indicator numerators

Violations of this rule may be caused by an incorrect reference to a deleted or modified data element. Review the indicator and make corrections to the numerator definition.

24.1.11. Invalid indicator denominators

Violations of this rule may be caused by an incorrect reference to a deleted or modified data element. Review the indicator and make corrections to the denominator definition.

24.1.12. Indicators violating exclusive group sets

Some indicators have been allocated to several indicator groups that are members of the same indicator group set. All group sets in DHIS2 are defined as exclusive, which means that an indicator can *only* be allocated to *one* indicator group within that group set. Go to Maintenance -> Data elements and indicators ->Indicator groups to review each indicator identified in the integrity check. Either remove the indicator from all groups except the one that it should be allocated to, or see if one of the groups should be placed in a different group set.

24.1.13. Duplicate periods

If periods have been imported from external applications, it may be possible that some periods will be duplicated. If you have any periods which appear to be duplicated here, you will need to resolve these directly in the DHIS2 database. All data which has been assigned to the duplicated period, should be moved to the correct period, and the duplicate period should be removed.

24.1.14. Organisation units with cyclic references

Organisation units cannot be both parent and children of each other, directly nor indirectly. If this situation occurs, you will need to resolve the cyclic reference directly in the DHIS2 database in the "organisation unit" table, by reassigning the "parentid" field of the organisation units.

24.1.15. Orphaned organisation units

All organisation units must exist within the organisation unit hierarchy. Go to Organisation-units >Hierarchy Operations and move the offending organisation unit into the proper position in the hierarchy.

24.1.16. Organisation units without groups

All organisation units *must* be allocated to at least *one* group. The problem might either be that you have not defined any compulsory OrgUnit Group Set at all, or that there are violations of the compulsory rule for some OrgUnits . NOTE: If you have defined no compulsory OrgUnit Group Sets, then you must first define them by going to Organisation units->Organisation unit group sets and define at least one compulsory Group Set (the group set 'Type' are nearly universally relevant). If you have the relevant group sets, go to Maintenance -> OrgUnit Groups to review each OrgUnit identified and add the relevant Group allocation.

24.1.17. Organisation units violating compulsory group sets

These organisation units have not been assigned to the any organisation unit group within one of the *compulsory* organisation unit group sets. When a group set is defined as compulsory, it means that an organisation unit must be allocated to at least one organisation unit group within that group set. For instance, all organisation units must belong to one of the groups in the 'Type' group set. It might belong to the `Hospital` or the `Clinic` or any other 'type' group - but it must belong to exactly one of them. Go to Organisation units->Organisation unit groups to review each organisation unit identified in the integrity check. Allocate all organisation units to exactly one compulsory group.

24.1.18. Organisation units violating exclusive group sets

Some organisation units have been allocated to several organisation unit groups that are members of the same organisation unit group set. All group sets in DHIS2 are defined as exclusive, which means that an organisation unit can *only* be allocated to *one* organisation unit group within that Group Set. For instance, one organisation unit cannot normally belong to the both the 'Hospital' and 'Clinic' groups , but rather to only to one of them. Go to Organisation unit->Organisation unit groups to review each organisation unit identified in the integrity check. Remove the organisation units from all groups except the one that it should be allocated to.

24.1.19. Organisation unit groups without group sets

The organisation unit groups listed here have not been allocated to a group set. Go to Maintenance->Organisation unit->Organisation unit group sets and allocate the Organisation unit group to the appropriate group set.

24.1.20. Validation rules without groups

All validation rules must be assigned to a group. Go to **Maintenance** app > **Validation rule group** and assign the offending validation rule to a group.

24.1.21. Invalid validation rule left side expressions

An error exists in the left-side validation rule definition. Go to **Maintenance** app > **Validation rule** and click **Edit** on the offending rule. Click **Left side** and make the required corrections.

24.1.22. Invalid validation rule right side expressions

An error exists in the right-side validation rule definition. Go to **Maintenance** app > **Validation rule** and click **Edit** on the offending rule. Click **Right side** and make the required corrections.

24.2. Maintenance

Table 24.1. Data maintenance functions in the Data Administration app

Function	Description
Clear analytics tables	Completely empties the analytics tables. These tables are used to generate aggregate data for the pivot tables, GIS and reports.
Remove zero data values	Removes zero data values from the database. Values registered for data elements with aggregation operator average is not removed, as such values will be significant when aggregating the data, contrary to values registered for data elements with aggregation operator sum. Reducing the number of data values will improve system performance.
Permanently remove soft deleted data values	When a data value is deleted in DHIS2, the system will mark the corresponding database row as deleted, and not actually delete the row. Running this maintenance function will physically remove these data value rows from the database.
Prune periods	Removes all periods which have no registered data values. Reducing the number of periods will improve system performance.
Remove expired invitations	Will delete users which represent user account invitations that now have gone past their expiry date.
Drop SQL views	DHIS2 lets you set up and manage SQL views as system objects with corresponding database SQL views. Running this maintenance function will drop underlying SQL views for all system views. Use the **Create SQL views** function to recreate these SQL views.
Create SQL views	Recreates all SQL views in the database.
Update category option combinations	Rebuilds the category option combinations. This may be required after altering the

Function	Description
	category options which belong to a given category.
Update organisation unit paths	The organisation unit table in the DHIS2 database has a column "path" which contains a concatenated string of all ancestors in the hierarchy for each organisation unit. Running this maintenance function will update and ensure that these values are in sync with the current organisation unit hierarchy. This column is managed by DHIS2, but a manual update might be useful when doing data loading directly in the database.
Clear application cache	Clears the system cache.
Reload apps	Manually reloads and detects installed DHIS2 apps. The installed apps are also detected when the system starts and when installing or uninstall apps.

24.3. Resource tables

Resource tables are supporting tables that are used during analysis of data. One would typically join the contents of these tables with the data value table when doing queries from third-party applications like Microsoft Excel. They are also used extensively by the analysis modules of DHIS2. Regeneration of the resource tables should only be done once all data integrity issues are resolved. The resource tables are also generated automatically, every time the analytics process is run by the system.

- Organisation unit structure (_orgunitstructure)

  This table should be regenerated any time there have been any changes made to the organisational unit hierarchy. This table provides information about the organisation unit hierarchy. It has one row for each organisation unit, one column for each organisation unit level and the organisation unit identifiers for all parents in the lineage as values.

- Data element group set structure (_dataelementgroupsetstructure)

  This table provides information about which data elements are members of which data element group sets. The table has one row for each data element, one column for each data element group set and the names of the data element group as values.

- Indicator group set structure (_indicatorgroupsetstructure)

  This table provides information about which indicators are members of which indicator group sets. The table has one row for each indicator, one column for each indicator group set and the names of the indicator group as values.

- Organisation unit group set structure (_organisationunitgroupsetstructure)

  This table provides information about which organisation units are members of which organisation unit group sets. The table has one row for each organisation unit, one column for each organisation unit group set and the names of the organisation unit groups as values.

- Category structure (_categorystructure)

This table provides information about which data elements are members of which categories. The table has one row for each data element, one column for each category and the names of the category options as values.

- Data element category option combo name (_categoryoptioncomboname)

  This table should be regenerated any time there have been changes made to the category combination names. It contains readable names for the various combinations of categories.

- Data element structure (_dataelementstructure)

  This table provides information about all data elements and which period type (frequency) they capture data at. The period type is determined through the data set membership and hence relies on data elements to be member of data sets with similar period types to have a defined behavior.

- Period structure (_dataperiodstructure)

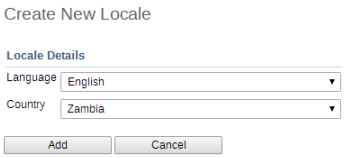
  This table provides information about all periods and which period type they are associated with. For each period type with lower frequency than itself, it contains information about which period it will fall within.

- Data element category option combinations (_dataelementcategoryoptioncombo)

  This table provides a mapping between data elements and all possible category option combinations.

24.4. Locale Management

It is possible to create custom locales in DHIS2. In addition to the locales available through the system, you might want to add a custom locale such as "English" and "Zambia" to the system. This would allow you to translate metadata objects to local languages, or to account for slight variants between countries which use a common metadata definition.



The locale is composed of a language along with a country. Select the desired values and press "Add". This custom locale will now be available as one of the translation locales in the system.

24.5. SQL View

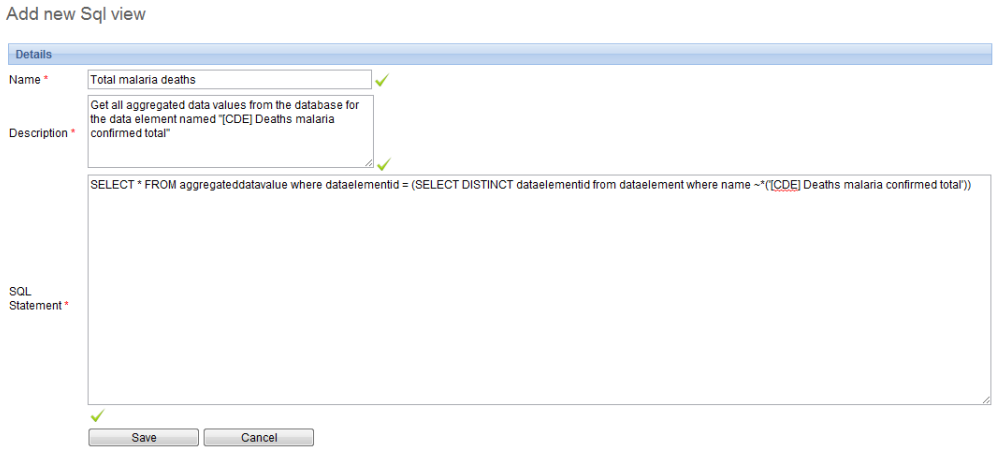
The SQL View functionality of DHIS2 will store the SQL view definition internally, and then materialize the view when requested.

Database administrators must be careful about creating database views directly in the DHIS 2 database. For instance, when the resource tables are generated, all of them will first be dropped and then re-created. If any SQL views depend on these tables, an integrity violation exception will be thrown and the process will be aborted.

The SQL views are dropped in reverse alphabetical order based on their names in DHIS2, and created in regular alphabetical order. This allows you to have dependencies between SQL views, given that views only depend on other views which come earlier in the alphabetical order. For instance, "ViewB" can safely depend on "ViewA". Otherwise, having views depending on other view result in an integrity violation error.

24.5.1. Creating a new SQL view

To create a new SQL view, click **Apps** > **Data administration** >**SQL view** and click **Add new**.



The "Name" attribute of the SQL view will be used to determine the name of the table that DHIS2 will create when the view is materialized by the user. The "Description" attribute allows one to provide some descriptive text about what the SQL view actually does. Finally, the "SQL statement" should contain the SQL view definition. Only SQL "SELECT" statements are allowed and certain sensitive tables (i.e. user information) are not accessible Press "Save" to store the SQL view definition.

24.5.2. SQL View management

In order to utilize the SQL views, simply click the view and from the context menu, choose "Execute query". Once the process is completed, you will be informed that a table has been created. The name of the table will be provided, and is composed from the "Description" attribute provided in the SQL view definition. Once the view has been generated, you can view it by clicking the view again, and selecting "Show SQL View".

Tip

If you have a view which depends on another view, you should be careful about how the views are named. When analytics is run on the DHIS2 server, all views must be dropped, and are recreated. When analytics starts, the views are dropped in alphabetical order, and then recreated in reverse alphabetical order. Thus, if view A depends on view B, it must appear before view B in alphabetical order. If it appears after view B in alphabetical order, analytics may fail, as the view with dependencies will not be dropped in the correct order.

24.6. Duplicate data elimination

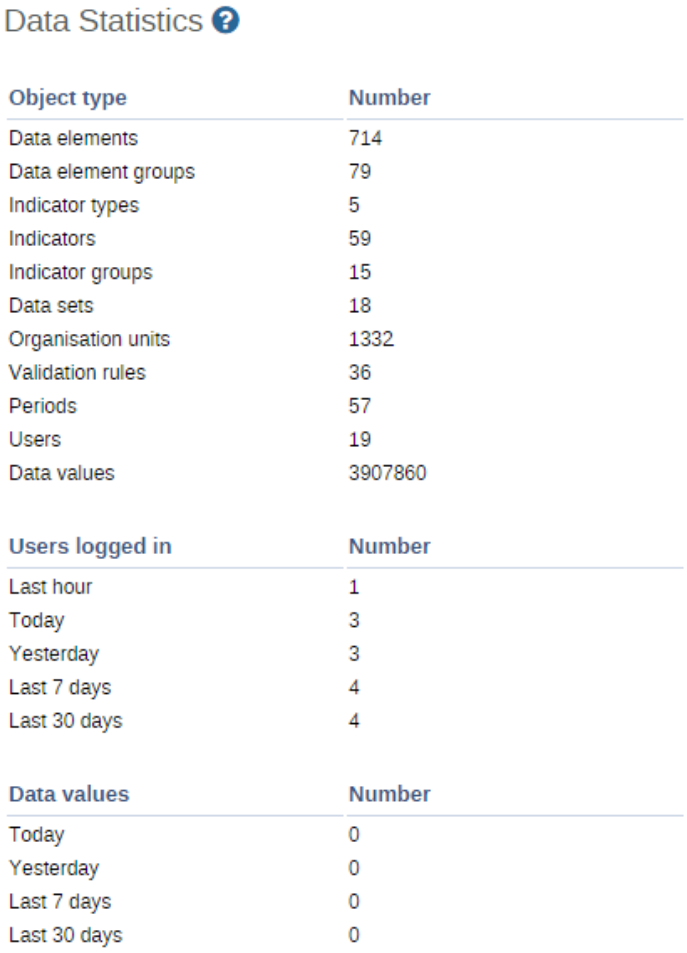
This function is useful when data has been entered mistakenly for two data elements which represents the same phenomena.

Start by selecting the data element to eliminate from the list and click confirm. Then select the data element to keep and click confirm again. Finally, verify the selection and click merge.

In the situation where data exists for the data element to eliminate and not for the one to keep, the data will be moved to the one to keep. When data exists for both data elements, the data which was updated last will be used. When data exists only for the one to keep, no action will be taken. The data element to eliminate will eventually be deleted, except when it is a multidimensional data element and has other data registered.

24.7. Data statistics

The data statistics module provides an overview of the number of objects stored in the DHIS2 database.



Data Statistics

Object type	Number
Data elements	714
Data element groups	79
Indicator types	5
Indicators	59
Indicator groups	15
Data sets	18
Organisation units	1332
Validation rules	36
Periods	57
Users	19
Data values	3907860

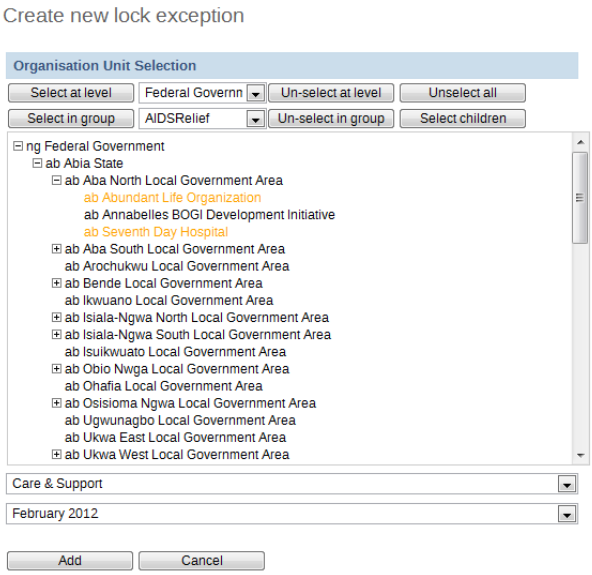
Users logged in	Number
Last hour	1
Today	3
Yesterday	3
Last 7 days	4
Last 30 days	4

Data values	Number
Today	0
Yesterday	0
Last 7 days	0
Last 30 days	0

The total number of each type of object is presented in a series of tables with summary statistics of each object.

24.8. Lock exceptions

Lock exceptions provide fine-grained control over exemption from a locked data set. After the expiry of the data set, data entry will be denied by default, unless an exception has been granted through the Lock exception interface. To enable a lock exception, select the desired organization units, data sets, and time period and press "Add". By granting a lock exception, data entry will be enabled even after the expiry period of the data set has passed.



In the example above, a data lock exception would be created for "ab Abundant Life Organization" and "ab Seventh Day Hospital" for the "Care and Support" dataset for "February 2012".

24.9. Min-Max Value Generation

This administrative function can be used to generate min-max values, which are used as part of the data quality and validation process for specific organization units and data sets. Simply select the dataset from the left hand frame, and then select the required organisation units to generate the min-max values for from the organisational units selector on the right. Press the "Generate" button to generate or regenerate all min-max values. Press "Remove" to remove all min-max values which are currently stored in the database.

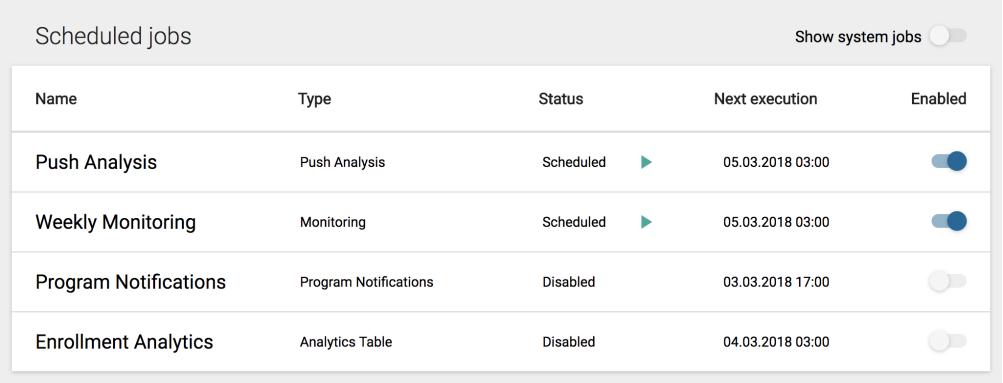
24.10. Cache Statistics

This option is for system administrators only to use. The cache statistics shows the status of the application level cache. The application level cache refers to the objects and query results that the application is caching in order to speed up performance. If the database has been modified directly the application cache needs to be cleared for it to take effect.

24.11. Scheduling

The Scheduler is an application for managing background jobs in DHIS2. Background jobs can do a number of tasks, such as running analytics, synchronizing data and meta data, or sending a push analysis report. The application provides the ability to create, modify and delete such jobs.

The Scheduler comes bundled with DHIS2 and is accessed through the App Menu.

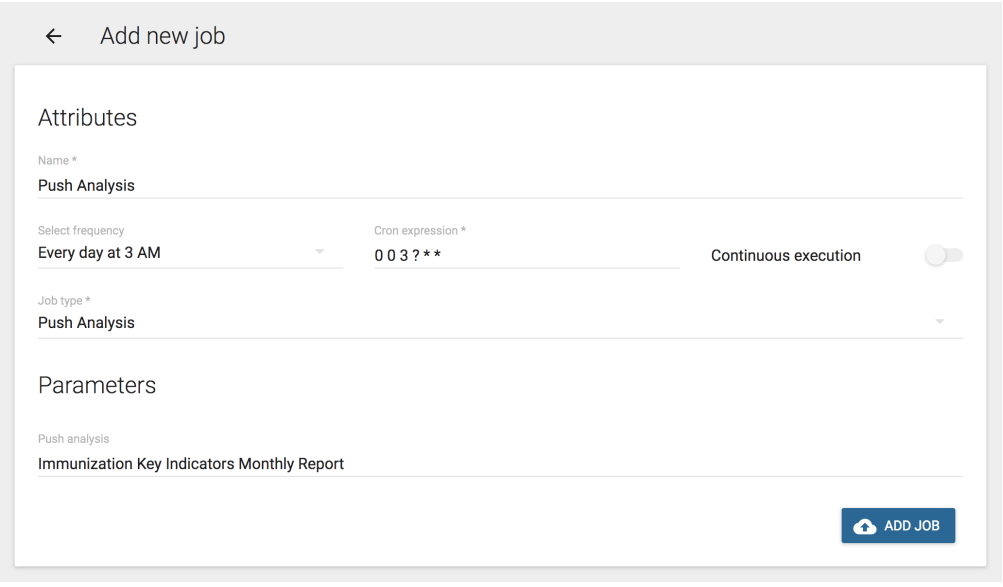


The start page of the Scheduler app shows an overview of existing jobs. By default, pre-defined system jobs are hidden. To view these, toggle **Show system jobs** in the top right corner.

When you create or modify a job, it will be rescheduled according to selected preferences. To run a job on demand, press the green triangle labeled "Run now". This action is only available for enabled jobs.

24.11.1. Creating a job

1. Open the **Scheduler** app and click the add button in the bottom right corner.
2. Choose a suitable **Name** for the new job.
3. Select a running frequency for the job, i.e. when and how often the job should run.
   a. You can either select a pre-defined frequency from the dropdown-menu, or ...
   b. You can give the job a custom **Cron expresssion** if you want a specific schedule.
   c. Enabling the **Continuous execution** option will make the job run constantly. In other words, as soon as the job finishes, it will be scheduled to run again right away. Selecting this option will disable the other fields.
4. Select the **Job type** you want to schedule using the dropdown-menu.
5. If the job type is customizable, a **Parameters** section will appear below. These additional options specify the details of the scheduled job, and will vary greatly depending on the job type.
6. Press the **Add job** button to confirm the job creation. The newly created job should now be listed in the job overview, given that the **Show system jobs** setting is not enabled.



Jobs are enabled by default.

24.11.2. Configuring a job

With the proper permissions, you can modify the details of user-created jobs. Note that for system jobs, only the schedule (cron expression) can be changed.

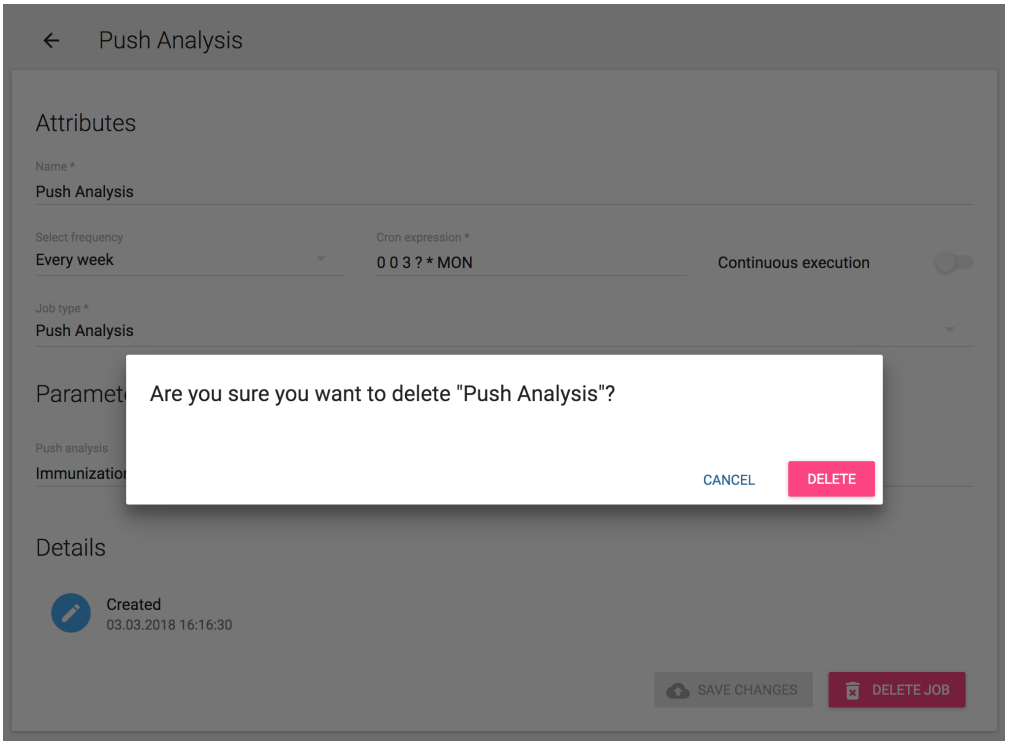
To quickly enable or disable a user created job from running, use the **Enabled** column on the landing page of the Scheduler app. System jobs are always enabled.

Further configuring a job:

1. Select a job from the landing page to unveil the **Attributes** and change them to accordingly. See the previous section for scheduling details.
2. If the job type supports extra options, the **Parameters** section will also be available.
3. When done, press the **Save changes** button to persist the changes.

24.11.3. Deleting a job

1. Select the job you want to delete.
2. Press the **Delete** button in the bottom right corner.
3. Confirm by pressing **Delete** again in the popup window.



24.12. Data synchronization

DHIS2 provides a feature for synchronizing data being captured on the local instance with a another, remote instance of DHIS2. This can be useful e.g. when you have deployed multiple stand-alone instances of DHIS2 which are required to submit data values to a central DHIS2 instance. Till now only aggregate data was being synced. Starting from 2.24 even non anonymous events data (line list) will also be synced.

These are the steps to enable data synchronization:

- Go to Settings > Synchronization, enter the remote server URL, username and password and click Save. You can test your settings by clicking on the "Test settings" link.
- Go to Data administration > Scheduling. Under Data synchronization set strategy to Enabled, and click Start.

Some aspects of the data synchronization feature to be aware of:

- The local DHIS2 instance will store the password of the user account on the remote instance encrypted in the local database. The remote account is used for authentication when transferring data. For security purposes make sure you set the "enryption.password" configuration parameter in hibernate.properties to a strong password.
- Deploying the remote server on SSL/HTTPS is strongly recommended as the username and password are sent in clear text using basic authentication and could be intercepted by an attacker.
- The data synchronization uses the UID property of data elements, category option combos and organisation units to match the meta-data. Hence the synchronization is dependent on these three meta-data objects being harmonized on the local and remote instance in order to work appropriately.
- The very first time DHIS2 attempts to synchronize data the system will include data entered during the last three days. For the subsequent attempts the system will store the time of the last successful data synchronization and only include data saved or edited since that time. A synchronization job is considered successful only if data was submitted, authenticated and saved successfully on the remote server,.
- The system will attempt a synchronization every minute. If the local server does not have a working Internet connection at the time, the synchronization will be silenly aborted and re-attempted after a minute.
- You can see the time of last successful synchronization with remote server in the scheduling screen next to the "Last success" label.

24.13. Metadata Synchronization Scheduling

DHIS2 provides a feature for synchronizing meta data from a remote instance to a local instance of DHIS2. This can be useful when you have deployed multiple stand-alone instances of DHIS2 and you need to create meta data in all the local instances similar to the central DHIS2 instance.

These are the steps to enable meta data synchronization:

- Go to Settings > Synchronization, enter the remote server URL, username and password and click Save.
- Go to Metadata administration > Scheduling. Under Metadata synchronization set strategy to Enabled, select the time-period and click Start.

Some aspects of the meta data synchronization feature to be aware of:

- The local DHIS2 instance will store the password of the user account of the remote instance in its database. The remote user account is used for authentication when transferring/ downloading data. For security purposes make sure you set the "encryption.password" configuration parameter in hibernate.properties to a strong password.
- Deploying the remote server on SSL/HTTPS is strongly recommended as the username and password are sent in clear text using basic authentication and could be intercepted by an attacker.
- Also ensure that the remote user is not having ALL authority, instead simply create a user with F_METADATA_MANAGE authority so that even if these details are intercepted by a hacker, one cannot have full control of the remote system.
- The meta data synchronization relies on the underlying import layer. Each meta data version is an export of meta data between two given timestamps. Each sync of meta data version is

an attempt to import that meta data snapshot into the local instance. The sync of versions is incremental. The local instance will try to download the meta data versions from the central instance one after the other. Failure to sync a specific meta data version will not let the sync proceed to further versions. In case of failures, appropriate changes must be made to meta data at central to ensure that the error gets resolved. Metadata configuration is critical and the configurator should be careful while rolling out the updates to the production. It's always recommended to have staging environments in place to ensure the sanity of the meta data versions and their impact thereafter. The local instance will sync the meta data from first version so that harmony is maintained and local and central instance will work appropriately.

- The system will attempt a synchronization at the scheduled time. If the local or remote server does not have a working Internet connection at the time, the synchronization will be aborted and re-attempted after as per the retry count as mentioned in the dhis.conf file.
- You can see the time of last successful synchronization with remote server in the scheduling screen next to the "Last success" label.

Chapter 25. Datastore Manager

The Datastore Manager is intended for advanced-level DHIS2 users. Before you use the Datastore Manager, you can read more about the Data store here: DHIS2 data store.

25.1. Using the Datastore Manager

The Datastore Manager lets you manage the content of the web API data stores. This is helpful when managing apps and external scripts.

25.2. Add a new namespace and key to the Datastore Manager

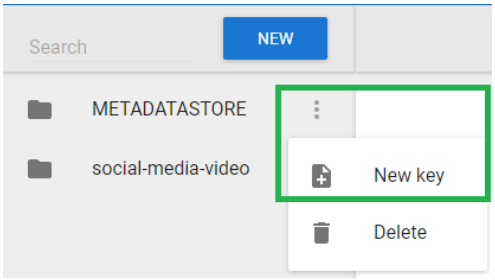
Note: You have to create a namespace before you can add a key to it.

1. Click **New**.
2. Enter a name for the namespace you want to create.
3. Enter a key name, and select **Create**. The new namespace displays in the left pane.

25.3. Add a key to an existing namespace in the Datastore Manager

To add a new key to an existing namespace in the Datastore Manager,

1. Select the namespace you want to add a key to.
2. Click the options menu, and click **New key**.



3. Enter a key name in the New key dialog box.
4. Click **Create**. The new key is added to the namespace you selected.

25.4. Delete a namespace or key from the Datastore Manager

To delete a namespace, or key, click the Options menu, and then click **Delete**, and then **Delete** again. Note that if you delete the only key in a namespace, you will also delete the namespace it belongs to.

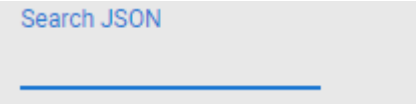
25.5. Search for namespaces or keys

Use the search tool in the top left corner to search for namespaces and keys as follows:

- Enter a namespace name followed by **#** and the key name to search for a specific key in a namespace.
- Enter **#** followed by the name of a key to search for keys only.

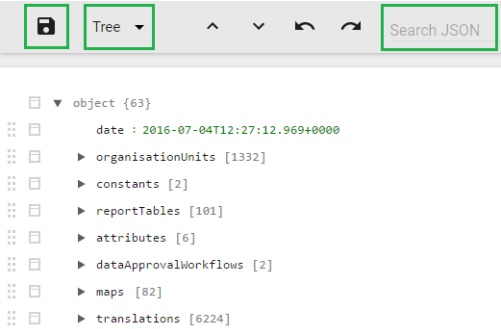
25.6. Search your JSON library

Use the search tool in the workspace toolbar to search your JSON library.

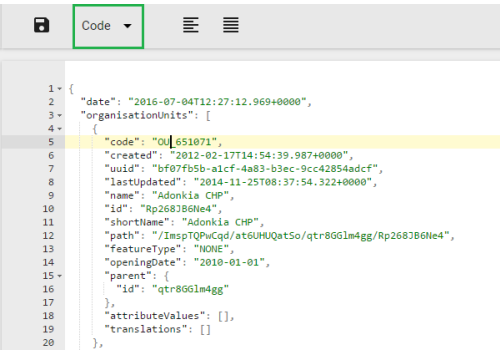


25.7. Edit namespaces or keys in the Datastore Manager

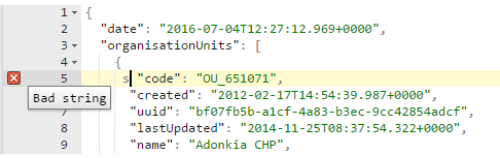
Use the **Search** tool to find namespaces or keys in your datastore. When you edit your content, you can toggle between the **Tree** view and the **Code** view. Use the **Tree** view to get an overview of the contents of the Datastore. Use the **Code** view to edit your code directly in the code editor. Remember to save your work by clicking the **Save** button.



In the Code view, you can edit your code. When you edit a line of code, it is highlighted in yellow.



Any errors are marked by the editor. If you hover over the error icon, you can view a short description of the error.



Chapter 26. Configure the GIS app

26.1. Context

Setting up the GIS simply means storing coordinates for the organisation units you want to show on the map in the database. Coordinates are often distributed in proprietary formats and will need to be converted to a format which DHIS2 understands. ESRI shapefiles are the most common geospatial vector data format for desktop applications. You might find shapefiles for your country here or in many other geospatial data repositories on the web. Some amount of work needs to be done in order to use these coordinates in DHIS2 GIS, namely transforming the data into a suitable format and ensuring the name which are contained in the geospatial data match exactly with the names of the organization units which they should be matched to.

If you go to the organisation unit module and edit one of the units, you can see a text field called Coordinates. Here you may fill in its coordinates directly (geojson format) which is useful if you just want to update a couple of units.

An example point/facility coordinate:

```
[29.341,-11.154]
```

An example polygon/area coordinates string:

```
[[[[29.343,-11.154],[28.329,-11.342],[28.481,-10.239],[29.833,-10.412]]]]
```

However, if you are going to e.g. add coordinates for all units at a certain level you don't want to do that manually. This is where the automatic GML import comes into play and the following section explains the preferred way of using it.

Important

The only co-ordinate reference system supported by DHIS2 is EPSG:4326, also known as geographic longitude/latitude. Coordinates must be stored with the longitude (east/west position) proceeding the latitude (north/south position). If your vector data is in a different CRS than EPSG 4326, you will need to re-project the data first before importing into DHIS2.

26.2. Importing coordinates

Step 1 - Simplify/generalize your geographical data

The boundaries in geographical data files are usually very accurate, too much so for the needs of a web-based GIS. This usually does not affect the performance when using GIS files on a local system, but it is usually necessary to optimize the geographical data for the web-based GIS system of DHIS2. All geographical data needs to be downloaded from the server and rendered in a browser, so if the data is overly complex, the performance of the DHIS2 GIS will be negatively impacted. This optimization process can be described as follows:

Coordinates: The number of significant decimal digits (e.g. 23.02937874993774) should be shortened to fewer digits (e.g. 23.03). Although this will result in some inaccuracies on the map, given the usual scale at which maps in DHIS2 are produced (> 1:50,000), the loss of precision should not be noticeable. Normally, no more than four significant digits after the decimal point should be necessary.
Polygons: In addition to shortening the number of significant digits, the actual number of points should also be reduced to an optimal level. Finding this optimal level may take a bit of experimentation. Decreasing the precision of the points as well as the number of points through

generalization, will lead to degradation of the polygon. However, after a bit of experimentation, an optimal level of generalization can be found, where the accuracy of the polygon is visually acceptable, and the performance of the GIS is optimal.

For polygons, we need to make the boundary lines less detailed by removing some of the line points. Make a backup of your shapefiles before you start. One possible method is the use of MapShaper which is an online tool which can be used to generalize geographical data. To use MapShaper, simply upload your shapefile to the site. Then, at the center bottom you see a slider that starts at 0%. It is usually acceptable to drag it up to about 80%. In the left menu you can check "show original lines" to compare the result and you may want to give a different simplification method a try. When you are happy with the result, click "export" in the top right corner. Then check the first of the four options called "Shapefile - polygons", click "create" and wait for the download buttons to appear. Now, download the two files to your local computer and overwrite the existing ones. Move on to the next step with your new simplified shapefile.

Step 2 - Convert the shapefile to GML

The recommended tool for geographical format conversions is called "ogr2ogr". This should be available for most Linux distributions **sudo apt-get install gdal-bin**. For Windows, go to http://fwtools.maptools.org/ and download "FWTools", install it and open up the FWTools command shell. During the format conversion we also want to ensure that the output has the correct coordinate projection (called EPSG:4326 with geographic longitude and latitude). For a more detailed reference of geographic coordinates, please refer to this site. If you have already reprojected the geographic data to the geographic latitude/longitude (EPSG:4326) system, there is no need to explicitly define the output coordinate system, assuming that **ogr2ogr** can determine the input spatial reference system. Note that most shapefiles are using the EPSG:4326 system. You can determine the spatial reference system by executing the following command.

```
ogrinfo -al -so filename.shp
```

Assuming that the projection is reported to be EPSG:27700 by **ogrinfo**, we can transform it to EPSG:4326 by executing the following command.

```
ogr2ogr -s_srs EPSG:27700 -t_srs EPSG:4326 -f GML filename.gml filename.shp
```

If the geographic data is already in EPSG:4326, you can simply transform the shapefile to GML by executing the following command.

```
ogr2ogr -f GML filename.gml filename.shp
```

You will find the created GML file in the same folder as the shapefile.

Step 3 - Prepare the GML file

Unfortunately, the GML file is not ready for importation yet. Open it in a robust text editor like Geany (Linux) or Notepad++ (Windows). GML is an XML based format which means that you will recognize the regular XML tag hierarchy. In the GML file an organisation unit is represented as a <gml:featureMember>. Inside the feature members we usually find a lot of attributes, but we are just going to import their coordinates.

In order to import geospatial data from the feature members of the GML input, DHIS2 must match each of them with an organisation unit in its database. The feature member element must, in other words, contain a reference to its corresponding organisation unit. The reference itself must be one of three possible DHIS2 identifiers: **uid**, **code** or **name**. The identifier of choice must be provided as a property for each feature member element. The importer will look for a property with the local name of either *Uid*, *Code* or *Name*, e.g. "ogr:Name" or "anyPrefix:Code".

If your feature members already contain a property of the identifier you wish to use (such as the name of an area) you can use search and replace in a text editor to rename these elements

to a name DHIS2 will recognize (see the below table). This is typically a workflow which is applicable when using the name as the identifier (the source shapefile or even GML will usually contain the name for each area it defines).

Table 26.1. Organisation unit identifiers supported for GML import

Matching priority	Identifier	Valid spellings	Guaranteed unique
1	Uid	uid, Uid, UID	Yes
2	Code	code, Code, CODE	No
3	Name	name, Name, NAME	No

In the case of renaming properties one would usually find a tag named something like "ogr:DISTRICT_NAME", "ogr:NAME_1" and rename it to "ogr:Name". If using the *code* or *uid* identifiers on the other hand, looking up the correct values in the DHIS2 database and going through the GML file, adding the properties for each corresponding feature member might be necessary. In any of the cases it is important to realize that the identifier used must **uniquely** identify an organisation unit (e.g. if there are two organisation units in the database of the same name or code, these cannot be matched properly on either). As *uid* is the only guaranteed-to-be-unque identifier it is the most robust choice. However, as matching on name is usually easier (given that the name is already part of your data), a viable approach to solving uniqueness conflicts can be to match any non-uniquely named organisation units on a different identifier (uid, preferrably) and the rest on their names.

As can be seen in the above table there is a matching priority, meaning is any two or more identifiers are provided for the same feature member, matching will be performed on the highest priority identifier. Note also the valid properties which can be used in you GML. The namespace prefix is not important as only the local name is used.

A common pitfall of performing preparation of the GML files is syntax- or element naming errors. Therefore please make sure that all properties of the GML file are started and terminated with correctly corresponding tags. Also make sure the properties follow either of the given valid spellings of the property name. The identifying properties are supposed to look like e.g. <ogr:Name>Moyamba District</ogr:Name>, <somePrefix:uid>x7uuia898nJ</somePrefix:uid> or <CODE>OU_12345</CODE>. Another common error is not making sure the identifier matches exactly, especially when using the *name* property. All matches are performed on exact values, meaning that "Moyamba" in a source GML file would not be matched against "Moyamba District" in the database.

Have a brief look at the identifiers and compare them to the corresponding values in the database. If they seem to match fairly good, it is about time to do a preview in the import-export module.

Go to Services -> Import-Export, select "Preview", select the GML file and click "Import". Look for new/updated organisation units. Our intention is to add coordinates to already existing organisation units in the database, so we want as many updates as possible and 0 new. Those listed as new will be created as root units and mess up the organisation unit trees in DHIS2. If any listed as new, click the number and the organisation units in question will appear in the list below. If there are any slight misspellings compared to the organisation unit names in the database - fix them and do the preview again. Otherwise, click the "discard all" button below the list and then the "Import all" button above the list.

If the import process completes successfully, you should now be able to utilize the geographical data in the DHIS2 GIS. If not, check the log for hints and look for common errors such as:

- Name duplicates in the GML file. The name column in the database is unique and does not accept two organisation units with the same name.

- The "shortname" column in the organisationunit table in your database has a too small varchar definition. Increase it to 100.

- Special name characters in the GML file. Be sure to convert these to appropriate XML equivalents or escape sequences.

- Wrongly formatted input GML, non-matching tags

Chapter 27. Configure report functionality

27.1. Data sources for reporting

27.1.1. Types of data and aggregation

In the bigger picture of HIS terminology all data in DHIS2 are usually called aggregated as they are aggregates (e.g. monthly summaries) of medical records or some kind of service registers reported from the health facilities. Aggregation inside DHIS2 however, which is the topic here, is concerned with how the raw data captured in DHIS2 (through data entry or import)are further aggregated over time (e.g. from monthly to quarterly values) or up the organisational hierarchy (e.g. from facility to district values).

27.1.1.1. Terminology

- *Raw data* refers to data that is registered into the DHIS2 either through data entry or data import, and has not been manipulated by the DHIS2 aggregation process. All these data are stored in the table (or Java object if you prefer) called DataValue.
- *Aggregated data* refers to data that has been aggregated by the DHIS2, meaning it is no longer raw data, but some kind of aggregate of the raw data.
- *Indicator values* can also be understood as aggregated data, but these are special in the way that they are calculated based on user defined formulas (factor * numerator/ denominator). Indicator values are therefore processed data and not raw data, and are located in the aggregatedindicatorvalue table/object. Indicators are calculated at any level of the organisational hierarchy and these calculations are then based on the aggregated data values available at each level. A level attribute in the aggregateddatavalue table refers to the organisational level of the orgunit the value has been calculated for.
- *Period and Period type* are used to specify the time dimension of the raw or aggregated values, and data can be aggregated from one period type to another, e.g. from monthly to quarterly, or daily to monthly. Each data value has one period and that period has one period type. E.g. data values for the periods Jan, Feb, and Mar 2009, all of the monthly period type can be aggregated together to an aggregated data value with the period Q1 2009 and period type Quarterly.

27.1.1.2. Basic rules of aggregation

27.1.1.2.1. What is added together

Data (raw) can be registered at any organisational level, e.g. at national hospital at level 2, a health facility at level 5, or at a bigger PHC at level 4. This varies form country to country, but DHIS2 is flexible in allowing data entry or data import to take place at any level. This means that orgunits that themselves have children can register data, sometimes the same data elements as their children units. The basic rule of aggregation in DHIS2 is that *all raw data is aggregated together*, meaning data registered at a facility on level 5 is added to the data registered for a PHC at level 4.

It is up to the user/system administrator/designer to make sure that no duplication of data entry is taking place and that e.g. data entered at level 4 are not about the same services/visits that are reported by orgunit children at level 5. NOTE that in some cases you want to have duplication of data in the system, but in a controlled manner. E.g. when you have two different

sources of data for population estimates, both level 5 catchment population data and another population data source for level 4 based on census data (because sum of level 5 catchments is not always the same as level 4 census data). Then you can specify using advanced aggregation settings (see further down) that the system should e.g. not add level 5 population data to the level 4 population data, and that level 3,2,1 population data aggregates are only based on level 4 data and does not include level 5 data.

27.1.1.2.2. How data gets added together

How data is aggregated depends on the dimension of aggregation (see further down).

Along the orgunit level dimension data is always summed up, simply added together. Note that raw data is never percentages, and therefore can be summed together. Indicator values that can be percentages are treated differently (re-calculated at each level, never summed up).

Along the time dimension there are several possibilities, the two most common ways to aggregate are sum and average. The user can specify for each data element which method to use by setting the aggregation operator (see further down). Monthly service data are normally summed together over time, e.g. the number of vaccines given in a year is the sum of the vaccines given for each month of that year. For population, equipment, staff and other kind of what is often called semi-permanent data the average method is often the one to use, as, e.g. 'number of nurses' working at a facility in a year would not be the sum of the two numbers reported in the six-monthly staffing report, but rather the average of the two numbers. More details further down under 'aggregation operators'.

27.1.1.3. Dimensions of aggregation

27.1.1.3.1. Organisational units and levels

Organisational units are used to represent the 'where' dimension associated with data values. In DHIS2, organisational units are arranged in a hierarchy, which typically corresponds to the hierarchical nature of the organisation or country. Organisational unit levels correspond to the distinct levels within the hierarchy. For instance, a country may be organized into provinces, then districts, then facilities, and then sub-centers. This organisational hierarchy would have five levels. Within each level, a number of organisational units would exist. During the aggregation process, data is aggregated from the lower organisational unit levels to higher levels. Depending on the aggregation operator, data may be 'summed' or 'averaged' within a given organisational unit level, to derive the aggregate total for all the organisational units that are contained within a higher level organisational unit level. For instance, if there are ten districts contained in a province and the aggregation operator for a given data element has been defined as 'SUM', the aggregate total for the province would be calculated as the sum of the values of the individual ten districts contained in that province.

27.1.1.3.2. Period

Periods are used to represent the 'when' dimension associated with data values. Data can easily be aggregated from weeks to months, from months to quarters, and from quarters to years. DHIS2 uses known rules of how these different intervals are contained within other intervals (for instance Quarter 1 2010 is known to contain January 2010, February 2010 an March 2010) in order to aggregate data from smaller time intervals, e.g. weeks, into longer time intervals, e.g. months.

27.1.1.3.3. Data Elements and Categories

The data element dimension specifies 'what' is being recorded by a particular data value. Data element categories are actually degenerated dimensions of the data element dimension, and are used to disaggregate the data element dimension into finer categories. Data element categories, such as 'Age' and 'Gender', are used to record a particular data element, typically

for different population groups. These categories can then be used to calculate the overall total for the category and the total of all categories.

27.1.1.4. Aggregation operators, methods for aggregation

27.1.1.4.1. Sum

The 'sum' operator simply calculates the sum of all data values that are contained within a particular aggregation matrix. For instance, if data is recorded on a monthly basis at the district level and is aggregated to provincial quarterly totals, all data contained in all districts for a given province and all weeks for the given quarter will be added together to obtain the aggregate total.

27.1.1.4.2. Average

When the average aggregation operator is selected, the unweighted average of all data values within a given aggregation matrix are calculated.

It is important to understand how DHIS2 treats null values in the context of the average operator. It is fairly common for some organisational units not to submit data for certain data elements. In the context of the average operator, the average results from the number of data elements that are actually present (therefore NOT NULL) within a given aggregation matrix. If there are 12 districts within a given province, but only 10 of these have submitted data, the average aggregate will result from these ten values that are actually present in the database, and will not take into account the missing values.

27.1.1.5. Advanced aggregation settings (aggregation levels)

27.1.1.5.1. Aggregation levels

The normal rule of the system is to aggregate all raw data together when moving up the organisational hierarchy, and the system assumes that data entry is not being duplicated by entering the same services provided to the same clients at both facility level and also entering an 'aggregated' (sum of all facilities) number at a higher level. This is to more easily facilitate aggregation when the same services are provided but to different clients/catchment populations at facilities on level 5 and a PHC (the parent of the same facilities) at level 4. In this way a facility at level 5 and a PHC at level 4 can share the same data elements and simply add together their numbers to provide the total of services provided in the geographical area.

Sometimes such an aggregation is not desired, simply because it would mean duplicating data about the same population. This is the case when you have two different sources of data for two different orgunit levels. E.g. catchment population for facilities can come from a different source than district populations and therefore the sum of the facility catchment populations do not match the district population provided by e.g. census data. If this is the case we would actually want duplicated data in the system so that each level can have as accurate numbers as possible, but then we do NOT want to aggregate these data sources together.

In the Data Element section you can edit data elements and for each of them specify how aggregation is done for each level. In the case described above we need to tell the system NOT to include facility data on population in any of the aggregations above that level, as the level above, in this case the districts have registered their population directly as raw data. The district population data should then be used at all levels above and including the district level, while facility level should use its own data.

27.1.1.5.2. How to edit data element aggregation

This is controlled through something called aggregation levels and at the end of the edit data element screen there is a tick-box called Aggregation Levels. If you tick that one you will see

a list of aggregation levels, available and selected. Default is to have no aggregation levels defined, then all raw data in the hierarchy will be added together. To specify the rule described above, and given a hierarchy of Country, Province, District, Facility: select Facility and District as your aggregation levels. Basically you select where you have data. Selecting Facility means that Facilities will use data from facilities (given since this is the lowest level). Selecting District means that the District level raw data will be used when aggregating data for District level (hence no aggregation will take place at that level), and the facility data will not be part of the aggregated District values. When aggregating data at Province level the District level raw data will be used since this is the highest available aggregation level selected. Also for Country level aggregates the District raw data will be used. Just to repeat, if we had not specified that District level was an aggregation level, then the facility data and district data would have been added together and caused duplicate (double) population data for districts and all levels above.

27.1.2. Resource tables

Resource tables provide additional information about the dimensions of the data in a format that is well suited for external tools to combine with the data value table. By joining the data value table with these resource tables one can easily aggregate along the data element category dimension or data element/indicator/organisation unit groups dimensions. E.g. by tagging all the data values with the category option male or female and provide this in a separate column 'gender' one can get subtotals of male and female based on data values that are collected for category option combinations like (male, <5) and (male,>5). See the Pivot Tables section for more examples of how these can be used. orgunitstructure is another important table in the database that helps to provide the hierarchy of orgunits together with the data. By joining the orgunitstructure table with the data values table you can get rows of data values with the full hierarchy, e.g. on the form: OU1, OU2, OU3, OU4, DataElement, Period, Value (Sierra Leone, Bo, Badija, Ngelehun CHC, BCG <1, Jan-10, 32) This format makes it much easier for e.g. pivot tables or other OLAP tools to aggregate data up the hierarchy.

27.1.3. Report tables

Report tables are defined, cross-tabulated reports which can be used as the basis of further reports, such as Excel Pivot Tables or simply downloaded as an Excel sheet. Report tables are intended to provide a specific view of data which is required, such as "Monthly National ANC Indicators". This report table might provide all ANC indicators for a country, aggregated by month for the entire country. This data could of course be retrieved from the main datamart, but report tables generally perform faster and present well defined views of data to users.

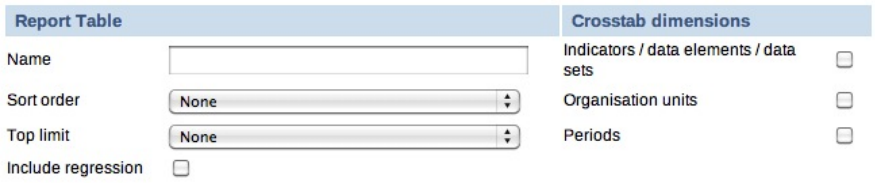
27.2. How to create report tables

To create a new report table, go to the Report tables section of the Reports module (Reports -> Report Table). Above the list of standard reports, use the "Add report table" or "Add Dataelement Dimension Table" buttons. A regular report table can be used to hold data on data elements, indicators or dataset completeness, while Dataelement dimension tables are used to include data element categories in report tables. Creating the tables are done in the same way, however, the only exception being when choosing data.

To create a report table, you start by making some general choices for the table, the most important of which is the crosstab dimension. Then, you choose which data elements, indicators, datasets or data element dimensions you want to include. Finally you select which organisation units and time periods to use in the report table. Each of these steps are described in detail below.

27.2.1. General options

Report table options



Cross tab dimensions

You can cross-tab one or more of the following dimensions: data element/indicator, orgunit, and period, which means that columns will be created based on the values of the dimensions chosen, e.g. if indicators is selected you will get column names in the table reflecting the names of the selected indicators.

For example, if you cross-tab on indicators and periods, the column headers will say "<indicator title> <period>". The organisation units will be listed as rows. See screenshot for clarification:

Indicators and periods are cross-tabbed

Organisation unit	ANC coverage February 2010	ANC coverage 2010
Jappineh Village OPD	0.0	0.0
Jappineh PHC Circuit	0.0	0.0
Jarra Central District	0.0	0.0

If you cross-tab on indicators and organisation units, the column headers of the table will say "<indicator title> <organisation unit>". Now the periods will be listed as rows. See screenshot for clarification:

Indicators and organisation units are cross-tabbed

Period	ANC coverage Jarra Central District	ANC coverage Jappineh PHC Circuit	ANC coverage Jappineh Village OPD
2010	0.0	0.0	0.0
February 2010	0.0	0.0	0.0

Note that the options made here regarding crosstab dimensions may have consequences for what options are available when using the report table as a data source later, for example for standard reports.

Sort order

Affects the rightmost column in the table, allows you to choose to sort it low to high or high to low.

Top limit

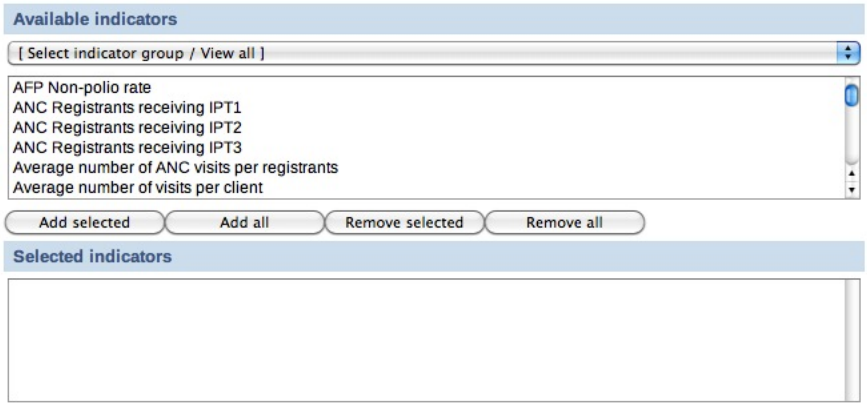
Top limit allow you to set a maximum number of rows you want to include in the report table.

Include regression

This adds additional columns with regression values that can be included in the report design, e.g. in line charts.

27.2.2. Selecting data

Data options



Indicators/Data elements

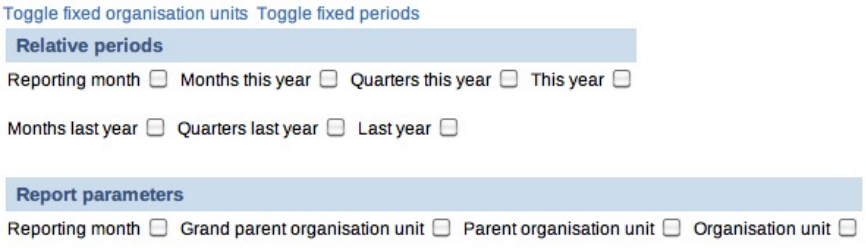
Here you select the data elements/indicators that you want to include in the report. Use the group filter to more easily find what you are looking for and double click on the items you want to include, or use the buttons to add/remove elements. You can have both data elements and indicators in the same report.

Data sets

Here you select the data sets that you want to include in the report. Including a data set will give you data on the data completeness of the given set, not data on its data elements. Double click on the items you want to include, or use the buttons.

27.2.3. Selecting report parameters

Report parameter options



There are two ways to select both what organisation units to include in a report, and what time periods should be included: relative, or fixed. Fixed organisation units and/or periods means that you select the units/periods to include in the report table when you create the report table. Using relative periods, you can select the time and/or units as parameters when the report table is populated, for example when running a standard report or creating a chart. A combination is also possible, for example to add some organisation units in the report permanently while letting the users choose additional. Report parameters is discussed below. In general, using fixed organisation units and/or time periods are an unnecessary restriction.

Fixed Organisation Units

To add fixed organisation units, click "Toggle fixed organisation units". A panel will appear where you can choose orgunits to always include in the report. If you leave it blank, the users select orgunits when running the report through the use of report parameters. Use the drop down menu to filter organisation units by level, double click or use the buttons to add/remove.

Fixed Periods

To add fixed periods, click "Toggle fixed organisation units". A panel will appear where you can choose periods to always include in the report. If you leave it blank, the users select periods when running the report through the use of report parameters. Use the drop down menu to choose period type (week, month, etc), the Prev and Next button to choose year, and double click or use the buttons to add/remove.

Relative periods

Instead of using fixed/static periods like 'Jan-2010' or 'Q1-2010', more generic periods can be used to create reusable report tables, e.g. for monthly reports the period 'Reporting month' will simply pick the current reporting month selected by the user when running the report. Note that all relative periods are relative to a "reporting month". The reporting month is either selected by the users, otherwise the current month is used. Here is a description of the possible relative periods:

- *Reporting month:*

  Use this for monthly reports. The month selected in the reporting month parameter will be used in the report.

- *Months/Quarters this year*:

  This will provide one value per month or quarter in the year. This is well suited for standard monthly or quarterly reports where all month/quarters need to be listed. Periods that still have no data will be empty, but will always keep the same column name.

- *This year:*

  This is the cumulative so far in the year, aggregating the periods from the beginning of the year up to and including the selected reporting month.

- *Months/Quarters last year*:

  This will provide one value per month or quarter last year, relative to the reporting month. This is well suited for standard monthly or quarterly reports where all month/quarters need to be listed. Periods that still have no data will be empty, but will always keep the same column name.

- *Last year:*

  This is the cumulative last year, relative to the reporting month, aggregating all the periods from last year.

Example - relative periods

Let's say we have chosen three indicators: A, B and C, and we have also chosen to use the relative periods 'Reporting month' and 'This year' when we created the report table. If the reporting month (selected automatically or by the user) is for example May 2010, the report table will calculate the values for the three selected indicators for May 2010 (= the 'Reporting month') and the accumulated values for the three selected indicators so far in 2010 (= so far 'This year').

Thus, we will end up with six values for each of the organisation units: "Indicator A May 2010", "Indicator B May 2010" "Indicator C May 2010", "Indicator A so far in 2010", "Indicator B so far in 2010" and "Indicator C so far in 2010".

Report parameters

Report parameters make the reports more generic and reusable over time and for different organisation units. These parameters will pop up when generating the report table or running a report based on the report table. The users will select what they want to see in the report. There are four possible report parameters, and you can select none, all, or any combination.

- *Reporting month:*

This decides which month will be used when the system is choosing the relative periods. If the box it not checked, the user will not be asked for the reporting month when the report is generated - the current month will then be used.

