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Title	COVID-19 vaccination intentions among mothers of 9 to 12-year-old children: a survey of the All Our Families cohort
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Reviewer 1	Dr. Maryse Guay
Institution	Université de Sherbrooke, Institut national de santé publique du Québec
General comments and author response	<p>Thank you for giving me the opportunity to review this manuscript.</p> <p>This submitted manuscript reports a cross-sectional study conducted in the spring of 2020 on Alberta pregnant women recruited in a cohort study from 2008 to 2011. The survey aimed at understanding parents' COVID-19 vaccination intention of their child now between 9 to 12 years old. The manuscript is generally well written and interesting. However, it should be put in the perspective that children don't suffer a big burden with the COVID-19, that children are neither included in most COVID-19 vaccine clinical trials nor included in the priority groups for COVID-19 vaccination. Also, I have concerns about the quantitative way of reporting the qualitative data.</p> <p>1. Title, Keywords and Abstract</p> <ul style="list-style-type: none"> The title could be misleading as the paper is about a cross-sectional study on a sample of women from Alberta. We have removed the words Canadian and longitudinal. (title) Why is "COVID-19" not included in the keywords? We have added COVID-19 as a keyword. In a few words please state in the abstract how the cohort was or is still representative of the baseline population. We have noted in the abstract that the sample does not represent populations vulnerable to poor outcomes, but does represent a more affluent parenting population in an urban centre with had historically high vaccine uptake. <p>2. Introduction</p> <ul style="list-style-type: none"> Please specify that the current clinical trials for COVID-19 vaccines do not include children and that the burden of disease is low in children unless they have a chronic condition. We specified the burden of disease in children. We have clarified that vaccines are not currently approved for children, but some trials do include children as young as 12 (e.g. Moderna), and the landscape on this is evolving quickly. (pg 4) Why data from other Canadian provinces are not included especially from Quebec for instance where surveys are conducted on adults since the beginning of the COVID-19 pandemic? This study leveraged an existing longitudinal cohort from Alberta. Our key intention with the current analysis was to examine vaccine intention as it related to historically collected information on infant vaccination. The study was not designed to measure vaccination intention alone, but part of a larger program of research investigating the impacts of the COVID-19 pandemic on families.

- “Past practices around vaccination may be critical to understanding barriers to uptake.” What is meant by this sentence? Please clarify and explain the relevance of the study because as I mention no clinical trial on the COVID-19 vaccines are conducted on children. How the study can be helpful especially if it is not known yet if children will be include in the priority groups for vaccination against COVID-19.

We have clarified this to indicate we meant that past uptake of childhood vaccination uptake. (pg 4)

- As mentioned for the title, please specify that the data come from a cross-sectional survey within a cohort study.

The study uses both cross-sectional and longitudinal data. Specifically, we use historically collected data on whether parents vaccinated their children according to the routine vaccination schedule. Parents who report concurrently on vaccine intention and vaccination history are much more likely to have recall bias than prospectively collected data on vaccination. We believe this is a strength of our study.

3. Methods Participants

- “Of the 2455 eligible participants, 1321 responded (53.8%).” Which methods were employed to minimise the non-answer bias? How the final 1321 participants still represent the 3388 eligible participants originally enrolled? It is partially answered in the study limits but should it be mentioned earlier? If a mother has more than one child now aged between 9 and 12, is the survey still refers to only one child?

We have clarified this section and added a table comparing responders to non-responders in an appendix. We have added limitations as to the generalizability of the study. We have clarified that the responses were analyzed unique to mothers (mothers could only answer once). (appendix, pg 7 and 11)

- What is the vaccine coverage in the original cohort compared to the general population? This would help to judge how the cohort is representative of the general population according to vaccination status.
We have specified the vaccination coverage in the general Alberta population (71%) compared to our cohort (85%). We carefully discuss how we believe that while our cohort is not fully representative of the Alberta population, we believe our estimates are generally conservative. (pg 11)

- The original cohort includes women. However in many places in the manuscript, the authors mention or conclude about the parents and the families. Even if women could be a good proxy for families or for both parents, please explain how it could be adequate to do so. The step between the

mother and the parents or the family could sometimes be wide especially on regular vaccination opinion or future COVID-19 vaccination. Would it be appropriate to illustrate the difference between mothers and fathers regarding vaccination choices for their child if possible in the manuscript?

We have revised the language in the manuscript throughout to refer to mothers in our study, and only mention parents when speaking about the broader literature. We have noted the lack of paternal reports in our limitations. (pg 11)

- It is mentioned in the introduction that vaccination information and demographic factors were historically collected. Please clarify if all demographic data were collected only at the beginning of the cohort or if changes in the situation were recorded. For instance, socio-economic status could have changed since recruitment. If only historically data on family income was used, it could generate a misclassification bias in the results if the socio-economic status has changed over time. Also were data collected from time to time on the health status of the child in the cohort since intention on child vaccination could be influenced by the presence of chronic conditions?

