THE IMPACT OF THE 2008 GLOBAL FINANCIAL CRISIS ON THE HEALTH OF CANADIANS

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ABSTRACT

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Despite a clear impact on the Canadian economy, little is known about the subsequent health impacts of the 2008 Global Financial Crisis (GFC). This thesis aims to fill this gap in knowledge by conducting a secondary analysis of Canadian Community Health Survey (CCHS) data to assess the impact of the GFC on health in Canada – a country that has not yet been thoroughly studied from this angle. Based on when the respondent completed the survey, exposure to the GFC was categorized into four phases: pre-crisis, crisis, stimulus, and austerity. Outcomes investigated include measures of mental health, physical health, and health-related behaviours. Statistically significant associations were observed between several health outcomes and the austerity period as compared to the pre-crisis period. Austerity has been linked to worsening health in other studies and represents an example of how the policy response can have greater detrimental impact on health than the financial crisis itself.

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ABBREVIATIONS

CCHS	Canadian Community Health Survey
CI	Confidence Interval
GDP	Gross Domestic Product
GFC	Global Financial Crisis
OR	Odds Ratio
OECD	Organization for Economic Co-operation and Development
SDH	Social Determinants of Health
SMH	Self-perceived Mental Health

CHAPTER ONE: INTRODUCTION

The Global Financial Crisis of 2007/8[A], hereafter referred to as the GFC, triggered the deepest recession since the Great Depression in the 1930s. As such the recession that ensued is commonly referred to as the '*Great Recession*'.[1] Since financial systems vary across the world, the onset of the crisis in each country is debatable, although in most cases the main economic effects began to be seen in 2008. Regardless of the start date, the repercussions were, and continue to be, felt worldwide. Shortly after its onset, many commentators began predicting that the GFC would result in social and economic impacts that would compromise major social determinants of health (SDH), producing harmful impacts on various dimensions of health, particularly mental health.[2,3,4] On the other hand, it was also suggested that positive health outcomes might also be observed following the most recent crisis.[5] This premise is based on research that found that previous recessions were associated with reduced motor vehicle accidents, an avoidance of certain risky health behaviours, and fewer hospital admissions.[6,7]

Studies of major historic economic crises have pointed to both negative and positive health outcomes following an economic crisis. To explain these contradictory findings is complex, but possible reasons for these inconsistencies have been previously studied.[7] For-example, it has been suggested that the impact of a financial crisis on health varies depending on the government policy response to the crisis. Stuckler and Basu (2013) in their book, *The Body Economic*, described the government's response as a choice between austerity (bailing banks through the reduction of public spending) and stimulus spending

[A] The Global Financial Crisis officially began in late 2007 in the US before spreading to the rest of the world in 2008. Therefore, the crisis is frequently referenced as taking place in '2007/8'

(including that targeted to health and social programs). Their book includes an in depth review and summary of many research publications covering a number of historical financial crises alongside the present one. The findings suggest that budget cuts and reduced social spending through austerity responses are linked to increased premature mortality, suicide, heart attacks, poor mental health and other health outcomes, whereas investments in social spending through stimulus responses lead to no such increases.[8] The choice between austerity and stimulus and their implications on the social determinants of health can be better understood by first considering the root causes of the GFC, and the historical context that precipitated its occurrence.

1.1 Root Causes and Historical Backdrop: Dominant Neoliberal Economics

Even today, the main contributing causes of the GFC continue to be debated, mainly due to a different weighting of the contributory causes by individuals within different schools of thought (market economists and neoconservative think tanks versus liberals and social democrats).[1] However, most observers agree that the United States (US) government's housing policies were among the first of a series of trigger events that led to the 2008 worldwide economic crisis. The collapse of the US housing market that precipitated the crisis occurred because loans were being handed out to unqualified individuals through the offering of deceivingly low initial interest rates ('sub-prime' mortgages). Mortgage brokers sold the scheduled repayments of these risky mortgages to Wall Street investment banks, which first securitized these investments then insured them, after which they resold them to other financial institutions as 'sound' investments. This strategy diffused the financial risk of bad loans globally, even as a housing bubble emerged where the difference between the real

and actual value of houses grew rapidly. The bubble inevitably burst when borrowers could no longer service their debts, leading to a sudden collapse in the US housing market.[1] Once the US housing market collapsed, a sense of distrust amongst financial institutions quickly arose and spread rapidly through global financial markets, leading to a subsequent crash in the stock market. Although these main events took placed in the United States, the effects quickly spread globally causing an economic and employment crisis on a grand scale.[9] Although the events leading up to the GFC are described here, the true causes of the GFC cannot be fully understood without consideration of the historical context in which it has occurred.

Ever since the 1970s, the prevalent economic paradigm has been moving away from Keynesianism and towards Neoliberalism; this has had major implications for public policy discourse. The main tenet of Keynesian economics hinges on the importance it places on the role of the government for stabilizing the economy when required – especially during times of recession.[10] Neoliberal economics, on the other hand, reflects an ideology that supports a transition of the control of economic factors from the public to private sector, and is characterized by economic liberalization policies such as privatization, open markets and de-regulation. In adopting a 'laissez-faire' approach that benefits the private sector but shrinks government revenue, there is less available to ensure social protection and welfare.[1,9] Many have attributed the occurrence of the GFC as an inevitable outcome of the ongoing push towards neoliberalism, which since its political ascendency (traced to the 1980s) has contributed towards increasing financial instability, evidenced by the over 200 financial crises that have occurred worldwide in the last three decades.[11] What is perhaps more concerning is that, as mentioned above, the severity of the GFC impact on health is largely mediated by a government's policy response. Austerity, one response to the crisis, is

consistent with neoliberal economics; it is also the response most closely associated with harmful impacts on human health.[8]

1.2 Connecting the Global Financial Crisis to the Social Determinants of Health

Although often misrepresented as a country largely unaffected by the 2008 crisis, Canada was not exempt, and has been no stranger to the persistent push towards neoliberalism over the last three decades. In Canada, a few prominent examples of the implementation of neoliberal policies with negative impacts on social determinants of health include cutbacks to social assistance programs, increasingly precarious employment conditions, decreased availability of affordable housing, and reduced taxation (both absolute and marginal rates, and as a percentage of GDP).[9] Although these examples represent changes that have been ongoing for the last two decades, the GFC deepened and accelerated the push towards increasingly neoliberal policies, as evidenced by the implementation of austerity measures (notably characterized by budget cuts and reduced social spending).

The connection between neoliberal economics, the GFC, and the attack on social determinants of health has become clearer as the effects of the GFC in many parts of the world have become better documented. To date, however, there has been little empirical study of how the GFC has affected Canadians' health. Based on evidence from other studies, discussed later in this thesis, it is anticipated that a combination of societal-level pathways (changes in public policy) and individual-level pathways (transformations in the labour market, income adequacy, and housing market), has created an environment in Canada whereby the GFC is likely to have a negative impact on various dimensions of Canadians' health, but particularly on their mental health.

1.3 Main Objective and Outline

The aim of this thesis is to contribute novel insight on the topic of the GFC and its consequences for health by conducting a secondary analysis of Canadian Community Health Survey data to assess the impact of the GFC on health in Canada – a country that has not yet been thoroughly studied from this angle. Before assessing these health effects, however, Chapter 2 discusses the economic impact of the GFC in Canada to show that, despite widely held misconceptions, the economic and social impacts of the GFC in Canada have been both substantial and long-lasting with important SDH implications. Subsequently, Chapter 3 provides a comprehensive literature review of the documented health-related impacts associated with the GFC across all the OECD Countries, and shows that very little is known about the health impacts of the crisis in Canada. Based on the findings from Chapter 2 and Chapter 3, a conceptual framework of the hypothesized health effects of the GFC in Canada is proposed in Chapter 4, along with study objectives and methodology for the secondary data analysis of the Canadian Community Health Survey. Chapter 5 provides all the relevant results obtained from the secondary data analysis. The thesis concludes, in Chapter 6, with a discussion of these results, including both the strengths and limitations of the secondary data analysis, and a final remark regarding the health impacts of the GFC in Canada.

CHAPTER TWO: IMPACT OF THE GLOBAL FINANCIAL CRISIS ON THE CANADIAN ECONOMY

Following the 2008 GFC, it was widely believed by many that Canada was, at most, only minimally impacted by the recession that ensued, and that the economy recovered quite quickly.[12,13,14] Relative to the United States and European Union, Canada was less severely hit; however, there has been an undeniable and long-lasting impact on the Canadian economy with many important economic indicators (including – GDP growth, the unemployment rate, the employment rate, and the proportion of involuntary part-time workers) remaining weak despite 6 years having passed since the crisis first began. In this chapter we will first discuss the technical definition of a recession and explain why many perceive Canada as a country that came out of the crisis unharmed. Then we will take a closer look at major changes that occurred in Canada (1) on a societal-level through changes in public policy and (2) at an individual-level through changes in the labour market, income adequacy, and the housing market, to show that the impact of the GFC on Canadians, contrary to widely held misconceptions, has been both significant and long lasting.

2.1 Definition of a Recession

The economic activity of a nation does not follow a linear upwards trajectory representing constant expansion, but is instead better understood as a series of expansions and contractions. These re-occurring fluctuations are referred to as business cycles.[15] A recession differs from the expected dip/contraction in economic activity. The C.D. Howe

Institute Business Cycle Council[B] in Canada defines an economic recession as follows: "a pronounced, pervasive and persistent decline in aggregate economic activity."[16] Similar, but with added detail, the National Bureau of Economic Research (NBER) in the United States, defines an economic recession as a, "significant decline in activity spread across the economy, lasting more than a few months, visible in industrial production, employment, real income and wholesale-retail trade."[17]

Note that both definitions are vague in terms of what actually constitutes a "decline" in economic activity; this has been done purposefully. According to the C.D. Howe Business Cycle Council, the economy and measurements of the economy change over time; therefore, by imposing pre-set conditions this fact would be ignored. That being said, an unofficial, yet commonly used, indicator of a recession is two or more consecutive quarterly declines in Gross Domestic Product (GDP) growth. GDP is used to measure overall economic activity of a country by calculating the value of a country's annual output of goods and services. The GDP is commonly used as an indicator of the standard of living or prosperity of a country, and provides important information on the severity of a recession, as well as the peak and trough of a recessionary period. However, both the C.D. Howe Institute and the NBER reject using two consecutive declines in GDP as the sole measure for a recession because often there can be small increases in GDP that occur throughout recessions, and these small gains should not imply that a recession has not occurred.

The C.D. Howe Institute Business Cycle Council, instead, simultaneously considers three characteristics of an economic downturn: the duration, amplitude and scope, to define

[B] The C.D. Howe Institute Business Cycle Council was founded to evaluate business cycles in Canada thereby performing a function similar to that of the NBER Business Cycle Dating Committee in the United States. The council is independent of the government and made up of several economists. More information on the council is available here: http://www.cdhowe.org/business-cycle-council

the start and end point of a recession, as well as its severity. Duration and amplitude are assessed using an aggregate measure of economic activity that is made up of two measures: GDP growth and total employment. Scope is assessed based on how many sectors/industries were impacted by the contraction in economic activity.

2.2 The Beginning and End of the Recession in Canada: The Misconception

Based on the methodology described above, in a report released in 2012, the Business Cycle Council concluded that the GFC's Great Recession began in Canada in the third quarter of 2008 (October 2008) and officially ended by the second quarter of 2009 (May 2009).[16] As previously mentioned, these dates are based on an aggregate measure of GDP and employment. To gain a more comprehensive understanding of the Canadian economy post-crisis, we will use data from Statistics Canada to have a closer look at both these measures individually.

Gross Domestic Product: A Flawed Measure

First, let us consider GDP. In Canada, GDP had been steadily increasing for at least 15 consecutive years prior to the GFC, and in October 2008, the real GDP peaked at $1,492,168 Chained (2007) Million Dollars[C]. From October 2008 to May 2009, the real GDP fell to $1,425,246, after which the GDP began to rise again.[18] A recession refers to the period between the peak and trough, and therefore since economic activity began to rise again after May 2009, the recession period could be considered officially over after three consecutive quarterly declines in GDP growth, with the recovery period starting by the third quarter of

[C] All values of GDP presented here are shown as chained (2007) dollars x 1,000,000. Chained dollars is a method of adjusting for inflation over time. It has replaced 'constant dollars' due to increased accuracy because it is weighted by a basket of goods and services that changes yearly to more closely reflect actual spending. 2007 was used as the base year for comparison purposes.

2009 (July 2009). The story, of course, does not end here. The duration of the recovery period, that is the time it takes for the GDP to return to pre-recession levels, is also of great importance. Canada's GDP did not recover until the third quarter of 2010 (August 2010).[18]

Figure 1 shows the real GDP in Chained (2007) Dollars at quarterly time intervals from January 2007 to December 2014, and also shows the percent change in GDP growth from quarter to quarter.

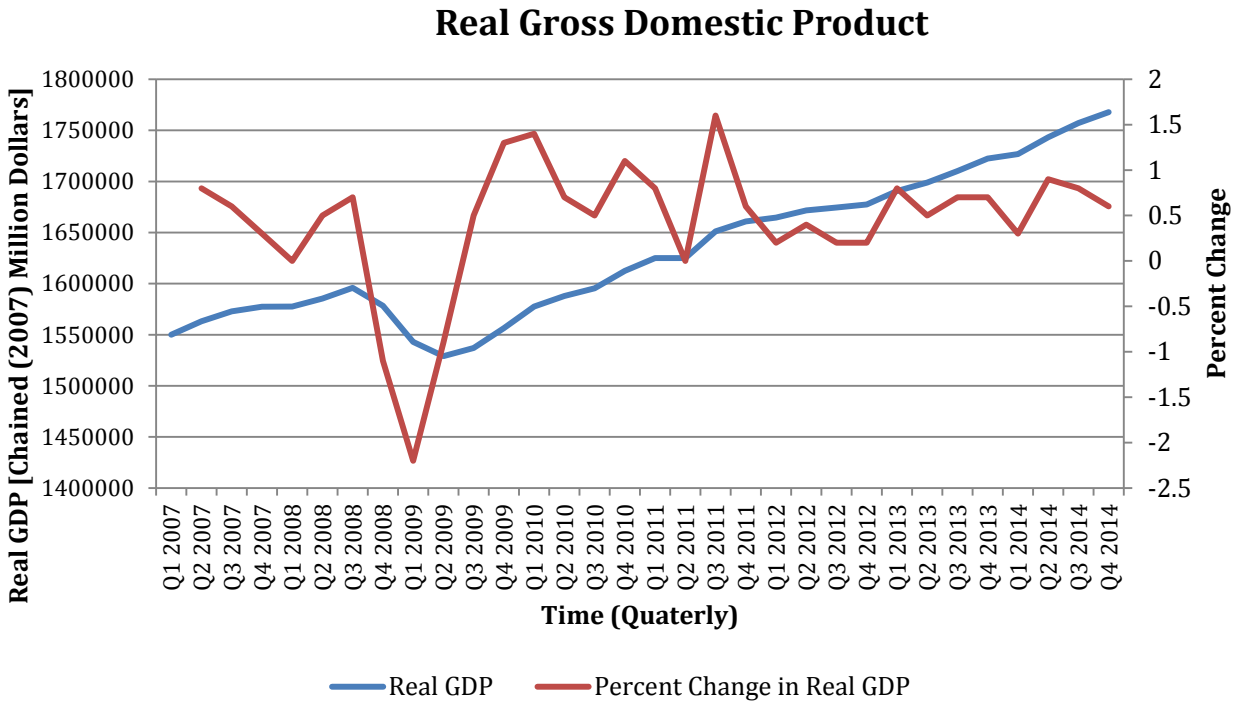

Figure 1
Seasonally adjusted GDP measured quarterly presented in chained 2007 dollars x 1,000,000, and percent change from quarter to quarter from 2007 to 2014. Source: Statistics Canada. CANSIM. Table 380-0064 (Accessed 01 March 2015).

At this point, one could still argue that, based on GDP as a measure of economic activity, Canada did not fare too badly. The misconception, however, lies with the GDP measure itself: GDP has been criticized for being an inherently flawed measure of economic development. The salient critiques are summarized here. First, the GDP does not capture

pertinent information on many things that are actually relevant to wellbeing. For-example, the GDP is blind to issues of environmental sustainability and distribution that is caused by production/consumption activities. Second, GDP growth can be deceiving in that it includes profits gained from economic activities that actually contribute negatively towards overall human well-being. Third, although it accounts for gains in economic activity within the country it does not take into consideration whether the gains remain in the country. Fourth, and lastly, one can have GDP growth without employment growth and with expansion of inequality.[19] This last point is especially worrisome since income inequality and employment are two very important social determinants of health.[20] From this we can begin to understand that although the GDP recovered and has been continuing to grow, the growth in GDP is not reflective of improvements at the individual-level in terms of prosperity and standard of living.

Total Employment: Dangerously Deceptive

We now turn to total employment, the second measure used by the C.D. Howe Business Cycle Council to calculate aggregate economic activity. Since approximately 1995, the number of employed persons had been steadily increasing over time, with some fluctuations along the way. This trend changed abruptly when the GFC made its way to Canada and caused a precipitous drop in the absolute number and rate of employed persons, as shown in Figure 2. The number of total employed persons peaked in October 2008 at 17 175 100, but then dropped steeply to 16 743 800 in July 2009, before it began to rise again.[21] As the number of employed individuals began to increase, total employment, in an absolute sense, recovered and has surpassed pre-recession levels.

The problem, however, is that the absolute number of persons employed is a deceptive measure when used alone. The reality is that, although the absolute number of employed persons has increased, there has not been sufficient job growth to sustain the increasing number of persons entering the labour market. According to the Canadian Labour Congress, the labour force grew by 818,000 persons from September 2008 to 2013; however only 618,000 new jobs were created over that same time period – a difference of 200,000.[22] The employment rate[D], a measure that takes into consideration the size of the participating labour force, provides a more accurate representation of the state of employment in Canada, also shown in Figure 2. As of December 2014, the employment rate had yet to recover to pre-recession levels, and has shown no signs of recovering, remaining flat since the initial drop occurred when the recession first began. In October 2008, the employment rate was 63.5%; by May 2009 (the official last month of the recession) it had dropped to 61.5%. Since then it has remained stagnant, and as of December 2014, the employment rate was 61.3%.[21]

[D] The employment rate is a relative measure that is calculated by dividing the absolute number of employed persons by the number of persons in the participating labour force.

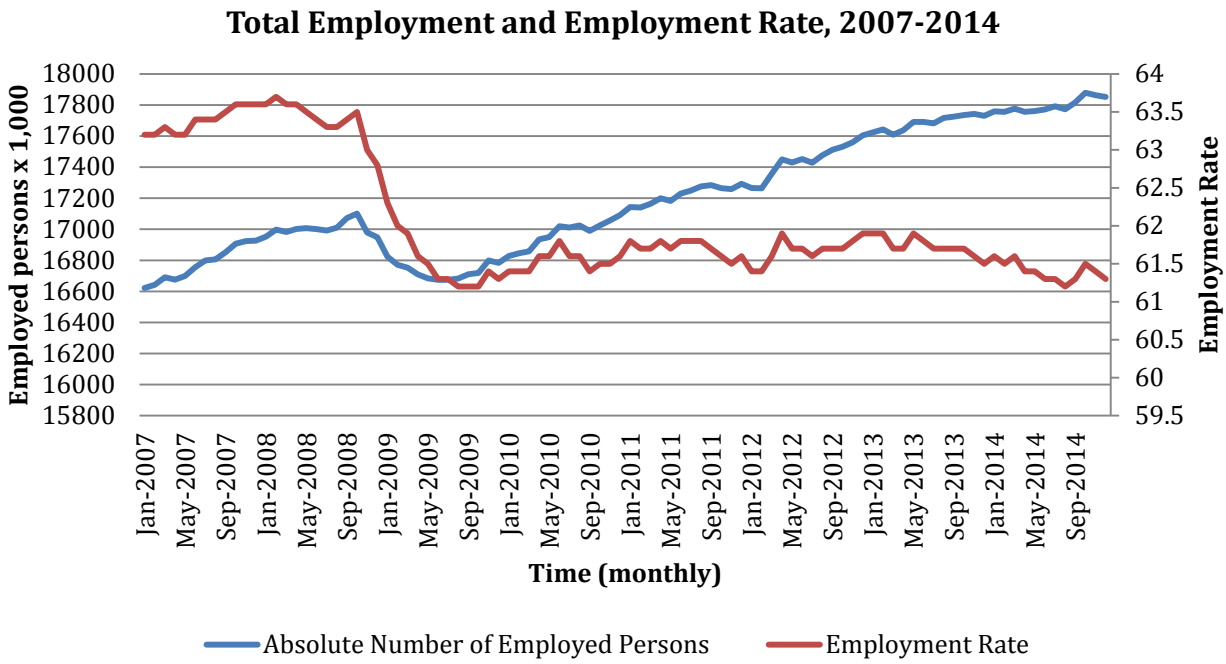

Figure 2
Total Employment Count and Employment Rate, seasonally adjusted, monthly, 2007-2014. Source: Statistics Canada. CANSIM Table 282-0087. (Accessed 01 March 2015).

Breaking down the Misconception: A Reality Check

Using the technical definition of a recession, both GDP and total employment show that the recession did indeed begin in October 2008, and end May 2009, as reported by the C.D. Howe Institute Business Cycle Council.[16] With only a 7-month duration and both GDP and total employment surpassing pre-recession levels, it is not surprising that Canada is commonly perceived as one of the few developed countries coming out of the recession in good shape. However, as we have shown above, the problem is that GDP is a flawed measure especially as an indicator of standard of living and prosperity, and the total employment, albeit increasing, does not accurately reflect the state of employment because it does not take the size of the labour force into consideration. Another point to consider is that the total employment does not differentiate between the types of employment, such as

permanent versus temporary contracts. As a result, in considering only the beginning and end of the recession period, a misconception of the impact of the GFC on Canadians has become prevalent. By considering more than just GDP and total employment, we will now show that six years later Canada's economy has yet to return to its pre-recession days.

2.3 Public Policy Response to the GFC: From Stimulus to Austerity

The Conservative party of Canada was elected as the federal minority government in October 2008, just as the 2008 GFC took hold of Canada. One response to the crisis would have been the implementation of a budget that concentrated its investment on a strong stimulus package. Investing in stimulus will cause an increase in the government's budget deficit, but the advantage could outweigh the temporary increase in government debt because it would help the economy to recover by increasing employment. A second option would be to respond with the implementation of austerity measures. The rationale for using austerity-driven policies is to free up more capital and bank-lending capacity to the private sector, on the assumption that the private sector is more efficient, effective, and essential in generating economic growth, and that the lack of credit access (i.e. no surplus cash) is the problem. According to critics of austerity, this rationale ignores the more pressing issues being faced by Canadians following the GFC, which include: (1) slow economic recovery (2) lack of employment (3) increasing household debt (4) stagnant wages (5) reductions in employment insurance coverage and retirement security and (6) large corporate cash surpluses reducing private sector demand for borrowing.[23]

The government's response to the GFC can be understood by analyzing the yearly Federal Budgets following the recession. At the onset Canada responded to the crisis with

stimulus spending rather than austerity cuts, as did many other affected high- and middle-income countries. Thus, one would expect positive outcomes for the Canadian economy and consequently population health. However, after a short period of stimulus spending the government adopted crisis-rationalized austerity measures, which began with the release of the 2012 Federal Budget and continued in the 2013 and 2014 budgets.[24,25,26,27,28,29]

In comparison to other OECD countries, it has been suggested that Canada displays far greater fiscal strength. The deficit currently amounts to only 1.4% of GDP; despite this, the current government continues to focus on austerity, which Labonté et al., (2013) have criticized for undermining the social determinants of health.[9,23] For example, they argue that the budget allows for additional corporate tax reductions, which led to decreased revenue for Canada. To compensate for this revenue loss, the government has curtailed federal spending on social programs as well as reduced social and health transfers to the provinces.[9] Federal spending was forecasted to decline by $4 billion dollars during the 2013/2014 fiscal year alone, as a result of cuts made in the 2012 and 2013 federal budget. Healthcare spending nationally, as a percentage of the GDP, has declined since the GFC.[9,23] The shift towards a government that is increasingly neoliberal in its economic and social policies represents a political trend that began well before the crisis; however, the timing at which the crisis occurred may have sped up and deepened the severity and impact of such policy choices.

2.4 The Labour Market Transformation

Well before the GFC, the Canadian labour market had been undergoing a transformation with industrial outsourcing, increased mechanization and a shift to a service economy. These changes were occurring largely in the context of an on-going adoption of

neoliberal economic policies. Once the recession hit Canada, a continuation and deepening of this long-term trend became increasingly evident.[21] The transformation primarily has to do with a decreasing quantity and deteriorating quality of employment available to Canadians. This poses a significant threat to Canadians given that the quantity and quality of employment are well-known and major social determinants of health.[7,9]

Decreasing Quantity of Employment: Insufficient Job Growth

Since January 2007, the national unemployment rate had been steadily decreasing and reached a low of 5.8% in June 2008. The unemployment rate had not dropped below 6% since before 1975.[21] Following June 2008, the unemployment rate reversed direction, and began to slowly increase. The timing of this increase coincides with the initial stages of the financial crisis worldwide. In just four months, the unemployment increased by 0.5% to 6.3% in October 2008.[21] As noted, October 2008 marks the official beginning of the economic recession in Canada. Following the onset of the recession, unemployment quickly rose and peaked at 8.7% in August 2009. The unemployment rate continued to remain high for a few months before starting a real decline at the beginning of 2010. Unfortunately, the decline in unemployment leveled-off by mid-2011, and since then has remained hovering just above 7%. As of January 2015 the unemployment rate was at 6.6%, which is still 0.3% higher than the unemployment rate in October 2008, when the recession initially took hold of the Canadian economy.

Figure 3
Unemployment, seasonally adjusted, monthly, 2007-2014. Source: Statistics Canada. CANSIM Table 282-0087. (Accessed 01 March 2015).

In terms of actual people affected, in August 2009 the number of unemployed persons reached 1,580,800, which represents a 41% increase in unemployed persons since the onset of the recession in October 2008. As of December 2014, the number of unemployed persons dropped to 1,325,400 persons, which is still 13.7% higher compared to October 2008.[21] As of December 2014, the unemployment rate had yet to reach pre-recession levels, had stopped declining and has remained fixed since around July 2011, which coincides closely with the end of the stimulus period and the beginning of the implementation of austerity measures in Canada.

Another point of distinction is between the official unemployment rate and the "real" unemployment rate. The statistics above reflect the "official" unemployment rate as defined by Statistics Canada. However, this measure does not include discouraged workers (who drop out of the labour force because they have given up looking for a job), or people working

part-time involuntarily or awaiting a potential job. Thus, the official unemployment rate does not accurately reflect reality for many Canadians. When considering these supplementary measures, the "real" unemployment rate peaked at 11.5% in 2009, up from 8.6% in 2007 (pre-recession). By 2013, "real" unemployment had dropped down to 10.1%, which is still 1.5% higher than pre-recession values.[30] Figure 4 below provides an illustration of these numbers.[E]

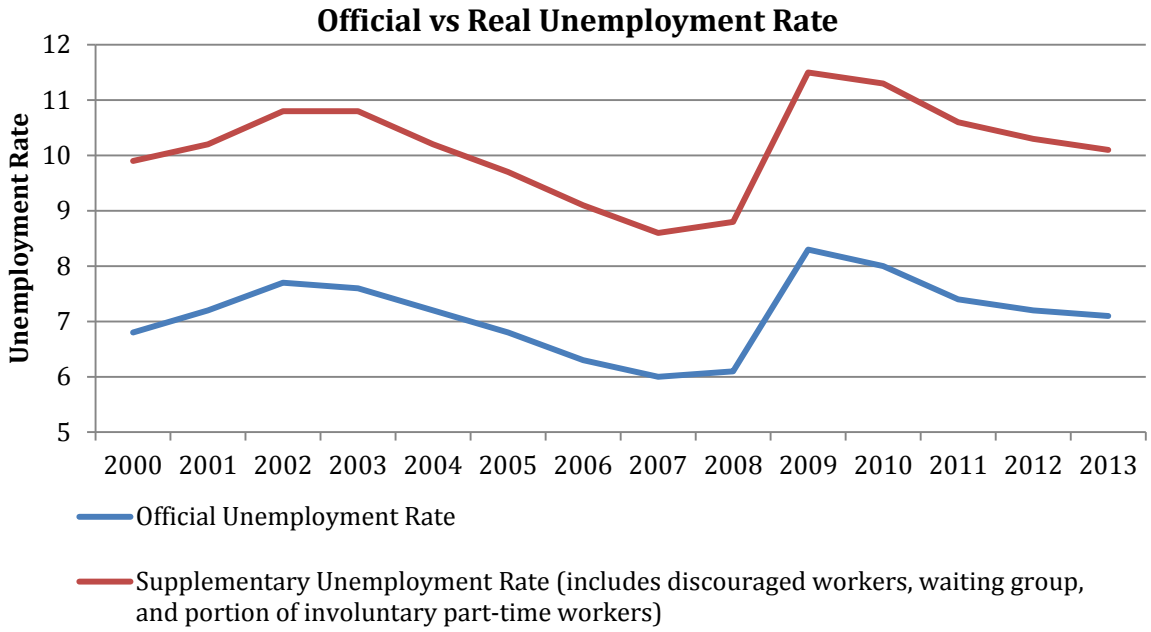

Figure 4
Official versus real annual unemployment rate, 2000 to 2013. Source: Statistics Canada. CANSIM Table 282-0086. (Accessed 01 March 2015).

[E] The "official" unemployment rate is calculated by dividing the absolute number of unemployed persons by the participating labour force. The "real" unemployment rate, however, is a supplementary measure calculated by Statistics Canada that expands the definition of those persons considered "unemployed" by including discouraged workers, involuntary part-time workers, and workers who are still waiting to begin future employment.

Albeit not reaching pre-recession levels, the decreasing unemployment rate has been a boasting point for the Canadian government. However, a closer look at the numbers reveals that at least part of the recovery can be attributed not to an increase in available jobs, but to an increasing number of people who have left the Canadian labour force. Thus the denominator used to calculate the unemployment rate has decreased, thereby shrinking the unemployment rate. At the onset of the recession in 2008, the labour force participation rate (a more useful measure of employment) was 67.7%, and has since decreased to 66.2% as of March 2014. This represents a decline of approximately 420,000 workers from the labour force. One plausible explanation could be that due to the aging of the baby boomer generation a larger portion of the population is exiting the labour force. However, the labour force participation rate for people aged 55 years and over has been steadily increasing over time, even throughout the recession period. On the other hand, the number of young workers aged 15 to 24 years exiting the labour force has been increasing since the onset of the recession.[22]

Deteriorating Quality of Employment: Precarization of Canadian Labour Market

Perhaps of even greater importance is the deteriorating quality of employment that has plagued Canadians since before and even more so after the 2008 GFC, but whose story remains untold by the economic indicators discussed above. Over the last few decades, precarious employment has been on the rise, in place of full-time permanent positions. Precarious employment is characterized by: temporary forms of employment, low wages, reduced benefits, and part-time hours.[31] Figure 5 below indicates that the number of involuntary part-time workers spiked in 2009 the year following the crisis. Unlike

unemployment, which began to improve in 2010, the number of involuntary part-time workers has shown no signs of improvement as of 2013.

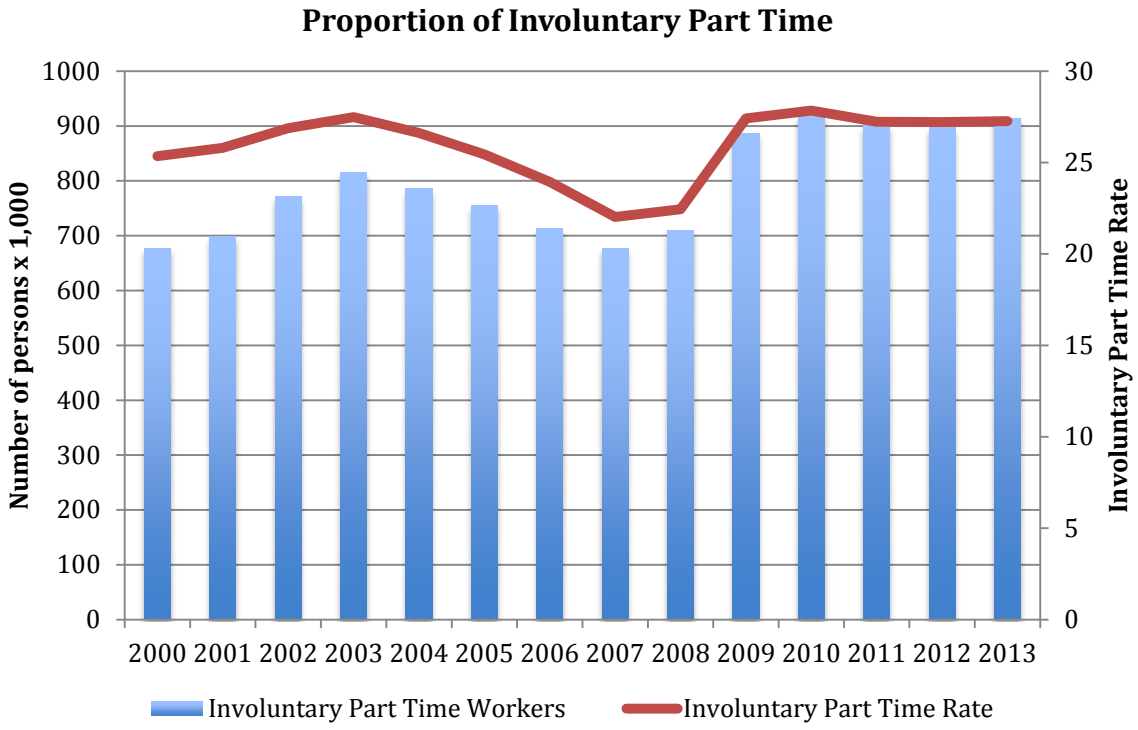

Figure 5
The number of persons (x1,000) working part-time involuntarily and the involuntary part time employment rate, annual, 2000 to 2013. Source: Statistics Canada. CANSIM Table. (Accessed 01 March 2015).

The graph above does not take into consideration whether the involuntary part time workers were actively looking for full-time employment. However, even when we consider only those workers who actively looked within the last month, but who could still not find employment, a similar trend is found: an increase following 2008, with no recovery, as shown in Figure 6, below.

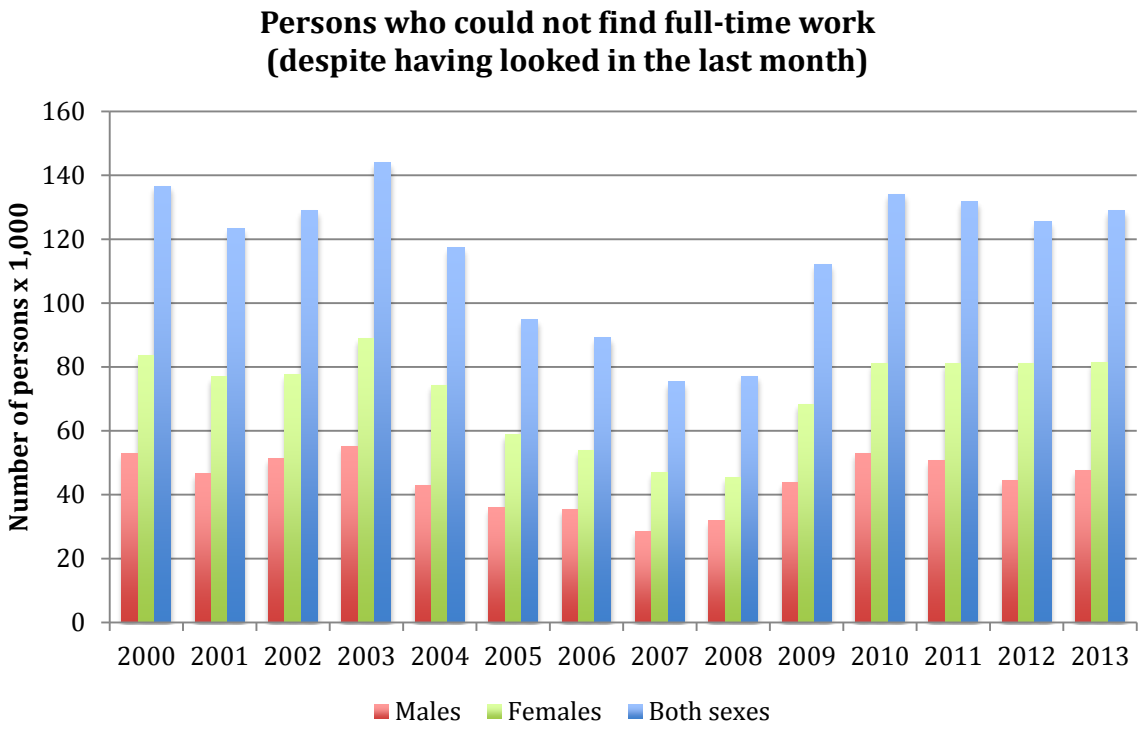

Figure 6
The number of persons who could not find full-time work, despite having looked in the last month, annual, 2000 to 2013. Source: Statistics Canada. CANSIM Table 282-0014. (Accessed 01 March 2015).

Clearly, there has been a shift in the quality of employment available to Canadians, as more persons are searching for better opportunities with no success. Involuntary part-time work is not the only measure of precarious employment. Employees working full-time, but at multiple jobs or full-time employees working temporary positions are also engaged in precarious employment. Following the recession, the number of employees in permanent positions increased by approximately 5% from 2009 to 2013, whereas temporary employees increased by approximately 14%.

