



Changes in health service use due to alcohol during the COVID-19 pandemic among individuals with and individuals without pre-existing alcohol-related medical diagnoses

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Abstract

Objective To compare changes in outpatient and acute care visits due to alcohol during the COVID-19 pandemic between individuals with and those without a history of alcohol-related health service use (AHSU).

Methods We conducted a cross-sectional analysis of health administrative data in Ontario, Canada. The Ontario population was stratified into those with and those without 1+ health service encounter(s) due to alcohol in the past 2 years. We compared age- and sex-standardized rates of alcohol-related outpatient visits, emergency department (ED) visits, and hospitalizations during the first 15 months of the pandemic (March 2020–May 2021) to those during the same 15-month period prior to the pandemic (March 2018–May 2019).

Results Of 13,450,750 eligible Ontarians on March 11, 2022, 129,434 (1.0%) had AHSU in the previous 2 years. Overall, rates of alcohol-related *outpatient* visits and *hospitalizations* increased, while rates of alcohol-related *ED visits* decreased during the pandemic. There was a similar relative increase in rates of alcohol-related outpatient visits and hospitalizations between those with and those without prior AHSU. However, the absolute increase in rates of alcohol-related outpatient visits and hospitalizations was higher among those with prior AHSU (*outpatient* rate difference (RD) per 10,000 population: 852.3, 95% confidence interval (CI): 792.7, 911.9; *inpatient* RD: 26.0, 95% CI: –2.3, 54.2) than among those without (*outpatient* RD: 6.5, 95% CI: 6.0, 6.9; *inpatient* RD: 0.4, 95% CI: 0.2, 0.7).

Conclusion Rates of alcohol-related outpatient and inpatient care increased during the COVID-19 pandemic, and high rate of recurrent harm among individuals with pre-pandemic AHSU was an important contributor to this trend.

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Résumé

Objectif Comparer les changements dans consultations externes et les consultations en soins actifs liées à l'alcool pendant la pandémie de COVID-19 chez les personnes avec et chez celles sans antécédents d'utilisation des services de santé liée à l'alcool (USSLA).

Méthode Nous avons effectué une analyse transversale des données administratives sur la santé de l'Ontario, au Canada. Nous avons stratifié la population ontarienne selon la présence (1+) ou l'absence de contacts avec les services de santé pour des raisons liées à l'alcool au cours des deux années antérieures. Nous avons comparé les taux de consultations externes, de consultations à l'urgence et d'hospitalisations liées à l'alcool, standardisés pour l'âge et le sexe, au cours des 15 premiers mois de la pandémie (mars 2020–mai 2021) aux taux correspondants pour la même période de 15 mois avant la pandémie (mars 2018–mai 2019).

Résultats Sur les 13 450 750 Ontariens et Ontariennes admissibles le 11 mars 2022, 129 434 (1,0 %) avaient utilisé les services de santé pour des raisons liées à l'alcool au cours des deux années antérieures. Dans l'ensemble, les taux de consultations externes et d'hospitalisations liées à l'alcool ont augmenté, tandis que les taux de consultations à l'urgence liées à l'alcool ont diminué pendant la pandémie. Il y a eu une augmentation relative semblable des taux de consultations externes et d'hospitalisations liées à l'alcool entre les personnes avec et sans antécédents d'USSLA. Par contre, l'augmentation absolue des taux de consultations externes et d'hospitalisations liées à l'alcool a été plus élevée chez les personnes ayant des antécédents d'USSLA (différence de taux [DT] de consultations externes pour 10 000 habitants : 852,3; intervalle de confiance de 95 % [IC] : 792,7, 911,9; DT d'hospitalisations : 26,0; IC de 95 % : -2,3, 54,2) que chez les personnes sans antécédents d'USSLA (DT de consultations externes : 6,5; IC de 95 % : 6,0, 6,9; DT d'hospitalisations : 0,4; IC de 95 % : 0,2, 0,7).

Conclusion Les taux de consultations externes et d'hospitalisations liées à l'alcool ont augmenté pendant la pandémie de COVID-19, et les taux élevés de méfaits récurrents chez les personnes ayant utilisé les services de santé pour des raisons liées à l'alcool avant la pandémie ont beaucoup contribué à cette tendance.

Keywords Alcohol harms · Health service use · Pandemic · COVID-19 · Alcohol use disorders

Mots-clés Méfaits de l'alcool · utilisation des services de santé · pandémie · COVID-19 · troubles de consommation d'alcool

Introduction

At the beginning of the COVID-19 pandemic, there was concern that alcohol use and its associated health and societal harms would increase in prevalence due to pandemic-related stressors (Hobin & Smith, 2020; Stockwell et al., 2021). While the impact of the pandemic on individual-level alcohol use has been complex (Schmidt et al., 2021), this concern appears to have broadly manifested itself in North America, with surveys and alcohol sales data indicating an average increase in alcohol consumption following the onset of the pandemic (Nordeck et al., 2022; Rossow et al., 2021; Shield et al., 2022; Zipursky et al., 2021). Furthermore, the proportion of emergency department (ED) visits caused by alcohol and rates of alcohol-attributable hospitalizations and mortality have increased in Canada and the United States (Murthy & Narasimha, 2021; Myran et al., 2021b; Rennert-May et al., 2021; White et al., 2022; Zipursky et al., 2021).

