

Income and Mental Health in the Canadian General, Military, and Veteran Populations:

A Multiple Database Investigation

by

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Abstract

The link between household income and mental health in the general population has been well established, however the relationship between mental health and income of military personnel remains relatively understudied in Canada. This research sought to determine whether household income is associated with poor mental health in terms of suicide ideation, suicide attempts, depression, post-traumatic stress disorder (PTSD), and mood and anxiety disorders in various military samples. First, the Canadian Community Health Survey Cycle 1.2 (CCHS-1.2; a representative sample of Canadians aged 15 and older that was restricted to ages 16-64, resulting in a final sample size of 28,688) and the corresponding Canadian Forces Supplement (CCHS-CFS; a representative sample of 8,441 active duty personnel ages 16-64) were used to investigate the household income-mental disorder relationship in active regular and reserve force personnel and compare this relationship to the general population. Second, associations of household income with categories of mental health conditions were examined in Canadian veterans using the Survey on Transition to Civilian Life (STCL) (a representative survey of 3,154 former regular force personnel released from the military between 1998 to 2007, ages 15-67) completed as part of the Life After Service Study (LASS). Multiple logistic regression analyses, adjusted for sociodemographic variables, were used to determine associations between household income and mental health conditions in the three populations. Military characteristics (such as rank, branch, years of service, and previous deployment) were examined for potential influence on the household income-mental health relationship in the military and veteran samples.

The primary hypothesis for this study was that lower income would be concomitant with poorer mental health in all three populations. This hypothesis was confirmed in the Canadian veteran population and general population. With respect to active service members, the results

were less definitive; although trends in the data suggest that household income is associated with mental disorders, statistical tests were non-significant.

The results of this study have important implications for future policy formulation and program development for military and veteran personnel; for active personnel, more thorough mental health screening procedures and prevention strategies focused on those in lower income brackets may have significant health and economic implications. For veteran personnel, the incorporation of knowledge and understanding of the impact of income on mental health into transition to civilian life policies and support programs may provide similar benefits.

Keywords: household income, mental disorders, Canadian Forces, military, veterans

Dedication

This dissertation is dedicated to all of my ingenious, idiotic, incredible, illogical, immemorial, immense and incidental, and inconceivable failures. For without these I would not be where I am now. And to the wisdom of “WWKS” for the absolute certainty that this is true.

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Definitions of Terms

Affective disorders – Also referred to as mood disorders, the disorders in this category include those in which the primary symptom is a disturbance in mood. A diagnosis of a mood disorder occurs when there is inappropriate, exaggerated, or limited range of feelings, such as excessive crying, frequent suicidal ideation or having excessive energy where sleep is not needed for days at a time (DSM-IVR, 2000). Specific affective disorders discussed in this study include major depression, dysthymia, and bipolar affective disorder.

Anxiety disorders - Anxiety disorders categorize a large number of disorders in which the primary feature is abnormal or inappropriate anxiety. Symptoms of an anxiety disorder include increased heart rate, increased breathing rate, tensed muscles, an acute sense of focus or alternatively an inability to focus. A diagnosis of an anxiety disorder results when these symptoms occur without any recognizable stimulus or the reaction is disproportionate to the stimulus (DSM-IVR, 2000). Anxiety disorders of importance to this study include social phobia, panic disorder, generalized anxiety disorder, and post-traumatic stress disorder.

Deployment - A period of time when members of the military are placed in locations away from their home to fill a strategic military function. Deployment can be for training purposes, to war zone areas, or in support of peacekeeping missions. Although typically defined as being in a different country deployment can also occur within one's own country in support of natural disaster relief or intelligence and communications operations (Department of National Defence, Canadian Forces, *Operations*, Retrieved January 21st, 2013). Deployment is not synonymous with combat.

Mental disorders – Mental disorders are a clinically important collection of symptoms that cause distress, disability, or incapacity. These symptoms result from abnormalities of thought, feeling, and behavior and cause distress, impairment in functioning, or disability due to a breakdown of the ability to function in society that is not expected as part of normal development or culture (DSM-IVR, 2000).

Mental health conditions – As in the definition of mental disorders, mental health conditions are a collection of symptoms that cause distress, disability, or incapacity that may result from abnormalities of thought, feeling, and behavior. However, these symptoms have not been clinically diagnosed or determined to meet clinical standards.

New Veterans Charter (NVC) – The NVC is a series of programs and services aimed at enhancing the transition from military to civilian life through rehabilitation and re-integration programs. Specific programs included under the NVC are: Disability Awards, Rehabilitation Services, Earning Loss Support, Career Transition Services, and Health Insurance (Department of Veterans Affairs Act, 2012).

Non-commissioned member (NCM) – Non-commissioned members are skilled personnel who provide operational and support services in the Canadian Forces. NCMs are typically trained as operators, technicians, administrators or health services support (Canadian Forces, *Career Options*, Retrieved January 21st, 2013).

Officers –Officers are required to have a university education and leadership training. Officers are trained as leaders in the Canadian Forces and are responsible for the members in their command. (Canadian Forces, *Career Options*, Retrieved January 21st, 2013).

Regular force personnel – Regular force members are those individuals who are employed full-time by the Canadian Forces. At enlistment, these members sign on for an initial term of service of no less than three years and are at all times liable to perform any lawful duty (Canadian Forces, *Career Options*, Retrieved January 21st, 2013).

Reserve force personnel – Reserve force members are defined as military personnel who do not regularly serve in the nation’s active military but can be called to assist civilian or military authorities with local or national emergencies and natural disasters, and to supplement active forces overseas when needed. Reserve service is part-time, voluntary, and for an indefinite period (Canadian Forces, *Career Options*, Retrieved January 21st, 2013).

Socioeconomic Status – Socioeconomic status (SES) depicts the position of a social grouping within a population or society, reflecting the overall hierarchy. The most frequently used indicators of SES are income, education, housing adequacy, and occupational categories. In maintaining consistency with Canadian national documentation on health status and its determinants, SES is used in the broadest sense of the term, referring to a combination of any number of SES indicators (Mikkonen & Raphael, 2010).

Suicidality – Suicide ideation, suicide attempts, and completed suicides are symptoms of a large number of mental disorders. Suicidality refers to a combined variable of suicide ideation and suicide attempts (Thompson, Sweet, Poirier, VanTil, 2011b).

Veteran – In Canada, a veteran is defined as “any person who served in the Canadian Forces or merchant navy or in the naval, army, or air forces or merchant navy of Her Majesty, or any person who has otherwise engaged in pursuits relating to war, and of any other person designated by the Governor of Council” (Department of Veterans Affairs Act, 2012, p. 2).

Acronyms

AOR	Adjusted Odds Ratio
CATI	Computer-Assisted Telephone Interviewing
CCHS-1.2	Canadian Community Health Survey Cycle 1.2
CCHS-CFS	Canadian Community Health Survey Cycle 1.2 - Canadian Forces Supplement
CF	Canadian Forces
CI	Confidence Interval
DND	Department of National Defence
DRTE	Deployment Related Traumatic Experience
DSM-IVR	American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders, 4 th Edition, Text Revision
Dx	Diagnosis
EI	Employment Insurance
FAU	Frequent Alcohol Use
GAD	Generalized Anxiety Disorder
HAU	Heavy Alcohol Use
HHI	Household Income
ICD-10	International Classification of Diseases, 10 th version
LASS	Life After Service Study
LICO	Low Income Cut-Off
LIM	Low Income Measure
LRDG	Low-Risk Drinking Guidelines
MDD	Major Depressive Disorder
MHC	Mental Health Condition
NCM	Non-Commissioned Member
NESARC	National Epidemiologic Study of Alcohol and Related Conditions
NPHS	National Population Health Survey
NVC	New Veterans Charter
OCD	Obsessive-Compulsive Disorder
OSI	Operational Stress Injury

PHAC	Public Health Agency of Canada
PTSD	Post-Traumatic Stress Disorder
R2MR	Road to Mental Readiness
RCMP	Royal Canadian Mounted Police
RDC	Research Data Centre
SA	Suicide Attempt
SES	Socioeconomic Status
SI	Suicidal Ideation
STCL	Survey on Transition to Civilian Life
SUD	Substance Use Disorder
SWF	Satisfaction with Finances
TLD	Third Location Decompression
TSL	Taylor Series Linearization
VAC	Veterans Affairs Canada
WHO	World Health Organization
WMH-CIDI	World Mental Health Composite International Diagnostic Interview version 2.1

Structure and organization of the thesis

This thesis is organized according to the manuscript style with two distinct, but inter-related manuscripts comprising the body of the document. Chapter 1 provides an introduction to the thesis topic material. Chapter 2 addresses the relevant literature and justification for this work. Chapter 3 discusses the theoretical underpinnings for this work. Chapter 4 provides the statistical model, research objectives, methodology and methods for this work. The findings are then presented in two manuscripts in Chapters 5 and 6. Chapter 7 speaks to comparisons between the samples and results presented in the manuscripts as well as additional analyses that were not included in the final manuscripts. Finally, Chapter 8 provides an overarching conclusion for the manuscripts as well as strengths, limitations, potential implications of the research, and future research directions.

As the manuscripts were developed as independent research articles for publication, there are some redundancies between these chapters. In addition, the references for each manuscript are found immediately following each of these chapters whereas the references for all other in-text citations in Chapters 1-4, 7, and 8 are found at the end of the document. Additionally, due to differences in the assessment of mental health in the two studies, Chapter 5 and references to the results of this study uses the term the “mental disorders” and Chapter 6 and all referring statements uses the term “mental health conditions.”

In fulfillment of the requirements for a manuscript style thesis, Chapter 6 (Household income, satisfaction with finances, and mental health conditions in a nationally representative sample of Canadian Veterans) has been submitted to the Journal of Psychological Medicine for potential publication. A copy of the acknowledgement of submission is provided in Appendix A.

Chapter One: Introduction

Statement of the Problem

Research has established that mental health issues are common among people who have been deployed to a combat zone (Belik, Stein, Asmundson, & Sareen, 2009; Fear et al, 2010; Hoge et al, 2004; Rona et al., 2009a; Rona et al., 2009b). The Canadian Forces (CF) is currently bringing all personnel back to Canada from the combat operations in Afghanistan after formally ending military involvement in the conflict on Wednesday, March 12th, 2014 (CBC News World, Retrieved March 12th, 2014). It is expected that as many as 2,750 returning military personnel will have PTSD and another 6,500 will have other mental health problems (Paré, 2011a). Research has also identified a strong link between low income and poor mental health (Caron & Liu, 2011; Goldman-Mellor, Saxton, & Catalano, 2010). Given the augmented pay scales for CF members while in service (Park, 2008) and the decreased income typically experienced following release from military service (MacLean et al., 2011a), determining the relationship between income and mental health in the Canadian military is imperative to developing and promoting effective policies and programs aimed at reducing both the social and financial cost of mental disorders in the CF.

The economy and mental disorders. Research shows that economic contraction (or a general slowdown in financial activities in a given economic system; Bok, 2010) is predictive of increased prevalence of psychological disorders (Goldman-Mellor et al., 2010). With the most recent global economic recession the relationship between mental disorders and income has had a resurgence of research interest (Lee et al., 2010; Sareen, Afifi, McMillan, & Asmundson, 2011). The relationship between psychological distress and economic conditions is hypothesized to result from two distinct pathways (Bok, 2010) and is generally approached in research from

two different perspectives. First, people experience economic contraction at an individual level, through job loss, job transition, or underemployment (Goldman-Mellor et al., 2010).

Alternatively, populations experience economic contraction at an ecological level, as measured by prevalence or incidence of various socioeconomic markers, such as national unemployment rates or employment insurance usage (Bok, 2010).

At the individual level, economic variables such as income and employment status are associated with a number of mental disorders (Jacobi et al., 2004; Kristensen, 2008; Levinson et al., 2010), including depression (Lamberg, Virtanen, Vahtera, Luukkaala, & Koskenvuo, 2010; Patten et al., 2006; Shields, 2006; Zimmerman & Katon, 2005), and anxiety disorders (Fryers, Melzer, & Jenkins, 2003; Stansfeld, Clark, Rodgers, Caldwell, & Power, 2011). The majority of studies also indicate an increased risk of suicidal ideation and attempted suicide (which is almost always precipitated by psychological distress) in low-income individuals (Lorant, Kunst, Huisman, Costa, & Mackenbach, 2005a; Nandi et al., 2012; Page, Taylor, Hall & Carter, 2009; Taylor, Page, Morrell, Harrison, & Carter, 2005). These results have been validated across a variety of cultures and countries (Lorant et al., 2005a; Lorant, Kunst, Huisman, Bopp, & Mackenbach, 2005b; Soeters, 1997).

At the ecological level, the relationship between income and health is so well established that research in the economic field often uses income as a proxy for human welfare (Frey, 2008). The majority of large cross-sectional epidemiologic studies conducted with the general population seem to suggest that depressed or contracted economies are associated with increased prevalence of both mood and anxiety disorders, suicides, and increased psychopathology (Economou, Madianos, Peppou, Patelakis, & Stefanis, 2013; Lorant et al, 2003; Nandi et al,

2012; Piachaud, 2008). Again, these results have been validated across a variety of cultures and countries (Lorant et al., 2005a; Lorant et al, 2005b; Soeters, 1997).

A global recession began in 2008. Most economies (including Canada's) have begun to recover and reports seem to agree that the last quarter of 2008 represents the lowest point in this recession for the Canadian economy. At that time, unemployment rates in Canada peaked at 8.4% (Usalcas, 2010). The number of employment insurance (EI) beneficiaries peaked in June of 2009 at 829,300 (representing an increase of almost 20.2% since October of 2008). The number of new applicants for EI benefits also peaked in May of 2009 to 327,700 (Statistics Canada Economic Fact Sheet, 2010). Correspondingly, in 2009 the prevalence of diagnosed mood disorders was reported as 6.3% (an increase of one percentage point since 2006; Statistics Canada Health Facts, 2011). More recent reports that may indicate a corresponding decrease in mental disorders as the economy improves are not yet available. Regardless, these associations between declining economic conditions and increased prevalence of mental health conditions have been validated across a number of cultures and countries (Lorant et al., 2005a; Soeters, 1997; Wang et al., 2010).

Mental disorders in the Canadian military. Despite validation of these associations between economic conditions and mental disorders across traditional boundaries, military personnel and veterans represent a very specific sub-culture of the population warranting focused investigation. Military personnel are recruited on the basis of physical and mental health criteria that should, in theory, make these individuals less susceptible to psychological distress than the general population. However, soldiers are, by nature of their occupation, exposed to more psychological trauma than the general population (Paré, 2011a). In fact, research suggests that Canadian regular force soldiers are at higher risk of psychological distress in comparison to the

general population (Paré, 2011a; Sareen et al., 2008; Sareen et al., 2010). U.S. studies align with this research, showing a prevalence of PTSD two to four times higher in veterans than in the general population (Bagalman, 2011). A Canadian study identified the prevalence of past-year depression in the military (6.9%; Sareen et al., 2007) as being higher than even the highest estimates of those found in the general population (between 2-6%; Langlois, Samokhalov, Rehm, Spence, & Gorber, 2012).

There is also evidence to suggest that mental disorders present differently in the military population. Recent research shows that PTSD assessed in military personnel is clinically different than in victims of other types of trauma (Brewin, Andrews, & Valentine, 2000; Elhai, Frueh, Gold, Gold, & Hamner, 2000; Naifeh et al., 2008; Pietrzak, Goldstein, Malley, Rivers, & Southwick, 2010). Combat veterans show significantly greater psychopathology than civilian victims of trauma (Amir, Kaplan, & Kotler, 1996; Elhai et al., 2000).

There is also a cultural consideration in the military perception of psychological trauma; recent research also seems to indicate that military personnel feel a greater degree of stigma surrounding mental health issues than the general population (Kim, Thomas, Wilk, Castro, & Hoge, 2010; Skopp et al., 2012). As a result, soldiers or veterans with mental health concerns may be less likely to seek care and the prevalence of mental health disorders in the military population may be under-reported (Hoge et al., 2004).

Income in the Canadian military. In addition to disparate experiences of and prevalence of mental disorders themselves, the augmented salaries provided while in service further complicate the relationship between mental health and income in CF personnel. Both active and reserve force personnel earn more than their civilian counterparts; in 2002, the median personal annual income of military men was \$50,000 compared to \$40,000 for civilians and for military

women was \$42,000 compared to \$30,000 for civilians (Park, 2008). As well, income rises with military rank (Park, 2008; Canadian Forces, *Pay Rates*, Retrieved January 21st, 2013).

Furthermore, regular force personnel are guaranteed full-time employment and income with service to the CF. This augmented salary should theoretically provide a protective effect from mental disorders (Caron & Liu, 2011; Kawakami et al., 2012). However, it appears that the increased job stress experienced in military work may offset the potential benefit of a higher salary (Hourani, Williams, & Kress, 2006; Pflanz & Sonnek, 2002; Pflanz & Ogle, 2006).

Research with the veteran population would also suggest that retirement from the military does not mean a simple transition from military employment and corresponding income to civilian employment income (Burnett-Zeigler et al., 2011a). Following discharge from the military, income typically declines; on average, if a veteran earns \$63,000 in his/her final year of service, he/she can expect to earn \$57,000 in the year following discharge. Both working and non-working veterans in Canada report lower rates of satisfaction with their finances in the year following discharge than the comparable general population (MacLean et al., 2010).

Income and mental disorders in the Canadian Forces. Very little research has been done investigating the relationship between income and mental disorders in the Canadian military. Furthermore, there is a lack of population-level research on the role of individual-level variables that may mediate the relationship between income and mental disorders in the military. In particular, military characteristics (such as rank, military occupation, et cetera) have not been specifically investigated. The limited research done in other countries, such as the U.S., may not be generalizable to Canada because the military systems differ greatly between countries (Davis et al., 2012).

A unique and pressing situation exists in Canada; Canadian troops are being repatriated following the conflict in Afghanistan and these members are returning to a significantly contracted economy. There are approximately 67,000 active regular force military personnel in Canada (DND Report on Priorities, 2009-2010) and it is anticipated that 25,000 to 35,000 soldiers will be released from their military service contracts in the next five years (Paré, 2011a). With a contracted economy, subsequently fewer jobs and increased numbers of job-seekers as military personnel return and/or are released, opportunities for meaningful employment and sustained income in the civilian sector may be limited. With the lowered income experienced following military release (MacLean et al., 2011a) coupled with the increased risk of psychological trauma experienced in conflict (Sareen et al., 2008; Sareen et al., 2010), it is reasonable to expect a significant increase in the prevalence of mental disorders in military personnel.

Policy-makers have an obligation to invest in post-war mental health as a result of shared responsibility of the harm inflicted (Abi-Rached, 2009; Cesur, Sabia, & Tekin, 2013). However, civilian supports and programs may be ill-equipped to deal with the specialized needs of military personnel and veterans (Waitzkin & Noble, 2009). Although Veterans Affairs Canada (VAC) serves to meet the specialized needs of military veterans, it is possible that programs currently provided under the New Veterans Charter (NVC) and by the CF to financially support military personnel during repatriation as well as after retirement from service (whether through disability benefits, vocational rehabilitation, or pensions) may be ineffective in protecting the mental health of personnel and veterans who fall below a given income threshold. Given the expected number of returning soldiers, it is important to determine this limiting threshold for effective policy and program development.

Study Rationale

There is strong evidence showing that low income is an important risk factor for psychological distress and mental disorders in the Canadian general population (Caron & Liu, 2011; Orpana, Lemyre & Gravel, 2009), and it is often assumed that a similar relationship exists in the military population. Given the recent research that indicates that mental disorders present differently in the military (Naifeh et al., 2008; Pietrzak et al., 2010a) and that the link between income and mental disorders is significantly more complex in both active military and veterans than the parallel relationship in the general population (MacLean et al., 2011a; Park, 2008), the relationship between income and mental disorders in Canadian military and veteran personnel is a topic requiring focused investigation. Determining empirically whether a similar relationship between income and mental disorders exists in military personnel and whether there is a limiting threshold for income that is predictive of mental disorders in this population is imperative for developing effective policy and programming to meet the unique characteristics of this population. For example, should a positive relationship between income and mental disorders be identified in active force personnel and veterans, programs that provide guaranteed meaningful employment and income after deployment or following discharge from the military may be effective in reducing the incidence of mental disorders in this population.

Despite having data from one of the largest representative samples of its military population in the results of the CCHS-CFS, in comparison to other countries, Canada has very little published literature on the mental health of its military. Military structures differ between countries and relationships identified in other military populations are not necessarily applicable to the Canadian military population. This study will begin to address this notable gap in the

current literature by investigating the relationship between income and mental health in three major groups of Canadian Forces personnel (regular, reserve and veterans).

Furthermore, it is important to have appropriate programs in place when personnel return from conflicts or are released from service in order for them to be effective. A comparison of the current research results with future surveys will allow for the identification of trends in military mental health and permit researchers to draw stronger conclusions about the implications of the Afghanistan and Iraq conflicts on the mental health of Canadian military personnel in comparison with other conflicts.

Chapter Two: Review of Literature

Canadian Forces (CF)

The CF consists of the Royal Canadian Navy, Canadian Army, and Royal Canadian Air Force, in addition to several Special Operations Task Forces. The mission of the CF is primarily to protect Canada, but also operates to protect North America in co-operation with the U.S. and to contribute to international peace and security (Canadian Forces, *CF Mission Statement*, Retrieved January 21st, 2013).

Typical progression through the CF begins with basic training, a physical and military skills training program lasting approximately three months. Individuals who do not yet have training or education in a specific discipline are enrolled as non-commissioned members (NCMs). Individuals with professional designations and leadership training (such as pilots or physicians) are enrolled as officers. Following basic training, personnel are posted to a base in Canada where they engage in further professional or occupational training as well as training specific to their chosen branch (army, navy, or air force). Both officers and NCMs ascend through the ranks with time in the service, meritorious service, and furthered training and education (Canadian Forces, *Life in the Forces*, Retrieved January 21st, 2013). A diagram of the ranks and insignia of the CF is provided in Appendix B (Government of Canada, Canadian Forces, *Military Ranks*, Retrieved January 21st, 2013).

Traditionally, the military population is divided into three distinct groups or categories: regular force members, reserve force members, and veterans. Although it is understood that there are considerably more categories (for example, commissioned and non-commissioned members, army, navy, or air force, or military occupation groups) and that these three categories are not

homogenous groups, there are some specific considerations for each subpopulation. An overview of the demographic characteristics of the CF as of 2008 is provided in Table 1.

Table 1

*Prevalence of Demographic Characteristics of the Canadian Forces (in percentages)**

Characteristic	Regular	Reserve	All Military	Veterans (at time of release)
Rank				
Junior NCM	56.3	68.2	59.8	30.1
Senior NCM	21.8	16.2	20.1	28.2
Officer	22.0	15.6	20.1	15.9
Service				
Land	50.2	70.1	56.0	48.8
Air	31.5	8.7	24.9	31.1
Sea	18.3	14.8	17.3	15.7
Communication	NR**	6.5	1.9	NR
Years in Service				
Less than 10	23.7	59.9	34.2	33.4
10 to 24	62.9	29.9	53.3	(10-19) 13.3
25 or more	13.4	10.3	12.5	(≥20) 53.3
Age				
15 to 24	9.9	42.1	19.3	4.5
25 to 39	57.7	37.4	51.8	29.7
40 to 54	32.0	19.2	28.3	48.9
55 to 64	0.4	1.3	0.6	16.2
Education				
Less than high school	7.1	4.3	6.5	6.8
High school diploma	31.4	15.2	28.0	40.7
Some postsecondary	13.1	11.0	12.7	36.1
Postsecondary degree	48.2	69.4	52.6	16.5
Sex				
Male	87.8	79.2	85.3	88.2
Female	12.2	20.8	14.7	11.8

*Data compiled from the *A profile of the Canadian Forces* by Park, Statistics Canada, Labour and Household Analysis Division, 2008 and *Survey on Transition to Civilian Life: Report on Regular Force Veterans* by MacLean et al., Veterans Affairs Canada, 2011.

**NR is for values not reported

Regular force members are those individuals who are employed full-time by Canadian Forces. At enlistment, these members sign on for an initial term of service of no less than three years and are at all times liable to perform any lawful duty. In essence, these individuals carry out the typical day-to-day duties of their given occupation, simply within the context of the military. For example, a mechanic in the army would continue to perform all job tasks related to his field but would work on military vehicles or machinery on base or on deployment and in uniform. In 2006, the CF had about 64,000 regular force members (Park, 2008).

Reservists represent a unique group within the military. Often referred to as “citizen-soldiers,” reserve force members are defined as military personnel who do not regularly serve in the nation’s active military but can be called to assist civilian or military authorities with local or national emergencies and natural disasters, and to supplement active forces when needed (Wisher & Freeman, 2006). Reserve service is part-time, voluntary, and for an indefinite period. Canadians can join the reserve force as cadets at the age of 15. In 2006, the CF had about 24,000 reserve force members (Park, 2008).

In Canada, a veteran is anyone who has served the Commonwealth in uniform (Department of Veterans Affairs Act, 2012). Military personnel are eligible for full pension and retirement benefits after 25 years of service. The CF enforces a mandatory retirement age of 65. Veterans represent another unique subculture within the military; even in successful integration to civilian life, these individuals do not simply become civilians and begin to follow patterns of the general population. There are social, psychological, societal and economic determinants that influence transition to civilian life as well as military characteristics that persist long after release from service. In Canada, approximately 4,300 regular force personnel are released from service each

year (MacLean et al., 2011a). It is estimated that there are currently 594,300 veterans living in Canada (Veterans Affairs Canada, *General Statistics*, Retrieved March 24th, 2014).

Military Culture

Culture, in anthropology, is defined as the patterns of thought and behaviour that people living in social groups learn, create, and share. Culture includes beliefs, rules of behaviour, language, art, technology, fashion, diet, religion, and political and economic systems (Miller, Van Esterik, & Van Esterik, 2007). Previous research suggests that culture is clearly connected to mental health, particularly culture that is defined by smaller organizations such as workplaces or communities (Theorell et al., 2012). According to Ray and Heaslip (2010, p. 199), military personnel and veterans “have their own military language, shared beliefs, values, rituals and customs,” which are all defining elements of a cultural group. Furthermore, this military culture transcends national boundaries and often supersedes local cultural norms.

Cultural dimensions. Seminal research on culture by Hofstede (2001) identified four key cultural dimensions: (1) Power distance, (2) Individualism, (3) Masculinity, and (4) Uncertainty avoidance. A fifth dimension, long-term orientation, was added following additional work by outside researchers (Soeters, Poponete, & Page Jr., 2006). Hofstede’s model has been instrumental in the analysis of national differences in numerous domains, including but not limited to, income distribution and social security policies, legal systems, and degree of democratization. These dimensions were first analyzed in relation to the military in 1997 by Soeters. In his research, Soeters suggests that as a cultural and social group, the military population differs from the general population it is embedded in on all of these dimensions.

Power distance. Hierarchical structure has a significant role in military culture and, not surprisingly, military personnel report a high degree of power distance (or high gradation of social inequality relative to authority) in their social structure (Soeters, 1997). Despite this power distance, military members easily accept role subservience and obedience to their leaders because it is in their best interests (Siebold, 2006), in contrast to the general population in which work towards a decreased power distance is often an organizational goal.

Individualism. In contrast to most social groupings found in Western individualistic cultures, military groups exist “as part of a large, long-lived, somewhat isolated, highly regulated, hierarchical organization from which the group member cannot easily leave or travel about” (Siebold, 2006, p185). Group cohesion is of particular importance as it is seen as paramount to successful functioning of troops (Pietrzak et al., 2010b; Sudom, Dursun, & Flemming, 2006). Furthermore, military group cohesion and its resultant behaviours operate similarly regardless of the wider culture within which they are situated and the parallel social groupings from which members are drawn (Henderson, 1985). While group cohesion is generally perceived as positive, one major drawback to strong attachment to a group is the overemphasis of its members on conformity and normalization, in both thought and action (Siebold, 2006).

