# Economic Conditions, Health and Health Care Utilization: Canada Evidence

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# Introduction

An individual's income is generally positively correlated with his/her health.[1] Hence, it seems natural to expect that health should move pro-cyclically with the economy. However, empirical evidence demonstrates the opposite - health actually improves during recessions. For example, Ruhm (2000) uses data from the United States over a 20-year period to show that unemployment rates have a significantly negative effect on mortality and eight of ten specific causes of death. Later, using similar empirical methods, Ruhm (2002) finds the pro-cyclical variation in mortality using aggregate data from 23 OECD countries over the period 1960-1997. And in 2003, with other measures of health, he finds that many other measures of health also decline when economy grows such as the incidence of medical conditions, chronic conditions and "restricted-activity days".[2]

However, the literature about the relationship between health conditions and recessions based on Canada evidence is very limited. To date only one study has looked at this relationship using Canadian data. Arizumi and Schirle (2012) find a pro-cyclical relationship between unemployment rate and mortality for working age individuals but not for infants and seniors. Examining the relationship between economic conditions and health/health care utilization in the Canadian context (in addition to the American context) may be informative for many reasons. Gerdtham and Ruhm (2006) suggest that a

[1] See for example, Ettner (1996). In this paper, the author demonstrates that income has a causal effect on both mental and physical health.
[2] Restricted-activity days are defined by a significant reduction in usual activities due to illness or injury.

country's health care and welfare systems may directly affect the effect of unemployment rate on health/health care utilization. And health care institutions are definitely different between these two countries. In Canada, all citizens have access to the health care coverage regardless of their employment status or personal income, while in the U.S., working age individuals who are out of employment may have no health insurance at all. According to the Commonwealth Fund, 26 percent of non-elderly adults which means almost 48 million people have no insurance in 2011.[3] Due to the Medicare, which is the government's health insurance for people aged 65 or older in the United States, the difference in health care coverage for the elderly is much smaller. However, difference still remains in some fields of the health care coverage such as the home care coverage. Though publicly funded home health care varies across provinces in Canada, all provinces and territories provide some home health care services. For example, some provinces offer very broad coverage in home nursing care while others only provide limited monthly dollar amount or the equivalent cost of institutional care.[4] Yet in U.S., Medicare does not offer nursing home facilities that provide long-term custodial care (Arizumi and Schirle, 2012).

In this paper, I replicate Ruhm's paper (2003) to analyze whether individual's health and

[3] Information from
http://www.reuters.com/article/2012/04/19/us-usa-healthcare-insurance-idUSBRE83I17420120419.

[4] Information from
http://www.cbc.ca/healthcare/final_report.pdf Chapter 8.

health care utilization increases during the recessionary periods using Canadian Community Health Survey over the period 2001 to 2010. In addition to two outcomes considered in Ruhm (2003) in the presence of at least one chronic condition and least having had one health care visit in last year, I examine four additional measures of health and health care utilization: the total number of chronic conditions, the total number of health care visits in the year prior to the survey, having spent at least one night and total number of nights in hospital in the year preceding the survey interview date. I follow the same methodology as in Ruhm's earlier work, proxying for economic conditions using province/year unemployment rates and using models which include year and time-invariant province fixed effects.

I have some results that are similar to Ruhm (2003) and others differ. We both find that the presence of at least one chronic condition falls during economic downturns. I find that when the unemployment rate falls 1 percentage point, the probability of people suffering from at least one chronic condition increases by 0.34 percent. He finds that a 1 percentage point falls in unemployment rate is associated with 0.15 percent increase in the probability of people suffering from at least one chronic condition. Both of our results suggest that health improves during economic downturns. However, when examining the effect of economic conditions on health care utilization, we find opposite effects. I find that when the unemployment rate falls 1 percentage point, the probability of people having health care visits once **decreases** by at least 1.84 percent and the total number of

people having health care visits **decreases** by 10.1 percent. He finds that 1 percentage point drop in the U.S. unemployment rate is associated with an imprecisely 0.3 percent **increase** in the probability of visiting a doctor. The different results may be explained by the difference of two countries' health care institutions. In Canada, the health care coverage is universal, and health care is accessible to all people at all time. Therefore, during economic upturns, non-market "leisure" time becomes more costly and people may decrease time-intensive health-producing activities such as having more health care visits, which can also be defined as the opportunity cost of time. However, in the U.S., there is a large proportion of people having no insurance when they are out of employment. Thus one can not only explain the relationship between economic conditions and the use of health care visits by opportunity cost of time. It should be also considered that during economic upturns, people can have better access to health care due to a higher income level.

I am not the only one to find that the effects of economic conditions on health are different between Canada and the United States. Using U.S. data, Miller et al. (2009) test the pro-cyclical relationship between unemployment rate and mortality for specific age group and find that the mortality of infants and seniors declines during recessions, while the mortality of the middle-aged individuals shows no variation. Their evidence supports Dehejia and Lleras Muney (2004) who find that the health of babies who are conceived during economic downturns is ameliorated. However, when Ariizumi and Schirle (2012)

estimate the effect of unemployment rate on mortality for similar age group using Canadian provincial level time-series data, they find that unemployment rate has the most obviously negative effect on the mortality of middle-aged individuals and women close to retirement age. They find no strong evidence for the mortality of infants and seniors. Ariizumi and Schirle (2012) explain the different effects of unemployment rate on mortality of infants and seniors between these two countries separately. First, for infants, in the U.S., children and pregnant women have limited access to the health care since a considerable number of people and families have no insurance. However, considering the finding that during recessions, the probability of less educated white mothers to have babies is the largest (Dehejia and Lleras Muney, 2004), Ariizumi and Schirle (2012) suggest that though these expectant mothers are more likely to be uninsured, they can spend more time to give consideration to their own health, which contributes to the improvement of their babies' health. Another possible explanation is that these expectant mothers may become qualified for Medicaid when they are jobless.[5] Yet this phenomenon may not appear in Canada since the health care is universal. Second, though the difference of health care coverage in these two countries for seniors is not very significant, the effects of unemployment rate on the quality of home care institutions are different. The evidence shows that the effect of unemployment rate on mortality of seniors in nursing homes is especially strong (Stevens et al, 2011). In the U.S., the staffing levels in nursing homes increase during economic downturns (Stevens et al,

[5] Medicaid is the United States' health program for families and individuals with low income and resources.

2011), while in Canada, the quality of nursing homes is more likely to remain stable (Arizumi and Schirle, 2012).

## Why Does Health Turn Worse in Good Times?

The hypothesis is accepted by many scholars that health can benefit from the economic prosperity by reducing the pressure coming from the economic insecurity.[6] Also, income rises with economy growth, which contributes to better access to health enhancing goods and medical care. However, the effect of business cycles on health can be very interesting.

