Health Outcomes Before, During and After the Great Recession in Canada: A Longitudinal Analysis

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Using panel data from Canadian National Population Health Survey (2006-2011), this study examined what happened to individuals' self-reported health during and in the aftermath of great recession of 2008-2009. The study used different methods such as ordered probit method, ordinary least square method and panel fixed effects method. Once individual specific fixed effects are controlled for, the results show that great recession had no statistically significant detrimental impact on self-reported health status. The results further show that health status in the aftermath of great recession did not significantly differ from the health status before the great recession.

The great recession of 2008-2009 generated lots of interests among researchers to study the impact of recession on health and health behaviors. These studies are important to understand the full costs of recession. For example, a negative impact of recession on individuals' health may increase health care expenditures. These increases in health expenditures need to be considered while estimating full costs of recession. Quite a number of studies, using data from the United States and European countries, focused on recession in general and examined how unemployment impacts health outcomes (Ruhm, 2000; Ruhm, 2003; Neumayer, 2004; Ruhm, 2005; Gerdtham and Ruhm, 2006; Charles and De Cicca, 2008; Economou, 2008). All of these studies, with the exception of Economou (2008), found that health improved when unemployment rate increased while health deteriorated when unemployment rate decreased. In Canadian contest, Arizumi and Schirle (2012) also found pro cyclical pattern of health outcomes. On the other hand, using Canadian data, Latif (2014) found that unemployment rate had a significant positive impact on the probability of being severely obese.

Above studies did not focus on the impact of great recession of 2008-2009 on health outcomes. However, a number of studies used data covering recession period of 2008-2009 to examine the impact of recession on health (Astell-Burt and Feng, 2013; Tekin et al., 2013;

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Reile et al., 2014; Drydakis, 2015; Tøge and Blekesaune, 2015; Abebe et al., 2016). Astell-Burt and Feng (2013) used data from the Quarterly Labour Force Survey of the United Kingdom (2006-2010) to examine the changes in health outcomes during the Recession. The study found a significant rise in poor health status not only for the unemployed, but also among people who remained employed. Using data from the Behavioral Risk Factor Surveillance System (BRFSS) between 2005 and 2011, Tekin et al. (2013) found that economic deterioration as measured by decreased employment or increased unemployment at the state level lead to poor physical health. Using nationally representative cross-sectional data (2004-2010), Reile et al. (2014) examined the changes in age-standardised prevalence rates of less-than-good self-rated health in Lithuania and Estonia. The study found that the prevalence of less-than-good self-rated health increased slightly in all countries during 2008-2010. However, these results were not statistically significant. Using six waves of the Longitudinal Labor Market Study data set, Drydakis (2015) examined the effect of unemployment on self-reported health and mental health in Greece from 2008 to 2013. The study found that the self-reported health and mental health were negatively affected by unemployment during the 2008-2013 period. Using longitudinal panel data drawn from the European Union Statistics on Income and Living Conditions for 28 European countries from 2008 to 2011, Tøge & Blekesaune (2015) investigated the association between a transition into unemployment and change in subjective health. The results showed that the correlation between unemployment and health was partly due to a decrease in self-rated health as people entered unemployment. Abebe et al. (2016) used balanced panel data, 2005–2011, from the European Union Statistics on Income and Living Conditions (EU-SILC) to examine Individual-level changes in self-rated health before and during the economic crisis in Europe. The study found that the working-age population in European countries experienced an increasing trend in fair and poor self-rated health during the crisis regardless of the severity of recessions.

Examining the impact of great recession on health outcomes is a neglected issue in Canadian health economics literature. According to C.D. Howe Institute Business Cycle Council, the great recession in Canada started in November 2008 and lasted seven months until May 2009 (Cross and Bergevin, 2012). In contrast, the great recession in the United States started in December 2007 and lasted for 18 months (Lavender and Parent, 2012). The great recession in Canada was relatively short lived and milder compared to that of the United States and European countries. Thus, it will be interesting to examine the impact of great recession on health outcomes in Canadian context.

