J Primary Prevent
DOI 10.1007/s10935-014-0377-9

ORIGINAL PAPER

Association Between Contraband Tobacco and Illicit Drug Use Among High School Students in Canada

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Abstract A particularly challenging issue to tobacco cessation efforts is the availability of contraband cigarettes. While studies have linked contraband tobacco to smoking initiation and poor cessation outcomes, little is known about its association with illicit drug use among adolescents. We examine the association between contraband tobacco and illicit drug use among adolescent students using a national representative sample of 2,136 current smoker students in grades 9–12 from the 2010–2011 Youth Smoking Survey. About 31 % of adolescent current smokers in grades 9–12 use contraband cigarettes. Prevalence in the use of illicit drugs ranged from 9 to 37 %, with MDMA being the most commonly used drug. Adjusted logistic regression revealed that smokers of contraband cigarettes, when compared with non-contraband cigarette smokers, were more likely to use cocaine (*OR* 2.14; CI 1.29–3.56), heroin (*OR* 7.92; CI 3.00–20.91), amphetamines (*OR* 4.25; CI 2.07–8.74), MDMA (*OR* 2.00; CI 1.25–3.19), hallucinogens (*OR* 2.18; CI 1.34–3.55), and ketamine (*OR* 3.48; CI 1.61–7.54). This paper adds to the existing evidence of the negative effects of contraband tobacco by showing that adolescent contraband smokers are more likely to use illicit drugs. Given the addictive nature of these drugs and the potential for such behavior to spill over into adulthood, more efforts should be invested in addressing this problem.

Keywords Illicit drugs · Contraband cigarettes · Adolescents

Introduction

There is substantial evidence that increasing cigarette prices through higher taxes is an effective tobacco control policy (Chaloupka, Straif, & Leon, 2011). One particularly challenging issue is the availability of contraband cigarettes, which limits the effectiveness of higher prices. Contraband tobacco comprises "tobacco products that do not comply with the provisions of all applicable federal and provincial statutes including importation, stamping, marking, manufacturing, distributing and payment of duties and taxes" (Royal Canadian Mounted Police, 2008). In Canada, one major source of contraband is cigarettes smuggled from US First Nation Reserves (primarily

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Published online: 01 November 2014

located on the US side of Akwesasne), whether lawfully or unlawfully manufactured, and those manufactured unlawfully in Canada (Kahnawake in Quebec, and Yendinaga and Six Nations in Ontario; Royal Canadian Mounted Police, 2008).

The market share for contraband cigarettes in Canada has increased dramatically in the past decade (Physician for a Smoke-free Canada, 2010). Estimated total sales of contraband in Canada increased from 10 % in 2003 to 31 % in 2008 (Physician for a Smoke-free Canada, 2010). National survey data from the 2006/2007 Youth Smoking Survey revealed that about 18 % of all cigarettes smoked by adolescent daily smokers in Canada were contraband, with 13 % of daily smokers reporting that contraband cigarettes were their usual brand (Callaghan, Veldhuizen, Leatherdale, Murnaghan, & Manske, 2009). A survey commissioned by the Canadian Convenience Stores Association (2009) showed that 36 % of the discarded cigarette butts collected from 185 sites at high schools in Quebec and Ontario were from contraband tobacco. Similarly, of 36,355 butts collected in post-secondary campuses in Ontario, Canada's largest province, 14 % were contraband cigarettes from First Nations (Barkans & Lawrance, 2013).

Several studies have shown that cheap contraband cigarettes use is strongly associated with smoking initiation, increased smoking relapse, nicotine dependence, and poor cessation outcomes (Callaghan et al., 2009; Diemert et al., 2010; Hyland et al., 2005; Joossens, Chaloupka, Merriman, & Yurekli, 2000; Mecredy, Diemert, Callaghan, & Cohen, 2013). In a population-based cohort study, Diemert et al. (2010) found that contraband cigarette smokers are more nicotine dependent and are less likely to intend to quit than are discount and premium smokers. In a US study, Hyland et al. (2005) found that smokers who purchased cheaper cigarettes from American Indian Reservations are less likely to make a quit attempt than those who purchased full-priced cigarettes. Using Canadian data, Gruber, Sen, and Stabile (2003) reported that smuggling not only serves to increase cigarette consumption but also the consumption of complementary substances like alcohol.

