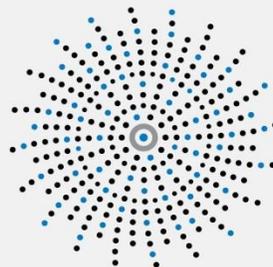


# Research Methods for the Canadian Student Tobacco, Alcohol and Drugs Survey, 2010-2015

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## ABSTRACT

This report describes the sampling design, questionnaire development, survey implementation, and the creation of the final dataset for the 2014/2015 Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) and the changes to the CSTADS / Youth Smoking Survey (YSS) across the three most recent survey cycles (2010/2011, 2012/2013, and 2014/2015).

CSTADS is a national, school-based survey of grades 6-12 students (grades 6 to secondary V in Quebec) of a generalizable sample of schools in each province. As a surveillance tool, the main objective of CSTADS is to help understand Canadian trends in student tobacco, alcohol, and drug use.

Important features of the 2014/2015 CSTADS include consistent measures across survey cycles, timely and reliable data on tobacco, alcohol, and drugs, provision of school-specific results to all participating schools, and publicly available datasets.

## BACKGROUND

Health Canada's 2014/2015 Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS; formerly the Youth Smoking Survey [YSS]) is a biennial, school-based survey of a provincially and nationally generalizable sample of students in grades 6 through 12 (grades 6 through secondary V in Quebec). CSTADS, funded by Health Canada since 1994, is implemented by the Propel Centre for Population Health Impact (Propel) at the University of Waterloo. Teams located in the participating provinces gathered data for the 2014/2015 cycle between October 2014 and May 2015.

The survey was renamed Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) beginning in 2014, to better reflect its content and sample. CSTADS provides key evidence for Health Canada and its partners and stakeholders, as well as the Canadian public, to help produce timely and reliable data on tobacco, alcohol, and drug use among Canadian students. Understanding these trends is vital to the effective development and monitoring of policies and programs (including the regulation of tobacco products and illicit drugs) aimed at reducing substance use by this population. It complements the Canadian Tobacco, Alcohol and Drugs Survey (CTADS) [1], which samples the general Canadian population aged 15 years and older.

CSTADS produces data comparable to previous cycles of the YSS. Participating grade 6 students reported on tobacco use only, while students in grades 7 through 12 (secondary I to secondary V in Quebec) reported on tobacco, alcohol, and drug use. In the 2014/2015 cycle, students also reported on bullying, school connectedness, and mental health.

While consistency across cycles has been high, there have been significant changes over time and between cycles of the survey. First administered in 1994, the next cycle was in 2002, and the survey has run on a biennial basis since then. Through 2004/2005, the YSS sampled students in grades 5-9. Coverage then expanded in 2006/2007 to include Canadian students in grades 5 to 12. As a result of low rates of tobacco use in grade 5, these students were not included after the 2006/2007 cycle.

This report describes the methods and highlights the changes between the 2014/2015 CSTADS and the previous two cycles (2010/2011 and 2012/2013), including sampling design, questionnaire development, data collection, and the creation of the Public Use Microdata File (PUMF). An earlier paper [2] described the methods for the 2008/2009 YSS, as well as the four cycles preceding it. Additional information on the design, measures, and protocols of this and all seven previous cycles of the CSTADS/YSS are available in the 2014/2015 Canadian Student Tobacco, Alcohol and Drugs Survey Microdata User Guide [3] as well as all previous user guides.

## METHODS/DESIGN

The target population for CSTADS consisted of Canadian residents attending private and publicly-funded schools and enrolled in one of grades 6 to 12 (grades 6 to secondary V in Quebec), excluding schools in the Yukon, Northwest Territories, and Nunavut. Students who attended special schools (e.g., schools for visually-impaired and/or hearing-impaired, daycares, special needs, First Nation reserve schools, virtual schools, schools located on military bases) were excluded from the target population. In addition, students from schools that did not have at least 20 students enrolled in at least one eligible grade were also excluded from the target population of schools to manage data collection costs. The provinces of New Brunswick and Manitoba declined participation in CSTADS/YSS in the 2010/2011 and 2012/2013 cycles, respectively. A provincially generalizable sample was not achieved in New Brunswick in the 2014/2015 cycle. See Table 1 for a summary of modifications in procedures since 2010/2011.

