Comparing Severity of Alcohol Problems and Depression using Two Alberta Population Surveys

by

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Abstract

A variety of approaches and models have been used to estimate treatment service needs of people experiencing substance misuse and mental health problems. Typically, estimates are derived from population data assessing the presence or absence of substance misuse or mental health diagnoses. However, this dichotomous approach is problematic because it assumes homogeneity in "cases," despite robust evidence that substance misuse and mental health problems vary in relation to problem severity. Thus, new approaches are needed to incorporate problem severity into ordinal estimates of population prevalence and service system planning. This study addressed this issue by comparing prevalence and treatment utilization for alcohol problems and depression in the general Alberta adult population using different measurement approaches employed in two 2012 surveys: the Alberta Addiction Survey (AAS; $N = 6,000$) and the Alberta sample of Canadian Community Health Survey—Mental Health component (CCHS—MH; $N = 2,785$). Canadian data from the CCHS were also analyzed to supplement CCHS Alberta results that exhibited high sampling variability. The research objectives of this study were to: (1) compare estimates of the size of sub-populations that would benefit from accessing health services, (2) describe whether correlates of alcohol and depression problems (e.g., age, sex, education, marriage, distress) differed across measurement approaches, and (3) assess whether increased problem severity is associated with increased receipt of help. Results revealed that depression was more prevalent than alcohol problems across both surveys and measurement tools. The majority of people with alcohol problems reported not receiving help, even among those with severe alcohol problems. For people with depression, help was more often received than people with alcohol problems; however, there were still substantial proportions of people with depression with unmet needs. Problem severity analysis demonstrated that assessment of different levels of problem severity enhanced understanding of alcohol misuse and depression. That is, in comparison to those with low-severity, people with high-severity alcohol and depression problems had higher levels of distress, received more help, and, for people with alcohol problems, were less likely to be married. A more detailed understanding of gaps in service is useful for service providers; a dichotomous approach falls short in providing the depth of information required to determine the types of services needed by people with

ranging problem severity. Findings help build the case for the utility of providing more differentiated population information for planning service system responses.

Preface

This thesis is an original work by Jesse Jahrig. No part of this thesis has been previously published. The data analyzed were secondary data; therefore ethics approval was not required for this thesis.

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Chapter 1: Introduction

The Population Burden of Substance Misuse and Mental Health Problems

Substance misuse and mental health problems affect people across the globe regardless of age, gender, race, culture or social class. In Canada, anywhere from 20 to 40% of the population will experience a mental disorder (including substance misuse disorders)[1] in their lifetime, and 60 to 80% of the population will be indirectly affected by the mental illness of a family member, a colleague, or a friend (Health Canada, 2002; Statistics Canada, 2013; RiskAnalytica, 2011). In 2012, an estimated 10% of the Canadian population met criteria for a current (i.e., past year) substance misuse disorder, mood disorder and/or generalized anxiety disorder, representing nearly 3 million Canadians (Statistics Canada, 2013). This may be an underestimate of the true rate of current mental health problems in the population due to survey limitations such as underreporting of these stigmatizing health conditions as well as the survey not assessing the full range of problems. One model estimated that nearly 20% of Canadians are living with mental illness (Risk Analytica, 2011).

Population projections suggest that the prevalence of substance-related and mental health problems will increase in the future. For example, the World Health Organization (WHO) projects that depression, just one type of mental health problem, will be the second largest medical burden by 2020 (Murray & Lopez, 1996). Three in five Canadians believe that mental health problems will increase in the coming years (Canadian Medical Association, 2008). This view is corroborated by the Mental Health Commission of Canada (RiskAnalytica, 2011), who projected that 8.9 million Canadians will be living with a mental health problem or illness (including substance use disorders) by 2041; a 31% increase from the current estimate of 6.7 million, a rate expected to outpace the projected population growth of 26% during that time.

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[1] Much of the mental health literature includes substance abuse disorders as one of several types of mental illnesses. Where possible, results are reviewed separately for substance abuse and mental disorders. It should also be noted that for the purposes of this thesis, substance abuse disorders do not include tobacco use.

Mental health problems and substance misuse are the leading cause of the global disease burden (i.e., number of years lived with disability). As a proportion of all-cause disability-adjusted life years, mental and substance use disorders increased from 5.4% in 1990 to 7.4% in 2010, suggesting that the population burden of these disorders is on the rise (Whiteford et al., 2013). According to the WHO (2014), 3.3 million deaths a year are attributed to harmful use of alcohol and 5.1% of the global burden of disease and injury result from alcohol use.

In a single year in Canada (2002), the social costs (productivity losses, health care costs, law enforcement costs, etc.) of substance misuse (i.e., tobacco, alcohol, illegal drugs) approached 40 billion dollars, of which 23 billion dollars were attributed to alcohol and illegal drug related costs. This amounted to $1,267 ($725 for alcohol and drugs) per Canadian at the time (Canadian Centre on Substance Abuse, 2006). The annual cost of health care and lost productivity due to mental illness exceeds 50 billion dollars in Canada (Lim, Jacobs, Ohinmaa & Dewa, 2008). This estimate does not account for costs to other areas impacted by substance misuse and mental health illness such as child welfare or the criminal justice system. Another study estimated that, in 2011, 48.6 billion dollars was spent on providing mental health treatment, care and support services in Canada and projected that cumulative costs over the next 30 years will exceed 2.5 trillion dollars (RiskAnalytica, 2011).

According to the Canadian Medical Association (2008), mental illness is the second leading cause of disability and premature death. The Government of Canada (2006) indicates mental illness is the leading cause of disability (excluding premature death) and accounts for nearly 70% of disability claim costs despite accounting for only 30% of the claims, indicating that treatment is disproportionately expensive compared to other health treatment. A 2008 study (Lim et al., 2008) reported that the average medical cost per capita for mental illness was $2,515 compared to $1,442 for those with an undiagnosed mental illness and $643 for those without a mental illness. This study also reported that people with a mental illness were more likely than people without a mental illness to utilize health services (primary care, specialists, hospital visits).

However staggering the health and social costs may be at the population level, the most important impact is on the health and well-being of the individuals, families and friends who face the challenges presented by substance misuse and/or mental health problems. Deleterious health

consequences include direct health challenges presented by the symptoms of people living with these conditions, exacerbation of other health conditions (e.g., diabetes) and effects on relationships with family and friends. For example, people suffering from alcohol misuse and dependence may experience painful withdrawal symptoms, intense cravings and are at an increased risk for a number of harms such as violence, collisions, death, behavioural disorders, cancer, liver cirrhosis, cardiovascular disease, tuberculosis, HIV/AIDS (Mohler, Dowdall, Koss & Wechsler, 2004; Smith, Branas & Miller, 1999; Naimi, Lipscomb, Brewer & Colley, 2003; National Institute of Alcohol Abuse and Alcoholism, 2000). People living with depression experience symptoms including loss of energy, loss of sleep, feelings of helplessness and hopelessness, weight changes, irritability and are at increased risk of self-injury and suicide (Robson & Gray, 2007; Canadian Centre on Substance Abuse, 2014; World Health Organization, 2015).

Publically Funded Services for Substance Misuse and Mental Health Problems

For people affected directly or indirectly by substance misuse or mental illness, a variety of health services are available; these are funded both publicly and privately. Services range along a continuum of care including health promotion and prevention activities, outpatient counseling and pharmacotherapy services, and intensive residential treatment and aftercare. In Canada, the provinces and territories are the primary jurisdictions responsible for planning and delivery of publicly-funded health services (Health Canada, 2015).

Although the economic burden of mental disorders accounts for 15% of the total burden of disease in Canada, mental health services in Canada only receive 5.5% to 7.3% of total health care funding (Institute of Health Economics, 2008). Substance misuse and mental health service providers across Canada are under pressure to deliver high cost and high quality services in a cost-efficient manner. System managers are faced with the daunting task of ensuring that public funds allocated to these services are being spent efficiently and directed to areas of need. Evidence suggests that treatment can have a dramatic effect on reducing the incidence of mental health illness and reducing associated costs. A 2012 report suggests a 10% decrease in the incidence rate of mental health problems in Canada would save 22.4 billion dollars annually in direct health costs by 2041 (RiskAnalytica, 2012). The National Institute on Drug Abuse (2012)

indicated that in the United States every dollar invested in addiction treatment can save 12 dollars in related in health care and social costs.

Despite a large international evidence base demonstrating that effective treatments exist at every level in the continuum of care for substance misuse and mental health problems (Babor, 2015; Dutra, Stathopoulou, Basden, Leyro, Powers & Otto, 2008; Strang, Babor, Caulkins, Fischer, Foxcraft & Humphreys, 2012; Araya, Rojas, Fritsh, Gaete, Rojas, Simon & Peters, 2003; Araya, Flynn, Rojas, Fritshch & Simon, 2006; Cuijpers, Andersson, Donker & Van Straten, 2011; Scott, 2007; Hunot, Churchill, Texeifa & Silva de Lima, 2010; Stewart and Chambless, 2009), research reveals that many people who have substance use and/or mental health problems do not access treatment services (Bilj & Ravelli, 2003; Rush, 2010; Urbanoski, Cairney, Bassard & Rush, 2008). This service gap can be addressed, in part, by systematic improvements in the planning of treatment services and systems. Historically, planning of treatment services for substance misuse and mental illness has been disjointed and subject to political influences of the day, personal philosophies, and/or service priorities set via anecdotal accounts. Systematic models for service planning have been absent from the planning process; this undermines the ability to provide consistent and appropriate services in response to population need. Improvements to the quality and efficiency of substance misuse and mental illness treatment systems can be achieved by well-informed and systematic service planning (World Health Organization, 2003; Crook & Oei, 1998). Empirically-informed service planning promotes efficient and appropriate allocation of resources to ensure that areas of the treatment continuum (e.g., promotion, prevention, counselling, pharmacotherapy, acute residential treatment) receive funding proportionate to diverse population needs for care.

Chapter 2: Background

Substance Misuse and Mental Health Problems are Heterogeneous Health Issues

A crucial element in understanding substance misuse and mental health problems is that these health problems vary in relation to severity. Severity varies *between* types of mental health problems (e.g., schizophrenia is typically a more severe and debilitating disorder than mood disorders) and *within* index problems (e.g., there can be mild, moderate and severe levels of alcohol misuse). Experts in the field of substance misuse and mental health recognize this heterogeneity and the need to consider problem severity in relation to diagnoses. Whooley (2016) reviewed recent developments in this area. Between 2006 and 2011, a Diagnostic and Statistical Manual of Mental Disorders (DSM-5) Task Force was struck to develop new severity scales—scales meant to account for heterogeneity—for each diagnosis in the DSM (Whooley, 2016). Despite broad interest in the field to incorporate problem severity into this influential diagnostic system, inclusion of problem severity scales in the DSM-5 experienced consensus challenges and was not adopted (and was critiqued for not doing so; see Insel, 2013; Whooley, 2016). Of particular relevance for this thesis, one of the reasons cited by Whooley (2016) for a heterogeneous measure not being adopted was a lack of consensus regarding operational definitions of severity. Although recent efforts to reform the DSM to incorporate problem severity failed, the premise of this thesis is that this issue continues to require research in order to (a) clarify implications of different operational definitions of severity, and (b) inform service planning.

Estimates of service needs at the population level are limited if they cannot be interpreted by service providers and system planners in a meaningful way. Describing population need for services in relation to problem severity is crucial for planning the appropriate types and intensity of services offered. This is apparent at the level of the individual: for instance, treatment needs for depression will vary depending on whether a patient experiences mild or severe symptoms. The former may be able to function well with a treatment plan emphasizing therapy offered in community day programs that are supplemented with medication while the latter may require intensive residential treatment support including individual therapy, group therapy, medication, suicide-risk observation and treating co-morbid disorders (e.g., co-occurring alcohol problems).

From this perspective, an individual's need for treatment and other services should be informed, at least in part, by problem severity. This heterogeneity extends to the population level. Aggregating individual-level substance misuse and mental health problem severity across a population should, in principle, dictate the type and volume of services demanded of the health system to meet the population's needs for treatment and other services.

Problem Severity

At the population level it is useful to conceptualize potential service users in terms of their problem severity along a tiered continuum. Rush (2010) proposed that problem severity can be assessed along three inter-related dimensions of acuity, chronicity, and complexity. Acuity refers to the immediate problems or risks (e.g., self-harm) associated with the index problem (e.g., alcohol misuse, depression). Chronicity refers to long-term persistence or exacerbation of index problems (e.g., alcohol dependence, major depression, bipolar disorder). Complexity refers to concurrent health issues (e.g., depression and substance misuse, schizophrenia and unemployment, bipolar disorder and homelessness) that add to difficulties in treating the index problem (see Figure 1).

These three factors each contribute to an overall level of problem severity. This approach assumes that size of the population needing services decreases as problem severity increases. That is, more people in the population exhibit lower levels of problem severity than people who exhibit higher levels of problem severity. People with lower levels of problem severity require less intensive treatment while those with greater levels of problem severity require more intensive treatment. Rush (2010) argues that health service systems need to acknowledge the full spectrum problem severity among target populations to ensure that services of varying intensity are available to meet different sub-population population needs for care. Figure 1 illustrates the different factors of problem severity along a tiered continuum. The most severe problems are represented at the top of the pyramid and the least severe or non-existent problems represent the base of the pyramid.

Figure 2.1 Dimensions of Problem Severity (adapted with permission from Rush, Trembley, Fougere, Behrooz, Perez, & Fineczko, 2012)
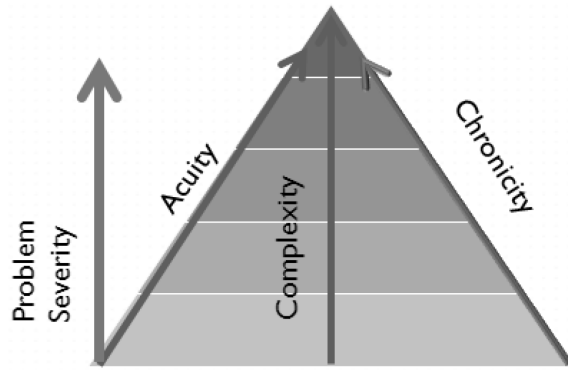
Heterogeneous (Tiered) Service Models

The substance misuse and mental health field has recognized for some time the need to incorporate heterogeneity of problems into diagnosis and treatment service planning (Whooley, 2016; WHO, 2012; Aoun, 2004; Sareen, 2005). WHO (2012) has also recommended that research and service planning needs to move beyond distinguishing people as having or not having a diagnosis and instead understanding problems in terms of the severity of a disorder. This recommendation includes consideration of people who have so-called "sub-threshold" disorders—people who may access services regardless of whether they reach a threshold for a formal diagnosis (WHO, 2012; Druss et al., 2007; Narrow, Rae, Robins & Regier, 2002). Service planners across the globe have adopted the heterogeneous philosophy into practice. A tiered-framework model has been used to guide system-level service planning for mental health and substance misuse in countries such as the UK (National Treatment Agency for Substance Misuse, 2006), Australia (National Mental Health Strategy, 2004), and Canada (Hollander & Prince, 2008; National Treatment Strategy Working Group, 2008). A tiered framework has also been proposed for mental health services (Alberta Health Services & Alberta Health and Wellness, 2012). In any tiered service system framework, the tiers represent different levels of services that are targeted to subpopulations experiencing different levels of problem severity. Each tier has defined functions (e.g., health promotion, screening, assessment, brief intervention, specialized mental health inpatient treatment) that address the heterogeneity of problem severity for substance misuse and mental health problems. A key implication of this approach is that service systems should be designed and delivered in such a way that problem severity can be

assessed across the population who may benefit from the service system. Planning for these services necessitates understanding the population in a corresponding, heterogeneous manner.

Estimating Population Need for Services in Relation to Prevalence of Mental Disorders

There have been several empirically-based approaches to assess population demand for substance misuse and mental health services identified in the literature (Dewitt and Rush, 1996; Crook & Oei, 1998; Joska and Fisher, 2005; Aoun, Pennebaker & Wood, 2004). Data sources for these approaches include population survey data, treatment utilization data, social indicator data (e.g., police arrests related to substance misuse, mortality rates related to substance misuse), and census data—and often different combinations of these data sources. Different methods and techniques are used to combine and analyze these data sources to produce estimates of population needs for care and, in some cases, forecast demand for services. There are advantages, disadvantages and assumptions associated with every approach. The following subsections provide a brief overview of various approaches for quantifying the size of needed-to-treat populations, primarily in the area of substance misuse, since diverse approaches to this issue have mainly been developed in that area. Nonetheless, the logic and methodologies described below are also applicable to mental health problems broadly. Further, when evaluating these approaches it is essential to consider how or if they account for the heterogeneous nature of need for services as opposed to dichotomous "need" vs. "no need" approaches.

      Demand-based models. Demand-based models use historical treatment utilization data to predict future demand for services for substance misuse or mental illness. Although service system planning using this approach is useful, it cannot always safely be assumed that previous demand for services will predict future need for those services. This is problematic because of potential inequities in accessing treatment service. For instance, an area could have high need for services, but inequities in access to service might result in low service utilization in that area, thereby suggesting lower need for future services as measured by treatment utilization. This could result in potentially less resourcing in an area of higher need than an area with less need but greater utilization, which serves to further perpetuate existing inequities (Aoun et al., 2004; Dewit & Rush, 1996; Crook & Oei, 1998).

