Is there a relationship between economic security and body mass for Canadian adults? A Natural Experiment Approach.

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Preliminary – Please Do Not Cite

Abstract

From 1998 to 2009, the National Population Health Survey (NPHS) reports the prevalence of self-reported adult obesity in Canada increased from 16 percent to over 23 percent. An emerging hypothesis suggests at least some of this gain is due to our economic environment. Using four cycles of longitudinal NPHS data, I examine whether increasing economic insecurity causes more obesity. In July 1996, a major policy change (Bill C-12) reduced Canadian unemployment insurance benefits considerably. This policy increased the economic insecurity of individuals who experience lay-offs or job termination. This paper examines the effect of this policy change on body mass for Canadian males and females between the ages of 25 and 64.To address causation and unobserved endogeneity, I apply a fixed effects transformation to a difference-in-difference model. For males aged 25 to 64 with a high school education or less, results suggest that the employment insurance policy change increased body mass index by 3.2 points. For females, results were not statistically significant at the 5 percent level. Robustness checks did not alter these findings.

I. INTRODUCTION

That North Americans are, on average, getting fatter is well known. However, the root causes of this phenomenon remain uncertain. Is it possible that a key determinant of body mass is our economic environment? Specifically, when individuals face elevated prospects of economic loss are they more likely to gain weight? In July 1996, Canada enacted a new unemployment insurance system that reduced the social safety net for Canadians. Using this exogenous change as a natural experiment, this paper tests the hypothesis that greater economic insecurity increases the likelihood an individual gains body weight.

Economic insecurity can be defined as the "inability to obtain protection against subjectively significant potential economic losses" (Osberg, 1998 pg 17). In broad terms, economic insecurity is increased by the removal of economic safety nets. Osberg and Sharpe (2009) find economic insecurity to be on the rise in Canada. Similarly, Hacker et al (2010) find that in the United States, economic insecurity has risen from 1985 to 2007. At the same time, another trend in Canada has coincided; the rise in obesity. A recent report by the Public Health Agency of Canada entitled "Obesity in Canada" finds that from 1981 to 2007 obesity prevalence roughly doubled in Canada (2010).

Over-eating causes a biochemical reaction within the brain that acts as a "self-medication" (Smith, 2009). Over-eating helps to relax the body – a reaction due to an evolutionary response to food scarcity – i.e. when there is a perceived probability that an individual will encounter a food shortage, it is evolutionarily adaptive to respond by increasing food intake so to create a protectionist response. Therefore, declining economic security may cause elevated obesity levels as the result of "self-

medication" through an over-eating response. To my knowledge, this is the first paper to examine this phenomenon using a natural experiment design.

In July of 1996, the Federal Government of Canada enacted a major change, Bill C-12, to the unemployment insurance program, which included stricter eligibility rules and the financial penalization of repeat claimants. Consequently, individuals who experience lay-offs or job termination faced a rise in economic insecurity. Using individual-level longitudinal data collected by the National Population Health Survey (NPHS), this paper examines the effect of this policy change on body mass for Canadian males and females age 25 to 64.

In order to test for a causal effect, I adopt a difference-in-difference strategy. Using ordinary least squares (OLS), this paper evaluates the effect job-loss has on the likelihood of change in individual body mass index (BMI) in the pre- and post-policy eras. Specifically, a panel of changes are observed. Each individual is observed twice before the policy change, and twice in the post-policy era. Given this design, in each policy period a set of employment groups emerge: those who are employed during both observations, those who find employment, those who become unemployed and those who are unemployed during both observations.

The hypothesis is that given the rise in economic insecurity as a result of Bill C-12, individuals who experience the onset of unemployment in the post-policy period are more likely to experience an increase in body mass. Moreover, because they are more exposed to the consequences of Bill C-12, this effect is predicted to be stronger for individuals with a relatively low education (high school completion or less). Such individuals are more likely to experience prolonged durations of unemployment and possess lower savings relative to their higher educated counterparts. As a result, this policy enactment is

predicted to have caused more stress to these individuals. Separate regressions are run for males and females. Additional controls for a host of factors thought to affect body mass are also included in the modelling.

Descriptive statistics collected from NPHS data support this argument for males. As shown in **Figure 1a**, the average rise in BMI for males who lost their job in the post-policy period is greater than those who are employed during that same time period. Moreover, average BMI gain for males who experience unemployment is larger in the post-policy period than in the pre-policy period. As depicted in **Figure 1b**, similar results persist for females. While the average change in BMI for females who experience unemployment in the pre-policy period is negative, the post-policy period change in BMI becomes positive.

In **Figure 2a**, for males with a relatively low education (i.e. highest level of education of high school or less), the post-policy average BMI gain for those experiencing unemployment is almost twice as large as those who report being employed. Relative to the pre-policy period, there is a noticeable jump in average BMI gain in the post-policy period for males who report an unemployment spell. For low education females, as presented in **Figure 2b**, the average increase in BMI is larger for females who experience an unemployment spell than for employed females in the post-policy period – this was not the case in the full sample. Additionally, the average change in BMI for females who experience unemployment goes from being negative in the pre-policy period to positive in the post-policy period.

Figure 1a: Male average change in BMI (full sample)

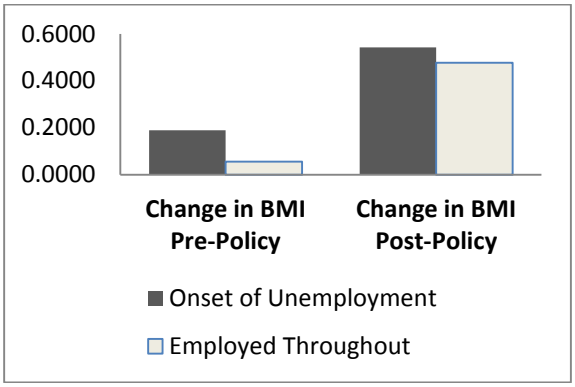


Figure 1b: Female average change in BMI (full sample)

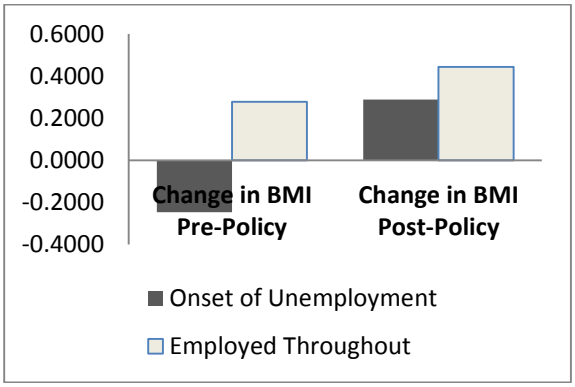


Figure 2a: Male average change in BMI (low education sample)

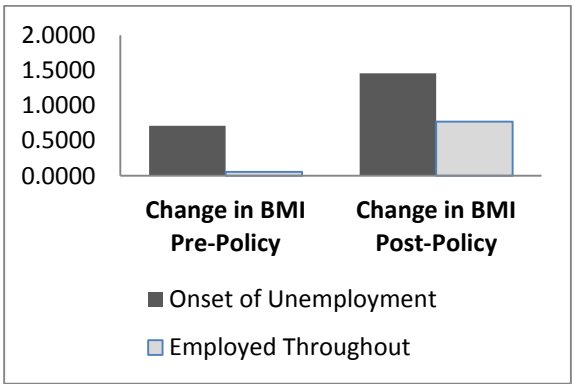
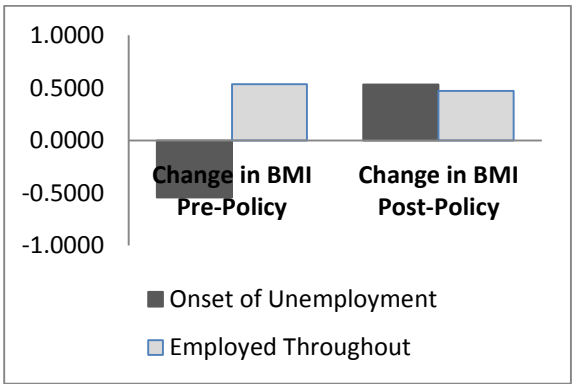


Figure 2b: Female average change in BMI (low education sample)



The key result (Table 5) suggests the enactment of Bill C-12 increased the body mass index for males age 25 to 64 with a high school diploma or less. Specifically, the onset of unemployment in the post-policy period is associated with a 3.2 point increase in BMI. For females between the ages of 25 and 64, the empirical evidence does not establish a significant link between economic insecurity and body mass. Robustness checks did not alter the final conclusions of the study.

The rest of the paper is laid out as follows. Section II provides the underlying hypothesis of the paper. Section III presents a review of the existing literature. Section IV describes the data. Section V presents

the methodology including the econometric specifications. Section VI is the results. A robustness check is presented in section VII. Lastly, section VIII summarizes the analysis and discusses potential limitations and avenues for future research.

II. HYPOTHESIS

The conjecture underlying this paper is that people who become unemployed are less economically secure and experience an increase in the likelihood of an overeating response due to that heightened economic insecurity. Issues surrounding unemployment insurance eligibility, duration of benefits, replacement ratio and mobility suddenly become crucial to well-being. If greater insecurity predicts an overeating response, the magnitude of the rise in economic insecurity from job loss can be mitigated by the existence of social safety nets, such as employment insurance and social assistance programs. However, the policy enactment in 1996 known as Bill C-12, reduced employment insurance generosity. Thus, job loss in this post-policy period is predicted to produce an even greater overeating response given the reduction in an established Canadian social safety net. Additionally, the effect of unemployment in the post-policy period on body mass will be greater for those with a relatively low education given their heightened exposure to the risk of unemployment.

III. LITERATURE REVIEW

Health institutions suggest that obesity is an epidemic that has the potential to cause serious declines in North American health (U.S. DHHS, 2001; Ogden et al, 2004). Wisman and Capehart (2010) claim that

"...only tobacco use causes more preventable deaths" (pg. 937). Recently, a report found that even moderate obesity (i.e. a body mass index between 30 and 35), can reduce life expectancy by 2 to 4 years (Prospective Studies Collaboration, 2009). Caballero (2007) notes that worldwide, there are now more overweight adults than non-overweight – the first time in recorded history this phenomenon has occurred.

Weight gain is no mystery. If an individual takes in more calories than he/she consumes during a given period of time, the result is a gain in weight and vice versa. Therefore, the determinants of weight gain depend on an individual's caloric intake and physical exertion. Increased intake of vegetables and physical exercise decrease the probability of obesity while foods high in fat and/or sugar increase the probability of obesity (Slattery et al, 1992; Bouchard, Depres, Tremblay, 1993; Harris et al, 1994; Prentice, 2001). Although total caloric and fat intake have decreased over the past few decades, it has not been enough to offset the rise in physical inactivity (Heini and Weinsier 1997). However, increased physical activity may not suffice in curbing the obesity epidemic. Lee and colleagues (2010) find that for overweight middle aged women, even 60 minutes of daily physical activity was insufficient to reduce body mass.

The colloquial term, "comfort foods", which refers to foods that tend to be high in sugar and/or fats, have been linked with obesity (Dallman et al, 2003). **"**Comfort foods" have earned their name from their popularity during times of stress (Dalman, Pecoraro, and la Fleur, 2005)**.** Parker (2008) notes that during the economic turmoil of 2008 Americans turned to comfort foods more than previously. This paper argues that the decision of Americans to consume larger quantities of foods that are high in sugar and/or fat during 2008 was not merely an exogenous change in preferences. Each individual's decision

making surrounding diet and exercise are likely also the result of a set of contextual variables – one in particular is economic insecurity.