A number of investigators have argued that tobacco and alcohol use is a pointer to future substance use; this is commonly referred to as the 'gateway hypothesis' (Agrawal et al., 2006; Everett, Giovino, Warren, Crossett, & Kann, 1998; Kandel, 2002; O'Cathail et al., 2011; Siqueira & Brook, 2003; Wagner, Velasco-Mondragón, Herrera-Vazquez, Borges, & Lazcano-Ponce, 2005). However, little is known about the association between the use of contraband cigarettes and illicit drugs, particularly among adolescents. Given the increasing availability of contraband cigarettes in many jurisdictions, we hypothesize a positive association between the use of contraband cigarettes and other illicit drugs. The primary objective of this study was to examine whether adolescent contraband cigarette smokers are more likely than corresponding non-contraband smokers to use other illicit drugs such as amphetamines, heroin, MDMA, hallucinogens, ketamine, and cocaine.

Examining youth substance use is important since adolescence is a critical period during which most addictive behaviors occur, and may carry into adulthood (Chambers, Taylor, & Potenza, 2003; Khuder, Dayal, & Mutgi, 1999). There is evidence that early substance use increases the risk of developing an addictive disorder (Brook, Brook, Zhang, Cohen, & Whiteman, 2002). Adolescents who use illicit drugs are more likely to engage in sexual risk-taking, crime, and violent conduct, and to experience poor mental health and increased mortality (Brook et al., 2002; Centers for Disease Control and Prevention, 2010; King, Iacono, & McGue, 2004).

Methods

Data

This paper used data from the 2010–2011 Youth Smoking Survey (YSS), a biennial Canadian cross-sectional school-based survey of adolescent students in grades 6–12. The survey included detailed information about a wide range of students' health risk behaviors such as smoking, alcohol and drug use, and physical activity. The survey covered about 50,949 students Canada-wide and excluded residents of institutions, First Nations Reserves, Yukon, Nunavut and Northwest Territories, special schools, and schools on military bases. The 2010–2011 iteration excluded the Province of New Brunswick, which declined to participate. Analyses examining the national smoking rate from the previous YSS cycle demonstrated no difference in rates when New Brunswick was excluded from the dataset. The total

response rate for the 2010–2011 YSS at the school-board level was 82, and was 56 % at the school level and 73 % at the student level. The Propel Centre for Population Health Impact at the University of Waterloo coordinated YSS implementation for Health Canada. A comprehensive description of the YSS has been documented elsewhere (University of Waterloo, 2011). All protocols and materials of the YSS received ethical approvals from the University of Waterloo, Health Canada, and the institutions of consortium members where required. We restricted analyses to students in grades 9–12 who were current smokers (defined as those smoked in the past 30 days and had smoked at least 100 cigarettes in their lifetime).

Measures

Outcome Variable

The survey assessed students' past year use of the following drugs (including some street names for each type of drug): amphetamines (speed, crystal meth or ice, meth); cocaine (crack, blow, snow); hallucinogens (LSD, PCP, acid, magic mushrooms, mesc); heroin (smack, junk, crank), MDMA (ecstasy, EX), and ketamine (special k, kit-kat). Those who responded 'yes' to the question for each drug: 'Have you used or tried this in the last 12 months?' were classified as a 'current user.'

Independent Variables

We assessed the main independent variable of interest in this study, contraband cigarette use, based on a respondent's answer to the following three questions: "In the last 12 months, how often did you smoke the following kinds of cigarettes? (a) Unbranded cigarettes from a plastic bag; (b) First Nations/Native brands D.K.'s, Putters, or Sago; (c) Other First Nations/Native brands such as Chiefs, Natives, Discount, or others." The response options for each of the questions were: (1) never, (2) less than once a month, (3) 1–3 times a month, (4) once a week, (5) 2–5 times a week, and (6) daily or almost daily. Students whose response to any of the first three questions (a, b and c) was a (4), (5) or (6) were classified as contraband users.