- *Grand parent organisation unit:*

  Select the grand parent of all the orgunit children and grand children you want listed in the report. E.g. a selected region will trigger the use of the region itself, all its district, and all their sub-districts.

- *Parent organisation unit:*

  Select the parent of all the orgunit children you want listed in the report. E.g. a selected district will trigger the use of the district itself and all its children/sub-districts.

- *Organisation unit:*

  This triggers the use of this orgunit in the report. No children are listed.

Example - report parameters

Continuing with the example on relative periods just above, let's say that in addition to 'Reporting month', we have chosen 'Parent organisation unit' as a report parameter when we created the report table. When we're running the report table, we will be asked to select an organisation unit. Now, let's say we choose "Region R" as the organisation unit. "Region R" has the children "District X" and "District Y".

When the report is run, the system will aggregate data for both "District X" and "District Y". The data will be aggregated from the lowest level where they have been collected. The values for the districts will be aggregated further to give an aggregated value for "Region R".

Thus, the report table will generate the six values presented in the previous example, for "District X", "District Y" and "Region R".

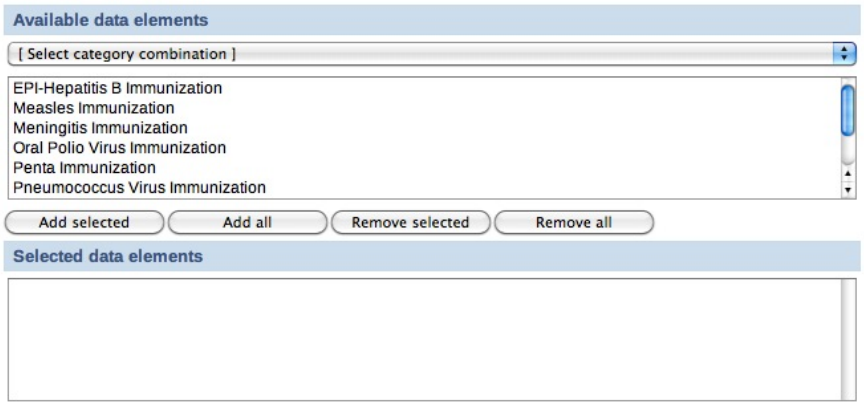
27.2.4. Data element dimension tables

These tables enable the use of data element categories in report tables. There are two differences from regular report tables. The first is that it is not possible to select crosstab dimensions, as the columns will always be the disaggregations from the category combinations. The other is the actual choice of data. Only one category combination can be added per report, and only data elements from the same category combo can be selected.

Subtotals and the total will also be included in the table, e.g. a gender (male, female) + EPI age(<1, >1) category combo would give the following columns: male+<1, male+>1, Female +<1, female+>1, male, female,<1, >1, total.

Selecting data

Selecting category combinations



Use the drop down menu to choose category combinations. The data elements using this category combination will be listed. Double click to add to the report, or use the buttons.

27.2.5. Report table - best practices

To make the report tables reusable over time and across orgunits they can have parameters. Four types of parameters are allowed; orgunit, parent orgunit (for listing of orgunits in one area), grand parent orgunit and reporting month. As a side note it can be mentioned that we are looking into expanding this to include reporting quarter and year, or to make that period parameter more generic with regard to period type somehow. The ability to use period as a parameter makes the report table reusable over time and as such fits nicely with report needs such as monthly, quarterly or annual reports. When a report is run by the user in DHIS2, the user must specify the values for the report tables that are linked to the report. First the report table is re-generated (deleted and re-created with updated data), and then the report is run (in the background, in Jasper report engine).

Report tables can consist of values related to data elements, indicators or data completeness, which is related to completeness of reporting across orgunits for a given month. Completeness reports will be covered in a separate section.

There are three dimensions in a report table that identify the data; indicators or data elements, orgunits and periods. For each of these dimensions the user can select which metadata values to include in the report. The user must select one or more data elements or indicators to appear in the report. The orgunit selection can be substituted with a parameter, either one specific orgunit or an orgunit parent (making itself and all its children appear in the report). If one or more orgunits are selected and no orgunit parameter is used, then the report is static with regard to which orgunits to include, which in most cases is an unnecessary restriction to a report.

Using relative periods

The period selection is more advanced as it can in addition to specific periods like Jan-09, Q1-08, 2007 also contain what is called relative periods. As report usually is run routinely over time a specific period like Jan-09 is not very useful in a report. Instead, if you want to design a monthly report, you should use the relative period called Reporting Month. Then you must also include Reporting Month as one of your report parameters to let the system know what exactly is the Reporting Month on the time of report generation. There are many other relative periods available, and they all relate to the report parameter Reporting Month. E.g. the relative period called So far this year refers to the accumulative value for the year incl. the Reporting Month. If you want a trend report with multiple periods in stead of one aggregated period, you can select e.g. 'Months this year', which would give you values for each month so far in the year. You can do a similar report with quarters. The idea is to support as many generic report types as possible using relative periods, so if you have other report needs, please suggest new relative periods on the mailing list, and they might be added to the report table options.

Cross-tabbing dimensions

Cross tabbing is a very powerful functionality in report design, as the typical DHIS2 data table with references to period, data element/indicator and orgunit makes more advanced report design very difficult, as you cannot put e.g. specific indicators, periods or orgunits on specific columns. E.g. by cross-tabbing on the indicator dimension in an indicator report table you will get the indicator names on the column headers in your report, in addition to a column referencing orgunit, and another column referencing period. With such a table design you could drag and drop indicator names to specific columns or chart positions in the iReport software. Similarly you can cross tab on orgunits or periods to make their names specifically available to report design. E.g. by cross-tabbing on periods and selecting the two relative periods 'Reporting month' and 'This year', you can design reports with both the last month and the accumulative

annual value for given month as they will be available as column headers in your report table. It is also possible to combine two dimensions in cross-tabbing, e.g. period and indicator, which makes it possible to e.g. look at three selected indicators for two specific relative periods. This would e.g. make it possible to make a table or chart based report with BCG, DPT3 and Measles coverage, both for the last month and the accumulative coverage so far in the year.

All in all, by combining the functionality of cross tabbing, relative periods and report table parameters you should have a tool to support most report scenarios. If not, we would be very happy to receive suggestions to further improvements to report tables. As already mentioned, we have started to look at more fine-grained parameters for the period dimension as the 'Reporting month' does not cover enough, or at least is not intuitive enough, when it comes to e.g. quarterly reports.

27.3. Report table outcome

When the report table is run, the system will calculate values for specified indicators/data elements/data sets, orgunits and periods. The data will be presented in DHIS2 in a table layout. The column headers will correspond to the cross-tab dimension you have selected. An example report table showing ANC coverage for a district in The Gambia, is shown below. Here the indicator and the periods are cross-tabbed, as can be seen from the column headers.

Example report table

Organisation unit	ANC coverage February 2010	ANC coverage 2010
Jappineh Village OPD	0.0	0.0
Jappineh PHC Circuit	0.0	0.0
Jarra Central District	0.0	0.0

Above the table there are six buttons; five download buttons and one Back button. Clicking the Back button will simply take you back to the previous screen. The function of the five download buttons, are presented below the screenshot:

The download buttons

The five download buttons

- *Download as Excel:*

  Downloads a generated Excel file you can open in Excel.

- *Download as CSV:*

  Downloads a generated .csv file. CSV stands for **C**omma **S**eparated **V**alues. It's a text file with the file ending .csv. Each line in the file corresponds to a row in the table, while the columns are separated with semi colons (;). The file can be opened in a text editor as well as in a spread sheet program (such as Excel).

- *Download as PDF:*

  Downloads a generated PDF file. The data will be presented in a similar layout as the generated table you are already viewing in DHIS2.

- *Download as Report:*

  Downloads a "styled" PDF file. In addition to present the data in a table layout, this file also presents a chart, showing the aggregated data from all the chosen periods and the parent

organisation unit chosen for the report table. The report is generated using the Jasper report engine.

- *Download as JRXML:*

  Downloads the design file for the generated Report described in the previous bullet. The design file (with the file ending .jrxml) can be opened in the Jasper iReport Designer software. If you plan to design standard reports, this is the starting point.

27.4. Standard reports

27.4.1. What is a standard report?

A standard report is a manually designed report that presents data in a manually specified layout. Standard reports can be based either on report tables or SQL queries. Both approaches are described in the following sections. The main advantage of using report tables is that of simplicity - no special development skills are required. In cases where you have special requirements or need to utilize additional parts of the DHIS2 database you might want to use a SQL based standard report. In any case you will be able to utilize report parameters in order to create dynamic reports. The following guide will use the report table approach, while the SQL approach is covered towards the end.

27.4.2. Designing Standard reports in iReport

Jasper iReport Designer is a tool for creating reports that can be used as Standard Reports in DHIS2. The tool allows for the creation of standard report templates that can easily be exported from DHIS2 with up to date data. The process of creating reports involves four major steps:

1. A report table must be created in DHIS2 with the indicators/data elements/datasets to be used in the report.
2. You have to run the report table and download the design file (Click the "Download as JRXML" button).
3. Open the downloaded .jrxml file using the free software Jasper iReport Designer to edit the layout of the report.
4. The edited report can then be uploaded to DHIS2 to be used as a standard report.

If you want to preview your report during the design in iReport, you actually have to upload your file to DHIS2 to see how it looks.

These four steps will be describe in detail in the coming sections. In general, when you are making standard reports you should have a clear idea of how it should look before you even make the report table, as how the report table is designed has implications for how the report can be formatted in iReport. For example, what crosstab dimensions are selected in the report table has consequences for what crosstabs are available for the standard report, and it has consequences for what types of charts you can make.

27.4.2.1. Download and open the design file

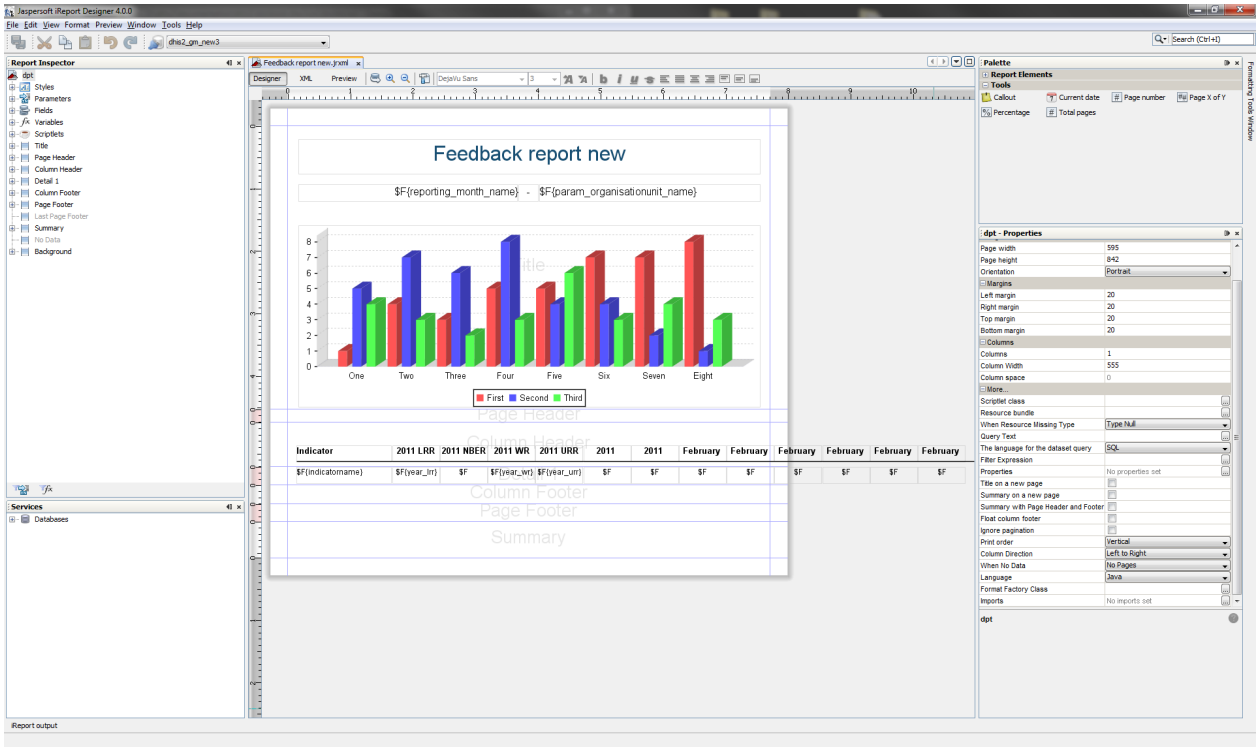
Note: If you have not created a report table yet, you have to do so. See section "How to create report tables" to do so.

Locate your desired report table and run it by clicking the green circle with a white arrow inside. When the report is shown, click the "Download as JRXML" button to download the design file. Then open that file in the Jasper iReport Designer software.

27.4.2.2. Editing the report

You are now ready to edit the layout of the report. The main iReport window consists of a "Report Inspector" to the left, the report document in the middle, a "Palette" area on the upper right hand side and a "Properties" area on the lower right hand side. The "Report Inspector" are used for selecting and examining the various properties of the report, and when selecting an item in the inspector, the "Properties" panel changes to display properties relating to the selection. The "Palette" is used for adding various elements, e.g. text boxes, images and charts to the document.

Overview of the main iReport window



Note: If you cannot see the Palette or Properties sidebar, you can enable them from the menu item called "Window" on the menu bar.

The iReport document is divided into seven main bands, divided by layout separators (the blue lines). These lines are used to decide how big each of the areas should be on the report.

The areas all have different purposes:

- Title - area for the title of the report
- Page header - area for the page header
- Column header - area for column headers (for the table)
- Detail 1 - area where the actual report data will be placed
- Column footer - area to make footer of the table
- Page footer - area for the page footer
- Summary - elements in this area will be placed at the end of the report

By default you will see that only the Title, Column Header and the Detail 1 bands have data. For most reports this is OK. The Title band is suitable for a title and e.g. a chart. Data fields entered into the Detail 1 area will be iterated over to create a table. For example, if a field called "dataelementname" is placed in the Detail 1 band, all data elements in the report table will be listed here. We'll come back to data fields management just a little below.

The unused bands in the report are shrinked to add more space for your report data. You can however increase/decrease the band height as you like. There are two ways to do that. The first way is simply to drag the blue band-line as shown below.

Drag the blue lines to change the band heights

The other way to adjust the band height is to select a band in the "Report Inspector", and then adjust the "Band height" value in the "Detail 1 - properties" area in the lower right corner.

Adjust the size of layout areas by changing the Band height property

As the fields are already present on the report, you probably don't want to do anything than just fix the layout and drag fields around. You can also resize the fields by dragging the side, top or bottom lines. If you want to change the text in the column headers, you simply double click the field and change the text.

To add the a field to the table, we simply drag it to the Detail 1 band from the "Report Inspector". The column header will be added automatically.

By double clicking the box, the text can be edited. The format of the text, such as size, font and alignment, can be adjusted with the tools above the document.

Double click to edit the text, and change its appearance

NOTE: Fields starting with "$F" present values that are retrieved from the database every time the report is run. The values here will vary, so do not change these fields unless you want a static value here!

27.4.2.3. Text

There are two types of text in iReport: «Text labels» and «Text fields» (data fields). They work in different ways, and should be used for different purposes. The main point is that text fields are just placeholders that will be filled with the correct text from the report table when the report is run, while text labels will stay the way they are when the report is run.

27.4.2.3.1. Static text

Static text are text plain text labels that can be edited normally. There are two ways to edit text labels:

- By double clicking in the text box
- By using the Static text properties in the Properties panel

Click to edit text label

27.4.2.3.2. Text fields

Text fields are formulas that will be filled from the report table when the report is run. Unlike static text, these can not be edited in a normal way. However, they can be manipulated in various ways to ensure that the desired output will be produced. There are three ways to edit the text fields:

- By right clicking on the text box and selecting Edit expression
- By double clicking the text field (not recommended, as this will not bring up the expression editor)
- By using the Text field properties in the Properties panel

Click to open Expression editor

Click to open Expression editor

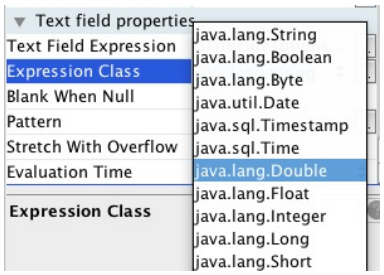
Text fields can represent either numbers or text, so that they can be used both for showing for example names of district or for numeric values. It is therefore important the Expression class, seen in the Text field properties matches the Text field expression. For the default text fields in the .jrxml file downloaded from DHIS2 this is not a problem, but it is important when making new text fields. The two most important Expression classes are java.lang.Double for numbers and java.lang.String for text.

27.4.2.3.2.1. Example

For example, let us say you have a quarterly report where you would like to add a new column with the yearly total. You therefore add a new Static text field to the column header band, and a Text field to the details band in. By default, new Text fields are set to java.lang.String (text). However, the yearly total column will be filled with numbers. We therefore have to change the Expression class for the new text field to java.lang.Double:

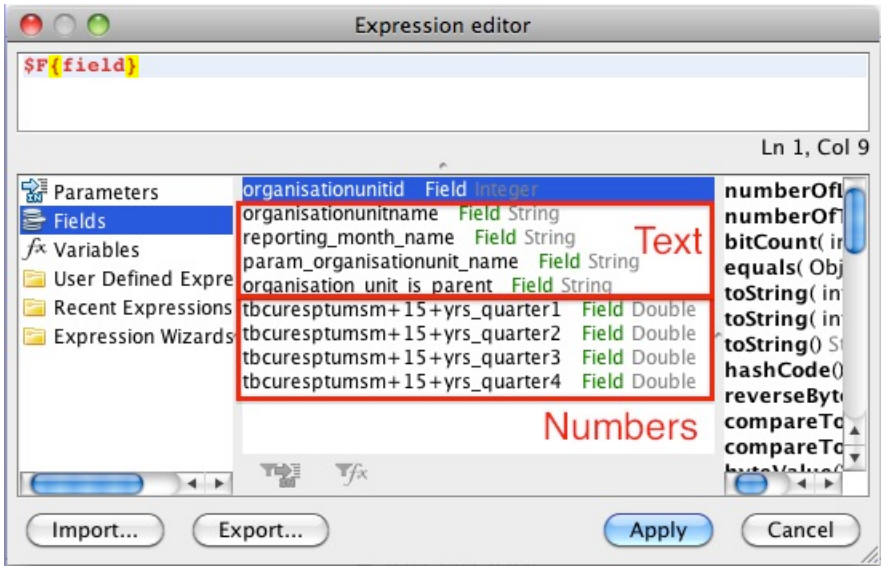
Click to show expression class options

Choose desired class



When we edit the text field expression, we see the Expression editor window with all the available columns from the report table. We can see here that each of these are marked with what type they are - text or number. What we need to make sure of is therefore that the expression class we choose for the text field matches the actual expression.

Expression editor



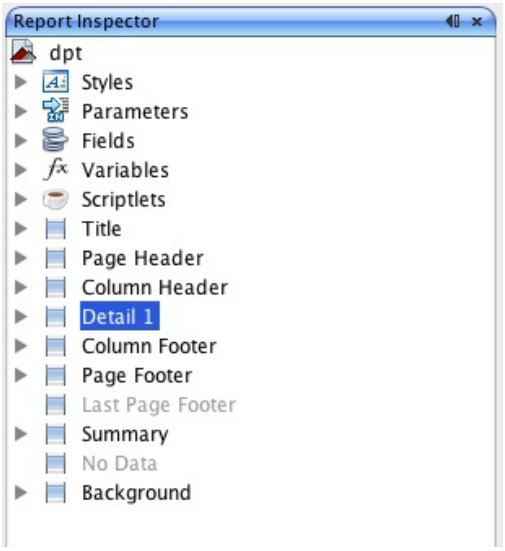
27.4.2.4. Filtering the table rows

In the default table exported from DHIS2, there are some rows that it might be better to leave out of the table, and some that it would be preferable to have at the end. For example, when making a table based on a report table with the «parent organisation unit» parameter, the default table might have a row with the national level somewhere in between all the regions. In iReport, this can be changed so that the «parent organisation unit» appears at the bottom of the table. This involves two steps that will be explained below. Note that this will not work where there is only one organisation units, and it is therefore most useful when using the «parent organisation unit» or «grand parent organisation unit» parameters in the report table.

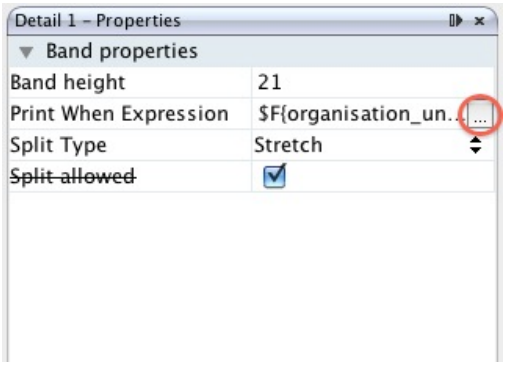
27.4.2.4.1. Hiding the «parameter organisation unit» from the table

We exclude the "parameter organisation unit" from the table by using a property in the Details band called "Print when expression". To set a Print when expression, start by selecting the Detail band in the Report inspector, then edit the Print when expression in the properties panel.

Select Detail 1 in the Report Inspector



Open the Expression Editor by clicking next to Print When Expression

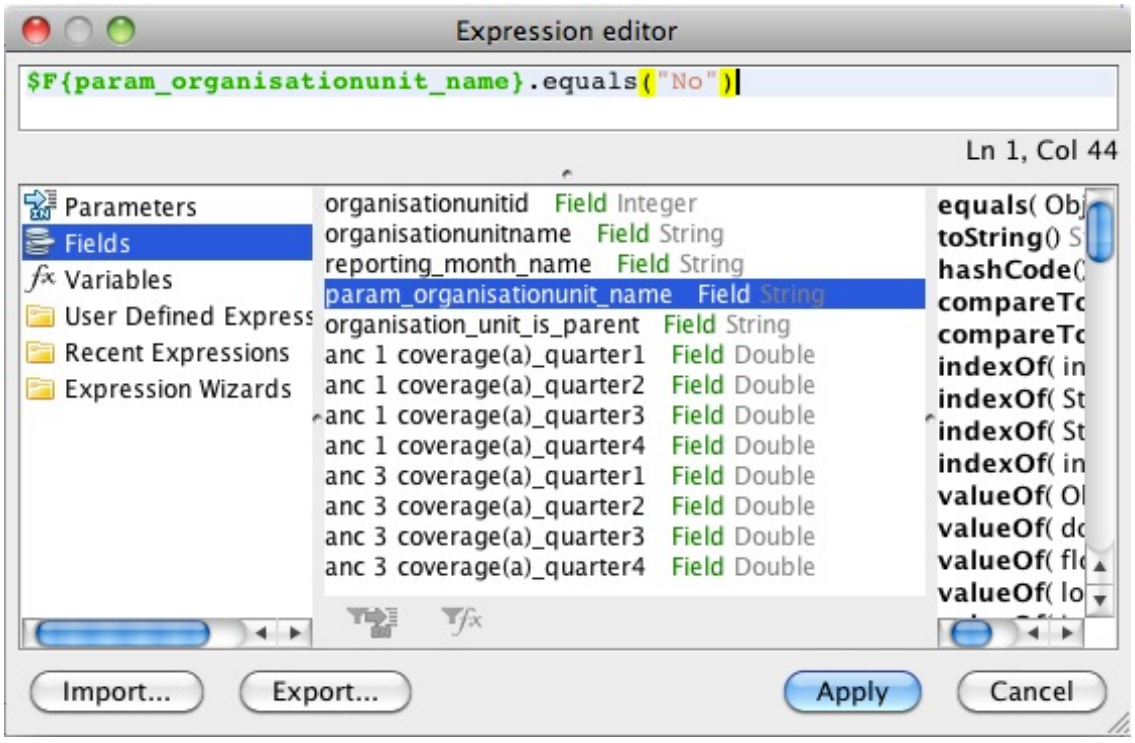


The Expression editor window should now appear. What we must do is to create an expression that checks if the row being generated is the row with the organisation unit given as a parameter. The report table contains a column that we can use for this called organisation_unit_is_parent. To exclude the row with the parameter organisation unit, double click on organisation_unit_is_parent in the list to copy it to the expression area, then add **.equals("No")** at the end so that the code is:

$F{organisation_unit_is_parent}.equals("No")

This tells the report engine to only print table rows where the organisation unit is not the parent organisation unit.

Code to skip parent organisation unit



27.4.2.4.2. Putting the "param organisation unit" at the bottom of the table

Instead of removing the "param organisation unit" from the table entirely, it is also possible to put it at the bottom (or top) of the table. This is done by using the sort functionality explained in the next section, and choosing to sort first by "organisation_unit_is_parent". Other sorting options can be added in addition to this, for example to make a list where the param organisation unit is at the bottom of the table, with the other organisation units listed alphabetically above it.

27.4.2.4.3. Hiding other rows

Using the expression editor it is also possible to exclude other rows from the table, in addition to the parent organisation unit as was explained above. In Ghana, for example, all regions have a «fake district» which is the name of the region in square brackets. This can also be excluded from the table using the Print when expression that was introduced above. To to this, follow the instructions above to bring up the Expression editor window. Then, we use Java expressions to test whether or not the row should be hidden.

27.4.2.4.3.1. Example - removing rows with organisation units starting with [

Example - removing rows with organisation units starting with [

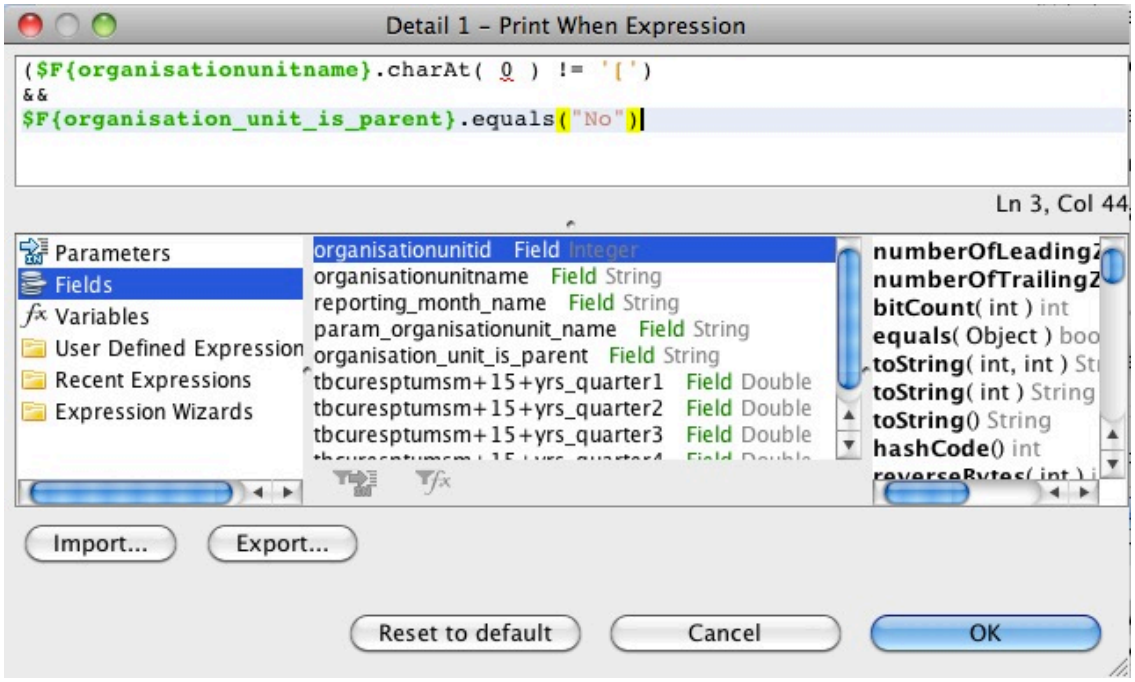
($F{organisationunitname}.charAt(0) != '[')

This makes the report skip any rows where the first character of the organisation unit name is [.

It is also possible to combine several of these expressions. To do this we put the expressions in a parenthesis with the two characters && in between. For example, to make a table that leaves both organisation units whose name starts with [and the parent organisation unit, we can use the following expression:

($F{organisationunitname}.charAt(0) != '[')&& $F{organisation_unit_is_parent}.equals("No")

Combining expressions in the Expression editor

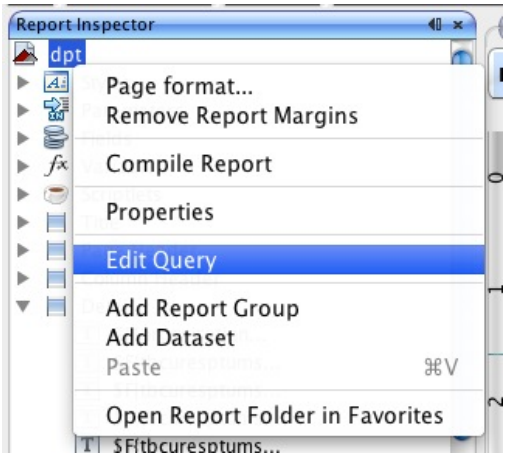


27.4.2.5. Sorting

Often you will be making reports where the first column is organisation unit names. However, it can be a problem that the list of organisation units are not sorted alphabetically. This can be fixed in iReport through a few simple steps.

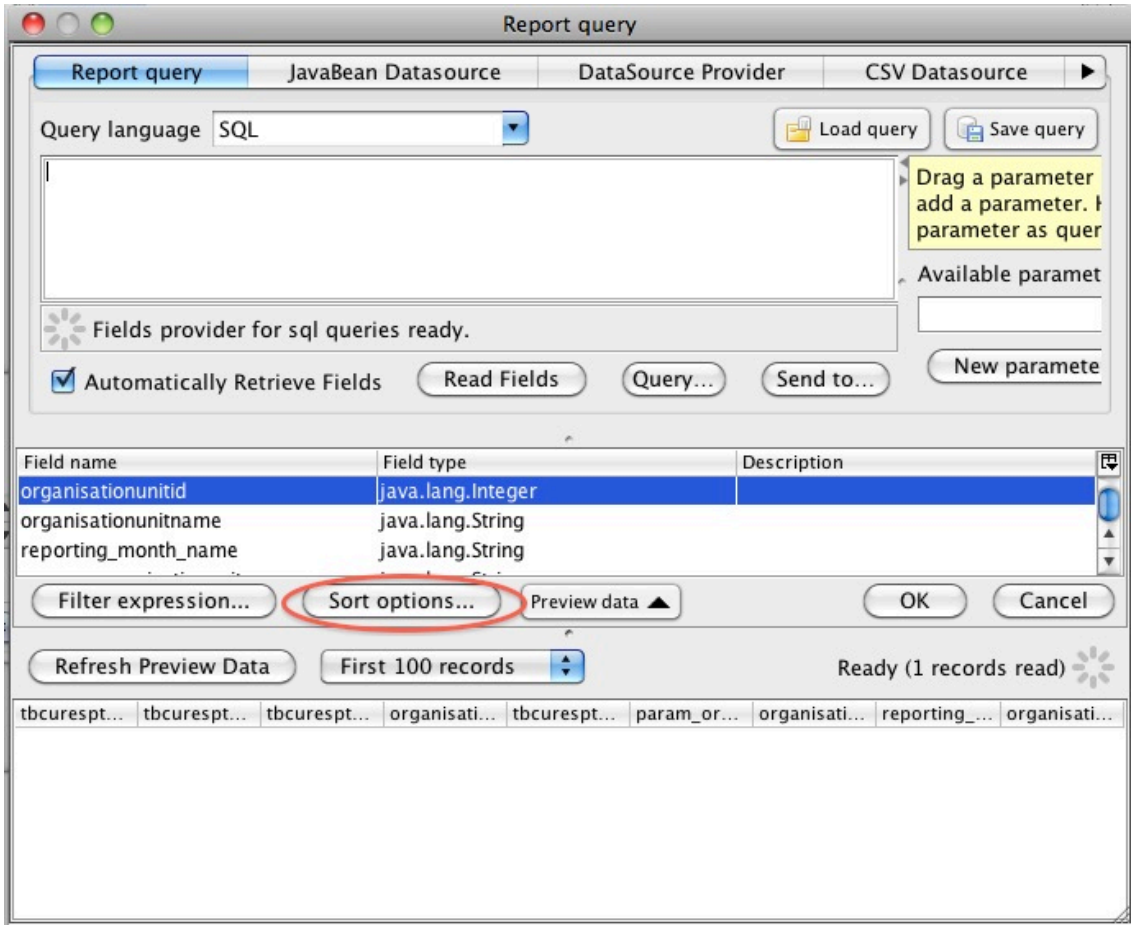
In the report inspector, right click on the name of the report (by default this is dpt) and select Edit query.

Choose Edit Query



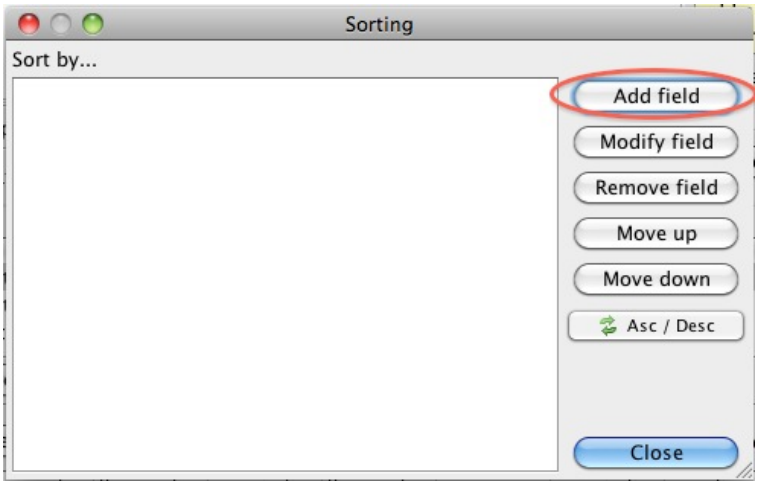
A Report query window will appear. Click on the Sort options button.

Choose Sort Options...

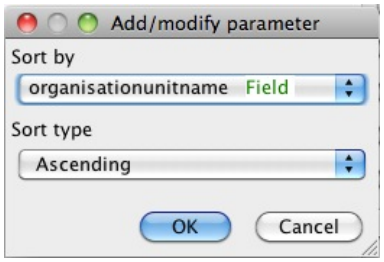


A Sorting window as show below will appear. Here, we can add our sorting options. Click the Add field button. Another small window will show up, with a drop down menu where you can choose Sort by organisationunitname to have the table sorted alphabetically by name.

Choose Add



Choose sort parameter

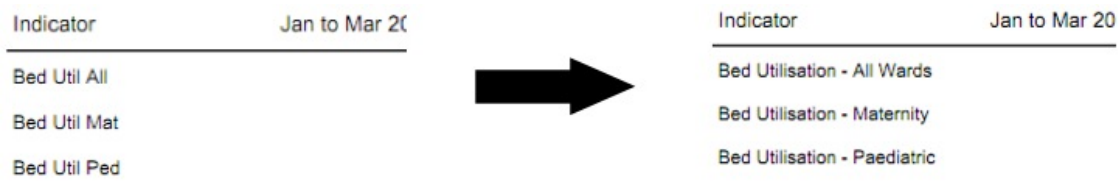


Click OK - Close - OK to close the three windows. The table should now be sorted.

27.4.2.6. Changing indicator/data element names

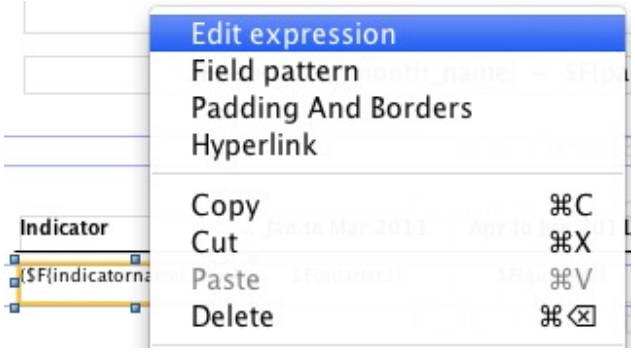
By default, the reports from DHIS2 uses the short names for indicators and data elements in reports and charts. In some cases these are not always very meaningful for third parties, but with some work they can be given custom names through iReport. This is useful for example if you are making a report with indicators as rows and periods as column, or for charts with indicators.

Shortnames - before and after



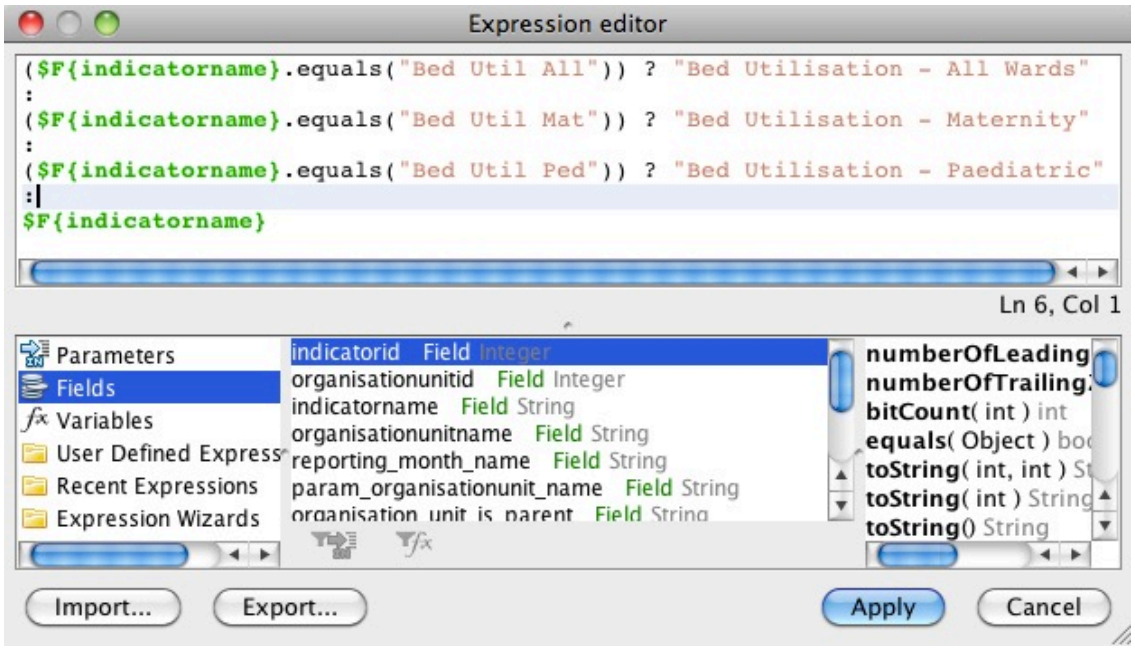
To change the names of an indicator or data element, we have to edit its «expression» or formula, for example by right clicking the text box and choosing Edit expression to bring up the Expression editor.

Choose Edit Expression



Next, we have to insert some Java code. In the following example, we will be replacing the shortname of three indicators with their proper names. The code searches for the shortname, and then replaces it with a proper name.

Expression editor, showing replacing shortnames



($F{indicatorname}.equals("Bed Util All")) ? "Bed Utilisation - All Wards"

:

($F{indicatorname}.equals("Bed Util Mat")) ? "Bed Utilisation - Maternity"

:

($F{indicatorname}.equals("Bed Util Ped")) ? "Bed Utilisation - Paediatric"

:

$F{indicatorname}

From this, we can see a pattern that is reusable for more general cases.

- For each indicator or data element we want to change the name for, we need one line
- Each line is separated by a colon :
- We finish the expression with a «regular» line

Each line has the same format, where the red text is the shortname, the blue text is what we want to insert instead.

Code for replacing shortnames. Shortname in red, new name in blue

```
($F{indicatorname}.equals("Bed Util All")) ? "Bed Utilisation - All Wards"
```

The same expressions can be used for example when having indicator names along the category axis of a chart.

27.4.2.7. Adding horizontal totals

By using the expression editor, it is possible to add a column to the table with totals for each row. In the following example, we will make a table with three months as columns as well as a column with the totals for the three months.

We start by dragging a text label into the table header and changing its text to "Total", and dragging a text field into the details row.

As was discussed in the section on "Text field", we have to change the properties of the new text field so that it can display numbers. To do this, change the "Expressions Class" in the properties panel to "java.lang.Double".

Right click the text field and choose "Edit Expression". This will bring up the "Expressions editor". As the expression, we want to sum up all the columns. In this case we have three value expressions we want to sum up: "September", "October 2010", "November 2010". The name of these fields will vary depending on the crosstab dimension you have chosen in the report table. In our case, the expression we make is "$f{September}+$f{October 2010}+ $f{November 2010}":

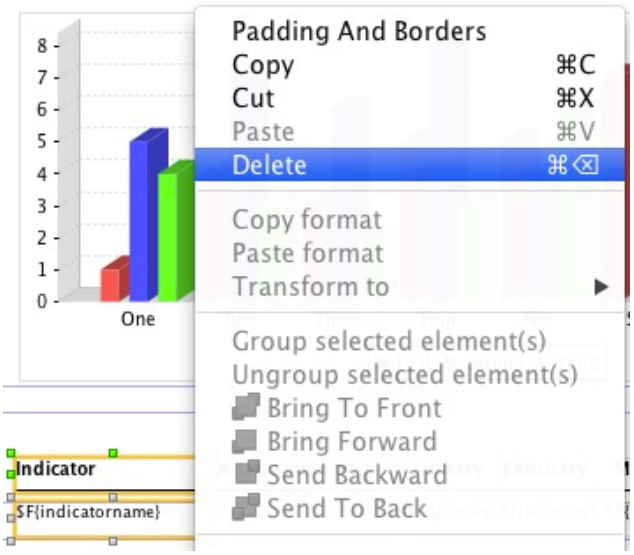
Each row of the table have a totals column to the right.

27.4.2.8. Groups of tables

There are cases when it can be useful to have several tables in one report. This can be done using Report groups. Using this functionality, one can for example create a report one table for each indicator, or one table of each organisation unit. In the following, we will go through the steps needed to make a report with three indicators, each represented in one table. It is important that the report table does not crosstab on indicators when we want to make groups of tables based on indicators.

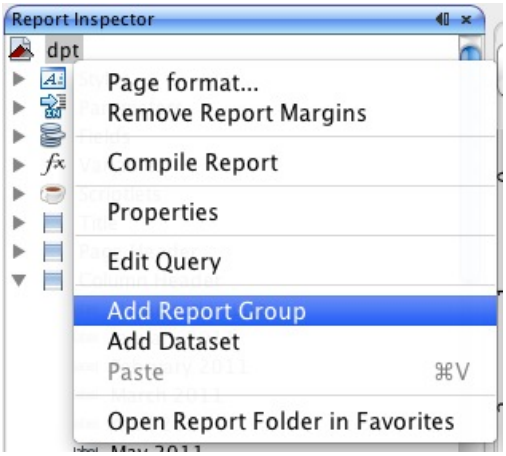
In our example, the .jrxml file downloaded from DHIS2 will by default have one column for organisation unit and on for indicators (assuming we have chosen periods as the only crosstab dimension). We start by removing the indicator column, since this in not needed in our case, and realign the other fields to fit the report.

Delete column



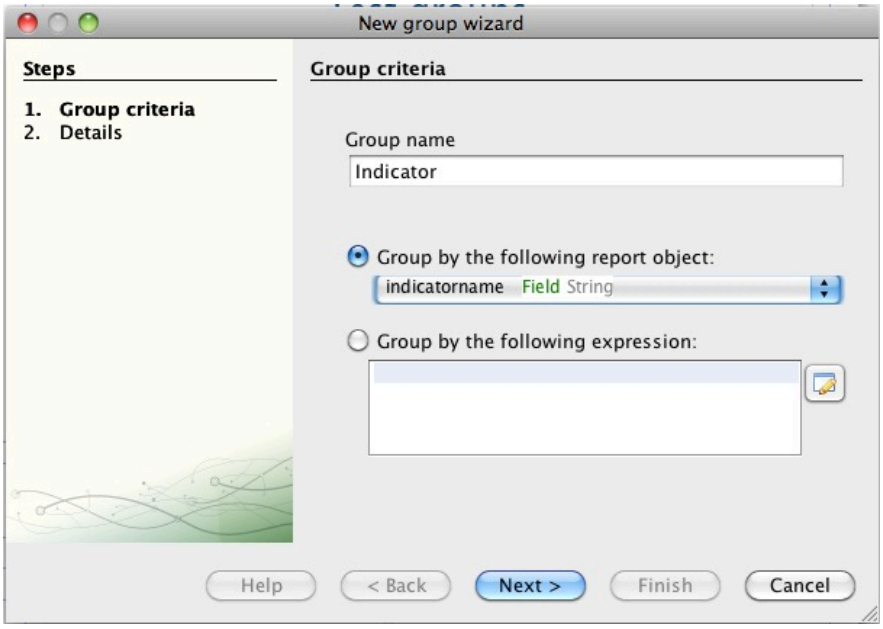
Next, we create out Report group. Go to the report inspector, right click on the report name (dpt is the default) and choose Add Report Group.

Add Report Group



A window will appear, with a report group wizard. Select a name for the group, in this case we choose «Indicator». In the drop down menu, we can select what columns in the report table we want the groups to be based on. So, if we wanted one table for each organisation unit, we would choose organisation unit name as the report object to group according to. However, since we are grouping by indicators in this example, we choose indicatorname. Then click next.

Choose grouping parameter - here, indicators



The next step is to select whether or not we want a separate Group header and Group footer band for each report group. In this case, we choose to include both. Click Finish, and the group bands should appear in the report.

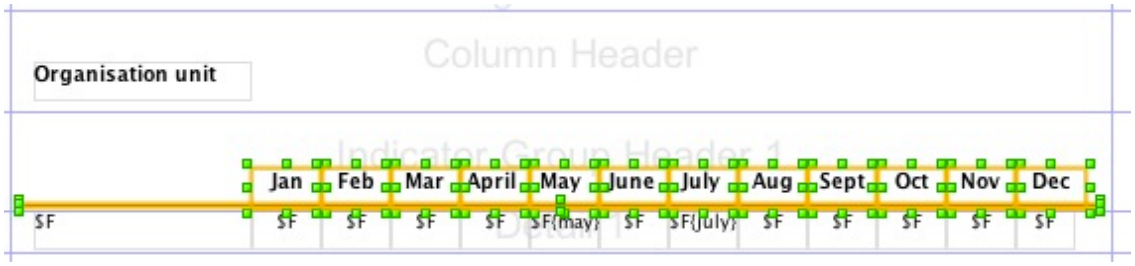
Add group header/footer

If you upload and run the report, it will now create one table for each indicator. However, it will not look very good as there will be no header row over each table - only one header at the top of each page. Also, there is no indication as to which table is showing which indicator. In the following, we will fix this.

Instead of having the title row in the column header, we can instead move it to the Group header. This will make the heading show up above each individual table. Furthermore, we can add a heading to each table with the name of the indicator.

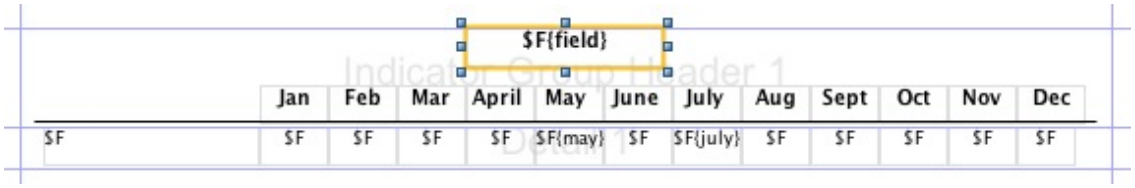
Move the column headers from the Column header band to the Indicator group header band.

Move header row to column header

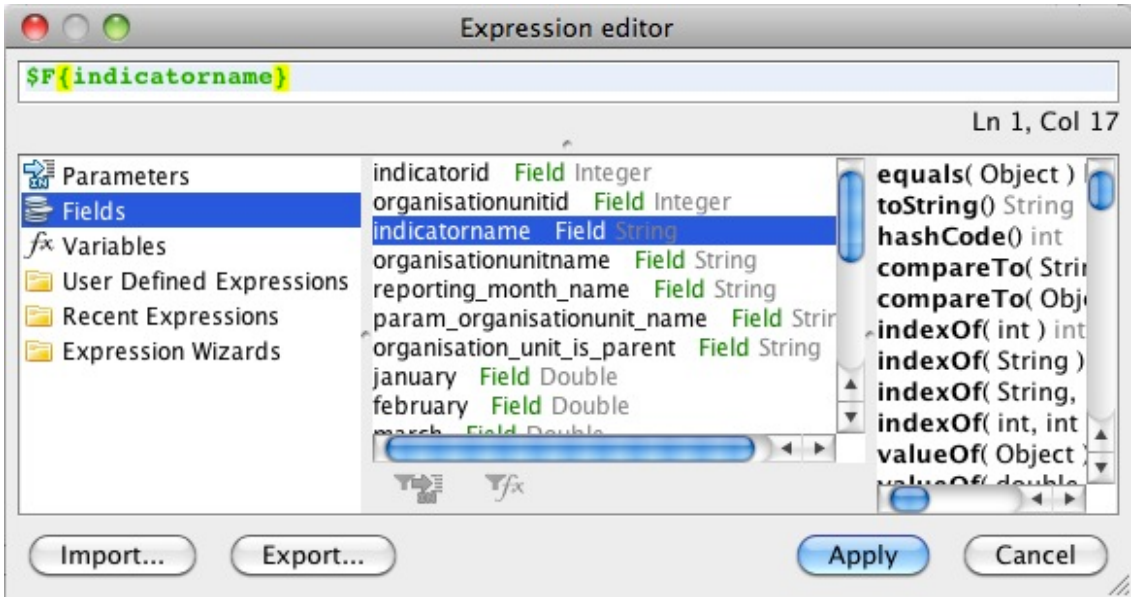


Next, add a text field to the Indicator group heading band, and edit it’s expression to display the indicator name.

Add text field to use as heading



Edit text field expression to show indicator name



The report should now have three tables, one for each indicator. Each table will have a heading with the name of the indicator, and also a table header row.

Example of finished report table

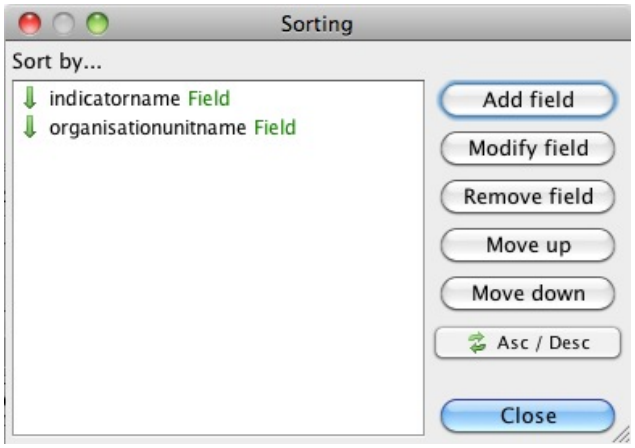
EPI BCG coverage

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Ashanti												
Central												
ZR												
Eastern												
Upper West												

27.4.2.8.1. Sorting and grouping

When using grouping, some precautions must be taken with regards to sorting. Notably, when adding sorting parameters, whatever parameter is used as basis for the grouping must come first. Thus if you are grouping the report by indicator, and want sort the organisation units alphabetically, you have to choose to sort first by indicator, then by organisation unit name as shown below. For instructions on how to add sorting, see the sorting section above.

Sorting by indicator and organisation unit name

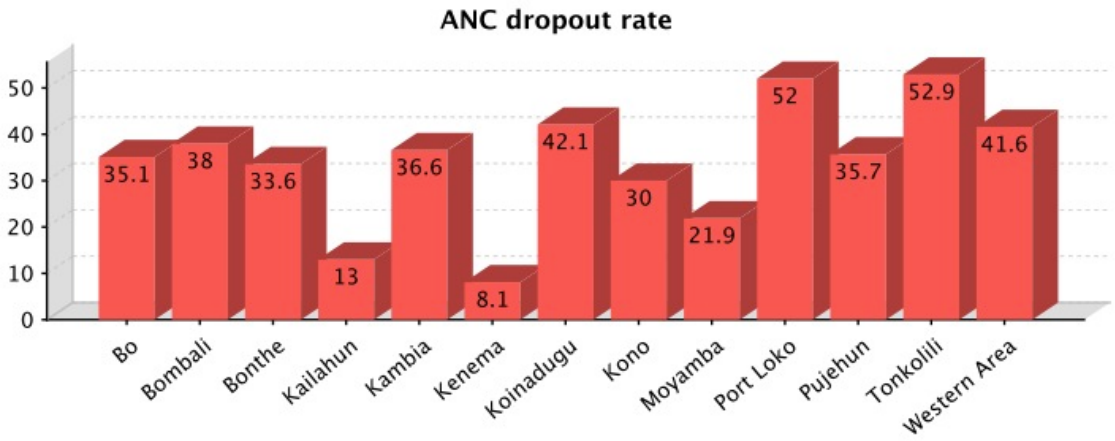


27.4.2.9. Charts

By default, a 3D bar chart is included in the .jrxml file that is downloaded from DHIS 2. This is set up so that only data from the «parameter organisation unit» (often the parent or grand parent) is used. Usually, this is a good solution. Since it is the default, we will start by looking at bar charts, before looking at line charts.

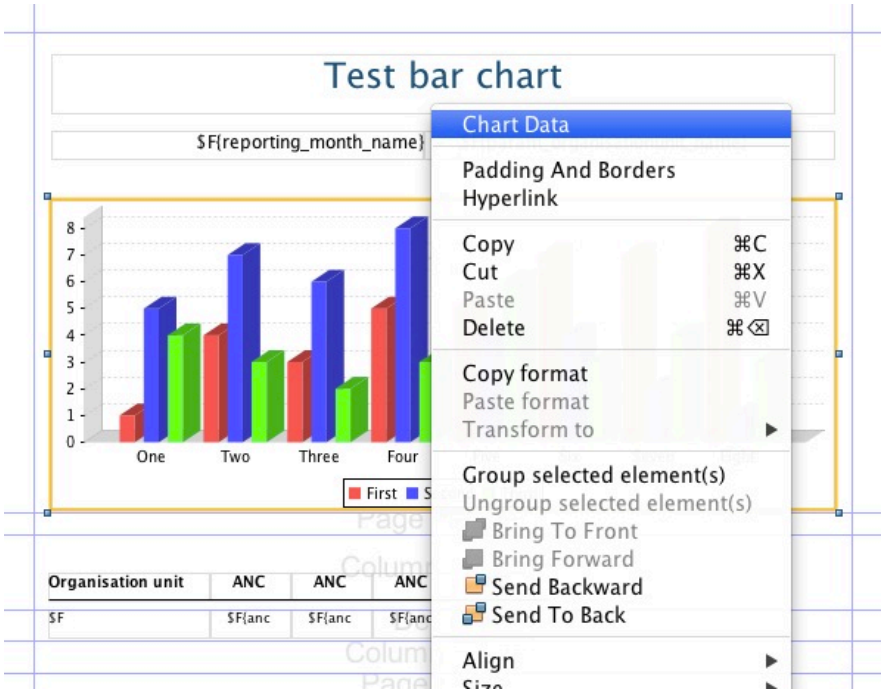
27.4.2.9.1. Bar charts

Example bar chart



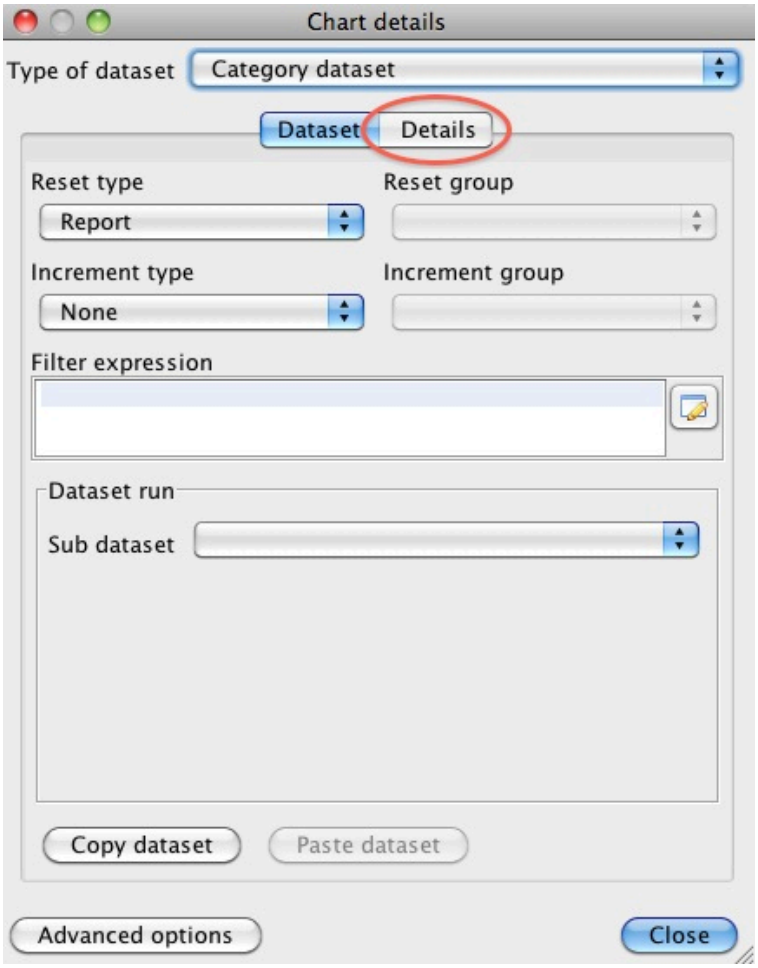
Bar charts are the default chart type in DHIS2. In this section, we will look at how to make a bar charts like the one above, comparing the value of one indicator in several districts. To edit the default chart in iReport, right click on it and choose Chart data.