Economic Insecurity and obesity

Offer, Pechey, and Ulijaszek (2010) suggest that when economic insecurity and/or inequality increase, elevated stress levels lead to over-eating and weight gain. They note: (i) obesity prevalence is higher among lower income individuals, (ii) body weight has been increasing over the past 20 to 30 years, and (iii) obesity is approximately 50 percent higher in countries with economic regimes that emphasize market liberalization. At the country level, their results suggest that "economic insecurity and 'market-liberal' welfare regime are the two strongest determinants of the level of obesity" (pg. 32).

Wisman and Capehart (2010) posit that increased economic insecurity has arisen from the shift toward greater emphasis on efficiency and economic growth. They argue that economic insecurity increases the stress level of individuals who in turn self-medicate through consumption of high-fat, high-sugar diets. Smith, Stoddard and Barnes (2009) find that among US working age men, a decline in economic security is associated with a rise in body weight. Additionally, an increase in insurance program generosity tends to prevent weight gain. Barnes and Smith (2009) explore the potential link between economic security and tobacco use in the United States suggesting that decreasing economic security predicts a decision to continue or resume tobacco use. This result is of interest as given individuals self-medicate not only by over-eating but also by smoking (Chou, Grossman and Saffer, 2004).

Phipps et al. (2006) find that children in Canada, and even more so in the United States, are far more likely to be obese than non-poor children. The authors note the economic structure of these economies does not promote risk pooling and hence the individual assumes the bulk of risks such as potential job

loss. This finding is also supported by Hacker (2006) who suggests that many of society's risks were at one time pooled and managed by over-arching institutions. However, in recent years, these risks have shifted to the individual within the North American economy. Such examples include the decreasing number of firms offering health insurance and pension plans to employees.

A Brief History of Unemployment Insurance in Canada

In 1940, Canada established a federal system of unemployment insurance. Prior to this time, unemployment insurance was considered, due to constitutional jurisdiction, a provincial problem and federal government intrusion was unconstitutional. However, a severe recession at the end of World War I and then the subsequent Great Depression during the 1930's supported the need for a labour insurance program in Canada. After an amendment to the British North America Act, the federal government passed the Unemployment Insurance act in August of 1940.

The act established financing was to come from employers, employees and the federal government. The original insurance program covered about 42 percent of the labour force (Pal, 1988). During the 1950s the insurance program was liberalized to include more of the Canadian labour force. About 75 percent of Canadians were then covered under the act for a maximum duration of 36 weeks (Pal, 1988).

Based on a white paper released in 1970, a new Unemployment Insurance Act was established in 1971. This new act covered approximately 96 percent of the labour force and greatly eased eligibility (Pal, 1988). To be eligible, a worker had to be employed for at least 8 of the previous 52 weeks (Lin, 1988). The replacement ratio was 75 percent of earnings; the highest rate over the course of the program (Lin 1988).

Subsequent to the 1971 act, unemployment insurance underwent a series of cut-backs primarily due to the financial pressures surrounding program liberalization. Eligibility became more difficult. For instance, in 1993, those who quit without cause, were fired for misconduct, or refused suitable employment were deemed ineligible to receive benefits. These changes reduced coverage to approximately 40 percent of the workforce (Lin 1988). Additionally the replacement ratio decreased over time to the current 55 percent level with individuals required to have worked a longer duration in order to qualify for benefits.

1996 Legislation: Bill C-12

Effective July 1st, 1996, Bill C-12 was enacted. The Canadian Employment Insurance Commission called this policy change "the most fundamental restructuring of the Unemployment Insurance program in 25 years" (2004). New legislation followed the previous trend of reducing the generosity of the program. Van den Berg (2004) notes "the EI Reform involved tightening of benefits access rules and lowering of obtainable benefits intended as much to produce significant cutbacks in expenditures as to influence labour market participation behaviour" (p.17). Human Resources and Social Development Canada (2009) note that benefit eligibility became increasingly strict for both new and returning users of the program. A paper by the Canadian Labour Congress (2003), shows that the percentage of those receiving benefits as a percentage of the unemployed decreased from 57 percent in 1993 to 42 percent in 1996.

Table 1 provides a description of Bill C-12's revisions to the program, as documented in the Human Resources Development Canada paper "The New Employment Insurance System" (1996). With this policy change, the replacement ratio for repeat users was reduced by 1 percentage point for every 20 week block of program use in the previous 5 years up to a maximum of a 5 percentage point decrease. Moreover, the duration of benefits was reduced from 50 weeks to a maximum of 45 weeks. For new entrants to the program there was a sharp increase in the number of insurable hours worked in order to

qualify. In fact, the eligibility requirement for repeat users also increased between 180 to 300 hours. Additionally the maximum insurable earnings were reduced from $845 per week to $750 per week. The earnings ceiling for repeat claimants was decreased significantly from $63,750 to $48,750 for those who have received 20 weeks or less of benefits in the past 5 years. For claimants that received in excess of 20 weeks of benefits, the earnings ceiling was decreased to a greater degree, falling from $63,750 to $39,000. Thus, individuals who earned in excess of the applicable ceiling faced a claw-back ranging between 50 to 100 percent of their benefit payout.

While eligibility required more hours of work than previously, this policy change helped some part-time workers achieve eligibility. Previously, eligibility was based on aggregate of weeks of employment in excess of 15 hours. Workers with less than 15 hours of work per week were at a disadvantage in accruing weeks of employment. However, Bill C-12 mandated that all hours of employment be eligible. However, part-time workers who worked more than 15 hours per week were made worse off by the policy change given the amount of work time necessary for eligibility increased.

IV. DATA

This study uses data collected from the Canadian National Population Health Survey (NPHS). This is a longitudinal survey which commenced in 1994 (cycle 1). Every two years a new cycle of data are released with the most recent having occurred in 2010 (cycle 9). This analysis uses cycles 1 to 4 (1994-2001). In addition to health issues, NPHS also surveys Canadians regarding their socio-demographic and economic backgrounds (e.g. gender, age, place of birth, employment status, etc.).

All data collected by the NPHS is self-reported – which entails potential reporting errors. Body mass is a particular area of concern as self-perception can differ from actuality. Notably, adults tend to under-report their weight but not their height (Mokhad, 1999; Niedhammer, 2000; Gorber, Tremblay, Moher et al, 2007). One particular test of reliability is a comparison of body mass scores from the 2007/08 Canadian Community Heath Survey (self-reported data) and the Canadian Health Measures Survey (measured data). During 2007-2009, the Canadian Health Measures Survey estimates 37 percent were considered overweight ($25 \leq BMI \leq 29.9$) and 24 percent were obese ($BMI \geq 30$). The 2007/08 Canadian Community Health Survey reports 33.7 percent were considered overweight while 17.4 percent were obese. Thus, self-reported data tends to underestimate overweight and obesity prevalence. Therefore, it must be cautioned that under-reporting of BMI is likely to have occurred. As discussed in the *Discussion and Limitations* section, this under-reporting has the potential to attenuate the hypothesized outcomes.

V. METHODOLOGY

This paper uses four observations collected from NPHS for each individual. That is, two observations pre-policy change and two observations post-policy change. With this set of observations, it is possible to evaluate changes in employment status and its effect on body mass both before and after the policy change. The basis for the models which follow is presented in **Figure 3**.

NPHS reports the exact day each respondent was surveyed. Thus, each individual has one set of observations prior to the policy change date and one set of observations post-policy. The result is a set of data ranging from 1994 to 2001. An individual's pre-policy observations occur in cycle 1 (1994-95) and cycle 2 (1996-97) with post-policy observations occurring in cycles 3 (1998-99) and 4 (2000-01).

However, some individuals were surveyed in cycle 2 subsequent to the policy enactment (i.e. after July 1st, 1996). As a result, these observations occur in the post-policy era. As a result, only one pre-policy observation exists for these individuals. Consequently, they are excluded from the analysis. Notably, those excluded from the study do not appear statistically different than those included.

The objective of the following econometric specifications is to evaluate the enactment of Bill C-12 on body mass. To address the underlying hypothesis, I begin by developing two separate models; one before the policy change and one after. I then incorporate these two models into a single model design that includes a dummy variable for the post-policy period and a set of interaction terms combining this policy dummy variable and employment status variables.

Policy Change Analysis

At each survey, an individual's body mass index, current employment status, and a set of additional variables thought to be associated with body mass are collected. Unemployment is measured as the respondent's unemployment status at the time of the survey - i.e. employed, unemployed or not in the labour force. Individuals reporting they were unemployed at the time of the survey are given a value of unity for that observation; zero otherwise. The survey did not ask retrospective questions regarding employment status. This issue is further discussed in the *Limitations* section of the paper. Individuals who report not being part of the labour force are excluded from the study. This assumption is later relaxed as a robustness check with results remaining remarkably similar.

Beginning with the pre-policy period, the following pooled regression is estimated.

$$BMI_{it} = \alpha_0 + \alpha_1 UE_{it} + \boldsymbol{X_{it}\alpha} + a_i + u_{it} \quad (1)$$

Where: BMI represents body mass

UE is equal to unity if the individual becomes unemployed; zero otherwise

$\boldsymbol{X}$ is a vector of variables thought to influence body mass

a is the time-constant, person-specific unobservable term

u is the idiosyncratic error

i indexes for the individual and t indexes for time

Individuals possess a set of unobservable fixed personal characteristics (e.g. genes, parental education, etc.) that may either inhibit or intensify weight gain. Such characteristics are assumed to remain constant during the study period and will be captured by the unobserved time constant term a given data on these variables is not available. Without any correction, regression results in equations (1) will be biased due to an omitted variable bias. To remove this bias, first differencing is employed. The result is a first difference model as follows.

$$\Delta BMI_i = \alpha_0 + \alpha_1 \Delta UE_i + \boldsymbol{\Delta X_{it}\alpha} + \Delta u_i \quad (2)$$

Where Δ represents the change from period 1 to period 2

Performing the same set of operations using the post-policy period data results in a first difference model akin to equation (2).

$$\Delta BMI_i = \gamma_0 + \gamma_1 \Delta UE_i + \mathbf{\Delta X_{it}} \boldsymbol{\gamma} + \Delta u_i \quad (3)$$

The result is two first difference regression models that examine the relationship between a change in current unemployment status and body mass respectively.

Employment Status Transition

The above regressions identify a change in employment status. To incorporate all possible employment states and transitions, a set of dummy variables are derived. These variables are then used to evaluate employment status. As a result, the following cases are identified:

Time Period 1 - Employment Status		**Time Period 2 Employment Status**
Employed	→	Employed
Employed	→	Unemployed
Unemployed	→	Employed
Unemployed	→	Unemployed

While the hypothesis that the onset of unemployment increases the likelihood of a rise in body weight remains, additional conjectures can now be made regarding the above set of variables. An individual who is unemployed in time period 1 but finds employment in time period 2 will experience an increase in economic security which is predicted to reduce BMI. Specifically, the individual experiences a reduction in stress which is predicted to remove the effect of self-medication through overeating. Given the policy change, I predict an individual finding employment in the post-policy period will be more likely to experience even greater weight loss than in the pre-policy era.

With respect to those who are employed during both time periods, insecurity is assumed to have not increased. Therefore, the prediction is their change in body mass will not be as large relative to those who reported the onset of unemployment. An individual who does not report an unemployment spell is less likely to have had their economic security level compromised. Additionally, the hypothesis is the respondent's change in body mass is unrelated to policy effects given the unemployment cuts are assumed to not have a direct effect on these individuals.

