future health index 2017

Care that delivers

How can global health systems use digital technology to help prepare for the future?

The Future Health Index is commissioned by Philips

Contents

Thanks and acknowledgements

This report was written by New Narrative Ltd with the research conducted by IPSOS, Schlesinger, and Braun.

We would also like to take this opportunity to thank those who have been involved in developing the research and interviewed for the report.

International expert advisory panel

To inform the 2017 research, including questionnaire development and analysis, in-depth feedback sessions were conducted with the following:

- Dr Rebecca Flyckt, board-certified OB/GYN with subspecialty board certification in Reproductive Endocrinology and Infertility
- Dr Matt Kalaycio, Chairman of the Department of Hematologic Oncology and Blood Disorders, Cleveland Clinic Taussig Cancer Institute
- Mr Michael Kessel, President and CEO, Cleveland Clinic Canada
- Angela Kiska, Director, Media Relations, Cleveland Clinic
- Dr Steve Nissen, Chairman of the Robert and Suzanne Tomsich Department of Cardiovascular Medicine, Cleveland Clinic Sydell and Arnold Miller Family Heart & Vascular Institute
- Sara Riggare, PhD student in Selfcare for Parkinson's Disease at Health Informatics Centre, Karolinska Institutet, Stockholm, Sweden
- Eileen Sheil, Senior Director, Public & Media Relations, Corporate Communications, Cleveland Clinic
- Dr Khalil Sivjee, Medical Director (Respirologist), Cleveland Clinic Canada

Experts interviewed

We also conducted a number of interviews with key opinion leaders through January to March, 2017.

- Arnaud Bernaert, Head of Global Health and Healthcare Industries, Member of the Executive Committee, World Economic Forum
- Dave deBronkart 'e-Patient Dave', Chair Emeritus of the Society for Participatory Medicine
- Patricia N Mechael, PhD MHS, Principal and Policy Lead at HealthEnabled and Executive Vice President at the Personal Connected Health Alliance, HIMSS
- Dr Pablo Perel, MD MSc PhD, Associate Professor, London School of Hygiene & Tropical Medicine and Senior Advisor at World Heart Foundation
- Paul Sonnier, Founder of the Digital Health group on LinkedIn
- Simon Spurr, co-founder and director of South Africa-based HealthCloud
- Leonard Witkamp, Professor at Academic Medical Center and CEO of KSYOS TeleMedical Center.

Foreword

To construct the health ecosystem of the future, we must first listen to the main users of this system – people and healthcare professionals – and understand their expectations and experiences. Second, we must investigate how technology is already transforming lives in different health systems around the world and how it can empower society even further.

This is the Future Health Index, a comprehensive record of where we are on the road to better health outcomes achieved at lower cost and how we are progressing to meet future healthcare needs. Where is connectivity having most benefit and where does it need further investment to prevent or treat illness to ease the burden on healthcare systems? The Future Health Index provides a platform for discussing where governments and businesses should concentrate resources to enable a revolution in the way healthcare is being delivered and experienced.

This is the second annual in-depth study, the result of surveys and interviews with more than 33,000 healthcare professionals, insurers and members of the public across 19 countries and five continents.

Empowerment is one of the Index's key themes. Professionals and people agree that digital technology can and must provide people with more control to manage their own health and health providers with tools to improve care delivery. Integration of health systems allowing people and doctors to work closer together for continuous care between hospital and home is key. This is especially true as populations live longer and lifestyle-related diseases are on the rise, while healthcare-related cost increases create a compelling need for systemic efficiencies.

The Future Health Index also points to concerning discrepancies as to how swiftly such a consumer-centric transformation is being made. Siloes persist.

Better incentives and more powerful partnerships need to be put in place. A more robust measurement framework must be engineered. And more training and awareness programs need to be introduced for healthcare professionals and the general population to fully embrace and engage with an always-on digital health environment.

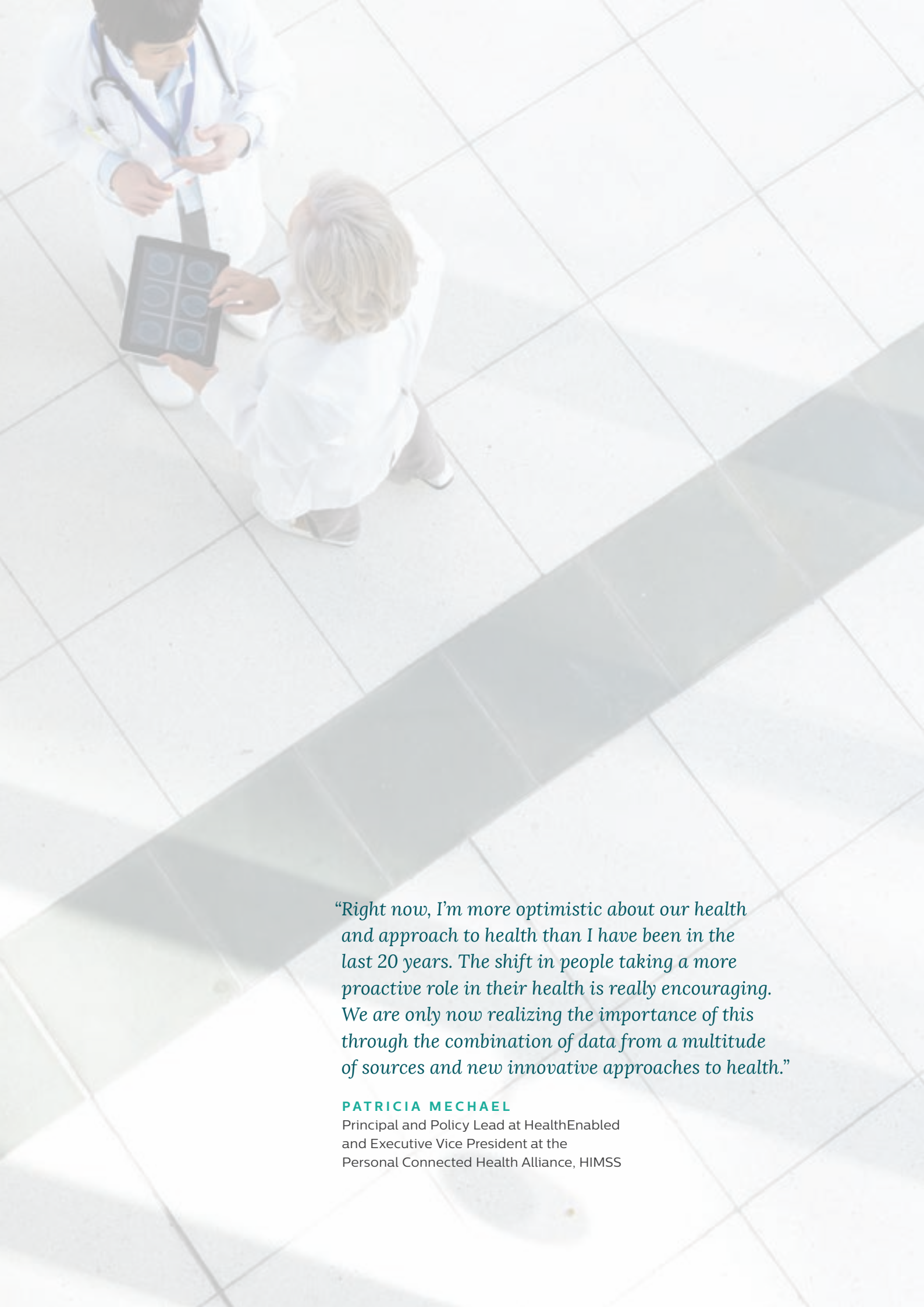
Looking to this future, the report also explores innovative projects and partnerships. These examples span the fields of telehealth, remote monitoring and digital workflows, where exciting new ground is being broken.

Alongside these case studies, the Future Health Index explores how people's perceptions match the realities of healthcare. If we are to reshape the future, it is vital to address gaps between what exists and what is desired. And to better understand how to deliver the right information and tools, in the right time and place, to maximize impact in health experiences and outcomes.

Creating a healthcare system fit for the 21st century is an undeniably complicated process and we hope that the 2017 Future Health Index research provides inspiring insights on our common journey. It is a report that both increases our level of understanding about where society is and points to better, more sustainable solutions that will ultimately yield better health and well-being for all.

JAN KIMPEN
Chief Medical Officer, Philips

PATRICIA MECHAEL
Principal and Policy Lead at HealthEnabled and Executive Vice President at the Personal Connected Health Alliance, HIMSS



"Right now, I'm more optimistic about our health and approach to health than I have been in the last 20 years. The shift in people taking a more proactive role in their health is really encouraging. We are only now realizing the importance of this through the combination of data from a multitude of sources and new innovative approaches to health."

PATRICIA MECHAEL
Principal and Policy Lead at HealthEnabled
and Executive Vice President at the
Personal Connected Health Alliance, HIMSS

Executive **summary**

Aging populations, higher levels of chronic diseases and the escalating cost of care are combining to create an enormous challenge for societies globally. Around the world, governments, businesses and individuals are grappling with the question; how can populations live well across the full health continuum – day-to-day healthy living, prevention, diagnosis, treatment and home care?

The Future Health Index seeks to fuel and further this discussion. Now in its second year, the research determines the readiness of 19 countries to address these most pressing health challenges. It does this by measuring the perceptions and experiences of the key users of healthcare systems – healthcare professionals and the general population – across:

1. **Access to care**
2. **Integration of health systems**
3. **Adoption of connected care technology.**

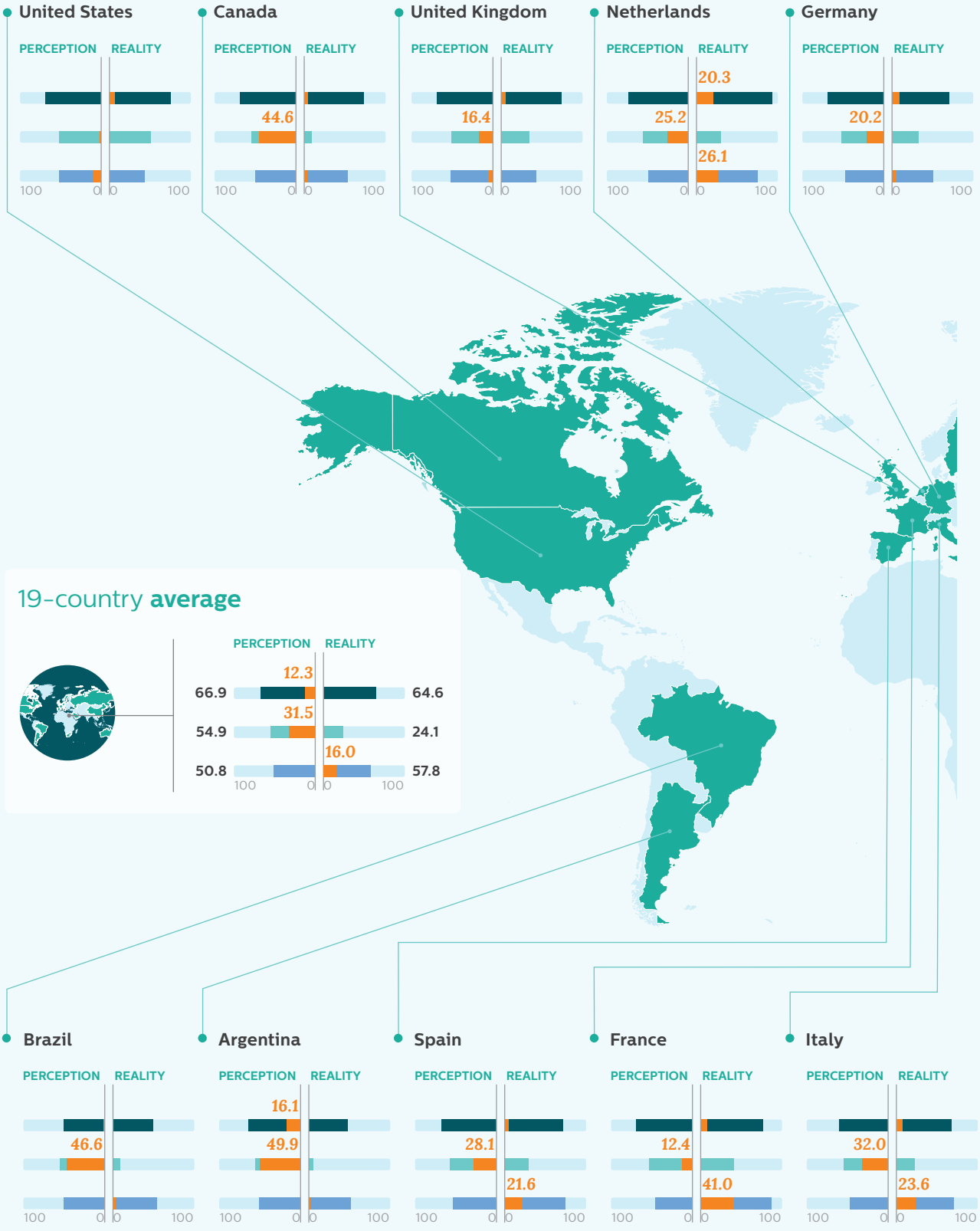
This year, these perceptions are juxtaposed with third-party data revealing the realities of health systems in each country in the same areas. Comparing with reality quickly highlights gaps between what healthcare professionals and citizens perceive, and what health systems are actually doing to evolve. This in turn points to areas where systems are (or are about to be) out- or underperforming; flourishing or under duress.

The research has also been extended to produce, for each country, an efficiency ratio that uses third-party data to compare healthcare expenditure with health outcomes such as maternal mortality rates and life expectancy, providing a snapshot of how healthcare spending is ultimately impacting the health of citizens[1].

By analyzing the current realities of healthcare in each country, as well as the views of healthcare professionals and the general public, the research provides insights into each country's progress on the path towards a future-ready healthcare system. The Future Health Index makes it clear that shifting the focus from treatment to prevention and empowering both the general public and professionals to take a more active role in managing health are both critical to bridging the gaps that afflict health systems, and moving towards the more connected form of care needed to ensure these systems will be sustainable in the future.

The Future Health Index – **investigating the perception versus reality of health systems' performance**

As a major extension to the study, this year perceptions are juxtaposed with third-party data revealing the realities of health systems in each country in the same areas. Comparing perception with reality quickly highlights gaps between what healthcare professionals and the general population experience, and what health systems are actually doing to evolve. The levels of gaps indicated on the map in turn points to areas where systems are (or are about to be) out- or underperforming; flourishing or under duress across the pillars of access, integration and adoption of connected care technology.

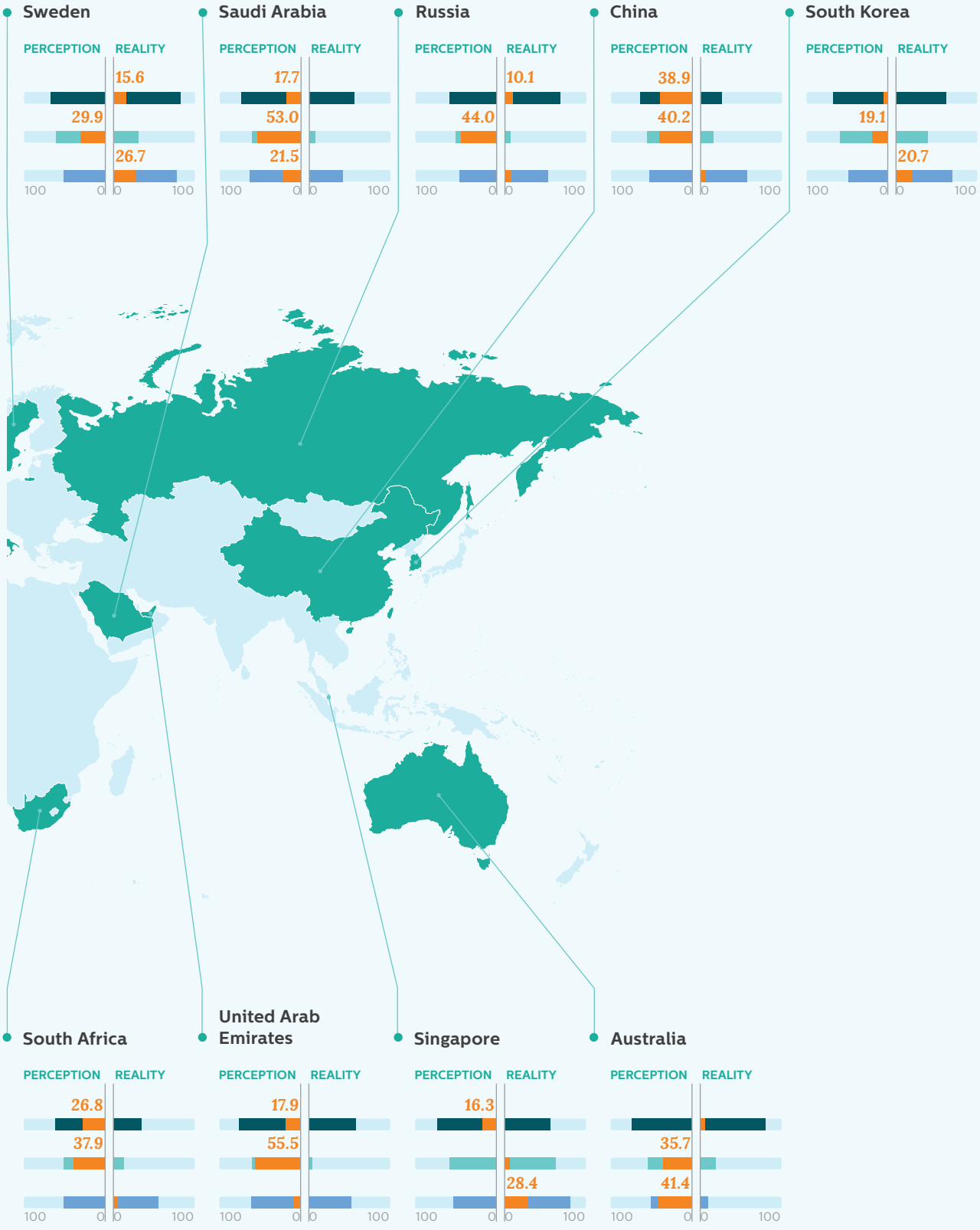


Measurement **indices**

- **Access to healthcare**
- **Integration of health systems**
- **Adoption of connected care technology**

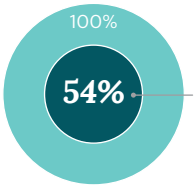
Gap

The gap placement indicates whether **perceptions or reality is highest.** Significant gaps have been highlighted with 10 points or more.



Overview of **key findings**

Populations and healthcare professionals place high levels of trust in their health systems. Better integration would further improve this.



of the general population said they trust the healthcare system in their country

Trust is **highest** among the populations in Spain (71%), France (67%), Singapore (66%), Canada (64%), Sweden (64%) and Australia (63%). This sentiment not only mirrored but is exceeded by healthcare professionals surveyed overall (72%).

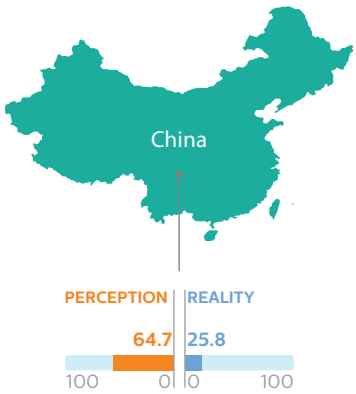
Those who see the system as more integrated are more likely to trust the system, with 79% of those who see the system as very or completely integrated trusting it, compared to just 47% of those who think the system is only somewhat or not at all integrated.

Across regions surveyed, the healthcare industry was the most trusted when it comes to personal data, with 44% of the general population saying they trust the healthcare industry most with their personal data, compared to 35% for the banking industry, 20% for the insurance industry and a mere 5% for the retail industry.

When it comes to access, integration and adoption, perceptions across stakeholders do not always align with reality – there are gaps.

The largest gaps appear between perceptions and reality when exploring the **integration** of health systems, where the reality is often less integrated than perceptions. While the general population and healthcare professionals feel that the health system is generally integrated, investments in Internet of Things technology in healthcare relating to integrated systems are a relatively low percentage of the country's GDP.

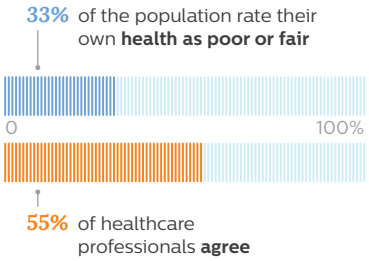
The **largest gap** in perception of access and the reality of **access** is seen in China, where perceptions far outnumber reality.



China's relatively low reality access index score is driven by the lowest skilled health professional density among the 19 countries researched (31.5 per 10,000 population) and extremely high risk of impoverishing expenditure for surgical care (52.7% of people are at risk).

The perceptions of healthcare professionals and the general population often differ in assessing the health of the population at large.

These differences are largest in **emerging markets,** where just:



For example, 32% of the population in Brazil rates their health as poor or fair, yet 91% of healthcare professionals in Brazil rate the health of the population as poor/fair. In South Africa the numbers are 19% and 67%, respectively.

To create and maintain sustainable health systems, there needs to be a shift in focus from treatment to prevention.

About half of the general population feel healthcare professionals should focus most of their time and resources overall **on preventive care** (that is, keeping the healthy well).

While a near equal amount (48%) felt the focus should be on **treating the sick.** Meanwhile, 59% of healthcare professionals say preventive care should be their focus.

About one-third (32%) of the general population do not agree they have access to medication or treatment to prevent disease.

> *"Patients may put preventive work on the side and try to focus on the actual problem, but with health there are so many organ systems, and the patient is focused on issues when the problem arises, but not when we could have done preventive work to prevent it."*
>
> **FAMILY PRACTITIONER**
> **Practiced for 10 years, Canada**

Connected care technology is seen as important for prevention, but is currently infrequently used.

Nearly three-quarters of healthcare professionals (73%) and the general population (72%) polled say connected care technology is important in **improving the prevention** of medical issues.

Yet nearly as many healthcare professionals (63%) say connected care technology was rarely or never being used when patients are healthy and have no medical conditions. The general population is slightly more optimistic about the use of connected care technology for healthy living, as 52% think it is rarely or never being used.

Overview of **key findings**

Currently, there is no consistent framework in place to reimburse and incentivize health providers towards prevention-focused healthcare.

"The key is that the early prevention won't make profit. In treatment, operations like placing stent will be profitable, while oral education on prevention won't make great financial benefit. Patients spend a lot when they get diseases."

CARDIAC SURGEON
19 years' work experience, China

"The problem is linked to human psychology; we do not want to collaborate, everyone is an egoist. Healthcare has become very commercial. The sick are like a bank note that is stolen by other hospitals"

CARDIOLOGIST
25 years' work experience, France

Both the general population and healthcare professionals have to be empowered to take a more active role in managing health.

There is a clear need to **empower the population** to feel they can take an active role in managing their own health:

24% About one-quarter of the general population feel **no ownership** at all over their medical record

23% Among those who used connected care technology in the last 12 months, about one-quarter do **not understand how to interpret the results** from the technology

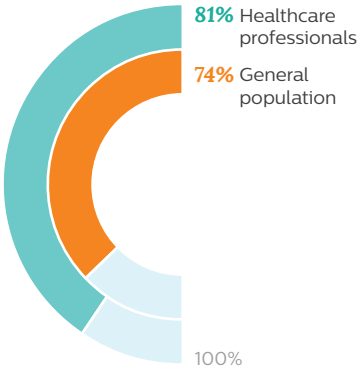
20% One-fifth of the general population say, on average, they go to a healthcare professional for a general checkup **0 times per year.**

There is room for improvement in **empowering healthcare professionals** to provide complete care to their patients:

30% Almost one-third of healthcare professionals believe accessible, secure information sharing platforms between healthcare professionals will have the most **positive impact** on citizens taking care of their health.

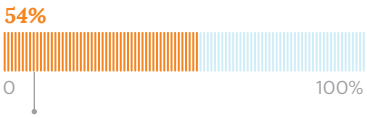
There is an immediate pay-off to be had with connected care technology in home care.