Capture-recapture model. This method uses treatment utilization data and/or social indicator data related to substance misuse such as treatment episodes, police records for arrests, mortality data, or hospital emergency room admissions. This technique has been used for several decades to estimate the size of substance abusing populations that could benefit from receiving specialized services (Doscher & Woodward, 1983; Bloor, Leyland, Barnard & McDegany, 1991; Hope, Hickman & Tilling, 2005). The basic process first involves selecting a random sample of members of the general population of interest (captured and released). A second random sample is taken again from the population. The proportion of members in the second sample who were also in the first sample (re-captured) is thought to be the same as the proportion of cases in the first sample. The size of the needed-to-treat population is then estimated by multiplying the number of members in both samples divided by the recaptured sample. To illustrate, if sample 1 comprises people who misuse alcohol captured from treatment utilization data and sample 2 comprises people who misuse alcohol captured in arrest data, there are four possible scenarios in which a person can appear. They could be captured in both samples, captured in sample 1 but not sample 2, captured in sample 2 but not sample 1, or not captured in either sample. This method attempts to estimate the latter scenario (neither sample) by using information from the other three scenarios. This approach helps overcome challenges accessing populations that are difficult to reach through other approaches (e.g., poor survey coverage for hidden populations). However, this approach is subject to a number of assumptions that may undermine estimates of population need for services if not met. For instance, there is an assumption that a hidden population has an equal likelihood of appearing in the sample data as the population who actually do appear. However, there may be an unequal likelihood of the hidden population being captured, sometimes referred to as "trap-shy," and this can systematically underestimate the size of the hidden population. Another limitation is that source data might not provide enough detail related to substance misuse for more in-depth analysis (Maxwell & Pullum, 2001; Dewitt & Rush, 1996). Further, this method does not capture information that can be used to describe severity of the problem in the target population, which limits its utility to inform need for services.

Population Estimation (Poisson distribution). This method uses social indicator or treatment utilization data to estimate the size of hidden populations of substance misusers by estimating the true population of users based on the probability of having an event that is already

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known (e.g., arrest, treatment episode; Hser, 1993; Dewitt & Rush, 1996). The expected population is estimated by fitting a probability distribution to the observed frequency distribution of events. The probability distribution is then used to estimate the true population. The Poisson distribution may be used to estimate populations that are difficult to reach with other methods. Like the capture-recapture method, however, this approach uses several assumptions that may be difficult to meet. For instance, the model assumes the hidden population has the same probability as the observed population of being captured in the data ("trap shy"), and violation of this assumption can result in underestimation of the true population. The model also uses social indicator administrative data, which may lack detailed information related to substance misuse (Dewitt & Rush, 1996). Also like the capture-recapture method, a Poisson distribution does not capture enough detail to describe the heterogeneous nature of the population in need of services in relation to problem severity.

Consumption/Ledermann model. This model was originally developed using population estimates of alcohol consumption to estimate need for alcohol services. Mean consumption rates are calculated for the population and an assumption is made that changes in mean consumption reflect associated changes in heavy drinking (Miller & Agnew, 1974; Dewitt & Rush, 1996). While this approach may have some benefit in evaluating local policies on reducing general alcohol consumption, the logic is overly simplistic in assuming there is a direct relationship between average alcohol consumption in a population and heavy-alcohol use in a population (Dewitt & Rush, 1996; Crook & Oei, 1998). Moreover, this method treats problem severity as homogenous, which is not useful in informing service planning.

Mortality-Based Prevalence model. This model, which stems from E.M. Jellinek's observation that alcohol consumption increases were followed by increases in liver cirrhosis, uses mortality data to estimate the number of people in a population who have alcohol misuse problems. Alcohol misuse is derived from: the proportion of deaths associated with alcohol use (e.g., liver cirrhosis, suicide) multiplied by the number of total deaths due to the specific cause and divided by the annual death rate due to the cause among people who misuse alcohol, this has model has been replicated and adapted over time (Single, 1979; Colon, 1981). For instance, if 80% of liver cirrhosis deaths are related to alcohol and there were 10,000 liver cirrhosis deaths as

well as an annual rate of death of twenty per 10,000 of cases liver cirrhosis among those misuse alcohol, then the estimated number of people who misused alcohol would be 0.80 * 10,000 / 20 = 400. The model is limited by data quality issues resulting in underestimates (e.g., misclassification, misdiagnosis), can be problematic if the data do not provide enough detailed information to generalize to sub-groups, and the method estimates only heavy use of alcohol and does not allow for dimensional analysis of alcohol problems in relation to problem severity (Dewitt & Rush, 1996; Crook & Oei, 1998).

Drug acquisition curve. This method uses an age of onset of substance use curve to predict prevalence of substance misuse at any age. The method is based on the idea that there is a fixed curve or pattern of substance misuse behavior that can be mapped mathematically (Oetting & Beauvais, 1983; Dewitt & Rush, 1996). In general terms, the rate of acquisition at an earlier age is used to predict need for services at a later age, following the idea that the greater the rate of onset at an early age the greater the prevalence in later life. The method has benefits for assessing prevalence of rare behavior (e.g., illicit drug use) through retrospective analysis and by identifying prevalence at a given age which can help with prevention and health promotion activities. However, there is not an ability to assess heterogeneity of problems and retrospective data is subject to recall error.

Synthetic estimation. This method synthesizes population survey data and social indicator data to estimate need for substance misuse services in local areas. This method identifies key factors known to be related to substance misuse (e.g., education, gender, age, employment) that are available in local area data sources (e.g., census data; Marden, 1974). Survey data are analyzed to quantify the proportion of the population that meets criteria for substance misuse by the characteristics previously identified in the local data. These proportions are then multiplied by the local population breakdowns to estimate need for services. For instance, a survey may reveal that 10% of unemployed males aged 30 to 39 have a substance misuse problem. That proportion (e.g., 10%) would then be multiplied by the size of the local population for that demographic subgroup (e.g., 50,000) to arrive at the number of local people who have a substance misuse problem in that demographic category (e.g., 5,000). Unlike the capture-recapture and Poisson distribution method, this approach draws from data that may have

more detail and provide further insight into substance misuse. The approach is limited by limitations of census data (e.g., underestimates of population size of certain groups), may not yield wide variation from different geographic areas, and may not provide insight into heterogeneity of the problem (Twigg & Moon, 2002; Dewitt & Rush, 1996).

Prescriptive model. This model estimates the prevalence of a substance misuse or mental health problem (e.g., using population survey data) and then applies a proportion to those with a problem who should receive treatment. The result is an estimate of the demand for treatment services and can be applied to various types of services contingent on the level of detail available. The model is useful in that it accounts for the idea that only a certain proportion of people in need of service will actually seek or receive services. However, the main difficulty with the model is accurately estimating the proportion of those in need that will receive treatment (Dewitt & Rush, 1996).

Projection/forecasting model. These models use prevalence estimates (e.g., using population survey data, social indicator data) on substance misuse or mental health problems and project or forecast the demand for services at some point in the future (e.g., 10 years) (Homer, 1993; Dewitt & Rush, 1996). Assumptions are then made about changes in variables that influence prevalence (e.g., demographic, economic, social, policy) and these are factored into a projection or forecast of how the need for services will change. These models offer a method to inform long-term planning of services and may be useful for assessing needs in local areas. These models are limited by the limitations of the data they draw from and the predictive power of the model decreases as projections become more distant from the time the projections were originally based on (Dewitt & Rush, 1996).

Population survey methods. This approach uses data from population surveys to estimate the size of needed-to-treat populations. Problematic substance or mental health issues can be assessed multiple ways using standardized instruments and scales (e.g., a disorder assessment tool), by asking respondents to indicate if they received a substance or mental health diagnosis from a health professional, and by asking if treatment has been accessed, or assessing self-perceived need for services. Population surveys are able to capture a detailed account of service needs, sociodemographics, related behaviour, treatment utilization, etc. However,

surveys are critiqued for potentially underestimating need due to underreporting of health problems by participants or not accessing portions of the population that have a higher prevalence of need than the general population (e.g., homeless people not typically sampled using standard survey methods; Aoun, et al., 2004; Dewitt & Rush, 1996; Crook & Oei, 1998). Analysis of population survey data is often limited in assessment of heterogeneity of problem severity and frequently adopts a dichotomous approach wherein respondents who meet diagnostic criteria for a substance use or mental disorder are assigned to be "cases" and thus in need of services. Despite these limitations, the population survey approach can provide ordinal assessment of problem severity given the proper analysis.

Consumer perspectives approach. This approach estimates needs for services in a population by incorporating estimates of perceived need for services provided by consumers (i.e., members of a target population who may use treatment services). This approach builds on research that consumers have a perceived need for treatment and that perceived need is a robust predictor of treatment use (Andersen, 1995). Many people who do not meet diagnostic criteria, or other expert-derived definitions of people who are in need of care, will actually use services and their perceived need for treatment is reliably associated with receiving treatment. For this reason treatment is conceptualized as a socially negotiated process that requires incorporating consumer perspectives (Druss, 2007; Meadows, Harvey, Fosey & Burgess, 2000).

Population Survey Estimates of Severity of Alcohol and Depression Problems

The previous section reviewed a variety of approaches and models to estimate population need for substance misuse and mental health services. These estimates are typically derived from data assessing the prevalence of substance misuse or mental health problems using a dichotomous measurement approach, i.e., the presence or absence of an index diagnosis. This measurement approach unfortunately provides limited insight into how need for services relates to problem severity. For instance, estimates based on mortality-based models assess need among individuals exhibiting the most problem severity and are unlikely to detect cases with less severe problems. Estimates based on a capture-recapture model will often look only at individuals who meet the criteria for being classified as a "case" that show up in multiple samples but typically offer no information on problem severity. Estimates using a drug-estimation curve similarly project how

many people will need services at a future point without measuring problem severity. Such approaches are problematic because they often (a) assume homogeneity among people who require treatment, despite evidence that substance misuse and mental health problems vary along a problem severity dimension, and (b) do not align well with the heterogeneous continuum of substance misuse and mental health treatment services that many jurisdictions have implemented to provide different types of health service interventions for clients based on severity of their problems. Thus, new approaches are needed to incorporate problem severity into estimates of population-based need for substance misuse and mental health services.

The WHO (2003) recommends the use of epidemiologic data as a proxy for assessing need and using these estimates to inform frameworks for planning services. While the population survey method for estimating service needs has generally adopted a dichotomous measurement approach (i.e., use of assessment tools that yield only the presence or absence of a disorder), population surveys can use other measurement approaches that more adequately model service need in relation to problem severity. Recent Canadian research by Rush et al. (2012) used population survey data to estimate the population in need of substance misuse services by analyzing problem severity in accordance with a tiered model of services; this allowed for estimates along a continuum of problem severity that could be used to project estimates of service needs at different service tiers. This work provided valuable insight into analyses of population data and application to service planning, but was partly limited by using the broad category of substance use given that treatment services are often specific to a diagnosis or health problem. For example, treatment for alcohol problems differs from that provided for opioid dependence, so producing severity estimates in relation to a diagnostically-sensitive index problem are more informative than estimates at a broader level (e.g., all forms of substance misuse).

Alcohol misuse is the most prevalent substance use disorder and depression is the most prevalent mental health disorder in the Canadian general population (Statistics Canada, 2013). Quantifying problem severity for these common conditions should yield useful information for planning services for this largest population of potential addiction and mental health service users. It is important to acknowledge that less prevalent addiction and mental health issues do warrant

further investigation, many of which can be as or more severe and difficult as alcohol and depression (e.g., injection drug use or schizophrenia); however, for the purposes of this study, alcohol and depression problem severity will be the focus.

Correlates of Alcohol Problems and Depression

In addition to understanding prevalence of alcohol misuse and depression in relation to problem severity, it is useful to understand correlates of problem severity of alcohol and depression. This has practical application to screening, assessment and intervention, including referral to appropriate levels of care (World Health Organization, 2010; Towers et al., 2011; Sanjuan et al., 2014). Further, examining how problem severity can predict service utilization, perceived need for services, and unmet need has practical application for service providers in planning and resource allocation.

Alcohol Use. Of the many population survey-based studies that have examined alcohol use and depression, several used common assessment scales that allow for analysis of factors associated with different types of alcohol consumption. Problematic alcohol use is positively associated with several factors, including being male, younger, lower education, other substance use, having mental health problems and distress (DeMartini & Carey, 2009; Tran et al., 2013; Park et al., 2012; Towers et al., 2011; Smith, Shevlin, Murphy & Houston, 2010; Sanjuan et al., 2014; Arnaud et al., 2010; Hasin, Stinson, Ogburn & Grant, 2007). A 2015 study of college students in the United States (Washesh & Lewis, 2015) found hazardous alcohol use was predicted by greater perceived approval of alcohol use, greater perception of peer use of alcohol, greater positive expectancies (e.g., reduced tension, increased sexuality) and lower negative expectancies. A 2011 study of 55 to 70 year-old New Zealanders found that hazardous alcohol use was associated with younger age (keeping in mind the age of the sample), higher income, being Caucasian (relative to other categories), having a partner, and male gender. The same study found that binge drinkers were more often rural, Maori, and less likely to have tertiary education (Towers et al., 2011). DeMartini & Carey (2009) found that hazardous drinkers in a population of college students were more likely to experience psychosocial problems as well as previous drug use. The latter finding was also revealed in Tran et al.'s (2013) study of HIV-

treated Vietnamese participants. Arnaud et al. (2010) found that distress was significantly higher among alcohol-dependent (more severe) participants than that of alcohol abuse participants.

Depression. Many population survey based studies have found depression is associated with being female, younger age, lower socioeconomic status, unemployed, unmarried, distress, lower physical and social function or functional impairment, and co-morbidity as well as outcome factors such as service utilization and sick days (Maske et al., 2016; Avenevoli et al., 2015; Aljassem et al., 2016; Ell et al., 2005; Shamsuddin et al., 2013; Lincoln, Taylor, Watkins & Chatters, 2011). Maske et al. (2016) used multiple measures to assess correlates of depression in an adult population in Germany. The three measures were the Composite International Diagnostic Interview (CIDI), self-reported diagnosed depression, and the Patient Health Questionaire-9 (PHQ-9). Across measures, depression was associated with lower self-rated health, lower physical and social functioning, higher somatic co-morbidity and greater health service utilization. In a national comorbidity survey (Avenevoli, Swendson, He, Burstein & Merikangas, 2015), youth aged 13 to 18 years who were assessed for major depressive disorder (MDD) using the CIDI, MDD was greater among males than females, increased with age and was often associated with psychiatric co-morbidity (substance disorder, anxiety, ADHD, behavioral disorder) and role impairment. In comparison to mild/moderate depression, people with severe MDD were more likely to experience behavioural disorders, co morbidity, greater role impairment and higher rates of suicidal thoughts. Further, when comparing severe MDD to mild/moderate depression, clinical correlates and comorbidity were two to five times greater among adolescents with severe MDD.

Alcohol misuse, depression, and help received. Research indicates that as illness severity increases so does the likelihood of help-seeking behavior (Coid, 2006; Lefebre, 1998). A number of factors related to severity of substance misuse and mental health problems are associated with treatment use and receiving help. Disability and distress have been suggested to be among the strongest factors associated with help received for mental health services (WHO, 2012; Bland, Newman & Orn, 1997; Henderson, Korten & Medway, 2001; Kessler, Andrews, Colpe, Hiripi, Mroczek, Walters & Zaslavksy, 2002). Kessler et al. (2002) suggest that distress scales might be more useful than psychiatric diagnoses in predicting mental health service use.

Treatment use is also more common among people with: poorer self-rated mental health, with any substance use or mental health disorder (compared to no disorder); disorders that are typically more severe in nature (e.g., schizophrenia vs. substance use disorder); and co-occurring disorders (compared to a single disorder; Lim et al., 2008; Regier et al., 1993; Chen et al., 2013; World Health Organization World Mental Health Survey Consortium, 2004; Bebbington, et al., 2000; Urbanoski, Rush, Wild, Bassani & Castel, 2007; Wu, Ringwalt & Williams, 2003; Harris & Edlund, 2005).

Compared to people without an alcohol health concern, people with alcohol problems are more likely to seek help (DeMartini & Carey, 2009). In regard to alcohol problem severity and receiving help, Ray et al. (2011) found that interest in treatment and help-seeking were associated with high levels of social impairment, previous unsuccessful efforts to stop, and drinking more than intended. Grella, Karno, Warda, Moor & Niv (2009) analyzed survey data to assess the factors related to receiving help for alcohol or other substance dependence disorders. The researchers found that participants were more likely to receive help if they had one or more problems related to their alcohol and/or other substance use problems, had a longer duration of the disorder, and were more likely to rate their mental health as fair or poor. Evans-Polce & Schuler (2016) analyzed U.S. survey data and found that respondents with moderate and/or severe alcohol use disorder had significantly higher treatment rates when compared to respondents with mild or no alcohol use disorder. Cohen, Feinn, Arias & Kranzler (2007) also found in a U.S. population survey that service utilization was greater among those who had alcohol abuse and dependence compared to those with just alcohol abuse or just alcohol dependence.

In regard to depression severity and help received, Kessler (2003) analyzed national survey data to examine treatment use among respondents with depression. The research found that increased symptom severity was associated with increased treatment in specialty mental health and general medical sectors of health. Kessler et al. (2003) also found that other clinical correlates were increased role impairment, length of symptoms and comorbidity. Further, Avenevoli et al's (2015) study of youth that examined mild/moderate depression with severe MDD found that disorder specific treatment, while generally low, was more likely for people with severe MDD

than people with mild/moderate depression. By demonstrating how differentiating problem severity can lead to different patterns of help-seeking, Avenevoli et al. (2015) demonstrated the practical value of examining whether different correlates of depression are evident at different levels of problem severity.

Measurement Strategies

Measurement of health problems influences how health problems are perceived (Espeland & Stevens, 1998; Nicholls, 2013) and how they are diagnosed and treated (Green, 20017; Hasson, 2012; Jutel, 2009). The mental health field has recognized for some time the need to consider heterogeneity of problems into population measurement strategies (Whooley, 2016; WHO, 2012; Aoun, 2004; Sareen, 2005). There are a number of measurement strategies for estimating population prevalence and treatment gaps that use diagnostic interviews and disability assessments. Measurement strategies that rely solely on case definitions based on a dichotomous measurement approach (i.e., did or did not meet diagnostic criteria for alcohol problems or depression) cannot by definition identify individuals with subthreshold disorders. This is problematic, because research indicates that many people with a subthreshold disorder seek help and many individuals with a diagnosis do not use mental health services (WHO, 2012; Druss et al., 2007; Narrow, Rae, Robins & Regier, 2002).