Table 1 Weighted sample characteristics (%)

	Total (n = 2,136[a])
Prevalence of illicit drug use	
Hallucinogens	35
MDMA	37
Amphetamines	19
Cocaine	22
Ketamine	12
Heroin	9
Contraband cigarette use	
Contraband cigarette smokers	31
Non-contraband cigarette smokers	69
Gender	
Male	55
Female	45
Grade level	
12	36
11	29
10	22
9	13
Ethnicity	
Aboriginal	11
Non-aboriginal	89
School truancy	
Skipped 3 or more classes	40
Skipped 1 or 2 classes	24
No skipped classes	36
School sport participation	
Yes	28
No	72
Binge drinking	
Yes	79
No	21
Region of residence	
Atlantic	7
Prairies	28
Quebec	18
British Columbia	16
Ontario	31

[a] Estimates are population weighted using the sampling weights available in the YSS

In our multivariate analysis we controlled for a number of covariates documented in the literature to be associated with youth risk-taking behaviors (Everett et al., 1998; O'Cathail et al., 2011; Wagner et al., 2005). These include: school grade level (12, 11, 10,

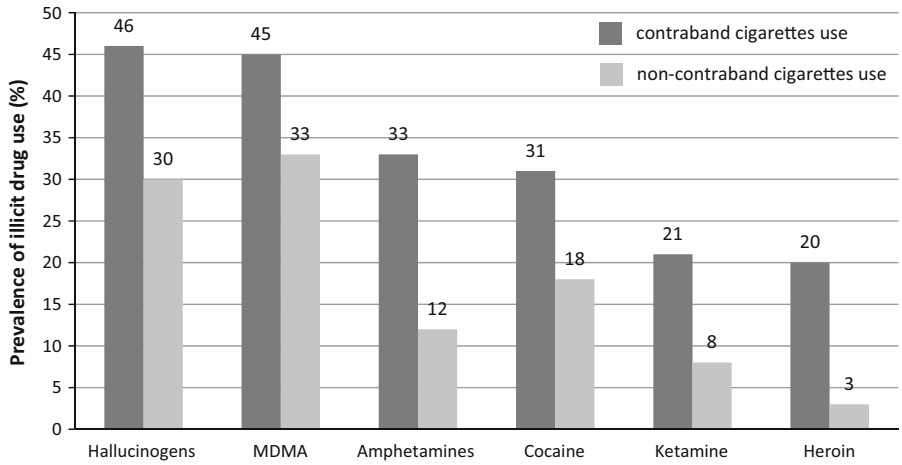

Fig. 1 Illicit drug use among smokers of contraband and non-contraband cigarettes—smokers of contraband cigarettes showed a higher rate of drug use. *Source*: Authors' compilation based on data from 2010 to 2011 YSS

with grade 9 as the reference category); ethnicity (aboriginal = 1, non-aboriginal = 0); gender (male = 1, female = 0); school truancy (student skipped classes 3 or more time; skipped classes 1 or 2 times—relative to skipped no classes as the reference category); school sport participation (participated = 1, did not participate in school sport = 0); binge drinking, defined as drinking more than five drinks on one occasion, (binge drinking = 1, no binge drinking = 0); and region of residence: Atlantic (Prince Edward Island, Nova Scotia, and Newfoundland), the Prairies (Alberta, Saskatchewan, and Manitoba), British Columbia, and Quebec, leaving Ontario as the reference category.

Statistical Analysis

To examine whether there was a statistically significant difference in illicit drug use between contraband and non-contraband smokers, we utilized a logistic regression. We weighted the descriptive statistics and all regression results using the sampling weights in the survey to produce population estimates and adjust for unequal probabilities of selection. All analyses were carried out using Stata version 13.