Choose Edit Chart Data



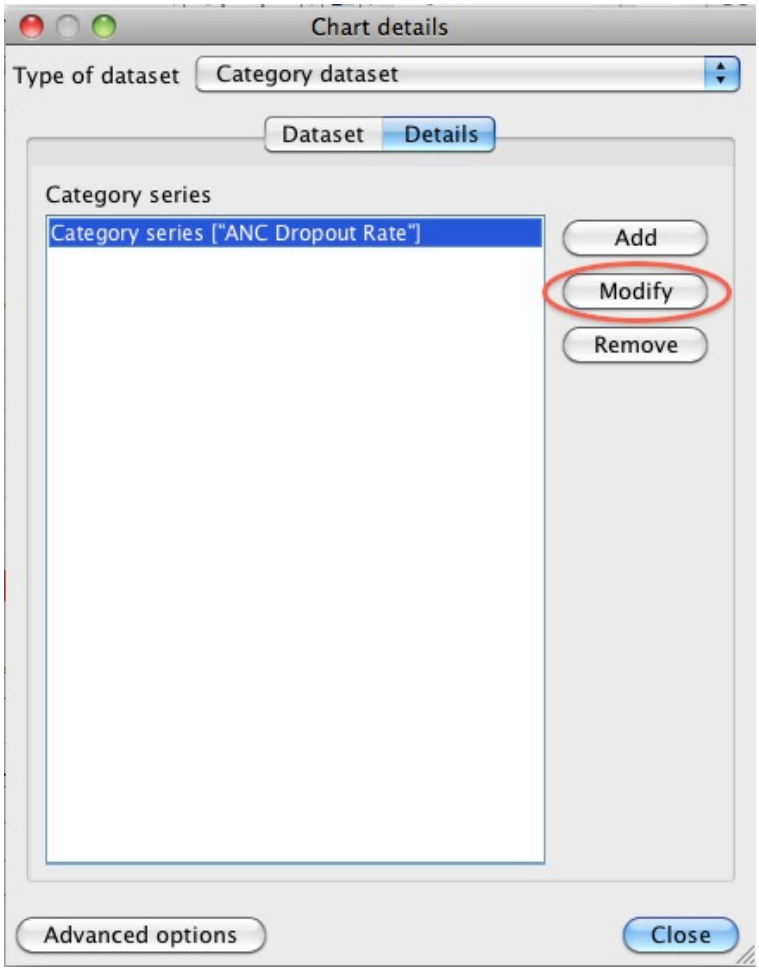
A window will appear. By default, the Filter expression is filled in so that only data for the parent organisation unit will be displayed. If for some reason you do not want this, simply delete the text in the text box. In this case we do NOT want the filter, as we are making a chart showing a comparison across districts. To continue, click the details tab.

Select the Details tab



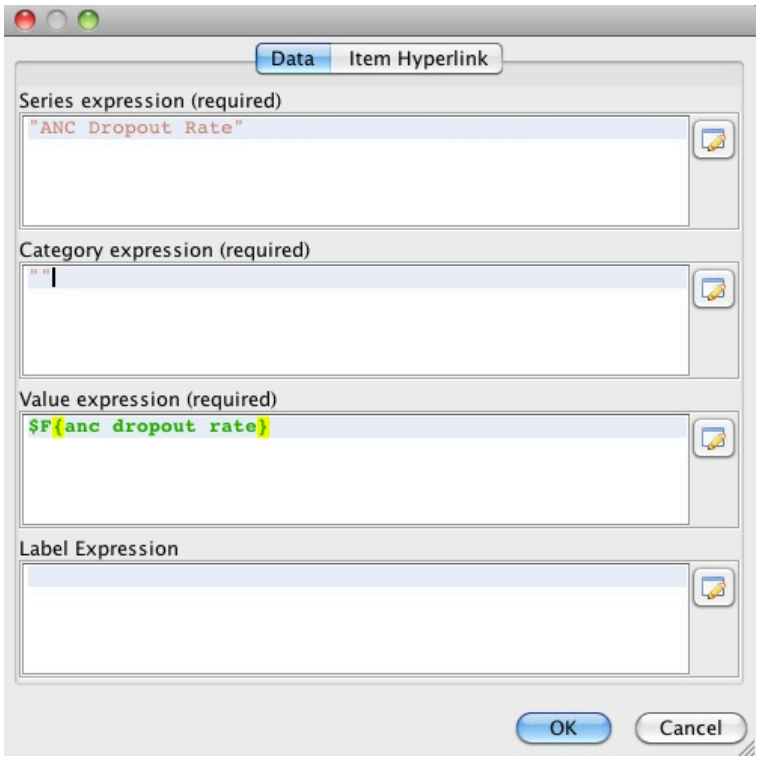
Under details, you see the list of series for the chart. By default, one series is created per crosstab column. In this case, we are looking at data for one indicator for the whole of 2010, for a number of districts. The indicator is along the crosstab dimension.

List of data series



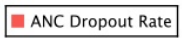
To make changes to a series, select it and click modify. Another window will appear where there are four areas that can be edit. The three first are required, but it is sufficient to add an empty quote («») in one of the first two.

The data series editor



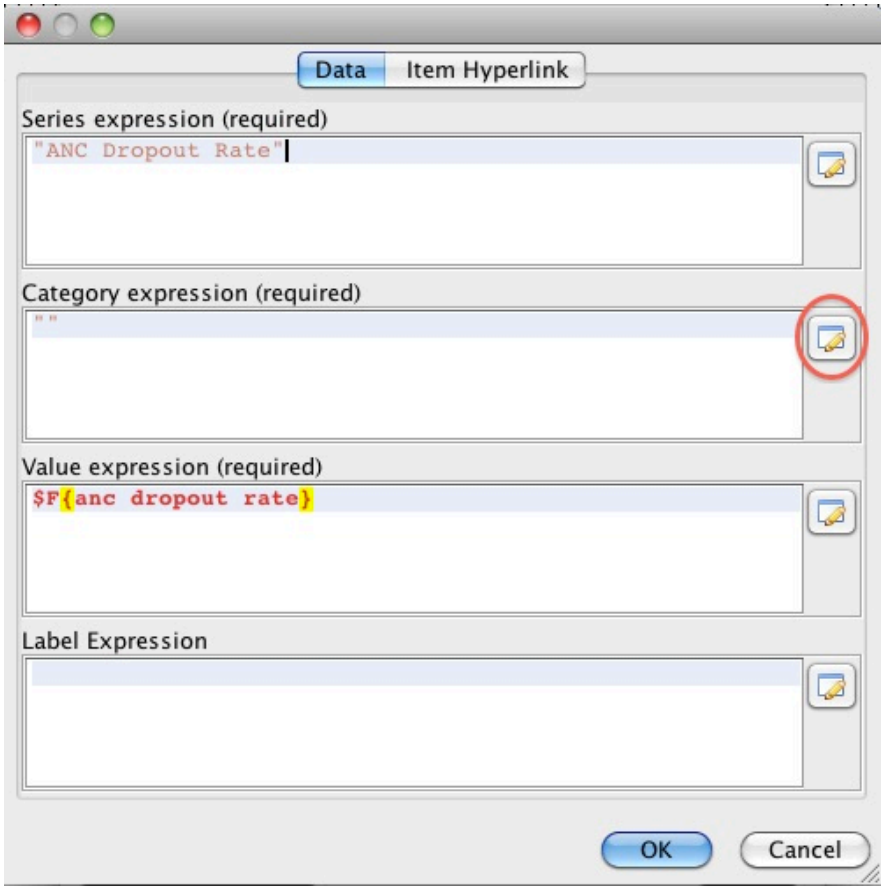
The first box is a text field where the name of the series can be inserted or edited. This is the field that will be used to fill the text in the legend box (shown below).

Chart legend



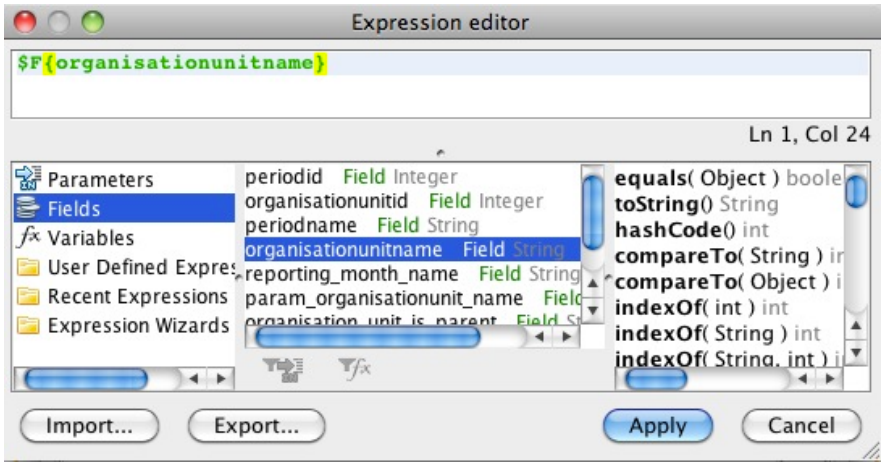
However, if you want to have the name of each bar along the x-axis of the chart instead of using the legend, this can be done by adding whatever text you want to present in the Category expression field, or by inserting an expression to have it filled automatically when the report is run. In this case, we want to have one bar for each organisation unit. We therefore edit the category expression by clicking on the button to the right.

Editing the category expression



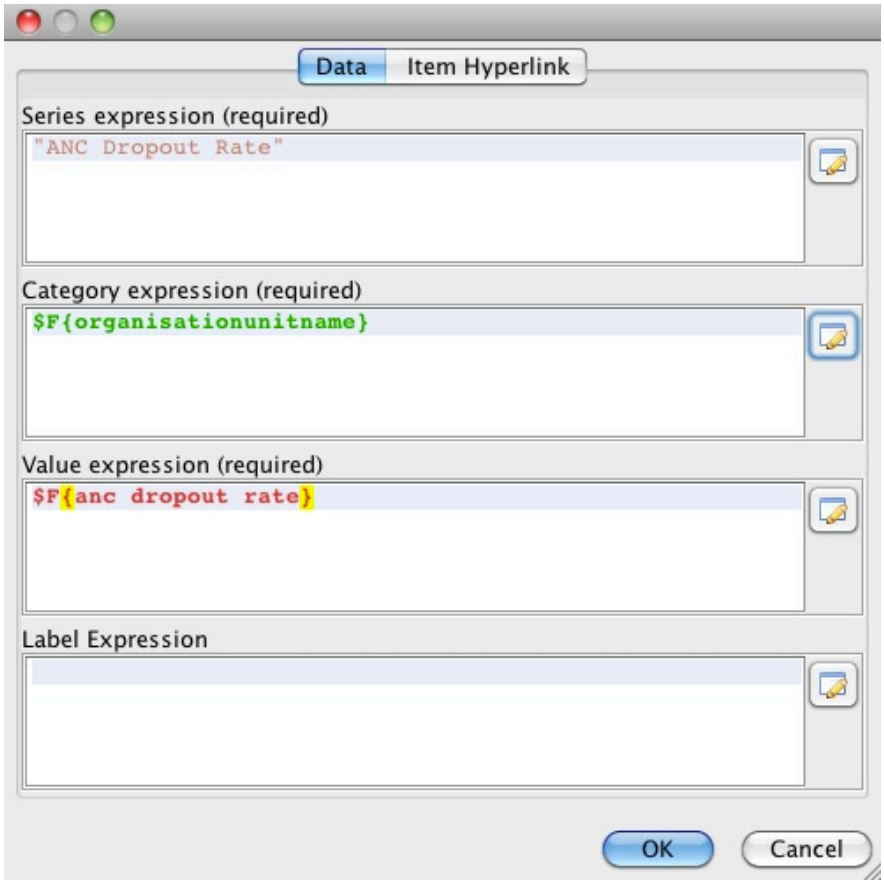
As the expression, we chose organisationunitname, as shown below.

Choose organisation unit name.



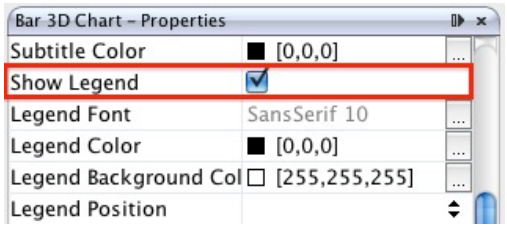
When we are finished, the series editor should look like below. Click OK, then Close to close the Chart Details window.

Series editor.



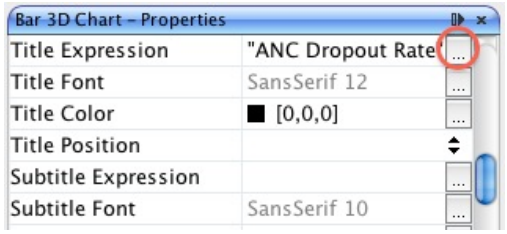
If you add a good description in the Category expression area, you can leave out the legend box. This is done in the Report properties panel of iReport, where you can also edit many other details of the chart.

Checkbox to show/hide chart legend



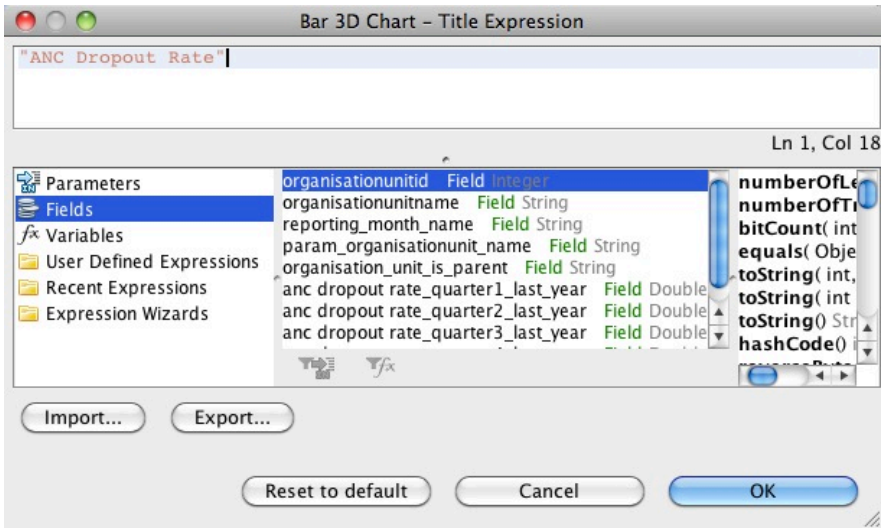
We can also add a title to the chart, for example the name of the indicator. This is also done in the Chart properties panel, under Title expression.

Edit chart title



The Expression editor window will appear, where you can enter the title. Note that the title must be in quotes, as shown below.

Expression editor



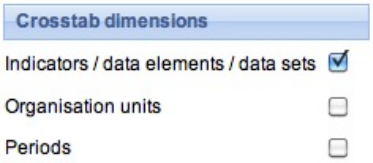
The chart is now ready.

27.4.2.9.2. Line charts

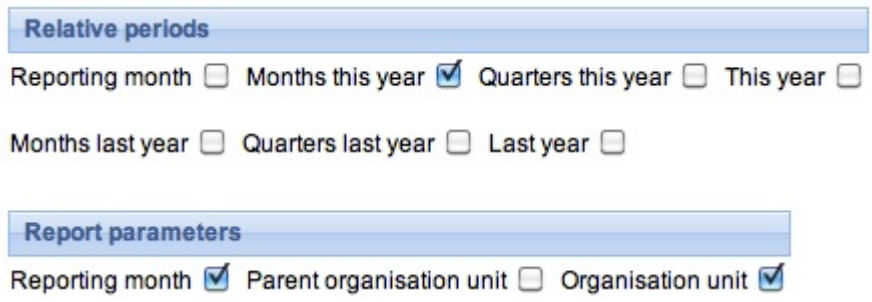
Line charts can be useful in many circumstances. However, to make line charts the report data (report table) must be suited for it. Thus if you want to make a line chart, it is important that the report table does not have periods in the crosstab dimension. Examples where this is useful is if you are making a report for a single organisation unit with one or more indicators, or if you are making a report with one indicator and one or more organisation units.

Below, we will go though the steps needed to make a report with a line chart showing the development of three indicators over one year, for one organisation unit. We start by making a report table with the choices shown below:

Report table - crosstab dimensions

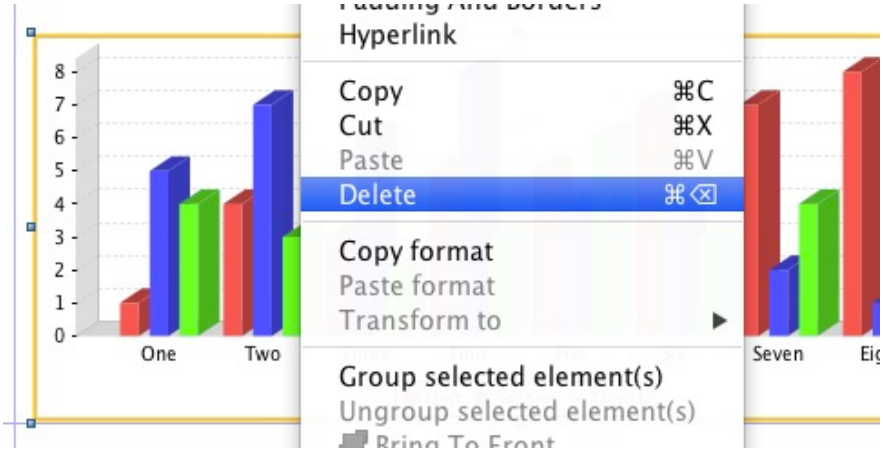


Report table - periods and parameters

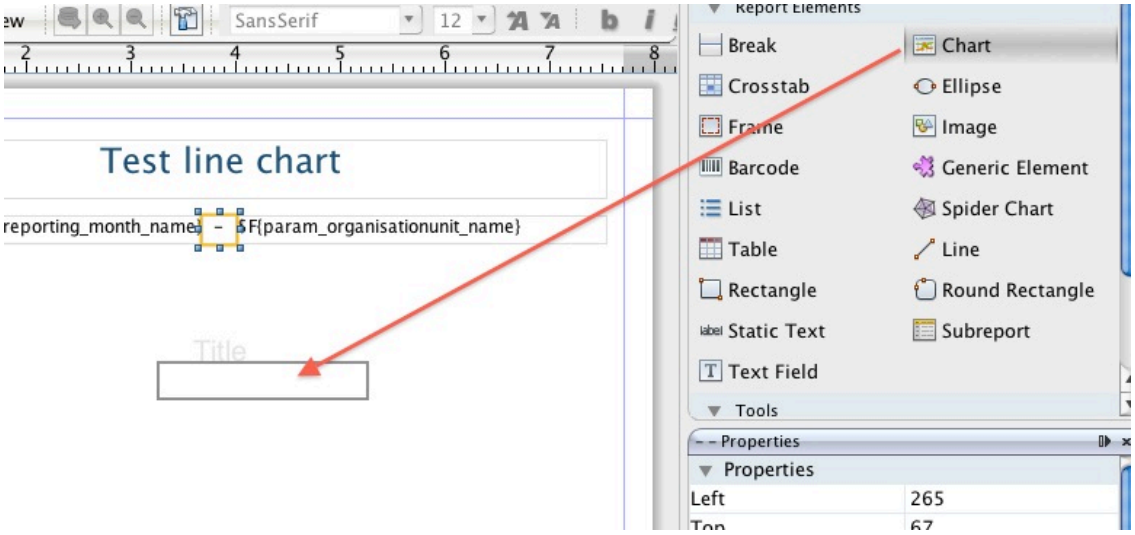


When we open the resulting .jrxml-file in iReport, the default line chart is included. Since we want to make a line chart, we delete this chart and drag a new chart element into the report from the Palette panel.

Delete the default chart

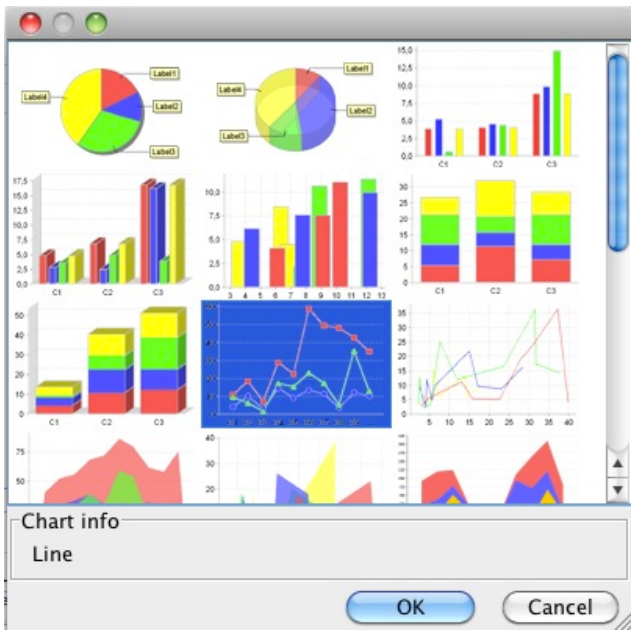


Drag in new chart element



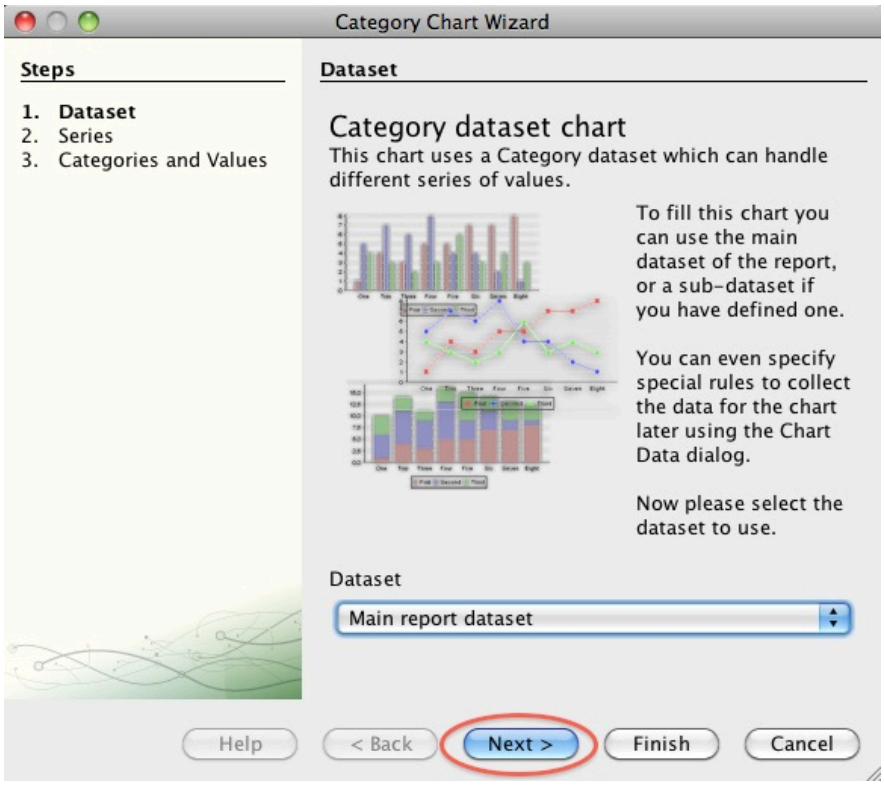
As soon as we drag the Chart element into the report, a window will appear. We choose the Line chart, as shown below.

Choose Line chart

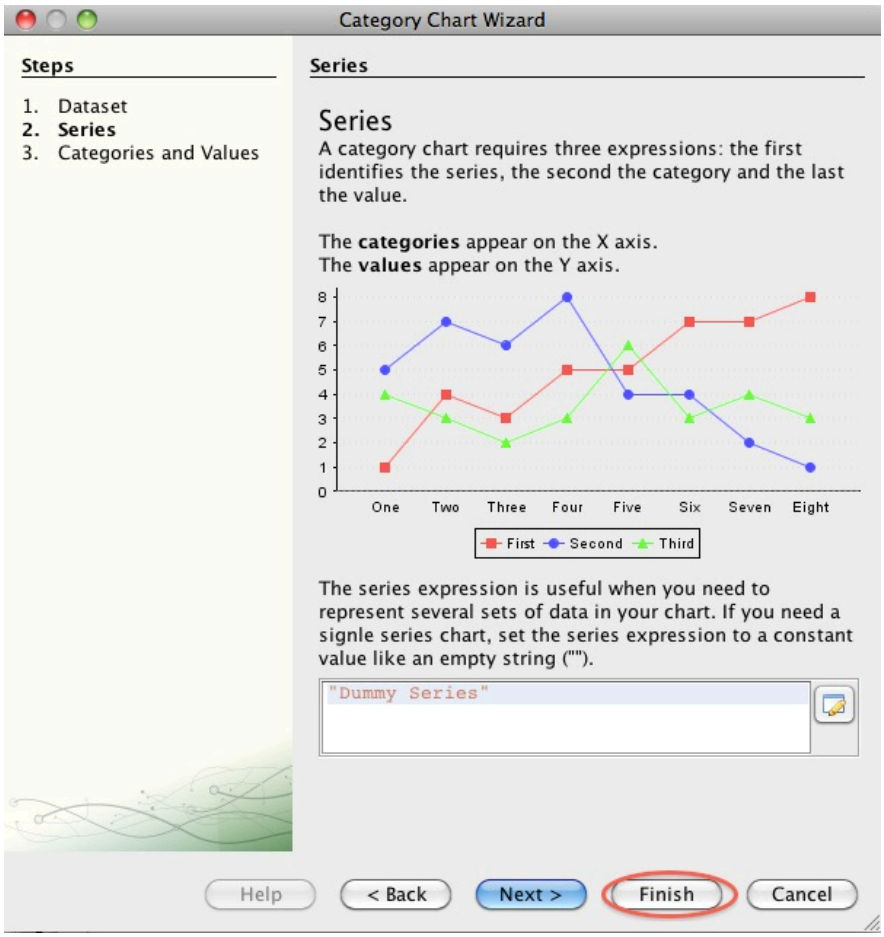


A chart wizard will appear. Click next in the first step, then Finish in the next - we will add the data later.

Choose Next



Choose Finish

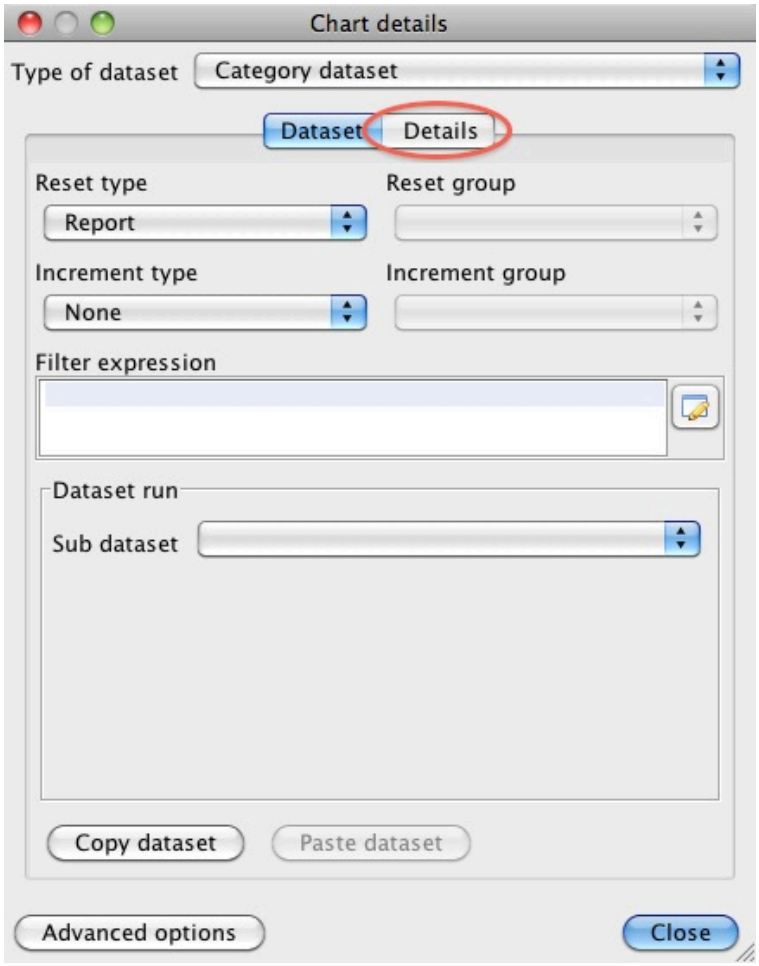


Next, adjust the size and position of the chart in your report. Then, we will add one data series for each of our three indicators. Right-click on the chart and choose Chart data. If you are making a chart with one indicator and several organisation units, you probably want to make a filter expression so that only data from the parameter/parent organisation unit is used in the chart. To do this, add this line to the Filter expression area:

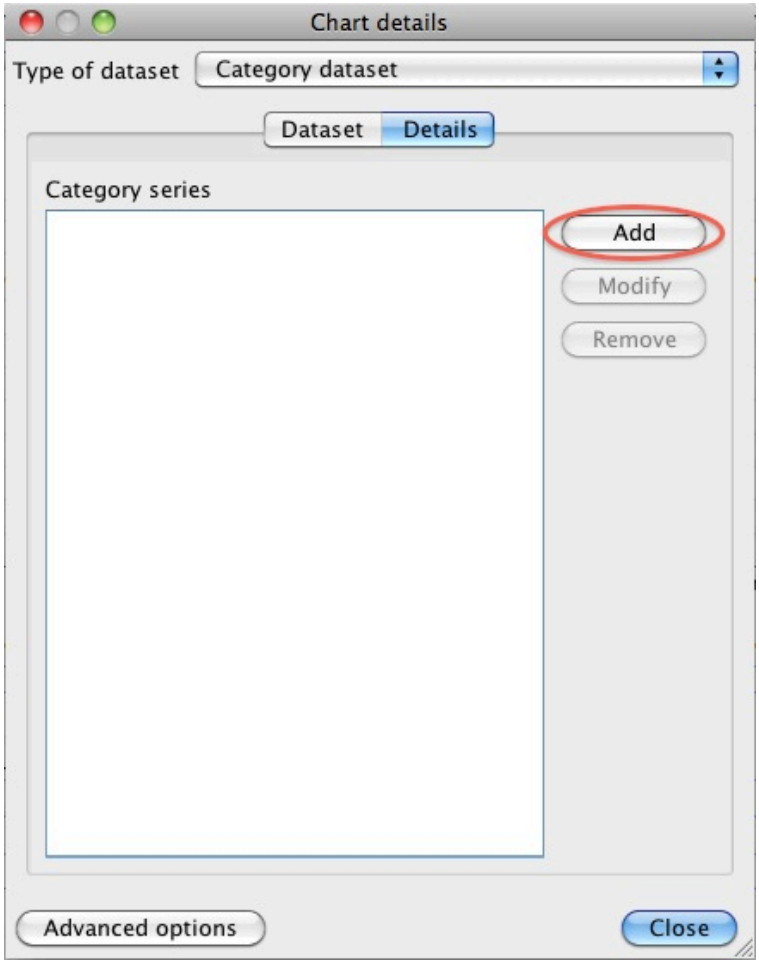
$F{organisation_unit_is_parent}.equals("Yes")

In our example, we only have on organisation unit, so this is not necessary. Next, click the details tab to see a list of the series in the chart. For now, this list is empty, but we will add one series for each of our three indicators. To add a series, click the Add button.

Choose the Details tab

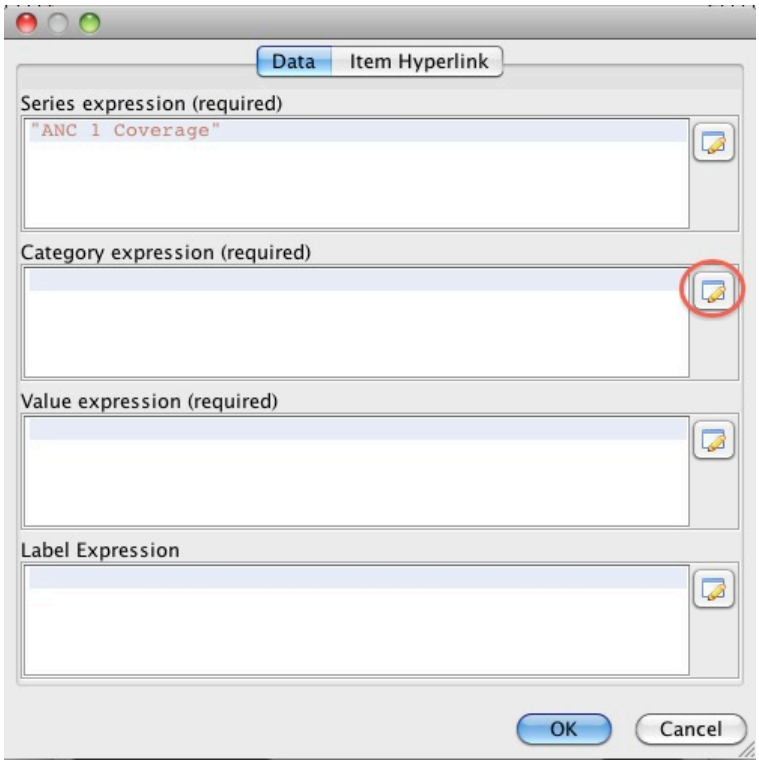


Choose Add

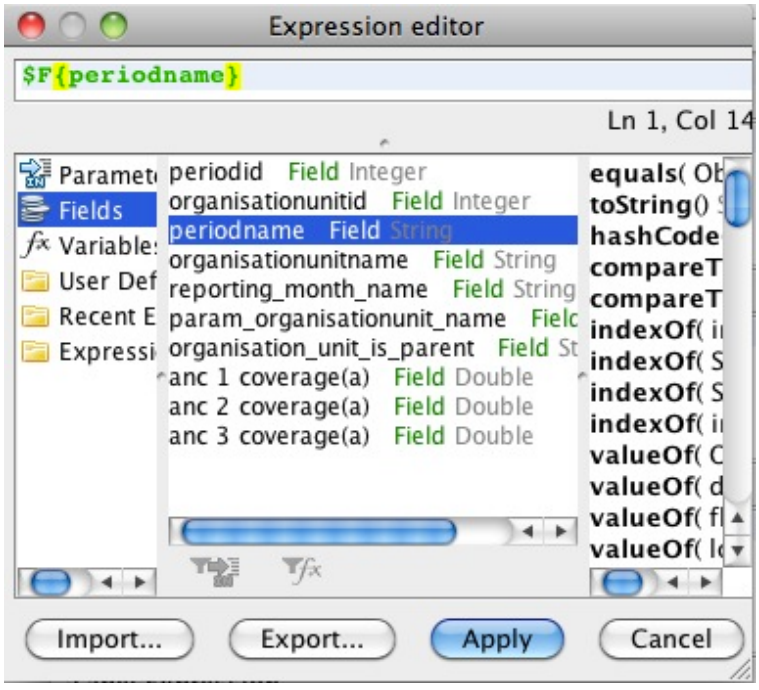


In the window that appears, enter the name of the first of the indicators in the Series expression window. Remember to put the name in quotes. In the category expression (along the x-axis) we want the months, so we use the button next to the field to open the Expression editor and add periodname.

Edit the category expression

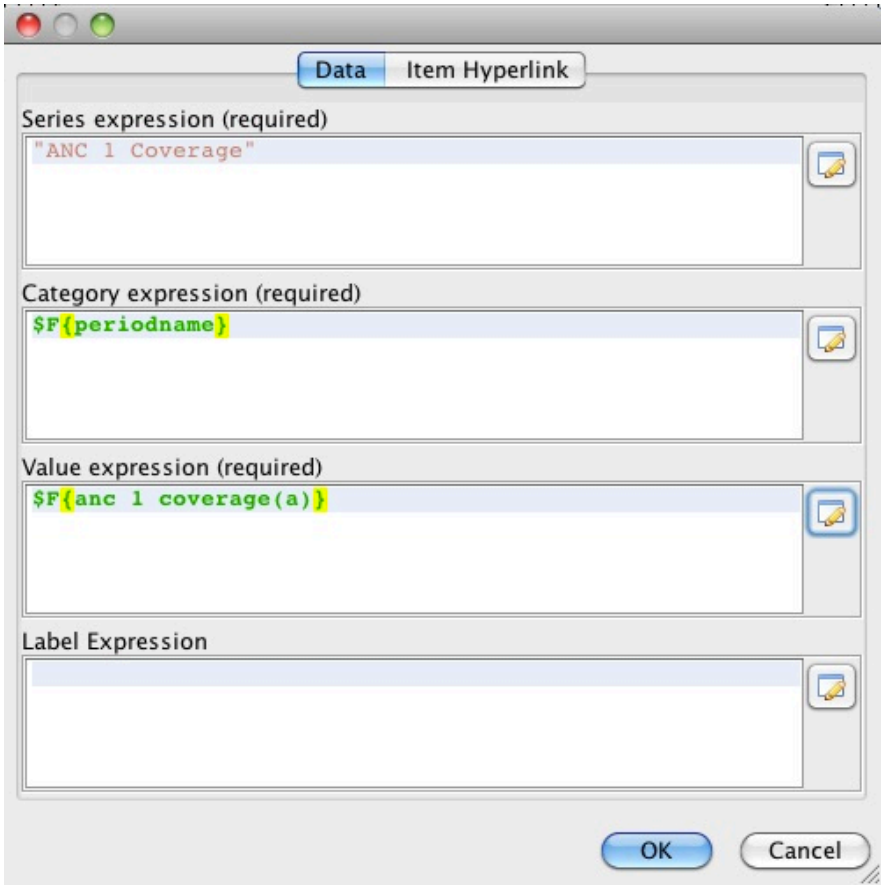


Choose periodname as the expression



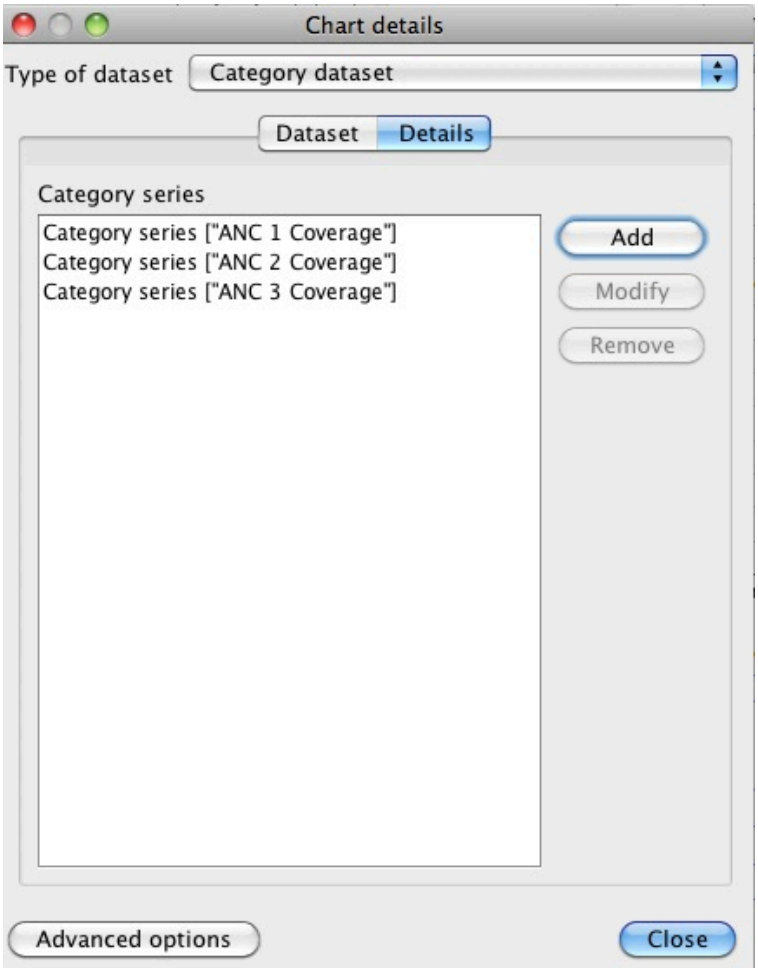
In the value expression, we add the actual data values for our first indicator. Use the Expression editor again to do this. When we are finished, the window should look like the one below, only with different names according to the indicator.

The finished category series



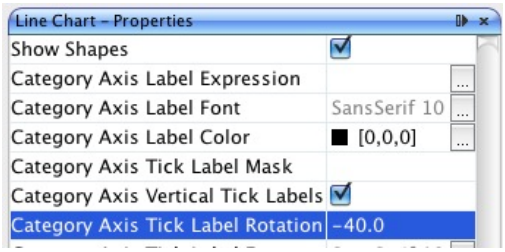
You can then Click OK to close the window. Follow the same steps to add a series for the other indicators.

Chart details after adding three series



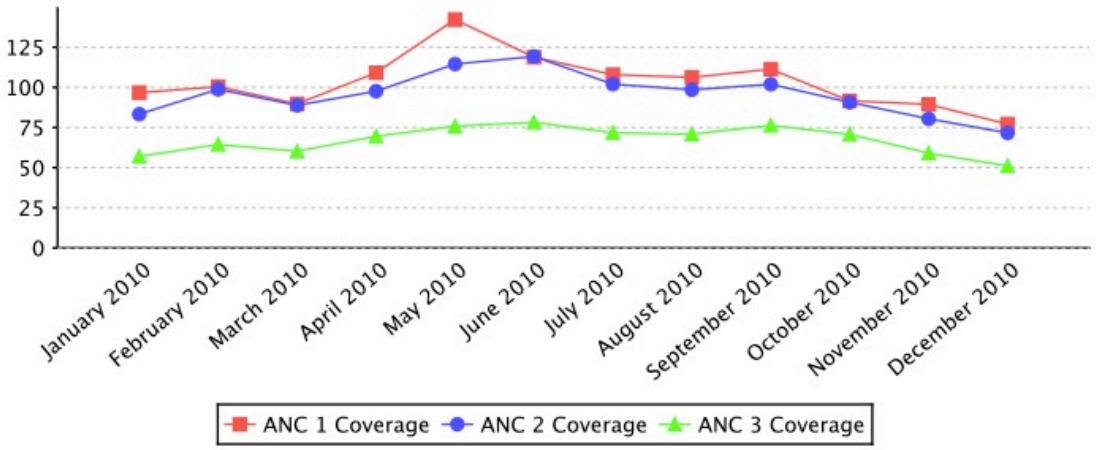
Close the window, and the data for the line chart should be ready. However, some additional adjustments might be needed - most of these can be found in the Line chart properties panel. For example, when making a month by month chart as we have in example, there is often not enough space for the month names along the category axis. This can be fixed by rotating the labels by for example -40 degrees, by using the property Category Axis Tick Label Rotation.

Changing the appearance of the category labels



Many other options are available to give the chart the desired look.

The finished line chart

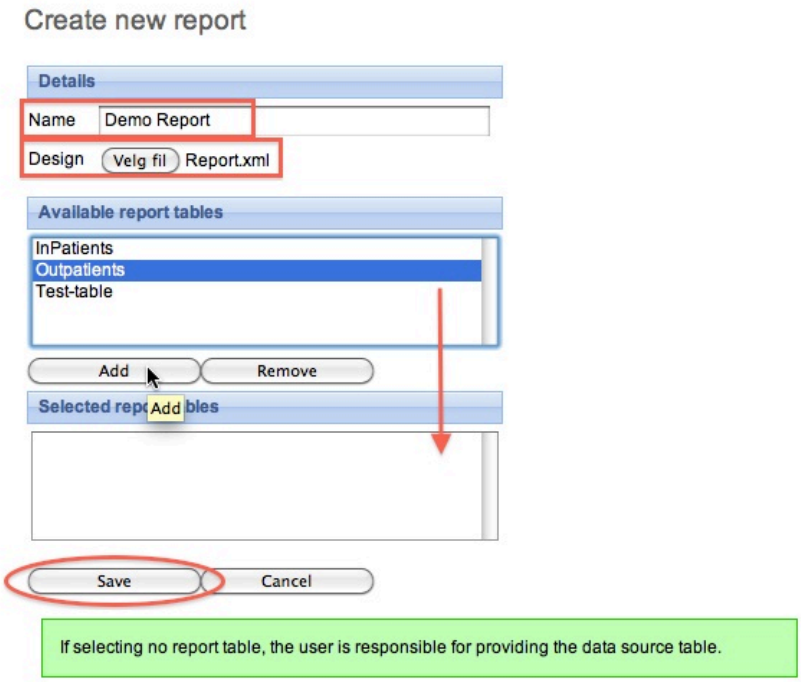


27.4.2.10. Adding the Report to DHIS2

We can now switch to DHIS2 and import our report. Go to the Report Module in DHIS2, and select "Standard Report". In the "Standard Report" screen, click "Add new", or edit an existing one.

In the following screen, there are several actions we need to take. First, enter a name for the new "Standard Report". Second, for design, click "Choose File" and find the .jrxml-file you have edited in iReport. Then we select the report table that we used as a basis for the report in iReport. Click add, and it should move to the "Selected report tables" area. Finally, click save.

Upload the file and choose the right report table



The report is now available as a "Standard Report" in DHIS2:

The report is available as a Standard Report

27.4.2.11. Some final guidelines

- Use the same version of iReport and DHIS2's version of Jasper reports. See the About page in DHIS2 for the Jasper version in use.
- Use report tables with cross tab dimensions as your data source for your report designs. This will make it a lot easier to design reports where you need to put specific indicators, periods, or orgunits on columns.
- Learn from others, there are many DHIS2 report designs for Jasper on launchpad, see http://bazaar.launchpad.net/~DHIS2-devs-core/DHIS2/trunk/files/head:/resources/

27.4.3. Designing SQL based standard reports

A standard report might be based on SQL queries. This is useful when you need to access multiple tables in the DHIS2 database and do custom selects and joins.

- This step is optional, but handy when you need to debug your reports and when you have direct access to the database you want to use. Click on the "report datasources" button, "New", "Database JDBC connection" and click "next". In this window you can give you connection a name and select the JDBC driver. PostgreSQL and MySQL should come included in your iReport. Then enter the JDBC connection URL, username and password. The last three refers to your database and can be retrieved from your DHIS2 configuration file (hibernate.properties). Click "save". You have now connected iReport to your database.

- Go to standard reports and click "add new", then "get report template". Open this template in iReport. This template contains a series of report parameters which can be used to create dynamic SQL statements. These parameters will be substituted based on the report parameters which we will later select and include in the standard report. The parameters are:

- periods - string of comma-separated identifiers of the relative periods
- period_name - name of the reporting period
- organisationunits - identifier of the selected organisation units
- organisationunit_name - name of the reporting organisation unit
- organisationunit_level - level of the reporting organisation unit
- organisationunit_level_column - name of the corresponding column in the _orgunitstructure resource table

These parameters can be included in SQL statements using the $P!{periods} syntax, where "periods" represents the parameter.

- To create a SQL query in iReport, click on the "report query" button. Write or paste your query into the textarea. An example SQL query using parameters which will create a report displaying raw data values at the fourth level in the org unit hierarchy is:

```
select district.name as district, chiefdom.name as chiefdom, ou.name as facility,
bcg.value as bcg, yellowfever.value as yellowfever, measles.value as  measles
from organisationunit ou
left outer join _orgunitstructure ous
  on (ou.organisationunitid=ous.organisationunitid)
left outer join organisationunit district
```

```
  on (ous.idlevel2=district.organisationunitid)
left outer join organisationunit chiefdom
  on (ous.idlevel3=chiefdom.organisationunitid)
left outer join (
  select sourceid, sum(cast(value as double precision)) as value
  from datavalue
  where dataelementid=359706
  and periodid=$P!{periods}
  group by sourceid) as bcg on bcg.sourceid=ou.organisationunitid
left outer join (
  select sourceid, sum(cast(value as double precision)) as value
  from datavalue
  where dataelementid=35
  and periodid=$P!{periods}
  group by sourceid) as yellowfever on yellowfever.sourceid=ou.organisationunitid
where ous.level=4
and ous.$P!{organisationunit_level_column}=$P!{organisationunits}
order by district.name, chiefdom.name, ou.name;
```

Notice how all parameters are used in the query, along with SQL joins of resource tables in the DHIS2 database.

- Finally, back in the add new report screen, we click on "Use JDBC data source". This enables you to select any relative period and report parameters for your report. Relative periods are relative to today's date. Report parameters will cause a prompt during report creation and makes it possible to dynamically select organisation units and periods to use for your report during runtime. For the example above, we must select "reporting month" under relative periods and both "reporting month" and "organisation unit" under report parameters. Click save. This will redirect you to the list of reports, where you can click the green "create" icon next to your report to render it.

27.4.4. Designing HTML based standard reports

A standard report can be designed using purely HTML and JavaScript. This requires a little bit of development experience in the mentioned subjects. The benefit of HTML based standard reports is that it allows for maximum flexibility. Using HTML you can design exactly the report you want, positioning tables, logos and values on the page according to your design needs. You can write and save your standard report design in a regular text file. To upload your HTML based standard report to DHIS2 do the following:

- Navigate to standard reports and click "Add new".
- Give the report a name.
- Select "HTML report" as type.
- If you want to you can download a report template by clicking on "Get HTML report template".
- Select desired relative periods - these will be available in JavaScript in your report.
- Select report parameters - these will be available in JavaScript in your report.

The report template, which you can download after selecting report type, is a useful starting point for developing HTML based standard reports. It gives you the basic structure and suggests how you can use JavaScript and CSS in the report. JavaScript and CSS can easily be included using standard script and style tags.

If you selected relative periods when creating the standard report you can access these in JavaScript like this:

```
var periods = dhis2.report.periods; // An array with period identifiers
var period = periods[0];
```

If you selected the organisation unit report parameter when creating the standard report you can access the selected organisation unit in JavaScript like this:

```
var orgUnit = dhis2.report.organisationUnit; // An object
var id = orgUnit.id;
var name = orgUnit.name;
var code = orgUnit.code;
```

When designing these reports you can utilize the analytics Web API resource in order to retrieve aggregated data in JavaScript. Have a look in the Web API chapter in this guide for a closer description. As a complete, minimal example you can retrieve analytics data after the report has been loaded and use that data to set the inner text of an HTML element like this:

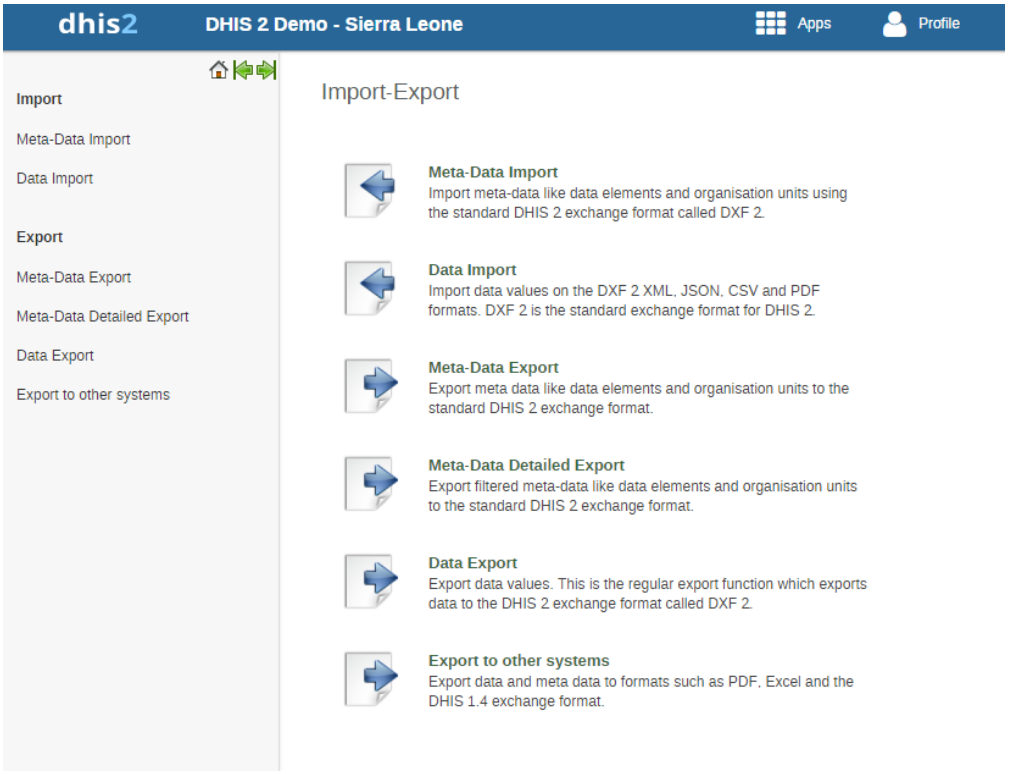
```
<script type="text/javascript">
$( document ).ready( function() {
    $.get( "../api/analytics?
dimension=dx:FnYCr2EAzWS;eTDtyyaSA7f&dimension=pe:THIS_YEAR&filter=ou:ImspTQPwCqd",
 function( json ) {
        $( "#bcg" ).html( json.rows[0][2] );
        $( "#fic" ).html( json.rows[1][2] );
    } );
} );
</script>

<div>BGG coverage: <span id="bcg"></span></div>
<div>FIC coverage: <span id="fic"></span></div>
```

A few other tips: To include graphics you can convert an image to SVG and embed that SVG content directly in the report - DHIS2 is based on HTML 5 where SVG tags are valid markup. To include charts and maps in your report you can use the charts and maps resources in the Web API. You can use the full capability of the Web API from JavaScript in your report - it may be useful to read through the Web API chapter to get an overview of all available resources.

Chapter 28. Import and export data and metadata

In a primary health system, the HMIS typically involves a distributed application, where the same application is running in different geographical locations (PHCs,CHCs, hospitals, districts, and state). Most of these physical locations do not have Internet connectivity, and hence they work off-line. At some point (normally at the district level), the data needs to be synchronised in order to have a consolidated database for the a particular geographical region. For this, it is important to be able to export data from one location (which is working offline, say at the health facility level) to another one say at the district level where the data would need to be imported. This feature of exporting and importing is thus a crucial function of a HMIS. This feature also helps us overcome the dependency on Internet to some degree, as data updates can be transferred via USB key where there is no connectivity, or through email where there is limited Internet connectivity. DHIS2 provides robust export-import functionality to fulfill these needs.

To access the main Import-Export module, choose Services->Import-Export. A number of services are available, all of which will be described in detail in respective sections below.

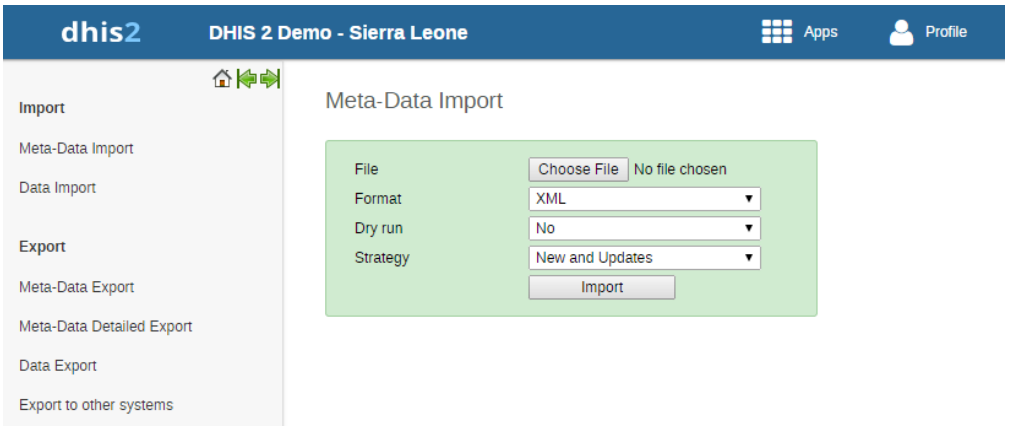


28.1. Meta-data import

28.1.1. Meta-data import

Meta-data objects can be easily imported by accessing Import-Export->Meta-Data import. Select the file to import by pressing "Select" and choose the file from your local file system. When importing XML and JSON files, the system will automatically detect which type of objects which should be imported. When importing CSV metadata, you will need to specify the object type. Consult the corresponding section in this manual on "CSV Metadata import" for more specific information on how the CSV file should be created.

Default import screen



There are two separate options for importing data.

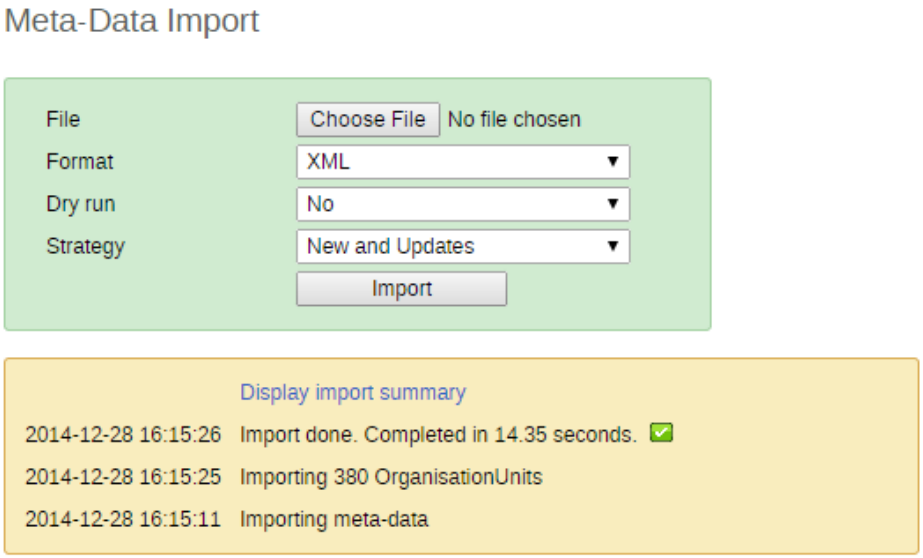
- Dry run: This is similar to the old preview option, this will do a dry run import, and give you information about any errors.
- Strategy: There are three options here, "New and Updates", "New only", and "Update only". New and updates tells the importer to expect both new meta-data, and updates to existing ones. New only will only accept fresh meta-data, usually you would use this on a empty database. Updates only will only allow the meta-data to match meta-data that is already there (same identifiers, new name etc).

