



## **Blown Off-Course? Unhealthy Vices of the Economically Insecure During the Great Recession**

**Barry Michael Watson**  
(University of New Brunswick)

**Angela Daley**  
(University of Maine)

**Lars Osberg**  
(Dalhousie University)

**Nicholas Rodhe**  
(Griffith University)

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# Blown Off-Course? Unhealthy Vices of the Economically Insecure During the Great Recession

Barry Watson<sup>\*,a</sup>, Angela Daley<sup>b</sup>, Nicholas Rohde<sup>c</sup>, Lars Osberg<sup>d</sup>

<sup>a</sup> Faculty of Business, University of New Brunswick, 100 Tucker Park Road, PO Box 5050, Saint John, New Brunswick, Canada E2L 4L5; Email: bwatson@unb.ca

<sup>b</sup> School of Economics, University of Maine, 5782 Winslow Hall, Room 206, Orono, Maine, USA 04469; Email: angela.daley@maine.edu

<sup>c</sup> Department of Accounting, Finance and Economics, Gold Coast campus, Griffith University, QLD 4222, Australia; Email: n.rohde@griffith.edu.au

<sup>d</sup> Department of Economics, Dalhousie University, 6214 University Avenue, PO Box 15000, Halifax, Nova Scotia, Canada B3H 4R2; Email: Lars.Osberg@dal.ca

## Abstract

This paper adds to the “costs of recessions” literature by examining the extent to which the greater economic insecurity (job insecurity or joblessness) of the Great Recession caused working age adults to increase their self-medicating “bad habits” (over-eating, alcohol use, and smoking). Using a difference-in-differences (DD) design, we examine two panels of the Canadian National Population Health Survey, comparing the pre-recession era (2004-05) with the Great Recession (2008-09). Quantile regressions examine how behaviour changes at different points along the outcome distribution, and we extend our DD model to allow the effects to vary across observable characteristics that are typically associated with health and labour market outcomes. Our results suggest the primary response to increased economic stress during the Great Recession was weight gain - for affected females a 2 point increase in body mass index, and for older and lower educated males a 3 point increase.

**Keywords:** Obesity, Economic Insecurity, Great Recession, Self-Medication, Difference-in-Differences

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\* Corresponding author at: Faculty of Business, University of New Brunswick, 100 Tucker Park Road, PO Box 5050, Saint John, New Brunswick, Canada E2L 4L5; Email: bwatson@unb.ca; Tel: +1 506 648 5739

# 1 Introduction

The welfare implications of macroeconomic volatility have often been downplayed on the argument that if people can borrow to finance the consumption path implied by their lifetime income, then they stay on their long run path during recessions, and an income shock need only imply a small loss in well-being.<sup>1</sup> However, an alternative perspective emphasizes the adverse effects of economic volatility for those most exposed, suggesting serious welfare implications - particularly with respect to health.<sup>2</sup> This paper adds to the literature on “costs of recessions” by examining the extent to which working age adults increased their self-medicating responses (i.e. over-eating, alcohol use, and smoking) because of greater economic insecurity (defined as job insecurity or joblessness) during the 2008-09 global recession.

Economic insecurity, defined as “inability to obtain protection against subjectively significant potential economic losses” (Osberg 1998, p. 17), has previously been found to predict weight gain and obesity.<sup>3</sup> Smith (2009) and Wisman & Capehart (2010) argue that this finding can be explained if one sees over-eating when anxious as a self-medicating response to stress which has been genetically inherited from the many millennia during which the threat of starvation was very common for most humans. Although functional in past times when calories were occasionally scarce, in a calorie-rich context over-eating, while now dysfunctional, is also an evolutionary response to anxiety resulting from a hard-wired psychological reflex. As well, Chou et al. (2004) suggest that in response to greater anxiety, individuals may also self-medicate by smoking. Barnes & Smith (2009) agree that a rise in economic insecurity predicts an increase in the likelihood of continued smoking while Grafova (2011) suggests financial strain is associated with a higher likelihood of tobacco use. As well, alcohol has long been used as a self-medicating relaxant drug. For instance, Deb et al. (2011) conclude that job loss predicts both an increase in body weight and more drinking.<sup>4</sup>

Although microeconomic studies of the links between economic insecurity and health behaviours tend to produce consensus results, research on the relationship between macroeconomic conditions and health has yielded mixed findings. For example, Ruhm (2000) previously suggested that, with the exception of suicides, the relationship between mortality and aggregate output is procyclical. However, Ruhm (2015) recently revised that perspective: “... total mortality has shifted from being strongly procyclical to being weakly related or unrelated to macroeconomic conditions” (p. 18) - a finding supported by Stevens et al. (2015) and McInerney & Mellor (2012). Ruhm (2000) also argues that both smoking and weight gain increase during periods of economic growth (see also Ruhm (2005) and Xu (2013)) but Charles & DeCicca (2008) suggest the opposite - that worsening labour market conditions are associated with weight gain for working age males in the United States. Moreover, while Novo et al. (2000) conclude that a rise in unemployment is associated with increased tobacco consumption, Ruhm & Black (2002) suggest that alcohol use decreases during poor economic times. In contrast, both Popovici &

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<sup>1</sup>Lucas (1987) remains the classic statement that welfare gains from stabilization policies are negligible.

<sup>2</sup>For example, Helliwell and Huang (2014) argue that: “For the unemployed, the nonpecuniary costs of unemployment are several times as large as those resulting from lower incomes, while the indirect effect at the population level is 15 times as large. For those who are still employed, a one percentage point increase in local unemployment has an impact on well-being roughly equivalent to a 4% decline in household income” (p. 1485). Additionally, both Wolfers (2003) and Yellen & Akerlof (2007) have suggested that macroeconomic volatility negatively impacts well-being.

<sup>3</sup>See: Offer et al. (2010); Rohde et al. (2017); Smith et al. (2009); Watson (2018); Watson et al. (2016).

<sup>4</sup>Counter to these findings, Apouey & Clark (2015) suggest that an exogenous positive income shock in the form of lottery winnings predicts increased smoking and alcohol use.

French (2013) and Davlos et al. (2012) find that a rise in the unemployment rate is associated with an increase in alcohol consumption and binge drinking.

Given this mix of previous findings, this paper seeks to clarify the connection between macroeconomic conditions and the micro-level effect of undesirable labour market outcomes on health behaviours. By examining two panels of the longitudinal Canadian National Population Health Survey (NPHS), we analyze this relationship for working age adults (aged 25-65), particularly for those most affected by business cycle fluctuations - i.e. the economically insecure. In particular, we compare the pre-recession 2004-05 panel (cycle 6) with the panel which was observed during the “Great Recession” of 2008-09 (cycle 8). In both cases, we limit the sample to those who were employed and job secure during the previous cycle of data (cycles 5 and 7 respectively). Using a dummy variable specification, we define the onset of economic insecurity as a transition to job insecure or jobless status, with the reference category being those who remained employed and job secure. We hypothesize that because adverse labour market outcomes are more stressful when the unemployment rate is high, the negative health impacts for an individual becoming job insecure or unemployed are greater during recessions.

Using a difference-in-differences (DD) design, we examine the argument that if greater economic insecurity predicts increased over-eating, alcohol use, and smoking, such behaviours will increase more when individuals become insecure during poorer economic times. Because our focus is the difference in behavioural response between recessionary and non-recessionary times, our results avoid the critique of reverse causation at the individual level. Moreover, given a large body of research suggests that males and females differ in labour market outcomes and their response to economic stress,<sup>5</sup> we perform separate analyses for men and women throughout the paper. Our DD regression model is also extended to a DD model that allows for heterogeneous effects across groups in order to evaluate income, education, and age differences in the effects of economic insecurity on self-medicating responses during stressful economic times.<sup>6</sup> Additionally, because the health impacts of increases in over-eating, alcohol use, and smoking are greatest for those who are already overweight, substantial alcohol users, or heavy smokers, we estimate quantile regression models to examine the effects of economic insecurity at differing points along the outcome distributions.

Our results suggest that, of the behaviours studied, the most common result of economic insecurity onset during the Great Recession was weight gain. For females, the onset of economic insecurity during the Great Recession increased their body mass index (BMI) by just over 2 points (i.e. a 12 pound gain for females of average Canadian height). Looking deeper, it would seem this result is driven primarily by those who were above the low-income threshold and by those who had at least some post-secondary education. Moreover, quantile regression results suggest these outcomes were largely concentrated among females who were relatively heavier to begin with. For males, older and lower educated individuals gained weight when exposed to economic insecurity during the Great Recession (approximately a 3 point increase in BMI which equals a 20 pound increase for males of average Canadian height). Quantile regression results suggest that the effect size increased for low educated males who were relatively heavier. However, the same is not true for older males as quantile regression results tended to produce

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<sup>5</sup>See: De Witte (1999); Kalil & Ziolo-Guest (2008); Kopasker et al. (2016); Lahelma (1992); Rege et al. (2011); Watson & Osberg (2018); Watson et al. (2016).

<sup>6</sup>Using Russian data, Staudigel (2016) suggests economic insecurity causes weight gain for only some population subgroups, suggesting a certain degree of heterogeneity across individuals.

effect sizes that are comparable to that found using ordinary least squares (OLS).