Overall, 81% of healthcare professionals and 74% of the general population surveyed say connected care technology is important to improving **home care services.**



Similarly, when asked what aspect of healthcare connected care technology can benefit the most, the highest proportion (55%) of healthcare professionals chose **home care-related** aspects, mainly in terms of improving the long-term management and tracking of medical issues.

Clearer policies and a more structured approach to the management and sharing of personal healthcare data are needed to capitalize on the opportunities such data presents.



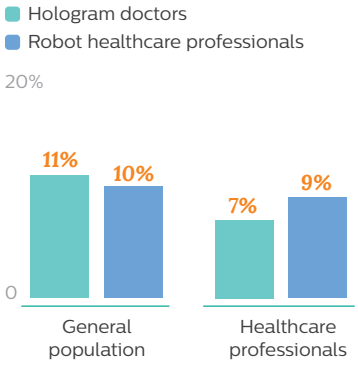
Most **healthcare professionals** (54%) think the responsibility for getting medical records from one healthcare facility to another currently lies with healthcare professionals/facilities.

However, they think this responsibility should lie with both patients and healthcare professionals/facilities (57%). Of the general population who used connected care technology to track any health indicator(s), 63% say they have shared this data or information with a healthcare professional.

Of those who have experienced a respiratory, cardiology, oncology, gynecological, or fertility health issue or recently been/currently pregnant, 32% said their medical records were automatically shared between healthcare professionals last time they went to see a doctor. Fewer, 21% said their medical records were not shared, 19% said they shared the records themselves and 17% said some sharing was automatic and some was shared by them.

People generally want connected care technology to enhance, rather than replace, the 'human touch' in healthcare.

When asked what artificial intelligence (AI) tools or technologies could have the most impact on improving healthcare, only 11% of the general population saw **potential** for remote appointments with hologram doctors and just 10% thought robot healthcare professionals would have the most **impact**. Healthcare professionals had similar views (robot healthcare professionals: 9%, hologram doctors: 7%).



Healthcare systems **under strain**

"Most health systems are not designed to deal with aging populations or the rise in non-communicable disease rates. Just keeping one person from becoming diabetic is a huge gain for a society and health system. It's individuals themselves, not just systems that have the most to gain or lose."

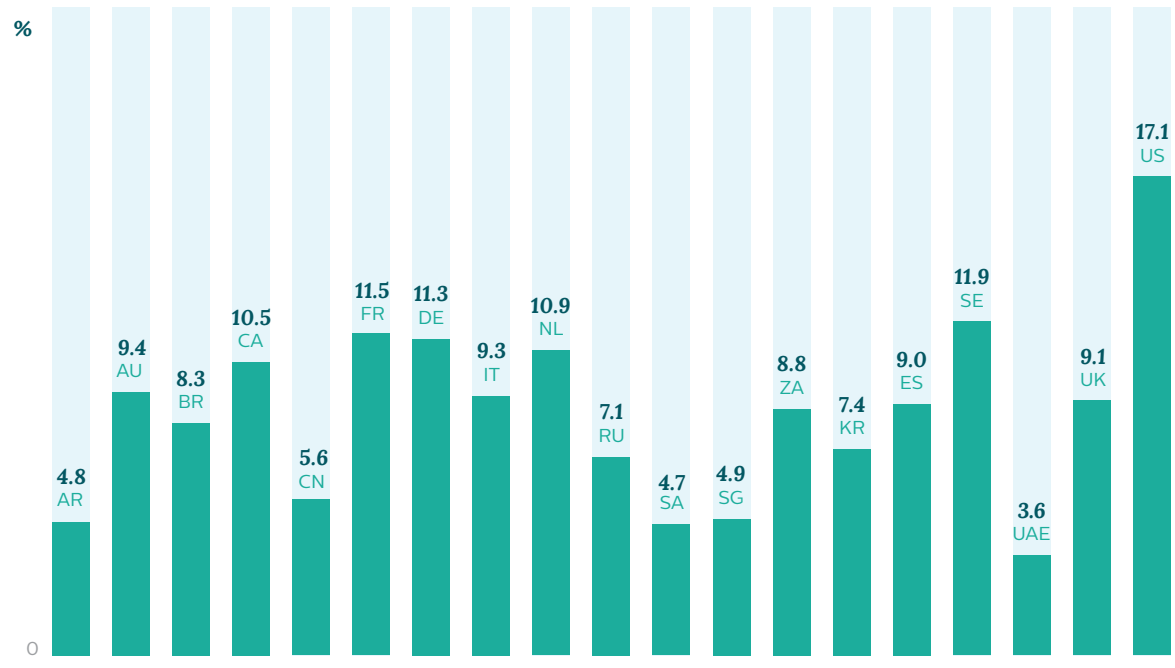
PATRICIA MECHAEL
Principal and Policy Lead at HealthEnabled and Executive Vice President at the Personal Connected Health Alliance, HIMSS

Healthcare systems **under strain**

The current pressure on healthcare systems is the inevitable result of a global population that is both rapidly expanding and aging, a process that the United Nations has called one of the "most significant social transformations of the 21st century."[2]

Advances in healthcare mean people are living longer than ever; a recent study of 35 industrialized countries projected life expectancy increases for all of them and assigned a more than 50% probability that national female life expectancy would crack the 90-year barrier by 2030.[3] Aging populations and more sedentary lifestyles mean chronic diseases such as diabetes and cancer will create much of the future healthcare burden; the World Economic Forum has estimated they will result in US$47 trillion in lost output by 2030.[4] Global healthcare spending is expected to more than double between 2013 and 2040 to over $18 trillion, yet many countries, particularly lower- and middle-income ones, will still fail to make the investments needed to achieve the health targets of the United Nations Sustainable Development Goals.[5]

Total health expenditure as a percentage of gross domestic product (GDP) by country*



* SOURCE: The World Health Organization, 2014

Mounting pressures mean systems and service models that were fit for purpose a few decades ago can no longer function as they used to. In Canada, for example, a recent survey showed wait times for 'medically necessary' treatments and procedures hit an average of 20 weeks in 2016, double the 1993 wait and the longest period ever recorded.[6] In the UK, hospital chiefs have warned underfunding and record patient numbers are bringing the National Health Service (NHS) to the edge of collapse.[7]

In emerging countries populations are generally younger but they are also faster growing, and governments are grappling with more limited resources, so systems are often in more dire straits. In China low salaries and tough working conditions have led to a severe shortage of doctors, particularly in rural areas.[8] Russia is contending with similar issues as it struggles to reform a largely Soviet-era health system.[9]

> *"The main challenge is that there are not enough medical personnel," says an oncologist from Russia with 23 years' experience. "The portion of the population that was supposed to finish school and start work in healthcare did not materialize. We had a transition to democracy (in the 1990s) and the population dropped, so we simply did not have enough people to replace older doctors."*

In Brazil, meanwhile, budget shortfalls and disease outbreaks have forced state governments to declare full-blown health system 'emergencies'.[10]

> *"At the moment we are experiencing a generalized crisis," says one nurse in Brazil with a decade of experience. "The patient demand is higher than the capacity of the hospitals. We go through a process of overcoming long waits, delays for examinations, broken equipment, every day."*

Delivering results for all

With demand rising and resources limited, efficiency – the ability to deliver maximum results at the lowest possible cost – will become increasingly vital for healthcare systems going forward. With this in mind, the Future Healthcare Index measures efficiency ratios for each country based on a comparison of healthcare expenditure (as a percentage of GDP) with health outcomes such as life expectancy, maternal mortality rates and probability of death from non-communicable diseases.

The UAE and Singapore stand out as highly efficient with ratios of 22.7 and 18.1 respectively; both manage to achieve strong to good outcomes with proportionally low spending. The least efficient country is South Africa, due primarily to lower outcomes, followed by the US, Germany, Sweden and France – all of which produce strong outcomes but spend a proportionally high amount to do so.

Before factors like quality and outcomes can even be considered, a healthcare system should be accessible, physically and financially, to all segments of the population and across the healthcare continuum – from healthy living to the prevention and treatment of diseases, and from management of chronic conditions to home-based care for the elderly.

Despite the advances made in combating poverty in recent decades, in many countries access to even the most basic health services still can't be taken for granted. A report by the World Health Organization and the World Bank found some 400 million people worldwide lack access to essential services such as family planning, antenatal care, immunization and tuberculosis treatment.[11]

Future Health Index findings show access issues are by no means confined to emerging markets. Countries with high access perception scores (that is, where survey data shows healthcare professionals and the general population perceive healthcare as accessible), include the UAE at 75.6 and Singapore at 72.6. However the 'reality' scores of the UAE and Singapore are significantly lower, at 57.7 and 56.3 respectively, due to relatively low skilled health professional density and affordability issues – in Singapore around 15% of the population would be at risk of impoverishing expenditure due to receiving surgical care, for example.

Efficiency ratio data

Rank	Country	Input Healthcare spend as a % of GDP	Outcomes Overall outcome score	Efficiency ratio (Outcomes/input on healthcare)
1	UAE (UAE)	3.6	82.6	22.7
2	Singapore (SG)	4.9	88.8	18.1
3	Saudi Arabia (SA)	4.7	73.1	15.6
4	China (CN)	5.6	76.6	13.8
5	Argentina (AR)	4.8	65.8	13.7
6	South Korea (KR)	7.4	87.9	11.9
7	Italy (IT)	9.3	91.3	9.9
8	Russia (RU)	7.1	68.2	9.6
9	UK (UK)	9.1	87.1	9.5
9	Australia (AU)	9.4	89.0	9.5
11	Spain (ES)	9.0	85.0	9.4
12	Canada (CA)	10.5	87.6	8.4
13	Netherlands (NL)	10.9	88.4	8.1
14	Brazil (BR)	8.3	65.5	7.9
15	France (FR)	11.5	89.4	7.8
16	Sweden (SE)	11.9	91.2	7.6
17	Germany (DE)	11.3	85.4	7.6
18	United States (US)	17.1	83.8	4.9
19	South Africa (ZA)	8.8	38.7	4.4
	Group average	8.7	80.3	10.5

The gaps are even wider in China, where the perception of access exceeds reality by 38.9 points, and South Africa, where perception exceeds reality by 26.8 points. In China, while, according to the government, public insurance now covers 95% of the population, millions of migrant workers are unable to tap into benefits that could save them from life-threatening conditions.[12] A study in South Africa, meanwhile, found distance remained a major obstacle to some segments of the community, particularly in rural areas, accessing healthcare services.[13]

> *"As far as availability is concerned, I think (South Africa) has got excellent healthcare facilities. However, if you look at the government sector, in most of the urban centers resources are very stretched and because of this the quality of care at primary levels is not as good," says a pulmonologist in South Africa's public healthcare system with 12 years' experience.*

In some relatively affluent countries with high access 'reality' scores, the perceptions of the general population in particular are less favorable. In Sweden, the perception of access trails the reality score by nearly 16 points. While Swedes enjoy a high density of skilled health professionals and are at virtually no risk of impoverishment from surgical care, less than half (48%) of the general population surveyed in Sweden agree they have access to treatments required for current or future medical conditions – though healthcare professionals generally did not share this view, with 77% agreeing their patients had such access.

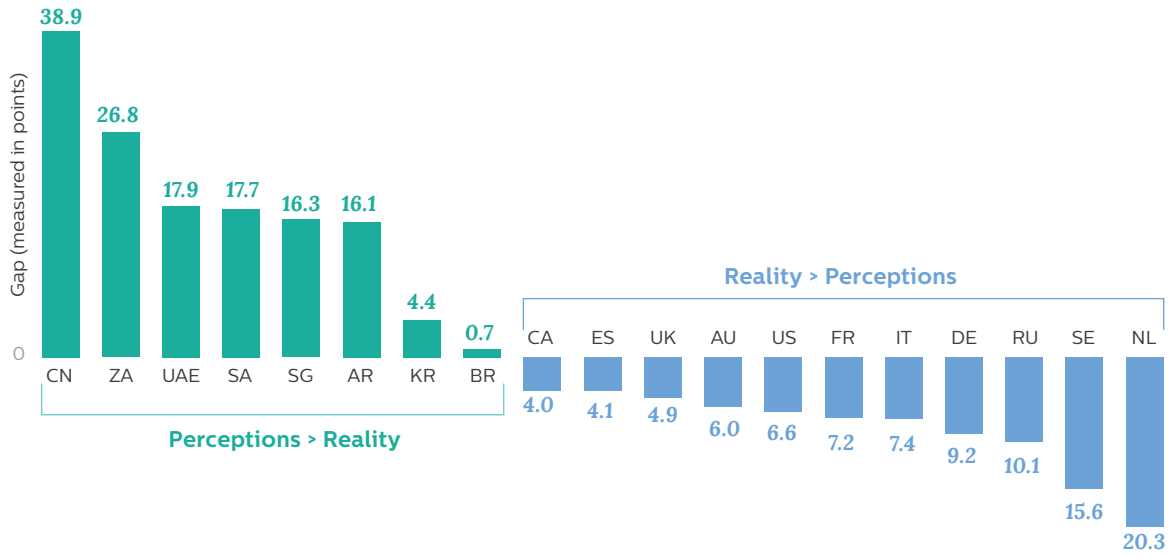
The wide (20.3 points) access reality over perception gap in the Netherlands, meanwhile, is largely due to the country having by far the highest density of skilled health professionals among the countries included in this study.

There are also examples of countries with high accessibility where the perceptions and realities of access seem relatively aligned – such as Canada (with a 4-point reality over perception gap) and the UK (4.9-point reality over perception gap). The findings show these systems are generally providing access to healthcare at the stages where care is in demand, though there is still work to be done – this is often true for the population in remote areas.

> *"Greater access to doctors remotely is really important," says a Canadian reproductive endocrinologist in a private practice with 47 years' experience. "It's a major issue for a huge country like Canada. There's a huge part of the population that is not urban."*

"(The healthcare system) works rather well, because it's hierarchical and not based on demand but rather governed by needs," says a pulmonologist with 34 years' experience in Sweden's public health sector. "All patients, no matter what background and status, proceed further through the system and eventually come to a place where they receive the right diagnosis, and hopefully treatment too."

Analysis of the gaps between perceptions and reality: 'access' to healthcare



Harnessing technology for systemic change

Ensuring access to healthcare and controlling spending while contending with rising demand is a delicate balancing act, and the best approach to future healthcare is being keenly debated in many countries. But overall these systemic pressures have yet to translate into the large-scale concrete shifts in government policy and public mindsets driven by similarly pressing issues like climate change – despite the importance of health and well-being both to economic activity and individuals themselves.

At the same time, the progress seen in areas like sustainability or financial industry regulation shows that crises can be averted, and that change is entirely within the realm of possibility. As the World Health Organization has pointed out, rising populations do not necessarily lead to unsustainable budget increases or systems freezing up. Older people able to maintain and manage their health independently are no more of a 'burden' to the system than anyone else. Rather than more money, what is needed is a focus on (and appropriate allocation of resources to) prevention rather than reactive treatment; reorientation towards maximizing health and well-being at *all* ages; and new attitudes towards later-life care – all with eventual outcomes and the end-consumer in mind.

"My biggest concern is the misalignment of incentives across the care delivery program," says Arnaud Bernaert, Head of Global Health and Healthcare Industries and Member of the Executive Committee at the World Economic Forum. "Systems should be organized around patients but not everything is being built with this in mind in the first place. A lot of incentives are built to enable different pools of profit across the value chain, with no direct connection with patient outcomes."

The Future Health Index shows a high degree of awareness of the potential of connected technologies to play a crucial role in healthcare transformation, and to provide solutions to the resource shortages confronting healthcare in many countries. For example, about three-quarters (76%) of the general population surveyed in emerging countries see connected care technology as important to improving the overall health of the population, as do 65% of those in developed countries. The possibilities are manifold, from standardized electronic records that facilitate the flow of patient information and reduce inefficiencies and errors in medical treatment, to remote monitoring devices that enable more people to track and report their health conditions outside the formal healthcare environment.

Big data analytics will offer new ways to identify emerging health trends and gauge and improve the quality of healthcare outcomes – as is already evident in some segments of the healthcare sector. In the United States, for example, research from McKinsey estimates Kaiser Permanente's implementation of the HealthConnect data exchange system produced $1 billion in savings, and that widespread adoption of big data applications could help reduce national healthcare spending by up to $450 billion.[14]

Among insurance professionals polled for the Future Health Index, half (50%) say they are currently using Internet of Things (IoT)-based services and using wearables and other connected care technology to offer more customized insurance plans. In essence, by making healthcare information more readily available and enabling automation and remote monitoring, technology empowers individuals to manage more aspects of healthcare themselves, potentially reducing the weight on systems and healthcare professionals.

> *"We need to put people at the center of their own care, rather than placing care exclusively in the hands of the health system, which can only do so much. It is a personal responsibility, and a lot more people are taking a greater interest. We have more access to information with wearables and activity trackers; we can measure new things and give people greater insight and information into their health," says Patricia Mechael, Principal and Policy Lead at HealthEnabled and Executive Vice President at the Personal Connected Health Alliance, HIMSS.*

However, the Future Health Index research has identified gaps between the awareness of the potential of connected care technology and the adoption of this technology.

In many countries a relatively high percentage of healthcare professionals surveyed say they are somewhat or extremely knowledgeable about connected care technologies – about 50% in Argentina, Australia, Brazil, China, Spain and Russia, rising to 66% in South Africa, 80% in Saudi Arabia and 83% in the UAE. Many also see connected care playing a role in improving the quality of care.

> *"Getting an appointment to see a doctor faster, getting a test done faster, streamlining investigation and treatment, providing exemplary care, care for everyone regardless of where they are physically – the possibilities of technology are endless," says a reproductive endocrinologist in Canada at a private practice with 47 years' experience.*

Yet there are also multiple barriers to connected care technology adoption when integrating health systems, from concerns about costs and data quality, to questions about how technology may impact healthcare professional compensation models and the ownership of health records. Around a quarter (24%) of the general population surveyed, for example, feel they have no ownership over their medical records at all. These gaps are both connected to and emblematic of the broader gulf that the study has identified between how healthcare systems are perceived – by healthcare professionals and the wider public – and how they actually function.

Bridging these divides, and building healthcare delivery systems that are more 'future proof,' is first and foremost a matter of pinpointing where these gaps exist, then moving from awareness to beginning to address them, through a roadmap to a more proactive and holistic approach to healthcare that is more in tune with emerging global realities. This approach will vary according to market conditions, but will inevitably be built on some common foundations – connected technology adoption, healthcare system integration, and empowerment not only of healthcare professionals, but also the public.

Professionals shifting the mindset **to prevention**

"The system does what it is designed to do, which is treat illness, not prevent it. According to the US Centers for Disease Control and Prevention 86% of healthcare costs go to preventable diseases, yet medical systems are not set up to prevent or drive behavioral change – though it is chronic lifestyle-driven diseases that are driving these costs."

PAUL SONNIER
Founder of the Digital Health group on LinkedIn

Professionals shifting the mindset **to prevention**

Countries seeking to make their healthcare systems more resilient will have to increase the focus on preventive care.

The World Economic Forum (WEF) has identified prevention as an essential element of the more value-based care approach needed to make health systems more sustainable.[15] There is ample evidence of the benefits of a more preventive healthcare approach; a 2016 study published in *Population Health Management*, for instance, showed personalized preventive care produced "definitive cost savings and better health management within three years of adoption".[16]

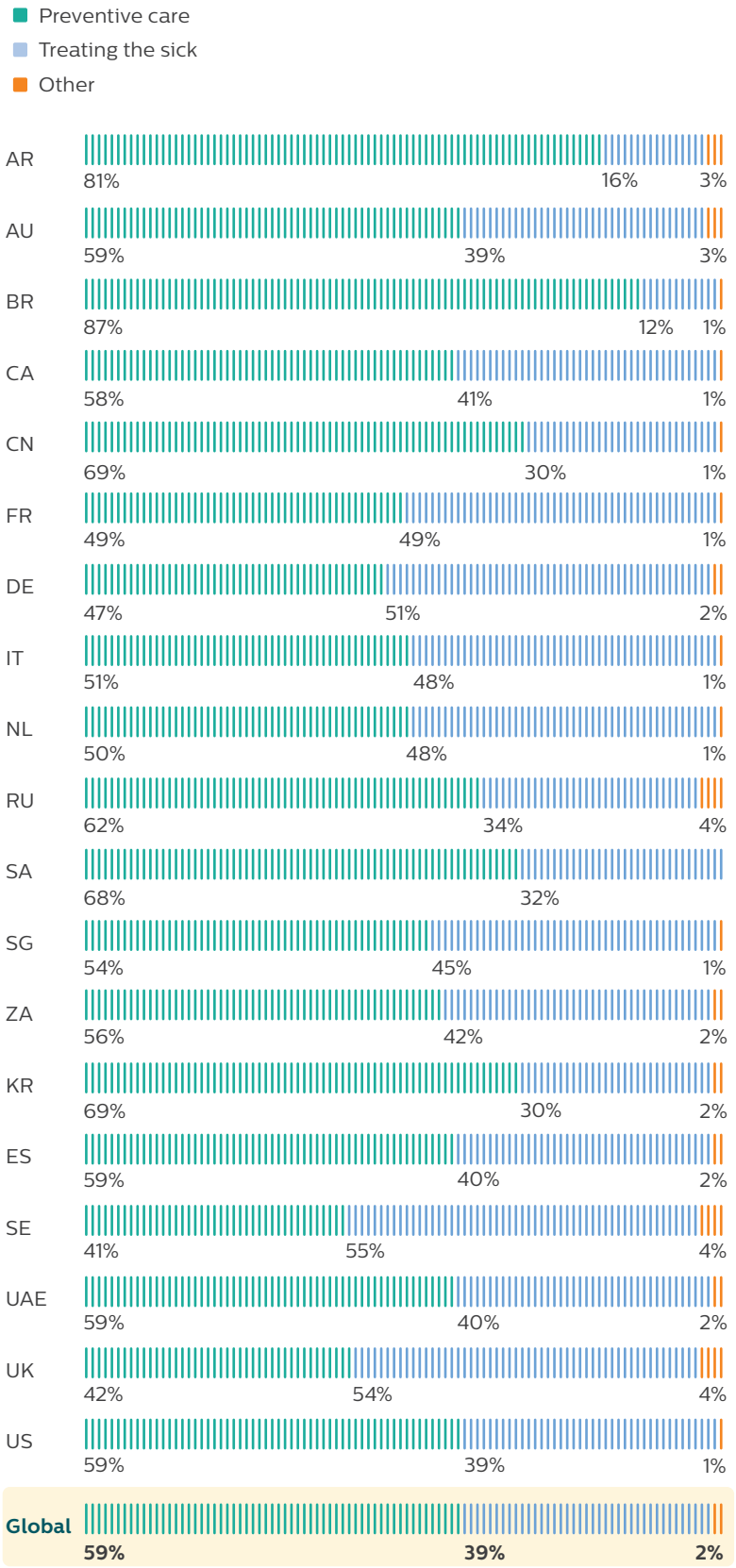
Yet the WEF also warns that countries "systematically underinvest" in prevention, and few of the healthcare experts interviewed in the course of this research saw a definitive shift towards preventive care taking place anytime soon.

The Future Health Index shows a majority (59%) of healthcare professionals surveyed feel they should focus most of their time and resources overall on preventive care (that is, keeping the healthy well). This belief is particularly prevalent among healthcare professionals in emerging markets like Brazil (87%), Argentina (81%), China (69%) and South Korea (69%); only in Sweden and the UK do a definitive majority of healthcare professionals believe they should prioritize treatment over prevention.

> *"Over the last two decades we haven't spent enough time talking about lifestyle improvement and prevention, which are very important in community health," notes a cardiologist in a private US practice with 30 years' experience.*

"There needs to be more investment in community and prevention, within that larger population at lower risk, because that's where the largest burden (on healthcare systems) could be avoided," says Dr. Pablo Perel, Director at the Centre for Global Non-Communicable Diseases at the London School of Hygiene & Tropical Medicine. "It's not so fancy, probably not so attractive for politicians. You won't see immediate results that could be on the front page, but I think in the longer term that's where most of the return in terms of investment will come."