Another strong distinction of the military population in the dimension of individualism is the focus on institutionalization. The Moskos model of Institution – Occupation orientation was first developed in 1977 and argues that subcultures exist on a continuum with occupational orientation (defined by a strong affinity toward individual specialist qualifications and opportunities for advancement) on one end and institutional orientation (defined by affinity toward and dedicated service to the organization) on the other end (Moskos Jr., 1977; Soeters, 1997). Recent explorations of this model suggest that military organizations exist on the

institutional end of this spectrum, with members displaying the traditional dedication entirely to the military organization and the ideal of serving the nation through their occupation (Siebold, 2006).

Masculinity. This dimension refers to the importance of “masculine” ideals such as career advancement and high salaries relative to nonmaterial or “feminine” markers of success such as good working relationships. Interestingly, Canadian military personnel seem to value job security and strong interpersonal connections more than income and promotion opportunities (Soeters, 1997). This result may be partly explained by the strong focus on institutionalization. An alternative explanation could be inferred from the influence of the hegemonic masculine ideal of military culture (Mota et al, 2012). The element of challenge embodied within military experiences as well as dependence on fellow members for success in these challenges promotes peer-to-peer bonding because individuals have endured the challenges together (Barrett, 1996; Green, Emslie, O'Neill, Hunt & Walker, 2010). Regardless, the implication of this result is that it appears Canadian military personnel have a fairly pessimistic view of the potential material benefits associated with a career in the military (Soeters, 1997).

Uncertainty avoidance and long-term orientation. These two dimensions tend to be integrated in the literature as they are often highly correlated and, as noted, it is only in recent research that they have been separated. Cultures with a high degree of uncertainty avoidance and long-term orientations are highly rule-oriented and have high levels of social commitment. Contrary to many other international military societies, the Canadian military appears to have a lower uncertainty aversion and is less long-term oriented (Soeters, 1997). This result aligns with recent data on reasons for release in the Canadian military, which suggests that most Canadian

military personnel do not intend to (and subsequently do not) remain in the military for their entire working careers (Thompson et al., 2011a).

Defining Mental Health and Mental Illness

The majority of research identifies mental illness or psychological disorders as markers of mental health, however the terms “mental health” and “mental illness” are often used synonymously. Psychological disorders are characterized by large alterations in mood, thinking, and behaviour, and other domains of mental functioning (Langlois, Samokhalov, Rehm, Spence, & Gorber, 2012) and can result from social, psychological, biochemical, or genetic circumstances or physical trauma (American Psychiatric Association Diagnostic and Statistical Manual – IVR, 2000). Three primary categories of mental disorders are affective disorders, anxiety disorders, and substance use disorders.

Affective disorders. Affective disorders are those conditions that primarily influence mood. Specific conditions included in this category include major depressive disorder (MDD) and depressive episodes, dysthymia, and bipolar affective disorder. As estimated from a systematic review of the literature by Wariach, Goldner, Somers, and Hsu (2004), the lifetime prevalence for mood disorders is reported as 14.1%.

There are three prominent mood disorders which deserve focused attention: major depression, dysthymia, and bipolar affective disorder. Major depression can result from a single psychological trauma or from repeated problems or disappointments in an individual's life. An individual may experience one depressive episode or multiple episodes over the course of his/her lifetime. According to the DSM-IVR, a diagnosis of a major depressive episode requires that at least five of the following seven symptoms be present during the same two-week period and

represent a change from previous functioning: 1) depressed mood; 2) diminished interest in or pleasure resulting from activities; 3) significant appetite change or weight change; 4) insomnia or hypersomnia; 5) feelings of worthlessness or excessive guilt; 6) diminished cognitive capacity or concentration and; 7) recurrent thoughts of death or suicide (DSM-IVR, 2000, p.

369). Dysthymia is often identified as a lesser, but far more persistent form of major depression. The majority of the symptoms present in a diagnosis of major depression overlap with those of dysthymia but are typically present with a lower intensity and persist significantly longer (DSM-IVR, 2000, p. 376). Bipolar affective disorder (also known as manic-depression) is characterized by periods of extreme highs (or manic episodes) and extreme lows (as experienced in a major depressive episode). Bipolar disorder is subtyped either type I (extreme or hypermanic episodes) or type II (moderate or hypomanic episodes) (DSM-IVR, 2000, p. 382).

Anxiety disorders. Anxiety disorders are those conditions that are characterized by overwhelming anxiety or fear. Specific conditions included in this category include panic disorder, agoraphobia, social phobia, generalized anxiety disorder (GAD), obsessive-compulsive disorder (OCD), and PTSD (Langlois et al., 2012). A systematic review of the literature conducted by Somers, Goldner, Waraich, and Hsu (2006) suggests that the lifetime prevalence for all anxiety disorders is 16.6%.

There are four conditions of particular interest in the category of anxiety disorders: GAD, panic disorder, social phobia, and PTSD. GAD is characterized as excessive anxiety, restlessness, difficulty concentrating, irritability, tension, and sleep disturbance in response to a variety of events, situations, or activities. A diagnosis of GAD is dependent on an individual being both unable to control the anxiety and the anxiety causing significant impairment in

important areas of functioning (DSM-IVR, 2000, p. 472). Panic disorder is differentiated from other anxiety disorders by the principal symptom of fear and is characterized by panic attacks. Panic attacks are discrete periods of intense fear, anxiety, or emotional distress with at least four of 13 common symptoms present (DSM-IVR, 2000, p. 430). Individuals often report different profiles of symptoms for these attacks, however the most commonly reported symptoms are heart palpitations, dizziness, trembling, and a fear of dying or losing control (Rapee, Sanderson, McCauley & DiNardo, 1992). Individuals suffering from social phobia experience unreasonable anxiety in connection with social experiences. Engaging in a feared social situation elicits excessive anxiety (or other symptoms of panic attacks or GAD) and as a result, such situations are avoided to as great an extent as possible (DSM-IVR, 2000, p. 450). Although the condition also typically involves alterations in mood, PTSD is an anxiety disorder that results from

exposure to an extreme traumatic stressor involving direct personal experience of an event that involves actual or threatened death or serious injury, or other threat to one's physical integrity; or witnessing an event that involves death, injury, or a threat to one's physical integrity (DSM-IVR, 2000, p. 463).

Symptoms of PTSD are divided into three categories: re-experiencing the trauma, avoiding stimuli associated with the trauma, and increased arousal in response to memories or triggers associated with the trauma (DSM-IVR, 2000, p. 465).

There is a high prevalence of comorbidity of conditions across the two categories of affective disorders and anxiety disorders (Meng & D'Arcy, 2012). Furthermore, recent evidence indicates that prevalence of psychological disorders in both categories are rising with increased frequency of diagnosis of psychological conditions (Simpson, Meadows, Frances, & Patten, 2012).

Substance use disorders. Substance use disorders (SUDs) are also classified as an independent category of mental disorders (Langlois et al., 2012). SUDs include both

abuse/harmful use of substances and dependence on substances (Hatzenbuehler, Keyes & Ogburn, 2006). Any number of substances are subject to abuse, however in some research they are very generally categorized as alcohol, opioids, stimulants, hallucinogens, and cannabis (Hasin et al., 2006). A study based on 2002 national household survey data indicated that approximately 2.6% of the Canadian population was dependent on alcohol and 0.8% was dependent on illicit drugs (Tjepkema, 2004). In addition, alcohol use disorders tend to occur within the context of other mental disorders, such as PTSD (Fetzner, McMillan, Sareen, & Asmundson, 2011).

Prevalences of individual conditions are given in Table 2.

Table 2

*Prevalence of Mental Disorders in the Canadian General Population**

Condition	Lifetime Prevalence	Past-year Prevalence
Major depression	12%	2-6%
Dysthymia	3-6%	0.8-3.1%
Bipolar affective disorder	2.4%	1%
Panic disorder	3.7%	1.6%
Agoraphobia	1.5%	0.7%
Social phobia	8-13%	6.7%
Generalized anxiety disorder	5%	3%
Obsessive compulsive disorder	2%	<2%
Post-traumatic stress disorder	8%	3.5%
Alcohol abuse	NR**	7-10%

*Data compiled from the *Health State Descriptions for Canadians: Mental Illnesses* by Langlois, Samokhalov, Rehm, Spence, & Gorber, 2012.

**NR is for values not reported

Suicidality. Although typically a symptom of other mental disorders, suicidal behaviour warrants focused investigation (Borges et al., 2010; Nepon, Belik, Bolton, & Sareen, 2010; Nock et al., 2008; Nock et al., 2009). Sociocultural characteristics such as low income,

underemployment, and low education (Agerbo, 2007) as well as exposure to trauma are also associated with suicidal behaviour (Belik, Cox, Stein, Asmundson, & Sareen, 2007; Belik, Cox, Stein, Asmundson, & Sareen, 2009). Regardless of the underlying etiology, suicide is one of the leading causes of death worldwide (DeLeo, Bertolote, & Lester, 2002). Suicidal behaviour is typically discussed in the literature as completed suicides, suicide attempts, suicidal ideation, and combined as suicidality. Ideation, attempt, and completed suicide tend to occur as a cascade; suicide attempt is among the best predictors of completed suicide (Suominen et al., 2004) and suicide attempts without previous suicide ideation are extremely rare (Goldstein, Black, Nasrallah & Winkour, 1991; Joiner, 2007). A recent study examining suicide ideation and suicide attempts in the CCHS-1.2 indicated that approximately 4.0% of the Canadian population endorses suicide ideation in the past-year and 0.6% report having attempted suicide in the past-year (Belik, Stein, Asmundson, & Sareen, 2010).

Mental Health Conditions in the Military Population

Military personnel are recruited on the basis of physical and mental health criteria that should, in theory, make these individuals less susceptible to psychological distress than the general population. However, soldiers are, by nature of their occupation, exposed to more psychological trauma than the general population (Paré, 2011a) and the culture of the military may well lend itself to increased incidence of mental disorders (English, 2012; Luhrmann, 2007; Martin et al., 2010). With the current state of conflict (i.e. ongoing peacekeeping/combat operations in Afghanistan, Cyprus, Darfur, Sierra Leone, Kosovo, and Israel/Syria; Department of National Defence, *Operations*, Retrieved January 21st, 2013) incidences of psychological disorders and suicidality in the military population are expected to increase (Gadermann et al.,

2012b). Given the cultural and occupational factors previously identified, it is not surprising that a large number of studies have empirically validated the relationship between military stressors and psychological well-being in terms of increased symptoms of psychopathology and a higher likelihood of mental disorders (Belik et al., 2009, 2010; King, King, Bolton, Knight, & Vogt, 2008; King, King, Vogt, Knight, & Samper, 2006; Sareen et al., 2008; Vogt, Pless, King, & King, 2005; Vogt, Proctor, King, King, & Vasterling, 2008a; Vogt, Samper, King, King, & Martin, 2008b).

With respect to prevalences for specific mental disorders in the military and veteran population in Canada, the available information is sparse. A potential explanation for this limited information is that symptoms of mental disorders, such as fatigue, limited concentration, or fear could negatively affect an individual's capacity to do his/her job effectually. Military personnel with mental health concerns may be unwilling to report symptoms of mental disorders and less likely to seek care for fear of career implications or limitations (Warner et al, 2011; Hoge et al., 2004). Available prevalences for past-year mental disorders are presented in Table 3.

Table 3

*Past-year Prevalence of Mental Disorders for Canadian Military Personnel**

Condition	Past-year Prevalence
Operational Stress Injuries (any mental disorder)	14.9%
Major depression	6.9%
Panic disorder	1.8%
Social phobia	3.2%
Generalized anxiety disorder	1.7%
Post-traumatic stress disorder	2.3%
Alcohol dependence	4.8%

*Data compiled from the *Combat and peacekeeping operations in relation to prevalence of mental disorders and perceived need for mental health care* by Sareen, Cox, Afifi, Stein, Belik, Meadows & Asmundson, 2007.

Affective disorders. Estimates of depression in the Canadian military are similar to those found in the general population, with 6.9% of the military population endorsing past-year major depression diagnosis (Sareen et al., 2007). Qualitatively, depressive features are similar between individuals with a history of military service and those without (Britton et al., 2011; Erickson, Wolfe, King, King, & Sharkansky, 2001) as well between deployed and non-deployed veterans (Black et al., 2004b). However, individuals who have taken part in combat operations have an increased odds ratio of depression of 1.36 and a further increased odds ratio of 1.82 if they have witnessed atrocities in the line of duty (Sareen et al., 2007). These results align with research from other countries; a meta-analysis by Gadermann et al (2012a) estimated the prevalence of major depression among U.S. military personnel to be 12.0% among currently deployed, 13.1% among previously deployed, and 5.7% among never deployed.

Anxiety disorders. Anxiety disorders, including generalized anxiety disorder, social phobia, and panic disorder, are estimated to be 1.7%, 3.2%, and 1.8% respectively, in the Canadian military population (Sareen et al., 2007). Although combat exposure does seem to impact the development of mental health conditions (Gade & Wenger, 2011; Hotopf et al., 2003; Hotopf et al., 2006), in a recent study by Sareen and colleagues (2007), prevalence of the identified anxiety disorders in military personnel who had been in active combat was not statistically significantly different from those identified in soldiers who had witnessed atrocities. However, the odds of experiencing an anxiety disorder were increased with either type of exposure versus those who had not experienced deployment-related traumatic events (DRTEs); the odds ratios were 2.82 for an anxiety disorder, 2.65 for social phobia, and 2.30 for panic disorder respectively (Sareen et al., 2007). This increase in odds is supported by research from

the U.S. that indicates that anxiety disorders are more common in military personnel who have been deployed (Black et al., 2004a).

It has been well documented that PTSD is considerably more common in military personnel with exposure to combat than in the general population (Britt, Adler, Bliese, & Moore, 2013; Gahm, Lucenko, Retzlaff, & Fukuda, 2007; Iversen et al., 2009; Larson, Highfill-McRoy, & Booth-Kewley, 2008; Sareen et al., 2007). Although prevalence of PTSD is estimated to be 2.3% in the Canadian military population, it is estimated to be 2.10 times higher in military personnel who have been in active combat and 4.33 times higher in soldiers who have witnessed atrocities (Sareen et al, 2007). In addition, there is evidence to suggest that mental illness presents differently in the military population. Recent research shows that PTSD assessed in military personnel is clinically different from that in victims of other types of trauma (Brewin, Andrews, & Valentine, 2000; Elhai et al., 2000; Erbes, Polusny, Arbisi, & Koffel, 2012; Naifeh et al., 2008; Pietrzak et al., 2010a). Combat veterans show significantly greater psychopathology and symptomatology than civilian victims of trauma (Amir, Kaplan, & Kotler, 1996; Elhai et al., 2000).

Substance use. The use of alcohol among the world's militaries has traditionally been accepted as a facet of military life (Hamilton, 2011). During WWI and WWII, alcohol was often provided to soldiers as treatment for shell shock, anxiety, insomnia, and as a means of morale reinforcement prior to and during continuous combat (Jones & Fear, 2011). Recently concerns have been growing regarding the overuse and misuse of alcohol within military groups (Hawkins, Grossbard, Benbow, Nacev, & Kivlahan, 2012). Trend analyses suggest that heavy alcohol use is increasing in the military population in recent years (Bray & Hourani, 2007; Bray et al., 2010). In 2004, alcohol abuse was identified as the most common psychological disorder

in Australian military veterans (Ikin et al., 2004). Furthermore, binge drinking has been steadily increasing in active U.K. forces (Hooper et al., 2008) and U.S. forces (Debon et al., 2011) since the initiation of the war on terror.

Research shows that substance use disorders are more prevalent among deployed troops than in the civilian population (Burnett-Ziegler et al, 2011b). Current prevalence of substance use disorders among Canadian soldiers are relatively unknown; however, given the research with other military populations, it is reasonable to assume that the prevalence is higher than those of 2.6% for alcohol abuse and 0.8% for illicit drug use found in the Canadian civilian population (Tjepkema, 2004). Further support for this assumption comes from more research that seems to suggest that SUDs are actually under diagnosed in the military population (Bonn-Miller, Bucossi & Trafton, 2012).

Suicidality. Despite programming and monitoring, the number of suicides by members of the military has seen an exponential increase in the past decade (Bush et al., 2013); in the U.S., the suicide rate has doubled since 2004 (Bryan, Rudd, & Wertenberger, 2012), reaching a high in 2012 of 22 per 100,000 per year (Hoge & Castro, 2012). A systematic review of literature conducted by Rozanov and Carli (2012) demonstrates that veterans are more likely die by suicide as well as to experience suicidal ideation than the general population. Suicide attempts in military personnel are more likely to result in death (Anestis & Bryan, 2012), although nonfatal suicide attempts are also increasing within the military population (Rozanov & Carli, 2012). Discharge from the military also appears to be a potential risk factor for suicidal behaviour (Bossarte et al., 2013; Hourani et al., 2012; Mansfield, Bender, Hourani, & Larson, 2011). There is limited current evidence available for the prevalence of suicide ideation and suicide attempts in the Canadian military; however, a study using the CCHS-CFS data indicated that

approximately 3.8% of military personnel endorse past-year suicide ideation and 0.2% report having attempted suicide in the past year (Sareen et al., 2007). Research indicates that risk for suicide increases with comorbid mood and anxiety disorders and SUD (Conner et al., 2012a; Conner et al., 2012b; Pfeiffer, Ganoczy, Ilgen, Zivin, & Valenstein, 2009).

With respect to suicidality, research suggests that people are not born with an innate capacity to commit suicide; rather they must progress from non-lethal self-harm and injurious acts to lethal suicidal behaviours (Anestis, Coffey, Schumacher & Tull, 2011; Joiner, 2007; Selby et al., 2010). In this manner, they develop a “tolerance” to suicide (Joiner, 2007). It is possible with respect to the military that being continuously placed in harm’s way within the line of duty facilitates this process. Further isolating military personnel as a unique population, research also seems to be increasingly supportive of the notion that killing in combat precipitates suicide (Maguen et al., 2012). Affective responses to combat, such as guilt, shame, or pride also appear to be more strongly associated with suicidal ideation than combat experiences independently (Bryan, Ray-Sannerud, Morrow, & Etienne, 2012a & 2012b).

Contributors to Poor Mental Health in the Military Population

A primary consideration in evaluating the prevalence of mental disorders in the military population (and subsequent focus of the majority of the research in this topic area) is deployment and traumatic experiences during deployment. Deployment-related traumatic experiences (DRTEs) are associated with a variety of mental health difficulties, including mood and adjustment disorders, anxiety, and post-traumatic stress (Black et al., 2004a; Fear et al., 2010; Gahm, Lucenko, Retzlaff, & Fukuda, 2007; Hourani, Yuan, & Bray, 2006). Additionally, multiple traumatic experiences, both in the context of service and prior to military service, have

been shown to have a cumulative impact on the development of mental health conditions (Gahm et al., 2007; Sareen et al., 2013), and have been shown to be relatively common among active duty personnel (Britt et al., 2013).

Numerous studies have shown that occupational stress is associated with a higher prevalence of mental disorders (Chopra, 2009; Pflanz & Ogle, 2006). In addition to their day-to-day occupational stressors, military personnel are subjected to numerous military-specific occupational stressors, such as frequent changes in station, duty away from home or family while on base, hazardous working or training conditions, or overseas deployment. Furthermore, military profession demands a strong adherence to hierarchy, heightened sense of competition and continuous insecurity (Martins & Lopes, 2012). These additional stressors may partially explain the disparities in the prevalence of mental health conditions between the military population and the general population (Fear et al., 2009).

Although occupational stressors may account for some of the disparities in mental health conditions in the military (Pflanz, 2001; Pflanz & Sonnek, 2002), it is highly likely that cultural conditions also influence the prevalence of mental health conditions. Jones and Wessely (2007) argue that there has been a distinct and important paradigm shift in the conceptualization of mental disorders in the military, particularly with respect to psychological trauma. Prior to the introduction of PTSD to the third edition of the American Psychological Association Diagnostic and Statistical Manual in 1980, it was believed that “traumatic neuroses” stemmed from an inherited disposition toward nervous disease. The recognition of PTSD specifically as resulting from an external event or events has helped to alleviate the personal responsibility and guilt felt by many affected by the disorder. Furthermore, it has reduced some of the stigma surrounding

psychological trauma, making it easier for sufferers to seek help and for institutions to award financial compensation (Jones & Wessely, 2007; English, 2012).

Despite the reconceptualization of mental disorders stemming from psychological trauma, research seems to suggest that mental illness still carries a greater stigma in the military population than in the general population (Skopp et al., 2012). The foundation for this stigma is believed to be grounded in the ancient Greek ideal of the aristocrat warrior, “arête.” As an ideal, arête embodies characteristics such as strength, valour, courage, and fortitude and these values and attitudes have continued relatively unchanged in the militaries of the world. In many military groups, the value of the military officer lies in how closely he or she resembles this ideal (Barrett, 1996). However, a consequence of this ideal is that it implies that to even have symptoms of stress is to fail as a warrior (Skopp et al., 2012). Within a culture that demands conformity and normalization of its members, in both thought and action, failure to live up to this high standard may result in ostracism and even rescinded group membership (Siebold, 2006).

In support of the position that cultural factors strongly influence the expression of mental disorders, epidemiological evidence shows that social factors actually increase the incidence of diagnosed mental illnesses (Luhmann, 2007; Martin et al., 2010). Again, a culture such as the Canadian military which has high degree of social inequality (Soeters, 1997), greater stigma (Skopp et al., 2012), and higher professional expectations of its members (Siebold, 2006), may in fact produce a higher degree, as well as a greater number of, social stressors than would be found in Canadian culture at-large (Park, 2008).

Noting that military personnel are not a homogenous group, mental disorders may present differently in the different subpopulations. For example, there is mounting evidence to suggest that reservists are at an increased risk (in comparison to regular force personnel) for mental

health problems on repatriation (Browne et al., 2007; Jones et al., 2011; Kehle et al., 2012; Milliken, Auchterlonie, & Hoge, 2007; Riviere, Kendall-Robbins, McGurk, Castro, & Hoge, 2011; Thomas et al., 2010; Vogt et al., 2008b). This may, in part, be due to fewer services available to assist in the transition between their military and civilian positions and less social support since these individuals are not typically on-base (Browne et al., 2007; Vogt et al., 2008b).

Veterans also present a number of unique risk factors related to mental health. Research shows that there is a loss of identity that often accompanies the transition from military to civilian life; similar to the civilian retirement experience, this can lead to depression and anxiety, as well as suicide ideation (Thompson et al., 2011a). Available evidence also suggests that this transition, among other factors may precipitate delayed-onset PTSD (Andrews, Brewin, Phillipot & Stewart, 2007; Brewin, Andrews, Hejdenberg, & Stewart, 2012).

Income as a Determinant of Mental Health

The Public Health Agency of Canada (PHAC) recently released a report identifying 10 key determinants of health. The first item in this list is “income and social status” (Mikkonen & Raphael, 2010). As a general guideline, higher socioeconomic status is associated with better health, both physical and mental (Johnson & Krueger, 2006). As a result, many researchers argue that well-being can be bought, citing evidence that higher socioeconomic status and income precede better health. In their review of literature, Diener and Biswas-Diener (2002) clearly link high income to a number of positive life outcomes, including better physical and mental health, greater longevity, fewer stressful life events, and higher educational attainment, among other outcomes. Conversely, many authors argue that the reverse relationship is true, suggesting that

poor health leads to lower income and socioeconomic status. In his essay on wealth and well-being, Bunge (2012, p. 68), suggests that “happiness is not for sale,” arguing that available evidence points toward genetics and temperament as greater influences on an individual’s well-being than economic circumstances.

Regardless of the direction of causality, a clear relationship between increased socioeconomic status and increased psychological well-being in the general population has been demonstrated in the literature (Anderson, Sorlie, Backlund, Diener & Biswas-Diener, 2002; Fiscella, Franks, Gold, & Clancy, 2000; Fiscella & Williams, 2004; Johnson, & Kaplan, 1997; Johnson & Krueger, 2006; Sareen et al., 2011). This relationship has been shown both in negative terms (low income and SES being linked to poor psychological well-being (Frey, 2008; Ludwig et al., 2012); and positive terms (high income and SES being associated with good psychological well-being (Diener & Biswas-Diener, 2002; Diener, Tay, & Oishi, 2012; Frey, 2008; Johnson & Krueger, 2006).

Unfortunately, the income-well-being relationship does not present as an infinite linear relationship. It appears from the literature that once the basic needs such as food and shelter have been met, higher levels of income do not improve life satisfaction or further reduce the risk of mental health problems (Kahneman, Krueger, Schkade, Schwartz, & Stone, 2006; Lora & Chaparro, 2008). The “unhappy growth paradox,” as defined by Lora and Chaparro (2008) suggests that the increased expectations and aspirations generated by increased wealth are typically not correspondingly achieved and individuals begin to feel greater degrees of pressure (Binswanger, 2006). This experience has also been referred to in the literature as the “financial treadmill” (Bok, 2010).

Specific to income, a study utilizing a large population-based longitudinal dataset from the U.S. (NESARC) identified individuals in the lowest income bracket as being at the greatest risk for mental disorders (Sareen et al., 2011). Within the Canadian context, data from the first 12 years of the National Population Health Survey (NPHS; 1994/1995 to 2006/2007) also suggests a causal link between income and psychological distress (Orpana, Lemyre, & Gravel, 2009). Using hazards modeling, this analysis found that men with low income (as determined by a derived low income cutoff measure – known as LICO) were 1.58 times as likely to become psychologically distressed as compared to high-income men. Similarly, low-income women were 1.25 times as likely to become distressed than those who were not low income (Orpana, Lemyre, & Gravel, 2009).

Clear connections can be drawn between income and mental health in general, but also between income and individual mental disorders and categories of disorders. Income is strongly associated with depression (Andersen et al. 2009; Lamberg et al. 2010; Zimmerman & Katon, 2005). In a systematic review, Lorant et al. (2003) found that individuals with low income were 1.81 times as likely to experience depression as those with higher income.

Income is also predictive of anxiety disorders (Stansfeld et al., 2011). In their review of literature, Fryers, Melzer, and Jenkins (2003) found that individuals in the lowest income categories or percentiles had increased odds for anxiety disorders with ratios ranging between 1.11 and 2.12.

Although considerably more complicated than other mental health and income relationships, income and SUDs are also closely linked. In fact, a seminal study by Smart (1977) indicates that alcohol use and alcoholism are more closely related to income and urbanicity than to basic availability of alcohol. Furthermore, in contrast to most other mental health disorders,

SUDs tend to be higher in high SES individuals and families (Patrick, Wightman, Schoeni, & Schulenberg, 2012). This relationship holds for non-medical use of prescription drugs and abuse or dependence on prescription drugs (Bali, Raisch, Moffett, & Khan, 2012; Huang et al., 2006) as well as for illicit drug use (Patrick et al., 2012).

The majority of studies to date show a strong association between low income and suicidal ideation and suicide attempts (Lorant et al., 2005a; 2005b). This appears to be a long-standing trend; studies dating back over 100 years have shown that the risk of suicide in the general population is associated with low income, unemployment, and educational underachievement (Agerbo, 2007).

Given that there is a ceiling effect to income, beyond which income no longer improves (or below which income no longer protects one's health), satisfaction with income may be as important a determinant of mental health as total income itself. Research suggests that income is inherently connected to self-worth; "money motivates psychologically because it is closely related to self-esteem and social status" (Kennedy, 2012, p. 21). One interpretation of this data is that it may not be the total value of one's income, but the perception of one's income relative to that of others that is of importance in the income-mental health link. Furthermore, two recent studies show psychiatric disorders to be more closely linked with decreasing income than to any specific income bracket (Lund, Myer, Stein, Williams, & Flisher, 2012; McMillan, Enns, Asmundson, & Sareen, 2010). In their testing of conceptual models, Zimmerman and Bell (2006) conclude that the primary pathway between income and poor health is through discriminatory comparisons to individuals of higher income. When an individual compares him or herself to others with higher income, he or she experiences increased stress levels, in turn leading to a decline in their individual health as they spend more time or effort trying to match their

comparator. Other researchers have shown that the opposite effect also occurs with comparisons to those of lower income or SES as well (Hagerty, 2000).