Results

The weighted summary statistics, reported in Table 1, showed that 31 % of current smokers in grades 9–12 used contraband cigarettes at least once a week in the past year. The prevalence of illicit drug use was consistently higher for contraband cigarette users than non-contraband users (Fig. 1). For example, the prevalence of ketamine and amphetamine use among contraband cigarette users was almost three times that of non-contraband users. Heroin had the greatest differential prevalence, being six times higher for contraband users. For cocaine, hallucinogens, and MDMA, the prevalence rate was about one and half times as great for contraband users.

Table 2 reports results of the adjusted logistic regressions, together with a 95 % confidence interval (CI) for each substance. In general, results revealed statistically significant differences in the likelihood of illicit drug use between contraband and non-contraband smokers, after controlling for the study's covariates.

For the other covariates included in the regression analysis, results showed no statistically significant gender differences in the use of illicit drugs, except for hallucinogens and amphetamines, where boys were more likely to use these drugs than girls. Skipping three or more classes was strongly associated with higher odds of using all the illicit drugs analyzed. We found no statistically significant association between ethnicity and participation in school sports with any of the illicit drugs. Binge drinking was positively associated with using all the analyzed illicit drugs, as all the odds ratios were significantly greater than unity. We also found statistically significant regional differences in MDMA use. Students in Atlantic, British Columbia, Quebec, and Prairie provinces had higher odds of MDMA use than those in Ontario. For the other substances, the provincial dummies were mostly

Table 2 Logistic regression of illicit drug use among adolescent smokers in grades 9–12

	Cocaine *AOR* (95 % CI)	MDMA *AOR* (95 % CI)	Hallucinogens *AOR* (95 % CI)	Amphetamines *AOR* (95 % CI)	Heroin *AOR* (95 % CI)	Ketamine *AOR* (95 % CI)
Contraband cigarette use						
Contraband smokers	2.17 (1.30–3.61)***	2.04 (1.28–3.26)***	2.21 (1.36–3.61)***	4.35 (2.11–8.96)***	8.05 (3.03–21.37)***	3.57 (1.65–7.70)***
Non-contraband smokers	Ref	Ref	Ref	Ref	Ref	Ref
Gender						
Male	1.30 (0.84–2.01)	1.05 (0.70–1.58)	1.71 (1.16–2.51)***	2.05 (1.18–3.57)**	1.75 (0.86–3.57)	1.54 (0.86–2.77)
Female	Ref	Ref	Ref	Ref	Ref	Ref
School grade level						
12	0.74 (0.36–1.50)	1.37 (0.67–2.80)	1.64 (0.86–3.13)	1.27 (0.46–3.54)	0.41 (0.15–1.13)*	1.01 (0.39–2.59)
11	1.57 (0.83–2.98)	1.84 (0.90–3.77)*	2.40 (1.28–4.52)***	4.95 (1.84–13.32)***	1.24 (0.45–3.40)	1.75 (0.65–4.69)
10	0.59 (0.29–1.23)	1.60 (0.77–3.32)	2.31 (1.17–4.56)**	2.70 (0.95–7.62)*	0.71 (0.21–2.39)	0.76 (0.25–2.31)
9	Ref	Ref	Ref	Ref	Ref	Ref
Ethnicity						
Aboriginal	0.76 (0.44–1.29)	0.69 (0.42–1.15)	0.71 (0.41–1.21)	0.60 (0.29–1.21)	0.67 (0.30–1.51)	0.53 (0.24–1.15)
Non-aboriginal	Ref	Ref	Ref	Ref	Ref	Ref
School truancy						
Skipped 3 or more classes	3.88 (2.33–6.46)***	2.15 (1.38–3.33)***	2.81 (1.80–4.38)***	2.98 (1.65–5.36)***	4.37 (1.98–9.65)***	2.41 (1.15–5.06)**
Skipped 1 or 2 classes	1.32 (0.64–2.71)	1.00 (0.55–1.83)	1.11 (0.65–1.87)	0.57 (0.26–1.27)	1.13 (0.43–3.00)	0.95 (0.40–2.26)
No skipped classes	Ref	Ref	Ref	Ref	Ref	Ref
School sport participation						
Yes	0.86 (0.54–1.36)	0.88 (0.56–1.37)	0.86 (0.57–1.32)	1.05 (0.59–1.87)	1.11 (0.59–2.09)	0.67 (0.36–1.25)
No	Ref	Ref	Ref	Ref	Ref	Ref
Binge drinking						
Yes	5.37 (2.78–10.36)***	1.98 (1.19–3.30)***	2.48 (1.47–4.19)***	2.32 (1.16–4.61)**	12.07 (4.63–31.49)***	5.80 (2.61–12.91)***
No	Ref	Ref	Ref	Ref	Ref	Ref
Region of residence						
Atlantic	1.74 (1.04–2.91)**	2.40 (1.57–3.67)***	1.22 (0.80–1.86)	1.31 (0.68–2.52)	1.60 (0.73–3.54)	1.53 (0.72–3.23)
Prairies	1.77 (0.89–3.50)	2.12 (1.20–3.74)***	1.69 (0.98–2.92)*	1.43 (0.57–3.60)	2.26 (0.76–6.69)	2.38 (0.86–6.55)*
Quebec	1.25 (0.57–2.72)	5.24 (2.49–11.06)***	2.20 (1.06–4.58)**	7.53 (2.94–19.31)***	0.45 (0.10–2.13)	2.76 (0.94–8.09)*
British Columbia	0.87 (0.42–1.83)	2.94 (1.57–5.51)***	1.99 (1.02–3.89)**	1.72 (0.68–4.34)	1.20 (0.38–3.78)	1.72 (0.64–4.63)
Ontario	Ref	Ref	Ref	Ref	Ref	Ref

