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Differences in tobacco use between Canada and the United States

Antwan Jones,
Department of Sociology, The George Washington University, 801 22nd Street NW, Washington, DC 20052, USA

Angelika Gulbis, and
Department of Sociology and Center for Family and Demographic Research, Bowling Green State University, Bowling Green, OH 43403, USA

Elizabeth H. Baker
Department of Sociology and Population Research Institute, Pennsylvania State University, 211 Oswald Tower, University Park, PA 16802, USA

Antwan Jones: antwan.jones@gmail.com

Abstract

Objectives—This study explores differences in who smokes (smoker type) and exposure to smoking (pack-years) between Canada and the US. Both countries have policies to limit the number of smokers and smoking-related deaths.

Methods—This research uses The Joint Canada/United States Survey of Health (JCUSH) and employs multinomial logistic regression and ordinary least squares regression.

Results—In Canada, native-born, young, White males without a degree, with poor health and who had been previously married predominate in smoking. This profile is the same for the US. However, different characteristics predict exposure to smoking for the two countries. Native-born males without a degree, with poor health and who had been previously married smoked more cigarettes per day in Canada. For the US, younger individuals smoked more cigarettes per day.

Conclusions—If countries want to focus on limiting the number of new cases of smokers, the target population is different from the target population that should be used if countries are interested in converting smokers into non-smokers, based on the demographic analyses presented.

Keywords

Canada; Pack-years; Smoking; Tobacco; United States

Introduction

Researchers have identified tobacco use as the most preventable cause of morbidity and mortality (Gottlieb 1999; Koh et al. 2007; Peto et al. 1992, 1996; World Health Organization 2006). In Canada and the United States, cigarette smoking is linked to a large percentage of deaths. In Canada, 21% of all deaths over the past decade are attributed to smoking, of which lung cancer and ischemic heart disease are top causes of adult smoking-related deaths (Ellison et al. 1995; Illing and Kaiserman 2004; Tanuseputro et al. 2005). In the US, approximately

Correspondence to: Antwan Jones, antwan.jones@gmail.com.

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17% of all deaths annually are attributed to smoking (Centers for Disease Control and Prevention 2005; U.S. Department of Health and Human Services 2004).

Since 1985, smoking prevalence in both Canada and the US has declined (Farrelly et al. 2008; Health Canada 2003), but not to the extent that smoking is rare. Findings indicate that although the downward trend is projected to continue into the future, the rate of decline has slowed dramatically (Mendez and Warner 2004). Recent estimates indicate that the prevalence of smoking among adults aged 18 or older in the US is 19.8% (Centers for Disease Control and Prevention 2008), and 18% among adults aged 15 and older in Canada (Health Canada 2008). In Canada, smoking prevalence is concentrated in the age group 20–24 (Adlaf and Ivis 1998; Clark 1996; Gilmore 2000; Morin et al. 1992; Poulin and Wilbur 2002).

Similarly, in the United States, smoking is prevalent among those aged 18–24 (Centers for Disease Control and Prevention 2007). As such, policymakers have targeted young people in their efforts to reduce smoking prevalence and smoking-related deaths in both countries. Indeed, there are similarities with respect to the profile of smokers and smoking prevalence in the US and Canada. However, we explore the potential *differences* between American and Canadian smokers that previous research has ignored when focusing on national similarities.

The purpose of this research is to examine international differences in smoking patterns among Canada and the US. This research adds to the general epidemiological research on smoking in three distinct ways. First, to date, few studies use an international perspective with unpooled sampled data to explore international differences (Pechmann and Reibling 2000). Those studies tend to focus more on international differences of multiple countries that do not share a border. In addition, much of the existing Canada–US health research relies on pooled data derived from two different data sources. Both approaches present limitations in understanding differences in US and Canada smoking. This research uses the Joint Canada/United States Survey of Health (JCUSH), which allows for robust comparisons between the two nations.

