PROBLEM GAMBLING THROUGH THE LENS OF POPULATION HEALTH

By

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ABSTRACT

The purpose of this thesis is to examine problem gambling from a population health perspective. In particular, this research determines the extent to which the level of household income, regional income inequality, and income insecurity are associated with problem gambling. The specific objectives of this research are:

1. To construct and validate an Income Insecurity Index (III) using the 2013-2014 Canadian Community Health Survey (CCHS) that can be used to understand problem gambling.

2. To use the III to determine whether income insecurity has a direct effect on health status independent of the level of household income and income inequality.

3. To examine the association between the income nexus, i.e., level of household income, income inequality and income insecurity, and problem gambling.

4. To estimate the costs internalized by gamblers in the form of reduced Health Related Quality of Life (HRQL) associated with problem gambling, controlling for the direct effect of the income nexus on HRQL.

Each of these specific goals are analytically treated in Chapters Two, Three, Four and Five.

The first essay (Chapter Two) makes use of the 2013-2014 Canadian Community Health Survey (CCHS) to construct the III by using three variables, namely employment status, current job status, and multiple job status. The constructed III passes a reliability test (Cronbach's Alpha), and validity tests (content validity, construct validity). In order to validate the III, I reconstructed the III using CCHS 1.2. The CCHS 1.2 includes an additional variable, "job insecurity", not available in the CCHS 2013-14, which I found to be positively correlated with income insecurity.

The III can be constructed from any wave of the CCHS and used to understand an additional pathway by which income and social outcomes like health status, problem gambling are related.

The second essay (Chapter Three) estimates the distinct impact of the III on health status, controlling for level of household income and income inequality. The Ordered Logit regression results of the III in association with the health status reveal that the III measures different aspects of income than the material deprivation and income inequality, thus serving to predict health status. This analysis provides some degrees of confidence in the construct validity of the index constructed in Chapter Two, and suggests that any analysis of the impact of gambling on Health-Related Quality of Life (HRQL) must control for the direct effect of income insecurity.

The third essay (Chapter Four) stands as the core of the thesis. It examines the association between problem gambling and the level of household income, regional income inequality and income insecurity, while controlling for other socio-demographic determinants and comorbidities using the 2013-2014 CCHS. The results suggest that individuals with high income insecurity have greater odds of developing gambling problems, independent of the roles played by material deprivation and income inequality. Household income is positively associated with problem gambling, while income inequality has a small but positive association with problem gambling. This essay carries out practical implications for the mitigation of problem gambling. To the extent that problem gambling is associated with income insecurity, there is a role for general social policy to play aiming at better addressing income insecurity faced by particular population groups such as the working poor and insecurely employed. Moreover, the introduction of

gambling opportunities should be conducted with sensitivity to the general and regional economic contexts for limiting the development of problem gambling.

The fourth essay (Chapter Five) quantifies the losses of Health-Related Quality of Life (HRQL) associated with problem gambling in Canada. Previous studies examining the costs of gambling ignored the costs internalized by the gambler. Using the same survey of 2013-2014 CCHS, I ran an Ordinary Least Squares (OLS) regression to estimate the association between the Health Utility Index (HUI) and problem gambling. The results illustrate that problem gamblers have significantly lower HRQL compared to non-problem gamblers. Using standard metrics for the value of a Quality-Adjusted Life Year (QALY), the annual cost associated with the losses of HRQL is $4,950 per problem gambler per year, and 95% confidence interval suggests that they may range from $300 to $9,450.

Chapter Six summarizes the policy implications of this research.

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CHAPTER 1

INCOME INSECURITY AND PROBLEM GAMBLING: AN INTRODUCTION

1.1 PURPOSE

The purpose of this thesis is to examine problem gambling from a population health perspective.

In particular, I would like to determine the extent to which the level of household income,

regional income inequality, and income insecurity are associated with problem gambling. This

research has four specific objectives:

1. To construct and validate an Income Insecurity Index (III) using the 2013-2014 Canadian
   Community Health Survey (CCHS) data that can be used to understand problem
   gambling.

2. To use the III to determine whether income insecurity has a direct effect on health status
   independent of the level of household income, and income inequality.

3. To examine the association between the income nexus, i.e., level of household income,
   income inequality and income insecurity, and problem gambling.

4. To estimate the costs internalized by gamblers in the form of reduced Health Related
   Quality of Life (HRQL) associated with gambling, controlling for the direct effect of the
   income nexus on HRQL.

Each of these specific objectives comprises the subject of Chapters Two through Five.

1.2 BACKGROUND

In recent decades, gambling has become popular as a normal leisure activity among people

worldwide, and Canada is not an exception (Korn and Skinner, 2000). According to The

Canadian Gaming Association, gambling generates the highest revenues, $16 billion in 2009

among selected hospitality industries - $5.7 billion more than Television/Movie rental, and $14.5 billion more than Movie theatre (Canadian Gaming Association). A Canadian household, on average, spends more than $1,000 per year on gambling (Azmier, 2005). This has not happened automatically. Rather it is a result of legalisation of gambling and rapid growth of gambling opportunities, especially video lottery terminal (VLT) and online gambling (Productivity Commission, 2010; Hodgins et al., 2012; Azmier, 2005). Easy access to gambling opportunities made it more popular. About three out of four Canadians have gambled in the previous year (Cox et al., 2005).

Although, most Canadians gamble with few or no consequences, this popular pastime is not free of harm. Gambling is problematic once it affects gambler's personal life, work life, finances, physical health, mental health and so on. It has profound costs to individuals, families, communities, society and to the country at large. The prevalence of problem gambling is higher in Canada than world average. While about 2 per cent people in the world are affected by gambling related problems (Fong, Fong, and Li, 2011; Productivity Commission, 2010; Jackson et al., 2009; Petry, 2005; Shaffer et al., 2004; Wardle et al., 2007), more than 3 per cent of Canadian adults experience moderate to severe problem gambling (Cox et al., 2005), and more than 2 per cent of youth aged 15-24 experience moderate risk or severe problem gambling (Huang and Boyer, 2007; Wood and Williams, 2009).

Rosenthal (1992) defines problem gambling as a progressive disorder characterized by: a) continuous or periodic loss of control over gambling; b) preoccupation with gambling and money with which to gamble; c) irrational thinking; and d) continuation of the activity despite

adverse consequences. Perhaps the most reputable definition of problem gambling is provided by Ferris and Wynne (2001). They define problem gambling as an excessive gambling behavior that creates negative consequences for the gamblers, others in their social network, and for the community.

There is hardly any doubt that problem gambling is a major public health concern. One's gambling problem affects his/her personal life, family life, and beyond. Earlier research focused overwhelmingly on the psychosocial and personality correlates of problem gamblers, and associated consequences of problem gambling in terms of marital and family breakdown (Kourgiantakis et al., 2013). Dowling et al. (2009) and Hodgins et al. (2007) suggested that individuals with gambling problem damage their intimate relationships through poor communication, frequent conflict and arguments, sexual dissatisfaction, and consideration of separation or divorce.

Gambling problems are also associated with intimate partner violences (Dowling et al., 2016, Afifi et al., 2010a). The negative consequences of problem gambling extend beyond the intimate partner; problem gambling effects children and other members in the family (Kalischuk et al., 2006; Dickson-Swift et al., 2005; Vitaro et al., 2008). Child and family victimization, and domestic violence are associated with gambling problems (Dowling et al., 2016; Suomi et al., 2013). The gambling problem continues from generation to generation. Dowling et al. (2010) found that children of parents with gambling problem have a high chance of developing gambling problems at later stage of life.

Problem gambling is linked to comorbidities like chronic conditions (Kohler, 2014), tobacco and alcohol consumption (Fong et al., 2011; Momper et al., 2010; Welte et al., 2001), depression (Johansson et al., 2009; Petry, Stinson, and Grant, 2005; Westphal and Johnson, 2007), mood disorders and anxiety disorders (Petry, 2007; Rush et al., 2008; Barry, Stefanovics, Desai, and Potenza, 2011, Desai and Potenza, 2008). In addition to health comorbidities, problem gambling was found correlated with socio-demographic variables like age, sex, ethnicity, and education as well as with socioeconomic variables like household income (Faregh and Derevensky, 2013; Sareen et al., 2011; Afifi et al., 2010b; Greenberg and Birnbaum, 2005 and Schissel, 2001).

However, the aspects of income explored in this research have been mostly overlooked in the existing body of literature. Question arises- does income insecurity influence the development of problem gambling, perhaps through attitudes towards risk and money, or the trade-offs an individual makes between present and future payoffs? My research aims to address this gap in knowledge. Clearly, there are sets of influences on risk-taking rooted deep in the individual psychology, and some of the investment literature began to explore these issues alongside the more traditional psychology literature (Hilton 2001; Filbeck et al., 2005, Keller et al., 2006). This research, however, focuses more directly on the association between problem gambling and income insecurity.

In addition, there is ambiguous evidence about income and problem gambling. It would be interesting to examine if high income (Williams and Volberg, 2013) or low income (Shaffer et a1., 2004) categories might be associated with problem gambling. This research examines this

critical aspect of the association between income and problem gambling from a population perspective.

1.3 THE INCOME NEXUS AND PROBLEM GAMBLING

There is good reason to believe that the relationship between problem gambling and income is not simple. Gambling is driven by attitudes towards money and luck, that are affected both by current circumstances, and our past and family history of income and gambling. Hilton (2001), Filbeck et al. (2005), and Keller et al. (2006) explored how individual personality and risk-taking attitudes play roles in financial decision making. Delfabbro and Thrupp (2003) focused on parental attitudes, and parents' teaching as a determinant of problem gambling. My focus is different from these studies. Rather, I focused on current experiences of income insecurity as a risk factor for problem gambling. This research marks first attempt in the literature to separate out the distinct effects of material deprivation, income inequality, and income insecurity.

Material deprivation, as measured by household income, focuses on limitations and constraints. It is conceivable that low income might encourage problematic gambling among vulnerable people, who perceive it as the only way or the easiest way, to overcome financial limitations. However, as the ambiguities noted above demonstrate, high incomes may also be associated with problem gambling. High income individuals have a greater capacity to engage in high stakes gamblings, and find it easier to borrow. Moreover, there might well be personality factors common to both high and low income individuals and a propensity to gamble. Few researchers (Williams et al., 2011; Barnes et al., 2011; van der Maas, 2016) explored these questions beyond those cited above.

Income inequality might also be associated with gambling behavior. In the case of health, income inequality is imagined operating primarily through envy (Patrick et al., 2014). Individuals compare themselves and their lives with those who have so much more. It is only a small step to imagine that some of the individuals who feel themselves deprived relative to richer groups might look for easy ways to increase their financial capacity. Gambling might seem to fit the bill. One of the challenges facing researchers is trying to decide who the comparator group might be for any individual. Are they more affected by local income inequality, or has the world of social media made the range of comparators much broader now than in the past? I focus on this issue in Chapter Four primarily based on local comparisons. Although Canale (2017) examined the relationship between income inequality and problem gambling among adolescent gamblers, no one examined the association between income inequality and problem gambling for the general population.

Income insecurity is the third aspect of income that I examine in this research. There is no literature that links problem gambling to income insecurity, so far. However, it is noteworthy here that there is a small but growing recognition of the role played by income insecurity in population health outcomes (Forget 2011, 2013; Access Alliance, 2011; Offer et al., 2010; Smith, 2012; de Vogli et al., 2013; Watson et al., 2016) with the pertinent suspicion that this aspect of income insecurity might be particularly associated with problem gambling. Individuals whose income is very volatile might well look to additional sources of income in the hope that these might stabilize their incomes. Therefore, someone with a job that promises no fixed hours and a very unstable earnings pattern, might pick up a second job in the hope of offsetting income fluctuations. However, a second poor job with no fixed hours might exacerbate the problem

further, with workers finding themselves either with a glut of income or too little to survive. Gambling is another imagined counterbalance to income insecurity. Individuals might look to gambling to provide income in a short period of time, but they might also find themselves gambling when they are apparently even with cash. No one explored these issues, but I attempt to do a preliminary analysis in Chapter Four.

One of the major problems in studying association between income insecurity and problem gambling (and population health more generally) is measuring income insecurity. Offer et al. (2010), Smith (2012), and de Vogli et al. (2013) used cross-country macro-indicators to construct economic insecurity. Watson, Osberg and Phipps (2016) used a natural experiment created by changes in the social safety net, especially unemployment insurance policy, to measure the impact of income insecurity on obesity. Smith et al. (2016) used the Economic Security Index (ESI), an integrated measure of unpredictability in income, out of pocket medical expenses, and financial wealth developed by Hacker et al. (2014) for the USA.

Some other studies (Smith et al., 2009; Barnes et al., 2013) examined individual level panel data to measure income or employment volatility over time. Although these studies used different methods to measure income insecurity, they all considered income insecurity as a distinct measure of income as opposed to income level and income inequality. This research builds on these insights.

In this research, I explicitly treated problem gambling from a population health perspective, and therefore, I adapted the well known Social Model of Health put forward by Dahlgren and Whitehead (1991) (see Figure 1.1).

Figure 1.1: Determinants of Gambling Behavior (Adapted from Dahlgren and Whitehead, 1991)
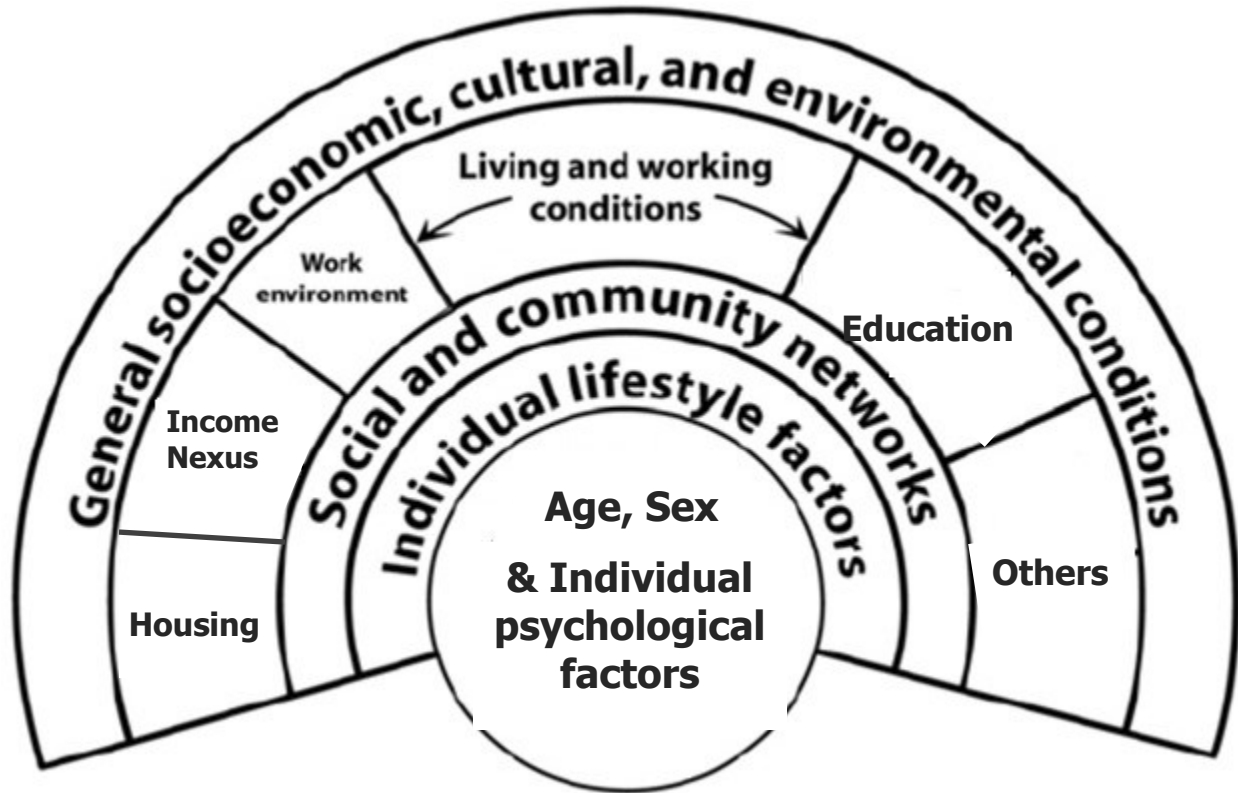
Source: Dahlgren and Whitehead (1991)

Figure 1.1 represents the relationship between individuals, their environment and their gambling behavior. Individuals' demographic and psychological factors are the loci of the diagram. The first layer is made up of the factors related to individuals' life style, for example, smoking, alcohol consumption, and physical activity that might influence gambling behavior positively or negatively. The second layer represents social and community influences on individual's gambling behavior. For example, social supports received during unfavorable life events would help ease the healing process and hold back detrimental gambling behavior. The social and community influence can also encourage problem gambling if peers also gamble. The third layer represents living and working conditions in which the income nexus fits. The fourth level would include issues like general recessions.