Collectively, these results suggested a need for population-level interventions to reduce harmful alcohol use during the pandemic recovery period and beyond. However, it is unclear whether the risk of alcohol-related harm during the pandemic was concentrated among individuals at a high baseline risk of alcohol-related harm (e.g., those with a pre-existing alcohol

use disorder [AUD]) or more broadly distributed across the population. In turn, it is unclear how much emphasis public health and clinical efforts aimed at reducing alcohol-related harms during periods of societal stressors, such as the COVID-19 pandemic, should place on targeted approaches that focus on those at the highest risk of harm versus more broad interventions aimed at reducing risk across the general population (Manuel et al., 2006; Rose et al., 2008).

Individuals with pre-existing AUD or subclinical hazardous patterns of alcohol use may have been at a disproportionately high risk of alcohol-related harm during the pandemic (Schmidt et al., 2021; Yazdi et al., 2020). The reasons for this are multifactorial and could include factors such as reduced access to inpatient addiction treatment services or an exacerbation of harmful alcohol use or AUD brought about by pandemic-related stressors (Clay & Parker, 2020; Kim et al., 2020). Indeed, isolation and psychiatric comorbidities are risk factors for relapse and increased alcohol consumption among individuals with AUD and both have increased in prevalence since the onset of the COVID-19 pandemic (Shield et al., 2022; Yazdi et al., 2020). Some surveys have suggested that individuals with pre-existing AUD have in fact reported greater increases in alcohol use during the pandemic than those without AUD and elevated rates

of relapse among individuals with a history of AUD have been documented in various countries (Barrio et al., 2021; Kim et al., 2020; Schmidt et al., 2021; Schmits & Glowacz, 2021). However, no studies have examined whether individuals with pre-existing alcohol-related morbidities (including AUD) have experienced larger increases in alcohol-related health care visits during the pandemic than those without.

To address this gap in knowledge, this study used population-level health administrative data to examine changes in rates of outpatient visits, ED visits, and hospitalizations due to alcohol following the onset of the COVID-19 pandemic for all individuals in Ontario, Canada. We then compared these changes between individuals with and those without a pre-pandemic history of alcohol-related health service use (AHSU), a specific marker of AUD. Our data contain individual-level data on health service use for virtually all Ontario residents, which provides a unique opportunity to track patterns in AHSU across the entire population. This allowed for us to evaluate the relative distribution of health care visits due to alcohol between the general population and those with a documented history of harmful alcohol use both prior to and during the COVID-19 pandemic.

Material and methods

Study design

We conducted a population-based, repeated cross-sectional study of individuals living in Ontario, Canada, using linked administrative data collected from the province's universal single-payer health care system (Ontario Health Insurance Program [OHIP]). All Ontario residents who were between the ages of 10 and 105 and were living in Ontario between January 2016 and May 2021 were eligible for inclusion. Individuals were assessed for eligibility on January 1st of each year.

Data sources

We obtained demographic data and diagnostic codes for health care visits from de-identified and linked health administrative databases. We used several databases, including the National Ambulatory Care Reporting System, which captures all ED visits in Ontario and the associated diagnostic code; the Discharge Abstract Database and Ontario Mental Health Reporting System, which capture all acute, inpatient hospitalizations in Ontario and the associated diagnostic code; the Registered Persons Database (RPDB), which includes the total number of persons at risk each month and individuals' age and sex; and the Postal Code Conversion File, which contains information on the rurality (urban vs rural) and neighbourhood income for each person's home

address. These datasets were linked using unique encoded identifiers and analyzed at ICES. ICES is an independent, non-profit research institute whose legal status under Ontario's health information privacy law allows it to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement.

Outcomes

Our three primary outcomes were outpatient visits, ED visits, and hospitalizations due to alcohol. ED visits and hospitalizations due to alcohol were defined using methodology from the Canadian Institute for Health Information's (CIHI) indicator on 'hospitalizations entirely due to alcohol' (Canadian Institute for Health Information, 2020). Briefly, a visit was considered due to alcohol when an alcohol-attributable diagnostic code from the 10th edition of the International Classification of Diseases (ICD-10) was present in the ED visit or hospitalization record (Supplementary Table 1). Outpatient visits due to alcohol were defined when the associated diagnostic code was alcohol psychosis (291) or alcoholism (303). These are the two diagnostic codes available for outpatient visits that are specific to alcohol; however, they do not capture less severe patterns of hazardous alcohol use (i.e., patterns of alcohol use that confer a risk of downstream harm but do not meet the clinical criteria for AUD). Therefore, these outpatient visits represent care for individuals with more severe patterns of alcohol use.

