Author’s response to reviews

Title: Providing dental insurance can positively impact oral health outcomes in Ontario

Authors:

Nevena Zivkovic (nzivkovic25@gmail.com)
Musfer Aldossri (musfer.aldossri@mail.utoronto.ca)
Noha Gomaa (noha.gomaa@utoronto.ca)
Julie Farmer (julie.farmer@mail.utoronto.ca)
Sonicia Singhal (sonica.singhal@dentistry.utoronto.ca)
Carlos Quiñonez (carlos.quinonez@dentistry.utoronto.ca)
Vahid Ravaghi (v.ravaghi@bham.ac.uk)

Version: 1 Date: 20 Dec 2019

Author’s response to reviews:

Dr. Zhongliang Zhou

BMC Health Services Research

RE: BHSR-D-19-02017

December 20, 2019

Dear Dr. Zhongliang Zhou,

On behalf of my co-authors, I am pleased to submit revisions for the research article titled “Providing dental insurance can positively impact oral health outcomes in Ontario”.

I thank the reviewers for their role in reading the paper and providing constructive comments. All reviewers’ comments are individually addressed in the subsequent pages, and all changes in the manuscript have been modified using tracked changes. We believe that the feedback has strengthened our paper and that we were able to adequately address the comments.

Thank you for your consideration,

Nevena Zivkovic

Corresponding Author:
Nevena Zivkovic
Faculty of Dentistry
University of Toronto
124 Edward St.
Email: nevena.zivkovic@mail.utoronto.ca

Reviewer #1: Mesele Damte Argaw, MPH: Date: 10 October 2019

Dear Editors of BMC Health Service Research Journal

This was an estimation of marginal effect of dental care insurance on health outcomes. The title of the study was "Providing dental insurance can positively impact oral health outcomes in Ontario." The study can contribute to the body of knowledge with regards to financial risk protection and universal health coverage. The following strengths are identified
* Address very important public health issues
* Follow scientific literature writing guides and
* Uses appropriate methods and statistical analysis
* Well written which uses advanced level of English language writing
* Results are presented properly
* Conclusions are in line with the results

Thank you for reading the paper and identifying its merits. We agree that this paper has some very important strengths, and we thank you for identifying them.

Reviewer #2: Kelsey Chalmers (Reviewer 2): Thank you for inviting me to review this article and to the authors for their work. In this article, the authors analyse a cross-sectional survey of the Ontarian population to report on the relationship between dental insurance and dental health outcomes. The authors advocate for a universal dental insurance scheme in Canada based on the positive relationship they find in their analysis.

Authors: Thank you for taking the time to read this paper and provide feedback. We appreciate your input.

Major comments:
Introduction: given the systematic review and previous studies mentioned from line 9, page 4, on dental insurance and utilization and unmet need, are the authors addressing an unknown gap in the literature? Have outcomes - like the ones the authors report - not been investigated before? This wasn't clear to me when reading the introduction.
Authors: The association between dental insurance and utilization and unmet need have primarily been addressed through reporting regression coefficients or odds ratios. Our manuscript applies a more recent methodological approach, known as marginal effects, to understand effects of dental insurance in Canada. Our first objective has been previously researched: “to estimate the impact of dental insurance on dental visit behaviour and oral health status outcomes in Ontario”. We believe that the method used in our paper improves interpretation of the effects of dental insurance. Research that have presented relative effects of insurance are generally more difficult to visualize on a population level.

Our second objective is novel, and has not been addressed in the literature: “to compare the impact of insurance on these outcomes across income, education and age subgroups; in other words, we wanted to see whether some groups are more sensitive to insurance coverage than others.”

We have updated our manuscript to reflect these important points. The following changes have been added (see page 3 and tracked changes):

1) Using data from Ontario, Canada’s most populated province, our aims were: (i) to learn about the potential impact of dental insurance on various oral health related outcomes and (ii) to describe the population-level impact of having dental insurance on these outcomes.

2) While our first objective has indeed been addressed in prior research, to the best of our knowledge there has not been any research exploring the differential impact of dental insurance on socio-demographic groups.

