Author's response to reviews

Title: The Relationship between Body System-Based Chronic Conditions and Dental Utilization for Medicaid-Enrolled Children: A Retrospective Cohort Study

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Author's response to reviews: see over
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Dear BMC Oral Health Editorial Staff,

Thank you very much for considering our manuscript (MS: 3388818965805310) and for providing suggestions for improvement. We revised the original manuscript and provided responses below. Major revisions and responses are noted in purple.

Please let us know if you or the reviewers have any additional concerns.

Thank you again for your time and consideration. We look forward to working with you as we progress through the manuscript review process.

Sincerely,

Donald Chi
Corresponding Author
REPONSES TO REVIEWER 1

Reviewer’s report
Overall evaluation
The purpose of this investigation was to assess utilization rates of dental care services among Medicaid-enrolled children across 10 body system-based chronic condition subgroups. The rationale for the study was well defined and reasonable. The methods were thoroughly described and appropriate for the purpose stated. The source and form of data (claims data from the Iowa Medicaid Program for 2005-2006) was appropriate for the analyses. In general, the authors did a good job describing their methods and findings. The statistical analyses were appropriate and correctly done. The Discussion section was balanced and well conceived. The conclusions followed directly from the study findings and were reasonable. The description of study limitations was thoughtful and complete. Given these strengths, the manuscript would benefit from a clearer description of the study sample, a comparison of utilization rates for those with and without chronic conditions, and a re-formatting of tables.

Thank you. These concerns have been addressed below and in the revised manuscript.

Major Compulsory Revisions
No major compulsory revisions are required.

Minor Essential Revisions
1. The study sample reflects only Medicaid-enrolled children with chronic conditions. This group is likely different from those without chronic conditions however the analyses do not adequately describe whether utilization rates are unique for this group of children. The reader would benefit from a comparison of utilization rates between those with and without chronic conditions so that findings may be placed in better context.

This is clarified in the Discussion section (page 13).

2. A chart describing the sample selection would be helpful. That is, how many of the Medicaid-enrolled children had a chronic condition and how many did not? How many were continuously enrolled for >11 months and how many were not? Other paths?

We created Figure 1 that describes how we derived our final study population.

3. Tables 1a and 1b would benefit from some percentage values for the second row (representing the % of children with each chronic condition)

Percentages have been added to Tables 1a and 1b.

4. Table 2 would benefit from some percentage values for the second row (representing the % of children with and without a dental visit)
Percentages have been added to Table 2.

Discretionary Revisions
1. The age group categories may not follow reasonable cut-offs. For example, children often do not visit a dentist until the beginning of school. Therefore, grouping all children from 3 years through 7 years may not be consistent with behaviors in the real world. The authors are asked to explore utilization rates across each age in years to determine whether different cut-offs might be better.

We agree that there are several ways of creating age cut points. We ran the regression models using alternative age cut points (e.g., 3-5, 6-12, 13-14) and the results were similar. In the end, we decided on broader cut points based on the expected dentition (primary/early mixed; middle/late mixed; permanent).

Level of interest: An article of importance in its field
Quality of written English: Acceptable
Statistical review: Yes, and I have assessed the statistics in my report.
Declaration of competing interests:
I declare that I have no competing interests related to this manuscript or the investigation described within.

RESPONSES TO REVIEWER 2

Review of: The Relationship between Body System-Based Chronic Conditions and Dental Utilization for Medicaid-Enrolled Children: A Retrospective Cohort Study

This paper uses data from the Iowa Medicaid program in 2005 and 2006 to compare dental care use for children with specific chronic conditions compared to children with other specific chronic conditions. It is an interesting topic, though the hypothesis being tested need more thought and the paper needs more editing before publication. The tables in this paper are set up in a very confusing way and are hard to understand. First, I don’t think it’s necessary to put the counts in each cell. I think having the counts in the column headings is sufficient, so that all that needs to go in the cells below the column headings is the percent. This will help the tables be much more readable.

