Author’s response to reviews

Title: Time loss due to oral health issues in the Canadian population: analysis of a nationwide cross-sectional survey

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Christopher Foote
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Re: Revisions to manuscript submission – “Time loss due to oral health issues in the Canadian population: analysis of a nationwide cross-sectional survey”

Dear Dr. Foote,

We would like to thank the reviewers for their insightful comments. Below please find the reviewers’ comments, and indented below them, our point-by-point responses.

Thank you in advance.

In response to:

**Reviewer #1 (Wael Sabbah)**

*Minor Essential Revisions*

**Background:**

Page 3, 2nd paragraph: The authors stated “this study thus aims to provide……estimates of the economic impacts of oral health issues....” this aim is inaccurate since the study did not include an estimate of dental treatment. The authors may consider using the objective statement used in the abstract.

We have changed the objective statement to correspond to the abstract (p.3; paragraph 3, line 3).

**Materials and Methods**

Page 5, 2nd paragraph: “Descriptive statistics (frequencies, means) were used to observer the sample”.

Did you mean observe?

We have corrected the spelling error.

Please state explicitly all the variables that were included in the two final regression models
We have listed all the variables entered into both the logistic and linear regression (p.6; paragraph 2, lines 6 and 10 respectively).

Results

In the text it was stated that 5,600 persons participated in CHMS. However, in Tables 1&2: N was reported as 29,157,460 for age, and similar figures for the rest of the variables. What are these numbers? Please use actual numbers included in the survey in the Tables and the results section.

These values represent the weighted sample size of the CHMS, sample and bootstrap weights were applied to ensure the data were nationally representative. While we agree there is value in presenting the un-weighted numbers, these cannot be reported due to the disclosure rules of Statistics Canada and the Research Data Centre.

Discretionary Revisions

Materials and Methods

Why did the authors decide to invert Odds Ratio below 1? This was confusing in reading the tables, especially when the odds ratios are reported in the text indicating lower probabilities. Unless you have a good reason for this, I suggest reporting odds ratios as produced by the statistical program.

We have changed the odds ratios and corresponding confidence intervals to reflect the values produced during statistical analysis. Please refer to Tables 2 and 4 to note the changes.

Discussion

One of the important limitations of the data is that the CHMS question pertaining to time loss did not distinguish between time loss for dental check-ups and treatment (whether preventive, curative or emergency), and time loss due to dental pain or dental problems (without seeking treatment). The lack of discrimination between time loss for dental treatment (which could be mostly for preventive reasons as shown in other Canadian studies) and due to pain or problems may explain why persons at the top of the social hierarchy reported more time loss. It would also explain why, for example, persons with DMFT=0 reported losing more time than persons with DMFT >0 as reported in Table 3. In other words, it is possible that most of the time loss reported in this study was due to seeking routine check-ups and preventive services, while those with real dental problems did not lose as much time on dental “issues”, perhaps due to barriers with access to care. This line of explanation is also consistent with the “inverse care law” that is well demonstrated in relation to the use of dental services in Canada and USA.

Yes we agree and we have attempted to address this in our discussion surrounding ‘good’ and ‘bad’ time loss. Further discussion has also been added, see p. 12; paragraph 2, line 5.

Reviewer #2 (Anna-Lena Ostberg)

SPECIFIC COMMENTS
TITLE and ABSTRACT

The term “oral health issues” is vague, please be more specific. Both clinical and self-reported data were collected. However, the clinical data are not commented on.

We agree that the term “oral health issues” is vague, however, to remain consistent with the use of the term in the summary report of the CHMS published by Health Canada, we have kept the terminology. The summary report is available at http://www.fptdwg.ca/assets/PDF/CHMS/CHMS-E-summ.pdf. As per the use of data, questions pertaining to time loss were self-reported and were correlated with clinical data in the analysis. Nonetheless, as per the comments of Reviewer 3, more data has been provided in the background to give a better sense of the oral health of the Canadian population as a whole (p.2; paragraph 1, line 2).

The aim of the study defined in the abstract and that in the main text differ to some extent. The one in the abstract is clearer.

We have changed the statement of objectives to correspond to the abstract (p.3; paragraph 3, line 3).

Please consider the construction of the second sentence under “Methods” in the abstract (proportion of who/what?).

We have changed the wording of the sentence for improve the understanding (p.1; line 4).