2.5 Income Adequacy

Much like the long-term trends of precarious employment in the labour market, income adequacy, too, has been an ongoing and ever-worsening issue facing Canadians. Just prior to the GFC, over 3 million Canadians, 2.2 million of which were working age adults, were living in poverty according to Statistics Canada's after-tax low-income cut-off (LICO[F]) measure.[32] Recessions are typically characterized by increasing poverty, thus it is natural to expect that income adequacy would become an even greater issue following the 2008 GFC. If previous Canadian recessions are any indication, Yalnizyan (2010) predicted that anywhere between 575,000 to 1.5 million additional working age adults would fall below the LICO following the 2008 GFC.[32] A worrisome distinction between this recession, relative to previous ones in Canada, is that Canadians had not been this exposed to the risk of joblessness since the 1940s; and that changes in federal employment insurance rules meant that just fewer than 50% of unemployed persons had no coverage at the peak of the recession.[32]

Between 2007 (pre-crisis) and 2011 (post-crisis) the median after-tax income among Canadian families remained stagnant.[33] However, while income remained relatively unchanged, the consumer price index (CPI) continued to increase as shown in Figure 7. From 2007 to 2009 CPI increased by 2.9%, and from 2009 to 2014 the CPI increased another 10.8% - not only is the CPI increasing, but the rate at which it is increasing has accelerated. This suggests that while income did not increase, the price consumers were paying for a

[F] A certain share of family income is devoted to food, shelter and clothing. Families who spend a large portion of their income on these necessities have less money for other items/services. The LICO represents a threshold income derived by Statistics Canada; if families fall below this threshold it means they spend a larger proportion of their income on food, shelter, and clothing compared to the average family.

basket of goods and services was increasing; logically, this implies a decrease in income adequacy.

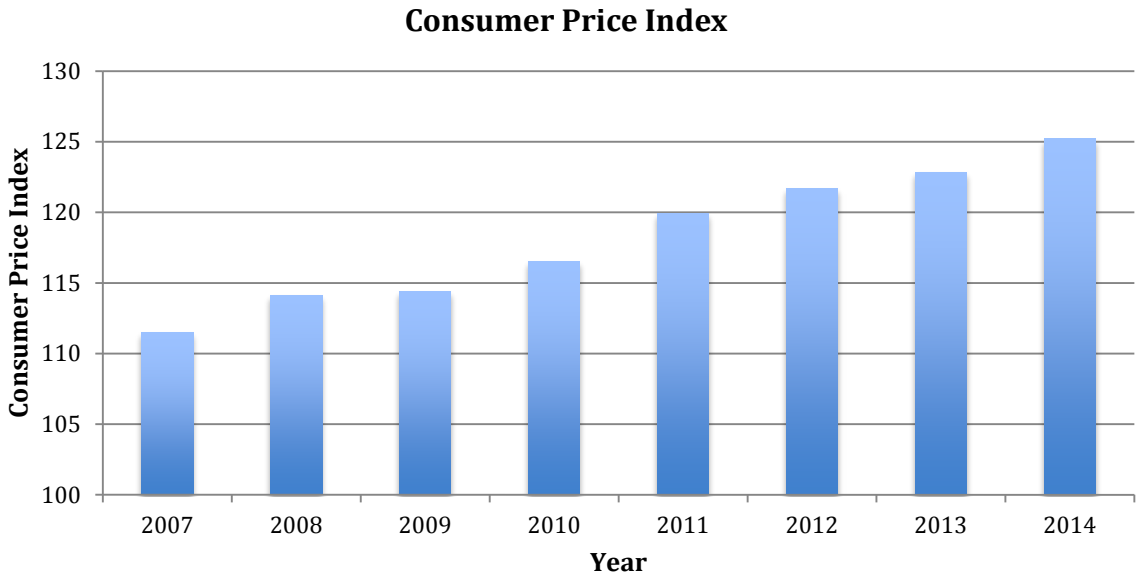

Figure 7
Change in consumer prices of a fixed basket of goods and services over time, 2007-2014. Source: Statistics Canada. CANSIM Table 326-0021 (Accessed 01 March 2015).

Income distribution is another important distinction to consider; according to Employment and Social Development Canada, not only is the level of income important, but the distribution of income within the Canadian population also contributes to the well-being of Canadians, and indicates the presence of income disparities within a population.[34] Income disparities have been increasing in Canada for approximately 16 consecutive years (1995 to 2011). The gap between the richest 20% and the poorest 20% widened over the 16 year period; the average after-tax income of the top 20% grew by 37.2%, whereas the bottom 20% grew by 12.7%.[35]

As illustrated in Figure 8, from 2007 to 2011, coinciding with the onset of the GFC, the after-tax income remained stagnant among all income groups. This suggests that the GFC

did not contribute to a worsening of income disparity on the short-term, at least as measured by income quintiles[G]. Nonetheless, given the already large gap between the top 20% relative to the middle 60% and the bottom 20%, income disparity continues to remain a problem in Canada. As such, it is still anticipated that the lower income individuals would face increased hardship and struggles in the face of inflation and rising costs during the recession as compared to those individuals who fall under higher income brackets.

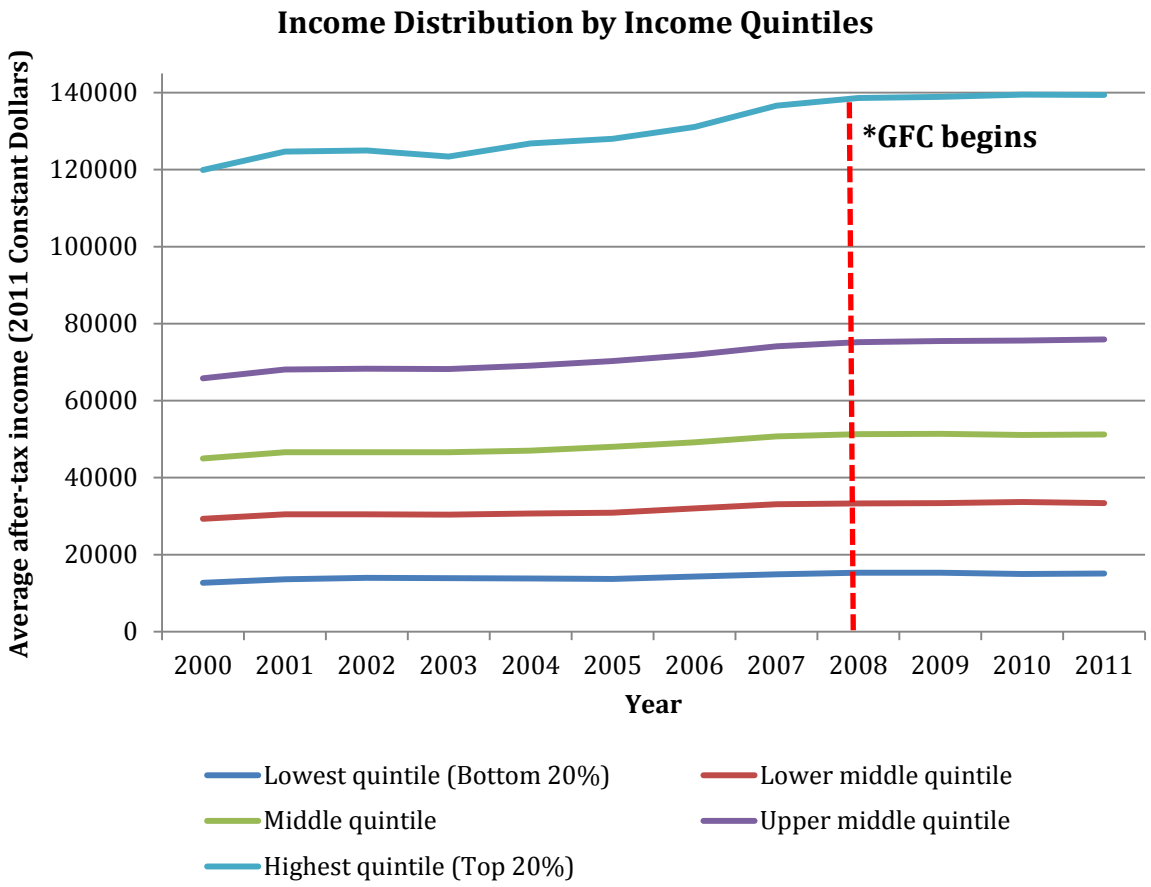

Figure 8
Income distribution in Canada illustrated using average after-tax income (2011 constant dollars) by income quintiles, 2000-2011. Source: Statistics Canada. CANDIM Table 202-0703 (Accessed 01 June 2015).

[G] Although the gap between the income quintiles did not appear to worsen, there is some concern that there is still a breakaway if one measured the top 1%, or even the top 0.01% as opposed to the top 20%.

Evidence of inadequate income can further be illustrated by considering the issue of food insecurity. Food insecurity, which refers to the lack of adequate access to nutritious foods, has been increasing since 2005, but has increased in severity since the onset of the crisis. From 2008 to 2011, approximately 450,000 additional Canadians (i.e. one in every eight Canadians) reported experiencing food insecurity. Correlating closing with the onset of the GFC, the number of people receiving food from food banks increased by 31%, between 2008 and 2010.[36] Even by March 2013, the number of people using food banks was still 23% higher than in 2008. A second consideration with regards to income adequacy is that due the rise in precarious employment, people are receiving reduced benefits and are increasingly being found ineligible for various social support programs such as Employment Insurance; this, too, has major implications for income adequacy.[37]

2.6 The Canadian Housing Market

Changes to the housing market are also posing significant threats to the well-being of Canadians. Unfortunately, the trend towards increasingly inadequate (i.e. unaffordable, requiring major repairs, and/or overcrowded housing) has been in place since the 1980s, where a lack of state involvement (consistent with neoliberal ideology) has been cited as a primary cause for this trend. [38,39] In fact, as of 2003, Canada ranked at the top, alongside the United States, in terms of having the most private-sector dominated, market-based system with the smallest social housing sector relative to any other Western country.[39] This has serious implications for the health of Canadians given that adequate and affordable housing is another one of the major social determinants of health.[39,40] Various reports and studies suggest that a lack of adequate and affordable housing is associated with an increased risk of

physical and mental health issues, which can be explained by both direct and indirect consequences of inadequate housing.[38,39,40,41] For-example, exposure to inadequate housing in terms of poor quality of overcrowding leads to increased exposure to toxins and mold. Inadequate housing in terms of unaffordability implies that the individual has less available resources to spend on other aspects of their quality of life (i.e. food security, social consumption patterns); therefore, adequate and affordable housing as a social determinant of health impacts other social determinants of health. Finally, inadequate housing has also been linked to increased stress and anxiety, which then indirectly also leads to increased morbidity and mortality.[39]

One indicator used to assess inadequate housing is as follows: housing is considered unaffordable when more than 30% of total income is spent on shelter costs and represents the major cause of inadequate housing; according to the Citizens for Public Justice analysis of Statistics Canada's National Household Survey data, 25% (i.e. 13.1 million) of Canadian households surpassed this 30% threshold in 2011.[38] Another indicator commonly used to measure inadequate housing is the number of Canadians who use temporary shelters; a study by Segaert et al suggests that a notable increase in the annual number of bed nights used at emergency shelters in Canada occurred during the GFC period.[42] This only represents the tip of the iceberg, given that for each individual using a shelter, there are 23 more additional persons living with a high risk for homelessness, a situation unlikely to improve in the face of the crisis and the subsequent implementation of austerity measures.[41]

2.7 Summary of the impact of the GFC on the Canadian Economy

The above analysis shows that, from a strictly technical and economical perspective, the GFC in Canada was indeed shorter and less severe than in the United States or Europe, beginning October 2008 and ending May 2009. However, our analysis shows that these dates are determined using two measures: GDP and Total Employment, which we describe as being flawed and deceptive, respectively. Using other economic indicators such as the official and real unemployment rates it is evident that Canada's economy has not returned to its pre-recession levels. Further, data from Statistics Canada also shows that the quality of employment in Canada has deteriorated mainly because permanent full-time employment is increasingly being replaced with temporary and/or part-time employment. This was evidenced by the increase in the number of involuntary part-time workers in Canada since the onset of the GFC as well as the increase in the number of people who could not find full-time work, despite having looked in the past month; both these indicators showed no signs of recovery even in 2014. Income adequacy is also an increasing issue in Canada, as evidenced by the insignificant growth in median after-tax income throughout the recession period despite rising costs and inflation. However, the consumer price index continued to rise, which means an increasing number of people are experiencing reduced purchasing power resulting in reduced income adequacy. Furthermore, a consideration of the income distribution in Canada also highlights that income disparities have been on the rise in Canada since 1995, and although the GFC did not appear to worsen this issue, there remains a large gap between the income of the top 20% relative to the middle 60% and the bottom 20%, suggesting that lower income individuals will likely be more vulnerable to the adverse impacts of the 2008 recession. Finally, this analysis also shows that housing quality and

affordability has been an on-going problem in Canada, and remained so throughout the recession period. Thus, from a SDH perspective, the GFC has the potential, theoretically, to worsen the health of Canadians.

CHAPTER THREE: SCOPING LITERATURE REVIEW

The preceding chapter examined some of the major economic impacts of the GFC in Canada, which we argued would anticipate deteriorating health for many Canadians. This hypothesis is largely based on the observations from previously published studies assessing the impact of the GFC on health in other OECD countries; evidence of which will be provided in this chapter. In order to review the existing literature in a comprehensive and systematic manner, the findings presented in this section were obtained following the protocol of a scoping study. A scoping study is a type of literature review, similar to a systematic review, but differs in a few key design elements.[43] Where the systematic review requires a clearly defined and specific research question, a scoping study uses an open-ended research question with fewer inclusion/exclusion criteria. The primary objective of the literature review here is to identify and describe the current state of research regarding the association between health outcomes and the GFC. Thus, following the protocol of a scoping study allows this objective to be accomplished while maintaining high quality and reducing bias by following a prescribed protocol.

3.1 Scoping Literature Review Methodology

We used the five-stage methodology for scoping reviews developed by Arksey & O'Malley[44]: (1) develop research question, (2) identify relevant literature, (3) establish inclusion and exclusion criteria, (4) chart the data, and (5) summarize/report findings. Note that recommendations to enhance Arksey & O'Malley's framework have been provided by

Levac et al[45] in 2010, Daudt et al[46] in 2013, and most recently by Pham et al[47] in 2014. Recommendations from all contributors were taking into consideration where relevant.

Research Questions

1. What health-related impacts of the GFC have been investigated?
2. What are the proposed pathways by which the GFC was presumed to lead to health outcomes?
3. What have been the methodological strategies used to assess the impact of the GFC (i.e. how is exposure to the recession ascertained)?
4. What are the existing gaps and overall limitations in the literature?

Identifying Relevant Literature

To identify articles for inclusion in the scoping study, two electronic databases were searched: Medline (PubMed) and EMBASE. The search strategies for these databases were specifically tailored for each database and were created in consultation with an experienced University of Ottawa Information Specialist. Keywords included various synonyms for financial crisis (including "recession" and "austerity" AND various keywords/MeSH headings used to describe a broad range of health outcomes of interest (see Appendix 1 for the exact queries that were used).

Inclusion/Exclusion Criteria

The following selection criteria were put in place to determine whether the identified articles would be included for further analysis: (1) The study had to assess the impact of the 2008 GFC (that is, impacts of previous economic downturns such as the Great Depression/Asian Crisis, were excluded); (2) Outcomes investigated had to be health-related,

however this was kept purposefully broad to retrieve as many relevant articles as possible; articles related to budget cuts, health systems, hospital cuts, etc., were excluded; (3) Studies that described trends over time, with no analysis of significance or impact associated specifically with the GFC were excluded; (4) Studies had to be published between January 2008 and June 2014; (5) Only English and French language publications were included. No restrictions for inclusion were placed on the study design or on the study population.

Charting the Data

All articles identified initially were stored and managed using RefWorks. The initial search yielded 1298 unique articles from the Medline database (n=37 duplicates removed) and 890 unique articles from the EMBASE database (n=892 duplicates removed), for a total of 2,195 articles. During the initial title and abstract screening process, 1,559 articles were removed, and another 437 articles were removed during the full-text screen. Finally, 101 articles were excluded because they were either in a language other than English/French or because they were inaccessible. The remaining 87 articles were included in the scoping study. For all articles included in the final review, data were extracted and entered into a spreadsheet created using Microsoft Excel. The data extraction template that was used was created based on the objectives of the study and was initially constructed using an iterative process by extracting data from 10 randomly selected articles that fit the inclusion criteria. Once the data extraction template was finalized, the template was used to extract data from all included articles. The following items were included in the data extraction form: author, year of publication, country under investigation, time period covered by study, the principal design and analytical strategy used, details on exposure/outcome ascertainment, and finally

the most pertinent results from the study (see Appendix 2 for the detailed data extraction table including all relevant information from the 87 included articles).

3.2 Literature Review Results

As mentioned, 87 articles were identified for inclusion in the literature review. In terms of outcomes being investigated in association with the GFC, all 87 articles fell into one or more of four broad categories: mental health, physical health, health-related behaviours, and/or healthcare utilization. Table 1, below, provides a breakdown of the number of articles that fell under each category.

Table 1
Breakdown of the number of articles identified from the scoping review according to the outcome being investigated

Health outcome category	**Total number of articles***
Mental Health	38
Physical health	27
Health-related behaviours	19
Healthcare utilization/access	10

*Some articles were included more than one category if the study investigated different types of outcomes

With regards to the populations being studied, the majority investigated the impact of the GFC in the working age population (between 18 and 64 years); however a few studies examined the impact in children/adolescents only, while others restricted their analysis to elderly populations. With regards to the countries being investigated, the majority of the literature was from Europe and the United States, with only very few originating from Australia, Canada, and South Korea. Table 2 provides a breakdown of the number of articles from various regions.

Table 2
Breakdown of the number of articles identified from the scoping review according to the region that was under investigation

Health outcome category	**Total number of articles**
Europe	42 Spain: 6 (Bartoll et al, Robert et al, Agudelo-Suarez; Gili et al; Lopez Bernal et al; Gonzalez-de-Olano et al;) Italy: 6 (De Vogli et al; Pompili et al; De Vogli et al; Regidor et al; Rajmil et al; Gallus et al) Greece: 11(Economou et al, Economou et al; Economou et al; Faresjo et al; Antonakakis et al; Vandoros et al; Madianos et al; Karatzanis et al; Zavras et al; Kentikelenis et al; Kentikelenis) United Kingdom: 6 (Astell-Burt et al; Fenge et al; Katikireddi et al;Saurina et al; Barr et al) Belgium: 2 (Vanderoost et al; Harhay et al; Houdmont et al;) Iceland: 7 (Hauksdottir et al; Snorradottir et al; Eiriksdottir et al; Guojonsdottir et al; Asgeirsdottir et al; McClure et al; McClure et al;) Slovenia: 1 (Avcin et al) Switzerland: 1 (Wolff et al) Multiple European Countries: 2 (Baumbach et al; Toffolutti et al)
United States	37 (Cagney et al; Cui et al; McInerney et al; Ayers et al; Burgard et al; Burgard et al; Cannuscio et al; McLaughlin et al; Alley et al; Lo et al; Reeves et al; Althouse et al; Li et al; Zhang et al; Chinta et al; Modrek et al; Schootman et al; Schwartz et al; Thompson et al;; Vijayasiri et al; Huang et al; Kalousova et al; Murphy et al; Bor et al; Colman et al; Fritjers et al; Jackson et al; Macy et al; Nandi et al; Zemore et al; Richman et al; Burgard et al; Chen et al; King et al; Mortensen et al; Dorn et al; Piette et al;)
Canada	3 (Frank et al; Bartfay et al; Wang et al)
Australia	2 (Sargent-Cox et al; Shi et al)
South Korea	1 (Chan et al)
Worldwide	1 (Chang et al)

In the following sections, each of the 87 articles will be summarized, including a brief description of common study designs and methodologies used, the time period covered by the study, how the exposure to the GFC was ascertained, and finally the main results from that study. The description of these articles is categorized according to the outcome being investigated.

Mental Health Outcomes

Studies investigating the association between the GFC and mental health were the most common among the literature identified in this scoping study. Approximately 43% (n=38) of all the articles retrieved fell under this category, 12 articles of which specifically examined suicide mortality in relation to the GFC. Many articles used a self-reported measure of poor mental health as the main indicator of worsening health, although there were articles that used clinically validated measures of depression and/or anxiety.

Bartoll and colleagues[48] used two waves of repeated cross-sectional survey data to study the impact of the GFC among the Spanish working age population aged 16 to 64 years using a Poisson regression model. Exposure to the GFC was assessed based on when the respondent completed the survey; respondents in the 2006-2007 wave were considered unexposed, whereas respondents in the 2011-2012 wave were considered exposed. An increased risk of poor mental health (defined as a score of ≥3 using the 12-Item General Health Questionnaire) was observed during the crisis period relative to the pre-crisis period among men only (crude prevalence ratio= 1.15, 95% CI: 1.04-1.26). When stratified by age, men between 35 and 54 years of age observed the greatest increase in risk. When the Poisson regression model was adjusted for employment status (categorical variable with 4 possible responses: employed, unemployed, homemaker, other), the observed association between

exposure to the crisis and poor mental health was no longer statistically significant, suggesting that unemployment was the main explanatory factor for the observed increase. Among females, however, even after adjusting, a decreased risk of poor mental health was observed during the crisis period relative to the pre-crisis period.

A similar study conducted among the Greek population aged 18 to 69 years showed that respondents exposed to the crisis period had a 2.6 times greater odds of reporting major depression as compared to respondents who took part in the survey during the pre-crisis period (OR=2.6, 95% CI: 1.97-3.43) and the overall prevalence of poor mental health in the sample population increased from 3.3% in 2008 to 8.2% in 2011.[49] Unlike the Spanish population, the Greek population observed an increased risk of poor mental health during the crisis amongst both males and females. However, when assessing the Greek population using a different measure of mental health (suicide ideation and suicide attempt), only men experienced an increase in prevalence of suicide ideation (+2.7%, p=0.011) and suicide attempt (+1.6%, p<0.001); no such increases during the recession period were observed for women.[50] Among the Greek population exposed to the crisis (respondents who participated in the 2011 survey), increasing financial hardship by one unit[H] led to an increased odds of experiencing major depression (OR = 1.2, 95% CI: 1.13-1.24)[49] and, conversely, higher levels of institutional and interpersonal trust had a protective association against major depression (OR = 0.95, 95% CI: 0.92-0.97 and OR = 0.96, 95% CI: 0.94-0.97, respectively).[51]

On a similar note, Gili et al[52] found statistically significant (p<0.001) increases between 2006 (pre-crisis) and 2010 (post-crisis) in the diagnosis of major depression

[H] In this study, financial hardship was assessed using the Index of Personal Economic Distress, which is a self-reported measure based on 8 questions.

(+19.4%), generalized anxiety disorder (+8.4%), somatoform disorder (+7.3%), and alcohol dependence (+4.6%) based on evidence from primary care centers in Spain. They did not find a statistically significant change in their control variable: diagnosis of bulimia. Bulimia was used as a control variable because they did not believe the prevalence of this disorder would be affected by the economic crisis. This analysis also found that there was a statistically significant greater risk of having major depression due to unemployment (OR=1.72, $p<0.001$), difficulty-paying mortgages (OR=2.12, $p<0.001$), and housing evictions (OR=2.95, $p<0.001$). Lastly, they concluded that men experiencing difficulties with housing payments and either individual/household unemployment are 33% more likely to be depressed than men without these risk factors. No results were presented on gender differences in this study.

Generally as demonstrated above, the majority of studies assessed the impact of the GFC using a time variable where survey respondents during the crisis period are compared to a reference population of survey respondents during the pre-crisis years. However, these studies have one major limitation, which is the inability to account for underlying time-trends in the data. Faresjo et al[53] overcame this limitation by comparing two populations at the same time period, the Swedish population (largely unaffected by the crisis) compared to the Greek population (severely affected by the crisis). A sample of university students from both areas were recruited from the study and compared. Unsurprisingly, accounting for other differences between both populations, the Greek population had a significantly ($p<0.05$) higher risk of perceived life stress and more symptoms of depression/anxiety.

A prospective cohort study that followed a representative random sample of the adult Icelandic population (aged 18 years and over) from 2007 to 2009 showed that the average level of perceived stress was significantly higher ($p=0.01$) in 2009 (crisis period) relative to

2007 (pre-crisis period). When stratified by sex however, unlike what was observed in Spain and Greece, the increase in prevalence was only significant among women, but not for men. When considering marital status and income covariates, however, men with a lower income or married men observed increased odds of reporting higher stress than their high income/single counterparts.[54] In a different study, also conducted on the Icelandic population, a cross-sectional survey was administered to employees of three Icelandic banks that collapsed during the GFC in 2009. It was observed that employees who were more directly affected by downsizing and restructuring processes observed a stronger positive correlation with increased psychological distress ($p<0.05$).[55]

A cross sectional study was administered in 2010 to a sample of 377 patients between 18 and 49 years of age attending two urban general practices in Belgium. Exposure to the GFC was assessed using employment loss in the past 12 months as a proxy measure. A very strong association between employment loss and suicide ideation was observed (OR = 8.8, 95% CI: 2.0-39.3).[56]

In Southeastern Michigan a cross-sectional survey was administered to a stratified random sample of employed (excluding self-employed) English-speaking adults between 25 and 64 years of age. The survey was administered from October 2009 to March 2010, approximately one year after the onset of the recession, and was designed with the objective of assessing the impact of the GFC on the health of Michigan residents. When using perceived job insecurity as a proxy measure for exposure to the GFC, persons exposed to job insecurity had significantly increased odds of reporting depression and anxiety (OR = 6.76,

95% CI: 3.43-13.3; OR = 3.73, 95% CI: 1.40-9.97, respectively).[57] When using housing instability[I] as a proxy measure for exposure to the GFC similar trends were observed.[58]

Voluntary participation in an on-line survey open to residents of Arizona, California, Florida and Nevada also revealed evidence of an association between respondents who reported being affected by the crisis (assessed housing status as a proxy measure) and poor mental health. For-example, respondents who were homeowners experiencing default/foreclosure were significantly more likely to report a higher number of days in the last 30 days where poor mental health was reported and to report serious psychological distress than their more housing secure counterparts.[59]

Houdmont et al[60] studied a cohort of employees of the Northern Ireland Civil Service (NICS) from 2005 (pre-crisis period) to 2009 (post-crisis period) and observed a 25% increase in the number of people taking time off work due to work-related stress ($p<0.001$) and a 35% increase in the reported number of absenteeism due to work-related stress ($p<0.001$).

Katikireddi et al[61] assessed trends over an extended period of time by conducting a repeat cross-sectional analysis of the 1991-2010 Health Surveys of England. Their analysis focused on the working age population (25-64 years) and found a statistically significant increased prevalence in poor mental health, among men, of 5.1% (95% CI 2.6% to 7.6%) in 2009 and 3% (95% CI 1.2% to 4.9%) in 2010 as compared to 2008; they did not find a statistically significant change in prevalence among women. Their results further suggest that employment status was not enough to account for the observed changes in mental health

[I] In the referenced study the term housing instability was defined based on 8 items: multiple moves, moved due to cost in past 3 years, moved in with someone in past 12 months, homeless in past 12 months, fell behind on rent in past 12 months, evicted in past 12 months, behind on mortgage/currently in foreclosure, foreclosed after onset of GFC, and past exposure to housing instability.

prevalence; they hypothesize other factors, such as job insecurity and precarious employment may have played an important role.

McLaughlin et al[62] followed a cohort of adults aged 18 years and older in Detroit between 2008 and 2010. They assessed exposure to the crisis using a proxy measure of experiencing home foreclosure to identify those people affected by the recession. Their findings suggest that home foreclosure was associated an increased risk of depression and anxiety as compared to the participants in the cohort who did not experience foreclosure.

In Slovenia, a cross-sectional survey was administered to a convenience sample of public and private sector employees between June and December 2009. Respondents who reported being impacted by the crisis had significantly higher levels of depression ($p<0.001$) and anxiety ($p=0.008$).[63]

Using hospital administrative data from a medical center in California, Lo et al[64] were able to show that patients admitted for psychiatric emergency services during the crisis period were significant less likely to have a previous history of previous mental health utilization as compared to the group of patients admitted prior to the crisis period. This suggests that the reason for emergency visits was significantly different during the crisis period than the pre-crisis period and suggests that perhaps these patients were being admitted for an unusual life-altering event, i.e. the GFC.

Although most of the mental health studies investigated impacts among the working age population, a few articles focused on different age groups. For-example, in a study based in the United States, the GFC impact on the mental health of adolescents aged 12 to 17 years was investigated, and it was found that relative to pre-crisis years, the crisis period was associated with statistically significant ($p<0.05$) increases in poor mental health, especially among adolescents in low and middle income families.[65] Conversely, another study in the

United States by Cagney et al[66] used data from a longitudinal study to assess whether individuals exposed to the GFC and residing in the United States aged 57 years and older were more likely to develop depression than their unaffected counterparts. Exposure to the crisis was assessed using household foreclosure status as a proxy measure. Respondents affected by the crisis were at a significantly greater risk of developing depression than unaffected respondents. For-example, participants who received a notice of default had a 75% increase in the odds of developing depression as compared to those unaffected by the crisis (OR = 1.75, 95% CI: 1.14-2.67).

Alley et al[67] followed a cohort of older Americans aged 50 years and older, and found that respondents who fell behind on their mortgage following the onset of the financial crisis were significantly more likely to experience more depressive symptoms (OR = 8.60, 95% CI: 3.38, 12.85). Similarly, also in the United States, a cross-sectional survey was administered to a sample of American adults aged 50 years in 2008. Respondents who participated in the survey prior to October 1, 2008 were considered the reference population and compared with respondents who participated in the survey on October 1, 2008 and onwards. The analysis was stratified based on the number of stocks the participant held prior to the recession. Exposed respondents (those who held many stocks prior to the recession) reported statistically significant ($p<0.05$) increased prevalence of self-reported poor mental health and anti-depressant use compared to the unexposed population. However, when clinical measures of poor mental health were used, a significant association was no longer observed.[68] Fenge et al[69] studied the elderly United Kingdom population, and found that based on a qualitative analysis of interview data, the population aged 65 years and older were adversely impacted by the recession and reported reduced mental and social well-being;

however, they found that this experience varied based on the presence of resilience factors such as money management and budgeting skills.

A few studies focused on the differential impact the GFC may have had on vulnerable groups. For-example, Agudelo-Suaraez et al[70], investigated the recession's impact on migrant workers in Spain using data from two waves (2008 and 2011) of a longitudinal study. In the second wave of the study, all the migrant workers were considered exposed to the financial crisis and among men a statistically significant increase in the risk of reporting poor mental health was observed (OR = 4.63, 95% CI: 2.11-10.16). Since migrant workers were more likely to be affected by the job loss that followed the initial crisis, Robert et al[71] used the same data to investigate whether a change in employment status, working hours, and income had an effect on the mental health of these migrant workers. Indeed a change in status from employed to unemployed, an increase in working hours, and a drop in monthly income all resulted in an increased odds of reporting poor mental health (OR = 3.62, 95% CI: 1.64-7.96; OR = 2.35, 95% CI: 1.02-5.44); OR = 2.75 (1.08, 7.00), respectively.

Using age-standardized death rates due to mental and behavioural disorders in the Italian population from 2000 through 2010, De Vogli et al[72] conducted an interrupted time trend analysis to determine the number of excess mental health related deaths that occurred during the financial crisis period (2008 to 2010) that would not have occurred had underlying trends from 2000 to 2007 continued. Approximately 548 excess mental health and behavioural disorder related deaths (95% CI: 347.3-865.7) were estimated to have occurred during the financial crisis period, of which 16.4% were attributable to increases in unemployment and 22.4% were attributable to loss of income. Both loss of income and unemployment are unfortunate consequences stemming directly from the GFC.

Two studies identified in the literature review assessed the impact of the recession in Australia. First, Shi et al[73] used pooled data from several repeated cross-sectional surveys that were administered from 2002 to 2009. Like many of the other studies discussed, they assigned exposure to the crisis based on when the respondent completed the survey. In other words, if the respondent took part in the survey in year 2008 and year 2009, they were considered exposed. With regards to statistically significant trends over time, they found that psychological distress had been declining since 2002 ($p<0.001$), stress had also been declining since 2004 ($p=0.007$). These time points were identified using joinpoint regression analysis, and none of these time points coincide with the crisis period. However, they also found that when stratified by employment status, full-time employees experienced a decrease in anxiety levels, whereas part-time employees experienced an increase, during the recession period. Additionally, stress levels among women, respondents with low income, low education, middle aged, full-time or unemployed, and/or in the lower income quintile experienced statistically significant increases. The second study, also focusing on Australia, limited its analysis to the elderly population for which longitudinal data were available from 2005 to 2010. Compared to participants who did not report an economic impact related to the recession, participants who were impacted had a statistically significant increase in reporting both depression ($p<0.014$) and anxiety symptoms ($p<0.001$).[74]

In Canada, three articles were identified that investigated the impact of the GFC on health; all three investigated mental health related outcomes. Frank and colleagues[75] assessed the impact of the GFC on the mental health of a representative sample of two rural communities in Ontario by conducting a longitudinal study from 2008 to 2010 with an initial baseline assessment and two follow-up assessments every nine months. Using a measure of financial strain as a proxy measure of exposure to the GFC, the study found that increasing

financial strain was associated with a worsening of anxiety, stress, and depression ($p<0.05$). When the level of social capital[J] was also considered, it was observed that the high social capital moderated the effect of financial strain on stress and depression. In another Canadian study, Bartfay et al[76] conducted qualitative interviews in a sample of previously employed autoworkers at a manufacturing plant in Ontario, Canada who had been laid-off due to the GFC. The most worrisome common theme that emerged from this study was that the entire sample of autoworkers experienced increased mental health issues after being laid-off (particularly increased stress and anxiety).

The third Canadian study was conducted by Wang et al.[77] They examined the prevalence of mental disorders in a working population residing in Alberta during the financial crisis by observing differences between the prevalence before, during, and following the GFC. The results of this study are based on a sample size of 3 579 participants. Survey data were collected at three different intervals: (1) 1 January 2008 to 31 August 2008, which represented the pre-crisis time period, (2)1 September 2008 to 1 March 2009, which represented the financial crisis, and (3) 1 March 2009 to 30 October 2009, which represented the post-crisis period. Based on survey data, lifetime and 12-month prevalence estimates were derived for various mental disorders, and these values were compared over the three different time intervals. This study found a statistically significant ($p=0.03$) increase in major depressive disorder over time, from 5.1% (pre-crisis) to 6.8% (crisis) to 7.6% (post-crisis).

In the United States, Ayers et al[78] made use of novel Google Search Trend data from 2004 to 2010 that were used to determine whether an increase in psychological distress

[J] In the referenced study social capital was measured using a Social Capital Scale comprised of eight topics (30 items) including: local community participation, social agency, feelings of trust/safety, neighborhood/family/work connectedness, tolerance to diversity, and value of life. A total score was derived based on all 30 items and were coded into a 4-point Likert scale.

related Google queries was observed during the recession period. Indeed, psychological distress queries increased at the end of 2008 coinciding with the onset of the crisis. At the end of 2009, queries peaked representing 300,000 queries attributable to the recession. At the end of 2010, psychological distress queries remained 20% higher than pre-recession levels.

Unlike the studies presented above, Astell-Burt et al[79] found no increases in depression or mental illness between 2006 and 2010 in the United Kingdom. This finding is contrary to what would be expected considering the evidence presented above, however the authors believe this is due to the way in which mental health problems were ascertained. Participants were asked if they believed their health problem would last for more than 12 months; the 12 months condition likely led to an under-reporting of mental health problems given that participants may not believe their current mental health issues would last for at least one year.

Suicide Mortality Outcomes

Of the studies categorized as investigating mental health outcomes, several (n = 12) quantified the impact of the most recent recession on suicide mortality trends. Despite the fact that a variety of countries were studied, the findings from all studies were generally consistent. Based on literature investigating the impacts of previous recessions on mortality, the prevailing hypothesis is that recessions are associated with elevated suicide mortality, and this appears to continue to be true for the most recent GFC and subsequent recession.

Antonakakis et al[80] analyzed annual suicide mortality data from Greece between 1968 and 2011. In examining the ecological time trends of suicide rates in Greece they concluded that using government consumption expenditure as a proxy measure for periods of economic crisis, approximately 381 of the suicides that occurred in Greece during the GFC

period from 2009 and 2010 were attributable to the implementation of austerity measures. When stratifying their analysis by age and sex they found that the effect fiscal austerity had on suicide rates was only significant for men, and for the population aged 45 to 89 years of age. Madianos et al[81] also looked at suicide mortality trends in Greece; however they used a different approach, an interrupted time series regression analysis of suicide mortality data between 1990 and 2011. Similar to the above study, they found that suicide mortality increased by 55.8% ($p<0.05$) in 2010 (post-crisis) as compared to the year 2007 (pre-crisis). Of note, when they analyzed mortality rate from accident falls/poisoning as a control variable, they observed no such increases during the GFC period.

