

## Electronic Cigarette Use Among Secondary School Students in Québec: 2012-2013

### YOUTH SMOKING SURVEY

Number 11

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### Highlights

Electronic cigarettes are new devices with which users mimic the gestures and produce the feeling of smoking without exposing themselves to the toxic by-products of tobacco combustion. While many experts consider them to be a less harmful alternative for smokers' health than conventional cigarettes, others are concerned that they could renormalize smoking and provide a gateway to conventional cigarettes for young people.

This study is one of the first to assess electronic cigarette use among secondary school students in Québec.

The findings indicate that most students have heard of electronic cigarettes. In 2012-2013, 34% of secondary school students had 'ever used' electronic cigarettes and approximately 6% had used them in the past 30 days. These estimates are high compared with those in the United States and suggest that youth in Québec have access to this product. Almost one third of secondary school students who had never tried electronic cigarettes did not rule out the possibility of doing so in the future.

While this study does not indicate whether electronic cigarette use causes youth to start smoking, it shows us that it is important to document the possible influence of this new product on smoking initiation.

The data come from the 2012-2013 Youth Smoking Survey (YSS) and the insert questionnaire added and funded by the Canadian Cancer Society – Quebec Division, which includes questions on electronic cigarette awareness and use.

## Background

An electronic cigarette (EC) is a new device that usually includes a liquid-filled cartridge, an atomizer, a battery and a microprocessor (Brown & Cheng, 2014; Poirier, 2013). Some models have a glowing tip that lights up when the user breathes in. The device does not produce smoke but releases a vapour into the air when the liquid in the cartridge is heated (Office français de prévention du tabagisme, 2013). The main constituents of the liquid are propylene glycol and glycerol, which are used in food and drugs as well as in the entertainment industry to simulate smoke (Office français de prévention du tabagisme, 2013). The liquid may contain nicotine, the substance responsible for tobacco dependence (Office français de prévention du tabagisme, 2013; Poirier, 2013). ECs can be disposable or reusable, either by replacing the cartridge of liquid or refilling the reservoir. Electronic cigarettes replicate the act and feel of smoking while giving off fewer toxicants than conventional cigarettes. However, little is known about their long-term health effects (Callahan-Lyon, 2014; Farsalinos & Polosa, 2014; Hajek et al., 2014; World Health Organization, 2014).

ECs were invented in China and first appeared on the market in 2004, with versions without nicotine entering retail stores in Québec in 2011 (Poirier, 2013). In Canada, electronic products for the vaporization and administration of inhaled nicotine, as well as cartridges of nicotine solutions and related products, fall within the scope of the *Food and Drugs Act*. All of these products require market authorization. Authorization is granted by Health Canada following a review of scientific evidence demonstrating the safety, quality and efficacy of the product; this evidence is provided by the sponsor seeking authorization (Health Canada, 2009). To date, no product has been authorized for sale by Health Canada, which means that ECs containing nicotine cannot be legally sold in Canada. ECs without nicotine are considered consumer products and do not require approval from Health Canada, provided no health claims are made.

In Québec, ECs containing nicotine are sold in a growing number of specialty stores. Products can also be bought over the Internet. A disposable EC without nicotine that provides approximately the same number of puffs as a pack of 20 cigarettes (Huang et al., 2014; Office français

de prévention du tabagisme, 2013) retails for around ten dollars, while a reusable electronic cigarette starter kit that can deliver nicotine requires a greater investment, around one hundred dollars. In comparison, a carton of 200 conventional cigarettes had an average cost of \$82 in Québec in 2014 (Ministère des Finances du Québec, 2014).

Health experts have different opinions on the risks and benefits of ECs for public health. While many consider they are a less harmful alternative for smokers' health than conventional cigarettes, others are concerned that they could provide a gateway to conventional cigarettes for young people and renormalize smoking (Durmowicz, 2014; Hajek et al., 2014; World Health Organization, 2014).

### Electronic cigarette use among youth

In general, EC use is assessed in two ways: ever use, or the proportion of people who report having used ECs at least once in their lifetime; and use in the past 30 days. In the United States, the prevalence of ever use among 12- to 19-year-old secondary school students is reported to have increased from 4% to 7% between 2011 and 2012, whereas use in the past 30 days was 1% and 2%, respectively (Corey et al., 2014). In Paris in 2012, 8% of 12- to 19-year-old students had ever used ECs (Dautzenberg et al., 2013). Interest in ECs is generally lower among young non-smokers than among current smokers (daily and occasional) and former smokers (Corey et al., 2014). In Paris, 4% of 12- to 19-year-old non-smokers had ever tried ECs in 2012, compared with 33% of smokers and 20% of former smokers (Dautzenberg et al., 2013). EC ever use was also higher among youth who reported using water-pipes, marijuana or engaging in binge drinking (Dautzenberg et al., 2013).

Most adult smokers tend to use ECs to reduce or stop smoking completely (Farsalinos et al., 2014). In addition to the reasons given by adult smokers, youth and young adults report using ECs for a host of reasons: they are cheaper, they can be used to avoid smoking around other people, or in places where smoking is banned (Czoli et al., 2014), for the pleasure of smoking or simply out of curiosity (Canadian Cancer Society – Quebec Division, 2013).

In Canada, the only published data on the prevalence of use among youth indicate that in 2012, 16% of youth and young adults aged 16 to 30 years reported ever using the product (Czoli et al., 2014). This proportion was higher among smokers (35%) and former smokers (19%) than among non-smokers (5%). According to the same study, 6% reported use in the last 30 days. The data were collected from a sample of 1,200 respondents recruited from an online panel, a recruitment method that is subject to a selection bias. A study conducted for the Ministère de la Santé et des Services sociaux [Québec's ministry of health and social services] in 2013 among more than 3,000 people in Québec showed that 35% of youth aged 15-19 years have used ECs in their lifetimes, a significantly higher proportion than in older age groups (internal document; Institut de la statistique du Québec, 2014). Data collected among youth aged 12 to 17 years are needed to determine the attractiveness of ECs for minors from the time they take up smoking, at around age 12 to 13.

The purpose of this study is to document EC awareness, ever use and use in the past 30 days among secondary school students in Québec as well as the relationship between alcohol or marijuana use and EC use. The proportion of students who had never used ECs and who did not rule out the possibility of trying them in the future was also examined.

## Questions from the Youth Smoking Survey and the insert questionnaire funded by the Canadian Cancer Society – Quebec Division, 2012-2013

The data used come from the 2012-2013 Youth Smoking Survey (YSS) and the insert questionnaire added and funded by the Canadian Cancer Society – Quebec Division, which includes questions on EC awareness and use. The two microdata files were matched to provide access to all the information available for the students who answered the insert questionnaire added to the 2012-2013 YSS. The study was conducted on 5,880 students in Grade 6 and Secondary 1 to 5 from a random selection of schools in Québec.