Methods: did the authors consider collinearity between the covariates? If dental insurance is collinear with household income (perhaps also education level? Geographic peer group?) this could impact the marginal effect estimates of dental insurance on the investigated outcomes. See: Wheeler, D. (2010). Collinearity. In N. J. Salkind (Ed.), Encyclopedia of research design (pp. 194-195). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781412961288.n62. "First, the interpretation of regression coefficients as marginal effects is invalid with strong collinearity, as it is not possible to hold highly correlated variables constant while increasing another correlated variable one unit."
Authors: We constructed our regression models to reflect the relationship between our exposure (dental insurance) and outcomes (oral health outcome) while adjusting for confounders. Conceptually, we expected the variables we adjusted for to be confounders associated with the exposure and the outcome. The confounding variables are not on the causal pathway between dental insurance and our outcomes. Each variable we adjusted for had reasoning with regards to being a confounder. Age and sex are common confounders generally adjusted for in multi-variable models. Income reflects an individual’s ability to afford dental care. Household education reflects an individuals’ health literacy level. We expected that general health status or having at least one tooth may affect the potential need for dental treatment (i.e. poorer general health may indicate more help is needed to maintain oral health). Area of residence (geographic location) can impact access to dental care as some areas are more densely populated with dentists than others.

Although we do not report unadjusted values in the manuscript, we confirm that adjusting for confounding variables decreases the marginal effects of dental insurance on the outcomes (i.e. the ME of insurance on visiting the dentist goes from 30.9% to 22.3% in the version without multiple imputation). Thus, adjustment makes our estimates more conservative.

We considered the potential impact of collinearity, if present by estimating the variance inflation factor (VIF) as described by the University of Utah STATA support document (see: https://campusguides.lib.utah.edu/c.php?g=160853&p=1054159). We downloaded the Collin STATA extension for the analysis. Our analysis did not suggest evidence of multicollinearity among the variables in our model. However, VIF and Collin STATA extension are more appropriate for continuous rather than categorical variables. While this is not the ideal analysis, it is encouraging that we do not notice multi-collinearity.

Some minor comments:

Introduction: the US's outcomes are mentioned several times along with Canada, but this doesn't add anything to the introduction - I would suggest deleting most of the US references here.

Authors: We have removed our emphasis on the US in our introduction. See page 3, tracked changes.
1) Canada ranks highest in income inequalities in visiting the dentist, compared to eighteen Organization for Economic Cooperation and Development (OECD) countries

2) Compared to eleven other Commonwealth countries, Canada ranked second highest in the proportion of individuals who skipped dental care in the past year due to cost

2) Canada has a predominantly private dental care system.

Line 53, page 3 - is there a difference between 'low income workers' and the 'working poor'? If not, this point doesn't really make sense.

Authors: Thank you for pointing this out. Low income workers and working poor are synonyms. We have revised our manuscript as follows (page 3, see tracked change):

- Further, it has become clear that it is not just unemployed and low-income earning Canadians who have difficulty affording and accessing dental care, but also middle income earning adults (13-15)

Line 36, page 3 mentions that dental insurance may be employment-based or individually purchased - is this describing the US and Canada, or just Canada (from the previous sentence, it would seem the US and Canada)?

Authors: This sentence describes the Canadian context. We have since changed the wording to reflect this (page 3, see tracked changes).

- In Canada, the majority of dental care services are paid through out of pocket payments and private dental insurance (employment-based or individually purchased)

If dental insurance is employment-based, do both low-income and high-income workers still have access to dental insurance? Or is this only a benefit typically for high-income workers?
Authors: In Canada, most higher income earning individuals have private dental insurance compared to lower income earning adults (78.2 v. 32.5%, respectively). Private insurance tends to be employment-based, but individuals have the option of purchasing their own private insurance.

See Table 2 of the following report for more information: http://www.caphd.ca/sites/default/files/CHMS-E-tech.pdf

Line 25, page 4 - "What's more, there is growing policy and civil society interest in universal dental care coverage in Canada (23, 24)." This line doesn't really lead into the rest of the paragraph, which discusses the modelling approach the authors used.