Baumbach et al[82] studied trends in suicide mortality between 2000 and 2010 in 8 different European countries and found that the increase in suicide mortality during the recession period (i.e. comparing year 2007 and year 2010) was not consistent in all countries. Some countries experienced an increase, others experienced a decrease; however, similar to the Antonakakis et al study, they found that when social spending was low, unemployment had a significantly greater impact on suicide mortality, as compared to when social spending was high. This is suggestive of the potential detrimental impact of austerity on mental health in general, and suicide mortality specifically. Another study that analyzed annual time trend data of annual suicide mortality rate using aggregate data from 23 European countries also found an increase in suicide mortality during the recession years, and that a 1% increase in country unemployment rate was associated with a 4.1% increase in suicide mortality.[83]

Chan et al[84], using an interrupted time-series regression analysis, analyzed monthly suicide mortality data in the South Korean population aged 20 to 58 years from 2003 to 2011. They defined the time period from January 2003 to December 2008 as the pre-recession period, and January 2009 to December 2010 represented the GFC period. A

statistically significant increase ($p<0.05$) in the suicide rate among all employed men aged 20 to 49 years of age was observed during the GFC period compared to the pre-crisis period, but the observed increase was not significant among men aged 50 to 59 years. A statistically significant increase was also observed among unemployed men aged 20 to 29 years, 40 to 49 years, and 50 to 59 years, but not 30 to 39 years. Among women, a statistically significant increase in suicides was noted among both unemployed and employed women, except for employed women aged 50 to 59 years. Interestingly, the most notable impact was observed among skilled workers (managers and senior officials) who experienced an increase in a pre-crisis suicide rate ratio equal to 0.75 (95% CI: 0.57, 0.99) to a post-crisis rate ratio of 2.81 (95% CI: 2.22, 3.55).

In Italy, Pompili et al[85] analyzed annual suicide mortality from year 1980 to 2010 using joinpoint regression analysis. The only significant change in the linear trend of suicide mortality that coincided with the GFC period was among men aged 25 to 64 years of age. The joinpoint was identified at year 2007; from 1994 to 2007 the annual percent change in suicide mortality was decreasing by 2.1%, however from 2007 to 2010, the annual percent change began to increase by an annual percent change of 4.2%. Using 2006 as the reference year, a statistically significant increase in the rate ratio of suicide was observed in men aged 25 to 64 years in all recession years (2008, 2009, and 2010). In 2010, the rate ratio increased by 12% ($p<0.05$) compared to year 2006. In another study based in Italy, De Vogli et al[86] estimated that 290 excess suicides and attempted suicides occurred due to economic reasons attributable to the recession.

Using a similar strategy, Lopez-Bernal et al[87] estimated that 680 excess suicides attributable to the financial crisis occurred in Spain between April 2008 and December 2010. Unlike evidence from Italy, Spain, and Greece, Saurina et al[88] analyzed suicide rates and

absolute number of suicides occurring in England between 1993 and 2010. Their study concluded that overall, there was no significant change observed in the age-standardized suicides rates coinciding with the GFC period; however, when they stratified their analysis by region they found considerable variability, indicating that some regions did in fact experience a significant increase, whereas other regions experienced no such changes. Although they found no significant change in the rate, they did find an increase in the absolute number of suicides.

Barr et al[89] also analyzed suicide mortality data in England and arrived at a different conclusion using an interrupted time series regression approach. From their study, it was estimated that compared to historical pre-crisis trends, approximately 846 excess male suicides (95% CI: 818, 877) occurred during the crisis period from 2008 to 2010, and 155 excess female suicides (95% CI: 121, 189). When factoring unemployment into their analysis, they concluded that 40% of the excess suicides observed among males during the recession period could be explained by unemployment; however, they found no such associations among females. Again, using the same approach, Reeves et al[90] looked at suicide mortality in the United States between 1999 and 2010, suggesting that approximately 4,750 excess suicides occurred during the recessionary period after 2007 (95% CI: 2570, 6920) and that unemployment accounted for approximately 1,330 out of the 4,450 excess suicides observed.

Finally, Chang et al[91], using national suicide data containing data from 54 countries worldwide, undertook a comprehensive time trend analysis, covering year 2000 through to 2009. Using data from 2000 to 2007, pre-recession trends of suicide were calculated, and the number of excess suicides occurring during the recession year (2009) was then calculated. In total, 4,884 excess suicides (95% CI: 3,907-5,860) occurred among the population aged 15

years and older in all 54 countries during the recession period. When stratified by gender, the rate ratio of suicide in men during the recession year compared to pre-recession period was 1.033 (95% CI: 1.027, 1.039), which corresponds to 5,124 excess suicides; however no major change in suicide rates was observed for women. The study provided individual data for each of the 54 countries examined as well; using Canadian data the rate ratio of suicides was 1.11 (95% CI: 1.089 to 1.132), corresponding to an estimated 294 excess suicides (95% CI: 243-346) during the recession period. Again, when stratified by sex the increase was not significant among women.

Physical Health Outcomes

Astell-Burt et al[79] used individual–level data from the Quarterly Labour Force Survey of the United Kingdom to examine the association between self-reported health and the rise in unemployment, which occurred due to the GFC. Their results show that observed increases in unemployment following the GFC (4.5% in January 2008 to 7.1% in September 2009) correspond with increases in reporting poor health (25.7% in July 2009 to 29.5% in December 2010). They found significant increases in cardiovascular and respiratory disease. In Greece an increased odds (OR = 1.14, 95% CI 1.02-1.28) of reporting 'bad' or 'very bad' health was observed in 2009 (post-crisis) compared to 2007 (pre-crisis).[92] These results are consistent with another study that calculated the odds ratio of reporting 'good' or 'very good' health in the year 2011 (post-crisis) as compared to the year 2006 (pre-crisis) to be 0.88 (95% CI 0.78-0.99).[93]

Vandoros et al[94] pointed out a weakness in the methodology used by these studies, however, stating that they do not account for the underlying time trends of the health outcomes being investigated. Therefore, they conducted a similar study in Greece but instead

of only comparing two time periods (before and after crisis) they added an interaction term to account for whether respondents were from Greece or Poland. The Polish respondents were considered the control group since Poland was not severely impacted by the recession whereas Greece was, and prior to the crisis Greece and Poland observed similar trends in self-rated health over time. Their study provided further convincing evidence of the detrimental impact of the GFC on health by showing that respondents from Greece, compared to Polish respondents, had a statistically significant increased odds of reporting poor health after the crisis (OR = 1.16, 95% CI: 1.04, 1.29). When stratified by sex the association remained significant for men only.

On a similar note, Burgard et al[57,58] used perceived job insecurity and housing instability as proxy measures for exposure to recession to show that among a sample of working age adults aged 19 to 64 years in south eastern Michigan, those with perceived job insecurity had 2.68 times the odds (95% CI: 1.14, 6.32) of reporting poor self-rated health compared to their job secure counterparts. And, that those who fell behind on their mortgage or experienced foreclosure had 3.09 times the odds (95% CI: 1.19, 8.03) of reporting poor self-reported health compared to their stable housing counterparts.

A representative sample of the elderly population in Australia was followed over time covering the period both before (2005/2006) and during the GFC (2009/2010). The participants of the study were considered affected by the crisis if they indicated that their financial security was impacted by the economic downturn. The changes in reporting poor self-rated health were not statistically different from the participants who reported no impact from the recession ($p= 0.59$).[74] Similarly in the United States, a study restricted to a sample of Americans 50 years old and over, also showed no significant association between the recession period (measured using housing status as a proxy variable) and a decline in self-

rated health (OR = 1.35, 95% CI: 0.52, 3.72).[67] While the elderly populations discussed above did not show significant associations, another study also based in the United States, observed that the prevalence of reporting poor mental health among adolescents between 12 and 17 years of age, increased significantly during the crisis years as compared to the pre-crisis (from 5.7%, 95% CI: 4.4, 7, to 10%, 95% CI: 7.2, 12.8).[65]

Changes in self-rated health associated with the GFC were also examined in specific population sub-groups. For-example, Schootman et al[95] found that among women in Missouri aged 25 years or over and diagnosed with primary breast cancer, those who were impacted by the GFC (measured using high neighborhood foreclosure risk as a proxy measure) had a statistically significantly increased risk of reporting poor self-rated health as compared to those women residing in low risk neighborhoods (OR = 2.39, 95% CI: 1.83, 3.13).

In terms of more objective health outcomes, as opposed to subjective measures, Huang et al[96] compared the incidence rate of non-accidental head trauma during the recession period (defined as from December 2007 to June 2010) with the incidence rate during the pre-recession period (defined as from December 2001 to November 2007) using data from a Trauma Registry in a children's hospital in Ohio. The study population was restricted to infants aged 0 to 2 years. The results showed that the mean monthly incidence rate of non-accidental head trauma increased by 101.4% (from 0.7/month to 1.4/month) during the recession period (p=0.01).

Eiriksdottir et al[97] conducted a unique study that investigated whether pregnant women were more at risk of delivering their babies with low birth weight, shorter gestation length, and small for gestational age due to exposure to the GFC. Their most noteworthy conclusion was that women who were in the first trimester of their pregnancy when the GFC

first began had significantly increased odds of low birth weight (OR = 1.70, 95% CI: 1.11, 2.59).

In Greece, a statistically significant increase in the prevalence of vertigo (from 6.96% to 8.65%) and tinnitus (from 1.41% to 2.43%) was observed based on data from a case-control study that used hospital records between 2009 and 2011 from a general hospital in Greece.[98] Chinta et al[99] observed that the incidence of headache related hospital admissions in the United States increased significantly ($p<0.0001$) in the recession period compared to the pre-recession period, and that people aged 25 to 55 years and women experienced the greatest incidence of headache related hospital admissions.

Guojonsdottir et al[100] wanted to investigate whether there were any immediate changes in health following the onset of the crisis; therefore they compared cardiac and emergency department hospital records data immediately before the collapse (i.e. Week 37 to Week 40 of year 2008) to those immediately after the collapse (i.e. Week 41 to Week 46). They found an increase in the total number of visits to the cardiac emergency department (rate ratio = 1.26, 95% CI: 1.07, 1.49), but when stratified by sex the association was only significant among women, and not men. Ischaemic heart disease was also significantly increased among women (rate ratio = 1.79, 95% CI: 1.01, 3.17). Increases were not observed when looking at hospital administrative data from general emergency department visits. Also, when comparing the same time period (i.e. Week 37 to Week 46) in 2006 and 2007, no such increases were observed.

In Spain, Rajmil et al[101] observed that the recession period was associated with an increased risk of reporting overweight/obesity (OR = 1.81, 95% CI: 1.18, 2.78). The overweight/obesity outcome was also investigated by Zhang et al[102] in the United States who found that state unemployment rates compared to county unemployment rates had differing

impacts on the risk of overweight/obesity, but they did not observe any meaningful differential impact on overweight/obesity as a result of the GFC.

In the United States, Li et al[103] examined all the cases of myocardial infarction occurring at two hospitals in New Jersey between 2006 and 2012. They assessed exposure to the crisis using two proxy measures: unemployment and the Dow Jones Stock Exchange Index. Using the Spearman Rank Correlation test they found that unemployment was significantly associated with the occurrence of myocardial infarction amongst the low-income group ($p=0.04$), but not the high-income group ($p=0.89$). However, the Stock Index did not demonstrate any significant association with the occurrence of myocardial infarction.

The Google Search Database mentioned in the previous section was also used by Althouse et al[104] to assess whether there any differences in trends regarding health-related search queries that coincide with the onset of the GFC in the United States. The study revealed an excess of 26% (95% CI: 3% to 38%) health-related queries that took place during the recession period compared to trends prior to the crisis. Most increased queries were related to stomach ulcer symptoms and headache symptoms. Combining the top 100 health concern related queries translates into 205 million excess searches executed during the recession period. Excess queries were categorized into the following emerging themes: headaches, hernias, chest-related, arrhythmia, gastric pain, back pain, joint pain, toothache, cancer, congestion and pregnancy.

Thompson et al[105] investigated the association between exposure to the GFC and heart failure hospitalization rate in the United States, but found no significant association. Similarly, mortality data in Los Angeles between 2005 and 2008 were studied to determine whether exposure to the stock market crash of October 2008 (i.e. the triggering event of the ensuing recession) was associated with excess mortality, but also found no significant

association between exposure to the crash and the daily death rate (all-cause and cardiac-related).[106] Another study based in the United States administered a cross-sectional survey to healthy employees working at an Aluminum Manufacturing Company who remained employed amidst severe downsizing. The investigators found that exposure to a work environment experiencing large downsizing increased the risk of developing negative health outcomes including hypertension, diabetes, asthma/COPD, and depression, but none of the observed increases reached statistical significance.[107] Similar findings were observed in Spain by Regidor et al[108], who found that premature mortality, prevalence of poor self-reported health, and incidence of diagnosed HIV all continued to improve throughout the GFC period based on a jointpoint regression analysis of time trends that identified no significant changes coinciding with the recession period.

In terms of mortality-related outcomes, Toffolutti et al[83] found that based on mortality data from 23 European countries, country unemployment rate (which increased during the recession period) was associated with statistically significant decreases in mortality from: all-causes, cardiovascular disease, cirrhosis/chronic liver disease, and parasite infections. Baumbach et al[82] also investigated mortality in 8 European countries and similarly found a decrease in overall all-cause mortality throughout the study period with no deviations from trends pre-crisis. They found that transport accident mortality declined in all of the 8 countries investigated with a clear difference in trends post-crisis in Bulgaria, Poland, Slovakia and Slovenia.

Vijayasiri et al[109] studied the association between the GFC and reporting somatic symptoms in a nationally representative sample of the English-speaking United States population aged 18 years and over (such as sleep problems, stomach problems, migraines/headaches, and fatigue/exhaustion). They found varying results depending on

which measure of exposure to the recession was used. Home ownership problems, inadequate health insurance, and inadequate sick leave were significantly associated with reporting somatic symptoms ($p<0.05$). However undesirable living situation/work situation and unemployment/underemployment were not significantly associated with reporting somatic symptoms. Interestingly, this finding also found that problematic alcohol use was associated with a higher number of somatic symptoms, but that this association was only significant for men. They concluded that their study provides evidence suggesting that men self-medicate with alcohol during times of economic uncertainty leading to problem drinking, whereas women do not appear to cope in the same manner. These findings lead nicely into the next section, which discusses the association between the GFC and its impact on health-related behaviours.

Health Behaviour Outcomes

Asgeirsdottir et al[110] studied health behaviour trends over time from 2007 to 2009 in a stratified sample of the Icelandic population. Several health behaviours were analyzed including risky health behaviours and health-promoting behaviours. During the recession this study observed an avoidance of risky behaviours such as smoking, heavy drinking, consumption of sugar-sweetened soft drinks, sweets and fast food, and indoor tanning. Additionally, the recession was also associated with an increase of health-promoting behaviours such as increased fish oil consumption and getting adequate sleep. However, the recession was associated with reduced consumption of fruits and vegetables, which is the only finding suggesting a negative effect on health behaviour. The study also included a mediation analysis to assess whether hours of work, real household income, financial assets, mortgage debt and mental health mediated the association between the recession and health

behaviour trends; however, in general these mediators did not account for the observed association. Also of interest, the authors found that the observed associations were stronger among the working age population (25 to 64 years) compared to the overall adult population.

Interestingly when the same sample population was assessed by McClure et al[111] to study the association between the GFC and several oral health behaviours, an improvement was observed during the recession period in terms of having at least one dental checkup in the year (OR = 1.11, 95%CI: 1.01, 1.23), brushing teeth daily (OR = 1.40, 95% CI: 1.06, 1.87), and flossing daily (OR – 1.12, 95% CI: 1.01, 1.21). As well, McClure et al[112] assessed smoking behaviour and found that statistically significant reductions in smoking prevalence were observed during the recession year among both men (17.4% to 14.8%, $p<0.01$) and women (20.0% to 17.5%, $p<0.01$).

While the McClure et al[111,112] studies suggested a positive impact on health behaviours associated with the recession in terms of smoking prevalence in the Icelandic population, Gallus et al[113] found the opposite in Italy. Repeated cross-sectional survey data administered to the general Italian population aged 15 years and over showed a significant increase in smoking prevalence during the crisis period as compared to the pre-crisis period. The prevalence of overall smoking increased from 22% in 2008 to 25.4% in 2009, $p<0.01$. However, when the analysis was stratified by sex, an increase in overall smoking was only significant for women, and not men. Conversely, the proportion of ex-smokers decreased significantly between 2008 and 2009, among both men and women.

An analysis of three waves of a repeated cross-sectional survey based in England administered to the adult population aged 20 to 50 years and of white ethnicity was conducted to determine whether the GFC was linked to changes in problematic alcohol consumption. The analysis revealed that frequent drinking significantly declined from 28.5%

to 26.5% ($p<0.01$), as did number units of alcohol consumed on heaviest drinking day and the number of days in past week where drinking was reported. However, the rate of binge drinking significantly increased ($p=0.03$) during the post-crisis period (year 2010). The authors concluded that despite declines in overall drinking, specific sub-groups such as unemployed individuals, showed a significantly increased risk of binge drinking during the recession years as compared to the pre-crisis period (OR = 1.64, 95% CI: 1.22, 2.19).[114]

In the United States, a stratified random sample of adults in southeastern Michigan, aged 19 to 64 years of age, were followed over time from 2009 to 2011. Participants who reported a decline in measured economic resources had a significantly increased risk of adopting tobacco smoking during the GFC (HR = 4.99, 95% CI: 1.65, 15.08), but no such association was observed with problematic alcohol consumption or marijuana use. Conversely, when perceived economic decline was used as the exposure variable (instead of measured economic decline), an increased risk of problematic alcohol consumption was observed (HR = 2.75, 95% CI: 1.20, 6.27).[115]

Similarly, a cross-sectional survey was administered to a nationally representative sample of the United States population in 2010 to assess the association between reporting being affected by the crisis and problematic alcohol consumption. Respondents who reported being affected by the crisis also had an increased risk of reporting negative alcohol consequences (OR = 2.37, $p<0.05$). An increase was also observed for alcohol dependence, however the association was not statistically significant after being adjusted for other demographic covariates (OR = 1.75, $p>0.05$).[116] In a similar cross-sectional study, respondents were assessed as being affected by the economic crisis using housing instability as a proxy measure. In this study a significant association was observed between housing instability and negative alcohol consequences, as well as alcohol dependence ($p<0.05$). This

study also assessed whether perceived family support mediated the relationship, and indeed the association between housing instability and problematic alcohol consumption remained significant only among those respondents reporting low perceived family support.[117]

Zenmore et al[118] also analyzed data from a single cross-sectional survey administered in 2010 and found that respondents reporting severe economic loss had a significantly increased risk of reporting monthly drunkenness (OR = 1.73, 95%CI: 1.03, 2.89) and negative alcohol consequences (OR = 2.54, 95% CI: 1.03, 6.25); however, no statistically significant association was observed with alcohol dependence or total volume of alcohol consumed. The study also revealed that Black and Latino respondents were significantly more likely to report being impacted by the GFC, as compared to Whites ($p<0.05$). When an interaction was tested between sex and economic loss to predict negative alcohol behaviours, however, no significant differential impact was observed.

Bor et al[119] analyzed repeated cross-sectional survey data between 2006 and 2010 administered to a nationally representative sample of adults aged 18 years and above in the United States. Exposure to the GFC period was ascertained based on when the respondent completed the survey; respondents from year 2006 and 2007 were classified as pre-crisis, and respondents from year 2008 and 2009 were classified as crisis period. The prevalence of any drinking declined during the crisis period compared to the pre-crisis period with a risk difference of -0.39, $p<0.05$. Using the 2008 population this corresponds to approximately 880,000 fewer drinkers (95% CI: 140,000, 1.6 million). Conversely, the prevalence of frequent binge drinking increased during the crisis period with a risk difference = 0.34, $p<0.01$; this corresponds to 770,000 more frequent binge drinkers (95% CI: 390,000, 1.1 million). In 2010, the prevalence changes observed in terms of any drinking and binge drinking returned to pre-crisis levels.

Data from one wave of a cross-sectional survey administered in 2009 also provided evidence of an association between negative alcohol drinking outcomes (such as drinking to intoxication, binge drinking, and problem drinking in the past year) and persons who were identified as impacted by the GFC. In fact, this association was particularly strong among men as compared to women, suggesting a differential gender related impact.[120]

Fritjers et al[121] examined trends in Google search queries over time between 2004 and 2011 to assess whether an increase in alcohol abuse/problem drinking related Google searches coincided with the onset of the GFC in the United States. They found that the recession period coincided with a 20% increase in Google-related problem drinking searches. Also, the Gili et al[52] study discussed earlier, also found a 4.6% increase ($p<0.0001$) in alcohol dependence and a 2.4% increase ($p<0.0001$) in alcohol abuse between 2006 (pre-crisis) and 2010 (post-crisis) in a sample of patients attending primary care centers representative of Spain's consulting population.

With regards to other types of health behaviours, Colman et al[122] used pooled data from repeated cross-sectional surveys administered to a sample of the United States population aged 25 to 55 years of age to assess whether changes in physical activity were associated with the onset of the GFC. A decrease in time spent at work was observed during the recessionary period, however, increases in recreational exercise, TV-watching, sleeping, child-care and housework were also observed. Overall, total physical exertion declined during the recessionary period.

Macy et al[123] used follow-up data from a longitudinal study on a sample of the mid-western United States population to assess whether the GFC was associated with a change in certain health-related behaviours using financial strain as a proxy measure of exposure to the crisis period. They observed that higher financial strain was associated with a lower

likelihood of checking ingredient labels while buying food ($p<0.01$), a lower likelihood of choosing foods to eat based on health value ($p<0.001$), and a lower frequency of vigorous exercising ($p<0.01$). Interestingly, when other proxy measures were used to represent exposure to the financial crisis, such as a change in working hours or a change in employment status, statistically significant associations were not observed.

As previously mentioned, improvements in mortality trends have been noted during previous recession periods and the mechanism used to explain this finding is the adoption of healthier behaviours during times of economic distress. Nandi et al[124] attempted to investigate whether this was true by investigating whether health behaviours mediate the association between recessions and mortality. To do so, they studied the United States population aged 25 years and over using pooled data from repeated cross-sectional surveys administered in year 2003 through to 2010. Trends in health behaviours were examined over time, but unlike findings from the other studies they reported that aside from modest reductions in alcohol consumption, most health behaviours (smoking, obesity, and exercise) did not demonstrate an association with the recessionary period. Thus, they concluded that they did not find evidence to support the hypothesis that the observed changes in mortality trends occur as a result of changes in health-related behaviours.

Healthcare Utilization/Accessibility Outcomes

Burgard et al[125] used pooled data from repeated cross-sectional surveys, covering a time period from January 2006 to May 2010, to show that healthcare utilization has significantly changed following the 2008 GFC in the United States among the working age population aged 25 to 64 years. The percentage of people who reported foregoing medical care, dental care, mental health care, and prescription medications all significantly increased

($p<0.05$) during the recession period as compared to the pre-recession period. Additional disparities by race were identified suggesting that African-Americans were disproportionally affected by the recession period, experiencing a significantly greater likelihood of foregoing medical care than their White counterparts.

Another study by Chen et al[126], reached similar conclusions after analyzing two waves of a cross-sectional survey administered to a nationally representative sample of the United States population aged 18-64 years. Exposure to the crisis period was assessed using the survey year as the primary explanatory variable. Wave 1 (conducted between 2005/2006) was the reference period, whereas Wave 2 (conducted between 2008/2009) was the exposure period. Respondents who were exposed to the crisis had significantly reduced odds of having any total health-care expenditure (OR = 0.88, $p<0.05$), prescription drug expenditure (OR = 0.92, $p<0.01$), outpatient expenditure (OR = 0.90, $p<0.001$), inpatient expenditure (OR = 0.90, $p<0.05$), and expenditure on other health-related sources (OR = 0.91, $p<0.001$). No statistically significant association was observed with expenditure on physician visits ($p>0.05$). On the other hand, exposure to the crisis resulted in significantly increased odds of emergency department expenditure (OR = 1.23, $p<0.001$). Unlike the study described above, no statistically significant differential impacts based on race/ethnicity were identified.

Mortensen et al[127] conducted a similar study of the United States population covering the same time period (2005 to 2009), but did not limit the study population to the working age population only and analyzed different measure of healthcare utilization. They observed that compared to the pre-recession period (survey years 2005-2006), the crisis period (survey years 2008-2009) was associated with a reductions in the number of persons reporting prescription drug refills and inpatient stays ($p<0.05$). However, no statistically significant associations were observed in the number of emergency department visits or the number of

office-based physician visits. The analysis of the data also included an interaction test between race and survey year, showing that following the GFC the Hispanic population reported a larger decrease in the number of physician visits compared to the White population. A study using a similar design, but based on a nationally representative sample of the Greek population, found consistent results as well. The Greek population exposed to the crisis experienced increased odds of reporting unmet medical needs as compared to the pre-recession period (OR = 1.47, 95% CI: 1.30, 1.66).[128]

King et al[129] attempted to answer a more specific research question pertaining to the effect the GFC had on the frequency of breast cancer and cervical cancer screening among women in the United States. Again, using data from two waves of a repeated cross-sectional survey, the authors reported that compared to the pre-recession period, the recession period was associated with decreased odds of breast cancer screening (OR = 0.82, $p<0.001$) and decreased odds of cervical cancer screening (OR = 0.79, $p<0.001$). When assessing the differential impact of race/ethnicity, the authors observed that respondents who identified as White were more affected by the crisis compared to Hispanics in terms of reduced breast cancer and cervical cancer screening frequency. Although the authors do not offer an explanation for this finding, it could perhaps by explained by the fact that Hispanics prior to the recession had little access, which did not change during the recession period, whereas the Whites did have access pre-crisis, but lost access afterwards. In another study also focusing on cancer screening, Dorn et al[130] demonstrated that the rate of screening colonoscopies among the United States population aged 50 to 64 years significantly declined during recession period (i.e. December 2007 to June 2009) as compared to the pre-recession period (i.e. January 2005 to November 2007). This conclusion was reached based on a time series analysis of health insurance claims data using a segmented regression model. Specifically,

the screening colonoscopy rate decreased by 68.9 colonoscopies per 1 million persons per 1 month (95% CI: -84.7, -53.1, p<0.001); assuming causality this corresponds to 500,000 fewer screening colonoscopies in the United States had pre-recession trends continued.

A few studies also examined the association between the GFC and prescription medication non-adherence. In one such study a sample of the population consulting a public hospital in Spain for an immunotherapy-related consult were followed over time to assess adherence to immunotherapy after 1 year. The first group of patients were enrolled in 2006 and followed for a 12-month period; these participants were the control group as they were unaffected by the GFC. The second group was enrolled in 2010 and also followed for a 12-month period; these participants were the exposed group. One year adherence to immunotherapy was more common among the control group than the exposed group (78% versus 67.5%, p=0.01). Results from a logistic regression analysis suggested that initiation of immunotherapy prior to the GFC period resulted in a better likelihood of medication adherence (OR = 1.89, 95% CI: 1.19, 2.97).[131]

Another example is provided by Alley and colleagues[67] who analyzed data from a longitudinal study that followed a nationally representative sample of the American population, aged 50 years and above. Their objective was to determine whether those participants who became affected by the crisis were more likely to experience incident cost-related medication non-adherence. They found a statistically significant and strong association as evidenced by an odds ratio equal to 8.66 (95% CI: 3.72, 20.16). In this study, exposure to the GFC was ascertained using housing status (i.e. people who fell behind on their mortgage following the onset of the GFC) as a proxy measure. Similarly, Piette et al[132] used data from a single cross-sectional survey to show that a significant number of chronically ill patients in the United States experienced hardships after the onset of the GFC

in terms of cost-related medication non-adherence. Finally, a similar analysis based on a single cycle of cross-sectional survey data, found that among a representative sample of the Geneva (Switzerland) population aged 35 to 75 years, 14.5% of the population went without health care due to economic reasons (including foregoing dental care, physician consultation, use of health devices, medication, and surgery), and that a decrease in income level category increased the odds of foregoing health care by 48% (OR = 1.48, 95% CI: 1.31, 1.65).[133]

3.3 Scoping Literature Review Discussion

Pathways presumed to lead to health outcomes

Generally, all the studies identified in this literature review hypothesized a similar set of pathways by which the GFC is presumed to lead to various health outcomes. These pathways include: (1) changes at the public policy level leading to reduced spending on social welfare, (2) changes in the labour market either through unemployment, precarious employment or job insecurity, (3) changes in housing stability either through rising house prices, difficulty paying mortgage/rent, home foreclosure, etc. (4) inadequate income leading to financial hardship/financial strain. While these pathways were presumed to lead to negative consequences for mental health and healthcare access/utilization, they were presumed to have a differing impact on physical health outcomes and health-related behaviours. For-example, these pathways could lead to a reduction in the adoption of risky health behaviours due to rising costs (e.g. an avoidance of smoking/drinking) and lead to an adoption of healthier behaviours (e.g. increased physical activity due to increased availability of leisure time following employment loss). These types of behaviours are anticipated to lead to positive overall physical health outcomes. Conversely, these very same pathways have

also been hypothesized to lead to the adoption of other risky behaviours to cope with economic stress (e.g. increased binge drinking) and lead to a reduction in certain health behaviours due to rising costs (e.g. healthy eating).

The evidence obtained from this literature review supports the validity of these presumed pathways. For example, studies that did not differentiate between the pathways but assessed exposure to the crisis in general found consistent results in terms of a worsening of poor mental health, which remained true despite using different measures of mental health (clinical versus self-perceived). This is expected given that all pathways were expected to have negative consequences for mental health. Similarly, healthcare utilization studies also showed consistent findings suggesting that people were more likely to forego healthcare due to financial reasons during the GFC. On the other hand, the impact of the GFC on physical health outcomes and health-related behaviours was more equivocal. Where some studies found associations between an increased likelihood of reporting poor self-perceived health, others did not find associations that were statistically significant. There was considerable variability observed with regards to studies that measured physical health using actual physical health outcomes such as cardiovascular diseases, myocardial infarction, respiratory problems, emergency hospital visits. This inconsistency in findings is likely the result of the way in which the proposed pathways interact having both positive and negative impacts on the population impacted by the crisis. However, this inconsistency could also be the result of an insufficient time period covered/time-lag effect, especially with regards to physical outcomes, many of which may only appear on the long-term. Studies examining health-related behaviours were not consistent with regards to the recession's impact on behaviours such as physical activity and smoking; however there were only a few studies that examined this association. On the other hand, there was strong and consistent evidence of an

association between the GFC and problematic drinking. Although the studies used various measures to describe problematic drinking making a comparison difficult, there was an overall consistency in the findings despite the use of different study designs and different studies that suggested an increase in problematic drinking after exposure to the GFC.

As mentioned, many of the studies did not account for the impact of each pathway individually. Therefore, it is not clear which of the four pathways had the strongest impact on health outcomes. However, for some studies that accounted for the pathways using proxy variables to explain their findings it appears that while unemployment, housing instability, and income did individually account for the findings partially, they did not explain the results entirely. Also, when studies used proxy measures to assess exposure to the crisis, strong associations were found when using unemployment, job insecurity, housing instability, and financial hardship/strain, further suggesting that all these pathways play an important role in the health-related impact of the GFC.

Methodological strengths and weaknesses

Based on findings from this literature review, there are two ways by which the health impacts of the recession were analyzed: either at the ecological level or at the individual level. Within these two types of designs various study designs have been used. Among the individual-level studies, three study designs were commonly used. The most common strategy was to use pooled repeated cross-sectional survey data including years from both pre-crisis and crisis period and then assign respondents an exposure variable based on when the respondent completed the survey. From this, respondents exposed to the crisis were compared to those not exposed to the crisis. Most countries have nationally representative health surveys that are administered periodically, thus this type of study design is feasible

and sufficient to cover periods of time both before and after the GFC; also, the population studied is representative and the number of subjects included is very high allowing for the calculation of precise measures of risk. Finally because the survey data being used captured a variety of data on respondents it is possible to control for important confounders or test potential effect modifiers such as: age, gender, marital-status, education, and income. These studies are not without limitations, however. Repeated cross-sectional data are not as methodologically strong as longitudinal data because the same persons are not being analyzed over time, thus even despite controlling for potential confounders, it is possible that the associations observed are the result of unmeasured differences between the persons being analyzed over time.

Another major limitation is that many of these studies do not account or consider underlying trends in data; this is a major concern because if underlying trends exist it will result in a false association between exposure to the GFC and the health outcome. An example of an approach used by one study to overcome these limitations is to compare repeated cross-sectional data from two different regions (Greece and Poland), where prior to the crisis underlying trends in health outcomes were the same; however, post-crisis Greece was heavily affected by the GFC unlike Poland. The researchers made use of this comparator region in their analysis by using both a time variable (before versus after the crisis) and a region variable (Greece versus Poland) to better characterize the true effect of the GFC.

A second study design used was longitudinal data analysis. This type of design has an obvious advantage over cross-sectional data because the same participants are being analyzed both before and during/after the GFC, thus true comparisons can be made by establishing a clear temporal relationship. Furthermore, the issue of underlying trends in data is also less of a concern. Exposure to the GFC was measured in two different ways, some

studies assessed exposure by introducing a new variable in the post-crisis wave asking respondents whether they felt impacted by the GFC[K], or alternatively, other studies assumed that all respondents in the second wave were impacted by the crisis (i.e. a similar strategy to the repeated cross-sectional analysis discussed above). The use of longitudinal data was less common, which is likely due to the fact that these studies are less feasible to conduct. Furthermore, these longitudinal prospective type designs are often limited to smaller sample sizes and to more restricted populations, which reduce the external validity of the findings.

Finally, a third commonly used study design was a cross-sectional survey administered at one point of time during the GFC period. In these types of study designs exposure was measured by asking respondents whether they felt impacted by the current recession or a proxy measure was used (common proxy measures included: employment status, employment/housing security, financial strain). This type of study design provides evidence that, at best, supports the association between the GFC and health outcomes demonstrated in other studies. The major strength lies in the ability to show the association between various pathways (using proxy measures) and the health outcome. This approach is limited in that it does not provide a clear picture of how the recession led to a change in health or how the association between a proxy measure (such as unemployment) and the health outcome changed over time because there is no pre-crisis data with which to make a comparison.

As mentioned the second broad category of studies that were identified in this literature review were ecological-level analyses. These types of studies were particularly common when the outcomes under investigation were suicide mortality or health-related

[K] When respondents were asked if they felt impacted by the crisis they were either asked directly or by using a proxy measure. Common proxy measures included: a change in employment status, housing instability, or financial hardship/strain.

behaviours. These studies analyzed trends in the health outcomes using population-level data (i.e. mortality rates, incidence/prevalence rates) over time and in some cases used data from multiple countries to make cross-country comparisons. These studies were useful for determining which countries were more/less affected by the GFC period, and allowed researchers to explain the pathways by which countries would be affected, using indicators such as unemployment to show the correlation with the health outcome over time. A common strategy used in the suicide mortality studies was to use segmented regression to compare the trend in mortality during the pre-crisis period (to establish the underlying trend) with the trend during the crisis period, and estimate the number of excess suicides deaths that were attributable to the recession period. This type of analysis was particularly strong and used in several countries allowing for comparisons to be made between several countries around the world. Both ecological- and individual-level convey important information on the impact of the GFC with regards to various health outcomes.

Conclusion

Overall, the evidence suggests that GFC was likely associated with self-perceived poor mental health, increased symptoms of depression/anxiety, increased suicide/suicide ideation, increased problematic alcohol drinking, and a decrease in healthcare utilization/accessibility due to changes in public policy leading to reduced social spending, changes in employment status, increasing housing instability, and reduced income adequacy. The evidence also suggests possible associations between the GFC and poor self-perceived health. The association between the GFC and other health-related behaviours such as smoking, healthy eating, and physical activity remain less clear.

Findings from this literature review also suggest that the association between the GFC and health outcomes continues to remain the focus of a lively academic debate. Even in 2015, several studies continue to be published with the objective of documenting the health-related consequences/benefits observed following the crisis period. The association between the GFC and health is complex and involves an interaction between various pathways; the severity of the impact greatly differs from one region to the next due to the different ways in which these pathways interact, thus making it difficult to compare and consolidate the research. Furthermore the different study designs used, the different ways of ascertaining exposure to the crisis (time variable versus proxy measures), and the different ways of measuring a specific health outcome (clinical definition versus self-reported), all contribute to the complexity in establishing consistent findings.

Finally, with the concentration of studies conducted in the European Union and the United States, one gap in knowledge became particularly evident: there is little known regarding the impact of the GFC on health in Canada. Although a few studies have taken place in, or referenced, Canada, much remains unknown. All three of the Canadian studies identified in this literature review analyzed small and specific sub-groups of the population (i.e. laid-off autoworkers in Ontario, employed adults in Alberta, a sample of two rural communities in Ontario), and the time period covered by each study was quite short. Based on the findings from the previous chapter, Canada did suffer economic consequences following the GFC, and thus supports the need to fill this gap in knowledge.

CHAPTER FOUR: EMPIRICAL ANALYSIS OBJECTIVES AND METHODOLOGY

The second chapter of this thesis examined the background to, and the repercussions of, the 2008 GFC on the Canadian economy, finding that, despite a widely held misconception that Canada came out of the crisis largely unaffected, many economic indicators worsened. Also, three (limited) studies point to possible consequences of the GFC (or the ensuing policy response) to the health of Canadians. Six years post-GFC, many of these economic indicators have still not returned to pre-crisis (pre-recession) levels. Similar to other high-income countries, the Canadian government initially responded to the crisis with a stimulus budget for years 2009/2010 and 2010/2011. The introduction of stimulus showed a correlation with improvements in the unemployment rate, which increased from October 2008 to June 2009, but subsequently began to fall again shortly after the introduction of the stimulus budget. A similar correlation was observed with other economic indicators including GDP and the employment rate. Instead of continuing in this direction, the government delivered an austerity budget for 2011/2012. This budget was closely correlated with a slowing in the improvement of many economic indicators, which remain stagnant below pre-recession levels.

The third chapter examined the health-related impacts associated with the 2008 GFC across all OECD countries. Briefly, this literature review identified 87 empirical studies that quantified the association between different health-related outcomes and the financial crisis. Based on this literature review, it was observed that the majority of all health-related impacts investigated fell into one of the following four categories: (1) mental health outcomes –

including suicide, (2) physical health outcomes, (3) risky health behaviours, and (4) changes in healthcare utilization/access. The literature identified from the scoping review primarily assessed the impact in European countries and the United States, with very little discussion regarding Canada. Thus, despite a clear impact on the Canadian economy, there is very little known about the subsequent health impacts of the crisis on the health of Canadians. The objective of this thesis is to fill this gap in knowledge.