The data presented concern mainly Secondary 1 to 5 students, although in some instances the data collected from Grade 6 students were also considered for comparison purposes.

Several variables from the insert questionnaire assess EC awareness and use among students in Québec. In addition, two variables provide an estimate of the proportion of students who do not rule out the possibility of using ECs in the future. All these variables come from survey questions that are presented in detail below.

### Variables of interest

#### ELECTRONIC CIGARETTE AWARENESS

To assess EC awareness among students in Québec, all respondents were asked the question “Have you ever heard of a product called an electronic cigarette (or e-cigarette)?” The response options were “Yes” or “No.”

#### ELECTRONIC CIGARETTE EVER USE

EC ever use among students in Québec was assessed by asking the question: “Have you ever used electronic cigarettes (or e-cigarettes), even just a few puffs?” Students could answer “Yes” or “No.”

#### ELECTRONIC CIGARETTE USE IN THE PAST 30 DAYS

Students were then asked about their use of ECs in the 30 days preceding the survey. The question they were asked was formulated as follows: “Have you used electronic cigarettes (or e-cigarettes) in the last 30 days?” Once again, students could answer “Yes” or “No.”

#### POSSIBILITY OF ELECTRONIC CIGARETTE USE IN THE FUTURE

Students were asked about their possible use of ECs in the future through two questions, namely: “If one of your best friends was to offer you an electronic cigarette (or e-cigarette), would you smoke it?” and “At any time during the next year do you think you will use an electronic cigarette (or e-cigarette)?” Respondents were given the same response options for both questions: “Definitely yes; Probably yes; Probably not; Definitely not.”

Students who responded “Definitely not” to both questions were classified as having ruled out the possibility of trying the product outright. Students who selected one of the other three response options were classified as not having ruled out the possibility of trying the product. While all students were asked the questions, analyses were conducted only on those who had never used ECs.

### Cross-tabulated variables

Analyses were carried out using sociodemographic variables (sex and grade), in addition to certain cross-tabulated variables in the 2012-2013 YSS microdata file. These variables are described below.

#### CIGARETTE EVER USE

Cigarette ever use among students in Québec was assessed in two different ways: based on having had a puff of a cigarette and based on having smoked a whole cigarette. Having had a puff of a cigarette was assessed by the following question: “Have you ever tried cigarette smoking, even just a few puffs?” Students had to answer “Yes” or “No.” For students who answered “Yes,” having smoked a whole cigarette was assessed by the question: “Have you ever smoked a whole cigarette?” (yes, no). Students who responded that they had never had a puff of a cigarette did not have to answer the second question.

#### CIGARETTE USE IN THE LAST 30 DAYS

Students who reported having smoked a whole cigarette were asked the question “On how many of the last 30 days did you smoke one or more cigarettes?” Respondents who had smoked on at least one day in the last 30 days were classified as smokers.

#### POSSIBILITY OF CIGARETTE USE IN THE FUTURE

The possibility that students who had never had a puff of a cigarette might use cigarettes in the future was assessed by three questions, namely: “Do you think in the future you might try smoking cigarettes?” “If one of your best friends was to offer you a cigarette, would you smoke it?” and “At any time during the next year do you think you will smoke a cigarette?” Respondents were given the same response options for all three questions:

“Definitely yes; Probably yes; Probably not; Definitely not.”

Students who answered “Definitely not” to all three questions were classified as having ruled out the possibility of smoking cigarettes in the future. Students who selected one of the other three response options were classified as not having ruled out the possibility of smoking cigarettes. These analyses were carried out among students who responded that they had never had a puff of a cigarette.

#### EVER USE OF FLAVOURED TOBACCO PRODUCTS

Ever use of flavoured tobacco products among students in Québec was assessed by the following question: “Have you ever used flavoured tobacco products (menthol, cherry, strawberry, vanilla, etc.)?” Students had to answer “Yes” or “No.”

#### ALCOHOL USE IN THE LAST 12 MONTHS

Alcohol use in the last year was assessed by the following question: “In the last 12 months, how often did you have a drink of alcohol that was more than just a sip?” There were several response options: “I have never drunk alcohol; I did not drink alcohol in the last 12 months; I have only had a sip of alcohol; Less than once a month; Once a month; 2 or 3 times a month; Once a week; 2 or 3 times a week; 4 to 6 times a week; Every day; I do not know.” Respondents who reported having drunk alcohol less than once a month, or more often, were classified as having consumed alcohol in the last year. Respondents who reported that they had never drunk alcohol in the last 12 months or had only had a sip were classified as not having consumed alcohol in the last 12 months.

#### BINGE DRINKING IN THE LAST 12 MONTHS

Binge drinking, defined as 5 or more drinks on one occasion, was assessed by the following question: “In the last 12 months, how often did you have 5 drinks of alcohol or more on one occasion?” Respondents were given various response options: “I have never done this; I did not have 5 or more drinks on one occasion in the last 12 months; Less than once a month; Once a month; 2 to 3 times a month; Once a week; 2 to 5 times a week; Daily or almost daily; I do not know.” As for the variable related to alcohol use, respondents who reported having

had five or more drinks less than once a month, or more often, were classified as having engaged in binge drinking in the last 12 months, while the others were classified as not having engaged in binge drinking during the same period.

#### MARIJUANA USE IN THE LAST 12 MONTHS

Marijuana use in the last year was assessed by the following question: “In the last 12 months, how often did you use marijuana or cannabis?” Respondents were given a number of response options: “I have never used marijuana; I have used marijuana but not in the last 12 months; Less than once a month; Once a month; 2 or 3 times a month; Once a week; 2 or 3 times a week; 4 to 6 times a week; Every day; I do not know.” Once again, respondents who reported having used marijuana less than once a month, or more often, were classified as

