TOBACCO USE AND FOOD INSECURITY IN NEW BRUNSWICK

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Tobacco Use and Food Insecurity in New Brunswick

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ABSTRACT

This paper draws on population-representative data from the Canadian Community Health Survey (CCHS) to estimate the association between tobacco use and food insecurity in households in New Brunswick. We find that households with smokers are more likely to be food insecure. We also find that food insecurity has larger effects on self-reported measures of health and well-being than tobacco use.

INTRODUCTION

Both food insecurity and tobacco use are associated with many health and social risks. Food insecurity is a consequence of household budget volatility and income inadequacy. Smoking behaviour is hypothesized to crowd out income available for food/nutrition, raising the risk of food insecurity.

METHOD

This paper draws on cross-sectional population-representative data from the Canadian Community Health Survey (CCHS) for the years 2007 to 2017 to estimate the association between tobacco use and food insecurity in households in New Brunswick. Using New Brunswick data, we investigate smoking behaviour as an independent correlate of food security after adjusting for other determinants, and we compare these results to Ontario and the rest of Canada. Based on the number of affirmative responses in the Household Food Security Survey Module, households are classified as food secure or food insecure (either moderate or severe).

RESULTS

We find that households with smokers are more likely to be food insecure, and smoking appears to be an independent determinant of food insecurity. We present evidence to show that food insecurity has a stronger relationship with poor health than smoking.

DISCUSSION

Outside the impact of smoking, families with younger respondents, females, individuals with low levels of education, renters, urban dwellers, Aboriginals, and recent immigrants are more likely to be food insecure. Regarding the possible ramifications of smoking cessation policies, policy makers need to acknowledge the income adequacy environment of lower-income households in New Brunswick. It is possible that actions that lower purchasing power (e.g., cigarette taxes) increase the prevalence of food insecurity.

INTRODUCTION – Why Study Food Insecurity and Tobacco Use?

Background

Food insecurity refers to a large range of experiences, including concerns about running out of food before having enough money to buy more; the inability to afford a balanced diet; going hungry; missing meals; and, in extreme cases, not eating for a whole day due to a lack of food and money for food.

In 2012, 12.6% of households in Canada suffered from food insecurity, defined as "inadequate or insecure access to food because of financial constraints" (Tarasuk et al., 2014, p. 2). This amounts to approximately 4 million individuals, including 1.15 million children. When divided by province and territory, the percentage of food insecurity in Canada ranges from a low of 11.5% in Alberta to a high of 45.2% in Nunavut. At that time, food insecurity impacted 15.6% of households in New Brunswick – more than one in every six households. As a result, 19.6% of children (under age 18) in New Brunswick live in a food insecure household. In other words, food insecurity impacts approximately one in every five children in the province (Tarasuk et al., 2014).

In large national surveys in North America, food insecurity has been widely associated with poor health outcomes across individuals' life cycles. Food insecurity is also associated with a higher likelihood of death during a four-year follow-up period (Gunderson et al., 2018). The health care costs associated with food insecurity are shown in a 2015 Ontario study, which finds that the average cost of health care for a food secure working-age adult is $1,608 annually, whereas the cost for a severely food insecure adult is $3,930 (Tarasuk et al., 2015).

In children, food insecurity can lead to poorer development and learning, impaired disease management, and increased likelihood of developing asthma, depression, and other chronic conditions. In adults, food insecurity is associated with a higher likelihood of reporting depression, anxiety disorders or suicidal thoughts (Jessiman-Perrault & McIntyre, 2017), poor cardiovascular health (Saiz et al., 2016), and various other chronic conditions (Vozoris & Tarasuk, 2003), as well as an increased probability of infectious and non-infectious diseases.[1] Food insecurity is also associated with measured hypertension and diabetes (Seligman et al., 2010), and it has been shown to complicate the ability of people to manage their diabetes (Chan et al., 2015).

Food insecurity has roots in low income and associated factors, such as receiving social assistance (Tarasuk et al., 2015). Income programs like public pensions have been associated with drops in food insecurity upon eligibility (McIntyre et al., "Reduction," 2016). For instance, a national study analyzing food insecurity by source of income showed that in 2014 food insecurity was prevalent in 60.9% of households on social assistance and only 7.3% of households with pension income, including investment income (dividends and interest), which is even lower than the prevalence of food insecurity in households with employment income (10.6%) (Tarasuk et al., 2016).

Wealth, as evidenced by home ownership, has been identified as protective against food insecurity (McIntyre et al., "Natural," 2016), possibly because home ownership mitigates the vulnerability that renters experience from changes in rent costs, or it simply functions as a store of value (McIntyre et al., "Homeowner," 2016). Renters are two to three times more likely to be food insecure than homeowners, and it is likely that – because home ownership reflects greater assets and access to credit – housing tenure affords protection against income shocks. However, homeowners are also susceptible to other unpredictable costs, like changes in the cost of heating,

[1] For more comprehensive information on the impact of food insecurity on various health outcomes, see Abibula et al., 2016; Anema et al., 2013; Anema et al., 2011; Gucciardi et al., 2009; Gunderson et al., 2018; Jessiman-Perreault & McIntyre, 2017; Kirk et al., 2015; Kirkpatrick et al., 2010; Marjerrison et al, 2011; McIntyre et al., 2013; McIntyre et al., 2017; Melchior et al., 2012; Tarasuk et al., 2013; Tarasuk et al., 2018.

which are shown to correlate with food insecurity among homeowners but not renters (Emery et al., 2012).

In addition to its association with variables such as health and housing, food insecurity carries its own unique risks. Loss of income and/or higher costs of living can place families in a precarious position in which they are forced to decide whether to "heat or eat" or "treat or eat" (i.e., weigh out-of-pocket costs for prescription medications with costs for food) – or, in some cases, smoke or eat.

Food insecure households can exhibit risky behaviours, like smoking, that confound our understanding of the relationship between income, food insecurity, and health. The relationship between smoking and food insecurity has been highlighted in the context of a household budget constraint problem: households with lower incomes have tighter budgets, and smoking represents a steady expense, like rent or transportation, that not all households face.

Cigarette smoking may contribute to food insecurity risks in various ways. First, the addictive qualities of tobacco may result in smokers having less (perceived) discretionary income to adjust to budget shocks – they prioritize spending on tobacco over food. American research suggests that children in households with adult smokers see approximately double the prevalence of food insecurity than those in nonsmoking households, and smoking has been associated with food insecurity for both children and adults even after calculations are adjusted for income (Cutler-Triggs et al., 2008).

The prevalence of food insecurity in the United States has increased faster among smokers than non-smokers, and the rate of smoking decline has been slower among the food insecure (Farrelly & Shafer, 2017).

Objectives

In Canada, it is unknown whether smoking is a challenge for food insecure households that needs policy attention. We aim to determine the nature of the relationship between smoking, food insecurity, and health outcomes.

Our first objective is to determine whether smoking is an independent risk of food insecurity by using logistic regression to estimate the impact of smoking and other covariates on food insecurity status. Then, we compare the relative importance of smoking and food insecurity relating to various health outcomes. To do so, we stratify the full sample into four groups: 1) Never smoked, food secure; 2) Never smoked, food insecure; 3) Current daily smoker, food secure; and 4) Current daily smoker, food insecure. Combining these results, we discuss the role that smoking and other addictive behaviours can play in affecting household food insecurity.

For this paper, we use CCHS data from the Statistics Canada Master Microdata Files available in the New Brunswick Regional Data Centre covering the years 2007-2017. The CCHS gathers data on the food security situations of various households through a set of 18 questions regarding the previous 12 months. The CCHS gathers data on the characteristics of survey respondents and their households, including information on current and previous tobacco use. We use CCHS samples for New Brunswick to analyze the detailed relationship between smoking and household food insecurity.

We consider two hypotheses in this report:

1) That smoking is a behaviour that has no causal effect on food insecurity status because the household characteristics that correlate with food insecurity are the same characteristics associated with smokers

2) That smoking is a behaviour that raises the risk of being food insecure

We find that households with smokers are more likely to be food insecure. We also find that food insecurity has larger effects on self-reported measures of health and well-being than tobacco use.

LITERATURE REVIEW

What evidence is there that tobacco use is associated with food insecurity? What do we know about smoking behaviour that may suggest a correlation with a higher risk of food insecurity?

Previous Canadian studies have not extensively considered the correlation between tobacco use and food insecurity. In an analysis of National Survey data from 1994, McIntyre, Connor, and Warren (2000) found that primary caregivers in severely food-insecure households (determined via assessment of child hunger) were 1.7 times more likely to report daily cigarette use, with the percentage of smokers varying according to the level of food insecurity (i.e., 50.7% of caregivers who reported that their children were *occasionally* hungry smoke, versus 72.2% of caregivers who reported that their children were *frequently* hungry and 29.7% of caregivers who did not report that their children had gone hungry). However, their report does not demonstrate proof of causation in either direction.

While a good deal of American research has focused on this correlation, only one study presents tobacco as an independent predictor of food insecurity. Associating smoking with food insecurity through multivariate analyses, Cutler-Triggs, Fryer, Miyoshi, and Weitzman (2008) find that living with adult smokers is "an independent risk factor for adult and child food insecurity, associated with an approximate doubling of its rate and tripling of the rate of severe food insecurity" (p. 1056). The authors show that from 1999 to 2002, 17% of children in smoking households were food insecure, compared to only 8.7% of children in nonsmoking households. For adults, the prevalence of food insecurity was 25.7% in smoking households versus 11.6% in nonsmoking households. The study finds a correlation between food insecurity and tobacco use, estimating that families with at least one smoker spend between 2-20% of their income on tobacco products. However, although they approach smoking as an independent predictor of food insecurity, Cutler-Triggs et al. still call for further research to determine behavioural or psychosocial differences between smoking and nonsmoking households as further explanatory mechanisms beyond the economic effect.

The remaining American literature shows positive correlations between smoking and food insecurity. Armour, Pitts, and Lee (2008) find that smoking is more prevalent in food insecure families than among the food secure (32.9% vs. 22.2%). Moreover, they estimate that the former smoke more packs of cigarettes a week (10.6 packs vs. 9.4 packs). Finally, among low-income families, Armour et al. find that smoking prevalence is 11.7 percentage points higher among food insecure families.

Widome, Jensen, Bangerter, and Fu (2014) focus more narrowly on rates of food insecurity among US veterans, and they similarly find that food-insecure veterans are more likely to use tobacco than their food secure counterparts.

Finally, while analyzing a sample of disadvantaged 18- to 30-year-old Californians, Kim and Tsoh (2016) find that respondents who experienced food insecurity are 54% more likely to be current smokers than their food secure counterparts. Although speculating that food insecurity increases psychological distress and therefore prompts stress relief (such as through smoking), Kim and Tsoh nonetheless find the association between smoking and food insecurity to be reciprocal, rather than independent. If there is a causal relationship between tobacco use and food insecurity, it is likely a product of the negative impact of smoking on earnings and the lack of adjustment in tobacco expenditure in response to changes in income and expenditures.

The few Canadian studies that examine the negative impact of tobacco use on earnings support the expectation that tobacco use raises the risk of a household being food insecure. Collingshaw and Myers (1984) find that tobacco use was responsible for 5% of all Canadian workers' disability

days in 1979.[2] Auld (2005) estimates that daily smokers earn between 8% (single-equation estimate) and 24% (system estimate) less than nonsmokers, and younger and more-educated smokers earn wages that are approximately 32% lower than those of their nonsmoking cohorts, which suggests that smokers are more likely to work in lower-paying occupations.