Dahlgren and Whitehead (1991) did not distinguish the components of the income nexus as it might be related to population health, but this research extends their analyses. I hypothesize that income inequality would be negatively correlated with health outcomes (operating primarily through stress and envy); income levels would be positively correlated with health (material deprivation leads to poor health) and income insecurity would be associated with poor health (higher cortisol levels due to the stress of not knowing what tomorrow will bring). These health effects are examined in Chapter Three to further validate the III, and to determine the direct impact of the income nexus on health.

Figure 1.2 shows all the determinants of problem gambling, but past studies have only looked at psychological determinants and peer groups/culture. I want to look at some aspects of "living and working conditions"- thus involving the income nexus.

Figure 1.2: Factors Affecting Problem Gambling
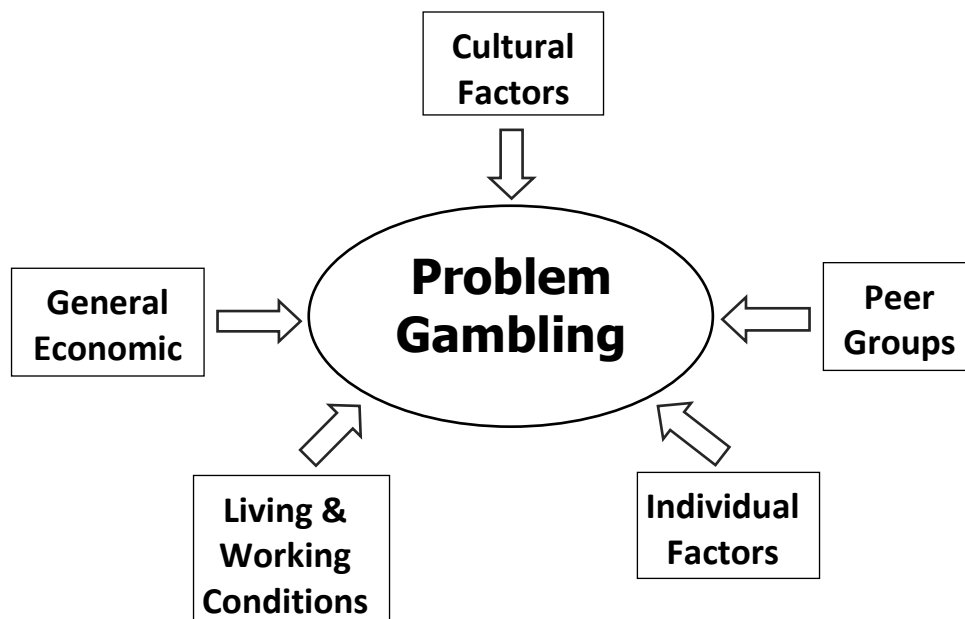
Figure 1.3 splits out the different components of the income nexus, and hypothesizes the pathways through which they might affect problem gambling.

Figure 1.3: The Income Nexus and Problem Gambling
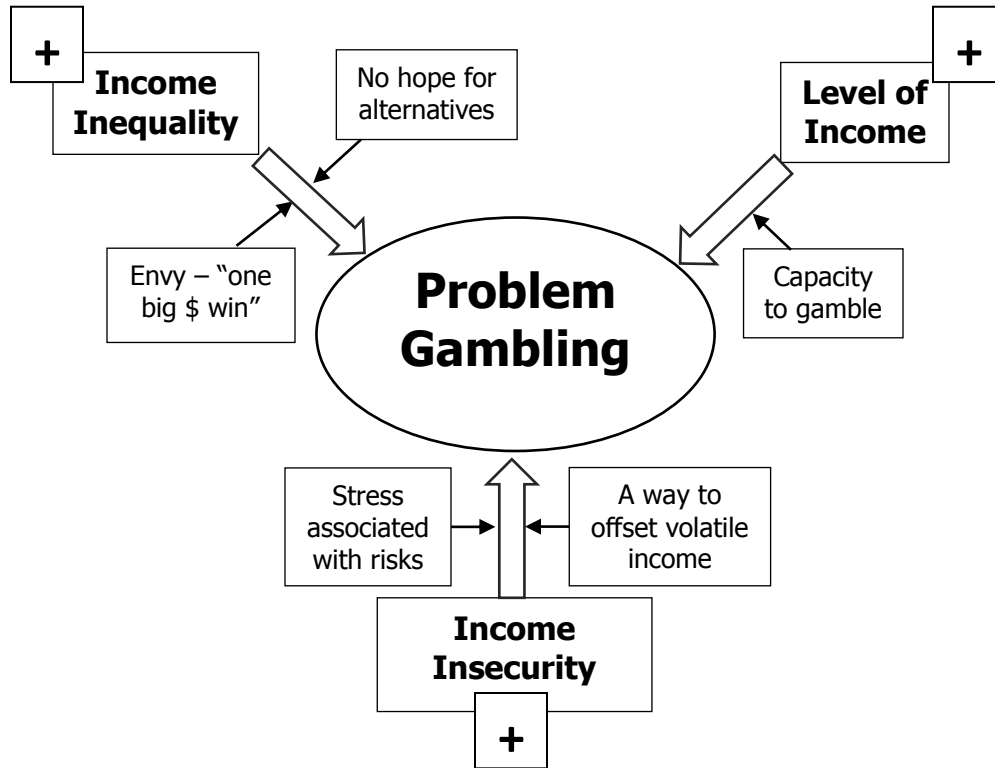
All three income measures are assumed to be positively associated with problem gambling. However, the pathways of their association are different. Higher income is assumed to be associated with higher problem gambling because individuals having higher income have more capacity to engage in gambling. Income inequality is also assumed to have positive association with problem gambling. The pathway for this association is primarility envy. Individuals who feel themselves deprived relative to richer groups might see no alternatives, but look for easy ways like gamblings to increase their financial capacity. Income insecurity is assumed to be associated with higher problem gambling because individuals with volatile income might imagine gambling as a counterbalance to income insecurity.

1.4 STRUCTURE OF THE THESIS

This thesis is made up of four essays and they are connected through a population health lens. The first essay (Chapter Two) develops an Income Insecurity Index (III). I constructed and validated the III as a composite measure of propensity for fluctuations in income from three variables namely employment status, current job status (full-time vs part-time), and multiple job status. As I considered problem gambling from the population health perspective, in Chapter Three, I use constructed index alongside the level of family income and income inequality, controlling for other determinants of health status, to see if these three measures pick up different aspects of the way in which income affects health status. The III worked as expected; all three measures of income had statistically significant associations with health status. This provides some degrees of confidence in the validity of the III, and suggests that any analysis of the health impact of problem gambling should control for the direct effects of the income nexus on health.

In the third essay (Chapter Four), the objective is to examine the association between problem gambling and the income nexus including income insecurity, while controlling for other socio-demographic variables and comorbidities. Using the 2013-2014 CCHS, I ran Ordered Logit regressions for three distinct income measures, i.e., household income, income inequality, and income insecurity controlling for age, sex, ethnicity, marital status, country of birth, chronic condition, smoking, alcohol consumption, depression, mood disorder, and anxiety disorder.

Income measures, especially the income insecurity index, are the variables of focus. Results suggest that individuals with higher incomes are at greater odds of problem gambling compared to lower income individuals. Income inequality showed no significant association with problem

gambling. However, individuals with high income insecurity are at greater odds compared to individuals with low income insecurity of becoming a problem gambler.

This essay provides important implications for both future research along with interventions and prevention strategies. The fact that income insecurity matters suggests that more research is needed to better understand how people develop attitudes towards money and risk. The association between income insecurity and problem gambling provides support for educational interventions based on a rich understanding of attitudes towards money and risk derived from household income insecurity, and the manifestation of these attitudes culminating in problem gambling. It also suggests an increased surveillance during periods of economic fluctuation and, perhaps, greater efforts to introduce new gambling opportunities during more stable economic periods.

In the fourth essay (Chapter Five), I quantify in monetary terms the losses of health related quality of life associated with problem gambling in Canada while controlling for the direct effects of the income nexus. I use the problem gambling severity index (PGSI) from the 2013-2014 CCHS to categorize individuals who experience problem gambling. I use the Health Utility Index (HUI) from the same data set to estimate the loss of health related quality of life associated with problem gambling. Then I run an ordinary least square (OLS) regression to estimate the coefficient of association between HRQL and problem gambling controlling for age, sex, marital status, ethnicity, country of birth, education, household income, income inequality, income insecurity, chronic conditions, smoking, physical activity, alcohol consumption, depression, mood disorders, and anxiety disorders.

Results show that problem gamblers have significantly lower health related quality of life compared to non-problem gamblers. The OLS regression coefficient indicates that the HRQL for a problem gambler is lower by 0.033 than that of a non-problem gambler. When I attach the value of Quality Adjusted Life Year (QALY) to this coefficient, I assess the annual losses of HRQL due to a single problem gambler in Canada at $4,950. By generalizing these losses to Canada, the total cost of HRQL loss associated with all problem gamblers stands at around $5 billion per year. Most estimates of the burden imposed by problem gambling neglect these costs that are internalized by the gamblers themselves.

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CHAPTER 2

CONSTRUCTING AN INCOME INSECURITY INDEX (III) USING POPULATION SURVEY DATA

Abstract

The objective of this paper is to construct an Income Insecurity Index (III). I create and validate the III using 2013-2014 Canadian Community Health Survey (CCHS) data. Applying polychoric Principal Components Analysis (Polychoric PCA), I derive the III as a linear combination of employment status during the last year, current job status, and multiple job status as these variables have factor loadings greater than cut-off value (0.40). After construction, I tested the III for reliability using Cronbach's Alpha, a measure of internal consistency. The Cronbach's Alpha for the III was greater than minimum acceptable value. I also tested the III for content validity and construct validity. The III that I constructed passed both the content validity and construct validity tests.

Keywords: Income Insecurity, Income Insecurity Index (III), Principal Component Analysis (PCA), Internal Consistency, Content Validity, Construct Validity

2.1 INTRODUCTION

Income insecurity, sometimes identified with "economic insecurity", is not well defined in the existing literature. Access Alliance (2011) defined and measured income insecurity by "self stated employment insecurity". In an American study following the 2007 economic downturn, Hacker et al. (2014) measured economic insecurity by creating the Economic Security Index (ESI) for the US. They defined the ESI as "An integrated measure of insecurity that captures the prevalence of large economic losses among households. More specifically, the ESI measures the proportion of individuals who lose at least 25 percent of their available household income, due to either changes in income or changes in out-of-pocket medical spending, and who lack sufficient liquid financial wealth to fully cushion the loss."

The International Labor Office (2004) distinguishes between income security and economic security by saying "income security is the most contentious and fundamental aspect of economic security" (ILO, 2004). According to ILO (2004), "income security consists of an adequate level of income, a reasonable assurance that such an income will continue, a sense that the income is fair, relative to actual and perceived "needs" and relative to the income of others, and the assurance of compensation or support in the eventuality of a shock or crisis affecting income." They identified unemployment, underemployment, and job insecurity as the causes of the income insecurity. However, their definition of income insecurity went beyond the vulnerability aspect of income; it included income adequacy, income inequality/equity, etc.

Watson et al. (2016) measured income insecurity through a natural experiment using changes in the social safety net. Smith et al. (2016) adapted the ESI to measure of unpredictability of income using out of pocket medical expenses and financial wealth. Offer et al. (2010), Smith (2012), and de Vogli et al. (2013) measured economic insecurity from a macroeconomic perspective. They attempted to capture economic insecurity utilizing cross-country macro-indicators. By contrast, Smith et al. (2009) and Barnes et al. (2013) used individual level panel data to measure income vulnerability over time in the US.

The purpose of this paper is to create and validate an III for Canada using data routinely available through the Canadian Community Health Survey (CCHS). I considered income inadequacy or material deprivation, income inequality and income insecurity as three distinct aspects of income. The III in this research is intended to measure the perceived volatility of income, which is distinct from the level of income (measured by, for example, household income) or income inequality. This index will subsequently be used to determine whether income insecurity is associated with the health status (in Chapter Three) and with problem gambling (Chapter Four) in ways distinct from the level of family income and income insecurity. However, income insecurity is suspected as an important component of income too little understood in the analyses of the risk factors associated with a wide variety of social outcomes beyond health status and problem gambling.

The value of such an index is two-fold. First, it might encourage researchers to think more carefully about what aspects of income they intend to measure and what pathways they believe are involved in the transmission of income to various anticipated social outcomes.

While such clarity is possible without an index, the index makes clarity unavoidable. Second, policymakers can use such an index in exercises such as community level needs assessment to determine whether the degree of income insecurity is increasing or decreasing over time. This is especially important during periods of rapid economic change.

The next section discusses the creation of the III. Then, I examine the reliability of the III using a widely accepted tool of internal consistency, namely the Cronbach's Alpha. Finally, I test the content validity and construct validity of III.

2.2 CONSTRUCTION OF THE INCOME INSECURITY INDEX (III)

2.2.1 Data Source

I used the 2013-2014 Canadian Community Household Survey (CCHS) for constructing III. The CCHS is a cross sectional survey conducted annually by Statistics Canada to collect information on health determinants, health status, and health system utilization. Started in 2001, the CCHS collected data in every two years until 2005 and collected a sample of about 130,000 in every bi-annual survey. From 2007, data were collected for approximately 65,000 respondents in every annual survey. The microdata files are prepared for each separate year and successive two years together.

In the CCHS, individuals aged 12 years or more are drawn from 136 health regions in ten provinces and three territories in Canada. For the 2013-2014 CCHS, the overall person-level response rate was 87.3%. However, the survey instrument did not include persons who live on First Nation reserves and other Aboriginal settlements. It also excluded full-time members

of the Canadian Forces, the institutionalized population, children in foster care aged 12 to 17 years, institutionalized individuals, and people from some remote areas.

2.2.2 Selection of Variables

I selected the variables to construct the III based on the existing literature, but kept limited to variables that exist in the CCHS. The first variable I considered is employment status. An unemployed individual's income is found to be more insecure than an employed individual's income (Clark, Knabe and Rätzel, 2010; Wiebe, 1996; United Nations, 2003). The second variable I considered is current job status. Literature suggests that part-time job status is associated with higher income insecurity than full-time job status (Kalleberg, 2009; Wiebe, 1996; ILO, 2004). The third variable I considered is multiple job status. People usually do multiple jobs when a single job is not well paid, income varies, or the number of hours worked is very volatile (Lewchuk, 2017; Benach et al., 2016; Lewchuk, Clarke, and Wolff, 2008; United Nations, 2003; ILO, 2004). This notion suggests that individuals with multiple jobs have more insecurity in income than those who hold a single job. The fourth variable I considered is food insecurity on the assumption that individuals who have higher food insecurity might have higher income insecurity.

Another variable the existing literature suggests might comprise a component of income insecurity is income inadequacy (Access Alliance, 2011; ILO, 2004). However, I consider income inadequacy or material deprivation as a distinct aspect of income; a family can have a very secure and predictable, but nonetheless inadequate income. This means that I finally selected four variables from 2013-2014 CCHS data to construct income insecurity. All the

selected variables are categorical: employment status (employee; self-employed; unemployed), current job status (full-time; part-time; not applicable), multiple job status (yes; no; not applicable), and household food insecurity status (food secure; moderate food insecure; severe food insecure).

2.2.3 Methods

The income insecurity index was derived from Principal Components Analysis (PCA). PCA is a widely used statistical technique for creating an index from a larger set of possibly correlated variables. Many economists including Drakos (2002), Caudill et al. (2000), Reichlin (2002), Stock and Watson (2002), Choi (2002) and Webster (2001) used PCA in their studies. Filmer and Pritchett (2001) made PCA popular by constructing indices from socioeconomic variables such as access to assets, access to residence, access to water and sanitation etc (Kolenikov and Angeles, 2009). In PCA, the indices are known as principal components and are linear combination or weighted average of correlated variables.

Suppose, there are 'n' possibly correlated variables, $X_1, X_2, X_3, \ldots X_{n-2}, X_{n-1}, X_n$ and I apply PCA to create 'k' uncorrelated components, then I have the following linear weighted relationship of correlated variables:

$$PC_1 = a_{11}X_1 + a_{12}X_2 + \ldots + a_{1n}X_n$$
.
.
.
$$PC_k = a_{k1}X_1 + a_{k2}X_2 + \ldots + a_{kn}X_n$$

where a_{kn} represents the weight for the kth principal component and the nth variable.

The performance of PCA in constructing indices depends on the assumptions that the variables need to be continuous and they need to follow a normal distribution. Kolenikov and Angeles (2009) suggests that when variables are categorical and do not follow normal distribution, some of the properties of PCA do not hold. As a result, PCA analysis produces biases to the underlying covariance structure as well as to the factor loadings. Besides, for the same reason, the reported proportion of explained variance gets smaller. In such a case, polychoric PCA provides improved results (Kolenikov and Angeles, 2009). Since the variables we used to construct our III are categorical, we applied polychoric PCA to get the principal component weights or factor loadings.

Similar to PCA, polychoric PCA provides principal components as the linear combinations or weighted averages of correlated variables. Polychoric PCA is basically an improved version of PCA when the variables are categorical. Kolenikov and Angeles (2009) suggests that when variables are categorical, they are more likely to have high skewness and kurtosis. This happens mainly when a major portion of data belongs to a single category of a variable. That is where polychoric PCA does better than PCA. The principal components in PCA are computed based on Pearson's correlation while they are computed based on polychoric correlation matrix in polychoric PCA. Polychoric correlations do not need the variables to be continuous and they do not need to be distributed normally. Therefore, applying polychoric PCA helps in dealing with the biases, especially the proportion of explained variance arising from the non-continuity of variables and non-normal distribution of them (Kolenikov and Angeles, 2009).