4.1 Hypothesis

Based on these two exploratory analyses (Chapter 2 and Chapter 3), we propose that a combination of societal-level pathways (i.e. worsening GDP and changes in public policy from an initial stimulus response to an austerity response), and individual-level pathways (i.e. labour market transformations, income adequacy and the housing market) have created an environment in Canada that has enabled the GFC to have a negative impact on various dimensions of health among Canadians. We hypothesize that the working age population in Canada (15 to 64 years)[L] would have been particularly impacted by the GFC. We also hypothesize that the post-crisis phase can be split up into three individual periods: the initial crisis period, the stimulus period, and the austerity period. We predict that the health, particularly the mental health, of Canadians would be worse in all these period as compared to the pre-crisis period, and that the odds of poor mental health would be greatest in the initial crisis and austerity periods, while the stimulus period would be associated with adverse health, but to a lesser extent. This prediction is based on the findings from Chapter 3,

[L] Although there are many persons aged >64years of age that continue to work, this age cut-off was chosen for consistency with the majority of other studies presented in the scoping study, and for consistency with Statistics Canada's definition of the "working age" population. Furthermore, the nature of employment amongst those older than 64 years differs from those persons aged 15 to 64 years given that older employees are either likely in more well-established positions and/or are nearing retirement.

which show a close connection with a government's policy response and the severity of impact on health outcomes. Our proposed conceptual model described here is shown in Figure 10.

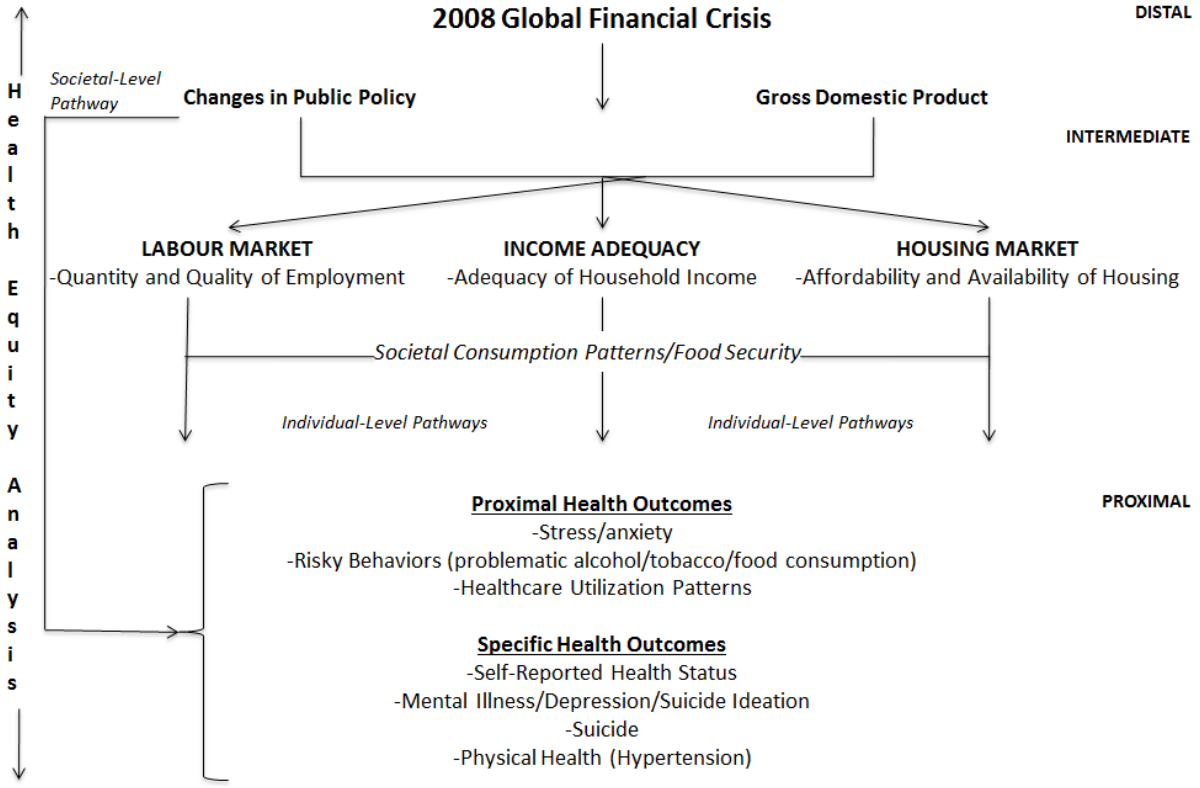

Figure 9 Conceptual Model: Societal and individual-level pathways by which the Global Financial Crisis is suspected to have impacted the health of the working age population in Canada.

4.2 Study Objectives

In order to assess the validity of our hypotheses, we undertook an empirical analysis of the 2008 GFC impact on the health of Canadians using a large nationally representative Canadian data set and several measures of mental health, physical health, and risky healthy

behaviours[M]. Specifically, the primary objective of this study sought to answer the following question:

1. Does exposure to the 2008 GFC result in a significantly increased risk of poor self-reported mental health in working age adults aged 15 to 64 years old?

Secondary objectives of this study sought to answer the following additional questions:

2. Have trends of several health outcomes/behaviours at the Canadian population-level changed significantly over time (2007 to 2013) coinciding with the occurrence of the 2008 GFC? Health outcomes to be investigated include: self-perceived mental health, self-perceived overall health, anxiety disorders, mood disorders, and health-related behaviours that contribute adversely to health (i.e. heavy alcohol drinking, decreased consumption of fruits/vegetables).
3. Are the odds of reporting anxiety or mood disorders, or poor physical health greater among those exposed to the GFC compared to those who were not exposed?
4. Are the odds of engaging in risky health-related behaviours significantly greater among those exposed to the GFC compared to those who were not exposed?
5. Are particular subgroups of the population more adversely impacted by the GFC than others? Subgroups of interest include: gender, low-income bracket, and new individuals entering the labour market (aged 25-34 years).
6. Do the individual-level pathways described in our conceptual model accurately describe the ways in which the health of individual Canadians is compromised, when exposed to a period of economic crisis (i.e. does accounting for unemployment,

[M] Healthcare utilization was dropped from the analysis because the data source (CCHS) did not have extensive utilization data that remained consistent over the time period studied (i.e. from 2007 to 2013).

precarious employment, income adequacy, and housing availability in the statistical model reduce the statistical significance of exposure to the GFC)?

4.2 Methodology

The present study involved the analysis of secondary data obtained from seven annual cycles of the Canadian Community Health Survey (CCHS) from 2007 to 2013. The survey is administered by Statistics Canada. A separate application was submitted to the Canadian Research Data Centre Network (RDC) to obtain access to the confidential microdata annual component files. Statistics Canada granted approval for the proposed project and access to the data were made available at the Carleton, Ottawa, Outaouais RDC (COOL-RDC) located at the University of Ottawa. All analysis had to be carried out inside the COOL-RDC and results could only be taken from the COOL-RDC after they were submitted to a RDC analyst for vetting; this process was in place to ensure that the confidentiality of the data were not compromised and that Statistics Canada release guidelines were followed.

Data Source

Data were obtained from the CCHS, which is a large-scale nationally representative cross sectional survey that asks a series of questions to respondents regarding their overall health status, important health determinants and health care utilization. The themes covered in the CCHS fall under four broad categories: (1) disease and health conditions, (2) health, (3) lifestyle and social conditions, and finally (4) prevention and detection of disease.[134] The CCHS is made up of core content, theme content, optional content and rapid response content. The core content refers to a series of questions that are asked to the entire sample and remain generally consistent year to year. Theme, optional and rapid response content

allows for the collection of data on more specific/timely topics that can vary from year to year, and, in the case of optional and rapid response content, do not include the entire sample population.[135]

When the CCHS was originally designed, data were to be collected every two years with a target sample size of 130,000 respondents over a 12-month period. In 2007, however, the CCHS was re-designed such that data collection now takes place on an on-going basis and the results are disseminated yearly. Each collection period is made up of a two-month period, of approximately 11,000 respondents, such that in one-year there are six two-month collection periods. Each two-month collection period is made up of a sample that is representative of the Canadian population living in the ten provinces at the health-region level. However, for the Canadian population living in the territories, the sample collected is only representative after 12 months of data have been collected (i.e. after 6 collection periods).[135]

The CCHS uses a complex multi-stage survey design wherein respondents are sampled using an area frame (49% of the sample), a telephone frame (50% of the sample) and a Random Digit Dialing (RDD) sampling frame (1% of the sample). The target sample size is distributed amongst the provinces and health regions within these provinces relative to the population size of each region such that a sample representative of the national population is collected. The sample allocation strategy differs for the three territories, which is determined based on the available budget.

The target population of the CCHS is persons aged 12 years and older who reside in the ten provinces and three territories of Canada. The following persons are not represented in the survey: full-time members of the Canadian Forces, the institutionalized population, and persons living in the Région du Nunavik, the Région des Terres-Cries-de-la-Baie-James,

and all persons living on reserves and other Aboriginal settlements in the ten provinces. The rate of coverage in the ten provinces is approximately 98% and slightly less in the three territories.[134]

Study Population, Exposure, and Covariates

The CCHS annual components (2007 through 2013) were pooled into one large dataset containing 446,820 observations. The data set was then restricted to include only the population residing in one of the ten Canadian provinces (i.e. excluding residents from the territories), and also restricted to include only the working age population (i.e. excluding respondents ≥65 years or <15 years). This left a dataset containing 306,623 observations. The exposure, GFC, was assessed based on the date on which the respondent completed the survey, and a new exposure variable was created with four categories: Pre-Crisis, Crisis, Stimulus, and Austerity. The dates corresponding to each period of the crisis were determined based on the analysis of key economic indicators discussed in Chapter 2. Table 3 below shows the breakdown of how the exposure variable was created. Respondents assigned to the pre-crisis period were used as the baseline population for this study. Since the exposure variable was created based on the date the respondent completed the survey there were no missing observations for this variable.

Table 3 A breakdown of the exposure variable used to assess exposure to the Global Financial Crisis

Survey Completion Date	**Exposure Variable Assignment**	**Sample Size (N=306, 623)**
January 2007 to August 2008	Pre-Crisis Period (control)	78, 186 (23.2%)
September 2008 to June 2009	Crisis Period	36, 703 (11.7%)
July 2009 to February 2011	Stimulus Period	80, 262 (26.3%)
March 2011 to December 2013	Austerity Period	111, 472 (38.8%)

Important covariates were also extracted from the CCHS dataset and included: age, gender, marital status, education, household income distribution, dwelling ownership, and employment status. Details regarding how these variables and the exposure variable were re-coded for analysis are provided in Appendix 3. At this stage, the analytical data set contained no missing observations for age and sex. Furthermore, because methodology was introduced by Statistics Canada to impute the household income distribution level for missing observations[136], there were also no missing observations for the income quintile variable. Respondents who had missing values for the remaining variables including: marital status, highest level of education attained, dwelling ownership, working status last week, and current working status (part-time or full-time) were removed from the dataset (N=12,424 observations); this left a dataset containing 294,199 observations. Since the number of observations removed represents only a very small proportion of the dataset (<5%) it is unlikely that serious bias would be introduced as a result of their exclusion. Table 4 below shows the demographic and socio-economic characteristics of the study population in the total analytic data set and according to the four phases of the GFC.

Table 4
Demographic and socio-economic characteristics of the analytic data set, working age population, Canadian provinces, 2007-2013

	Total		Pre-Crisis Period		Crisis Period		Stimulus Period		Austerity Period	
	N	%	N	%	N	%	N	%	N	%
Total Sample	294,199	100	75,307	23.28	35,484	11.76	77,186	26.35	106,222	38.61
Sex										
Males	135,811	49.97	35,050	49.94	16,454	49.68	35,688	50.07	48,619	50.02
Females	158,388	50.03	40,257	50.06	19,030	50.32	41,498	49.93	57,603	49.98
Age (years)										
15 to 24 years	51,294	19.19	12,415	19.18	6,077	19.27	13,765	19.01	19,037	19.30
25 to 34 years	52,901	19.69	13,923	19.75	6,525	19.54	13,994	19.25	18,459	19.99
35 to 44 years	55,296	20.57	15,409	21.75	6,880	20.94	14,336	20.51	18,671	19.79
45 to 54 years	59,889	22.20	16,258	22.46	7,417	22.62	15,631	22.65	20,583	21.61
55 to 64 years	74,819	18.35	17,302	16.87	8,585	17.63	19,460	18.58	29,472	19.31
Marital Status										
Married/Common-Law	160,728	59.80	42,134	60.26	19,609	60.35	42,009	60.51	56,976	58.88
Widowed/Divorced/Separated	37,524	8.81	9,778	8.77	4,476	8.60	9,859	8.90	13,411	8.84
Single/Never-Married	95,947	31.39	23,395	30.97	11,399	31.05	25,318	30.59	35,835	32.28
Education										
Less than secondary school	49,845	14.53	13,553	15.79	6,282	15.32	12,894	14.17	17,116	13.78
Secondary school graduate	53,707	17.46	12,859	16.64	5,940	16.23	13,606	16.75	21,302	16.46
Some post-secondary education	21,834	8.16	6,327	9.38	2,084	9.45	6,332	8.51	6,091	8.16
Post-secondary diploma/degree	168,813	59.86	42,568	58.19	20,178	59.00	44,354	60.58	61,713	59.86
Income Distribution										
Highest Quintile (Top 20%)	73,565	22.92	18,483	22.85	8,767	23.14	19,249	22.87	27,066	22.91
Upper Middle Quintile	64,696	21.58	16,536	21.76	7,781	21.45	16,880	21.42	23,499	21.61
Middle Quintile	59,00	20.36	14,972	20.65	6,901	19.72	15,428	20.65	21,798	20.17
Lower Middle Quintile	49,423	17.95	12,944	17.81	6,095	18.11	13,112	18.09	17,272	17.90
Lowest Quintile (Bottom 20%)	47,416	17.20	12,372	16.93	5,940	17.58	12,517	16.96	16,587	17.40
Employment Status										
Employed, Full-Time	17,827	62.43	45,548	63.98	20,796	62.27	44,372	61.51	61,111	62.16
Employed, Part-Time–Precarious	37,125	12.21	9,115	12.11	4,423	12.32	9,968	12.30	13,619	12.12
Unemployed	75,267	22.92	18,107	21.43	9,133	23.15	20,253	23.68	27,774	23.24
Permanently unable to work	9,980	2.43	2,537	2.47	1132	2.27	2,593	2.41	3,718	2.48
Dwelling Ownership										
Owner	224,974	73.26	57,033	74.06	27,106	74.09	59,116	74.22	81,719	71.86
Renter	69,225	26.74	18,274	25.94	8,378	25.91	18,070	25.78	24,503	28.14

*The N columns reflect the number of persons in the study sample; however, they do not correspond precisely with the percentage estimates shown. This is because the appropriate weights were used to generate prevalence estimates that account for the complex survey design of the CCHS to ensure that the study sample is representative of the entire population.

Measures of Health

Several measures of health were carefully selected for this analysis. Table 5 provides a list of all the health outcomes selected for this research study.

Table 5
Selected measures of health that were analyzed as part of the secondary data analysis

Measures of Health	Variable
Primary outcome measure:	Self-Reported Mental Health
Secondary outcome measures:	
Measures of mental health	Mood Disorders
	Anxiety Disorders
Measures of physical health	Perceived health
Measures of risky behaviours	Heavy alcohol consumption
	Health eating (Fruit/Vegetable Consumption)

The primary outcome variable was self-reported mental health. Respondents were asked to rate their mental health on a five-point scale: 1 (Excellent), 2 (Very Good), 3 (Good), 4 (Fair), or 5 (Poor). In our total dataset of 294,199 respondents, 1.3% (n=3,866) had a missing value for this variable (which included respondents who refused to answer, did not state the answer, or claimed they did not know). These respondents were not included in subsequent analyses involving the self-reported mental health variable. The self-reported mental health variable was re-coded into a dichotomous variable: respondents reporting Excellent, Very Good, or Good mental health were assigned a value of "0" representing good mental health, and those reporting Fair or Poor were assigned a value of "1" representing poor mental health. Secondary health measures were re-coded in a similar way and included: fair/poor self-reported health, self-reported presence/absence of a health professional diagnosis of mood disorder, self-reported presence/absence of health professional diagnosis of anxiety disorder, heavy alcohol drinking (i.e. report of consuming 5 or more drinks, at least once every month versus lower use), and healthy eating (i.e. self-report of 5 or more servings of fruits/vegetables per day versus less frequent consumption). Note that all these variables are measured by asking respondents about the present (i.e. the here and now), with the exception of the heavy alcohol drinking, which asks respondents to summarize their

habits over the past 12 months. This has implications on the interpretation of the results, and has been considered accordingly. See Appendix 3 for additional details regarding how these outcome measures were re-coded for analysis.

Since the proposed analysis included several outcome variables, missing observations for the relevant outcome variable was removed in each analysis. Therefore the final number of observations in each data set varied slightly depending on the outcome under investigation. Table 6 below provides the final sample size for each analytical data set used for each outcome that was analyzed.

Table 6
Number of observations included in the final analytic datasets based on outcome under investigation

Outcome	Missing Observations (N)	Final Sample Size (N)
Fair/Poor Mental Health	3,866	290,333
Mood Disorder	315	293,884
Anxiety Disorder	378	293,821
Fair/Poor Self-Perceived Health	230	293,969
Healthy Fruit/Vegetable Consumption*	12,778	281,421
Heavy Alcohol Consumption**	8,777	245,417

*The large number of missing observations for the Healthy Fruit/Vegetable Consumption outcome was analyzed to determine whether patterns existed in missing observations by year and by socio-economic/demographic characteristics. However, no such trends existed. Furthermore, despite a large number of missing observations, relative to the other outcomes, the missing observations still account for less than 5% of the total sample size.
**The large number of missing observations for the Heavy Alcohol Consumption outcome variable can be explained by the fact that data from 2013 was excluded from the analysis because the definition of the variable changed slightly.

Statistical Data Analysis

This study involves a novel use of CCHS data whereby we analyzed data over 2-month intervals from January 2007 to December 2013. In total, there were 42 bi-monthly cross-sections of the Canadian household populations between 2007 and 2013. This time period was sufficient to cover trends before, during, and following the 2008 GFC, and the bimonthly cross-sections available as of 2007 allow for the detection of short-term changes. Since the re-design of the CCHS in 2007, it was also possible to analyze cross-sections at the

bi-monthly level and re-group the data into four distinct groups that were more reflective of the various phases of the GFC. The study comprised a multi-stage analysis of data as follows:

Phase I: Descriptive Analysis. The period prevalence of reporting poor self-perceived mental health was plotted for each individual two-month collection period of CCHS data available from 2007 to 2013; this resulted in 42 distinct data points. Data plots including 95% confidence intervals (95% CI) were visually inspected for patterns. To account for the complex survey design of the CCHS, the appropriate weights were used to generate representative period prevalence estimates. The BOOTVAR version 3.2 macro provided by Statistics Canada was used to obtain 95% CIs. All estimates were presented separately for men and women.

Phase II: Analysis of Trends. Joinpoint regression analysis software (Joinpoint Version 4.2.0) was used to identify changes in trends in bimonthly period prevalence estimates across the study period between 2007 and 2013. The methodology for this statistical technique has been discussed in detail previously[137]; however, to briefly summarize the software plots the data points and fits a single linear trend line to the data, which represents zero joinpoints (the presence of a joinpoint indicates a change in the linear trend). The software then tests whether the data would be better represented using more joinpoints (up to a maximum of five). The null hypothesis of the model predicts that there will be zero joinpoints (i.e. no significant change in trend over time). The software produces a separate graph for each joinpoint model and identifies which model best represents the data using a Monte Carlo Permutation method and a default level of significance of α=0.5; note that a Bonferroni

adjustment is used to account for the fact that multiple tests are performed. Using a log-transformation, the final model obtained provides the slope of the linear segments identified which, in this case, represents the bimonthly percent change in period prevalence of the health outcome under investigation.

Phase III: Measures of Association. Independent from the findings produced from the above analysis, the purpose of this stage was to test the association between the exposure to the GFC and poor health outcomes using a logistic regression model. A logistic regression model was the most appropriate statistical method to use for this study because the dependent outcome variable (i.e. fair/poor self-reported mental health) is dichotomous. The model predicts the probability of the dependent variable response based on one more exposure variable. In this case the exposure variable of interest is the different phases of the global financial crisis. Dummy variable for each phase of the crisis were used in the model to represent exposure to the crisis period, the stimulus period, and the austerity period compared to the pre-crisis period (baseline). The logistic regression models were also adjusted to account for potential confounders. Potential confounders for which all models were adjusted for include: age, sex, marital status, and education.

Using logistic regression analysis, the validity of the conceptual model was also tested; the conceptual model outlines which determinants of health we posit are responsible for changes in health following exposure to the GFC. To test the assumptions of our conceptual model, we conducted a mediation analysis. To do this we included measures of unemployment, precarious employment, and income inadequacy, which represent the intermediate factors along the causal pathway, in our logistic regression model. Because we hypothesized that the GFC would impact on health through its effects on these mediators

(employment, income adequacy, and home ownership), we anticipated that the effect of the crisis variable would be reduced upon addition of these putative mediators.

External Validation Method. The logistic regression analysis proposed above to test for an association between exposure to the GFC and poor health outcomes is limited due to the lack of an unexposed counterfactual population to follow concurrently with those affected by the GFC. This suggests that, from the logistic regression analysis alone, it is not clear whether any of the observed associations are truly a result of exposure to the GFC, or whether they are simply the result of previous underlying long-term trends. Phase I of this analysis includes an assessment of trends of each of the outcomes by looking at the bimonthly prevalence estimates over time; however, because the bimonthly data were only collected beginning in 2007 this analysis was limited. An external validation measure will be used to account for this limitation. Long-term trends in the proportion of poor health outcomes in the Canadian population will be plotted using annual estimates (from 2003 to 2013) retrieved from public available Statistics Canada data[N]. The qualitative inspection of these long term trends will reveal whether underlying trends existed, and will therefore serve as a tool to provide added validity to the findings from this study.

All analyses were conducted using SAS® Software Version 2.4, and all the data were weighted using the weights provided by Statistics Canada. For all logistic regression analysis, the BOOTVAR version 3.2 macro provided by Statistics Canada was used to obtain estimates representative of the national population, including reliable 95% CIs.

[N] Public data were not available for all the outcomes (i.e. mood disorders and anxiety disorders) being investigated, however, where possible, this external validation measure will be conducted when significant associations are produced from the logistic regression analysis.

CHAPTER FIVE: RESULTS

5.1 Self Perceived Mental Health and the Global Financial Crisis

The final analytic data set for the fair/poor self-perceived mental health (SMH) outcome contained 290,333 observations. During the pre-crisis period, the prevalence of fair/poor self-perceived mental health (SMH) was 5.0%, during the crisis period the prevalence rose to 5.3% and stayed constant through the stimulus period at 5.3%, however during the austerity period the prevalence grew to 6.1%; representing a growth of 1.8% relative to the pre-crisis period. Higher prevalence of fair/poor SMH was observed during the austerity period across all demographic and socio-economic subgroups in terms of crude period prevalence estimates. Table 7 provides a breakdown of the prevalence of fair/poor mental health by population subgroups and the four phases of the GFC.

Table 7 Prevalence of fair/poor mental health by population subgroups during phases of the GFC

	Total		**Pre-Crisis Period**		**Crisis Period**		**Stimulus Period**		**Austerity Period**	
	N	%	N	%	N	%	N	%	N	%
Total Sample	17,963	5.5	4,164	5.0	2,083	5.3	4,721	5.3	6,995	6.1
Sex										
Males	7,881	5.0	1,816	4.7	933	4.8	2,090	4.9	3,042	5.4
Females	10,082	6.0	2,348	5.3	1,150	5.8	2,631	5.7	3,953	6.8
Age (years)										
15 to 24 years	2,365	4.6	528	4.4	269	3.8	577	4.0	991	5.3
25 to 34 years	2,721	4.9	639	4.2	333	5.1	693	4.6	1,056	5.4
35 to 44 years	3,244	5.5	856	4.9	415	5.7	847	5.7	1,126	5.8
45 to 54 years	4,740	6.6	1,143	5.8	547	6.2	1,326	6.4	1,724	7.3
55 to 64 years	4,893	6.0	998	5.5	519	5.6	1,278	5.6	2,098	6.6
Marital Status										
Married/Common-Law	6,837	4.2	1,594	3.7	837	4.4	1,815	4.1	2,591	4.6
Widowed/Divorced/Separated	4,259	10.9	1,024	9.9	451	9.2	1,165	11.2	1,619	11.7
Single/Never-Married	6,867	6.6	1,546	6.1	795	6.1	1,741	6.0	2,785	7.3

Education										
Less than secondary school	4,301	8.6	1,032	8.2	534	7.6	1,125	8.1	1,610	9.5
Secondary school graduate	3,160	5.5	650	4.6	306	4.2	820	5.6	1,384	6.4
Some post-secondary education	1,586	6.5	434	5.6	209	6.4	460	6.4	484	7.4
Post-secondary diploma/degree	8,916	4.7	2,048	4.2	1,034	4.9	2,316	4.5	3,518	5.1
Income Distribution										
Highest Quintile (Top 20%)	2,394	3.1	554	2.9	264	2.9	648	3.2	928	3.2
Upper Middle Quintile	2,651	3.8	615	3.4	298	3.7	700	3.7	1,038	4.1
Middle Quintile	2,997	4.6	680	4.0	327	4.5	763	4.1	1,227	5.2
Lower Middle Quintile	3,428	6.1	798	5.8	413	6.1	887	5.8	1,330	6.6
Lowest Quintile (Bottom 20%)	6,493	11.6	1517	10.2	781	10.8	1,723	11.2	2,472	13.0
Employment Status										
Employed, Full-Time	7,079	3.8	1,707	3.4	809	3.8	1,855	3.6	2,708	4.2
Employed, Part-Time–Precarious	2,014	5.5	441	5.1	237	5.2	529	4.7	807	6.3
Unemployed	5,994	7.8	1,327	6.0	702	7.2	1,576	7.4	2,389	8.6
Permanently unable to work	2,876	32.4	689	30.9	335	30.8	761	33.4	1,091	33.0
Dwelling Ownership										
Owner	10,771	4.3	2,441	4.0	1,263	4.3	2,825	4.1	4,242	4.7
Renter	7,192	8.8	1,723	7.8	820	8.3	1,896	8.6	2,753	9.6

*The N columns reflect the number of persons in the study sample; however, they do not correspond precisely with the percentage estimates shown. This is because the appropriate weights were used to generate prevalence estimates that account for the complex survey design of the CCHS to ensure that the study sample is representative of the entire population.

To better understand whether the prevalence of fair/poor SMH changed during the GFC, bimonthly period prevalence estimates were plotted from 2007 to 2013 for males and females separately (see Figure 10 and Figure 11). Visual inspection of these plots does not reveal any distinct or clear change in the short-term trends. Nonetheless, joinpoint regression analysis was used to detect whether any statistically significant changes in the linear trend existed. As expected, the joinpoint regression confirmed that the data were best presented by a single linear trend (i.e. no significant change in trend was identified).

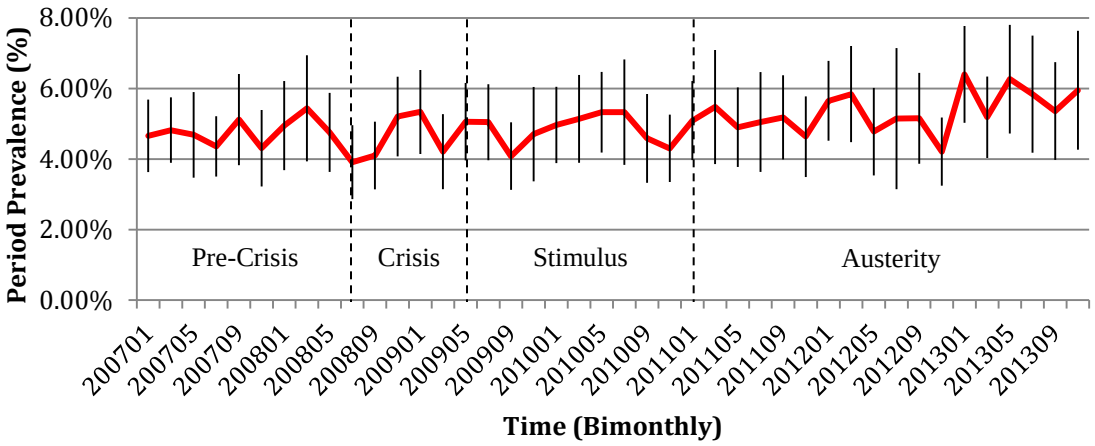

Figure 10 Prevalence of fair/poor SMH amongst males, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

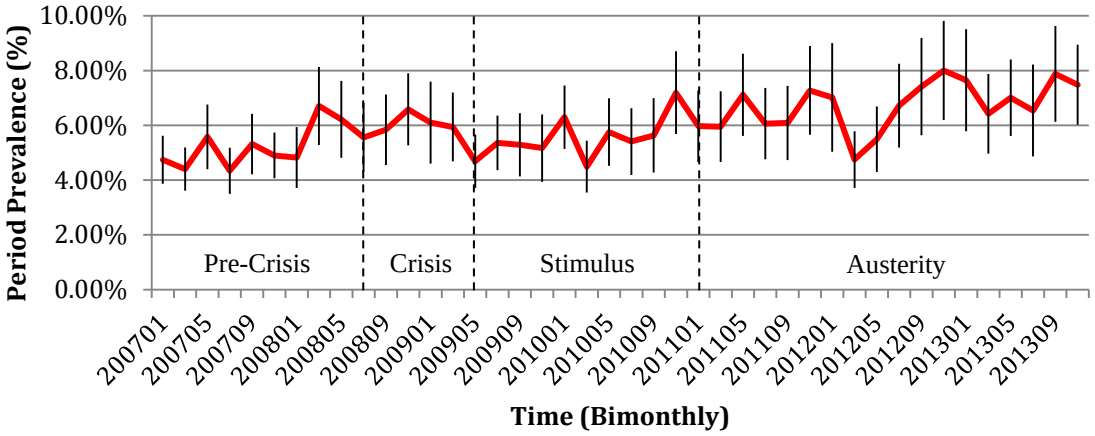

Figure 11 Prevalence of fair/poor SMH amongst females, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. Note: The dashed line represents the beginning of a new phase of the GFC.

Results from the logistic regression analysis are shown in Table 8. The unadjusted odds ratio for the crisis period and stimulus period compared to the pre-crisis period showed increased odds of reporting fair/poor mental health, but did not reach statistical significance. The austerity period, however, was associated with a statistically significant increased risk of

reporting fair/poor mental health. This was true even when the findings were adjusted for key demographic factors (i.e. age, sex, marital status, and education); in fact accounting for the demographic characteristics had very little impact on the association between GFC and mental health. Thus, exposure to the austerity period was associated with a 26% (OR = 1.3, 95% CI: 1.17, 1.34) increase in the odds of reporting fair/poor mental health. Counterintuitively, however, accounting for the mediating variables that were hypothesized in the initial conceptual model (i.e. income adequacy, employment status, and home ownership) did not reduce the effect of the austerity period.

Finally, to determine whether certain sub-groups were more vulnerable to the impacts of the GFC, an interaction term was included in the logistic regression model to see whether a significant interaction existed between (i) austerity and sex, (ii) austerity and age groups, and (iii) austerity and income quintiles; however, none of the interaction tests reached statistical significance, and therefore there is no evidence to suggest that certain population sub-groups were more adversely impacted by the austerity period than others.

Table 8 Logistic Regression Models exploring the association between different phases of the GFC and reporting fair/poor SMH

	Unadjusted OR [95% CI]	**[A] Adjusted OR [95% CI]**	**[B] Mediation Analysis OR [95% CI]**
Exposure to the GFC			
Pre-Crisis Period	1.0	1.0	1.0
Crisis Period	1.16 [0.98, 1.17]	1.08 [0.98, 1.18]	1.07 [0.97, 1.17]
Stimulus Period	1.07 [0.99, 1.16]	1.08 [1.00, 1.18]*	1.06 [0.98, 1.15]
Austerity Period	1.24 [1.15, 1.32]***	1.26 [1.17, 1.34]***	1.23 [1.15, 1.32]***

N = 290, 333
*p<0.05, **p<0.01, ***p<0.001
[A] Adjusted by age, sex, marital status, and education
[B] Testing for mediators: logistic regression model includes potential explanatory variables to test accuracy of conceptual model. Mediators include: Income Adequacy (Quintiles), Employment Status (Employed, Unemployed, Precarious Employment, Permanently Unable to Work), and Home Ownership (Ownership, Renting)

NOTE: All estimates have been weighted and 95% confidence intervals shown in brackets were derived using bootstrap techniques; *p<0.05, **p<0.01, ***p<0.001

To determine whether the significant association observed between exposure to the austerity period and poor mental health was the result of underlying trends, annual prevalence estimates of poor mental health among Canadians from 2003 to 2013 was plotted as shown in Figure 12. From 2003 to 2007 (pre-crisis) the prevalence of reporting fair/poor mental health appears stable, however, afterwards, from 2008 to 2013, there appear to be a change in this trend with increasing prevalence, and significantly more variability relative to the pre-crisis period. This time period coincides closely with the onset of the GFC, suggesting that our observations of increased poor mental health outcomes likely represent an effect of the GFC.

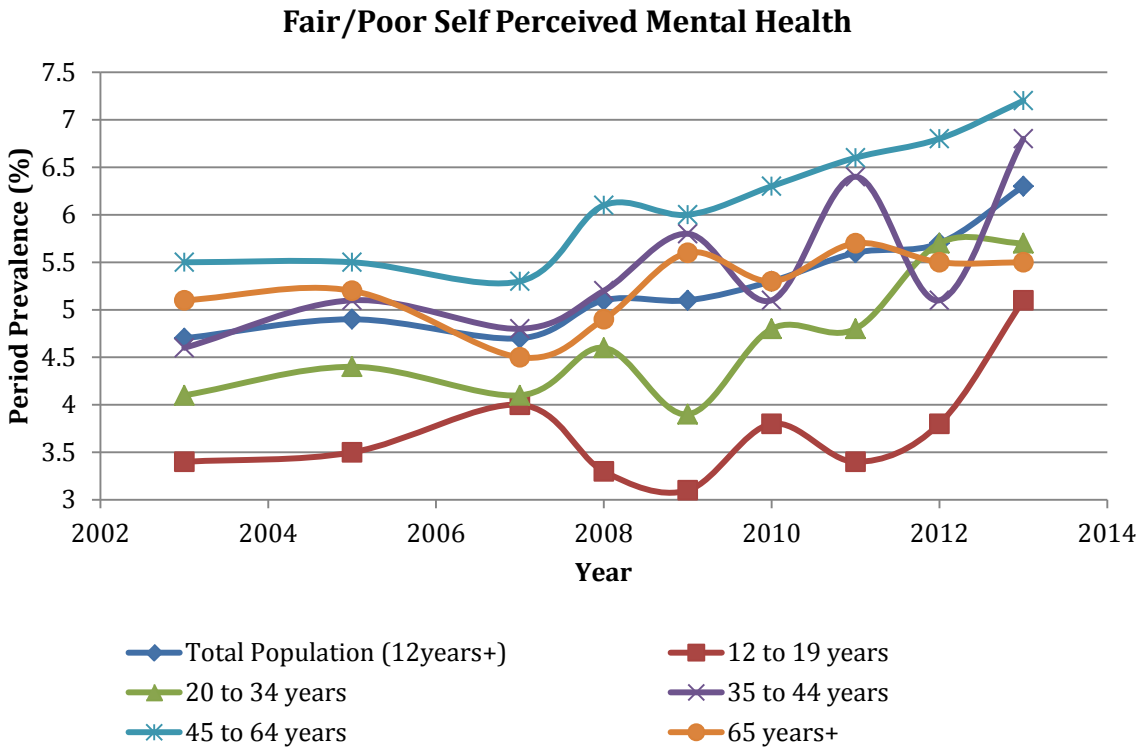

Figure 12 Fair/poor self-perceived mental health over time, 2003-2013. Source: Statistics Canada. CANSIM Table 105-0503 (Accessed 01 March 2015).

5.2 The GFC Impact on Anxiety and Mood Disorders

Anxiety disorders

The final analytic data set for the presence/absence of anxiety disorders outcome contained 293,821 observations.