Note

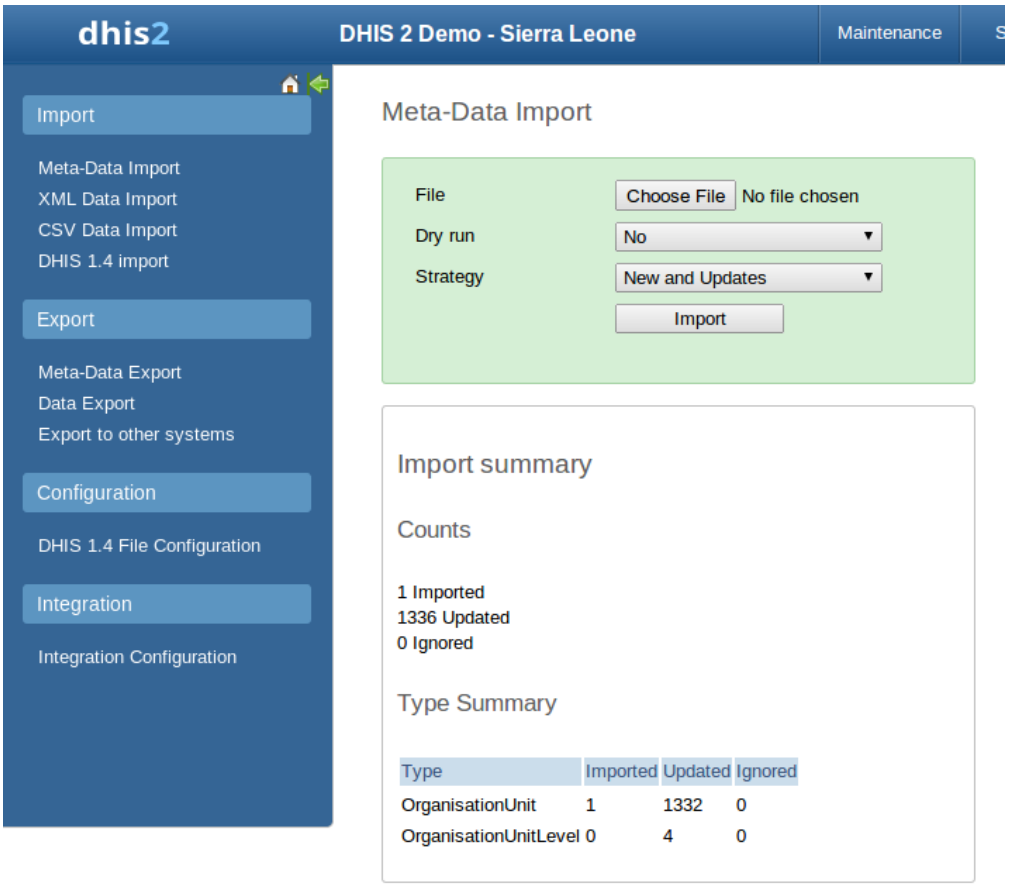
It is highly recommend always using the Dry run option when importing data to make sure you keep control over any changes to your meta-data and databases being out of synch on data elements or organisation unit names

28.1.1.1. Dry run before importing

Before doing the import into your database, it is highly recommended that you run the import with the dry run option set to true first. This will enabled you to have a look at how many new, updates, and ignored meta-data there will be. After you have selected your file, set dry run to true, you can now click the import button. After doing this, you will be greeted by this window.

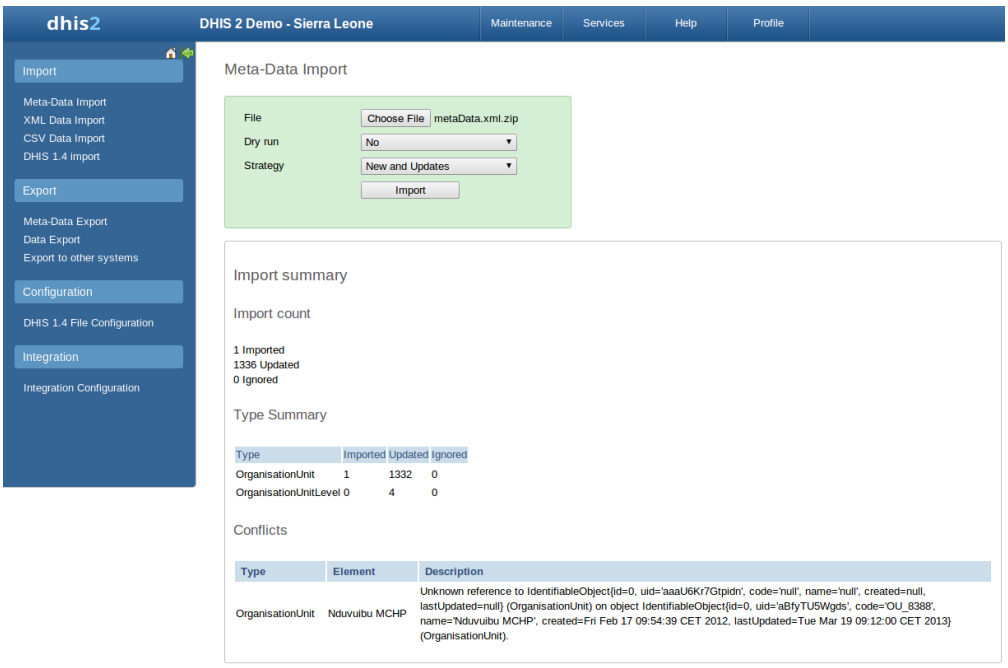


Here you can see a short summary of what was contained in your import file. To see further details, please click on the "Display import summary" link.



Here you can see that the import dry run was successful and the import contained **1** new organisation unit, **1332** updated, and **4** organisation unit levels.

Below you can see another example.



Here you can see that the organisation unit "Nduvuibu MCHP" had a unknown reference to an object with ID "aaaU6Kr7Gtpidn", which means that an object with this ID was not present in your imported file, and it could not be found in the existing database. Its important to note that

even if a reference could not be found, the object will still be imported, but you might have to fix this directly in DHIS2 later, if the reference should have pointed to something else.

28.1.1.2. Matching identifiers in DXF2

The DXF2 format currently support matching for two identifiers, the internal DHIS2 identifier (known as a UID), and also using an external identifier called called a "code". When the importer is trying to search for references (like the one above), it will first go to the UID field, and then to the code field. This allows you to import from legacy systems without having a UID for every meta-data object. I.e. if you are importing facility data from a legacy system, you can leave out the ID field completely (DHIS2 will fill this in for you) and the put the legacy systems own identifiers in the code field, this identifier is required to be unique. This not only works for organisation units, but for all kinds of meta-data, allowing for easy import from other systems.

28.1.2. Import CSV meta-data

To import CV meta-data go to import-export module and select CSV Meta-Data Import form the left side menu. You must select the object type which your CSV file contains. You can only upload one type of objects at the time. Upload your file and click update. For the CSV format, please visit the Web API chapter > CSV meta-data import in the developer guide.

28.1.3. GML data import

The GML import function can be used to import data prepared in the Geography Markup Language (GML). GML can be used to update the coordinates (both polygons and points). Once you have prepared your GML file as detailed in the chapter on "Importing coordinates", you can load the file with this function.

Importing the organisation unit hierarchy from GML is not supported. Therefore you should create the organisation unit hierarchy separately, and then use GML to update the coordinates once the hierarchy has been created.

28.2. Import data

The import option allows different instance of DHIS2 to receive standardised sets of data in the absence of a networked system. The functionality can also be used to import data produced by another system (perhaps on a regular basis) or to import legacy data which has been transformed into a format which DHIS2 can understand. Typically, a data set is exported from one DHIS2 instance (e.g. a district level system) to another system (e.g. a provincial level system). DHIS2 is also capable of importing data directly from a DHIS2 1.4 Access database. Each of these options will be discussed in the following sections.

28.2.1. XML data import

To import data in XML format, simply select Services->Import-export->XML data import. Similar options to the XML meta-data import facility are available. Please refer to the Developer guide > Web API > Data values chapter on XML data import for details on the XML format which is used by DHIS2 for aggregate data import.

28.2.2. Import CSV data

DHIS2 supports import of data in the CSV (Comma Separated Values) format. This can be used to import exchange file produced by DHIS2 itself. It also comes in handy when you want to import data from a third-party system as CSV is widely supported in applications and is easy to produce manually.

To import a CSV data exchange file navigate to the *CSV Data Import* item in the left-side menu. Upload the exchange file and click *Import*. CSV files can be imported both as plain text file or as compressed ZIP file archive.

Please refer to the Developer guide > Web API > Data values chapter on CSV data import for a description of the CSV format to use.

28.2.3. Event data import

Event data can also be easily imported with the "Event data import" function. Refer to the section in the WebAPI for more information on the format used for importing events. Otherwise, the functionality is the same as the XML data import used for aggregate data.

28.2.4. Import PDF data

DHIS2 supports import of data in the PDF format. This can be used to import data produced by off-line PDF data entry forms. Please refer to the section "Data set management" for details on how to produce a PDF form which can be used for off-line data entry.

To import a PDF data file, navigate to the *PDF Data Import* item in the left-side menu. Upload the completed PDF file and click *Import*.

After the import process is finished, you can follow the link to the import summary, which will inform you about the outcome of the import process in terms of number of records imported, updated and ignored and potential conflicts.

28.2.5. Import data from DHIS2 1.4

There are two ways to import data from a DHIS2 1.4 database; 1) through the 1.4 XML-based export files, or 2) directly from the DHIS2 1.4 data file (.mdb). Both are accessible from the DHIS2 1.4 Import menu under Import in the Import-Export module.

It is critical that all data integrity violations which are present in the DHIS2 1.4 database be fully resolved before attempting an import into DHIS2. You can check the data integrity of DHIS2 1.4 through the CORE Module->Advanced->Data integrity checks. A report will be generated of all data integrity violations which should be resolved prior to importing into DHIS2.

Warning

When data is imported from DHIS2 1.4, both the meta-data as well as data are imported. You should therefore be exceedingly careful that the meta-data present in DHIS2 1.4 is compatible with your DHIS2 data, otherwise during a DHIS2 1.4 data import, the meta-data in the DHIS2 system will be potentially overwritten by the i

28.2.5.1. DHIS2 1.4 File (database) Import

This method is recommend when doing large imports from 1.4, and especially when importing into a new DHIS2 database.

DHIS2 1.4 File Configuration

Before you can start the 1.4 file import you need to provide a few details about the 1.4 database:

Datafile(#): Here you put the full path to the DHIS2 1.4 data file you want to import from, e.g. C:\DHIS14\DHIS_#LR_LIBERIA.mdb.

Username: Leave blank (unless you have set up extra security measures on the file)

Password: Leave blank (unless you have set up extra security measures on the file)

Levels: Provide the number of levels in the orgunit hierarchy in your 1.4 database, e.g. 5.

Click "Save" and you will return to the DHIS2 1.4 File Import window.

Import Type:

As with other imports you have the options to Import (directly), Preview, or Analyse the import. We recommend using the Analyse option first to check that the 1.4 database is OK and ready to be imported.

When importing a large database into a new blank DHIS2 database we recommend using the Import option to save time.

For smaller incremental imports the Preview is OK.

Last Updated:

If you want the full import, all the data in the 1.4 database you leave this field blank.

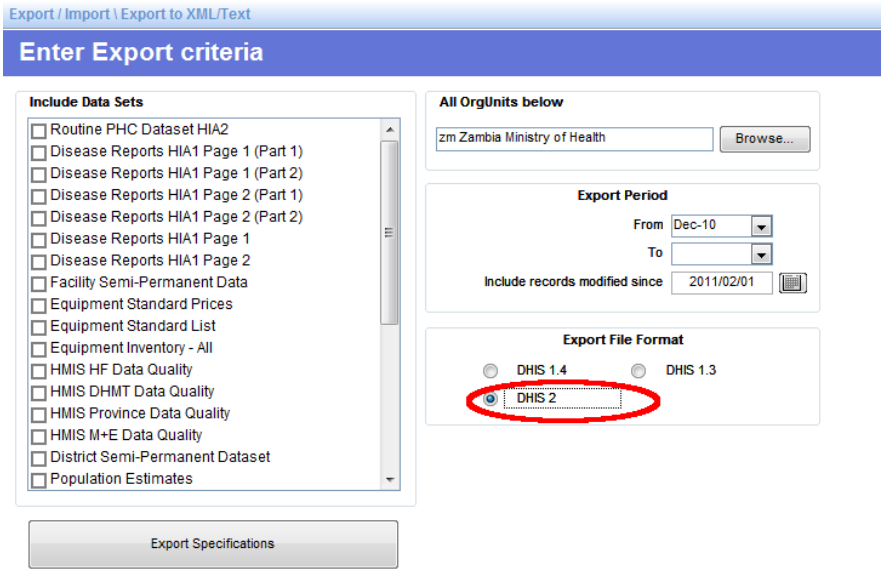
If you only want to do an incremental import into an already existing DHIS2 database you can use this field to filter which data values to import. Only values added or edited after the date you specify will be imported. This filter makes use of the LastUpdated column in the RoutineData table in the DHIS2 1.4 data file.

Import process:

When you are done selecting Method, and LastUpdated you can begin the import by clicking on the Import button. This process might take a long time, depending on how many data values you are importing. On a reasonable spec. computer the import takes about 2 million records per 30 minutes.

28.2.5.2. DHIS2 1.4 XML Import

Import though XML data from DHIS2 1.4 is also possible using the standard DHIS2 1.4 export format. Just be sure that the DHIS2 1.4 export format has been set to "DHIS 2" as illustrated in the screen shot below. After the data has been exported by DHIS2 1.4, you can import the data by choosing "Services->Import-Export->DHIS 1.4 Import->DHIS2 1.4 XML Import" and proceeding via the procedure outline in the previous section.



28.2.5.3. Limitations to DHIS2 1.4 imports

Although it is possible to import and export data between instances of DHIS2 1.4 and DHIS2, there are significant limitations. Currently, the import of some metadata is not supported from DHIS2 1.4 to DHIS2. This includes:

- Organisational unit alternate names
- Compulsory data element pairings
- Custom data entry forms
- Dataset data entry levels

It is also important that the aggregation operator defined in DHIS2 1.4 be set to the correct value. Some data, such as population, should have their aggregation operator set to "Average" in DHIS2, as this controls how the aggregation of data is handled over time (but not within the organisational unit hierarchy).

28.3. Export data and meta-data

DHIS2 makes it possible to export various types of data in multiple data formats. You can export your data, also referred to as measures or facts; and your meta-data, which refers to the information describing your data. Data can be exported both in raw, non-aggregated format and in aggregated format. It is also possible to export a combination of data and meta-data in case you have special requirements. This chapter covers mainly how to export data and meta-data through the user interface of the import-export DHIS2 module. Data can also be exported programmatically through the DHIS2 Web API, and it is useful to be aware of the various options available:

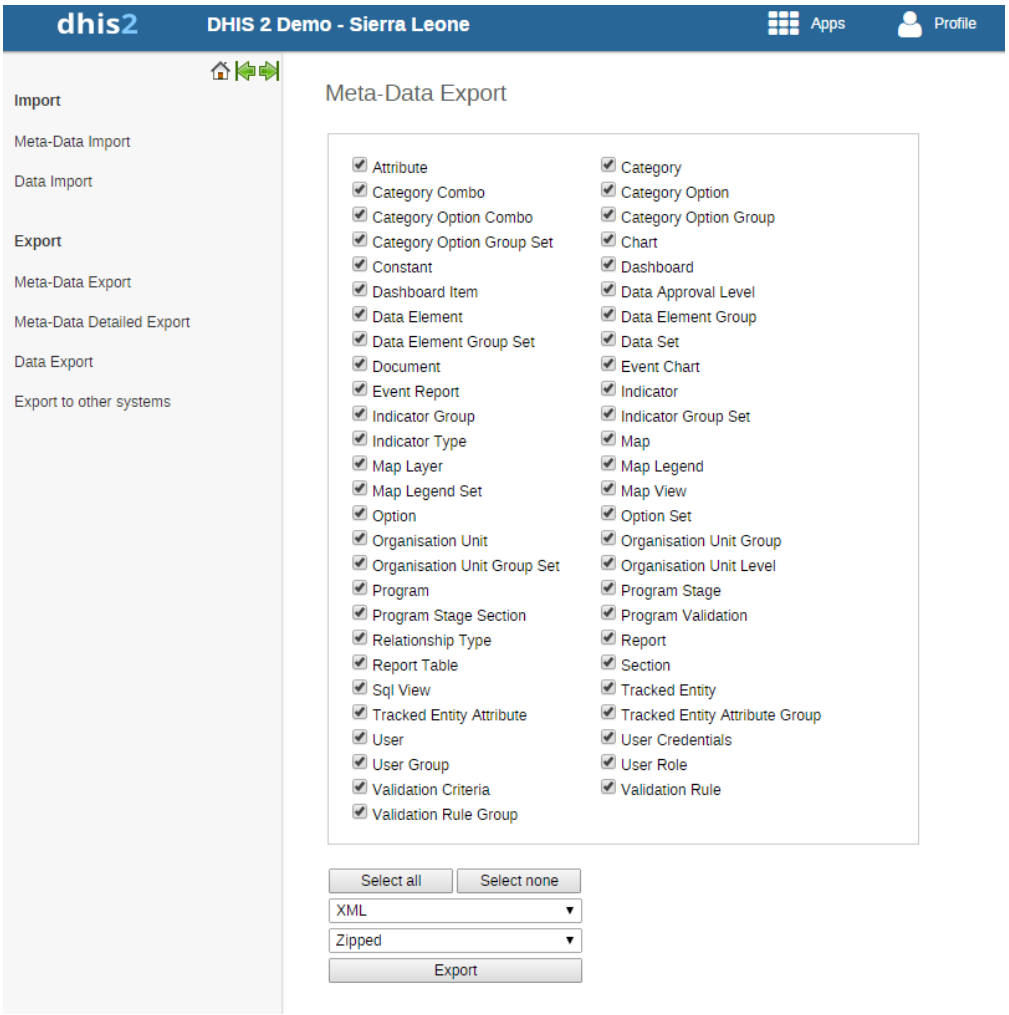
- Export raw, non-aggregated data through the user interface: Covered in this chapter.
- Export aggregated data programmatically through the Web API: Please refer to the Web API chapter, section on Analytics.
- Export a combination of data and meta-data: Please refer to the SQL view sections in the Data administration chapter and Web API chapter.
- Export meta-data through the user interface: Covered in this chapter.
- Export meta-data programmatically through the Web API: Please refer to the Web API chapter, section on meta data.

Data can be exported on various formats, including DXF 2 (the DHIS2 meta-data and data exchange format based on XML), CSV, PDF, MS Excel and the DHIS2 1.4 XML format.

Another aspect of data export is the type of DHIS2 deployment. In the case of online deployment, all data is saved into a single database only. In an offline deployment, each instance will store data in a separate database in their local system. In an offline deployment, after the data entry is finished, data will have to be manually sent to the next level in the organizational hierarchy. In an on-line application this is not required, as all data is captured over an Internet connection and stored in a central location.

28.3.1. Metadata export

Meta-data is "data about data". In the context of DHIS2, meta-data consists of definitions of data elements, indicators, the structure and names contained in the organizational hierarchy, and other options. Click on the "Meta-data export" link from the main "Data export" screen in order to access this. Just select the features, format, and the compression that you want and click "Export". This metadata file can then be transmitted just like a data file, except it will contain information on the definitions of the various features, as opposed to the values of the data themselves.



Simply choose the objects which you would like to export, and click "Export".

28.3.2. Metadata export with dependencies

Metadata export with dependencies lets you create canned exports for metadata objects. This type of export will include the metadata objects and the metadata object's related objects, that is the metadata which belong together with the main object.

Table 28.1. Object types and their dependencies

Object type	Dependencies included in export
Data set	Data elements Sections Indicators Indicator types Attributes Data entry forms Legend sets Legends Category combinations

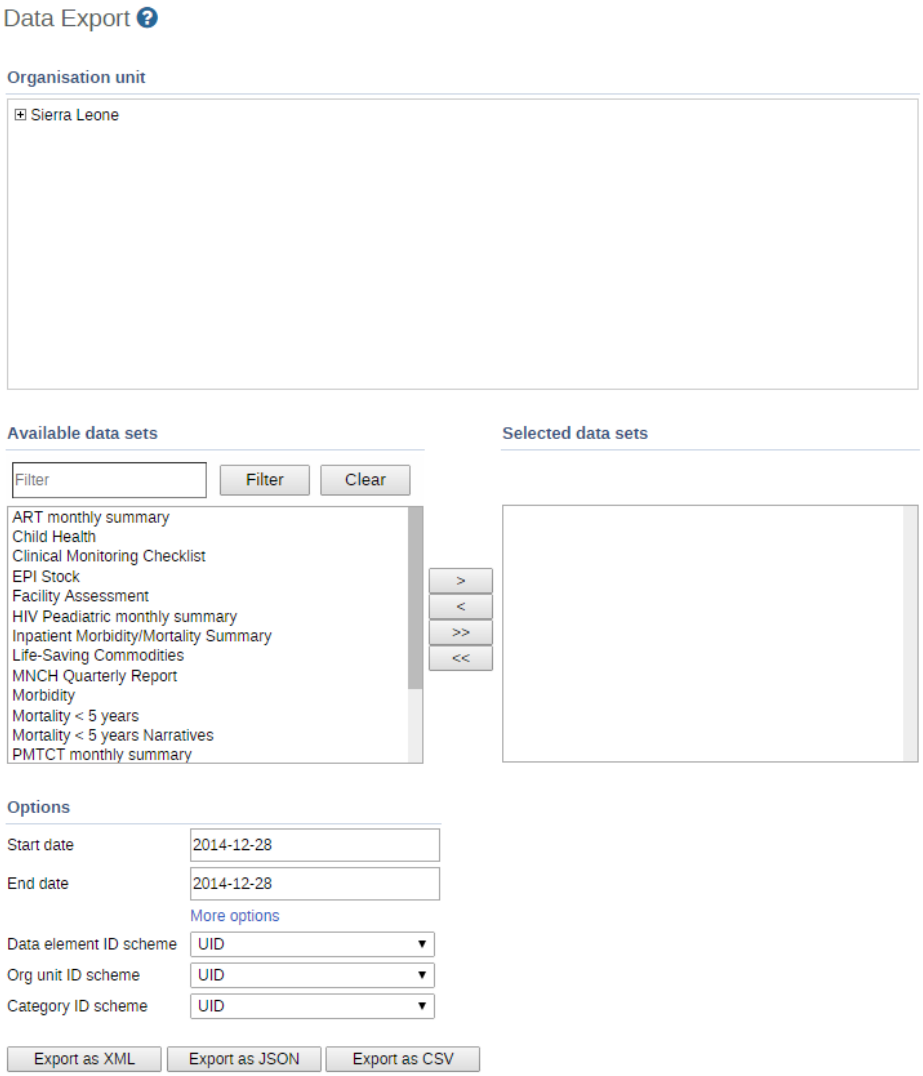
Object type	Dependencies included in export
	Categories Category options Category option combinations Option sets
Program	Data entry form Tracked entity Program stages Program attributes Program indicators Program rules Program rule actions Program rule variables Program attributes Data elements Category combinations Categories Category options Category option combinations Option sets
Category combination	Category combinations Categories Category options Category option combinations Attributes
Dashboard	Dashboard items Charts Event charts Pivot tables Event reports Maps Reports Resources

Object type	Dependencies included in export
Data element group	Data elements Category combinations Categories Category options Category option combinations Option sets Attributes Legend sets Legends

1. Open the **Import-Export** app.
2. Click **Metadata dependency export**.
3. Select an **Object type**: **Data set**, **Program**, **category combo**, **Dashboard** or **Data element group**.
4. Select an **Object**.
5. Select a **Format**.
6. Select a format: **XML** or **JSON**.
7. Select **Compression**: **Zip**, **Gzip** or **Uncompressed**.
8. Click **Export**. The export file is downloaded to your local computer.

28.3.3. Data export

To export raw data from DHIS2, choose "Import-export->Data export". Select the organisation unit(s), the start and end date, and dataset or data sets for which data export should be selected. You can also select which types of identifiers which will be exported by pressing "More options" and then selecting either UID, Code, or Name for data elements, organisation units and category options. Once you have specified all options as required, press "Export as..." along with the format which you would like to export the data as (XML, JSON or CSV).



A pop-up save option will appear on the displayed screen (see picture below) prompting the saving of the exported data. You may save the export folder on your desktop or any other folder by selecting the ‘Save to Disk’ option from the pop-up prompt.

28.3.4. Event data export

You can export event or tracker data in **XML**, **JSON** or **CSV** formats.

1. Open the **Import-Export** app.
2. Click **Event Export**.
3. Select an organisation unit.
4. Select a program and a program stage (if applicable).
5. Select the **ID scheme** to use for export: **UID** (default) or **CODE**.

   If you select **CODE** but the object's attribute does not have code, it will not be included in the return payload.
6. Select **Start date** and **End date**.
7. Select the **Inclusion**:
   - **Selected organisation unit**: Export event data only for the selected organisation unit
   - **Include children of organisation unit**: Export event data for the children of the organisation unit as well as the selected organisation unit itself.

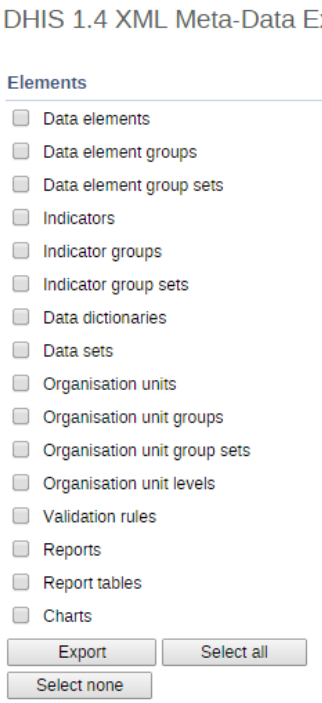
- **Include descendants of organisation unit**: Export event data for the descendants of the organisation unit as well as the selected organisation unit itself.

8. Select a format: **XML**, **JSON** or **CSV**.
9. Select **Compression**: **Zip**, **Gzip** or **Uncompressed**.
10. Click **Export**. The export file is downloaded to your local computer.

28.3.5. Export data to other systems

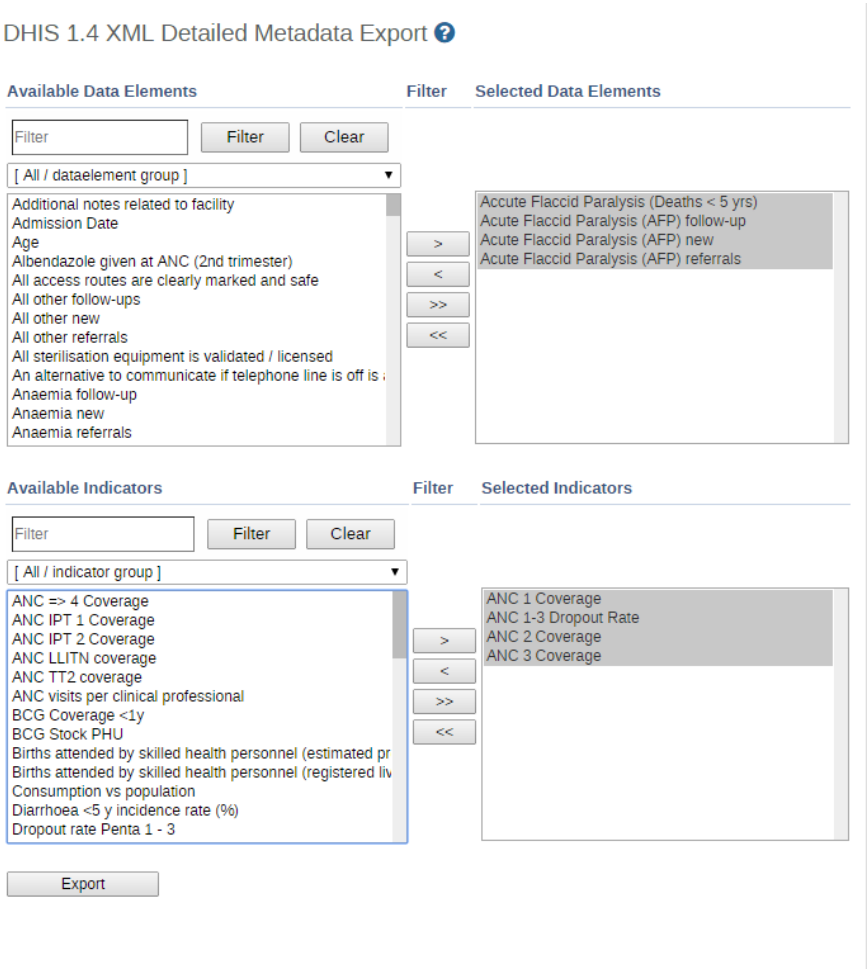
28.3.5.1. DHIS2 1.4 Meta-data export

The DHIS2 1.4 Meta-data export functionality provides the same functionality as the standard DHIS2 meta-data export, except that the resulting file can be used to transmit meta-data information to DHIS2 1.4 systems.



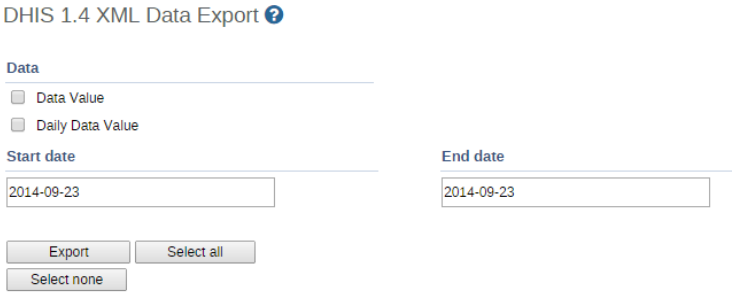
28.3.5.2. DHIS2 1.4 Detailed Metadata Export

The DHIS2 1.4 Metadata export functionality provides the same functionality as the detailed DHIS2 metadata export, except that the resulting file can be used to transmit meta-data information to DHIS2 1.4 systems. Simply select the data elements and indicators that you want and click "Export" to begin the export process.



28.3.5.3. DHIS2 1.4 Data export

This service allows you to export data to a format which can easily be imported into a compatible DHIS2 1.4 database.



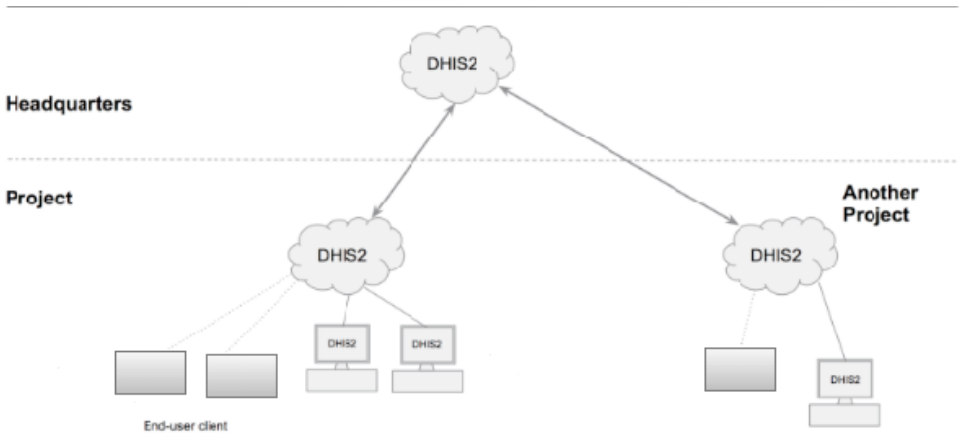
28.3.5.4. XLS metadata export

Meta-data can be exported directly to the XLS format with this function. Simply click all of the available object which you wish to export and click "Export".

Chapter 29. Configure metadata synchronizing

29.1. About data and metadata synchronization

You can synchronize data and metadata between different DHIS2 instances. Given two instances in a central-local deployment strategy, metadata created at the central system can be synchronized with the local system and the data created at local system can be synchronized with the central system. This can be useful when you've multiple stand-alone instances of DHIS2 and global metadata needs to be created at all the local instances.



If metadata creation and update take place at the central system and if the metadata synchronisation task is enabled, the metadata gets synchronized down to all the local instances which are bound to the central instance. These local instances will in turn push data values to the central instance. Enabling or disabling versioning of metadata synchronization at local instance, will not hinder the metadata synchronization process. This is because the metadata synchronization interacts with versioning end points of the central instance and not with end points of the local instance.

Each snapshot of metadata export generated is referred to a metadata version. A new metadata version contains only the changes between the previous version and the current version, that is it's an export between two timestamps. All metadata versions are maintained in the DHIS2 database and are available to all local instances that connect to it. You can schedule each of the local instances to download new metadata versions. It is recommended to keep the metadata versions' sizes small and logical.

Don't create new metadata versions on local instances

Each instance of DHIS2, whether central or local, can create metadata versions. The local instance is meant to synchronize metadata from a central system and not create metadata on its own.

If a new metadata version is created on the local instance, this instance can't receive new metadata versions from the central instance, since the content of the metadata versions will be out of synchronization.

If you've created metadata versions on a local instance, you must manually deleted these versions from the database before you can synchronize with the central instance.

Example 29.1.

Assume the central and local DHIS2 instances have identical metadata snapshots until version 10. Then the local instance creates a new snapshot called version 11. After that, the central instance creates a new snapshot called version 11. When the local instance attempts to synchronize metadata, version 11 is not downloaded. However, the content of version 11 on the local instance is not identical to the content of version 11 on the central instance.

Note

You can also use the **Import-Export** app to synchronize metadata manually.

29.2. Workflow

1. On the central instance, configure metadata versioning. You should do this once the central instance contains metadata.
2. Connect local instance(s) to the central instance.
3. On local instance(s), configure automatic synchronization.

29.3. Configure metadata versioning on central instance

Note

To synchronize metadata, the user account of the central system must have the following authority:

F_METADATA_MANAGE

Only users with this authority will then be able to create and download metadata. This is to ensure security of the central system where the metadata is created. Instead of giving the credentials of user having ALL authority to the field instances, you need to create a user having this specific authority only.

1. On the central instance, open the **System Settings** app and click **Synchronization**.
2. Go to the **Metadata versioning** section and select **Enable versioning for metadata sync**.

3. (Optional) Select **Don't sync metadata if DHIS versions differ**.
4. Select a type of metadata version: **Best effort** or **Atomic**.
   - *Best effort* means that if the metadata import encounters missing references (for example missing data elements on a data element group import) it ignores the errors and continues the import.
   - *Atomic* means all or nothing - the metadata import will fail if any of the references do not exist.

Note

Each metadata entity is associated with a "User" object. If this "User" reference is missing while importing metadata version of type ATOMIC, the import will fail at the validation phase itself. This means that the user who creates metadata also needs to synchronize down to local instances to successfully import the metadata version of type ATOMIC.

5. Click **Create new version**. The new version is added to the versioning table.

29.4. Connect local instance to central instance

To enable metadata synchronization, you must configure the connection between the local instance and the central instance.

1. On the local instance, open the **System Settings** app and click **Synchronization**.
2. Add the central DHIS2 instance's details to the local instance:
   - **Remote server URL**
   - **Remote server user name**
   - **Remote server password**
3. Go to the **Metadata versioning** section and select **Enable versioning for metadata sync**.
4. (Optional) Select **Don't sync metadata if DHIS versions differ**.

   The metadata schema changes between versions of DHIS2 which could make different metadata versions incompatible.

   When enabled, this option will not allow metadata synchronization to occur if the central and local instance(s) have different DHIS2 versions. This apply to metadata synchronization done both via the user interface and the API.

   The only time it might be valuable to disable this option is when synchronizing basic entities, for example data elements, that have not changed across DHIS2 versions.
5. (Optional) Configure email notifications to notify users about successful or unsuccessful metadata synchronization:
   a. Open the **System Settings** app and click **Email**.
   b. Enter **Host name**, **Port**, **User name**, **Password** and **Email sender**.
   c. Click **Server** and enter a **System notifications email address**.

   This email address will receive notifications about the metadata synchronization status.

Tip

When you receive email notification about a metadata synchronization failure, check which metadata version that causes the error and resolve it. Then you avoid future errors when the system downloads new metadata versions.

29.5. Configure automatic metadata synchronization on local instance

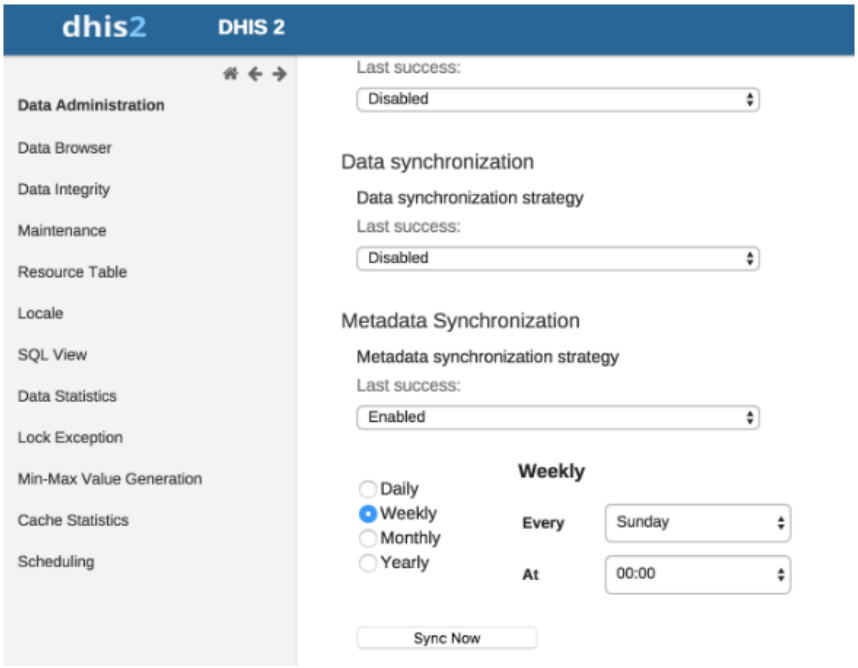
Once you have configured automatic metadata synchronization (scheduling) on local instance(s), the scheduler will run at that specific time and synchronize (download and import) the metadata from the central instance. No manual intervention is required from the users at the local instance(s).

After the scheduler has completed the metadata synchronization, the local instance will have the metadata exactly as created on the central system.

Note

Passwords of users are not synchronized. They are nullified for security reasons. After metadata synchronization, the Admin user must reset these passwords.

1. On the local instance, open the **Data Administration** app and click **Scheduling**.
2. In the **Metadata Synchronization** section, select **Enabled**.
3. Select a time period: **Daily**, **Weekly**, **Monthly** or **Yearly**.



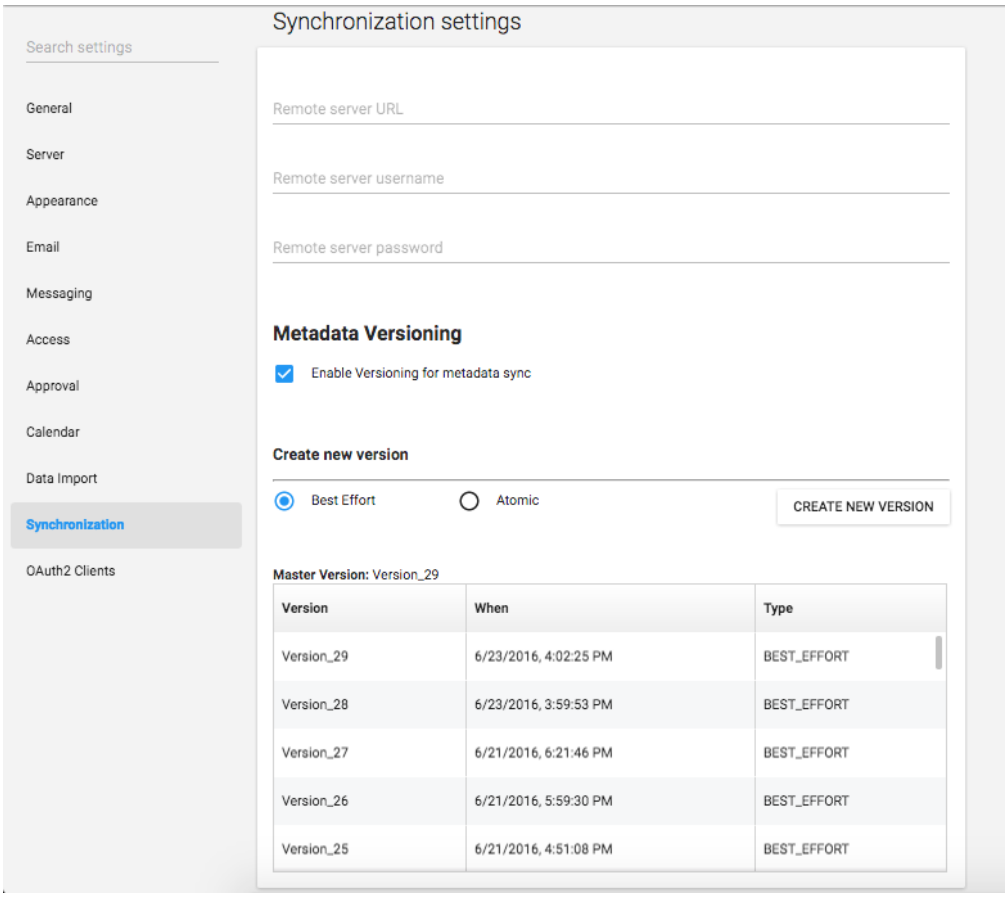
4. Click **Start**.

29.6. Create a new metadata version manually on central or local instance

1. Open the **System Settings** app and click **Synchronization**.
2. Go to the **Metadata versioning** section and select **Enable versioning for metadata sync**.
3. (Optional) Select **Don't sync metadata if DHIS versions differ**.
4. Select **Best effort** or **Atomic**.
5. Click **Create new version**. The new version is added to the versioning table.

Example 29.2. Versioning table for a central instance

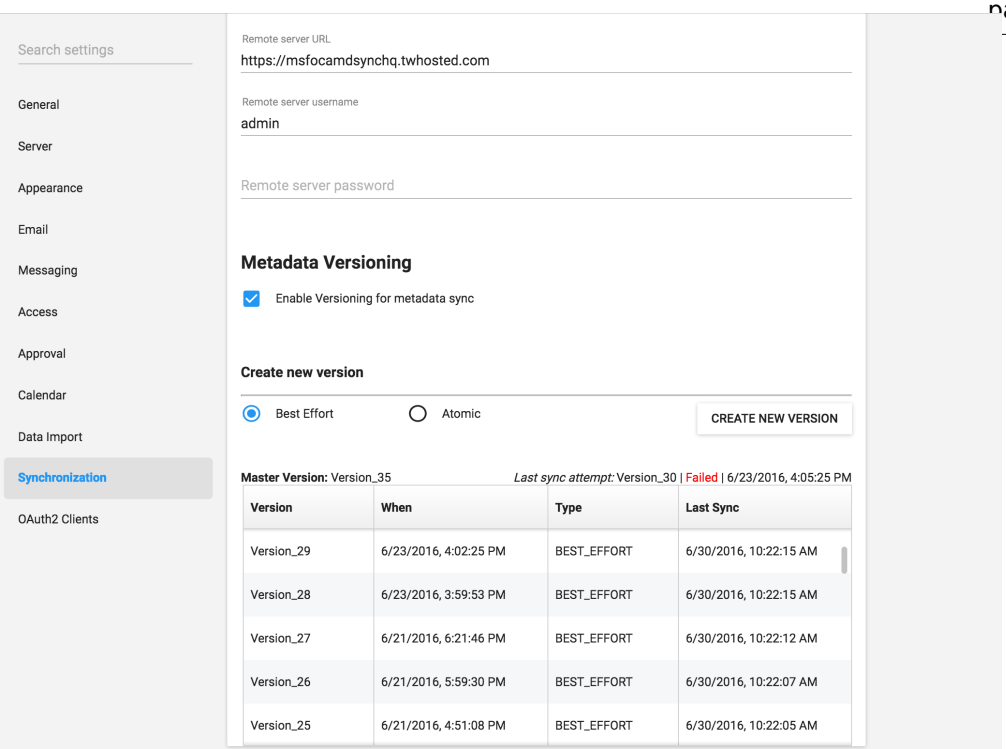
When the system is a *central instance*, you'll see three columns in the versioning table:



Object	Description
Master version	The latest version in the system.
Version	Name of the version. The name is automatically generated by system.
When	The timestamp of the metadata version creation at the central instance.
Type	Type of metadata version.

Example 29.3. Versioning table for a local instance

When system is a *local instance*, you'll see four columns in the versioning table:



Object	Description
Master version	The latest version of the central instance. **Note** The master version information is the central instance's latest version. This is important to look at the difference between the versions of metadata that exist at central and at local.
Last sync attempt	If the last sync attempt is a failure, this will be displayed.
Version	Name of the version. The name is automatically generated by system.
When	The timestamp of the metadata version creation at the central instance.
Type	Type of metadata version.
Last sync	Timestamp of when the last sync happened for this version in this system.

29.7. Reference information: metadata synchronization configuration parameters

The process which performs metadata synchronization is called Metadata Sync Task. This task performs a series of steps before syncing of metadata:

- Push data (aggregate data and anonymous events data) from local instance to central instance.
- Gets the current metadata version of the local instance. Then uses this version information as a baseline to fetch the list of metadata versions created after the baseline.

- If there are new versions created at central instance, it performs the synchronization of metadata versions one after the other. A mail will be sent to the configured user (if any) after each successful synchronization of metadata version at the local instance.

Once the Metadata Sync Task has run at the scheduled time, the task can retry (if any of the steps fail) based on the configuration of the following parameters defined in `dhis.conf` file:

Parameter	Default value
`metadata.sync.retry`	3
`metadata.sync.retry.time.frequency.millisec`	30000

Each retry will be made after the time (in millisecond) as specified. If the steps still fail even after all the retries, then the scheduler stops its execution and then a mail will be sent to the configured user (if any). If no values are specified then the default values will be used.

Example 29.4. Metadata synchronization configuration parameters

`metadata.sync.retry` = 5

`metadata.sync.retry.time.frequency.millisec` = 10000

Chapter 30. Mobile

This chapter covers various mobile technologies including Web, J2ME, SMS Service and SMS Command.

30.1. DHIS2 Mobile Introduction

DHIS2 provides a range of options to allow data entry from mobile devices, including a dedicated GPRS/3G J2ME client and two versions of DHIS2 which have been optimized specifically for mobile browsers. Each of these solutions will be described in detail in the following sections. DHIS2 offers several Android clients, which are described in detail in other sections of this guid.

Collection of data in the field can be technically challenging and expensive. Mobile phone solutions have the potential to significantly reduce the complexity of deploying a distributed data collection system. Using a simple Java client installed on a mobile phone or a web browser which works on the mobile phone, field workers can report directly to the DHIS2 database through their mobile device.

While mobile phone solutions have a great potential, there are complexities with such deployments. Phones lack processing power and have a small display, they need to be charged, and often such deployments make the most sense in areas with poor or intermittent network coverage.

Each of the mobile solutions are introduced briefly below, and the discussed in separate sections in detail:

- DHIS2 Light: A mobile browser optimized data entry module for all devices

  This module allows for data entry directly with the browser of the mobile device. A wide range of devices and mobile browsers are supported including: Opera mini 3 & 4 (basic and advanced) - Opera mini 4, Nokia S40 mobiles ,Windows Phone 7, Window Mobile 6, Palm Pre, Blackberry (v5 and v6), Firefox mobile, iOS devices (iPhone) and Android devices. This client does not have offline-support, and an active GPRS/3G connection is required. It does not require a new application installation on the phone to support new features, but does require a stable data connection for use. This solution is described in Section 30.2, “Mobile browser based data entry”

- DHIS2 Smartphone client: A mobile browser optimized data entry module for Smartphone devices

  This module allows for data entry directly with the browser of a Smartphone. Offline data entry is supported and it does not require any installation of a special client on the phone itself.

- J2ME GPRS/3G client

  DHIS-mobile includes two separate J2ME clients supporting GPRS/EDGE/3G as a transport mechanism. One clients supports facility aggregate reporting and the second client supports name-based program tracking. These clients are split into separate applications to make deployment easier. Some health workers may have both applications installed on their phone. Both of these clients support offline-storage of data and work on J2ME enabled devices (feature phones).

  An active GPRS/3G connection is required in order to send data to the DHIS2 database, but data can be entered offline and transmitted when a connection is present. This client is intended primarily for low-end devices which support J2ME applications, although the offline-

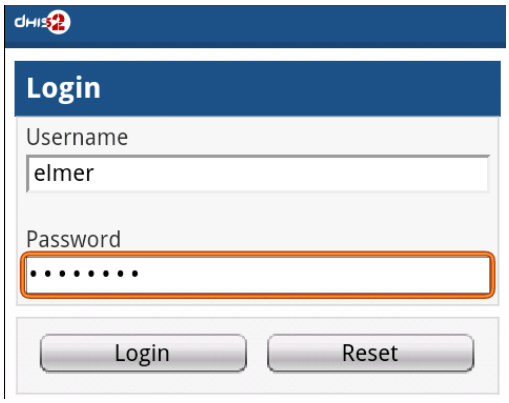
supports adds some memory requirements which limits the handset selection. While the solution is primarily tested on Nokia phones, it also works on several other J2ME capable handsets.

The facility reporting J2ME client is described in the chapter "J2ME GPRS/3G Client"

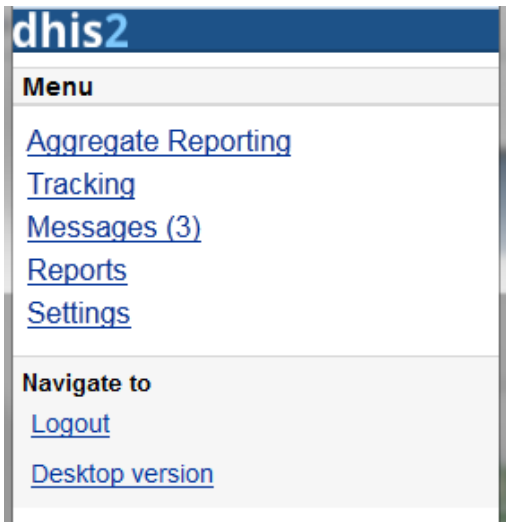
30.2. Mobile browser based data entry

30.2.1. Getting started with mobile browser data entry

This approach is for data-entry on a smart phone with a mobile browser by navigating to the URL of the DHIS2 instance, for example: the full URL link for demo on dhis2.org http://apps.dhis2.org/dev/mobile/index.action . And your mobile browser will automatically detect the DHIS2 application where the server URL is given (e.g.: http://apps.dhis2.org/dev). Here is the login form to access the application with user-name and password. Click on "Login" to continue or "Reset" to reset:



After logging in, there are the list of functions:



- Aggregate Reporting: Entries for aggregate data with defined/assigned dataset by organisation-units

- **Tracking:**

- Find Person: find person based on Name, Phone Number or ID, and Organization unit.
- Activity Plan: Entries data for the persons by organisation-units, persons and programs/ program-stages

- Person Registration: Registry a new person
- Anonymous: Entries for anonymous person based on programs

- Messages: Manage the messages and discussions from the server. Message reply is available. User can send feedback message in Messages.

- Reports: The output reports from the server.

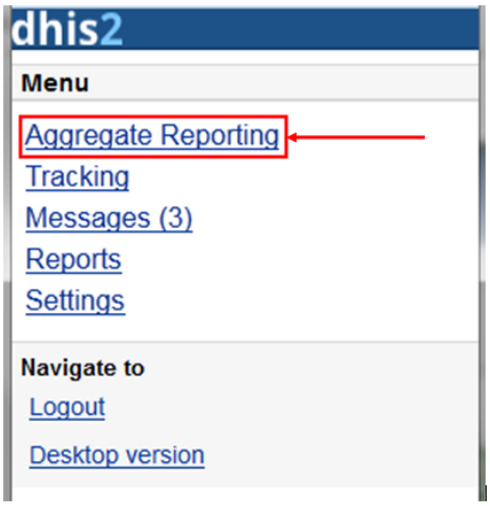
- **Settings:** User-information (e.g.: First-name, Surname, Phone number, E-mail) and the Interface language.

- Logout: to log out the application.

- Desktop version: navigate to the desktop version of DHIS2 for administration. This require a lot of resources from the client mobile, for example: the sufficient memory to load the pages. Not recommended for the normal GPRS/3G/... phones.

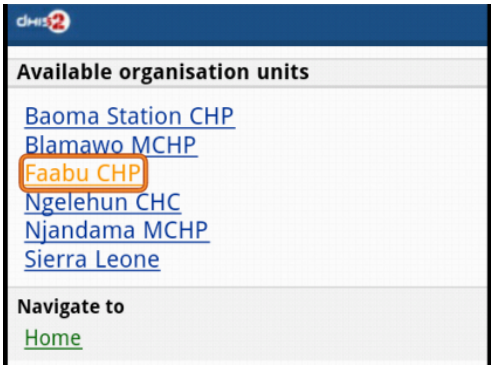
The list above will be explained in details:

1. **Aggregate Reporting:** Entries for aggregate data with defined/assigned dataset by organisation-units.

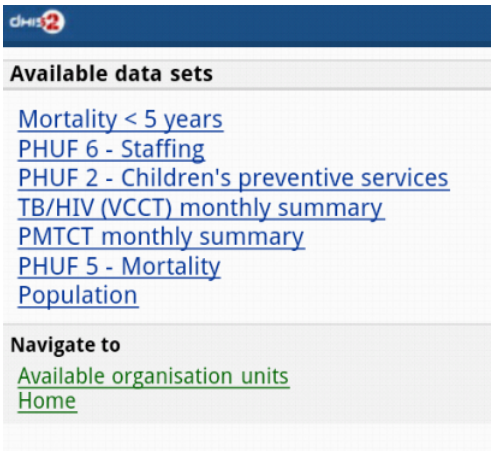


Click on the "Aggregate Reporting", then choose an Organisation Unit from the list and the list of the datasets will be appeared for entering aggregate data. See the below example:

Step 1: Select an Organisation Unit from the list

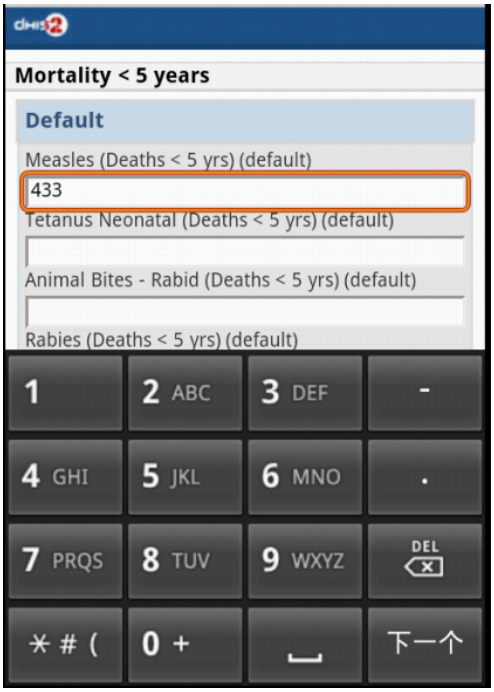


Step 2: Select a Dataset (entry form) from the list

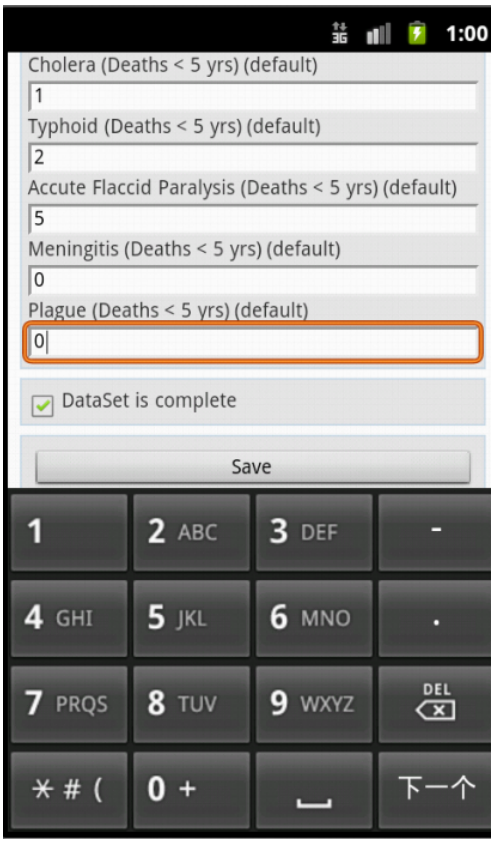


Step 3: Select a period (based on the period type of the chosen dataset) from the list

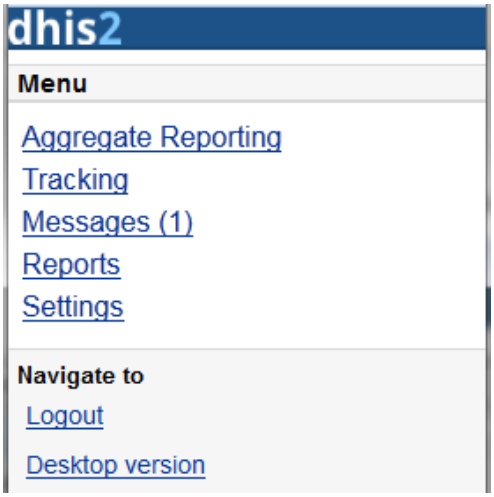
Step 4: Entering the data



Step 5: Save the data entered after completing the data, choose the option for data completeness if having.

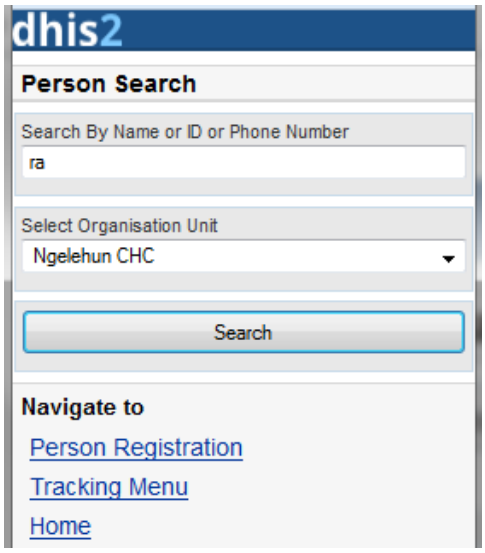


2. **Tracking: Find/Add Person, Visit Schedule, Person Registration, Anonymous**



2.1 *Find/Add Person* : find person based on Name, Phone Number or ID, and Organization unit.

