Reviewer's report

Title: A Cross-Sectional Study on Health Differences Between Rural and Non-Rural Counties Using the County Health Rankings

Version: 3
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Reviewer: Corrine Ruktanonchai

Reviewer's report:

Major Compulsory Revisions

1. In general, it is unclear why counties are stratified into quartiles—is this done via the County Health Rankings protocol, or did the authors choose to do this, and if so, to what end? The justification for this can be more clearly communicated in the Methods section. Along these lines, the authors might consider how stratification can produce potential statistical limitations—for example, one is more likely to see a significant difference given increasing ‘levels’ of stratification, simply by chance (problem of multiplicity).

2. Within the Methods section, there needs to be much more detail about the County Health Rankings dataset and data collection efforts, or the reader should at least be directed to previous literature where a more comprehensive description can be found. It was unclear throughout the manuscript, for example, as to whether these surveys are individual-based surveys, or an aggregation of statistics at the county level. If individual-based (which I believe is the case), how were individuals selected to be surveyed? How was the survey administered (e.g., paper, digital, in-person, phone)? What kind of refusal rate was seen? How were weights calculated for the data (mentioned in line 66)? Which counties and states are represented within the dataset (see Discretionary Revision below for a suggestion on how to show this)?

The strength of this paper lies in the novelty of the dataset, and therefore it is vital that as much information as possible is provided on how these data were collected and processed. These are all important questions that can provide background information for epidemiologists when assessing the strength of findings.

3. Along these lines, it is important to explicitly state how confidentiality was maintained. Since the manuscript is stated as being IRB exempt, it seems as though the surveys were anonymous, but the authors should state that information within Methods.

4. Given that each of six indexed domain were stratified into quartiles, the Bonferroni correction can justifiably be employed for Table 1 (see: Armstrong RA. When to use the Bonferroni correction. Ophthalmic Physiol Opt 2014; 34: 502–508. doi: 10.1111/opo.12131). As mentioned previously, the problem of multiplicity could be arising, and by utilizing this correction, the authors can be
more certain that statistically significant patterns observed are not simply due to chance.

5. The logistic regression model building protocol should be more clearly outlined and justified. Which variables were included in the model, and how did the authors choose these variables? The Methods section should have more detailed information on this process.

6. In general, it is important to know whether the authors considered any kind of multicollinearity before proceeding with the regression model—particular to the clinical care, social and economic factors, and physical environment domains, it would be reasonable to assume that counties located closer to each other in space might have higher levels of spatial autocorrelation. If this is in fact found to be the case, a variable encompassing this spatial phenomenon should be included in the model as a random effect.

Minor Essential Revisions

1. After employing the Bonferroni correction, p-values should be reported at more than 3 decimal points. In general, I find one to two significant digits is adequate for reporting purposes.

2. The information outlining the variables comprising the County Health Rankings in the Introduction section (starting at line 62, ‘Nearly all counties…’) should be moved to Methods.

Discretionary Revisions

1. The sample size for this study is large enough to justify use of the chi-square test, but I generally encourage the use of Fisher’s Exact tests over chi-square statistics. The benefit of Fisher’s Exact test is that it provides precise calculations, as opposed to approximations of test statistics which follow a chi-square distribution. Because it can be used regardless of sample characteristics (i.e., with no parametric assumptions made a priori), generally the only time I don’t use the Fisher’s Exact test is when it takes an inordinate amount of computational time and power.

2. In general, I find that reporting the unadjusted odds ratios can provide useful information, particularly if it is used to build an adjusted model. The authors could reduce the size of the ‘Indexed Domain’ and ‘Quartile’ columns in Table 2, and still have room to add an ‘Unadjusted Odds Ratio’ column within the table.

3. Currently, Figure 1 does not contribute much added information to the manuscript, as it is only mentioned once in the Introduction, and the variables comprising the domain indices are explicitly listed within the same section (although per my previous comment in Minor Essential Revisions, this needs to be moved to Methods).

I would strongly recommend replacing this figure with a more useful choropleth map reflecting which US counties are represented in this data, with bins
corresponding to number of persons surveyed within the county, and outlines of county borders reflecting urban versus rural classification. Right now there is no mention of which counties are represented, which states, etc. and a map is a great way to include this information in an easily interpretable manner.

4. I’m curious as to whether the authors examined sub-regions within the US? For example, I would expect that differences between urban and rural counties within the Southeast US might be vastly different from other parts of the US—and if not, that universality would be quite interesting and a useful thing to know. A paragraph or two in the Discussion section addressing regional similarities/differences would go a long way in increasing impact.

Level of interest: An article whose findings are important to those with closely related research interests

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