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Co-occurrence of depression, anxiety and increased alcohol use during the late stage of the COVID-19 pandemic in Saskatchewan, Canada: a cross-sectional survey

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ABSTRACT

Background Impact of the COVID-19 pandemic on mental health and substance use is well recognised. COVID-19 impacted Saskatchewan particularly hard as it has a higher prevalence of alcohol consumption than the national average. Our study investigated the prevalence and associated factors of co-occurrence of poor mental health and alcohol consumption (also referred to as dual experience) among Saskatchewan adults.

Method Cross-sectional data of 1034 eligible adults collected between July and November 2022, were analysed. Dual experience was defined as mild to severe symptoms of depression (Patient Health Questionaire-9) and/or anxiety (Generalised Anxiety Disorder-7) AND increased alcohol consumption during the later stage of COVID-19 pandemic. Multivariable binary logistic regression models were fitted to identify the factors that are associated with dual experience.

Results The prevalence of different forms of dual experience was 7.32% for depression and alcohol use, 6.09% for anxiety and alcohol use and 5.44% for co-occurrence of depression, anxiety and alcohol use. Dual experiences were less likely among participants from racialised groups, and more likely among those with household food insecurity, as well as concerns over alcohol consumption.

Conclusion Our analysis suggests that Saskatchewan adults are still experiencing poor mental health due to the impact of the COVID-19 pandemic, and a large proportion of people continue to consume alcohol at a higher rate than before the pandemic. Data driven interventions, for example, improving mental health and substance use treatment and counselling services, harm reduction strategies, especially targeting people living in food insecure households, are needed.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The COVID-19 pandemic significantly increased poor mental health and altered the alcohol use among people around the world. However, the co-occurrence of these two outcomes, poor mental health and increased alcohol use, in the same people has not gain much scientific attention, especially in the pandemic context.

WHAT THIS STUDY ADDS

⇒ 1 out of 20 adults in Saskatchewan reported co-occurrence of poor mental health (depression and anxiety) and increased alcohol use into the third year of the COVID-19 pandemic.

⇒ Food insecurity and concern about alcohol use increased the likelihood of co-occurrence of poor mental health and increased alcohol use, while identifying as a visible minority decreased the likelihood.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study highlighted the need for integrated mental health and addiction services in the province. The need for developing interventions and improving service delivery systems to better manage mental health and substance use as co-occurring conditions should be prioritised.

⇒ This research might be useful as a baseline study and as a reference for future longitudinal studies.

INTRODUCTION

Following the declaration of the global COVID-19 pandemic and the documented outbreak of the SARS-CoV-2 virus in Canada, the federal and provincial governments across the country implemented public health guidelines and restrictions to curb the spread of the virus and to alleviate strains on healthcare systems. These measures included social and physical distancing, mandatory masking, self-isolation and vaccination campaigns. As a result of these public health countermeasures being put into effect and the public adhering to them, especially in the early stages, the spread of the virus was slowed. However,

other health outcomes such as mental health and alcohol consumption worsened during this time among Canadians.[1 2]

At the height of the pandemic, surveys conducted in Canada found an increase in symptoms related to depression and anxiety in the general population.[1] Furthermore, the prevalence and severity of these mental health outcomes increased during the pandemic compared with the pre-pandemic period.[1 3] Women, young Canadians aged 18–29 years and those working on the frontlines of care, such as nurses, were most likely to be diagnosed with anxiety or depression during the pandemic. In addition, negative mental health outcomes were associated with having low income or being laid off or unemployed during the pandemic.[1 4]

