The effects of Unemployment on Health Behaviours in Canada after the 2008 Financial Crisis

by

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Abstract

Using Canadian individual-level panel data from the National Population Health Survey, this paper explores the effects of unemployment on selected health behaviours in the country. More precisely, it focuses on the effects that being unemployed before and after the 2008 economic crisis has on smoking, drinking, and exercise levels. The aim is to explore the idea that the 2008 crisis might have changed the existing relationships between employment status and the aforementioned behaviors. The results show that being unemployed before 2008 in Canada had no effects on the intensity of smoking for those already smoking, whereas being unemployed after 2008 resulted in individuals smoking more, conditional on being a smoker. As for the extensive margin of smoking, there were no significant results. Furthermore, findings for consumption of alcoholic beverages show that unemployment used to result in more drinking before 2008. However, there is no significant effect of unemployment on drinking behaviour after 2008. As for physical activity levels, unemployment before 2008 had no effects and unemployment after 2008 resulted in lower levels of exercise for the Canadians in the sample. These findings indicate that unemployment in Canada, after an exogenous shock, would be worse than better for individual health. The results are consistent with some previous Canadian and German studies, but in opposition with some research and outcomes found in the Unites States.

I. Introduction

When considering the effects of unemployment on overall health, one could be tempted to think that job loss results in a tightened budget constraint, and thus in poorer health, because health and income are positively correlated[1]. This reasoning is partly true, but partly flawed. One could also easily argue that a tightened budget constraint might result in individuals consuming less goods overall, which also includes the consumption of goods linked to poor health. In such a case employment loss could result in maintenance or increase of the health level. Furthermore, one could argue that the time gained by not working could be used for either, "bad" and/or "good" health behaviours. For example, a recently laid off individual could use his newly found leisure time to exercise more, but he could also stay at home and become more sedentary. It all comes down to individual preferences, elasticity of goods and to different socio-economic characteristics (age, education level, civil status, number of children, income, sex, etc.). As an example, after losing their jobs, individuals that are married and have families might be more likely to spend the same amounts in family-related consumption (i.e. education, clothing) and less on their individual consumption (i.e. cigarettes, alcohol).

When exploring past research, the different outcomes described above seem to be heterogeneously represented, depending on the country where the research was conducted and the data sets used. This is not surprising since, as mentioned above, it is plausible that behaviour following a change in employment will depend on preferences and socio-economic characteristics. Accordingly, the question *is unemployment good for your health?* should be analyzed at national or regional levels. Most of the previous research found is from within the United States, and concludes that the overall relationship between recessions (or

[1] Multiple papers have studied this relationship, with the transmission mechanism being education (Deaton, 2003).

unemployment) and health is positive. Thus, contrary to what might be expected at first glance, recessions are good for individuals' health (Ruhm, 2000). However, there is research in Germany (Schmitz, 2011), and more recently in Canada (Latif, 2014, 2014, 2015), that comes to a different conclusion: unemployment is bad for people's health[2].

This paper explores the effects of unemployment, before and after the 2008 crisis, on health in Canada. It focuses primarily on specific health behaviours and not on the overall health level. This is done by using three different dependent variables: (i) Quantity of cigarettes smoked daily, (ii) Quantity of alcoholic drinks consumed[3], and (iii) Physical activity levels. The results of interest are the difference, if any, between the effects of unemployment before and after the 2008 economic crisis. The idea is that the importance of the crisis might have affected the existing link between unemployment and health behaviours in Canada.

In this paper, a fixed-effects instrumental variable approach is used to estimate the relationship between unemployment and each one of the health behaviours. There is a need to instrument for unemployment, using provincial level unemployment as an instrument, because of endogeneity issues[4]. The need for fixed-effects comes from individual heterogeneity in the sample used. A difference-in-difference approach (employment status and year) is also used to obtain results on the effect of being unemployed after 2008. To estimate the models in this paper, described later on with more detail, the Canadian National Population Health Survey is used. This is a longitudinal survey of 17 276 individuals covering the period from 1994 to 2011.

[2] Ruhm uses mortality rates as a proxy for overall health, Schmitz uses a health satisfaction index for overall health, and Latif looks at specific health behaviours instead of overall health.
[3] The positive or negative effect of alcohol on health is still debated, and thus is left for further research (National Institutes of Health, U.S. Department of Health and Human Services, 2000). This paper only focuses on the effects of unemployment on alcohol consumption
[4] This idea is further explored in the methodology section of this paper.

This paper is relevant because there doesn't appear to be any other Canadian studies except Latif's, and it is important to test if different methodology[5] will yield the same results. Furthermore, this paper explores if exogenous shocks, like the 2008 economic crisis, have an effect on the existing relationship between unemployment and health behaviors (i.e. does the relationship change with higher levels of unemployment? Is there a difference between behaviors before and during the crisis?). Furthermore, exploring the links between unemployment and health behaviors can help orient future policy. For example, if unemployment has actually a negative impact on health, the costs of unemployment might be higher than currently thought, and policy should focus even more in getting the unemployed back to work. Additionally, regardless of the effect of unemployment on health, this type of research will help discuss the roles of health insurance and severance packages in the labour market as these types of measures might alleviate and offset the effects of tightened budget constraints after becoming unemployed. Finally, compared to the previous economic uses of the data set used for this paper, this study has a more global approach in the sense that it doesn't only focus on low-income (McLeod and Veall, 2006) or elderly individuals (Au, Crossley and Schellhorn, 2005), but on the population at an aggregate level. To dress a better portrait of current knowledge and findings, the next few pages explore American, Canadian and German papers: their motivations, methods and conclusions.

II. Literature Review

First, one of the most prominent papers on the subject: *Are Recessions Good for Your Health* by Christopher J. Ruhm (2000). Ruhm states that before his paper it was clear that unemployment was positively correlated with infant mortality rates and deaths due to cardiovascular disease,

[5] Latif uses a logit regression.

suicide, and homicide. In his paper, he shows that unemployment is actually negatively correlated with total mortality. He brings forward the importance of cyclical variations on healthy lifestyles and on the negative effects of job-holding. For example, he finds that lower earnings reduce normal goods consumption like alcohol and driving, which results in fewer car accidents. He also brings attention to the negative effects of being employed, like job-related stress and time costs of medical care (in terms of time, it is expensive to schedule and go to appointments with physicians when you have a full-time job), and to the fact that naturally, with job loss, these costs and negative effects are reduced. Other positive effects of becoming unemployed include the reduction of risk from hazardous working conditions, as well as eligibility for welfare programs like Medicaid (it might be more profitable for a low income individual to lose his working income but gain more utility from a combination of different welfare programs).

Ruhm uses a fixed-effects estimation with longitudinal state-level data from 1972-1991. His model takes health and a composite good as components for utility, where health is derived from a combination of a baseline health level, medical care received, and non-work time. This utility is subject to a budget constraint that includes income and the costs of consuming the composite good and being in good health. To test this model, he uses mortality rates as a proxy for health (as well as other specific causes of death), and unemployment as a proxy for macroeconomic conditions. Ruhm is thus measuring the impact on mortality of within-state deviations in economic conditions. The causes of death used by Ruhm to proxy mortality (or health) are cardiovascular diseases, motor vehicle accidents, other accidents, suicide, pneumonia, liver disease, homicide and infant mortality, amongst others.

Overall, Ruhm's paper shows evidence that macroeconomic cycles, specifically recessions, have a positive impact on health (recessions are negatively linked to mortality). However, he mentions that the relationship between personal income and health is weak and sensitive to model specification, periods, and dependent variables. Finally, because Ruhm uses state-level data, his set of covariates is less comprehensive than what individual or household-level data can provide. Use of a different data set might thus allow for more robust results in terms of the relationship between personal characteristics and health.

The second paper examined is: *Why Are Recessions Good for Your Health* by Douglas L. Miller, Marianne E. Page *et al.* (2009). The authors of this paper base their research in the results obtained by Ruhm, but also on the fact that some research links job displacement to higher probabilities of dying (at the individual-level), which could contradict Ruhm's findings. The authors first explore the cyclicality of mortality rates, and then they find that the causes of death that contribute to changes in aggregate cyclical mortality are not linked with personal stress levels or health behaviours. For example, they find that one of the drivers of the change in mortality cycles is the increase in motor vehicle accidents (procyclical). They also find that the work behaviour of the elderly is not an important mechanism explaining the mortality within this group. They stress the fact that pollution level changes and changes in the quantity and quality of healthcare should be studied, since it is plausible that these are the factors affecting cyclical mortality. Essentially, the authors find that the higher mortality rates observed at times of better macroeconomic conditions are not caused by individual work status and health behaviours, especially amongst the elderly (which represent a big portion of the mortality in a given population). Thus, their results do not contradict Ruhm's, but shine light on other possible causes behind the negative relationship of business cycles and health.

