

**THREE ESSAYS ON HEALTH ECONOMICS FOR
POPULATIONS WITH VULNERABILITY IN
CANADA**

By

Jing Han

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Department of Economics
University of Manitoba
Winnipeg, Manitoba

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AUTHOR: Jing Han,

M.A. in Economics, University of Manitoba

SUPERVISORS: Dr. Julia C. Witt (Supervisor)

Dr. Evelyn L. Forget

Dr. Rashid Ahmed

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Abstract

This thesis consists of three essays that use empirical analyses in health economics to address various issues related to health status, social and economic determinants of health and utilization of health care resources for populations with vulnerability, in particular immigrants and homeless people in Canada.

The first essay explores the influence of one of the most important social and economic factors - labour force status - on the health outcomes of Canada's immigrants. This paper provides cross-sectional analyses on the marginal responses of self-assessed general and mental health status to an unemployment shock faced by eligible labour force participants drawn from the Canadian Community Health Survey (CCHS) 2010. The results show robust evidence that Canada's immigrant population is much more vulnerable to an unemployment shock compared to their native-born counterparts. Given the detrimental impact of unemployment on the health of immigrants, the need for social policies and strategies that effectively reduce unemployment and create favorable vocational opportunities are necessary to substantially improve immigrants' health and to reduce the effect of these avoidable health expenditures on the Canadian health care budget.

The second essay investigates the roles of various social supports in easing the psychological distress of unemployed immigrants over a ten-year time period by employing longitudinal data drawn from cycles 4 to 9 of the National Population Health Survey (NPHS). Fixed effects and random effects logit models and survival analyses are used in the estimations. The results

suggest that social supports play a fundamental role in reducing psychological distress from unemployment for immigrants compared to matched non-immigrants. The survival trajectories demonstrate that social supports have positive influences on mental health, which significantly ease mental distress from unemployment, especially for the Canadian immigrant population.

The third essay is a systematic study to investigate and identify emergency department (ED) use among homeless people in Canada; in particular, this paper aims to understand and map the main reasons for emergency department (ED) visits and the contributing factors to various ED visit dispositions (especially in-patient admission to hospitalization) following episodes of ED visits. Record-level claim data from the National Ambulatory Care Reporting System (NACRS) during four budgetary years (2009-2010 to 2013-2014) are used for the estimations. The results of the analyses suggest that the main reasons for ED visits by homeless adults in Canada are mental and behavioral disorders, as well as external hazard-related issues, which also predict significantly higher cost of ED visits compared to other general medical causes. However, they are not identified as major causes of medically necessary in-patient hospitalizations for homeless adults in Canada in the multinomial logistic analyses.

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THREE ESSAYS ON HEALTH ECONOMICS FOR POPULATIONS WITH VULNERABILITY IN CANADA

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CHAPTER 1

Health Status, Social and Economic Determinants of Health and Utilization of

Health Care Resources for Immigrants and Homeless People in Canada:

An Introduction

Vulnerable populations are defined as individuals with economic disadvantages; racial and ethnic minorities, the homeless, children, seniors and those with certain health conditions and illnesses. The severity of their vulnerability varies by psychical disparities, lifestyle risk behaviours, social resources, community environments, as well as access to health care services (Aday, 1994). Certain population groups in Canada, such as immigrants and homeless people, are identified to be comparatively vulnerable or at elevated risk for exposure to health related hazards due to various social and economic reasons (Baldwin, 2003; Satcher, 2000; Keppel *et al*, 2000; Frankish, Hwang & Quantz, 2017). Many studies suggest that the health status of these groups deteriorate more rapidly and reactively in response to potential risk factors embedded in the societal environment compared to other population counterparts (Evans, Barer, & Marmor, 1994; Flaskerud *et al*, 1998; Link & Phelan, 1996).

Great efforts have been made over decades to identify, summarize and assess risk factors that affect the health status of Canadian immigrants and homeless people. Among the determinants of health (DOH), the World Health Organization (WHO) emphasizes the important roles of social and economic determinants of health, such as employment/working conditions, social support and connectedness, stable housing, income and social status, on reducing and eliminating health disparities and health inequities between regions and population groups (WHO, 2008). Health Canada also recommends that efforts should be taken to develop policies

focusing on social and economic drivers that affect population health outcomes (Mikkonen, 2010). Raphael (2009) investigates social and economic determinants of health in the Canadian context, and finds that job security, stable housing and financial and income security are the main determinants of health among Canadians, rather than just biomedical or lifestyle-related factors. The uneven distribution of social and economic resources, as well as gaps in the quality of social and economic determinants of health between population groups, result in significant health inequalities in the Canadian society. For vulnerable populations, greater awareness of social and economic determinants of health should be promoted and pertinent public policies should be developed and implemented to effectively and efficiently economize the utilization of health care system resources, to minimize risks and to increase protective factors in our society.

Current public policy interventions mainly focus on addressing socially and economically determined health inequalities from two perspectives: efficiency and equity. Efficiency studies the optimal allocation of resources in the system considering imperfect information and externalities, while equity focuses on the distribution of resources following the notion of justice. In a 2013 WHO report, economic evidence and rationales are discussed to facilitate evaluation of health benefits from multiple cross-sectional policy actions. Following efficiency- and equity-based rationales, the report summarizes the positive effects of intersectoral public policies that include health, education, social safety nets and urban development (housing), which inspire the policy-oriented research and analyses conducted in the following three essays.

This dissertation contributes to the existing literature on systematic evaluations on multiple health domains focusing on general health, psychological health, social and economic determinants of health and utilization of health care resources for immigrants and homeless people in Canada. By employing extensive datasets and comprehensive methodologies, the

research complements findings from existing studies and sheds light on further improvement of efficiency and equity in the health care system.

The first two essays investigate the influence of one of the social and economic determinants of health – employment - on the general and mental health of immigrants in Canada. The first essay (Chapter 2) uses the evidence that Canadian immigrant labour participants are relatively disadvantaged in the Canadian labour market, and that comparatively little is known about the exact impact of this unemployment gap on the general health outcomes of immigrants. Existing literature suggests that unemployment has a negative effect on general and mental health outcomes (Böckerman & Ilmakunnas, 2009; Schmitz, 2011; Salm, 2009; Dyck and Dunn, 2000; Kennedy and McDonald, 2003; Kuhn et al., 2009). However, most of these studies are based on the general population without further investigating the health outcomes of specific groups who are more vulnerable and thus at higher risk of negative effects from their unemployment status. The causal mechanisms and measurement bias underlying the negative relationship between unemployment and health has resulted in debates and controversies among researchers who point out the lack of sufficient consideration of health related self-selection issues and the interpretation of health and labour outcome measures (Browning et al., 2006; Stewart, 2001; Cai, 2010). Thus, the first essay presents a rigorous comparative investigation of the effect of unemployment on various health outcomes (generally and mentally) of Canadian immigrant labour market participants, compared to matched Canadian-born counterparts, controlling the reverse health driven self-selection bias and individual level confounding factors from determinants of health (DOH). The research is implemented by employing survey data from the Canadian Community Health Survey (CCHS) 2010 and an ordered logistic model. The results suggest that the health status of immigrants tends to significantly deteriorate with unemployment

spells or any unfavourable variations in labour market participation in contrast with non-immigrants with similar health and socio-economic characteristics, and controlling for health-related self-selection bias. The results show that unemployed immigrants are 13.6 per cent less likely to report excellent/very good/good health status due to unemployment caused by lay-off or lockout, and are 13.6 per cent more likely to report fair and poor health compared to when they are employed. For their non-immigrant counterparts, the marginal response on health status due to unemployment caused by lay-off or lockout is much less and in the opposite direction (2.5% more likely to report excellent/very good/good health status and 2.5% less likely to report fair and poor health). The results suggest that the experience of immigrants in the Canadian labour market is influential in shaping their health, and this sheds light on the importance of social policy in the aim of improving labour market outcomes and promoting social equity and welfare for Canadian immigrants.

The second essay (Chapter 3) conducts a dynamic comparison to investigate the causal effect of various social supports on easing the psychological distress of unemployment experienced by Canadian immigrants compared to their Canadian-born counterparts. It focuses on answering two questions. First, how does unemployment affect the dynamic trajectories of mental distress of Canadian immigrants versus non-immigrants over time; and second, do social supports play a significantly important role in reducing psychological distress and preventing further deterioration of mental health of Canadian immigrants over time compared to matched non-immigrants? Many studies have examined the influence of unemployment episodes on mental distress and the preventive/buffering effect of social support on easing the associated psychological distress (Ullah, Banks & Warr, 1985; Gore, 1978; Cohen & Wils, 1985; Bjarnason & Sigurdardottir, 2003; Thoits, 1995; McKee-Ryan *et al.* 2005; Ensminger & Celentano, 1988;

Barrera, 1986). However, the causal inference of job loss and the dynamic influence of social support on psychological distress are still unclear. Most of the studies are based on large-scale populations without considering the heterogeneities of social and economic characteristics among specific groups, especially for Canadian immigrants who already experience disadvantages in the Canadian labour market. The purpose of the second essay is to fill these gaps in the literature. The investigation is based on longitudinal follow-up data drawn from cycles 4 to 9 of the longitudinal National Population Health Survey (NPHS) 2000/01 to 2010/11. The results show that various social supports play fundamental roles in easing the psychological distress and reducing the negative effect on mental health caused by unemployment among Canadian immigrants compared to non-immigrants over time, while controlling for reverse health-related self-selection bias. The positive influence of social supports on mental distress caused by unemployment significantly varies in magnitude between immigrants and non-immigrants. For unemployed immigrants, medium to high levels of the social support alleviates the relative risk of experiencing high distress by up to 90% in contrast to an approximately 30% reduction of relative risk for the unemployed non-immigrant counterparts, controlling for other potential contributors. The essay also reports that female and younger immigrants are at higher relative risk to experience psychological distress caused by unemployment. This suggests that more attention should be paid to vocational education programs, public policies and social service interventions that promote the development of stronger community and social networks, especially for these disadvantaged and vulnerable sub-groups of Canadian immigrants.

The third essay (Chapter 4) concerns another population group with substantial vulnerabilities in Canadian society: homeless people who are frequent users and intensive resource consumers in Emergency Departments (ED). Literature documents significantly higher

frequency of ED visits by homeless individuals in contrast to the general population, and most of those visits are repeat visits (Pearson, 2007; Little & Watson, 1996; Han & Wells, 2003; Morris *et al*, 2002). Frequent and unnecessary overutilization of ED resources significantly impairs the efficiency of the system, which results in ED overcrowding, wastes and abuses health care resources (Trzeciak & Rivers, 2003; Bindman *et al*, 1991; D'Amore *et al*, 2001; Oates *et al*, 2009). Existing research also focuses on the risk factors (predisposing, enabling and need factors) driving the frequent ED encounters by homeless people, such as demographic characteristics, income, housing history, criminal/victimization records and chronic conditions (Kushel *et al*, 2002; Olsson & Hansagi, 2001; Padgett *et al*, 1995). Case management programs and alternative solutions, such as supportive housing projects, are advised to target the underlying risks and to reduce ED overutilization by homeless people (Pope *et al*, 2001; Martinez & Burt, 2006; Rodriguez *et al*, 2009).

Literature on ED utilization of homeless people is limited, and there is, in particular, a lack of adequate investigation in the Canadian context. Existing literature studying the experience of homeless persons in ED are often based on qualitative research, questionnaire interviews, experimental studies and randomized controlled trials. However, there is no published nationwide study that systematically examines utilization of emergency departments (ED) among the homeless in Canada. The objective of the third essay is to empirically evaluate ED utilization, ED visit disposition of homeless patients and the incurred corresponding economic costs in the emergency department (ED), using record-level claim data drawn from the National Ambulatory Care Reporting System (NACRS) (2009-2010 to 2013-2014). The results of the investigation suggest that the leading reasons for ED visits by homeless adults in Canada, such as mental illness, behavioral disorders and external hazard, are predicted to significantly increase the cost

of ED visits compared to other general medical causes. However, these are not identified as the main causes for medically necessary in-patient hospitalizations among homeless adults in Canada after controlling for other potentially contributing factors. This implies that policies should be targeted toward addressing underlying risk factors among those exhibiting high rates of ED use and investing in alternative measures to avoid excessive social and economic expenditures incurred by frequent ED service use, such as providing recovery-oriented and client-centered services to promote mental health, harm reduction and social and community integration.

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CHAPTER 2

The Influence of Unemployment on Health Outcomes of Canada's Immigrant

Population: Results from the Canadian Community Health Survey, 2010

Abstract

This paper provides a cross-sectional analysis of the sensitivity of self-assessed physical and mental health status to the unemployment shock faced by eligible labour force participants, using data drawn from the Canadian Community Health Survey (CCHS) 2010. The analysis compares health outcomes between two different population subgroups: immigrants and non-immigrants in Canada. Employing the logit model and economic marginal effects analysis, this paper examines whether unemployment is influential in shaping immigrants' health status and behaviour. The paper finds robust evidence that Canada's immigrant population is much more vulnerable following an unemployment shock compared with native-born Canadians, although the association between unemployment and adverse health outcomes universally exists in the whole sample without controlling for the selection effect. By emphasizing the importance of job security and income stabilization, this paper suggests that the health status of immigrants tends to significantly deteriorate with unemployment spells or any unfavourable variations in the labour market, compared with non-immigrants with similar health and socio-economic characteristics. Considering the detrimental impact of unemployment on health, the need for social policies and strategies that effectively reduce unemployment and create productive vocational opportunities, especially for Canada's immigrants, are necessary to improve their health and to reduce the burden on the health care budget.

Keywords: Canada's Immigrant health; unemployment; self-assessed general health

2.1. INTRODUCTION

On 21 October 2011, the World Health Organization (WHO) adopted The Rio Political Declaration on Social Determinants of Health to discuss the possibility to reduce avoidable, remediable and continuously widening gaps regarding health outcomes across various population groups. Health inequalities associated with social determinants of health has also become an increasing concern in Canada. Among socioeconomic determinants, unemployment/job security is one of the most important factors affecting the health of our population both physically and mentally, especially for certain vulnerable population groups, such as Canada's immigrant population (Bhatti & Hamilton, 1996; Hayes & Dunn, 1998; Hayes, 1994, 1999; Hertzman & Weins, 1996; National Forum on Health, 1997; etc.). According to Annual Demographic Statistics (Statistics Canada, 2010), the Canadian population increased by 129,300 to 34,238,000 in the third quarter of 2010, and 65% of inflows are new immigrants arriving in Canada. Core working-age immigrants (25-54 years old) account for over half of the labour force increase in the Canadian labour market in 2010. As the demographic shift in the labour force continues, mainly caused by population aging and retirement of the post-war baby boom generation, immigrants play a crucial role in filling the required demand in the labour market in the future. Based on statistics of the Canadian Labour Force Survey (2011), if the immigration levels were to continue, almost one in three people in the Canadian labour force could be foreign born by 2031 and immigrants will continue to comprise a significant proportion of new entrants into the labour market. With the expansion of the immigrant population, the health of Canada's immigrant population is a prime concern for researchers and policymakers under current economic challenges.

Despite the contributions immigrants make to the Canadian labour market, the labour force status of immigrants is still in an unfavourable position. Based on figures released by Statistic Canada, in March 2011 there was a 2 to 2.5 per cent gap between the unemployment rate of immigrants and their Canadian-born counterparts. The jobless rate for recent newcomers was at almost 15 per cent, which is much higher compared to the population average. It is widely acknowledged that unemployment, job loss and inferior working environment are normally associated with poor health; therefore, huge disparities in health outcomes could be generated due to this existing gap in income security and job stability between immigrants and Canadian born residents. This could have significant financial implications and present a social burden to the Canadian health care service sector.

In this paper, I use individual-level data drawn from the Canadian Community Health Survey (2010) to investigate the association between unemployment and self-rated health status, both physically and mentally, among Canada's immigrant population, as well as the matched non-immigrant population, to examine whether the disadvantages Canada's immigrants experience in the labour market affects their health more negatively compared with non-immigrants. A number of personal characteristics and socioeconomic factors associated with health conditions will also be considered in the analysis, such as age, gender, education, income level, health related behaviour and other external factors, such as social and community supports. There are two important points I am going to focus on in this paper. One is the rigorous investigation on the exact association between unemployment and self-assessed health status by minimizing the effect of endogeneity bias caused by self-selection issues in the empirical analysis. The second one is the significance level of differences regarding the impact of job loss

on health between immigrants and non-immigrants in Canada by implementing a comparison study.

This paper is organised as follows. The first part will briefly examine the literature on the relationship between unemployment and health, immigrant health issues and the determinants of immigrant health. The second section of this paper will explain the research methodology, data source and the selection of variables. The empirical results will be reported based on the ordered logit regression analysis, hypothesis significance test and marginal effects analysis. The last section of this paper will conclude with a discussion of key results, suggestions for future research and the implications for public health policy for Canada's immigrant population.

2.2. LITERATURE REVIEW

The health of immigrants is a complex issue, which is influenced by multiple factors, such as socioeconomic status of specific groups, personal experience, environment and the economic and social support networks in Canadian society. According to the definition by the World Health Organization Constitution 1948, health is a comprehensive term which includes physical, emotional and social well-being embedded in the context of the social and cultural environment. Prior to an immigrant's arrival in Canada, a self-assessment and selective procedure has already been implemented to choose healthier potential immigrant candidates with competitive physical and financial advantages. Therefore, the majority of immigrants maintain much higher self-assessed health scores during the initial period after arriving in Canada compared with the native-born (Newbold and Danforth, 2003). In order to control the quality of labour force inflow and the health of the population, the existing medical examination system, established according

to Canadian Immigration Health Policy and designed to screen and select admissible immigrant candidates, gives rise to relatively healthier immigrants. This rigorous candidacy medical examination procedure, implemented before the arrival of new immigrants, not only aims to guarantee a healthy and productive labor force for the Canadian economy, but also helps to avoid excessive expenses caused by high social or medical care service demand (Kinnon,1999). Canadian Immigration Health Policy ensures that the initial general health of the majority of new immigrants is good, at least in the short run. However, once immigrants have arrived in Canada, they gradually lose their advantage in health as years of residence in Canada increase. Over time, the health status of immigrants merges with the national average. This phenomenon is called the “Healthy Immigrant Effect” which is documented by the vast volume of literatures (Ali, 2002; Blanton, Rushing, & Ruiz, 2003; Dunn & Dyck, 2000; Hyman, 2001; Gee, Kobayashi, & Prus, 2003; Leclere, Jensen, & Biddlecom, 1994; Stephen et al., 1994; Newbold & Danforth, 2003)

A variety of behavioral, socio-economic and inter-cultural factors have been shown to be key barriers to immigrants receiving health services, and these are mainly responsible for the deterioration of health of new immigrants. These factors include, for example, language proficiency (Aroian, Wu, & Tran, 2005; Bischoof, Perneger, Bovier, Loutan,& Stadler, 2003), cultural shock and sensitivity (Padilla & Villaobos, 2007; Stewart et al., 2006; Wang, 2007), stress while getting accustomed to a new community environment (Aroian et al., 2005; Bader, Musshauer, Sahin, Bezirkan, & Hochleitner, 2006) and increased economic and financial burden (Lasser, Himmelstein,& Woolhandler, 2006). The majority of those barriers to health resources could also stem from the particular conditions of how immigrants go through acculturation and become accepted in the Canadian labor market (Dunn, J., & Dyck, I. 2000). Dyck and Dunn (2000) also point out that socio-economic factors from the labor market, such as

the unemployment rate of immigrants, and income levels of immigrants are much more important in shaping the health status of immigrants than of non-immigrants. Based on the systematic review of pertinent research on immigrant health in Canada by Kinnon (1999), a “determinants of health” approach is introduced to emphasize the impact of income and socio-economic status, employment and working conditions on health outcomes. The disadvantages of immigrants in the labour market could lead to the accumulation of tension and anxiety, which trigger the formation of chronic diseases associated with stress and pressure, as well as corresponding unhealthy coping behaviour, such as alcohol abuse, substance use and risky smoking. Meanwhile, health is the main ingredient to determine one’s work capacity. The accessibility to Canadian public health resources and other social services will influence new immigrant’s health outcomes, which will translate into economic outcomes, such as labor force involvement, labor productivity and work efficiency.

Employment enables satisfaction of basic requirements, which includes not only support for physical needs, but also generates life satisfaction, self-esteem, a sense of achievement and self-realization. Much literature in public health and labor economics document the associations between unemployment and health, however the correlation formats and causal mechanisms underlying the relationship between unemployment and health are still debatable and controversial amongst researchers. Salm (2009) suggests that although the negative association between unemployment and health status is well-established, it still lacks robust evidence that unemployment itself will directly cause the adverse health condition. Freyer-Adam (2011) points out that increased behavior-related health risk factors, such as risky drinking, smoking, substance abuse, are often associated with aggravated unemployment condition. Unemployment spells can lead to unhealthy behaviors and further result in long-term poor health, physically and

psychologically. An important input factor contributing to labor efficiency and productivity, health is a crucial element that employer takes into consideration when hiring. Healthier workers have higher chances of retaining employment compared to those with comparatively poor health or disability (Arrow, 1996; Riphahn, 1999 and Lindholm et al. 2001). Stewart (2001) and Cai (2010) suggest that there a self-selection issue exists as workers with poor health tend to select themselves into unemployment and healthy workers select themselves out of unemployment. Therefore, healthy workers have a better chance of getting a stable job, which promotes the enhancement of health accordingly. On the contrary, workers with poor health may suffer adverse impacts caused by the higher risk of being unemployed. The self-selection issue leads to a loop of causality between unemployment and health status, which results in endogeneity bias in the regression analysis and limits the power of the causality test. Workers in poor health tend to be selected or self-select into unemployment, which increases the possibility of longer unemployment spells and, thus, leads to lower average health status of the unemployed.

In order to accurately capture the correlation between unemployment and health and keep the potential selection effect under control, a number of different approaches documented in the literature could be used as a guide for my research. The first method to control for unobservable factors that could lead to endogeneity bias is to use individual-level panel data in the research analysis. The panel data would control the health-related selection effect and explore the direction of causality via dynamic analysis. Using panel data, Bockerman and Ilmakunnas (2009) find that the negative correlation between unemployment and health is largely driven by the health-related selection issue whereby an unemployment shock reduces health status and leads to a high possibility of unemployment in the future. Using the German Socioeconomic Panel for the years 1991-2008, Schmitz (2011) finds that unemployment is negatively correlated with health,

using fixed-effects methods. However, this negative relationship primarily stems from the unemployed group, which individuals with ill health select themselves into. The second approach to be adopted to control for the reverse health-related selection effect is to use some exogenous factor to restrain the endogeneity in the regression analysis. Several international papers document an efficient method by choosing involuntary reasons for job termination, such as the plant closures, lay-offs or lock-outs, to rule out the reverse health-driven selection issue. By assuming that the plant closures or lay-off is not directly connected with the health of the workers, this approach separates the impact of involuntary unemployment due to plant closure or lay-off on health from the influence of unemployment due to internal reasons, such as ill health or other voluntary reasons, to investigate the actual direction of causality between unemployment and health status. Browning et al. (2006) finds that there is no significant causal effect of unemployment due to lay-off and job displacement on the probability of hospitalization using Danish register data. Schmitz (2011) also failed to find a negative impact of unemployment due to plant closure and lay-off on several health measures, although the negative relationship between unemployment and health exists in the general results, using the German Socio-Economic Panel from 1991 to 2008. Salm (2009) finds no causal effect of involuntary unemployment on different health measures, using the Health and Retirement Study, a panel data only for the American elderly. Kuhn et al. (2009) do not find a short-run impact of unemployment on health care service utilization, but they find that involuntary unemployment increases hospitalizations due to mental health problems, though only for males.

Job loss could normally be associated with increased stress and frustration, especially for immigrants who go through the transition of adapting to their new living and cultural environment in their destination country. Kennedy and McDonald (2003) find that

unemployment, especially a long duration of unemployment, is associated with poor mental health, using the Longitudinal Survey of Immigrants to Australia (LSIA). Clark and Oswald (1994) study the effects of unemployment spells on mental health based on traditional psychological approaches from the patient's utility perspective. Long-term involuntary unemployment can cause a reduction in a person's utility, which leads to severe mental health problems, such as depression, chronic anxiety and other psychological illness. In this paper, I include some self-rated mental health measures in the analysis to evaluate the effect of unemployment on mental health of immigrants versus non-immigrants. The mental health of immigrants is a fairly complex topic, which requires more systematic and comprehensive analyses. Due to data limitations, my research in this paper will only touch the tip of the "iceberg" regarding the mental health of immigrants. Further studies are required to improve the empirical analysis.

2.3. DATA AND METHODOLOGY

2.3.1. Data

Data is obtained from a nationally representative sample of Canadian population who participated in the Canadian Community Health Survey (CCHS) conducted by the Statistic Canada in 2010. CCHS includes micro-level health-related information and socioeconomic information from persons aged 12 years and older who are living in private dwellings in ten provinces and three territories. The sample is created from survey questions in the CCHS (2010) centred on current labour force status, which includes respondents between the ages of 15 and 75, who are currently eligible to be labour force participants. Full time students and retired workers

are excluded from the sample. Respondents from the territories (Yukon, Northwest Territories and Nunavut), which account for 2.60% of the total sample, are also excluded from the selected sample as the characteristics of respondents in the territories differ from the representative features of samples from the provinces. The final sample size is 34,278 observations, which is selected based on the three-stage weighted survey sampling framework described in the CCHS 2010 user guide (Statistic Canada, 2010). The number of immigrants in the sample is 4,886, accounts for 14.3% of the total sample, and of which 1,285 respondents have been in Canada between 0 to 9 years, and 3,601 report more than 10 years of residence in Canada. The size of the non-immigrant population is 29,392, or 85.7% of the total sample size. The confidential micro-level data from 2010 CCHS were accessed at the Manitoba Research Data Centre (RDC) following the approval of the research project by Statistics Canada.

2.3.2. Study Variables

I employ four different self-rated health measures to evaluate the health status of immigrants and non-immigrants. The self-rated health measure documents health status on the day that the interview being conducted, and has been widely demonstrated as a reliable proxy for physical as well as mental health for all population groups (Davies & Ware, 1981; Idler, Kasl & Lemke, 1990; Jones and Schurer, 2011; Saravanabhavan & Marshall, 1994). The first health measure I chose from the CCHS 2010 is self-assessed general health with five levels, ranging from 1 (excellent) to 5 (poor). The second health measure is self-perceived health compared to one year ago to measure whether current health improved or deteriorated compared to the previous year. The measure also contains five levels, ranging from 1 (much better now than one year ago) to 5

(much worse now than one year ago). The third measure is self-perceived general mental health, which also uses five levels, from 1(excellent) to 5 (poor). The fourth outcome measure is self-reported life satisfaction, with levels ranging from 1 (very satisfied) to 5 (very dissatisfied).

The CCHS contains some information about individual-level labour market experience of the respondents in 2010. I select three variables to represent current labour market status, for both immigrants and non-immigrants. The first variable used to capture labour force status is based on the response to the survey question “Did you work at a job or a business at any time in the past 3 months?” If the answer is “Yes” (coded as 1), it means the respondent is currently employed, otherwise, the respondent could be either “unemployed in the past 3 months” (coded as 2) or labour force status is “Not Applicable in the past 3 month” (coded as 3). One limitation of the data is that there is a very obscure line separating unemployed workers from individuals who are out of the labour force in the past 3 months. After I exclude full-time students and respondents who report the reason for not working as “retired”, there are still 12.4% of individuals who answered “Not applicable”, which represent that none of the labour force status in the past 3 months is applicable for the survey respondent. The second independent variable captures labour force status over a longer time period (12 months). Based on CCHS 2010 survey questions, if respondents report that they have been employed in the past 12 months, they should also respond to the question “Have you worked at a job or business at any time in the past 3 months?” Since there is no one reporting “Not Applicable” for the question regarding their labour force status in the past 12 months, then some of the respondents who reported being employed in the past 12 months may have become inactive in the labour market due to various reasons and report their labour force status as “Not Applicable” in the past 3 months. The third independent variable differentiates full time and part time status of the current job.

From an individual perspective, there are many reasons for exiting employment, such as self-resignation, retirement, dismissal, lay-off, lockout, plant closure, etc. Some reasons for job termination are associated with poor health of the respondent, which could lead to endogeneity bias if we include health-related job loss as a regressor in the analysis on self-reported health. In order to control for self-selection bias that ill workers are selected into unemployment and healthy workers are selected out of unemployment, I construct new variables, which are recoded by combining the employment status variables separately with different causes of unemployment. There are a number of international studies in recent literature that use plant closure or mass lay-offs to rule out health-driven selection into unemployment. Salm (2009), Browning (2006), Kuhn (2009) and Schmitz (2011) use plant closures as an exogenous reason to test the pure effect of unemployment on self-assessed health by controlling the self-selection issue. In the CCHS 2010, there is one variable (“LOPG020”) that captures reasons for not working, which are listed as follows. The first reason is health-related job termination, such as chronic physical or mental health diagnosis; owning injuries such as broken bones, bad cut; own infectious disease such as cold and flu. The second reason includes other external causes, such as caring for own children, caring for elderly relatives, maternity and paternity leaves, education and training. Finally, “LOPG020” also includes involuntary reasons for job termination, such as temporary lay-off, strike or lockout, etc. The external reasons temporary lay-off, strike or lockout will be used to generate new binary independent variables combined with the first two explanatory variables related to labour force status in the past 3 months and 12 months. The first four reasons related to health will be used to generate new binary variables to capture unemployment status caused by poor health condition. Other reasons will be used to generate new variables to capture unemployment due to other reasons.

To examine the independent impact of an unemployment shock on physical and mental health, several other individual level variables are included in the multivariate regression analysis to control for the effect of other explanatory factors associated with health status. The selection of these factors was informed by the conceptual framework of “determinants of health” (DOH) summarized from the public health and social science literature. DOH included in the ordered logit regressions are categorized as follows: demographic and socioeconomic factors, such as gender, age of respondent, marital status, household income, main source of household income, educational level of respondent ((Dunn, 2000; Evans & Stoddart, 1990; Wolinsky et al.,1983; Liberatos et al., 1988), living arrangement of the selected respondent (whether respondent has dependents), main languages used to conduct the conversation (Anderson, 1987; Chen et al., 1996; Aroian, Wu, & Tran, 2005; Bischoof, Perneger, Bovier, Loutan,& Stadler, 2003); life style factors, such as type of drinker (12 months), type of smoker, leisure physical activity index (Hayes, 1994; Kinnon, 1999); the social contextual factors, which could significantly influence health outcomes of immigrants based on the findings of some literature, such as sense of belonging to the community and the availability of social support (Aroian et al., 2005; Bader, Musshauser, Sahin, Bezirkan, & Hochleitner, 2006; Berkman & Syme, 1979).