Researchers have also assessed changes in substance use including alcohol after the onset of the pandemic, revealing nuances of alcohol consumption across the country. The Mental Health Commission of Canada found over one in four who responded to AUDIT (Alcohol Use Disorder Identification Test) and CUDIT-R (Cannabis Use Disorder Identification Test – Revised) had scores that indicated problematic alcohol or cannabis use between October and December 2020; more respondents from the Prairie provinces indicated problematic use of alcohol.[1] Furthermore, between 12% and 18% of Canadians indicated their alcohol consumption had increased throughout 2020, in the first year of the pandemic, citing a lack of a regular schedule, boredom, stress and loneliness as major reasons for the increase. While women more often indicated stress as a reason for increased consumption of alcohol, men more frequently indicated boredom.[3 5] Additionally, 18% of Canadians who reported staying home between 30 March and 2 April 2020 indicated an increase in their alcohol consumption, especially Canadians aged 35–54.[5] Of Canadians reporting that their alcohol consumption decreased during the pandemic, 61% indicated that this was because of a lack of socialising (2020).[5]

Notably, problematic alcohol consumption can co-occur with mental health challenges[5–7]; studies have found relationships between declining mental health and increased alcohol consumption during the pandemic.[1 3 8–10] Reasons given for this have included worsening financial security, social isolation, an individual's or their family's, own health/mental health status or disruptions to daily routines during the pandemic in Canada. There is evidence that alcohol consumption can increase the risk of developing or exacerbating mental health disorders, including anxiety and depression.[11–13] Ascertaining causality of alcohol use and mental health co-occurrence, for example, which is the cause and which is the effect, or whether both are caused by yet another factor, has proven to be challenging; more fundamental research is needed to unpack this dual outcome.[14]

The province of Saskatchewan, located in the Canadian prairies has one of the highest proportions of rural populations in the country.[15] People living in rural settings have reported heavier drinking (defined as having more than five drinks on one occasion by men or four drinks by women at least once a month in the last year) than those living within urban centres. The province was the fourth-highest among self-reported alcohol consumption in the country in 2017[16] and the fifth-highest among alcohol-related hospitalisations in 2015–2016.[17] According to the Canadian Alcohol and Drugs Survey of 2019, rates of lifetime alcohol use in Saskatchewan were fourth-highest of the provinces and territories in the country and surpassing the national average (90.1 per 100 000 people in Saskatchewan compared with 87.0 nationally), but the province was comparable to the rest of the country in shorter-term use of alcohol (past 30 days, or 12 months).[18]

Alcohol consumption in Saskatchewan has been identified as an issue for men, youth and those living rurally in non-farm residences.[17 19–24] Further, social, cultural and economic factors contribute to the complexity of tobacco and alcohol-related behaviours among historically marginalised populations that include First Nations communities.[25] The legacy of colonialism, with intergenerational trauma and high rates of poverty, racism, has led Indigenous community members and their allies to raise concerns about alcohol consumption within their communities.[26 27] Governments at all levels have been working toward reducing harms related to alcohol consumption for Indigenous peoples through various collaborative strategies and programming including launching a Northern Alcohol Strategy in Saskatchewan.[28 29]

During the pandemic, the increases in poor mental health outcomes and alcohol consumption in Saskatchewan were not dissimilar from national trends.[1] A high proportion of adults in the province reported symptoms related to anxiety (60%) and depression (45%) between August 2020 and June 2021.[30] However, the co-occurrence of poor mental health and alcohol consumption (also referred to as dual experience) during the COVID-19 pandemic has not been comprehensively examined. This study, therefore, aims to identify populations who had experienced dual adverse outcomes, poor mental health and increased alcohol use and the drivers of these dual experiences in Saskatchewan. The study sheds light on the prevalence of increased alcohol consumption and mental health challenges as well as the contours of this relationship including its associations with other health, social and economic stressors observed during the pandemic. Furthermore, the study seeks to highlight the inequitable distribution of this dual experience within Saskatchewan.