Income in the Military Population

The distinctive work conditions and responsibilities attributed to military service warrant increased compensation and accordingly, Canadian members of the military differ from their civilian counterparts with respect to wages. Regular Force members of the military are paid first by rank then by specific occupation, meaning income rises with military rank (Park, 2008). For example, a Corporal in the Canadian Army is paid a base salary of \$4,622 per month for service. A Corporal with specialist training would earn \$5,177 per month. Members receive a pay increase every year on the anniversary of their enlistment date. Members in professions in high demand are also paid signing bonuses upon recruitment. Regular force personnel are also entitled to health and life insurance benefits (Canadian Forces, *Pay Rates*, Retrieved January 21st, 2013).

As a result of the rank and profession pay scale, the annual income of military personnel is higher than that of the comparable full-time working civilian population. In 2002, the median personal annual income of men in service was \$50,000 compared to \$40,000 for civilians in equivalent professions (Park, 2008). This distinction is also partly attributed to supplementary allowances (such as for field operations and hazard pay).

Reserve personnel are also paid by rank and then by profession; however, they are paid at a daily rate corresponding to the amount of time they spend in service or training (Canadian Forces, *Pay Rates*, Retrieved January 21st, 2013). Reserve personnel are more likely to hold simultaneous civilian employment. However, reservists often encounter additional financial barriers when they are summoned to active duty; because these individuals are in military service

only part-time, their civilian jobs are often disrupted, there are fewer services available to assist in the transition between their civilian and military positions since these individuals are not typically on-base, there may be differences in access to health care and health insurance and employment insurance, among other potential problems (Wisher & Freeman, 2006).

For most veterans, release from service typically leads to a second career rather than retirement. Following discharge from the military, income typically declines; on average, if a veteran earns an average income of \$63,000 in his or her final year of service, he or she can expect to earn \$57,000 in the year following discharge. Once back in civilian life, veterans need an average of six years to reach their pre-release income (MacLean et al., 2011a). Furthermore, medically-released veterans in Canada report lower rates of satisfaction with their income than non-medically-released veterans (MacLean et al., 2011b).

Due to the high rate of disability experienced in the line of duty, income and finances become increasingly complex for military veterans. Individuals who are released from the military on medical grounds are often given a one-time financial award in compensation for injuries sustained in service (Thompson et al., 2011a). This award is given in proportion to the severity of the injury as determined by a disability assessment (Aiken & Buitenhuis, 2011). Under the New Veterans Charter (NVC), veterans who sustain a career-ending injury that impacts their ability to earn income following release from the military are eligible for the Rehabilitation Program. Veterans who complete the Rehabilitation Program but are still unable to find employment are further eligible for CF Income Support (MacLean et al., 2011a).

Income as a Determinant of Mental Health in the Military Population

The research available on the potential association between income and mental health in the active duty military population is extremely sparse and the majority of research investigates income as a covariate. The available research from the U.S. focuses on the importance of employment, particularly meaningful employment, in moderating mental health following repatriation from conflict (Burnett-Ziegler, Valenstein, Ilgen, Blow, Gorman, & Zivin, 2011a; Davis et al., 2012; Elbogen, Johnson, Wagner, Newton, & Beckham, 2012). Although employment is a factor in SES and contributor to income, it is not synonymous with income.

In reservists, experiencing financial difficulties following repatriation from conflict is uniquely associated with both depression and PTSD (Riviere et al., 2011). Job loss is also associated with depression in returning reservists (Harvey et al., 2011; Riviere et al., 2011).

With respect to veterans, the limited evidence is more direct: recent research from the U.S. indicates that lump sum disability awards are associated with not only improved mental health outcomes, but also overall reduced rates of poverty in military veterans (Murdoch et al., 2011; Murdoch, van Ryn, Hodges, & Cowper, 2005). Employment (Resnick & Rosenheck, 2008; Rosenheck & Mares, 2007) and stable housing (Bossarte, Blosnich, Piegari, Hill & Kane, 2013) also appear to be an important determinants of recovery for veterans.

Summary

There is strong evidence showing that low income is an important risk factor for psychological distress and mental disorders in the general population. However, very little research has been done investigating the potential relationship between income and mental disorders in Canadian military and veteran personnel. Research focusing specifically on income

(rather than addressing income as a covariate) is needed to fill this gap. Furthermore, a strong theoretical framework that can account for the complex cultural and social environment of this specialized population is needed to investigate the potential household income – mental disorder association.

Chapter Three: Theoretical Model

Bronfenbrenner's Dynamic Ecological Systems Model

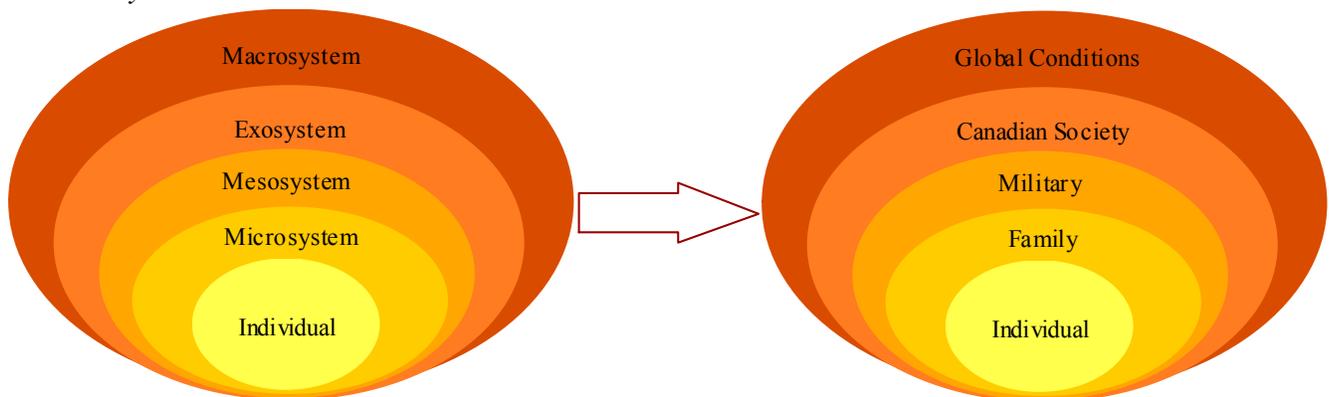
The Dynamic Ecological Systems Model, originally developed by Urie Bronfenbrenner (1979), theorizes a reciprocal relationship between genes and environment. This model suggests a feedback loop in which an individual's biologically influenced characteristics combine with environmental forces to shape development. Essentially the model incorporates both the social causation and the social selection approaches: the genetic traits of an individual define how the individual will interact with his or her environment and the environment an individual is exposed to in turn promotes or suppresses the expression of the individual's genetic traits. The model further defines the environment as a series of interconnected, nested structures, ranging from immediate settings, such as the family, to more remote contexts such as global culture, with the developing person embedded at the centre of the structure. Each structure's distance from the individual assesses the degree of impact each layer has on an individual's development. One of the primary benefits of this approach is that it allows the layers to be separated to some extent and investigated individually. Furthermore, given that a solely biological model is insufficient to address mental health and an ecological model is insufficient to address poverty, a combined bio-ecological model may be better suited to address the cross-section of these issues.

Within the ecological systems model, the individual is embedded at the center of the model and includes all of an individual's genetic endowments, skills, abilities, and attitudes and intrapersonal traits. The innermost layer or microsystem includes all of the activities and social roles (e.g., daughter/son, student, citizen) that the individual plays or directly participates in. The mesosystem incorporates the interrelations of these social roles within the wider environment, such as the relations between parents in the home or interactions of peers in the workplace.

Exosystems, comprising the third grouping of layers, refer to those systems that do not directly involve or interact with the individual but influence him/her, for example the mass media, public policy, and governmental agencies. Finally, the outermost ring, the macrosystem refers to the patterns of culture, values, and beliefs that are linked to the economic, legal, political, and educational systems of society (Bronfenbrenner, 1979). The impact of each level on the individual is filtered through the inner layers sequentially. For this study, the microsystem is defined as the family, the mesosystem as the military, the exosystem as Canadian society, and the macrosystem as global conditions (See *Figure 1*).

Figure 1

Bronfenbrenner's Dynamic Ecological Systems Theory Adapted to Encompass the Canadian Military



Unpublished Figure, Adapted by K. Klassen from Bronfenbrenner's Model, 1979.

Bronfenbrenner's original model was adapted to address the unique attributes of military culture not found in the general population. Placing the military as the mesosystem layer between family and wider society (rather than as a macrosystem) recognizes the role of the military as a defining factor in an individual's psychological development that directly involves

the individual. For regular force personnel, an argument could be made to place the military mesosystem directly around the individual since more time is spent with the military during the working hours than is spent with immediate family, particularly during deployment or training (Park, 2008). This selected placement also acknowledges the influence of military culture, which operates independently of larger cultural structures (Henderson, 1985).

Income Distribution Theory

Income distribution refers to the manner in which income is divided among the members of the economy (such as a company, industry, or country). A perfectly equal income distribution would mean everyone in the respective economy receives an equal proportion of the payout (i.e. has exactly the same income). In general, a certain amount of inequality in the income distribution is to be expected (for example, some labour forces are naturally more productive or some economic systems have access to better resources, both conditions resulting in more income). However, without intervention, an unequal distribution of income tends to perpetuate itself, meaning those who have more income can invest in more productive labour pools or better natural resources, and thus add even more to their income.

Martin Bronfenbrenner's (1971) income distribution theory can be applied at both the microeconomic and the macroeconomic level. At the microeconomic level, Bronfenbrenner argued that the welfare of the members of the labouring class is dependent not only on whether they receive reasonable compensation for their labour but also on the equality of that compensation with that of other members of their social classes. At the macroeconomic level, he also argued that political control of income distribution (through income policies) is almost impossible in a free market economy.

Martin Bronfenbrenner (1971) further posits that the unequal distribution of income is imperative to economic growth and resource conservation in a free market economy. However, he acknowledges (and research supports) the position that this unequal distribution inherently results in the stratification of the social grouping in more than just income (Duncan, 1996; Jen, Jones, & Johnston, 2009). The extension of Bronfenbrenner's argument from this perspective is that ineffective or a complete lack of income policies may inadvertently produce impoverished conditions. Following the strong research cited linking income and economic activity to mental health, this theory lends credence to the argument that poor income perpetuates poor mental health. Other economic theorists have capitalized on Martin Bronfenbrenner's position, even going so far as to suggest that economic expansion threatens the mental health of society at large (Catalano, 2009; Catalano & Bellows, 2005).

Social Causation versus Social Selection.

The direction of the relationship between mental health and the environment has been long debated. Studies which attempt to more clearly illuminate this relationship commonly have conflicting outcomes (Aneshensel, 2009; Clements, Aber, & Seidman, 2008; Conger, Conger, & Martin, 2010; Costello, Compton, Keeler, & Angold, 2003; Fiscella & Williams, 2004; Fuhrer et al., 2002; Hudson, 2005; Kaniasty & Norris, 2008; Kristensen, Gravseth, & Bjerkedal, 2010; Moos, Brennan, Schutte, & Moos, 2010; Ritsher, Warner, Johnson, & Dohrenwend, 2001; Shin, Han, & Kohzuki, 2010; Simmons, Braun, Charnigo, Havens, & Wright, 2008; Stansfeld et al., 2011). The two primary opposing theories are social selection and social causation.

In relation to Urie Bronfenbrenner's model, the theory of social selection posits an outward flow pattern. Also identified in the literature as a gene-environment *correlation*, this theory

suggests that innate traits (such as genetic predisposition to mental illness) define the capacity of the individual and the subsequent pattern through which an individual would be connected to wider society or environmental conditions. This theory would suggest that poorer mental health leads to lower income. Support for this theory has been generated through twin studies showing that genetic factors that contribute to mental disorders are inversely related to socioeconomic status (Dohrenwend et al., 1992).

Conversely, the theory of social causation posits an inward flow pattern. Also discussed as a gene-environment *interaction*, in this view, adversity experienced as a result of economic conditions and societal factors influence the expression of an individual's innate traits and lead to mental illness. From this perspective, lower income causes poorer mental health. Evidence to support this perspective lies in the research investigating psychosocial connection of individuals to money; money "changes the behaviour of all its users" (Kennedy, 2012, p. 21).

Although the literature is historically divided, more recent longitudinal studies specifically investigating the link between mental health and income seem to point more towards a theory of social causation (gene-environment interaction). Seminal research by Dohrenwend et al (1992) indicates that social causation theory is a more explanatory model for most mental health conditions (schizophrenia being the exception; Luhrmann, 2007). This emerging literature is encouraging, as it would suggest that interventions aimed at improving negative social conditions could be effective in reducing mental disorders and psychological distress in low income individuals and families (Orpana, Lemyre, & Gravel, 2009).

Although these two theories are often presented in the literature as dichotomous, there is a possible third option: a reciprocal relationship between genetics and environment. Some theorists suggest that both social causation and social selection are operative over time and that

socioeconomic status and health exist in an inextricable cycle. From this perspective, low income results in poor health and subsequently poor health further affects earning capacity and socioeconomic status and so forth (Zimmerman & Bell, 2006; Zimmerman & Katon, 2005).

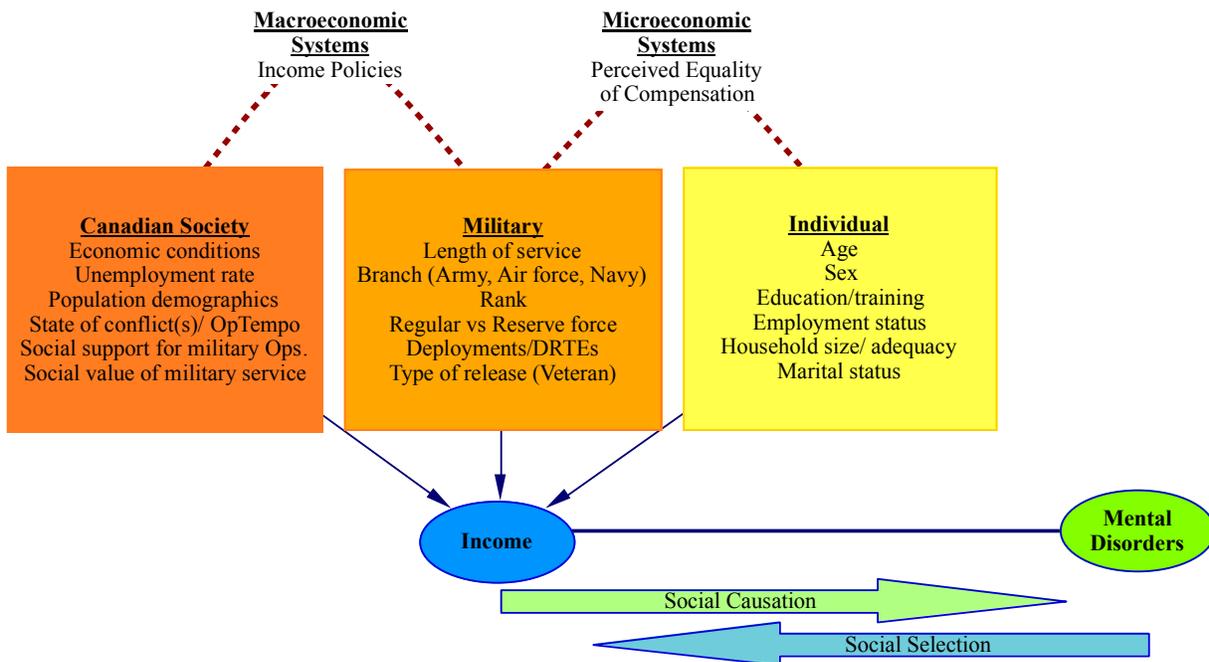
Summary of the Conceptual Model for Understanding Income as a Determinant of Mental Health in the Military

The use of Bronfenbrenner's Dynamic Ecological Systems Model offers a unique interpretation of the relationship between income and mental health, particularly relevant when adapted for the military population. The application of this model, in the context of social theories of mental health (social causation and social selection) and economic theories (income distribution theory) may help to identify gaps in our existing understanding of the relationship between mental health and income in the military population. If, as the model posits, variables within each layer of the model individually influence the overall relationship between mental health and income as well as being impactful as a series of interconnected structures, using a conceptual framework that allows the separation of variables in each layer, and to some extent, the investigation of these variables individually will identify previously unknown relationships between variables. Furthermore, being able to address the macroeconomic systems and microeconomic systems which operate between specific layers will allow for a greater understanding of the specific effects of these systems on the variables and relationships of interest. In the military population, an understanding of the relative importance of the military variables to the relationship between mental health and income could promote policies and programs aimed at reducing both the social and financial cost of mental illness in the CF which

may be more successful in this venture as they are focused on the appropriate layer. An integrated theoretical model is presented in Figure 2.

Figure 2

Conceptual Model for Understanding Income as a Determinant of Mental Health in Canadian Forces Personnel and Veterans



Unpublished Figure, by K. Klassen.

Chapter Four: Methods

Research Design and Delimitations

This research consisted of two separate studies both using secondary data analysis. The first study used the Canadian Community Health Survey Cycle 1.2 (CCHS-1.2) and the corresponding Canadian Forces Supplement (CCHS-CFS) to investigate the household income-mental disorder relationship in active regular and reserve force personnel and compare these relationships to the general population. The second used the Survey on Transition to Civilian Life (STCL) completed as part of the Life After Service Study (LASS) to investigate the household income-mental disorder relationship in veterans.

The study was quantitative in nature. According to Creswell (2009), quantitative research involves the collection of information that links concepts with data and attempts to explain relationships among variables through the application of theory and the testing of hypotheses in an objective manner. In contrast, qualitative research utilizes collected information to identify themes and patterns, not to measure relationships. This study did not use qualitative investigations of the relationships identified, as the primary objective was to examine the relationship between income as the independent variable and individual mental disorders as the dependent variables.

The population for the current study was limited to active regular and reserve force and veteran regular force members of the Canadian Forces. Interpretations of the results of this research are applied only to the Canadian Forces and are not generalizable to other militaries. The researcher did not investigate potential comparisons between other national militaries or other organizations engaged in military-type work (such as the Canadian Security Intelligence Service, the Royal Canadian Mounted Police, or municipal or provincial police forces).

Although income is used as the independent variable and mental disorders as the dependent variables, this study was not intended to be a path analysis. There were no attempts made to test the direction of the relationship between income and mental disorders in the Canadian military.

Statistical Model

There are far more variables and interrelationships to be considered in the association between income and mental disorders than even those presented in the theoretical model and not all elements are testable or can be controlled for in this research. Therefore, the theoretical model has been modified to produce a testable statistical model. The model has been modified with respect to all three of the integrated theories (Social Causation versus Social Selection, Bronfenbrenner's Dynamic Ecological Systems Theory, and the Income Distribution Theory).

With respect to the application of social causation versus social selection, the assumed relationship between household income and mental disorders is based on social causation. Therefore, income is identified as the independent variable and the individual mental disorders or mental health conditions as the dependent variables. Satisfaction with finances (SWF) is also framed within the model as an independent variable.

Second, as noted in the theoretical model discussion, the application of Bronfenbrenner's Dynamic Ecological Systems model allows for the distinction of the various layers. In the statistical model, global and Canadian societal elements (the macro and exosystems respectively) are not considered. The microsystem (identified in the theoretical model as family) is also excluded due to a lack of available information regarding this system in the datasets (for example, variables such as family composition and relationships between household members were not available in the datasets). Individual characteristics examined as covariates of

household income include age, sex, marital status, education, employment status and household size. Military characteristics (including branch, rank, regular or reserve force status, previous deployment, and length of time since release for veterans) are also possible covariates of income and subsequently may impact the association between household income and mental disorders. The model identifies the covariates as stemming from different ecological levels to allow for separate tests (i.e. regression models that include only individual covariates, only military covariates, or both). The statistical model is not a hierarchical, multilevel, or nested model.

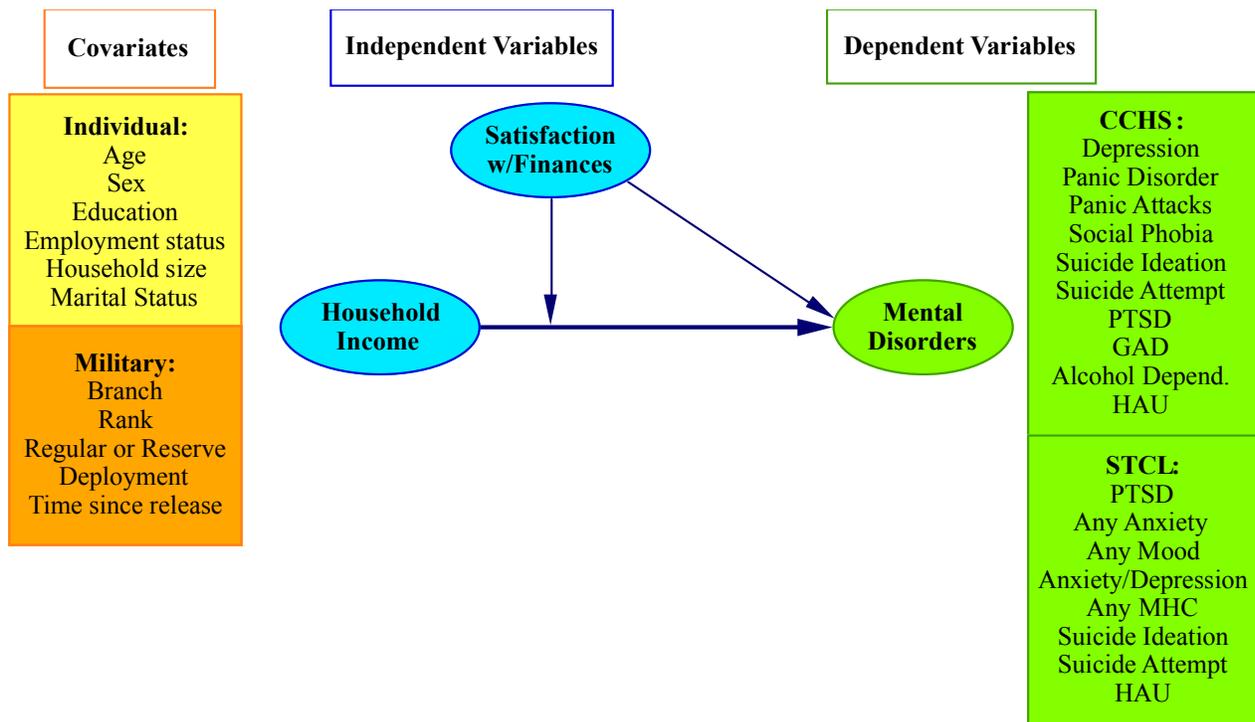
With respect to the Income Distribution Theory, in the theoretical model, SWF is related to perceived equality of compensation and this variable is conceptualized as part of a microeconomic system. In the statistical model, SWF is connected directly to mental disorders to indicate the potential role of the variable as an independent variable (i.e. having direct effects). However, this variable is also connected directly to the link between household income and mental disorders to indicate potential indirect effects with respect to mental disorders and mental health conditions. Again, this model is not intended to be a path analysis, but to identify the potential variables that may influence the association between household income and mental disorders. This model is presented in Figure 3.

As presented, the statistical model supports a logistic regression approach. Logistic regression models the dependence of a binary dependent variable (i.e. the presence of a mental disorder/mental health condition or not) on one or more independent variables (i.e. income or satisfaction with finances; Hayes, 2013; Tabachnick & Fidell, 2013). The statistical model focuses on the primary relationship between mental disorders and household income and the primary goal of logistic regression is to determine the best fitting model to describe the relationship between the dependent and independent variables. Additionally, logistic regression

is one method for testing the indirect effects of an additional independent variable; the statistical model indicates potential influence of satisfaction with finances on the association between household income and mental disorders.

Figure 3

Statistical model for evaluating income and mental disorders in the Canadian military and veterans



Unpublished Figure, by K. Klassen.

The manuscripts presented following the methods chapter evaluate the validity of this statistical model in application to an active Canadian military sample in comparison to the Canadian general population, and in a Canadian veteran sample. The individual mental disorders and mental health conditions (i.e. dependent variables) and covariates investigated in these

samples are identified in Table 5 following the discussion of the coding and interpretation of these variables.

Research Objectives

There are four primary research objectives: 1) to examine the association between household income and mental disorders in active regular force and reserve force personnel; 2) to compare the associations identified between household income and mental disorders in active regular and reserve force personnel to those identified in the general population; 3) to examine the association between household income, a measure of low income, and satisfaction with finances with mental health conditions in regular force veterans; and 4) to examine the role of military factors including rank, branch, and deployments as potential intervening factors of the relationship between income and mental health in military personnel and veterans. Objectives one and two are specific to the CCHS-1.2 and CCHS-CFS study. Objective three is specific to the STCL study and objective four relates to both studies. The specific research questions and corresponding hypotheses for this research are presented in Table 4.

Table 4

Research Questions and Hypotheses

Research Questions	Hypotheses
1A: Is there a gradient association between household income and mental disorders in active CF personnel?	1A: As income declines, odds of mental disorders will increase.
1B: Does this association differ between regular force and reserve force personnel?	1B: Reserve personnel will have increased odds of mental disorders.
2A: Are the associations between household income and mental disorders in active regular and reserve force personnel similar to those identified in the general population?	2A: The associations found in the active military population will parallel those found in the general population.
3A: Is there an association between household income and mental health conditions in CF veterans?	3A: Individuals in the lowest income categories will have increased odds of mental health conditions.
3B: Is low income associated with mental health conditions in veterans?	3B: Individuals falling below the LIM will have increased odds of mental health conditions.
3C: Is satisfaction with finances associated with mental health conditions in veterans?	3C: Individuals dissatisfied with finances will have increased odds of mental health conditions.
3D: Does satisfaction with finances influence the association between income and mental health conditions in veterans?	3D: Being dissatisfied with finances will impact the association between income and mental health conditions.
4A: Do military factors including rank, branch, and deployments influence the relationship between income and mental health in military personnel?	4A: Lower rank, being a member of the army, and exposure to deployments will more strongly influence the association between household income and mental disorders.
4B: Do military factors including rank, branch, and deployments, as well as length of time since release influence the relationship between income and mental health in military veterans?	4B: Lower rank and being a member of the army at the time of release, shorter time since release, and exposure to deployments will more strongly influence the association between household income and mental disorders in veterans.

Samples

Canadian Community Health Survey – Canadian Forces Supplement. The primary database used for the first study was the CCHS-CFS (n=5,155 regular force; n=3,286 reserve force), a large and representative sample of military personnel ages 16-64 in the Canadian Forces. Statistics Canada and the Department of National Defence (DND) collected the survey between May and December of 2002. Ensuring accurate representation of the Canadian Forces population was accomplished through the employment of a multistage sampling design. Regular versus reserve membership was the first sampling stage. The second stage stratified by both sex and rank (collapsed to junior, senior, and officer). In this stage, due to smaller cell sizes, women were stratified into only two groups: junior personnel versus a further collapsed category of senior personnel/officers. The third sampling stage stratified by region (Atlantic, Quebec, Ontario, Prairies) and type of military environment (air, land, sea, communications). Face-to-face interviews were conducted with respondents in on-base rooms by trained lay interviewers from Statistics Canada. The overall response rate was of 79.5% regular force personnel and 83.5% for reserve force personnel.