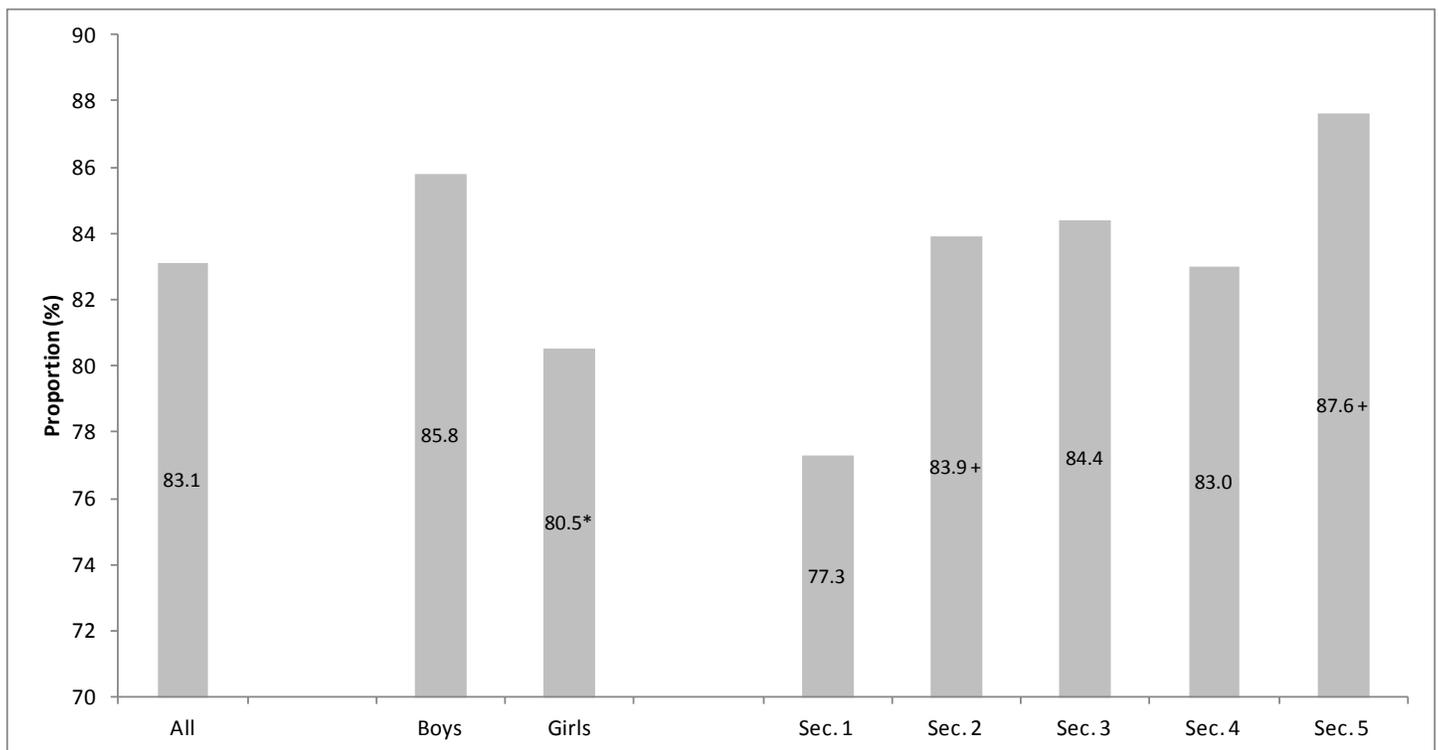
having used marijuana in the last 12 months, while the others were classified as non-users of marijuana.

## Results

### Electronic cigarette awareness

Most secondary school students (83%) have heard of ECs (Figure 1), with the proportion of boys higher (86%) than that of girls (81%). Moreover, the proportion of students who have heard of this product is higher in Secondary 5 (88%) than in Secondary 4 (83%). Similar proportions of students in Secondary 2, 3 and 4 (83-84%) have heard of ECs, while the proportion of Secondary 1 students is significantly lower than that of Secondary 2 students (77% versus 84%). Note also that slightly more than half of Grade 6 students (55%) have heard of this product (data not shown).

**Figure 1** Proportion of students who have heard of electronic cigarettes by sex and grade, Secondary 1 to 5 students, Québec, 2012-2013



\* Proportion significantly different from that of boys ( $p < .05$ ).

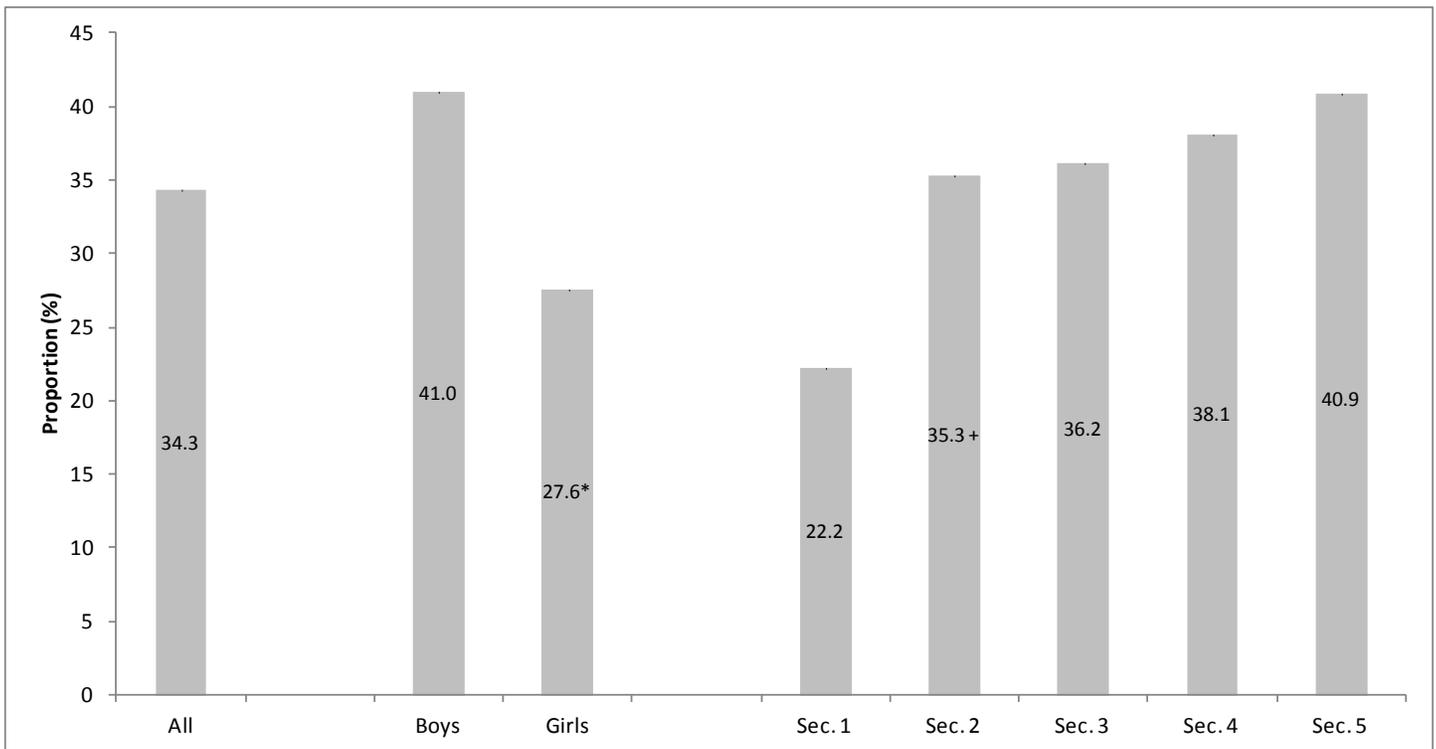
+ Proportion significantly higher than in the previous grade ( $p < .05$ ).

## Electronic cigarette ever use

In Québec, more than one in three secondary school students (34%) have ever used ECs in their lifetimes (Figure 2), which represents approximately 143,300 students. EC use is more widespread among

boys (41%) than girls (28%). The proportions of students who have tried ECs are similar among Secondary 2 to 5 students (35-41%) and higher than among Secondary 1 students (22%). Fewer than one in ten Grade 6 students (9%) have tried ECs, a lower proportion than in secondary school (data not shown).