Beyond the impact of tobacco use on earnings reductions, smokers also demonstrate behaviour in which tobacco consumption does not respond to increases in cigarette prices or in income. This would result in the reduced purchasing power of household income for non-tobacco needs like food, raising the risk of food insecurity. In an estimation of the sensitivity of smoking to price in Canada, Gruber, Sen, and Stabile (2003) consider the context of smuggling. Using smoking expenditure data at the household level, they find cigarette price elasticity in the range of -0.45 to -0.47 after excluding the provinces and years in which smuggling was greatest. Their results show that cigarette taxes may not actually decrease the consumption of cigarettes by much, meaning that expenditure on tobacco will be a larger share of total expenditure, potentially reducing income available for food.

However, not all research comes to the same conclusions. Gruber et al.'s (2002) findings contradict research from the 1990s, which shows that increased cigarette taxes and no-smoking bylaws result in a decrease in smoking (Laugesen & Meads, 1991; Stephens et al., 1997; Townsend, 1996). Later research disagrees, with Gruber and Mullainathan (2002) predicting that cigarette taxes will make smokers happier in the long term.

Bader, Boisclair, and Ferrence (2011) show that increasing the price of cigarettes has little to no impact on the smoking behaviours of persons with dual diagnoses of mental health and non-nicotine substance abuse disorders,[3] as well as heavy/long-term smokers and Aboriginal persons. However, they do find that it would be an effective policy tool for reducing smoking consumption among youth, young adults, and persons of low socioeconomic status. Overall, they conclude that most kinds of regulation and cigarette taxation impact cigarette consumption in both Canada and the United States.

While the published literature addressing food insecurity and tobacco in Canada is not extensive, there is an established association between smoking behaviour and food insecurity. The literature demonstrates that tobacco consumption is not responsive to changes in tobacco prices or incomes. Effectively, smoking results in greater household expenditure, which reduces the discretionary income of the household, thus increasing the likelihood of food insecurity relative to an otherwise comparable nonsmoker.

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[2] Moreover, they calculate the value of each disability day as 40-43% of the average daily income for the age group and sex of the disabled individual, costing 57-60% of one's wages. Kaiserman (1997), on the other hand, considers the loss of future income and finds that $10.5 billion in employee wages was lost to the premature death of smokers in 1991. However, this study's focus on lifetime total earnings is not as relevant to the food insecurity status of a household as current annual earnings.

[3] Smokers diagnosed with mental health and/or non-nicotine substance abuse disorders are disproportionately affected by tobacco dependence. In North America, 5-10% of the population has a diagnosable mental illness, yet this small percentage smokes approximately 40% of all cigarettes consumed in Canada and the US (Bader et al., 2011).

METHODS & DATA

Our data comes from multiple cycles of the Canada Community Health Survey (CCHS). The CCHS is a cross-sectional national survey delivered annually by Statistics Canada.[4] The CCHS gathers information on health status, health care utilization, and health determinants from Canadians aged 12 and over, not including those living on reserves or in institutions or members of the armed forces. We use CCHS cycles from 2007 to 2017 covering New Brunswick and the other nine provinces and three territories, with a sample size of 464,496 in Canada and 16,721 in New Brunswick, respectively. All master file data was accessed through the New Brunswick Research Data Centre.

The CCHS tracks food insecurity using the Household Food Security Survey Module (HFSSM). This validated 18-item scale assesses a large range of experiences within the household over the previous 12 months, including concerns about not having enough food; running out of food before having enough money to buy more; the inability to afford a balanced diet; going hungry; adults or children skipping meals; lost weight; and, in extreme cases, not eating for a whole day – all due to a lack of food and money for food. In the CCHS, a household is classified as food secure, moderately food insecure, or severely food insecure[5] based on its responses to the HFSSM'S 18 questions.

Smoking status is self-reported as either 'current smoker' (daily or occasionally), 'former smoker' (daily or occasionally), or 'never smoker.' We use constant 2002 dollar before-tax household income as our income variable, adjusted for family size by dividing by the square root of household size.[6] Other covariates include main source of income, age group, sex, highest education level in the household, household structure, housing tenure, immigrant status, Aboriginal identity, urban/rural residence, province or territory (when using the national sample), and year.

For health outcomes, we use variables indicative of general health, all measured with a five-point Likert scale. These include self-perceived physical health, self-perceived mental health, sense of belonging, and self-perceived life stress. For all variables, responses of "excellent," "very good," or "good" were coded to indicate favourable health, and "fair" or "poor" were coded to indicate bad health.

Analytical Strategy

In this paper, we use logistic regression analysis with robust (Huber-White) standard errors to estimate the association between household food insecurity and tobacco. We use a binary dependent variable that is equal to 1 if households are facing moderate or severe food insecurity problems and equal to 0 if they are food secure. Each category of smoking condition is included as a binary indicator variable on the right-hand side of the equation. All other geographic and socio-demographic characteristics are included in the model.

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[4] http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3226

[5] The three separate classifications are defined as follows:
1) Food secure – Households with little or no indication of income-related compromises in food access, as indicated by no more than one affirmative response to the HFSSM's 18 questions.
2) Moderately food insecure – Households that reported compromises in the quality and/or quantity of food consumed due to a lack of money for food, with 2 to 9 affirmative responses to the HFSSM's 18 questions.
3) Severely food insecure – Households that reported reduced food intake and disrupted eating patterns due to lack of money for food, as indicated by 10 or more affirmative response to the HFSSM's 18 questions.

[6] Statistics Canada, Table 326-0021: Consumer Price Index (CPI), annual (2002=100)

The general model we specify and estimate with logistic regression is

$$Food\ Insecurity_{ijt} = \alpha + \beta_s SD_{ijt}^{smoker} + \sum_{t=1998}^{T} \delta_t D_t + \sum_{j=1}^{J} \delta_j D_j + X_{ijt}' \theta + \mu_{ijt},$$

where food insecurity is a binary variable equal to 1 if a household is food insecure, 0 otherwise. SD_{ijt}^{smoker} is a category variable equal to 1 if anyone in the household smokes, 0 otherwise. D_t is a binary variable equal to 1 during year *t*. In models we estimate using the national sample, D_j is a binary variable equal to 1 for province or territory *j*. $X_{ijt}^{'}$ is a vector of the other covariates, and μ_{ijt} is the error term of the model.

The reference categories in our analysis are the year 2007; Ontario (in the national sample estimations); wages/salaries or self-employment as main source of income; female; 19 to 34 age group; Bachelor's degree or higher level of education; couples without children; home owners; Canadian-born; urban residents; non-Aboriginal; and 'never smoked' status. The reference categories have a relatively larger number of observations across categories. For all independent variables, missing responses are coded as missing in the model to minimize sample loss.

Respondents younger than 19 years old or earning a real adjusted household income lower than $0 or higher than $250,000 have been excluded from the sample. All analyses were done using Stata 14.

RESULTS

Table 1

Pooling data from 2007 to 2017 shows that 6.01% of households in New Brunswick are moderately food insecure, and 2.89% are severely food insecure. In Canada, 5.33% of households were moderately food insecure, and 2.39% were severely food insecure. Table 1 presents the proportion of household food insecurity status by year of sample and household socio-demographic characteristics in New Brunswick. We can see that, of the families facing severe food insecurity, 48.9% are current daily smokers, and only 16.9 % of families never smoked. Households with respondents who self-report being a current daily or current occasional smoker are more prevalent in the food insecure samples and less prevalent in the food secure sample.

Table 1 shows that families with younger respondents, female respondents, low levels of education, renters, urban dwellers, Aboriginals, and recent immigrants have higher representation among the food insecure. On the contrary, elderly people, males, families with post-secondary education or higher, home owners, non-Aboriginals, Canadian-born individuals, and longer settled immigrants have a lower representation among the food insecure. Average income, adjusted for household size, is substantially lower for moderately food insecure households compared to food secure households and lower still for those reporting severe food insecurity.

The same table for all of Canada appears in the Appendix, showing similar trends to New Brunswick for most variables. The most notable difference is the proportion of people living in rural areas in New Brunswick, which is much higher than the national share. There is also a higher prevalence of home ownership in New Brunswick among the food insecure. Smoking is more prevalent in the New Brunswick sample than the national sample.

Table 1: Socio-demographic characteristics of households, by household food insecurity status, New Brunswick, 2007-2017 (n=16,721)

Column %	Food Secure	Food insecure	
		Moderate	Severe
Weighted *n* (000's)	2,711	179	86
Real adjusted household income,[a] (mean $000)	$39.1	$21.0	$17.3
Main source of household income, %			
Wage/Salaries or self-employment	69.0%	66.7%	48.3%
Senior's income, pensions,[b] dividends, and interest	22.3%	13.1%	12.0%
Employment insurance, workers compensation	1.6%	5.6%	4.7%
Social assistance or welfare	0.9%	5.4%	24.5%
Other or none[c]	2.0%	5.6%	7.5%
Main Source_Missing	4.2%	3.7%	2.9%
Age Group, %			
35 years old and lower	22.2%	36.4%	23.2%

35 to 44 years old	16.2%	22.7%	21.3%
45 to 54 years old	18.8%	15.6%	29.7%
55 to 64 years old	20.1%	15.7%	20.3%
65 to 74 years old	13.8%	7.7%	4.8%
75 years and older	8.9%	1.9%	0.9%
Sex, %			
Male	49.6%	45.8%	34.7%
Female	50.4%	54.2%	65.3%
Education (Highest education level in the household), %			
Grade 13 or lower	8.7%	13.8%	22.7%
Secondary school graduate, no post-secondary	15.5%	24.3%	24.0%
Completed post-secondary, below bachelor's degree	43.3%	46.3%	46.7%
Bachelor's degree or higher	29.1%	12.7%	3.2%
Education_Missing[d]	3.4%	2.9%	3.5%
Household structure, %			
Unattached, living alone or with other	18.5%	29.0%	39.6%
Couple, no children	39.4%	18.3%	23.6%
Couple with children	33.5%	36.6%	19.4%
Female, lone parent	5.7%	12.5%	15.2%
Male, lone parent	1.5%	1.6%	1.3%
All other household types	0.8%	1.2%	0.3%
Household type_Missing	0.6%	0.7%	0.7%
Housing tenure, %			
Owner	83.3%	55.5%	43.9%
Renter	16.6%	44.0%	56.1%
Housing tenure_Missing	0.1%	0.4%	0.0%
Cultural/racial identity, %			
Non-Aboriginal	93.8%	87.6%	85.4%
Aboriginal	2.7%	7.5%	11.6%
Identity_Missing	3.5%	5.0%	3.1%
Immigrant, %			
Canadian-born	94.9%	94.8%	97.9%
Immigrant < 10 years	1.4%	2.3%	0.2%
Immigrant ≥ 10 years	2.9%	2.4%	1.8%

Immigrant_Missing	0.8%	0.5%	0.1%
Urban/Rural residence, %			
Urban/population centre	53.4%	54.8%	56.6%
Rural	46.6%	45.2%	43.4%
Household smoke conditions, %			
Currently Daily Smoker	14.4%	33.4%	48.9%
Currently Occasional Smoker	3.2%	5.4%	4.8%
Former Daily Smoker	30.3%	22.9%	21.0%
Former Occasional smoker	9.8%	5.9%	5.4%
Never Smoked	34.7%	27.3%	16.9%
Smoking Condition_Missing[e]	7.6%	5.2%	3.1%

Notes:
a. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.
b. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplements.
c. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.
d. Education_Missing includes some post-secondary since these variables are missing after 2014.
e. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.

Figures 1 and 2 show smoking behaviour by household food insecurity status. Currently daily smokers represent nearly 40% of food insecure respondents and less than 20% of food secure respondents.