2.2.4 Empirical Results

Table 2.1 shows the results of polychoric PCA.

Table 2.1. Polychoric Principal Component Analysis (PCA), and Factor Loadings

A. Polychoric PCA			
Component	Eigen Value	Proportion Explained	Cumulative Proportion Explained
Component 1	2.87	0.71	0.71
Component 2	0.99	0.25	0.96
Component 3	0.12	0.03	0.99
Component 4	0.02	0.01	1.00
B. Factor Loadings (Pattern Matrix)			
Variable	Component 1		Component 2
Employment status	0.578		-0.0452
Current job status	0.584		-0.0274
Multiple job status	0.565		-0.6665
Household food insecurity	0.080		0.9964

In Table 2.1 Part A, I have four principal components with corresponding Eigen values and proportion explained. Kaiser's criterion suggests for retaining the components which have Eigen values greater than one (Kaiser, 1960). Component 1 satisfies this criterion. Component 1 has an Eigen value of 2.87 and explains 71 per cent of the total variation. Table 2.1 Part B illustrates that all four variables I considered for the III construction are unidimensional in Component 1. However, only three of them, namely employment status, current job status, and multiple job status produce significant factor loadings for Component 1. Given the factor loadings, it is reasonable to label Component 1 as the "Income Insecurity Index (III)". The fourth variable, "household food insecurity" does not contribute significant loadings to Component 1. As a result, I did not include "household food insecurity" variable in constructing III.

In short, I selected only the variables in the III which bear factor loadings greater than the cut-off value for factor loadings (0.40) in the literature. Three variables, namely employment status, current job status, and multiple job status, whose factor loadings are 0.40 or higher are retained for constructing the III. The III is thus a linear combination of employment status, current job status, and multiple job status, i.e.,

III = 0.578*Employment status + 0.584*Current job status + 0.565*Multiple job status   (1)

The above equation (1) produces an III value for each individual on the applicable categories of three variables we determined for index construction. In 2013-2014 CCHS, for 'employment status' variable, employee is recorded as 1, self-employed is recorded as 2 and unemployed is recorded as 6. For 'current job status', full-time employee is recorded as 1, part-time employee is recorded as 2 and not applicable is recorded as 6. And, for 'multiple job status', employee with multiple jobs is recored as 1, employee with single job is recorded as 2, ; and not applicable is recorded as 6. These lead the III value for an unemployed person to the highest and a employee with single full time job to the lowest. A sample of III values calculation is provided below.

Examples	III Value
An unemployed person	0.578*6 + 0.584*6 + 0.565*6 = 10.362
A self-employed person	0.578*2 + 0.584*6 + 0.565*6 = 8.05
An employee with single part time job	0.578*1 + 0.584*2 + 0.565*2 = 2.876
An employee with multiple part time jobs	0.578*1 + 0.584*2 + 0.565*1 = 2.311
An employee with single full time job	0.578*1 + 0.584*1 + 0.565*2 = 2.29

The III is constructed from categorical variables, and therefore the numerical values of the III are ordinal and not cardinal.

2.2.5 The Reliability Test of the III

The reliability test for the constructed III was done using Cronbach's Alpha. Although Cronbach's alpha is widely used in social sciences, it is mainly used for continuous variables. However, the literature suggest that Cronbach's alpha can be used when the variables are non-continuous, that is dichotomous or categorical (ordinal) (Goforth, C., 2015; Santos, 1999). The Cronbach's alpha measures the internal consistency of an index derived from a set of variables. In the case of an index, the internal consistency or reliability refers to the homogeneity of variables used to construct the index. The value of the Cronbach's Alpha lies between 0 and 1. A value of 0 indicates that the variables used to construct an index are independent, that is they share no correlation or covariance. On the other hand, a value of 1 indicates that all the variables used to construct an index have high correlation or covariance. In other words, the higher the value of Cronbach's Alpha, the higher the reliability of the index. The minimum acceptable value of Cronbach's Alpha is not unanimous. Some studies (for example, Nunnaly, 1978; Santos, 1999) suggested that a Cronbach's Alpha value of 0.70 or higher is acceptable. On the other hand, Bryman and Cramer (1997) suggested that the standard acceptable value for Cronbach's Alpha is 0.8 or higher. The Cronbach's Alpha for the III is higher than 0.90. That means an excellent internal consistency exists among the variables I selected to construct III.

2.2.6 The Content Validity of the III

Content validity is an important procedure of index construction in social sciences. It describes the degree to which the index appears to measure what a researcher wants to measure. For the III construction, following questions are kept in the center of thoughts:

(i) Does it cover all the aspects of income insecurity? In other words, does the III include all the variables I wanted it to include to capture the vulnerability of income?

(ii) Do the variables included in the III make sense?

The variables used to construct the III have been used in many other studies to capture a propensity for fluctuations in income. For example, unemployment status (Clark, Knabe and Rätzel, 2010; Wiebe, 1996; United Nations, 2003), part-time vs full-time job status (Kalleberg, 2009; Wiebe, 1996; ILO, 2004), and multiple job status (Lewchuk, 2017; Benach el al., 2016; Lewchuk, Clarke, and Wolff, 2008; United Nations, 2003; ILO, 2004) were found to be the sources of income insecurity. I intentionally excluded income inadequacy in opposition to the existing literature because I think income insecurity and income adequacy affect social outcome through distinct paths. The III appears to measure the concept that I wanted it to measure, i.e., the potential volatility of income at the personal level. It excludes peripheral concepts and focuses on central items, but I was limited by the variables available in the database.

2.2.7 The Construct Validity of the III

Construct validity measures how well an index performs in terms of theoretical context (Felder and Spurlin, 2005). An index is considered to have convergent construct validity if it

is found to be correlated with which it should be correlated. On the other hand, an index is considered to have divergent construct validity if it is found to be uncorrelated with which it should be uncorrelated.

There is, unfortunately, no "gold standard" for measuring income insecurity. If there were, the appropriate way to assess construct validity would be to examine the correlation between the III and the "gold standard". Due to that limitation, I attempt to assess construct validity less formally. The questions considered for addressing 'construct validity' include:

(i) Is the III correlated with what it is expected to be correlated with and vice versa?

(ii) Does the III work, i.e., how good the III is as a predictor of social variables?

Based on these questions, the best available way of testing construct validity for the III would be to examine its correlation with other similar variables such as job insecurity, as suggested by past literature (United Nations, 2008; Adams, Abass and Cantah, 2014; Access Alliance, 2011). Unfortunately, 2013-2014 CCHS does not include the job insecurity variable which was included in other cycles, such as 2002 CCHS (cycle 1.2). As a result, I constructed an III using unemployment status, current job status and multiple job, and then calculated Pearson correlation coefficient for the constructed III and job insecurity status from 2002 CCHS. The Pearson coefficient between the III and job insecurity in cycle 1.2 presents some degrees of confidence that the constructed III is correlated with job insecurity and hence, confirms the construct validity.

In Chapter Three, I investigate the association between the III and health status as a further test of construct validity. If the income level, income inequality, and income insecurity are all measuring different aspects of the income nexus and, all three have an independent effect on health, then all three measures can be included in the same model to find statistically significant associations between health outcomes and these income measures.

If a negative relationship between health status and the III is established, construct validity of the III would be re-enforced because other research using different methods already suggested that health status is negatively correlated with income insecurity. The Ordered Logit regression results in Chapter Three show that there is a negative association between III and health. The findings reveal that the III that I constructed measures a different aspect of income than income level and income inequality and therefore, work as a predictor of health status. This provides some degrees of confidence in the construct validity of the III.

2.3 DISCUSSION AND CONCLUSION

Income insecurity is an important aspect of income, quite distinct from material deprivation or income inequality. Yet this important aspect of income has not been thoroughly investigated. In this study, I attempt to measure income insecurity by constructing an III that captures the riskiness or potential volatility of income at the level of the individual.

This is the first study in Canada that used a population survey to construct an index to measure income insecurity at the individual level. One of the challenges in index construction in social sciences is the acceptability of the index, which depends on reliability as well as content and construct validity. Cronbach's Alpha is a well accepted method of

testing the reliability of an index. Alpha value confirms that constructed index passed the reliability test. In other words, the three variables the III included have an excellent internal consistency.

The III constructed in this essay seems to possess content and construct validity, though there is no widely accepted measure of "income insecurity" that is perceived to be the "gold standard" for measurement. It does, however, possess content validity; the III makes sense as an index to measure an aspect of the income nexus often neglected in social science.

This study has limitations. Firstly, validation of the III was limited by the absence of a widely accepted measure of income insecurity. Hence, I couldn't directly examine the association between the III and another measure of income insecurity. In fact, that absence of a measure of income insecurity was the motivation why I created the index. Use of the III in the subsequent studies, such as those in Chapters Three and Four below, would strengthen confidence in constructed index. Secondly, I used employment status during the last year, current job status, and multiple job status in constructing III, and Cronbach's Alpha for these variables was greater than 0.90 which may be attributed to redundancy of any of these variables; also, some other important variables relevant for index construction might be missed out. However, options are limited to the variables in 2013-2014 CCHS survey data.

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CHAPTER 3

THE ASSOCIATION BETWEEN INCOME INSECURITY AND HEALTH STATUS: A POPULATION HEALTH APPROACH

Abstract

I examine the association between income insecurity and health status while controlling for household income and income inequality along with other socio-demographic and economic variables. Using the 2013-2014 Canadian Community Health Survey (CCHS), I ran an Ordered Logit model to explore the association between income insecurity and general self reported health status. The odds ratios of the Ordered Logit model illustrate that high income insecurity is associated with poorer general health while low income insecurity is associated with better general health. When I control for household income and income inequality, individuals with high income insecurity have 21 per cent lower odds of being in better health. A similar association exists between income insecurity and mental health. These results suggest that income insecurity is an important socio-economic covariate in health policy research and measures a different aspect of income than does the level of household income and income inequality.

Keywords: General Health Status, Mental Health Status, Income Insecurity, Ordered Logit, Odds Ratio.

3.1 INTRODUCTION

Many social and health outcomes are found to be associated with different income measures. For example, it is very common to identify an income gradient whereby lower income is associated with poorer health outcomes across a wide range of measures while higher incomes are associated with better outcomes (Scambler, 2012, Mackenbach et al., 2007; Benzeval et al., 2001, Backlund et al. 1996, Hart et al., 1998; Wilkinson, 1996). Very often, the intuition behind these results is associated with a materialist explanation: low income individuals have less access to fundamental elements for survival like nutritious diets, housing, etc. (Bartley, 2004; Link and Phelan, 1995). Even the positive relationship between income and health is found for different regions within a country (Fritjers et al., 2005; Humphries and van Doorslaer, 2000; Mustard et al. 1997) or across countries (Evans et al. 1994).

More recently, there has been a strong focus on income inequality (Pickett, K.E. and Wilkinson, R.G., 2015). Some scholars (Currie and Schwandt, 2016; Lynch et al., 2004a, 2004b; Macinko et al., 2004; Subramanian and Kawachi, 2004; Wilkinson and Pickett, 2006) argue that greater income inequality is associated with poorer health outcomes across the income spectrum. The explanations range from a focus on envy and stress, through inequitable power relationships that have both mental and physical outcomes (Marmot 2015, Wilkinson and Pickett 2009a, 2009b, Bartley,2004).

Another aspect of income, less commonly referenced in empirical studies, is the relationship between income insecurity and health. Forget (2011, 2013), and Access Alliance (2011)

explored the relationship between income insecurity and health indirectly. Explanations again focus on the mental health consequences of unpredictable variations in income – the stress of never knowing if one can afford fundamental expenses incurred.

Unfortunately, these three quite different aspects of income are often confused or ignored in empirical analyses. The level of income and income inequality exerts influence on health through quite different channels (Blakely and Kawachi, 2001). Similarly, some authors (Painter, 2016; Tiessen, 2016; Access Alliance, 2011; ILO, 2004) refer to income insecurity to mean inadequate income, for example, the extent of reliance on income assistance programs. I argue that income insecurity measures a propensity for unpredictable variations in income. All of this is, of course, complicated by how closely these measures functionally relate at the individual level and the accompanying interactions that might occur.

The purpose of this study is to determine whether the Income Insecurity Index (III) works in practice as expected to work with health status. That is, I determine whether income insecurity has an independent effect on health status in addition to the level of income and regional income inequality. I choose to examine the association between income insecurity and health status because a significant association between income insecurity and health status would provide provides some degrees of that the III constructed in Chapter Two is valid from the population health perspective. I control for the level of income and income inequality. I expect the III to be negatively correlated with health status.

3.2 LITERATURE REVIEW

Some have suggested that self rated health is dependent on income insecurity (Watson et al., 2016; Offer et al., 2010; Smith, 2012). Job insecurity is associated with poor health (Moynihan, 2012; Green, 2015). One way that job insecurity might affect health is through income insecurity. Individuals with a high likelihood of being laid off or terminated from a job have higher income insecurity.

Economic insecurity and vulnerability are common within the literature that examined the association with health (Berloffa and Modena, 2012; Bossert and D'Ambrosio, 2013; Hacker, 2006; Hacker et al., 2010; Osberg and Sharpe, 2014; Calvo and Dercon, 2005; Dutta et al., 2011). Benach et al. (2014) suggested that employment precariousness is associated with health and health equities. In a similar vein, Clark and Georgellis (2013) asserted that past unemployment could affect mental health of individuals.

Offer et al. (2010) used both country level and individual level data from 11 countries and documented economic insecurity as a predictor of obesity; psychological distress is the channel through which this relationship is established. Smith (2012) also suggested that higher levels of stress and job insecurity are contributing to the epidemic of obesity.

A recent study Rohde et al. (2017) used health data from Australia and revealed the corresponding negative effects on both physical and mental health of individuals as they confront economic insecurity. They also suggested that the effect on mental health is three times the effect on physical health. Watson, Osberg, and Phipps (2016) revealed similar

results using Canadian data. They suggested that economic insecurity has a detrimental impact on health measured by body mass index (BMI), and that males are impacted more than females. The study also illustrated that economic insecurity would lead to a deterioration in mental health.

The importance of income security is central to the overall health of household members. More recent works sheds further light on broader issues such as long term health effects (Slopen et al., 2012), and broad societal effects (LaMontagne 2014).

3.3 DATA AND METHODOLOGY

3.3.1 Data Source

To examine the association between Income Insecurity and Health Status, I used the 2013-2014 Canadian Community Household Survey (CCHS) data from Statistics Canada. The CCHS is a cross sectional survey which includes Canadian residents aged 15 years and older. Since 2007, the CCHS survey is conducted every year. The 2013-2014 CCHS provides the combined data for health regions across Canada, collected in 2013 and 2014.

3.3.2 Dependent Variable

The dependent variables used to test the applicability of the III are self rated general health status and self rated mental health status. Although there are literature (for example, Campolieti, 2002; Bound, 1991) which argue that self rated health status is a weak proxy for individuals' true health condition, the use of self rated health status has become a common measure of individuals' health (Seo and Senauer, 2011). A sizeable number of literature

suggests that an individual's subjective assessment of health is related to objective measures of health (Barger et al., 2016; Bailis, 2003; Meng et al., 2014; Wu et al., 2013; Curtis et al., 2002; Farmer and Ferraro,1997; Miilunpalo et al., 1997; Hornbrook and Goodman, 1996).

In 2013-2014, CCHS, the respondents were asked: "In general, would you say your health is...?". The respondents were given five alternatives: excellent (recorded as 1), very good (recorded as 2), good (recorded as 3), fair (recorded as 4), or poor (recorded as 5)." For this study, I changed the orders of the categories of the health status and merged fair and poor into a single category, namely 'fair/poor' because of the small sample size, meaning dependent variable health status finally would be reflected by four values: 1 (fair/poor), 2 (good), 3 (very good), and 4 (excellent).

3.3.3 Independent Variables

Socio-demographic variables: The sociodemographic variables considered for this study are age (continuous), sex (male; female), marital status (married; common law; widowed; separated; divorced; single), ethnicity (white; black; Filipino; Chinese; south Asian; others), education (less than secondary school graduation; secondary school graduation; some post-secondary education; and post-secondary graduation), and country of birth (Canada born; foreign born).

Income measures: I used three income measures for this study – specifically, the household income level, income inequality at a regional level, and individual level income insecurity.

(i) Household income: In 2013-2014 CCHS, the household income variable includes the total household income from all sources. Statistics Canada imputed the missing values in the household income variable using a 'nearest neighbor donor approach' which finds a respondent with similar characteristics as the non-respondent and insert the income value to the non-respondent. Then the respondents are distributed in deciles. Using the 2013-2014 CCHS data, the deciles in household income are converted into quintiles and a higher quintile is associated with higher household income level. For example, decile 1 and decile 2 are merged into the 1st quintile, decile 3 and decile 4 are into 2nd quintile, decile 5 and decile 6 are into 3rd quintile, and so on.