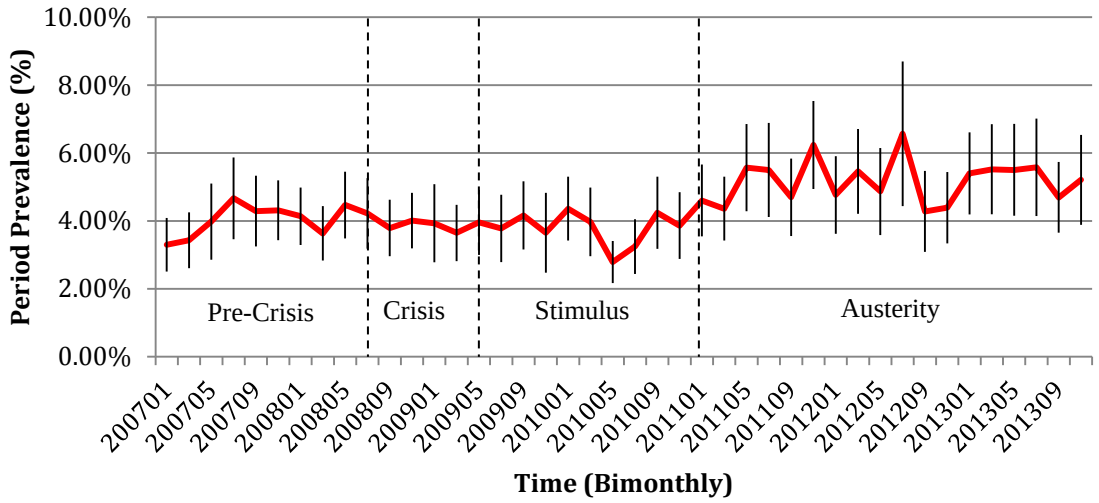

Figure 13 Prevalence of anxiety disorders amongst males, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

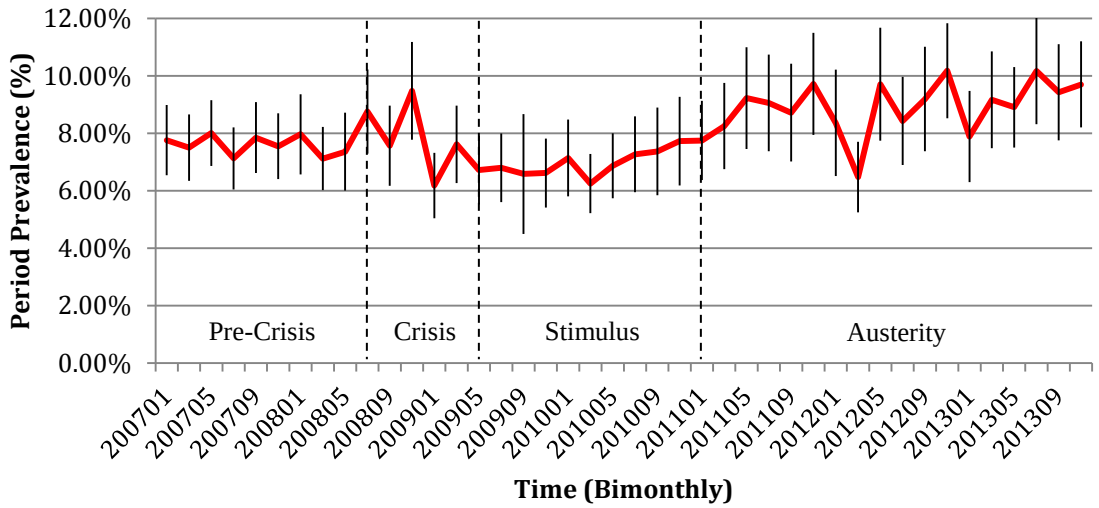

Figure 14 Prevalence of anxiety disorders amongst females, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

Figures 13 and 14, shown above, display the prevalence of anxiety disorders over time in males and females, respectively. Once again, the austerity period shows the most notable increase in the prevalence of anxiety disorders. For both males and females the prevalence of anxiety disorders remains relatively stable until mid-way through the stimulus period, where the increase becomes notable. The joinpoint regression analysis, however, maintained that the data were best represented by a single linear trend line. Similar to what was observed for the poor mental health outcome, exposure to the austerity period was associated with increased odds of reporting an anxiety disorder (adjusted OR = 1.25, 95% CI: 1.17, 1.33). The same interaction tests as previously done for the SMH were conducted for this outcome, however, as for the SMH outcome, no significant results were identified.

Table 9 Logistic Regression Models exploring the association between different phases of the GFC and reporting the presence of an anxiety disorder

	Unadjusted OR [95% CI]	**[A] Adjusted OR [95% CI]**	**[B] Mediation Analysis OR [95% CI]**
Exposure to the GFC			
Pre-Crisis Period	1.00	1.00	1.00
Crisis Period	0.97 [0.89, 1.06]	0.97 [0.89, 1.06]	0.97 [0.89, 1.06]
Stimulus Period	0.94 [0.88, 1.00]	0.95 [0.89, 1.02]	0.94 [0.87, 1.00]
Austerity Period	1.23 [1.16, 1.31]***	1.25 [1.17, 1.33]***	1.23 [1.15, 1.31]***

N = 293, 821
*p<0.05, **p<0.01, ***p<0.001
[A] Adjusted by age, sex, marital status, and education
[B] Testing for mediators: logistic regression model includes potential explanatory variables to test putative causal pathways of conceptual model. Mediators include: Income Adequacy (Quintiles), Employment Status (Employed, Unemployed, Precarious Employment, Permanently unable to Work), and Home Ownership (Ownership, Renting)
NOTE: All estimates have been weighted and 95% confidence intervals shown in brackets were derived using bootstrap techniques; *p<0.05, **p<0.01, ***p<0.001

Mood Disorders

The final analytic data set for the presence/absence of mood disorders outcome contained 293,884 observations. Figure 15 and Figure 16 show the trends in reporting mood disorders over time among males and females, respectively.

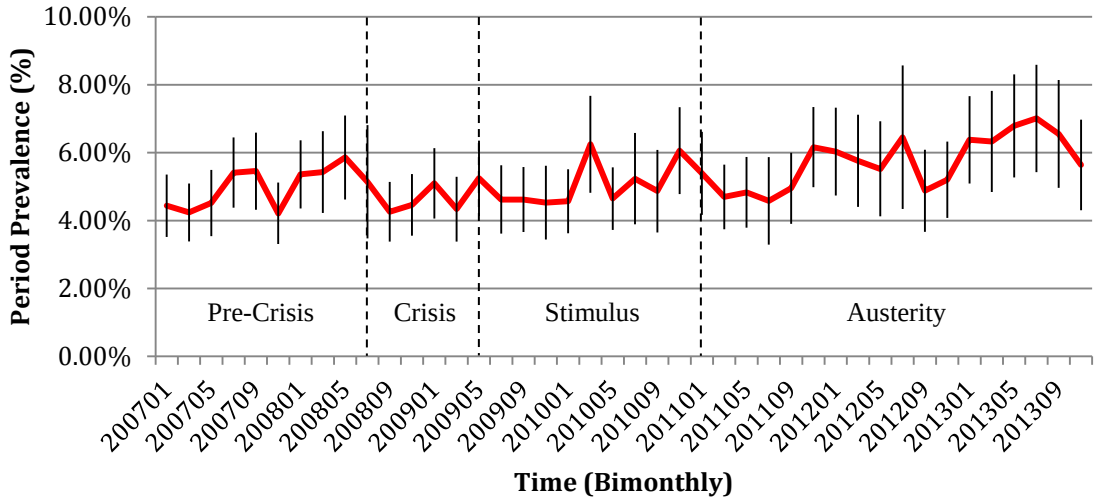

Figure 15 Prevalence of mood disorders amongst males, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

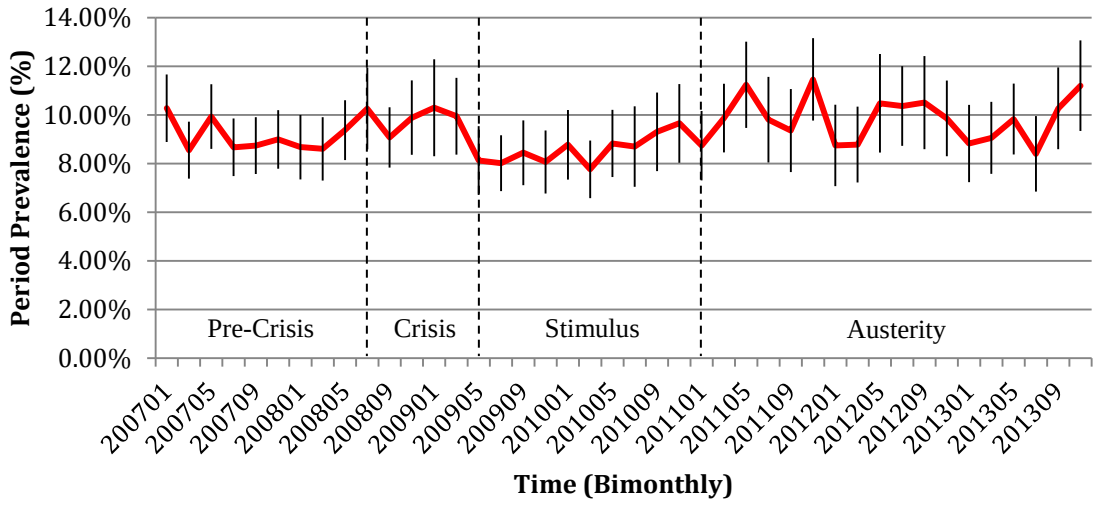

Figure 16 Prevalence of mood disorders amongst females, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

Again, the joinpoint regression analysis did not reveal any significant changes in the linear trend line.

Table 10 Logistic Regression Models exploring the association between different phases of the GFC and reporting mood disorders

	Unadjusted OR [95% CI]	**[A] Adjusted OR [95% CI]**	**[B] Mediation Analysis OR [95% CI]**
Exposure to the GFC			
Pre-Crisis Period	1.00	1.00	1.00
Crisis Period	1.00 [0.93, 1.07]	1.00 [0.93, 1.08]	1.00 [0.93, 1.07]
Stimulus Period	0.97 [0.91, 1.03]	0.98 [0.92, 1.04]	0.96 [0.90, 1.02]
Austerity Period	1.11 [1.05, 1.18]***	1.12 [1.06, 1.19]***	1.10 [1.04, 1.17]**

[A] Adjusted by age, sex, marital status, and education
*p<0.05, **p<0.01, ***p<0.001
[B] Testing for mediators: logistic regression model includes potential explanatory variables to test accuracy of conceptual model. Mediators include: Income Adequacy (Quintiles), Employment Status (Employed, Unemployed, Precarious Employment, Permanently unable to Work), and Home Ownership (Ownership, Renting)
NOTE: All estimates have been weighted and 95% confidence intervals shown in brackets were derived using bootstrap techniques; *p<0.05, **p<0.01, ***p<0.001

As evidenced by Table 10 above, the odds of reporting mood disorders (after adjusting for age, sex, marital status, and education) was 12% higher during the austerity period as compared to the pre-crisis period. These findings are similar to what was observed when investigating poor mental health and anxiety disorders, although the association for mood disorders is weaker. An interaction test was conducted for this outcome as well; however no significant results were identified.

5.3 The GFC Impact on Self-Perceived Physical Health

The final analytic data set for the fair/poor self-perceived health outcome contained 293,969 observations. Figure 17 and Figure 18 display the trends in the prevalence of reporting fair/poor self-perceived health over time for males and females, respectively.

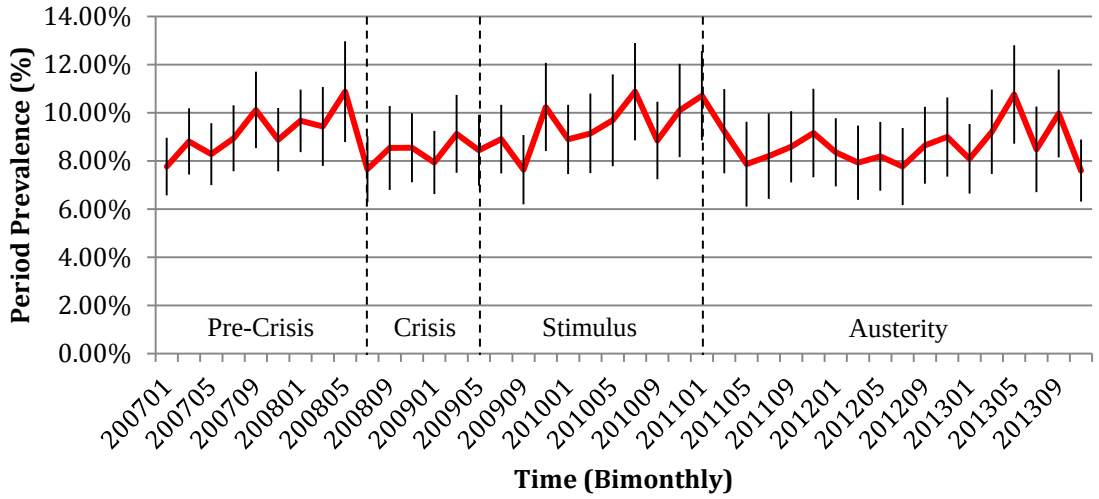

Figure 17 Prevalence of fair/poor self-perceived health amongst males, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

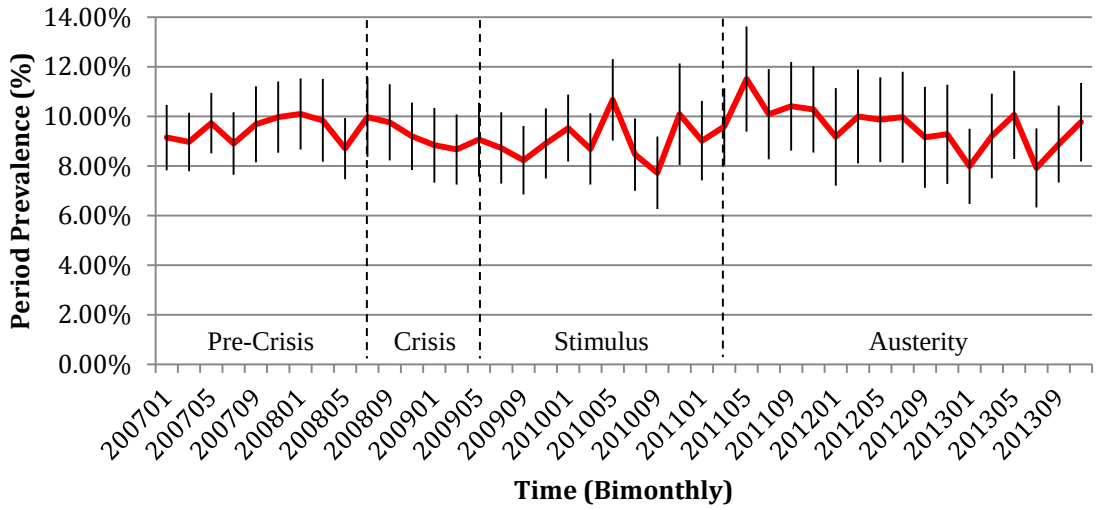

Figure 18 Prevalence of fair/poor self-perceived health amongst females, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

Based on the plots of prevalence over time, there appears to be no change in the trend of reporting fair/poor self-perceived health over time; this was confirmed by the joinpoint regression analysis, which did not reveal any significant changes in the linear trend. Nonetheless, the logistic regression analysis was conducted. As anticipated, no phases of the GFC demonstrated an association with reporting fair/poor self-perceived health.

Table 11 Logistic Regression Models exploring the association between different phases of the GFC and reporting fair/poor self-perceived health

	Unadjusted OR [95% CI]	**[A] Adjusted OR [95% CI]**
Exposure to the GFC		
Pre-Crisis Period	1.00	1.00
Crisis Period	0.94 [0.88, 1.01]	0.94 [0.88, 1.01]
Stimulus Period	1.00 [0.95, 1.06]	1.01 [0.95, 1.06]
Austerity Period	0.98 [0.93, 1.04]	0.99 [0.93, 1.04]

[A] Adjusted by age, sex, marital status, and education
*p<0.05, **p<0.01, ***p<0.001
NOTE: All estimates have been weighted and 95% confidence intervals shown in brackets were derived using bootstrap techniques; *p<0.05, **p<0.01, ***p<0.001

5.4 The GFC Impact on Health-Related Behaviours

Healthy Eating (Fruit/Vegetable Consumption)

The final analytic data set for the healthy eating outcome contained 281,421 observations.

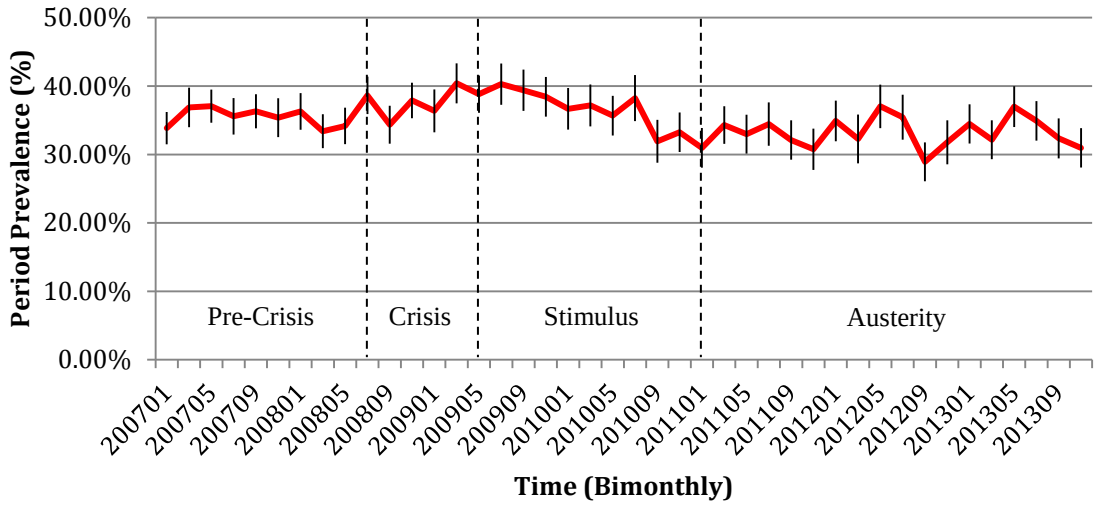

Figure 19 Prevalence of healthy eating amongst males, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

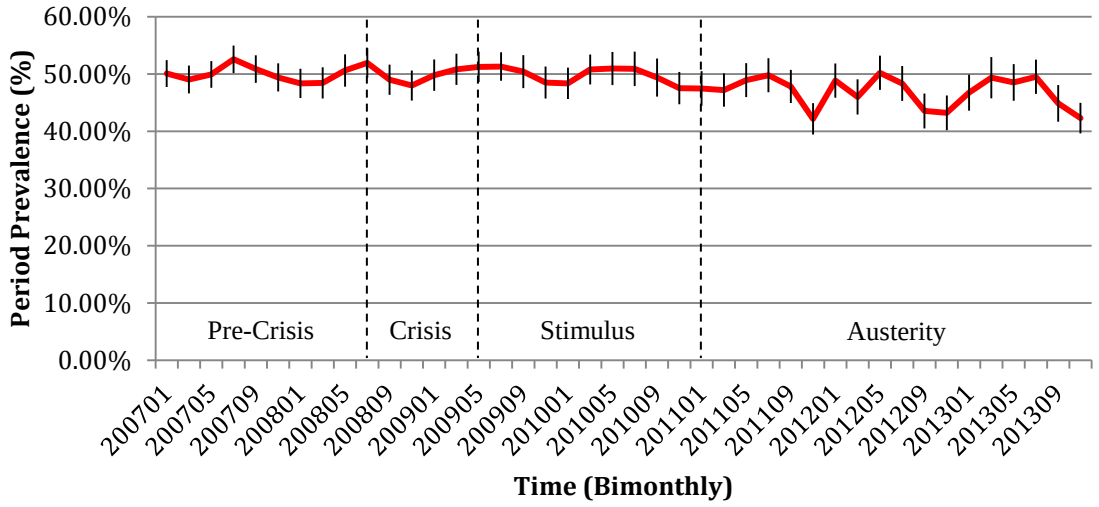

Figure 20 Prevalence of healthy eating amongst females, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

Figure 19 and Figure 20 show the trends in healthy eating over time for males and females, respectively. The trends appear to be quite stable all the way through to the austerity period, at which point the prevalence of healthy eating appears to have declined. Although the joinpoint regression analysis did not detect a significant change in trend, findings from the logistic regression analysis suggest that the austerity period was associated with decreased odds of reporting healthy eating (adjusted OR = 0.88, 95% CI: 0.85, 0.91). The mediation analysis adjusting for potential mediators had no appreciable effect on the observed association.

Table 12 Logistic Regression Models exploring the association between different phases of the GFC and reporting healthy eating

	Unadjusted OR [95% CI]	**[A] Adjusted OR [95% CI]**	**[B] Mediation Analysis OR [95% CI]**
Exposure to the GFC			
Pre-Crisis Period	1.00	1.00	1.00
Crisis Period	1.04 [0.99, 1.08]	1.03 [0.98, 1.08]	1.03 [0.99, 1.08]
Stimulus Period	0.99 [0.95, 1.02]	0.98 [0.94, 1.02]	0.98 [0.94, 1.01]
Austerity Period	0.88 [0.86, 0.92]***	0.88 [0.85, 0.91]***	0.88 [0.85, 0.91]***

[A] Adjusted by age, sex, marital status, and education
*p<0.05, **p<0.01, ***p<0.001
[B] Testing for mediators: logistic regression model includes potential explanatory variables to test accuracy of conceptual model. Mediators include: Income Adequacy (Quintiles), Employment Status (Employed, Unemployed, Precarious Employment, Permanently unable to Work), and Home Ownership (Ownership, Renting)
NOTE: All estimates have been weighted and 95% confidence intervals shown in brackets were derived using bootstrap techniques; *p<0.05, **p<0.01, ***p<0.001

With regards to the long term trends of healthy eating, there appears to be an increasing trend until 2009, after which the prevalence (%) drops rather sharply as shown in Figure 21; again, this coincides closely with the onset of the GFC, which confirms that the decreasing trend did not exist prior to the crisis.

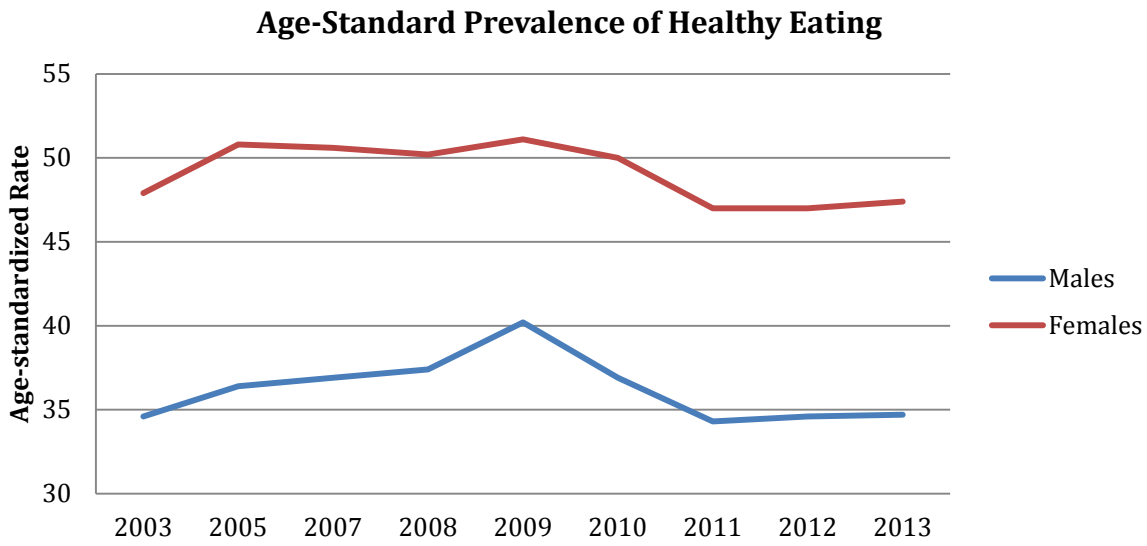

Figure 21 Age-standardized prevalence of fruit and vegetable consumption, 2003-2013. Source: Statistics Canada. CANSIM Table 105-0503 (Accessed 01 March 2015).

Heavy Drinking

The final analytic data set for the heavy drinking outcome contained 245,417 observations. Note that the definition of heavy drinking changed in the CCHS survey year 2013, therefore the analysis of data pertaining to this outcome has been restricted to year 2012.

In observing the trends over time of the prevalence of reporting heavy drinking, there appears to be an increase in prevalence coinciding with the stimulus period. Note that this variable was operationalized by asking respondents about their drinking habits over the past 12 months; therefore, the increase observed in the stimulus period corresponds to the period immediately following the onset of the GFC. During the austerity period, the prevalence appears to return to pre-crisis levels amongst both sexes. Nonetheless, there appears to be a clear increase occurring shortly after the crisis first began. For-example, in May 2007 the prevalence of reporting heavy drinking was 27.6%

among males, in May 2008 the prevalence decreased to 26.5%, in May 2009 (i.e. shortly after the initial crisis), prevalence increased to 29.7%, in May 2010, the prevalence increased again to 36.5%, however by May 2011 the prevalence began to decrease to 29.8%, and by May 2012 the prevalence had dropped to 25.7%.

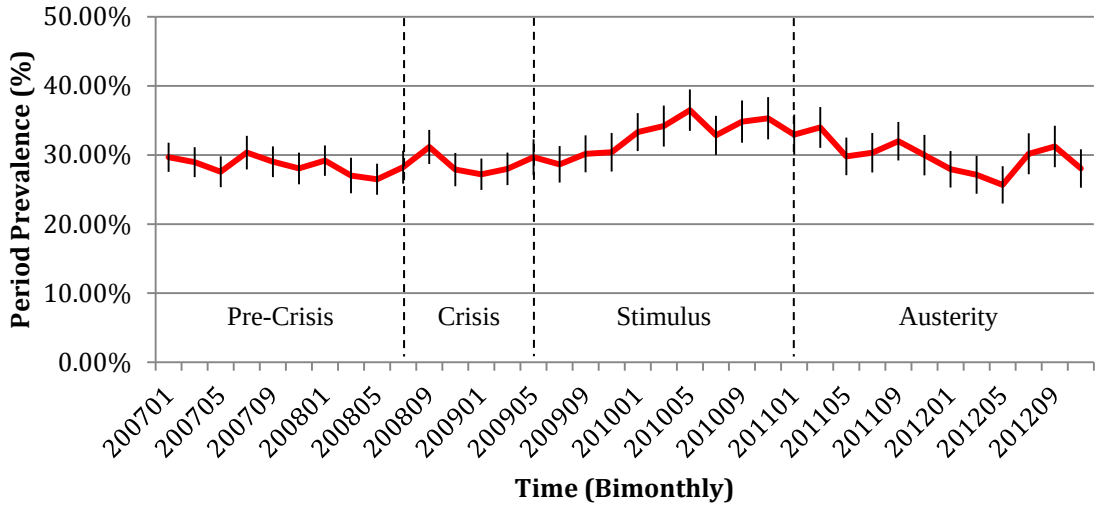

Figure 22 Prevalence of heavy drinking amongst males, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

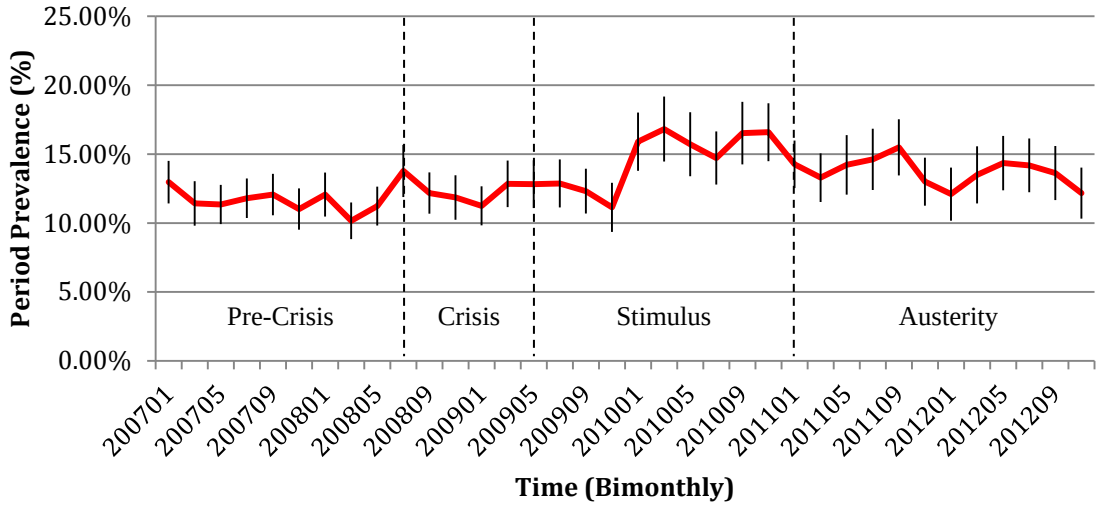

Figure 23 Prevalence of heavy drinking amongst females, aged 15 to 64 years and residing in one of the 10 Canadian provinces, from 2007 to 2013. *Note*: The dashed line represents the beginning of a new phase of the GFC.

The logistic regression analysis, shown in Table 13 below, revealed that both the stimulus period and the austerity period demonstrated a significantly increased odds of heavy drinking as compared to the pre-crisis period (OR = 1.26, 95% CI: 1.20, 1.31 and OR = 1.09, 95% CI: 1.04, 1.14). Once again, however, accounting for the hypothesized mediators had no effect on the observed association.

Table 13 Logistic Regression Models exploring the association between different phases of the GFC and reporting heavy drinking at least once a month in the past 12 months

	Unadjusted OR [95% CI]	**[A] Adjusted OR [95% CI]**	**[B] Mediation Analysis OR [95% CI]**
Exposure to the GFC			
Pre-Crisis Period	1.00	1.00	1.00
Crisis Period	1.02 [0.97, 1.07]	1.03 [0.97, 1.08]	1.04 [0.98, 1.10]
Stimulus Period	1.24 [1.19, 1.29]***	1.26 [1.20, 1.31]***	1.27 [1.22, 1.33]***
Austerity Period	1.09 [1.04, 1.13]***	1.09 [1.04, 1.14]***	1.10 [1.05, 1.15]***

[A] Adjusted by age, sex, marital status, and education
*p<0.05, **p<0.01, ***p<0.001
[B] Testing for mediators: logistic regression model includes potential explanatory variables to test accuracy of conceptual model. Mediators include: Income Adequacy (Quintiles), Employment Status (Employed, Unemployed, Precarious Employment, Permanently unable to Work), and Home Ownership (Ownership, Renting)
NOTE: All estimates have been weighted and 95% confidence intervals shown in brackets were derived using bootstrap techniques; *p<0.05, **p<0.01, ***p<0.001

Figure 25 shows the age-standardized prevalence (%) of heavy drinking from 2003 to 2013, again the trend line appears quite stable until year 2010, rising slightly with the stimulus period before falling in 2012, coinciding closely with the implementation of austerity measures in Canada.

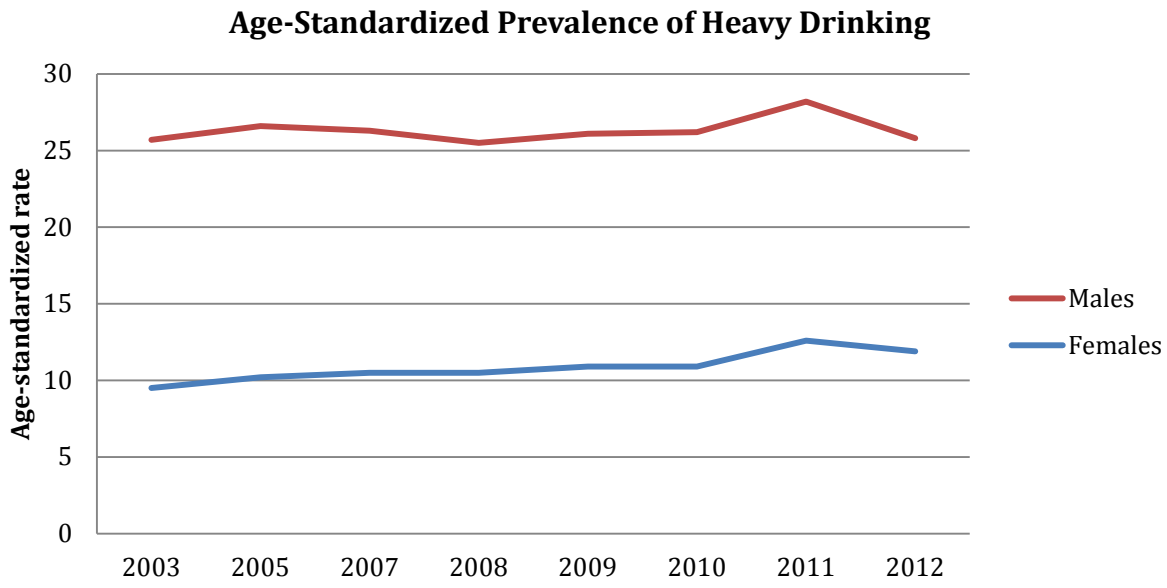

Figure 24 Age-standardized heavy drinking prevalence over time, 2003-2013. Source: Statistics Canada. CANSIM Table 105-0503 (Accessed 01 March 2015).

As mentioned previously when testing for interactions between exposure to the GFC and sex, age, and income adequacy, none of the outcomes investigated previously showed any significant interactions. However, with regards to heavy drinking, statistically significant differences were observed between sex and income quintiles, but not age. Table 14 and Table 15 below discuss these findings. Women had statistically significant increased odds of reporting heavy drinking during the austerity period compared to males, but the interaction was not significant during the stimulus period. Conversely, the lowest two income quintiles had statistically significant increased odds of reporting heavy drinking compared to the highest income respondents during the stimulus period, but this same interaction was no longer significant during the austerity period.

Table 14 Effect modification by sex in association between exposure to stimulus/austerity and heavy drinking

	OR for heavy drinking [95% CI]
Exposure to the GFC	
Males exposed to Stimulus	1.00
Females exposed to Stimulus	1.01 [0.94, 1.09]
Males exposed to Austerity	1.00
Females exposed to Austerity	1.14 [1.05, 1.24]***

*p<0.05, **p<0.01, ***p<0.001

Table 15 Effect modification by income quintiles in association between exposure to stimulus/austerity and heavy drinking

	OR [95% CI]
Exposure to the GFC	
High income quintile exposed to Stimulus	1.00
Upper middle income quintile	1.01 [0.91, 1.12]
Middle income quintile	1.06 [0.95, 1.18]
Lower middle income quintile	1.28 [1.14, 1.45]*
Low income quintile	1.17 [1.03, 1.33]***
High income quintile exposed to Austerity	1.00
Upper middle income quintile	0.99 [0.89, 1.12]
Middle income quintile	1.10 [0.98, 1.23]
Lower middle income quintile	1.06 [0.93, 1.21]
Low income quintile	1.04 [0.91, 1.19]

*p<0.05, **p<0.01, ***p<0.001

CHAPTER SIX: DISCUSSION AND CONCLUSION

This study provides the largest and most comprehensive analysis of the health impact of the 2008 GFC on Canadians. Based on existing literature predominantly concentrating on regions thought to be more severely impacted by the recession, such as Europe and the United States, exposure to the GFC has been associated with negative health outcomes at the individual-level, with some improvements observed regarding health-related behaviours. Most of the positive health outcomes observed following the GFC were seen at the ecological level of analysis whereby overall-mortality rates decreased, largely driven by reductions in motor vehicle accidents. The analysis presented here provides the first-ever comprehensive look of what has happened to Canadians at the individual-level following the crisis.

Main Findings

The primary objective of this study was to determine whether exposure to the 2008 GFC resulted in a significantly increased risk of poor self-reported mental health in working age adults aged 15 to 64 years old. The crisis period and stimulus periods were not significantly associated with an increased risk of poor mental health; however, the austerity period was associated with a 26% (OR = 1.3, 95% CI: 1.17, 1.34) increase in the odds of reporting fair/poor mental health.

There were several secondary objectives of this thesis as follows. The study sought to answer whether the odds of reporting anxiety disorders, mood disorders, or poor physical health were significantly greater among those exposed to the GFC compared to those who

were not exposed. The findings suggest that the odds of reporting poor physical health were not impacted by exposure to the GFC, however, similar to the findings observed for the SMH outcome, the austerity period was associated a 25% increase in the odds of reporting an anxiety disorder, and a 12% increase in the odds of reporting a mood disorder.

Using joinpoint regression analysis, this study also explored whether trends of several health outcomes/behaviours at the Canadian population-level changed significantly over time (2007 to 2013) coinciding with the occurrence of the 2008 GFC. However, the joinpoint regression analysis did not show a significant change in linear trends over this period for any of the studied outcomes. It is possible that this is because there was insufficient data pre-crisis to detect a change. This can be explained by the fact that annual estimates of the prevalence of certain health outcomes were assessed over the long-term (2003 to 2013), and a visual inspection of these plots showed a change in trends following the onset of the crisis.

Third, this study examined whether the odds of engaging in risky health-related behaviours were significantly greater among those exposed to the GFC compared to those who were not exposed. Indeed, findings from the logistic regression analysis suggest that the austerity period was associated with a 12% decrease in the odds of reporting healthy eating, which shows that working age Canadians were less likely to report eating a healthy amount of fruits and vegetables during the austerity period; a significant association was not observed with the crisis period or the stimulus period. The second risky behaviour that was analyzed was the likelihood of reporting heavy alcohol consumption in the past 12 months. The logistic regression analysis revealed that both the stimulus period and the austerity period demonstrated significantly increased odds of heavy drinking as compared to the pre-crisis period (OR = 1.26, 95% CI: 1.20, 1.31 and OR = 1.09, 95% CI: 1.04, 1.14). This was the only outcome that showed a significant association with the stimulus period.

The fourth secondary objective of this study asked whether particular subgroups of the population were more adversely impacted by the GFC than others. The findings from the logistic regression interaction tests, which tested for effect modification among various sub-groups including: sex, income quintile, and age, did not reveal that any one sub-group was particularly more impacted by the GFC relative to the others. However, with regards to heavy drinking, women had statistically significant increased odds of reporting heavy drinking during the austerity period compared to males, but the interaction was not significant during the stimulus period. Conversely, the lowest two income quintiles had statistically significant increased odds of reporting heavy drinking compared to the high income respondents during the stimulus period, but this same interaction was no longer significant during the austerity period. Given the variability in these findings with no distinct pattern, it is not advisable to make any concrete conclusions based on these findings alone.