Figure 1: Sample proportion of smoking status by FI status

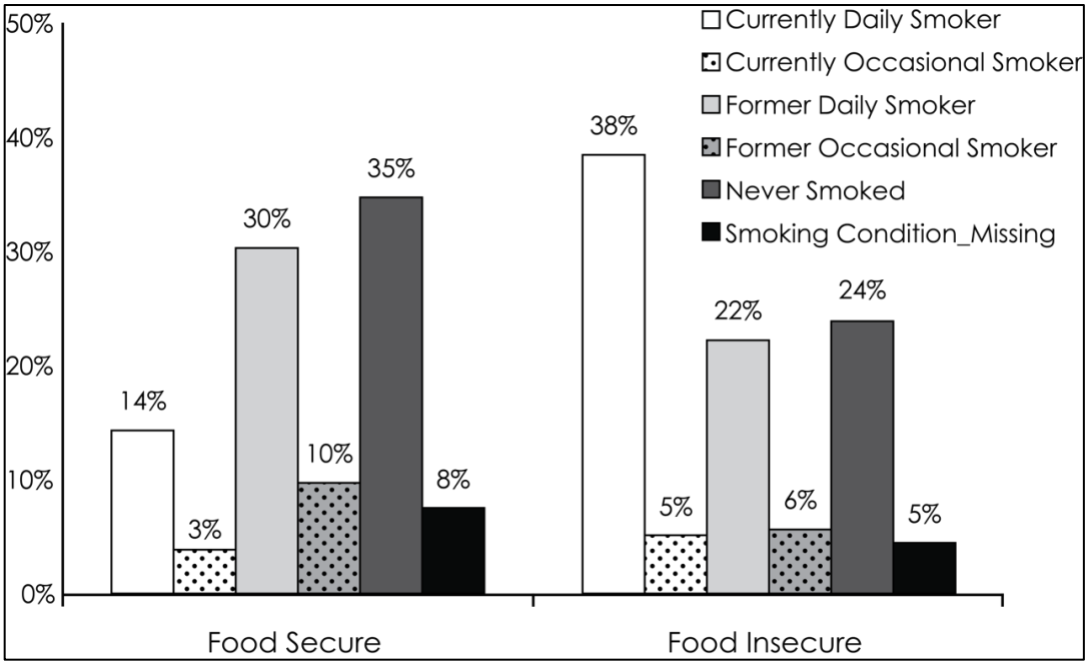


Figure 2: Smoking status of respondents in food insecure households

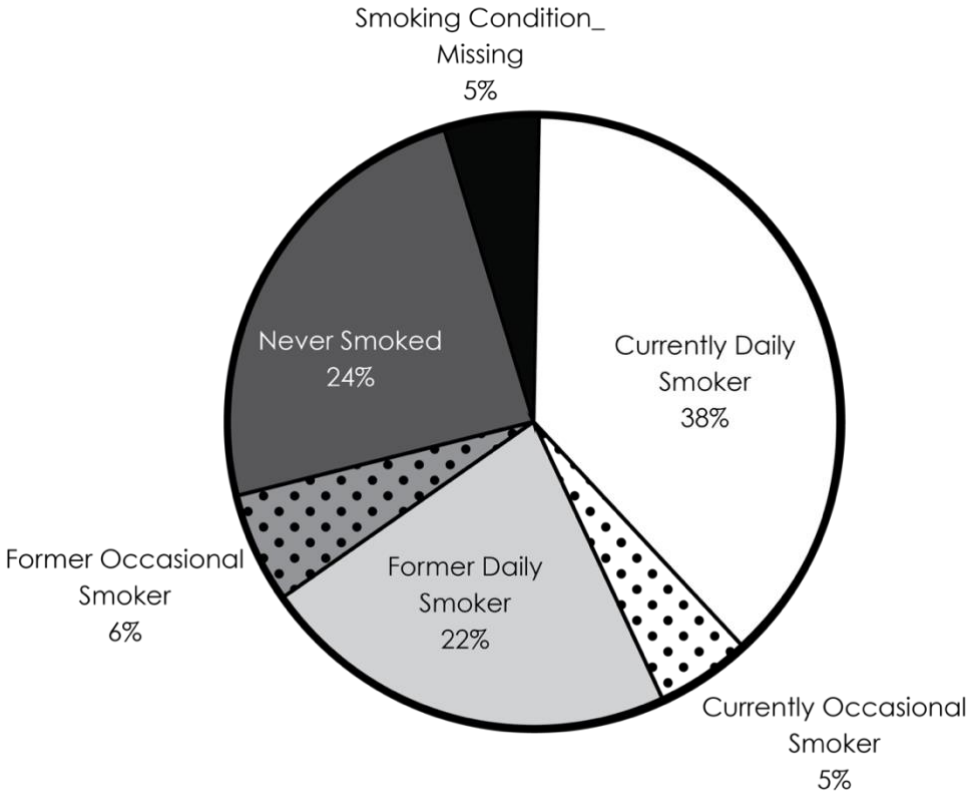


Table 2

Table 2 presents the distribution of household food insecurity status by year of sample and household socio-demographic characteristics in New Brunswick. Food insecurity prevalence for occasional smokers is double that of former smokers and 'never smokers,' while it is nearly triple for current daily smokers. Over half (55.2%) of New Brunswick households reliant on provincial or municipal social assistance or welfare are food insecure, with 37.9% reporting severe food insecurity. Also noteworthy is the 24.6% prevalence of food insecurity among households reliant on Employment Insurance or Workers' Compensation in the province.

In the Appendix, we present the same table for all of Canada, and it shows some differences from the New Brunswick sample. New Brunswick respondents in most age groups are more likely to be food insecure through the study period, with a lower average income among the food secure. Renters are more likely to be food insecure in New Brunswick compared to the rest of Canada. The rural population of New Brunswick is more likely to be food insecure than the national rural sample.

Finally, any reported smoking activity in New Brunswick (other than Never Smoked) is more likely to be associated with food insecurity than that of national smoking respondents. The overall prevalence of food insecurity reported in most national surveys (approximately 1 in 10 households) is also evident in our sample.

Table 2: Household food insecurity, by sociodemographic characteristics of households, New Brunswick, 2007-2017 (n=16,721)

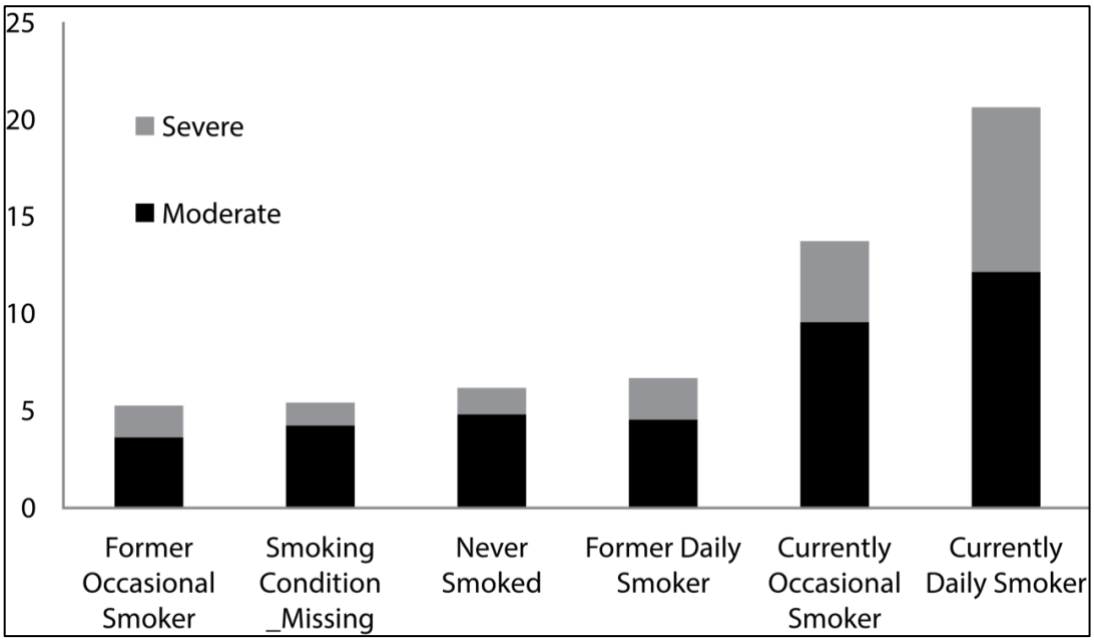
Row %	Food Secure	Food insecure	
		Moderate	Severe
Weighted *n* (000's)	2,711	179	86
Year, %			
2007	90.1%	7.8%	2.1%
2008	91.5%	5.7%	2.7%
2011	91.5%	5.8%	2.6%
2012	91.3%	6.5%	2.2%
2013	91.4%	5.7%	2.9%
2014	91.0%	5.1%	3.9%
2015	91.9%	4.9%	3.2%
2016	89.7%	6.7%	3.6%
2017	91.9%	5.8%	2.3%
Real adjusted household income,[a] mean ($ 000)	$39.1	$21.0	$17.3
Main source of household income, %			
Wage/Salaries or self-employment	92.1%	5.9%	2.0%
Senior's income, pensions,[b] dividends, and interest	94.7%	3.7%	1.6%
Employment insurance, workers compensation	75.4%	17.5%	7.1%
Provincial or municipal social assistance or welfare	44.8%	17.4%	37.9%
Other or none[c]	76.5%	14.4%	9.1%
Main Source_Missing	92.7%	5.3%	2.0%
Age Group, %			
35 years old and lower	87.6%	9.5%	2.9%
35 to 44 years old	88.2%	8.2%	3.7%
45 to 54 years old	90.5%	4.9%	4.5%
55 to 64 years old	92.3%	4.8%	3.0%
65 to 74 years old	95.5%	3.5%	1.0%
75 years and older	98.3%	1.4%	0.3%
Sex, %			
Male	92.3%	5.6%	2.0%
Female	89.9%	6.4%	3.7%
Education (Highest education level in the household), %			
Grade 13 or lower	84.2%	8.8%	7.0%
Secondary school graduate, no post-secondary	86.8%	9.0%	4.2%

Completed post-secondary, below Bachelor's degree	90.5%	6.4%	3.1%
Bachelor's degree or higher	96.9%	2.8%	0.3%
Education_Missing[d]	91.9%	5.1%	3.0%
Household structure, %			
Unattached, living alone or with other	85.4%	8.8%	5.8%
Couple, no children	95.3%	2.9%	1.8%
Couple with children	91.7%	6.6%	1.7%
Female, lone parent	81.4%	11.7%	6.8%
Male, lone parent	90.7%	6.8%	2.5%
All other household types	90.3%	8.8%	1.0%
Household type_Missing	88.8%	7.7%	3.6%
Housing tenure, %			
Owner	94.3%	4.1%	1.6%
Renter	78.0%	13.7%	8.4%
Housing Tenure_Missing	83.1%	16.0%	0.9%
Cultural/racial identity, %			
Non-Aboriginal	91.7%	5.7%	2.6%
Aboriginal	76.0%	13.7%	10.2%
Identity_Missing	89.2%	8.3%	2.5%
Immigrant, %			
Canadian-born	91.0%	6.0%	3.0%
Immigrant < 10 years	89.6%	10.0%	0.4%
Immigrant ≥ 10 years	93.2%	5.0%	1.8%
Immigrant_Missing	95.2%	4.4%	0.5%
Urban/Rural residence, %			
Urban/population centre	90.8%	6.2%	3.0%
Rural	91.5%	5.8%	2.7%
Household smoke conditions, %			
Currently Daily Smoker	79.3%	12.1%	8.5%
Currently Occasional Smoker	86.2%	9.6%	4.2%
Former Daily Smoker	93.3%	4.6%	2.0%
Former Occasional Smoker	94.7%	3.7%	1.6%
Never Smoked	93.7%	4.9%	1.4%
Smoking Condition_Missing[e]	94.5%	4.3%	1.2%

Notes:
a. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.

b. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplement.
c. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.
d. Education_Missing includes some post-secondary until 2014, which was dropped from education categories after that year.
e. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.

Figure 3: Food insecure prevalence by respondent's smoking behaviour



To distinguish between the independent influence that smoking behaviour has on the risk of household food insecurity and the possibility that households with smokers are compositionally dominated by households with characteristics known to be risk factors for food insecurity, we estimate logistic regression models.