There is also evidence suggesting that male light smokers tended to smoke 4 to 5 more cigarettes per day and relatively older women consumed about 2.5 more drinks per week as a result of economic insecurity onset during the Great Recession, suggesting a degree of heterogeneity in behavioural responses to economic stress. However, given the relatively small effect sizes, the primary response given the onset of economic insecurity during the Great Recession was undoubtedly weight gain for both working age males and females. Although such weight gain could be due to less exercise, a robustness check suggests those who experienced economic insecurity during the Great Recession did not change their level of physical activity. Therefore, it would appear that over-eating and/or changes in composition of diet were the primary self-medicating responses to the greater economic stress induced by the recession.

Section 2 outlines the background while Section 3 describes the data and methods. Next, Section 4 presents the results and Section 5 outlines a series of robustness checks. Lastly, Section 6 discusses our key findings.

## 2 Background and Motivation

When unemployment is low and new jobs are easy to find, the prospect of losing one's current job may involve relatively less stress. Prior to the Great Recession, real gross domestic product (GDP) in Canada grew by 2.7 percent annually from 2004 to 2007, and in 2007 the annual national unemployment rate was at a thirty year low of 6 percent.<sup>7</sup> NPHS data indicate that perception of job insecurity among employed working age Canadians (aged 25-64) fell during this era from just over 13 percent in 2004 to slightly below 10 percent in 2007. This is consistent with the conclusion of Brochu & Zhou (2009) that from 1977 to 2006, such insecurity perceptions varied with business cycle fluctuations.

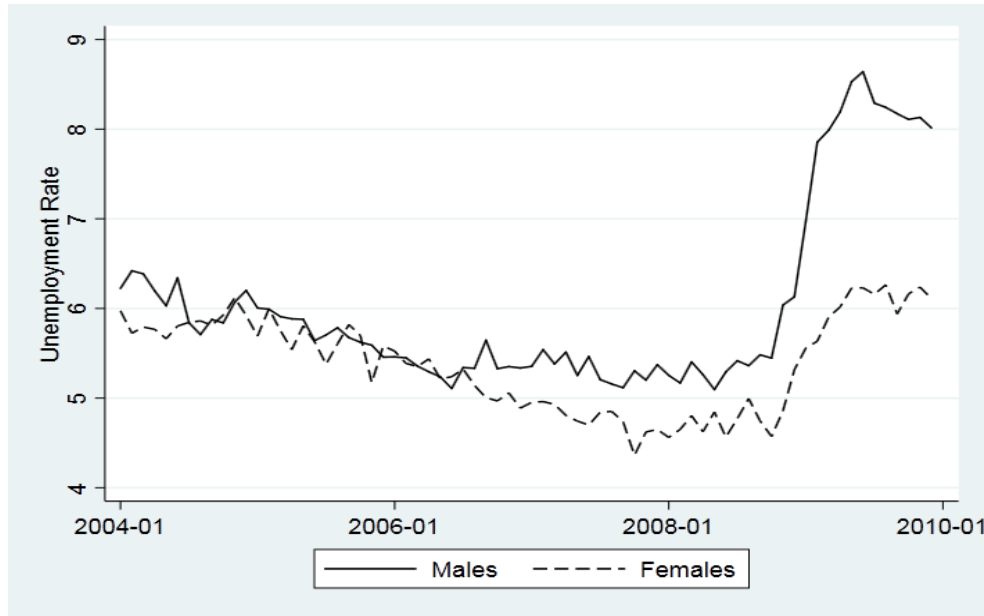
However, in October 2008 the International Monetary Fund (IMF) noted in its World Economic Outlook that: "The world economy is now entering a major downturn in the face of the most dangerous shock in mature financial markets since the 1930s" (p. 1). Throughout the world, GDP dropped, unemployment rates spiked, housing prices declined, and stock markets experienced significant decline with periods of unprecedented volatility. Based on the definition of a technical recession, the Great Recession started in Canada during the last quarter of 2008 and lasted until June 30, 2009 - i.e. real GDP declined over three consecutive quarters.<sup>8</sup> For those aged 25-64, the unemployment rate relevant to the study period is depicted in Figure 1. The spike in unemployment during the recession is apparent, reaching highs of 8.6 (male) and 6.3 percent (female).

Undoubtedly, the increase in unemployment during the Great Recession caused a substantial increase in economic insecurity (Osberg & Sharpe, 2009). Compared to previous downturns, economic insecurity was heightened by the fact that (i) it was "... much more uncommon for Canada's unemployed to receive regular EI benefits during this recession compared to previous recessions" (Osberg, 2009, p. 3) and (ii) as Osberg (2009) also suggests, most Canadian provinces had weakened their social security programs over the preceding twenty years. The Great

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<sup>7</sup>Refer to Statistics Canada, CANSIM Tables 3840038 and 2820002.

<sup>8</sup>Real GDP declined by \$76.7 billion, measured in constant 2007 dollars based on CANSIM Table 3800084.



**Fig. 1** Seasonally Adjusted Monthly Unemployment Rate for Males and Females Aged 25-64; *Source:* Statistics Canada CANSIM Table 2820087

Recession also amplified the longer run trend described by Hacker (2006) of individuals bearing more of the economic risk which had previously been pooled and managed by over-arching institutions. As a result, we argue that for the Canadian working age population, the occurrence or threat of job loss during the Great Recession was a more stressful event than it was during the prior period of economic prosperity. This paper therefore asks whether that greater stress caused changes in health behaviour with potentially long run implications.

### 3 Data and Methods

#### 3.1 Data

In this study, we use two cycles of self-reported longitudinal data (cycles 6 and 8) drawn from the Canadian NPHS which commenced in 1994-95 (cycle 1) and was administered every two years until 2009-10 (cycle 9). Its objective was to measure the health, socio-economic and demographic status of Canadian residents. Because NPHS used a stratified sampling procedure based on selection of households within geographical clusters stratified by socioeconomic characteristics, a set of 500 individual-specific bootstrapping weights are provided. Notably, these weights were also designed to help adjust for non-response. Thus, to account for sampling design and non-response, we use individual-level longitudinal population weights in all statistical analyses.

To abstract from the employment instability of the youth labour market and from retirement decisions among the elderly, the pooled sample used in this paper is restricted to respondents aged 25-64, inclusive. NPHS did not survey Aboriginal peoples living on reserve. Moreover, given the small number of observations (less than 0.25 percent of the sample) and very different economic circumstances, residents of the Canadian Territories are excluded from the analysis.

The limitations of our study include the fact that NPHS data are self-reported, which has the potential to create measurement error. Stommel & Schoenborn (2009) find that while respondents who are heavy (BMI > 28) tend to underestimate their BMI, those who are light (BMI < 22) are more likely to overestimate. A systematic review by Gorber et al. (2007) suggests that, on average, adults tend to under-report their weight but over-report their height. A comparison of Canadian body weight averages suggests there is some under-reporting of excess weight. Specifically, the self-reported 2007-08 Canadian Community Health Survey (2008) found that 33.7 percent of Canadian adults were overweight and 17.4 percent were obese. During the same period, the Canadian Health Measures Survey (2008), using measured data, found that 37 percent of Canadian adults were overweight and 24 percent were obese. Similarly, Livingston & Callinan (2015) suggest self-reported alcohol consumption tends to be under-stated by about 40 to 50 percent but heavy drinkers are actually less likely to under-report their alcohol consumption than infrequent drinkers. For present purposes, the key question is whether the amount of under-reporting is correlated with observable characteristics.

### 3.2 Dependent Variables

We examine the effects of economic insecurity on three health-related outcomes: body weight, alcohol use, and smoking. Body weight is measured using self-reported height and weight in order to calculate the respondent's BMI (mass in kilograms divided by height in meters squared).<sup>9</sup> The objective of any adiposity index is measurement of body fat. Although BMI calculations are not adjusted for fat-free mass such as bone and muscle, and more accurate measures of fatness such as waist-to-hip ratio, waist circumference, and skinfold thickness were not collected by NPHS, Heineck (2007) finds that BMI, relative to these more sophisticated techniques, tends to produce similar findings regarding labour market outcomes.

Alcohol consumption is measured using a continuous variable based on the respondent's self-reported typical number of drinks consumed per week, ranging from 0 to just over 100. This variable only includes those who reported having at least one drink during the 12 months prior to the survey date. The smoking variable is attributable to those who report daily smoking and is measured as typical daily smoking frequency, ranging from 1 to almost 70 cigarettes per day.

### 3.3 Economic Insecurity

Perceived job insecurity measures the respondent's subjective assessment of their current level of job security. The respondent was asked to evaluate the statement "my job security is good" on a 5 point Likert scale, ranging from "strongly agree" (1) to "strongly disagree" (5). However, the category "strongly disagree" contains less than 1.5 percent of the sample which precludes the inclusion of a set of dummy variables representing each possible response. As a result, this study uses a dichotomous perceived job insecurity variable equal to unity if respondent  $i$  in time period  $t$  was to "disagree" or "strongly disagree" (values 4 and 5 respectively) with the above statement;

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<sup>9</sup>Pregnant women are excluded given their BMI score is a misleading indication of obesity. Although the Canadian Guidelines for Body Weight Classification in Adults recommends that BMI not be calculated for lactating women, NPHS does not ask females respondents if they are lactating and thus they are included in the study. In our data, less than 0.3 percent of the distribution has a BMI value below 15. Since BMI < 15 is often used as an indicator of starvation and most of these observations are of nonsensical value (e.g. BMI = 0), they are deleted. Inspection of the upper range of data gives no reason to suspect measurement error with the largest weight reported being slightly over 180 kilograms ( $\approx$  400 pounds).

zero otherwise (values 1, 2 and 3 which correspond to “strongly agree”, “agree”, and “neutral” respectively).