Table 2.1 Variable Definitions

Variable	Definition
Self-perceived health	In general, would you say your health is: 1.Excellent**; 2.Very good; 3. Good; 4. Fair; 5. Poor?
Self-perceived health compared to 1 year ago	Compared to one year ago, how would you say your health is now: 1.Much better now than 1 year ago**; 2.Somewhat better now than 1 year ago; 3.About the same as 1 year ago; 4.Somewhat worse now; 5. Much worse now than 1 year ago?
Self-perceived mental health	In general, would you say your mental health is: 1.Excellent**; 2.Very good; 3. Good; 4. Fair; 5.Poor?
Self-reported level of life satisfaction	In general, would you report your satisfaction with life is: 1. Very satisfied**; 2. Satisfied; 3. Neither satisfied nor dissatisfied; 4. Dissatisfied; 5. Very dissatisfied?
Age	Age is collapsed to 3 categories: 1.15-24 years**; 2.25-54 years; 3. 55-75 years.
Gender	Dummy variable in regressions is 0. Males** vs. 1. Female
Unemployment due to lay-off and lock-out in 3 or 12 months	Independent variable in regression is 1.Employment**; 2. Unemployment due to lay-off and lock-out; 3. Not Applicable (Only for unemployment in past 3 months)
Unemployment due to ill health in 3 or 12 months	Independent variable in regression is 1.Employment**; 2. Unemployment due to ill health condition; 3. Not Applicable (Only for employment status in past 3 months)
Unemployment due to other reasons in 3 or 12 months	Independent variable in regression is 1.Employment **; 2. Unemployment due to other reasons; 3. Not Applicable (Only for employment status in past 3 months)
Part-time or full time work	1. Full-time work**; 2. Part-time work; 3. Not applicable=3.
Marital status	Dummy variable in regression: 0. married/common law**; 1. Widow/Single
Household income and household income source	The survey respondents are asked to match their income level with a list of categories regarding their household income levels from all main sources
Education level	Highest level of education of respondent for both immigrants and non-immigrants.
Living arrangement	Living arrangement to show if there is any dependent individual to respondents.1. Single**; 2.With partner or spouse; 3. Parents with Children ; 4.Other.
English speaking/Non-English speaking	In which language the respondents conduct the conversation for both immigrants and non-immigrants: 1. English or French**; 2. Neither English nor French.
Health-related behaviour and life style	Three category variables describes the health-related behaviour characteristics of the respondents: such as smoking, the habit of drinking and physical activity level
Sense of belonging to the local community	The description of your sense of belonging to your local community. 1.very Strong** 2.somewhat strong, 3. somewhat weak, 4.very weak
Whether receive the social support	1. Receive social support of any kind** 2. Not receive social support

**** First category of each variable is recognized by logit analysis as reference group by default.**

2.3.3. Methodology

Self-assessed health is an ordinal measure; hence ordered logit model is the appropriate estimation method to identify the independent effect of the unemployment shock on self-reported health measures for the two subsamples (immigrants vs. non-immigrants), while the effect of a number of other factors, which were found to be associated with health, were included as controlled variables. The ordered logit model contains an ordered self-reported health status h_i^* which is measured by the respondent but unobserved by the researchers. Respondents report a self-assessed health status of $h_i = j$ if h_i^* falls within the range of two corresponding thresholds. Therefore, the dependent variable h_i could represent all the five rating categories from 1 (Excellent health) to 5 (Poor health). The second dependent variable captures the change of health status of the respondents compared to one year ago, which is represented by another latent variable Δh_i . The third and fourth dependent variables are self-reported mental health and general satisfaction with life, which also contain five ordered ratings from highest level to lowest level. The model is estimated as the following three logit models:

$$P(h_i = j) = \frac{1}{1 + e^{-W_i}} \quad (1)$$

$$P(\Delta h_i = k) = \frac{1}{1 + e^{-W_i}} \quad (2)$$

$$P(m_i = l) = \frac{1}{1 + e^{-W_i}} \quad (3)$$

$$P(sl_i = s) = \frac{1}{1 + e^{-W_i}} \quad (4)$$

$$W_i = \alpha + X_i\beta + E_i\gamma + \varepsilon_i$$

Where h_i , Δh_i , m_i , sl_i are the measures of different types of health or mental related status of an individual i , X_i is a vector of all other independent variables, such as demographic and socioeconomic factors, health-related behaviour characteristics and external influence from the community and society. E_i is the explanatory variable that captures labour force status of individual i in the past 3 or 12 months. If $E_i=0$, the respondent is employed in the past 3 or 12 months. If $E_i=1$, the respondent is unemployed due to various reasons which fall into three categories (lay-off and lock-out, health and other reasons). Marginal effects analysis will be implemented to test how much the probabilities of health getting worse both physically and mentally change by one rating when the respondent moves from employment to unemployment due to various reasons, which are interpreted by $\partial P(h_i = j)/\partial E_i$. Statistics Canada employed a complex, multi-stage, multi-frame survey sampling design to collect information from a sample large enough to represent the Canadian population for the Canadian Community Health Survey (CCHS) 2010. To fully account for the survey design effect and address possible measurement biasness caused by the limited sample size, bootstrap weights in the master data file of CCHS 2010 were used to estimate the standard errors, coefficients of variation, and 95% confidence interval (CIs) in order to increase the statistical power of estimation. All analyses of the data from respondents were weighted based on the probability of each household unit being sampled to reflect the representativeness of the entire target population. Hence, the selected samples from CCHS 2010 in this research fully represent estimated 4,475,602 immigrant and 13,979,399 non-immigrant labor force participants at the population level in 2010. All statistical analyses were conducted using STATA statistical software version 12.0 and a two tail p value < 0.05 was considered statistically significant.

2.4. RESULTS

2.4.1. *Descriptive Statistics*

Table 3.1 shows the weighted relative distribution of explanatory variables across four subsamples: immigrant and Canadian-born residents; immigrants with less than 10 years of residence in Canada and immigrants with more than 10-years of residence in Canada. The table shows that the distribution of age for immigrants is skewed to the elderly group compared with non-immigrants. In general, immigrants as a whole are older than non-immigrants with a larger proportion in the 55-74 age groups and a smaller proportion in the 15-24 age groups. However, immigrants and non-immigrants have very similar proportions in the core working-age group (25-54 years old). New immigrants with shorter time length of residence in Canada are comparatively younger. There is no significant difference in the distribution of gender between the immigrant group and non-immigrant group; however, a larger proportion of immigrants are married or in common-law compared with non-immigrants in Canada. There are very small differences in the distribution of household income between immigrants and Canadian-born residents, but the immigrants are underrepresented at the high income range compared to non-immigrants. There is no significant difference in terms of the distribution of main household income source between immigrants and non-immigrants. Immigrants have significant disadvantages in the labour market, demonstrated by more than 5% higher unemployment in the past 12 months and past 3 months compared with non-immigrants. Even though well-established immigrants with over 10 years of residence in Canada start to get integrated into the Canadian labour market and the unemployment gap between them and Canadian-born residents is smaller, they still face challenges in the Canadian labour market compared with non-immigrants. New immigrants living in Canada less than 10 years are at highest risk of being unemployed with an

almost 10% gap compared with non-immigrants. Differences in educational attainment are also significant between immigrants and non-immigrants. Immigrants have a high proportion in the highest quintile (post-secondary education level), especially among new immigrants, while non-immigrants are overrepresented in the “less than secondary school” and “some post-secondary” categories. Overall, immigrants are more likely to have high educational achievements which are partially caused by self-screening at the time of immigration (Newbold and Danforth, 2003).

Table 3.1 Sample Profiles of Main Socio-demographic Characteristics

	Immigrants (%)	Canadian-born (%)	0-9 years (%)	10+ years (%)
Age 15-24 years	6.7	11.6	12.0	4.4
Age 25-54 years	70.8	69.4	84.9	64.9
Age 55-74 years	22.5	19.0	3.1	30.7
Male	49.3	51.3	48.6	49.6
Female	50.7	48.7	51.4	50.4
Married /common-law	74.3	64.7	76.9	73.1
Single/Widow	25.7	35.3	23.1	26.9
Employed in 3 months	79.1	84.1	72.2	82.0
Unemployed in 3 months	5.1	4.6	6.9	4.3
Not applicable in 3 months	15.8	11.3	20.9	13.7
Employed in 12 months	84.8	89.5	79.5	87.0
Unemployed in 12 months	15.2	10.5	20.5	13.0
Household Income \$0-\$20,000	6.1	6.0	9.1	4.9
\$20,000-39,999	14.2	11.3	20.9	11.4
\$40,000 to \$59,999	15.6	14.0	15.4	15.7
\$60,000 to \$79,999	15.3	14.6	15.4	15.2
\$80,000 or more	31.7	42.4	20.6	36.4
Not Sated	17.1	11.7	18.6	16.4
Employment Income	86.6	86.6	85.1	87.3
EI /welfare	3.3	3.8	3.8	3.1
Senior Benefit	2.1	4.0	0.3	3.0
Other Income	2.2	1.8	2.7	1.9
Not stated	5.8	3.8	9.1	4.7
Less than Secondary School	7.7	11.3	5.9	8.5
Secondary School	17.1	17.1	11.1	19.5
Some post-secondary	4.3	7.1	3.7	4.5
Post-secondary	70.0	63.8	77.7	66.8
Not stated	0.9	0.7	1.5	0.7

2.4.2. Estimation Results

Table 4.1 shows the ordered logit regression estimation results for the four health measurements for immigrants and non-immigrants separately. Due to limitations of cross-sectional data, it is not clear that the estimated coefficients of the unemployment dummies can be interpreted as the causal effect of unemployment on health accurately without isolating unobserved heterogeneity of individuals, which could vary over time. However, I managed to separate health-related selection into unemployment from general job loss to control for the reversed causality issue due to endogeneity (e.g. a health problem could be associated with poor health status and increase the chance of being unemployed). From Table 4.1, it can be seen that involuntary unemployment, which happened in the past three months due to external reasons, such as plant closure and lay-offs, is statistically significantly associated with poor self-rated health only for the immigrant group, significant at 1%. Among immigrants who lost their job (in the past 3 month) due to exogenous factors (plant closure/lay-off), compared to those who are employed, increases the log odds of having poor self-assessed health by 1.121 (other variables remain fixed). The immigrant group tends to report worse health after they are faced with job loss in the past 3 months due to unfavorable labour market conditions. However, for the non-immigrant and total sample, after controlling for health-related selection bias, there is no significant negative effect of unemployment due to plant closure on health. For non-immigrants, the estimated coefficient of the unemployment dummy in the past three months due to exogenous job loss shows that instead of an increase in the probability of health deterioration, the log odds of experiencing a comparatively poor self-assessed health condition actually decrease by 0.402. For the whole sample, there is no significant association between poor health and job loss due to lay-off/plant closure based on the results from the ordered logit regression analysis.

The estimated coefficient of unemployment due to health problems (such as diagnosed chronic physical and mental disease, injury or infectious diseases) shows that there is a significantly positive relationship between unemployment caused by any health problem and poor self-rated health for all individuals from the sample. Individuals with any physical or mental illness have a much higher probability of reporting poor health and simultaneously selecting themselves into unemployment. Hence, the separation of reasons for unemployment plays an important role in isolating endogenous factors due to health-related selection into unemployment to determine the pure association between individual health and labour force status. The estimated coefficient of unemployment due to other reasons, such as caring for children, elderly, temporary exit for training or education opportunities, generally does not cause any significant negative effect on self-assessed health among all individuals in the sample. Unemployment caused by parental care or educational reason is significantly associated with minor improvements in health for both immigrants and non-immigrants. The “Not Applicable” category describes the labour force status of respondents who were employed in the past 12 month but reported their status as “Not Applicable” in the past three months. Since I have already excluded full-time students and retired workers from the sample, those respondents could represent individuals who worked in the past 12 months but exited the labour force in the past 3 months due to unreported reasons. Results from the ordered logit regression show that reporting “not applicable”, compared to being employed, increases the log odds of reporting worse health for both immigrants and non-immigrants. Since the reasons for choosing “Not Applicable” in the past three month are not clear, reverse selection issues due to any other endogenous problems cannot be ruled out.

Relying on plant closures and lay-offs as exogenous reasons for unemployment that are not directly related with respondents' health, the association between unemployment and health can be further identified for the immigrant group and non-immigrant group. Even though there is no significant negative effect of unemployment due to lay-offs and lock-outs on self-assessed health for the whole sample, which is consistent with several empirical findings using data from other countries (Schmitz, 2011; Salm, 2009), the estimated results show a different pattern particularly for the immigrant group in terms of the impact of exogenous unemployment on health. Immigrants have a much higher probability of reporting deterioration in health under the exogenous unemployment shock compared with non-immigrants.

To further test the robustness of the comparative study, I use the Adjusted Wald test on the regression results to test the actual hypothesis that there is no significant difference between the coefficients of the regression models for the immigrant group and the non-immigrant group (See the Appendix 1). The test result shows that, for the coefficients of unemployment due to the lay-off and plant closure, the p-value is 0.0001, which is much smaller than 0.01. Therefore, we reject the hypothesis of equal coefficients and accept that there is significant difference between the coefficients of unemployment caused by lay-offs and plant closures between immigrants and non-immigrants. The p-values for the differences of the coefficients of unemployment due to health and other reasons are 0.60 and 0.78, respectively, which is much bigger than the statistical significance level of 0.05; therefore, we fail to reject the null hypothesis of equal coefficients. The test results support the regression results that unlike non-immigrants, unemployment caused by external factors indeed deteriorates health of immigrants, which leads to high social and economic costs to Canadian society. As for the endogenous reasons for unemployment, immigrants share the same results and patterns as non-immigrants. Except for self-selection

issues of ill individuals into unemployment which cause highly positive correlations between unemployment and poor health, unemployment due to other reasons does not seem to be harmful to the health of either immigrants or non-immigrants.

Life satisfaction is significantly correlated with self-rated health, especially among immigrants. Among immigrants, the log odds of suffering worse health increases by 4.3 as the respondent moves incrementally from “very satisfied with life” to “very dissatisfied with life” . It is possible that immigrants become more depressed and stressed when unemployed, and correspondingly their satisfaction with life decreases sharply. Hence, I use life satisfaction as another dependent variable to investigate how general life satisfaction is affected by having entered unemployment in the past 12 months. The estimated regression results show that the log odds of reporting lower life satisfaction significantly increase for immigrant respondents faced with unemployment due to lay-off and health problems in the past 12 months. The life satisfaction of immigrants is negatively influenced by any deterioration in the labour force status for involuntary reasons (lay-off, lockout) from a period of unemployment, which could affect their mental health. However, the log odds of reporting lower life satisfaction decrease at significance 5% for both immigrants and non-immigrants under the unemployment caused by other reasons (caring for own children, caring for elderly relatives, maternity, paternity, education and training). Unemployment due to these reasons does not significantly affect to the life satisfaction of either immigrants or non-immigrants.

The results show that self-assessed mental health has no statistical significant correlation with unemployment in the past 12 month as reported in Table 4.1. This is in line with Flatau et al., (1998) and Clark and Oswald (1994), who show that only chronic stress, in the sense of periods of persistent stress, has been found to lead to poorer mental health (such as chronic

anxiety or depression). Whether self-assessed mental health is an effective and reasonable measure of actual mental health is debatable. Furthermore, the CCHS only contains unemployment information for 3 months and 12 months, so any unemployment spells outside these time frames are not captured in the data. Many factors increase stress and can lead to poor mental health, such as a poor working environment, or stressful domestic situation. In the cross-sectional data, heterogeneities of individual characteristics can lead to omitted variable bias which weakens correlation between self-assessed mental health and unemployment. Table 4.1 also shows that job termination due to lay-offs and lock-outs in the past 12 months could be associated with deterioration of self-rated general health compared with one year ago for the immigrant group. It is obvious that the longer the workers experience unemployment, the poorer their health will be. Unemployment due to any physical or mental illness is also positively associated with the worsening of health. However, the change of health affected by unemployment due to health problems is comparatively minor given the limitation of considering only a one-year period in the CCHS. Given a longer time period, the impact of health-related unemployment on the change of personal health could be more substantial.

I also checked the significance of the coefficients of other explanatory variables of the Logit regression models reported in the tables. Most of the results are consistent with the findings by Dunn & Dyck (2000), who use the National Population Health Survey. The likelihood of reporting worse health increases with age among both immigrants and non-immigrants, although the gradient is steeper amongst immigrants. For both immigrants and non-immigrants, being female tends to be positively related with good health and higher life satisfaction compared to being male. However, women are more likely to report worse mental health among both immigrants and non-immigrants. Marital status appears to be more closely

associated with life satisfaction. Being single is significantly associated with lower life satisfaction. For both immigrants and non-immigrants, the respondents who report that they are receiving EI or senior benefits tend to have a higher likelihood of poor health. For both immigrants and non-immigrants, there are significant associations between higher income and better self-assessed health. Immigrants from households in a higher income group (\$60,000 to \$79,999 and over \$80,000) are much likely to report higher life satisfaction and better mental health compared with non-immigrants in the same income group. The likelihood of reporting good health increases with educational achievement in both immigrants and non-immigrants. Respondents with more dependents are more likely to report poor health compared with unattached individuals living alone, among both immigrants and non-immigrants. However, there is no clear association between more complex living arrangement and better health this year compared to last year, especially for immigrants. There is also no significant relationship between first official language used in household (“mother tongue”) and the health of both immigrants and non-immigrants. In terms of health behaviours known to influence health status, there is no clear association between the frequency of consuming alcohol and health among all respondents, which is consistent with other literature. However, those who do not smoke regularly are more likely to be in good health, and this is true for both immigrants and non-immigrants. In both immigrants and non-immigrants, those engaged in only moderate or no physical activity, compared to those who were active, were more likely to report fair or poor health.

It is also very interesting to see that the role of community attachment is particularly important in influencing the health of immigrants and non-immigrants. Sense of belonging to local community plays an important role in determining health condition of respondents both

physically and mentally, especially for immigrants. There is a significant positive association between satisfaction with life and physical and mental health for both immigrants and non-immigrants. Overall, the health of immigrants tends to be more significantly influenced by the social determinants of health, compared with the health of non-immigrants. The close bond and connection with the local community play a vital role in determining the health of immigrants.

Table 4.1 Ordered Logit Model results for self-rated general and mental health status

	<u>Rate Own Health Status Poor</u>		<u>Less Life Dissatisfaction</u>		<u>Rate Own Health State Worse than 1 year ago</u>		<u>Rate Own Mental Health Poor</u>	
	<u>Immigrant</u>	<u>Non-immigrant</u>	<u>Immigrant</u>	<u>Non-immigrant</u>	<u>Immigrant</u>	<u>Non-immigrant</u>	<u>Immigrant</u>	<u>Non-immigrant</u>
	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)
Unemployed lay-off	1.121** (0.297)	-0.402* (0.184)	1.839** (0.467)	0.455 (0.574)	1.518**(0.508)	-0.360* (0.329)	0.763 (0.558)	-0.286 (0.317)
Unemployed health	2.118** (0.649)	1.720**(0.282)	1.793** (0.246)	1.213** (0.134)	0.825*(0.422)	0.734** (0.147)	1.685** (0.435)	1.188** (0.134)
Unemployed other	-0.365* (0.196)	-0.303* (0.129)	-0.364* (0.174)	-0.295* (0.122)	-0.269 (0.218)	-0.226* (0.106)	0.038 (0.219)	-0.279** (0.105)
25≤Age<54	0.649** (0.181)	0.156** (0.065)	0.659* (0.207)	0.583**(0.088)	0.207 (0.360)	0.437** (0.080)	0.389* (0.161)	0.354** (0.078)
55≤Age<74	1.150** (0.167)	0.491** (0.081)	0.583** (0.221)	0.537**(0.100)	0.374 (0.356)	0.703** (0.104)	0.463** (0.149)	0.392** (0.106)
Female	-0.041 (0.084)	-0.021**(0.037)	-0.026 (0.081)	-0.233** (0.046)	0.105 (0.129)	-0.055 (0.042)	0.308** (0.094)	0.079** (0.040)
Widow/Single	0.152 (0.203)	0.057 (0.050)	0.514** (0.133)	0.692** (0.063)	-0.372 (0.194)	-0.058 (0.060)	0.140 (0.149)	0.216** (0.066)
EI /welfare	0.705** (0.259)	0.864** (0.134)	-0.319 (0.172)	0.356** (0.131)	0.174 (0.221)	0.305* (0.141)	-0.318 (0.341)	0.426** (0.111)
Senior Benefit	0.757** (0.258)	0.641**(0.108)	-0.009 (0.238)	-0.065 (0.091)	0.349 (0.190)	0.014** (0.102)	0.012 (0.196)	0.071 (0.072)
Other income	-0.211* (0.179)	0.161 (0.161)	0.334 (0.265)	-0.062 (0.136)	-0.281 (0.337)	-0.362 (0.236)	-0.325 (0.284)	0.170 (0.150)
Not Applicable	-0.033 (0.315)	0.069 (0.123)	-0.094 (0.225)	-0.062 (0.136)	-0.256 (0.249)	-0.053 (0.123)	-0.064 (0.245)	0.020 (0.117)
\$20K to \$39K	-0.313* (0.163)	-0.059 (0.102)	-0.474 (0.301)	0.366** (0.135)	-0.313* (0.163)	0.035 (0.119)	-0.312 (0.167)	-0.031 (0.085)
\$40K to \$59K	-0.340 (0.263)	-0.352** (0.110)	-0.693** (0.273)	0.354* (0.120)	-0.340 (0.263)	-0.147 (0.132)	-0.392* (0.176)	-0.311** (0.105)
\$60K to \$79K	-0.272 (0.219)	-0.306** (0.114)	-0.810* (0.404)	0.122 (0.138)	-0.272 (0.219)	-0.174 (0.128)	-0.325* (0.173)	-0.297** (0.095)
\$80K	-0.491** (0.196)	-0.483** (0.111)	-0.892** (0.344)	0.014 (0.143)	-0.491** (0.196)	-0.159 (0.109)	-0.509** (0.188)	-0.450** (0.105)
Not Applicable	-0.434 (0.194)	-0.382** (0.110)	-0.770* (0.359)	-0.009 (0.146)	-0.434 (0.194)	0.107 (0.113)	-0.329 (0.187)	-0.455** (0.124)
Secondary edu.	0.115 (0.189)	-0.192* (0.085)	0.173 (0.222)	0.094 (0.090)	0.115 (0.189)	0.046 (0.078)	0.182 (0.266)	-0.232** (0.070)
Some post-second.	-0.154 (0.188)	-0.163* (0.081)	-0.053 (0.451)	0.216 (0.117)	-0.154 (0.188)	-0.120 (0.091)	0.334 (0.342)	-0.114 (0.109)

Post-secondary | -0.395* (0.193) -0.365* *(0.075) -0.038 (0.194) 0.030 (0.078) -0.395* (0.193) -0.042(0.058) -0.140 (0.253) -0.241** (0.069)

	<u>Rate Own Health Status Poor</u>		<u>Life Dissatisfaction</u>		<u>Rate Own Health State Worse than 1 year ago</u>		<u>Rate Own Mental Health Poor</u>	
	<u>Immigrant</u>	<u>Non-immigrant</u>	<u>Immigrant</u>	<u>Non-immigrant</u>	<u>Immigrant</u>	<u>Non-immigrant</u>	<u>Immigrant</u>	<u>Non-immigrant</u>
	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)	Coeff. Est (S.E.)
Live with spouse	0.023 (0.183)	0.161** (0.058)	-0.124 (0.138)	0.053 (0.075)	0.023 (0.183)	0.183** (0.085)	-0.129 (0.108)	0.139 (0.077)
Live with children	0.079 (0.134)	0.134** (0.058)	0.145 (0.144)	0.032 (0.074)	0.079 (0.134)	0.139* (0.081)	-0.052 (0.119)	0.227** (0.073)
Other	0.066 (0.228)	0.306** (0.106)	0.097 (0.183)	0.145* (0.097)	0.066 (0.228)	0.141 (0.124)	-0.181 (0.116)	0.324* (0.148)
Non English or French	-0.164 (0.259)	0.912 (0.852)	-0.242 (0.172)	0.236 (0.371)	-0.164 (0.259)	-1.618 (1.293)	0.137 (0.257)	1.095 (1.263)
Part-time work	-0.031 (0.149)	0.101* (0.051)	-0.202 (0.117)	0.455 (0.574)	-0.167 (0.148)	-0.030 (0.059)	-0.011 (0.120)	0.132* (0.065)
Not applicable	0.075 (0.198)	0.133* (0.060)	0.002 (0.178)	1.213** (0.134)	-0.105 (0.205)	-0.061 (0.089)	0.025 (0.209)	0.262** (0.055)
Occasional drinker	0.348** (0.153)	0.250** (0.049)	-0.024 (0.107)	0.085 (0.073)	-0.143 (0.089)	-0.119 (0.069)	0.035 (0.111)	0.139** (0.059)
No drink in 12 months	0.115* (0.112)	0.292** (0.090)	-0.099 (0.112)	-0.131* (0.075)	0.113 (0.089)	-0.054 (0.070)	-0.114 (0.085)	0.000 (0.061)
Occasional smoker	-0.123 (0.248)	-0.263* (0.114)	-0.057 (0.285)	-0.222** (0.084)	-0.252 (0.269)	-0.118 (0.124)	-0.166 (0.281)	-0.124 (0.115)
Never smoke	-0.196 (0.135)	-0.534** (0.061)	-0.206 (0.156)	-0.280** (0.064)	-0.251 (0.139)	-0.088 (0.067)	-0.259 (0.149)	-0.295** (0.063)
Moderately active	0.286* (0.154)	0.312* * (0.051)	0.114 (0.123)	0.279** (0.062)	0.113 (0.135)	0.255** (0.044)	-0.067 (0.135)	0.101 (0.064)
Inactive individual	0.489** (0.104)	0.707** (0.068)	0.451** (0.103)	0.487** (0.055)	0.513 ** (0.132)	0.680** (0.044)	-0.087 (0.094)	0.239** (0.051)
Somewhat Strong bel	0.435** (0.114)	0.179** (0.069)	0.350** (0.086)	0.522** (0.048)	0.168 (0.119)	0.086 (0.082)	0.508** (0.117)	0.300** (0.052)
Somewhat weak belo.	0.685** (0.186)	0.317** (0.085)	0.796** (0.165)	0.907** (0.056)	0.420* (0.167)	0.132 (0.081)	0.937** (0.135)	0.541** (0.063)
Very weak belonging	0.682** (0.212)	0.663** (0.094)	0.908* (0.229)	1.169** (0.079)	0.344* (0.161)	0.406** (0.104)	0.793** (0.200)	0.768** (0.077)
Not receive social sup.	0.008 (0.092)	0.061 (0.065)	0.181** (0.070)	0.152** (0.053)	-0.018 (0.121)	0.041 (0.042)	-0.087 (0.076)	0.035 (0.067)

Standard errors in parentheses; *P <0.05 ** P <0.01 Cut-off points for the ordered logit model not presented here

Table 4.2 shows the marginal effects of labour force status on self-rated health, and these will be used to examine the exact impact of unemployment on the shift across health categories for immigrants and non-immigrants separately, after controlling for other context factors and individual characteristics. The results show that unemployed immigrants have a conditional probability of 13.6 per cent less likely to report excellent/very good/good health due to unemployment caused by lay-offs and lock-outs, however for non-immigrants, the direction of the marginal effect of unemployment due to exogenous factors is opposite. Non-immigrants unemployed due to lay-off and lock-out are 2.5 per cent more likely to report excellent/very good/good health, holding all other regressors constant. For immigrants who are unemployed due to external reasons, the conditional probability of reporting fair and poor health is 13.6 per cent compared with when they are employed. Among non-immigrants, the unemployed are a 2.5% less likely to report fair or poor health compared with employed non-immigrants. Due to the cross-sectional nature of the data, the duration of the unemployment and other information related with labour force status are not detailed. However, by holding other regressors at the constant value and separating the influence of self-selection, the results of the marginal effects analysis shows that the immigrant population tends to be more significantly and substantially affected by unfavourable positions in the labour market compared with non-immigrants. Those two sub-samples show the opposite response to job loss and risks in the labour market. It is possible that non-immigrants are more likely to cope with unemployment by replacing work with more leisure and engaging in a healthier life style to maintain good health. However, for immigrants, especially for new immigrants with weak social bonds, being fired or laid off could increase the risk of fair or poor health, which is associated with risky health behaviours, cumulative distress and psychological unease and insecurity.

Table 4.2 Marginal effect of the ordered logit regression: Dependent variable Self-rated health status is rated as Excellent ($\partial P(h_i = j)/\partial E_i$)

Variables	Immigrant		Non-immigrant	
	Marginal Effect	P-value	Marginal Effect	P-value
Hi=1 (Self-rated health status = 1. Excellent)				
Unemployed lay-off(3 month)	-.144 (.023)	0.000	.073 (.037)	0.050
Unemployed health (3 month)	-.200 (.023)	0.000	-.163 (.015)	0.000
Unemployed others (3 month)	.071(.040)	0.079	.054 (.025)	0.032
Hi=2 (Self-rated health status =2. Very Good)				
Unemployed lay-off(3 month)	-.129(.044)	0.003	.015 (.003)	0.000
Unemployed health (3 month)	-.253(.066)	0.000	-.235 (.038)	0.000
Unemployed others (3 month)	.012(.003)	0.000	.014 (.003)	0.000
Hi=3 (Self-rated health status=3. Good)				
Unemployed lay-off (3 month)	.137(.019)	0.000	-.063 (.027)	0.021
Unemployed health (3 month)	.107(.076)	0.160	.153 (.013)	0.000
Unemployed others (3 month)	-.058(.031)	0.057	-.048 (.020)	0.015
Hi=4 (Self-rated health status=4. Fair)				
Unemployed lay-off (3 month)	.098(.035)	0.005	-.020 (.008)	0.011
Unemployed health (3 month)	.226(.082)	0.006	.178 (.040)	0.000
Unemployed other (3 month)	-.019(.009)	0.043	-.016 (.006)	0.009
Hi=5 (Self-rated health status=5. Poor)				
Unemployed lay-off (3 month)	.038(.016)	0.020	-.005 (.002)	0.010
Unemployed health (3 month)	.120(.082)	0.143	.067 (.023)	0.003
Unemployed others (3 month)	-.006(.003)	0.044	-.004 (.002)	0.007

2.5. DISCUSSION

The main results of this study are consistent with the literature on the association between unemployment and self-assessed health, as well as that on immigrant health issues. The contribution of this paper is the focus on investigating the impact of unemployment on the health of a particular population group in Canadian society via a comparison study. The separation of

job loss from unemployment caused any other endogenous factors helps to rule out reverse causality (poor health leads to unemployment) and allows the exploration of the actual impact of unemployment on health separately for immigrants and non-immigrants. The empirical results show that the health status of Canada's immigrants is much more sensitive and vulnerable to any socio-economic change compared with Canadian-born residents, especially any unfavourable changes about labour force status which may affect income security and job stability in Canadian society. The labour market experience of immigrants is influential in shaping their health, which is particularly important to policy-makers who aim to promote social equity and welfare. If immigrants suffer from an unemployment spell, especially during their first years after immigrating to Canada, this could undermine the aim of cost minimization of health policies and create substantial social and financial burdens to Canadian health system.

This paper contains several shortcomings and study limitations which are points for future research. The first limitation is the imperfect measure of health. Although self-assessed health is a universally recognized measure of actual health, there could be bias generated in the process of assessment, especially for immigrants, that is characterized by their unique personal experiences, diversified cultural and ethnic backgrounds and major changes coming from integration and adaptation. The stress of migration combined with the anxiety caused by unemployment could exaggerate their recognition of the harms of unemployment and lead to bias in self-reported health. This case also holds for the measurement of self-rated mental health. In this paper, I use life satisfaction as another variable to try to capture the psychological condition of the respondents differently. However, this measure still poses many problems and limitations in terms of the objectivity and the selected time scope. Therefore, introducing other objective and direct measures of health status (Tausman and Rosen, 1982), especially for the measure of

mental health, is essential for future research. The second limitation is that the survey data does not provide detailed labour market information, such as underemployment, the duration of unemployment, occupation and information related with the out-of-labour force category. Underemployment refers to insufficient labour utilization when workers suffer involuntary part-time work or are over-qualified for their job, which is also a serious issue among Canada's immigrant population. The CCHS data only contains very limited information about immigrant characteristic, such as the length of the residence in Canada since immigration (and only contain two categories: less than 10 years and more than 10 years), immigration classes, origin country of the respondent and their ethnic background. The Longitudinal Survey of Immigrants to Canada (LSIC) and the National Population Health Survey (NPHS), which contain more detailed and sufficient information, should be considered to support further investigation of the economic and social determinants of immigrant's health. The third limitation is the small sample size due to control of health-driven self-selection bias in this comparative analysis, which limits the statistical power of estimation and results in increased probability of a Type II error. The fourth limitation of this paper is related to the research methodology and the model used to test the direction of causality between unemployment and health. There are other methods which could be used to eliminate the endogeneity problem due to selection bias. Introducing an instrument variable could be one option to address this. The use of panel data and econometric methods with random and fixed effects could facilitate a more comprehensive examination of the direction of causality, as well as control for unobserved heterogeneity correlated with independent variables across the observations with various characteristics. A multinomial logit model is another method to examine the direction of causality of the impact of the unemployment shock on health across different waves of longitudinal data (NPHS is preferable). The covariate analysis could be

introduced at last to examine the level of the association of unemployment with chronic disease and mental ailments as supplementary analysis.

2.6. CONCLUSION

The reason why Canada's unemployed immigrant workers report worse health outcomes than native born workers is a complex issue, which requires collaboration of government, health sectors, immigrant communities and economic units in the Canadian labour market to facilitate and expedite narrowing the gap between native-born and immigrant populations. Canada's immigrants face many challenges while they adapt to the native labour market, as well as to new cultural and economic environments. Immigrants, especially new immigrants, are exposed to more risks due to, for example, the lack of social welfare protections, such as EI and unemployment compensation benefits, which results from less work experience in Canada. Unemployment is always strongly associated with risky health behaviours, which cause health problems and further lead to a worse position in the labour market. The built-up stress, the feeling of frustration and financial insecurity caused by unemployment, combined with the additional uneasiness arising from the transition to a new country compound the deterioration of immigrants' health. This research suggests that policies that help improve labour market outcomes and promote the accumulation social capital of immigrants should be implemented in conjunction with public health policies to address health problems caused by risky health behaviours caused by unemployment, in order to reduce overall health care costs and relieve the financial burden to the government. The following discussion summarizes pertinent policy recommendations.

First, public policies focusing on better recognition of foreign credentials and work experience of immigrants should be promoted to help new immigrants integrate into the Canadian labour market, especially for new, skilled immigrants who enter Canada under the Federal Skilled Worker or Provincial Nominee Programs (PNPs). The results of this research show much lower health status of immigrants associated with unemployment compared to matched Canadian-born counterparts, although comparatively higher educational achievements are observed in immigrant respondents in the sample. Thus, designing policies to help immigrants adapt their skills, professional qualifications and employment experience to fit the specific demand of Canadian employers. Community based training, career driven education programs and alternative vocational training courses in the private sector should be considered as measures to improve labour market and health outcomes of Canadian immigrants.

Second, the policies should be enhanced to address the underlying risk factors that affect labour market outcomes of immigrants, such as language barriers, cultural adaptation and recognition, lack of social capital, and minimal involvement and attachment to the community. The uprooting process of immigration creates isolation and separation from social capital in the destination country, which results in negative labour market outcomes and exacerbation of poor health (Ross & Mirowsky, 1995; Wilkins, 1996; Raphael, 2004). Thus, settlement services should be designed to promote the accumulation of social resources and a connection to the Canadian job market (eg. job search services, English as a Second Language (ESL) program, community based leisure and recreational programs, ethnocultural community activities).

