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**Title:** Substance-related injury hospitalizations prior to and during the COVID-19 pandemic: a descriptive surveillance study using administrative data

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**Reviewer 1:** Lynne Moore

**Institution:** Social and Social and Preventive Medicine, Université Laval

General comments (author response in bold)

Thank you for the opportunity to review this manuscript. Authors present interesting new data on the influence of the pandemic on substance-related injury hospitalisations. Analysis of routinely collected data is challenging, even with the most sophisticated statistical methods and extensive sensitivity analyses. I have made several suggestions below:

Please report study according to RECORD guidelines. This will help better align study hypotheses-objectives-methods-results and conclusions.

**We have revised the manuscript throughout to accommodate the RECORD guidelines. We have attached the completed RECORD checklist with our submission.**

Abstract

2) Clearly state objectives: it may improve clarity to state both primary and secondary objectives

**Thank you we agree the objectives needed to be more explicitly stated. We have revised the objectives in the abstract (lines 6-9) and background sections (lines 48-56) of the manuscript.**

3) The last sentence of background appears to report the results of this study rather than demonstrate the evidence gap it addresses.

**The background section of the abstract has been revised (lines 3-9).**

Methods

4) A table describing the ICD codes used should be added as supplemental content

**We agree including this information increases reproducibility and transparency of our work. We have added a table (Table 1) in the methods section to specify the exact codes included in each substance group and each injury group.**

5) Interrupted time series would have been more appropriate to analyze results

**In the initial conceptualization phases of this project, we had decided to do an interrupted time series analysis (ITS). We did carry out the analysis but ultimately decided that the time period for which we were conducting the trends over was quite short and likely did not have sufficient power. Additionally, we had used the pandemic onset (March 2020) as the interruption point, however the first year of the pandemic saw other events (i.e. introduction/removal of public health interventions, peaks/troughs in case counts and hospital capacity) that could also be considered interruption points. Therefore, due to the relatively few time points available and multiple interruption points as well as differing pandemic responses**

across provinces and territories we decided not to conduct an ITS to analyse national trends.

6) Please revise verb tenses in this section

**This has been revised throughout the methods section.**

7) Please clarify what hypotheses statistical tests were designed to evaluate

**We have added to the methods section, the type of statistical test used to calculate the odds of substance-related injury hospitalizations (lines 97-98)**

8) What are the hypotheses underlying subgroup analyses by intent, sex, type, age? Specifying these will help guide the interpretation of results.

**Previous research conducted during the pandemic and pre-pandemic, showed that there were variations in substance use hospitalizations by sex and age group. We also wanted examine the results by injury intent to understand if there were differences in the types of substance-related injuries that occurred during the pandemic. We suspected based on the literature, that there would be more injuries related to certain substances such as alcohol and cannabis since these are legal and readily accessible substances in Canada, whereas other substances we suspected to decline due to changes in social behaviours during the pandemic as well as supply chain disruptions. Therefore, we presented results by substance type as well. Lines 88-90 have been revised.**

9) How were subgroups determined?

**As per the previous comment, we were interested in examining results based on age group and sex, as these are demographic variables available in the administrative database. Additionally, groupings by injury intent and substance type were grouped based on the ICD-10 coding manual. The ICD-10 external cause of injury codes are grouped by injury intent (unintentional and intentional). The substance type codes are also grouped according to substance type. Since we had a large study population, we decided to present age groups and substance types with as many subgroups as possible (lines 86-90).**

Results

10) I'm not sure if authors have chosen the best way to present results. I'm wondering whether figures with (monthly) age-standardized rates (preferably from interrupted time-series analysis) over the whole time period then tables with rates before and after the pandemic by subgroups (intention, type, age, sex) would be easier to interpret.

**Thank you for this suggestion. As mentioned in previous comments, we decided that an interrupted time-series analysis would not be the most appropriate method for this work. We have kept the monthly ASR trends for pre-pandemic and during the pandemic. We agree that a table presenting rates by injury intent and age group would be more appropriate, we have revised figure 4a&b to be a table instead of figure (Table 2).**

11) Did authors look at differences in trends across provinces?

**We did look into trends across provinces and territories. Our results showed that the majority of provinces did see an increase in substance-related injury hospitalizations during the pandemic. We have briefly added in some**

provincial/territorial results, however due to space limitations we did not present these results in depth (line 134-140).

12) Did they have access to data on social and material deprivation indices? Would have been interesting.

**We agree this would be very interesting and help tell the story of the analysis better; however since we are using an administrative database this data is not available.**

Discussion

13) Lack of granularity in the discussion for the influence of age, biological sex, intent, and type of substance on changes. For example, what may explain the decrease in cocaine and sedatives?

**We have revised the discussion section to provide more granularity.**

14) What lag time for the effect of the pandemic on injury hospitalisations would be expected?

**Thank you, this is a great question. We have made mention about some potential factors that might contribute to the trends seen in the substance-related injury hospitalizations after the onset of the pandemic (discussion lines 192-196). The effect of the pandemic on substance-related injuries may have been immediately felt; however, due to other factors such as worry about going to a hospital, the trend in hospitalizations was slightly lower during the first two months of the pandemic. Unfortunately, there is no literature quantifying what this lag time would be, this may be an interesting topic for a future paper.**

15) Need more discussion of limits – what is the accuracy of ICD coding for substance abuse, type of substance and for intentional versus unintentional injury? How could this affect results? Are there any potential confounding factors that could have been missed? What about selection bias caused by differing access to care?