METHOD

Study design and sampling

This cross-sectional study uses data from the larger project 'Build Back Better: Data and equity needed to drive post-pandemic recovery in Saskatchewan'.[31]

Muhajarine *et al* have previously published and described the design, rationale and full spectrum of methods of the larger research project, which aimed to identify and measure the relationship between the pandemic and its wider health and social impacts such as food insecurity, housing precarity and homelessness, mental health and substance use, on the residents of Saskatchewan. Briefly, this study employed a hybrid sampling design: two panels of probability samples and one non-probability sample. The Saskatchewan Community Panel from the Canadian Hub for Applied and Social Research and the Probit Panel from the EKOS Research Associates were constructed based on probability sampling of the population. The sampling through Voxco's omnichannel cloud is a convenience sample. Further, weighting was used, using the iterative proportional fitting method or raking, to 'correct' the under-representation or over-representation of the sample so it reflects the population more representatively. The inclusion criteria for this survey were as follows: (1) being at least 18 years of age, (2) currently residing in Saskatchewan and (3) having the ability to read and understand English. Details of the survey protocols can be found elsewhere.[31] For this analysis, we have used the quantitative data for mental health and substance use components. Quantitative data were collected through a population-based cross-sectional online survey between July and November 2022.

Outcome variables

There were three outcome variables considered in this analysis: (1) depression and increased alcohol use; (2) anxiety and increased alcohol use; and (3) co-occurrence of depression, anxiety and increased alcohol use, collectively called as 'dual experience of poor mental health and increased alcohol use'. These variables were measured using three different indicators as follows:

Symptoms of depression, and anxiety, were measured using Patient Health Questionnaire-9 (PHQ-9) and Generalised Anxiety Disorder-7 (GAD-7) scales, respectively. Both PHQ-9 and GAD-7 scales are widely acceptable and commonly used tools to screen non-clinical depression, and anxiety symptoms among the general population. Details of these scales can be found elsewhere.[32 33] PHQ-9 is a nine-item questionnaire, and each item is evaluated on a severity scale ranging from 0 to 3, yielding a total score ranging from 0 to 27, which is further categorised as: 0–9 none/mild depression, 10–19 moderate depression and 20–27 severe depression. Similarly, GAD-7 used seven different questions, and each item was scored on a 4-point (0–3) Likert scale. The total was scored out of 40 and then categorised as: 0–9 none/mild anxiety, 10–14 moderate anxiety and 15–21 severe anxiety.

For alcohol use, participants were asked, 'In general, how would you describe your alcohol consumption during the pandemic compared to before the pandemic began (March 2020)?' and the responses were categorised as: do not drink/stopped drinking, no change, decreased and increased.

Finally, three binary outcome variables were generated as; (1) depression and increased alcohol use (coded as: 1=moderate-to-severe depression and increased alcohol use, 0=none/mild depression and do not drink/stop drinking/no change/decreased (reference category for regression)), (2) anxiety and increased alcohol use (coded as: 1=moderate-to-severe anxiety and increased alcohol use, 0=none/mild anxiety and do not drink/stop drinking/no change/decreased (reference category for regression)) and (3) co-occurrence of depression, anxiety and increased alcohol use (coded as: 1=moderate-to-severe depression and anxiety and increased alcohol use, 0=none/mild depression and anxiety and do not drink/stop drinking/no change/decreased (reference category for regression)).

Independent variables

A set of co-variables, driven by programme theory and literature, were selected as the independent variables for this study. Variables considered in this study were: (1) age in years (categorised as 25–34, 35–44 and 45+), (2) gender (categorised as female, male, non-binary), (3) location of residence (categorised as urban, rural), (4) ethnicity (categorised as Caucasian, Indigenous, visible minority/other), (5) employment (categorised as employed, unemployed, retired), (6) household annual income (categorised as less than $C40 000, $C40 000 to $C69 999 and $C70 000 and above), (7) household size (categorised as 1, 2, 3+), (8) household food security (categorised as food secure, moderate food insecure, severe food insecure), (9) proportion of household income spent on housing cost (<30%, 30–50%, >50%), (10) physical disability (no, yes), (11) concerned about alcohol use since the pandemic began (no, yes), (12) alcohol use disorder (no, yes) and (13) ever tested positive for COVID-19 (no, yes).