According to Ruhm (2000), there are three main reasons why economy growth might be associated with worse health. First, during economic upturns, non-market "leisure" time is relatively expensive which decreases time-intensive health-producing activities such as exercise.[7] This phenomenon can be explained by opportunity cost of time.[8] Using data from the Behavioral Risk Factor Surveillance System (BRFSS), Ruhm (2000, 2002) finds that risky health behaviors such as smoking, severe obesity and physical inactivity increase during economic upturns. Second, individual's health can be an input into the production of goods and services. For instance, individual's health can be negatively affected by hazardous working conditions, the physical exertion of employment and

[6] For example, see the research by Brenner and Moony, 1983; Catalano and Dooley, 1983; Fenwck and Tausing, 1994.
[7] For example, see the research by Chay and Greensstrone (1999).
[8] Opportunity cost is the cost of any activity measured in terms of the value of the next best alternative forgone (that is not chosen).

job-related stress, particularly working hours are extended during short-lasting economic expansions (Baker, 1985; Karasek and Theorell, 1990; Sokejima and Kagamimori, 1998). Moreover, cyclical sectors (like construction) are associated with high accident rates and some economic activities joint products (like pollution or traffic congestion) contain health risks.[9] Third, economic downturns can reduce health unfriendly behavior such as drinking and driving (Ruhm 2002). During recessions, risky lifestyle activities turn to be luxury since people have limited amount of money for other needs besides basic needs.

## Literature Review

A growing body of studies explores the relationship between the fluctuations of economic conditions and health status.

Ruhm (2000) was the first to demonstrate that mortality falls when unemployment rate increases. In the paper, he measures health by total and age-specific mortality rates and ten particular causes of death with longitudinal data over the period 1972-1991 from the United States. The main finding is that unemployment rate has significantly negative effects on the total mortality and eight of the ten specific causes of fatalities, with suicides representing an important exception.

Dehejia and Lleras-Muney (2004) find that infants' health improves during economic

[9] See for example, Chay and Greenstone (1999).

downturns. Using data from the U.S. Vital Statistics Natality records from 1975 to 1999, they measure babies' health as low and very low birth weight, less neonatal and post neonatal mortality, and lower congenital malformations. And they show that these measures of health are decreased during recessions. They suggest the reason that babies' health improves during recessions is that mothers are more likely to increase the use of pre-natal care and reduce health risky behavior.

Analysis by Miller et al. (2009) aims at estimating the pro-cyclical relationship between mortality and economic upturns, particularly focusing on the mortality at each age by replicating Ruhm's (2000) analysis. With more recent data from the United States over the period 1978 to 2004, they find that unemployment rate has particularly strong negative effects on the mortality of elderly but no significant effects on the mortality of middle-aged individuals.

More recently, Coile, Levine, and McKnight (2012) estimate the effects of unemployment rate on the mortality of individual close to retirement age. With the data from the 1980-2010 March Current Population Surveys and the 1991-2010 Behavioral Risk Factor Surveillance System surveys, they claim that although numerous evidence indicates that mortality declines during recessions, these effects are not permanent, especially for old workers. They suggest that if a recession appears when an individual is close to retirement age, then the effect of unemployment rate is detrimental in the long

run.

Gerdtham and Ruhm (2006) use data from 23 OECD countries over the period 1960-1997 to show that mortality and several death causes rise during economic upturns. They find that as one percentage decreases in unemployment rate, the total mortality rate increases by 0.4 percent, and the death cause of motor vehicle increases by 2.1 percent as the largest impact. Compared to Ruhm's earlier work (2002), their evidence is similar, but generally weaker. This may reflect the difference in institutions between the United States and these countries, since most OECD countries have universal health care and many Western European nations have commendable welfare.

As I mentioned above, Ariizumi and Schirle (2012) use Canadian provincial data over the period of 1977-2009 to test the relationship between unemployment rate mortality of each age group. They find that a 1 percentage point fall in the unemployment rate is associated with 2 percent increase in the mortality rate of individuals in their 30s, but has no effect on infants and seniors. Recall that in this respect, their results differ from those of Miller (2009) and Dehejia and Lleras-Muney (2004).

Additional study based on Canadian evidence by Brochu, Deri Armstrong, and Morin (2013) use Canadian data to explore the pro-cyclical relationship between the local unemployment rate and sleeping time in years 1992, 1998 and 2005. Their findings

suggest that there is an average of 2 hours and 34 minutes increase in sleeping time per week, or 22 minutes more per day during recessions.

Other studies investigate the relationship between economic conditions and health using other measures of health rather than mortality. In 2002, Ruhm and Black show that economic downturns are associated with the decrease in the alcohol consumption. Later in 2005, Ruhm suggests that high unemployment rate can contribute to the reduction of smoking, obesity and increase of physical activity.

The study by Ruhm (2003), which my work follows closely, uses U.S. data from National Health Interview Surveys (NHIS) over the period 1972 to 1981. He uses different measures of health, such as the presence of a chronic condition, the presence of one or more medical conditions, acute morbidity, one or more "restricted-activity day" and "bed-day" during the preceding 2 weeks. The study indicates that there is a counter-cyclical fluctuation among most measures of health and recessions. He also finds that the probability of individuals having visited a doctor has a 0.3 percent increase when unemployment rate drops 1 percentage point.

## Econometric Methods

The empirical strategy follows that of Ruhm (2003). I estimate the following

regression:

$$H_{itj} = \alpha_t + X_{ijt}\beta + \gamma E_{jt} + P_j + \varepsilon_{ijt} \qquad (1)$$

where $H_{itj}$ measures the health or health care utilization of individual i in province j at time t, $X_{itj}$ is a vector of personal characteristics, $E_{jt}$ is the provincial annual unemployment rate, $\alpha_t$ is a year-specific intercept, $P_j$ is the fixed- effect of province j and $\varepsilon_{ijt}$ is the error term.

The dependent variable $H_{itj}$ contains six different measures of health or health care as follows: *the presence of at least one chronic condition, the total number of chronic conditions, having spent at least one night in hospital, total number of nights spent in hospital in the year preceding the survey interview date, the presence of at least once health care visit, and the total number of health care visits in the year prior to the survey.* The year-specific intercept $\alpha_t$ reflects the variation in health over time across the country that is constant across provinces. The year dummies can pick up trends in medical technology or in diseases such as flu shocks. However, important determinants of health such as lifestyle may vary across provinces. Therefore, the province fixed-effects can control such time invariant provincial differences.[10] The $X_{itj}$ vector includes controls forgender, age, marital status, employment status, immigration, education, self-perceived health and income level.[11]

[10] Note that in addition to this model, Ruhm (2003) also estimates another model which includes the vector of province-specific linear time trends. His results are largely consistent between the two models.

