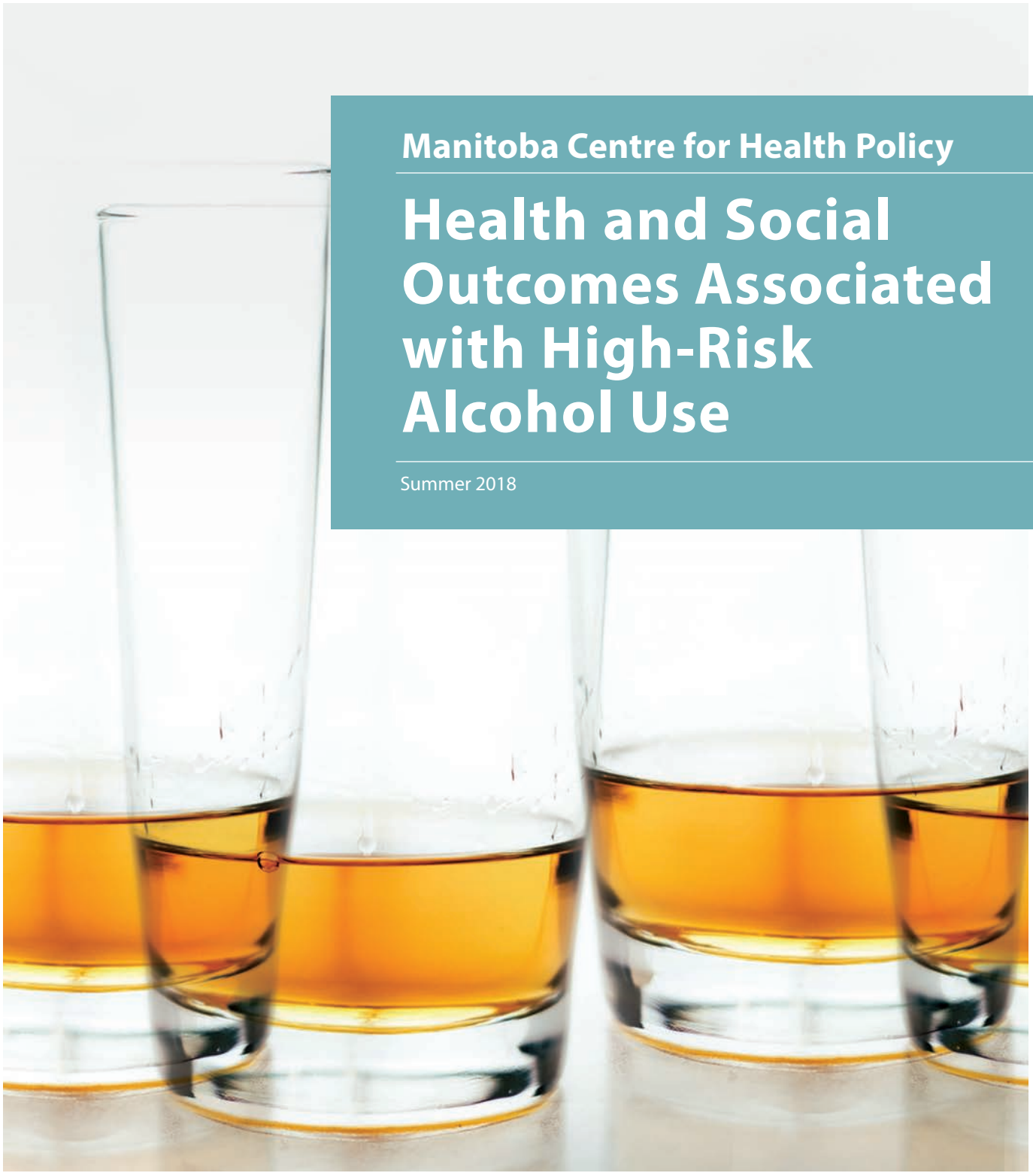

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Health and Social Outcomes Associated with High-Risk Alcohol Use

Summer 2018

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About the Manitoba Centre for Health Policy

The Manitoba Centre for Health Policy (MCHP) is located within the Department of Community Health Sciences, Max Rady College of Medicine, Rady Faculty of Health Sciences, University of Manitoba. The mission of MCHP is to provide accurate and timely information to healthcare decision–makers, analysts and providers, so they can offer services which are effective and efficient in maintaining and improving the health of Manitobans. Our researchers rely upon the unique Manitoba Population Research Data Repository (Repository) to describe and explain patterns of care and profiles of illness and to explore other factors that influence health, including income, education, employment, and social status. This Repository is unique in terms of its comprehensiveness, degree of integration, and orientation around an anonymized population registry.

Members of MCHP consult extensively with government officials, healthcare administrators, and clinicians to develop a research agenda that is topical and relevant. This strength, along with its rigorous academic standards, enables MCHP to contribute to the health policy process. MCHP undertakes several major research projects, such as this one, every year under contract to Manitoba Health, Seniors and Active Living. In addition, our researchers secure external funding by competing for research grants. We are widely published and internationally recognized. Further, our researchers collaborate with a number of highly respected scientists from Canada, the United States, Europe, and Australia.

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List of Acronyms

AUD	Alcohol use disorder
CCHS	Canadian Community Health Survey
DPIN	Drug Program Information Network
DWI	Driving while intoxicated
ED	Emergency Department
FSA	Forward sortation area
MCHP	Manitoba Centre for Health Policy
MPR	Medication possession ratio
IHD	Ischemic heart disease
PRISM	Prosecution Information and Scheduling Management
PMR	Premature mortality rate

Executive Summary

Introduction

The Chief Provincial Public Health Officer's 2011 report on the Health Status of Manitobans identified addictions and substance abuse as a public health concern. In 2015, Manitoba released "A Culture of Shared Responsibility", the Province's strategy to reduce alcohol-related harms. A Culture of Shared Responsibility included four strategic areas for action:

1. Health Promotion, Prevention, and Education, which aims to increase awareness around the outcomes of harmful alcohol use and promote low-risk use within a culture of shared responsibility;
2. Health Impacts and Treatment, which focuses on building partnerships between practitioners, researchers, and other stakeholders to understand the epidemiology around addictions and alcohol use, and promote and support screening, brief intervention, and referral within the context of primary healthcare;
3. Availability of Alcohol, with an aim to maintain and strengthen measures that control alcohol availability; and
4. Safer Communities, focusing on creating safer drinking environments at home, in the workplace, and at licensed establishments.

The current study is designed to provide evidence that can support efforts to implement the Province's alcohol strategy. To that end, the study had the following research objectives:

1. Describe the characteristics of Manitobans with an indication for having an alcohol use disorder (AUD);
2. Describe the characteristics of Manitobans who exceed the recommendations for low-risk drinking provided by Health Canada: for women, no more than 10 drinks per week with a limit of two drinks per day; and, for men, no more than 15 drinks per week with a limit of three drinks per day;
3. Identify annual trends in alcohol use and associated outcomes;
4. Identify patterns in health service use and health and social outcomes associated with alcohol use among Manitoba residents; and
5. Examine the outcomes associated with different strategies for treating alcohol use.

To address these five research objectives, we used data in the Manitoba Population Research Data Repository ('the Repository') housed at the

Manitoba Centre for Health Policy. Data in the Repository go back several decades and include virtually all contacts with the healthcare and social services systems for more than 99% of the Manitoba population. These data allow researchers to explore how health is changing over time and investigate the interconnections between health, social factors, and geography.

We used two approaches to examine the outcomes associated with high-risk alcohol use in Manitoba. First, we examined outcomes associated with having an indication of an AUD (Chapters 4-7). Second, we considered outcomes associated with exceeding the low-risk drinking limits recommended by Health Canada (Chapter 8).

For the first approach, we used administrative health data to identify individuals with an indication for an AUD; most of these individuals had mental disorder diagnoses made during ambulatory physician visits or hospitalizations. We refer to individuals with an AUD as 'cases'. We followed cases from five years before their first AUD diagnosis to as many as 20 years after diagnosis. We examined their patterns of healthcare use and their health and social outcomes over time.

For the second approach, we used survey data collected by the Canadian Community Health Survey. This survey collected information on health and social factors from a representative sample of Manitobans. We used respondents' self-reported alcohol consumption to determine whether or not they exceeded the recommended low-risk drinking limits; individuals who exceeded the guidelines are referred to as 'cases'. We linked cases' responses with administrative health and social data to identify outcomes associated with unsafe drinking behaviours.

Key Findings from Chapter 3: Demographics

The incidence rate for having an indication of an AUD decreased for both males and females between fiscal years 1990/91 and 2014/15; the decline was greater among males.

Between 1990/91 and 2014/15, a total of 53,556 individuals had an indication of an AUD. Those with an AUD were from neighbourhoods of lower socioeconomic status, less likely to be from Winnipeg, and their average age was lower than the average age of Manitoba's general population. Individuals with an AUD were also more likely to have been non-users of the healthcare system in the year prior to receiving their first indication of an AUD.

We found that 15.1% of females and 20.6% of males exceeded the recommended daily limits for alcohol consumption. The prevalence of female respondents who reported that they exceeded the recommended weekly and daily limits for alcohol consumption increased between 1996 and 2013. We did not find any changes in the percentage of males who exceeded either the daily or weekly alcohol limits.

We found little evidence of a socioeconomic gradient for self-reported alcohol use in excess of the daily and/or weekly limits.

Key Findings from Chapter 4: Provincial Trends in Outcomes Associated with Alcohol Use Disorders: Health Services, Health and Social Outcomes

Results are presented by fiscal year, comparing cases with matches. Individuals were matched on age, sex, and postal code of residence, which provided a proxy for area-level neighbourhood socioeconomic status.

Across all fiscal years, cases demonstrated a higher use of the hospital system when compared with their matches. In 2014/15, female cases were hospitalized at a rate 2.83 times higher than their matches, and male cases were hospitalized at a rate 2.37 times higher than their matches. Both female and male cases were prescribed a greater number of prescription drugs than their matches (70% and 48% more, respectively). Female cases' emergency department (ED) visit rate was 3.27 times greater than their matches, and male cases' ED visit rate was 2.69 times greater than their matches.[1]

Cases had a higher rate of negative health outcomes when compared with their matches. In 2014/15, the all age mortality rate among female cases was 18.02 deaths per 1,000 person-years (which was twice the rate among their matches); among male cases, the all age mortality rate was 24.98 deaths per 1,000 person-years (also twice the rate among their matches). A starker pattern was evident for premature mortality (i.e., death before age 75): female cases' premature mortality rate was 14.13 per 1,000 person-years (4.33 times greater than among their matches); male cases' premature mortality rate was 20.73 per 1,000 person-years (3.33 times greater than their matches).

Patterns for ischemic heart disease (IHD), diabetes, and alcohol-related cancers were more variable. Many fiscal years showed trends that suggested increased rates of these illnesses among cases; however, some of the fiscal years did not show statistically significantly different rates between cases and matches.

[1] Note that all analyses related to emergency department visits were limited to Winnipeg hospitals due to data availability.

Across all fiscal years of our study, cases had higher rates of social service use compared with their matches. In 2014/15, cases were more than three times more likely to move into social housing compared with their matches. The rate of justice involvement was higher amongst cases than among their matches. For example, rates of charges for driving while intoxicated (DWI) were 6.77 times higher for female cases and 4.96 times higher for male cases compared with their respective matches. We also found that female cases were 9.26 times more likely to have their children taken into care than their matches. Lastly, female cases were 4.67 times more likely and male cases were 4.73 more likely to receive income assistance than their respective matches.

Key Findings from Chapter 5: Patterns in Health Services Use Associated with Alcohol Use Disorders

Chapter 5 presents a life-course perspective of healthcare utilization. Whereas Chapter 4 examined health service use by fiscal year, Chapter 5 examines an individual's use of health services during the five years prior to first receiving an AUD diagnosis (i.e., their 'index date') and up to 20 years after the index date.

Across all outcomes, cases had higher rates of health service use over the course of their life compared with their matches, even after adjusting for characteristics such as mental disorder diagnoses, region of residence, and neighbourhood-level income. This excess health service use associated with an AUD was found in each year after the index date.

There was a spike in health service use corresponding with the year of diagnosis across several indicators: inpatient hospitalizations, days spent in hospital, ambulatory (physician) visits, and prescription drugs. This suggests that around the time of diagnosis, individuals with an AUD accessed services at a rate that exceeded the rate of health service use among their matches. Unlike the other health service indicators, ED visits spiked in the year before index date among cases.

Health service use among individuals with an AUD was consistently elevated for extended periods of time. Over a 25-year period, an average female case had 4.5 additional hospital visits and spent an additional 41.0 days in hospital compared with her matches; an average male case had 2.9 additional hospital visits and spent 34.8 additional days in hospital compared with his matches. An average female case had 73.4 additional ambulatory visits compared with her matches; an average male case had an additional 41.7 visits compared with his matches.

The reasons for health service use among individuals with an AUD differed. The most common reason cases went to hospital was due to a mental disorder and/or behavioural disorder; this was true even up to five years after index date. Meanwhile, the most common reason for hospitalization among matches was pregnancy among females and circulatory diseases among males. For physician visits, the most common reason among cases was mental and behavioural disorders and similarly persisted for 5 years after index date. Among matches, the most common reason for a physician visit was pregnancy among females and circulatory diseases among males. Among female and male cases, psycholeptics were the most commonly dispensed prescription drug. Among male matches, agents acting on the renin system were the most common drug, and among female matches, birth control was the most common drug.

Key Findings from Chapter 6: Patterns in Health Outcomes Associated with Alcohol Use Disorders

Having an AUD was associated with significantly elevated risk for mortality – both total mortality and premature mortality – throughout the entire study period, from five years before to 20 years after index date. For both females and males, having an AUD more than doubled a person's risk for mortality. We saw that cases had the highest risk for mortality during the index year; indeed, around the time of diagnosis, individuals with an AUD had 3.5 times higher mortality risk than their matches, even after adjusting for differences in characteristics such as differing mental disorder diagnoses. Over a 20-year period, these differences in mortality rates translated into 1,971 additional deaths among females and 4,207 additional deaths among males. When we looked at premature mortality, female cases had more than a 6 times higher premature mortality rate during the index year when compared with their matches, and men had more than a 4 times higher premature mortality rate when compared with their matches, even after adjusting for mental disorder status. These rates mean that there were 1,690 excess premature deaths among females and 3,617 excess premature deaths among males over a 20-year period. These findings highlight the exceptionally high risk for mortality among cases during the year they receive an AUD diagnosis.

Both female and male cases had an elevated rate of receiving an IHD diagnosis during the year before the index date. Differences between cases and matches were greater among males than among females. After adjustment, female cases had an IHD incident rate that was 2.92 times higher compared with their matches; male cases had a 3.59 times higher rate compared with their matches. After

index date, the rate of IHD remained elevated among cases compared with their matches; however, elevated rates were not consistently statistically significant after the index date.

The diagnostic incidence rate for diabetes was elevated during the year preceding the index date among males, but not among females. After diagnosis, female cases had statistically significantly elevated rates for diabetes compared with their matches.

Cases had an elevated diagnostic incidence rate of alcohol-related cancer the year before the index date. Compared to their matches and after adjustment, female cases had close to twice the rate and male cases had nearly five times the rate of alcohol-related cancer. After the index date, the differences between female cases and matches became non-significant; among males, however, differences between cases and matches remained significant throughout 18 years of follow-up.

It is important to note that there are many factors we could not account for that contribute to whether or not a person develops an AUD and their use of the healthcare system; e.g., health outcomes associated with structural racism, intergenerational trauma, intimate partner violence, etc. Our results highlight the complexity of AUDs and the need to develop holistic strategies to target these structural and social determinants of health to prevent the development of AUDs and mitigate their harmful impacts on individuals' health and well-being.

Key Findings from Chapter 7: Patterns in Social Outcomes Associated with Alcohol Use Disorders

Male cases had higher rates of justice involvement than female cases. Both male and female cases had a statistically significantly elevated rate of justice system involvement compared with their matches, even after adjusting for factors such as mental disorder comorbidities and socioeconomic status. Across all justice indicators (Domestic violence, DWI, and having any charge recorded in the justice system database), the relative differences between cases and matches was greater among females than among males. One factor that may be at play in these findings is that the rate of justice involvement among female matches was lower than among male matches. It also appears, though, that the relative impact of having an AUD on justice involvement may be stronger among females than males (updated June 18, 2018).

We saw that for DWI and for any justice system involvement, the rate of charges occurring during the year prior to index date was elevated. This pattern was not seen with domestic/family violence[2] charges; rather, we found evidence of an increased rate of justice involvement aligning with the index year. Differences in justice involvement were attenuated after adjusting for factors such as mental disorder comorbidities and socioeconomic status.

Cases had between a 1.6 and 5.3 times higher rate of moving into social housing compared with their matches, after adjusting for mental disorder comorbidities and socioeconomic status. However, there was no spike corresponding with the index year or the year prior to index date, as with the justice system indicators.

Diagnosis with an AUD was associated with having a child taken into care of Child and Family Services. After adjusting for mental disorder comorbidities and socioeconomic status, we saw that children of female cases were consistently taken into care more often than their matches' children. During the year prior to index date, female cases' rate was 30.31 times higher than their matches'.

Although there were higher rates of income assistance among cases compared with their matches, these differences became non-significant once we adjusted for mental disorders.

When considering the social outcomes associated with having an AUD, it is vital to note that there are a multitude of social determinants (including intergenerational trauma, historical and structural racism, exposure to violence, and other systemic factors) that we could not account for in our analyses. Nevertheless, our results highlight the need for a more integrated and comprehensive approach to intervene on these social and structural determinants to better support individuals and prevent the development of AUDs in the first place.

Key Findings from Chapter 8: Outcomes Associated with Exceeding Recommended Low-Risk Drinking Limits

In Chapter 8, we examined outcomes associated with exceeding the recommended low-risk drinking guidelines:

- Low-risk daily drinking limits: two drinks per day for women and three drinks per day for men;
- Low-risk weekly drinking limits: 10 drinks per week for women and 15 drinks per week for men.

Exceeding the daily and weekly limits was associated with increased risk for having any charge in the justice system and for driving while intoxicated. We did not find

[2] We only had data on charges of domestic/family violence from the Winnipeg Police Service.

a significant relationship between self-reported drinking and use of the healthcare system. It is important to note, though, that these findings have limitations, including the fact that respondents only reported their drinking behaviours for the past year and that individuals may under-report their drinking behaviours. Thus, these findings may underestimate the relationship between self-reported drinking and health and social service use outcomes.

Key Findings from Chapter 9: Pharmacological Interventions for Alcohol Use Disorders

We had hoped to evaluate treatments and interventions available in Manitoba to support individuals with an AUD and to prevent the development of an AUD. Unfortunately, data on most of these strategies are not currently available in the Manitoba Population Research Data Repository. We did however examine the following three pharmacotherapies for treating individuals with an AUD: (1) acamprosate, (2) disulfiram, and (3) naltrexone.

We used data from the Drug Program Information Network (DPIN) database, which contains information about prescription drugs dispensed from pharmacies. If a case received a prescription for a drug used to treat AUD but did not fill that prescription, they would not appear in the DPIN data. Therefore, we were only able to measure drug dispensation rates (not drug prescription rates).

Although efficacious pharmacotherapies for treating AUD have been available for decades, less than 1% of the 53,356 AUD cases in our study had a prescription dispensed for one of the three major pharmacotherapies used to treat AUD. Among cases, those with a diagnosis for a mood and anxiety disorder and those living in an urban area were more likely to receive one of the examined pharmacotherapies.

The vast majority of prescriptions were given by family practitioners living in an urban setting, followed by psychiatrists. We found an overall increase in the rate of pharmacotherapies dispensed for an AUD between 1996/97 and 2011/12. From 2011/12, there was a slow decline in the rate of dispensing prescription drugs to treat AUD.

When we looked at each drug individually, there was an increase in the prescription dispensation rate for naltrexone, particularly since 2005/06. The rate for dispensing acamprosate peaked around 2010/11 and has since declined. We found very little to no use of disulfiram since 2001/02. Since 2003/04, there has been an increase in the rate of prescription drugs dispensed within one year after index date, suggesting that, although still rare, individuals with an AUD are now receiving this treatment sooner than they were 15 years ago.

Policy and Practice Implications

This report makes a unique and valuable contribution to our knowledge about AUD and its associated impacts on Manitobans' health services use and their health and social outcomes. Our whole-population approach enables us to provide a broad-scale perspective on the impacts of AUD. Few other jurisdictions are able to link data across sectors to take a truly interdepartmental look at the outcomes associated with risky alcohol use, including examining tangible measures of well-being, such as contacts with the justice system. Finally, the fact that we can link individuals' data over time meant that we could follow individuals across systems both before and after they received their first diagnosis for AUD. While considering the findings of this report, readers should however take into account our use of administrative data to identify individuals with an AUD, as this method underestimates the true magnitude of the population impact of AUDs.

The prevalence of unsafe drinking patterns has increased over the past 20 years among both females and males. These results suggest a need to identify and implement strategies that can effectively promote low-risk use in Manitoba.

Individuals with an AUD persistently experience negative health and social outcomes, often over the course of decades. Specific outcomes include excess days spent in the hospital, excess number of physician visits, increased contacts with the justice system and other social services, and ultimately increased risk for premature mortality. These excess contacts show up before the person receives their first diagnosis for an AUD, in some cases peaking during the year preceding first diagnosis. These periods of elevated risk may serve as a touch point for future screening efforts developed as part of Manitoba's Culture of Shared Responsibility. They also highlight the need to be doing more sooner to identify, serve, and support Manitobans who are experiencing negative outcomes associated with AUD.

It is imperative to remember that the underlying determinants of alcohol use disorders and harmful alcohol consumption are many and complex. Strategies for reducing alcohol consumption need to target the underlying reasons for harmful alcohol consumption, provide holistic support to individuals at risk, and identify and treat individuals sooner to prevent the progression and development of an AUD. A cross-sectoral approach will likely be required to mitigate the wide-sweeping negative outcomes associated with AUDs.

Identifying strategies that support Manitobans with AUDs is a logical next step for this area of research. While we were limited to our current data holdings during this study, bringing in new administrative databases from centres

that treat and support individuals with AUDs would enable more evaluation research to identify what strategies works to reduce the harmful effects of AUDs. Our finding that efficacious pharmacotherapies available to treat AUD are under-utilized highlights the need to bolster training and education efforts among physicians and other healthcare providers to provide these therapies.

Chapter One:
Introduction

Synopsis

While a majority of Canadians who drink do so within Health Canada's Low-Risk Drinking Guidelines [1], the harms associated with misuse of alcohol have far-reaching impacts across the health, social and justice sectors. In 2015, Manitoba released its strategy, entitled 'A Culture of Shared Responsibility', aimed at reducing alcohol-related harms. The current study was conducted to quantify the healthcare use and health and social outcomes associated with high-risk alcohol use in Manitoba and to provide a baseline for the efforts outlined in the Manitoba strategy to support low-risk drinking in the province.

We measured high-risk alcohol use in Manitoba in two ways. The first way was to identify individuals with an indication of an alcohol use disorder (AUD) in administrative health data. We quantified their patterns of healthcare use and their health and social outcomes over a 20-year period. The second way we measured high-risk alcohol use was using survey data from Statistics Canada. We identified individuals who self-reported alcohol consumption exceeding Canada's Low-Risk Drinking Guidelines. We stratified our analyses by sex to examine the impacts of AUDs and of deviating from Canada's low-risk guidelines on men and women separately.

Finally, we examined the use of pharmacotherapies (prescription drugs) available to treat alcohol use disorders. We looked at how frequently these drugs were prescribed and described the characteristics of physicians prescribing these therapies.

Background on Alcohol Use

Alcohol is consumed by a majority of Canadians; in 2015, it was estimated that 77% of Canadian adults consumed alcohol in the past year [1]. Among Canadians who drank alcohol, nearly 80% did so within the low-risk drinking guidelines. The guidelines suggest that women consume no more than 10 drinks per week and no more than two drinks per day most days, while men should consume no more than 15 drinks per week and no more than three drinks per day on most days. While low-risk alcohol consumption can enhance special occasions, social gatherings, and meals, high-risk drinking is associated with excess healthcare use, negative social consequences, and compromised health.

Epidemiology of Alcohol Use

An estimated 19.0% of Canadians and 16.8% of Manitobans reported heavy drinking behaviours – defined for men as having five or more drinks in one sitting more than once a month, and for women having four or more drinks in one sitting more than once a month [2]. The prevalence of heavy drinking in Manitoba aligns with the Canadian average. However, it is estimated that risky drinking in Canada has increased over the past 15 to 20 years [3,4].

Estimating the incidence rate for diagnoses indicating an AUD – i.e., how quickly new cases of an alcohol use disorder arise – is challenging due to data scarcity. One study in the UK used medical records from primary care settings to show that, on average, there were 1.7 new cases of an AUD for every 1,000 person-years of observation time [5]. That is, one would observe 1.7 new cases of an AUD after following 1,000 people for one year. It has also been shown that diagnoses for AUDs follow a socioeconomic gradient, where individuals from lower socioeconomic status (SES) are at greater risk [5–8]. Research from the US suggests an increase in the number of individuals being diagnosed with an AUD since the 1990s [9]. In Canada, time trends in the number of diagnoses for AUDs are not available.

Factors Associated with Excessive Drinking

Four main individual-level factors are shown to be associated with excessive drinking: physiological responses to alcohol, gender/sex, SES, and social responses to alcohol. Heavy drinkers are shown to have a stronger physiological response and sensitivity to alcohol [10,11]. King et al. showed that heightened sensitivity to alcohol, liking, and wanting alcohol were significant predictors of having symptoms for an alcohol use disorder [10]. Heavy drinkers display different neurological patterns than light drinkers [12]. Social dynamics may influence risk for heavy drinking [13].

There is a sex difference in how alcohol is processed [14], and men and women appear to drink heavily for different reasons – men are more likely to drink in response to positive emotions while women are more likely to drink heavily in response to negative emotions [15]. While the evidence is equivocal as to whether individuals from higher socioeconomic groups were more or less likely to drink heavily when compared with lower socioeconomic groups [16,17], the harmful outcomes associated with excessive drinking are often greater among groups of lower SES.

Health Services Associated with Alcohol Consumption

Alcohol use has been shown to be associated with increased use of the healthcare system. Heavy drinking is associated with increased risk for inpatient hospitalizations [3,18,19], and excessive alcohol consumption has been linked with increased physician and emergency department visit rates [20]. A recent report estimated that $3.3 billion in excess healthcare costs were attributable to alcohol consumption in Canada in 2002. While many studies have looked at the links between alcohol consumption and healthcare use, few have followed individuals who drink heavily over an extended period of time to investigate their individual-level patterns of healthcare use.

Health Outcomes Associated with Alcohol Consumption

Alcohol has been linked with a variety of health outcomes. Alcohol has been shown to be a potential carcinogen and is linked with a variety of cancers, including cancers of the pharynx and oesophagus [21]. Heavy alcohol consumption has also been found to be associated with increased risk for chronic diseases such as cardiovascular disease, diabetes, and cirrhosis of the liver.

Social Outcomes Associated with Alcohol Consumption

Several social outcomes are also shown to be associated with heavy alcohol consumption, including higher rates of motor vehicle collisions, family violence and other markers of domestic/family violence, and decreased work productivity.

Study Objectives

The objective of our study was to use administrative and survey data to identify the impacts of harmful alcohol consumption in Manitoba. The intent is for the results presented here to provide a baseline for future work aimed at reducing risky drinking in the province.

The specific research objectives of this study were to:

1. Describe the characteristics of Manitobans with an indication for an AUD;
2. Describe the characteristics of Manitobans who exceed the recommendations for low-risk drinking – for women, no more than 10 drinks per week with a limit of two drinks per day; for men, no more than 15 drinks per week with a limit of three drinks per day;
3. Identify annual trends in alcohol use and associated outcomes;
4. Identify patterns in healthcare use and health and social outcomes associated with AUDs and high-risk alcohol use among Manitoba residents; and
5. Examine the outcomes associated with different strategies for treating alcohol use.

Organization of Report

This report is organized into ten chapters. In Chapter 2, we present an overview of the analytic methods we used to address each of our study's objectives. In Chapter 3, we present sociodemographic information about our study cohorts – individuals with an AUD and individuals whose self-reported alcohol consumption exceeded the low-risk drinking guidelines. We present trends in these indicators over time. In Chapter 4, we look at changes in our outcomes by fiscal year for all Manitobans with an AUD diagnosis.

In Chapters 5-7, we look at patterns in healthcare use, health outcomes, and social service use associated with having an AUD from 5 years before an individual receives a diagnosis until 15 to 20 years after receiving a diagnosis (years of follow-up based on data availability). Chapter 5 provides information on when individuals with an AUD are most likely to access healthcare services. In Chapter 6, we look at patterns in health outcomes among individuals with an AUD to get a sense of individuals' health trajectories. In Chapter 7, we investigate the relationship between social outcomes and AUD. We identify patterns in justice system involvement, moving into social housing, having children taken into care, and receiving income assistance.

In Chapter 8, we examine outcomes among individuals who exceeded the low-risk drinking guidelines for alcohol consumption. In Chapter 9, we look at the use of pharmacotherapies for treating AUDs in the province. We identify characteristics of physicians who are most likely to provide these therapies and characteristics of individuals who are most likely to receive these therapies to treat high-risk alcohol use. In Chapter 10, we provide an overview of the report's findings and discuss potential policy implications.

Chapter Two:
Methods

Data Used in this Report

This study leveraged information from several databases held in the Manitoba Population Research Data Repository (Repository) at the Manitoba Centre for Health Policy (MCHP). The Repository contains administrative, clinical, survey, and programmatic data. We used administrative and survey data in these analyses.

The Manitoba Population Research Data Repository

The Repository was established in 1979, originating as a registry to conduct longitudinal studies on surgical outcomes [22]. The Repository now contains data on nearly every individual registered with Manitoba's universal health insurance plan since 1970 [22]. Since the Repository comprises more than 99% of individuals living in Manitoba and covers a period of more than 40 years, scientists are in a unique position to conduct both population-based and individual-level longitudinal health research. Furthermore, the Repository allows scientists to study populations that may otherwise be difficult to follow over time [23–26].

The Repository contains over 70 databases grouped into six domains: health, education, social, justice, registries, and database support files. Temporary individual-level linkages across databases allow scientists to conduct cross-sector population-based research in a wide variety of areas. Linkages across databases can be made using a unique scrambled numeric identifier provided by Manitoba Health to maintain confidentiality. Validity checks on the Repository have demonstrated that the data are high quality for conducting health research [22,25,27,28].

Administrative Data

Data on patterns of healthcare use and health and social outcomes came from the following administrative databases in the Repository: Manitoba Health Insurance Registry (e.g., births, deaths, health insurance coverage status, sex, postal code of residence); Hospital Abstracts Database (e.g., hospitalizations, diagnoses, procedures, length of stay); Medical Services (e.g., ambulatory services, diagnoses); Drug Program Information Network (e.g., prescription drugs); Canada Census; Vital Statistics Mortality Registry; and Long Term Care Utilization History. Data from the Manitoba Cancer Registry, maintained by CancerCare Manitoba, were used to capture cancer diagnoses, treatment, and pharmacy drug dispensations. We also used

data from the Prosecutions Information Scheduling and Management System (i.e., criminal justice data) to obtain information on charges for driving while intoxicated or domestic/family violence and data from social housing (information on entry into social housing and length of stay). We used data from the Social Assistance Management Information Network to gain information on who received income assistance. We used data from the Families First Screen to create the matched cohorts. Finally, we used data from Child and Family Services to measure incidence of children being taken into care.

For more information on the databases used in this report, please visit the following site: http://umanitoba.ca/faculties/medicine/units/community_health_sciences/departmental_units/mchp/resources/repository/datalist.html

Survey Data

Statistics Canada's Canadian Community Health Survey (CCHS) is a cross-sectional survey of Canadians' health behaviours (e.g., physical activity, alcohol intake, vegetable consumption, smoking), and measures of health. The CCHS has been administered by Statistics Canada annually or biannually since 2000. A new sample is selected at each cycle. Certain sub-populations are excluded from the survey sample, such as individuals living on Reserves and on Crown Lands, institutionalized residents, full-time members of the Canadian Forces, and some residents of remote regions. CCHS uses a multi-stage sampling strategy to ensure that results are representative of both provincial and regional populations.

Readers can learn more about the CCHS elsewhere [29].

In this report, we used the survey responses to look at Manitobans' self-reported drinking behaviours to assess whether Manitobans exceeded Canada's recommended low-risk drinking guidelines. Our results were produced by linking survey data with the administrative records from the Repository. We used CCHS data from 2000-2001, 2003, 2005, 2011, 2012, and 2013.

Study Population and Time Period

Administrative Data

Individuals with an Indication of an Alcohol Use Disorder in the Administrative Data

Individuals were classified as 'cases' if they were aged 12 or older and had an indication for an alcohol use disorder (AUD) in the administrative data. Having an indication for an AUD meant they met at least one of the following conditions within the study period (April 1, 1990 – March 31, 2015):

- Diagnosed with a disease caused by excessive alcohol consumption;
- Diagnosed with an alcohol-related mental disorder; or
- Filled a prescription for a medication used to treat alcohol use disorder.

We used the Hospital Discharge Abstract and Medical Claims databases to identify individuals with these diagnoses, and the Drug Program Information Network (DPIN) database to identify individuals who filled prescriptions to treat alcohol use disorder. It should be noted that only 81 individuals fell into this latter category. This has two implications: (1) all but these 81 individuals received their first prescription for a pharmacotherapy only after receiving a mental or physical diagnosis related to an AUD; and (2) since the vast majority of individuals classified with an AUD were identified via a mental or physical diagnosis, we refer to the AUD cohort as individuals having either a mental or physical diagnosis related to alcohol consumption throughout the remainder of this report.

Individuals with an AUD were added to the cohort based on the date that they received their first indication for an AUD:

- When the first indication of an AUD was a diagnosis of a mental disorder or physical illness, the individual entered the cohort on the date that they received the diagnosis;
- When the first indication of an AUD was a prescription given to treat alcohol use disorders, the individual entered the cohort on the date the prescription was dispensed.

The full list of codes used to identify individuals with an AUD is presented in the Appendix 1.

Many of our analyses focused on exploring patterns of healthcare use and health and social outcomes before and after having an indication for an AUD. For this reason, it was important to identify each individual's first indication of an AUD. The date that a person received their first indication of an AUD is their 'index date'.

Figure 2.1 shows the cases categorized by their first indication for an AUD. For example, a mental disorder diagnosis related to alcohol use was the first indication of an AUD for 79.5% of cases; a physical illness diagnosis related to alcohol use was the first indication of an AUD for 7.9% of cases; and the first indication of an AUD were co-occurring diagnoses for both mental disorder and physical illness related to alcohol use for 11.8% of cases.

Comparison Group: Individuals Without Indication of an Alcohol Use Disorder

The matched comparison group comprised individuals without any indication of an AUD in the administrative data. We began with all Manitobans registered with Manitoba's

universal health insurance program between April 1, 1985 and March 31, 2015. Individuals were then excluded if they met any of the following conditions:

- Had ever been a case;
- Had ever had one or more prescriptions for drugs to treat alcohol dependence;
- Had an alcohol-related illness diagnosis prior to 1990/91;
- Had been reported as consuming alcohol during pregnancy in the Families First Screening data;
- Had a charge for driving while intoxicated appear in the justice records[3];
- Had a child diagnosed with FASD, as assessed at the Manitoba FASD Centre;
- Had engaged in high-risk alcohol consumption, as reported in survey data (see Appendix 1 for details).

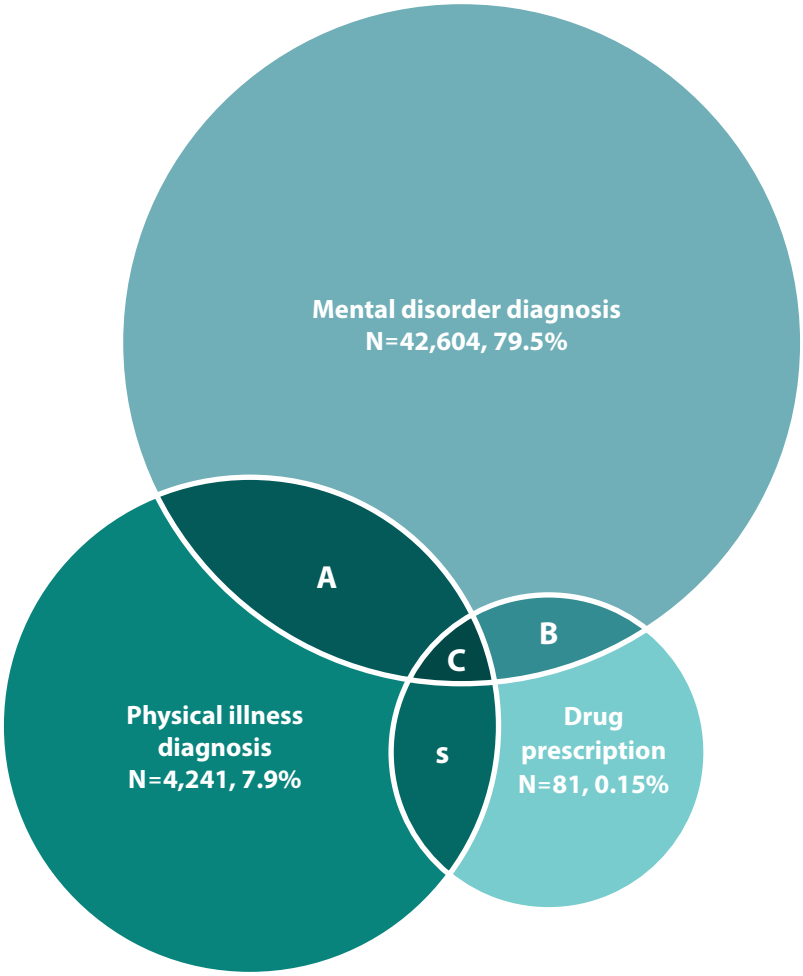
After applying the above exclusion criteria, we matched the remaining individuals to those with an AUD using the following criteria:

- Hard match on sex, income quintile, and forward sortation area (FSA) of residence (3.9% of matches were drawn from a neighbouring FSA);
- Match as close as possible on birth date, with a maximum difference of 2.5 years; and
- Match as close as possible on geography, to minimize the geographic distance between a case and a match.

Finally, individuals in the comparison group were matched to cases by diagnosis date. Thus, the end result of the matching algorithm was to ensure that on the date that

[3] This exclusion was relaxed when we examined associations between having an AUD and justice involvement.

Figure 2.1: Cases Categorized By Their First Indication Of An Alcohol Use Disorder



A: N = 6,324, 11.8%
B: N = 270, 0.5%
C: N = 102, 0.2%
s indicates suppression due to small numbers

an individual received their first indication of an AUD, their matches were approximately the same age, same sex, and living in the same place at the same time. The 'match date' for the matches is synonymous with the 'index date' for the cases. For simplicity, we use the term 'index date' for both cases and matches in this report.

Where possible, a matching ratio of 1:5 was applied: that is, we identified five matches for each case.

Exclusions

After constructing the cohort of individuals with an AUD (cases) and their matches, we excluded any remaining individuals who did not have five years of continuous health care coverage prior to their index date. We also excluded individuals diagnosed with an alcohol-related disorder between April 1, 1985 and March 31, 1990.

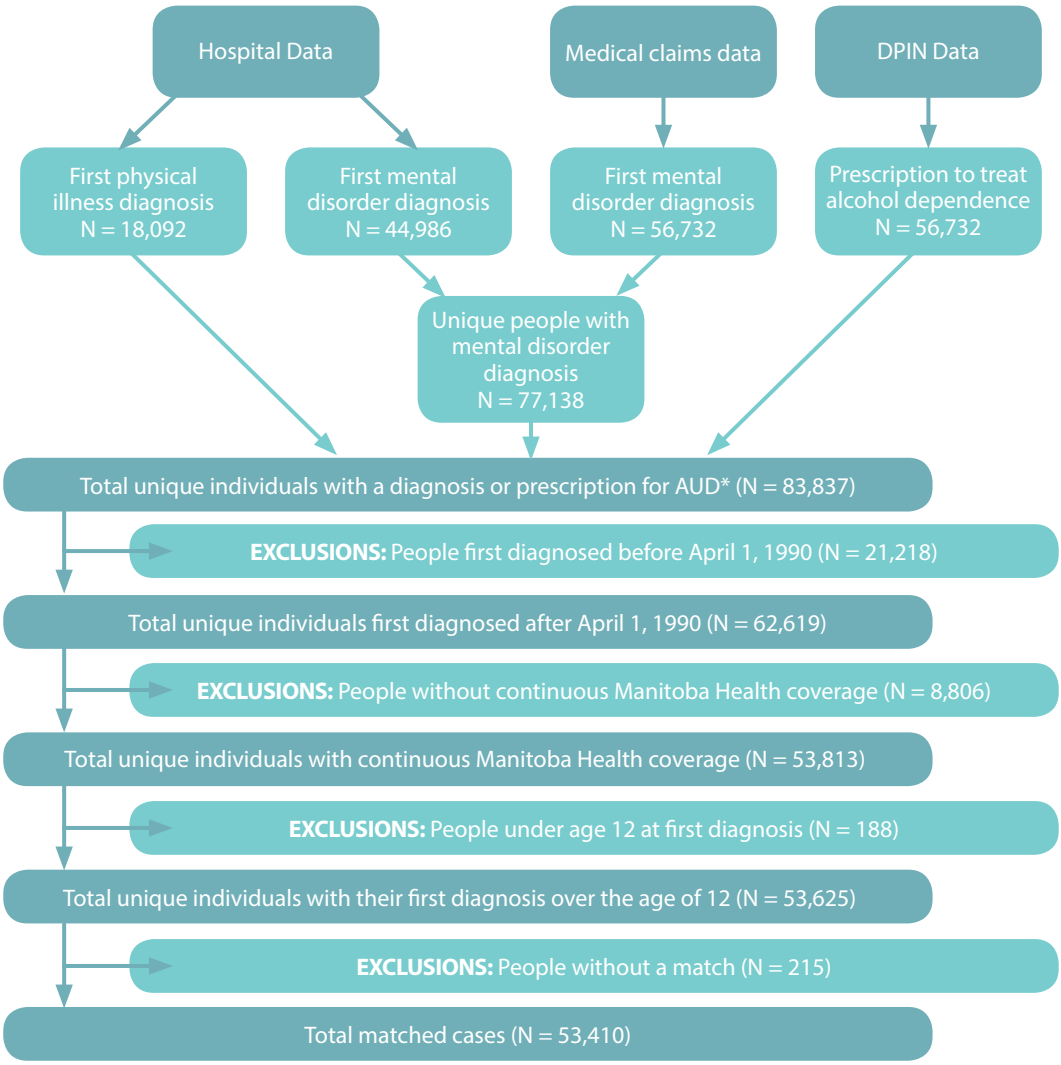
Study Period

The study period was April 1, 1990 to March 31, 2015. Cases and matches were followed from five years before their index date until either (1) the end of the study period (March 31, 2015), (2) death, or (3) loss of coverage (i.e., the individual moved out of the province).

Figures summarizing cohort construction are presented in figures 2.2 and 2.3.

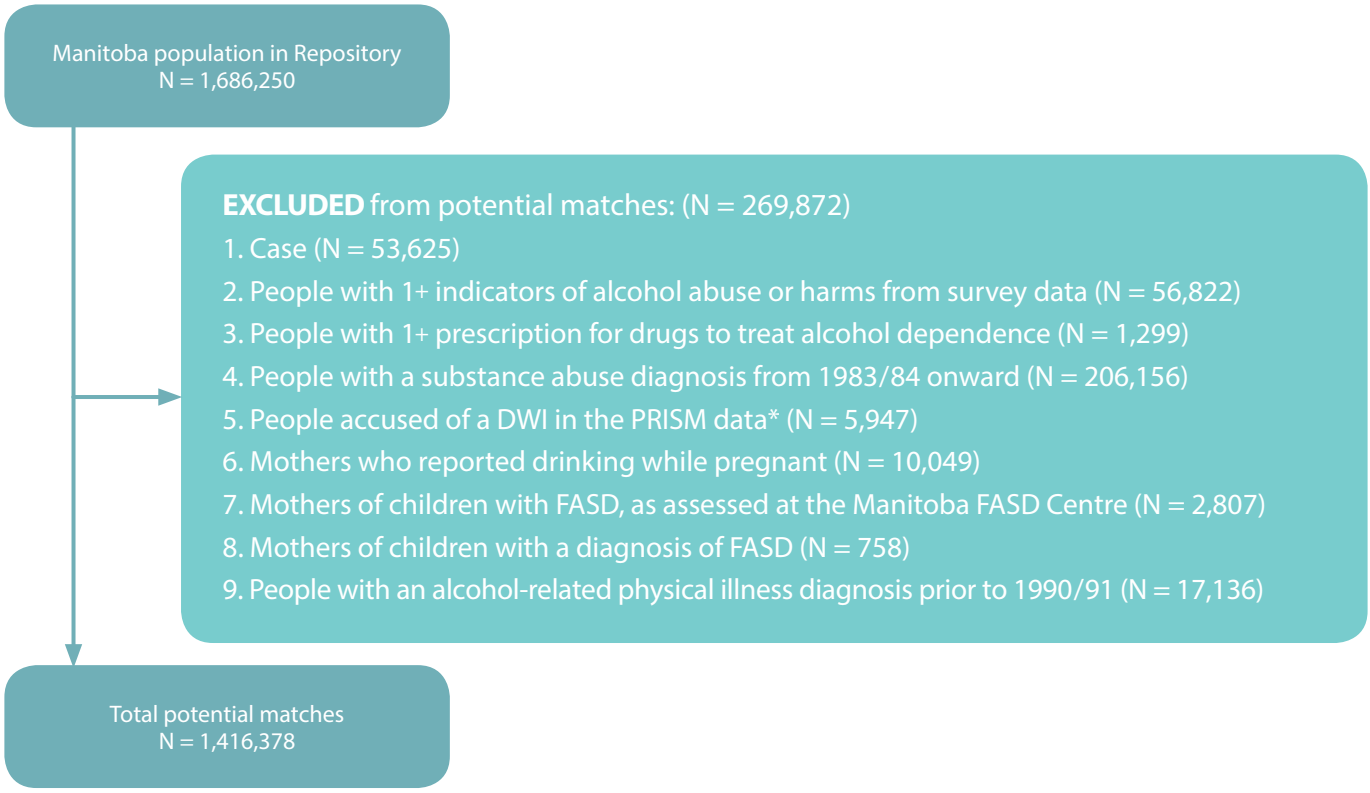
Due to data availability (i.e., years of data available in the Repository or data coverage), we used sub-cohorts for the following outcomes: emergency department visits, involvement with the justice system, residence in social housing, children taken into care, and income assistance. Details on how these cohorts were constructed are presented in Appendix 2.

Figure 2.2: Case Cohort Development



* AUD: Alcohol Use Disorder
Medical claims data did not provide physical illness diagnosis for AUD as only three-digit ICD codes are available in the Manitoba Population Research Data Repository

Figure 2.3: Match Cohort Development



Note: Individuals could be excluded from potential matches for several reasons. Individual exclusions will not equal to the total exclusions.
* To create the analysis cohort of individuals charged with a DWI, this step was omitted

Survey Data

We defined two groups of cases using the survey data:

1. Individuals whose self-reported alcohol consumption exceeded the recommended low-risk daily drinking guidelines;
2. Individuals whose self-reported alcohol consumption exceeded the recommended low-risk weekly drinking guidelines.

We classified female respondents as exceeding the daily limit if they reported consuming more than two drinks per day, and as exceeding the weekly limit if they reported consuming more than 10 drinks per week. We classified male respondents as exceeding the daily limit if they reported consuming more than three drinks per day, and as exceeding the weekly limit if they reported consuming more than 15 drinks per week.

Outcome Variables

Table 2.1 lists all the outcomes examined in this study.

Table 2.1: Measured Outcome Variables

Health Services	
• Inpatient Hospitalizations • Days in Hospital • Ambulatory Visits (Physician Visits)	• Prescription Drugs • Emergency Department Visits
Health Outcomes	
• Total Mortality • Premature Mortality • Ischemic Heart Disease	• Diabetes • Alcohol-Related Cancers
Social Outcomes	

• Justice Involvement
  • Driving While Intoxicated
  • Domestic/Family Violence
  • Any Charge in the Justice Data
	• Social Housing
	• Children Taken into Care
	• Income Assistance

Health Services

Inpatient Hospitalizations: Hospitalizations in which patients were formally admitted to the hospital for diagnostic, medical, or surgical treatment, and typically stayed for one or more days. Multiple admissions of the same person were counted as separate events. All Manitoba hospitals were included, but federal hospitals were excluded, as were personal care homes, nursing stations and long-term care facilities (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out-of-province hospitalizations for Manitoba residents were also included.

Days in Hospital: The total number of days spent as an inpatient in a hospital. This variable takes transfers between hospitals into account so as to not double-count any days. All Manitoba hospitals were included; federal hospitals, personal care homes, nursing stations, and long-term care facilities (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre) were excluded. Out-of-province hospitalizations for Manitoba residents were also included.

Ambulatory Visits (Physician Visits): Almost all contacts with physicians (family physicians and specialists), including office visits, walk-in clinic visits, home visits, visits to personal care homes, and visits to outpatient departments. Services provided to patients while admitted to hospital and emergency department visits were excluded.

Prescription Drugs: The average number of different types of prescription drugs dispensed. Each pharmaceutical agent that falls under a different fourth-level Anatomical Therapeutic Chemical Classification (ATC) class was counted as a new drug for each person. A person could have several prescriptions for drugs in the same fourth-level ATC class, but this counted as one drug type in that year. This essentially separated out drugs used for different health problems and helped us avoid double-counting dispensations for drugs in the same group.

Nearly all prescriptions dispensed from community-based pharmacies across the province were included; prescription drugs given to hospitalized patients and some residents in personal care homes with hospital-based pharmacies were not included. Prescriptions included were limited to those covered by Manitoba Health's Pharmacare program; prescriptions for over-the-counter drugs were excluded. The above exclusions were made in order to have a common set of drugs that could be compared fairly across the province.

Emergency Department Visits: The Emergency Department Information System database contains information on a patient's experience as they progress through the emergency department (ED), from first point of entry at the triage desk to discharge. The database captures ED data from the following Winnipeg hospitals: Concordia Hospital, Grace Hospital, Health Sciences Centre Adult, Seven Oaks General Hospital, St. Boniface General Hospital, and Victoria General Hospital. ED data was available for fiscal years 2008/09 to 2014/15.

Health Outcomes

Total Mortality: Mortality rate was calculated as the number of deaths per 1,000 person-years.

Premature Mortality: The number of deaths per population occurring before age 75. Premature mortality rate is an important indicator of a population's general health; high premature mortality rates indicate poor population health. Premature mortality rate was calculated as the number of deaths before age 75 per 1,000 person-years.

Ischemic Heart Disease: Ischemic heart disease (IHD) was defined by one of the following conditions:

- One or more hospitalizations with a diagnosis of IHD, ICD-9-CM codes 410–414; ICD-10-CA codes I20–I22, I24, I25;
- Two or more physician visits with a diagnosis of IHD (ICD-9-CM codes as above); or
- One physician visit with a diagnosis of IHD (ICD-9-CM codes as above) and two or more prescriptions for medications to treat IHD (see Appendix 1 for more details).

Diabetes: Diabetes was defined by one of the following conditions:

- One or more hospitalizations with a diagnosis of diabetes, ICD-9-CM code 250; ICD-10-CA codes E10–E14;
- Two or more physician visits with a diagnosis of diabetes (ICD-9-CM code as above); or
- One or more prescriptions for medications to treat diabetes (ATC code A10; see Appendix 1 for more details).

This measure of diabetes combines type 1 and type 2 diabetes because physician claims data do not identify these separately. Gestational diabetes has a separate diagnosis code and is not specifically included here, but some cases may be included if gestational diabetes was not properly coded.

Alcohol-Related Cancers: The incidence rate of alcohol-related cancer per 100,000 person-years was calculated using the cancer registry. Alcohol-related cancer sites included oral cavity (gums, floor of mouth, tongue and other buccal cavity), nasopharynx, pharynx and larynx, esophagus, colon and rectum, liver, and breast.

Social Outcomes

Involvement with the Justice System – Driving While Intoxicated: Using Manitoba Justice's PRISM charges and incident database, we counted the number of charges (or accusations) for a driving while intoxicated (DWI) violation among the alcohol related-disease cases and their matches each index year (and each fiscal year). The total number of charges was then divided by the person-time accumulated during the corresponding index year (and fiscal year) and multiplied by 100 to gives us a rate per 100 person-years of DWI charges.

Involvement with the Justice System – Domestic/Family Violence: Using Manitoba Justice's PRISM charges and incident database, we counted the number of charges (or accusations) for a domestic/family violence violation among our alcohol-related disease cases and their matches each index year (and each fiscal year). The total number of charges was then divided by the person-time accumulated during the corresponding index year (and fiscal year) and multiplied by 100 to generate a rate of domestic/family violence charges per 100 person-years. Data on domestic/family violence were only available from the Winnipeg Police Service; thus, this outcome was limited to charges for events occurring in Winnipeg.

Involvement with the Justice System – Any Charge : Using Manitoba Justice's PRISM charges and incident database, we counted the number of charges (or accusations) for any violation among our alcohol-related disease cases and their matches each index year (and each fiscal year). It is important to note that not all of these charges are criminal charges; non-criminal charges, such as charges under the Highway Traffic Act, were also included. A list of the Acts and Regulations appearing in the PRISM database is available in Appendix 1. The total number of charges was then divided by the person-time accumulated during the corresponding index year (and fiscal year) and multiplied by 100 to generate a rate of any charge per 100 person-years.

Social Housing: The incidence of people moving into social housing per 100 person-years was determined by counting the total number of persons (alcohol-related disease cases and their matches) who resided in social housing residences directly managed by Manitoba Housing at any point during the fiscal year or index year. This sum was divided by the total person-time accumulated by all of the cases and matches during that fiscal or index year. Incident cases (i.e., new cases) in each year were defined as persons who had not resided in social housing anytime within the past 12 months.

Children Taken into Care: Children in care are children who have been removed from the care of their original families because of a situation where authorities have deemed their family unable or unfit to look after them properly. This does not include children who remain with or are returned to a parent or guardian under an order of supervision. We identified all women (mothers) among the cases and matches who had at least one child, and counted the number of times their child/children were taken into care in a given fiscal or index year. Due to challenges with data linkage, we were only able to examine this indicator among female cases and matches. The sum of these events was divided by the total person-time accumulated by all of the mothers during that fiscal or index year. These values were then multiplied by 100 to generate rates of children taken into care of Manitoba Child and Family Services per 100 person-years in each fiscal or index year.

Income Assistance: The incidence of receiving income assistance per 100 person-years was determined by counting the total number of persons who received Manitoba income assistance at any point during the fiscal year or index year. We used a one-year washout period, meaning we only counted incidents of receiving income assistance when it was the first time a person had received income assistance in a year or more. This sum was divided by the total person-time accumulated by all of the cases and matches during that fiscal or index year. Incident cases (i.e., new cases) in each year were defined as persons who had not received income assistance anytime within the past 12 months.

Statistical Analyses

All data management, programming, and analyses were performed using SAS® version 9.4.

The uses of Aggregated Diagnosis Groups™(ADGs®) codes for risk adjustment in logistic models were created using The Johns Hopkins Adjusted Clinical Group® (ACG®) Case-Mix System" version 11.

Descriptive Models

We first modeled population-based rates for each of the outcomes by fiscal year. Annual rates were calculated separately for female cases and matches and male cases and matches.

For each outcome, we used 95% confidence intervals to determine whether the annual rates among cases differed from annual rates among matches. We modeled annual rates using generalized linear models with either a negative binomial distribution or a Poisson distribution and a log offset of person-years to account for person-time to test for trends over time.

Generalized linear models are a set of models that allow one to analyze a wide range of outcomes, including counts of events. Negative binomial distributions and Poisson distributions are used to model counts; we chose the distribution that yielded the best model fit for each outcome. We used the log of person-years as an offset to account for the fact that individuals had different observation times.

In graphs presenting crude rates over time, bands that do not overlap signal a statistically significantly difference in crude rates.

Outcome Models

Alcohol Use Disorder Analyses: Administrative Data Cohort

For each of the outcomes listed above, we calculated annual rates for each of the five years before index date and for the 20 years after index date, or until the individual was

lost to follow-up (i.e., because they died, moved out of the province, or lost coverage due to some other reason). Crude rates were calculated separately for female and male cases and matches.

We modeled rates using generalized linear models with either a negative binomial distribution or a Poisson distribution and a log offset of person-years to account for each person's follow-up time.

The baseline outcome models included a dichotomous indicator for whether the individual was a case or a match, and for male/female sex. We used relative rates (sometimes called 'rate ratios') to estimate whether there was a statistically significant rate difference across each of the outcomes between cases and matches. Relative rates were calculated by dividing the rate among cases by the rate among matches.

We used linear trend tests to test for time trends in each outcome before and after the index date. An interaction between time and the dichotomous indicator for having a diagnosed AUD was used to test for differences in trends over time.

We used 95% confidence intervals to signal statistically significant differences. In graphs, 95% confidence intervals are represented by shaded bands. In graphs presenting rate ratios over time, bands that do not cross 1.0 signal a statistically significant rate ratio.

Exceeding the Recommended Limits for Alcohol Consumption: Survey Data Cohort

We used the CCHS survey data to determine whether exceeding the recommended low-risk drinking limits was associated with excess use of health and social services. We constructed two sets of models: the first set modeled the outcomes associated with exceeding the recommended low-risk daily limit for alcohol use and the second modeled outcomes associated with exceeding the recommended low-risk weekly limits for alcohol consumption. For both sets of models, the exposure variable was a dichotomous indicator for whether or not the survey respondent exceeded the daily or weekly limits, respectively.

We conducted time-to-event analyses (also called survival analyses) that modeled the time between the date when the respondent answered the survey and the first time the respondent experienced the outcome of interest. Time-to-event analyses allow one to account for differing follow-up time and situations where the respondent never experienced the outcome of interest. We constructed weighted Cox proportional hazards regression models to produce hazard ratios, which provided an estimate for the relative comparison between the rate of the outcome between those who did and those who did not exceed recommended low-risk drinking limits. As an example, in our study we used time-to-event models to examine the relationship between exceeding the weekly limit for alcohol consumption and having a charge for driving while intoxicated. This model yielded a hazard ratio of 3.84 (HR 3.84; 95% CI 2.46-5.99), after adjusting for educational attainment, marital status, neighbourhood income, and region of residence. In essence, those who reported alcohol consumption levels that exceeded the weekly limit had 3.84 times the risk for being charged with driving while intoxicated compared with those who did not report alcohol consumption levels that exceeded the weekly limits.

We bootstrapped the standard errors based on the survey sampling frame and used 95% confidence intervals on our time-to-event models to determine statistical significance. When the interval included 1.0, we concluded that there was not sufficient evidence to support a difference in the outcome between those who did and those who did not exceed the recommended limits. When the 95% confidence interval excluded 1.0, we concluded that those who exceeded the recommended limits for alcohol consumption had differential outcomes compared with those who did not exceed the limits.

Strengths and Limitations

The chief challenge we faced in our study was measuring alcohol use in the population. We used two approaches to quantify alcohol use: an administrative data approach where we identified individuals with evidence for an AUD, and a survey data approach where we identified individuals whose self-reported alcohol consumption exceeded the recommended daily and weekly limits. While these two approaches complement one another, they have limitations.

Limitations with Defining an Alcohol Use Cohort using Administrative Data

While we are reasonably confident in our identification of individuals with an indication for an AUD in the administrative data, we know that a many individuals with an AUD go undetected by the medical system. On a related note, because we only have access to three-digit ICD codes in the medical claims data, we could not identify physical conditions from outpatient visits, only from hospitalizations; thus, people receiving only outpatient services for physical conditions related to alcohol use would not appear in the AUD group and may even have been selected as matches in our analyses. This means that the estimated population-level impact of AUD on health and social services presented in this report is, in all likelihood, an underestimate of the true population-level impact of AUD in Manitoba. We also acknowledge that those who present to the medical system and receive an indication for having an AUD may be sicker and have more advanced progression of AUD compared with those who remain in the community without seeking medical attention. However, we took great efforts to ensure that our comparison group for the administrative data analyses was free of anyone with an indication of an AUD. Moreover, if our comparison group does contain individuals

with an AUD, this would serve to attenuate any differences in outcomes between our cases and matches. This would chiefly impact our comparative outcome models where we examine rates in our cases and compare them to rates in our matches. Specifically, the fact that our comparison group may contain individuals with an AUD means that our results provide a conservative estimate of the true impact of AUDs. Finally, in the administrative data analyses, we were only able to detect individuals once they presented with an AUD. We have no means for determining when their harmful alcohol consumption began, nor when they likely developed an AUD. Again, this would result in an underestimate of the life-long impact of harmful alcohol consumption on health and social services.

There is also the potential for coding errors, which would lead to misclassification of someone as having or not having an AUD. It is also true that the administrative data could contain misdiagnoses made by physicians. For example, a person could diagnose an individual with an AUD when they have another primary mental disorder; or, it could be that an individual is diagnosed with another mental disorder when in fact they have an AUD.

Limitations with Defining an Alcohol Use Cohort using Survey Data

The CCHS does not ask about life-long alcohol consumption. Rather, the surveys limit their questions to measuring alcohol consumption over the past year. The result is that we were unable to ascertain whether someone had been exceeding the daily/weekly limits for a short period of time or whether they had been exceeding these limits for considerably longer. Another limitation is that survey respondents who were in recovery may have appeared to be non-drinkers based on their self-reported alcohol consumption. Both scenarios would result in misclassification and attenuate any differences towards the null. Some outcomes that are associated with alcohol consumption require that an individual drink beyond the limits for an extended length of time.

Strengths

In spite of these limitations, this report makes a unique contribution to our knowledge regarding AUDs and their associated impacts on the health and social services systems. Reporting on data from the entire population enables us to provide a powerful population-based perspective on the impacts of AUD. Few other jurisdictions are able to link data across sectors to take a truly interdepartmental look at the outcomes associated with high-risk alcohol use. Finally, the fact that we can link individuals' data across time meant that we could follow individuals across systems both before and after they received their AUD. Thus, we provide a set of results that can provide useful information for policy development and clinical practice to better serve Manitobans.

Chapter Three:
Demographics

Introduction

We created two cohorts to address our study objectives: (1) the administrative cohort, in which individuals were defined as having an indication for an AUD if they had a diagnosis for a mental disorder and/or physical illness related to alcohol use; and (2) the Canadian Community Health Survey (CCHS) cohort. This chapter provides a summary of the demographic characteristics for these two cohorts.

We defined people in our cohorts as follows:

- **Case:** someone who had a physical illness or mental disorder resulting from alcohol consumption; or
- **Match:** someone who did not have any indication that they used alcohol excessively and who was similar to a case based on characteristics such as age, sex, and postal code of residence at the index date.

We provide more details on how we identified cases and matches, as well as information on our matching algorithm, in Chapter 2 and Appendix 1.

Individuals with an Alcohol Use Disorder

Characteristics of People with an Alcohol Use Disorder in the Administrative Data

Overall, the cases were 35.6% female and 64.4% male. Table 3.1 presents descriptive information for female cases and matches alongside a descriptive summary of the general population of females in Manitoba; Table 3.2 presents this same information for male cases. Because we matched on age, sex, and postal code (and therefore also neighbourhood income quintile), there were no statistically significant differences between our cases and matches on these indicators. When we compared the study cohort with the general Manitoba population in December 2013, the cohort was more likely to live in a low-income neighbourhood and be from the Northern Health Region; as well, the cohort was less likely to be from Winnipeg. Both men and women in our cohort were younger than the general population; on average, women were 6 years younger and men were one year younger. The cohort of people with an AUD has a higher proportion of males than the general Manitoba population.

We observed several differences between our cases, matches, and the general population when we examined baseline use of the healthcare system. We used Resource Utilization Bands (RUBs), which are part of the Johns Hopkins Adjusted Clinical Group (ACG®) case mix system, to quantify use of the healthcare system. Individuals are classified into one of six categories based on their ACG value: values range from '0' as a non-user up to '5', indicating very high morbidity. Both cases and matches were significantly more likely to have not used the healthcare system (RUB 0) during the year prior to their index date when compared with the general population. Among male cases and matches, 45.7% were classified as non-users of the healthcare system, compared with 28.7% non-users among the general male population. We observed a similar trend among females: among cases, 32.7% were non-users and among matches, 33.0% were non-users; 16.0% of females in the general Manitoba population were non-users. Although fewer than 1% of the general population were identified as RUB 5, 1.3% of female cases and 1.1% of male cases were identified as being in this highest healthcare use group.

The cases had significantly higher prevalence of mental disorder diagnoses when compared with either matches or the general population. Over half (51.6%) of female cases had a mood and anxiety diagnosis; this is 23.8 percentage points higher than the general Manitoba population and 31.0 percentage points higher than the female matches. Note that the low prevalence of mental disorder comorbidities among matches, compared with the general population, may reflect an under estimate of the true prevalence, since this was defined as a diagnostic prevalence. Likewise, female cases were more likely to have diagnoses related to personality disorder (6.5%) and psychosis (6.7%) than both the general population and the matches. A similar pattern was observed among males. Male cases were almost twice as likely to have a mood and anxiety diagnosis when compared with the general population and almost three times more likely than their matches. Male cases also had a higher prevalence of personality disorder (3.9%) and psychosis (6.5%) diagnoses than either the general population or their matches.