Table 3

Table 3 below shows logistic regression results from three models. The first excludes all smoking variables and represents the typical model specified in Canadian food insecurity literature. The second model accounts for households having a currently daily smoker present, and the third accounts for other smoking statuses. In all cases with smoking variables, the odds ratio tells us the relative risk for food insecurity for a household with a member with the reported smoking behaviour relative to the omitted smoking categories. An odds ratio greater than 1 indicates higher relative risk, and an odds ratio less than 1 indicates lower relative risk than the omitted category.

The inclusion of smoking status does not meaningfully change the impact of other variables, most notably income or source of income. This implies that smoking is an independent correlate of food insecurity despite being more prevalent among low-income individuals. In Model 3, the impact of being a current daily smoker doubles the likelihood of being food insecure; being a current occasional smoker has a high but statistically insignificant impact; and being a former smoker has the same impact as being a non-smoker.

Table 3: Logistic Regression of food insecurity status for New Brunswick, 3 models reporting odds ratios			
	Model 1	**Model 2**	**Model 3**[a]
Household Smoking Status			
Currently Daily Smoker		1.857***	2.014***
		(5.34)	(4.97)
Currently Occasional Smoker			1.474
			(1.51)
Former Daily Smoker			1.178
			(1.18)
Former Occasional Smoker			1.001
			(0.01)
Never smoked	1.00	1.00	1.00
Real Adjusted Household Income[b]	0.949***	0.950***	0.950***
	(-11.11)	(-10.91)	(-10.92)
Main Source of Household Income			
Wages or Self Employment	1.00	1.00	1.00
Seniors income, including pensions,[c] dividends, and interest	0.998	1.011	1.017
	(-0.01)	(0.07)	(0.11)
Employment Insurance and workers compensation	1.855*	1.837*	1.818*
	(2.54)	(2.48)	(2.48)
Provincial or municipal social assistance or welfare	2.061***	1.941**	1.909**
	(3.43)	(3.17)	(3.09)
Other or None[d]	1.266	1.274	1.275
	(1.22)	(1.25)	(1.26)
Age Group			
35 years old and lower	1.00	1.00	1.00
35 to 44 years old	1.347	1.284	1.279
	(1.90)	(1.58)	(1.54)
45 to 54 years old	1.106	1.046	1.037
	(0.64)	(0.29)	(0.22)
55 to 64 years old	0.666*	0.674*	0.661*

	(-2.43)	(-2.38)	(-2.42)
65 to 74 years old	0.289***	0.307***	0.301***
	(-6.04)	(-5.77)	(-5.74)
75 years and older	0.0772***	0.0888***	0.0877***
	(-9.88)	(-9.44)	(-9.35)
Sex			
Male	0.881	0.851	0.841
	(-1.20)	(-1.54)	(-1.65)
Female	1.00	1.00	1.00
Education (Highest education level in the household)			
Grade 13 or lower	2.370***	2.024***	1.972**
	(4.21)	(3.42)	(3.26)
Secondary school graduate, no post-secondary	1.907**	1.690**	1.652*
	(3.27)	(2.68)	(2.54)
Completed post-secondary below Bachelor's degree	1.904***	1.754**	1.708**
	(3.64)	(3.16)	(2.98)
Bachelor's degree or higher	1.00	1.00	1.00
Household Structure			
Unattached, living alone or with other	1.597***	1.581***	1.577***
	(3.60)	(3.53)	(3.51)
Couple, no children	1.00	1.00	1.00
Couple with children	1.160	1.158	1.163
	(0.93)	(0.92)	(0.95)
Female, lone parent	1.168	1.071	1.059
	(0.69)	(0.31)	(0.26)
Male, lone parent	1.111	1.115	1.132
	(0.30)	(0.30)	(0.34)
All other household types	1.215	1.129	1.119
	(0.43)	(0.28)	(0.26)
Housing Tenure			
Owner	1.00	1.00	1.00
Renter	2.171***	2.048***	2.048***

	(6.16)	(5.68)	(5.68)
Cultural/Racial Identity			
Non-Aboriginal	1.00	1.00	1.00
Aboriginal	1.825**	1.774*	1.746*
	(2.70)	(2.54)	(2.52)
Immigrant Status			
Canadian-born	1.00	1.00	1.00
Immigrant < 10 years	0.533	0.546	0.565
	(-1.12)	(-1.11)	(-1.05)
Immigrant ≥ 10 years	0.825	0.811	0.824
	(-0.57)	(-0.60)	(-0.56)
Urban/Rural Residence			
Urban/population centre	1.00	1.00	1.00
Rural	1.084	1.065	1.061
	(0.75)	(0.59)	(0.55)
Year			
2007	1.00	1.00	1.00
2008	0.950	0.943	0.938
	(-0.31)	(-0.34)	(-0.38)
2011	0.883	0.893	0.888
	(-0.74)	(-0.66)	(-0.70)
2012	0.964	0.970	0.962
	(-0.21)	(-0.17)	(-0.22)
2013	0.905	0.913	0.916
	(-0.60)	(-0.53)	(-0.52)
2014	0.922	0.944	0.944
	(-0.48)	(-0.34)	(-0.34)
2015	0.901	0.944	0.942
	(-0.57)	(-0.31)	(-0.32)
2016	1.557*	1.606*	1.602*
	(2.40)	(2.50)	(2.45)
2017	1.170	1.257	1.272

	(0.80)	(1.15)	(1.18)
N	**16,720**	**16,720**	**16,720**
t statistics in parentheses, p<0.05, ** p<0.01,***p<0.001, missing variable coefficients removed*			
a. Combining categories of families with severe, moderate, and marginal food insecurity. The cases where there is no food insecurity response are dropped.			
b. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer price index (2002=100) each province each year.			
c. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, Old Age Security, and guaranteed income supplements.			
d. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.			

Consistent with other studies that use the CCHS to investigate food insecurity, our results show that families with higher incomes, families reliant on senior's incomes, elderly age groups, male respondents, households with higher education, and recent immigrants (<10 years) have a lower risk of food insecurity. Meanwhile, households that receive social assistance as their primary income source, households that rent rather than own their dwelling, respondents 35 to 54 years old, female respondents, households with lower education levels, households with children, Canadian-born persons, and Aboriginal respondents have significantly higher odds of experiencing food insecurity. An increase in real adjusted household income would lower the risk of food insecurity.

When we investigate health and well-being associated with food insecurity and tobacco use, we stratify the sample into four groups – 1) Food secure, never smoked; 2) Food secure, currently daily smoker; 3) Food insecure, never smoked; and 4) Food insecure, currently daily smoker – and report the mean values.

Figure 4: Good responses to health outcome by smoking and food conditions

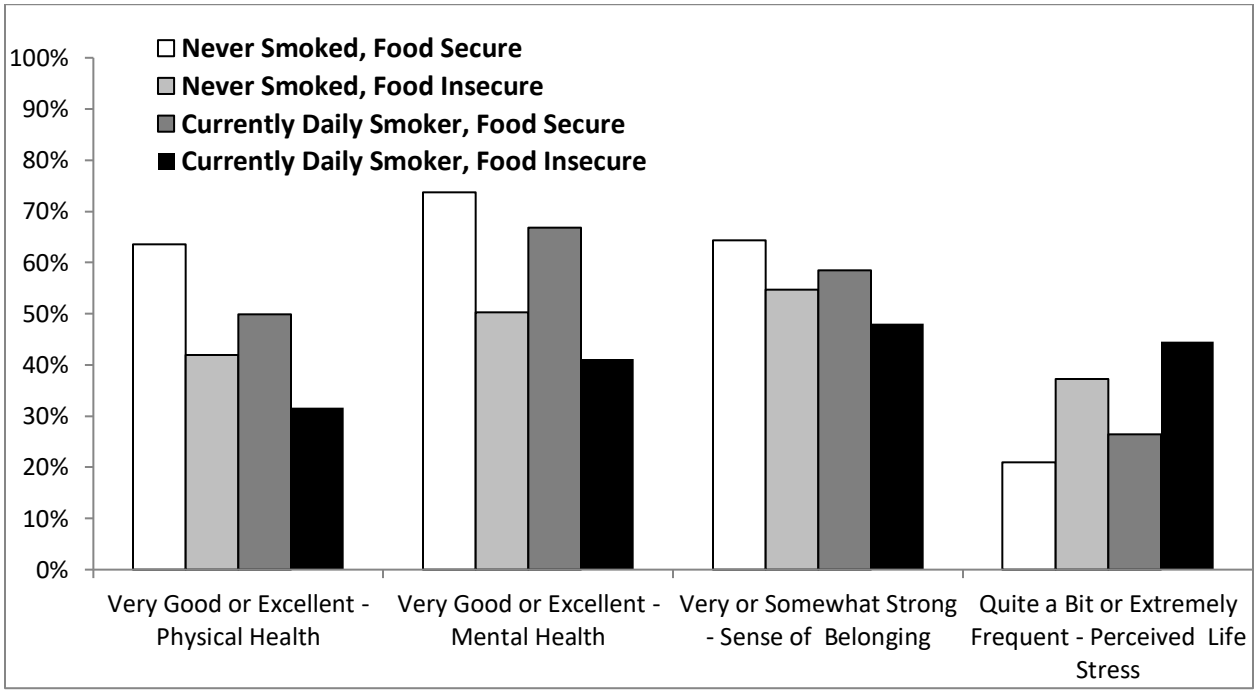


Figure 4 shows that, compared to the effects of smoking, food insecurity has a larger impact on health. The comparison shows that the impacts of food insecurity are present for all the depicted indicators, whereas the impacts of smoking are not only smaller in magnitude but also are not present in the mental health indicators.

These results may reflect that the health impacts of food insecurity are more immediate than the health impacts of smoking and that being food insecure offers no benefits of consumption whatsoever. Smoking may be bad for one's health, but – at least in the short run – smokers do experience the benefit of consumption. Overall, these results suggest that reducing food insecurity will do more to improve the health and well-being of smokers and non-smokers.

DISCUSSION

Periodic reports on the annual cycles of the Canadian Community Health Survey have persistently indicated a high prevalence of household food insecurity in New Brunswick, with almost 10% of households experiencing moderate or severe food insecurity. Given the deleterious effects of food insecurity on health and well-being, this represents a significant public health concern.

This report advances the understanding of food insecurity in New Brunswick by providing the first multivariable analysis of food insecurity-monitoring data for the province. Our results reveal the tight intersection of household food insecurity with other markers of social and economic disadvantage in New Brunswick, highlighting the heightened vulnerability associated with lower incomes, lower levels of education, renting rather than owning one's home, reliance on social assistance or welfare, and Aboriginal status. While similar associations have been charted nationally (e.g., Tarasuk et al., 2018), the analyses here provide province-specific results.

Consistent with national findings, our analyses also highlight the significantly lower rates of food insecurity among seniors – a finding explained by the protection afforded by Canada's old-age pension system (see McIntyre et al., "Reduction," 2016). In addition, our results indicate that smoking is more prevalent among adults in food-insecure households than in food-secure households and that smoking in an independent predictor of household food insecurity.

Based on patterns of household consumption, tobacco expenditure is defined as leisure consumption, rather than a necessity, and cigarette smoking may contribute to food insecurity risks in various ways. The addictive qualities of tobacco may result in smokers having less (perceived) discretionary income to adjust to budget shocks – they prioritize spending on tobacco over food – and the existing literature shows that smoking reduces earnings, further contributing to a decrease in discretionary income.

Policy approaches to reducing the prevalence of food insecurity should address the income inadequacy of lower income households in New Brunswick regardless of household smoking status, as food insecurity has a much larger impact on health than smoking.