To obtain a sample of students, we used a stratified single-stage cluster design in which we selected schools from strata, described below, and then surveyed all eligible students within selected schools. Propel updates its *School Database* biennially and uses this current list of schools for the sampling frame.

The strata were formed by crossing the levels of two classification variables: 1) health region smoking rate (high, low, urban) and 2) type of school (elementary, secondary). Within each provincial sampling frame, we defined four or six strata: two or three health-region smoking rate categories crossed with two school-level categories. The allocation of the school sample into strata helps to ensure adequate sample sizes inside each stratum, and typically increases precision of population estimates.

### *Classification variable 1: Health-region smoking rate*

As per past cycles of CSTADS (YSS), we stratified by provincial health region smoking rate. In each province, we dichotomised schools based on the smoking rate of 15-19 year olds in the health region in which the school was located, as reported in the most recent cycle of the Canadian Community Health Survey (CCHS). We used CCHS data because they are generalizable to the health-region level. The school's six-digit postal code helped identify its health region.

We assigned schools located in a health region with a smoking rate lower than the median provincial smoking rate to the "low" smoking rate health-region category. Similarly, we assigned the remaining schools to the "high" smoking rate health-region category.

As a result of experience implementing the survey, and to ensure adequate representation of schools in the most highly populated areas of certain provinces, we created a third "urban" category in Ontario beginning in 2008/2009, Alberta beginning in 2010/2011, Quebec in 2012/2013, and Nova Scotia beginning in 2014/2015. In these provinces, we established health region categories (high and low) as described above, excluding schools we defined as being part of the urban areas of Toronto in Ontario, Montreal in Quebec, Calgary and Edmonton in Alberta, and Halifax in Nova Scotia. Schools within these urban areas formed the third "urban" level for the classification variable.

### *Classification variable 2: School type*

For all provinces, we classified each school in either the elementary or secondary category. The elementary level consisted of schools with total enrolment of elementary grades greater than or equal

to the total enrolment of the secondary grades. The remaining schools formed the secondary school level. We defined elementary grades as grade 6 for Quebec, grades 6 to 9 in Alberta, and grades 6 to 8 in all other provinces. All other grades were defined as secondary.

Crossing the two classification variables yielded six strata in Quebec, Ontario, Alberta, and Nova Scotia and four in each other province. Within each stratum, in each province, we used simple random sampling to select schools. In general, we sampled two elementary schools per sampled secondary school to ensure appropriate distribution of participants across all grades, given that the elementary schools characteristically have lower enrolments than secondary schools. In Nova Scotia, an exception, we sampled equal numbers in each stratum.

In the province of Prince Edward Island a census of grades 6 through 12 schools participated as part of the CSTADS partnership with the School Health Action, Planning and Evaluation Survey. Similarly in 2012/2013, a census of grade 6 through 12 schools in New Brunswick participated in CSTADS as part of a partnership with the New Brunswick Student Wellness Survey. In 2010/2011, CSTADS (YSS) partnered with a provincial survey in Quebec and the sampling design ensured a generalizable sample of elementary schools in 17 of the 19 health regions and secondary schools in 13 of the 17 targeted health regions in Quebec (representing 95.2% of the population).

**Table 1: Summary of modifications to the Canadian Student Tobacco, Alcohol and Drugs Survey<sup>a</sup> methodology, since 2010/2011**

	<b>2010/2011</b>	<b>2012/2013</b>	<b>2014/2015</b>
<i>Province Participation</i>	Nine provinces participated. The province of New Brunswick declined participation.	Nine provinces participated. The province of Manitoba declined participation.	Ten provinces participated. A provincially generalizable sample in the province of New Brunswick was not achieved.
<i>Stratification</i>	Urban stratum added in Alberta.	Urban stratum added in Quebec.	Urban stratum added in Nova Scotia.
<i>Sampling</i>	Census sample of schools in PE and expanded sample of schools in QC in partnership with provincial surveys.	Census sample of schools in NB and PE in partnership with provincial surveys.	Census sample of schools in PE in partnership with a provincial survey.
<i>Sample Size (participation rate)</i>	50 949 (73%)	47 203 (72%)	42 094 (66%)
<i>Number of Participating Schools (participation rate)</i>	426 (56%)	450 (64%)	336 (47%)

<sup>a</sup> Renamed the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) for the 2014/2015 cycle; formerly the Youth Smoking Survey (YSS).