We have clarified that demographic information from the most recent previous timepoint was used with the exception of income, which was collected at the COVID survey. We did not have comprehensive information on chronic conditions among children which has been noted as a limitation. (Table 1, pg 6)

Data collection

- Please mention how the survey data were collected. Was it a mail, phone or an online survey? Please give more details on reminders or recalls because the 2017 reference on the cohort design is not helpful.

We have clarified that the survey was conducted online using REDCap and specified the number of email and phone call reminders. (pg 5)

- Was it mentioned to participants in the questionnaire that for now, no COVID-19 vaccine trials are conducted on children because it could impact on vaccination intention?

In our pilot testing, we carefully considered the wording of this question and determined that simplified wording regarding whether a parent would consider vaccinating their child “if a vaccine were approved” was the most broadly understood. The wording of the vaccine intention question is available in the appendix.

Data analysis

- The quantitative analysis is fine. However, the qualitative analysis and results of the manuscript bring many questions and doubts.

We address the concerns with the qualitative analysis point by point below.

- How long could be the answers given by the participant in the open text box (especially if it was an on line survey)? Why did the authors choose an inductive thematic analysis instead of a deductive analysis in the context of vaccine hesitancy literature and because the listed factors look to be mostly already known?

The review is correct in pointing out that responses were quite short. We chose the thematic analysis as described as it allows us to generate larger meaning from short answers. Because a COVID-19 vaccine was hypothetical at the time we asked the questions, we did not want to assume that attitudes towards this vaccine would be similar to previous vaccine intentions. We clarify our use of an inductive rather than deductive approach in the methods.(pg 6, 7)

- “Frequency of themes were categorized by intention to vaccinate”. How this method is justified in the context of spontaneous answers and since not all participants gave open text responses? Is there a methodological basis for this way of doing qualitative data analysis? What is the scientific value or scientific ground of adding themes and presenting frequencies on this data set or to do the comparisons

between different groups of intention to vaccinate? Were the “Concerned about long term safety” answers included in the “Safety and Efficacy” factor answers? Is it possible that people against or unsure about vaccine were more reluctant to answer this optional open question because of a desirability bias? Would it be more appropriate to discuss the factors influencing decisions to vaccinate altogether, for an exploratory purpose, and not try to contrast them according to the intention to vaccinate category?

We clarify that 85% of participants spontaneously provided an answer which includes participants from all intention categories. We clarify that several studies that quantify qualitative answers and consider this approach appropriate for large surveys. Specifically, quantifying qualitative results has been widely used in qualitative content analysis and thematic analysis which we reference. Regarding the characterization of the different themes, we did not infer meaning beyond what the participants said. For example, regarding general safety compared to long term safety we categorized responses based on the level of specificity used. If a participant mentioned only safety generally, it was coded to the “safety and efficacy” category. If long-term safety was mentioned, it was coded to “long term safety”, if both were mentioned, it was coded to both. We believe the coding framework was specific enough because an independent second coder was able to replicate the coding with a high level of accuracy. While desirability bias is possible, we do not think it would unduly impact results as participants across all intentions provided answers. We specifically did not conduct any statistical analyses on comparing across categories as this would be putting too much precision on broad categories. Instead, we simply present responses and allow the reader to draw the conclusions they deem appropriate. We have reviewed the language and removed any explicit comparisons between vaccination category and simply present the proportions.

4. Results

- Why \$80,000 was chosen for the family income breakdown?

We have clarified this reasoning as it relates to eligibility for low-income rental housing in the city of Calgary. (Table 1)

- Why the “partially vaccinated” and the “not vaccinated” were analysed together? Is it simply a matter of size?

We have clarified that we collapsed these categories due to small sample size. (pg 6)

- Who had to be infected with COVID-19, the mother, the father or both to be considered in the “Yes/May be” category?

Any family member within the household could have had a confirmed or suspected case, this is clarified in Table 1.

- What is the recommendation for flu vaccine to children in Alberta? Is it included in the “complete vaccines at 2 years”?

The Alberta government does recommend annual flu vaccines to children over the age of 6 months. However, in Alberta, the flu vaccine is generally administered at large “pop up” vaccination clinics, whereas other childhood vaccinations are administered through public health clinics. We did not ask about flu vaccines at age 2. We have clarified which vaccines are included in the complete vaccinations at age 2 in table 1 and the lack of information on flu vaccine uptake in the

limitations. (Table 1 and pg 11)

- As mentioned before, the way of reporting the qualitative data results with proportions could be of concerns even if the different factors and quotes reported are interesting and relevant. All the proportions reported could be misleading because of the way answers on the factors influencing COVID- 19 vaccine decision were collected. I would suggest to remove all the quantitative results of the qualitative data and analysis.