Conceptualizing the Impact of the GFC on Health

In order to explain the findings discussed above, one has to consider the mechanisms by which the GFC could have an impact on these studied outcomes, this involves developing a conceptual model, which outlines the pathways by which the GFC impacts health. The conceptual model proposed for this study, shown in Chapter 4, was based on the exploratory analyses of key economic indicators in Canada before and after the GFC, as well as existing published literature measuring the association between the GFC and health outcomes in other OECD countries. Based on these findings, our conceptual model hypothesized that a combination of societal-level pathways (i.e. worsening GDP and changes in public policy from an initial stimulus response to an austerity response), and individual-level pathways

(i.e. labor market transformations, income adequacy and the housing market) have created an environment in Canada that has enabled the GFC to have a negative impact on various dimensions of health among Canadians.

The data used for the logistic regression analysis of the CCHS data also included variables that represent proxy measures of the individual level pathways described in the conceptual model. Therefore, our empirical analysis also included a component to test the accuracy of the conceptual model by determining whether accounting for unemployment (proxy measure for transformations in the quantity of employment), precarious employment (proxy measure of decreasing quality of employment), income distribution (proxy measure of income adequacy), and housing stability (proxy measure for the transformation in the housing market) in the statistical model reduces the statistical significant of exposure to the GFC. Contrary to what was expected, the findings from this study showed that accounting for these variables did not impact the observed associations. Although, these findings do not provide evidence to validate the conceptual model proposed in this study, they do not contradict the model either. The mediation analysis would have provided more meaningful findings had the nature of the data been different. Since the data used were repeat cross-sectional, as opposed to longitudinal, the proxy variables used to assess the impact of the individual level pathways did not actually measure whether the individual experienced a change in this outcome throughout the crisis period. This could explain why the mediation analysis did not yield meaningful conclusions. Additional research is required to confirm the validity of the proposed theoretical conceptual model.

Situating the Findings of the Present Study in the World Literature on the GFC

Findings from this study suggest that, consistent with existing literature from other OECD countries, the risk of fair/poor mental health, anxiety and mood disorders, and heavy drinking increased following the onset of the GFC, whereas the likelihood of healthy eating decreased. On the other hand, no association between the GFC and fair/poor self-perceived health in general was observed. This is consistent with findings from the scoping literature review, which showed more variability with respect to the association between measures of physical health and exposure to the GFC.

By dividing exposure to the crisis into phases categorized according to policy response, we were able to identify which period was associated with increases or decreases. The present study was unique in its ability to disaggregate the post-GFC period according to stimulus and austerity policy responses. The austerity period was the only phase of the crisis that observed consistently significant associations with the outcomes discussed above. This is also consistent with the findings from the scoping literature, which found that areas which were more severely impacted by the implementation of austerity experienced the most severe health consequences.

Study Strengths and Limitations

Our study provides evidence that suggests an increased risk of poor health outcomes among those exposed to the austerity period, specifically. However, from our analysis it is not clear whether the observed increases in poor health outcomes are actually a symptom of the austerity period or whether they demonstrate a lagged effect of the recession. Without longitudinal data, it was not possible to account for this possible time-lag. This study also

relies on secondary data, and therefore, the questions asked to respondents could not be customized to obtain more specific information. As such, all respondents who were categorized as being exposed to the crisis were assumed to be equally exposed to the crisis, whereas in reality respondents would have been affected to varying degrees of severity. The use of secondary data also limited our ability to test the validity of the proposed conceptual model due to limitations associated with the proxy measures being used. It would thus be useful for future research to collect primary data that could specifically account for the time-lag effect and measure the extent to which respondents were affected by the implementation of austerity measures.

Another question that arises is whether the associations observed are simply the result of underlying trends that have been on-going since before 2007 and are simply continuing through the duration of the study. For-example, if the prevalence of poor mental health had been steadily increasing for many years and continued to do so throughout the study period (i.e. from 2007 to 2013) our analysis would show a significant association between the recession period and increased risk of poor mental health simply as a result of the underlying trends. Our analysis included an assessment of trends of each of the outcomes by looking at the bimonthly prevalence estimates over time; however, because the bimonthly data were only collected beginning in 2007 this analysis was limited. To account for this limitation, long-term trends of the health outcomes from 2003 to 2013 were considered. The long-term trend analysis showed that trends observed post-crisis did not exist prior to the crisis; therefore, it appears that the GFC was a precipitating event leading to a change in the prevailing trends. Taking these long-term trends into consideration adds important validity to our findings and renders the observed associations more convincing.

Although unlikely, there is always the possibility that unaccounted confounders explain all or part of the observed associations exists. However, our analysis did adjust for several potential confounding variables including: age, sex, marital status and education. These variables did not have an appreciable impact on the overall model; however, they were included for completeness.

Finally, our analysis is also based on repeated cross-sectional data. This means that instead of following the same population over time, as in the case of a longitudinal study, different samples of the same population were analyzed over time. Therefore, the associations observed could be the result of a difference in the underlying populations being sampled. This, however, is highly unlikely given that each cross-section was representative of the same population over time, and the demographics of the target population did not change over the study period (this was confirmed from an analysis of demographic and socio-economic covariates). Potential confounders were also adjusted for the in the analysis, as discussed above. In this repeated cross-sectional analysis the unexposed and exposed populations were not being assessed concurrently, but instead the unexposed population can be considered a historical control. To combat this challenge, future research could focus on stratifying the population by province and grouping the provinces in two categories based on severity of the impact. The comparison between provinces would allow for a comparison of two groups concurrently and add further insight into this topic. Although less ideal than longitudinal data, the repeated cross-sectional approach has been used by several other researchers identified in the scoping literature review and is among the strongest research designs.

Despite the limitations discussed above, this study represents the largest and most comprehensive analysis of the impact of the GFC in Canada. Furthermore, the findings

produced are robust since they rely on data that is representative of the Canadian population, and that covers a sufficient time period both before and following the crisis period. Also, the outcome measures that were analyzed remained consistent throughout the study period (200 7 to 2013). The analysis included extremely large datasets, which contribute to the precision of the estimates obtained. Due to the way in which the data was collected, our analysis included a component whereby it was possible to disaggregate the GFC period according to stimulus and austerity policy responses; this represented a novel use of the CCHS data. Overall, the findings obtained from this study are consistent with existing literature across other OECD countries, and our observations have been further externally validated using long term trend data.

Final Remarks

The findings from this empirical analysis do not provide overwhelming evidence of a strong association between exposure to the GFC and various health outcomes; however, modest statistically significant associations were observed particularly during the austerity period. Note that, it is not unusual for important contextual factors operating at the population level (such as the social determinants of health) to have magnitudes of effect similar those found here. Our findings suggest that the GFC was associated with poorer mental health, anxiety/mood disorders, heavy drinking, and healthy eating particularly during the austerity period, and in the case of heavy drinking also during the stimulus period. However, no such association was observed with self-perceived general health. Our analysis does not provide compelling evidence to suggest that any subgroups based on sex, age, or income were disproportionately affected by the crisis. Short term changes in the linear trend of bimonthly prevalence estimates were not observed for any of the outcomes; however,

when considering long-term trend data from 2003 to 2010, it would appear that underlying trends did not exist prior to the crisis, and that the GFC appears to have been a precipitating event leading to a change in the observed trends. Finally, despite efforts to test the validity of the conceptual model proposed in this study, further research is required to either confirm or reject the proposed mechanisms by which the GFC has been conceptualized to adversely impact health. This study represents the first analysis of the GFC's impact in Canada and fills an important gap in the existing literature.

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APPENDICES

Appendix 1
Scoping Literature Review Search Terms

The following search query was entered into MEDLINE and EMBASE to identify all relevant articles for the literature review. The final search was executed on June 30, 2014.

1. exp economic recession/
2. (econom* adj3 cris*).tw.
3. (econom* adj3 recession*).tw.
4. (financ* adj3 cris*).tw.
5. (financ* adj3 recession*).tw.
6. (glob* adj3 recession*).tw.
7. (great* adj3 recession*).tw.
8. austerity.tw.
9. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
10. exp physical stress/ or exp mental stress/
11. exp anxiety disorder/
12. exp depression/
13. exp suicidal ideation/ or exp suicide attempt/ or exp suicidal behavior/ or exp suicide/
14. exp mental health/
15. exp mental disease/
16. exp alcoholism/ or exp drinking behavior/ or exp alcohol consumption/
17. exp drug seeking behavior/
18. exp health behavior/
19. exp impulsiveness/
20. exp risk reduction/
21. exp high risk behavior/
22. exp tobacco dependence/ or exp "tobacco use"/ or exp tobacco consumption/
23. exp health status/
24. exp feeding behavior/
25. exp food preference/
26. exp fitness/
27. exp lifestyle/
28. exp attitude to health/
29. exp "quality of life"/
30. exp primary health care/
31. exp health service/
32. exp health care access/
33. exp addiction/
34. exp smoking/ or exp smoking habit/ or exp cannabis smoking/ or exp smoking cessation/
35. exp public health/
36. exp human activities/
37. exp family health/
38. exp occupational health/
39. exp anxiety/
40. exp nutrition/
41. (mental adj1 illness*).tw.
42. (mental adj1 health*).tw.
43. depression.tw.
44. suicid*.tw.
45. stress*.tw.
46. anxiety.tw.
47. (health* adj3 behavio*).tw.
48. (risk* adj3 behavio*).tw.
49. (health* adj3 access*).tw.
50. (health* adj3 utili*).tw.
51. morbidit*.tw.
52. mortalit*.tw.
53. hypertens*.tw.
54. cardiovascul*.tw.
55. smok*.tw.
56. alcohol*.tw.
57. HIV*.tw.
58. diet*.tw.
59. (food adj1 insecur*).tw.
60. 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59
61. 9 and 60

Appendix 2
Data Extraction Tables for Literature Review (Table 1 to Table 5)

Table 1 Studies investigating mental health outcomes, excluding suicide mortality

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
Bartoll et al.	2014	Spain	Representative sample of the non-institutionalized Spanish population, aged 16 to 64 years N= 40,376	2006/2007 to 2011/2012	Repeated cross-section data analyzed using poisson regression with robust error variance used to test for association [Prevalence Ratio (PR) and 95% Confidence Interval]	The main exposure variable was survey year. Respondents of the 2011/2012 Survey were considered exposed (vs. respondents of 2006/2006). The outcome of interest was poor mental health measured GHQ-12; poor mental health was defined with a score of 3 or higher.	Descriptive statistics: increase in poor mental health among men: 14.6% to 16.9%; decrease in poor mental health among women: 24.6% to 22.7%. Socioeconomic inequalities in mental health were also assessed, among men, both absolute and relative inequalities in poor mental health increased among men (Relative Index of Inequality = 1.02 (95%CI: 0.99-1.04) [2006/2007) compared to Relative Index of Inequality = 1.08 (95%CI: 1.04-1.11) [2011/2012], p-value for change <0.001. Among women, inequality remained stable. Among men, change in prevalence ratio: Crude PR = 1.15 (1.04-1.26), when stratified, increases were larger in men aged 35-44, and 45-54 years of age, those in social class IV, those with primary or secondary education, foreigners, and breadwinners. When adjusted for age, the PR was unchanged, but when adjusted for working status as well, none of the associations were significant. Adjusted PR = 0.99 (0.90-1.08) Among women, change in prevalence ratio: Crude PR = 0.92 (0.87-0.98), Adjusted PR = 0.89 (0.85-0.95)
Cagney et al.	2014	United States	Nationally representative sample of older adults (aged 57 years and over) in the United States N= 2,261	2005/2006 to 2010/2011	Two waves of longitudinal survey data analyzed using primarily logit-linked regression	Exposure to the crisis was assessed using survey year (2010/2011 represented exposure year) and also a proxy variable representing household foreclosures The primary outcome of interest was a dichotomous measure of depression measured using the Centers for Epidemiologic Studies Depression Scale	The development of depression between Wave 1 and Wave 2 of the survey revealed that the risk was greatest for participants exposed to household area foreclosure (exposure to 3 different levels of the foreclosure process were assessed): Notices of default: OR = 1.75, 1.14-2.67 Auctions: OR = 1.45, 0.96, 2.19 Real-estate owned: 1.62, 1.06-2.47 Neighborhood disorder was not associated with depression
De Vogli et al.	2014	Italy	Age standardized death rates due to mental and behavioural disorders per 100,000 persons	2000-2010	Interrupted time trend analysis of Standardized Death Rates (SDR) in Italy from 2000-2010, to compare trends pre-crisis (2000-2007) to crisis period (2008-2010) to determine excess number of	The exposure to crisis was assessed using a time variable (year), where year 2008, 2009, and 2010, were considered the recession period. The outcome of interest was SDR due to mental and behavioural disorders.	Additional 0.303 per 100,000 deaths per year (95% CI: 0.192-0.478, p=0.001) due to the crisis, which corresponds to an excess of 548 deaths due to mental and behavioral disorders (95%CI 347.3-864.7) attributable to the financial crisis. -Loss of income can account for 22.4% (n=123) of the additional deaths that were observed to occur (increase = 0.126/100,000 (95% CI: 0.046-0.205, p=0.004) -1% annual increase in unemployment = 0.074/100,000 deaths due to mental disorders (95% CI: 0.032-0.117, p=0.002).

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
					mental health related deaths during the recession		-Rise in unemployment during three years of recession is associated with 0.15/100,000 deaths due to mental disorders, which corresponds to 16.4% (n=90) of the additional deaths that were observed to have occurred.
Economou et al.	2014	Greece	Adults aged 18-69 years old randomly sampled from the national phone-number databank, representative of most households in Greece N= 2,256	2011	Primary data collected via telephone interviews. Data analysis included primarily logistic regression analysis	Exposure to the financial crisis was assessed using the following proxy variables: *interpersonal trust* and *institutional trust* measured using the European Social Survey (ESS) The primary outcome variables were: -*Major Depression* diagnosed using the Structure Clinical Interview module (SCID-I), and -*Generalized Anxiety Disorder* also measured using the SCID-I	Interpersonal trust demonstrated a protective effect against major depression: OR: 0.95 (0.92-0.98) aOR: 0.95 (0.92-0.97), adjusted for gender, age, and education. Institutional trust also demonstrated a protective effect against major depression: OR: 0.95 (0.93-0.97) aOR: 0.96 (0.94-0.97), adjusted for gender, age, and education. When stratified by financial hardship, low economic hardship showed an unchanged protective effect (aOR: 0.94 (0.91-0.97), but high economic hardship was no longer statistically significant associated once adjusted (aOR: 0.99-1.05). Neither interpersonal nor institutional trust was statistically significantly associated with generalized anxiety disorder. Study highlights that intervention targeting mental health should focus on not only the promotion of social capital but also in reducing the burden of economic hardship.
Frank et al.	2014	Canada	Representative sample of two rural communities in Ontario, Canada. N = 315	2008 to 2010	Longitudinal study with an initial baseline assessment and two subsequent follow-up assessments. Data analyzed using linear regression models	Exposure was assessed using the proxy variable: financial strain. Additionally, a variable: social capital was used to see whether it had a moderating effect. The primary outcomes of interest were anxiety symptoms, depressive symptoms, and physical health.	Financial strain was positively associated with a worsening of anxiety, depression, and self-reported health, $p<0.05$. Including social capital into the models revealed that high social capital is a significant moderator in the relationship between financial strain and stress/depression, but not anxiety/self-reported health.
Robert et al.	2014	Spain	A convenience sample of migrant workers from Colombia, Ecuador, Morocco and Romania in Spain. For subsequent analysis sample was restricted to those individuals who reported good mental health in 2008 N=318 (restricted sample, N=214)	2008 to 2011	Secondary data analysis of a two-wave longitudinal survey data using multivariate logistic regression modeling	The primary explanatory variables were related to employment conditions in 2008 and 2011 The outcome of interest was poor mental health measured by GHQ-12 (respondents with a score of 3 or higher were considered to have poor mental health)	***Association between poor mental health and employment conditions:*** With regards to the respondent˝s legal status in Spain, in comparing those migrants who acquired Spanish nationality over the study period (reference group), with those who had a continuous legal status, aOR: 3.32 (1.15-9.58), with those who had a continuous illegal status, aOR: 17.34 (1.96-153.23), and with those who changed from illegal to legal status: aOR=1.91 (0.42-8.63) With regards to social security, respondents who had no insurance in 2008 but acquired insurance in 2011 had a significant protective effect from poor mental health as compared to respondents with continuous insurance: aOR: 0.10 (0.02-0.48). Respondents who went from insurance to no insurance, and who had continuous lack of insurance demonstrated no significant increased risk as compared to those with continuous insurance. A statistically significant association with poor mental health among respondent˝s whose status changed from employment to unemployment was

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
Agudelo-Suarez, et al.	2013	Spain	A convenience sample of migrant workers from Colombia, Ecuador, Morocco and Romania in Spain N= 318	2008 to 2011	Secondary data analysis of a two-wave longitudinal survey data using multivariate logistic regression modeling	Measured as a time variable, 1st wave (2008) = onset of crisis; 2nd wave (2011) = post-crisis. The outcome of interest was poor mental health measured by GHQ-12 (respondents with a score of 3 or higher were considered to have poor mental health)	observed: aOR=3.62, 1.64-7.96, and whose number of working hours increased: aOR=2.35 (1.02-5.44), and whose monthly income decreased from 2008 to 2011: aOR=2.75 (1.08, 7.00). Statistically significant increase in risk of poor mental health in 2011 vs. 2008 for men (aOR=4.63, 95% CI 2.11-10.16). Association even stronger among unemployed men, men experiencing family burden, and men with a lower income. Increase in risk of poor mental health observed in women as well, but association not statistically significant.
Astell-Burt, at al.	2013	United Kingdom (England, Wales, Scotland, Northern Ireland) N= 131,216	Men (16-64yr.) and Women (16-59yr.) in the UK	Jan 2006 to Dec 2010	Secondary data analysis of repeated-cross sectional data repeated every 3 months for 20 quarters using multivariate logistic regression model	Exposure was measured as a time variable relative to when the subject completed the survey. The outcome of interest was self-rated physical health. Secondary outcomes of interest included: cardiovascular health, respiratory health, depression, and mental illness (all outcomes were self-perceived).	Pre-recession from Q1 2006 to Q1 2008, unemployment did not rise, depression increased by 0.2%, and mental illness grew by 0.1%. From the onset of the recession, Q1 2008 to Q4 2010, unemployment rose by 2.5%, depression grew by 0.3%, and mental illness grew by 0.1%. aOR [depression] = 2.98 (2.85, 3.10) in unemployed versus employed aOR [mental illness] = 3.18 (2.98, 3.38) in unemployed versus employed In comparing the trends of unemployment over time and the health outcomes over time, it is clear that unemployment preceded the increasing prevalence of health outcomes. No major change in the prevalence of depression or mental illness was observed during recession period.
Bartfay et al.	2013	Canada	Blue-collar laid-off autoworkers previously employed in the automotive manufacturing industry in the Ontario (Durham Region), Canada N = 34	2009	Qualitative study (primary data collection) using focus group interview question. Thematic analysis of data was conducted.	All respondents recruited into the study were considered exposed to the financial crisis since they were laid off as a result of the recession. The primary outcomes of interest were the lived experiences of self-reported health, health care service utilization and health-care services required.	Analysis of results from the focus groups revealed the following themes: -Mental Health issues: increased stress and anxiety reported by all participants -More than 50% of participants reported a lack of mental health resources -Approximately 32% of males and 25% of males reported problems related to altered sexual function and intimacy with partner
Cui et al.	2013	United States	Nationally representative sample of adolescents in the United States, aged 12 to 17 years	2001-2010	Cross-sectional survey data (repeated – 5 waves) analyzed using multinomial logistic regression	Survey year represented exposure to the crisis The primary outcomes of interest were self-rated health, number of physically unhealthy days, mentally unhealthy days, and activity limitation days.	Adolescent mental health declined significantly in 2009/2010 to 49.4% from 60.9% in 2005/20062 Among low-income adolescents, % of 0 mentally unhealthy days significantly decreased from 63% in 2003/2004 to 46% in 2009/2010 % of adolescents reporting 14 to 20 mentally unhealthy days increased significantly among adolescents from low income family from 5% in 2007/2008 to 11% in 2009/2010 and middle-income families from 4% in 2001/2002 to 10% in 2009/2010.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
Economou et al.	2013	Greece	Adults aged 18-69 years old randomly sampled from the national phone-number databank, representative of most households in Greece N= 4,453	February-April 2008 - February-April 2011	Primary data collected via telephone interviews. Data analysis included chi-square analysis, Student t test, and logistic regression	Survey year represented exposure to crisis, where 2008 was pre-crisis, and 2011 was post-crisis. Important outcome variable were: -*Major Depressive Episode measured using* the Structured Clinical Interview methodology (SCID-I) and -*Financial Hardship* measured using the Index of Personal Economic Distress	In 2011 (vs. 2008) there was a statistically significant increase ($p<0.01$) of people reporting financial hardship (mean=10.97(2011) versus mean =8.99 (2008). In 2011 (vs. 2008) there was a statistically significant ($p<0.0001$) increase in the prevalence of depression (8.2% (2011) versus 3.3% (2008)). The odds of suffering from major depression was 2.6 time greater in 2011 than in 2008 (OR=2.6, 1.97-3.43). Similar increases were seen when examining the following population sub-groups: gender, education, place of residence, employment status. For age and marital status, the increase was not significant for people aged 35-44, and above 65 years, and for widowed/divorced respondents. Using data from 2011 only it was observed that the number of depressive symptoms was higher for people who experience high financial hardship ($p<0.0001$). This was also true when stratified by sex. Using data from 2011, the following predictors of major depression were identified: decreasing age, being married, and increasing financial hardship, where for every unit increase in financial hardship score increased odds of experiencing major depression by 1.2 (OR=1.2, 1.13-1.24).
Economou et al.	2013	Greece	Adults aged 18-69 years old randomly sampled from the national phone-number databank, representative of most households in Greece N = 4,448 (2,192 [2009] + 2,256 [2011])	February-April 2009 to February-April 2011	Primary data collected via telephone interviews. Data analysis included primarily chi square analysis and logistic regression analysis.	Exposure to crisis was assessed using survey year, where 2009 was initial crisis period, and 2011 was recession period (i.e. exposure year) The two primary outcome variables were suicide ideation and suicide attempt.	***Suicide ideation change from 2009 to 2011*:** Entire sample: +1.5% ($p=0.04$) Males: +2.7% from 2009 to 2011 (p-value=0.011); Non-significant increase for females Marital status: -6% (p-value <0.001) in unmarried people; +5% (p-value<0.001) in married people Statistically significant increases for people who are aged 55-64 years, were married, sought professional help or used psychotropic medications Statistically significant decrease in those aged younger than 24 years, and unmarried ***Suicide attempt changes from 2009 to 2011***: No significant increase noted in entire sample, but among males only prevalence increased by 1.6% ($p<0.001$), increased among those aged 25-34 (+1.7%) and 35-44 years (+2.3%), and decreased among those aged 45-54 years (-2.5%), increased among married people (+1.3%), among unemployed (+4.45), and among those with highest level of education attainment (+1.1%)
Faresjo et al.	2013	Greece	A sample of university students from Athens, Greece and south-eastern Sweden N = 236	2012	Cross-sectional survey comparing a Greek population with a Swedish population to assess differences. Data analyzed using chi square analysis, t-tests, ANOVA, and linear regression modeling	The exposure to crisis was assessed based on where the participant was located, Greek students were considered exposed, and Swedish students were the comparator (control) population. Two primary outcomes were of interest: level of cortisol in hair sample and self-perceived level of stress.	Greek cortisol levels were significantly lower than the Swedish population ($p<0.0001$). Greek population had significantly higher perceived life stress, reported more experiences of serious life events, and lower hope for the future, including more symptoms of depression/anxiety.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
Gili et al.	2013	Spain	Patients attending primary care centers representative of Spain″s consulting populations	2006-2010	Cross-sectional survey data (2 waves) analyzed using multivariate logistic regression modeling to assess changes in outcomes post-economic crisis compared to pre-crisis	Exposure to crisis was assessed using a time variable: Wave 1 (2006/2007) = pre-crisis and Wave 2 (2010/2011) = crisis period Outcomes of interest were: major depression, dysthymia, generalized anxiety disorder, multisomatoform disorder, panic attack disorder, minor depression, alcohol abuse, and alcohol dependence	From 2006 to 2011: Major depression increased from 28.9% to 47.5%, p<0.0001 Minor depression increased from 6.4% to 8.6%, p<0.0001 Dysthymia increased from 14.^% to 25.1%, p<0.0001 Generalized anxiety disorder increased from 11.7% to 19.7%, p<0.0001 Multisomatoform disorder increased from 14.8% to 21.4%, p<0.0001 Panic attack disorder increase from 9.7% to 15.7%, p<0.0001 Note. Further analysis was done on the major depressive outcome, which showed that the association of unemployment and education with major depressive disorders did not significantly change after the crisis. According to the PAR, 3.1% of the risk of having depression among the sample could be attributed to unemployment; individual and family unemployment jointly account for 23.3% of the population risk of attending with major depression during the post-crisis survey. Additionally, 11.0% of population risk of depression could be explained by mortgage payment difficulties.
Hauksdottir et al.	2013	Iceland	Representative random sample of Icelandic adults (18 years and above) N = 3,7555	2007-2009	Cohort study: 2-wave survey (2007 & 2009) data analyzed using repeated measures ANOVA and logistic regression models	Exposure to recession was assessed using a time variable: survey year (2007 vs. 2009) The outcome of interest was level of perceived stress	Average level of perceived stress (adjusted for age) was significantly increased in 2009 compared to 2007 (p=0.01), when stratified by sex, this increase was significant for women only (p=0.005), but not men (p=0.49) In 2009, compared to 2007, the adjusted odds ratio for high stress overall was aOR=1.29 (95%CI: 1.14-1.45); when stratified by sex, the OR was only significant for women (aOR=1.37, 95%CI: 1.16-1.61). Adults aged 40-49 or 60-69, those married/cohabitating, middle education (Grade 7-12),living in a village or city, working in a skilled or non-skilled occupation, employed, students, or middle income, and no children were all associated with increased odds. When stratified by sex, among men increased odds were only observed for married men or low-income men. Among women, age between 18-29 years, 40-49 years, and 60-69 years, single women or divorced women, married/cohabitating women, women with basic/middle education, living in a city of village, non-skilled or no paid employment, employed, unemployed, student or home-maker, middle income, and no children were all associated with increased odds of high stress.
McInerney et al.	2013	United States	Nationally representative sample of adults aged 50 years and over N = 10,020	2008	Secondary data analysis of survey data using linear regression modeling	Exposure was assessed using a time variable; prior to October 1 2008 = unexposed, and October 1 2008 onwards = exposed. The primary outcomes of interest were several measures of mental health.	A worsening of subjective mental health was observed among respondents who held many stocks prior to the crash (p<0.05), but not among those with low or no stocks. This trend was not statistically significant when using clinical measures of poor mental health. Antidepressant use significantly increased among those exposed to the crisis who held high stocks prior to the crash, but not among those who had low or not stocks (p<0.05).
Snorradottir et al.	2013	Iceland	All employees from three banks in Iceland	2009	Cross-sectional data was analyzed using	Exposure to the crisis was assessed based on a variable	Overall the study observed that those employees more engaged in downsizing or directly impacted through restructuring observed a higher correlation with

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
			that experienced a collapse due to the 2008 Financial Crisis N = 1,880		ordinary least squares (OLS) regression	that determined whether the respondent was in a work environment that was affected by downsizing, and also their psychosocial work environment. The primary outcome of interest was psychological distress.	increased psychological distress, p<0.05. To mediate the effects a variable of social support was also included, however it did not have an appreciable impact on reducing the observed positive correlation.
Vanderoost et al.	2013	Belgium	Patients attending two urban general practices in Belgium, aged between 18 and 49 years N = 377	September to December 2010	Cross-sectional survey data analyzed using Chi-Square tests and logistic regression analysis	Exposure to the crisis was assessed using proxy variables including: employment loss in the past 12 months The primary outcome of interest was suicide ideation.	Employment loss in the past 12 months was associated with a statistically significantly increased risk of suicide ideation: Adjusted OR = 8.8 (2.0-39.3)
Ayers, et al.	2012	United States	Google search trends in U.S.	2004-2010	Analysis of Google search queries related to psychological distress using a time series model	Exposure was assessed by time (month) that coincided with the recession period. The outcomes of interest were all psychological distress related Google queries.	Psychological distress (PD) queries increased at the end of 2008 coinciding with onset of crisis. At the end of 2009, PD queries peaked representing 300,000 queries attributable to the recession At the end of 2010, PD queries remained 20% higher than pre-recession levels Economic indicators were associated with PD queries to explain increased trend. Unemployment, underemployment and mortgage delinquencies and foreclosure trends were statistically significantly associated with increases in PD queries (up to 6 months in the future). +1% unemployment = 7% increase in PD queries 1 month after +1% delinquency/foreclosure = +16% PD queries 2 month after +1% underemployment= ~+4% PD queries 2 moths after Other indicators: S&P 500, median home values, and home sale price trends did not exhibit consistent trends with PD queries.
Burgard et al.	2012	United States (Michigan)	Stratified random sample of employed (excluding self-employed) English-speaking adults aged 25 to 64 years who lived in southeastern Michigan N=519	October 2009 to March 2010	Cross-sectional survey designed to assess the impact of the 2008 recession. Bivariate associations were assessed using logistic regression.	To distinguish between those affected by the crisis and those unaffected, the proxy measure perceived job insecurity was used. The outcome of interest was self-rated health, symptoms of major/minor depression, in the past 2 weeks and experiencing an anxiety attack in the past 4 weeks.	17.5% of sample reported being job insecure; the population who reported job insecurity were statistically significantly (p<0.05) less healthier (increased poor self-rated rate (19.3% vs. 7.1%), increased poor mental health (40.8% vs. 7.3), and increased anxiety (30.0% vs. 9.8%)). Respondents reporting perceived job insecurity had a significantly higher chance of being diagnosed with a chronic physical condition within the last three years, being African American, not having at least a Bachelor˝s degree, a temporary employee, and report 6 or more months of unemployment. Explanatory Variable: Perceived Job Insecurity Adjusted OR [minor/major depression] = 6.76 (3.43, 13.3) Adjusted OR [anxiety attack] = 3.73 (1.40, 9.97) *Adjusted for age, sex, African American, married/co-habitating, has a child less than 18 years, education, an income-to-needs ratio<2, earlier chronic condition, earlier mental condition, temporary employment, recent unemployment.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
Burgard et al.	2012	United States	Stratified random sample of adults aged 19 to 64 years who lived in southeastern Michigan N=894	October 2009 to March 2010	Cross-sectional survey designed to assess the impact of the 2008 recession. Bivariate associations were assessed using logistic regression.	To distinguish between those affected by the crisis and those unaffected, the proxy measure housing instability was used. The outcomes of interest were: poor self rated health, symptoms of minor/major depression in the past 2 weeks, anxiety attack in past 4 weeks, and harmful/hazardous alcohol consumption.	***Odds of reporting depression***: All respondents, N = 822 Reference Group: Stable Housing Multiple moves in the past 3 years: OR = 1.35 (0.62, 2.92) Moved for cost reasons in past 3 years: OR = 1.93 (0.93, 4.01) Moved in with someone in past 12 months: OR = 0.86 (0.39, 1.89) Homeless in past 12 months: OR = 6.14 (2.47, 15.3) *Among renters, N=333* Reference Group: Not behind on rent/Not evicted Behind on rent currently: OR = 3.66 (1.15, 11.7) Evicted in past 12 months: OR = 0.85 (0.16, 4.5) *Among respondents currently paying mortgage, N=313* Reference group: Not behind on mortgage or in foreclosure Behind on mortgage/in foreclosure now: OR = 3.13 (0.76, 12.9) *Among respondents who ever owned a home, N=517* Compared to those who have not foreclosed, Foreclosed since 2006: OR = 5.76 (1.93, 17.2)
Cannuscio et al.	2012	United States	Voluntary participation in an on-line survey encompassing four states: Arizona, California, Florida and Nevada. N= 798	July 2008	Cross-sectional survey data analyzed using t-tests, Wilcoxon‟s rank-sum test, logistic regression and negative binomial regression	Exposure to the crisis period was assessed using a proxy variable of housing status (homeowners with no strain [comparator], versus: homeowners with moderate straight, renters, and homeowners in default/foreclosure. Primary outcomes of interest included: self-reported health, poor mental health days, psychological distress, and number of symptoms of poor physical health	The number of days in the last 30 days where mental health was reported as not good, was significantly higher among homeowners in default/foreclosure as compared to renters, owners with moderate strain, and owners with no strain ($p<0.05$) The prevalence of serious psychological distress was significantly higher among homeowners in default/foreclosure as compared to renters, owners with moderate strain, and owners with no strain ($p<0.05$)
Fenge et al.	2012	United Kingdom	The „asset rich-income poor" ageing population in the UK, aged 65 years and older; participants were recruited voluntarily. N = 28	September 2010 to January 2011	Cross-sectional qualitative (semi-structured) interview of all participants. Data was interpreted via a thematic analysis.	Exposure to the crisis was assessed directly using interview questions. The outcome of interest was the respondent‟s overall well being.	Qualitative analysis of interview data suggested that the older UK population was adversely impacted by the recession in terms of reduced mental and social well-being, but that the experiences were varied based on the presence of resilience factors which include: money management and budgeting skills.
Houdmont, et a.	2012	Northern Ireland	Employees of the Northern Ireland Civil Service (NICS)	2005-2009	Survey administered to anonymous cohort of employees in 2005 (pre-recession) and again in 2009 (recession period),	Exposure to the crisis was assessed using a time variable: survey year (2009 vs. 2005) The primary outcome of interest was work-related stress	In 2005, 18.5% of population reported work related stress as very or extremely stressful, whereas in 2009, 26.5% reported very/extreme stress. This difference is statistically significant, $p<0.001$. 25% increase in number of people taking time off work due to work-related stress ($p<0.001$) and a 35% increase in the reported number of absenteeism due

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
					results were compared using bivariate correlations and t-tests		to work-related stress (p<0.001). Exposure to psychosocial hazards in the workplace became worse during recession period.
Katikireddi et al.	2012	England	Representative sample of community-dwelling, English-speaking, working age population, aged 25 to 64 years N = 106,985	1991 to 2010	Repeat cross-sectional analysis of survey data using regression models (logistic regression and poisson regression)	Exposure to the crisis was assessed using a time variable (year) The outcome of interest was poor mental health measured using the GHQ-12 Questionnaire	Compared to baseline year (2008), the age-adjusted prevalence of mental health cases increased significantly in 2009 (+5.1%, 95%CI: 2.6% to 7.6%) and in 2010 (+3%, 95%CI: 1.2%-4.9%) among men. There were no significant increases observed among women. To explain increase in prevalence, analysis was done to see whether employment status and education level between genders, explained the different; however they did not account for the gender difference. Adjustment for equivalized household income did not account for the increase in prevalence.
McLaughlin et al.	2012	United States	Representative sample of the adult (18 years and older) population in Detroit N = 1,054	2008 to 2010	Prospective cohort study: two waves of data analyzed using logistic and poisson regression analysis	Exposure to the crisis was assessed as those subjects who experienced home foreclosure between wave 1 and wave 2 of the study. The primary outcomes of interest were measures of depression and anxiety.	Experiencing a home foreclosure was associated with an increased risk of depression and anxiety: Depression: Adjusted Incidence Density Ratio = 2.4 (1.59-3.64) Anxiety: Adjusted Incidence Density Ratio = 1.9 (1.46-2.58)
Wang et al.	2012	Canada (Alberta)	Employees aged between 25 and 65 years who are residing or working in Alberta N= 3, 579	2008 to 2009	Primary data collected via cross-sectional survey on a random sample of employees in Alberta. Analysis conducted using multivariate logistic regression	Exposure was assessed based on when subject completed survey. If before 1 September 2008 = unexposed; if between September 1 2008 and March 1 2009 = exposed to crisis; if between March 1 2009 and October 2009 = exposed to post-crisis period. The outcome of interest was lifetime and 12-month prevalence of depressive and anxiety disorders.	12-month prevalence of major depressive disorder was 5.1% (4.0-6.4) during pre-crisis, 6.8% (5.2-8.9) from September 1 2008 to March 1 2009, and 7.6% (6.5-9.2) from March 1 2009 to October 30, 2009). The increase over intervals was statistically significant (p=0.03). A significant increase p=0.006 was also observed for dysthymia, and all disorders combined (p<0.001). However, increases were not statistically significant for the other outcomes include: bipolar disorder, social phobia, panic disorder, or generalized anxiety disorder. Logistic regression analysis of the MDD outcome found a statistically significant interaction between time period and marital status, and between time period and educational level. As such, 12-month prevalence of MDD was presented separately over time by sex, marital status, and educational levels. When stratified by sex, only men showed a statistically significant increase in 12-month MDD prevalence over the three time intervals, and when stratified by marital status, only married or common-law individuals showed a statistically significant increased prevalence in 12-month MDD over the three time intervals.
Alley, et al.,	2011	United States	Americans > 50 years old	2006 to 2008	Secondary data analysis of two waves of a longitudinal survey using logistic regression	Housing status (mortgage delinquency) (i.e. people who fell behind on their mortgage following onset of financial crisis) The outcome of interest was psychological impairment measured using an 8 item	Mortgage delinquent participants were significantly more likely to experience incident elevated depressive symptoms (aOR=8.60, 95% CI 3.38-2.85)

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Result(s)/Conclusion(s)
						version of the Center for Epidemiological Studies Depression Scale.	
Avcin et al.	2011	Slovenia	Convenience sample of employees in private and public sectors N= 2,364	June to Dec 2009	Primary data collection and analysis of cross-sectional data using linear and logistic regression models	Self-determined exposure to crisis (yes/no) The outcomes of interest were depression and anxiety symptoms measured using two self-rating scales	Significantly higher levels of depression ($p<0.001$) and anxiety ($p=0.008$) were associated with persons who reported being affected by the present crisis compared to those where reported not being affected.
Lo et al.	2011	United States	Admission data from the Psychiatric Emergency Services at a medical center in California N = 1,145	Q1 2008 to Q12009	Admission data in two time period (pre-crisis versus post-crisis) was compared using chi-square tests and Student t tests	Exposure to the crisis was assessed using a time variable: 2008 = pre-crisis and 2009 = crisis period The outcome of interest was a measure of Psychiatric Emergency Services Use.	Patients admitted during the crisis period, compared to the pre-crisis period, were significantly more likely to have no history of previous mental health utilization (35.1% versus 31%, $p=0.049$)
Sargent-Cox et al.	2011	Australia	Participants aged 60 to 65 years at baseline randomly selected for a large longitudinal survey N = 1,973	2005/2006 to 2009-2010 (i.e. two survey waves)	Secondary data analysis of longitudinal survey data using chi-square analysis, t-test, one-way ANOVA, and a latent difference score model to test for differences between both waves of the survey	Exposure variables included a dichotomous outcome asking if participant"s financial security was impacted by the economic downturn. Additional variable such as perceived financial hardship, and the month they responded were also recorded. The outcomes of interest were: -*Depression/Anxiety* measured using the Goldberg Depression and Anxiety Scales -*Self-Rated Health* measured using a five-point scale (excellent, very good, good, fair or poor)	Compared to participants who did not report an economic impact related to the recession, participants who were impacted experienced a statistically significant larger increase in reporting depression and anxiety symptoms (i.e. worsening psychological health), $p<0.014$, and $p<0.001$, respectively.
Shi et al.	2011	Australia	Representative sample of South Australian population aged 16 years and over N = 38,979	2002-2009	Secondary data analysis of survey data using chi square tests, logistic regression modelling, and joinpoint regression analysis	Exposure to the crisis was determine using a time variable based on when the respondent completed the survey (if between 2008-2009, the subject was considered exposed). The primary outcomes of interest were several variables related to mental illness (suicidal ideation, anxiety, depression, psychological distress, stress, and current treatment)	With regards to statistically significant trends over time, psychological distress has been declining since 2002 ($p<0.001$), stress has been declining since 2004 ($p=0.007$), and anxiety has increased ($p=0.004$). With regards to stratification, it was observed that full-time employees experienced a decrease in anxiety levels, whereas part-time employees experienced an increased, during the recession period. Stress levels among women, those with low income, low education, middle age, full-time or unemployed, and in lower income quintiles experienced statistically significant increases. Psychological distress worsened during the recession period particularly for females and participants with low education. Joinpoint regression analysis did not reveal a statistically significant change in trend coinciding with the recession period.