Miller *et al.* use a fixed-effects model with state-level data running from 1978 to 2004. Their data is of course longitudinal. Just like Ruhm's, their model takes utility as a function of health and a composite good, and is subject to a standard budget constraint. However, the authors focus on more detailed decompositions of health (measured by mortality): by age, sex and race. They also compare a specific demographic group's health and its unemployment numbers with the unemployment rate of other demographic groups. Their basic econometric model uses health, measured by the natural log of the mortality rate in state *j* and year *t*, as dependent variable. Their regressors are a vector of year fixed effects, a vector of state-year demographic controls, unemployment rate as the main indicator of a state's economic health, a state fixed-effect, and a state-specific time trend. Just like in Ruhm's research, the coefficient of interest is the impact on mortality of within-state deviations in economic conditions. By estimating their model by single year of age, the authors find that "the larger magnitude of the cyclicality among young adults extends to children as well." They say that this finding implies that the large coefficient estimates found are a result from other sources than individuals' own employment status changes.

Overall, this paper contributes to the existing literature by stating that individual labor and health behaviour might not be driving the state-level health. It also concludes that understating the procyclicality of mortality requires understanding work and health patterns among the elderly. These are interesting results, but unfortunately, most of the coefficients reported by the authors are not statistically significant. Moreover, this paper doesn't contribute much to the relationship between income and health. Finally, the authors consent that unemployment level is not the best measure of labor market activity for the elderly, so they do not know how robust their conclusion about this particular result is.

The third paper consulted is *The Business Cycle and Health Behaviours* by Xin Xu and Robert Kaestner (2010). These two authors base their research on previous work by Halliday (2006), where it shows that sustained economic expansion is good in terms of health behaviours, especially for the less wealthy. This is interesting because it seems to be in contradiction with the findings by Ruhm. In their paper, Xu and Kaestner find that an increase in working hours is linked with more smoking and less exercise. However, this wouldn't be the result of the relationship between work and unhealthy behaviour, but rather the result of an existing relationship between work and time intensive activities. What this implies is that individuals not working can pursue more time intensive activities, like exercise, and individuals working only have time to pursue less time intensive activities, like smoking. This is directly linked to the time constraint logic stated at the beginning of this paper. Moreover, in their paper, Xu and Kaestner come to the conclusion that the effects associated with change in working hours can be attributed to the changes in the extensive margin of employment. What this implies is that the health effects observed are the result of the change in employment status, and not the variation in working hours (for those who *are* employed). Finally, they find evidence that a wage increase is linked with a greater consumption of cigarettes.

The authors base their model in the assumption that it is changes in time use and income that determine health, and not the economic activity itself. They describe utility as being a function of current health status, a time-intensive health-related commodity (such as physical activity), a less time-intensive health-related commodity (like cigarette consumption), other consumption, and a vector of individual characteristics. In this model, health is the result of environmental influences (i.e.: air quality), the time-intensive health commodity, the less time-intensive health commodity, the individual characteristics, and the time spent working. The utility is subject to a time constraint and a budget constraint, where the time constraint is fixed in the short-run

(individuals can't freely trade their time for money during recessions or expansions). For the empirical model, the authors use a two sample instrumental variable approach. This is because they believe wages and hours are endogenous. This is why they first evaluate the effect of economic activity on wages and hours, and then the effect of wages and hours on health behaviours. As instruments for wages and hours they use state unemployment and industry mix respectively. Their econometric model uses health behaviour as a dependent variable, and as regressors it uses state fixed effects, year fixed effects, personal and family characteristics, and time varying state specific characteristics (for example, state cigarette and beer prices). Their coefficients of interest are the effect of hours worked and the effect of the wage rate. The authors claim that the IV approach is almost perfectly suited for their objectives, as "changes in hours of works and wages in response to changes in economic activity will yield estimates of the local average treatment effects of wages and hours on health behaviours." This allows the authors to obtain causal effects linking recessions to health. They believe that prices of other goods may affect health behaviours and may be correlated with economic activity, which would violate their exclusion restriction. However, they argue that prices are determined at the national level, and they control for national trends in prices, as well as for time-invariant changes in prices across locations (state fixed effects).

Globally, Xu and Kaestner's paper finds that expansions, especially changes in employment associated with economic activity (which is the one of the main interest of this paper), are associated with increasingly unhealthy behaviours, more smoking, less exercise and fewer medical consultations. Specifically, the authors conclude that it is an increase in working hours that results in more smoking and less physical activity. However, they find little evidence that employment and alcohol consumption are related for those with less education attainment.

Furthermore, the authors discuss a possible bias in their results coming from the fact that the wages of those not working are unobserved.

Another influential study examined is the work of Hendrik Schmitz in *Why Are the Unemployed in Worse Health?* (2011). Schmitz states that past research shows negative correlation between individual health and unemployment, or between health and low income (Adams et al. 2003, Arrow 1996, Riphahn 1999, and Romeu Gordo 2006), but notes that the direction of causality is not well understood. He documents three reasons why the unemployed might be observed to be less healthy than the employed. These reasons are: (i) the selection of ill workers from work into unemployment (what if the unemployed lost their jobs because they were already ill?), (ii) the fact that poor health causes longer unemployment spells, and (iii) unemployment itself can lead to deterioration in health. Schmitz then proceeds to note that because of the unobservable effects affecting health and the probability of becoming unemployed, it is very difficult to estimate the third reason listed. The author then states that a causal effect can only be established if the health-related selection into unemployment is controlled. This paper finds that the reason for unemployment has an impact on the results: if the reason for unemployment is exogenous, it doesn't deteriorate health; if it isn't, then unemployment conveys a negative effect on health (which is likely biased due to endogeneity or reversed causality).

The author uses German Socio-Economic panel data from 1991 to 2008 and brings an interesting change to previous models, in that he allows for different measures of health, including health satisfaction, mental health, and the probability of a hospital visit within four years after the survey interview. The author also uses plant closures as an exogenous reason for unemployment, thus ruling out the endogeneity problem mentioned earlier (i.e. poor health being the reason for unemployment). Because of the ordinal dimension of health satisfaction,

Schmitz uses a fixed-effect conditional logit model where the information on health satisfaction becomes a binary variable (1 if health satisfaction is above the within-individual average over time, and 0 if it is below). Moreover, only the observations that vary in health satisfaction contribute to the likelihood estimation, and thus, only individuals who change their health status at least once in the observed period are included in the regression.

Schmitz paper is very interesting for this study because it unveils that becoming unemployed might be the result of already being ill, and is thus something that must be controlled for if one wishes to establish causality. However, even if the results are interesting, the sample size used by the author seems inadequate (only 5% of the unemployed in the sample loss their job due to plant closures). Furthermore, the mental health variable might be a flawed measure since the survey questions only cover 1 month before the interview[6].

Additional papers consulted include some Canadian studies. The first, by Ehsan Latif (2014), explores *The Impact of Macroeconomic Conditions on Obesity in Canada.* This paper uses data from the Canadian National Population Health Survey (NPHS) and estimates the impact of macroeconomic conditions on individual obesity and body mass index. The author uses a conditional fixed-effect logit model to control for individual unobserved heterogeneity. The main conclusion of this study is that unemployment rate had a significant and positive impact on the probability of being severely obese. There were no significant results on the probability of being overweight or obese. The author defines an econometric specification using obesity as dependent variable, and individual characteristics, and provincial unemployment as regressors.

In addition to fixed-effects, Latif mentions that the reverse causality problem between individual obesity and unemployment is not likely to be of concern because it is highly unlikely that

[6] Mental health should be measured over longer periods of time. One would not expect depression or other mental afflictions do develop during a short span of time.

individual-level obesity affects the provincial unemployment rate. The first results of the study show that provincial unemployment has no significant impact on the probability of being obese. However, in further specifications, the author shows that higher provincial unemployment has a positive and significant impact on the probability of being severely obese (body mass index of 35 or more). This is especially true for two subgroups of the sample: the male group and the individuals with university or college education. However, the author mentions that it is important to note that height and weight are self-reported in the data set used, and this could introduce measurement error. Latif cites studies (Connor et al., 2007; Shields et al., 2008) indicating that self-reports underestimate weight and overestimate height, which would lead to downward bias on the body mass index variable, and thus on the prevalence of obesity.