Second, this research uses two approaches to explore smoking differences between the two countries. Smoking in cross-sectional data can be measured by tabulating the number or percentage of smokers in a given point in time or by calculating the total number of years that an individual has smoked. Both measurements tap into different processes of smoking—percentage of smokers gives a snapshot of how prevalent smoking is in a given country, while years of smoking provide information on cumulative exposure to smoking. Both measures are used in this research, since the differences in smoking between Canada and the US could be due to both types of information.

Third, the research has direct policy implications. Both Canada and the US have national programs with goals to eliminate smoking in the respective countries. For the US, Healthy People 2010 has the goal of helping individuals of all ages increase life expectancy and improve their quality of life by decreasing the national adult smoking prevalence to 13% (U.S. Department of Health and Human Services 2000), while Canada's Federal Tobacco Control Strategy also has an expectation to decrease the prevalence of smokers to 12% by 2011 (Health Canada 2007). This research uses demographic data to explore international smoking differences. Significant differences can help policy makers target populations to meet their respective goals.

Methods

The 2002–2003 JCUSH is a collaborative project conducted by Statistics Canada and the Centers for Disease Control and Prevention to study the variations in health systems, health care, health status, and functional status (Sanmartin et al. 2004). The data were collected one-time using a telephone survey conducted in both countries. The same instruments and

methodology ensure the validity of cross-country comparisons. The data are ideal because the jointly developed survey instrument is designed with questions covering chronic conditions, functional status, and determinants of health.

Households were identified using a random digit dialing process and one person over the age of 18 was chosen from each household to receive the survey. The questionnaire was administered to 3,505 Canadians and 5,183 Americans living in households, with a response rate of 66% for Canada and 50% for the US. This response rate is similar or higher than other well-regarded, telephone-conducted surveys on health, such as the Behavioral Risk Factor Surveillance Survey (Centers for Disease Control and Prevention 2009). The survey was conducted in two different languages for both countries; English and French for Canada and English and Spanish for the US (Sanmartin et al. 2004), and is representative of individuals 18 and older.

Person weights are created by stratum using the 1996 Canadian Census and the 2002 US Current Population survey. Variance estimates are calculated by the approximated bootstrap method using the Bootvar program that is provided with the data. Due to missing responses on variables, the analytic sample is reduced from 8,688 to 7,941.

The research uses two measures of smoking. The first measures smoker type. Respondents fall in one of three categories: current smoker, former smoker, and never smoker. Respondents are asked if they currently smoke cigarettes every day, some days or not at all. Respondents were also asked if they have ever smoked 100 cigarettes in their lifetime. Respondents who smoke currently every day or some days are coded as current smokers. Individuals who currently do not smoke, but have smoked 100 cigarettes in their lifetime are coded as former smokers. Finally, respondents who currently do not smoke, and have never smoked 100 cigarettes in their lifetime are coded as never smokers.

The second measure of smoking is pack-years. Participants are asked about the number of cigarettes smoked per day. Following past research, we use the standard 20 cigarettes per pack approximation (Rafalson et al. 2009). Thus, the number of cigarettes is divided by 20 to approximate the number of packs per day smoked. The number of packs is then multiplied by the number of years that the respondent has smoked, which yields pack-years. Pack-years are a way to measure the amount a person has smoked over a long period of time (Gilman et al. 2008; National Cancer Institute 2009). For interpretation, a person with a pack-year score of 20 is likely to have smoked one pack a day for 20 years.

Nativity is assessed by self-report. Respondents are asked to identify their country of birth. Respondents are considered native born if they were born in the country in which they were administered the survey.

Health measures are used in this research because Canada and the US have different structures of their health care systems: Canada has a universal, publicly funded health care system, while the US does not (Barr 2007). Self-reported health has been shown to be a valid proxy for actual health with some exceptions from specific subpopulations (Krieger et al. 2005; Kunst et al. 2005; Miilunpalo et al. 1997). Respondents are asked to think about their day-to-day health and rate generally their health as excellent, very good, good, fair, or poor. Poor and fair are collapsed into one category (fair) due to the low number of people who selected poor (4.5%).