Canadian Community Health Survey – Cycle 1.2. The parallel survey conducted in the general population (and used to compare the identified relationships between the CF and the general population) was the Canadian Community Health Survey – Mental Health and Well-Being (CCHS-1.2). The CCHS-1.2 is a cross-sectional, nationally representative survey of Canadians aged 15 and older. Statistics Canada conducted the survey over eight months, beginning in May 2002. The final sample for the CCHS-1.2 included 36,984 individuals living in private dwellings in the ten Canadian provinces (response rate = 77%). Again, a multistage sampling frame was employed and the datum is representative of the general population at the

provincial level. The populations not included in the survey were residents of the Canadian territories, Indian Reserves, Crown Lands, or institutions, members of the Canadian Forces, and residents of certain remote regions. Again, Statistics Canada provided an adjustment to the weight variable for study participants to account for the potential bias of persons who could not be contacted or refused to participate. Further details if necessary are available on Statistics Canada's website (Statistics Canada, *CCHS* and *CCHS-CFS*, Retrieved September 30th, 2012).

Survey on Transition to Civilian Life. The primary database used for the second study in this research was the cross-sectional Survey on Transition To Civilian Life (STCL; $n = 3154$, response rate =70%), which was one of four surveys conducted as part of the Life After Service Study (LASS; MacLean et al., 2010). The sample consists of Regular Force Personnel who were released from service between 1998 and 2007 and excludes those who re-enlisted or were still serving at the time of the interview. To ensure representation of the population, the sample was stratified by New Veterans Charter (NVC) clients, non-NVC clients, and non-VAC clients. Statistics Canada conducted the STCL via computer-assisted telephone interviews (CATI) between February and March 2010 (MacLean et al., 2010). A detailed description of the entire LASS is available from Veterans Affairs Canada (MacLean et al., 2010).

Instruments

The content for the CCHS-1.2 was partly based on constructs from the World Mental Health Survey conducted in 2000. Statistics Canada partnered closely with the WHO to ensure that the final survey had international comparability. In turn, the content for the CCHS-CFS was partly based on the CCHS-1.2. Both surveys employed an expert group of mental health professionals to develop the content for the surveys. Datum for the CCHS-1.2 and the CCHS-

CFS was collected using nearly identical methodologies. Both surveys employed computer-assistance to standardize the questions between interviewers as well as to minimize errors and invalid responses (Statistics Canada, *CCHS* and *CCHS-CFS*, Retrieved September 30th, 2012).

One formalized instrument of particular importance to this study is the World Mental Health Composite International Diagnostic Interview version 2.1 (WMH-CIDI; World Health Organization, 2001), used to assess mental disorders. Based on the DSM-IVR and the International Classification of Diseases (ICD-10; World Health Organization, 2011) criteria, the WMH-CIDI is a lay-administered survey that generates both lifetime and past-year mental disorders. The reliability and validity of this semi-structured, standardized diagnostic interview has been verified in previous research (Kessler & Ustun, 2004). When administered to the CCHS-CFS population, reasonable modifications were made to the WMH-CIDI to lessen response burden and for clarification purposes.

The content for the STCL was partly based on the CCHS conducted in the general population in 2007. A team of experts at VAC was employed to develop additional content specific to the military and transition to civilian life. The computer-assisted interviews were conducted over the telephone. Further details related to the implementation of all three surveys is available from Statistics Canada's website (Statistics Canada, *CCHS* and *CCHS-CFS*, Retrieved September 30th, 2012) and Veterans Affairs Canada (Maclean et al., 2010).

Independent Variables

Income in the CCHS-1.2 and CCHS-CFS. Participants were first asked to estimate their total annual household income with the following question: What is your best estimate of the total income before taxes and deductions of all household members from all sources in the past

12 months? They were then asked to identify the range into which their income fell and were queried in \$10,000 increments (i.e. “Was the total household income between 20,000 and 30,000 dollars annually?”). This method of questioning more than once and in multiple formats has been shown to substantially improve response rates (Duncan & Petersen, 2004).

Previous research suggests that survey participants who choose not to report income are statistically distinct (Kim, Egerter, Cubbin, Takahashi, & Braveman, 2007). Some statistical manuals often recommended that a category for missing income be included in statistical analyses involving income (Miles & Shevlin, 2001). However, in these datasets, the rate of non-response for the income question in both formats was extremely low and therefore a missing income category was not included in the analysis.

Due to the high disparity in income between the Canadian military sample and the Canadian general population sample, income quartiles were not considered to be an appropriate means of dividing income. Therefore, income was coded into \$5,000 increments, decreasing from \$100,000. This method of income division is discussed further in Chapter 5.

Income in the STCL. Income was measured again by direct question in the same manner as in the CCHS-1.2 and CCHS-CFS as well as by range (i.e. “was your total household income during the year ending in December 31st, 2009 between \$50,000 and \$60,000?”). As per previous investigations using income as an independent variable, income was coded as four quartiles (Belik et al., 2010; McMillan et al., 2010; Sareen et al, 2007) (\$59,000 or less, \$60,000 to \$84,000, \$85,000 to \$125,000, and \$126,000 or greater). In maintaining consistency with the previous study, an income variable using \$5,000 increments declining from \$100,000 was also produced however this analysis was redundant of the results presented in the quartile analyses

and was not developed for publication. Again, the number of non-reporters was extremely low so a category for missing income was not used.

Low Income Measure (LIM). The low income measure (LIM) was calculated for the STCL population. The LIM is a relative measure of low income, set at 50% of adjusted median family income. The measure is compiled according to the number of adults and children (identified as individuals under the age of 16) present in families, as a means of reproducing the economies of scale inherent in family size and composition (Income Statistics Division, 2006). This measure has been shown to have better predictive value than simply using the poverty line or previous Statistics Canada measures such as the LICO (MacLean et al, 2011a). This variable was investigated as dichotomous (below LIM or above LIM).

In the CCHS-1.2 and CCHS-CFS, children were defined as those individuals under the age of 12. Therefore, calculating a true LIM was not possible. The measure of low income used was calculated in the same manner as the LIM (but was not comparable to) used in the STCL or more current Canadian surveys because of this age difference. Regardless, low income was excluded from the final analysis as only 2% of the total military population fell below the defined low income point.

Satisfaction with finances. The STCL also investigated satisfaction with finances (SWF). This variable was queried as “how satisfied are you with your financial situation?” on a five-point Likert scale. To maintain consistency with literature in the economic field (Lora & Chaparro, 2008), the variable was analyzed as dichotomous with all respondents indicating “very dissatisfied” or “dissatisfied” as dissatisfied with finances and all those indicating “neither satisfied nor dissatisfied,” “satisfied,” or “very satisfied” as satisfied with finances.

Dependent Variables

Mental disorders in the CCHS-1.2 and the CCHS-CFS. Mental disorders were assessed and diagnosed based on the DSM-IVR (2000) and the ICD-10 (WHO, 2011) criteria using the WMH-CIDI (WHO, 2001). The past year mental disorders that were included in both the CCHS-CFS and the CCHS-1.2 were major depressive disorder, social phobia, panic disorder, and panic attacks. Post-traumatic stress disorder and generalized anxiety disorder were assessed in the CCHS-CFS only. DSM-IVR alcohol dependence was also assessed with the CIDI Short Form, where the presentation of three or more of the criterion symptoms was assigned a diagnosis. Past-year alcohol abuse was not measured in either of the surveys. In accordance with previous studies (Sareen et al., 2007), a heavy alcohol use variable was created. Past-year heavy alcohol use (HAU) was identified using the following question: “How often in the past 12 months have you had five or more drinks on one occasion?” and participants were able to choose from the following responses: “never,” “less than once a month,” “once a month,” “2–3 times a month,” “once a week,” or “more than once a week.” Canadian Low-Risk Drinking Guidelines (LRDG; Butt et al., 2011) identify having no more than four standard drinks per day and no more often than once a week at these upper limits as an element of low-risk drinking therefore, those respondents endorsing “never” or “less than once a month” were classified as low use, and the remaining respondents classified as heavy use.

Respondents were also asked about suicidal ideation and suicide attempts both within the past-year and within their lifetime. Past-year suicidal ideation was assessed with the following question: “In the past 12 months, did you seriously think about committing suicide or taking your own life?” Past-year suicide attempts were then assessed by querying whether the individual had “attempted suicide or tried to take [their] own life” in the past 12 months.

Mental health conditions in the STCL. With respect to mental health, the survey asked respondents four specific questions related to mental disorders: 1) “Do you have depression or anxiety;” 2) “Do you have post-traumatic stress disorder;” 3) “Do you have an anxiety disorder such as phobia, obsessive-compulsive disorder or a panic disorder;” and 4) “Do you have a mood disorder such as mania, dysthymia, or bipolar disorder?” All four questions were prefaced by asking respondents to think only about conditions diagnosed by a health professional and that had persisted or were expected to persist longer than six months. An “any mental health condition” variable was produced for this analysis. In addition, the survey assessed suicide ideation and attempts by asking respondents, “have you ever seriously considered committing suicide or taking your own life?” and “have you ever attempted to commit suicide or tried taking your own life?” This survey used skip logic and if respondents did not endorse suicide ideation they were not queried about suicide attempts. If participants did endorse suicide ideation or attempts, they were further asked whether this occurred in the past 12 months.

HAU was queried in the same manner as in the CCHS-CFS. To maintain consistency these variables were coded in the same way as they were for the CCHS-CFS with those respondents identifying “2–3 times a month,” “once a week,” or “more than once a week.” coded as heavy users and those responding “never” or “less than once a month” classified as low use.

Covariates

Sociodemographic characteristics. Sociodemographic characteristics were included as covariates in the adjusted statistical models and were the same for both studies. Sex was controlled for in both studies. Age and number of persons in the household were examined as continuous variables, while marital status was coded as a three-level variable (married/common-

law, divorced/separated/widowed, and never married). Education was also coded as a three-level variable (less than high school diploma, high school diploma or equivalent, and greater than high school). Employment status coding differed slightly between the three studies; in the CCHS-1.2, the variable was coded with three categories (unemployed, employed, not able to work) whereas in the STCL, the variable was coded with four-levels (unemployed, employed, not able to work, and not in the labour force). For comparison purposes, all respondents in the CCHS-CFS sample were automatically identified as employed. To the greatest extent possible, all covariates were coded in the same manner as previous investigations using these datasets (Belik et al., 2009; Belik et al., 2010; Mota et al., 2012; Sareen et al., 2008).

Military variables in the CCHS-CFS. The sample was first stratified by regular/reserve status. Further military variables included as covariates were rank (junior NCM, senior NCM, officer), and type of service (land, air, sea, communications). As per previous investigations with this dataset, deployment was dichotomized into deployed or not deployed (Sareen et al., 2011).

Military variables in the STCL. This sample included only regular force veterans so stratification by regular or reserve status was not possible. Military variables included rank (private or recruit, junior NCM, senior NCM, officer) and type of service (army, air force, and navy). Deployments outside of Canada for longer than 30 days were also included. Due to the wide variation in responses to this question, this variable was also coded as dichotomous (deployed or not deployed). Length of service was also queried as a potential variable of investigation but was found in other studies with the dataset to be highly correlated with age (Thompson et al., 2011b) and was excluded from the final analysis. Finally, the sample for the STCL was comprised of individuals who had released from the military between 1998 and 2007.

As a result, the variable “years since release” was included as a continuous covariate. A detailed description of all variables of investigation is presented in Table 5.

Table 5

Variables of Investigation

Variable Name	Sample	Type	Inquiry	Scale & Value
Income	CCHS-CFS CCHS-1.2 STCL	IV	1. What is your best estimate of the total income, before taxes and deductions, of all household members from all sources in the past 12 months? 2. Can you estimate in which of the following groups your household income falls? [Queried in \$10,000 increments]	0 = Lowest quartile 4 = Highest quartile Continuous, diminishing \$5000 increments from \$100000
LIM/Low Income	STCL	IV	Derived from household income and size of household and corresponding LIM thresholds from Statistics Canada	0 = Below LIM 1 = Above LIM
Satisfaction with finances	STCL	IV	How satisfied are you with your financial situation? Very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied?	0 = Dissatisfied 1 = Satisfied
Major Depressive Disorder	CCHS-CFS CCHS-1.2	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis
Social Phobia Disorder	CCHS-CFS CCHS-1.2	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis
Panic Disorder	CCHS-CFS	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis
Panic Attacks	CCHS-CFS CCHS-1.2	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis
Generalized Anxiety Disorder	CCHS-CFS	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis

Variable Name	Sample	Category	Inquiry	Scale & Value
PTSD	CCHS-CFS	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis
	STCL	DV	Do you have post-traumatic stress disorder?	0 = No reported Dx 1 = Reported Dx
Heavy Alcohol Use	CCHS-1.2	DV	How often in the past 12 months have you had five or more drinks on one occasion? Range from 'never, to 'more than once a week'	0 = No HAU present 1 = HAU present
	CCHS-CFS			
	STCL			
Alcohol Dependence	CCHS-1.2	DV	WMH-CIDI Questionnaire	0 = No diagnosis 1 = Diagnosis
	CCHS-CFS			
Anxiety Disorder	STCL	DV	Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder, or a panic disorder?	0 = No reported Dx 1 = Reported Dx
Mood Disorder	STCL	DV	Do you have a mood disorder such as mania, dysthymia, or bipolar disorder?	0 = No reported Dx 1 = Reported Dx
Depression or Anxiety	STCL	DV	Do you have depression or anxiety?	0 = No reported Dx 1 = Reported Dx
Suicide Ideation	CCHS-CFS	DV	WMH-CIDI Questionnaire	0 = No 1 = Yes
	CCHS-1.2			
	STCL	DV	Have you ever attempted to commit suicide or tried taking your own life? Has this happened in the past 12 months?	0 = No 1 = Yes
Suicide Attempt	CCHS-CFS	DV	WMH-CIDI Questionnaire	0 = No 1 = Yes
	CCHS-1.2			
	STCL	DV	Have you ever attempted to commit suicide or tried taking your own life? Has this happened in the past 12 months?	0 = No 1 = Yes

Variable Name	Sample	Type	Inquiry	Scale & Value
Sex	CCHS-CFS CCHS-1.2 STCL	Co	What is your gender?	0 = Male 1 = Female
Age	CCHS-CFS CCHS-1.2 STCL	Co	What is your date of birth?	Continuous
Number of Persons in Household	CCHS-CFS STCL	Co	Including yourself, how many persons live in your household?	Continuous
Marital Status	CCHS-CFS STCL	Co	Are you: Married? Living common-law? Widowed? Separated? Divorced? Single/never married?	0 = married/common-law 1 = divorced/separated/widowed 2 = never married
Education	CCHS-CFS STCL	Co	What is the highest certificate, diploma or degree that you have completed? Range from “Less than high school diploma or equivalent” to “University certificate, diploma, degree above the bachelor's level”	0 = less than high school 1 = high school or equivalent 2 = greater than high school
Employment Status	CCHS-1.2	Co	Last week, did you work at a job or a business? Please include part-time jobs, seasonal work, contract work, baby-sitting self-employment, and any other paid work, regardless of the number of hours worked. a. Worked at a job b. Had a job but did not work c. Unemployed d. Permanently unable to work *All CFS personnel are inherently employed	0 = employed 1 = unemployed 2 = not able to work
	STCL	Co	As above but also included “not in labour force” as response option	3 = not in labour force

Variable Name	Sample	Type	Inquiry	Scale & Value
Status	CCHS-CFS	Co	Determined in sampling frame	0 = Regular 1 = Reserve
Branch	STCL	Co	Determined in sampling frame	0 = Army 1 = Air Force 2 = Navy
	CCHS-CFS	Co	Determined in sampling frame	0 = Land 1 = Air 2 = Sea 3 = Communications
Rank	CCHS-CFS	Co	Determined in sampling frame	0 = Junior 1 = Senior 2 = Officer
	STCL	Co	Determined in sampling frame	0 = Junior 1 = Senior 2 = Officer 3 = Private/Recruit
Years Since Release	STCL	Co	How many years since you were released from the military?	Continuous
Deployments	CCHS-CFS	Co	During your military career, in how many deployments of 30 days or longer did you participate in total?	0 = Not deployed
	STCL			1 = Deployed

Research Methods

The primary constructs in the CCHS-CFS were based on the CCHS-1.2 questionnaire, enabling direct comparison of constructs between the two surveys. To further this objective, both samples were restricted to the narrower age range of the CCHS-CFS (ages 16–64) and then merged together to create one dataset with identical measures. Prevalence of mental disorders in these two samples has been previously presented in other publications. However, due to the restricted age range of the general population sample, the numbers differ slightly from those previously published. Multiple logistic regressions were used to assess the strength of the relationship between household income and each individual mental disorder. Odds ratios were adjusted for age, sex, marital status, education, employment status, and number of people in the household. The military group was further stratified by regular force and reserve force. Specifics of the models are discussed in chapter 5.

In the STCL sample, prevalence of mental disorders in the veteran population was examined by using cross-tabulations to determine the percentage of those in each income quartile with a mental health condition. Cross-tabulations were also used to determine the prevalence of mental disorders above and below the LIM and for satisfied or dissatisfied with finances. Again, multiple logistic regressions were used to assess the strength of the relationship between household income, satisfaction with finances, and low income and each individual mental health condition. Odds ratios were then adjusted for age, sex, marital status, education, employment status, and number of people in the household. Analyses using the LIM variable were not adjusted for family size as this was already accounted for in the calculation of the variable itself. In a second model, odds ratios were also adjusted for military rank, military branch, years since release, and deployments. Logistic regressions were also run using satisfaction with finances as

an independent variable, as a covariate with household income as the independent variable, and as an interaction term with household income. Specifics of the models related to income quartiles and satisfaction with finances are discussed in chapter 6 and specifics of the models related to the LIM are discussed in chapter 7.

In all datasets, to maintain consistency with previous investigations and other ongoing analyses with the STCL dataset, an alpha of $p < 0.05$ and corresponding 95% CIs were used. In all investigations, the highest income quartile or highest income increment, above the LIM and satisfied with finances were used as the reference categories. STATA version 12 software was used as the primary statistical program to conduct the analyses (StataCorp, 2011).

As indicated, to ensure representativeness of the data, appropriate statistical weights provided by Statistics Canada were used in the analyses. To accommodate the complex multi-stage sampling design of the surveys and obtain measures of precision for the parameter estimates, in the final stage of the analysis the STATA program was used to employ bootstrapping (StataCorp, 2011). The bootstrap method derives an approximate form of the parameter estimates by resampling with replacement from the study sample and then computing values from the multiple samples (Mooney, 2008). Bootstrapping is the recommended technique for variance estimation by Statistics Canada (Bailie, Dufou & Hamilton, 2002). Bootstrapping weights were not available for the STCL sample so Taylor Series Linearization (TSL) was used. TSL produces results similar to bootstrapping however rather than resampling from the study sample, TSL uses the linear terms of Taylor series expansion to approximate the parameter estimates of the sample (Williams, 2008).

Logistic regression was deemed the most appropriate statistical approach because the research question focuses on dependent variables that are dichotomous in nature (i.e. whether

there is a diagnosis of a specific mental disorder or not). Furthermore, logistic regression allows the use of both continuous and discrete independent variables and does not require the normal distribution of these variables (Miles & Shevlin, 2001). However, logistic regressions inherently present a number of assumptions. Tabachnick and Fidell (2013) identify six assumptions that must be addressed. These assumptions and the appropriate solutions employed for each study are presented in Table 6.

Table 6

Assumptions of Logistic Regression and Solutions Employed

Assumption	CCHS-CFS and CCHS-1.2	STCL
<p>Ratio of Cases to Variables: Production of large parameter estimates and standard errors and failure of convergence may occur when too many cells do not have cases or the dependent variable has perfect separation.</p>	<p>With respect to suicide attempts, stratification by regular or reserve status was eliminated to account for the lack of cases. Stratification by sex also resulted in failure of convergence for most mental disorders.</p>	<p>Assumption was satisfactorily met; no cells with too few cases were identified.</p>
<p>Adequacy of Expected Frequencies: Expected frequencies are too small resulting in little power when goodness-of-fit test is used to compare observed and expected frequencies</p>	<p>Assumption was satisfactorily met; chi-squared tests indicated that expected frequencies were large enough for all categories investigated.</p>	<p>Assumption was satisfactorily met; chi-squared tests indicated that expected frequencies were large enough for all categories investigated.</p>
<p>Absence of Multicollinearity: Large standard errors for parameter estimates or failure of a tolerance test produced by collinearity of the independent variables</p>	<p>Collinearity was assessed using Pearson, Spearman rank, polychoric, tetrachoric, and point biserial correlations. No multicollinearity problems were observed.</p>	<p>Collinearity was assessed using Pearson, Spearman rank, polychoric, tetrachoric, and point biserial correlations. Pearson correlation indicated that age and length of service were collinear ($r=0.910$, $p<0.0001$) and length of service was removed from the model. No other multicollinearity problems were observed</p>

<p>Absence of Outliers in the Solution: Outliers in the model may result in a poorly fit model</p>	<p>Scatter plots of standardized residuals were assessed. Outliers were observed for all mental disorders however, with a non-normal distribution (such as is observed with income), this is an expected outcome.</p>	<p>Scatter plots of standardized residuals were assessed by the statistician at VAC. Again, any outliers observed were expected and were not removed.</p>
<p>Linearity of the Logit: Statistic assumes a linear relationship between continuous independent variables and the log of the odds transform of the dependent variable</p>	<p>Logistic regressions were run with all non-continuous independent variables and interaction terms. Interaction terms were computed using each continuous level independent variable (age, household size, and income) multiplied by its natural logarithm. Interaction terms were statistically significant in some cases. However, the linearity of the logit assumption is commonly violated in regression (Miles & Shevlin, 2001) and in terms of usefulness of results and effective interpretation of data, it seems appropriate to report the regression model using the original variables.</p>	<p>Assumption was satisfactorily met; Interaction terms for continuous level variables within the logistic regressions were not statistically significant.</p>
<p>Independence of Errors: Different cases are independent of each other</p>	<p>Assumption was satisfactorily met; multilevel modeling with the dependent variables indicated that different cases were independent of each other.</p>	<p>Assumption was satisfactorily met; multilevel modeling with the dependent variables indicated that different cases were independent of each other.</p>

*Compiled from *Using Multivariate Statistics, 6th Edition* by Tabachnick & Fidell, 2013 and *Testing Statistical Assumptions*, by Garson, 2012.

Data Access and Ethics

CCHS-1.2 and CCHS-CFS Study. Participants in both the CCHS-1.2 and the CCHS-CFS were informed of the privacy, confidentiality, and security guidelines implemented by Statistics Canada. Survey respondents were also informed that participation was voluntary, as was agreement to allow responses to be used for research. A total of 94% of respondents in both samples consented to their responses being used for research purposes.

This study was completed at the Research Data Centre at the University of Manitoba, where the CCHS-CFS and CCHS-1.2 data is securely housed and where strict guidelines of confidentiality were followed to guarantee the anonymity of respondents. Permission to access databases housed in the RDC is required by Social Sciences and Humanities Research Council (SSHRC) and was granted in September of 2012. Ethical approval for this study was obtained from the University of Manitoba Health Research Ethics Board. A copy of the ethics certificate is provided in Appendix C.

STCL Study. As per Statistics Canada protocol, respondents in the STCL were informed of the privacy, confidentiality, and security guidelines for participation in the survey. Participants were also informed that participation was voluntary and that responses would in no way influence the services they received from VAC (if they received any services from VAC). A total of 94% of respondents also consented to their responses being used for research purposes.

The dataset for the STCL is housed in the Research Directorate of VAC in Charlottetown, PEI. The raw data is not accessible to persons outside of the department to guarantee the anonymity of respondents. STATA syntax was written for all of the analyses and the primary statistician on site ran the syntax and returned the output for the researcher to complete the analysis.

Ethical approval for this study was obtained from the University of Manitoba Health Research Ethics Board. A copy of the ethics certificate is provided in Appendix D.

Chapter Five: CCHS-1.2 and CCHS-CFS Manuscript

Household Income and Mental Disorders in the Canadian Forces and Canadian General Population

Kristen Klassen, Elizabeth Ready, Tracie Afifi, Juliette Cooper, & Jitender Sareen

Abstract

Objective: To determine the association between household income and mental disorders (major depressive episodes, panic disorder, panic attacks, social phobia, suicide ideation, suicide attempts, alcohol dependence, and heavy alcohol use (HAU)) in active regular and reserve Canadian Forces personnel and to compare the association in this population to the Canadian general population.

Methods: The Canadian Community Health Survey – Canadian Forces Supplement (CCHS-CFS) was used to investigate the household income-mental disorder relationship in active regular and reserve force personnel and the corresponding CCHS-Cycle 1.2 was used to investigate this relationship in the general population. Multiple logistic regressions were used to assess the strength of the relationship between household income and mental disorders (PTSD and generalized anxiety disorder were also assessed in the military sample). Odds ratios were adjusted for relevant sociodemographic variables including age, sex, marital status, education, and household size.

Results: Associations between household income and all mental disorders identified (with the exception of alcohol dependence and heavy alcohol use) were statistically significant to the $p \leq .05$ level in the general population. Only major depressive disorder, alcohol dependence,

heavy alcohol use, and suicide ideation were significantly related to household income to the $p \leq .05$ level before controlling for covariates in the military population as a whole. When controlled for covariates, all associations between household income and mental disorders in the Canadian Forces population as a whole and stratified by regular and reserve status became statistically insignificant.

Conclusions: The results of this study align with the results of previous studies that suggest low income is associated with mental disorders in the Canadian general population. In contrast, it appears that the increased income level found in the military eliminates this pattern in this specialized population; although there are evident trends, household income does not appear to be statistically significantly associated with mental disorders in Canadian Forces personnel. Possible mechanisms and potential implications for these results are discussed.

Background

The Public Health Agency of Canada has identified “income and income distribution” as one of 10 key determinants of health (Mikkonen & Raphael, 2010). The majority of research supports this position, showing a clear positive relationship between lower socioeconomic status and poorer psychological well-being in the general population (Fiscella & Williams, 2004; Anderson, et al., 1997; Sareen et al., 2011; Diener & Biswas-Diener, 2002). Numerous studies have identified individuals in the lowest relative income bracket as being at the greatest risk for a number of mental disorders (Sareen et al., 2011), including depression (Lamberg et al. 2010; Zimmerman & Katon, 2005; McMillan et al., 2010), anxiety disorders (Stansfeld et al., 2011; Fryers, Melzer, & Jenkins, 2003), and suicidal ideation and attempts (Lorant et al., 2005a; 2005b). Within the Canadian context, data from the first 12 years of the National Population

Health Survey (NPHS; 1994/1995 to 2006/2007) also suggest a causal link between low income and psychological distress (Orpana, Lemyre, & Gravel, 2009). Using hazards modeling, this analysis found that men with low income were 1.58 times more likely to become psychologically distressed as compared to high-income men. Similarly, low-income women were 1.25 times more likely to become distressed than those who were not low income (Orpana, Lemyre, & Gravel, 2009).

This relationship between low income or low SES and mental disorders has not been as clearly demonstrated in the Canadian military population, partially due to the fact that members of the military differ from their civilian counterparts with respect to wages. Prior to 1996, Canadian Forces (CF) personnel were paid less than their public service counterparts. However, the Canadian government determined that the distinctive work conditions and responsibilities attributed to military service (i.e. loss of personal freedom, frequent postings, and prolonged periods of separation from family in addition to occupational factors such as excessive overtime, hazardous conditions, and combat exposure (Sudom, Dursun, & Flemming, 2006; SCONDVA, 1998)) warranted increased compensation. Accordingly, Veterans Affairs Canada (VAC) sought to increase wages for CF personnel to account for the “military factor” and at a minimum, to equal the remuneration of those in equivalent Canadian public service positions. Less than five years after the implementation of this initiative, the annual income of military personnel exceeded that of the comparable full-time working civilian population (Park, 2008). In 2002, the median personal annual income of men in service was \$50,000 compared to \$40,000 for civilians in equivalent professions (Park, 2008). Despite the relatively rapid increases in pay standards, there is currently no research investigating the potential impact of this shift in pay standards for military personnel on mental health outcomes.