Those who were either unemployed or not in the labour force at the time of the survey were not asked about job insecurity. As a result, there are four distinct possible employment categories for each respondent at the time of survey: (i) employed and job secure; (ii) employed and job insecure; (iii) unemployed; or (iv) not in the labour force. We define the respondent to have become economically insecure if they transitioned from a state of employed and job secure in the previous cycle to a state of job insecurity or joblessness in the current (i.e. (i)  $\rightarrow$  (ii or iii or iv)) with those who remained job secure characterizing the reference category.<sup>10</sup>

### 3.4 Additional Explanatory Variables

In addition to labour market status, we control for socio-economic status using a set of low-income and education dummy variables. Low-income is defined as household income falling below Statistics Canada’s Low Income Cut-Off (LICO).<sup>11</sup> Education is controlled for with a dummy variable for highest education level being high school completion or less; zero otherwise. Additional socio-demographic controls include: age (between 45 and 64, with 25-44 being the reference category), race (visible minority or otherwise), being an immigrant, marital status (married or otherwise), and region of residence (Quebec<sup>12</sup> or otherwise and rural residence or otherwise). While dire macroeconomic events may trigger a stress response for those most vulnerable, competing household-level concerns could also produce an increase in stress-related activities. Therefore, we also control for a set of stressful life events which include: the onset of marriage, divorce, widowhood, chronic illness, and the presence of children under the age of five. Lastly, using Statistics Canada Consumer Price Index data, we also include controls for food, alcohol, and cigarette prices in the respective BMI, alcohol use, and smoking regressions.

### 3.5 The DD Method

To answer this paper’s key question, we use a natural experiment design to estimate effect sizes, making use of the exogeneity of the Great Recession. The onset of the Great Recession (2008-09) is thought of as the “policy period” while the 2004-05 pre-recession period forms the “pre-policy” era. Based on the definition of a technical recession, we define the recessionary period in Canada to have occurred from October 1st, 2008 until June 30th, 2009. Observations during this period are coded unity ( $GR = 1$ ) and values occurring in cycle 6 are coded zero ( $GR = 0$ ).<sup>13</sup> The “control” group ( $EI = 0$ ) include those who sailed through the pre-recessionary and recessionary

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<sup>10</sup>Note that classification is based on the respondent’s labour status at the time of the survey. Unfortunately, NPBS did not ask respondents to report on their retrospective labour status (e.g. unemployed or not in the labour force during the 52 weeks prior to the survey). This has the potential to attenuate results and is further discussed in Section 6.

<sup>11</sup>LICO values incorporate adjustments for household size and location of residence and are a poverty line methodology which is uniquely Canadian. In addition to LICO, we also defined low-income using the Statistics Canada’s Low Income Measure, which is internationally comparable. It is defined as household income (adjusted for household size using the Luxembourg Income Study equivalence scale) below 50 percent of the sample median. Key results remained unchanged.

<sup>12</sup>The Quebec dummy variable can be seen as a test of whether Canada’s only Francophone province is, in this context, distinctly different from the rest of the Country in cultural and political characteristics.

<sup>13</sup>If the observations during cycle 8 did not occur during this 9 month policy period time frame, they are excluded from the study. Descriptive statistic comparisons suggest those excluded do not statistically differ from those included in the study.



eras unscathed (tenured university professors would be an example). In contrast, the “treatment” group ( $EI = 1$ ) are those who were employed and economically secure during the previous cycle of data (cycles 5 or 7), but became job insecure, unemployed, or no longer in the labour force.<sup>14</sup>

Given individuals may have become economically insecure during either the pre-recession or recessionary era, an interaction term ( $GR \times EI$ ) provides a DD method of identification. Estimating Equation 1 using OLS examines the question: do individuals engage in more self-medicating behaviour ( $Y$ ) when becoming economically insecure during more difficult economic times? Thus, we estimate the following regression equation:

$$Y_{i,t} = \alpha_0 + \alpha_1 GR_t + \alpha_2 EI_{i,t} + \alpha_3 (GR \times EI)_{i,t} + X'_{i,t} \alpha + e_{i,t} \quad (1)$$

where:

$GR \times EI$  = the DD estimator,

$X$  = a set of control variables,

$e$  = error term, and

$i$  indexes for the individual and  $t$  indexes for time.

Our hypothesis is that economic stress is associated with more self-medicating behaviour, which suggests  $\alpha_2$  will be positive. That is, regardless of the economic climate, because transitioning to perceived job insecurity, unemployment, or being out of the labour force is stressful, such transitions are associated with self-medicating responses. In addition, the key hypothesis of this study is:  $\alpha_3 > 0$ . We hypothesize that the interaction coefficient ( $\alpha_3$ ) will be positive since during a recession, employment, and especially job secure employment, is harder to come by. Thus, relative to the pre-recession era, the onset of economic insecurity during a recessionary period is predicted to cause more weight gain, alcohol use, and smoking.

### 3.6 Allowing for Heterogeneous Effects

#### *Extension of the DD Model*

We also examine if certain observable characteristics may be associated with more self-medicating behaviour given the onset of economic insecurity during recessionary periods. Hence, Equation 2 presents a model allowing the DD effect to vary across groups:

$$Y_{i,t} = \beta_0 + \beta_1 GR_t + \beta_2 EI_{i,t} + \beta_3 Z_{i,t} + \beta_4 (GR \times EI)_{i,t} + \beta_5 (GR \times Z)_{i,t} + \beta_6 (Z \times EI)_{i,t} + \beta_7 INT_{i,t} + X'_{i,t} \beta + u_{i,t}. \quad (2)$$

Where:

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<sup>14</sup>We exclude those not in the labour force due to pregnancy, caring for a child, or being enrolled as a student.

$Z$  = an observable characteristic,

$INT$  = DD estimator given the interaction of the Great Recession dummy variable with the observable characteristic and the economic insecurity variable, and

$u$  = error term.

In this instance, the coefficient associated with  $INT$  captures the additional effects on  $Y$  given the characteristic  $Z$  for those who were economically insecure during the Great Recession. For instance, consider the outcome variable is BMI and the characteristic in question is age where we derive a dummy variable equal to unity if the respondent reported being between the age of 45 and 64; zero otherwise. Our DD estimator in this case would examine whether relatively older individuals who are economically insecure, self-medicate by over-eating during stressful economic times to a greater degree than younger individuals. In contrast,  $GR \times EI$  captures the DD estimator for the reference group, which in the above example would be those aged 25-44.

We examine three individual characteristics: income, education, and age. Specifically, we ask whether those with low-income, high school or less education, or aged 45 and over differ in response to becoming insecure during stressful times. In analyzing the potential for heterogeneous effects, these characteristics were chosen because they are associated with economic prospects (Oesch, 2010; Virick, 2011), reactions to stress (Mroczek & Almeida, 2004), as well as rates of obesity, alcohol consumption and smoking (Cawley & Ruhm, 2011; Salmasi & Celidoni, 2017). Thus it is plausible these groups have different self-medicating responses to economic insecurity during stressful times. For example, Watson et al. (2016) find that low educated males experience considerable weight gain caused by economic insecurity, but find no statistically significant effect for those with more than high school education.

### *Quantile Regression*

In empirical economics, OLS has long been a standard tool of analysis. However, quantile regression can produce more efficient estimates for specific quantiles of the dependent variable conditioned on a set of explanatory variables (Koenker & Hallock, 2001). This allows for the examination of the association between economic insecurity and its health implications for differing points along each outcome's distribution. Because weight gain for thin people may have little impact on health, but weight gain for those who are already overweight may be much more important, the estimated effect of economic insecurity on the conditional mean of BMI may not be as important as the predicted effect of greater insecurity on weight gain at the upper tail of the BMI distribution.

Quantile regressions thus act as further tests of heterogeneity regarding health implications of economic insecurity. Therefore, we extend Equations 1 and 2 to include a series of regressions evaluating effect sizes at each quantile of the outcome distribution. Our econometric approach comes from Firpo et al. (2009) which estimates treatment effects over the unconditional quantiles of the response variable. This differs from the traditional quantile regression estimator of Koenker & Bassett (1978) which defines quantiles after conditioning on  $X$ .