Data analysis

Data set was first coded and cleaned before formal analysis. Multiple imputation (chained equation approach) was done to handle missing data. Data were analysed using Stata (V.14.2) software (StataCorp, College Station, Texas, USA). Descriptive analysis was performed to report the characteristics of the study participants and the prevalence of the outcome variable. Cross-tabulation was performed to see the distribution of the prevalence of outcome variables across the independent variables considered in this study. Pearson's χ^2 test and Fisher's exact test, as appropriate, were used to assess the measure of association. Multivariable binary logistic regression models were fitted to identify the factors associated with each outcome variables, and results were presented as ORs and their 95% CIs. Co-variates showed p<0.25 in the bivariate association were included in the final regression model. Interaction between a priori selected sociodemographic variables were used to check whether the

associations with the outcome variable were modified (buffered or exacerbated) by equity-seeking groups; however, none of the interactions were significant, so it was not included in the final regression model. All associations were considered significant at 5% level of significance. In terms of study power, a sample of 1034 adults (representing a population base of 909 385 adults) is adequately powered to detect true differences in the range of 2.5%. Survey results were weighted with 2021 Canada Census data, and a side-by-side comparison of key demographics of the survey sample with Canada Census data are presented in online supplemental table 1 (S1). Comparing with provincial portion of census data we have oversample study participants aged 25–34 years and 65 years and above.

RESULTS

A total of 1034 eligible adults participated in this survey. As shown in table 1, 27% of participants were 65 years or older, 50% identified as women and the majority of respondents were living in urban areas (74%). 81% of participants were white/Caucasian, 10% were from a visible minority ethnocultural group, 54% were employed and 54% reported an annual total household income >$C70 000. 14% were moderate and 13% were severely food insecure. 19% of participants reported that they spent more than 50% of their income on housing, and 60% reported that they had never tested positive for COVID-19.

Figure 1 shows the prevalence of different forms of dual experience of poor mental health and increased alcohol use. The prevalence of depression and increased alcohol use was 7.32% (95% CI: 5.62% to 9.01%), while the prevalence of anxiety and increased alcohol use was 6.10% (95% CI: 4.53% to 7.65%). Also, the prevalence of both depression and anxiety and increased alcohol use was 5.44% (95% CI: 3.95% to 6.92%). Individual components of dual experience, namely depression, anxiety and pattern of alcohol consumption, are presented in online supplemental figure 1 (S2). Prevalence of moderate, and severe levels of depression was 10.69% and 13.79%, respectively. Prevalence of severe anxiety was 8.66% and 21.22% reported they had increased their alcohol consumption during the pandemic. Prevalence of different forms of dual experience across the independent variables are presented in online supplemental table 2 (S3).

Table 2 shows the factors independently associated with the different forms of dual experience of poor mental health and increased alcohol use. Multivariable adjusted models suggest that ethnicity, household food security status and self-perceived concern about alcohol use were associated with the different forms of dual experience. In addition, age was a factor associated with anxiety and increased alcohol use.

Those who identified as a member of a visible minority group in Canada had a reduced likelihood of dual

Table 1 Background characteristics of the survey participants (N=1034)

Characteristics	%
Age in years	
25–34 years	25.35
35–44 years	10.64
45–54 years	14.80
55–64 years	21.76
65+ years	27.43
Gender	
Female	49.52
Male	48.41
Non-binary	2.06
Location of residence	
Urban	73.89
Rural	26.10
Ethnicity	
White/Caucasian	81.14
Indigenous	8.59
Visible minority/other	10.25
Education	
High-school and less	19.03
College and skilled training	29.57
College/university or higher	51.39
Employment	
Employed	53.98
Unemployed	16.26
Retired	29.75
Household annual income	
<$C40 000	22.69
$C40 000 to $C69 999	23.12
≥$C70 000	54.18
Household size	
1	19.28
2	43.51
3+	37.19
Household food insecurity	
Food secure	73.14
Moderate food insecure	13.92
Severe food insecure	12.93
Proportion of household income spent on housing cost	
Less than 30%	46.13
30–50%	34.95
More than 50%	18.91
Physical disability	
No	90.08