Table 3.1: Characteristics of Females with AUD* (cases) and Females without AUD (matches)
1990/91 to 2013/14

	Manitoba Population on December 31, 2013	Cases (With an AUD diagnosis)	Matches (Without an AUD diagnosis)
	N = 560,102	N = 19,017	N = 94,566
Age (Years)			
Average Age at Diagnosis (95% CIs)	44.9	38.3 (38.1-38.6)	38.3 (38.2-38.4)
Median Age	44.0	34.0	34.0
Proportion of Population (%)			
Female	560,102 (50.7)	19,017 (35.6)	94,566 (35.7)
Regional Health Authority			
Southern Health-Santé Sud	76,607 (13.7)	1,189 (6.3)	5,745 (6.1)
Winnipeg	327,998 (58.6)	9,769 (51.4)	48,983 (51.8)
Prairie Mountain	72,360 (12.9)	2,509 (13.2)	16,355 (17.3)
Interlake-Eastern	53,772 (9.6)	1,761 (9.3)	8,802 (9.3)
Northern	28,086 (5.0)	3,789 (19.9)	14,681 (15.5)
Living in Winnipeg or Brandon (%)			
	353,506 (63.1)	10,527 (55.4)	52,477 (55.5)
Income Quintile (%)			
Urban 1 (Lowest Income)	68,287 (12.2)	4,326 (22.8)	21,607 (22.9)
Urban 2	70,370 (12.6)	2,131 (11.2)	10,634 (11.3)
Urban 3	69,913 (12.5)	1,661 (8.7)	8,290 (8.8)
Urban 4	69,155 (12.4)	1,167 (6.1)	5,813 (6.2)
Urban 5 (Highest Income)	70,751 (12.6)	955 (5.0)	4,774 (5.1)
Rural 1 (Lowest Income)	38,419 (6.9)	3,096 (16.3)	15,343 (16.2)
Rural 2	41,532 (7.4)	1,879 (9.9)	9,337 (9.9)
Rural 3	42,333 (7.6)	1,193 (6.3)	5,912 (6.3)
Rural 4	41,124 (7.3)	1,216 (6.4)	6,063 (6.4)
Rural 5 (Highest Income)	41,876 (7.5)	1,053 (5.5)	5,251 (5.6)
Income Unknown	6,342 (1.1)	340 (1.8)	1,542 (1.6)
Resource Utilization Band (RUB) (%)			
RUB 0 (Non-User)	89,542 (16.0)	6,209 (32.7)	31,197 (33.0)
RUB 1 (Lowest User Morbidity)	54,858 (9.8)	687 (3.6)	6,710 (7.1)
RUB 2	139,035 (24.8)	2,707 (14.2)	19,234 (20.3)
RUB 3	248,589 (44.4)	7,757 (40.8)	33,718 (35.7)
RUB 4	23,899 (4.3)	1,416 (7.5)	3,191 (3.4)
RUB 5 (Highest User Morbidity)	4,222 (0.8)	241 (1.3)	516 (0.6)
Mental Health (%)			
Mood and Anxiety Diagnosis	155,809 (27.8)	9,809 (51.6)	19,428 (20.5)
Personality Disorder Diagnosis	18,009 (3.2)	1,226 (6.5)	723 (0.8)
Psychosis Diagnosis	8,633 (1.5)	1,269 (6.7)	1,541 (1.6)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction.
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. RUB was calculated 1 year prior to index date. Mental health was calculated 5 years prior to index date.
* AUD: Alcohol Use Disorder

Table 3.2: Characteristics of Males with AUD* (cases) and Males without AUD (matches)
1990/91 to 2013/14

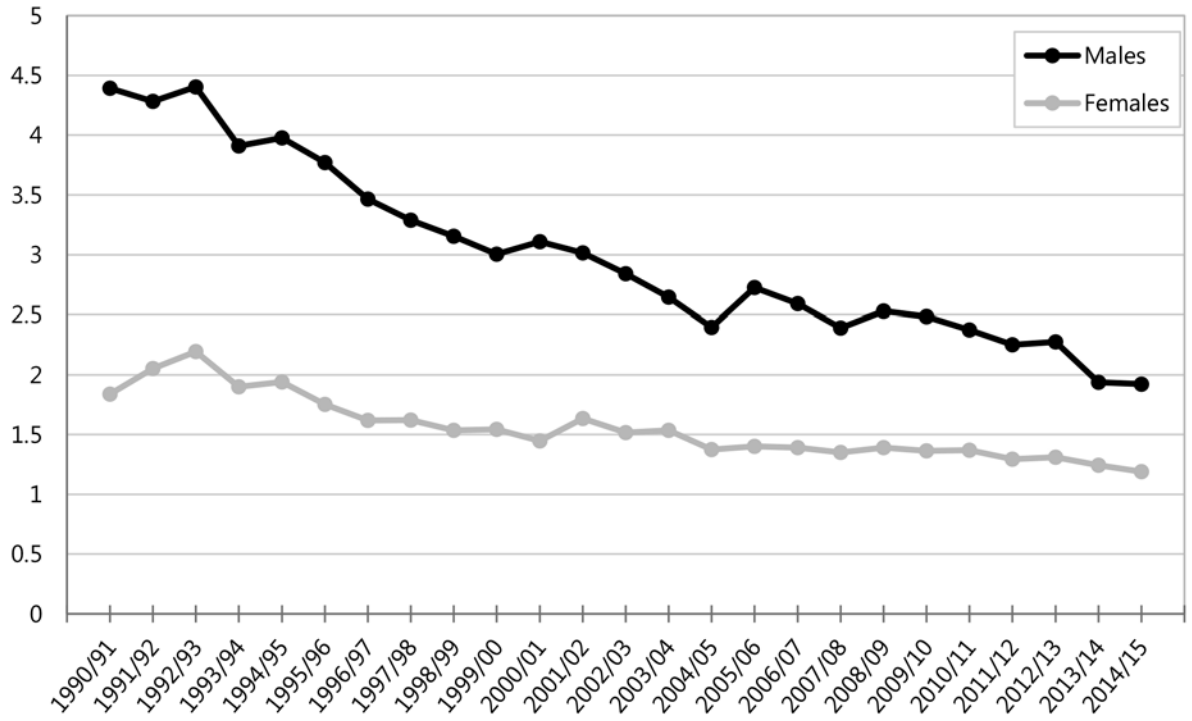
	Manitoba Population on December 31, 2013	Cases (With an AUD diagnosis)	Matches (Without an AUD diagnosis)
	N = 544,672	N = 34,393	N = 170,291
Age (Years)			
Average Age at Diagnosis (95% CIs)	43.1	42.2 (42.0-42.4)	42.2 (42.1-42.3)
Median Age	42.0	40.0	40.0
Proportion of Population (%)			
Male	544,672 (49.3)	34,393 (64.4)	170,291 (64.3)
Regional Health Authority			
Southern Health-Santé Sud	77,024 (14.1)	2,810 (8.2)	13,751 (8.1)
Winnipeg	312,539 (57.4)	17,794 (51.7)	89,059 (52.3)
Prairie Mountain	69,954 (12.8)	4,580 (13.3)	29,451 (17.3)
Interlake-Eastern	54,705 (10.0)	3,803 (11.1)	18,494 (10.9)
Northern	28,904 (5.3)	5,406 (15.7)	19,536 (11.5)
Living in Winnipeg or Brandon (%)			
	336,087 (61.7)	18,940 (55.1)	94,347 (55.4)
Income Quintile (%)			
Urban 1 (Lowest Income)	64,495 (11.8)	6,727 (19.6)	33,586 (19.7)
Urban 2	66,222 (12.2)	4,109 (12.0)	20,519 (12.1)
Urban 3	66,089 (12.1)	3,230 (9.4)	16,113 (9.5)
Urban 4	67,598 (12.4)	2,541 (7.4)	12,654 (7.4)
Urban 5 (Highest Income)	68,231 (12.5)	1,958 (5.7)	9,777 (5.7)
Rural 1 (Lowest Income)	38,845 (7.1)	4,976 (14.5)	24,248 (14.2)
Rural 2	41,626 (7.6)	3,244 (9.4)	15,925 (9.4)
Rural 3	42,326 (7.8)	2,543 (7.4)	12,641 (7.4)
Rural 4	41,872 (7.7)	2,383 (6.9)	11,794 (6.9)
Rural 5 (Highest Income)	42,813 (7.9)	2,230 (6.5)	11,087 (6.5)
Income Unknown	4,555 (0.8)	452 (1.3)	1,947 (1.1)
Resource Utilization Band (RUB) (%)			
RUB 0 (Non-Users)	156,101 (28.7)	15,728 (45.7)	77,863 (45.7)
RUB 1 (Lowest User Morbidity)	55,759 (10.2)	1,322 (3.8)	10,619 (6.2)
RUB 2	133,935 (24.6)	4,738 (13.8)	29,650 (17.4)
RUB 3	175,726 (32.3)	10,361 (30.1)	45,652 (26.8)
RUB 4	19,392 (3.6)	1,872 (5.4)	5,467 (3.2)
RUB 5 (Highest User Morbidity)	3,817 (0.7)	372 (1.1)	1,040 (0.6)
Mental Disorder (%)			
Mood and Anxiety Diagnosis	85,360 (15.7)	10,724 (31.2)	18,608 (10.9)
Personality Disorder Diagnosis	13,998 (2.6)	1,330 (3.9)	1,035 (0.6)
Psychosis Diagnosis	8,394 (1.5)	2,218 (6.5)	2,679 (1.6)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction.
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. RUB was calculated 1 year prior to index date. Mental health was calculated 5 years prior to index date.
* AUD: Alcohol Use Disorder

Trends in Alcohol Use Disorders Captured in the Administrative Data

Figure 3.1 summarizes the sex-stratified incidence rate for AUDs from fiscal years 1990/91 to 2014/15. During the 1990/91 fiscal year, there were roughly 4.4 new male cases of AUD per 1,000 person-years; or put another way, for every 1,000 male individuals, we found roughly 4.4 new cases of an AUD. For female individuals, the incidence rate in fiscal year 1990/91 was just under two new female cases per 1,000 person-years. For both males and females, the rate has steadily declined over time, with a greater rate of decline among males than among females.

Figure 3.1: Crude Incidence Rate of Alcohol Use Disorder
Per 1,000 person-years at risk



Characteristics of the Survey Respondents

Exceeding the Recommended Low-Risk Drinking Daily Limit

Canada's low-risk alcohol drinking guidelines [30] suggest that men consume no more than 15 drinks per week and three or fewer drinks per day on most days, and that women consume no more than 10 drinks per week and no more than two drinks per day on most days.

Across all waves of the CCHS, roughly 21.1% of male individuals and 13.8% of female individuals exceeded the recommended daily limit for alcohol consumption. Those who exceeded the daily limit were, on average, younger and more likely to come from a rural region in Manitoba compared to those who did not exceed the limit. Although we found little difference in mental disorder comorbidities between those who did and those who did not exceed the daily limits, respondents who reported exceeding the daily limits were more likely to be high users of the healthcare system in the administrative data (RUB 4 and 5) in the years immediately preceding the survey date.

Table 3.3: Characteristics of Canadian Community Health Survey* Respondents Exceeding Recommended Low-Risk Daily Drinking Limit
Population-weighted sample size, 95% confidence intervals

	Exceeded Daily Limit		Did Not Exceed Daily Limit	
	Male	Female	Male	Female
Age (Years)				
Mean (95% CI)	37.2 (36.3-38.0)	36.5 (35.7-37.5)	44.1 (43.8-44.5)	45.3 (45.0-45.6)
Median	35.0	34.0	44.0	44.0
Regional Health Authority (%)				
Southern Health-Santé Sud	78,064 (11.7)	49,233 (10.8)	369,413 (15.2)	388,707 (14.2)
Winnipeg	408,144 (61.1)	283,171 (62.1)	1,441,300 (59.2)	1,645,389 (60.3)
Prairie Mountain	87,715 (13.1)	62,854 (13.8)	322,812 (13.3)	367,430 (13.5)
Interlake-Eastern	71,356 (10.7)	46,102 (10.1)	236,893 (9.7)	250,207 (9.2)
Northern	23,233 (3.5)	14,505 (3.2)	65,032 (2.7)	77,128 (2.8)
Urban	443,737 (66.4)	305,833 (67.1)	1,537,036 (63.1)	1,754,548 (64.3)
Rural	224,775 (33.6)	150,033 (32.9)	898,413 (36.9)	974,313 (35.7)
Income Quintile (%)				
Urban 1 (Lowest)	51,273 (7.7)	46,621 (10.2)	256,677 (10.5)	301,878 (11.1)
Urban 2	98,421 (14.7)	64,056 (14.1)	309,360 (12.7)	363,604 (13.3)
Urban 3	103,652 (15.5)	71,061 (15.6)	300,856 (12.4)	360,291 (13.2)
Urban 4	98,335 (14.7)	56,953 (12.5)	331,438 (13.6)	349,036 (12.8)
Urban 5 (Highest)	90,553 (13.5)	66,874 (14.7)	332,915 (13.7)	374,138 (13.7)
Rural 1 (Lowest)	22,780 (3.4)	19,111 (4.2)	110,752 (4.5)	132,598 (4.9)
Rural 2	42,565 (6.4)	33,935 (7.4)	194,485 (8.0)	200,647 (7.4)
Rural 3	46,656 (7.0)	34,646 (7.6)	195,908 (8.0)	213,303 (7.8)
Rural 4	44,509 (6.7)	25,765 (5.7)	179,908 (7.4)	202,935 (7.4)
Rural 5 (Highest)	67,780 (10.1)	36,362 (8.0)	215,369 (8.8)	221,417 (8.1)
Income Unknown	1,989 (0.3)	481 (0.1)	7,781 (0.3)	9,013 (0.3)
Resource Utilization Band (RUB) (%)				
RUB 0 (Non-Users)	192,637 (28.8)	54,149 (11.9)	538,566 (22.1)	295,873 (10.8)
RUB 1 (Lowest User Morbidity)	94,682 (14.2)	67,058 (14.7)	305,201 (12.5)	290,740 (10.7)
RUB 2	181,580 (27.2)	133,957 (29.4)	629,943 (25.9)	681,661 (25.0)
RUB 3	181,772 (27.2)	184,140 (40.4)	832,095 (34.2)	1,242,197 (45.5)
RUB 4	15,435 (2.3)	16,167 (3.5)	99,181 (4.1)	183,674 (6.7)
RUB 5 (Highest User Morbidity)	2,405 (0.4)	395 (0.1)	30,463 (1.3)	34,716 (1.3)
Mental Disorder (%)				
Mood and Anxiety Disorders	84,305 (12.6)	115,463 (25.3)	374,261 (15.4)	687,656 (25.2)
Personality Disorder	2,562 (0.4)	5,658 (1.2)	10,897 (0.4)	15,664 (0.6)
Psychoses	8,692 (1.3)	1,458 (0.3)	29,295 (1.2)	22,672 (0.8)

*CCHS (2000, 2003, 2005 & 2007-2011; aged 12+), CCHS Healthy Aging (2008/09; aged 45+)

Note: Age, RHA, urban/rural, and income quintile were calculated at survey date. RUB was calculated 1 year prior to survey date. Mental health was calculated 5 years prior to survey date

Exceeding the Recommended Low-Risk Drinking Weekly Limit

The CCHS asked respondents to report how many drinks they consumed in the past week. We determined whether individuals' self-reported alcohol consumption for the past week exceeded either the daily and/or weekly limit.

Across all survey waves, roughly 7.4% of males and 4.2% of females exceeded the recommended weekly limit for alcohol. As with those who exceeded the daily limit, those who exceeded the weekly limit were on average younger and were more likely to be high users of the healthcare system in the year prior to survey date than those who did not exceed the limit.

Table 3.4: Characteristics of Canadian Community Health Survey* Respondents Exceeding Recommended Low-Risk Weekly Drinking Limit
Population-weighted sample size, 95% confidence intervals

	Exceeded Weekly Limit		Did Not Exceed Weekly Limit	
	Male	Female	Male	Female
Age (Years)				
Mean (95% CI)	40.3 (38.6-41.8)	38.8 (36.9-40.9)	42.8 (42.6-43.2)	44.3 (44.0-44.5)
Median	40.0	37.0	42.0	43.0
Regional Health Authority (%)				
Southern Health-Santé Sud	29,886 (12.8%)	15,449 (11.1%)	417,590 (14.5%)	422,491 (13.9%)
Winnipeg	149,454 (64.0%)	92,585 (66.4%)	1,699,990 (59.2%)	1,835,975 (60.3%)
Prairie Mountain	23,245 (10.0%)	17,501 (12.5%)	387,282 (13.5%)	412,783 (13.6%)
Interlake-Eastern	22,172 (9.5%)	9,646 (6.9%)	286,077 (10.0%)	286,664 (9.4%)
Northern	8,633 (3.7%)	4,297 (3.1%)	79,632 (2.8%)	87,336 (2.9%)
Urban	160,003 (68.6)	99,750 (71.5)	1,820,770 (63.4)	1,960,630 (64.4)
Rural	73,388 (31.4)	39,728 (28.5)	1,049,800 (36.6)	1,084,618 (35.6)
Income Quintile (%)				
Urban 1 (Lowest)	17,864 (7.7)	12,935 (9.3)	290,085 (10.1)	335,563 (11.0)
Urban 2	40,969 (17.6)	20,459 (14.7)	366,811 (12.8)	407,201 (13.4)
Urban 3	36,859 (15.8)	17,582 (12.6)	367,649 (12.8)	413,770 (13.6)
Urban 4	33,226 (14.2)	20,495 (14.7)	396,547 (13.8)	385,494 (12.7)
Urban 5 (Highest)	30,720 (13.2)	28,279 (20.3)	392,748 (13.7)	412,733 (13.6)
Rural 1 (Lowest)	5,787 (2.5)	4,971 (3.6)	127,745 (4.5)	146,738 (4.8)
Rural 2	12,231 (5.2)	10,258 (7.4)	224,818 (7.8)	224,324 (7.4)
Rural 3	15,617 (6.7)	7,323 (5.3)	226,948 (7.9)	240,627 (7.9)
Rural 4	16,149 (6.9)	6,305 (4.5)	208,268 (7.3)	222,396 (7.3)
Rural 5 (Highest)	23,501 (10.1)	10,834 (7.8)	259,648 (9.0)	246,945 (8.1)
Income Unknown	468 (0.2)	37 (0.0)	9,302 (0.3)	9,457 (0.3)
Resource Utilization Band (RUB) (%)				
RUB 0 (Non-Users)	59,979 (25.7)	12,948 (9.3)	671,224 (23.4)	337,074 (11.1)
RUB 1 (Lowest User Morbidity)	25,846 (11.1)	18,657 (13.4)	374,038 (13.0)	339,141 (11.1)
RUB 2	64,442 (27.6)	41,013 (29.4)	747,081 (26.0)	774,605 (25.4)
RUB 3	70,170 (30.1)	60,391 (43.3)	943,697 (32.9)	1,365,946 (44.9)
RUB 4	11,575 (5.0)	5,664 (4.1)	103,042 (3.6)	194,177 (6.4)
RUB 5 (Highest User Morbidity)	1,379 (0.6)	805 (0.6)	31,489 (1.1)	34,306 (1.1)
Mental Disorder (%)				
Mood and Anxiety Disorders	35,274 (15.1)	38,402 (27.5)	423,292 (14.7)	764,717 (25.1)
Personality Disorder	1,765 (0.8)	1,854 (1.3)	11,694 (0.4)	19,469 (0.6)
Psychoses	4,180 (1.8)	484 (0.3)	33,807 (1.2)	23,646 (0.8)

*CCHS (2000, 2003, 2005 & 2007-2011; aged 12+), CCHS Healthy Aging (2008/09; aged 45+)

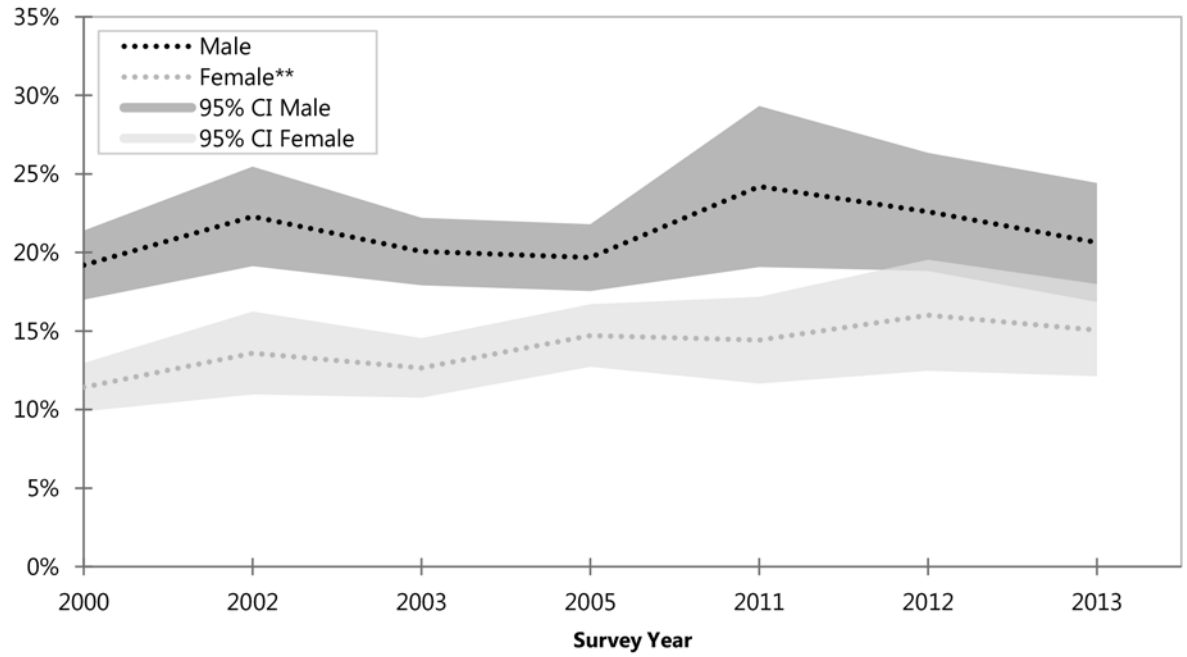
Note: Age, RHA, urban/rural, and income quintile were calculated at survey date. RUB was calculated 1 year prior to survey date. Mental health was calculated 5 years prior to survey date

Trends in Alcohol Consumption

We next considered trends over time in alcohol consumption using survey data from the CCHS.

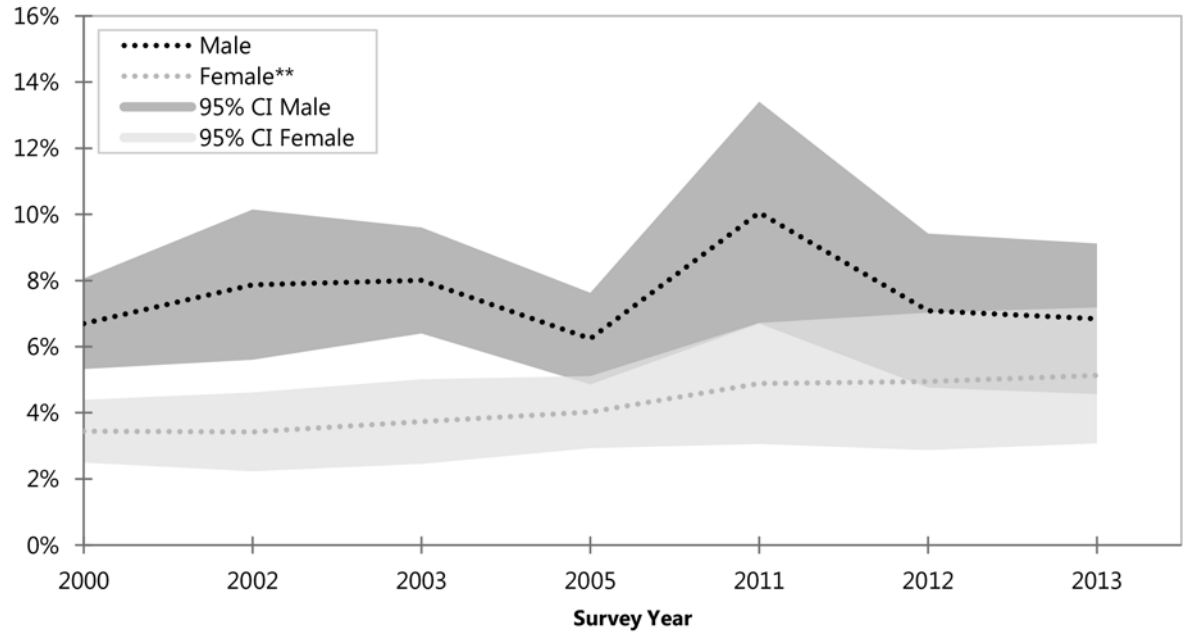
We calculated the prevalence of Manitobans whose self-reported drinking behaviours exceeded the low-risk daily (Figure 3.2) and weekly (Figure 3.3) limits for males and females from 2000 to 2013. We found no change over time among male individuals for either indicator; however, there was an annual increase in prevalence among female individuals for both indicators (1.5% in the daily limit and 2.8% annual increase in the weekly limit).

Figure 3.2: Weighted Percent of Respondents who Reported Exceeding the Recommended Low-Risk Daily Limit of Alcohol Consumption, by Survey Year*
Directly Standardized, 95% Confidence Intervals



* CCHS (2000, 2003-2005 & 2007-2011; aged 12+), CCHS Healthy Aging (2008/09; aged 45+)
** Indicates a statistically significant trend over time
Note: Recommended daily alcohol limit is 3 drinks for men, 2 drinks for women

Figure 3.3: Weighted Percent of Respondents who Reported Exceeding the Recommended Low-Risk Weekly Limit of Alcohol Consumption, by Survey Year*
Directly Standardized, 95% Confidence Intervals



* CCHS (2000, 2003-2005 & 2007-2011; aged 12+), CCHS Healthy Aging (2008/09; aged 45+)
** Indicates a statistically significant trend over time
Note: Recommended weekly alcohol limit is 15 drinks for men, 10 drinks for women

Conclusions

Summary of Key Findings

The incidence rate for AUDs decreased for both males and females between fiscal years 1990/91 and 2014/15; the decline was greater among males.

Fifteen percent of females and 21% of males exceeded the recommended daily limits for alcohol consumption. The prevalence of females exceeding the recommended daily and weekly limit for alcohol consumption increased between 2000 and 2013. There were no changes in the prevalence of males exceeding either the recommended daily or weekly limits.

Individuals with an AUD tended to be from lower socioeconomic neighbourhoods, were less likely to be from Winnipeg, and their average age was lower than the average age of Manitoba's general population. They were also more likely to have been a non-user of the healthcare system before their diagnosis, and to have mental disorder comorbidity.

We found little evidence for a socioeconomic gradient for self-reported alcohol use exceeding the daily and/or weekly limits.

Incidence Rates for Alcohol Use Disorder over Time

Similar to other studies, we found that males in Manitoba had a higher risk of being diagnosed with an AUD compared with females [6,7], In our study, incidence rates for males (1.9 per 1,000 person-years) were slightly higher than those found by a similar study using primary care administrative data (1.7 per 1,000 person-years) [5]. Our incidence rates for females (1.2 per 1,000 person-years) were also higher when compared with this other study (0.8 per 1,000 person-years). Our study also found a declining rate of individuals with an AUD while the other study reported an increase between 1990 and 2013 [5]. Differences in time trends between the two studies could be due to differences in diagnosis patterns and/or differing patterns of societal attitudes towards alcohol consumption, rather than true differences in incident rates.

We also found that AUD diagnoses followed a socioeconomic gradient. Individuals with an AUD were more likely to be from low-income neighbourhoods. This finding was similar to what was found in several other epidemiological studies on AUDs [6,7] and studies using administrative data to identify individuals with an AUD [5,8].

Exceeding Recommended Low-Risk Drinking Limits

We found that the characteristics of people with an AUD differed from characteristics of individuals who reported exceeding the recommended daily and weekly limits for alcohol consumption. Those with an AUD followed a stark SES gradient and were more likely to be either non-users or high users of the healthcare system, but we noted very few differences between those who did and did not exceed recommended alcohol consumption limits.

A recent Canadian study hypothesized that these discrepancies (i.e., a socioeconomic gradient among those with an AUD, but not among those self-reporting that they exceeded recommended drinking limits) may be due to individuals of lower socioeconomic status (SES) having fewer resources with which to deal with excessive alcohol use, thus making them more susceptible to the harmful effects of excessive alcohol consumption [8]. Similar to this other study, we found that those with a diagnosis of AUD were more likely to be from lower SES neighbourhoods, and that individuals reporting that they exceeded the daily and/or weekly limits were just as likely to be from a high SES neighbourhood as they were to be from a low SES area. Future research is needed to identify the drivers behind this discrepancy in trends.

Chapter Four:

Provincial Trends in Outcomes Associated with Alcohol Use Disorders: Health Services and Health and Social Outcomes

In this chapter, we explore the health service use and health and social outcomes of cases and matches by fiscal year. By looking at the number of people with an AUD who received health and social services on an annual basis, we gain an understanding of the fiscal implications of excessive alcohol use. For each indicator, we present rates for cases and matches.

We defined our cohorts as follows:

- **Case:** someone who had a physical illness or mental disorder resulting from alcohol consumption; or
- **Match:** someone who did not have any indication that they used alcohol excessively and who was similar to a case based on characteristics such as age, sex, and postal code of residence at index date.

More details on how we identified cases and matches, as well as information on our matching algorithm, is available in Chapter 2 and Appendix 1.

We used 95% confidence intervals to signal statistically significant differences. In graphs, 95% confidence intervals are represented by shaded bands. When these bands do not overlap, this signals that crude rates are statistically significantly different from one another.

Health Services

We looked at the following indicators of health system use: inpatient hospitalizations, days spent in hospital, ambulatory visits, prescription drugs, and emergency department visits.

Table 4.1: Measured Outcome Variables

Health Services	
• Inpatient Hospitalizations • Days in Hospital • Ambulatory Visits (Physician Visits)	• Prescription Drugs • Emergency Department Visits
Health Outcomes	
• Total Mortality • Premature Mortality • Ischemic Heart Disease	• Diabetes • Alcohol-Related Cancers
Social Outcomes	

• Justice Involvement
  • Driving While Intoxicated
  • Domestic/Family Violence
  • Any Charge in the Justice Data
	• Social Housing
	• Children Taken into Care
	• Income Assistance

Inpatient Hospitalizations

Both male and female cases had higher rates of hospitalizations than their matches. [4] Differences between cases and matches were greater among females than among males. In 1990/91, female cases had a 2.49 times higher hospitalization rate than their matches; in 2014/15, female cases had a 2.83 times higher rate (Figure 4.1). For males, the differences were smaller. In 1990/91, male cases had a 2.12 times higher hospitalization rate than their matches; in 2014/15, they had a 2.36 times higher rate (Figure 4.2).

[4] Obstetric hospitalizations excluded.

Figure 4.1: Crude Hospitalization Rates for Females with AUD* (cases) and Females without AUD (matches)
Per 1,000 person-years, by fiscal year

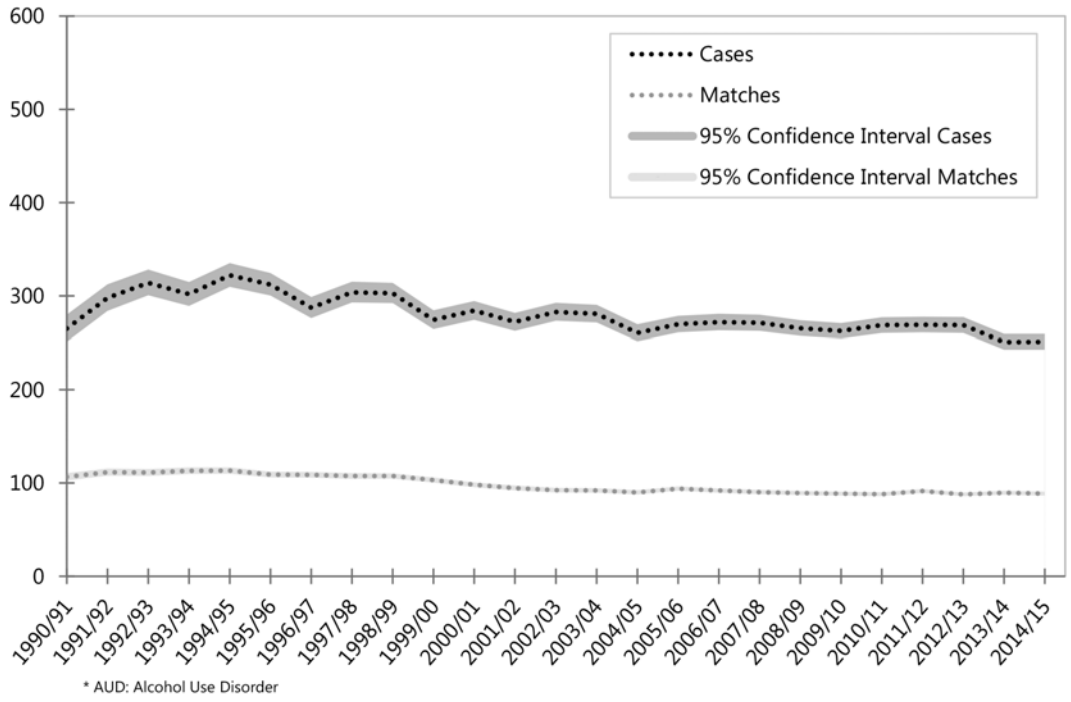
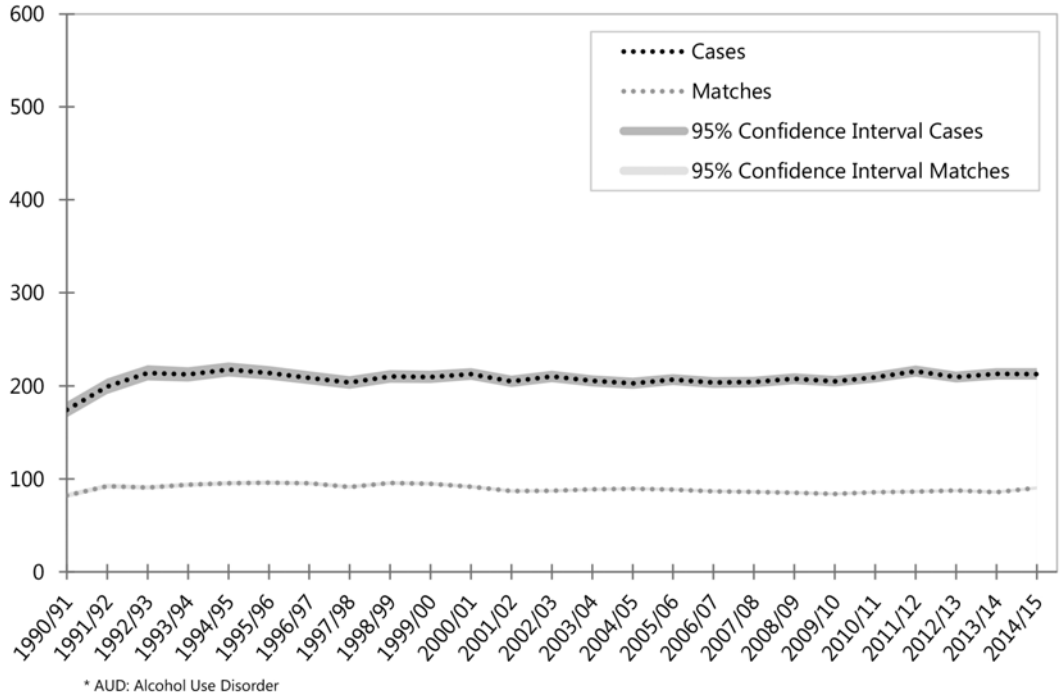


Figure 4.2: Crude Hospitalization Rates for Males with AUD* (cases) and Males without AUD (matches)
Per 1,000 person-years, by fiscal year



Days Spent in Hospital

We measured how many days male and female cases and matches spent in hospital (Figure 4.3 and Figure 4.4). In 2014/15, female cases spent 3.19 times more days in hospital than their matches; male cases spent 2.72 times more days in hospital than their matches. However, there was a slight decrease in the number of hospital days among male cases towards the end of the study.

Figure 4.3: Crude Number of Hospital Days for Females with AUD* (cases) and Females without AUD (matches)
Per 100 person-years, by fiscal year

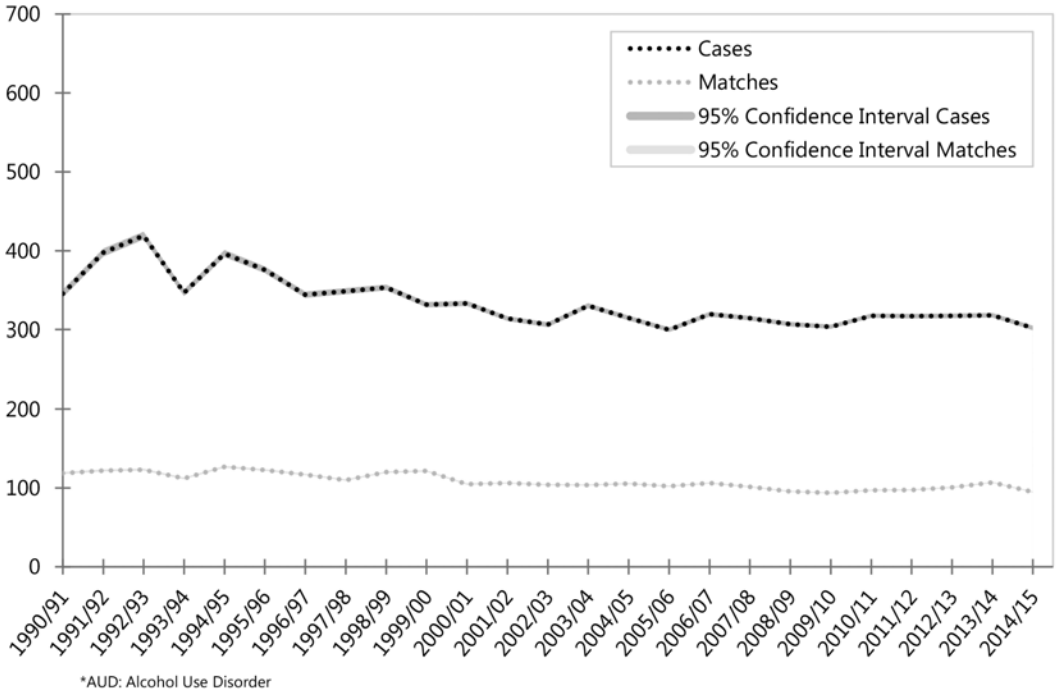
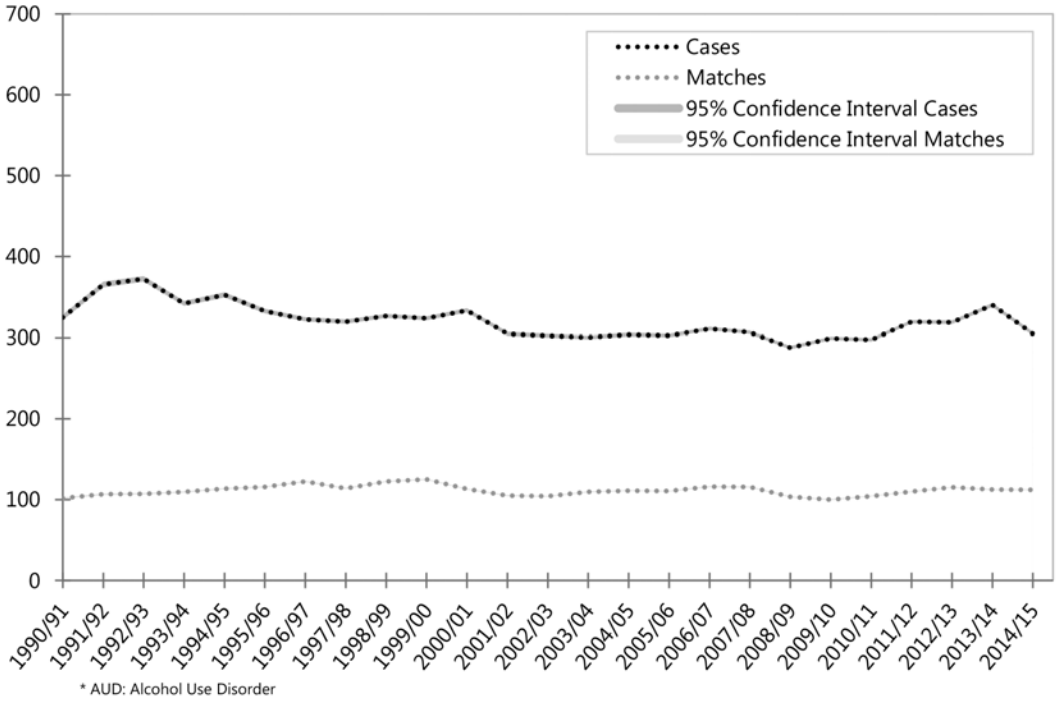


Figure 4.4: Crude Number of Hospital Days for Males with AUD* (cases) and Males without AUD (matches)
Per 100 person-years, by fiscal year



Ambulatory Visits (Physician Visits)

Female cases had between a 43% and 69% higher rate of ambulatory (physician) visits compared with their matches (Figure 4.5); this difference between cases and matches has declined since 1996/97. Male cases had between a 31% and 54% higher rate of physician visits compared with their matches (Figure 4.6); there was no trend over time in the number of ambulatory visits per person-year among males.

Figure 4.5: Crude Number of Ambulatory Visits for Females with AUD* (cases) and Females without AUD (matches)
Per person-year, by fiscal year

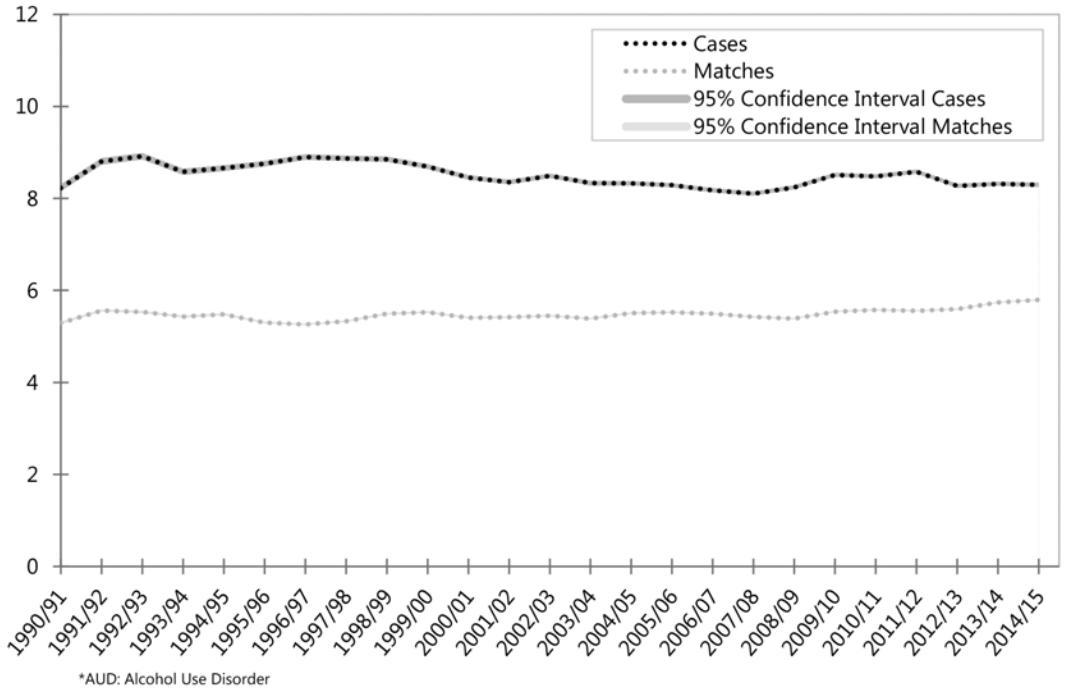
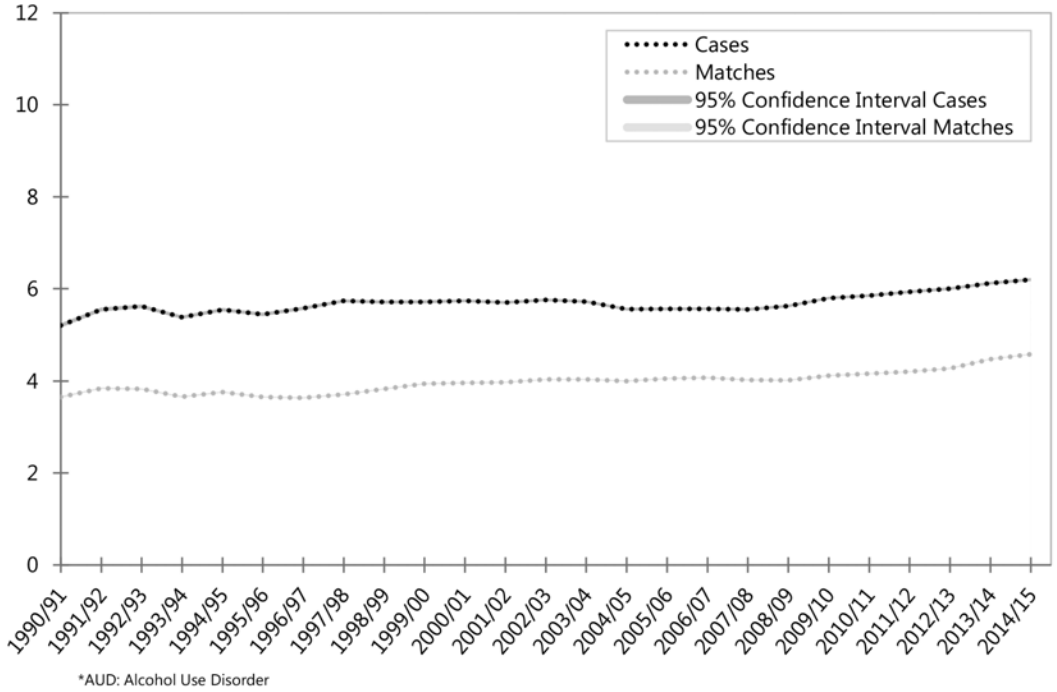


Figure 4.6: Crude Number of Ambulatory Visits for Males with AUD* (cases) and Males without AUD (matches)
Per person-year, by fiscal year



Prescription Drugs

Over the course of the study, the number of different prescription drugs dispensed to individuals in the cohort increased. Male and female cases consistently had a higher rate of drug dispensations compared with their matches. The differences between cases and matches were bigger among females than among males. Across the 20 years of data examined, female cases had a 60-74% higher rate of drug dispensations compared with their matches (Figure 4.7); male cases had a 42-50% higher rate compared with their matches (Figure 4.8). The difference between female cases and matches increased from 2005/06 onwards, but this increase was not statistically significant over time.

Figure 4.7: Crude Rates of Number of Different Drugs Dispensed to Females with AUD* (cases) and Females without AUD (matches)
Per person-year, by fiscal year

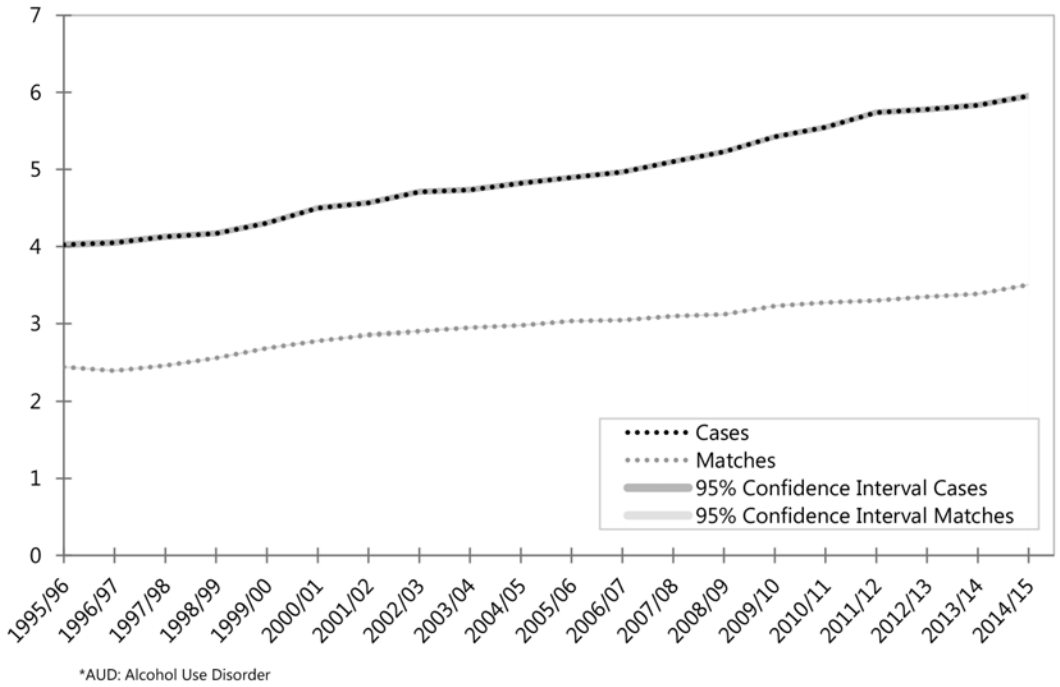
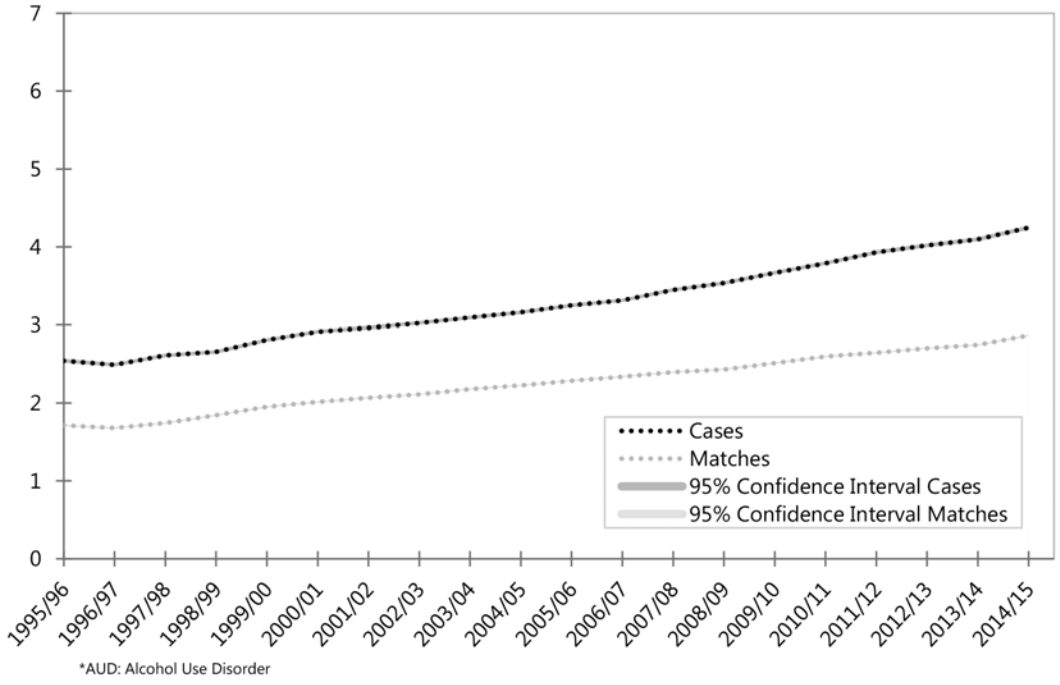


Figure 4.8: Crude Rates of Number of Different Drugs Dispensed to Males with AUD* (cases) and Males without AUD (matches)
Per person-year, by fiscal year



Emergency Department Visits

Across the seven years of available data, female cases had a 3.27-4.00 times greater emergency department (ED) visit rate than their matches (Figure 4.9). Male cases had a 2.70-3.25 times higher ED visit rate than their matches (Figure 4.10). Differences in ED visits between cases and matches were greater among females than males.

Figure 4.9: Crude Rates of Emergency Department Visits for Females with AUD* (cases) and Females without AUD (matches)
Per 100 person-years, by fiscal year, Winnipeg Facilities only

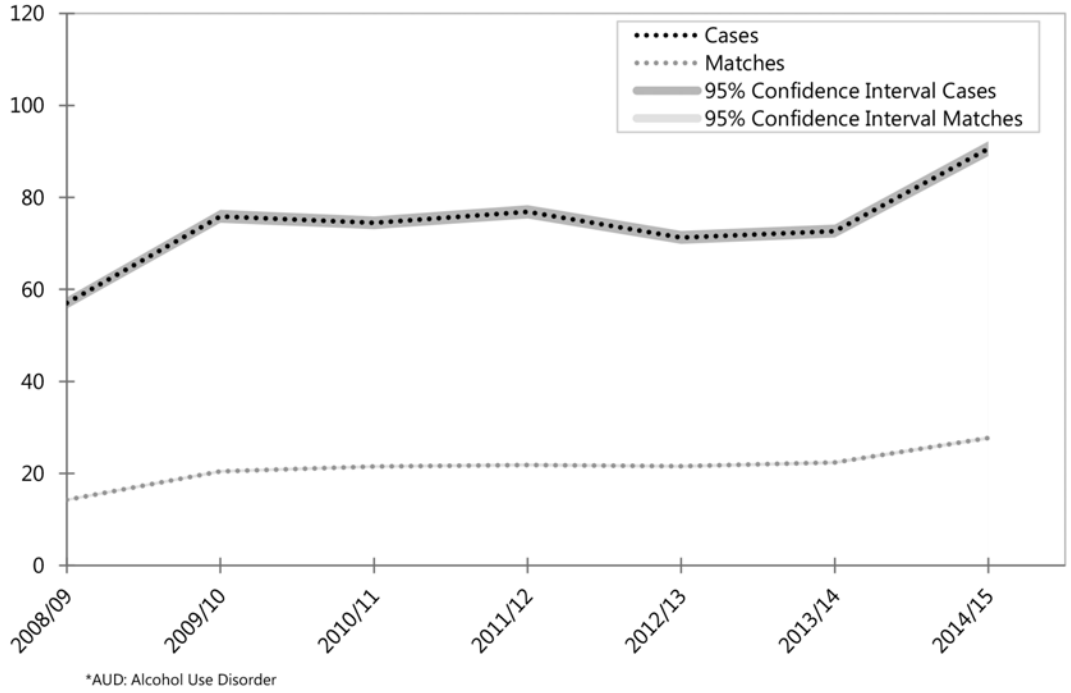
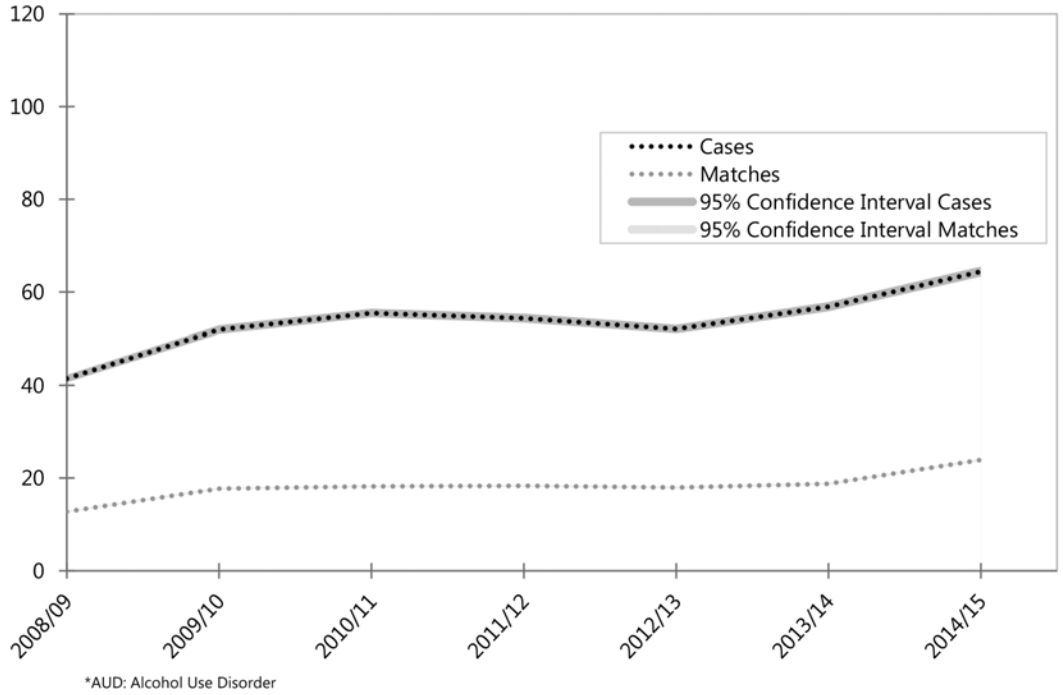


Figure 4.10: Crude Rates of Emergency Department Visits for Males with AUD* (cases) and Males without AUD (matches)
Per 100 person-years, by fiscal year, Winnipeg Facilities only



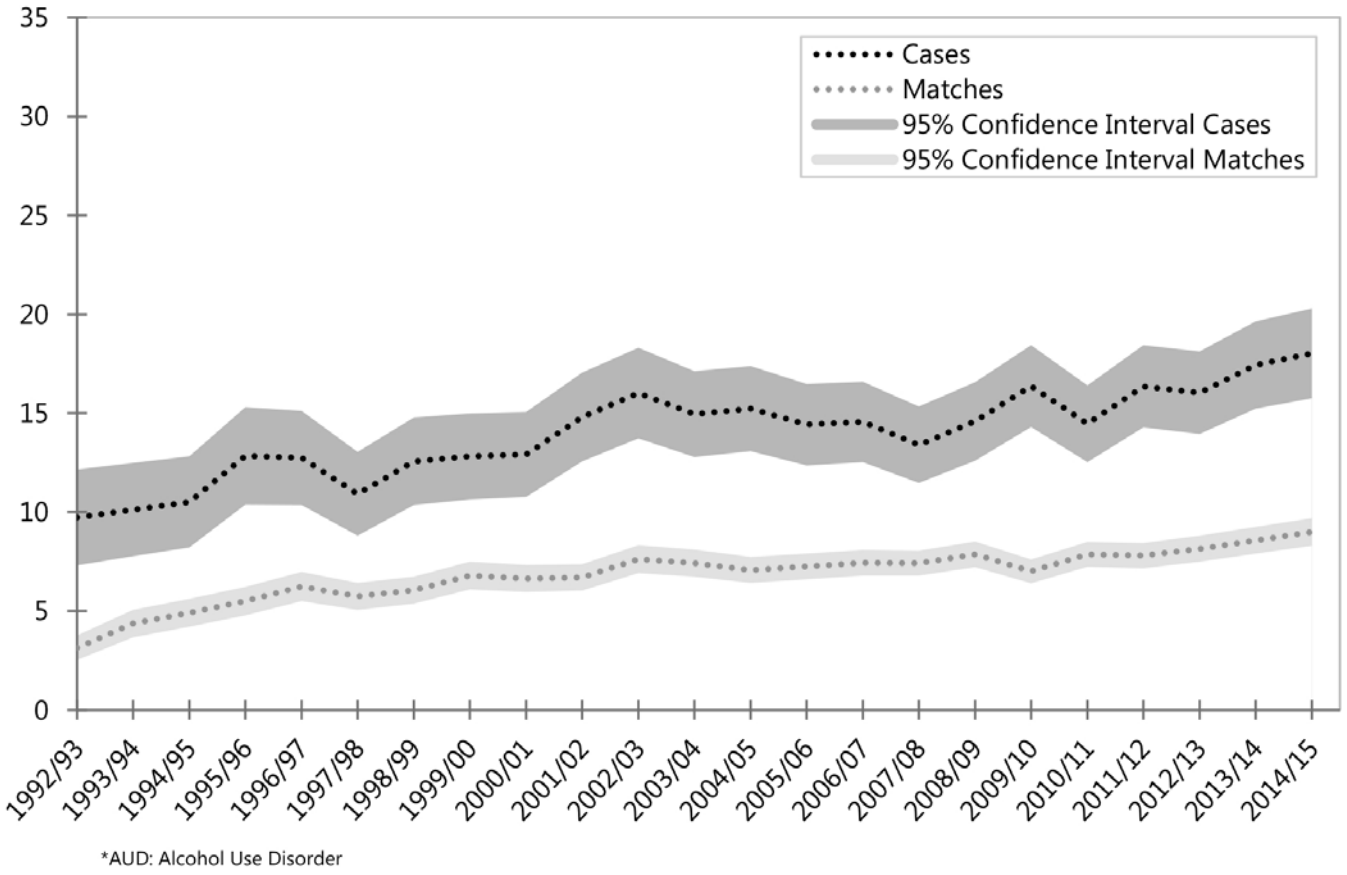
Health Outcomes

We examined the following health outcomes among cases and matches by fiscal year: total mortality rates, premature mortality rates, incident cases of ischemic heart disease (IHD), incident cases of diabetes, and incident cases of alcohol-related cancers.

Total Mortality

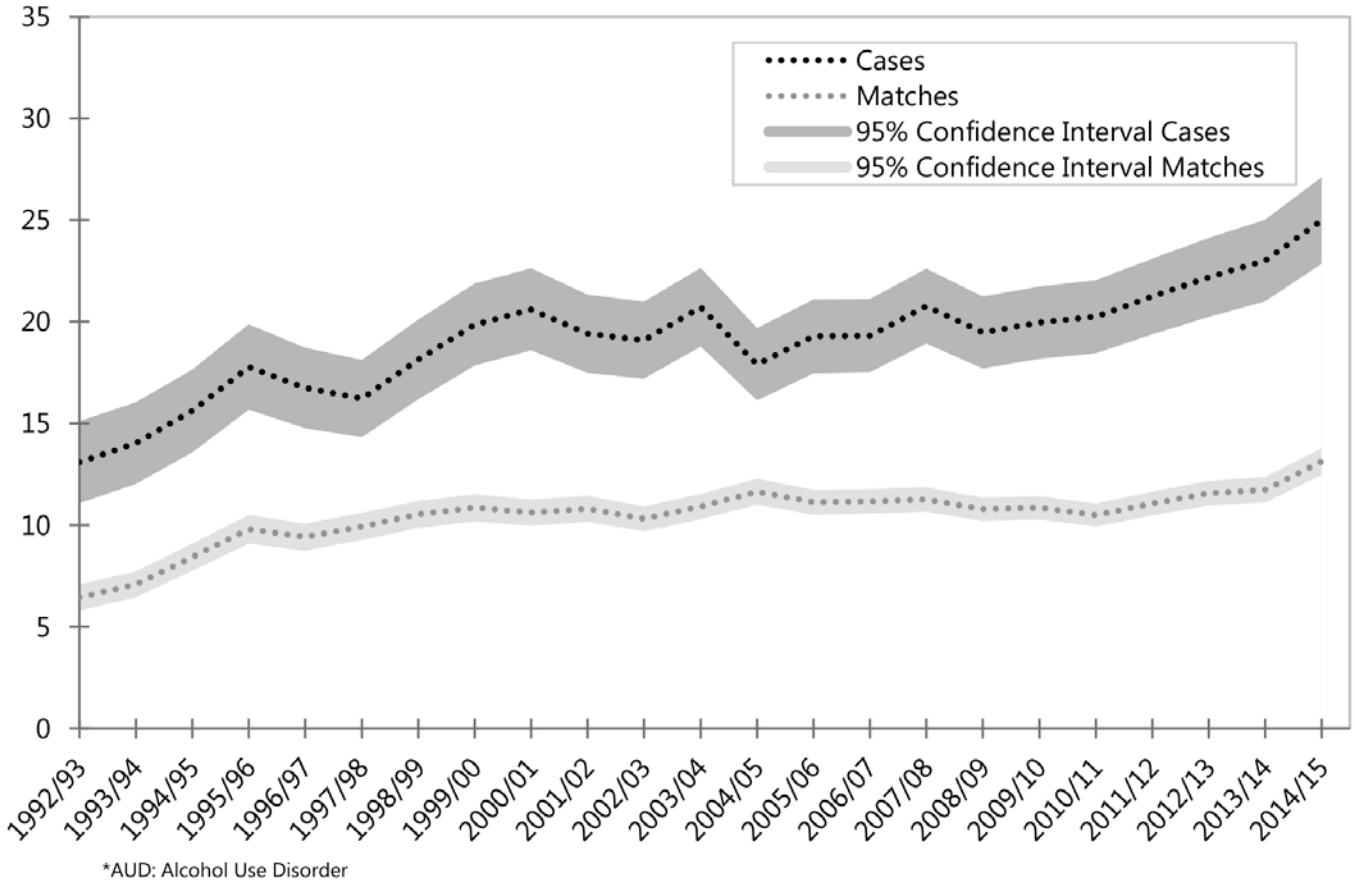
In 1992/93, all-age mortality rates among females with an AUD was roughly 10 deaths per 1,000 person-years; by 2014/15, this had increased to 18 deaths per 1,000 person-years (Figure 4.11). Among men with an AUD, all-age mortality increased from 13.1 to 25.0 deaths per 1,000 person-years (Figure 4.12). Both men and women with an AUD had elevated mortality rates when compared with their matches.

Figure 4.11: Crude All-Age Mortality Rates for Females with AUD* (cases) and Females without AUD (matches)
Per 1,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder

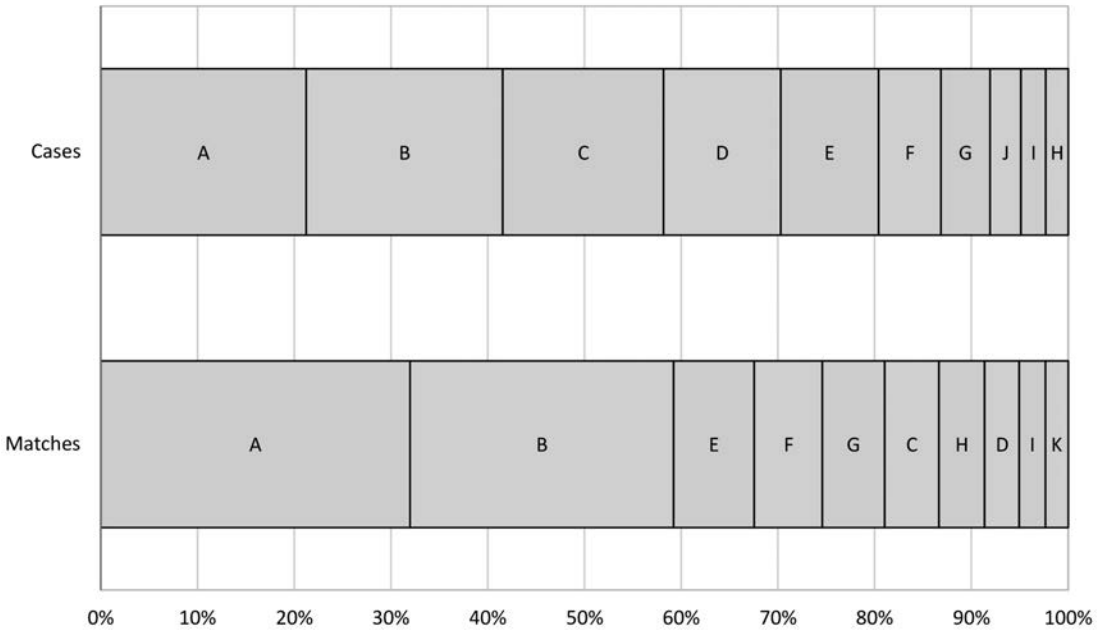
Figure 4.12: Crude All-Age Mortality Rates for Males with AUD* (cases) and Males without AUD (matches)
Per 1,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder

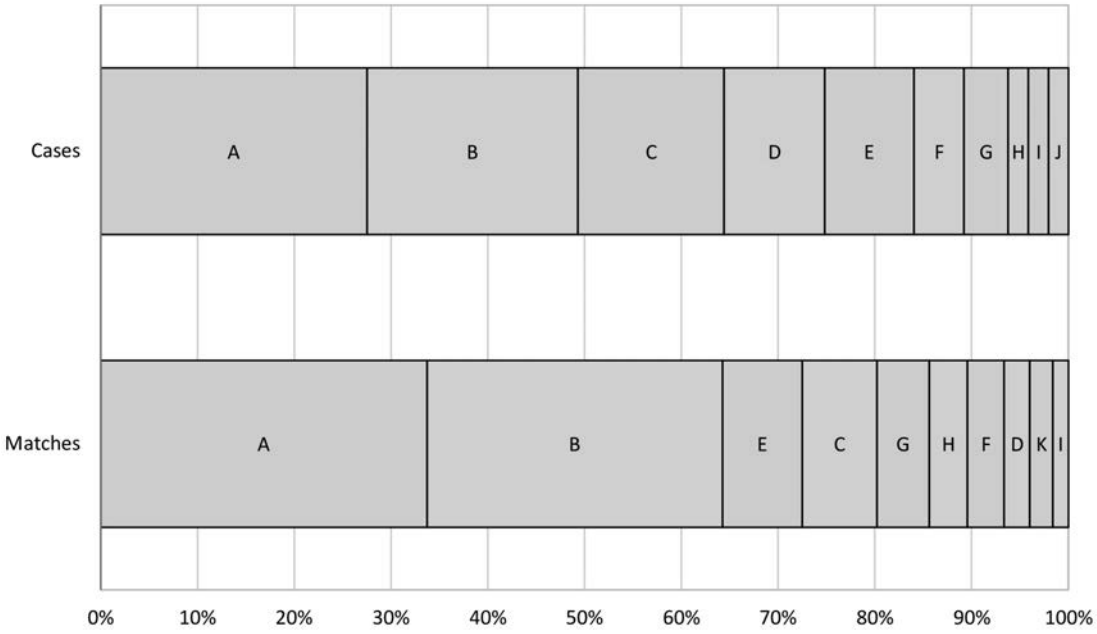
We investigated the 10 most common causes of death by ICD chapter among cases and matches. Circulatory diseases and cancer were the most frequent two causes of death for both cases and matches. External causes (e.g., causes from injuries and accidents, such as transport accidents, falls, drowning, exposure to fire and smoke, and deaths due to suicide and complications of medical care) and digestive diseases were the third and fourth most common reasons for death among cases, while respiratory and external causes were the third and fourth most common among our matches. It is interesting to note that the distribution of the causes of death are largely similar between men and women (Figures 4.13 and 4.14).

Figure 4.13: Most Common Causes of Death for Females with AUD* (cases) and Females without AUD (matches)



*AUD: Alcohol Use Disorder
A - Circulatory Disease, B - Cancer, C - External Causes, D - Digestive Diseases, E - Respiratory Disease, F - Mental and Behavioural Disorders, G - Endocrine and Metabolic Disease, H - Nervous System Disease, I - Not Otherwise Classified, J - Infectious and Parasitic Disease, K - Genitourinary Disease

Figure 4.14: Most Common Causes of Death for Males with AUD* (cases) and Males without AUD (matches)



*AUD: Alcohol Use Disorder
A - Circulatory Disease, B - Cancer, C - External Causes, D - Digestive Diseases, E - Respiratory Disease, F - Mental and Behavioural Disorder, G - Endocrine and Metabolic Disease, H - Nervous System Disease, I - Not Otherwise Classified, J - Infectious and Parasitic Disease, K - Genitourinary Disease

Premature Mortality

Premature mortality rates provide an overall indicator for population health. We examined trends in premature mortality to assess whether the underlying health of the cohort changed significantly over time. Premature mortality rates for both female and male cases dropped significantly in the early 1990s; following that, there was little change in either group. Among female matches, premature mortality rates have remained fairly stable over the past 25 years (Figure 4.15); however, among male matches, rates declined during the 1990s (Figure 4.16). This decline in premature mortality has been noted in other MCHP studies, and may reflect an overall increase in the health of Manitoban males during the 1990s [31,32]. After 2000, we did not see a statistically significant change in premature mortality over time.