- Step 1: insert Name, Phone Number or ID and select the Organization Unit, then click Search.

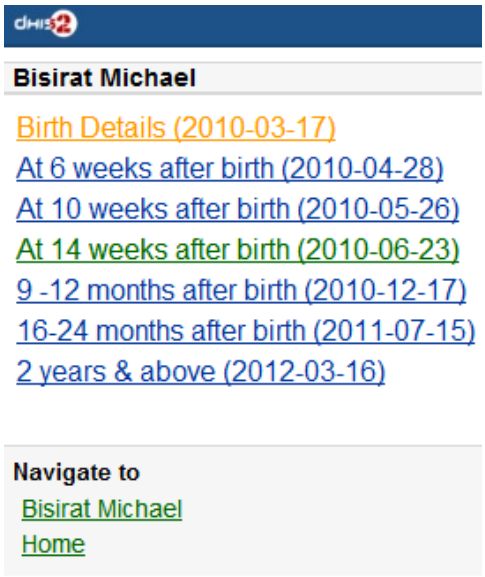


- Step 2: select a person

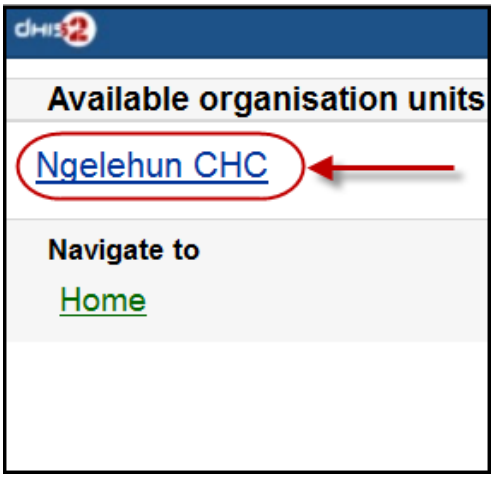
Then all the information of that person will be displayed

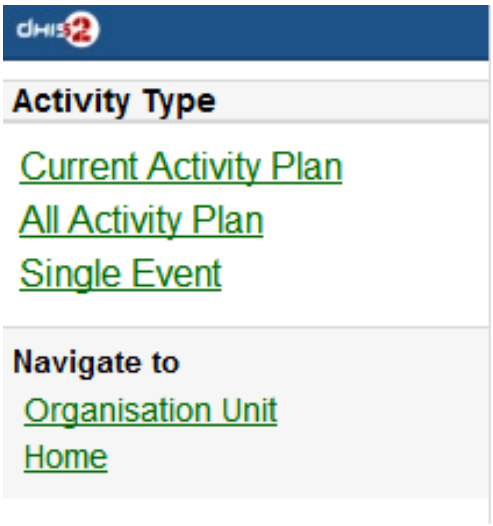
- Step 3: choose the next program stage for entering the data

To view all the program stages, click on the name of that program (Child Heath Program as the screen shot)



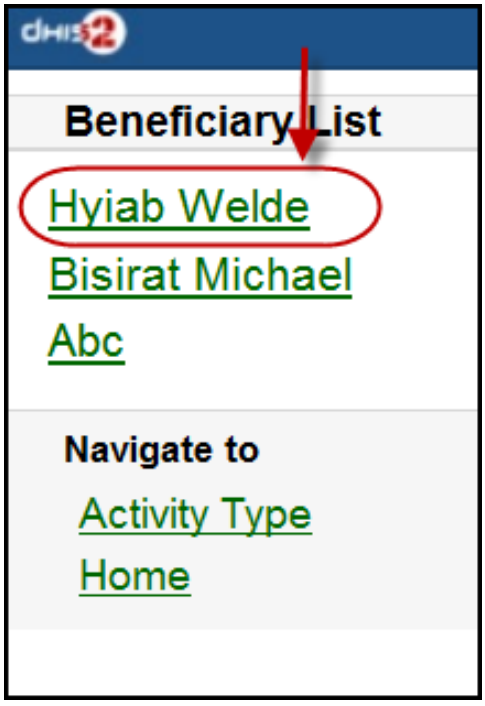
2.2: *Visit Schedule:* Choose An Organization Unit



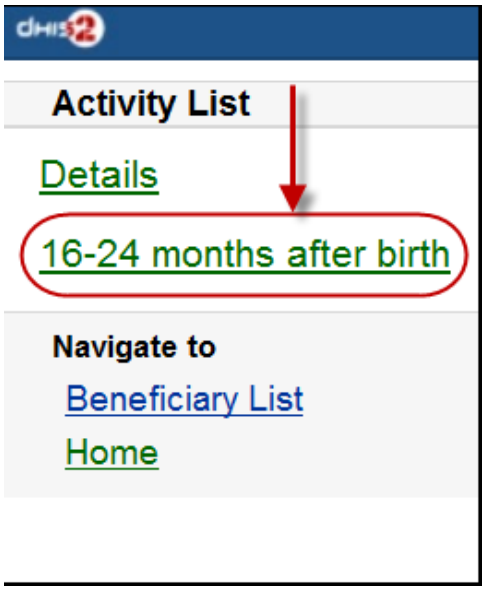


- Current Activity Plan: the list of the beneficiaries registered, enrolled, not yet finish/ complete a/many program and there is at least a program-stage open for data-entry.

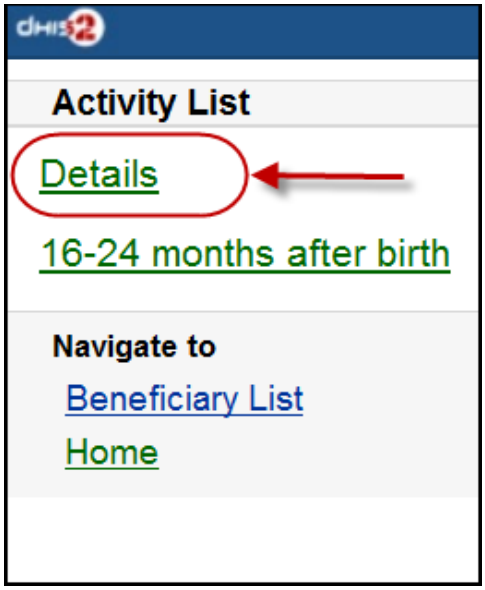
  + *Step 1: Choose a Person for entry*



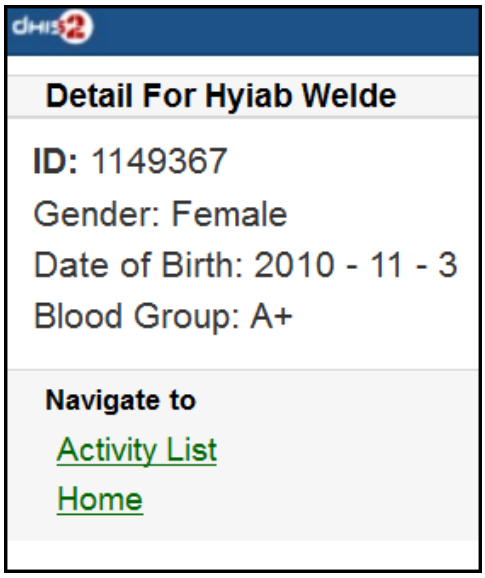
  + *Step 2: Choose a current and active program-stage for entering the data*



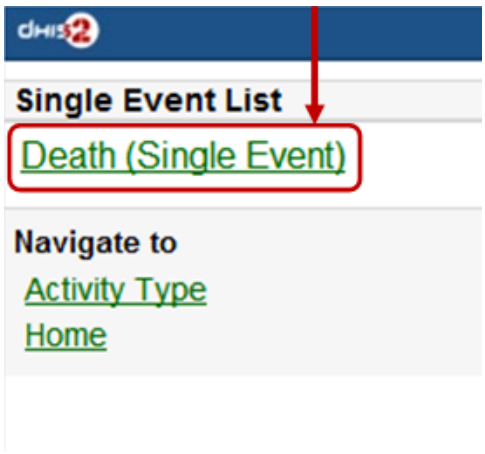
You can also see the person's information (ID, gender, Date of Birth, and Blood Group) by clicking on the Details (on top of the list appeared)



The details information of the chosen person:

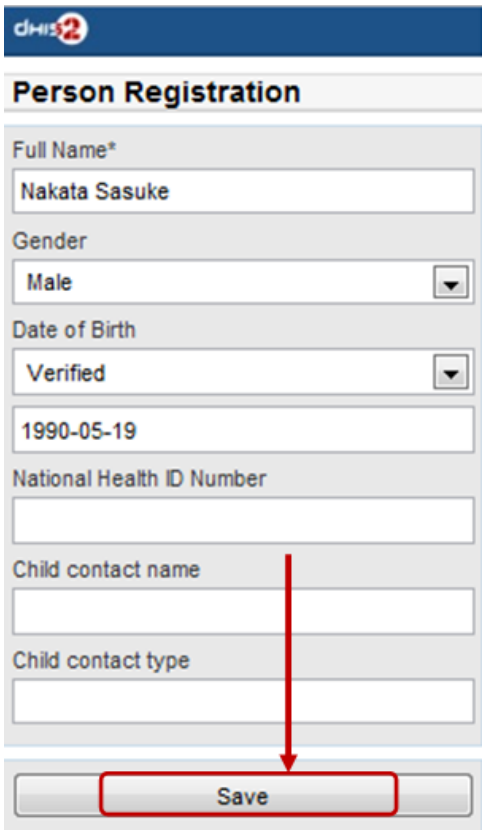


- All Activity Plan: the list of all beneficiaries registered, enrolled, not yet finish/complete a/many program.
- Single Event:

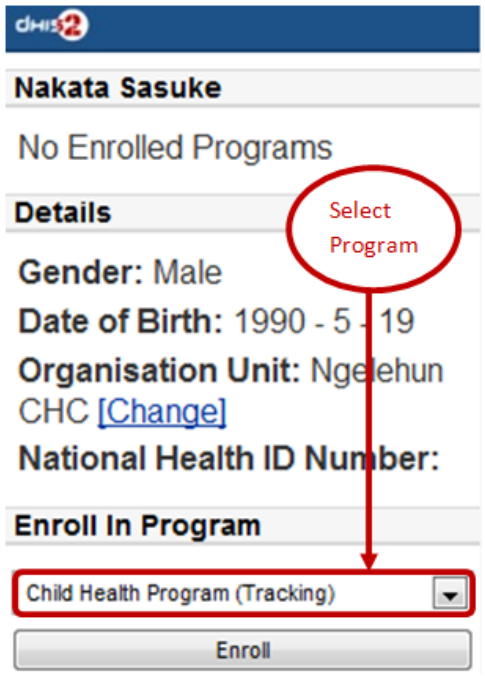


2.3: **Person Registration:** Registry a new Person

- Step 1: Entry personal information

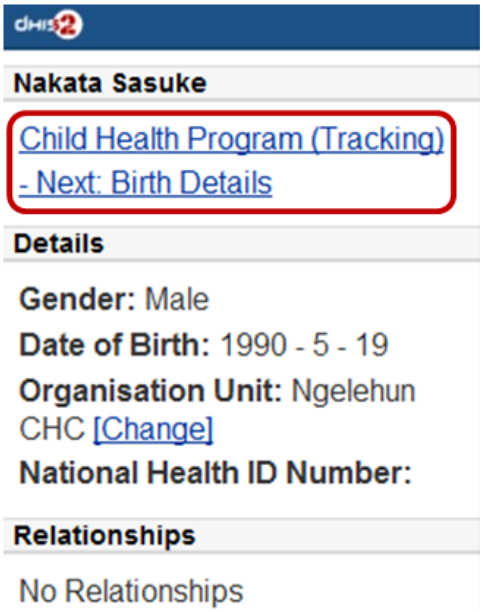


- Step 2: Enroll program for the person just been registered, then click "Enroll".

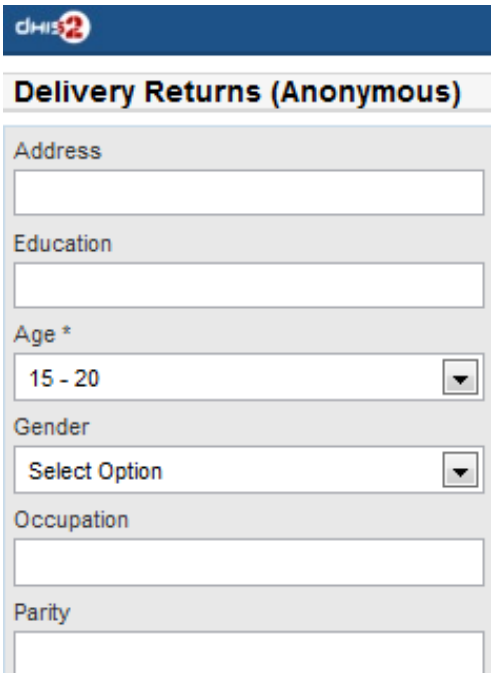


- Step 3: Entry required information for the chosen program, then click "Enroll"

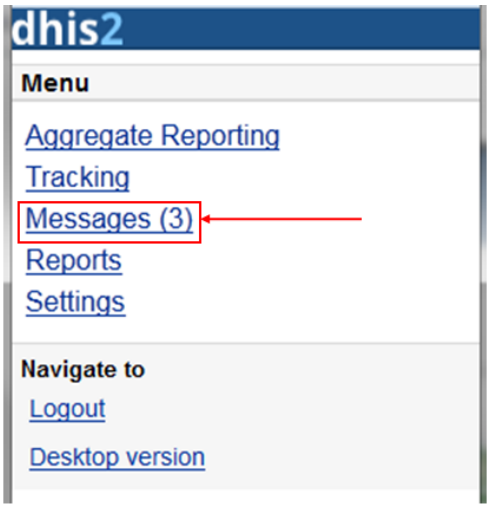
Here is the result:



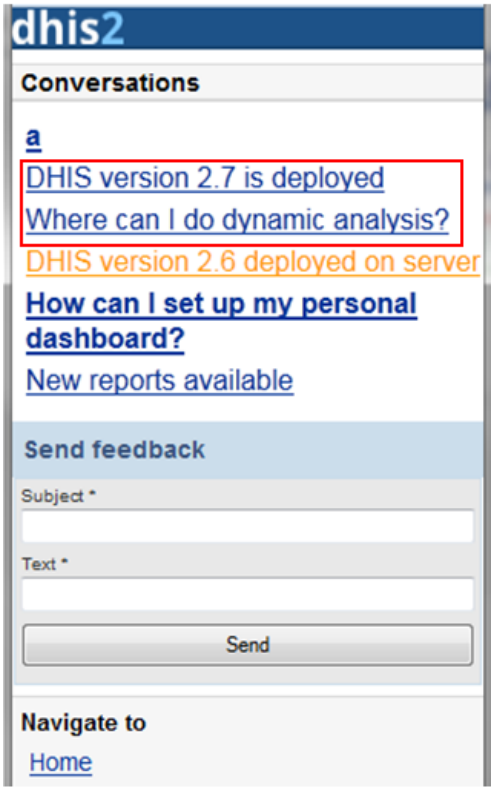
2.4: **Anonymous:** Entries for anonymous person based on specific programs



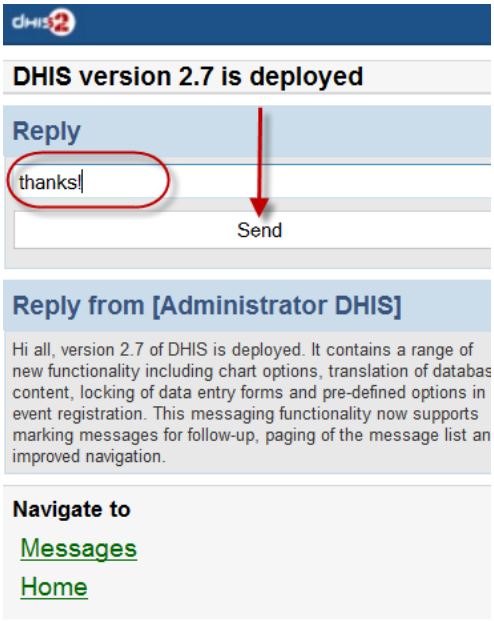
3. **Messages:** Manage the messages and discussions from the server. Message reply is available.



The number showed is the unread messages. Click on that to view the list of the messages (the unread messages are in bold and dark blue color):

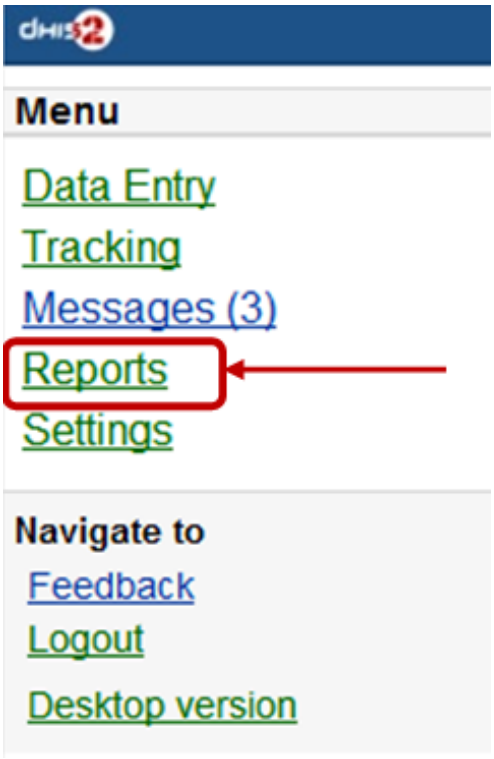


Then you can pick up the message/topic for the discussions by leaving the reply message, see this example:



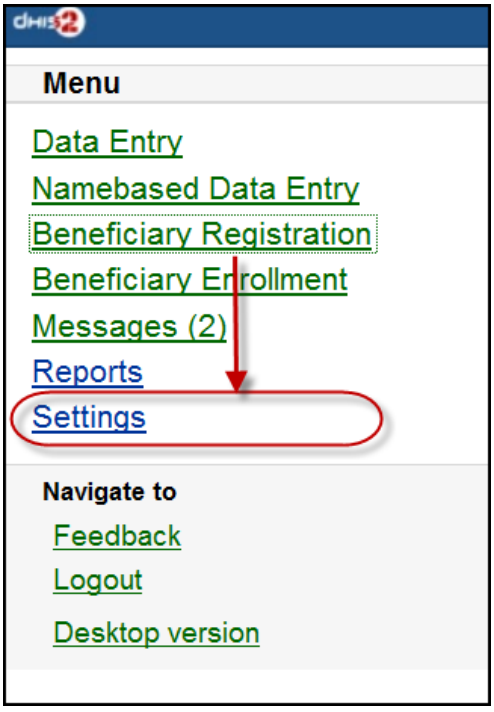
User can create and send a feedback to server in messages section. After sending out the new feedback, the message (feedback) will be listed under "Messages" for further following up.

4. **Reports:** The output reports from the server

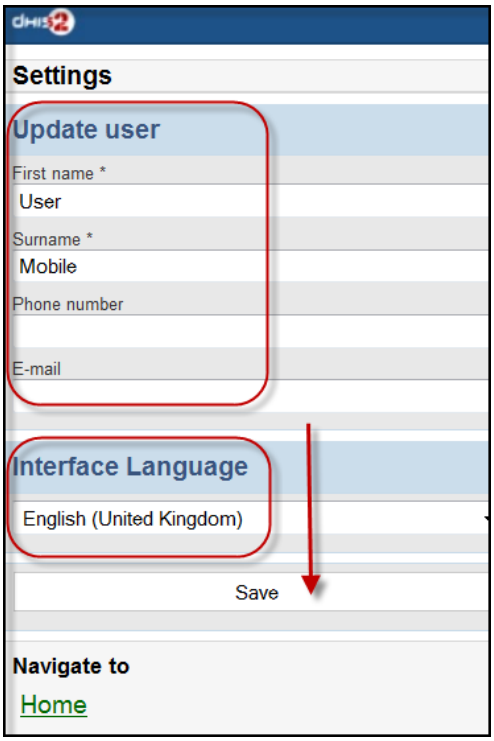


(will be updated)

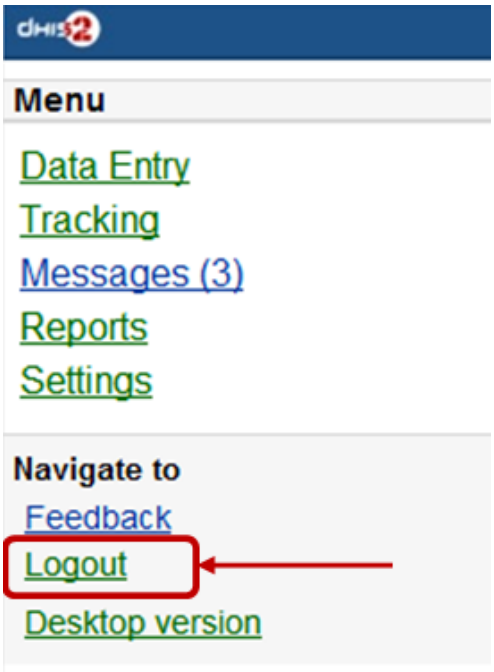
5. **Settings:** User-information (e.g.: First-name, Surname, Phone number, E-mail) and the Interface language.



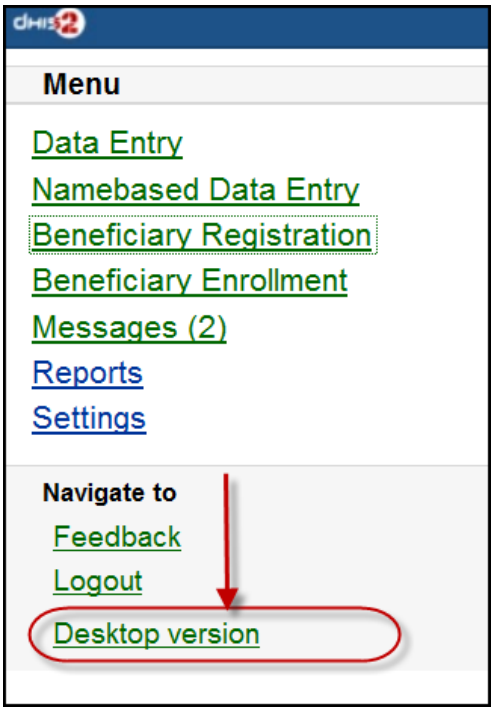
Here is the form for setting the user account/access and the interface language. Click on "SAVE" for completing the settings, see the example below:



6. **Logout:** to log out the application

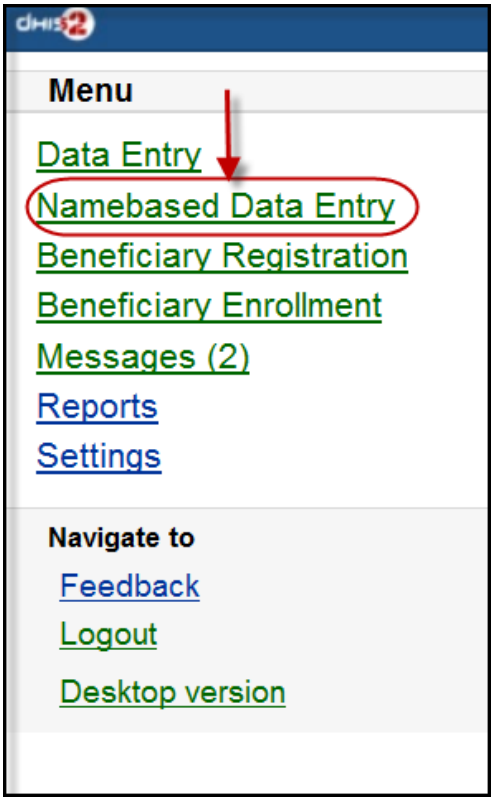


7. **Desktop version**: navigate to the desktop version of DHIS2 for administration.



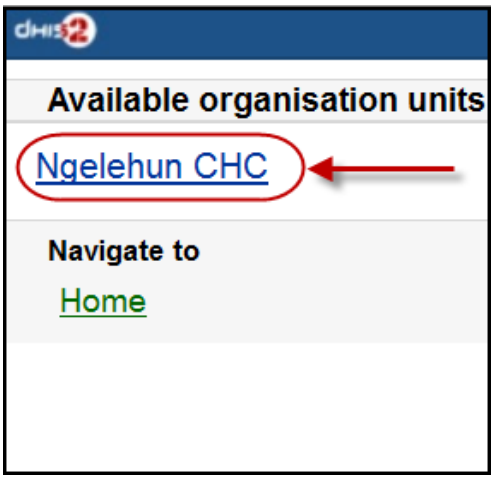
Here is the GUI of the desktop version (which require much memory for loading), not recommended for normal mobile. The example with DHIS2 Demo (from dhis2.org)

1.

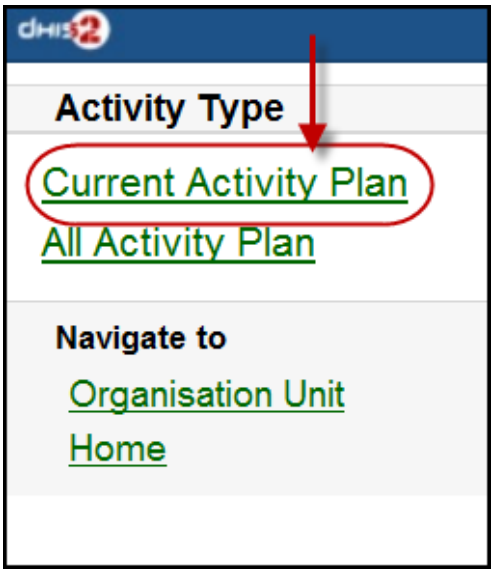


After clicking on the "Namebased Data Entry", the next will guiding to the selections in the following steps:

Step 1: Choose an Organisation Unit



Step 2: Choose the Activity Type



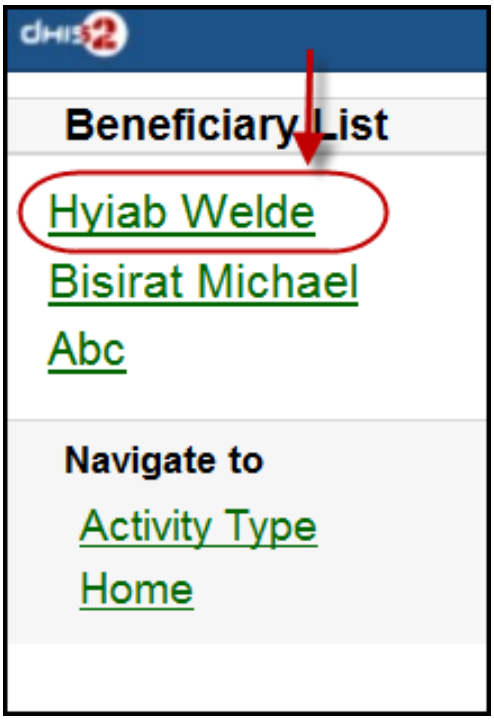
(the screen-shot with an example with "Current Activity Plan" option)

There will be normally these two type of Activity:

+ "Current Activity Plan": the list of the beneficiaries registered, enrolled, not yet finish/ complete a/many program and there is at least a program-stage open for data-entry.

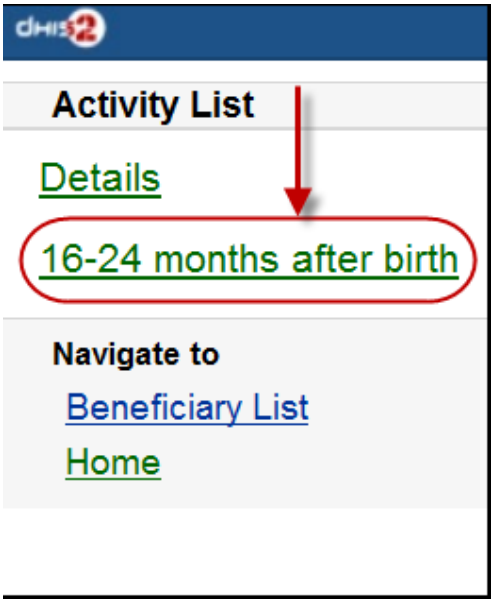
+ "All Activity Plan": the list of all beneficiaries registered, enrolled, not yet finish/complete a/many program.

Step 3: Choose a Beneficiary for entry



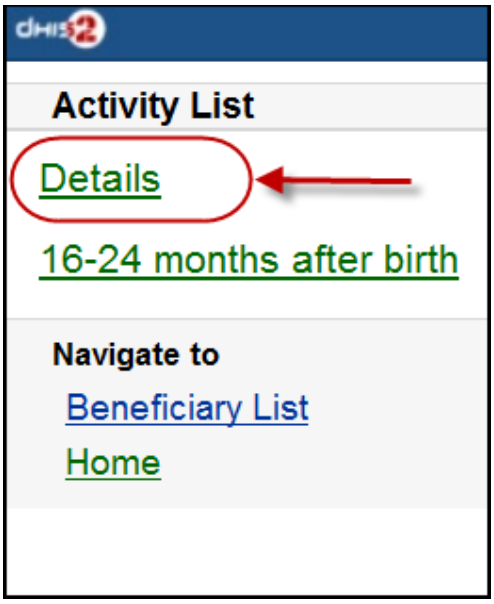
(the screen-shot with an example with "Hybia Welde" option)

Step 4: Choose a current and active program-stage for entering the data

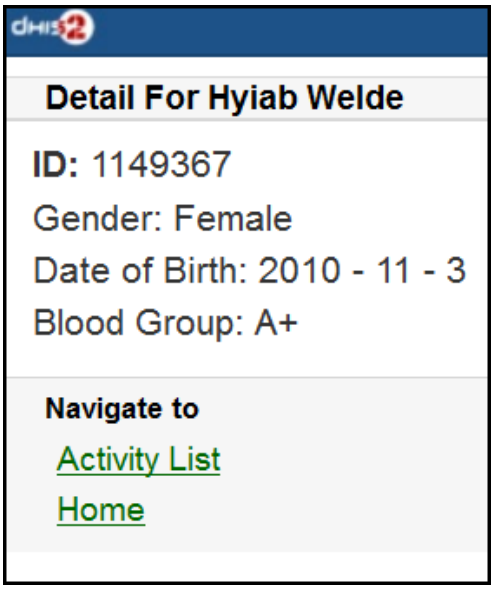


(the screen-shot with an example with "16-24 months after birth" option)

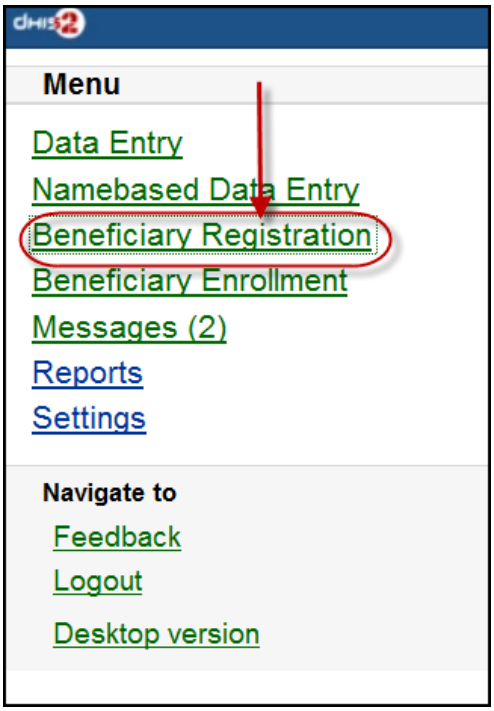
You can also see the beneficiary's information (ID, gender, Date of Birth, and Blood Group) by clicking on the Details (on top of the list appeared)



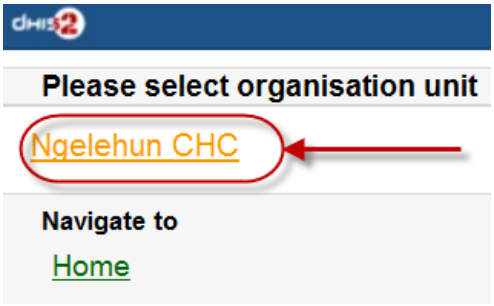
The details information of the chosen beneficiary:



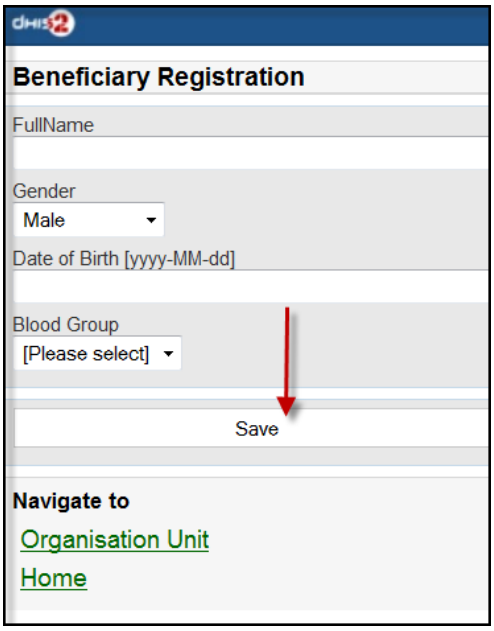
2. **Beneficiary Registration:** Registry a new beneficiary



Step 1: Choose an OrganisationUnit



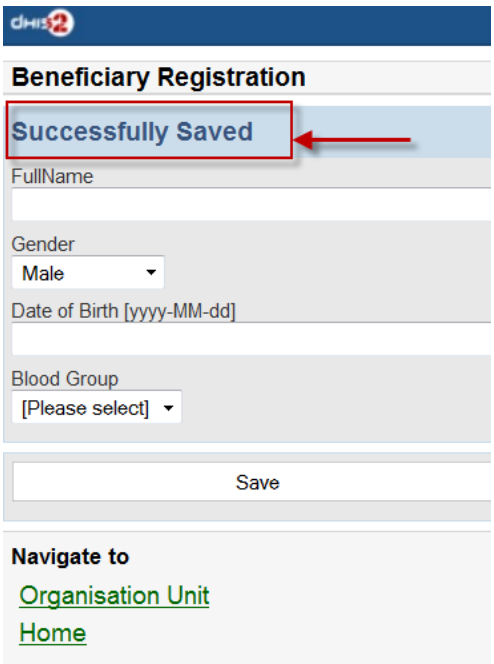
Step 2: Fill in the Beneficiary Registration form



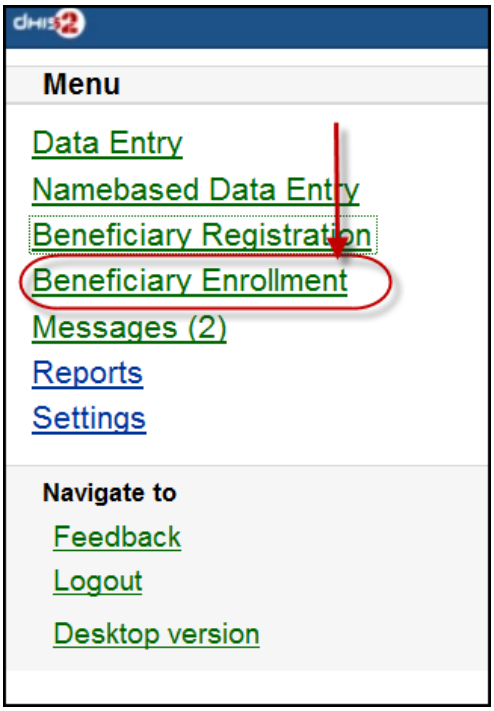
There necessary information: Full Name, Gender, Date of Birth (and Blood Group).

Click on "SAVE" to register a new beneficiary.

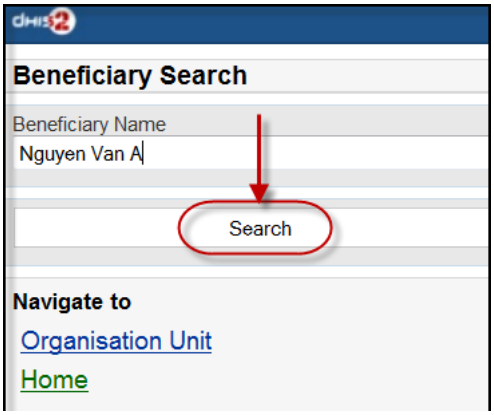
A message "Successfully Saved" will appear when the beneficiary is created/registered successfully.



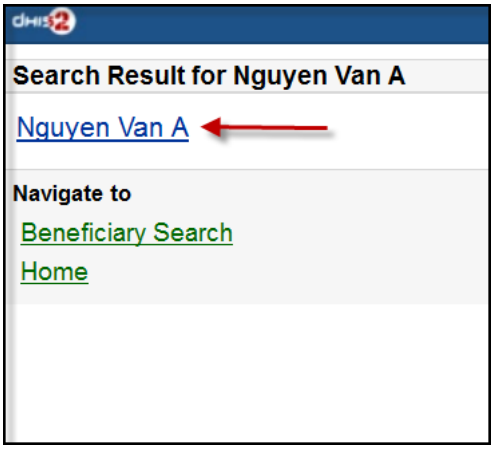
3. **Beneficiary Enrollment:** Enroll a beneficiary to one or many programs



Before enrolling a beneficiary to a program, the search function for a beneficiary is provided:



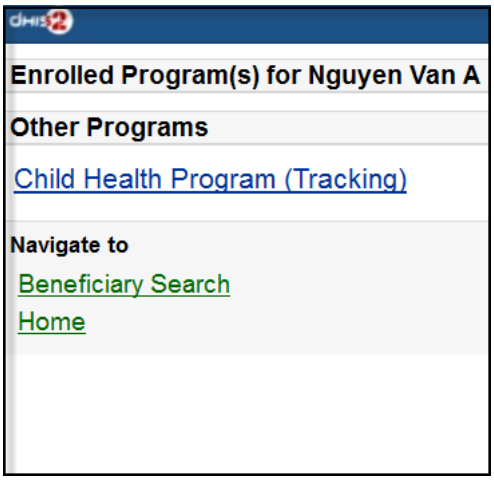
If the beneficiary is found, the result will be listed. The simply click on the beneficiary name for navigating to the programs in which the beneficiary enrolled:



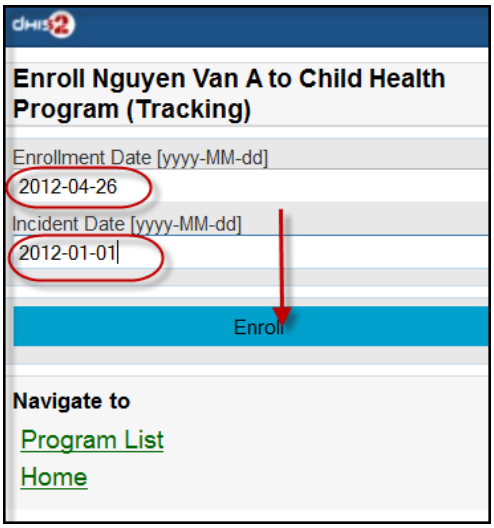
The below screen-shot example describes the beneficiary named "Nguyen Van A":

- Has not enrolled any programs before

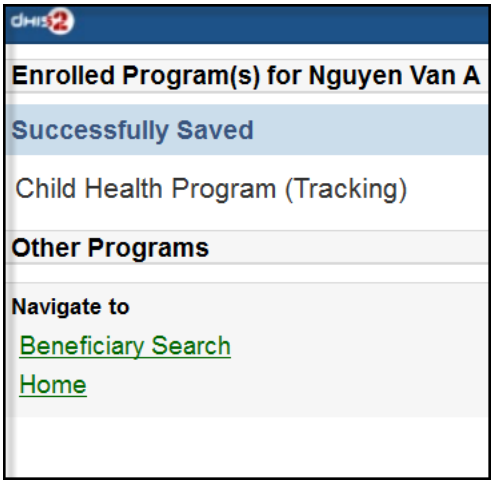
- There is one program: "Child Health Program" available for enrollment



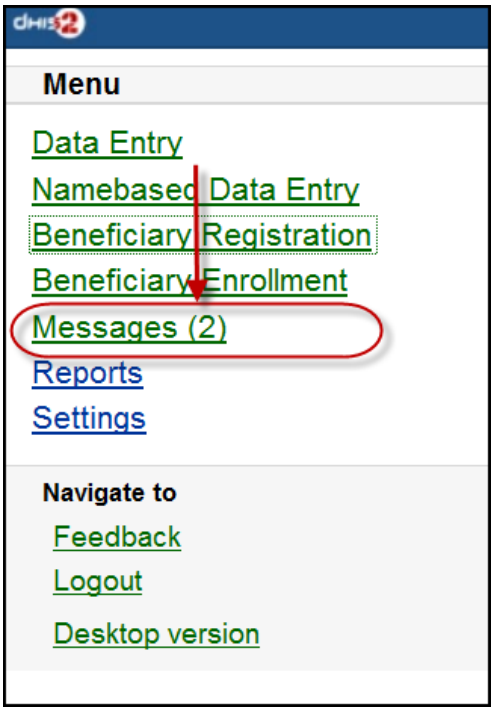
The list of the available programs for enrollment will be listed. Just click on the program for enrollment by specifying the date of enrollment and the date of incident. See the example:



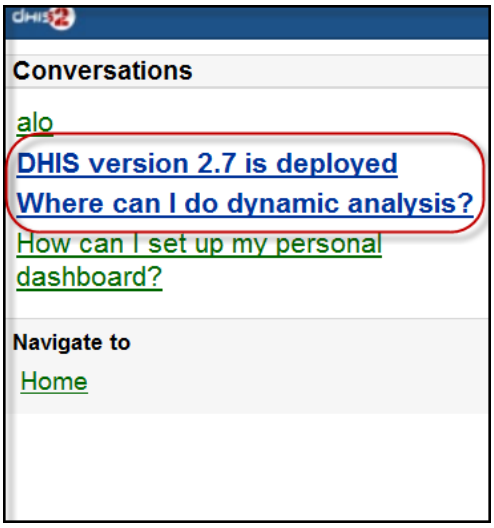
After clicking on the "ENROLL" button, if successful, the program enrolled will be listed under "Enrolled Programs for" + <Name of the beneficiary>, see the example:



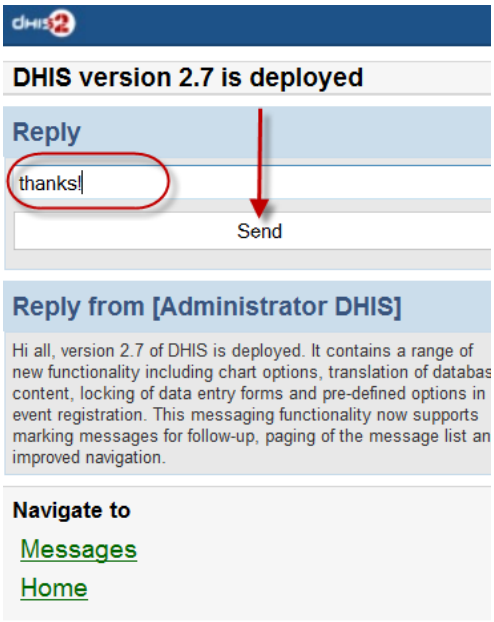
4. **Messages:** Manage the messages and discussions from the server. Message reply is available.



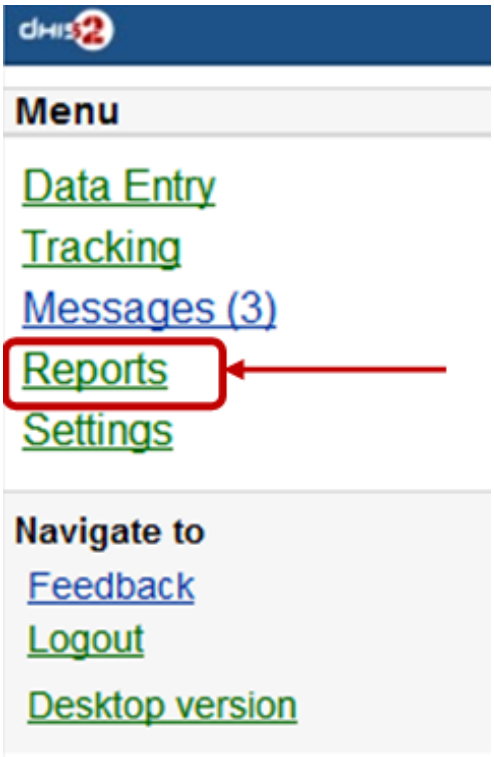
The number showed is the unread messages. Click on that to view the list of the messages (the unread messages are in bold and dark blue color):



Then you can pick up the message/topic for the discussions by leaving the reply message, see this example:

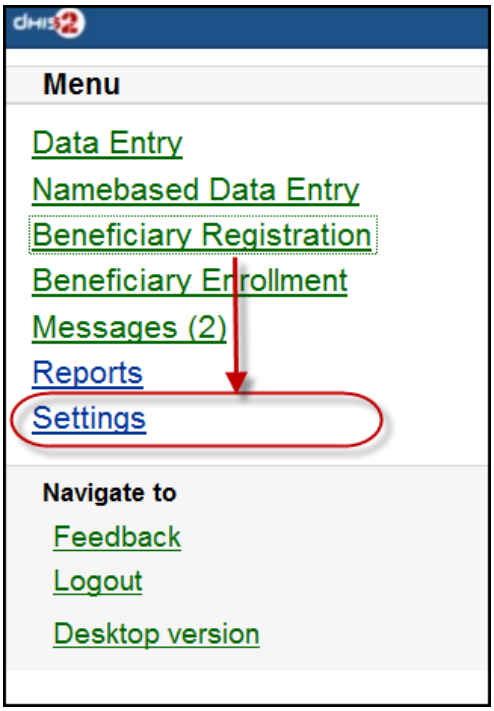


5. **Reports:** The output reports from the server

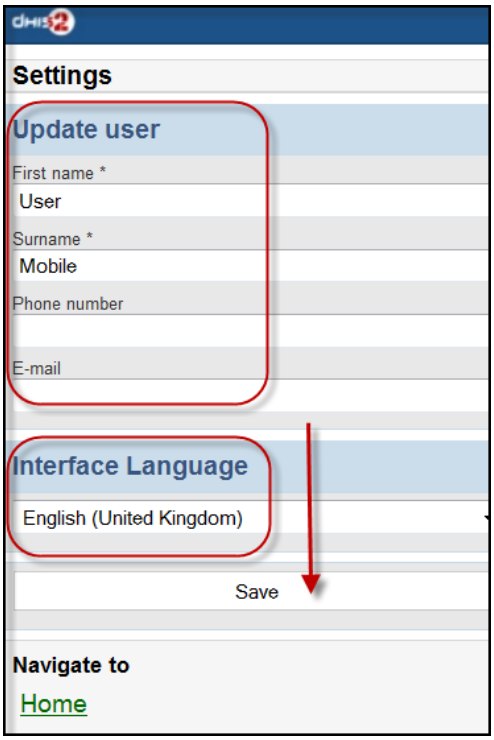


(will be updated)

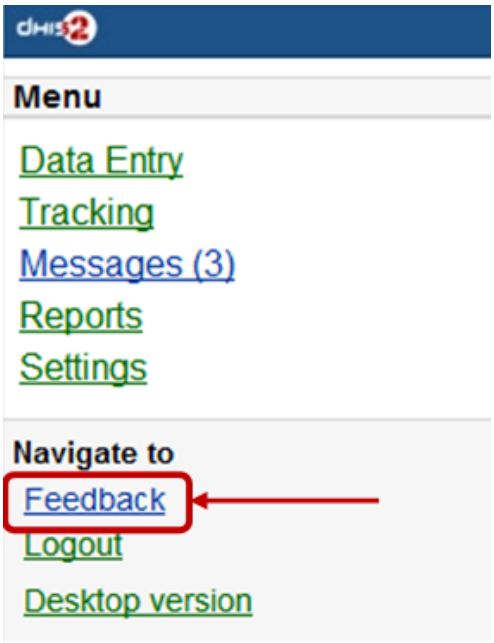
6. **Settings:** User-information (e.g.: First-name, Surname, Phone number, E-mail) and the Interface language.



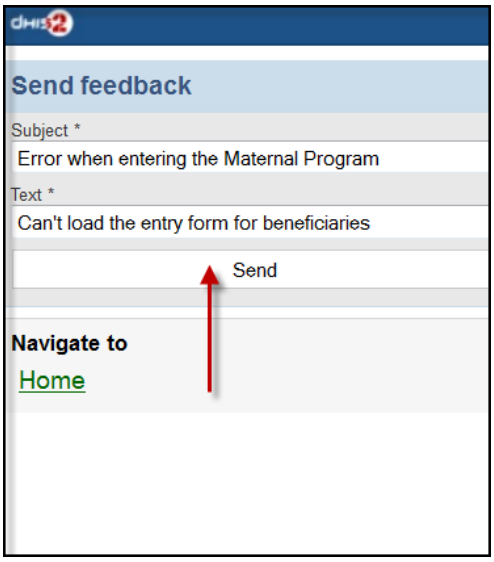
Here is the form for setting the user account/access and the interface language. Click on "SAVE" for completing the settings, see the example below:



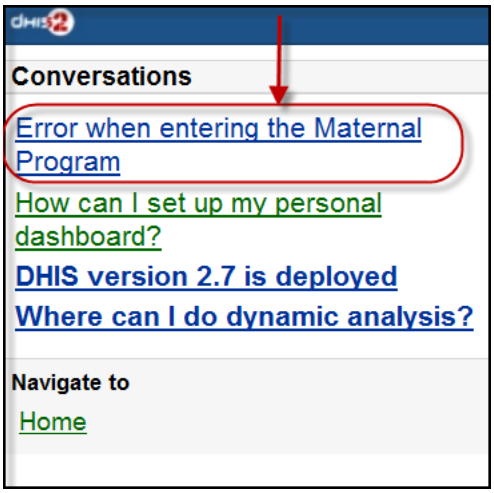
7. **Feedback:** the extra function for creating a new message to send to the server. The new created feedback from this will be listed under "**Messages**"



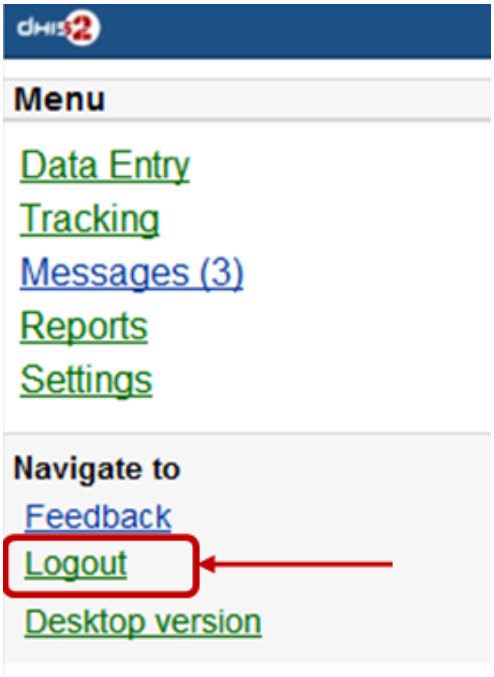
After clicking on the "Feedback", there will be a form for editing/sending out a new message/ discussion. See the example below:



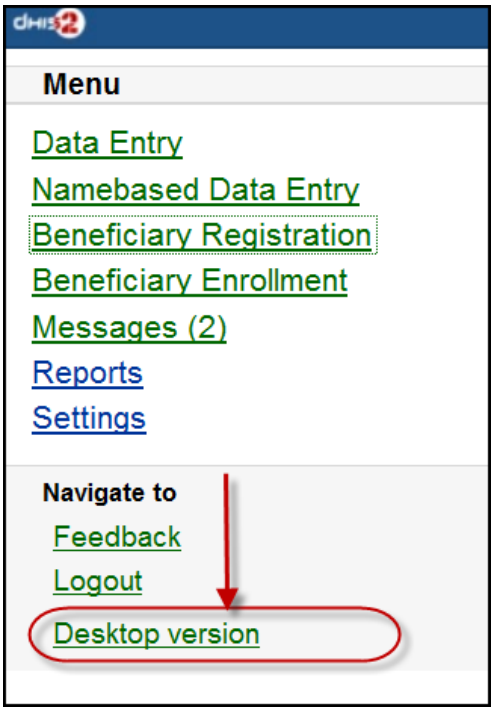
After sending out the new feedback, the message (feedback) will be listed under "Messages" for further following up.



8. **Logout:** to log out the application



9. **Desktop version**: navigate to the desktop version of DHIS2 for administration.



Here is the GUI of the desktop version (which require much memory for loading), not recommended for normal mobile. The example with DHIS2 Demo (from dhis2.org)

30.3. J2ME GPRS/3G Client

The DHIS2 GPRS/3G mobile module provides a mechanism for remote clients using mobile phones to enter data directly into the DHIS2 system. There are two functions of the client, namely:

The solution relies on the mobile phone having a data connection available (i.e. GPRS, Edge, 3G), over which it communicates with a DHIS2 instance which must be publicly available on the internet, as any other web server. The client application on the phone downloads the data entry forms to the phone from the server, and the forms can therefore be updated without installing a new application. This is also a crucial feature for community reporting, which relies on regularly downloading activity plans from the server.

- Facility reporting, for data entry and reporting of regular DHIS2 aggregate data,
- Activity reporting, for supporting individual activity reporting with the Community module.

30.3.1. Data connection availability

Data connection availability can be a problem in many of the contexts where DHIS2 mobile reporting would otherwise be a good solution for getting data directly into DHIS2. If that is the case for you, you might want to consider trying the SMS based solution described in a separate document. Keep in mind that even though a data connection is currently required for communication between the server and the mobile phone, it is only required when initializing

or updating the mobile application and when sending reports to the server. The phone stores all entered data locally, so it can work fine with only temporary access to a data connection on a regular basis.

30.3.2. J2ME GPRS 3G facility reporting client

The server side component of the web based solution is included in the general build of DHIS2.

In order to configure the DHIS2 web-based mobile reporting, you should follow the following steps.

- Set the "Available for Mobile Reporting" flag for the data sets you want reported: Under *Maintenance->DataSet->Edit* mark the “Available for Mobile Reporting” check box and save.
- Create a user role for the mobile user. Select *Maintenance->Users->User Role->Add new*. Add a user role name and description. Add the desired data sets for the role. The mobile user role will need to have at least privileges for DHIS2 Web API. Save the user role by clicking "Save".
- Create a user which will be used by the client to login from *Maintenance->Users->User ->Add new*. Fill in all of the required details, keeping in mind that the password must be at least 8 digits long, contain one capital letter,and one digit. Assign the desired user role to the user which was created in the previous step.

Important

Assign the user to exactly **one** organisation unit. Each mobile reporting client will need their own user name and password.

30.3.3. Detailed configuration of data sets and reporting forms

Though the previous steps is all that should be needed for testing the solution more detail configuration of the datasets may be required and are described in the following sections.

30.3.3.1. The mapping of data sets to form layout on the phone

By default, a data set is mapped to a single form on the phone. If the data set is divided into sections, each section is displayed as a separate page on the phone. If a data element has more than one category option combo it will be displayed as a heading with the category combination options following.

Table 30.1.

Form design element	DHIS2 Metadata	Metadata element
Form title	Data set	Short Name if it exists, otherwise Name
Page tile	Section	Section name (or form name if no sections)
Question	Data element	Alternative name if it exists, otherwise Name
Question name if combos	Category option combo	name

30.3.3.2. Sorting of forms

By default, data elements will be sorted according to the global sorting assigned in DHIS2. If sections are used, their section specific sorting order will be used. In some cases, when

sections are not used, a data element might be used in multiple data sets, and conflict in the way it should be sorted in individual data sets. A work around for this situation is to wrap the whole dataset in one section (note that this will only work if the data elements have the same category option combo)

30.3.3.3. Versioning of data sets

To make it possible to compare and update the data sets on the mobile phone with the version on the server, data sets are automatically versioned when you edit the data set structure. Some changes which occur on the DHIS2 server, will cause the mobile client to update its forms with a new version.

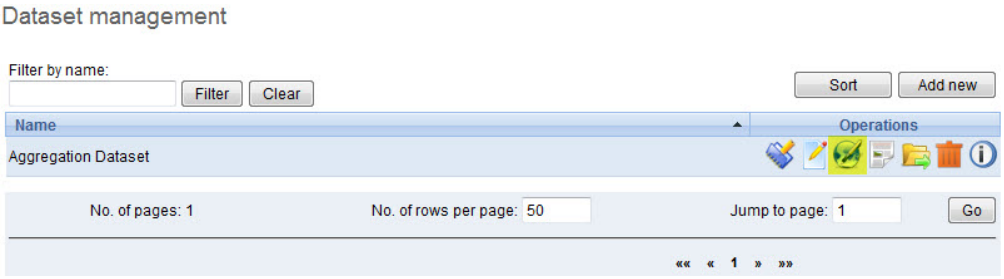
Changes that currently trigger a new data set version

- Create DataSet
- Edit DataSet
- Create/edit/delete Section in DataSet
- Sort Section Order
- Update DataElement (affect many related DataSets)
- Delete DataElement (affect many related DataSets)
- Edit DataElement Category
- Edit DataElement Category Combo

30.3.3.4. Language support

Multi-language support is available.

DataSet and DataElement are translated through web-based function. Default language on server is used on mobile in cases requested language from mobile is not available.



30.3.4. Mobile application setup

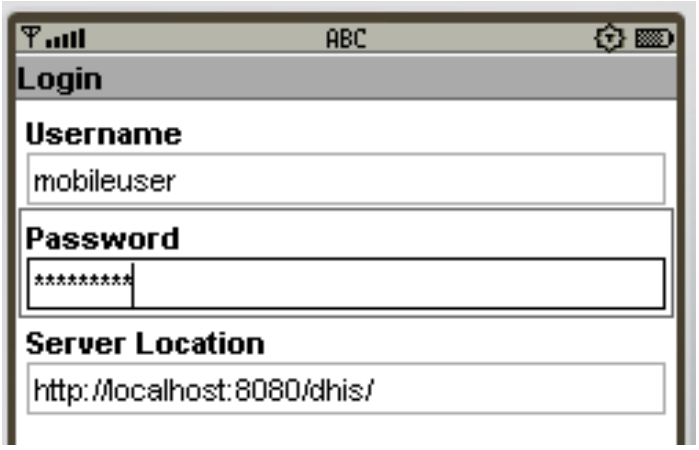
30.3.4.1. Installation and initialization

30.3.4.1.1. Installation

Download the jar packages from the DHIS2 homepage: www.dhis2.org/downloads

30.3.4.1.2. Initialization

Initialization should be performed before the phones are delivered end-users. Given the large variation in possible phone configurations, it is impossible to describe the exact steps which are required in order to enable the client on the phone. However, for most phones, simply copying the DHIS2 Web Mobile client "JAR" file to the phone with a USB cable or via Bluetooth is sufficient. Of course, GPRS/3G connectivity must be enabled. Contact your mobile service provider for exact details on the configuration of the phones and networks.