Another Canadian study by Latif (2014) uses the NPHS data set to estimate *The impact of recession on drinking and smoking behaviours in Canada*. Using conditional fixed-effect logit models, the author shows that unemployment has a significant and positive impact on weekly alcohol consumption and on the probability of being a binge drinker. The study also finds that unemployment has a significant positive impact on the number of daily cigarettes smoked, although it doesn't have an impact on the extensive margin. The study also finds that the impact of unemployment on drinking and smoking is higher for males than females, which is in agreement with previous studies (Engemann and Wall, 2010; Larochelle-Cote and Gilmore, 2009).

Finally, the last Canadian paper consulted, explores *The Impact of Economic Downturn on Mental Health in Canada* (Latif, 2015). Latif uses NPHS data to measure the effect of unemployment rate on mental health as measure by the "short form depression scale". Using fixed-effects and OLS models, the author finds that higher unemployment rates have a positive

and significant impact on depression. This is an important addition to existing literature in that it implies that policy makers should provide more mental health support programs during economic recessions. The econometric model uses a depression score as dependent variable, and individual characteristics, and provincial unemployment (contemporary and lagged 1, 2, 3, and 4 periods) as regressors. Another interesting result of this paper is that a one-period lagged unemployment rate has also a significant and positive impact on mental health, which implies that early recession indicators can cause an increment in mental health problems.

With these papers and their different results in mind, this particular study is relevant because it will explore if existing relationships between unemployment and health behaviours have changed after the 2008 economic crisis. Moreover, the methodology used will differ from Latif's and might thus yield different results. Additionally, there doesn't seem to be a consensus in international literature on the effects of unemployment on health, and the Canadian studies to this date are the work of a single author. Finally, this paper looks at the changes in the intensive margin of health behaviors instead of changes in overall health. The next sections will present the data set, the methodology, the results and a brief conclusion.

III. Data

This paper uses the National Population Health Survey of Canada. This survey collects information on 17 276 individuals over 9 cycles (starting in 1994/1995 and ending in 2010/2011). The survey is administered every cycle, with two or more collection periods over the cycle. It measures 9246 variables and collects data on economic, social, demographic, occupational and environmental correlates of health. Some of the relevant socio-economic variables for this study are gender, age, highest level of education attained, province of residence, immigrant status,

income, and number of people in the household. It also compiles a number of health related variables subdivided in different categories. Some of the categories are: stress, physical activity, medical conditions, mental health, disabilities, smoking, drinking, visits to physicians, injuries, nutrition, and weight. Additionally, the survey has Labour Status and Labour Force categories that include variables such as the amount of hours worked, the number of jobs and the reason and duration of non-working spells. The major goals of the survey were to provide measures of the level, trend and distribution of health status across Canada, assist in understanding the determinants of health, and reflect on the dynamic process of health and illness. The economic uses of this survey in previous research have been centered around the effects of health on the work activity of older Canadians (Au, Crossley and Schellhorn 2005), the impact of income change and poverty on smoking cessation (Young-Hoon, 2012), and the dynamics of food insecurity and overall health (Mcloed and Veall, 2006). Most recently, Latif (2014, 2014, 2015) has used the survey to conduct research similar to this paper.

These characteristics are ideal to study the effects of unemployment on health behaviors, since it is possible to observe changes in employment status and in health for a specific individual and over time. What's even more interesting is that the survey starts before the 2008 recession and ends in 2011, which gives a higher number of possible changes in employment status, as well as an exogenous reason for unemployment.

However, even if most of the answers to the questions in the survey have been coded categorically, in ordered or unordered fashion, which will help the analysis because it allows to order and divide the respondents in subgroups, the answers related to health are both objective and subjective (i.e. there are questions about the number of cigarettes or drinks consumed, but also self-reported answers on general level of health and stress). This is of course a source of

measurement error that must be taken into account when trying to infer after performing the adequate regressions.

Also, there have been some consistency issues in the administration of the questionnaire over the years, and these might be sources of error. For example, when building the sample, a different source was used for Quebec than for the rest of Canada (the Labour Force Survey for Canada and an equivalent for Quebec). Moreover, the survey used to include north components and institutions, but these were dropped after a few cycles[7]. The data collection method also changed over the course of the survey, passing from actual interviewers to computer assisted interviews.

Moreover, there could be attrition problems because even though the sample is still representative of the 1994 population, it might not be representative of today's Canadian population. It should also be noted that the participation rate dropped from over 83% in the first four cycles to 77%-81% in cycles five, six, and seven, and to 70% and less in the last two cycles.

Finally, the questionnaire has been changed over the years and some questions are only used on specific cycles. This reduces the set of potential variables that can be used if one decides to keep only the questions that have been asked every cycle (for consistency purposes). Finally, the last concern with this data set is that some of the variables used (i.e. overall stress level and overall health level), are indexes build on the answers given and not actual questions to which the respondents provided answers.

[7] Thus, the results from this paper apply to Canadian households in the ten provinces excluding individuals living in Indian Reserves, residents of health institutions, and permanent members of the Canadian Forces.

The variables of interest for this paper are coded as follows: For smoking, the survey asks the amount of cigarettes smoked daily. The question was asked every cycle, and the responses were entered as given. Another interesting variable is smoking status, coded as follows: 1- Daily smoker, 2- Occasional smoker, 3- Not a smoker, 6- Not Applicable, 8- Refusal to answer, and 9- Not Stated. For drinking, the survey asked the frequency of alcohol consumption and coded the responses in the following way: 1- less than one drink per month, 2- one drink per month, 3- between 2 and 3 drinks per month, 4- one drink per week, 5- between 2 and 3 drinks per week, 6- between 4 and 6 drinks per week, 7- one drink every day. Finally, for the level of physical activity, the survey contains multiple questions asking about the type, duration and intensity of exercise done by the respondents. In the data set there is a derived variable that combines answers from all the responses into a single index. This derived variable has 3 categories (1- active, 2- moderate, 3- inactive). To attribute a category to every individual in the sample, the survey looks at the responses given to the type of physical activity (from walking to tennis, including gardening and jogging, amongst a dozen others), to the number of times the respondent practiced the said activities (number of times in the last three months), and to the duration of these activities (in minutes).

Initial perusal of this data set allowed the extraction of the summary statistics found in Table 1 and Table 2. Table 1 shows that employment numbers in the sample have dropped over the years, but so have unemployment numbers. This might indicate that individuals have been retiring out of the workforce, which is plausible considering the longitudinal nature of the survey, or it might be a result of the decreasing participation rate in the survey over the years. Moreover, the unemployment rate in the sample oscillates around 7% from 1994 to 2011. This is somewhat lower than the actual levels of unemployment during this period, and could be explained by the proportion of individuals in the sample not stating their current employment

status. In fact, it is plausible that unemployed individuals might be more reticent to unveil their employment status than employed individuals. A further subdivision of this statistic by gender shows that the composition of the employed has slowly shifted over the years, with women going from being 47.51% of the employed in cycle 1 to 50.85% in cycle 9. As for the composition of the unemployed, males make the majority of it almost every cycle, although by a very small margin. Additionally, it can be seen that the sample is evenly distributed between males (47%) and females (53%), and thus the composition of the employed and unemployed is not biased by under or over representation of gender. Another statistic in Table 1 is the mean income over the years, which has augmented from CAD $53740 in 1999 to CAD $88824 in 2011, although this doesn't account for inflation.

Concerning the dependent variables in this paper, Table 1 shows that the proportion of smokers in the sample has decreased over the years, going from 26% in 1994-1995 to 10% in 2010-2011. The average number of daily cigarettes smoked, conditional on being a daily smoker, has also decreased over the years. This is not surprising as it is known that a downward trend in cigarette consumption has been observed in most developed countries since the 1980s (OECD, 2005). As for the other dependent variables, drinking and physical activity, they are categorical variables, and thus they have been examined in the histograms following this section.

Finally, regarding health, Table 2 shows overall health levels[8] by employment status in the sample. It can be seen that almost two-thirds of the employed in the sample are in "very good health" or in "excellent health", whereas the same amount of unemployed are in "good health" or in "very good health". Thus, in this sample, the unemployed might be in slightly worse health than the employed.

[8] The health level measure is a derived variable in the sample classifying individuals according to their answers to different health related questions.