Figure 4.15: Crude Premature Mortality Rates for Females with AUD* (cases) and Females without AUD (matches)
Per 1,000 person-years, by fiscal year

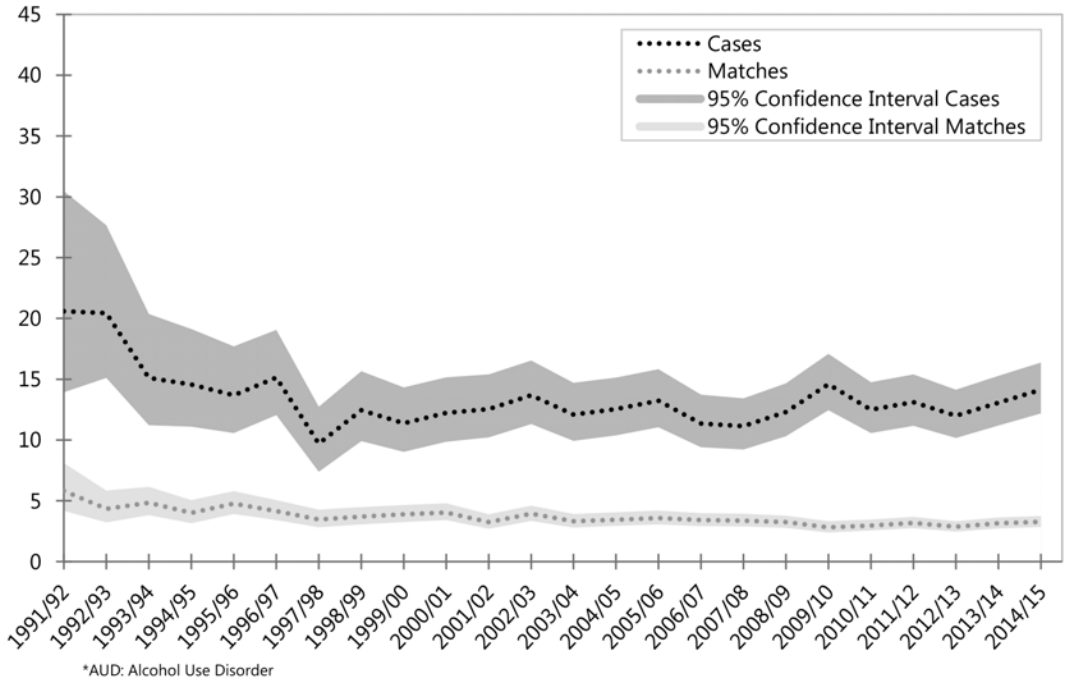
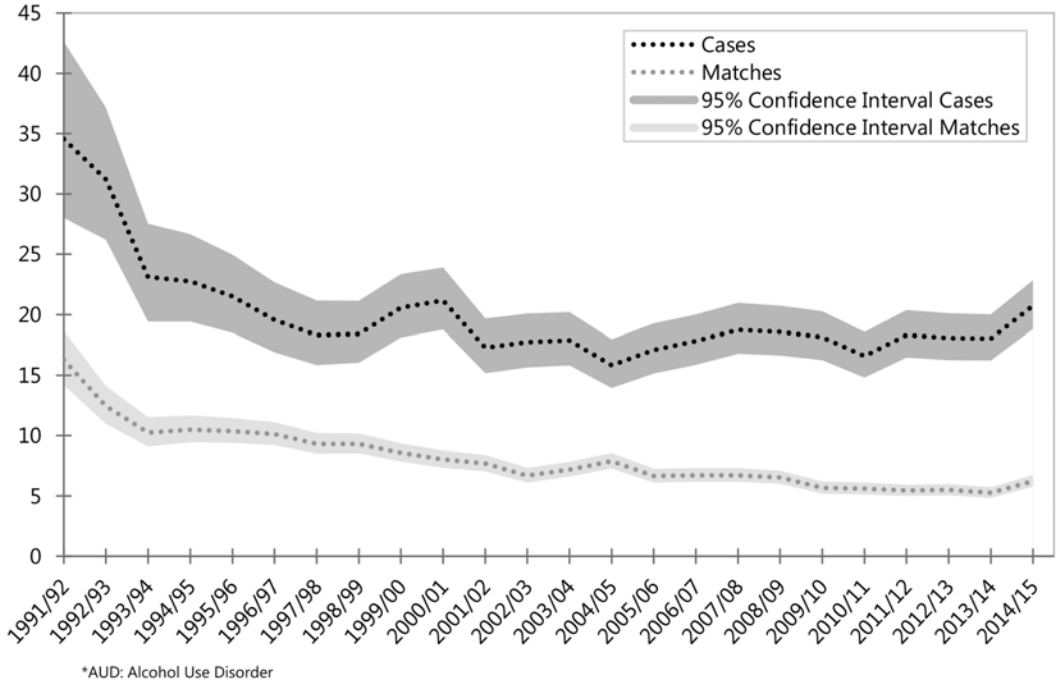


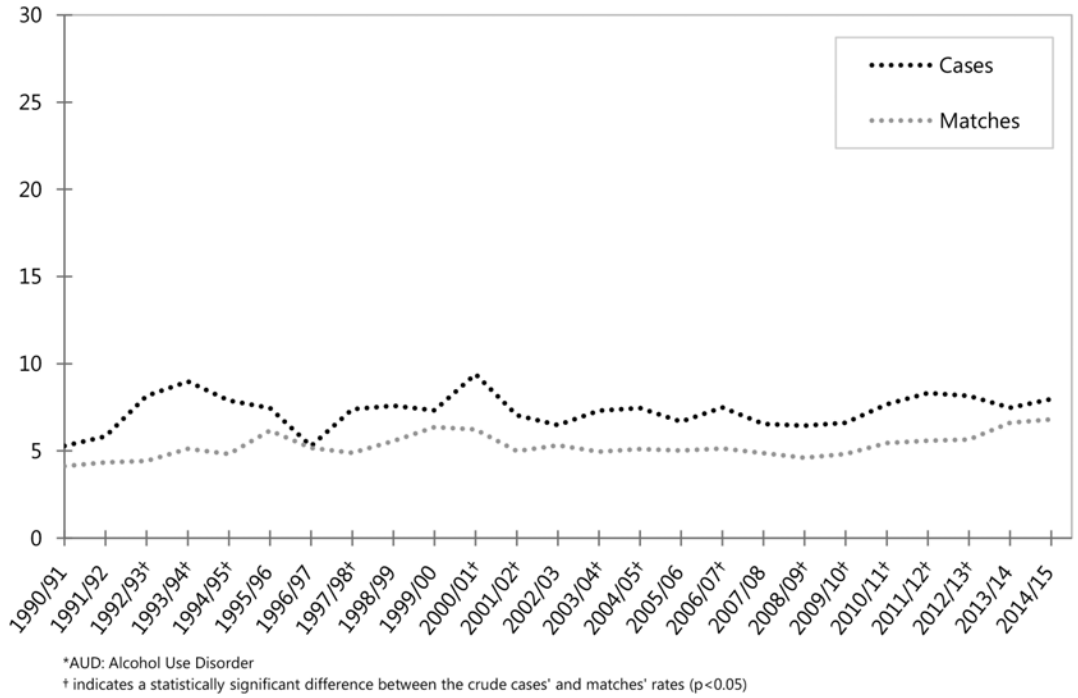
Figure 4.16: Crude Premature Mortality Rates for Males with AUD* (cases) and Males without AUD (matches)
Per 1,000 person-years, by fiscal year



Ischemic Heart Disease

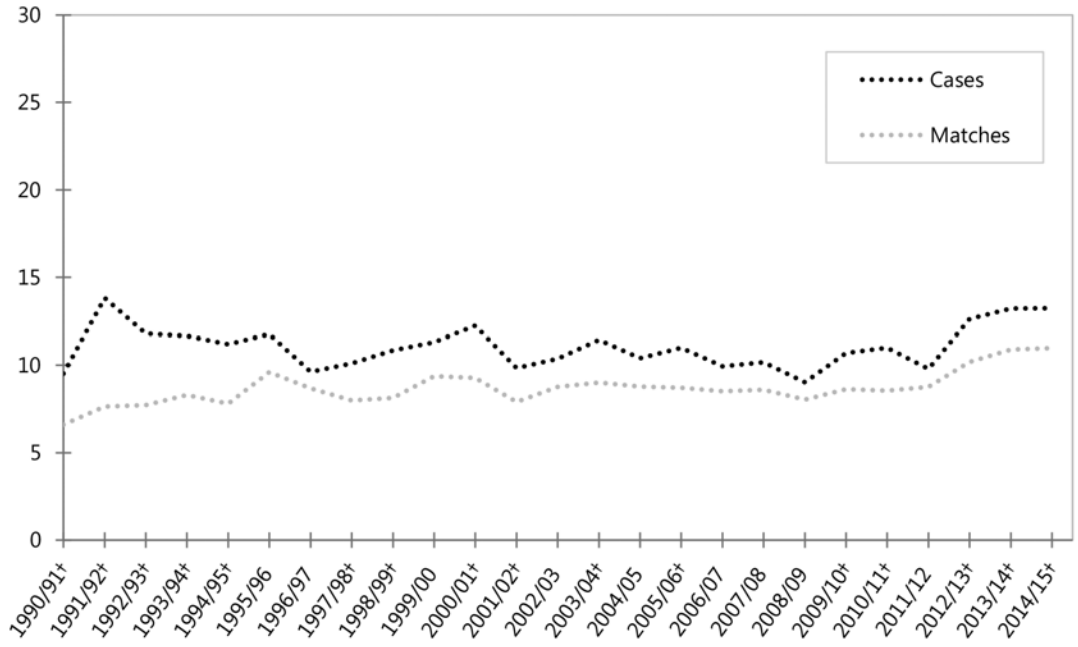
There were minimal differences in ischemic heart disease (IHD) rates between cases and matches. Both female and male cases had elevated rates compared to their matches for IHD in just over half of the study years (Figure 4.17 and Figure 4.18). Statistical significance in the figures for IHD is indicated by daggers next to the fiscal years on the horizontal axis. Confidence bands were not included on this graph due to the overlapping lines between the two groups.

Figure 4.17: Crude Incidence Rates of Ischemic Heart Disease among Females with AUD* (cases) and Females without AUD (matches)
Per 1,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude cases' and matches' rates (p<0.05)

Figure 4.18: Crude Incidence Rates of Ischemic Heart Disease among Males with AUD* (cases) and Males without AUD (matches)
Per 1,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude cases' and matches' rates (p<0.05)

Diabetes

Female cases had higher rates of diabetes compared with their matches (Figure 4.19); male cases likewise had elevated rates of diabetes compared with their matches (Figure 4.20). Diabetes rates increased over time across all individuals in the cohort.

Figure 4.19: Crude Incidence Rates of Diabetes among Females with AUD* (cases) and Females without AUD (matches)
Per 100 person-years, by fiscal year

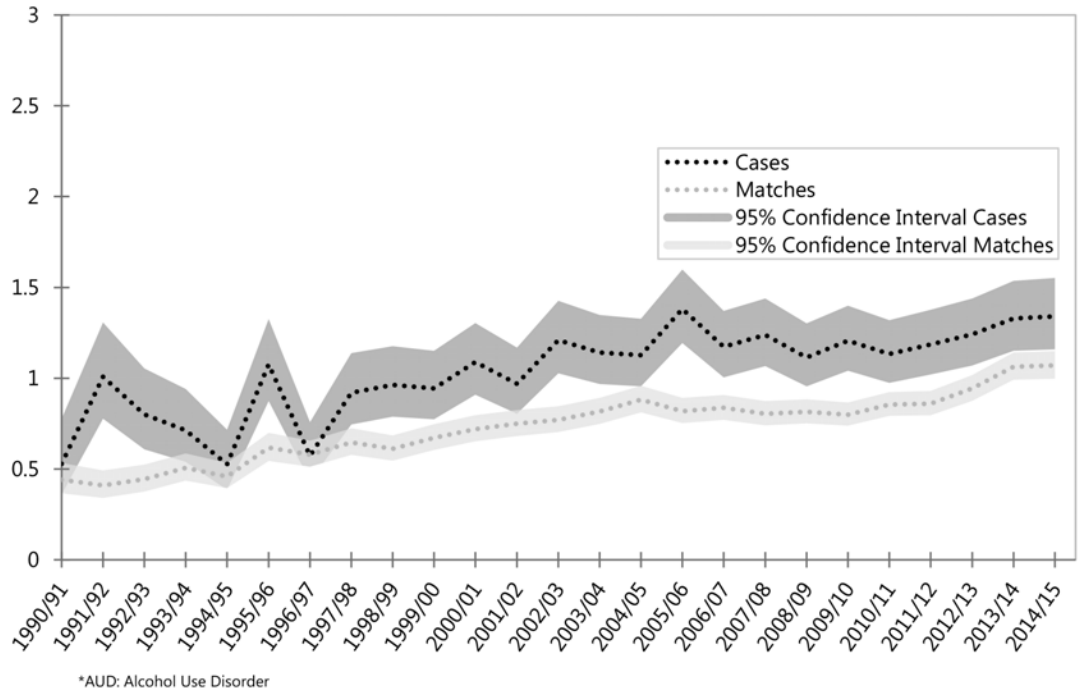
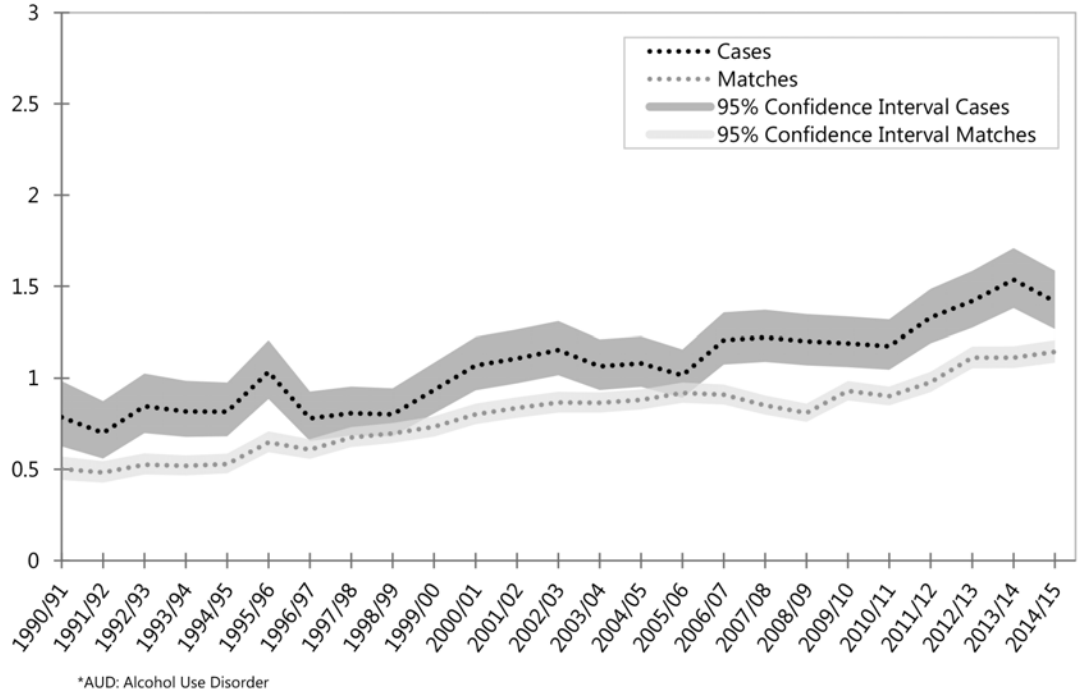


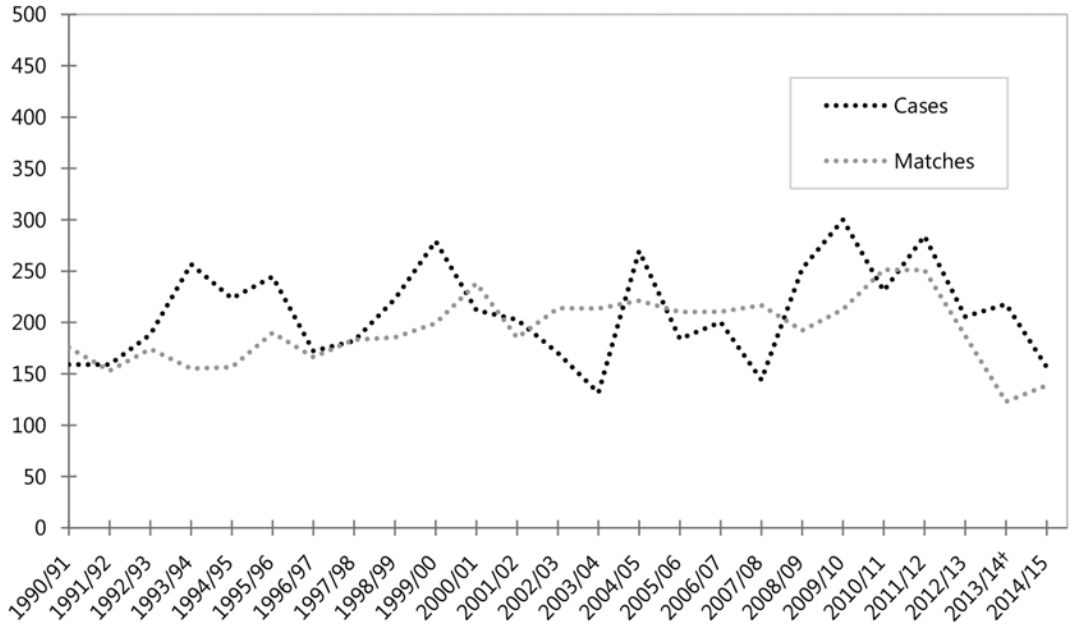
Figure 4.20: Crude Incidence Rates of Diabetes among Males with AUD* (cases) and Males without AUD (matches)
Per 100 person-years, by fiscal year



Alcohol-Related Cancers

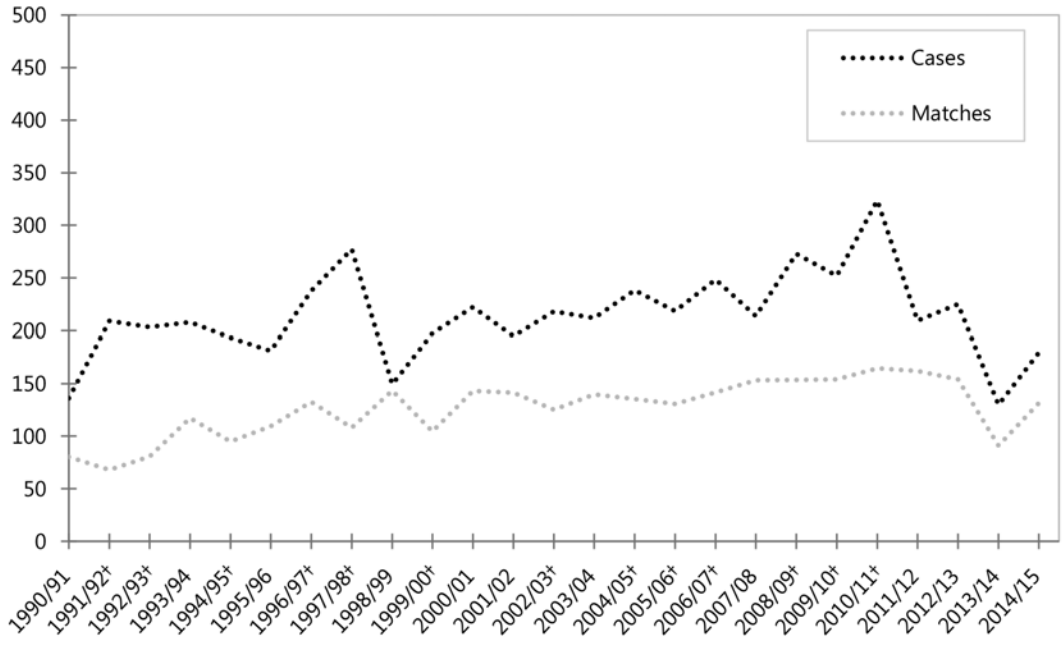
We examined incidence rates for cancers that have been shown to be associated with an AUD. Patterns differed between females and males over time. There was no difference in incidence rates for alcohol-related cancers between female cases and matches (Figure 4.21). Among males, however, there was a statistically significantly elevated rate of alcohol-related cancers for cases compared to their matches across most years of the study (Figure 4.22). It is important to note that the variation over time in both graphs indicates that new cases of alcohol-related cancers are relatively rare. Confidence bands were not included on this graph due to the overlapping lines between the two groups. We did not see a change over time in alcohol-related cancers. Statistical significance in the figures for alcohol-related cancers is indicated by daggers next to the fiscal years on the horizontal axis.

Figure 4.21: Crude Incidence Rates of Alcohol-Related Cancers among Females with AUD* (cases) and Females without AUD (matches)
Per 100,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude cases' and matches' rates (p<0.05)

Figure 4.22: Crude Incidence Rates of Alcohol-Related Cancers among Males with AUD* (cases) and Males without AUD (matches)
Per 100,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude cases' and matches' rates (p<0.05)

Social Outcomes

We looked at four broad markers of social service use among our cohort: (1) having a charge recorded in the justice system; (2) moving into social housing; (3) having a child taken into the care of Child and Family Services; and (4) starting to receive income assistance.

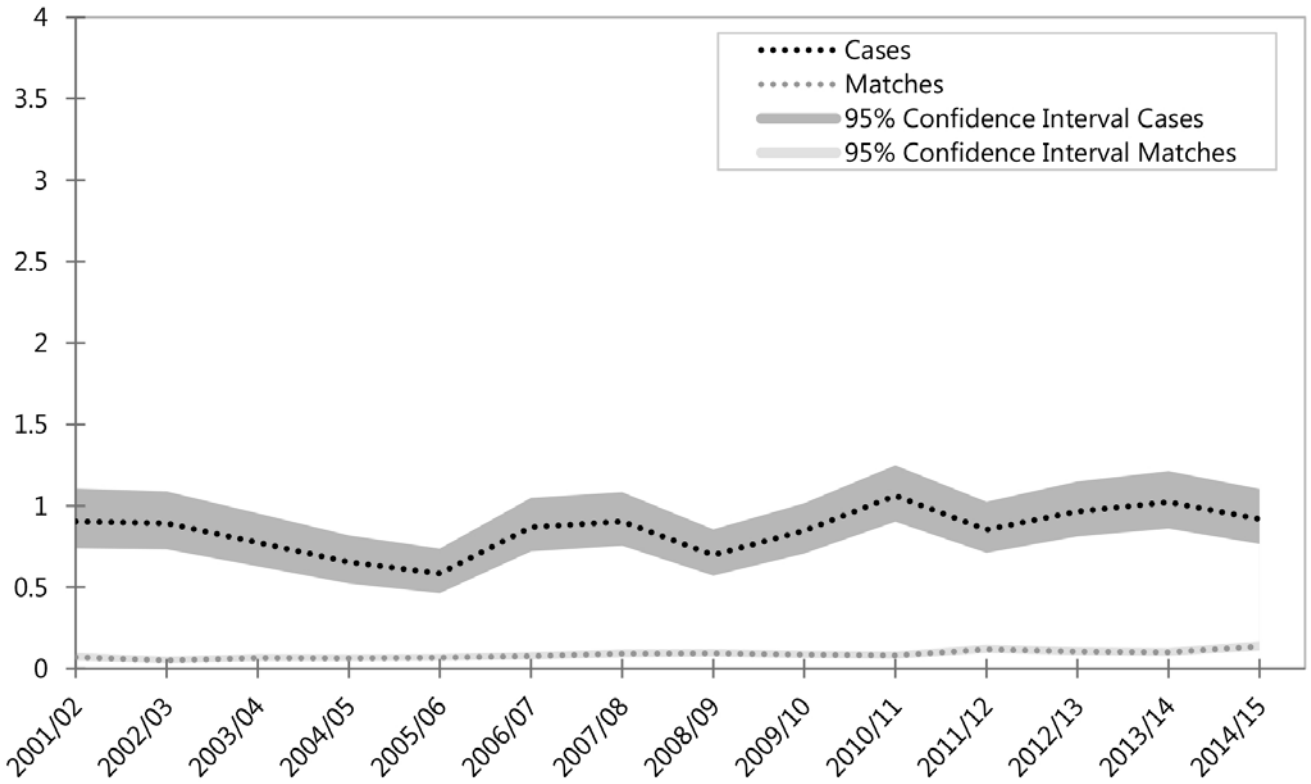
Involvement with the Justice System

We examined three indicators of justice system involvement: (1) being charged with driving while intoxicated, (2) being charged with domestic/family violence, and (3) any charge in the justice database. We used data from the Prosecution Information and Scheduling Management (PRISM) database.

Driving While Intoxicated

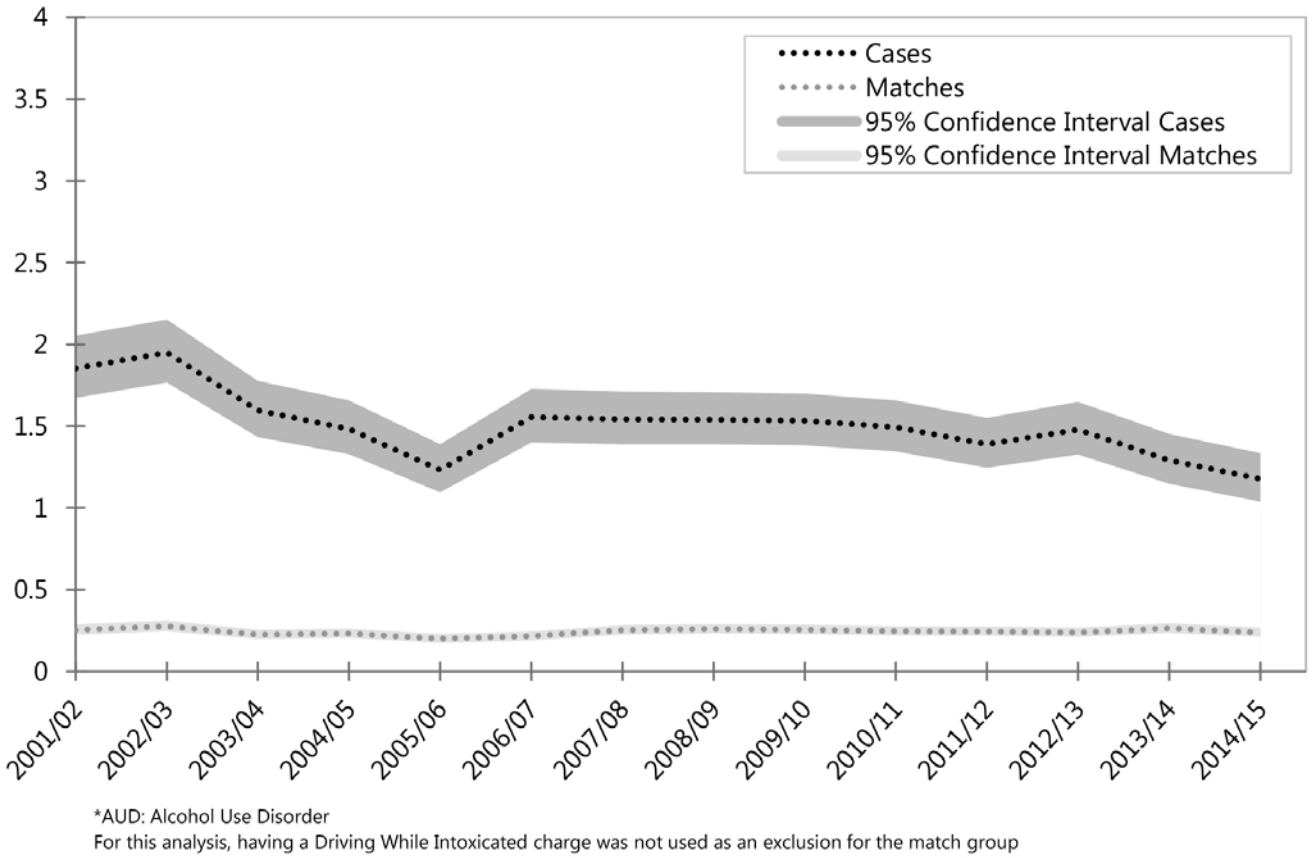
Between 2001/02 and 2014/15, rates of driving while intoxicated (DWI) among female cases varied between 0.58 and 1.06 charges per 100 person-years (Figure 4.23); among male cases, DWI rates varied between 1.18 and 1.95 charges per 100 person-years (Figure 4.24). Both female and male cases had higher rates of DWI when compared with their matches. The relative difference in DWI rates between cases and matches was greater among females than males. Across all study years, female cases had, on average, 10.5 times the rate of DWI when compared with their matches; in 2002/03, the relative difference was greatest – female cases had 17.6 times the rate of DWI compared with their matches. Among males, the relative difference was less pronounced. Male cases had, on average, 6.2 times the rate of DWI when compared with their matches. This could reflect a "floor effect", where male matches had a much higher baseline rate of DWI than did female matches. Thus, the relative differences between male cases' and matches' DWI rates would be smaller.

Figure 4.23: Crude Incidence Rates of Females with AUD* (cases) and Females without AUD (matches) Charged with Driving While Intoxicated
Per 100 person-years, by fiscal year



*AUD: Alcohol Use Disorder
For this analysis, having a Driving While Intoxicated charge was not used as an exclusion for the match group

Figure 4.24: Crude Incidence Rates of Males with AUD* (cases) and Males without AUD (matches) Charged with Driving While Intoxicated
Per 100 person-years, by fiscal year

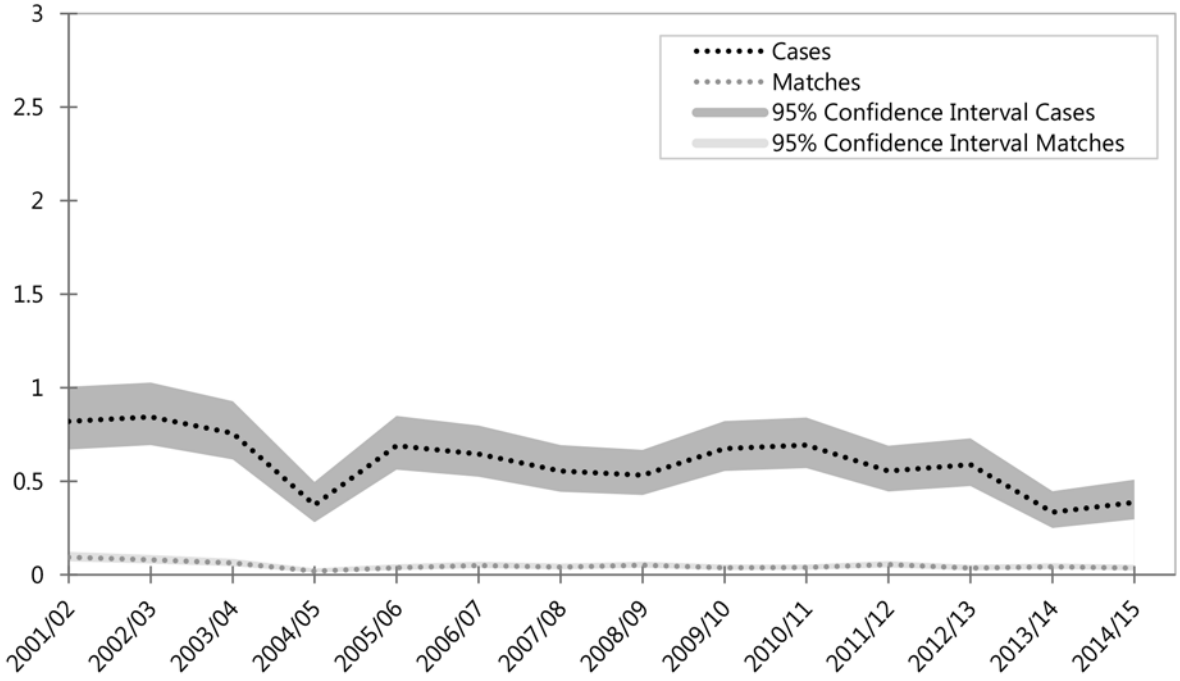


*AUD: Alcohol Use Disorder
For this analysis, having a Driving While Intoxicated charge was not used as an exclusion for the match group

Domestic / Family Violence

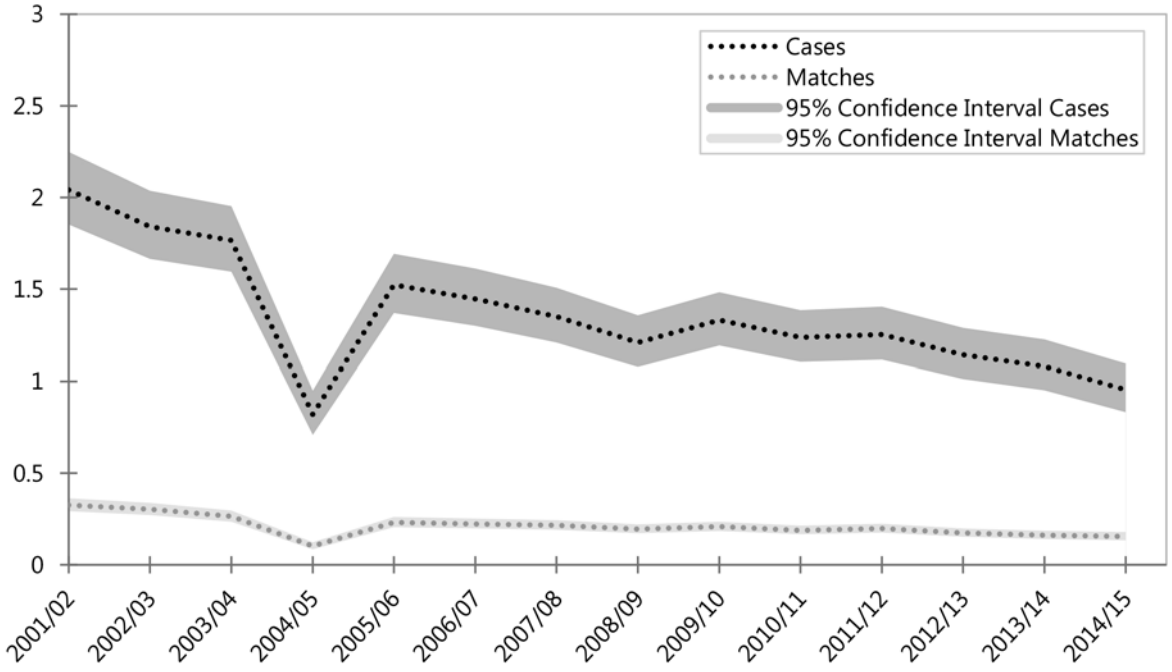
A similar pattern was found when we analyzed trends in charges for domestic/family violence. Note that there may have been anomalies in recording of justice involvements in 2004/05; these are seen as dips in the graph during that year. Female cases had, on average, 0.6 charges of domestic/family violence per 100 person-years, with annual rates ranging between 0.3 and 0.8 charges per 100 person-years over the study period (Figure 4.25). Male cases had a higher rate of domestic/family violence charges. Over the study period, male cases had, on average, 1.4 charges for domestic/family violence per 100 person-years; this rate varied on an annual basis between 0.8 and 2.0 charges per 100 person-years (Figure 4.26). We found that the relative difference in charges for domestic/family violence between cases and matches was greater among females than males. Indeed, female cases had between 7.8 and 19.8 times the rate of being charged with domestic/family violence compared with female matches. The differences among men were far less pronounced: male cases had between 6.1 and 8.0 times the rate of being charged with domestic/family violence compared with their male matches. Again, this likely reflects a floor effect, where male matches had a much higher baseline charge rate for domestic/family violence than did female matches. Thus, the relative differences between male cases' and matches' rates would be smaller.

Figure 4.25: Crude Incidence Rates of Females with AUD* (cases) and Females without AUD (matches) Charged with Domestic / Family Violence
Per 100 person-years, by fiscal year



*AUD: Alcohol Use Disorder
Due to data limitations, the charge of domestic/family violence is only captured for charges made by the Winnipeg Police Service; however, an individual does not have to be a Winnipeg resident to be charged with this violation

Figure 4.26: Crude Incidence Rates of Males with AUD* (cases) and Males without AUD (matches) Charged with Domestic / Family Violence
Per 100 person-years, by fiscal year

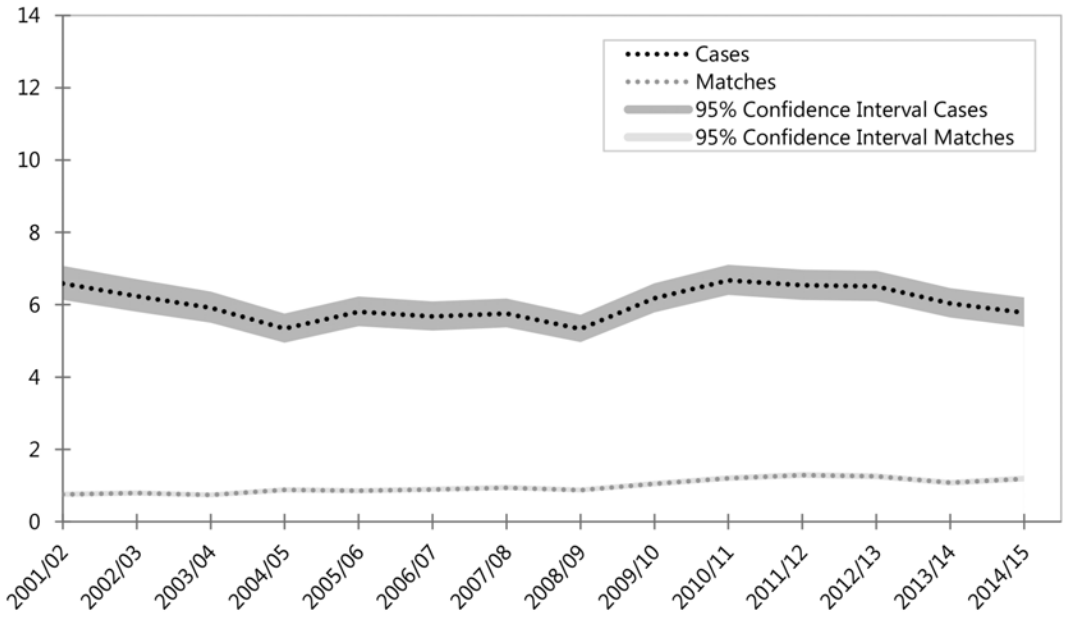


*AUD: Alcohol Use Disorder
Due to data limitations, the charge of domestic/family violence is only captured for charges made by the Winnipeg Police Service; however, an individual does not have to be a Winnipeg resident to be charged with this violation

Any Charge in the Justice System Database

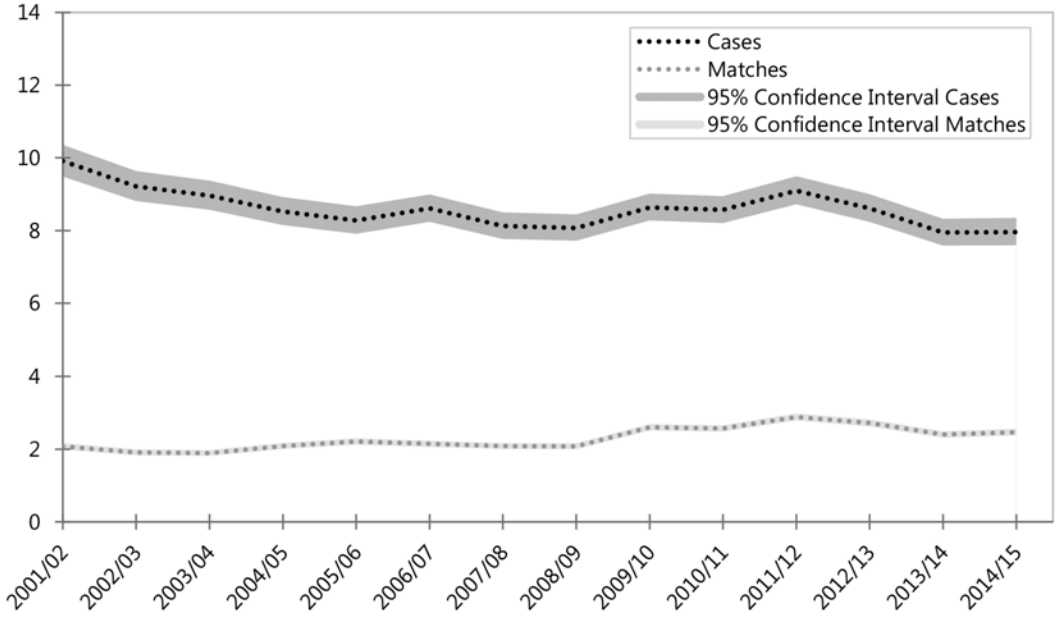
As with the other two indicators, we found that cases consistently had a higher rate of having a charge recorded in the justice data than their matches. Among female cases, the rate ranged between 5.3 charges per 100 person-years and 6.7 charges per 100 person-years (Figure 4.27). Male cases had rates that ranged between 7.9 and 9.9 charges per 100 person-years (Figure 4.28).

Figure 4.27: Crude Incidence Rates of Any Charge* against Females with AUD† (cases) and Females without AUD (matches)
Per 100 person-years, by fiscal year



* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.
† AUD: Alcohol Use Disorder

Figure 4.28: Crude Incidence Rates of Any Charge* against Males with AUD† (cases) and Males without AUD (matches)
Per 100 person-years, by fiscal year



* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.
† AUD: Alcohol Use Disorder

Social Housing

The annual rate of female cases moving into social housing varied between 1.2 and 2.5 per 100 person-years (Figure 4.29); the rate of moving into social housing among male cases varied between 0.4 and 1.0 per 100 person-years (Figure 4.30). After 1996/97, for both females and males, cases had a higher rate of moving into social housing compared with their matches: female cases had a 2.06-4.43 times higher rate of moving into social housing; and men had a 2.06-4.47 times higher rate.

Figure 4.29: Crude Incidence Rates of Females with AUD* (cases) and Females without AUD (matches) moving into Social Housing
Per 100 person-years, by fiscal year

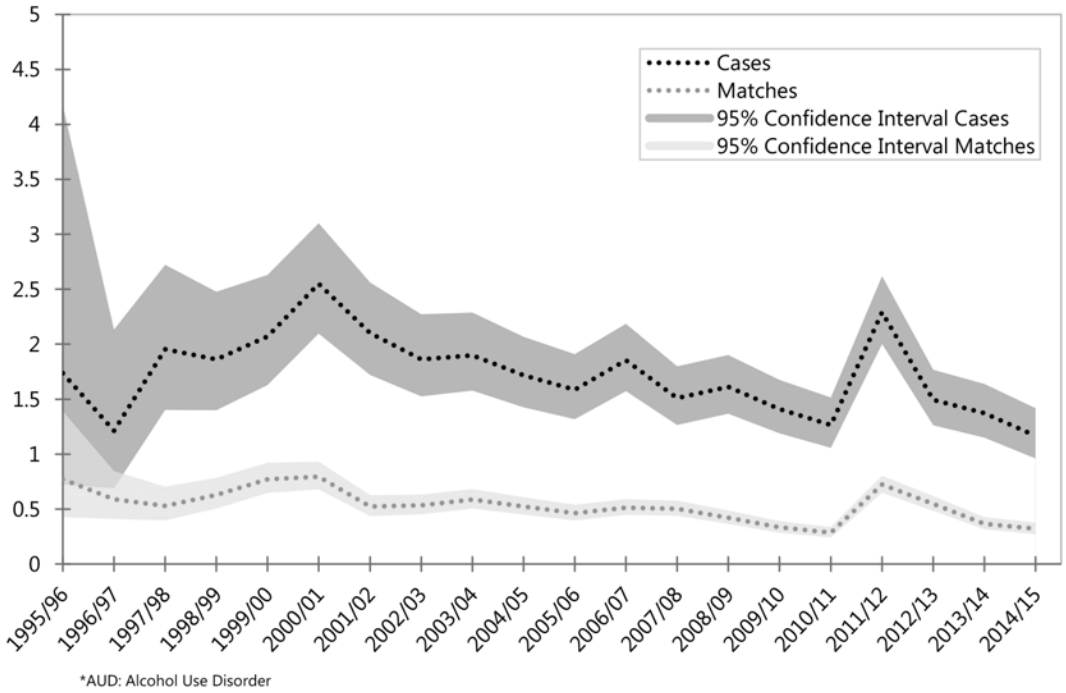
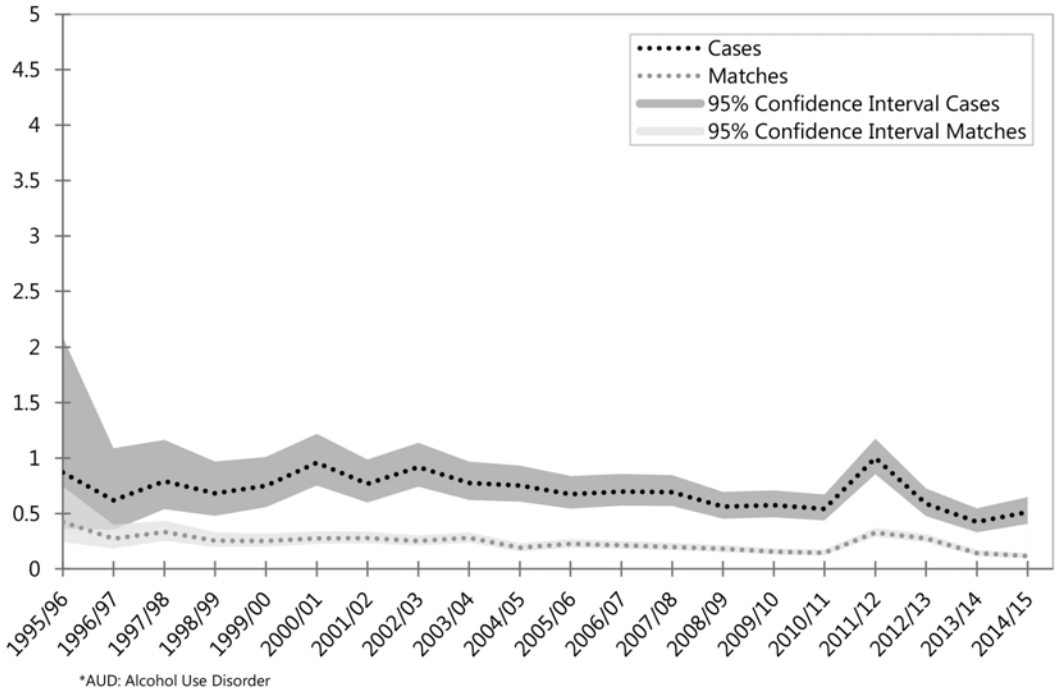


Figure 4.30: Crude Incidence Rates of Males with AUD* (cases) and Males without AUD (matches) moving into Social Housing
Per 100 person-years, by fiscal year

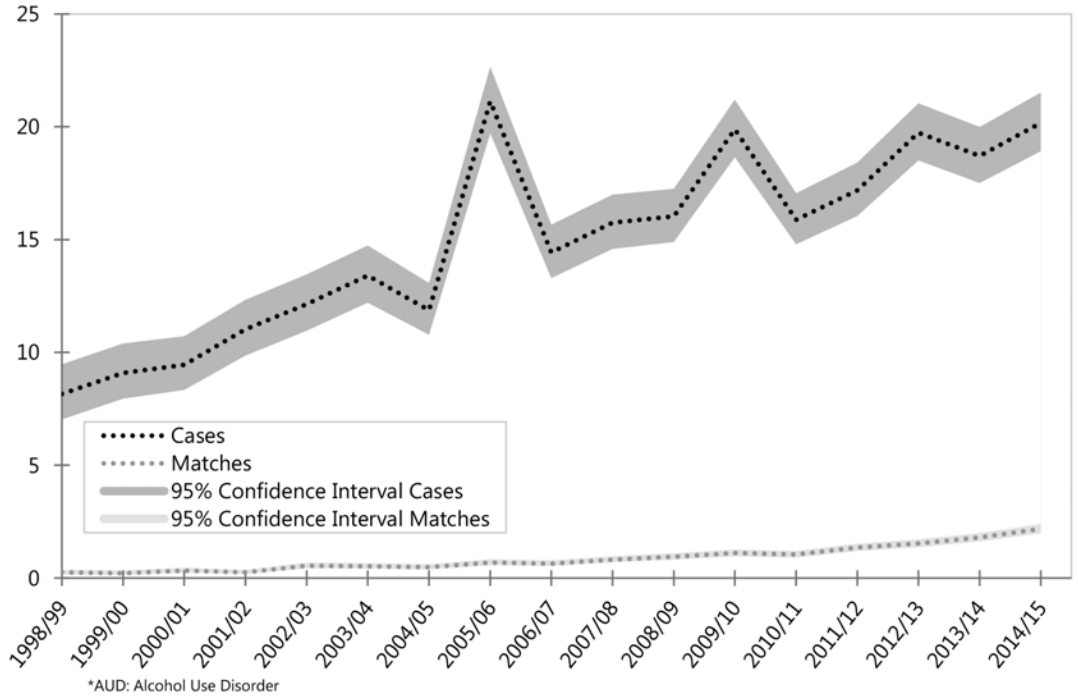


Children Taken into Care

Due to challenges with data linkage, we were only able to examine this indicator among female cases and matches. Rates of having a child taken into care were consistently higher among cases (Figure 4.31), ranging from 8.2 episodes to 21.1 episodes per 100 person-years. Rates among female matches were considerably lower – between 0.2 and 2.2 episodes per 100 person-years. Aside from the spike in 2005/06[5], rates increased over time for cases and matches. For cases, the rates of a child being taken into care were between 9.2 and 44.2 times higher than for their matches.

Figure 4.31: Crude Incidence Rates of Children Taken into Care of Child and Family Services for Females with AUD* (cases) and Females without AUD (matches)

Per 100 person-years, by fiscal year



Income Assistance

Rates of individuals receiving income assistance were greater among females than among males. Among female cases, we observed between 21.6 and 25.0 new episodes of receiving income assistance per 100 person-years (Figure 4.32). We found between 4.7 and 6.3 new episodes of receiving income assistance among female matches. We likewise found elevated rates among male cases compared with their matches. We found between 11.4 and 14.8 new episodes of receiving income assistance per 100 person-years among male cases (Figure 4.33), compared with rates between 2.7 and 3.9 among male matches. Although rates differed between females and males, the relative differences between cases and matches were similar for both sexes. Female cases had between 3.9 and 4.7 times the rate of receiving income assistance when compared with their matches; similarly, male cases had between 3.8 and 4.7 times the rate of receiving income assistance when compared with their matches.

[5] The spike in 2005/06 corresponds with the death of Phoenix Sinclair, which could have translated into increased monitoring of children living in marginalizing circumstances

Figure 4.32: Crude Incidence Rates of Females with AUD* (cases) and Females without AUD (matches) receiving Income Assistance
Per 100 person-years, by fiscal year

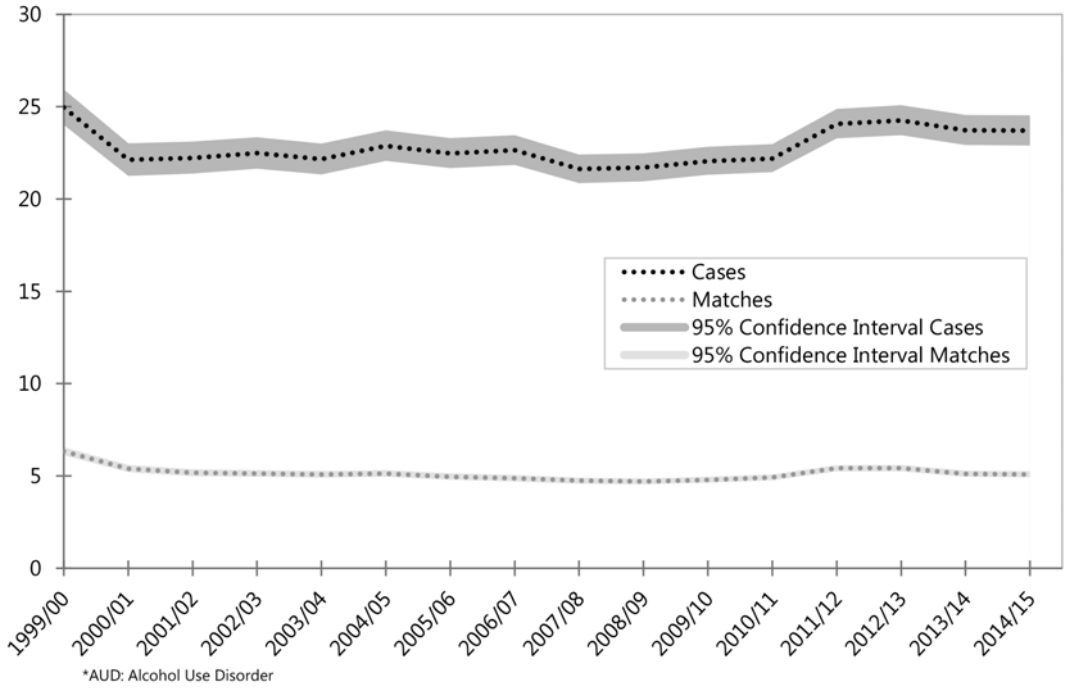
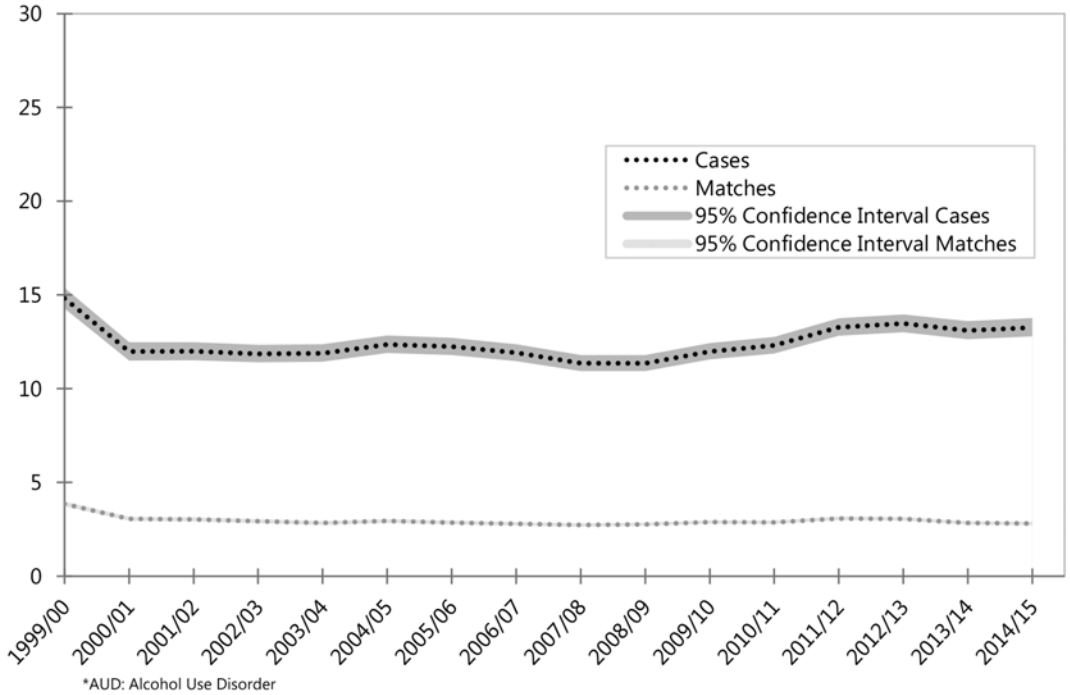


Figure 4.33: Crude Incidence Rates of Males with AUD* (cases) and Males without AUD (matches) receiving Income Assistance
Per 100 person-years, by fiscal year



Conclusions

This chapter looked at trends over time in health service use and health and social outcomes among AUD cases and matches, stratified by sex. With the exception of IHD and alcohol-related cancers, both female and male cases had elevated rates for each outcome compared with their matches.

These findings can serve as benchmarks against which to evaluate policies and/or strategies implemented to reduce negative outcomes associated with harmful alcohol consumption, including the actions outlined in the Province's alcohol strategy.

Summary of Key Findings

1. Across all fiscal years in our study, cases demonstrated a higher use of the hospital system compared with their matches. In 2014/15, female cases were hospitalized at a 2.79 times higher rate than their matches, and male cases were hospitalized at a 2.54 times higher rate than their matches. In the same year, female and male cases were prescribed a greater number of different types of drugs than their matches. As well, female cases had an ED visit rate that was 3.27 times greater than their matches, and male cases had an ED visit rate that was 2.69 times greater than their matches.
2. Cases had higher mortality rates compared with their matches. In 2014/15, the all-age mortality rate among female cases was 18.02 deaths per 1,000 person-years, a rate that was 2.00 times higher than among their matches. Male cases had an all-age mortality rate of 25.00 deaths per 1,000 person-years, a rate that was 1.90 times greater than their matches. Female cases had a premature mortality rate of 14.13 per 1,000 person-years, a rate that was 4.33 times greater than among their matches. Male cases had a premature mortality rate of 20.73 per 1,000 person-years, a rate that was 3.33 times greater than their matches.
3. We found less consistent patterns when we examined rates of IHD, diabetes, and alcohol-related cancers. In some years, there were increased rates among cases compared to their matches; but in many years, this difference was not statistically significant.
4. Across all fiscal years of our study, cases had higher rates of social services use compared with their matches. In 2014/15, cases had more than five times the rate of moving into social housing compared with their matches. Justice involvement was higher among cases than matches; in 2014/15, female cases had a 6.77 times higher rate of DWI charges compared with their matches, and male cases had a 4.96 times higher rate. Female cases had their children taken into care at a rate 9.26 times greater than their matches. And female cases started receiving income assistance at a rate 4.67 times greater than their matches while male cases started receiving income assistance at a rate 4.73 times greater than their matches.
5. The sex differences we found are also notable. Female cases often had higher rates of negative outcomes when compared with male cases. More research is needed to determine whether this reflects a diagnostic pattern where female individuals typically have more severe AUD when diagnosed compared with male individuals, whether the impacts of AUD are greater among female individuals, or whether there is another explanation for these results. The findings highlight the need for additional services for female individuals to mitigate the deleterious outcomes associated with their diagnosis.

Chapter Five:

Patterns in Health Service Use Associated with Alcohol Use Disorders

The previous chapter examined differences in healthcare utilization from a population health perspective. In this chapter, we change our focus to look at the impact of an alcohol use disorder (AUD) on the individual.

Our objective was to identify differences in health service use over the course of a person's experience with an AUD. We first pinpointed the index date for each case, or the date when they had their first indication of an AUD. We then calculated rates of health service use from five years before to 20 years after the index date. We also calculated annual rate ratios to compare cases with their matches for each year (from five years before to 20 years after index date), accounting for the amount of time each person was part of the cohort and adjusting for age, socioeconomic status, and characteristics that can change over time (i.e., time-varying) such as mental disorder comorbidities and residential mobility. Thus, we were able to determine whether having an indication for an AUD was associated with increased health service use over the course of a person's life. Analyses are stratified by sex.

We defined people in our cohorts as follows:

- **Case:** someone who had a physical illness or mental disorder resulting from alcohol consumption; or
- **Match**: someone who did not have any indication that they used alcohol excessively and who was similar to a case based on characteristics such as age, sex, and postal code of residence at the index date.

Details on how we identified cases and matches, as well as information on our matching algorithm, are available in Chapter 2 and Appendix 1.

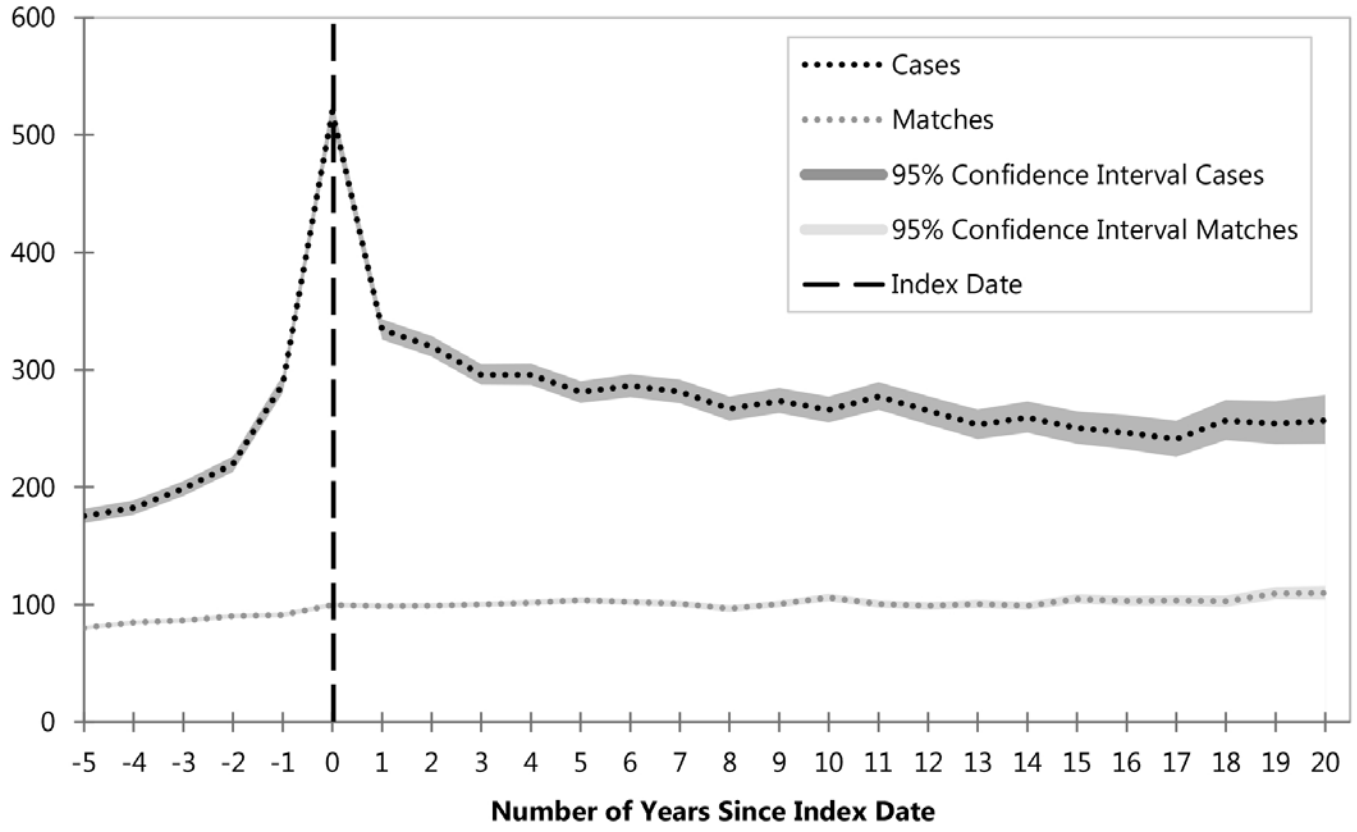
We used 95% confidence intervals to signal statistically significant differences. In graphs, 95% confidence intervals are represented by shaded bands. In graphs presenting crude rates over time, bands that do not overlap signal statistically significantly differences. In graphs presenting rate ratios over time, bands that do not cross 1.0 signal statistically significant differences.

Inpatient Hospitalization

We calculated rates of all-cause hospitalizations (excluding obstetric-related) among cases and their matches. A common trend was observed in both sexes, with peak hospitalization rates occurring during the index year. For females (Figure 5.1), the rate of hospitalizations at the index year was 519.8 per 1,000 person-years for cases compared to 99.8 per 1,000 person-years for matches. For males (Figure 5.2), the rate of hospitalizations at the index year was 472.1 per 1,000 person-years for cases compared to 88.1 per 1,000 person-years for matches. Interestingly, the rate of hospitalizations for both sexes started to increase in the year prior to index date, and although declining after the index year, rates remained higher than before diagnosis.

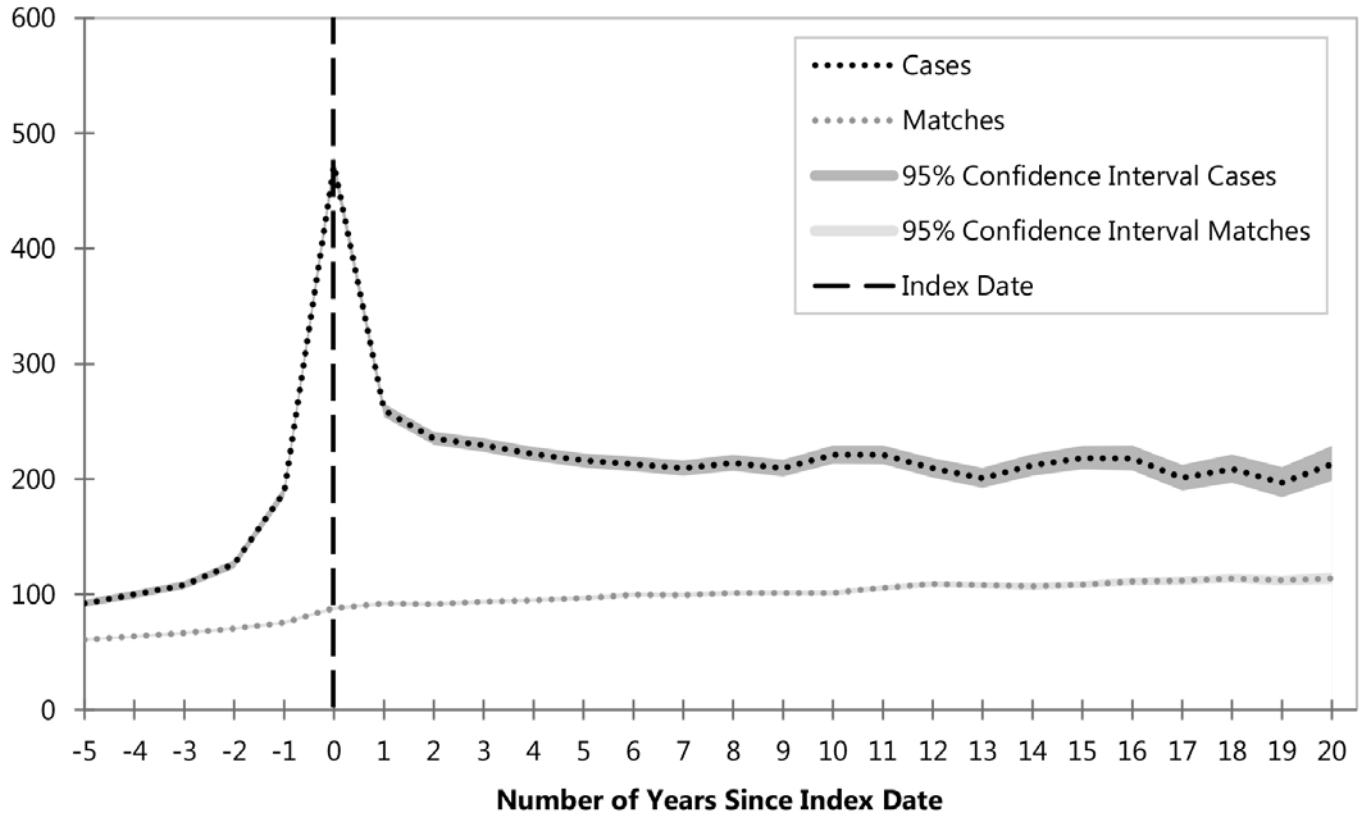
When we considered the entire 25-year study period, on average, female cases had 4.5 additional hospitalizations compared with their matches; male cases had roughly 2.9 additional hospitalizations compared with their matches.

Figure 5.1: Crude Hospitalization Rates for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Per 1,000 person-years



* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

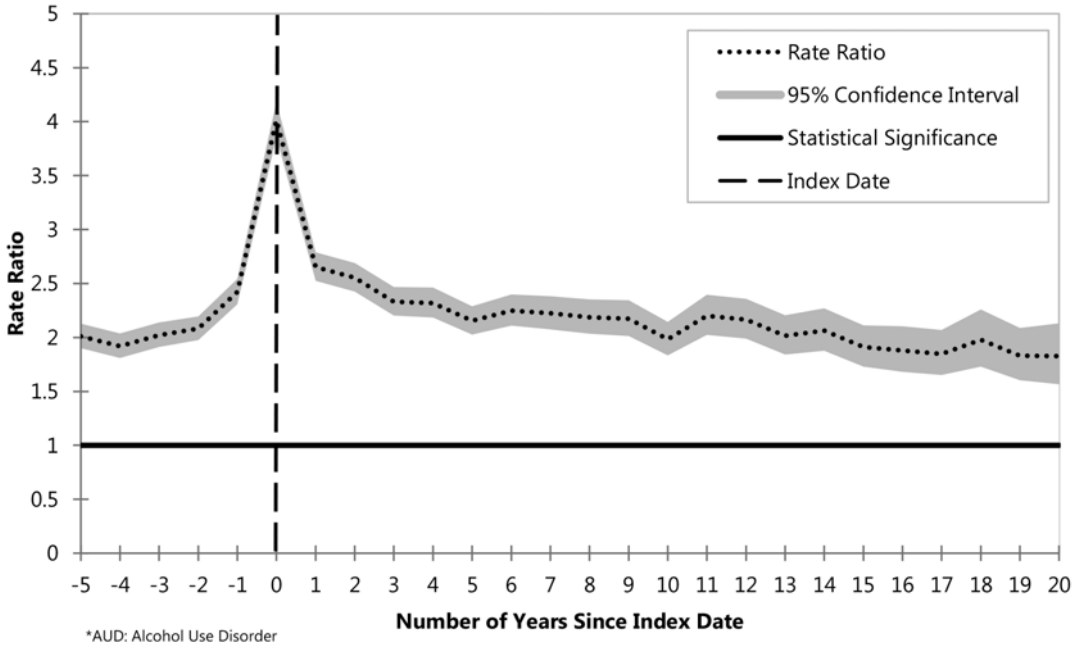
Figure 5.2: Crude Hospitalization Rates for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Per 1,000 person-years



* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

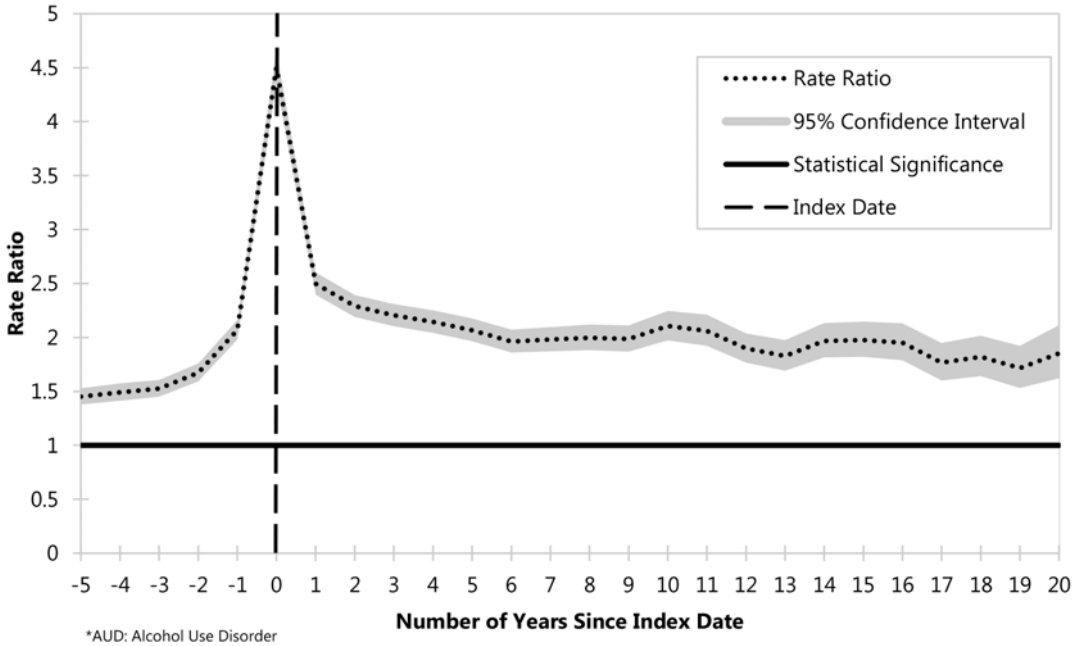
Figures 5.3 and 5.4 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. Both females and males had a similar pattern in hospitalization rates. Among female cases, the rate of hospitalization at the index year was four times the rate among their matches (Figure 5.3). The rate of hospitalization for male cases at index year was more than four and a half times the rate among their matches (Figure 5.4). For both males and females, the relative rate of hospitalization decreased after the index year, but remained elevated compared to before diagnosis: adjusted rates five years before diagnosis were less than half the rate of hospitalizations five years after diagnosis. Interestingly, following their diagnosis of an AUD, both female and male cases had a roughly two-fold increased rate of hospitalization compared to their matches.

