

## Peer review comments

**Article ID:** 2021-0248

**Article title:** Determinants of COVID-19 vaccine willingness among people incarcerated in three Canadian federal prisons: a cross-sectional study

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### Reviewer #1 Dr. Rose Ricciardelli, Memorial University

Comment 1: The paper has international relevance, and thus, this should be made clear in the abstract. It is in many ways the first article of its kind, written when most prison COVID articles are simply said academic journalism. This is an empirical and important article and that should be made clear early on in the abstract and introduction. Response: Unfortunately, due to word restrictions, we are unable to add the international relevance of this paper in the abstract. We have added the following to our Limitations paragraph: “Despite these limitations, our study adds to the dearth of COVID-19 vaccine willingness data in an understudied population,” underscoring the importance of this work (page 15).

Comment 2: Disambiguate provincial/territorial from federal corrections in the introduction. They are very different environments and findings from federal may not apply to provincial and territorial correctional services. It's mixed right now and that is in essence a bit of an error. Response: While we agree that federal and provincial/territorial facilities are different, they have been equally susceptible to COVID-19 outbreaks in Canada since the start of the pandemic. Furthermore, the recommendation made by the Canadian National Advisory Committee on Immunization was to prioritize residents and staff of both facilities in their COVID-19 vaccine recommendation. As such, we do not feel that the Introduction requires any modifications.

Comment 3: Something about rates of infectious disease in prison would strengthen the introduction as well. Response: Thank you for this comment. While the authors agree that this would be relevant to include, the most recent data on Infectious Diseases (including latent TB and sexually transmitted and bloodborne infections) in Canadian federal prisons compared disease trajectories from 1998-2000 to 2008 (<https://www.csc-scc.gc.ca/text/pblct/infdsfcfp-2007-08/descriptions-eng.shtml#f51>). Thus, we believe it would be inappropriate and misleading to include this outdated data, and outside the scope of this manuscript.

### Methods

Comment 4: Why these three prisons? Outside of their rates of flu vaccine uptake? Wouldn't vaccine uptake be different in a max? why not include a max, particularly when already including the training centre? I'm having difficulty understanding select processes. Prior the authors wrote that vaccine uptake varies by security classification but there was no variance of such in the sample, which is confusing.

Response: Please refer to additional Editor comment #6c for details on prison site selection. Site selection was made in consultation with Correctional Service Canada and included reasons that were outside the scope of the manuscript including sites' willingness to conduct research,

nursing/health services collaboration, and the inclusion of a women's site. GVIW is a multi-security site, including a maximum facility, where participation was sought. However, given research participation is often significantly lower in maximum security sites, and carries a higher burden of logistical challenges, the research team was advised to prioritize lower security sites to ensure study completion prior to COVID-19 vaccine roll-out.

Comment 5: Interesting sampling procedure! Great support from CSC! Can you provide a one-line justification for the sampling procedure?

Response: Please refer to additional Editor comment #7b. We have now included a reference to justify our sampling procedure.

Comment 6: Did CSC's research branch also approve the study -- that should be noted if they did or did not.

Response: Please refer to additional Editor comment #10 for details on ethics board approval.

## Results

Comment 7: Instead of visible minority, it should be people of colour, please revise with the currently appropriate term.

Response: Thank you for this comment. We would like to retain the term "visible minority" as it is in accordance with Statistics Canada Standards of "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour," and is a term that is consistently used by Correctional Service Canada during reporting. Visible minority includes those who identify as Hispanic, Latin American, Black, Chinese, Korean, Japanese, Southeast Asian, East/Southeast Asian, Asiatic, Filipino, West Asian, Arab, Arab/West Asian, East Indian, or South Asian (<https://www23.statcan.gc.ca/imdb/p3Var.pl?Function=DEC&Id=45152>).