We respectfully disagree. We believe that the qualitative answers provide meaningful context into understanding how mothers make decisions about vaccination. The way in which the qualitative answers are counted and compared may be less familiar to some who are used to seeing qualitative data from in-depth interviews. However, the method we used is appropriate for the type of qualitative data we have, mainly short answers from open text boxes from a very large number of participants. We have expanded on the methodology employed to capture the qualitative answers and provide evidence of other studies using similar techniques. While there is always a risk of bias or unrepresentative results in qualitative responses, we believe the strength of our study lies in the mixed methods approach using both historically collected data regarding vaccine behaviour, as well as contemporary opinions on vaccine intentions. (pg 7)

5. Interpretation

- Most of the interpretation part of the manuscript is adequate.
- As mentioned before, discussion on the themes or factors found in the qualitative data is accurate and relevant. However, all the quantitative analysis done on the qualitative data should be removed. The interpretation on the qualitative data should be presented as exploratory and the authors should discuss about the limitations of the qualitative data as well as they do so on the quantitative data. There is no mention at all of the limitations of the qualitative data or analysis of the study and it should be added.

We have included limitations of the qualitative data.(pg 11)

- Because the survey is not anonymous, the authors should discuss about its possible impact on answers.

The survey is not anonymous, and we believe the reviewer is concerned that this may influence responses. The participants are aware that any identifying information will be stripped prior to data analysis and we have received ethical approval for data collection and this approach. Only aggregate data is presented. The AOF team has demonstrated that mothers are typically well positioned to answer even sensitive questions in this context as evidenced by, for example, higher rates of alcohol use compared to administrative data. In addition, we have validated maternal response against medical records for key variables related to pregnancy labor and delivery. Further evidence of robust and authentic information is noted in the similarity of the reporting of adverse childhood experiences and mental health conditions that would be expected based on other sources. Finally, because there is no association between survey responses and medical or other care, there is less likelihood of response bias.

- “Polarization regarding vaccines is increasingly common, and has been linked with political ideology and general skepticism of science in both Europe and the United States.^{6, 22, 23} In Canada, vaccine hesitancy has increased in recent years and careful engagement with those who may be uncertain about vaccines is

	<p>recommended". Polarization and vaccine hesitancy are quite different and should not be included in the same phenomenon. The authors should be more nuanced here.</p> <p>We have removed the sentence on polarization.</p> <ul style="list-style-type: none"> • Finally a few words on the external validity would be of interest since the manuscript title refers to Canadian parents. The generalizability (external validity) of the sample has been addressed in the limitations and the title altered. (pg 11)
Reviewer 2	Dr. Roger Thomas
Institution	University of Calgary, Calgary, Alta.
General comments and author response	<p>You wrote: "This study used data from the longitudinal cohort study All Our Families in Alberta, Canada. Cohort characteristics and study design are described in detail elsewhere.¹³ Briefly, the All Our Families Cohort is a population-based pregnancy cohort that began in 2008 and recruited over a three year period. Of the 3388 women originally enrolled, 2455 remain part of the study after 12 years (72%). From May-June 2020, All Our Families participants, whose children had reached ages 9-12 years, were invited to complete the COVID-19 impact survey. Of the 2455 eligible participants, 1321 responded (53.8%)."</p> <p>Please describe the All our Families cohort as many readers may not look in your other publications. How representative is your ultimate sample of the population of interest?</p> <p>We have added information as to the representativeness of the sample and provided a table in the appendix regarding responders and non responders.(abstract, pg 11, appendix)</p> <p>"The inter-rater agreement for the categorization of open text responses into themes was 82% (kappa 0.76)." What differences between raters or difficulties did you encounter in reaching a kappa of 0.76? This is rather low - what strategies did you use to endeavour to increase your kappa as this is one of your important outcomes?</p> <p>We provided the interrater reliability and kappa statistic as a metric to show that our coding framework was sufficiently specific to allow an independent coder to categorize responses into the same categories as the first coder. Differences in coding were resolved through discussion which is now clarified in the text. (pg 6)</p> <p>You wrote: "Eighty-five percent of participants provided a response in the open text box asking about reasons underlying vaccine intention. Thematic analysis revealed ten primary factors influencing decision-making were identified among all parents, regardless of intention to vaccinate."</p> <p>The key response was safety and efficacy. Your conclusions correctly advocate carefully addressing this issue in public interest statements. What would your detailed recommendations be for the content of these statements?</p> <p>We refrained from providing recommendations on the content safety and efficacy statements as these will depend on data from trials of vaccines in children which have not yet been completed.</p>