Figure 5.3: Comparing Hospitalization Rates for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

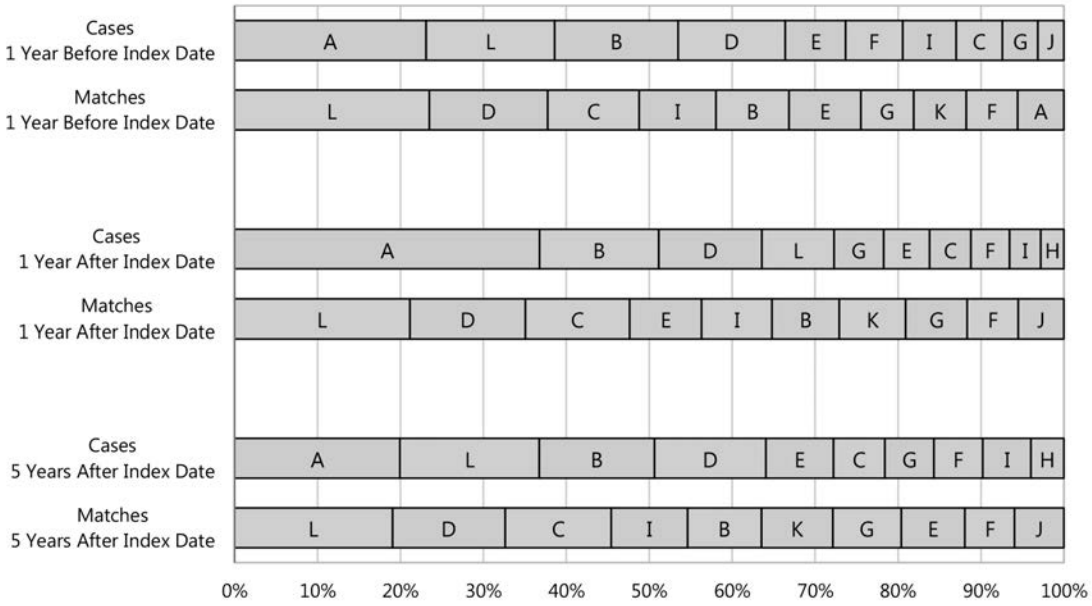
Figure 5.4: Comparing Hospitalization Rates for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

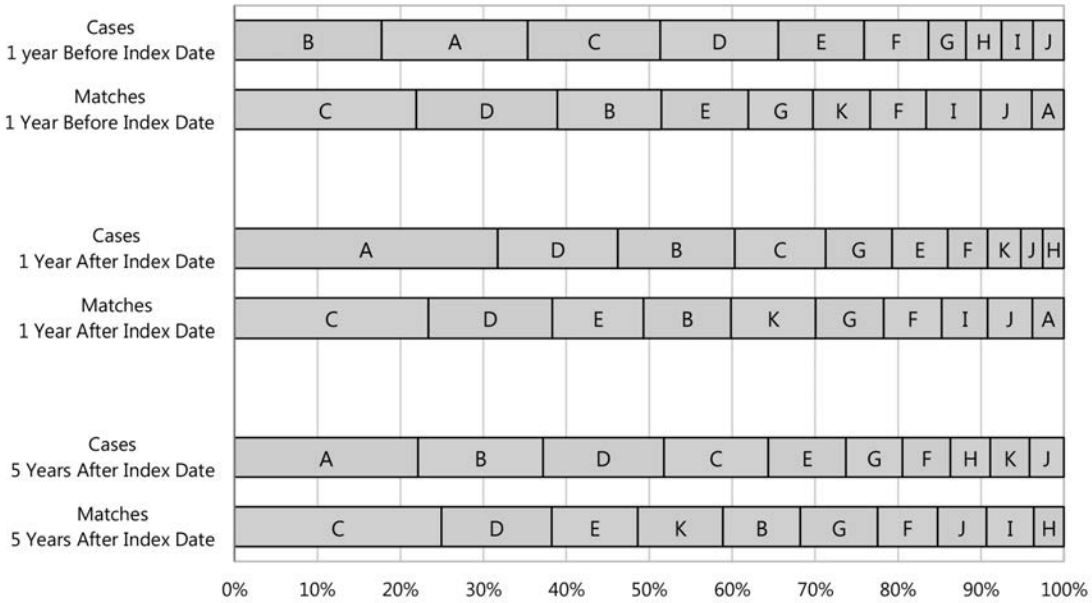
We examined the ten most common causes for hospitalization among cases and matches – both before and after index date. For female cases, during the year immediately prior to the index date, the most common reason for hospitalization was having a mental or behavioural disorder. This remained the most common reason for hospitalization at one year and five years after diagnosis. For female cases, hospitalizations for injury or poisoning were either the second or third most frequent cause of hospitalization. Among male cases, during the year before index date, the most common reason for hospitalization was due to injury or poisoning. One year and five years after index date, the most common reason for hospitalization among male cases was due to mental or behavioural disorders. The distribution of reasons for hospitalization among matches was considerably different. For female matches, the most common reason for hospitalization was due to pregnancy and/or birth; for male cases, it was due to circulatory diseases.

Figure 5.5: Most Common Causes of Hospitalizations for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date



*AUD: Alcohol Use Disorder
A - Mental and Behavioural Disorders, B - Injury, Poisoning, External Causes, C - Circulatory Diseases, D - Digestive Diseases, E - Respiratory Diseases, F - Not Otherwise Classified, G - Health Contact and Status, H - Endocrine and Metabolic Diseases, I - Genitourinary Diseases, J - Musculoskeletal Diseases, K - Cancer, L - Pregnancy

Figure 5.6: Most Common Causes of Hospitalizations for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date



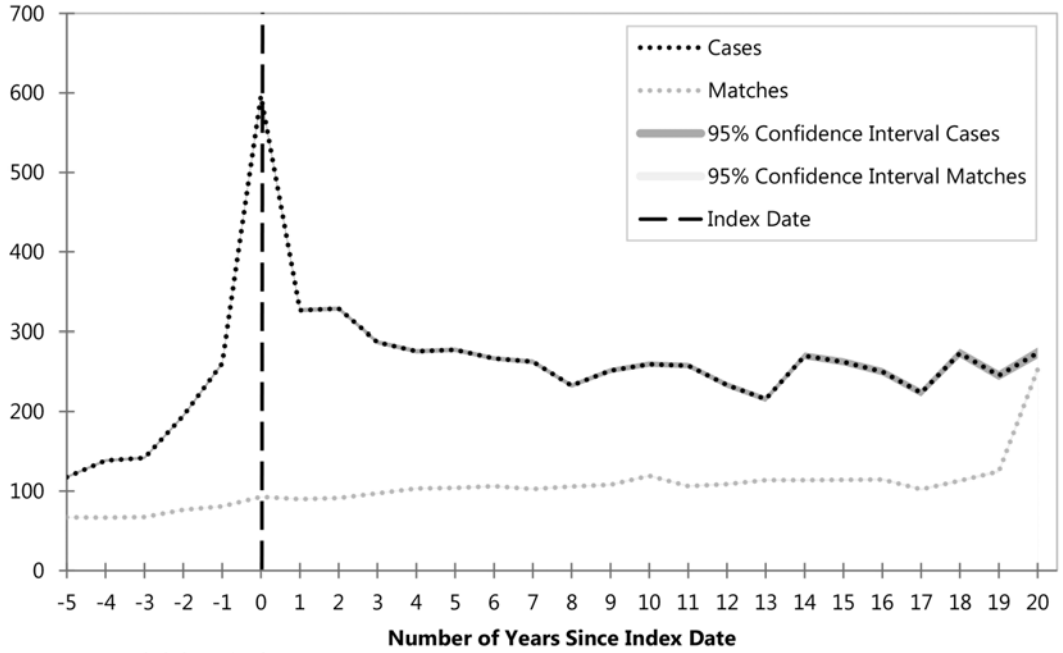
*AUD: Alcohol Use Disorder
A - Mental and Behavioural Disorders, B - Injury, Poisoning, External Causes, C - Circulatory Diseases, D - Digestive Diseases, E - Respiratory Diseases, F - Not Otherwise Classified, G - Health Contact and Status, H - Endocrine and Metabolic Diseases, I - Genitourinary Diseases, J - Musculoskeletal Diseases, K - Cancer

Days Spent in Hospital

During the index year, female cases spent 596.1 days in hospital per 100 person-years and male cases spent 640.8 days in hospital per 100 person-years. Among both females and males, the number of days spent in hospital after the index date remained elevated when compared with the five years before index date.

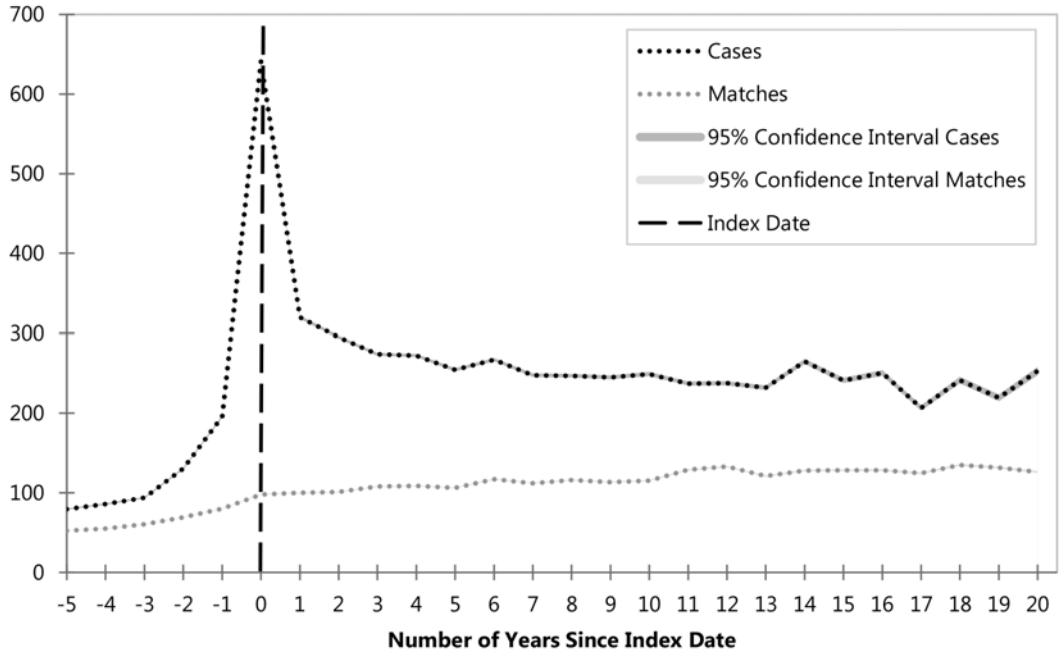
We determined how many additional days an average female or male case spent in hospital compared with his or her matches. On average, compared to their matches, female cases spent an additional 41.0 days in hospital during the five years before to 20 years after index date, while male cases spent an additional 34.8 days in hospital.

Figure 5.7: Crude Number of Hospital Days for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Per 100 person-years



* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

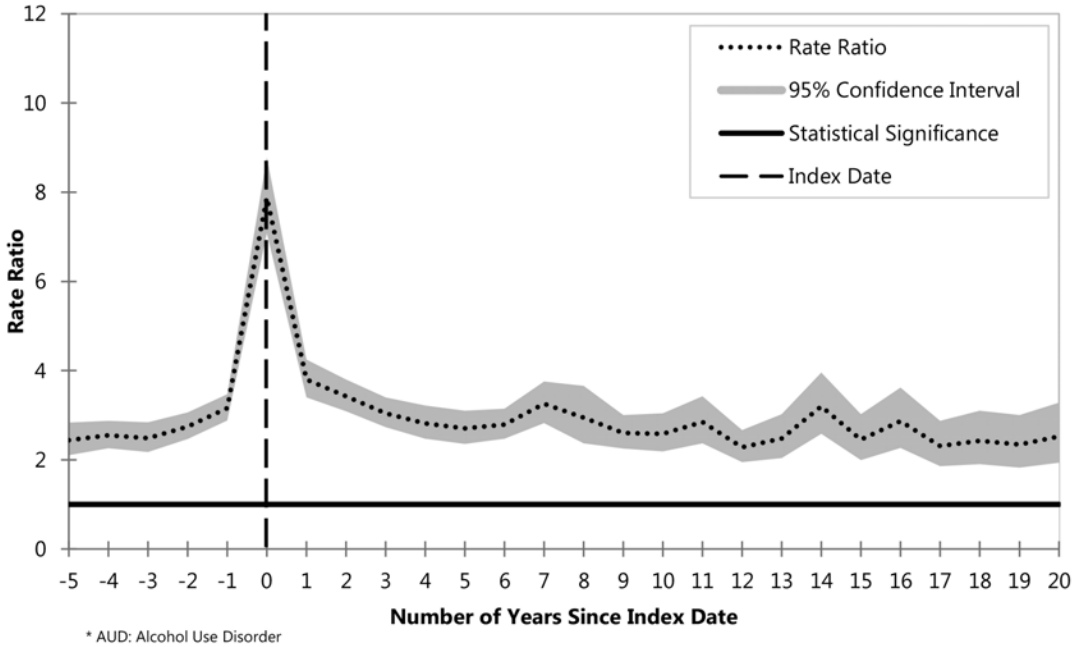
Figure 5.8: Crude Number of Hospital Days for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Per 100 person-years



* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

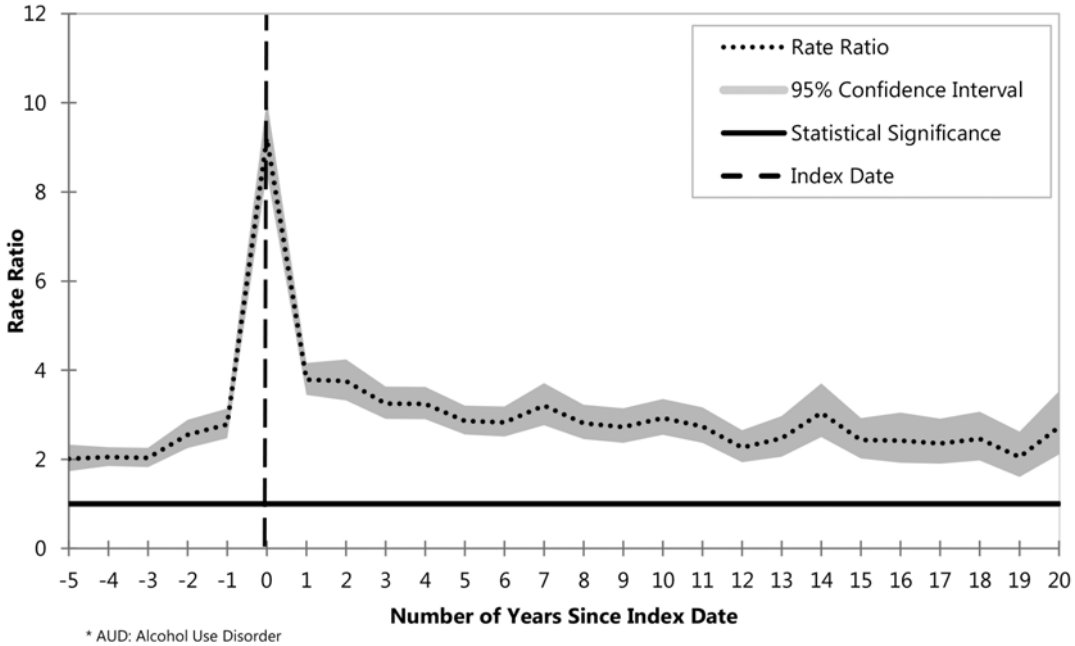
Figures 5.9 and 5.10 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. For both females and males, we found a spike in the number of hospital days corresponding with the index year. Female cases had a 2.3-7.9 times greater number of hospital days compared with their matches. Male cases had a 2.0-9.2 times greater number of hospital days compared with their matches.

Figure 5.9: Comparing Number of Hospital Days for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Adjusted rate ratios



* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 5.10: Comparing Number of Hospital Days for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Adjusted rate ratios



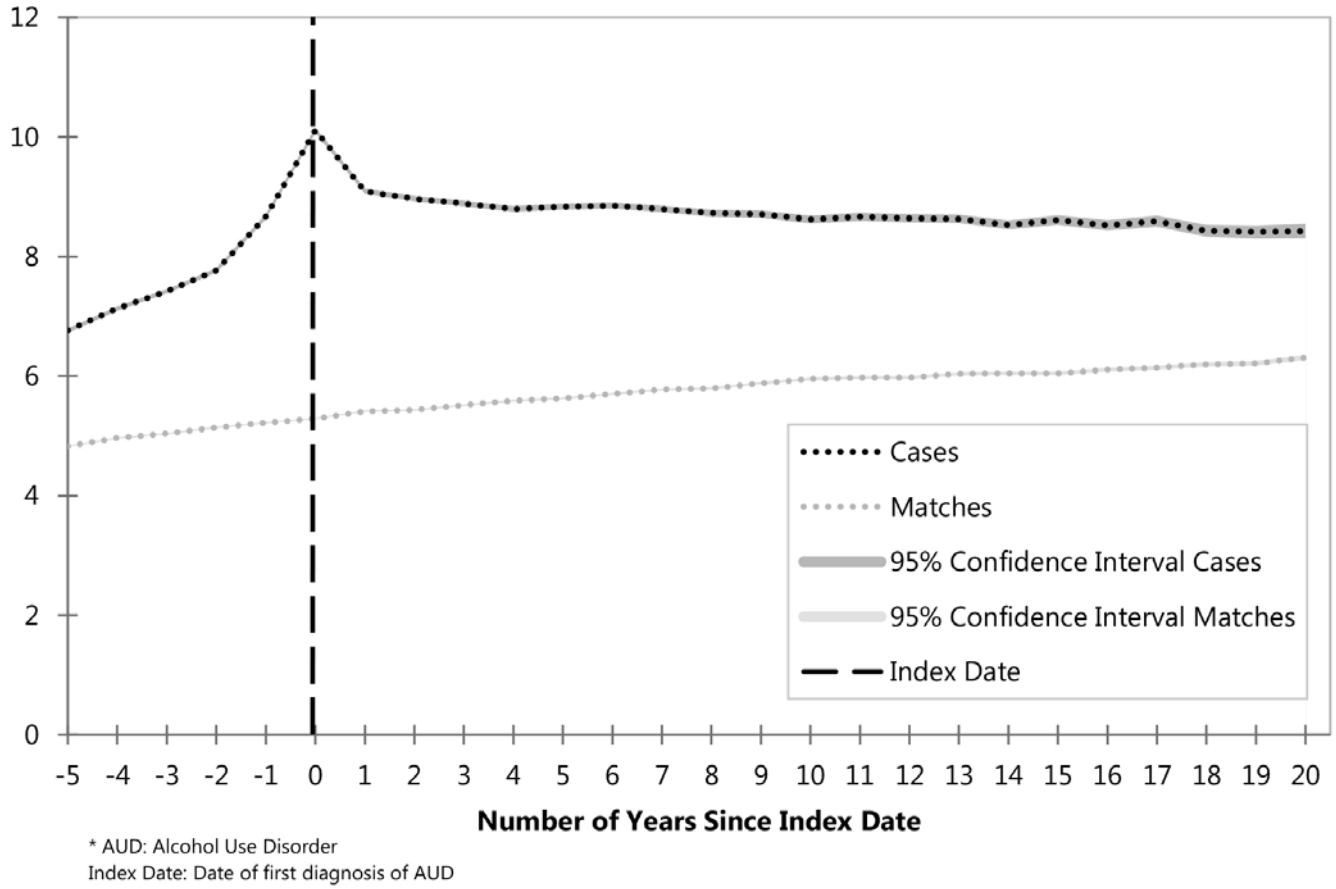
* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Ambulatory Visits (Physician Visits)

Patterns of ambulatory (physician) visits were similar to those observed for hospital services (Figures 5.11 and 5.12). Physician visits among males increased over time; this increase corresponded with their increasing age over the study period. We saw higher rates of physician visits among females than among males. Once more, we found an elevated rate in the index year among both female and male cases.

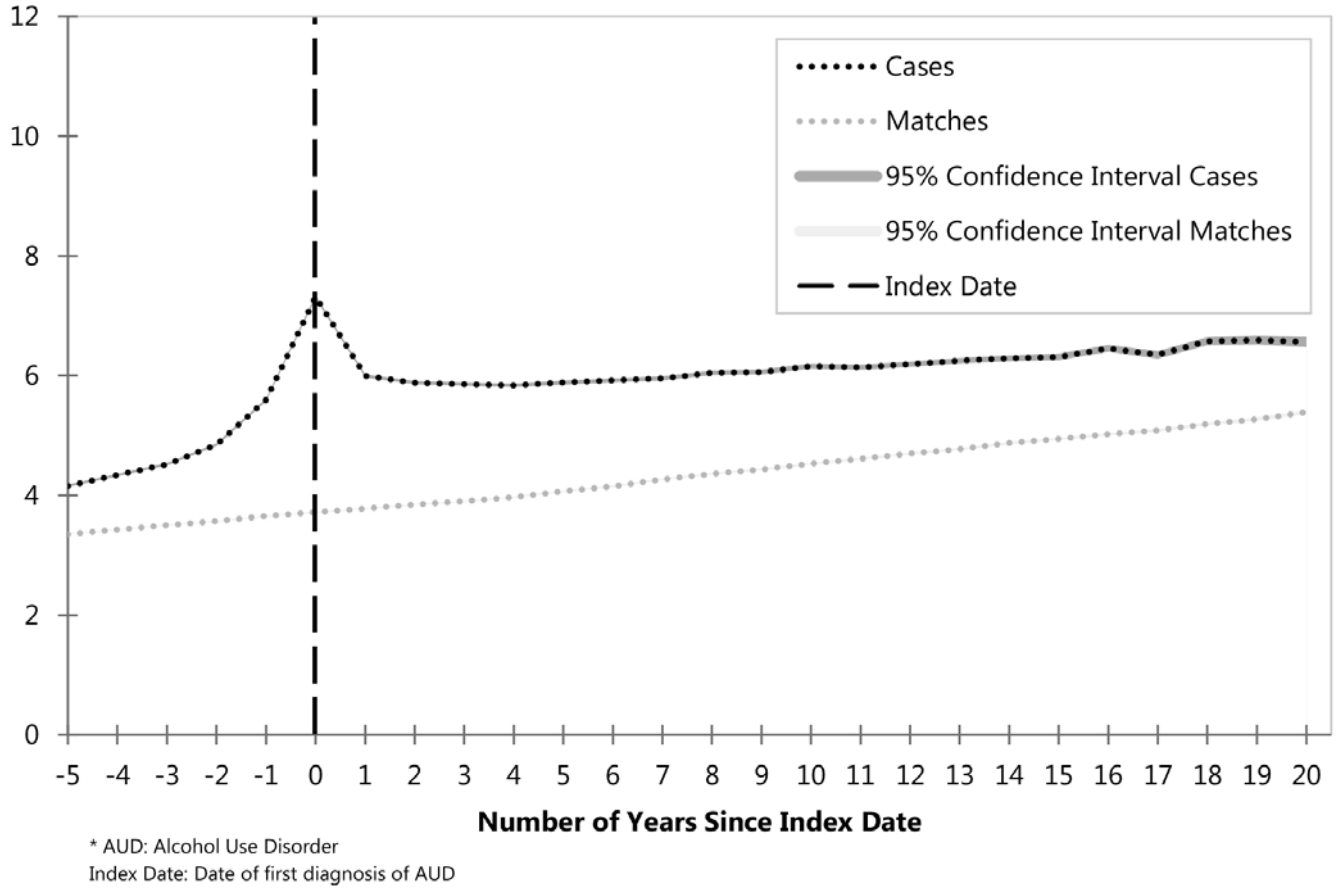
The graphs for both females and males highlight that ambulatory visits are relatively common among both cases and matches. We used these rates to determine how many excess visits an average case had compared with their match. On average, over the 25-year study period, female cases had 73.4 additional ambulatory visits and males had 41.7 additional ambulatory visits compared with their respective matches.

Figure 5.11: Crude Number of Ambulatory Visits for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Per person-year



* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figure 5.12: Crude Number of Ambulatory Visits for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Per person-year

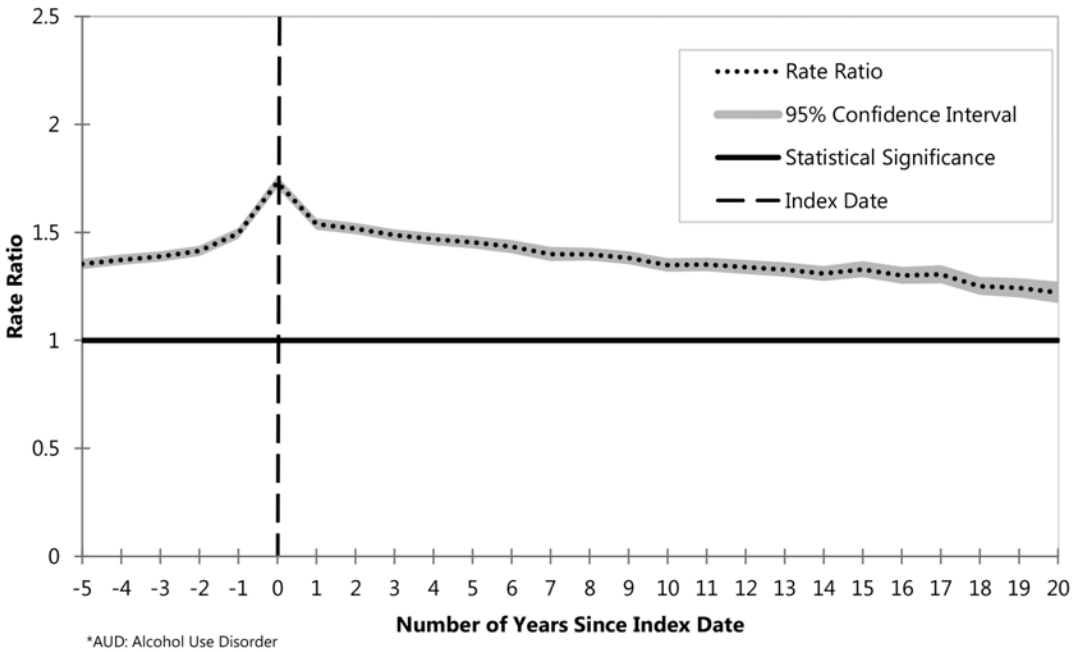


* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figures 5.13 and 5.14 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. During the years before diagnosis, both female and male cases had elevated physician visit rates compared with their matches. Among males, the relative difference in physician visit rates was greater after the index date than before. The relative differences between cases and matches consistently declined post-diagnosis, indicating that the relative difference in physician visits declined as cases and matches aged.

Figure 5.13: Comparing Number of Ambulatory Visits for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

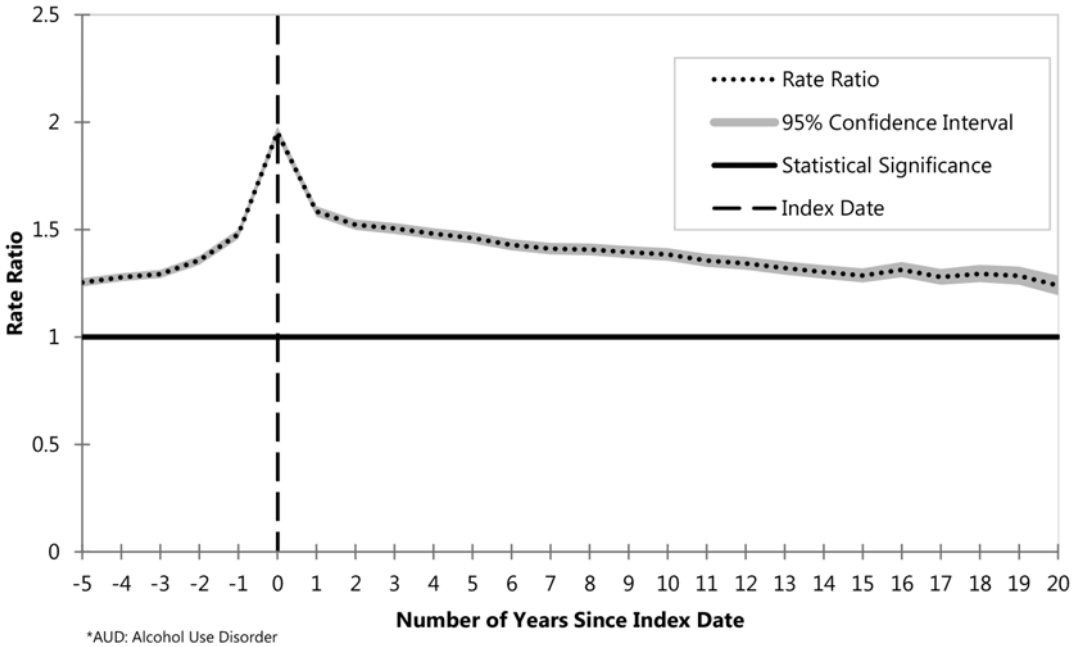
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 5.14: Comparing Number of Ambulatory Visits for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

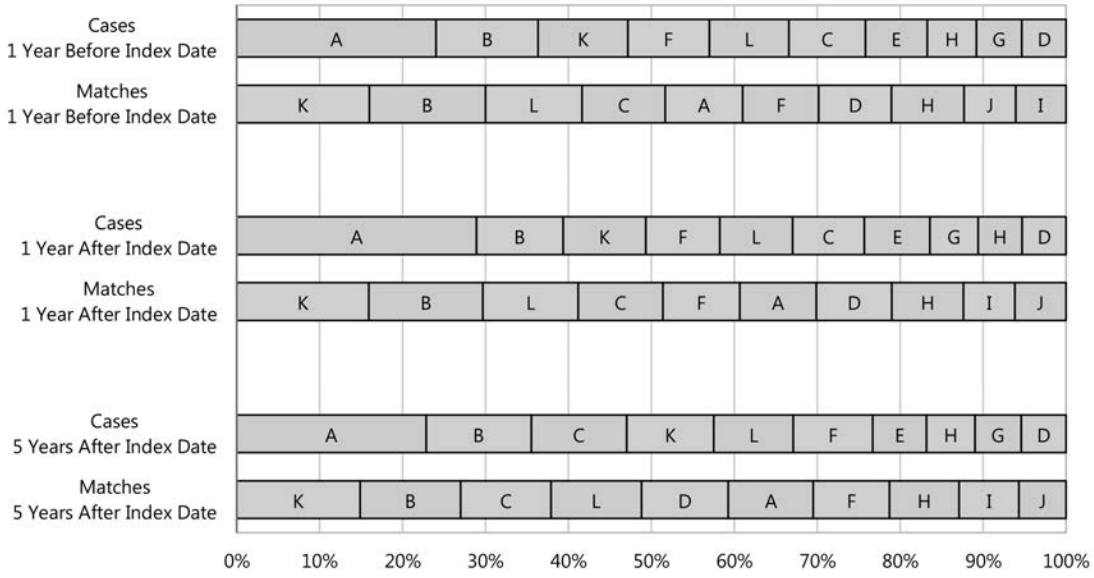
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

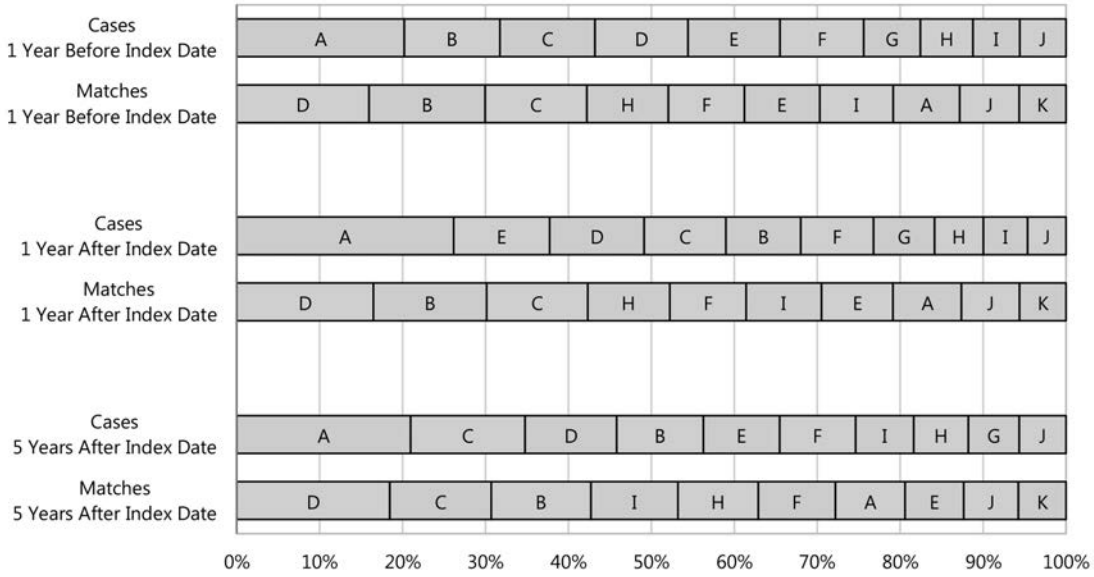
The reasons for physician visits differed between cases and matches (Figures 5.15 and 5.16). Among female and male cases, the most common reason for having a physician visit was related to having a mental disorder. Among female matches, the most common reasons for a physician visit was for non-disease-related visits (e.g., routine physical examination) and among male matches, the most common reason was for circulatory diseases.

Figure 5.15: Most Common Reasons for Ambulatory Visits for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
A - Mental or Behavioural Disorders, B - Respiratory Diseases, C - Musculoskeletal Diseases, D - Circulatory Diseases, E - Injury, Poisoning, External Causes, F - Not Otherwise Classified, G - Digestive Diseases, H - Nervous and Sense Organ Diseases, I - Endocrine and Metabolic Diseases, J - Skin and Subcutaneous Diseases, K - Health Contact and Status, L - Genitourinary Diseases

Figure 5.16: Most Common Reasons for Ambulatory Visits for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
A - Mental or Behavioural Disorders, B - Respiratory Diseases, C - Musculoskeletal Diseases, D - Circulatory Diseases, E - Injury, Poisoning, External Causes, F - Not Otherwise Classified, G - Digestive Diseases, H - Nervous and Sense Organ Diseases, I - Endocrine and Metabolic Diseases, J - Skin and Subcutaneous Diseases, K - Health Contact and Status

Prescription Drugs

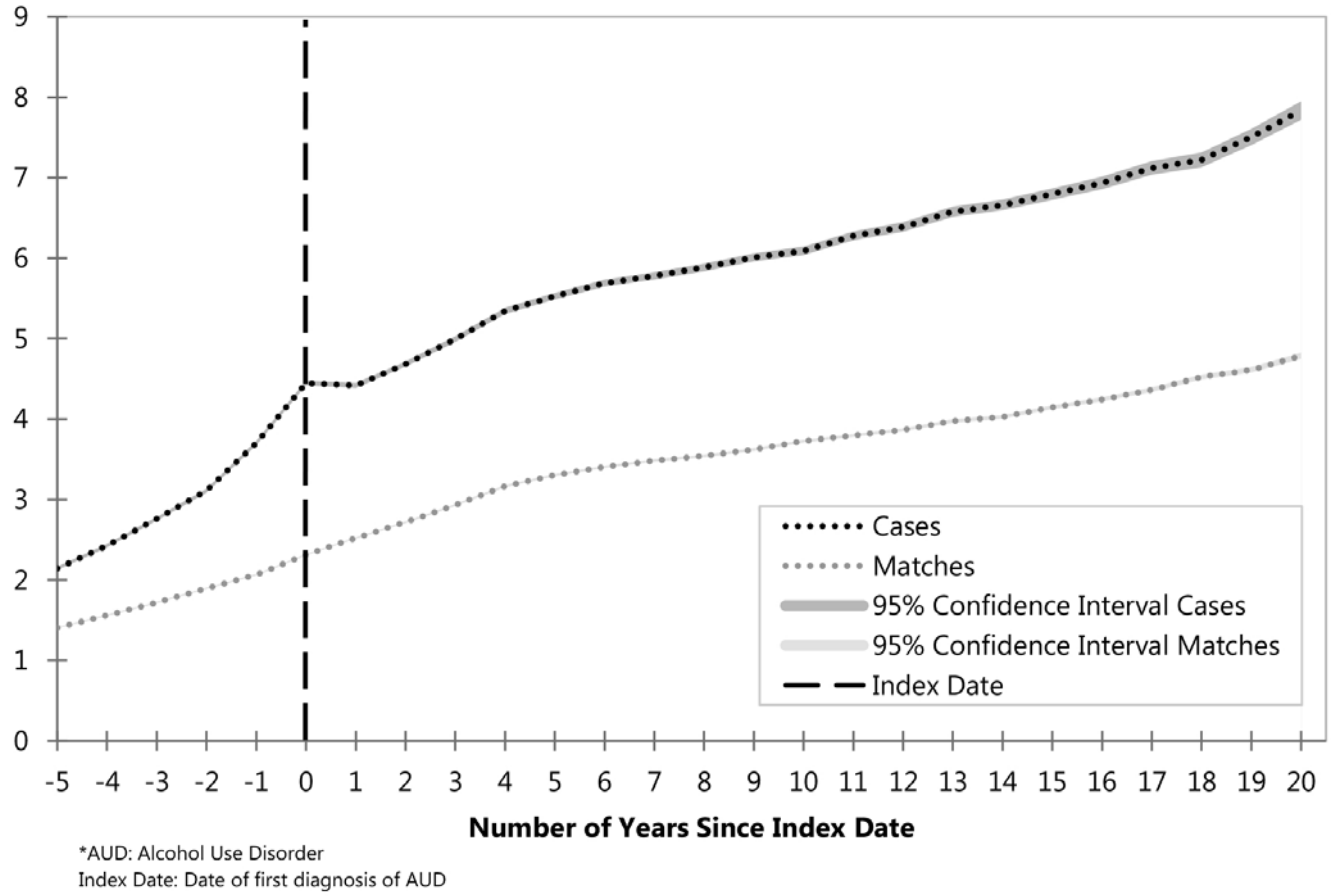
Figures 5.17 and 5.18 show the number of different drugs[6] dispensed to cases and matches for females and males, respectively. There was a progressive increase in the number of different pharmaceutical drugs dispensed to all individuals in the cohort over the study period.

Male cases had a 4.7-fold increase in the number of different drugs dispensed to them from five years before to 20 years after index date, from 1.2 to 5.6 drugs (vs. a 4.4-fold increase from 0.9 to 4.0 drugs for matches). Female cases had a 3.9-fold increase in the number of different drugs dispensed to them from five years before to 20 years after index date, from 2.1 to 7.8 drugs (vs. a 4.1-fold increase from 1.4 to 4.8 drugs for matches). On average, we found that women with an AUD had 56.6 more drug dispensations over the 25-year period compared with their matches and that men had 29.0 more dispensations compared with their matches.

[6] The average number of different types of drugs dispensed to each individual. Each pharmaceutical agent that falls under a different fourth-level Anatomical Therapeutic Chemical (ATC) class is counted as a new drug for each case or match.

Figure 5.17: Crude Rates of Number of Different Drugs Dispensed to Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

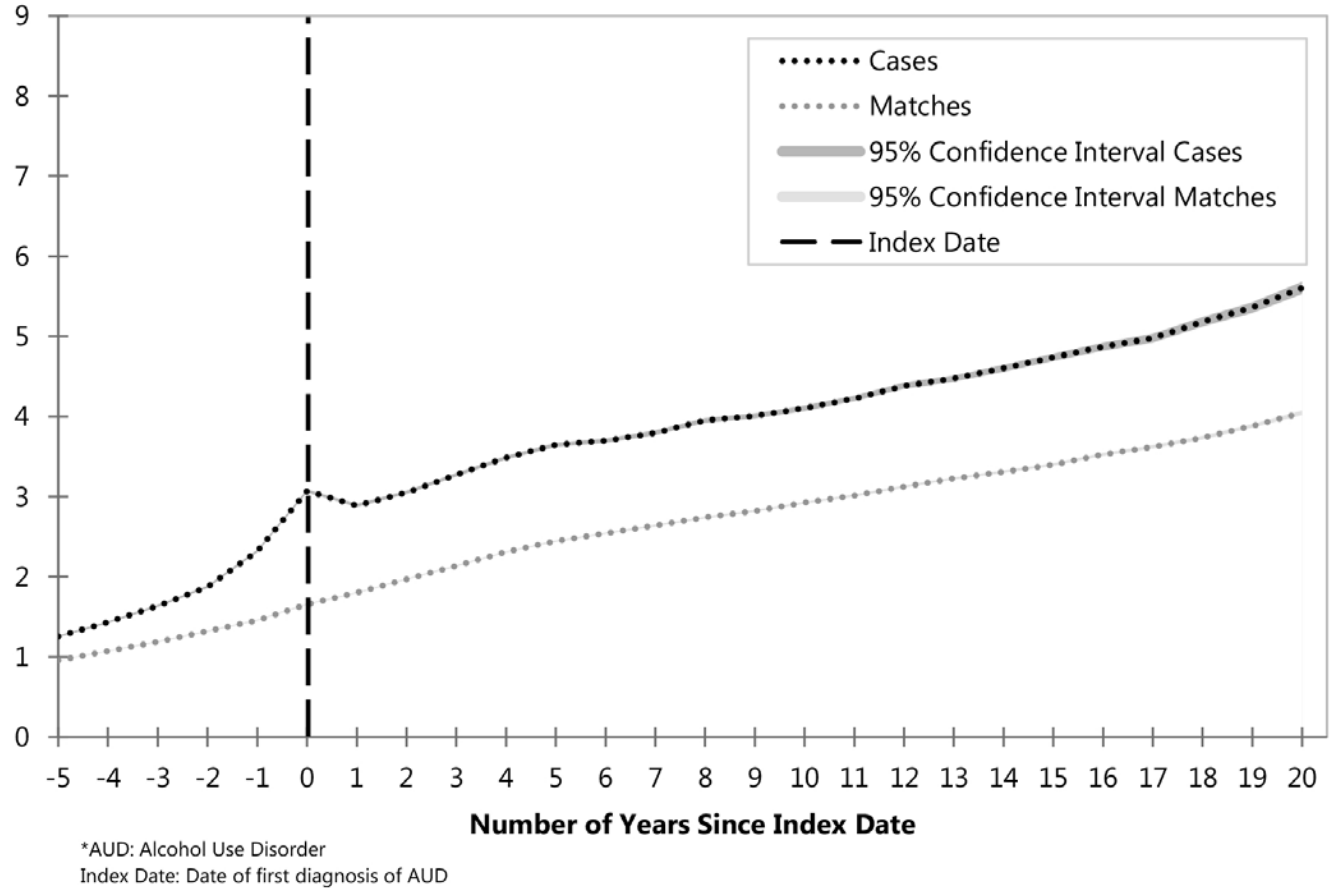
Per person-year



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figure 5.18: Crude Rates of Number of Different Drugs Dispensed to Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per person-year

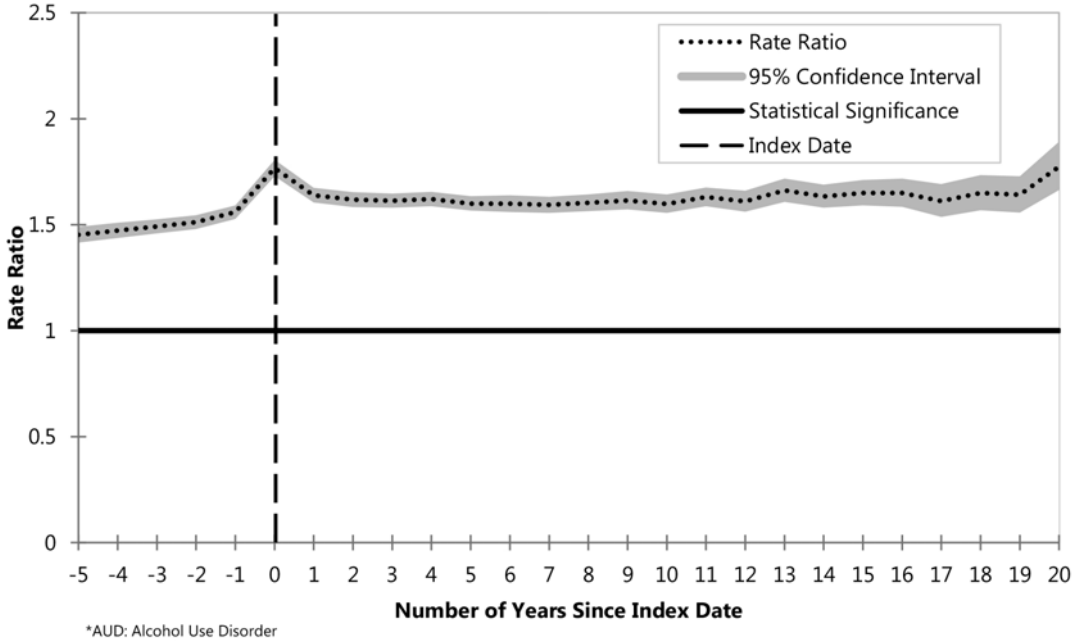


*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figures 5.19 and 5.20 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. During the years before the index date, both female and male cases had an elevated number of prescription drugs dispensed to them compared with their matches. Among males, the relative difference in the number of prescription drugs dispensed was greater after diagnosis than before diagnosis. The relative differences between cases and matches remained consistent during the post-diagnosis period, indicating that the relative difference in number of prescription drugs dispensed remained constant as the cases and matches aged.

Figure 5.19: Comparing Number of Different Drugs Dispensed for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

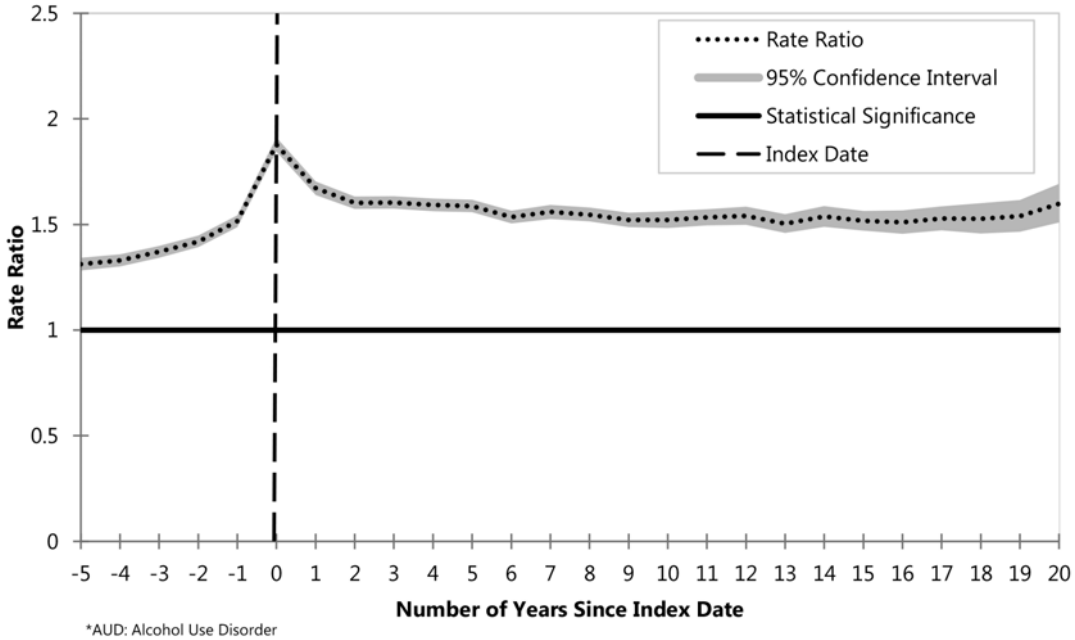
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 5.20: Comparing Number of Different Drugs Dispensed for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

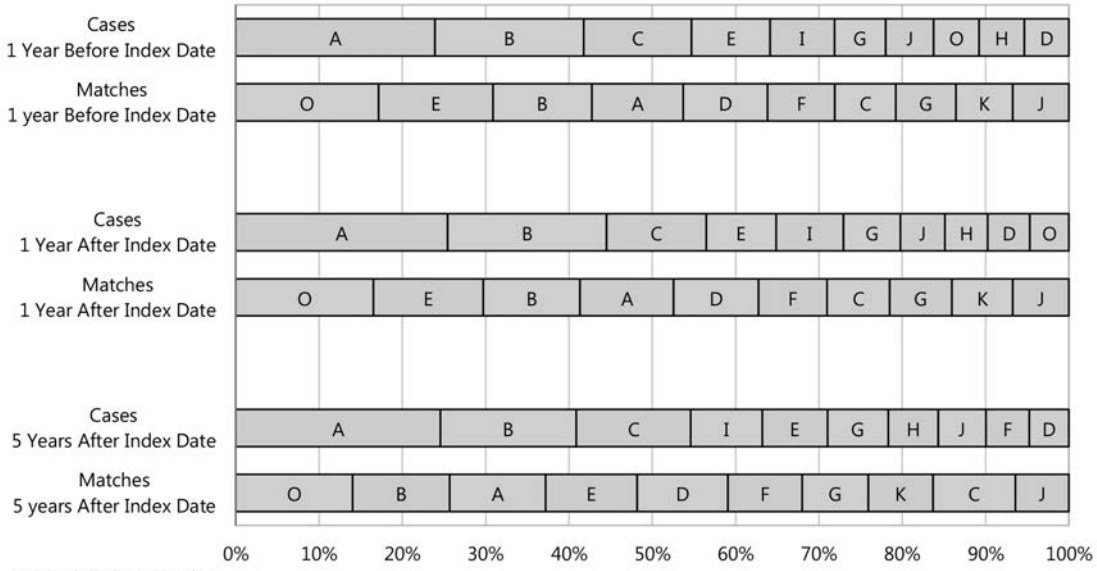
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

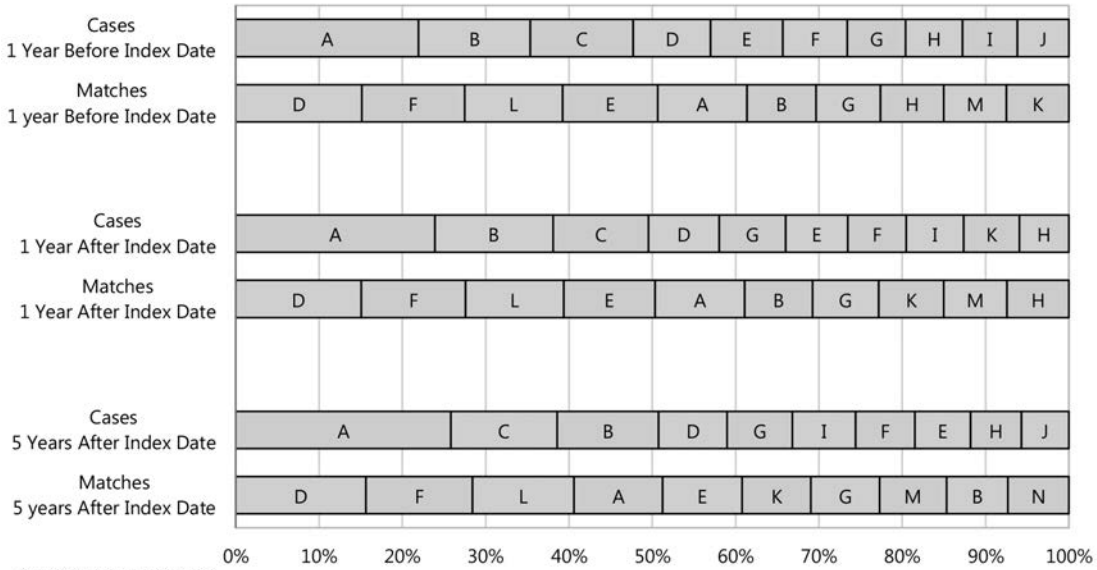
Figures 5.21 and 5.22 show the 10 most common prescriptions dispensed to cases and matches at three time points: one year before the index date, one year after the index date, and five years after the index date. Among cases, the most common prescription was consistently a psycholeptic. At most time points, the second most prescribed drug for cases was a pyschoanaleptic. Among our male matches, the most common prescription was for agents acting on the renin-angiotensin system. It is also interesting to note that birth control were the most prescribed drug class among female matches, but were not even among the top five for women with an AUD.

Figure 5.21: Most Common Prescription Drugs for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
A - Psycholeptics, B - Psychoanaleptics, C - Analgesics, D - Agents Acting on the Renin-Angiotensin System, E - Antibacterials for Systemic use,
F - Drugs Used in Diabetes, G - Antacids, Drugs for Treating Peptic Ulcers and Flatulence, H - Anti-Asthmatics, I - Antiepileptics,
J - Anti-Inflammatory and Antirheumatic Products, K - Diuretics, L - Serum Lipid Reducing Agents, M - Beta Blocking Agents, N - Calcium Channel Blockers,
O - Sex Hormones and Moderators

Figure 5.22: Most Common Prescription Drugs for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
A - Psycholeptics, B - Psychoanaleptics, C - Analgesics, D - Agents Acting on the Renin-Angiotensin System, E - Antibacterials for Systemic use,
F - Drugs Used in Diabetes, G - Antacids, Drugs for Treating Peptic Ulcers and Flatulence, H - Anti-Asthmatics, I - Antiepileptics,
J - Anti-Inflammatory and Antirheumatic Products, K - Diuretics, L - Serum Lipid Reducing Agents, M - Beta Blocking Agents, N - Calcium Channel Blockers

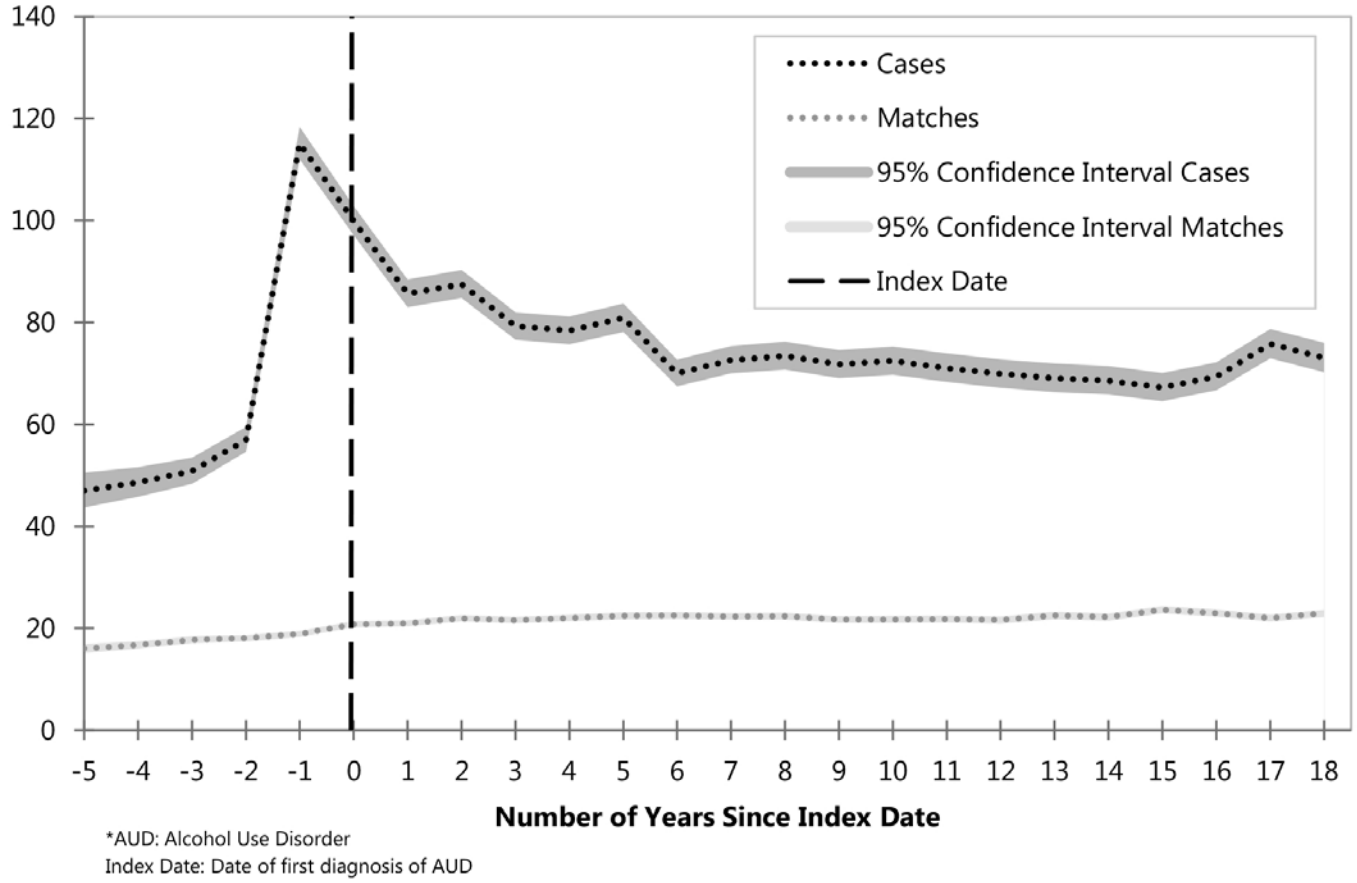
Emergency Department Visits

Due to data limitations, our analyses were restricted to emergency departments (EDs) in Winnipeg.

We previously showed that other indicators of health service use spiked during the index year. Patterns of ED use, however, spiked in the year before index year among both female and male cases. In the year before diagnosis, female cases had 115.1 visits to the ED per 100 person-years compared with 47.0 visits per 100 person-years five years before diagnosis (Figure 5.23). This represents a 145% increase in ED visits. Similarly, male cases visited the ED 92.0 times per 100 person-years during the year before diagnosis (Figure 5.24), which is a 217% increase in ED visits compared to five years before diagnosis (29.0 visits per 100 person-years). Emergency department visit rates among both female and male cases decreased after the index date; however, rates remained elevated when compared with the five years before index date. Over the next 23 years, on average, female cases had 13.4 additional visits to the ED compared with their matches, and male cases had, on average, 8.9 additional visits to the ED compared with their matches.

Figure 5.23: Crude Rates of Emergency Department Visits for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

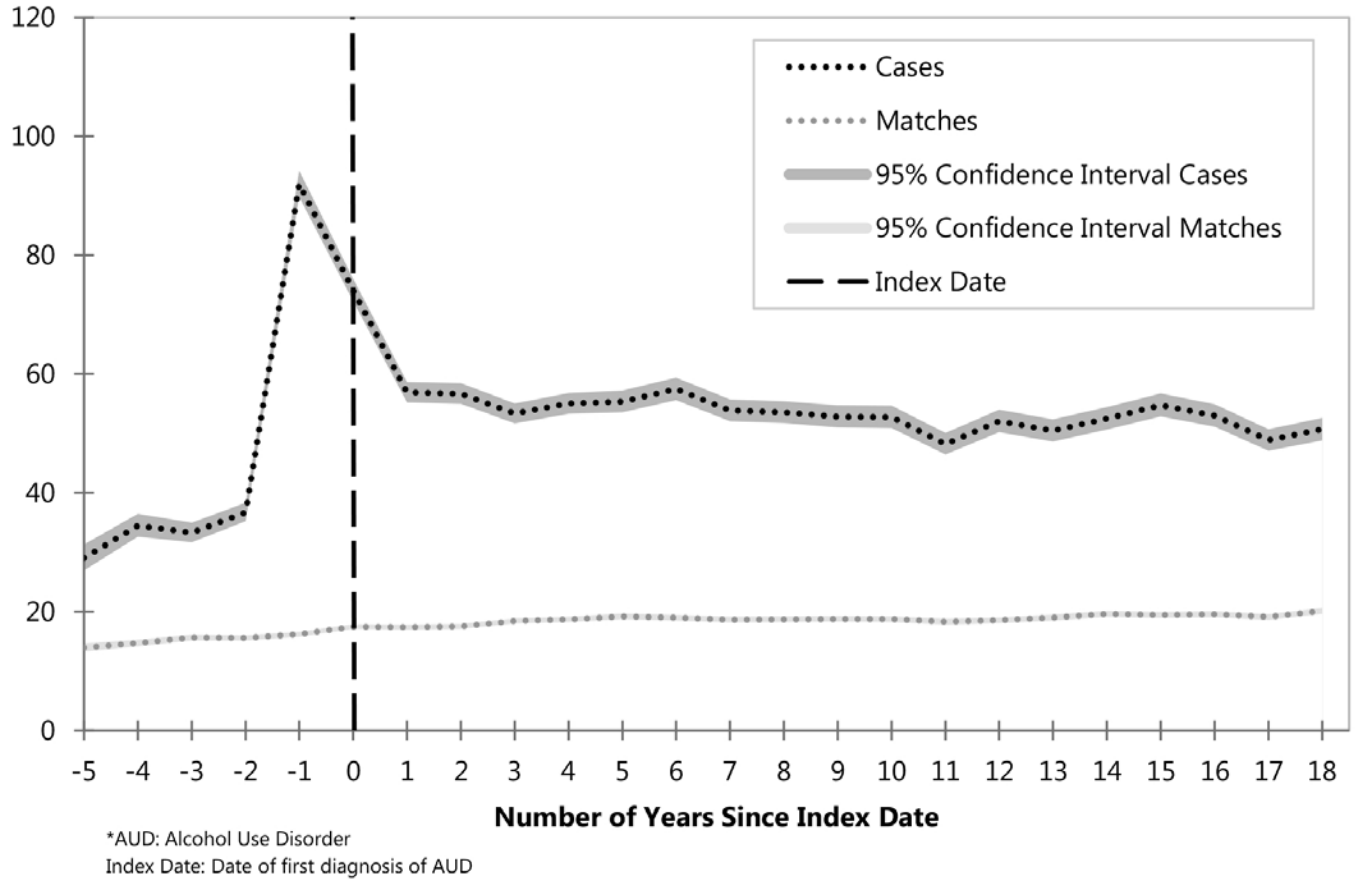
Per 100 person-years, Winnipeg facilities only



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figure 5.24: Crude Rates of Emergency Department Visits for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100 person-years, Winnipeg facilities only

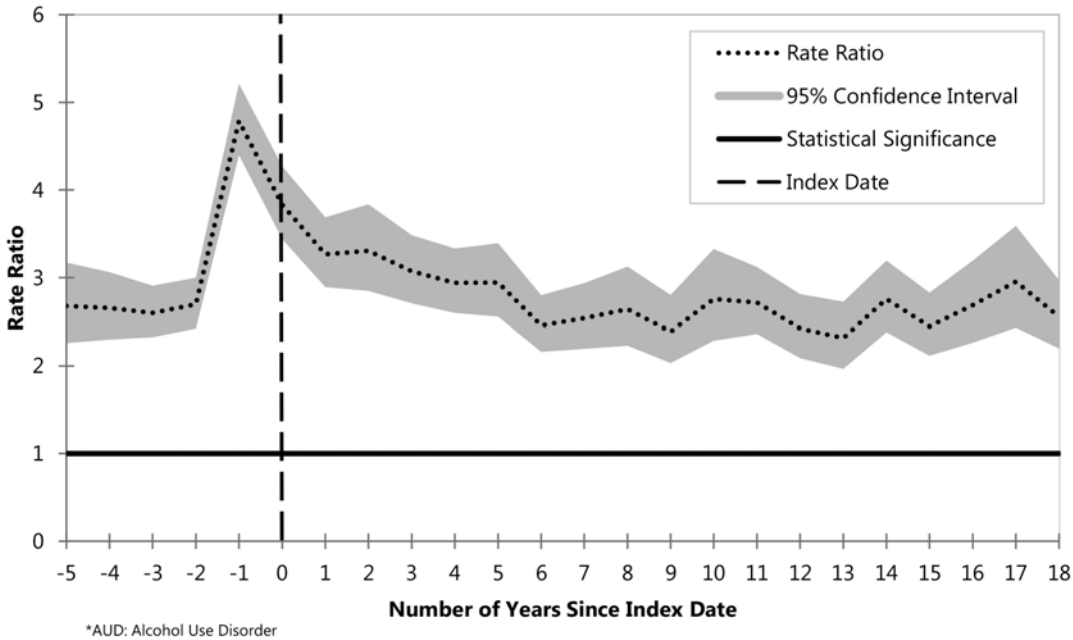


*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figures 5.25 and 5.26 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. We found that both female and male cases had significantly increased rates of ED visits compared with their matches: female cases had a 4.8 times greater ED visit rate and male cases had a 4.5 times greater ED visit rate in the year before index date. Statistically adjusting for the factors listed above attenuated many of the differences in ED visit rates when comparing the pre- and post-index date periods. Still, aside from the spike occurring at one year before index date, cases consistently had a two- to three-fold increase in ED visit rate compared with their matches.

Figure 5.25: Comparing Emergency Department Visit Rates for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

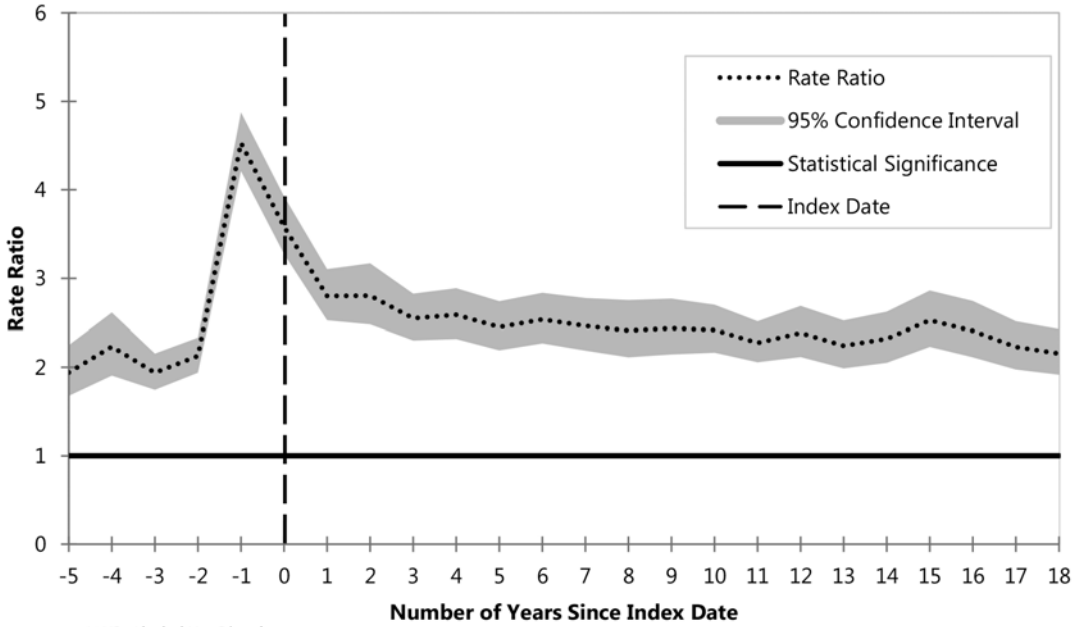
Adjusted rate ratios, Winnipeg facilities only



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 5.26: Comparing Emergency Department Visit Rates for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios, Winnipeg facilities only



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Conclusions

Summary of Key Findings

1. Across all outcomes we examined, cases had higher rates of health system use compared with their matches – even after adjusting for characteristics such as mental disorder status, region of residence, and neighbourhood-level income.
2. Health service use spiked during the index year across several indicators: inpatient hospitalizations, hospital days, ambulatory visits, and prescription drug dispensations. This could be due to a decline in health (AUD was worsening), or it could be that the individual had another comorbid health condition which led to frequent interactions with the healthcare system, resulting in detection of the AUD. It is also possible that the spike is due to a combination of these two scenarios.
3. Unlike other health service use indicators, ED visits spiked in the year before the index date among cases.
4. When we followed cases for an extended period, we saw that health service use was consistently elevated. Over a 25-year period, an average female case had 4.5 additional hospital visits and spent an additional 41.0 days in hospital compared with her match. An average male case had approximately 2.9 additional hospital visits and spent 34.8 additional days in hospital when compared with his match. Over the same 25-year period, an average female case had 73.4 additional ambulatory visits compared with her matches, and an average male case had an additional 41.7 visits compared with his matches.
5. The most common reasons for seeking healthcare differed between cases and matches. The number one reason cases went to the hospital was due to a mental or behavioural disorder; this was true even five years after index date. Meanwhile, the most common reasons for hospitalization among matches were pregnancy among females and circulatory diseases among males. We found a similar pattern when we looked at the reasons for a physician visit. Again, among cases, the top reason for having an ambulatory visit was consistently for mental or behavioural disorders. As with hospitalizations, this persisted through to five years after index date. There were differences in the prescription drugs dispensed to cases and matches. Among female and male cases, psycholeptics were the most commonly dispensed drug. Among male matches, agents acting on the renin system were the most common type of drug, and among female matches, sex hormones and moderators were the most common type of drug.