Exposures

The two exposures of interest for this study were (1) the COVID-19 pandemic and (2) a history of AHSU. We considered the COVID-19 pandemic to begin on March 11, 2020 (WHO declaration of pandemic). Data were available through to the end of May 2021, so we considered March 11, 2020–May 10, 2021 to be the 15-month 'COVID-19 pandemic period' and the equivalent 15-month period prior to the pandemic (i.e., March 11, 2018–May 10, 2019) to be the 'pre-COVID-19 pandemic period'.

Prior AHSU was a binary variable defined by whether or not an individual had any type of health care visit (outpatient, ED, or hospitalization) attributable to alcohol in the 2 years prior to either the pre-pandemic or pandemic periods. Prior AHSU was defined using the same criteria used to identify primary outcomes. As a sensitivity analysis, prior AHSU was also broken down by three types: prior (1) alcohol-related outpatient visit, (2) alcohol-related ED visit, or (3) alcohol-related hospitalization. These groups were created hierarchically whereby an individual was placed in the 'hospitalization' category if they had one or more alcohol-related hospitalizations in the 2-year lookback period, in the 'ED visit' category if they had no alcohol-related

hospitalizations but one or more alcohol-related ED visits in the 2-year lookback period, and in the ‘outpatient’ category if they had no alcohol-related hospitalizations or ED visits but one or more alcohol-related outpatient visits in the 2-year lookback period. In turn, this created a mutually exclusive severity gradient for prior AHSU, which has been previously used to categorize psychiatric comorbidities in Ontario (Klaassen et al., 2019).

Demographic variables

Differences in age structure, sex, rural-urban status, and neighbourhood income quintile were compared between those with and those without prior AHSU. Age and sex for all Ontario residents were available through the RPDB. Individuals were classified as urban or rural residents using the Statistics Canada definition, which defines a rural residence as living in a town or municipality outside of a census metropolitan area (CMA, population of 100,000 or more) or census agglomeration (CA, population of 10,000 or more). We defined neighbourhoods as dissemination areas (average 400–700 individuals) and classified neighbourhoods by income quintiles based on the average before-tax income, adjusted for household size and relative to other neighbourhoods either within the same CMA or CA or in rural Ontario.

Statistical analysis

Descriptive statistics for study variables, stratified by prior AHSU, were tabulated. To evaluate historic trends in alcohol-related health service use in Ontario, counts and per capita rates of alcohol-related outpatient visits, ED visits, and hospitalizations were gathered for each month between January 2016 and May 2021 and plotted. Counts and per capita rates of the study outcomes were also tabulated within the pre-pandemic and pandemic periods, stratified by prior AHSU. The changes in rates of each outcome between the pre-pandemic and pandemic periods across groups were evaluated using rate differences (for absolute change) and rate ratios (for relative change). All per capita rates were standardized for age and sex using the 2016 Ontario census data. Data were analyzed in SAS version 9.4 (SAS Institute Inc., 2013).

Research ethics

This project was conducted under section 45 of Ontario’s Personal Health Information Protection Act, which allows ICES to collect personal health information without consent for the purpose of health system evaluation and improvement, and approved by ICES’s Privacy and Legal Office.

Results

Descriptive statistics of the study population

At the beginning of the pandemic (March 2020), there were 13,450,750 individuals living in Ontario who were between ages 10 and 105. Of these, 129,424 (1.0%) had an AHSU event in the previous 2 years, which broke down to 31,502 (0.2%) individuals with a prior alcohol-related hospitalization, 55,349 (0.5%) individuals with a prior alcohol-related ED visit, and 42,583 (0.3%) individuals with a prior alcohol-related outpatient visit (Table 1). Of note, the hierarchical nature of these categories means that individuals in the prior ‘hospitalization’ category may have had prior alcohol-related ED or outpatient visits and individuals in the ‘ED visit’ category may have had prior alcohol-related outpatient visits.

Relative to individuals without prior AHSU, those with prior AHSU were proportionately more male (*no AHSU* % male = 49.0%; *prior AHSU* % male = 65.0%), more likely to be over the age of 19 (*no AHSU* % ages 10–19 = 11.0%; *prior AHSU* % ages 10–19 = 3.6%), more likely to live in a rural area (*no AHSU* % rural = 10.0%; *prior AHSU* % rural = 13.1%), and more likely to live in a low-income neighbourhood (*no AHSU* % lowest income quintile = 19.5%; *prior AHSU* % lowest income quintile = 28.5%). The same demographic differences between those with and those without prior AHSU were observed at the beginning of the pre-COVID-19 pandemic period (Supplementary Table 2).