The unconditional quantile estimates are of greater interest than their conditional counterparts, as it is more likely that the effects of economic insecurity vary according to an individual's

absolute position in the distribution of  $Y$ , rather than their position in  $Y|X$ . As an example, if BMI is the dependent variable, overweight individuals (who may have already established over-eating as a mechanism for stress diffusion) might plausibly be more affected than the rest of the distribution by adverse economic events. The unconditional quantile estimator works by re-weighting  $Y$  for each regression such that the transformed mean is equal to that of a given quantile. Following Firpo et al. (2009) let us define the influence function  $IF$  at quantile  $\tau$  as

$$IF(Y; q_\tau) = (\tau - \mathbf{1}\{Y \leq q_\tau\})/f_Y(q_\tau). \quad (3)$$

Here,  $\mathbf{1}\{Y \leq q_\tau\}$  is the indicator function which is equal to one when  $Y$  is less than the value specified by quantile  $\tau$ ; zero otherwise, and  $f_Y(q_\tau)$  is the marginal distribution of  $Y$  estimated non-parametrically using kernel methods. Adding  $q_\tau$  re-centres this function such that its mean is equal to the distributional value at the appropriate value of  $\tau$ . This gives the transformed dependent variable which can be modeled using standard regression techniques:

$$RIF(Y; q_\tau) = q_\tau + IF(Y; q_\tau). \quad (4)$$

We then estimate the right-hand side specification as per Equation 1 using OLS:

$$E[RIF(Y_{i,t}; q_\tau)] = \alpha_0^\tau + \alpha_1^\tau GR_t + \alpha_2^\tau EI_t + \alpha_3^\tau INT_{i,t} + X'_{i,t} \alpha^\tau + e_{i,t} \quad (5)$$

This is done for multiple quantiles whereby we use 5 percentage point intervals (i.e.  $\tau_1 = 0.05$ ,  $\tau_2 = 0.1$ , . . . ,  $\tau_{19} = 0.95$ ) such that the full distributional impact of economic insecurity is approximated. As in the previous instance,  $\alpha_3^\tau$  is interpreted as a causal effect (subject to the exogeneity assumptions outlined above) however the estimate is localized to people at rank  $\tau$ . This same procedure is then applied to Equation 2 such that  $\beta_7^\tau$  and  $\beta_4^\tau$  are the causal effects of interest for those at rank  $\tau$ .

## 4 Results

### 4.1 Descriptive Statistics

Table 1 presents the means and standard deviations of key variables. As expected, mean BMI values for males and females increased over the study period and in all cases exceeded the overweight threshold of 25. Regarding alcohol use, males who reported having at least one drink in the past 12 months, on average, consumed about 5 to 6 drinks per week, increasing by almost half a drink when comparing the Great Recession period with the pre-recession era. For females, a similar increase transpired, although the average level of consumption was somewhat lower at about 2.5 to just over 3 drinks per week. Average cigarette consumption for male smokers increased slightly, going from 17 to almost 19 cigarettes per day. Female smokers however experienced a decrease of about 2 cigarettes per day on average when comparing the recessionary period with the pre-recession era (14 to 12 cigarettes per day).

Unsurprisingly, the mean level of economic insecurity increased for both working age males and females when comparing the pre-recession era with the Great Recession. The increase was most pronounced for males where prevalence of insecurity went from 12.60 percent to 17.75 percent. For females, the increase was slightly over 2.5 percentage points, rising from 13.85 percent to 16.43 percent.

**Table 1. Key Descriptive Statistics**

Variables	Males		Females	
	Pre-Recession	Recession	Pre-Recession	Recession
Body Mass Index	27.22 (4.27)	27.64 (4.53)	25.74 (5.25)	26.25 (4.75)
Alcohol Use (Per Week)	5.74 (8.63)	6.20 (8.34)	2.50 (3.77)	3.37 (5.10)
Cigarettes (Per Day)	17.06 (8.69)	18.61 (7.24)	14.01 (7.41)	11.95 (6.28)
Economic Insecurity Onset (%)	12.60 (33.12)	17.75 (38.25)	13.85 (34.56)	16.43 (37.09)
Income: Below LICO (%)	5.52 (22.84)	5.56 (22.93)	8.26 (27.53)	8.63 (28.12)
High School Education or Less (%)	23.79 (42.59)	22.40 (41.74)	20.64 (40.48)	18.97 (39.25)
Age: 45-64 (%)	49.85 (50.01)	54.37 (49.86)	48.65 (50.00)	49.94 (50.05)

*Notes:* Standard deviations in parentheses.

## 4.2 OLS Regression Results

Tables 2 (males) and 3 (females) present the interaction variable parameter estimates,  $\alpha_3$  and  $\beta_7$ , from Equations 1 and 2 respectively. A series of tables which present the results of all variables under consideration are included in the Appendix (Tables A1-A4). BMI results are based on 2,503 and 2,194 observations of males and females respectively. Alcohol use results are derived from 2,214 male and 2,081 female observations. Lastly, daily smoking regressions evaluate 504 male and 431 female observations.<sup>15</sup>

In several contexts, overall results mask underlying heterogeneity. For the entire sample of working age males, it appears that BMI, alcohol use, and smoking habits did not change in light of economic insecurity during the Great Recession. However, males exposed to economic insecurity with high school education or less are predicted to have experienced an increase in BMI of just over 3 points during the Great Recession, a finding consistent with Watson et al. (2016). Additionally, males aged 45-64 exposed to economic insecurity are also predicted to have experienced an increase in BMI of almost 3 points during the Great Recession. Results regarding alcohol use and smoking are in all cases statistically insignificant at conventional levels.

For working age females, OLS regressions based on Equation 1 suggest an increase of about 2 BMI points given the onset of economic insecurity during the Great Recession. Interestingly, females who possessed at least some post-secondary education are expected to have gained about 2.5 BMI points as a result of economic insecurity during the Great Recession. Furthermore, economically insecure females who were above the Statistics Canada low-income threshold are also expected to have experienced a rise in BMI of just over 2 points during the recessionary period.

Moreover, results regarding alcohol use suggest that relatively older females (aged 45-64) are predicted to have consumed about 2.5 more drinks per week should they have experienced

<sup>15</sup>Because alcohol data only exist for those who reported having at least one drink in the previous 12 months and the number of cigarettes smoked per day is applicable to only those who smoke, there is a possibility of sample selection bias. A Heckman selection model was therefore estimated. Using both the 1- and 2-stage estimation methods and a lag variable of alcohol use and smoking for their respective selection equations, results in all cases were largely unchanged. These results are available upon request.

**Table 2. Select OLS Regression Results - Males**

	<b>Body Mass Index</b>	<b>Alcohol Use (Per Week)</b>	<b>Cigarettes (Per Day)</b>
Equation 1: DD Estimator ( $\alpha_3$ )	-0.0428 (0.68)	-3.1022 (2.65)	0.9596 (2.47)
Equation 2: DD Estimator Given:			
Income is Below Low Income Cut-Off (LICO) ( $\beta_7$ )	1.8151 (2.56)	2.9849 (4.49)	5.0134 (7.18)
<i>Reference Category: Income is Above LICO (<math>\beta_4</math>)</i>	0.0980 (0.69)	-3.3342 (2.85)	1.0429 (2.57)
Education: High School or Less ( $\beta_7$ )	3.0458* (1.61)	-8.0644 (7.63)	-2.3566 (5.32)
<i>Reference Category: At Least Some Post-Secondary (<math>\beta_4</math>)</i>	-0.7914 (0.76)	-0.9163 (1.60)	2.003 (3.27)
Age: 45-64 ( $\beta_7$ )	2.9184** (1.40)	4.6626 (6.13)	4.7879 (4.95)
<i>Reference Category: Age: 25-44 (<math>\beta_4</math>)</i>	-1.7682 (1.16)	-5.8429 (5.70)	-1.1351 (3.20)

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 6 and 8 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.

economic insecurity during Great Recession. However, in complete contrast, economically insecure younger females (aged 25-44) are expected to have consumed about 2.5 less drinks per week during the recession. Results regarding smoking are in all cases statistically insignificant.

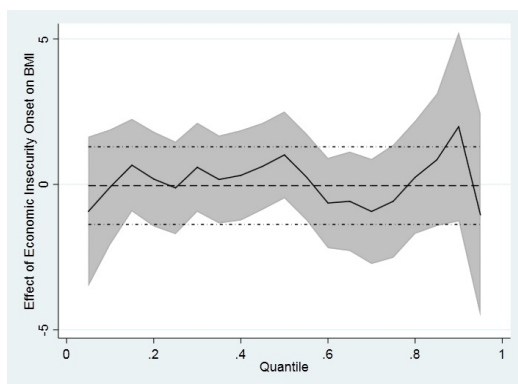
**Table 3. Select OLS Regression Results - Females**

	<b>Body Mass Index</b>	<b>Alcohol Use (Per Week)</b>	<b>Cigarettes (Per Day)</b>
Equation 1: DD Estimator ( $\alpha_3$ )	2.1439** (0.96)	-1.1072 (0.85)	-1.6123 (3.15)
Equation 2: DD Estimator Given:			
Income is Below Low Income Cut-Off (LICO) ( $\beta_7$ )	-0.7586 (5.70)	1.0135 (1.95)	9.3698 (7.32)
<i>Reference Category: Income is Above LICO (<math>\beta_4</math>)</i>	2.0190** (0.97)	-1.1618 (0.89)	-2.6495 (3.40)
Education: High School or Less ( $\beta_7$ )	-1.6846 (2.47)	2.1828 (1.97)	0.2963 (6.22)
<i>Reference Category: At Least Some Post-Secondary (<math>\beta_4</math>)</i>	2.5012** (1.08)	-1.4924 (0.98)	-1.4425 (3.81)
Age: 45-64 ( $\beta_7$ )	2.7479 (1.81)	2.5982* (1.53)	1.0233 (5.16)
<i>Reference Category: Age: 25-44 (<math>\beta_4</math>)</i>	0.6405 (1.56)	-2.4982*** (0.95)	-0.7968 (3.14)

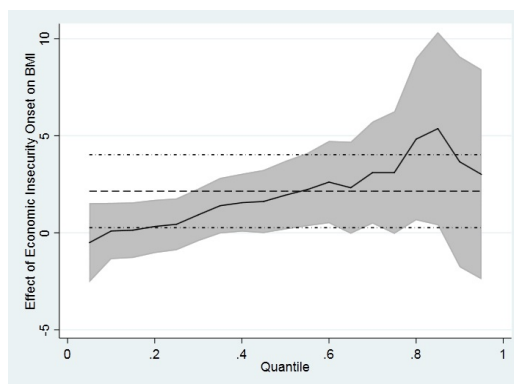
Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 6 and 8 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.