[11] Self-perceived health and income level are likely endogenous, however, both variables are very important for the estimation. I have estimated the models without self-perceived health; fortunately, there is no big difference in the

I use probits regressions to estimate the probability of chronic condition, overnight patient and health care visit; and use OLS to estimate the total number of chronic conditions, nights as overnight patients and health care visits. All regression results reported in this paper are weighted. Robust standard errors (based on Huber/White estimator) are provided and clustered at the province level and reported in the tables.

I first estimate the regressions of all six health/health care utilization measures on the full sample, the sample of men and the sample of women. Second, I extract two subsamples as 30-54-years-olds and 30-54-years-olds employed, and estimate the regressions of the six dependent variables on these two subsamples separately. At the end, I use all the 12 specific chronic conditions in the database as the dependent variables, and regress each of the specific chronic conditions on the full sample, the subsample of 30-54-year-olds and the subsample of 30-54-year-olds employed.

# Data

estimates. The estimated effects for economic conditions on health and health care utilization without controlling for self-perceived health are presented in Table 1. Their inclusion has no measurable impact on the coefficient of interest. Income level, as cited at the beginning of my paper, is an endogenous determinant of health status (Ettner, 1996). Permanent income is likely a better determinant health status than current income, however, former cannot be observed. For example, McDonald and Kennedy (2004) include measures of permanent income that are less likely to be endogenous in their "health" regressions such as whether the individual received dividend income, whether the individual owns his or her own home, the type of dwelling, the number of bedrooms in the dwelling and the number of children living at home. Ettner (1996) uses spouse's education, education of parents, work experience and the state unemployment rate as instruments for family income. However, since there is a lack of instrument variables to provide a good way to address the problem, I still use personal current income as a control variable but recognize its potential endogeneity.

The data I use in this paper are mostly from cycles of the Canadian Community Health Survey (CCHS) over the period 2001 to 2010. The CCHS is a cross-sectional survey that comes from Statistics Canada and covers a wide range of topics about health. The CCHS was formerly released surveys every two years before 2007. Then in 2007, the CCHS became an annual survey. Cycle 2008, the aging survey data, is a unique survey, which only contains respondents over 45 years old. Though the data collected in 2008 is not as usual, it is still useful since the aging survey also contains large body of information that I need in this paper such as chronic conditions and health care utilization.

For my analysis I use data from respondents 12 years old and older living in all ten provinces except the territories. Types of health/health care measures are not exactly the same among all the CCHS surveys. In this study, I choose variables that are included in all the CCHS surveys. First, I use the following 12 types of chronic conditions: asthma, arthritis, back problem, high blood pressure, migraine, diabetes, heart diseases, cancer, stomach or intestinal ulcers, urinary incontinence and bowel disorder. I define the presence of at least one chronic condition by whether the respondent has had at least one chronic condition. And the total number of chronic conditions is defined by the total kinds of chronic conditions that the respondent has had. Second, to test whether individual has ever had a health care visit and the total number of health care visits, I choose 11 types of health care utilization as follows: has visited a regular medical doctor, family doctor/general practitioner, eye specialist, other medical doctor, nurse, dentist or

orthodontist, chiropractor, physiotherapist, psychologist, social worker or counselor, and ever attended any speech/audio/occasional therapist during the last past 12 months. I define the presence of at least once health care visit by whether the respondent has used at least once health care utilization. And the total number of health care visits is defined by the total times that the respondent has used the health care utilization.

Table 3 provides the means of the dependent variables, for the full sample, for men and women, and for region of low and high unemployment rate.[12] Overall more than half of respondents are suffering from chronic conditions (55%) and the average number of chronic conditions is 1.08. Eighty one percent of respondents report using any health care in the past year and the average of the total number of health care visits is 2.73. Less than ten percent (9.58%) of respondents spent at least a night in hospital and the average number of nights is 0.65.

Observations coming from the group of low unemployment rate demonstrate a smaller value in most health/health care measures than those from the group of high unemployment rate. The probability of having at least one chronic condition and the total number of chronic conditions are less in the high unemployment rate group than the low unemployment rate group. It suggests that individuals are suffering less chronic

[12] I distinguish the low/high unemployment rate group as the unemployment rates below/above the mean value of the unemployment rates, i.e. 7.35%.

conditions during high unemployment rate periods. This evidence is consistent with Rhum's (2003) finding that health conditions are getting better when unemployment rate increases. On the other hand, individuals use more health care during high unemployment rate periods. More than eighty percent (83.56%) of respondents have at least once health care visit during high unemployment rate periods. When it comes to different gender, it seems that women are suffering more chronic condition problems and also have more health care visits than men.

Table 4 summarizes the means of the independent variables. All the independent variables I use in all models are dummy variables except unemployment rates. Unlike Table 3, Table 4 only has three categories for full sample, for men and women. Most means are not different among those categories. Variables like married and employed are all around fifty percent, which are 51% and 59%, respectively. More than thirteen percent (13.75%) of respondents are immigrants.

In this paper, I use the CANSIM unemployment rate as the proxy of economic condition. CANSIM is the key socioeconomic database of Statistics Canada. Unemployment rate demonstrates good variations across provinces and the time periods considered in this paper. Figure 1 and Figure 2 presents high and low unemployment rate groups respectively by province from 2001 to 2010. Over this period, the Atlantic Provinces (Newfoundland, Nova Scotia, New Brunswick and Prince Edward Island) have the

highest unemployment rates, while the Prairie Provinces (Manitoba, Saskatchewan and Alberta) have the lowest unemployment rates. Also, it seems that the unemployment rates of Prairie Provinces remained fairly stable until 2008 when the recession affected Canada's labor market largely. From 2008 to 2010, the unemployment rates have significantly increased across the Prairie Provinces. However, even though the unemployment rates increase in those provinces during the recession, the highest unemployment rate across the whole country is still Newfoundland and Labrador in 2009.

# Results

### *1. Economic conditions and health status*

The results from Table 5 summarize the relationship between economic conditions and health status for full sample, for men and women. All models include individual characteristics, province fixed-effect, and year dummy variables. Robust standard errors are estimated with Huber-White sandwich estimator. All the regressions I use in this paper are weighted.

From the results, I find that half measures of health have a negative relationship with the unemployment rates. As the unemployment rate drops 1 percentage point, the probability of full sample of having any chronic condition statistically significantly increases by 0.34 percent. A 1 percentage point fall in the unemployment rate, the probability of the sample of men having one or more chronic conditions has the least increase, 0.22 percentage

points, while the sample of women has the largest effect, statistically significant 0.49 percentage point increase. Compared to the U.S. evidence, 0.15 percentage predicted rise in chronic problems (Ruhm, 2003), the Canadian evidence shows a similar effect on full sample, but only larger. However, the same results can not be found in the total number of chronic conditions. There is almost no significant evidence show any effect on the total number chronic conditions on the full sample and women when economy strengthens. Only the effect of the unemployment rate on men is statistically significant. With a 1 percentage point drop in the unemployment rate, the predicted value of men to suffer another chronic condition rises by 0.77 percent.