Health service use due to alcohol before and during the COVID-19 pandemic

Figure 1 shows monthly data for rates (top) and absolute counts (bottom) of outpatient visits, ED visits, and hospitalizations due to alcohol between 2016 and 2021, stratified by prior AHSU (any AHSU in the past 2 years). Pre-pandemic per capita rates of all study outcomes were substantially higher among those with prior AHSU than among those without (Fig. 1). Absolute monthly counts of events due to alcohol were also higher among those with prior AHSU. Individuals with prior AHSU accounted for 73% of all outpatient visits due to alcohol, 63% of all ED visits due to alcohol, and 63% of all hospitalizations due to alcohol pre-pandemic (Table 2), despite representing 1.0% of Ontario’s population. There was also a clear gradient in severity of alcohol health service use where individuals with a history of hospitalizations due to alcohol had much higher rates of all visits due to alcohol than individuals with a history of ED visits or outpatient visits due to alcohol. For example, individuals with a history of hospitalizations due to alcohol had a higher rate of hospitalization due to alcohol during the pandemic (standardized rate: 3244)

Table 1 Descriptive statistics of the COVID-19 study sample stratified by alcohol-related health service use (AHSU) in the prior 2 years

	AHSU subgroup				
	No AHSU <i>n</i> = 13,321,316	Prior AHSU <i>n</i> = 129,434	Outpatient visit <i>n</i> = 42,583	ED visit <i>n</i> = 55,349	Hospitalization <i>n</i> = 31,502
Sex					
Female	6,796,943 (51.0%)	45,358 (35.0%)	14,130 (33.2%)	21,337 (38.5%)	9891 (31.4%)
Male	6,524,373 (49.0%)	84,076 (65.0%)	28,453 (66.8%)	34,012 (61.5%)	21,611 (68.6%)
Age group					
10–19 years	1,467,004 (11.0%)	4695 (3.6%)	353 (0.8%)	3681 (6.7%)	661 (2.1%)
20–29 years	2,094,565 (15.7%)	26,937 (20.8%)	4681 (11.0%)	18,834 (34.0%)	3422 (10.9%)
30–39 years	2,073,484 (15.6%)	21,888 (16.9%)	7412 (17.4%)	9977 (18.0%)	4499 (14.3%)
40–49 years	1,961,417 (14.7%)	19,554 (15.1%)	7658 (18.0%)	7165 (12.9%)	4731 (15.0%)
50–59 years	2,138,354 (16.1%)	24,075 (18.6%)	9445 (22.2%)	7598 (13.7%)	7032 (22.3%)
60+ years	3,586,492 (26.9%)	32,285 (24.9%)	13,034 (30.6%)	8094 (14.6%)	11,157 (35.4%)
Rurality					
Urban	11,953,623 (89.7%)	111,603 (86.2%)	37,659 (88.4%)	47,262 (85.4%)	26,682 (84.7%)
Rural	1,333,868 (10.0%)	16,953 (13.1%)	4776 (11.2%)	7591 (13.7%)	4586 (14.6%)
Missing	33,825 (0.3%)	878 (0.7%)	148 (0.3%)	496 (0.9%)	234 (0.7%)
Income quintile					
1 (lowest)	2,596,810 (19.5%)	36,846 (28.5%)	9882 (23.2%)	17,073 (30.8%)	9891 (31.4%)
2	2,618,439 (19.7%)	26,725 (20.6%)	8693 (20.4%)	11,387 (20.6%)	6645 (21.1%)
3	2,672,408 (20.1%)	23,572 (18.2%)	8367 (19.6%)	9684 (17.5%)	5521 (17.5%)
4	2,683,478 (20.1%)	20,785 (16.1%)	7493 (17.6%)	8476 (15.3%)	4816 (15.3%)
5 (highest)	2,711,625 (20.4%)	20,555 (15.9%)	7976 (18.7%)	8203 (14.8%)	4376 (13.9%)
Missing	38,556 (0.3%)	951 (0.7%)	172 (0.4%)	526 (1.0%)	253 (0.8%)

AHSU, alcohol-related health service use; ED, emergency department

than individuals with prior ED visits due to alcohol (standardized rate: 778.7) or those with prior outpatient visits due to alcohol (standardized rate: 322.6; Table 3).