## Interpretation

Comment 8: Factors that could be impacting the results are not discussed (i.e., fear of infectious disease, security level, etc.). the interpretation is lacking and needs more interpretation within a correctional lens that is more aware of the nuance around health, contagion, and experience in prison. How does institutional culture impact vaccine uptake? What is really going on that informs hesitancy? This section can be much more clearly interpreted to strengthen the impact of the article. I would suggest you give a read to the Royal Society of Canada's policy brief on COVID in prisons. That will help with framing.

Response: We thank the reviewer for this important comment. Given the word restrictions, an in-depth discussion of the reasons for vaccine hesitancy are outside the scope of the manuscript. The corresponding author has now conducted two qualitative studies exploring barriers and facilitators to vaccine uptake within a correctional lens in federal prisons, and they are referenced for additional information.

## **Reviewer #2 Dr. Jane Buxton, UBC, BC Centre for Disease Control**

This study describes the results of self-administered questionnaire completed by persons in Canadian federal prisons which assesses willingness to receive COVID-19 vaccines.

## Abstract

Comment 1: Methods: Question is regarding hypothetical “if a safe and effective vaccine becomes available” This to me implied the survey was administered pre-vaccine development and availability. However, in fact recruitment occurred Mar31-Apr 19 2021 which was after vaccines had become available and in community was being widely offered and had been offered to some people in prison therefore it is important to provide dates in abstract to make context clear.

Response: Thank you for this comment. Please refer to additional Editor comment #8c. We have now included the recruitment dates in the Abstract.

Comment 2: States ‘self-administered questionnaire on Knowledge, attitude and beliefs’ - I did not see KAB aspects addressed or mentioned further in the paper except perceived importance of vaccine. These aspects may have been part of a larger study and explored elsewhere but are they relevant to this paper? It seems main outcome is reported willingness to receive vaccine and predictors include the response to one question “Vaccines are important to me”?

Response: Please refer to our response for Editor comment #2. Unfortunately, we were not able to conduct our intended study due to the timing of COVID-19 vaccine roll-out at CSC, and while knowledge, attitude, and beliefs (KAB) towards vaccines were the primary focus of our questionnaires, they were not used for this sub-study. As KAB aspects were the focus of the questionnaires, we believe that they deserve mentioning even though they were not explored in detail during our analysis.

#### Introduction

Comment 3: Provides list of “risk factors” predisposing correctional settings to outbreaks and states these are non-modifiable. However, I would suggest some may be modified but need a systems level change. Good justification why study needed and clear aim.

Response: Please refer to additional Editor comment #3.

#### Methods

Comment 4: More details how/why the three prisons in the study were chosen would be helpful. States selected based on low influenza vaccine uptake was this below a certain proportion of uptake? Was sex and inclusion of prisons in different provinces a consideration?

Response: Please refer to additional Editor comment #6c for details on prison site selection.

Comment 5: Was there any benefit for the prison residents to participate?

Response: There was no direct benefit for participants, as stipulated in our information and consent form to participants: “There is no direct benefit to you for participating in this research.” Furthermore, as per CSC regulations, and as stated in our Methods, “Participants did not receive compensation for their participation...”. No additional changes were made to the manuscript.

Comment 6: Study design and setting: A table describing security levels, total population, sex, % Indigenous and minority groups. Would make it easier to compare between the prisons and also to assess how representative participants were of the prison population.

Response: Table 1 was modified to stratify baseline data by vaccine willingness. Given the relatively high willingness to get vaccinated among our study participants, it is possible that our sample is less representative of the general prison population but of the Canadian general population in Canada. This is discussed in detail in the second paragraph of our Discussion. As such, no changes were made to the manuscript.

Comment 7: Exclusion: Those previously vaccinated were excluded (older, medically vulnerable offered in Jan). Results show no association willingness with age and chronic health conditions. However, how may this have affected results? Can the authors share the uptake prior to the questionnaire in this population high risk population and hence who would be excluded. Could address this in limitations too.