**Figure 2** Proportion of students who have ever used electronic cigarettes by sex and grade, Secondary 1 to 5 students, Québec, 2012-2013



\* Proportion significantly different from that of boys ( $p < .05$ ).

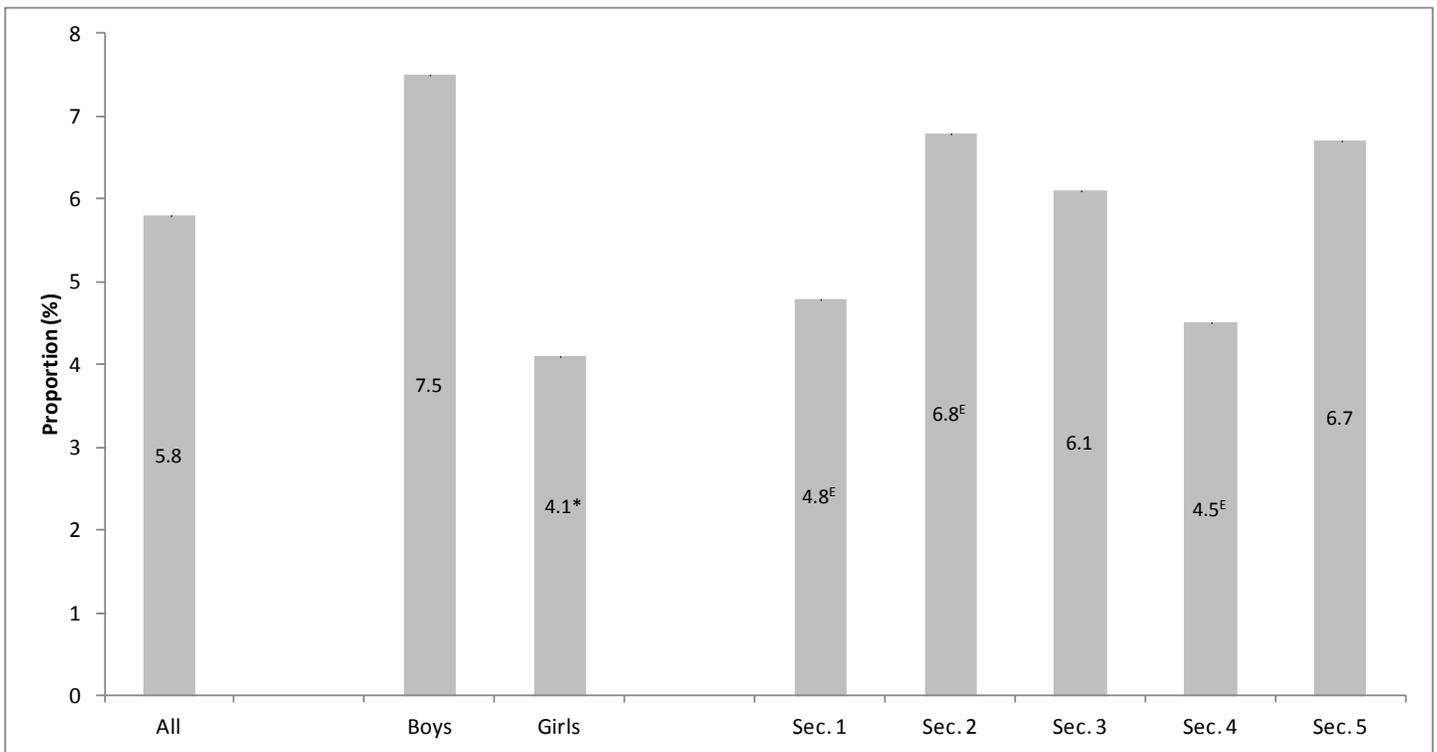
+ Proportion significantly higher than in the previous grade ( $p < .05$ ).

### Electronic cigarette use in the past 30 days

Six percent (6%) of secondary school students reported having used ECs in the past 30 days, which corresponds to approximately 24,100 students (Figure 3). As was observed for the prevalence of EC ever use,

a significantly higher proportion of boys had used ECs in the past 30 days (8%) than girls (4%). A breakdown by grade did not reveal any significant differences between secondary school grades with respect to the proportion of students who had used ECs in the past 30 days.

**Figure 3** Proportion of students who have used electronic cigarettes in the past 30 days by sex and grade, Secondary 1 to 5 students, Québec, 2012-2013



\* Proportion significantly different from that of boys ( $p < .05$ ).

<sup>E</sup> Coefficient of variation between 16.6% and 33.3%; interpret with caution.

## Electronic cigarette use as a function of cigarette use

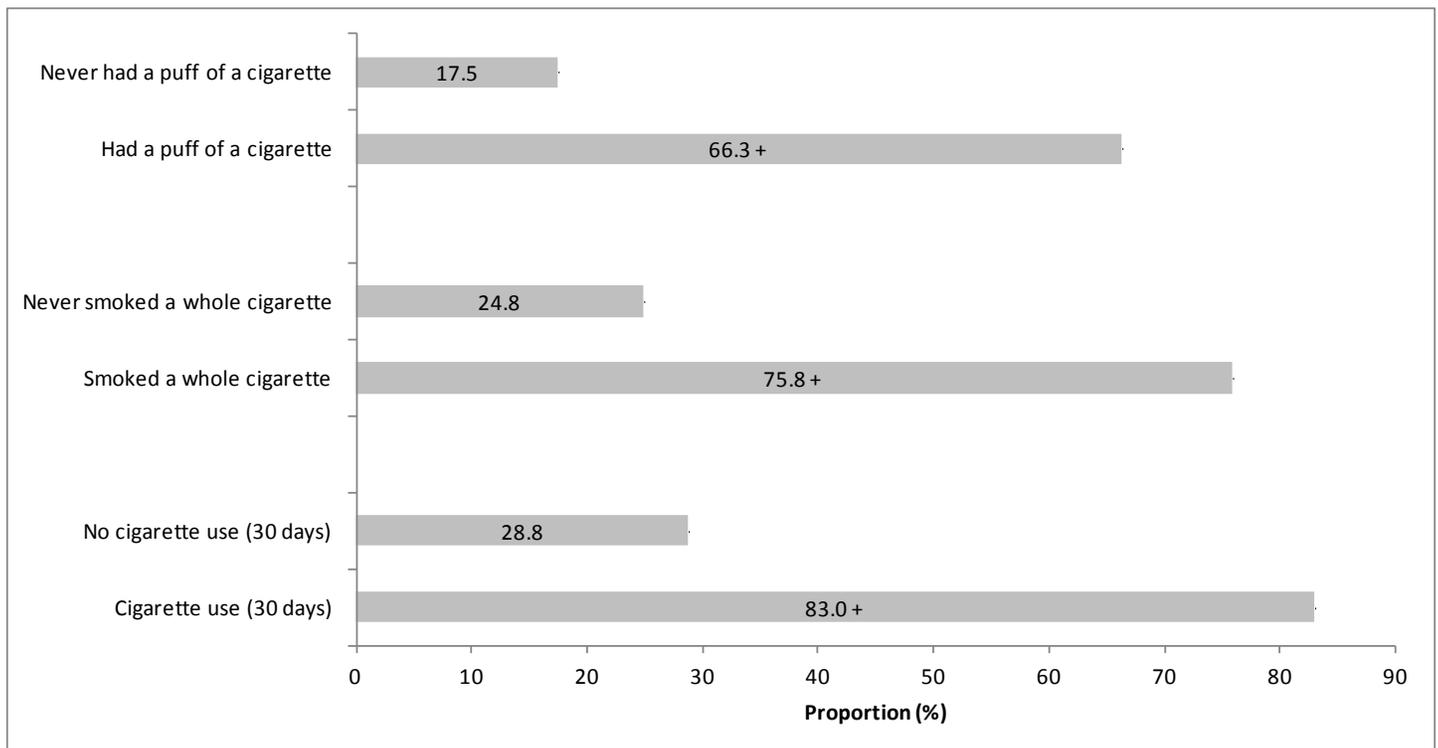
The results in Figures 4 and 5 show the proportion of students who have tried ECs in relation to their past or present experiences with cigarette smoking. Compared with other students, it is clear that a proportionally higher number of students who have already smoked cigarettes have tried ECs, either at least once in their lifetimes or in the past 30 days.