Thank you very much for your thoughtful review. We agree that eliminating cell counts from the Tables would improve readability. However, we used previous BMC Oral Health publications as a guide in designing our tables. It appears that including cell counts is standard practice. We would be happy to remove cell counts if requested by the editorial staff.

A second big issue is that in quite a few cases it is difficult to understand which numbers cited in the text in the Results section are in the tables and which are not. For example, I would take the sentence below out of the text since Table 1a that is referred to in this sentence does not actually have mean age in it. (It does have the distribution of children
across age group. I think figures that are actually in the tables should be the ones refereed to.) In cases where the authors really need to cite figures not in the tables (though I am not sure there are such cases), it would be helpful if it were made clear that that figure is not in the data, perhaps my noting that that data is not shown.

Descriptive Statistics. The mean age for children in the study was $8.9 \pm 3.4$ years (Table 1a).

We agree there was confusion in the text regarding numbers presented in the text not aligning with numbers in the Tables. Any information cited in the text but not the Tables (including the sentence quoted above) is noted as “data not shown”.

Similarly, I don’t see the the figures below in Table 1a, though they are cited in a paragraph that appears to be referring to the table. Can a row be added to the table with the figures below?

The proportions of children in each non-mutually exclusive chronic condition subgroups, in descending order, are as follows: respiratory (83.0%); ear/nose/throat (73.2%); digestive (43.2%); musculoskeletal (43.2%); endocrine (21.4%); cardiovascular (10.2%); hematologic (6.4%); catastrophic neurological (2.5%); craniofacial (1.8%); and diabetes (1.4%).

Thank you for pointing out this oversight. Reviewer 1 also mentioned this. These figures have been added to Tables 1a and 1b.

The methods section of the paper also doesn’t indicate that the authors did the statistical comparisons that are done in Table 1a. The title of the table mentions Pearson chi-square tests but the methods section never said what was being tested. Before the sentence below in the methods section, the text should indicate that the authors tested the distribution of covariates for children with and without each specific condition using Pearson chi-square tests. Though the authors should probably consider streamlining this table. One option might be to just have columns comparing the distribution of covariates for children with none of the conditions to that of children having at least one of the conditions, though I guess that is awkward since this paper really doesn’t compare dental care use for children with conditions to those without, only to those with other conditions.

After generating descriptive statistics, we used the Pearson chi-square test ($\alpha=0.05$) to identify the relationship between model covariates and (1) the 10 chronic condition subgroups; and (2) the five outcome measures.

The sentence on page 8 has been revised.

I also think the text would read better with fewer subsection titles. Some of it almost seems to be in outline format.
We used subsection titles to organize our manuscript, which is common in BMC Oral Health publications. We would be happy to remove any specific subsection titles that might make it difficult to read the manuscript.

And the text could use some additional editing in general. For example, I would change where the n is cited in the table titles below.

OLD: Table 1a. Medicaid-Enrolled Children by Chronic Condition Subgroup (N=25,993) and Accompanying Results from Pearson Chi Square Tests

NEW: Table 1a. Medicaid-Enrolled Children (N=25,993) by Chronic Condition Subgroup and Accompanying Results from Pearson Chi Square Tests

Done.

I believe Table 2 should have the same rows as Table 3, for example, there should be rows for specific conditions in Table 2 as there is in Table 3. The fact that different tables have different rows contributes to it being difficult to follow the train of thought in this paper.

Additional rows have been added to Table 2 to make Table 2 consistent with Table 3.

This paper really does not provide a meaningful way to compare the magnitude of the difference in dental care use for children with some specific chronic conditions to others. Reporting odds ratios is not a good way of doing that. (See, for example BMJ, 1998, How can odds ratios mislead?). Many, many statements in the results section of the text refer to odds ratios in a way that is incorrect. I have copied two examples from the text below. Having a lower odds ratios does not at all necessarily imply that something is less likely. The odds are lower, but that does not mean it is less likely. An odds ratio of 0.72 also does not necessarily mean that something is 0.72 as likely.