This paper aims at making following contributions to the literature:

- To the best of the knowledge of this author, this study will be the first Canadian study to use longitudinal data to examine the impact of great recession on health outcomes. Consequently, this study will control unobserved individual specific fixed factors that may impact both health and job market status.

- Unlike most of other studies, this study will also examine what happened to individuals' health in the aftermath of recession during recovery period.

The paper is structured as follows: section 2 deals with data and methodology; section 3 presents the results of the study; section 4 is the concluding section.

2   Data

This study uses longitudinal Canadian data from the National Population Health Survey (NPHS) covering a period from 2006 to 2011.[1] The NPHS collects health and socio-demographic information of the Canadian population, and it has three components: households, health institutions, and the North components. This study uses data from the household component. The target population of the household component is household residents in the ten Canadian provinces, excluding persons living on Indian Reserves and Crown Lands, residents of health institutions, full-time members of the Canadian Forces and some remote areas in Ontario and Quebec. In the longitudinal NPHS, the same persons are interviewed every two years, and this process is expected to continue over a period of 18 years or 10 cycles. In each cycle, a common set of health questions is asked to the respondents. Besides the common set of questions, the questionnaire also includes focus content and supplements that change from cycle to cycle. This present study restricts the sample to individuals aged 16 and 64, yielding 12,387 person-wave observations.

The dependent variable of this study is health outcomes, which are represented by self-reported health status indicators. The self-reported health status has the following ordinal categories: 1. poor health, 2. fair health, 3. good health, 4. very good health, and 5. excellent health. The major independent variables are indicator variables Year 2008-2009 and Year 2010-2011. The indicator variable Year 2008-2009 represents recession year while Year 2010-2011 represents aftermath of recession. The base category is Year 2006-2007 representing year before recession.

Age is a continuous variable and variable 'Squared Age' is included in the model to capture the nonlinear impact of age on health outcomes. The dummy variable 'Marital Status' has three categories: single, married and widowed/ divorced. The base category is 'Single'. The dummy variable 'Education' has four categories: less than secondary, secondary graduate, post-secondary graduate, and college-university education. The base category is 'Less than Secondary Education'. The variable 'Having Own Home' is a dummy variable indicating whether or not an individual owns a home. The dummy variable 'Immigrant' indicates whether or not individual is an immigrant. The indicator variable 'Unemployed' indicates whether or not the individual is unemployed. 'Household Income' is measured using four dummy

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[1] For a detailed discussion on the NPHS, please visit Statistic Canada website at: http://www.statcan.gc.ca/start-debut-eng.html

variables: lowest income, low middle income, up middle income, and highest income. The base category is lowest income.

2.1 Conceptual Framework

The most important aspect of recession is increase in unemployment rate. Unemployment impacts of individuals' health outcome in a number of ways. First, unemployed people have more time to spend on health related activities such as exercises, cooking at home and visiting physicians. These healthy behaviours may contribute improving health outcomes. Second, unemployment may lead to loss in income and consequently, individuals may not spend enough on costly nutritious diet. This may result in deterioration in health outcome. Third, if income falls because of unemployment, individuals are likely to spend less on drinking and smoking. This positive health behaviour may improve health. Fourth, unemployed people do not have to suffer from job related stress and anxiety. This is good for both mental and physical health. However, unemployed people are not immune from the tension and anxiety related to the uncertainty about future job and income. This may contribute to decline in health. In summary, theoretically it is not possible to predict the net impact of recession on health outcomes.

In contrast, during recovery period, unemployment rate started to decline. At the initial stage of recovery, firms over utilize existing employees. As a result job related exertion, tension and anxiety increase which may negatively impact health (Ruhm, 2000). On the other hand, increase in earnings during economic recovery may improve individuals' health. Once again, theoretically, it is not possible to predict the net impact of economic recovery on health.