**Few studies have examined the accuracy of ICD-10 codes for substances in administrative databases compared to chart records. Among the available literature, most studies have shown high accuracy of ICD substance codes in administrative databases, with very high specificity and a wider range of sensitivity (~50-80%). Some findings showed that when including more ICD-10 codes the sensitivity increased. Therefore, for our study we decided to include as many codes as possible to most accurately capture cases of substance-related injuries, however accuracy in ICD coding varied by the substance type. We have added a sentence to the methods section to highlight the accuracy of ICD coding in administrative databases for substance use (lines 250-254).**

**There is very limited literature broadly examining the accuracy of ICD-10 codes for external causes of injury. One study (Johnson D et al., 2018) examining the accuracy of pediatric self-inflicted injuries showed relatively low inter-rater reliability when comparing administrative emergency department data with medical chart records.**

**We have mentioned in the limitations that sociodemographic factors, pre-existing health conditions and pre-existing inequalities may potentially confound the results, however since we are using administrative data we do not have the data available to control for these confounders.**

**We have also mentioned throughout the discussion that certain factors may bias access to care, such as fear of legal ramifications and social stigma, for consuming legal or illegal substances. This may also contribute to the underrepresentation of substance-related injuries presented in our study.**

16) Authors could better highlight how this research fills a knowledge gap.

**We have added to the introduction (lines 51-54), that this is the first national study presenting substance-related injury hospitalization results from pre and during the pandemic. Previous research has shown an increase in hospitalizations and ED visits for substance consumption and other research has shown that due to behavioural changes during the pandemic (i.e. less organized sports, staying at home more) that the injury landscape has changed. Therefore, this work will help to address this gap and shed light on how the pandemic has changed substance-related injuries in Canada.**

17) They could also explore the potential implications of results in terms of public health and resource. This Discussion should consider how results are modified by sex, age, type of substance and intent. They could also offer suggestions for future research, for example qualitative studies that may help explain observed results.

**Thank you for this comment. We have revised the discussion section to provide more granularity of results by sex and age group however; there is limited research providing results on substance-related harms by age group and sex during the pandemic. We have also added to the conclusion section the suggestion for future qualitative research to help fill in some of the gaps and offer more explanation for observed results, possibly by using a sentinel surveillance system such as CHIRPP.**

**Reviewer 2:** David Barbic

**Institution:** Emergency Medicine, University of British Columbia

General comments (author response in bold)

Page 5, Line 24-26: This statement requires a reference

**References have been added.**

Page 6, Line 3-13: The authors state what they will do in this study, but what was the primary objective? What were the secondary objectives? This needs to be stated more clearly for readers.

**We agree the objectives needed to be more explicitly stated. We have revised the objectives in the abstract (lines 6-9) and background sections (lines 48-56) of the manuscript.**

Page 6 Data Source and Methods: It is unclear why the investigators chose to limit their study to data on hospital discharges. This requires patients to be admitted to hospital, and then discharged. A more accurate understanding of the injury burden related to substance use during the pandemic across Canada would be obtained by including emergency department (ED) visits for substance related injuries as well. Most Canadian EDs only admit 10-15% of all patients presenting to the ED, and an even smaller proportion of those presenting with substance related injuries. As a result, this reviewer is concerned that this may create a selection bias, and a skewed representation of the true nature of substance related injuries in Canada.

**Thank you for this comment, we agree that using hospital discharge records is not the only data source that should be used to capture the true burden of substance-related injuries in Canada, as we are likely only capturing more severe injuries that would require hospitalizations. We considered using the National Ambulatory Care Reporting System (NACRS), which captures emergency department admissions, however, only Alberta, Ontario and Yukon completely report to this database and therefore it cannot be use to present national results. We have made this limitation more clear in the limitations section of the paper (lines 263-269).**

Page 7 Statistical Analyses

Two key concerns:

1) Did the investigators consider using an Interrupted Time Series Analysis with regression to explore the impact of COVID-19 related public health measures on substance related injury hospitalizations? This would seem a more appropriate model for examining the impact over time, as opposed to Monthly Percent Change.

**In the initial conceptualization phases of this project, we had decided to do an interrupted time series analysis. We did carry out the analysis but ultimately decided that the time period for which we were conducting the trends over was quite short and likely did not have sufficient power. Additionally, we had used the pandemic onset (March 2020) as the interruption point, however the first year of the pandemic saw other events (i.e. introduction/removal of public health interventions, peaks/troughs in case counts and hospital capacity) that could also be considered to be an interruption point. Therefore, due to the relatively few time points available and no clear interruption point as well as differing pandemic responses across provinces and territories we decided not to conduct an ITS to analyse national trends.**

2) Given the current statistical approach employed, did the investigators account for multiple planned comparisons with any form of statistical correction for multiple comparisons?

**We did not conduct multiple planned comparisons for this analysis, therefore we did not employ any statistical corrections.**

Page 7, Line 48-50: Suggest changing the first sentence to more accurately reflect the nature of this study, since the COVID-19 pandemic is ongoing: "During the study period of XX-XX..."

**This has been updated (line 103).**

Page 12, Discussion, line 3-19 This paragraph does not fit with the findings in the Results, and is based off a reference (ref 32) that is a hypothetical model. There is significant evidence from across Canada that the COVID-19 pandemic has resulted in rapid adaptation, novel and improved care delivery models:

**We agree, this paragraph does not add much to the discussion and is a bit speculative. We have decided to remove this paragraph from the discussion section.**