Where healthcare professionals think they should focus the majority of their time and resources, overall



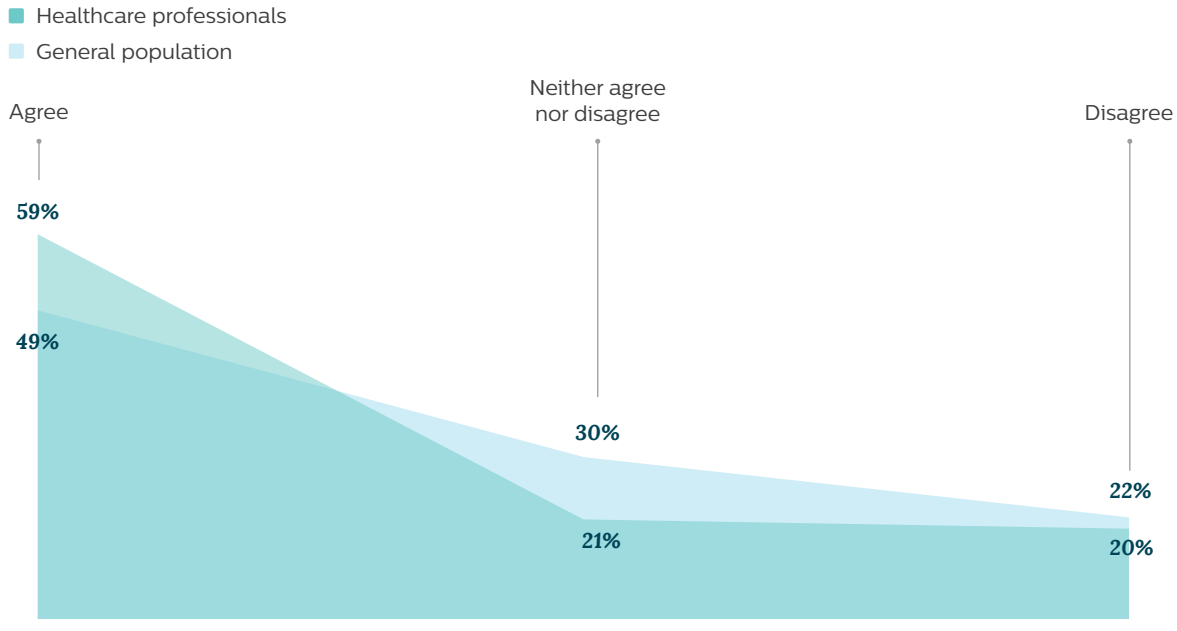
Healthcare professional: n=3,891

"There has to be investment now in education and the prevention of chronic disease[17] to make a difference long term," agrees a cardiologist in Australia with 17 years' experience in both the private and public sectors. "For example, in coronary disease we need to intervene at younger ages, like patients in their 20s and 30s, ideally at the general practitioner level to screen for hypercholesterolemia, diabetes, smoking and obesity."

Advance screening and lifestyle improvement are particularly important because the research indicates many people may be in worse health than they think, or in effect 'sleepwalking' into poor health. Across all countries, 37% of healthcare professionals surveyed rate the population's overall health poor to fair at best, but just 33% of the general population give their own health poor to fair ratings. Over a quarter (29%) of the general population polled say their health is very good to excellent, while 22% of healthcare professionals rate the population's health the same. The differences tend to be starker in emerging markets; 55% of healthcare professionals in emerging markets rate the health of the population as poor to fair, versus just 33% of the general public.

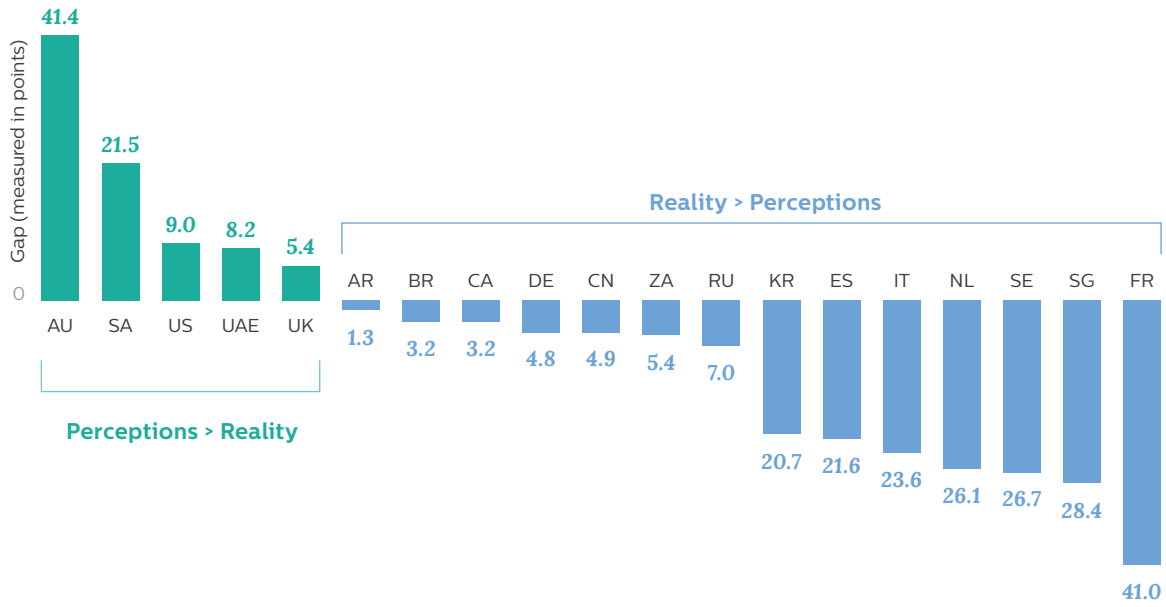
Overall views of national health systems are relatively consistent; only 22% of the general population and 20% of healthcare professionals (and just 5% of insurers) do not believe that the health system in their country meets patients' needs. However, in some emerging markets healthcare professionals are significantly more critical than the general population. In China, while 51% of the general population feel the healthcare system meets their needs just 39% of healthcare professionals feel it meets the needs of patients; in Argentina the rates are 43% and 37% respectively. In developed countries, by contrast, the situation is more frequently reversed; 80% of Australian healthcare professionals agree the system meets patient needs but only 62% of the general population; among healthcare professionals and the public in Germany the rates are 68% and 46% respectively; and in Italy 55% and 30%.

How much do you agree that the healthcare available via the health system in your country meets your/patients' needs?



General population: n=29,410
Healthcare professional: n=3,891

Analysis of the gaps between perceptions and reality: adoption of connected care technology



The promise of connected care

Healthcare professionals see connected care technology as useful tools in the battle to advance prevention, especially in terms of enabling regular monitoring of health indicators or conditions, as well as sharing and analyzing health data. Nearly three-quarters (73%) of healthcare professionals polled say connected care technology is important in improving the prevention of medical issues, climbing to as high as 86% in Brazil, 91% in China, 92% in the UAE and 94% in Saudi Arabia.

> *"We need more promotion of self-diagnostic tools, because patients rarely come to doctors unless something hurts," notes a Russian oncologist with 23 years' experience. "For younger people, (connected care technology) could create significant progress (by pushing them to go to doctors more often)."*

Yet 63% of healthcare professionals say connected care technology is rarely or never used when patients are healthy and have no medical issues. Much like broader health systems, connected technology use seems to concentrate on diagnosis and treatment of medical conditions, where 68% and 71% of healthcare professionals, respectively, say it was always, often or at least sometimes being used.

To assess the gaps between perceptions and reality, the views of healthcare professionals and the general population on the usage, knowledge, attitudes and value of connected care devices were contrasted with IT spending on IoT hardware in healthcare (as a proportion of GDP) and the degree to which countries have adopted a national health technology medical policy.

Based on these metrics, perceptions of adoption significantly exceeded the reality in Australia (by 41.4 points) and Saudi Arabia (21.5 points); a result of Australia's lack of health technology policy and proportionally low IT spending relative to GDP in Saudi Arabia. In Europe, by contrast, adoption reality scores more often exceeded perceptions – by 41 points in France, 26.7 points in Sweden, 26.1 points in the Netherlands and 23.6 points in Italy.

The paradox between healthcare professionals understanding the benefits of connected technology in the preventive context, but not always applying it that way, is likely rooted in a range of issues. In many cases the systems (or budgets) of the institutions in which healthcare professionals work may not be set up to enable usage. But the research indicates mindsets may also be factor, and for all the technological advancements in healthcare in recent decades a level of professional skepticism continues to surround connected care technology generally.

Converting the cynics

One roadblock to connected care adoption is a simple lack of understanding; less than half (47%) of healthcare professionals in total claim to be knowledgeable about connected care technology, with even smaller proportions of knowledgeable healthcare professionals in France (35%), Sweden (35%), Italy (34%), the Netherlands (25%), Germany (10%) and even highly-wired South Korea (30%). Unsurprisingly given the budget pressures many healthcare systems face, there are also widespread concerns about the costs of technology adoption; 51% of healthcare professionals overall feel connected care technology would make healthcare somewhat or much more expensive overall over the long term.

There is also a healthy amount of anecdotal evidence of healthcare professionals fearing technology will add to their workload, threaten revenue streams or even result in job loss. In South Korea, for example – which had one of the lowest rates of healthcare professional knowledge about connected care among countries surveyed – government plans to broaden telemedicine services have triggered widespread protests by doctors.[18] This underlines the need to adjust revenue models to keep pace with connected care roll-outs.

"Doctors might be against technology because they think it will take away their jobs and they will become peripheral figures," says a private cardiologist in Germany with 20 years of experience. "They fear in the end doctors won't be needed."

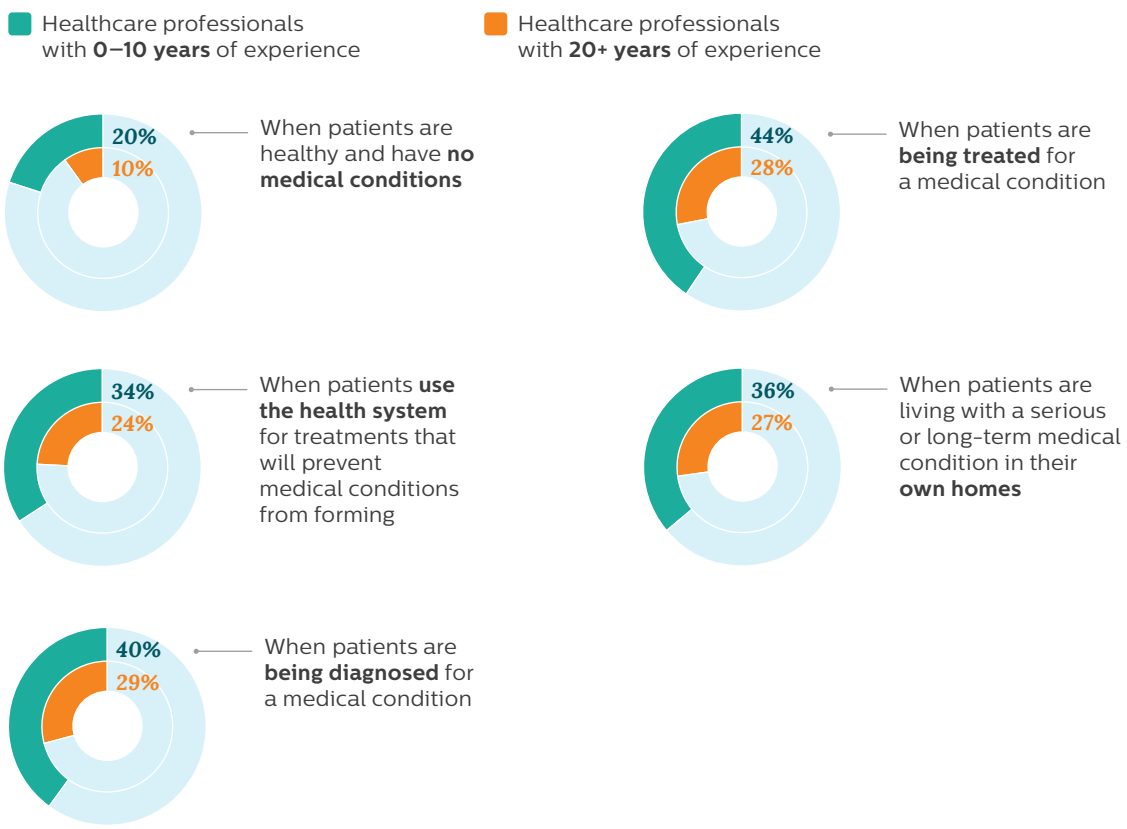
Leonard Witkamp, professor at the Academic Medical Center in the Netherlands and CEO of KSYOS TeleMedical Center, gives the example of tele-dermatology, under which general practitioners can send pictures of a patient to a dermatologist to get a diagnosis instead of referring the patient to the specialist physically. He estimates this reduces the process to just hours instead of days or weeks, and can slash costs and patient visits to dermatologists.

"This is something that everyone sees the benefit of," he says. "Nevertheless, if we do it right away, maybe a quarter of dermatologists could be out of a job. So I always plead for a modular implementation of innovation to give the health system the time and possibility to change in a gradual way."

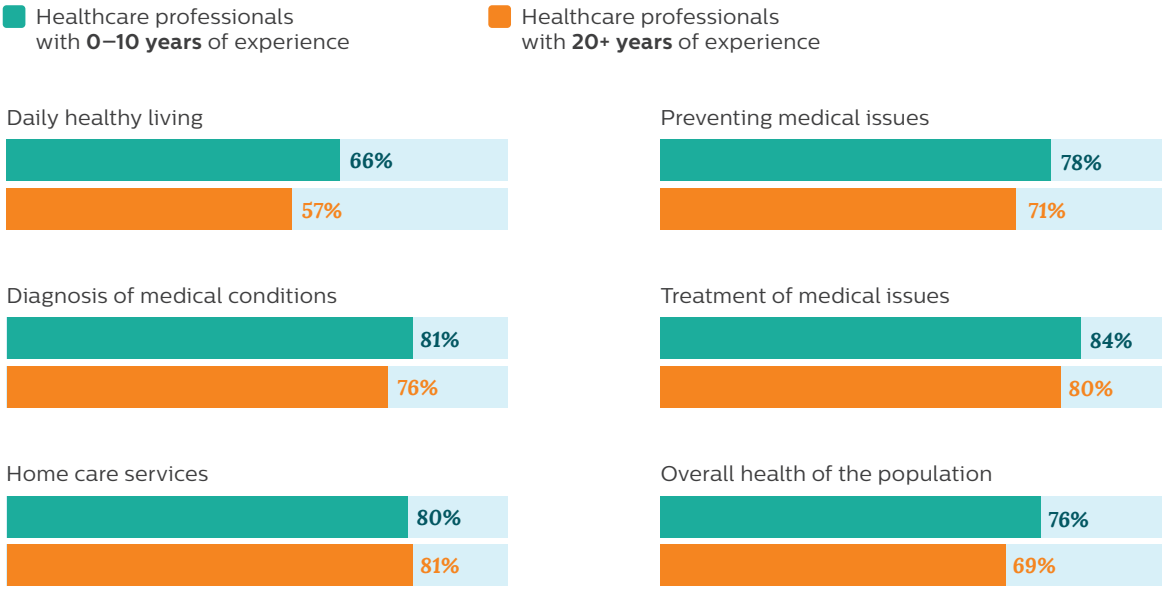
Fears around connected care technology may in part be generational, and could ease as a new generation 'digitally native' healthcare professional population takes the helm. The survey shows that healthcare professionals with less years of experience are more likely to say they are knowledgeable about connected care technologies – 54% of those with 0–10 years' experience and 49% of those with 11–19 years' experience claim to be so, versus 42% of those with 20 or more years of experience. Likewise these healthcare professionals are also more likely to see connected care being used across most of the health continuum.

In fact, technology adoption has been highlighted by industry insiders as a vital means to attract young people to the medical profession and prevent medical talent from being lured to other sectors.[19] But there are other findings that point to fundamental issues with the way technology is applied in the healthcare environment, and the need for policy changes, particularly in the areas of incentivization and personal data.

Percentage of healthcare professionals who think connected care is often/always being used in the following situations:



Percentage of healthcare professionals who think connected care is important for improving the following situations:



Healthcare professionals with 0–10 years of experience: n=803
Healthcare professionals with 20+ years of experience: n=1,975

Making data a discipline

Clear rules and processes around the ownership and sharing of healthcare data provide the baseline needed for connected care to be effective. Patient information is of limited utility if it's not being disclosed to healthcare professionals or between specialists. Sharing data between patients and healthcare professionals is already at least somewhat in process; around half of all healthcare professionals surveyed say in the past year at least some of their patients have shared with them blood pressure (52%) or blood sugar level (51%) data they tracked themselves with connected care technology, with the rate rising to 67% in Russia, 88% in Saudi Arabia and 84% in the UAE for blood pressure data.

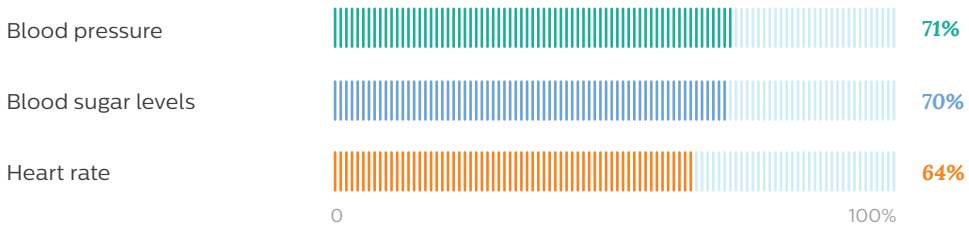
Nonetheless, there are questions about what happens to patient data, and how effectively this information is exchanged in what are still largely under-integrated health frameworks. A majority (58%) of all healthcare professionals polled say their national health systems are not at all or only somewhat integrated; only in the UAE and Saudi Arabia did most healthcare professionals feel systems are very or completely integrated (90% and 73%, respectively). Yet an even higher percentage (88%) of all healthcare professionals see health systems integration as somewhat or extremely important, as do nearly all (94%) insurance professionals polled.

"Continuity is a problem," says a cardiologist in Sweden's public healthcare sector with 27 years' experience. "The more new interactions, the more ineffective the healthcare, because patients visit unnecessarily and tests are done that might already have been done or which are not supported (by another institution). There are many bugs like that and this puts a burden on specialist care."

Health system integration is where the Future Health Index identifies the largest perception-reality gaps – perceptions are measured by the general population and healthcare professional views on integration; and reality scores are based on actual spending on the Internet of Things (IoT) in healthcare as a proportion of GDP, including services, software and connectivity.

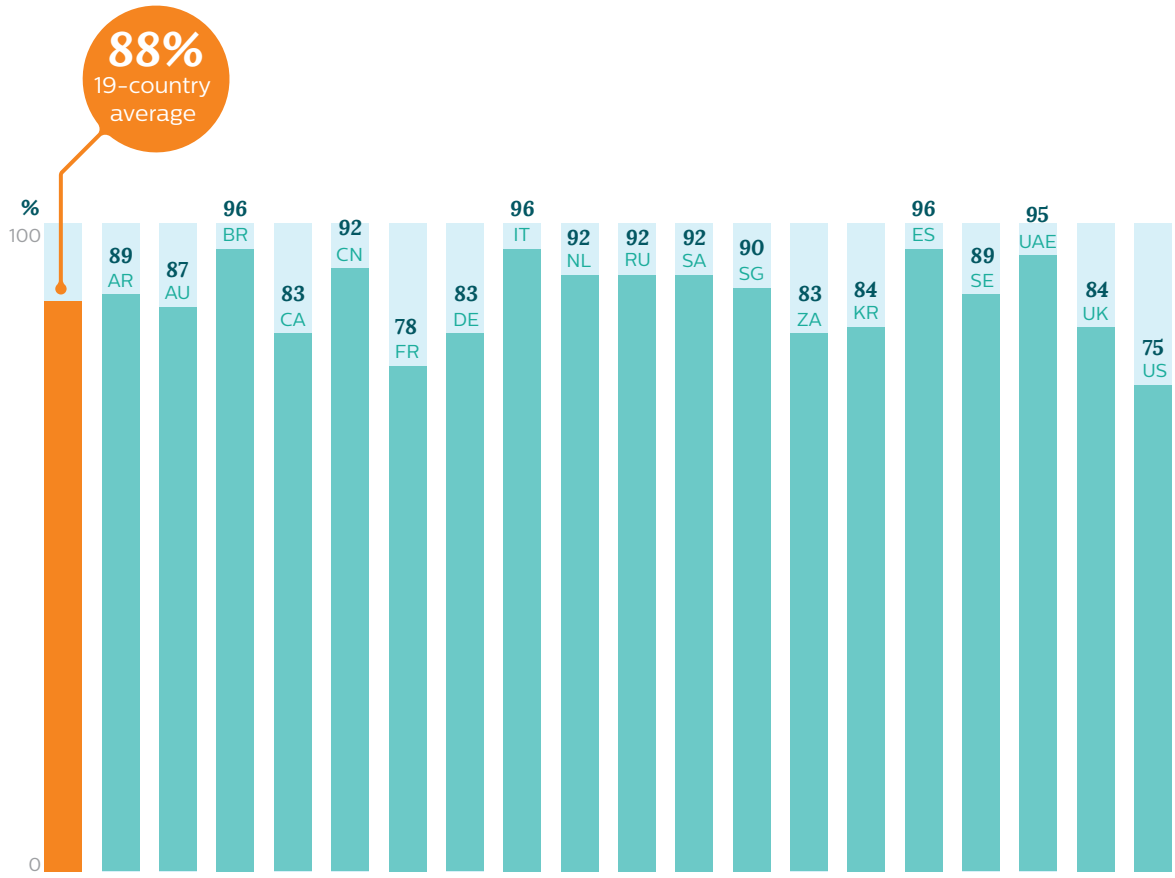
In all the countries studied with the exception of Singapore, integration perception scores are greater than the reality; that is, healthcare systems are perceived as being more integrated than they actually are. The gap between perception and reality scores swelled to as high as 55.5 in the UAE and 53.0 in Saudi Arabia, where IT spending on IoT in healthcare is relatively low as a proportion of GDP.

Percentage of healthcare professionals who have had any patients share health data/information tracked on connected care technology about the following indicators with them in the past 12 months



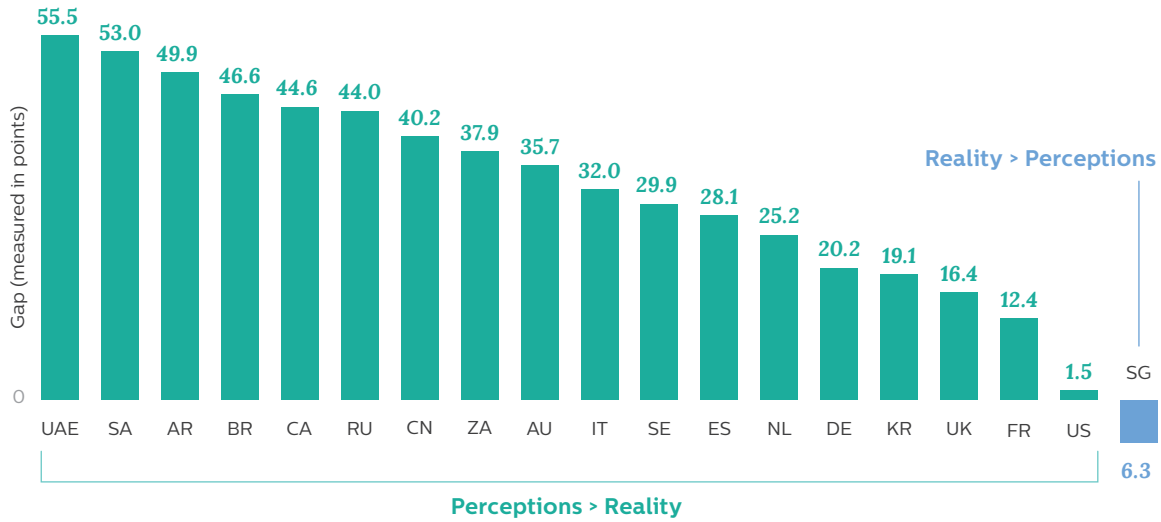
Healthcare professional: n=3,891

Percentage of healthcare professionals who feel it is important that the health system in their country is integrated



Healthcare professional: n=3,891

Analysis of the gaps between perceptions and reality: integration of health systems



This means the broadly positive healthcare professional assessments of integration in those countries – 90% of healthcare professionals in the UAE and 73% of those in Saudi Arabia believe the healthcare system is very or completely integrated – may not be entirely warranted. Certainly, some healthcare professionals noted information doesn't always flow seamlessly through these healthcare systems, at times due to competitive or financial rather than technological reasons.