As for other variables in the model, age is a major determinant of health. Studies suggest that functional health steadily declined with age among the adult individuals (Prus, 2001; Kutty, 2000). Marriage may improve economic well-being which in turn positively impacts health (Lerman, 2002). Marriage may also influence health through its positive effect on healthy behaviours such as regular exercise and good diet and its negative effect on unhealthy behaviours such as heavy drinking and alcohol consumption (Umberson, 1987; Curran et al. 1998; Miller-Tutzauer, 1991). Grossman (1972) argued that education increases the efficiency of health production function which in turn improves health. A number of empirical studies have suggested positive impact of education on the health status (Berger and Leigh, 1989; Currie and Moretti 2003; Silles, 2009). Income is expected to impact health positively since individuals with high income can afford nutritious diet and a better neighbourhood to live and they have better and more access to quality care. However, high income may also be associated with increased work hours and job related stress leading to deterioration of health. A number of studies found positive impact of income on the health status (Contoyannis et al., 2004; Frijters et al., 2005) while some studies did not find any significant impact of income on health (Adams et al., 2003; Cawley et al. 2010). Home ownership is a form of wealth and a number of studies have found positive impact of home ownership on health (Macintyre, 1998; Cairney

et al. 2004). However, study also suggests mortgage payment associated with the homeownership may be a source of stress and anxiety (Cairney et al. 2004).

2.2   Empirical Strategy

The empirical model for this study has the following form:

$$H_{it} = \beta_0 + \beta_1 Y2008\text{-}2009 + \beta_2 Y2010\text{-}2011 + X_{it}\beta_x + \mu_i + \varepsilon_{it} \qquad (1)$$

Where H_{it} represents self-reported health status for individual i living in year t. Y 2008-2009 is a dummy representing recession year; Y 2010-2011 is a dummy indicating post-recession year; X is the vector of other variables that influence health such as gender, marital status, education, provinces, age, whether individual owns home, immigration status, race, household income and unemployment status. μ_i represents individual specific fixed effect while ε_{ijt} is the error term.

As self- reported health is an ordered categorical variable, the most pertinent method to estimate equation (1) is the ordered probit method. Thus, the study estimates the equation (1) using ordered probit method. Ferrer-i-Carbonell, & Frijters (2004) showed that assuming ordinality or cardinality of an ordered categorical variable was relatively unimportant to the results. Thus, as robustness check of the result, this study assumes cardinality of self-reported health variable as estimates the equation (1) is using Ordinary Least Square (OLS) method.

However, the ordered probit method and the OLS method do not take into account the unobserved individual specific heterogeneity such as rate of time preference. If unobserved individual specific factors are correlated both with unemployment status and with health status, then the ordered probit and OLS estimations of equation (1) will be inconsistent.

To control unobserved individual specific fixed effect, this study, following French and Davalos (2011), used fixed effect model. Using a fixed effect estimation results in dropping of time invariant unobserved factors such as genetic factors, personality traits and consequently, the method will produce a consistent estimate of the impact of unemployment on health status. A drawback of the fixed effect method is that it cannot address reverse causality. However, in this case, reverse causality should not be a big concern as it is unlikely that individual health significantly affects macroeconomic conditions such as unemployment rate (French and Davalos, 2011).

3   Results of the Study

Descriptive statistics on key variables are shown in Table 1. Table 2 compares health outcomes of recession period and post-recession period with that of pre-recession period. It suggests that mean score of self-rated health outcomes declined over time.

Table 1: Descriptive Statistics

	Overall	Male	Female
Female	.56		
Immigrant	.082	.090	.074
Mean Age	45.14	45.38	45.43
Single	.184	.206	.167
Married	.579	.596	.564
Common Law	.122	.125	.119
Divorced/ Widow/ Separated	.115	.072	.148
Less Than Secondary	.084	.099	.072
Secondary Graduate	.119	.123	.116
Post-Secondary Graduate	.272	.273	.272
College- University Education	.525	.505	.540
Lowest Income Group	.032	.024	.039
Low Middle Income Group	.091	.066	.112
Upper Middle Income Group	.296	.256	.324
Highest Income Group	.581	.654	.525
Unemployed	.039	.043	.036
Owned Home	.818	.830	.810

Table 2: Behaviour of Health Outcomes

	2006-2007	2008-2009	2010-2011
Overall Health (Mean)	3.81	3.79	3.77
Excellent Health (in percentage)	20.7	19.7	20.2
Very Good Health (in percentage)	45.7	46.1	43.6
Good Health (in percentage)	27.8	28.6	30.5
Fair Health (in percentage)	5.3	4.9	5
Poor Health (in percentage)	0.5	.7	.7