Results from health care visit are all statistically significant and has a positive relationship with the unemployment rate. A 1 percentage point reduction in the unemployment rate is associated with statistically significant 1.84 percent rise in the probability of health care visit and 10.1 percent increase in the total number of health care visits. This finding is contrary to Ruhm (2003). He finds that 1 percentage point decline in unemployment rate is associated with an imprecisely 0.3 percent increase in the probability of visiting a doctor. This opposite results may be explained by the difference health care insurance in these two countries. During economic upturns, people would rather spend more time working than participating in time-intensive health-producing activities such as to schedule medical appointments, because the non-market “leisure” time is more costly. That can also be defined as the opportunity cost of time. In Canada,

the difference in income levels does not affect people's access to health care because of the universal health care. Hence, the opportunity cost of time may explain the positive relationship between the unemployment rate and health care visits. However, in the United States, the access to health care insurance largely depends on the income level. Thus, the opportunity cost of time may not fully explain the relationship between the unemployment rate and health care visits. It should be considered that the increase in income level leads to better access to health care utilization during economic upturns, which leads to the negative relationship between unemployment rate and health care visit in the U.S.

However, both findings of health care visits from Ruhm (2003) and I may not be able to explain why health improves during bad times. Although there is a positive relationship between health and health care, there is a limit to how much health you can improve with increased use of health care. Additional health care use improves progressively smaller increment in health.[13] This suggests that when reaching some point of use of health care, there is not much difference in health improvement with the increase or decrease in the use of health care. Hence, I highly doubt that the relationship between economic conditions and health care, either positive or negative, has a strong effect on health.

[13] Information from http://books.google.ca/books?id=Nfos247EaX4C&printsec=frontcover&dq=inauthor:%22James+W.+Henderson%22&hl=zh-CN&sa=X&ei=WzFnUdvENcH12wXZ8YDIAw&ved=0CC8Q6AEwAA#v=onepage&q&f=false.

Results are both statistically insignificant from individuals at least once spent a night in hospital and the total number of nights. Hence, the fluctuation of the unemployment rate has no effect on these dependent variables.

### *2. Subsamples*

Table 6 summarizes findings from subsamples of prime working age (35-54 years old) respondents. Ruhm (2003) claims that middle-aged working people are most affected by business cycles. Hence, I use the 30-54-year-old and 30-54-year-old employed as subsamples to make a clearer compare to Ruhm's work (2003). I create two columns referring to 30-54-year-olds and 30-54-year-olds employed. Most effects of the unemployment rate on health/health care measures for the "prime working age" age group appears to be larger than the full sample, which is similar to Ruhm's work (2003). I find that a 1 percentage point drop in the unemployment rate can lead to 0.41 percent increase of the probability of 30-54-year-olds people of having any chronic condition, almost one-tenth larger than the full sample. Ruhm (2003) finds that a 1 percentage point fall in the unemployment rate is associated with 0.4 percent increase in the probability of 30-55-year-olds having chronic condition, almost two-thirds larger than the full sample.[14] Ruhm (2003) explains that some differences between prime working age people and the full sample by changes in lifestyles. For example, Ruhm (2002) suggests that the increase

[14] Note that Ruhm (2003) defines the "prime-working" age as 30-55-year-olds, however, due to the limitation of the database, I define "prime-working" age as "30-54-year-olds".

in severe obesity and physical inactivity during economic upturns are concentrated among groups with high labor force attachments. However, he also mentions that the further research is still needed to explain the difference in macroeconomic effects and to identify mechanism for them.

Compared to the whole sample of 30-54-year-olds, economic environment does not have much larger effect on the probability of health care visits of the sample of 30-54-year-olds employed. As 1 percentage point reduction in the unemployment rate, the probability of health care visit for all 30-54-year-olds and 30-54-year-olds employed has a statistically significant 1.39 and 1.67 percent increase, respectively. The total number of health care visits has statistically significant 16.2 and 15.9 percent increase, respectively. Same as the full sample, there is no statistically significant effects on both the probability of individual spent a night in hospital and the total number of nights in hospital for all three samples. Only the probability of individuals spent at least one night in hospital for 30-54-years-old employed has a statistically significant 0.48 percentage increase.

***3. Specific chronic conditions***

To show the counter-cyclical pattern of specific chronic conditions with recessions individually, I estimate the effect of the unemployment rate on each of the chronic conditions to find which chronic condition has the most significant fluctuations. Table 7 provides findings for specific chronic conditions stratified by three categories, the full

sample, 30-54-year-olds and 30-54-year-olds employed. Most chronic conditions are not statistically significant which means that the unemployment rate has no effect on those chronic conditions. For the full sample, only the estimated coefficients for back problem, diabetes, cancer and bowel disorder are statistically significant. Back problem and bowel disorder have the strongest pro-cyclical relationship with economic growth. A 1 percentage point drop in the unemployment rate is associated with 0.23 and 0.17 percent increases in the full sample of back problems and bowel disorder, respectively. There are also four statistically significant effects on the chronic conditions for 30-54-year-olds sample, which are back problem, diabetes, stomach or intestinal ulcers and bowel disorder. The largest effect of macroeconomic conditions on specific limiting chronic conditions is the back problem for the 30-54-year-olds which the predicted value is 0.69 percent. And there is only one statistically significant effect on chronic conditions for 30-54-year-olds employed sample, which is heart disease with 0.44 percent increase.

However, my results from back problem and bowel disorder are not consistent with that of Baker, Stabile, and Deri (2004). They show that measurement error in self-reported chronic conditions is related to labor market status. When people are jobless, they may report poor health to justify their absence from work which leads to the measurement error in self-reported of chronic conditions. Then one should expect an increase in chronic conditions during times of high unemployment rate. However, in my study, I find the probability of having any chronic condition is less during high unemployment rate

periods. Therefore, if this type of measurement error exists, my estimates may underestimate the effect of the unemployment rate on the probability of having any chronic condition.

## Conclusion and Discussion

This paper aims at exploring the relationship between economic conditions and health /health care utilization in Canada. The evidence I present for the probability of having a chronic condition is consistent with that of Ruhm (2003), but the probability of at least once health care visit and the total number of health care visits is opposite. Moreover, the other three measures of health/health care utilization (the total number of chronic conditions, the probability and total number of nights individuals spent in hospital) are not statistically significant. We both find the counter-cyclical relationship between the probability of having chronic conditions and the unemployment rate, which supports the suggestion by Ruhm (2003) that economic expansions are associated with deteriorating health. The opposite results between us are the effects of unemployment rate on health care visit, which may reflect the difference between the health care insurance in these two countries. In Canada, the pro-cyclical relationship between health care visits and the unemployment rate may be explained by the opportunity cost of time. While in the United States, Ruhm (2003) finds the counter-cyclical relationship. Therefore, in addition to the opportunity cost of time, one should also consider better access to health care insurance during economic upturns. However, the relationship between economic

conditions and health care visits can not fully explain health improvement during economic downturns.