Statisticians used school participation rates from past cycles of CSTADS (YSS) to estimate the number of sampled schools needed to reach provincial school targets, (taking into consideration board and school refusals).

Within each participating school, all students within eligible grades received an invitation to participate in CSTADS. In rare cases, schools restricted the grades allowed to participate in the survey. Simple random sampling of schools within a stratum and then surveying all students in eligible grades in each participating school implies equal inclusion probabilities at the outset for all students in the stratum.

### **Questionnaire development**

Similar to previous CSTADS cycles, a team developed the 2014/2015 CSTADS content through a series of meetings and pilot testing sessions. Several key considerations guided the design and content of the questionnaire:

**Comparability:** Past versions of the CSTADS questionnaire formed the basis of the questionnaire for each new cycle to facilitate comparisons across cycles.

**Responsiveness:** To meet the needs of users of the data, those responsible for federal and provincial tobacco, alcohol, and drug strategies and CSTADS investigators had the opportunity to contribute topics/items for consideration.

**Relevance to the Education Sector:** To enhance value for schools to participate, we added items and content areas (i.e., bullying, mental well-being, and school connectedness) to augment the school-specific results profiles and summaries.

**Feasibility:** To meet the criterion of students being able to complete the questionnaire in one 30-minute class, questionnaire length was restricted.

### **Pilot testing**

Questionnaire pilot testing occurred in two settings prior to survey implementation each cycle. The 2014/2015 CSTADS questionnaire testing occurred in Woodstock, Ontario, and in Montréal, Québec [4].

In each location, 3-5 groups completed the questionnaire and participated in facilitated focus group discussions about the questionnaire. Pilot testing established student understanding of items, and gathered feedback from students on new questions, questionnaire flow, and overall completion times. Pilot testing resulted in a number of questionnaire modifications.

### **Survey implementation**

In advance of pilot testing and survey implementation, the implementation team obtained ethics approval from research ethics boards at the University of Waterloo, Health Canada, and the provincial institutions implementing the project in each province. School board research review committees also reviewed and approved the project, where required. The following details the recruitment of schools and students and survey implementation.

#### *Data quality: Recruitment and participation rates*

The CSTADS implementation involved three levels of recruitment. Trained provincial teams recruited boards within each province. After recruiting a school board, the team approached the randomly

selected schools within that school board. Provincial teams directly approached schools that had no governing school board. An online, real-time database used by all staff permitted central monitoring by Propel to ensure that protocols and progress were consistent across the country.

In the 2014/2015 CSTADS, 128 school boards participated (had at least one participating school) yielding a school board participation rate of 49% (the number of school boards that agreed to participate and had at least one school that participated / the number of school boards that were approached). School board numbers (participation rates) in 2010/2011 and 2012/2013 were 162 (67%) and 127 (57%) respectively. The most common reason for board refusals across cycles is participation in other research projects.

As detailed in Table 1, a total of 336 schools participated in the 2014/2015 CSTADS (2010/2011: 426; 2012/2013: 450), giving a school-level participation rate of 47% (2010/2011: 56%; 2012/2013: 64%). A total of 42,094 students across all 10 Canadian provinces participated in the 2014/2015 CSTADS (2010/2011: 50,949; 2012/2013: 47,203). The student-level response rate was 66% (calculated as number of completed surveys / the number of students enrolled in participating classes; students absent during the data collection were counted as a non-response) (2010/2011: 73%; 2012/2013: 72%). The student-level response rate reported above varied by permission type. Schools with active information-passive permission (hereafter referred to as passive permission) protocols averaged 81% participation (2010/2011: 84%; 2012/2013: 84%). Schools with active permission protocols averaged 48% student participation (2010/2011: 54%; 2012/2013: 50%).

We obtained parent permission for student participation via either passive or active permission protocols. School boards and schools determined which permission protocol to use within their schools.

Schools sent information and permission materials home to parents of students enrolled in grades 6 to 12. We followed each school's usual method of communication: letter-mail, email, or sent home with the student. The information letters provided details about the project, contact information for project staff, and referred parents to the project website for further details and questionnaire content. Parents had a minimum of two weeks to respond. Active permission protocols required that only those students whose parents indicated "yes" on a permission form were able to participate in the survey. Passive permission protocols required that parents call into a toll-free number if they did not want their child to participate in the survey. Students also had the opportunity to decline participation on the day of data collection.