Table 2. Studies investigating suicide mortality

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
Antonakakis, et al.	2014	Greece	Annual suicide data for population of Greece	1968-2011	Secondary data analysis of suicide mortality data using multivariate logistic regression modeling to predict suicide rate per 100,000 persons	Fiscal austerity (measured using proxy: government consumption expenditure, % of GDP). The outcome of interest was suicide rate.	According to best-fitting model: 1% decrease in government expenditure leads to a 0.3% increase in suicide rate. Considering the Greece population, this translates into 381 suicides attributed to austerity measures in Greece between 2009 and 2010. Model included the following significant predictors: exposure to fiscal austerity, higher unemployment rates, negative economic growth and reduced fertility rates (alcohol consumption & divorce rates were not). Effect of fiscal austerity is gender-specific (significant in males only) and age-specific (greatest association on population aged 45-89yr.)
Baumbach et al.	2014	Europe	8 single EU countries (Bulgaria, Czech, Finland, Germany, Poland, Portugal, Slovakia, Slovenia)	2000-2010	Mixed approach using ecological and time trend designs (with correlation analysis)	The exposure to the crisis was measured by a proxy measure of economic situation (measured by GDP and unemployment). The outcomes of interest were: overall mortality, suicide mortality, and transport accident mortality.	Suicide Rates, 2010 versus 2007: Germany: +5.3%, Portugal: +5.2%; Czech Republic: +7.6%; Slovakia: 22.7%; Poland: 19.3%; Finland; -4.6%; Slovenia (-6.5%) and Bulgaria: -2.1% A statistically significant relationship was identified between unemployment and suicide mortality in: Finland (p=0.04), Czech Republic (p=0.00), Slovakia (p=0.00), and Bulgaria (p=0.0). When using GDP, only Poland had a statistically significant relationship. Rank correlation analysis showed a significant negative association between social spending and the relationship between unemployment and suicide mortality (r= -0.83, p=0.01). This means when social spending is low, the affect of unemployment on suicide mortality is greater. Rank correlation for other outcomes were not significant.
Chan et al.	2014	South Korea	Monthly mortality data due to suicide in South Korea among population aged 20-59yrs.	2003 to 2011	Interrupted time-series analysis of mortality data	Exposure to crisis was assessed using a time variable: -January 2003 to Dec 2008 = pre-recession -Jan 2009 to Dec 2010 = recession period The outcome of interest was monthly mortality data due to suicide	There was a statistically significant increase in suicides during the recessionary period among all employed men, aged 20-49 years, there was an observed increase among employed men, aged 50-59 yrs, but the increase was not statistically significant (p=0.107) There was a statistically significant increase in suicides during the recessionary period among unemployed men aged 20-29 years, 40-49 years, and 50-59 years, but not 30-39 years. There was a statistically significant increase in suicides during the recessionary period among unemployed and employed women of all ages, except employed women aged 50-59 years (p=0.186) Among employed, there was an increase in suicides during recession period among all occupational classes, except Agriculture, fishery, forestry workers. Most drastic changed observed among skilled workers (managers and senior officials) with a RR=0.75 (95%CI 0.57 – 0.99) pre-crisis and a RR=2.81 (2.22-3.55) during recession period.
Madianos et al	2014	Greece	Annual suicide mortality rate representative of the entire Greek population	1990 to 2011	Interrupted time-series analysis of mortality data	Exposure to the crisis was assessed based on time (year) where years 2008 to 2011 were considered recession years. Economic proxy variables also included: GDP and	Suicide mortality increased by 55.8% between Year 2007 (pre-recession) and 2011 (post-recession). The increase was statistically significant, $p<0.05$. A control variable, which was mortality rate from accident falls/poisoning, did not observe any such increase.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
						unemployment The primary outcome of interest was annual suicide mortality	
Pompili et al.	2014	Italy	Mortality data on the Italian population aged 15 years and over	1980 to 2010	Time trend analysis of annual mortality data using joinpoint regression	Exposure to the crisis was assessed based on a time variable (year), where 2006 was the reference year and 2007-2010 was the crisis years. The primary outcome of interest was annual suicide mortality	The joinpoint regession analyzed time series data from 1980 to 2010 for men and women and for different age groups separately. The only significant change in trend that was identified that occurred with the timing of the crisis was among men aged 25 to 64 years of age. The joinpoint was identified at year 2007, from 1994 to 2007 the annual percent change in suicide mortality was decreasing by 2.1%, but from 2007 to 2010 the annual percent change began to increase with an annual percent change of +4.2. Using 2006 as a reference year, statistically significant increase in the rate ratio of suicide was observed in men aged 25 to 64 years in 2008, 2009, and 2010. In 2010, the RR had increased by 12%, $p<0.05$. Increases were not observed for women (any age group) or men 24 years and younger or men over 65 years.
Toffolutti et al.	2014	European Union (several countries)	23 European Union Countries	2003 to 2010	Annual time trend data analyzed using linear regression.	Exposure to the crisis was assessed using the proxy measure country unemployment rate The primary outcomes of interest were: All-cause mortality Suicide mortality Cirrhosis & Chronic liver disease mortality Motor vehicle traffic accidents mortality Parasitic infections mortality Alcohol consumption Fruit & vegetable availability	A one percent increase in country unemployment rate is associated with a: 4.1% increase in suicide mortality All the above are statistically significant, $p<0.05$
Chang et al.	2013	54 countries worldwide	National suicide data	2000-2009	Time trend analysis using negative binomial regression models to determine trends pre-crisis and to calculate excess suicides during recession period	Time (year): 2009 (considered the recession year) compared to trends during pre-recession (2000-2007)	4884 (95%CI 3907-5860) excess suicides among population 15 years and older in all 54 countries Overall suicide rate in men: rate ratio=1.033(95%CI 1.027-1.039) = 5124 excess suicides (4219-6029), no major change in rates of women: rate ratio=1.05 (1.003-1.013) . Among men, age gradient observed: 5.8%(3.5%-8.1%), 4.1%(2.3%-6%), 3.6% (0.8%-6.5%) in those aged 15-24, 25-44, 25-44, and 45-64, respectively [no change in those aged 65] Specific data provided for each country, only Canada shown here: Rate ratio = 1.110 (1.089 to 1.132) = 294 (243-346) excess suicides, not statistically significant for women
De Vogli et al.	2013	Italy	Suicide and attempted suicide cases due to economic reasons in	2000-2010	Time trend analysis comparing trends before and the	Exposure was assessed using a time variable (years), where years 2008, 2009, and 2010	In total, 290 (p=0.006, 95% CI: 112.4 to 467.6) excess suicides and attempted suicides due to economic reasons are attributable to the recession in Italy.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
			the Italian population		recession and after to determine excess number of suicides due to economic reasons occurred during the recession	were considered the recession period.	
Lopez Bernal et al.	2013	Spain	Monthly suicide rate in Spain (72 months = 72 data points)	2005 to 2010	Interrupted time series analysis of monthly suicide rate	The exposure to the financial crisis was assessed based on time: January 2005 to March 2008 = pre-crisis, and April 2008 to December 2010 = post-crisis period The outcome of interest = monthly suicide rate	The underlying monthly suicide rate (i.e. pre crisis) was -0.3% per month (95% CI: 0.995-0.998, p<0.001). The crisis period resulted in an 8.0% increase in suicide rate (95%CI: 1.009-1.156, p=0.03). In absolute numbers, based on this study, the financial crisis could account for 680 of the suicides occurring post-recession until 2010, or 21 suicides per month As a control variable, monthly death rate due to accidental falls was also investigated, and as expected, no significant change in mortality rate was associated with the crisis
Saurina et al.	2013	England	Men and women aged 15 years and over who were recorded as due to intention self-harm or undetermined cause.	1993-2010	Trends in the absolute number of suicides and age-standardized suicide rates from 1993-2010 were assessed using a mixed models (conditional model) approach that takes into consideration variation within the nine regions of England to determine whether statistically significant changes occurred during the recession period.	The impact of the recession was assessed using a time variable (year), where the recession period was defined as between 2008 and 2010. The outcome of interest was suicide measured as number of deaths and age-standardized suicide rates (per 100,000 population)	Although increase in the number of suicides was observed during the recession period, the increase was not statistically significant. With regards to the age-standardized suicide rates, in England, as a whole, no statistically significant change was observed post-recession, however within region variability exists, where some regions displayed an increase, and others a decrease.
Barr et al.	2012	England	Men and women who were recorded as dying due to suicide/undetermined cause	2000 to 2010	Time trend analysis comparing trends before the recession to after the recession to determine excess number of suicides that occurred due to the recession	Time variable (year) [recession period defined as between 2008 and 2010] The outcome of interest was the number of excess suicides	Using historical trends as a baseline, 846 excess suicides (95%CI 818-877) occurred during the crisis period from 2008 to 2010 in men, and 155 excess suicides (95% CI 121-189) in women. Annual 10% increase in # of unemployed men was associated with a 1.4% increase in # of male suicides (95% CI 0.5 to 2.3%). Based on this ~40% of increase in suicides during recession period can be explained by unemployment in men. Associations with unemployment were not significant in women.
Reeves et al.	2012	United States	Suicide mortality rate in all 50 US states	1999 to 2010	Time-trend regression analysis used to compare trends before and after to determine the number of excess suicides that occurred during the recession period.	Time variable (year) [recession period defined as between 2008 and 2010] The outcome of interest was the number of excess suicides	An additional 1,580 suicides per year (95% CI: 860-2300) were observed during the recession period (2008-2010), than would have been observed had pre-crisis trends continued. This value corresponds to a total number of 4750 excess suicides during the recessionary period after 2007 (95% CI: 2570-6920). Further analysis revealed that increasing unemployment accounted for approximately 1,330 out of the 4,450 excess suicides.

Table 3. Studies investigating physical health outcomes

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
Althouse, et al.	2014	United States	Google search trends in U.S.	Jan 2006 to Dec 2011	Modified interrupted time-series: analyzed changes in health-related search queries after the crisis vs. trends before the crisis	Measured as a time variable: executing search query during recession period (between Dec 2008 –Dec 2011) The outcome of interest was various health-related search queries.	26% (95% CI 3%-38%) excess health-related queries took place during recession period compared to trends prior to the crisis. Most increased queries were related to stomach ulcer symptoms (excess of 228%, 95%CI 35%-363%), and headache symptoms (excess of 193%, 95% CI 60%-275%) Combining the top 100-health concern-related queries translate into 205 million excess searches executed during recession period. Excess queries were categorized into the following emerging themes: headaches, hernias, chest-related, arrhythmia, gastric pain, back pain, joint pain, toothache, cancer, congestion, and pregnancy.
Baumbach et al.	2014	Europe	8 single EU countries (Bulgaria, Czech, Finland, Germany, Poland, Portugal, Slovakia, Slovenia)	2000-2010	Mixed approach using ecological and time trend designs (with correlation analysis)	The exposure to the crisis was measured by a proxy measure of economic situation (measured by GDP and unemployment). The outcomes of interest were: overall mortality, suicide mortality, and transport accident mortality.	Overall all-cause mortality decreased throughout study period with no deviation from trends pre-crisis Transport accident mortality declined throughout study period in all 8 countries, with pronounced deviations from previous trends during the crisis period in: Bulgaria, Poland, Slovakia, and Slovenia. Minimum change was -18% in Portugal and maximum change was -52% in Slovenia between 2007 and 2010. A statistically significant relationship was identified for the relationship between unemployment and overall mortality in Finland (p=0.01), Portugal (p=0.0), Poland (p=0.01), Czech Republic (p=0.02), Slovakia (p=0.00), and Bulgaria (p=0.00). When using GDP, no countries had a statistically significant relationship. A statistically significant relationship was identified for the relationship between unemployment and transport accident mortality in: Portugal (p=0.00) and Poland (p=0.03). When using GDP, only Slovenia had a statistically significant relationship.
Li et al.	2014	United States	All cases of acute myocardial infarction diagnosed at two hospitals in New Jersey N = 1,490	2006 to 2012	Data retrieved on all cases were analyzed using primarily the Spearman Rank Correlation Test	The exposure to the crisis was assessed using two proxy measures: unemployment and the Dow Jones Stock Exchange Index. The outcome of interest was the monthly occurrence of acute myocardial infarction cases	Statistically significant correlation between unemployment and the occurrence of acute myocardial infarction was observed for the low-income group only (0.234, p=0.04), but not the high-income group (-0.016, p=0.89). The proxy measure Stock Index was not statistically significantly correlated with acute myocardial infraction occurrence regardless of income group.
Regidor et al.	2014	Spain	Representative of the entire Spanish population using data from national registries and the National Health Survey	1995-2011	Joinpoint regression analysis was used to detect significant changes in time trends by calculating the average annual percent change (AAPC) for 4-year periods	Exposure to recession was considered based on time, where years 2008 to 2011 represented the recession years. The outcomes of interest were: -*Premature Mortality (0-74 years)*, overall and cause-specific -*Prevalence of self-reported*	All outcomes investigated (pre-mature mortality) prevalence of poor perceived health and HIV incidence continued to decline during the recession period (although the decline was not statistically significant for HIV incidence and cancer-specific mortality). In all cases, no outcome declined at a significantly slower rate than that identified during the previous four-year period, and thus no significant changes in the trends of these health indicators over time was observed.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
						poor Health *-Incidence of diagnosed HIV in Spanish Population*	Authors concluded that overall health in Spain continued to improve despite the recessionary period.
Toffolutti et al.	2014	European Union (several countries)	23 European Union Countries	2003 to 2010	Annual time trend data analyzed using linear regression.	Exposure to the crisis was assessed using the proxy measure country unemployment rate The primary outcomes of interest were: All-cause mortality Suicide mortality Cirrhosis & Chronic liver disease mortality Motor vehicle traffic accidents mortality Parasitic infections mortality Alcohol consumption Fruit & vegetable availability	A one percent increase in country unemployment rate is associated with a: 3.4% decrease in all-cause mortality 3.7% decrease in cardiovascular disease mortality 4.1% increase in suicide mortality 9.2% decrease in mortality due to cirrhosis/chronic live disease 11.5% increase in motor vehicle accidents 4.1% decrease in parasitic infections mortality All the above are statistically significant, $p<0.05$ No statistically significant effect was observed between unemployment and alcohol consumption and fruit/vegetable consumption When considering level of social protection, increasing social protection smoothed the effects of the recession in terms of health.
Zhang et al.	2014	United States	National random sample of adults >18 years N = 722, 692	2007 to 2011	Secondary data analysis of three waves of a national cross-sectional survey (2007, 2009, and 2011) using multivariate linear and logistic regression	The exposure variable used in this study was state and county unemployment rate, used as a proxy measure of the 2008-2009 economic recession. The outcome of interest was Body Mass Index (BMI); overweight if BMI ≥25; and obesity if BMI ≥30.	Dichotomous variables of overweight and obesity and their relationship with state and county unemployment rate during each cycle wave were analyzed using logistic regression. ***Risk of Overweight***: State unemployment: 2007, OR=0.87(0.78-0.97); 2008, OR=0.97 (0.83-1.13); 2011, OR=0.52 (0.34-0.78) County unemployment: 2007, OR=1.06 (1.03-1.08); 2008, OR=1.04 (1.03-1.05); OR=1.104 (1.03-1.05) ***Risk of Obesity***: State unemployment rate: 2007, OR=0.93 (0.84-1.03); 2008, OR=0.98 (0.85-1.13); 2011, OR=0.63 (0.39-1.04) County unemployment rate: 2007, OR=1.07 (1.04-1.09); 2008, OR=1.03 (1.02-1.04); 2011, OR=1.04 (1.02-1.05) Interaction test between survey year and unemployment rates revealed that the relationship between state unemployment rates and obesity was significantly reduced after the recession. And that the relationship between county unemployment rates and obesity was stronger before the recession, and weaker after the recession. Similar patterns were observed for men, women and employed persons, but not for unemployed persons. Estimates were adjusted for age, gender, race/ethnicity, income, education, state level GDP per capita, smoking behavior, state dummies, and employment status.
Astell-Burt, at al.	2013	United Kingdom (England, Wales, Scotland, Northern	Men (16-64yr.) and Women (16-59yr.) in the UK	Jan 2006 to Dec 2010	Secondary data analysis of repeated-cross sectional data repeated every 3 months for 20 quarters using multivariate	Exposure was measured as a time variable relative to when the subject completed the survey. The outcome of interest was	Pre-recession from Q1 2006 to Q1 2008, unemployment did not rise, persons reporting poor health decreased by 0.3%, respiratory problems did not change, cardiovascular and increased by 0.2%. From the onset of the recession, Q1 2008 to Q4 2010, unemployment rose by 2.5%, poor health grew by 4.7%, respiratory problems grew by 1%,

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
		Ireland) N= 1, 31, 216 subjects			logistic regression model	self-rated physical health. Secondary outcomes of interest included: cardiovascular health, respiratory health, depression, and mental illness (all outcomes were self-perceived).	cardiovascular problems grew by 0.6%. aOR [poor self health] = 1.38 (1.35, 1.40) in unemployed versus employed. aOR [respiratory problems] = 1.20 (1.16, 1.24) in unemployed versus employed aOR [cardiovascular problems] = 1.05 (1.01, 1.09) in unemployed versus employed In comparing the trends of unemployment over time and the health outcomes over time, it is clear that unemployment preceded the increasing prevalence of health outcomes. To examine potential health inequalities sub-group analysis showed that the increase in poor self-health was slightly higher among people who remained employed versus unemployed, and by those in professional and managerial occupations. There was also variation across regions, with the greatest increases in poor health prevalence not concentrated in regions with the highest pre-2008 prevalence.
Chinta et al.	2013	United States	U.S. population presenting with hospital discharges related to headache	2005 to 2009	Differences in mean and proportions of headache admissions from 2005-2009 were calculated using ANOVA and the Chi-square test	Exposure to recession was measured as time variable (Year 2008 and 2009 = recession, Year 2005-2007 = pre-recession) & Unemployment was also considered. The outcome of interest was headache related hospital admission.	Overall incidence of headache related hospital admissions increased significantly ($p<0.0001$) in recession period compared to pre-recession. During recession period, the age group most affected by higher incidence of headaches: 25-55yrs Women were more affected than men (approximately 75% higher).
Cui et al.	2013	United States	Nationally representative sample of adolescents in the United States, aged 12 to 17 years	2001-2010	Cross-sectional survey data (repeated – 5 waves) analyzed using multinomial logistic regression	Survey year represented exposure to the crisis The primary outcomes of interest were self-rated health, number of physically unhealthy days, mentally unhealthy days, and activity limitation days.	Adjusted percentage of adolescents reporting excellent/very good health in 2009/2010 (51.8% 95% CI: 47.5-56.2) was significantly lower than in 2001/2002 (63.4%, 95% CI: 58.7-68.1) and 2003/2004 (64%, 95% CI: 59.9-68.2). Adjusted percentage of adolescents reporting fair/poor health in 2007/2008 (10%, 95% CI: 7.2-12.8) was significantly higher than in 2003/2004 (5.7%, 95% CI: 4.4-7) Adjusted percentage of adolescents reporting 0, 1-13, or 14+ physically unhealthy days did not change significantly for duration of study.
Eiriksdottir et al.	2013	Iceland	All Icelandic women giving birth to live-born singletons N = 16, 271	Jan 2006 to Dec 2009	Before-after-analysis of time-series data pre-crisis vs. post-crisis using chi-square analysis, linear regression, ANOVA, and logistic regression analyses	Exposure to the recession was measured using a time variable based on when the baby was born: Jan 2006 to Oct 5 2008 = pre-recession and Oct 6 2008-Dec 31 2009 = post-recession. Two primary outcome variables were assessed: birth weight and gestational length (pre-term	Infants born post-crisis weighed 28 grams (average) less than infants born during pre-crisis Rates of infants born with low-birth weight (LBW) increased by 0.5% from pre-crisis to post-crisis (aOR=1.25, 95%CI: 1.02-1.53), adjusting for further mediating intervals results in an non-significant OR. Rates of pre-term born and SGA infants were not statistically significantly different after vs. before the crisis. Statistically significant increased odds of LBW (aOR=1.70, 95%CI: 1.11-2.59) among women who were in their 1st trimester when the crisis began, giving birth in April-June 2009 (6-9 months after onset of crisis)

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
						birth [PB], small for gestational age [SGA]	Statistically significant increases in LBW and SGA (but not PB) were observed among mothers younger than 25 years, non- employed mothers, and those living outside the capital area
Modrek et al.	2013	United States	Healthy employees at an Aluminum manufacturing company that stayed employed ruing the 2008 recession despite downsizing N = 13,393	2010	Cross-sectional data analysis using logistic regression analysis	Exposure was assessed based on whether the employee was working in a plant that experience high lay-offs (large downsizing). The primary outcomes of interest were incident cases of hypertension, diabetes, asthma/COPD, and depression	Increased risk of developing all health outcomes (hypertension, diabetes, asthma/COPD, and depression) was observed, but none reached statistically significance.
Rajmil et al.	2013	Spain	Population younger than 15 years of age in Catalona, Spain N = 4,167	2006 to 2012	A before-after analysis of two cross-sectional surveys (before the crisis compared to after the crisis). Data analyzed using logistic and multiple linear regression	Exposure to crisis was assessed using a time variable based on survey year, Year 2006 = pre-crisis, and years 2010-2012 = post-crisis. The primary outcomes of interest were: overweight/obesity, health behaviour, mental health, and health-related quality of life	Exposure to the crisis was associated with less time spent watching the screen (-0.72, -0.85 to -59), but not to any of the other health behaviours (junk food consumption, physical activity, risk behaviours, and never having breakfast). The crisis period was associated with an increased odds of overweight/obesity, OR = 1.81 (1.18-2.78), and an increased odds of improved health-related quality of life (OR = 4.15 to 7.99), but no statistically significant association with mental health.
Vandoros et al.	2013	Greece and Poland	Persons residing in private households and aged ≥ 16 years from Greece and Poland N = 54,120 (Greece) N = 136,952 (Poland)	2006 to 2009	Quasi-experimental analysis using a difference-in-difference approach of secondary data obtained from nationally representative cross-sectional surveys	Exposure to the crisis was assessed based on where the respondent was located, Greek subjects were considered exposed to the crisis, and Polish subjects were considered unexposed, and exposure was also based on the survey year. An interaction term was used to assess the impact of the recession. The outcome of interest was self-rated health (measuring using a 5-point scale, and then re-coded into a dichotomous variable: poor health versus good health)	Respondents from Greece, compared to Respondents from Poland, had a statistically significant increased odds of reported poor health after the crisis: OR = 1.16, 95%CI: 1.04, 1.29) When stratified by sex: Males, OR = 1.20 (1.03, 1.40) Females, OR = 1.12 (0.97, 1.30)
Burgard et al.	2012	United States	Stratified random sample of employed (excluding self-employed) English-speaking adults aged 25 to 64 years who lived in southeastern	October 2009 to March 2010	Cross-sectional survey designed to assess the impact of the 2008 recession. Bivariate associations were assessed using logistic regression.	To distinguish between those affected by the crisis and those unaffected, the proxy perceived job insecurity was used. The outcome of interest was self-rated health, symptoms of	17.5% of sample reported being job insecure; the population who reported job insecurity were statistically significantly ($p<0.05$) less healthier (increased poor self-rated rate (19.3% vs. 7.1%), increased poor mental health (40.8% vs. 7.3), and increased anxiety (30.0% vs. 9.8%)). Respondents reporting perceived job insecurity had a significantly higher change of being diagnosed with a chronic physical condition within the last three years, being African American, not having at least a Bachelor"s degree, a temporary employee, and report 6 or more

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
			Michigan N=519			major/minor depression, in the past 2 weeks and experiencing an anxiety attack in the past 4 weeks.	months of unemployment. Explanatory Variable: Perceived Job Insecurity Adjusted OR [poor self health] = 2.68 (1.14, 6.32) *Adjusted for age, sex, African American, married/co-habitating, has a child less than 18 years, education, an income-to-needs ratio<2, earlier chronic condition, earlier mental condition, temporary employment, recent unemployment.
Burgard et al.	2012	United States	Stratified random sample of adults aged 19 to 64 years who lived in southeastern Michigan N=894	October 2009 to March 2010	Cross-sectional survey designed to assess the impact of the 2008 recession. Bivariate associations were assessed using logistic regression.	To distinguish between those affected by the crisis and those unaffected, the proxy measure housing instability was used. The outcomes of interest were: poor self rated health, symptoms of minor/major depression in the past 2 weeks, anxiety attack in past 4 weeks, and harmful/hazardous alcohol consumption.	Odds ratios from logistic regression models of poor self-rated health: All respondents, N = 822 Reference Group: Stable Housing Multiple moves in the past 3 years: OR = 1.32 (0.48, 3.64) Moved for cost reasons in past 3 years: OR = 2.64 (0.73, 9.54) Moved in with someone in past 12 months: OR = 1.93 (0.83, 4.47) Homeless in past 12 months: OR = 3.95 (1.17, 13.3) Among rents, N=333 Reference Group: Not behind on rent/Not evicted Behind on rent currently: OR = 2.28 (0.74, 7.01) Evicted in past 12 months: OR = 1.47 (0.30, 7.16) Among respondents currently paying mortgage, N=313 Reference group: Not behind on mortgage or in foreclosure Behind on mortgage/in foreclosure now: OR = 3.09 (1.19, 8.03) Among respondents who ever owned a home, N=517 Compared to those who have not foreclosed, Foreclosed since 2006: OR = 4.23 (0.56, 31.9)
Cannuscio et al.	2012	United States	Voluntary participation in an on-line survey encompassing four states: Arizona, California, Florida and Nevada. N= 798	July 2008	Cross-sectional survey data analyzed using t-tests, Wilcoxon˝s rank-sum test, logistic regression and negative binomial regression	Exposure to the crisis period was assessed using a proxy variable of housing status (homeowners with no strain [comparator], versus: homeowners with moderate straight, renters, and homeowners in default/foreclosure. Primary outcomes of interest included: self-reported health, poor mental health days, psychological distress, and number of symptoms of poor physical health	The prevalence of fair/poor self-rated health, was significantly higher among homeowners in default/foreclosure as compared to owners with moderate strain, and owners with no strain ($p<0.05$), but not compared to renters. The number of symptoms of poor physical health was significantly higher among homeowners in default/foreclosure as compared to renters, owners with moderate strain, and owners with no strain ($p<0.05$)

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
Guojonsdottir et al.	2012	Iceland	Population aged 18 years and older attending cardiac and general emergency department in Reykjavik, Iceland	Week 37 to Week 46 in 2006, 2007, and 2008	Secondary data analysis of electronic health records data. Trends in counts were tested using the chi-square trend test, and overall and gender-stratified relative risk were calculated to reflect ED visits per total population at risk .	Exposure was assessed as a dichotomous time variable: ED visits between Week 37 and 40 of year 2008 were considered unexposed (pre-crisis), and Week 41-46 of year 2008 were considered exposed (crisis period). The outcome of interest was discharge diagnoses of the cardiovascular system, particularly ischemic heart disease, and relevant symptom diagnoses of the cardiovascular system.	Increase in total number of visits to cardiac ED (RR=1.26, 95%CI: 1.07-1.49); when stratified by sex, association is not significant in men, but in women RR=1.41 , 95% CI: 1.17-1.69. [Weeks 41-46 vs Weeks 37-30] Immediately post-collapse (Week 41) was associated with an increase in visits with ischaemic heart disease among women (RR=1.79, 95% CI: 1.01-3.17 (but association was not significant for men) Increases were not observed for general ED visits No significant increases were observed during the 10-week period for either general or cardiac ED in 2006 or 2007
Karatzanis et al.	2012	Greece	Health care records of outpatient ordinary visits to the Department of Otorhinolaryngology at the University General Hospital of Heraklion in Greece	2009 to 2011	Retrospective data analysis of case control study observed during the crisis period compared to the pre-crisis period	Exposure to the crisis was assessed based on the date in which the outpatient visit occurred, if during the first semester of 2009, the case was considered unexposed, and if during the first semester of 2011, the cases were considered exposed. The outcomes (cases) of interest included diagnoses of vertigo, tinnitus, reflux and temporomandibular joint disorder.	There was an increase in the prevalence of all outcomes during the crisis period, however, only statistically significant increases were observed for two of the outcomes: Vertigo: increased from 6.96% to 8.65%, p=0.009 Tinnitus: increased from 1.41% to 2.43%, p = 0.002
Schootman et al.	2012	United States	Women in Missouri aged 25 years and over, diagnosed with first primary breast cancer between June 2006 to June 2008 recruited from a Missouri Cancer Registry N = 1,047	2007 to 2009	Telephone interview data was analyzed using primarily logistic regression analysis	Exposure to the recession was assessed using a proxy measure that measured whether the respondent lived in a neighborhood with high/moderate foreclosure risk (exposed) compared to those who live in a neighborhood with low foreclosure risk (unexposed). The outcome of interest was self-rated health based on a five-point scale, and subsequently re-coded into a dichotomous (poor vs. good) self-rated health variable.	Women who are breast cancer survivors living in a neighborhood with high foreclosure risk were significantly more at risk for poor self-rated health than those residing in a low risk neighborhood (OR = 2.39, 1.83-3.13). The OR was not statistically significant for those in a moderate risk neighborhood. Adjusting for income, physical activity, and perceived neighborhood conditions reduced the observed OR, and therefore were identified as explanatory variables.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
Schwartz et al.	2012	United States	All deaths occurring in the Los Angeles county from 2005 to 2008	2005 to 2008	Daily number of deaths from 2005 to 2008 were converted into a daily death rate (per 100,000 population) and smoothed to show 11-day moving average in daily death rates and analyzed over time.	Exposure to the crisis period was assessed using a variable that assessed exposure to the stock market crash and was measured as the daily death rate during October 2008 (when the stock market crashed. The primary outcomes of interest were: total deaths from all causes, and cardiac deaths (circulatory death, coronary heart disease, and acute myocardial infarction)	After adjusting for seasonality no association between the stock market crash and the daily death rate (all-cause and cardiac-related) was observed
Thompson et al.	2012	United States	Patients admitted to a large academic medical center for decompensated heart failure N = 278	July 1 2006/February 28 2007 to July 1, 2008/February 28, 2009	Patients admitted during the first wave (pre-crisis) are compared to the patients admitted during the second wave (crisis period) and differences between groups are assessed using Student t tests	Exposure to the crisis period is based on when the patient was admitted to the medical center. If admitted between 2006-2007, patient is considered unexposed, if between 2008-2009, patient is considered unexposed. The outcome of interest is heart failure	No statistically significant differences between exposed and unexposed population were identified in terms of heart failure hospitalization rate.
Vijayasiri et al.	2012	United States	Nationally representative sample of the English-speaking United States population, aged 18 years and over N=663	June 2010 to January 2011	Cross-sectional survey data analyzed using Structured Equation Modeling	Exposure to the crisis period was assessed based on a series of economic indicators including: Unemployment/underemployment, problematic employment, home ownership problems, undesirable living situation, inadequate health insurance, and inadequate sick leave. The exposure of interest was somatic symptomatology (measured according to four factors: sleep problems, stomach problems, migraines/headaches, and fatigue/exhaustion). The second outcome of interest was problem drinking.	Home ownership problems, inadequate health insurance, and inadequate sick leave were significantly associated with reporting somatic symptoms, $p<0.05$. The other indicators: undesirable living situation, undesirable work situation, and unemployment/underemployment were not significantly associated. Problematic alcohol use was associated with a higher number of somatic symptoms, but the association was only significant for men not women, suggesting that men self-medicate with alcohol leading to problem drinking, whereas women do not appear to do this.
Zavras et al.	2012	Greece	National random sample of adults > 18 years	2006 to 2011	Secondary data analysis of pooled data from two national cross-sectional surveys	Survey year (2006 vs. 2011) was used to assess exposure to the financial crisis. If respondents took part in the	Prevalence of good/very good self-rated health decreased from 71.0% in 2006 to 68.8% in 2011 ($p<0.05$). A logistic regression analysis was used to assess the influence of different

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
			N = 10 572			2011 survey they were considered exposed. The outcome of interest was self-rated health (measured using a 5-point scale, and then re-coded into a dichotomous variable: poor health versus good health)	variables on self-reported health. The final logistic regression model included: income, education, employment status, age, existence of chronic disease, gender and survey year. The predictive ability of the model was high (McFadden R^2=0.21 and area under ROC curve = 0.80). Exposure to the financial crisis was statistically significantly associated with decreased odds of reporting good/very good self-rated health. (OR=0.88 (0.78-0.99), SE=0.05, p=0.042).
Alley, et al.	2011	United States	Americans > 50 years old	2006 to 2008	Secondary data analysis of two waves of a longitudinal survey using logistic regression	Housing status (mortgage delinquency) (i.e. people who fell behind on their mortgage following onset of financial crisis). The outcome of interest was decline in self-rated health. A decline was considered if subjects reported excellent, very good, or good health in 2006 and declined to either fair or poor in 2008, OR if subject reported fair in 206 and poor health in 2008.	Mortgage delinquent participants showed an increased risk of experiencing a major decline in self-rated health, but association was NOT statistically significant (aOR=1.39, 95% CI 0.52-3.72) Mortgage delinquent participants were significantly more likely to experience incident food insecurity (aOR=7.53, 95%CI 3.01-18.84)
Huang et al.	2011	United States	Infants aged 0-2 years of age admitted to the Trauma Registry at a children″s hospital in Ohio, identified as being admitted for a non-accidental head trauma N= 639	December 2001 to June 2010	Secondary data analysis of hospital database data using Chi-square tests, Fisher exact tests, and Mann-Whitney U-tests to examine monthly incidence of head trauma during the recession period compared to the non-recession period	Exposure to the recession period was assessed using a time variable, where December 2001 to November 2007 was considered pre-recession period, and December 2007 to June 2010 was considered recessionary period. The outcome of interest was non-accidental head trauma monthly incidence rate.	Incidence rate of non-accidental head trauma increased during the recession period from 0.7/month to 1.4/month, representing a 101.4% increase in mean monthly incidence. The increase was statistically significant, p=0.01. There was a decrease in traumas over all and accidental head traumas during the recession period compared to the pre recession period, although the differences were not statistically significant.
Kentikelenis et al.	2011	Greece	Nationally representative sample of the Greek population N = 26, 489	2007 to 2009	Secondary data analysis of cross-sectional survey data using logistic regression analysis.	Exposure to the crisis was assessed using survey year, where year 2009 = exposure to crisis, and 2007 = unexposed. The outcomes of interest included: Poor Self-Reported Health Unmet Medical Care Unmet Dental Care	With Year 2007 as the Reference, Year 2009 (i.e. exposure to economic crisis) was associated with the following outcomes: Unmet Medical Care: adjusted OR= 1.15 (1.02, 1.30) Unmet Dental Care: adjusted OR = 1.14 (1.01, 1.28) Poor Self-Reported Health: adjusted OR = 1.14 (1.02, 1.28) Also of note, The number of people able to obtain sickness benefits declined: adjusted OR = 0.61 (0.38, 0.98)

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
Sargent-Cox et al.	2011	Australia	Participants aged 60 to 65 years at baseline randomly selected for a large longitudinal survey N = 1,973	2005/2006 to 2009-2010 (i.e. two survey waves)	Secondary data analysis of longitudinal survey data using chi-square analysis, t-test, one-way ANOVA, and a latent difference score model to test for differences between both waves of the survey	Exposure variables included a dichotomous outcome asking if participant"s financial security was impacted by the economic downturn. Additional variable such as perceived financial hardship, and the month they responded were also recorded. The outcomes of interest were: -*Depression/Anxiety* measured using the Goldberg Depression and Anxiety Scales -*Self-Rated Health* measured using a five-point scale (excellent, very good, good, fair or poor)	Changes in reporting poor self-rated health were not statistically different from participants who reported no impact from the recession, p=0.59.