Continued

Table 1 Continued

Characteristics	%
Yes	9.92
Concern about alcohol use	
No	75.45
Yes	24.55
Tested COVID-19 positive	
No	59.65
Yes	40.35

experience; these groups were 74% less likely to report depression and anxiety and increased alcohol use (OR=0.26, 95% CI: 0.08 to 0.89) compared with White/Caucasians. Those who were classified as living in a moderate food-insecure household were 4.70 times, and those in severe food-insecure households 10.73 times, more likely to experience depression and anxiety and increased alcohol use compared with those who were in food secure households. Those who stated that they were concerned about their alcohol use during the pandemic were 13.95 times more likely to report depression and anxiety and increased alcohol use (OR=13.95, 95% CI: 5.47 to 35.56). Participants aged 35–44 years were 8.57 times more likely to report anxiety and increased alcohol use compared with participants aged 65 years or older (OR=8.57, 95% CI: 1.43 to 51.52). Those who were physically disabled were three times more likely to report depression and increased alcohol use compared with those who were able-bodied (OR=3.03, 95% CI: 1.03 to 8.86).

DISCUSSION

This study identifies the extent to which people in the adult population in Saskatchewan experienced both poor mental health and increased alcohol consumption, more than 2 years into the COVID-19 pandemic and factors associated with this dual experience. Population-based evidence is important for the decision-makers and service delivery systems to re-evaluate how best to move forward with mental health and addictions services during this post-pandemic period.

We report that the prevalence of depression and/or anxiety with increased alcohol consumption was still very high among Saskatchewan adults as of summer/fall in 2022. About 5–7% of participants reported different combinations of co-occurrence of poor mental health (ie, depression, anxiety) and increased alcohol consumption. Notably, visible minority participants in this study were less likely to experience poor mental health and increased alcohol use; however, those who experienced household food insecurity and those who were concerned about their alcohol use during the pandemic were significantly more likely to experience both poor mental health and increased alcohol use.

The prevalence of moderate depression found in this study was lower than the previous study that reported the prevalence of depression among Saskatchewan adults during fall 2020, winter 2021 and spring 2021.[30] However, the prevalence of severe depression during fall 2022 (when data were collected for this present study) was slightly higher than in the spring 2021.[30] This indicates the persistence of severe depression among those who experience it even at later stages of the COVID-19 pandemic. The prevalence of anxiety found in this study was notably lower than the previous study among Saskatchewan adults.[30] In addition, the prevalence of depression and anxiety among Saskatchewan adults was