It is appealing to adopt a dichotomous measurement approach to identify cases who meet diagnostic criteria as it provides a clear, unambiguous definition of cases, allows for easier comparison of prevalence across populations, and provides a single estimate of the proportion of target populations who need services. However, this measurement approach is ill-suited to describe problem severity, and thus has limited relevance to service planners, who require more sophisticated assessments of the size of needed-to-treat subpopulations in relation to problem severity in order to allocate resources to different intervention strategies. WHO (2012) recommended that measurement approaches move beyond a dichotomous approach to obtain information on severity of mental disorders as well as subthreshold disorders. Research comparing traditional dichotomous measurement approaches to alternative strategies that take into account problem severity and allow for identification of subthreshold cases is required. However, little empirical evidence has compared these approaches with regard to prevalence and

correlates of alcohol misuse and depression, the two most common mental health issues experienced by Canadians.

Research Objectives

This study compared dichotomous and ordinal measurement approaches with respect to (a) prevalence, (b) correlates of alcohol misuse and depression, and (c) help received. Specifically, using data from two population surveys of Alberta adults, the objectives of this study were to: (1) compare estimates of the size of sub-populations that would benefit from health services, (2) describe whether correlates of alcohol and depression problems (e.g., age, sex, marriage, distress) differed across measurement approaches, and (3) assess whether increased problem severity is associated with increased receipt of help.

Chapter 3: Methods

Data Sources

Alberta Addiction Survey (AAS; 2012)

The 2012 AAS was conducted by the Addiction and Mental Health Research Laboratory of the University of Alberta. The purpose of the survey was to estimate population needs for addiction and mental health services among Alberta adults as part of a larger project assessing gaps in publicly-funded addiction and mental health services (Wild, Wolfe, Wang & Ohinmaa, 2014). The AAS included extensive questions on alcohol use and depression; this allowed the sample to be stratified in relation to severity analysis (more detail to follow). The survey also assessed service utilization, perceived need for care, and unmet need for services. Finally, the survey collected information on sociodemographic variables (e.g., sex, marital status, education, employment), related health conditions (e.g., distress), as well as geographic information (e.g., health region).

A cross-sectional survey was administered to 6,000 Albertans aged 18 years and older. A single-stage, stratified cluster design was used, and an individual response rate of 84.5% (17.2% household response rate) was obtained. The authors of the survey indicated the importance of considering the individual response rate given that if addiction and mental health issues influence response rates, then this influence mostly likely occurs at the individual level. Random digit dialing was used to select interviewees. Interviews were conducted over the phone using computer-assisted telephone interviewing. Data were weighted using bootstrap weighting methods to help ensure representative survey estimates. Computer Assisted Telephone Interview methods were used to aid interviews participants. The survey excluded Alberta adults without telephone land lines.

Canadian Community Health Survey—Mental Health Component (CCHS-MH; 2012)

The 2012 CCHS—MH survey was conducted by Statistics Canada (2012) to assess the mental health status of Canadians, including select mental health disorders (depression, mania, bipolar, and general anxiety disorders) and substance misuse disorders (alcohol, illicit drugs). The survey also asked participants about the degree to which mental health disorders interfered with their

lives; this allowed the sample to be stratified in relation to problem severity (more detail to follow). Service utilization information was captured, including perceived need for treatment and whether treatment needs were met, similar to the information captured by the AAS. In addition, several different sociodemographic (e.g., sex, marital status, education, employment, income), related health conditions (e.g., distress) and geographic (including provincial and local health region location); several of these were similar to the information captured in the AAS.

The cross-sectional survey was administered to 25,113 Canadians (2,785 Albertans) aged 15 years and older living in the ten provinces. A three-stage cluster design based on geographic area, household and person (one person per household) was followed and an individual response rate of 86.3% (79.8% household response rate; 80.2% in Alberta) was obtained. Most interviews (87%) were conducted in-person using computer-assisted personal interviewing. Once a household was identified for sampling, a person from the household was randomly selected for an interview. Data were weighted to help ensure representative survey estimates. The survey excluded persons on Aboriginal reserves and other settlements, full-time armed forces members and people who are institutionalized. Statistics Canada estimates those excluded comprise about 3% of the population.

Analyses were conducted on the CCHS master file, which required submitting a proposal to the University of Alberta's Research Data Centre, which provided data access as part of Statistics Canada's initiative to support access to confidential data.

Key Differences between Surveys
The AAS and the CCHS—MH surveys were similar in purpose and content. The methods differed in some respects, however. The AAS sampled Albertans aged 18 years and older while the CCHS—MH survey sampled Canadians aged 15 years and older (provincial and age-specific data were available for secondary analyses); due to this difference analysis of the CCHS data was conducted on respondents aged 18 years and older. The CCHS—MH used computer-assisted personal interviewing to aid in-person interviews and the AAS used a computer-aided telephone interview. Previous research suggests both methods (telephone and in-person interviews) are capable of assessing alcohol and depression problems and that differences are

negligible (Midanik & Greenfield, 2003; Wettergren, Mattsson, Von Esson, 2011; Sobin et al., 1993). Table 3.1 outlines the methods and the relevant measures for each survey.

Table 3.1 AAS and CCHS—Methods and Measures Used

AAS	CCHS—MH
Methods	
- Cross-sectional survey - Single-stage cluster sample design stratified by geographic area 6,000 Albertans aged 18 years and older - Computer-aided telephone interview - Data collected from November to December, 2012 - Data weighted to help ensure representative survey estimates	- Cross-sectional survey - Three-stage cluster sample design stratified by geographic area, household and person 2,785 Albertans aged 18 years and older 23,330 Canadians aged 18 years and older - Computer-assisted personal interviewing - Data collected from February to December, 2012 - Data weighted to help ensure representative survey estimates
Alcohol Problems and Depression	
Alcohol problems assessed using the Alcohol Use Disorders Identification Test (AUDIT)	Alcohol dependence assessed using the Composite International Diagnostic Interview (CIDI) module for assessment questions of alcohol abuse and alcohol dependence
Depression assessed using the Patient Health Questionnaire (PHQ-9)	Depression assessed using the Composite International Diagnostic Interview (CIDI) module for assessment questions of depression
Correlates	
- Age 18+ years (continuous measure)	- Age 18+ years (continuous measure)
- Sex - Male - Female	- Sex - Male - Female
- Education - Less than post-secondary - Grade 9 or less - Some high school - High school diploma - Some post-secondary - Post-secondary or more - College or post-secondary trades/technical diploma	- Education - Less than post-secondary - Less than secondary school graduation - Secondary school graduation, no post-secondary - Some post-secondary education - Post-secondary or more - Post-secondary certificate/diploma or university degree

AAS	CCHS—MH
▪ Completed university undergraduate ▪ Completed university graduate or professional degree	

• Marital status
  o Not married
    ▪ Separated/Divorced
    ▪ Widowed
    ▪ Single
  o Married or common-law
	• Marital status
	  o Not married
	    ▪ Separated
	    ▪ Divorced
	    ▪ Widowed
	    ▪ Single/never married
	  o Married or common-law

• Employment (among those <75 years of age)
  o Unemployed
    ▪ Unemployed
    ▪ Student
    ▪ Retired
    ▪ Disability
    ▪ Other
  o Full or part time
    ▪ 30+ hours a week
    ▪ < 30 hours a week
	• Employment (among those <75 years of age)
	  o Unemployed
	    ▪ Did not work in week prior to interview (did not have a job, permanently unable to work, had a job but did not work)
	  o Full or part time

• Distress
  o Kessler-6 (continuous)
	• Distress
	  o Kessler-6 (continuous)

Help Received	

• Received help in past 12 months for problems with emotions, mental health or use of alcohol or drugs
  o Information
  o Medication
  o Counselling of any kind outside hospital
	• Received help in past 12 months for problems with emotions, mental health or use of alcohol and drugs
	  o Information
	  o Medication
	  o Counselling or therapy (another response option addressed hospital care; assumption is that this counselling provided outside hospital)

Measures

    Alcohol Problems. Alcohol misuse was assessed in the AAS using the Alcohol Use Disorders Identification Tool (AUDIT). The AUDIT was developed over two decades ago by the WHO (2001) and can be used to assess hazardous or harmful alcohol consumption or alcohol dependence in a number of settings (e.g., primary care, emergency room, psychiatric hospital).

The tool consists of 10 questions that have been validated across sex, age and cultures (Saunders, Aasland, Babor, de la Fuente & Grant, 1993; Saunders, Aasland, Amundsen & Grant, 1993; Allen, Litten, Fertig & Babor, 1997). The AUDIT can be scored from 0 to 40 with increasing scores representing increasing severity of alcohol problems. The user manual for the instrument provides guidelines for health professionals on interventions appropriate for different score values. A score of less than eight indicates abstinence or a low risk of alcohol related problems and a corresponding recommended intervention of simple alcohol education. A score between 8 and 15 indicates risk of alcohol related problems and a corresponding recommended intervention of brief intervention using simple advice and patient education materials to reduce or prevent hazardous drinking. A score of 16 to 19 indicates harmful and hazardous drinking and a corresponding recommended intervention for a combination of simple advice, brief counselling and continued monitoring with potential for further diagnostic assessment if alcohol dependence is suspected. A score of 20 or greater indicates a likelihood of dependence with a corresponding recommended intervention to refer patients to a specialist for further diagnostic evaluation for alcohol dependence (WHO, 2001).

For the CCHS—MH, alcohol disorders were assessed using questions based on the Composite International Diagnostic Interview (CIDI), which was developed by the WHO in 1990. The CIDI is used to identify people with alcohol dependence (among other mental health disorders). While it does not provide a clinical diagnosis it does align with the criteria of the Diagnostic and Statistical Manual of Mental Disorders version IV (DSM-IV) and the International Classification of Diseases (ICD-10) (Statistics Canada, 2013 CCHS-MH User Guide). If a survey respondent received a classification of alcohol dependence, the Sheehan Disability Scale (SDS) was used to assess level of interference experienced by respondents in relation to the disorder. On a scale of 0 to 10, respondents rated the level of interference their disorder had in three separate areas of life (work/school, social relationships, family life/home responsibilities). Scores can be grouped into "none" (0), "mild" (1-3), "moderate" (4-6), "severe" (7-9) and "very severe" (10). Respondents who did not receive a classification of alcohol dependence did not receive the SDS.

       Depression. Depression was assessed in the AAS using the Patient Health Questionnaire-9 (PHQ-9), which was originally developed by Kroenke, Spitzer & Williams (2001) and

subsequently validated (Cameron, Crawford, Lawton, Reid, 2008; Haddad, Walters, Phillips, 2013). The tool is a nine item measure that scores nine DSM-IV criteria based on presence and frequency of depressive symptoms experienced within the last two weeks. Scores on each question range from 0 to 3 (0 = not present, 1 = present for several days, 2 = present for more than half of the days, 3 = present nearly every day) for a total score ranging from 0 to 27 wherein increasing scores reflect increasing problem severity. Total scores of 0 to 4, 5 to 9, 10 to 14, 15 to 19 and 20 to 27 represent "none-minimal," "mild," "moderate," "moderately severe" and "severe" depression, respectively. The manual for the tool provides a guideline for health professionals on interventions appropriate for different score values. A score of 0 to 4 indicates no depression or minimal depression and no recommended treatment actions. A score of 5 to 9 indicates mild depression severity with a recommended treatment action of watchful waiting and repeating the PHQ at follow-up. A score of 10 to 14 indicates moderate depression severity with a recommended treatment action of a treatment plan, considering counseling, follow-up and/or pharmacotherapy. A score of 15 to 19 indicates moderately severe depression with a recommended treatment action for active treatment with pharmacotherapy and or psychotherapy. A score of 20 to 27 indicates severe depression with a recommended treatment action plan to initiate pharmacotherapy and, if severe impairment or poor response to therapy, expedited referral to psychotherapy and/or collaborative management (Kroenke & Spitzer, 2002).

In the CCHS—MH, depression was defined as having experience a major depressive episode in the past 12 months. Depression was assessed using questions based on the CIDI and respondents who met criteria for depression were administered the SDS to inquire about the level of interference on a scale of 0 to 10 in three separate areas of life (work/school, social relationships, family life/home responsibilities). It is also possible to generate a single subthreshold category of people who did not meet criteria for depression.

Dichotomous and ordinal measurement of alcohol problems. Three population strata were created for people with alcohol and depression problems in each of the AAS and CCHS datasets: non-cases, low-severity cases and high-severity cases. For both the dichotomous and ordinal measurement approaches, non-cases were defined as not meeting the respective assessment tool criteria for having an alcohol problem. For the dichotomous measurement

approach, the remaining respondents were considered cases. For the ordinal approach, the remaining respondents (i.e., cases) were sub-categorized as either low-severity cases or high-severity cases.

For dichotomous measurement, in the AAS, respondents who scored 7 or less on the AUDIT were classified as non-cases. In the CCHS, respondents who did not meet the CIDI criteria[2] for an alcohol problem were classified as non-cases. All remaining respondents in both the AAS and CCHS were classified as cases. For the AAS, cases were defined as respondents who scored 8 or greater on the AUDIT and, for the CCHS, cases were defined as respondents who met the CIDI criteria for having an alcohol problem. For ordinal measurement, low- and high-severity cases were differentiated by calculating median scores among cases on the respective scales. Cases who scored below the median for the assessment tool were classified as low-severity cases, and cases who scored at or above the median for the assessment tool were classified as high-severity cases. For the AAS, respondents who scored between 8 and 10 (median = 11) were classified as low-severity cases; respondents who scored between 11 and 40 on the AUDIT were classified as high severity cases. For the CCHS, cases who scored between 0 to 0.99 (median = 1.00) in Alberta and between 0 to 1.49 (median = 1.50) in Canada on the SDS were classified as low-severity cases; cases who scored between to 1.0 to 10 in Alberta and 1.5 to 10 in Canada [3] on the SDS were classified as high-severity cases.

Dichotomous and ordinal measurement of depression. For dichotomous measurement, in the AAS, non-cases were respondents who scored 9 or less on the PHQ-9 and, for the CCHS,

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[2] Alcohol problem criteria: respondents who had lifetime alcohol abuse or dependence or symptoms of alcohol abuse or dependence in the year prior to the interview.

[3] In addition to the Alberta population, results were also analyzed for Canadian data from the CCHS. This was to help supplement the CCHS Alberta results, which in some analyses were subject to high sampling variability.

non-cases were respondents who did not meet the CIDI criteria[4] for depression problems. All the remaining respondents were classified as being cases. For the AAS, cases were those who scored 10 or greater on the AUDIT and, for the CCHS, cases were those who met the CIDI assessed criteria for having depression problems. For ordinal measurement, cases were further divided into low-severity cases and high-severity cases. Low- and high-severity cases were distinguished by calculating the median score among cases on the respective assessment tools. Among cases, respondents who scored below the median for the assessment tool were classified as low-severity cases and cases who scored at or above the median for the assessment tool were classified as high-severity cases. For the AAS, respondents who scored between 10 and 13 (median = 14) were classified as low-severity cases, and respondents who scored between 14 and 30 on the PHQ-9 were classified as high-severity cases. For the CCHS, cases who scored between 0 to 5.49 (median = 5.5) in Alberta and between 0 to 5.79 (median = 5.8) in Canada on the SDS were classified as low-severity cases; respondents who scored between to 5.5 to 10 on the SDS were classified as high-severity cases were those who scored in Alberta and 5.8 to 10 in Canada on the SDS.

A median cut-point was used to provide a standard method for subcategorizing cases across the surveys and assessment tools. Using a statistical criterion to subcategorize cases also had the advantage of maximizing sample sizes within strata. Further, having a standard method that could be applied across surveys rather than choosing cut-points that related to tool cut-point definitions was preferred to avoid making distinctions based on varying and, in some cases limited, operational definitions.

Psychological Distress. In both the AAS and the CCHS, the Kessler Psychological Distress Scale (K6) was used. The K6 uses six questions to assess psychological distress with each question being scored from 0 (experiencing stress none of the time) to 4 (experiencing stress all the time). Scores can therefore range from 0 to 24 with low scores indicating low levels

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[4] Depression problem criteria: respondents who did not have a lifetime diagnosis of a major depressive episode, nor reported an episode in the past 12 months and did not report marked impairment in occupational or social functioning.

of distress and high scores indicating high levels of distress (Kessler et al., 2002). In this study the K6 was treated as a continuous variable.

Help Received. Help received was assessed by a single question on the AAS and the CCHS ("In the past 12 months, please indicate if you received each of the following kinds because of problems with your emotions, mental health or use of alcohol or drugs?"; and "During the past 12 months, did you receive the following kinds of help because of problems with your emotions, mental health or use of alcohol or drugs?", respectively). Due to differences in the response options of the surveys for the questions, the response options that were common to both surveys were used to ensure people were receiving the same type of help. As such, respondents who indicated they received help did so in the form of information, medication or counselling (see Table 3.1 for more detail).

Sociodemographics. Age was assessed by single questions on the AAS and the CCHS ("How old are you today?"; "What is your age?"), respectively and responses were recorded as a continuous variable. Gender was recorded as either male of female on the AAS and CCHS. Education was assessed by single questions on the AAS and CCHS ("What is the highest level of education you have attained"; "what is the highest certificate, diploma or degree that you have completed?"), respectively (see Table 3.1 for response options and how they were recoded for analyses). Marital status was assessed by single questions on the AAS and CCHS ("What is your current marital status?"; "What is your marital status?"), respectively (see Table 3.1 for response options and how they were recoded for analysis). Employment was assessed by single question on the AAS ("Which of the following best describes your employment status?") and for the CCHS a derived variable was used that indicated whether they had full-time or part-time work to reflect employment and used the population exclusion (those who responded in a prior question that they were not employed) as unemployed (see Table 3.1 for response options and how they were collapsed for analysis)—the CCCHS only asked respondents younger than 75 years about employment status so the analysis for the AAS respondents was also restricted to those younger than 75 years.