Table 1: Summary Statistics – Employment, Income & Smoking

Cycle	1	2	3	4	5	6	7	8	9	Total
Employed	8110	7735	7556	7273	6837	6505	6369	5621	5369	-
Males	4257	4045	3920	3675	3424	3212	3180	2779	2639	-
(M) as % of employed	52.49	52.29	51.88	50.53	50.08	49.38	49.93	49.44	49.15	-
Females	3853	3690	3636	3598	3413	3293	3189	2842	2730	-
(F) as % of employed	47.51	47.71	48.12	49.47	49.92	50.62	50.07	50.56	50.85	-
Unemployed	774	694	509	552	497	479	421	401	439	-
Males	455	366	262	279	242	240	216	208	253	-
(M) as % of unemployed	58.79	52.74	51.47	50.54	48.69	50.10	51.31	51.87	57.63	-
Females	319	328	247	273	255	239	205	193	186	-
(F) as % of unemployed	41.21	47.26	48.53	49.46	51.31	49.90	48.69	48.13	42.37	-
Rate of Unemployment	**8.71**	**8.23**	**6.31**	**7.05**	**6.78**	**6.86**	**6.20**	**6.66**	**7.56**	-
No. of males	-	-	-	-	-	-	-	-	-	8046 (47%)
No. of females	-	-	-	-	-	-	-	-	-	9230 (53%)
Mean Income (in CAD)	**-**	**-**	53740	60946	66195	71918	79992	87752	88824	-
% of Smokers	**26.38**	**23.81**	**21.59**	**19.44**	**16.02**	**14.07**	**13.16**	**10.99**	**10.26**	-
Daily Cigarettes Mean (Std. Dev.)	18.57 (9.74)	17.49 (8.87)	16.91 (8.56)	16.16 (8.46)	15.15 (8.33)	15.15 (8.13)	14.89 (8.28)	14.49 (8.18)	14.24 (7.72)	

Table 2: Summary Statistics – Overall Health by Employment Status

Health Level	Employed		Unemployed	
	No. of Obs.	as %	No. of Obs.	as %
Poor	299	0.77	948	5.24
Fair	1932	5.01	2681	14.83
Good	11416	29.58	5830	**32.25**
Very Good	16901	**43.79**	6277	**34.73**
Excellent	8050	**20.86**	2340	12.95
Total	38598	100.00	18076	100.00

As a complement to these statistics, the histograms in Figures 1 through 8[9] give insight into the dependent variables, their time trends over time and their distributions in the sample. Figure 1 shows that between cycles 1-2 and cycles 8-9, the number of Canadians in the sample smoking more than 20 cigarettes per day has diminished. The distribution appears to have shifted to the left. This would imply that people have reduced their cigarette consumption over the years. Figure 2 illustrates the differences in smoking distribution between the employed and the unemployed. The distributions look fairly similar, but the concentration of heavy smokers appears to be slightly higher for the unemployed. Figure 3 displays that in the first years of the survey, the distribution of the amount of alcoholic beverages consumed by individuals was fairly even, with people falling into categories between 3 and 5 (between 2-3 drinks per month and 2-3 drinks per week). Over the years, the distribution seems to have shifted to category 1 (less than a drink per month) and category 5. It is as if there was a subgroup of the sample that had reduced their consumption over the years. Figure 4 shows that the employed are fairly spread between drinking categories 1 and 5, and the unemployed seem to be concentrated at category

[9] See appendix for Figures

1 and then evenly distributed across all the other categories. However, it is worthy to note that the concentration of heavier drinkers is higher for the unemployed than for the employed. Figure 5 shows that people have become more active through the years. In fact, even if the majority of the sample is still in the inactive category, the difference between categories is smaller in cycles 8 and 9 than in cycles 1 and 2. Figure 6 shows that in the sample the unemployed and active count for more than the unemployed and moderate, whereas there is little to no difference between the active and moderate in the employed subgroup. Perhaps being unemployed is linked with going from moderate to active, but has no impact on going from inactive to moderate. Figures 7 through 8 do not look at the dependent variables of this study, but at other significant health related measures. Figure 7 shows that the proportion of overweight to normal weight individuals has increased over the years[10]. This is also true for the three classes of obesity. Finally, Figure 8 illustrates that there seems to be no relative difference in weight distribution between the employed and the unemployed.

Overall, these set of statistics and figures shows that unemployment in Canada has decreased since 1994, with the exception of a spike in 2010-2011. These statistics also appear to convey less smokers and smoking across the country, but higher concentration of heavy smokers amongst the unemployed. This is also true for drinking behaviours. As for physical activity, Canadians in the sample are more active today than a decade ago. Therefore, it would appear that lower unemployment could be correlated with better health behaviours in Canada.

[10] Categories are: underweight, normal weight, overweight, and then three classes of obese

IV. Methodology

To formally explore this last idea, and to examine if the relationship between employment and health behaviours has changed, let's use an econometric model with three different dependent variables (one regression for each). The response variables are thus: variations in drinking behaviour, variations in smoking behaviour, and variations in physical activity levels. For each one of these, the regressions will use socio-economic characteristics, employment status, and an interaction effect (employment status*year) as regressors. An individual fixed-effects approach is used to control for the heterogeneity across individuals, and a time dummy is used to divide the sample between pre-crisis and during crisis. The interaction effect allows the implementation of a difference-in-difference approach, where the first difference is time and the second is employment status.

Furthermore, an instrumental variable approach is used to control for selection into unemployment, because it is possible that the individuals becoming unemployed during one cycle might have been already ill or in poor health. In other words, this approach controls for endogeneity: having bad health behaviours to start with could have led to unemployment or to longer unemployment spells in some cases. The possibility that the dependent variable (health behaviours) can affect or cause the main independent variable (employment status) is source of correlation between this independent variable and the error term in the model, and thus source of endogeneity. For example, an individual could lose their job because they have an alcohol dependence, but being an alcoholic could be explained by this individual's parents being alcoholics as well (which would be found in the error term since this information is not available in the sample used for this paper). As a result, this individual's employment status (independent variable) is correlated with his parents being alcoholics (error term). The IV approach will control for this and provide unbiased and consistent estimators.

The instrument for individual employment status will be yearly provincial unemployment. This same instrument will be used in the interaction term time*employment status. This is a good instrument because province level unemployment is highly correlated with individual unemployment (if unemployment is higher at a certain point in a specific province, then the likelihood of becoming unemployed for an individual living in that province at that time is also higher), and because province level unemployment should not be correlated with individual health behaviours and choices. In simpler terms, the instrument chosen affects the likelihood of being unemployed but it does not affect the changes in individual health behaviours. Thus, the first step of the regressions is to estimate the relationship between individual and province unemployment, and then use the estimate of individual unemployment to estimate changes in health behaviours. Note that none of the American or Canadian studies consulted use a similar methodology. In fact, these papers use provincial level unemployment as an explanatory variable instead of individual level unemployment. This solves the endogeneity problem, but their results might be less precise as they omit the effects of individual unemployment on individual health behaviours.

Finally, the provincial rate of unemployment (instrument) will be taken from The Conference Board of Canada. This organization publishes yearly provincial level unemployment rates going as far as three decades ago. Since the survey cycles go over two years (ex: C1 is 1994/1995, C2 is 1996/1997, etc.), this paper takes the average unemployment rate corresponding to the two years of each cycle. Perhaps Statistics Canada or the Bank of Canada have more reliable, better data, but access to the Conference Board's was easier and faster. Another possible source of error in the Conference Board data is that they do not specify if the data is deseasonalized or not. In a future paper this issue could be addressed.

Therefore, the basic econometric model goes as follows:

$$HB_{it} = \lambda_t + D_{it} + \mathrm{X}_{it}\beta + (D_{it} * \lambda_t)\gamma + \alpha_i + \varepsilon_{it}$$

Where *HB* is the health behaviour for individual *i* at time *t* (one regression per health behaviour), λ_t is a year dummy (1 if year=2008-2011, 0 if not), *X* is a vector of socio-economic characteristics for individual *i* at time *t*, *D* is the per year individual treatment instrumented with provincial unemployment rates (1 if the respondent is unemployed in period *t*, 0 if the respondent is employed in period *t*), α_i is the individual fixed effect, and ε_{it} is the error term, as usual. Note here the presence of the interaction term $(D_{it} * \lambda_t)$, which signifies that $\hat{\gamma}$ is the effect on *HB* from being unemployed during the recession. This term is the difference-in-difference estimator, and when compared to a regression without it (henceforth referred to as specification 2), the coefficient will allow to compare the effect of being unemployed after the start of the recession with being unemployed before the recession (i.e. if the recession actually changed the relationship between unemployment and health behaviors at all).

As it was mentioned earlier, a different regression will be run for each health behavior. Recall that for smoking, the variable of interest from the data set is the daily number of cigarettes smoked. For drinking, it is the frequency of alcoholic beverage consumption, and for physical activity it is a combined index of activity, frequency and duration.