There is much evidence on the impacts of policy interventions to improve the resources of low-income households. For example, Loopstra, Dachner, and Tarasuk (2015) find a drop in food insecurity among social assistance recipients with improved benefits in Newfoundland and Labrador. Ionescu-Ittu, Glymour, and Kaufman (2015) find a reduction in food insecurity among households with children under six years of age following the Universal Child Care Benefit in 2006. Li, Dachner, and Tarasuk (2016) find a brief reduction in food insecurity among social assistance recipients in British Columbia following a modest, one-time increase in rates. McIntyre, Dutton, Kwok, and Emery (2016) find a 50% reduction in food insecurity among low-income unattached adults with eligibility for Old Age Security and Guaranteed Income Supplements. Finally, Tarasuk, Dachner, and Mitchell (2019) find a reduction in food insecurity among families eligible for the Ontario Child Benefit (evident only from 2009 to 2012).

Policies seeking to promote lower tobacco use and/or cessation should not choose approaches that reduce the purchasing power of income. For instance, policies would be best to avoid implementing tax instruments beyond the current level of taxation and focus instead of programs, such as counselling, covered by public tax revenue. Provincial revisions to cigarette taxes may cause financial harm to smokers if the increased price of cigarettes does not result in reduced tobacco consumption. The higher cost of cigarettes could lead to higher expenditures on tobacco and less available income for food. In both cases, reduced cigarette consumption would reduce food insecurity risk. However, in the latter case, investment in smoking cessation

initiatives would be preferable to price-based incentives (i.e., increased taxes), as the latter further decreases smokers' discretionary income.

Our findings yield insights into the relationship between household food insecurity and other key markers of the health and well-being of household members 18 years and older, and they provide data on how these associations are impacted by smoking.

The use of cross-sectional survey data limits our ability to determine causal relationships between food insecurity and smoking behaviours and particular outcomes of interest, such as household health and well-being. However, by interpreting the observed associations in the context of other research on household food insecurity (see St-Germain & Tarasuk, 2018), we are able to generate some explanations as to why specific population subgroups are at an elevated risk of food insecurity.

REFERENCES

Abibula, W., Cox, J., Hamelin, A.-M., Mamiya, H., Klein, M. B., & Brassard, P. (2016). Food insecurity and low CD4 count among HIV-infected people: A systematic review and meta-analysis. *AIDS Care 28*(12), 1577-1585. https://doi.org/10.1080/09540121.2016.1191613

Anema, A., Chan, K., Chen, Y., Weiser, S., Montaner, J. S. G., & Hogg, R. S. (2013, May 27). Relationship between food insecurity and mortality among HIV-positive injection drug users receiving antiretroviral treatment therapy in British Columbia, Canada. *PLoS One 8*(5), e61277. https://doi.org/10.1371/journal.pone.0061277

Anema, A., Weiser, S. D., Fernandes, K. A., Brandson, E. K., Palmer, A., … Hogg, R. S. (2011, February). High prevalence of food insecurity among HIV-infected individuals receiving HAART in a resource-rich setting. *AIDS Care 23*(2), 221-230. doi: 10.1080/09540121.2010.498908

Armour, B. S., Pitts, M. M., & Lee, C-W. (2008, July 1). Cigarette smoking and food insecurity among low-income families in the United States, 2001. *American Journal of Health Promotion 22*(6), 386-391. https://doi.org/10.4278/ajhp.22.6.386

Auld, M. C. (2005). Smoking, drinking, and income. *Journal of Human Resources 40*(2), 505-518. doi: 10.3368/jhr.XL.2.505J

Bader, P., Boisclair, D., & Ferrence, R. (2011, October 26). Effects of tobacco taxation and pricing on smoking behavior in high risk populations: A knowledge synthesis. *International Journal of Environmental Research and Public Health 8*(11), 4118-4139. doi:10.3390/ijerph8114118

Chan, J., DeMelo, M., Gingras, J., & Gucciardi, E. (2015). Challenges of diabetes self-management in adults affected by food insecurity in a large urban centre of Ontario, Canada. *International Journal of Endocrinology 2015*, Article 903468. http://dx.doi.org/10.1155/2015/903468

Collingshaw, N. E., & Myers, G. (1984, May/June). Dollar estimates of the consequences of tobacco use in Canada, 1979. *Canadian Journal of Public Health 75*(3), 192-199. Retrieved from https://www-jstor-org.proxy.hil.unb.ca/stable/41990275

Cutler-Triggs, C., Fryer, G. E., Miyoshi, T. J., & Weitzman, M. (2008, November 3). Increased rates and severity of child and adult food insecurity in households with adult smokers. *Archives of Pediatrics and Adolescent Medicine 162*(11), 1056–1062. doi:10.1001/archpediatrics.2008.2

Emery, J. C. H., Bartoo, A. C., Matheson, J., Ferrer, A., Kirkpatrick, S. I., Tarasuk, V., & McIntyre, L. (2012, June). Evidence of the association between household food insecurity and heating cost inflation in Canada, 1998-2001. *Canadian Public Policy 38*(2), 181-215. https://doi.org/10.3138/cpp.38.2.181

Farrelly, M. C., Pechacek, T. F., & Chaloupka, F. J. (2001, December). The impact of tobacco control program expenditures on aggregate cigarette sales: 1981-1998. (*NBER* Working Paper No. 8691). National Bureau of Economic Research, Inc. Retrieved from http://www.nber.org/papers/w8691

Farrelly, M. C., & Shafer, P. R. (2017). Comparing trends between food insecurity and cigarette smoking among adults in the United States, 1998-2011. *American Journal of Health Promotion 31*(5), 413-416. doi: 10.1177/0890117116660773

Gruber, J., & Mullainathan, S. (2002, April). Do cigarette taxes make smokers happier? (*NBER* Working Paper No. 8872). National Bureau of Economic Research, Inc. Retrieved from https://www.nber.org/papers/w8872.pdf

Gruber, J., Sen, A., & Stabile, M. (2003, March 1). Estimating price elasticities when there is smuggling: The sensitivity of smoking to price in Canada. *Journal of Health Economics 22*(5), 821–842. https://doi.org/10.1016/S0167-6296(03)00058-4

Gucciardi, E., Vogt, J. A., DeMelo, M., & Stewart, D. E. (2009, December). Exploration of the relationship between household food insecurity and diabetes in Canada. *Diabetes Care 32*(12), 2218-2224. https://doi.org/10.2337/dc09-0823

Gunderson, C., Tarasuk, V., Cheng, J., de Oliveira, C., & Kurdyak, P. (2018, August 23). Food insecurity status and mortality among adults in Ontario, Canada. *PLoS ONE 13*(8), e0202642. https://doi.org/10.1371/journal.pone.0202642

Ionescu-Ittu, R., Glymour, M. M., & Kaufman, J. S. (2015). A difference-in-differences approach to estimate the effect of income-supplementation on food insecurity. *Preventive Medicine 70*, 108-116. http://dx.doi.org/10.1016/j.ypmed.2014.11.017

Jessiman-Perreault, G., & McIntyre, L. (2017, December). The household food insecurity gradient and potential reductions in adverse population mental health outcomes in Canadian adults. *SSM – Population Health 3*, 464-472. https://doi.org/10.1016/j.ssmph.2017.05.013

Kaiserman, M. J. (1997). The cost of smoking in Canada, 1991. *Chronic Diseases in Canada 18*(1), 13-19. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/9188515

Kim, J. E., & Tsoh, J. Y. (2016, January). Cigarette smoking among socioeconomically disadvantaged young adults in association with food insecurity and other factors. *Preventing Chronic Disease 13*(E08), 1-10. Retrieved from https://europepmc.org/backend/ptpmcrender.fcgi?accid=PMC4714942&blobtype=pdf

Kirk, S. F. L., Kuhle, S., McIsaac, J.-L. D., & Williams, P. L. (2015, November). Food security status among grade 5 students in Nova Scotia, Canada and its association with health outcomes. *Public Health Nutrition 18*(16), 2943-2951. https://doi.org/10.1017/S1368980014001414

Kirkpatrick, S. I., McIntyre, L., & Potestio, M. L. (2010, August). Child hunger and long-term adverse consequences for health. *Archives of Pediatrics and Adolescent Medicine 164*(8), 754-762. doi:10.1001/archpediatrics.2010.117

Laugesen, M., & Meads, C. (1991). Tobacco advertising restrictions, price, income and tobacco consumption in OECD countries, 1960-1986. *British Journal of Addiction 86*(10), 1343-1354. doi: 10.1111/j.1360-0443.1991.tb01710.x

Li, N., Dachner, N., & Tarasuk, V. (2016). The impact of changes in social policies on household food insecurity in British Columbia, 2005-2012. *Preventive Medicine 93*, 151-158. https://doi.org/10.1016/j.ypmed.2016.10.002

Loopstra, R., Dachner, N., & Tarasuk, V. (2015, September). An exploration of the unprecedented decline in the prevalence of household food insecurity in Newfoundland and Labrador, 2007-2012. *Canadian Public Policy 41*(3), 191-206. Retrieved from https://muse.jhu.edu/article/592137/pdf

Marjerrison, S., Cummings, E. A., Glanville, N. T., Kirk, S. F., & Ledwell, M. (2011, April). Prevalence and associations of food insecurity in children with diabetes mellitus. *The Journal of Pediatrics 158*(4), 607-611. doi: 10.1016/j.jpeds.2010.10.003

Matheson, J. (2010, October 24). Estimating price elasticity for tobacco in Canada's Aboriginal communities. (Job Market Paper). Retrieved from https://www.uvic.ca/socialsciences/economics/assets/docs/pastdept-3/Matheson.pdf

McIntyre, L., Connor, S. K., & Warren, J. (2000, October 17). Child hunger in Canada: Results of the 1994 National Longitudinal Survey of Children and Youth. *Canadian Medical Association Journal 16*(8), 961-965. Retrieved from http://www.cmaj.ca/content/cmaj/163/8/961.full.pdf

McIntyre, L., Dutton, D. J., Kwok, C., & Emery, J. C. H. (2016, September). Reduction of food insecurity among low-income Canadian seniors as a likely impact of a guaranteed annual income. *Canadian Public Policy 42*(3), 274-286. https://doi.org/10.3138/cpp.2015-069

McIntyre, L., Williams, J. V. A., Lavorato, D. H., & Patten, S. (2013). Depression and suicide ideation in late adolescence and early adulthood are an outcome of child hunger. *Journal of Affective Disorders 150*(1), 123-129. https://doi.org/10.1016/j.jad.2012.11.029

McIntyre, L., Wu, X., Fleisch, V. C., & Emery, J. C. H. (2016, June). Homeowner versus non-homeowner differences in household food insecurity in Canada. *Journal of Housing and the Built Environment 31*(2), 349-366. doi: 10.1007/s10901-015-9461-6

McIntyre, L., Wu, X., Kwok, C., & Emery, J. C. H. (2016, June 17). A natural experimental study of home ownership on food insecurity in Canada before and after a recession (2008-2009). *Canadian Journal of Public Health 108*(2), e135-e144. doi: 10.17269/cjph.108.5568

McIntyre, L., Wu, X., Kwok, C., & Patten, S. B. (2017, March 11). The pervasive effect of youth self-report of hunger on depression over 6 years of follow up. *Social Psychiatry and Psychiatric Epidemiology 52*(5), 537-547. doi: 10.1007/s00127-017-1361-5

Melchior, M., Chastang, J.-F., Falissard, B., Galéra, C., Tremblay, R. E., Côté, S. M., & Boivin, M. (2012, December 26). Food insecurity and children's mental health: A prospective birth cohort study. *PLoS ONE 7*(12), e52615. https://doi.org/10.1371/journal.pone.0052615

Saiz, A. M., Jr., Aul, A. M., Malecki, K. M., Bersch, A. J., Bergmans, R. S., LeCaire, T. J., & Nieto, F. J. (2016, December). Food insecurity and cardiovascular health: Findings from a statewide population health survey in Wisconsin. *Preventative Medicine 93*, 1-6. https://doi.org/10.1016/j.ypmed.2016.09.002