The results of the Ordered Probit Regressions are shown in Table 3. Model 1 includes only indicator variables and results of this model, as shown in the column 2 of Table 3, suggest that Year 2010-2011 had a significant negative effect on self-reported health status. Thus, the results imply that health deteriorated in the aftermath of recession. The Model 2 includes socio-demographic covariates along with indicator variables. The results of Model 2, as shown in the third column of Table 3, suggest that Year 2010-2011 had a significant negative while Year 2008-2009 had a negative but non-significant coefficient. The fourth column of Table 3 shows the results of Model 3 that includes indicator variables, covariates and provinces. This model also suggests that indicator variable Year 2010-2011 had a significant negative effect on self-reported health status. Finally, Model 4 includes indicator variables, socio-demographic covariates, provinces, unemployment status and household income. The results of this model, as shown in the fifth column of Table 3, suggest that both Year 2008-2009 and Year 2010-2011 had significant negative effect on self-reported health suggesting that health deteriorated during and after the great recession.

Table 4 shows results of Ordinary Least Square estimations of all the four models. The second column of Table 4 shows the results of Model 1 that includes only indicator variables. The results show that only Year 2010-2011 had a significant negative impact on self-reported health status. The results of Model 2, as shown in the third column of Table 4, also suggest that health deteriorated in the after math of great recession. The results of Model 3 are similar to the results of Model 2. Finally, the fifth column of Table 4 shows the findings of Model 4 and these results suggest that both Year 2008-2009 and Year 2010-2011 had significant negative effect on self-rated heath.

In sum, the results of Ordered Probit and Ordinary Least Square estimations are qualitatively similar.

Table 3: Ordered Probit Regression for Self-Rated Health Status

	Model 1	Model 2	Model 3	Model 4
Year 2008-2009	-0.0355 (0.0235)	-0.0249 (0.0236)	-0.0252 (0.0236)	-0.0439** (0.0234)
Year 2010-2011	-0.0694** (0.0236)	-0.0428** (0.0239)	-0.0432** (0.0239)	-0.0718* (0.0240)
Covariates	No	Yes	Covariates plus provinces	Also included unemployment status and income

Notes: ** indicates that the coefficient is statistically significant at the 5% level. Covariates are gender, marital status, education, age, home ownership, immigration status, and race.

Table 4: Least Square Regression for Self-Rated Health Status

	Model 1	Model 2	Model 3	Model 4
Year 2008-2009	-0.0285 (0.0186)	-0.0195 (0.0184)	-0.0197 (0.0184)	-0.0340** (0.0182)
Year 2010-2011	-0.0562* (0.0187)	-0.0337** (0.0186)	-0.0340** (0.0186)	-0.0559* (0.0184)
Covariates	No	Yes	Covariates plus provinces	Also included unemployment status and income

Notes: ** indicates that the coefficient is statistically significant at the 5% level. Covariates are gender, marital status, education, provinces, age, home ownership, immigration status, and race.

Both the Ordered Probit method and Ordinary Least square method do not control for unobserved individual specific heterogeneities that affect labor market outcomes as well as health status. For example, future oriented individuals are more likely to adopt health promoting behavior such as physical exercise and avoid unhealthy behavior such as smoking. At the same time, these individuals are likely to get more education and training so that they can be successful in job markets. Any estimation without taking into account of unobserved individual specific heterogeneities will result in biased results. This study uses individual specific fixed effects method to take into account of unobserved individual specific fixed effects.

Table 5 shows the results of panel data fixed effects model. The second column of Table 5 shows the findings of Model 1 that includes only the indicator variables. In this model, both indicator variables have significant negative coefficients suggesting that recession year and the year after the recession had deteriorating impact on self-reported health. The results of Model 2, as shown in the third column of Table 5, suggest that none of the indicator variables had significant impact on health. The results of Model 3, as shown in the fourth column of Table 5, are qualitatively similar to the results of Model 2. Finally, the fifth column of Table 5 shows results of Model 4 that includes indicator variables, socio-demographic covariates, provinces, unemployment status and household income. The results are qualitatively similar to the findings of Model 2 and Model 3 suggesting that indicator variables have no significant impact on self-reported health.