Statistical Analyses

Research Objective 1. Prevalence of alcohol problems and depression. Frequency analyses compared dichotomous and ordinal measurement approaches with respect to prevalence. In order to validate the ordinal measurement approach across surveys, mean distress levels for non-cases, low- and high-severity cases were compared using the Kessler-6 measure, which was used in both surveys. In light of previous evidence showing a high positive correlation between the Kessler-6 and depression, it was expected that psychological distress would be highest among high-severity cases (Cairney, Veldhulzen, Wade, Kurdyak & Streiner, 2007; Chan & Fung, 2013). Research also suggests that distress is associated with increased levels of alcohol problems (Arnaud et al., 2010) and therefore it was anticipated that self-reported distress would be highest among people with high-severity alcohol problems.

Research Objective 2. Associations between problem severity and socio-demographic and clinical factors. Regression analyses were conducted to assess associations between problem severity (dependent measures) and factors identified previously in the literature as correlates of alcohol or depression problems (for list correlates; see Table 3.2 & Table 3.3). For the dichotomous measurement approach, binomial regression was conducted (Hosmer, Lemeshow, & Sturdivant, 2013), predicting caseness (versus non-cases) from sociodemographic and clinical factors. For the ordinal measurement approach, multinomial regression was used, predicting membership in the three strata (non-cases, low-severity cases, and high-severity cases) from sociodemographic and clinical correlates. Differences in correlates between low- and high-severity subgroups indicate that there is value in assessing problem severity using ordinal measurement.

All correlates previously identified in the literature and common to both the AAS and CCHS were included in the regression models (Table 3.2). These correlates were included regardless of statistically significant associations with the outcome variable. This was done because this objective of the study was to understand how the known correlates were associated or not associated with problem severity when comparing an ordinal approach to a dichotomous

approach. Correlates were coded as either continuous or dichotomous variables.[5] Correlates were added one at a time to the regression model. To test for confounding, as correlates were added, the beta values of correlates in the new model were compared to their respective beta values in the previous model (the model before the new variable was added). A change in value greater than 15% was set as the threshold for confounding, though no changes greater than 15% were found. A design-based goodness-of-fit for logistic regression, an extension of the traditional Hosmer-Lemeshow goodness of fit for survey sample data (Archer, Lemeshow & Lichter, 2010), was conducted for regression to assess whether the final regression model gives a good fit for the data. If a goodness-of-fit test is violated, the results from the regression should be interpreted with caution.

Table 3.2 Analyzed Correlates of Alcohol Problem Severity

Dependent variable: alcohol problem severity • 2 levels for binomial (non-case and case) • 3 levels for multinomial regression (non-case, low-severity case, high-severity case)		
Independent variables	**Expected relationship with alcohol severity based on literature**	**Type of variable**
Age	Younger age associated with greater severity	Continuous
Education	Lower education associated with greater severity	Dichotomous (0 = less than post-secondary; 1 = post-secondary or greater)
Sex	Male associated with greater severity	Dichotomous (0 = female; 1 = male)
Employment	Unemployment associated with greater severity	Dichotomous (0 = not part-time or full-time; 1 = part-time or full-time)
Marital status	Less support (divorced, living alone) associated with greater severity	Dichotomous (0 = not married or common-law; 1 = married or common-law)

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[5] It should be noted that ordinal regression was attempted for analysis but due to data limitations, (sample sizes were too small to consistently use ordinal regression), multinomial regression was used instead.

Distress	Greater distress associated with greater severity (note, there was limited research on this relationship)	Continuous (score range = 0 to 24)

Table 3.3 Analyzed Correlates of Depression Problem Severity

Dependent variable = depression problem severity • 2 levels for binomial (non-case and case) • 3 levels for multinomial regression (non-case, low-severity case, high-severity case)		
Independent variables	**Expected relationship with depression severity based on literature**	**Type of variable**
Age	Younger age associated with greater severity	Continuous
Education	Lower education associated with greater severity	Dichotomous (0 = less than post-secondary; 1 = post-secondary or greater)
Sex	Female associated with greater severity	Dichotomous (0 = female; 1 = male)
Employment	Unemployment associated with greater severity	Dichotomous (0 = not part-time or full-time; 1 = part-time or full-time)
Marital status	Less support (divorced, living alone) associated with greater severity	Dichotomous (0 = not married or common-law; 1 = married or common-law)
Distress	Greater distress associated with greater severity	Continuous (score range = 0 to 24)

Research Objective 3: Predicting help received from caseness and correlates.
Binomial regression analyses were used to compare dichotomous and ordinal definitions of cases, respectively, in relation to help received. Help received was classified a dichotomous variable (i.e., 1 = treatment accessed; 0 = no treatment accessed). Because case definitions derived from dichotomous versus ordinal measurement approaches were the primary independent variables of interest, these were included in models regardless of significance. Logistic regression analyses were performed for the dichotomous measurement approach (i.e., cases versus non-cases); results were compared to binomial regressions predicting treatment utilization from the ordinal measurement approaches (i.e., non-cases, low-severity cases and high-severity cases). As with the other research objectives, a comparison between high- and low-severity cases was of particular interest, as significant differences between analyses would indicate that a dichotomous assessment approach for the target population omits important information about the relationship between problem severity and treatment use.

Additional known correlates from the research literature were included in the model if they (a) yielded a significant relationship with the help received independent of other predictors and (b) continued to yield a significant relationship with help received once other correlates were included and confounding and interaction were ruled out. Of note, due to the measures used in the AAS and CCHS, help received was not assessed in relation to diagnosis, meaning that the help received was not necessarily for an alcohol or depression problem; this is acknowledged as a limitation of the survey and this study.

A design-based goodness-of-fit for logistic regression, an extension of the traditional Hosmer-Lemeshow goodness of fit for survey sample data (Archer et al., 2010), was conducted for regression to test whether the final regression model gives a good fit for the data. If a goodness-of-fit test is violated, the results from the regression should be interpreted with caution.

Table 3.4 Binomial Logistic Regression Models for Predicting Help Received using Alcohol and Depression Problem Severity

Dependent Variable	Independent Variable	Control Variables
Help received	Alcohol severity	Sex, marriage, employment, distress
Help received	Depression severity	Sex, marriage, employment, distress

Chapter 4: Results

Research Objective 1: Description of Prevalence and Help Received

Alcohol Problems: Prevalence and Psychological Distress

Prevalence. Table 4.1 presents the prevalence of alcohol problems and associated levels of respondent distress. Using a dichotomous assessment approach, the prevalence of non-cases (people without an alcohol problem) represented 91.16% of Albertan adults (AAS sample) and 97.15% (CCHS sample) and 97.47% of Canadians (CCHS sample). Cases (people with concerning or problematic alcohol use) represented 8.84% (AAS sample) and 2.87% (CCHS sample) of Albertans, and 2.53% of Canadians (CCHS sample). Using an ordinal approach, low-severity cases represented 4.41% (AAS sample) and 1.69% (CCHS sample) of Albertans. For the CCHS Canadian sample, low-severity cases represented 1.53% of Canadians. High-severity cases represented 4.43% (AAS sample) and 1.16% (CCHS sample) of Albertans. For the CCHS Canadian sample, high-severity cases represented 1.00% of Canadians.

Psychological distress. Using a dichotomous measurement approach, mean distress scores among the AAS sample were significantly higher ($p < 0.05$) among cases (5.22; 95% CI: 4.83, 5.62) than non-cases (3.83; 95% CI: 3.73, 3.93). Mean distress scores among the CCHS Alberta sample did not differ significantly among cases and non-cases. For the CCHS Canadian sample, mean distress scores were significantly higher ($p < 0.05$) among cases (5.49; 95% CI: 4.96, 6.01) compared to non-cases (2.92; 95% CI: 2.85, 3.00). With the ordinal measurement approach, mean distress scores among the AAS sample were significantly higher ($p < 0.05$) among high-severity cases (7.29; 95% CI: 6.57, 8.11) compared to low-severity cases (4.31; 95% CI: 3.70, 4.92). Mean distress scores among the CCHS Alberta sample were also significantly higher ($p < 0.05$) among high-severity cases (6.38; 95% CI: 5.43, 6.68) than low-severity cases (4.31; 95% CI: 3.70, 4.92). This pattern was replicated in the CCHS Canadian sample, where mean distress scores were significantly higher ($p < 0.05$) high-severity cases (5.49; 95% CI: 4.96, 6.01) than low-severity cases (2.92; 95% CI: 2.85, 3.00).

Using an ordinal measurement approach, mean distress scores among the AAS sample approached significance between low-severity and non-cases and the mean distress scores among the CCHS Alberta sample were not significantly different. For the CCHS Canadian sample,

mean distress scores were significantly higher (p < 0.05) among low-severity cases (4.31; 95% CI: 3.70, 4.92) than non-cases (2.92; 95% CI: 2.85, 3.00).

Table 4.1 Alcohol Prevalence and Distress, Alberta and Canadian adults 18 years of age and older.

	Prevalence of Alcohol Problems[a]			Distress[b]		
	%	95% CI	Popl'n[e]	Mean	SE	95% CI
Dichotomous measurement approach						
Non-case						
AB (AAS)[c]	91.16	90.26, 91.99	2,788,592	3.83	0.05	3.73, 3.93
AB (CCHS)[d]	97.15	95.95, 98.01	2,778,088	2.85	0.10	2.65, 3.06
Canada (CCHS)[d]	97.47	97.11, 97.78	25,741,087	2.92	0.04	2.85, 3.00
Case						
AB (AAS)[c]	8.84	8.01, 9.74	270,417	5.22	0.20	4.83, 5.62
AB (CCHS)[d]	2.87	2.01, 4.07	81,391	3.93	0.63	2.69, 5.17
Canada (CCHS)[d]	2.53	2.22, 2.89	668,089	5.49	0.27	4.96, 6.01
Ordinal measurement approach						
Non-case						
AB (AAS)[c]	91.16	90.26, 91.99	2,788,592	3.83	0.05	3.73, 3.93
AB (CCHS)[d]	97.15	95.95, 98.01	2,778,088	2.85	0.10	2.65, 3.06
Canada (CCHS)[d]	97.47	97.11, 97.78	25,741,087	2.92	0.04	2.85, 3.00
Low severity cases						
AB (AAS)[c]	4.41	3.82, 5.09	134,903	4.39	0.24	3.91, 4.86
AB (CCHS)[d]	1.69	0.98, 2.87	48,210	2.27	0.60	1.10, 3.44
Canada (CCHS)[d]	1.53	1.28, 1.83	403,880	4.31	0.31	3.70, 4.92
High severity cases						
AB (AAS)[c]	4.43	3.83, 5.11	135,515	6.06	0.32	5.43, 6.68
AB (CCHS)[d]	1.16	0.81, 1.66	33,181	6.38	0.80	4.80, 7.95
Canada (CCHS)[d]	1.00	0.83, 1.21	264,210	7.29	0.42	6.57, 8.11

Notes [a]Assessed using the Alcohol Use Disorders Identification Test (AUDIT) for the AAS and the Composite Interviewing Diagnostic Instrument/Sheehan Disability Scale for the CCHS. [b]Assessed using the Kessler-6 Psychological Distress scale. [c]Alberta Addiction Survey (AAS), 2012. [d]Canadian Community Health Survey (CCHS), 2012.[e]Estimated population size, subject to rounding error. Sum of sub-population proportions (i.e., low and high severity) may not equal to dichotomous case proportion due to rounding error.

Depression: Prevalence and Psychological Distress

 Prevalence. Table 4.2 reveals the prevalence of depression and associated levels of distress. Using a dichotomous measurement approach, non-cases (people without a depression problem) represented 88.13% (AAS sample using the PHQ-9 to assess depression) and 95.61%

(CCHS sample using the CIDI to assess depression) of Albertans and 95.46% of Canadians (CCHS sample using the CIDI to assess depression). Cases (people with a depression concern or problem) represented 11.87% (AAS sample) and 4.39% (CCHS sample) of Albertans and 4.54% of Canadians (CCHS samples).

The ordinal measurement approach, low-severity cases represented 5.46% (AAS sample) and 1.90% (CCHS sample) of Albertans and 2.07% of Canadians (CCHS sample). High-severity cases represented 6.41% (AAS sample) and 2.48% (CCHS sample) of Albertans and 2.47% of Canadians (CCHS sample).

Psychological Distress. Using a dichotomous approach, mean distress scores among the AAS sample were significantly higher ($p < 0.05$) among cases (8.71; 95% CI: 8.33, 9.08) than non-cases (3.24; 95% CI: 3.16, 3.32). Mean distress scores among the CCHS Alberta sample were significantly higher ($p < 0.05$) among cases (7.86; 95% CI: 6.79, 8.92) than non-cases (2.65; 95% CI: 2.46, 2.85). For the CCHS Canadian sample, mean distress scores were also significantly higher ($p < 0.05$) among cases (9.78; 95% CI: 9.32, 10.24) than non-cases (2.65; 95% CI: 2.59, 2.72). With the ordinal approach, mean distress scores among AAS respondents were significantly higher ($p < 0.05$) among high-severity cases (10.15; 95% CI: 9.61, 10.68) than low-severity cases (6.99; 95% CI: 6.49, 7.49). Mean distress scores among the CCHS Alberta sample were significantly higher ($p < 0.05$) among high-severity cases (9.46; 95% CI: 8.28, 10.63) than low-severity cases (5.79; 95% CI: 4.34, 7.24). For the CCHS Canadian sample, mean distress scores were significantly higher ($p < 0.05$) among high-severity cases (11.32; 95% CI: 10.70, 11.94) than low-severity cases (7.95; 95% CI: 7.37, 8.53).

With the ordinal approach, mean distress scores among the AAS were significantly higher ($p < 0.05$) among low-severity cases (6.99%; 95% CI: 6.49%, 7.49%) than non-cases (3.24%; 95% CI: 3.16%, 3.32%). Mean distress scores among the CCHS Alberta sample were significantly higher ($p < 0.05$) among low-severity cases (5.79%; 95% CI: 4.34%, 7.24%) than non-cases (2.65%; 95% CI: 2.46%, 2.85%). For the CCHS Canadian sample, mean distress scores were significantly higher ($p < 0.05$) among low-severity cases (7.95%; 95% CI: 7.37%, 8.53%) than non-cases (2.65%; 95% CI: 2.59%, 2.72%).

Table 4.2 Depression Prevalence and Distress Alberta and Canadian adults, 18 years of age and older.

	Prevalence of Depression[a]			Distress[b]		
	%	95% CI	Popl'n[e]	Mean	SE	95% CI
Dichotomous measurement approach						
Non-case						
AB (AAS)[c]	88.13	87.17, 89.02	2,695,904	3.24	0.04	3.16, 3.32
AB (CCHS)[d]	95.61	94.42, 95.56	2,764,241	2.65	0.10	2.46, 2.85
Canada (CCHS)[d]	95.46	95.03, 95.85	25,511,356	2.65	0.03	2.59, 2.72
Case						
AB (AAS)[c]	11.87	10.98, 12.98	363,105	8.71	0.19	8.33, 9.08
AB (CCHS)[d]	4.39	3.44, 5.58	126,901	7.86	0.54	6.79, 8.92
Canada (CCHS)[d]	4.54	4.15, 4.97	1,213,629	9.78	0.24	9.32, 10.24
Ordinal measurement approach						
Non-case						
AB (AAS)[c]	88.13	87.17, 89.02	2,695,904	3.24	0.04	3.16, 3.32
AB (CCHS)[d]	95.61	94.4, 96.56	2,764,241	2.65	0.10	2.46, 2.85
Canada (CCHS)[d]	95.46	95.03, 95.85	25,511,356	2.65	0.03	2.59, 2.72
Low severity cases						
AB (AAS)[c]	5.46	4.85, 6.15	167,022	6.99	0.25	6.49, 7.49
AB (CCHS)[d]	1.90	1.30, 2.78	55,074	5.79	0.74	4.34, 7.24
Canada (CCHS)[d]	2.07	1.80, 2.38	554,538	7.95	0.30	7.37, 8.53
High severity cases						
AB (AAS)[c]	6.41	5.73, 7.15	196,083	10.15	0.27	9.61, 10.68
AB (CCHS)[d]	2.48	1.76, 3.49	71,827	9.46	0.60	8.28, 10.63
Canada (CCHS)[d]	2.47	2.18, 2.79	659,090	11.32	0.31	10.70, 11.94

Notes [a]Assessed using the Patient Health Questionaire-9 (PHQ-9) for the AAS and the Composite Interviewing Diagnostic Instrument/Sheehan Disability Scale for the CCHS. [b]Assessed using the Kessler-6 Psychological Distress scale. [c]Alberta Addiction Survey (AAS), 2012. [d]Canadian Community Health Survey (CCHS), 2012. [e]Estimated population size, subject to rounding error. Sub-proportions (i.e., low and high severity) may not total dichotomous case proportion due to rounding error.

Alcohol Problems and Service Utilization

Table 4.3 presents the prevalence of alcohol use and the proportion of cases who received any services (information, treatment and/or medication) with emotions, mental health and/or alcohol/drug use. Using a dichotomous measurement approach, 27.61% (AAS sample) and 16.29% (CCHS sample) of Albertans and 29.21% (CCHS sample) of Canadians classified as cases received help. Conversely, 72.39% (AAS sample) and 83.71% (CCHS sample), and

70.79% (CCHS sample) of Canadians who met criteria for an alcohol problem using the dichotomous assessment approach did not report receiving help. Compared to non-cases, cases were significantly more likely to receive help for the AAS sample (27.61%; 95% CI: 23.28, 32.41 vs. 21.81%; 95% CI: 20.66, 23.00) and the CCHS Canada sample (29.21%; 95% CI: 24.09, 34.91 vs. 14.48; 95% CI: 13.72, 15.28). Cases and non-cases exhibited similar help received proportions in the CCHS Alberta sample (16.29%; 95% CI: 9.40, 26.75 vs. 14.48; 95% CI: 13.72, 15.28).