Chapter Six:

Patterns in Health Outcomes Associated with Alcohol Use Disorders

In Chapter 4, we looked at how differences in health outcomes associated with having an AUD have changed over time from a population perspective. In Chapter 6, we adopt an individual-level focus, like in Chapter 5. We examined patterns in health from five years before diagnosis to the time of diagnosis, and then for 20 years following diagnosis. We adopted this "life-course" approach to study the impacts of AUD on a person's health over their lifetime. We looked at differences in total mortality rates, premature mortality rates, ischemic heart disease, diabetes, and cancers associated with alcohol consumption. For the two mortality indicators, we followed individuals from the index date until 20 years after the index date; for all the other indicators, we followed individuals from five years before to 20 years after index date. Analyses are stratified by sex because of the differing experiences men and women have with alcohol consumption.

We defined people in our cohorts as follows:

- **Case:** someone who had a physical illness or mental disorder resulting from alcohol consumption; or
- **Match:** someone who did not have any indication that they used alcohol excessively and who was similar to a case based on characteristics such as age, sex, and postal code of residence at the index date.

More details on how we identified both cases and matches, as well as information on our matching algorithm, are available in Chapter 2 and Appendix 1.

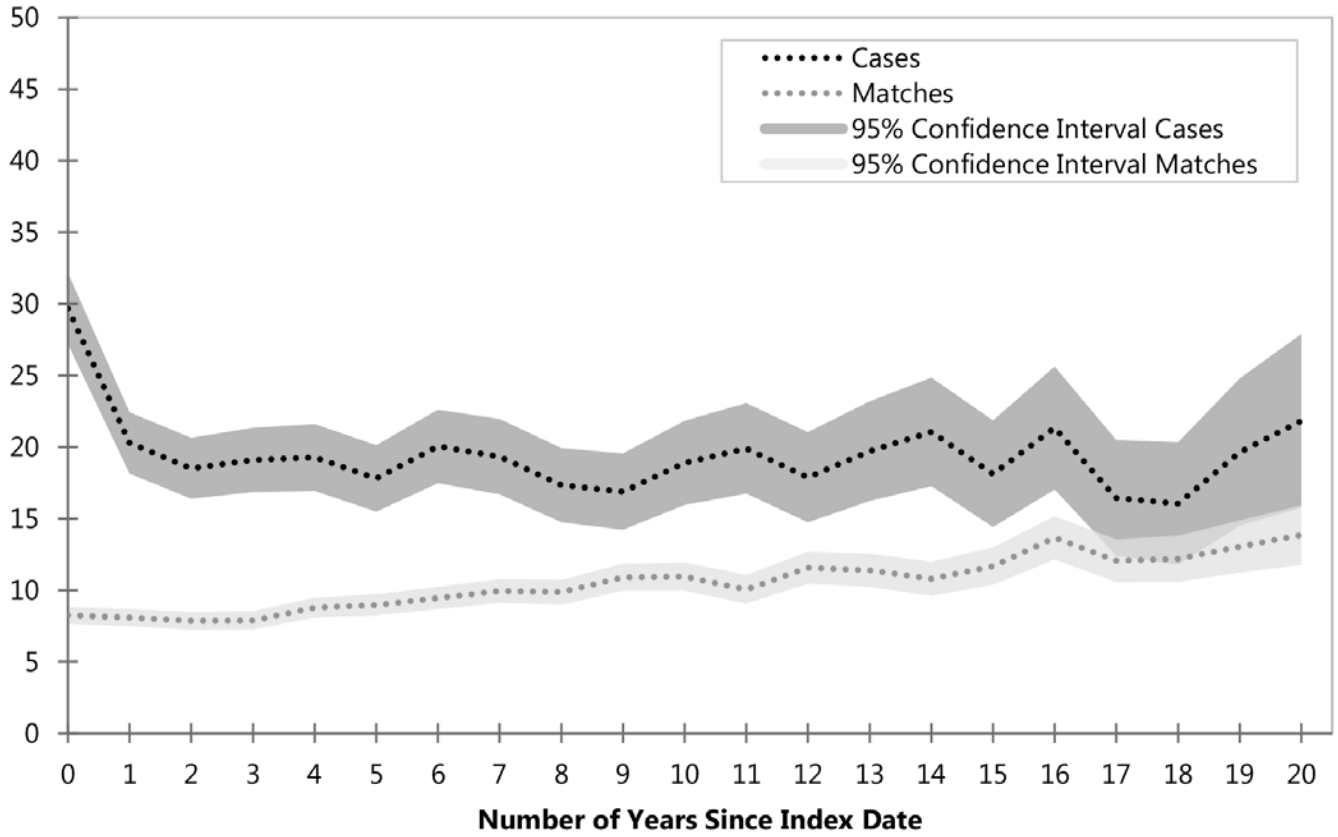
We used 95% confidence intervals to signal statistically significant differences. In graphs, 95% confidence intervals are represented by shaded bands. In graphs presenting crude rates over time, bands that do not overlap signal statistically significant differences in crude rates. In graphs presenting rate ratios over time, bands that do not cross 1.0 signal statistically significant differences in rate ratios.

Total Mortality

Figures 6.1 and 6.2 show all-age mortality rates among cases and matches from the index date to 20 years after the index date[7], for females and males, respectively. For both female and male cases, we found a significantly elevated total mortality rate when compared with their matches. We found 29.67 deaths per 1,000 person-years among female cases during the index year. Among male cases, the total mortality rate was 43.70 deaths per 1,000 person-years during the index year. Also during the index year, female cases had a total mortality rate 3.60 times higher than their matches; male cases had 3.34 times higher total mortality rate than their matches. Although differences in mortality rates between cases and matches declined substantially after index date, cases consistently had an elevated total mortality rate compared with their matches. Over the course of the 20-year period after index date, we estimated that there were 1,971 additional deaths among female cases and 4,207 additional deaths among male cases, and over 1,000 of these excess deaths occurred within one year after index date among male cases.

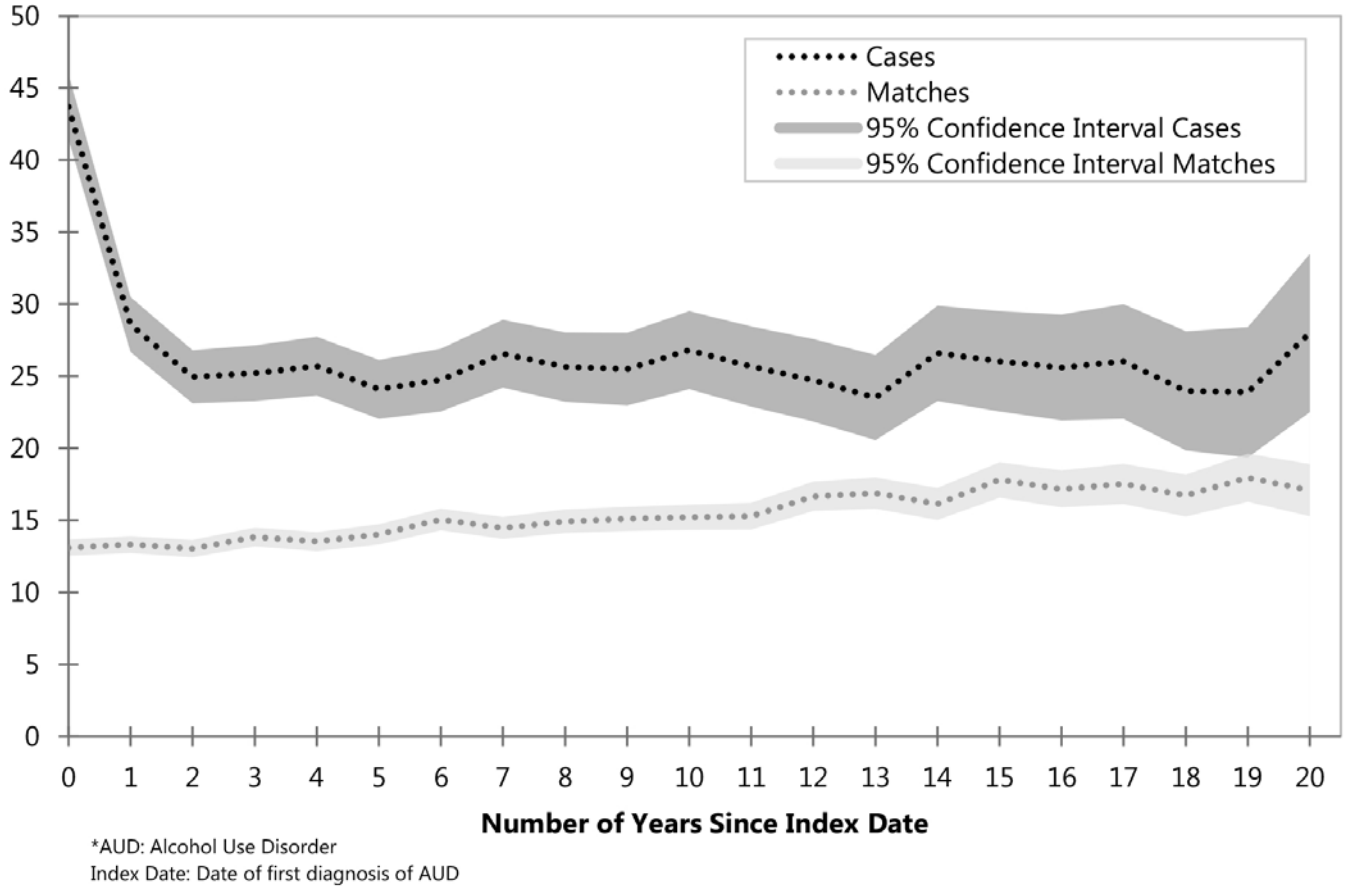
[7] Note: We were unable to look at total mortality and premature mortality prior to the index date because mortality prior to the index date means an individual would die before receiving a diagnosis.

Figure 6.1: Crude All-Age Mortality Rates for Females with AUD* (cases) and Females without AUD (matches), After Index Date
Per 1,000 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

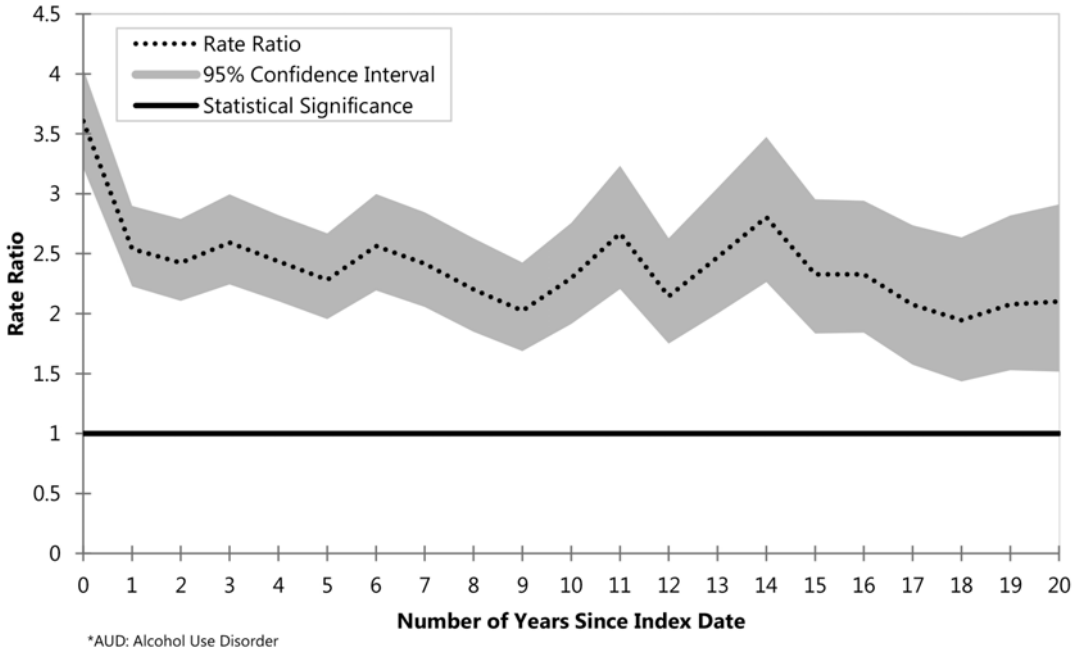
Figure 6.2: Crude All-Age Mortality Rates for Males with AUD* (cases) and Males without AUD (matches), After Index Date
Per 1,000 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

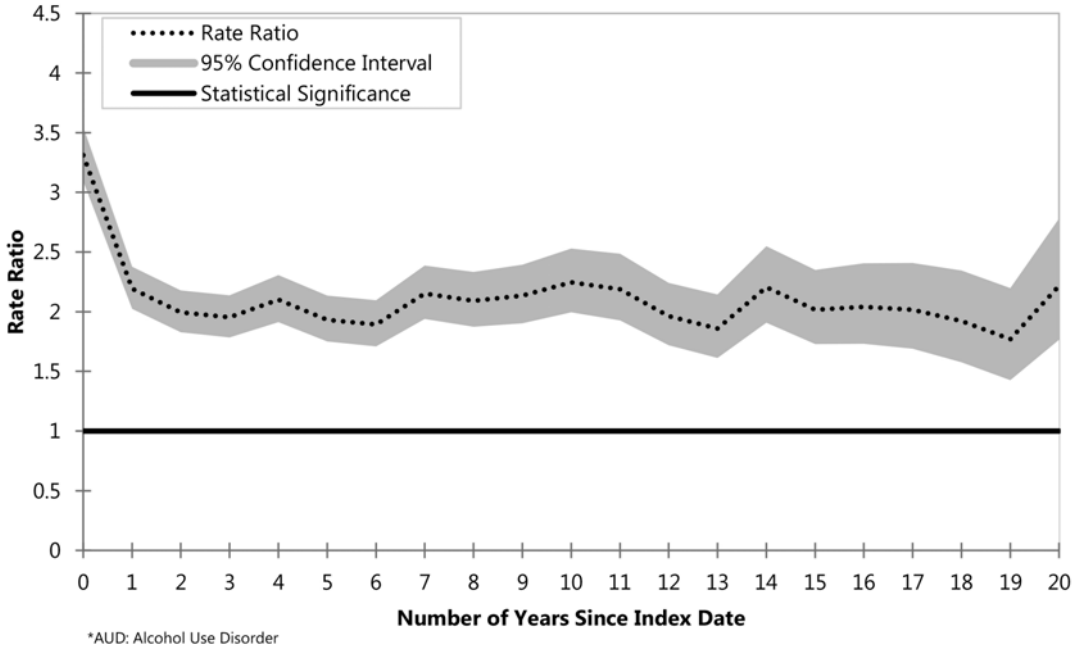
Figures 6.3 and 6.4 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. Statistically adjusting for differences between cases and matches did little to mitigate the relative differences in mortality rates between these groups. Female cases still had a 3.61 times higher mortality rate compared with their matches during the index year. Differences between female cases and matches were reduced to roughly 1.95 to 2.8 times the mortality rate during the years following. We observed a similar pattern among males. During the index year, males cases had a 3.31 times higher mortality rate compared with their matches. This difference was reduced to about a two times higher mortality rate during the remaining years of the study.

Figure 6.3: Comparing Rates of All-Age Mortality among Females with AUD* (cases) and Females without AUD (matches), After Index Date
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 6.4: Comparing Rates of All-Age Mortality among Males with AUD* (cases) and Males without AUD (matches), After Index Date
Adjusted rate ratios

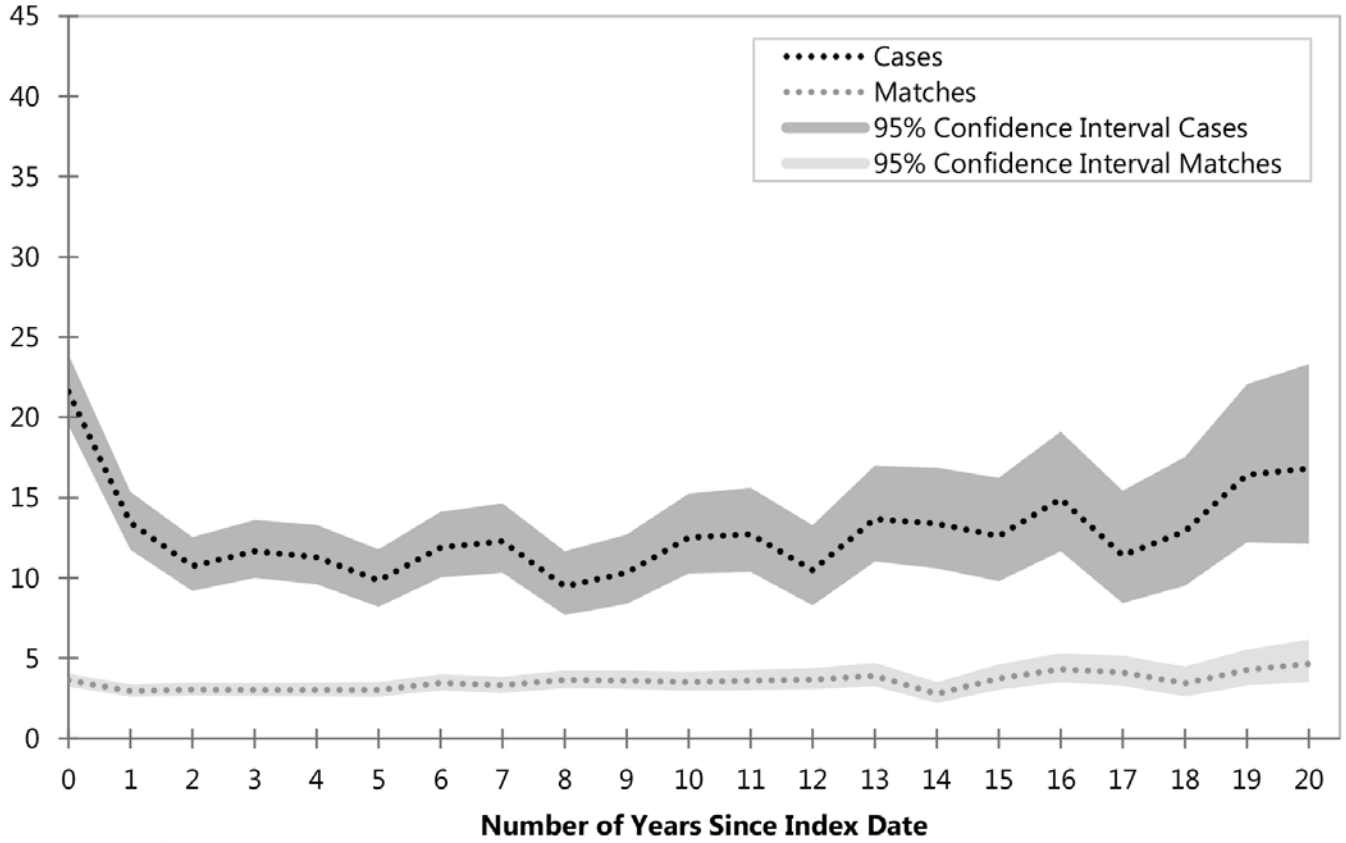


*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Premature Mortality

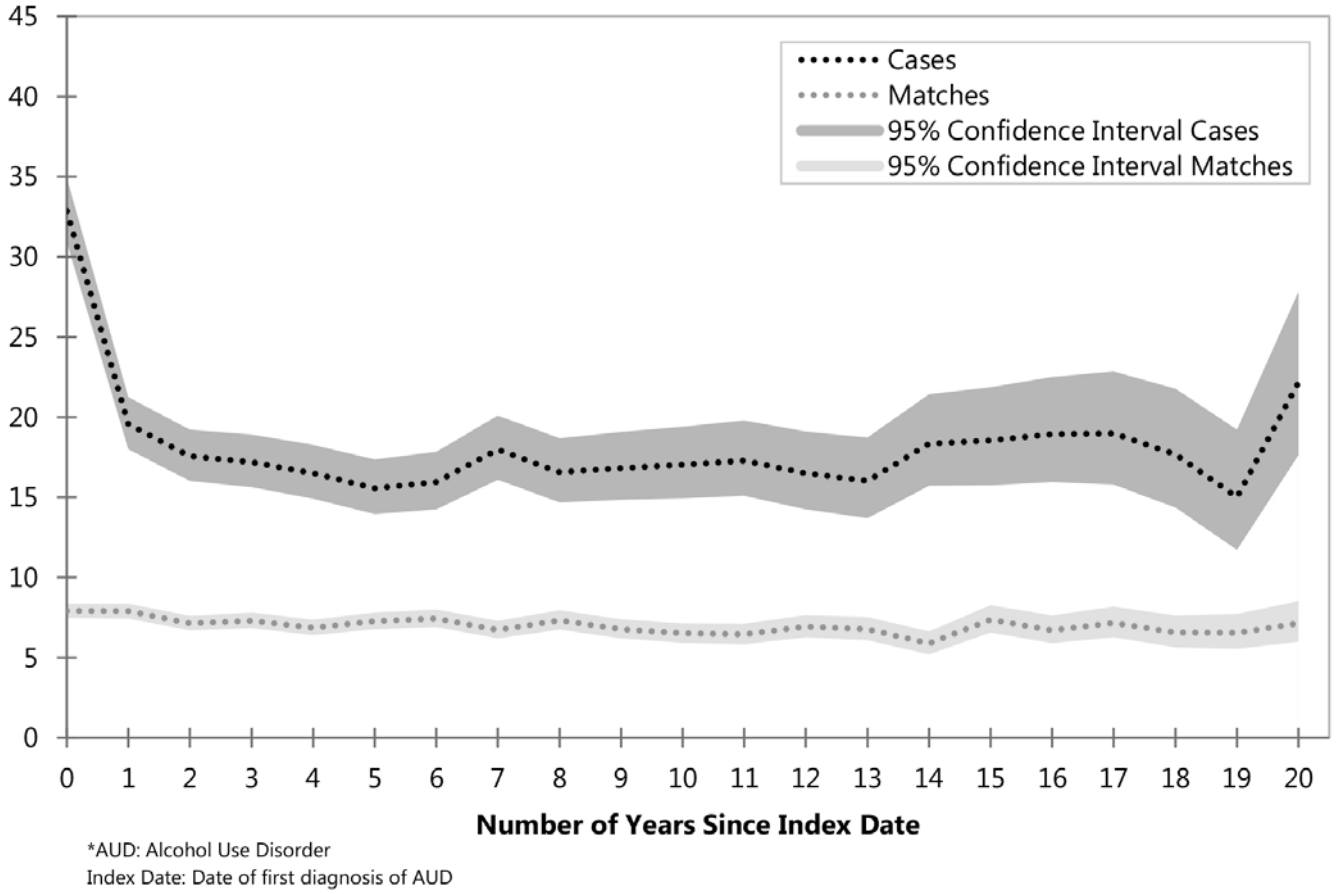
As with total mortality, premature mortality rates (deaths before the age of 75) were consistently higher among cases than matches (Figures 6.5 and 6.6). Roughly 26% of cases experienced a premature death. During the index year, the premature mortality rate (PMR) among female cases was 21.59 deaths per 1,000 person-years – nearly six times higher than the PMR among female matches (3.62 deaths per 1,000 person-years). Premature mortality rates decreased after that initial year and remained between 9.83 and 16.81 deaths per 1,000 person-years for the remainder of the study period. Among males, we saw a similar pattern. During the index year, there were 32.8 premature deaths per 1,000 person-years among male cases; this rate was 4.15 times higher than the PMR among male matches (7.91 deaths per 1,000 person-years). As with females, the PMR among males cases decreased after index year; however, it remained between 15.01 and 22.15 deaths per 1,000 person-years for the rest of the study period. The PMR among cases translates into substantial differences over the 20-year follow-up period. When we considered the excess premature mortalities from the index date until 20 years after the index date, we calculated that there were 1,690 excess premature deaths among female cases compared with their matches. Among male cases, we found 3,617 excess premature deaths compared with their matches.

Figure 6.5: Crude Premature Mortality Rates for Females with AUD* (cases) and Females without AUD (matches), After Index Date
Per 1,000 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

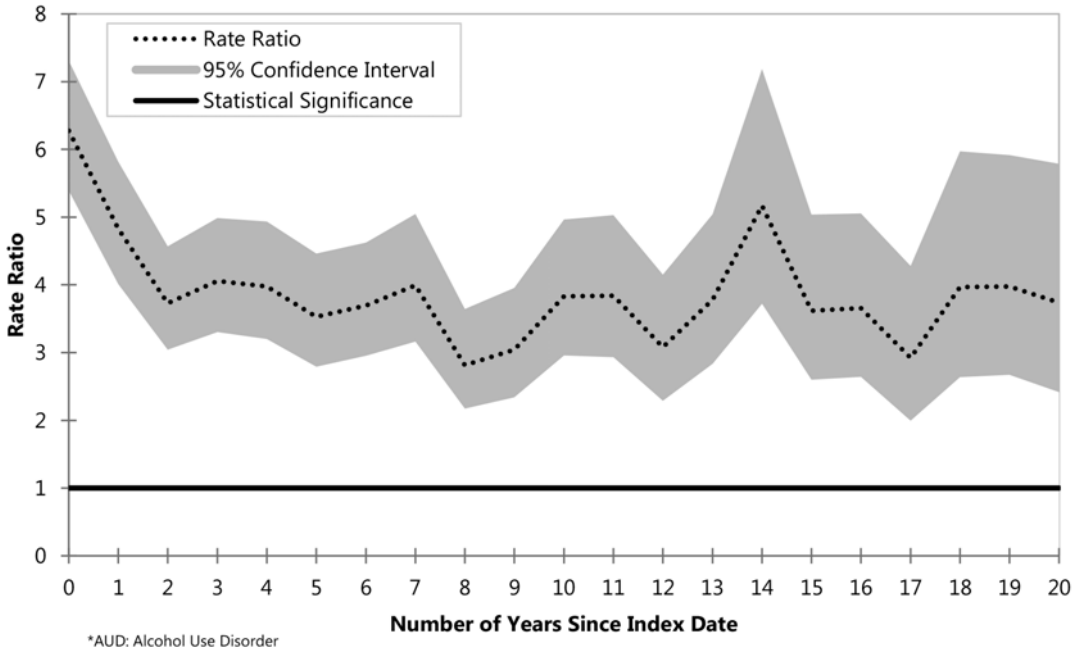
Figure 6.6: Crude Premature Mortality Rates for Males with AUD* (cases) and Males without AUD (matches), After Index Date
Per 1,000 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

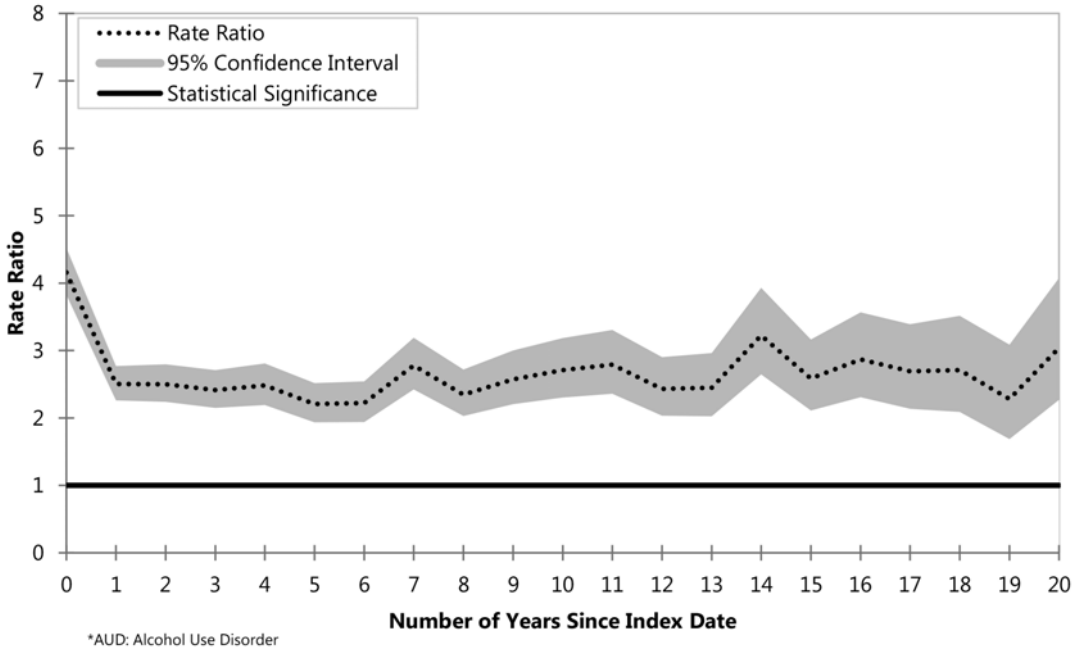
Figures 6.7 and 6.8 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. With the adjustment, we saw that female cases had a 6.27 times higher PMR when compared with their matches during the index year. A year later, this decreased to a 4.83 times higher rate, and two years later, decreased again to a 3.73 times higher rate. However, across the entire period, the PMR among female cases remained between 2.81 and 5.17 times higher than among female matches. A similar pattern, although somewhat reduced, was observed among the males. During the index year, after adjustment, we saw that male cases had a 4.16 times higher PMR compared with their matches. This rate came down precipitously, such that in the year after index year, male cases had a 2.50 times higher PMR than their matches. Between 2 and 20 years after index date, the PMR among male cases ranged from 2.21 to 3.22 times higher than male matches.

Figure 6.7: Comparing Rates of Premature Mortality among Females with AUD* (cases) and Females without AUD (matches), After Index Date
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 6.8: Comparing Rates of Premature Mortality among Males with AUD* (cases) and Males without AUD (matches), After Index Date
Adjusted rate ratios

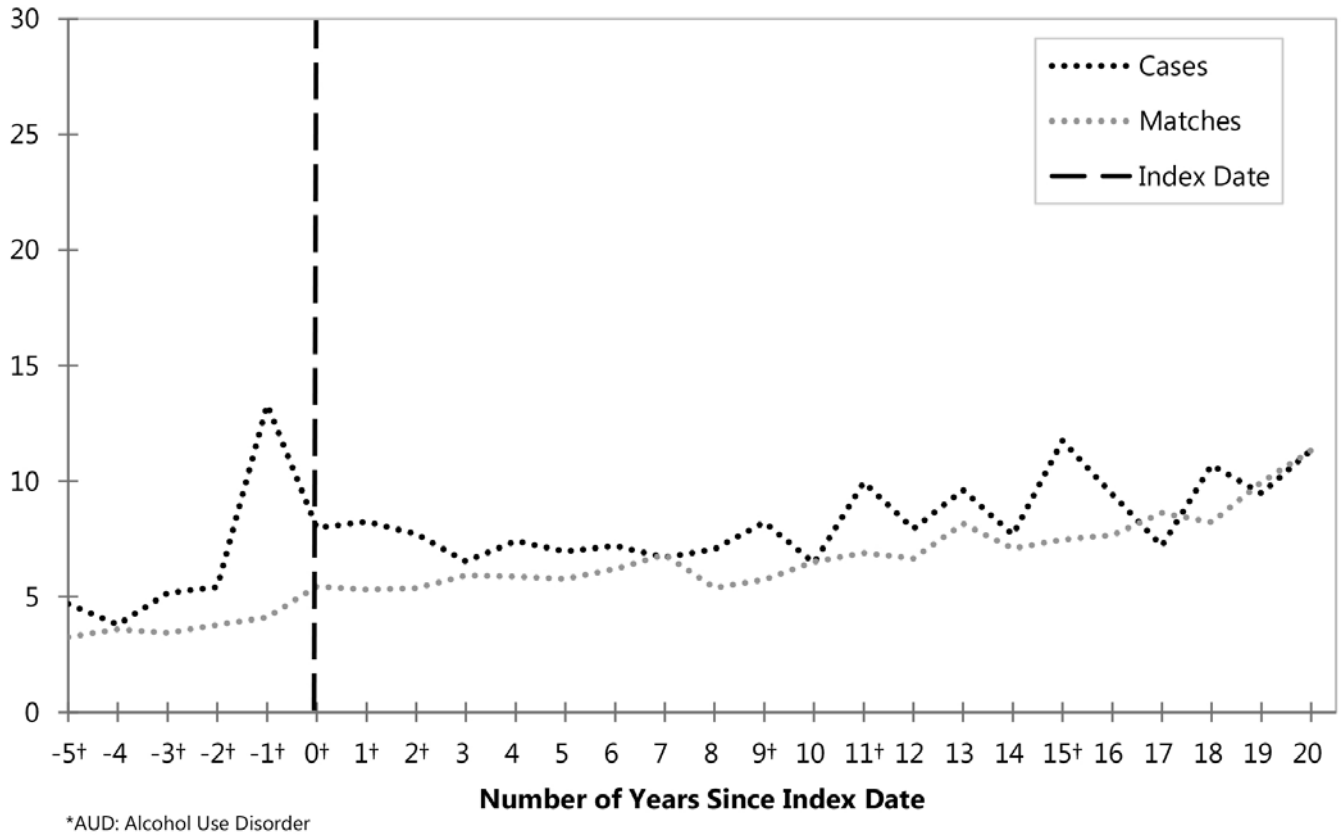


*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Ischemic Heart Disease

For all of the indicators that we have examined up until this point, we have found a substantial and persistent difference in outcomes between cases and matches. However, we found that differences in rates of ischemic heart disease (IHD) mostly occurred in the years before index date. Among female cases (Figure 6.9), we saw that the highest incidence rate for IHD occurred the year before the index date (13.30 new cases of IHD per 1,000 person-years). This corresponded to a 3.24 times higher rate than among their matches. Among male cases (Figure 6.10), we found 27.71 new cases of IHD per 1,000 person-years in the year before the index date – a rate that was 3.83 times higher than among their matches. For both female and male cases, the rates came down in the index year and became non-significant in the next year. After this point, cases and matches had roughly similar rates of new cases of IHD for the remainder of the follow-up period. Indeed, among males, none of the differences in IHD rates between cases and matches were statistically significant after the index year. Among females, we found statistically significant differences during only five times in the 20-year post-diagnosis period, and two of these five times were immediately after diagnosis.

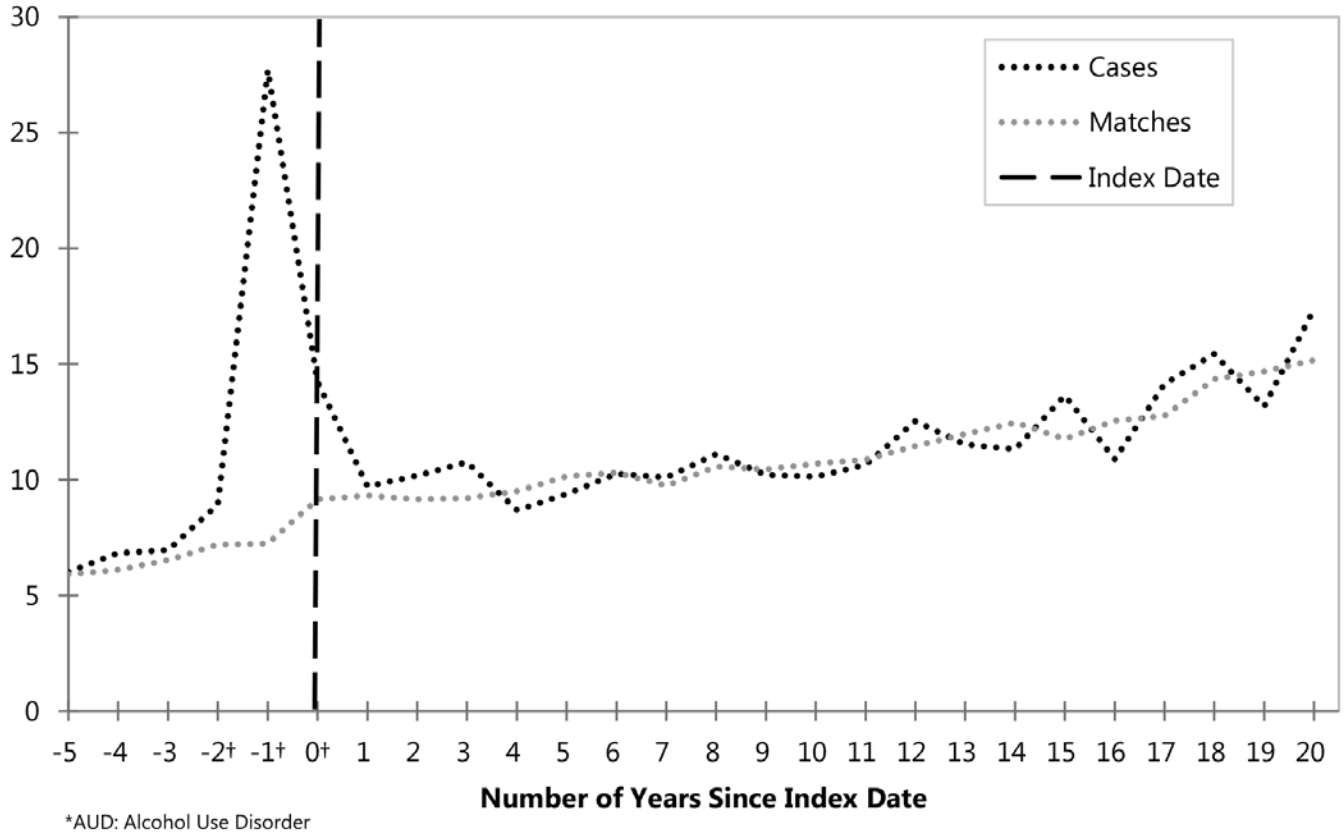
Figure 6.9: Crude Incidence Rates of Ischemic Heart Disease for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Per 1,000 person-years



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude cases' and matches' rates ($p<0.05$)
Index Date: Date of first diagnosis of AUD

Figure 6.10: Crude Incidence Rates of Ischemic Heart Disease for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 1,000 person-years



*AUD: Alcohol Use Disorder

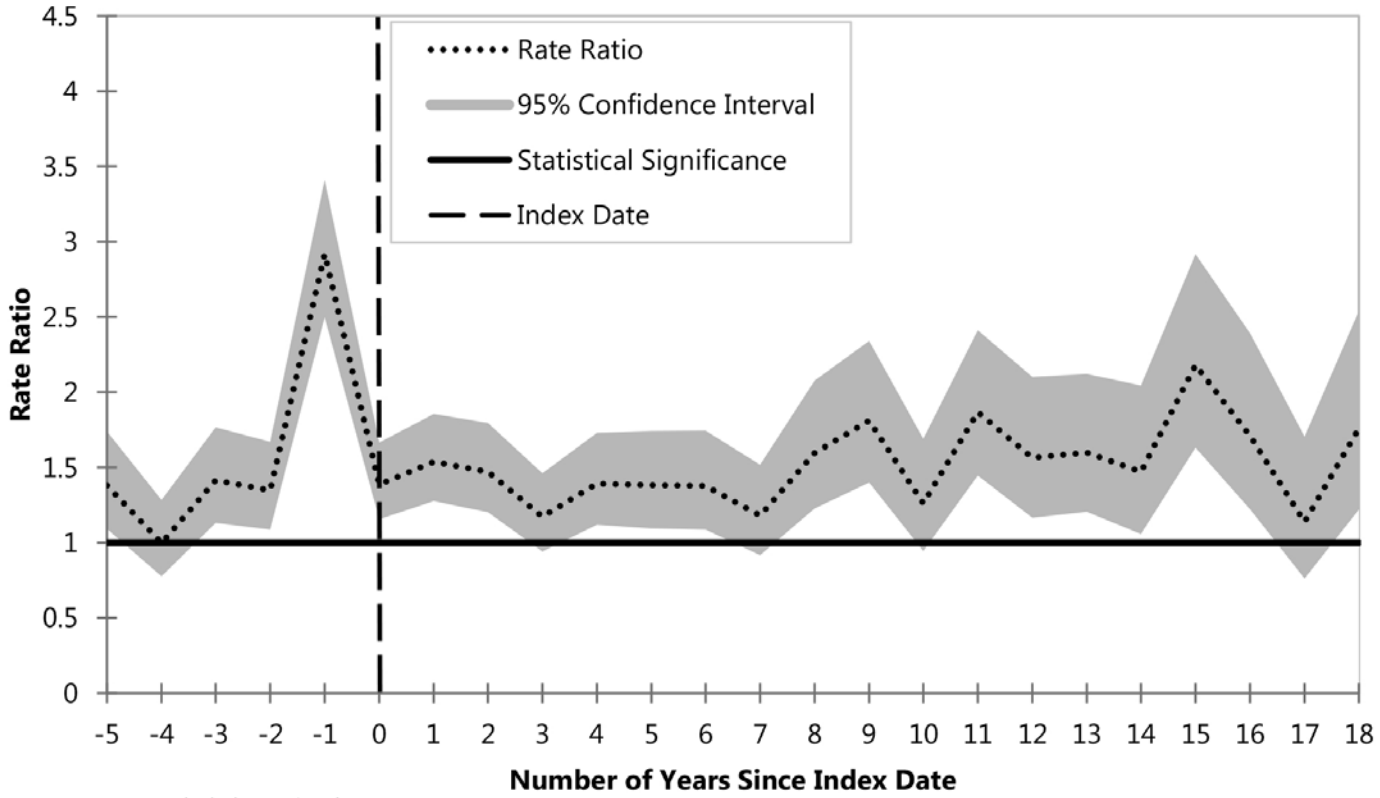
† indicates a statistically significant difference between the crude cases' and matches' rates ($p<0.05$)

Index Date: Date of first diagnosis of AUD

Figures 6.11 and 6.12 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. As anticipated from the crude analyses, we saw that there was a statistically significantly elevated rate of new IHD cases during the year before index date. Among females, we found a 2.92 times higher rate among cases than their matches; among males, we found a 3.59 times higher rate among cases than their matches. After the index date, we saw that female and male cases had between a 1.02 and 2.18 times higher rate for new cases of IHD compared with their matches. These differences were statistically significant during most years of the follow-up period. The differences in findings between the crude and modelled analyses may indicate the presence of confounding in the crude analyses (i.e., because of unmeasured confounding, the differences between those with and without an AUD may have been masked in the crude results).

Figure 6.11: Comparing Rates of Ischemic Heart Disease for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

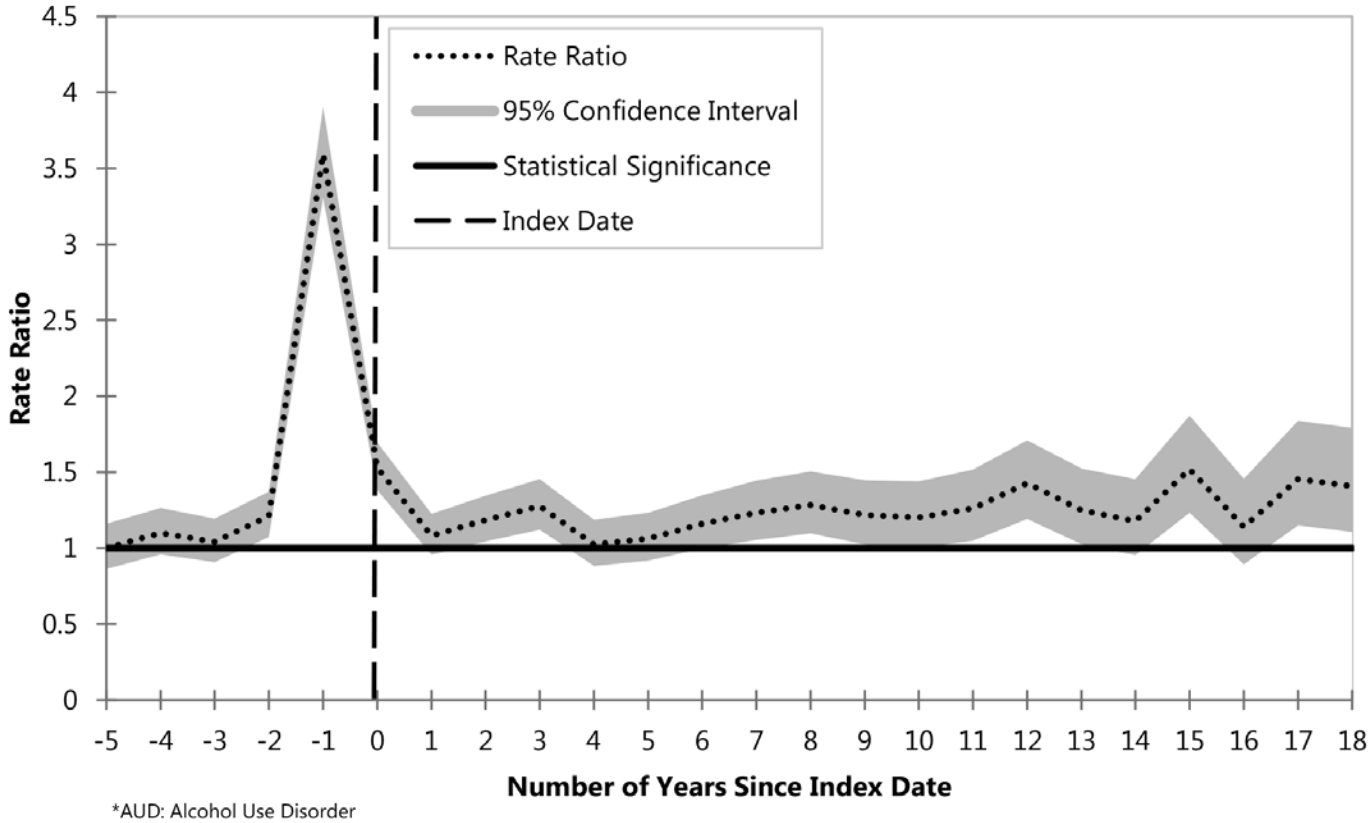
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income).

Figure 6.12: Comparing Rates of Ischemic Heart Disease for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios



*AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income).

Diabetes

Figures 6.13 and 6.14 show the crude diabetes rates for cases and matches for females and males, respectively. Among all individuals in our cohort, we found that diabetes rates increased over the course of the follow-up period. This was anticipated because the risk for diabetes increases as people age. Among female cases, we saw a slight increase in diabetes rates corresponding with the year before the index date, which was subsequently reduced the following year. Among male cases, this spike was substantially more pronounced. Female cases had a significantly higher diabetes rate compared with their matches during most of the follow-up period. Among males, however, the differences in diabetes rates between cases and matches were non-significant for many years during the post-diagnosis period.

Figure 6.13: Crude Incidence Rates of Diabetes for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Per 100 person-years

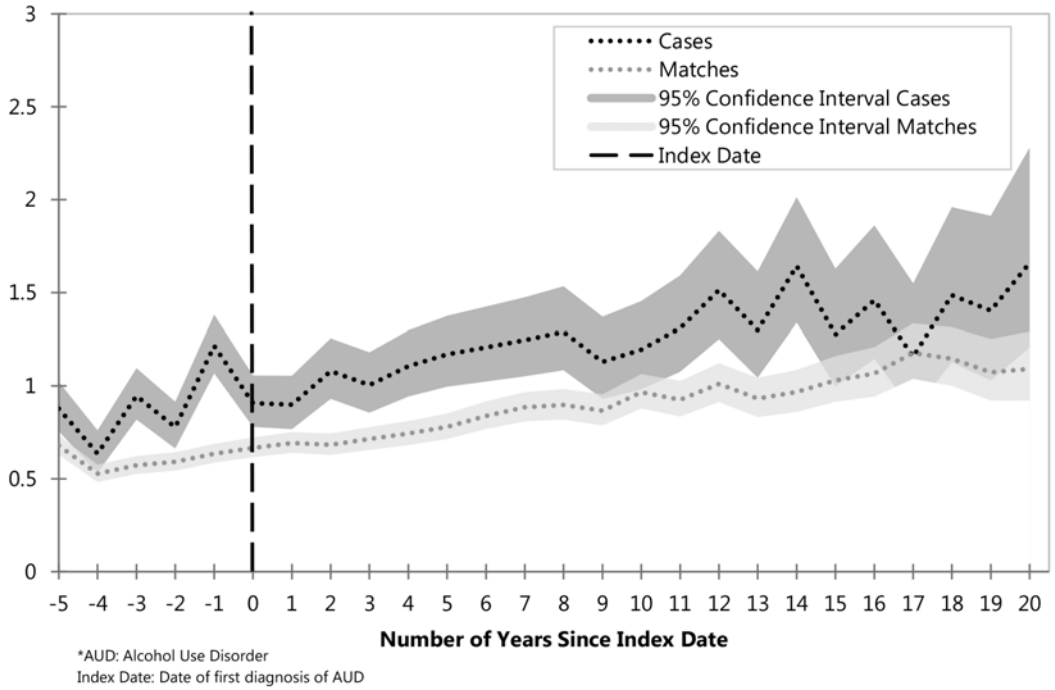
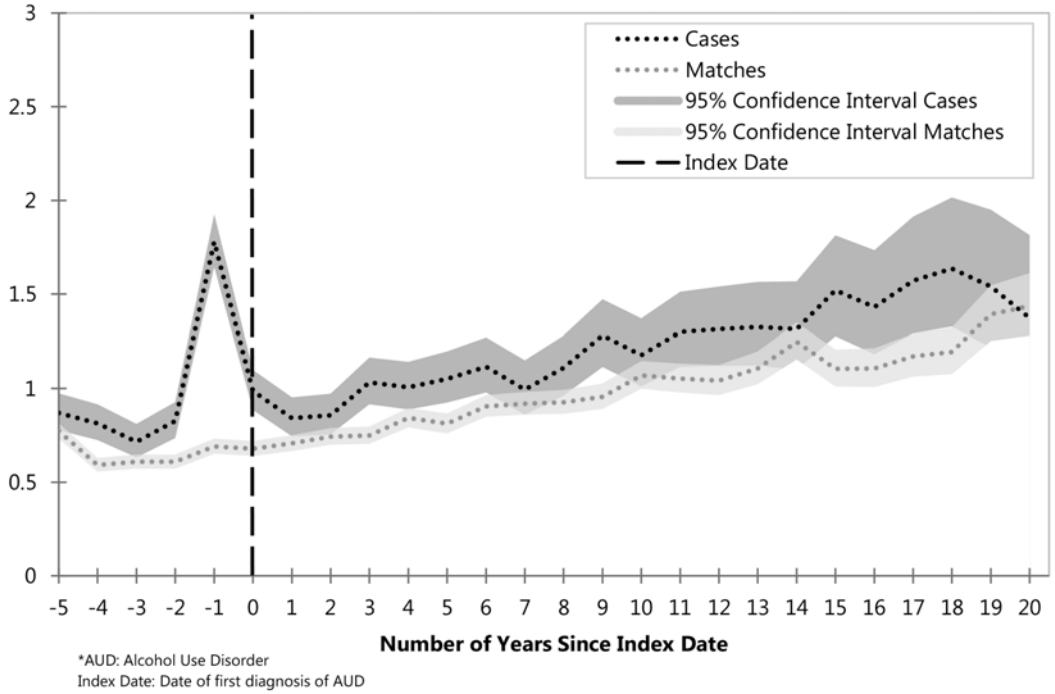
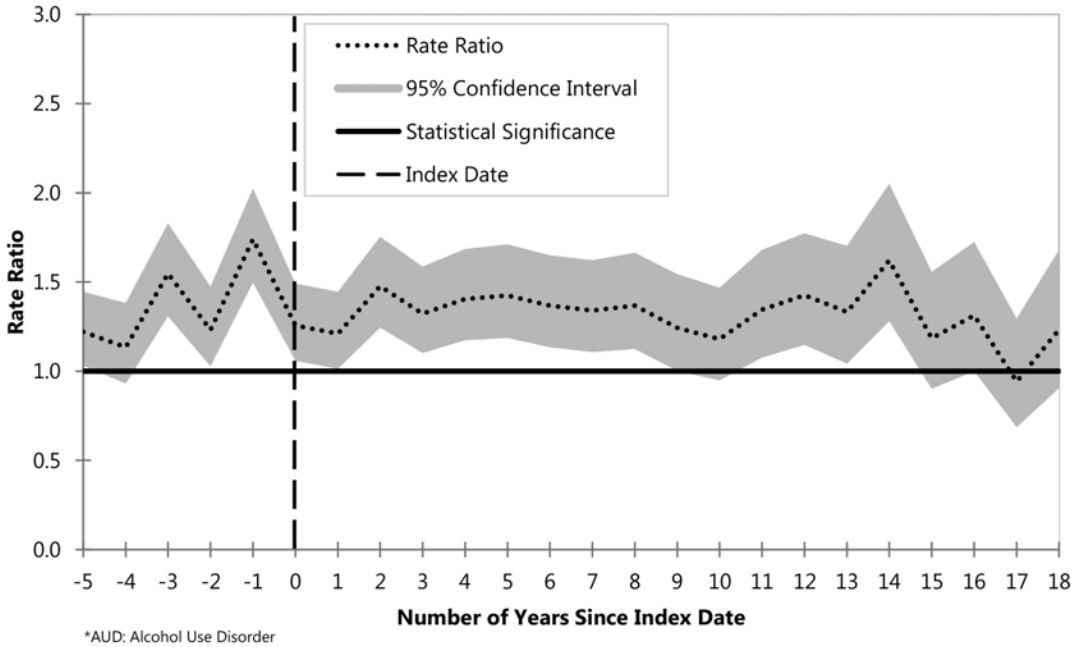


Figure 6.14: Crude Incidence Rates of Diabetes for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Per 100 person-years



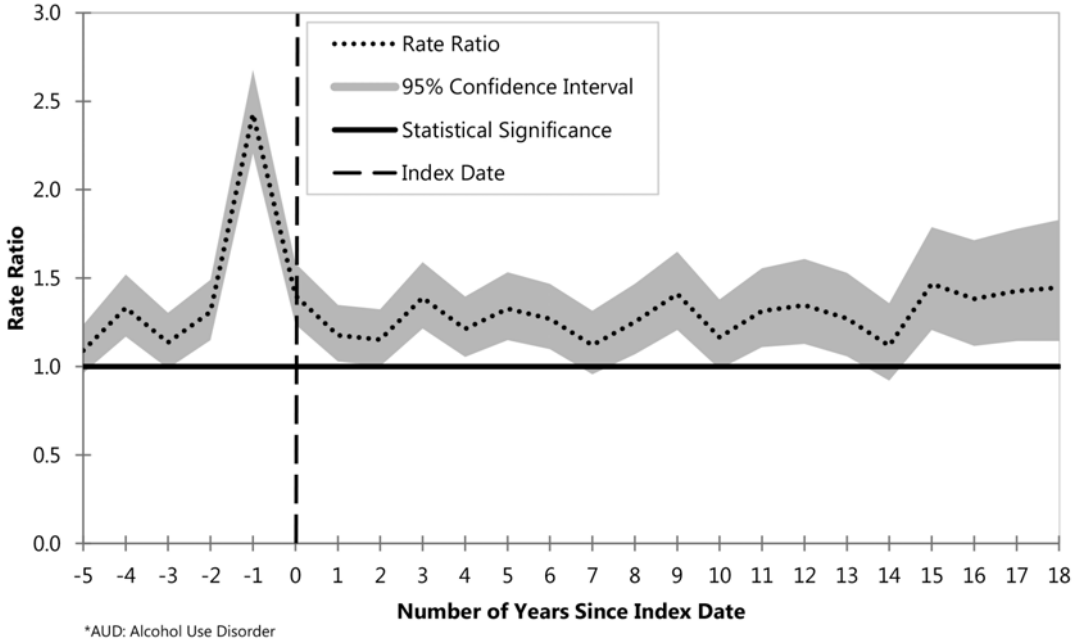
Figures 6.15 and 6.16 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. After these adjustments, we saw that the differences in diabetes rates remained significant for both females and males through most of the study period.

Figure 6.15: Comparing Diabetes Rates for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income).

Figure 6.16: Comparing Diabetes Rates for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date
Adjusted rate ratios



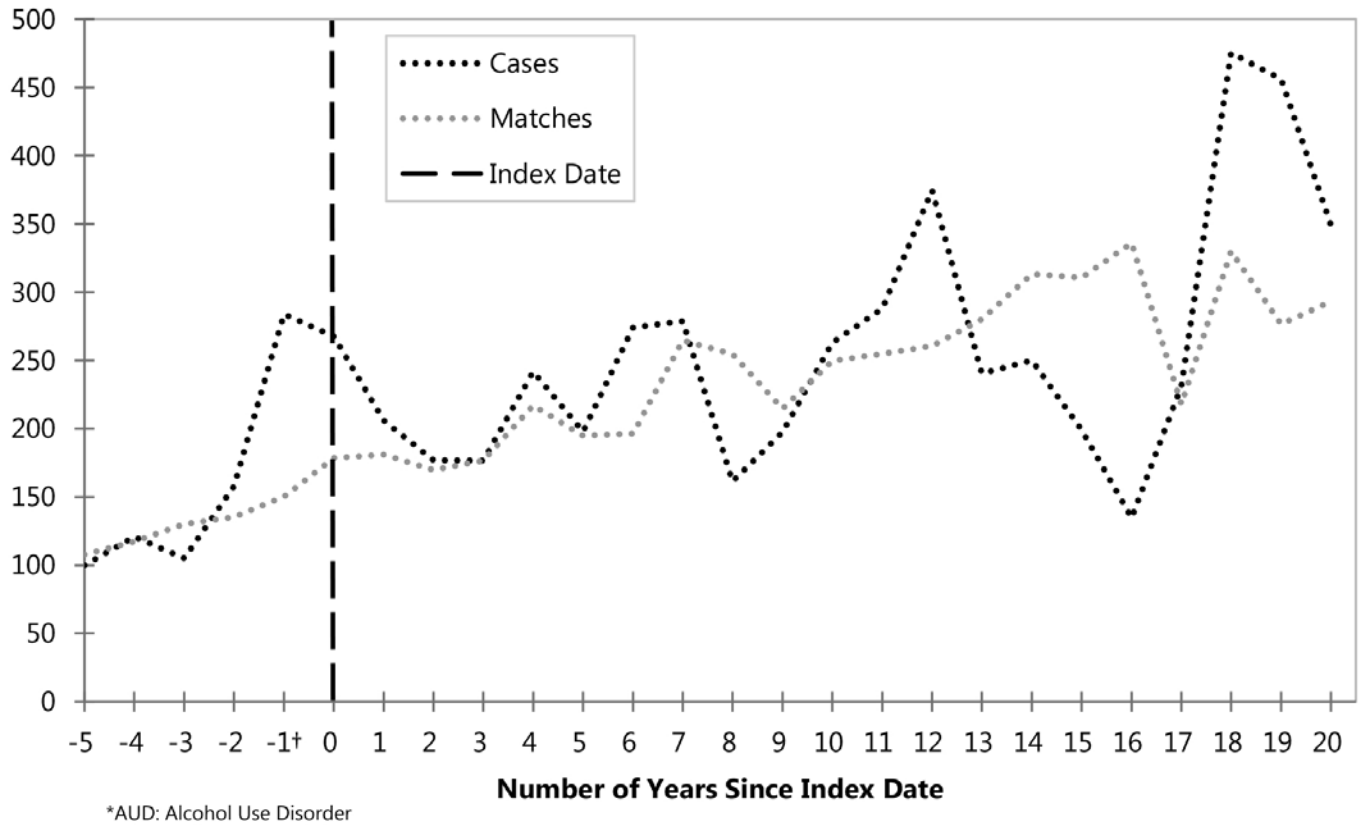
*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income).

Alcohol-Related Cancers

We looked at the incidence rate for cancers that have been shown to be associated with excessive alcohol consumption: cancer of the oral cavity and pharynx, esophageal cancer, colorectal cancer, liver cancer, cancer of the larynx, and breast cancer. During the year before the index date, we found that both female and male cases had higher rates of alcohol-associated cancers when compared with their matches (Figures 6.17 and 6.18). During that year, there were 283.96 new cancer cases per 100,000 person-years among female cases and 462.30 new cancer cases per 100,000 person-years among male cases. However, contrary to expectations, we found that, among females, the difference in cancer incidence rates was unique to the year before diagnosis; in all other years of the study, female cases had similar incident rates of alcohol-related cancers to their matches. Among males, the differences in cancer rates were slightly more consistent. From one year before to four years after the index date, male cases consistently had a higher cancer rate than their matches. While alcohol consumption has been implicated as a risk factor for breast cancer, the mechanisms at play linking alcohol consumption with breast cancer differ slightly from alcohol's links with other cancers. We conducted a sensitivity analysis excluding breast cancers to determine whether some of the differences between men and women were being driven by breast cancer, but these patterns remained largely unchanged (results available in Appendix 3).

Figure 6.17: Crude Incidence Rates of Alcohol-Related Cancers for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

Per 100,000 person-years



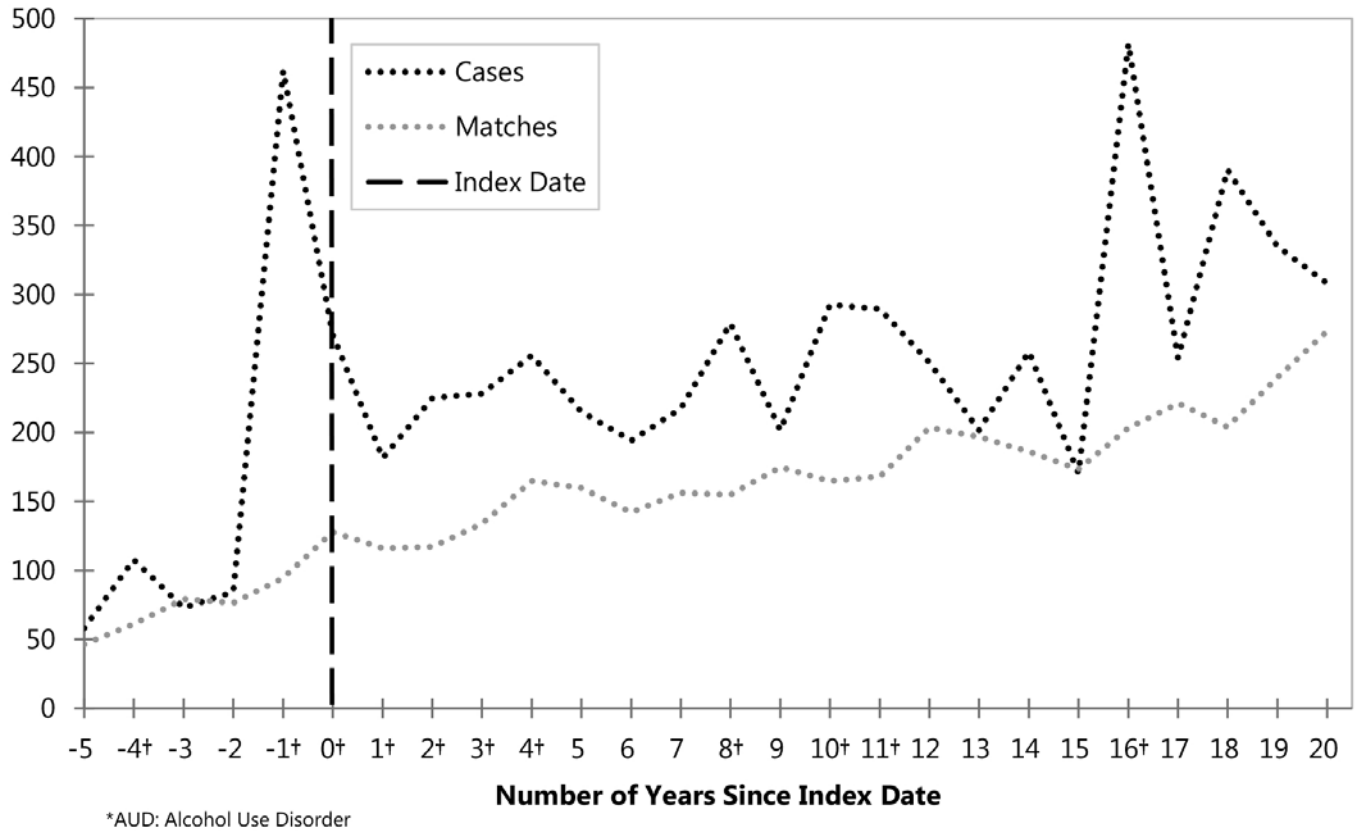
*AUD: Alcohol Use Disorder

† indicates a statistically significant difference between the crude cases' and matches' rates ($p<0.05$)

Index Date: Date of first diagnosis of AUD

Figure 6.18: Crude Incidence Rates of Alcohol-Related Cancers for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100,000 person-years



*AUD: Alcohol Use Disorder

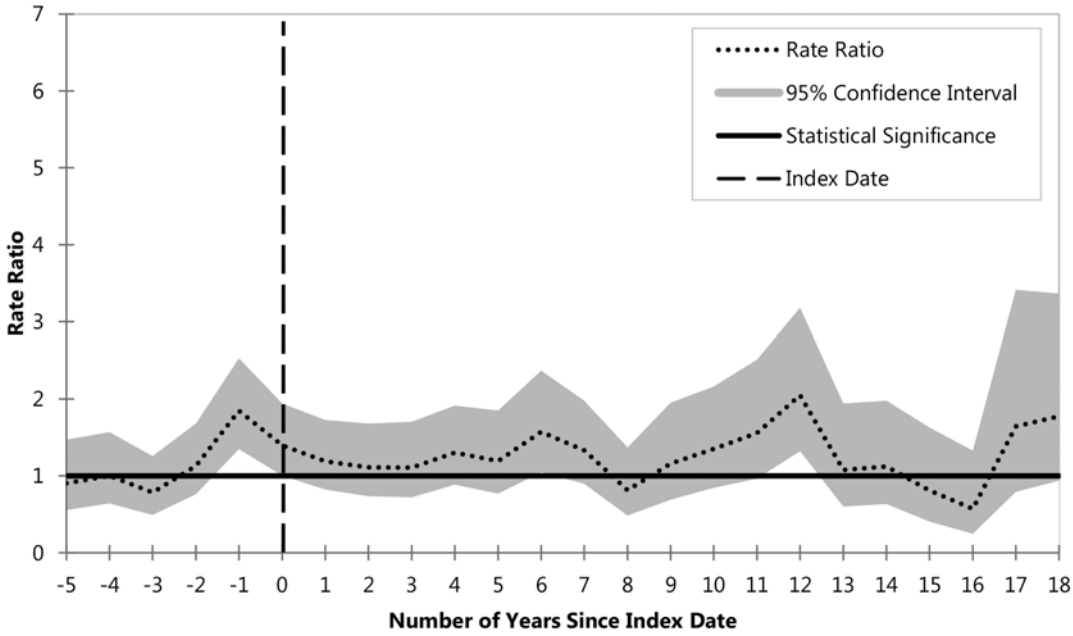
† indicates a statistically significant difference between the crude cases' and matches' rates ($p<0.05$)

Index Date: Date of first diagnosis of AUD

Figures 6.19 and 6.20 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. For both females and males, adjustment attenuated observed differences in cancer rates. For both females and males, we saw that there was a statistically significantly elevated rate during the year before the index date. Among female cases and matches, this difference became non-significant from the index year onward; however, among males, the rate for cases remained statistically significantly higher than for matches.

Figure 6.19: Comparing Rates of Alcohol-Related Cancer for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

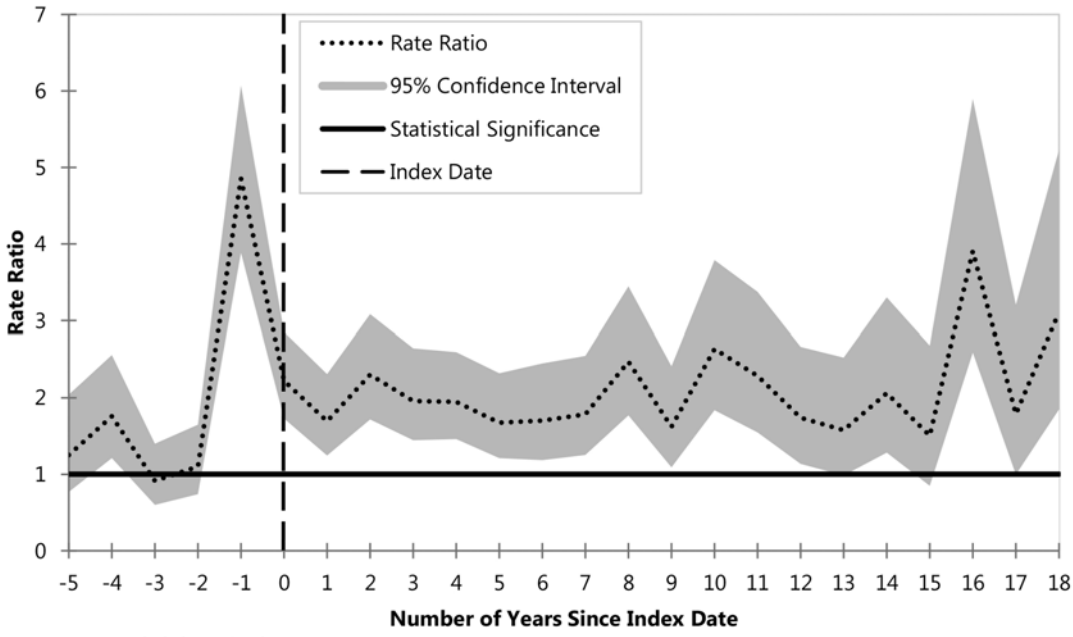
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income).