Two thirds of students (66%) who have already had a puff of a cigarette have tried ECs, compared with 18% of students who had never had a puff (Figure 4). The proportions for experimentation with ECs are higher

among students who have smoked a whole cigarette (76%) as well as among those who have never smoked a whole cigarette (25%). Furthermore, 83% of students who reported having smoked one or more cigarettes in the last 30 days have tried ECs, compared with 29% of students who had not smoked cigarettes in the last 30 days.

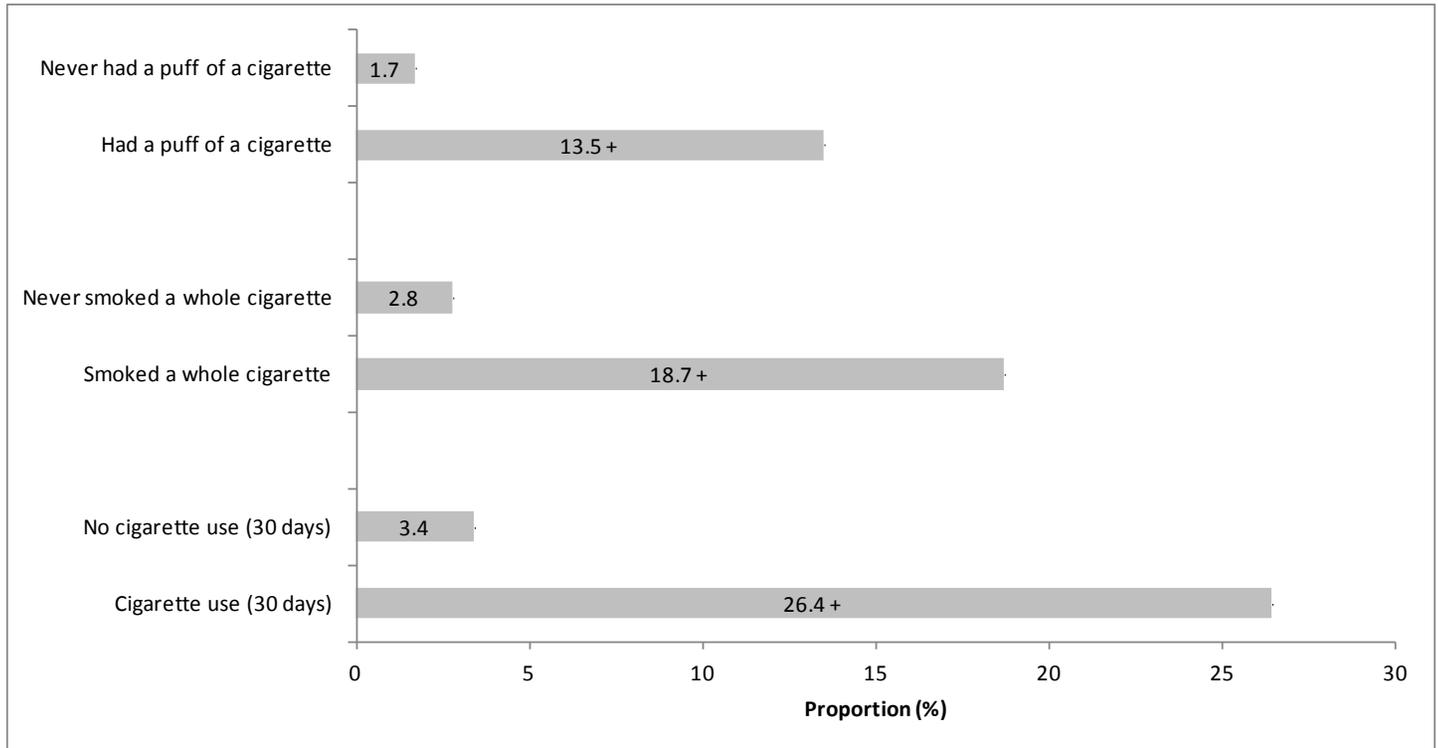
As shown in Figure 5, compared with other students, the proportion of students who had used ECs in the past 30 days was higher among those who had already smoked cigarettes, either a puff (14% versus 2%) or a whole cigarette (19% versus 3%). More than one in four smokers (26%) had used ECs in the last month, while 3% of students who had not smoked cigarettes in the last 30 days had used ECs during the same period.

**Figure 4** Proportion of students who have ever used electronic cigarettes in relation to ever having had a puff of a cigarette, ever having smoked a whole cigarette and cigarette use in the past 30 days, Secondary 1 to 5 students, Québec, 2012-2013



+ Proportion significantly higher than that of the comparison category ( $p < .05$ ).

**Figure 5** Proportion of students who have used electronic cigarettes in the past 30 days in relation to ever having had a puff of a cigarette, ever having smoked a whole cigarette and cigarette use in the past 30 days, Secondary 1 to 5 students, Québec, 2012-2013



+ Proportion significantly higher than that of the comparison category ( $p < .05$ ).

It should be noted that ever use of flavoured tobacco products also seems to be associated with EC use (data not shown). Indeed, 76% of secondary school students who have ever used a flavoured tobacco product have ever used ECs (compared with 20% of those who have never used flavoured tobacco products). A similar relationship is observed for EC use in the past 30 days: 17% of students who had used a flavoured tobacco product had used ECs in the past 30 days, compared with only 2% of students who had not used flavoured tobacco products (data not shown).