95 % Confidence intervals (CI) are in parentheses

AOR adjusted odds ratio

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

not statistically significant, with a few exceptions. In particular, students in Quebec were more likely to use hallucinogens and amphetamines than were students in Ontario. Similarly, students in the Atlantic Provinces were more likely to use cocaine than those in Ontario. For the school grade level, students in higher grade were more likely to use hallucinogens, and amphetamines than were students in grade 9.

Discussion

Using a nationally representative survey of adolescent Canadian students, we found that about one in three current smokers in grades 9–12 used contraband cigarettes at least once weekly in the past year. Prevalence rates in the past year use of illicit drugs ranged from 9 to 37 %, with MDMA being the most commonly used drug among the six illicit drugs analyzed in the study. The adjusted logistic regression revealed that adolescents who smoke contraband cigarettes were more likely to use illicit substances than were non-contraband smokers. To our knowledge, this is the first study to demonstrate that use of contraband cigarettes was strongly associated with illicit drug use.

While it is not possible to disentangle the possible reasons for this association, the results presented here are congruent with those of previous studies that have showed that the use of alcohol or tobacco may lead to the use of other drugs (Everett et al., 1998; Siqueira & Brook, 2003). One longitudinal study found that cigarette smoking is strongly associated with later marijuana and other illicit drug use, as well as drug-related problems among Colombian youth (Siqueira & Brook, 2003). Similarly, O'Cathail et al. (2011) found that cigarette smoking is positively associated with drug use and other risk-taking behaviors in Irish teenagers. The 'gateway hypothesis' has been extensively studied, with some studies providing empirical evidence (Agrawal et al., 2006; Hall & Lynskey, 2005; Kandel, 2002; Lynskey et al., 2003; Morral, McCaffrey, & Paddock, 2002; Shaham, Shalev, Lu, de Wit, & Stewart, 2003). In addition, some studies have argued that vulnerability to drug use and abuse may in part be due to genetic or pharmacological factors (Hall & Lynskey, 2005; Kendler, Jacobson, Prescott, & Neale, 2003). Irrespective of which of these theoretical constructs may be applicable here, we make no claim about the sequencing of drug use, but show that opportunity for easy access to drugs may elevate use among adolescents. As Agrawal et al. (2006) notes, younger smokers, and particularly those who are underage, may find the illegal market a common source for licit drugs before attaining a permitted age as well as a source for illicit substances. Another plausible reason for our findings may be related to financial considerations, insofar as cheap cigarettes from the illegal market may allow students sufficient money to purchase other drugs. The latter point was echoed by the Royal Canadian Mounted Police declaration:

> The clear plastic re-sealable bags or "baggies" of 200 cigarettes are the most popular, and account for the largest proportion of seizures by police and provincial revenue enforcement agencies (RCMP, 2008, p. 13).