(ii) Income inequality: To measure income inequality at the regional level, I used the Gini coefficient (after-tax income) by province from CANSIM[1] table 202-0705. The Gini coefficient is a measure of inequality (United Nations Development Programme, Human Development Report 2016). The values of the Gini coefficient lie between 0 and 1. A value of 0 corresponds with perfect income equality, i.e., everyone has the same income in each society and a value of 1 corresponds to perfect inequality, i.e., one person has all the income while others have no income.

As per CANSIM data by Statistics Canada, the 2014 after-tax income Gini coefficients for Canadian provinces are Newfoundland and Labrador (0.293), Prince Edward Island (0.275), Nova Scotia (0.291), New Brunswick (0.277), Quebec (0.281), Ontario (0.316), Manitoba

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[1] CANSIM is Statistics Canada's key socio-economic database. In the literature, the Gini index often replaces the Gini coefficient. The Gini index is expressed as the Gini coefficient in percentage form and is calculated by multiplying the Gini coefficient by 100.

(0.297), Saskatchewan (0.307), Alberta (0.319), and British Columbia (0.308). Among

provinces, income inequality is the lowest in Prince Edward Island followed by New

Brunswick while income inequality is the highest in Alberta followed by Ontario. Hence, I

created a variable named Gini by assigning the value of respective provincial Gini coefficient

to each respondent, based on his province of residence. For example, if a person lives in

Manitoba, I assign 0.297 to that respondent.

In addition, the literature suggests that income inequality is lower in rural areas compared to

urban areas (Wiebe, 1996). Fortunately, a variable named 'Geodur' in the 2013-2014 CCHS

is available with categories: rural coded as 1, core metropolitan coded as 2, urban fringe

coded as 3, population center coded as 4, secondary core coded as 5, and mix of population

center and rural coded as 6. Therefore, an income inequality variable is created as a product

of Gini and Geodur, i.e., Gini*Geodur. This furnishes income inequality variable having 60

possible values with the lowest possible value of 0.275 (Prince Edward Island's Gini 0.275

multiplied by the lowest value (1) of 'Geodur') and the highest possible value of 1.595

(Alberta's 0.319 multiplied by the highest value (6) of 'Geodur'). As a result, income

inequality can be treated as a continuous variable. It is important to mention that the

interaction of provincial Gini coefficients with rural/urban indicators does not measure

different urban and rural inequality. It allows for provincial inequality to affect rural and

urban residents differently.

(iii) Income insecurity: The values for another income measure, the III, are calculated as

discussed in Chapter Two. The values of the III range from 1.577 to 10.24, that are converted

into a dichotomous variable by applying k-mean clustering. Cluster analysis as a technique of data analysis helps in sorting different objects into clusters such that the highest possible degree of association exists among objects within a cluster, and the lowest possible degree of association among objects across clusters (Yim and Ramdeen, 2015). The k-mean clustering provides exactly k different clusters of greatest possible distinction (Jain, 2010). I divided the III into two clusters with two different means. The cluster with lower mean value of the III represents lower income insecurity and the higher mean value represents higher income insecurity.

Health related comorbidities: Another set of explanatory variables are health related comorbidities including smoking (daily smoker; occasional smoker; non-smoker), alcohol consumption (no; yes), depression (often; sometimes; never), mood disorder (yes; no), anxiety disorder (yes; no), physical activity index (active; moderately active; inactive), and the presence of at least one chronic condition (yes; no). For chronic condition, a single dummy variable was created for asthma, arthritis, back problems, high blood pressure, migraine, chronic bronchitis or emphysema or obstructive pulmonary disease, diabetes, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, and bowel disorder. If an individual had ever suffered from any of them, I assign a value of 1 (yes) and 0 (no) otherwise.

3.3.4 Econometric Model

To estimate the association between health status and various measures of income, the current study employs the following model (Greene, 2008):

$h_i = \alpha + \beta x_i + \gamma g_i + \eta*$household income$_i + \zeta*$income inequality$_i + \psi*$income insecurity$_i + \varepsilon_i$

where h_i measures self rated health status of individual i, x_i represents the vector of demographic and economics variables (age, sex, marital status, ethnicity, education, country of birth, and household food insecurity) of individual i, g_i indexes the vector of health-related comorbidities (smoking, physical activity, alcohol consumption, depression, mood disorder, and anxiety disorder) of individual i. α and ε_i represent constant term and error term respectively. β, γ, η, ζ, and ψ are the parameters to be estimated.

I ran Ordered Logit models for both self rated general health status and self rated mental health on various income measures and other socio-demographic variables and health related comorbidities. The reason I choose this estimation strategy is the categorical nature of the dependent variable, self rated health status. The modification made here focuses on odds ratios instead of regression coefficients as the logit regression coefficients represent the change in the log of odds and do not provide meaningful interpretation (Greene, 2008). To draw even better interpretations, I computed the average (at the sample means of data) marginal effects of the income measures on health status (Greene, 2008).

If an independent variable is continuous, the marginal effect measures the instantaneous rate of change. On the other hand, if an independent variable is categorical, the marginal effects provide the difference in the predicted probabilities of a category relative to the reference category of a variable, keeping all other variables at their mean (Long and Freese, 2014).

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Finally, I used bootstrapping weights from Statistics Canada to make the research sample representative and bring estimates to the Canadian population at the provincial level.

3.3.5 Descriptive Statistics

Table 3.1 Descriptive Statistics of Self Rated Health by Income Insecurity (Population Size = 25,634,264)

	Total Group	Low income insecurity	High income insecurity
	Per cent	Per cent	Per cent
Self rated general health			
Fair or Poor	10.0	6.0	17.0
Good	29.0	28.0	30.0
Very good	40.0	43.0	35.0
Excellent	21.0	23.0	18.0
Self rated mental health			
Fair or Poor	6.0	5.0	8.0
Good	22.0	20.0	25.0
Very good	38.0	39.0	35.0
Excellent	34.0	36.0	32.0

Table 3.1 represents the distribution of the sample with respect to respondents' self rated general and mental health status. In terms of self rated general health, individuals with low income insecurity and high income insecurity reveal quite different distributions. 94 per cent of individuals with low income insecurity experience excellent or very good or good general health status. Whereas among individuals with high income insecurity, this proportion is only 83 per cent. Only 6 per cent individuals with low income insecurity rated their health status as fair or poor as opposed to 17 per cent individuals in high income insecurity group. Self rated mental health also shows distinguished distribution among two groups. The percentage of individuals who rated their mental health status as fair/poor is greater in high income insecurity group than in low income insecurity group.

3.3.6 Income Measures and Self Rated General Health Status

3.3.6.1 Odds Ratios

I ran four ordered logistic regression models and the results are presented in Table 3.2. As the values of the dependent variable, health status, are ordered from 1 (fair/poor), to 2 (good), to 3 (very good), to 4 (excellent), the higher odds mean greater chance of being in better health and lower odds would mean lower chance of being in better health.

Table 3.2 Odds Ratios of General Health Status (Population Size = 25,634,264)

	Odds Ratios			
	Model 1	Model 2	Model 3	Model 4
Age	0.99***	0.99***	0.99***	0.99***
Sex				
Female	1.21***	1.18***	1.20***	1.22***
(Ref: Male)	1.00	1.00	1.00	1.00
Marital Status				
Common Law	0.94	0.92**	0.92**	0.93**
Widowed	1.00	0.91**	0.97	1.04
Separated	0.96	0.89*	0.87**	00.93
Divorced	1.06	0.97	0.96	1.04
Single	0.87***	0.79***	00.87***	0.99***
(Ref: Married)	1.00	1.00	1.00	1.00
Ethnicity				
Black	1.62***	1.44***	1.43***	1.58***
Filipino	1.21*	1.11	1.06	1.15
Chinese	0.73***	0.68***	0.69***	0.73***
South Asian	0.89	0.81***	0.81***	0.87**
Others	1.00	0.91*	0.92	0.99
(Ref: White)	1.00	1.00	1.00	1.00
Education				
Secondary school grad	1.47***	1.59***	1.54***	1.44***
Some post-secondary	1.50***	1.62***	1.56***	1.48***
Post-secondary grad	1.72***	2.03***	1.91***	1.67***
(Ref: Less than secondary school grad)	1.00	1.00	1.00	1.00
Country of birth				
Foreign born	0.97	0.92***	0.92***	0.97
(Ref: Canada)	1.00	1.00	1.00	1.00
Physical Activity Index				

Moderate active	0.68***	0.67***	0.66***	0.67***
Inactive	0.44***	0.43***	0.42***	0.43***
(Ref: Active)	1.00	1.00	1.00	1.00
Smoking				
Occasional smoker	1.36***	1.37***	1.38***	1.37***
Non-smoker	1.58***	1.63***	1.66**	1.61***
(Ref: Daily smoker)	1.00	1.00	1.00	1.00
Alcohol				
No	0.75***	0.70***	0.76***	0.78***
(Ref: Yes)	1.00	1.00	1.00	1.00
Chronic Conditions				
No	0.36***	0.36***	0.36***	0.36***
(Ref: Yes)	1.00	1.00	1.00	1.00
Depression				
Sometime	1.47	1.52*	1.46***	1.45
Never	2.02***	1.99***	1.98***	1.97***
(Ref: Often)	1.00	1.00	1.00	1.00
Mood Disorder				
No	2.41***	2.46***	2.42***	2.39***
(Ref: Yes)	1.00	1.00	1.00	1.00
Anxiety Disorder				
No	1.83***	1.87***	1.86***	1.82***
(Ref: Yes)	1.00	1.00	1.00	1.00
Household food insecurity				
Moderate food insecure	0.86***	0.85***	0.85***	0.89***
Severe food insecure	0.54***	0.45***	0.48***	0.55***
(Ref: Food secure)	1.00	1.00	1.00	1.00
Household income				
2nd Quintile	1.24***	-	-	1.21***
3rd Quintile	1.40***	-	-	1.34***
4th Quintile	1.64***	-	-	1.54***
5th Quintile	1.88***	-	-	1.75***
(Ref: 1st Quintile)	1.00	-	-	1.00
Income inequality (continuous)	-	0.96*	-	0.97**
Income insecurity index				
High income insecurity	-	-	0.73***	0.79***
(Ref: Low income insecurity)	-	-	1.00	1.00

***p<.01, **p<.05, *p<.10

In all four models, self-reported general health status was used as the dependent variable. In

terms of independent variables, Model 1 included level of household income with all other

socio-demographic variables, namely age, sex, marital status, ethnicity, education, country of birth, health related comorbidities, namely smoking, alcohol consumption, chronic conditions, physical activity, depression, mood disorder, anxiety disorder, and socio-economic variable, household food insecurity. Model 2 and Model 3 replaced the level of household income in Model 1 by income inequality and income insecurity respectively. Model 4 is my final model where all three measures of income were incorporated as independent variables with other socio-demographic variables, comorbidities and socio-economic variable from previous models.

The results of Model 1 portray that age has a significant association with self rated general health status. Compared to males, females had 21 per cent greater odds of association of being in better health. With regards to marital status, singles would likely have significantly lower odds of association, by 13 per cent, of being in better health compared to married people. Compared to married individuals, people in common law or widowed or separated or divorced categories revealed no significant differences in terms of odds of association with general health status. Those who identified as black had 62 per cent higher odds of being healthier, while Chinese respondents displayed 27 per cent lower odds being healthier compared to individuals of those who identified as White. South Asian and others ethnicities exhibited no significant differences with those who are identified as White in association with health status.

The odds of association of having better health increases with higher education. Individuals with secondary education displayed 47 per cent higher odds of having better health compared

to individuals with less than secondary school graduation. For individuals with some post-secondary education and post-secondary graduation, the odds of association were greater by 50 per cent and 72 per cent respectively compared to the comparator group of individuals with less than secondary education. Canada-born and foreign-born individuals exhibited no significant differences in terms of odds of association with general health status.

With respect to health-related comorbidities, physical activity, smoking, alcohol consumption, chronic conditions, having no depression, mood disorder, and anxiety disorder were significantly associated with health status. The odds of association of being in better health decreased by 32 per cent and 56 per cent for individuals with moderate physical activity and no physical activity respectively compared to physically active groups. Occasional smokers and non-smokers were found to be healthier by 36 per cent and 58 per cent respectively compared to daily smokers. No alcohol consumption decreased the odds of association of being in better health by 25 per cent. Having at least one chronic condition versus having no chronic condition reduced the odds of being healthier by 64 per cent.

Individuals with no depression displayed more than double odds of being healthier compared to those who often suffered from depression. However, those who sometimes suffered from depression displayed no significant differences with those who always suffer depression in odds of being in better health. Nonexistence of mood disorder and anxiety disorder increased the odds of association of being healthier by 141 per cent and 83 per cent respectively. Household food insecurity was found to be significant in association with general health

status. Moderate food insecure and severe food insecure groups revealed 14 per cent and 46 per cent greater odds of being healthier compared to food secure groups.

Household income also displayed a positive association with health status. Household income of 2nd quintile versus 1st quintile increased the odds being healthier by 24 per cent. The odds of association of being in better health increased by 40 per cent, 64 per cent, and 88 per cent for individuals with household income level of 3rd quintile, 4th quintile and 5th quintile respectively.

Model 2 produced similar results as in Model 1. Age, sex, education, physical activity, smoking, alcohol consumption, chronic conditions, mood disorder, anxiety disorder and household food insecurity illustrated similar associations with general health status. On the other hand, marital status, ethnicity, country of birth, and depression showed slightly different results in Model 2 than in Model 1. In addition to single individuals, people in common law relation, widowed, and separated groups were found to be significant at 5 per cent and 10 per cent level. Ethnicity was found to be significantly associated with general health status as in Model 1. In addition, those of South Asian ethnicity had 19 per cent lower odds of being healthy than Caucasians. Foreign born individuals revealed 8 per cent lower odds of association of being healthier than their native-born counterparts. Income inequality, the income measure used alone in Model 2, turned out to be weakly negatively significant, at 10 per cent level of significance, in association with general health status.

The associations of age, sex, marital status, ethnicity, education, country of birth, physical activity, smoking, alcohol consumption, chronic conditions, depression, mood disorder,

anxiety disorder and household food insecurity with general health status remained similar in Model 3. The odds ratio for income insecurity showed that individuals with high income insecurity had 27 per cent lower odds of being healthier compared to those with low income insecurity.

Model 4 included all three income measures in the current study- household income level, income inequality and income insecurity in addition to other socio-demographic-economic variables and health related comorbidities. The empirical results revealed age having significant association with general health status. The results showed that females were healthier than their male counterparts.

Being in a common-law relationship or single exhibited lower odds of being in better health. Compared to Caucasians, those who identified as Black displayed 58 per cent greater odds of being in better health. Chinese and South Asian ethnicities exhibited 27 per cent and 13 per cent lower odds of association of being in better health. The higher the education, the higher the odds of being in better health. Having secondary school graduation, some post-secondary education and post-secondary graduation increased the odds by 44 per cent, 48 per cent, and 67 per cent of being healthier.

Country of birth remained insignificant in association with general health status. Physically active individuals were found to be healthier. Compared to physically active individuals, moderately active and inactive individuals had 33 per cent and 57 per cent lower odds of being healthier respectively. Occasional smokers and non-smokers increased the odds of

association of being in better health by 37 per cent and 61 per cent respectively compared to daily smokers. Those who refrained from alcohol were found to be less healthy.

Having at least one chronic condition decreased the odds of association of being in better health by 64 per cent. Individuals with no depression had 97 per cent greater odds of being healthier. Having no mood disorder meant the odds of being healthier more than double. Similarly, absence of anxiety disorder increased the odds of association by 82 per cent. Food insecurity is found to be significantly associated with general health status. Moderate food insecurity and severe food insecurity displayed 11 per cent and 45 per cent lower odds of association of being in better health compared to food secure groups.

All three income measures - household income level, income inequality and income insecurity were significantly associated with general health status. Individuals from higher income quintiles were found to be healthier. For example, individuals in 2nd income quintile had 21 per cent higher odds of association than those in 1st income quintile. Similarly, individuals in 3rd and 4th income quintiles had 34 per cent and 54 per cent higher odds respectively of being in better health compared to those who were in 1st income quintile. The odds of association increased the most, by 75 per cent, for individuals in 5th income quintile. Income inequality was found to be significantly and negatively associated with general health status. Finally, individuals with high income insecurity were healthier. Individuals with high income insecurity had 21 per cent lower odds of being in better health compared to those trapped in low income insecurity.

3.3.6.2 Marginal Effects

Table 3.3 represents the marginal effects (average) of self rated health status in relation to various measures of income used in Model 4.