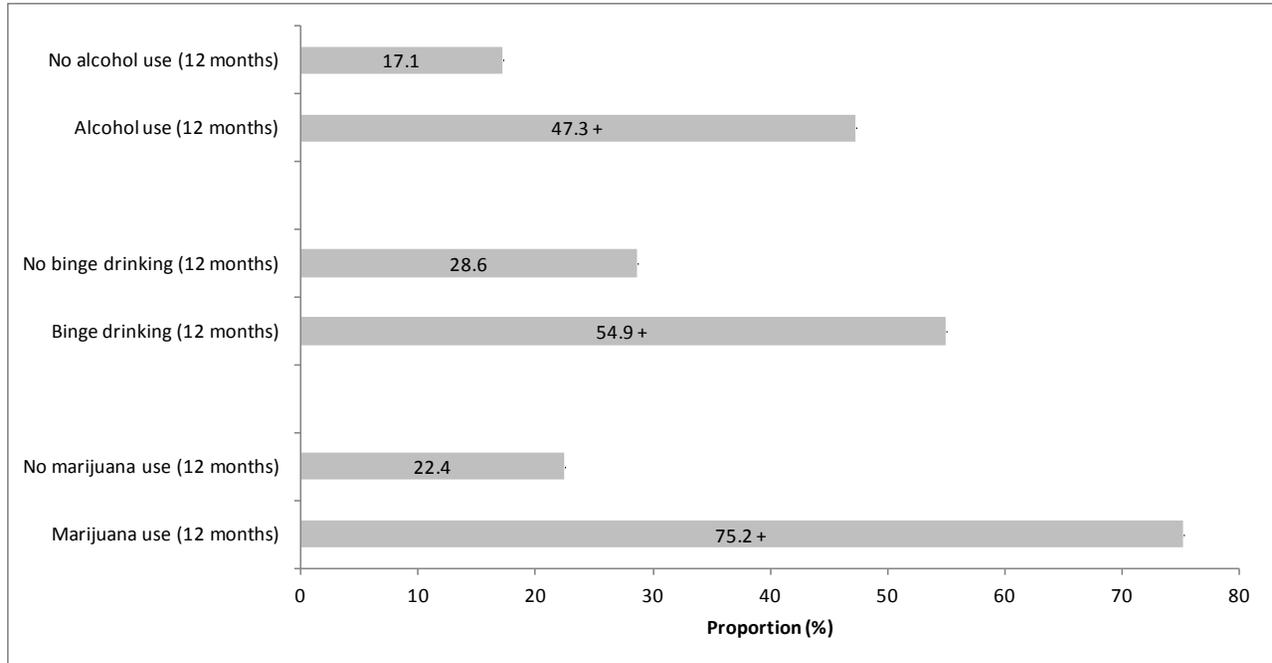
### Electronic cigarette use as a function of other substance use

The relationships between EC use and other psychoactive substances, namely alcohol and marijuana, were also examined. As was observed for the relationship between cigarette use and EC use, students who had used alcohol in the last 12 months were more likely to have ever used ECs (47% versus 17%)

(Figure 6) or used it in the past 30 days (8% versus 2%) (Figure 7). Findings were similar for students who reported binge drinking on at least one occasion in the last year.

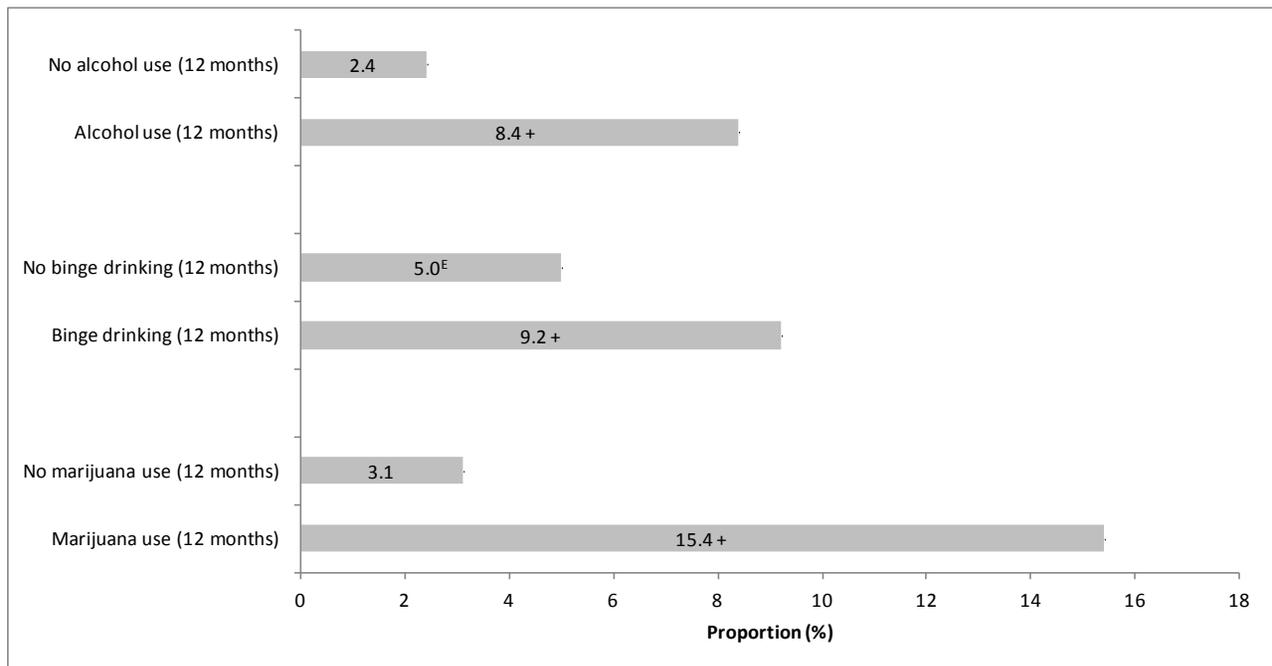
With respect to both EC ever use and EC use in the past 30 days, there were significant differences between students depending on whether or not they had used marijuana in the last 12 months (Figures 6 and 7). The prevalence of EC ever use among students who had used marijuana in the last year was 75% (compared with 22% in non-users of marijuana), while their prevalence of EC use in the past 30 days was 15% (compared with 3% in non-users of marijuana).

**Figure 6** Proportion of students who have ever used electronic cigarettes in relation to alcohol use, binge drinking and marijuana use in the past 12 months, Secondary 1 to 5 students, Québec, 2012-2013



+ Proportion significantly higher than that of the comparison category ( $p < .05$ ).

**Figure 7** Proportion of students who have used electronic cigarettes in the past 30 days in relation to alcohol use, binge drinking and marijuana use in the past 12 months, Secondary 1 to 5 students, Québec, 2012-2013



+ Proportion significantly higher than that of the comparison category ( $p < .05$ ).