Lastly, those who report being unemployed in both periods are predicted to have a higher body mass relative to those who report being employed in both periods. In particular, these individuals are less able to afford healthy nourishment or the means to be physically active. Additionally, for these individual's economic security is likely to have decreased in the post-policy era. Consequently, the prediction is the response in weight gain from unemployment will be greater in the post-policy period.

Single Model Analysis

The next step combines equations 3 and 4 with the inclusion of the set of employment state/transition variables into a single model. In addition, a post-policy dummy variable and a set of interaction terms are specified. The interaction terms evaluate the combined effect of a change in employment status with the post-policy dummy variable. The reference category regarding employment, is being employed in both time periods. Thus, the equation is as follows.

$$\Delta BMI_{\mathrm{i}} = \beta_0 + \beta_1 Post + \beta_2 U\_E_i + \beta_3 (U\_E) \times (Post)_{1i} + \beta_4 E\_U_i + \beta_5 (E\_U) \times (Post)_{2i} + \beta_6 U\_U_i + \beta_7 (U\_U) \times (Post)_{3i} + \Delta \boldsymbol{X}_{\mathrm{it}} \beta + \Delta u_i \quad (4)$$

Where $Post$ is equal to unity if the observation takes place in the post-policy period; zero otherwise

U_E is equal to unity if the respondent transitions from unemployment to employment; zero otherwise

$(U\_E) \times (Post)_1$ represents the interaction of U_E with $Post$

E_U is equal to unity if the respondent transitions from employment to unemployment; zero otherwise

$(E\_U) \times (Post)_2$ represents the interaction of E_U with $Post$

U_U is equal to unity if the respondent reports being unemployed in both time periods; zero otherwise

$(U\_U) \times (Post)_3$ represents the interaction of U_U with $Post$

$\boldsymbol{X}$ is a vector of time-variant variables thought to influence body mass

u is the idiosyncratic error term

Given the general rise in obesity, the hypothesis is that the variable $Post$ will be associated with gains in body mass. Given the conjecture that economic insecurity is predicted to makes gains in weight more likely, I hypothesize the dummy variable E_U to have a positive effect. If increased economic insecurity is associated with gains in body mass, it is also likely that the opposite be true. That is, the dummy variable U_E is predicted to have a negative relationship with the change in BMI. Lastly, the variable U_U is predicted to have a positive relationship with respect to change in BMI.

The interaction term β_5 is predicted to be positive. Specifically, becoming unemployed in the post-policy period will have a larger predicted impact on increasing body mass relative to before the policy change. Moreover, I expect the interaction term β_3 to be negative. That is, finding employment in the post-policy period will predict a larger decline in body mass in comparison to the pre-policy period. Lastly, the coefficient associated with being unemployed for both periods in the post-policy period (β_7) is predicted to be positive. Therefore the following relationships are hypothesized.

$$\beta_2 < 0;\ \beta_4 > 0;\ \beta_6 > 0$$

$$\beta_3 < 0;\ \beta_5 > 0;\ \beta_7 > 0$$

Results for this model can be found in **Table 4** for males and females.

Extension: Low Education Sample Restriction

The next step evaluates a demographic group more affected by changes to employment insurance; specifically those with a relatively low education. Such individuals are more prone to unemployment spells (Oesch, 2010; Rothwell and Berube 2011). As a result, policy enactments aimed at employment insurance will have a greater effect on these individuals. The hypothesis is that individual's with a relatively low education will be more affected by the 1996 policy change than otherwise. Those with a high school education or less are classified as having a relatively low education. In light of the enactment of Bill C-12, these individuals are hypothesized to experience a larger predicted increase in body mass in the event of unemployment. I base this conjecture on the following factors.

Given NPHS data, those with a relatively low level of education have an unemployment rate that is about 50 percent higher. **Figures 4** and **5** depict the unemployment rate from 1990 to 2010 for Canadian males and females respectively between the ages of 25 and 64. For both genders, the unemployment rate is higher for those with a highest level of education of high school completion or less in every year. While unemployment rates for both education groups tend to fluctuate with the business cycle, those with a highest level of education of a high school diploma or less have an unemployment rate that is about 3 percentage points higher on average.

In general, firms are less likely to lay-off highly educated labour given their skill set (Farber 2004). Formal education provides an individual with not only a gain in human capital but also a set of transferable workplace skills. In the event of job loss, highly educated individuals have an advantage in finding new

employment given their set of transferrable skills. In turn, low education individuals are more likely to acquire the bulk of their human capital from work experience and on-the-job training as opposed to formal schooling. In the event of unemployment, these individuals face fewer prospects given their lack of transferrable skills. Thus, low education individuals are more likely to experience a higher probability of unemployment and/or longer unemployment duration (Ashenfelter and Ham 1979; Nickell 1979; Mincer 1991; Kettunen 1997).

If low education individuals are more likely to experience unemployment and for longer durations, then reductions in benefits are likely to be more influential in their income stream. Therefore, a policy aimed at reducing the generosity of unemployment insurance makes low education individuals more economically insecure. For instance, Bill C-12 contains punitive measures for repeat users. Given the above findings, repeat users are more likely to have a low education. The result is even less economic security for this group. Therefore, cuts to the program are expected to have a greater effect on these individuals given their relatively high dependence on unemployment insurance.

Given that low education individuals are more likely to experience unemployment and for longer durations, the hypothesis is that cuts to the employment insurance program are likely to induce greater stress in these individuals and have a larger effect on their body mass. Equation (4) is re-run with the low education sample restriction. If the respondent reports a high school diploma or less as their highest level of education in 2000-01 (cycle 4), they are included in this analysis. The hypothesis is that the effect of the onset of unemployment in the post-policy period will be greater than without the sample restriction.

$$\tilde{\beta}_5 > \beta_5$$

Where $\tilde{\beta}_5$ is the parameter for with the $(E\_U) \times (Post)$ interaction term with the sample restriction

β_5 is the parameter for with the $(E\_U) \times (Post)$ interaction term without the restriction

Results for this model can be found in **Table 5** for males and females.

Additional Explanatory Variables

In addition to employment, policy and interaction variables, the following variables are controlled for in all regressions. Given that all regression models employ first differencing, all time constant variables and variables where change over time is constant are swept out of the equation. Therefore, variables such as race, immigration and language cannot be controlled for in the models.

Energy Expenditure

The regressions include the Energy Expenditure Index derived by NPHS. This index measures the daily energy expenditure of a respondent during leisure time activities over the past three months using the frequency and duration of physical activity. Each physical activity is adjusted to reflect its metabolic energy cost (MET value). This adjustment is based on a multiple of the metabolic rate when the body is at rest. For instance, a physical activity that has a MET value of 5 would require five times the amount of energy in comparison to when the body is at rest. MET values are specified for each activity based on the Canadian Fitness and Lifestyle Research Institute. For example, walking possesses a MET value of 3 while running has a MET value of 9.5. As a result, energy expenditure is defined as

$$EE = \sum_i \frac{(NI)(DI)(MET)_i}{365}$$

Where:

NI = frequency a respondent engaged in activity *i* over a 12 month period

DI =average duration of activity *i* (in hours)

MET = metabolic energy cost

The energy expenditure variable is entered as a continuous model. Once first differencing is accounted for, the variable measures the change in energy expenditure from one period to the next.

Depression

Depression has often been linked with gains in body mass. However, the actual transmission of depression to weight gain is debatable. For instance, depression has been found to be the result of a lack of serotonin release (Popa, Lena, Alexandre, et al. 2008; Karg, Burmeister, Shedden, et al., 2011). A lack of serotonin release can be self-medicated through overeating (Wurtman and Wurtman, 1989; Hoffman, 1994; Halford, Harrold, Lawton, et al, 2005; Smith 2009). However, given the difficulty of serotonin measurement, the relationship between serotonin and depression has been questioned (Barton, Esler, Dawood, et al. 2008).

This variable is derived by NPHS using a set of questions associated with depression. These questions were selected based on research by Kessler and colleagues (1998). This is a subset of questions measuring Major Depressive Episodes (MDE) from the Composite International Diagnostic Interview (CIDI) established by the World Health Organization. This variable is measured as a probability of

depression. Higher values suggest a higher probability of depression. The NPHS authors discourage the setting of cut-off scores, beyond which, the respondent is classified as being depressed. Thus, only the probability of depression scale is used for this study. Once first differencing is introduced the variable captures the change in the probability of depression from one period to the next.

Marital Status

If the respondent is married their financial position along with their lifestyle may differ from that of someone who is unmarried. In particular, married men and women are predicted to have a higher body mass and prevalence of obesity than otherwise (Woo et al 1999; Jeffery and Rick 2012; Ball, Mishra, Crawford 2012). Thus, a dummy variable equal to unity is included if the individual is married, zero otherwise.

However, with the presence of first differencing, the marital status variable captures the change in marital status from one time period to the next. This becomes problematic in terms of interpretation. For example, the effect of divorce on body mass is simply the inverse of the effect marriage has on body mass. Additionally, marriage in both time periods is treated the same as being unmarried in both time periods. Therefore, to account for change in marital status (or lack thereof), a set of dummy variables are specified in the first differenced regression with the respondent reporting being married in both time periods as the reference category. The dummy variables include:

i) The onset of marriage in second time period

ii) The dissolution of marriage in the second time period

iii) Unmarried in both time periods

Presence of Children

The presence of children greatly affects the time constraints of a parent. This is even more apparent when the children are young and high levels of supervision are necessary. Given a parent has only so much time, the pressures of having a child, or children, in the household may reduce an individual's ability to be physically active and prepare nutritious meals. Laroche, Hofer, and Davis (2007) find there is a positive association between the presence of young children in the household and the consumption of foods that are high in fat. Belows-Riecken and Rhodes (2008) find that parents with dependent children are more likely to be physically inactive than non-parents. As a result, this study includes a dichotomous variable controlling for the presence of children in the household under the age of 5.

Akin, to marital status, first differencing the variable identifies the change in the presence of children over time periods. Again this leads to interpretation problems (e.g. the continuation of having no children in the household under 5 is treated statistically equivalent to always having children under 5 in the household). As a result, a set of dummy variables are included in the model with the respondent reporting no presence of children under 5 in both time periods as the reference category. The dummy variables include:

i) The presence of children under 5 in the first time period only

ii) The presence of children under 5 in the second time period only

iii) The presence of children under 5 in both time periods

Smoking

Chou et al. (2004) suggest that tobacco use and obesity are substitute goods. Nicotine is known to increase the release of serotonin (Quattrocki et al. 2000). Moreover, many pharmaceutical drugs that promote weight loss are designed to release serotonin (Halford, Cooper, Dovey, 2005). There is evidence

that over-eating is linked with the release of serotonin (Hart, 1996). Additionally, compulsive eaters tend to possess levels of serotonin that are significantly lower than otherwise (Hoffman, 1994). Thus, smokers may be able to self-medicate the release of serotonin through smoking as opposed to over-eating. For this reason, smoking may play a crucial role as a substitute for over-eating and hence a determinant of an individual's body mass. Without inclusion of the smoking variable, estimates would produce a downward bias. To illustrate, consider the following relationship:

$$\Delta BMI = \mathrm{F}_1(\Delta Stress, \boldsymbol{X_1})$$

This paper assumes over-eating is a self-medicating response to stress. As a result, stress increases BMI. Therefore, we can assume the following relationship:

$$\Delta Eating = \mathrm{F}_2(\Delta Stress, \boldsymbol{X_2})$$

However, as noted above, smoking is also a coping mechanism for elevated stress. Thus we have:

$$\Delta Smoking = \mathrm{F}_3(\Delta Stress, \boldsymbol{X_3})$$

Both responses assume a positive relationship with respect to stress. However, increased smoking and eating are assumed to be negatively correlated. Hence, we have the following correlations:

$$corr(\Delta Stress, \Delta Smoking) > 0$$

$$corr(\Delta Eating, \Delta Smoking) < 0$$

Thus, if smoking is not included in the model, the result is a downward bias due to an omitted variable related to stress.