Third, during unemployment, the loss of income may result in financial strain and hardship, which affects health outcomes. Thus, social and employment welfare arrangements with financial and economic support for disadvantaged newcomers to Canada could be potential

measures to prevent the deterioration of health outcomes of Canadian immigrants. However, economic evaluation and evidence-based researches that measures cost-effectiveness and cost-benefit of alternative policy interventions should be taken into consideration.

My future research will investigate dynamic evolution of immigrants' health as they gradually integrate into the Canadian labour market and how the unemployment "shock" shapes the health of immigrants over time. I hope that, by examining the dynamic effect, I could explore how much the social and economic determinants, especially those related to immigrants in the Canadian labour market, help explain the deterioration of the "Healthy Immigrant Effect" of immigrants.

APPENDIX

(1) Adjusted Wald test of the difference of the coefficients of the unemployment due to lay-off and plant closure in 3 months or 12 months for immigrants and non-immigrants models

Ho: [reggen_gen_01]_Iemploy03l_1 - [reggen1_gen_01]_Iemploy03l_1 = 0

F(1, 87) = 16.06 Prob > F = 0.0001 : **Reject the null hypothesis Ho.**

Ho: [reggen_gen_02]_Iemploy12l_1 - [reggen1_gen_02]_Iemploy12l_1 = 0

F(1, 87) = 10.36 Prob > F = 0.0018 : **Reject the null hypothesis Ho.**

(2) Adjusted Wald test of the difference of the coefficients of the unemployment due to any chronic physical or mental disease or injury or infectious disease in 3 month or 12 months for immigrants and non-immigrants

Ho: [reggen_gen_01]_Iemploy03h_1 - [reggen1_gen_01]_Iemploy03h_1 = 0

F(1, 87) = 0.27 Prob > F = 0.6024 : **Fails to reject the null hypothesis Ho.**

Ho: [reggen_gen_02]_Iemploy12h_1 - [reggen1_gen_02]_Iemploy12h_1 = 0

F(1, 87) = 0.04 Prob > F = 0.8362 : **Fails to reject the null hypothesis Ho.**

(3) Adjusted Wald test of the difference of the coefficients of the unemployment due to other reasons in 3 months or 12 months for immigrants and non-immigrants

Ho: [reggen_gen_01]_Iemploy03o_1 - [reggen1_gen_01]_Iemploy03o_1 = 0

F(1, 87) = 0.07 Prob > F = 0.7874 : **Fail to reject the null hypothesis Ho.**

[reggen_gen_02]_Iemploy12o_1 - [reggen1_gen_02]_Iemploy12o_1 = 0

F(1, 87) = 0.03 Prob > F = 0.8660 : **Fail to reject the null hypothesis Ho.**

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CHAPTER 3

The Influence of Social Supports on Reducing Psychological Distress of Unemployed Canadian Immigrants: A Longitudinal Study based on the National Population Health Survey (2001-2011)

Abstract

With the growing immigrant population, the mental health of Canada's immigrants is of concern for researchers and policymakers, especially given limited healthcare budgets. Using longitudinal data drawn from cycles 4 to 9 of the National Population Health Survey (NPHS) 2000/01 to 2009/10, this essay investigates the roles of various social supports in easing psychological distress from unemployment experienced by immigrants in Canada compared to non-immigrants over a ten-year time period. Both fixed effects and random effects logit models and survival analyses are utilized in a dynamic comparison and robustness check by addressing the estimation bias caused by an initial value problem of health and other exogenous variables. This essay finds evidence that various social supports play a fundamental role in easing psychological distress and controlling the deterioration of mental health caused by unemployment among Canadian immigrants compared to non-immigrants over time, while controlling reversed health-related self-selection bias. The survival trajectories demonstrate that the positive influence of social supports on reducing mental distress caused by unemployment significantly varies in magnitude between immigrants and non-immigrants. The results also show that female and younger immigrants are at higher relative risk for experiencing psychological distress caused by unemployment. This suggests that more attention should be paid to these in vocational education programs, public policies and social service interventions, which promote

the development of stronger community and social networks, especially for these disadvantaged and vulnerable sub-groups of Canadian immigrants.

Keywords: psychological distress; unemployment; Medical Outcomes Study Social Support Scale (MOSSS); Social Determinate of Health (SDH), health equality, immigrant's health

3.1. INTRODUCTION

Unemployment and social supports are crucial social determinants of health (SDH), which are recognized by the World Health Organization (WHO) as an integral part towards reducing health inequality and improving quality of physical and mental health in the post-2015 Sustainable Development Goals agenda¹. The Canadian Mental Health Association (CMHA) also emphasizes the significant role of employment and social supports on promoting psychological and emotional well-being. Nationally, health inequality driven by the expanding gap of SDH across population groups has become an aggravating issue that is increasingly supported by evidence (Wagstaff & Doorslaer, 2003; Frohlich et al., 2006; De Maio & Kemp, 2010; Premji & Shakya, 2017) especially for underprivileged groups (e.g. immigrants and ethnic minorities).

Challenging economic conditions in recent years were felt in the Canadian labour market, where the general unemployment rate of 6.1% in 2008 rose to 8.3% and 8.0% in 2009 and 2010, respectively (Statistic Canada, 2011, Labour Force Survey). Although the rate stabilized at

¹ In September 2015, the new post-2015 development agenda – a global plan of action for the next 15 years was formally adopted at United Nations Headquarters in New York. WHO, UN and all partner organizations recommit to the 17 Sustainable Development Goals (SDGs) and 169 targets demonstrate the scale and ambition of this new agenda.

around 7.0% since 2011, there is a noticeable unemployment gap between immigrants and Canadian-born workers and the disparity varies drastically across demographic factors, duration of residence and socioeconomic status. The unemployment rate gaps range from 2 to 8.1 percentage points between core-aged immigrant groups and their Canadian-born counterparts, based on data released by Statistic Canada in 2011². Very recent immigrants represent the most vulnerable group in the Canadian labour market with highest unemployment rate and gap over all years. Even for established immigrants with residence duration of more than 10 years, there is still a lack of evidence that the unemployment gap between them and their Canadian-born counterparts is narrowing.

As one of the top immigrant destinations, Canada continuously attracts skilled economic immigrants from all over the world. Immigrants make important contributions towards filling demand in the labour market. However, immigrants face a multitude of challenges in the settlement and transition process. Challenges emerge from acculturation, development of language proficiency, recognition of educational and professional credential, etc., and impede smooth integration of immigrants into the Canadian labour market. It is widely acknowledged that unemployment/joblessness is normally associated with lower levels of psychological well-being (e.g., Erikson,1959; Seligman,1975; Warr,1987; Jahoda 1981; Kanfer *et al.*, 2001; McKee-Ryan *et al.*, 2005). Inequalities in mental health triggered by comparatively higher unemployment rate of vulnerable immigrant groups have raised substantial concerns and drawn considerable attention from public health sectors and public health researchers around the world

² Statistics Canada documents the percentage-point difference between the unemployment rate for each immigrant group (very recent immigrants, recent immigrants, established immigrants) and the rate for the Canadian born aged 25 to 54, 2011.

(e.g., Hollander, 2013; Benach *et al.*, 2012; William & Collins, 1995; Williams, Yu, Jackson & Anderson, 1997).

Another key factor of SDH that has been extensively researched is the important role of social supports in improving psychological well-being as a “springboard” or “cushion”, especially for new immigrants and other underprivileged population groups who face multiple barriers to acquire and obtain social capital accumulation (e.g. Simich, Beiser, Stewart & Mwakarimba, 2005; Furnham & Shiekh, 1993; Ritsner, Modai & Ponizovsky, 2000). Social supports in general include not only multiple tangible social material assistances, but also intangible, emotional and affectional support, experienced subjectively by individuals from certain community and societal background. Higher levels of social support normally promote active involvement and participation of newcomers in the labour market of their destination country, which could significantly ease and alleviate psychological distress in the transitional period of immigration and further prevent occurrences of major mental disorders or psychological depression to improve the overall wellness of the immigrant population.

In this paper, I use individual-level data drawn from the last six cycles of the strictly longitudinal National Population Health Survey (2000-2011) to conduct a dynamic comparison and survival study to investigate the effect of social supports on easing mental distress and promoting psychological well-being of immigrants. I am also interested in plotting the mental health trajectories of Canada’s immigrant groups compared with matched non-immigrant groups in response to an unemployment shock and how social supports alleviate and control the deterioration of mental health. There are two important points I focus on in this paper. One is the rigorous investigation on the causal effect of involuntary unemployment on mental health outcomes by minimizing the influence of endogeneity bias caused by self-selection issues in the

empirical analysis. The second one is to plot the survival trajectories regarding the influence of various social supports on moderating mental distress from unemployment for Canadian immigrants versus non-immigrants by implementing a comparison study. Results will be applied to policy development with the aim of promoting social equity and welfare as well as reducing the social and financial burdens to the Canadian healthcare system.

This paper is organised as follows. The first part briefly examines the literature on unemployment and psychological distress, immigrant mental health issues and the role of social supports in various dimensions. The second part explains the research methodology, data source and the selection of variables. The empirical results are based on the dynamic regression analyses, hazard and survival analyses and analyses of marginal effects from the survival model. The last section of this paper concludes with a discussion of key results, suggestions for future research and the implications for public health policy for Canada's immigrant population.

3.2. LITERATURE REVIEW

A wide range of empirical studies have examined the effect of unemployment on mental health, and these are based on both cross-sectional and longitudinal data. The negative psychological effects of job loss are well-documented in the literature, and are often referred to as a "Depressive Effect". It has been shown that unemployment triggers distress, anxiety, frustration, mental disorders and depression, which have a negative effect on individuals' psychological well-being and induce risky behaviour, such as substance abuse, suicide, domestic violence, etc. (O'Brien, 1986; Warr, 1987; Murphy & Anthanasou, 1999; Linn et al., 1985; Pharr et al., 2012; Goldsmith et al., 1997; Clark & Oswald, 1994; Winefield & Tiggemann, 1990).

Several studies examined the causal mechanism and potential factors that affect the impact of unemployment on mental health (Breslin & Mustard, 2003; Bartley, 1994; Paul & Moser, 2009; Weich & Lewis, 1998; Jahoda, 1981; Warr, 1987). Jahoda (1981) formalized the “deprivation theory” in a functional model, which states that the deprivation of physical materials, financial remunerations and other beneficial by-products gained from employment induces the accumulation of psychological distress and destructive impacts on worker’s mental health. Warr (1987) proposed a “Vitamin model”, which identified job security and employment stability as one of the most important environmental factors (“vitamins”) that protect and nourish an individual’s mental health. Unemployment or the abrupt shift from employment to unemployment will negatively affect environmental factors (financial availability, economic and physical security, opportunity for control and skill use, interpersonal connection and valued social status) as well as an individual’s psychological well-being. Breslin & Mustard (2003) suggests that demographic and socioeconomic characteristics of the population, especially differences in terms of age groups and household income, play an important role in the magnitude of the effect of unemployment on psychological distress after considering the process of causation by employing population-based longitudinal survey. Winefield & Tiggemann (1991) found that the length of the unemployment spell has a negative association with the deterioration of mental health, which differs in magnitude among populations from different age groups.

The literature also documents self-reported symptoms of psychological distress and depression caused by unemployment exists among immigrants, especially for newcomers to different immigration destinations. Empirical studies suggest that socioeconomic characteristics and post-immigration factors, such as community and family cohesion, social connection and support, language proficiency, education, occupation and household income, etc., play

significant roles in mediating the influence of unemployment on the psychological well-being of immigrants (Pernice & Brook, 2010; Zhang & Ta, 2009; Beiser & Hou, 2001; Hurh & Kim, 1990; Tinghog et al. 2007; Aycan & Berry, 1996; Axelsson & Ejlertsson, 2002).

Although the general, deleterious effects of unemployment on mental health are recognized in the existing literature, some studies have focused on and shown differences between the reactions of individuals to unemployment and that these are caused by multiple factors. Fryer's agency critique (1986) and O'Brien's analysis of personal control (1986) show that self-evaluation, self-motivation and proactive activities during unemployment play an active role in moderating psychological distress and promote restoration of mental health, which emphasizes the importance of socioeconomic factors and social connection in an institutional dimension.

Therefore, much literature has started to focus on investigating "cures" to ease the accumulation of psychological distress from unemployment. Cohen & Wills (1985), Gore et al. (1978) and Kaplan et al. (1977) suggests a "buffering hypothesis" that social supports play protective and preventive functions to ease the adverse effects of stressful unemployment on mental health. The degree of integration in the social network, interpersonal connection, family and community cohesion play beneficial roles in the maintenance and development of psychological well-being. Kawachi and Berkman (2001) summarize two possible pathways to identify the causal influence of social networks and social supports on mental health, including the main-effect model and stress-buffering model. Gender difference, social capital embedded in broader social structure and social support interventions are also discussed in their research. There are several studies focusing on the investigation of particularly beneficial role of social support on reducing psychological distress by considering disparities among gender, age, different population groups with ethnic background whose social capital endowments and social

ties place them in vulnerable and disadvantaged positions (Artazcoz et al. 2004; Seeman, 1996; Furnham & Shiekh, 1993; Oppedal et al.,2004; Dean & Wilson, 2009; Berry, 1997; Bhugra, 2004; Kennedy& McDonald, 2006)

However, a gap in the literature still exists regarding the causal inference of unemployment and the dynamic effects of various social supports on psychological distress. Most of the studies are based on large-scale populations without considering the heterogeneities of social and economic characteristics among specific groups, especially for Canadian immigrants, who experience greater disadvantages in the Canadian labour market. The purpose of the second essay is to fill these gaps in the literature. The relevant investigation is based on longitudinal data drawn from cycles 4 to 9 of the longitudinal National Population Health Survey (NPHS) 2000/01 to 2010/11.

3.3. DATA AND METHODOLOGY

3.3.1 Data

To address the research questions, data is drawn from cycles 4 to 9 of the longitudinal component of the National Population Health Survey (NPHS), collected by Statistic Canada from 2000/01 to 2010/11. Since the fourth cycle (2000/01), the NPHS became a strictly longitudinal survey that interviewed the same respondents every two years. It contains information about demographic characteristics, physical and mental health status, social well-being, access and utilization of health care services, and factors that potentially influence mental health, such as labor force status, socioeconomic status, lifestyle behaviors and the social

environment of respondents. The main advantage of using the National Population Health Survey is that it allows a dynamic comparison study as both immigrants and non-immigrants answer the same survey questions in every cycle. It also contains specific information about Canada's immigrants, such as age at time of immigration, country of birth and length of residence in Canada since immigration. Compared with the public use microdata files, the longitudinal nature of the NPHS can capture the response of mental health trajectories to any stressful events, such as unemployment, in the time period of the six cycles. The NPHS data also contains information about the health status of individuals before their unemployment episodes begin. Statistically, the strictly longitudinal NPHS data facilitates a more comprehensive examination of the causality by controlling health-related selection issues and unobserved heterogeneity across observations over time. The bootstrapped weights provided by Statistics Canada are also available in the longitudinal NPHS and are used to account for sample attrition to ensure accurate estimation³. During economic recessions, Canada's immigrants tend to be more severely affected by widespread employment losses (Picot & Sweetman, 2012). With the longitudinal NPHS, this information can be tracked at the individual level in the corresponding economic and social context. . The confidential micro-level data from the cycles 4 to 9 of the longitudinal component of the NPHS were accessed at the Manitoba Research Data Centre (RDC) following the approval of the research project by the Statistic Canada.

The target population of the longitudinal NPHS Household component includes household residents in the ten Canadian provinces in 1994/1995 excluding persons living on Indian Reserves and Crown Lands, residents of health institutions, full-time members of the Canadian Forces Bases and some remote areas in Ontario and Quebec³. Based on the questions on current

³ <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3225>

labour force status, the eligible labour force that I selected for the research includes respondents aged between 15 and 75, but excluding not working full time students and retired workers from the sample in each cycle. Immigrant and non-immigrant subsamples will be created using the individual's response to immigrant status. Immigrants only include individuals who immigrate to Canada from other countries and claim permanent residence status and do not include those from other countries with a work or study permit⁴.

3.3.2. Study variables

Mental health outcome - Kessler psychological distress scale (K6 score) (Kessler & Mroczek, 1998) will be investigated in this study. The K6 score⁵ is widely recommended as a simple measure of psychological distress and as a measure of outcomes for common mental health disorders. It consists of six questions about depressive and anxiety symptoms that a person has experienced during the previous month. The six questions include sadness, nervousness, restlessness, hopelessness, worthlessness, and the feeling that everything is an effort. Based on the frequency of distress, the responses to six questions are rated on five-point scales ranging from score 1 (“none of the time”) to score 5 (“all of the time”). The sum of these six items ranges from score 6 (indicating no distress) to 30 (indicating severe distress). For this paper, the K6 psychological distress scores are categorized into two levels in order to create a binary outcome

⁴ In our data, 2200 individuals who reported positive immigrant status have been tracked over 9 cycles. Only the last 6 cycles are included into our analysis due to strictly longitudinal survey structure (collecting health information from the same individuals each cycle).

⁵ The K6 is non-specific psychological distress measure developed by Kessler and Mroczek of the University of Michigan which measures distress through six questions in the framework of World Health Organization's Composite International Diagnostic Interview (WHO CIDI, 1990). It is adopted for the Canadian Nation Population Health Survey in all the cycles.

of mental health to evaluate mental health status of the respondents. The first level represents low range (6-11), among which people are likely to be well and may benefit from early intervention and promotional information to prevent further distress or anxiety related mental health issues. The second level represents a moderate to high range (12-30), in which respondents are likely to have a moderate to severe mental health disorder and would be encouraged to access information or treatment from health professional⁶.

The NPHS contains some information about the individual-level labour force status of the survey respondents since the fourth wave. The survey question about current labour force status (LFS) is used to capture respondents' labour force status each cycle. Respondents are categorized into "employed", "unemployed" and "not in the labour force". To rule out reversed health-related selection bias, I create a derived variable to capture the main cause of unemployment or separation from the labour force, using relevant questions in the NPHS. The survey respondents are asked to identify the main causes for being unemployed or inactive in the labour market, which include permanent physical inability to work, illness and disability, self-resignation, vacation or education leave, child care and family responsibility, dismissal, lay-off, lockout, plant closure, etc. Some reasons for job termination are clearly associated with health, which could lead to endogenous bias if we include health-related job loss as predictor in the regression analysis with self-reported mental health as the dependent variable. In order to control for self-selection bias that ill workers are being selected into unemployment and healthy workers out of unemployment, a new variables is derived by combining labour force status (LFS) with different causes of the unemployment and separation from the labour force (Salm, 2009; Browning, 2006 and Schmitz, 2011). This new variable of labour market status has four categories. The first

⁶ Andrews, G., & Slade, T. (2001). Interpreting scores of the Kessler Psychological Distress Scale (K10). *Australian & New Zealand Journal of Public Health*, 25(6), 494-497.

category includes respondents who are self-identified as “employed” in each cycle. The second and third categories are those who are either unemployed or out of the labour force due to reasons not related to health, such as searching for a job, labour dispute, lay-off, caring for children or elder relatives. The fourth category is composed of those who are unemployed or out of the labour force due to permanent health conditions, illness or disabilities, etc.

To examine the independent impact of unemployment on psychological distress, several other individual level variables are included in the multivariate regression analysis to control for the effect of all other explanatory factors associated with mental health status other than employment status. The selection of these factors was informed by the conceptual framework of “determinants of health”, obtained from the extensive public health and social science literature. Dummies for chronic condition and long-term disability or handicaps are included in the analysis to control for health-related issues. Other controllable DOH included in the regressions are categorized as follows: demographic and socioeconomic factors, such as gender, age of respondent, marital status, household income, educational level of respondent (Dunn, 2000; Evans & Stoddart, 1990; Liberatos et al., 1988); main language spoken in household; living arrangement of the selected respondent (whether having dependent individuals to the respondent); life style factors, such as type of drinker, type of smoker, physical activity level.

Measures of social support are based on the Medical Outcomes Study Social Support (MOSSS) measure in the NPHS (Sherbourne & A.L., 1991). The MOSSS is a functional social support measure that assesses the scale of social support in four different domains: tangible support, affectionate support, positive social interaction and emotional or information support (See the Appendix I). For tangible support, the scores are recorded based on the responses of interviewees to all four questions: having someone to give help if confined to bed, to go to the

doctor with, to help with daily chores if sick and to prepare meals. The affectionate support is scored by the responses to three questions: having someone who shows love and affection, gives hugs and loves and makes feel wanted. Four additional interview questions measure the score of positive social interactions, which include: having someone to have a good time with, get together with for relaxation, do things to get mind off things and do something enjoyable with. The last eight interview questions are used to score emotional or information support and include: having someone to count on to listen, given advice about a crisis, gives information to understand a situation, confide in, give advice, share most private worries and fears, turn to for suggestions for personal problems and understands problem. The response of “None of the time” to any of the above questions assigns each social support measure with the lowest score “0”, and is followed by scores “1”, “2”, “3” for the responses “ A little of the time”, “Some of the time “, “Most of the time”, respectively. The response “All of the time” produces the highest score (“4”) for the social support measure. Hence, the scores for tangible support and positive social interaction range from “0” to “16”; the score for affectionate support is between 0” and “12”; and the score for emotional or information support ranges from “0” to “32”. The lower quantile ratings of the four social supports are defined as “Lower” level of social support; “High” level of social support are defined from medium and high quantile ratings. Hence, four binary predictor variables of social supports (tangible support, affectionate support, positive social interaction and emotional or information support) are created and used in the regression estimation (Patten et al., 2010).

3.3.3. Methodology

NPBS was a biennial strictly longitudinal survey where the same respondents were re-

interviewed every two years starting from cycle 3 (1998-1999). To handle intermittent missing data across cycles in this longitudinal study, available case analysis is used to conduct pooling of available information from all the observations and cycles for the regression estimation. The longitudinal characteristics of cycles 4-9 of the NPHS data enable us to estimate fixed and random effects logit models to investigate the causal influence of unemployment and various social supports on psychological distress of the immigrant and Canadian-born subsamples, controlling for other demographic and socio-economic variables. The K6 score was recoded into two categories: low range, moderate to high range (Andrews & Slade, 2001; Kessler et al., 2003). Since the categorized K6 score is a binary outcome, a non-linear logit model provides a better fit than the linear regression model. Both fixed effects and random effects will be investigated in order to control for the estimation biases inherent in each model. The fixed effects logit model provides implicit control of person-specific and time invariant unobserved heterogeneities and cluster-level variations in the structure of longitudinal analysis by holding the observation cluster constant. It also accounts for the forgotten or hard-to-measure variables to reduce the problem of self-selection and omitted-variable bias (Chamberlain, 1980). The random effects logit model facilitates the overall estimation of variation both within and between observation clusters to consider all potential heterogeneities among the observations and across time expansion (Wolf, 1987). Both random-effects and fixed-effects logit models are logistically distributed; with probability mass function as follows:

$$Pr(K_{it} = 1|X_{it}, c_i) = P(LF_{it}\beta_1 + SS_{it}\beta_2 + (LF_{it} * SS_{it})\beta_3 + X_{it}\beta_3 + v_i + \varepsilon_{it})$$

for $i = 1, \dots, n$ observations, where $t = \text{cycle 4 to cycle 9}$, v_i are i.i.d., $N(0, \sigma^2 v)$, ε_{it} are i.i.d., logistically distributed with mean zero and variance $\sigma_\varepsilon^2 = \pi^2/3$, independently of v_i and $P(z) = \{1 + \exp(-z)\}^{-1}$.

The initial time period is cycle 4 of the NPHS and $t = T$ refers to cycle 9. A binary variable K_{it} represents individual self-rated psychological distress level in each cycle t . LF_{it} is a vector of labor force status to capture the incidence of unemployment or separation from the labor force due to various reasons in each cycle t . Vector SS_{it} measures the level of social supports in four dimension in each cycle reported by the respondent. Vector X_{it} captures all other time variant explanatory variables in all time periods and the set of time invariant variables v_i are also included as independent covariates. I also create an interaction term ($LF_{it} * SS_{it}$) by multiplying the ordinal variable for labor force status with the binary social support variable in four dimensions. The estimation of interaction terms will measure the interactive effect of social supports on psychological distress from four different states in the labor force (employed, unemployed due to health unrelated reasons, out of labor force due to health unrelated reasons and unemployed/out of labor force caused by health problems).

Survival analysis with the Cox Proportional Hazard Model (Cox, 1992) is used to measure the magnitude of the interaction effects of social support with labor force status on the psychological status of Canadian immigrants versus non-immigrants and to estimate the dynamic trajectory of mental distress responding to various social supports over time.

$$h_i(t) = h_0(t) \exp(LF_{it}\beta_1 + SS_{it}\beta_2 + (LF_{it} * SS_{it})\beta_3 + X_{it}\beta_3)$$

This model is semi-parametric because the baseline hazard can take any form, but the covariates enter the model linearly. If two observations i and i' differ in their x-values, the corresponding linear predictors take the following form.

$$\eta_i = LF_{it}\beta_1 + SS_{it}\beta_2 + (LF_{it} * SS_{it})\beta_3 + X_{it}\beta_3$$

$$\eta_{i'} = LF_{i't} \beta_1 + SS_{i't} \beta_2 + (LF_{i't} * SS_{i't}) \beta_3 + X_{i't} \beta_3$$

Hence, the hazard ratio for these two observations is independent of time t, which can be measured as follows

$$\frac{h_i(t)}{h_{i'}(t)} = \frac{h_{0(t)} e^{\eta_i}}{h_{0(t)} e^{\eta_{i'}}} = \frac{e^{\eta_i}}{e^{\eta_{i'}}$$

Due to the complicated sampling method employed by the NPHS 2000-2011, weighted bootstrapping techniques will be used to derive accurate estimates for small sample size and to ensure that the probability of each household unit being sampled reflects the representativeness of entire target population. All statistical analyses were conducted using STATA statistical software version 12.0 and a two tail p-value < 0.10 was considered statistically significant.

3.4 RESULTS

3.4.1 Descriptive Statistics

Table 3.1 shows a weighted cross-tabulation of the K6 psychological distress level and labor market status separately for immigrants and Canadian-born individuals whose age is less than 45 and larger than or equal to 45 using the NPHS from 2000 to 2011⁷. The data provide evidence that the psychological distress level of those who are currently unemployed is higher than those currently employed within the same age group. In particular, immigrants are more likely to be psychologically distressed compared with Canadian-born individuals, especially the

⁷ In the NPHS, Statistic Canada defines four age groups (1. 1 "less than 35" 2 "35-44" 3 "45-64" 4 "larger than 64"). Due to the limitation of sample size of immigrants, I collapse the first two and last two groups and categorize into two big groups. Smaller groups based on more detailed age category are unattainable.

younger age groups. The proportion of suffering medium to high level distress tends to be comparatively larger among unemployed or out-of-labor force immigrants (30%) compared with unemployed or out-of-labor force Canadian-born (26%), for age groups less than 45. Overall, unemployed persons display higher levels of psychological distress compared with employed persons for all collapsed cycles, and this relative disadvantage is especially obvious among immigrants age less than 45. However, without controlling for other covariates, which could be associated with exacerbated mental health condition, this does not reveal a causal relationship between unemployment and individual mental health.

Bivariate analyses outcomes in Tables 3.2 and 3.3 show that lower psychological distress is significantly associated with high level of social supports⁸ for both immigrants and non-immigrants, and after controlling for age and gender. Only 14% of younger immigrants with high levels of social support report high psychological distress. However, over 29% of younger immigrants report high distress when they also report lower levels of social support. The same fact can be observed in the non-immigrant group. For female immigrants, with adequate tangible supports, the weighted probability of reporting high psychological distress decreases from 30% to 15%. For male immigrants, the weighted probability diminishes from 24% to 8% when they also report high levels of tangible supports.

Chart 3.1 plots the weighted mean of scores of social supports in four dimensions from cycle 4 to cycle 9 of the NPHS for employed and unemployed immigrants and native-born Canadians separately. The data provide evidence that unemployment is generally associated with lower levels of social support. For immigrants, there is an obvious disadvantage shown by the

⁸ Only the outcomes of bivariate analyses between tangible support and psychological distress reports in Table 3.2 and Table 3.3. The bivariate outcomes regarding affectionate support, positive social interaction and emotional or information support can be requested from the author as well. The empirical results are consistent for all supports.

generally lower weighted means for all four scores compared to their native-born counterparts. Existing literature shows that immigrants face multiple challenges to establish social links in the destination country and to adapt to new cultural and economic environments while social support is perceived to play an important role in immigrant settlement and to have a positive impact on immigrant health (Hernández-Plaza et al., 2006; Aroian, 2005; Berkman & Syme, 1979). It is suspected that comparative disadvantages in terms of social and informational support could lead to poor general and mental health for Canadian immigrants.

Table 3.1 Distribution of the K6 psychological distress level for immigrants vs. Canadian-born with different labor market status

(Two age groups: age<45 vs. age≥ 45)

K6 distress level	Employed immigrant (age<45)	Employed Canadian-born (age<45)	Unemployed or out of labor force Immigrant (age<45)	Unemployed or out of labour force Canadian-born (age <45)	Employed immigrant (age≥45)	Employed Canadian-born (age≥45)	Unemployed or out of labor force Immigrant (age≥45)	Unemployed or out of labor force Canadian-born (age ≥45)
Low (score 6-11)	0.82 (0.12)	0.83 (0.03)	0.70 (0.20)	0.74 (0.06)	0.86 (0.08)	0.90 (0.02)	0.75 (0.16)	0.74 (0.06)
Medium to high (Score13-30)	0.18 (0.12)	0.17 (0.03)	0.30 (0.20)	0.26 (0.06)	0.14 (0.08)	0.10 (0.02)	0.25 (0.16)	0.26 (0.06)
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: First row in cells report the weighted column proportion. Bootstrap standard errors of column proportions in parentheses.

Table 3.2 Distribution of the K6 psychological distress level for immigrants vs. Canadian-born with tangible social supports

(Two age groups: age<45 vs. age≥ 45)

K6 distress level	Immigrant + Lower tangible supports (age<45)	Canadian-born + Lower tangible supports (age<45)	Immigrant + High tangible support (age<45)	Canadian-born + High tangible support (age <45)	Immigrant + Lower tangible supports (age≥45)	Canadian-born + Lower tangible supports (age≥45)	Immigrant + High tangible support (age≥45)	Canadian-born + High tangible support (age ≥45)
Low (score 6-11)	0.71 (0.05)	0.73 (0.05)	0.86 (0.20)	0.85 (0.03)	0.75 (0.11)	0.77 (0.05)	0.90 (0.07)	0.91 (0.02)
high (Score13-30)	0.29 (0.05)	0.27 (0.05)	0.14 (0.20)	0.15 (0.03)	0.25 (0.11)	0.23 (0.05)	0.10 (0.07)	0.09 (0.02)
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: First row in cells report the weighted column proportion. Bootstrap standard errors of column proportions in parentheses. Distributions of the K6 psychological distress level for immigrants vs. Canadian-born with positive social interaction; affectionate support; emotional or information support are not reported in the table. Details are upon request from the author.

Table 3.3 Distribution of the K6 psychological distress level for immigrants vs. Canadian-born with tangible social supports

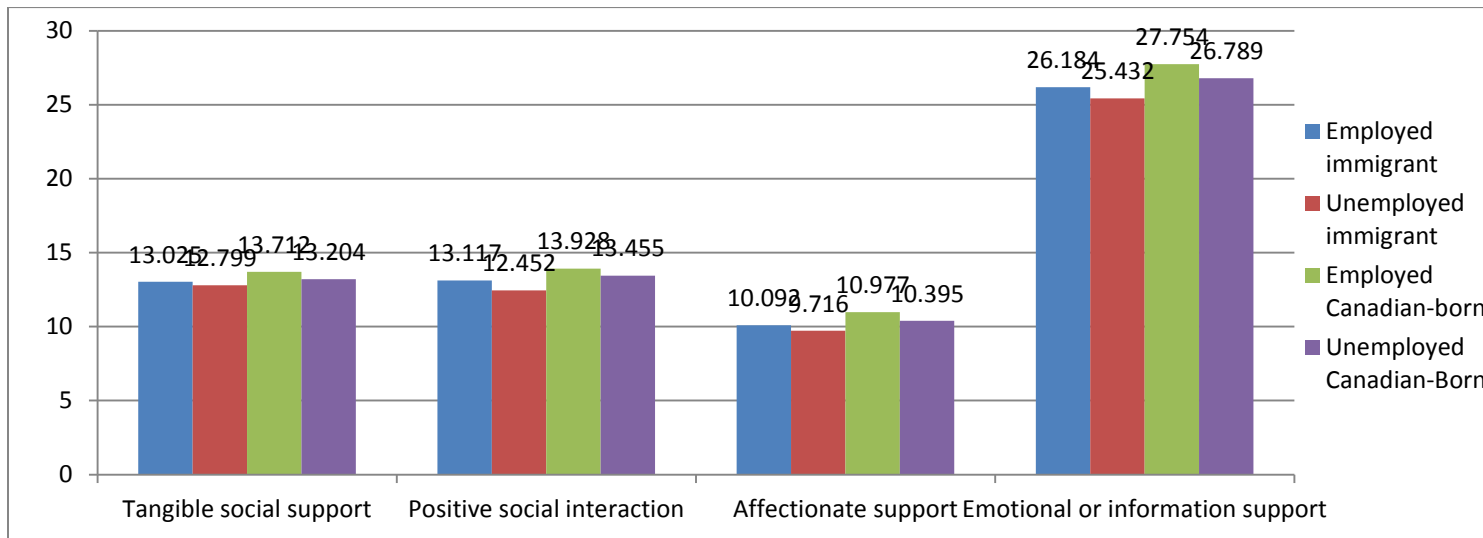
(Two gender groups: male vs. female)

K6 distress level	Immigrant + Lower tangible supports (male)	Canadian-born + Lower tangible supports (male)	Immigrant + High tangible support (male)	Canadian-born + High tangible support (male)	Immigrant + Lower tangible supports (female)	Canadian-born + Lower tangible supports (female)	Immigrant + High tangible support (female)	Canadian-born + High tangible support (female)
Low (score 6-11)	0.76 (0.13)	0.78 (0.06)	0.92 (0.06)	0.90 (0.02)	0.70 (0.14)	0.72 (0.05)	0.85 (0.09)	0.84 (0.03)
high (Score 12-30)	0.24 (0.13)	0.22 (0.06)	0.08 (0.06)	0.10 (0.02)	0.30 (0.14)	0.28 (0.05)	0.15 (0.09)	0.16 (0.03)
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: First row in cells report the weighted column proportion. Bootstrap standard errors of column proportions in parentheses. Distributions of the K6 psychological distress level for immigrants vs. Canadian-born with positive social interaction; affectionate support; emotional or information support are not reported in the table. Details are upon request from the author.