<sup>E</sup> Coefficient of variation between 16.6% and 33.3%; interpret with caution.

## Possibility of electronic cigarette or cigarette use in the future

In addition to EC awareness and use, the possibility that non-users of ECs might use them in the future was also examined. The results show that 31% of secondary school students who have never tried ECs do not rule out the possibility of using them in the future, which represents approximately 84,400 students in Québec. Proportions were similar for girls (33%) and boys (29%).

An additional analysis was carried out to determine the proportion of students who do not rule out the possibility of smoking cigarettes in the future in relation to EC ever use. The results show that 46% of students who have tried ECs do not rule out the possibility of smoking cigarettes in the future, compared with 25% of students who have never used ECs (data not shown). An estimated 21,800 secondary school students who have never smoked a cigarette, but have used ECs, do not rule out the possibility of trying cigarettes in the future.

## Discussion

This study is one of the first in Canada to document the prevalence of EC use among secondary school students in Québec. Based on this data, which is representative at a provincial level, the following observations can be made:

- Most secondary school students in Québec have heard of ECs.
- Approximately one in three secondary school students (34%) ever used ECs, which corresponds to approximately 143,300 students.
- Approximately 6% of secondary school students have used ECs in the past 30 days, which is the equivalent of approximately 24,100 students.
- EC use is more widespread among boys and among students who have smoked cigarettes, and those who reported alcohol use, binge drinking or marijuana use the last 12 months.
- Nearly one third of secondary school students who have never used ECs do not rule out the possibility of trying them in the future.

- Nearly one half of students who have ever used ECs do not rule out the possibility of trying cigarettes in the future, compared to one in four students who have never used ECs.

Interest in ECs is more widespread among Québec youth than we might have expected based on data from other countries, such as the United States, France and England. Prevalence of EC ever use was 7-8% among secondary school students in France and the United States in 2012 (Corey et al., 2014; Dautzenberg et al., 2013), a proportion similar to that observed in England in 2013 among 16- to 18-year olds (10%) and 11- to 14-year olds (5%; Action on Smoking and Health, 2014). In Québec, ever use prevalence among secondary school students was 34% in 2012-2013, which is similar to the 35% rate observed among 15- to 19-year olds in Québec in 2013 (internal document; Institut de la statistique du Québec, 2014).

Since the popularity of ECs is soaring and since the available data were collected more recently in Québec than in France and the United States, the prevalence of EC use in Québec may be higher than had it been estimated using data collected at an earlier time. Despite these considerations, the difference between Québec data and the data from France, the United Kingdom and the United States is surprising, since only ECs without nicotine are approved for sale on the Québec market, whereas ECs with and without nicotine are readily available in the United States, France and the United Kingdom. In 2010-2011, ever use among adult smokers was higher in countries where the product was legal, such as the United States (15%) and the United Kingdom (10%), than in countries where it was not, such as Canada (4%) and Australia (2%) (Adkison et al., 2013). In Québec and elsewhere, past 30-day use rates are much lower than ever use rates.

This study reveals that interest in ECs is much higher among young people who have already smoked cigarettes, which has been observed elsewhere in the world (Corey et al., 2014; Dautzenberg et al., 2013). However, a significant proportion of Québec students who have never had a puff of a cigarette reported having tried ECs (18%). Moreover, a proportionally higher number of students who have tried other psychoactive substances such as alcohol and marijuana have tried

ECs, which is consistent with the findings of Dautzenberg and his colleagues (2013).

Nearly one in three secondary school students who have never tried ECs do not rule out the possibility of doing so in the future. Furthermore, 46% of students who have already used ECs do not rule out the possibility of trying *cigarettes* in the future, compared with only 25% of students who have not tried ECs. These findings are similar to those obtained with American students (Bunnell et al., 2014). The study does not indicate whether EC use would lead students to try cigarettes or if students that try ECs were already interested in cigarettes. The results must also be interpreted with caution, for they are based on questions that ask teenage students to project themselves into the future, i.e., into the next year, and into a hypothetical situation, i.e., where they are offered a cigarette or an EC by a close friend. Young people's behaviour if such a situation were to arise might be different to what they imagined when completing the questionnaire. Nevertheless, the interest shown in cigarettes by young people who have tried ECs must not be taken lightly, given the novelty of the device and the lack of knowledge about its long-term effects.

The study has certain limitations. Firstly, the results do not identify the proportions of students who used ECs with or without nicotine, for this aspect was not addressed in the questions. When the data for the study were collected, a number of sources reported that cartridges labelled "nicotine free" had been found to contain nicotine (Poirier, 2013), including a study carried out in Québec in January 2013 (Canadian Cancer Society – Quebec Division, 2013). Secondly, past 30-day use (a criterion usually used in tobacco use monitoring to distinguish between young people experimenting with cigarettes and those who smoke on a more regular basis) may overestimate the proportion of students who use ECs regularly, since some may be recent experimental users given the novelty of the product (Giovenco et al., 2014). Finally, the data collected for the study are not representative of young people who do not attend school, young people living in institutions or on First Nations reserves, and young people attending special schools or attending schools located on military bases.

A number of criteria can be used to classify students as cigarette smokers or non-smokers. Since there does not appear to be a consensus at present regarding which cigarette use variable to use when cross-tabulating with an EC use variable, we decided to present the data in relation to several variables (having had a puff of a cigarette, having smoked a whole cigarette, cigarette use in the last 30 days). Each variable has particular characteristics that the reader must take into account when interpreting the results of the analysis:

- Students who have never had a puff of a cigarette form a homogeneous group, reporting no cigarette use at all; however, the drawback of this variable is that the other category combines students who smoke daily or occasionally, former smokers and those who have only smoked a whole cigarette or had a puff of a cigarette.
- Students who have smoked a whole cigarette include students who have not smoked in the last 30 days, students who have not smoked 100 cigarettes in their lifetimes, and others who smoke regularly, thus forming a heterogeneous group.
- Students who have smoked in the last 30 days are classified as smokers based on the typology commonly used in the "Youth Smoking Survey" series; this category includes daily, occasional and beginning smokers.

The number of studies published on ECs has increased rapidly since the first study was published in 2007 (Zyoud et al., 2014). Nevertheless, few studies on the product's long-term harmlessness and its effectiveness as a smoking cessation aid have been published to date (World Health Organization, 2014; Zyoud et al., 2014). Evidence concerning the long-term health effects of EC use is not available given the product's recent entry into the market and the lengthy lag time for onset of many diseases (World Health Organization, 2014). Little is known about the effects of long-term inhalation of glycerol, propylene glycol, flavourings and additives commonly used in ECs (Hajek et al., 2014; Office français de prévention du tabagisme, 2013).