The research available on the potential association between income and mental health in the active duty military population is sparse and the majority of research investigates income as a covariate. The available research from the U.S. focuses on the importance of employment, particularly meaningful employment, in moderating mental health following repatriation from conflict (Burnett-Ziegler, et al., 2011; Davis et al., 2012; Elbogen, et al., 2012). As would be expected, these studies suggest that meaningful and consistent employment does impact mental health outcomes in military personnel. Job loss has also been associated with depression in returning reservists (Riviere et al., 2011; Harvey et al., 2011). Although employment is a factor in SES and a contributor to income, it is not synonymous with income.

One study investigating income as a covariate in the association between job stress and mental disorder prevalence in Brazilian military personnel found that those personnel that perceived their job to require high effort but offer low rewards were more likely to meet screening criteria for mental disorders (Martins & Lopes, 2012). In U.S. army reservists, experiencing financial difficulties following repatriation from conflict was also uniquely associated with both depression and PTSD (Riviere et al., 2011).

To our knowledge, there is currently no published literature investigating income as the primary independent variable (rather than as a covariate) and mental disorders in active Canadian military personnel. This dearth of research in the area is problematic with respect to the mental health of military personnel; an understanding of the effect of low income on active Canadian Forces personnel is key to developing policies and programs that may help reduce the incidence of mental disorders in this population (Mikkonen & Raphael, 2010). The increased income in the CF as a result of the income policy implemented in 1996 may in fact be ineffective in offsetting the impact of the “military factor” on mental health outcomes. Therefore, this study aims to

determine if the association between household income and mental disorders in military personnel parallels that found in the general population despite the increased income of the former. There are two primary research questions for this study:

- (1) Do the associations between household income and mental disorders (including major depressive episodes, panic disorder, panic attacks, social phobia, suicide ideation, suicide attempts, alcohol dependence, and heavy alcohol use) in the Canadian military population parallel those found in the general population?
- (2) Do the associations between household income and mental disorders differ between regular and reserve force personnel?

Answers to these questions will help to establish whether mental disorders in the military (and more specifically regular or reserve force) are more strongly associated with general socioeconomic factors or with other factors specific to military service.

Method

Sample: The CCHS-CFS (n=5,155 regular force; n=3,286 reserve force) is a large and representative sample of military personnel ages 16-64 in the Canadian Forces. Statistics Canada and the Department of National Defence (DND) collected the survey between May and December of 2002. Ensuring accurate representation of the Canadian Forces population was accomplished through the use of a multistage sampling design. Regular versus reserve membership was the first sampling stage. The second stage stratified by both sex and rank (collapsed to junior, senior, and officer). In this stage, due to smaller cell sizes, women were stratified into only two groups: junior personnel versus a further collapsed category of senior personnel/officers. The third sampling stage stratified by region (Atlantic, Quebec, Ontario,

Prairies) and type of military environment (air, land, sea, communications). Face-to-face interviews were conducted with respondents in on-base rooms by trained lay interviewers from Statistics Canada. The overall response rate was 79.5% for regular force personnel and 83.5% for reserve force personnel (Statistics Canada, *CCHS-CFS*, Retrieved September 30th, 2012).

The CCHS-1.2 is the parallel survey that was conducted in the general population. The CCHS-1.2 is also a cross-sectional, nationally representative survey of Canadians aged 15 and older. Statistics Canada conducted the survey over eight months, beginning in May 2002. The final sample for the CCHS-1.2 included 36,984 individuals living in private dwellings in the ten Canadian provinces (response rate 77%). Again, a multistage sampling frame was employed and the datum is representative of the general population at the provincial level. The populations not included in the survey were residents of the Canadian territories, Indian Reserves, Crown Lands, or institutions, members of the Canadian Forces, and residents of certain remote regions. Computer-assisted telephone interviews were employed to obtain the data (Statistics Canada, *CCHS*, Retrieved September 30th, 2012).

Data for the CCHS-CFS and the CCHS-1.2 were collected using nearly identical methodologies based on the World Mental Health Organization Composite International Diagnostic Interview (WMH-CIDI; World Health Organization (WHO), 2001), allowing for direct comparison between the two samples. To further equalize the comparison, the CCHS-1.2 was restricted to the narrower age range of the CCHS-CFS (16-64 years). The two datasets were then merged together to create one dataset with comparable measures. With the restricted age range applied to the general population, the final sample size for the merged dataset was $n=37,129$.

Measures

Income: Participants in both surveys were first asked to estimate their total household income. They were then asked to identify the appropriate range into which their household income fell and were queried in \$10,000 increments (i.e. “Is your total household income between 20,000 and 30,000 dollars annually?”). This method of questioning more than once and in multiple formats has been shown to substantially improve response rates (Duncan & Petersen, 2001). For these analyses, income was categorized in decreasing \$5,000 increments, beginning at \$100,000. The reference category is defined as all those who had a household income of \$100,000 or more and all other categories identify those who made \$5,000 less than \$100,000 progressively (i.e. \$95,000, \$90,000, \$85,000, et cetera decreasing to \$0).

Low income was also assessed using the Low Income Cut-Offs (LICOs) established by Statistics Canada (Income Statistics Division, 2006). LICOs indicate the household income level at which a family may be in impoverished circumstances because it has to spend a greater proportion of its income on necessities than the average family of comparable size. In calculation of the measure, LICOs account for family size, community size, and urban or rural location (Orpana, Lemyre, & Gravel, 2009). However, only 2% of military population fell below the LICO, resulting in cell sizes that were too small to report and the model was dropped from the analysis.

Mental Disorders: Mental disorders were assessed and diagnosed using the World Mental Health – Composite Diagnostic Interview (WMH-CIDI; WHO, 2001) and based on criteria from the American Psychiatric Association’s Diagnostic and Statistical Manual, version IV Revised (DSM-IVR; APA, 2000) and the International Classification of Diseases, 10th revision (ICD-10; WHO, 2011). The WMH-CIDI is a structured interview intended for use by lay interviewers.

The instrument has been shown to have high ratings of consistency and reliability (Kessler & Ustun, 2004). The WMH-CIDI was administered by lay interviewers from Statistics Canada who had been trained to World Health Organization standards. The mental disorders that were included in both the CCHS-CFS and the CCHS-1.2 were major depressive episodes, social phobia, panic disorder, and panic attacks. Post-traumatic stress disorder (PTSD) and generalized anxiety disorder (GAD) were assessed in the CCHS-CFS only. To maintain consistency with previous research, only past-year mental disorders (rather than lifetime) were assessed in this analysis (Belik et al., 2010; Sareen et al., 2007). DSM-IVR alcohol dependence was also assessed with the CIDI Short Form, where the presentation of three or more of the criterion symptoms was assigned a diagnosis. In accordance with previous studies (Sareen et al., 2007) a heavy alcohol use variable was also created. Past-year HAU was identified by using the following question: “How often in the past 12 months have you had five or more drinks on one occasion?” and participants were able to choose from the following responses: 1) never, 2) less than once a month, 3) once a month, 4) 2–3 times a month, 5) once a week, or 6) more than once a week. This variable was then dichotomized, with those respondents endorsing “never” or “less than once a month” classified as low use, and the remaining respondents classified as heavy use.

Respondents were also asked about suicidal ideation and suicide attempts within the past-year. Suicidal ideation was assessed with the following question: “In the past 12 months, did you seriously think about committing suicide or taking your own life?” Suicide attempts were then assessed by querying whether the individual had “attempted suicide or tried to take [their] own life” in the past 12 months.

Sociodemographic Variables: Sociodemographic characteristics were included as covariates in the adjusted statistical models. All sociodemographic variables were categorized

according to previous research with these two datasets (Belik et al., 2010; Sareen et al., 2007). Sex was controlled for in both population groups. Age and number of persons in the household were examined as continuous variables. Marital status was coded as a three-level variable (married/common-law, divorced/separated/widowed, and never married). Education was also coded as a three-level variable (less than high school diploma, high school diploma or equivalent, and greater than high school). Employment status was initially included in the model, coded as a three-level variable for the general population (unemployed, employed, and unable to work) and all respondents in the CCHS-CFS sample identified as employed. This was deemed an appropriate approach given that active-serving military are employed by definition of their service. In addition, the two primary employment survey questions “did you work at a job or business last week?” and “did you have a job from which you were absent last week?” accounted for the entire CFS sample. Finally, the military sample was investigated as a whole as well as stratified by force (regular versus reserve force).

Data Analysis

All statistical analyses were conducted using STATA version 12 (StataCorp, 2011), using the appropriate weights provided by Statistics Canada. Estimates of variance were conducted by using bootstrapping to account for the complex sampling procedures employed in the survey implementation. Bootstrapping derives an approximate form of the parameter estimates by resampling with replacement from the study sample and then computing the estimates from the multiple samples. Bootstrapping is the recommended variance estimation technique by Statistics Canada (Bailie, Dufou, & Hamilton, 2002).

Due to the disparity in household income quartiles between the military population (median = \$75,000) and the general population (median = \$40,000), rather than create arbitrary categories, household income was coded into \$5,000 increments, decreasing from \$100,000. Household income above \$100,000 was used as the reference category. All variables in the regression analysis (household income, mental disorders and covariates) were first analyzed to estimate potential correlation among the variables. No multicollinearity problems were detected. However, employment was found to have a very small effect in the models and was removed to reduce unnecessary restriction of the models. The dataset was first stratified by population group (general population, CF as a whole, and regular and reserve force personnel). Multiple bivariate logistic regressions between household income and each individual mental disorder, alcohol dependence, HAU, and suicide ideation and attempts were then conducted. These regressions were then repeated including covariates in the model (age, sex, marital status, education, and household size). Finally, the analyses conducted in the active military population were repeated stratifying by sex in addition to population group. However, the repeated stratification resulted in significantly reduced sample sizes, resulting in regressions that could not be computed and for the regressions that did produce outcomes, only two significant relationships remained after controlling for covariates. All analyses were completed using the merged dataset.

Results

Table 1 presents the demographic characteristics of the sample. The military and general population samples differ on a number of factors. First, although the range was the same (\$0 to \$500,000), the mean income for the military sample (\$74,300) was higher than the mean income for the general population (\$67,775). The military sample had a higher proportion of males

(85.3%) than the general population (50.0%). In addition, the military sample was younger ($\mu=33.97$ years versus $\mu=39.2$ years) and more educated (91.7% had a high school education or greater versus 80.1%) than the general population. The distribution over marital status categories was similar across the military and general population samples with the majority of participants indicating that they were married or living common law in both the military population (63.0%) and the general population (63.4%). The range in total household size was smaller in the military population (range=1-11) than in the general population (range=1-16) although the mean household size in the two populations was not significantly different ($\mu=2.90$ for the military versus $\mu=3.16$ for the general population).

Table 1

Weighted Prevalence of Sociodemographic Characteristics for the Canadian Forces and General Population Samples

Covariates	Military Population (n=8,441) weighted % (SE)	General Population (n=28,688) weighted % (SE)
Sex		
Male	85.3 (0.14)	50.1 (0.02)
Female	14.7 (0.33)	49.9 (0.02)
Education		
Less than secondary school	8.3 (0.34)	19.9 (0.02)
Secondary school or equivalent	29.3 (0.30)	20.1 (0.02)
Greater than secondary school	62.4 (0.22)	60.0 (0.01)
Marital Status		
Married/Common Law	63.0 (0.22)	63.4 (0.01)
Divorced/Separated/Widowed	7.4 (0.35)	9.1 (0.02)
Single/Never Married	29.6 (0.30)	27.5 (0.02)
Low Income Cut-Off		
Above LICO	98.0 (0.05)	83.8 (0.01)
Below LICO	2.0 (0.36)	9.3 (0.02)
Employment Status		
Employed		68.5 (0.01)
Unemployed		29.4 (0.02)
Unable to Work		2.1 (0.02)
<hr/>		
Continuous Measures	Mean (95% CI)	Mean (95% CI)
Age	33.97 (33.79-34.14)	39.20 (39.10-39.31)
Number of People in Household	2.90 (2.87-2.93)	3.16 (3.14-3.19)
Income	\$74,300 (73,521-75,082)	\$66,775 (65,715-67,835)

The prevalence of mental disorders in the military sample has been previously published (see Sareen et al., 2007) and the results of this study align with these reported figures. However, the prevalences presented in Table 2 for the general population are different than those

previously published due to the restricted age range used in these analyses. When examining the overall prevalences for the mental disorders investigated, with the exception of alcohol dependence and heavy alcohol use, prevalences of mental disorders were relatively similar between the age-matched populations.

Table 2

Weighted prevalence of mental disorders in the Canadian military and general population samples

Condition	Military Population weighted prevalence (SE)	General Population weighted prevalence (SE)
Major depressive episode	6.9% (0.35)	5.3% (0.02)
Panic attacks	8.9% (0.35)	8.8% (0.02)
Panic disorder	1.8% (0.36)	1.7% (0.02)
Social phobia	3.2% (0.35)	3.4% (0.02)
Suicide ideation	3.8% (0.35)	4.0% (0.02)
Suicide attempts	0.2% (0.36)	0.6% (0.02)
Alcohol dependence	4.8% (0.35)	3.1% (0.02)
Heavy alcohol use	34.2% (0.30)	24.4% (0.02)
Post-traumatic stress disorder	2.3% (0.36)	-
Generalized anxiety disorder	1.7% (0.36)	-

Table 3 presents the unadjusted and adjusted odds ratios for household income and each mental disorder, suicide ideation and attempts, alcohol dependence and HAU. PTSD and GAD are also included for the military population. The ratios identify the odds of having a given mental disorder in declining \$5,000 increments beginning at \$100,000. For example, for every \$5,000 less than \$100,000 an individual in the regular forces earns, he or she is 1.03 times more likely than an individual who earned \$100,000 or more to have had a past-year major depressive episode. When controlled for sociodemographic variables, this odds ratio declined to 1.00 and lost statistical significance. In the military population as a whole, only the associations between

household income and major depressive episodes, alcohol dependence, HAU, and suicide ideation were statistically significant at the $p \leq 0.05$ level. After controlling for sociodemographic variables, no statistically significant associations remained. When stratified by force, associations between household income and major depressive episodes, alcohol dependence, HAU, and suicide ideation were statistically significant in regular force personnel. Only suicide ideation was statistically significant in reserve force personnel. After controlling for age, sex, education level, marital status and household size, no statistically significant associations between household income and mental disorders remained for regular or reserve force groups.

In the Canadian general population sample, household income was statistically significantly related to at least the $p \leq 0.05$ level to all past-year mental disorders with the exception of alcohol dependence and HAU. After controlling for sociodemographic variables (age, sex, education level, marital status and household size), associations between household income and past-year major depressive episodes, panic disorder, suicide ideation and suicide attempts remained statistically significant.

Table 3

Unadjusted and adjusted odds ratios for household income and mental disorders in the regular status, reserve status, Canadian military and general population

Past Year Mental Disorder	Adjusted for Covariates ^b	Income by Sample Group ^a			
		Regular Force OR (95% CI)	Reserve Force OR (95% CI)	Whole CF OR (95% CI)	General Population OR (95% CI)
Major Depressive Episode	No	1.03 (1.00, 1.05)*	1.03 (1.00, 1.07)	1.02 (1.00, 1.04)*	1.07 (1.05, 1.08)***
	Yes	1.00 (0.97, 1.04)	1.01 (0.97, 1.06)	1.02 (0.99, 1.04)	1.04 (1.02, 1.05)***
Panic Attacks	No	1.00 (0.98, 1.03)	1.00 (0.98, 1.03)	1.00 (0.98, 1.02)	1.03 (1.01, 1.04)***
	Yes	0.99 (0.96, 1.02)	0.99 (0.96, 1.02)	0.99 (0.97, 1.01)	1.01 (1.00, 1.02)
Panic Disorder	No	0.97 (0.93, 1.03)	1.01 (0.95, 1.08)	0.98 (0.94, 1.02)	1.06 (1.03, 1.09)***
	Yes	0.94 (0.89, 1.00)	1.01 (0.94, 1.08)	0.97 (0.93, 1.02)	1.04 (1.01, 1.07)**
Social Phobia	No	1.03 (0.99, 1.07)	1.02 (0.97, 1.07)	1.02 (0.99, 1.05)	1.03 (1.01, 1.05)***
	Yes	1.03 (0.98, 1.08)	1.01 (0.95, 1.08)	1.03 (0.99, 1.06)	1.01 (0.99, 1.03)
Suicide Ideation	No	1.04 (1.01, 1.08)*	1.05 (1.01, 1.09)*	1.04 (1.01, 1.06)**	1.08 (1.06, 1.10)***
	Yes	1.01 (0.97, 1.06)	1.03 (0.98, 1.09)	1.02 (0.99, 1.05)	1.06 (1.04, 1.07)***
Suicide Attempts	No	-	-	1.07 (0.99, 1.17)	1.13 (1.06, 1.21)***
	Yes	-	-	1.04 (0.94, 1.15)	1.08 (1.02, 1.14)**
Alcohol Dependence	No	1.16 (1.11, 1.21)***	1.02 (0.98, 1.05)	1.10 (1.07, 1.13)***	1.02 (1.00, 1.03)
	Yes	1.03 (0.98, 1.08)	0.98 (0.94, 1.02)	1.01 (0.98, 1.04)	1.00 (0.98, 1.02)
Heavy Alcohol Use	No	1.06 (1.05, 1.08)***	1.01 (1.00, 1.03)	1.05 (1.03, 1.06)***	1.00 (0.99, 1.01)
	Yes	1.00 (0.98, 1.02)	0.98 (0.96, 1.00)	0.99 (0.98, 1.01)	0.99 (0.97, 1.00)
PTSD	No	1.02 (0.98, 1.06)	1.03 (0.96, 1.10)	1.02 (0.98, 1.05)	-
	Yes	1.01 (0.95, 1.06)	1.02 (0.93, 1.12)	1.01 (0.97, 1.06)	-
GAD	No	0.99 (0.94, 1.04)	1.06 (1.00, 1.13)	1.00 (0.96, 1.04)	-
	Yes	0.95 (0.89, 1.01)	1.05 (0.98, 1.13)	0.99 (0.94, 1.04)	-

^a Reference value for all sample groups is household income of \geq \$100,000

^b Covariates include age, sex, marital status, education, and number of people in the household

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Discussion

In the Canadian general population sample, household income was statistically significantly related to major depressive episodes, panic attacks, panic disorder, social phobia, suicide ideation and suicide attempt. These findings align with previous research that suggests that low household income is associated with mental disorders in the Canadian general population. Although previous studies have identified associations between poverty and various mental health conditions, this study provides strong support to the argument that household income, as a gradient measure, is associated with specific mental disorders through the use of a standardized diagnostic instrument rather than self-report or administrative data.

This identified relationship between income and psychological disorders found in the general population is posited to be the result of the social impact of income on health. Research into the social determinants of health suggests that low income predisposes people to social deprivation and that the greater the deprivation, the less likely individuals and families experiencing low income are to be able to afford prerequisites to good health (Gunasekara, Carter, Crampton, & Blakely, 2013; Mikkonen & Raphael, 2010). With respect to psychological health, this deprivation may be interpreted as social exclusion; individuals with reduced income are excluded from educational, cultural, and recreational activities that facilitate good mental health and protect against the development of mental disorders.

A novel finding of this study is that a parallel relationship to the general population between household income and all other identified mental disorders is not observed in the Canadian Forces population, either as a whole, or when stratified by regular and reserve force. Despite the results not being statistically significant, they offer important interpretive insight with respect to the discussion of household income and mental disorders in the Canadian Forces.

The adjusted odds ratios presented for the three military groups are in the expected positive direction (i.e. decreasing income is associated with increasing odds of a mental disorder) for all mental disorders with the exception of panic attacks in the reserve forces and panic disorder and generalized anxiety disorders in the regular forces. With the exception of these three instances, these results would suggest that the minimum income provided by military service is still sufficient to be protective against mental disorders. In economic literature, this is often referred to as a “ceiling effect,” or the lowest point above which income no longer has an effect on the variable of interest (Pollin, Brenner, Wicks-Lim, & Luce, 2008). In essence, even at the lowest end of the scale, it appears that the income provided by military service means that military personnel are not subject to the deprivation that may lead to mental disorders experienced by individuals in the general population.

Other elements of military service may also be protective against mental disorders by preventing social deprivation through military cohesiveness and social connectedness (Pietrzak et al., 2010). A large body of research suggests that individuals who are more socially connected, whether with peers or family members, are less likely to present with mental disorders (Easterly, Ritzen, & Woolcock, 2006; Fergusson, Beautrais, & Horwood, 2003). The majority of military systems actively promote group cohesion as it is seen as paramount to successful functioning of troops (Griffith, 2002; Siebold, 2006). Therefore, it is possible that members of the military are less susceptible to the effects of lower household income because of the protective effect of being connected to their military peers.

A third interpretation for the lack of statistically significant results in the military population is the hypothesized “healthy soldier effect.” This hypothesis posits that military personnel are typically healthier, both physically and mentally, than their civilian counterparts as

a result of the requirements for personnel in active service (Wilson et al., 2009). In addition, mental training programs provided to military personnel while in service, such as Road to Mental Readiness (R2MR), may further maintain this mental health advantage (Government of Canada, Canadian Forces, *R2MR*, Retrieved September 1st, 2013). This effect may also precipitate the exit of unhealthy military personnel, meaning that those who do develop mental health problems while in service are less likely to remain in this specialized population group. Furthermore, the selection process for military service may effectively exclude those individuals who are at risk for experiencing poor mental health prior to enlistment; military personnel are recruited on the basis of physical and mental health criteria that should make these individuals less susceptible to psychological distress than the general population (McLaughlin, Nielsen, & Waller, 2008).

There are several income-related factors that should be considered in interpreting these results; first, the disparity between income in the military (median=\$75,000) and the general population (median=\$40,000) was significant. Previous research by Kahneman and Deaton (2010) identified the “income ceiling” to be \$75,000 in the U.S. general population. Their results indicated that for people who earn less than \$75,000 annually, individual temperament and life circumstances are less influential in emotional well-being than money. It is possible that the value of \$100,000 used as the reference value was not appropriate for both populations. Furthermore, the role of military service as a life circumstance may be significantly more influential, resulting in a lower income ceiling in this specialized population.

A second income factor that must be considered is that only 2% of the military sample fell below the Low Income Cut-Off (LICO: a Statistics Canada measurement of poverty that accounts for economies of scale) versus 9.3% of the general population. As noted, research consistently indicates that low-income is associated with an increased risk of mood and anxiety

disorders as well as suicide ideation and attempts (Sareen et al., 2011; McMillan et al, 2010). Furthermore, international research suggests that poverty and mental ill-health interact in a negative and relatively inextricable cycle (i.e. once individuals experience mental health problems and low income, these conditions tend to persist; Lund et al., 2011; Strohschein, 2005). The disparity between the two samples with respect to poverty levels may have impacted the results of this study.

Employment as an element of income must also be considered. Initially, employment status was included in the model, coded as a three-level variable for the general population (employed, unemployed, and unable to work) and all respondents in the CCHS-CFS sample identified as employed. This was deemed an appropriate approach given that active-serving military are employed by definition of their service. In addition, the two primary employment survey questions “did you work at a job or business last week?” and “did you have a job from which you were absent last week?” accounted for the entire CFS sample. The patterns with respect to directionality and significance of the odds ratios remained consistent between models including employment status in the general population and those that did not (major depressive episodes, panic disorder, and suicide attempts showed decreased statistical significance with the inclusion of employment in the model). However, it is possible that the measure of employment used was not sensitive enough and that the 100% employment rate of the military sample group did indeed confer additional benefits to this group, particularly with respect to the perception of one’s employment as being meaningful. Many military personnel identify service as a calling or vocation, inherently giving it meaning (Siebold, 2006). Previous research looking at employment as a predictor of mental health outcomes in military personnel and veterans has identified meaningfulness (both in terms of quality relative to one’s qualifications and personal value) of

employment as a significant factor (Burnett-Ziegler, et al., 2011a; Davis et al., 2012; Elbogen, et al., 2012).

Finally, the gender imbalance found in the military population as compared to the general population must also be considered. As a factor in household income, men in Canada make more money than women; women in Canada typically earn \$0.71 for every \$1.00 that men earn (Parliament of Canada, *Wage Gap Between Men and Women*, Accessed 31-Jan-14). Although women in the Canadian military are paid at a standardized rate for their profession and are unlikely to be underpaid in comparison to women in the general population, overall females in the military still have lower income than males (Park, 2008).

To further investigate the potential implications of gender, additional analyses stratifying by sex were also conducted. However, the repeated stratification resulted in significantly reduced sample sizes in the military, resulting in regressions that could not be computed. Only two relationships with household income remained statistically significant in the military population; generalized anxiety disorder in men in the reserve force had an adjusted odds ratio of 1.11 (CI= 1.02-1.20, $p \leq 0.05$) and alcohol dependence in women in the regular force had an adjusted odds ratio of 1.15 (CI= 1.03-1.29, $p \leq 0.05$). Research indicates that mental disorders are more prevalent in deployed personnel than non-deployed (Belik et al., 2009; Black et al., 2004; Kelley et al., 2013). With respect to GAD in reserve force men, U.S. research showed that predeployment psychiatric difficulties were strongly associated with the development of anxiety disorders postdeployment, independent of combat exposure while deployed (Black et al., 2004). However, with respect to alcohol use in regular force women, recent research with U.S. female veterans indicates that non-combat related traumatic events cease to predict alcohol misuse once combat exposure is accounted for (Hassija et al., 2012). These two different outcomes with

respect to gender may suggest that men and women enter the military with different vulnerabilities to mental health outcomes and predispositions toward coping skills. These two significant results may also have been attenuated if sample sizes allowed for the inclusion of previous deployment or deployment-related traumatic events as a covariate.

Although previous research with this dataset has investigated the prevalence of mental disorders and suicide in the Canadian Forces sample as a whole (Belik et al., 2010), in its annual research studies, Canadian Forces Health Services Group (2010) argues that there are significant differences between regular and reserve status personnel with respect to health and therefore investigates the two groups separately. This study supports that assertion, particularly with respect to alcohol dependence and HAU; regular and reserve forces behaved differently with respect to these two outcomes. Often referred to as “citizen-soldiers,” reserve soldiers exhibited different patterns (patterns that more closely resembled those found in the general population) with respect to alcohol dependence and heavy alcohol use and combining the two groups simply “watered down” the stronger effects seen in regular force personnel.

There are several limitations that need to be considered in this study. First, the cross-sectional nature of the surveys does not allow for the examination of causal relationships between household income and mental disorders. This study was not intended to be an analysis for causality and although previous research supports the position that income precedes the development of mental disorders, it is possible that the relationship runs in the opposite direction and that mental disorders precede income. Second the relationships (or lack thereof) identified may be spurious and/or influenced by other variables not considered in the analysis. For example, it is possible that employment, particularly meaningful employment, has a greater impact than was reflected in the models. Third, the data for the CCHS-1.2 and CCHS-CFS

surveys was collected in 2002. Given that the data was collected a number of years ago, it may not be generalizable to current military personnel.

Despite these limitations, this study still has value; the large sample size and positive response rate, the active duty nature of the sample, and the assessment of mental disorders with a standardized diagnostic instrument speak to the validity of the results. Furthermore, the results presented will be particularly important to future investigations of income and mental disorders in the Canadian Forces, providing a point of reference. Comparisons of these results with the next wave of the CCHS-CFS (expected to be released in late-2014) will provide valuable insights into potential changes in the household income – mental disorder association over time.