Once the client has been installed on the phone, an initialization process must occur by providing a user name, password and server URL.

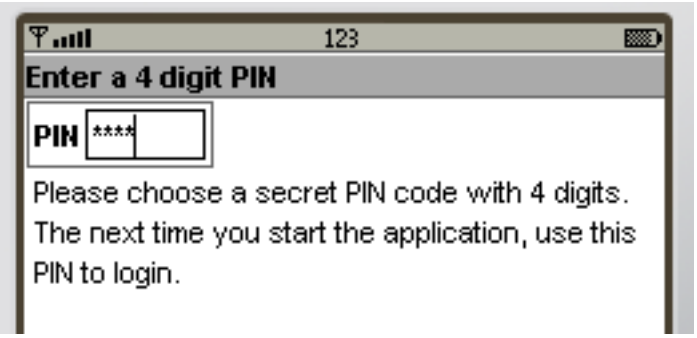
1. Logging into the server for the first time.

   The first time the client logins to the server, or if the client is reinitialized, the username, password and server URL must be entered.

   If the client is unable to login, there could be several possible error messages which you see.

   - Connection Not Found: The specified server URL is not correct. Check the server address, ensure that the server is actually reachable, and try again.
   - Invalid User Name Or Password: the username or password is incorrect
   - Application not authorized to access restricted APIs : The server can be contacted, but the user does not have the necessary permissions to access the mobile reporting module

2. Setting the PIN number: After the initial login process, a PIN number can be entered by the user. This will make the login process much easier, as the user only has to remember the four digit pin number, as opposed to typing in the user name and password each time. The PIN number can be preset if the phone is initialized prior to delivery, or it can be set by the users themselves if they have been provided with usernames and passwords.



   After entering the PIN, press (Menu)->Next.

3. Download all forms: After the PIN has been specified, all forms will be downloaded from the server and stored locally on the phone..

   If the user has been configured to report on aggregate datasets, a list of appropriate datasets will be displayed. If the user is responsible for community based reporting, the list of assigned activities is displayed.

   Notes: If the Health Worker is responsible for both Facility Reporting and Community Reporting, DHIS2 server will send all forms of both Facility Reporting and Community Reporting to mobile and on mobile, there will be a screen to choose whether displaying Facility Reporting or Community Reporting.

   Errors:

30.3.4.2. Logging in (for regular use)

After starting the application, the PIN form is displayed.

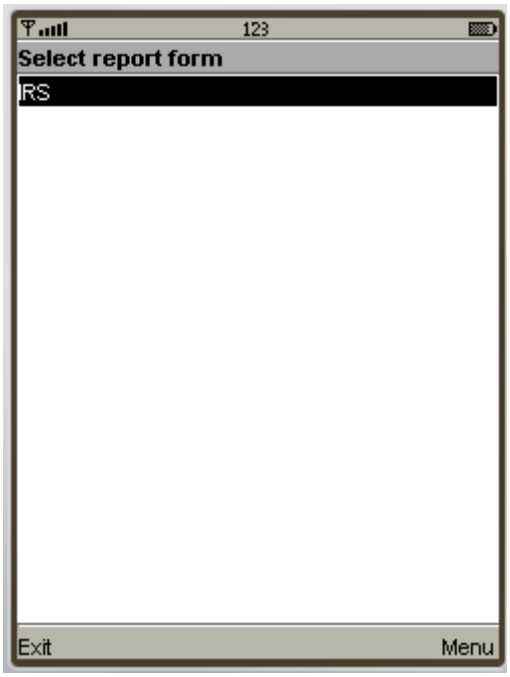
- PIN: Enter the four digit number PIN.
- Reinitialize Command: this function will clear all data on mobile and we start from the login screen with username and password.
- Errors: Invalid PIN: If the user has entered an invalid PIN, they will need to enter the correct PIN, or reinitialize the application with the correct username and password.

30.3.4.3. Facility Reporting Module

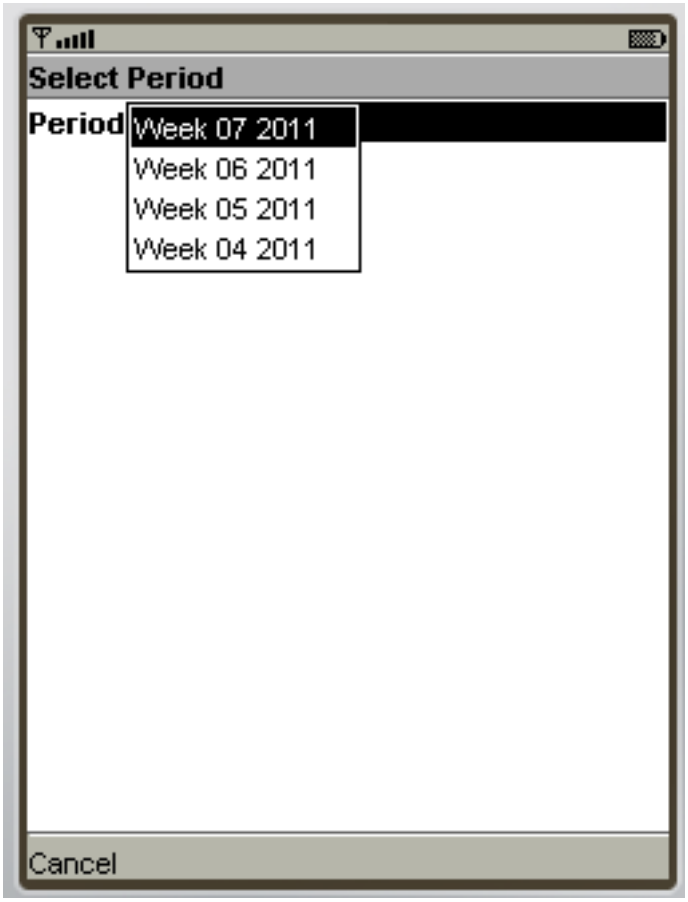
30.3.4.3.1. Entering data

After selecting an aggregate dataset from the "Select report form" window, the user will need to select an appropriate time period. A list of available time periods is automatically generated.

1. After the user has entered their PIN, they can select from a list of available datasets. Select the appropriate dataset and press "Next".



2. Choosing periods: A list of available periods will be automatically displayed to the user. They can select the appropriate period from the list.



3. Fill in values: After choosing the period, the form can be displayed in two modes, depending on the

   - Form with sections

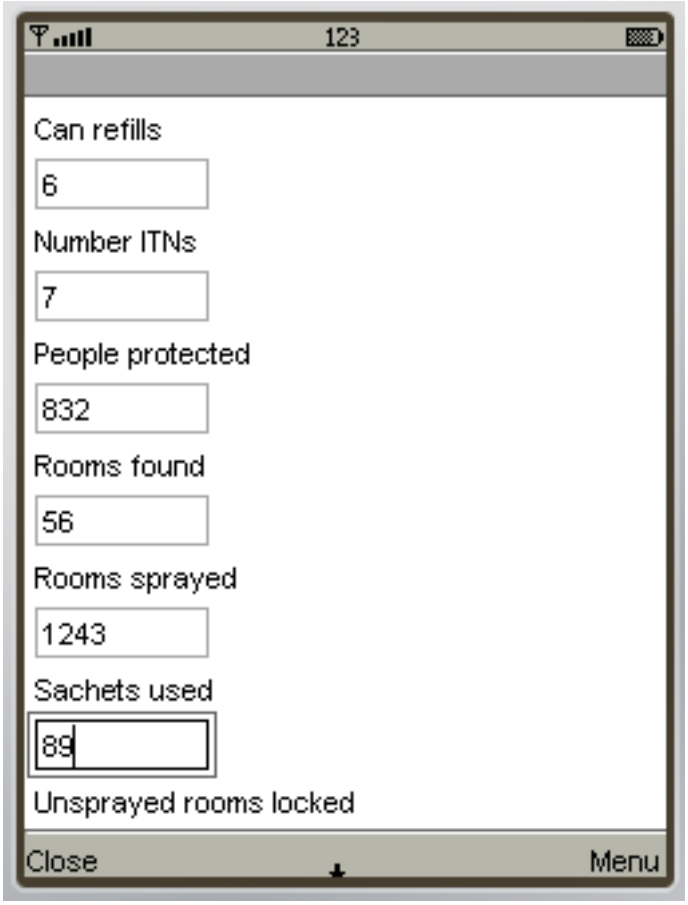
     Each form section is displayed in a single screen with the name of the section in the title window.

     To navigate from screen to screen, push "Next".

   - Forms without section (Datasets without sections)

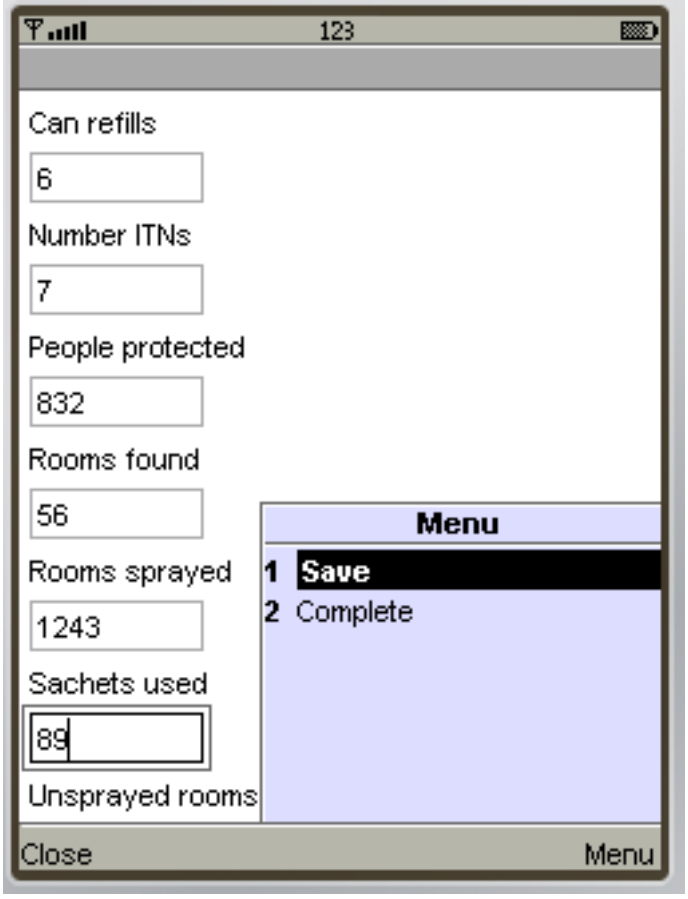
     All fields are displayed on one screen with the title that is the name of DataSet

   The user simply fills in each data element with the appropriate value.

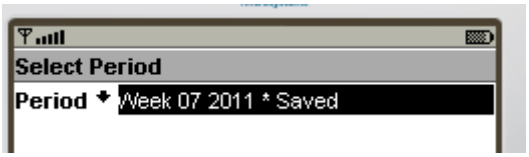


4. Save and Complete:

   After finishing data entry, the user can choose to save the data locally on the phone or to upload the data directly to the DHIS2 server.



If the user saves the data form, they can edit the form at a later point in time if they need to. When selecting a period once again, the period will be marked as "Saved' as seen in the next screen shot.



If the user selects "Complete", and the data entry form is not complete, the user will be asked if they are certain they wish to submit the form as incomplete. Once the form has been submitted, a message should be displayed informing the user that the transmission was successful.

30.3.4.3.2. Notes

1. Period list:

   Periods marked with an asterisk (*) is the period that is completed or saved, depending on the status of the data entry.

   All periods that are not in period list are considered old and will be deleted automatically.

2. Storing values duration

   The number of saved forms on mobile are limited only by the effective amount of storage of the mobile device.

   Forms are saved for limited period only, depending on the frequency of collection of the particular dataset.

   - Daily Forms: 2 months (current and previous month)
   - Weekly Forms: 4 weeks (current and 3 previous week)

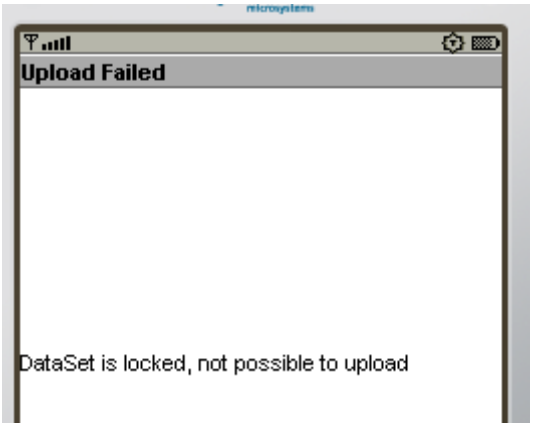
- Monthly Forms: 2 months (current and previous month)
- Quarterly Forms: 2 quarters (current and previous quarter)
- Yearly Forms: 2 years (current and previous year)

3. Completed forms - Uneditable forms

   If the form has been completed, the user can view the form on their phone, but they cannot make any subsequent edits to the form. Each field is greyed out and inactive for editing.

4. Re-Edit completed forms

   If the user wishes to edit data which has already been submitted to the server, they can do so by pressing the "Edit" button. They are allowed to do this assuming that the dataset has not been locked for the period in question. If they attempt to upload the data, the user will be informed that the dataset has been locked, and it is not possible to upload the data.



5. Update Forms:

   This function is used to synchronize the forms on mobile and on server. The process is automatically triggered after entering PIN number.

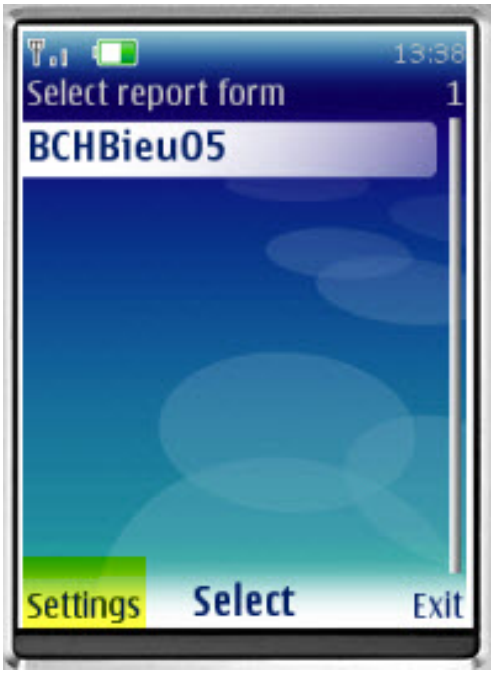
   Note: Checking and downloading updated forms process run in background. After finished, prompt is displayed to ask user whether refresh form list or stay where they are.

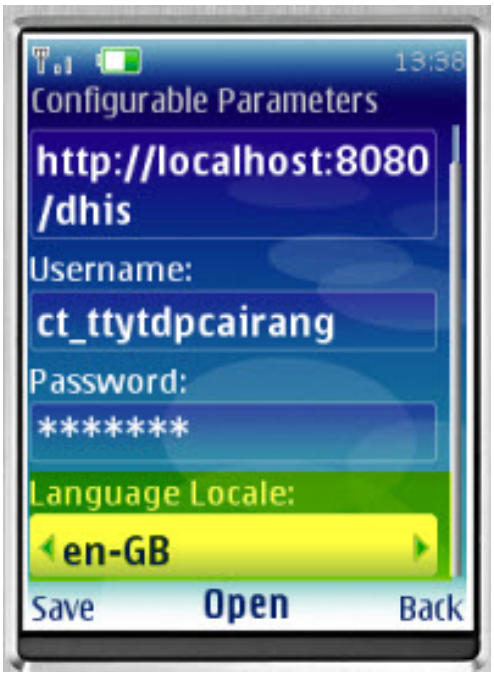
6. Multi-Language Support:

   This function help user to choose language of mobile's GUI (graphical user interface) and content's language (Forms).

   The forms must be translated on server, otherwise, default language is used.

   Default language of first login is English. Change language in Setting menu will affect both interface and content.


13:38
Select report form
1
BCHBieu05
Settings
Select
Exit


13:38
Configurable Parameters
http://localhost:8080
/dhis
Username:
ct_ttytdpcairang
Password:
****
Language Locale:
en-GB
Save
Open
Back

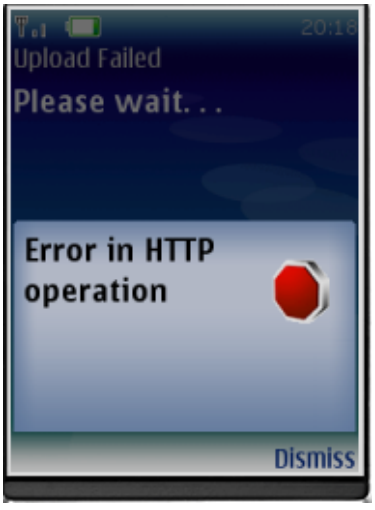
Multi-Language Interface: In Setting menu, there are list of supported language (downloaded from server). Language of GUI is only changed after restart application.

Multi-Language Content (forms): Form's language is change after click "Save". In case there are many forms, it take several minutes to save setting.

30.3.4.3.3. Troubleshooting

- Data has been entered on the phone but does not appear on the server

This usually occurs when users enter data on the phone, but cannot send it to the server. This may be because of the configuration of the phone, lack of credit on the phone, or lack of coverage. Usually an error message is displayed as shown below.



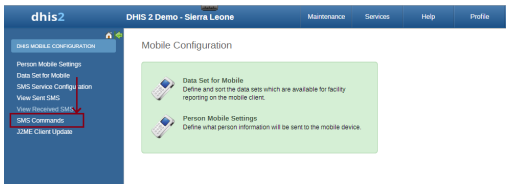
Users should be informed that if they see this error, then it means that their data has not been transmitted.

30.4. SMS Command

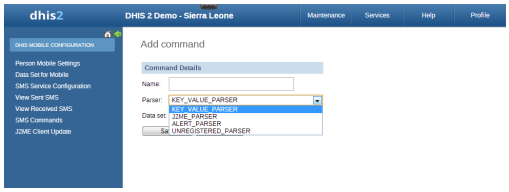
SMS command feature helps DHIS2 system receiving SMS from users, patients, or even anonymous. A SMS command is an object containing the configurations for each SMS form: reporting data from phones or j2me apps, alerting users, registering patient or user, etc.

30.4.1. Set up SMS command

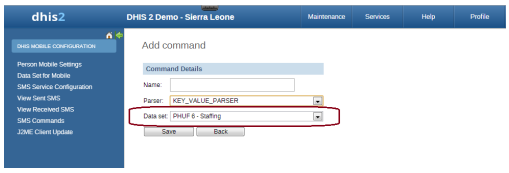
This is where you can create a new SMS command



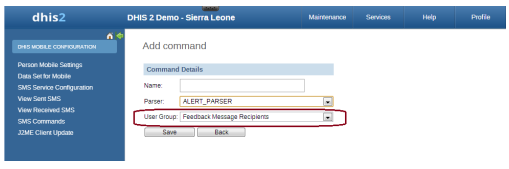
Usually each SMS command has it own property, then the setting up process may be different from each other. Currently, we have 4 types of SMS command:



With KEY_VALUE_PARSER and J2ME_PARSER, the SMS command will have dataset because those are used for reporting data. If data is reported for a Period which is already approved then SMS response will be sent back containing information about approval status of the period.



With ALERT_PARSER and UNREGISTERED_PARSER, the SMS command will have user group because those are used for sending message such as SMS, DHIS2 conversation, email.



There are certain parameters which are common to all SMS Command types. These parameters have default values configured in the system, if user does provide any value to these parameters then those default ones will be used. Here is the list of those parameters

Table 30.2. Common Parameters

Parameter	Type	Description
Code Value Separator	String	To provide custom code value separator. Default is "="

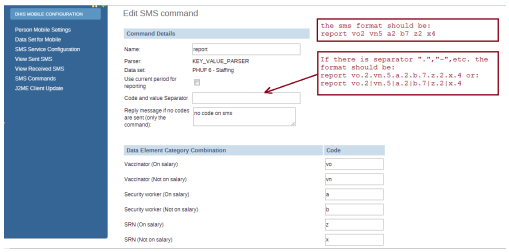
Parameter	Type	Description
Field Separator	String	To provide custom field separator. Default is "|"
Reply message if no codes are sent (only the command)	String	To provide message if no code is found in SMS text input. Default is "Parameter missing"
Wrong format message	String	To provide message if command is not formatted correctly. Command should be fomatted as per code value separator. This message will also be sent back if any mandatory parameter is missing.
No user message	String	To provide message if sending phone number is not registered in DHIS 2.
User belong to more than one OrgUnit message	String	Certain SMS command types require user (retrived from sending phone number) to be associated with only one organization unit. This message can be configured to be sent back in case that requirement is not fullfilled.
Success Message	String	To provide message that will be sent upon successful completion of the process.

30.4.2. SMS Command Type

The SMS command is basically defined by its parser type. In other word, each SMS command has one unique parser to parse the plain text SMS, then the result will be used for the purpose of that SMS command.

30.4.2.1. SMS Command for Reporting Data

In order to report data for example data set (aggregation), we use SMS commands which have KEY_VALUE_PARSER (for phone's plain text), or J2ME_PARSER (for j2me apps)



If the command has name "report", and a list of data element with code like above. The format should be: [command's name] [code][value] [code][value] [code][value]....,the [value] of course might be changed depends on real data, so you have to preapre a SMS text like this example: **report vo2 vn5 a2 b6 z3 x1**

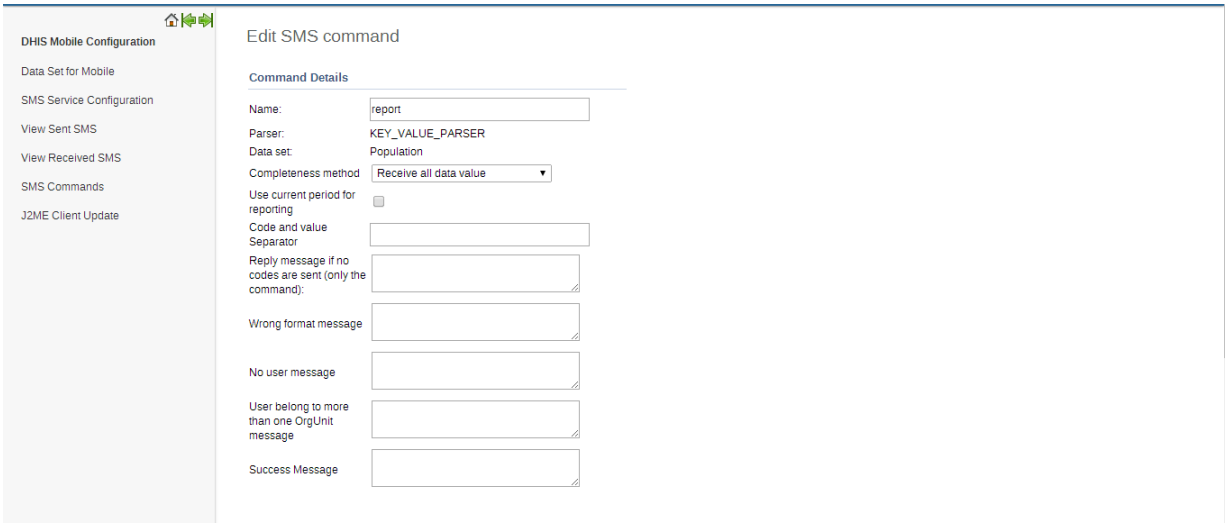
In case the command has a separator for instance ".", the SMS text should be:

report vo.2.vn.5.a.2.b.6.z.3.x.1

or **report vo.2|vn.5|a.2|b.6|z.3|x.1**

Moreover in SMS text input, orgUnit can be specified like this **org orgUnitCode** If no orgUnit is specified in SMS then user is retrieved first from the sending phoneNumber and then orgUnit from that user. As far as PeriodType is concerned it should be specified in this format "ddMM" for example 3108, but in case its not specified then PeriodType will be retrieved from DataSet attached to SMSCommand

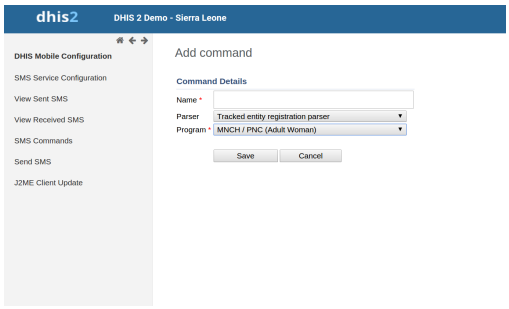
With the J2ME_PARSER, you don't need to prepare those SMS text, because the J2ME will do this job



User can set the custom response message for "Wrong format message", "No User Message", "User belong to more than one OrgUnit message" and "Success message". If no custom message is being set, system will use the default message.

30.4.2.2. SMS Command for Entity Enrollment

TRACKED_ENTITY_REGISTRATION_PARSER can be used to enroll tracked entity into the system.



Command name will be followed by tracked entity attributes pertaining to specific program which this command is associated with. Program selection will be done while creating this command.

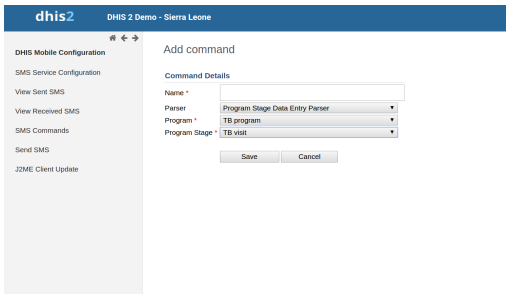
Default text pattern (if field separator and codevalue separator is not provided) for this parser would look like this. **childProgram fn=xmen|ln=xmen2|age=4**

In case field separator is for example "," then text would look like this. **childProgram fn=xmen,ln=xmen2,age=4**

Rest of the behavior is same as for other commands. If user does not provide those parameters then default ones will be used.

30.4.2.3. SMS Command for Program Stage Data Entry

PROGRAM_STAGE_DATAENTRY_PARSER can be used to enter program stage related data for a specific tracked entity instance.



Command name will be followed by data elements pertaining to specific program stage which this command is associated with. Program and program stage selection will be done while creating this command.

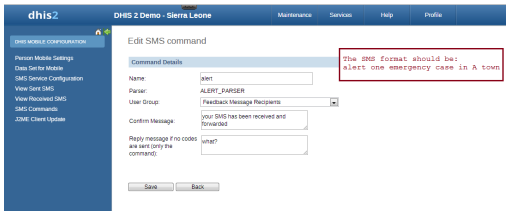
Default text pattern (if field separator and codevalue separator is not provided) for this parser would look like this. **programstage bcgd=1|opvd=2|wght=34**

In case field separator is for example "," then text would look like this. **programstage bcgd=1,opvd=2,wght=34**

Rest of the behavior is same as for other commands. If user does not provide those parameters then default ones will be used.

30.4.2.4. SMS Command for Alerting, Registering

In order to alert users, we use SMS commands which have ALERT_PARSER (for phone's plain text), or UNREGISTERED_PARSER (for j2me apps). UNREGISTERED_PARSER can also be used for registering IDSR rumour.



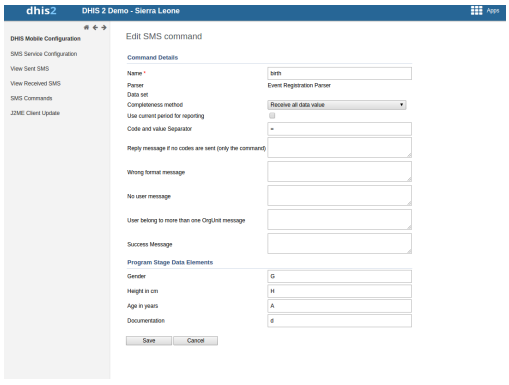
The format of those command will be: [command's name] [text], for example:

alert one emergency case in A town

Commands which has ALERT_PARSER will be received from users only

30.4.2.5. SMS Command for Event Registration

Event Registration can be used to register anonymous event into the system based on the data collected through SMS. This command type is associated with Programs of type WITHOUT_REGISTRATION. For example Birth events can be tracked using this parser.



The format of those command will be: [command's name] [code][separator][value], for example:

birth A=1,B=2,G=Male

Code/Value separator is configurable. Pipe "|" is by default taken as field separator. Commands which has EVENT_REGISTRATION_PARSER will be received from DHIS2 users only. Once command is successfully received then data received in SMS will be parsed and event will be registered in DHIS2.

30.5. SMS Service

SMS Service is a generic service used for sending/receiving SMS. Any other DHIS2 module can include this service and utilize it to send and receive SMS from users or workers in the field.

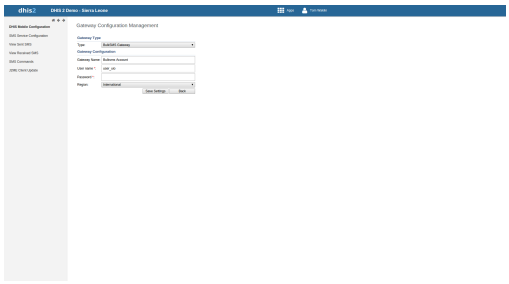
30.5.1. Setting up SMS service

There are few pre-requisites in order to make this service functional. There are two ways to complete these steps. One way is to configure gateway from the GUI in Mobile Configuration Module. The other way is to use SMS Web Api.

- Configure SMS Gateway

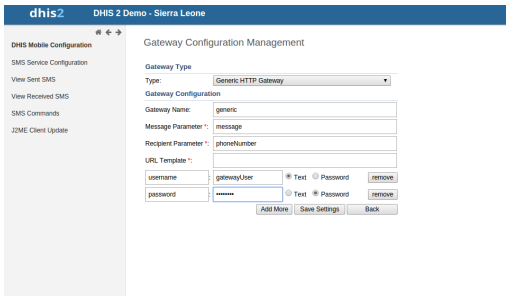
30.5.1.1. Configure SMS Gateway

There are five different types of Gateways supported by SMS Service. SMS can be sent if any one of the gateway is configured. If more than one gateways are present, then they will be used in round-robin fashion for load balancing. There are different parameters for different type of gateway. The Gateway can be configured in GUI in Mobile Configuration Module as shown in the figure. More information about parameters needed to configure gateway can be found in Gateway Configuraitons



30.5.1.2. Configure GenericHttp Gateway

Many DHIS2 instances are using GenericHttpGateway to connect to their local gateways. These local gateways provides HTTP APIs for sending SMS. In new GenericHttpGateway it is now possible to configure url parameters provided in their APIs. For example `http://gateway.com/sendMessage?username=AA&password=xxxxx&message=testing&msisdn=9999`. In this url username, password, message, msisdn are parameters that are required by external gateways. Now in GenericHttp these parameters are configurable which was not possible in previous releases. Making is configurable will help DHIS2 to interact with other gateways which have different url formats.



30.5.2. Gateway Configurations

Below table shows the parameters required for configuring gateway.

Table 30.3. Gateway Configuration Parameters

Parameter	BulkSMS Gateway	Clickatell Gateway	Generic HTTP Gateway	Description
Gateway Name	Optional	Optional	Optional	Used as gateway identity. Default name will be stored in case this parameter is not configured. Its use is recommended
User Name	Required	Optional (if token is used)	Required	Used for API authentication
Password	Required	Optional (if token is used)	Required	Used for API authentication
Auth-Token	N/A	Optional (if password is used)	N/A	Used for API authentication
MessageParameter	N/A	N/A	Required	Message query parameter. For example http://gateway.com?*message*=Hi
RecipientParameter	N/A	N/A	Required	Recipient query parameter. For example http://gateway.com?*phoneNumbe*
URL Template	N/A	N/A	Required	Url Tempalte is only required in case of GenericHttpGateway For example "http://smsgatewa1.com"
Headers	N/A	N/A	Optional	Header option can be checked to send selected parameter as

Parameter	BulkSMS Gateway	Clickatell Gateway	Generic HTTP Gateway	Description
				http header. For example username/ password/token can be sent in http header.

Chapter 31. DHIS2 Tutorials

31.1. Create Scorecards using the Pivot Table app

Scorecards definition: In public health settings such as Ministries of Health, scorecards offer a useful and standardized method for combining related indicators into one table. A scorecard gives an overall view of the performance of a health program such as a vaccination program, highlighting successes, weaknesses, and areas for improvement Here's what a typical scorecard looks like:

ANC 1 Coverage		ANC 2 Coverage		ANC 3 Coverage		ANC => 4 Coverage		ANC IPT 1 Coverage		ANC IPT 2 Coverage	
Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016
136.6	165.2	119.1	155	120.3	94.8	63.2	51.9	127.1	91.5	111.5	70.8
54.5	88.8	51.3	75.2	36.3	59	17.6	30.2	98.7	72.7	74.9	60.2
35.8	118	35.4	117.6	30.1	84.3	22.1	55.4	125.5	107.6	73.2	83.2
77.4	84.7	83.3	84.1	72.2	71.7	45.8	49.1	130.1	83	104.2	78.3
109.4	97.7	95.3	94.8	65.6	65.8	33.9	29.1	120.7	78.7	118.7	57.8
93.5	90	117	106.3	86.7	87.7	57.5	56	94.3	93.1	54.7	65.4
37.7	84.4	28.9	70	20.5	51.7	16.1	38.4	112.5	114.3	103.7	107.4
26.6	57.4	25.2	55.3	15.9	43.9	5.8	29.1	85	95.7	45.8	61.8
108	123.1	97.9	111.6	83.9	96.1	76.7	82	104.4	108	96.2	97.2
64.2	112.1	57.7	95.5	36.6	57.1	20.3	31.6	168.3	162.2	128	138.1
0.71	113.1	1.1	106.6	0.74	82	0.13	48.3	223.8	143.6	118.2	116.6
139.6	135	114.4	104.2	67.6	60.4	28.2	25	127.8	96.8	96.7	90
122.2	123.7	111.8	112.9	72.3	83.8	66.2	63.3	119.6	155.6	115.2	128.9

This tutorial explains how to create a scorecard in the DHIS2 Pivot Table app. There are several advantages to using the Pivot Table to create a scorecard, such as:

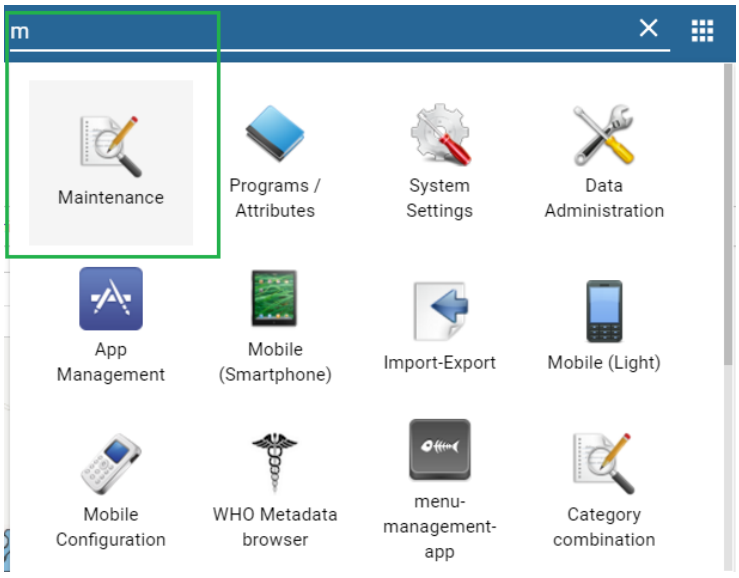
- You can save the scorecard on the dashboard and use it offline.
- You can share the scorecard with other DHIS2 users.

Let's get started!

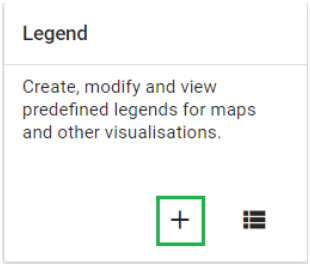
31.1.1. Create a legend for your scorecard

First, we'll create a 3-color "traffic light" legend for the scorecard. With three basic colors, the scorecard is easy to scan and easy to understand.

1. Open the **Maintenance** app. Click the menu in the top right corner and select Maintenance from the list of apps. You can also type the first letters of the word maintenance in the search field to find the app.

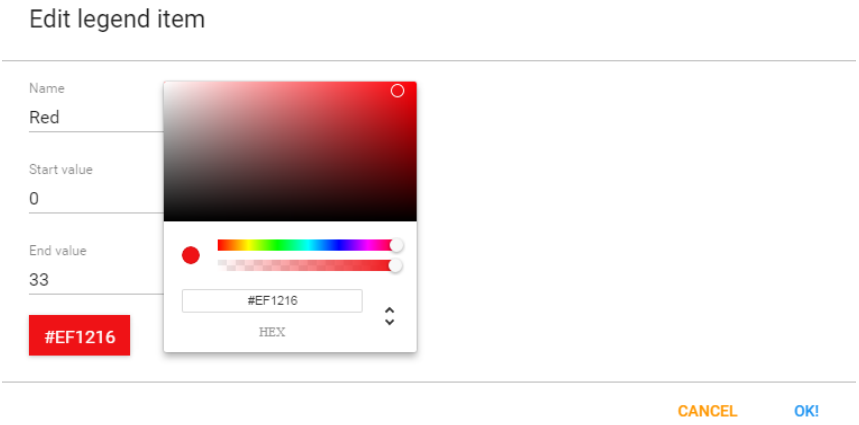


2. In the Maintenance app, scroll to the bottom of the page right down to the **Other** section.
3. Go to **Legend** and click the **+**.



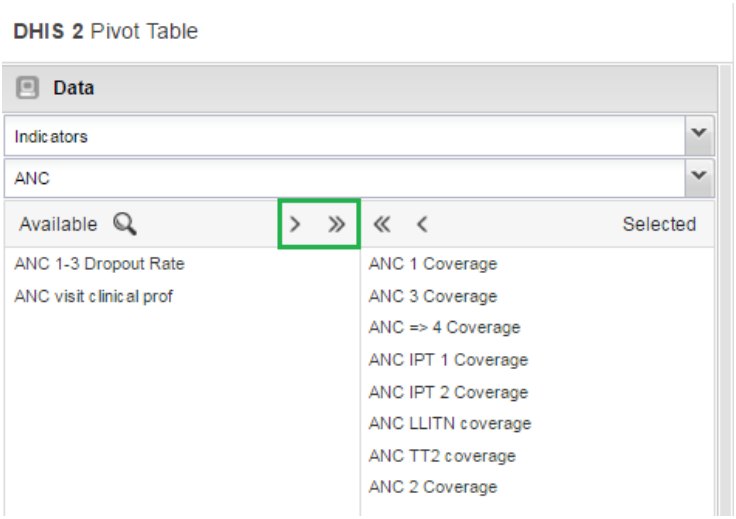
4. In the **Legend Management** page, scroll to the bottom of the page and create a new legend by clicking the blue + button.

5. Enter a name for the legend such as “Traffic light”, a start value and an end value in the fields. The values you enter here depend on the performance ratings you wish to set for the scorecard.
6. Change **Number of legend items** to 3 to display three colors in the scorecard. To change the legend item colors, click the blue + button and then edit the colors.



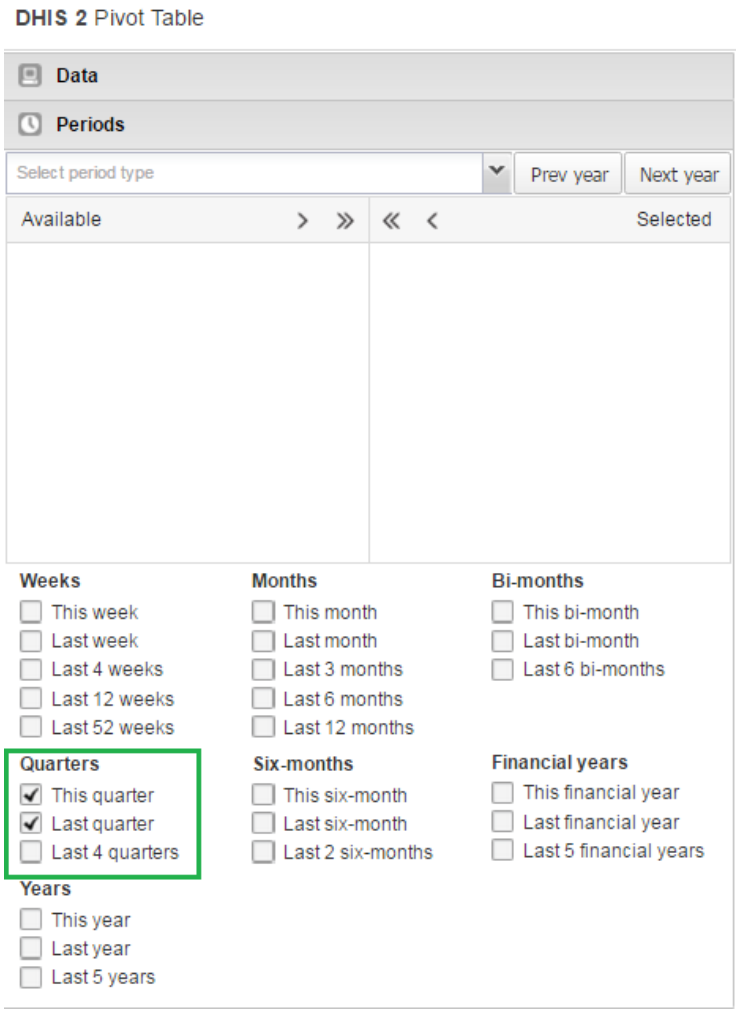
31.1.2. Create a scorecard in the Pivot Table app

1. Open the **Pivot Table** app from the top right menu of the dashboard. You can also enter the first letters of Pivot Table in the search field.
2. Go to **Data** in the pane on the left side and select **Indicators** in the list.
3. Select an **Indicator group** such as “ANC” in the second list.
4. Using the arrows, select the type of indicators you want to see in your scorecard.



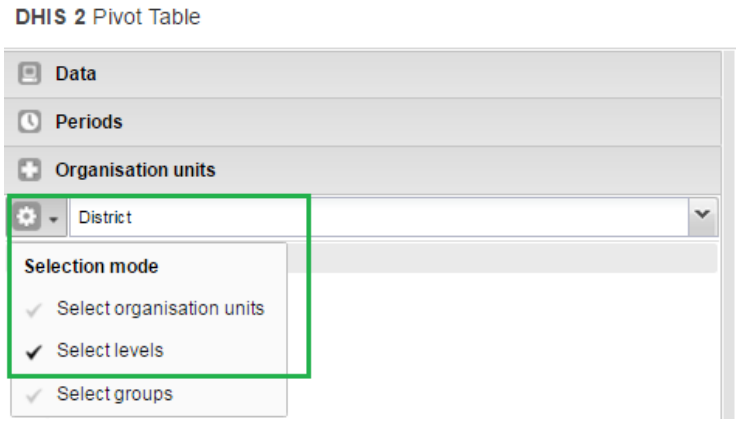
5. Click **Update**. This button is in the menu at the top of the workspace

6. Go to **Periods** and select a period for which you want to display data. In this “traffic light” example, we’ll use the relative period section. In **Quarters**, select **This quarter** and **Last quarter**. Clear any other checkboxes and click **Update**.

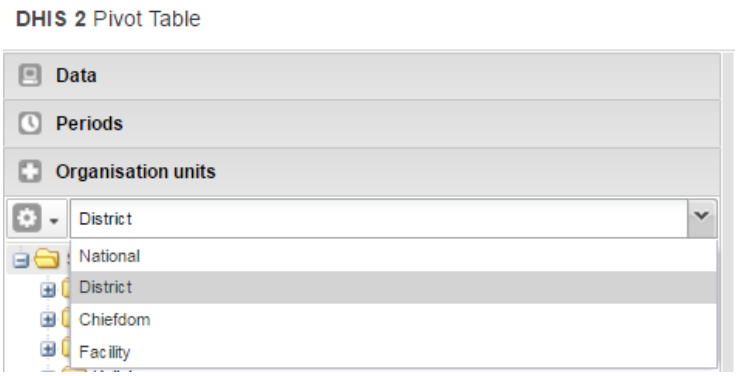


7. Go to **Organisation Units** in the same left side pane, and click the arrow next to the gear button.

8. Select **Select levels**.



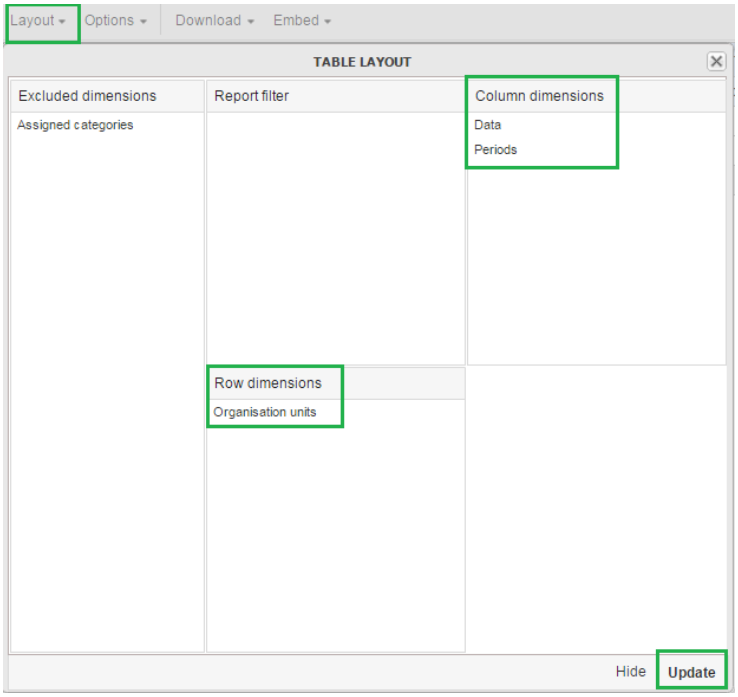
9. Select **District** from the list (next to the gear button). Click **Update**.



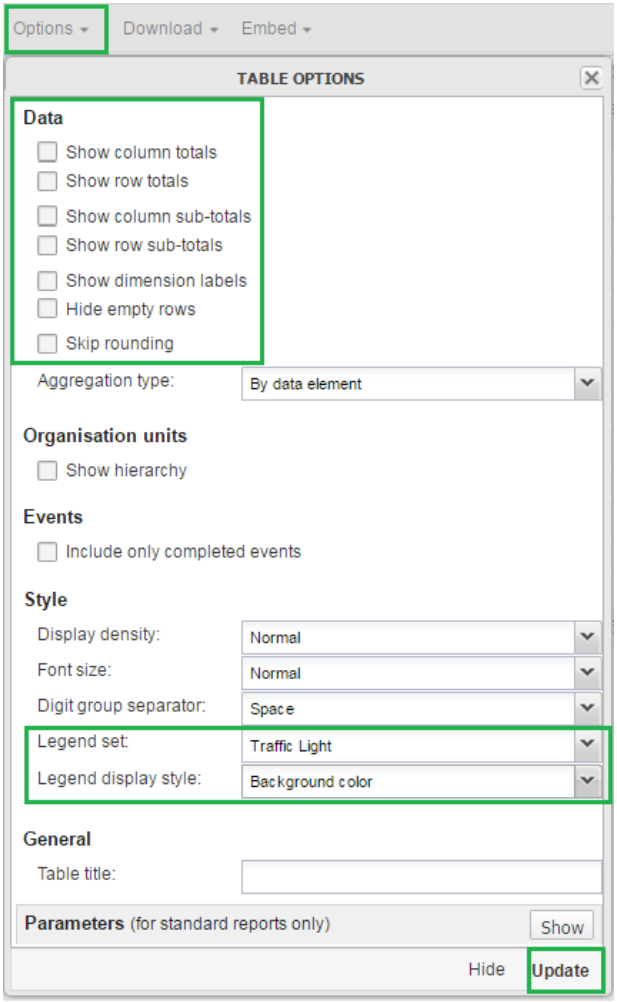
As you can see, the scorecard is starting to take shape in the workspace. Now it's time to fine-tune the look and feel.

31.1.3. Organise the layout and display of your scorecard

1. In the workspace, click **Layout**.



2. In **Table layout**, drag **Organisation units** down to the **Row dimensions** section.
3. Drag **Data** to the **Column dimensions** section.
4. In the **Column dimensions** pane, drag **Periods** below **Data**, and click **Update**.
5. In the workspace, click **Options**.



6. Go to **Data** and clear all the checkboxes.
7. Go to **Style** > **Legend set** and from the list, select the legend you created in the Maintenance app. In this example, we called it Traffic light.
8. Go to **Style** > **Legend display style** and select **Background color**.
9. Click **Update**.

The Scorecard is ready!

ANC 1 Coverage		ANC 2 Coverage		ANC 3 Coverage		ANC => 4 Coverage		ANC IPT 1 Coverage		ANC IPT 2 Coverage	
Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016	Oct to Dec 2016	Jul to Sep 2016
136.6	165.2	119.1	155	120.3	94.8	63.2	51.9	127.1	91.5	111.5	70.8
54.5	88.8	51.3	75.2	36.3	59	17.6	30.2	98.7	72.7	74.9	60.2
35.8	118	35.4	117.6	30.1	84.3	22.1	55.4	125.5	107.6	73.2	83.2
77.4	84.7	83.3	84.1	72.2	71.7	45.8	49.1	130.1	83	104.2	78.3
109.4	97.7	95.3	94.8	65.6	65.8	33.9	29.1	120.7	78.7	118.7	57.8
93.5	90	117	106.3	86.7	87.7	57.5	56	94.3	93.1	54.7	65.4
37.7	84.4	28.9	70	20.5	51.7	16.1	38.4	112.5	114.3	103.7	107.4
26.6	57.4	25.2	55.3	15.9	43.9	5.8	29.1	85	95.7	45.8	61.8
108	123.1	97.9	111.6	83.9	96.1	76.7	82	104.4	108	96.2	97.2
64.2	112.1	57.7	95.5	36.6	57.1	20.3	31.6	168.3	162.2	128	138.1
0.71	113.1	1.1	106.6	0.74	82	0.13	48.3	223.8	143.6	118.2	116.6
139.6	135	114.4	104.2	67.6	60.4	28.2	25	127.8	96.8	96.7	90
122.2	123.7	111.8	112.9	72.3	83.8	66.2	63.3	119.6	155.6	115.2	128.9

31.1.4. Save and share your scorecard

1. In the workspace, go to the **Favorites** menu.
2. Click **Save as**. Enter a name for your Scorecard.
3. To share your Scorecard, select **Favorites**.
4. Enter the name of a user group name, and click **Save**. Your scorecard can be viewed by people that you share a dashboard with.

31.2. Working with TextPattern

TextPattern was introduced in DHIS2 version 2.29, as a way of defining a pattern that includes variables, generated values and raw text, which then could be generated into a text value. The current use-case for TextPattern is automatically generated attributes for tracked entities, where you want to generate for example unique ids based on a specific pattern.

This guide will cover both basic and advanced topics for working with TextPattern, but is mainly focused on how you can define TextPatterns and which limitations and caveats exists.

31.2.1. TextPattern syntax

A TextPattern is a sequence of *segments*, joined together by the "+" character. A segment has a specific notation and in most cases a parameter *format*, which allows for further manipulation of the value.

Table 31.1. TextPattern segments

Segment notation	Description	Parameter (format)	Example (segment → input value → result)
"Plain text"	The plain text segment will remain unchanged in all generated values. This special segment is defined by wrapping text between two double quotes. If your pattern should include separation symbols like a dash, you should use this "-".	None	"Hello world" → None → Hello world
CURRENT_DATE(format)	Current date segment will be generated by the server at the time of generation. This is useful if you want your patterns to have a time-constraint that is disconnected from the context. You should not use this if you need to control which date is injected into the pattern.	Date format	CURRENT_DATE(yyyy) → 01-01-2018 → 2018
ORG_UNIT_CODE(format)	This segment represents the organisation unit code associated with the generation.	Text format	ORG_UNIT_CODE(…) → OSLO → OSL
RANDOM(format)	Random segments will be replaced by a value randomly generated by the server based on the format. Generated segments, like Random, bases its uniqueness on the rest of the pattern. That means a random value can appear twice, as long as the rest of the pattern is different, which means the generated text as a whole will be unique.	Generation format	RANDOM(X####) → None → A1234
SEQUENTIAL(format)	Sequential segments will be replaced by a number, based on a counting value on the	Generation format	"A"+SEQUENTIAL(###) → None → A001

Segment notation	Description	Parameter (format)	Example (segment → input value → result)
	server. Sequential segments will start at the value 1, and for each generated value count up until no more values are available, based on the format. Like Random segments, uniqueness is based on the rest of the pattern, so each possible version of the pattern will have it's own sequential counter starting from 1.		"A"-SEQUENTIAL(###) → None → A002 "B"-SEQUENTIAL(###) → None → B001 "B"-SEQUENTIAL(###) → None → B002

Most segments has a paramter *format*, except for the plain text segment. The following table lists the available formats, how they are used and example notations using them.

Table 31.2. Parameter formats

Format	Description	Example
Date format	This format is based directly on the java SimpleDateFormat, which means any pattern valid for SimpleDateFormat, will be valid as a date format in TextPattern	CURRENT_DATE(dd-MM-yyyy) → 31-12-2018 CURRENT_DATE(MM-yyyy) → 12-2018
Text format	The text format allows for some basic text manipulation. Leaving the format empty will return the value unmodified, but using "^", "." and "$", you can modify the value before it is returned. Each "." represents a character, while "^" represents the start of the text nd "$" represents the end. When using formats, the input value must be at least the same length as the format.	ORG_UNIT_CODE(….) → OSLO ORG_UNIT_CODE(..) → OS ORG_UNIT_CODE(..$) → LO ORG_UNIT_CODE(^…$) → OSLO ^….$ will require the input value to be exactly 4 characters.
Generation format	The generation format accepts a combination of one or more of he following characters: "#", "X", "x" and "*". They respectively represent a number(0-9), an uppercase letter (A-Z), a lowercase letter(a-z) or any of the above(0-9,a-z,A-Z). The SEQUENTIAL segment only accepts "#", since it will only generate numbers. The number of characters in the format decides the size of the value generated. Using just one "#" will in other words only allow for 10 values (0-9), while "###" will allow for 1000 values (000-999). SEQUENTIAL generated values have leading zeroes, so the length of the generated value will always match the format length.	RANDOM(X###) → A123 RANDOM(****) → 1AbC SEQUENTIAL(###) → 001 SEQUENTIAL(######) → 000001

A few important things to note regarding the formats:

- Date format is very versatile, but be aware of which date or time components you are using. Using components smaller than a day (For example hours or seconds) is not reccomended, even though available.

- Text format allows for marking both the start and end of the input value, but "^..." and "..." will in reality give exactly the same results. The only time you would want to use "^" is when you want to enforce the length of the input value. For example, "^....$" will accept OSLO, since its 4 characters between the start and end, but PARIS will be rejected, since it has 5 characters.
- When text format is used for unique values, like organisation unit code, make sure that the format doesnt break the uniqueness. (Example: ORG_UNIT_CODE(..) for "PARIS" and "PANAMA CITY" would both return PA, which means these two organisation units would in reality share generated values)
- Generation format is the primary way to understanding the capacity of your pattern. Make sure the format is long enough to cover more values than you need.

To finish off the syntax section of the tutorial, here is a couple of example TextPattern:

```
ORG_UNIT_CODE(…) + "-" + CURRENT_DATE(yyyyww) + "-" + SEQUENTIAL(#####)
```

This pattern will have 99999 possible values (based on SEQUENTIAL. 00000 is never used since we start at 1). In addition, the remaining pattern will change for each different organisation unit generating values (ORG_UNIT_CODE) and for each week (CURRENT_DATE(yyyyww) represents year and week). That effectively means every new week, each organisation unit will have 99999 new values they can use.

```
"ABC_" + RANDOM(****)
```

The plain text segment of this pattern, will make no difference in the total capacity of the pattern, however the generated segment (RANDOM) will allow for 14776336 possible values. The reason for this is that * can be any one character of the 62 characters available (0-9, a-z, A-Z). You can read more about understanding pattern capacity further down in the tutorial.

31.2.2. Designing TextPattern for generating ids

One use-case for TextPattern is to generate unique ids. In this section we will present guidelines and common issues related to desining TextPatterns used for ids.

An id should never contain sensitive information, or information that in combination can identify an individual. TextPattern does not currently support segments that uses these kind of values, but might do so in the future.

The following list highlights some of the TextPattern specific restrictions you need to consider when designing a TextPattern for ids:

- Make sure the capacity (number of possible values) of the TextPattern covers your use-case. It's better to have more values than needed than less. Tracked entity attributes using TextPattern will require that a single generated segment is present in the TextPattern.
- A TextPattern is unique in the entire system, but only for the object using it. In other words, if you have a single tracked entity attribute with TextPattern, used by multiple Tracked entities (Not to be mistaken for tracked entity instances), all values generated will be shared between all traced entities using the attribute. This also means that if you have two tracked entity attributes with the same TextPattern syntax, each attribute will be able to generate the same value as the other, since uniqueness is based on the attribute.
- SEQUENTIAL segments are in the implementation numbers starting from 1, increasing by 1 for each value, sequentially until no more values are available. However, in reality you will most likely end up with gaps when users generate and reserve values that is never used, or if a user sends in a value where the SEQUENTIAL segment has a higher value than recorded on the server.
- The current implementation relies on the user-client to send in the values contained in the TextPattern when storing a new value. That means generating a correct id is depending on the user, and user-client, to provide the correct data.

31.2.3. Understanding TextPattern capacity

The most important thing to keep in mind when designing a TextPattern, is the capacity - that means the total number of potential values a TextPattern can yield.