Table 3.3 Marginal Effects for General Health Status (Population Size = 11,980,452)

	Self rated health categories			
	Excellent (%) (S.E.)	Very good (%) (S.E.)	Good (%) (S.E.)	Fair/Poor (%) (S.E.)
Household income				
2nd Quintile	2.5 (.005)***	1.4 (.003)***	-2.2 (.005)***	-1.8 (.004)***
3rd Quintile	4.0 (.005)***	2.0 (.003)***	-3.4 (.0056)***	-2.6 (.004)***
4th Quintile	6.2 (.005)***	2.7 (.003)***	-5.2 (.005)***	-3.7 (.004)***
5th Quintile	8.2 (.006)***	3.1 (.003)***	-6.7 (.005)***	-4.6 (.004)***
Income inequality	-0.5 (.002)**	-0.2 (.001)**	0.4 (.002)**	0.3 (.001)**
Income Insecurity Index				
High income insecurity	-3.5 (0.004)***	-1.3 (0.002)***	2.8 (0.003)***	2.0 (0.002)***

Source: 2013-2014 CCHS, ***p<0.01, ***p<0.05. Standard errors (S.E.) are in parentheses.

The likelihood of being in excellent or very good health status increased with the increase in household income level. Individuals in 2nd quintile displayed 2.5 per cent more likeliness of being in excellent health, 1.4 per cent more likely to be in very good health than those placed in 1st quintile. Combining these percentages, I assert that individuals in 2nd quintile were 3.9 per cent more likely to be in excellent or very good health than those in 1st quintile. Similarly, individuals in 3rd quintile, 4th quintile and 5th quintile were 6.0 per cent, 8.9 per cent, and 11.3 per cent more likely to be in excellent or very good health respectively than those in 1st quintile.

On the other hand, compared to the reference group, individuals in 2nd quintile, 3rd quintile, 4th quintile, and 5th quintile were 4.0 per cent, 6.0 per cent, 8.9 per cent and 11.3 per cent less likely to be in good or fair/poor health. The marginal effects with regards to income

inequality were found to be significant. Finally, compared to individuals with low income

insecurity, individuals with high income insecurity were 3.5 per cent less likely to be in

excellent health, and 1.3 per cent less likely to be in very good health, i, e., 4.8 per cent less

likely to be in excellent or very good health. On the other hand, the increased likelihood of

being in good or fair/poor health for individuals with high income insecurity than low income

insecurity was 4.8 per cent.

3.3.7 Income Measures and Self Rated Mental Health Status

I replicated Model 4 for self rated mental health status as the dependent variable and

presented Ordered Logit regression results in Table 3.4.

Table 3.4 Odds Ratios of Mental Health Effects (Population Size = 25,634,264)

	Observed Odds Ratio	Bootstrap Std. Error
Age	1.00	0.001
Sex		
Female	1.01	0.023
(Ref: Male)	1.00	
Marital Status		
Common Law	0.96	0.035
Widowed	0.97	0.044
Separated	0.75***	0.049
Divorced	0.94	0.042
Single	0.89***	0.028
(Ref: Married)	1.00	
Ethnicity		
Black	1.58***	0.153
Filipino	1.07	0.112
Chinese	0.51***	0.042
South Asian	1.06	0.079
Others	0.90*	0.052
(Ref: White)	1.00	
Education		
Secondary school grad	1.74***	0.063
Some post-secondary	1.54***	0.100
Post-secondary grad	1.45***	0.061
(Ref: Less than secondary school)	1.00	-

Country of birth		
Foreign born	1.04	0.036
(Ref: Canada born)	1.00	-
Alcohol		
No	0.97	0.028
(Ref: Yes)	1.00	-
Physical activity index		
Moderate active	0.88***	0.025
Inactive	0.73***	0.019
(Ref: Active)	1.00	-
Chronic conditions		
Yes	0.73***	0.018
(Ref: No)	1.00	-
Smoking		
Occasional smoker	0.92	0.056
Non-smoker	1.19***	0.042
(Ref: Daily smoker)	1.00	-
Depression		
Sometime	2.99***	0.776
No depression	6.01***	1.533
(Ref: Often)	1.00	-
Mood disorder		
No	7.12***	0.322
(Ref: Yes)	1.00	-
Anxiety disorder		
No	3.00***	0.143
(Ref: Yes)	1.00	-
Household food insecurity		
Moderately food insecure	0.82***	0.020
Severely food insecure	0.61***	0.062
(Ref: Food secure)	1.00	-
Household income		
2nd Quintile	1.13***	0.043
3rd Quintile	1.17***	0.045
4th Quintile	1.35***	0.052
5th Quintile	1.42***	0.058
(Ref: 1st Quintile)	1.00	-
Income inequality	0.98	0.015
Income insecurity index		
High income insecurity	0.92***	0.022
(Ref: Low income insecurity)	1.00	-

***p<.01, **p<.05

The results related to mental health status were as expected. The odds ratios revealed that age, sex, country of birth had no significant association with mental health status. On the other hand, education, physical activity, chronic condition, depression, mood disorder, anxiety disorder and household food insecurity were significantly associated with mental health status.

Regarding income variables, the higher the household income level, the greater the odds of association of being in better mental health. Compared to individuals in 1st to 5th income quintile displayed 13 per cent, 13 per cent, 17 per cent, 35 per cent and 42 per cent greater odds of association respectively of being in better mental health.

Income inequality was found statistically insignificant with mental health status. On the other hand, income insecurity was found significant in association with mental health status. High income insecurity is associated with poorer mental health. High income insecurity reduced the odds of association of being in better mental health by 8 per cent compared to those having low income insecurity.

3.4 DISCUSSION AND CONCLUSION

The results of this study were broadly consistent with past literature. Age and sex have a significant association with general health status but no association with mental health status. Education, physical activity, alcohol consumption, chronic conditions, mood disorder, and anxiety disorder were significantly associated with general health status. Many of these associations were consistent with the existing literature. Martín-García et al. (2013), Sullivan

et al. (2000), and Yancik et al. (2007) also identified significant association between these comorbidities and health status.

Daily smoking, mood disorder and anxiety disorder were negatively associated with health status. Physical activity was found positively associated with health status. A similar association of physical activity with general health was demonstrated in Kaplan et al. (1996), and Scully et al. (1998) and with mental health in Stephens (1988), Farmer et al. (1988), and Camacho et al. (1991).

Being single was associated with lower odds of being in better general and mental health compared to their married counterpart. Being widowed or separated displayed no significant association with health status. The absence of depression was associated with better general health and mental health. Occasional depression was significantly associated with mental health, but not with general health status. Household food insecurity was associated with general and mental health. Moderately and severely food insecure individuals fared worse than feed secure individuals in general and mental health. Country of birth revealed no significant association with health.

The primary purpose of this study was to examine the various ways in which income was related to health status. Household income showed a significant association with health status. Higher levels of household income were associated with greater odds of being in better general health and mental health. This association had been documented in previous

studies (Arber et al., 2014; Sturm and Gresenz, 2002; Lynch et al., 2000; Backlund et al., 1996).

Income inequality had a significant association with general health, but not with mental health. In the existing literature, the association between income inequality and health showed mixed results. Many previous studies, for example, Ross et al. (2000), Wilkinson (1996), and Kawachi et al. (1997) found a significant association between income inequality and health status whereas Sturm and Gresenz (2002), Ross et al. (2000), and Fiscella and Franks (1997) among many others recorded insignificant associations between income inequality and health.

Income insecurity was found to be significantly associated with general health and mental health. High income insecurity indicated poorer health status. Although a few previous studies including Forget (2011, 2013), Watson, Osberg, and Phipps (2016) and Access Alliance (2011) indirectly suggested a similar association between income insecurity and health, none of them utilized a composite index to capture income insecurity. The significant association between income insecurity and health controlling for level of household income and income inequality reinforced the construct validity of the III index constructed in Chapter Two.

This study has limitations. Firstly, a major issue of using income inequality as a predictor of health is that there exists no standard measure of income inequality in the literature. Even the most accepted measure of income inequality, the Gini coefficient does not have a universal

application. For example, Payne and Smith (2015) used income inequality, measured by the Gini index at the neighborhood and municipality levels. On the other hand, Ross et al. (2000) used income inequality at the Canadian province or metropolitan area levels. Other studies like Ecob and Smith (1999) used country levels Gini coefficients. In this study, I used Gini coefficients at the provincial level measured by Statistics Canada and modified for rural and urban residents.

Secondly, in studying the association of health with various income measures, questions may arise regarding endogeneity. The direction of causation between health and income is argued to be bi-directional as health can impact the ability to work and the level and stability of earnings of an individual. When endogeneity is present, applying Ordered Logit regression which assumes income variables are exogenous will produce biased estimates. Kuehnle (2014) and Case et al. (2002) used instruments for income and suggested that instrumentations strengthen the association between income and health.

The endogeneity caused by possible simultaneous or reverse causality can be addressed by introducing instrumental variables (IV) approach. Our ability to use instrumental variables in this study was limited by an inability to find a good instrument in the data available to us. An instrument in this case must have direct correlation with income variables, but not with health, i.e., the instrument can only influence health via income variables. Previous studies such as Muennig (2008) and Beckett (2000) suggested that income has a greater impact on health, than health on income.

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CHAPTER 4

THE INCOME NEXUS AND PROBLEM GAMBLING: IS INCOME INSECURITY A PREDICTOR OF PROBLEM GAMBLING?

Abstract

Using the 2013-2014 Canadian Community Health Survey (CCHS), this essay examines the association between problem gambling and income measures, namely household income, income inequality, and income insecurity. I controlled for age, sex, marital status, ethnicity, education, country of birth, smoking, alcohol consumption, depression, mood disorder, anxiety disorder and household food insecurity. I applied an Ordered Logit model regression to examine the association between income measures and problem gambling. The Ordered Logit results revealed that age, marital status, ethnicity, education, health status, as well as higher household income, high income inequality and high income insecurity lead to greater odds of developing a gambling problem. On the other hand, being female, foreign born, and refraining from smoking are protective.

Keywords: Inequality; Insecurity; Low Risk Gambler; Severe Risk Gambler; Problem Gambler.

4.1 INTRODUCTION

Gambling is considered as a widely acceptable form of recreation in society (Stucki and

Rihs-Middel, 2007). Most of the people who gamble keep it as a pastime. However, there are

people who become addicted to gambling and suffer further problems. The negative

consequences of problem gambling not only affect the gambler themselves, but also affect

their families and societies. (Meyer et al., 2009). The expansion of legalized gambling has

been identified as an important public health concern (Shaffer and Korn, 2002; Williams et

al., 2012; Canadian Public Health Association, 2000; Korn, 2000; Abbott et al., 2004;

Suurvali et al., 2008).

More than three per cent of Canadian adults are affected by moderate to severe problem

gambling[2], and more than two per cent of youth aged between 15-24 years are affected by

moderate or problem gambling (Huang and Boyer, 2007; Wood and Williams, 2009).

According to provincial surveys conducted between 2001 and 2006, Saskatchewan and

Manitoba have the highest rates of moderate risk and problem gambling. On the other hand,

Quebec and New Brunswick have the lowest rates of moderate risk and problem gambling

(Canadian Partnership for Responsible Gambling, 2009).

Gambling problems can develop for a variety of reasons. They are not the same for all

problem gamblers. The risk factors that contribute to gambling problems include: easy access

to gambling opportunities, having experienced a recent personal or family loss (e.g., divorce,

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[2]Ferris and Wynne (2001) defined problem gambling as 'gambling behavior that has a negative impact on the gambler, others in his or her social network, or the community.'

job loss, death of loved one), depression, and anxiety. Some hold mistaken beliefs about the odds of winning, and do not monitor gambling wins and losses. Others are lonely (Thomas and Moore, 2003) and might enjoy taking risks (Mishra and Novakowski, 2016).

Historically, gambling was a male-dominated activity; however, recent research indicates that women are now just as likely to gamble as men (Welte et al., 2002). Age, marital status, income, education, social support, stress, and coping abilities are among several key demographic and social variables that have been investigated, to some degree, in relation to problem gambling (Afifi et al., 2010a, 2010b). Johansson et al. (2009) argued that among the risk factors for problematic gambling were age, gender, education, marital status, income and coping ability.

Some scholars noted the association between problem gambling and income the ways in which problem gambling plays a role in creating economic chaos within a household (Gorton et al., 2010). There is, however, little literature that examines specifically the experience of income insecurity, as opposed to low income, and the role that income insecurity plays in shaping attitudes towards money, and risk. I propose a quantitative study that explores how income insecurity influences the likelihood of engaging in problem gambling.

The objective of this study is to examine the association, at an individual level, between income insecurity and problem gambling when controlling for other income measures, namely household income and income inequality. This research is not prompted merely by intellectual curiosity; it has practical implications for the mitigation of problem gambling.

Firstly, understanding the role that income insecurity plays in problem gambling would help us better understand who to target when we deliver these educational interventions. Secondly, if income insecurity leads to an increase in the prevalence of problem gambling, then there are implications for when, where, and how new gambling opportunities should be introduced. Thirdly, to the extent that income instability (and therefore insecurity) is associated with rapid economic change, there is a heightened need for vigilance and surveillance during economic fluctuations. Fourthly, and most significantly, if irresponsible financial decision-making is engendered, at least in part, by income insecurity, then there is a role for general social policy to better address the income insecurity faced by population groups such those working poor and insecurely employed.

4.2 LITERATURE REVIEW

Gambling terminology is used in diverse and inconsistent ways in the existing literature (Toronto Public Health, 2012). Due to the lack of standard terminology in gambling studies, ambiguity and confusion may arise and obscure public discourse (Canadian Public Health Association, 2000).

Some studies (Ferris and Wynne, 2001; Korn et al., 2003; Afifi et al., 2010a, 2010b; Williams et al., 2012; Korn, 2000; Korn and Shaffer, 1999) used a public health perspective and focused on problem gambling based on gambling behavior, rather than clinically derived measures, such as the Diagnostic and Statistical Manual (DSM-IV) definition of pathological gambling (Kessler et al., 2008) or the South Oaks Gambling Screen (SOGS) for a disorder (Lesieur et al., 1987). According to this public health approach, problem gambling is

considered as a continuum of gambling behavior that creates negative consequences for the gambler, others in their social networks or community. In addition to problem and pathological gambling, a variety of other terms are used in the literature such as 'disordered', 'problematic', 'compulsive', 'addictive' and 'excessive' gambling.

Problem gambling is associated with high rates of smoking, alcohol consumption, and substance abuse (Delfabbro, 2012; Johansson et al., 2009; Williams, Volberg, and Stevens, 2012; Williams, West, and Simpson, 2012; Gainsbury et al., 2012; Griffiths et al., 2009; Wood and Williams, 2010). Literature also suggests that problem gamblers experience high level of comorbidities, such as depression, mood disorders, and anxiety disorders (Hodgins et al., 2011; Lorains, Cowlishaw, and Thomas, 2011).

Many socio-demographic characteristics are associated with problem gambling including ethnicity (Alegria et al., 2009; Collins and Barr, 2006; Arthur et al., 2008), country of birth (Bakken et al., 2009; Sassen et al., 2011; Hass et al., 2012), age, sex, marital status, education, and employment status (Abbott et al., 2004; Johansson et al., 2009; Orford 2004; Welte et al., 2004). Research in psychology addressed the relationship between individual characteristics, family environment, risk-seeking behavior, and problem gambling (Roberti, 2004; El-Guebaly et al., 2006; McCready et al., 2008; Desai et al., 2008). Other scholars looked at socioeconomic status and risk-seeking behavior (Hanson and Chen, 2007; Poysti and Majamaki, 2013).

The correlation between problem gambling and economic insecurity has been studied, but most of the literature focuses on how problem gambling plays a role in creating economic chaos within a household over time (Gorton et al., 2010; Affifi et al., 2010c).

4.3 DATA AND METHODOLOGY

4.3.1 Data source

I used the 2013-2014 Canadian Community Health Survey (CCHS), a national Statistics Canada survey that assess the health and well-being of Canadians. Information was collected in 2013-214, using a random, multistage stratified cluster design to select private dwelling Canadian residents aged 15 years and older. However, samples in this study included those 18 years of age and over since no one under this age can legally gamble anywhere in Canada.[3] The 2013-2014 CCHS includes data on problem gambling from four provinces, namely Quebec, Manitoba, Saskatchewan, and British Columbia, as housed at Statistics Canada's Research Data Center (RDC).

4.3.2 Dependent variable

I used type of gambler as the dependent variable. In the 2013-2014 CCHS, there is a derived variable, namely CPGDTYP (Type of gambler), based on two other variables: CPGFGAM (Gambling Activity - Gambler vs. Non-gambler) and CPGDSEV (Problem Gambling Severity Index (PGSI)- Modified Version). The variable CPGDTYP considered five categories: 'non-gambler (denoted by 1)', 'non-problem gambler (denoted by 2)', 'low-risk

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[3]For the legal minimum age for gambling by province, see Gambling Online in Canada, Province by Province at http://www.onlinegambling.ca/legislation-guide.php

gambler (denoted by 3)', 'moderate-risk gambler (denoted by 4)', 'problem gambler (denoted by 5)'.

The category 'not a gambler' consisted of individuals who answered 'NO' to the question 'Have you gambled in the last 12 months?'. In contrast, the other four categories were derived by using the Problem Gambling Severity Index (PGSI), derived from the Canadian Problem Gambling Index (CPGI) which assessed the past 12-month prevalence of problem gambling (Ferris and Wynne, 2001). The higher the score on PGSI, the greater is the likelihood of a person's problem gambling. A score of 0 for PGSI corresponds to a non-problem gambler while a score of 1 or 2 identifies a low-risks gambler with a few or no identified negative consequences, a score of 3 to 7 identifies a moderate-risks gambler facing some negative consequences, and a score of 8 or more identifies a severe risks gambler or problem gambler who faces greater negative consequences and a possible loss of control over his or her habit.