The decision over the year dummy was discretionary. This paper considers that 2008 was the key year of the last economic crisis. This seems to be the general consensus in business cycle literature, in financial journals, and even in encyclopaedias[11]. By choosing the time dummy this way, the regression results will show, if any, accentuation, maintenance or decline in individual health behaviour trends following an exogenous economic shock.

[11] The Economist, 2013; Britannica 2009; Forbes, 2014

The socio-economic vector will include age, age squared, education attainment (coded categorically: 1- no education, 2- elementary school, 3- some secondary school, 4- graduated from secondary school, 5- other post-secondary school, 6- some trade school, 7- some community college, 8- some university, 9- diploma or certificate from trade school, 10- diploma or certificate from cegep or community college, 11- bachelor's degree, 12- master's degree, 13- degree in Medicine, 14- obtained a doctorate), and marriage status (1 if married, common law couple, or domestic partnership, and 0 if widowed, separated, divorced, or single). Income will be excluded as its correlation with unemployment would be source of endogeneity bias.

For unemployment, the survey asks multiple questions on hours worked, current labour force status, reasons why not working, etc. Then, based on the answers given to this set of questions, the survey derives a labour force status variable, with the following categories: 1- Employed, 2- Unemployed, 3- Not in the labour force, 6- Not applicable, 9- Not stated. These values have been recoded to 0 if the individual was employed and to 1 if the individual was unemployed but not out of the labour force.

Once the data set reduced to the variables of interest, there are 155 484 observations (17 276 individuals over 9 cycles), although this number drops to between 15 000 and 65 000 observations in the regressions. This is due to the fact that not all the individuals respond to every question every year. There is thus a non-negligible number of missing values, as well as non-applicable responses to the questions used in this analysis. Furthermore, recall that the overall participation rate to the survey decreased almost every year. Another problem of this methodology is that the precision of the instrumental variable estimates might be lower than the one from a regular OLS estimation. More on the drawbacks and possible improvements to this research will be discussed in the next sections, after presenting the results.

V. Results[12]

Table 3 shows the results for the two specifications with smoking behavior (daily number of cigarettes for the smoking subgroup) as a dependent variable. The first thing to notice is that the coefficient of interest on the interaction term (employment status*year dummy) is positive (6.47) and statistically significant at 10%. When this coefficient is omitted, employment status is not statistically significant. Thus, it would appear that being unemployed had no effect on the number of cigarettes smoked before 2008, but being unemployed after 2008 results in a higher number of cigarettes smoked daily. Therefore, the economic crisis of 2008 did change the relationship between unemployment and smoking behaviour, for the subgroup of smokers. Other results of interest in the main specification include age (positive and significant at 1%), age squared (negative and significant at 1%), and marriage status (negative and significant at 1%). This would imply that Canadian smokers, regardless of employment status, smoke more with age, but the increment is smaller every year. The result on marriage indicates that not living alone would decrease the number of daily cigarettes smoked by an individual (by 1.05). This could be the result of individuals giving up smoking when entering a relationship where the other person is not a smoker. Let's note that in the two specifications, the F statistic for the first stage results[13] (2 instruments for specification 1, 1 instrument for specification 2) is larger than 10, and thus the instruments used are strong. As a complement to smoking behaviour, Table 4 reports extensive margin results (the dependent variable takes 0 as a value if the individual doesn't smoke at all and it takes 1 as a value if the individual smokes daily or occasionally). The coefficient of interest is not significant in this case for either one of the specifications. Accordingly, there is nothing to be said about the effect of unemployment on becoming a smoker, before or after 2008. All other results from this regression will not be discussed nor

[12] All inference made is *ceteris paribus*

[13] First stage results for all regressions can be found in the appendix, Table 7

reported because of the flaws of linear probability models with dichotomous dependent variables[14]. As in the case of daily cigarettes smoked, the first stage F statistic is above 10 in all cases and therefore the instruments are strong.

Table 3: Cigarettes smoked (daily) as dependent variable

Variable	**Specification I (with cross-effect)**	**Specification II (without cross effect)**
Post 2008	0.3292	0.9220***
	(0.3658)	(0.2021)
Age	0.2738***	0.2756***
	(0.0621)	(0.0605)
Age squared	-0.0063***	-0.0063***
	(0.0006)	(0.0006)
Education	-0.0230	-0.0232
	(0.01897)	(0.0185)
Married	-1.0523***	-1.0725***
	(0.1688)	(0.1644)
Unemployed	*4.5902*	*3.8074*
	(2.9783)	*(2.9029)*
*Post2008*Unemployed*	*6.4713**	-
	(3.3582)	-

Standard errors in parenthesis. Significance: *10%; **5%; ***1%
Instrumented: unemployed; post2008*Unemployed
Instruments: post2008, age, age square, education, married, provincial unemployment, provincial unemployment*post2008

Table 4: Smoking behaviour (extensive margin) as dependent variable

Variable	**Specification I (with cross-effect)**	**Specification II (without cross effect)**
Unemployed	*-0.1184*	*-0.0740*
	(0.1265)	*(0.1179)*
*Post2008*Unemployed*	*-0.2156*	-
	(0.1547)	-

Standard errors in parenthesis. Significance: *10%; **5%; ***1%
Instrumented: unemployed; post2008*Unemployed
Instruments: post2008, age, age square, education, married, provincial unemployment, provincial unemployment*post2008

[14] A logit regression wasn't used because the IV fixed-effect model doesn't allow this option

Table 5 further reports the results for the specification using drinking as a dependent variable. Mainly, the coefficient of interest is not statistically significant, and when excluded (specification 2), employment status is positive[15] and statistically significant (1%). There is thus no effect of employment status on drinking behaviour post crisis. However, this is different from the effect of unemployment before the crisis, which was positive. This implies that the 2008 crisis changed the relationship between unemployment and drinking. Before, unemployment would lead to more drinking, whereas now there is no effect. Other results of specification 1 include that age (positive), age square (negative), education (positive) and time (positive) are all significant, at 5%, 1%, 1%, and 1% respectively. This indicates that drinking increases with age (albeit at a decreasing rate), that going up one educational category is linked with drinking more, and that individuals, employed and unemployed alike, have been drinking more after 2008. This is interesting and further work might explore if drinking actually increases with education, as well as why drinking might have increased after 2008 for all Canadians. However, this is out of the scope of the current subject. Once again, all first stage F statistics are well above 10 and indicate that all instruments used in both specifications are strong.

[15] Because the drinking variable is categorical nothing can be said about the magnitude of these effects. In future work, it would be possible to obtain the marginal effects following this regression. This is also true for the physical activity regressions.

Table 5: Drinking category as dependent variable

Variable	Specification I (with cross-effect)	Specification II (without cross effect)
Post 2008	0.4141***	0.5587***
	(0.1306)	(0.0446)
Age	0.0479**	0.0426**
	(0.0193)	(0.0173)
Age squared	-0.0008***	-0.0008***
	(0.0002)	(0.0002)
Education	0.0169***	0.0166***
	(0.0061)	(0.0057)
Married	-0.0217	-0.0345
	(0.0525)	(0.0479)
Unemployed	*11.1610****	*10.6530****
	(1.5277)	*(1.3312)*
*Post2008*Unemployed*	*2.6144*	-
	(2.1901)	-

Standard errors in parenthesis. Significance: *10%; **5%; ***1%
Instrumented: unemployed; post2008*Unemployed
Instruments: post2008, age, age square, education, married, provincial unemployment, provincial unemployment*post2008

Finally, Table 6 presents the results obtained when using the physical activity index as a dependent variable. The coefficient on the interaction term (employment status*time dummy) is significant at 10%, and yields a negative relationship between being unemployed after the 2008 crisis and being physically active[16]. Specification 2 shows that being unemployed has no significant effect on physical activity levels. This means that before the crisis unemployment did not affect exercise levels, but after 2008 unemployed individuals exercised less. This result is very interesting, since it would imply that the 2008 crisis changed the existing relationship between employment status and physical activity (for the unemployed). However, this result should be verified in further work with a model allowing to quantify the magnitude of the effects. Other results of specification 1 show that education (positive) and marriage status

[16] Recall that a lower category corresponds to active individuals and a higher category corresponds to inactive individuals

(positive) are significant at 1% confidence each. This indicates that more educated people and people not living alone are less active. This could be the result of individuals having less time to exercise as they specialize more, and individuals having less time to allocate to physical activity when they are in a relationship. Once more, all the first stage results yield F statistics well above ten and thus give strength to the instruments used.