With the current implementation of TextPattern, there are three main factors that decides the capacity:

1. Capacity of the generated segment in the TextPattern
2. The presence of a CURRENT_DATE segment
3. The presence of a ORG_UNIT_CODE segment

The presence of a date segment (like CURRENT_DATE) will effectively reset the capacity each time the segment changes. Depending on the date format, it can change anywhere to yearly to daily. **Important: If your date format don't contain a year, the pattern will resolve to the same value every year.** That means values will already be used. For example, if your TextPattern looks like this:

```
CURRENT_DATE(ww) + "-" + RANDOM(#)
```

This pattern will give you up to 10 unique values for each week, but after 1 year, CURRENT_DATE(ww) will be the same as last year, and you will have no new values available. If you use "yyyy-ww" instead, it will be unique for every year, every week.

Organisation unit codes will make your values unique for each different organisation unit, which means if you have a text pattern like this:

```
ORG_UNIT_CODE() + "-" + RANDOM(#)
```

This pattern will give you 10 unique values for each different organisation unit.

31.2.3.1. Calculating capacity for generated segments

Understanding how to calculate the capacity of a TextPattern is critical when designing TextPatterns. The generated segments will be the main component of any TextPattern in terms of capacity, then increased based on the presence of ORG_UNIT_CODE or CURRENT_DATE.

Let's start with SEQUENTIAL segments. Each "#" in the format represents a number between 0 and 9. To calculate the total capacity, you multiply the number of possible values for each "#". Since it's always 10 (0-9) the math is quite straight forward:

```
SEQUENTIAL(#) = 10 = 10
SEQUENTIAL(###) = 10 * 10 * 10 = 1000
SEQUENTIAL(#####) = 10 * 10 * 10 * 10 * 10 = 100000
```

Since SEQUENTIAL counters on the server start at 1 and not 0, the actual capacity is 999, but that's insignificant in most cases.

As soon as we involve RANDOM, the calculation becomes a bit more complicated. Similar to SEQUENTIAL, a "#" has 10 possible values, in addition we have "X" and "x" with 26 possible values each, as well as "*" which can be any of the previous, which means 62 (10+26+26) possible values.

To calculate the capacity, you need to take each character in your format and replace with the number of possible values, then multiply them all together like we did for SEQUENTIAL:

```
RANDOM(#) = 10 = 10
RANDOM(X) = 26 = 26
RANDOM(*) = 62 = 62

RANDOM(X##) = 26 * 10 * 10 = 2600
RANDOM(XXxx) = 26 * 26 * 26 * 26 = 456976
```

```
RANDOM(***) = 62 * 62 * 62 = 238328
```

As you can see, the math gets a bit more complicated when, but by following this recipe you can see the number of potential values.

31.2.4. Random segments and why you should avoid it

There is a hidden cost of using the random segment in TextPattern in the long run, but that does not mean you should never use it. This section will highlight the problems of using the random segment and suggest when it might be more appropriate to use it.

This section is motivated by an issue with the previous generation strategy, where you only had random generation. After while, instances using this feature would actually be unable to generate and reserve new values, since it was taking to long to find available values. This section looks at some of the problems with random generation that created this situation.

31.2.4.1. Generating random values

Before using the RANDOM segment in your TextPattern, you should consider the following problems connected to the use of RANDOM:

- Generating values from a TextPattern with a RANDOM segment will be more complex than other TextPatterns

31.2.5. Data entry for TextPattern based metadata

As previously mentioned, the only metadata currently supporting TextPattern is the tracked entity attributes. In this section, we will describe the different ways data entry for TextPattern works, especially for tracked entity attributes.

31.2.5.1. Validation of values using TextPattern

By default, all values sent to the server for metadata using TextPattern, will be validated. Validation can be skipped if needed, but you should always validate input under normal circumstances. The validation will be based on the TextPattern you have defined and will be as strict as possible:

- Date segments must match the same format as specified in the segment parameter
- Plain text segments must match exactly
- Text segments values must be at least as long as the format string. If both "^" and "$" is present, the value must match the exact length.
- Generated segment values must match the format exactly, character by character.

When using the server to first generate and reserve values, the server will modify the values used in the TextPattern before injecting them, meaning you will always get a valid value when generating it on the server.

A final exception to TextPattern validation is made for a special case: If you change a TextPattern after reserving values for the original pattern, values sent to the server that are invalid according to the new TextPattern, will still be accepted if it was already reserved.

31.2.5.2. Different data entry flows for TextPattern

There is currently 2 ways a client can store values for TextPattern metadata:

1. Generating and reserving values (Apps should do this for you)
2. Storing a custom value

The preferred way, is to generate and reserve the needed values (The number of values generated and reserved is handled by the app). That means each time you are seeing and storing a value, it has been generated and reserved by the server, and will be valid.

The other way might be useful in specific cases. The user will supply the value themselves and as long as the value supplied is valid for the TextPattern, they can put anything they want. The caveat of doing it this way, is that you might use values that was reserved by someone else and if you have a SEQUENTIAL segment, the counter will not be updated.

Chapter 32. About demo server, live package and database design

32.1. Using the DHIS2 demo server

The DHIS2 team maintains a demonstration server at https://play.dhis2.org/demo. This is by far the easiest way to try out DHIS2. Simply open the link in your web browser and login with username = admin and password = district.

Note

All changes on this server are deleted each night, so do not save any important work on this server. It is strictly for demonstration purposes on only!

32.2. Using the DHIS2 live package

32.2.1. Starting the DHIS2 Live package

The DHIS2 Live package is the easiest way to get started with DHIS2 on your local computer. DHIS2 Live is appropriate for a stand-alone installation and demos. Simply download the application from here. Once the file is downloaded, you can simply double-click the downloaded file, and get started using DHIS2.

32.2.1.1. Prerequisites for DHIS2 Live

You must be sure that you have a current version of the Java Runtime installed on your machine. Depending on your operating system, there are different ways of installing Java. The reader is referred to this website for detailed information on getting Java installed.

32.2.1.2. Starting up with a blank database

The live package comes with a demo database just like what you see on the online demo (which is based on the national Sierra Leone HMIS), and if you want to start with a blank system/ database and build up your own system then you need to do the following:

1) Stop DHIS2 live if it is already running. Right click on the tray icon and select Exit. The tray icon is the green symbol on the bottom right of your screen (on Windows) which should say' DHIS2 Server running' when you hover your mouse pointer over the icon.

2) Open the folder where the DHIS2 live package is installed and locate the folder called "conf".

3) In conf/ open the file called 'hibernate.properties' in a text editor (notepad or similar) and do the following modification: locate the string 'jdbc:h2:./database/dhis2' and replace the 'dhis2' part with any name that you want to give to your database (e.g. dhis2_test).

4) Save and close the hibernate.properties file.

5) Start DHIS2 Live by double-clicking on the file dhis2-live.exe in the DHIS2 Live installation folder or by using a desktop shortcut or menu link that you might have set up.

6) Wait for the browser window to open and the login screen to show, and then log in with username: admin and password: district

7) Now you will see a completely empty DHIS2 system and you should start by adding your users, organisational hierarchy, data elements, and datasets etc. Please refer to the other sections of the user manual for instructions on how to do this.

32.2.2. Downloading and installing the server version

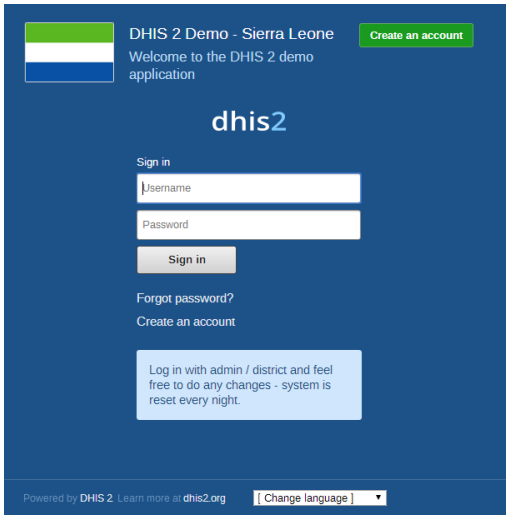
The latest stable server version can be downloaded from this website. For detailed information on how to install it please refer to the installation chapter in the implementation manual.

32.3. Logging on to DHIS2

Regardless of whether you have installed the server version of the desktop Live version, you will use a web-browser to log on to the application. DHIS2 should be compatible with most modern web-browsers, although you will need to ensure that Java Script is enabled.

To log on to the application just enter http://localhost:8080/dhis if you are using the DHIS2 live package, or replace `localhost` with the name or IP address of the server where the server version is installed.

Once you have started DHIS2, either on-line or off-line, the displayed screen will prompt you to enter your registered user-name and password. After entering the required information click on log-in button to log into the application. The default user name and password are 'admin' and 'district'. They should be changed immediately upon logging on the first time.



You can select the language which you wish to display DHIS2 in from the "Change language" dialog box at the bottom of the screen. Not all languages may be available.

Should you have forgotten your password, you can click on the "Forgot password?" link. You must have informed DHIS2 of your email address and the server must be properly configured to send emails.

If you want to create your own account (and the server administrator allows this), simply click "Create an account" and follow the directions provided.

Once you have logged into DHIS2, refer to the specific sections in this manual for the different functionality which is available.

32.4. Logging out of DHIS2

Just click on the Profile and the click "Log out" the top-right corner of the DHIS2 menu.

32.5. Quick intro to designing a DHIS2 database

DHIS2 provides a powerful set of tools for data collection, validation, reporting and analysis, but the contents of the database, e.g. what to collect, who should collect it and on what format will depend on the context of use. However, in order to do anything with DHIS2, you must first create meta-data. Meta-data, or data about the data, describes what should be collected (data elements and categories), where it should be collected (organisation units) and how frequently it should be collected (periods). This meta-data needs to be created in the DHIS2 database before it can be used. This can be done through the user interface and requires no programming or in-depth technical skills of the software, but does require a good understanding of the processes which you are trying to collect data form.

This section will provide a very quick and brief introduction to DHIS2 database design and mainly explain the various steps needed to prepare a new DHIS2 system for use. How to do each step is explained in other chapters, and best practices on design choices will be explained in the implementers manual. Here are the steps to follow:

1. Set up an organisational hierarchy
2. Define data elements
3. Define data sets and data entry forms
4. Define validation rules
5. Define indicators
6. Define report tables and design reports
7. Set up the GIS module
8. Design charts and customise the dashboard

32.5.1. The organisational hierarchy

The organisational hierarchy defines the organisation using the DHIS2, the health facilities, administrative areas and other geographical areas used in data collection and data analysis. This dimension to the data is defined as a hierarchy with one root unit (e.g. Ministry of Health) and any number of levels and nodes below. Each node in this hierarchy is called an organisational unit in DHIS2.

The design of this hierarchy will determine the geographical units of analysis available to the users as data is collected and aggregated in this structure. There can only be one organisational hierarchy at the same time so its structure needs careful consideration. Additional hierarchies (e.g. parallel administrative groupings such as "Facility ownership") can be modelled using organisational groups and group sets, however the organisational hierarchy is the main vehicle for data aggregation on the geographical dimension. Typically national organisational hierarchies in public health have 4-6 levels, but any number of levels is supported. The hierarchy is built up of parent-child relations, e.g. a Country or MoH unit (the root) might have e.g. 8 parent units (provinces), and each province again (at level 2) might have 10-15 districts as their children. Normally the health facilities will be located at the lowest level, but they can also be located at higher levels, e.g. national or provincial hospitals, so skewed organisational trees are supported (e.g. a leaf node can be positioned at level 2 while most other leaf nodes are at level 5).

Typically there is a geographical hierarchy defined by the health system. e.g. where the administrative offices are located (e.g. MoH, province, district), but often there are other administrative boundaries in the country that might or might not be added, depending on how its boundaries will improve data analysis. When designing the hierarchy the number of children for any organisational unit may indicate the usefulness of the structure, e.g. having one or

more 1-1 relationships between two levels is not very useful as the values will be the same for the child and the parent level. On the other extreme a very high number of children in the middle of the hierarchy (e.g. 50 districts in a province) might call for an extra level to be added in between to increase the usefulness of data analysis. The lowest level, the health facilities will often have a large number of children (10-60), but for other levels higher up in the hierarchy approx. 5-20 children is recommended. Too few or too many children might indicate that a level should be removed or added.

Note that it is quite easy to make changes to the upper levels of the hierarchy at a later stage, the only problem is changing organisational units that collect data (the leaf nodes), e.g. splitting or merging health facilities. Aggregation up the hierarchy is done based on the current hierarchy at any time and will always reflect the most recent changes to the organisational structure. Refer to the chapter on Organisation Units to learn how to create organisational units and to build up the hierarchy.

32.5.2. Data Elements

The Data Element is perhaps the most important building block of a DHIS2 database. It represents the "WHAT" dimension, it explains what is being collected or analysed. In some contexts this is referred to an indicator, but in DHIS2 we call this unit of collection and analysis a *data element*. The data element often represents a count of something, and its name describes what is being counted, e.g. "BCG doses given" or "Malaria cases". When data is collected, validated, analysed, reported or presented it is the data elements or expressions built upon data elements that describes the WHAT of the data. As such the data elements become important for all aspects of the system and they decide not only how data is collected, but more importantly how the data values are represented in the database, which again decides how data can be analysed and presented.

It is possible to add more details to this "WHAT" dimension through the disaggregation dimension called data element categories. Some common categories are Age and Gender, but any category can be added by the user and linked to specific data elements. The combination of a data element's name and its assigned category defines the smallest unit of collection and analysis available in the system, and hence describes the raw data in the database. Aggregations can be done when zooming out of this dimension, but no further drill-down is possible, so designing data elements and categories define the detail of the analysis available to the system (on the WHAT dimension). Changes to data elements and categories at a later stage in the process might be complicated as these will change the meaning of the data values already captured in the database (if any). So this step is one of the more decisive and careful steps in the database design process.

One best practice when designing data elements is to think of data elements as a unit of data analysis and not just as a field in the data collection form. Each data element lives on its own in the database, completely detached from the collection form, and reports and other outputs are based on data elements and expressions/formulas composed of data elements and not the data collection forms. So the data analysis needs should drive the process, and not the look an feel of the data collection forms. A simple rule of thumb is that the name of the data element must be able to stand on its own and describe the data value also outside the context of its collection form. E.g. a data element name like "Total referrals" makes sense when looking at it in either the "RCH" form or the "OPD" form, but on its own it does not uniquely describe the phenomena (who are being referred?), and should in stead be called "Total referrals from Maternity" or "Total referrals from OPD". Two different data elements with different meanings, although the field on the paper form might only say "Total referrals" since the user of the form will always know where these referrals come from. In a database or a repository of data elements this context is no longer valid and therefore the names of the data elements become so important in describing the data.

Common properties of data elements can be modelled through what is called data element groups. The groups are completely flexible in the sense that they are defined by the user,

both their names and their memberships. Groups are useful both for browsing and presenting related data, but can also be used to aggregate data elements together. Groups are loosely coupled to data elements and not tied directly to the data values which means they can be modified and added at any point in time without interfering with the raw data.

32.5.3. Datasets and data entry forms

All data entry in DHIS2 is organised through the use of Datasets. A Dataset is a collection of data elements grouped together for data collection, and in the case of distributed installs they also define chunks of data for export and import between instances of DHIS2 (e.g. from a district office local installation to a national server). Datasets are not linked directly to the data values, only through their data elements and frequencies, and as such a dataset can be modified, deleted or added at any point in time without affecting the raw data already captured in the system, but such changes will of course affect how new data will be collected.

A dataset has a period type which controls the data collection frequency, which can be daily, weekly, monthly, quarterly, six-monthly, or yearly. Both which data elements to include in the dataset and the period type is defined by the user, together with a name, short name, and code.

In order to use a dataset to collect data for a specific orgunit you must assign the orgunit to the dataset, and this mechanism controls which orgunits that can use which datasets, and at the same time defines the target values for data completeness (e.g. how many health facilities in a district expected to submit RCH data every month).

A data element can belong to multiple datasets, but this requires careful thinking as it may lead to overlapping and inconstant data being collected if e.g. the datasets are given different frequencies and are used by the same orgunits.

32.5.3.1. Data entry forms

Once you have assigned a dataset to an orgunit that dataset will be made available in Data Entry (under Services) for the orgunits you have assigned it to and for the valid periods according to the dataset's period type. A default data entry form will then be shown, which is simply a list of the data elements belonging to the dataset together with a column for inputting the values. If your dataset contains data elements with categories such as age groups or gender, then additional columns will be automatically generated in the default form based on the categories. In addition to the default list-based data entry form there are two more alternatives, the section-based form and the custom form.

32.5.3.1.1. Section forms

Section forms allow for a bit more flexibility when it comes to using tabular forms and are quick and simple to design. Often your data entry form will need multiple tables with subheadings, and sometimes you need to disable (grey out) a few fields in the table (e.g. some categories do not apply to all data elements), both of these functions are supported in section forms. After defining a dataset you can define it's sections with subsets of dataelements, a heading and possible grey fields i the section's table. The order of sections in a dataset can also be defined. In Data Entry you can now start using the Section form (should appear automatically when sections are available for the selected dataset). You can switch between default and section forms in the top right corner of the data entry screen. Most tabular data entry forms should be possible to do with sections forms, and the more you can utilise the section forms (or default forms) the easier it is for you. If these two types of forms are not meeting your requirements then the third option is the completely flexible, although more time-consuming, custom data entry forms.

32.5.3.1.2. Custom Forms

When the form you want to design is too complicated for the default or section forms then your last option is to use a custom form. This takes more time, but gives you full flexibility in

term of the design. In DHIS2 there is a built in HTML editor (FcK Editor) for the form designer and you can either design the form in the UI or paste in your HTML directly using the Source window in the editor. In the custom form you can insert static text or data fields (linked to data elements + category) in any position on the form and you have complete freedom to design the layout of the form. Once a custom form has been added to a dataset it will be available in data entry and used automatically. You can switch back to default and section (if exists) forms in the top right corner of the data entry screen.

32.5.4. Validation rules

Once you have set up the data entry part of the system and started to collect data then there is time to define data quality checks that help to improve the quality of the data being collected. You can add as many validation rules as you like and these are composed of left and right side expressions that again are composed of data elements, with an operator between the two sides. Typical rules are comparing subtotals to totals of something. E.g. if you have two data elements "HIV tests taken" and "HIV test result positive" then you know that in the same form (for the same period and organisational unit) the total number of tests must always be equal or higher than the number of positive tests. These rules should be absolute rules meaning that they are mathematically correct and not just assumptions or "most of the time correct". The rules can be run in data entry, after filling each form, or as a more batch like process on multiple forms at the same time, e.g. for all facilities for the previous reporting month. The results of the tests will list all violations and the detailed values for each side of the expression where the violation occurred to make it easy to go back to data entry and correct the values.

32.5.5. Indicators

Indicators represent perhaps the most powerful data analysis feature of the DHIS2. While data elements represent the raw data (counts) being collected the indicators represent formulas providing coverage rates, incidence rates, ratios and other formula-based units of analysis. An indicator is made up of a factor (e.g. 1, 100, 100, 100 000), a numerator and a denominator, the two latter are both expressions based on one or more data elements. E.g. the indicator "BCG coverage <1 year" is defined a formula with a factor 100, a numerator ("BCG doses given to children under 1 year") and a denominator ("Target population under 1 year"). The indicator "DPT1 to DPT3 drop out rate" is a formula of 100 % x ("DPT1 doses given"- "DPT3 doses given") / ("DPT1 doses given").

Most report modules in DHIS2 support both data elements and indicators and you can also combine these in custom reports, but the important difference and strength of indicators versus raw data (data element's data values) is the ability to compare data across different geographical areas (e.g. highly populated vs rural areas) as the target population can be used in the denominator.

Indicators can be added, modified and deleted at any point in time without interfering with the data values in the database.

32.5.6. Report tables and reports

Standard reports in DHIS2 are a very flexible way of presenting the data that has been collected. Data can be aggregated by any organisational unit or orgunit level, by data element, by indicators, as well as over time (e.g. monthly, quarterly, yearly). The report tables are custom data sources for the standard reports and can be flexibly defined in the user interface and later accessed in external report designers such as iReport or through custom HTML reports. These report designs can then be set up as easily accessible one-click reports with parameters so that the users can run the same reports e.g. every month when new data is entered, and also be relevant to users at all levels as the organisational unit can be selected at the time of running the report.

32.5.7. GIS

In the integrated GIS module you can easily display your data on maps, both on polygons (areas) and as points (health facilities), and either as data elements or indicators. By providing the coordinates of your organisational units to the system you can quickly get up to speed with this module. See the GIS section for details on how to get started.

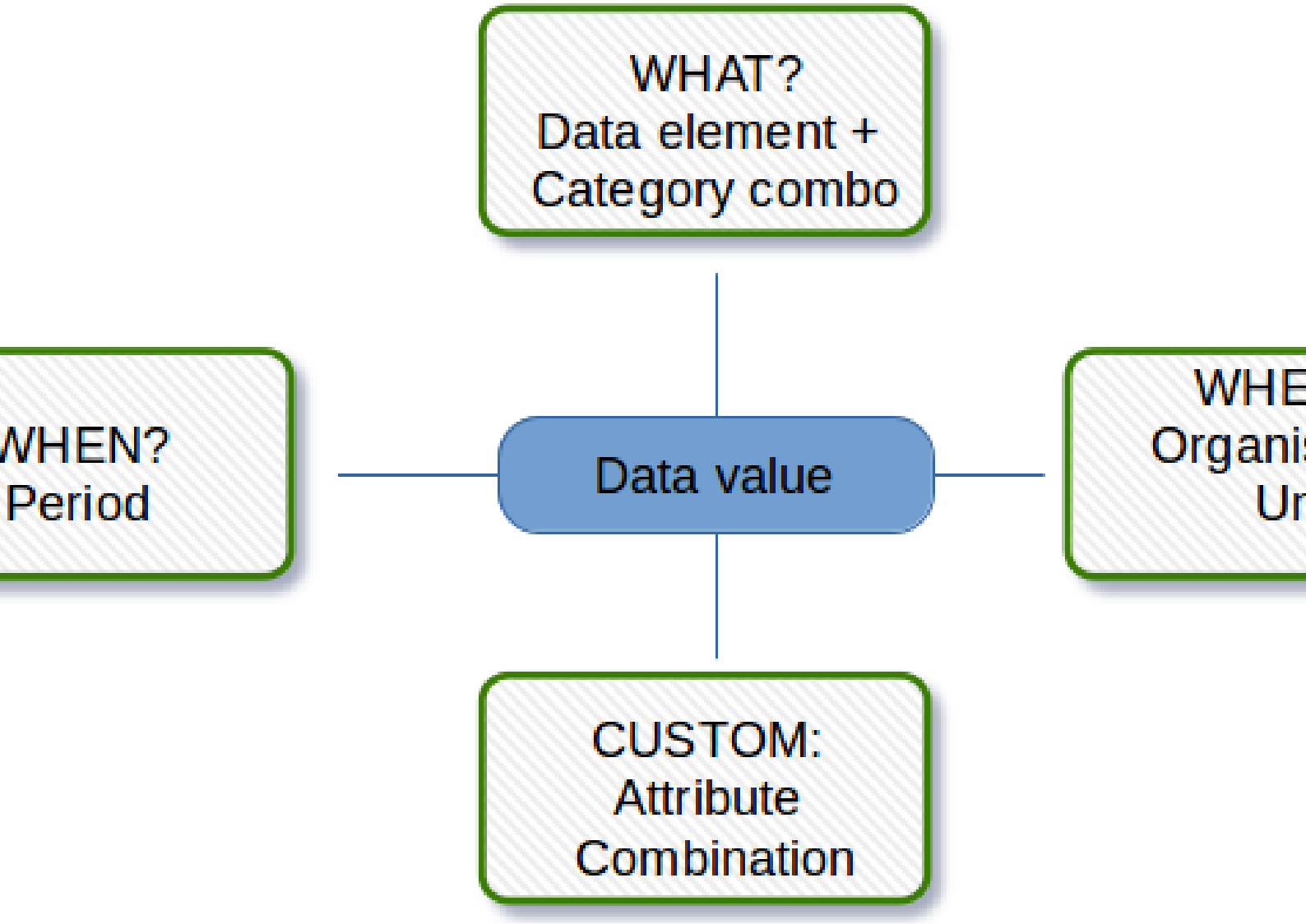
32.5.8. Charts and dashboard

On of the easiest way to display your indicator data is through charts. An easy to use chart dialogue will guide you through the creation of various types of charts with data on indicators, organisational units and periods of your choice. These charts can easily be added to one of the four chart sections on your dashboard and there be made easily available right after log in. Make sure to set the dashboard module as the start module in user settings.

Chapter 33. About data dimensions in DHIS2

33.1. Data dimensions: Core building blocks in DHIS2

A data value in DHIS2 is described by at least three dimensions: 1) data element, 2) organisation unit, and 3) period. These dimensions form the core building blocks of the data model.



As an example, if you want to know how many children that were immunised for measles in Gerehun CHC in December 2014, the three dimensions which describe that value are the Data Element "Measles doses given", the Organisation Unit "Gerehun CHC", and the Period "Dececmber 2014". All data values have at least these three dimensions describing What, Where and When.

In addition to the organisation unit, period and data element dimensions, data values may also be associated with a custom dimension consisting of attributes. A common use of this dimension is to describe data values which are reported by multiple partners in the same location for the same data element and time period. In principle, it can be used as a "free-form" dimension, to describe multiple observations of the same phenomena at the same place and time.

Table 33.1.

Organisation Unit	Data Element	Period	Value
Gerehun CHC	Measles doses given	Dec-09	22
Tugbebu CHP	Measles doses given	Dec-09	18

33.2. Data elements: The What dimension

33.2.1. Data element categories

The data element mentioned above ,"Measles doses given", can be further disaggregated into by combinations of data element categories. Each system administrator of DHIS2 is free to define any data element category dimensions for data elements. There are however, certain best practices which should generally be followed.

Given the example of Measles vaccination, if you want to know whether these vaccines were given at the facility (fixed) or out in the community as part of the outreach services then you could add a dimension called e.g. "Place of service" with the two possible options "Fixed" and "Outreach". Then all data collected on measles immunisation would have to be disaggregated along these to options. In addition to this you might be interested in knowing how many of these children who were under 1 year or above 1 year of age. If so you can add an Age dimension to the data element with the two possible options "<1 y" and ">1 y". This implies further detail on the data collection process. You can also apply both categories "Place of service" and "Age" and combine these into a data element category combination e.g. called "EPI disaggregation". You would then be able to look at four different more detailed values in stead of only one as in the example above for the data element "Measles doses given": 1) "Fixed and <1 y, 2) Fixed and >1 y, 3) Outreach and <1 y, and 4) Outreach and >1 y. This adds complexity to how data is collected by the health facilities, but at the same time opens up for new possibilities of detailed data analysis of Measles immunisation.

Table 33.2. Example of detailed storage of data values when using data element categories "Place of Service" and "Age" (simplified for readability compared to the actual database table)

Organisation Unit	Data Element	Place of service	Age	Period	Value
Gerehun CHC	Measles doses given	Fixed	<1 y	Dec-09	12
Gerehun CHC	Measles doses given	Outreach	<1 y	Dec-09	4
Gerehun CHC	Measles doses given	Fixed	>1 y	Dec-09	4
Gerehun CHC	Measles doses given	Outreach	>1 y	Dec-09	2
Tugbebu CHP	Measles doses given	Fixed	<1 y	Dec-09	10

Organisation Unit	Data Element	Place of service	Age	Period	Value
Tugbebu CHP	Measles doses given	Outreach	<1 y	Dec-09	4
Tugbebu CHP	Measles doses given	Fixed	>1 y	Dec-09	3
Tugbebu CHP	Measles doses given	Outreach	>1 y	Dec-09	1

33.2.2. Data element group sets

While the data element categories and their options described above provide the level of detail (disaggregation) at the point of data collection and how data values get stored in the database, the data element group sets and groups can be used to add more information to data elements after data collection. As an example, if you are analyzing many data elements at the same time in a report, you would want to group these based on some criteria. Instead of looking at all the data captured in a form for immunisation and nutrition, you might want to separate or group data elements along a programme dimension (known as a data element group set in DHIS2) where "Immunisation" (or EPI) and "Nutrition" would be the two groups.

Expanding the report to include data from other programs or larger themes of health data would mean more groups to such a group set dimension, like "Malaria", "Reproductive Health", "Stocks". For this example, you would create a data element group set called "Programme" (or whatever name you find appropriate), and to represent the different programmes in this dimension you would define data elements groups called "EPI", "Nutrition", "Malaria", "Reproductive health" and so on, and add all these groups to the "Programme" group set. To link or tag the data element "Measles doses given" to such a dimension you must (in our example) add it to the "EPI" group. Which groups you add "Measles doses given" to does not affect how health facilities collect the data, but adds more possibilities to your data analysis. So for the group set dimensions there are three levels; the group set (e.g. "Programme"), the group (e.g. "EPI"), and the data element (e.g. "Measles doses given").

Indicators can be grouped into indicator groups and further into indicator group sets (dimensions) in exactly the same way as data elements.

Table 33.3.

Organisation Unit	Data Element	Programme	Period	Value
Gerehun CHC	Measles doses given	EPI	Dec-09	22
Gerehun CHC	Vitamin A given	Nutrition	Dec-09	16
Tugbebu CHP	Measles doses given	EPI	Dec-09	18
Tugbebu CHP	Vitamin A given	Nutrition	Dec-09	12
Gerehun CHC	Malaria new cases	Malaria	Dec-09	32
Tugbebu CHP	Malaria new cases	Malaria	Dec-09	23

33.3. The organisation unit dimension

Organisation units in DHIS2 should typically represent a location, such as a Community Health Centre or referral hospitals, or an administrative unit like "MoHS Sierra Leone", "Bo District" or "Baoma Chiefdom". In non-health sector applications, they could be "schools" or "water points". Orgunits are represented in a default hierarchy, usually the default administrative hierarchy of a country or region, and are therefore assigned an organisational level. As an example, Sierra Leone has four organisation unit levels; National, District, Chiefdom, and PHU, and all orgunits are linked to one of these levels. An orgunit hierarchy in DHIS2 can have any number of levels. Normally data is collected at the lowest level, at the health facility, but can be collected at any level within the hiearchy, such as both the districts as well as the facility level.

When designing reports at higher levels with data aggregated at the district or province level, DHIS2 will use the hierarchy structure to aggregate all the health facilities' data for any given unit at any level. The organisation unit level capturing the data always represents the lowest level of detail that is possible to use in data analysis, and the organisational levels define the available levels of aggregation along a geographical dimension.

33.3.1. Organisation unit group sets and groups

While facility level is typically the lowest geographical level for disaggregation in DHIS2, there are ways to flexibly group organisation units into any number of dimensions by using the organisation unit groups and group set functionality. As an example, if all facilities are given an official type like "Community health center" or "District Hospital, it is possible to create an organisation unit group set called "Type" and add groups with the names of the types mentioned above. In order for the group sets to function properly in analysis, each organisation unit should be a member of a single group (compulsory and exclusive) within a group set. Stated somewhat differently, a facility should not be both a "Community health center" as well as a "District hospital".

33.3.1.1. Inherit the values of an organisation unit group set

You can improve the completeness of your aggregated data by inheriting the settings of a "parent" organisation unit in your organisation unit hierarchy. This is particularly helpful if you are aggregating the data of more than 100 organisation units. See the Maintenance app documentation for more details.

33.3.1.2. Alternative organisation unit hierarchies - advanced use of group sets and groups

A more advanced use of organisation unit group sets is to create alternative hierarchies e.g. use administrative borders from other ministries. In Sierra Leone that could mean an alternative hierarchy of 1:MoHS, 2:Districts, and 3: Local councils, instead of the four-level hierarchy with chiefdoms and PHUs. For instance, if all PHUs are linked to a specific local council, it would be possible to look at data aggregated by local council instead of chiefdom. Then you would first need to create a group set called "Local council" and then create one organisation unit group for every local council, and finally link all PHUs to their corresponding local council group.

Table 33.4.

District	OrgUnit Type	Data Element	Period	Value
Bo	CHC	Measles doses given	Dec-09	121
Bo	CHP	Measles doses given	Dec-09	98
Bo	MCHP	Measles doses given	Dec-09	87

District	OrgUnit Type	Data Element	Period	Value
Bombali	CHC	Measles doses given	Dec-09	110
Bombali	CHP	Measles doses given	Dec-09	67
Bombali	MCHP	Measles doses given	Dec-09	59

33.3.2. Best practice on the use of group sets and groups

As mentioned above, all organisation units should be a member of a single group within a group set. If an organisation unit is not present in any group or is present in multiple group members in a group set, this can lead to unexpected results in the analysis modules. DHIS2 has integrity checks to identify organisation units which are not present in any organisation unit group set member, or which is present in multiple groups.

33.4. The period dimension in DHIS2

The period dimension becomes an important factor when analysing data over time e.g. when looking at cumulative data, when creating quarterly or annual aggregated reports, or when doing analysis that combines data with different characteristics like monthly routine data, annual census/population data or six-monthly staff data.

33.4.1. Period types

In DHIS2, periods are organised according to a set of fixed period types described below. The following list is for the default ISO 8601 calendar type.

1. Daily
2. Weekly: The system supports various weekly period types, with Monday, Wednesday, Thursday, Saturday and Sunday as the first day of the week. You collect data through data sets configured to use the desired weekly period type. The analytics engine will attribute weekly data to the month which contains four days or more of the week.
3. Monthly: Refers to standard calendar months.
4. BiMonthly: Two-month periods beginning in January.
5. Quarterly: Standard ISO quarters, beginning in January.
6. SixMonthly: Six-month periods beginning in January
7. Yearly: This refers to a calendar year.
8. Financial April: Financial year period beginning on April 1st and ending on March 31st of the calendar next year
9. Financial July: Financial year period beginning on July 1st and ending on June 31st of the calendar next year
10. Financial Oct: Financial year period beginning on October 1st and ending on September 31st of the calendar next year
11. Six-monthly April: Six-month periods beginning on April 1st with a duration of six calendar months.

As a general rule, all organisation units should collect the same data using the same frequency or periodicity. A data entry form therefore is associated with a single period type to make sure data is always collected according to the correct and same periodicity across the country.

It is possible however to collect the same data elements using different period types by assigning the same data elements to multiple data sets with different period types, however

then it becomes crucial to make sure no organisation unit is collecting data using both data sets/period types as that would create overlap and duplication of data values. If configured correctly the aggregation service in DHIS2 will aggregate the data together, e.g. the monthly data from one part of the country with quarterly data from another part of the country into a national quarterly report. For simplicity and to avoid data duplication it is advised to use the same period type for all organisation units for the same data elements when possible.

33.4.2. Relative periods

In addition to the fixed period types described in the previous section, DHIS2 also support relative periods for use in the analysis modules.

When creating analytical resources within DHIS2 it is possible to make use of the relative periods functionality. The simplest scenario is when you want to design a monthly report that can be reused every month without having to make changes to the report template to accommodate for the changes in period. The relative period called "Last month" allows for this, and the user can at the time of report generation through a report parameter select the month to use in the report.

A slightly more advanced use case is when you want to make a monthly summary report for immunisation and want to look at the data from the current (reporting) month together with a cumulative value for the year so far. The relative period called "This year" provides such a cumulative value relative to the reporting month selecting when running the report. Other relative periods are the last 3,6, or 12 months periods which are cumulative values calculated back from the selected reporting month. If you want to create a report with data aggregated by quarters (the ones that have passed so far in the year) you can select "Last four quarters". Other relative periods are described under the reporting table section of the manual.

Table 33.5.

Organisation Unit	Data Element	Reporting month	So far this year	Reporting month name
Gerehun CHC	Measles doses given	15	167	Oct-09
Tugbebu CHP	Measles doses given	17	155	Oct-09

33.4.3. Aggregation of periods

While data needs to be collected on a given frequency to standardise data collection and management, this does not put limitations on the period types that can be used in data analysis and reports. Just like data gets aggregated up the organisational hierarchy, data is also aggregated according to a period hierarchy, so you can create quarterly and annual reports based on data that is being collected on a Monthly basis. The defined period type for a data entry form (data set) defines the lowest level of period detail possible in a report.

33.4.3.1. Sum and average aggregation along the period dimension

When aggregating data on the period dimension there are two options for how the calculation is done, namely sum or averge. This otion is specified on a per data element in DHIS2 through the use of the 'aggregation operator' attribute in the Add/Edit Data Elements dialog.

Most of the data collected on a routinely basis should be aggregated by summing up the months or weeks, for instance to create a quarterly report on Measles immunisation one would sum up the three monthly values for "Measles doses given".

Other types of data that are more permanently valid over time like "Number of staff in the PHU" or an annual population estimate of "Population under 1 year" need to be aggregated

differently. These values are static for all months as long as there are valid data. For example, the "Estimated population under 1", calculated from the census data ,is the same for all months of a given year, or the number of nurses working in a given facility is the same for every month in the 6 months period the number is reported for.

This difference becomes important when calculating an annual value for the indicator morbidity service burden for a facility. The monthly head-counts are summed up for the 12 months to get the annual headcount, while the number of staff for the PHU is calculated as the average of the two 6-monthly values reported through the 6-monthly staff report. So in this example the data element "OPD headcount" would have the aggregation operator "SUM" and the data element "Number of staff" would have it set to "AVERAGE".

Another important feature of average data elements is the validity period concept. Average data values are standing values for any period type within the borders of the period they are registered for. For example, an annual population estimate following the calendar year, will have the same value for any period that falls within that year no matter what the period type. If the population under 1 for a given facility is 250 for the year of 2015 that means that the value will be 250 for Jan-15, for Q3-15, for Week 12 of 2015 and for any period within 2015. This has implications for how coverage indicators are calculated, as the full annual population will be used as denominator value even when doing monthly reports. If you want to look at an estimated annual coverage value for a given month, then you will have the option of setting the indicator to "Annualised" which means that a monthly coverage value will be multiplied by a factor of 12, a quarterly value by 4, in order to generate an effective yearly total. The annualised indicator feature can therefore be used to mimic the use of monthly population estimates.

33.5. Data collection vs. data analysis

33.5.1. Data collection and storage

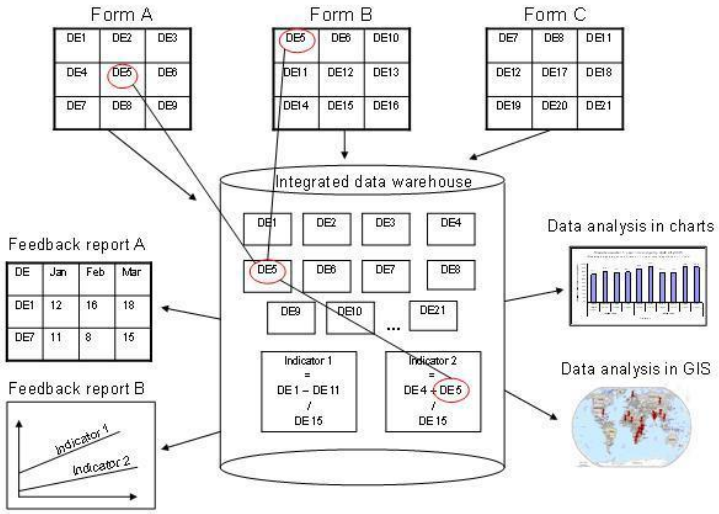
Datasets determine what raw data that is available in the system, as they describe how data is collected in terms of periodicity as well as spaital exten. Data sets define the building blocks of the data to be captured and stored in DHIS2. For each data dimension we decide what level of detail the data should be collected at namely 1) the data element (e.g. diagnosis, vaccine, or any event taking place) and its categories (e.g. age and gender), 2) the period/frequency dimension, and 3) the organisation unit dimension. For any report or data analysis you can never retrieve more detailed data than what is defined in the data sets, so the design of the datasets and their corresponding data entry forms (the data collection tools) dictate what kind of data analysis will be possible.

33.5.2. Input does not equal Output

It is important to understand that the data entry forms or datasets themselves are not intrinsically linked to the underlying data value and that the meaning of data is only described by the data element (and its categories). This makes it perfectly safe to modify datasets and forms without altering the data (as long as the data elements stay the same). This loose coupling between forms and data makes DHIS2 flexible when it comes to designing and changing new forms and in providing exactly the form the users want.

Another benefit of only linking data to data elements and not to forms, is the flexibility of creating indicators and validation rules based on data elements, and also in providing any kind of output report (in pivot tables, charts, maps etc) that can combine data individually or across forms, e.g. to correlate data from different health programs. Due to this flexibility of enabling integration of data from various programs (forms) and sources (routine and semi permanent (population, staff, equipment)) a DHIS2 database is used as an integrated data repository

for many or all parts of the aggregated data in a larger HIS. The figure below illustrates this flexibility.



In this example, we see that data elements from multiple forms can be combined to create a given indicator. As a more concrete example, one might collect "Population under one year of age" in an annual data set by district, and then collect a data element like "Fully immunized children" by month at the facility level. By annualizing the population, we can generate an approximation of the effective monthly population, and combining this with the aggregate total of the number of fully immunized children by month, it would be possible to generate an inidicator "Fully immunized coverage", consisting of the aggregated total of children who are fully immunized, divided by the effective monthly population.

33.6. Extended examples of data elements and forms

The table below combines data element the two group sets Diagnosis (all the diseases) and Morbidity/Mortality (New cases, Follow-ups, Referrals, Deaths) with the data element category PHU/Community. Deaths are captured in a separate form with other dimensions (e.g. the PHU/ Community) than morbidity.

Diagnosis	New cases	Follow-up	Referrals	Deaths		Total
				PHU	*Community*	
Malaria	19	9			1	29
Anaemia	1	1	4		23	29
All Others	1	1	6	5	5	18
Diarrhoea With Blood (Dysentery)	13				1	14
Yellow Fever	3	3		7		13
Wounds/Trauma				11		11
Tetanus					11	11
Lassa Fever				11		11
Measles		1	5	2		8
Etc. etc.						

This output table combines the two data element categories HIV_Age and Gender with the data element group set ART Group. The group enables subtotals for staging and entry points

summing up the data elements in that group. Subtotals for either age groups and gender would be other possible columns to easily include here.

DHIS2 Login screen

ART enrollment		Female				Male				Tot
ART Group	Data Element	<15y	15-24y	25-49y	>49 y	<15	15-24	25-49	>49	
ART staging	ART enrollment stage 1	1	8	3	11	1	1	2	1	28
	ART enrollment stage 2	1	2	15	2	2	1	3	1	27
	ART enrollment stage 3	11	4	8	1	1	2	12	2	41
	ART enrollment stage 4	11	1	1	1	1	1	11	1	28
ART staging total		24	15	27	15	5	5	28	5	124
ART entry points	ART entry point: Old patients	1	10	10	1	1	1	15	2	41
	ART entry point: Other	1	11	1	1	1	1	5	11	32
	ART entry point: Transfer in	11	1	3	1	1	11	4	1	33
	ART entry point: Walk in	1	3	15	3	2	1	7	3	35
	ART entry point: PMTCT	1	1	1	1	1	1	1	1	8
	ART entry point: transfer out	1	1	1	1	11	1	1	1	18
ART entry points total		16	27	31	8	17	16	33	19	167

33.7. How this works in pivot tables

When doing data analysis in Excel pivot tables or any other OLAP based tool the dimensions become extremely powerful in providing many different views into the data. Each data element category or group set become a pivot field, and the options or groups become values within each of these fields. In fact categories and groupsets are treated exactly the same way in pivot tables, and so are orgunits, periods, and data elements. All these become dimensions to the data value that can be used to rearrange, pivot, filter, and to drill down into the data. Here we will show some examples of how the data dimensions are used in pivot tables.

Using the example of morbidity and mortality data, a pivot table can show how the dimensions can be used to view data for different aggregation levels.

The completely aggregated number is viewed when none of the pivot fields are arranged in the table area, as column or row fields, but are listed above the table itself as page field (filter).

Country	(All)
District	(All)
Chiefdom	(All)
year	(All)
month	(All)
referrals_age	(All)
mortality_age	(All)
phucommunity	(All)
morbidity_age	(All)
dataelement	(All)
MorbidityMortalityGroups	(All)
diagnosis	(All)
Sum of value	
main_de_groups	Total
Morbidity	2084600

Here we have selected to look at the Morbidity total. The various data elements on morbidity have been ordered into the main_de_groups Morbidity (we will get back to Mortality later). The fields above the table itself are all set to "All", meaning that the totals in the table will contain data from all Countries, Districts, Chiefdom, ou_type, year, months, the various categories as listed in the red fields, and all data elements in the Morbidity group.

As we have seen, this is not a very useful representation, as Morbidity is organized into new cases, follow-ups, referrals, and then again in age groups. Also, we do not see the various diagnoses. The first step is to include the diagnoses field (which is a group set), which is done by dragging the "diagnosis" field down to be a row field, as shown in the figure below, and to add the group set called "morbiditymortality" in the column field to display new cases, follow-up, and referrals.

DHIS2 Login screen

Contrast this figure above to the one below.

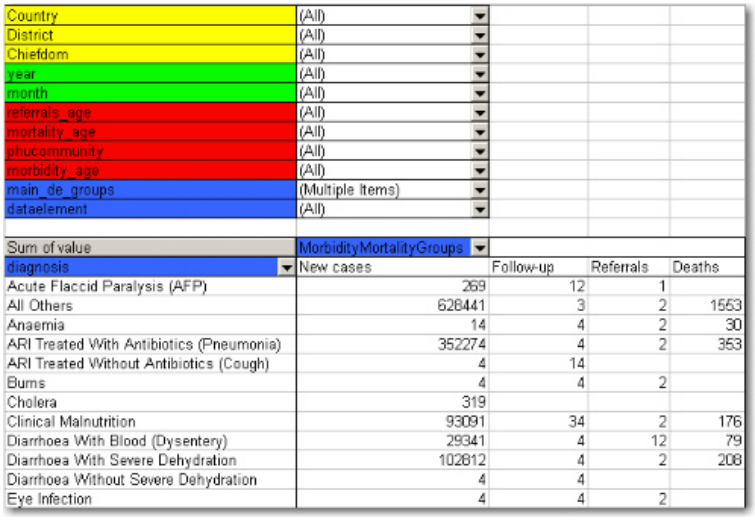
Country	(All)				
District	(All)				
Chiefdom	(All)				
year	(All)				
month	(All)				
referrals_age	(All)				
mortality_age	(All)				
phucommunity	(All)				
morbidity_age	(All)				
diagnosis	(All)				
Sum of value		MorbidityMortalityGroups			
main_de_groups	dataelement	New cases	Follow-up	Referrals	Grand Total
Morbidity	Acute Flaccid Paralysis (AFP) follow-up		12		12
	Acute Flaccid Paralysis (AFP) new	269			269
	Acute Flaccid Paralysis (AFP) referrals			1	1
	All other follow-ups		3		3
	All other new	628441			628441
	All other referrals			2	2
	Anaemia follow-up		4		4
	Anaemia new	14			14
	Anaemia referrals			2	2
	ARI treated with antibiotics (pneumonia) follow-up		4		4
	ARI treated with antibiotics (pneumonia) new	4			4
	ARI treated with antibiotics (pneumonia) referrals			2	2
	ARI treated without antibiotics (cough) follow-up		14		14
	ARI treated without antibiotics (cough) new	4			4

They both show the same data (some of the rows have been cut in the screenshot due to image size), albeit in a different way.

- The "dataelement" field, used in the bottom figure, displays each diagnosis as three elements; one follow-up, one new, and one referrals. This is the way the data elements have been defined in DHIS, as this makes sense for aggregation. You would not like to aggregate follow-ups and new, thus these have not been made as categories, the whole point of is to ease aggregation and disaggregation.
- The "diagnosis" group set has instead been made to lump these three (follow-up, new, referrals) together, which can then be split with another group set, namely the one called "morbiditymortality". This allows us to organize the data as in the first of the two figures, where we have the single diagnosis per row, and the groups new, follow-up, referrals as rows.

The idea of using group sets is that you can combine, in any set, different data elements. Thus, if we add the mortality data (by checking it from the drop-down menu of the main_de_groups field, and moving this field out of the table) we can see also the deaths, since the mortality data elements have been included as a "death" group in the "morbiditymortality" group set. The result is shown below.

DHIS2 Login screen



Country	(All)			
District	(All)			
Chiefdom	(All)			
year	(All)			
month	(All)			
referrals_age	(All)			
mortality_age	(All)			
phucommunity	(All)			
morbidity_age	(All)			
main_de_groups	(Multiple Items)			
dataelement	(All)			
Sum of value	MorbidityMortalityGroups			
diagnosis	New cases	Follow-up	Referrals	Deaths
Acute Flaccid Paralysis (AFP)	269	12	1	
All Others	628441	3	2	1553
Anaemia	14	4	2	30
ARI Treated With Antibiotics (Pneumonia)	352274	4	2	353
ARI Treated Without Antibiotics (Cough)	4	14		
Burns	4	4	2	
Cholera	319			
Clinical Malnutrition	93091	34	2	176
Diarrhoea With Blood (Dysentery)	29341	4	12	79
Diarrhoea With Severe Dehydration	102812	4	2	208
Diarrhoea Without Severe Dehydration	4	4		
Eye Infection	4	4	2	

The result is a much more user-friendly pivot table. Now, another figure shows the relationship between the group sets and elements (these are fake data values).

This small detail of the pivot table show how the actual data elements link to the group sets:

- The four data elements, as defined in DHIS, are Measles death, Measles follow-up, Measles new, and Measles referrals
- They all belong to the group set "diagnosis", where they have been lumped together in the group Measles
- The group set "morbiditymortality" contains the groups New cases, Follow-up, Referrals, and Deaths.
- Only the data element Measles deaths has data related to the group Deaths, thus this is where the data value (20) is shown, at the upper right corner. The same for Measles new; the value (224) is shown at the intersection of the data element Measles new and the group New cases (in the group set morbiditymortality)
- All the intersections where the data element does not link with the groups in morbiditymortality are left blank. Thus in this case we would get a nice table if we excluded the dataelement from the table, and just had diagnosis and the group set morbiditymortality, as in the figure shown earlier

Now lets see how the data element categories can be used. In the data entry form for Morbidity the new cases and follow-ups use one age category, the referral data another,, and the mortality data a third age breakup, so these are available as three individual age group fields in the pivot tables called morbidity_age, referrals_age and mortality_age. It doesn't make sense to use these while looking at these data together (as in the examples above), but e.g. if we only want to look at the only the new cases we can put the MobidityMortalityGroups field back up as a page field and there select the New cases group as a filter. Then we can drag the Morbidity_age field down to the column area and we get the following view:

Country	(All)			
District	(All)			
Chiefdom	(All)			
year	(All)			
month	(All)			
referrals_age	(All)			
mortality_age	(All)			
phucommunity	(All)			
main_de_groups	(All)			
dataelement	(All)			
MorbidityMortalityGroups	New cases			
Sum of value	morbidity_age			
diagnosis	0-11m	12-59m	5-14y	15y+
Acute Flaccid Paralysis (AFP)	1	76	29	163
All Others	1	129705	53752	444983
Anaemia	1	1	11	1
ARI Treated With Antibiotics (Pneumonia)	1	204517	45752	102004
ARI Treated Without Antibiotics (Cough)	1	1	1	1
Burns	1	1	1	1
Cholera		88	104	127
Clinical Malnutrition	1	71259	11970	9861
Diarrhoea With Blood (Dysentery)	1	6868	4334	18138
Diarrhoea With Severe Dehydration	1	56345	15375	31091

The following table illustrates the benefits of reusing data element categories across datasets and categorycombinations. The VCCT, ART and PMTCT data are collected in three different datasets, the first two with both gender and age breakdown, and the PMTCT only age (gender is given). All three share the same age groups and therefore it is possible to view data elements from all these three datasets in the same table and use the age dimension. In the previous example with morbidity and mortality data this was not possible since new cases, referrals and deaths all have different age groups.

Country	(All)						
District	(All)						
Chiefdom	(All)						
year	(All)						
month	(All)						
anc_age	(All)						
pmtct	(All)						
Gender	(All)						
Sum of value		hiv_age					
main_de_groups	dataelement	<15y	15-24y	25-49y	>49y	Grand Total	
ART	ART enrollment stage 1		7	3		10	
	ART enrollment stage 2	1	2	7	1	11	
	ART enrollment stage 3		6	23	2	31	
	ART new clients started on ARV		6	24	4	34	
	ART treatment stopped due to death			5		5	
	ART treatment stopped due to loss to follow-up			5	1	6	
	ART enrollment stage 4			1		1	
	ART clients with new adverse clinical event			1	2	3	
	ART entry point: No walk in	1	3	13	5	22	
	ART No started Opportunist Infection prophylaxis		8	16	3	27	
	ART entry ponit: No diagnostic testing		3	11		14	
	ART entry point: No transfer in			5		5	
	ART entry point: No old patients	6	9	27	1	43	
	ART entry point: No other			4		4	
	ART No clients who stopped TRT due to TRT failure			2		2	
PMTCT	PMTCT HIV positive w. received ART for own health	1	136	118	1	256	
	PMTCT HIV positive women received ZDV at ANC	1	199	193		393	
	PMTCT male partners tested for HIV	30	1292	1277	25	2624	
	PMTCT male partners tested HIV positive	1	74	82	1	158	
	PMTCT No HIV women who delivered in the health facility (Normal)		57	86		143	
	PMTCT reported mother death		4	5		9	
	PMTCT women counselled for infant feeding	246	20791	15992	143	37172	
	PMTCT women HIV positve	3	339	275		617	
	PMTCT women HIV1	2	302	242	2	548	
	PMTCT women HIV1 and HIV2		26	29		55	
	PMTCT women HIV2		13	9	2	24	
	PMTCT women lost to contact	4	71	67	6	148	
	PMTCT women received complete ARV for PMTCT		77	93		170	
	PMTCT women received NVP during labour		55	75		130	
	PMTCT women received post test counselling and result	197	14901	10647	86	25831	
	PMTCT women received ZDV & 3CT after delivery		96	118		214	
	PMTCT women seen for 1st ANC	262	15838	11376	173	27649	
	PMTCT women tested for HIV	228	15000	10813	78	26119	
VCCT	VCCT No positive test HIV1 and HIV2	3	11	24	4	42	
	VCCT No positive test HIV1 only	18	127	333	35	513	
	VCCT No positive test HIV2 only		4	9		13	
	VCCT No receiving positive test results	36	374	710	88	1208	
	VCCT No receiving Pre-test counselling	810	3878	5009	683	10380	

In the table below PMTCT data has been removed from the table and the gender category added to the column area so that you can analyse the data for VCCT and ART by age and gender. An optional subtotal for gender has also been added, as well as a grand total for all age and gender.

Country	(All)										
District	(All)										
Chiefdom	(All)										
year	(All)										
month	(All)										
anc_age	(All)										
pmtct	(All)										
Sum of va		Gender	hiv_age								
		Female				Female Total	Male				Male Total	Grand Total
main d	dataelement	<15y	15-24y	25-49y	>49y		<15y	15-24y	25-49y	>49y		
ART	ART enrollment stage 1			7	2	9			1		1	10
	ART enrollment stage 2			2	5	1	8	1	2		3	11
	ART enrollment stage 3			4	10	1	15		2	13	1	16	31
	ART new clients started on ARV			4	13	2	19		2	11	2	15	34
	ART treatment stopped due to death				2		2			3		3	5
	ART treatment stopped due to loss to follow-up				4	1	5			1		1	6
	ART enrollment stage 4									1		1	1
	ART clients with new adverse clinical event				1	2	3						3
	ART entry point: No walk in			2	5	3	10	1	1	8	2	12	22
	ART No started Opportunist Infection prophylaxis			7	9	3	19		1	7		8	27
	ART entry ponit: No diagnostic testing			2	7		9		1	4		5	14
	ART entry point: No transfer in				2		2			3		3	5
	ART entry point: No old patients	6		9	9		24			18	1	19	43
	ART entry point: No other									4		4	4
	ART No clients who stopped TRT due to TRT failure				1		1			1		1	2
VCCT	VCCT No positive test HIV1 and HIV2	2		8	13	2	25	1	3	11	2	17	42
	VCCT No positive test HIV1 only	7		88	187	22	304	11	39	146	13	209	513
	VCCT No positive test HIV2 only			3	4		7			1	5	6	13
	VCCT No receiving positive test results	15		218	367	49	649	21	156	343	39	559	1208
	VCCT No receiving Pre-test counselling	452		2342	2737	352	5883	368	1536	2272	331	4497	10380
	VCCT No reiciving result & post-test counselling	401		1901	2221	267	4790	317	1236	1891	267	3711	8501
	VCCT No Test	449		2262	2697	303	5601	357	1469	2193	296	4315	9916

33.8. Case study: From paper forms to multidimensional datasets - lessons learned

Typically the design of a DHIS2 dataset is based on some requirements from a paper form that is already in use. The logic of paper forms are not the same as the data element and data set model of DHIS, e.g. often a field in a tabular paper form is described both by column headings and text on each row, and sometimes also with some introductory table heading that provides more context. In the database this is captured in one atomic data element with no reference to a position in a visual table format, so it is important to make sure the data element with the optional data element categories capture the full meaning of each individual field in the paper form.

Another important thing to have in mind while designing datasets is that the dataset and the corresponding data entry form (which is a dataset with layout) is a data collection tool and not a report or analysis tool. There are other far more sophisticated tools for data output and reporting in DHIS2 than the data entry forms. Paper forms are often designed with both data collection and reporting in mind and therefore you might see things such as cumulative values (in addition to the monthly values), repetition of annual data (the same population data reported every month) or even indicator values such as coverage rates in the same form as the monthly raw data. When you store the raw data in DHIS2 every month and have all the processing power you need within the computerised tool there is no need (in fact it would be stupid and most likely cause inconsistency) to register manually calculated values such as the ones mentioned above. You only want to capture the raw data in your datasets/forms and leave the calculations to the computer, and presentation of such values to the reporting tools in DHIS.