> *"Because we are in the private sector each hospital has its own confidentiality practices and other similar issues," says one healthcare professional from the UAE with eight years' experience in a private practice. "This is due to competition between private hospitals; each one wants to be the best. The confidentiality may be lost so they may not want to share."*

In the UK, France and US, where IT spending in healthcare is proportionally higher, the gap between integration perception and reality scores is much smaller at 16.4, 12.4 and 1.5 respectively. Singapore is a major investor in IoT in healthcare relative to the size of its economy, and the only market with an integration reality score that topped the perception score by 6.3 points.

> *"There's so much fragmentation in healthcare," says Simon Spurr, co-founder and director of South Africa-based HealthCloud, which develops interoperability solutions and promotes partnerships in the medical industry. "Legacy systems weren't built to speak to each other and the manual collection of information still exists. In Africa a vast majority of health systems are still paper-based. The adoption of technology has to take place universally for change to begin."*

How health records travel

Transfer of information, then, is rarely automatic. Currently, healthcare professionals and facilities themselves bear the burden of transferring medical records, with 54% of healthcare professionals polled overall and even higher rates in Europe – 83% in the UK and Italy, 68% in the Netherlands and 63% in Spain – saying this is a combined responsibility of healthcare professionals and healthcare facilities.

However, 57% of healthcare professionals surveyed feel this is a job that should be shared to at least some extent with their patients, rising to almost three-quarters of healthcare professionals in South Africa (74%), 71% in the Netherlands and 69% in the US and Canada. This shows a need for approaches to data sharing that clearly apportion responsibility and limit additional administrative pressures on healthcare professionals if the potential of data in areas like patient monitoring and the early identification of health issues is to be realized.

> *"Things like tests are being done unnecessarily, because the data doesn't move from one system to another, or (healthcare professionals) don't trust the information from previous practices," notes Dave deBronkart, better known as 'e-Patient Dave', Chair Emeritus of the Society for Participatory Medicine. "No one admits this is policy – some people are told they need to repeat the scan because (the institution) needs the revenue."*

Greater adoption will also depend to an extent on the technology industry addressing concerns over the quality of data, particularly from common consumer devices which record health data, which some recent cases involving wearables have called into question.

> *"We have to see whether key data is certified, and how reliable it is. It's important for data to be reliable, but that reliability must be certified by some kind of authority," says a gynecologist with 11 years' experience in China's public health sector.*

Adoption is also impacted by regulation; many institutions and healthcare professionals may be concerned about falling foul of privacy rules such as those found in the EU's data protection framework and the US Health Insurance Portability and Accountability Act, which make it difficult to share patient data without explicit consent. The adoption of clear, industry-wide standards and metrics could assist in this regard, increasing the 'value' of data and encouraging its use as an early diagnostic tool by healthcare professionals.

> *"All patient data is confidential," says a primary care physician in the UAE with 23 years' experience. "We can only transfer data if the patient agrees. It would have a positive impact on the patient if we could share the data with other healthcare professionals for the ease of treatment."*

Data is another area where compensation or reimbursement models may have to change, since some professionals now see a fundamental mismatch.

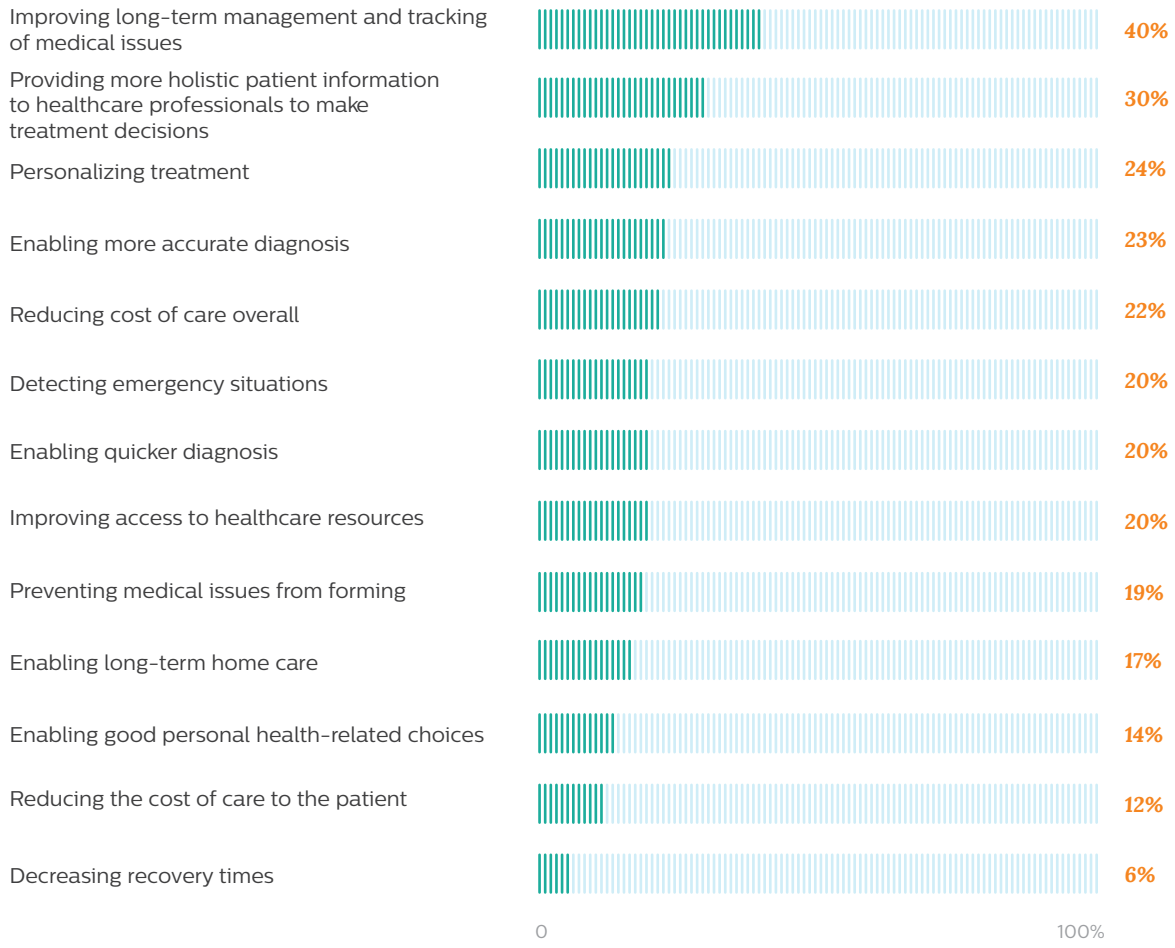
"Sharing is not set up with standards for reimbursement; while the responsibility of the medical record lies with the patient because they have to sign consent, the (financial) burden falls on providers to follow through with the requests," says a US cardiologist in a private practice with 30 years' experience.

"Healthcare is grounded in the old-fashioned regulatory and reimbursement system, which is an outdated model for knowledge transfer," notes Sara Riggare, a PhD student in self-care for Parkinson's disease at the Health Informatics Centre, Sweden's Karolinska Institutet. "A patient movement has started and is growing, so sooner or later regulators are going to have keep up."

Efficiency trumps cost savings

Policies aside, the best way to make the case for technology supporting a more preventive form of care is, to coin the old adage, by showing not telling. Emerging countries could prove valuable test cases for the return on investment on preventive care, since they are in many cases building newer, more technology-driven health systems essentially from scratch, and tend to prioritize prevention over treatment – a potentially natural bias in places where treatment resources or quality may historically have been lacking. The survey showed 69% of healthcare professionals in emerging markets think healthcare professionals overall should focus the majority of their time and resources on preventive care, compared to 52% in developed countries.

Percentage of healthcare professionals who think connected care can benefit the following aspects of healthcare most



Healthcare professionals: n=3,891

There are also specific fields and practices where greater connected care technology adoption and data sharing seem poised to provide quick wins in terms of demonstrating the value of connecting technology and encouraging its use in other segments of the healthcare system. One clear example is home care, including home care for the elderly – a rapidly expanding area given the rate at which many country populations are aging.

Overall, 81% of healthcare professionals surveyed say connected care technology is important to improving home care services, and 82% say it is important to improving healthcare services for geriatric (elderly) care. Similarly, when asked what aspect of healthcare connected care technology benefits the most, the highest proportion (55%) of healthcare professionals chose home care-related aspects, mainly in terms of improving the long-term management and tracking of medical issues. In China, Singapore and Italy – all economies with rapidly aging populations – the rates were 61%, 61% and 67% respectively.

Though wearable devices are becoming better and cheaper, making home monitoring more feasible than ever, currently "the home care process is poorly managed," says Mr. Spurr. "But if you can engage and manage a patient after they leave hospital you not only avoid a potential readmission, but also create a better environment for patients to be in."

It is also worth noting that financial gains aren't necessarily the main focus when healthcare professionals are evaluating connected care technology adoption. Particularly in developed countries, substantially more emphasis was placed on the ability of technology to produce efficiencies. In the Netherlands, for example, 50% of healthcare professionals polled say proof that connected care technology would make processes more efficient would make them more likely to use it, but only 28% say decreased costs would do the same. Similar views are evident in Sweden (48% and 39% respectively), Canada (50% and 36%) and China (54% and 34%).

Putting **people** at center stage

"It's the healthcare team's responsibility to be innovative and advocate for their patients and communities in new ways. This includes looking for creative solutions to provide patients seamless access to care and information sharing. Physicians must not only utilize the power of technology to connect with their patients, but should be encouraging all patients to take a more active role in managing their care. Healthcare is a team sport that needs both the medical team and the patient's participation to produce positive outcomes."

BRIAN DONLEY
MD, Chief of Staff at Cleveland Clinic

Putting **people** at center stage

Healthcare professionals and institutions may need to change, but the other essential agent in the shift to a more holistic, technology-driven approach to 'health' care (as opposed to 'sick' care) is the general public. More active monitoring and health management, particularly outside the formal healthcare infrastructure, requires not only more sophisticated devices but an informed, engaged population that uses or interacts with these devices regularly and in the right way; shares relevant health data with healthcare professionals; and uses this data (or healthcare professional recommendations based on the data) as a catalyst for lifestyle changes that improve health for the long term. Encouragingly, many experts already see signs of this shift emerging – with mixed implications for healthcare professionals.

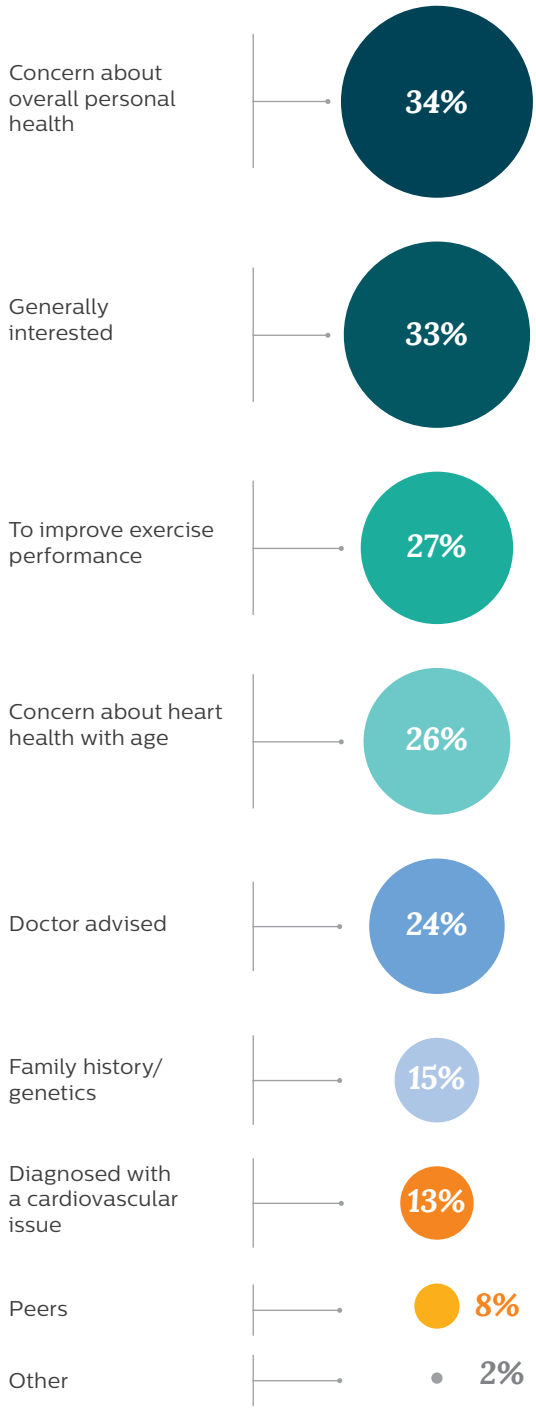
"There is a trend towards more consumer-friendly (health) services, engagements and initiatives; people are becoming more demanding about what they want and how they want to be treated," says Dr. Mechael. "Before the doctor was God and we listened to him or her – but with the democratization of health people are becoming aware of their rights and the quality or care they want to receive."

As with healthcare professionals, in many cases there is an apparent distance between public awareness of connected care technology and the role it actually plays in people's lives. In the survey, the general population cite healthcare professional recommendations as the top overall factor (44%) that would convince them to use connected care technology (such as health-related trackers and home health monitoring devices), followed by the government subsidizing or paying for the technology (42%) – though the latter tends to be a bigger motivator in emerging markets (46%, versus 39% in developed countries), where disposable incomes are lower.

Yet the survey also shows a significant number of people don't necessarily follow healthcare professionals' advice, even where they are more likely to have the necessary resources. Overall 16% of those with cardiology issues surveyed whose doctors recommended they start tracking their heart rate did not do so.

Like healthcare professionals, the general public seems attuned to the potential benefits of connected care. About three-quarters polled overall say it is extremely or somewhat important to improving diagnosis of medical conditions (76%), treatment of medical issues (77%) and healthcare services for the elderly (78%), while smaller majorities see connected care technology playing an important role in improving the overall health of the population (70%) or daily healthy living (63%).

Why did you first start tracking your heart rate?

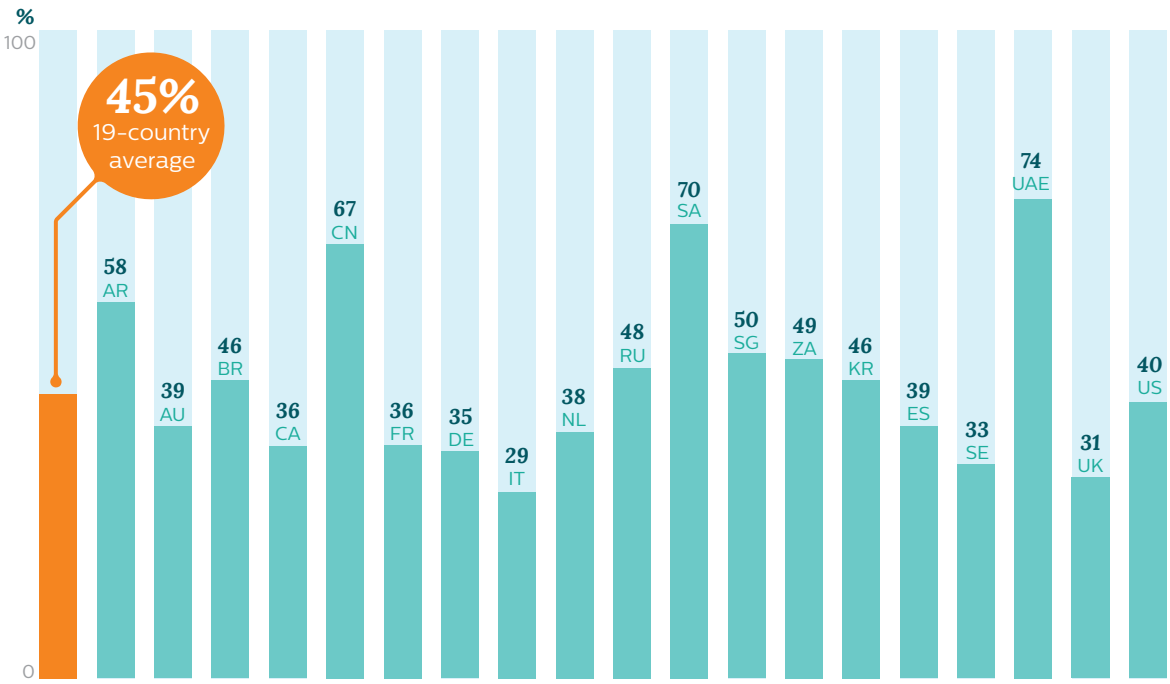


General population who use connected care technology to track heart rate: n=3,835

The proliferation of wearables would seem to offer curious, health-conscious people plenty of opportunities to incorporate connected care technology into their homes or daily routines. However, over half polled (55%) say they have not used any connected care technology to monitor their health indicators independently of a healthcare professional in the last 12 months. Surprisingly, despite the costs at times associated with these devices, usage rates are significantly higher in emerging markets, where 57% of the general population surveyed have used connected care technology in the past 12 months, versus 37% in developed countries.

This could reflect people turning to devices in countries where medical care may not always be readily accessible. But it also suggests that though cost is a concern (50% of the general population polled feel connected care technology is likely to make healthcare somewhat or much more expensive overall in the long term), it is not necessarily the main consideration in connected care technology adoption for the general population – just as it is not necessarily the main factor for healthcare professionals.

Percentage of the general population who have used connected care technology to monitor any health indicators in the past 12 months



General population: n=29,410

No robot doctors, please

The research indicates changes in awareness and mindset could play a more critical role in empowering people to seize the opportunities offered by new technologies and use them as a basis for a more active approach to health.

First, it is important to recognize that while people clearly see the potential of technology in healthcare and in the management of their own health, they do not necessarily want it to take over. Health can be a delicate matter and the 'human touch' that healthcare professionals provide will be valued, no matter how sophisticated technology becomes – a point that healthcare professionals fearing technology-linked job loss or obsolescence may want to keep in mind.

When asked what artificial intelligence (AI) tools or technologies could have the most impact on improving healthcare, the highest proportion of the general population polled (25%) chose an AI-fuelled app or wearable that could automatically track key indicators and make related suggestions; only 11% see potential for remote appointments with hologram doctors and just 10% chose full-scale robot healthcare professionals (though South Korea was relatively keen with 25% selecting this). Viewing (and promoting) technology as complementary to, rather than a substitute for, the skills of healthcare professionals, could do much to assuage concerns and boost adoption among members of the public and healthcare professionals alike.

Some professionals have also pointed out that technology and the human touch needn't be mutually exclusive, if, for example, technology reduces the number of people visiting healthcare professionals for minor matters that could be addressed through self-monitoring and diagnosis, allowing healthcare professionals to devote more time to more serious cases.

> *"For me technology enables the human touch. If you see 30 patients in an afternoon, there's no human touch; there's just hand-shaking," says Dr Witkamp. "But if you can replace these 30 patients with four patients that really need your help, that's definitely a human touch. And I think that will be the main role of the healthcare professional in future."*

Another issue that needs to be tackled is knowledge, which, as evaluated by people themselves, seems decidedly mixed.

About a quarter (24%) of the general population polled overall claim to be knowledgeable about connected care technologies. The rate is typically even lower in developed countries and particularly Europe, falling to 9% in Italy and 8% in Germany. Even in the UAE, which ranks highly in connected care adoption, only 48% of the general population claim to be knowledgeable.

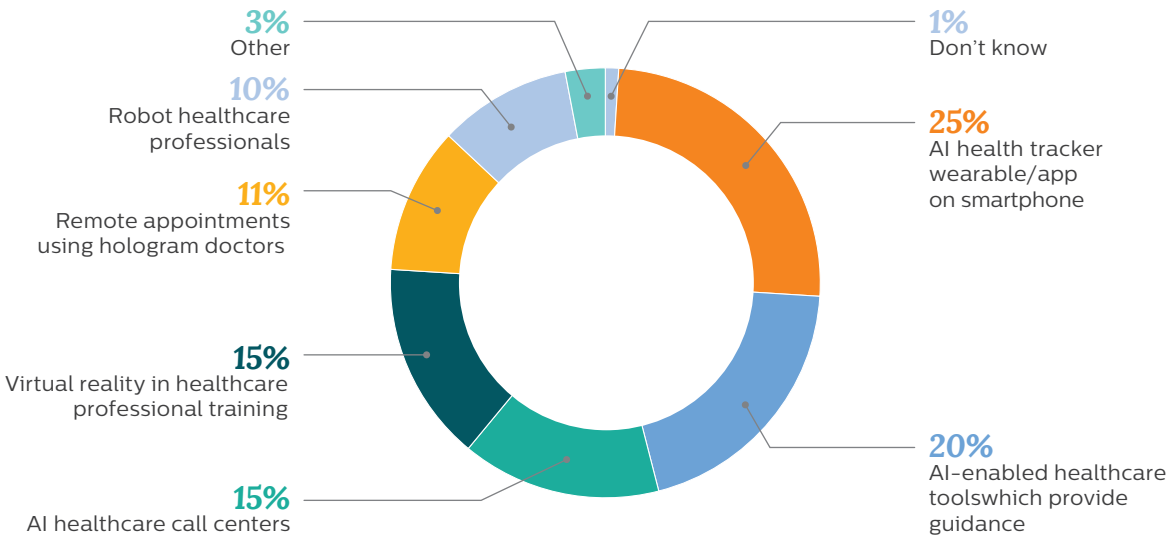
Yet, among the general population polled who have used any connected care technology in the last 12 months, 81% claim to somewhat or completely understand how to properly use it, and 77% to understand how to interpret the results from the technology. Interestingly, 76% of healthcare professionals who have had any patients share information from connected care technology with them in the last 12 months believe that their patients understand how to properly use the technology, and 67% say their patients understand how to interpret results from connected care technology.

At the very least, these differences indicate more needs to be done to both introduce connected care technologies and illustrate their correct use. Around a third (31%) of the general population surveyed say training on connected care technology would encourage them to use it. This highlights the importance of simplicity and user-friendly design.

"To be able to see the shift that everybody is talking about healthcare needs to move into the homes of people and patients," says Ms Riggare. "And that means technology needs to be designed differently to current standards. If we want people to be able to take care of themselves, they will need technology that is designed for them as primary users, and we also need reimbursement systems to support that."

"The biggest opportunity in healthcare is investing in developing self-care models," Ms Riggare adds. "If it's done right, I feel very strongly it has the possibility to transform things."

Which of the following Artificial Intelligence (AI) tools and other technologies do you think would have the most impact on improving healthcare today if they were available?



General population: n=29,410

Taking ownership, building trust

Within institutions and among healthcare professionals, the ownership and management of patient data also represent possible stumbling blocks for the general public. Only 23% of the general population surveyed who used connected care technology within the last 12 months claim to completely understand when to share data from connected care technology with a healthcare professional, or the easiest way to do so.

Healthcare systems and healthcare professionals could also do more to 'lead by example' through system integration. Among the general population surveyed who had visited healthcare professionals for a variety of conditions, only a minority (32%) experienced their medical records being automatically shared between healthcare professionals – 33% in the case of artery disease, 29% with arrhythmia, 33% with heart valve issues, 40% with cancer and 28% with high blood pressure – though records needed to be shared in the vast majority of cases.