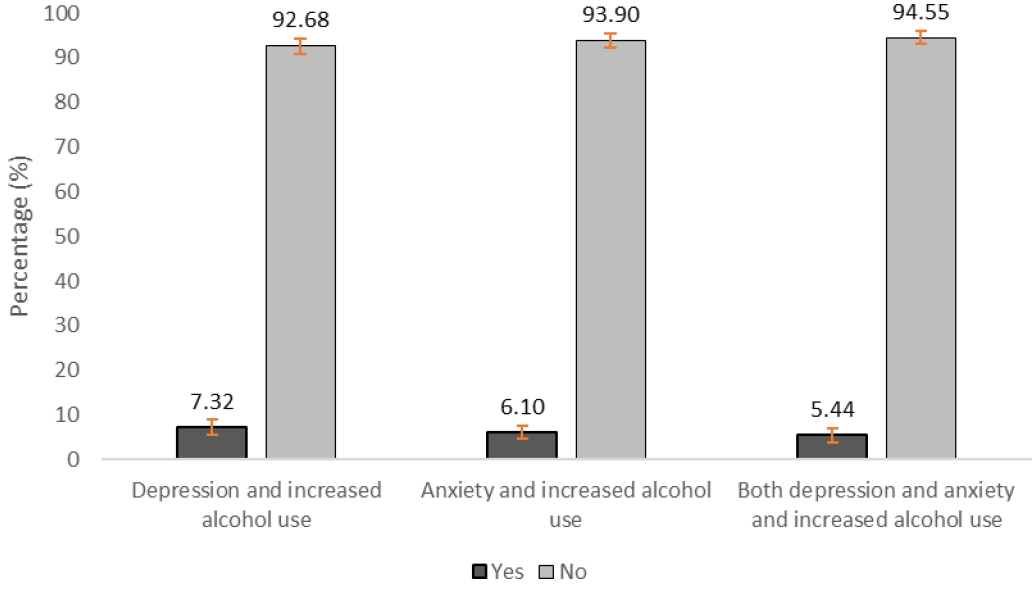

Figure 1 Prevalence of dual experience of poor mental health symptoms and alcohol use (error bars indicate 95% CI) about here.

Table 2 Factors associated with dual experience of poor mental health symptoms (depression, anxiety) and increased alcohol use, Saskatchewan adults, 2022

Characteristics	Depression and increased alcohol use OR (95% CI)	Anxiety and increased alcohol use OR (95% CI)	Co-occurrence of depression, anxiety and increased alcohol use OR (95% CI)
Age in years			
25–34 years	2.27 (0.41 to 12.62)	5.78 (0.95 to 35.23)	4.37 (0.55 to 34.73)
35–44 years	3.78 (0.64 to 22.06)	8.57 (1.43 to 51.52)*	8.02 (0.99 to 64.72)
45–54 years	1.36 (0.23 to 7.79)	2.90 (0.49 to 15.62)	1.82 (0.24 to 13.66)
55–64 years	0.91 (0.15 to 5.30)	1.35 (0.22 to 8.28)	1.50 (0.20 to 11.46)
65+ years	Ref.	Ref.	Ref.
Gender			
Female	Ref.	Ref.	Ref.
Male	0.57 (0.29 to 1.15)	0.59 (0.27 to 1.28)	0.52 (0.23 to 1.19)
Non-binary	1.19 (0.22 to 6.35)	1.68 (0.43 to 6.63)	2.34 (0.49 to 11.26)
Location of residence			
Urban	Ref.	Ref.	Ref.
Rural	0.54 (0.22 to 1.32)	0.92 (0.36 to 2.34)	0.71 (0.24 to 2.11)
Ethnicity			
White/Caucasian	Ref.	Ref.	Ref.
Indigenous	0.66 (0.21 to 2.11)	0.37 (0.09 to 1.49)	0.36 (0.08 to 1.67)
Visible minority/other	0.19 (0.06 to 0.68)**	0.28 (0.08 to 0.92)*	0.26 (0.08 to 0.89)*
Education			
High-school and less	Ref.	Ref.	Ref.
College and skilled training	0.75 (0.28 to 1.97)	1.03 (0.34 to 3.12)	0.91 (0.31 to 2.69)
College/university or higher	0.75 (0.26 to 2.11)	0.99 (0.34 to 2.95)	0.78 (0.25 to 2.42)
Employment			
Employed	Ref.	Ref.	Ref.
Unemployed	1.69 (0.67 to 4.26)	2.04 (0.76 to 5.43)	2.32 (0.83 to 6.52)
Retired	0.48 (0.09 to 2.35)	0.97 (0.21 to 4.43)	1.10 (0.19 to 6.31)
Household annual income			
<$C40 000	Ref.	Ref.	Ref.
$C40 000 to $C69 999	0.72 (0.24 to 2.21)	0.49 (0.16 to 1.55)	0.78 (0.25 to 2.47)
≥$C70 000	1.42 (0.52 to 3.88)	0.48 (0.15 to 1.49)	0.79 (0.24 to 2.56)
Household size			
1	1.37 (0.57 to 3.30)	1.17 (0.43 to 3.18)	1.61 (0.56 to 4.62)
2	0.90 (0.43 to 1.89)	1.45 (0.63 to 3.37)	1.46 (0.61 to 3.48)
3+	Ref.	Ref.	Ref.
Household food insecurity			
Food secure	Ref.	Ref.	Ref.
Moderate food insecure	2.27 (0.79 to 6.47)	3.52 (1.21 to 10.18)*	4.70 (1.50 to 14.64)**
Severe food insecure	5.95 (2.24 to 15.83)**	6.82 (2.25 to 20.62)**	10.73 (3.44 to 33.45)***
Household income spent on housing cost			
Less than 30%	Ref.	Ref.	Ref.
30–50%	1.98 (0.78 to 4.99)	1.90 (0.71 to 5.09)	2.60 (0.85 to 7.90)
More than 50%	1.77 (0.54 to 5.82)	1.16 (0.34 to 3.99)	1.60 (0.41 to 6.31)