Chart 3.1 Weighted mean of tangible social support, positive social interaction and emotional or informational support

Immigrants vs. Canadian-born (Controlled age difference)



In table 3.4, the weighted average ages (95% confidence intervals (CI)) of immigrants and Canadian-born in the sample are 45.0 (95% CI: 44.8–45.3) and 38.7 (95% CI: 38.5–40.0) years, respectively. The weighted mean of the length of residency in Canada since immigration (95% confidence intervals (CI)) is 28.0 (95% CI: 27.8–28.3) years (with positive skewness of 0.47). Hence, most of immigrants in the sample are “established” and “medium-term” immigrants, based on the definition by Statistic Canada⁹. Ng (2011) also suggests that the health advantage due to the self-selection screening process of recent immigrants generally diminishes. However, the decline of the “Healthy immigrant effect” cannot be captured in the descriptive analyses shown here.

Table 3.4 shows the weighted relative distribution of the support-related explanatory variables of the two subsamples, immigrants and Canadian-born residents. The table shows that, in general, immigrants as a whole are older than non-immigrants with a larger proportion in the 45-64 age groups and smaller proportion in the 15-24 age groups. However, immigrants and non-immigrants have almost equal proportions in the core working-age group (25-54 years old). There is no significant difference in the distribution of gender between immigrants and non-immigrants; however, a larger proportion of immigrants are married or in common law compared with non-immigrants. There are very small differences in the distribution of household income between immigrants and Canadian-born residents, and no significant difference in terms of the distribution of main household income source. In the selected labour force sample, Immigrants do not have a significant disadvantage in the current labour market. This could be due to well-established immigrants with over 10 years of residence in Canada integrating into the Canadian labour market and a decrease in the initial unemployment gap. Due to data limitations, the RDC

⁹ The period-of immigration categories were: before 1970 (established), 1970 through 1980 (medium-term), and 1981 through June 1991 (recent) based on 1991-2001 Canadian census (Edward Ng, 2011)

could not release the weighted unemployment rate for recent immigrants due to small sample size. However, there is a significant discrepancy in terms of number of weeks looking for new job in past 12 months once the respondents are unemployed. On average, immigrants will spend 4 more weeks per year on job search compared with native-born Canadians, which equals to one whole month every year. Differences in education attainment are also significant between immigrants and non-immigrants. Immigrants have a higher proportion in the highest quantile (post-secondary education level) while non-immigrants are overrepresented in the “less than secondary school” and “some post-secondary” categories. Overall, immigrants are more likely to have higher educational achievements, which are partially caused by the self-screening at the period of immigration (Newbold and Danforth, 2003).

Table 3.4 Baseline sample characteristics (weighted and bootstrapped proportions)

	Population¹⁰(%)	Immigrant (%)	Canadian-born (%)
Mean age (95% confidence interval) ¹¹	39.6 (39.3-39.9)	45.1 (44.8-45.3)	38.7 (38.4-38.9)
Age 15-35 years	37.4	21.1	40.1
Age 35-45 years	22.6	24.0	22.4
Age 45-64 years	37.4	50.6	35.2
Age 64- 75 years	2.6	4.3	2.3
Male	49.7	49.9	49.6
Female	50.3	50.1	50.3
Married /common-law	59.2	68.9	57.7
Single/Widow	40.8	31.1	42.3
Employed	83.3	85.4	83.0
Unemployed (Health unrelated reason)	5.0	3.8	5.2
Out of labour force (Health unrelated reason)	7.5	6.0	7.7
Unemployed/Out of labour force (Health problem)	4.2	4.8	4.1
Mean of the time spent on looking for job	7.9 (7.6-8.2)	12.1 (11.9-12.4)	7.4 (7.1-7.7)
Household Income (Lowest)	1.7	1.5	1.7
Low-middle	3.1	2.8	3.1
Middle	12.2	11.8	12.2
Upper-middle	30.2	29.3	30.3
Highest	44.7	47.2	44.3
Not Sated	8.2	7.3	8.2
Less than Secondary School	14.5	10.2	15.1
Secondary School	13.1	14.2	13.0
Some post-secondary	28.3	25.5	28.8
Post-secondary	44.1	50.1	43.1

¹⁰ The proportions shown here are weighted and bootstrapped proportions in the respective categories.

¹¹ The means and standard deviations shown over here are weighted and bootstrapped.

3.4.2 Estimation Results

Tables 4.1, 4.2, 4.3 and 4.4 present the longitudinal estimations of the effect of labor force status, various social supports, other controllable sociodemographic factors and determinants of health on psychological distress of immigrants and non-immigrants. An interaction term is created by combining labor force status with the binary social support variable. This interaction term, included in both the random-effects and fixed-effects logit models, investigates the effect of social supports on mental distress considering variations in labor market experiences force status for both immigrants and non-immigrants. The moderating effects of all social supports (tangible support, positive social interaction, affectionate support and emotional or informational support) on distress are strongly significant for both immigrants and non-immigrants after controlling for other potential predictors. The magnitudes of moderating effects of social supports vary between Random-effect and fixed-effect logit model estimations. The estimated effects using fixed-effect model are consistently lower than random-effect model as fixed-effect controls all time-invariant differences between the individuals and focus on studying the causes of change within an individual. However, the random-effect model allows the variations across individuals to be random and uncorrelated with the independent predictors included in the model, which generalize the inferences beyond the sample used in the study and increase the effects of estimation. The estimated odds of reporting high psychological distress for immigrants with high tangible social support over the odds of reporting high psychological distress for immigrants with low tangible social support is $\exp(-0.99) = 0.37$ (Random-effect) and $\exp(-0.71) = 0.49$ (Fixed-effect). So the odds of immigrants with high tangible social support to report high psychological distress are 63% (Random-effect) and 51% (Fixed-effect) lower than those of

immigrants with low tangible social support, holding other potentially influential factors fixed. For non-immigrants with high tangible social support, the estimated odds of reporting high psychological distress is $\exp(-0.68) = 0.51$ (Random-effect) and $\exp(-0.37) = 0.69$ (Fixed-effect). Hence the odds of matched non-immigrants with high tangible social support to report high psychological distress are 49% (Random-effect) and 31% (Fixed-effect) lower than those of matched non-immigrants with low tangible social support, keeping other potential predictors fixed.

Unemployment due to health-unrelated reasons significantly contributes to high psychological distress by increasing the log-odds of high distress, especially for immigrants, holding all other independent variables constant. The estimated effects of unemployment due to health-unrelated reasons on inducing high psychological distress using fixed-effect model are also consistently and significantly lower than random-effect model. The estimated odds of reporting high psychological distress for immigrants reporting unemployment due to health-unrelated reasons over the odds of reporting high psychological distress for employed immigrants is $\exp(1.33) = 3.78$ (Random-effect) and $\exp(0.80) = 2.23$ (Fixed-effect)¹². So the odds for unemployed immigrants due to health-unrelated reasons to report high psychological distress are 278% (Random-effect) and 123% (Fixed-effect) higher than employed immigrants, holding other potentially influential factors constant. The estimated odds of reporting high psychological distress among non-immigrants reporting unemployment due to health-unrelated reasons are $\exp(0.55) = 1.73$ (Random-effect) and $\exp(0.33) = 1.39$ (Fixed-effect). Hence the odds for unemployed non-immigrants due to health-unrelated reasons to report high

¹² The results related with other social supports (social interaction, affectionate support and emotional or information support) are generally consistent with the results related with tangible supports, which are not reported here but can be requested from the author.

psychological distress are 73% (Random-effect) and 39% (Fixed-effect) higher than that of employed non-immigrants, keeping other potential predictors constant.

Being unemployed or out of the labor force due to health problems also strongly and significantly increases high distress for both immigrants and non-immigrants. The estimated odds for immigrants who are unemployed or out of the labor force caused by health problems to report high psychological distress are 200% (Random-effect) and 164% (Fixed-effect) higher than for employed immigrants, keeping other potential contributors constant. For non-immigrants who are unemployed or out of the labour force due to health problems, the estimated odds to report high psychological distress are 555% (Random-effect) and 348% (Fixed-effect) higher than employed non-immigrants, keeping other influential factors fixed.

It is very interesting that the log odds of reporting a high level of psychological distress is significantly lower for unemployed immigrants and non-immigrants with higher levels of social supports in all four dimensions. The moderating effect of high levels of social supports on easing distress differs by labour force status. For individuals experiencing unemployment due to health unrelated reasons, such as lay-off, business closure, job search, the moderating effect of high social supports on reducing distress is statistically significant and strong, especially for immigrants. The estimated odds of reporting high psychological distress for immigrants reporting unemployment due to health-unrelated reasons with high tangible social support over the odds of reporting high psychological distress for the unemployed immigrants with low tangible social support is $\exp(-2.19) = 0.11$ (Random-effect) and $\exp(-1.98) = 0.14$ (Fixed-effect). So for immigrants who are unemployed due to health-unrelated reasons and who have high tangible social support, the odds to report high psychological distress are 89% (Random-effect) and 86% (Fixed-effect) lower than unemployed immigrants with low tangible social supports,

holding other potentially influential factors constant. For non-immigrants reporting unemployment due to health-unrelated reasons and who have high tangible social support, the odds to report high psychological distress are 22% (Random-effect) lower than that of unemployed non-immigrants with low tangible social support, keeping other potential predictors constant. However, among immigrants and non-immigrants who are unemployed due to health problems (disability, permanent health problem, chronic condition) and the ones who are currently out of the labor force, the moderating effects of high levels of social supports on their mental distress are not significantly noticeable.

Among the control variables, several results are of note. Respondents have significantly higher log odds of reporting high psychological distress, compared to lower distress, if they were women for both immigrant and non-immigrant groups. Respondents who are older (older than 45 years), have no disability or chronic condition, are physically active, and are non-smokers, have a significantly smaller probability to report high distress for both immigrant and non-immigrant groups. For immigrants, being a single parent with dependent(s) significantly increases the log odds of reporting higher psychological distress. Immigrants who report a bigger gap between their household income and their personal income have a smaller probability of reporting high distress. For non-immigrants, higher education, higher household income and a (marital) relationship decreases their probability of reporting high psychological distress.

Although the logit regressions provide general investigations of the effect of social supports on easing the psychological distress caused by unemployment for both immigrants and non-immigrants, there are limitations regarding comparability between the immigrant group and non-immigrant group in both magnitude and change over time. Hence, the following estimations

focus on investigating differences among immigrants and non-immigrants regarding their mental distress response to unemployment and different levels of social support over time.

Table 4.1 Predictors of high psychological distress with tangible support, National Public Health Survey (NPHS), Cycle 4 to Cycle 9 (2000/01 to 2001/11)

Results from Random-effect and Fixed-effect Logit Regression (those who reported low psychological distress ($6 \leq K6 \text{ score} \leq 11$) as the reference group)

	Immigrant		Non-immigrant	
	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)
Labor market status				
- Unemployed due to health unrelated reasons	1.33*** (0.30)	0.80* (0.31)	0.55*** (0.13)	0.33** (0.15)
- Out of labour force due to health unrelated reasons	0.02 (0.28)	-0.31 (0.35)	0.46*** (0.13)	0.29** (0.13)
- Unemployed or out of labour force due to health problems	1.10*** (0.30)	0.97* (0.42)	1.88*** (0.14)	1.50*** (0.19)
High tangible social support	- 0.99*** (0.11)	-0.71*** (0.15)	-0.68*** (0.05)	-0.37*** (0.06)
Interaction term (Labor market status * tangible support)				
-Unemployed (health unrelated) * high tangible support	- 2.19*** (0.51)	-1.98*** (0.59)	-0.25* (0.16)	-0.02 (0.18)
-Out of labor force (health unrelated) * high tangible support	-0.01 (0.39)	0.23 (0.50)	-0.41** (0.14)	-0.35** (0.16)
-Unemployed or out of labour force due to health problems * high tangible support	0.35 (0.38)	0.91 (0.48)	-0.52** (0.17)	-0.55** (0.21)
Other Control Variables				
Age group				
- Age (35-44)	-0.69 (0.16)	-0.713 (0.23)	-0.51 (0.08)	-0.12 (0.11)
- Age (45-64)	-0.86*** (0.18)	-1.02** (0.32)	-0.70** (0.09)	-0.12* (0.15)
- Age (≥ 65)	-1.53*** (0.21)	-1.15** (0.42)	-1.02** (0.09)	-0.08** (0.19)
Gender				
- Female	0.55*** (0.14)	-	0.71*** (0.06)	-
Main language in household (Other languages)	0.08 (0.13)	-0.69** (0.26)	0.15 (0.08)	-0.03 (0.13)
Household type				
-couple (No dependents)	-0.10 (0.27)	-0.46 (0.40)	0.05 (0.09)	-0.23* (0.13)
-couple (with dependents)	-0.12 (0.24)	-0.70* (0.37)	-0.11 (0.08)	-0.21** (0.10)
-Single male (with dependent)	0.95* (0.48)	2.16* (1.21)	0.02 (0.16)	-0.03 (0.22)
-Single Female (with dependent)	0.53** (0.24)	0.85* (0.45)	-0.17 (0.09)	0.24** (0.12)
-Other	-1.50*** (0.54)	-0.46 (0.74)	-0.09 (0.22)	-0.02 (0.26)
Marital status				
-Married/couple	-0.02 (0.21)	0.77** (0.39)	-0.60*** (0.08)	-0.09 (0.11)
-Widowed/Separated/Divorced	-0.05 (0.24)	0.10 (0.54)	-0.48*** (0.10)	-0.43*** (0.15)
No disability	-0.81*** (0.17)	-0.62*** (0.22)	-0.47*** (0.06)	-0.19*** (0.08)
No chronic condition	-0.75*** (0.12)	-0.50*** (0.17)	-0.47*** (0.05)	-0.27*** (0.07)
Household income				
- Low - middle income	0.07 (0.43)	0.40 (0.51)	-0.33** (0.15)	-0.28 (0.18)
- Middle income	0.04 (0.38)	0.18 (0.48)	-0.55*** (0.14)	-0.53*** (0.16)
- Upper-middle income	0.02 (0.38)	0.42 (0.48)	-0.62*** (0.14)	-0.44*** (0.16)
- Highest income	0.06 (0.39)	0.77 (0.49)	-0.75*** (0.14)	-0.47*** (0.17)
Household and personal income difference				
- $20000 \leq \text{Income difference} \leq 39999$	-0.41** (0.16)	-0.61** (0.20)	-0.05 (0.07)	-0.23*** (0.08)

- 40000 ≤ Income difference ≥69999	-0.50*** (0.17)	-0.81*** (0.21)	-0.21*** (0.07)	-0.38*** (0.09)
- 70000 ≤ Income difference ≥ 9999	-0.36 (0.24)	-0.72** (0.29)	-0.07 (0.10)	-0.20* (0.12)
- Income difference ≥100000	-0.32** (0.15)	-0.30* (0.18)	-0.02 (0.06)	-0.12* (0.08)
Educational level				
- Secondary education	0.28 (0.23)	0.40 (0.62)	-0.39*** (0.09)	-0.35** (0.17)
- Some post-secondary education	-0.31 (0.21)	-0.06 (0.62)	-0.39*** (0.07)	-0.46*** (0.12)
- Post-secondary education	-0.26 (0.21)	-0.06 (0.63)	-0.44*** (0.07)	-0.69*** (0.13)
Physical active level				
-Moderate active	0.17 (0.14)	0.33** (0.17)	0.07 (0.06)	0.11* (0.06)
-Inactive	0.33** (0.13)	0.32** (0.17)	0.25*** (0.05)	0.17*** (0.07)
Type of smoker				
-Occasional smoker	0.30 (0.25)	1.04* (0.36)	0.00 (0.09)	0.00 (0.11)
-Former smoker	-0.30* (0.18)	0.13 (0.35)	-0.37*** (0.06)	-0.22** (0.09)
-Never smoker	-0.41** (0.19)	0.04 (0.48)	-0.65*** (0.07)	-0.34** (0.14)
Type of alcohol user				
-Occasional alcohol user	-0.25* (0.14)	-0.16 (0.20)	0.01 (0.06)	0.00 (0.07)
-Former alcohol user	0.11 (0.17)	-0.16 (0.25)	0.18** (0.08)	0.08 (0.11)
-Never alcohol user	0.10 (0.19)	-0.22 (0.33)	-0.01 (0.12)	-0.21 (0.16)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%, *10%. Reference group: Employed, 15 ≤ age ≤35, lower tangible support, males, English & French as main language in household, individual without dependent, single, with disability and chronic condition, lowest level of household income, income difference <20000, less than secondary education, physically active, regular smoker and regular alcohol user.

Table 4.2 Predictors of high psychological distress with positive social interaction, National Public Health Survey (NPHS), Cycle 4 to Cycle 9 (2000/01 to 2001/11)

Results from Random-effect and Fixed-effect Logit Regression (those who reported low psychological distress (6 ≤ K6 score ≤ 11) as the reference group)

	Immigrant		Non-immigrant	
	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)
Labor market status				
- Unemployed due to health unrelated reasons	0.66*** (0.27)	0.34 (0.30)	0.56*** (0.12)	0.34** (0.14)
- Out of labour force due to health unrelated reasons	0.04 (0.28)	-0.47 (0.40)	0.45*** (0.12)	0.28* (0.14)
- Unemployed or out of labour force due to health problems	1.27*** (0.28)	1.47*** (0.41)	1.57*** (0.13)	1.28 (0.19)
High social interaction	-1.18*** (0.11)	-0.68 (0.15)	-0.98*** (0.05)	-0.63*** (0.06)
Interaction term (Labor market status * high social interaction)				
-Unemployed (health unrelated) * high social interaction	-0.85** (0.50)	-0.37* (0.56)	-0.29* (0.16)	-0.07 (0.18)
-Out of labor force (health unrelated) * high social interaction	0.17 (0.38)	0.93 (0.50)	-0.36** (0.14)	-0.29* (0.16)
-Unemployed or out of labour force due to health problems * high social interaction	-0.13 (0.38)	-0.49 (0.49)	-0.07 (0.16)	0.01 (0.20)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%, *10%. Reference group: Employed, lower social interaction. Other controlling variables are not reported in this table.

Table 4.3 Predictors of high psychological distress with affectionate support, National Public Health Survey (NPHS), Cycle 4 to Cycle 9 (2000/01 to 2001/11)

Results from Random-effect and Fixed-effect Logit Regression (those who reported low psychological distress (6 ≤ K6 score ≤ 11) as the reference group)

	Immigrant		Non-immigrant	
	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)
Labor market status				
- Unemployed due to health unrelated reasons	0.81*** (0.29)	0.40 (0.32)	0.66*** (0.12)	0.52*** (0.14)
- Out of labour force due to health unrelated reasons	0.10*** (0.27)	-0.24 (0.36)	0.44*** (0.12)	0.30** (0.13)
- Unemployed or out of labour force due to health problems	1.26*** (0.30)	1.58*** (0.45)	1.54*** (0.14)	1.12*** (0.18)
High affectionate support	-1.22*** (0.12)	-0.82*** (0.15)	-0.97*** (0.05)	-0.63*** (0.06)
Interaction term (Labor market status * affectionate support)				
-Unemployed (health unrelated) * high affectionate support	-1.00** (0.49)	-0.67 (0.56)	-0.44*** (0.16)	-0.32* (0.18)
-Out of labor force (health unrelated) * high affectionate support	-0.04 (0.39)	0.56 (0.51)	-0.34** (0.14)	-0.30* (0.16)
-Unemployed or out of labour force due to health problems * high tangible support	0.13 (0.39)	-0.41 (0.55)	0.03 (0.17)	0.22 (0.20)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%, *10%. Reference group: Employed, lower affectionate support. Other controlling variable are not reported in this table

Table 4.4 Predictors of high psychological distress with emotional or information support, National Public Health Survey (NPHS), Cycle 4 to Cycle 9 (2000/01 to 2001/11)

Results from Random-effect and Fixed-effect Logit Regression (those who reported low psychological distress (6 ≤ K6 score ≤ 11) as the reference group)

	Immigrant		Non-immigrant	
	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)	RE Coeff. Est (S.E.)	FE Coeff. Est (S.E.)
Labor market status				
- Unemployed due to health unrelated reasons	0.89*** (0.30)	0.34 (0.32)	0.62*** (0.13)	0.40** (0.15)
- Out of labour force due to health unrelated reasons	0.39 (0.28)	0.03 (0.38)	0.54*** (0.12)	0.34** (0.14)
- Unemployed or out of labour force due to health problems	1.19*** (0.29)	1.45*** (0.42)	1.71*** (0.15)	1.43*** (0.19)
High emotional or information support	-0.96*** (0.11)	-0.40*** (0.14)	-1.02*** (0.05)	-0.62*** (0.06)
Interaction term (Labor market status * emotional or information support)				
-Unemployed (health unrelated) * high emotional or information support	-0.96** (0.46)	-0.30 (0.52)	-0.33** (0.17)	-0.10 (0.19)
-Out of labor force (health unrelated) * high emotional or information support	-0.67* (0.39)	-0.10 (0.48)	-0.52*** (0.14)	-0.40** (0.16)
-Unemployed or out of labour force due to health problems * high emotional or information support	0.14 (0.38)	-0.29 (0.49)	-0.31* (0.17)	-0.45* (0.21)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%, *10%. Reference group: Employed, lower emotional or information support. Other controlling variable can be requested.

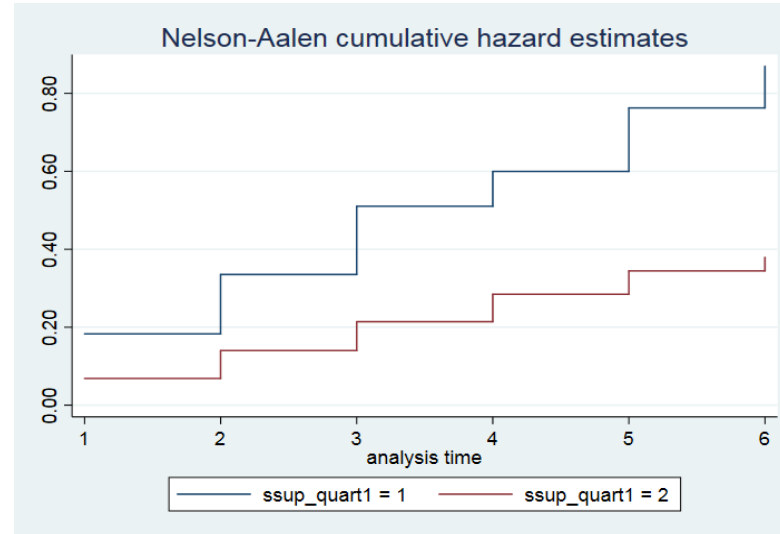
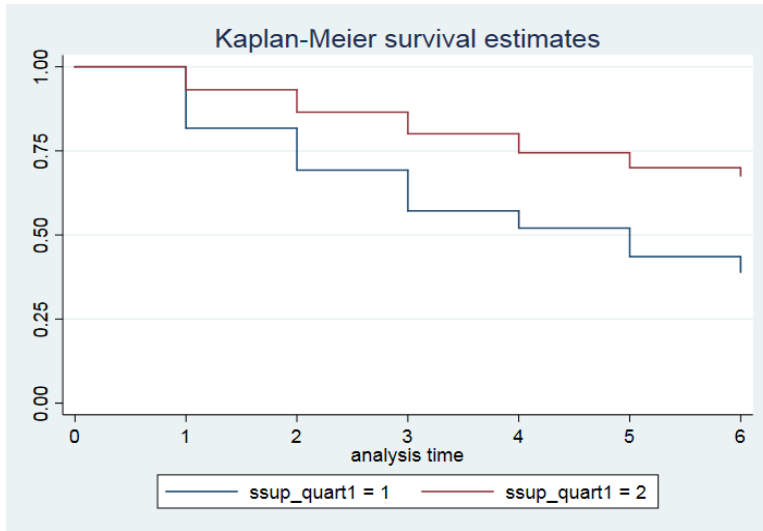
Graphs 4.1, 4.2, 4.3 and 4.4 plot the longitudinal survival trajectories of experiencing high psychological distress responding to two treatments (lower social support versus high social support) from four dimensions (tangible support, positive social interaction, affectionate support) across a ten-year time expansion (Cycle 4 to cycle 9, NPHS). Kaplan-Meier Survival estimates (Kaplan & Meier, 1958) and Nelson-Aalen Cumulative Hazard estimates (Nelson, 1972; Aalen, 1978) are generated to measure the probability of survival from psychological distress (K6 shifts from higher range to lower range) and failure of psychological status (K6 shifts from lower range to higher range) considering the treatments of high social support in contrast to low social support for immigrants and non-immigrants. High levels of social supports play a significant, fundamental and supportive role in easing psychological stress. For the respondents with high tangible supports, the probability of surviving from high psychological distress (K6 transits to lower range) in the first survey cycle is 93% for immigrants compared to 90% for non-immigrants. The chance of survival in last cycle is 68% for immigrants compared to 65% for non-immigrants if high tangible supports are available. However, for the respondents with low tangible supports, the chance of surviving from high psychological distress (K6 transits to lower range) in the first survey cycle declined to 82% for immigrants and 83% for non-immigrants. In the last cycle, the survival rate substantially dropped to 39% for immigrants and 43% for non-immigrants if they received lower levels of tangible support. From a different perspective, the Nelson-Aalen Cumulative Hazard estimates indicate that the probability of reporting a stressful psychological hazard increases comparatively faster for the respondents with lower tangible supports (18% in the first cycle and 87% in the last cycle for the immigrant group; 17% in the first cycle and 78% in the last cycle for the non-immigrant group). With stronger tangible supports, the chance of experiencing a distress hazard reduced substantially to 7% in the first

cycle and 38% in the last cycle for immigrants and 9% and 41% for non-immigrants in the first and last cycles. Results for the other three dimensions (positive social interaction, affectionate support and emotional or information support) are consistent with these. Strong social support and connection play a fundamentally supportive role as a “cushion” or “spring” to prevent and decrease the gradual deterioration of psychological distress for both immigrants and non-immigrants over cycles.

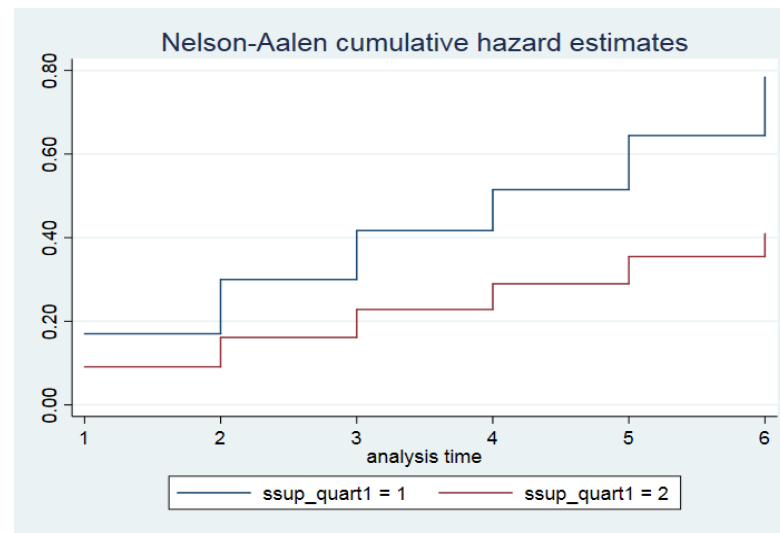
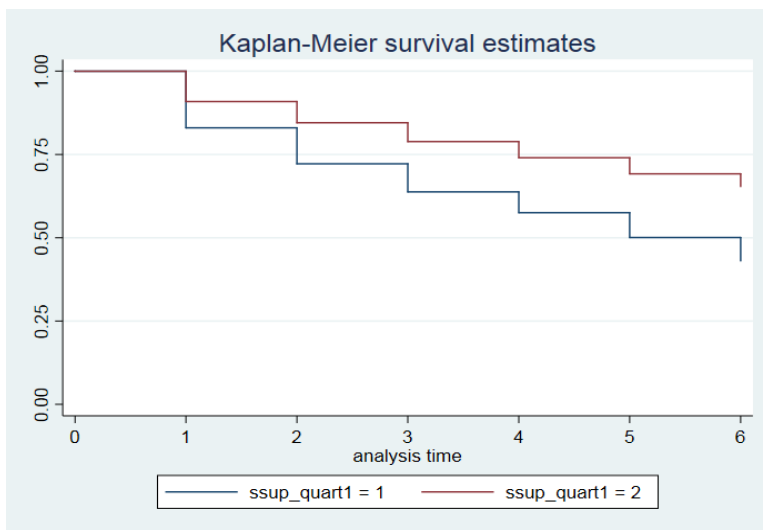
The survival trajectories also demonstrate significant discrepancies between the immigrant group and the non-immigrant group regarding the response of psychological distress to different levels of social support. The immigrant group with lower social supports generally experiences much steeper trajectories of failures of psychological distress and much flatter trends of cumulative hazards over cycles as opposed to the non-immigrant group with the same level of social supports. The outcomes of the stratified Cox regression-based tests for equality of survival curves (between low social supports and high social supports; stratified by immigration status) show the statistically significant inequality of survival trajectories between the two stratified groups, immigrants versus non-immigrants (See Appendix II). Hence, it is estimated that the immigrant status of the respondent also significantly affects the survival trajectory of psychological distress under the circumstances of different social supports. The inequalities of survival trajectories between immigrants and non-immigrants are demonstrated in all the social supports from four dimensions (tangible support, positive social interaction, affectionate support and emotional or information support).