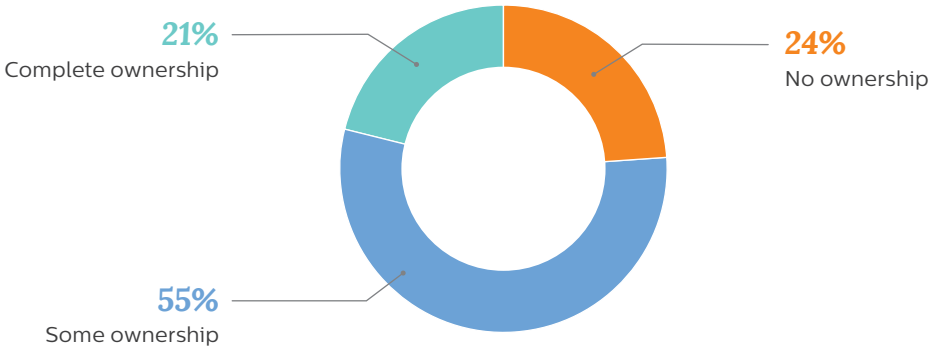
As noted earlier many healthcare professionals hope to see patients take an active role in this process, and indeed a significant number are; among the general population surveyed respondents with any health issue, over a third (36%) say they have shared some or all of their records themselves. The survey highlights a clear opportunity to make people more involved stewards and sharers of their data. The majority (76%) of the general population surveyed feel they have some or complete ownership over their medical records, though this rate slipped to 62% in Germany and 57% in the UK.

> *"Patients should be responsible for their healthcare records, but at the same time to be fair to them they need to have access to the records," says a cardiologist in a private institution in Singapore with 10 years' experience. "Rights to data and authority to control its movement are non-existent at the moment. Right now nobody is responsible for information that is transmitted."*

> *"Most of the power currently lies with the physicians and the specialists, and I think we need to hear the patient voice more," says Dr Perel. "I don't think we are listening and involving patients enough. However, not all patients might want to have that power."*

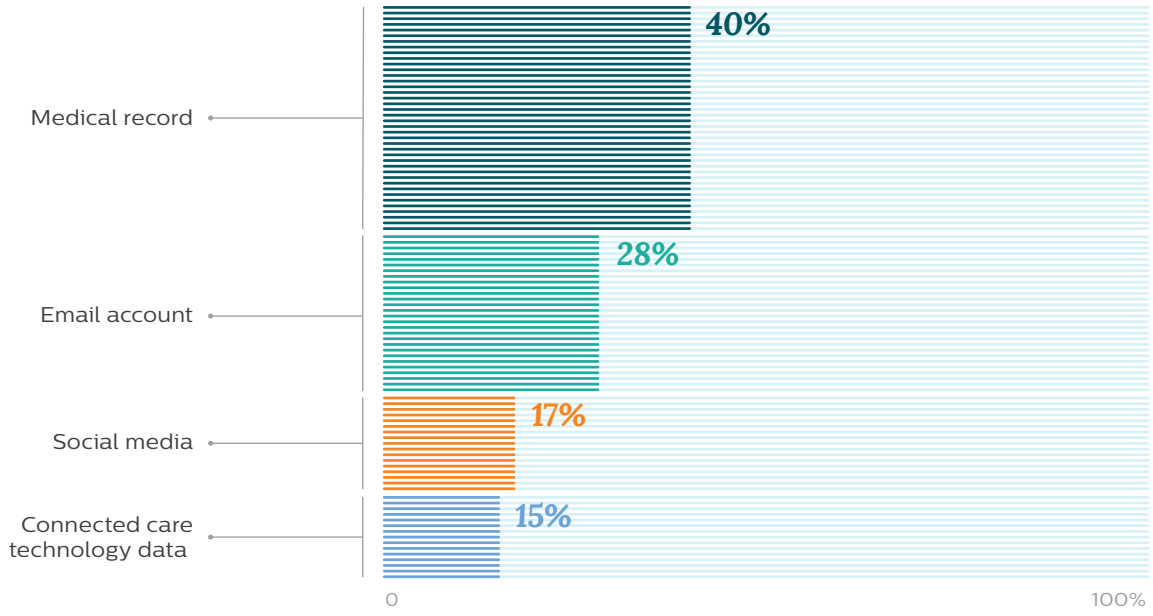
Trust is a key factor in encouraging people to monitor and share their health data, particularly because many people see it as sensitive. When asked what they would least want to be made public if their account or data was hacked, 55% of the general population surveyed chose health data versus just 28% for e-mail and 17% information from social media accounts.

How much ownership the general population feels they have over their medical records



General population: n=29,410

What information the population would least want to be made public if account or data was hacked



General population: n=29,410

Encouragingly, the healthcare sector enjoys relatively high levels of trust when it comes to personal data compared to other industries. Overall 44% of the general population say they trust the healthcare industry the most with their data, compared to 35% for the banking industry, 20% for the insurance industry and a mere 5% for the retail industry. Levels of trust with personal data in the healthcare industry tend to be even higher in countries with high levels of connected care adoption and healthcare system integration, such as the UAE (55%), Singapore (51%) and Sweden (55%); but are lower in the US (39%), Germany (36%) and emerging countries like Brazil (35%) and particularly Russia (20%). Cultivating a degree of trust in healthcare systems with personal data – whether through more robust data protection regimes or disclosure on data practices – and ensuring people know the 'entry points' at which their data should be interacting with these systems could ensure more data is put to use, as well as reduce inefficiencies and duplication within institutions.

Reimagining incentives

Even as technology promises to make self-monitoring easier, just as with recycling waste a decade or two ago, the adoption of a more prevention-focused healthcare mindset and new behaviors will likely have to be cultivated through a mixture of obligations and rewards.

Most people are aware of the need to plan for retirement and elect (or indeed, are compelled by their governments) to put aside some amount of retirement savings – in the US 69% of workers report they or their spouses have saved for retirement, for example.[20] Yet the idea of 'investing' – not necessarily financially, but by changing lifestyle or habits – to ensure this retirement is a healthy one tends to receive less focus. This is also true of governments, who in many countries continue to spend a higher proportion of GDP on pensions than health services despite the fact that an aging population will bring pressure on both fronts.[21]

Connected care technology has produced some notable successes in terms of people assuming more responsibility for their own health. 'e-Patient Dave' cites the example of OpenAPS.org, an open-source solution designed by a community of people with diabetes that puts artificial pancreas system technology within the reach of anyone with a compatible device.[22] OpenAPS can communicate with a wide range of insulin pumps and glucose monitors to keep a person's blood glucose in a safe range, and is designed to serve as a bridge between stand-alone insulin pumps and proprietary APS systems that are still years away from regulatory approval.

"Something new is happening," 'e-Patient Dave' says. "Digital health information is enabling patients with a problem increasingly to act on their own, with or without a physician's cooperation."

Mr Sonnier sees some potential for 'gamification' in the health context, such as mobile games that can help detect the onset of Alzheimer's and motion-sensitive consoles designed to get people off the couch. "It's not a prescription, but it's a method to keep people moving," he says. "All this drives behavioral change."

Many experts agree some sort of incentivization – whether financial or social in the form of 'peer pressure' – will be needed to encourage people to take a more proactive health role.

"The moment you mention incentives people are more eager," says a radiologist with one year of experience in South Africa's public healthcare sector. "With the incentives, whoever collects more data will probably be more motivated to live healthily."

"People can support each other," Mr Spurr says. "There are many community-driven health initiatives where people have been brought together to promote healthy living, particularly driven through social media initiatives."

Incentives "need to be targeted properly to the right audience," says Dr Bernaert. "Monetary incentives help behavioral change but there's not enough understanding of behavioral triggers; health is very personal. There's a need to combine behavioral analytics with social media and social interests to target value propositions that appeal to (individuals) and not necessarily their neighbors."

Employers are also emerging as a major potential contributor to change in this regard. More workplaces are encouraging effective health planning and incentivizing staff to adopt healthier lifestyles, in much the same way many support employees' financial planning. The corporate wellness market – which includes things like workplace health risk assessments, fitness, nutrition and smoking cessation programs – in Asia Pacific alone is expected to more than double from 2015–2024 to US$7.4 billion.[23] Successful employer health promotion initiatives may provide a model for the adoption of broader, more ambitious healthcare incentivization programs at a national level – a process to which connected care technology can contribute by facilitating monitoring as well as the measurement of outcomes.

The Cleveland Clinic strives to keep all of their patients healthy, which includes their own employees. Cleveland Clinic employees and their legally married spouses who are enrolled in the employee health insurance plan can earn up to 30% off insurance premiums. To attain the incentives, those with a range of chronic conditions such as diabetes, hypertension or obesity, can enroll in programs to help them meet personalized medical or nutritional goals. Those who are already healthy can earn the discounts by reaching physical activity goals, such as consistently going to the gym or achieving a certain number of steps per month. These programs have helped Cleveland Clinic keep premiums down and encourage patients to get or stay healthy and be in control of their well-being. Prior to this program healthcare costs were increasing over 7% a year, but just this past year (2016) Cleveland Clinic started to see a decline in spending at a rate of about 2%.

Future measures of **value**

"Measurement is the first step but needs to be considered in the sense of benchmarking and then change protocols. We need to 'measure, benchmark, improve, measure, benchmark' ... better systems need to be better unified, and aligned with all stakeholders around the outcome of good care."

ARNAUD BERNAERT
Head of Global Health and Healthcare Industries,
Member of the Executive Committee, World Economic Forum

Future measures of **value**

While the shift from reactive, 'sick' to proactive and lifestyle-focused 'health' care will not take place overnight, there are steps that can be taken in the near term to lay the groundwork for this transformation – and in most cases the resources and technologies already exist to implement them.

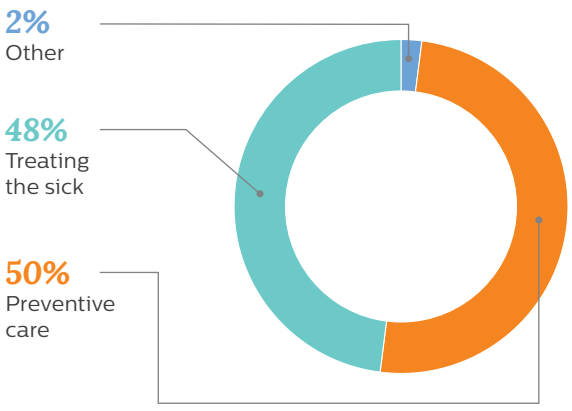
First, government spending and healthcare revenue models should be reassessed to support the shift towards preventive care that organizations such as the United Nations and World Health Organization have noted will be necessary to address the challenges of an aging global population. As this study has made clear, many healthcare professionals and emerging countries are already aware of the need to prioritize prevention, as are members of the general population in many countries. In Argentina, for example, 68% of the general population surveyed say the majority of healthcare professionals' time and resources should be focused on preventive care, as did 64% of those in Brazil; 64% of those in the US and 62% of those in China. Funding and reimbursement practices will also need to change to support consumer-focused care that takes place to some extent outside the system.

Planning a policy overhaul

Second, policy around the ownership and use of health data, particularly in the institutional environment, needs to evolve in a way that encourages people to be more active 'owners' of their data, providing well-defined pathways

"There's very little engagement when patients leave the hospital until the next check-up; in many cases they don't have or can't remember their treatment plans, often resulting in them turning to the internet for their next steps," says Mr Spurr. "Insurers pay the hospital bills, but not for what could happen after a patient is discharged. A portion of funding should be invested in aftercare to reduce costs further down the line."

Where the general population thinks healthcare professionals should focus the majority of their time and resources, overall



General population: n=29,410

for the sharing of information from home monitoring devices when pertinent or required, and making clear the patient role (if any) in the transference of data between healthcare professionals or institutions. This can contribute to healthcare integration by fostering the flow of patient information, and prevent data-driven administrative burdens from falling exclusively on already overworked healthcare professionals, which could encourage adoption further.

By implementing and communicating robust and transparent policies on data protection and use, institutions will reassure people their data will not be compromised, making sharing more likely and contributing to the already relatively strong foundation of consumer trust in the healthcare sector.

Consistent measurement frameworks have been identified as a critical element of value-based care, which is above all based on the systematic analysis and measurement of health outcomes.[24]

Connected care technology can contribute to this process by providing the data needed to track and analyze performance over time. However, for this technology to succeed it also needs to be measured itself. Objective assessments that demonstrate the value of connected care could be a potent driver of adoption – bearing in mind finances are not the soul arbiter of value, and goals such as efficiency or health outcomes can also be considered.

Of course, the onus to capitalize on the potential of connected care does not entirely belong to healthcare institutions. The technology industry has a responsibility to increasingly develop solutions in a way that supports the emerging healthcare paradigm, developing and designing tools for prevention and home as well as treatment and professional use.

> *"If we are to fix health systems we need to look outside of just healthcare," says Mr Sonnier. "Wellness and fitness for example are obvious and in your face. Under Amour, for example, launched Connected Fitness to aggregate your lifestyle data from different apps in one place."*

While the shift to more preventive strategies is key in driving better health outcomes, connected care technology and data sharing are also key enablers of an integrated network of care providers and patients, allowing them to work closer together for improved decision and treatment support.

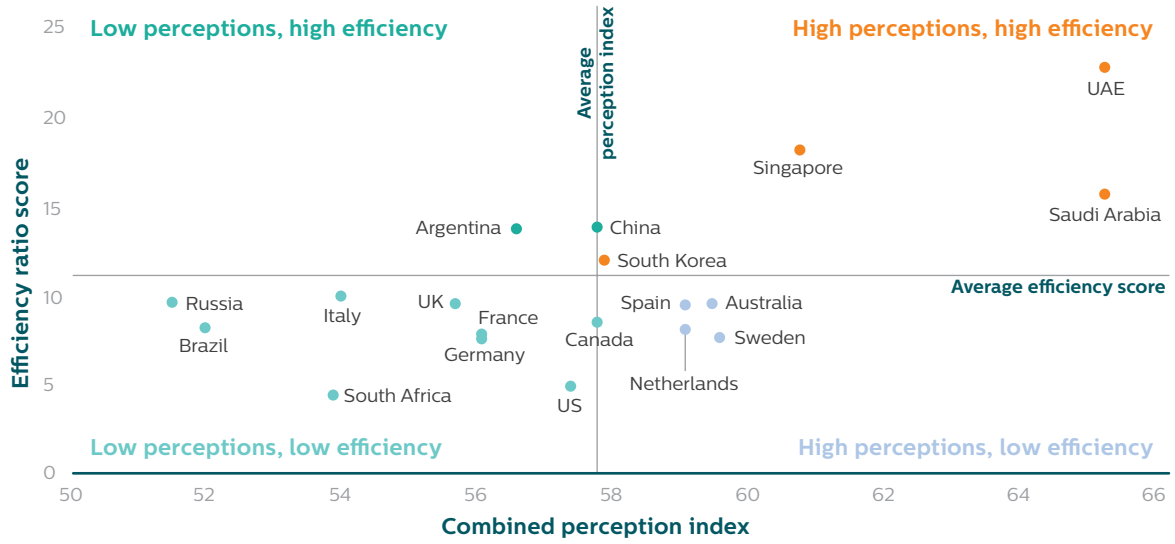
The path to perpetual healthcare

Progress in these challenges is already evident in the countries achieving high Future Health Index scores across the pillars of access, integration and adoption of connected care technology, many of which share a focus on preventive care and have relatively high rates of health system integration, technology investment and adoption; and which can provide models for other health systems to follow. However, as the perception-reality gaps indicate, even index outperformers need to do more to align health systems to the needs and expectations of healthcare professionals and members of the public, and measure system goals with actual results.

As improving access, integration and adoption will lead to better health outcomes at a lower cost – that is, enhance future efficiency – Future Health Index efficiency ratios can be contrasted with perception and reality scores to gauge progress towards a future-proof healthcare system.

Assessed in this way, there is clear alignment between efficiency ratios and overall perceptions of access, integration and adoption; countries with high efficiency ratios, such as the UAE, Saudi Arabia and Singapore, have high perception scores and vice versa. There is less correlation between efficiency and reality; China, Saudi Arabia and the UAE, for example, have above-average efficiency but fairly low overall reality scores, while France, the Netherlands and Sweden achieve high reality scores with relatively low efficiency (that is, at a relatively high cost).

Combining a country's efficiency ratio with the overall perception index to define its position on the path to a future-proof healthcare system



For healthcare systems to be sustainable for the long term, these various readings will need to converge. A high efficiency ratio combined with high perception and reality scores would point to a healthcare system that manages to produce good outcomes, and is recognized as producing those outcomes by healthcare professionals and the public, in a cost-effective way – and is thus unlikely to face widespread discontent or financial collapse.

Governments, health systems and individuals need to recognize that given current trends, to be sustainable, healthcare can no longer effectively stop at hospital or clinic doors, or when patients are successfully treated for an ailment. Connected care technology has removed (or at least extended) many of the limitations of time and place that previously applied to health monitoring and diagnosis; what remains is for more systems, healthcare professionals and members of the public to embrace a form of healthcare that, much like the internet, is 'always on' and integrated into daily lives.

"Routine actions like doing your shopping or going to a travel agency have been replaced by the internet, and this will also take place in healthcare," says Dr Witkamp. "With the availability of more and more data, we will have intelligent systems that may make even better decisions than medical specialists. In both routine healthcare provision and more complicated processes, there will be major changes."

Appendix I: **Research methodology**

Appendix I: **Research methodology**

Research overview and objectives

Since 2016, Royal Philips has conducted ongoing, original research in order to better understand perceptions towards connected care technology and the role it plays in the future of healthcare. The research focuses on understanding global nuances concerning access to healthcare, integration of healthcare systems and adoption of connected care technology. In 2016, the results were used to create the Future Health Index (FHI). The index itself is a measure of how well-poised various health systems around the globe are to address healthcare challenges currently and into the future by analyzing the components of healthcare that will be important to create sustainable health systems.

In 2017, the study has evolved to measure more experiences of larger audiences around the world, while also incorporating secondary data to supplement the primary data findings. Incorporating secondary data into the 2017 Future Health Index provides a unique comparison of the main healthcare system players' perceptions/ personal experiences in comparison to the reality of the state of healthcare around the world.

To provide a holistic understanding of the current healthcare systems around the world, the 2017 study combines quantitative surveys, secondary data analysis, and qualitative in-depth interviews conducted from January–March, 2017 among the following key stakeholders:

- Healthcare professionals in 19 countries (qualitative and quantitative).
- The general population in 19 countries (quantitative).
- Insurance professionals in five countries (quantitative).

Detailed methodology

Qualitative interviews

Healthcare professionals

To provide context to the quantitative data (as described below), the research was supplemented with 30–45 minute in-depth interviews with 10 healthcare professionals in each country. Healthcare professionals are specifically defined as those who work in healthcare as a doctor, surgeon, nurse practitioner, registered nurse, licensed practical nurse or nurse across a variety of specializations. The interviews were conducted in partnership with Schlesinger from January 24–February 16, 2017. Interviews were conducted in-person or over the phone.

Quantitative surveys

Healthcare professionals and the general population

In partnership with IPSOS, an independent global market research firm, a survey was fielded from January 18, 2017 to March 3, 2017 in 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, Italy, the Netherlands, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, UAE, UK and US) in their native language. The survey had an average length of 25–30 minutes. A combination of online, face-to-face (computer-assisted) and phone (computer-assisted) interviewing was used to reach a total sample of:

- 3,891 healthcare professionals (defined as those who work in healthcare as a doctor, surgeon, nurse practitioner, registered nurse, licensed practical nurse or nurse across a variety of specializations)
- 29,410 adults (representative of each country's respective adult population).

About 200 healthcare professionals and between 1,400 and 2,000 members of the public were surveyed in each country. At the 95% confidence level, the 19-country total for the general population has a margin of error[25] of +/- 0.6 percentage points and the 19-country total for the healthcare professional population has an estimated margin of error of +/- 1.6 percentage points[25].

Insurance professionals
In partnership with Braun Research, Inc., an independent market research firm, an 11-minute survey was conducted online from February 11–March 1, 2017 in China, France, the Netherlands, the UK and US among:

- 151 insurance professionals (defined as those who have worked at an above-entry-level role for at least a year at either a private healthcare insurance company, a public funded health insurance organization, or an organization that oversees publically funded healthcare systems).

About 30 insurance professionals were surveyed in each country. At the 95% confidence level, the total estimated margin of error[26] is +/- 8.0 percentage points.

Below is the specific sample size, margin of error at the 95% confidence level, and interviewing methodology used for each market.

	General population			Healthcare professionals		
	Unweighted sample size (N=)	Margin of error %	Interview methodology	Unweighted sample size (N=)	Estimated margin of error[26] %	Interview methodology
19-country total	**29,410**	**+/- 0.6**	**Online Face-to-face**	**3,891**	**+/- 1.6**	**Online Face-to-face Phone**
Argentina	1,433	+/- 2.6	Online Face-to-face	203	+/- 6.9	Online Phone
Australia	1,517	+/- 2.5	Online	208	+/- 6.9	Online
Brazil	1,442	+/- 2.6	Online Face-to-face	201	+/- 6.9	Online
Canada	1,491	+/- 2.5	Online	201	+/- 6.9	Online
China	1,534	+/- 2.5	Online	203	+/- 6.9	Online
France	1,473	+/- 2.6	Online	200	+/- 6.9	Online
Germany	1,483	+/- 2.5	Online	207	+/- 6.9	Online
Italy	1,453	+/- 2.6	Online	204	+/- 6.9	Online
Netherlands	1,473	+/- 2.6	Online	201	+/- 6.9	Online
Russia	1,680	+/- 2.4	Online	200	+/- 6.9	Online
Saudi Arabia	1,422	+/- 2.6	Online Face-to-face	206	+/- 6.9	Online Phone Face-to-face
Singapore	1,493	+/- 2.5	Online	200	+/- 6.9	Online Face-to face
South Africa	2,168	+/- 2.1	Online Face-to-face	202	+/- 6.9	Online Phone
South Korea	1,693	+/- 2.4	Online	200	+/- 6.9	Online
Spain	1,462	+/- 2.6	Online	201	+/- 6.9	Online
Sweden	1,490	+/- 2.5	Online	202	+/- 6.9	Online
UAE	1,696	+/- 2.4	Online Face-to-face	249	+/- 6.2	Online Phone
UK	1,500	+/- 2.5	Online	202	+/- 6.9	Online
US	1,507	+/- 2.5	Online	201	+/- 6.9	Online

Local market general population key notes
Weighting
For the general population sample, all countries are weighted to be representative of the national population based on census statistics for key demographics (including age, gender, urban/rural dwelling, region, and income and/or socioeconomic level), with the exception of China, which is weighted to be representative of the country's online population due to lower internet penetration in that market. The weighting is applied to ensure the sample is representative of individuals age 18 or older in each country.

Year-over-year comparisons
In 2016, the patient population was defined as those who had interacted with the healthcare system in the last three months. In 2017, we evolved this group to be fully inclusive and representative of the general population, meaning respondents are not required to have had a recent interaction with the healthcare system to be included.

To accommodate this audience switch, the 2016 all-online methodology was adjusted in many countries to reach the wider population. This applies in Brazil, South Africa and the UAE, where mixed methodologies (online and face-to-face) were used.

Local market healthcare professional key notes
Weighting
In the absence of a reliable sampling frame for the healthcare professional population, the healthcare professional sample in countries which were included in the 2016 Future Health Index are weighted to ensure comparability in samples year-over-year. Key variables weighted on to ensure consistency include: years of experience, specialty, public or private work, gender and region.

Year-over-year comparisons
The healthcare professional definition remains consistent from the 2016 study. This means direct comparisons can be made year-over-year.

In the UAE, the methodology was adjusted to allow for reaching a more representative healthcare professional population as defined by country of origin.