### 4.3 Quantile Regression Results

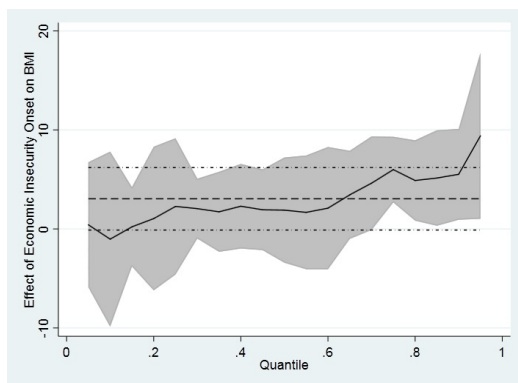
We examine the impact of economic insecurity during difficult economic times on BMI using quantile regression for the groups whom OLS results show an overall effect.<sup>16</sup> These results are depicted in Figures 2 to 4. In each case the horizontal axis gives the unconditional quantile for the self-medicating response and the vertical axis shows point estimates with 95 percent confidence intervals depicted in greyscale. For ease of comparison the figures also depict: (i) coefficients obtained from the OLS model, and (ii) 95 percent intervals surrounding these estimates.



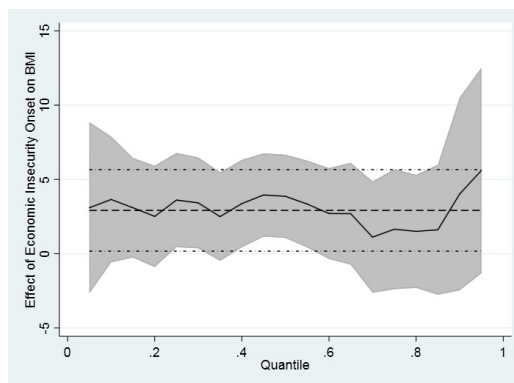
**Fig. 2a** Male BMI results given economic insecurity onset during the Great Recession



**Fig. 2b** Female BMI results given economic insecurity onset during the Great Recession



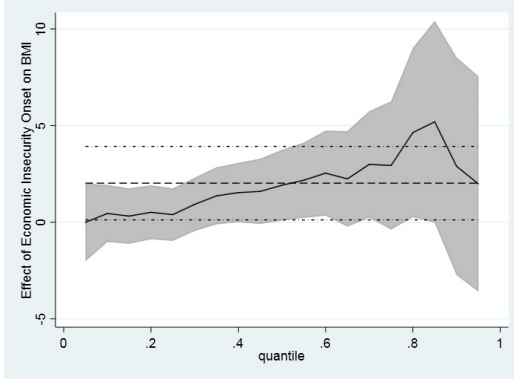
**Fig. 3a** Male BMI results given economic insecurity onset during the Great Recession for those with high school education or less



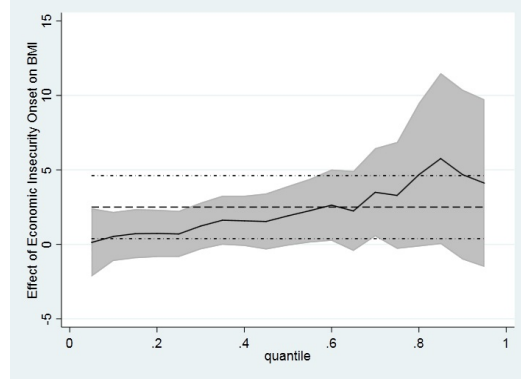
**Fig 3b** Male BMI results given economic insecurity onset during the Great Recession for those aged 45-65

BMI quantile regression results regarding the effect of economic insecurity onset during the Great Recession are presented in Figures 2a and 2b for males and females respectively. The quantile regression results for males line up strongly with the estimate from the OLS model. Specifically,

<sup>16</sup>To ensure we did not overlook any potential vices that may have been pursued by those at differing points along the outcome distributions, we examined the effect of economic insecurity during the Great Recession across all outcome variables, allowing this DD effect to vary across groups. The only notable result not presented above is that males who were light smokers (10th to 35th percentile) tended to smoke 4 to 5 more cigarettes per day as a result of economic insecurity during the Great Recession - a result not evident using OLS methods.



**Fig. 4a** Female BMI results given economic insecurity onset during the Great Recession for those with above LICO income



**Fig. 4b** Female BMI results given economic insecurity onset during the Great Recession for those with at least some post-secondary

the point estimates are small with broad standard errors suggesting results are statistically insignificant at conventional levels. This confirms that our null result is not an artifact of offsetting negative and positive effects at different ends of the BMI distribution.

The estimates for females show that the onset of economic insecurity predicts weight gain (as per the OLS model), however, the figure shows that this effect is driven only by the centre and right tail of the BMI distribution. The steady increase in parameter estimates for higher quantiles implies that the more overweight a woman is, the greater the impact on her BMI. For example, estimates at the 80th percentile (BMI  $\approx$  35) are approximately double the sample average, indicating that these individuals are twice as strongly affected.

Figures 3a and 3b present BMI quantile regression results regarding our DD estimator for males who had high school education or less, and for those who were relatively older. For poorly educated males, quantile regression results suggest that our OLS findings are driven primarily by those who were relatively heavier. However, for males aged 45-64, quantile regression results tend to produce a fairly consistent stream of coefficients across percentiles which are very much in line with the OLS result, implying that no specific weight category is driving this finding.

Our key results for females who were above the low-income threshold and for females with at least some post-secondary education are presented in Figures 4a and 4b. It would seem that, as in the case of Figure 2a, weight gain from economic insecurity onset during stressful times is being driven by those who are overweight or obese. Along the distribution there is a general rise in the magnitude of the coefficient, reaching its peak at the 85th percentile.

## 5 Validity Tests and Robustness Checks

### 5.1 Parallel Trends

In the absence of the Great Recession, the average change for all outcome variables are assumed to have been the same for both the economically secure and insecure. This assumption does not require that the outcome levels be the same in the pre-recession era; only the difference. Thus,

the trends in BMI, alcohol use, and smoking are assumed to have been the same during the pre-recession years for both groups of respondents.

To test the validity of our results, a placebo regression was specified where instead of evaluating cycles 6 and 8, our focus was on comparing cycles 5 (2002-03) and 7 (2006-07). Both cycles 5 and 7 were a prosperous era for many Canadians with robust GDP growth and a low unemployment rate. Using cycles 5 and 7, if our DD estimators regarding Equations 1, 2, and 5 are statistically significant, it would cast doubt on our previous results which suggest the Great Recession caused those who became economically insecure to peruse more self-medicating behaviour.

However, results presented in Table 4 suggest economic insecurity occurring in cycle 7 did not cause self-medicating behaviour to statistically differ from that of cycle 5. There are only two cases where the DD estimator is statistically significant. Females who were not low-income along with those who had relatively high education tended to drink about 0.9 less drinks per week as a result of economic insecurity during cycle 7 in comparison to cycle 5. Hence, these results provide support in interpreting our results as causal.

## 5.2 Changes to “Policy” Date

For this study, we define the recessionary period as occurring between October 1, 2008 and June 30th, 2009 - coinciding with the technical recessionary period in Canada. However, at the beginning of 2008, the onset of major stock market volatility captured a lot of media exposure. During this time, large stock market fluctuations often received front page news attention and were often linked with sensationalist terminology. Therefore, as a robustness check, we revise our definition of the recessionary era to also include January 1, 2008 to September 30th, 2008.

While most people do not own stocks, some may view stock market movements as an indicator of macroeconomic health. So when working age individuals hear of negative stock market shocks, does that conjure up thoughts of recessions which could be particularly stressful? As a test of the potentially distressing effects of market volatility, we test whether our findings are robust to a “policy” date which begins nine months prior to the contraction of real GDP.

Interestingly, this recessionary period specification produces dampened, and in certain cases, statistically insignificant effects regarding our key results. Like in the previous sub-section, these results suggest that the technical recession period of actual contractions in real economic activity was what mattered for stress and economic insecurity.<sup>17</sup>

## 6 Discussion and Conclusion

This study asks whether the onset of economic insecurity (i.e. job insecurity or joblessness) predicts a change in self-medicating behaviour for working age Canadians and whether this change in behaviour becomes more pronounced during poor macroeconomic conditions. We examine these questions using a DD method, thinking of the global recession of 2008-09 as a natural experiment. To test for potentially heterogeneous effects, we evaluate the impact of economic insecurity on self-medicating outcomes based on low-income status, education, and age

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<sup>17</sup>These results are available from the lead author upon request.