Body mass index (BMI) is assessed through self-report. Respondents are asked to report both their height (either in inches or centimeters) and their weight (either in pounds or kilograms). BMI is calculated from these two measurements. Further, five categories were created from the computed BMI data: underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), obese I (30.0–34.9), and obese II (>34.9). This categorization is based on clinical

guidelines of BMI (NHLBI Obesity Education Initiative Expert Panel 1998) and with contemporary research using adult measures of BMI (Goldberg et al. 2006; Jones and Goza 2008).

Several demographic measures consistently found in the literature as correlates to smoking are also used. Age is used as a control variable. Age is calculated in years by the interviewer and confirmed based on the respondent's self-report. Education is asked of the respondents and corresponds to the highest level of school the respondent has completed or the highest degree attained. This variable was collapsed into four distinct categories: less than high school, high school graduate, vocational training, and university degree. "Vocational training" collapses two responses: having a non-university/college certificate from a community college, or having a university/college certificate below the bachelor's level. "University degree" collapses individuals who received their bachelor's, master's, doctoral, or professional degrees.

Income is the respondent's best estimate of total household income before taxes and deductions from all sources in the past 12 months. Respondents report their income without adjustment. However, cross-country income comparisons cannot be made without adjusting for currency differences between the two countries. In order to make income comparisons possible, two exchange rates are provided in the data. This research uses the Canadian to US dollars exchange rate. Thus, income is measured in US dollars. Important to note that the exchange rates provided in the data are the medians of the daily (fluctuated) exchange rates that occurred during data collection. In the regression models, the log of the income will be used to transform the variable to be more normally distributed (DeMaris 2002; Krusell and Smith Jr 2005).

Gender is self-reported, with males being the contrast category. The respondent's current marital status is also incorporated in the analyses. Seven marital status categories are collapsed into four larger categories: married, separated, widowed, and never married. Respondents are coded as never married if they identify as being never married. Married individuals identify themselves as married or living common-law. Separated and widowed individuals are coded as such through self-report. Finally, respondents in Canada and the US are asked to identify their racial and/or ethnic background through self-report.

Multinomial Logistic and Ordinary Least Squares (OLS) regression models are used to capture Canada- and US-specific differences in smoker type and cumulative smoking exposure. All analyses were completed in Stata 10.1, a general-purpose statistical software package. We assess model fit by model chi-square and F tests. All tests were significant, and thus model fit is validated. In addition, we assess multicollinearity using variance inflation factors (VIFs). We are confident that with an average model VIF of 1.4 and a maximum VIF of 3.2, there is no issue of multicollinearity in the models.

Results

Table 1 presents means and percentages of the variables by country of residence and for the total analytic sample. Bivariate tests indicate many significant, country-specific differences across the variables. The US has more current smokers than Canada (39.4% vs. 25.9%) while Canada has more former (44.5% vs. 38.5%), and never smokers (29.6% vs. 22.2%) than the US. However, looking at pack-years as a measure for cumulative exposure, Canada has a higher average pack-year count than the US (25.1 vs. 21.9, respectively). More residents are also foreign born in Canada (18.4%) compared to the US (14.7%).

For self-reported health, more Canadian residents say they are in very good health (36.1%, compared to 32.8%), while more US residents say they are in excellent health (25.1% compared to 22.3%). Regarding BMI, more normal weight individuals reside in Canada than in the US

(47.9% vs. 42.9%). In addition, more obese (levels I and II) persons are found in the US compared to Canada.

The average age of the respondents is higher in the US than in Canada (48.5 and 47.6, respectively). US residents in the sample tend to be more educated than Canadians. However, 22.0% of Canadians compared to 14.2% of US residents have vocational training. On average, Canadians make significantly more money ($1,730) per annum than US residents. There are 55.9% of US residents, who are female, compared to 52.9% of Canadians. Regarding marital status, 21.2% of people in Canada have never been married, while only 18.8% of US residents fall within that category. However, 15.2% of US residents (compared to 12.0% of Canadians) are separated at survey date. Moreover, 10.6% of US residents (vs. 9.2% for Canadians) are widowed at survey date. Finally, in the sample, racial/ethnic minorities are represented more in US than in Canada (23.0% vs. 16.5%).