Conclusion

Although there remains a need for further investigation of this topic, this study is an important contribution to existing literature focusing on income and mental disorders in the military population. The results of this study would suggest that the association between household income and mental disorders in military personnel does not parallel the association found in the general population. Although the adjusted odds ratios presented for the three military groups suggest that decreasing income is associated with increasing odds of a mental disorder, there is no statistically significant gradient association between household income and mental disorders in the Canadian military population as a whole or by sub-sample of regular and reserve status.

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Chapter Six: STCL Manuscript

Household income, satisfaction with finances, and mental health conditions in a nationally representative sample of Canadian veterans

Kristen Klassen, Elizabeth Ready, Tracie Afifi, Juliette Cooper, & Jitender Sareen

Abstract

Objective: To examine associations between household income and satisfaction with finances and negative mental health conditions (i.e., suicide ideation, suicide attempts, posttraumatic stress disorder (PTSD), heavy alcohol use (HAU), and anxiety and mood disorders) in Canadian Forces veterans.

Method: Participants were selected from the Survey on Transition To Civilian Life (STCL; n = 3154, response rate = 71%) conducted by Statistics Canada and Veterans Affairs Canada in 2010. Mental health conditions were self-reported conditions diagnosed by a health professional and that had persisted or were expected to persist for longer than six months. Income was divided into quartiles and cross-tabulations were calculated to determine the proportion of individuals in each quartile who self-reported a diagnosis of a mental health condition or endorsed suicidal ideation or attempts. Differences in prevalence of mental health conditions in each quartile were then examined by employing multiple logistic regression analyses adjusted for age, sex, marital status, education, number of people in the household, military rank at time of release, branch at release, years since release, and previous deployment. A second set of analyses was conducted using satisfaction with finances as an independent

variable. The third set of analyses investigated the effect of an interaction term between household income and satisfaction with finances on mental health conditions.

Results: Being in the lowest income quartile was strongly associated with mental health conditions in Canadian veterans (adjusted odds ratios (AORs) ranged from 0.63 to 3.01). Associations between lower income and suicide ideation, PTSD, any anxiety disorder, any mood disorder, and any mental health condition were statistically significant to at least the $p \leq .05$ level. Being dissatisfied with finances was also strongly associated with mental health conditions (AORs ranged from 0.88 to 3.61). When also controlled for household income, adjusted odds ratios for dissatisfaction with finances declined slightly (ranged from 1.00 to 3.04) but remained statistically significant.

Conclusions: Findings suggest that both household income and satisfaction with finances are associated with increased odds of mental health conditions in Canadian veterans. However, income and satisfaction with finances as an interaction term appear to have an effect only with respect to the categories of “any mood disorder” and “depression or anxiety.” Possible explanations for this outcome and potential implications for Canadian forces veterans are discussed.

Background

The recent economic recession has reignited the debate about the relationship between income and happiness. The Easterlin Paradox, an integral concept in this debate, suggests that although wealthier people overall report greater happiness, once income is sufficient to meet the basic needs, happiness does not continue to increase with income (Easterlin, 2010). Yet the majority of individuals in developed countries where basic needs are met still devote a

substantial amount of time and energy to the pursuit of money and wealth (Ahuiva, 2008). This may be in part due to the fact that relative income (i.e. one's income relative to that of his/her social counterparts rather than one's absolute income) plays an important role in the determination of individual well-being. Zimmerman and Bell (2006) argue that the primary pathway between income and well-being is through invidious comparisons to individuals of higher income; individuals who perceive themselves as having less income than their social counterparts tend to pursue money more vigorously, causing themselves undue stress and experiencing more negative health outcomes as a result. In turn, these individuals tend to experience the "financial treadmill" in which aspirations of greater wealth rise with income and inevitably are never attained leaving them more unhappy than their counterparts (Bok, 2010). Some studies suggest that satisfaction with finances (Diener & Biswas-Diener, 2002) and perceptions of income inequality (Bjørnskov et al., 2013) better predict happiness than income alone. In addition, there is evidence to suggest that financial satisfaction is of greater importance in lower income brackets (Okulicz-Kozaryn, 2012).

The increased attention to the importance of income is not limited to the discussion of happiness alone; the majority of large cross-sectional epidemiologic studies conducted with the general population suggest that low household income is associated with negative psychological outcomes such as depression (Economou et al., 2013; Lamberg et al., 2010; Shields, 2006; Zimmerman & Katon, 2005) and anxiety (Fryers, Melzer, & Jenkins, 2003; Stansfeld et al., 2011). The majority of studies also indicate an increased risk of suicidal ideation and attempted suicide in low-income individuals (Lorant, et al., 2005a; McMillan et al., 2010; Nandi et al., 2012). These results have been validated across a variety of cultures and countries (Lorant et al., 2005a; Lorant, et al., 2005b; Soeters, 1997).

However some sub-cultures may warrant focused investigation. In the military there are two primary reasons for this; first, some research suggests that the culture of the military may well lend itself to an increased incidence of mental disorders (Blais & Renshaw, 2013; Keeling et al., 2012). Second, in hierarchical systems such as the military, the impact of social comparison may be of greater importance than in non-hierarchical systems as income is so readily apparent. In the Canadian Forces, members of the military are paid first by rank then by specific occupation, meaning income rises with military rank (Park, 2008). In addition, members receive a pay increase every year on the anniversary of their enlistment date (Canadian Forces, *Pay Rates*, Retrieved January 21st, 2013) and veterans receive a superannuation annuity after 20 years of service (Paré, 2011b) meaning that income also rises with length of service. Thus individuals of lower rank and with shorter terms of service may be acutely aware of their own diminished income.

The average age of release from the Canadian Forces is quite young (39 years; Veterans Affairs Canada, *General Statistics*, Retrieved January 7th, 2014) and therefore, discharge from the military does not lead predictably to retirement. However, for veterans of the Canadian Forces, despite programming and policy to support transition to civilian life financially, income typically declines following discharge. If a veteran earns an average income of \$63,000 in his or her final year of service, she or he can expect to earn \$57,000 in the year following discharge. Once back in civilian life, veterans need an average of six years to reach their pre-release income (MacLean et al., 2011b). Therefore, veterans may not only be aware of the disparity in their income relative to others in their profession, but they may also be less satisfied with their income relative to their own previous earnings.

Research into the potential roles of absolute income and relative income in mental health conditions has received limited attention within military and veteran samples. Studies in these populations tend to focus on trauma-exposure as a predictor of mental disorders (see Sareen et al., 2007 or Sareen et al., 2010 for examples). Both household income and satisfaction with finances have been shown to be predictive of mental disorders in the general population; it is possible that the same relationship would exist in the veteran population. To our knowledge, no current studies have investigated household income and satisfaction with finances concurrently in the Canadian veteran population. There are three research questions for this study:

- (1) Is there an association between household income and mental health conditions in Canadian veterans?
- (2) Is satisfaction with finances associated with mental health conditions in Canadian veterans?
- (3) Does satisfaction with finances influence the association between household income and mental health conditions in this population?

Method

Sample: The Survey on Transition To Civilian Life (STCL; n = 3154, response rate =71%) was one of four surveys conducted as part of the Life After Service Study (LASS; MacLean et al., 2010). Administrative data from the Department of National Defence was used to develop the population frame. The sample consists of Regular Force personnel who were released from service between 1998 and 2007 and excludes those who re-enlisted or were still serving at the time of the interview, individuals living in institutions, the Territories, or outside of Canada. To ensure representation of the population, the sample was stratified by veterans who received

services from Veterans Affairs Canada (VAC) under the New Veterans Charter (NVC), veterans who received services from VAC prior to the implementation of the NVC, and veterans who were not clients of VAC. Statistics Canada conducted the STCL via computer-assisted telephone interviews between February and March 2010 (MacLean et al., 2010).

Income: Income was measured using two direct questions: “can you estimate your total household income during the year ending in December 31st, 2009” and “was your total household income during the year ending in December 31st, 2009 between \$50,000 and \$60,000?” In maintaining consistency with previous studies and to ensure sufficient sample size for statistical analysis income as a continuous variable was then divided into quartiles (\$59,000 or less, \$60,000 to \$84,000, \$85,000 to \$125,000, and \$126,000 or greater) based on the distribution of the sample. This method of income division has been used in several peer-reviewed journal articles (Agerbo, 2007; McMillan et al., 2010; Sareen et al., 2011). Satisfaction with finances (SWF) was also assessed by direct question: “How satisfied are you with your current financial situation?” Five responses were possible (“very dissatisfied,” “dissatisfied,” “neither dissatisfied nor satisfied,” “satisfied,” and “very satisfied”). These responses were collapsed to a dichotomous variable of satisfied or dissatisfied to maintain consistency with previous research in the economic literature (Lora & Chaparro, 2008).

Mental Health Conditions: Respondents were asked to think only about conditions diagnosed by a health professional and that had persisted or were expected to persist for longer than six months. The survey then asked respondents four specific questions related to mental health: (1) “Do you have depression or anxiety;” (2) “Do you have post-traumatic stress disorder;” (3) “Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or panic disorder;” and (4) “Do you have a mood disorder such as mania, dysthymia, or bipolar

disorder?” An “any mental health condition” variable combining these four questions was also produced for this analysis. In addition, the survey assessed suicide ideation and attempts by asking respondents, “have you ever seriously considered committing suicide or taking your own life?” and “have you ever attempted to commit suicide or tried taking your own life?” This survey used skip logic and if respondents did not endorse suicide ideation they were not queried about suicide attempts. To assess alcohol use, participants were asked “How often in the past 12 months have you had five or more drinks on one occasion?” Participants were able to choose from the following responses: (1) never, (2) less than once a month, (3) once a month, (4) 2–3 times a month, (5) once a week, or (6) more than once a week. To maintain consistency with previous research with this dataset (Thompson et al., 2011b) this variable (heavy alcohol use; HAU) was coded as a two level variable with those respondents identifying “never” or “less than once a month” classified as low use, and all other respondents as heavy use.

Sociodemographic Variables and Military Characteristics: The sociodemographic variables assessed included age, sex, marital status, number of people in the household, education, and employment status. Age, number of people in the household, and years since release were investigated as continuous variables. Marital status was collapsed to three categories (single/never married, married/common law, and divorced/separated/widowed). Education was also collapsed into three categories (less than high school diploma, high school diploma or equivalent, and greater than high school). Employment status was conceptualized as a four-level variable (employed, unemployed, unable to work, not in the labour force). Military factors investigated included military rank as a four level variable (private/recruit, junior non-commissioned member, senior non-commissioned member, and officer), military branch as a three level variable (army, air force, and navy), years since release as a continuous variable, and

previous deployment as a dichotomous variable. Due to the variability of responses, number of deployments was not assessed and deployment was coded as a yes or no variable. Length of service was also initially investigated but was found to be highly correlated with age ($r=0.910$, $p<0.0001$) and was subsequently removed from the final models.

Data Analysis

All statistical analyses were conducted using STATA version 12 (StataCorp, 2011), using the appropriate weights provided by Veterans Affairs Canada Research Directorate. Estimates of variance were conducted by using Taylor Series Linearization (TSL) to account for the complex statistical sampling procedures employed in the survey implementation. Cross-tabulations were first calculated to determine the proportion of individuals in each household income quartile who reported having a mental health condition. Four separate logistic regressions models were assessed to determine the associations between household income quartiles, satisfaction with finances and self-reported mental health conditions: (1) household income quartiles with mental health conditions; (2) satisfaction with finances and mental health conditions; (3) satisfaction with finances controlled for household income and mental health conditions and; (4) an interaction term between household income and satisfaction with finances and mental health conditions. With respect to potential associations between satisfaction with finances and household income, the assumption of lack of multicollinearity in logistic regression was tested and the two variables were deemed independently sufficiently discriminatory and therefore were included in the same model. The regressions were controlled for sociodemographic variables and relevant military characteristics (age, sex, marital status, number of people in the household,

education, employment status, previous deployment, years since release, rank at time of release and military branch).

All associations between household income quartiles and mental health conditions were investigated by comparing the lowest three income quartiles with the highest income quartile and all associations between satisfaction with finances and mental health conditions were investigated with satisfaction with finances as the reference category.

Results

Table 1 provides an overview of the sociodemographic factors included in the analysis. The average age of the veteran was well below the mandatory retirement age in the Canadian Forces of 65. The majority of the sample was male, married or living common-law, had a high school diploma or greater, and was employed. In addition, the majority were non-commissioned members at the time of their discharge and the military branch most represented in the sample was the army. These characteristics closely resemble what is found in the active military population in Canada as well (see Park, 2008 for further details).

Table 1

Prevalence of sociodemographic characteristics in Canadian veterans

Covariates	n (weighted % ± SE)
Sex	
Male	2780 (88.2 ± 0.19)
Female	374 (11.8 ± 0.52)
Education	
Less than secondary school	233 (6.7 ± 0.54)
Secondary school or equivalent	1632 (40.6 ± 0.43)
Greater than secondary school	1285 (52.6 ± 0.39)
Marital Status	
Married/Common Law	2450 (75.6 ± 0.28)
Divorced/Separated/Widowed	340 (9.2 ± 0.53)
Single/ Never Married	363 (15.3 ± 0.51)
Labour Force Status	
Employed	2159 (73.9 ± 0.29)
Unemployed	185 (6.1 ± 0.54)
Not in labour force	673 (17.5 ± 0.51)
Not able to work	135 (2.5 ± 0.55)
Branch	
Army	1570 (48.8 ± 0.46)
Air Force	1004 (31.1 ± 0.40)
Navy	473 (15.7 ± 0.51)
Rank	
Officer	553 (20.5 ± 0.50)
Senior NCM	1045 (28.2 ± 0.47)
Junior NCM	1129 (30.1 ± 0.47)
Private/Recruit	427 (21.2 ± 0.50)
Deployment Outside of Canada	
Yes	2127 (60.0 ± 0.30)
Continuous Measures	
	Weighted Mean (± SE)
Age	43.7 (± 0.23)
Number of People in Household	2.8 (± 0.03)
Years Since Release	6.85 (± 0.06)

Figure 1 illustrates the prevalence of mental health conditions among the four income quartiles. With the exception of HAU, a clear distribution is evident: there is a higher prevalence of mental health conditions in the lowest income quartile and the prevalence declines as income increases.

Figure 1

Prevalence of Mental Health Conditions, Suicidality, and HAU Across Household Income Quartiles

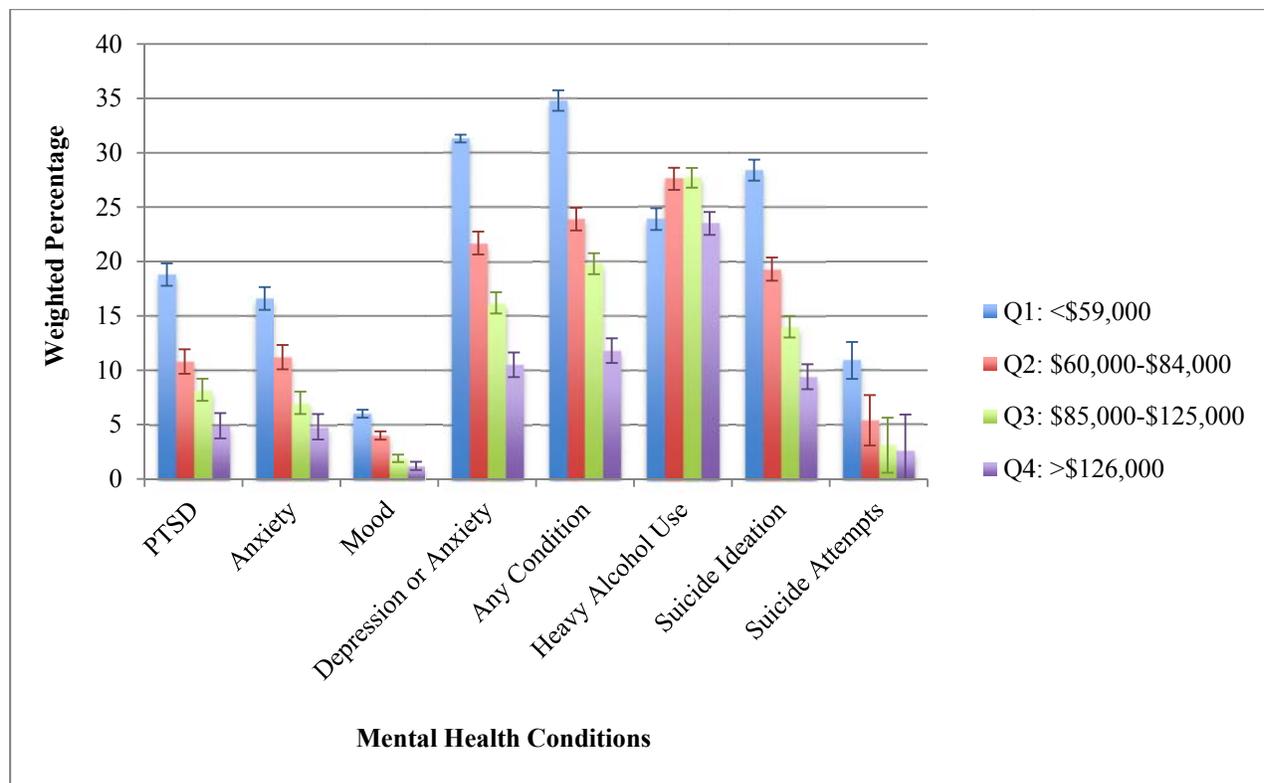


Table 2 presents the adjusted odds ratios for the associations between household income quartiles and the various mental health conditions reported by participants, in two separate models. The first model is controlled for sociodemographic variables and military characteristics. Significant differences were found between the lowest income category and the highest for all

mental health conditions with the exception of suicide attempts. Significant differences were also found between the second lowest income category and the highest for all mental health conditions with the exception of suicide attempts and HAU. The second model controlled for satisfaction with finances in addition to the sociodemographic variables and military characteristics. The adjusted odds ratios for household income quartiles when controlled for satisfaction with finances decline slightly but do not diminish in significance.

Table 2

Adjusted odds ratios for mental health conditions in household income quartiles

Chronic Mental Health Conditions	Adjusted for Satisfaction w/ Finances	Income Quartiles			
		≤\$59,000 AOR (95%CI) ^a	\$60,000-\$84,000 AOR (95%CI) ^a	\$85,000-\$125,000 AOR (95%CI) ^a	≥\$126,000 AOR (95%CI) ^a
PTSD	No	2.92 (1.89-4.51)***	1.95 (1.28-2.97)**	1.42 (0.94-2.15)	1.00
	Yes	2.35 (1.50-3.68)***	1.76 (1.15-2.69)**	1.37 (0.90-2.07)	1.00
Any Anxiety Disorder	No	2.76 (1.69-4.51)***	2.01 (1.23-3.29)**	1.22 (0.76-1.96)	1.00
	Yes	2.11 (1.29-3.47)**	1.79 (1.09-2.92)*	1.16 (0.72-1.87)	1.00
Any Mood Disorder	No	2.99 (1.30-6.90)**	2.35 (1.03-5.40)*	1.29 (0.55-3.02)	1.00
	Yes	2.30 (0.98-5.39)	2.12 (0.94-4.79)	1.26 (0.55-2.92)	1.00
Depression or Anxiety	No	2.88 (2.01-4.10)***	1.88 (1.32-2.66)***	1.43 (1.02-2.00)*	1.00
	Yes	2.16 (1.48-3.15)***	1.67 (1.17-2.37)***	1.39 (0.99-1.95)	1.00
Any Mental Health Condition	No	3.01 (2.14-4.23)***	1.85 (1.33-2.59)***	1.52 (1.11-2.08)**	1.00
	Yes	2.28 (1.59-3.26)***	1.65 (1.18-2.31)**	1.47 (1.07-2.03)*	1.00
Heavy Alcohol Use	No	0.63 (0.45-0.88)**	1.01 (0.73-1.38)	1.06 (0.80-1.41)	1.00
	Yes	0.63 (0.44-0.89)**	1.00 (0.73-1.38)	1.06 (0.80-1.41)	1.00
Suicide Ideation	No	2.44 (1.68-3.53)***	1.74 (1.21-2.50)**	1.37 (0.96-1.95)	1.00
	Yes	1.85 (1.25-2.73)**	1.55 (1.08-2.24)*	1.33 (0.93-1.90)	1.00
Suicide Attempts	No	1.73 (0.82-3.66)	1.15 (0.54-2.45)	0.77 (0.36-1.61)	1.00
	Yes	1.62 (0.76-3.47)	1.11 (0.52-2.35)	0.76 (0.36-1.60)	1.00

^a Adjusted for age, sex, marital status, education, household size, employment status, as well as military covariates including branch, rank at release, and years since release

*p≤0.05, **p≤0.01, ***p≤0.001

Table 3 presents three separate models. The first two models use satisfaction with finances as the primary independent variable. Model 1 presents the adjusted odds ratios for satisfaction with finances and mental health conditions controlled for sociodemographic variables and military covariates. Significant differences were found between those who described dissatisfaction with finances and those who described satisfaction with finances for all mental health conditions with the exception of suicide attempts and HAU. For the majority of mental health conditions, the significant adjusted odds ratios for dissatisfaction with finances were larger than the corresponding ratios found in income quartiles (PTSD, any mood disorder, and HAU being the exceptions).

The second model identifies the odds ratios for the association between satisfaction with finances and mental health conditions controlled for household income in addition to sociodemographic variables and military characteristics. Although the odds ratios for the association between dissatisfaction with finances and mental health conditions when controlled for household income decreased for all conditions (with the exception of HAU), the relationships remained statistically significant.

The third model identifies the odds ratios for the association between an interaction term of household income and satisfaction with finances and mental health conditions, controlled for sociodemographic variables and military characteristics. Only two statistically significant associations between the interaction term and mental health conditions were identified: “any mood disorder” and “depression or anxiety”. When discussing interaction terms, the main effects should not be interpreted, only the statistical significance and slope of relationship should be considered (Hayes, 2013). Figure 2 illustrates the difference in the slope between household income and satisfaction with finances for the two statistically significant conditions. The graphs

indicate that there is a stronger effect (or steeper slope) for those who are dissatisfied with finances with respect to the association between household income and any mood disorder and depression or anxiety.

Table 3

Adjusted odds ratios for mental health conditions and satisfaction with finances in three separate models

Chronic Mental Health Conditions	Model 1[^] AOR (95%CI)^a	Model 2[^] AOR (95%CI)^{a,b}	Model 3 AOR (95%CI)^c	Interaction Interpretation
PTSD	2.66 (1.96-3.60)***	2.31 (1.68-3.19)***	1.04 (0.73-1.48)	Non-significant
Any Anxiety Disorder	2.97 (2.19-4.02)***	2.49 (1.80-3.46)***	1.03 (0.75-1.41)	Non-significant
Any Mood Disorder	2.67 (1.69-4.22)***	2.48 (1.49-4.11)***	1.59 (1.00-2.54)*	Stronger effect for those dissatisfied with finances
Depression or Anxiety	3.56 (2.74-4.61)***	2.99 (2.25-3.96)***	1.42 (1.07-1.87)*	Stronger effect for those dissatisfied with finances
Any Mental Health Condition	3.61 (2.78-4.68)***	3.04 (2.29-4.03)***	1.30 (0.98-1.72)	Non-significant
Heavy Alcohol Use	0.88 (0.67-1.16)	1.00 (0.75-1.34)	1.05 (0.79-1.40)	Non-significant
Suicide Ideation	3.03 (2.32-3.95)***	2.74 (2.07-3.65)***	1.32 (1.00-1.75)	Non-significant
Suicide Attempts	1.38 (0.91-2.11)	1.19 (1.77-1.85)	0.85 (0.54-1.34)	Non-significant

[^]Models 1 and 2 identify odds ratios with those satisfied with their finances as the reference category

^a Adjusted for age, sex, marital status, number of people in the household, education, employment status, previous deployment, rank at time of release, years since release, and military branch.

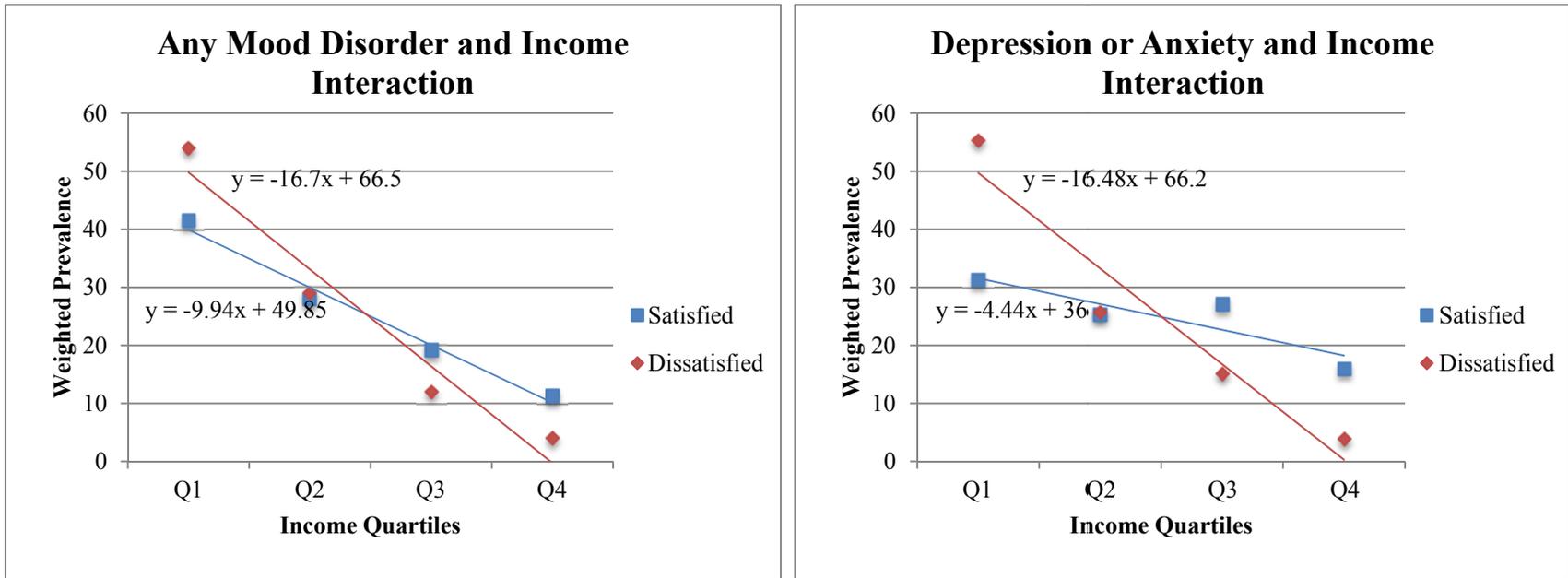
^b Adjusted for household income quartiles.

^c Adjusted Odds Ratio for interaction term between household income quartiles and satisfaction with finances adjusted for all identified covariates, household income quartiles, and satisfaction with finances.

*p≤0.05, **p≤0.01, ***p≤0.001

Figure 2

Slope of best-fit line for significant interaction terms between household income and satisfaction with finances



Discussion

With respect to the first two models focusing on household income quartiles, these results indicate that there are increased odds of self-reported mental health conditions among the lowest income groups of Canadian Forces veterans in comparison to the highest income category of veterans. This is a unique finding as these income quartiles differ from typical measures used in associations between income and mental health conditions where individuals have been classified as low income based on a median split or other low income measure (LIM) which aligns with poverty standards. In this sample a very small proportion fell below the LIM (weighted %=6.3), considerably smaller than the percentages of 13% and 16% for working and non-working civilians respectively (Statistics Canada, *Low Income*, Retrieved January 21st, 2013). These results suggest that despite the fact that veterans had adequate income (i.e. even those in the lowest income category were for the most part above the relative poverty standard), the lowest income group and the second lowest income group were still at greater risk for mental health problems. These results suggest that some element of absolute household income (i.e. not just poverty) is important in explaining this increased risk in mental health conditions.