Graph 4.1 Survival analysis of the risk of high psychological distress ($12 \leq K6 \leq 30$): Kaplan-Meier Survival estimates (Kaplan & Meier, 1958) and Nelson-Aalen Cumulative Hazard estimates (Nelson, 1972; Aalen, 1978)

For Immigrants (ssup_quart1 “1”: Lower tangible support ; ssup_quart1 “2”: High tangible support)

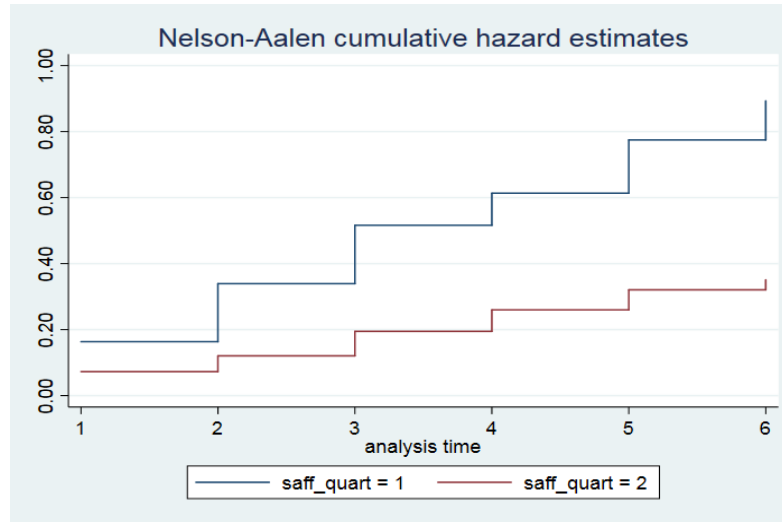
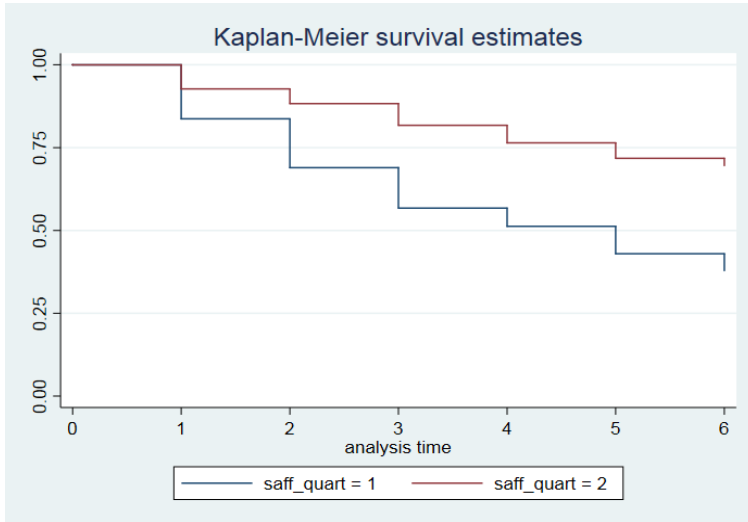


For Non-immigrants (ssup_quart1 “1”: Low tangible supports ; ssup_quart1 “2”: High tangible supports)



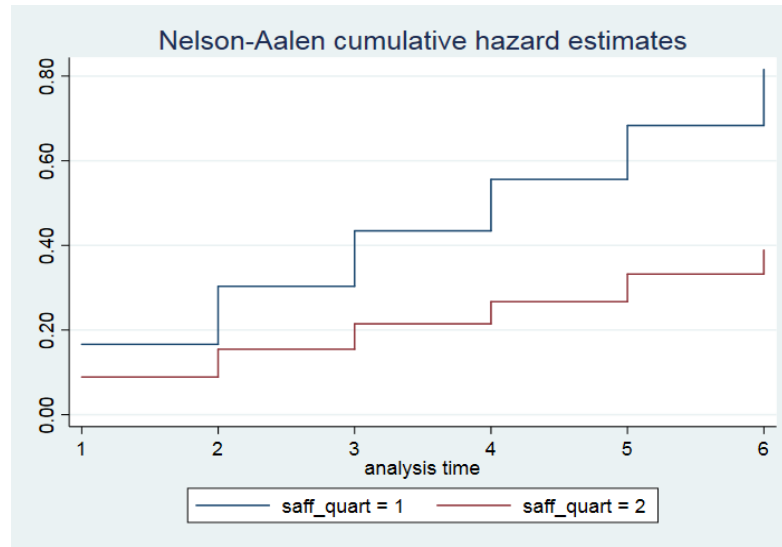
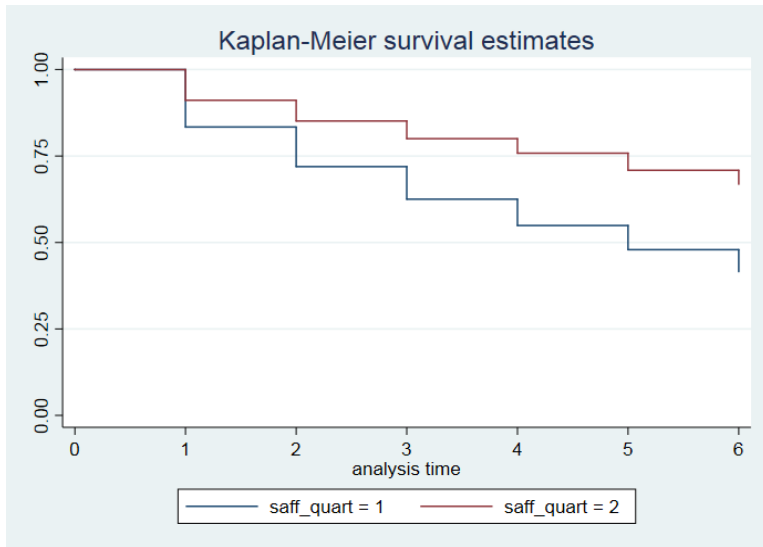
Graph 4.2 Survival analysis the risk of high psychological distress ($12 \leq K6 \leq 30$): Kaplan-Meier Survival estimates (Kaplan & Meier, 1958) and Nelson-Aalen Cumulative Hazard estimates (Nelson, 1972; Aalen, 1978)

For Immigrants (saff_quart “1”: Lower affectionate support saff_quart “2”: High affectionate support)



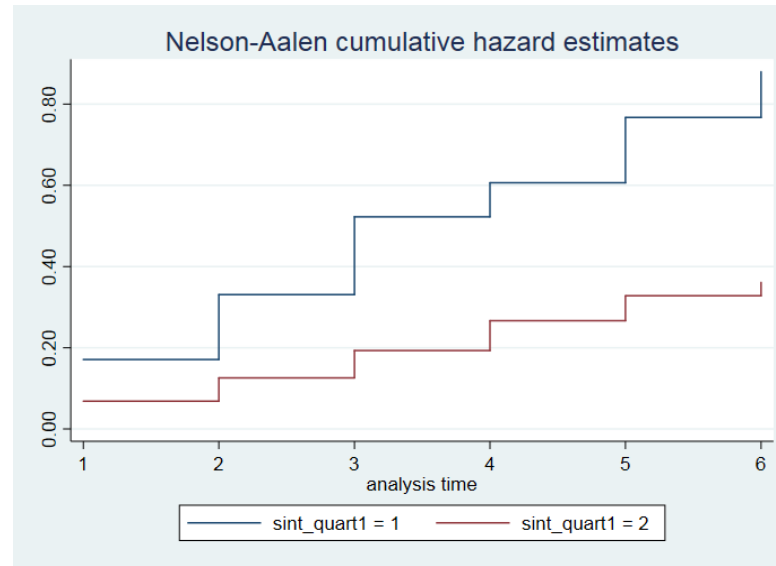
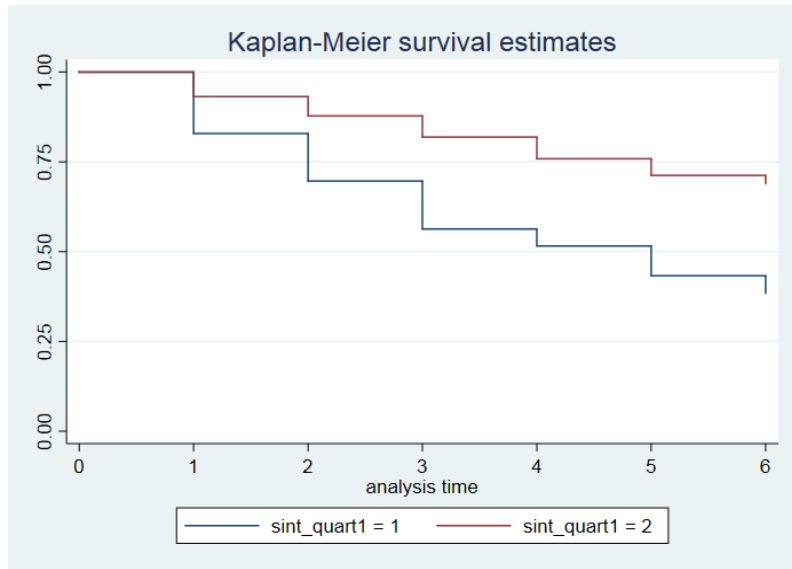
For Non-immigrants (saff_quart “1”: Lower affectionate support saff_quart “2”: High affectionate support)

saff_quart “2”: High affectionate support)

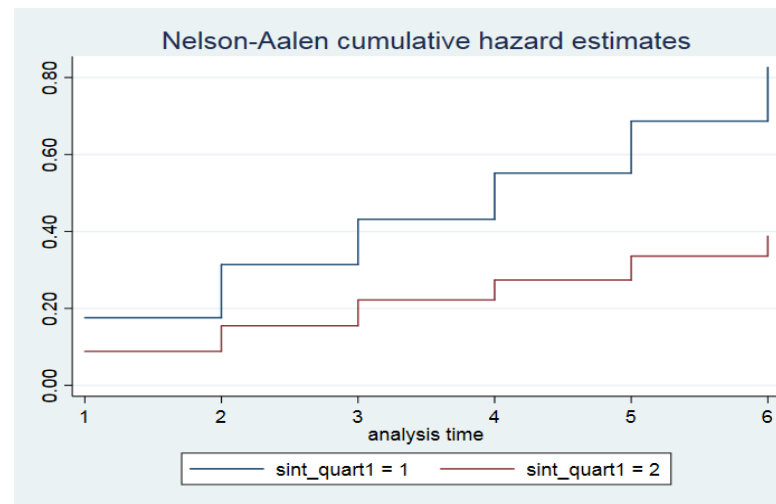
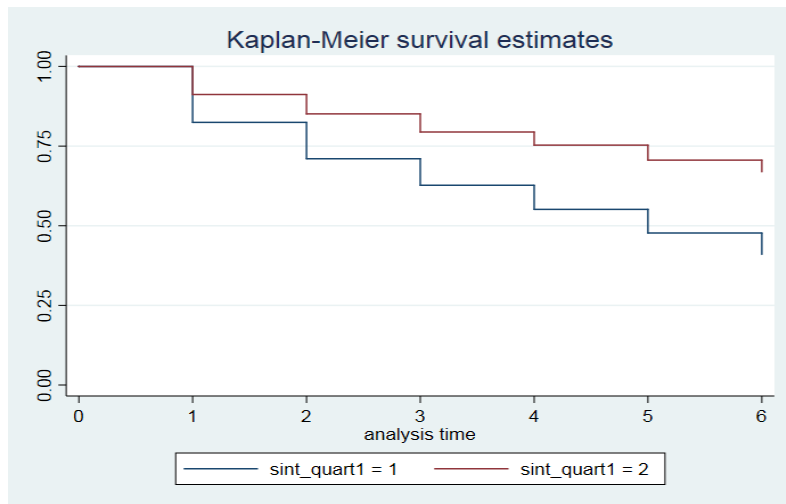


Graph 4.3 Survival analysis of the risk of high psychological distress ($12 \leq K6 \leq 30$): Kaplan-Meier Survival estimates (Kaplan & Meier, 1958) and Nelson-Aalen Cumulative Hazard estimates (Nelson, 1972; Aalen, 1978)

For Immigrants (sint_quart1 “1”: Lower positive social interaction sint_quart1 “2”: High positive social interaction)

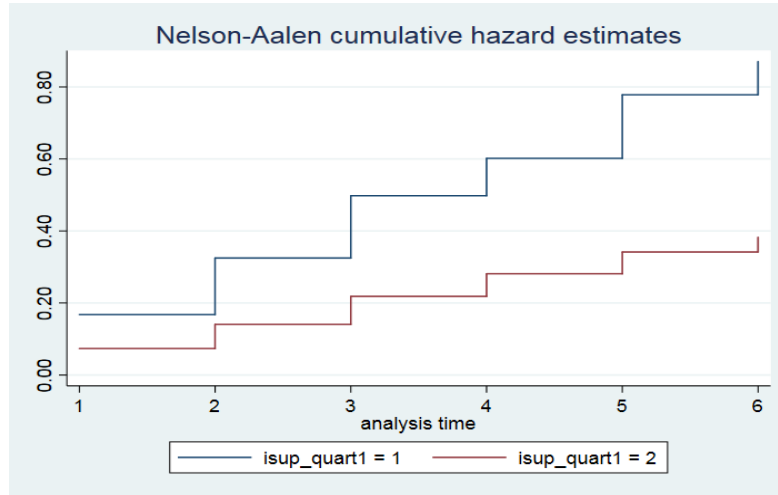
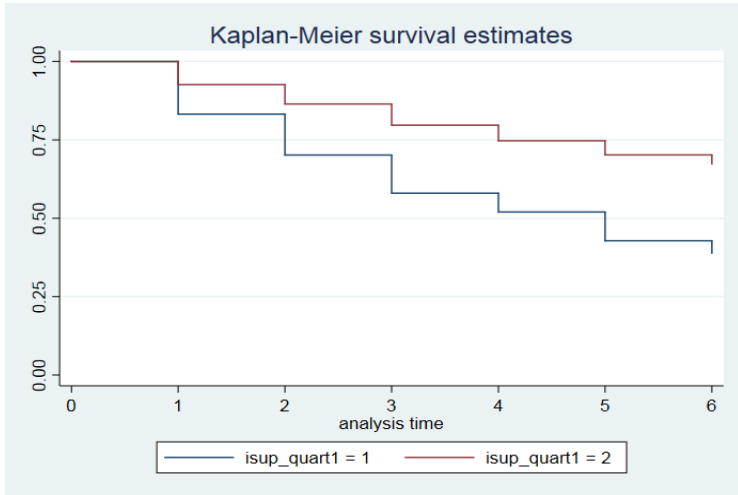


For Non-immigrants (sint_quart1 “1”: Lower positive social interaction sint_quart1 “2”: High positive social interaction)

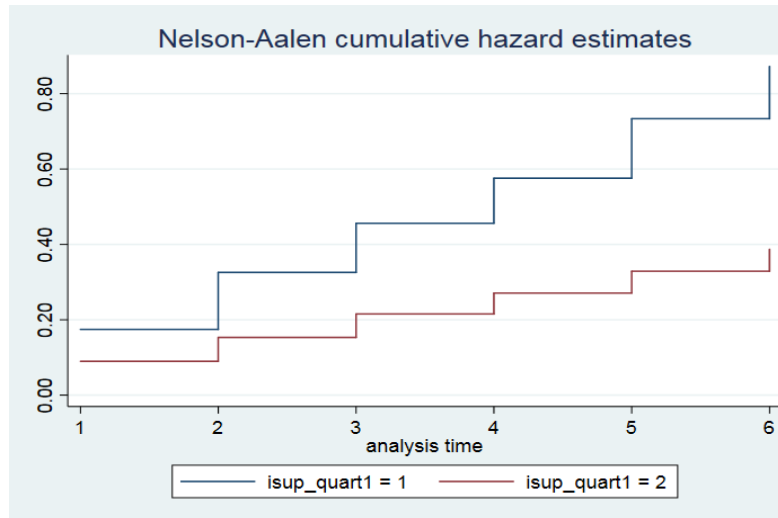
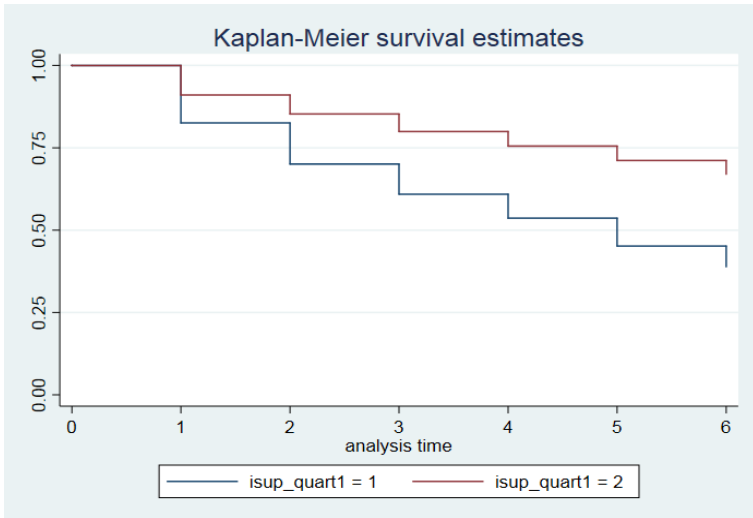


Graph 4.4 Survival analysis the risk of high psychological distress ($12 \leq K6 \leq 30$): Kaplan-Meier Survival estimates (Kaplan & Meier, 1958) and Nelson-Aalen Cumulative Hazard estimates (Nelson, 1972; Aalen, 1978)

For Immigrants (isup_quart1 “1”: Lower emotional or information support isup_quart1 “2”: High emotional or information support)



For Non-immigrants (isup_quart1 “1”: Lower emotional or information support isup_quart1 “2”: High emotional or information support)



Cox proportional hazards regression models were used to calculate the multivariate-adjusted hazard ratios (HR) of unemployment and the levels of social supports for the high-psychological distress group compared to the low-psychological distress group over consecutive cycles. Table 4.5 shows that the respondents experiencing unemployment due to health unrelated reasons are 1.64 times more likely than employed respondents to suffer high psychological distress ($12 \leq K6 \leq 30$) over the ten-year survey period (HR=1.64, 95% CI = 1.03-2.62, $p < 0.05$ for immigrants), after controlling for tangible support and other independent predictors. However, the risks of health unrelated unemployment are not always significant after controlling for other social supports (social interaction, affectionate and emotional or information supports) and immigrant status. It is evident that unemployment or being out of the labor force due to health related reasons (disability, chronic conditions, etc.) significantly contributes to higher risk of psychological distress for both immigrants and non-immigrants, keeping tangible support and other predictors constant (HR= 1.60, 95% CI = 0.99-2.58, $p < 0.05$ for immigrants and HR= 1.89, 95% CI = 1.56-2.29, $p < 0.01$ for non-immigrants). Hence, the negative causal effect of unemployment on psychologic health could largely be driven by a health related self-selection issue where healthy respondents select themselves into the group with less mental distress and less healthy respondents stay in the group with higher distress.

Table 4.5 also shows the immigrants with high levels of tangible support, positive social interaction, affectionate support and emotional or information support were 52%, 55%, 60% and 51% less like to report high psychological distress compared to immigrants with low levels of social support (HR=0.48, 95% CI = 0.37-0.63, $p < 0.01$; HR= 0.45 , 95% CI = 0.34-0.59, $p < 0.01$; HR= 0.40 , 95% CI = 0.31-0.54, $p < 0.01$; HR= 0.49 , 95% CI = 0.38-0.63, $p < 0.01$). Similar results are also found for the non-immigrant group who are 38%, 48%, 48% and 51% less likely

to suffer from mental distress. The estimates of the interaction term between labor force status of the respondents and different social supports in the Cox regression demonstrate the moderating effect of social supports on psychological distress caused by unemployment or being out of the labor force. For immigrants who are unemployed for health unrelated reasons, receiving high levels of tangible supports significantly reduces the risk of high psychological distress by 87% (HR= 0.13, 95% CI = 0.03-0.58, $p < 0.05$). Receiving high emotional or information support reduces the hazard of high psychological distress by 60% for unemployed immigrants and 48% immigrants who are currently out-of-labor force due to health unrelated reasons (HR= 0.40, 95% CI = 0.13-1.20, $p < 0.05$; HR= 0.52, 95% CI = 0.25-1.08, $p < 0.05$). For non-immigrants, the social supports (affectionate support, social interaction, emotional or information supports) do not significantly affect psychological distress caused by health-related unemployment or being out of the labor force. Other types of interventions are required to address the increased risks of distress from unemployment for this group.

In order to measure the exact magnitudes of the effect of social supports in alleviating psychological distress for immigrants and non-immigrants, relative risks (RR) are derived from the estimates of the interaction terms in the Cox regression. Table 4.6 reports that while unemployment increases the relative risk of high distress by 64% (RR= 1.64, 95% CI = 1.03-2.62, $p < 0.05$) compared to employed immigrants with same level of social support, high tangible support significantly reduces the relative risk of experiencing high distress by up to 90% (RR = 0.10, 95% CI = 0.02-0.42, $p < 0.01$). In contrast, for non-immigrants, high levels of tangible support only reduce the relative risk of distress by 32% (RR = 0.68, 95% CI = 0.54-0.86, $p < 0.01$). Hence, the moderating effect of high levels of tangible support on mental distress caused by health unrelated unemployment is almost 3 times stronger for immigrants compared to non-

immigrants, controlling other potential risk determinants. Positive social interaction also significantly reduces distress especially for unemployed immigrants who are 81% less likely (RR=0.19, 95% CI =0.06-0.66, $p<0.01$) to report high distress compared to their non-immigrant counterparts who are only 45% less likely (RR=0.55, 95% CI =0.44-0.70, $p<0.01$) to suffer high distress. High levels of affectionate support play a significant role in alleviating the distress of unemployed immigrants more than double compared to their non-immigrant counterparts. With high levels of affectionate support, unemployed immigrants are 88% less likely to report high risk of psychological distress (RR=0.12, 95% CI =0.03-0.49, $p<0.01$) relative to employed immigrants. However, for their non-immigrant counterparts with high affectionate support, the possibility of reporting high distress only decreased by 42% relative to employed non-immigrants (RR=0.58, 95% CI =0.45-0.73, $p<0.01$). High level of emotional or information support reduce distress of unemployed immigrants by almost 1.6 times more compared to their non-immigrant counterparts. The likelihood of reporting high distress decreases by 74% (RR=0.26, 95% CI =0.10-0.65, $p<0.01$) for unemployed immigrants with high levels of emotional or information support. For unemployed non-immigrants, the relative risks of high distress only decreases by 46% (RR=0.54, 95% CI =0.42-0.68, $p<0.01$).

Table 4.5 Cox Regression for the risk of high psychological distress (Multivariate analysis)

	Immigrant		Non-immigrant	
	Hazard Ratio (95% CI)	Coeff. Est (95% CI)	Hazard Ratio (95% CI)	Coeff. Est (95% CI)
Labor market status				
- Unemployed due to health unrelated reasons	1.64** (1.03-2.62)	0.35** (0.14-0.56)	1.33	0.291** (0.05-0.52)
- Out of labour force due to health unrelated reasons	1.37 (0.87-2.17)	0.22 (0.03-0.42)	1.19* (0.96-1.46)	0.21* (-0.00-0.42)
- Unemployed or out of labour force due to health problems	1.60** (0.99-2.58)	0.61** (0.43-0.79)	1.89*** (1.56-2.29)	0.64*** (0.45-0.83)
High tangible support	0.48*** (0.37-0.63)	-0.48*** (-0.65- -0.31)	0.62*** (0.56-0.69)	-0.52*** (-0.69- -0.34)
Interaction term (Labor market status * high tangible support)				
-Unemployed (health unrelated) * high tangible support	0.13*** (0.03-0.58)	-0.35*** (-0.65- -0.04)	0.83 (0.60-1.15)	-0.20 (-0.53-0.12)
-Out of labor force (health unrelated) * high tangible support	0.79 (0.40-1.59)	-0.34 (-0.61- -0.07)	0.76* (0.57-1.02)	-0.33* (-0.63- -0.04)
-Unemployed or out of labour force due to health problems * high tangible support	1.23 (0.63-2.39)	0.17 (-0.06-0.40)	1.14 (0.90-1.45)	0.12 (-0.12-0.37)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower tangible support. Other controlling variables are not reported in this table.

	Immigrant		Non-immigrant	
	Hazard Ratio (95% CI)	Coeff. Est (95% CI)	Hazard Ratio (95% CI)	Coeff. Est (95% CI)
Labor market status				
- Unemployed due to health unrelated reasons	1.10 (0.64-1.91)	0.18 (-0.36-0.72)	1.32** (1.07-1.64)	0.30** (0.09-0.52)
- Out of labour force due to health unrelated reasons	1.34 (0.86-2.10)	0.35 (-0.11-0.81)	1.15 (0.94-1.40)	0.18* (-0.02-0.39)
- Unemployed or out of labour force due to health problems	1.65** (1.07-2.56)	0.52** (0.09-0.96)	1.69*** (1.41-2.02)	0.53*** (0.35-0.71)
High social interaction	0.45*** (0.34-0.59)	-0.56*** (-1.09- -0.04)	0.52*** (0.47-0.57)	-0.63*** (-0.80--0.46)
Interaction term (Labor market status * high social interaction)				
-Unemployed (health unrelated) * high social interaction	0.39 (0.10-1.53)	-1.08 (-2.45-0.29)	0.81 (0.59-1.11)	-0.25 (-0.57-0.07)
-Out of labor force (health unrelated) * high social interaction	0.81 (0.41-1.61)	-0.39 (-1.08-0.305)	0.79* (0.60-1.06)	-0.31* (-0.60--0.02)
-Unemployed or out of labour force due to health problems * high social interaction	1.00 (0.48-2.08)	0.02 (-0.75-0.78)	1.42** (1.12-1.79)	0.34** (0.10-0.58)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower social interaction. Other controlling variables are not reported in this table.

	Immigrant		Non-immigrant	
	Hazard Ratio (95% CI)	Coeff. Est (95% CI)	Hazard Ratio (95% CI)	Coeff. Est (95% CI)
Labor market status				
- Unemployed due to health unrelated reasons	1.19 (0.69-2.04)	0.24 (-0.29-0.77)	1.26** (1.02-1.57)	0.26** (0.04-0.47)
- Out of labour force due to health unrelated reasons	1.18 (0.74-1.89)	0.21 (-0.27-0.68)	1.17 (0.96-1.44)	0.19* (-0.02-0.39)
- Unemployed or out of labour force due to health problems	1.53* (0.95-2.45)	0.43* (-0.04-0.91)	1.75*** (1.47-2.11)	0.56*** (0.38-0.75)
High affectionate support	0.40*** (0.31-0.54)	-0.61*** (-1.15--0.06)	0.52*** (0.47-0.57)	-0.57*** (-0.74--0.39)
Interaction term (Labor market status * high affectionate support)				
-Unemployed (health unrelated) * high affectionate support	0.25* (0.06-1.13)	-1.54* (-3.03--0.05)	0.88 (0.64-1.22)	-0.16 (-0.49-0.16)
-Out of labor force (health unrelated) * high affectionate support	1.01 (0.50-2.04)	-0.13 (-0.85-0.58)	0.80 (0.60-1.07)	-0.26* (-.55-0.03)
-Unemployed or out of labour force due to health problems * high affectionate support	1.39 (0.72-2.69)	0.39 (-0.34-1.12)	1.36** (1.07-1.73)	0.30** (0.06-0.55)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower affectionate support. Other controlling variables are not reported in this table.

	Immigrant		Non-immigrant	
	Hazard Ratio (95% CI)	Coeff. Est (95% CI)	Hazard Ratio (95% CI)	Coeff. Est (95% CI)
Labor market status				
- Unemployed due to health unrelated reasons	1.32 (0.76-2.32)	0.33 (-0.23-0.89)	1.37*** (1.12-1.71)	0.32*** (0.11-0.53)
- Out of labour force due to health unrelated reasons	1.58** (1.02-2.46)	0.56** (0.11-1.01)	1.18* (0.99-1.48)	0.19* (-0.01-0.40)
- Unemployed or out of labour force due to health problems	1.49 (0.91-2.47)	0.41 (-0.09-0.91)	1.79*** (1.49-2.16)	0.58*** (0.40-0.77)
High emotional or information support	0.49*** (0.38-0.63)	-0.46*** (-0.99- 0.07)	0.49*** (0.41-0.58)	-0.72*** (-0.90--0.55)
Interaction term (Labor market status * high emotional or information support)				
-Unemployed (health unrelated) * high emotional or information support	0.40** (0.13-1.20)	-1.09** (-2.20-0.02)	0.79 (0.58-1.08)	-0.24 (-0.55-0.08)
-Out of labor force (health unrelated) * high emotional or information support	0.52** (0.25-1.08)	-0.84** (-1.58 -0.11)	0.72** (0.54 -0.96)	-0.33** (-0.62--0.05)
-Unemployed or out of labour force due to health problems * high emotional or information support	1.35 (0.67-2.74)	0.38 (-0.38-1.14)	1.30** (1.02-1.65)	0.26** (0.02-0.50)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower emotional or information support. Other controlling variables are not reported in this table.

Table 4.6 Effect of labour market status and four types of social supports on psychological distress: Cox Regression with all 2-Way Interaction Terms

For Immigrant

Tangible Social Support	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.64** (1.03-2.62)	1.37 (0.87-2.17)	1.60** (0.99-2.58)
High	0.48*** (0.37-0.63)	0.10*** (0.02-0.42)	0.52** (0.30 - 0.93)	0.95 (0.51-1.74)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower tangible support. Other controlling variables are not reported in this table.

For Non-immigrant

Tangible Social Support	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.33** (1.05-1.68)	1.19* (0.96-1.46)	1.89*** (1.56-2.29)
High	0.62*** (0.56-0.69)	0.68*** (0.54-0.86)	0.56*** (0.45-0.69)	1.34** (1.09-1.64)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower tangible support. Other controlling variables are not reported in this table.

For Immigrant

Positive Social interaction	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.10 (0.64-1.91)	1.34 (0.86-2.10)	1.65** (1.07-2.56)
High	0.45*** (0.34-0.59)	0.19*** (0.06-0.66)	0.48*** (0.28-0.85)	0.74 (0.36-1.50)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%, *10%. Reference group: Employed, lower positive social interaction. Other controlling variables are not reported in this table.

For Non-immigrants

Positive Social Interaction	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.32** (1.07-1.64)	1.15 (0.94-1.40)	1.69*** (1.41-2.02)
High	0.52*** (0.47-0.57)	0.55*** (0.44-0.70)	0.47*** (0.38-0.59)	1.24** (1.01-1.52)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%, *10%. Reference group: Employed, lower positive social interaction. Other controlling variables are not reported in this table.

For Immigrants

Affectionate Support	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.19 (0.69-2.04)	1.18 (0.74-1.89)	1.53* (0.95-2.45)
High	0.40*** (0.31-0.54)	0.12*** (0.03-0.49)	0.48*** (0.28-0.85)	0.86 (0.47-1.57)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower affectionate support. Other controlling variables are not reported in this table.

For Non-immigrants

Affectionate Support	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.26** (1.02-1.57)	1.18 (0.96-1.44)	1.76*** (1.47-2.11)
High	0.52*** (0.32-0.94)	0.58*** (0.45-0.73)	0.49*** (0.39-0.61)	1.23* (1.00-1.52)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower affectionate support. Other controlling variables are not reported in this table.

For Immigrants

Emotional or Information Support	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.32 (0.76-2.32)	1.59* (1.02-2.46)	1.5 (0.91-2.47)
High	0.49*** (0.38-0.63)	0.26*** (0.10-0.65)	0.40*** (0.22-0.74)	0.99 (0.52-1.87)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower emotional or information support. Other controlling variables are not reported in this table.

For Non-immigrants

Emotional or Information Support	Labour Market Status			
	Employment	Unemployment	Out of Labour Market	Unemployment/Out of Labour Market due to Health Problem
	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI	Relative Risk 95% CI
Lower	1.00	1.37** (1.11-1.70)	1.18 (0.96-1.45)	1.79*** (1.48-2.15)
High	0.49*** (0.44-0.55)	0.54*** (0.42-0.68)	0.43*** (0.35-0.54)	1.15 (0.94-1.40)

Note: Weighted standard errors in parentheses. Significance: ***1%, **5%,*10%. Reference group: Employed, lower emotional or information support. Other controlling variables are not reported in this table.

3.5 DISCUSSION

The above results provide firm evidence that high levels of social support play a fundamental role in moderating and easing psychological distress caused by unemployment or separation from the labor force due to health-unrelated reasons, such as lay-off, business closure, child or family care, new job search, for both immigrants and non-immigrants. Although the negatively causal effect of unemployment on mental distress is not significantly identified after keeping self-selection bias under control, all of the measures of social support examined in four dimension (tangible support, positive social interaction, affectionate support and emotional or information support) were strong predictors of significant reductions in psychological distress for all NPHS respondents. However, it is interesting to observe that the moderating effect of social supports is significant only for respondents who are unemployed due to health-unrelated reasons. For respondents who are unemployed or out of labour force due to disability, permanent illness, or other health conditions, social supports play a very limited role in preventing or reducing the increased risks of high psychological distress, according to the results of this study. Therefore, it is suggested that alternative treatments, clinical therapies, activities or customized supports in our societal context should be tailored and promoted to fit the needs of this particular group in order to reduce distress and control the risk of other mental health issues.

The moderating effects of the different social support measures vary in magnitude between immigrants and non-immigrants. Immigrants experience significantly stronger benefits from high levels of social support in terms of easing psychological distress caused by health unrelated unemployment compared to their non-immigrant counterparts. For unemployed immigrants, having more real tangible help with their daily living substantially reduces their distress from unemployment by 90%, which is almost triples the moderating effect of high levels

of tangible supports on distress for unemployed non-immigrants. Affection supports, which emphasize the behaviour manifestation of love that make the respondents feel wanted or loved, can also significantly moderate psychological distress of unemployed immigrants by 88%, which is double the effects of affectionate supports on reducing distress among unemployed non-immigrants. Having someone to give advice or suggestions or share private worries with could significantly reduce psychological distress in unemployed immigrants by 74%, which is 1.6 times higher compared to unemployed non-immigrants. Having someone to have a good time with, to get together with for relaxation, reduces the risk of high distress by 81%, which is 1.8 times higher than among unemployed non-immigrants. Hence, the results clearly emphasize the importance of tangible help on reducing psychological distress from unemployment for the immigrant group. The results also show that unemployment is significantly associated with resources and tangible materials deprivations, which results in the deterioration of mental health. As for immigrants facing higher unemployment rate than Canadian-born, having some tangible help instead of intangible supports would be a very effective way to reduce distress compared to their non-immigrant counterparts. The study also shows that the response of psychological distress of immigrants to any social supports vary across gender and age groups. Gender and age differences in psychological distress are reported in the literature and the psychological distress experienced by females and youth is a matter of concern to researchers and policy makers (Ensminger & Celentano, 1990; Leana & Feldman, 1991; Jorm et al., 2005; Bjarnason & Sigurdardottir, 2003). This study shows that female respondents are at higher risk of reporting increasing distress compared to male respondents, controlling for other influential factors. The study also finds that younger respondents (less than 45 years old) are at comparatively higher risk to report distress. The results are consistent with findings from the existing literature.

Mirowsky and Ross (1995) report that women experience distress about 30 percent more frequently than men because women genuinely express emotions more freely than men other than behaviour related reasons. Simon (1992) points out that higher levels of psychological distress experienced by women are influenced by social psychological factors, following identity theory especially in parenthood. Ensminger & Celentano (1990) find the gender differences in psychological distress are caused by differences in role configurations related with employment status, parenting, financial difficulties, social supports and other socioeconomic factors, rather than intrinsic gender differences.