No musculoskeletal conditions were investigated in this study and should not be reported in the results here.

We have removed this sentence from the abstract.

The conclusion in the abstract and that in the main text do not correspond. Moreover, it should be better focused.

We agree that the conclusion of the abstract required focusing and it has been changed to be more reflective of the main text (p.1; line 12)

BACKGROUND

The background is adequate as a whole. However, the same currency must be given when comparing costs for time loss in different countries.

We have ensured that all costs are now reported in 2012 Canadian dollars (p.3; paragraph 2, line 9).

METHODS
Exclusion criteria shall be justified. The sample is said to statistically represent 97% of the total Canadian population. It would be interesting to know the total count of the population.

We have provided further detail surrounding the exclusion of certain sub-groups of the Canadian population (p.4; paragraph 1; line 3). In regards to the total population count further information has been added to the text (p.4; paragraph 1, line 3).

The questionnaire contained 722 items. This is extremely much. Please see below under DISCUSSION.

The survey instrument was developed by Statistics Canada and underwent a substantial pre-test and validity process. For further information regarding this process please refer to http://www.statcan.gc.ca/pub/82-003-s/2007000/article/10362-eng.pdf.

The answer options of the used items should also be described.

We agree that a description of all the variables used in this study would be ideal, but due to space limitations it is not feasible. The majority of variables were recoded to the categories seen in the tables, the original response categories can be found at http://www23.statcan.gc.ca/imdb-bmdi/instrument/5071_Q2_V2-eng.pdf.

Statistics: The usage of inverted odds ratios is debatable and not justified. Please see comment under RESULTS.

We have changed these odds ratios; please refer to our comments in the results section.

Whether here or under RESULTS, the variables omitted due to multicollinearity should be given.

The only variable omitted due to collinearity has been discussed in the text (p.6; paragraph 2, line 15). Further to this, in response to Reviewer 1, all variables included in the regression models have been discussed in the text.

The data were collected between March 2007 and March 2009. Why was average household wages per occupation classification from February 2012 used to estimate individual losses?

As we did not intend to provide a hard estimate of the economic impacts of oral health issues, we utilized the most recent data available at time of analysis to speculate on the economic impacts of oral health issues in the Canadian population. Also, the average wage data from the Canadian Labour Force Survey during the CHMS survey period was not publicly available.

Ethical approval and data deposition shall be accounted for.

Details pertaining the survey’s ethics process have been provided in the text (p.4; paragraph 1, line 6). In regards to data deposition, the survey data is held at, and is only accessible through, Statistics Canada’s Research Data Centre.

RESULTS
My main concern is the pedagogical approach in using inverted odds ratios for OR:s <1. An example: in §2 of the results the second sentence begins as follows: “Table 2 demonstrates that as income decreased so did the odds of reporting time loss”. However, the table shows increasing inverted OR:s. What is the reference group in the different calculations? If the authors wanted all OR:S to be >1, reverse coding of specific items could have been carried out before the analyses - although this could also entail difficulties in the interpretation.

We have changed the odds ratios and corresponding confidence intervals to reflect the values produced during statistical analysis. Please refer to Tables 2 and 4 to note the changes. Reference groups are labeled within the tables.

The tables are very extensive. Table 1: no option for those =high school. “Frequency of seeing dental professional”: it surprises me that there is no option between “One or more times per year” and “Emergency or never”.

To remain consistent with the technical document for the oral health component of the CHMS, as produced by Health Canada, education was dichotomized for analysis and interpretation. For the frequency of seeing a dental professional variable there is a category for “less than once a year” which is the reference category, please refer to tables for further clarification.

Table 2: See above regarding inverted OR:s. Why is dmft and DMFT given – nothing is commented on or used in the analyses.

We have only highlighted certain findings in the reporting of the results, nonetheless a discussion surrounding DMFT has been added to the discussion (p.13; paragraph 1, line 2)

And what does N=27,629,868 stand for (the same for the primary and the permanent dentitions)?

This value represents the weighted sample size of those who had DMFT and dmft data collected.

Table 4: were all the variables mentioned in the table included in the same regression model?

Yes, the variables in the regression models were entered en bloc.

Table 6 reports on productivity loss in different occupational groups. The clinical relevance of this is unclear, please motivate.