Table 2 presents the results of the multinomial logistic model for smoker type. In this model, the reference category is current smoker. The total sample estimates are given to show significant differences in the odds of being a former or never smoker compared to being a current smoker according to country. We note that the variable for US residents is significant, indicating that US residents have 40% higher odds of being a never smoker compared to being a current smoker. However, a Chow test (DeMaris 2002) was performed to assess whether the variables used to model smoker type operate differently in the US than in Canada. This test was significant ($\chi^2 = 31.2$, $P < 0.001$), indicating that variables are differentially associated with smoker type when looking at Canada and the US. Thus, to explore variable impacts, we turn to the country-specific models.

For the Canadian subsample, there are several significant predictors of smoker type. Native-born residents have lower odds of being former smokers (OR = 0.6) or never smokers (OR = 0.4) than being current smokers. In addition, those individuals in very good health are less likely to be former smokers (OR = 0.7) or never smokers (OR = 0.6), compared to being current smokers. In contrast, Canadians in fair health are more likely to be former smokers (OR = 1.5) or never smokers (OR = 2.2) than be current smokers.

Increasing BMI is also associated with increased odds of being a former smoker than being a current smoker. In contrast, only those individuals who are overweight have higher odds of being a never smoker compared to being a current smoker. Age slightly increases the odds of being a former or never smoker (OR = 1.01), compared to being a current smoker. In addition, Canadians without a university degree are less likely to be former or never smokers than to be current smokers.

Females are more likely to be never smokers than current smokers (OR = 1.7). In addition, never married and separated Canadians are less likely to be former smokers than current smokers, but only separated individuals are less likely to be never smokers than current smokers. Finally, racial minorities in Canada have 40% higher odds of being a never smoker than a current smoker.

Turning the focus to the US, we notice similar patterns. Native-born residents have lower odds of being former smokers (OR = 0.6) or never smokers (OR = 0.5) than being current smokers. In addition, those individuals in very good health are less likely to be former smokers (OR = 0.7) or never smokers (OR = 0.5), compared to being current smokers. In contrast, US residents in fair health are more likely to be former smokers (OR = 1.7) or never smokers (OR = 2.5) than be current smokers.

For BMI, individuals in the obese categories (I and II) are more likely to be former smokers than current smokers. However, only respondents in the obese I category in the US have higher

odds of being never smokers than current smokers. Age slightly decreases the odds of being a former and never smoker (OR = 0.99), compared to being a current smoker. In addition, individuals without a university degree are less likely to be former or never smokers than to be current smokers.

Females are more likely to be never smokers than current smokers (OR = 1.9). In addition, maritally separated US residents are less likely to be former smokers than current smokers, and widowed individuals are 30% less likely to be former smokers than current smokers. Finally, racial minorities in the US have 20% lower odds of being a former smoker and 30% higher odds of being a never smoker than a current smoker.

Table 3 presents OLS regression models for pack-years. The total sample estimates are again given to show that there is a country effect on average pack-years in the sample. The US resident variable is significant, indicating that US residents smoke 3.4 pack-years less than Canadians. A Chow test was performed to assess whether the variables used to model pack-years operate differently in the US than in Canada. This test was significant ($F = 1.62$, $P < 0.05$), indicating that variables are differentially associated with smoker type when looking at Canada and the US. Thus, we report separate country-specific results.

Canadian residents who are native-born smoke 8.1 pack-years more on average than foreign-born Canadians. In addition, Canadian individuals in good or fair health average 6.2 and 8.9 pack-years less than residents in excellent health. Age is positively associated with pack-years. That is, every year increase of age corresponds to an average 0.8 gain in pack-years.