This association may be explained in part by social class effects. Social classes typically categorize individuals in groupings based on the ranking of individuals along a continuum of some socioeconomic measure, such as income. However, grouping individuals into classes on the basis of one gradient measure typically stratifies groups by other measures as well (Barata et al., 2013). For example, producing social classes on the basis of income often results in groups being classified by access to productive resources, work experiences, and material interests and consumption practices. Although this practice may seem limiting, Barata and colleagues (2013) argue that class concepts are more useful in explaining social inequalities in health at the

population level than are individual gradient measures. With respect to the current study, individuals in the lowest income quartile may share other social traits that are associated with mental health conditions such as working class (i.e. blue collar versus white collar) or attitudes toward and use of mental health services.

The reversed relationship seen between household income and HAU (where lower income appears to be protective against HAU (AOR=0.63, 95% CI (0.45, 0.88) $p \leq 0.05$) is a controversial finding. Sareen et al. (2011) found a similar result in a study conducted with the general population and speculated that reduced income limits an individual's ability to purchase alcohol. However in a recent literature review of alcohol use in the military it was found that military personnel are heavier drinkers than their civilian counterparts (Hamilton, 2011). Canadian data supports this finding and further suggests that this tendency toward heavier drinking precedes military enrollment (Canadian Forces Health Services Group, 2010). In support of this, HAU was distributed relatively uniformly across the four income quartiles. Therefore it is possible that this particular condition is more strongly influenced by other variables than by income. The greater prevalence of HAU in higher income Canadian veterans (and subsequent lack of statistical significance in the adjusted odds ratios) may be the result of tendencies toward heavier drinking, which precede military enrollment and persist after release from the military.

The use of a Canadian study population is a particularly important contribution to the existing literature. Previous studies investigating the association between household income and mental disorders in the U.S. sample have found similar results, with those in the lowest income quartiles more likely to report psychological disorders (McMillan et al., 2010; Sareen et al., 2011). However, in the U.S., income is closely tied to health care service use. It is estimated that 44 million Americans cannot afford health insurance and another 38 million have inadequate

health insurance (Aaron & Burtless, 2014) and may not be able to access necessary health care services. In a publicly funded health system such as is found in Canada, the results of this study would indicate that access to appropriate services is not the only moderating component of the association between household income and mental disorders as those in the lowest income quartiles still displayed increased odds of self-reported mental health conditions despite not being limited to health care for reasons of income.

Much of the literature has focused solely on the relationship between household income and mental disorders, however this research shows that satisfaction with finances (or other relative income measures) may be of significant import. When compared to those who were satisfied with their finances, individuals who were dissatisfied with their finances were more likely to report a diagnosis of all of the identified mental health conditions and suicide ideation (AORs range between 2.66 to 3.61, all significant to the $p \leq 0.05$ level) with the exception of HAU and suicide attempts. One interpretation of this data is that it may not be one's total financial value, but the perception of one's financial value relative to that of others that is of importance with respect to mental health. This result parallels those found in previous studies that suggest that satisfaction with finances effectively predicts subjective well-being (Diener & Biswas-Diener, 2002; Hagerty, 2000) and that this predictive value is most pronounced when the social inequality between the comparators is greatest (Hagerty, 2000; Okulicz-Kozaryn, 2012).

The results of this study indicate that dissatisfaction with finances does impact the income-mental health conditions relationship as controlling for household income within models focusing on satisfaction with finances did account for a proportion of the variance in the relationship (as evidenced by the diminished adjusted odds ratios without a corresponding decrease in significance). This would suggest that measures of relative income (i.e. satisfaction

with finances) controlled for measures of absolute income (i.e. total household income) may prove to be the most accurate predictors of mental health conditions. In addition, when investigated for potential moderation effects, the interaction term between household income and satisfaction with finances was statistically significantly associated with two conditions: any mood disorder and depression or anxiety. These results suggest that a moderation effect is occurring. However, since both household income and SWF are independently significantly associated with these conditions, it is mathematically impossible to determine which independent variable is actually the moderator, and which is the main predictor. Regardless, these results support the hypothesis that income influences well-being through relative means (i.e. social comparison) in addition to absolute means with respect to the category of mood disorders or categories that include mood disorders (i.e. depression and anxiety).

The findings of this study with respect to policy implications are timely; recently the New Veterans Charter (NVC) has been publicly criticized for being ineffective in its financial support of veterans (The Globe and Mail, December 13th, 2013). The NVC is administered by Veterans Affairs Canada and provides lump sum financial awards for individuals who are released from the military as a result of a disability experienced while in service (Thompson et al., 2011a), as well as vocational rehabilitation programs and income support programs for veterans who sustain a career-ending injury that impacts their ability to earn an income following release (MacLean et al., 2011a). The results of this study would suggest that if these programs are not meeting the financial needs of military veterans (both in absolute terms and relative terms), mental health may also be adversely affected. A recent study investigating income and mental disorders on an international scale suggested that programmes focused on mental health were associated with improved economic outcomes whereas programmes focused on alleviating poverty were less

effective at improving mental health outcomes (Lund, et al., 2011). Given this information, transition programs and services currently offered under the NVC may better support releasing members by including a focused mental health component. In addition, ensuring satisfaction with financial outcomes through financial counselling may help to reduce overall burdens on existing mental health services provided by VAC.

For future investigations, there are several issues that should be considered. First, it appears that the majority of changes experienced by the veteran occur in the year immediately following release (i.e. income has the sharpest overall decline, the prevalence of low income is highest at 7%, and receipt of employment insurance peaks at 17%; Thompson et al., 2011a). Although the current study controlled for time since release from the military, a study investigating the prevalence of mental disorders and associations with household income and satisfaction with finances in a subsample of veterans in the year immediately after release appears to be warranted. Second, recent prospective modeling studies in the Canadian general population suggest that the prevalence of low income rises as employment income diminishes (Emery, Fleisch, & McIntyre, 2013). Given that the majority of the sample indicated employment as their primary activity over the past 12 months and that a very small proportion of the sample was over the pensionable age of 60, the longer-term implications of these results is unknown. Repeating this study on future waves of the STCL would allow for an investigation into this issue in this specialized population.

Findings in this study should be interpreted within the context of the following limitations: (1) although respondents were asked to consider only those conditions diagnosed by a professional, these responses may not have been accurate, for example respondents may have identified only their symptoms or alternatively under- or over-reported diagnoses; (2) the

question regarding mood disorders did not explicitly state depression and respondents may not have intuitively made the connection between a mood disorder and depression, therefore it is possible that results for that category actually underrepresent the true values; (3) suicide attempts may be under-estimated due to the skip logic whereby individuals were not asked about attempts if they did not endorse ideation; (4) participants were asked about satisfaction with finances, which differs from satisfaction with income, therefore caution should be exercised in comparing the results of this study to others focusing on satisfaction with income; (5) the cross-sectional design of the current study precludes any causal interpretations of the findings (i.e. from the current investigation it is not possible to discern whether household income and satisfaction with finances predict mental health conditions or vice versa; (6) as noted in the implications for future studies, given the wider time-frame of release from military service, onset and resolution of emotional symptoms may be differentially affected by household income and it is possible that mental health conditions are greatest in the initial time frame following discharge rather than at the end of the six years at which point income has typically returned to pre-release levels.

Conclusions

Despite the limitations noted, the main findings from this study have important implications for the mental health of Canadian veterans. This study is the first to demonstrate within a representative population-based military sample that both household income and satisfaction with finances are significantly associated with mental health conditions. Although conclusions cannot be drawn with respect to the direction of the relationship between household income, satisfaction with finances and mental health conditions, the strength of the associations between the lowest income category or dissatisfaction with finances and suicide ideation, PTSD,

any anxiety disorder, any mood disorder and any mental health condition identify a clear need for the implementation of prevention and support programming for lower income, high risk veterans. In future, to better prevent emergence of mental health conditions post-release, both absolute and relative measures of income should be considered when developing income policies and financial support programs for Canadian veterans.

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Chapter Seven: General Discussion

As discussed in chapter 2, there is a significant body of research that suggests that income is associated with mental disorders in the general population. However, military personnel are relatively absent from these investigations. To address this, the current research endeavored to analyze the association between household income and mental disorders/mental health conditions in a Canadian Forces active duty sample and Canadian veteran sample as well as to determine some of the potentially influential covariates of these associations.

Household Income in Military Personnel and Veterans

Table 7 identifies the means, medians, and quartile ranges for the various sample groups. Military personnel and veterans have notably higher household incomes than the general population. This is to some extent, an expected outcome for a number of reasons; first, the CF Income Policy was established to ensure equal wages for military members for comparable civil service positions. However, military personnel often receive bonuses or additional payment for job requirements not typically found in the civilian sector (such as deployment and subsequent hazard pay; Park, 2008). Income in the CF has been rising continuously since the late 1990s and was found to exceed the income of comparable civilian sector wages only 4 years after implementation of the policy (Park, 2008). In addition, proportionally there are more specialized positions in the military (that warrant increased pay) than are found in the general population. Second, military personnel (and by extension veterans) are better educated than the Canadian general population and income and education are positively associated in most research (i.e. higher education is associated with increased income; Agerbo, 2007; Goldman-Mellor, Saxton, & Catalano, 2010). With respect to educational attainment, 91.7% of the CF sample group and

93.1% of the veteran sample group had a high school degree or greater versus only 80.1% of the general population. Third, the military population has a greater proportion of men than the general population (85.3% of the active sample group and 88.2% of the veteran sample group versus 49.9% of the general population sample) and currently men in Canada earn more than women; women in Canada typically earn \$0.71 for every \$1.00 that men earn (Parliament of Canada, *Wage Gap Between Men and Women*, Retrieved January 31st, 2014). Although women in the Canadian military are paid at a standardized rate for their profession and are unlikely to be underpaid in comparison to women in the general population (Park, 2008), overall females had lower income than males, while in service (Park, 2008) and after release (MacLean et al., 2011a). Fourth, employment and income are also positively associated (Agerbo, 2007; Goldman-Mellor, Saxton, & Catalano, 2010). In the three samples used in this research, CF personnel had 100% employment (CF are inherently employed), veterans had 73.9% employment and the general population sample had 68.5% employment.

Table 7

Income values for all sample groups

Measure		Regular	Reserve	CF	STCL	Gen Pop
Weighted Mean		\$74,500	\$74,000	\$74,500	\$98,400	\$67,000
Weighted Median		\$75,000	\$71,500	\$75,000	\$85,000	\$40,000
Income Quartiles (Upper Bounds)	1	≤\$55,000	≤\$47,000	≤\$53,000	≤\$60,000	≤\$24,000
	2	\$75,000	\$71,000	\$75,000	\$85,000	\$40,000
	3	\$100,000	\$100,000	\$100,000	\$125,000	\$70,000
	4	\$500,000	\$500,000	\$500,000	\$5,000,000	\$500,000

Income was chosen as the independent variable in part because it is an objective measure that could be effectively used across all three populations investigated without artificial equivalencies being required. However, utilizing income as the primary marker of socioeconomic status does present some limitations; grouping individuals into classes on the basis of one gradient measure typically stratifies groups by other measures as well (Barata et al., 2013). For example, producing social classes on the basis of income often results in groups being classified by access to productive resources, educational backgrounds, work experiences, and material interests and consumption practices. This effect appeared to be particularly influential in the active military sample. To account for this, a number of additional models were run in the CCHS-CFS sample controlling for various combinations of socioeconomic covariates, however none of these models produced statistically significant results. These results seem to suggest that although some measures of SES (such as educational attainment) are less vulnerable to selection effects, military service is in itself a form of social selection.

Low income in veterans. Despite the higher income overall, low income still occurred at a high enough rate to allow for investigations into the associations between mental health conditions and the LIM in the STCL sample. As previously discussed, the LIM is a relative measure of low income, set at 50% of adjusted median family income. The measure is compiled according to the number of adults and children (identified as individuals under the age of 16) present in families, as a means of reproducing the economies of scale inherent in family size and composition (Income Statistics Division, 2006). For a full discussion of the variables and statistical methods used in this analysis, please refer to chapter 4.

Weighted prevalence of the various mental health conditions above and below the LIM are presented in Table 8. Overall, 6.3% of respondents in the STCL sample fell below the LIM. As a point of reference, Statistics Canada reports that in 2011, 13% of working civilians and 16% of non-working civilians fell below the LIM (Statistics Canada, *Low Income*, Retrieved January 31st, 2014). There was a higher prevalence of all mental health conditions in the subsample of veterans falling below the LIM.

The AORs for the various mental health conditions above and below the LIM are also presented in Table 8. The model indicates that falling below the LIM results in statistically significant increased odds of experiencing PTSD, any anxiety disorder, depression or anxiety, any mental health condition, and suicide attempt, after controlling for sociodemographic variables and military factors. These results align with research conducted both with the general population (Emery, Fleisch, & Jenkins, 2013) and with U.S. military veterans (Bossarte et al., 2013; Murdoch et al., 2011; Resnick & Rosenheck, 2008), which suggest that low income and other measures of poverty (such as homelessness) are associated with mental health conditions. The results further support the hypothesis that low income is independently associated with mental health conditions in the Canadian veteran population.

Time-series analyses conducted by VAC suggest that as high as 15% of veterans may experience low income post-release (MacLean et al., 2011b). With respect to mental health outcomes, veterans who experience low income may represent a higher risk category that requires focused intervention from VAC. A recent study investigating income and mental disorders on an international scale suggested that programmes focused on mental health were associated with improved economic outcomes whereas programmes focused on alleviating poverty were less effective at improving mental health outcomes (Lund, et al., 2011). Given this

information, transition programs and services currently offered to all releasing members may benefit this higher risk category by including a mental health component.

Table 8

Prevalence and Adjusted Odds Ratios for Mental Health Conditions Above and Below the Low Income Measure (LIM)

Mental Health Condition	N (Weighted %)		AOR (95% CI)[^]	
	Below LIM	Above LIM	Below LIM	Above LIM
PTSD	53 (18.0)	482 (10.2)	1.94 (1.23-3.05)**	1.00
Any Anxiety Disorder	48 (17.8)	378 (9.3)	1.84 (1.13-2.99)*	1.00
Any Mood Disorder	14 (4.9)	125 (3.1)	1.22 (0.59-2.55)	1.00
Depression or Anxiety	74 (30.9)	745 (19.2)	1.72 (1.14-2.61)*	1.00
Any Mental Health Condition	76 (35.5)	822 (21.7)	1.85 (1.23-2.79)**	1.00
Heavy Alcohol Use	52 (29.8)	684 (25.4)	0.92 (0.62-1.37)	1.00
Suicide Ideation	68 (28.3)	602 (17.0)	1.47 (0.98-2.20)	1.00
Suicide Attempt	32 (47.2)	182 (28.8)	2.45 (1.47-4.07)***	1.00

[^]Adjusted for age, sex, marital status, education, employment status, previous deployment, rank at time of release, years since release, and military branch

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Satisfaction with finances (SWF). The use of just household income as a predictor of mental health conditions and mental disorders has been previously criticized in the literature as being incomplete (Muntaner et al., 2003), however one study by Patrick et al. (2012) found strong concurrence across three separate measures of socioeconomic status and argued that one measure may be sufficient for the evaluation of socioeconomic status and mental disorder linkages. Findings using satisfaction with finances as an independent variable of mental health conditions in military veterans further support this theory. This finding has implications for future research; it is possible that SWF could be used as an alternative independent variable if household income is unavailable or the response rate is low.

The addition of SWF adds a previously unexplored variable in the association between household income and mental health conditions in the Canadian veteran population. After controlling for sociodemographic variables and military characteristics, SWF was independently associated with increased odds of experiencing PTSD, any anxiety disorder, any mood disorder, anxiety or depression, any mental health condition and suicide ideation. When examined as a covariate to household income quartiles, SWF was associated with increased odds of PTSD, any anxiety disorder, anxiety or depression, any mental health condition and suicide ideation within the lowest two quartiles (i.e. for those falling below the median income).

Interpretation of these results is difficult given the cross-sectional nature of the data; it is possible that dissatisfaction with finances is a cause of psychological distress (Caron & Liu, 2011; Orpana, Lemyre & Gravel, 2009). Alternatively, stress or psychological distress occurring as a result of economic hardship could taint one's perception of his/her financial situation (Durden, Hill, & Angel, 2014). Regardless of the direction of the association, the results of this study offer support for the hypothesis that SWF in conjunction with household income has greater predictive value for most mental health outcomes than income alone.

How household income and SWF interrelate with respect to mental health conditions is unclear; the lack of statistically significant odds ratios resulting from the interaction model (HHI \times SWF) for the majority of mental health conditions indicates that the "differences in the differences" of these odds ratios is insignificant. However, the interaction term between household income and SWF did seem to be important in the category of mood disorders or categories that include mood disorders (i.e. depression and anxiety). This suggests that SWF is conditional; the impact of the variable was to some extent dependent on household income. It is possible that SWF moderates the association between household income and mood disorders

more than other mental health conditions. Since both household income and SWF are independently significantly associated with these conditions, it is mathematically impossible to determine which independent variable is actually the moderator, and which is the main predictor. Nonetheless, previous research in the fields of happiness and economics provide strong support for the position that SWF is the moderating variable (Bok, 2010; Frey, 2008).

In potential application of these findings, it is important to distinguish between satisfaction with finances and satisfaction with income. SWF refers to an individual's subjective evaluation of his/her finances, including (but not limited to) financial elements such as income, debt, net worth, credit management, financial planning strategies, and capital accumulation (Kim, 1999). Therefore, an individual could be satisfied with his or her income but dissatisfied with his or her finances. This is a positive distinction with respect to future policy and programming for veterans; transition programs and services currently offered by VAC may better serve veterans with the inclusion of financial education programming to improve SWF.

Role of Military Covariates in the Associations Between Income and Mental Disorders

In order to assess the potential role of military covariates in the household income and mental disorder association, logistic regressions were run controlling only for military characteristics (rank, branch, previous deployment, as well as regular or reserve status in the active military population and years since release in the veteran population). These variables were first tested to eliminate potential problems with multicollinearity and no multicollinearity was observed.

In these analyses with the active military population, there were still no statistically significant relationships between household income and any of the assessed mental disorders.

However, when focusing on the military covariates as independent variables and controlling for household income, rank (specifically non-commissioned members in comparison to officers) was positively statistically significantly associated with all of the identified mental disorders (i.e. being of lower rank showed increased odds of each mental disorder). The results support the hypothesis that rank is influential in the association between household income and mental disorders in the active Canadian military population.

With respect to branch, being a member of the army or navy in comparison to the air force was positively associated with alcohol dependence and HAU. The results with respect to the association between household income and branch also align with studies from the U.S., which indicate that alcohol misuse is more prevalent in the army (Golub & Bennett, 2013) and navy branches (Ames et al., 2007). Being a member of the army in comparison to the air force was also positively associated with PTSD, a result that is again consistent with previous research from other military populations that suggests that direct combat exposure increases the risk of PTSD (Britt et al., 2013; Gade & Wenger, 2011; Hassija et al., 2012).

Finally, previous deployment was positively associated with PTSD in the active military population. However, the lack of statistically significant associations between mental disorders and deployment appears to be under-representative of the potential association; previous analyses with this dataset have shown that deployment and deployment-related traumatic events (DRTEs) controlled for household income and other covariates are statistically significantly associated with a variety of mental health outcomes, including suicide ideation and attempts (Belik et al., 2010) and major depressive episodes, panic disorder, social phobia, GAD, and PTSD (Sareen et al., 2007).

In the veteran population, previous deployment and rank at time of release were positively statistically significantly associated with depression or anxiety, PTSD, and any mental health condition when controlled for household income. Previous deployment was also associated with any anxiety disorder. These results support the hypothesis that previous deployment and rank are influential in the association between income and mental health conditions in Canadian veterans but do not support the hypothesis that military branch or years since release are influential in this association.

Rank appears to be of particular importance in both the active military and the veteran population. This result aligns with previous studies, particularly Maclean and Edwards' 2010 study on the pervasive role of rank in the health of U.S. military. Similar to the results found in the present investigation, the researchers found that rank was not significantly correlated with other measures of socioeconomic status (such as income) but that nonetheless, in concert with other variables, continued to exert a significant influence on the health of the population.

Income and Mental Disorders/Mental Health Conditions in the Canadian Military and Veterans

This research provides some new insights into the associations between income and individual mental disorders or categories of disorders in Canadian military personnel and veterans. Results are discussed within the primary categories of affective and anxiety disorders, alcohol use, and suicidality.

Affective and Anxiety Disorders. As previously reported, prevalence of affective and anxiety disorders was very similar between the military population sample and the age-restricted

general population sample. Furthermore, none of the affective or anxiety disorders noted, along with PTSD and GAD were statistically significantly associated with income in either regular or reserve force personnel or the military sample as a whole. There are several factors that should be considered in interpreting these outcomes. First, there may be a gender bias in this sample; many previous studies report that women have higher prevalences of depression and mood and anxiety disorders than men (Jacobi et al., 2004; Kessler et al., 2005; Piccininelli & Wilkinson, 2000). It is possible that the higher proportion of men in the sample influences the prevalence of mood disorders and subsequently the association with household income. Second, mental health services may be more readily available to military personnel than to the general population. For example, all active military personnel have access to a general physician (GP) on-base whereas The College of Family Physicians of Canada estimates that 17% of Canadians do not have access to a GP (The Wait Starts Here, 2009). Third, the universality of service clause in the Canadian military service contract may inadvertently eliminate those individuals with mental disorders from the sample (Canadian Forces, *Fit to Serve*, Retrieved February 1st, 2014). Individuals who had been previously identified as having a mental disorder and therefore, unable to perform their duties effectively, may have been placed on Temporary Category (TCAT) and thus been excluded from the sampling frame.

In summary, with respect to the active military sample, the results of this study are novel; although the adjusted odds ratios suggest that decreasing income is associated with increasing odds of major depressive episodes, social phobia, and PTSD in both regular and reserve force personnel as well as panic disorder and GAD in reserve force personnel, the lack of statistical significance suggests that there are other variables not accounted for within the model. These additional factors must be discerned and are relevant to future investigations. Furthermore, the

results seem to suggest that the minimum income provided by military service is sufficient to be protective against affective and anxiety disorders. These results do not support the hypothesis that the association between income and mental disorders in the military population parallels the association found in the general population.

With respect to the veteran population, the results of this study suggest that being in the lowest income quartile is associated with increased odds of self-reporting PTSD, any anxiety disorder, any mood disorder, anxiety or depression, and any mental health condition. These results align with the research conducted in the general population which suggests that both affective disorders and anxiety disorders are associated with low income (Sareen et al., 2011; McMillan et al., 2010). The majority of research investigating income in veterans focuses on measures of low income or investigates income as a covariate with respect to mental disorders. However, this limited research available from the U.S. military examining measures of low income and mental disorders supports the findings of the current study (Resnick & Rosenheck, 2008; Murdoch et al., 2011; Bossarte et al., 2013). These results support the hypothesis that veterans in the lowest income categories have increased odds of mental health conditions.

Alcohol Use. For comparison purposes, logistic regressions were run in the veteran population using the same variable definitions as was used in the CCHS-1.2 and CCHS-CFS analyses (i.e. logistic regressions were run for HAU, suicide ideation, and suicide attempts, with household income categorized in \$5,000 increments and using \$100,000 and above as the reference category). The differing results of the three population groups with respect to HAU is noteworthy; the general population sample did not display any statistically significant association between HAU and decreasing income whereas active regular force personnel displayed increased odds of HAU with decreasing income and veterans displayed decreased odds of HAU with

declining income. However after controlling for sociodemographic variables, no statistically significant associations remained between household income and HAU in any of the population groups. The direction of these associations also seems to indicate that lower income is protective against HAU in the general population and the veteran population. These results are presented in Table 9. It must be emphasized that direct comparison of the military population and general population to the veteran population is not accurate and the numbers presented are intended only to assist in the discussion of potential trends.

Table 9

Odds Ratios for Alcohol and Suicidality in the STCL and CCHS-CFS samples

Mental Health Condition	Sample Group				
	Regular Force OR (95% CI)	Reserve Force OR (95% CI)	CF OR (95% CI)	Veteran OR (95% CI)	General Pop. OR (95% CI)
Heavy Alcohol Use					
Unadjusted	1.06 (1.05-1.08)***	1.01 (1.00-1.03)	1.05 (1.03-1.06)***	1.00 (0.98-1.02)	1.00 (0.99-1.01)
Adjusted ^a	1.00 (0.98-1.02)	0.98 (0.96-1.00)	0.99 (0.98-1.01)	0.98 (0.96-1.00)	0.99 (0.97-1.00)
Suicide Ideation					
Unadjusted	1.04 (1.01-1.08)*	1.05 (1.01-1.09)*	1.04 (1.01-1.06)**	1.09 (1.07-1.11)***	1.08 (1.06-1.10)***
Adjusted ^a	1.01 (0.97-1.06)	1.03 (0.98-1.09)	1.02 (0.99-1.05)	1.08 (1.06-1.10)***	1.06 (1.04-1.07)***
Suicide Attempt					
Unadjusted	-	-	1.07 (0.99-1.17)	1.06 (1.02-1.10)**	1.13 (1.06-1.21)***
Adjusted ^a	-	-	1.04 (0.94-1.15)	1.06 (1.02-1.10)**	1.08 (1.02-1.14)**

^aAdjusted for age, sex, marital status, education, and number of people in the household

*p≤0.05, **p≤0.01, ***p≤0.001

Although a variety of mechanisms have been presented to explain the contentious relationship between income and alcohol abuse in the military, historical research seems to suggest that alcohol availability is the most consistent explanation. Alcohol availability refers not only to physical availability (Ames et al., 2007), but also to affordability (Smart, 1977), and social norms surrounding alcohol use (Ames et al., 2007; Bray et al., 2005). Despite military policy that has been in effect since 1987 focused on reducing the improper use and abuse of alcohol in military personnel, Canadian Forces and the Department of National Defence acknowledge a culture of enabling within the military (Canadian Forces, *Alcohol Use*, Retrieved January 3rd, 2013). Canadian research has shown that active CF personnel consistently exceed the Canadian Low Risk Drinking Guidelines (LRDG; unpublished analysis by Zamorski et al., 2008) developed by The Canadian Centre for Substance Abuse (Butt et al., 2011). In addition, frequency of alcohol intake among military personnel has consistently increased in each successive wave of the quadrennial Canadian Forces Health and Lifestyle Information Survey (CF-HLIS) since 2000 (unpublished analysis by Zamorski et al., 2008). Furthermore, trend analyses suggest that heavy alcohol use is increasing in the military population in recent years (Bray & Hourani, 2007; Bray et al., 2010). Ames et al., (2007) report that within the U.S. Navy, where drinking rituals and traditions still persist despite changing alcohol policies, normative beliefs about drinking (i.e. the perception that one's peers drink heavily) are strongly associated with both heavy drinking and heavy episodic drinking.

With respect to the opposite result seen in veterans, one potential explanation is that reduced income limits an individual's ability to purchase alcohol, as hypothesized in the general population (Sareen et al., 2011). In a recent literature review of alcohol use in various military groups, it was found that military personnel are heavier drinkers than their civilian counterparts

(Hamilton, 2011). Canadian data supports this finding and further suggests that this tendency toward heavier drinking precedes military enrollment (Canadian Forces Health Services Group, 2010). An alternative speculative answer specific to veterans is that these tendencies toward heavier drinking simply persist after release from the military (irrespective of income).

Suicidality. Table 9 also indicates the odds ratios for the association between household income and suicide ideation and suicide attempts for the general population, military, and veteran samples. Once again, it is important to note that these samples are not directly comparable and the numbers presented are intended only to illustrate trends with respect to suicidality.

Decreasing income was associated with increased odds of both suicide ideation and suicide attempt in active military personnel, however statistical significance disappeared after controlling for sociodemographic variables. Suicide attempts occurred at such a low prevalence in the active military population that odds ratios could not be reported for the stratified samples. A focused study on covariates of suicide in the Canadian military by Belik et al. (2010) aligns with these results, providing evidence that suicide occurs at a lower prevalence in the military than in the general population.