Previous discussions in the literature (Reisine 1988; Gift, Reisine and Larach 1992) discussed differences in time loss by occupational class (e.g., blue versus white collar jobs) and by job autonomy respectively, such that those with white collar jobs or greater autonomy tended to lose more time, albeit for different reasons. The availability labour force data in the CHMS, which corresponded to the wage data of the Canadian Labour Force Survey (another Statistics Canada survey) allowed us to further examine this relationship. The importance of this is that when burden of illness is discussed in the literature, indirect costs for oral health issues are rarely quantified. The CHMS provided an opportunity to estimate these costs and to provide
policymakers with a better understanding of the true cost of oral health issues in the Canadian population.

DISCUSSION

Results are repeated to some extent in the discussion section, which enables reductions (too long as is, > 5 pages). On some points, new results are given for the first time in the discussion section (§2: “the majority of 1 to 2 member households were comprised of higher educated, higher income earners” and §5: about the total estimated monetary loss).

We agree that it was not appropriate to provide new data within the discussion section and have removed it.

Some parts of the discussion are not supported by references (§§ 3 and 4). Specifically “the very few examples from the dental literature” shall be cited (§4, line 2).

We have added references where needed (p.11; paragraph 2, line 2)

In §6, comparisons are made with an Australian national survey, which produced opposite findings to the current study (line 9). Please discuss better.

The finding of the Australian study, which highlighted that a section of the population experience poor oral health and problem based visiting, is not in opposition to this study. However, the Australian study could discern this more easily due to their question structure, while we inferred that this was the case for our survey.

The method’s discussion is balanced. However, the validity of a questionnaire containing 722 items must be discussed!

The survey instrument was developed by Statistics Canada and underwent a substantial pre-test and validity process. For further information regarding this process please refer to http://www.statcan.gc.ca/pub/82-003-s/2007000/article/10362-eng.pdf.

The conclusion in the abstract and that in the main text do not correspond. Also, see above my comments to the abstract.

We have changed the statement of objectives to correspond to the abstract (p.3; paragraph 3, line 4).

Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore):

Key words should preferably be MeSH terms.

We have changed the keywords to MeSH terms.

Reviewer #3 (Marco Peres)
Specific comments

Abstract

There are no ‘numbers’ in spite of mentioning ‘quantity of time loss’. Please, quantify the magnitude of time loss due to oral health issues in the abstract.

We have quantified the magnitude of time loss within the abstract. (p1; line 9).

Introduction

The authors clearly justified the study and objectives but I suggest adding some statistics of dental health in Canadians. Reporting that dental diseases affected over 95% of Canadian adults in 2009 is too vague.

We have provided further detail regarding the oral health status of the Canadian population in 2009 (p.2; paragraph 1, line 2).

Please, commence this section conceptualizing direct and indirect cost supported by recognised and very well known references.

We have provided further explanation of direct and indirect costs within the background section (p.2; paragraph 1, line 6).

Be consistent with heath economics terminology. For instance, when reporting the days of restricted activity per 100 persons (last paragraph, page 2), it is mandatory to indicate the temporal unit, i.e. month, year or period. Later (first paragraph, page 3), the authors reported an estimated AUD$808 million lost due to oral pain and discomfort without mentioning during what period of time. It would be preferable if the authors provided information on similar studies in different countries and described the search method.

We agree that it is ideal to provide information regarding the temporal unit for every study however the US report does not provide this information. However, further examination of the survey revealed a 2 week recall period, while the Australian questions refer to the previous 12 months. This information has been added to the text (p.3; paragraph 2, lines 3 and 7).

The objectives of the study should include identifying factors associated with time loss.

We have included the identification of factors associated with time loss into the study’s objectives (p.3; paragraph 3, line 5).

Methods

Please provide information about sources of fluoride in the studied population.

The CHMS was designed to only provide national estimates of oral and general health indicators in the Canadian population. Geographical identifiers are not provided within the data. Also, in
Canada, community water fluoridation is governed at the municipal level, and thus varies substantially between regions and municipalities.

The authors omitted how the sample size was calculated and selected. What were the statistical parameters that guided the sample calculation? The sample size calculation and selection should be explained in depth (or referenced). Moreover, the authors should explain how they dealt with sample calculation to test the association of the outcomes with exploratory variables. This requires another sample calculation.