A dummy variable controlling for daily smoking is included in the regression. As in the previous two cases, first differencing captures the change in a respondent's smoking behaviour which makes interpretation difficult. For instance, the effect of being a smoker in both periods is unlikely to be the same as the effect of being a non-smoker in both periods. Thus, a set of smoking dummy variables are

included in the model with being a non-smoker in both time periods being the reference category. The variables are as follows:

i) Smoker in the first time period; non-smoker in the second time period

ii) Non-smoker in the first time period; smoker in the second time period

iii) Smoker in both time periods

Alcohol

Any caloric intake can be classified as a: protein, fat, carbohydrate, or alcohol. While alcohol is a unit of calorie intake, its relationship with other caloric intake is questionable. Specifically, is alcohol consumed as a substitute to other calories, namely food items, or are they consumed in a complementary fashion? Wakabayashi (2011) finds that BMI is lower among light and moderate alcohol drinkers in comparison to non-drinkers. Regarding heavier drinking, Lourenco et al (fothcoming) finds that those who consume more than 6 drinks per day (greater than 60 grams) are more likely to be obese than non-drinkers. Ryu et al (2010) finds that having more than 2 drinks per day is associated with a higher waist circumference. Akin to smoking, the omission of the variable would likely produce biased estimates. This is due to the potential correlation between body mass and alcohol use, along with the correlation between alcohol and over-eating. To illustrate, consider the relationship as denoted previously:

$$\Delta BMI = \mathrm{F}_1(\Delta Stress, \boldsymbol{X_1})$$

$$\Delta Eating = \mathrm{F}_2(\Delta Stress, \boldsymbol{X_2})$$

However, alcohol is also a coping mechanism for elevated stress (Brady and Sonne, 1999; Frone, 1999). Thus we have:

$$\Delta Alcohol = \mathrm{F}_3(\Delta Stress, \boldsymbol{X_3})$$

Both responses assume a positive relationship with respect to stress. However, increased alcohol and eating are assumed to be negatively correlated. Hence, we have the following correlations:

$$corr(\Delta Stress, \Delta Alcohol) > 0$$

$$corr(\Delta Eating, \Delta Alcohol) < 0$$

Thus, if alcohol is not included in the model, the result is a downward bias due to an omitted variable related to stress.

This study does not distinguish between types of alcoholic beverages. This specification considers one and a half ounces of liquor equivalent to one glass of wine or one bottle/can of beer. This serves as a slight limitation given alcoholic beverages are not homogenous goods. For instance, Vadstrup et al (2003) find that moderate to high consumption of beer and spirits is positively associated with body mass while moderate to high consumption of wine is predicted to reduce body mass.

A continuous variable measuring an individual's weekly alcohol consumption is specified. The variable is derived based on the sum of all drinks consumed in the week prior to the interview. Given the empirical evidence above, a quadratic term is also included. With first differencing, interpretation of the variable now pertains to change in alcohol consumption over time.

Food Prices

Ledikwe, Ello-Martin and Rolls (2005) note that the increase in body mass over the last 30 years has coincided with a rise in the portion size of many foods. Additionally, Nielsen and Popkin (2003) find that the portions of restaurant servings increased over time. Unfortunately it is very hard to measure the amount of food someone consumes over a period of time. Moreover, the variety of food choices makes it exceedingly difficult to categorize all food types based on nutrients and caloric intake.

However, consumer demand theory suggests price changes have a direct impact on the quantity of food an individual consumes. Assuming food is a normal good, if the price of food becomes cheaper relative to other consumer goods; consumer choice models would suggest individuals will increase their consumption of food. Statistics Canada publishes monthly data measuring the Consumer Price Index (CPI) at the provincial level. Within this index, Statistics Canada also partitions out several items including that of food prices. Thus, the change in food prices is measured against the change in overall consumer prices.

Increases in food prices relative to overall consumer prices can be expected to reduce an individual's expenditure on food. The result is a reduction in calorie intake which, holding energy expenditure constant, would produce a decline in body mass. The expectation is increases (decreases) in the price of food relative to consumer prices will decrease (increase) body mass. This variable ratios food inflation against overall inflation. With first differencing, the variable captures change in food prices relative to inflation over time periods.

Dependent Variable Specification: Body Mass Index

The Body Mass Index (BMI) is calculated as follows:

$$BMI = \frac{mass\ (kg)}{height\ (m)^2}$$

Pregnant women are excluded from the analysis given their BMI score is a misleading indication of obesity. Also, the Canadian Guidelines for Body Weight Classification in Adults recommends that BMI not be calculated for lactating women. However, NPHS does not ask females respondents if they are lactating - thus, women who are lactating are included in the sample.

Sample Restrictions

Only respondents who in the labour force are studied. This restriction was chosen due to the potential disconnect between economic loss and BMI. Individuals not in the labour force reporting household income which is not social assistance based, likely report an income earned by someone else in the household. It is possible the stress endured by the income earner regarding the possibility of economic loss is passed on to the household member(s) outside the labour force. However, the objective of this paper is to make a direct link between labour force participants, their probability of future economic loss and its association with body mass. Therefore, only those in the labour force are studied. This paper does relax this restriction as a robustness check. Key results were relatively unchanged.

The sample is restricted to those between and including the ages of 25 and 64. The lower bound was chosen as it is assumed individuals during their first few years in the labour force are more likely to be concerned about finding employment that suits their interests and skill set instead of a job that allows them to avoid a position of economic insecurity. This is exemplified by those who take apprenticeship positions during their first years of employment in order to enhance their credentials and improve their return on education investment. Relatively young workers are also more likely to experience periods of frictional unemployment in their pursuit of job matching. Such unemployment spells are more likely to be voluntary as these individuals pursue other employment paths and thus, are relatively less disconcerting. Furthermore, those in their early 20s are less likely to face significant financial burdens (e.g. mortgage, child rearing, etc.) in relation to those who are older. As a result, job loss during this period of time may not have as great a level of stress as it would later in life.

The upper bound was selected as it approximates the date of retirement and the onset of transfer payments (e.g. Old Age Security). Given the dataset contains no variable pertaining to the start of retirement, approximation is used. Thus, individuals aged 65 and over are excluded from the analysis.

Given their small sample size, those residing in the Canadian Territories are excluded from the analysis. Furthermore, NPHS does not include Aboriginal peoples living on reserve in its surveying. As a result, these individuals are not included in the analysis.

Self-employed labour in Canada cannot receive employment insurance benefits in the event of job loss. Therefore, Bill C-12 does affect their economic insecurity situation. As a result, they are excluded from the analysis.

Outliers are removed from the data. In this sample, BMI ranges from 0 to a score just over 52. Notably, less than 0.3 percent of the distribution of BMI fell below an index value of 15. The World Health Organization suggests that a BMI value be*low 15 is an indicator of starvation. Close inspection of these observations shows potential errors in weight measurement. In some instances, both males and females report weighing less than 23 kilograms. Whether these were key stroke errors, or mistakes due to the nature of self-reported data, the data are very likely incorrect. As a result, this study removes the bottom 0.3 percent of the distribution. Inspection of the upper range of data gave no reason to suspect measurement error. The largest body mass recorded was slightly over 182 kilograms (≈400 pounds). After the adjustment, BMI ranges from a value of 15 to just over 52. For a male of average height (1.85 metres), the weight range is 52 to 163

kilograms. For a female of average height (1.63 metres), the weight range is 43 to 130 kilograms.

VI. RESULTS

Descriptive Statistics

Based on Statistics Canada data, the beneficiary-to-unemployed ratio (B/U ratio) ranged from about 60 to 75 percent in the 1980s. However, during the 1990s, eligibility was reduced significantly, reaching a modern era low in 1997 of just over 37 percent. Since then, the B/U ratio has remained relatively stable at just below 40 percent. Given **Figure 6**, it is apparent that prior to the inception of Bill C-12, eligibility was more lenient than after. As shown in **Box 1,** based on the study period for this paper, the B/U ratio prior to the introduction of Bill C-12 (January 1994 – June 1996) was about 9 percentage points higher than the post-policy period (July 1996 - December 2001).

Box 1. B/U Ratio for Study Period

Time	B/U Ratio
January 1st, 1994 – June 30th, 1996	47.48
July 31st, 1996 – December 31st, 2001	38.49

Source: Statistics Canada Table 282-0001 & Table 276-0002

Descriptive statistics for respondents are partitioned into pre- and post-policy observations. Under both pre- and post-policy scenarios, two observations exist for each individual. In addition, the sample is segregated by education with a separate set of statistics for those who report high school completion as their highest level of education attained. This sub-sample is referred hereafter as the Low Education

sub-sample. All descriptive statistics are weighted based on NPHS derived population weights. Descriptive statistics for males can be found in **Table 2** while females are presented in **Table 3**.

Males

Roughly 48 percent of the sample are male. For the low education sub-sample, about 49 percentage of the sample is male. In the pre-policy era, average BMI for males is relatively constant for the full sample rising by about 0.05 points over that time period. For low education males, average BMI actually decreased over the pre-policy period, falling by about 0.07 points. In the post-policy era, average BMI increased by almost 0.46 points for the full sample. For low education males, the average change is even greater with an increase of approximately 0.72 points over this time period.

For the full sample of males, about 2 percent reported the onset of unemployment. In the post-policy era, this percentage increased slightly to 2.5 percent. For low education males, the percentage reporting the onset of unemployment in the pre-policy era was slightly higher at 3.5 percent. However, in the post-policy period this percentage fell to 2.4 percent. For the full sample, about 4.4 percent report the onset of employment in the pre-policy period. During the post-policy period this percentage fell to 2.4 percent. For low education males, about 8.8 percent reported the onset of employment in the pre-policy period. This percentage declined to 4.6 percent in the post-policy period. While those reporting unemployment during both periods fell from the pre- to post-policy period for the full sample (2 percent to 1.1. percent), it increased for the low education sample (2.9 percent to 3.4 percent).

Females

About 52 percent of the full sample is female. With respect to the low education sub-sample, about 51 percent are female. For females in the full and low education sub-sample, BMI increased in both the

pre- and post-policy period. During the pre-policy period, BMI on average grew 0.30 points for the entire sample. For the low education sub-sample, average BMI increased by 0.41 points. In the post-policy period, BMI for both samples increased by 0.33 points for the full sample and 0.24 points for the low education sample.

For the full sample of females, 4.5 percent reported the onset of unemployment in the second year of the pre-policy period. In the post-policy era, this percentage decreased to 2.8 percent. For low education females, the percentage reporting the onset of unemployment in the pre-policy era was slightly lower at 4.2 percent and in the post-policy period, this percentage fell to 1 percent. For the full sample, about 4.4 percent report the onset of employment in the pre-policy period. During the post-policy period this percentage fell to 3.2 percent. For low education females, the percentage reporting the onset of employment remained at 4.9 for both the pre- and post-policy periods. Both samples experienced a decrease in the percentage reporting unemployment in both time periods. For the full sample, this percentage fell from 1 to 0.3 percent. For the low education sample the percentage fell from 2.3 to 0.7.