Residents having some high school education or diploma smoke 3.1 and 3.9 more pack-years than those who have a university degree. Individuals in Canada making more income smoke 2.1 pack-years less. Thus, smoking is most common among those with low socioeconomic status in Canada. Females smoke 11.0 pack-years less on average than males. Separated Canadians smoke 3.6 pack-years more than married. Finally, Canadian racial minorities smoke 4.6 pack-years less than Whites.

Turning to the US, native-born residents smoke 5.5 pack-years more on average than foreign-born US residents. In addition, individuals in very good health smoke 3.1 pack-years more than individuals in excellent health. In contrast, US residents in good or fair health average 6.2 and 11.4 pack-years less than residents in excellent health. In the US, underweight individuals smoke an average 5.4 pack-years more than those of normal weight. Age is positively associated with pack-years. That is, every year increase of age corresponds to an average 0.7 gain in pack-years.

Individuals with vocational training smoke, on average, 2.9 pack-years more than those with a university degree. Females smoke 11.8 pack-years less on average than males. Maritally separated US residents smoke 6.9 pack-years more than married, and widowed US residents, on average, smoke 6.2 pack-years less than married. Finally, racial minorities in the US smoke 6.9 pack-years less than Whites.

Discussion

This study explored international differences in tobacco use among Canada and the US. This line of inquiry is important, as there are differences in smoking behaviors and smoking-related deaths between the two border countries. In this research, several findings need to be highlighted. First, there were differences in smoking behaviors between Canada and the US. Canadians were more likely to be former or never smokers, while more current smokers were US residents. In addition, the average number of pack-years was higher in Canada than in the US.

Using this international difference in smoking behavior, the research found that demographic and health characteristics were important to consider in the Canada and in the US. In both countries, native-born residents and males were more likely to be a current smoker and smoke significantly more pack-years than foreign-born residents and females. Education and age were negatively associated with smoker type and pack-years. Race/ethnic minorities were less likely to smoke, especially in the US. Finally, separated or divorced individuals smoked significantly more in both countries.

The health variables had differential effects for the two countries and may be reflective of the different health care systems. Self-reported health was a significant predictor of smoker type and cumulative smoking exposure (pack-years) for both countries. Overweight and obesity was negatively associated with duration and amount of smoking only in the US. Interestingly, income had a positive effect on pack-years for Canada and in the pooled sample. This finding may be reflective of greater availability of resources to spend on cigarettes.

Some limitations of the study merit discussion. The data set does not include any national indicators regarding costs of smoking, age structure of population, amount of money spent on anti-tobacco campaigns, and their effectiveness. Due to this limitation, structural differences between the two countries could not be controlled, thereby limiting our generalizations regarding international differences in smoking. Due to sample size limitations, specific racial/ethnic differences in smoking for both countries could not be tested, which has been shown as significant in the literature (Day et al. 1993; Williams and Collins 1995).

Only a small number of respondents reported poor health. Thus, another limitation is that there may have been positive selectivity with regards to health, which creates some amount of bias in the results (Shankar et al. 2006). Also, some key individual variables such as occupation or family structure were not available in the survey, and were not used as controls in the models. However, we did include measures that may tap into these constructs such as education, income, and marital status.

The data were cross-sectional and thus, longitudinal effects of residing in either Canada or the US could not be ascertained. Finally, the recalling of previous smoking behaviors prior to the study may be biased upwards, and pack-years may be overestimating the cumulative smoking patterns of occasional smokers. Potentially, this study may have been overestimating the pack-years for each respondent (Ferro et al. 1998), although prior research has demonstrated a relative degree of validity between retrospective and prospective measures of pack-years (Bernaards et al. 2001).