Reviewer 3	Dr. Hugo Soudeyns
Institution	Centre de recherche du CHU Sainte-Justine
General comments and author response	<p>In this short manuscript, Hetherington and coworkers present the results of a study on factors affecting parental intent to vaccinate their children against COVID-19 once a vaccine becomes available and approved. Their analysis was based on participants to the « All our Families » cohort study whose children had reached 9-12 years of age (n = 1321). Associations between sociodemographic data and intent to vaccinate (yes, no, unsure) were tested using bivariate multinomial regression models.</p> <p>Qualitative analysis was also performed on open text responses from participants. Main findings were that lower levels of maternal education and lower levels of family income were associated with intent not to vaccinate (« no ») and uncertainty as to whether or not to vaccinate (« unsure »), while partial immunization history in the child was only associated with intent not to vaccinate. Concerns related to vaccine safety and efficacy, long-term safety, vaccines being « rushed through trials », perception of personal risk, and being against vaccination were mentioned by participants. Perhaps intriguingly, the relatively benign nature of COVID-19 in children has not. Overall, this is an interesting and straightforward study. My main concern relates to the meaningfulness of these findings now that</p> <p>Alberta has been harder hit by the COVID-19 pandemic (second wave) and that safe and effective COVID-19 vaccines have been approved and are being deployed across Canada. The situation of the COVID-19 pandemic has been evolving rapidly in the past weeks and months and parental (maternal) attitudes towards vaccination might have shifted (e.g. threats posed by novel viral variants). This should at least be mentioned in the discussion as a study limitation. Please also consider the following comments:</p> <p>Thank you for these comments. We have mentioned the very fast-moving landscape of the pandemic. We hope that the reviewer appreciates that no vaccines were approved for use in Canada when this manuscript was submitted. We have added the fluid nature of the pandemic and vaccine approval process as a limitation of the study and note that maternal attitudes may have changed since they were assessed. (pg 11)</p> <p>1. Abstract and Page 5 (Methods). The abstract mentions that « Parents were asked... ». However, it would seem that the « All our Families » cohort only enrolled women. Is this correct? In addition, Table 1 and Table 2 report results on maternal age and maternal education, but not paternal age or education. Does that mean that data pertaining to the father was not collected? If that is the case, then the term « parents » should be replaced by « mothers » throughout the text. This needs to be clarified.</p> <p>We have changed the wording to mothers, unless referring to external research.</p> <p>2. Page 4, lines 1-4. These numbers should be updated to reflect the current state of the COVID-19 pandemic.</p> <p>We have updated the numbers.(pg 4)</p> <p>3. Page 5 (Methods). It is unclear from the text how participants were surveyed (telephone call, web- based questionnaire, mailed-in questionnaire?). Why was the study solely focused on families (women) with children aged 9-12?</p> <p>We have clarified that this was an online survey administered through REDCap</p>

and the age range of children reflects how old children are now based on original enrolment in the pregnancy cohort. (pg 5)

4. Table 1. Please correct the title (« Characteristics of parent's their intention... ». We have corrected this. (Table 1)

5. Table 1, second row (Maternal age). The numbers that appear between parentheses are not percentages, unlike what is mentioned in the column labels and the rest of the data presented in this table. This is confusing. We have clarified that the numbers in parentheses are standard deviations from the mean as listed in the row title. (Table 1)

6. Table 1 and Table 2 should be merged into a single table. We recognize that Table 1 and 2 present similar information in different formats (proportions vs ORs from multinomial models). We chose to present both because readers may appreciate the raw numbers as well as the ORs. Merging the tables would likely make the table too wide, but we defer to the editor and will merge them if requested.

7. Table 2, second line and footnotes. What do the authors mean by « increasing in years »?
We have clarified this to say “measured in years”. This allows the reader to interpret the OR as: “Each additional year of maternal age was associated with a 0.97 OR (95%CI 0.93, 1.01) of intending not to vaccinate compared to intending to vaccinate. (Table 2)

8. Table 2, second line, last column. Is this association (maternal age, unsure vs. yes) statistically significant (it is in bold)? If so, it should be mentioned in the text and discussed.
We have added this to the results. (pg 9)

9. Page 9, line 2. Why do you mention a « growing uncertainty »? Any clues from your data that uncertainty might be growing?
We do not have data on changes in vaccine uncertainty from our data, but refer to broader trends in vaccine uncertainty. We have clarified the language. (pg 9)