Table 6: Physical activity levels as dependent variable

Variable	**Specification I (with cross-effect)**	**Specification II (without cross effect)**
Post 2008	-0.0316	0.0124
	(0.0266)	(0.0099)
Age	-0.0007	-0.0020
	(0.0040)	(0.0038)
Age squared	-0.0002***	-0.0002***
	(0.0000)	(0.0000)
Education	0.0034***	0.0032***
	(0.0013)	(0.0012)
Married	0.0877***	0.0846***
	(0.0108)	(0.0105)
Unemployed	*0.1404*	*-0.0142*
	(0.3251)	*(0.2990)*
*Post2008*Unemployed*	*0.7497**	-
	(0.4151)	-

Standard errors in parenthesis. Significance: *10%; **5%; ***1%
Instrumented: unemployed; post2008*Unemployed
Instruments: post2008, age, age square, education, married, provincial unemployment, provincial unemployment*post2008

Overall, these are the results of interest: being unemployed after 2008 in Canada results in higher levels of smoking (conditional on being a smoker), which was not the case before 2008 (no significant effect). Thus, for the population represented in the sample, the events unfolding after 2008 changed the nature of the relationship between these variables. Unemployment became a negative factor for this specific health behaviour. Additionally, unemployment used to result in more drinking, but not anymore after 2008 (no significant effect). As for exercise levels,

this paper finds that before 2008 unemployment had no effect on this behaviour, but 2008 marked a turning point where unemployed Canadians became more reactive and exercised less. Another interesting result is that higher levels of education are associated with less exercise and more drinking, for the unemployed and employed alike.

This set of results is in closer agreement to that found by Latif (2014, 2014, 2015), which indicated that economic downturns could be worse for Canadians' health (this paper finds less exercise and more smoking when unemployed after 2008 in comparison to being unemployed before 2008). The results are nonetheless in disagreement with those found by Ruhm (2000), Miller (2009) and Xu (2010), which concluded that individuals' health could benefit from tougher macroeconomic conditions. The results of this study on drinking seem to be closer to those found by Schmitz (2011), who found no effect of unemployment on health if the source of unemployment was exogenous. As a whole, it would seem that unemployed Canadians could be losing more than they are gaining in health: more smoking, less exercise, but however no effect on drinking (compared to more drinking when unemployed before 2008).

VI. Conclusion

This paper used Canadian longitudinal data from the National Population Health Survey to explore the causal effects of being unemployed, before and after the 2008 crisis, on specific health behaviours. Previous literature in the United States shows that unemployment has a positive correlation with health, but there are some international studies that show either no significant relationship or the opposite. The idea behind this type of research is that unemployment can be seen as a tightening of the budget constraint and a relaxing of the time constraint for consumers. How individuals will react to these changes will depend on their

preferences and socio-economic characteristics. The main interest of this paper was thus to consolidate the few Canadian studies on the subject, and to explore the idea that the relationship between cyclical economic downturns (represented by unemployment) and health behaviours could have changed after the economic crisis of 2008. In fact, there didn't seem to be any study exploring this possibility.

The survey used is practical for analysis of causality, but it might suffer from measurement errors and from attrition problems. In fact, the sample is highly likely to be representative only of the 1994-1995 Canadian population, and not representative of the current population. Moreover, it would have been practical to have questions reporting the expenditure of individuals on physical activities, alcohol consumption and smoking, more than only they quantities consumed. However, the richness of the survey (it followed around 17 000 individuals over more than a decade) makes it an ideal tool for the current purposes.

To extract causal effects a difference-in-difference approach was used by the means of an interaction term that would take the value 1 if an individual was unemployed after 2008. An instrumental variable approach was also used to control for possible self-selection bias (what if the individuals who became unemployed had already bad health behaviours?). This approach didn't seem to be used by any of the Canadian or American studies consulted. The instrument used was the provincial level unemployment rate (which should not be correlated with individual health behaviors, but highly correlated with individual unemployment rates).

The variables of interest were smoking behaviour, drinking behaviour, and physical activity levels. The regressions generated the following significant results: being unemployed after 2008 in Canada results in higher levels of smoking (conditional on being a smoker), which was not the case before 2008 (no significant effect); unemployment used to result in more drinking, but not

anymore after 2008; and exercise levels were not affected by unemployment before 2008, but unemployed Canadians became less active after this date. Therefore, it would seem that after 2008, unemployed Canadians could be losing more than they are gaining in health.

In future papers, it would be important to try different specifications including different measures for all the variables. For example, the survey variable used for unemployment categorized individuals in three groups. However, this is not the only variable that measured unemployment in the NPHS. There are many others that register the amount of hours worked, the duration of the last employment, the reasons behind the employment status, etc. It would be interesting to create another index of labour status or labour force from all these different variables. This is also true for the dependent variables, as there is more than one question in the survey covering smoking, drinking, and physical activity. Furthermore, it could be interesting to divide age and education into subgroups to obtain more explicit or insightful results (which subgroups drive some of the results, like the fact that education and drinking have a positive correlation). Finally, a different approach to estimate the econometric models in this study would have been to use an instrumental variable probit instead of a simple instrumental variable for smoking and drinking, since these two variables are categorical. Alternatively, a Heckman model could be used, although the current data set might not provide proper restriction variables for the selection equation into (or more precisely, out of) the workforce[17].

[17] One can easily argue that variables such as age, income or education have an effect both on work status and health behaviours.