The results of this study have some important policy implications towards improving the mental well-being of immigrants in Canada. The strong moderating role of social support on reducing psychological distress for unemployed immigrants suggests that programs which promote community integration, accumulation of social capital and enforcement of social networks should be highly advocated. For new immigrants, in particular, who face challenges from language and cultural differences and other stressors associated with migration and resettlement, customized programs that focus on their particular needs to promote family, community and social integration should be highly promoted to improve their mental well-being.

The study has several limitations. First, the K6 distress scale is a general measure of normal psychological distress. Although it is universally accepted and adopted as a reliable proxy for mental distress, it fails to capture other psychological health problems. Hence, another clinically proven indicator, such as the Major Depressive Episodes (MDEs), could be used as a robustness check. Second, due to sample size limitations in the longitudinal structure, each health unrelated reason for unemployment cannot be further specified, which limits more specific explanations for the exact mechanism of the effect of social supports on easing psychological distress from

unemployment. Third, the investigations of gender and age differences in this study are limited by small sub-sample size within the immigrant group. Further studies are required in order to investigate more completely.

3.6 CONCLUSION

This study uses longitudinal follow-up data drawn from cycles 4 to 9 of the longitudinal National Population Health Survey (NPHS) 2000/01 to 2010/11, and shows that various social supports play fundamental roles in reducing psychological distress and controlling the deterioration of mental health from unemployment in Canadian immigrants and non-immigrants over time, while controlling other predictors and reverse health-related self-selection bias. The positive influence of social supports on mental distress caused by unemployment significantly varies in magnitude between immigrants and non-immigrants. For unemployed immigrants, medium to high levels of the social supports reduces the relative risks of experiencing high distress by up to 90% compared to an around 30% reduction in relative risks for their unemployed non-immigrant counterparts, and controlling for other potential determinants. Higher levels of social supports play a moderating role in reducing the risk of a moderate and severe mental disorder for unemployed immigrants and preventing further distress or anxiety related mental health issues. This suggests that more attention should be paid to vocational education programs, public policies and social service interventions that promote the development of stronger community and social networks, especially for these disadvantaged and vulnerable sub-groups of Canadian immigrants. The following discussions highlight policy recommendations based on the key results of this research.

First, intersectoral policy interventions, which promote collaborations and partnerships across the health, social support/protection and education sectors, should be promoted to prevent and ease the deterioration of the mental health of immigrants who face an unemployment shock. The research shows that immigrants benefit significantly from high levels of social support in terms of easing psychological distress caused by health-unrelated unemployment compared to their non-immigrant counterparts. However, the distress driven by negative labour market outcomes caused by illness or health problems cannot be effectively moderated solely by social support, but with associated clinical interventions. Hence, policy-makers and practitioners would need to identify and modify corresponding policy measures (“health sector-led” or “other sector-led”) for specific objectives following evidence-based analyses to better prioritize the utilization of resources and economize limited budgets.

Second, policies promoting positive mental health of female immigrants and young newcomers to Canada should be emphasized. Results from this research suggest that female immigrants and younger immigrants were significantly more likely to report experience mental distress under unemployment caused by health-unrelated reasons. Hence, policies should focus on addressing potential risk factors experienced by female and young immigrants, such as gender and age specific issues (e.g. gender inequality, bullying in youth), cultural and language barriers, environmental and financial challenges, and risk behaviours (e.g. smoking, alcohol and substance abuse). Community-based educational programs, peer-support mental health workshops and mental health advocacy, which strengthen the social ties in the lives of female and younger immigrants and promote involvement to community activity, would play an important role in moderating their mental distress and psychological health challenges. Policies

which focus on developing self-esteem and self-confidence, and that facilitate accumulation of social skills should be also advocated to improve their mental health.

Third, mental health advocacy programs focusing on developing and maintaining healthy social supports for immigrants should be encouraged and advocated to address psychological distress from unemployment and promote positive mental health outcomes. According to results from this research, tangible supports play a significant functional role in easing the psychological distress of unemployed immigrants, which is three times more powerful in magnitude compared to matched Canadian-born counterparts. For immigrants, having someone physically present, receiving practical supports in overcoming day-to-day life challenges, or even just getting help with daily house chores and child care could substantially ease the distress from health-unrelated unemployment. Other social supports, such as affectionate support, emotional or information sharing and positive social interaction also play significant positive roles in moderating mental distress caused by health-unrelated unemployment for immigrants. Hence, programs that focus on building close interpersonal bonds and social ties, and that promote connection to the local community for immigrants would be an effective public policy intervention to prevent and alleviate mental distress from unemployment.

APPENDIX I

Social supports (MOSSS)	
Tangible Support	Has someone to give help if confined to bed
	Has someone to go to the doctor with
	Has someone to help with daily chores if sick
	Has someone to prepare meals
Affectionate Support	Has someone who shows love and affection
	Has someone who gives hugs
	Has someone who loves and makes feel wanted
Positive Social Interaction	Has someone to have a good time with
	Has someone to get together with for relaxation
	Has someone to do things to get mind off things
	Has someone to do something enjoyable with
Emotional or Information Support	Has someone to count on to listen
	Has someone to give advice about a crisis
	Has someone who gives information to understand a situation
	Has someone to confide in
	Has someone to give advice
	Has someone to share most private worries and fears
	Has someone to turn to for suggestions for personal problems
Has someone who understands problems	

Source: Sherbourne, C.D. and A.L. Stewart, "The MOS Support Survey" (Medical Outcomes Study Social Support Survey), *Social Sciences & Medicine*; 32: 705 - 714

APPENDIX II

1. Stratified Cox regression-based test for equality of survival curves (between lower Tangible support and high tangible support) (Stratified by immigration status)

	Events observed	Events expected(*)	Relative hazard(*)	(*) sum over calculations within imm (immigrant status)
1	2974.69	1961.60	1.5942	Wald chi2(1) = 269.69 Pr>chi2 = 0.0000
2	3792.70	4804.71	0.8266	
Total	6767.39	6766.31	1.0000	

2. Stratified Cox regression-based test for equality of survival curves (between lower affectionate support and high affectionate support) (Stratified by immigration status)

	Events observed	Events expected(*)	Relative hazard(*)	(*) sum over calculations within imm (immigrant status)
1	1921.92	1224.42	1.6799	Wald chi2(1) = 346.08 Pr>chi2 = 0.0000
2	2048.00	2745.50	0.7935	
Total	3969.92	3969.92	1.0000	

3. Stratified Cox regression-based test for equality of survival curves (between lower positive social interaction and high positive social interaction) (Stratified by immigration status)

	Events observed	Events expected(*)	Relative hazard(*)	(*) sum over calculations within imm (immigrant status)
1	1877.64	1184.45	1.6966	Wald chi2(1) = 345.54 Pr>chi2 = 0.0000
2	2092.28	2785.47	0.7987	
Total	3969.92	3969.92	1.0000	

4. Stratified Cox regression-based test for equality of survival curves (between lower positive social interaction and high positive social interaction) (Stratified by immigration status)

	Events observed	Events expected(*)	Relative hazard(*)	(*) sum over calculations within imm (immigrant status)
1	1817.49	1105.37	1.7690	Wald chi2(1) = 384.64 Pr>chi2 = 0.0000
2	2152.43	2864.55	0.8024	
Total	3969.92	3969.92	1.0000	

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CHAPTER 4

Emergency Department Utilization and Visit Dispositions among Urban Homeless Adults in Canada

Abstract

This chapter focuses on systematic studies to investigate and identify reasons for emergency department utilization, and the contributing factors to various emergency department visit dispositions (especially in-patient admissions to hospital) following episodes of ED visits by homeless adult ED users in Canada. Record-level claim data drawn from the National Ambulatory Care Reporting System (NACRS) during four budgetary years (2009-2010 to 2013-2014) are used for the estimations. The results of the analyses suggest that the leading problems of ED visits by homeless adults in Canada, such as mental and behavior disorders and external hazards, are predicted to significantly increase the cost of each ED visit compared to other general medical causes. However, they are not identified as the main causes of medically necessary in-patient hospitalizations for homeless adults in Canada, even after controlling for other potential contributing factors. For policy, this suggests that risk factors among high frequency ED user should be targeted, and that taking alternative measures, to avoid excessive social and economic expenditures incurred by frequent ED use, such as providing recovery-oriented and client-centered services to promote mental health, harm reduction and social and community integration, should be provided to the homeless.

Keywords: Emergency Department (ED), homelessness, visit disposition, costs of ED visit, in-patient admission

4.1 INTRODUCTION

Homeless individuals face multiple social and economic disadvantages and vulnerabilities in their life. Based on the State of Homelessness in Canada 2013 report by the Canadian Homelessness Research Network (CHRN), in partnership with the Canadian Alliance to End Homelessness in 2013, it is estimated that there are over 200,000 Canadians who experience homelessness without any physical shelter or contact emergency shelter services in a given year. This number is likely highly underestimated, considering that many cases of homelessness are not reported. Although in Canada, health care is publicly funded; homeless and marginally housed persons still face challenges getting reasonable access to effective and efficient health care (Hwang, 2001). Homelessness has also shown to be one of the contributing factors to high health care costs, which is a major concern to policy makers and planners. Literature shows that homeless and marginally housed persons frequently obtain medical care through acute care services, such as emergency departments (ED). Furthermore, existing research shows a highly imbalanced distribution of frequency of ED use across population groups, and homeless people account for a relatively large proportion of frequent visitors to emergency departments (Pearson, 2007; Little & Watson, 1996; Han & Wells, 2003; Morris & Gordon, 2006). One report shows that homeless people access ambulatory care and emergency departments 9.1 times and 8.48 times on average per year, respectively, which is 1.76 times and 8.48 times higher than the general population (Frankish, 2005). High frequency of ED use not only leads to overcrowding and inefficiency in the health care system, but also results in increased health care-related expenditures (Trzeciak & Rivers, 2003; Bindman *et al*, 1991; D'Amore *et al*, 2001; Oates *et al*, 2009).

In addition to the significantly higher morbidity and mortality rates compared to non-homeless individuals, the majority of homeless individuals in urban settings also have high rates of substance use or dependence, mental and behavioral disorders, and external injuries and hazards, which further increase risks to their health (Hwang, 2001). The complexity of their health issues results in different utilization patterns of ED and hospital resource consumption compared to the rest of the Canadian population. Since emergency rooms are convenient to access and open around the clock, homeless people who struggle with multiple challenges often use emergency rooms as their last resort for safety and shelter, as well as to meet their primary medical care services (Rodriguez et al, 2009; Doran et al, 2013).

In response to the growing challenges of homelessness in Canada, the Government of Canada allocated \$110 million to the Mental Health Commission of Canada (MHCC) in 2008 to lead a research demonstration project in mental health and homelessness. The At home/Chez Soi, a national five-year research project built on existing evidence and knowledge of the “Housing First” approach and applied in Canadian settings, was launched in five selected Canadian cities that aimed to provide stable housing, practical services, and efficient system interventions to Canadians experiencing homelessness combined with mental health problems. “Housing First” is a recovery oriented and client-centered approach that provides people who experience homelessness with immediate access to permanent housing with no preconditions, and then providing them with individualized and client-driven home visits, outpatient treatments and pertinent community-based services and supports as needed to promote harm reduction and social and community integration (Tull, 1988). This viable approach is recommended to lessen the economic burden caused by homeless patients seeking emergency health care and to improve

the efficiency of the Canadian health care system by meeting the health care needs of the homeless as they develop rather than when they require emergency care.

4.2 LITERATURE REVIEW

Current research on ED use among the homeless often focuses on investigating the risk factors driving the frequent ED encounters by the homeless. A behavioral model of health services utilization, originally developed by Andersen & Newman (1973), identifies the factors that contribute to the use of the ED and classifies them into three sets: predisposing (demographic characteristics), enabling (insurance coverage and income) and need factors (Aday & Andersen, 1974). Need factors, such as alcohol dependence, injuries, criminal and victimization records, are the strongest significant predictors for emergency room encounters in a 6-month time period among the homeless (Padgett et al, 1995). Other studies also show that associated factors such as unstable housing, substance abuse, physical and mental illness, are main driving forces in high frequency ED use, and these findings are based on community-based interview with homeless and marginally housed persons (Kushel *et al*, 2002; Olsson & Hansagi, 2001). Employing a prospective, case-control survey, D'Amore (2001) compares homeless subjects to non-homeless controls and find that infectious disease, adverse life circumstances, alcohol and other substance misuse, psychological and psychiatric illnesses and social problems are the main contributing factors to high frequency ED utilization.

Measures to mitigate the associated underlying risks among homeless frequent ED users are discussed in several papers. Padgett (1992) suggests a series of procedures promoting access to primary and efficient healthcare, and targeted delivery of health care to avoid non-urgent ED

use, in particular that induced by psychosocial factors (socioeconomic stress, social isolation and psychiatric problems) . Pope *et al* (2000) and Moss *et al* (2002) propose that various services from a multidisciplinary Care Coordination Team (CCT) should be provided to the frequent ED users among the homeless with complex chronic medical conditions and behaviour related problems, such as alcohol, substance and violence abuse. Case management programs and other alternative solutions, such as supportive housing under the philosophy of “Housing First”, are advised to target the underlying risks and address ED overutilization by homeless people, and to promote harm reduction and involvement with community and society (Martinez & Burt, 2006; Rodriguez *et al*, 2009). Many projects and research also demonstrate that stable housing combined with outreach services and support to help access existing community services, would play a fundamental role in improving general and psychological health of the homeless and promote cost savings, especially in acute care and emergency department (ED). These recovery-oriented services include the reduction of substance use and addictive behavior; developing independence via recreational, educational, occupational and vocational activities based on individual choice; addressing stigma by promoting connection with the community and society; and improving the mental health through family and peer support (Graves & Sayfan, 2007; Tsemberis *et al*, 2004 & 2010; Tull, 2004; Culhane, 2002; Moore & Rosenheck, 2017; Padgett *et al*, 2011; Shinn, 2004; Walsh, 2015).

Existing literature studying the experience of homeless persons in ED are normally based on qualitative interview questionnaires, experimental studies and randomized controlled trials on a small sample size of patients. However, few studies have been conducted to generate a general evaluation of ED utilization, ED visit disposition among the homeless and the incurred corresponding costs in ED. This paper fills those gaps by using administrative data from two

provinces to conduct systematic studies of adult homeless ED users and marginally housed adult users with record-level claim data drawn from the National Ambulatory Care Reporting System (NACRS) (2009-2010 to 2013-2014). Estimated costs of patient stay in the ED will be obtained from the Canadian Institute of Health Information's (CIHI) "Cost of a Standard Hospital Stay" (CSHS), which has been appended to the NACRS at record level. This research thus provides a comprehensive understanding of the emergency care-seeking behaviour of homeless and marginally housed adults in Canadian urban settings. It also reports the reasons for ED utilization and the contributing factors resulting in ED visit dispositions, especially subsequent in-patient admission to hospital following episodes of ED visits of homeless adults. Therefore, this chapter contributes a more detailed and comprehensive picture of utilization of ED resources and potentially avoidable ED use by homeless individuals, which should be further investigated and clarified to provide evidence to design appropriate policy interventions.

4.3 DATA AND METHODOLOGY

4.3.1 Data

This study employs administrative data from the National Ambulatory Care Reporting System (NACRS) (Level 3) provided by the Canadian Institute for Health Information (CIHI) from four fiscal years: 2010-2011, 2011-2012, 2012-2013, and 2013-2014. CIHI receives reports of client visit data directly from participating facilities, regional health authorities or ministries of health, and these are collected at the time of service being provided. The National Ambulatory Care Reporting System (NACRS) contains all hospital-based ambulatory care abstracts from the Emergency Department (ED) component following standardized reporting and quality control

protocols. The “ED visit indicator” is used to select the sample of ED visits under the emergency MIS functional centre account code. The sample is selected using the code “XXX” from the variable “Forward Sortation Area” (i.e., the first three digits of the postal code), together with the variable “Residence Type” coded as “homeless” or “shelter, and thereby restricted to ED visits by homeless or marginally housed individuals. Since urban regions of Ontario and Alberta are the only areas mandated to provide ED data, the research is further confined to data from these urban areas to limit the risk of underreporting. Children and adolescents under the age of 18 are excluded to avoid differences in policies and social assistance for homelessness in children and teens. Estimated general costs in the emergency department (ED) are obtained from the “Cost of Standard Hospital Stay (CSHS)”, appended to each record of ED visits from NACRS, and provided directly by the Financial Standards and Information (FSI) team at CIHI. The research sample contains 15,844, 15,980, 16,086, and 16,070 ED visits in 4 fiscal years from 2010-2011 to 2013-2014 excluding persons who are deceased on arrival in the ED. Due to privacy and confidentiality concerns, all the data are provided and available at per record/claim level, but no identifier is available to make the data longitudinal. Hence, individual information and the number of ED visits per homeless person cannot be directly identified from the data. More details regarding sampling and data collection procedures of NACRS is available from CIHI¹³.

4.3.2 Study Variables

One key outcome is ED visit disposition following each ED visit, and this is defined by four categories. The first category is when the patient gets discharged to place of residence, such as

¹³ Canadian Institute for Health Information. National Ambulatory Care Reporting System. Available at:<https://www.cihi.ca/en/national-ambulatory-care-reporting-system-metadata>

private dwelling¹⁴, institution or nursing home. The second category includes patients leaving the ED at his/her own risk following registration, triage level, and initiation of further assessments by a service provider with or without preliminary treatments in the ED. The third category captures visits that end in intra facility transfer to day surgery, another emergency department, clinic or acute or non-acute care facility directly from the ambulatory care visit functional center. The last category includes ED visits that end in a necessary admission to the reporting facility as an in-patient to the critical care unit or operating room or another unit directly from the ambulatory care visit functional center. Based on the CIHI's classification of hospital admitted cases, the last category is used to evaluate the admission rate of in-patient hospitalization. Any transfer cases in category three are excluded.

To identify the reasons for the ED visit and contributing factors to subsequent hospitalization, several independent variables are used. Causes of ED visits are based on one single main problem reported during one given emergency visit. The main/common problems resulting in ED visits are constructed following the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada (ICD-10-CA) developed by the World Health Organization (WHO) and enhanced by CIHI to meet Canadian morbidity data needs. ICD-10-CA not only classifies diseases, but also includes injuries, causes of death, and external causes of injury and poisoning and certain risk factors. Following the protocol of classification, the reported main problems driving ED visit by the homeless are classified into 23 categories, including a range of classifications such as “certain infectious and parasitic diseases” and “factors influencing health status and contact with health services”. Based on the descriptive analyses of leading causes to ED visit, nominal variable “main problems” is generated by re-

¹⁴ This description follows the official definition of ED visit disposition by CIHI. Since the study sample is adult homeless people, this description may contain other meanings, e.g. return to the street or other temporary shelters.

grouping 23 categories into 5 larger categories: (a) ED visits driven by mental and behavioral disorders; (b) ED visits caused by injury, poisoning and certain other consequence of external causes; (c) ED visits due to symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; (d) ED visits caused by factors influencing health status and contact with health services; (f) ED visits due to all other problems. This nominal variable will be used in regression estimation to identify contributing factor to hospitalization of homeless patients.

Other independent variables include an ambulance admission identifier: “Whether the homeless visitors are admitted to ED relying on any air/ground/water/combined ambulance services or no ambulance arrival?”; Access code to primary health care: “Whether the visitors have access to services of family physician or other primary health care providers, such as family health team, walk-in clinic or in other setting?”; Ambulatory Visit Status Code: “whether patients who come to a facility or who receive community services on a recurring or continual basis for the same problem or reason?”; visit type code, which is used to differentiate between planned and unplanned visits to the emergency department (only for fiscal year 2010 – 2011); and ambulatory care type code: “Which ambulatory care group of MIS functional center is contacted by the homeless visitors: emergency department, Urgent Care Centre (UCC) or emergency mental health service?”.

Demographic variables of interest include age, gender, and province, and these are used to dummy variables for six age groups “18-24”; “25-44”; “45-64”; “65-74”; “75-84” and “85+”, a male/female variable, and whether they are from Ontario or Alberta.

To control for the contributing effect of clinical comorbid conditions at hospital admission, the Charlson Comorbidity Index, which predicts the risk of mortality for patients with

a range of comorbid conditions, are derived, based on one main diagnosed problem and nine other problems recorded at the exit from ED visit (Appendix I). If one or more additional diseases or disorders are co-occurring with the primary disease, a range of comorbidities are listed under 17 categories. Each comorbid condition is assigned a score of 1, 2, 3 or 6 depending on the risk of dying associated with this condition. For “Metastatic solid tumor” and “AIDS/HIV”, the highest score of 6 is assigned to reflect the high risk of mortality. For other comorbid conditions, such as “Myocardial infarction”, “congestive heart failure”, “chronic pulmonary”, etc., a low score of 1 is assigned to reflect the lower risk. In this study, an Age-Adjusted Charlson Comorbidity Index (ACCI) is also generated by adding a score of 1 to the previously unadjusted comorbidity index for each decade increment to the age of 40 and up, for each record. The number of comorbid conditions is also reported based on the records of one major problem and nine other diagnosed problems during one certain emergency visit by homeless individuals.

Estimated costs per ED visit are reported to evaluate the expenditures of health resources consumed by homeless adults in emergency departments. The major categories of the main interventions from each ED visit are generated based on the Canadian Classification of Health Interventions (CCI). CCI is the national standard for classifying health care procedures and the companion classification system to ICD-10-CA, which summarizes a broad range of specific interventions and services health professionals provide in the ED. The variable “main interventions” will be examined in the descriptive analyses to provide a complete analysis of the clinical pathway of homeless patients and their resource utilization of emergency care.

4.3.3 Methodology

Data analyses proceeds in two phases, and SAS Statistical Analysis Version 9.4 is used for all analyses. In the first phase of data analyses, descriptive analyses of the characteristics of ED visits by homeless adults are generated, which include the basic demographic features of homeless patients in ED, Canadian Triage and Acuity Scale (CTAS) levels of each ED visit, subsequent visit disposition following each ED visit, primary care accessibility, ambulance services, etc. The main problems and main intervention of homeless ED visits are identified based on analyses of frequencies for ED visits in the 4 fiscal years. Cross-tabulation and χ^2 tests were conducted to identify the factors that are significantly associated with different visit dispositions. The significant factors from the bivariate analyses, and those suggested by the literature and available in the data, were included in multivariate logistic regression analyses.

In the second phase, multinomial logistic regression analyses were conducted to determine which factors significantly contribute to subsequent necessary hospitalizations compared to other visit dispositions for homeless ED visitors, controlling for other influential factors. The leading causes of hospitalization and avoidable reasons for ED visits by the homeless will be identified. The results provide a better understanding of homeless persons' clinical pathways through the emergency department and provide suggestions for improving the efficiency of service delivery in emergency departments, in particular for the homeless.

To measure the economic costs of ED visits by the homeless, summary statistics are generated using the Cost of Standard Hospital Stay (CSHS) appended to the NACRS data at each record level for various categories, based on the main problem associated with the ED visit, main intervention during the ED visit, demographic factors, CTAS level and visit disposition. Finally, an OLS regression analysis is used to investigate the factors that significantly contribute to ED

cost. The cost analyses provide important implications for the potential of economic evaluation of alternative measures to economize the use of ED resources among homeless populations.

4.4 RESULTS

4.4.1 Descriptive Statistics

The study sample contains 16,070, 16,074, 15,844 and 15,979 ED visits by homeless adults (aged 18 years or older) derived from NACRS in 4 fiscal years (2010-2011 to 2013-2014). During each year, the majority of ED visits are by men (77.4% in 2013-2014; 76.9% in 2012-2013; 75.2% in 2011-2012 and 75.3% in 2010-2011) in age groups ranging from 25-44 to 45-64 (e.g. 44.9% and 38.3% in the 2013-2014 fiscal year). The average age of ED visit patients is 42 years, and the information is submitted by participating facilities or directly from regional health authorities or ministries of health in Ontario (65.9% in 2013-2014 fiscal year) and Alberta (34.1% in 2013-2014). (Table 4.1)

Most of ED visits in the study are cases with high acuity (CTAS I-III: resuscitation, emergent or urgent) following the Canadian Triage and Acuity Scale (72.2% in 2013-2014) from general emergency departments (90.4% in 2013-2014). However, some ED visits are to the urgent care center (UCC) and the emergency mental health crisis services center (6.2% and 3.4% in 2013-2014). In fiscal year 2013-2014, around 59.5% of ED homeless visitors arrived at the emergency department on foot and around 40.5% cases by ambulance services (air, water or ground). In the same fiscal year, around 27.4% homeless ED visitors reported having certain access to primary health care, such as family physicians and others (excluding family health teams and walk-in clinics). In fiscal year 2011-2012, “Type of ED Visits” and “Scheduled ED

Visit Indicator”, which are data elements that were retired in later years, show that most ED visits are unplanned and unscheduled for the purpose of a new (62.7% in 2010-2011) or the same clinical condition (7.4% in 2010-2011). Combined diagnosed main problems with other possible problems from each ED visit, the number of comorbidities, the unadjusted and age-adjusted Charlson Comorbidity Index (CCI and ACCI) are generated to reflect the long-term chronic conditions and estimated mortality of patients with co-existing and co-occurring conditions or diseases. They are also used in the regression analyses as key control variables. The descriptive information shows that the majority ED visits by the homeless are not associated with any comorbid condition, so the CCI is zero (e.g. 92.7% in 2013-2014). Around 6.9% ED visits record a CCI score of 1–2, which indicates mild comorbidity; moderate and severe comorbid conditions, with CCI scores of 3–4 and scores ≥ 5 , account for 0.3% and 0.1%, respectively, of total ED visits by homeless adults, in fiscal year 2013-2014. After the modification of the CCI by including age in the comorbidity index, the ACCI reports 94.5% zero to mild conditions (scores of 0-1). Moderate and severe conditions comprise 3.4% (scores of 2-3), 1.7% (scores of 4-5) and 0.4% (score ≥ 6) of the sample in fiscal year 2013-2014 (Table 4.1).

Table 4.1 shows the descriptive analyses. Different visit dispositions are summarized, which are the endpoint of emergency department visits. In fiscal year 2013-2014, around 10.3% ED visits resulted in admission to the reporting facility as an inpatient, including to the critical care unit or operating room or others directly from an ambulatory care visit functional centre (general emergency, UCC or mental health crisis service centre). 72.9% of ED visits end with a direct discharge to place of residence, such as private dwelling¹⁵, institution or nursing home, and around 14.3% ED visits end with the patient leaving the emergency department at his/her own

¹⁵ This description follows the official definition of ED visit disposition by CIHI. Since the study sample is adult homeless people, this description may contain other meanings, e.g. return to the street or other temporary shelters.

risk following registration and triage. Further assessment and treatment may or may not be provided by a service provider. Approximately 2.9% ED visits result in inter- or intra-facility transfers from any ambulatory care visit functional centre (emergency department, UCC or mental health centre) to another acute care or non-acute care facility, such as day surgery, other emergency department or clinic. The average estimated costs of ED visits by homeless adults in Ontario and Alberta range from \$306.27 in the fiscal year of 2010-2011 (\$282.79 in Ontario and \$365.01 in Alberta) to \$342.68 in the fiscal year of 2013-2014 (\$290.83 in Ontario and \$442.75 in Alberta).

Table 4.1 Characteristics of ED visits by homeless adults, NACRS, 2010–2014

Homeless/In Shelter	2010-2011		2011-2012		2012-2013		2013-2014	
Total No. of Visits, No. (%)	15,979	(100)	15,844	(100)	16,074	(100)	16,070	(100.0)
Female, No. (%)	3,945	(24.7)	3,927	(24.8)	3,712	(23.1)	3,623	(22.6)
Male	12,034	(75.3)	11,917	(75.2)	12,362	(76.9)	12,447	(77.4)
Age Groups, No. (%)								
18-24	2,011	(12.6)	2,322	(14.7)	2,218	(13.8)	1,830	(11.4)
25-44	6,995	(43.8)	6,802	(42.8)	6,770	(42.1)	7,218	(44.9)
45-64	6,128	(38.4)	5,960	(37.6)	6,336	(39.4)	6,160	(38.3)
65-74	513	(3.2)	530	(3.4)	468	(2.9)	651	(4.1)
75-84	133	(0.8)	153	(1.0)	164	(1.1)	90	(0.6)
85+	199	(1.2)	77	(0.5)	118	(0.7)	121	(0.7)
Reporting Provinces, No. (%)								
AB	4,562	(28.6)	5,172	(32.6)	2,403	(15.0)	5,484	(34.1)
ON	11,418	(71.4)	10,672	(67.4)	13,671	(85.0)	10,586	(65.9)
Canadian Triage and Acuity Scale (CTAS) levels, No. (%)								
High Acuity: CTAS I-III	10,486	(65.6)	10,298	(65.0)	11,147	(69.9)	11,608	(72.2)
Low Acuity: CTAS IV-V	5,408	(33.9)	5,437	(34.3)	4,767	(29.9)	4,387	(27.3)
Unknown/Unavailable	85	(0.5)	109	(0.7)	31	(0.2)	75	(0.5)
Admit via ambulance, No. (%)								
Air/Ground/Water ambulance	6,202	(38.8)	6,224	(39.3)	6,545	(40.7)	6,503	(40.5)
No Ambulance (walk in)	9,777	(61.2)	9,620	(60.7)	9,529	(59.3)	9,567	(59.5)
Access to Primary Health Care, No. (%)								
No	4,667	(29.2)	4,626	(29.2)	5,895	(36.7)	4,426	(27.5)
Yes (Family Physicians and others)	5,440	(34.0)	4,626	(29.2)	5,824	(36.2)	4,401	(27.4)
Unknown/Unavailable	5,872	(36.8)	6,592	(41.6)	4,355	(27.1)	7,243	(45.1)
Visit Ambulatory Care Functional Centre, No. (%)								
Emergency (ED) General Emergency	13,804	(86.4)	13,728	(86.6)	15,175	(94.4)	14,526	(90.4)
Urgent Care (UCC)	1,518	(9.5)	1,475	(9.3)	86	(0.5)	1,002	(6.2)

Emergency Mental Health Service (ED-Mental Health)	657	(4.1)	641	(4.1)	813	(5.1)	542	(3.4)
Type of ED Visits (Retired in F2011/12), No. (%)								
Unplanned Emergency Dept. visit for a new clinical condition	10,023	(62.7)						
Unplanned return visit to Emergency Dept. for the same clinical condition	1,187	(7.4)						
Planned return visit or follow-up to the Emergency Dept. for the same clinical condition	166	(1.0)						
Patients referred and seen by a non-Emergency Dept. service provider	41	(0.3)						
Unknown/Unavailable	4,562	(28.6)						
Scheduled ED Visit Indicator (Retired in F2011/12), No. (%)								
No schedule	11,498	(72.0)						
Scheduled or Unknown/Unavailable	4,481	(28.0)						
Visit Disposition, No. (%)								
Discharged to Place of Residence (Private dwelling, institution, nursing home)	11,537	(72.2)	11,643	(73.5)	11,577	(72.0)	11,664	(72.9)
Patient left the emergency department at his/her own risk following registration and triage. Further assessment by a service provider. Treatment did not occur or initiation of treatment.	2,393	(15.0)	2,372	(15.0)	2,410	(15.0)	2,295	(14.3)
Transferred to another acute care or non-acute care facility directly from the ambulatory care visit functional centre; Intra Facility transfer to day surgery /emergency department/clinic.	375	(2.3)	414	(2.6)	399	(2.5)	464	(2.9)
Admitted into Reporting Facility as an in-patient to critical care unit or operating room or another unit of the reporting facility directly from an ambulatory care visit functional centre.	1,674	(10.5)	1,415	(8.9)	1,688	(10.5)	1,647	(10.3)
Numbers of comorbid conditions per ED visit, No. (%)								
0	15,085	(94.4)	14,763	(93.2)	15,054	(93.7)	14,893	(92.7)
1	852	(5.3)	1,006	(6.4)	950	(5.9)	1,087	(6.7)
2-4	42	(0.3)	75	(0.4)	70	(0.4)	90	(0.6)
The Charlson Comorbidity Index (CCI) per ED visits, No. (%)								
0	15,084	(94.4)	14,763	(93.2)	15,054	(93.6)	14,893	(92.7)
1-2	845	(5.3)	1,019	(6.4)	963	(6.0)	1,103	(6.9)
3-4	20	(0.1)	24	(0.2)	28	(0.2)	55	(0.3)
>=5	27	(0.2)	37	(0.2)	29	(0.2)	19	(0.1)
The Age-adjusted Charlson Comorbidity Index (ACCI) per ED visit, No. (%)								
0-1	15,324	(96.0)	15,052	(95.0)	15,307	(95.2)	15,180	(94.5)
2-3	431	(2.7)	538	(3.4)	502	(3.1)	552	(3.4)
4-5	150	(0.9)	179	(1.1)	207	(1.3)	278	(1.7)
>=6	70	(0.4)	73	(0.5)	57	(0.4)	60	(0.4)
Mean of Estimated Cost per ED visit, \$ (SD)	\$306.27	(217.17)	\$313.54	(222.56)	\$312.71	(210.33)	\$342.68	(247.45)

Sources: National Ambulatory Care Reporting System, 2010–2014, Canadian Institute for Health Information.