There are many reasons why health conditions worsen during economic upturns. First, it may be explained partially by direct risks of heightened economic activities, such as the increase in workplace accidents and high way vehicle fatalities (Rhum, 2003). Other explanations could be lifestyles and health investment, such as the increase of smoking, heavy drinking, obesity and physical inactivity during economic upturns (Ruhm, 2002; Ruhm and Black, 2002).

Three things need to be kept in mind when comparing my work to that of Ruhm (2003). First, due to the difference of database, CCHS has different chronic conditions categories from NHIS, which may lead to the bias of estimation.[15] Second, the regression model I use for the total number of chronic conditions, health care visits and nights spent in hospital are OLS regression, which may not be the most appropriate. Negative binomial regression models may be more suitable. Third, as I mentioned above, self-perceived health condition and income level are potential endogenous variables and may lead to inconsistent estimate. To solve these problems, further research is needed to fully explain

[15] The CCHS contains chronic conditions data as :arthritis, cardiovascular disease (stroke, H.P), asthma, COPD, diabetes, migraine, back problems, caner, digestive diseases, fibromy, chro, fatigue syn, or mult.che. While, the NHIS contains data as: disease of the heart (heart), arthritis and related disorders (arthritis), chronic obstructive pulmonary diseases (lung), diabetes mellitus (diabetes), circulatory system disorders (circulatory), intervertebral disk disorders (back), cerebrovascular disease (stroke), malignant neoplasms (cancer), mental disorders (metal) and central nervous system disorders (CNS).

the relationship between health and economic conditions.

## References

Becker, G. S. (1965). A theory of the allocation of time. *The Economic Journal 75(299)*, 493-517.

Brenner, M. H., & Mooney, A. (1983). Unemployment and health in the context of economic change. *Social Science Medicine 17 (16)*, 1125–1138.

Baker, D. B. (1985). The study of stress at work. *Annual Review of Public Health*, 6367–6381.

Baker, M., Stabile, M. , & Deri, C. (2004). What do Self-Reported, Objective Measures of Health Measure?. *Journal of Human Resources, 39(4)*, 1067-1093.

Brochu, P., Deri Armstrong, C., & Morin, L.-P. (2013). The 'trendiness' of sleep: An empirical investigation into the cyclical nature of sleep time. *Empirical Economics 43(2)*, 891-913.

Catalano, R., & Dooley, D. (1983). Health effects of economic instability: A test of economic stress hypothesis. *Journal of Health and Social Behavior*, 46-60.

Chay, K.Y., Greenstone, M. (1999). The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced By a Recession. *National Bureau of Economic Research Working Paper* No. 7442.

Dehejia, R., & Lleras-Muney, A. (2004). Booms, busts, and babies' health. *The Quarterly Journal of Economics, 119(3)*, 1091-1130.

DeNavas-Walt, C., Proctor, B. D., & Smith, J. C. (2009). Income, poverty, and health insurance coverage in the United States: 2009. *published September.*

Ettner, S. L. (1996). New evidence on the relationship between income and health. *Journal of health economics, 15(1)*, 67-85

Fenwick, R., & Tausig, M. (1994). The macroeconomic context of job stress. *Journal of Health and Social Behavior*, 266-282.

Gerdtham, U. G., & Ruhm, C. J. (2006). Deaths rise in good economic times: evidence from the OECD. *Economics & Human Biology, 4(3)*, 298-316.

Henderson, J. W. (2011). Health Economics and Policy. *Retrieved on April 11, 2013 from http://books.google.ca/books?id=Nfos247EaX4C&printsec=frontcover&dq=inauthor:%22James+W.+Henderson%22&hl=zh-CN&sa=X&ei=WzFnUdvENcH12wXZ8YDIAw&ved=0CC8Q6AEwAA#v=onepage&q&f=false*

Karasek, R.A., & Theorell, T. (1990). Healthy work: stress, productivity, and the reconstruction of working life. *Basic Books*, New York.

Lleras-Muney, A. (2005). The relationship between education and adult mortality in the United States. *The Review of Economic Studies, 72(1)*, 189-221.

McDonald, J. T., & Kennedy, S. (2004). Insights into the 'healthy immigrant effect': health status and health service use of immigrants to Canada. *Social science & medicine, 59(8)*, 1613-1627.

Miller, D. L., Page, M. E., Stevens, A. H., & Filipski, M. (2009). Why are recessions good for your health?. *The American Economic Review, 99(2)*, 122-127.

Romanow, R. (2002). Building on values, the future of health care in Canada. Retrieved on April 11, 2013 from

http://www.cbc.ca/healthcare/final_report.pdf

Ruhm, C. J. (2003). Good times make you sick. *Journal of health economics, 22(4)*, 637-658.

Ruhm, C. J. (2007). A healthy economy can break your heart. *Demography,44(4)*, 829-848.

Ruhm, C. J., & Black, W. E. (2002). Does drinking really decrease in bad times?. *Journal of Health Economics, 21(4)*, 659-678.

Ruhm, C. J. (2000). Are recessions good for your health?. *The Quarterly Journal of Economics, 115(2)*, 617-650.

Sokejima, S., & Kagamimori, S. (1998). Working hours as a risk factor for acute myocardial infarction in Japan: case-control study. *Bmj, 317(7161)*, 775-780.

Stevens, A. H., Miller, D. L., Page, M. E., & Filipski, M. (2011). *The best of times, the worst of times: Understanding pro-cyclical mortality (No. w17657)*. National Bureau of Economic Research.

**Table 1**

**Predicted effect of changes in macroeconomic conditions on health outcomes without self-perceived health**

| Variable name | Full Sample |
|---|---|
| Number of Chronic condition | -0.0057* |
| | (0.0032) |
| Chronic condition>=1 | -0.00346** |
| | (0.0017) |
| Overnight patient>=1 | -0.0003 |
| | (0.0007) |
| Number of nights as overnight patients | -0.0045 |
| | (0.0070) |
| Number of health care visit | 0.101*** |
| | (0.0050) |
| Health care visit>=1 | 0.0184*** |
| | (0.0011) |
| N | 730,494 |

Note: Data are from Canadian Community Health Survey 2001 to 2010. Robust standard errors are in parentheses. *** denotes significance at 1 percent level, ** denotes significance at the 5 percent level, * denotes significance at the 10 percent level. The regression equations are estimated as linear probability models and OLS regression models which all contain province and year dummy variables, covariates for age, sex, education level, income level, marital status, immigrant status, self-reported health. This table only refers to the full sample.