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Appendix

Figure 1: Smoking distribution, cycles 1 and 2 vs cycles 8 and 9

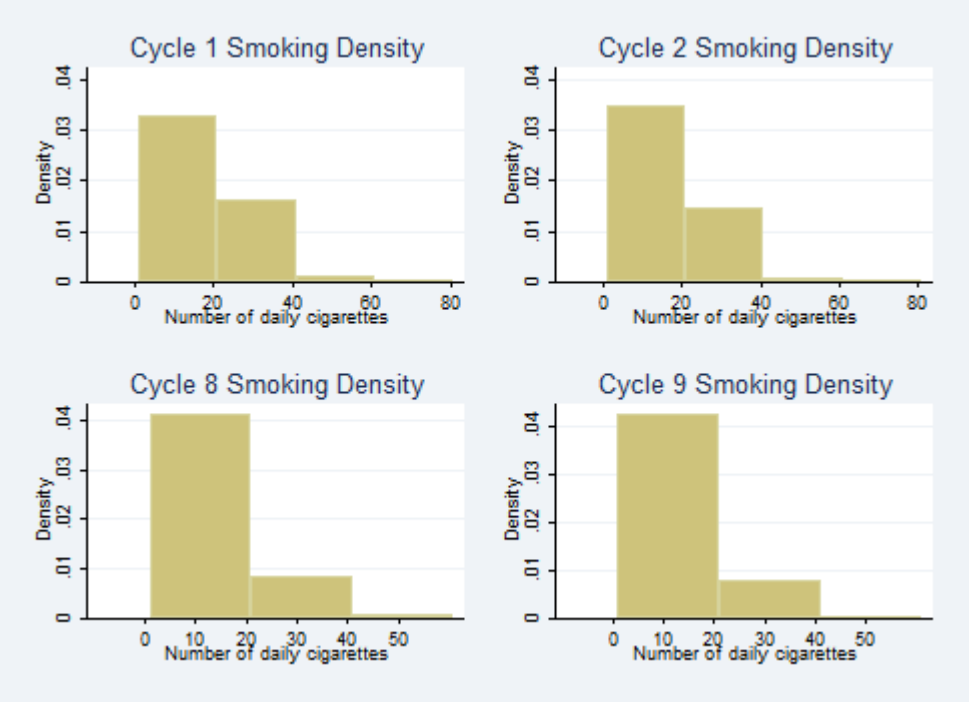


Figure 2: Smoking distribution by employment status

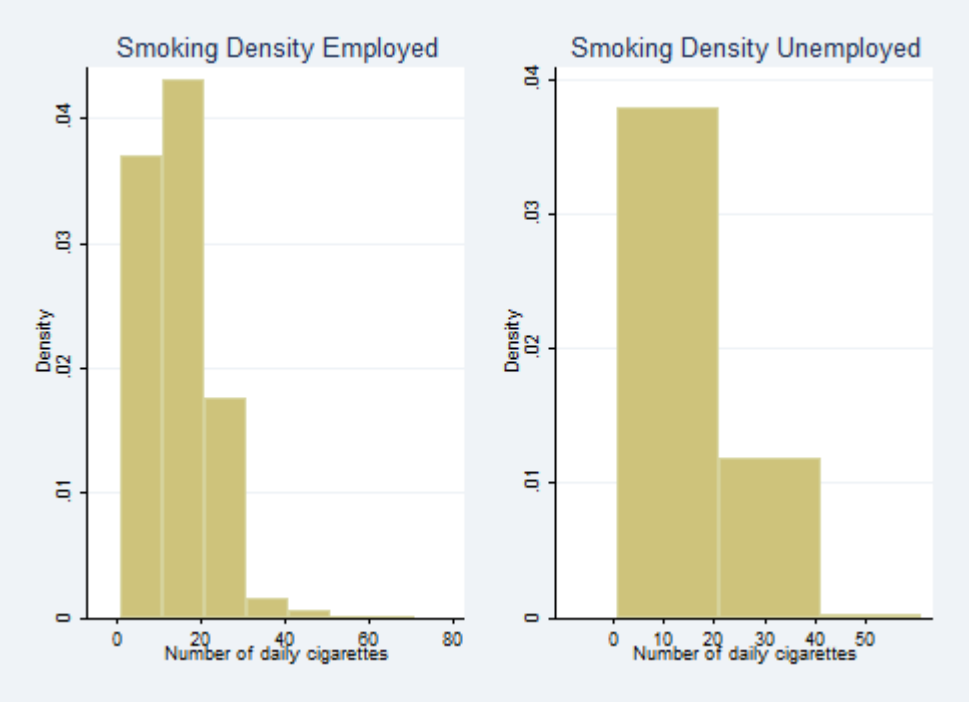
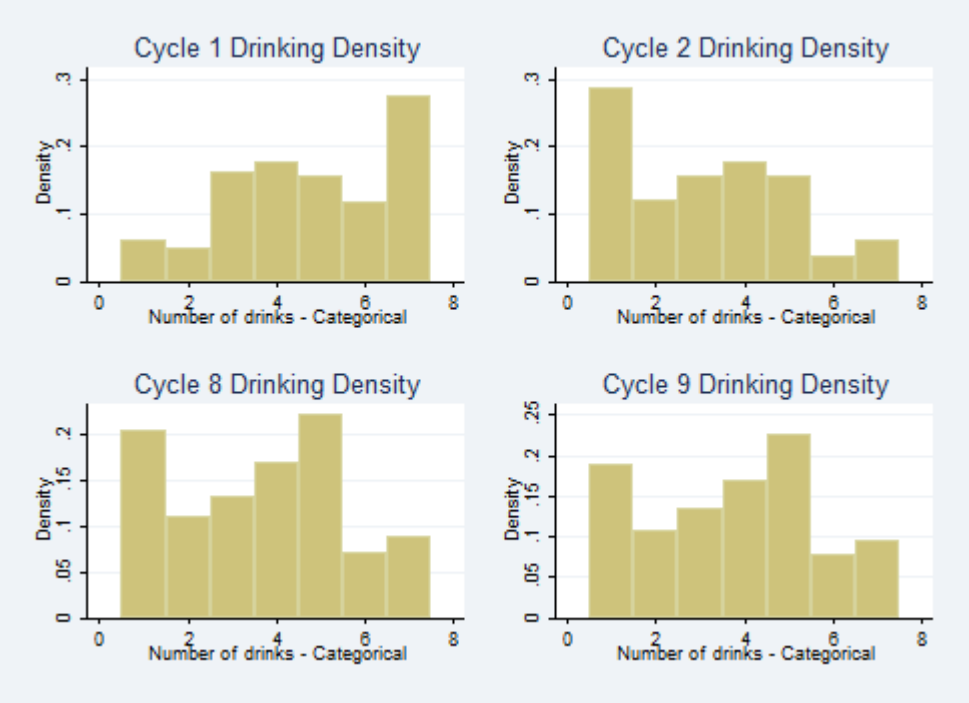
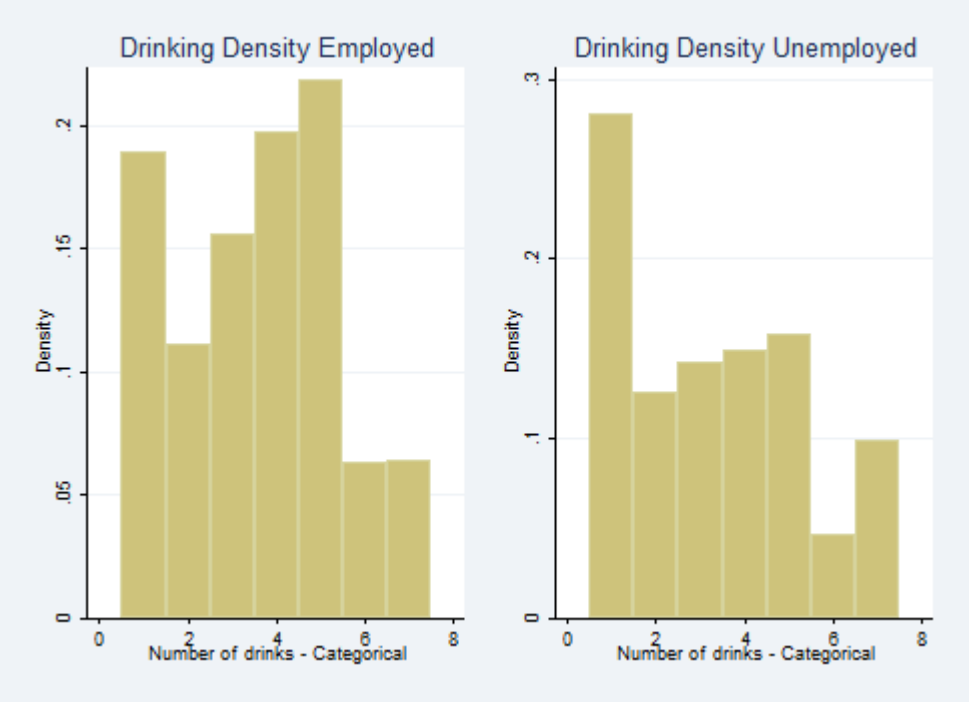


Figure 3: Drinking distribution, cycles 1 and 2 vs cycles 8 and 9



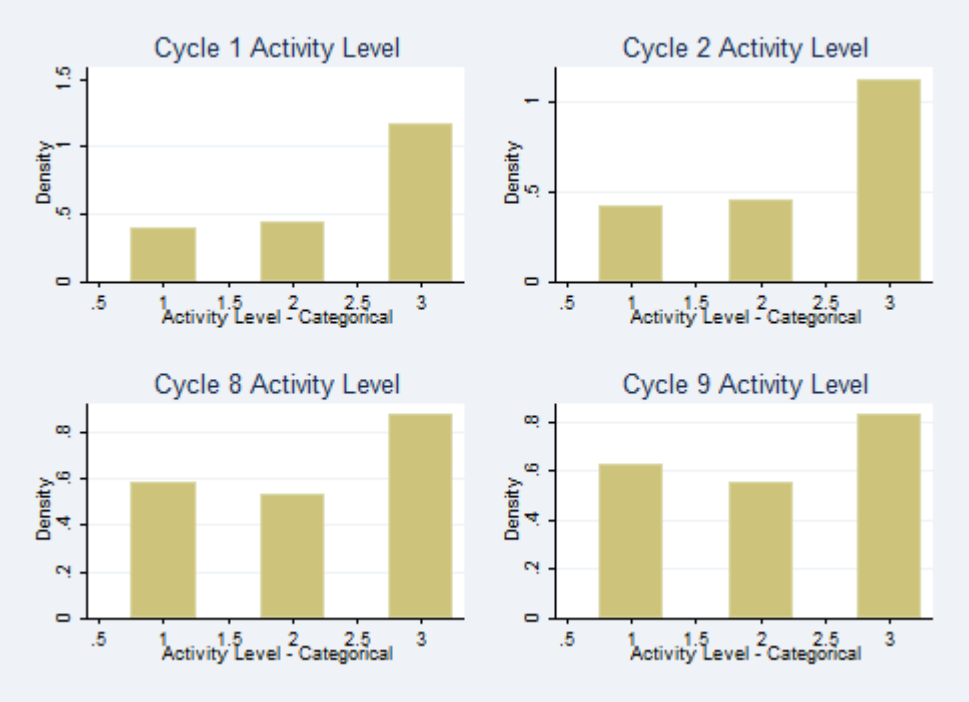
1- less than 1 drink per month; 2- 1 drink per month; 3- between 2 and 3 drinks per month; 4- 1 drink per week; 5- between 2 and 3 drinks per week; 6- between 4 and 6 drinks per week; 7- 1 drink every day