For the 2014/2015 CSTADS, 66% of respondents (2010/2011: 76%; 2012/2013: 73%) participated with passive parental permission and the remainder with active permission.

### ***Classroom implementation***

Data collection occurred between October and June for each cycle of CSTADS. On the day of a school's data collection, classroom teachers followed standard and detailed project instructions to administer the paper questionnaire during a designated class period. Questionnaire administration, including instructions to the students, required 20-30 minutes within each class. To protect confidentiality, teachers avoided circulating within the classroom while students completed the questionnaire, and students placed their completed questionnaire in a sealable envelope before handing it to a fellow

student who returned classroom sets to a central location (e.g., school office). In most cases, CSTADS staff was available at the school on the day of data collection for support.

### ***School results***

Within two months of contributing to the survey, participating schools received a \$100 honorarium, a school-specific profile, and two one-page summaries of their survey results. These school-specific results were produced for schools in advance of most data cleaning, imputation, and the creation of the Public Use Microdata File (PUMF). The summaries facilitated the distribution of results to school staff and administrators, students, and the parent community. Profiles and summaries provided context for school-specific results by including national and provincial comparisons to the previous CSTADS cycle and suggestions for action. Content included most topics from CSTADS including tobacco, alcohol, and drug use, bullying, mental well-being, and school connectedness.

### **Creating a Public Use Data File**

A final PUMF for each cycle of CSTADS is produced in SAS, SPSS, and STATA to facilitate the use and sharing of data. The PUMF is available to the public via *Propel's Data Repository*. The data provide for both national and provincial estimates for grades 6 to 12 students regarding use, attitudes, and behaviours around tobacco, alcohol, and drugs. A generalizable sample was not achieved in the province of New Brunswick in 2014/2015, as only three schools participated from two of the four strata used in sampling that province. The provinces of New Brunswick and Manitoba did not participate in CSTADS in the 2010/2011 and 2012/2013 cycles of CSTADS, respectively. As a result, the PUMF cannot be used to produce provincial estimates for New Brunswick in 2010/2011 or 2014/2015 or Manitoba in 2012/2013. However, based on comparative analysis conducted of past cycles of CSTADS (YSS), there are no statistically significant differences when comparing estimates between New Brunswick or Manitoba and the rest of Canada. This gives assurance that Canadian rates remain valid.

The following details the methods used to create the PUMF for the 2014/2015 CSTADS.

### ***Data capture***

Completed questionnaires were returned to Propel for processing, which involved visually- and machine-scanning the paper questionnaires to create electronic data files. All stages of processing included quality-control measures to ensure the accuracy of data captured. The processing staff visually scanned all questionnaires to ensure that Optical Mark Recognition (OMR) technology would correctly record the pencil marks on the questionnaires. Subsequently, OMR technology machine-scanned student-completed questionnaires as well as control questionnaires to provide ongoing validation of the scanning process.

### ***Cleaning and imputation***

After data processing, analysts cleaned the data file to create the PUMF. Prior to data cleaning, the 2014/2015 CSTADS dataset contained 42,379 records and retained 42,094. Record removal occurred when respondents did not record sex (278 records) or completed only demographic questions (7 records).

In cases with a missing response for grade, or when grade response did not match eligible grades within the school, we used the median grade for the class to which the student belonged to impute grade. If this option was not available, then we used student age to impute grade.

#### *Imputation of core measures*

To be consistent, core survey measures remained the same across cycles. These included measures used to define the smoking status of each respondent using Health Canada definitions, susceptibility to future smoking, age of initiation, amount smoked, use of other tobacco products, alcohol use, marijuana use, other drug use, and key demographic variables. We imputed missing values for the following core smoking questions so that every record would have a response and to allow for the creation of two derived smoking status variables.

- Have you ever tried cigarette smoking, even just a few puffs?
- Have you ever smoked a whole cigarette?
- Have you ever smoked 100 or more whole cigarettes in your life?
- Have you ever smoked every day for at least 7 days in row?
- On how many of the last 30 days did you smoke one or more cigarettes?

