Reviewer’s report

Title: Assessing the context of health care utilization in Ecuador: A spatial and multilevel analysis

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Reviewer: David Hotchkiss

Reviewer’s report:

The title and introduction of the paper suggest that the authors are analyzing the influence of contextual factors on health care utilization, which is an important topic that I would think would be of interest to health systems decision-makers in Ecuador and elsewhere. However, the article in reality attempts to analyze the determinants of health outcomes, or more precisely, the “resolution of health problems”.

My overall opinion is that the article suffers from a number of conceptual and empirical problems, largely because the authors use a conceptual model of health care utilization to analyze health outcomes, which I think is problematic. I would urge the authors to consider refocusing the analysis on the determinants of health care utilization rather than on health outcomes. Another alternative would be to use structural equation techniques to analyze the determinants of health care use and, and then health care utilization and other factors as predictors of health outcomes.

Below are my comments, organized by the reviewer guideline questions provided by the editors.

Major compulsory revisions

1. Is the question posed by the authors well defined?

- The description of the objectives of the study, in the introduction, is very confusing and disjointed. Specifically, paragraph one provides a background on the health policy situation in Ecuador, paragraph two describes the importance of understanding the influence of contextual factors (which according to the authors should include perceptions of health care services and health status) on health care utilization and previous theoretical and empirical research on the determinants of health care utilization. However, the last paragraph presents research questions not on the determinants of utilization, but on the determinants of health outcomes. If the authors chose to analyze the context of health care utilization in Ecuador, as the title and the first two paragraphs indicate, then I would suggest focusing the paper on health care utilization as the outcome variable of interest (for both preventive and curative care) and not on health outcomes. This would enable the authors to fill the gaps in the literature identified by Phillips et al, which seems to be a key article referenced in the paper. If the
authors decide to analyze the determinants of health outcomes, then they need to 1) come up with a more appropriate conceptual model to guide their analysis and 2) explain how the study contributes to the research literature on the determinants of health outcomes.

2. Are the methods appropriate and well described?

- Relationship between provider measures and health outcomes at the level. This is the focus of the first research question, but I did not see in the paper any method/analysis of relationship at the province level. The authors describe that they are using Global Moran’s I statistic to assess spatial correlation, but do not provide a clear explanation of the purpose of this analysis for readers not familiar with ecological methods, nor how this analysis helps answer the research questions.

- Choice of dependent variable in the multi-level model. I am concerned about the authors’ choice of “resolution of health problem” as an indicator of health outcomes. Can the authors defend the use of this variable? Have previous researchers used this type of indicator in previous conceptual and empirical studies? Also, can the authors provide a clearer description of what exactly this variable is measuring, and how and why the measure is influenced by contextual factors? How can one interpret this measure without knowing what illnesses and conditions sample individuals were suffering from?

- Choice of independent variables in multi-level model: If the authors are interested in analyzing the influence of provider variables on health outcomes, then I am not clear why they are including a measure of health care utilization as an explanatory variable in the model. I would think that an increase in the numbers of providers does not have any direct effects on health outcomes, but would have indirect effects through increased health care utilization. If so, then how should one interpret the parameters of the provider measures, given that it controls for health care utilization? Moreover, is not this health care utilization endogenous in the model? If so, the results may be biased. See Phillips et al (1998), referenced by the authors, for a description of this issue. If the authors decide to focus on health outcomes, then I would suggest considering not including health care use as an explanatory variable. In addition, could the authors clarify whether the indicators are standardized by the population size of the provinces? I was not sure of this when reading the paper.

- Modeling. What sub-samples where used in the multivariate models? What was the unit of analysis? The authors need to provide more information on how the analysis was conducted.

3. Are the data sound?

- The 2004 Demographic and Maternal & Child Health Survey not well described. Is this a household survey? Is it national representative? What was the sampling frame for the survey? How was the sampling conducted?
- The authors should also describe how the data sets included in the analysis were linked and any problem encountered.

4. Does the manuscript adhere to the relevant standards for reporting and data deposition?

- For the table that presents the multivariate results (Table 3), the authors should include the N’s for the sample sizes used to estimate the models

5. Are the discussion and conclusions well balanced and adequately supported by the data?

- In the first paragraph of the discussion, the authors state that “… preliminary ecological analysis conducted at the province level showed that increasing the density of outpatient clinics could decrease infant and crude mortality; while increasing the density of private practice physicians could decrease maternal mortality” In reading the results section, I did not see any empirical support for this statement.

6. Are limitations of the work clearly stated?

- In the discussion section, the authors mention several caveats, including the cross-sectional aspects of the data, the use of aggregated province-level data, and inclusion of only main effects and not interactions. Assuming the authors decide to refocus the analysis on health care utilization, I would also suggest the authors take one more look at the Phillips et al article to considering addressing other possible limitations of the study, particularly the issue of endogeneity.

7. Do the authors clearly acknowledge any work upon which they are building, both published and unpublished?

- As mentioned above, the authors describe work on the determinants of health care utilization, but not much on the key outcome of interest, resolution of a health problem. Again, the authors need to consider the pros and cons of focusing the analysis on the determinants of health outcomes rather than on health care utilization (or both).

8. Do the title and abstract accurately convey what has been found?

- As indicated above, the title suggests that the authors will focus the analysis on the influence of contextual factors on health care utilization, which the authors do analyze for preventive care but not for curative care

- The background section of the abstract is very vague – it could be improved by briefly describing the types of relationships that are estimated in the paper.

9. Is the writing acceptable?
- The use of English in the paper is good.

**Level of interest:** An article of insufficient interest to warrant publication in a scientific/medical journal

**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