This study demonstrates the relevance of looking at all types of smoking behavior using an international perspective. In addition to distinguishing measures of smoking, the results also aid in establishing a more stable relationship between demographic characteristics and smoking outcomes. The link between demographic characteristics and tobacco use is a major strength to this research. As previously mentioned, both the US and Canada have set forth policy to limit smoking among their citizens. This research used demographic data to explore smoking differences and found populations in both countries that policy makers can target anti-smoking campaigns. Moreover, this research noted that depending on the outcome, the target population differed. In Canada, the target populations for smoking are individuals who are native-born Canadian males without a university degree. This group consumes more tobacco and has greater stability in smoking as demonstrated by their effects on pack-years. However, if policy makers would also like to specifically target current smokers in their campaigns regardless of past smoking habits, the demographic shifts to, younger White males.

Similar to Canada, the target populations for smoking in the US includes native-born, White males without a college degree. This group of people should be targeted for programs focused

on smoking cessation. However, if policy makers would also like to prevent persons from becoming smokers, then the target population switches to include younger individuals. Policy that specifically targets young males in deterring initial uptake of the behavior and encourages those who began smoking to quit, may be especially fruitful avenues for both countries. Identifying vulnerable subpopulations for eliminating smoking behaviors helps both countries reach their respective goals.

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Table 1

Sample description of variables by country

	Canada (%; *N* = 3,269)	United States (%; *N* = 4,672)	Total sample (%; *N* = 7,941)
Smoker type			
Current smoker	25.9	39.4	23.7*
Former smoker	44.5	38.5	40.9*
Never smoker	29.6	22.2	35.4*
Pack-years	25.1	21.9	23.2*
Foreign-born resident	18.4	14.7	16.2*
Self-reported health			
Fair	13.3	15.1	14.3
Good	28.4	27.0	27.5
Very good	36.1	32.8	34.2*
Excellent	22.3	25.1	24.0*
Body mass index			
Underweight	3.0	2.3	2.6
Normal weight	47.9	42.9	45.0*
Overweight	33.8	33.5	33.6
Obese I	11.4	14.2	13.0*
Obese II	3.9	7.1	5.8*
Age	47.6	48.5	48.2*
Education			
Less than high school	21.9	11.5	15.8*
High school	28.6	36.4	33.2*
Vocational training	22.0	14.2	17.4*
University degree	27.5	37.9	33.7*
Income	$55,265	$53,535	$54,247*
Female	52.9	55.9	54.6*
Marital status			
Never married	21.2	18.8	19.8*
Married	57.6	55.4	56.3
Separated/divorced	12.0	15.2	13.9*
Widowed	9.2	10.6	10.0*
Racial/ethnic minority	16.5	23.0	20.3*

* Statistical significance at the 0.05 alpha level is based on independent 2-sample *t*-test, Kruskal–Wallis H tests, and Chi-square tests

Table 2

Odds ratios, regression coefficients, and 95% confidence intervals for evaluating smoking in the United States and Canada