Table 4. Studies investigating health behaviour outcomes

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
Asgeirsdottir, et al.	2014	Iceland	Stratified random sample of Icelandic population, 18-79yrs. N=9,807	2007 to 2009	Secondary data analysis of two waves of a longitudinal survey (before-and-after crisis) using fixed-effect regression models	Measured as a time variable: 2009 (exposure to crisis) vs. 2007 (pre-crisis) The outcomes of interest were 11 health behavior variables.	Economic crisis associated with a decrease in the following risky health behaviors: smoking, heavy drinking, consumption of sugared soft-drinks/sweets/fast food, indoor tanning. Economic crisis associated with reduced consumption of fruits and vegetables, and increased consumption of fish oil and getting adequate sleep. Effects of economic crisis were stronger in working age population (25 to 64 yrs.), compared to overall adult population (18-79 yrs.). For the mediation analysis, mediators such as hours of work, real household income, financial assets, mortgage debt and mental health did not substantially mediate the impact on smoking, drinking, or consumption of sugared soft drinks. However, increasing mortgage debt explained the major effect seen on fast food /sweets consumption and indoor tanning. All five mediators considered together reduced the effect of the crisis only for fish oil consumption.
Harhay et al.	2014	England	Representative sample of working age adults (aged 20 to 50 years) of white ethnicity N = 36,525	2004 to 2010	Repeated cross-sectional survey data analyzed using time trend analysis and regression models	Exposure to the recession was assessed using a time variable: survey year (2006/2007=pre-recession; 2008/2009=early recession; and 2010=long-term post-recession) The outcomes of interest were related to various alcohol measures: frequency of drinking, level of drinking, and binge drinking.	Relative to year 2006/2007, in year 2008/2009, there was a decrease in: -Frequent drinking in the past week (4 or more times) from 28.5 to 26.5%, $p<0.001$ -Rate of binge drinking dropped, although not significantly, and then increased during the post-recession year (2010) significantly, $p=0.003$ -Number of units of alcohol consumed on heaviest drinking day declined, $p<0.01$ -Number of days in past week reported drinking declined, $p<0.01$ Although there were declines in overall drinking, specific sub-group (i.e. the unemployed drinkers) showed increased risk of binge drinking during recession years (OR=1.64, 95%CI: 1.22-2.19 in 2009), which did not exist during pre-recession years from 2004-2008.
Kalousova et al.	2014	United States	Stratified random sample of English-speaking adults residing in south-eastern Michigan, aged 19 to 64 years N = 840	2009 to 2011	Secondary data analysis of two waves of a longitudinal survey using logistic regression modeling	Exposure to the crisis was assessed over time, the first survey wave was pre-crisis, and the second survey wave was post-crisis, proxy variables were used to differentiate respondents who were and were not affected by the crisis using the following variables: unemployment, measured and perceived decline in economic resources The outcomes of interest were: tobacco smoking, hazardous alcohol consumption, and marijuana use.	Unemployment was statistically significantly associated with the adoption of tobacco smoking during the economic crisis (HR: 2.34, 1.30-4.23) and marijuana use (HR: 5.31 (1.29, 21.84), but not hazardous alcohol consumption. Measured economic decline was statistically significantly associated with the adoption of tobacco smoking during the economic crisis (HR: 4.99, 1.65-15.08), but not alcohol consumption or marijuana use. Perceived economic decline was statistically significantly associated with hazardous alcohol consumption (HR: 2.75, 1.20-6.27, but not tobacco smoking or marijuana use.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
McClure et al.	2014	Iceland	Stratified random sample of the adult Icelandic population N = 4,100	2007 to 2009	Two waves of longitudinal data analyzed using logistic regression	Exposure to the crisis was assessed using a time variable where the second wave of the follow-up study represented exposure to crisis. The outcome of interest was related to various dental behaviours.	The odds of having at least one dental checkup in the year was increased post-recession: OR=1.11 (1.01-1.23). When stratified by sex, the OR was only significant for men, OR = 1.20 (1.04-1.39). The odds of brushing daily also increased post-recession: OR = 1.40 (1.06-1.87), when stratified by sex, the OR was only significant for males. The odds of flossing daily also increased post-recession: OR = 1.12 (1.01-1.21), when stratified by sex, the OR was only significant for males.
Mulia et al.	2014	United States	Nationally representative sample of the adult population, aged 18 years and over N = 5,382	2010	Cross-sectional survey data analyzed using linear and logistic regression	The exposure to the crisis was assessed using a variable that recorded whether the respondent felt affected by the crisis The primary outcome of interest was related to alcohol consumption and included the following variable: total volume of alcohol consumption, frequency of drunkenness, negative alcohol consequences, and alcohol dependence.	Those affected by the crisis had a greater odds of reporting negative alcohol consequences Adjusted OR = 2.37, $p<0.05$ An increased odds was also observed for alcohol dependence, however the association was not statistically significant after adjustment, Adjusted OR = 1.75, $p>0.0$
Murphy et al.	2014	United States	Nationally representative sample of the adult population, aged 18 years and over N = 5,307	2010	Cross-sectional survey data analyzed using negative binomial modeling	The exposure to the crisis was assessed using a proxy variable: housing instability. Also perceived family support was also used to assess whether it was a significant moderator. The outcome of interest was negative drinking consequences and alcohol dependence	Compared to respondents with stable housing, respondents reporting difficulty paying mortgage/rent or respondents who lost housing were significantly more likely to report negative alcohol outcomes and alcohol dependence ($p<0.05$). However, when perceived family support was included as a potential mediator, it was found that only respondents with low perceived family supported reported a significant association, and not respondents who reported high perceived support.
Toffolutti et al.	2014	European Union (several countries)	23 European Union Countries	2003 to 2010	Annual time trend data analyzed using linear regression.	Exposure to the crisis was assessed using the proxy measure country unemployment rate The primary outcomes of interest were: All-cause mortality Suicide mortality Cirrhosis & Chronic liver	No statistically significant effect was observed between unemployment and alcohol consumption and fruit/vegetable consumption

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
						disease mortality Motor vehicle traffic accidents mortality Parasitic infections mortality Alcohol consumption Fruit & vegetable availability	
Bor et al.	2013	United States	Nationally representative sample of U.S. adults aged ≥18 yrs. N= 2,050,431	2006 to 2010	Repeated Cross-sectional survey data analyzed using OLS regression models	Exposure to recession was assessed using a time variable (survey years 2008 & 2009 were compared to survey years 2006 to 2007). Year 2010 was not included in regression analysis. The outcome of interest was drinking beehaviour, measured by drinking participation, drinking frequency, drinking intensity, total alcohol consumption, and frequency of binge drinking	Prevalence of any drinking declined during recession vs. pre-recession (risk difference =-0.39, $p<0.05$), which when applied to the 2008 population corresponds to 880,000 fewer drinkers (95%CI: 140,000-1.6 million) Prevalence of frequent binge drinking increased during recession (frequency of 5 or more drinks for men/4 or more drinks for women), risk difference = 0.34%, $p<0.01$, which when applied to the 2008 population corresponds to 770,000 more frequent binge drinkers (95%CI: 390,000 to 1.1 million). By 2010, these prevalence changes returned to pre-recession (2007) levels Decrease in light drinking observed, but increase for all other types (abstention, moderate, heavy, frequent binging) Employment status and household income reduced but did not entirely account for the effect of recession period had on drinking outcomes Frequent binge drinker were more likely to be male, under 30, single, non-Black, short-term unemployment, without a college degree, and higher household income Relative to the characteristics that predicted frequent binging prior to the recession, relative increase in odds of frequent binging was observed among 25-34 year age group and 55-59 year age group. This was the only demographic factor that observed a significant change during the recession period.
Colman et al.	2013	United States	Nationally representative sample of household residents, 25 to 55 years of age, N = 62,554	2003 to 2010	Cross-sectional survey data is pooled together and analyzed using various statistical models	Exposure to economic crisis was assessed using a proxy measure of employment-to-population ratio (one-month lagged) The primary outcome of interest was number of minutes spent exercising.	Work-time decreases during the recessionary period, but recreational exercise, TV-watching, sleeping, childcare and housework increases. Overall total physical exertion declined during recessionary period, especially among: low-educated men. The findings of this study also suggest that spouses of individuals affected by unemployment are also affected in terms of physical activity.
Fritjers et al.	2013	United States	Sample of US Google Search Trends	2004 to 2011	Google search trend data was analyzed using linear regression	Exposure to the crisis is assessed using a proxy variable of unemployment. The primary outcome of interest is alcohol	The recessionary period coincided with an increase in Google-related problem drinking searches (20% increase). Unemployment closely correlated with increased Google searches, such that a 5% increase in unemployment leads to an increase in Google-related searches by 15% in the following 12 months.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
						abuse/problem drinking and measured by Google-related searches.	
Gili et al.	2013	Spain	Patients attending primary care centers representative of Spain"s consulting populations	2006 to 2010	Cross-sectional survey data (2 waves) analyzed using multivariate logistic regression modeling to assess changes in outcomes post-economic crisis compared to pre-crisis	Exposure to crisis was assessed using a time variable: Wave 1 (2006/2007) = pre-crisis and Wave 2 (2010/2011) = crisis period Outcomes of interest were: major depression, dysthymia, generalized anxiety disorder, multisomatoform disorder, panic attack disorder, minor depression, alcohol abuse, and alcohol dependence	From 2006 to 2011: Alcohol dependence increased from 0.2% to 2.7% (unadjusted), in adjusted terms this represents a change of 4.6% Alcohol abuse increased from 1.4% to 6.2% (unadjusted) , in adjusted terms this represents a change of 2.4% *Findings are both statistically significant, p<0.0001
Jackson et al.	2013	United States	Nationally representative sample of the U.S. civilian, non-institutionalized population aged 18 years and over with a child-at-home with diagnosed asthma N = 7,845	2008 to 2010	Two waves of cross-sectional survey data analyzed using logistic regression analysis	Exposure to the crisis was assessed using an interaction term that used survey year (2008=pre-crisis, 2010=crisis) to assess whether the association between unemployment and smoking changed between both waves. The primary outcome of interest was smoking status.	In 2008, unemployment was not statistically significantly associated with smoking status among parents with asthma: adjusted OR = 1.26 (0.85, 1.95), but in 2010 (post-crisis), the association between unemployment and smoking status was statistically significant, adjusted OR = 1.80 (1.24, 2.61). Thus the relationship between unemployment and parental smoking during times of economic stress seems to be more apparent, as compared to time period with less economic stress.
Macy et al.	2013	United States	Representative sample of the mid-western US population. N = 3,984	2005 to 2011	Two waves of longitudinal survey data analyzed using logistic regression	Exposure to the crisis was assessed using proxy variables: financial strain, change in working hours, and change in employment status. Also respondents pre-recession 2005 health behaviours were accounted for in the regression to assess the changes in trends post-recession. The outcomes of interest were five health-related behaviours	After accounting for several potential confounders and pre-recession trends of health behaviours, it was observed that higher financial strain resulted in the following associations: Lower likelihood of checking ingredient labels when buying food, p<0.01 Lower likelihood of choosing foods to eat based on health value, p<0.001 Lower frequency of vigorous exercise, p<0.001 Increased likelihood of not smoking on a regular basis, p<0.01 The association of financial strain and not wearing a seat belt was not statistically significant. Note, the other proxy variables: change in working hours, and change in employment status were not statistically significant predictors of health behavior trends.
Nandi et al.	2013	United States	Representative sample of the non-institutionalized US adult population, aged 25 years and over	2003 to 2010	The cross-sectional survey data was pooled together and analyzed using ordinary least squares	Exposure to the crisis was assessed using a proxy variable: the quarterly Metropolitan Statistical Areas and Metropolitan Division	The recession period appeared to coincide with a slight decrease in alcohol consumption; however the associations with other health behaviors were negligible. Overall, this study did not support the overall theory that recessions lead to changes in mortality due to changes in health-related behaviors.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
			N= 944,159		regression modeling	(MMSA) level unemployment rate. The primary outcomes of interest were: self-reported alcohol consumption, smoking, obesity, and exercise	
Zemore et al.	2013	United States	Nationally representative sample of adults aged 18 years and over N = 5,382	2010	Cross-sectional data analyzed using linear and logistic regression	Exposure to the crisis was assessed using a dichotomous (yes/no) variable that asked respondent whether they were affected by the economic crisis. Economic loss was further characterized by asking about job loss; change in hours worked, lost housing and trouble paying rent/mortgage. Race/ethnicity was an important secondary predictor variable to assess for effect modification The primary outcomes of interest were: total volume of alcohol consumed, frequency of drunkenness, negative alcohol consequences, and alcohol dependence	Black and Latino respondents (compared to White respondents) had a statistically significant higher likelihood of reporting an impact from the recession ($p<0.05$). Experiencing severe economic loss (compared to no economic loss) was statistically significantly associated with an increased risk of reporting monthly drunkenness (OR = 1.73, 1.03-2.89) and negative alcohol consequences (OR = 2.54, 1.03-6.25), but the association was not statistically significant for alcohol dependence or total volume of alcohol consumed. Experiencing moderate economic loss (compared to no economic loss) was not significantly associated with higher risk of experiencing any of the problematic alcohol related outcomes. When testing for an interaction between race and economic loss and the association with alcohol outcomes, none of the interaction terms were statistically significant at the $p<0.05$ level, however the results suggested that Blacks experiencing severe economic loss were more at risk of experiencing negative alcohol consequences and alcohol dependence than Whites (OR = 5.16 and OR = 6.08, respectively). And that, Latinos were less at risk of experiencing negative alcohol consequences than Whites (OR = 0.19).
Burgard et al.	2012	United States	Stratified random sample of adults aged 19 to 64 years who lived in southeastern Michigan N=894	October 2009 to March 2010	Cross-sectional survey designed to assess the impact of the 2008 recession. Bivariate associations were assessed using logistic regression.	To distinguish between those affected by the crisis and those unaffected, the proxy measure housing instability was used. The outcomes of interest were: poor self rated health, symptoms of minor/major depression in the past 2 weeks, anxiety attack in past 4 weeks, and harmful/hazardous alcohol consumption.	Odds ratios from logistic regression models of: harmful alcohol use All respondents, N = 822 Reference Group: Stable Housing Multiple moves in the past 3 years: OR = 0.69 (0.23, 2.11) Moved for cost reasons in past 3 years: OR = 0.81 (0.25, 2.60) Moved in with someone in past 12 months: OR = 0.89 (0.44, 1.82) Homeless in past 12 months: OR = 3.45 (1.03, 11.6) Among rents, N=333 Reference Group: Not behind on rent/Not evicted Behind on rent currently: OR = 2.99 (0.45, 20.1) Evicted in past 12 months: OR = 1.00 (0.09, 11.8) Among respondents currently paying mortgage, N=313 Reference group: Not behind on mortgage or in foreclosure Behind on mortgage/in foreclosure now: OR = 0.22 (0.05, 1.06) Among respondents who ever owned a home, N=517

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) – outcome of interest
							Compared to those who have not foreclosed, Foreclosed since 2006: OR = 1.61 (0.19, 13.4)
McClure et al.	2012	Iceland	Stratified random sample of the Icelandic population N = 3,755	2007 to 2009	Prospective cohort study	Exposure to the crisis based on the time period, the second follow-up during 2009 was when the respondent was considered exposed, and a change in income from pre-crisis to crisis period was further used to classify exposure status. The primary outcomes of interest were: perceived stress and smoking behaviour	Statistically significant reductions in smoking prevalence were observed during the recession year among men (17.4% to 14.8%, p<0.01) and women (20% to 17.5%, p<0.01) Men who experienced a drop in income were less likely to relapse into smoking OR = 0.37 (0.16-0.95) Whereas men who experienced a increase in income were more likely to relapse OR = 4.02 (1.15 to 14.00) A drop in income did not have a significant association with smoking relapse amongst women
Richman et al.	2012	United States	Random sample aged 18 years or older and English-speaking, identified using a random digit dial phone survey of the continental United States N = 663	Fall/Winter 2009	Primary data collected via a mail survey and analyzed using multiple regression analyses	Exposure to the crisis was assessed using an overall measure (LCCGR), which was comprised of various variables including: home ownership problems, undesirable living situation, problematic employment situation, unemployment/underemployment, inadequate health insurance, social role constraints, and inadequate sick time. The primary outcomes of interest were related to alcohol drinking behaviors.	A statistically significant relationship between LCCGR and quantity of drinks per day in the past month was observed, but no interaction with gender was observed. For the other drinking outcomes (drinking to intoxication, binge drinking, and past year problem drinking) a significant gender interaction was identified revealing a stronger association between LCCGR and these drinking outcomes in men.
Gallus et al.	2011	Italy	Representative sample of the general Italian population aged 15 years or over, N = 6,248	March-April 2008 to March-April 2009	Secondary data analysis of two waves of a cross-sectional survey, using chi-square analysis	Exposure to crisis was assessed by survey year. 2008 respondents were considered unexposed and 2009 respondents were considered exposed. The primary outcome variable was smoking status.	Compared to 2008, in 2009 there was an increase in the prevalence of overall smoking overall (25.4% in 2009 vs. 22% in 2008, p<0.01). Stratified by sex, the association remained significant for women (p<0.01), but not men (p=0.13) The proportion of ex-smokers decreased significantly overall (p<0.01), and in men (p<0.01) and women (p<0.03). Proportion of never smokers and the number of cigarettes per day did not significantly change overall and when stratified by sex.

Table 5 Studies investigating healthcare utilization/accessibility outcomes

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) - outcome of interest
Burgard et al.	2014	United States	National representative sample of U.S. adults aged 25 to 64 years N= 73,403 to 74, 204 (depending on the outcome measure)	January 2006 to May 2010	Repeated cross-sectional survey data analyzed using logistic regression model to assess bivariate associations between recessionary time period and ethnicity/education with foregone health care as the outcome	The main exposure variables were: Ethnicity/Education & Time period: May 2006 to Nov 2007 = pre-recession; Dec 2007 to Nov 2008 = early recession; Dec 2008 to May 2010 = recession/post-recession period Outcome variables included: frequency of foregone medical visits, dental visits, mental health care, and prescribed medications	Proportion of people reporting foregone medical care, dental care, mental health care, and prescription medication increased during early recession vs. pre-recession, and recession/post-recession vs. pre-recession (all values = $p<0.05$) Disparities related to foregone health care pre-crisis remained the same during early recession and late-recession for most groups except the following: -Disparities in foregone medical care increased between African Americans vs. White during early-recession (vs. pre-recession); disparities in foregone dental care increased between Hispanics vs white during later recession (vs. pre-recession); disparities in foregone dental care increased between those with less than a high-school degree vs. those with a bachelor¨s degree or more during later recession (vs. pre-recession) [only statistically significant changes reported here where $p<0.05$]
Chen et al.	2014	United States	Nationally representative sample of the non-institutionalized, civilian population, aged 18-64 years	2005/2006 to 2008/2009	Two waves of cross-sectional survey data are analyzed using various regression analysis techniques, including logistic regression and quantile regression analysis	Exposure to crisis was assessed using a time variable representing survey year, where respondents participating in year 2008/2009 were considered exposed. The primary outcome of interest was annual health care expenditure per person	Exposure to the recession resulted in a lower likelihood of having any total health-care expenditure (OR=0.88, $p<0.05$), prescription drug expenditure (OR=0.92, $p<0.01$), outpatient expenditure (OR=0.90, $p<0.001$), in patient expenditure (0.90, $p<0.05$), and expenditure on other sources (OR=0.91, $p<0.001$) Exposure to the recession resulted in a significantly higher likelihood of having any Emergency Department expenditure (OR=1.23, $p<0.001$). No significant association was observed between recession and probability of having any spending on physician visit ($p>0.05$). On average lower expenditure was similar amongst all race/ethnic groups, but when analyzed separately along expenditure distribution, significantly higher variability was seen among the lower expenditure distributions.
Kentikelenis et al.	2014	Greece	Nationally representative sample of the Greek population N = 24,177	2007 to 2011	Repeated cross-sectional survey analysis using year 2007 as the pre-crisis reference period and year 2011 as the post-recession exposure year. Data analyzed using logistic regression.	The exposure was assessed using a time variable where respondents in the year 2011 were considered exposed, and respondents in the year 2006 were considered unexposed. The primary outcome of interest was unmet medical need	Exposure to the financial crisis resulted in a statistically significant odds of unmet medical need as compared to pre-recession years: OR = 1.47 (1.30-1.66); the associated remained significant when observing the population younger than and older than 65 years of age. Statistically significant explanatory variables for this observed increase included inability to afford, too far to travel, and “other” reasons.
King et al.	2014	United States	Nationally representative sample of the civilian, non-	2004/2005 to 2009/2010	Two waves of cross-sectional survey data are analyzed using	The exposure to the crisis period was assessed using a survey time (year) variable,	Compared to the pre-recession period, the recession period was associated with a decreased odds of breast cancer screening: OR = 0.82, $p<0.001$ and decreased odds of cervical screening: OR = 0.79, $p<0.001$

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) - outcome of interest
			institutionalized female population aged 50 to 74 years (breast screening population), and aged 21 to 65 years (cervical screening population) N = 10,984 (breast) N = 19,957 (cervical)		multivariate logistic regression analysis	where 2004/2005 respondents were un-exposed, and 2009/2010 were exposed to the crisis. The outcome of interest was breast cancer screening frequency and cervical cancer screening frequency.	The decline in screening for both breast and cervical cancer was most pronounced among white ethnicity, suggesting that whites had a significantly less likelihood of receiving screening than Hispanics during the recession period. The interaction term between race and recession: Hispanics=1.56, p<0.001 (compared to whites) for cervical cancer, and 1.39, p=0.05 (compared to whites) for breast cancer.
Gonzalez-de-Olano et al.	2013	Spain	Population consulting a public hospital in the centre of Spain for an immunotherapy consult. N= 295	2006-2010	Univariate analysis using the chi-square test to compare the exposed and unexposed populations at onset of immunotherapy and after 1 year of treatment. Logistic regression analysis was also used to identifying independent risk factors associated with both exposed and unexposed groups.	Exposure to the crisis period was assessed using a time variable based on when the subject had their initial immunotherapy consult. If in 2006, respondent was considered unexposed, if in 2010, respondent was considered exposed. The outcome of interest was adherence to immunotherapy after 1 year.	One year adherence to immunotherapy to immunotherapy was significantly greater in the pre-recession group, than the post-recession group (78% vs. 67%, p=0.01). When using logistic regression, onset of immunotherapy before the crisis resulted in a better odds of adherence to immunotherapy (OR=1.89, 1.19-2.97, p=0.006).
Mortensen et al.	2013	United States	Nationally representative sample of the civilian non-institutionalized population N = 54.007	2005 to 2009	Repeated cross-sectional survey, data analyzed using negative binomial modeling	Exposure to the crisis was assessed using a time variable, where respondents in survey wave 2008 and 2009 were considered exposed, and respondents in survey wave 2005 and 2006 were considered unexposed. Primary outcomes of interest included: office based physician visits, inpatient stays, emergency department visits and prescription drug fills	***Office-based physician visits***: Compared to the pre-recession period: IRR = 0.93, p>0.05 (not significant) ***Prescription Drug Fills*** Compared to the pre-recession period: IRR = 0.91, p<0.01 ***Inpatient stays*** Compared to the pre-recession period: IRR = 0.90, p<0.05 ***Emergency Department Visits*** Compared to the pre-recession period: IRR = 0.98, p>0.05 (not significant) When an interaction term between survey year and race was introduced, the only significant findings suggests that Hispanics had a larger decrease in the

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) - outcome of interest
							number of physicians vists compared to white respondents (IRR = 0.91, p<0.05).
Dorn et al.	2012	United States	Random sample of nationally representative database of the commercially insured population in the US, aged 50 to 64 years	January 2005 to June 2009	Time-series analysis (segmented regression model) using health insurance claims data	Exposure to crisis was assessed using a time variable: -Jan 2005 – Nov 2007 = pre-recession -Dec 2007-June 2009 = recession. The outcome of interest was rate of screening colonoscopy	Screening colonoscopy rates decreased by 68.9 colonoscopies/1 million individuals/month (95% CI: -84.6 to -53.1; p<0.001). This corresponds to 500,000 fewer screening colonoscopies in the U.S. Persons with high out-of-pocket (OOP) costs pre-recession have lower rates of screening both before and during recession than people with low OOP costs, and they experienced the greatest decline in screening rates during recession (p=0.035)
Alley et al.	2011	United States	Nationally representative sample of the elderly American population, aged > 50 years old	2006 to 2008	Secondary data analysis of two waves of a longitudinal survey using logistic regression	Housing status (mortgage delinquency) (i.e. people who fell behind on their mortgage following onset of financial crisis) The outcome of interest was medication non-adherence; measured by asking if subject took less medication than was prescribed because of cost at any time in previous 2 years.	Mortgage delinquent participants were significantly more likely to experience incident cost-related medication non-adherence (aOR=8.66, 95%CI 3.72-20.16)
Piette et al.	2011	United States	Nationally representative sample of American adults with chronic illness, aged 40 years and above N = 27, 302	2009	Cross sectional survey data analyzed using logistic regression analysis	All patients interviewed were assumed to be exposed to the financial crisis. The primary outcome of interest was related to cost-related non adherence to prescription medication.	Overall this study provides evidence that a greater number of chronically ill patients were experiencing increased difficulties after the economic recession in terms of medication adherence due to cost-related pressures.
Wolff et al.	2011	Canton of Geneva, Switzerland	Population-based representative sample of non-institutionalized residents aged 35 to 75 years. N=1, 579	2008-2009	Descriptive and logistic regression analysis of one cycle of cross-sectional survey data	The survey was conducted during the economic recession; therefore all subjects were "exposed". The outcome of interest was whether participants had renounced health care service for economic reasons during the previous 12 months and whether during the previous 12 months, subject was unable to pay their premiums for	14.5% (229/1579) renounced health care for economic reasons. Of the 229 subjects, 74% renounced dental care, 37% renounced physician consultation, 26% renounced health devices, 13% renounced medication, and 5% renounced surgery. Income showed a negative correlation with renouncement (r=0.18, p<0.001). Each decrease in income level category provided a 48% increased risk of renouncing health care for economic reasons (OR=1.48, 1.31-1.65) During 2008 and 2009, 4.7% of participants declared they were unable to pay their health insurance premiums at least once.

Author	Year	Country	Population	Period	Design	Exposure & Outcome Ascertainment	Main Conclusion(s) - outcome of interest
						economic reasons. Cardiovascular disease and risk factors were also recorded and socio-economic status, and deductible.	

Appendix 3
Re-coding of exposure, covariate, and outcome variables for analysis using SAS

Table 1 Re-coding of exposure measure

CCHS Variable	Concept	Population	Question	Response Codes	Procedure followed to re-code variable
SAM_CP	Sampled Collection Period	All respondents	N/A, variable assigned based on month subject completed survey	YEARMONTH (YYYYMM); for-example January-February 2007 is coded as 200701, and March-April 2007 is coded as 200703	Using Sample Collection Period, an exposure variable 'RECESSION' was created: Recession = 0 [Pre-Crisis], if subject participated in survey between 200701 and 200807 Recession = 1 [Recession Period], if subject participated in survey between 200809 and 200905 Recession = 2 [Stimulus Period], if subject participated in survey between 200907 to 201103 Recession = 3 [Austerity Period], if subject participated in survey between 201105 to 201311 *Dummy variables were used in logistic regression analysis to represent the crisis, stimulus, and austerity periods, with the pre-crisis period as the reference group.

Table 2 Re-coding of demographic and socio-economic measures

CCHS Variable	Concept	Population	Question	Response Codes	Procedure followed to re-code variable

DHH_AGE	Age	All respondents	"What is your age?"	Numeric Variable, Response Code rage: 12 to 101 Years	The age variable was re-coded into 10 year age groups:
					
					`if DHH_AGE=>12 and DHH_AGE<15 then AGE=0;`
					`if DHH_AGE=>15 and DHH_AGE<25 then AGE=1;`
					`if DHH_AGE=>25 and DHH_AGE<35 then AGE=2;`
					`if DHH_AGE=>35 and DHH_AGE<45 then AGE=3;`
					`if DHH_AGE=>45 and DHH_AGE<55 then AGE=4;`
					`if DHH_AGE=>55 and DHH_AGE<65 then AGE=5;`
					`if DHH_AGE=>65 then AGE=6;`
					
					*__Restriction__: Subsequently, respondents less than 15 and older than 64 were removed from the data set.

DHH_SEX	Sex	All respondents	"Is respondent male or female?"	1: Male
				2: Female
					The sex variable was re-coded into a dummy variable as follows:
					
					`if DHH_SEX in (1) then SEX=0;`
					`if DHH_SEX in (2) then SEX=1;`
					`*FEMALE;`

DHH_MS	Marital Status	All respondents	"What is your marital status? Are you married, living common-law, widowed, separated, divorced, or single/never	1: Married
				2: Common-Law
				3: Widowed
				4: Separated
				5: Divorced
				6: Single/Never Married
				97: Don't Know
					The marital status variable was collapsed into a three level variable:
					
					`if DHH_MS in (1,2) then MARITAL_STATUS=0;`
					`*Married/Common-Law;`
					
					`if DHH_MS in (3,4,5) then`

			married?"	98: Refusal 99: Not Stated	MARITAL_STATUS=1; *Widowed/Separated/Divorced; if DHH_MS in (6) then MARITAL_STATUS=2; *Single/Never-Married; *If DHH_MS = 97, 98, 99 then marital status was considered missing and removed from the dataset.
EDUDR04	Highest level of education acquired by the respondent	All respondents	Derived variable based on CCHS Variables: EDU_1, EDU_2, EDU_3, EDU_4	1: Less than secondary school graduation 2: Secondary school graduation, no post-secondary education 3: Some post-secondary education 4: Post-secondary degree/diploma 9: Not stated	The education variable was not re-coded. If EDUDR04 = 9 then the value for education was considered missing and removed from the dataset.

INCDRCA	Household income distribution	Respondents residing in one of the ten Canadian provinces.	Derived variable based on CCHS Variables: INCDADR (the adjusted ratio of the respondent's total household income to the low income cut-off corresponding to their household and community size.	1: Decile 1
				2: Decile 2
				3: Decile 3
				4: Decile 4
				5: Decile 5
				6: Decile 6
				7: Decile 7
				8: Decile 8
				9: Decile 9
				10: Decile 10
				96: Not applicable
				99: Not stated
					The income distribution variable was collapsed into quintiles instead of deciles:
					
					IF INCDRCA in (1,2) then
					INCQUINT=1;
					if INCDRCA in (3,4) then
					INCQUINT=2;
					if INCDRCA in (5,6) then
					INCQUINT=3;
					if INCDRCA in (7,8) then
					INCQUINT=4;
					if INCDRCA in (9,10) then
					INCQUINT=5;
					
					*As of 2011, a method of imputation was derived to account for missing observations. This method was applied to all cycles of the CCHS; therefore there were no missing observations for the income quintile variable.

DHH_OWN	Dwelling ownership – own or rent	All respondents	"Is this dwelling…owned by your or a member of this household or rented (even if no cash rent is paid)?
			
			*In Year 2007, 2008, 2009 and 2010, the question posed was slightly different but with no appreciable effect on the coding or subsequent analysis of the variable.
				1: Owned by you or a member of this household
				2: Rented, even if no rash rent is paid
				7: Don't know
				8: Refusal
				9: Not Stated
					The home ownership variable was re-coded into a dummy variable:
					
					if DHH_OWN in (1) then
					OWNERSHIP=0; *Owned by you or a member of this household;
					
					if DHH_OWN in (2) then
					OWNERSHIP=1; *Rented;
					
					If DHH_OWN=9 then home ownership was considered missing and removed from the dataset.

LBSDWSS	Working status last	Respondents aged 15 to 75	Derived variable based on CCHS	1: Had a job – at work last week	Using variables LBSDWSS and LBSDPFT a variable was created to reflect Employment

	week		Variables: LBS_01 and LBS_02	2: Had a job – absent from work last week
				3: Did not have a job last week
				4: Permanently unable to work
				6: Not applicable
				9: Not stated
					Status with four possible outcomes: Unemployed, Employed Full-Time, Precarious Employment (i.e. Employed Part-Time), and Permanently Unable to Work):
					
					`if LBSDPFT in (1) then employmentType=0; *Employed Full-Time;`
					
					`if LBSDPFT in (2) then employmentType=1; *Precarious Employment;`
					
					`if LBSDWSS in (3) then employmentType=2; *Unemployed;`
					
					`if LBSDWSS in (4) then employmentType=3; *Permanently unable to work;`
					
					*If respondent did not provide a response regarding their working status last week, or distinguish whether they were part time versus full time, then employment type was considered missing and removed from the dataset.

LBSDPFT	Current full-time or part-time status	Respondents aged 15 to 75 who indicated that they were employed	Derived variable based on CCHS Variable: LBSDHPW (usual hours currently worked)	1: Full-Time 2: Part-Time 6: Not Applicable 9: Not Stated	

Table 3 Re-coding of outcome measures

CCHS Variable	Concept	Population	Question	Response Codes	Procedure followed to re-code variable

GEN_02B	Self-perceived mental health	All respondents	"In general, would you say your mental health is: (excellent, very good, good, fair, poor, don't know, refusal, not stated"	1: Excellent
				2: Very Good
				3: Good
				4: Fair
				5: Poor
				7: Don't Know
				8: Refusal
				9: Not Stated
					Variable re-coded into dichotomous Poor Mental Health outcome variable:
					
					`IF GEN_02B in (1,2,3) then MENTALHEALTH=0;`
					`ELSE IF GEN_02B in (4, 5) then MENTALHEALTH=1; *POOR MENTAL HEALTH;`
					
					*If GEN_02B = 7, 8, 9 then Poor Mental Health was considered missing and excluded from the dataset.

CCC_290	Has an anxiety disorder	All respondents	"Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder, or a panic disorder?"	1: Yes
				2: No
				7: Don't Know
				8: Refusal
				9: Not Stated
					Variable re-coded into a dichotomous Anxiety outcome variable:
					
					`IF CCC_290=2 then ANXIETY=0;`
					`ELSE IF CCC_290=1 then ANXIETY=1;*HAS ANXIETY DISORDER;`
					
					*If CCC_290 = 7,8,9 then Anxiety was considered missing and excluded from the dataset.

CCC_280	Has a mood disorder	All respondents	"Remember, we are interested in conditions diagnosed by a health professional. Do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia?"
			**From 2011 onwards, respondents were reminded that the condition should have already lasted or be expected to last 6 months*
				1: Yes
				2: No
				7: Don't Know
				8: Refusal
				9: Not Stated
					Variable re-coded into a dichotomous Mood outcome variable:
					
					`IF CCC_280=2 then MOOD=0;`
					`ELSE IF CCC_280=1 then MOOD=1;*HAS MOOD DISORDER;`
					
					*If CCC_280 = 7,8,9 then Mood was considered missing and excluded from the dataset.

			or more		

GEN_01	Self-perceived health	All respondents	"In general, would you say your health is: (excellent, very good, good, fair, or poor)?	1: Excellent
				2: Very Good
				3: Good
				4: Fair
				5: Poor
				7: Don't Know
				8: Refusal
				9: Not Stated
					Variable re-coded into a dichotomous Poor Health outcome variable:
					
					`IF GEN_01 in (1,2,3) then POORHEALTH=0;`
					`ELSE IF GEN_01 in (4 5) then POORHEALTH=1; *POORHEALTH;`
					
					*If GEN_01 =7,8,9 then Poor Health was considered missing and excluded from dataset

FVCGTOT	Daily consumption – total fruits and vegetables	All respondents	This variable classifies the respondent based on the total number of times per day he/she eats fruits and vegetables	1: Less than 5 times/servings per day
				2: 5 to 10 times/servings per day
				3: More than 10 times/servings per day
				9: Not Stated
					Variable re-coded into a dichotomous Health Eating outcome variable:
					
					`IF FVCGTOT in (2,3) then HEALTHYEATING=1; *EATS 5+ servings per day;`
					`IF FVCGTOT in (1) then HEALTHYEATING=0;`
					
					If FVCGTOT = 9 then Health Eating was considered missing and excluded from dataset

ALC_3	Frequency of having 5 or more drinks	All respondents who answered positively to drinking in the past 12 months or who didn't know or refused to answer	How often in the past 12 months have you had 5+ drinks on one occasion?	1: Never
				2: Less than once
				3: Once a month
				4: 2 to 3 time a month
				5: Once a week
				6: > Once a week
				96: Not Applicable
				97: Don't Know
				98: Refusal
				99: Not Stated
					Variable re-coded into a dichotomous Heavy Drinking outcome variable:
					
					`IF ALC_3 in (1,2,96) then BINGER=1; *Consumes 5 or more drinks on one occasion at least once a month;`
					`IF ALC_3 in (3,4,5,6) then BINGER=0;`
					
					If ALC_2 = 97, 98, 99 then Heavy Drinking was considered missing and excluded from the dataset