## Table 2 Coefficients of Independent Variables

| Variable name | Number of Chronic condition | Chronic condition>=1 | Overnight patient>=1 | Sum of nights as overnight patients | Number of health care visit | Health care visit>=1 |
|---|---|---|---|---|---|---|
| Age 18 to 24 | 0.103*** | 0.0457*** | 0.0496*** | 0.311*** | 0.0398** | 0.0464*** |
| | (0.0066) | (0.0050) | (0.0038) | (0.0214) | (0.0161) | (0.0021) |
| Age 25 to 34 | 0.376*** | 0.222*** | 0.0665*** | 0.463*** | -0.0740*** | 0.0351*** |
| | (0.0079) | (0.0047) | (0.0040) | (0.0230) | (0.0164) | (0.0024) |
| Age 35 to 44 | 0.567*** | 0.304*** | 0.0283*** | 0.411*** | 0.0182 | 0.0336*** |
| | (0.0087) | (0.0044) | (0.0035) | (0.0240) | (0.0168) | (0.0024) |
| Age 45 to 54 | 0.821*** | 0.393*** | 0.0247*** | 0.470*** | 0.188*** | 0.0425*** |
| | (0.0097) | (0.0040) | (0.0034) | (0.0260) | (0.0172) | (0.0024) |
| Age 55 to 64 | 1.138*** | 0.470*** | 0.0378*** | 0.542*** | 0.328*** | 0.0577*** |
| | (0.0100) | (0.0031) | (0.0036) | (0.0265) | (0.0168) | (0.0021) |
| Age 65 to 74 | 1.399*** | 0.501*** | 0.0632*** | 0.764*** | 0.483*** | 0.0713*** |
| | (0.0108) | (0.0023) | (0.0041) | (0.0303) | (0.0169) | (0.0019) |
| Age more than 80 | 1.710*** | 0.518*** | 0.115*** | 1.194*** | 0.551*** | 0.0785*** |
| | (0.0131) | (0.0019) | (0.0051) | (0.0432) | (0.0184) | (0.0019) |
| Female | 0.142*** | 0.0592*** | 0.0188*** | 0.0058 | 0.380*** | 0.00664*** |
| | (0.0046) | (0.0024) | (0.0011) | (0.0097) | (0.0072) | (0.0013) |
| Single | 0.0312*** | -0.0013 | -0.0117*** | 0.0771*** | -0.120*** | -0.0148*** |
| | (0.0053) | (0.0026 | (0.0012) | (0.0125) | (0.0078) | (0.0015) |
| Married missing | -0.0709 | -0.0824*** | -0.0064 | -0.1380 | -0.178** | 0.0160 |
| | (0.0721) | (0.0270) | (0.0104) | (0.0855) | (0.0761) | (0.0161) |
| Prince Edward Island | -0.0464** | -0.0183* | 0.0156*** | 0.110** | 0.561*** | 0.0510*** |
| | (0.0201) | (0.0109) | (0.0054) | (0.0546) | (0.0311) | (0.0045) |
| Nova Scotia | 0.0729*** | 0.0182 | 0.0008 | -0.0880 | 0.804*** | 0.0751*** |
| | (0.0235) | (0.0127) | (0.0056) | (0.0571) | (0.0366) | (0.0041) |
| New Brunswick | -0.0364* | -0.0310*** | 0.0102* | 0.0344 | 0.741*** | 0.0759*** |
| | (0.0217) | (0.0117) | (0.0056) | (0.0556) | (0.0340) | (0.0035) |
| Quebec | -0.208*** | -0.0923*** | 0.0086 | -0.0662 | 0.819*** | 0.0963*** |
| | (0.02320 | (0.0125) | (0.0058) | (0.0575) | (0.0369) | (0.0057) |
| Ontario | -0.0383 | -0.0348** | -0.0052 | -0.133** | 0.985*** | 0.112*** |
| | (0.0276) | (0.0149) | (0.0064) | (0.0650) | (0.0426) | (0.0091) |
| Manitoba | -0.0959*** | -0.0642*** | 0.0021 | -0.0853 | 1.205*** | 0.0984*** |
| | (0.0341) | (0.0184) | (0.0083) | (0.0805) | (0.0543) | (0.0038) |
| Saskatchewan | -0.0677** | -0.0453** | 0.0146 | -0.0130 | 1.267*** | 0.104*** |
| | (0.0336) | (0.0182) | (0.0091) | (0.0788) | (0.0534) | (0.0029) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Alberta | -0.0668* | -0.0427** | 0.0066 | -0.0699 | 1.228*** | 0.112*** |
| | (0.0341) | (0.0186) | (0.0086) | (0.0799) | (0.0545) | (0.0046) |
| British Columbia | -0.129*** | -0.0662*** | -0.0022 | -0.132** | 0.987*** | 0.0873*** |
| | (0.0279) | (0.0152) | (0.0066) | (0.0672) | (0.0454) | (0.0058) |
| Self-perceived health poor | 1.330*** | 0.323*** | 0.150*** | 2.027*** | 0.565*** | 0.0215*** |
| | (0.0160) | (0.0047) | (0.0039) | (0.0588) | (0.0168) | (0.0031) |
| Self-perceived health not stated | 0.328** | -0.0130 | 0.0371** | 0.282* | -0.2370 | -0.138*** |
| | (0.1340) | (0.0375) | (0.0150) | (0.1550) | (0.1520) | (0.0336) |
| Secondary School Graduation | -0.0984*** | -0.0193*** | -0.00514*** | -0.0271 | 0.0520*** | -0.0261*** |
| | (0.0099) | (0.0048) | (0.0018) | (0.0259) | (0.0136) | (0.0035) |
| Some Post-Secondary | -0.0546*** | -0.0049 | -0.0011 | -0.0065 | 0.147*** | -0.0321*** |
| | (0.0120) | (0.0058) | (0.0025) | (0.0284) | (0.0166) | (0.0041) |
| Post-Secondary Graduation | -0.108*** | -0.0310*** | -0.00947*** | -0.0224 | 0.220*** | -0.0402*** |
| | (0.0085) | (0.0038) | (0.0016) | (0.0232) | (0.0110) | (0.0024) |
| Education not stated | -0.0777*** | -0.0189*** | -0.00511** | 0.0034 | 0.0545*** | -0.0494*** |
| | (0.0122) | (0.0061) | (0.0024) | (0.0358) | (0.0177) | (0.0047) |
| Income $20,000 to $39,999 | 0.0174* | -0.0012 | 0.0005 | -0.0094 | 0.0160 | -0.0145*** |
| | (0.0089) | (0.0043) | (0.0018) | (0.0219) | (0.0129) | (0.0025) |
| Income $40,000 to 49,999 | -0.0516*** | -0.0129*** | -0.00547*** | -0.121*** | 0.0440*** | -0.0276*** |
| | (0.0089) | (0.0045) | (0.0019) | (0.0216) | (0.0136) | (0.0026) |
| Income $60,000 to $79,999 | -0.111*** | -0.0243*** | -0.0154*** | -0.186*** | 0.0505*** | -0.0461*** |
| | (0.0095) | (0.0049) | (0.0020) | (0.0222) | (0.0153) | (0.0031) |
| Income $80,000 or more | -0.151*** | -0.0403*** | -0.0171*** | -0.213*** | 0.123*** | -0.0591*** |
| | (0.0112) | (0.0060) | (0.0025) | (0.0235) | (0.0192) | (0.0040) |
| Immigrant | -0.167*** | -0.0797*** | -0.0143*** | -0.162*** | -0.275*** | -0.0249*** |
| | (0.0064) | (0.0033) | (0.0014) | (0.0120) | (0.0097) | (0.0021) |
| Employed | -0.199*** | -0.0430*** | -0.0289*** | -0.259*** | -0.0741*** | 0.00406* |
| | (0.0075) | (0.0034) | (0.0016) | (0.0184) | (0.0106) | (0.0021) |
| Constant | 0.569*** | | | 0.408*** | -0.0038 | |
| | (0.0501) | | | (0.1130) | (0.0804) | |
| N | 730,494 | 730,494 | 730,494 | 730,494 | 730,494 | 730,494 |