Authors: We revised this paragraph as follows (page 4, see tracked changes):

1) (This has been moved to the previous paragraph that discusses universal health coverage) In addition, there is growing policy and civil society interest in universal dental care coverage in Canada (23, 24).

2) (our new methods paragraph now starts with the following sentence:) The use of marginal effects models (ME) in the Canadian dental insurance market is a novel approach to report the population-level impact of insurance in this context.

Methods: Line 56, page 5 - it may be useful to readers to include, if possible, the survey items these outcomes are based on. "Visiting a dentist only for emergencies was defined as whether or not an individual identifies as someone who visits the dentist only for emergency situations" - are these people who have never visited the dentist other than an emergency situation, or have the intention of never going to the dentist other than in an emergency?

Authors: We have updated the manuscript to make this outcome more clear (page 6, see tracked changes):
In the survey, individuals were asked: “Do you usually visit the dentist more than once a year for check-ups, about once a year for check-ups, less than once a year for check-ups, or only for emergency care.” Visiting a dentist only for emergencies was dichotomized as individuals who visit only for emergency care versus those who visit for check-ups.

Covariate description (line 38, page 6): "Dental insurance includes any coverage (public and private) that offsets the cost of dental services partially or completely" - were public/private and partial/complete coverage distinguishable in the original data, and this was then combined by the authors? If some individuals have dental insurance, but then still have out-of-pocket costs when using dental care, this might change the impact of dental insurance on the outcomes investigated by the authors. If these data/breakdowns are not available, perhaps this could be mentioned in the discussion.

Authors: The dental insurance data available in Canadian Community Health Survey (CCHS), does not capture the quality of dental insurance (e.g. co-payments, scope of coverage). The CCHS does contain a sub-question about the type of dental insurance (private or public), however, we found considerable misclassification within this question (e.g. individuals who worked in government settings reported having public dental insurance), and therefore did not use it in our analysis.

We have included the following statement in our discussion to describe this limitation (page 12, see tracked changes).

- We did not have detailed information about insurance coverage, so we are unable to determine to what extent insurance comprehensiveness and quality affects our results.

Line 15, page 7 should include et al after Onukwugha.

Authors: Addressed (see page 7 tracked changes)

- Onukwugha and colleague
Discussion: line 15, page 12 - "Using these methods, bias from missing data would arguably be minimized". As pointed out by the authors at the beginning of the paragraph, the missing data may not have been missing at random (which the authors assumed in their methods) if some answers were more sensitive than others.

Authors: We have revised the wording to “bias from missing data would arguably be reduced” (page 12 tracked changes) in order to prevent the language from over-estimating our analysis. Indeed, there is a risk of bias with survey data. Income was imputed by Statistics Canada using a complex methodology of near neighbour imputation. Income is the variable that we would expect to be the most sensitive to bias.

We do not have any reason to believe that any of the variables are especially biased. We still think that the data are missing at random. There is only &lt;9% total missing data in our analysis, and income was 100% complete. Therefore, we believe that using multiple imputation is justified. Referring to a similar paper (Steele J, Shen J, Tsakos G, Fuller E, Morris S, Watt R, et al. The Interplay between Socioeconomic Inequalities and Clinical Oral Health. Journal of Dental Research. 2014;94(1):19-26.), we see that previous authors have used multiple imputation in a situation with even more missing data and with 17% missing income data.

Imputation has not altered the significance of our results. Without imputation, we estimate that the ME of insurance on visiting the dentist is 22.3 (95%CI 20.3-24.2). With multiple imputation, the ME is 22.8 (95%CI 20.9-24.7).

Also we have changed our methods language to state missing at random, instead of missing completely at random (page 8, see tracked changes)

- We assumed data was missing at random (MAR)

Line 20, page 12 - Suggest removing all these phrases which are at the start of every sentence in this paragraph: "However,…", "Thus, …", "Yet, …", "In fact,…"; since it makes it difficult to read.
- The large sample size in our study allows us to make valuable population-level estimates in Ontario, Canada’s most populated province. Our findings are most applicable in an Ontario context. Canadian provinces have similar financing schemes and dental care systems, and may possibly show similar results to this study, where comparable analyses are conducted. We would expect insurance to have a strong impact on dental care across all Canadian jurisdictions.