First, children with catastrophic neurological conditions were significantly less likely (OR: 0.44-0.63) to use most types of dental care than children without…

Children with craniofacial conditions were 0.72 times as likely to use routine restorative care and children with hematologic conditions were 0.81 times as likely to utilize complex restorative dental care as children without these conditions (p=.02 and p=.03; respectively).

A better way to report results would be to either report relative risk or marginal effects. Medical journals are just now doing this (finally), but I think marginal effects would be best. Marginal effects will calculate the change in the mean predicted probability of use of any dental care, for example, for a one unit change in each independent variable, holding other independent variables constant. Suppose that overall, for example, 30 percent of children with at least one chronic condition used dental care in 2006. (A
figure such as this should be in Table 2, perhaps by adding an “all” row to the top.) The marginal effect of being female might turn out to be something like 2.0. That would indicate that being female increases the chance of dental care use by 2 percentage points. Relative to the mean of 30%, being female therefore increases the chance of having any dental care use by about 6.7%. Maybe having a respiratory condition would increase it by about 5 percentage points, or 16.7%. Or whatever. This would be more meaningful.

Thank you very much for this insight. We agree that relative risk ratios (RRR) are more appropriate for the present study. All analyses have been re-run using Poisson regression models with robust GEE estimators of variance. As expected, the RRR were slightly attenuated compared to the previously estimated odds ratios, but none changed direction. All relevant text in the manuscript has been revised to reflect these new RRR.

Though I think it would probably be more meaningful to compare to children with no chronic conditions. Not sure why the authors don’t want to do that – perhaps because of the volume of the data? If volume of data is not a concern, I would have the whole paper compare dental care use for children with specific chronic conditions to children without conditions.

Data volume was not the reason why we excluded children with chronic conditions. Our goal was to identify, among children with chronic conditions, those who are at greatest risk for disparities in dental care use. These data are needed to develop clinical interventions and Medicaid policies that focus on the most vulnerable Medicaid enrollees. Comparing dental utilization for children with and without chronic conditions is a different research question that has already been addressed.

If the authors want to, they could also supplementary text could be adding comparing one condition to the other, though the general pattern would be clear. If having a respiratory condition greatly reduced dental care use compared to children with no chronic condition but having some other condition only slightly reduced it, it would be fairly clear that the respiratory condition reduced use more than the other condition. (though supplementary testing – from the sample logit – could be done to test whether this difference was statistically significant. That could be indicated with particular symbols in the table.)

This is an interesting suggestion that one could address in future studies.

In any case, marginal effects are now finally used sometimes in medical journals - see, for example, Decker, JAMA, July 13, 2000. They are extremely easily implemented in Stata with the “margins” or “mfx” command. I forget what it is in SAS, though is the pred_eff in SUDAAN.
Thank you again for the suggestion. In the revised manuscript, we estimated risk ratios, which are easily understood by clinicians, policymakers, and public health officials.

One final point. The end of the statistical analysis section of the paper says: “To address the problem of high correlation between use of any dental care in 2005 and the outcome measures, we dropped this variable from the final regression models..” But then I see a row for “Child used preventive medical care in 2005” in Table 3 and results for it described on p. 12? I don’t think this variable should be in multivariate models. I don’t think it should even have been considered for inclusion. If all other covariates (e.g. age, sex, etc) are expected to affect use in 2006, they would also affect use in 2005, so you are taking out their effect by including use in 2005. This is not appropriate.

We included medical care utilization as a confounder, a decision that is based on previous studies. On the other hand, previous dental care use was excluded because of collinearity.

RESPONSES TO REVIEWER 3

Reviewer’s report:
Overview
This paper uses Medicare administrative data to describe patterns dental care provided to Medicaid-enrolled Iowa children who had chronic medical conditions, ranging in severity from mild to catastrophic. The stated goals of the study were to evaluate dental care use by these children and to identify subgroups of chronic conditions that are associated with low levels of dental care. Contingency tables and logistic regression used five measures of dental care as dependent variables, testing for associations with each of ten subgroups of medical condition, adjusting for a dozen covariates. The main findings were that neurological conditions were associated with lower likelihood of dental care, whereas respiratory, musculoskeletal, or ear/nose/throat conditions were associated with higher likelihood of dental care.