During the pandemic, there was a 21.3% increase in outpatient visits, a 14.5% decrease in ED visits, and a 6.2% increase in hospitalizations due to alcohol (Table 2). Changes in health care visits due to alcohol varied by whether or not an individual had AHSU in the prior 2 years (Table 2). After age and sex standardization, the relative increase in outpatient visits was comparable between individuals with AHSU (relative rate (RR) 1.19, 95% confidence interval (CI): 1.17–1.20) and those without (RR: 1.19, 95% CI: 1.17–1.20). Relative declines in ED visits due to alcohol were smaller for individuals with prior AHSU (RR: 0.86, 95% CI: 0.85–0.87) compared to no AHSU (RR: 0.80, 95% CI: 0.79–0.81). Relative increases in hospitalizations due to alcohol were comparable between those with prior AHSU (RR: 1.02, 95% CI: 1.00–1.05) and those with no prior AHSU (RR: 1.04, 95% CI: 1.02–1.07; Table 3). Importantly, despite similar relative changes between individuals with and those without a history of AHSU, individuals with AHSU had much larger *absolute* changes in all the study outcomes during the COVID-19 pandemic due to the higher baseline rate of each outcome (Table 3).

Discussion

During the first 15 months of the COVID-19 pandemic in Ontario, rates of outpatient visits and hospitalizations due to alcohol increased, whereas rates of ED visits due to alcohol decreased. Previous work from Ontario demonstrated that the decrease in rates of ED visits due to alcohol was smaller than the decrease in rates of all-cause ED visits, such that there was an increase in the proportion of total ED visits that were attributable to alcohol during the pandemic (Myran et al., 2021b). Compared to those without AHSU in the past 2 years, individuals with prior AHSU experienced a smaller relative decrease in rates of ED visits due to alcohol but similar relative increases in rates of outpatient visits and hospitalizations due to alcohol. Importantly, despite representing just 1% of the population, individuals with prior AHSU experienced much larger absolute increases in outpatient visits and hospitalizations due to alcohol during the pandemic and accounted for 76% of all outpatient visits due to alcohol, 66% of all ED visits due to alcohol, and 63% of all hospitalizations due to alcohol during the pandemic.

While trends in health service use due to alcohol are a surrogate measure of underlying trends in alcohol use in the population (insofar as not everyone who consumes alcohol will be harmed by alcohol use, and not everyone