Adult smokers already expose themselves to a large quantity of toxicants whose harmful effects on health are well known. It is unlikely that EC use exposes them to products that are more toxic than those to which they are exposed by smoking tobacco products (World Health

Organization, 2014). Youth who do not smoke do not expose themselves to the toxic by-products of tobacco combustion, and those who do smoke have done so for a shorter time than adults. Therefore, the potentially harmful effects of exposure to the substances in ECs are likely to have an important impact on the health of young people on a long-term basis. EC use may also cause young people to start smoking (Durmowicz, 2014; Hajek et al., 2014; World Health Organization, 2014). This study neither rules out nor confirms this hypothesis, but supports the importance of continuing to monitor EC use among Québec youth.

The EC market is booming and the product is evolving rapidly. In January 2014, 466 EC brands could be identified on the Internet, each with its own website, and with more than 7,000 flavours (Zhu et al., 2014). New models of ECs bear little resemblance to conventional cigarettes and allow users to manipulate nicotine content and add other ingredients, in short, to customize their EC (Zhu et al., 2014). This shift towards new designs was associated with an explosion of new flavours and a tendency to no longer compare ECs with conventional cigarettes in promotional messages (Zhu et al., 2014). The exponential increase in the number of flavours is a concern, since young people find flavoured cigarettes more appealing than unflavoured products, especially high sensation-seeking youth (Manning et al., 2009). Advertising, which is allowed in the United States, is increasing rapidly and reaches youth and young adults (Duke et al., 2014).

Despite health experts' differences in opinion on the risks and benefits of ECs for public health, a consensus is emerging with respect to the need to regulate EC advertising and promotion and prohibit access to those under the age of 18 (Direction de santé publique de l'Agence de la santé et des services sociaux de Montréal, 2013; Journal officiel de l'Union européenne, 2014; World Health Organization, 2014; Canadian Cancer Society, 2013; Tremblay & Montreuil, 2013).

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## About the Canadian Youth Smoking Survey

The first Youth Smoking Survey (YSS) was administered in 1994 by Statistics Canada on behalf of Health Canada, with subsequent surveys conducted on a biennial basis as of 2002. Since 2004, the YSS has been administered under an agreement between Health Canada and the Propel Centre for Population Health Impact at the University of Waterloo. In Québec, the study was conducted by the Institut national de santé publique du Québec (INSPQ) twice, in collaboration with McGill University (2004-2005) and the Centre de recherche du CHUM (2006-2007). The Québec component of the 2008-2009 survey was administered by the Centre de recherche du CHUM, that of 2010-2011 was conducted by Québec en Forme and that of 2012-2013 by the Centre de recherche du CHUM. This survey is different from the Enquête québécoise sur le tabac, l'alcool, la drogue et le jeu chez les élèves du secondaire [Québec Survey on Smoking, Alcohol, Drugs and Gambling in High School Students], a biennial survey conducted by the Institut de la statistique du Québec from 1998 to 2008 and repeated in 2013.

Data collection for the 2012-2013 YSS was implemented between November 2012 and June 2013. Of the schools selected, all students at all grade levels targeted by the survey were eligible for inclusion in the final sample. The questionnaire was completed in the classroom. In 2012-2013, 6,158 students in Québec and 47,203 students in Canada (Grades 6 to 12) participated in the seventh YSS. Of the students in Québec who participated in the 2012-2013 YSS, 5,880 completed the insert questionnaire funded by the Canadian Cancer Society – Quebec Division.

The analysis is based on anonymized data from the public use microdata file for the 2012-2013 Youth Smoking Survey and the microdata file for the insert questionnaire funded by the Canadian Cancer Society – Quebec Division. The two microdata files were matched to provide access to all the information available for the 5,880 students who completed the insert questionnaire funded by the Canadian Cancer Society – Quebec Division. The authors assume full responsibility for the calculations and interpretation of data presented in the document.

Estimates and confidence intervals were calculated in accordance with the recommendations in the YSS Microdata File User Guide, using the set of 500 bootstrap weights that accompany the survey data. The statistical significance of a comparison between two estimates was determined based on the results of difference in proportions tests, also using bootstrap weights. The Bonferroni-Holm correction was applied when multiple comparisons of proportions were made. It should be noted that the difference tests used are less conservative than the comparison of the confidence intervals of the proportions. They are therefore likely to identify significant statistical relationships that would not be found by comparing confidence intervals.

“Dans le cas de l'estimation des effectifs de population, la non-réponse partielle a pour effet direct de sous-estimer les effectifs” [In the case of estimates of population quantities, partial non-response has the direct effect of underestimating quantities] (Institut de la statistique du Québec et al., 2011; page 30). Corrections were therefore made to produce estimates for which the biases were minimized, irrespective of the partial non-response rate observed. More specifically, the estimates of population quantities presented in the document were calculated by redistributing the weights of partial non-respondents within the different categories of the analysis variable, in proportion to the distribution observed among respondents.

The YSS survey has a few methodological limitations. First, it is important to bear in mind that the information collected from respondents is self-reported and is therefore subject to recall or social desirability bias. Furthermore, it should be pointed out that some subgroups of young people were not included in the target population, namely, young people residing in Yukon, the Northwest Territories or Nunavut, young people living in institutions or on First Nations reserves, young people attending special schools or attending schools located on military bases, as well as young people not attending school (e.g., dropouts). Lastly, it should be noted that Manitoba did not participate in the 2012-2013 YSS.

For further information on the methodology used in the YSS, please consult the survey website at the following address:

[www.yss.uwaterloo.ca](http://www.yss.uwaterloo.ca).

## Acknowledgements

Production of this document was made possible by a financial contribution from the Ministère de la Santé et des Services sociaux [Québec's ministry of health and social services]. The views expressed herein do not necessarily reflect the views of the MSSS.

The analyses conducted were made possible by the collaboration of the Canadian Cancer Society – Quebec Division, which graciously provided access to its proprietary data source. The views expressed herein do not necessarily reflect the views of the Canadian Cancer Society – Quebec Division.

Administration of the Youth Smoking Survey was made possible by a financial contribution from Health Canada. The views expressed herein do not necessarily reflect the views of Health Canada.

The authors would like to thank the Propel Centre for Population Health Impact at the University of Waterloo for providing support for this project.

Lastly, the authors would like to Michèle Tremblay for her collaboration in the writing of the document, as well as Réal Morin, Johanne Laguë and Christine Stich for their contributions to the revision of the document.

# Electronic Cigarette Use Among Secondary School Students in Québec: 2012- 2013

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## TRANSLATION

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The translation of this publication was made possible with funding from the Public Health Agency of Canada.

*This document is available in its entirety in electronic format (PDF) on the Institut national de santé publique du Québec Website at: <http://www.inspq.qc.ca>.*

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Legal deposit – 2<sup>nd</sup> quarter 2015  
Bibliothèque et Archives nationales du Québec  
Library and Archives Canada  
ISSN: 1922-2475 (PDF)  
ISBN: 978-2-550-71868-0 (French PDF)  
ISBN: 978-2-550-73420-8 (PDF)

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Publication n°: 2019