Critique
This study uses conventional statistical methods to examine associations between dental care and chronic medical conditions using a subset of Medicare enrollees. Potentially, these datasets provide useful evidence of associations in the Medicaid-eligible population. However, this study obscures the evidence for three main reasons:

1) The study sample is limited to 25,993 children who had CHSG categories 3-9, thereby excluding children who were healthy or who had acute medical conditions. The paper does not state what proportion of Medicaid-eligible children was excluded in this way.

We added Figure 1 in the revised manuscript which provides information on how many children were excluded and how we derived our final study population.
More importantly, the restriction makes it impossible to document the extent to which ANY type of chronic medical condition is associated with dental care. This severely hampers interpretation: for example, the reportedly large difference in dental utilization between children with catastrophic neurological conditions (44%) and those without (59%) would be interpreted in three very different ways if utilization among healthy children was: a) 30%; b) 50%; c) 70%. Instead, this study effectively has no control group. As a consequence, the authors’ conventional inferences ascribed to reference groups (for example, when describing odds ratios) are tenuous at least, and invalid at worst.

This is a valid concern and your reasoning is correct. However, previous studies have already compared dental use for children with and those without chronic conditions. The goal of this study was to identify, among children with chronic conditions, those children at greatest risk for disparities in dental care use. This is a critical next step in developing interventions and policies aimed specifically at subgroups of children with chronic conditions.

For example, at p11, the authors report "children with catastrophic neurological conditions were significantly less likely (OR: 0.44-0.63) to use most types of dental care THAN CHILDREN WITHOUT." (my emphasis) In fact, the contrast is "than children without chronic medical conditions that were not classified as catastrophic neurological conditions". While this turgid text is accurate, it is of questionable public health relevance: the important questions are whether any dental care for children with any single chronic condition occurs more or less frequently that dental care for otherwise-healthy children. Then, the magnitude of those differences can sensibly be contrasted according to the type of medical condition.

We agree that the language in the original manuscript was imprecise, which could lead readers to draw erroneous conclusions. This has been corrected in the revised manuscript.

2) Tables correctly reported probability of dental care, whereas adjusted estimates are reported only as relative odds of dental care, computed from multivariable logistic regression models. Given that the primary outcome measure has a probability of 0.58, while secondary outcome measures have probabilities as low as 9%, odds ratios are extremely poor measures of effect. For example, based on Table 3, the percentage with any dental attendance was 59.1% for children with respiratory conditions to children compared to 54.3% for children without respiratory conditions, an absolute difference of 4.8% and an odds ratio of 1.21. Meanwhile, complex restorative care was provided to 9.4% and 7.6% (respectively), an absolute difference of only 1.8%, but an odds ratio of 1.25. From a public health perspective, a difference of 9.4% versus 7.6% in the rate of dental care is meaningless, yet the odds ratio of 1.25 gives the impression of an effect that is at least as great as the 4.8% difference seen for any dental visit. These limitations of odds ratios are widely known, and can easily be avoided by modeling the probability of dental care, rather than the odds of dental care.
Thank you for bringing this important point to our attention. To address limitations of odds ratios, in the revised manuscript we present risk ratios.

Probably both of these methodological limitations contribute to a third major shortcoming of this paper, namely its discussion of interpretation and implications. The fact is, all of these groups have levels of dental care that are MUCH lower than desired when considering their medical conditions and low socioeconomic status. Arguably, all of these children should have at least one dental visit per annum; to show that the percentage is a few points either side of 55% for subgroups of them is mere statistical minutia.

We agree that all Medicaid-enrolled children should have at least one dental visit per year. However, we are far from achieving this goal. Some studies report that children with chronic conditions utilize dental care at lower rates than children without chronic conditions whereas other studies report the opposite. Findings from our study begin to reconcile these conflicting findings so that we can move forward to develop intervention and policies that will help us to improve dental utilization rates.

Level of interest: An article of limited interest
Quality of written English: Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:
I declare that I have no competing interests