Figure 6.20: Comparing Rates of Alcohol-Related Cancer for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income).

Conclusions

Summary of Key Findings

1. Having an AUD was associated with significantly elevated risk for mortality – both total mortality and premature mortality – throughout the entire observation period. For both females and males, having an AUD more than doubled a person's risk of death. Cases had the highest risk for mortality during the index year; indeed, around the time of diagnosis, cases had a 3.5 times higher mortality risk than their matches, after adjusting for differences in characteristics such as differing mental disorder diagnoses. When we looked at premature mortality, we found an even starker picture: female cases had a PMR more than six times higher than their matches, and male cases had a PMR four times higher than their matches, even after adjusting for differences in characteristics such as mental disorder status. These findings highlight that individuals who receive an AUD have an exceptionally high risk for mortality during their index year.
2. We saw that both female and male cases had an elevated rate of receiving an IHD diagnosis the year before index year. Differences were greater among males than among females. After adjustment, female cases had a 2.92 times higher rate of IHD diagnosis compared with their matches; male cases had a 3.59 times higher rate compared with their matches. After diagnosis, the rate for IHD remained elevated among cases compared with their matches; however, elevated rates were not consistently statistically significant after the index date.
3. We observed a similar, although substantially muted, pattern when we looked at diabetes. We found an elevated incidence rate for diabetes during the year before the index date. However, after diagnosis, we did not see any statistical differences in diagnostic incidence rates for diabetes between cases and matches.
4. Finally, there was an elevated diagnostic incidence rate of alcohol-related cancers the year before the index date. After adjustment, female cases had close to twice the diagnostic incidence rate for cancer and male cases had nearly five times the diagnostic incidence rate compared to their matches. After the index date, the differences between female cases and matches became non-significant; however, among males, differences in diagnostic incidence of cancer remained significant throughout the 18 years of follow-up.

Chapter Seven:

Patterns in Social Outcomes Associated with Alcohol Use Disorders

In the previous two chapters, we described patterns of health service use and health outcomes associated with harmful alcohol consumption. The third objective of our study was to investigate social outcomes linked with alcohol use disorders (AUDs) in Manitoba.

Chapter 4 looked at differences in social outcomes over time from a population health perspective. In Chapter 7, like in Chapters 5 and 6, we have adopted an individual-level focus. We looked at patterns in social outcomes from before diagnosis, to the time of diagnosis, and then for 20 years following diagnosis. This "life-course" approach helps describe the impacts of an AUD on a person's social outcomes over their lifetime.

The data in the Manitoba Population Research Data Repository provide a unique opportunity to explore linkages between indications of an AUD and a variety of social services outcomes. In this chapter, we focused on four broad categories of social outcomes:

1. We examined patterns of justice system involvement. We determined whether or not an individual had a charge recorded in the Prosecution Information and Scheduling Management (PRISM) database. The PRISM database is an incident-based data tracking system developed and maintained by Manitoba Justice Prosecution Service, which contains information on incidents and charges. It is important to note that not all charges that appear in the PRISM database are criminal charges: for example, PRISM also includes incidents relating to Highway Traffic Act violations (e.g., speeding tickets). At the time of our study, we did not have access to data documenting the outcomes of the charges appearing in PRISM; we only looked at whether the following charges were laid: (1) driving while intoxicated (DWI); (2) domestic/family violence; and (3) any charge/violation appearing in the PRISM database.
2. We studied the use of social housing. We limited this analysis to an exploration of moving into social housing for the first time within a one-year period.
3. We investigated the rate of children being taken into care of Child and Family Services. Because of challenges in linking children to their fathers in the data, this analysis is limited to females (mothers) who had a child taken into care.
4. We examined the rates of receiving income assistance for the first time within a one-year period.

We defined people in our cohorts as follows:

- **Case:** someone who had a physical illness or mental disorder resulting from alcohol consumption; or
- **Match:** someone who did not have any indication that they used alcohol excessively and who was similar to a case based on characteristics such as age, sex, and postal code of residence at the index date.

We provide more details on how we identified cases and matches, as well as information on our matching algorithm, in Chapter 2 and Appendix 1.

We used 95% confidence intervals to signal statistically significant differences. In graphs, 95% confidence intervals are represented by shaded bands. In graphs presenting crude rates over time, bands that do not overlap signal statistically significant differences in crude rates. In graphs presenting rate ratios over time, bands that do not cross 1.0 signal statistically significant differences in the rate ratios.

Involvement with the Justice System

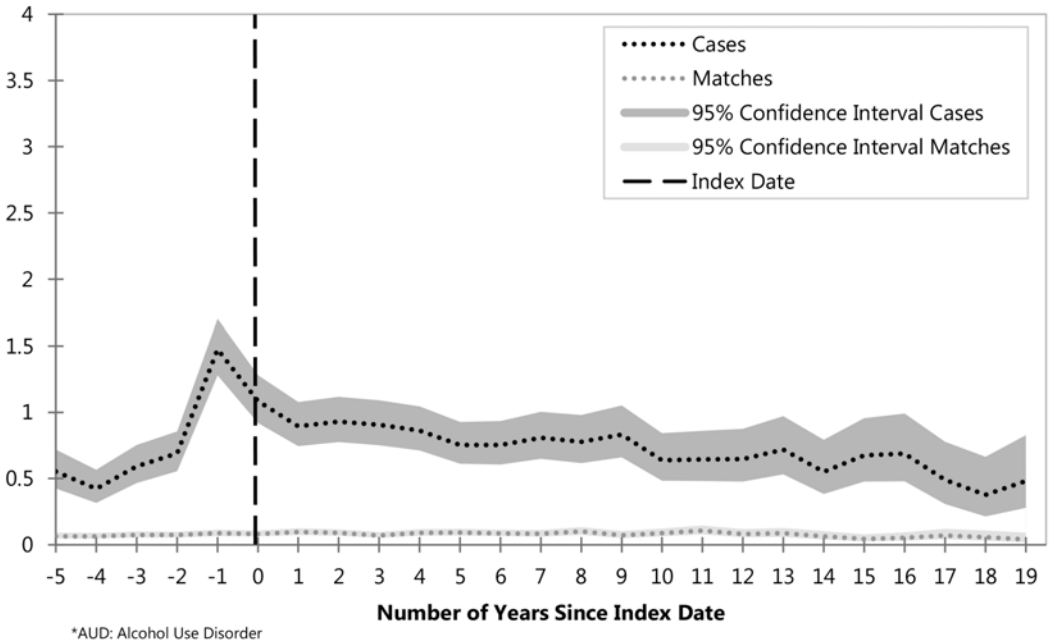
This section presents results from analyses looking at three justice involvement outcomes: charges for DWI, domestic/family violence, and having any charge or violation in the PRISM database. Similar to Chapters 5 and 6, we examined patterns from five years before to 19 years after index date. We present crude rates and adjusted rate ratios comparing cases and matches.

Driving while Intoxicated

Figures 7.1 and 7.2 present rates of DWI per 100 person-years from five years before to 19 years after index date. Male cases consistently had between two and three times the rate of DWI charges compared to female cases. In both female and male cases, we observed a spike in DWI rates corresponding with the year before index date. Among female cases, the DWI rate more than doubled between two years prior and one year prior to index date (0.69 charges per 100 person-years vs. 1.47 charges per 100 person-years, respectively). Among male cases, there was an 86% increase in DWI rates when comparing two years prior and one year prior to index date (1.72 charges per 100 person-years vs. 3.19 charges per 100 person-years, respectively). When we compared cases with their matches, the largest relative differences in DWI rates were among females: during the year before diagnosis, female cases had 16.96 times the rate for DWI charges when compared with their matches (1.47 charges vs. 0.09 charges per 100 person-years).

Figure 7.1: Crude Rates of Charges for Driving While Intoxicated for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

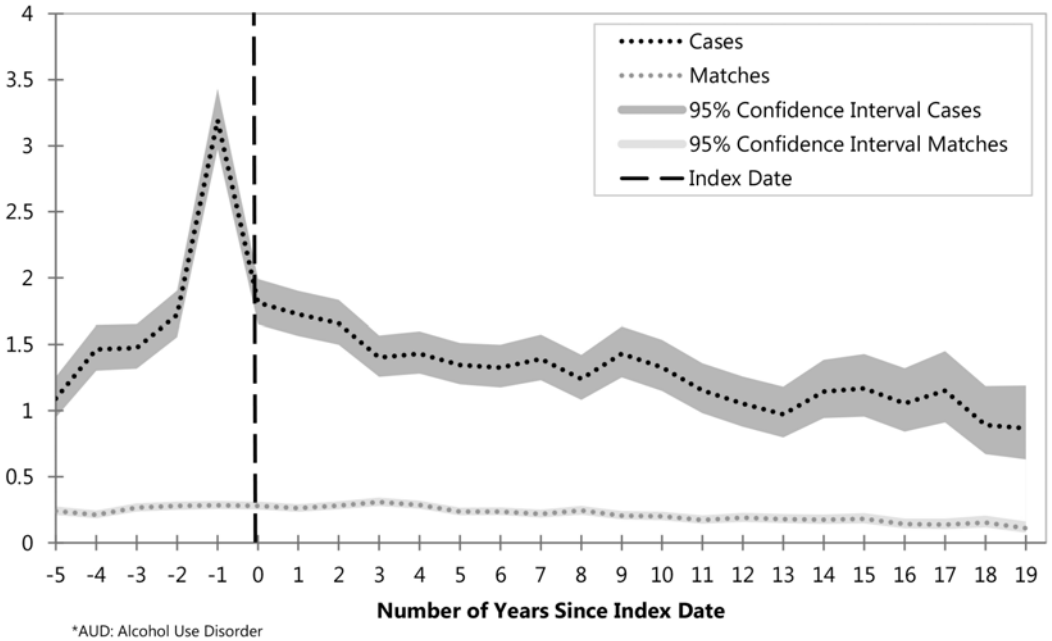
Per 100 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
For this analysis, having a Driving While Intoxicated charge was not used as an exclusion for the match group

Figure 7.2: Crude Rates of Charges for Driving While Intoxicated for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100 person-years

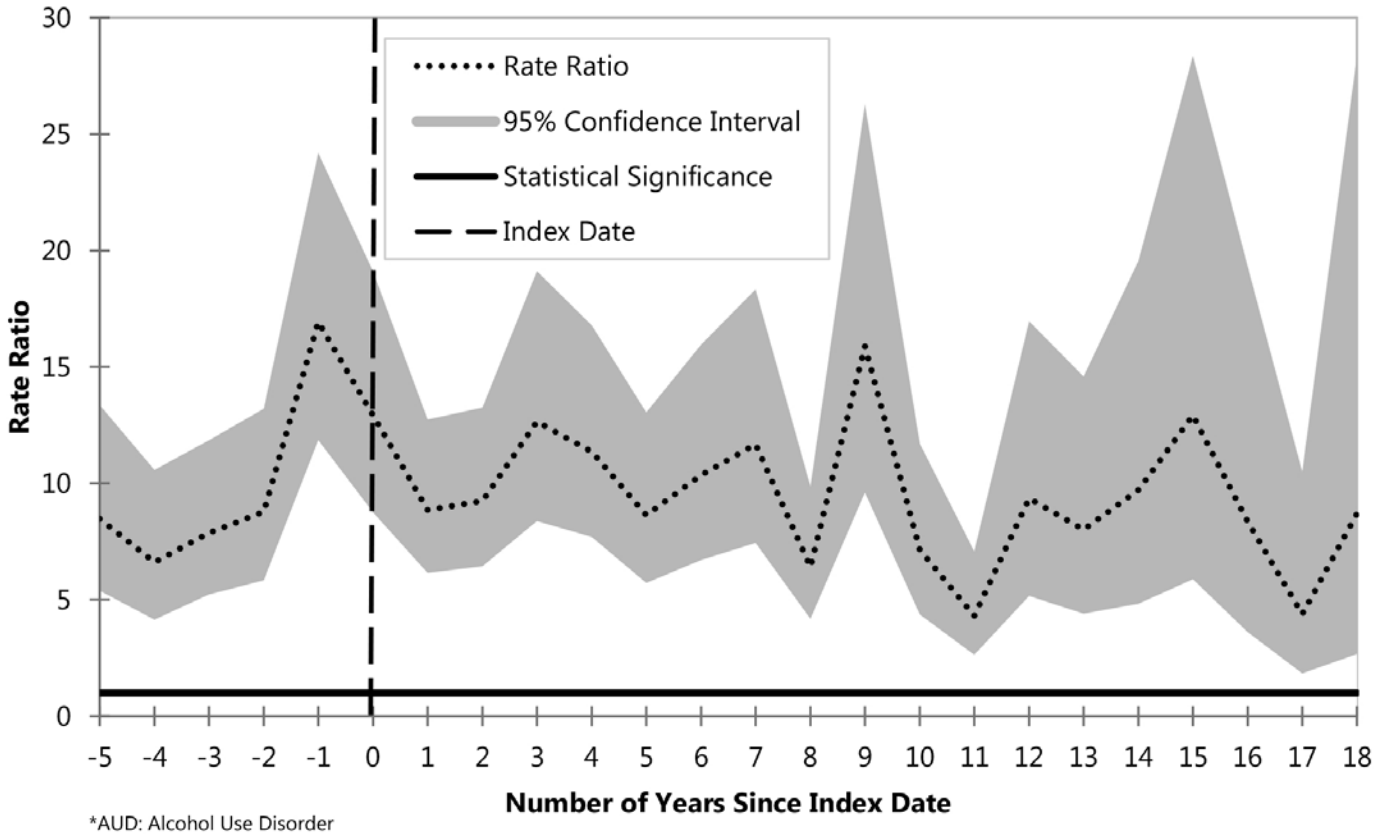


*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
For this analysis, having a Driving While Intoxicated charge was not used as an exclusion for the match group

Figures 7.3 and 7.4 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. Although there was a spike at one year before diagnosis among female cases, there were also additional spikes at 3, 7, 9, and 15 years after the index date. The high variability in adjusted rate ratios over time indicates that this was a rare outcome among females. Among males, we found the following pattern: during the year before the index date, male cases had 11.92 times the rate of DWI charges compared with their matches. The DWI rate then returned to levels similar to before the index date, and the relative difference consistently hovered at a rate about 6 times higher among male cases than among matches for nearly 20 years. Although there was substantial variability among females, the results did suggest that the relative difference between cases and matches was greater among females over time.

Figure 7.3: Comparing Rates of Charges for Driving While Intoxicated for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

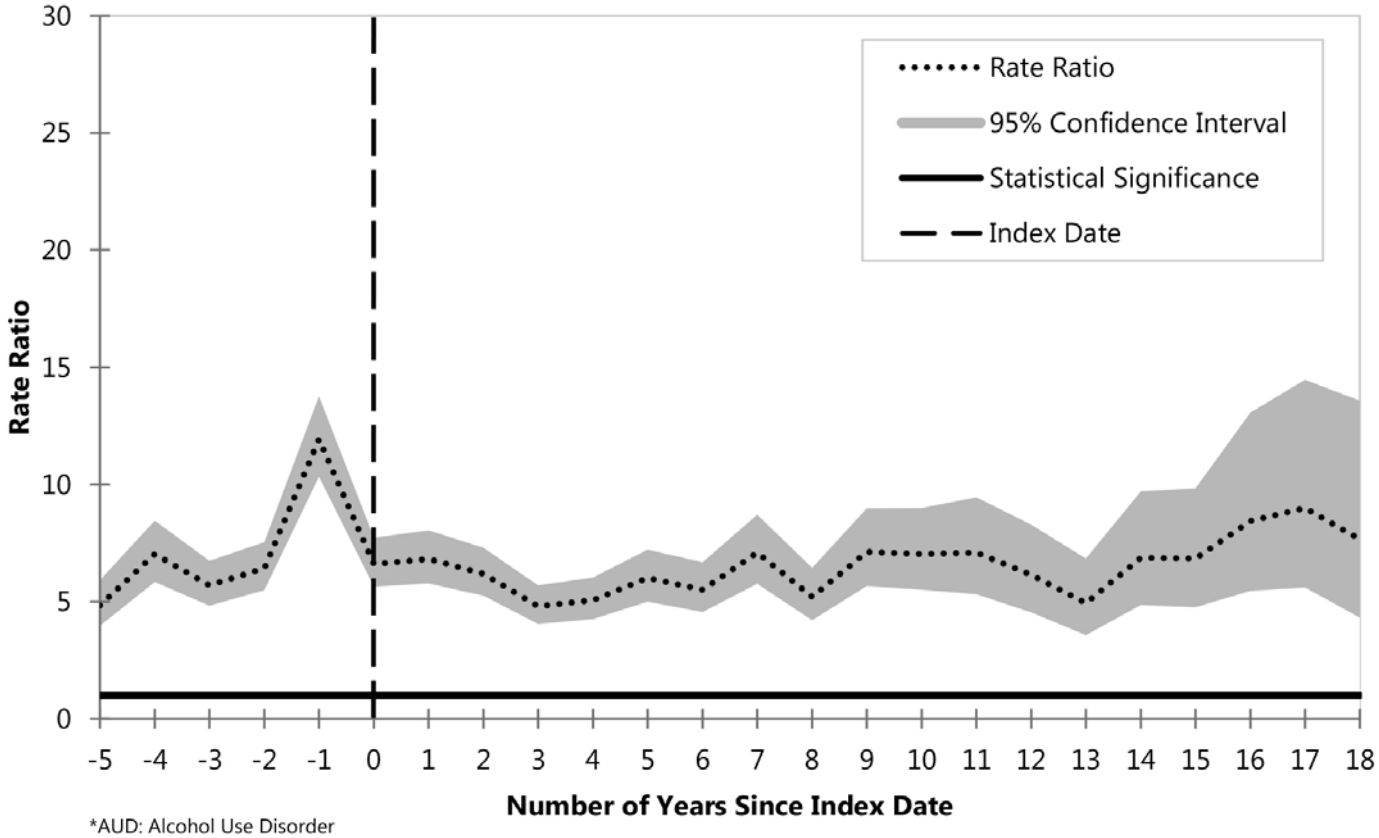
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 7.4: Comparing Rates of Charges for Driving While Intoxicated for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios



*AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

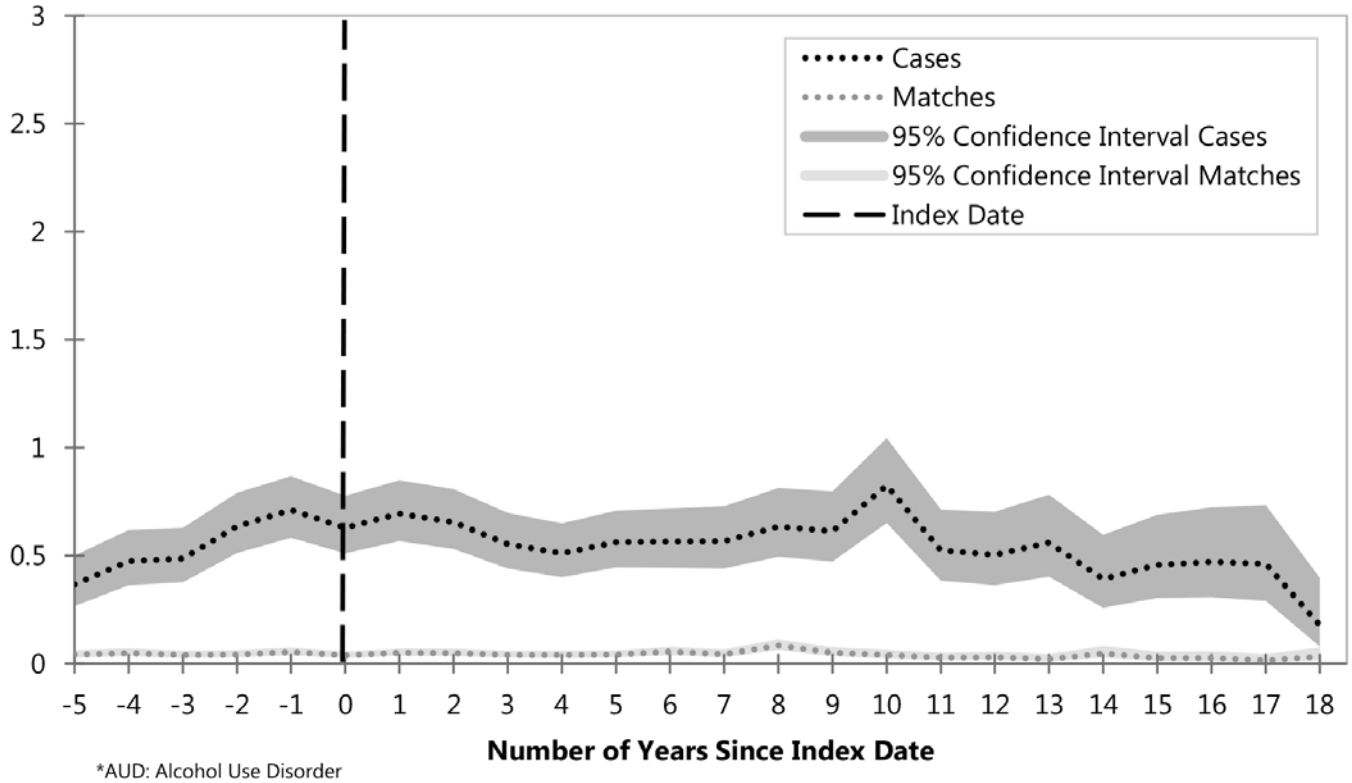
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Domestic/Family Violence

Patterns of being charged for domestic/family violence are presented in Figures 7.5 and 7.6. Female cases had an increase in rates of being charged with domestic/family violence from five years before the index date (0.37 charges per 100 person-years) to the index year (0.63 charges per person-year). Female cases consistently had a higher rate than their matches. During the index year, female cases had 16.74 times the rate of being charged with domestic/family violence when compared with their matches (0.63 charges per 100 person-years vs. 0.04 charges per 100 person-years). However, these incidents remained rare throughout the entire observation period. Rates among males were higher. From five years to three years before index date, male cases had roughly 0.96 to 0.98 charges for domestic/family violence per 100 person-years. During the index year, this rate rose to 1.59 charges per 100 person-years. Although the rates among male cases were higher than their female counterparts, rates among male matches were also higher; thus, the relative difference between male cases and matches was smaller than between female cases and matches. Indeed, during the index year, male cases had 6.92 times the rate of being charged with domestic/family violence when compared with their matches (1.59 per 100 person-years vs. 0.23 per 100 person-years).

Figure 7.5: Crude Rates of Charges for Domestic/Family Violence for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

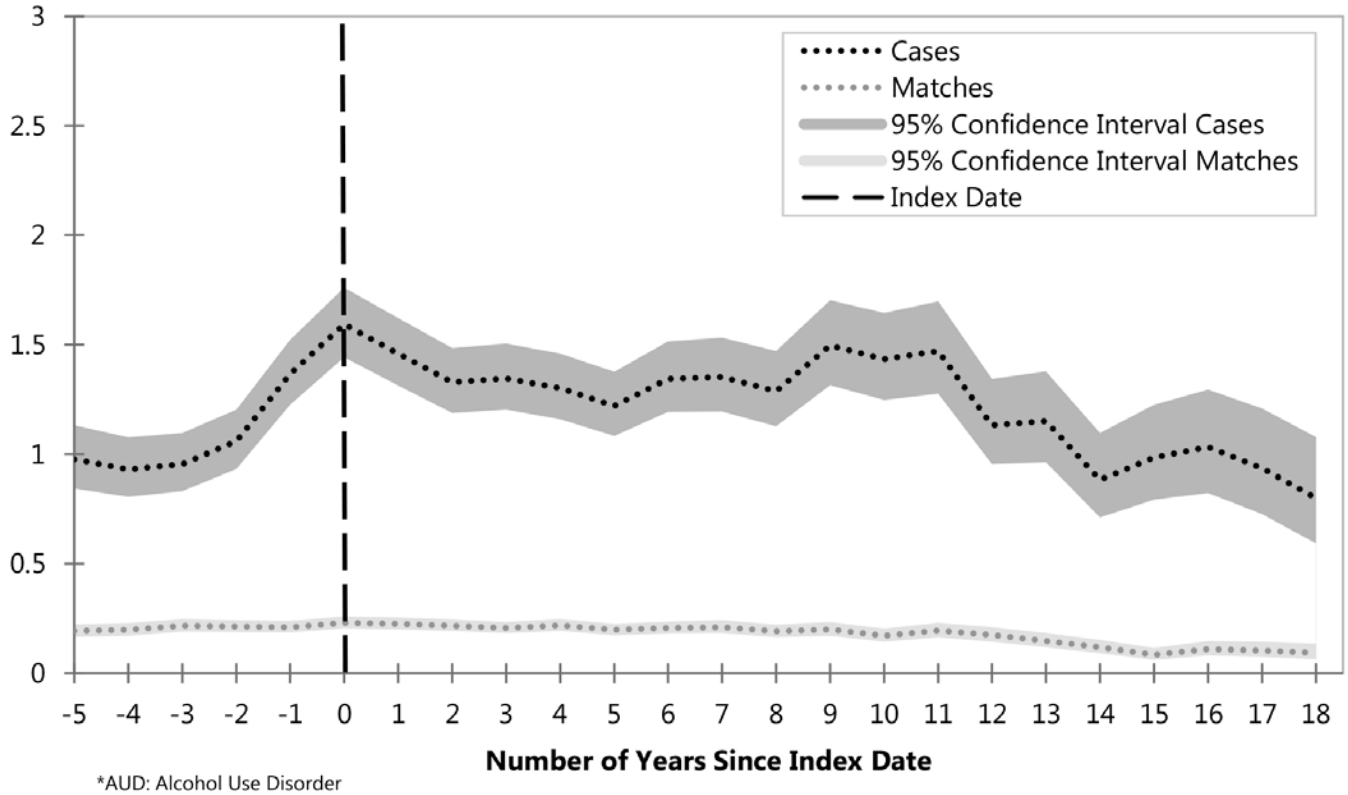
Per 100 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Due to data limitations, the charge of domestic/family violence is only captured for charges made by the Winnipeg Police Service; however, an individual does not have to be a Winnipeg resident to be charged with this violation

Figure 7.6: Crude Rates of Charges for Domestic/Family Violence for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100 person-years



*AUD: Alcohol Use Disorder

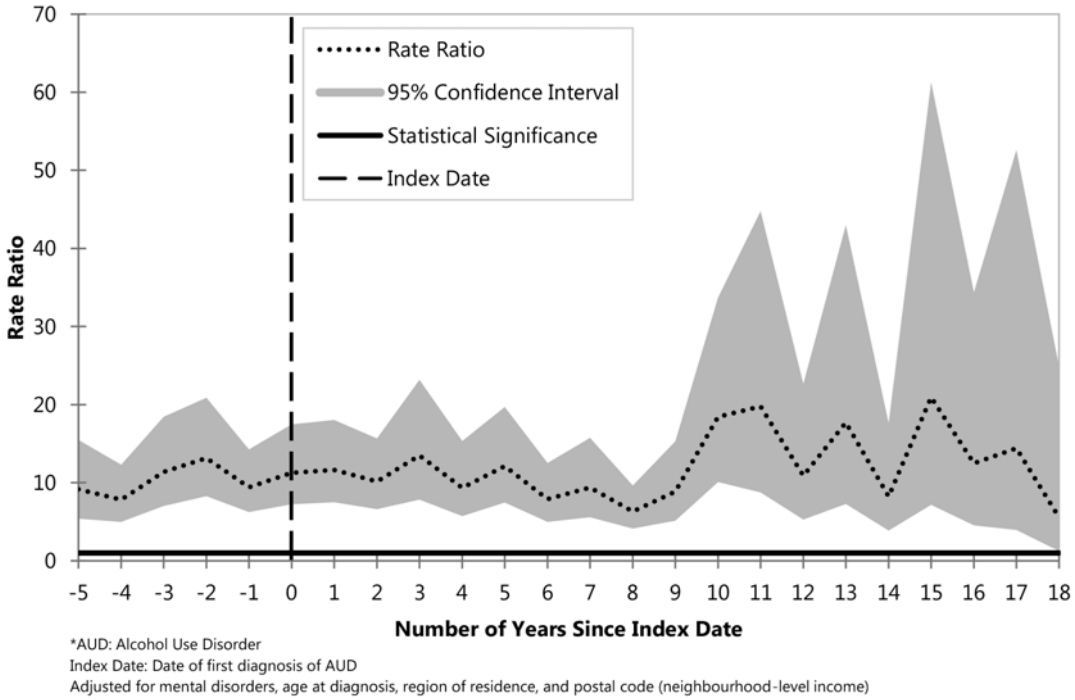
Index Date: Date of first diagnosis of AUD

Due to data limitations, the charge of domestic/family violence is only captured for charges made by the Winnipeg Police Service; however, an individual does not have to be a Winnipeg resident to be charged with this violation

Figures 7.7 and 7.8 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. Across the entire course of the study, even after statistical adjustment, the relative difference between cases and matches was roughly twice as great for females compared to males. Again, this likely reflects the high base-rate among males. Unlike DWI, we did not see a prominent spike corresponding with the index date.

Figure 7.7: Comparing Rates of Charges for Domestic/Family Violence for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

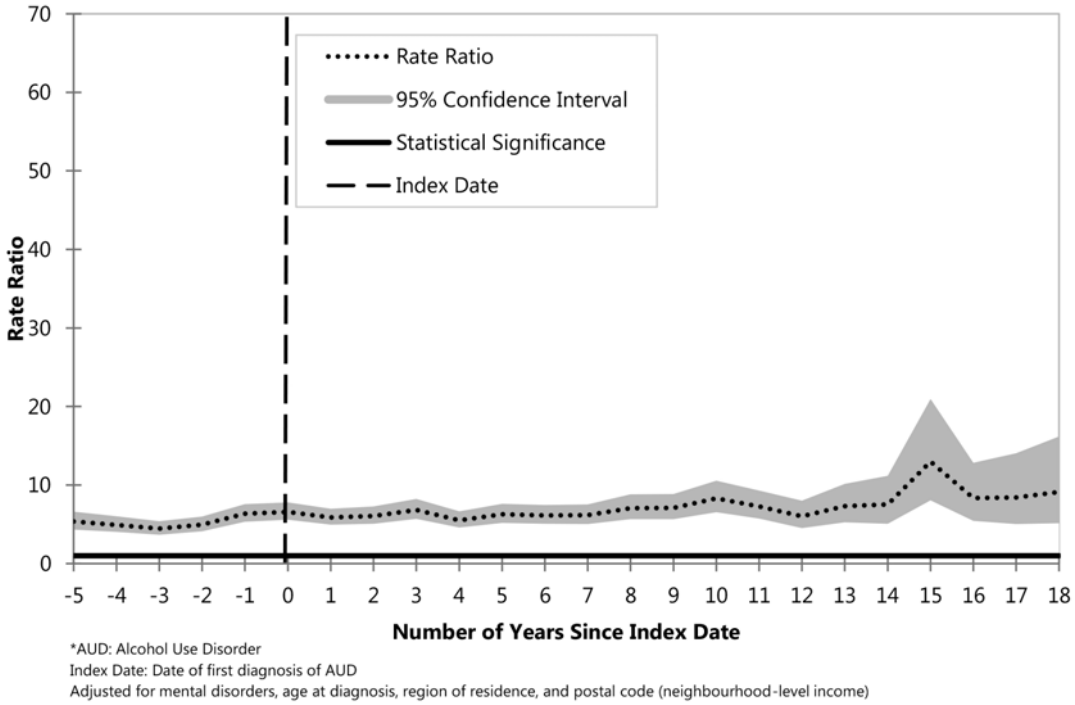
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 7.8: Comparing Rates of Charges for Domestic/Family Violence for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios



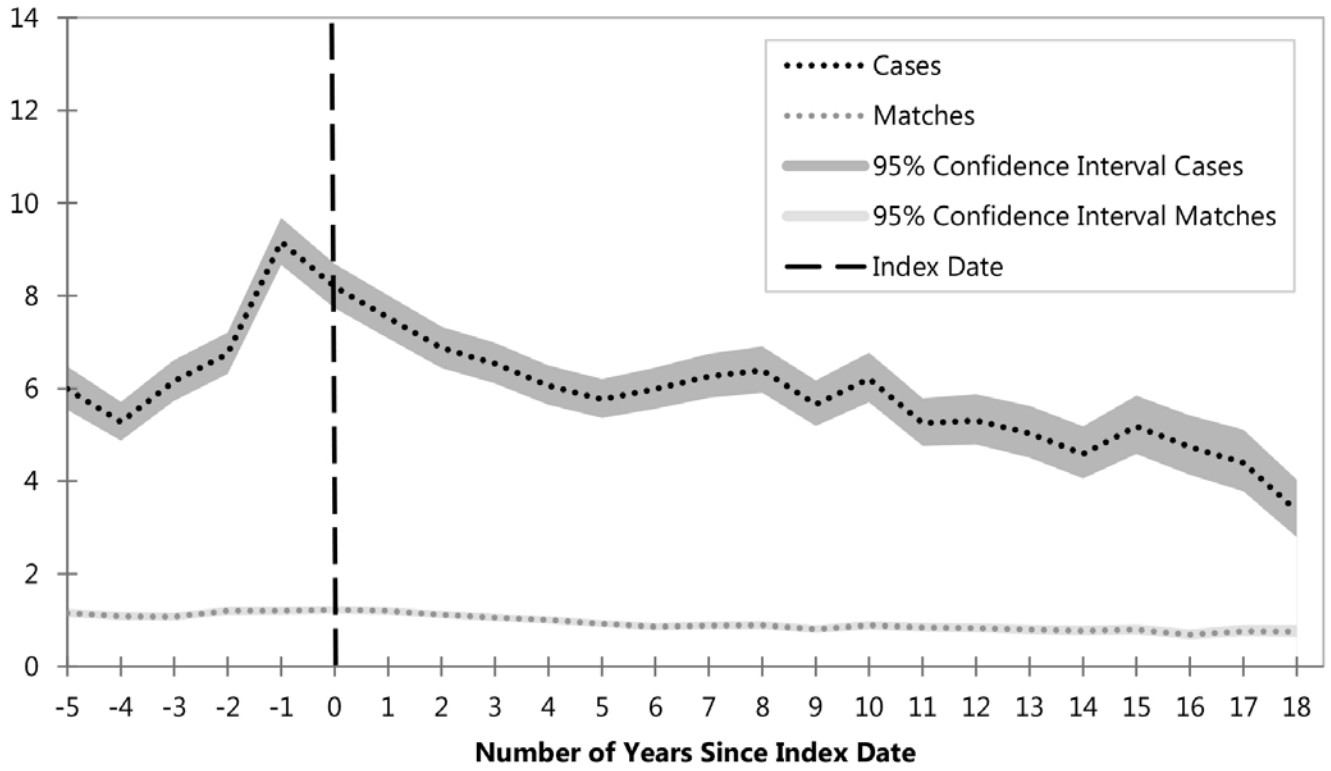
*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Any Charge in the Justice System Database

Similar to the other two justice indicators, we found that male cases consistently had higher charge rates than female cases, and that male matches also had higher charge rates than female matches (Figures 7.9 and 7.10). Among female cases, the charge rate ranged between 3.36 charges per 100 person-years (18 years after index date) and 9.16 charges per 100 person-years (the year before index date). The charge rate among male cases ranged between 6.17 charges per 100 person-years (18 years after index date) to 13.00 charges per 100 person-years (during the year before index date). The relative difference between male cases and matches was smaller than between female cases and matches during the year before diagnosis: male cases had a 4.58 times greater charge rate than their matches and female cases had a 7.64 times greater charge rate than their matches. And, as with previous justice indicators, the fact that the relative difference was smaller among males than among females likely reflects the high base-rate among male matches.

Figure 7.9: Crude Rate of Any Charge* in the Justice System for Females with AUD† (cases) and Females without AUD (matches), Before and After Index Date

Per 100 person-years

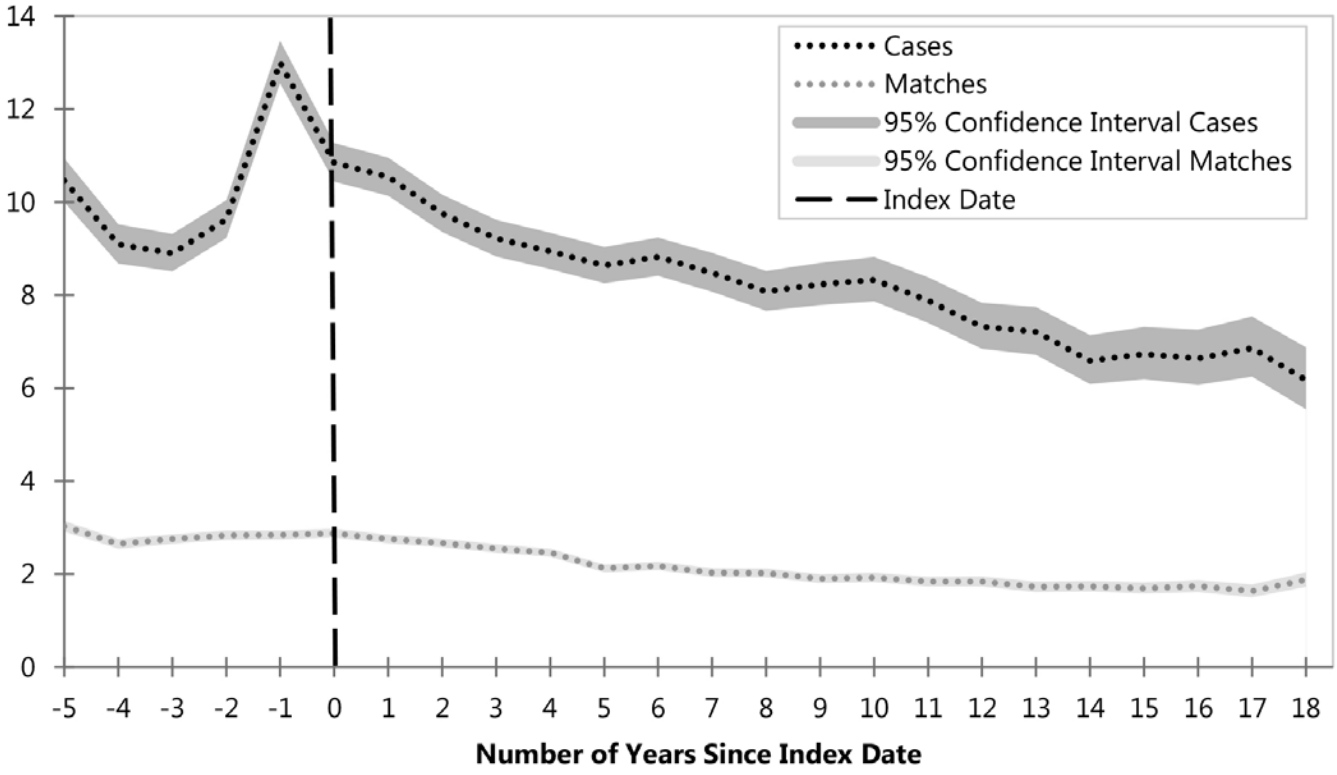


* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.

† AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Figure 7.10: Crude Rate of Any Charge* in the Justice System for Males with AUD† (cases) and Males without AUD (matches), Before and After Index Date
Per 100 person-years

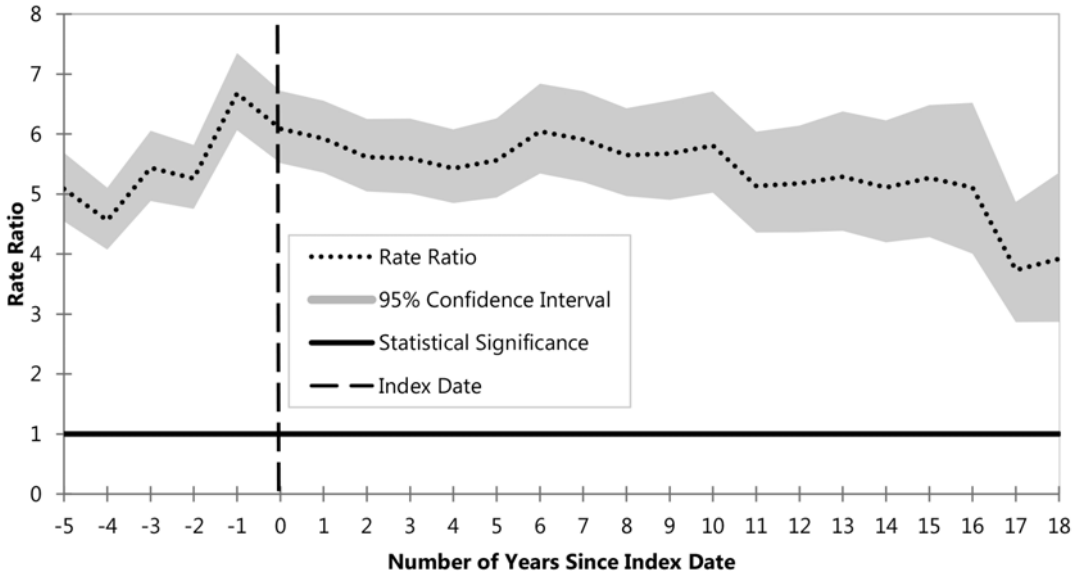


* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.
† AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Figures 7.11 and 7.12 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. After this adjustment, we found that the relative difference between cases and matches was roughly twice as great among females than among males. We saw an elevated rate ratio among both females and males at one year before index date. Among females, the rate ratio for any charge in the PRISM database after index date was greater than it was before 1 year prior to index date; thus, the excess rate of justice system involvement persisted and increased among female cases after receiving their first diagnosis for an AUD. Among males, the relative rate after index date returned to roughly the same level as during the pre-index date period. However, male cases also had a persistently elevated rate of charges in the PRISM database compared to their matches.

Figure 7.11: Comparing Rates of Any Charge* for Females with AUD† (cases) and Females without AUD (matches), Before and After Index Date

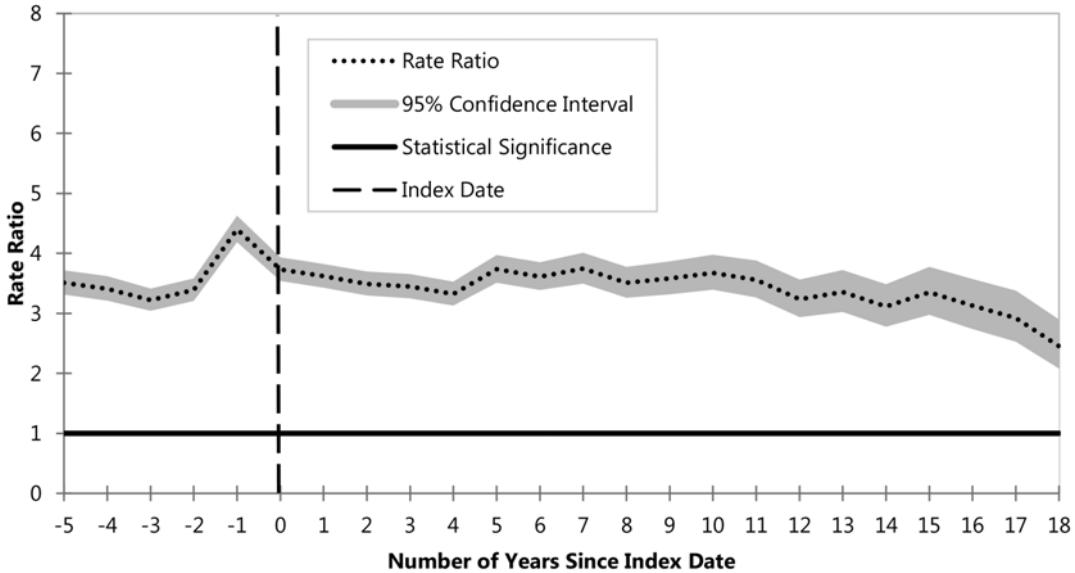
Adjusted Rate Ratios



* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.
† AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 7.12: Comparing Rates of Any Charge* for Males with AUD† (cases) and Males without AUD (matches), Before and After Index Date

Adjusted Rate Ratios

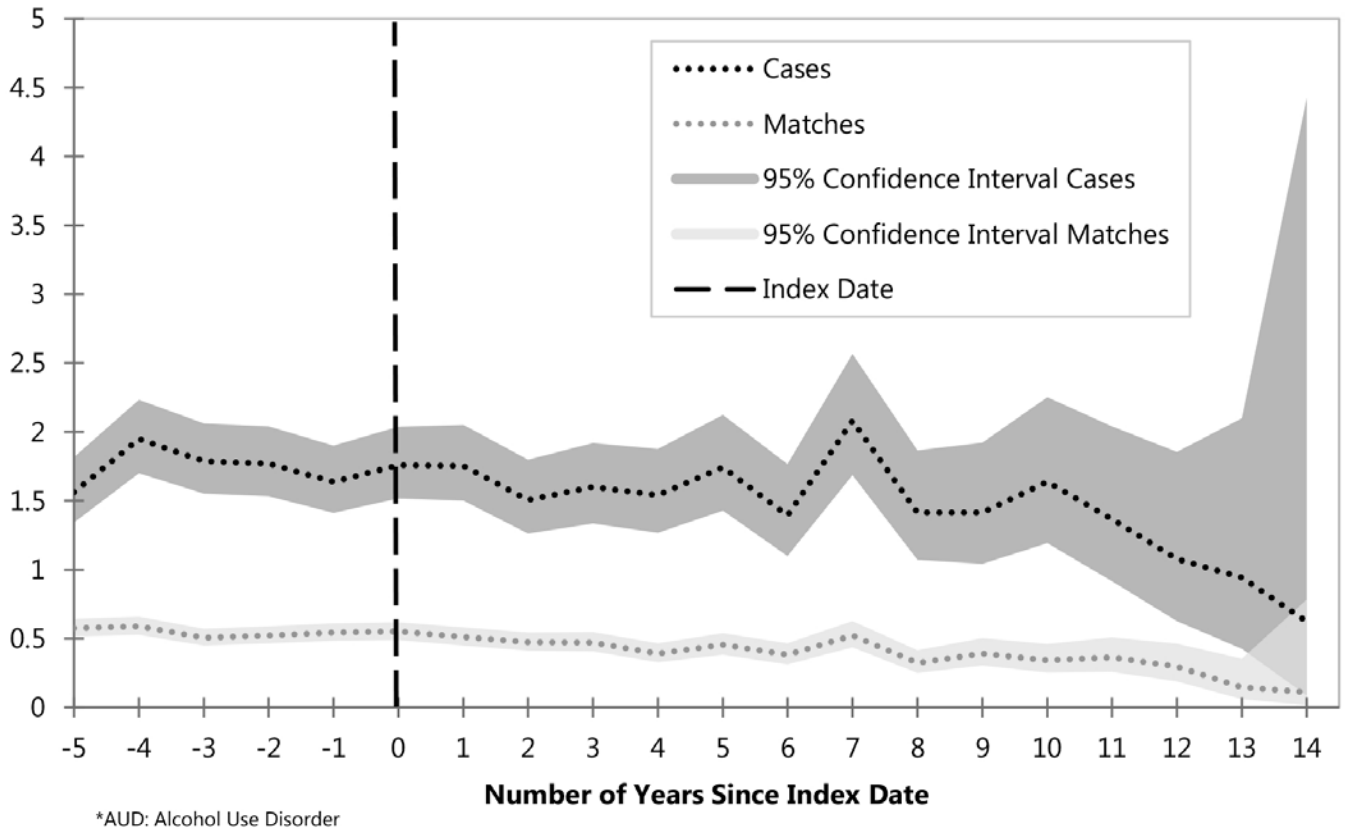


* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.
† AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Social Housing

We found that cases consistently had a higher rate of moving into social housing compared with their matches. Among female cases, there were between 1.37 and 2.08 new instances of moving into social housing per 100 person-years from five years before to 11 years after index date. After that, the rate of moving into social housing among female cases declined and the confidence intervals became increasingly wide (Figure 7.13). Among male cases, the rate of moving into social housing was considerably less; this likely reflects priority given to single mothers. The rate ranged between 0.91 new instances per 100 person-years during the index year to 0.32 new instances per 100 person-years at 11 years after diagnosis (Figure 7.14). We observed an elevated rate of moving into social housing during the index year among male cases; among these men, the rate of going into social housing was 57% higher in the index year than at five years before index year (0.91 vs. 0.58 new cases per 100 person-years). We did not observe a similar spike among female cases corresponding with the index year.

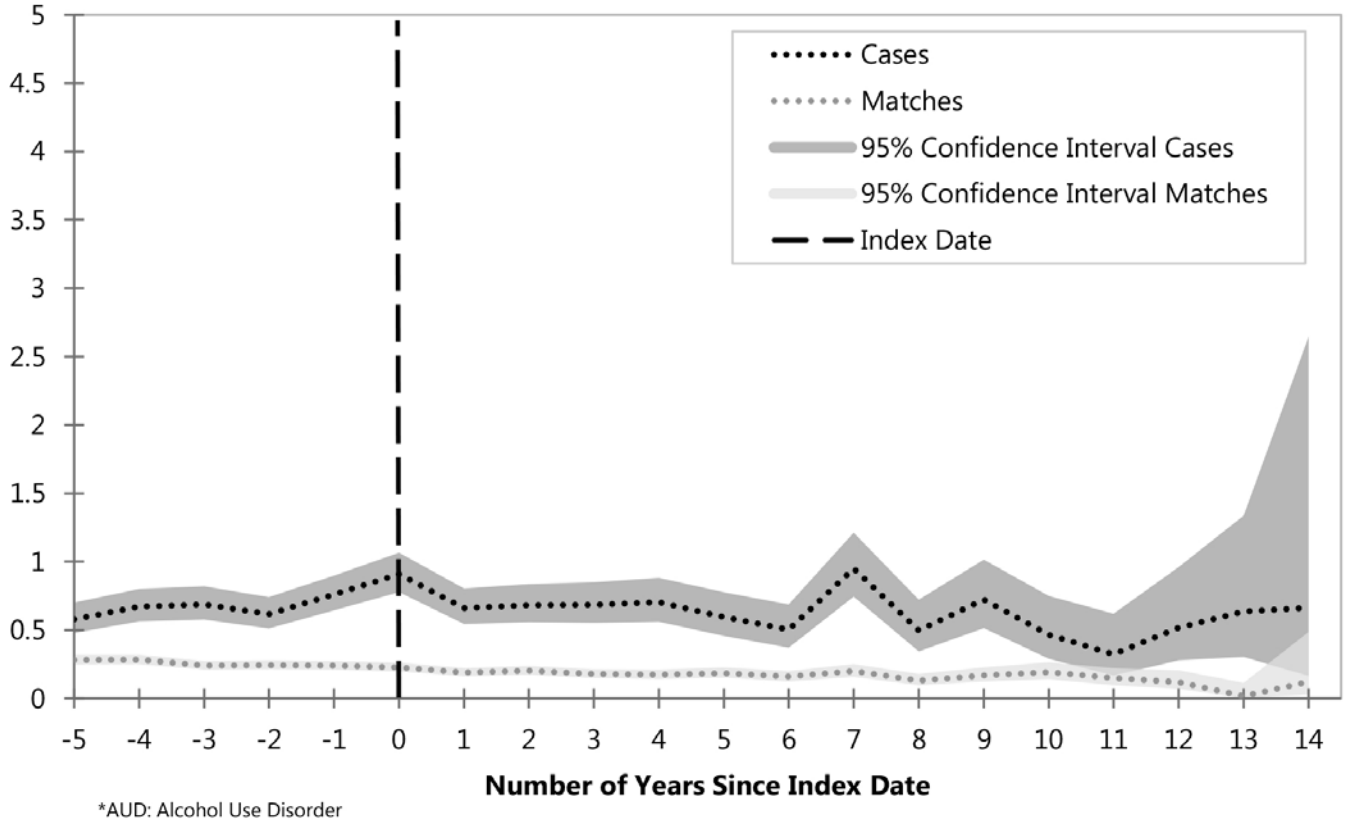
Figure 7.13: Crude Rate of Moving into Social Housing for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Per 100 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Cohort restricted to female individuals with an index date in 2000 or later

Figure 7.14: Crude Rate of Moving into Social Housing for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100 person-years

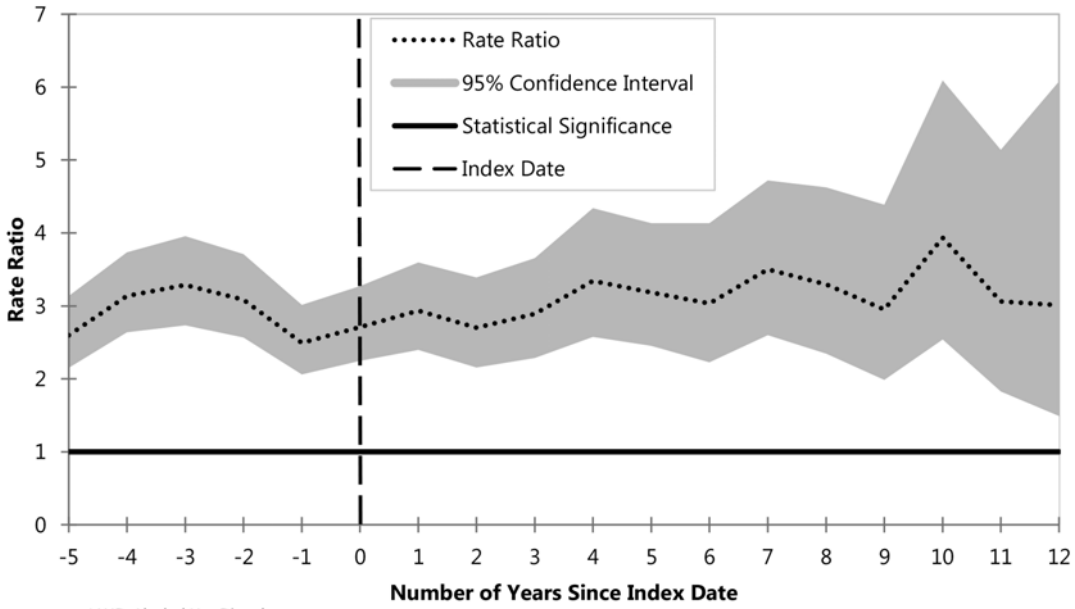


*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Cohort restricted to male individuals with an index date in 2000 or later

Figures 7.15 and 7.16 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. We found that the relative differences in moving into social housing between cases and matches were similar for females and males. Among males, we observed a slight peak corresponding with the index year, which we did not observe among females. However, we saw significant variation in the rate ratios over time for both females and males.

Figure 7.15: Comparing Rates of Moving into Social Housing for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

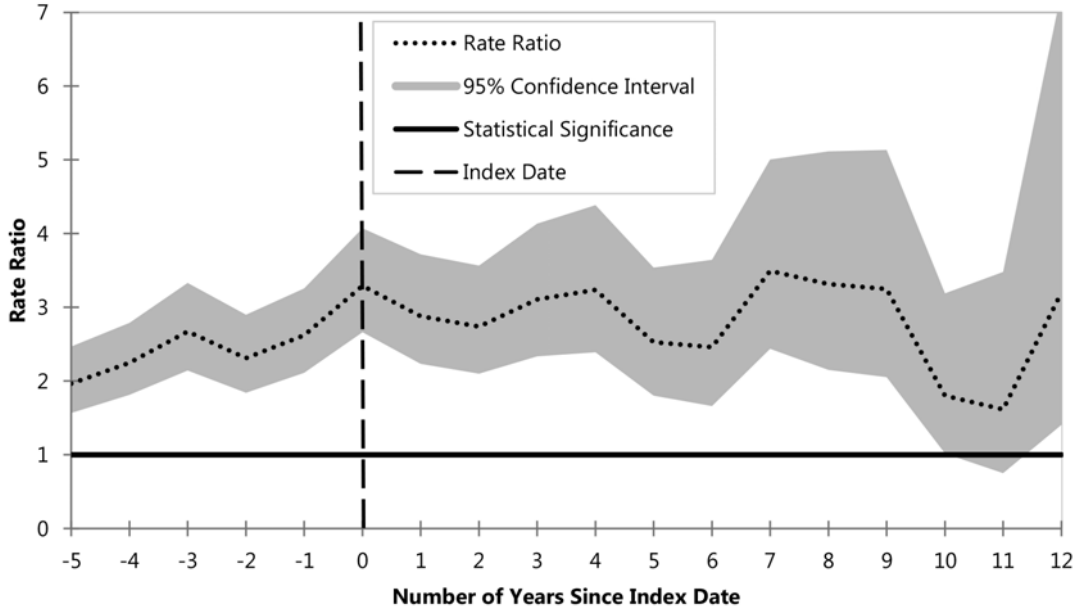
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)
Cohort restricted to female individuals with an index date in 2000 or later

Figure 7.16: Comparing Rates of Moving into Social Housing for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios



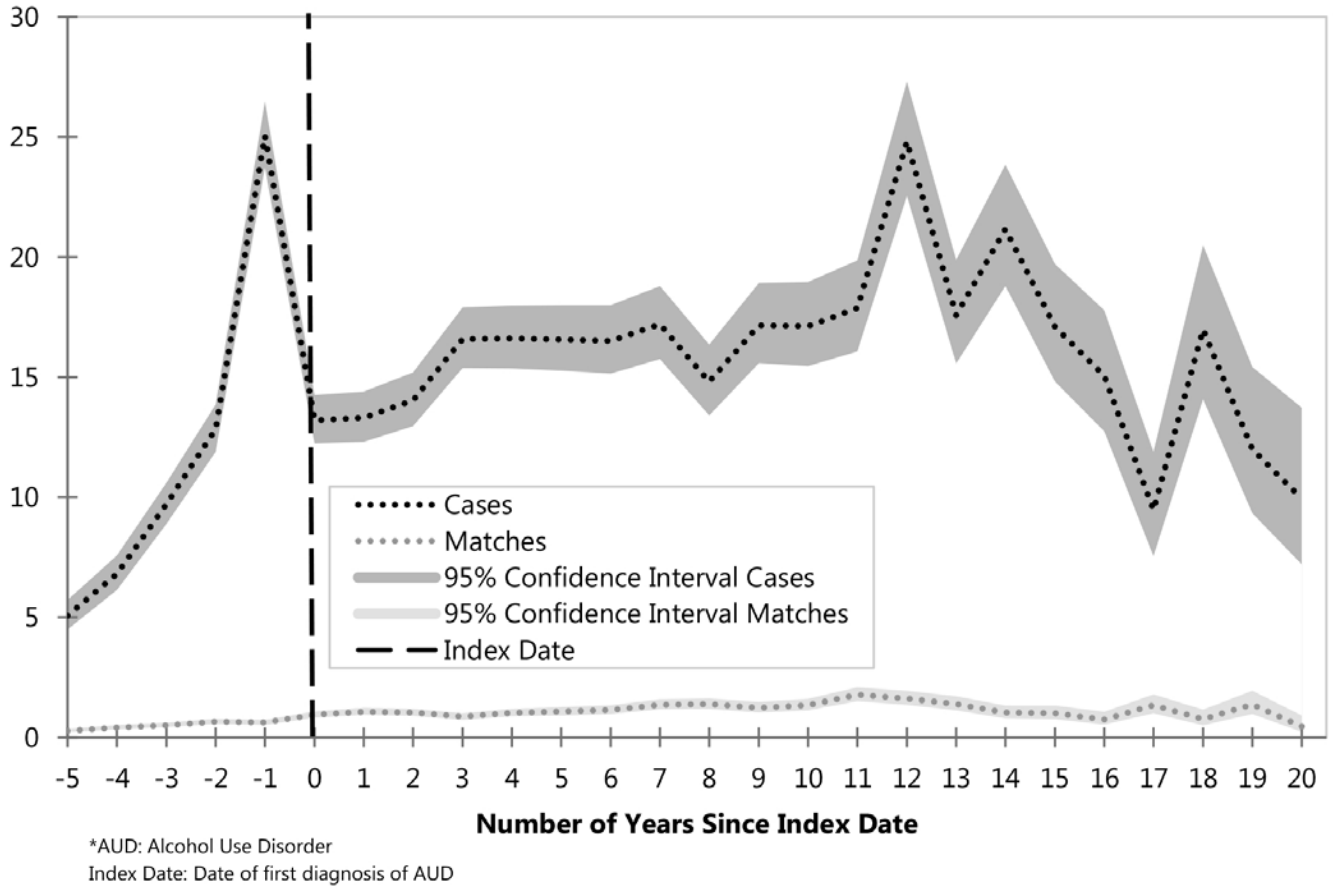
*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)
Cohort restricted to male individuals with an index date in 2000 or later

Children Taken into Care

Over the course of the study, female cases had a higher risk of having a child taken into care of Child and Family Services compared with their matches (Figure 7.17). At five years before the index date, cases had 5.07 events per 100 person-years in which their child was taken into care. This rate steadily climbed until one year before index date when 25.06 children were taken into care for every 100 person-years; this was more than 394% higher when compared with the rate five years before index date. In comparison, female matches had substantially lower rates, which were consistently about one child taken into care for every 100 person-years.

Figure 7.17: Crude Rate of Children Being Taken into Care of Child and Family Services for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

Per 100 person-years

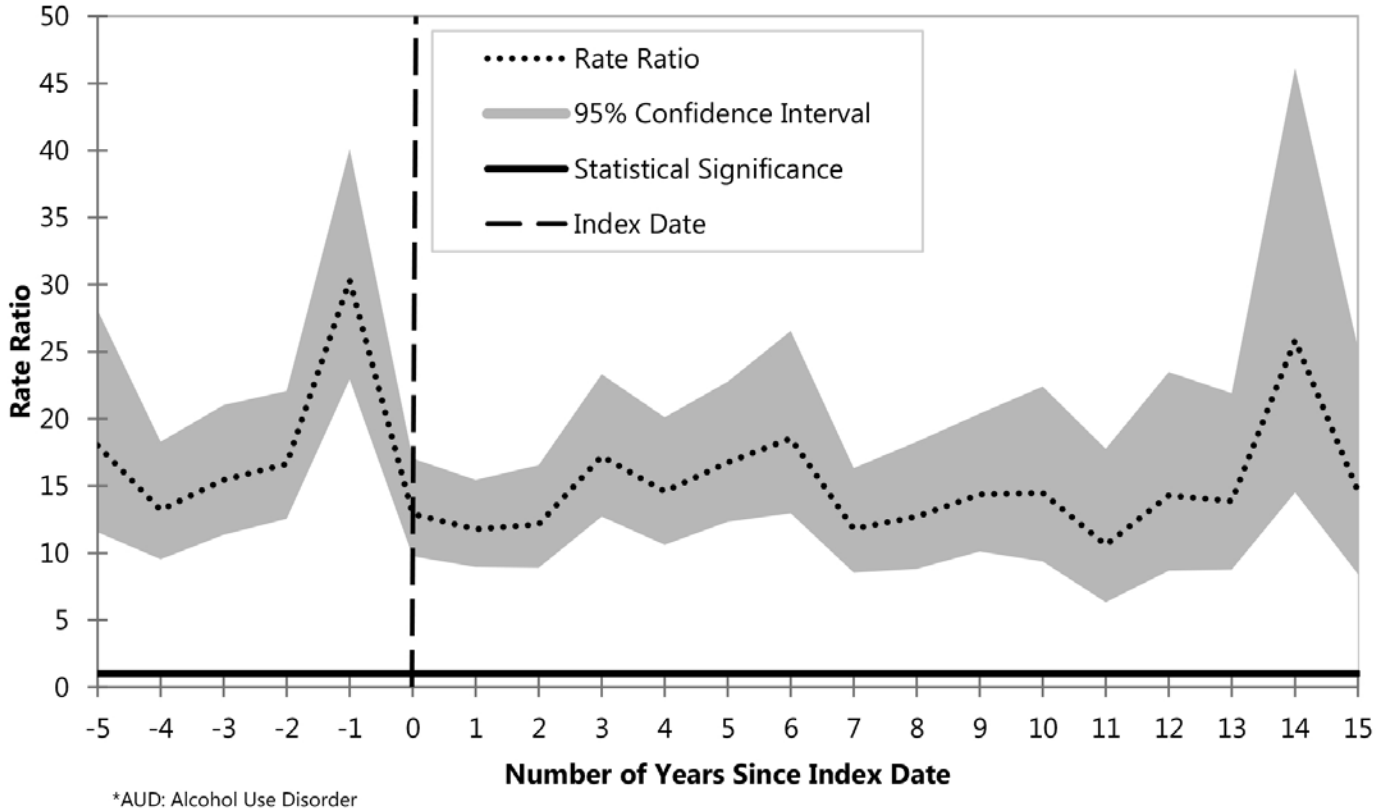


*AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Figure 7.18 shows modeled comparisons between female cases and matches after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. Even after adjustment, at five years before index date, female cases had their children taken into care at 18 times the rate of their matches. During the year before index date, female cases had their children taken into care at a rate 30.31 times the rate of their matches.

Figure 7.18: Comparing Rates of Children Being Taken into Care of Child and Family Services for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Income Assistance

Figures 7.19 and 7.20 show the rate of starting to receive income assistance for the first time in a one year period among females and males, respectively. Cases had a significantly higher rate of starting to receive income assistance across the entire observation period from five years before to 20 years after index date or until they turned 65 and were no longer eligible to receive income assistance. The rate among female cases was 3.56 times higher than among their matches at five years before index date (18.54 vs. 5.21 per 100 person-years, respectively). The rate was lowest at four years before the index date: 16.03 per 100 person-years among female cases. After this time point, the rate of starting income assistance steadily increased until nine years after the index date, when they had the greatest likelihood of starting income assistance (a rate of 26.28 per 100 person-years). We observed a similar pattern among males. At four years before index date, we observed the lowest rate of starting to receive income assistance among male cases: 6.95 per 100 person-years. The rate steadily increased until 10 years after the index date when male cases had the greatest likelihood of starting income assistance (a rate of 14.10 per 100 person-years). The relative difference between cases and matches was greater among females than among males. Female cases had rates between 3.54 and 5.96 times higher than their matches; male cases had rates between 2.47 and 5.59 times greater than their matches.