Seligman, H. K., Laraia, B. A., & Kushel, M. B. (2010, February). Food insecurity is associated with chronic disease among low-income NHANES participants. *The Journal of Nutrition 140*(2), 304-310. https://doi.org/10.3945/jn.109.112573

St-Germain, A. F., & Tarasuk, V. (2018, March 21). Prioritization of the essentials in the spending patterns of Canadian households experiencing food insecurity. *Public Health Nutrition 21*(11), 2065-2078. https://doi.org/10.1017/S1368980018000472

Statistics Canada. (2012, November 27). *Canadian Community Health Survey – Annual component (CCHS)*. Retrieved from http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=135927

Statistics Canada. (2018, November 13). *Canadian Community Health Survey – Annual component (CCHS)*. Retrieved from http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3226

Stephens, T., Pederson, L. L., & Koval, J. J. (1997, September). The relationship of cigarette prices and no-smoking bylaws to the prevalence of smoking in Canada. *American Journal of Public Health 87*(9), 1519-1521. Retrieved from https://search-proquest-com.proxy.hil.unb.ca/nahs/docview/215096984/D331D00F54414576PQ/24?accountid=14611

Tarasuk, V., Cheng, J., de Oliveira, C., Dachner, N., Gunderson, C., & Kurdyak, P. (2015, October 6). Association between household food insecurity and annual health care costs. *CMAJ 187*(14), E429-E436. https://doi.org/10.1503/cmaj.150234

Tarasuk, V., Cheng, J., Gunderson, C., de Oliveira, C., & Kurdyak, P. (2018). The relation between food insecurity and mental health care service utilization in Ontario. *The Canadian Journal of Psychiatry 63*(8), 557-569. https://doi.org/10.1177/0706743717752879

Tarasuk, V., Li, N., Dachner, N., & Mitchell, A. (2019, March). Household food insecurity in Ontario during a period of poverty reduction, 2005-2014. *Canadian Public Policy 45*(1), 93-104. https://doi.org/10.3138/cpp.2018-054

Tarasuk, V., Mitchell, A., & Dachner, N. (2014) *Household food insecurity in Canada, 2012*. Toronto, ON: PROOF. Retrieved from https://proof.utoronto.ca/wp-content/uploads/2014/05/Household_Food_Insecurity_in_Canada-2012_ENG.pdf

Tarasuk, V., Mitchell, A., & Dachner, N. (2016). *Household food insecurity in Canada, 2014*. Toronto, ON: PROOF. Retrieved from https://proof.utoronto.ca/wp-content/uploads/2016/04/Household-Food-Insecurity-in-Canada-2014.pdf

Tarasuk, V., Mitchell, A., McLaren, L., & McIntyre, L. (2013). Chronic physical and mental health conditions among adults may increase vulnerability to household food insecurity. *The Journal of Nutrition 143*(11), 1785-1793. https://doi.org/10.3945/jn.113.178483

Townsend, J. (1996, January 1). Price and consumption of tobacco. *British Medical Bulletin 52*(1):132-142. https://doi.org/10.1093/oxfordjournals.bmb.a011521

Vozoris, N. T., & Tarasuk, V. S. (2003). Household food insufficiency is associated with poorer health. *Journal of Nutrition 133*(1), 120-126. Retrieved from https://academic.oup.com/jn/article/133/1/120/4687580

Widome, R., Jensen, A., Bangerter, A., & Fu, S. S. (2014, May 8). Food insecurity among veterans of the US wars in Iraq and Afghanistan. *Public Health Nutrition 18*(5), 844-849. doi:10.1017/S136898001400072X

Zhang, B., Cohen, J., Ferrence, R., & Rehm, J. (2006, June). The impact of tobacco tax cuts on smoking initiation among Canadian young adults. *American Journal of Preventive Medicine 30*(6), 474-479. https://doi.org/10.1016/j.amepre.2006.02.001

APPENDIX

Table 4: Household food insecurity status by sociodemographic characteristics of households, Canada, 2007-2017 (n=464,496)

Row%	Food Secure	Food insecure	
		Moderate	Severe
Weighted *n* (000 s)	137,166	7,931	3,557
Year, %			
2007	92.9%	5.3%	1.8%
2008	92.7%	5.4%	1.9%
2009	92.4%	4.9%	2.6%
2010	93.0%	4.7%	2.3%
2011	92.6%	5.3%	2.2%
2012	92.2%	5.7%	2.1%
2013	92.8%	4.9%	2.3%
2014	92.7%	5.0%	2.3%
2015	92.1%	5.2%	2.7%
2016	91.5%	5.9%	2.7%
2017	91.4%	5.8%	2.8%
Provinces and Territories, %			
Newfoundland	92.7%	5.5%	1.7%
Prince Edward Island	90.4%	7.2%	2.3%
Nova Scotia	90.4%	6.3%	3.3%
New Brunswick	91.1%	6.0%	2.9%
Quebec	93.3%	4.7%	2.0%
Ontario	91.9%	5.5%	2.6%
Manitoba	91.8%	5.9%	2.2%
Saskatchewan	92.8%	5.1%	2.0%
Alberta	92.4%	5.4%	2.2%
British Columbia	91.8%	5.5%	2.8%
Yukon	90.1%	7.1%	2.8%
Northwest Territories	86.9%	9.2%	3.9%
Nunavut	60.5%	23.0%	16.5%
Real adjusted household income,[a] mean ($ 000)	45.095	22.652	18.601
Main Source of Household Income, %			
Wage/Salaries or self-employment	93.5%	4.8%	1.7%
Senior's income, pensions,[b] dividends, and interest	95.7%	3.0%	1.3%

Employment insurance, workers compensation	74.4%	15.8%	9.8%
Provincial or municipal social assistance or welfare	43.8%	28.3%	27.9%
Other or none[c]	78.6%	13.4%	8.0%
Main Source_Missing	92.0%	5.6%	2.4%
Age Group, %			
35 years old and lower	89.8%	7.2%	3.0%
35 to 44 years old	90.6%	6.7%	2.7%
45 to 54 years old	92.0%	5.1%	2.9%
55 to 64 years old	93.8%	4.1%	2.1%
65 to 74 years old	96.2%	2.7%	1.0%
75 years and older	97.4%	2.1%	0.4%
Sex, %			
Male	93.3%	4.6%	2.1%
Female	91.3%	6.0%	2.7%
Education (Highest education level in the household), %			
Grade 13 or lower	84.7%	9.5%	5.8%
Secondary school graduate, no post-secondary	88.5%	7.5%	4.0%
Completed post-secondary, below Bachelor's degree	91.3%	6.0%	2.7%
Bachelor's degree or higher	96.3%	2.9%	0.8%
Education_Missing[d]	89.9%	7.2%	2.9%
Household Structure, %			
Unattached, living alone or with other	87.5%	7.2%	5.3%
Couple, no children	96.4%	2.6%	1.0%
Couple with children	93.6%	5.2%	1.2%
Female, lone parent	81.1%	12.6%	6.3%
Male, lone parent	88.6%	7.5%	3.9%
All other household types	91.3%	6.5%	2.2%
Household Type_Missing	89.4%	8.4%	2.2%
Housing Tenure, %			
Owner	96.2%	3.0%	0.9%
Renter	82.0%	11.5%	6.5%
Housing Tenure_Missing	90.7%	7.7%	1.6%
Cultural/Racial Identity, %			
Non-Aboriginal	93.0%	4.7%	2.3%
Aboriginal	79.8%	12.3%	8.0%

Identity_Missing	90.9%	7.2%	1.9%
Immigrant, %			
Canadian-born	92.5%	4.9%	2.6%
Immigrant < 10 years	88.9%	9.2%	1.9%
Immigrant ≥ 10 years	92.5%	5.7%	1.8%
Immigrant_Missing	90.2%	7.9%	2.0%
Urban/Rural Residence, %			
Urban/population centre	91.9%	5.6%	2.5%
Rural	94.1%	4.3%	1.7%
Household Smoke Conditions, %			
Currently Daily Smoker	83.6%	9.7%	6.7%
Currently Occasional Smoker	88.7%	7.3%	4.0%
Former Daily Smoker	94.5%	3.9%	1.6%
Former Occasional Smoker	95.3%	3.4%	1.2%
Never Smoked	93.6%	4.9%	1.5%
Smoking Condition_Missing[e]	93.6%	4.7%	1.6%

Notes:
a. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.
b. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplement.
c. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.
d. Education_Missing includes some post-secondary until 2014, which was dropped from education categories after that year.
e. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.

Table 5: Household food insecurity status by sociodemographic characteristics of households, Ontario, 2007-2017 (n=142,817)

Row %	Food Secure	Food insecure	
		Moderate	Severe
Weighted *n* (000's)	46,224	2,762	1,309
Real adjusted household income,[a] mean ($ 000)	46.0	21.4	17.4
Main Source of Household Income, %			
Wage/Salaries or self-employment	93.6%	4.7%	1.7%
Senior's income, pensions,[b] dividends, and interest	94.9%	3.6%	1.5%
Employment insurance, workers compensation	72.0%	18.6%	9.3%
Provincial or municipal social assistance or welfare	42.6%	27.8%	29.6%
Other or none[c]	75.3%	14.8%	9.8%

Main Source_Missing	93.0%	5.2%	1.8%
Age Group, %			
35 years old and lower	90.1%	6.8%	3.1%
35 to 44 years old	89.9%	7.2%	3.0%
45 to 54 years old	91.8%	5.1%	3.1%
55 to 64 years old	92.7%	4.8%	2.5%
65 to 74 years old	95.8%	3.0%	1.2%
75 years and older	97.1%	2.4%	0.4%
Sex, %			
Male	93.1%	4.7%	2.2%
Female	90.7%	6.3%	3.0%
Education (Highest education level in the household), %			
Grade 13 or lower	82.7%	10.6%	6.7%
Secondary school graduate, no post-secondary	87.5%	8.0%	4.5%
Completed post-secondary, below Bachelor's degree	90.7%	6.2%	3.1%
Bachelor's degree or higher	96.0%	3.0%	0.9%
Education_Missing[d]	89.2%	7.8%	3.0%
Household Structure, %			
Unattached, living alone or with other	86.7%	7.3%	6.0%
Couple, no children	95.9%	2.8%	1.3%
Couple with children	93.6%	5.1%	1.3%
Female, lone parent	80.2%	12.8%	7.0%
Male, lone parent	88.6%	6.5%	4.9%
All other household types	91.6%	6.2%	2.3%
Household Type_Missing	85.9%	12.5%	1.6%
Housing Tenure, %			
Owner	96.0%	3.1%	0.9%
Renter	79.7%	12.6%	7.6%
Housing tenure_Missing	82.6%	15.4%	2.0%
Cultural/Racial Identity, %			
Non-Aboriginal	92.6%	4.8%	2.6%
Aboriginal	80.5%	10.1%	9.3%
Identity_Missing	90.7%	7.4%	1.9%
Immigrant, %			

Canadian-born	92.3%	4.7%	2.9%
Immigrant < 10 years	88.2%	9.8%	2.0%
Immigrant ≥ 10 years	91.9%	6.1%	2.0%
Immigrant_Missing	91.5%	7.2%	1.2%
Urban/Rural residence, %			
Urban/population centre	91.5%	5.8%	2.8%
Rural	94.4%	4.0%	1.6%
Household Smoke Conditions, %			
Currently Daily Smoker	83.9%	8.8%	7.3%
Currently Occasional Smoker	88.1%	8.2%	3.7%
Former Daily Smoker	94.3%	4.0%	1.7%
Former Occasional Smoker	95.2%	3.3%	1.5%
Never Smoked	92.8%	5.6%	1.6%
Smoking Condition_Missing[e]	92.3%	5.1%	2.6%

Notes:
a. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.
b. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplement.
c. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.
d. Education_Missing includes some post-secondary until 2014, which was dropped from education categories after that year.
e. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.