Thus, once unobserved individual specific fixed effects are taken into account and socio-demographic covariates are added into the models, the indicator variables have no significant impact of individuals' self-reported health status. In other words, the panel data fixed effects models suggest that Canadian individuals did not face deteriorating health condition during the recession and in the aftermath of recession.

Table 5: Fixed Effects Regression for Self-Rated Health Status

	Model 1	Model 2	Model 3	Model 4
Year 2008-2009	-0.0286** (0.0121)	0.0377 (0.0569)	0.0347 (0.0570)	0.0341 (0.0570)
Year 2010-2011	-0.0562* (0.0121)	0.0755 (0.1099)	0.0706 (0.1099)	0.0704 (0.1099)
Covariates	No	Yes	Covariates plus provinces	Also included unemployment status and income

Notes:** indicates that the coefficient is statistically significant at the 5% level. Covariates are gender, marital status, education, age, home ownership, immigration status, and race.

3.1 Analysis on Gender

Studies suggest that great recession had differential labor market impacts on males and females in Canada. Thus, it is expected that the impact of great recession on health would vary between males and females. This study estimated regressions separately for males and females. The results of these estimations are shown in Table 6. All these models include socio-demographic covariates, provinces, unemployment status and household income. The results are qualitatively similar to over all models. The results from panel fixed effects models show that for both males and females, indicators variables had no significant impacts on self-reported health status.

Table 6: Self-Rated Health by Gender

	Ordered Probit Method		Ordinary Least Square Method		Fixed Effects Method	
	Male	Female	Male	Female	Male	Female
Year 2008-2009	-0.0578 (0.0352)	-0.0326 (0.0321)	-0.0451 (0.0272)	-0.0250 (0.0245)	-0.0164 (0.0834)	0.0781 (0.0786)
Year 2010-2011	-0.0798** (0.0355)	-0.0650** (0.0321)	-0.0611** (0.0272)	-0.0512** (0.0249)	-0.0166 (0.1600)	0.1564 (0.1522)

Notes:** indicates that the coefficient is statistically significant at the 5% level.All models include following covariates: gender, marital status, education, provinces, age, home ownership, immigration status, race, unemployment status, and household income.

3.2 Robustness Test

To test the robustness of the results, the study restricted the sample to individuals who were in the labor force and estimated Ordered Probit, Ordinary Least Square and Panel Fixed Effects models. The results are shown in Tables 7, 8 and 9. The findings are qualitatively similar to the results of the unrestricted samples as shown in Table 3, 4, and 5. In other words, the robustness tests confirmed the findings that once individual specific fixed effects are controlled for, the

great recession had no statistically significant detrimental impact on self-reported health status. As further robustness check, the study limited the sample to individuals in prime age working group (aged 25-54) and estimated regression models. The estimations did not show any qualitative change in results.[2]

Table 7: Ordered Probit Regression for Self-Rated Health Status (Labor Force sample)

	Model 1	Model 2	Model 3	Model 4
Year 2008-2009	-0.0125 (0.0257)	-0.0116 (0.0258)	-0.0116 (0.0258)	-0.0266 (0.0258)
Year 2010-2011	-0.0513** (0.0258)	-0.0424 (0.0261)	-0.0425 (0.0262)	-0.0650** (0.0262)
Covariates	No	Yes	Covariates plus provinces	Also included unemployment status and income

Notes:** indicates that the coefficient is statistically significant at the 5% level. Covariates are gender, marital status, education, age, home ownership, immigration status, and race.