Figure 7.19: Crude Rate of Starting to Receive Income Assistance for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

Per 100 person-years

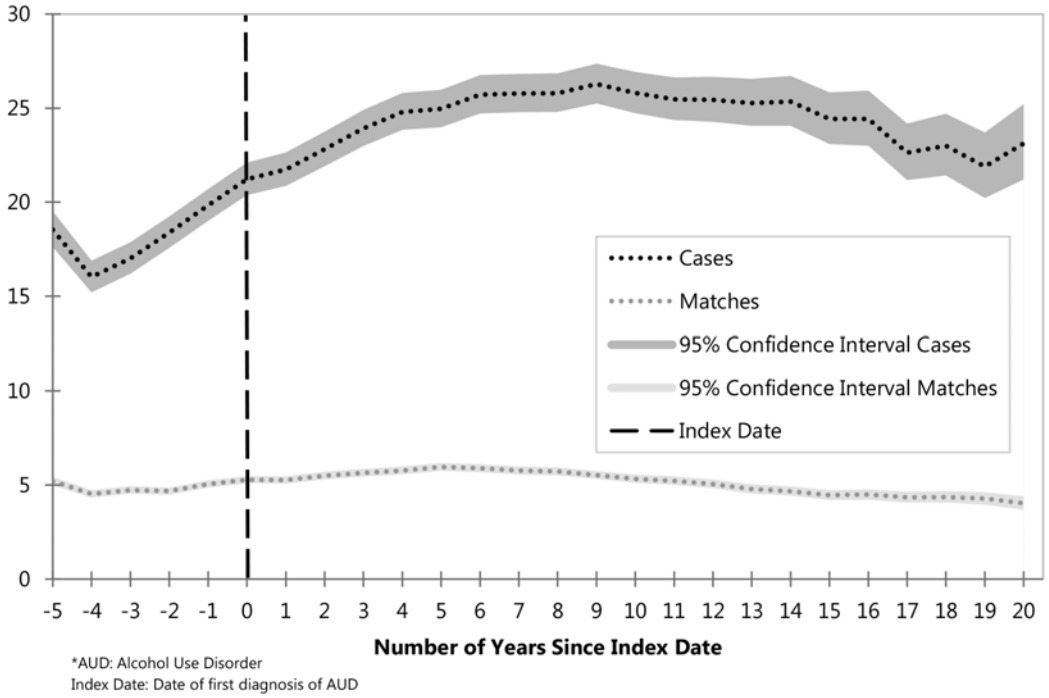
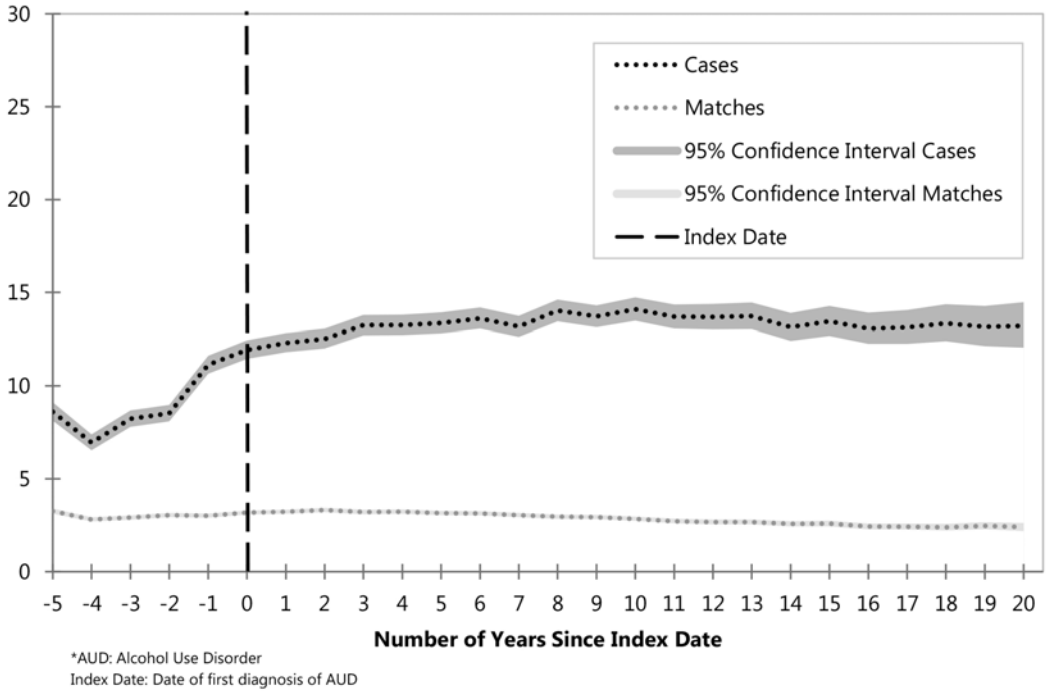


Figure 7.20: Crude Rate of Starting to Receive Income Assistance for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100 person-years

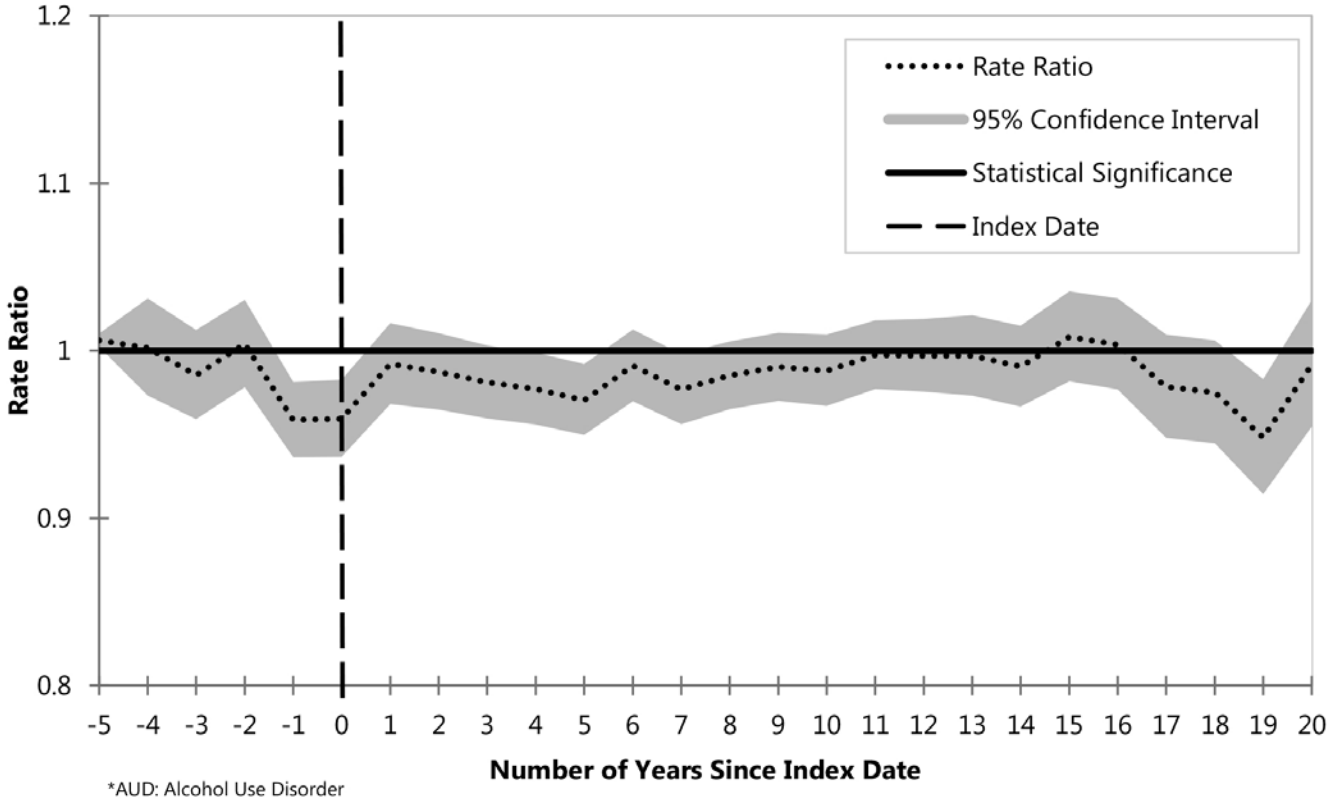


Figures 7.21 and 7.22 show modeled comparisons between cases and matches for females and males, respectively, after adjusting for age, sex, time-varying postal code of residence (a proxy for neighbourhood-level income), and time-varying mental disorder comorbidities. After this adjustment, we found that many of the differences between cases and matches disappeared. Among females, the rate ratios comparing cases and matches ranged between 0.95 and 1.01. Among males, the rate ratios ranged between 0.86 and 1.00. While the relative comparisons for both sexes were considerably closer to 1.0 (i.e., no difference) than they were for other indicators we measured, there was a low rate ratio for going onto income assistance during the index year. These findings, at first appearance, seem to run counter to the other social indicators presented in this chapter. However, this discrepancy could be affected by the following factors:

1. In order to receive income assistance, one must actively apply for assistance. It may be that individuals who are diagnosed with an AUD are dealing with other ramifications associated with their alcohol consumption that prevent them from seeking income assistance; and
2. Many of the differences between cases and matches in receipt of income assistance are confounded by differing mental disorder comorbidities and SES between the two groups. Adjusting for these confounders reduces many of the observed differences in the crude analyses.

Figure 7.21: Comparing Rates of Receiving Income Assistance for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

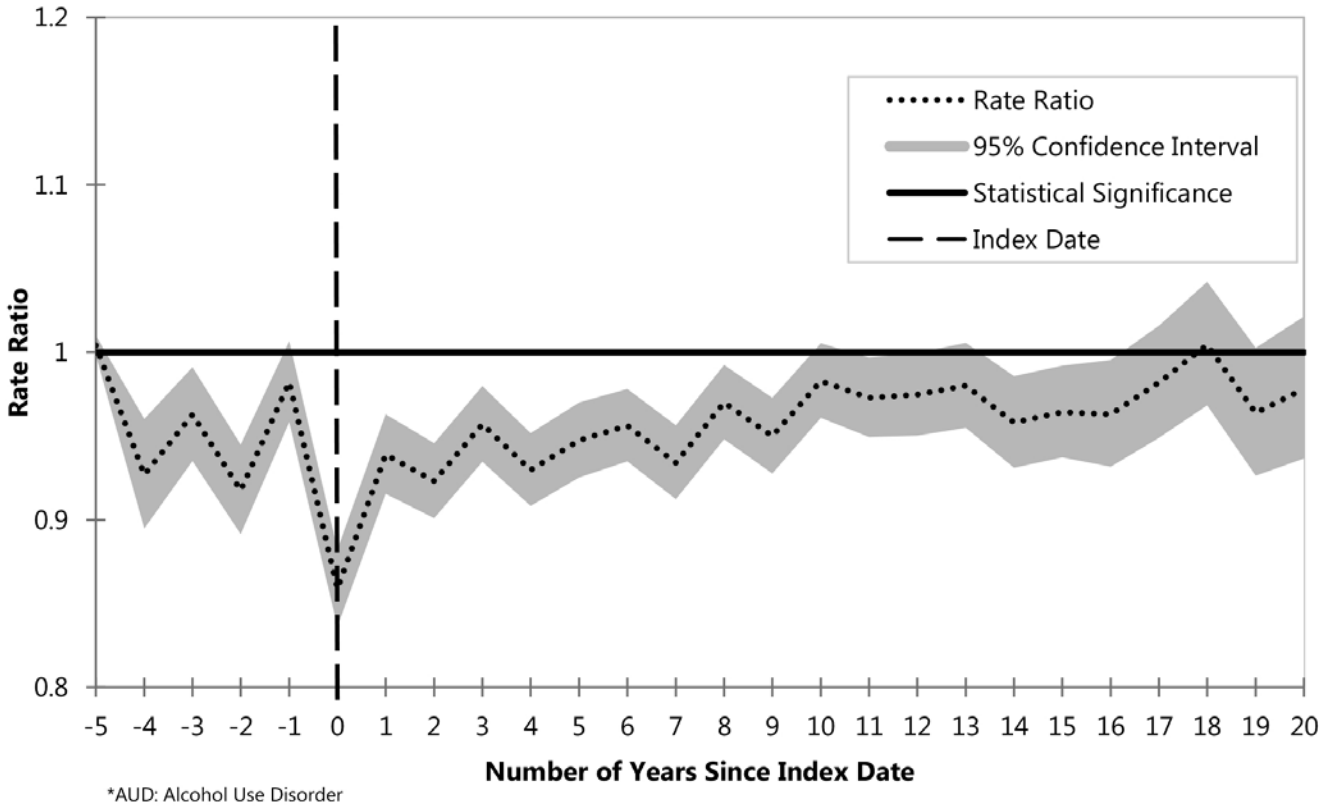
Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Figure 7.22: Comparing Rates of Receiving Income Assistance for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Adjusted rate ratios



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
Adjusted for mental disorders, age at diagnosis, region of residence, and postal code (neighbourhood-level income)

Conclusions

When considering the findings of this chapter, it is imperative that we remember that there are a multitude of reasons for why an individual may develop an AUD and why they may experience the social outcomes we examined; we may not have accounted for all of these reasons in our analyses. Some examples include sexual abuse, intimate partner violence, historical and intergenerational trauma, systemic and structural racism, etc. The complexity and interrelatedness of these factors should give us pause. Social outcomes associated with AUDs are wide-sweeping, demonstrating that we need to do better at supporting individuals living at the intersection of marginalizing circumstances that may place them at increased risk for developing an AUD. We need integrated strategies that address the social and structural determinants of both AUDs and the associated outcomes.

Summary of Key Findings

1. For DWI and for any justice involvement, an elevated rate of charges occurred during the year prior to the index date. For domestic/family violence charges, the increased rate of justice involvement aligned with the index year. Differences in justice charges were attenuated after adjusting for factors such as mental disorder comorbidities and socioeconomic status.
2. Male cases had higher rates of justice involvement than female cases. On average, male and female cases had higher rates of justice system involvement compared with their matches, even after adjusting for factors such as mental disorder comorbidities and socioeconomic status. The relative differences in the rate of domestic/family violence charges between cases and matches was greater among females than among males. For the other justice indicators – DWI and any charge – the relative differences between cases and matches was greater among females. One explanation for this finding is that the base-rate of justice involvement among female matches was lower than among male matches. It also appears, though, that the relative impact of having an AUD on justice involvement may be stronger among females than among males.
3. We found an elevated rate of moving into social housing when comparing cases with matches. After adjusting for mental disorder comorbidities and socioeconomic status, we saw that female and male cases had higher rates of going into social housing compared with their matches. However, we did not see much of a spike in the index year or the year prior to the index year, as we did with the justice involvement indicators.
4. Having an AUD was associated with having a child taken into the care of Child and Family Services. After adjusting for mental disorder comorbidities and socioeconomic status, we saw that female cases had a higher rate of having their child taken into care compared with their matches. During the year prior to the index date, female cases had a 30 times higher rate of having their child taken into care compared with their matches.
5. Finally, although there were statistically significantly higher rates of starting to receive income assistance among cases compared with their matches, these differences became non-significant once we adjusted for mental disorder comorbidities.

Taken together, these results point to the long-lasting and broad-sweeping social outcomes associated with AUDs. Individuals with AUDs have the greatest need for social services during the year prior to or year of diagnosis, pointing to the necessity of cross-sector supports that can better serve these individuals.

Chapter Eight:

Outcomes Associated with Exceeding Recommended Low-Risk Drinking Limits

The previous chapters examined outcomes among people with an indication for an alcohol use disorder (AUD) and their matches. We recognized, however, that using an administrative data-based approach to identify people who drink excessively would substantially underestimate the potential burden alcohol use places on the healthcare system and social services. We therefore turned to the survey data housed in the Manitoba Population Research Data Repository (Repository) to examine associations between self-reported drinking behaviours, healthcare use and social services use outcomes.

The Repository is unique in its ability to link – at the individual-level and in a de-identified way – an individual's self-reported behaviours with their specific, individual administrative records documenting contacts with not only the healthcare system, but the justice system, social housing, and income assistance.

Using data from the Canadian Community Health Survey (CCHS), we defined two exposure groups:

1. Individuals whose self-reported alcohol consumption exceeded the recommended low-risk daily drinking guidelines; and
2. Individuals whose self-reported alcohol consumption exceeded the recommended low-risk weekly drinking guidelines.

For females, we classified a respondent as exceeding the daily limit if she reported that she consumed more than two drinks per day, and we classified her as exceeding the weekly limit if she reported consuming more than 10 drinks per week. For males, we classified a respondent as exceeding the daily limit if he exceeded three drinks per day, and we classified him as exceeding the weekly limit if he reported consuming more than 15 drinks per week.

We constructed two sets of models: the first set modeled the outcomes associated with exceeding the recommended low-risk daily limit for alcohol use and the second modeled outcomes associated with exceeding the recommended low-risk weekly limits for alcohol consumption. For both sets of models, our exposure variable was a dichotomous indicator of whether or not the survey respondent exceeded the daily or weekly limits, respectively.

We conducted time-to-event analyses that modeled the time between the date when the respondent answered the survey and the first time the respondent experienced the outcome of interest. Time-to-event analyses allow one to account for both differing follow-up time and situations where the respondent never experiences the outcome of interest. We constructed weighted Cox proportional hazards regression models to produce hazard ratios, which provide an estimate for the relative comparison between the

rate of the outcome between those who did and those who did not exceed recommended low-risk drinking limits. Hazard ratios provide a measure of the excess risk associated with the exposure; an adjusted hazard ratio provides a measure of risk, after adjusting for measured covariates.

We bootstrapped the standard errors based on the survey sampling frame and used 95% confidence intervals on the time-to-event models to determine statistical significance. When the interval included 1.0, we concluded that there was not sufficient evidence to support a difference in risk between those who did and those who did not exceed the recommended limits. When the 95% confidence interval excluded 1.0, we concluded that the data supported the conclusion that those who exceeded the recommended limits for alcohol consumption had differential outcomes when compared with those who did not exceed the limits.

In this chapter, we look at whether the outcomes listed in Table 8.1 are associated with exceeding the recommended low-risk daily and weekly drinking limits.

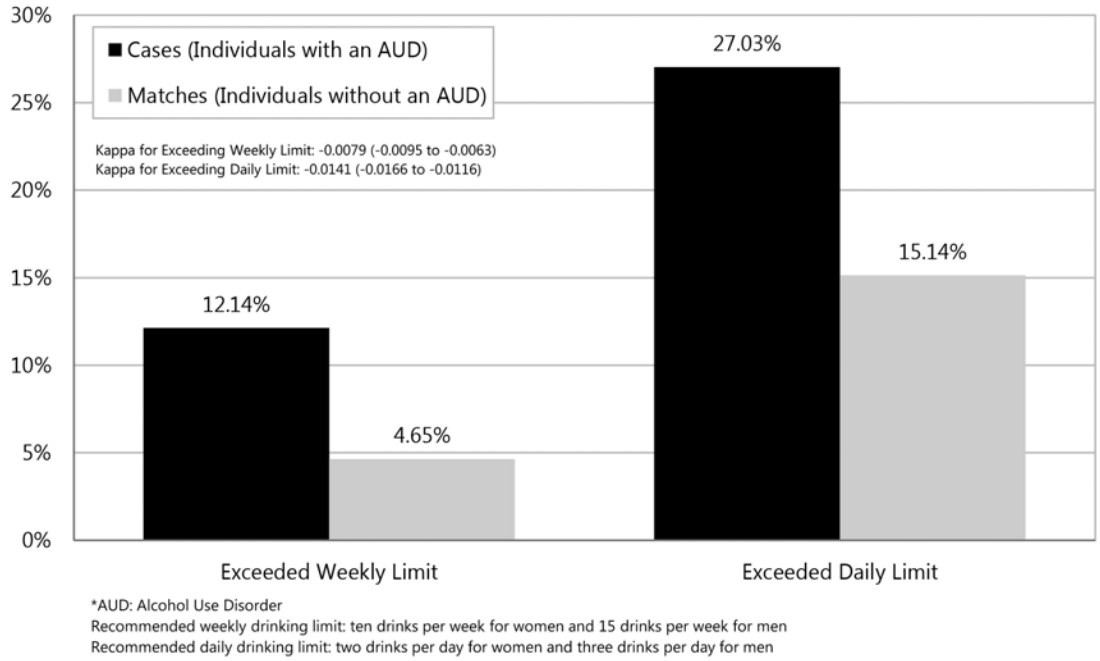
Table 8.1: Measured Outcome Variables

Healthcare Outcomes	
• Hospitalizations for Motor Vehicle Collisions • Hospitalizations for Injury	• Admissions to Intensive Care Unit • Emergency Department Visits
Justice Outcomes	
• Driving While Intoxicated • Domestic/Family Violence	• Any Charge in the Justice Data
Social Service Use Outcomes	
• Social Housing	• Income Assistance

Self-Reported Drinking and AUD Diagnoses

Before starting the comparative analyses, we first examined whether there was a correlation between individuals whose self-reported drinking exceeded the daily/weekly limits and having an AUD diagnosis (Figure 8.1). Our survey analysis cohort comprised 37,490 individuals. Just over 5% (n=1,885) exceeded the weekly limits for drinking and 15.74% exceeded the daily limits (n=5,901). Out of the 37,490 respondents, 1,887 had a diagnosis for an AUD (5.03%). Those who exceeded the weekly limit were 2.1 times more likely to also have an AUD diagnosis compared with respondents whose drinking did not exceed the weekly limits (12.1% vs. 4.7%, respectively). We found a similar pattern when looking at the daily limits; those who exceeded the daily limits were 1.8 times more likely to have an AUD diagnosis compared with those whose drinking did not exceed the daily limits (27.0% vs 15.1%).

Figure 8.1: Percentage of Individuals With and Without an AUD* who Exceeded the Recommended Low-Risk Daily and Weekly Alcohol Consumption Limit



Hospitalizations for Motor Vehicle Collisions

We examined differences in hospitalizations based on self-reported alcohol consumption (Tables 8.2 and 8.3); models adjusted for several additional characteristics. We first looked at differences in hospitalizations due to motor vehicle collisions. After adjusting for sex, area-level socioeconomic status, and region of residence, there were no statistically significant differences in hospitalizations due to motor vehicle collisions associated with exceeding the daily or weekly recommended limit for alcohol consumption.

Table 8.2: Risk of Hospitalization for Motor Vehicle Collisions among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.12 (0.69-1.84)
Adjusted for	
Sex (ref = Female)	
Male	**1.82 (1.21-2.73)**
Age (continuous)	
	0.99 (0.98-1.00)
Income Quintile (ref = Q5 (highest))	
Q1	**2.14 (1.07-4.29)**
Q2	1.36 (0.66-2.80)
Q3	0.98 (0.50-1.95)
Q4	1.62 (0.80-3.30)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**2.36 (1.43-3.89)**
Prairie Mountain	**2.10 (1.32-3.34)**
Interlake-Eastern	**1.86 (1.07-3.21)**
Northern	1.41 (0.77-2.58)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.3: Risk of Hospitalization for Motor Vehicle Collisions among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.34 (0.71-2.55)
Adjusted for	
Sex (ref = Female)	
Male	**1.82 (1.20-2.74)**
Age (continuous)	
	0.99 (0.98-1.00)
Income Quintile (ref = Q5 (highest))	
Q1	**2.14 (1.07-4.30)**
Q2	1.37 (0.67-2.80)
Q3	0.98 (0.50-1.95)
Q4	1.62 (0.80-3.30)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**2.36 (1.42-3.91)**
Prairie Mountain	**2.11 (1.33-3.36)**
Interlake-Eastern	**1.87 (1.08-3.24)**
Northern	1.40 (0.77-2.57)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Hospitalizations for Injury

We also tested for differences in hospitalizations for injury associated with exceeding the daily and weekly limits for alcohol consumption (Tables 8.4 and 8.5). Again, we found no differences between those who exceeded and who did not exceed the limits.

Table 8.4: Risk of Hospitalization for Injury among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.02 (0.83-1.25)
Adjusted for	
Sex (ref = Female)	
Male	1.10 (0.97-1.25)
Age (continuous)	
	1.04 (1.04-1.04)
Income Quintile (ref = Q5 (highest))	
Q1	**1.92 (1.52-2.41)**
Q2	**1.36 (1.10-1.68)**
Q3	**1.38 (1.11-1.71)**
Q4	1.16 (0.92-1.46)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**1.25 (1.07-1.46)**
Prairie Mountain	**1.36 (1.18-1.56)**
Interlake-Eastern	**1.24 (1.02-1.52)**
Northern	**1.66 (1.21-2.27)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.5: Risk of Hospitalization for Injury among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.24 (0.92-1.67)
Adjusted for	
Sex (ref = Female)	
Male	1.09 (0.97-1.24)
Age (continuous)	
	1.04 (1.04-1.04)
Income Quintile (ref = Q5 (highest))	
Q1	**1.92 (1.53-2.42)**
Q2	**1.36 (1.11-1.68)**
Q3	**1.38 (1.12-1.71)**
Q4	1.16 (0.92-1.46)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**1.25 (1.07-1.47)**
Prairie Mountain	**1.36 (1.18-1.57)**
Interlake-Eastern	**1.25 (1.02-1.52)**
Northern	**1.66 (1.21-2.26)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Admissions to Intensive Care Unit

Finally, we looked at differences in admission to the intensive care unit associated with exceeding the daily and weekly limits for alcohol consumption (Tables 8.6 and 8.7). We did not find a statistically significant relationship between exceeding the recommended low-risk drinking limits and admission to the intensive care unit.

Table 8.6: Risk of Admission to Intensive Care Unit among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	0.83 (0.60-1.15)
Adjusted for	
Sex (ref = Female)	
Male	**2.02 (1.77-2.32)**
Age (continuous)	
	1.05 (1.04-1.05)
Income Quintile (ref = Q5 (hightest))	
Q1	**1.59 (1.26-2.01)**
Q2	**1.46 (1.14-1.86)**
Q3	**1.38 (1.09-1.74)**
Q4	**1.30 (1.01-1.66)**
Health Region (ref = Winnipeg)	
Southern Health/Santé Sud	**1.45 (1.21-1.75)**
Prairie Mountain	1.01 (0.86-1.20)
Interlake-Eastern	**1.45 (1.19-1.77)**
Northern	**1.68 (1.23-2.29)**
Resource Utilization Band (RUB)	
	1.35 (1.25-1.45)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.7: Risk of Admission to Intensive Care Unit among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.13 (0.64-1.97)
Adjusted for	
Sex (ref = Female)	
Male	**2.00 (1.75-2.29)**
Age (continuous)	
	1.05 (1.05-1.05)
Income Quintile (ref = Q5 (hightest))	
Q1	**1.60 (1.26-2.02)**
Q2	**1.46 (1.14-1.86)**
Q3	**1.38 (1.09-1.74)**
Q4	**1.30 (1.01-1.66)**
Health Region (ref = Winnipeg)	
Southern Health/Santé Sud	**1.46 (1.22-1.76)**
Prairie Mountain	1.01 (0.86-1.20)
Interlake-Eastern	**1.45 (1.19-1.76)**
Northern	**1.68 (1.23-2.28)**
Resource Utilization Band (RUB)	
	1.35 (1.26-1.46)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Across all analyses examining hospital service use associated with exceeding the daily and weekly limits for alcohol consumption, we found that the most significant factors were socioeconomic status and region of residence. Residing in neighbourhoods of low socioeconomic status and living in the Northern Health Region were consistently associated with excess hospital service use, but exceeding the weekly or daily limits for alcohol consumption was not.

Emergency Department Visits

Tables 8.8 and 8.9 show the association between exceeding the daily and weekly recommended limits for alcohol consumption and visits to the emergency department (ED), respectively. We did not find any differences in risk for ED visits between those who did and those who did not exceed the daily or weekly drinking limits. Again, we found that the most significant predictor of ED visits was the income quintile for the neighbourhood where the respondent lived. We also found that prior health service use, as measured by the resource utilization band (RUB), was a significant risk factor for using the ED.

Table 8.8: Risk of Emergency Department Visit among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI, Winnipeg Residents Only

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	0.98 (0.89-1.09)
Adjusted for	
Sex (ref = Female)	
Male	1.06 (0.98-1.15)
Age (continuous)	
	1.00 (1.00-1.01)
Income Quintile (ref = Q5 (highest))	
Q1	**1.37 (1.22-1.55)**
Q2	**1.27 (1.13-1.43)**
Q3	**1.26 (1.11-1.42)**
Q4	**1.16 (1.03-1.31)**
Resource Utilization Band (RUB)	
	1.26 (1.21-1.31)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.9: Risk of Emergency Department Visit among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI, Winnipeg Residents Only

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.10 (0.92-1.31)
Adjusted for	
Sex (ref = Female)	
Male	1.06 (0.97-1.15)
Age (continuous)	
	1.00 (1.00-1.01)
Income Quintile (ref = Q5 (highest))	
Q1	**1.38 (1.22-1.55)**
Q2	**1.27 (1.13-1.43)**
Q3	**1.25 (1.11-1.42)**
Q4	**1.16 (1.03-1.31)**
Resource Utilization Band (RUB)	
	1.26 (1.21-1.31)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Driving While Intoxicated

We looked at the association between exceeding the daily and weekly recommended limits for alcohol consumption and being charged with a DWI (Tables 8.10 and 8.11). Individuals who self-reported that they exceeded the recommended daily limit for alcohol consumption had three and a half times the risk for being charged with a DWI (adjusted hazard ratio 3.57; 95% CI 2.62-4.85) compared to individuals who reported that they did not exceed the daily limit. Individuals who exceeded the weekly limit had 3.29 times the risk of being charged with a DWI (95% CI 2.24 – 4.84) compared to individuals who reported that they did not exceed the weekly limit. The strongest predictor for being charged with a DWI was being male, and exceeding the daily or weekly limit was the second strongest predictor.

Table 8.10: Risk of First Charge for Driving While Intoxicated among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	**3.57 (2.62-4.85)**
Adjusted for	
Sex (ref = Female)	
Male	**3.91 (2.58-5.94)**
Age (continuous)	
	0.97 (0.96-0.99)
Education (ref = Post-Secondary Graduate)	
Not a High School Graduate	**2.09 (1.38-3.16)**
High School Graduate/Some Post-Secondary	1.16 (0.73-1.85)
Marital Status (ref = Married/Commonlaw)	
Single, Never Married	**1.65 (1.06-2.57)**
Separated/Divorced/Widowed	1.55 (0.94-2.55)
Mental Disorder Diagnosis (ref = No)	
	1.77 (1.14-2.73)
Income Quintile (ref = Q5 (highest))	
Q1	0.92 (0.54-1.57)
Q2	0.91 (0.52-1.58)
Q3	1.22 (0.72-2.05)
Q4	0.95 (0.56-1.62)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**1.68 (1.06-2.65)**
Prairie Mountain	**1.52 (1.02-2.26)**
Interlake-Eastern	**2.18 (1.44-3.28)**
Northern	**1.65 (1.01-2.70)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.11: Risk of First Charge for Driving While Intoxicated among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	**3.29 (2.24-4.84)**
Adjusted for	
Sex (ref = Female)	
Male	**4.14 (2.70-6.35)**
Age (continuous)	
	0.97 (0.96-0.98)
Education (ref = Post-Secondary Graduate)	
Not a High School Graduate	**1.90 (1.25-2.87)**
High School Graduate/Some Post-Secondary	1.17 (0.73-1.85)
Marital Status (ref = Married/Commonlaw)	
Single, Never Married	**1.62 (1.03-2.56)**
Separated/Divorced/Widowed	1.58 (0.96-2.59)
Mental Disorder Diagnosis (ref = No)	
	1.68 (1.08-2.60)
Income Quintile (ref = Q5 (highest))	
Q1	0.92 (0.54-1.58)
Q2	0.93 (0.54-1.62)
Q3	1.25 (0.74-2.11)
Q4	0.97 (0.57-1.66)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**1.61 (1.02-2.53)**
Prairie Mountain	**1.62 (1.08-2.41)**
Interlake-Eastern	**2.29 (1.52-3.46)**
Northern	**1.72 (1.06-2.80)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Domestic/Family Violence

Tables 8.12 and 8.13 show results from analyses that looked at the relationship between being charged with domestic/family violence and exceeding the daily and weekly limits for alcohol consumption, respectively. In both sets of analyses, exceeding the daily and weekly limits was not significantly associated with having a domestic/family violence charge; however, being male and having a mental disorder diagnosis were both significant predictors. As well, being younger and being from the lowest income quintile were significantly associated with having a domestic/family violence charge.

Table 8.12: Risk of First Charge for Domestic/Family Violence among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.60 (0.88-2.89)
Adjusted for	
Sex (ref = Female)	
Male	**3.04 (1.49-6.17)**
Age (continuous)	
	0.94 (0.91-0.96)
Education (ref = Post-Secondary Graduate)	
Not a High School Graduate	2.15 (0.92-5.04)
High School Graduate/Some Post-Secondary	1.43 (0.57-3.57)
Marital Status (ref = Married/Common-law)	
Single, Never Married	0.49 (0.23-1.07)
Separated/Divorced/Widowed	1.52 (0.51-4.56)
Mental Disorder Diagnosis (ref = No)	
	2.52 (1.24-5.08)
Income Quintile (ref = Q5 (highest))	
Q1	**4.09 (1.64-10.17)**
Q2	1.35 (0.52-3.54)
Q3	1.32 (0.39-4.50)
Q4	0.38 (0.06-2.34)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis
Due to data limitations, the charge of domestic/family violence is only captured for charges made by the Winnipeg Police Service; however, an individual does not have to be a Winnipeg resident to be charged with this violation
Note: To enable convergence of this regression model, we combined persons with missing average household income with group Q1. In other models, these people were included as their own separate group but the data were not presented as this group makes up 0.33% of the AUD cohort.

Table 8.13: Risk of First Charge for Domestic/Family Violence among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.75 (0.75-4.05)
Adjusted for	
Sex (ref = Female)	
Male	**3.03 (1.49-6.17)**
Age (continuous)	
	0.94 (0.91-0.96)
Education (ref = Post-Secondary Graduate)	
Not a High School Graduate	2.14 (0.91-5.03)
High School Graduate/Some Post-Secondary	1.47 (0.59-3.69)
Marital Status (ref = Married/Common-law)	
Single, Never Married	0.49 (0.22-1.05)
Separated/Divorced/Widowed	1.51 (0.51-4.53)
Mental Disorder Diagnosis (ref = No)	
	2.50 (1.23-5.06)
Income Quintile (ref = Q5 (highest))	
Q1	**4.05 (1.62-10.09)**
Q2	1.36 (0.52-3.55)
Q3	1.31 (0.39-4.47)
Q4	0.38 (0.06-2.32)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis
Due to data limitations, the charge of domestic/family violence is only captured for charges made by the Winnipeg Police Service; however, an individual does not have to be a Winnipeg resident to be charged with this violation
Note: To enable convergence of this regression model, we combined persons with missing average household income with group Q1. In other models, these people were included as their own separate group but the data were not presented as this group makes up 0.33% of the AUD cohort.

Any Charge in the Justice System Database

We found that exceeding both the daily and weekly recommended limits for alcohol consumption was associated with increased risk for having a charge in the justice data (Tables 8.14 and 8.15). After adjusting for education, marital status, income, and region, a person who reported exceeding the daily limit for alcohol consumption had a 70% increased risk for having a charge recorded in the justice data system (95% CI 1.45 - 1.99). We found a similar relationship associated with exceeding the recommended weekly limit for alcohol consumption: adjusted hazard ratio 1.94 (95% CI 1.54 - 2.45). Other factors that were associated with increased risk included being male, having a mental disorder diagnosis, being younger, and being from either Southern Health-Santé Sud or Prairie Mountain Health regions.

Table 8.14: Risk of First Charge* among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	**1.70 (1.45-1.99)**
Adjusted for	
Sex (ref = Female)	
Male	**2.77 (2.38-3.21)**
Age (continuous)	
	0.96 (0.95-0.97)
Education (ref = Post-Secondary Graduate)	
Not a High School Graduate	**1.24 (1.05-1.46)**
High School Graduate/Some Post-Secondary	0.94 (0.79-1.12)
Marital Status (ref = Married/Common-law)	
Single, Never Married	0.93 (0.77-1.12)
Separated/Divorced/Widowed	1.25 (0.96-1.64)
Mental Disorder Diagnosis (ref = No)	
	1.65 (1.40-1.95)
Income Quintile (ref = Q5 (highest))	
Q1	**1.63 (1.32-2.00)**
Q2	0.95 (0.76-1.19)
Q3	0.89 (0.72-1.09)
Q4	1.02 (0.82-1.28)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**0.74 (0.61-0.90)**
Prairie Mountain	**0.65 (0.53-0.80)**
Interlake-Eastern	0.95 (0.79-1.15)
Northern	1.15 (0.94-1.40)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis
* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.

Table 8.15: Risk of First Charge* among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	**1.94 (1.54-2.45)**
Adjusted for	
Sex (ref = Female)	
Male	**2.80 (2.41-3.25)**
Age (continuous)	
	0.96 (0.95-0.97)
Education (ref = Post-Secondary Graduate)	
Not a High School Graduate	**1.18 (1.00-1.39)**
High School Graduate/Some Post-Secondary	0.95 (0.80-1.13)
Marital Status (ref = Married/Common-law)	
Single, Never Married	0.92 (0.76-1.11)
Separated/Divorced/Widowed	1.25 (0.96-1.63)
Mental Disorder Diagnosis (ref = No)	
	1.63 (1.38-1.93)
Income Quintile (ref = Q5 (highest))	
Q1	**1.62 (1.31-2.00)**
Q2	0.96 (0.77-1.20)
Q3	0.89 (0.72-1.09)
Q4	1.03 (0.82-1.29)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	**0.74 (0.61-0.90)**
Prairie Mountain	**0.67 (0.55-0.82)**
Interlake-Eastern	0.98 (0.81-1.18)
Northern	1.16 (0.95-1.41)

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis
* Charges in the Prosecution Information and Scheduling Management database include both criminal code violations and non-criminal code violations, such as Highway Traffic Act violations (e.g., speeding ticket). See Appendix 1 for more details.

Social Housing

We examined whether exceeding the recommended daily and weekly limits for alcohol consumption was associated with an increased likelihood of moving into social housing. Neither indicator was associated with moving into social housing. We found that being from Northern Health, Interlake-Eastern RHA, or Prairie Mountain Health was associated with an increased likelihood for moving into social housing, and that being male was associated with a decreased likelihood of moving into social housing.

Table 8.16: Risk of Moving into Social Housing among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	0.92 (0.54-1.55)
Adjusted for	
Sex (ref = Female)	
Male	**0.48 (0.32-0.70)**
Age (continuous)	
	0.99 (0.97-1.00)
Income Quintile (ref = Q4-Q5 (highest)	
Q1	**4.06 (2.51-6.55)**
Q2	**2.02 (1.18-3.45)**
Q3	**2.17 (1.02-4.64)**
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	1.04 (0.60-1.81)
Prairie Mountain	**1.84 (1.11-3.05)**
Interlake-Eastern	**1.76 (1.06-2.91)**
Northern	**3.03 (1.56-5.88)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.17: Risk of Moving into Social Housing among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.52 (0.79-2.94)
Adjusted for	
Sex (ref = Female)	
Male	**0.47 (0.31-0.70)**
Age (continuous)	
	0.99 (0.98-1.00)
Income Quintile (ref = Q4-Q5 (highest)	
Q1	**4.10 (2.55-6.60)**
Q2	**2.02 (1.18-3.45)**
Q3	**2.18 (1.02-4.66)**
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	1.05 (0.61-1.82)
Prairie Mountain	**1.83 (1.10-3.06)**
Interlake-Eastern	**1.76 (1.05-2.94)**
Northern	**3.03 (1.56-5.86)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Income Assistance

Finally, we looked at associations between starting to receive income assistance and self-reported alcohol consumption. We found that neither exceeding the daily nor weekly limits was associated with an increased likelihood of receiving income assistance.

Table 8.18: Risk of Starting to Receive Income Assistance among Individuals who Exceeded the Recommended Low-Risk Daily Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Daily Limit (ref = Did not Exceed Limit)	
Exceeded Limit	0.97 (0.67-1.40)
Adjusted for	
Sex (ref = Female)	
Male	0.91 (0.70-1.17)
Age (continuous)	
	0.96 (0.95-0.97)
Income Quintile (ref = Q5 (highest))	
Q1	**3.72 (2.40-5.76)**
Q2	**2.25 (1.44-3.51)**
Q3	**1.75 (1.10-2.77)**
Q4	0.94 (0.58-1.52)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	1.01 (0.71-1.44)
Prairie Mountain	1.15 (0.71-1.87)
Interlake-Eastern	1.36 (0.90-2.05)
Northern	**2.04 (1.43-2.91)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Table 8.19: Risk of Starting to Receive Income Assistance among Individuals who Exceeded the Recommended Low-Risk Weekly Alcohol Limit Compared to Those who did not
Survey Weighted, 95% CI

Parameter	Hazard Ratio
Exceeded Weekly Limit (ref = Did not Exceed Limit)	
Exceeded Limit	1.38 (0.79-2.41)
Adjusted for	
Sex (ref = Female)	
Male	0.89 (0.69-1.16)
Age (continuous)	
	0.96 (0.95-0.97)
Income Quintile (ref = Q5 (highest))	
Q1	**3.76 (2.42-5.83)**
Q2	**2.26 (1.45-3.53)**
Q3	**1.76 (1.11-2.78)**
Q4	0.94 (0.58-1.52)
Health Region (ref = Winnipeg)	
Southern Health-Santé Sud	1.02 (0.72-1.45)
Prairie Mountain	1.15 (0.70-1.88)
Interlake-Eastern	1.36 (0.90-2.06)
Northern	**2.03 (1.42-2.90)**

Bold indicates statistical significance at p<0.05
Ref indicates the reference category for analysis

Conclusions

This chapter examined the relationship between self-reported drinking behaviours and health/social outcomes. We found very few statistically significant relationships when we examined outcomes associated with exceeding low-risk drinking guidelines. We did, however, find that exceeding the limits was associated with increased risk for having contacts with the justice system.

The lack of statistically significant findings in this analysis should be interpreted with caution. One limitation of the analysis is that the CCHS does not capture data on life time drinking behaviours; rather, we only have data on the respondents drinking patterns for the past year. This means that we are unable to identify individuals with long-term risky drinking behaviours in the data; the impact of this misclassification bias would mean that our results may be more conservative (closer to the null) than is warranted. Another limitation of our analysis is that individuals may have underreported their alcohol consumption; this too would bias results towards the null, resulting in fewer statistically significant relationships.

Very few Canadian provinces are able to directly link self-reported health behaviours with administrative records on social service use such as contacts with the justice system and income assistance. This is a strength of our approach that should not be overlooked.

Future research that links valid data on drinking patterns with administrative records capturing contacts with the social services system and the healthcare system can help to further elucidate the outcomes associated with exceeding the low-risk drinking guidelines.

Chapter Nine:

Pharmacological Interventions for Alcohol Use Disorders

The previous chapters documented the long-lasting impacts of having an alcohol use disorder (AUD) on individuals' healthcare use, health, and social outcomes. Although these findings corroborate numerous other studies documenting the substantial individual, societal, and global burden of AUD, people with AUD remain largely untreated [33].

Effective pharmacotherapies for treating AUD have been available for decades. While numerous randomized control trials, systematic reviews, and meta-analyses have established both efficacy and safety for naltrexone and acamprosate [34,35], these drugs have been found to be profoundly underutilized [36–39]. The Veterans Health Administration has shown that among its patients with AUD, only 3.4% received any pharmacotherapy in 2009 [37] and only 2.75% received Naltrexone in 2010 [36]. However, many of the studies examining pharmacotherapy treatment for AUD focus on non-representative samples, specifically the veteran or low income population [36–38]. Thus, it is largely unknown how many people in the general population receive pharmacotherapy for AUDs. In Manitoba, the use of these treatments among individuals with an AUD has not previously been investigated.

In addition to pharmacotherapies, individuals in Manitoba have other treatment options for AUD. The Addictions Foundation of Manitoba provides a variety of client-centered services to support individuals with AUDs. They have adopted a biopsychosocial-spiritual model of addiction, which maintains that addictions arise from a variety of factors.

Our intention in this chapter was to identify the impact that these various treatment options have on changing the healthcare and social service use patterns observed in previous chapters, thereby reducing the negative outcomes associated with harmful alcohol consumption. Unfortunately, however, we were unable to access data on addiction treatments available outside the healthcare sector, such as those provided by the Addictions Foundation of Manitoba or by services provided by registered social workers or licensed psychologists. As a result of these data limitations, we focused on explorations of pharmacotherapies available in the province.

Thus, we addressed the following research objectives: (1) determine the overall proportion of individuals with an AUD who received pharmacotherapy; (2) describe the sociodemographic and clinical characteristics of individuals who were more likely to receive a prescription; and (3) identify the medical specialty most likely to prescribe these medications.[8]

[8] It is important to recognize that this analysis examined only prescriptions dispensed from pharmacies, which may underestimate the number of prescriptions actually written by prescribers for these agents.

Pharmacotherapies for Alcohol Use Disorders

Our analyses focused on three pharmacotherapies* used to treat an AUD: disulfiram (Anatomical Therapeutic Classification (ATC) N07BB01), acamprosate (ATC N07BB03), and naltrexone (ATC N07BB04). We determined the overall proportion of AUD prescriptions dispensed during the study period using the Drug Program Information Network (DPIN) database. The DPIN database also allowed us to determine which prescriber specialty was most likely to prescribe a medication for AUD.

The cohort used in this analysis was a subset of the total AUD cohort used throughout the report. We limited analyses to individuals with an index date between 1996/97 and 2014/15 to align with the years of DPIN data we had available. Our cohort comprised two groups:

1. Individuals with an AUD who received a dispensation of one of the three pharmacotherapies used to treat AUD ; and
2. All other individuals with an AUD who did not receive a dispensation for a pharmacotherapy used to treat AUD.

* Calcium Carbimide (ATC N07BB02) was included to identify the cohort but was excluded from these analyses because it is no longer recommended to be prescribed due to severe reactions when people consume alcohol. (Updated May 22, 2019)

Descriptives for Individuals with an Alcohol Use Disorder and with a Pharmacotherapy Dispensation

Table 9.1 presents the demographic information for the AUD cohort with index dates from 1996/97 to 2014/15. During the study period, a total of 493 individuals with an AUD had at least one dispensation for one of the three pharmacotherapies, which is roughly 1.42% of all individuals with an AUD:

- 0.82% of individuals with an AUD had a dispensation of naltrexone;
- 0.52% of individuals with an AUD had a dispensation of acamprosate;
- 0.08% of individuals with an AUD had a dispensation of disulfiram.

The mean age at the index date was 40 for both groups. The sex distribution differed between those who did and those who did not have a prescription dispensed; the relative proportion of females was greater amongst individuals who had a prescription dispensed than among those who did not (42.4% vs. 36.3%, respectively). The vast majority of individuals who had a prescription dispensed lived in an urban (vs rural) setting. Higher income individuals were more likely to receive a dispensation of an AUD prescription compared with their lower-income counterparts.

Table 9.1: Demographics for Individuals with an Alcohol Use Disorder with Index Date 1996/97 to 2014/15
Individuals who were or were not dispensed a pharmacotherapy

	Dispensed Pharmacotherapy N = 493	Not Dispensed Pharmacotherapy N = 36,895	p-value
Mean Age	40.02	40.48	0.4193
Age Group			
12-19	**16 (3.25%)**	**5,369 (14.55%)**	**<.0001**
20-29	**91 (18.46%)**	**8,223 (22.29%)**	
30-39	**137 (27.79%)**	**6,213 (16.84%)**	
40-49	**136 (27.59%)**	**5,588 (15.15%)**	
50-59	**88 (17.85%)**	**4,547 (12.32%)**	
60-69	**16 (3.25%)**	**3,281 (8.89%)**	
70-79	**7 (1.42%)**	**2,411 (6.53%)**	
80-89	**s**	**1,118 (3.03%)**	
90+	**s**	**145 (0.39%)**	
Sex			
Male	**284 (57.61%)**	**23,511 (63.72%)**	**0.0050**
Female	**209 (42.39%)**	**13,384 (36.28%)**	
Residence			
Urban (Winnipeg/Brandon)	**369 (74.85%)**	**20,069 (54.39%)**	**<.0001**
Rural	**124 (25.15%)**	**16,826 (45.61%)**	
Income Quintile			
Urban 1 (Lowest Income)	**67 (13.59%)**	**7,399 (20.05%)**	**<.0001**
Urban 2	**81 (16.43%)**	**4,186 (11.35%)**	
Urban 3	**79 (16.02%)**	**3,330 (9.03%)**	
Urban 4	**68 (13.79%)**	**2,599 (7.04%)**	
Urban 5 (Highest Income)	**72 (14.60%)**	**2,054 (5.57%)**	
Rural 1 (Lowest Income)	**s**	**5,784 (15.68%)**	
Rural 2	**19 (3.85%)**	**3,510 (9.51%)**	
Rural 3	**30 (6.09%)**	**2,640 (7.16%)**	
Rural 4	**30 (6.09%)**	**2,660 (7.21%)**	
Rural 5 (Highest Income)	**32 (6.49%)**	**2,148 (5.82%)**	

Bold indicates statistical significance at $p<0.05$

s indicates suppression due to small numbers

Table 9.2 presents healthcare use information for the AUD cohort with index dates from 1996/97 to 2014/15. Those who had a prescription dispensed were 1.60 times more likely to have a comorbid mood or anxiety-related diagnosis than those who did not (64.9% vs. 40.7%). Those who had a prescription dispensed were also more likely to be higher users of the healthcare system.

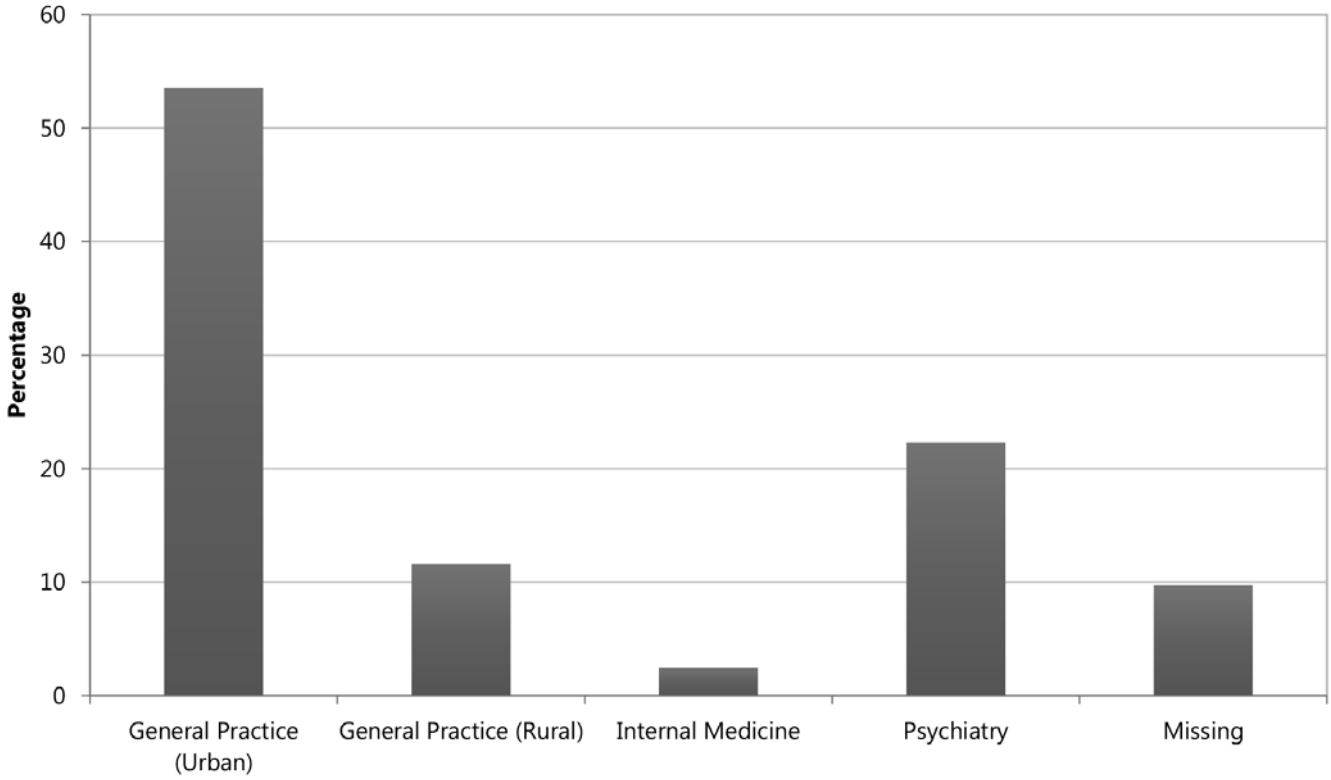
Table 9.2: Healthcare Use for Individuals with an Alcohol Use Disorder with Index Date 1996/97 to 2014/15
Individuals who were or were not dispensed a pharmacotherapy

	Dispensed Pharmacotherapy N = 493	Not Dispensed Pharmacotherapy N = 36,895	p-value
Resource Utilization Band (RUB)			
0 (non-user)	57 (11.56%)	13,317 (36.09%)	<.0001
1 (lowest)	**14 (2.84%)**	**1,578 (4.28%)**	
2	55 (11.16%)	5,642 (15.29%)	
3	**295 (59.84%)**	**13,441 (36.43%)**	
4	63 (12.78%)	2,438 (6.61%)	
5 (highest)	**9 (1.83%)**	**479 (1.30%)**	
Comorbidities			
Mood and Anxiety Disorders	320 (64.91%)	15,008 (40.68%)	<.0001
Personality Disorders	**31 (6.29%)**	**1,748 (4.74%)**	0.1082
Pyschoses	23 (4.67%)	2,359 (6.39%)	0.1185
Healthcare Related Visits			
Number of Hospitalizations 1 year before index date (SD)	83 (0.86)	10,705 (0.81)	<.0001
For mental health reasons	**29 (0.37)**	**1,796 (0.32)**	0.3119
Number of Ambulatory Visits 1 year before index date (SD)	4,239 (10.07)	240,361 (7.79)	<.0001
For mental health reasons	**1,630 (6.37)**	**48,679 (3.78)**	**<.0001**
Number of Emergency Department Visits 1 year before index date (SD)*	343 (2.18)	12,488 (2.27)	0.8103
Prescriptions			
Number of Chronic Prescription Medications 1 year before index date (SD)	819 (2.06)	57,623 (2.65)	0.0794
Chronic Prescription Medication Groups			
0	187 (37.93%)	20,197 (54.74%)	<.0001
1-3	**232 (47.06%)**	**10,771 (29.19%)**	
4-8	68 (13.79%)	4,745 (12.86%)	
9+	**6 (1.22%)**	**1,182 (3.20%)**	
Use of Medications 1 year before index date (2+ prescriptions with gap < 25% days' supply)			
SSRI Antidepressants	121 (24.54%)	3,238 (8.78%)	<.0001
TCA Antidepressants	14 (2.84%)	1,065 (2.89%)	0.9515
Other Antidepressants	80 (16.23%)	2,038 (5.52%)	<.0001
Sedatives and Anxiolytics	**118 (23.94%)**	**5,228 (14.17%)**	**<.0001**
Antipsychotics (excl. Lithium)	s	47 (0.13%)	0.6453
Gabapentin/Pregabalin	31 (6.29%)	1,656 (4.49%)	0.0629
Topiramate	s	321 (0.87%)	0.2821
Valproic acid	**s**	**57 (0.15%)**	**0.0013**
Carbamazepine	s	214 (0.58%)	0.9343
Lamotrigine	s	166 (0.45%)	0.4270
Lithium	7 (1.42%)	87 (0.24%)	<.0001
Skeletal muscle relaxants	s	180 (0.49%)	0.3815
Opioids	s	263 (0.71%)	0.7972

Bold indicates statistical significance at p<0.05
SD: Standard Deviation
s indicates suppression due to small numbers
* Emergency department visits limited to Winnipeg residents only, index dates 2000/01-2012/13

The distribution of prescriber specialty for initiation of an AUD medication is shown in Figure 9.1. The majority of dispensed prescriptions for an AUD came from general practitioners working in urban centers (53.55%), followed by psychiatrists (22.31%).

Figure 9.1: Distribution of Prescriber Specialty for First Alcohol Dependence Drug Prescription Dispensed
1996/97 - 2014/15



Note: Pediatric and Anesthetic specialties are suppressed due to small numbers

We used logistic regression to identify factors associated with having a prescription for a pharmacotherapy to treat AUD dispensed (Table 9.3). We found that individuals living in an urban setting (i.e., in Winnipeg or Brandon) or with a diagnosed mood and anxiety disorder had greater odds of having a prescription dispensed to treat an AUD.

Table 9.3: Logistic Regression Predicting Pharmacotherapy Dispensation among Individuals with an Alcohol Use Disorder

Variable	Adjusted Odds Ratio (95% Confidence Interval)
Age	1.00 (0.99-1.00)
Female Sex	1.06 (0.88-1.27)
Urban (Winnipeg/Brandon)	**2.25 (1.83-2.77)**
Mood and Anxiety Disorders	**2.40 (1.98-2.90)**

Bold indicates statistical significance at $p<0.05$

Trends in Prescriptions by Fiscal Year

We next looked at the percentage of our cohort who had any prescription dispensed to treat their AUD, by fiscal year (Figure 9.2). There is a small trend towards increased dispensing of these medications with a peak in 2004/05, which is primarily due to naltrexone prescribing. We also stratified the data by specific prescription (Figure 9.3). Overall, naltrexone was the most commonly dispensed medication for AUD, closely followed by acamprosate. Recently, however, the number of prescriptions for acamprosate has declined. Disulfiram has not been widely prescribed in Manitoba since the late 1990s. It is important to note that prescriptions for several drugs were too rare to report (i.e., fewer than 6 prescriptions were dispensed to the AUD cohort, and thus, these results were suppressed).

Figure 9.2: Prescriptions Dispensed Among Individuals with an Alcohol Use Disorder, by Fiscal Year

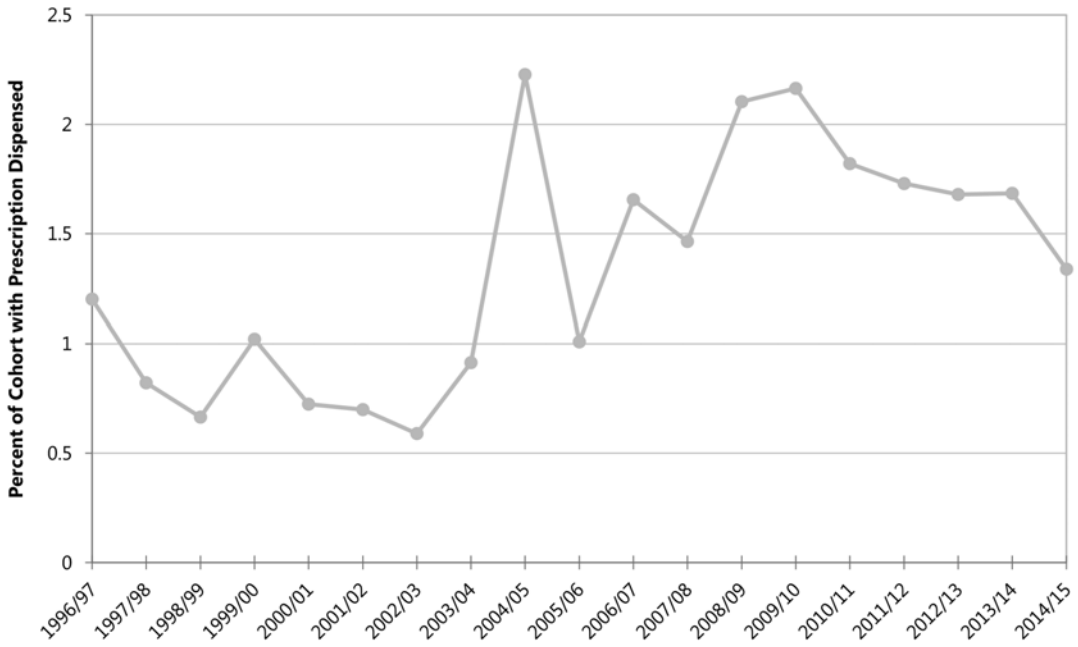
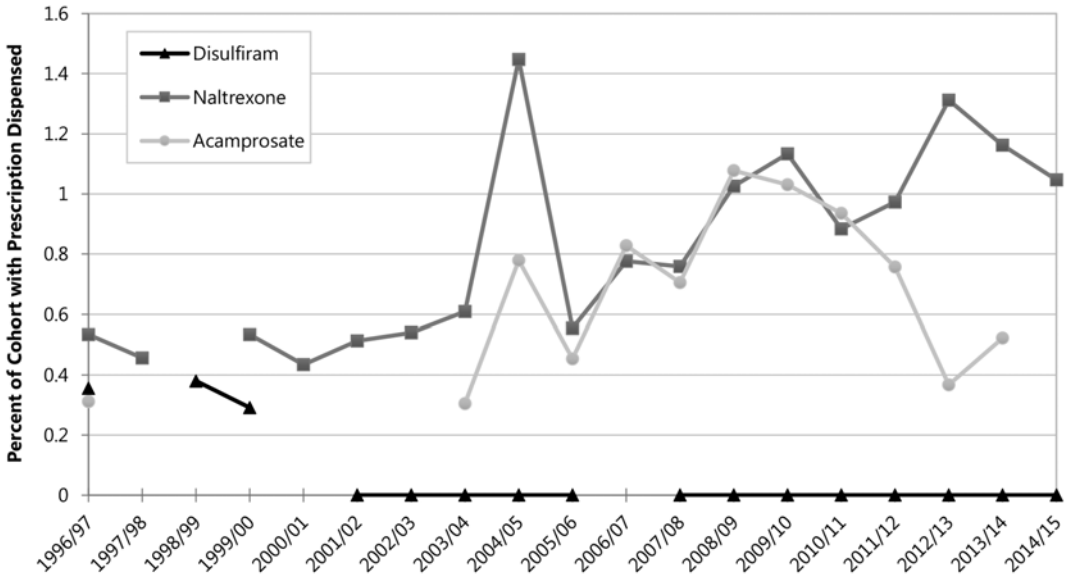


Figure 9.3: Prescriptions Dispensed Among Individuals with an Alcohol Use Disorder, by Fiscal Year and Specific Prescription



Note: In 1997/98, 2000/01 and 2006/07, Disulfiran was suppressed
Note: In 1998/99, Naltrexone was suppressed
Note: In 1997/98 - 2002/03, Acamprosate was suppressed
Suppression is due to small numbers

Figure 9.4 depicts the percentage of individuals who had a prescription dispensed within one year of an AUD diagnosis. Figure 9.5 shows these data stratified by prescription type. Over the past ten years, there was an increase in the percentage of individuals who were dispensed a prescription within one year of index date; this was most pronounced for naltrexone prescriptions. During the study period, the overall proportion of people with AUD who were dispensed a medication for AUD within one year of index date was 0.57%. We found an increase in the proportion of patients who had a prescription for naltrexone and acamprosate dispensed within one year of index date. We also saw a drop in the percentage of individuals who had a prescription dispensed for disulfiram.

Figure 9.4: Rate of Alcohol Use Disorder Prescription Dispensation Within One Year after Alcohol Use Disorder Diagnosis

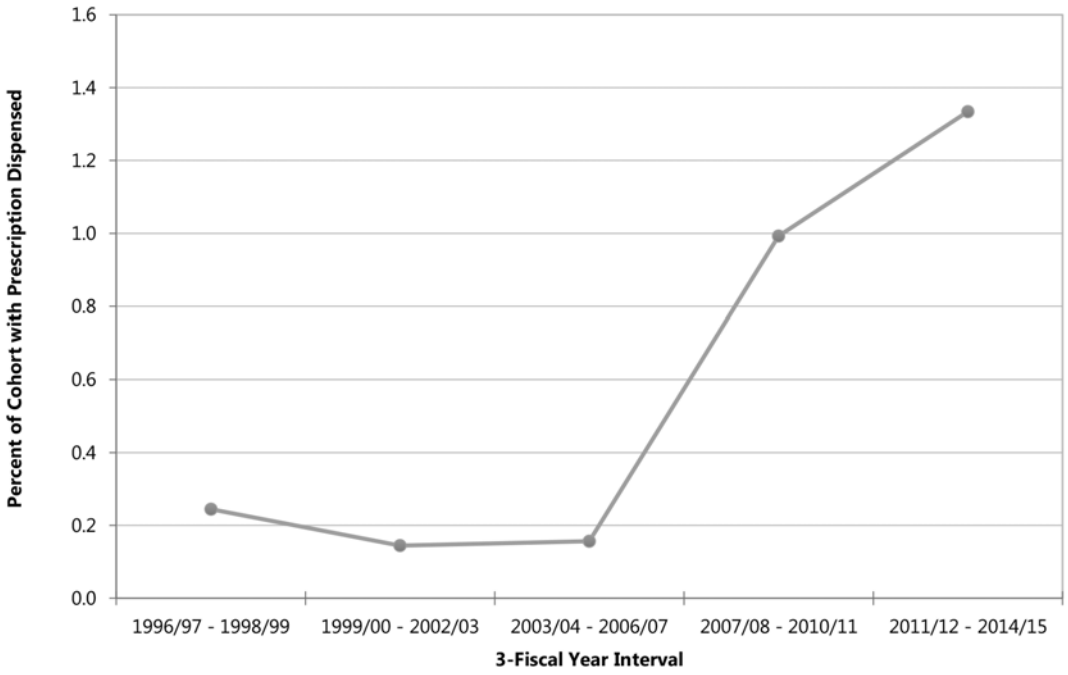
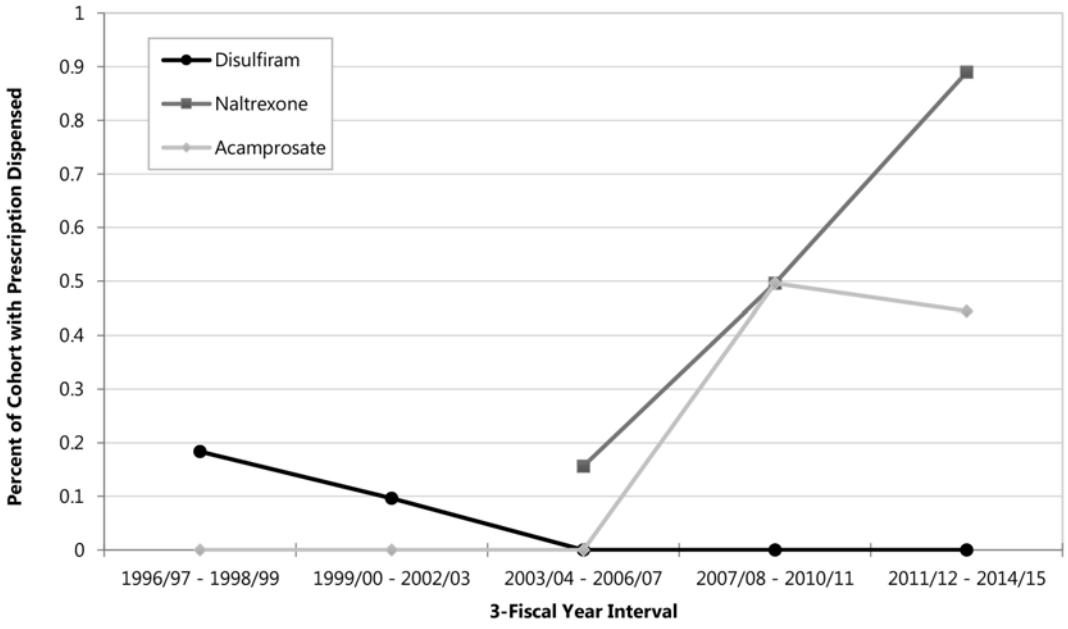


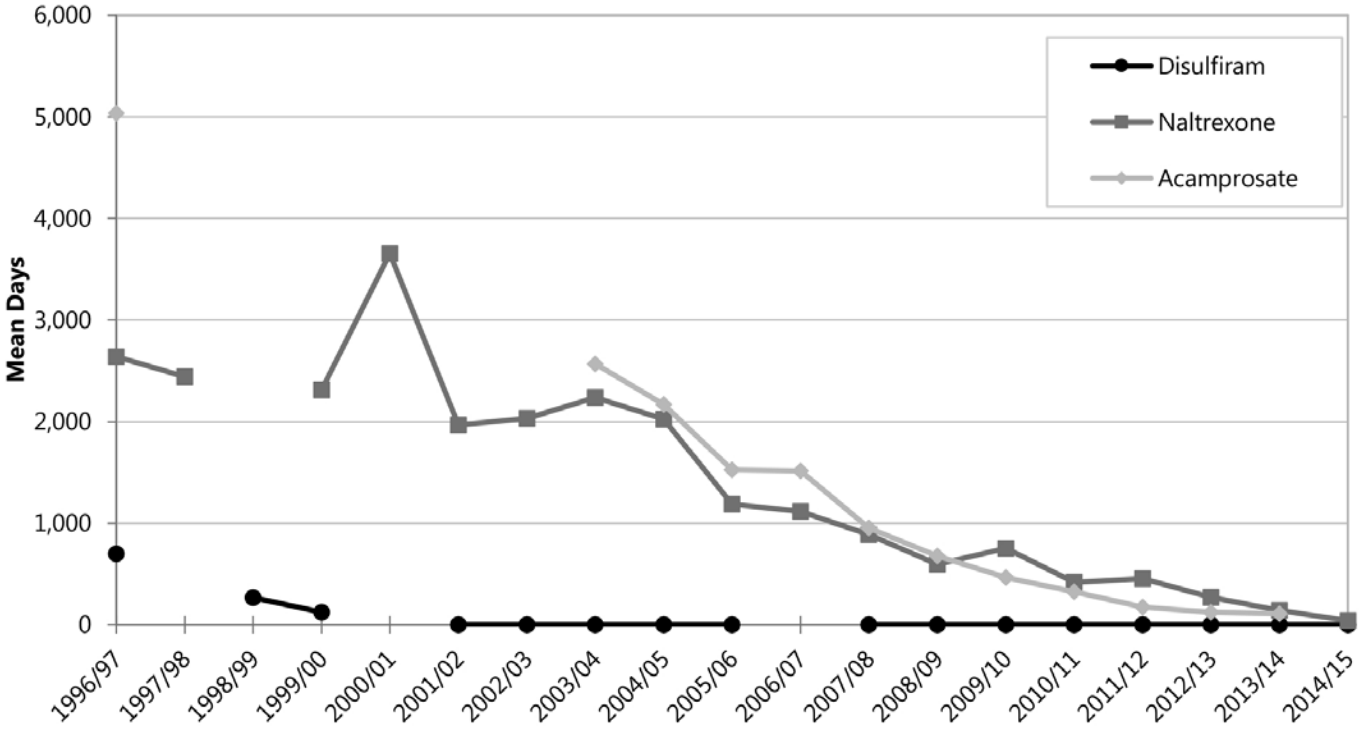
Figure 9.5: Rate of Alcohol Use Disorder (AUD) Prescription Dispensation Within One Year after AUD Diagnosis by Prescription



Note: In 1996/97 - 2002/03, Naltrexone was suppressed
Suppression is due to small numbers

The mean times to having the first prescription for an AUD medication dispensed following index date were 1,239 and 652 days, respectively, over the study period. This decreased from a mean of 2,685 days at the beginning of the study period to 46 days at the end. Interestingly, the mean days to AUD medication initiation markedly decreased over time (Figure 9.6).

Figure 9.6: Mean Number of Days until Dispensation of Alcohol Use Disorder Medication



Note: In 1997/98, 2000/01, and 2006/07, Disulfiran was suppressed
Note: In 1998/99, Naltrexone was suppressed
Note: In 1997/98 - 2002/03, Acamprosate was suppressed
Suppression is due to small numbers

The medication possession ratio[9] (MPR) provides a proxy measure for whether or not an individual is taking their prescription drugs as prescribed. We calculated the MPR for the six months after an individual received their prescription. Over half (63.69%) of those who had a prescription dispensed had an MPR <0.5 and a minority, 17.24%, had an MPR >0.8. While there was an increasing trend for naltrexone having higher MPR rates, there was no measurable statistical difference between the three medications. Naltrexone had the highest 6-month persistence at 48.30%, compared to 43.65% for acamprosate and 32.14% for disulfiram. Taken together, adherence to pharmacotherapies used to treat AUDs was low in our population.

[9] The number of days of medication supplied within the refill interval divided by number of days in refill interval.

Conclusions

We began these analyses with the intent of exploring whether having a prescription to treat an AUD was associated with a reduction in harms related to having an AUD. Unfortunately, the small number of individuals who had a prescription dispensed for one of these three drugs prevented us from fully examining the impacts of this treatment approach. Moreover, we were struck by the extensive underutilization of these drugs in Manitoba. Several studies have shown that these therapies are efficacious at reducing the symptoms of addiction. The low prescription prevalence in this population seems to be a missed opportunity for treating AUDs.