Regression Results

Regression results are presented in **Tables 4** for the full sample and **Table 5** for the low education sample. Robust standard errors are calculated to account for potential heterogeneity and serial correlation. Applicable longitudinal population weights provided by NPHS are used in all regressions. The key result from this section suggests for males with a relatively low education, the onset of unemployment in the post-policy period is associated with gains in body mass. In particular, this group is predicted to gain 3.2 BMI points in the event they lose their job during the post-policy era. For a male within an average height range (1.75m – 1.80m), this translates to approximately 8 to 10 kilograms.

Males

With respect to **Table 4**, the post-policy dummy variable and the employment status variables are not statistically significant at the 5 percent level. Nor are the variables that interact the post-policy dummy variable with the employment status variables statistically significant. While the onset of unemployment in the post-policy period variable possesses a positive coefficient, it is statistically insignificant. Additionally, the onset of employment in the post-policy variable has a negative coefficient which is statistically insignificant. Lastly, the variable associated with being unemployed throughout the post-policy period, while having a positive co-efficient, is statistically insignificant at the 5 percent level. Thus, these results, while having the hypothesized direction of effect, do not coincide with the underlying hypotheses due to statistical insignificance.

As expected, an increase in energy expenditure is associated with a decline in BMI. Moreover, in the event children under the age of 5 are no longer present in the household, the body mass of a male is expected to fall by about two-thirds of a BMI point. With 674 observations, this model explains about 5.7 percent of the total variation in the change in BMI for males.

With the sample restriction (**Table 5)**, the onset of employment in the pre-policy period is associated with a 1.1 decrease in BMI for males. Additionally, the interaction term of the post-policy period with the onset of unemployment is positive and statistically significant at the 5 percent level. The parameter estimate suggests the onset of unemployment in the post-policy period is associated with a rise in BMI of about 3.2 points for low education males. Thus, the result supports the underlying hypothesis that heightened economic insecurity has a positive association with BMI. While the onset of employment in the post-policy period has the hypothesized direction of effect, it is not statistically significant at the 5

percent level. Due to a lack of observations, those who report being unemployed in both time periods were dropped from the regression.

Akin to the full sample model, an increase in energy expenditure is associated with a decline in BMI, all else constant. In both the full sample and low education sub-sample, the magnitude of effect is relatively similar. Low education males who report the onset of children under the age of 5 in the household are associated with a rise in BMI of approximately 1.7 points. Additionally, low education males who report being married in the first year but unmarried in the second year are predicted to have a BMI score that is about 1.8 points higher than males who are married in both years. Lastly, low education males who report smoking cessation in the second year are associated with a BMI score that is about 1 point higher than non-smokers. Overall, with 198 observations, the model depicted in **Table 5** explains approximately 18.8 percent of the variation in BMI for males; a notable increase from the full sample model.

Females

Regarding the full sample (**Table 4**), the post-policy period dummy variable, employment status variables, and the interaction terms are all statistically insignificant at the 5 percent level. Contrary to the hypothesis, the coefficient associated with the onset of unemployment in the post-policy period has a positive direction of effect but the magnitude is small and statistically insignificant at the 5 percent level. Thus, results do not support the underlying hypothesis for females.

Females who report being married in the first year but unmarried in the second year have a BMI score that is predicted to be about 0.58 points lower than those who report being married in both years. Additionally, females who report the commencement of smoking are associated with a BMI score that is

approximately 0.97 points lower than non-smokers. Alcohol consumption, measured in quadratic form appears to be statistically insignificant. However, an F-test shows the two variables to be jointly significant at the 5 percent level. In particular, an increase in alcohol consumption of up to 10.5 drinks per week is associated with a decrease in BMI. Any larger of an increase, BMI is expected to rise. With 593 observations, the model depicted in **Table 4** explains about 4.2 percent of the total variation in the change in BMI for females.

For females with a highest education level of high school completion or less (**Table 5**), none of the variables associated with employment status in the post-policy period are statistically significant at the 5 percent level. While the onset of unemployment in the post-policy period is associated with a change in BMI that is about 1.9 points higher, this variable is statistically insignificant at the 5 percent level. Yet, it should be noted that the magnitude of effect increased substantially once the sample was restricted to those with a low education. Thus, the key result does not support the underlying hypothesis for low education females. Note that due to the very small number of low education females reporting unemployment in both periods, this variable was dropped from the regression.

Low education females who report being married in the first year but unmarried in the second year are associated with a BMI score that is about 0.8 points lower than females who report being married in both years. As in the case of the full sample, low education female alcohol use is correlated with body mass. For those who increase their alcohol consumption by about 7.3 drinks per week or less, BMI is expected to decrease. After this point, increases in alcohol consumption is predicted to increase BMI. Overall, with 153 observations, the model depicted in **Table 5** explains about 19.6 percent of the total variation in the change in BMI for females with a relatively low level of education.

Placebo Regression

A placebo regression is tested whereby the model from equation (4) is run restricting the sample to those with a highest level of education of at least some post-secondary schooling. The belief is that the onset of unemployment for these individuals will not be as relatively dramatic of an event given their education level is expected to produce a more prompt return to employment. Additionally, these individuals are less likely to experience repeat bouts of unemployment, especially in the short run given their heightened level of education. As a result, unemployment for these individual's is less likely to cause a major reduction in economic security. Therefore, the onset of unemployment for these individuals is not expected to produce increases in body mass. As well, Bill C-12 is not predicted to be associated with an increase in body mass for individuals who experience the onset of unemployment in the post-policy period. Results for this model are presented in **Table 6**.

For males, the onset of unemployment in the pre-policy period is not a statistically significant predictor of body mass. The key result, the onset of unemployment in the post-policy period, is also statistically insignificant at the 5 percent level. Notably, the coefficient is negative which is opposite to that found for males with a relatively low level of education. In the event an unemployed individual finds employment, body mass index is predicted to increase by 0.84 of a point. This outcome is also counter to the hypothesis that increases to economic security reduce body mass. It is also worth noting the explanatory power of this model is much lower than when the sample is restricted to those with a high school education or less (0.18 vs. 0.059).

For females, the onset of unemployment in the post-policy period, while having a positive coefficient, is not a statistically significant predictor of body mass. In fact none of the variables associated with employment are statistically significant. These results, are similar to those found when the sample is not

restricted based on education level with the onset of unemployment in either period not being statistically significant at the 5 percent level. However, when the sample is restricted to those with a low level of education, the onset of unemployment in the post-policy period approaches statistical significance with a magnitude of effect that is much larger. Additionally, the goodness of fit when the sample is restricted to those with a level of education that includes at least some post-secondary is much lower than when the sample only includes those with a relatively low education (0.046 vs. 0.196).

VII. ROBUSTNESS CHECK

As a robustness check, the sample now includes those who are not in the labour force. That is, the sample now identifies individuals as either having a job or not having a job. Those who report not having a job at the time of the survey could be either unemployed (i.e. actively seeking employment) or not in the labour force (i.e. not actively seeking employment). The objective of this robustness check is to see if discouraged workers also experience a similar reaction to a drop in economic insecurity. The key hypothesis remains the same as previously - the onset of joblessness in the post-policy period will have a positive effect on body mass, all else considered. Results are presented in **Tables 7** and **8** for the entire sample and the low education sub-sample respectively.

Males

For the entire sample (**Table 7**), the only difference between the two specifications regarding employment, is now the onset of employment in the post-policy period is associated with a decrease in BMI of approximately 1.2 points. Previously, the co-efficient was -1.04 and statistically insignificant.

However, much like in **Table 4**, given the remaining employment and policy variables are statistically insignificant at the 5 percent level, results do not overly coincide with the underlying hypotheses.

With the low education sample restriction, the onset of employment in the pre-policy period now has a slightly smaller effect on change in BMI (-0.95 vs. -1.07) but remains statistically significant. The interaction term of the post-policy period with the onset of joblessness remains almost identical to that found in **Table 5**. The parameter estimate suggests the onset of joblessness in the post-policy period is associated with a rise in BMI of just over 3.3 points. Hence, results are remarkably similar to those found in **Table 5**. This is unsurprising given the sample size is only slightly larger than previous; a result to be expected given the bulk of working age males report being part of the labour force.

Females

Akin to the previous specification, **Table 7** shows the post-policy period dummy variable, employment status variables, and the interaction terms are all statistically insignificant when the entire female sample is studied. The coefficient in regard to the onset of joblessness in the post-policy period has a negative direction of effect which is opposite to the hypothesis. However, this effect is statistically insignificant at the five percent level. Thus, results do not support the underlying hypothesis for females.

For females with a highest education level of high school completion or less, none of the variables associated with employment status in the post-policy period are statistically significant at the 5 percent level given this specification. Notably, the onset of joblessness in the post-policy period is now noticeably smaller in magnitude (0.47 vs. 1.89). Hence, much like in **Table 5**, key results do not support the underlying hypotheses for females. However, it should be noted that the fall in magnitude associated with the onset of joblessness in the post-policy period suggests even further departure from

the key hypothesis. As expected, the sample size increases by a greater degree for females than for males when the sample is extended to include those not in the labour force.

VIII. DISCUSSION & CONCLUSION

From an economic perspective, the societal costs of obesity are very apparent. Finkelstein and colleagues (2009) found in the United States, medical care costs alone for obesity were approximately $147 billion in 2008, representing almost 10 percent of US medical costs. The report, Obesity in Canada (2010), suggests the economic burden of obesity is approximately $4.6 billion annually in Canada. This figure includes direct healthcare costs associated with obesity and indirect costs through reduced workplace productivity. In an era where governments are experiencing financial strain in meeting their budget requirements, policies that aid in the reduction of obesity can have notable fiscal advantages. This is especially true in Canada where healthcare is for the most part, publicly provided.

A link between body mass gain and economic insecurity has begun to emerge as demonstrated by Smith and colleagues (2009), Wisman and Capehart (2010), and Offer and colleagues (2010). Smith and colleagues (2009) suggest in the presence of stress, our response as humans is to overeat and thus, store fat. This phenomenon can be linked to early humankind where the threat of starvation was often present. In order to deal with this threat, humans would eat. While starvation may no longer be a threat in the developed world, Smith and colleagues (2009) argue that our bodies have evolved such that our response to stress is to self-medicate by over-eating “comfort foods”.

This paper examines a specific policy enactment that increased economic insecurity in Canada during the 1990s. In particular, the policy targeted the unemployment insurance system, making it more difficult for Canadians to qualify for benefits and reducing unemployment benefits paid out. Thus, Canadians experiencing unemployment in the post-policy period experienced greater economic insecurity. As a result, the hypothesis is a predicted increase in BMI for those who become unemployed in the post-policy period.

With the use of a panel dataset developed by the National Population Health survey, the findings suggest there is a sizeable link between the onset of unemployment in the post-policy period and weight gain for males with a relatively low education (**Table 5**). Given their low socioeconomic status, these individuals are more prone to unemployment spells. Thus, reductions in benefits are likely to be more influential in their income stream and have a greater impact on their life. Moreover, a specific component of the policy was the punishing of repeat users with a reduced replacement ratio.

Specifically, job loss in the post-policy period is predicted to increase BMI by 3.2 points for low education males between the ages of 25 and 64. However, the same cannot be said about females as statistical significance is not established. It should be noted that with the sample restriction, the magnitude of effect for females increases rather noticeably and approaches statistical significance. Without the age restriction, results regarding the onset of unemployment in the post-policy period for both males and females were statistically insignificant at the 5 percent level.