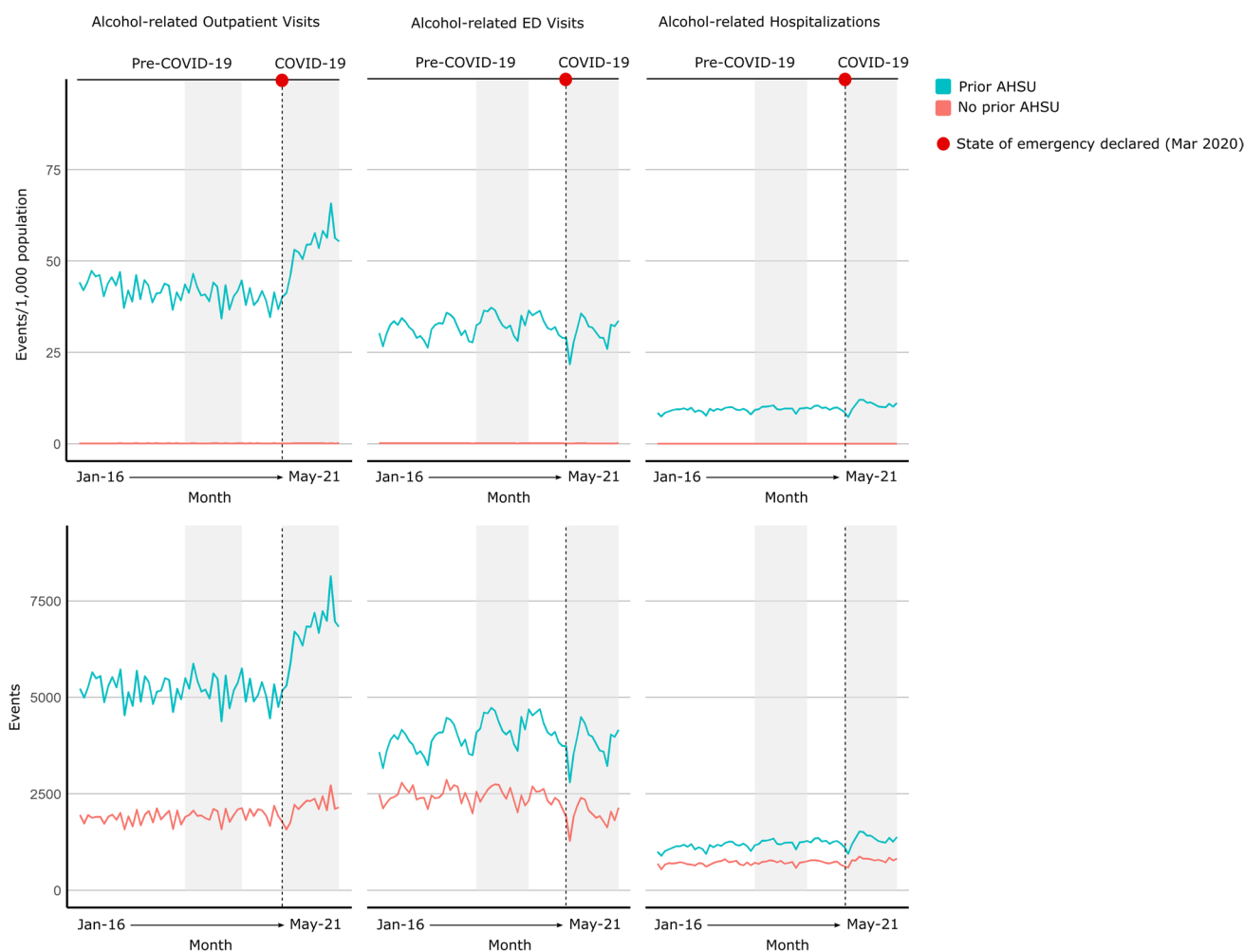


Fig. 1 Differences in rates of health service use due to alcohol prior to and during the COVID-19 pandemic in Ontario. (*Top*) Monthly rates of alcohol-related outpatient visits (left), emergency department (ED) visits (middle), and hospitalizations (right) per 1000 population between January 2016 and May 2021. Different lines reflect whether alcohol-related health service use (AHSU) was recorded in the 2 years prior to the beginning of the pre-COVID-19 pandemic period (March 2018). Grey panels indicate the periods used to collect

rates of health service use due to alcohol for the pre-pandemic and pandemic periods in the study. The beginning of the pandemic, defined as the month when a state of emergency was declared in Ontario (March 2020), is indicated by the vertical dashed black line. (*Bottom*) Same as top panels except indicating the monthly counts of outpatient visits (left), ED visits (middle), and hospitalizations (right) due to alcohol between January 2016 and May 2021, instead of the per capita rates

who is harmed by alcohol use will seek health care), the findings of this study are consistent with previous reports of increasing alcohol use and sales and concerns over a large increase in hazardous and harmful alcohol use during the pandemic (Myran et al., 2021c; Nordeck et al., 2022; Rossow et al., 2021; Shield et al., 2022; Zipursky et al., 2021). Indeed, both outpatient visits and hospitalizations due to alcohol increased in frequency, and, while ED visits due to alcohol decreased, this was to a much lesser degree in comparison with all-cause ED visits (Myran et al., 2021b). The primary goal of our study was to determine whether individuals with a 2-year history of AUD

or hazardous alcohol use had experienced larger increases in health care visits due to alcohol during the pandemic than those without. Our results provide some reassurance that individuals with a pre-pandemic history of AUD or hazardous alcohol use did not experience a larger *relative* increase in health service use due to alcohol than the general population during the pandemic, as was previously hypothesized (Kim et al., 2020; Yazdi et al., 2020). However, these individuals experienced much larger *absolute* increases in these outcomes and accounted for the majority of health care visits entirely attributable to alcohol prior to and during the pandemic.

Table 2 Changes in counts of outpatient visits, ED visits, and hospitalizations due to alcohol during the COVID-19 pandemic relative to the pre-pandemic period

	Alcohol-related outpatient visits			Alcohol-related ED visits			Alcohol-related hospitalizations		
	Pre-COVID-19	COVID-19	% Change	Pre-COVID-19	COVID-19	% Change	Pre-COVID-19	COVID-19	% Change
	Count (% total)	Count (% total)		Count (% total)	Count (% total)		Count (% total)	Count (% total)	
Total	108,795 (100%)	131,969 (100%)	21.3	101,318 (100%)	86,627 (100%)	-14.5	29,389 (100%)	31,202 (100%)	6.2
No AHSU	29,333 (27%)	32,272 (24%)	10.0	37,008 (37%)	29,322 (34%)	-20.8	10,845 (37%)	11,586 (37%)	6.8
Prior AHSU	79,462 (73%)	99,697 (76%)	25.5	64,310 (63%)	57,305 (66%)	-10.9	18,544 (63%)	19,616 (63%)	5.8
AHSU subgroup									
Outpatient visit	33,128 (30%)	45,240 (34%)	36.6	3295 (3%)	2994 (3%)	-9.1	1463 (5%)	1565 (5%)	7.0
ED visit	15,934 (15%)	19,784 (15%)	24.2	24,128 (24%)	19,634 (23%)	-18.6	3954 (13%)	3955 (13%)	0.0
Hospitalization	30,400 (26%)	34,673 (26%)	14.1	36,887 (36%)	34,677 (40%)	-6.0	13,127 (45%)	14,096 (45%)	7.4

Pre-COVID: March 2018 to May 2019; COVID: March 2020 to May 2021

Table 3 Changes in standardized rates of outpatient visits, ED visits, and hospitalizations due to alcohol during the COVID-19 pandemic relative to the pre-pandemic period