As this study was a secondary analysis the CHMS, Statistics Canada determined the sample size and sampling strategy for this survey, which is discussed in the methods section of the paper. Further information regarding this topic can be found at [http://www.statcan.gc.ca/pub/82-003-s/2007000/article/10363-eng.pdf](http://www.statcan.gc.ca/pub/82-003-s/2007000/article/10363-eng.pdf).

The clinical examination, as well as all collected explanatory variables, must be described and their cut-off points justified or referenced.

We have added to the methods sections further detail regarding the collection of oral health data for the CHMS (p.5; paragraph 2, line 12). Further information can be found at [http://www.fptdwg.ca/assets/PDF/CHMS/CHMS-E-tech.pdf](http://www.fptdwg.ca/assets/PDF/CHMS/CHMS-E-tech.pdf)

Please provide additional information about the fieldwork team, data setting and data quality control.

Within the methods section, we have added further detail about the data collection process (p.5; paragraph 2, line 4)

How did the authors perform statistical modelling? It is mentioned that linear and logistic regression models were performed but it is necessary to justify why and if the outcome variables distribution adhered to the assumptions of these techniques.

In logistic regression no assumptions are made about the distributions of the explanatory variables, yet the explanatory variables should not be highly correlated with one another. Large sample sizes are also required for logistic regression to provide sufficient numbers in both categories of the response variable. Thus logistic regression does not require normally distributed independent variables or a linear relationship. It requires a binary outcome variable, which was used in the analysis. The assumptions for a linear regression are that the response variable is normally distributed, that there is a linear relationship between the independent and dependent variable and that the independent variables are not correlated. The outcome variable for this regression was continuous, but was not normally distributed. With multiple independent variables, collinearity was accounted for by excluding variable with a Variance Inflation Factor of greater than three.

As is unusual in dental public health literature the use of econometric methodology approach, I suggest a more detailed explanation about the calculation of the potential productivity loss (last paragraph, page 5)
We have provided more detail regarding the lost wages method (p.7; paragraph 2, line 2). Further to this the formulas for the calculation of potential productivity loss are included in the text (p.7; paragraph 2, lines 7 and 10).

Results

Start the results section by providing the participation rate and the main reason for drop out.

We have added data about the overall participation rate (p.7; paragraph 3, line 1). Further information can be found at http://www.statcan.gc.ca/pub/82-003-x/2012002/article/11677/data-donnees-eng.htm.

Tables 2 and 3 are too long; they need to be shortened. P-values should be displayed for each variable instead of each category.

In Table 3 no post-hoc tests analysis was conducted therefore the P-value indicates a difference between the groups; which specific group differs is unknown.

Tables 4 and 5 should show crude and unadjusted models; the SE column in Table 5 is not necessary.

In response to the reviewer’s comment the SE column in the Tables have been removed.

In Table 4, I identified some 95% CI with the upper limit presented before the lower limit when the contrary is the correct way of presentation.

These errors resulted from the inverting of the odds rations and corresponding confidence intervals. We have changed the odds ratios and corresponding confidence intervals to reflect the values produced during statistical analysis. Please refer to Tables 2 and 4 to note the changes.

Please, refrain from repeating values from the tables; instead highlight the most important results. Omit p values and 95% CI in that section.

Within the results section all p-values and confidence intervals have been removed from the text.

Discussion

Apparently there is a paradox in the time lost owing to dental issues. The majority of those reporting time loss are from middle-to high-income groups. This issue must be discussed in depth.

We have attempted to discuss this paradox in the article when discussing ‘good’ and ‘bad’ time loss (p.10; paragraph 2).

Please, take care with comparisons. In the past paragraph of page 10, the authors compared their findings with findings from another study on musculoskeletal strain and bone disorders published in
1998, at least 10 years earlier. In addition, it is important to report if the same methodology was used in both (dental and non-dental) studies.

We agree that the use of studies with the same methodology is ideal. However, the ability to provide policymakers with comparisons to other illnesses was important, as it has been identified as a key knowledge gap in Canada. Thus we used available data regarding musculoskeletal disorders, and also discussed these comparisons with strong caveats (p. 11; paragraph 3).

We appreciate each reviewer’s comments and look forward to your response.

Please note the correction of Dr. Ravaghi’s family name under author details section of the website.

Sincerely,

Alyssa Hayes, BDS, MSc, FRCDC