Using the ordinal measurement approach, in the AAS sample, high-severity cases (39.46%; 95% CI: 35.29%, 46.77%) were significantly more likely ($p < 0.05$) than low-severity cases (15.71%; 95% CI: 11.19%, 21.60%) to receive help. For the CCHS Canada sample, high-severity cases (45.96%; 95% CI: 37.28%, 54.88%) were significantly more likely ($p < 0.05$) than low-severity cases (18.26%; 95% CI: 12.88%, 25.22%) to receive help. The CCHS Alberta sample size was insufficient to analyze low-severity cases; however, 29.60% (95% CI: 16.74%, 46.79%) of high-severity cases used services. Low-severity cases did not differ from non-cases in receiving help for the AAS or the Canadian CCHS sample.

As with the dichotomous approach, high proportions of cases were unserved. Among respondents classified as low-severity cases, the proportion not receiving help ranged from 81.74% to 92.86% and among people in the high-severity group, the proportion not receiving help ranged from 54.04% to 70.40%.

Table 4.3 Past-Year Prevalence of Alcohol Problems, Help Received, and Being Unserved, 2012.

	Alcohol problems[a]			Received help[b]			Unserved[c]		
	%[f]	95% CI	Popl'n[g]	%[f]	95% CI	Popl'n[g]	%[f]	95% CI	Popl'n[g]
Dichotomous measurement approach									
Non-case									
Alberta (AAS)[d]	91.16	90.26, 91.99	2,788,592	21.81	20.66, 23.00	608,192	78.19	77.00, 79.34	2,180,400
Alberta (CCHS)[e]	97.15	95.95, 98.01	2,778,088	15.05	13.23, 17.06	417,969	84.95	82.94, 86.77	2,360,119
Canada (CCHS)[e]	97.47	97.11, 97.78	25,741,087	14.48	13.72, 15.28	3,727,737	85.52	84.72, 86.28	22,013,350
Case									
Alberta (AAS)[d]	8.84	8.01, 9.74	270,417	27.61	23.28, 32.41	74,663	72.39	67.59, 76.72	195,755
Alberta (CCHS)[e]	2.87	2.01, 4.07	81,391	16.29	9.40, 26.75	13,261	83.71	73.25, 90.60	68,130
Canada (CCHS)[e]	2.53	2.22, 2.89	668,089	29.21	24.09, 34.91	195,151	70.79	65.09, 75.91	472,938
Ordinal measurement approach									
Non-case									
Alberta (AAS)[d]	91.16	90.26, 91.99	2,788,592	21.81	20.66, 23.00	608,192	78.19	77.00, 79.34	2,180,400
Alberta (CCHS)[e]	97.15	95.95, 98.01	2,778,088	15.05	13.23, 17.06	417,969	84.95	82.94, 86.77	2,360,119
Canada (CCHS)[e]	97.47	97.11, 97.78	25,741,087	14.48	13.72, 15.28	3,727,737	85.52	84.72, 86.28	22,013,350
Low severity case									
Alberta (AAS)[d]	4.41	3.82, 5.09	134,903	15.71	11.19, 21.60	21,194	84.29	78.40, 88.81	113,710
Alberta (CCHS)[e]	1.69	0.98, 2.87	48,210	s	s	s	92.86	78.68, 97.87	44,771
Canada (CCHS)	1.53	1.28, 1.83	403,880	18.26	12.88, 25.22	73,730	81.74	74.78, 87.12	330,150
High severity case									

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Alberta (AAS)[d]	4.43	3.83, 5.11	135,515	39.46	32.59, 46.77	53,475	60.54	53.23, 67.41	82,041
Alberta (CCHS)[e]	1.16	0.81, 1.66	33,181	29.60	16.74, 46.79	9,821	70.40	53.21, 83.26	23,360
Canada (CCHS)[e]	1.00	0.83, 1.21	264,210	45.96	37.28, 54.88	121,422	54.04	45.12, 62.72	142,788

Notes. [a]Assessed using the Alcohol Use Disorders Identification Test (AUDIT). [b]Received help with emotions, mental health and/or alcohol/drug use among those with alcohol problems. [c]Unserved need refers to respondents with alcohol problems who reported not receiving help. [d]Alberta Addiction Survey, 2012. [e]Canadian Community Health Survey, 2012. [f]Sub-proportions (i.e., low and high severity) may not total dichotomous proportion due to rounding error. [g]Estimated population size, subject to rounding error. Further, the estimated population for services received and unserved need population may not total diagnosed population due to missing and non-responses to questions on received services.
s=Suppressed, sample size too small for analysis.

Depression and Service Utilization

Table 4.4 provides the prevalence of depression and the proportion of respondents who received help (information, treatment and/or medication) with emotions, mental health and/or alcohol/drug use. Using the dichotomous approach 63.29% (AAS sample) and 62.73% (CCHS sample) of Albertans and 71.31% (CCHS sample) of Canadians who were classified as cases received services. Conversely, 36.71% (AAS sample) and 37.27% (CCHS sample), and 28.69% of Canadians who met criteria for depression problem did not report receiving help. Compared to non-cases, cases were significantly more likely to receive help in the AAS sample (63.29%; 95% CI: 59.18%, 67.21% vs. 16.72%; 95% CI: 15.63%, 17.87%), the CCHS Alberta sample (62.73%; 95% CI: 49.34%, 74.41% vs. 13.13%; 95% CI: 11.39%, 15.11%) and the CCHS Canada sample (71.31%; 95% CI: 66.73%, 75.48% vs. 12.17%; 95% CI: 11.49%, 12.89%).

Using the ordinal approach, in the AAS sample, high-severity cases (70.93%; 95% CI: 65.62%, 75.73%) were significantly more likely ($p < 0.05$) than low-severity cases (54.32%; 95% CI: 48.08%, 60.43%) to receive help. For the CCHS Canada sample, high-severity cases (78.73%; 95% CI: 73.18%, 83.39%) were significantly more likely ($p < 0.05$) than low-severity cases (62.48%; 95% CI: 55.40%, 69.07%) to receive help. For the CCHS Alberta sample high- and low-severity cases did not differ with respect to service utilization. In the AAS sample, low-severity cases (54.32%; 95% CI: 48.08%, 60.43%) were significantly more likely ($p < 0.05$) than

non-cases (16.72%; 95% CI: 15.63%, 17.87%) to receive help. For the CCHS Alberta sample, low-severity cases (44.74%; 95% CI: 26.64%, 64.35%) were significantly more likely (p < 0.05) than non-cases (13.13%; 95% CI: 11.39%, 15.11%) to receive help. For the CCHS Canadian sample, low-severity cases 62.48%; 95% CI: 55.40%, 69.07%) were significantly more likely (p < 0.05) than non-cases (12.17%; 95% CI: 11.49%, 12.89%) to receive help.

As with the dichotomous approach, there were still high proportions of those who had depression reporting they did not receive help. Among people who were in the low-severity case group, the proportion not receiving services ranged from 37.52% to 55.26% and among people in the high-severity group, the proportion not receiving help ranged from 12.21% to 24.27%.

Table 4.4 Past-Year Prevalence of Depression, Received Help, and Being Unserved, 2012.

	Depression[a]			Received help[b]			Unserved[c]		
	%[f]	95% CI	Popl'n[g]	%[f]	95% CI	Popl'n[g]	%[f]	95% CI	Popl'n[g]
Dichotomous measurement approach									
Non-case									
Alberta (AAS)[d]	88.13	87.17, 89.02	2,695,904	16.72	15.63, 17.87	450,753	83.28	82.13, 84.37	2,245,149
Alberta (CCHS)[e]	95.61	94.42, 95.56	2,764,241	13.13	11.39, 15.11	363,073	86.87	84.89, 88.61	2,401,168
Canada (CCHS)[e]	95.46	95.03, 95.85	25,511,356	12.17	11.49, 12.89	3,105,873	87.83	87.11, 88.51	22,405,483
Case									
Alberta (AAS)[d]	11.87	10.98, 12.98	363,105	63.29	59.18, 67.21	85,380	36.71	32.79, 40.82	133,296
Alberta (CCHS)[e]	4.39	3.44, 5.58	126,901	62.73	49.34, 74.41	79,600	37.27	25.59, 50.66	47,301
Canada (CCHS)[e]	4.54	4.15, 4.97	1,213,629	71.31	66.73, 75.48	865,393	28.69	24.52, 33.27	348,236
Ordinal measurement approach									
Non-case									
Alberta (AAS)[d]	88.13	87.17, 89.02	2,695,904	16.72	15.63, 17.87	450,753	83.28	82.13, 84.37	2,245,149
Alberta (CCHS)[e]	95.61	94.4, 95.56	2,764,241	13.13	11.39, 15.11	363,073	86.87	84.89, 88.61	2,401,168
Canada (CCHS)[e]	95.46	95.03, 95.85	25,511,356	12.17	11.49, 12.89	3,105,873	87.83	87.11, 88.51	22,405,483
Low severity case									
Alberta (AAS)[d]	5.46	4.85, 6.15	167,022	54.32	48.08, 60.43	90,727	45.68	39.51, 51.92	76,296
Alberta (CCHS)[e]	1.90	1.30, 2.78	55,074	44.74	26.64, 64.35	24,638	55.26	35.65, 76.36	30,436
Canada (CCHS)[e]	2.07	1.80, 2.38	554,538	62.48	55.40, 69.07	346,500	37.52	30.93, 44.60	208,038
High severity case									
Alberta (AAS)[d]	6.41	5.73, 7.15	196,083	70.93	65.62, 75.73	139,082	29.07	24.27, 34.38	57,002
Alberta (CCHS)[e]	2.48	1.76, 3.49	71,827	76.52	59.63, 87.79	54,961	23.48	12.21, 40.37	16,866
Canada (CCHS)[e]	2.47	2.18, 2.79	659,090	78.73	73.18, 83.39	518,892	21.27	16.61, 26.82	140,198

Notes. [a]Assessed using the Patient Health Questionnaire-9. [b]Received help with emotions, mental health and/or alcohol/drug use among those with depression. [c]Unserved need among those with

depression. [d]Alberta Addiction Survey, 2012. [e]Canadian Community Health Survey, 2012. [f]Sub proportions (i.e., low and high severity) may not total dichotomous proportion due to rounding error). [g]Estimated population size, subject to rounding error. Further, the estimated population for services received and unserved need population may not total diagnosed population due to missing and non-responses to questions on received services.
s=Suppressed, sample size too small for analysis.

Research Objective 2: Associations between Problem Severity and Sociodemographic, Clinical Factors

Predictors of Caseness: Alcohol Use

Table 4.5 presents the results of the binomial and multinomial logistic regression analyses, yielding odds ratios of the correlates of alcohol severity for the AAS and the CCHS. Binomial logistic regression was used to assess correlates for the dichotomous outcome (case vs. non-case). Binomial regression analyses for the AAS and the CCHS Canada sample indicated that age (being younger), sex (being male), education (less), not being married, being unemployed and distress (more distressed) were all significantly associated with caseness. Multinomial logistic regression was used to assess correlates for the ordinal outcome. Table 4.5 presents odds ratios from the multinomial logistic regression for the comparison of high-severity problem cases to low-severity problem cases. Differences between high and low severity categories indicate that sub-categorizing cases provides additional information about correlates than simple case versus non-case analysis. Analyses indicated that in comparison to low-severity cases, high problem severity was associated with not being married (p = 0.025; CCHS Canadian sample only) and distress (p < 0.001; AAS and CCHS Canadian samples).

Table 4.5 Odds Ratios and 95% CI Describing Associations Between Sociodemographics, Clinical Factors, and Alcohol Problems

Survey	Age	Sex *	Education*	Marriage*	Employment *	Distress
Cases (reference = non-cases)						
AAS#	0.97 (0.97, 0.98) p < 0.001	3.07 (2.39, 3.95) p < 0.001	0.76 (0.59, .98) p = 0.032	0.60 (0.47, 0.76) p < 0.001	1.57 (1.18, 2.10) p = 0.002	1.07 (1.04, 1.10) p < 0.001
AB CCHS	0.94 (0.92, 0.97) p < 0.001	3.83 (1.99, 7.4) p < 0.001	0.48 (.20, 1.11) p = 0.087	0.77 (0.25, 2.33) p = 0.64	2.12 (1.01, 4.41) p = 0.045	1.06 (0.96, 1.17) p = 0.27
CA CCHS #	0.97 (0.96, 0.98) p < 0.001	3.12 (2.43, 4.01) p < 0.001	0.64 (0.47, 0.87) p = 0.004	0.65 (0.48, 0.88) p = 0.005	1.43 (1.11, 1.92) p = 0.017	1.14 (1.11, 1.17) p < 0.001
High severity cases (reference = low severity)						
AAS	1.00 (0.98, 1.01) p = 0.69	1.09 (0.66, 1.80) p = 0.74	1.17 (0.75, 1.82) p = 0.50	0.85 (0.53, 1.37) p = 0.50	0.98 (0.58, 1.67) p = 0.95	1.09 (1.04, 1.14) p < 0.001
AB CCHS	s	s	s	s	s	s
CA CCHS	1.01 (0.99, 1.02) p = 0.49	0.70 (0.40, 1.21) p = 0.20	0.74 (0.41, 1.32) p = 0.31	0.53 (0.30, 0.92) p = 0.025	0.73 (0.40, 1.35) p = 0.321	1.10 (1.05, 1.15) p < 0.001

* Reference categories: Sex (female), Education (< post sec), Marriage (not married or common law), Employment (not full time or part time).
# design-based goodness-of-fit for logistic regression assumption not met.
s = Suppressed, sample size too small for analysis.

Predictors of Caseness: Depression

Table 4.6 presents the results of the binomial and multinomial logistic regression yielding odds ratios (with 95% CI) of the correlates of depression severity for the AAS and the CCHS. Binomial logistic regression was used to assess correlates for the dichotomous outcome (case vs. non-case). Binomial regression analyses revealed that being younger (all samples), being female (AAS and CCHS Canadian samples), having more education (CCHS Canadian sample), not

being married (AAS and CCHS Alberta sample), being unemployed (AAS sample) and being more distressed (all samples) were all associated with having a depression problem.

Multinomial logistic regression was used to assess correlates for the ordinal outcome. Table 4.6 presents odds ratios from the multinomial logistic regression for the comparison of high-severity problem cases to low-severity problem cases. Analyses indicated that in comparison to low-severity cases, high problem severity was associated with distress ($p = 0.025$).

Table 4.6 Odds Ratios of Depression

Data source	Age	Sex*	Education *	Marriage*	Employment *	Distress
Case (reference: non-case)						
AAS#	0.99 (0.99, 1.00) p = 0.036	0.53 (0.42, 0.68) p < 0.001	0.97 (0.77, 1.22) p = 0.77	0.72 (0.57, 0.90) p = 0.005	0.89 (0.69, 1.14) p = 0.035	1.45 (1.41, 1.50) p < 0.001
AB CCHS#	0.98 (0.96, 0.99) p = 0.008	0.58 (0.30, 1.09) p = 0.09	1.36 (0.70, 2.62) p = 0.36	0.42 (0.22, 0.81) p = 0.010	0.81 (0.42, 1.6) p = 0.53	1.32 (1.20, 1.46) p < 0.001
CA CCHS#	0.98 (0.97, 0.99) p < 0.001)	0.75 (0.59, 0.94) p = 0.012	1.26 (1.00, 1.57) p = 0.044	0.80 (0.62, 1.01) p = 0.064	1.06 0(.81, 1.67) p = 0.068	1.42 (1.38, 1.47) p < 0.001
High severity case (reference: low severity)						
AAS	1.01 (1.00, 1.02) p = 0.14	0.94 (0.64, 1.40) p = 0.75	0.87 (0.58, 1.30) p = 0.50	0.88 (0.61, 1.27) p = 0.51	0.85 (0.57, 1.26) p = 0.42	1.17 (1.12, 1.23) p < 0.001)
AB CCHS	1.03 (0.99, 1.06) p = 0.11	0.78 (0.24, 2.53) p = 0.68	1.56 (0.50, 4.89) p = 0.45	0.61 (0.20, 1.84) p = 0.38	1.03 (0.31, 3.45) p = 0.97	1.14 (1.02, 1.28) p = 0.025
CA CCHS	1.00 (0.98, 1.01) p = 0.38	1.23 (0.84, 1.80) p = 0.29	0.87 (0.58, 1.31) p = 0.52	1.23 (0.83, 1.84) p = 0.30	0.68 (0.45, 1.04) p = 0.074	1.10 (1.07, 1.14) p < 0.001

* Reference categories: Sex (female), Education (< post sec), Marriage (not married or common law), Employment (not full time or part time).
# design-based goodness-of-fit for logistic regression assumption not met.

Research Objective 3: Predicting Help Received from Problem Severity

Alcohol Problems

Tables 4.7 and 4.8 present predictors of help received for the dichotomous and ordinal approaches, respectively. As shown in Table 4.7, binomial logistic regression was used to produce odds ratios that indicated presence of an alcohol problem (case) was not a significant predictor of help received in the AAS and CCHS Alberta samples. Having an alcohol problem was a predictor of service use in the CCHS Canadian sample. With regard to covariates, help received was associated with being female (all samples), higher psychological distress (all samples), unmarried (AAS sample), and not employed (AAS sample).

Table 4.7 Binomial Logistic Regression Predicting Help Received (Alcohol Problems, Dichotomous Measurement)

	AAS#	CCHS AB#	CCHS CA#
Case (reference = non-case)	1.23 (0.93, 1.64) $p = 0.15$	1.00 (0.50, 2.00) $p = 0.99$	1.71 (1.28, 2.28) $p < 0.001$
Sex (reference = female)	0.54 (0.47, 0.63) $p < 0.001$	0.56 (0.40, 0.78) $p = 0.001$	0.55 (0.48, 0.62) $p < 0.001$
Marriage (reference = not married/c.law)	0.79 (0.68, 0.92) $p = 0.002$	--	--
Employment (reference = not f.t./ p.t.)	0.72 (0.61, 0.85) $p < 0.001$	--	--
Distress	1.21 (1.18, 1.23) $p < 0.001$	1.23 (1.16, 1.29) $p < 0.001$	1.28 (1.25, 1.30) $p < 0.001$

design-based goodness-of-fit for logistic regression assumption not met.
--Correlate not included in model.

