

Supplementary Material

Appendix A – Data and methods

–Data

Canadian Tobacco Use Monitoring Survey (CTUMS) / Canadian Tobacco, Alcohol and Drug Survey (CTADS)

The CTUMS surveys were conducted by Statistics Canada from 1999 to 2012 and in 2013 under the name CTADS, with data collected annually from February to December, using computer-assisted random digit-dialed telephone interviews. CTUMS/CTADS samples were selected using a stratified random sampling procedure. The target population included all persons 15 years of age and older, living in Canada, excluding residents of the Yukon, Northwest Territories, and Nunavut; full-time residents of institutions; and residents without telephones or with cell phones only. An equal number of respondents (~2000 per year) in each province were surveyed, and youth (15-24 year-olds) were over-sampled to comprise half of the respondents.

For more information see:

- http://healthycanadians.gc.ca/science-research-sciences-recherches/data-donnees/ctads-ectad/index-eng.php?_ga=1.197043500.1202237540.1441821052
- http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/_ctums-esutc_2012/ann_summary-sommaire-eng.php

Canadian Community Health Survey (CCHS)

The CCHS surveys were conducted by Statistics Canada from 2001 to 2014. Since 2007, data have been collected on an ongoing basis with annual releases, rather than released every two years and collected over a one year period, as was the case prior to 2007. Until the redesign in 2007, the first year of the survey cycle, designated by ".1", was a general population health survey, designed to provide reliable estimates at the health region level. The second year of the survey cycle, designated by ".2", had a smaller sample and was designed to provide provincial level results on specific health topics. The CCHS 2004 dataset is the only ".2" we used in our analyses. The CCHS data are always collected from persons aged 12 and over living in private dwellings in the 115 health regions covering all provinces and territories. Excluded from the sampling frame are individuals living on Indian Reserves and on Crown Lands, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions. The CCHS covers approximately 98% of the Canadian population aged 12 and over. In our CCHS analyses we looked at both: all Canadians aged 15 years and over and all Canadians aged 12 years and over, and only report on the estimates based on all Canadians aged 15 years and over to allow for better comparability with CTUMS/CTADS.

For more information see:

- <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3226&lang=en&db=imdb&adm=8&dis=2>
- <http://www.statcan.gc.ca/daily-quotidien/150617/dq150617b-eng.htm>

Youth Smoking survey (YSS)

For the YSS, the target population was youth in grades 6-12 attending public and private schools in the 10 Canadian provinces. In 2006-07, grade 5 students were surveyed, but we did not include them in our analysis. Schools in the Yukon, Nunavut and the Northwest Territories were excluded, as were youth living in institutions or on First Nation Reserves, and youth attending special schools or schools on military bases. New Brunswick did not participate in 2010-11 and Manitoba did not participate in 2012-13. Data were collected in schools from November 2006 to June 2007, December 2008 to June 2009, October 2010 to June 2011, and November 2012 to June 2013.

For more information see:

- <https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/>
- https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/sites/ca.canadian-student-tobacco-alcohol-drugs-survey/files/uploads/files/yss12_user_guide_en_v5_20131231.pdf
- <http://www.phac-aspc.gc.ca/publicat/hpcdp-pspmc/32-1/ar-07-eng.php>

International Tobacco Control Policy Evaluation (ITC) Project, Canada surveys

ITC surveys are longitudinal cohort surveys of tobacco use that are designed to assist policy makers in the implementation of evidence-based tobacco control policies. In all ITC-Canada surveys, probabilistic sampling methods were employed to obtain nationally representative samples of smokers. Stratified sampling designs were employed. Sampling strata were defined by geographic regions. Sampling weights were computed for each wave so that results are nationally representative of smokers. Sampling weights account for survey non-response.

For more information see:

- <http://www.itcproject.org>
- http://tobaccocontrol.bmj.com/content/15/suppl_3/iii3.full
- http://tobaccocontrol.bmj.com/content/15/suppl_3/iii12.full

Ontario Centre for Addiction and Mental Health (CAMH) monitor

The CAMH monitor is the longest ongoing representative survey of adult substance use in Canada. CAMH Monitor surveys employ a two-stage, probability sample based, computer-assisted telephone interviewing, random-digit dialling method, and samples the Ontario general adult population (18+ years); adults without a phone, those who are institutionalized, and those who are unable to complete the interview in English are excluded. Each CAMH Monitor cycle is based on the annual cumulation of four quarterly rolling samples. The CAMH Monitor is regionally stratified with equal allocation of respondents within each of the six regional areas. Beginning in 2000, the CAMH Monitor sampling plan introduced list-assisted sampling, thus including cell phones (as well as newly connected or listed and unpublished numbers) into the survey population frame. The CAMH Monitor sample size was increased from earlier cycles – now approaching or exceeding 3,000 per year. Between 1996 and 2013, the annual sample size varied from 2,005 to 3,039 respondents.