Response: This is a recurring comment, and we appreciate its significance to the overall interpretation of our results. While we did not purposely seek to recruit high-risk individuals above the age of 60, it is possible that their inclusion resulted in selection bias. This has now been included as a limitation in our Discussion (page 14). Please refer to Editor comment #4.

Comment 8: Data collection states questionnaire focuses on knowledge attitudes and beliefs towards vaccines in general and more specifically COVID vaccine. See comment in abstract. It is concerning if questions re KAB were asked but not included here as makes the reader wonder about cherry picking variables. Were other variables not included as not significant?

Response: As is stated in the Abstract and manuscript, independent variables were determined a priori using published literature on vaccine hesitancy among incarcerated individuals and the general population. Due to the limited number of people who were unwilling to receive a COVID-19 vaccine, which affected the overall power of our study, we limited our regression analysis to five variables. See Statistician comment #10 for a detailed rationale for the removal of various variables. See Reviewer #2, response #2 as well. Comment 9: Was “importance of vaccine” selected a priori to be included in this study or decision made after analysis of all variables?

Response: Yes, the variable “importance of vaccines” was selected a priori. However, in response to another reviewer’s comment, we have reformulated the final regression with a much more selective set of variables to ensure the study is adequately powered. Our decision to remove this variable from the final model considered that “importance of vaccines” is encompassed within the variable representing 2019-2020 influenza vaccination, which is a reflection of pre-pandemic vaccine hesitancy. These variables had a significant correlation of 0.32 and “importance of vaccines” was consequently removed.

Comment 10: Please include all the relevant survey questions as an appendix or supplemental resource.

Response: The questionnaire is now included as Appendix 1.

## Results

Comment 11: The authors made decisions where and how to include variables of prefer not to answer or don’t know. For clarity these numbers should be included in Table 1 so reader can see for themselves. It is understandable that the authors wished to allocate all unknowns so as not to further lose participants from the adjusted analysis as the study is potentially underpowered.

Response: We agree with this reviewer's desire for increased transparency. We have now included prefer not to answer data for each variable in Table 1. We changed our analysis and only those participants who did not know or preferred not to answer receipt of the 2019/2020 influenza vaccine (n=4) were categorized as not having received it. Remaining participants who "preferred not to answer" were removed from the regression analysis (n=18).

Comment 12: Did the authors consider a sensitivity analysis using multiple imputation for missing data to see if results differed from the results when they purposefully allocated the unknowns?

Response: We opted to perform a complete case analysis. Participants who "preferred not to answer" were removed entirely from the regression analysis (n=18). We also opted not to perform multiple imputation as there was relatively minimal (7.5%) missing data in the multivariable regression analysis.

Comment 13: Participants could request support to complete the questionnaire – how many asked for assistance?

Response: Please see additional Editor comment #12 for details on questionnaire assistance.

Comment 14: Figure 1- suggest don't use term "sample" as these are individual participants and very depersonalizing. States did not collect demographics of those who declined but presumably know where they declined. Was the proportion who declined similar across the 3 prisons?

Response: The title for Figure 1 has been updated to "Participant selection flow chart". The number of individuals who declined at GVIW and FTC were 26 and 41, respectively, representing 16% (26/159) and 12% (41/381), respectively, of the total eligible population (excluding those who were previously vaccinated in phase I of the COVID-19 vaccine rollout). We did not collect demographic information on these individuals and unfortunately, the 22 number of individuals who declined participation was not systematically collected at MI. We do recognize this as a limitation of our study – that is, that our results may not be generalizable to other CSC correctional facilities (as mentioned in the Limitations paragraph).

Comment 15: Table 2 Is it self-identified ethnicity? Why are some results bolded and not others e.g. Unadjusted OR Indigenous 0.42 (0.20-0.91) i.e. 95% CI do not pass through one but is not bolded like other ORs that appear significant?

Response: As the questionnaires were primarily self-administered, the answers are self-reported, including ethnicity. We have removed all bolded results in Table 2 so as not to draw particular attention to any results.