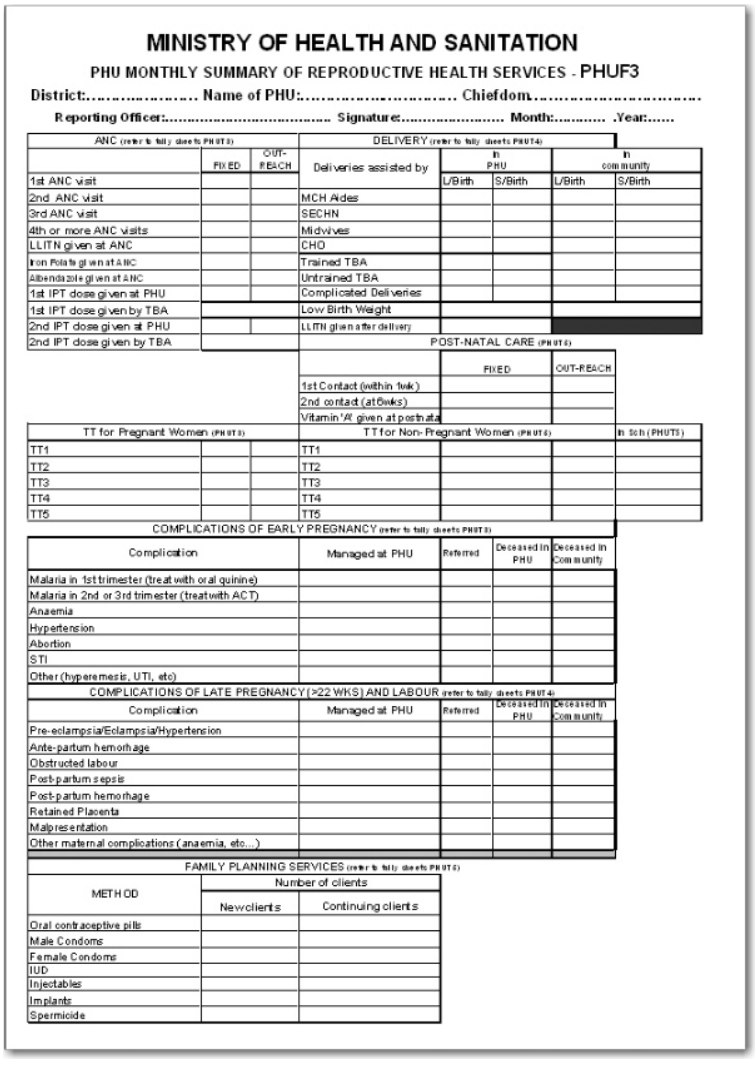
33.8.1. From tables to category combinations - designing multi-dimensional data sets

As we have seen in the examples above, data element categories and category options are helpful in representing tabular data, when adding dimensions to a field in a paper form. We have also seen how the data element is one of the required dimensions which describe data in DHIS2. As we will see in the example below there are often more than one way to represent a paper form in DHIS2 , and it can be difficult to know which dimension to represent with a data element name and which to represent as categories, or even as groups as we have seen above. Here are some general lessons learned from working with data element and category combinations:

- Design your dimensions with data use in mind, not data collection. This means that disaggregation of data values at collection time should be easily aggregated up along the various dimensions, as in adding up to a meaningful total.

- Reuse dimensions as much as possible as this increases the ability to compare disaggregated data (e.g. age groups, fixed/outreach, gender).
- Disaggregation dimensions should add up to a total. In certain cases, data elements may be collected a subsets of each other. In this case, use of categories to disaggregate the data element should not be used. As an example, we might collect "Number of confirmed malaria cases" and disaggregate this by "Under 5" and "Over 5". A third data element "Number of confirmed malaria cases under 1" might also exist on the form. It would seem reasonable then to create three age groups : Under 1, Under 5 and Over 5, to describe the disaggregation. However, the Under 1 is actually a subset of the Under 5 group, and when totaled, would result in duplication. Thus, categories should be generally be composed of mutually exclusive category options, such that the sum of individual category options results in a coherent total.
- Different levels of dimensions; 1) disaggregation and 2) grouping. Disaggregation dimensions dictate how you collect and how detailed you store your data, so plan these carefully. The group dimension is more flexible and can be changed and added to even after data collection (think of it as tagging).
- It is best to think of how the data would be used in an integrated data repository and not how it will actually be collected on forms or by programs when designing the meta-data model. Ideally, the same type of disaggregation should be used across forms and datasets for data elements which will be analysed together, or used to build indicators. Reuse definitions so that the database can integrate even though the forms themselves might be duplicated (which in practice, is often the case).

In order to better explain the approach and the possibilities we present an example paper form and will walk through it step by step and design data elements, categories, category options and category combinations.



MINISTRY OF HEALTH AND SANITATION

PHU MONTHLY SUMMARY OF REPRODUCTIVE HEALTH SERVICES - PHUF3

District:..... Name of PHU:..... Chiefdom.....

Reporting Officer:..... Signature:..... Month:..... .Year:.....

ANC (refer to tally sheets PHUT3)			DELIVERY (refer to tally sheets PHUT4)				
	FIXED	OUT-REACH	Deliveries assisted by	In PHU		In community	
1st ANC visit				L/Birth	S/Birth	L/Birth	S/Birth
2nd ANC visit			MCH Aides				
3rd ANC visit			SECHN				
4th or more ANC visits			Midwives				
LLITN given at ANC			CHO				
Iron Folate given at ANC			Trained TBA				
Albendazole given at ANC			Untrained TBA				
1st IPT dose given at PHU			Complicated Deliveries				
1st IPT dose given by TBA			Low Birth Weight				
2nd IPT dose given at PHU			LLITN given after delivery				
2nd IPT dose given by TBA							

POST-NATAL CARE (PHUT4)		
	FIXED	OUT-REACH
1st Contact (within 1wk)		
2nd contact (at 6wks)		
Vitamin 'A' given at postnatal		

TT for Pregnant Women (PHUT3)			TT for Non-Pregnant Women (PHUT4)			In Sch (PHUT5)
TT1			TT1			
TT2			TT2			
TT3			TT3			
TT4			TT4			
TT5			TT5			

COMPLICATIONS OF EARLY PREGNANCY (refer to tally sheets PHUT3)

Complication	Managed at PHU	Referred	Deceased in PHU	Deceased in Community
Malaria in 1st trimester (treat with oral quinine)				
Malaria in 2nd or 3rd trimester (treat with ACT)				
Anaemia				
Hypertension				
Abortion				
STI				
Other (hyperemesis, UTI, etc)				

COMPLICATIONS OF LATE PREGNANCY (>22 WKS) AND LABOUR (refer to tally sheets PHUT4)

Complication	Managed at PHU	Referred	Deceased in PHU	Deceased in Community
Pre-eclampsia/Eclampsia/Hypertension				
Ante-partum hemorrhage				
Obstructed labour				
Post-partum sepsis				
Post-partum hemorrhage				
Retained Placenta				
Malpresentation				
Other maternal complications (anaemia, etc...)				

FAMILY PLANNING SERVICES (refer to tally sheets PHUT5)

METHOD	Number of clients	
	Newclients	Continuing clients
Oral contraceptive pills		
Male Condoms		
Female Condoms		
IUD		
Injectables		
Implants		
Spermicide		

This form has many tables and each of them potentially represent a data element category combination (from now on referred to as a catcombo). As such there is no restriction on a dataset to only have one set of dimensions or catcombo, it can have many and as we see above this is necessary as the dimensions are very different from table to table. In the following paragraphs, we will analyze how to break down this form into its compoenent pieces and suggest an implementation pathway in DHIS2.

ANC table. This table in the top left corner is one the simpler ones in this form. It has two dimensions, the first column with the ANC activity or service (1st visit, IPT 2nd dose etc) and the second and third column which represent the place where the service was given with the two options "Fixed" and "Outreach". Since the ANC service is the key phenomena to analyse here, and often there is a need for looking at the total of "ANC 1st visits" no matter where they actually took placed, it makes a lot of sense to use this dimension as the data element dimension.

Thus, all items on the first column from "1st ANC" visit to "2nd IPT dose given by TBA" are represented as individual data elements. The "where" dimension is represented as a data element category (from now on referred to as category) with the name "fixed/outreach" with the two data element category options (from now on catoptions) "fixed" and "outreach". There is no other dimension here so we add a new catcombo with the name "Fixed/Outreach" with one category "Fixed/Outreach". Strictly speaking there is another dimension in this table, and that is the at PHU or by TBA dimension which is repeated for the two doses of IPT, but since none of the other ANC services listed have this dimension it does not seem like a good idea to separate out two data elements from this table and give them another catcombo with both fixed/outreach and at PHU/by TBA. reusing the same catcombo for all the ANC services makes more sense since it will be easier to look at these together in reports etc. and also the fact that there is not much to lose by repeating the at PHU or by TBA information as part of the data element name when it is only for four data elements in a table of eleven data elements.

DELIVERY table. This table is more tricky as it has a lot of information and you can see that not all the rows have the same columns (some columns are merged and a one field is grayed out/disabled.). If we start by looking at the first column "Deliveries assisted by" that seems to be one dimension, but only down to the "Untrained TBA" row, as the remaining three rows are not related to who assisted the delivery at all. Another dimension is the place of delivery, either In PHU or in Community as stated on the top column headings. These deliveries are further split into the outcome of the delivery, whether it is a live or still birth, which seems to be another dimension. So if we disregard the three bottom rows for a moment there seems to be 3 dimensions here, 1) assisted by, 2) place of delivery, and 3) delivery outcome. The key decision to make is what to use as the data element, the main dimension, the total that you will most often use and want easily available in reports and data analysis.

In this case, the outcome dimension as "Total live births" is a very commonly used value in many indicators (maternal mortality ratio, births attended by skilled health personnel etc.). In this case the "Assisted By" dimension could also have been used without any problem, but the added value of easily getting the total live births information was the decisive point for us. This means that from this table (or sub-table of row 1 to 6) there are only two data elements; "Live births" and "Still births".

Next, there are two more dimensions, the "PHU/Community" with its two options and a "Births attended by" with options ("MCH Aides", "SECHN", "Midwives", "CHO", "Trained TBA", "Untrained TBA"). These two categories make up the catcombo "Births" which is assigned to the two data elements "Live births" and "Still births". Considering the final three rows of the delivery table we can see that "Complicated Deliveries" does not have the assisted by dimension, but has the place and the outcome. "Low birth weight" also does not have the assisted by dimension and not the outcome either. The LLITN given after delivery does not have any additional dimension at all. Since not any of the three rows can share catcombo with any other row we decided to represent these fields as so called flat data elements, meaning data elements with no categories at all, and simply adding the additional information from the column headings to the data element name, and therefore ended up with the following data

elements with the default (same as none) catcombo; "Complicated deliveries in PHU live birth", "Complicated deliveries in PHU still births", "Complicated deliveries in community live birth", "Complicated deliveries in community still births", "Low birth weight in PHU", "Low birth weight in community", and "LLITN given after delivery".

POST-NATAL CARE table This table is simple and we used the same approach as for the ANC table. 3 data elements listed in the first column and then link these to the catcombo called "fixed/outreach". Reusing the same category fixed/outreach for these data elements enables analysis on fixed/outreach together with ANC data and other data using the same category.

TT table This table is somewhat more complex than the previous examples.We decided to use "TT1", "TT2" ... "TT5" as data elements which makes it easy to get the total of each one of these. There is fixed/outreach dimension here, but there is also the "In school place" that is only applied to the Non-Pregnant, or more correctly to any of the two as the school immunisation is done whether the girls are pregnant or not. We consulted the program people behind the form and found out that it would be OK to register all school TT immunisations as non-pregnant, which simplifies the model a bit since we can reuse the "TT1" to "TT5" data elements. So we ended up with a new category called "TT place" with the three options (Fixed, Outreach, In School), and another category called "Pregnant/Non-pregnant" with two options. The new catcombo "TT" is then a combination of these two and applied to the 5 TT data elements. Since we agreed to put all In Schools immunisations under Non-pregnant in means that the combination of options (Pregnant+In School) will never be used in any data entry form, and hence become a possible optioncombo, which is OK. As long as the form is custom designed then you can choose which combinations of options to use or not, and therefore it is not a problem to have such passive or unused catoptions. Having school as one option in the TT place category simplifies the model and therefore we thought it was worth it. The alternative would be to create 5 more data elements for "TT1 in school" ... "TT5 in school", but then it would be a bit confusing to add these together with the "TT1" ..."TT5" plus TT catcombo. Having school as a place in the TT place category makes it a lot easier to get the total of TT1.. TT5 vaccines given, which are the most important numbers and most often used values for data analysis.

Complications of early and late pregnancy and labour tables We treat these two tables as one, and will explain why. These two tables are a bit confusing and not the best design. The most important data coming out of these tables are the pregnancy complications and the maternal deaths. These data elements contain further detail on the cause of the complication or death (the first column in both tables), as well as a place of death (in PHU or community), and an outcome of the complication (when its not a death) that can be either "Managed at PHU" or " Referred". We decided to create two data elements for these two tables; "Pregnancy complications", and "Maternal Deaths", and two category combinations, one for each of the data elements. For the Pregnancy Complications data element there are two additional dimensions, the cause of the complication (the combined list of the first column in the two tables) and the outcome (managed at PHU or Referred), so these are the categories and options that make up that category combination. For the "Maternal deaths" data element the same category with the different causes are used and then another category for the place of death (in PHU or In community). This way the two data elements can share one category and it will be easy to derive the total number of pregnancy complications and maternal deaths. While the list of complications on the paper form is divided into two (early and late/labour) you can see that e.g. the malaria in 2nd and 3rd trimester are listed under early, but in fact are for a later phase of the pregnancy. There is no clear divide between early and late complications in the form, and therefore we gave up trying to make this distinction in the database.

Family Planning Services table This table has 2 dimensions, the family planning method (contraceptive) and whether the client is new or continuing. We ended up with one data element only "Family planning clients" and then added two categories "FP method" with all the contraceptives as options, and another category "FP client type" with new or continuing as options. This way it will be easy to get the total number of family planning clients which is the major value to look at in data analysis, and from there you can easily get the details on method or how many new clients there are.

33.8.2. Step-by-step approach to designing datasets

1. Identify the different tables (or sub datasets) in the paper form that share the same dimensions
2. For each table identify the dimensions that describe the data fields
3. Identify the key dimension, the one that makes most sense to look at in isolation (when the others are collapsed, summed up). This is your data element dimension, the starting point and core of your multidimensional model (sub dataset). The data element dimension can be a merger of two or more dimensions if that makes more sense for data analysis. The key is to identify which total that makes most sense to look at alone when the other dimensions are collapsed.
4. For all other/additional dimensions identify their options, and come up with explanatory names for dimensions and their options.
5. Each of these additional dimensions will be a data element category and their options will be category options.
6. Combine all categories for each sub dataset into one category combination and assign this to all the data elements in your table (or sub dataset if you like).
7. 7. When you are done with all the tables (sub datasets), create a new dataset and add all the data elements you have identified (in the whole paper form) to that dataset.
8. 8. Your dataset will then consist of a set of data elements that are linked to one or more category combinations.

Chapter 34. DHIS2 Frequently Asked Questions

34.1. I have entered data into a data entry form, but I cannot see the data in any reports (pivot tables, charts, maps). Why does data which is entered not show up immediately in my graphs in DHIS2?

Data which is entered into DHIS2 must first be processed with the "analytics". This means that data is not immediately available in the analytics resources (such as reports, pivot tables, data visualizer, GIS, etc) after it has been entered. If scheduling is active, the analytics process will run automatically at midnight each day. After that, new data which was entered since the last time the analytics process ran, will become visible.

You can trigger the analytics process manually by selecting Reports->Analytics from the main menu and pressing the "Start export" button. Note, the process may take a significant amount of time depending on the amount of data in your database.

Other factors which can affect the visibility of data are:

- Data approval: If data has not been approved to a level which corresponds to your users level, the data may not be visible to you.
- Sharing of meta-data objects: If certain meta-data objects have not been shared with a user group which you are a member of, the data may not be visible to you.
- Caching of analytics: In many cases, server administrators cache analytical objects (such as pivot tables, maps, graphs) on the server. If you have entered data, re-run analytics, and you are still not seeing any (updated) data, be sure that your data is not being cached by the server.

34.2. I have downloaded DHIS 2 from https://www.dhis2.org/downloads but when i try to enter the system it needs a username and password. Which should I use?

By default, the username will be "admin" and the password "district". Usernames and passwords are case sensitive.

Chapter 35. Release and upgrade notes

Table 35.1. DHIS2 releases

Version	Release date	Release notes	Upgrade notes
2.28	2017-10-11		
2.27	2017-06-02		
2.26	2017-02-01		
2.25	2016-10-13		
2.24	2016-07-04		
2.23	2016-04-25		
2.22	2016-01-15		
2.21	2015-10-21		
2.20	2015-07-20		
2.19	2015-05-15		
2.18	2015-01-22		
2.17	2014-11-21		
2.16	2014-07-25		
2.15	2014-05-10		

Appendix A. User authorities

Table A.1.

Accept data at lower levels	F_ACCEPT_DATA_LOWER_LEVELS
Access my data mart	F_MYDATAMART_VIEW
Add Facility	F_FRED_CREATE
Add Locale	F_LOCALE_ADD
Add Option Set	F_OPTIONSET_ADD
Add Organisation Unit Group Set	F_ORGUNITGROUPSET_ADD
Add Program Rule	F_PROGRAM_RULE_ADD
Add Public Map	F_MAP_PUBLIC_ADD
Add Relationship Type	F_RELATIONSHIPTYPE_ADD
Add/Remove Members In Read-Only User Groups	F_USER_GROUPS_READ_ONLY_ADD_MEMBERS
Add SQL View	F_SQLVIEW_ADD
Add Tracked Entities	F_TRACKED_ENTITY_ADD
Add Tracked Entity Attribute Value	F_TRACKED_ENTITY_ATTRIBUTEVALUE_ADD
Add Tracked Entity Form	F_TRACKED_ENTITY_FORM_ADD
Add Tracked Entity Instance Comment	F_TRACKED_ENTITY_COMMENT_ADD
Add Tracked Entity Relationship	F_RELATIONSHIP_ADD
Add/Update Attribute	F_ATTRIBUTE_ADD
Add/Update Chart	F_CHART_ADD
Add/Update Concept	F_CONCEPT_ADD
Add/Update Constant	F_CONSTANT_ADD
Add/Update Data Value	F_DATAVALUE_ADD
Add/Update Indicator Type	F_INDICATORTYPE_ADD
Add/Update Min/max rule	F_DATAELEMENT_MINMAX_ADD
Add/Update Organisation Unit	F_ORGANISATIONUNIT_ADD
Add/Update Private Category Option Group	F_CATEGORY_OPTION_GROUP_PRIVATE_ADD
Add/Update Private Category Option Group Set	F_CATEGORY_OPTION_GROUP_SET_PRIVATE_ADD
Add/Update Private Data Element	F_DATAELEMENT_PRIVATE_ADD
Add/Update Private Data Element Category	F_CATEGORY_PRIVATE_ADD
Add/Update Private Data Element Category Combo	F_CATEGORY_COMBO_PRIVATE_ADD
Add/Update Private Data Element Category Option	F_CATEGORY_OPTION_PRIVATE_ADD
Add/Update Private Data Element Category Option Combo	F_CATEGORY_OPTION_COMBO_PRIVATE_ADD
Add/Update Private Data Element Groups	F_DATAELEMENTGROUP_PRIVATE_ADD
Add/Update Private Data Element Group Sets	F_DATAELEMENTGROUPSET_PRIVATE_ADD
Add/Update Private Data Set	F_DATASET_PRIVATE_ADD

Add/Update Private Document	F_DOCUMENT_PRIVATE_ADD
Add/Update Private Indicator	F_INDICATOR_PRIVATE_ADD
Add/Update Private Indicator Group	F_INDICATORGROUP_PRIVATE_ADD
Add/Update Private Indicator Group Sets	F_INDICATORGROUPSET_PRIVATE_ADD
Add/Update Private Option Set	F_OPTIONSET_PRIVATE_ADD
Add/Update Private Organisation Unit Group	F_ORGUNITGROUP_PRIVATE_ADD
Add/Update Private Organisation Unit Group Set	F_ORGUNITGROUPSET_PRIVATE_ADD
Add/Update Private Program	F_PROGRAM_PRIVATE_ADD
Add/Update Private Report	F_REPORT_PRIVATE_ADD
Add/Update Private SQL View	F_SQLVIEW_PRIVATE_ADD
Add/Update Private Tracked Entity Attribute	F_TRACKED_ENTITY_ATTRIBUTE_PRIVATE_ADD
Add/Update Private User Group	F_USERGROUP_PRIVATE_ADD
Add/Update Private User Role	F_USERROLE_PRIVATE_ADD
Add/Update Private Validation Rule Group	F_VALIDATIONRULEGROUP_PRIVATE_ADD
Add/Update Program Attribute	F_PROGRAM_ATTRIBUTE_ADD
Add/Update Program Indicator	F_ADD_PROGRAM_INDICATOR
Add/Update Program Stage	F_PROGRAMSTAGE_ADD
Add/Update Program Stage Section	F_PROGRAMSTAGE_SECTION_ADD
Add/Update Public Category Option Group	F_CATEGORY_OPTION_GROUP_PUBLIC_ADD
Add/Update Public Category Option Group Set	F_CATEGORY_OPTION_GROUP_SET_PUBLIC_ADD
Add/Update Public Chart	F_CHART_PUBLIC_ADD
Add/Update Public Dashboard	F_DASHBOARD_PUBLIC_ADD
Add/Update Public Data Element	F_DATAELEMENT_PUBLIC_ADD
Add/Update Public Data Element Category	F_CATEGORY_PUBLIC_ADD
Add/Update Public Data Element Category Combo	F_CATEGORY_COMBO_PUBLIC_ADD
Add/Update Public Data Element Category Option	F_CATEGORY_OPTION_PUBLIC_ADD
Add/Update Public Data Element Category Option	F_CATEGORY_OPTION_DELETE
Add/Update Public Data Element Category Option Combo	F_CATEGORY_OPTION_COMBO_PUBLIC_ADD
Add/Update Public Data Element Groups	F_DATAELEMENTGROUP_PUBLIC_ADD
Add/Update Public Data Element Group Sets	F_DATAELEMENTGROUPSET_PUBLIC_ADD
Add/Update Public Data Set	F_DATASET_PUBLIC_ADD
Add/Update Public Document	F_DOCUMENT_PUBLIC_ADD
Add/Update Public Indicator	F_INDICATOR_PUBLIC_ADD
Add/Update Public Indicator Group	F_INDICATORGROUP_PUBLIC_ADD
Add/Update Public Indicator Group Sets	F_INDICATORGROUPSET_PUBLIC_ADD
Add/Update Public Option Set	F_OPTIONSET_PUBLIC_ADD

Add/Update Public Organisation Unit Group	F_ORGUNITGROUP_PUBLIC_ADD
Add/Update Public Organisation Unit Group Set	F_ORGUNITGROUPSET_PUBLIC_ADD
Add/Update Public Program	F_PROGRAM_PUBLIC_ADD
Add/Update Public Report	F_REPORT_PUBLIC_ADD
Add/Update Public Report Table	F_REPORTTABLE_PUBLIC_ADD
Add/Update Public SQL View	F_SQLVIEW_PUBLIC_ADD
Add/Update Public Tracked Entity Attribute	F_TRACKED_ENTITY_ATTRIBUTE_PUBLIC_ADD
Add/Update Public User Group	F_USERGROUP_PUBLIC_ADD
Add/Update Public User Role	F_USERROLE_PUBLIC_ADD
Add/Update Public Validation Rule Group	F_VALIDATIONRULEGROUP_PUBLIC_ADD
Add/Update Section	F_SECTION_ADD
Add/Update Tracked Entity	F_TRACKED_ENTITY_ADD
Add/Update Tracked Entity Attributes	F_ALLOW_EDIT_TRACKED_ENTITY_ATTRIBUTES
Add/Update Tracked Entity Data Value	F_TRACKED_ENTITY_DATAVALUE_ADD
Add/Update Tracked Entity Instance	F_TRACKED_ENTITY_INSTANCE_ADD
Add/Update User	F_USER_ADD
Add/Update User Group Managing Relationships	F_USERGROUP_MANAGING_RELATIONSHIPS_ADD
Add/Update User Within Managed Group	F_USER_ADD_WITHIN_MANAGED_GROUP
Add/Update Validation Criteria	F_VALIDATIONCRITERIA_ADD
Add/Update Validation Rule	F_VALIDATIONRULE_ADD
Add Validation Rule Groups	F_VALIDATIONRULEGROUP_ADD
Administrate data mart	F_DATAMART_ADMIN
Administrate data mart	F_DATA_MART_ADMIN
Administrate data vizualiser	F_DV_ADMIN
Administrate GIS	F_GIS_ADMIN
Approve data	F_APPROVE_DATA
Approve data at lower levels	F_APPROVE_DATA_LOWER_LEVELS
Archive data	F_ARCHIVE_DATA
Change GIS Configuration	F_GIS_CONFIGURATION_UPDATE
Change Location of Tracked Entity Instance	F_TRACKED_ENTITY_INSTANCE_CHANGE_LOCATION
Change order in Data Set	F_DATASET_ORDER_CHANGE
Change system settings	F_SYSTEM_SETTING
Change Tracked Entity Instance Location	F_TRACKED_ENTITY_CHANGE_LOCATION
Chart External Access	F_CHART_EXTERNAL
Concept Management	F_CONCEPT_MANAGEMENT
Constant Management	F_CONSTANT_MANAGEMENT
Copy Excel Item	F_COPY_EXCEL_ITEM_ADMINISTRATION
Create and download backup	F_DASHBOARD_DOWNLOAD_BACKUP
Data Admin Locking	F_DATAADMIN_LOCK

Data Admin UnLocking	F_DATAADMIN_UNLOCK
Delete Attribute	F_ATTRIBUTE_DELETE
Delete Category Option Group	F_CATEGORY_OPTION_GROUP_DELETE
Delete Category Option Group Set	F_CATEGORY_OPTION_GROUP_SET_DELETE
Delete Chart	F_CHART_DELETE
Delete Concept	F_CONCEPT_DELETE
Delete Constant	F_CONSTANT_DELETE
Delete Data Element	F_DATAELEMENT_DELETE
Delete Data Element Category	F_CATEGORY_DELETE
Delete Data Element Category Combo	F_CATEGORY_COMBO_DELETE
Delete Data Element Groups	F_DATAELEMENTGROUP_DELETE
Delete Data Element Group Sets	F_DATAELEMENTGROUPSET_DELETE
Delete Data Set	F_DATASET_DELETE
Delete Data Value	F_DATAVALUE_DELETE
Delete Document	F_DOCUMENT_DELETE
Delete Excel Template	F_EXCEL_TEMPLATE_MANAGEMENT_DELETE
Delete Facility	F_FRED_DELETE
Delete Indicator	F_INDICATOR_DELETE
Delete Indicator Group	F_INDICATORGROUP_DELETE
Delete Indicator Group Sets	F_INDICATORGROUPSET_DELETE
Delete Indicator Type	F_INDICATORTYPE_DELETE
Delete Locale	F_LOCALE_DELETE
Delete Min/max rule	F_DATAELEMENT_MINMAX_DELETE
Delete Option Set	F_OPTIONSET_DELETE
Delete Organisation Unit	F_ORGANISATIONUNIT_DELETE
Delete Organisation Unit Group	F_ORGUNITGROUP_DELETE
Delete Organisation Unit Group Set	F_ORGUNITGROUPSET_DELETE
Delete Program	F_PROGRAM_DELETE
Delete Program Attribute	F_PROGRAM_ATTRIBUTE_DELETE
Delete Program Enrollment	F_PROGRAM_INSTANCE_DELETE
Delete Program Stage	F_PROGRAMSTAGE_DELETE
Delete Program Stage Section	F_PROGRAMSTAGE_SECTION_DELETE
Delete Relationship Type	F_RELATIONSHIPTYPE_DELETE
Delete Report	F_REPORT_DELETE
Delete Report Table	F_REPORTTABLE_DELETE
Delete Section	F_SECTION_DELETE
Delete SMS	F_MOBILE_DELETE_SMS
Delete SQL View	F_SQLVIEW_DELETE
Delete Tracked Entity	F_TRACKED_ENTITY_DELETE
Delete Tracked Entity Attribute	F_TRACKED_ENTITY_ATTRIBUTE_DELETE

Delete Tracked Entity Attribute Value	F_TRACKED_ENTITY_ATTRIBUTEVALUE_DELETE
Delete Tracked Entity Data Value	F_TRACKED_ENTITY_DATAVALUE_DELETE
Delete Tracked Entity Form	F_TRACKED_ENTITY_FORM_DELETE
Delete Tracked Entity Instance	F_TRACKED_ENTITY_INSTANCE_DELETE
Delete Tracked Entity Instance Comment	F_TRACKED_ENTITY_COMMENT_DELETE
Delete Tracked Entity Instance Visit	F_PROGRAM_STAGE_INSTANCE_DELETE
Delete Tracked Entity Relationship	F_RELATIONSHIP_DELETE
Delete User	F_USER_DELETE
Delete User Group	F_USERGROUP_DELETE
Delete User Role	F_USERROLE_DELETE
Delete User Within Managed Group	F_USER_DELETE_WITHIN_MANAGED_GROUP
Delete Validation Criteria	F_VALIDATIONCRITERIA_DELETE
Delete Validation Rule	F_VALIDATIONRULE_DELETE
Delete Validation Rule Group	F_VALIDATIONRULEGROUP_DELETE
Eliminate duplicate data elements	F_ELIMINATE_DUPLICATE_DATA_ELEMENTS
Excel Reporting Administration	F_EXCEL_REPORT_ADMINISTRATION
Execute SQL View	F_SQLVIEW_EXECUTE
Export Activity Plan to XLS file	F_ACTIVITY_PLAN_EXPORT
Export data	F_EXPORT_DATA
Export events	F_EXPORT_EVENTS
Export meta-Data	F_METADATA_EXPORT
Generate Activity Plans	F_GENERATE_ACTIVITY_PLANS
Generate min-max values	F_GENERATE_MIN_MAX_VALUES
Generate Program Statistics Report	F_GENERATE_STATISTICAL_PROGRAM_REPORT
Generate Program Summary Report	F_GENERATE_PROGRAM_SUMMARY_REPORT
Generate Tracked Entity Tabular report	F_GENERATE_BENEFICIARY_TABULAR_REPORT
Import data	F_IMPORT_DATA
Import events	F_IMPORT_EVENTS
Import from other systems	F_IMPORT_OTHER_SYSTEMS
Import GML	F_IMPORT_GML
Import meta-Data	F_METADATA_IMPORT
Insert custom Java script and CSS	F_INSERT_CUSTOM_JS_CSS
List Excel Template	F_EXCEL_TEMPLATE_MANAGEMENT_LIST
List Tracked Entity Instance	F_TRACKED_ENTITY_INSTANCE_LIST
List User Groups	F_USERGROUP_LIST
List User Roles	F_USERROLE_LIST
Load event reminder messages	F_PROGRAM_STAGE_INSTANCE_REMINDER
Load Tracked Entity Instance History	F_TRACKED_ENTITY_INSTANCE_HISTORY
Lock Data Set	F_DATASET_LOCK
Manage integration routes	F_MANAGE_INTEGRATION_ROUTES

Manage Program Indicators	F_PROGRAM_INDICATOR_MANAGEMENT
Manage Program Rule	F_PROGRAM_RULE_MANAGEMENT
Manage Tracked Entities	F_TRACKED_ENTITY_MANAGEMENT
Manage Tracked Entity Instance Reminders	F_TRACKED_ENTITY_INSTANCE_REMINDER_MANAGEMEN
Map External Access	F_MAP_EXTERNAL
Merge organisation units	F_MERGE_ORGANISATION_UNITS
Move Organisation Unit	F_ORGANISATIONUNIT_MOVE
Multiple Individual Data Entry	F_NAME_BASED_DATA_ENTRY
Option Set Management	F_OPTIONSET_MANAGEMENT
Organisation Unit Registration	F_ORGANISATION_REGISTRATION
Perform maintenance tasks	F_PERFORM_MAINTENANCE
Program Enrollment	F_PROGRAM_ENROLLMENT
Program Event Management	F_PROGRAM_INSTANCE_MANAGEMENT
Program Stage Section Management	F_PROGRAMSTAGE_SECTION_MANAGEMENT
Program Tracking Management	F_PROGRAM_TRACKING_MANAGEMENT
Program Un-enrollment	F_PROGRAM_UNENROLLMENT
Prune organisation units	F_PRUNE_ORGANISATION_UNITS
Remove Empty Tracked Entity Events	F_TRACKED_ENTITY_REMOVE_EMPTY_EVENTS
Rename Excel Template file	F_EXCEL_TEMPLATE_MANAGEMENT_RENAME
Report Table External Access	F_REPORTTABLE_EXTERNAL
Run validation	F_RUN_VALIDATION
Scheduling Administration	F_SCHEDULING_ADMIN
Scheduling case aggregate query builder	F_SCHEDULING_CASE_AGGREGATE_QUERY_BUILDER
Scheduling send messages	F_SCHEDULING_SEND_MESSAGE
Search Activity Plan	F_ACTIVITY_PLAN
Search events without registration	F_PROGRAM_STAGE_INSTANCE_SEARCH
Search events with registration	F_PROGRAM_TRACKING_SEARCH
Search Tracked Entity Instance	F_TRACKED_ENTITY_INSTANCE_SEARCH
Search Tracked Entity Instance in All Org Units	F_TRACKED_ENTITY_INSTANCE_SEARCH_IN_ALL_ORGUN
See API Module	M_dhis-web-api
See Apps Maintenance module	M_dhis-web-maintenance-appmanager
See Browser Cache Cleaner module	M_dhis-web-cache-cleaner
See Dashboard integration module	M_dhis-web-dashboard-integration
See Dashboard module	M_dhis-web-dashboard
See Data Administration module	M_dhis-web-maintenance-dataadmin
See Data Elements and Indicators Maintenance module	M_dhis-web-maintenance-datadictionary
See Data Entry module	M_dhis-web-dataentry
See Data Mart module	M_dhis-web-datamart
See Data Set Maintenance module	M_dhis-web-maintenance-dataset

See Data Visualizer module	M_dhis-web-visualizer
See Event Capture module	M_dhis-web-event-capture
See Event Reports module	M_dhis-web-event-reports
See Event Visualizer module	M_dhis-web-event-visualizer
See Excel Report module	M_dhis-web-excel-reporting
See Export Data Mart Module	M_dhis-web-exportdatamart
See FRED API Module	M_dhis-web-api-fred
See GIS module	M_dhis-web-gis
See GIS module	M_dhis-web-mapping
See Import-Export module	M_dhis-web-importexport
See Individual Records	M_dhis-web-caseentry
See Light module	M_dhis-web-light
See Line-listing DataEntry module	M_dhis-web-dataentry-national
See Mobile Maintenance module	M_dhis-web-maintenance-mobile
See NRHM Reports module	M_dhis-web-reports
See Organisation Unit Maintenance module	M_dhis-web-maintenance-organisationunit
See Pivot Table module	M_dhis-web-pivot
See Report module	M_dhis-web-reporting
See Settings Maintenance module	M_dhis-web-maintenance-settings
See Smartphone module	M_dhis-web-mobile
See SMS module	M_dhis-web-sms
See Tracked Entity And Programs module	M_dhis-web-maintenance-program
See Tracker Capture module	M_dhis-web-tracker-capture
See User Maintenance module	M_dhis-web-maintenance-user
See Validation Analysis module	M_dhis-web-validationrule-local-in
See Validation Rule module	M_dhis-web-validationrule
Send message	F_SEND_MESSAGE
Send SMS	F_MOBILE_SENDSMS
Set mobile settings	F_MOBILE_SETTINGS
Single Event Without Registration Data Entry	F_ANONYMOUS_DATA_ENTRY
Single Event With Registration Data Entry	F_SINGLE_EVENT_DATA_ENTRY
Sql View External Access	F_SQLVIEW_EXTERNAL
Sql View Management	F_SQLVIEW_MANAGEMENT
Tracked Entity Aggregation	F_TRACKED_ENTITY_AGGREGATION
Tracked Entity Form Management	F_TRACKED_ENTITY_FORM_MANAGEMENT
Tracked Entity Instance Dashboard	F_TRACKED_ENTITY_INSTANCE_DASHBOARD
Tracked Entity Instance Management	F_TRACKED_ENTITY_INSTANCE_MANAGEMENT
Tracked Entity Relationship Management	F_RELATIONSHIP_MANAGEMENT
Update Facility	F_FRED_UPDATE
Update Organisation Unit Level	F_ORGANISATIONUNITLEVEL_UPDATE

Update Program Rule	F_PROGRAM_RULE_UPDATE
Update Relationship Type	F_RELATIONSHIPTYPE_UPDATE
Update Tracked Entities	F_TRACKED_ENTITY_UPDATE
Update Tracked Entity Attribute	F_TRACKED_ENTITY_ATTRIBUTE_EDIT
Upload Excel Template	F_EXCEL_TEMPLATE_MAMAGEMENT_UPLOAD
View and Search Tracked Entity Attributes and Identifiers	F_ACCESS_TRACKED_ENTITY_ATTRIBUTES
View data browser	F_VIEW_DATABROWSER
View Program Stage Completeness Report	F_PROGRAM_STAGE_COMPLETENESS
View program tracking	F_PROGRAM_TRACKING_LIST
View Report	F_REPORT_VIEW
View Tracked Entity Attribute	F_TRACKED_ENTITY_ATTRIBUTE_VIEW
View unapproved data	F_VIEW_UNAPPROVED_DATA
View User	F_USER_VIEW
View User Group Managing Relationships	F_USERGROUP_MANAGING_RELATIONSHIPS_VIEW
View User Within Managed Group	F_USER_VIEW_WITHIN_MANAGED_GROUP

Appendix B. System settings

B.1. General settings

Table B.1. General settings

Setting	Description
Maximum number of analytics records	Increase this number to provide more records from the analytics. The default value is 50,000. **Warning** Use the setting **Unlimited** carefully, it might result in a very high load on your server.
Infrastructural indicators	Defines an indicator group where the member indicators should describe data about the organisation units' infrastructure. You can view the infrastructural data in the **GIS** app: right-click a facility and click **Show information**.
Infrastructural data elements	Defines a data element group where the member data elements should describe data about the organisation units' infrastructure. **Example B.1.** Infrastructural data elements can be population, doctors, beds, Internet connectivity and climate. You can view the infrastructural data in the **GIS** app: right-click a facility and click **Show information**.
Infrastructural period type	Sets the frequency for which the data elements in the infrastructural data elements group are captured. This will typically be yearly. When viewing the infrastructural data you will be able to select the time period of the data source. You can view the infrastructural data in the **GIS** app: right-click a facility and click **Show information**.
Default relative period for analysis	Setting this value will determine which relative period is selected as the default in the analytics apps.
Feedback recipients	Defines a user group where the members will receive all messages sent via the feedback function in the **Dashboard** app.

Setting	Description
	This will typically be members of the super user team who are able to support and answer questions coming from end-users.
Max offline organisation unit levels	Defines how many levels in the organisation unit hierarchy will be available offline in the organisation unit tree widget. Under normal circumstances you can leave this on the lowest level, which is default is the default setting. It can be useful to set it to a higher level to reduce initial load time in cases where you have a large number of organisation units, typically more than 30 000.
Data analysis std dev factor	Sets the number of standard deviations used in the outlier analysis performed on the captured data in the **Data Entry** app. The default value is 2. A high value will catch less outlier values than a low value.
Phone number area code	The area code for the area in which your deployment is located. Used for sending and receiving SMS. Typically, this is a country code. **Example B.2.** *+260* (country code for Zambia)
Enable multi-organisation unit forms	Enables support to enter data forms for multiple organisation units at the same time in the **Data Entry** app. If you've enabled this setting, you can in the **Data Entry** app, click on the parent organisation unit for the children that you want to enter data for, and the data set list will include data sets that are assigned to the children of that parent.
Acceptance required before approval	When this setting is selected, acceptance of data will be required first before submission to the next approval level is possible.

B.2. Analytics settings

Table B.2. Analytics settings

Setting	Description
Default relative period for analysis	Defines the relative period to use by default in analytics app: **Data Visualizer**, **Event Reports**, **Event Visualizer**, **GIS** and **Pivot Table** apps. The relative period will be

Setting	Description
	automatically selected when you open these apps. Recommended setting: the most commonly used relative period among your users.
Financial year relative start month	Defines which month (April, July or October) the the relative financial year in the analytics apps should begin on.
Cacheability	Sets whether analytics data responses should be served with public or private visibility. **Private**: Any node or server between the DHIS2 server and the end user which has the ability to cache can NOT cache the web page. This is useful if the page served can or do contain sensitive information. This means that each time you want a web page, either you get a new page from the DHIS2 server, or the DHIS2 server caches the page. No other server than the DHIS2 server are allowed to cache the page. **Public**: Any node or server between the DHIS2 server and the end user which has the ability to cache can cache the web page. This relives the traffic to the DHIS2 server and potentially speeds up the subsequent page loading speed.
Cache strategy	Decides for how long reports analytics responses should be cached. If you use the scheduled, nightly analytics update, select **Cache until 6 AM tomorrow**. This is because data in reports change at that time, and you can safely cache data up to the moment when the analytics tables are updated. If you are loading data continuously into the analytics tables, select **No cache**.
Max number of years to hide unapproved data in analytics	Sets whether and for how long back in time analytics should respect the approval level of the data. Typically, data which is several years old would be considered to be approved by default. In order to speed up analytics requests, you can choose to ignore the actual approval level of historical data. **Never check approval**: no data will be hidden, irrespective of its data approval status. **Check approval for all data**: approval status will always be checked.

Setting	Description
	Other options, for example **Last 3 years**: approval status will be checked for data which is newer than 3 years old; older data will not be checked.
Threshold for analytics data caching	Sets whether to enable caching data older than the specified number of years only. This allows for returning the most recent data directly with no caching, while serving cached version of older data for performance concerns.
Respect category option start and end date in analytics table export	This setting constrols whether analytics should filter data which is assocciated with a category option with a start and end date, but which is not associated with a period within the category options interval of validity.
Put analytics in maintenance mode	Places the analytics and web API of DHIS2 in maintenance mode. This means that "503 Service Unavailable" will be returned for all requests. This is useful when you need to perform maintenance on the server, for example rebuilding indexes while the server is running in production, in order to reduce load and more efficiently carry out the maintenance.

B.3. Server settings

Table B.3. Server settings

Setting	Description
Number of database server CPUs	Sets the number of CPU cores of your database server. This allows the system to perform optimally when the database is hosted on a different server than the application server, since analytics in DHIS2 scales linearly with the number of available cores.
System notifications email address	Defines the email address which will receive system notifications. Notifications about failures in processes such as analytics table generation will be sent here. This is useful for application monitoring.
Server base URL	Defines the full, externally accessible base URL for your server.

Setting	Description
	The URL is used to provide links to your server from external locations such as emails sent from the system. **Note** If you don't specify a server base URL, emails sent from the DHIS2 messaging system will not contain a reply link. **Example B.3.** *https://apps.dhis2.org/demo* is the server base URL for the DHIS2 demo server.
Google Analytics (Universal Analytics) key	Sets the Google UA key to provide usage analytics for your DHIS2 instance through the Google Analytics platform. It should be noted that currently, not all apps in DHIS2 support Google Analytics, so certain activity of your users may not appear in this platform. You can read more about Google Analytics at http://google.com/analytics.

B.4. Appearance settings

Table B.4. Appearance settings

Setting	Description
Select language	Sets the language for which you can then enter translations of the following settings: • **Application introduction** • **Application title** • **Application notification** • **Application left-side footer** • **Application right-side footer**
Application title	Sets the application title on the top menu.
Application introduction	Sets an introduction of the system which will be visible on the top-left part of the login page.
Application notification	Sets a notification which will be visible on the front page under the login area.
Application left-side footer	Sets a text in the left-side footer area of the login page.
Application right-side footer	Sets a text in the right-side footer area of the login page.
Style	Sets the style (look-and-feel) of the system. The user can override this setting in the **Settings** app: **User settings** > **Style**.

Setting	Description
	Note Due to technical reasons, it's not possible to change the color of the newest version of the header bar. The apps with the newest header bar will retain the blue header bar.
Start page	Sets the page or app which the user will be redirected to after log in. Recommended setting: the **Dashboard** app.
Help page link	Defines the URL which users will see when they click **Profile** >**Help**.
Flag	Sets the flag which is displayed in the left menu of the **Dashboard** app.
Interface language	Sets the language used in the user interface. The user can override this setting in the **Settings** app: **User settings** > **Interface language**.
Database language	Sets the language used in the database. The user can override this setting in the **Settings** app: **User settings** > **Database language**.
Property to display in analysis modules	Sets whether you want to display the metadata objects' names or short names in the analytics apps: **Data Visualizer**, **Event Reports**, **Event Visualizer**, **GIS** and **Pivot Table** apps. The user can override this setting in the **Settings** app: **User settings** > **Property to display in analysis modules**.
Default digit group separator to display in analysis modules	Sets the default digit group separator in the analytics apps: **Data Visualizer**, **Event Reports**, **Event Visualizer**, **GIS** and **Pivot Table** apps.
Require authority to add to view object lists	If you select this option, you'll hide menu and index page items and links to lists of objects if the current user doesn't have the authority to create the type of objects (privately or publicly).
Custom login page logo	Select this option and upload an image to add your logo to the login page.
Custom top menu logo	Select this option and upload an image to add your logo to the left in the top menu.

B.5. Email settings

Table B.5. Email settings

Setting	Description
Host name	Sets the host name of the SMTP server. **Example B.4.** When you use Google SMTP services, the host name should be *smtp.gmail.com*.
Port	Sets the port to connect to the SMTP server.
User name	The user name of the user account with the SMTP server. **Example B.5.** mail@dhis2.org
Password	The password of the user account with the SMTP server.
TLS	Select this option if the SMPT server requires TLS for connections.
Email sender	The email address to use as sender when sending out emails.
Send me a test email	Sends a test email to the current user logged into DHIS2.

B.6. Messaging settings

Table B.6.

Setting	Description
Enable message email notifications	Defines whether DHIS 2 user messages should be delivered to the email address associated with the user by default. This setting can be overridden by user settings.
Enable message SMS notifications	Defines whether DHIS 2 user messages should be delivered as SMS to the mobile phone number associated with the user by default. This setting can be overridden by user settings.

B.7. Access settings

Table B.7. Access settings

Setting	Description
Self registration account user role	Defines which user role should be given to self-registered user accounts. To enable self-registration of users: select any user role from the list. A link to the self-

Setting	Description
	registration form will be displayed on the login page. **Note** To enable self-registration, you must also select a **Self registration account organisation unit**. To disable self-registration of users: select **Disable self registration**.
Self registration account organisation unit	Defines which organisation unit should be associated with self-registered users. **Note** To enable self-registration, you must also select a **Self registration account user role**.
Do not require reCAPTCHA for self registration	Defines whether you want to use reCAPTCHA for user self-registration. This is enabled by default.
Enable user account recovery	Defines whether users can restore their own passwords. When this setting is enabled, a link to the account recovery form will be displayed on the front page. **Note** User account recovery requires that you have configured email settings (SMTP).
Lock user account temporarily after multiple failed login attempts	Defines whether the system should lock user accounts after five successive failed login attempts over a timespan of 15 minutes. The account will be locked for 15 minutes, then the user can attempt to log in again.
Allow users to grant own user roles	Defines whether users can grant user roles which they have themselves to others when creating new users.
Allow assigning object to related objects during add or update	Defines whether users should be allowed to assign an object to a related object when they create or edit metadata objects. **Example B.6.** You can allow users to assign an organisation unit to data sets and organisation unit group sets when creating or editing the organisation unit.

Setting	Description
Require user account password change	Defines whether users should be forced to change their passwords every 3, 6 or 12 months. If you don't want to force users to change password, select **Never**.
Enable password expiry alerts	When set, users will receive a notification when their password is about to expire.
Minimum characters in password	Defines the minimum number of characters users must have in their passwords. You can select 8 (default), 10, 12 or 14.
OpenID provider	Defines the OpenID provider.
OpenID provider label	Defines the label to display for the specified OpenID provider.
CORS whitelist	Whitelists a set of URLs which can access the DHIS 2 API from another domain. Each URL should be entered on separate lines. Cross-origin resource sharing (CORS) is a mechanism that allows restricted resources (e.g. javascript files) on a web page to be requested from another domain outside the domain from which the first resource was served.
Mapzen search API key	Defines the API key for the Mapzen API. This API is used to search addresses globally within DHIS 2.
Google Maps API key	Defines the API key for the Google Maps API. This is used to display maps within DHIS 2.

B.8. Calendar settings

Table B.8. Calendar settings

Setting	Description
Calendar	Defines which calendar the system will use. The system supports the following calendars: Coptic, Ethiopian, Gregorian, Islamic (Lunar Hijri), ISO 8601, Julian, Nepali, Persian (Solar Hijri) and Thai. **Note** This is a s system wide setting. It is not possible to have multiple calendars within a single DHIS2 instance.
Date format	Defines which date format the system will use.

B.9. Data import settings

The data import settings apply to extra controls which can be enabled to validate aggregate data which is imported through the web API. They provide optional constraints on what should be considered a conflict during import. The constraints are applied to each individual data value in the import.

Table B.9. Data import settings

Setting	Description
Require periods to match period type of data set	Require period of data value to be of the same period type as the data sets for which the data element of data value is assigned to.
Require category option combos to match category combo of data element	Require category option combination of data value to be part of the category combination of the data element of the data value.
Require organisation units to match assignment of data set	Require organisation unit of data value to be assigned to one or more of the data sets which the data element of data value is assigned to.
Require attribute option combos to match category combo of data set	Require attribute option combination of data value to be part of the category combination of the data set which the data element of data value is assigned to.
Require category option combo to be specified	Require category option combination of data value to be specified. By default it will fall back to default category option combination if not specified.
Require attribute option combo to be specified	Require attribute option combination of data value to be specified. By default it will fall back to default attribute option combination if not specified.

B.10. Synchronization settings

The following settings are used for both data and metadata synchronization.

Note

For more information about how you configure metadata synchronization, refer to Configure metadata synchronizing

Table B.10. Synchronization settings

Setting	Description
Remote server URL	Defines the URL of the remote server running DHIS2 to upload data values to. It is recommended to use of SSL/HTTPS since user name and password are sent with the request (using basic authentication).

Setting	Description
	The system will attempt to synchronize data once every minute. The system will use this setting for metadata synchronization too. **Note** To enable data and metadata synchronization, you must also enable **Data synchronization** and **Metadata synchronization** in the **Data administration** app > **Scheduling**.
Remote server user name	The user name of the DHIS2 user account on the remote server to use for data synchronization. **Note** If you've enabled metadata versioning, you must make sure that the configured user has the authority "F_METADATA_MANAGE".
Remote server password	The password of the DHIS2 user account on the remote server. The password will be stored encrypted.
Enable versioning for metadata sync	Defines whether to create versions of metadata when you synchronize metadata between central and local instances.
Don't sync metadata if DHIS versions differ	The metadata schema changes between versions of DHIS2 which could make different metadata versions incompatible. When enabled, this option will not allow metadata synchronization to occur if the central and local instance(s) have different DHIS2 versions. This apply to metadata synchronization done both via the user interface and the API. The only time it might be valuable to disable this option is when synchronizing basic entities, for example data elements, that have not changed across DHIS2 versions.
Best effort	A type of metadata version which decides how the importer on local instance(s) will handle the metadata version. *Best effort* means that if the metadata import encounters missing references (for example missing data elements on a data element group import) it ignores the errors and continues the import.

Setting	Description
Atomic	A type of metadata version which decides how the importer on local instance(s) will handle the metadata version. *Atomic* means all or nothing - the metadata import will fail if any of the references do not exist.

B.11. OAuth2 clients

You create, edit and delete OAuth2 clients in the **System Settings** app.

1. Open the **System Settings** apps and click **OAuth2 clients**.
2. Click the add button.
3. Enter **Name**, **Client ID** and **Client secret**.
4. Select **Grant types**.

Grant type	Description
Password	TBA
Refresh token	TBA
Authorization code	TBA

5. Enter **Redirect URIs**. If you've multiple URIs, separate them with a line.

DHIS2 Glossary

A

Aggregation

In the context of DHIS2, aggregation refers to how data elements are combined within a particular hierarchical relationship. As an example, all the health facilities in a particular district would contribute to the total value for the particular district in question. Different aggregation operators are supported within DHIS2, such as SUM, AVERAGE, and COUNT.

Ananlytics

Analytics refers to the process which processes and prepares data which has been entered into DHIS2 into a format which is more suitable for retreiving indicators and aggregated data. When data is entered into DHIS2, it is stored in a format which is optimized for writing the data. However, when data needs to be processed into indicators or aggregated (e.g from months to quarters), it is more efficent to transform and store this data in a different format which is optimized for read-only operations. The analytics system of DHIS2 is used extensively by the anaytics apps (GIS, Pivot Table, Event reports, etc).

It is important to keep in mind that because the data which has been entered into DHIS2 must be processed into the analytics format, the data which appears in the analytics apps only represents the data which was present in the system the last time analytics was run. If data has been entered after that, analytics will need to be run again for this data to appear in the analytics apps.

Aggregate data

In the context of DHIS2, aggregate data refers to either data elements or indicators that have been derived from other hierarchical data sources. For instance, aggregate facility data would result from the aggregate totals of all patients that have attended that facility for a particular service. Aggregate district data would result from the aggregate totals of all facilities contained with a particular district.

Application programming interface

An application programming interface is a specification of how different software components should interact with each other. The DHIS2 API (or WebAPI) can be used to interface DHIS2 with other software, to build reports or custom data entry forms.

Approvals

Approvals can be used to control the visibility and editibility of data. When data is submitted from the lowest reporting level, it can be approved by the next higher level. This approval has two effects:

1. Data is no longer able to be edited in the data entry screens at the lower level.
2. Depending on the system settings which have been enabled, the data will become visibile at the approval level.

As an example, data is entered at the facility level, and the submitted for approval. Once the data has been approved at the district level, the data will become locked in the data entry screens for the facility level. It will also become visible in the analytics apps to district users.

B

Bi-monthly	Refers to a two-month period, such as January 1st to February 28th.

C

Category	Categories are groups of category options. The are used in combinations to disaggregate data elements. Categories are typically a single type of concept, such as "Age" or "Gender".
Category combinations	Category combinations are used to disaggregate data elements. As an example, the data element "Number of confirmed cases of malaria" could be disaggregated subdivided into to categories: "Age" and "Gender". In turn each of these categories, would consist of several category options, such as "Male" and "Female" for the gender category. Category combinations may consist of one or several categories.
Category combination options	Category combination options are dynamically composed of all of the different combinations of category options which compose a category combination. As an example, two categories "Gender" and "Age", might have options such as "Male"/"Female" and "<5 years"/">5 years". The category combination options would then consist of: (Male/<5 years) (Male/>5 years) (Female/<5 years) (Female/>5 years)
Category option	Category options are atomic elements that are grouped into categories.
Comma separated values	Comma separated values are series of tabular data stored in a plain-text format. They are commonly used with DHIS2 to export and import data values.

D

Data dictionary	A collection of data elements and indicators, which can be exchanged with other DHIS2 systems. Typically used to define a set of data elements and indicators when setting up the DHIS2 system.
Data exchange format	In the context of DHIS2, the "data exchange format" refers to a XML schema that enables the transportation of data and meta-data between disconnected DHIS2 instances, as well as between different applications that support the DXF schema.
Datamart	A set of database tables in DHIS2 that contains processed data elements and indicator values that is generated based on aggregation rules and calculated data element and indicator formulae. Datamart tables are used for analysis and report production. Typically, users should not work directly with unaggregated data values, but rather with values that have resulted from a datamart export for analysis.
Data element	A data element is the fundamental building block of DHIS2. It is an atomic unit of data with well-defined meaning. Essentially it is a data value that has been actually observed or recorded which is further

characterized by a number of dimensions. As an example the data element "Number of fully immunized children" would refer to the number of children that received this particular service. Data elements are always linked to a period as well as an organizational unit. They optionally may be linked to other dimensions.

Data element group — Data element groups are used to categorize multiple data elements according to a common theme, such as "Immunization" or "ART". Typically, they are used during reporting and analysis to allow related data elements to be analyzed together.

Data element group sets — Data element groups are used to categorize multiple data element groups into a common theme.

Dimension — A dimension is used to categorize data elements during analysis. Dimensions provide a mechanism to group and filter data based on common characteristics. Typically, related data elements may be aggregated or filtered during analysis with the use of dimensions. Dimensions may be a member of a hierarchy. For instance the "Period" dimension may be broken down into "Day->Month->Quarter->Year".

DXF — See Data exchange format.

H

Health management information system — Typically, an electronic database system that is used to record aggregated data on service delivery, disease incidence, human resource data and other information used to evaluate the performance of delivery of health services. Typically, an HMIS does not contain the highly detailed data of electronic medical record systems or individual patient data.

I

Indicator — The divisor of an indicator. Can be composed of multiple data elements with the use of an indicator formula.

$$indicator = \frac{numerator}{denominator} \quad (1)$$

This is obviously a very generalized example. The numerator and indicator themselves can be composed of various data elements, factors, and the four basic operands (addition, multiplication, division and subtraction).

N

Numerator — The dividend of a indicator. Can be composed of multiple data elements and factors with the use of indicator formulas.

O

Organisational unit — An organisational unit is usually a geographical unit, which exists within a hierarchy. As an example, in the United States, "Georgia"

	would be considered an organisational unit with in the orgunit level of "State". Organizational units can also be used to specify an administrative unit, such as a ward within a hospital. The organisational unit dimension specifies essentially "where" a particular data value occurs.
Organisational unit level	Refers to a level within an organizational hierarchy. Typically, countries are administered at different levels, such as 1) Country 2) States 3) Counties 4) Health facilities. In the context of DHIS2, health facilities typically are the lowest orgunit level. Data is aggregated upwards from the lowest orgunit level to the highest.

P

Period	A period is a specific time interval which consists of a start date and end date. For instance "January 2011" would refer to the time interval of January 1st 2011-January 31st 2011.

U

Unique identifier	A unique identifier (UID) is a semi-random series of letters and numbers used by DHIS2 to identify specific resources. UIDs begin with a letter, and are followed by exactly 10 letters or digits.

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