For more information see:

- http://www.camh.ca/en/research/news_and_publications/Pages/camh_monitor.aspx
- http://www.camh.ca/en/research/news_and_publications/CAMH%20Monitor/CAMH_Monitor_2013_eReport_Final%202.pdf

Ontario Student Drug Use and Health Survey (OSDUHS)

The Ontario Student Drug Use and Health Survey (OSDUHS) is a population survey of Ontario students in grades 7 through 12. The OSDUHS began in 1977. This self-administered, anonymous survey is conducted across Ontario every two years with the purpose of identifying epidemiological trends in student drug use, mental health, physical health, gambling, bullying, tobacco use and other risk behaviours, as well as identifying risk and protective factors. Typically, the OSDUHS surveys thousands of students in over 150 elementary and secondary schools across Ontario. The survey sample is considered representative of all students in grades 7-12 in publicly funded schools in Ontario (just under one million). A total of 10,272 students (63% of selected students in participating classes) in grades 7 through 12 from 42 school jurisdictions (boards), 198 schools, and 671 classes participated in the 2013 OSDUHS.

For more information see:

- http://www.camh.ca/en/research/news_and_publications/ontario-student-drug-use-and-health-survey/Pages/default.aspx

– *Methods*

Estimates of total number of cigarettes smoked

CTUMS/CTADS

The yearly cigarette consumption of all Canadians was calculated for each round of CTUMS/CTADS. All respondents who had smoked in the last 30 days before responding to the questionnaire were asked the number of cigarettes they smoked on each of the seven days before the questionnaire. Non-smokers who had not smoked in the last 30 days were assigned a value of 0 for each day. The seven days were summed together to get a weekly value. The weighted sum and the confidence interval of the weighted sum of this weekly amount were calculated for all individuals using PROC SURVEYMEANS in SAS by specifying the options SUM and CLSUM. The bootstrap weights were used in this calculation by specifying the command for balanced repeated replication (BRR) with Fay's method with all years where bootstrap weights were available. This weekly sum and its upper and lower confidence limits were multiplied by 52.14286 to get the yearly amount. SAS 9.4 was used for all analyses.

CCHS

The yearly cigarette consumption of all Canadians was calculated for each round of CCHS. First, the monthly cigarette consumption was computed for each individual. Daily smokers were asked the number of cigarettes they smoke per day. This was multiplied by 30.4166667 to get the monthly value. Occasional smokers were asked the number of cigarettes they smoked per day on the days that they smoked and they were asked the number of days in the past month that they smoked one or more cigarettes. These two variables were multiplied together. Non-smokers were assigned a monthly value of 0. The weighted sum and the confidence interval of the weighted sum of this monthly amount were calculated for all individuals using PROC SURVEYMEANS in SAS by specifying the options SUM and CLSUM. This monthly sum and its upper and lower confidence limits were multiplied by 12 to get the yearly amount. These analyses were done twice, once with respondents aged 15 and older and once with respondents aged 12 and older. SAS 9.4 was used for all analyses. We report estimates based on 'all Canadians aged 15 years and over' to allow for better comparability with CTUMS/CTADS.

Estimates of ratio of self-reported cigarette consumption from to licit cigarette sales

Let C_{LICIT} = licit cigarette consumption, $C_{ILLICIT}$ = illicit cigarette consumption, U = rate of under-reporting, and S = the total wholesale sales as reported to Health Canada. As cigarette users are not asked to differentiate between licit and illicit cigarettes when asked about their consumption, we can use survey data to obtain an estimate of $(C_{LICIT} + C_{ILLICIT})$.

Then $(C_{LICIT} + C_{ILLICIT})/(1-U)$ is the total reported consumption adjusted for an under-reporting rate of U ; and the ratio R is then $((C_{LICIT} + C_{ILLICIT})/(1-U))/S$. This approach can easily be adapted to include other elements that may lead R to deviate from 1 (i.e., $(C_{LICIT} + C_{ILLICIT}) \neq S$). Such elements may include cigarettes smoked by tourists in Canada, by Canadians abroad, and by those not in the sampling frame for the surveys (e.g., cigarettes smoked by youth under the age of 15).

Estimates of 12 month cigarette consumption from First Nations Reserves – CTUMS/CTADS

First, the number of cigarettes smoked in the last week for all current smokers was calculated; then multiplied by 52.14286 (approximate number of weeks in a year) to obtain an approximate measure of the number of cigarettes that each individual smoked that year. For those who are both current smokers and have indicated that they purchased cigarettes on a First Nations Reserve in the last 6 months, the approximate number of cigarettes smoked that year is multiplied by the percentage of cigarettes bought

on a First Nations Reserve in the last 6 months, which is assumed to be the same percentage for the whole year. Everyone else is assigned zero consumption from First Nations Reserves.

Other contraband questions – CTUMS/CTADS, YSS and ITC

Weighted frequencies were computed for each measure in each wave of YSS and each wave of CTUMS/CTADS using SAS 9.4. Stata 12 was used to calculate the confidence intervals of these measures using bootstrap weights. The surveyset commands in Stata were used to account for the complex survey design and variance estimates were derived using the bootstrap weights and the command for balanced repeated replication (BRR) with Fay's method. All ITC estimates presented were weighted using cross-sectional sampling weights using Stata 12.