Comment 16: Limitations: was sample size sufficient to identify differences e.g. re sex and ethnicity? The authors state sample size was determined for a different outcome "ample size chosen for an alternative primary endpoint (change in willingness to receive a COVID-19 vaccine posteducational intervention)." Was an assessment made to see if sample size would be sufficient #s for this study end-point and variables included - even if assessment one post hoc?

Response: Please refer to Editor comment #2 for a post-analysis cross-sectional sample size calculation.

Comment 17: Was there any consideration of variable interaction/correlation with other independent variables? For example, was there a correlation between smoking and chronic health conditions?

Response: Yes, a cross correlation matrix was completed prior to the analysis. No independent variables were associated above the 0.3 level.

Comment 18: Interpretation: Could perceived severity of the COVID-19 disease account for difference in reported willingness to receive COVID vaccine vs. actual receipt of flu vaccine?

Response: Indeed, perceived severity of COVID-19 disease could account for difference in reported willingness to receive COVID vaccine vs. actual receipt of flu vaccine; however, this was not a variable considered in our analysis.

Comment 19: Could social desirability influence the results i.e. reported willingness? Response: While social desirability bias could affect self-reported COVID-19 vaccine willingness, we believe that the use of self-administrated questionnaires may have mitigated this effect. That said, we do include it as a potential limitation (pages 14-15).

Comment 20: Need to tell reader why this is an important question as vaccine is now readily available and uptake can be measured.

Response: We agree that a study designed with the outcome of “COVID-19 vaccine willingness” is a moot point currently. While this does not undervalue the contribution of our study, we make clear recommendations for future research to explore reasons for vaccine hesitancy in the incarcerated population as the most appropriate way forward.

### **Reviewer #3 Dr. Giulio DiDiodato, Royal Victoria Regional Health Centre**

I'd like to commend the authors on undertaking and completing this important study.

Comment 1: On p 10 line 54, I believe the sentence is missing the proportion of participants who had previously declined a vaccine

Response: Unfortunately, we do not have access to the number of high-risk individuals at the three study sites who were offered the COVID-19 vaccine and declined. As such, we cannot include any additional data.

Comment 2: On reviewing the sample size estimation, I am not sure I understand how this was determined. It does not appear to be based on margin of error estimations of the proportion of participants who responded they were willing to receive a cover-19 vaccine as this is not how the data were reported in the results. Was it based on a predicted effect size for odds ratio for some explanatory variable(s)? If so, which one(s)? I realize the SAP is offered to be provided by the authors, but I think more detail is required in the main body to really understand why this sample size was chosen given the very large confidence intervals associated with almost every non-significant and significant explanatory variable which suggests the sample size estimates were too conservative.

Response: Please refer to Editor comment #2.

Comment 3: In trying to understand the statistical model used in the study, it treats the variable vaccine importance like any other variable. But I wonder if instead this variable may not just be a mediator of many of the other variables on the primary outcome? If it is, by including it in the model, it would result in a false negative association of another variable with the primary outcome, especially if most or all of the effect was mediated through the vaccine importance variable. I think it would be prudent to do a sensitivity analysis whereby you either removed this vaccine importance variable from the multivariate regression analysis to see if it unmasks its mediation effect or you perform a separate mediation analysis to tease out the direct and indirect effects associated with this mediator. Given that all the previous variables you included in your model were all previously shown to be positively associated with your outcome, and yet they did not appear to be in your study strongly suggests you may have mis-specified your statistical model.

Response: Thank you for this helpful comment. Vaccine importance was not associated with the influenza vaccination variable in the correlation analysis. Nevertheless, we have decided to remove the vaccine importance variable as we agree it appears to be theoretically related with influenza vaccination and has not been validated in the prison population. Thank you again to the reviewers for their insightful comments. We hope that these revisions are satisfactory for publication and very much believe our manuscript has been strengthened by the reviewers' feedback and subsequent revisions.