Odds ratio results from the logistic regression for the ordinal measurement approach are displayed in Table 4.8. High-severity alcohol problems compared to low-severity alcohol problems were significantly associated with help received (AAS and CCHS Canadian samples). In comparison to the dichotomous approach represented in Table 4.7, the ordinal approach does reveal that high-severity problems can be used to predict help received. As for the other

covariates, the same relationships found with the dichotomous approach held true: females were more likely to seek services (AAS and CCHS Canadian samples), people who were not married (AAS sample), people who were not employed (AAS sample) and people who were more distressed (AAS and CCHS Canadian samples).

Table 4.8 Binomial Logistic Regression Predicting Help Received (Alcohol Problems; Ordinal Measurement)

	AAS#	CCHS AB	CCHS CA#
High severity case (reference = low-severity case)	3.11 (1.76, 5.51) p < 0.001	s	2.15 (1.15, 4.01) p = 0.017
Non case (reference = low-severity)	1.54 (1.00, 2.39) p = 0.049	s	0.85 (0.55, 1.29) p = 0.435
Sex (reference = female)	0.53 (0.46, 0.62) p < 0.001	s	0.55 (0.48, 0.62) p < 0.001
Marriage (reference = not married/c.law)	0.79 (0.68, 0.92) p = 0.002	s	--
Employment (reference = not f.t./ p.t.)	0.72 (0.61, 0.85) p < 0.001	s	--
Distress	1.21 (1.18, 1.23) p < 0.001	s	1.28 (1.25, 1.30) p < 0.001

\# design-based goodness-of-fit for logistic regression assumption not met.
--Correlate not included in model.
s Data suppressed due to insufficient sample size.

Depression

Table 4.9 presents the odds ratio results from binomial logistic regression analyses used to assess help received using the dichotomous approach. Having depression was a significant predictor of services use in all samples. As for the other covariates, females were more likely to seek services (all samples), as were people who reported more psychological distress (all samples), people who were not married (AAS sample), and people who were not employed (AAS sample).

Table 4.9 Binomial Logistic Regression Predicting Help Received (Depression Problems; Dichotomous Measurement)

	AAS	CCHS AB#	CCHS CA#
Case (reference = non-case)	4.28 (3.36, 5.45) $p < 0.001$	5.31 (2.62, 10.74) $p < 0.001$	5.87 (4.43, 7.77) $p < 0.001$
Sex (reference = female)	0.58 (0.49, 0.68) $p < 0.001$	0.61 (0.42, 0.88) $p = 0.008$	0.56 (0.49, 0.64) $p < 0.001$
Marriage (reference = not married/c.law)	0.81 (0.69, 0.95) $p = 0.009$	--	--
Employment (reference = not f.t./ p.t.)	0.73 (0.61, 0.86) $p < 0.001$	--	--
Distress	1.14 (1.11, 1.17) $p < 0.001$	1.18 (1.12, 1.24) $p < 0.001$	1.22 (1.20, 1.25) $p < 0.001$

\# design-based goodness-of-fit for logistic regression assumption not met.
--Correlate not included in model.

Table 4.10 presents the odd ratios from the binomial logistic regression analysis used to assess the ordinal measurement approach. In AAS sample, people with high-severity depression were more likely than people with low-severity depression problems to receive help. For all samples, low-severity cases were more likely than non-cases to receive services. As for the other correlates, the same relationships revealed by the dichotomous analysis held true for the ordinal analyses: females were more likely to seek services (all samples), as were people who were not married (AAS sample), people who were not employed (AAS sample) and people who were more distressed (all samples).

Table 4.10 Binomial Logistic Regression Predicting Help Received (Depression Problems; Ordinal Measurement)

	AAS	CCHS AB#	CCHS CA#
High severity case (reference = low-severity)	1.52 (1.01, 2.28) p = 0.043	2.53 (0.64, 10.04) p = 0.19	1.36 (0.84, 2.21) p = 0.22
Non-case (reference = low-severity)	0.28 (0.21, 0.38) p < 0.001	0.30 (0.10, 0.86) p = 0.026	0.20 (0.14, 0.28) p < 0.001
Sex (reference = female)	0.58 (0.49, 0.68) p < 0.001	0.61 (0.42, 0.88) p = 0.008	0.56 (0.49, 0.64) p < 0.001
Marriage (reference = not married/c.law)	0.81 (0.69, 0.95) p = 0.009	--	--
Employment (reference = not f.t./ p.t.)	0.73 (0.62, 0.87) p < 0.001	--	--
Distress	1.13 (1.11, 1.16) p < 0.001	1.18 (1.11, 1.17) p < 0.001	1.22 (1.20, 1.25) p < 0.001

design-based goodness-of-fit for logistic regression assumption not met.
--Correlate not included in model.

Chapter 5: Discussion

Traditional approaches to measuring prevalence of alcohol problems and depression, and mental disorders more broadly, have adopted a dichotomous approach to defining cases wherein diagnostic criteria are used to classify the population into cases and non-cases (i.e., those with a disorder or not). This approach is disadvantageous because it does not conceptualize problems as occurring along a continuum of severity; it excludes people who have subthreshold disorders and among people with a diagnosed disorder it homogenizes severity of problems. From the perspective of health service planning, without assessing mental disorders in relation to problem severity it is difficult to anticipate and plan heterogeneous types of treatment needed in the population. The substance misuse and mental health field has long recognized this issue and has proposed that dichotomous case definitions be supplemented with continuous measures of problem severity (Whooley, 2016; WHO, 2012; Aoun, 2004; Sareen, 2005; WHO, 2012). Assessing substance misuse and mental health problems along a continuum of severity reveals there are differences in associations with sociodemographic correlates and help received (Towers et al., 2011; DeMartini & Carey, 2009; Avenevoli et al., 2015; Maske et al., 2016). This information can be useful in clinical assessments and be beneficial to service providers in predicting and planning treatment use.

The research objectives of this study were to compare dichotomous and ordinal measurement approaches with respect to (a) prevalence, (b) correlates of alcohol misuse and depression, and (c) help received. Specifically, using data from two population surveys, the objectives of this study were to: (1) compare estimates of the size of sub-populations that would benefit from accessing health services, (2) describe whether correlates of alcohol and depression problems (e.g., age, sex, education marriage, distress) differed across measurement approaches, and (3) assess whether increased problem severity is associated with increased receipt of help.

Prevalence of Alcohol Problems

In the dichotomous analysis using the AUDIT, over 270,000 (8.84%) Albertans aged 18 years and older met criteria for alcohol problems and may benefit from intervention. However, a dichotomous approach leaves the severity of the alcohol problem unclear; that is, among those who meet criteria for alcohol misuse, it is not possible to determine the severity of that problem.

This poses a challenge to service providers in planning appropriate interventions as problem severity is needed to determine the appropriate treatment from an array of interventions available—from simple advice to brief counseling and monitoring to evaluation for alcohol dependence and, for people with severe alcohol problems, referral to specialized treatment. That is, of those 270,000+ Albertans who were identified as having an alcohol problem, a dichotomous approach does not inform planners of how many people should receive simple advice or how many need a more serious intervention such as counseling or assessment of alcohol dependence.

An ordinal approach is a step towards a clearer understanding of service needs in the population. This study found that 4.41% Albertans (approximately 135,000) had low severity alcohol problems (had an AUDIT score above 8 but below 11) and 4.43% Albertans (approximately 135,000) had high severity (had an AUDIT score of 11 or greater) alcohol problems. Mean distress scores differed significantly among these two groups, suggesting a meaningful difference between low- and high-severity groups in terms of severity.

According to the WHO (2001) recommended cut-offs for the AUDIT, scores of 16 to 19 indicate harmful and hazardous drinking and a corresponding recommended intervention consisting of simple advice, brief counselling and continued monitoring with potential for further diagnostic assessment if alcohol dependence is suspected. A score of 20 or greater indicates a likelihood of dependence with a corresponding recommended intervention to refer patients to a specialist for further diagnostic evaluation for alcohol dependence. Using the ordinal approach and the WHO (2001) cut-offs, people with a score of less than 16 do not require more intensive interventions. In the AAS, there were approximately 135,000 Albertans who scored above 8 but below 11; these Albertans would not require intensive services and instead would require the milder interventions such as brief intervention using simple advice and patient education materials to reduce or prevent hazardous drinking.

The ordinal approach used in this study is a stride in the direction of understanding alcohol problems in in relation to severity. The approach could be improved if the survey sample was robust enough to allow for analysis of population data by the different cut-off points of the AUDIT (or similar tool) so that the interventions that corresponded with those cut-off points

could be directly connected to the population. For instance, with a large enough sample size, rather than using the median cut-off point, an analysis could group Albertans as scoring between 8 and 15, 16 to 19 and 20 or greater. If, for example, 5% of Albertans scored between 8 and 15 we could infer that 5% of Albertans required brief intervention, simple advice and educational materials. Similarly, if 2% of the population scored between 16 and 19 we could infer that 2% of the population requires interventions that combine simple advice, brief counselling and continued monitoring of risks. Lastly, if 1% of the population scored 20 or greater we could infer that 1% of the population requires interventions to refer patients to a specialist. Using this example, it starts to become clear how dividing the population along a continuum of severity that corresponds with specific interventions can provide practical information for service providers. For the current study this was not possible due to limited sample size. However, even this single step helps illustrate the value of conceptualizing and analyzing substance use problems in terms of severity.

A similar trend emerges when looking at the result of alcohol dependence and/or misuse using the CIDI and SDS instruments. A dichotomous approach reveals that 2.87% of Albertans (approximately 80,000) met the criteria for having alcohol dependence and/or misuse.[6] As with the AUDIT, providing only a case vs non-case analysis provides limited detail on the severity of those who do have a problem. The SDS was used to distinguish low- and high-problem severity, revealing 1.69% of Albertans (approximately 50,000) had low-severity alcohol problems and 1.16% of Albertans (approximately 30,000) had high-severity problems. Mean distress scores differed significantly among these two groups, suggesting a meaningful difference between low- and high-severity groups in terms of severity.

Unlike the AUDIT, the SDS does not provide interpretation guidelines for the scores with regard to treatment interventions. SDS scores can be grouped into "none" (0), "mild" (1-3), "moderate" (4-6), "severe" (7-9) and "very severe" (10). These groupings put the burden on service planners

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[6] The CIDI cut-off used to assess alcohol dependence and/or abuse, which is more severe than the AUDIT cut-off was looking at alcohol problems (not necessarily dependence or abuse), which may account for the difference in proportions and number of Albertans.

to speculate about the types of services needed and, in doing so, undermine the ability of the survey data to provide meaningful results that service providers can use to plan services. This highlights another important consideration of analyzing survey data; namely, that survey administrators need to consider whether and how the assessment tools employed in population surveys characterize population need and if that characterization can be interpreted by service planners into directing service planning decisions. In the case of the SDS, a lack of operational definitions that characterize the population needs limits the utility of population estimates in planning specific services.

Prevalence of Depression

Using the PHQ-9, over 360,000 (11.87%) Albertans aged 18 years and older had depression problems (PHQ-9 score of 10 or greater). As with the dichotomous approach for alcohol, it is unclear what type of services these 360,000 plus people require. For individuals with a score of 10 or greater, the suggested services range from a treatment action plan, considering counselling, pharmacotherapy, psychotherapy, to expedited referral to collaborative management. Without further breakdown of the population it is impossible to discern what proportion of the population requires what services.

The ordinal approach used in this study reveals more of the picture. According to the recommended PHQ-9 cut-off scores (Kroenke et al., 2001) a score of 10 to 14 indicates moderate depression severity with a recommended treatment action of a treatment plan, considering counseling, follow-up and/or pharmacotherapy. Analyses yielded that 5.5% Albertans (approximately 170,000) reported low-severity depression problems (PHQ-9 score between 10 and 13), suggesting people in this segment would require a treatment plan, considering counselling, follow-up and/or pharmacotherapy. Likewise, 6.4% of Albertans (approximately 200,000) reported high-severity depression problems (PHQ-9 score of 14 or greater), suggesting people in this segment would require more treatment action for active treatment with pharmacotherapy and /or psychotherapy and potentially expedited referral to psychotherapy and/or collaborative management. Of note, mean distress scores differed significantly among these two groups, suggesting a meaningful difference between low- and high-severity groups in terms of severity.

Again, by example, an interpretation of depression scores could be enhanced if population severity categories corresponded with the scale cut-off points of the PHQ-9 (Kroenke et al., 2001) and subsequent recommended interventions. That is, with robust enough data a researcher might find that 7% of Albertans scored 10 to 14 and suggest that the same proportion of Albertans will need the corresponding the interventions associated with moderate depression (e.g., treatment plan, counselling); that 3% of Albertans scored between 15 and 19 and recommend the same proportion of Albertans need active treatment with pharmacotherapy and/or psychotherapy; and 2% of Albertans scored between 20 and 27 and recommend the same proportion of Albertans need pharmacotherapy and expedited referral to psychotherapy and collaborative management.

Using the CIDI instrument from the CCHS to assess depression demonstrated the limitations of the dichotomous approach. That is, dichotomous approach revealed that 4.39% of Albertans (approximately 130,000) met criteria for depression but does not provide further information on the range of severity among those who meet criteria for diagnosis. Using an ordinal approach, however, the SDS was able to distinguish low- and high-problem severity, revealing 1.90% of Albertans (approximately 55,000) had low-severity depression problems and 2.48% of Albertans (approximately 70,000) had high-severity problems.[7] Mean distress scores differed significantly among these two groups, suggesting a meaningful difference between low- and high-severity groups in terms of severity. However, and as was the case with using the SDS to assess severity of alcohol dependence/misuse, the tool does not provide guidelines on how to interpret scores thereby limiting its utility in service planning. This limitation is shared with the dichotomous approach, which also cannot provide information that can be interpreted with respect to appropriate treatment interventions.

Dichotomous and Ordinal Prevalence Summary
A major challenge among field experts from the APA who were tasked with creating severity scales for mental health disorders in the DSM-V was a lack of detailed direction on developing

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[7] Mean distress scores differed significantly among these two groups, suggesting a meaningful difference between low- and high-severity groups in terms of severity.

scales and a shared operational definition of severity (Whooley, 2016). This study supports a heterogeneous approach that provides information useful to clinicians and planners that cannot be provided using a dichotomous approach. An ordinal approach often revealed differences among cases regardless of the tool used to assess problem severity and the degree of the severity, reaffirming the need to recognize the heterogeneity that exists within dichotomous prevalence estimates. There is further need in the field to adopt scales that have clinical utility to move toward a more standardized approach for measuring, reporting and understanding the needs of those with substance misuse and mental health problems.

Problem severity should be measured using tools that provide guidelines for interpreting cut-off scores that translate to recommended services (e.g., a score of 10 to 14 on the PHQ-9 comes with a recommendation for a treatment plan, considering counseling, follow-up and/or pharmacotherapy). Two such tools are the AUDIT or PHQ-9. Tools that are able to divide the population into segments using cut-off scores but are unable to provide recommendations on the service types for those divisions may undermine the tool's ability to inform service planners. In fact, one may argue, that it is an inefficient use of often public resources to conduct multi-million dollar surveys that aim to inform service planning but cannot provide service providers with basic information about the types of services that are in demand because the tools used do not lend themselves to clinical or health service interpretation. While there is merit to knowing basic prevalence and clinical severity, an instrument that cannot guide the planning of anticipated services gives rise to questions about what instruments should be included in surveys and selection of tools should consider how the data from the instruments can be analyzed to provide estimates on the continuum of service needs based on the severity of a population.

Lastly, using a survey that can segment the population according to severity and allow for interpretation of scores with regard to services needed (e.g., AUDIT and PHQ-9) also needs to be supported with survey samples that are large enough to allow the population to be divided into severity groupings that align with the survey cut-off scores.

General Prevalence

In addition to illuminating the differences in the dichotomous and ordinal approach, the prevalence results revealed that depression problems were more common than alcohol problems

in the AAS and the CCHS samples. Prevalence of depression and alcohol differed between the two surveys. In comparison to the CCHS samples, the AAS samples yielded higher prevalence of alcohol and depression problems. This is most likely due to differences in the tools used to assess problems in the population. The CCHS used the CIDI, which is closely aligned with the DSM-IV, a diagnostic tool that is designed to identify alcohol abuse and dependence or major depressive episodes. The AAS, on the other hand, used the AUDIT and the PHQ-9, both of which are designed to assess severe problems (e.g., alcohol dependence or severe depression) as well as subthreshold diagnostic problems (e.g., low risk of alcohol related problem, none or minimal depression problems). It was anticipated that distress, as measured by the K6, would increase with problem severity. While this was the case when comparing results within a survey using the same tool to assess problem severity, when comparing across the Alberta samples the mean K6 scores were sometimes higher for the AUDIT and the PHQ-9 than the CIDI/SDS. This finding was unanticipated because the AUDIT and PHQ-9 were expected to be capturing a population that was less severe on average than the population captured by the CIDI/SDS. It is difficult to assess whether this finding was significant because differences in survey methods may contribute to the differences in the K6 mean scores. Further, there is not literature that establishes the validity of using the K6 as a measure of distress caused by alcohol problems, which further limits comparisons of alcohol distress within and across samples. Despite this, the more general finding should not be lost; that is, an ordinal approach often revealed differences where a dichotomous approach did not—regardless of the degree of severity or the tool used to assess severity. This reaffirms the need to recognize the heterogeneity that exists within dichotomous prevalence estimates (cases) and the need to adopt an ordinal approach to uncover this heterogeneity to better understand and serve the population experiencing alcohol and depression problems.

Correlates of Problem Severity

Understanding that certain correlates are more strongly associated with low- or high-severity problems may be useful to: health professionals who are trying to screen and assess people with low- or high-severity service needs, health professionals who are targeting services based on demographic correlates, and service planners who are designing programming that addresses issues related to correlates among people with different levels of problem severity.