4.3.3 Independent variables

Scholars argue that problem gambling is associated with a wide range of socio-demographic variables (age, sex, marital status, ethnicity, level of education, country of birth, etc.), economic variables (household income level, income inequality, income insecurity, household food insecurity, etc.), and comorbidities (smoking, alcohol consumption, depression, mood disorder, anxiety disorder, chronic conditions, etc.).

Socio-demographic variables: The socio-demographic variables selected for this study are supported by existing studies. Scholars like Huang and Boyer (2007), Wood and Williams (2009) and Kessler et al. (2008) suggested that age is significantly associated with the prevalence of problem gambling. The age variable in 2013-2014 CCHS is continuous and measured in years. For the convenience of comparison among different age groups, I distributed the sample in this study into four categories: 18-24 years, 25-44 years, 45-64 years, and 65 years and above. Men participated in gambling more than women (Welte et al., 2002) and the prevalence of problem gambling is higher for men than women (Williams et al. 2012a).

Botterill et al. (2016) asserted that there is a significant association between marital status and problem gambling for older men (Southwell et al. 2008). In this study, marital status is measured by six categories: married, common law, widowed, separated, divorced, and single. Rinker et al. (2016) suggested that the prevalence of problem gambling varies by ethnicity, and Alegría et al. (2009) stated that the prevalence rate of disordered gambling is higher for Blacks, Native/Asian Americans than White Americans. The ethnicity variable in this study is divided into White, Black, Filipino, Chinese, South Asian, and others.

Education is associated with problem gambling and the prevalence of problem gambling is higher for individuals with lower level education (Abbott et al. 2004; Rogers and Webley 2001; Shaffer and Hall. 2002). The education variable has four categories: less than secondary school, secondary school graduation, some post-secondary education, and post-secondary graduation. Tse, Wong, and Kim (2004) suggested that country of birth matters for

the prevalence of problem gambling. In this study, the respondents are categorized in two broad groups: Canada born and foreign born.

Income nexus and other economic variables: I used three income measures for this study: level of household income, income inequality at the regional level, and income insecurity at the individual level. Household income variables were categorized under five quintiles: the higher the quintile, the higher the household income is. The Income inequality variable is a continuous variable derived from the provincial Gini coefficient obtained from CANSIM data coupled with 'Geodur' variable from the 2013-2014 CCHS. The 'Geodur' variable is categorized in rural, core metropolitan, urban fringe, population center, secondary core, and mix of population center and rural. The values of income inequality variable ranged from 0.281 to 1.540. To measure income insecurity, I used the III constructed in Chapter Two. The income insecurity variable is dichotomous with values '1' (low income insecurity) and '2' (high income insecurity).

Olayemi (2014) asserted that the food insecurity variables and problem gambling are positively associated. In the 2013-2014 CCHS, the food insecurity variable is created following the Health Canada model of food security status that asks 18 questions related to a household's food insecurity situation in the last year. This variable has three categories: (i) food secure including households where individuals experienced one or fewer instance of difficulty in food access, (ii) moderately food insecure that includes households where individuals compromise with food quality or quantity or both, and (iii) severely food insecure

that includes households where individuals experienced lower intake of food consumption frequently.

Comorbidities: Comorbidities considered for this study include smoking, alcohol consumption, depression, anxiety disorder, mood disorder, and chronic conditions. Gainsbury et al. (2014) and National Research Council (1999) suggested that smoking and alcohol consumption are significantly associated with problem gambling. In this study, smoking has three categories: daily smoker, occasional smoker, and non-smoker while alcohol consumption is dichotomous: yes; no. Hodgins et al. (2011) and Afifi et al. (2010b) asserted that depression and anxiety disorders are positively associated with problem gambling. I used three categories (often, sometimes, and never) for depression and two categories (yes, no) for anxiety disorder. Mood disorder is found to be associated with problem gambling (Smith et al., 2011; Romer et al., 2009), and the variable is also dichotomous (yes, no) in this study.

Subramaniam et al. (2015) illustrated that problem gambling is associated with chronic conditions like asthma, chronic bronchitis, diabetes, high blood pressure, arthritis, back problems, migraine headaches, Cancer, cardiovascular disorders, and bowel disorders. I used the 2013-2014 CCHS to create a dichotomous (yes, no) for the presence of chronic condition like asthma, arthritis, back problems, high blood pressure, migraine, chronic bronchitis or emphysema or obstructive pulmonary disease, diabetes, heart disease, cancer, stomach or intestinal ulcers, effects of a stroke, and bowel disorder.

4.3.4 Econometric model

To estimate the association of problem gambling with income insecurity, I employed the following model (Greene, 2008):

$$h_i = \alpha + \beta x_i + \gamma g_i + \eta * \text{income insecurity}_i + \varepsilon_i$$

where h_i represents the type of gambler (derived from problem gambling severity index) of individual i, x represents the vector of socio-demographic and economic variables (age, sex, marital status, ethnicity, education, country of birth, household income, income inequality, and food insecurity) of individual i, g is the vector of comorbidities (chronic condition, smoking, alcohol consumption, depression, mood disorder, and anxiety disorder) of individual i, α is constant term and ε_i represents error term. β, γ, η are the parameters to be estimated and my focus is on η, the coefficient of income insecurity.

To examine the association between problem gambling and the income nexus, I calculated the odds ratios by means of Ordered Logit models for problem gambling on various income measures and other socio-demographic variables and comorbidities. In addition to odds ratios, I computed the marginal effects of income measures on problem gambling.

4.4 EMPIRICAL RESULTS

4.4.1 Descriptive Statistics

Table 4.1 Descriptive Statistics of Type of Gambler by Income Insecurity (Population: 8,083,755)

Type of gambler	Total Group	Low income insecurity	High income insecurity
	Per cent (Std. Error)	Per cent (Std. Error)	Per cent (Std. Error)
Non-gambler	39.5 (0.01)	47.0 (0.01)	35.0 (0.01)
Non-problem gambler	57.0 (0.01)	49.0 (0.01)	61.0 (0.01)
Low risk gambler	2.1 (0.00)	2.5 (0.00)	2.0 (0.00)
Moderate risk gambler	1.0 (0.00)	0.9 (0.00)	1.1 (0.00)
Problem gambler	0.4 (0.00)	0.6 (0.00)	0.9 (0.00)

Table 4.1 represents the distribution of gamblers by income insecurity. Individuals with low income insecurity and high income insecurity have different distributions. The proportion of gamblers is higher (65 per cent versus 53 per cent) among individuals with high income insecurity than with low income insecurity. Among those who gamble in the high income insecurity group, 1.1 per cent are moderate risk gamblers and 0.9 per cent are problem gamblers. Among the low-income insecurity group, these percentage values are slightly lower: 0.9 per cent for moderate risks gamblers and 0.6 per cent for problem gamblers.

4.4.2 Odds Ratios

We ran four ordered logistic regression models and the results are presented in Table 4.2.

Table 4.2 Odds Ratios of Problem Gambling (Population Size = 8,083,755)

	Odds Ratios			
	Model 1	Model 2	Model 3	Model 4
Age				
25-44 years	1.47***	1.55***	1.44***	1.44***
45-64 years	1.64***	1.73***	1.60***	1.64***
65 years+	1.35***	1.33***	1.53***	1.57***
(Ref: 18-24 years)	1.00	1.00	1.00	1.00

Sex				
Female	0.73***	0.71***	0.73***	0.74***
(Ref: Male)	1.00	1.00	1.00	1.00
Marital Status				
Common Law	1.25***	1.26***	1.22***	1.25***
Widowed	1.07	0.96	0.92	1.08
Separated	0.89	0.82	0.80	0.87
Divorced	1.41***	1.28***	1.24***	1.39***
Single	1.06	0.99	0.88**	1.06
(Ref: Married)	1.00	1.00	1.00	1.00
Ethnicity				
Black	0.96	0.85	0.86	0.96
Filipino	2.44***	2.19***	2.11***	2.40***
Chinese	0.89	0.81	0.86	0.93
South Asian	1.13	1.08	1.07	1.13
Others	0.97	0.89	0.91	0.98
(Ref: White)	1.00	1.00	1.00	1.00
Education				
Secondary school grad	1.05	1.14	1.12	1.04
Some post-secondary	1.29**	1.41***	1.35***	1.28***
Post-secondary grad	0.91	1.08	1.04	0.89
(Ref: Less than secondary school grad)	1.00	1.00	1.00	1.00
Country of birth				
Foreign born	0.58***	0.54***	0.55***	0.58***
(Ref: Canada)	1.00	1.00	1.00	1.00
Smoking				
Occasional smoker	0.95	0.97	0.94	0.96
Non-smoker	0.64***	0.67***	0.65***	0.64***
(Ref: Daily smoker)	1.00	1.00	1.00	1.00
Alcohol				
No	0.50***	0.47***	0.48***	0.51***
(Ref: Yes)	1.00	1.00	1.00	1.00
Chronic Condition				
Yes	1.22***	1.21***	1.24***	.85***
(Ref: No)	1.00	1.00	1.00	1.00
Depression				
Sometime	1.12	1.17	1.10	1.08
No depression	0.68	0.71	0.65*	0.69
(Ref: Often)	1.00	1.00	1.00	1.00
Mood Disorder				
No	1.04	1.07	1.00	1.01
(Ref: Yes)	1.00	1.00	1.00	1.00
Anxiety Disorder				
No	1.03	1.06	1.06	1.03

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(Ref: Yes)	1.00	1.00	1.00	1.00
Food insecurity				
Moderately food insecure	1.31***	1.31***	1.31***	1.30**
Severely food insecure	0.84	0.68*	0.74	0.86
(Ref: Food secure)	1.00	1.00	1.00	1.00
Household income				
2nd Quintile	1.49***	-	-	1.44***
3rd Quintile	1.59***	-	-	1.51***
4th Quintile	1.91***	-	-	1.78***
5th Quintile	1.87***	-	-	1.73***
(Ref: 1st Quintile)	1.00	-	-	1.00
Income inequality (continuous)	-	1.09***	-	1.09***
Income insecurity index				
High income insecurity	-	-	1.55***	1.32***
(Ref: Low income insecurity)	-	-	1.00	1.00

Source: 2013-2014 CCHS. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

In all four models, I used type of gambler derived from the problem gambling severity index as the dependent variable. As independent variables: age, sex, marital status, ethnicity, education, and country of birth, chronic conditions, smoking, alcohol consumption, depression, mood disorder, anxiety disorder, and household food insecurity are common in all four models. Model 1 includes only household income; Model 2 includes only income inequality; Model 3 includes only income insecurity while Model 4 includes all three income measures at the same time.

Age is found to be significantly associated with problem gambling. The results of Model 4 illustrated that all three older age groups had higher odds of association of developing gambling problems compared to the 18-24 year-old age group. Individuals within the age groups of 25-44 years, 45-64 years, 65 years and above witnessed 47 per cent, 64 per cent, and 35 per cent higher odds of developing gambling problem. Females had lower odds of

association with problem gambling than their male counterparts. Females had 27 per cent, 29 per cent, 27 per cent, and 26 per cent lower odds in Model 1, Model 2, Model 3 and Model 4 respectively.

In terms of marital status, individuals who are in common-law relationships or divorced are associated with higher odds of developing gambling problem than those who are married. Widowed, separated, and single categories do not show any significant difference in odds of developing a gambling problem. Filipino ethnicity was associated with significantly higher (almost two and half times) odds than those who identified as White of having a gambling problem in Model 4. All other ethnicities were found insignificant in all four models.

Odds ratios in relation to educational attainment revealed that education categories, except some post-secondary education, were found statistically insignificant in association with gambling problem. Foreign born individuals showed lower odds of developing a gambling problem than their native-born counterparts. Those born outside Canada had 42 per cent, 46 per cent, 45 per cent and 42 per cent lower odds compared to their native-born counterparts in Model 1, Model 2, Model 3 and Model 4 respectively.

In terms of comorbidities, although occasional smokers did not exhibit significant differences with daily smokers in odds of association with problem gambling, non-smokers showed significantly lower odds by more than 30 per cent than daily smokers in all four models. Alcohol consumption increased the odds of being a problem gambler. The odds ratios related to chronic conditions were not conclusive. While Model 1, Model 2, and Model 3 revealed

that having at least one chronic condition meant higher odds of a gambling problem, Model 4 produced the opposite result indicating chronic conditions reduced the odds of a gambling problem. Depression, mood disorder, and anxiety disorder were found to be insignificant in association with a gambling problem.

The odds ratios for household income illustrated that all four higher income quintiles had significantly higher odds of association with problem gambling compared to income quintile 1. In Model 1, where I used household income as the only income measure, the odds of association of developing problem gambling were 49 per cent, 59 per cent, 91 per cent and 87 per cent higher for individuals in quintile 2, quintile 3, quintile 4, and quintile 5 respectively relative to individuals in quintile 1. In Model 4, where I used all three income measures, the odds were 44 per cent, 51 per cent, 78 per cent and 73 per cent higher for individuals in quintile 2, quintile 3, quintile 4, and quintile 5 respectively.

Income inequality had a significant association with problem gambling in both Model 2 and Model 4. Income insecurity was also found significantly associated with problem gambling. High income insecurity was found associated with greater odds of problem gambling. Model 3, where I used income insecurity as the only income measure, showed that individuals with high income insecurity had 55 per cent higher odds of association than individuals with low income insecurity. In the presence of all three income measures in Model 4, the results revealed that high income insecurity is associated with 32 per cent higher odds of problem gambling compared to low income insecurity.

4.4.3 Marginal Effects

Table 4.3 represents the marginal effects (average) of problem gambling in relation to

various measures of income used in Model 4.

Table 4.3 Marginal Effects for Problem Gambling in Relation to Income Measures
(Population: 11,980,452)

	Type of gamblers				
	No gambler (%)	No problem gambler (%)	Low risk gambler (%)	Moderate risk gambler (%)	Problem gambler (%)
Household income					
2nd Quintile	-8.3***	7.3***	0.6***	0.3***	-0.0***
3rd Quintile	-9.3***	8.2***	0.7***	0.3***	-0.0***
4th Quintile	-13.0***	11.3***	1.0***	0.5***	-0.0***
5th Quintile	-12.4***	10.8***	1.0***	0.5***	-0.0***
Income inequality	-1.8***	1.5***	0.2***	0.1***	0.0***
Income Insecurity					
High insecurity	-6.2***	5.3***	0.5***	0.3***	0.0***

Source: 2013-2014 CCHS, ***$p < 0.01$. Standard errors (S.E.) are in parentheses.

The marginal effects in Table 4.3 revealed that household income had a significant

association with problem gambling. The signs of the marginal effects revealed that

individuals with higher household income quintiles were less likely to be in 'No gambler'

category. As household income improved, the chance of being low to moderate risk

increased. However, the chance being in the 'Problem gambler' category decreased with

higher household income quintiles. The sign of the marginal effect of income inequality

indicated that higher income inequality was associated with higher risks of problem

gambling. The chance of developing gambling problems (low risks, moderate risks and

severe risks) was found associated with income insecurity. Although the magnitudes were

low, signs of the marginal effects indicated that compared to low income insecurity, high

income insecurity was associated with elevated risks of problem gambling. This is a

significant result as it shows income insecurity is important as a predictor of health even if household income and income inequality are controlled for.

4.5 DISCUSSION AND CONCLUSION

This research investigates the association between problem gambling and income insecurity at an individual level, controlling for various correlates of problem gambling. Results revealed that problem gambling was significantly associated with higher age, sex, marital status (common law; divorced), ethnicity (Filipino), education (some post-secondary), country of birth, smoking, alcohol consumption, chronic conditions, food insecurity (moderate), household income, income inequality and high income insecurity. On the other hand, depression, mood disorder, and anxiety disorder were found statistically insignificant.

Our results revealed that higher age categories were more likely to experience gambling problems. This result was not surprising knowing that older adults had greater prevalence of problem gambling than youth in other studies (Huang and Boyer, 2007; Wood and Williams, 2009; Kessler et al., 2008). Results also suggested that males had greater odds of problem gambling problem than females.

Being widowed, separated, or single had no significant difference in odds of association with being married. These results support Nordmyr, Forsman and österman (2016) to the fact that marital status was not significantly associated with problem gambling. Filipino ethnicity was associated with greater odds of developing a gambling problem compared with those who

identified as White. Other ethnicities had no significant association with problem gambling. These results contradict with the findings suggested by Marshall et al. (2009), Petry et al. (2003), Toyama et al. (2014), Barry et al. (2011a, 2011b), Barnes et al. (2009), and Welte et al. (2008).

Native-born individuals had higher odds of association than their foreign-born counterparts. Regarding education variables, only individuals with some post-secondary education showed significantly higher odds of developing gambling problems compared to individuals who had less than secondary education. All other categories (secondary school graduation; post-secondary graduation) did not show significant association with problem gambling. This insignificant association between levels of education and problem gambling severity was quite surprising. Many studies reported that low levels of education lead to higher rates of problem gambling (Abbott et al. 2004; Rogers and Webley 2001; Shaffer and Hall, 2002).