Table 8: Least Square Regression for Self-Rated Health Status (Labor Force sample)

	Model 1	Model 2	Model 3	Model 4
Year 2008-2009	-0.0103 (0.0195)	-0.0093 (0.0193)	-0.0093 (0.0193)	-0.0205 (0.0192)
Year 2010-2011	-0.0399** (0.0197)	-0.0325*** (0.0195)	-0.0324*** (0.0195)	-0.0491** (0.0194)
Covariates	No	Yes	Covariates plus provinces	Also included unemployment status and income

Notes:** indicates that the coefficient is statistically significant at the 5% level. *** indicates that the coefficient is statistically significant at the 10% level. Covariates are gender, marital status, education, provinces, age, home ownership, immigration status, and race.

Table 9: Fixed Effects Regression for Self-Rated Health Status (Labor Force sample)

	Model 1	Model 2	Model 3	Model 4
Year 2008-2009	-0.0245** (0.0133)	0.0727 (0.0639)	0.0716 (0.0640)	0.0729 (0.0641)
Year 2010-2011	-0.0599* (0.0138)	0.1335 (0.1237)	0.1322 (0.1239)	0.1354 (0.1241)
Covariates	No	Yes	Covariates plus provinces	Also included unemployment status and income

Notes:* indicates that the coefficient is statistically significant at the 1% level. ** indicates that the coefficient is statistically significant at the 5% level. Covariates are gender, marital status, education, age, home ownership, immigration status, and race.

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[2] The results are not shown in the text. However, readers can receive these results upon request.

3.3   Unemployment and Employment Transition[3]

The study created two variables: transition from employment to unemployment and transition from unemployment to employment. As further specification, the study included these two variables in the models and estimated Ordered Probit, Ordinary Least Square and Fixed Effects regressions. The results of these regressions are shown in Table 10. The results suggest that transition to unemployment had a significant negative impact on self-rated health. On the other hand, the impact of transition to employment was not statistically significant. The finding that transition to unemployment had a negative impact on health is in conformity with the results from Abebe et al. (2016) and Tøge and Blekesaune (2015).

Table 10: Impact of Transition to Unemployment and Transition to Employment on Health

	Ordered Probit Method	Ordinary Least Square Method	Fixed Effects Method
Transition to Unemployment	-0.1128** (0.0447)	-0.0894** (0.0357)	-0.0481** (0.0367)
Transition to Employment	-0.0107 (0.0399)	-0.0081 (0.0305)	-0.0388 (0.0255)
Covariates	Yes	Yes	Yes

Notes:**indicates that the coefficient is statistically significant at the 5% level. All models include following covariates: gender, marital status, education, provinces, age, home ownership, immigration status, race, unemployment status, household income, Year 2008-2009 and Year 2010-2011.

4   Conclusion

Using panel data from Canadian National Population Health Survey (2006-2011), this study examined what happened to individuals' self-reported health during and in the aftermath of great recession of 2008-2009. The study used different methods such as ordered probit method, ordinary least square method and panel fixed effects method. Once individual specific fixed effects are controlled for, the results show that great recession had no statistically significant detrimental impact on self-reported health status. The results further show that health status in the aftermath of great recession did not significantly differ from the health status before the great recession.

    The results of this study are in contrast with the findings from the majority of other studies covering the recession period (Astell-Burt and Feng, 2013; Tekin et al., 2013; Reile et al., 2014; Drydakis, 2015). One possible reason for the differing results is the difference in the data and

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[3] The author is grateful to an anonymous reviewer for suggestion to include this analysis.

methodologies between this study and other existing studies. However, the finding of this study that transition to unemployment had a negative impact on health is in conformity with the results from Abebe et al. (2016) and Tøge and Blekesaune (2015).

In sum, health of Canadian individuals did not change significantly during the period of great recession and its aftermath compared to the year before the recession. A possible reason is that though the great recession was very severe, but it was milder than that of the United States and many European countries. Canadian economy also experienced very quick recovery. Another possible reason for better health outcomes is the presence of publicly funded universal health care system in Canada. For all of these, Canadian government deserves much credit. Due to prudent regulatory framework, major financial institutions in Canada did not suffer from problems such as those seen in the US and Europe (Cross, 2009). The government also maintained the publicly funded universal health care system.

Future study, using Canadian longitudinal data, may focus on health related behaviours such as physical exercise, healthy eating, drinking, smoking etc. and examine what happened to these behaviours during the great recession and in the aftermath of recession.

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