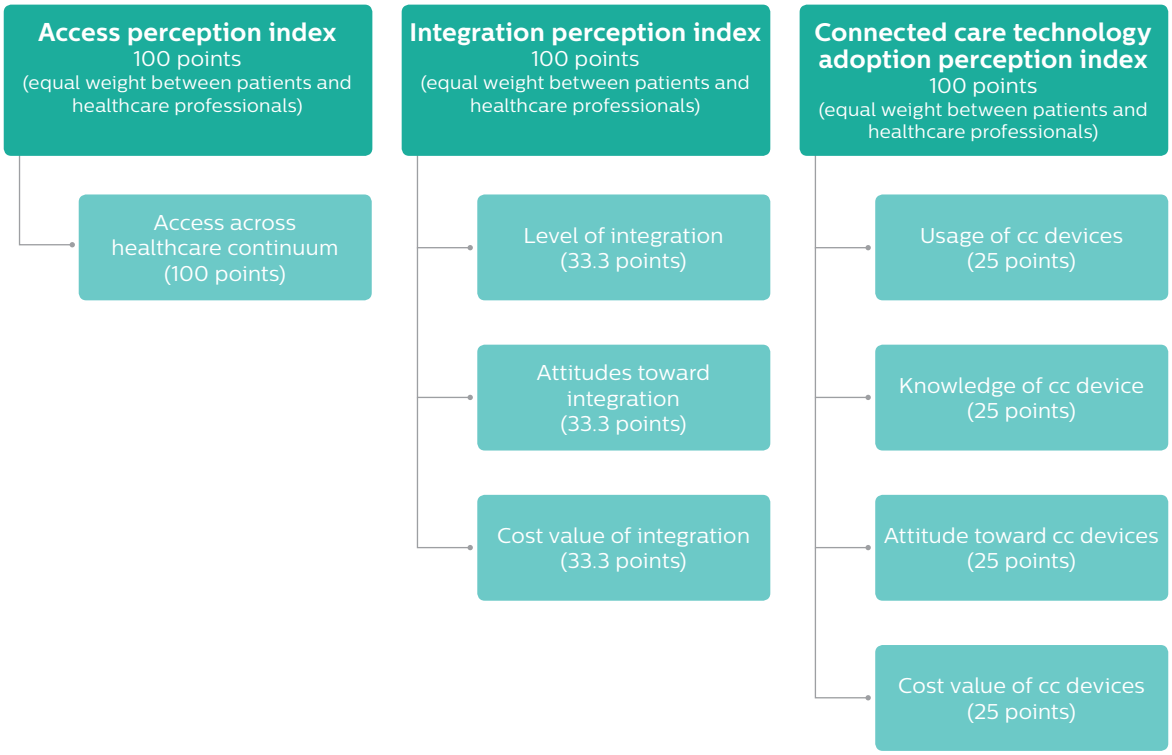
Total country weighting (healthcare professionals and general population)
The 19-country total is an average calculation with each country's sample size weighted to have the same value. This was completed to ensure each country has an equal weight in this total. The same approach was used for all regional totals.

Perception index

In order to benchmark and measure changes in perceptions, an index has been created and will be run on an annual basis. The perception side of the Future Health Index is calculated by combining the quantitative survey responses from patients and healthcare professionals equally on questions about their country's current state of integration of the healthcare system, adoption of connected care devices and access to the healthcare system. Each index ranges from 0 to 100 points.

The three perception index scores are based on a series of question groupings (or components) that draw from a distinct theme in the questionnaire.[27] These components were statistically tested using an exploratory factor analysis to ensure that each component is actually measuring a unique dimension.

The figure below outlines the scoring structure of the perception index scores.



Reality index

To build on the 2016 Future Health Index's perceptions analysis, the 2017 Future Health Index also incorporates secondary data sourced from the World Health Organization, the World Bank and International Data Corporation (IDC).

These various metrics are grouped into three sub-indices to mirror the perception index structure as follows:

- **Access:** skilled health professional density per 10,000 people and the percentage of people in each country at risk of impoverishing spend for surgical care.
- **Integration:** IT spending on Internet of Things in healthcare on services, software and connectivity.
- **Adoption:** IT spending on Internet of Things in healthcare on hardware and presence of a health technology national policy.

The metrics are normalized to ensure comparability across countries and scored to fit onto a 0 to 100 scale. Metrics which are related to spending are calculated as a percentage of the country's GDP to minimize effects of varying levels of affluence by country. In most cases metrics are scored by setting the 'best' score among all countries with a population over 1,000,000 as '100' and any optimal minimum baseline number as '0'.[28] By excluding countries with less than 1,000,000 population we exclude outliers which may create unrealistic potential to reach '100'. Scores are calculated as a percentage of the 'best' country's score. Metrics which do not follow this pattern of normalization include:

- Risk of impoverishing expenditure for surgical care – this metric is reported as a percentage, so it is simply inversed and no further normalization is needed.
- Presence of a national health technology policy – this metric is categorical, so points are assigned to each distinct group and no further normalization is needed.

The scores for each metric are then averaged to calculate each reality index score.

Appendix II:
Country profiles

Argentina (AR)

Country background

GDP per capita (2015 – USD)	$583.169 billion
Healthcare expenditure per capita (2014 – USD)	$605.18
Healthcare expenditure as a percentage of GDP (2014)	4.8%
Type of health system	Public and Private • Composed of three sectors: the public sector, financed through taxes; the private sector, financed through voluntary insurance schemes; and the social security sector, financed through obligatory insurance schemes
Average life expectancy	76.3 • Healthy life expectancy: 67.6
Infant mortality rate (per 1,000)	12.5
Top cause of death	Coronary heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	19-country average		Argentina		Argentina Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	63.6	47.5	16.1
Integration Sub-Index	54.9	24.1	55.3	5.4	49.9
Adoption Sub-Index	50.8	57.8	50.5	51.8	1.3
Overall Index	57.6	48.8	56.5	34.9	21.6

Efficiency ratio 2017

	Argentina score	19-country average
Input (healthcare spend as a percentage of GDP)	4.8	8.7
Overall outcome score	65.8	80.3
Efficiency ratio (outcome/input)	13.7	10.5

In the areas of access and adoption, perceptions among Argentina's general population and healthcare professionals are somewhat aligned with the realities of the healthcare system. However, the integration sub-index is less aligned, primarily due to the reality score falling significantly below the 19-country average.

Perceptions and the reality of access to care across the continuum are both below the 19-country average in Argentina. This is particularly true for the reality score, which in turn creates a gap of 16.1 points between perceptions and reality. This suggests that the general population in Argentina perceives they have more access to healthcare than they actually do and that there is opportunity to improve access to care further. Argentina's lack of skilled healthcare professionals is potentially driving this gap, as the country ranks among the lowest of all 19 countries surveyed when it comes to this metric.

Perceptions of integration of the health system in Argentina are about on par with the 19-country average (55.3 versus 54.9). However, with a score of 5.4, Argentina scores well below average (24.1) on the reality sub-index for integration. Accordingly, these scores result in a large gap (49.9) in integration. Argentina's reality score is driven down by lower than average spend on Internet of Things (IoT) in healthcare (across services, software and connectivity) as a proportion of gross domestic product, allowing significant room for growth if investments are made.

The gap of 1.3 between perceptions (50.5) and reality (51.8) of adoption of connected care technology is among the smallest of the 19 countries in this study, showing alignment of the general population and healthcare professionals with the reality of the level of adoption of connected care technology in Argentina. However, Argentina's reality score falls slightly below the 19-country average (51.8 versus 57.8 respectively) due to low levels of IT spending on IoT in healthcare hardware as a percentage of gross domestic product.

While Argentina's efficiency ratio is among the highest of the countries in this study (13.7 compared with 10.5 group average), indicating high efficiency, this score is driven by below average expenditure on healthcare while also obtaining below average health outcomes.

Other key findings

1. The majority of the general population in Argentina feel healthy. However, healthcare professionals in the country paint a different, less positive picture of Argentinians' overall health.
2. The general population recognizes the importance of prevention, as many believe healthcare professionals should focus the majority of their time and resources on preventive care. Additionally, many Argentinians and healthcare professionals already understand that new approaches, such as connected care technologies, are important to building sustainable health systems.
3. Likewise, Argentina's general public and healthcare professionals believe that about a quarter of the country's budget should go towards healthcare – significantly more than is currently the case. Additionally, they believe that a higher proportion of the healthcare budget should be spent on preventive measures as caring for those with chronic and acute conditions.
4. Many Argentinians who already use connected care technologies also share the data with their healthcare professional.
5. Many Argentinians with respiratory, cardiology or fertility, pregnancy and parenting issues have used connected care technologies over the last year. In fact, patients with a cardiology related medical history are particularly likely to utilize these innovative technologies.

Australia (AU)

Country background

GDP per capita (2015 – USD)	$1.339 trillion
Healthcare expenditure per capita (2014 – USD)	$6,031.11
Healthcare expenditure as a percentage of GDP (2014)	9.4%
Type of health system	Public • Regionally administered • Joint national and state public hospital funding • Universal public medical insurance program (Medicare)
Average life expectancy	82.8 • Healthy life expectancy: 71.9
Infant mortality rate (per 1,000)	3.8
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	Australia Perception	19-country average Perception	19-country average Reality	Australia Perception	Australia Reality	Australia Perception versus Reality Gap
Access Sub-Index	71.5	66.9	64.6	73.7	79.7	6.0
Integration Sub-Index	55.1	54.9	24.1	54.1	18.4	35.7
Adoption Sub-Index	47.2	50.8	57.8	50.5	9.1	41.4
Overall Index	57.9	57.6	48.8	59.4	35.7	23.7

Efficiency ratio 2017

	Australia score	19-country average
Input (healthcare spend as a percentage of GDP)	9.4	8.7
Overall outcome score	89.0	80.3
Efficiency ratio (outcome/input)	9.5	10.5

In the areas of integration and adoption, perceptions among Australia's general population and healthcare professionals are not aligned with the realities of the healthcare system. These gaps can be attributed to the reality scores on these sub-indices falling significantly below the 19-country average. However, this gap between perception and reality is much smaller when it comes to access to healthcare.

While perceptions and the reality of access to healthcare in Australia are both above the 19-country average, there is still a small gap (6.0), suggesting the general population and healthcare professionals in Australia perceive they have slightly less access to healthcare than is actually available.

Perceptions of integration of the health system are on par with the 19-country average (54.1 versus 54.9). However, with a reality score of 18.4, Australia scores below average (24.1) on the integration sub-index, resulting in a large gap (35.7). Australia's integration reality index score is driven down by mid-range scores on IT spending on Internet of Things (IoT) in services, software and connectivity for healthcare as a percentage of GDP compared with other markets.

The gap of 41.4 points between perceptions (50.5) and reality (9.1) of adoption is notable, showing a lack of alignment with the reality of the level of adoption of connected care technology in Australia. Australia's reality score falls well below the 19-country average (9.1 versus 57.8), driven by low levels of IT spending on IoT in hardware in healthcare as a percentage of GDP and a lack of a cohesive health medical technology policy.

Australia's efficiency ratio is slightly below the 19-country average (9.5 versus 10.5 respectively), as the country achieves above average health outcomes but also spends more than average on healthcare as a percentage of GDP.

Other key findings

1. Both the general population and healthcare professionals overwhelmingly see cost/affordability as the largest barrier to providing high quality healthcare in Australia.
2. The general population and healthcare professionals recognize the importance of preventive care, and most believe that tools like connected care technologies can empower the population to take more preventive measures, especially seniors.
3. The biggest health concerns for Australians are ones they can act on, including being more active and eating better.
4. While prevention is widely believed to be important, when it comes to allocation of the budget, healthcare professionals and the general population alike prioritize 'sick care' over preventive measures.
5. While most of the Australian general population and healthcare professionals believe that patients have ownership of their medical records, the responsibility of moving the medical records is currently mostly in the hands of healthcare professionals. However, healthcare professionals would prefer more of a shared responsibility with their patients.

Brazil (BR)

Country background

GDP per capita (2015 – USD)	$1.774 trillion
Healthcare expenditure per capita (2014 – USD)	$947.42
Healthcare expenditure as a percentage of GDP (2014)	8.3%
Type of health system	Public and Private • 3/4 depend on free care from Brazil's Unified Health System (SUS) • The largest public health system in the world • 1/4 is enrolled in private health plans (many use the public system, as well)
Average life expectancy	75.0 • Healthy life expectancy: 65.5
Infant mortality rate (per 1,000)	16.4
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	Brazil Perception	Perception	Reality	Perception	Reality	Brazil Perception versus Reality Gap
Access Sub-Index	45.4	66.9	64.6	49.9	49.2	0.7
Integration Sub-Index	57.0	54.9	24.1	55.3	8.7	46.6
Adoption Sub-Index	49.4	50.8	57.8	50.5	53.7	3.2
Overall Index	50.6	57.6	48.8	51.9	37.2	14.7

Efficiency ratio 2017

	Brazil score	19-country average
Input (healthcare spend as a percentage of GDP)	8.3	8.7
Overall outcome score	65.5	80.3
Efficiency ratio (outcome/input)	7.9	10.5

In the areas of access and adoption of connected care technology, perceptions among Brazil's general population and healthcare professionals are generally aligned with the realities of the healthcare system. However, the integration sub-index is less aligned, primarily due to the reality score falling notably below the 19-country average. Additionally, Brazil's reality scores fall below the 19-country average across all three pillars, showing opportunities for growth.

Perceptions and the reality of access to care across the continuum are both below the 19-country average in Brazil. However, the perceptions of the general population and healthcare professionals appear to be aligned with the reality. Brazil's reality index score is driven down by a higher than average risk of impoverishing expenditure for surgical care and a below average amount of skilled health professionals in the country.

The gap of 3.2 between perceptions (50.5) and reality (53.7) as it relates to adoption of connected care technology is among the smallest of the 19 countries in this study. This gap shows alignment of the general population and healthcare professionals with the reality of the level of adoption of connected care technology in Brazil. However, Brazil's reality score falls slightly below the 19-country average (53.7 versus 57.8 respectively) due to relatively low IT spending on Internet of Things (IoT) in hardware for healthcare as a percentage of country's GDP.

Perceptions of integration of the health system are about on par with the 19-country average (55.3 versus 54.9) in Brazil. However, with a score of 8.7, Brazil's reality score is well below the 19-country average (24.1), resulting in a large gap (46.6). Brazil's reality score is driven down by low IT spending on IoT in services, software and connectivity within healthcare as a percentage of GDP compared with other markets.

Brazil's efficiency ratio is below the 19-country average, hindered by below average health outcomes as a result of average expenditure on healthcare as a percentage of GDP.

Other key findings

1. Healthcare professionals and the general population alike have limited trust in the Brazilian healthcare system, partially due to limited access.
2. Healthcare professionals and the general population understand the importance of prevention. Many agree that healthcare professionals should focus on prevention to empower healthcare professionals and healthcare consumers alike, taking stress off of the healthcare system overall.
3. Many patients currently think they have high ownership of their own medical records and healthcare professionals agree. Further, many healthcare professionals believe that the responsibility for getting records to the next medical facility should be shared, suggesting alignment among healthcare professionals and patients.
4. Cardiology patients are responsive to increased education, doctor recommendations and connected care technology which may be a path to increasing the use of connected care technologies across health the spaces.

Canada (CA)

Country background

GDP per capita (2015 – USD)	$1.550 trillion
Healthcare expenditure per capita (2014 – USD)	$5,291.75
Healthcare expenditure as a percentage of GDP (2014)	10.5%
Type of health system	Public and Private • Regionally administered universal public insurance program that plans and funds (mainly private) provision
Average life expectancy	• 82.2 • Healthy life expectancy: 72.3
Infant mortality rate (per 1,000)	4.9
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	19-country average		Canada		Canada Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	69.3	73.3	4.0
Integration Sub-Index	54.9	24.1	54.0	9.4	44.6
Adoption Sub-Index	50.8	57.8	49.9	53.1	3.2
Overall Index	57.6	48.8	57.7	45.3	12.4

Efficiency ratio 2017

	Canada score	19-country average
Input (healthcare spend as a percentage of GDP)	10.5	8.7
Overall outcome score	87.6	80.3
Efficiency ratio (outcome/input)	8.4	10.5

In the areas of access and adoption, perceptions among Canada's general population and healthcare professionals are generally aligned with the realities of the healthcare system. The integration sub-index is the exception, primarily due to the reality score falling significantly below the 19-country average.

Perceptions among Canada's general population and healthcare professionals of access to healthcare are in line with reality, as indicated by only a small gap (4.0 points). Perceptions of access are slightly above the 19-country average, similar to Canada's reality score (73.3 versus the 64.6 group average), driven by an above average amount of skilled health professionals and nearly no risk of impoverishing expenditure for surgical care.

The gap of 3.2 points between perceptions (49.9) and reality (53.1) as it relates to adoption is among the smallest of the 19 countries in this study, showing alignment of the general population and healthcare professionals with the reality of connected care technology adoption in Canada. However, Canada's reality score falls slightly below the 19-country average (53.1 versus 57.8 respectively) due to below average IT spend on Internet of Things (IoT) hardware in healthcare as a percentage of GDP.

Perceptions of healthcare system integration are on par with the 19-country average (54.0 versus 54.7). However, with a score of 9.4, Canada scores well below average (24.1) for reality, resulting in a large gap (44.6 points). Canada's reality score is driven down by low spend on IoT for services, software and connectivity in healthcare as a percentage of GDP, which leaves significant room for growth if investments are made.

Canada achieves above average health outcomes, expenditure on healthcare as a percentage of GDP is also higher than average, placing Canada's efficiency ratio slightly below the 19-country average (8.4 versus the group average of 10.5).

Other key findings

1. Across Canada, there is strong recognition that healthcare spending is substantial, as the system provides universal access to all. However, Canadian healthcare professionals and the general population believe that considerably more should be spent than is currently spent in reality.
2. Healthcare professionals and Canadian citizens recognize the need and importance of preventive care. However, healthcare professionals also acknowledge that it is often deprioritized, and may fall under the remit of other areas of healthcare.
3. Additionally, healthcare professionals and the general population both believe that a larger proportion of the healthcare budget should be spent on 'sick care' instead of preventive measures. Considering how overburdened healthcare professionals believe the system is, and the importance of prevention when it comes to creating a sustainable health system, solutions that help drive efficiencies will be important to meet the needs of Canadians.
4. Canadians with oncology issues are more positive towards the healthcare system than the general population and are more likely to believe in the importance of connected care technology.
5. Interpretation of results from connected care technology is a concern to both healthcare professionals and the general population. Establishing protocols and supporting training for healthcare professionals and the general population can help systematize use of connected care technologies.

China (CN)

Country background

GDP per capita (2015 – USD)	$11.007 trillion
Healthcare expenditure per capita (2014 – USD)	$419.73
Healthcare expenditure as a percentage of GDP (2014)	5.6%
Type of health system	Public • Merger of the New Rural Cooperative Medical Scheme (NCMS) with the Medical Financial Assistance Scheme (MFA)
Average life expectancy	• 76.1 • Healthy life expectancy: 68.5
Infant mortality rate (per 1,000)	10.7
Top cause of death	Stroke

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	China Perception	Perception	Reality	Perception	Reality	China Perception versus Reality Gap
Access Sub-Index	64.8	66.9	64.6	64.7	25.8	38.9
Integration Sub-Index	57.3	54.9	24.1	55.7	15.5	40.2
Adoption Sub-Index	52.1	50.8	57.8	52.7	57.6	4.9
Overall Index	58.1	57.6	48.8	57.7	33.0	24.7

Efficiency ratio 2017

	China score	19-country average
Input (healthcare spend as a percentage of GDP)	5.6	8.7
Overall outcome score	76.6	80.3
Efficiency ratio (outcome/input)	13.8	10.5

In the areas of access and integration, perceptions among China's general population and healthcare professionals generally lack alignment with the realities of the healthcare system. However, this gap between perception and reality is much smaller for the adoption sub-index. Additionally, reality scores for the access and integration sub-indices are both well below the 19-country average, showing opportunities for growth.

Perceptions and the reality of access to care across the continuum are both below the 19-country average in China. This is particularly true for the reality score, which happens to be among the lowest of the 19 countries in this study, creating a gap of 38.9 points between perceptions and reality. This is the largest access gap seen among all 19 countries, suggesting that the general population and healthcare professionals in China perceive they have more access to healthcare than is available. Access to healthcare across the continuum is hindered by a lack of skilled healthcare professionals in relation to the size of the population and by over half of the population being at risk of impoverishing spend for surgical care.

China's perceptions of integration are about in line with the 19-country average (55.7 compared with 54.9). However, with a score of 15.5, China scores below average (24.1) on the reality sub-index for integration. Accordingly, these scores result in a large gap (40.2 points), driven by lower Internet of Things (IoT) spend on IT services, software and connectivity in healthcare as a proportion of GDP than the 19-country average, allowing significant room for growth if investments are made.

The gap of 4.9 points between perceptions (52.7) and reality (57.6) for adoption of connected care technology is relatively small, showing general alignment of the general population and healthcare professionals with the reality of the level of connected care technology adoption in China.

China's efficiency ratio is among the highest of the 19 countries in this study (13.8 compared with the 19-country average of 10.5), indicating high efficiency, primarily driven by relatively low healthcare spend as a percentage of GDP, but also resulting in below average health outcomes.

Other key findings

1. There is a significant gap between the perceptions of healthcare among the general population in China with that of healthcare professionals. While the general population in China rates their own health positively, healthcare professionals are less optimistic. Healthcare professionals dealing with the healthcare system on a daily basis, may serve as an early warning system for general population sleepwalking into poor health.
2. While the general population in China rates their own health positively, healthcare professionals are less optimistic.
3. The Chinese general population and healthcare professionals believe that more funding should be allocated to healthcare.
4. The Chinese general population and healthcare professionals alike recognize the importance of prevention in healthcare. Many believe prevention should be a priority when allocating the overall healthcare budget, as well as the time and resources of healthcare professionals.
5. Financial barriers and lack of training are some of the challenges that connected care technology has to overcome in China to enable further usage.

France (FR)

Country background

GDP per capita (2015 – USD)	$2.419 trillion
Healthcare expenditure per capita (2014 – USD)	$4,958.99
Healthcare expenditure as a percentage of GDP (2014)	11.5%
Type of health system	Public • Statutory health insurance (SHI) system • All SHI insurers incorporated into a single national exchange
Average life expectancy	• 82.4 • Healthy life expectancy: 72.6
Infant mortality rate (per 1,000)	4.3
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	France Perception	Perception	Reality	Perception	Reality	France Perception versus Reality Gap
Access Sub-Index	66.9	66.9	64.6	69.0	76.2	7.2
Integration Sub-Index	54.4	54.9	24.1	53.1	40.7	12.4
Adoption Sub-Index	42.6	50.8	57.8	45.8	86.8	41.0
Overall Index	54.6	57.6	48.8	56.0	67.9	11.9

Efficiency ratio 2017

	France score	19-country average
Input (healthcare spend as a percentage of GDP)	11.5	8.7
Overall outcome score	89.4	80.3
Efficiency ratio (outcome/input)	7.8	10.5

In the areas of access and integration, France's general population and healthcare professionals are somewhat aligned with the realities of the healthcare system. The adoption sub-index is the exception, primarily due to a reality score that is significantly above the 19-country average.

Perceptions and the reality of access to healthcare across the continuum are both above the 19-country averages in France, implying that healthcare professionals and the general population are generally aligned with the reality of access (gap of 7.2 points). France's reality score is driven up by an above average amount of skilled health professionals in relation to the size of the population and nearly no risk of impoverishing expenditure for surgical care.

Perceptions of integration of the health system in France are about on par with the 19-country average (53.1 versus 54.9, respectively), while reality is significantly above average (40.7 versus 24.1, respectively). These scores result in a relatively small gap (12.4 points) between perceptions of healthcare professionals and the general population and the reality of integration. The reality score in France is driven up by higher than average spend on Internet of Things (IoT) in healthcare across software, services and connectivity as a percentage of the country's GDP.

The gap of 41.0 points between perceptions (45.8) and reality (86.8) for adoption is among the highest of the 19 countries in this study, showing a lack of alignment of the general population and healthcare professionals with the reality of the level of connected care technology adoption. However, France's reality score is well above the 19-country average (86.8 versus 57.8, respectively) due to France having both a health technology medical policy and the highest IT spend on IoT for hardware in healthcare as a percentage of GDP across all 19 countries in the study.

France's efficiency ratio is on the lower end of the 19 countries in this study. While France achieves above average health outcomes, healthcare expenditure as a percentage of GDP is also high.

Other key findings

1. The overall health of the French population is viewed positively by the general population and healthcare professionals alike, but more can be done to ensure future sustainability of the health system.
2. Currently, the healthcare system appears to be meeting the needs of the French population and trust in the system remains high among both the general population and healthcare professionals.
3. According to the general population in France, the health system should invest more in prevention than 'sick care'. Meanwhile, healthcare professionals are more mixed in their opinions of how the healthcare budget should be spent and where they should focus their time and resources.
4. Those with cardiology issues are more likely to trust the French health system than the general population. Additionally, this group may become advocates for integration as they are also more likely than average to see the value of it.
5. While the general population and healthcare professionals place importance on integrating the health system in France, the perceived financial trade-off may be hindering widespread adoption and associated higher quality of care.