Those who never smoked had significantly lower odds of developing gambling problems compared to those who smoked daily. Similarly, individuals who consumed alcohol had lower odds of developing gambling problem than those who did not. These results support the research of Gainsbury et al. (2014) and National Research Council (1999). Results illustrated that depression, mood disorders, and anxiety disorders were statistically insignificant in association with problem gambling. Studies like Hodgins et al. (2011) and Afifi et al. (2010b) documented greater odds of association for depression, and anxiety disorder. However, most of these studies were not based on population surveys or conducted for targeted group such as women, youth and so on. For example, Hodgins et al. (2011) was

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not conducted by using data from a population survey and Afifi et al. (2010b) was conducted

for women only. The link between depression and problem gambling may work differently

for men and women. Further studies may help identifying the reasons behind the

insignificant association of problem gambling with depression and anxiety that are found in

this study. Problem gambling was significantly associated with moderate food insecurity, but

not with severe food insecurity.

This study was primarily concerned with the association between income insecurity, the level

of income and income inequality on the one hand, and problem gambling on the other.

Higher levels of income were associated with greater odds of problem gambling, in contrast

with many of the previous studies (Reith, 2006; Shaffer et al., 2002; Sproston et al., 2000).

Income inequality in this study was statistically significant which is in conformity with

Canale (2017) who documented that students with high regional income inequality were

more likely to develop gambling problems than those with low regional income inequality.

My research documented a significant association between income insecurity and problem

gambling. The results revealed that high income insecurity increased the odds of having a

gambling problem.

This study has limitations. Firstly, I used the III constructed in Chapter Two. Therefore, any

weaknesses in the III are inherited in the present study. Secondly, I conducted this study

using data for only four provinces (Manitoba, Saskatchewan, Quebec and British Columbia)

as gambling questions in the 2013-2014 CCHS were targeted in these four provinces. This

restricted the range of income inequality variable to some extent. Finally, a reader might

wonder why Indigenous status was not used as an explanatory variable when so much previous research suggests that health status for Indigenous people in Canada is worse than for other Canadians. The Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2) bases its recommendations for indigenous research on the premise, "nothing about us, without us". Chapter 9 explicitly states that in the case of research based on secondary analysis of data accessible in accord with legislation, respect for Indigenous Canadians means:

> Community engagement is not required. Findings of such research nevertheless may have an impact on the identity or heritage of persons or communities. In order to minimize any harm, researchers should seek culturally informed advice before use of such data to determine if harms may result and if other considerations such as sharing of the research results should be explored with the original source community.

The Health Research Ethics Board at the University of Manitoba interprets this provision to include the use of Indigenous status as an explanatory variable, even if no Indigenous-specific conclusions or recommendations are anticipated. Culturally informed advice was not sought for this project, and therefore the analysis was not disaggregated by Indigenous status. Previous research has demonstrated that, in the case of Manitoba at least, socioeconomic status appears to be the pathway by which health outcomes are affected by Indigenous status (cf. Finlayson et al. 2010). If this result can be generalized to Canada as a whole, excluding Indigenous status from this analysis should have little impact on estimated outcomes because

income variables are included. Future research might explore the implications of this decision.

In conclusion, problem gambling is an important public health concern. This research, investigating the association between problem gambling and income insecurity, can be used as evidence to formulate public policies related to problem gambling and framing general social policies to lessen income insecurity for vulnerable Canadians.

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CHAPTER 5

**ESTIMATING LOSSES OF HEALTH-RELATED QUALITY OF LIFE (HRQL)
ASSOCIATED WITH PROBLEM GAMBLING IN CANADA**

Abstract

This study estimated losses of health-related quality of life associated with problem gambling

in Canada. Using the 2013-2014 CCHS, I ran an Ordinary Least Squares (OLS) regression to

estimate the coefficient of association between HRQL, measured by the Health Utility Index

mark III (HUI) and problem gambling controlling for other socio-demographic and economic

variables, and comorbidities. Results showed that problem gamblers had significantly lower

health-related quality of life compared to non-problem gamblers. The HRQL for a problem

gambler was lower by 0.033 than that of a non-problem gambler. I used 95 per cent

confidence interval [95% C.I.] as a sensitivity analysis and found that the reduction of HRQL

for a problem gambler could be as low as 0.002 and as high as 0.063. By attaching the value

of quality adjusted life year (QALY), I quantified the HRQL losses connected to problem

gambling. The costs associated with the loss of HRQL for problem gambling ranged between

$300 and $9,450 with a reference estimate of $4,950 per problem gambler per year. The total

cost of HRQL associated with all problem gamblers in Canada is estimated to be

approximately $5.4 billion per year and may be as high as $10.2 billion per year.

Keywords: Health utility index; Health related quality of life; Value of quality adjusted life

year; Problem gambling; Problem gambling severity index.

5.1 INTRODUCTION

Problem gambling is considered a form of behavioral issue (Lorains et al., 2014). The extraordinary expansion of government-owned legalized gambling during recent decades is viewed as a serious public health issue (Gainsbury et al., 2013; Korn, 2000; Canadian Public Health Association, 2000; Shaffer and Korn 2002; Shaffer, 2003). Problem gambling prevalence is higher in Canada than the world average. While 0.2 per cent to 2.3 per cent of people are suffering from gambling problems internationally (Fong, Fong, and Li, 2011; Petry, 2007; Productivity Commission, 2010; Shaffer et al., 2004; Wardle et al., 2007), more than 3.0 per cent of Canadian adults are affected by moderate to severe problem gambling (Huang and Boyer, 2007; Wood and Williams, 2009).

Problem gamblers create problems for themselves, their families, employers, and others in the society. It has been estimated that one problem gambler affects approximately ten more people (Productivity Commission, 2010; Delfabbro, 2010). The social and health related costs of gambling problem are of many kinds: job losses, productivity losses, depression, insomnia, irritating attitudes, intestinal disorders, migraines, other stress related disorders, suicide, relationship breakups, bankruptcy, and crime (Productivity Commission, 2010; Delfabbro, 2010; Rosenthal and Lesieur, 1992).

Family violence is another negative consequence of problem gambling. Those whose intimate partners were identified as pathological gamblers faced the risk of domestic violence (Muelleman et al., 2002). Women having partners with a gambling problem faced ten times the risk of being a victim of violence (National Research Council, 1999). Although problem

gambling is identified as a public health concern, research related to the social and economic impacts of problem gambling is still not well developed (Griffiths, 1996).

A New Zealand-based Gambling and Addictions Research Centre (2014) suggested that problem gamblers exhibited lower self rated physical and mental health. The report also suggested that problem gambling was associated with low health related quality of life (HRQL), displayed from the fact that 77 per cent of problem gamblers had less than median quality of life compared 42 per cent of the overall adult population.

Several studies were conducted on the overall impact of gambling on the quality of people's lives, however there is lack of consensus on what constitutes 'quality of life' and how it should be measured. Several researchers studied the association of pathological or problem gambling with quality of life and concluded that problem gambling is associated with poorer quality of life (Morasco et al., 2006; Black, Moyer, and Schlosser, 2003; Erickson et al., 2005; Pietrzak et al., 2005; Scherrer et al., 2005).

The purpose of this essay is to estimate the losses in health-related quality of life, measured by HUI associated with problem gambling in Canada. This study is the first of its kind in Canada to use HUI derived from a nationally representative population-based survey to estimate the losses of health-related quality of life. These losses are internalized by the problem gamblers and not often considered in estimates of the economic burden of gambling.

5.2 LITERATURE REVIEW

The literature on gambling studies can be divided into two broad groups. A large body of literature examined the psychological aspects of gambling including diagnosis, prevention, and treatment of gambling disorders, while some researchers examined the economic and social impacts of gambling (Philander et al., 2012). This study fits into the latter category.

Within this second body of literature, there is a debate concerning what should be included in the costs associated with problem gambling, and how these costs be measured. There are distinct social costs associated with problem gambling, including the costs associated with criminal activity and treatment for problem gamblers. Many would also argue, consistent with the public health perspective on problem gambling discussed above, that there are significant negative consequences of this behavior for the individual who engages in problem gambling.

In line with Becker and Murphy (1988), the gambling addict might be deemed as fully informed of the potential consequences of his or her actions, and acting as a rational consumer. That way, the loss in quality of life is a private cost which is internalized or individual; it should not be seemingly included in the social cost estimation. On the other hand, Collins and Lapsley (2003), Productivity Commission (2010, 1999) and Kohler (2014) viewed gamblers as not fully informed, most notably concerning the potential risks of problem gambling and the odds of winning, and probably not completely rational in outlook and behavior; consequently, the loss of quality of gambler's life should be considered a social cost.

Politzer, Morrow, and Leavey (1985) assessed the cost of problem gambling to society and the benefit-cost ratio of gambling treatment in United States. Some scholars including Schwer et al. (2003), Morasco et al. (2006), Grinols (2004), Emshoff et al. (2007), Zorland et al. (2008) and Fong et al. (2011) examined the social cost of problem gambling. The National Gambling Impact Study Commission report (1999) was the first comprehensive study that addressed the economic and social impacts of gambling in addition to the psychological aspects. In a similar vein, Gerstein et al. (1999) studied the prevalence and both direct costs and indirect costs of problem gambling to society in the United States.

Anielski and Braaten (2008) estimated the cost associated with individual problem gamblers and the total cost of problem gambling to Alberta's economy. Following the estimation put forward by the Australian Productivity Commission (1999), Anielski and Braaten (2008) estimated the cost of problem gambling or negative consumer surplus as excessive spending of problem gamblers over recreational gamblers incurred for Alberta in 2005. However, both studies ignored the quality of life loss to individuals addicted to problem gambling. The most comprehensive study on the social and economic costs of problem gambling in Canada was initiated by the Canadian Consortium for Gambling Research (William et al., 2011). However, this study did not add the costs associated with loss of health-related quality of life experienced by gamblers to the social costs of gambling.

Using the South Oaks Gambling Screen (SOGS) on adults, Morasco et al. (2006b) found that compared to the population at large, recreational gamblers had a poorer quality of life. The quality of life was even worse for both pathological gamblers and problem gamblers. Fong et

al. (2011) used self rated quality of life and found that pathological, problem, and at-risk gamblers suffered from deficiency in quality of life relative to recreational gamblers, but the differences between the first three were not statistically significant.

Lin et al. (2010) used a different measure, 'loss to income ratio' for quality of life and ended up with similar result of a negative correlation between problem gambling and quality of life. Perhaps, the most comprehensive study that focused on the loss of quality of life was conducted by the Productivity Commission in Australia first in 1999 and subsequently in 2010. Focusing on Health-Related Quality of Life (HRQL), the commission concluded that pathological gambling is associated with poorer quality of life as outlined in the classical model from the Health Economics literature (Collins and Lapsley, 2003; Single et al., 2001).

Kohler (2014) first quantified the costs of Health-Related Quality of Life (HRQL) associated with problem gambling. The study used the health utility index (SF-6D) as a measure of health-related quality of life and estimated the losses in HRQL associated with pathological gambling in Western Switzerland controlling for comorbidities and age. Their results demonstrated that pathological gambling is significantly associated with reduced quality of life (0.076 QALYs annually for each pathological gambler, which they have monetized at 3,830 Swiss Francs).

5.3 DATA AND METHODOLOGY

5.3.1 Data Source

For this study, I used data from the 2013-2014 Canadian Community Health Survey (CCHS).

As mentioned earlier, the gambling module of the 2013-2014 CCHS was only completed for

four provinces, and among the total sample, 39.5 per cent were considered 'non- gamblers',

57.0 per cent were 'non-problem gamblers', 2.1 per cent were 'low-risk gamblers', 1.0 per

cent were 'moderate risk gamblers', and 0.4 per cent were 'problem gamblers'.

5.3.2 Dependent Variable

Health Related Quality of Life (HRQL) is the dependent variable of this study. I used the

Health Utility Index Mark III (HUI) from the 2013-2014 CCHS to estimate losses of HRQL

connected to problem gambling (Feeny et al., 1999; Feeny et al, 2002; Mo et al., 2004).

The HUI was constructed based on eight attributes, namely vision, hearing, speech, mobility

(ability to get around), dexterity (use of hands and fingers), cognition (memory and thinking),

emotion (feelings), and pain/discomfort to measure individual's quality of life living with

various chronic conditions (Furlong et al., 1999, and Torrance et al., 1995). Utility scores

were reported in the CCHS. The lower the value of the HUI, the worse an individuals'

HRQL.

5.3.3 Independent Variables

The 'type of gamblers'variable has five categories: non-gamblers, non-problem gamblers,

low-risk gamblers, moderate-risk gamblers, and problem gamblers. For this study, I

combined the moderate risk gamblers with problem gamblers, which I collectively treated as

'problem gamblers'. Although moderate risk gamblers might or might not be having adverse consequences of gambling which the problem gambling typically poses, they are at a significant risk (Ferris and Wynne, 2001; Afifi et al., 2009). Then I combined the remaining three categories of non-gamblers, non-problem gamblers and low-risk gamblers, which I identified as non-problem gamblers. This categorization is consistent with the literature (Afifi et al., 2010; Huang and Boyer, 2007; McIntyre et al., 2007; Cox et al., 2005; Currie et al., 2006; Wiebe et al., 2001).

Comorbidities: To isolate the effects of problem gambling on the HUI, I control for related comorbidities. Petry (2007); Petry, Stinson, and Grant (2005); Rush et al. (2008); Westphal and Johnson (2007) established that problem gamblers showed high rates of co-morbidities like alcohol abuse and tobacco consumption (Fong et al., 2011; Momper et al., 2010; Welte et al., 2007), depression (Johansson et al., 2009; Momper et al., 2010; Petry, 2005; Petry et al., 2005; Westphal and Johnson, 2007) and drug abuse, and chronic diseases (Kohler, 2014). The set of comorbidities I considered include smoking (categorical), alcohol consumption (dichotomous), depression (categorical), mood disorder (dichotomous), anxiety disorder (dichotomous), physical activity (categorical), and having a chronic condition (dichotomous).

Socio-demographic and economic variables: I used the same set of socio-demographic variables (age, sex, marital status, ethnicity, education, and country of birth) and economic variables (household income, income inequality, income insecurity, and household food insecurity) as in Chapter Three, in order to control for the independent effects of these variables on HRQL

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5.3.4 Econometric Model

The econometric model for this study was derived following Anielski and Braaten (2008),

Collins and Lapsley (2003), and Single et al. (2003). The association between an individual's

health related quality of life (q) and problem gambling (g) is given in the following equation:

$q = \alpha + \beta x + \gamma g + \varepsilon$

where x is (a vector of) the individual's other socio-demographic and economic

characteristics, ε is a random term that covers variables not included in x, and α, the vector β,

and γ are parameters to be estimated.

As the values of Health Utility Index (HUI) in the 2013-2014 CCHS range from -2.97 to 1, it

can be treated as a continuous variable. I ran an Ordinary Least Squares (OLS) model to

examine the association between HRQL and problem gambling.

5.4 EMPIRICAL RESULTS

5.4.1 Descriptive Statistics

Table 5.1 Descriptive statistics of HUI by type of gamblers

Dependent variable	Total group (Population: 7,965,967)		Non-Problem gambler (Population: 7,859,679)		Problem gambler (Population: 106,287)	
	Mean	Bootstrap Std. Error	Mean	Bootstrap Std. Error	Mean	Bootstrap Std. Error
Health Utility Index (HUI)	0.88	0.002	0.88	0.002	0.80	0.018

Table 5.1 represents the average HRQL of the total group (comprising both problem

gamblers and non-problem gamblers). It is evident that the average HRQL of non-problem

gamblers (0.88) is higher than that of the problem gamblers (0.80). The difference might be

explained to some extent by the fact that problem gamblers are more likely to have health-

related comorbidities (Kohler, 2014).

The descriptive statistics for the independent variables are presented in Table 5.2.