Note: This table only refers to the coefficients other than unemployment rates of the full sample.

**Figure 1 The Unemployment Rates across Time I (High unemployment rate group)**

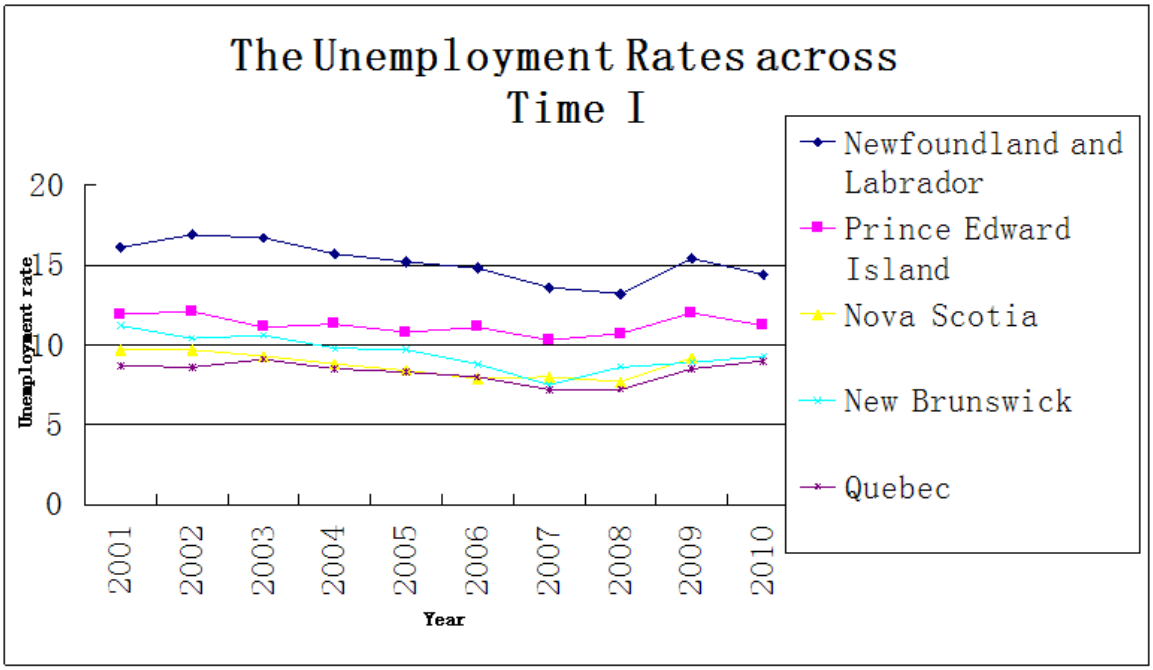

**Figure 2 The Unemployment Rates across Time II (Low unemployment rate group)**

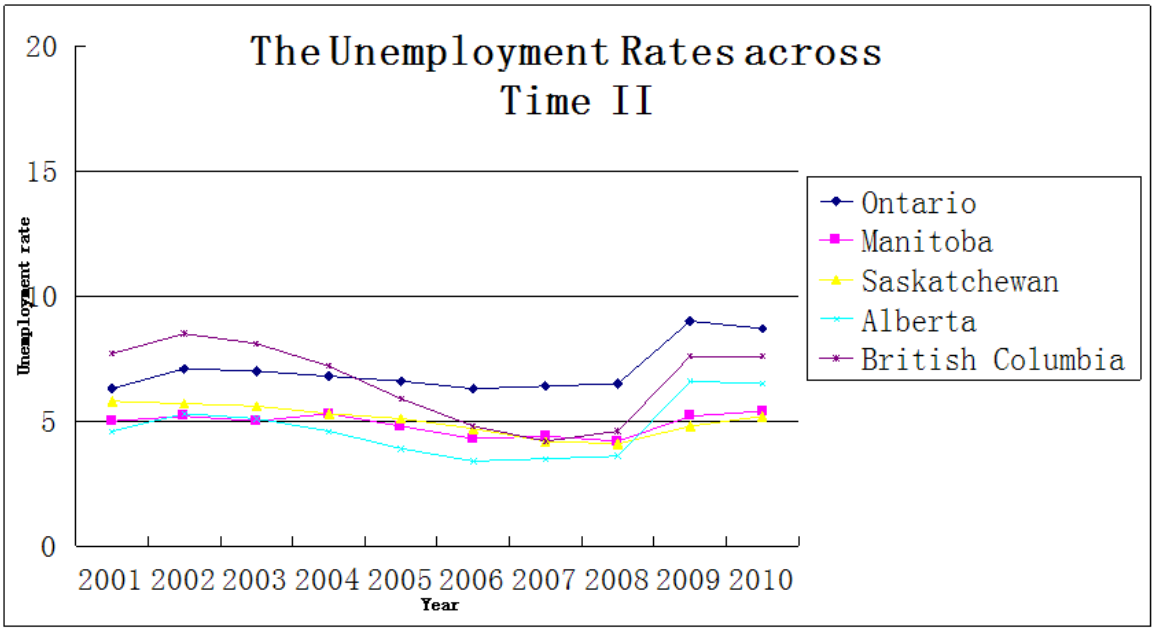

**Table 3 means of dependent variables**

| Variable name | Full sample | Men | Women | Low unemployment | High unemployment |
|---|---|---|---|---|---|
| Chronic condition>=1 | 0.5456 | 0.4976 | 0.5858 | 0.5567 | 0.5323 |
| Number of chronic condition | 1.0808 | 0.9234 | 1.2124 | 1.0975 | 1.0608 |
| Health care visit>=1 | 0.8054 | 0.7975 | 0.8120 | 0.7802 | 0.8356 |
| Number of health care visit | 2.7338 | 2.5305 | 2.9037 | 2.6513 | 2.8328 |
| Overnight patient>=1 | 0.0958 | 0.0810 | 0.1082 | 0.0951 | 0.0966 |
| Nights as overnight patient | 0.6547 | 0.5965 | 0.7034 | 0.6426 | 0.6692 |
| N | 730,494 | 332,648 | 397,846 | 398,544 | 331,950 |

Note: Using individuals 12 years old and older. The summary statistics are weighted.