Principal diagnoses of ED visits are classified into categories following the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada (ICD-10-CA) developed by the World Health Organization (WHO) and enhanced by CIHI to meet Canadian morbidity data needs (Table 4.2). The most frequently reported diagnoses in ED visits by homeless adults are in the category “Mental and Behavior Disorders” (Chapter 5 in ICD-10-CA). In the fiscal year of 2013-2014, around 36.8% ED visits were for mental and behavior-related disorders and this rate is observed consistently in all years. The most common problems reported under mental and behavior disorders are harmful alcohol abuse and intoxication (19.9%), drug and other psychoactive substance abuse (5.1%), followed by Schizophrenia, Schizotypal and delusion disorder (4.9%), neurotic, stress-related and somatoform disorders (3.6%), and mood/affective and anxiety disorders (2.3%). The category “Injury, poisoning and certain other consequences of external causes” (Chapter 19) accounts for 16.5% of all visits. Homeless individuals are exposed to various hazards on street and are more vulnerable to external injuries and substance misuses, which may drive these ED visits. Category 18 “Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified” (14.6% of all visits in 2013-2014) and Category 21 “Factors influencing health status and contact with health services” (9.8% of all visits in 2013-2014) make up the other top reasons for ED visits among homeless adults. Among these, some causes require special attention since these might be more common among the homeless, such as symptoms related to emotional state and behavior disorders; ED visitors seeking medical services due to repeated prescription and follow-up examinations; ED visits due to potential health hazards related to socioeconomic and psychosocial circumstances. There are significant differences regarding the leading causes of ED visits between the homeless adults and the general population. (Table 4.2)

Based on descriptive summaries of the NACRS done by CIHI for the fiscal year of 2013-2014 (Table 4.3), the top 10 main problems of ED visits for the general population in Canada are listed as “Abdominal and pelvic pain”, “Pain in throat and chest”, “Acute upper respiratory infection multiple/unspecified site”, “Other medical care”, “Other disorders of urinary system”, “Dorsalgia (back pain)”, “Open wound of wrist and hand”, “Other gastroenteritis and colitis Cellulitis” and “Open wound of head”. According to the descriptive information summarized in Table 4.2, those same medical symptoms and problems only account for a very small proportion of causes for ED visits among homeless adults in Canada. For example, “Abdominal and pelvic pain” accounts for less than 2.4% out of all diagnoses; “Pain in throat and chest” and “Acute upper respiratory infection multiple/unspecified site” comprise less than 3.4% and 3.7%, respectively, out of the total. From Table 4.2, it can be seen that the major causes of ED visits among homeless adults are mental and behavior related disorders due to alcohol abuse and drug/substance dependency; and external hazards and other factors related with socioeconomic status and psychosocial circumstances. Hence, there are significant differences in the leading causes of ED visits between homeless adults and the Canadian general population; ED use by the homeless is clearly driven by different reasons than ED use of the general population in Canada.

Table 4.2 Top Ten Main Problems resulting in ED Visits by Homeless Adults, NACRS 2010-2014

Main Problem (ICD-10-CA)	2010-2011		2011-2012		2012-2013		2013-2014	
Total ED visits by Homeless Adults, No. (%)	15,979	(100)	15,844	(100)	16,074	(100)	16,070	(100)
V. Mental and Behavioural Disorders, No. (%)	5,648	(35.4)	5,652	(35.7)	6,271	(39.0)	5,913	(36.8)
- Use of alcohol: Acute intoxication; Harmful use; Withdrawal state; Dependence syndrome.	2,976	(18.6)	3,061	(19.3)	3,445	(21.4)	3,205	(19.9)
- Multiple drug use and use of other psychoactive substances, cocaine, opioids, etc.: Harmful and multiple use.	702	(4.4)	788	(5.0)	712	(4.4)	826	(5.1)
- Schizophrenia, Schizotypal and delusion disorder, Schizoaffective disorders, unspecified nonorganic psychosis.	824	(5.2)	698	(4.4)	893	(5.6)	793	(4.9)
- Neurotic, stress-related and somatoform disorders. Reaction to severe stress, and adjustment disorders, Acute stress reaction	558	(3.5)	579	(3.7)	609	(3.8)	584	(3.6)
- Mood/Affective disorders, Anxiety disorder	378	(2.4)	382	(2.4)	453	(2.8)	366	(2.3)
- All others	210	(1.3)	144	(0.9)	159	(1.0)	139	(1.0)
XIX. Injury, poisoning and certain other consequences of external causes	2,731	(17.1)	2,797	(17.7)	2,394	(14.9)	2,645	(16.5)
- Injuries to the head, neck, the ankle and foot, the wrist and hand, the knee and lower leg, etc.	2064	(12.9)	2078	(13.1)	1915	(11.9)	2137	(13.3)
- Toxic effects of substances chiefly nonmedicinal as to source; Poisoning by drugs, medicaments and biological substances	438	(2.7)	425	(2.7)	290	(1.8)	343	(2.1)
- All others	229	(1.5)	294	(1.9)	189	(1.2)	165	(1.1)
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2,336	(14.6)	2,144	(13.5)	2,421	(15.1)	2,339	(14.6)
- Symptoms and signs involving emotional state: Suicidal ideation(tendencies), Restlessness and agitation; Symptoms and signs involving appearance and behaviour (Strange and inexplicable behaviour)	486	(3.0)	563	(3.6)	472	(2.9)	437	(2.7)
- Symptoms and signs involving the circulatory and respiratory systems: Pain in throat and chest. Chest pain, unspecified.	544	(3.4)	461	(2.9)	570	(3.5)	496	(3.1)
- General symptoms and signs: Fever of other and unknown origin, Fit NOS, Seizure (convulsive) NOS Headache, Malaise and fatigue, etc.	590	(3.7)	522	(3.3)	585	(3.6)	533	(3.3)
- Symptoms and signs involving the digestive system and abdomen Abdominal and pelvic pain, etc.	377	(2.4)	384	(2.4)	383	(2.4)	434	(2.7)
- All others	339	(2.1)	214	(1.3)	411	(2.7)	439	(2.8)

XXI. Factors influencing health status and contact with health services	1,695	(10.6)	1,789	(11.3)	1,614	(10.0)	1,579	(9.8)
- Persons encountering health services in other circumstances: Issue of repeat prescription (appliance, medicaments and spectacles)	467	(2.9)	467	(2.9)	517	(3.2)	398	(2.5)
- Persons encountering health services for examination, and investigation; specific procedures and health care (Other chemotherapy; surgical follow-up care, etc.)	600	(3.8)	505	(3.2)	581	(3.6)	681	(4.2)
- Persons with potential health hazards related to socioeconomic and psychosocial circumstances: Homeless, Problems related to housing and economic circumstances.	214	(1.3)	242	(1.5)	401	(2.5)	296	(1.8)
- All others	414	(2.6)	575	(3.7)	115	(0.7)	204	(1.3)
XIII. Diseases of the musculoskeletal system and connective tissues	745	(4.7)	732	(4.6)	677	(4.2)	712	(4.4)
- e.g. Soft tissue disorder: pain in limb, Achilles tendinitis, leg, joint disorder; Dorsalgia; low back pain, etc.								
XII. Diseases of the skin and subcutaneous tissue	625	(3.9)	596	(3.8)	567	(3.5)	648	(4.0)
- e.g. Cellulitis (Cellulitis of other parts of limb: Axilla, Hip, Shoulder), etc.								
X. Diseases of the respiratory system	594	(3.7)	534	(3.4)	567	(3.5)	611	(3.8)
- e.g. Influenza and pneumonia; Chronic lower respiratory diseases; Upper acute respiratory infections; Chronic lower respiratory diseases, etc.								
XI. Disease of the digestive system	489	(3.1)	440	(2.8)	467	(2.9)	418	(2.6)
- Diseases of oral cavity, salivary glands and jaws; Non-infective enteritis and colitis; Diseases of oesophagus, stomach and duodenum and others, etc.								
I. Certain infectious and parasitic disease	211	(1.3)	223	(1.4)	225	(1.4)	260	(1.6)
- Other gastroenteritis and colitis of infectious and unspecified origin; Viral infection, etc.								
VI. Disease of the nervous system	208	(1.3)	226	(1.4)	224	(1.4)	250	(1.6)
- Episodic and paroxysmal disorders: Epilepsy, migraine, sleep disorders, etc.								

Sources: National Ambulatory Care Reporting System, 2010–2014, Canadian Institute for Health Information.

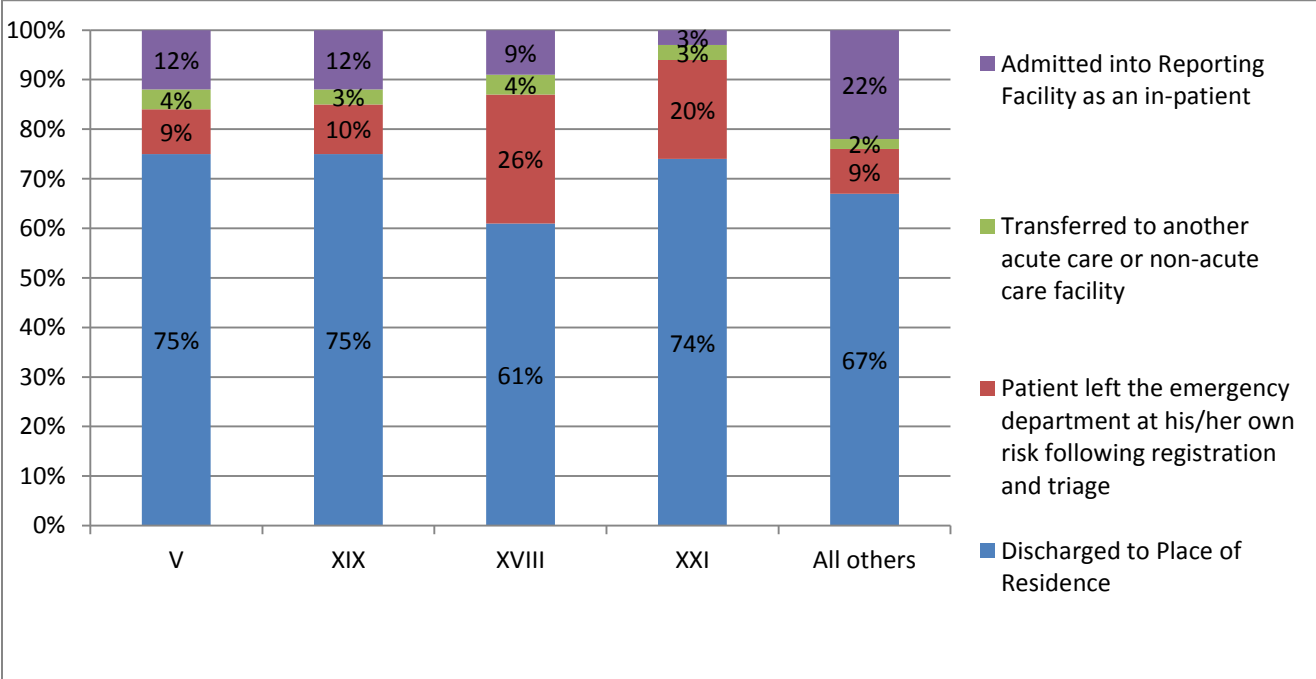
**Table 4.3 Number of ED visits by Top 10 High-Volume Main Problems,
NACRS 2012/13 & 2013/14**

2012-2013	2,004,923	100%	2013-2014	2,009,356	100%
Abdominal and pelvic pain	367,035	18.3%	Abdominal and pelvic pain	381,326	19%
Pain in throat and chest	275,601	13.8%	Pain in throat and chest	282,243	14%
Acute upper respiratory infection multiple/unspecified sites	231,616	11.6%	Acute upper respiratory infection multiple/unspecified sites	211,200	11%
Other medical care	209,734	10.5%	Other disorders of urinary system	207,934	10%
Other disorders of urinary system	194,846	9.7%	Other medical care	194,878	10%
Dorsalgia (back pain)	177,118	8.8%	Dorsalgia (back pain)	181,128	9%
Open wound of wrist and hand	149,116	7.4%	Open wound of wrist and hand	149,583	7%
Other gastroenteritis and colitis	134,111	6.7%	Other gastroenteritis and colitis	138,409	7%
Acute pharyngitis	133,296	6.6%	Cellulitis	132,202	7%
Open wound of head	132,450	6.6%	Open wound of head	130,453	6%

Source: National Ambulatory Care Reporting System, 2012/13 to 2013/14, Canadian Institute for Health Information.

The following charts (4.1 and 4.2) show visit disposition following ED episodes among homeless adults based on the NACRS for fiscal year 2013-2014. For ED visits with high acuity (CTAS I-III), the admission rate and inter/intra facility transfer rate is significantly higher for all five categories of diagnosed main problem compared to ED visit with low acuity (CTAS IV-V). ED visits caused by mental and behaviours disorder and external hazards have high direct discharge rates to the place of residence for both acuity levels (75% and 77% for mental and behaviour related disorder; 75% and 81% for external causes). ED visits caused by unclassified symptoms or signs account for the highest proportion of separation from the ED at his/her own risk following ED procedures (26% for high acuity and 40% for low acuity). ED visits due to factors related to repeated prescriptions, follow-up examinations or contacts due to socioeconomic circumstances also result in higher separation rates from the ED at his/her own

risk without/against further medical advice (20% for high acuity and 19% for low acuity). ED visits caused by all other general medical conditions with high acuity are significantly associated with the highest proportion of hospital admission (22%). However, the rate is substantially lower for cases with low acuity (3%). To further investigate major contributing factors to the types of ED visit dispositions by the homeless, more advanced analyses are required to control other confounding factors.



**Chart 4.1 ED Visit dispositions by Main Problems among homeless adults, NACRS, 2013-2014
(High Acuity: CTAS I-III)**

Sources: National Ambulatory Care Reporting System, 2013–2014, Canadian Institute for Health Information.
 Notes: “V”: Mental and Behavioural Disorders; “XIX”: Injury, poisoning and certain other consequences of external causes; “XVIII”: Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; “XXI”: Factors influencing health status and contact with health services; “All others”: all other chapters of general medical conditions.

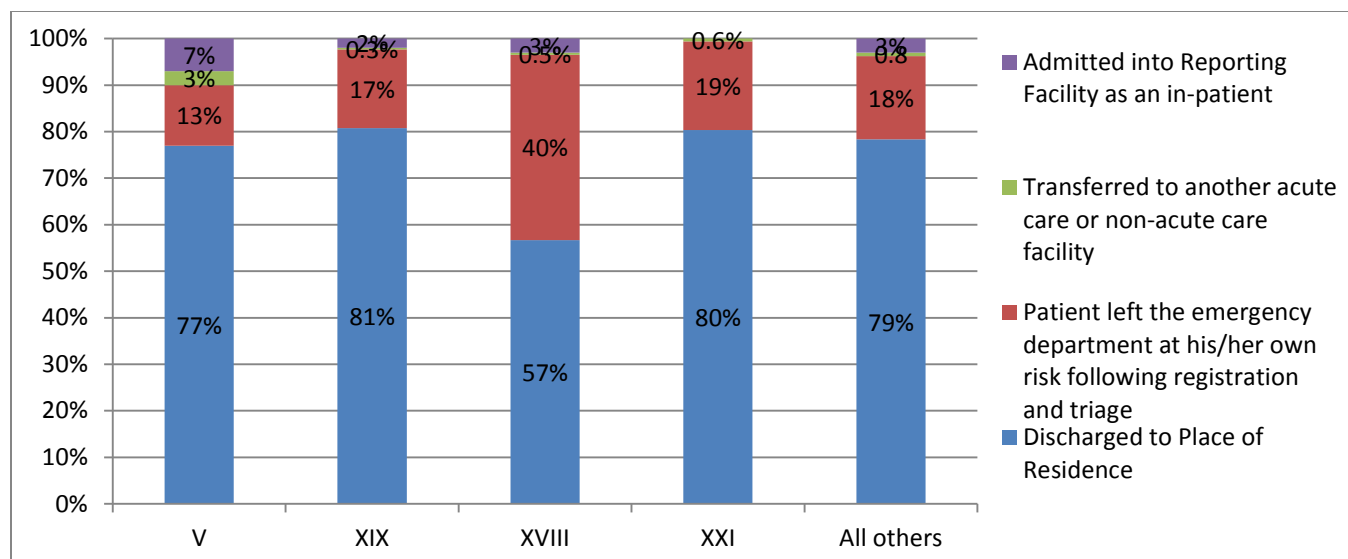


Chart 4.2 ED Visit dispositions by Main Problems among homeless adults, NACRS, 2013-2014

(Low Acuity: CTAS IV-V)

Sources: National Ambulatory Care Reporting System, 2013–2014, Canadian Institute for Health Information.

Notes: “V”: Mental and Behavioural Disorders; “XIX”: Injury, poisoning and certain other consequences of external causes; “XVIII”: Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; “XXI”: Factors influencing health status and contact with health services; “All others”: all other chapters of general medical conditions.

4.4.2 Estimation Results

In the multinomial logistic regression analyses, the major contributing factors to ED visit dispositions are identified, controlling for other influential factors. The analyses are conducted for all four fiscal years (2010-2011 to 2013-2014) and results are consistent across fiscal years. The following results are based on fiscal year 2013-2014. A table of the regression results for another fiscal year is in the appendix (Appendix II).

The key finding of the analysis is that the main problems leading to ED visits by homeless adults are all significantly, negatively and strongly related to in-patient hospital admission. Table

4.4 shows the relative risk ratios (RRR) with 95% confidential intervals and estimated coefficients from the multinomial logistic regression model for four types of ED visit dispositions, after adjusting and controlling for demographic and other characteristics and factors of ED visits. The analyses show that ED visits by homeless adults caused by mental and behaviour related problems (such as alcohol/drug/substance abuse), external hazards (such as injury and poisoning) have a statistically significantly lower risk to end in inpatient hospital admission than being discharged to a place of residence (reference group) compared to ED visits caused by other general medical condition. (RRRs: 0.59 and 0.56; estimated coefficient: -0.53 and -0.59). Other major problems resulting in ED visits, such as unclassified symptoms and other factors influence health status and contact with health services, also have a lower relative risk of hospital admission relative to ED visits being discharged to place of residence (reference group) compared to ED visits due to other general medical problems. (RRRs: 0.62 and 0.06; estimated coefficient: -0.47 and -2.80).

The results also show that ED visits caused by the mental and behaviour disorders or external hazards or unclassified causations are significantly more likely to results in transfers across various care facilities or different emergency departments relative to ED visits with normal medical symptoms, and these may result in high consumption of ED resources (RRs: 3.20, 1.51 and 2.61; estimated coefficient: 1.16, 0.41 and 0.96). The risk of an ED visit caused by the mental and behaviour related disorders to be separated from ED at the patient's own risk after following ED procedures is lower and these are more likely to be directly discharged to the place of residence compared to ED visits with other normal medical conditions (RRs: 0.72; estimated coefficient: -0.32). However, ED visits with unclassified conditions or driven by factors influencing health status and contact with health services are more likely to follow certain

ED procedures (registration, triage, assessment, intervention or not) and leave at the patient's own risk (RRs: 2.74 and 1.50; estimated coefficient: -0.32).

There are other important findings from the multivariate regression. ED visits by homeless females have a higher risk of in-patient admission to hospital or for transfer to another care facility, compared to ED visits made by males, controlling for other confounding factors (RRs: 1.15 and 1.27; estimated coefficient: 0.14 and 0.27). ED visits made by homeless seniors in age groups 64-74 and 75-84 have a significantly higher relative risks to be admitted to hospital as an inpatient relative to the youngest age group (18-24) (RRs: 1.51 and 3.53; estimated coefficient: 0.41 and 1.26). ED visitors arriving by ambulance services are more likely to be admitted to hospital and have a lower risk of transfer across departments relative to walk-in visits (RRs: 1.30 and 0.67; estimated coefficient: 0.26 and -0.40). The types of Ambulatory Care Functional Centre that homeless visitors contact for their ED visits also affect the relative risk of different ED visit dispositions. ED visits made by homeless adults to emergency mental health service centers have significantly higher risks of admission due to special requirements of acute care, compared to general emergency department (RRs: 6.07; estimated coefficient: 1.80). Not surprisingly, the relative risk ratio of hospital admission for ED visitors with more comorbidities and a higher age-adjusted Charlson comorbidity index substantially increase relative to those with zero or low comorbid condition and index, holding other variables in the model constant (RRs: 4.13, 1.81, 2.18 and 3.81; estimated coefficient: 1.42, 0.60, 0.78 and 1.34). Most of the comorbidities are long term or chronic medical conditions, which are likely one of the main contributing factors to in-patient hospitalization.

Table 4.4 Predictors of ED Visit dispositions among homeless adults in Canada, NACRS, 2013-2014
Results from multinomial logistic regression

(The reference group: Discharged to Place of Residence, e.g. Private dwelling, institution, nursing home, etc.)

Main Problems	Patient left at his/her own risk (Following ED Registration and Triage)		Transferred to another facility		Admitted as an in-patient	
	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)
Other problems (Ref)	1.00		1.00		1.00	
V. Mental and Behavioural Disorders	0.73*** (0.63 - 0.84)	-0.32*** (-0.46 - -0.18)	3.20*** (2.35-4.37)	1.16*** (0.85-1.47)	0.59*** (0.51-0.68)	-0.53*** (-0.68 - -0.39)
XIX. Injury, poisoning and certain other consequences of external causes	0.89 (0.76 - 1.04)	-0.12 (-0.28-0.04)	1.51** (1.03-2.21)	0.41** (0.03-0.79)	0.56*** (0.47-0.66)	-0.59*** (-0.76 - -0.41)
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2.74*** (2.38 - 3.15)	1.01*** (0.87-1.15)	2.61*** (1.83-3.72)	0.96*** (0.61-1.31)	0.62*** (0.52-0.75)	-0.47*** (-0.66 - -0.28)
XXI. Factors influencing health status and contact with health services	1.51*** (1.28-1.77)	0.41*** (0.25-0.57)	0.78 (0.47-1.28)	-0.25 (-0.75 - 0.25)	0.06*** (0.04-0.10)	-2.80*** (-3.34 - -2.26)
Control Variables						
Male (Ref)	1.00		1.00		1.00	
Female	0.96 (0.86 - 1.07)	-0.04 (-0.15 - 0.07)	1.27** (1.01-1.57)	0.23** (0.01-0.45)	1.15** (1.01-1.30)	0.14** (0.01-0.26)
Age Groups						
18-24 (Ref)	1.00		1.00		1.00	
25-44	1.04 (0.89-1.21)	0.04 (-0.11-0.19)	1.33* (0.97-1.81)	0.28* (-0.03- 0.59)	1.16 (0.96-1.40)	0.15 (-0.04-0.33)
45-64	0.99 (0.85-1.16)	-0.01 (-0.17-0.15)	0.92 (0.66-1.29)	-0.10 (-0.42-0.25)	1.05 (0.85-1.26)	0.04 (-0.16-0.23)
65-74	1.27* (0.98-1.65)	0.24* (-0.02-0.50)	0.58 (0.28-1.17)	-0.55 (-1.26-0.16)	1.51*** (1.10-2.06)	0.41*** (0.10-0.72)
75-84	0.79 (0.35-1.79)	-0.24 (-1.04-0.58)	1.56 (0.49- 4.95)	0.45 (-0.71-1.60)	3.53*** (2.06-6.05)	1.26*** (0.72-1.80)
85+	1.69** (1.05-2.72)	0.53** (0.05-1.00)	0.57 (0.13-2.47)	-0.56 (-2.03-0.90)	1.38 (0.70-2.71)	0.32 (-0.36-1.00)
Reporting Province						
AB (Ref)	1.00		1.00		1.00	
ON	0.87 (0.74-1.03)	-0.14 (-0.30-0.03)	2.82*** (1.93-4.12)	1.04*** (0.66-1.41)	1.03 (0.86- 1.23)	0.03 (-0.15-0.20)
Admit via ambulance						
No Ambulance (walk in) (Ref)	1.00		1.00		1.00	
Air/Ground/Water ambulance	0.93 (0.84-1.03)	-0.07 (-0.17-0.03)	0.67*** (0.55-0.83)	-0.3954*** (-0.60 - 0.19)	1.30*** (1.15-1.46)	0.2596*** (0.14-0.38)

Access to Primary Health Care						
Yes (Family Physicians and others) (Ref)	1.00		1.00		1.00	
No Access	1.39*** (1.23-1.58)	0.33*** (0.20-0.46)	1.12 (0.89-1.40)	0.11 (-0.12-0.34)	0.83** (0.71-0.97)	-0.19** (-0.34 - -0.03)
Unknown/Unavailable	1.35*** (1.14-1.60)	0.30*** 0.13 0.47	1.04 (0.76-1.43)	0.04 (-0.28-0.36)	1.48*** (1.25-1.77)	.3950 .2199956 .5700
Visit MIS Functional Centre						
Emergency (ED) General Emergency (Ref)	1.00		1.00		1.00	
Urgent Care (UCC)	0.66*** (0.54-0.81)	-0.41*** (-0.62 - -0.21)	3.30*** (2.20-4.96)	1.193*** (0.79-1.60)	0.00	-17.32 (-982.37-947.73)
Emergency Mental Health Service (ED-Mental Health)	0.48*** (0.31-0.75)	-0.74*** (-1.18 - -0.29)	0.34*** (0.17-0.67)	-1.09*** (-1.77- -0.40)	6.07*** (4.85-7.59)	1.80*** (1.58-2.03)
Numbers of comorbid conditions per ED visit						
0 (Ref)	1.00		1.00		1.00	
1	0.68* (0.46-1.03)	-0.38* (-0.78-0.03)	1.09 (0.55-2.17)	0.09 (-0.59-0.77)	1.14 (0.79-1.66)	0.13 (-0.24-0.51)
2-4	0.34 (0.04-2.67)	-1.09 (-3.17-0.98)	3.12 (0.73-13.31)	1.14 (-0.31-2.59)	4.13*** (2.15-7.93)	1.42*** (0.77-2.07)
The Age-adjusted Charlson Comorbidity Index (ACCI) per ED visit						
0-1 (Ref)	1.00		1.00		1.00	
2-3	0.76 (0.45-1.29)	-0.27 (-0.80-0.26)	1.31 (0.55-3.17)	0.27 (-0.61-1.15)	1.81*** (1.17 -2.80)	0.60*** (0.16-1.03)
4-5	0.54* (0.27-1.09)	-0.61* (-1.31-0.09)	1.17 (0.35-3.87)	0.16 (-1.04-1.35)	2.18*** (1.34-3.54)	0.78*** (0.29-1.26)
>=6	0.00	-18.46 (-12185.58 -12148.66)	6.79*** (1.72- 26.76)	1.91*** (0.54-3.29)	3.81*** (1.78-8.14)	1.34*** (0.58-2.10)

Sources: National Ambulatory Care Reporting System, 2010–2014, Canadian Institute for Health Information.

Notes: * p<.1; ** p<.05; *** p<.01

CI: Confidential Interval; RRR: Relative Risk Ratio.

To further evaluate the economic costs of ED visits and generate a comprehensive picture of the pathways of homeless adults in emergency department. The, major interventions are identified for each of the leading problems that were investigated earlier. Following the Canadian Classification of Health Interventions (CCI) by CIHI, Table 4.5 shows that the top major interventions at ED for homeless adults are “diagnostic Imaging Interventions on the respiratory

system/musculoskeletal system/orocraniofacial region/digestive and hepatobiliary tracts and other sites within the abdominal cavity NEC/nervous System”; “diagnostic Interventions on the Cardiovascular System”; and “Therapeutic Interventions on the Skin, Subcutaneous Tissue and Breast/body NEC”.

“Therapeutic interventions for mental health and addictions” is notably one of the major interventions done at ED for multiple leading problems. Table 4.5 also summarizes the average estimated costs of ED visits by main problems and interventions. The results show that the average cost of ED visits varies by the type of main diagnosed problems. The average costs of ED visits caused by mental and behavior disorders and external hazards (with and without intervention at ED) have the highest costs; while average costs of ED visits resulting from factors influencing health status and contact with health services have the lowest.

Table 4.5 Main Interventions in ED and the associated costs by main problems of each ED visit among homeless adults in Canada, NACRS, 2013 – 2014

Main Problem (ICD-10-CA)	Top 5 Main Intervention (CCI)	Cost estimates (Mean)
V. Mental and Behavioural Disorders with records of main intervention	Diagnostic Imaging Interventions on the Respiratory System	\$380.95
	Therapeutic Interventions for Mental Health and Addictions	\$361.36
	Diagnostic Imaging Interventions on the Musculoskeletal System	\$378.73
	Diagnostic Imaging Interventions on the Orocraniofacial Region	\$372.15
	Diagnostic Interventions on the Cardiovascular System	\$384.30
V. Mental and Behavioural Disorders without records of main intervention		\$377.66
XIX. Injury, poisoning and certain other consequences of external causes	Diagnostic Imaging Interventions on the Respiratory System	\$369.63
	Diagnostic Imaging Interventions on the Musculoskeletal System	\$340.27
	Diagnostic Imaging Interventions on the Orocraniofacial Region	\$331.48
	Therapeutic Interventions on the Skin, Subcutaneous Tissue and Breast	\$346.57
	Diagnostic Imaging Interventions on the Digestive and Hepatobiliary Tracts and Other Sites within the Abdominal Cavity NEC	\$377.36

XIX. Injury, poisoning and certain other consequences of external causes <u>without</u> records of main intervention		\$385.92
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	Diagnostic Imaging Interventions on the Respiratory System	\$281.27
	Diagnostic Imaging Interventions on the Musculoskeletal System	\$300.37
	Therapeutic Interventions for Mental Health and Addictions	\$313.14
	Diagnostic Imaging Interventions on the Orocraniofacial Region	\$310.02
	Therapeutic Interventions on the Skin, Subcutaneous Tissue and Breast	\$349.66
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified <u>without</u> records of main intervention		\$316.02
XXI. Factors influencing health status and contact with health services	Therapeutic Interventions for Mental Health and Addictions	\$194.75
	Diagnostic Imaging Interventions on the Respiratory System	\$182.36
	Diagnostic Interventions on the Cardiovascular System	\$168.40
	Diagnostic Imaging Interventions on the Musculoskeletal System	\$164.23
	Diagnostic Imaging Interventions on the Nervous System	\$178.71
XXI. Factors influencing health status and contact with health services <u>without</u> records of main intervention		\$176.97
All other problems	Diagnostic Interventions on the Cardiovascular System	\$ 346.66
	Diagnostic Imaging Interventions on the Respiratory System	\$362.02
	Diagnostic Imaging Interventions on the Musculoskeletal System	\$328.91
	Therapeutic Interventions on the Body NEC	\$ 298.76
	Therapeutic Interventions on the Skin, Subcutaneous Tissue and Breast	\$300.08
All other problems <u>without</u> records of main intervention		\$351.49

Results for the linear OLS regressions are reported in Table 4.6 based on fiscal year 2013-2014, and these show how the predictors induce a change in estimated cost of each ED visit by homeless adults in Canada. The analyses are conducted for all four fiscal years (2010-2011 to 2013-2014) and results are consistent across fiscal years. Tables of the regression results for other fiscal years are in the Appendix III. For ED visits caused by mental and behavior-related disorders and external hazards, the predicted costs of each ED visit are 23.46 dollars and 18.07 dollars higher (significant at 1%) than ED visits that result from other general medical problems, holding all other variables constant. However, ED visits associated with unclassified

symptoms and factors related with health status are 22.78 dollars and 93.90 dollars lower than other general medical conditions, keeping all other variables fixed. ED visits by older patients, ambulance services, higher illness severity level and more comorbidity also positively increase the estimated cost of each ED visit. Estimated costs of each ED visit in reporting facilities in Ontario are significantly lower by 176.83 dollars than the costs in Alberta. For the ED visits made to the Emergency Mental Health Service Center (ED-Mental Health), the estimated costs of each visit are significantly higher by 73.25 dollars than ED visits to the general emergency department, holding all other variables constant.

The leading diagnoses of ED visits by homeless adults in Canada, such as mental and behavior disorder and external hazard, are predicted to significantly increase costs of ED visits compared to other general medical causes. However, the results from the multinomial logistic analyses show that these they are not identified as causes of medically necessary in-patient hospitalizations for homeless adults. ED visits caused by mental behavior disorder and external hazard generate huge economic costs and consume large amounts of ED resources. However, the risk of being admitted to in-patient hospitalization is comparatively lower if ED visits are caused by these.