	Canada (*N* = 3,505)		United States (*N* = 4,672)		Total sample (*N* = 7,941)	
	Former smoker OR (95% CI)	**Never smoker OR (95% CI)**	**Former smoker OR (95% CI)**	**Never smoker OR (95% CI)**	**Former smoker OR (95% CI)**	**Never smoker OR (95% CI)**
Canada resident					1.0 (referent)	1.0 (referent)
United States resident					0.9 (0.8, 1.0)	1.4 (1.2, 1.6)*
Foreign-born resident	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Native-born resident	0.6 (0.5, 0.8)*	0.4 (0.3, 0.5)*	0.6 (0.5, 0.8)*	0.5 (0.4, 0.6)*	0.7 (0.5, 0.8)*	0.4 (0.4, 0.5)*
Self-reported health						
Excellent	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Very good	0.7 (0.6, 1.0)*	0.6 (0.9, 1.7)*	0.7 (0.5, 0.8)*	0.5 (0.4, 0.7)*	0.7 (0.6–0.8)*	0.6 (0.5, 0.7)*
Good	1.0 (0.7, 1.3)	1.2 (1.5, 3.1)	1.0 (0.8, 1.3)	1.1 (0.9, 1.5)	1.0 (0.8, 1.2)	1.2 (1.0, 1.4)
Fair	1.5 (1.1, 2.1)*	2.2 (1.5, 3.1)*	1.7 (1.3, 2.2)*	2.5 (1.9, 3.3)*	1.6 (1.3–2.0)*	2.3 (1.9, 2.9)*
Body mass index						
Underweight	0.6 (0.4, 1.1)	1.0 (0.6, 1.7)	0.7 (0.4, 1.3)	0.8 (0.5, 1.3)	0.7 (0.5, 1.0)	0.9 (0.6, 1.2)
Normal weight	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Overweight	1.5 (1.2, 1.8)*	1.5 (1.2, 1.8)*	1.2 (1.0, 1.4)	1.1 (0.9, 1.4)	1.3 (1.1, 1.5)*	1.3 (1.1, 1.4)*
Obese I	1.8 (1.3, 2.4)*	1.3 (0.9, 1.9)	1.5 (1.2, 1.9)*	1.4 (1.1, 1.9)*	1.6 (1.4, 2.0)*	1.4 (1.2, 1.8)*
Obese II	1.8 (1.1, 2.9)*	1.6 (0.9, 2.8)	1.9 (1.4, 2.6)*	1.2 (0.9, –1.7)	1.9 (1.4, 2.5)*	1.3 (1.0, 1.8)
Age	1.0 (1.0, 1.0)*	1.0 (1.0, 1.0)*	1.0 (1.0, 1.0)*	1.0 (1.0, 1.0)*	1.0 (1.0, 1.0)*	1.0 (1.0, 1.0)*
Education						
University degree	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Vocational training	0.6 (0.5, 0.8)*	0.5 (0.4, 0.7)*	0.6 (0.5, 0.8)*	0.6 (0.5, 0.8)*	0.6 (0.5, 0.7)*	0.5 (0.4, 0.6)*
High school	0.5 (0.4, 0.6)*	0.4 (0.3, 0.5)*	0.4 (0.3, 0.5)*	0.4 (0.4, 0.5)*	0.4 (0.4, 0.5)*	0.4 (0.4, 0.5)*
Less than high school	0.4 (0.3, 0.5)*	0.4 (0.3, 0.5)*	0.4 (0.3, 0.5)*	0.5 (0.3, 0.6)*	0.4 (0.3, 0.4)*	0.4 (0.3, 0.5)*
Income	1.0 (1.0, 1.1)	1.0 (1.0, 1.1)	1.0 (0.9, 1.0)	1.0 (1.0, 1.1)	1.0 (1.0, 1.0)	1.0 (1.0, 1.0)
Male	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Female	1.1 (0.9, 1.3)	1.7 (1.4, 2.1)*	1.0 (0.8, 1.2)	1.9 (1.6, 2.2)*	1.0 (0.9, 1.1)	1.8 (1.6, 2.1)*
Marital status						

	Canada (*N* = 3,505)		United States (*N* = 4,672)		Total sample (*N* = 7,941)	
	Former smoker OR (95% CI)	**Never smoker OR (95% CI)**	**Former smoker OR (95% CI)**	**Never smoker OR (95% CI)**	**Former smoker OR (95% CI)**	**Never smoker OR (95% CI)**
Married	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Never married	0.6 (0.5, 0.8)*	0.8 (0.6, 1.1)	0.9 (0.7, 1.1)	0.9 (0.7, 1.1)	0.8 (0.7, 0.9)*	0.9 (0.7, 1.0)
Separated/divorced	0.4 (0.3, 0.5)*	0.4 (0.3, 0.6)*	0.5 (0.4, 0.7)*	0.4 (0.3, 0.4)*	0.5 (0.4, 0.6)*	0.4 (0.3, 0.4)*
Widowed	0.7 (0.5, 1.1)	1.5 (1.0, 2.3)	0.7 (0.5, 0.9)*	1.1 (0.8, 1.6)	0.7 (0.6, 0.9)*	1.2 (1.0, 1.6)
White	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
Racial/ethnic minority	0.9 (0.7, 1.1)	1.4 (1.0, 1.8)*	0.8 (0.6, 1.0)*	1.3 (1.1, 1.6)*	0.8 (0.7–1.0)*	1.4 (1.2, 1.6)*
−2 Log likelihood	6,500.6		9,305.9		15,837.7	
Model χ^2	682.1*		959.6*		1,610.5*	