In CSTADS 2014/2015, we imputed values for each core question by multiple imputation using PROC MI (SAS statistical software, Version 9.4). We only used core smoking variables in the imputation. This procedure produced five replicate imputed values for each missing value. The rounded average of the five replicate imputed values replaced the missing values for each core smoking question. In CSTADS 2014/2015, 220 of 42,094 records had at least one core smoking variable imputed. In the other two previous cycles, we used an algorithm to impute the core smoking questions. In the algorithm, we used the answers to other smoking questions to determine the value of each missing core smoking question. If the answers to other smoking variables indicated the respondent was a smoker then we set the ever tried question, if missing, to yes. Otherwise, we set the ever tried question to no. We used a similar approach to the other four core smoking questions.

#### ***Skip patterns and inconsistent responses***

The questionnaire was intentionally designed with no skip patterns and includes response options like “I do not smoke” and “I did not use”. These response options help avoid the identification of substance users by length of questionnaire completion time.

Unlike a computer-assisted questionnaire, which may be programmed to generate prompts when inconsistent responses are provided (e.g., age at first cigarette is older than current age), there can be no built-in verification of answers in a paper-and-pencil survey. We imposed valid skips on follow-up variables if an initial question established the respondent as a non-user of a given substance (tobacco, alcohol, drugs). Otherwise, we retained respondents’ inconsistent answers.

#### ***Derived variables***

The PUMF includes derived variables, created by combining questionnaire items, to facilitate data analysis and ensure consistency across users. Derived variables include the following:

- smoking status (two variables);
- susceptibility to future smoking;
- amount smoked (five variables);
- smoking cigarettes in the last 30 days;
- use of flavoured tobacco products;
- whether the respondent's school was in an urban or rural region;
- median household income of the area where the respondent's school was located according to the Canadian 2011 census data; and,
- indicators of mental wellness and social behaviour (five variables).

### ***Weighting***

Survey weights support the derivation of population estimates from the survey sample. We detail stages in the development of the survey weights below.

1. Created a weight ( $W_1$ ) to account for the school selection within health region and school strata.
2. Calculated a second weight ( $W_2$ ) to adjust for student non-response.
3. Re-based weights (weight/sum of the weights multiplied by sample size) province by province and trimmed the product of  $W_1$  and  $W_2$  at 10 times the average weight.
4. Calibrated the resulting re-based and trimmed weights to the provincial sex and grade distribution so that the total of the survey weights by sex, grade, and province was equal to the actual enrolments of those groups for the target population.
5. Generated bootstrap weights to facilitate estimations of sampling error.

## DISCUSSION

CSTADS, a school-based survey of Canadian students in grades 6 to 12, has been implemented biennially since 2002. The survey estimates both national and provincial rates of tobacco, alcohol, and drug use.

### Strengths & Limitations

CSTADS offers several distinctive features in comparison to other Canadian surveys:

- Publicly available datasets are available via request from the Propel Centre for Population Health Impact at the University of Waterloo;
- Generalizable data on tobacco, alcohol, and drug use at the provincial and national levels;
- A pan-Canadian team spanning academic and non-academic sectors; and,
- School-specific results delivered to schools within 2 months of data collection.

Changing environments, including an increasing number of surveys in schools, may require adjustments to future cycles to maintain a robust, useful sample.

CSTADS is an important Canadian surveillance tool that collects provincially and nationally generalizable estimates on student tobacco, alcohol, and drug use. The survey informs national (e.g., Canada's Federal Tobacco Control Strategy and the Canadian Drugs and Substances Strategy) and provincial programs, regulations and policies related to substance use. For instance, CSTADS data were instrumental in prompting a number of provincial governments to enact flavoured tobacco bans [5, 6]. Researchers have investigated issues to inform future policy decisions, such as: smoking susceptibility [7-9], cigarette contraband [10, 11], medicinal substance abuse [12], hookah use [13], youth retail tobacco access [14], youth exposure to second-hand smoke in cars [15], smoking initiation on predicting future smoking [16], and inverse probability weighting and multiple imputation [17].

### Conclusion

The Canadian Student Tobacco, Alcohol and Drugs Survey continues to provide useful evidence for national and provincial decision-making. In the cluttered context of school-based research, it offers value to schools while maintaining high standards of implementation.

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