Figure 4: Drinking distribution by employment status



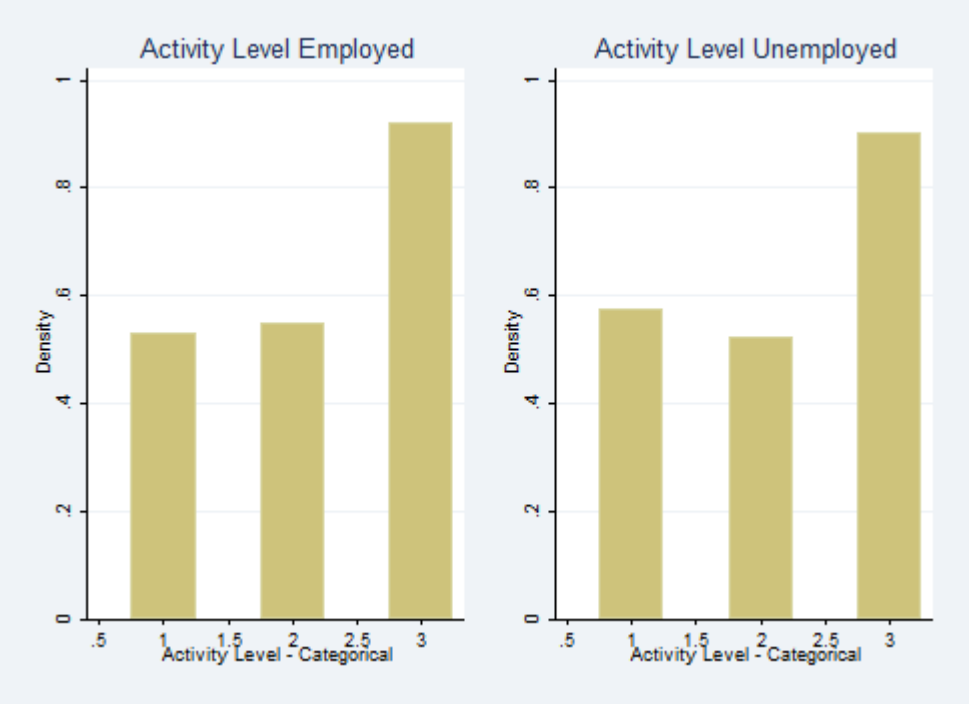
1- less than 1 drink per month; 2- 1 drink per month; 3- between 2 and 3 drinks per month; 4- 1 drink per week; 5- between 2 and 3 drinks per week; 6- between 4 and 6 drinks per week; 7- one drink every day

Figure 5: Physical activity distribution, cycles 1 and 2 vs cycles 8 and 9



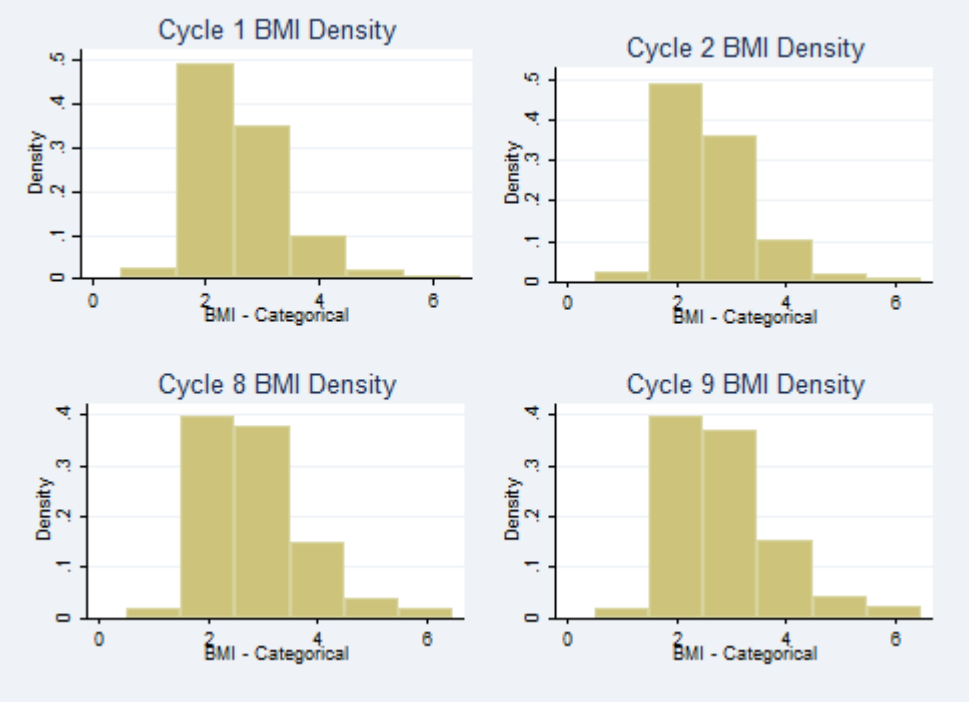
1- Active, 2- Moderate, 3- Inactive

Figure 6: Physical activity distribution by employment status



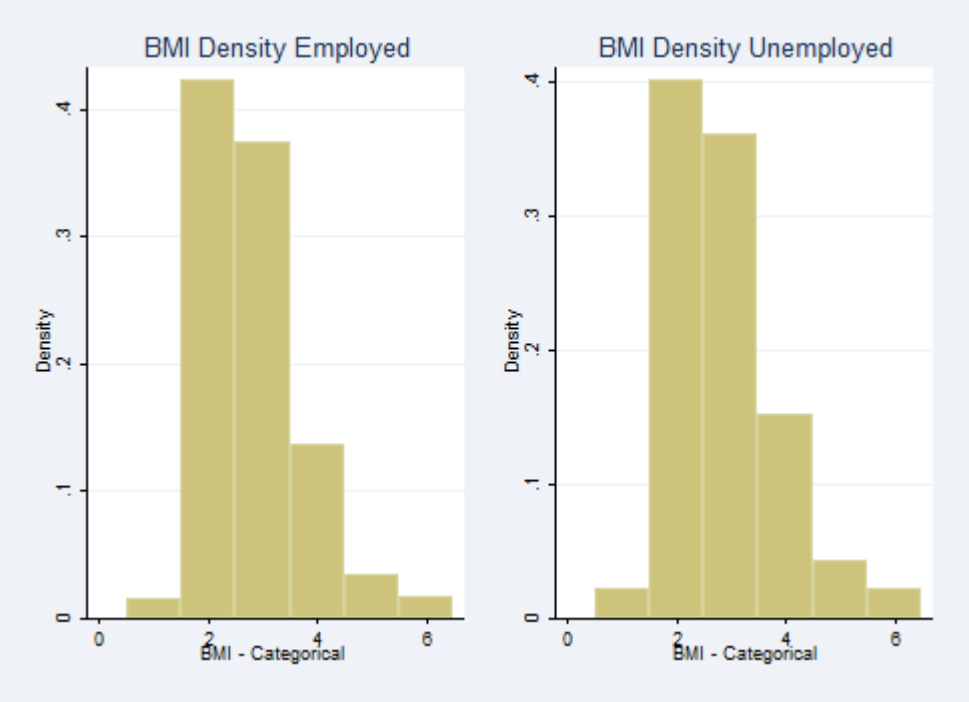
1- Active, 2- Moderate, 3- Inactive

Figure 7: BMI distribution, cycles 1 and 2 vs cycles 8 and 9



1- Underweight; 2- Normal weight; 3- Overweight; 4- Obese type I; 5- Obese type II; 6- Obese type III

Figure 8: BMI distribution by employment status



1- Underweight; 2- Normal weight; 3- Overweight; 4- Obese type I; 5- Obese type II; 6- Obese type III

Table 7: First Stage F- Statistics for strength of the instruments

Regression	**Instrumenting for employment status**	**Instrumenting for Post2008*employment status**
Smoking Specification I[1]	18.06	173.21
Smoking Specification II[2]	21.04	-
Smoking Ext. Margin Specification I[1]	44.20	430.10
Smoking Ext. Margin Specification II[2]	51.40	-
Drinking Specification I[1]	39.24	339.26
Drinking Specification II[2]	45.60	-
Phys. Activity Specification I[1]	44.10	418.88
Phys. Activity Specification II[2]	51.20	-

[1]Instruments: post2008, age, age square, education, married, provincial unemployment, provincial unemployment*post2008

[2]Instruments: post2008, age, age squared, education, married, provincial unemployment