Research suggests a number of factors are associated with alcohol misuse including being male, younger, lower education, other substance use, and having mental health problems (DeMartini & Carey, 2009; Tran et al., 2013; Park et al., 2012; Towers et al., 2011; Smith et al., 2010; Sanjuan et al., 2014; Wahesh & Lewis, 2015). In this study, the dichotomous approach found correlates of alcohol problems that were consistent with those in the literature; that is, correlates of having an alcohol problem were: being of younger age, male, less educated, not married, employed and more distressed. Results from the ordinal analysis revealed that in comparison to people with low-severity alcohol problems, high-severity alcohol problems were associated with not being married (in the CCHS Canadian sample). Not being married has been associated with alcohol problems (Towers et al., 2011; Park et al., 2012) and this study further demonstrates that severity of alcohol problem is also associated with not being married. In comparison to people with low-severity alcohol problems, high-severity alcohol problems were associated with increased distress (in the AAS and CCH Canadian sample). This is consistent with previous research wherein scores on the K6 were significantly higher among people who were alcohol-dependent (more severe) than people who experienced alcohol abuse (Arnaud et al., 2010).

With regard to associated factors of depression, research literature has demonstrated that being female, younger, lower socioeconomic status, distress, lower physical and social function or functional impairment, and co-morbidity are highly associated with depression (Maske et al., 2016; Avenevoli et al., 2015; Aljassem et al., 2016; Ell et al., 2005; Shamsuddin et al., 2013; Mitchell & Beals, 2011; Lincoln et al., 2011). In this study, using the dichotomous results were consistent with previous research; that is, results indicated that being younger, female, not married, unemployed, and distress was associated with depression. In comparison to people with low-severity depression problems, high-severity depression problems were associated with increased distress. While previous research has found that depression and distress are highly associated (Mitchell & Beals, 2011; Kubiak, Beeble & Bybee, 2009; Baggaley, et al., 2007; Cairney et al., 2007), and it logically follows that higher levels of distress would be associated with higher levels of depression, no previous studies were found that demonstrated this relationship, making the findings in this study unique.

Problem Severity and Help Received

Among Albertans with an alcohol problem, a relatively small proportion (27.2% using the AUDIT and 16.3% using the CIDI) received help, meaning approximately three quarters of Albertans did not receive help. This amounts to an alarming proportion (72.39% for the AAS and 83.71% of CCHS sample) of Albertans with an alcohol problem not receiving services. This is comparable to previous research in 2002 that found 13.6% of Canadians with a substance dependence disorder used services leaving approximately 76% of Canadians who had a substance dependence disorder and did not receive services (Urbanoski, Rush, Wild, Bassani & Castel, 2007). Further, a U.S. population survey (Hasin et al., 2007) was used to estimate that only 12.1% of individuals with alcohol problems reported in the previous year also received treatment.

Among Albertans with depression, more than half of Albertans (63.29% AAS, 62.73% CCHS) received help, leaving approximately 40% of Albertans with a depression problem who did not receive help. While Albertans with a depression problem fair better than Albertans with an alcohol problem in terms of receiving help, it is clear there are a considerable number of Albertans with depression problems who could benefit from services but are not receiving them. In comparison, in 2002 44.1% of Canadians with a mental health disorder used services leaving approximately 56% of Canadians who had a mental health disorder and did not receive services (Urbanoski et al., 2007).

Although comparing alcohol misuse problems with depression problems was not the focus of the study, it is difficult to ignore the startling difference between the two with regard to the proportion of people with a problem who are receiving services. The proportion of people with depression problems who received services was more than double the proportion of people with alcohol problems who received services regardless of survey or severity level. Stigma has long been cited as a barrier to getting help and research suggests that people with alcohol problems are severely stigmatized, even more so than people with mental disorders such as depression (Schomerus, Lucht, Holzinger, Matchinger, Carta & Angermeyer, 2010). This may be because alcohol problems are viewed as deviant and voluntary behaviour (Phelan, Link & Dovido, 2008; Olsen, Richardson, Dolan & Menzel, 2003) and people are held more responsible for their condition and provoke more negative emotions and social judgment (Schomerus et al., 2010).

There may be a greater sentiment among those who use alcohol that their problems do not warrant treatment and that they should be able to handle the problems without treatment. It may also be that in comparison to those with depression, people with alcohol problems may be less aware of where to go for services, have less of the treatment costs covered and less access to treatment. While a full review of these barriers is beyond the scope of the current research objectives, it is important to acknowledge the differences between the two groups with regard to help received: both groups are underserved but those with alcohol problems vastly more so.

It is critical for health service planning to anticipate those with health problems will seek help, and therefore not being able to predict who will receive help is a fundamental limitation. Using the dichotomous approach in this study, presence of an alcohol problem did not predict whether someone would receive help in either Alberta sample (though an association was found in the CCHS Canadian sample). For depression, the dichotomous approach revealed that having a problem was a significant predictor of receiving services. Research indicates that as severity increases so does the likelihood of receiving services (Coid, 2006; Lefebre, 1998; Avenevoli et al., 2015; Maske et al., 2016; Cohen, Feinn, Arias & Kranzler, 2007) and the ordinal approach allowed a closer look that revealed alcohol problem severity was in fact associated with help received. Specifically, in the AAS and the CCHS Canadian sample, people with higher severity alcohol problems were more likely than those with low severity problems to seek help for services, which is consistent with the research literature. Cohen et al. (2007) found that in a U.S. population survey a greater proportion of respondents who suffered alcohol abuse and dependence (27.9%) accessed services than the proportion of people who had only alcohol abuse (7.5%) or only alcohol dependence (4.8%). In a more recent U.S. population survey, Evans-Polce et al. (2016) found that approximately 20% of people with moderate/severe alcohol use disorder received treatment compared to just 5% of individuals with mild alcohol use disorder. For depression, in the AAS sample, the ordinal approach yielded that not only do low-severity and high-severity cases receive significantly more services than non-cases but that in comparison to low-severity cases, high-severity cases are significantly more likely to seek services, which is again demonstrates that the ordinal approach provides further detail that the dichotomous approach does not. This is consistent with findings from Avenevoli et al. (2015) who found that treatment was more frequent for those with severe depression (44.7% of participants received

disorder-specific treatment) than for those with mild/moderate depression (29.4% received disorder-specific treatment).

A more detailed understanding of gaps in service is useful for service providers; the dichotomous approach falls short in providing the depth of information required to determine the types of services needed by people with ranging problem severity. The ordinal approach revealed that people with high-severity alcohol or depression problems were significantly more likely than their counterparts with low-severity problems to receive help. The distinction among low- and high-severity problems is useful for service providers because it illuminates a number of key findings. First, it still reveals that people with alcohol and depression problems are grossly underserved. The group receiving the lowest rate of help, Albertans with low-severity alcohol problems, there are approximately 84% to 93% are not receiving services. While there may be reasons to explain why people with depression are more likely to receive help than people with alcohol problems (e.g., there is more stigma associated with alcohol use than depression and stigma is a barrier to treatment seeking), the point of the ordinal approach is best highlighted when trying to understand why there are differences within a particular problem. That is, the ordinal approach sparks questions such as "why are people with low-severity alcohol problems less likely than those with high-severity problems to receive services?" The answer to this question will vary by jurisdiction and service provider but having a clearer understanding of problem severity helps characterize the service demands of people who are more likely to receive help, people with high-severity problems. It also calls attention to the importance of better addressing the needs of people with low-severity problems who, at least in the case of alcohol problems, were not receiving any more help than people without a problem. For instance, the lower rates of help received may be due to a lack of services available to people with low-severity problems and service planners could use this information in part to justify an increase in resourcing lower level interventions (e.g., screening, brief intervention, referral). Further, service planners may see the lower received help rates and use these proportions to justify funding for prevention and health promotion interventions targeted at people with low-severity alcohol problems in an effort to reduce the number of people with high-severity alcohol problems and the higher costs associated with more intensive interventions.

While low- and high-severity divisions can be used to inform segments of the population that may need treatment, it should be acknowledged that there are people in the population who have sub-threshold problems that still require attention from service providers. Perceived need is a strong predictor of treatment use (Andersen, 1995). In a population there will be individuals who are assessed as having a sub-threshold problem and who have a perceived need for treatment and will seek treatment. The health system still needs to account for the needs of sub-threshold populations and determine the appropriate treatment needs and services to appropriately support individuals along their care path. That is, a comprehensive population needs assessment should account for consumer driven needs as well as professionally assessed needs in determining service planning and treatment for a population.

Summary of Key Findings

The results of this analysis demonstrated that assessment of problem severity enhanced understanding of correlates of alcohol misuse and depression. For instance, using an ordinal measurement approach, results indicated that Albertans with high-severity alcohol problems were more likely than those with low-severity problems to receive help in both the AAS and the CCHS Canadian samples (the CCHS Alberta sample was not large enough for analysis). For depression, the ordinal approach revealed that people with high-severity problems were more likely than those with low severity problems to receive help in the AAS sample, and people without depression were less likely than those with low-severity depression problems to receive help across all samples. With regard to correlates of severity, distress was more strongly associated with high- rather than low-severity problems for both alcohol (AAS and the CCHS Canadian sample) and depression (all samples); and for alcohol, not being married was more strongly associated with high- rather than low-severity problems in the CCHS Canadian sample.

Strengths, Limitations and Future Research

A notable strength of the method employed in this study was the availability of two population surveys conducted in the same population (Alberta) during the same time period (2012) with similar content (e.g., alcohol misuse and depression, help received, sociodemographics). Use of these two survey sets allowed for a robust analysis that often replicated findings across surveys and across different tools measuring the same concepts (i.e., alcohol and depression). These

differences in surveys provided convergent validity demonstrating the recurring disadvantages of the dichotomous approach in comparison to the ordinal approach to assessing substance misuse and mental health problems among a population.

Given the limited sample sizes of the surveys in the Alberta populations, dividing cases into additional severity groups (beyond low- and high-severity) would have limited the ability to analyze the data. As mentioned, there are better ways to divide the population into different levels of severity; namely, analyzing the population data in alignment with the clinical scores of a tool, which would foster better interpretation of results. A more robust data sample is needed for this analysis and is a limitation of this study.

It is also recognized that population survey data are limited (mainly by underestimation), however, all models reviewed are limited to some extent. Moreover, the purpose of any model is to provide a basis for improving planning and ultimately outcomes in the population. It is often suggested in the literature (Maxwell & Pullum, 2001), that even a conservative estimate yields results which exceed current funding for services.

There are a number or correlates of alcohol and depression as well as with help-seeking. This study was limited to just those correlates that existed in both the AAS and CCHS. Future research could examine other known correlates of alcohol, depression and help-seeking with regard to problem severity. This includes correlates such as peer perception, expectations (Washesh & Lewis, 2015), income and socioeconomic status (Towers, 2011), social function or functional impairment and other mental health or psychosocial problems (Maske et al., 2016; DeMartini & Carey, 2009; Tran et al., 2013; Avenevoli et al., 2015; Smith et al., 2010), suicidal thoughts (Avenevoli et al., 2015; Smith et al., 2010), sick days (Maske et al., 2016), self-rated health (Maske et al., 2016), perceived need for help (Edlund, Booth & Feldman, 2009), and duration of disorder (Evans-Polce & Schuler, 2016; Kessler et al., 2003).

Additionally, this study focused on severity of alcohol and depression problems and relation to correlates and help received. Given sufficient sample size, future research could expand focus to other addiction and mental health problems such as anxiety disorders, schizophrenia, cannabis problems, illicit drug use, etc.

The ordinal approach provides more information than the dichotomous approach to service providers to inform decisions about where to focus efforts to improve access and appropriately match services with demand. There are several directions to further build on the multi-severity level approach. Consideration for future research and particularly population surveys is the use of tools that assess problem severity along a continuum. These tools should be able to provide an assessment that can be analyzed in such a way that allows a population to be grouped into segments of problem severity that correspond with appropriate interventions (e.g., prevention, promotion, screening, assessment, referral, and specialized treatment). The current use of the CIDI tool paired with the SDS is limited in ability to translate scores into a corresponding treatment or intervention offers limited information for service planners. Tools that have the ability to assess a continuum of problem severity and offer clinical interpretation of scores that translate to services, such as the AUDIT and PHQ-9, should be employed in population surveys that are large enough for proper analysis. In doing so, population survey data could be much more directive in making evidence-based service delivery decisions.

Another direction for future research could examine the nature of the help received by problem severity to further illuminate the types of help that are least and most often accessed and how that differs among the continuum of problem severity to further inform service planning efforts.

Conclusion

This study consistently revealed the deficits of the dichotomous approach in light of the ordinal approach in characterizing alcohol and depression problems. In comparison to the dichotomous approach, the ordinal approach provided: more information about the severity of needs and, in some instances, the different interventions needed for the different segments of the population, which would have very practical advantages for service planners; some differences in correlates associated with problem severity (e.g., distress) that may be beneficial for screening and assessment; and confirmation of the research finding that increased severity is strongly associated with receiving help (both approaches demonstrated there was a significant gap in service needs).

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Appendix A – Alberta Addiction Survey Ethics Certificcate

Notification of Approval

Date:	September 28, 2012
Study ID:	Pro00032920
Principal Investigator:	Thomas Wild
Study Title:	Gap Analysis of Public Mental Health and Addictions Programs: Addiction and Mental Health Service Needs Survey
Approval Expiry Date:	September 27, 2013

Approved Consent Form:	Approval Date 9/28/2012	Approved Document Information and Consent Script

Sponsor/Funding Agency:	Alberta Health & Wellness	AH

	Project ID	Project Title	Speed Code	Other Information
RSO-Managed Funding:	G599001668	Measuring Addictions and Mental Health Problems in Alberta: Phase 1	21C75	

Thank you for submitting the above study to the Research Ethics Board 2 . Your application has been reviewed and approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Dr. Stanley Varnhagen

Chair, Research Ethics Board 2

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix B – Research Data Centre Access Approval

Contract number : 16-SSH-UAB-4813
Title : Comparing severity of alcohol problems and depression using two Alberta population surveys

MICRODATA RESEARCH CONTRACT

(Hereinafter referred to as the "Contract")

BETWEEN:

> HER MAJESTY THE QUEEN IN RIGHT OF CANADA, as represented by the Minister responsible for Statistics Canada,
>
> (Hereinafter referred to as "Statistics Canada"),

AND:

> Jesse Jahrig ;   University of Alberta
>
> T. Cameron Wild ;   University of Alberta
> Ambikaipakan Senthilselvan ;   University of Alberta
>
> (Hereinafter referred to as Researcher(s))
>
> Each a "Party" and collectively referred to as "Parties".

Recitals

1. Statistics Canada requires the services of the Researcher(s) to perform Special Services of statistical research and analysis, as described herein, pursuant to the *Statistics Act* R.S.C. 1985 chapter S-19;

2. The performance of these Special Services requires that the Researcher(s) has/have access to the Information in Appendix D;

3. Subsection 5(3) of the *Statistics Act* provides that any persons retained under contract to perform Special Services for the Minister pursuant to the *Statistics Act*, and the employees and agents of those persons shall, for the purposes of the *Statistics Act*, be deemed to be employed under the *Statistics Act* while performing those services;

4. (Select for public servants and re-number) Subsection 5(2) of the *Act* provides that the Minister may, for such periods as the Minister may determine, use the services of any employee of the public service of Canada in the exercise or performance of any duty, power or function of Statistics Canada or an officer of Statistics Canada under this *Act* or any other *Act*, and any person whose services are so used shall, for the purposes of this *Act*, be deemed to be a person employed under this *Act*;

5. Subsection 6(1) of the *Statistics Act* provides that any person deemed to be employed pursuant to the *Statistics Act* shall, before entering on his/her duties, take and subscribe the oath or solemn affirmation contained in that subsection;

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6. To perform these services and to have access to confidential information, the Researcher(s) must become Deemed Employee(s) of Statistics Canada, and is/are required to take the Oath of Secrecy and must adhere to Statistics Canada's security and confidentiality requirements;

7. The Proposed Output and all materials (excluding Other Source Data) brought into Statistics Canada premises (which includes Research Data Centres) by Researcher(s) pursuant to the execution of the Special Services will be subject to the *Access to Information Act,* R.S.C., 1985, c. A-1 and the *Privacy Act,* R.S.C., 1985, c. P-21;

8. Other Source Data brought into Statistics Canada premises by Researcher(s) pursuant to the execution of the Special Services will be subject to the confidentiality provisions of the *Statistics Act.*

9. Statistics Canada wishes to establish the terms and conditions under which the Researcher(s) is/are retained to perform Special Services for the Minister pursuant to the *Statistics Act,* notably to ensure the appropriate use and the protection of the confidentiality of the Information to which the Researcher(s) may have access during the performance of these Special Services;

NOW THEREFORE the Parties agree as follows:

1. DEFINITIONS AND INTERPRETATIONS

1.1 Definitions

In this Contract, a capitalized term has the meaning given to it in this section, unless the context indicates otherwise:

"Deemed Employee"
Deemed Employee means any person, not currently an employee of Statistics Canada, retained to perform Special Services for Statistics Canada pursuant to the *Statistics Act,* for which access to Information protected by the *Statistics Act* is required in order to perform the Special Services.

"Information"
Information means the confidential identifiable microdata provided to Researcher(s) by Statistics Canada and listed in Appendix D, pursuant to this Contract, and statistical aggregates thereof that could directly or indirectly identify a Person.

"Other Source Data"
Other Source Data means data brought into Statistics Canada premises by Researcher(s) for use in the performance of Special Services and listed in Appendix C.

"Person"
Person means an individual, a corporation incorporated under any Act of Canada or a province or territory, a partnership, an association or an unincorporated business.

"Proposed Output"
Proposed Output means output/work created by Deemed Employee(s) as a result of providing Special Services outlined in Appendix C.

"Special Services"
Refers to statement of work described in Appendix C.