In the veteran population, both suicide ideation and suicide attempts were significantly associated with decreasing household income. These results are supported by data from U.S. veterans, which suggest that suicide ideation and attempts are strongly associated with a number of measures of low socioeconomic status including homelessness and employment status (Bossarte et al., 2013; Murdoch et al., 2011; Resnick & Rosenheck, 2008; Rosenheck & Mares, 2007).

Comorbidity. A missing element from these two studies is comorbidity of mental disorders. Several recent studies have suggested that complexity of multiple mental disorders or mental health conditions may be important in understanding their relationship to socioeconomic status (Conner et al., 2012a; Conner et al., 2012b; Ilgen et al., 2010; Ilgen et al., 2012). Particularly with respect to the STCL, this may be a confounding factor as, with the exception of PTSD, the affective and anxiety disorders were investigated in categories rather than individually.

Integrated Model for Understanding Income and Mental Disorders in Military Personnel

This research strove to understand the association between income and mental disorders/mental health conditions in military personnel and veterans from a unique perspective; by utilizing human development and social comparison theories that stem from the social psychology literature and data that is conventional to the economic perspective, a new lens was created through which to view the link between income and mental disorders/mental health conditions in this population.

Bronfenbrenner's Dynamic Ecological Systems Model formed the basis of this integrated model. This model was selected because it could be adapted to include those facets and individual characteristics found in military life not common to civilian life, a primary area of interest for this research. The model also acknowledged multiple social influences of varying proximity on personal development and life course.

The integration of the income distribution theory allowed for further distinction between the macroeconomic and the microeconomic influences on the individual. This distinction was

intended to support the position that both poor income on an individual level and poor economic conditions on a systemic level contribute to poorer mental health.

In application to the veteran population, this novel model was effective in identifying individual correlates of the association between income and mental disorders from the various levels of Bronfenbrenner's model. In essence, when considering all variables, the model identified that age, sex, education, marital status, household size, and employment status as individual characteristics, and branch, previous deployments, rank at time of release, and length of time since release as elements of the mesosystem are all significant correlates of the relationship between income and mental health conditions in Canadian Forces veterans. Furthermore, the model identified SWF, as part of a microeconomic system, as potentially predictive for mental health conditions in veterans. The trends in the adjusted odds ratios for those in the lowest two income quartiles (i.e. falling below the median household income) and those dissatisfied with their finances were parallel. This is an important implication of the model, as it indicates that satisfaction with finances may be an appropriate proxy for household income when household income is not available within a given dataset.

The potential moderation role of SWF also requires further investigation. Hayes (2013) identifies significance of an interaction term as the primary qualifier for a moderation variable. Although interaction terms between household income and SWF were statistically significant for any mood disorder and depression or anxiety, income was not investigated as a centered continuous variable in these interactions. Hayes recommends caution in interpreting any interaction term that is not based on a centered variable as collapsing a variable too much may cause problems in the model. Furthermore, as noted, it is not possible to interpret the main effects in an interaction model as the coefficients are conditional effects that may not have any

substantive interpretation value. Even if the slope of the interaction is consistent with the original hypothesis, the results may not be consistent with one's predictions (Hayes, 2013). Regardless of its' potential role as a moderator variable in the association between household income and mental health conditions, with respect to the theoretical model, the results of this study indicate that SWF is influential as a microeconomic system. These results support the inclusion of microeconomic systems within the theoretical model.

Although further testing of this model in additional datasets is necessary, the initial findings of this study suggest that this integrated model is suitable in application to the veteran population. Expansion of the model to include more of Bronfenbrenner's systems, such as microsystem variables (for example family characteristics) and the economic macrosystem (such as specific variables related to the New Veterans Charter) may further increase the predictive value of the model. Additionally, testing this model in veteran samples which use a more consistent evaluation of mental health (such as the WMH-CIDI rather than self-report of a previous diagnosis) would also improve the validity of the model.

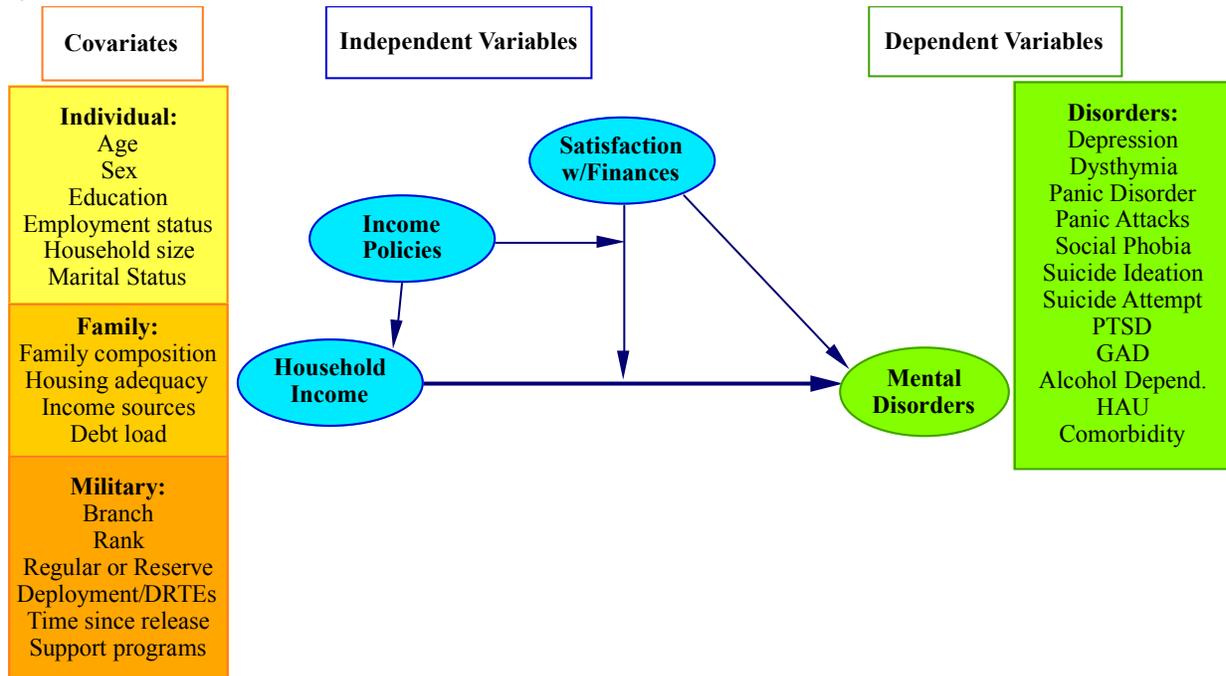
In application to active Canadian Forces personnel, this model was less effective. However, it is hypothesized that this is not a limitation of the model but rather that this is due to a ceiling effect, with the majority of the military population above the household income threshold beyond which variation in income can successfully predict mental disorders and account for differences between the variables in the model (Kondo et al, 2009). Further support for this position stems from additional analysis of the CF population with household income in quartiles. In this analysis, it appears that the distribution becomes too narrow to distinguish any potential impact on the prevalence of mental disorders (as there were no statistically significant results). The hypothesis emerging from this analysis is that impact of the macroeconomic system

(i.e. CF income policies) on the individual was greater than the potential impact of the individual variables (i.e. age, sex, marital status, education, and household size) and military specific variables (i.e. branch, rank, regular or reserve status, and previous deployment) as a predictive tool. Other measures of socioeconomic status that were not available in the current study (such as housing adequacy or household composition) may also be of importance to the predictive capacity of the model.

Analysis of this model in the active military population with the inclusion of SWF may be key; since income is distributed too narrowly, SWF may offer greater variability and subsequently greater predictive value. Furthermore, the potential mediating role of the CF Income Policy on the potential relationship between SWF and household income and mental disorders may help facilitate understanding of the association between household income and mental disorders. Again, further testing of this model in additional datasets is necessary. A revised statistical model including additional variables and relationships that may improve the model is provided in Figure 4.

Figure 4

Adjusted Statistical Model



Unpublished figure, by K. Klassen

Summary

This research had nine research questions and hypotheses. Statements of support or negation of the primary hypotheses are presented in Table 10.

Table 10

Support or Negation of Primary Research Hypotheses

Hypotheses	Research Support or Negation
1A: As income declines, active military personnel will have increased odds of mental disorders.	1A: Negated
1B: The association between HHI and mental disorders will be stronger in reserve personnel than in regular personnel.	1B: Negated
2A: The associations found in the active military population will parallel those found in the general population.	2A: Negated
3A: Veterans in the lowest HHI categories will have increased odds of MHCs.	3A: Supported
3B: Veterans falling below the LIM will have increased odds of MHCs.	3B: Supported
3C: Veterans dissatisfied with their finances will have increased odds of MHCs.	3C: Supported
3D: Being dissatisfied with finances will impact the association between HHI and MHCs.	3D: Supported
4A: Lower rank, being a member of the army, and exposure to deployments will more strongly impact the relationship between income and mental disorders in active military.	4A: Rank: Supported Branch: Supported for alcohol dependence, HAU, and PTSD Deployment: Supported for PTSD
4B: Ibid for veterans	4B: Rank: Supported for affective and anxiety disorder categories Branch: Negated Deployment: Supported for affective and anxiety disorder categories

In summary, the results of the analyses of these databases indicate that income is associated with a number of mental disorders in the Canadian general population and with mental health conditions in Canadian veterans. However, there are no parallel associations found between in household income and mental disorders in the active military population. The

increased income found in active military personnel and subsequent lack of statistically significant associations between mental disorders and household income lends support to the argument for a ceiling effect on income; there appears to be a threshold beyond which income can no longer effectively predict variation in mental disorders in military personnel. Further key findings from these two studies are highlighted in Table 11.

Table 11

Summary of Key Findings

	Active Military	Veterans
Integrated Model	The model is limited by an income ceiling effect and does not yet identify all variables of importance in the association between HHI and mental disorders.	The model has good predictive value for this population.
Income	Military personnel have a higher HHI than the Canadian general population. This higher income may be sufficient to be protective against mental disorders in this population.	Although veterans have a higher HHI than active military personnel, HHI income was still significantly associated with mental health conditions. SWF was also significantly associated with MHCs
Low Income	Less than 2% of the CF fell below the measure of Low Income used in 2002.	6.3% of veterans fell below the LIM. Falling below the LIM was associated with increased odds of MHCs.
Military Characteristics	Rank, branch and deployment differentially influence the associations between HHI and mental disorders.	Rank and deployment differentially influence the associations between HHI and MHCs.
Mental Disorders/Mental Health Conditions	This research suggests that military personnel are mentally healthier than the general population and that military service seems to support this advantage.	The results of this study suggest that any benefit conferred by military service to mental health does not persist beyond release from the military.
Alcohol Use	HAU is associated with decreasing income in regular force personnel, however, this relationship is influenced by other as yet unidentified factors.	Prevalence suggests that HAU is still high in veterans, however low income seems to confer a protective benefit.
Suicidality	Suicide ideation is associated with decreasing income in military personnel however suicide attempts occur at a low enough prevalence so as not to be testable in relation to income.	Both suicide ideation and suicide attempts are associated with decreasing income and with falling below the median income.

Chapter Eight: Summary and Conclusions

Limitations

These studies presented in concert offer a fairly comprehensive picture of income in the military across the lifespan and offer a comparison to the Canadian general population. However there are some limitations inherent in this research that must be considered. With respect to both studies:

1. The cross-sectional nature of the surveys did not allow for the examination of causal relationships between income and mental disorders. Although income was defined as the independent variable, it is possible that the relationship runs in the opposite direction and that income is the dependent variable with respect to mental disorders. Furthermore, since the datum was collected at only one time point, it is not possible to investigate changes in the relationship between income and mental disorders over time. As well, given the cross-sectional nature of the study, it is only possible to investigate prevalence of mental disorders in the identified samples and not the incidence of mental disorders.
2. Relationships identified might have been spurious and/or influenced by other variables not considered in the analysis. For example, it is possible that variables from layers of the theoretical model not investigated (such as family composition), are particularly meaningful.
3. Mental health and wellness may not necessarily be synonymous with a lack of psychological symptoms or diagnosis of a mental disorder. In addition, all three surveys excluded some relevant psychiatric disorders. Both the CCHS-1.2 and CCHS-CFS did not investigate OCD and other pertinent anxiety disorders. The CCHS-1.2 did not investigate PTSD or GAD. With the exception of PTSD, the STCL did not investigate any individual

conditions, only the two primary categories (mood and anxiety) of mental disorders. None of the three surveys investigated substance abuse (only dependence and a measure of heavy alcohol use).

4. Psychological trauma as a result of deployment was not assessed in either the STCL or the CCHS-CFS and according to previous research (Sareen et al., 2008; Sareen et al., 2010), this may in fact be an important factor in defining relationships between income and mental disorders in the military.
5. As this study is a secondary data analysis, the researcher was limited by the design and implementation of the original survey. None of the variables investigated were within the control of the researcher. In addition, inclusion and exclusion criteria for the population were not modifiable.

An additional limitation with respect to the CCHS-1.2 and CCHS-CFS surveys is the age of the surveys. The datum was collected a number of years ago and although it is still relevant in the analysis of income policies and programming that have been in existence since the data was collected, as well as of value to the development of further data analysis with more recent surveys, it may not be generalizable to current military personnel.

Specific to the STCL survey, because the interview was conducted by lay interviewers and did not utilize a standardized instrument for the diagnosis of mental disorders, there is a greater possibility of recall bias or misinterpretation (Wilson et al., 2008). Furthermore, although depressive disorders were queried, depression itself was not measured as an independent construct in STCL survey, nor was it included as a prompt in the mood disorders question. This may be of significance as, of the category mood disorders identified, depression has the highest prevalence (Wariach, Goldner, Somers & Hsu 2004). In addition, the questions regarding suicide

utilized skip logic; if an individual did not endorse suicide ideation, he or she was not queried about suicide attempts. Although it is rare, it is possible that some individuals did not consider suicide before attempting and these individuals would be effectively excluded.

Furthermore, given the differences between the two surveys, direct comparison between the veteran force sample and the other two samples with respect to mental disorders is not possible. This limits the potential understanding of the transition from active military service to civilian life. Previous research suggests that retired military personnel do not simply become civilians and begin to follow patterns of the general population, particularly with respect to income (Maclean et al., 2011b; Sayer et al., 2011) however this research cannot investigate this hypothesis.

Strengths

Using the CCHS-CFS and corresponding CCHS-1.2 dataset conferred a number of significant strengths. These included the large sample size and positive response rate, the active duty nature of the sample, and the assessment of mental disorders with a standardized diagnostic instrument. The STCL dataset also had a large sample size and positive response rate. The recent time frame for release of the veterans also improves the generalizability of the results. The consistent measurement of household income across all three samples is also beneficial for comparability between samples.

Potential Implications

With respect to household income in active military personnel, the CF Income Policy has resulted in increased income for military personnel relative to the general population. The results

of this research would suggest that the minimum income provided by military service exceeds the income ceiling. Other factors that are more sensitive to differences in the prevalence and incidence of mental disorders need to be considered in future programming and planning. The role of rank within the military appears to be of particular importance.

With respect to financial support following retirement, VAC currently administers veteran care under a program known as the New Veterans Charter (NVC), a program that provides financial awards for individuals who are released from the military as a result of a disability experienced while in service (Thompson et al., 2011a). Also administered by the NVC are the rehabilitation program and the income support program, which are provided to veterans who sustain a career-ending injuries that impact their ability to earn an income following release (MacLean et al., 2011a). The NVC has recently come to the attention of policy-makers as potentially being ineffective in its support of veterans (The Globe and Mail, December 13th, 2013). Although income source was not investigated in this project, the results of this study would suggest that if these programs are not effective in maintaining income levels above the LIM or current lowest income quartile value, that they will be ineffective in protecting and rehabilitating mental health as well.

The results also indicate the need for more thorough screening procedures and prevention strategies for military personnel who are in lower economic brackets both prior to enlistment and prior to retirement. Early detection of those individuals who are at risk for mental health conditions as a result of poor financial circumstances may in turn have significant health and economic implications both for this population and for Canadian society. Second, knowledge and understanding of the impact of household income and satisfaction with finances on mental disorders should inform and be incorporated into post-deployment reintegration and transition to

civilian life policies and support programs. Increased income support following repatriation and/or retirement may help to reduce the incidence of mental disorders and subsequent social cost of mental disorders.

Future Research

The implications of the proposed study should also propel a number of future directions in military mental health research. First, further testing is needed in additional datasets to confirm the generalizability of these results. Second, specific investigation into the role of satisfaction with finances in the association between household income and mental disorders or mental health conditions is needed to determine the conditions of SWF under which household income significantly associated with mental disorders. Third, research into the role of income policies (both the CF Income Policy and the NVC) is needed to discern their specific value. Fourth, the quantitative associations found require longitudinal investigation to determine a more causal relationship between income and mental disorders. Finally, both qualitative and quantitative studies investigating what factors may help in attenuating negative outcomes associated with low income in the military would be beneficial.

Conclusions

With respect to the association between household income and mental disorders in the military and mental health conditions in veterans, this research does contribute significantly to the existing literature. To my knowledge, this is the first Canadian study to investigate income as a potential predictive variable for mental disorders or mental health conditions (rather than a covariate) in military personnel and veterans. In essence, this research suggests that income is

associated with mental disorders and mental health conditions in Canadian military personnel and veterans, although there appear to be confounding factors that influence the strength of this association, particularly for active military.

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Appendix A

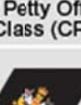
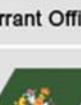
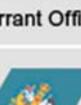
Acknowledgement of Submission of Manuscript

Submissions Being Processed for Author Kristen Klassen, M.Sc.					
Page: 1 of 1 (1 total submissions)			Display <input type="text" value="10"/> results per page.		
Action	Manuscript Number	Title	Initial Date Submitted	Status Date	Current Status
Action Links		Household income, satisfaction with finances, and mental health conditions in a nationally representative sample of Canadian veterans	Apr 07, 2014	Apr 07, 2014	Submitted to Journal
Page: 1 of 1 (1 total submissions)			Display <input type="text" value="10"/> results per page.		

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Appendix B

Rank and Insignia for Non-Commissioned Members

NAVY 	ARMY 	AIR FORCE 
NON-COMMISSIONED MEMBERS		
 Ordinary Seaman (OS)	 Private (Pte Recruit)	 Private (Pte Recruit)
 Able Seaman (AB)	 Private (Pte)	 Private (Pte)
 Leading Seaman (LS)	 Corporal (Cpl)	 Corporal (Cpl)
 Master Seaman (MS)	 Master Corporal (MCpl)	 Master Corporal (MCpl)
 Petty Officer, 2nd Class (PO 2)	 Sergeant (Sgt)	 Sergeant (Sgt)
 Petty Officer, 1st Class (PO 1)	 Warrant Officer (WO)	 Warrant Officer (WO)
 Chief Petty Officer, 2nd Class (CPO 2)	 Master Warrant Office (MWO)	 Master Warrant Office (MWO)
 Chief Petty Officer, 1st Class (CPO 1)	 Chief Warrant Officer (CWO)	 Chief Warrant Officer (CWO)

Rank and Insignia for Officers

<p>NAVY</p> 	<p>ARMY</p> 	<p>AIR FORCE</p> 
<p>OFFICERS</p>		
 <p>Naval Cadet (NCdt)</p>	 <p>Officer Cadet (OCdt)</p>	 <p>Officer Cadet (OCdt)</p>
 <p>Acting Sub-Lieutenant (A/SLt)</p>	 <p>Second Lieutenant (2Lt)</p>	 <p>Second Lieutenant (2Lt)</p>
 <p>Sub-Lieutenant (SLt)</p>	 <p>Lieutenant (Lt)</p>	 <p>Lieutenant (Lt)</p>
 <p>Lieutenant (N) (Lt(N))</p>	 <p>Captain (Capt)</p>	 <p>Captain (Capt)</p>
 <p>Lieutenant-Commander (LCdr)</p>	 <p>Major (Maj)</p>	 <p>Major (Maj)</p>
 <p>Commander (Cdr)</p>	 <p>Lieutenant-colonel (LCol)</p>	 <p>Lieutenant-colonel (LCol)</p>
 <p>Captain (N) (Capt(N))</p>	 <p>Colonel (Col)</p>	 <p>Colonel (Col)</p>

Appendix C

Ethics Certificate for CCHS-1.2 and CCHS-CFS Study



UNIVERSITY
OF MANITOBA

BANNATYNE CAMPUS
Research Ethics Boards

P126 - 770 Bannatyne Avenue
Winnipeg, Manitoba
Canada R3E 0W3
Telephone 204-789-3255
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HEALTH RESEARCH ETHICS BOARD (HREB)
CERTIFICATE OF FINAL APPROVAL FOR NEW STUDIES
Delegated Review

PRINCIPAL INVESTIGATOR: Ms. K. Klassen	INSTITUTION/DEPARTMENT: UofM / Applied Health Sciences	ETHICS #: H2013:408
APPROVAL DATE: November 8, 2013	EXPIRY DATE: November 8, 2014	
STUDENT PRINCIPAL INVESTIGATOR SUPERVISOR (if applicable): Dr. J. Sareen		

PROTOCOL NUMBER: NA	PROJECT OR PROTOCOL TITLE; Associations between income and mental disorders in the Canadian Community Health Survey and Canadian Forces Survey
SPONSORING AGENCIES AND/OR COORDINATING GROUPS: Research Data Centre Graduate Student Award	

Submission Date of Investigator Documents: October 7, 2013	HREB Receipt Date of Documents: October 15, 2013
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THE FOLLOWING ARE APPROVED FOR USE:

Document Name	Version(if applicable)	Date
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Protocol:

Proposal received October 15, 2013

Consent and Assent Form(s):



Other:

List of Variables received October 15, 2013

CERTIFICATION

The above named research study/project has been reviewed in a *delegated manner* by the University of Manitoba (UM) Health Research Board (HREB) and was found to be acceptable on ethical grounds for research involving human participants. The study/project and documents listed above was granted final approval by the Chair or Acting Chair, UM HREB.

HREB ATTESTATION

The University of Manitoba (UM) Research Board (HREB) is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement 2, and the applicable laws and regulations of Manitoba. In respect to clinical trials, the HREB complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations of Canada and carries out its functions in a manner consistent with Good Clinical Practices.

QUALITY ASSURANCE

The University of Manitoba Research Quality Management Office may request to review research documentation from this research study/project to demonstrate compliance with this approved protocol and the University of Manitoba Policy on the Ethics of Research Involving Humans.

CONDITIONS OF APPROVAL:

1. The study is acceptable on scientific and ethical grounds for the ethics of human use only. *For logistics of performing the study, approval must be sought from the relevant institution(s).*
2. This research study/project is to be conducted by the local principal investigator listed on this certificate of approval.
3. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to the research study/project, and for ensuring that the authorized research is carried out according to governing law.
4. **This approval is valid until the expiry date noted on this certificate of approval. A Bannatyne Campus Annual Study Status Report** must be submitted to the HREB within 15-30 days of this expiry date.
5. Any changes of the protocol (including recruitment procedures, etc.), informed consent form(s) or documents must be reported to the HREB for consideration in advance of implementation of such changes on the **Bannatyne Campus Research Amendment Form**.
6. Adverse events and unanticipated problems must be reported to the HREB as per Bannatyne Campus Research Boards Standard Operating procedures.
7. The UM HREB must be notified regarding discontinuation or study/project closure on the **Bannatyne Campus Final Study Status Report**.

Sincerely,

Appendix D

Ethics Approval and Renewal Certificates for STCL Study



UNIVERSITY
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APPROVAL FORM

Principal Investigator: Dr. J. Sareen

Ethics Reference Number: H2012:125

Date of Approval: April 3, 2012

Date of Expiry: April 3, 2013

Protocol Title: The association between income and mental disorders in a nationally representative sample of veterans

The following is/are approved for use:

- Protocol, Version dated March 26, 2012

The above underwent delegated review and was **approved as submitted** on April 3, 2012 by Dr. John Arnett, Ph.D., C. Psych., Health Research Ethics Board, Bannatyne Campus, University of Manitoba on behalf of the committee per your submission dated March 27, 2012. The Research Ethics Board is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement, and the applicable laws and regulations of Manitoba. The membership of this Research Ethics Board complies with the membership requirements for Research Ethics Boards defined in Division 5 of the *Food and Drug Regulations of Canada*.

This approval is valid for one year only. A study status report must be submitted annually and must accompany your request for re-approval. Any significant changes of the protocol and informed consent form should be reported to the Chair for consideration in advance of implementation of such changes. The REB must be notified regarding discontinuation or study closure.

This approval is for the ethics of human use only. For the logistics of performing the study, approval must be sought from the relevant institution, if required.

Sincerely yours,



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HEALTH RESEARCH ETHICS BOARD (HREB)
CERTIFICATE OF ANNUAL APPROVAL

PRINCIPAL INVESTIGATOR: Dr. J. Sareen	INSTITUTION/DEPARTMENT: U of M/PsychHealth Centre	ETHICS #: HS15267 (H2012:125)
HREB MEETING DATE (If applicable):	APPROVAL DATE: September 10, 2013	EXPIRY DATE: April 3, 2014
STUDENT PRINCIPAL INVESTIGATOR SUPERVISOR (If applicable):		

PROTOCOL NUMBER: NA	PROJECT OR PROTOCOL TITLE: The association between income and mental disorders in a nationally representative sample of veterans
SPONSORING AGENCIES AND/OR COORDINATING GROUPS: NA	

Submission Date of Investigator Documents: May 17, 2013	HREB Receipt Date of Documents: September 10, 2013
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REVIEW CATEGORY OF ANNUAL REVIEW: Full Board Review Delegated Review

THE FOLLOWING AMENDMENT(S) and DOCUMENTS ARE APPROVED FOR USE:

Document Name(if applicable)	Version(if applicable)	Date
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Annual approval

*Annual approval implies that the most recent **HREB approved** versions of the protocol, Investigator Brochures, advertisements, letters of initial contact or questionnaires, and recruitment methods, etc. are approved.*

Consent and Assent Form(s):

CERTIFICATION

The University of Manitoba (UM) Health Research Board (HREB) has reviewed the annual study status report for the research study/project named on this **Certificate of Annual Approval** as per the category of review listed above and was found to be acceptable on ethical grounds for research involving human participants. Annual approval was granted by the Chair or Acting Chair, UM HREB, per the response to the conditions of approval outlined during the initial review (full board or delegated) of the annual study status report.

HREB ATTESTATION

The University of Manitoba (UM) Health Research Board (HREB) is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement 2, and the applicable laws and regulations of Manitoba. In respect to clinical trials, the HREB complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations of Canada and carries out its functions in a manner consistent with Good Clinical Practices.

QUALITY ASSURANCE

The University of Manitoba Research Quality Management Office may request to review research documentation from this research study/project to demonstrate compliance with this approved protocol and the University of Manitoba Policy on the Ethics of Research Involving Humans.

CONDITIONS OF APPROVAL:

1. The study is acceptable on scientific and ethical grounds for the ethics of human use only. ***For logistics of performing the study, approval must be sought from the relevant institution(s).***
2. This research study/project is to be conducted by the local principal investigator listed on this certificate of approval.
3. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to the research study/project, and for ensuring that the authorized research is carried out according to governing law.
4. **This approval is valid until the expiry date noted on this certificate of annual approval.** A Bannatyne Campus **Annual Study Status Report** must be submitted to the REB within 15-30 days of this expiry date.
5. Any changes of the protocol (including recruitment procedures, etc.), informed consent form(s) or documents must be reported to the HREB for consideration in advance of implementation of such charges on the **Bannatyne Campus Research Amendment Form**.
6. Adverse events and unanticipated problems must be reported to the REB as per Bannatyne Campus Research Boards Standard Operating procedures.
7. The UM HREB must be notified regarding discontinuation or study/project closure on the **Bannatyne Campus Final Study Status Report**.

Sincerely,