Table 5.2. Descriptive Statistics of Independent Variables by Type of Gambler (Population: 7,645,064)

Independent variables	Total group	Non-problem gambler	Problem gambler
	Proportion (%)	Proportion (%)	Proportion (%)
Age			
18-24 years	13.2	13.2	11.5
25-44 years	36.4	36.4	36.1
45-64 years	33.5	33.5	35.2
65 years+	16.9	16.9	17.2
Sex			
Female	52.0	52.0	36.2
Male	48.0	48.0	63.8
Marital status			
Married	45.3	45.5	33.0
Common-law	16.1	16.1	14.0
Widowed	4.2	4.3	4.0
Separated	2.6	2.6	2.0
Divorced	6.1	6.0	9.7
Single	25.7	25.5	37.6
Country of birth			
Canada born	76.4	76.4	78.7
Foreign born	23.6	23.6	21.3
Education			
Less than secondary graduation	6.3	6.3	11.7
Secondary school graduation	10.4	10.3	16.6
Some post-secondary	4.5	4.5	6.2
Post-secondary graduation	78.8	78.9	65.4
Household Income			
1st quintile	20.0	20.0	23.3
2nd quintile	19.9	19.8	26.9
3rd quintile	20.8	20.9	13.3
4th quintile	20.5	20.5	18.9
5th quintile	18.8	18.8	17.6
Income Inequality (Mean)	.665 (.009)	.656 (.005)	.690 (.025)
Income Insecurity			

Low income insecurity	33.4	33.4	37.5
High income insecurity	66.6	66.6	62.5
Chronic disease			
No	51.4	51.6	35.3
Yes	48.6	48.4	64.7
Smoking			
Daily smoker	13.3	13.0	37.3
Occasional smoker	5.4	5.4	8.8
Non-smoker	81.3	81.6	53.9
Physical activity index			
Active	28.1	28.2	24.9
Moderate active	26.6	26.6	25.9
Inactive	45.3	45.2	49.2
Alcohol			
Yes	83.1	83.1	86.4
No	16.9	16.9	13.6
Depression			
Often	0.3	0.2	0.4
Sometime	2.0	2.0	4.4
No depression	97.7	97.8	95.2
Mood disorder			
Yes	6.7	6.5	16.3
No	93.3	93.5	83.7
Anxiety disorder			
Yes	5.8	5.8	9.8
No	94.2	94.2	90.2
Household food insecurity			
Food secure	56.4	56.5	47.9
Moderate food insecure	42.4	42.3	48.9
Severe food insecure	1.2	1.2	3.2

Table 5.2 shows that many of the independent variables exhibited statistically significant differences between the non-problem gamblers and problem gamblers. The average age of problem gamblers is higher than that of non-problem gamblers. Among non-problem gamblers, 52.0 per cent were female and 48.0 per cent were male. On the other hand, among problem gamblers 36. 2 per cent were female while 68.8 per cent were male.

Married individuals were the largest proportion among non-problem gamblers while single individuals were the highest proportion among problem gamblers. A 76% of non-problem

and 78% of problem gamblers are Canadian born. More than three quarters of the non-problem gamblers possessed post-secondary graduation while 65.4 per cent of problem gamblers had the similar level of education. While 6.3 per cent non-problem gamblers had less than secondary graduation while the percentage was almost double (11.7 per cent) among problem gamblers.

Problem gamblers were over-represented in the1st quintile and 2nd quintile, (50.2 per cent versus 39.8 per cent of non-problem gamblers) and under represented in higher income quintiles (49.8 per cent versus 60.2 per cent non-problem gamblers). The average income inequality was higher for problem gamblers than for non-problem gamblers. Both problem gamblers and non-problem gamblers had higher proportions of individuals with low income insecurity. Similarly, a major proportion of both problem gamblers and non-problem gamblers consumed some alcohol, but exhibited no depression, mood disorder and anxiety disorder.

Problem gamblers included a significantly higher proportion of daily smokers than non-problem gamblers (37.3 per cent versus 13.0 per cent); they had a higher proportion (64.7 per cent compared to 48.4 per cent non-problem gamblers) who suffered from at least one chronic condition. Compared to non-problem gambler groups, problem gamblers had a significantly lower proportion (24.9 per cent versus 28.2 per cent) of physically active individuals and a higher proportion (49.2 per cent versus 45.2 per cent) of physically inactive individuals. The proportion of food secure individuals is higher for non-problem gamblers (56.5 per cent) compared to problem gamblers (47.9 per cent), and by contrast, problem

gamblers included a higher proportion of both moderately and severely food insecure

individuals.

5.4.2 HRQL Loss Attributable to Problem Gambling

To estimate the loss of HRQL with regards to problem gambling, I ran an Ordinary Least

Squares (OLS) regression of problem gambling on the HUI. I controlled for problem

gambling related comorbidities like smoking, alcohol consumption, depression, mood

disorder, anxiety disorder, physical activity, and chronic conditions along with other socio-

demographic and economic variables like age, sex, marital status, ethnicity, education,

country of birth, household income, income inequality, income insecurity, and household

food insecurity. The results of OLS regression are displayed in Table 5.3.

Table 5.3 The OLS Regression Results of HRQL (Population: 7,965,967)

Variables	Coefficients	Bootstrap Std. Error	95% Confidence Interval	
			Lower Boundary	Upper Boundary
Age				
25-44 years	0.005	0.006	-0.006	0.017
45-64 years	-0.009	0.006	-0.021	0.003
65 years+	-0.005	0.007	-0.019	0.009
(Ref: 18-24 years)				
Sex				
Female	0.006**	0.003	0.000	0.017
(Ref: male)				
Marital Status				
Common-law	-0.002	0.004	-0.010	0.006
Widowed	-0.024***	0.007	-0.039	-0.010
Separated	-0.031***	0.010	-0.050	-0.011
Divorced	-0.024***	0.007	-0.037	-0.011
Single	-0.015***	0.004	-0.023	-0.006
(Ref: married)				
Ethnicity				
Black	0.031***	0.016	0.008	0.053
Filipino	0.008	0.013	-0.020	0.035
Chinese	0.007	0.015	-0.009	0.023

South Asian	0.018	0.015	-0.007	0.042
Others	-0.003	0.007	-0.016	0.011
(Ref: White)				
Country of birth				
Foreign born	0.013***	0.004	0.005	0.021
(Ref: Canada born)				
Education				
Secondary school grad	0.010	0.008	-0.006	0.025
Some post-secondary	0.019**	0.010	0.000	0.038
Post-secondary grad	0.017**	0.007	0.003	0.030
(Ref: less than secondary edu)				
Household income				
2nd quintile	0.028***	0.005	0.017	0.038
3rd quintile	0.030***	0.005	0.020	0.041
4th quintile	0.037***	0.005	0.027	0.048
5th quintile	0.038***	0.005	0.027	0.048
(Ref: 1st quintile)				
Income inequality	-0.005	0.004	-0.007	0.001
Income insecurity				
High income insecurity	-0.038***	0.004	0.030	0.046
(Ref: Low income insecurity)				
Chronic conditions				
Yes	-0.065***	0.003	-0.070	-0.059
(Ref: No)				
Physical activity				
Moderately active	-0.016***	0.004	-0.023	-0.009
Inactive	-0.041***	0.004	-0.048	-0.034
(Ref: active)				
Smoking				
Occasional smoker	0.017**	0.008	0.002	0.032
Non-smoker	0.025***	0.005	0.015	0.035
(Ref: Daily smoker)				
Alcohol consumption				
No	-0.023***	0.005	-0.032	-0.014
(Ref: Yes)				
Depression				
Sometime	0.104*	0.029	0.065	0.180
No depression	0.142*	0.029	0.101	0.214
(Ref: Often)				
Mood disorder				
No	0.139***	0.008	0.123	0.155
(Ref: Yes)				
Anxiety disorder				
No	0.074***	0.009	0.057	0.091
(Ref: Yes)				

Household food insecurity				
Moderate food insecure	-0.033***	0.003	-0.039	-0.028
Severe food insecure	-0.132***	0.024	-0.180	-0.085
(Ref: food secure)				
Problem gambler				
Problem gambler	-0.033***	0.015	-0.063	-0.002
(Ref: Non-problem gambler)				
Constant term	0.514	0.031	0.454	0.574

***p < 0.01, **p <0 .05, *p <0.10

The OLS estimates in Table 4.3 illustrated that age had no significant association with HRQL. Females demonstrated higher HRQL than male. Compared to married individuals, separated, divorced or single groups were associated with lower HRQL. Those who identified as Black had a higher HRQL than those who identified as White. None of the other ethnicities showed significant differences. Country of birth was found to be statistically significant in association with HRQL. Foreign-born individuals had higher HRQL values of 0.013 than Canada-born individuals. Education displayed significant association with HRQL. Having some-post secondary education or post-secondary graduation was associated with higher HRQL, by 0.019 and 0.017 respectively compared to having less than secondary education.

It is evident from the OLS regression results that higher income quintiles were associated with better HRQL. Individuals belonging to 2nd-5th quintiles had higher HRQL of 0.028, 0.030, 0.037 and 0.038 respectively than individuals included in 1st quintile. Income inequality is found to be statistically insignificant. Individuals with high income insecurity had lower HRQL by 0.038 than individuals with low income insecurity. Having at least one chronic condition could lead to lower HRQL by 0.065 while moderate active or inactive individuals had lower HRQL than those physically active by 0.016 and 0.041 respectively.

Smoking is significantly associated with HRQL. Individuals who occasionally smoked and did not smoke had higher HRQL than those who smoked daily by 0.017 and 0.025 respectively. Individuals who sometimes or never suffered from depression had higher HRQL by 0.104 and 0.142 respectively compared to those who often suffered from depression. Individuals with no mood disorder displayed higher HRQL by 0.139 than those with mood disorder. Similarly, those without anxiety disorder had higher HRQL by 0.074 than those with anxiety disorder.

Household food insecurity was found negatively associated with HRQL. Having moderate food insecurity in household lead to lower HRQL by 0.033 compared to those with food security. Individuals with severe household food insecurity experienced lower HRQL by 0.132 compared to those with food security. Interestingly, regarding problem gambling, HRQL decreased with problem gambling. A problem gambler had lower HRQL by 0.033 compared to a non-problem gambler, and the 95% confidence interval showed that the impact could be as high as 0.063.

5.4.3 Monetary Value of HRQL Loss

I estimated the HRQL loss associated with problem gambling. The HRQL for a problem gambler was 0.033 lower compared to a non-problem gambler, controlling for other sociodemographic and health factors. The 95% confidence interval indicated that this reduction could be as low as 0.002 and as high as 0.063. This study assesses the monetary value for the loss of HRQL related to problem gambling by using the cost-effectiveness

threshold value per Quality Adjusted Life Year (QALY). A QALY is determined by

multiplying a year of life by its HRQL. Since the CCHS captures loss of HRQL during the

previous twelve months, the loss of HRQL associated with problem gambling is equivalent to

the loss of QALYs.

Table 5.4 Annual Cost Associated with HRQL for Problem Gambler

	Lower bound	Reference estimate	Upper bound
OLS coefficient for problem gambler	0.002	0.033***	0.063
Cost-effective threshold per QALY		$150,000	
Annual HRQL costs per problem gambler (in C$)	$300	$4,950	$9,450

***p< 0.01

I measured the monetary loss of HRQL associated with problem gambling by multiplying

OLS estimate with the cost-effective threshold value per QALY for Canada. It is not possible

to find a single threshold to represent society's willingness to pay for QALYs gained. Jaswal

(2013) provided a range of the cost-effectiveness thresholds for Canada from about $50,000

per QALY to $80,000 per QALY. Laupacis et al. (1992) established a set of Canadian

guidelines that suggested a threshold between $50,000 and $100,000.

On the other hand, Peden et al. (2014) suggested a range from $50,000 per QALY to

$150,000 per QALY. The threshold of $150,000 per QALY was derived from the World

Health Organization (WHO)'s recommendation of thresholds of a country equivalent to three

times the country's GDP per capita. I used this threshold value for calculation of the loss of

HRQL associated with problem gambling presented in Table 5.4. The annual cost associated

with reduced HRQL for a problem gambler is $4,950 with a range between $300 and $9,450 per problem gambler per annum (based on 95% confidence intervals).

5.5 DISCUSSION AND CONCLUSION

This study provides an estimate of the loss of health-related quality of life due to problem gambling. This is the first study of its kind that uses nationally representative survey data, a validated instrument (the HUI) to assess health related quality of life and attempts to monetize the resulting losses.

The regression results illustrate that age had no significant association with HRQL. This contrasts with the studies of Häggström et al. (2007), Lubetkin et al. (2005), and Burstrom, Johannesson, Rehnberg (2007) which documented that higher age is associated with health-related quality of life. People in a common-law relationship, separated, divorced or single had a lower HRQL than married people. Females had higher HRQL than their male counterparts. Scholars like Hoi et al. (2010), Frick and Jones (2008), Lubetkin et al. (2005), Burstrom, Johannesson, Diderichsen (2001a, 2001b), Luo et al. (2005) and Johnson and Pickard (2000) recorded similar results.

Results showed that foreign-born individuals had higher HRQL than their native-born counterparts. This finding might be explained by the "healthy immigrant effect". Studies found that immigrants had better general health than Canadian-born individuals (Ng, 2011). Some post-secondary and post-secondary graduation were found significantly associated with HRQL. These findings are found in conformity with other studies like Luo et al. (2005), Burstrom, Johannesson, and Diderichsen (2001a), Lubetkin et al. (2005).

In this study, higher income quintiles were associated with higher HRQL which supports the work of Leisinger, Michalos, and Zumbo (2002). Income inequality was found to be statistically insignificant. High income insecurity was associated with a lower HRQL. As in other studies (Kohler, 2014 and Leisinger, Michalos, and Zumbo, 2002), my findings suggested that chronic conditions, reduced physical activity, smoking, alcohol consumption, depression, mood disorders, and anxiety disorders were significantly associated with lower health related quality of life.

Finally, I estimated the loss of HRQL associated with problem gambling and assigned a monetary value to the annual costs for a problem gambler in Canadian dollars. Findings revealed that problem gambling significantly reduced the HRQL and the costs associated with gambling problem ranged between $300 and $9,450 with a reference estimate of $4,950 per problem gambler per annum. Although many Canadians gamble with very few or no negative consequences, about 3 per cent Canadians suffer from gambling behaviors that interfere with personal life, work life, personal and household finances, or physical and/or mental health (Cox et al., 2005).

With our population of 36 million, more than one million Canadians have problem gambling, meaning that the total cost of poorer HRQL associated with problem gambling is about $5.4 billion for Canada, and perhaps as much as $10.2 billion per year. These are the costs internalized by the gamblers themselves. The true social cost of the gambling would add these estimated costs to the direct and indirect costs of gambling– addictive treatments, crimes, family breakdown, and loss of productivity (Toronto Public Health, 2012).

This study has some limitations. Firstly, the gambling module in the 2013-2014 CCHS was not adopted in all provinces of Canada, and covered less than half of the Canadian population. Hence, although the studied four provinces constitute a good representation of Canada in terms of gambling, generalization of these results for the country might be associated with some caveats. Secondly, identifying the threshold level of QALY for a society is a difficult task. There is no agreed-upon policy of what a QALY is worth for a medical intervention, and hence, I depended on QALY estimates available in the existing literature.

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CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATIONS

This dissertation presented four essays on problem gambling from a population health perspective. In the first essay (Chapter Two), I constructed an Income Insecurity Index (III) and validated it by using the 2013-2014 Canadian Community Health Survey (CCHS). My constructed III is a linear combination of three variables: employment status, current job status, and multiple job status.

In the second essay (Chapter Three), I examined the association between health status and income insecurity along with household income and income inequality explaining the ways in which income is associated with general health and mental health. The empirical results revealed that household income, income inequality and income insecurity are all significantly associated with overall health as well as mental health. These associations suggest that the III measures a different aspect of income than material deprivations and helps to predict health status, even when I control for the latter. I chose to examine these associations because I wanted to consider problem gambling from population health perspective. As a result, a negative association between the III and health status rationalized the use of III as a predictor for problem gambling in Chapter Four.

In the third essay (Chapter Four), I used the III to explore the role of the income nexus in problem gambling by examining the association between problem gambling and the three income measures (income level, income inequality and income insecurity) along with other socio-demographic determinants and comorbidities. My Ordered Logit regression results

suggested that individuals with high income insecurity have higher odds of developing gambling problems than those who have low income insecurity.

In the fourth essay (Chapter Five), I estimated the loss of HRQL due to problem gambling internalized by gamblers. The empirical results illustrated that problem gamblers have significantly lower HRQL compared to non-problem gamblers. When I attached monetary value to the loss of HRQL for problem gamblers, the annual costs associated with the losses of HRQL due to gambling problem stand at $4,950 per problem gambler and $5.4 billion for Canada. These are the costs internalized by the gamblers themselves – costs which are most often not acknowledged in studies of the economic burden associated with gambling. This dissertation has important policy implications:

1. I demonstrated that income insecurity has a unique effect on problem gambling and health status that is quite distinct from material deprivation or income inequality. Future analyses of risk factors for problem gambling should take this into account. Moreover, any new gambling opportunities introduced by governments should be sensitive to regional and overall economic conditions. It would be reckless, for example, to introduce these new opportunities at a time when many Canadians feel threatened in their jobs because a recession is underway. Young people are especially vulnerable to income insecurity because of the nature of the changing job market. Those introducing new gambling opportunities should be sensitive to the types of gamblings that are likely to be particularly attractive to young and vulnerable players.

2. If income insecurity has a distinct effect on both health status and problem gambling, it is very likely that it will also be associated with other social issues such as decisions to stay in school or leave, or to become involved with the youth justice system. Therefore, those conducting "Community Needs Assessments" and identifying vulnerable populations might want to use the III. I constructed it to be easy to construct and interpret. This might be routinely reported.

3. However, if the III is to be useful to policymakers and researchers, Statistics Canada must commit to ensuring that the appropriate data is available. Over the past decade, the questions related to income and jobs were not stable. Some years, respondents were asked about job security, which could and should have been included in the index. However, in other years including 2013-2014, this question was missing. It would be extremely helpful for Statistics Canada to re-examine all the income and job-related questions on their social surveys to capture different facets of income including, at least, material deprivation (measured by household or individual income), income inequality (with some questions pertaining to perceived income inequality) and income insecurity (including at least a consistent series of questions related to job security).