**Table 4. Select OLS Regression Results - Validity Test: Parallel Trends  
(Using Cycles 5 and 7)**

<i>Males</i>	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)
Equation 1: Onset of Economic Insecurity ( $\alpha_3$ )	-0.3882 (0.47)	-0.8106 (1.17)	-1.5230 (1.82)
Equation 2: Onset of Economic Insecurity Given:			
Income is Below Low Income Cut-Off (LICO) ( $\beta_7$ )	-2.1498 (1.84)	0.8327 (4.71)	2.5934 (6.90)
<i>Reference Category: Income is Above LICO</i> ( $\beta_4$ )	-0.2040 (0.49)	-0.8423 (1.20)	-1.4160 (2.03)
Education: High School or Less ( $\beta_7$ )	0.0713 (1.10)	2.4208 (2.73)	0.2645 (3.92)
<i>Reference Category: At Least Some Post-Secondary</i> ( $\beta_4$ )	-0.3760 (0.53)	-1.3945 (1.30)	-1.9444 (1.95)
Age: 45-64 ( $\beta_7$ )	-0.3854 (0.92)	0.9087 (2.23)	-2.2364 (3.75)
<i>Reference Category: Age: 25-44</i> ( $\beta_4$ )	-0.1863 (0.65)	-1.1329 (1.78)	-0.7237 (2.84)
<i>Females</i>			
Equation 1: Onset of Economic Insecurity ( $\alpha_3$ )	0.8602 (0.62)	-0.7772 (0.49)	-0.4810 (1.85)
Equation 2: Onset of Economic Insecurity Given:			
Income is Below Low Income Cut-Off (LICO) ( $\beta_7$ )	-0.0481 (2.11)	-0.1322 (1.93)	1.0113 (4.33)
<i>Reference Category: Income is Above LICO</i> ( $\beta_4$ )	0.7846 (0.63)	-0.8695* (0.50)	-0.9897 (2.78)
Education: High School or Less ( $\beta_7$ )	0.5094 (1.67)	0.3601 (1.21)	-1.6834 (4.14)
<i>Reference Category: At Least Some Post-Secondary</i> ( $\beta_4$ )	0.6755 (0.71)	-0.9026* (0.53)	0.1441 (2.37)
Age: 45-64 ( $\beta_7$ )	-0.9417 (1.21)	-0.0242 (0.92)	-3.0979 (3.08)
<i>Reference Category: Age: 25-44</i> ( $\beta_4$ )	1.3542 (0.91)	-0.7169 (0.65)	-0.0752 (2.02)

*Notes:* \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 5 and 7 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.

and run a series of quantile regressions to examine whether the onset of economic insecurity has differing impacts at various points along the self-medicating outcome distributions.

Our key results suggest that the primary impact of economic insecurity during stressful economic times is weight gain. Females, primarily those who reported having a relatively high level of education and/or were above LICO, are predicted to have gained about 2 points on the BMI scale as a result of economic insecurity during the Great Recession. For a female of average height, this translates to a gain of about 12 pounds. Furthermore, during the Great Recession, both relatively older and low educated males tended to experience weight gain as a result of economic insecurity. In both cases, the increase was about 3 points which, for a male of average height, is a gain of about 20 pounds.

As a test on these results, we ran a series of regressions akin to those detailed above, but with an

energy expenditure index as the dependent variable.<sup>18</sup> For both males and females, regardless of observable characteristics, energy expenditure patterns did not change as a result of economic insecurity during the Great Recession. Therefore, it would appear that our BMI results are primarily being driven by either over-eating or a change in dietary composition as predicted by the literature (see: Smith (2009); Wisman & Capehart (2010)).

Watson et al. (2016) find that lower educated males are likely to gain weight as a result of job loss during periods of reduction in social safety nets. This is a similar finding to our research in terms of statistical significance and impact. However, our results regarding BMI also show a strong impact for women, especially those who are well-educated and/or above LICO. It is plausible that concerns about discrimination, which has historically affected the position of women in the labour market, may have been present when faced with economic insecurity during the Great Recession.

Altonji & Blank (1999) suggest discrimination explains some of long-standing gender wage gap.<sup>19</sup> However, they also argue that the gender wage gap has shrunk over time due to declining marriage and birth rates, as well as the increased importance of cognitive and interpersonal skills in the labour market. Moreover, Drolet (2011) finds that Canadian men and women are increasingly similar in terms of educational attainment, job tenure, and unionization rates. She suggests this may explain some of the reduction in the gender wage gap, which fell from 25 percent in 1998 to 17 percent in 2008. Additionally, attitudes toward gender roles have changed over time, becoming more egalitarian. For example, Fortin (2005) finds the belief that “when jobs are scarce, men should have more right to a job than women” has been declining across birth cohorts and time in OECD countries.

Although the effects of gender-based economic discrimination have likely dampened, it still negatively affects female labour market outcomes. Using Canadian data, Yap & Konrad (2009) find that women are less likely to be promoted than Caucasian males, and Javdani & McGee (2015) conclude that women in Canada tend to experience less wage growth in light of promotion. Therefore, even if an affected female was to regain secure employment, the reduced prospects of wage growth may certainly be concerning. Thus, we speculate that, even though women have been faring better in recent years, stress from the onset of economic insecurity during the Great Recession may have been compounded by the uncertainty of returning to secure employment given the threat of discrimination.

Results also suggest relatively older women are likely to drink more as a result of economic insecurity during poor economic times. Ruhm & Black (2002) suggest alcohol use is procyclical, a result primarily driven by heavy drinkers. On average, relatively older females are not heavy drinkers. In fact, statistically they are some of the lightest drinkers in our survey. Therefore, while drinking may rise for this group, it is less likely to be as concerning as weight gain (which has a much larger effect size) given both the parameter estimate (2.5 more drinks per week) and the starting point (i.e. a low level of expected drinks per week). In lieu of number of drinks per week, Equations 1, 2, and 5 were run with the frequency of five or more drinks on one occasion

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<sup>18</sup>This index measures the respondent’s daily energy expenditure, in both frequency and duration terms during the 12 months preceding the survey. Activities are adjusted based on their metabolic energy cost (MET) relative to when the body is at rest. For instance, activities requiring twice the amount of energy relative to when the body is at rest receive a MET value of 3.

<sup>19</sup>More recent work has also focused on psychological factors such as risk and social preferences, attitudes toward competition and negotiation (Bertrand, 2011).

during the past 12 months as the outcome variable - a level often associated with binge drinking. With the exception of relatively young and highly educated females who are predicted to binge drink less, key results were statistically insignificant. Thus, it seems insecurity during stressful economic times is not predicting more alcohol abuse among working age adults.

BMI quantile regression results for working age females - primarily those who were above the low-income threshold and those with at least some post-secondary education - suggest a steady increase in parameter estimates for higher quantiles. The same is true for males with a relatively low level of education (i.e. high school completion or less). This finding is novel for several reasons. First, it is consistent with a behavioural model where only some individuals overeat (or change the composition of their diet) as a stress diffusion mechanism. In this case, over-consumption of food causes these individuals to develop elevated BMIs, which opens up the observed association with our estimated effect sizes. Second, as mentioned above, it is possible that a feedback loop occurs where a higher BMI leads to weight discrimination, which in turn makes the person more likely to be economically insecure, causing them to overeat in response to such stress.

As previously mentioned, retrospective data on employment status is not available. Thus, we only know the respondent's employment status at the time of survey. It is possible that a respondent who was recently economically insecure found a secure job just prior to the survey date. As suggested by both Clark et al. (2001) and Knabe & Ratzel (2011), past bouts of economic hardship may have negative lingering effects even after the person finds subsequent employment. Also, the fact that NPHS data is self-reported is concerning given people are likely to under-report certain characteristics/behaviours as discussed in Section 3.1 and such under-reporting, especially regarding body weight, may be more apparent at the high end of the distribution. These issues are likely to cause an attenuation bias suggesting our results are perhaps conservative estimates of the health impacts from economic insecurity during stressful economic times.

## 6.1 Conclusion

In both good times and in bad, some of the workforce have insecure employment, and an emerging literature has examined the health implications of that economic insecurity.<sup>20</sup> Although our results suggest a degree of heterogeneity, increased weight gain tends to be the most common health impact of economic insecurity during stressful economic times. Such weight gain is unlikely to be reversed in light of secure employment in the future - especially if the respondent was previously already overweight (Daouli et al., 2014). This suggests that for some of the economically insecure, the adverse impacts of a business cycle shock, even if secure employment is subsequently found, may not be just transitory.