Using these cycles of data, the average height of a Canadian male, aged 25-64, with a highest level of education of high school or less, is approximately 1.75 metres (5 foot, 9 inches). Hence, for a male of average height, the onset of unemployment in the post-policy period is associated with an increase in

weight of approximately 9.2 kilograms (20 pounds). This is of considerable concern given NPHS data suggests the average BMI for a male in this age group with a relatively low education is just over 25. Should they lose their job in the post-policy period, their BMI is predicted to rise to a value of almost 29. The threshold for obesity is a BMI in excess of 30. Thus, this policy enactment creates a considerable push toward obesity for low socioeconomic status males.

As a check, a placebo regression is run whereby the sample is restricted to those with at least some post-secondary education. The conjecture is these individuals will not be as affected by the policy change given they're more likely to have stronger employment prospects. That is, in comparison to low education respondents, job loss either before or after the policy change is not going to produce as large of a gain in body mass. Results, showed this hypothesis to be true. The only employment variable to be statistically significant was the onset of employment for males. However, this variable had a positive coefficient suggesting employment is associated with gains in body mass for males – this stands in contrast to the hypothesis. All female outcomes involving employment were statistically insignificant.

The fact that males and females have a different set of outcomes regarding the relationship between economic insecurity and body mass is not surprising. Perhaps less true now than in the past, traditional gender roles view the man as the family breadwinner. A rise in their economic insecurity may cause overwhelming stress as their breadwinner role is at risk. To the extent this culture persists today, we would expect results to show a larger magnitude of effect for males relative to females regarding the association between economic insecurity and body mass. Boehnke (2011) finds that egalitarian gender roles are more supported by individuals with a relatively high level of education. As a result, the difference in the results that exists between the full and low education samples may in part be due to a set of gender defined roles that remain more prevalent for low socioeconomic groups.

The above theory is supported in the Robustness Check section. The key coefficient of interest, the onset of joblessness in the post-policy period, is statistically insignificant for females regardless of sample specification. What is more interesting though, is the drop in magnitude of effect when comparing low education women within the labour force versus low education women regardless of labour force participation. When the sample is restricted to only women reporting labour force participation, the coefficient associated with this variable becomes relatively larger (1.89) and approaches statistical significance. However, once the sample includes all low education females within the 25 to 64 age bracket, regardless of labour force participation, the magnitude of effect drops sharply (0.47). It is possible many of these females who are not part of the labour force reside in a household where the breadwinner role of the male remains pertinent.

Limitations

All data is self-reported. As discussed above, individuals tend to under-report their body mass. The degree to which this attenuates results depends on how the individual under-reports. If individuals are inclined to under-report by a constant amount, regardless of their body weight, first differencing would remove this measurement error. However, if an individual's body mass and tendency to under-report are positively correlated, then first differencing will lead to measurement error, hence understating increases in BMI and attenuating results. Notably, past literature has found that females are more likely to under report their body mass in comparison to males (Johnson, Goran, and Poehlman, 1994; deVries, Zoch, Mensink, et al 1994). If the same holds true for the above NPHS dataset, results for females may possess a downward bias. This may contribute to the current gap between male and female outcomes regarding the onset of unemployment in the post-policy era and its association with gains in body mass. Future research using measured data could shed further light on this potential limitation.

The study period occurred shortly after a significant Canadian recession which wreaked havoc on the labour market. Given the recovery economic recovery, unemployment rates dropped considerably during the study period. Canadians in the post-policy period were more exposed to job opportunities, making it easier to find a replacement job. Thus, unemployment regardless of socioeconomic status, may have been a less stressful event. As a result, this post-recession recovery period also worked to attenuate the results of this paper.

In this study, there is decline in the sample size across years. This analysis assumes that attrition is random and is not correlated with body mass and/or economic insecurity. If individuals are dropping out because of death due to obesity, or a loss of fixed address due to poverty, results may be biased. Given the sample size is restricted to those under the age of 65; the former may not be of great concern. However, further analysis regarding missing data may provide additional insights.

First differencing makes the assumption of strict exogeneity. That is, the idiosyncratic error term ($\mathrm{e.g.}\,\Delta u_i$) must be uncorrelated with all the explanatory variables in each time period. Any violation of this assumption will produce biased estimates. Although, I would argue that this assumption is not violated, future research may wish to explore this possibility. An additional drawback with first differencing is the loss of variation in the explanatory variables. As a result, standard errors increase which elevates the probability of a Type II error occurring (i.e. failure to reject the null hypothesis when it is false).

For these cycles of data, NPHS only asks respondent's about their employment status at the time of the survey. It does not measure an individual's retrospective employment status. Thus, some individual's

reporting that they were employed at the time of the survey, may have been unemployed at some point between surveys (i.e. the preceding 2 years). Given the underlying hypothesis regarding unemployment in the post-policy period, this could cause this variable to possess a downward bias. Specifically, consider individuals who were unemployed at some point during the two cycles, but not at survey time. If these respondents were in fact subject to weight gain as this paper argues, this would reduce the chances of a statistically significant result.

Conclusion

The central question this study addressed is, do people gain more weight when they lose their job after a negative shock to their social safety net? Using four panels of longitudinal data, this analysis compared the effect of job loss on body mass before and after the introduction of a more stringent unemployment insurance policy. For males between the ages of 25 and 64, with an education of high school completion or less, job loss in the post-policy era predicted a rise in their body mass index of approximately 3.2 points greater than in the pre-policy era. For a male of average height, this equates to a gain of approximately 9.2 kilograms (20 pounds). Given the average BMI for low education males (≈25), this policy change predicts a BMI change that pushes expected BMI levels dangerously close to the obesity threshold of 30. Results for females with a comparable level of education were statistically insignificant at the 5 percent level.

Over the past two decades, Canada has experienced a decline in its social safety nets; especially for those most exposed to economic risk (Osberg, 2009). Given the recent recession, unemployment rates in Canada, like much of world, soared. However, given the reduction in generosity of the current unemployment insurance system, fewer displaced full-time workers qualified for benefits. Given the research presented in this paper, unemployed males with a low education are now more exposed to

weight gain. As a result, we can expect these males to be at greater risk of obesity; this coming at a time when obesity rates are already considered to be at epidemic levels.

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Figure 3. Change in BMI and Employment Status Before and After Bill C-12