Outcome	Group	Pre-COVID-19 rate*	COVID-19 rate*	Rate difference (95% CI)	Rate ratio (95% CI)	
Alcohol-related outpatient visits	Total	78.1	94.9	16.8 (16.1, 17.5)	1.22 (1.21, 1.23)	
	No AHSU	35.3	41.8	6.5 (6.0, 6.9)	1.18 (1.17, 1.20)	
	Prior AHSU	4606.7	5459.0	852.3 (792.7, 911.9)	1.19 (1.17, 1.20)	
	AHSU subgroup					
	Outpatient visit	5699.6	6921.9	1222.3 (1094.7, 1349.9)	1.21 (1.19, 1.24)	
	ED visit	2913.2	3286.7	373.5 (294.2, 452.7)	1.13 (1.10, 1.16)	
	Hospitalization	6249.9	7393.1	1143.2 (999.5, 1286.9)	1.18 (1.16, 1.21)	
Alcohol-related ED visits	Total	72.5	61.9	-10.6 (-11.2, -10.0)	0.85 (0.85, 0.86)	
	No AHSU	31.2	25.0	-6.2 (-6.6, -5.8)	0.80 (0.79, 0.81)	
	Prior AHSU	4138.2	3565.4	-572.8 (-623.3, -522.4)	0.86 (0.85, 0.87)	
	AHSU subgroup					
	Outpatient visit	887.0	738.4	-148.6 (-203.9, -93.3)	0.83 (0.78, 0.89)	
	ED visit	4171.8	3404.4	-767.4 (-851.3, -683.5)	0.82 (0.80, 0.83)	
	Hospitalization	9584.9	8523.0	-1061.9 (-1230.5, -893.3)	0.89 (0.87, 0.91)	
Alcohol-related hospitalizations	Total	21.2	22.4	1.2 (0.8, 1.5)	1.06 (1.04, 1.07)	
	No AHSU	9.9	10.3	0.4 (0.2, 0.7)	1.04 (1.02, 1.07)	
	Prior AHSU	1166.0	1191.9	26.0 (-2.3, 54.2)	1.02 (1.00, 1.05)	
	AHSU subgroup					
	Outpatient visit	325.5	322.6	-2.9 (-32.5, 26.7)	0.99 (0.90, 1.09)	
	ED visit	766.9	778.7	11.9 (-28.0, 51.7)	1.02 (0.96, 1.07)	
	Hospitalization	3121.2	3244.2	123.0 (24.6, 221.4)	1.04 (1.01, 1.07)	

*Rate per 10,000 at-risk population standardized for age and sex
AHSU, alcohol-related health service use

Prior to the pandemic, alcohol use resulted in substantial adverse health and social harms, including a major burden on the Canadian health care system (Myran et al., 2021a; Myran

et al., 2019). Our study examined health care visits that were entirely attributable to alcohol and found that the majority of these visits were incurred by individuals with prior AHSU,

who represented just 1% of the population. Consequently, our findings suggest that meaningful reductions in alcohol-related health service use in Ontario may be achievable through targeted interventions that expand treatment services and social supports to individuals with prior AHSU. This could include a variety of targeted services including the expansion of rapid access addiction treatment following alcohol-related ED visits and hospitalizations (Wiercigroch et al., 2020), an increased use of evidence-based pharmacotherapies for AUD (which are notoriously underutilized in Ontario (Spithoff et al., 2017)), and addressing upstream determinants (e.g., poverty, housing instability, access to health services) that contribute to recurrent AHSU in this small and often marginalized population (Bellis et al., 2016; Bloomfield, 2020; Collins et al., 2012). In addition, the large increase in alcohol-related outpatient visits may reflect expansions of outpatient virtual care services during the pandemic, which may have improved the accessibility of health services for individuals with AUD (Bhatia et al., 2021; Boschuetz et al., 2020; Drake et al., 2020; Glazier et al., 2021; Rossow et al., 2021; Schmidt et al., 2021). Importantly, increases in outpatient alcohol service use during the pandemic were greater than previously documented changes in outpatient use, which may suggest increases in harmful alcohol use and consequences in the population. An alternative possibility is that virtual care options improved access to treatment for a population that historically has struggled to access these services due to high rates of stigma and other access barriers. Further research exploring the potential role and benefits of ongoing access to virtual care for addiction medicine services is indicated.