Moreover, it should be recognized that labour market discrimination may accentuate the financial consequences of more weight gain as a result of greater economic insecurity. Both Chu & Ohinmaa (2016) and Larose et al. (2016) find that increased body weight is a predictor of lower income for females, but not males. Such gender differences in weight discrimination suggests that women who become economically insecure and subsequently gain weight are more prone to financial penalization, which may expose them to the potential of a feedback loop whereby

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<sup>20</sup>See: Barnes & Smith (2009); Deb et al. (2011); Grafova (2011); Kopasker et al. (2016); Offer et al. (2010); Rohde et al. (2016, 2017); Smith et al. (2009); Watson (2018); Watson & Osberg (2018); Watson et al. (2016)

economic insecurity causes weight gain, putting them at risk of future economic insecurity which implies more weight gain.

Although males with a high school education or less were affected by economic insecurity during the Great Recession, they represent only a minority of the workforce. However, they are still large enough to be worth paying attention to, and as Ruckert & Labonte (2014) note, there was an increase in health inequality following the Great Recession as a result of austerity measures and the rise in precarious employment in the recession's aftermath - particularly for those of low socioeconomic status. The implications of more rapid weight gain and later exposure to heightened health inequality resulting from poor labour market prospects and budget cutbacks are likely to accumulate for some affected individuals. We therefore suggest that when evaluating the true costs of recessions, policy-makers should also consider their health implications and the increase in health inequalities, especially those associated with more rapid weight gain during a recession.

## **Compliance with Ethical Standards**

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*Declarations of Interest:* None

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# Appendix

Table A1. OLS Regression Results - Equation 1

	Males			Females		
	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)
Great Recession	-1.1863 (1.08)	2.2906** (1.03)	-0.4654 (1.63)	1.0350 (1.07)	2.1301*** (0.72)	-0.5110 (1.58)
Economic Insecurity Onset	-0.0265 (0.40)	3.1327 (2.58)	2.1822 (1.79)	-0.4300 (0.41)	0.2492 (0.37)	1.3547 (1.54)
DD Estimator	-0.0428 (0.68)	-3.1022 (2.65)	0.9596 (2.47)	2.1439** (0.96)	-1.1072 (0.85)	-1.6123 (3.15)
Income: Below LICO	-0.8831 (0.70)	-2.4630* (1.33)	-0.7706 (1.57)	0.2839 (0.73)	-0.6739 (0.45)	1.0589 (1.35)
High School Education or Less	0.0744 (0.30)	0.8839 (1.02)	2.4259** (1.22)	0.9095* (0.48)	-0.3697 (0.31)	1.7578* (1.01)
Age: 45-64	0.7194** (0.30)	0.3098 (0.68)	1.6720* (0.97)	0.9224*** (0.32)	0.0943 (0.28)	1.6722 (1.05)
Immigrant	-0.4610 (0.44)	-1.5143** (0.73)	-1.5412 (2.53)	-0.4111 (0.60)	-0.6264 (0.53)	0.6261 (1.68)
Visible Minority	-1.1753** (0.57)	-2.5004*** (0.89)	-6.3107*** (1.96)	-0.9076 (0.91)	-0.5884 (0.85)	-6.2551*** (2.06)
Married	1.0080*** (0.30)	-1.6041** (0.76)	0.7061 (1.02)	-0.5137 (0.33)	-0.3590 (0.30)	-0.4507 (1.14)
Reside in Quebec	-0.7346** (0.33)	-1.5392** (0.61)	-0.0128 (1.30)	-1.8121*** (0.36)	-0.2903 (0.41)	-2.3410** (1.06)
Rural Residence	-0.1796 (0.36)	-1.1424* (0.59)	1.2753 (1.36)	-0.2398 (0.40)	-0.2389 (0.36)	2.0294* (1.17)
Marriage Onset	-0.9671* (0.50)	-0.8740 (0.70)	-4.4266*** (1.71)	0.2258 (0.63)	2.0539 (1.55)	-0.9900 (1.61)
Divorce Onset	0.5851 (1.13)	-0.8818 (1.99)	-0.9641 (5.84)	-1.3431 (1.33)	-2.4771*** (0.47)	11.1205*** (3.69)
Widowhood Onset	1.6979** (0.72)	-1.3278 (2.84)	0.5915 (2.56)	-1.2764 (1.20)	0.8287 (0.93)	0.5669 (2.20)
Chronic Illness Onset	-0.0637 (0.37)	-0.7489 (0.60)	-1.0267 (1.40)	-0.7893* (0.42)	0.1870 (0.40)	3.0977* (1.63)
Children Onset	0.8878* (0.51)	-0.3592 (1.07)	1.3300 (2.09)	-0.0467 (1.21)	-1.2091* (0.68)	-0.0461 (2.82)
Food Price Index	0.0956 (0.08)			-0.0834 (0.07)		
Alcohol Price Index		-0.1589 (0.12)			-0.1726*** (0.06)	
Cigarette Price Index			0.0078 (0.08)			-0.0683 (0.07)
Constant	16.5997** (8.32)	24.3131* (12.51)	14.4251 (9.70)	34.8034*** (7.72)	21.2290*** (6.03)	21.2688** (8.98)
Observations	2,503	2,214	504	2,194	2,081	431
R-squared	0.0382	0.0383	0.1494	0.0515	0.0377	0.1526

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 6 and 8 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.

**Table A2. OLS Regression Results: Income Below LICO - Equation 2**

	Males			Females		
	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)
Great Recession	-1.2120 (1.07)	2.3319** (1.03)	-0.2968 (1.63)	1.0225 (1.07)	2.1673*** (0.73)	-0.4263 (1.62)
Economic Insecurity Onset	-0.3104 (0.40)	3.4526 (2.76)	2.1116 (1.85)	-0.1994 (0.42)	0.3077 (0.39)	1.6160 (1.76)
Income: Below LICO	-1.4470* (0.76)	-0.8557 (1.71)	-0.3301 (2.30)	0.4096 (0.82)	-0.4023 (0.58)	0.8872 (1.59)
Great Recession × Income: Below LICO	-3.3705** (1.52)	-2.1216 (2.55)	-7.6471 (6.51)	2.0846 (1.72)	-0.9464 (1.13)	-1.6997 (3.19)
Economic Insecurity Onset × Income: Below LICO	4.2949** (2.08)	-4.5830 (3.73)	1.5105 (4.20)	-2.2705* (1.20)	-0.7278 (1.14)	-1.1607 (2.97)
Great Recession × Economic Insecurity Onset	0.0980 (0.69)	-3.3342 (2.85)	1.0429 (2.57)	2.0190** (0.97)	-1.1618 (0.89)	-2.6495 (3.40)
DD Estimator	1.8151 (2.56)	2.9849 (4.49)	5.0134 (7.18)	-0.7586 (5.70)	1.0135 (1.95)	9.3698 (7.32)
High School Education or Less	0.0420 (0.30)	0.8926 (1.04)	2.4905** (1.24)	0.8947* (0.48)	-0.3676 (0.31)	1.7592** (1.02)
Age: 45-64	0.6908** (0.30)	0.3464 (0.67)	1.6250* (0.96)	0.9248*** (0.32)	0.0993 (0.28)	1.8112* (1.02)
Immigrant	-0.4783 (0.44)	-1.5198** (2.54)	-1.6181 (2.54)	-0.3987 (0.60)	-0.6290 (0.53)	0.6161 (1.69)
Visible Minority	-1.2116** (0.56)	-2.4518*** (0.89)	-6.2560*** (1.89)	-0.8943 (0.91)	-0.6091 (0.86)	-6.2362*** (2.11)
Married	0.9788*** (0.30)	-1.5949** (0.75)	0.7488 (1.01)	-0.5420 (0.33)	-0.3572 (0.30)	-0.4483 (1.15)
Reside in Quebec	-0.7686** (0.33)	-1.5151** (0.61)	-0.0460 (1.28)	-1.7726*** (0.36)	-0.2857 (0.41)	-2.3407** (1.06)
Rural Residence	-0.1444 (0.37)	-1.2018** (0.61)	1.2452 (1.34)	-0.2199 (0.41)	-0.2462 (0.36)	2.0668* (1.18)
Marriage Onset	-0.9382* (0.50)	-0.8998 (0.70)	-4.4561*** (1.71)	0.2848 (0.63)	2.0559 (1.55)	-0.9447 (1.56)
Divorce Onset	0.5636 (1.15)	-0.8981 (2.03)	-0.9535 (5.79)	-1.5681 (1.39)	-2.3928*** (0.50)	11.3666*** (3.70)
Widowhood Onset	1.6894** (0.71)	-1.3540 (2.85)	0.5854 (2.59)	-1.2106 (1.22)	0.8648 (0.94)	0.5633 (2.23)
Chronic Illness Onset	-0.0801 (0.37)	-0.7538 (0.62)	-1.0096 (1.46)	-0.7992* (0.42)	0.1753 (0.40)	2.9488* (1.65)
Children Onset	0.9199* (0.50)	-0.3802 (1.08)	1.2022 (2.14)	-0.0492 (1.21)	-1.1892* (0.68)	0.1846 (2.95)
Food Price Index	0.0999 (0.08)			-0.0863 (0.07)		
Alcohol Price Index		-0.1576 (0.12)			-0.1736*** (0.06)	
Cigarette Price Index			0.0025 (0.07)			-0.0714 (0.07)
Constant	16.2199* (8.29)	24.1042* (12.51)	15.0594 (9.54)	35.1133*** (7.70)	21.3190*** (6.04)	21.6103** (9.21)
Observations	2,503	2,214	504	2,194	2,081	431
R-squared	0.0457	0.0397	0.1516	0.0542	0.0381	0.1589

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 6 and 8 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.