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Contract number : 16-SSH-UAB-4813
Title : Comparing severity of alcohol problems and depression using two Alberta population surveys

1.2 Interpretation of Appendices

This Contract contains the following Appendices, which form an integral part of this contract:

(a) Appendix A - Security Requirements

(b) Appendix B - Operational Requirements

(c) Appendix C - Description of Special Services to be provided to Statistics Canada by Researcher(s)

(d) Appendix D - Information and related documentation provided to Researcher(s)

(e) Appendix E - Documents to be reviewed by Researcher(s)

(f) Appendix F - Conflict of Interest Declaration Form

In case of inconsistency or conflict between a provision contained in the part of the Contract preceding the signatures and a provision contained in any of the appendices, the provision contained in the part of the Contract preceding the signatures will prevail.

2. STATEMENT OF WORK

2.1 The Researcher(s) is/are hereby retained to perform the Special Services as documented in Appendix C, for the Minister pursuant to the *Statistics Act*.

2.2 Special Services shall consist of carrying out the research project and in providing the Proposed Output as described in Appendix C, in accordance with the requirements contained in this Contract.

3. INFORMATION ACCESSED BY DEEMED EMPLOYEE(S)

Subject to this Contract, Statistics Canada shall grant Deemed Employees access to the Information required to perform Special Services for Statistics Canada.

4. TERMS AND CONDITIONS OF ACCESS TO THE MICRODATA

4.1 Subject to the terms and conditions contained in this section and the Security Requirements in Appendix A as well as the Operational Requirements in Appendix B, Statistics Canada will provide access to the Information to the Researcher(s) for the purpose of performing the Special Services.

4.2 Such access will be provided only to the extent necessary, at Statistics Canada's discretion, for the performance of the Special Services.

4.3 Such access will only be provided on Statistics Canada premises and using equipment provided and/or specifically designated by Statistics Canada.

4.4 The Researcher(s) acknowledge and agree that, in order to have and maintain access to the Information, the Researcher(s) shall comply with the following pre-access requirements:

4.4.1 Having been granted at minimum, a "Reliability" security status as defined in the federal Policy on Government Security;

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4.4.2   Having taken the oath of office, as required by section 6 of the
        Statistics Act;

4.4.3   Having read, understood and will comply with the relevant Statistics
        Canada policies, directives, guides and guidelines listed in Appendix
        E;

4.4.4   Having read, understood and will comply with the *Values and Ethics Code
        for the Public Sector*, Statistics Canada Code of Conduct and the Policy
        on Conflict of Interest and Post-Employment listed in Appendix E;

4.4.5   Having declared in Appendix C:

    4.4.5.1   That the sole purpose of the research project is statistical
           research,

    4.4.5.2   The sources of monetary or in kind support they are receiving
           to carry out the Research Project;

4.4.6   The Researcher(s) understand the potential penalties should they
        contravene the terms and conditions of access to the Information and
        the penalties should the Researcher(s) contravene the *Statistics Act*
        and any applicable related Acts, including the *Income Tax Act* or the
        Excise Tax Act.

5. LIMITATIONS ON USE OF INFORMATION

5.1   The Researcher(s), in the course of carrying out this Contract, may not use any of
      the information gained by accessing the Information for any other purpose except that
      which was agreed upon in this Contract.

5.2   Access to the Information is being provided for the statistical and research purpose
      outlined in the Statement of Work in Appendix C.

5.3   The Researcher(s) shall not disclose any of the Information to anyone other than
      current Statistics Canada employees involved in the review or evaluation of any aspect
      of the research project.

5.4   The Researcher(s) shall ensure that no attempts are made to link the Information
      supplied herein to any other files in order to relate the particulars to any
      identifiable Person.

6. PENALTIES

As Deemed Employees of Statistics Canada, and having taken the oath/solemn affirmation
of secrecy set out in section 6 of the *Statistics Act*, Researcher(s):

6.1   Remains/Remain subject to the oath/solemn affirmation of secrecy even after the term
      of the Contract has ended.

6.2   Is/are subject to all the applicable penalties provided for in the *Statistics Act* for
      contravention of any of the confidentiality provisions and are liable on summary
      conviction to any of the applicable fines or imprisonment terms.

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6.3 Is/are prohibited from disclosing information related to any Person (subsection 17(1) of the *Statistics Act*) obtained under the *Statistics Act*. Researcher(s) contravening subsection 17(1) of the *Statistics Act* is/are guilty of an offence and liable on summary conviction to a fine not exceeding one thousand dollars or to imprisonment for a term not exceeding six months or to both (paragraph 30(c) of the *Statistics Act*).

6.4 Is/are prohibited from disclosing confidential information obtained through the course of their employment that might exert an influence on or affect the market value of any stocks, bonds or other security or any product or article, or using the same information to speculate in any stocks, bonds or other security or any product or article (section 34 of the *Statistics* Act). Researcher(s) contravening section 34 of the *Statistics Act* is/are guilty of an offence and liable on summary conviction to a fine not exceeding five thousand dollars or to imprisonment for a term not exceeding five years or to both.

6.5 Is/are reminded that if they are accessing data from sources other than Statistics Canada, in accordance to this Contract, then they are subject to all the applicable penalties provided for in related and applicable laws for contravention of any of the confidentiality provisions and are liable on summary conviction to any of the applicable fines or imprisonment terms.

7. OWNERSHIP AND COPYRIGHT OF INFORMATION

7.1 Statistics Canada is the owner and/or steward of the Information and related documentation listed in Appendix D and Parties agree that this Contract pertains to the use of the Information and related documentation to produce the Proposed Output for Statistics Canada. Nothing contained herein shall be deemed to convey any title or ownership interest in the Information or the related documentation to the Researcher(s).

7.2 Copyright in the Proposed Output shall vest in Her Majesty the Queen in Right of Canada. The Researcher(s) may be required to provide to Statistics Canada, at the completion of the Contract, or at such other time as Statistics Canada may require; a written permanent waiver of Moral rights from every author who contributed to the Proposed Output.

7.3 Copyright in any subsequent work created by the Researcher(s) using the Proposed Output shall vest in the Researcher(s).

8. USE OF AND PUBLISHING OF PROPOSED OUTPUT

8.1 Release of the Proposed Output by Statistics Canada may be considered by Statistics Canada in consultation with the Principal Researcher.

8.2 Statistics Canada reserves the right:

8.2.1 To publish in whole or in part or an amended/derived version of the Proposed Output; or

8.2.2 Not publish at all, any part of the Proposed Output

8.3 Use of the Proposed Output by Researcher(s) will be governed by the Statistics Canada Open License Agreement which can be found at the link below. This license agreement allows Researcher(s) to use Statistics Canada information without restrictions on sharing and redistribution, for commercial and non-commercial purposes.

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http://www.statcan.gc.ca/eng/reference/licence-eng

9. CONFLICT OF INTEREST

9.1   Researcher(s) engaged as Deemed Employee(s) in the course of carrying out this Contract shall conduct themselves in accordance with the principles and spirit of the *Values and Ethics Code for the Public Sector*, Code of Conduct at Statistics Canada and the Policy on Conflict of Interest and Post-Employment found in Appendix E.

9.2   Researcher(s) must complete the Conflict of Interest Declaration Form found in Appendix F.

9.3   If Researcher has a conflict, the Researcher must fill out a Confidential Report to be provided by the Statistics Canada representative. This Report must be approved by the Director General, Human Resources Branch, Statistics Canada, who may require corrective action prior to providing the approval.

10. DESIGNATED REPRESENTATIVES

10.1   Any notice to be given to Statistics Canada pursuant to this Contract will be addressed to:

> Director
> Microdata Access Division
> Statistics Canada
> 9A, R.H. Coats Building
> Ottawa, ON K1A 0T6

10.2   And any notice to be given to the Researcher(s) will be addressed to:

> Jesse Jahrig
> University of Alberta
>
> Home address:
> 727 173st SW,
> Edmonton, AB, T6W 0M4, CAN
> (587)783-6161

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11. PAYMENT

Funding arrangements and payment modalities for purposes of this Contract are outlined in a separate Letter of Agreement between Statistics Canada and the Researcher(s).

12. TERM

This Contract comes into force when signed by all Parties, beginning on the date of the later signature, and shall continue until 2018-02-28 unless terminated earlier in accordance with section 13.

13. TERMINATION

13.1   This Contract may be terminated for any reason by either Party upon thirty (30) day
Notice of termination having been made in writing to the other Party, or at a time otherwise agreed upon by the Parties. Such termination will take effect on the expiry of the notice period.

13.2   Statistics Canada will terminate this contract immediately upon giving written notice to the Researcher(s) where the Researcher(s) commits or permits a breach of any of the terms and conditions contained in this Contract.

14. NOTICE OF CHANGE

Researcher(s) shall inform Statistics Canada, in writing, within thirty (30) days of any changes in their programs and policies, as well as of any legislation or regulation that may affect this contract.

15. AMENDMENT

No amendment to this Contract will be effective unless it is made in writing and signed by the persons occupying the positions of the signatories of this Contract.

16. GENERAL

16.1   No Assignment
The Researcher(s) acknowledges that this Contract will not be assigned in whole or in part without the prior written consent of Statistics Canada, and any assignment made without such consent will be void and of no effect.

16.2   Notices
Unless otherwise specified in the Contract, where in this Contract any notice or other communication is required to be given or made by either Party, it will be in writing and be effective if sent by registered mail, e-mail, facsimile, postage prepayment or delivered in person, addressed to the respective Party at the contact information outlined under Section 10 of this Contract. Any notice or other communication will be deemed to have been given: if by registered mail when the postal receipt is acknowledged by the other Party; if by e-mail or facsimile on the day after the e-mail or facsimile was sent; if by mail on the eighth (8th) calendar day following the day of mailing.

16.3   Survival
The sections of this Contract regarding restrictions on use, confidentiality, conflict of interest, offenses and punishment, disclaimer of warranty, termination and general, and any other provisions which by their nature survive the termination or expiry of this Contract, will survive any termination or expiration of this Contract.

16.4 Law

This Contract shall be governed by and construed in accordance with the laws of the   Province of Ontario and all applicable laws of Canada.

16.5 Entire Agreement

The Contract constitutes the entire agreement between Parties with respect to the subject matter described herein and supersedes all previous negotiations, communications and other agreements on the same topic, unless specifically incorporated by reference in this Contract.

16.6 Waiver

Any tolerance or indulgence demonstrated by one Party to the other, or any partial or limited exercise of rights conferred on a Party, shall not constitute a waiver of rights, unless expressly waived in writing by that Party.

16.7 Severance

If any provision of this Contract, whether in whole or in part, is held by a court of competent jurisdiction to be void or unenforceable, such provision or portion thereof declared invalid or unenforceable shall be deemed to be severable and shall be deleted from this Agreement and all remaining terms and conditions of this Contract will continue to be valid and enforceable.
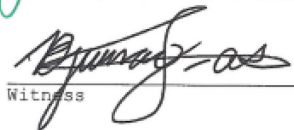
Contract number : 16-SSH-UAB-4813
Title : Comparing severity of alcohol problems and depression using two Alberta population surveys

IN WITNESS WHEREOF, this Contract has been executed on behalf of:
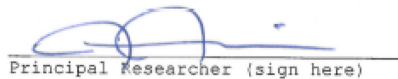
FOR STATISTICS CANADA:

(signature)   **Jodi-Anne Brzozowski**

Director, Microdata Access Division   Print Name

(signature)   BALDWIN JUMPRAS

Witness   Print Name

DATED at Ottawa, Province of Ontario, this __23__ day of __AUG__ (month) __2016__ (year).

FOR THE PRINCIPAL RESEARCHER AND CO-RESEARCHER(S):

(signature)   Jesse Jahrig

Principal Researcher (sign here)   Print Name

(signature)   IRENE WONG

Witness (sign here)   Print Name

DATED at Edmonton, Province of Alberta, this __3__ day of __August__ (month) __2016__ (year).

(signature)   T. Cameron Wild

Co- Researcher (sign here)   Print Name

(signature)   IRENE WONG

Witness (sign here)   Print Name

DATED at Edmonton, Province of Alberta, this __3__ day of __03__ (month) __2016__ (year).

(signature)   Ambikaipakan Senthilselvan

Co- Researcher (sign here)   Print Name

(signature)   R.C. Young

Witness (sign here)   Print Name

DATED at Edmonton, Province of Alberta, this __29__ day of __July__ (month) __2016__ (year).

(Complete for all deemed employees signing contract)

Contract number : 16-SSH-UAB-4813
Title : Comparing severity of alcohol problems and depression using two Alberta population surveys

APPENDIX A
SECURITY REQUIREMENTS

The Information is designated as confidential. The security requirements described below are the minimum requirements that Researchers must comply with.

1. The Researcher(s) shall not remove any of the Information or any confidential sensitive statistical information provided pursuant to this contract from the premises of Statistics Canada.

2. The Researcher(s) may request the removal of information subject to the following conditions.

   a) Any material to be removed from the Statistics Canada premises by the Researcher(s) must first be screened by Statistics Canada to ensure that there is no risk of disclosure of confidential information, which includes any information that may lead to the identification of a Person as defined in section 17 of the *Statistics Act.*

3. Researcher(s) must take all precautions to avoid disclosure of confidential information.

4. The Researcher(s) must use only equipment that is provided in the secure premises of Statistics Canada. Such equipment must never be removed from the premises of Statistics Canada including Research Data Centres.

5. The Researcher(s) shall make no attempt to tamper with the configuration or security features of any computer workstation they are provided with to perform the Special Services.

6. The Researcher(s) shall not attempt to compromise the security of the computing environment. Without limiting the generality of the foregoing, this includes using screen capture/sharing software or devices, and allowing unauthorized individuals to view the data.

7. Should the Researcher(s) become aware of a real or suspected breach of security, an unauthorized disclosure or unauthorized access of confidential data, they must inform the Statistics Canada Representative without delay.

8. **Network Use**
   In accordance to Statistics Canada IT Security Policies as defined in the Network Use Policy Researcher(s) acknowledge that the following limitations apply to all use of the Research Data Centre wide area network:

   Researchers must not conduct any unlawful or unacceptable activity. Examples of this include:

- **Attempting to defeat information technology security features**, through such means as using anti-security programs; using someone else's password, user-identification or computer account; disclosing one's password, network configuration information or access codes to others; or disabling anti-virus programs. (Government Security Policy).

- **Destroying, altering or encrypting data** without authorization and with the intent of making it inaccessible to others with a lawful need to access it.

Contract number : 16-SSH-UAB-4813
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APPENDIX B
OPERATIONAL REQUIREMENTS

1. The Statistics Canada representative shall provide Researcher(s), with copies of all relevant Statistics Canada policies related to confidentiality, privacy and security and standard operating procedures listed in Appendix E.

2. Should a conflict of interest be acquired or develop during the life of this Contract, the Researcher(s) shall inform the Statistics Canada representative without delay. It may be necessary to submit or modify a Confidential Report. The performance of the Special Services will be suspended until the Confidential Report is approved by the Director General, Human Resources Branch, Statistics Canada, who may request corrective action prior to approval.

3. The Researcher(s) shall provide Statistics Canada with the programs, the supporting documentation and any other information necessary to reproduce all the tabulations and analytical output they would like to remove from Statistics Canada premises under Appendix A (1)(2).

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APPENDIX C

DESCRIPTION OF SPECIAL SERVICES TO BE PROVIDED TO STATISTICS CANADA BY RESEARCHER(S)

DESCRIPTION OF STATEMENT OF WORK
See attached proposal entitled Comparing Severity of Alcohol Problems and Depression using Two Alberta Population Surveys.

DESCRIPTION OF PROPOSED OUTPUT

Select one:

- Specific work related to a particular statistical program which has been specified in advance as part of a legal agreement.

DESCRIPTION OF OTHER SOURCE DATA BEING BROUGHT INTO STATISTICS CANADA RESEARCH DATA CENTRE BY RESEARCHER(S)

Conditions of use of other source data:

- If used solely for Special Services described above:
  - Must be destroyed by Statistics Canada after completion of Special Services in accordance with the Statistics Canada Policy on Information Management.

- If data are to be used for other Statistics Canada projects:
  - Terms of use shall be negotiated in a separate agreement.

LOCATION OF WORK

Contact Name	RDC
Jesse Jahrig	UAB - University of Alberta
T. Cameron Wild	UAB - University of Alberta
Ambikaipakan Senthilselvan	UAB - University of Alberta

COMPLETION DATE

See Section 12.

SOURCE OF FUNDING

None

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APPENDIX D
INFORMATION AND RELATED DOCUMENTATION PROVIDED TO RESEARCHER(S)

Product Description
5015_CCHS-ESCC_C2012-MH

14

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surveys

APPENDIX E
DOCUMENTS TO BE PROVIDED TO RESEARCHER(S)

The following documents will be provided to Researcher(s).

* Research Data Centre Researcher Guide
* Research Data Centre Orientation Session
* Code of Conduct at Statistics Canada
* *Values and Ethics Code for the Public Sector*
* Policy on Conflict of Interest and Post-Employment

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APPENDIX F
CONFLICT OF INTEREST DECLARATION FORM

Deemed Employees are required to conduct themselves in accordance with the *Values and Ethics Code for the Public Sector*, including taking all possible steps to prevent and resolve any real, apparent or potential conflicts of interests between their official responsibilities and their private affairs in favour of the public interest.

As a Deemed Employee of Statistics Canada, I acknowledge that I have read the *Values and Ethics Code for the Public Sector*, that I will not undertake any projects in the future that would benefit from my access to any confidential data as a result of this contract, and I further declare that I will comply with the code and that:

✓ I have no conflicts to declare, or

___ I may have a conflict and will complete the "Confidential Report" as required.

_____   _____   2016/08/03
Signature of Deemed Employee   Jesse Jahrig   Date
                                      Printed Name of Deemed Employee

✗ I have no conflicts to declare, or

___ I may have a conflict and will complete the "Confidential Report" as required.

_____   _____   3 August 2016
Signature of Deemed Employee   T. Cameron Wild   Date
                                      Printed Name of Deemed Employee

✓ I have no conflicts to declare, or

___ I may have a conflict and will complete the "Confidential Report" as required.

_____   _____   2016-07-29
Signature of Deemed Employee   Ambikaipakan Senthilselvan   Date
                                      Printed Name of Deemed Employee

(Complete for all deemed employees signing contract)