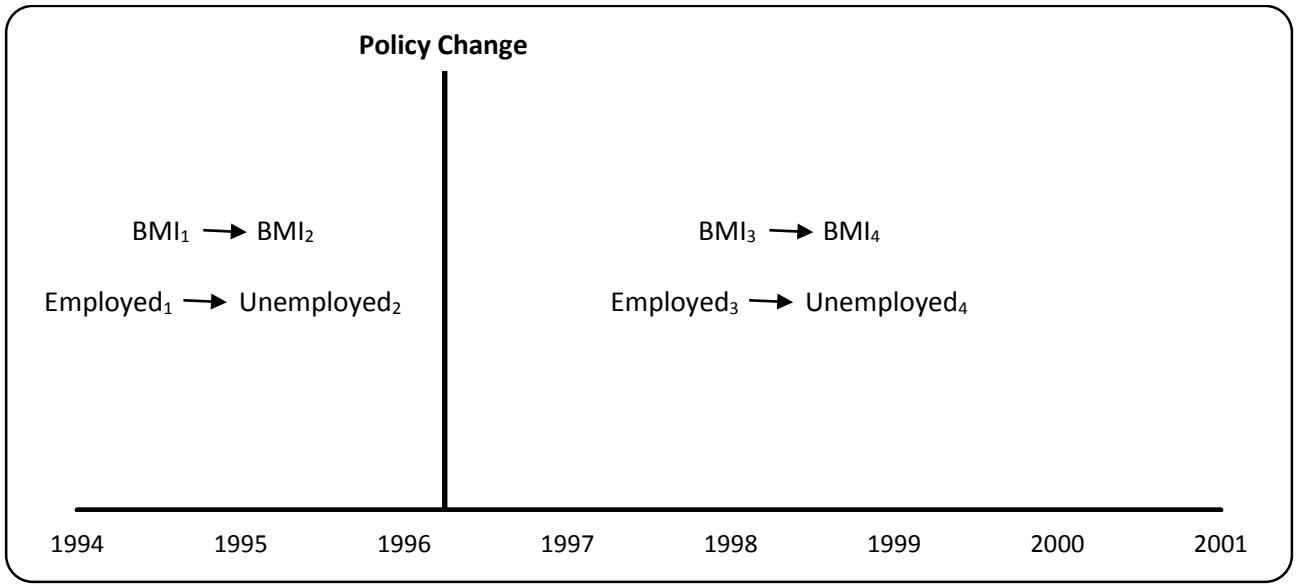


Figure 4. Unemployment Rate for Males Aged 25-64 in Canada

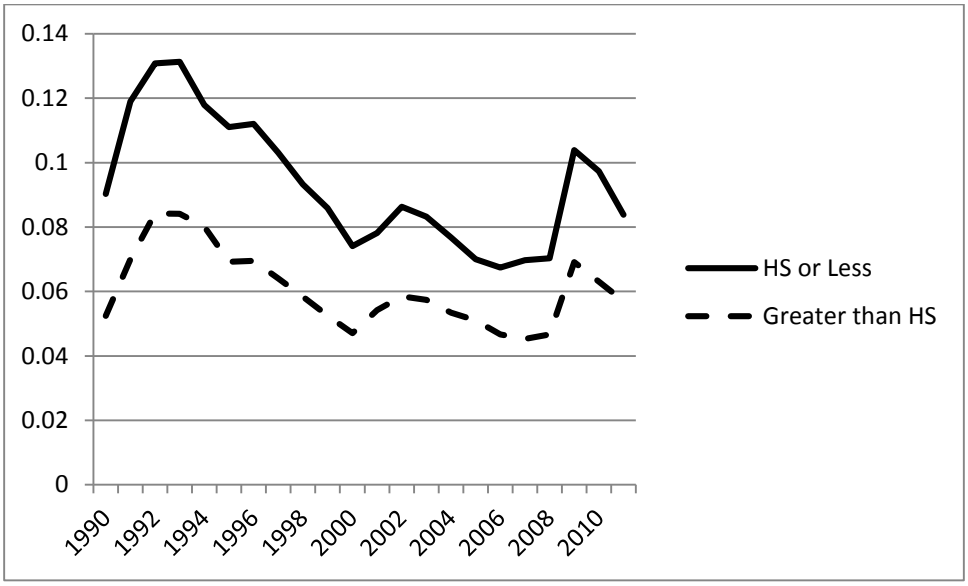


Figure 5. Unemployment Rate for Females Aged 25-64 in Canada

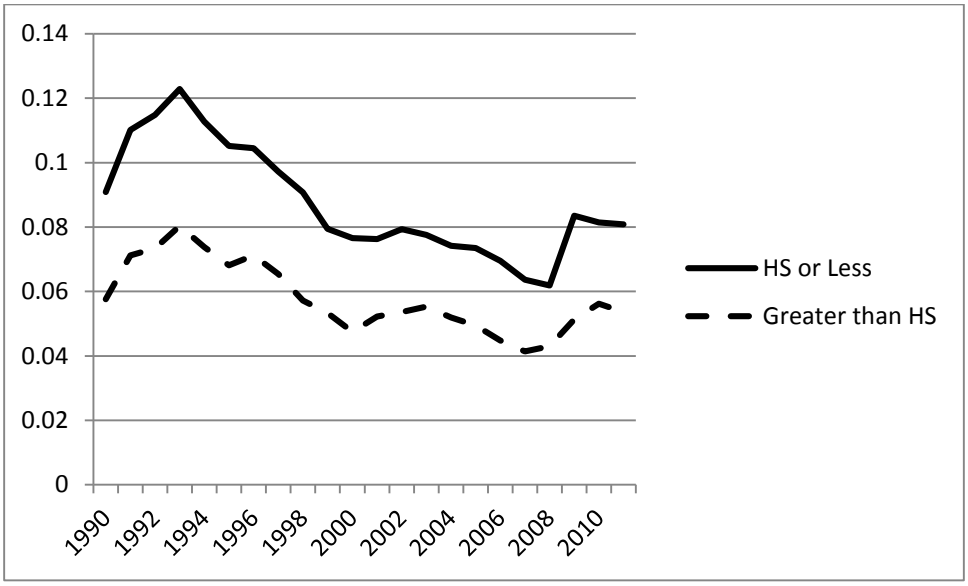
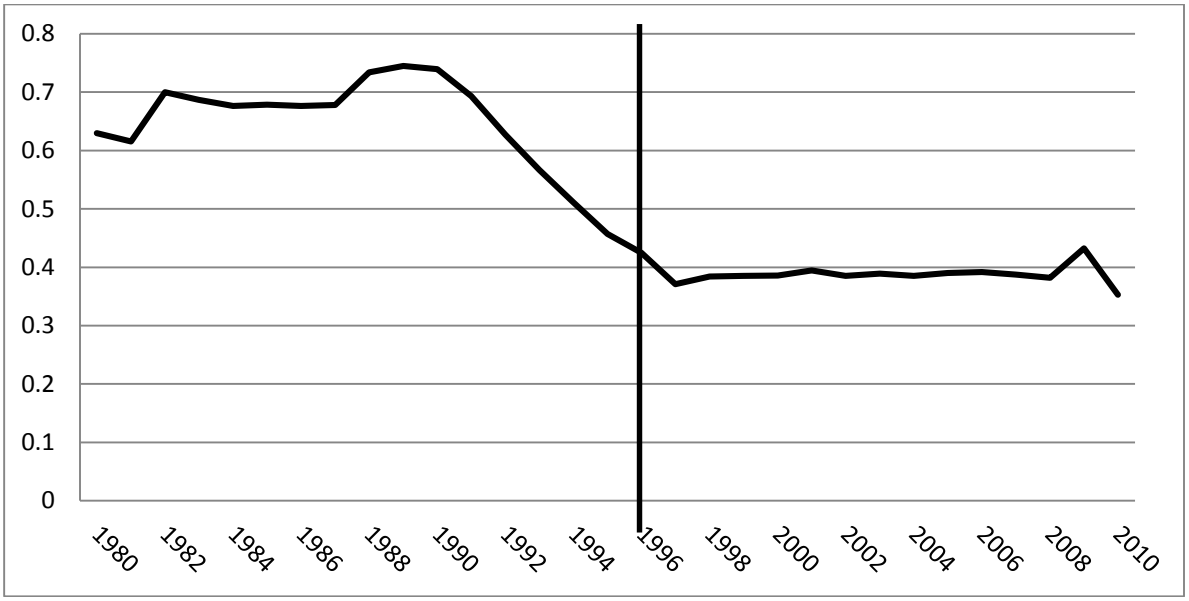


Figure 6. Beneficiary to Unemployed Ratio (B/U Ratio)



Source: Statistics Canada Table 282-0004

Table 1. Bill C-12 Revisions

Title	Description
Program Name	Program renamed to Employment Insurance (EI)
Intensity Rule	The replacement ratio for repeat users was reduced by one percentage point for each group of 20 weeks of benefits collected in the past 5 years, up to the maximum of 5 percentage points.
Clawback	Repeat claimants face a benefit clawback of up to 100%, depending on earnings and weeks of benefits in the last five years. The earnings threshold was lowered from $63,750 to $48,750 for those who have received 20 weeks or less of benefits over the past 5 years. If a claimant earned in excess of this threshold, they are required to pay back up to 30 percent of the benefits received. For those who received greater than 20 weeks of benefits over the past 5 years, the threshold was lowered from $63,750 to $39,000. For these claimants, the maximum repayment rate ranges from 50 to 100 percent depending on the number of weeks in which benefits were provided.
Maximum Insurable Earnings	Weekly maximum insurable earnings were revised to $750 per week (the equivalent of $39,000 per annum). Based on a 55 percent replacement ratio, this base generated a maximum weekly benefit of $413. Prior to the change, the weekly maximum benefit was $465 based on maximum insurable earnings of $845 per week.
Hours based Eligibility	Eligibility for benefits was adjusted such that hours instead of weeks are insurable. To be eligible, a claimant must have worked 420 to 700 insurable hours with all hours worked being eligible. Prior to this revision, a claimant was required to work 12 to 20 weeks with a threshold of 15 hours or less per week excluded from eligibility. Previously, the minimum number of hours to qualify for benefits ranged from 180 to 300.
New Entrants	For those who have minimal or no labour market participation over the past 2 years, 910 insurable hours must be amassed prior to eligibility.
Duration of Benefits	The duration of benefit period was reduced from a maximum of 50 to 45 weeks. Depending on the economic region, the duration of benefits ranges from 14 to 45 weeks.
Divisor Rule	The weekly benefit amount is determined by total earnings over the 26 week period prior to the claim. In turn, these earnings are divided by either (i) the number of weeks that were actually worked, or (ii) the minimal entry requirement plus 2. Depending on the on the regional unemployment rate, the divisor ranges from 14 to 22. Previously, the weekly benefit was determined by the minimum number of weeks required for qualification which ranged from 12 to 20 weeks of insurable earnings depending on the economic region.
Allowable Earnings	Those receiving benefits can receive up to 25 percent of their weekly EI benefit or up $50 per week (the greater of the two) without incurring any loss in benefits. Previous to the revision, only the 25 percent condition was applied.
Family Supplement	Claimants with dependents and an annual family income of $25,921 or less are entitled to a top-up, raising the maximum replacement ratio to 65 percent.

Table 2. Summary Statistics for Males

	Full Sample		Low Education Sample	
Variable	**Pre-Policy**	**Post-Policy**	**Pre-Policy**	**Post-Policy**
Change in BMI Over Previous 2 Years	0.048	0.457	-0.068	0.717
	(1.65)	(2.02)	(1.92)	(1.87)
Employed in First Year, Unemployed in Second Year	0.020	0.025	0.035	0.024
	(0.14)	(0.16)	(0.18)	(0.15)
Unemployed in First Year, Employed in Second Year	0.044	0.024	0.088	0.046
	(0.21)	(0.15)	(0.28)	(0.21)
Unemployed in Both Years	0.020	0.011	0.029	0.034
	(0.14)	(0.10)	(0.17)	(0.18)
Change in Average Daily Energy Expenditure	0.245	-0.117	0.387	-0.298
	(1.62)	(1.92)	(1.76)	(2.03)
Change in the Probability of Depression	-0.005	0.011	0.016	-0.006
	(0.22)	(0.20)	(0.26)	(0.17)
Children Under 5 Present in Both Periods	0.214	0.117	0.257	0.061
	(0.41)	(0.32)	(0.44)	(0.24)
Onset of Children Under 5 in the First Year	0.014	0.021	0.004	0.031
	(0.12)	(0.14)	(0.06)	(0.17)
Exit of Children Under 5 in the Second Year	0.047	0.058	0.027	0.056
	(0.21)	(0.23)	(0.16)	(0.23)
Married in First Year, Not Married in Second Year	0.036	0.015	0.024	0.004
	(0.19)	(0.12)	(0.15)	(0.06)
Not Married in First Year, Married in Second Year	0.023	0.028	0.011	0.042
	(0.15)	(0.16)	(0.10)	(0.20)
Not Married in Both Years	0.215	0.216	0.275	0.263
	(0.41)	(0.41)	(0.45)	(0.44)
Smoker in Both Years	0.326	0.273	0.433	0.360
	(0.47)	(0.45)	(0.50)	(0.48)
Smoker in First Year, Non-smoker in Second Year	0.034	0.041	0.019	0.054
	(0.18)	(0.20)	(0.14)	(0.23)
Non-smoker in First Year, Smoker in Second Year	0.030	0.037	0.037	0.045
	(0.17)	(0.19)	(0.19)	(0.21)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	-0.703	0.204	-0.295	0.783
	(7.25)	(6.37)	(6.33)	(9.07)
Change in Food-Inflation Ratio Over Previous 2 Years	-0.036	-1.647	-0.049	-1.620
	(0.79)	(0.77)	(0.97)	(0.77)

Note: Standard deviations are in parentheses

Table 3. Summary Statistics for Females

	Full Sample		Low Education Sample	
Variable	**Pre-Policy**	**Post-Policy**	**Pre-Policy**	**Post-Policy**
Change in BMI Over Previous 2 Years	0.297	0.328	0.406	0.241
	(2.01)	(2.44)	(2.14)	(2.10)
Employed in First Year, Unemployed in Second Year	0.045	0.028	0.042	0.009
	(0.21)	(0.17)	(0.20)	(0.10)
Unemployed in First Year, Employed in Second Year	0.044	0.032	0.049	0.049
	(0.21)	(0.18)	(0.22)	(0.22)
Unemployed in Both Years	0.009	0.003	0.023	0.007
	(0.09)	(0.06)	(0.15)	(0.09)
Change in Average Daily Energy Expenditure	-0.095	-0.231	0.045	-0.317
	(1.63)	(1.69)	(1.59)	(1.80)
Change in the Probability of Depression	-0.018	-0.001	0.004	0.008
	(0.31)	(0.29)	(0.31)	(0.24)
Children Under 5 Present in Both Periods	0.158	0.078	0.145	0.077
	(0.36)	(0.27)	(0.35)	(0.27)
Onset of Children Under 5 in the First Year	0.033	0.004	0.030	0.000
	(0.18)	(0.07)	(0.17)	(0.00)
Exit of Children Under 5 in the Second Year	0.088	0.080	0.072	0.078
	(0.28)	(0.27)	(0.26)	(0.27)
Married in First Year, Not Married in Second Year	0.027	0.027	0.031	0.020
	(0.16)	(0.16)	(0.17)	(0.14)
Not Married in First Year, Married in Second Year	0.017	0.042	0.014	0.043
	(0.13)	(0.20)	(0.12)	(0.20)
Not Married in Both Years	0.197	0.222	0.184	0.208
	(0.40)	(0.42)	(0.39)	(0.41)
Smoker in Both Years	0.280	0.268	0.369	0.367
	(0.45)	(0.44)	(0.48)	(0.48)
Smoker in First Year, Non-smoker in Second Year	0.044	0.030	0.046	0.018
	(0.20)	(0.17)	(0.21)	(0.13)
Non-smoker in First Year, Smoker in Second Year	0.033	0.012	0.047	0.013
	(0.18)	(0.11)	(0.21)	(0.11)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	-0.326	0.128	-0.551	0.023
	(3.93)	(2.93)	(5.02)	(2.88)
Change in Food-Inflation Ratio Over Previous 2 Years	-0.068	-1.709	-0.068	-1.660
	(0.83)	(0.66)	(0.78)	(0.60)