In terms of other control variables, we found no salient gender differences in the use of four out of the six illicit drugs, whereas boys were more likely to use hallucinogens and amphetamines than girls. This mixed pattern in gender differences in substance use is consistent with previous studies (Schwinn, Schinke, & Trent, 2010). Johnston, O'Malley, Bachman, and Schulenberg (2008) found that males have a higher prevalence of use of certain illicit drugs, such as steroids and heroin. Our results showing no significant association between participation in school sports and illicit drug use did not support the belief that participation in sports was protective of drug use and abuse. We suspect that this may be due to the fact that our sample is restricted to smokers. A systematic review study found evidence that participation in sport was strongly related to lower levels of both cigarette smoking and illegal drug use (Lisha & Sussman, 2010). Our finding that binge drinking was associated with a greater likelihood of illicit drug use is in keeping with a previous study. Best, Manning, Gossop, Gross, & Strang (2006) found that excessive drinking was positively associated with frequency of cigarette smoking, use of cannabis, and positive attitudes towards illicit drugs among UK students aged 14–16 years. School truancy has been consistently identified as a strong predictor of the onset of substance use (Henry & Huizinga, 2007; Henry & Thornberry, 2010). In the present study, we found similar evidence that those who skipped three or more

classes are more likely to use all the illicit drugs we examined.

We note some limitations to this study. First, the results shown in this cross-sectional study indicate association but not causation, insofar as the results may in part be due to a third variable, such as a deviance-prone personality. Second, illicit drug use was self-reported, which could be subject to recall or social desirability bias (Davis, Thake, & Vilhena, 2010). Third, the YSS did not contain either socioeconomic status (parent's education status and family/household income) or information concerning the context or source of illicit drugs used by student participating in this study. Finally, the prevalence of contraband use may be underestimated given that other sources of contraband were not captured in the study.

Despite these limitations, we believe this study is timely and contributes to the ongoing debate about the need to intensify the effort to tackle the illegal tobacco market. Article 15 of the Framework Convention on Tobacco Control (FCTC) presents a comprehensive strategy to combat the illicit trade in tobacco in all its three forms, namely smuggling, illicit manufacturing and counterfeiting. These measures include: strengthening legislation and law enforcement, enhancing cooperation and exchange of information between relevant national and international agencies; effective monitoring and documentation of the storage and distribution of tobacco products; and clear and marked packaging information (World Health Organization, 2005). In November 2012, the Protocol to Eliminate Illicit Trade in Tobacco Products was introduced as a supplement to the WHO FCTC, and as of November 2013, 38 countries have signed it. "Supply chain control" was considered the cornerstone of this new protocol and several measures were suggested that included licensing, tracking, and record-keeping, and sales through the internet. The new protocol also regulates other issues such as offences, seizure payments and destruction of confiscated products; international cooperation such as the exchange of information; and the protection of personal data (World Health Organization, 2013).

Conclusion

Studies have shown that access to cheap cigarettes deters attempts at smoking cessation and induces smoking initiation (Diemert et al., 2010; Hyland et al., 2005; Mecredy et al., 2013). This paper adds to the existing evidence on the negative effects of the availability of cheap cigarettes by showing that adolescent contraband smokers are more likely to use illicit drugs. While the findings may not be unexpected, they are nevertheless disturbing since 31 % of adolescent smokers are contraband users. Given the addictive nature of these drugs, the negative ramifications of illegal tobacco and the potential for such behavior to spill over into adulthood suggest that more concerted efforts are needed to address this problem.

Acknowledgments This work was supported by a research grant from the Canadian Cancer Society Research Institute (Grant Number 2011-701019).

Conflict of interest None.

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