Critically, health service encounters that are entirely attributable to alcohol use only represent an estimated 30% of all alcohol-related hospitalizations (Canadian Institute for Health Information, 2017), given that there are many health conditions to which alcohol is a partial contributor (e.g., alcohol-related cancers and cardiovascular disease). In addition, alcohol use contributes to a multitude of health and social harms (e.g., alcohol-impaired driving, interpersonal violence, and lost productivity in the workforce) that are not directly captured within health administrative data (Rehm, 2011; Rehm et al., 2017; Sherk, 2020). These partially attributable alcohol harms and other health and social harms are far more diffusely distributed across the population and require the use of public health strategies that promote population-level changes in alcohol use behaviours across the entire population (i.e., primordial or primary prevention efforts) such as minimum unit pricing, controls over alcohol marketing and promotion, and restricting retail density (Giesbrecht et al., 2011; Gruenewald, 2011; Hobin et al., 2020). Prior literature has shown that these population-level interventions are also effective at reducing alcohol use and harms across the entire drinking spectrum including high-risk drinkers (Giesbrecht et al., 2011). Consequently, the results of this study do not undermine the importance of

population-level primary prevention efforts for alcohol use, but rather highlight that greater efforts to reduce the burden of alcohol harms in Canada, particularly during and post COVID-19, are indicated. These efforts should include both population-level interventions and secondary and tertiary prevention strategies for individuals with a known history of AUD.

Limitations

This study is limited by the fact that the diagnostic codes used in this study only capture an estimated half of individuals with AUD (~50% sensitivity in a previous study), despite being highly specific for AUD (~97% specificity) (Kim et al., 2012). In turn, while most individuals with a recent history of AHSU have an AUD, they do not represent all individuals with AUD. This means that many individuals who meet the clinical criteria for AUD but did not have an alcohol-related health service encounter will have been placed in the ‘no prior AHSU’ category, which may have biased the association between pre-existing alcohol-related morbidities and pandemic-induced changes in alcohol-related health service use towards the null. For this reason, we avoided using the term ‘AUD’ and instead used the descriptor ‘individuals with prior AHSU’ and it is important to recognize this distinction when interpreting the results of this study. In addition, because our definition of prior AHSU used a 2-year lookback window, many individuals with a lifetime history of AUD that had been well managed in the years leading up to the pandemic would have been placed in the ‘no prior AHSU’ category which would also bias our results towards the null. Second, the COVID-19 pandemic resulted in major changes in the delivery of health care in Ontario (e.g., virtual care) and patterns of health service use (e.g., reduction in overall ED use). As discussed previously, these changes challenge fully attributing increases in visits due to alcohol to greater alcohol consumption and harms in the population.

Conclusion

Health service use due to alcohol increased in Ontario during the first 15 months of the COVID-19 pandemic. A small portion of the Ontario population who repeatedly use health services for alcohol-related health conditions account for the majority of health service use entirely caused by alcohol in the province. This population experienced larger absolute increases but similar relative increases in health service use due to alcohol compared to the general population. Consequently, prevention efforts to reduce recurrent health care visits due to alcohol among those with pre-existing alcohol-related morbidities are indicated during public health crises to reduce health inequities and the acute burden of alcohol on the health care system.

Contributions to knowledge

What does this study add to existing knowledge?

- Prior studies have found increases in acute care visits due to alcohol during the early phases of the COVID-19 pandemic.
- Less data are available on longer-term changes in health service use due to alcohol and whether these changes differ for individuals with and those without pre-pandemic alcohol use disorders (AUD).
- This study found that, overall, outpatient visits and hospitalizations due to alcohol increased over the first 15 months of the pandemic whereas ED visits due to alcohol decreased.
- Absolute increases in health service use due to alcohol were greater for individuals with an AUD that pre-dated the start of the pandemic compared to the general population.

What are the key implications for public health interventions, practice, or policy?

- Health service use due to alcohol increased overall during the COVID-19 pandemic, indicating that public health interventions aimed at reducing population-level alcohol consumption are warranted.
- However, a substantial portion of health service use due to alcohol was attributed to a small proportion (1%) of the population with pre-existing AUD and these individuals experienced larger absolute increases in health service use due to alcohol than the general population during the COVID-19 pandemic.
- Interventions specifically focusing on this high-risk subpopulation are indicated during the pandemic recovery period and future periods of health system strain to reduce health inequities and the acute burden of alcohol on the health care system.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.17269/s41997-023-00739-8>.

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Author contributions DM, EF, CM, PK, MS, and PT conceptualized the study. MP and CM collected the data. DM, EF, MP, and MS analyzed the data. DM, EF, CM, and MS wrote the first draft of the manuscript. All authors edited the manuscript and approved the final version.

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Data availability The dataset from this study is held securely in coded form at ICES. While legal data sharing agreements between ICES and data providers (e.g., health care organizations and government) prohibit ICES from making the dataset publicly available, access may be granted to those who meet pre-specified criteria for confidential access, available at www.ices.on.ca/DAS(email: das@ices.on.ca).

Code availability Available on request.

Declarations

Ethics approval The use of the data in this project is authorized under section 45 of Ontario's Personal Health Information Protection Act (PHIPA) and does not require review by a Research Ethics Board.

Consent to participate Not applicable.

Consent for publication Not applicable.

Conflict of interest The authors declare no competing interests.

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