Table 6: Sociodemographic characteristics of households, by food insecurity status, Canada, 2007-2017 (n=464,496)

Column %	Food Secure	Food insecure	
		Moderate	Severe
Weighted *n* (000's)	137,166	7,931	3,557
Province and Territories, %			
Newfoundland	1.1%	1.1%	0.8%
Prince Edward Island	0.4%	0.5%	0.4%
Nova Scotia	3.1%	3.8%	4.3%
New Brunswick	2.0%	2.3%	2.4%
Quebec	27.4%	24.1%	22.2%
Ontario	33.7%	34.8%	36.8%
Manitoba	3.3%	3.7%	3.1%
Saskatchewan	3.3%	3.2%	2.8%
Alberta	12.7%	12.9%	11.7%

British Columbia	12.9%	13.2%	15.0%
Yukon	0.1%	0.1%	0.1%
Northwest Territories	0.1%	0.1%	0.1%
Nunavut	0.0%	0.2%	0.3%
Real adjusted household income,[a] mean ($ 000)	45.095	22.652	18.601
Main Source of Household Income, %			
Wage/Salaries or self-employment	74.5%	66.3%	51.0%
Senior's income, pensions,[b] dividends, and interest	18.2%	9.9%	3.9%
Employment insurance, workers compensation	0.8%	2.8%	3.8%
Provincial or municipal social assistance or welfare	1.0%	10.7%	23.5%
Other or none[c]	2.3%	6.8%	9.0%
Main Source_Missing	3.3%	3.5%	3.3%
Age Group, %			
35 years old and lower	26.7%	37.2%	34.6%
35 to 44 years old	18.0%	23.1%	20.9%
45 to 54 years old	19.2%	18.4%	23.6%
55 to 64 years old	17.2%	12.9%	15.0%
65 to 74 years old	11.3%	5.6%	4.7%
75 years and older	7.5%	2.9%	1.2%
Sex, %			
Male	50.6%	43.4%	44.2%
Female	49.4%	56.6%	55.8%
Education (Highest education level in the household), %			
Grade 13 or lower	6.0%	11.5%	15.8%
Secondary school graduate, no post-secondary	11.0%	16.1%	19.2%
Completed post-secondary, below Bachelor's degree	41.6%	47.4%	47.4%
Bachelor's degree or higher	37.3%	19.2%	12.4%
Education_Missing[d]	4.2%	5.9%	5.3%
Household Structure, %			
Unattached, living alone or with other	19.7%	28.0%	45.7%
Couple, no children	31.9%	14.8%	13.2%
Couple with children	40.1%	38.2%	20.3%
Female, lone parent	5.7%	15.4%	17.3%
Male, lone parent	1.5%	2.2%	2.5%
All other household types	0.7%	0.8%	0.6%
Household Type_Missing	0.4%	0.7%	0.4%

Housing Tenure, %			
Owner	75.5%	40.4%	25.8%
Renter	24.4%	59.4%	74.1%
Housing Tenure_Missing	0.1%	0.2%	0.1%
Cultural/Racial Identity, %			
Non-Aboriginal	81.5%	71.0%	76.4%
Aboriginal	2.9%	7.6%	11.0%
Identity_Missing	15.6%	21.4%	12.6%
Immigrant, %			
Canadian-born	75.8%	69.4%	80.9%
Immigrant < 10 years	6.0%	10.8%	5.0%
Immigrant ≥ 10 years	16.9%	17.9%	13.0%
Immigrant_Missing	1.2%	1.9%	1.0%
Urban/Rural Residence, %			
Urban/population centre	81.7%	85.7%	87.4%
Rural	18.3%	14.3%	12.6%
Household Smoke Conditions, %			
Currently Daily Smoker	14.1%	28.2%	43.6%
Currently Occasional Smoker	3.6%	5.1%	6.3%
Former Daily Smoker	25.7%	18.6%	16.4%
Former Occasional Smoker	11.6%	7.2%	5.8%
Never Smoked	38.7%	35.3%	23.7%
Smoking Condition_Missing[e]	6.2%	5.5%	4.2%

Notes:
a. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.
b. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplement.
c. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.
d. Education_Missing includes some post-secondary until 2014, which was dropped from education categories after that year.
e. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.

Table 7: Sociodemographic characteristics of households, by food insecurity status, Ontario, 2007-2017 (n=142,817)

Column %	Food Secure	Food insecure	
		Moderate	Severe
Weighted n (000's)	46,224	2,762	1,309

Real adjusted household income,[a] mean ($ 000)	46.0	21.4	17.4
Main Source of Household Income, %			
Wage/Salaries or self-employment	75.6%	64.0%	47.7%
Senior's income, pensions,[b] dividends, and interest	17.2%	10.8%	9.7%
Employment insurance, workers compensation	0.7%	2.9%	3.1%
Provincial or municipal social assistance or welfare	1.1%	12.3%	27.6%
Other or none[c]	2.1%	6.9%	9.7%
Main Source_Missing	3.3%	3.0%	2.3%
Age Group, %			
35 years old and lower	26.6%	33.7%	32.5%
35 to 44 years old	18.7%	24.9%	22.0%
45 to 54 years old	19.8%	18.2%	23.7%
55 to 64 years old	16.6%	14.4%	15.9%
65 to 74 years old	10.8%	5.6%	4.8%
75 years and older	7.5%	3.2%	1.1%
Sex, %			
Male	50.1%	42.0%	42.6%
Female	49.9%	58.0%	57.4%
Education (Highest education level in the household), %			
Grade 13 or lower	4.8%	10.5%	13.8%
Secondary school graduate, no post-secondary	10.8%	16.4%	19.5%
Completed post-secondary, below Bachelor's degree	39.5%	45.3%	47.7%
Bachelor's degree or higher	40.7%	21.7%	14.1%
Education_Missing[d]	4.2%	6.1%	4.9%
Household Structure, %			
Unattached, living alone or with other	16.9%	23.9%	41.1%
Couple, no children	29.0%	14.2%	13.5%
Couple with children	45.2%	41.2%	22.1%
Female, lone parent	6.4%	17.2%	19.7%
Male, lone parent	1.3%	1.6%	2.5%
All other household types	0.8%	0.9%	0.7%
Household Type_Missing	0.4%	1.0%	0.3%
Housing Tenure, %			
Owner	77.9%	41.5%	25.7%
Renter	22.0%	58.1%	74.2%

Housing Tenure_Missing	0.1%	0.4%	0.1%
Cultural/Racial Identity, %			
Non-Aboriginal	77.4%	67.7%	75.8%
Aboriginal	2.1%	4.4%	8.7%
Identity_Missing	20.5%	27.9%	15.5%
Immigrant, %			
Canadian-born	66.1%	56.9%	73.8%
Immigrant < 10 years	7.1%	13.2%	5.7%
Immigrant ≥ 10 years	25.5%	28.2%	19.9%
Immigrant_Missing	1.3%	1.7%	0.6%
Urban/Rural Residence, %			
Urban/population centre	84.8%	89.4%	90.7%
Rural	15.2%	10.6%	9.3%
Household Smoke Conditions, %			
Currently Daily Smoker	14.0%	24.5%	43.0%
Currently Occasional Smoker	3.0%	4.7%	4.3%
Former Daily Smoker	22.7%	16.2%	14.5%
Former Occasional Smoker	13.4%	7.7%	7.5%
Never Smoked	42.5%	42.9%	26.3%
Smoking Condition_Missing[e]	4.4%	4.0%	4.4%

Notes:
a. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.
b. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplement.
c. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.
d. Education_Missing includes some post-secondary until 2014, which was dropped from education categories after that year.
e. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.

We use 3 models in our analysis, and each model regresses data for Canada, Ontario, and New Brunswick.

Model 1: Without smoking variables
Model 2: With currently daily smoker
Model 3: With different smoking behaviours

Table 8: Odds of food insecurity in relation to sociodemographic characteristics and smoking behaviours

Food Insecurity [a]									
	Model 1			**Model 2**			**Model 3**		
Logit Regr-ession Odd ratio (95% CI)	CAN	NB	ON	CAN	NB	ON	CAN	NB	ON
Year									
2007	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***
2008	**1.066**	**0.950**	**1.169**	**1.071**	**0.943**	**1.176**	**1.071**	**0.938**	**1.179**
	(1.17)	**(-0.31)**	**(1.65)**	**(1.24)**	**(-0.34)**	**(1.70)**	**(1.25)**	**(-0.38)**	**(1.72)**
2009	**1.096**		**1.155**	**1.109**		**1.167**	**1.109**		**1.167**
	(1.71)		**(1.71)**	**(1.91)**		**(1.82)**	**(1.92)**		**(1.82)**
2010	**0.946**		**0.853**	**0.953**		**0.858**	**0.954**		**0.859**
	(-1.00)		**(-1.71)**	**(-0.86)**		**(-1.64)**	**(-0.85)**		**(-1.63)**
2011	**0.987**	**0.883**	**0.871**	**1.005**	**0.893**	**0.885**	**1.006**	**0.888**	**0.886**
	(-0.25)	**(-0.74)**	**(-1.51)**	**(0.09)**	**(-0.66)**	**(-1.33)**	**(0.11)**	**(-0.70)**	**(-1.31)**
2012	**1.032**	**0.964**	**0.829***	**1.050**	**0.970**	**0.838**	**1.050**	**0.962**	**0.835***
	(0.59)	**(-0.21)**	**(-2.08)**	**(0.91)**	**(-0.17)**	**(-1.95)**	**(0.91)**	**(-0.22)**	**(-1.98)**
2013	**0.950**	**0.905**	**0.835***	**0.971**	**0.913**	**0.852**	**0.971**	**0.916**	**0.853**
	(-0.91)	**(-0.60)**	**(-2.02)**	**(-0.52)**	**(-0.53)**	**(-1.80)**	**(-0.52)**	**(-0.52)**	**(-1.79)**
2014	**0.970**	**0.922**	**0.894**	**0.998**	**0.944**	**0.908**	**1.001**	**0.944**	**0.912**
	(-0.54)	**(-0.48)**	**(-1.27)**	**(-0.04)**	**(-0.34)**	**(-1.08)**	**(0.02)**	**(-0.34)**	**(-1.04)**
2015	**1.279*****	**0.901**		**1.329*****	**0.944**		**1.320*****	**0.942**	
	(4.56)	**(-0.57)**		**(5.22)**	**(-0.31)**		**(5.04)**	**(-0.32)**	

2016	**1.589*** **	**1.557***		**1.651*** **	**1.606***		**1.635*** **	**1.602***	
	(8.57)	**(2.40)**		**(9.21)**	**(2.50)**		**(8.92)**	**(2.45)**	
2017	**1.432*** **	**1.170**	**1.379*** **	**1.496*** **	**1.257**	**1.418*** **	**1.488*** **	**1.272**	**1.407*** **
	(7.43)	**(0.80)**	**(3.79)**	**(8.24)**	**(1.15)**	**(4.10)**	**(8.05)**	**(1.18)**	**(3.99)**
Provinces and Territories									
NFLD	**0.725*** **			**0.725*** **			**0.723*** **		
	(-4.52)			**(-4.46)**			**(-4.51)**		
PEI	**1.062**			**1.075**			**1.074**		
	(0.84)			**(1.01)**			**(1.00)**		
NS	**1.093**			**1.094**			**1.089**		
	(1.84)			**(1.85)**			**(1.76)**		
NB	**1.018**			**1.024**			**1.022**		
	(0.31)			**(0.42)**			**(0.38)**		
QC	**0.613*** **			**0.615*** **			**0.611*** **		
	(-13.68)			**(-13.53)**			**(-13.69)**		
ON	***1.00***			***1.00***			***1.00***		
MB	**0.879***			**0.886**			**0.885**		
	(-2.06)			**(-1.91)**			**(-1.94)**		
SK	**0.840** **			**0.838** **			**0.837** **		
	(-3.16)			**(-3.20)**			**(-3.22)**		
AB	**1.098***			**1.098***			**1.095***		
	(2.26)			**(2.25)**			**(2.17)**		
BC	**0.985**			**1.007**			**1.004**		
	(-0.36)			**(0.16)**			**(0.08)**		