Germany (DE)

Country background

GDP per capita (2015 – USD)	$3.363 trillion
Healthcare expenditure per capita (2014 – USD)	$5,410.64
Healthcare expenditure as a percentage of GDP (2014)	11.3%
Type of health system	Public and Private • Statutory health insurance (SHI) system • 131 competing SHI insurers • High income can opt out for private coverage
Average life expectancy	• 81.0 • Healthy life expectancy: 71.3
Infant mortality rate (per 1,000)	3.7
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	Germany Perception	Perception	Reality	Perception	Reality	Germany Perception versus Reality Gap
Access Sub-Index	69.2	66.9	64.6	70.0	79.2	9.2
Integration Sub-Index	52.8	54.9	24.1	52.3	32.1	20.2
Adoption Sub-Index	41.5	50.8	57.8	45.5	50.3	4.8
Overall Index	54.5	57.6	48.8	56.0	53.9	2.1

Efficiency ratio 2017

	Germany score	19-country average
Input (healthcare spend as a percentage of GDP)	11.3	8.7
Overall outcome score	85.4	80.3
Efficiency ratio (outcome/input)	7.6	10.5

Germany's general population and healthcare professionals are generally aligned with the realities of the healthcare system when it comes to adoption of connected care technology and access to healthcare. However, the gap between perception and reality is larger in the area of integration.

In Germany, the smallest gap between perception and reality is in the area of adoption (4.8 points), showing the German population and healthcare professionals have a relatively accurate sense of the state of connected care technology adoption within the healthcare system. Nonetheless, Germany's scores are still below the 19-country average for both perceptions and reality. Germany's reality score is hindered by the lack of a health technology medical policy.

The German general population and healthcare professionals may be underestimating the access they have to healthcare services across the continuum, as perceptions (70.0) fall below reality (79.2), creating a gap (9.2 points). Nonetheless, perceptions and the reality of access to care across the continuum are still above the 19-country average. Germany's reality score is driven up by an ample amount of skilled health professionals and no risk of impoverishing expenditure for surgical care.

While the perceptions of the German general population and healthcare professionals are generally in line with the 19-country average (52.3 versus 54.9, respectively) when it comes to integration, Germany's reality score on this sub-index is well above average (32.1 versus 24.1, respectively), creating a relatively large gap (20.2 points). This gap can likely be attributed to Germany's above average IT spend on Internet of Things (IoT) for connectivity, software and services in healthcare as a percentage of the country's GDP.

While Germany achieves above average health outcomes, the efficiency ratio is among the lowest of the countries in this study (7.6 compared with 10.5 group average), driven by above average expenditure on healthcare as a percentage of GDP.

Other key findings

1. A large proportion of the German general population would prefer to obtain their health records on paper. Among those who would prefer to obtain their records electronically, there is a split on preferences of the format. Unsurprisingly, the younger generation that have grown up in a digital world are more open to digitalization via email and mobile devices than their older counterparts.
2. Interestingly, there is currently a generational gap among the German general population when it comes to perceived ownership of their medical record. Younger generations are more likely than their older counterparts to feel they have no ownership at all, which may be why younger generations are more open to exploring digital formats for their medical data.
3. Attitudes among German citizens towards paper and electronic formats for medical records may be due to trust concerns with their personal data.
4. Although only about a third of healthcare professionals and general population believe that their health system is integrated, many already understand the importance of an integrated health system.
5. While knowledge about connected care technology is very limited among the general population and healthcare professionals alike, many Germans understand the importance of connected care technology for improving care across most phases of the health continuum.

Italy (IT)

Country background

GDP per capita (2015 – USD)	$1.821 trillion
Healthcare expenditure per capita (2014 – USD)	$3,257.75
Healthcare expenditure as a percentage of GDP (2014)	9.3%
Type of health system	Public and Private • National healthcare system. Funding and definition of minimum benefit package by national government; planning, regulation and provision by regional governments • 15% buy complementary (services excluded from statutory benefits) or supplementary coverage (more amenities in hospitals, wider provider choice)
Average life expectancy	• 82.7 • Healthy life expectancy: 72.8
Infant mortality rate (per 1,000)	3.5
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	19-country average		Italy		Italy Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	59.9	67.3	7.4
Integration Sub-Index	54.9	24.1	54.5	22.5	32.0
Adoption Sub-Index	50.8	57.8	47.2	70.8	23.6
Overall Index	57.6	48.8	53.9	53.5	0.4

Efficiency ratio 2017

	Italy score	19-country average
Input (healthcare spend as a percentage of GDP)	9.3	8.7
Overall outcome score	91.3	80.3
Efficiency ratio (outcome/input)	9.9	10.5

With regards to access, the perceptions of the general population and healthcare professionals are generally aligned with the realities of the healthcare system. However, there are larger gaps between perceptions and reality in the areas of integration and adoption, showing opportunities for growth.

Perceptions of access to care across the continuum among the general population and healthcare professionals in Italy are below the 19-country average (59.9 versus 66.9, respectively). Reality is more in-line with the average (67.3 versus 64.6, respectively). This suggests that the perceptions of the general population and healthcare professionals in Italy are somewhat aligned with reality in terms of access to healthcare. Italy scores above average on the reality sub-index for access as there is a lower than average risk of impoverishing expenditure for surgical care in the country.

Perceptions of integration of the health system in Italy are also about on par with the 19-country average (54.5 versus 54.9, respectively). However, Italy's most sizeable gap between perceptions and reality is on the integration sub-index (32.0 points), as the reality score falls slightly below the average (22.5 versus 24.1, respectively) due to low IT spend on Internet of Things (IoT) for services and connectivity in healthcare as a percentage of the country's GDP.

Italy also has a considerable gap between perceptions and reality on the adoption sub-index (23.6 points), as the perceptions of the general population and healthcare professionals in Italy are slightly below average (47.2 versus 50.8, respectively), while the reality is well above the 19-country average (70.8 versus 57.8, respectively). This implies that perceptions of the level of connected care technology adoption in Italy are not aligned with the reality. Italy's reality score is above average due to a higher than average spending on IoT in hardware within healthcare as a percentage of GDP.

Italy's efficiency ratio is just below the 19-country average (9.9 compared with 10.5 respectively), indicating slight inefficiencies. While Italy achieves above average health outcomes, the score is hampered by an above average expenditure on healthcare as a percentage of GDP.

Other key findings

1. There is common optimism among both healthcare professionals and the general population about the state of the population's health in Italy. However, there are differences in opinions between those living in different neighborhood types.
2. In Italy over half of the general population believe the majority of healthcare professionals' time and resources should be allocated to preventive healthcare. Preventive care requires providing information and tools to empower the general population and alleviate pressure on the health system. However, just half of the general population believe that they have access to these resources.
3. Healthcare professionals agree that increased awareness of the benefits of sharing data and monitoring vital signs, as well as encouraged adoption from the health system would empower the general population in self-prevention.
4. Connected care is deemed to be important to the future of Italy's healthcare system, with almost all of the population at large agreeing that they think it would be beneficial. However, one possible drawback would be cost.

Netherlands (NL)

Country background

GDP per capita (2015 – USD)	$750.284 billion
Healthcare expenditure per capita (2014 – USD)	$5,693.86
Healthcare expenditure as a percentage of GDP (2014)	10.9%
Type of health system	Public and Private • Statutory health insurance system • Universally-mandated private insurance • Government regulates and subsidizes insurance
Average life expectancy	• 81.9 • Healthy life expectancy: 72.2
Infant mortality rate (per 1,000)	3.8
Top cause of death	Trachea, bronchus, lung cancers

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	Netherlands Perception	Perception	Reality	Perception	Reality	Netherlands Perception versus Reality: Gap
Access Sub-Index	72.4	66.9	64.6	72.8	93.1	20.3
Integration Sub-Index	58.8	54.9	24.1	55.2	30.0	25.2
Adoption Sub-Index	45.5	50.8	57.8	49.1	75.2	26.1
Overall Index	58.9	57.6	48.8	59.0	66.1	7.1

Efficiency ratio 2017

	Netherlands score	19-country average
Input (healthcare spend as a percentage of GDP)	10.9	8.7
Overall outcome score	88.4	80.3
Efficiency ratio (outcome/input)	8.1	10.5

In the areas of access, integration and adoption, there are considerable gaps in perceptions of healthcare professionals and the general population with the reality of the healthcare system. Across all indices, reality scores are above the 19-country average, indicating there may be an opportunity to further educate the public on the healthcare system and its offerings.

Perceptions (among the general population and healthcare professionals) and the reality of access to healthcare across the continuum are both above the 19-country average in the Netherlands. This is particularly true for the reality score (93.1 versus the 64.6 group average), which in turn creates a gap of 20.3 points between perceptions and reality. The Netherlands' reality score for access is among the highest of the 19 countries in this study due to a high amount of skilled health professionals and no risk of impoverishing expenditure for surgical care.

Another large gap between perception and reality is observed for integration, as perceptions of integration are about on par with the 19-country average (55.2 versus 54.9), but the reality is well above average (30.0 versus 24.1, respectively). The Netherlands' reality score is driven by above average IT spend on Internet of Things (IoT) for software and connectivity in healthcare as a percentage of GDP.

The largest gap across the three sub-indices is in the perceptions and reality of connected care technology adoption (26.1 points). Perceptions of adoption in the Netherlands are about on par with the 19-country average (49.1 versus 50.8 respectively). However, the Netherlands' reality score is considerably above average (75.2 versus 57.8 respectively) due to above average IT spend on IoT for hardware in healthcare as a percentage of GDP.

The Netherlands' efficiency ratio (8.1) falls slightly below the 19-country average (10.5), showing some inefficiencies. While the Netherlands experiences higher than average health outcomes, this score is driven by higher than average expenditure on healthcare as a percentage of GDP.

Other key findings

1. Healthcare professionals in the Netherlands have a more positive perception of the overall health of the population compared to how the general population feel themselves.
2. The general population perceives treating the sick to be more of a priority than prevention in terms of time and resource allocations. However, healthcare professionals believe that both are almost equally important unless it comes to their own specialization when the pendulum swings in favour of treating the sick.
3. Those with cardiology issues are more likely than average to think that healthcare system is not integrated, yet they are also more likely to believe that integration will make the quality of care better and will improve care across the health continuum. Accordingly, cardiology patients may be more open to new technologies than the average.
4. Technologies that would have the most impact on healthcare in the Netherlands today according to the general population and healthcare professionals are linked to artificial intelligence (AI).

Russia (RU)

Country background

GDP per capita (2015 – USD)	$1.331 trillion
Healthcare expenditure per capita (2014 – USD)	$892.85
Healthcare expenditure as a percentage of GDP (2014)	7.1%
Type of health system	Public and Private • Russian citizens are entitled to free universal healthcare, however, they are required to take out compulsory private medical insurance
Average life expectancy	• 70.5 • Healthy life expectancy: 63.3
Infant mortality rate (per 1,000)	9.6
Top cause of death	Coronary heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	19-country average		Russia		Russia Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	58.0	68.1	10.1
Integration Sub-Index	54.9	24.1	50.0	6.0	44.0
Adoption Sub-Index	50.8	57.8	46.1	53.1	7.0
Overall Index	57.6	48.8	51.4	42.4	9.0

Efficiency ratio 2017

	Russia score	19-country average
Input (healthcare spend as a percentage of GDP)	7.1	8.7
Overall outcome score	68.2	80.3
Efficiency ratio (outcome/input)	9.6	10.5

In the areas of access and adoption, perceptions among Russia's general population and healthcare professionals are somewhat aligned with the realities of the healthcare system. The integration sub-index is less aligned, primarily due to the reality score falling significantly below the 19-country average. Overall, Russia falls below average across the board, with the exception of the access reality score, showing opportunities for growth.

Perceptions and the reality of adoption of connected care technology are both below the 19-country average in Russia. Additionally, Russia's gap of 7.0 points between perceptions (46.1) and reality (53.1) imply the general population and healthcare professionals perceive there is slightly less connected care technology use in healthcare than there is. Russia's adoption reality score is slightly below average due to less expenditure as a percentage of GDP on Internet of Things (IoT) for hardware in healthcare relative to the other 19 countries.

Perceptions of healthcare professionals and the general population of access to healthcare across the continuum are slightly below the 19-country average (58.0 compared with 66.9). The reality access score in Russia is slightly above average (68.1 versus 64.6 respectively), driven by Russia's considerable number of skilled health professionals. These scores create a gap (10.1 points) between perception and reality, suggesting the general population and healthcare professionals in Russia perceive they have less access to healthcare than is available.

The largest gap between the perceptions of healthcare professionals and the general population and reality in Russia is for integration (44.0 points), driven by one of the lowest reality scores among the 19 countries (6.0 versus the group average of 24.1) due to Russia's relatively low IT spend on IoT across services, software and connectivity in healthcare as a percentage of the country's GDP.

Russia's efficiency ratio is only slightly below the 19-country average (9.6 versus 10.5 respectively) due to below average expenditure on healthcare as a percentage of GDP, in addition to achieving below average health outcomes.

Other key findings

1. Healthcare professionals have a less optimistic evaluation of the current state of health in Russia than the general population. Additionally, few healthcare professionals think highly of the healthcare system, showing that more needs to be done to improve the current perception.
2. Although healthcare professionals and the general population alike believe that the health system does not meet patients' needs, both have considerable trust in the healthcare system, showing a positive foundation for change.
3. Healthcare professionals recognize the importance of spending time and resources on preventive care, while the general population is less convinced, especially younger Russians.
4. The general population is open to remote consultations, but is less likely to do it when meeting with healthcare professionals for the first time. However, healthcare professionals think that cost and quality concerns may be the top barriers for wider adoption of telemedicine.
5. Healthcare professionals are significantly more knowledgeable about connected care technologies than the general population – suggesting a lack of awareness among Russians who do not work in the healthcare field.

Saudi Arabia (SA)

Country background

GDP per capita (2015 – USD)	$646.002 billion
Healthcare expenditure per capita (2014 – USD)	$1,147.45
Healthcare expenditure as a percentage of GDP (2014)	4.7%
Type of health system	Public and Private • National healthcare system, where government provides healthcare services through a number of government agencies • There is a growing role and increased participation from the private sector in the provision of healthcare services.
Average life expectancy	• 74.5 • Healthy life expectancy: 64.5
Infant mortality rate (per 1,000)	14.5
Top cause of death	Coronary heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	19-country average		Saudi Arabia		Saudi Arabia Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	73.3	55.6	17.7
Integration Sub-Index	54.9	24.1	59.7	6.7	53.0
Adoption Sub-Index	50.8	57.8	62.5	41.0	21.5
Overall Index	57.6	48.8	65.2	34.4	30.8

Efficiency ratio 2017

	Saudi Arabia score	19-country average
Input (healthcare spend as a percentage of GDP)	4.7	8.7
Overall outcome score	73.1	80.3
Efficiency ratio (outcome/input)	15.6	10.5

Across access, integration and adoption areas, Saudi Arabia's general population and healthcare professionals generally lack alignment with the realities of the healthcare system. This is most evident with regards to integration, where the gap between perception and reality is the largest, driven by the reality score falling well below the 19-country average. All of Saudi Arabia's reality scores fall below average, indicating opportunities for growth.

Perceptions of healthcare professionals and the general population in terms of access to healthcare in Saudi Arabia are above the 19-country average (73.3 versus 66.9, respectively), while the reality score is below average (55.6 versus 64.6, respectively) due to a lack of skilled healthcare professionals. These scores create a sizeable gap (17.7 points), indicating that both groups perceive more access to healthcare than is available.

In the area of adoption, perceptions of healthcare professionals and the general population in Saudi Arabia are above average (62.5 versus 50.8, respectively), while the reality score is below average (41.0 versus 57.8, respectively). This indicates that there is misalignment on the level of connected care technology adoption in the health system. Saudi Arabia's reality score is driven down by relatively low IT spend on Internet of Things (IoT) for hardware in healthcare as a percentage of GDP in comparison to the 19-country average.

The largest gap between perceptions and reality for Saudi Arabia is in integration (53.0 points), driven by a reality score that is well below the 19-country average (6.7 versus 24.1, respectively). This score is brought down by a below average IT spend on IoT across services, software and connectivity in healthcare as a percentage of the country's GDP.

Saudi Arabia has an above average efficiency ratio (15.6 compared with the group average of 10.5), driven by below average expenditure on healthcare as a percentage of GDP and below average health outcomes.

Other key findings

1. A large proportion of the general population of Saudi Arabia have positive evaluations of their health. However, healthcare professionals are less optimistic and third-party evaluations are less positive.
2. While the general population and healthcare professionals in Saudi Arabia are more likely to believe that healthcare professionals should focus the majority of their time and resources on preventive care, when it comes to expenditure of the healthcare budget, their priorities shift.
3. Saudi Arabian citizens with respiratory or cardiology issues are more likely than average to have used connected care technology in the past 12 months and to have a better understanding of specific usage.
4. Healthcare professionals in Saudi Arabia would like to see more information sharing platforms, which they think would have the most positive impact on patient health.

Singapore (SG)

Country background

GDP per capita (2015 – USD)	$292.739 billion
Healthcare expenditure per capita (2014 – USD)	$2,752.32
Healthcare expenditure as a percentage of GDP (2014)	4.9%
Type of health system	Public and Private • Government subsidies at public healthcare institutions and some providers • Medisave: mandatory medical savings program for routine expenses • MediShield: catastrophic health insurance • Medifund: government endowment fund to subsidize healthcare for low-income and those with large bills • Government regulation of private insurance, central planning and financing of infrastructure
Average life expectancy	• 83.1 • Healthy life expectancy: 73.9
Infant mortality rate (per 1,000)	2.7
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				Singapore Perception versus Reality
	Singapore Perception	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	70.1	66.9	64.6	72.6	56.3	16.3
Integration Sub-Index	54.8	54.9	24.1	56.8	63.1	6.3
Adoption Sub-Index	48.2	50.8	57.8	52.8	81.2	28.4
Overall Index	57.7	57.6	48.8	60.7	66.9	6.2

Efficiency ratio 2017

	Singapore score	19-country average
Input (healthcare spend as a percentage of GDP)	4.9	8.7
Overall outcome score	88.8	80.3
Efficiency ratio (outcome/input)	18.1	10.5

In the areas of access and adoption, perceptions among Singapore's general population and healthcare professionals are generally not aligned on the realities of the health system. However, this gap between perception and reality is much smaller for integration. While the reality score for integration is well above the 19-country average, it is about in line with the perceptions of the general population and healthcare professionals on integration.

Perceptions of healthcare professionals and the general population on access to healthcare in Singapore are above the 19-country average (72.6 versus 66.9, respectively), while the reality falls below the 19-country average (56.3 versus 64.6, respectively). This, in turn, creates a gap of 16.3 points between perceptions and reality, suggesting the general population and healthcare professionals in Singapore perceive they have more access to healthcare than what is available and that there could be an opportunity to improve access to care further. Singapore's relatively low density of skilled healthcare professionals and relatively high risk for impoverishing expenditure on surgical care hamper the country's access reality score, driving this gap.

Singapore's gap of 6.3 points between perceptions (56.8) and reality (63.1) on the integration sub-index is among the smallest of the 19 countries in this study, showing general alignment of the general population and healthcare professionals with the reality of the level of integration. The reality score exceeds the 19-country average (63.1 versus 24.1, respectively) due to above average IT spend on Internet of Things (IoT) across connectivity, software and services in healthcare as a percentage of the country's GDP.

The reality score of 81.2 for connected care technology adoption, Singapore scores well above average (57.8) on the reality sub-index for this area. Accordingly, these scores result in a large perception versus reality gap on adoption (28.4 points). Singapore's reality score is driven up by Singapore having the second highest IT spend on IoT for hardware in healthcare as a percentage of the country's GDP.

Singapore's efficiency ratio is among the highest of the countries in this study (18.1 compared with 10.5 group average), indicating high efficiency. This efficiency score is driven by below average expenditure on healthcare while obtaining above average health outcomes.

Other key findings

1. Both the general population in Singapore and healthcare professionals positively evaluate the population's health and have considerable trust in the healthcare system.
2. Prevention is viewed as highly important in Singapore in terms of resource and time allocation by healthcare professionals. However, healthcare professionals do not view preventive measures as a top priority for healthcare budget allocation.
3. Both the general population and healthcare professionals alike believe that the cost of hospital systems should be subsidized/covered by the government and insurers.
4. Despite the perceived benefits, a majority of the general population believes that integration of the healthcare system will increase the costs in the long term. A smaller proportion of healthcare professionals feel the same, indicating that education may help to manage cost expectations among the general public.
5. The general population and healthcare professionals believe that healthcare should be allocated the largest portion of the national budget. However, there is a gap between the perceptions of budget to be allocated towards healthcare and the reality of healthcare spend.

South Africa (ZA)

Country background

GDP per capita (2015 – USD)	$314.572 billion
Healthcare expenditure per capita (2014 – USD)	$570.21
Healthcare expenditure as a percentage of GDP (2014)	8.8%
Type of health system	Public and Private • Roll-out of the National Health Insurance (NHI) system designed to ensure that all South African citizens have access to essential healthcare • NHI system is expected to be funded through personal taxation and mandatory employer contributions • The system is two-pronged: – Public: large, under-resourced and overused – Private: small, well-funded and well-equipped
Average life expectancy	• 62.9 • Healthy life expectancy: 54.5
Infant mortality rate (per 1,000)	40.5
Top cause of death	HIV/AIDS

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	South Africa Perception	Perception	Reality	Perception	Reality	South Africa Perception versus Reality: Gap
Access Sub-Index	63.2	66.9	64.6	61.0	34.2	26.8
Integration Sub-Index	55.3	54.9	24.1	50.3	12.4	37.9
Adoption Sub-Index	51.6	50.8	57.8	50.3	55.7	5.4
Overall Index	56.7	57.6	48.8	53.8	34.1	19.7

Efficiency ratio 2017

	South Africa score	19-country average
Input (healthcare spend as a percentage of GDP)	8.8	8.7
Overall outcome score	38.7	80.3
Efficiency ratio (outcome/input)	4.4	10.5

In the areas of access and integration, perceptions of the general population and healthcare professionals generally do not align with the realities of the health system. However, the gap between perception and reality is much smaller in the adoption space. Across all areas, South Africa's reality scores come in below average, indicating opportunities for growth.

Both perceptions and the reality of access to healthcare across the continuum are below the 19-country average in South Africa. This is particularly true for the reality score, creating a gap of 26.8 points between perceptions and reality of access. This suggests that the general population and healthcare professionals in South Africa perceive they have more access to healthcare than what is actually available and that there is opportunity to improve access to care further. South Africa's lack of skilled healthcare professionals and high risk of impoverishing expenditure for surgical care hamper the access reality score, driving this gap.

Perceptions and the reality of integration within the healthcare system are both below the 19-country average. This is especially true for the reality score (12.4 versus 24.1, respectively), which, in turn, creates South Africa's largest gap between perception and reality (37.9 points). South Africa's integration reality score is driven down by low services-related expenditures on Internet of Things (IoT) in healthcare as a percentage of GDP compared to other countries, showing significant room for growth if investments are made.

Perceptions and the reality of connected care technology adoption in South Africa are both about on par with the 19-country average, showing general alignment of the general population and healthcare professionals. South Africa's adoption reality score is hindered by lower spending on IoT for hardware in healthcare as a percentage of GDP in comparison to other countries.

South Africa's efficiency ratio is the lowest out of the 19 countries in this study (4.4 compared with the group average of 10.5) indicating considerable inefficiencies. This score is a result of average healthcare spend as a percentage of GDP and considerably below average health outcomes.

Other key findings

1. While South Africans generally evaluate their health positively, healthcare professionals are less optimistic.
2. Healthcare professionals and the general population also have differing opinions about the health system in South Africa, as they see a discrepancy between healthcare offered in public and private settings.
3. The South African general population and healthcare professionals are almost evenly split on whether 'sick care' or preventive aspects of care should be prioritized.
4. Healthcare professionals say they currently do not spend much time on prevention. The implementation of the National Health Insurance (NHI) may result in a more prevention-focused system since healthcare professionals expect the use of clinics to increase which is where the general population appear to go more often for preventive care.
5. Lack of perceived knowledge about connected care technologies among the general population and long-term cost concerns are some of the barriers to wider technology proliferation. However, training opportunities, government subsidies, and healthcare professionals' recommendation may increase the likelihood of use.