**Table 4 means of independent variables**

| Variable name | Full Sample | Men | Women |
|---|---|---|---|
| Married | 0.5064 | 0.5370 | 0.4808 |
| Self-perceived health poor | 0.0598 | 0.0588 | 0.0607 |
| Less than secondary school graduation | 0.1387 | 0.1227 | 0.1521 |
| Secondary school graduation | 0.1236 | 0.1219 | 0.1250 |
| Some post-secondary | 0.0575 | 0.0568 | 0.0582 |
| Post-secondary graduation | 0.6216 | 0.6324 | 0.6125 |
| No income or less than $20,000 | 0.1328 | 0.0869 | 0.1711 |
| Income $20,000 to $39,999 | 0.2239 | 0.1785 | 0.2619 |
| Income $40,000 to $59,999 | 0.2109 | 0.2200 | 0.2033 |
| Income $60,000 to $79,999 | 0.1320 | 0.1697 | 0.0405 |
| Income $80,000 or more | 0.0664 | 0.0974 | 0.0187 |
| Immigrant | 0.1375 | 0.1375 | 0.1375 |
| Employed | 0.5896 | 0.6453 | 0.5431 |
| N | 730,494 | 332,648 | 397,846 |

Note: Using individuals 12 years old and older. The summary statistics are weighted.

**Table 5**
**Predicted effect of changes in macroeconomic conditions on health outcomes**

| Health outcome | Full sample | Men | Women |
|---|---|---|---|
| Chronic condition>=1 | -0.0034** | -0.0022 | -0.0049** |
| | (0.0017) | (0.0025) | (0.0023) |
| Number of the chronic condition | -0.0047 | -0.0077* | -0.0025 |
| | (0.0031) | (0.0044) | (0.0044) |
| Health care visits>=1 | 0.0184*** | 0.0219*** | 0.0128*** |
| | (0.0011) | (0.0017) | (0.0014) |
| Number of the health care visits | 0.101*** | 0.106*** | 0.0955*** |
| | (0.0050) | (0.0072) | -0.0069) |
| Nights as overnight patients>=1 | -0.0002 | -0.0002 | 0.0001 |
| | (0.0007) | (0.0010) | (0.0011) |
| Nights as overnight patients | 0.0028 | -0.0049 | -0.0009 |
| | (0.0069) | (0.0097) | (0.0099) |
| N | 730,494 | 332,648 | 397,846 |

Note: Data are from Canadian Community Health Survey 2001 to 2010. Robust standard errors are in parentheses. *** denotes significance at 1 percent level, ** denotes significance at the 5 percent level, * denotes significance at the 10 percent level. The regression equations are estimated as linear probability models and OLS regression models which all contain province and year dummy variables, covariates for age, sex, education level, income level, marital status, immigrant status, self-reported health.

**Table 6**
**Predicted effect of changes in macroeconomic conditions on subsamples**

| Dependent variable | 30-54-year-olds | 30-54-year-olds employed |
|---|---|---|
| Chronic condition>=1 | -0.0041*<br>(0.0023) | -0.0038<br>(0.0052) |
| Number of the chronic condition | -0.0072<br>(0.0068) | -0.0139<br>(0.0121) |
| Health care visits>=1 | 0.0139***<br>(0.0012) | 0.0167***<br>(0.0020) |
| Number of the health care visits | 0.162***<br>(0.0081) | 0.159***<br>(0.0167) |
| Nights as overnight patients>=1 | 0.0002<br>(0.0014) | -0.00476**<br>(0.0024) |
| Nights as overnight patients | 0.0105<br>(0.0191) | -0.0039<br>(0.0220) |
| N | 270,697 | 73,559 |

Note: Data are from Canadian Community Health Survey 2001 to 2010. Robust standard errors are in parentheses. *** denotes significance at 1 percent level, ** denotes significance at the 5 percent level, * denotes significance at the 10 percent level. The regression equations are estimated as linear probability models and OLS regression models which all contain province and year dummy variables, covariates for age, sex, education level, income level, marital status, immigrant status, self-reported health.

**Table 7**
**Predicted effect of macroeconomic conditions on specific limiting chronic conditions**

| Chronic condition | Full Sample | 30-54-year-olds | 30-54-year-olds employed |
|---|---|---|---|
| Asthma | 0.0001 | 0.0017 | 0.0009 |
| | (0.0008) | (0.0013) | (0.0025) |
| Arthritis | 0.0014 | 0.0055** | 0.0069 |
| | (0.0009) | (0.0024) | (0.0044) |
| Back problem | -0.0023* | -0.0069*** | -0.0055 |
| | (0.0012) | (0.0023) | (0.0045) |
| High blood | 0.0001 | -0.0002 | -0.0049 |
| pressure | (0.0010) | (0.0025) | (0.0050) |
| Migraine | -0.0003 | 0.0012 | 0.0025 |
| | (0.0009) | (0.0011) | (0.0025) |
| Diabetes | 0.0017*** | 0.0055*** | 0.0032 |
| | (0.0005) | (0.0017) | (0.0032) |
| Heart disease | -0.0004 | -0.0017 | -0.00440* |
| | (0.0004) | (0.0016) | (0.0024) |
| Cancer | -0.0005*** | -0.0013 | -0.0022 |
| | (0.0002) | (0.0009) | (0.0014) |
| Stomach or | -0.0005 | -0.0031*** | -0.0007 |
| intestinal ulcers | (0.0005) | (0.0010) | (0.0017) |
| Stroke | 0.0000 | -0.0005 | 0.0004 |
| | (0.0001) | (0.0006) | (0.0008) |
| Urinary | -0.0005* | -0.0010 | -0.0018 |
| incontinence | (0.0003) | (0.0012) | (0.0016) |
| Bowel disorder | -0.0017*** | -0.0017* | -0.0015 |
| | (0.0005) | (0.0010) | (0.0019) |
| N | 730,494 | 270,697 | 73,559 |

Note: Data are from Canadian Community Health Survey 2001 to 2010. Robust standard errors are in parentheses. *** denotes significance at 1 percent level, ** denotes significance at the 5 percent level, * denotes significance at the 10 percent level. The regression equations are estimated as linear probability models and OLS regression models which all contain province and year dummy variables, covariates for age, sex, education level, income level, marital status, immigrant status, self-reported health.