YT	**0.990**			**0.968**			**0.965**		
	(-0.10)			**(-0.33)**			**(-0.37)**		
NT	**1.276****			**1.247***			**1.245***		
	(2.81)			**(2.54)**			**(2.53)**		
NU	**3.276*****			**2.948*****			**2.949*****		
	(12.64)			**(11.37)**			**(11.42)**		
Real Adjust-ed House-hold Income[b]	**0.957*****	**0.949*****	**0.951*****	**0.958*****	**0.950*****	**0.951*****	**0.958*****	**0.950*****	**0.951*****
	(-35.49)	**(-11.11)**	**(-26.66)**	**(-35.09)**	**(-10.91)**	**(-26.42)**	**(-35.07)**	**(-10.92)**	**(-26.39)**
Main Source of Household Income									
Wage / Salaries or Self-employ-ment	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***
Senior income[c]	**0.891***	**0.998**	**0.888**	**0.896***	**1.011**	**0.889**	**0.895***	**1.017**	**0.892**
	(-2.51)	**(-0.01)**	**(-1.39)**	**(-2.39)**	**(0.07)**	**(-1.38)**	**(-2.40)**	**(0.11)**	**(-1.33)**
Employ-ment Insura-nce and workers comp	**2.021*****	**1.855***	**2.086*****	**1.945*****	**1.837***	**2.034*****	**1.934*****	**1.818***	**2.030*****
	(9.12)	**(2.54)**	**(4.61)**	**(8.50)**	**(2.48)**	**(4.42)**	**(8.40)**	**(2.48)**	**(4.39)**
Provin-cial or munici-pal social assist-ance or welfare	**3.143*****	**2.061*****	**2.841*****	**3.029*****	**1.941****	**2.733*****	**3.018*****	**1.909****	**2.730*****
	(22.45)	**(3.43)**	**(11.91)**	**(21.48)**	**(3.17)**	**(11.48)**	**(21.39)**	**(3.09)**	**(11.45)**
Other or none[d]	**1.313*****	**1.266**	**1.260***	**1.310*****	**1.274**	**1.250***	**1.312*****	**1.275**	**1.254***
	(5.05)	**(1.22)**	**(2.27)**	**(4.94)**	**(1.25)**	**(2.14)**	**(4.96)**	**(1.26)**	**(2.17)**

Main Source_ Missing	0.844*	0.499*	0.769*	0.853*	0.520*	0.779*	0.850*	0.517*	0.781*
	(-2.46)	(-2.46)	(-2.25)	(-2.32)	(-2.40)	(-2.14)	(-2.36)	(-2.45)	(-2.13)
Age Group									
35 years old and lower	*1.00*			*1.00*			*1.00*	*1.00*	*1.00*
35 to 44 years old	1.222***	1.347	1.458***	1.195***	1.284	1.434***	1.189***	1.279	1.432***
	(5.71)	(1.90)	(5.84)	(5.03)	(1.58)	(5.53)	(4.92)	(1.54)	(5.50)
45 to 54 years old	1.131***	1.106	1.234**	1.085*	1.046	1.199**	1.078*	1.037	1.198**
	(3.34)	(0.64)	(3.10)	(2.20)	(0.29)	(2.67)	(2.00)	(0.22)	(2.62)
55 to 64 years old	0.781***	0.666*	1.034	0.767***	0.674*	1.027	0.760***	0.661*	1.028
	(-5.42)	(-2.43)	(0.38)	(-5.75)	(-2.38)	(0.31)	(-5.81)	(-2.42)	(0.31)
65 to 74 years old	0.411***	0.289***	0.491***	0.423***	0.307***	0.501***	0.420***	0.301***	0.504***
	(-15.48)	(-6.04)	(-6.35)	(-15.02)	(-5.77)	(-6.17)	(-14.86)	(-5.74)	(-5.99)
75 and higher years old	0.203***	0.0772***	0.269***	0.222***	0.0888***	0.285***	0.223***	0.0877***	0.288***
	(-20.95)	(-9.88)	(-9.57)	(-19.79)	(-9.44)	(-9.16)	(-19.52)	(-9.35)	(-8.94)
Sex									
Male	0.871***	0.881	0.860**	0.838***	0.851	0.831***	0.828***	0.841	0.822***
	(-5.47)	(-1.20)	(-3.17)	(-6.92)	(-1.54)	(-3.87)	(-7.40)	(-1.65)	(-4.08)
Female	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Education (Highest education level in the household)									
Grade 13 or lower	2.111***	2.370***	1.819***	1.904***	2.024***	1.698***	1.885***	1.972**	1.688***
	(14.76)	(4.21)	(6.42)	(12.57)	(3.42)	(5.57)	(12.35)	(3.26)	(5.49)

Second-ary school graduate, no post-secondary	1.704***	1.907**	1.453***	1.582***	1.690**	1.389***	1.566***	1.652*	1.379***
	(11.70)	(3.27)	(4.58)	(9.92)	(2.68)	(3.97)	(9.65)	(2.54)	(3.88)
Completed post-secondary below Bachelor's degree	1.764***	1.904***	1.586***	1.675***	1.754**	1.536***	1.658***	1.708**	1.528***
	(14.78)	(3.64)	(6.88)	(13.25)	(3.16)	(6.30)	(12.88)	(2.98)	(6.19)
Bachelor's degree or higher	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Education_Missing[e]	1.977***	1.478	1.856***	1.848***	1.274	1.789***	1.832***	1.237	1.785***
	(9.86)	(1.32)	(5.18)	(8.82)	(0.81)	(4.84)	(8.67)	(0.71)	(4.82)
Household Structure									
Unattached, living alone or with other	1.572***	1.597***	1.465***	1.562***	1.581***	1.465***	1.560***	1.577***	1.458***
	(13.45)	(3.60)	(5.79)	(13.22)	(3.53)	(5.78)	(13.15)	(3.51)	(5.67)
Couple, no children	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Couple with children	1.283***	1.160	1.199*	1.289***	1.158	1.206*	1.297***	1.163	1.211*
	(6.29)	(0.93)	(2.41)	(6.37)	(0.92)	(2.48)	(6.53)	(0.95)	(2.52)
Female lone parent	1.720***	1.168	1.657***	1.694***	1.071	1.647***	1.692***	1.059	1.643***
	(10.83)	(0.69)	(5.60)	(10.46)	(0.31)	(5.51)	(10.42)	(0.26)	(5.49)
Male lone parent	1.635***	1.111	1.300	1.594***	1.115	1.279	1.598***	1.132	1.282
	(5.08)	(0.30)	(1.58)	(4.81)	(0.30)	(1.48)	(4.84)	(0.34)	(1.50)

All other household-types	1.391*	1.215	1.446	1.309	1.129	1.404	1.288	1.119	1.378
	(2.42)	(0.43)	(1.49)	(1.95)	(0.28)	(1.35)	(1.83)	(0.26)	(1.28)
Household type_ Missing	1.802***	1.679	2.578***	1.725**	1.617	2.551***	1.736**	1.653	2.573***
	(3.57)	(1.19)	(3.59)	(3.21)	(1.05)	(3.49)	(3.23)	(1.09)	(3.51)
Housing Tenure									
Owner	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Renter	2.376***	2.171***	2.398***	2.263***	2.048***	2.328***	2.252***	2.048***	2.321***
	(27.63)	(6.16)	(15.61)	(25.76)	(5.68)	(14.94)	(25.55)	(5.68)	(14.81)
Housing tenure_ Missing	1.547	3.668	3.109*	1.594	4.076	3.202*	1.619	4.309	3.231*
	(1.40)	(1.18)	(2.49)	(1.49)	(1.29)	(2.55)	(1.53)	(1.35)	(2.56)
Cultural/Racial Identity									
Non-Aboriginal	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Aboriginal	1.666***	1.825**	1.466***	1.589***	1.774*	1.411***	1.566***	1.746*	1.400***
	(11.73)	(2.70)	(4.59)	(10.56)	(2.54)	(4.12)	(10.21)	(2.52)	(4.02)
Identity _Missing	1.053	1.726	1.110	1.053	1.837	1.106	1.059	1.794	1.109
	(0.85)	(1.43)	(1.13)	(0.85)	(1.57)	(1.09)	(0.95)	(1.54)	(1.12)
Immigrant									
Canadian-born	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*

Immig-rant < 10 years	**0.762*** **	**0.533**	**0.694*** **	**0.835** **	**0.546**	**0.749** **	**0.857***	**0.565**	**0.765***
	(-4.12)	**(-1.12)**	**(-3.48)**	**(-2.73)**	**(-1.11)**	**(-2.74)**	**(-2.34)**	**(-1.05)**	**(-2.54)**
Immig-rant ⩾ 10 years	**1.002**	**0.825**	**0.972**	**1.064**	**0.811**	**1.021**	**1.082**	**0.824**	**1.033**
	(0.04)	**(-0.57)**	**(-0.37)**	**(1.13)**	**(-0.60)**	**(0.27)**	**(1.44)**	**(-0.56)**	**(0.42)**
Immig-rant_ Missing	**0.594*** **	**0.123***	**0.464** **	**0.630*** **	**0.134***	**0.484** **	**0.638*** **	**0.145***	**0.491** **
	(-4.11)	**(-2.14)**	**(-3.12)**	**(-3.70)**	**(-2.09)**	**(-3.00)**	**(-3.60)**	**(-2.02)**	**(-2.96)**
Urban/Rural Residence									
Urban/ popul-ation centre	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***
Rural	**0.900*** **	**1.084**	**0.918**	**0.888*** **	**1.065**	**0.910**	**0.887*** **	**1.061**	**0.910**
	(-3.53)	**(0.75)**	**(-1.43)**	**(-3.99)**	**(0.59)**	**(-1.58)**	**(-4.02)**	**(0.55)**	**(-1.57)**
Household Smoke Conditions									
Current-ly Daily Smoker				**1.669*** **	**1.857*** **	**1.438*** **	**1.791*** **	**2.014*** **	**1.501*** **
				(18.88)	**(5.34)**	**(7.22)**	**(17.50)**	**(4.97)**	**(6.77)**
Current-ly Occas-ional Smoker							**1.445*** **	**1.474**	**1.513*** **
							(6.33)	**(1.51)**	**(3.77)**
Former Daily Smoker							**1.128** **	**1.178**	**1.050**
							(3.21)	**(1.18)**	**(0.72)**
Former Occas-ional Smoker							**1.018**	**1.001**	**0.991**
							(0.37)	**(0.01)**	**(-0.11)**
Never Smok-ed				***1.00***	***1.00***	***1.00***	***1.00***	***1.00***	***1.00***

Smoking Condition_ Missing							**1.043**	**0.900**	**1.057**
							(0.69)	**(-0.42)**	**(0.38)**
n	**464,495**	**16,720**	**142,815**	**464,495**	**16,720**	**142,815**	**464,495**	**16,720**	**142,815**

t statistics in parentheses, p<0.05, ** p<0.01,***p<0.001*

Notes:

a. Combining categories of families with severely and moderately food insecure. Cases with no food insecurity response are dropped.

b. Before-tax income, rescaled in thousands of Canada dollars, adjusted for family size by dividing by the square root of household size, also deflated to the Consumer Price Index (2002=100) for each province each year.

c. Pensions include benefits from Canada or Quebec Pension Plan, job-related retirement pensions, superannuation, annuities, PPSP/RRIF, old age security, and guaranteed income supplements.

d. Other or none include child tax benefits or family allowances, child support, alimony, rental income, scholarships, etc., and no income.

e. Education_Missing includes some post-secondary since these variables are missing after 2014.

f. Smoking Condition_Missing includes the always occasional smoker before 2014 and experimental smoker after 2014.