Table 4.6 Predictors to changed costs of each ED visit among homeless adults in Canada, NACRS, 2013-2014 – Results from OLS regression

Contributing Factors	OLS (1) Costs of each ED visit		OLS (2) Costs of each ED visit		OLS (3) Costs of each ED visit	
	β	SE β	β	SE β	β	SE β
Main Problems						
V. Mental and Behavioural Disorders	31.18***	5.08	30.15***	4.80	23.46***	4.98
XIX. Injury, poisoning and certain other consequences of external causes	32.79***	6.16	15.58***	5.70	18.07***	5.70
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	-28.50***	6.39	-29.78***	5.94	-22.78***	5.87

XXI. Factors influencing health status and contact with health services	-170.03***	7.26	-110.91***	6.82	-93.90***	6.71
Control Variables						
Female			5.04	4.22	2.38	4.13
Age Groups						
25-44			23.31***	5.80	19.10***	5.67
45-64			37.55***	5.94	21.89***	5.89
65-74			95.74***	10.15	62.88***	10.23
75-84			207.82***	23.90	176.00***	23.62
85+			95.37***	20.79	82.28***	20.38
Reporting Province						
ON			-174.48***	3.80	-176.82***	6.26
Canadian Triage and Acuity Scale (CTAS) levels						
High Acuity: CTAS I-III			140.19***	4.22	116.48***	4.25
Unknown/Unavailable			-9.10	25.81	-20.30	25.25
Admit via ambulance						
Air/Ground/Water ambulance					52.40***	3.81
Access to Primary Health Care						
No Access					-17.00***	4.63
Unknown/Unavailable					6.561	6.16
Visit MIS Functional Centre						
Urgent Care (UCC)					-86.72***	7.67
Emergency Mental Health Service (ED-Mental Health)					73.25***	10.07
Numbers of comorbid conditions per visit						
1					49.90***	13.00
2-4					223.81***	29.11
The Age adjusted Charlson Comorbidity Index (ACCI)						
2-3					32.89**	16.03
4-5					80.93***	19.15
>=6					141.50***	33.66

Notes: * p<.1; ** p<.05; *** p<.01

4.5 DISCUSSION

This empirical study shows that Canadian homeless people's use of acute emergency department services are mainly driven by risk factors related to mental and behavioural disorders, alcohol and substance abuse, injury, drug poisoning and other potential health hazard related to socioeconomic and psychosocial circumstances. Living on the street without stable housing and

sufficient resources exposes the homeless to dangerous and risky environments, which not only result in adverse effects on their general and mental health, but also induce unique patterns of utilization of health care resources that differ from the general population. However, an interesting finding is that mental and behaviour problems or external hazards, which cause high rates of ED visits, are not significant contributing factors to medically necessary in-patient hospitalization. Compared to general health conditions, ED visits caused by mental and behavior problems and external hazards have 41% and 44% lower risk of resulting in hospitalization and are patients are much less likely to be admitted into hospital (critical care unit or operating room) as an in-patient to receive further necessary medical treatments or interventions. However, ED visits by the homeless for mental and behavior problems or suffering from external dangers normally have 320% and 151% higher estimated relative risk of transfer to acute care or non-acute care facilities (day surgery center, other emergency department or clinic) directly from the ambulatory care visit functional center or the emergency department, which can lead to high medical care resource consumption in the process. The study also showed that each ED visit made by the homeless diagnosed with mental and behavior problems significantly increases the dollar value of estimated ED costs by \$23.46 than ED visits resulting from general medical conditions. ED visits resulting from external hazards, such as injuries, drug poisonings and toxic effect of substance abuses, are estimated to increase ED costs by \$18.07 compared to ED visits associated with general medical conditions, keeping other contributing factors constant.

Therefore, one conclusion of this study is that ED visits by homeless adults that result from mental and behavior disorder or external hazards results in the use of large amounts of economic resources in the emergency department that could be avoided. Compared to general medical conditions, the top causes of ED visits by homeless do not result in medically necessary in-

patient treatments or hospitalizations. Nevertheless, these ED visits consume significant amounts of economic resources in the emergency department and affect the efficiency of the health care system.

This study contains several limitations. First, data from the matched general population was not available and this would have facilitated comparative studies. NACRS is a large data base, which contains administrative emergency department (ED) records submitted by participating facilities or from regional health authorities or ministries of health in Canada. Requesting specific ED records from the matched non-homeless population is feasible for future study but requires longer waiting time for official approval by CIHI. Second, in order to protect confidentiality, no individual ED users' personal information, such as socioeconomic characteristics, cultural and ethnical background, education level, personal and household income, income resources, social support and connection, were available. These would have been valuable control variables to add to the regression analyses, and to provide a more comprehensive description of homeless ED users. Third, due to data limitations, other potential contributing factors are not included, such as time length of triage at the emergency department; frequency of ED visits by individual ED users; general physical and mental health status of ED user, etc. Fourth, due to limited data size, comparative analyses based on gender and age differences cannot be fully investigated. Future comparative analyses, based on more detailed data, are proposed to overcome the above limitations and fill additional research gaps. These results would shed further light on alternative solutions to homelessness, in particular following the philosophy of "Housing First", to direct effective and efficient utilization of ED resources. Policies should be targeted toward addressing underlying risk factors among homeless exhibiting

high rates of ED use and taking alternative measures to avoid the expenditures from frequent visits.

4.6 CONCLUSION

Homeless people in Canada face many challenges and hardships in their life. Complex physical and mental health problems, trauma, related stigma and discrimination, and substance and alcohol abuse make them a vulnerable population group that actively resorts to medical help from the emergency department (ED) - the most accessible and easily approachable medical care in the health care system. However, since these health conditions often do not require ED treatment, and can be controlled through different social support systems, other measures that include both clinical services and housing should be promoted to alleviate additional burdens on emergency departments. Based on the results from this research, the policy recommendations are to focus on addressing the fundamental risk factors of the homeless in the following three sectors.

In the public health sector, health care services and innovations should be tailored to meet the specific medical needs of homeless people in Canada. Research shows that risk factors related to mental and behavioural disorders, alcohol and substance abuse, injury, drug poisoning and other potential health hazard related to external circumstances are the main contributors to intensive utilization of ED resources by homeless people. Hence, harm-reduction-oriented policy interventions promoting mental health and prevention in primary care should be central with special attention on the identification and management of adverse environmental stressors of homelessness, such as alcohol and substance reliance and abuse. The societal and environmental

conditions of homeless people need to be investigated and health-care providers have to be aware of these to develop corresponding strategies that help patients better manage their health and reduce inappropriate healthcare utilization. The homeless should also be encouraged to access and acquire information to better navigate the healthcare system and learn to differentiate their non-emergency medical needs from urgent ones. With the support of multi-sectoral educational programs in community settings and the development of health information technology, improvement in medical information communication within the public health sector could play a fundamental role in helping to decrease the reliance on emergency departments and improving the quality and efficiency of health care delivery in the system.

In the housing sector, guided by the philosophy of “Housing First”, multiple pilot research projects were implemented nation-wide, which provided homeless people with immediate access to stable and supportive housing, individualized and comprehensive medical treatments and recovery-oriented programs to promote hazard reduction, community integration and reduce homelessness. However, the homeless population in Canada is diverse, with many different cultural and ethnic backgrounds, including indigenous peoples, racialized groups and refugees and newcomers (Zerger et al., 2014; Stergiopoulos et al., 2015). In addition to the traditional “Housing First” approach, the development of a tailored program to fit the Canadian context should be emphasized in the policy design of different jurisdictions.

The main results of this research show that the main problems of homeless ED users - mental and behavioural problems, and external hazards - are not significant contributing factors to medically necessary in-patient hospitalization, but that they consume significant amounts of economic resources in the emergency department. Hence, in other sectors, the focus should be on providing customized support to homeless people with complex needs, which includes treatment

of alcohol and substance abuse, legal consultation and criminal justice support to avoid victimization, peer support, safety and security education, cultural sensitive education focusing on the sense of family belonging and community integration, community educational programs to promote living skills and employment, as well as financial supports from both public and private sectors to improve the living environment of homeless people. A prevention program in cold winter that provides transitional shelter should also be widely available to all homeless people to reduce infections and the need to go to the ED for warm shelter.

There are lessons we can learn from other countries to improve our policies. In the US, policy recommendations under the Affordable Care Act (e.g., Medicaid Expansion and Health Homes) focus on outreach efforts to provide case management interventions for mental illnesses, traumatic injury, and infectious diseases supported by multi-disciplinary providers, which are financed not only by public funds but also third parties from the private and non-profit and charitable sectors (Fazel et al., 2014; Lin et al., 2015). In the EU, there is a shift in strategies to help the homeless from the traditional “treatment first” approach to the modern “housing first” approach, and are generally publicly funded. Instead of providing emergency medical treatment to make the homeless ready for housing, independent and stable accommodation is arranged and supplied combined with appropriate support services as the leading intervention, to prevent conditions that require emergency treatment (Johnson & Teixeira, 2010). In Australia, cooperation and coordination among multiple jurisdictions (Department of Health, Department of Child Protection & Family Services, Department of Education, Department of Corrections, Mental Health Commission) are advocated to assist the homeless overcome financial, bureaucratic and personal barriers in accessing appropriate health care, and thus alleviating the burden on emergency departments (Moore, Gerdtz & Manias, 2007).

Canada's health care system is publicly funded, which requires coordinated administration of ten provincial and three territorial health systems within the guidelines set by the federal government. The efficiency and quality of policy delivery depends on the optimization and coordination of resource utilization among the sectors. Hence, the collection of administrative data of homeless people, evidence-based research and economic evaluations on the cost effectiveness of relevant policies should be promoted to investigate outcomes of potential projects and policies, and to prioritize alternative policy measures given budget limits. The comprehensive evaluation of policies should focus on the following goals from different perspectives. From the economic efficiency perspective, goals should include the proper evaluation of intervention costs, such as expenses associated with staff, administration, treatment, and support; the evaluation of avoided expenses and money saved by Housing First participation. From the client perspective, the goals should include securing permanent, stable housing through the private market; combining housing with outreach services and support to help access existing community services; improving mental and physical health of the client and promoting harm reduction to reduce substance use and addictive behavior; developing independence via recreational, educational, occupational and vocational activities based on individual choice; addressing stigma by promoting integration within the community; and improving spiritual health by promoting traditional aboriginal values and cultures. From the system perspective, goals should include reduction in the number of homeless people; reduction in resources used by other public sectors, such as shelters, acute care and emergency departments, emergency medical services and police, social and justice systems.

In summary, ED resources utilized by the homeless should be redirected and re-guided through policies focusing on addressing the underlying risks of homeless people. Due to the

heterogeneous demographic and socioeconomic characteristics of urban homeless people in Canada, priority and intensity of policies should be also customized by incorporating the changing factors to fit into the experiences and needs of target groups based on local community circumstance.

APPENDIX I

Charlson Comorbidity Index Scoring System

Score	Condition
1	Myocardial infarction (history, not ECG changes only)
	Congestive heart failure
	Peripheral disease (includes aortic aneurysm \geq 6 cm)
	Cerebrovascular disease: CVA with mild or no residua or TIA
	Dementia
	Chronic pulmonary disease
	Connective tissue disease
	Peptic ulcer disease
	Mild liver disease (without portal hypertension, includes chronic hepatitis)
	Diabetes without end-organ damage (excludes diet-controlled alone)
2	Hemiplegia
	Moderate or severe renal disease
	Diabetes with end-organ damage (retinopathy, neuropathy, nephropathy, or brittle diabetes)
	Tumor without metastasis (exclude if $>$ 5 y from diagnosis)
	Leukemia(acute or chronic)
	Lymphoma
3	Moderate or severe liver disease
6	Metastatic solid tumor
	AIDS (not just HIV positive)

APPENDIX II

Predictors of ED Visit dispositions among homeless adults in Canada, NACRS, 2012-2013

Results from multinomial logistic regression

(The reference group: Discharged to Place of Residence, e.g. Private dwelling, institution, nursing home, etc.)

Main Problems	Patient left at his/her own risk (Following ED Registration and Triage)		Transferred to another facility		Admitted as an in-patient	
	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)
Other problems (Ref)	1.00		1.00		1.00	
V. Mental and Behavioural Disorders	0.77*** (0.67 - 0.89)	-0.26*** (-0.40--0.11)	4.49*** (3.02-6.68)	1.50*** (1.11-1.90)	0.65*** (0.56-0.75)	-0.43*** (-0.58- -0.28)
XIX. Injury, poisoning and certain other consequences of external causes	0.87 (0.74 -1.03)	-0.13 (-0.30-0.03)	2.59** (1.63-4.11)	0.94** (0.49-1.41)	0.59*** (0.49-0.71)	-0.52*** (-0.70--0.33)
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2.69*** (2.33 -3.10)	0.99*** (0.85-1.13)	4.22*** (2.72-6.54)	1.44*** (1.00-1.88)	0.80*** (0.67-0.95)	-0.22*** (-0.04- -0.05)
XXI. Factors influencing health status and contact with health services	2.12*** (1.82-2.48)	0.75*** (0.60-0.91)	2.22*** (1.34-3.66)	0.79*** (0.30-1.30)	0.08*** (0.05-0.12)	-2.56*** (-3.03- -2.09)
Control Variables						
Male (Ref)	1.00		1.00		1.00	
Female	0.96 (0.86 - 1.07)	-0.04 (-0.15-0.07)	1.36*** (1.08-1.71)	0.30*** (0.08-0.53)	1.11 (0.98-1.25)	0.10 (-0.02-0.22)
Age Groups						
18-24 (Ref)	1.00		1.00		1.00	
25-44	0.97 (0.85-1.12)	-0.03 (-0.17-0.11)	1.06 (0.79-1.41)	0.05 (-0.24-0.34)	1.15 (0.97-1.36)	0.14 (-0.03-0.31)
45-64	0.97 (0.84-1.12)	-0.03 (-0.18-0.11)	0.75* (0.54-1.03)	-0.28* (-0.61-0.03)	1.12 (0.94-1.34)	0.11 (-0.07-0.29)
65-74	0.81 (0.59-1.11)	-0.21 (-0.53-0.10)	0.81 (0.40-1.65)	-0.21 (-0.92-0.50)	1.72*** (1.26-2.35)	0.54*** (0.23-0.85)
75-84	0.76 (0.47-1.24)	-0.27 (-0.76-0.21)	0.49 (0.11-2.10)	-0.71 (-2.16-0.74)	1.93*** (1.21-3.07)	0.66*** (0.19-1.12)
85+	1.57* (0.96-2.57)	0.45* (-0.04-0.94)	0.28 (0.04-2.12)	-1.25 (-3.25-0.75)	0.74 (0.35-1.55)	-0.30 (-1.05-0.44)
Reporting Province						
AB (Ref)	1.00		1.00		1.00	
ON	1.08 (0.91-1.28)	0.08 (-0.10- 0.25)	2.30*** (1.44 -3.67)	0.83*** (0.36-1.30)	1.26* (1.04-1.52)	0.23* (0.04-0.42)

Admit via ambulance						
No Ambulance (walk in) (Ref)	1.00		1.00		1.00	
Air/Ground/Water ambulance	0.91 (0.82-1.01)	-0.09 (-0.19-0.01)	0.62*** (0.49-0.78)	-0.48*** (-0.71- -0.25)	1.14** (1.01-1.27)	0.13** (0.01-0.24)
Access to Primary Health Care						
Yes (Family Physicians and others) (Ref)	1.00		1.00		1.00	
No Access	1.28*** (1.15-1.42)	0.24*** (0.14-0.35)	1.10 (0.87-1.38)	0.09 (-0.14-0.32)	0.88** (0.77-0.99)	-0.13** (-0.26- -0.00)
Unknown/Unavailable	1.43*** (1.23-1.66)	0.35*** (0.21-0.50)	1.15 (0.83-1.59)	0.13 (-0.19-0.47)	1.56*** (1.33-1.83)	0.45*** (0.29-0.60)
Visit MIS Functional Centre						
Emergency (ED) General Emergency (Ref)	1.00		1.00		1.00	
Urgent Care (UCC)	0.63 (0.31-1.28)	-0.47 (-1.18-0.25)	9.11*** (5.23-15.86)	2.21*** (1.66-2.76)	0.00	-29.57 (-2202568- 2202509)
Emergency Mental Health Service (ED-Mental Health)	0.36*** (0.25-0.51)	-1.03*** (-1.40- -0.66)	0.73 (0.45-1.16)	-0.31 (-0.79-0.15)	5.38*** (4.47-6.48)	1.68*** (1.50-1.87)
Numbers of comorbid conditions per ED visit						
0 (Ref)	1.00		1.00		1.00	
1	0.62** (0.40-0.98)	-0.47** (-0.93- -0.02)	0.79 (0.29-2.16)	-0.23 (-1.24-0.77)	1.64*** (1.17-2.32)	0.50*** (0.16-0.84)
2-4	0.23 (0.03-1.86)	-1.49 (-3.60 -0.62)	0.60 (0.06 -6.30)	-0.51 (-2.87-1.84)	3.94*** (2.03-7.66)	1.37*** (0.71-2.04)
The Age-adjusted Charlson Comorbidity Index (ACCI) per ED visit						
0-1 (Ref)	1.00		1.00		1.00	
2-3	0.65 (0.36-1.16)	-0.44 (-1.03-0.15)	2.21 (0.70-7.04)	0.80 (-0.36-1.95)	0.86 (0.56-1.30)	-0.15 (-0.57-0.26)
4-5	1.24 (0.59-2.61)	0.21 (-0.53-0.96)	6.38*** (1.78- 22.80)	1.85*** (0.58-3.12)	2.13*** (1.31-3.47)	0.76*** (0.27-1.24)
>=6	0.00	-14.13 (-1139.31- 1111.04)	2.35 (0.23-23.66)	0.86 (-1.45-3.16)	2.16** (1.08-4.35)	0.77** (0.07-1.47)

Sources: National Ambulatory Care Reporting System, 2010–2014, Canadian Institute for Health Information.

Notes: * p<.1; ** p<.05; *** p<.01

CI: Confidential Interval; RRR: Relative Risk Ratio.

Predictors of ED Visit dispositions among homeless adults in Canada, NACRS, 2011-2012
Results from multinomial logistic regression
(The reference group: Discharged to Place of Residence, e.g. Private dwelling, institution, nursing home, etc.)

	Patient left at his/her own risk (Following ED Registration and Triage)		Transferred to another facility		Admitted as an in-patient	
Main Problems	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)
Other problems (Ref)	1.00		1.00		1.00	
V. Mental and Behavioural Disorders	0.77*** (0.67-0.88)	-0.26*** (-0.41-0.12)	3.48*** (2.52- 4.79)	1.25*** (0.92-1.56)	0.69*** (0.59-0.81)	-0.37*** (-0.53- -0.21)
XIX. Injury, poisoning and certain other consequences of external causes	0.88* (0.75-1.03)	-0.13* (-0.29-0.03)	1.56** (1.06-2.28)	0.44** (0.06-0.83)	0.61*** (0.50-0.74)	-0.50*** (-0.69- -0.30)
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2.42*** (2.10-2.80)	0.89*** (0.74-1.02)	2.43*** (1.66-3.56)	0.89*** (0.51-1.27)	0.63*** (0.51-0.78)	-0.46*** (-0.68- -0.25)
XXI. Factors influencing health status and contact with health services	1.55*** (1.33-1.82)	0.44*** (0.29-0.60)	0.94 (0.59-1.50)	-0.06 (-0.52-0.40)	0.11*** (0.07-0.17)	-2.20*** (-2.64- -1.75)
Control Variables						
Male (Ref)	1.00		1.00		1.00	
Female	0.95 (0.86-1.07)	-0.04 (-0.15-0.06)	1.15 (0.92-1.45)	0.15 (-0.08-0.37)	1.21*** (1.06-1.38)	0.19*** (0.06-0.31)
Age Groups						
18-24 (Ref)	1.00		1.00		1.00	
25-44	1.21*** (1.05-1.39)	0.19*** (0.05-0.33)	1.04 (0.79-1.39)	0.05 (-0.24-0.33)	1.27** (1.06-1.52)	0.24** (0.06-0.42)
45-64	1.13* (0.98-1.30)	0.12* (-0.02-0.27)	0.76* (0.56-1.04)	-0.26* (-0.58-0.04)	1.04 (0.86-1.26)	0.04 (-0.16-0.23)
65-74	1.08 (0.81-1.44)	0.07 (-0.21-0.36)	0.82 (0.42-1.60)	-0.20 (-0.87-0.46)	2.21*** (1.61-3.04)	0.79*** (0.47-1.11)
75-84	0.27*** (0.12-0.63)	-1.30*** (-2.14-0.47)	0.96 (0.36-2.60)	-0.03 (-1.03-0.95)	2.24*** (1.36-3.69)	0.81*** (0.31-1.30)
85+	0.71 (0.32-1.62)	-0.33 (-1.14-0.48)	0.67 (0.15-3.07)	-0.39 (-1.91-1.12)	1.52 (0.73-3.13)	0.42 (-0.31-1.14)
Reporting Province						
AB (Ref)	1.00		1.00		1.00	
ON	1.25** (1.04-1.49)	0.22** (0.04-0.40)	2.64*** (1.77-3.93)	0.97*** (0.57-1.37)	1.16 (0.96-1.41)	0.15 (-0.04-0.34)
Admit via ambulance						
No Ambulance (walk in) (Ref)	1.00		1.00		1.00	
Air/Ground/Water ambulance	0.89** (0.81-0.99)	-0.11** (-0.21-0.00)	0.56*** (0.45-0.70)	-0.57*** (-0.80--0.34)	1.33*** (1.17-1.51)	0.29*** (0.16-0.41)

Access to Primary Health Care						
Yes (Family Physicians and others) (Ref)	1.00		1.00		1.00	
No Access	1.27*** (1.13-1.43)	0.24*** (0.13-0.36)	1.42*** (1.10-1.84)	0.35*** (0.10-0.61)	0.94 (0.80-1.12)	-0.06 (-0.23-0.11)
Unknown/Unavailable	1.39*** (1.17-1.66)	0.33*** (0.16-0.51)	1.68*** (1.18-2.42)	0.52*** (0.16-0.88)	2.29*** (1.90-2.78)	0.83*** (0.64-1.02)
Visit MIS Functional Centre						
Emergency (ED) General Emergency (Ref)	1.00		1.00		1.00	
Urgent Care (UCC)	0.76*** (0.64-0.91)	-0.27*** (-0.45--0.09)	2.98*** (2.10-4.23)	1.09*** (0.74-1.44)	0.02*** (0.01-0.06)	-3.76*** (-4.75--2.78)
Emergency Mental Health Service (ED-Mental Health)	0.60*** (0.43-0.84)	-0.50*** (-0.84-0.16)	0.37*** (0.20-0.73)	-0.97*** (-1.63--0.31)	7.50*** (6.06-9.29)	2.02*** (1.80-2.22)
Numbers of comorbid conditions per ED visit						
0 (Ref)	1.00		1.00		1.00	
1	0.37*** (0.23-0.61)	-0.99*** (-1.47--0.50)	0.98 (0.45-2.11)	-0.02 (-0.80-0.75)	1.52** (1.06-2.18)	0.42** (0.06-0.77)
2-4	0.16* (0.02-1.31)	-1.81* (-3.91-0.27)	2.03 (0.55-7.43)	0.70 (-0.59-2.00)	2.04** (1.01-4.14)	0.72** (0.01-1.42)
The Age-adjusted Charlson Comorbidity Index (ACCI) per ED visit						
0-1 (Ref)	1.00		1.00		1.00	
2-3	1.30 (0.72-2.38)	0.27 (-0.33-0.87)	2.58** (1.06-6.32)	0.95** (0.05-1.84)	1.30 (0.84-2.00)	0.258 (-0.18-0.69)
4-5	0.73 (0.28-1.95)	-0.30 (-1.28-0.67)	1.81 (0.49-6.76)	0.60 (-0.72-1.91)	2.13*** (1.26-3.60)	0.76*** (0.23-1.28)
>=6	0.00	-13.04 (-1009.01- 982.91)	10.29*** (3.06-34.58)	2.33*** (1.12-3.54)	3.03*** (1.54-5.97)	1.11*** (0.43-1.79)

Sources: National Ambulatory Care Reporting System, 2010–2014, Canadian Institute for Health Information.

Notes: * p<.1; ** p<.05; *** p<.01

CI: Confidential Interval; RRR: Relative Risk Ratio.

Predictors of ED Visit dispositions among homeless adults in Canada, NACRS, 2010-2011
Results from multinomial logistic regression
(The reference group: Discharged to Place of Residence, e.g. Private dwelling, institution, nursing home, etc.)

Main Problems	Patient left at his/her own risk (Following ED Registration and Triage)		Transferred to another facility		Admitted as an in-patient	
	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)	RRR (95% CI)	Estimated coefficient (95% CI)
Other problems (Ref)	1.00		1.00		1.00	
V. Mental and Behavioural Disorders	0.74*** (0.64-0.85)	-0.30*** (-0.44- -0.16)	2.44*** (1.78-3.36)	0.89*** (0.57-1.21)	0.66*** (0.57-0.76)	-0.41*** (-0.56- -0.27)
XIX. Injury, poisoning and certain other consequences of external causes	0.69*** (0.59-0.81)	-0.37*** (-0.53- -0.21)	1.14 (0.76-1.69)	0.13 (-0.27-0.52)	0.54*** (0.45-0.65)	-0.61*** (-0.79- -0.43)
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2.46*** (2.14-2.82)	0.90*** (0.76-1.04)	2.53*** (1.77-3.63)	0.93*** (0.57-1.29)	0.72*** (0.60-0.86)	-0.33*** (-0.51- -0.14)
XXI. Factors influencing health status and contact with health services	1.49*** (1.27-1.74)	0.40*** (0.24-0.55)	0.33*** (0.17-0.64)	-1.12*** (-1.80- -0.45)	0.07*** (0.04-0.11)	-2.63*** (-3.14- -2.13)
Control Variables						
Male (Ref)	1.00		1.00		1.00	
Female	0.99 (0.89-1.10)	-0.01 (-0.12-0.10)	0.92 (0.71-1.18)	-0.08 (-0.34-0.17)	1.22*** (1.08-1.38)	0.20*** (0.08-0.32)
Age Groups						
18-24 (Ref)	1.00		1.00		1.00	
25-44	1.01 (0.88-1.16)	0.01 (-0.13-0.15)	0.96 (0.68-1.36)	-0.03 (-0.38-0.31)	1.27*** (1.06-1.52)	0.24*** (0.06-0.42)
45-64	0.86* (0.75-1.01)	-0.14* (-0.29-0.01)	1.03 (0.72-1.46)	0.03 (-0.32-0.38)	1.21** (1.00-1.46)	0.19** (0.00-0.38)
65-74	1.05 (0.79-1.41)	0.05 (-0.24-0.34)	1.17 (0.63-2.16)	0.16 (-0.46-0.77)	2.30*** (1.70-3.10)	0.83*** (0.53-1.13)
75-84	0.75 (0.41-1.37)	-0.29 (-0.90-0.32)	2.49** (1.07-5.81)	0.91** (0.07-1.76)	3.36*** (2.06-5.49)	1.21*** (0.72-1.70)
85+	1.40* (0.93-2.10)	0.34* (-0.07-0.74)	1.50 (0.68-3.33)	0.41 (-0.39-1.20)	1.18 (0.70-1.97)	0.16 (-0.35-0.67)
Reporting Province						
AB (Ref)	1.00		1.00		1.00	
ON	0.97 (0.80-1.16)	-0.04 (-0.22-0.15)	2.03*** (1.28-3.23)	0.71*** (0.25-1.17)	1.21** (1.01-1.46)	0.19** (0.01-0.38)
Admit via ambulance						
No Ambulance (walk in) (Ref)	1.00		1.00		1.00	
Air/Ground/Water ambulance	0.96 (0.86-1.06)	-0.05 (-0.15-0.06)	0.80* (0.64-1.01)	-0.22* (-0.45-0.01)	1.25*** (1.12-1.41)	0.23*** (0.11-0.34)

Access to Primary Health Care						
Yes (Family Physicians and others) (Ref)	1.00		1.00		1.00	
No Access	1.36*** (1.21-1.52)	0.30*** (0.19-0.42)	1.05 (0.82-1.35)	0.09 (-0.14-0.32)	0.67*** (0.58-0.78)	-0.39*** (-0.54- -0.25)
Unknown/Unavailable	1.64*** (1.37-1.95)	0.49*** (0.31-0.67)	1.13 (0.76-1.67)	0.13 (-0.19-0.47)	1.80*** (1.51-2.14)	0.59*** (0.42-0.76)
Visit MIS Functional Centre						
Emergency (ED) General Emergency (Ref)	1.00		1.00		1.00	
Urgent Care (UCC)	0.68*** (0.57-0.81)	-0.38*** (-0.56- -0.21)	2.96*** (2.00-4.39)	2.21*** (1.66-2.76)	0.04*** (0.02-0.08)	-3.22*** (-3.89- -2.55)
Emergency Mental Health Service (ED-Mental Health)	0.40*** (0.27-0.59)	-0.90*** (-1.29- -0.51)	0.52** (0.27-1.01)	-0.64** (-1.30-0.01)	4.72*** (3.87-5.75)	1.55*** (1.35-1.75)
Numbers of comorbid conditions per ED visit						
0 (Ref)	1.00		1.00		1.00	
1	0.40*** (0.24-0.68)	-0.90*** (-1.44- -0.38)	0.90 (0.33-2.48)	-0.10 (-1.10-0.91)	1.78*** (1.26-2.52)	0.58*** (0.23-0.92)
2-4	0	-13.04 (-742.30- 716.21)	3.25 (0.70-15.17)	1.18 (-0.36-2.72)	4.08*** (1.69-9.82)	1.40*** (0.53-2.28)
The Age-adjusted Charlson Comorbidity Index (ACCI) per ED visit						
0-1 (Ref)	1.00		1.00		1.00	
2-3	1.08 (0.56-2.10)	0.08 (-0.59-0.74)	1.16 (0.35-3.90)	0.15 (-1.06-1.36)	1.01 (0.67-1.56)	0.02 (-0.41-0.45)
4-5	0.91 (0.35-2.35)	-0.09 (-1.04-0.85)	6.38*** (1.97-20.71)	1.85*** (0.68-3.03)	1.08 (0.64-1.86)	0.08 (-0.45-0.62)
>=6	0.30 (0.04-2.39)	-1.20 (-3.27-0.87)	3.69* (0.87-15.63)	1.31* (-0.14-2.75)	1.13 (0.56-2.25)	0.12 (-0.57-0.81)

Sources: National Ambulatory Care Reporting System, 2010–2014, Canadian Institute for Health Information.

Notes: * p<.1; ** p<.05; *** p<.01

CI: Confidential Interval; RRR: Relative Risk Ratio.

APPENDIX III

Predictors to changed costs of each ED visit among homeless adults in Canada, NACRS, 2010-2013 – Results from OLS regression

Contributing Factors	OLS (2010-2011) Costs of each ED visit		OLS (2011-2012) Costs of each ED visit		OLS (2012-2013) Costs of each ED visit	
	β	SE β	β	SE β	β	SE β
Main Problems						
V. Mental and Behavioural Disorders	20.29***	4.54	29.98***	4.57	15.31***	4.30
XIX. Injury, poisoning and certain other consequences of external causes	16.76***	5.12	16.67***	5.09	12.20**	5.11
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	-17.65***	5.32	-15.64***	5.47	-10.78**	5.06
XXI. Factors influencing health status and contact with health services	-86.93***	5.90	-76.23***	5.85	-92.96***	5.81
Control Variables						
Female	3.22	3.61	3.74	3.62	-2.57	3.54
Age Groups						
25-44	8.42*	4.94	4.55	4.68	8.09*	4.58
45-64	18.06***	5.11	6.91	4.87	12.58***	4.75
65-74	78.47***	9.85	65.71***	9.60	69.38***	9.76
75-84	104.46***	17.68	95.22***	16.44	93.16***	15.28
85+	14.541	14.69	45.26**	22.95	1.11	17.75
Reporting Province						
ON	-101.45***	6.45	-127.90***	6.21	-147.51***	5.81
Canadian Triage and Acuity Scale (CTAS) levels						
High Acuity: CTAS I-III	101.93***	3.65	101.61***	3.61	107.08***	3.53
Unknown/Unavailable	9.31	21.40	-3.17	19.00	-27.48*	15.17
Admit via ambulance						
Air/Ground/Water ambulance	50.22***	3.51	50.88***	3.55	40.42***	3.29
Access to Primary Health Care						
No Access	-25.38***	3.90	-8.45**	4.07	-12.06***	3.47
Unknown/Unavailable	10.66*	6.00	20.37***	5.98	9.28*	4.93
Visit MIS Functional Centre						
Urgent Care (UCC)	-82.67***	6.14	-77.86***	6.08	3.78	20.18
Emergency Mental Health Service (ED-Mental Health)	47.84***	8.11	75.15***	8.35	65.86***	7.11
Numbers of comorbid conditions per visit						
1	35.13***	12.74	56.50***	11.66	26.77**	11.92
2-4	119.83***	35.72	71.44***	27.69	136.01***	27.67
The Age adjusted Charlson Comorbidity Index (ACCI)						
2-3	27.64*	15.803	2.56	14.45	13.59	14.58
4-5	63.11***	20.75	65.60***	19.36	111.45***	18.51
>=6	66.54**	28.09	147.04***	27.35	102.16***	28.70

Notes: * p<.1; ** p<.05; *** p<.01

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5. CONCLUSION

This dissertation presents three essays that contribute to the existing literature on systematic evaluations of multiple health domains focusing on general health, psychological health, social and economic determinants of health and utilization of health care resources, among vulnerable populations, in particular immigrants and the homeless. Different datasets and comprehensive methodologies were employed, and the analyses provide additional information to complement the existing literature. The analyses of this thesis provide additional details that have not previously been extensively investigated, and so help towards better identifying policies that will help vulnerable populations improve health and other outcomes, as well as identify areas of public policy that need improvement to make social systems in Canada more efficient and equitable.