Reviewer’s report

Title: Fitting multilevel models in complex survey data with design weights: Recommendations

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Reviewer: Byron Gajewski

Reviewer’s report:

Articulated clearly in the current literature, multilevel models (MLM) are necessary for properly accounting for correlations in clustered data (example: participants within states). MLMs are useful for studying variations at the participants (level-1) and variations in clusters (level-2). Also articulated clearly in the current literature, scaled weights (scaled to cluster size) need consideration when analyzing data from complex survey designs. However, using a compelling literature review, the author of this submitted paper argues for incorporating both MLM and scaled weights when analyzing data from complex surveys. I congratulate the author on applying this approach to an actual dataset from the National Survey of Children with Special Health Care needs using an array of popular MLM software programs. The author shows differences in the software parameter estimates and standard errors. The author discusses why these differences may occur in the context of the software programs’ limitations and strengths at performing the combined approach. Any analyst who is working with complex designed data will need to read this paper and consider adopting one of the three recommended strategies.

- Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)
  o Page 6. Define “level-1” and “level-2” for the reader.
  o Page 12, line -8. I think it should be “…the design weights ‘are’ correlated…”
  o Page 23. I don’t know what the sentence “When using complex surveys, one should include the entire population in the analyses” is referring to.
  o Page 25. Appendix A. The author mentions using “multiple imputation (MI).” MI traditionally implies that there are several imputed datasets. Why weren’t standard Rubin formulas used for combing several datasets? Please explain.
  o Please provide an appendix that defines the parameters in Tables 1 & 2 using traditional MLM equations.

- Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)
  o The writing, at times, is verbose and could use an eye from a professional writer to help tighten (the author is a fine writer, but just could use some tightening). I struggle with being verbose too.
Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

I declare that I have no competing interests.