Continued

Table 2 Continued

Characteristics	Depression and increased alcohol use OR (95% CI)	Anxiety and increased alcohol use OR (95% CI)	Co-occurrence of depression, anxiety and increased alcohol use OR (95% CI)
Physical disability			
No	Ref.	Ref.	Ref.
Yes	3.03 (1.03 to 8.86)*	1.84 (0.48 to 6.99)	2.07 (0.52 to 8.19)
Concern about alcohol use			
No	Ref.	Ref.	Ref.
Yes	14.96 (7.19 to 31.15)***	14.47 (6.20 to 33.73)***	13.95 (5.47 to 35.56)***
Tested COVID-19 positive			
No	Ref.	Ref.	Ref.
Yes	0.57 (0.27 to 1.16)	0.60 (0.26 to 1.34)	0.53 (0.22 to 1.29)

Regression models were adjusted with all the variables in the table.
p value: *p<0.05, **p<0.01, ***p<0.001.

lower when compared with the national data during similar period of time.[34 35]

In our study, 21% of the participants reported that they had increased their alcohol consumption during the pandemic, which compares closely with the national average during the first year of the pandemic reported by Shield *et al*.[9] A study conducted in Saskatchewan reported that 13% of Saskatchewan adults reported problematic alcohol consumption during the winter of 2022.[36] These findings support the observation that alcohol consumption in Saskatchewan was one of the highest in Canada before the pandemic,[17] and that COVID-19 pandemic may have worsened a bad situation.

The prevalence of co-occurrence of depression and drinking among Saskatchewan adults during the later stages of the pandemic, when this research was conducted, was higher than a previous study that reported 2.5% of Canadian adults experienced dual experience of depression and drinking during the early months of the pandemic.[37] However, the prevalence of anxiety and alcohol consumption was lower than that reported in a study conducted elsewhere in Canada.[37] This co-occurrence is concerning because individuals experiencing concurrent mood and substance use disorders have higher needs for treatment,[38] but typically not receiving adequate integrated treatment for both conditions.[39] Due to a lack of data, however, we could not compare the prevalence of concurrent poor mental health and increased alcohol use specifically among Saskatchewan adults with previous provincial statistics.

In relation to factors that are associated with co-occurrence, those who are from visible minority groups were less likely to have this dual experience. A previous study also reported that younger adults from racialised groups in Saskatchewan were less likely to report poor mental health symptoms during the pandemic.[30] This finding is counter to generally reported mental health-related observations that equity-seeking groups, including visible minorities in Canada, suffered disproportionately from the consequences of the COVID-19 pandemic. While there is much evidence to support this observation,[40] our specific finding regarding visible minority groups in Saskatchewan having lower odds of poor mental health and increased alcohol use add a nuance to these claims. Evidence shows that white Canadians consume 3.5 times more alcohol compared with minority populations,[41] and this rate is higher among older adults.[42] It stands to reason, then, visible minority populations may have lower risk of co-occurrence of poor mental health and increased alcohol use because of lower rates of alcohol consumption in these groups. This statement is supported by cross-tabulations of ethnicity with depression, anxiety and alcohol use pattern (data not presented), which suggest that although the prevalence of depression and anxiety were higher among the visible minorities (almost double compared with white), the prevalence of increased alcohol use was double among the white compared with the visible minorities.