*$P < 0.05$

OR odds ratio; *CI* confidence interval

Table 3

Regression coefficients and 95% confidence intervals for pack years

	Canada (*N* = 3,269) *β* (95% CI)	United States (*N* = 4,672) *β* (95% CI)	Total sample (*N* = 7,941) *β* (95% CI)
Canada resident			1.00 (referent)
United States resident			−3.4 (−4.6, −2.1)*
Foreign-born resident	1.00 (referent)	1.0 (referent)	1.00 (referent)
Native-born resident	8.1 (5.4, 10.7)*	5.5 (3.1, 8.0)*	6.7 (4.8, 8.5)*
Self-reported health			
Excellent	1.00 (referent)	1.0 (referent)	1.00 (referent)
Very good	1.1 (−1.5, 3.6)	3.1 (1.0, 5.2)*	2.4 (0.8, 4.0)*
Good	−6.2 (−9.4, −3.0)*	−6.2 (−8.8, −3.6)*	−6.2 (−8.2, −4.2)*
Fair	−8.9 (−12.5, −5.3)*	−11.4 (−14.2, −8.6)*	−10.5 (−12.7, −8.3)*
Body mass index			
Underweight	−1.5 (−7.2, 4.2)	5.4 (0.1, 10.8)*	2.1 (−1.7, 6.0)
Normal weight	1.00 (referent)	1.0 (referent)	1.00 (referent)
Overweight	−0.3 (−2.5, 1.9)	−1.2 (−3.1, 0.6)	−0.9 (−2.3, 0.5)
Obese I	1.1 (−2.1, 4.3)	−0.4 (−2.9, 2.0)	0.0 (−1.9, 2.0)
Obese II	0.4 (−4.6, 5.4)	3.2 (−0.1, 6.4)	2.3 (−0.4, 5.0)
Age	0.8 (0.7, 0.8)*	0.7 (0.6, 0.7)*	0.7 (0.7, 0.7)*
Education			
University degree	1.00 (referent)	1.0 (referent)	1.00 (referent)
Vocational training	1.6 (−1.2, 4.3)	2.9 (0.5, 5.4)*	2.1 (0.3, 3.9)*
High school	3.1 (0.6, 5.7)*	1.4 (−0.4, 3.3)	2.1 (0.6, 3.6)*
Less than high school	3.9 (1.0, 6.9)*	0.4 (−2.5, 3.3)	2.5 (0.5, 4.5)*
Income	−2.1 (−3.6, −0.6)*	−0.6 (−1.4, 0.1)	−0.9 (−1.6, −0.3)*
Male	1.00 (referent)	1.0 (referent)	1.00 (referent)
Female	−11.0 (−13.0, −9.0)*	−11.8 (−13.4, −10.1)*	−11.5 (−12.8, −10.2)*
Marital status			
Married	1.00 (referent)	1.0 (referent)	1.00 (referent)
Never married	−1.6 (−4.3, 1.0)	−0.7 (−3.0, 1.6)	−1.1 (−2.8, 0.6)
Separated/divorced	3.6 (0.5, 6.7)*	6.9 (4.6, 9.2)*	5.7 (−2.8, 0.6)*
Widowed	−12.7 (−16.6, −8.8)	−6.2 (−9.2, −3.2)*	−8.8 (−11.3, −6.4)*
White	1.00 (referent)	1.0 (referent)	1.00 (referent)
Racial/ethnic minority	−4.6 (−7.5, −1.8)*	−6.9 (−8.9, − −4.8)*	−6.20 (−7.8, −4.5)*
Model F	60.3*	73.2*	126.4*

* $P < 0.05$

β regression coefficient; *CI* confidence interval