Summary of Key Findings

1. Although efficacious pharmacotherapies for treating AUDs have been available for decades, only 493 out of the 53,625 individuals with an AUD had a prescription dispensed for one of three major pharmacotherapies used to treat AUD. This suggests a drastic underutilization of a potential therapy for treating AUDs in Manitoba.
2. Among individuals with an AUD, those with a diagnosis for a mood and anxiety disorder and those living in an urban area were more likely to have a prescription dispensed for one of the examined pharmacotherapies.
3. The vast majority of dispensed prescriptions were given by general practice physicians working in an urban setting, followed by psychiatrists.
4. We found an overall increase in the rate of dispensation of pharmacotherapies used to treat AUD between 1996/97 and 2010/11. Since 2010/11 there has been a slow decline in the rate of dispensation of pharmacotherapies used to treat AUD.
5. When we looked at each drug individually, we found an increase in the prescription dispensation rate for naltrexone, particularly since 2005/06. For acamprosate, we found that the rate peaked around 2008/09 and has since declined. For disulfiram, we found very little to no prescription dispensation since 2001/02.
6. Since 2003/04, there has been an assuring increase in the rate of prescriptions dispensed within the first year of index date, suggesting that although this mode of treatment is still rare, individuals with an AUD are receiving this treatment sooner than at the turn of the century.

Discussion

There are several potential reasons for the exceptionally low utilization of medications to treat AUDs in Manitoba. It is difficult to know from the data whether low uptake of these drugs reflects barriers to access (e.g., systems barriers, such as obtaining coverage), bias among providers and/or the public against use of pharmacotherapies for treating AUDs, or limitations of our knowledge as it pertains to actual effectiveness of drugs used to treat AUD in real world practice. Low uptake of AUD pharmacotherapy could also be explained by the limited availability of these products. Disulfiram was discontinued as a commercial product in 2001 and acamprosate was only introduced into the market in 2007 [40]. Moreover, not all pharmacotherapies are appropriate for all patients with an AUD. While naltrexone has been available since 1996, as an opioid antagonist, its use is limited to those who are not concurrently using opioids. In addition, there are other pharmacotherapies that can be used to treat AUD that we didn't examine in this study, such as topiramate and baclofen. These agents are primarily used for indications other than AUD and it would be difficult to identify cases in which these drugs were truly being used for AUD.

It is important to recognize that this study examined prescriptions dispensed from pharmacies, which may underestimate the number of prescriptions actually written by prescribers for these agents. The DPIN database also does not capture any samples provided in clinic, which would also underestimate utilization.

Chapter Ten:
Concluding Remarks

Key Findings on the Relationship between Harmful Alcohol Consumption and Health and Social Outcomes

- **Persistently Elevated Healthcare Use Among Individuals with an Alcohol Use Disorder:** We compared individuals with an indication of an AUD with individuals matched on age, sex, postal code, and neighbourhood-level income, and observed that individuals with an AUD had a sustained, elevated use of the healthcare system over a 25-year period. Differences remained even after we adjusted for differences in mental disorder comorbidities between the two groups. In most instances, there was a spike in health services use during the year an individual received an AUD diagnosis, except for emergency department visits, which spiked in the year before diagnosis. This finding suggests that individuals with an AUD begin to experience the negative outcomes associated with their disorder even before receiving their diagnosis.
- **Having an AUD is Associated with Compromised Health:** Individuals with an AUD had higher total and premature mortality rates when compared with their matches (who did not have an AUD); this difference persisted after adjusting for differences between the two groups, including mental disorder comorbidities.
  The period of greatest risk of mortality was the year when an individual received a diagnosis for an AUD. We also saw that individuals with an AUD had elevated rates of ischemic heart disease, diabetes, and cancer the year before receiving an AUD diagnosis. These findings highlight the negative health outcomes associated with AUDs even before diagnosis.
- **Having an AUD is Associated with Elevated Social Services Use:** Having an AUD was associated with increased contact with social services and higher risk for involvement with the justice system. Specifically, we found increased rates of moving into social housing, receiving income assistance, having a child taken into care, and being in contact with the justice system. In many cases, elevated use of these systems persisted over an extended period of time.
- **Impacts of Harmful Alcohol Consumption may be Greater among Women:** Although we found that men were more likely to drink heavily and were more likely to have an AUD, the impacts of AUDs were greater among women across several indicators. This could be due to

the already high rates of negative outcomes among male matches, but it also suggests that heavy drinking impacts women more severely.

- **Decreasing Incidence of AUDs :** We found that the incidence of AUDs have declined over the past several years. This pattern could reflect changing sociocultural norms around alcohol consumption and mental disorders. Future research is needed to explore whether the declining incidence rate reflects a diagnostic shift – e.g., diagnoses patterns shifting from AUDs to other mental disorder diagnoses – due to increasing awareness around and focus towards treating mental disorders.
- **Self-Reported Risky Drinking Associated with Negative Outcomes:** Individuals who reported drinking behaviours that exceeded low-risk drinking guidelines had some negative outcomes. It is important to note that these modest results are likely an underestimate of the true impacts of risky drinking. Extensive research has documented that individuals often under-report their true drinking practices. This would mean that some individuals we classified as having "low-risk drinking behaviours" were actually high risk drinkers, and this misclassification would likely have attenuated any differences in outcomes we measured.
- **Potential Underutilization of Pharmacotherapies for Treating AUDs in Manitoba:** In spite of evidence pointing to the efficaciousness of AUD pharmacotherapies, very few individuals in Manitoba received dispensation of a drug that could be used to treat an AUD.

Recommendations

The findings in our report demonstrate the wide-sweeping impacts of harmful alcohol use in the province. The fact that we found elevated use of health and social services prior to receiving an AUD diagnosis – and that we observed significant spikes in contacts with both the justice system and emergency department visits prior to receiving a diagnosis – highlights that individuals who are experiencing negative outcomes associated with heavy drinking are appearing in our systems even before receiving treatment. Strategies to support Manitoba residents with an AUD need to be focused on identifying and supporting individuals sooner. Earlier identification may help to mitigate some of the negative outcomes experienced by this population.

There needs to be improved integration of addictions/alcohol treatment within the mental disorder care system, as evidenced by the high comorbidity of these conditions. Furthermore, there is need for better integration of addictions treatment within general medicine. Addictions treatment tends to be removed and difficult to access, and this gap represents a major barrier to care. Practitioners across all specialties, as well as primary care, need to have awareness for alcohol disorder screening and access to treatment resources.

Brief interventions in the primary care setting focused on identifying individuals with an AUD sooner have been shown to both reduce heavy drinking and the negative outcomes associated with harmful drinking behaviours [41–43]. Our findings of increased contacts with social systems, even before receiving a diagnosis, point to possible areas to probe for screening within a primary care setting. For example, clinicians may want to ask patients about their contacts with social services in the context of asking about their drinking as a part of a holistic medical history. This may offer a particular benefit as studies have found that health professionals can influence patients by helping them to recognize their risk for harm from heavy drinking [41–43].

Elevated contacts with the social systems also suggest a need to adopt a broader, more intersectoral approach for identifying individuals who are experiencing the negative outcomes associated with harmful drinking. Adopting a culture of shared responsibility and collaborating across departments is needed to more appropriately serve this population. Manitoba already has a mental health court, which offers intensive services and supports to individuals whose criminal involvement is a direct result of their mental disorder. Raising awareness about AUDs within the context of law enforcement and the criminal justice system may serve to identify individuals whose criminal involvement is a result of their AUD. In turn, this could lead to connecting individuals with the mental health court and connect them with the appropriate treatment. The elevated use of other services – such as social housing and emergency departments – suggests additional points of contact where individuals with an AUD may be identified and brought into treatment.

It will be important to adopt more upstream approaches – intervening before an AUD has developed. Interventions targeting risk factors have also been shown to be effective. For example, programs that are aimed at identifying and intervening on the reasons for using alcohol have been shown to reduce drinking and the negative impacts of harmful alcohol consumption by offering participants healthy coping skills and life styles [44–47].

It will also be important to raise awareness around heavy drinking as a public health issue. It is difficult to craft messaging that resonates within the context of alcohol consumption. Many people are unaware of the connections that alcohol consumption has with cancer, diabetes, and other chronic diseases.

Evidence has shown that controlling the sale of alcohol can help to reduce the impacts of alcohol use. Pricing and taxation are tools that can reduce alcohol-related health consequences [48].

Finally, there is a need for better data to study alcohol-related consequences and to evaluate strategies put in place to reduce alcohol-related harms. We began our study with the intent of evaluating community treatment programs, such as those offered by the Addictions Foundation of Manitoba. However, these data do not currently reside within the Manitoba Population Research Data Repository; thus, we could not examine the effectiveness of programs offered by this and other community-based organizations. As well, we lacked reliable and valid data on frequency and quantity of alcohol consumption over a person's lifetime. This is a recognized limitation in research on alcohol consumption, which weakens our ability to fully explore the relationships that alcohol may have with health and social outcomes. Collecting information on alcohol consumption in a consistent way – perhaps during medical visits – and having those data available in the Repository would facilitate future total-population research in this area.

Concluding Remarks

This report offers the first total-population look at AUDs in Manitoba. We highlight the intersectoral impacts of harmful alcohol consumption on the province. Our longitudinal analyses demonstrate that the outcomes associated with AUDs continue throughout a person's life. They also show that individuals are often showing up in our health and social systems even before they receive their AUD diagnosis. These spikes in system use indicate a critical period of risk where screening and interventions can be implemented. We also found that pharmacotherapies used to treat AUDs remain largely underutilized. A whole-of-government approach is required to fully support individuals living with an AUD in our province. We need to develop policies and strategies – in line with a culture of shared responsibility – that recognize that there are many system-wide negative outcomes associated with extreme alcohol use at the personal health, healthcare, judicial, and social system levels, and aim to curb the negative outcomes associated with harmful alcohol consumption to promote better mental health in Manitoba.

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Appendix 1: Technical Definitions

Alcohol Use Disorder – Cases

The following ICD-9-CM, ICD-10-CA, and ATC codes were used to identify individuals with an alcohol use disorder (AUD).

The following mental health diagnoses were used to identify individuals with an AUD, using the Hospital Discharge Abstracts and Medical Claims databases:

ICD-9-CM Diagnosis Code	ICD-10-CA Diagnosis Code
291 Alcohol-induced mental disorders	F10 Mental and behavioural disorders due to use of alcohol
303 Alcohol dependence syndrome	
305.0 Alcohol abuse	

The following physical health diagnoses were used to identify individuals with an AUD, using the Hospital Discharge Abstracts database:

ICD-9-CM Diagnosis Code	ICD-10-CA Diagnosis Code
571.0 Alcoholic fatty liver	K70 Alcoholic Liver Disease
571.1 Acute alcoholic hepatitis	
571.2 Alcoholic cirrhosis	
571.3 Alcoholic liver damage unspecified	
425.5 Alcoholic Cardiomyopathy	I42.6 Alcoholic Cardiomyopathy
535.5 Alcoholic Gastritis	K29.2 Alcoholic Gastritis
357.5 Alcoholic Polyneuropathy	G62.1 Alcoholic Polyneuropathy
760.71 FASD (for mothers of children with diagnosis)	Q86.0 FASD (for mothers of children with diagnosis)
977.3 Poisoning by Alcohol Deterrents	X45 Accidental poisoning by and exposure to alcohol
E86.00 Accidental poisoning by Alcoholic Beverages	X65 Intentional self-poisoning by and exposure to alcohol
	Y15 Poisoning by and exposure to alcohol, undetermined intent
980.0 Toxic effect of alcohol (ethanol)	T51.0 Toxic effect of alcohol (ethanol)
V11.3 Alcoholism	Y90 Evidence of alcohol involvement determined by blood alcohol level
	Y91 Evidence of alcohol involvement determined by level of intoxication
	Z50.2 Alcohol rehabilitation
	Z71.4 Alcohol abuse counselling and surveillance
	Z72.1 Problems related to lifestyle, Alcohol use
	E24.4 Alcohol-induced pseudo-Cushing's syndrome
	G31.2 Degeneration of nervous system due to alcohol
	G72.1 Alcoholic Myopathy
	K85.2 Alcohol-induced acute pancreatitis
	K86.0 Alcohol-induced chronic pancreatitis
	O35.4 Maternal care for (suspected) damage to fetus from alcohol

The following ATC codes were used to identify individuals with an AUD, using the Drug Program Information Network database:

ATC Code	Generic Drug Name
N07BB01	Disulfiram
N07BB02	Calcium Carbimide
N07BB03	Acamprosate Calcium
N07BB04	Naltrexone

(Updated May 22, 2019)

Alcohol Use Disorder – Matches

People were excluded from the pool of potential matches for a variety of reasons (outlined in Chapter 2). The table below lists the survey variables (i.e., questions) used to identify people to remove from the pool of potential matches.

Survey Variable	Survey(s) in which Variable Appeared
5+ drinks in one sitting (at least once a month for past year)	CCHS: 1.1, 1.2, 2.1, 2.2, 3.1, 2007, 2008, Healthy Aging, 2009, 2010, 2011, 2012, 2013
5+ drinks in one sitting (at least once a month for 1 year)	CCHS: 1.2
Daily alcohol consumption in past week (exceeds daily limits)	CCHS: 1.1, 1.2, 2.1, 3.1, 2011, 2012, 2013
Number of drinks in past week (exceeds weekly limits)	CCHS: 1.1, 1.2, 2.1, 3.1, 2011, 2012, 2013
Ever regularly drank >12 drinks/week	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - drinking problem	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - affected work/studies	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - interfered with family or home life	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - affected physical health	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - affected social relationships	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - affected financial position	CCHS: 1.1, 1.2, 2.1, 3.1
Reason reduced drinking - affected outlook on life, happiness	CCHS: 1.1, 1.2, 2.1, 3.1
Drank while pregnant	CCHS: 1.1, 2.1, 3.1
Frequency of drinks while pregnant	CCHS: 1.1, 2.1, 3.1
Alcohol dependence (yes to any question in module)	CCHS: 1.1, 1.2
Drove motor vehicle after drinking 2+ drinks in hour before	CCHS: 2.1, 2007, 2008, 2011, 2012
Frequency of driving after 2+ drinks in past year	CCHS: 2.1, 2007, 2008, 2011, 2012
Drove boat, ATV, snowmobile, etc. after drinking 2+ drinks in hour before	CCHS: 2.1, 2007, 2008, 2011, 2012
Frequency of driving boat, ATV, snowmobile after 2+ drinks in past year	CCHS: 2.1, 2007, 2008, 2011, 2012
Cause of health problems - alcohol or drugs	CCHS: 1.2, 2.1, 3.1, 2007, 2008, 2009, 2010, 2012, 2013
Cause of poor ADLs or social difficulties - alcohol or drugs	CCHS: 1.2, 2.1, 3.1,
Barrier to improving health - addiction to drugs or alcohol	CCHS: 3.1, 2007, 2008, Healthy Aging, 2011, 2012, 2013
Frequency of coping with stress by drinking alcohol	CCHS: 1.2
Depressive episodes due to alcohol	CCHS: 1.2
Manic episodes due to alcohol	CCHS: 1.2
Panic attacks due to alcohol	CCHS: 1.2
Not currently working due to use of alcohol or drugs	CCHS: 2.1
Not looking for work due to use of alcohol or drugs	CCHS: 2.1, Healthy Aging
Reason retired - use of alcohol or drugs	CCHS: Healthy Aging

Health Services Use Outcomes

Admission to Intensive Care Unit (ICU)

Inpatient hospitalizations with at least one stay in the ICU can be identified in the hospital abstracts database. ICUs are inpatient units specifically designed, staffed and equipped for the continuous observation and treatment of critically ill patients. Step-down/intermediate care units and neonatal ICUs were not included.

In Chapter 8, we used time-to-event models to estimate the risk of being admitted to the ICU associated with exceeding the recommended low-risk daily and weekly drinking limits. Analyses in Chapter 8 focused on CCHS respondents. In this analysis, the time to first ICU visit was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for being admitted to the ICU among those who exceeded the recommended daily limits with the risk for being admitted to the ICU among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Ambulatory Visits (Physician Visits)

Almost all contacts with physicians (family practitioners and specialists): office visits, walk-in clinic visits, home visits, visits to personal care homes, and visits to outpatient departments. Excluded were services provided to patients while admitted to hospital and emergency department visits. In previous MCHP reports, visits for prenatal care were excluded due to global physician tariffs that could not capture the actual number of prenatal visits, but for the current report, coding practices were improved and prenatal visits were included.

Prenatal visits were included, but how prenatal visits are captured in medical claims data has changed over time. Before October 2000, physicians billed for all prenatal visits related to one woman's pregnancy under a global tariff, which meant that the actual number of prenatal visits were not captured. After this date, physicians billed for each prenatal visit separately rather than using a global tariff.

Days Spent in Hospital

The total number of days spent as an inpatient in a hospital. The total number of days in hospital takes into account transfers, so as to not double-count any days. All Manitoba hospitals were included; personal care homes, nursing stations, federal hospitals, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out-of-province hospitalizations for Manitoba residents were also included.

Emergency Department Visits

The Emergency Department Information System (EDIS) contains information on a patient's experience as they progress through the emergency department (ED) from their first point of entry at the triage desk through to their discharge. EDIS captures ED data from the following Winnipeg hospitals: Concordia Hospital, Grace Hospital, Health Sciences Centre Adult, Seven Oaks General Hospital, St. Boniface General Hospital, and Victoria General Hospital. ED data was available for fiscal years 2008/09 to 2014/15. The emergency department visits to these hospitals were counted and a rate per 100 person-years was calculated for alcohol-related cases and their matches.

In Chapter 8, we used time-to-event models to estimate the risk of an ED visit associated with exceeding the recommended low-risk daily and weekly drinking limits. Analyses in Chapter 8 focused on CCHS respondents. In this analysis, the time to first ED visit was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for an ED visit among those who exceeded the recommended daily limits with the risk for an ED visit among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Hospitalizations for Injury

Inpatient hospitalizations due to injury were identified in the hospital abstracts using ICD-9-CM diagnosis codes E800-E99 and ICD-10-CA diagnosis codes V01-Y98, except for injuries related to complications of medical and surgical care: ICD-9-CM diagnosis codes E87.0-E87.6, E87.8-E879, E93-E94 and ICD-10-CA diagnosis codes Y40-Y84.

In Chapter 8, we used time-to-event models to estimate the risk of a hospitalization due to injury associated with exceeding the recommended low-risk daily and weekly drinking limits. Analyses in Chapter 8 focused on CCHS respondents. In this analysis, the time to first inpatient hospitalization for injury was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for hospitalization due to injury among those who exceeded the recommended daily limits with the risk for

hospitalization due to injury among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Hospitalizations for Motor Vehicle Collisions (MVC)

Inpatient hospitalizations due to MVC resulting in injury were identified in the hospital abstracts using ICD-9-CM diagnosis codes E81, E82.2, E82.3, E82.4, E82.5 and ICD-10-CA diagnosis codes V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1, V83-V86, V87.0-V87.8, V880.-V88.8, V89.0, V89.2.

In Chapter 8, we used time-to-event models to estimate the risk of a hospitalization due to MVC associated with exceeding the recommended low-risk daily and weekly drinking limits. Analyses in Chapter 8 focused on CCHS respondents. In this analysis, the time to first MVC hospital visit was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for hospitalization due to MVC among those who exceeded the recommended daily limits with the risk for hospitalization due to MVC among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Inpatient Hospitalizations

Hospitalizations in which patients were formally admitted to the hospital for diagnostic, medical, or surgical treatment and typically stayed for one or more days.

Multiple admissions of the same person were counted as separate events. All Manitoba hospitals were included, but personal care homes, nursing stations, federal hospitals, and long-term care facilities were excluded (Deer Lodge Centre, Manitoba Adolescent Treatment Centre, Rehabilitation Centre for Children, and Riverview Health Centre). Out-of-province hospitalizations for Manitoba residents were also included.

Prescription Drugs

The average number of different types of prescription drugs dispensed to each case and match. Each pharmaceutical agent that falls under a different fourth-level Anatomical Therapeutic Chemical Classification (ATC) class was counted as a new drug for each person. A person could have several prescriptions for drugs in the same fourth-level ATC class, but this only counted as one drug type. This essentially separated drugs used for different health problems and avoided double-counting prescriptions for drugs in the same group.

Nearly all prescriptions dispensed from community-based pharmacies across the province were included; prescription drugs given to hospitalized patients and some residents in personal care homes with hospital-based pharmacies were not included. Prescriptions were limited to those covered by Manitoba Health's Pharmacare program; prescriptions for over-the-counter drugs were excluded. These exclusions were made in order to have a common set of drugs that could be compared fairly across the province.

Health Outcomes

Alcohol-Related Cancers

The incidence rate of alcohol associated cancer per 100,000 person-years was calculated using data from the Manitoba Cancer Registry. Alcohol-associated cancer sites included: oral cavity (gums, floor of mouth, tongue and other buccal cavity), nasopharynx, pharynx and larynx, esophagus, colon and rectum, liver, and breast (excluding in situ cases).

Diabetes

The incidence rate per year of diabetes was calculated for alcohol-related cases and their matches. Diabetes was defined by one of the following conditions:

- One or more hospitalizations with a diagnosis of diabetes, ICD-9-CM code 250; ICD-10-CA codes E10–E14; or
- Two or more physician visits with a diagnosis of diabetes (ICD-9-CM code as above); or
- One or more prescriptions for medications to treat diabetes (ATC code A10, specific drugs that were included are listed below).

This measure of diabetes combines type 1 and type 2 diabetes because physician claims data do not allow separate identification. Gestational diabetes has a separate diagnosis code and is not specifically included here, but some cases may be included if gestational diabetes was not properly coded.

List of drugs used to treat diabetes:

ATC code	Generic Drug Name
A10A	insulins and analogues
A10BA02	metformin
A10BB01	glibenclamide
A10BB02	chlorpropamide
A10BB03	tolbutamide
A10BB09	gliclazide
A10BB12	glimepiride
A10BB31	acetohexamide
A10BD03	metformin and rosiglitazone
A10BD04	glimepiride and rosiglitazone
A10BD07	metformin and sitagliptin

ATC code	Generic Drug Name
A10BF01	acarbose
A10BG01	troglitazone
A10BG02	rosiglitazone
A10BG03	pioglitazone
A10BH01	sitagliptin
A10BH03	saxagliptin
A10BH05	linagliptin
A10BX02	repaglinide
A10BX03	nateglinide
A10BX04	exenatide
A10BX07	liraglutide

Ischemic Heart Disease

The prevalence and incidence of ischemic heart disease (IHD) was calculated for cases and their matches. IHD was defined by one of the following conditions:

- One or more hospitalizations with a diagnosis of IHD, ICD-9-CM codes 410–414; ICD-10-CA codes I20–I22, I24, I25;
- Two or more physician visits with a diagnosis of IHD (ICD-9-CM codes as above); or
- One physician visit with a diagnosis of IHD (ICD-9-CM codes as above) and two or more prescriptions for medications to treat IHD (listed below)

List of drugs used to treat IHD:

ATC code	Generic Drug Name
B01AC04	clopidogrel
B01AC22	prasugrel
B01AC24	ticagrelor
C01DA02	glyceryl trinitrate
C01DA05	pentaerithrityl tetranitrate
C01DA08	isosorbide dinitrate
C01DA14	isosorbide mononitrate
C07AA02	oxprenolol
C07AA03	pindolol
C07AA05	propranolol
C07AA06	timolol
C07AA12	nadolol
C07AB02	metoprolol
C07AB03	atenolol
C07AB04	acebutolol
C07AB07	bisoprolol
C07AG01	labetalol
C07BA05	propranolol and thiazides
C07CA03	pindolol and other diuretics
C07CB03	atenolol and other diuretics
C08CA01	amlodipine
C08CA02	felodipine
C08CA04	nicardipine
C08CA05	nifedipine
C08CA06	nimodipine
C08DA01	verapamil
C08DB01	diltiazem
C09AA01	captopril
C09AA02	enalapril
C09AA03	lisinopril
C09AA04	perindopril
C09AA05	ramipril
C09AA06	quinapril
C09AA07	benazepril
C09AA08	cilazapril
C09AA09	fosinopril
C09AA10	trandolapril
C09BA02	enalapril and diuretics

ATC code	Generic Drug Name
C09BA03	lisinopril and diuretics
C09BA04	perindopril and diuretics
C09BA06	quinapril and diuretics
C09BA08	cilazapril and diuretics
C09CA01	losartan
C09CA02	eprosartan
C09CA03	valsartan
C09CA04	irbesartan
C09CA06	candesartan
C09CA07	telmisartan
C09CA08	olmesartan
C09DA01	losartan and diuretics
C09DA02	eprosartan and diuretics
C09DA03	valsartan and diuretics
C09DA04	irbesartan and diuretics
C09DA06	candesartan and diuretics
C09DA07	telmisartan and diuretics
C09DA08	olmesartan and diuretics
C10AA01	simvastatin
C10AA02	lovastatin
C10AA03	pravastatin
C10AA04	fluvastatin
C10AA05	atorvastatin
C10AA06	cerivastatin
C10AA07	rosuvastatin
C10AB02	bezafibrate
C10AB04	gemfibrozil
C10AB05	fenofibrate
C10AX09	ezetimibe
C10BX03	atorvastatin and amlodipine
N02BA01	acetylsalicylic acid (tablet strength <= 325 mg)

Premature Mortality

The number of deaths per population occurring before age 75. The premature mortality rate (PMR) is an important indicator of a population's general health; high PMRs indicate poor health.

Total Mortality

In this study, the rate of deaths per 1,000 person-years was calculated for the cohort of alcohol-related disease cases and their matches.

Social Outcomes

Children Taken into Care

Children in care are children who have been removed from the care of their original families because of a situation where authorities have deemed their family unable or unfit to look after them properly. Children in care do not include children who remain with or are returned to a parent or guardian under an order of supervision. We identified all women (mothers) among cases and matches who had at least one child. We then counted the number of times these children were taken into care in a given fiscal or index year. The sum of these events was divided by the total person-time accumulated by all of the mothers during that fiscal or index year. These values were multiplied by 100 to give rates per 100 person-years of apprehensions by Child and Family Services per fiscal or index year.

Income Assistance

The prevalence of income assistance (IA) per 100 person-years was determined by counting the total number of cases and their matches who received Manitoba employment income assistance or social assistance at any point during the fiscal year or index year. This sum was divided by the total person-time accumulated by all of the cases and matches during that fiscal or index year.

Incident cases each year were defined as persons who had not received IA anytime within the past 12 months.

In Chapter 8, we used time-to-event models to estimate the risk of starting to receive IA associated with exceeding the recommended low-risk daily and weekly drinking limits. Analyses in Chapter 8 focused on CCHS respondents. In this analysis, the time to first IA case (i.e., excluding prevalent cases) was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios which compared the risk for starting to receive IA among those who exceeded the recommended daily limits with the risk for starting to receive IA among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Involvement with the Justice System

Any Charge in the Justice System Database

Using Manitoba Justice's PRISM charges and incident database, we counted the number of charges (or accusations) for any violation among our alcohol-related disease cases and their matches each index year (and each fiscal year). The total number of charges was then divided by the person-time accumulated during the corresponding index year (and fiscal year) and multiplied by 100 to give a rate per 100 person-years of any crime.

The 20 most common Acts and Regulations found in the PRISM database are listed below. The following four Acts represent 86.75% of the total records in PRISM, and correspond with violations that are considered criminal: Criminal Code, Youth Criminal Justice Act, Controlled Drugs and Substances Act, and Young Offenders Act.

Most Common Acts and Regulations found in the PRISM Database

Act / Regulation	Description
CC	Criminal Code of Canada
YCJA	Youth Criminal Justice Act
CDSA	Controlled Drugs and Substances Act
YOA	Young Offenders Act
BL	By-Law
DVA	Drivers And Vehicle Act
ACA	Animal Care Act
WFA	Wildfires Act
CFSA	Child & Family Services Act
DLR	Driver Licensing Regulation
CSRPR	Cargo Securement Regulation Provincial Regulation
WSHA	Workplace Safety and Health Act
CCRA	Corrections and Conditional Release Act
CFRR	Commercial Fishermen's Record Regulation
BPA	Business Practices Act
DRS	Drivers Hours of Service Regulation
CVDHSR	Commercial Vehicle Drivers Hours of Service Regulation
CPA	Consumers Protection Act
BAFVCA	Body Armour & Fortified Vehicle Control Act
CMV	Commercial Motor Vehicle And Trailer Trip Inspection

In Chapter 8, we used time-to-event models to estimate the risk of any charge associated with exceeding the recommended low-risk daily and weekly drinking limits. In this analysis, the time to first charge was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for any charge among those who exceeded the recommended daily limits with the risk for any charge among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Domestic/Family Violence

Using Manitoba Justice's PRISM charges and incident database, we counted the number of charges (or accusations) for a domestic/family violence violation among our alcohol-related cases and their matches each year. The total number of charges was then divided by the person-time accumulated during the corresponding index year (and fiscal year) and multiplied by 100 to give a rate per 100 person-years of domestic/family violence charges.

In Chapter 8, we used time-to-event models to estimate the risk of being changed with domestic/family violence associated with exceeding the recommended low-risk daily and weekly drinking limits. In this analysis, the time to first domestic/family violence charge was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for being changed with domestic/family violence among those who exceeded the recommended daily limits with the risk for being changed with domestic/family violence among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Driving While Intoxicated

Using Manitoba Justice's PRISM charges and incident database, we counted the number of charges (or accusations) for a driving while intoxicated (DWI) violation among cases and their matches, by index year and fiscal year, during the period 1995/96-2014/15. The total number of charges was then divided by the person-time accumulated during the corresponding index year (and fiscal year) and multiplied by 100 to give a rate per 100 person-years of DWI charges.

For this outcome, people with a DWI were not excluded from the pool of potential matches so that we could provide a comparison between cases and matches.

In Chapter 8, we used time-to-event models to estimate the risk of being changed with a DWI associated with exceeding the recommended low-risk daily and weekly drinking limits. In this analysis, the time to first DWI charge was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for being changed with a DWI among those who exceeded the recommended daily limits with the risk for being changed with a DWI among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Social Housing

The prevalence of people living in social housing per 100 person-years was determined by counting the total number of cases and their matches who resided in social housing (directly managed by Manitoba Housing) at any point during the fiscal year or index year. This sum was divided by the total person-time accumulated by all of the cases and matches (separately) during that fiscal or index year.

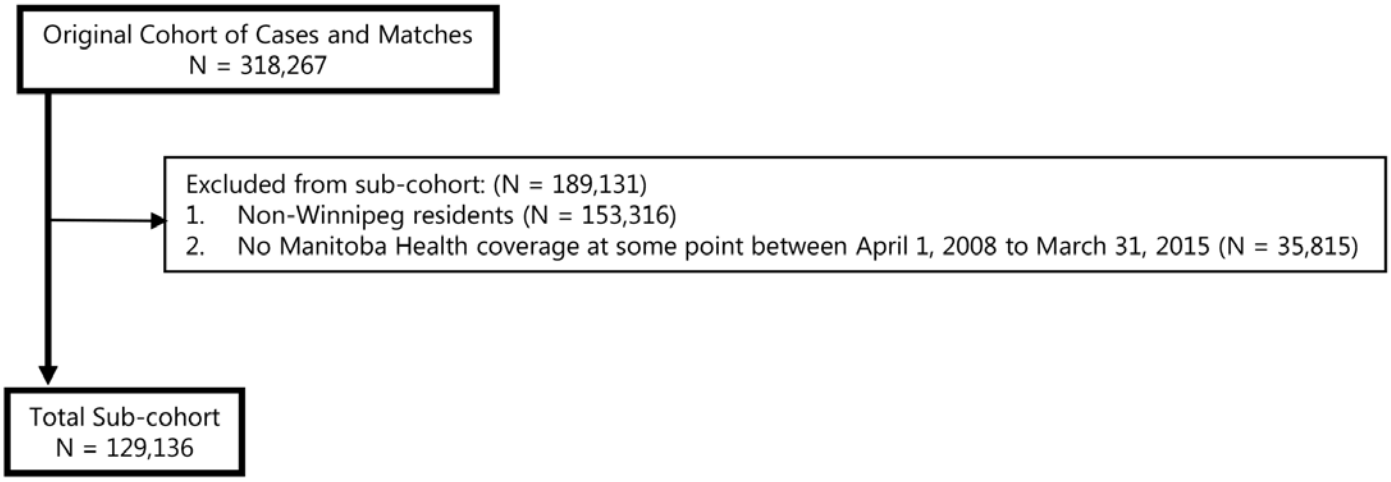
Incidence cases each year were defined as cases and matches who had not resided in social housing anytime within the past 12 months. Study years for this indicator include 1999/2000-2013. Residents of Churchill were excluded as many Churchill residents live in social housing not because they need assistance, but rather they have no other housing options.

In Chapter 8, we used time-to-event models to estimate the risk of moving into social housing associated with exceeding the recommended low-risk daily and weekly drinking limits. Analyses in Chapter 8 focused on CCHS respondents. In this analysis, the time to moving into social housing was the outcome; this outcome was then regressed onto whether or not the respondent's self-reported alcohol consumption exceeded the low-risk drinking recommendations. This regression model also included other confounding covariates. Specifically, we constructed Cox proportional hazards regression models to estimate hazard ratios, which compared the risk for moving into social housing among those who exceeded the recommended daily limits with the risk for moving into social housing among those who did not exceed the recommended daily limits. Models were weighted using CCHS survey weights generated by Statistics Canada.

Appendix 2: Sub-Cohort Development and Demographics

Emergency Department Visits

Appendix Figure 2.1: Emergency Department Sub-Cohort Development



Appendix Table 2.1: Characteristics of Females with AUD* (cases) and Females without AUD (matches) in the Emergency Department Cohort
Cases' and matches' characteristics described at index date, 2008/09 to 2014/15, Winnipeg Residents only

	Manitoba Population in 2013/14	Cases	Matches
	N = 560,102	N = 7,548	N = 40,156
Age (Years)			
Average Age at Diagnosis (95% CI)	44.9 (44.8-44.9)	38.2 (37.8-38.6)	40.1 (39.9-40.2)
Median Age	44.0	35.0	37.0
Proportion of Population N(%)			
Female	560,102 (50.7)	7,548 (37.0)	40,156 (36.9)
Income Quintile N(%)			
Urban 1 (Lowest Income)	68,287 (12.2)	3,173 (42.0)	16,330 (40.7)
Urban 2	70,370 (12.6)	1,506 (20.0)	8,119 (20.2)
Urban 3	69,913 (12.5)	1,122 (14.9)	6,191 (15.4)
Urban 4	69,155 (12.4)	873 (11.6)	4,803 (12.0)
Urban 5 (Highest Income)	70,751 (12.6)	720 (9.5)	3,954 (9.9)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	155,809 (27.8)	4,610 (61.1)	9,671 (24.1)
Personality Disorder Diagnosis	18,009 (3.2)	683 (9.1)	418 (1.0)
Psychosis Diagnosis	8,633 (1.5)	509 (6.7)	550 (1.4)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date
*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

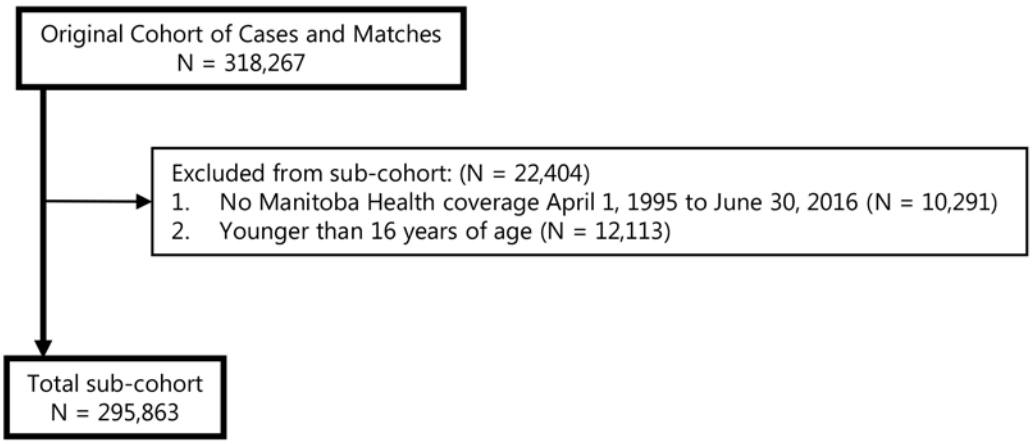
Appendix Table 2.2: Characteristics of Males with AUD* (cases) and Males without AUD (matches) in the Emergency Department Cohort
Cases' and matches' characteristics described at index date, 2008/09 to 2014/15, Winnipeg Residents only

	Manitoba Population in 2013/14	Cases	Matches
	N = 544,672	N = 12,833	N = 68,599
Age (Years)			
Average Age at Diagnosis (95% CI)	43.1 (43.0-43.1)	41.4 (41.1-41.7)	42.8 (42.7-42.9)
Median Age	42.0	40.0	41.0
Proportion of Population N(%)			
Male	544,672 (49.3)	12,833 (63.0)	68,599 (63.1)
Income Quintile N(%)			
Urban 1 (Lowest Income)	64,495 (11.8)	4,489 (35.0)	23,019 (33.6)
Urban 2	66,222 (12.2)	2,767 (21.6)	14,975 (21.8)
Urban 3	66,089 (12.1)	2,130 (16.6)	11,755 (17.1)
Urban 4	67,598 (12.4)	1,818 (14.2)	10,020 (14.6)
Urban 5 (Highest Income)	68,231 (12.5)	1,429 (11.1)	7,806 (11.4)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	85,360 (15.7)	4,936 (38.5)	9,264 (13.5)
Personality Disorder Diagnosis	13,998 (2.6)	677 (5.3)	582 (0.9)
Psychosis Diagnosis	8,394 (1.5)	892 (7.0)	1,032 (1.5)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date
*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Justice System Involvement

Appendix Figure 2.2: Justice Sub-Cohort Development



Appendix Table 2.3: Characteristics of Females with AUD* (cases) and Females without AUD (matches) in the Justice System Cohort
Cases' and matches' characteristics described at index date, 2001/02 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 560,102	N = 17,445	N = 86,499
Age (Years)			
Average Age at Diagnosis (95% CI)	44.9 (44.8-44.9)	39.5 (39.2-39.8)	39.9 (39.7-40.0)
Median Age	44.0	35.0	35.0
Proportion of Population N(%)			
Female	560,102 (50.7)	17,445 (35.0)	86,499 (35.2)
Regional Health Authority N(%)			
Southern Health-Santé Sud	76,607 (13.7)	1,081 (6.2)	5,258 (6.1)
Winnipeg	327,998 (58.6)	9,141 (52.4)	46,156 (53.4)
Prairie Mountain	72,360 (12.9)	2,236 (12.8)	14,477 (16.7)
Interlake-Eastern	53,772 (9.6)	1,622 (9.3)	8,118 (9.4)
Northern	28,086 (5.0)	3,365 (19.3)	12,490 (14.4)
Living in Winnipeg or Brandon N(%)			
	353,506 (63.1)	9,583 (54.9)	48,162 (55.7)
Income Quintile N(%)			
Urban 1 (Lowest Income)	68,287 (12.2)	4,060 (23.3)	20,225 (23.4)
Urban 2	70,370 (12.6)	1,973 (11.3)	10,014 (11.6)
Urban 3	69,913 (12.5)	1,552 (8.9)	7,837 (9.1)
Urban 4	69,155 (12.4)	1,102 (6.3)	5,528 (6.4)
Urban 5 (Highest Income)	70,751 (12.6)	896 (5.1)	4,558 (5.3)
Rural 1 (Lowest Income)	38,419 (6.9)	2,780 (15.9)	13,485 (15.6)
Rural 2	41,532 (7.4)	1,689 (9.7)	8,198 (9.5)
Rural 3	42,333 (7.6)	1,065 (6.1)	5,284 (6.1)
Rural 4	41,124 (7.3)	1,083 (6.2)	5,389 (6.2)
Rural 5 (Highest Income)	41,876 (7.5)	960 (5.5)	4,686 (5.4)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	155,809 (27.8)	9,215 (52.8)	18,872 (21.8)
Personality Disorder Diagnosis	18,009 (3.2)	1,143 (6.6)	691 (0.8)
Psychosis Diagnosis	8,633 (1.5)	1,177 (6.8)	1,405 (1.6)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction

Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date

* AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Appendix Table 2.4: Characteristics of Males with AUD* (cases) and Males without AUD (matches) in the Justice System Cohort
Cases' and matches' characteristics described at index date, 2001/02 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 544,672	N = 32,375	N = 159,544
Age (Years)			
Average Age at Diagnosis (95% CI)	43.1 (43.0-43.1)	42.3 (42.1-42.5)	42.9 (42.8-43.0)
Median Age	42.0	40.0	41.0
Proportion of Population N(%)			
Male	544,672 (49.3)	32,375 (65.0)	159,544 (64.8)
Regional Health Authority N(%)			
Southern Health-Santé Sud	77,024 (14.1)	13,231 (8.3)	2,655 (8.2)
Winnipeg	312,539 (57.4)	84,811 (53.2)	16,830 (52.0)
Prairie Mountain	69,954 (12.8)	26,881 (16.9)	4,265 (13.2)
Interlake-Eastern	54,705 (10.0)	17,514 (11.0)	3,582 (11.1)
Northern	28,904 (5.3)	17,107 (10.7)	5,043 (15.6)
Living in Winnipeg or Brandon N(%)			
	336,087 (61.7)	88,258 (55.3)	17,569 (54.3)
Income Quintile N(%)			
Urban 1 (Lowest Income)	64,495 (11.8)	31,458 (19.7)	6,336 (19.6)
Urban 2	66,222 (12.2)	19,574 (12.3)	3,872 (12.0)
Urban 3	66,089 (12.1)	15,480 (9.7)	3,047 (9.4)
Urban 4	67,598 (12.4)	12,295 (7.7)	2,433 (7.5)
Urban 5 (Highest Income)	68,231 (12.5)	9,451 (5.9)	1,881 (5.8)
Rural 1 (Lowest Income)	38,845 (7.1)	21,924 (13.7)	4,678 (14.5)
Rural 2	41,626 (7.6)	14,363 (9.0)	3,010 (9.3)
Rural 3	42,326 (7.8)	11,824 (7.4)	2,392 (7.4)
Rural 4	41,872 (7.7)	11,141 (7.0)	2,245 (6.9)
Rural 5 (Highest Income)	42,813 (7.9)	10,359 (6.5)	2,096 (6.5)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	85,360 (15.7)	17,996 (11.3)	10,251 (31.7)
Personality Disorder Diagnosis	13,998 (2.6)	977 (0.6)	1,255 (3.9)
Psychosis Diagnosis	8,394 (1.5)	2,398 (1.5)	2,009 (6.2)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction

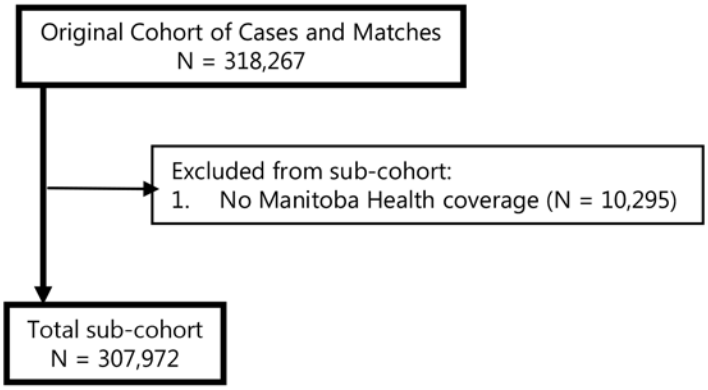
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date

* AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Social Housing

Appendix Figure 2.3: Social Housing Sub-Cohort Development



Appendix Table 2.5: Characteristics of Females with AUD* (cases) and Females without AUD (matches) in the Social Housing Cohort
Cases' and matches' characteristics described at index date, 1995/96 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 560,102	N = 18,519	N = 92,063
Age (Years)			
Average Age at Diagnosis (95% CI)	44.9 (44.8-44.9)	38.5 (38.2-38.8)	38.8 (38.7-38.9)
Median Age	44.0	34.0	34.0
Proportion of Population N(%)			
Female	560,102 (50.7)	18,519 (35.9)	92,063 (35.9)
Regional Health Authority N(%)			
Southern Health-Santé Sud	76,607 (13.7)	1163 (6.3)	5650 (6.1)
Winnipeg	327,998 (58.6)	9,458 (51.1)	47,533 (51.6)
Prairie Mountain	72,360 (12.9)	2469 (13.3)	15906 (17.3)
Interlake-Eastern	53,772 (9.6)	1727 (9.3)	8683 (9.4)
Northern	28,086 (5.0)	3702 (20.0)	14291 (15.5)
Living in Winnipeg or Brandon N(%)			
	353,506 (63.1)	9,934 (53.6)	49,958 (54.3)
Income Quintile N(%)			
Urban 1 (Lowest Income)	68,287 (12.2)	4197 (22.7)	20946 (22.8)
Urban 2	70,370 (12.6)	2061 (11.1)	10449 (11.4)
Urban 3	69,913 (12.5)	1611 (8.7)	8134 (8.8)
Urban 4	69,155 (12.4)	1140 (6.2)	5727 (6.2)
Urban 5 (Highest Income)	70,751 (12.6)	925 (5.0)	4702 (5.1)
Rural 1 (Lowest Income)	38,419 (6.9)	3063 (16.5)	15019 (16.3)
Rural 2	41,532 (7.4)	1844 (10.0)	9045 (9.8)
Rural 3	42,333 (7.6)	1175 (6.3)	5810 (6.3)
Rural 4	41,124 (7.3)	1155 (6.2)	5750 (6.3)
Rural 5 (Highest Income)	41,876 (7.5)	1025 (5.5)	5021 (5.5)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	155,809 (27.8)	9615 (51.9)	19066 (20.7)
Personality Disorder Diagnosis	18,009 (3.2)	1190 (6.4)	701 (0.8)
Psychosis Diagnosis	8,633 (1.5)	1208 (6.5)	1425 (1.6)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date
* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Appendix Table 2.6: Characteristics of Males with AUD* (cases) and Males without AUD (matches) in the Social Housing Cohort
Cases' and matches' characteristics described at index date, 1995/96 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 544,672	N = 33,132	N = 164,258
Age (Years)			
Average Age at Diagnosis (95% CI)	43.1 (43.0-43.1)	42.2 (42.0-42.4)	42.6 (42.5-42.7)
Median Age	42.0	40.0	40.0
Proportion of Population N(%)			
Male	544,672 (49.3)	33,132 (64.1)	164,258 (64.1)
Regional Health Authority N(%)			
Southern Health-Santé Sud	77,024 (14.1)	2,718 (8.2)	13,491 (8.2)
Winnipeg	312,539 (57.4)	17,094 (51.6)	85,656 (52.2)
Prairie Mountain	69,954 (12.8)	4426 (13.4)	28366 (17.3)
Interlake-Eastern	54,705 (10.0)	3674 (11.1)	18028 (11.0)
Northern	28,904 (5.3)	5,220 (15.8)	18,717 (11.4)
Living in Winnipeg or Brandon N(%)			
	336,087 (61.7)	17851 (53.9)	89555 (54.5)
Income Quintile N(%)			
Urban 1 (Lowest Income)	64,495 (11.8)	6440 (19.4)	31961 (19.5)
Urban 2	66,222 (12.2)	3945 (11.9)	19896 (12.1)
Urban 3	66,089 (12.1)	3096 (9.3)	15699 (9.6)
Urban 4	67,598 (12.4)	2461 (7.4)	12428 (7.6)
Urban 5 (Highest Income)	68,231 (12.5)	1909 (5.8)	9571 (5.8)
Rural 1 (Lowest Income)	38,845 (7.1)	4870 (14.7)	23503 (14.3)
Rural 2	41,626 (7.6)	3144 (9.5)	15295 (9.3)
Rural 3	42,326 (7.8)	2461 (7.4)	12268 (7.5)
Rural 4	41,872 (7.7)	2246 (6.8)	11209 (6.8)
Rural 5 (Highest Income)	42,813 (7.9)	2137 (6.5)	10589 (6.5)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	85,360 (15.7)	10420 (31.5)	18105 (11.0)
Personality Disorder Diagnosis	13,998 (2.6)	1275 (3.9)	980 (0.6)
Psychosis Diagnosis	8,394 (1.5)	2061 (6.2)	2423 (1.5)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction

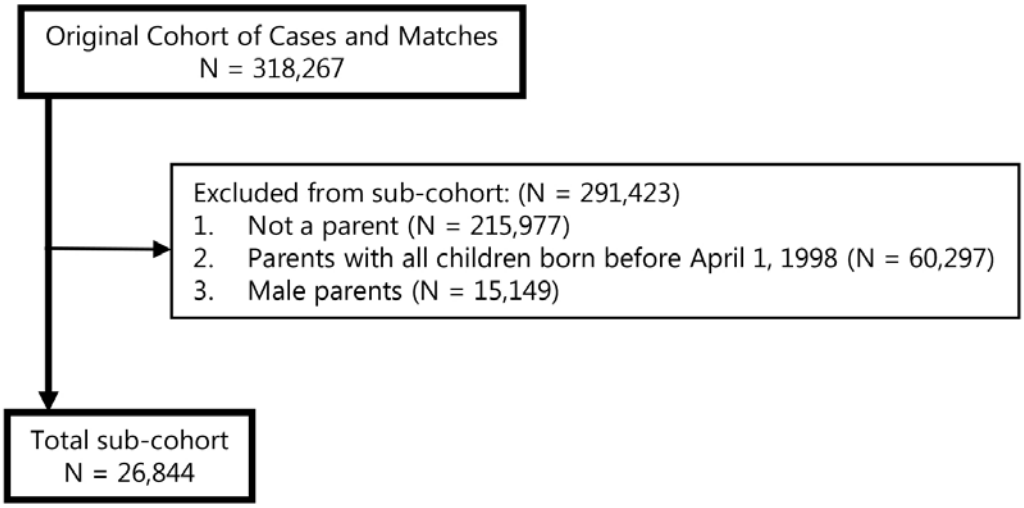
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date

* AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Children Taken into Care

Appendix Figure 2.4: Child and Family Service Sub-Cohort Development



Appendix Table 2.7: Characteristics of Females with AUD* (cases) and Females without AUD (matches) in the Child and Family Services Cohort
Cases' and matches' characteristics described at index date, 1998/99 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 560,102	N = 5,108	N = 21,736
Age (Years)			
Average Age at Diagnosis (95% CI)	44.9 (44.8-44.9)	23.4 (23.2-23.6)	24.8 (24.7-24.9)
Median Age	44.0	22.0	23.0
Regional Health Authority N(%)			
Southern Health-Santé Sud	76,607 (13.7)	297 (5.8)	1,349 (6.2)
Winnipeg	327,998 (58.6)	2,073 (40.6)	9,013 (41.5)
Prairie Mountain	72,360 (12.9)	737 (14.4)	4,403 (20.3)
Interlake-Eastern	53,772 (9.6)	452 (8.9)	1,988 (9.2)
Northern	28,086 (5.0)	1,549 (30.3)	4,983 (22.9)
Living in Winnipeg or Brandon N(%)			
	353,506 (63.1)	2,297 (45.0)	9,789 (45.0)
Income Quintile N(%)			
Urban 1 (Lowest Income)	68,287 (12.2)	1,125 (22.0)	4,705 (21.7)
Urban 2	70,370 (12.6)	483 (9.5)	2,043 (9.4)
Urban 3	69,913 (12.5)	311 (6.1)	1,392 (6.4)
Urban 4	69,155 (12.4)	204 (4.0)	919 (4.2)
Urban 5 (Highest Income)	70,751 (12.6)	131 (2.6)	611 (2.8)
Rural 1 (Lowest Income)	38,419 (6.9)	1,239 (24.3)	5,422 (24.9)
Rural 2	41,532 (7.4)	611 (12.0)	2,564 (11.8)
Rural 3	42,333 (7.6)	311 (6.1)	1,323 (6.1)
Rural 4	41,124 (7.3)	408 (8.0)	1,639 (7.5)
Rural 5 (Highest Income)	41,876 (7.5)	227 (4.4)	957 (4.4)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	155,809 (27.8)	2,551 (49.9)	3,967 (18.3)
Personality Disorder Diagnosis	18,009 (3.2)	342 (6.7)	130 (0.6)
Psychosis Diagnosis	8,633 (1.5)	176 (3.5)	69 (0.3)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction

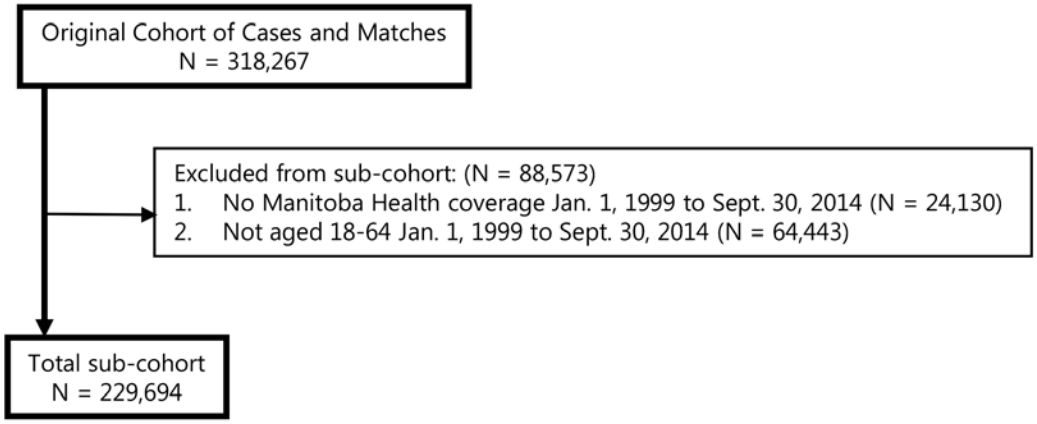
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date

* AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Income Assistance

Appendix Figure 2.5: Income Assistance Sub-Cohort Development



Appendix Table 2.8: Characteristics of Females with AUD* (cases) and Females without AUD (matches) in the Income Assistance Cohort
Cases' and matches' characteristics described at index date, 1999/2000 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 560,102	N = 13,656	N = 67,388
Age (Years)			
Average Age at Diagnosis (95% CI)	44.9 (44.8-44.9)	35.2 (35.0-35.4)	35.6 (35.5-35.7)
Median Age	44.0	33.0	34.0
Proportion of Population N(%)			
Female	560,102 (50.7)	13,656 (35.0)	67,388 (35.3)
Regional Health Authority N(%)			
Southern Health-Santé Sud	76,607 (13.7)	829 (6.1)	4037 (6.0)
Winnipeg	327,998 (58.6)	7,042 (51.6)	35,542 (52.7)
Prairie Mountain	72,360 (12.9)	1,639 (12.0)	11,080 (16.4)
Interlake-Eastern	53,772 (9.6)	1282 (9.4)	6394 (9.5)
Northern	28,086 (5.0)	2,864 (21.0)	10,335 (15.3)
Living in Winnipeg or Brandon N(%)			
	353,506 (63.1)	7,474 (54.7)	37,609 (55.8)
Income Quintile N(%)			
Urban 1 (Lowest Income)	68,287 (12.2)	3,216 (23.6)	15,931 (23.6)
Urban 2	70,370 (12.6)	1536 (11.3)	7838 (11.6)
Urban 3	69,913 (12.5)	1180 (8.6)	6009 (8.9)
Urban 4	69,155 (12.4)	861 (6.3)	4371 (6.5)
Urban 5 (Highest Income)	70,751 (12.6)	681 (5.0)	3460 (5.1)
Rural 1 (Lowest Income)	38,419 (6.9)	2,286 (16.7)	11,009 (16.3)
Rural 2	41,532 (7.4)	1318 (9.7)	6291 (9.3)
Rural 3	42,333 (7.6)	793 (5.8)	3965 (5.9)
Rural 4	41,124 (7.3)	889 (6.5)	4353 (6.5)
Rural 5 (Highest Income)	41,876 (7.5)	804 (5.9)	3811 (5.7)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	155,809 (27.8)	7,567 (55.4)	15,088 (22.4)
Personality Disorder Diagnosis	18,009 (3.2)	999 (7.3)	546 (0.8)
Psychosis Diagnosis	8,633 (1.5)	691 (5.1)	583 (0.9)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction
Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date
* AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD

Appendix Table 2.9: Characteristics of Males with AUD* (cases) and Males without AUD (matches) in the Income Assistance Cohort
Cases' and matches' characteristics described at index date, 1999/2000 to 2014/15

	Manitoba Population in 2013/14	Cases	Matches
	N = 544,672	N = 25,353	N = 123,297
Age (Years)			
Average Age at Diagnosis (95% CI)	43.1 (43.0-43.1)	37.7 (37.5-37.9)	38.4 (38.3-38.4)
Median Age	42.0	37.0	38.0
Proportion of Population N(%)			
Male	544,672 (49.3)	25,353 (65.0)	123,297 (64.7)
Regional Health Authority N(%)			
Southern Health-Santé Sud	77,024 (14.1)	2077 (8.2)	10362 (8.4)
Winnipeg	312,539 (57.4)	13,064 (51.5)	65,507 (53.1)
Prairie Mountain	69,954 (12.8)	3,110 (12.3)	20,118 (16.3)
Interlake-Eastern	54,705 (10.0)	2769 (10.9)	13373 (10.9)
Northern	28,904 (5.3)	4,333 (17.1)	13,937 (11.3)
Living in Winnipeg or Brandon N(%)			
	336,087 (61.7)	13,744 (54.2)	68,673 (55.7)
Income Quintile N(%)			
Urban 1 (Lowest Income)	64,495 (11.8)	4,946 (19.5)	24,238 (19.7)
Urban 2	66,222 (12.2)	3,051 (12.0)	15,360 (12.5)
Urban 3	66,089 (12.1)	2329 (9.2)	11830 (9.6)
Urban 4	67,598 (12.4)	1943 (7.7)	9851 (8.0)
Urban 5 (Highest Income)	68,231 (12.5)	1475 (5.8)	7394 (6.0)
Rural 1 (Lowest Income)	38,845 (7.1)	3,845 (15.2)	17,329 (14.1)
Rural 2	41,626 (7.6)	2327 (9.2)	10665 (8.7)
Rural 3	42,326 (7.8)	1765 (7.0)	8804 (7.1)
Rural 4	41,872 (7.7)	1813 (7.2)	8839 (7.2)
Rural 5 (Highest Income)	42,813 (7.9)	1686 (6.7)	8260 (6.7)
Mental Disorder N(%)			
Mood and Anxiety Diagnosis	85,360 (15.7)	8,471 (33.4)	13,728 (11.1)
Personality Disorder Diagnosis	13,998 (2.6)	1079 (4.3)	789 (0.6)
Psychosis Diagnosis	8,394 (1.5)	1349 (5.3)	1272 (1.0)

Note: Alcohol use disorder is defined by a diagnosis of mental illness related to alcohol use and/or physical illness caused by excessive alcohol use and/or a prescription drug used to treat alcohol addiction

Note: Age, RHA, urban/rural, and income quintile were calculated at index date. Mental health was calculated 5 years prior to index date

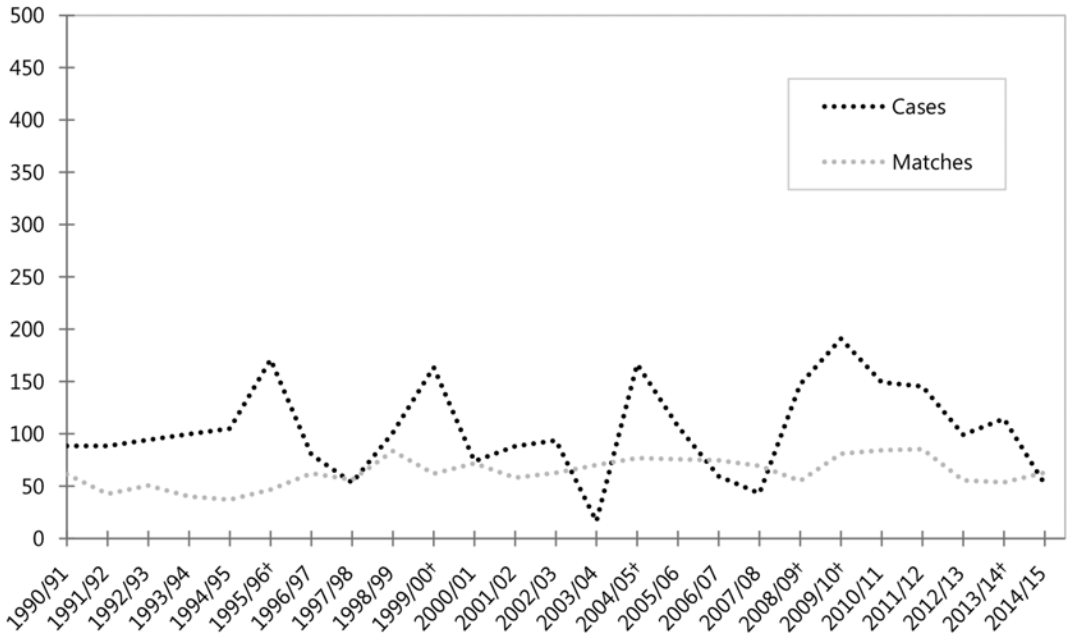
* AUD: Alcohol Use Disorder

Index Date: Date of first diagnosis of AUD

Appendix 3: Cancer Sensitivity Analysis

Appendix Figure 3.1: Crude Incidence Rates of Alcohol-Related Cancer Excluding Breast Cancer for Females with AUD* (cases) and Females without AUD (matches)

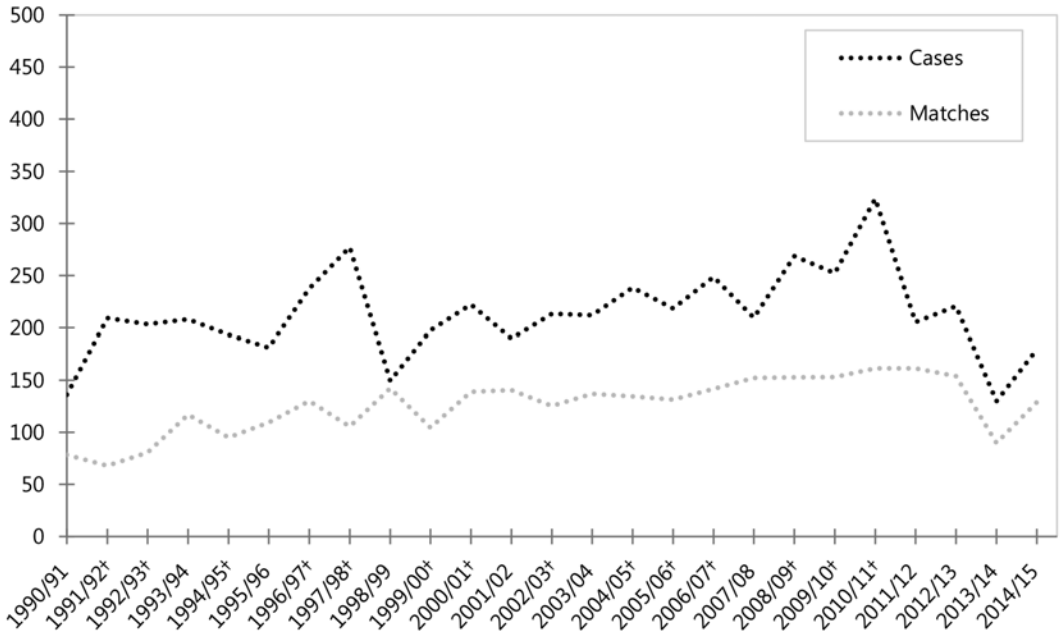
Per 100,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude Case and Match rates (p<0.05)

Appendix Figure 3.2: Crude Incidence Rates of Alcohol-Related Cancer Excluding Breast Cancer for Males with AUD* (cases) and Males without AUD (matches)

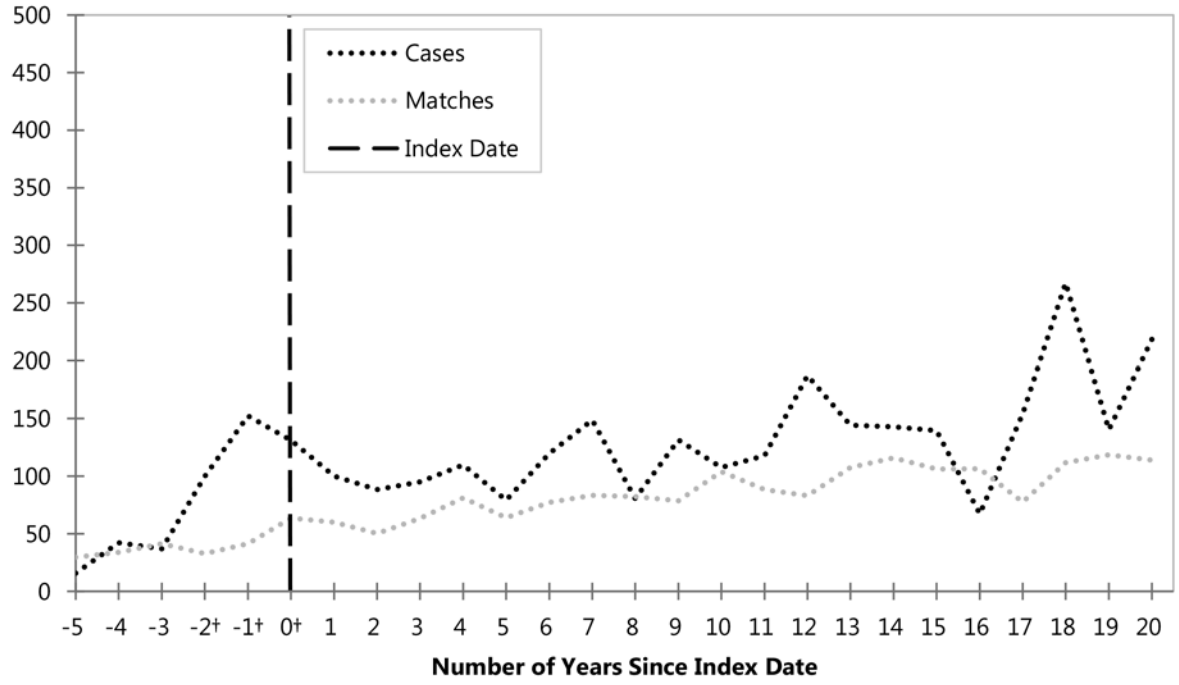
Per 100,000 person-years, by fiscal year



*AUD: Alcohol Use Disorder
† indicates a statistically significant difference between the crude Case and Match rates (p<0.05)

Appendix Figure 3.3: Crude Incidence Rates of Alcohol-Related Cancer Excluding Breast Cancer for Females with AUD* (cases) and Females without AUD (matches), Before and After Index Date

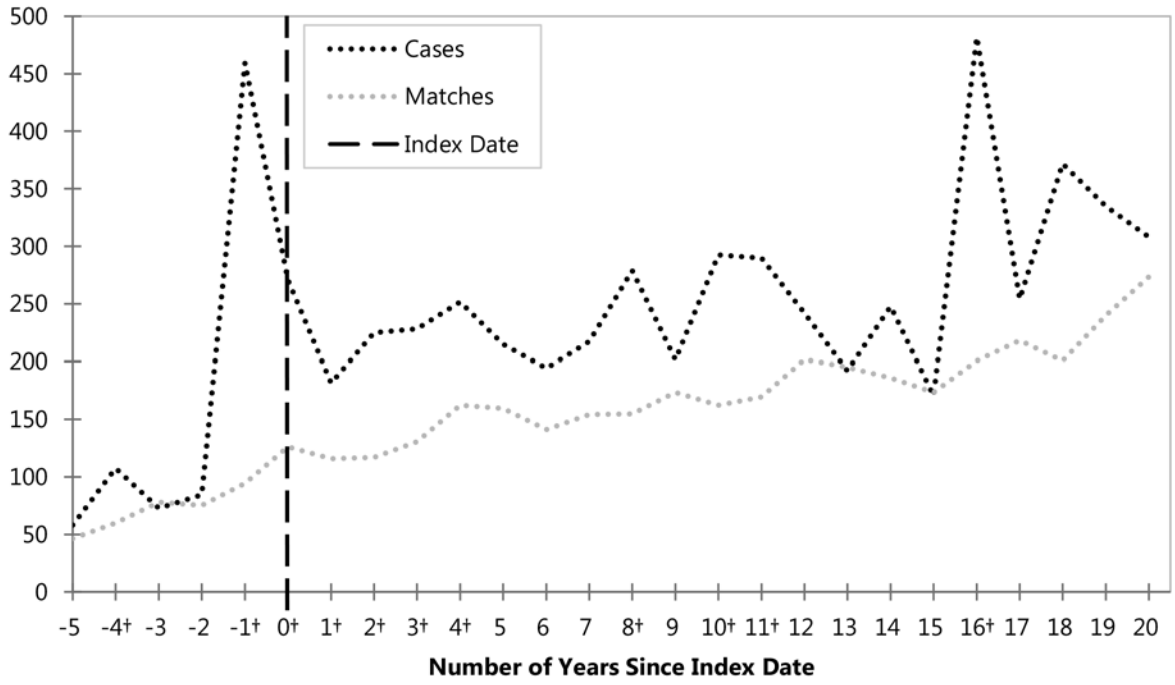
Per 100,000 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
† indicates a statistically significant difference between the crude Case and Match rates ($p<0.05$)

Appendix Figure 3.4: Crude Incidence Rates of Alcohol-Related Cancer Excluding Breast Cancer for Males with AUD* (cases) and Males without AUD (matches), Before and After Index Date

Per 100,000 person-years



*AUD: Alcohol Use Disorder
Index Date: Date of first diagnosis of AUD
† indicates a statistically significant difference between the crude Case and Match rates ($p<0.05$)

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