Association between household food insecurity and mental health during the COVID-19 pandemic is well documented.[43 44] In our study as well, those who were in food insecure households were more likely to experience poor mental health and higher alcohol consumption. Household food insecurity is often associated with financial strain and resource uncertainty. A previous study also reported a positive association between financial stress and poor mental health and drinking during the pandemic among Canadian adults.[37] As we report in online supplemental table 2, those who were unemployed, with lower household incomes, less education and who spend more than half of their earnings on housing have higher odds of poor mental health outcomes and increased alcohol

consumption. The stress related to not having enough food or facing economic hardship can contribute to poor mental health conditions. The emotional toll of food insecurity combined with the broader challenges posed by the pandemic may have driven some individuals to use alcohol as a coping mechanism to temporarily alleviate the distress.

Our analysis also identified that those who were concerned about their alcohol use during the pandemic were more likely to report dual experience. Although this association may appear quite straightforward and as expected, it may also signal something more nuanced. For example, when one is concerned about one's use of alcohol, it indicates awareness, as opposed to denial and it may coexist with a belief that alcohol provides a means of relaxation or escape from all types of stressors including those related to the pandemic.[45] In response to heightened stress, individuals may turn to alcohol as a coping mechanism, even if they are concerned about its potential negative effects.

As in any study, there are several limitations that should be noted. This study of a general population was, in part, based on cross-sectional survey data, therefore, rather than revealing causal relationship, this study reports associated factors. Although future longitudinal studies may tease out causality, cross-sectional studies have a place as they could deepen the understanding of the complexity of a problem especially during an unprecedented pandemic, as it does in this study. Since data were collected using a self-reported questionnaire, another limitation is the potential recall bias. However, this survey questionnaire used previously validated scales to minimise any bias and the recall period was often kept to a narrow, most recent past. During data collection, a true random sample was not enrolled. However, to ensure data representativeness we have used survey weights based on Canadian census data. This survey was conducted in the province of Saskatchewan, and the study population was skewed towards older adults, which limits the generalisability of our findings. We suggest caution while interpreting results. Finally, the online survey method is unlikely to capture the experience of the people dealing with acute mental health issues combined with homelessness and substance use disorders. We are working with harm reduction agencies to better understand this part of the population in related studies. The strength of this study, however, is that this is one of few studies to report the dual experience of poor mental health and increased alcohol consumption in a general population sample (in Saskatchewan) during a specific period in the COVID-19 pandemic.

CONCLUSION

In conclusion, this study which examined the co-occurrence of poor mental health and increased alcohol consumption among Saskatchewan adults during the late stages of the pandemic (in the fall of 2022) shed light on the profound impact of the COVID-19 pandemic on people's well-being. Higher prevalence of poor mental health symptoms, especially depression and increased alcohol consumption underscores the need for targeted interventions and support systems to address the continuing, longer-term effects of the pandemic. Our findings reveal the social contours of the dual experience in Saskatchewan, illuminating inequitable outcomes across socioeconomic variables especially among those who are experiencing food insecurity. Though our purpose was not a discernment of temporality in our findings, it is plausible that socioeconomic disadvantage in coping with stress is expressed through increased alcohol consumption; our study reveals a gradient effect in the dual experience by severity of food insecurity that warrant note.

Inequitable consequences of the COVID-19 pandemic on the dual experience of poor mental health and increased alcohol use outcomes are apparent but these contours are hardly new. Economic and health inequalities existed prior, though were exacerbated in the pandemic.[46] Implicit in this work are the impacts of structural determinants including neoliberal capitalism, an evolving market and workforce and colonisation and ongoing colonial practices especially as they relate to in the jurisdiction where the study was conducted. A holistic and upstream approach that combines accessible mental health and substance use services, community engagement, harm reduction strategies and targeted public health initiatives will be pivotal in mitigating the long-term consequences of the post-pandemic mental health landscape. As we move forward, it is important to prioritise mental health as an integral part of public health strategies, ensuring that the lessons learnt during this crisis period inform both preventative measures and a more robust and responsive approach to mental well-being in the face of future challenges.

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