South Korea (KR)

Country background

GDP per capita (2015 – USD)	$1.378 trillion
Healthcare expenditure per capita (2014 – USD)	$2,060.25
Healthcare expenditure as a percentage of GDP (2014)	7.4%
Type of health system	Public and Private • In contrast to public health, financing and healthcare delivery relies heavily on the private sector, though some public health facilities provide medically necessary services at the central, regional and municipal levels
Average life expectancy	• 82.3 • Healthy life expectancy: 73.2
Infant mortality rate (per 1,000)	3.4
Top cause of death	Stroke

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

19-country average

South Korea

	19-country average		South Korea		South Korea Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	66.7	62.3	4.4
Integration Sub-Index	54.9	24.1	58.3	39.2	19.1
Adoption Sub-Index	50.8	57.8	48.4	69.1	20.7
Overall Index	57.6	48.8	57.8	56.9	0.9

Efficiency ratio 2017

	South Korea score	19-country average
Input (healthcare spend as a percentage of GDP)	7.4	8.7
Overall outcome score	87.9	80.3
Efficiency ratio (outcome/input)	11.9	10.5

In the areas of integration and adoption, perceptions of the general population and healthcare professionals in South Korea are generally not aligned with the realities of the healthcare system. Reality scores for these areas are above the 19-country average while perception scores are about on par with or slightly below average, which contributes to large gaps. However, the gap is much smaller in the area of access to care across the health continuum.

The gap of 4.4 points between perceptions (66.7) and reality (62.3) of access to healthcare across the continuum is among the smallest of the 19 countries studied, showing alignment of the general population and healthcare professionals with the reality of access to care in South Korea. However, South Korea's reality score falls slightly below the 19-country average due to a below average density of skilled health professionals in the country.

Perceptions and the reality of the healthcare system integration are both above the 19-country average in South Korea. This reality score in particular is considerably above the average, creating a gap of 19.1 points between perception and reality of integration. South Korea's integration reality score is driven by higher than average spending on Internet of Things (IoT) in services, software and connectivity within healthcare as a percentage of the country's GDP.

Perceptions of connected care technology adoption in South Korea are about on par with the 19-country average (48.4 versus 50.8, respectively). However, with a reality score of 69.1, South Korea scores above average (57.8) on the reality sub-index for adoption. Accordingly, these scores result in a large gap (20.7 points) in perceptions and reality of connected care technology adoption. South Korea's reality score is driven up by having a health technology medical policy and above average IT spending on IoT for hardware in healthcare as a proportion of the country's GDP.

South Korea's efficiency ratio is above the 19-country average (11.9 compared with 10.5, respectively), driven by below average expenditure on healthcare as a percentage of GDP and achieving above average health outcomes.

Other key findings

1. A majority of healthcare professionals rate the general population's health positively. However, this view is not shared by South Korean citizens who are much less optimistic about their own health. This suggests a need to improve connectivity and communication between healthcare professionals and the general population.
2. Many South Koreans are aware that prevention is key, and already recognize the importance of connected care technologies and integrated health. This provides South Korea with the opportunity to set up a sustainable health system catalyzed by higher levels of integrated health systems and the adoption of connected care technologies.
3. South Korean patients (those who have interacted with the healthcare system in the last three months), especially those who have respiratory or cardiology issues, are more knowledgeable and aware of integration and connected care technologies than the general population. Further, they are more optimistic about costs associated with connected care technology.
4. While about half of healthcare professionals already use connected care technologies in their practices, many also would like training opportunities or data that shows connected care technologies' efficiency and effectiveness to catalyze more use.

Spain (ES)

Country background

GDP per capita (2015 – USD)	$1.199 trillion
Healthcare expenditure per capita (2014 – USD)	$2,658.27
Healthcare expenditure as a percentage of GDP (2014)	9%
Type of health system	Public and Private • Includes a parallel public healthcare system and a network of private health insurance companies • State healthcare is free of charge to anyone living and working in Spain, although in some of the Spanish islands you may have to travel to find a state healthcare provider
Average life expectancy	• 82.8 • Healthy life expectancy: 72.4
Infant mortality rate (per 1,000)	4.1
Top cause of death	Coronary heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	19-country average		Spain		Spain Perception versus Reality
	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	66.9	64.6	67.1	71.2	4.1
Integration Sub-Index	54.9	24.1	57.0	28.9	28.1
Adoption Sub-Index	50.8	57.8	52.9	74.5	21.6
Overall Index	57.6	48.8	59.0	58.2	0.8

Efficiency ratio 2017

	Spain score	19-country average
Input (healthcare spend as a percentage of GDP)	9.0	8.7
Overall outcome score	85.0	80.3
Efficiency ratio (outcome/input)	9.4	10.5

In the areas of integration and adoption, perceptions of healthcare professionals and the general population are generally not aligned with the realities of the healthcare system. However, this gap is much smaller when it comes to access. Both Spain's reality and perception scores exceed the 19-country average across all areas.

Perceptions and the reality of access to healthcare across the continuum in Spain are both slightly above the 19-country average resulting in a gap of 4.1 points between perceptions and reality. Spain's reality score is driven up by an above average density of skilled health professionals and relatively low risk of impoverishing expenditure for surgical care.

Perceptions and the reality of health system integration in Spain are both slightly higher than the 19-country average. However, perception of integration (57.0) is much higher than reality (28.9), creating a gap of 28.1 points. This implies that healthcare professionals and the general population perceive the system is more integrated than it is. Spain's reality score is driven by slightly above average IT spending on Internet of Things (IoT) for services, software and connectivity in healthcare as a proportion of the country's GDP.

The gap (21.6 points) between perception (52.9) and reality (74.5) as it relates to connected care technology adoption indicates healthcare professionals and the general population in Spain perceive there is less proliferation of connected care technology in the health system than there actually is. Spain's reality score for adoption is well above the 19-country average (74.5 versus 57.8, respectively) due to the existence of a health technology medical plan that is a part of the National Health Plan, as well as above average IT spend on IoT for hardware in healthcare as a percentage of GDP.

Spain's efficiency ratio is slightly below the 19-country average (9.4 versus 10.5, respectively), driven by achieving slightly above average health outcomes, yet with higher than average expenditure on healthcare as a percentage of GDP.

Other key findings

1. The general population in Spain generally feels positively about their current health status, and tend to have both high trust in and satisfaction with the country's healthcare system.
2. Healthcare spending should be prioritized along with funding of preventive care measures according to healthcare professionals and the general population.
3. Connected care technologies' role in advancing preventive health measures need to be underscored in order to empower the general population to avoid sleepwalking into poor health.
4. Receptiveness for connected care technology is highest among cardiology patients. Further, those with cardiology, respiratory and oncology experience would prefer to receive home healthcare management from a medical device/ health technology company the most as opposed to entities from other sectors.
5. Spain's ability to deliver on the population's home care needs may need improvement in the future as the population ages.

Sweden (SE)

Country background

GDP per capita (2015 – USD)	$495.623 billion
Healthcare expenditure per capita (2014 – USD)	$6,807.72
Healthcare expenditure as a percentage of GDP (2014)	11.9%
Type of health system	Public • National healthcare system • Regulation, supervision and some funding by national government • Responsibility for most financing and purchasing/ provision devolved to county councils
Average life expectancy	• 82.4 • Healthy life expectancy: 72.0
Infant mortality rate (per 1,000)	3.0
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				Sweden Perception versus Reality
	Sweden Perception	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	64.0	66.9	64.6	67.1	82.7	15.6
Integration Sub-Index	60.9	54.9	24.1	60.5	30.6	29.9
Adoption Sub-Index	46.9	50.8	57.8	50.9	77.6	26.7
Overall Index	57.3	57.6	48.8	59.5	63.7	4.2

Efficiency ratio 2017

	Sweden score	19-country average
Input (healthcare spend as a percentage of GDP)	11.9	8.7
Overall outcome score	91.2	80.3
Efficiency ratio (outcome/input)	7.6	10.5

Overall, the perceptions of the general population and healthcare professionals in Sweden are not aligned with the realities of the healthcare system. This is particularly true in the adoption and integration spaces, implying opportunities for growth and increased alignment.

Perceptions and the reality of access to healthcare across the continuum are both above the 19-country average in Sweden. This is particularly true for the reality score, creating a gap of 15.6 points between perceptions and reality of access. This suggests the general population and healthcare professionals perceive they have less access to care than what is actually available. Sweden's access reality score is driven by a much higher than average skilled healthcare professionals density as well as no risk of impoverishing expenditure for surgical care.

In Sweden, the largest gap (29.9 points) can be seen in the area of health system integration. While both perceptions and reality in Sweden are above the 19-country average, there is still a lack of alignment on the level of integration of the health system. Sweden's integration reality score is driven by higher than average spending on Internet of Things (IoT) for software in healthcare as a percentage of GDP compared with other countries in the study.

Perceptions of connected care technology adoption in Sweden are on par with the 19-country average (50.9 versus 50.8, respectively). However, with a score of 77.6, Sweden scores well above average (57.8) on the reality sub-index for adoption. Sweden's reality score is driven by the presence of a health technology medical policy that is part of the National Health Plan, as well as higher than average spending on IoT for hardware within healthcare as a percentage of the country's GDP.

Sweden's efficiency ratio is below the 19-country average (7.6 versus 10.5, respectively), driven mostly by relatively high healthcare expenditure as a percentage of GDP. While Sweden achieves above average health outcomes, the proportionate spend indicates some inefficiencies.

Other key findings

1. Swedish citizens, and to a lesser extent, healthcare professionals believe that treating the sick should be prioritized over preventive care when it comes to the nation's healthcare budget and healthcare professionals time and resources. This showcases the need for education regarding the importance of prevention for a sustainable health system.
2. Swedish citizens and healthcare professionals' believe that the government should devote the largest amount of the overall budget to healthcare.
3. Both healthcare professionals and the general population believe that connected care technology provides benefits for home care, which could be beneficial given lower perceptions of access to home care. As the Swedish population continues to age, the availability of adequate home care will become increasingly important.
4. While the majority of the general population wants the benefits of a universal health record, and the healthcare industry is the most trusted with personal data, there are low levels of comfort with health data being stored outside of hospital premises.

UAE (UAE)

Country background

GDP per capita (2015 – USD)	$370.296 billion
Healthcare expenditure per capita (2014 – USD)	$1,610.79
Healthcare expenditure as a percentage of GDP (2014)	3.6%
Type of health system	Public • UAE nationals covered under the government-funded healthcare program • Expatriates have to pay for private healthcare insurance • The UAE government is encouraging more private participation in the sector • Will likely continue to finance the bulk of healthcare spending
Average life expectancy	• 77.1 • Healthy life expectancy: 67.9
Infant mortality rate (per 1,000)	6.8
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	UAE Perception	Perception	Reality	Perception	Reality	Gap
		19-country average		UAE		UAE Perception versus Reality
Access Sub-Index	72.1	66.9	64.6	75.6	57.7	17.9
Integration Sub-Index	60.0	54.9	24.1	59.4	3.9	55.5
Adoption Sub-Index	63.9	50.8	57.8	60.5	52.3	8.2
Overall Index	65.3	57.6	48.8	65.2	37.9	27.3

Efficiency ratio 2017

	UAE score	19-country average
Input (healthcare spend as a percentage of GDP)	3.6	8.7
Overall outcome score	82.6	80.3
Efficiency ratio (outcome/input)	22.7	10.5

In the areas of access and integration, the perceptions of the general population and healthcare professionals in the United Arab Emirates are not aligned with the realities of the healthcare system. This is especially true for integration, as the reality score falls significantly below the 19-country average. However, the gap between perception and reality is much smaller when it comes to adoption. A further consideration is that the UAE's reality scores are consistently below average, indicating there are opportunities for growth.

Perceptions of access to healthcare across the continuum are higher than the 19-country average (75.6 versus 66.9, respectively), but the reality score falls below average (57.7 versus 64.6, respectively), producing an access gap of 17.9 points. The UAE's access reality index score is driven down by a lower than average density of skilled healthcare professionals in the country.

While the UAE's perceptions on integration of the health system are above the 19-country average (59.4 versus 54.9, respectively), the reality score is well below the 19-country average (3.9 versus 24.1, respectively), resulting in the largest integration sub-index gap (55.5 points) across all countries in the study. The UAE's integration reality score is driven down by below average IT spend on Internet of Things (IoT) across services, software and connectivity in healthcare as a percentage of the country's GDP.

Perceptions of healthcare professionals and the general population on connected care technology adoption are higher than the 19-country average (60.5 versus 50.8, respectively). However, with a score of 52.3, the UAE's adoption reality score is slightly below average (57.8). These scores result in the UAE's smallest gap (8.2 points), showing general alignment of the general population and healthcare professionals with the reality of connected care technology. The UAE's reality score is driven down by a below average IT spending on IoT for hardware within healthcare as a percentage of the country's GDP.

The UAE has the highest efficiency ratio out of all 19 countries included in the study (22.7 versus the group average of 10.5), indicating high efficiency. This score is driven by considerably below average healthcare expenditure as a percentage of GDP, while having slightly above average health outcomes.

Other key findings

1. The vast majority of the general population in the UAE rate their health positively, and healthcare professionals agree. Furthermore, many in the general population think the healthcare system meets their needs.
2. The general population and healthcare professionals alike understand the importance of prevention, as they agree that healthcare professionals should focus the majority of their time and resources on preventive care. The general population and healthcare professionals both recognize the importance of connected care technologies in improving all phases of the healthcare continuum.
3. Both, the general population and healthcare professionals in the UAE believe that the general population/ patients have high ownership over their medical records. However, healthcare professionals believe shared responsibility over medical records should be the goal.
4. Healthcare professionals feel significantly more knowledgeable about connected care technologies than the general population. Additionally, healthcare professionals are also confident in their patients' abilities to use connected care technologies.

UK (UK)

Country background

GDP per capita (2015 – USD)	$2.858 trillion
Healthcare expenditure per capita (2014 – USD)	$3,934.82
Healthcare expenditure as a percentage of GDP (2014)	9.1%
Type of health system	Public • National health service (NHS) • Coverage is universal • All 'ordinarily residents' in the UK are automatically entitled to healthcare • Largely free at the point of use through the National Health Service
Average life expectancy	• 81.2 • Healthy life expectancy: 71.4
Infant mortality rate (per 1,000)	4.2
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				UK Perception versus Reality
	UK Perception	Perception	Reality	Perception	Reality	Gap
Access Sub-Index	70.2	66.9	64.6	68.9	73.8	4.9
Integration Sub-Index	53.7	54.9	24.1	50.7	34.3	16.4
Adoption Sub-Index	45.3	50.8	57.8	47.2	41.8	5.4
Overall Index	56.4	57.6	48.8	55.6	49.9	5.7

Efficiency ratio 2017

	UK score	19-country average
Input (healthcare spend as a percentage of GDP)	9.1	8.7
Overall outcome score	87.1	80.3
Efficiency ratio (outcome/input)	9.5	10.5

In the areas of access and adoption, perceptions of the UK's general population and healthcare professionals are generally aligned with the realities of the healthcare system. However, there is a larger gap between perception and reality in the integration space. Additionally, the UK's perception scores are generally below average, demonstrating there are more opportunities for growth.

The gap of 4.9 points between perceptions (68.9) and reality (73.8) for access to healthcare across the continuum is among the smallest of the 19 countries in this study. The UK's above average access reality score is driven by a higher than average skilled healthcare professionals density, as well as a much lower than average risk of impoverishing oneself to afford surgical care.

The UK's largest gap is seen within integration (16.4 points), as perceptions are below 19-country average (50.7 versus 54.9, respectively) and reality is above average (34.3 versus 24.1, respectively). The UK's reality score is among the highest of the 19 countries, driven by higher than average IT spending on Internet of Things (IoT) across software, connectivity and services in healthcare as a percentage of the country's GDP.

The gap of 5.4 points between perceptions (47.2) and reality (41.8) as it relates to connected care technology adoption is on the smaller side when compared to the other 19 countries in the study. However, the scores fall below the 19-country averages for both perception (47.2 versus 50.8, respectively) and reality (41.8 versus 57.8, respectively), indicating there is room for growth.

The UK's efficiency ratio is slightly below the 19-country average (9.5 versus 10.5, respectively). While the UK achieves above average health outcomes, healthcare spend as a percentage of GDP is also above average, indicating slight inefficiencies.

Other key findings

1. When it comes to the healthcare system, most healthcare professionals rate it well. Further, healthcare professionals and the general population believe that the system meets patient needs. However, trust in the system is higher among healthcare professionals than the general population. Additionally, trust in the healthcare system has dropped slightly year-over-year among patients.
2. Both the general population and healthcare professionals believe the UK population has access to preventive aspects of healthcare. However, both audiences also believe that healthcare professionals should spend the majority of their time on treating the sick, rather than on prevention.
3. Less than half of the general population in the UK is somewhat or completely confident that they will receive the care they need to lead a good life as they reach retirement age and beyond.
4. Healthcare professionals in the UK see a growing strain on national health services. As the population ages, tools such as connected care technology have the potential to help alleviate some of this strain. However, healthcare professionals say they don't see usage of these technologies increasing.

US (US)

Country background

GDP per capita (2015 – USD)	$18.037 trillion
Healthcare expenditure per capita (2014 – USD)	$9,402.54
Healthcare expenditure as a percentage of GDP (2014)	17.1%
Type of health system	Private • Medicare: age 65+, some disabled • Medicaid: some low income; for those without employer coverage, state-level insurance exchanges with income-based subsidies • Insurance coverage mandated, with some exemptions (13.4% of adults uninsured)
Average life expectancy	• 79.3 • Healthy life expectancy: 69.1
Infant mortality rate (per 1,000)	6.5
Top cause of death	Ischemic heart disease

Sources: GDP per capita: World Bank (2015); Healthcare expenditure per capita: World Bank (2014); Type of health system: Commonwealth Fund (2014); Average life expectancy: World Health Organization (2015); Healthy life expectancy: World Health Organization (2015); Infant mortality rate (per 1,000): World Health Organization (2015); Top cause of death: World Health Organization (2012)

Future Health Index 2017

	2016	2017				
	US Perception	Perception	Reality	Perception	Reality	US Perception versus Reality Gap
Access Sub-Index	68.4	66.9	64.6	68.5	75.1	6.6
Integration Sub-Index	54.7	54.9	24.1	51.8	50.3	1.5
Adoption Sub-Index	49.0	50.8	57.8	51.6	42.6	9.0
Overall Index	57.4	57.6	48.8	57.3	56.0	1.3

Efficiency ratio 2017

	US score	19-country average
Input (healthcare spend as a percentage of GDP)	17.1	8.7
Overall outcome score	83.8	80.3
Efficiency ratio (outcome/input)	4.9	10.5

Across the areas of access, integration and adoption, the general population and healthcare professionals in the United States are generally aligned with the realities of the healthcare system. The sub-index with the largest gap between perceptions and reality is adoption, primarily due to the reality score falling below the 19-country average.

In the US, perceptions of access to healthcare are on par with the 19-country average. While the reality score is above average due to a surplus of skilled health professionals relative to population and a lower risk of impoverishing spend on surgical care compared to the 19-country average.

The perception score of 51.8 for integration sub-index is slightly below average (54.9), while the reality sore is well above the 19-country average (50.3 versus 24.1, respectively) in the US, producing the smallest gap (1.5 points) out of all the countries for the integration sub-index. The reality index score is driven by higher than average IT spend on Internet of Things (IoT) across services, software and connectivity in healthcare as a percentage of the country's GDP.

For perceptions of connected care technology adoption, the US scored 51.6, which is on par with the 19-country average (50.8). However, the reality score for the US is below average (42.6 versus 57.8, respectively), resulting in the largest gap for the US (9.0 points) among the three indices. The adoption reality score is hampered by a lack of a national health technology medical policy. While the US appears to be working towards putting policies in place, there is no concrete plan with associated timing at this point.

The US achieved an efficiency score of 4.9, which is well below the 19-country average (10.5) and is the second lowest score overall, indicating inefficiencies. This is driven by the highest healthcare expenditure as a percentage of GDP across all countries in the study, while only obtaining slightly above average healthcare outcomes.

Other key findings

1. A majority of Americans rate their own health positively. However, healthcare professionals are less optimistic.
2. Trust in the healthcare system among those who work in healthcare is much higher compared to the general population of Americans. Those who believe that integration of the health system is important also are more likely to have higher levels of trust.
3. Overall, the majority of Americans have put in some effort to maintain their health, ranging anywhere from their food selection to exercise routine. Older Americans are more likely to see a doctor on a regular basis compared to those who are younger, though the younger population is more likely to use connected care technologies to maintain their well-being compared to those who are older.
4. The general population in the United States would rather be healthy than rich, if given the option.
5. Access to home care is perceived to be significantly weaker than other phases of the health continuum by healthcare professionals and the general population alike. However, it is also ranks among the top three aspects of healthcare that would most benefit from connected care technology.

Appendix III: **Glossary and references**

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Glossary

Access: the perceived level of access for all people to a range of healthcare solutions and services across all health needs.

Adoption: the perceived proliferation, take-up and use of; and familiarity with, connected care technology.

Connected care technology: technology that enables sharing of information throughout all parts of the health system (doctors, nurses, community nurses, patients, hospitals, specialists, insurers, and government). This technology can take a variety of forms, including, but not limited to: devices that track various health indicators such as heart rate or steps (e.g. wearables such as a smart watch/fitness trackers or home health monitoring devices); computer software that allows secure communication between doctors and hospitals; health devices that are internet enabled and transmit data.

Efficiency ratio: the ratio of health outcomes relative to expenditure on healthcare. This is calculated by aggregating and scoring seven health outcome indicators and dividing this outcome score by input (total expenditure on health as a percentage of GDP).

Electronic health records (EHR): digitalized patient records available to access in real time.

General population: representative demographic sample of the 19 countries surveyed (Argentina, Australia, Brazil, Canada, China, France, Germany, Italy, Netherlands, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, UAE, UK, US).

Healthcare continuum:

- Healthy living: living a healthy life in a healthy environment
- Prevention: enable people to manage their own health
- Diagnosis
- Treatment
- Home care: support and recovery for chronic illnesses at home

Health expenditure, total (% of GDP): Level of total expenditure on health (THE) expressed as a percentage of gross domestic product (GDP) from WHO, 2014.

Healthcare professional: those who work in healthcare as a doctor, surgeon, nurse practitioner, registered nurse, licensed practical nurse or nurse across a variety of specializations.

Integrated health system: a health system where all the parts of the system (general practitioners, nurses, doctors, community nurses, patients, hospitals, specialists, insurers, and government) are working together to coordinate care effectively (e.g. sharing medical results and data, aligning on treatment plans, etc.). Coordinating care includes (but is not limited to), sharing of patient data or patient information through traditional methods (e.g. paper, phone etc.) or via technology devices or an IT system that is integrated across departments and/or across primary care (e.g. primary care doctors/general practitioners) and secondary care (e.g. hospitals).

Integration: the perceived state of functional integration and interoperability between healthcare systems.

Perception indices: aggregated scored responses from the general population and healthcare professionals to a variety of survey questions related to the following three pillars: access, integration and adoption.

Preventive healthcare: actions aimed at avoiding the manifestation of a disease, aiming to minimize the burden of diseases and associated risk factors.

Reality indices: aggregated scored metrics from third-party data (from sources including The World Health Organization, The World Bank, and International Data Corporation) related to the following three pillars: access, integration and adoption.

Value-based health systems: A health system that prioritizes patient-centred outcomes relative to cost.

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25. Estimated Margin of Error is the margin of error that would be associated with a sample of this size for the full healthcare professional population in each market. Since there is limited data available on the specific demographic profile of healthcare professionals in each country, this estimated margin of error is for directional purposes only.

26. Estimated Margin of Error is the margin of error that would be associated with a sample of this size for the full insurance professional population in each market. Since there is limited data available on the specific demographic profile of insurance professionals in each country, this estimated margin of error is for directional purposes only.

27. Refer to Appendix I for the full questions that go into each perception index component.

28. Refer to Appendix II for the sources and normalization methods for each metric.

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