Note: Standard deviations are in parentheses

Table 4. Difference-In-Difference Regression Model

Dependent Variable: Change in BMI Over Previous 2 Years	Males	Females
Post-policy Period	0.0655	0.3720
	(0.30)	(0.31)
Employed in First Year, Unemployed in Second Year	-0.3535	-0.3671
	(0.58)	(0.39)
Unemployed in First Year, Employed in Second Year	-0.0582	-0.6205
	(0.34)	(0.32)
Unemployed in Both Years	-0.2959	-0.0601
	(0.26)	(0.59)
(Post-policy Period) X (Employed in First Year, Unemployed in Second Year)	0.7986	0.1932
	(0.79)	(0.95)
(Post-policy Period) X (Unemployed in First Year, Employed in Second Year)	-1.0496	-0.6450
	(0.59)	(0.76)
(Post-policy Period) X (Unemployed in Both Years)	0.4530	-0.3928
	(0.75)	(0.79)
Change in Average Daily Energy Expenditure	-0.1442*	0.0749
	(0.06)	(0.15)
Change in the Probability of Depression	-0.5018	-0.4144
	(0.38)	(0.33)
Children Under 5 Present in Both Periods	-0.2273	-0.0444
	(0.30)	(0.32)
Onset of Children Under 5 in the First Year	-0.2379	-0.6318
	(0.66)	(0.58)
Exit of Children Under 5 in the Second Year	-0.6652*	-0.2041
	(0.31)	(0.29)
Married in First Year, Not Married in Second Year	-0.0889	-0.5836*
	(0.38)	(0.28)
Not Married in First Year, Married in Second Year	0.7143	0.3306
	(0.47)	(0.40)
Not Married in Both Years	-0.3436	0.1911
	(0.23)	(0.25)
Smoker in Both Years	-0.1498	0.0045
	(0.21)	(0.22)
Smoker in First Year, Non-smoker in Second Year	0.7770	0.1023
	(0.51)	(0.47)
Non-smoker in First Year, Smoker in Second Year	0.0936	-0.9700*
	(0.77)	(0.48)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	0.0044	-0.1248
	(0.03)	(0.07)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years^2	0.0003	0.0054
	(0.00)	(0.00)

Change in Food-Inflation Ratio Over Previous 2 Years	-0.1507	-0.0196
	(0.10)	(0.12)
Constant	0.2896	0.2495
	(0.17)	(0.17)
Observations	674	593
R-squared	0.0568	0.0420

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table 5. Difference-In-Difference Regression Model with Education Restriction

Dependent Variable: Change in BMI Over Previous 2 Years	Males	Females
Post-policy Period	-0.1235	0.5886
	(0.53)	(0.51)
Employed in First Year, Unemployed in Second Year	-0.9588	-0.5149
	(0.72)	(0.38)
Unemployed in First Year, Employed in Second Year	-1.0721*	-1.5384
	(0.43)	(0.98)
Unemployed in Both Years	N/A	N/A
(Post-policy Period) X (Employed in First Year, Unemployed in Second Year)	3.1541***	1.8867
	(0.87)	(1.36)
(Post-policy Period) X (Unemployed in First Year, Employed in Second Year)	-0.5021	0.4391
	(0.64)	(1.26)
(Post-policy Period) X (Unemployed in Both Years)	N/A	N/A
Change in Average Daily Energy Expenditure	-0.2265**	-0.0346
	(0.09)	(0.11)
Change in the Probability of Depression	-0.5277	-0.5701
	(0.79)	(0.45)
Children Under 5 Present in Both Periods	-0.2678	0.6521
	(0.50)	(1.01)
Onset of Children Under 5 in the First Year	1.6592***	-0.3712
	(0.44)	(0.50)
Exit of Children Under 5 in the Second Year	-0.0540	0.7402
	(0.46)	(0.55)
Married in First Year, Not Married in Second Year	1.8490**	-0.8114*
	(0.67)	(0.33)
Not Married in First Year, Married in Second Year	0.3184	-0.9490
	(0.51)	(0.85)
Not Married in Both Years	0.0791	0.4361
	(0.37)	(0.53)
Smoker in Both Years	0.1717	0.1285
	(0.36)	(0.38)
Smoker in First Year, Non-smoker in Second Year	1.0407*	-1.9022
	(0.44)	(1.60)
Non-smoker in First Year, Smoker in Second Year	-0.1188	-1.1797
	(0.39)	(1.12)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	0.0504	-0.2550*
	(0.04)	(0.11)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years^2	-0.0001	0.0174*
	(0.00)	(0.01)

Change in Food-Inflation Ratio Over Previous 2 Years	-0.3391	0.2875
	(0.23)	(0.20)
Constant	-0.0085	0.2542
	(0.32)	(0.26)
Observations	198	153
R-squared	0.1881	0.1960

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table 6. Difference-In-Difference Regression– Placebo Model

Dependent Variable: Change in BMI Over Previous 2 Years	Males	Females
Post-policy Period	0.1195	0.2820
	(0.38)	(0.39)
Employed in First Year, Unemployed in Second Year	0.1781	-0.1680
	(0.79)	(0.64)
Unemployed in First Year, Employed in Second Year	0.8419*	-0.3565
	(0.34)	(0.39)
Unemployed in Both Years	-0.2509	0.6112
	(0.34)	(0.97)
(Post-policy Period) X (Employed in First Year, Unemployed in Second Year)	-0.2191	0.0326
	(0.88)	(1.09)
(Post-policy Period) X (Unemployed in First Year, Employed in Second Year)	-1.3205	-0.6795
	(0.73)	(1.09)
(Post-policy Period) X (Unemployed in Both Years)	0.4190	-1.8984
	(0.47)	(1.41)
Change in Average Daily Energy Expenditure	-0.1138	0.1127
	(0.08)	(0.19)
Change in the Probability of Depression	-0.4339	-0.3717
	(0.35)	(0.43)
Children Under 5 Present in Both Periods	-0.2985	-0.2080
	(0.36)	(0.33)
Onset of Children Under 5 in the First Year	-1.2208	-0.5125
	(0.65)	(0.64)
Exit of Children Under 5 in the Second Year	-0.8064*	-0.4214
	(0.37)	(0.36)
Married in First Year, Not Married in Second Year	-0.3723	-0.2028
	(0.37)	(0.39)
Not Married in First Year, Married in Second Year	0.8769	0.3198
	(0.63)	(0.50)
Not Married in Both Years	-0.5882*	0.1791
	(0.30)	(0.30)
Smoker in Both Years	-0.2969	-0.0952
	(0.23)	(0.30)
Smoker in First Year, Non-smoker in Second Year	0.7290	0.6714
	(0.63)	(0.39)
Non-smoker in First Year, Smoker in Second Year	0.2537	-0.8171
	(1.12)	(0.50)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	-0.0132	-0.0691
	(0.03)	(0.08)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years^2	0.0004	-0.0012
	(0.00)	(0.00)

Change in Food-Inflation Ratio Over Previous 2 Years	-0.0642	-0.1313
	(0.11)	(0.14)
Constant	0.4216*	0.2288
	(0.21)	(0.21)
Observations	476	440
R-squared	0.0590	0.0464

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table 7. Robustness Check: Difference-In-Difference Regression Model

Dependent Variable: Change in BMI Over Previous 2 Years	Males	Females
Post-policy Period	0.0014	0.2686
	(0.27)	(0.25)
Employed in First Year, Jobless in Second Year	-0.4416	0.0370
	(0.60)	(0.34)
Jobless in First Year, Employed in Second Year	-0.1075	-0.4314
	(0.28)	(0.30)
Jobless in Both Years	-0.4281	0.0311
	(0.26)	(0.58)
(Post-policy Period) X (Employed in First Year, Jobless in Second Year)	0.4365	-0.3609
	(0.89)	(0.87)
(Post-policy Period) X (Jobless in First Year, Employed in Second Year)	-1.1997*	-0.1315
	(0.54)	(0.74)
(Post-policy Period) X (Jobless in Both Years)	0.6616	-0.2425
	(0.72)	(0.79)
Change in Average Daily Energy Expenditure	-0.1131*	0.0685
	(0.05)	(0.11)
Change in the Probability of Depression	-0.5086	-0.1557
	(0.30)	(0.36)
Children Under 5 Present in Both Periods	-0.1877	0.0069
	(0.28)	(0.26)
Onset of Children Under 5 in the First Year	-0.1806	-0.4425
	(0.64)	(0.56)
Exit of Children Under 5 in the Second Year	-0.4321	-0.2815
	(0.32)	(0.24)
Married in First Year, Not Married in Second Year	-0.1980	-0.7159*
	(0.35)	(0.29)
Not Married in First Year, Married in Second Year	0.6244	-0.1993
	(0.45)	(0.63)
Not Married in Both Years	-0.2335	0.2242
	(0.21)	(0.24)
Smoker in Both Years	-0.0137	-0.0670
	(0.19)	(0.19)
Smoker in First Year, Non-smoker in Second Year	0.7650	-0.0630
	(0.47)	(0.44)
Non-smoker in First Year, Smoker in Second Year	0.1857	-1.0250**
	(0.68)	(0.36)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	0.0069	-0.0504
	(0.03)	(0.04)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years^2	0.0002	0.0024*
	(0.00)	(0.00)

Change in Food-Inflation Ratio Over Previous 2 Years	-0.1472	-0.0612
	(0.09)	(0.10)
Constant	0.2472	0.2208
	(0.16)	(0.16)
Observations	854	910
R-squared	0.0432	0.0288

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table 8. Robustness Check: Difference-In-Difference Regression Model with Education Restriction

Dependent Variable: Change in BMI Over Previous 2 Years	Males	Females
Post-policy Period	-0.2031	0.1642
	(0.51)	(0.44)
Employed in First Year, Jobless in Second Year	-1.0479	-0.5048
	(0.72)	(0.31)
Jobless in First Year, Employed in Second Year	-0.9519**	-0.6010
	(0.37)	(0.72)
Jobless in Both Years	-0.3425	-0.3660
	(0.38)	(0.86)
(Post-policy Period) X (Employed in First Year, Jobless in Second Year)	3.3352***	0.4716
	(0.86)	(1.35)
(Post-policy Period) X (Jobless in First Year, Employed in Second Year)	-0.8445	0.8228
	(0.61)	(1.25)
(Post-policy Period) X (Jobless in Both Years)	0.1931	1.1555
	(0.56)	(0.99)
Change in Average Daily Energy Expenditure	-0.1854*	0.0001
	(0.08)	(0.11)
Change in the Probability of Depression	-0.4867	0.0336
	(0.58)	(0.61)
Children Under 5 Present in Both Periods	-0.2416	0.7053
	(0.45)	(0.73)
Onset of Children Under 5 in the First Year	1.7215***	-0.3657
	(0.47)	(0.51)
Exit of Children Under 5 in the Second Year	0.0287	0.1342
	(0.46)	(0.41)
Married in First Year, Not Married in Second Year	1.8653**	-0.6727*
	(0.66)	(0.32)
Not Married in First Year, Married in Second Year	0.2968	-1.3973
	(0.46)	(1.59)
Not Married in Both Years	0.1411	0.1198
	(0.34)	(0.43)
Smoker in Both Years	0.2950	0.1353
	(0.31)	(0.31)
Smoker in First Year, Non-smoker in Second Year	1.1639**	-1.9878
	(0.40)	(1.49)
Non-smoker in First Year, Smoker in Second Year	-0.0729	-0.8414
	(0.37)	(0.68)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years	0.0544	-0.0413
	(0.04)	(0.06)
Change in Average Number of Alcoholic Drinks per Week Over Previous 2 Years^2	-0.0003	0.0027*
	(0.00)	(0.00)

Change in Food-Inflation Ratio Over Previous 2 Years	-0.3320	0.0395
	(0.22)	(0.20)
Constant	-0.0778	0.1558
	(0.29)	(0.25)
Observations	238	244
R-squared	0.1775	0.0724

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05