**Table A3. OLS Regression Results: High School Education or Less - Equation 2**

	Males			Females		
	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)
Great Recession	-1.2287 (1.08)	2.1646** (1.05)	-0.1986 (1.76)	0.8081 (1.08)	2.4051*** (0.79)	-0.8167 (1.59)
Economic Insecurity Onset	0.2831 (0.47)	1.0105 (1.13)	2.7601 (2.05)	-0.7330 (0.49)	0.2685 (0.39)	-0.1875 (1.49)
High School Education or Less	0.0454 (0.30)	-0.0832 (0.65)	3.3254** (1.47)	0.3971 (0.45)	-0.0316 (0.37)	0.9142 (1.20)
Great Recession × High School Education or Less	0.1128 (0.52)	0.9525 (1.20)	-1.2029 (1.97)	1.2684 (0.81)	-1.3483** (0.61)	0.5609 (2.14)
Economic Insecurity Onset × High School Education or Less	-1.0708 (1.02)	7.6115 (7.41)	-1.5454 (4.21)	1.4522 (1.31)	-0.1029 (1.06)	4.5344 (3.84)
Great Recession × Economic Insecurity Onset	-0.7914 (0.76)	-0.9163 (1.60)	2.0030 (3.27)	2.5012** (1.08)	-1.4924 (0.98)	-1.4425 (3.81)
DD Estimator	3.0458* (1.61)	-8.0644 (7.63)	-2.3566 (5.32)	-1.6846 (2.47)	2.1828 (1.97)	0.2963 (6.22)
Income: Below LICO	-0.8864 (0.70)	-2.7559* (1.62)	-0.4447 (1.59)	0.2941 (0.73)	-0.6576 (0.46)	1.3869 (1.42)
Age: 45-64	0.7012** (0.30)	0.3679 (0.62)	1.7889* (1.03)	0.8948*** (0.33)	0.1216 (0.28)	1.6139 (1.07)
Immigrant	-0.4513 (0.44)	-1.4109* (0.73)	-1.7465 (2.53)	-0.3957 (0.59)	-0.6494 (0.53)	0.5769 (1.65)
Visible Minority	-1.1471** (0.57)	-2.6596*** (0.92)	-6.4627*** (1.95)	-0.9061 (0.90)	-0.5700 (0.85)	-6.2597*** (2.06)
Married	1.0403*** (0.30)	-1.7402** (0.69)	0.6747 (1.05)	-0.5038 (0.33)	-0.3838 (0.30)	-0.6352 (1.14)
Reside in Quebec	-0.7461** (0.34)	-1.4454** (0.59)	0.0000 (1.33)	-1.8204*** (0.36)	-0.2941 (0.41)	-2.2933** (1.08)
Rural Residence	-0.1889 (0.37)	-1.0888* (0.57)	1.2656 (1.41)	-0.2130 (0.41)	-0.2708 (0.36)	1.8800 (1.21)
Marriage Onset	-1.0037** (0.51)	-0.7612 (0.63)	-4.4742*** (1.72)	0.2061 (0.63)	2.0811 (1.55)	-0.9257 (1.61)
Divorce Onset	0.5642 (1.13)	-0.8511 (1.89)	-1.0565 (5.77)	-1.3635 (1.32)	-2.5608*** (0.49)	10.2467*** (3.66)
Widowhood Onset	1.7502** (0.72)	-1.5216 (2.84)	0.4119 (2.65)	-1.2102 (1.21)	0.7407 (0.93)	0.3488 (2.20)
Chronic Onset	-0.0948 (0.38)	-0.6794 (0.59)	-0.8604 (1.42)	-0.7945* (0.42)	0.1603 (0.40)	2.9312* (1.63)
Children Illness Onset	0.9271* (0.50)	-0.3972 (1.12)	1.0775 (2.10)	-0.0287 (1.21)	-1.2151* (0.68)	-0.1298 (2.92)
Food Price Index	0.0970 (0.08)			-0.0847 (0.07)		
Alcohol Price Index		-0.1698 (0.11)			-0.1755*** (0.06)	
Cigarette Price Index			0.0174 (0.08)			-0.0596 (0.07)
Constant	16.4389** (8.34)	25.7189** (12.25)	12.9108 (9.82)	35.0499*** (7.68)	21.4936*** (6.08)	20.5644** (8.71)
Observations	2,503	2,214	504	2,194	2,081	431
R-squared	0.0410	0.0484	0.1557	0.0538	0.0410	0.1646

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 6 and 8 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.

Table A4. OLS Regression Results: Age: 45-64 - Equation 2

	Males			Females		
	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)	Body Mass Index	Alcohol Use (Per Week)	Cigarettes (Per Day)
Great Recession	-0.9522 (1.14)	2.3550* (1.20)	-0.6980 (1.86)	1.2806 (1.13)	2.3357** (0.96)	0.3933 (1.78)
Economic Insecurity Onset	0.6029 (0.65)	5.1493 (5.53)	4.4902** (1.98)	-0.3090 (0.59)	0.2336 (0.47)	3.8754** (1.96)
Age: 45-64	0.8487*** (0.30)	0.5048 (0.53)	2.0648* (1.21)	0.9968*** (0.34)	0.1040 (0.30)	2.9575** (1.21)
Great Recession × Age: 45-64	-0.4155 (0.43)	-0.0064 (0.96)	0.5735 (1.95)	-0.5519 (0.57)	-0.4488 (0.75)	-1.8959 (1.60)
Economic Insecurity Onset × Age: 45-64	-1.0782 (0.82)	-3.5209 (5.63)	-5.4230 (3.34)	-0.2891 (0.83)	0.0269 (0.75)	-5.6739** (2.72)
Great Recession × Economic Insecurity Onset	-1.7682 (1.16)	-5.8429 (5.70)	-1.1351 (3.20)	0.6405 (1.56)	-2.4982*** (0.95)	-0.7968 (3.14)
DD Estimator	2.9184** (1.40)	4.6626 (6.13)	4.7879 (4.95)	2.7479 (1.81)	2.5982* (1.53)	1.0233 (5.16)
Income: Below LICO	-0.8451 (0.70)	-2.3123* (1.23)	-0.3812 (1.62)	0.3230 (0.72)	-0.6483 (0.46)	0.6360 (1.30)
High School Education or Less	0.0621 (0.30)	0.8467 (0.97)	2.4267* (1.24)	0.9201* (0.48)	-0.3570 (0.31)	1.8435* (1.01)
Immigrant	-0.4229 (0.44)	-1.4605** (0.72)	-1.4462 (2.56)	-0.4042 (0.60)	-0.6334 (0.53)	0.6155 (1.65)
Visible Minority	-1.2127** (0.57)	-2.5454*** (0.90)	-6.2724*** (1.99)	-0.9301 (0.91)	-0.5995 (0.86)	-6.2561*** (2.06)
Married	1.0501*** (0.31)	-1.5190* (0.81)	0.7744 (1.02)	-0.4819 (0.33)	-0.3236 (0.29)	-0.4787 (1.13)
Reside in Quebec	-0.7529** (0.33)	-1.6134** (0.63)	-0.1551 (1.32)	-1.7879*** (0.36)	-0.2570 (0.39)	-2.4136** (1.05)
Rural Residence	-0.1777 (0.36)	-1.1121* (0.58)	1.5613 (1.36)	-0.2260 (0.41)	-0.2267 (0.36)	2.1190* (1.17)
Marriage Onset	-0.9585* (0.50)	-0.9058 (0.75)	-4.1688** (1.73)	0.1945 (0.62)	2.0263 (1.53)	-0.9916 (1.53)
Divorce Onset	0.6336 (1.13)	-0.8994 (2.11)	-0.7747 (5.47)	-1.3180 (1.36)	-2.4427*** (0.50)	10.7034*** (3.89)
Widowhood Onset	1.7448** (0.73)	-1.3746 (2.85)	0.6453 (2.76)	-1.2600 (1.21)	0.8287 (0.94)	0.5196 (2.24)
Chronic Illness Onset	-0.0559 (0.37)	-0.7340 (0.60)	-1.1488 (1.39)	-0.8003* (0.42)	0.1646 (0.40)	3.2889** (1.63)
Children Onset	0.8991* (0.50)	-0.2932 (1.05)	1.1718 (2.21)	-0.1185 (1.21)	-1.2799* (0.69)	-0.1780 (2.83)
Food Price Index	0.0943 (0.08)			-0.0817 (0.07)		
Alcohol Price Index		-0.1671 (0.11)			-0.1719*** (0.05)	
Cigarette Price Index			0.0101 (0.08)			-0.0707 (0.08)
Constant	16.6416** (8.27)	25.0346** (11.99)	13.8519 (9.75)	34.5694*** (7.75)	21.1216*** (5.83)	21.0328** (9.28)
Observations	2,503	2,214	504	2,194	2,081	431
R-squared	0.0409	0.0413	0.1591	0.0538	0.0415	0.1738

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Estimation technique: OLS using cycles 6 and 8 of NPHS data. Robust standard errors are in parentheses. Economic insecurity onset is defined as the transition from job security to that of job insecurity or joblessness.