Reviewer's report


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Reviewer: Douglas Ewbank

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Major Compulsory Revisions:

1) I think it is important to state in the Discussion that mortality is higher in the North East and North West but these differences are reduced and become insignificant once both individual level and community level controls were added. This is very important. You have “explained away” most of the differences in the NE and NW, but the difference in the SS is not explained by the variables you have included in the model. Your discussion emphasizes a series of unmeasured variables that might explain the difference in the SS, but doesn’t even mention that the excesses in the NE and NW are explained in part by two measured differences in social services (female education and prenatal care) in the NE and NW. Are the unmeasured social and service problems more serious in the SS than in the NE, NE and NC? The fact that the excess mortality in the NE and NW become insignificant is not evidence that the unmeasured differences are only important in the SS. It is conceivable that if all of the relevant social services were controlled that the NE, NW and NC would have lower <5 mortality than SW due to other unmeasured differences, e.g., length of breastfeeding. The mean length of breast feeding in the 3 northern regions is 19-21% months compared to 13-16% in the 3 southern regions.

There are several community level variables that you didn’t include (and probably couldn’t because of sample sizes) that could explain some of the higher mortality in SS and also reduce the OR in the north even more. In particular, the DHS shows lower immunization rates in the SS (21%) than the SW (33%) but the rates are even lower in the NE (6%), NW (4%) and NC (12%). The proportion of cases of ARI treated at a health facility in the SS (25%) is much lower than the proportion in the SW (53%), but the rates in the NE (20%), NW (33%) and NC (50%) are also very low. You suggest that the proportion of births of order 5+ is related only to socioeconomic differences. Can you rule out the reduced availability of family planning services in the NE & NW?

The point of all of this is simple: you can’t suggest that SS is the only region treated worse than the SW. Perhaps it is, but your analysis (and the DHS) doesn’t support that conclusion. You should remove the heavy rhetoric about regionalization and “socio-political conditions” from the introduction and discussion section.
2) The authors state that they did not include religion in the analysis because it is highly collinear with ethnicity. I don’t find the word ethnic or the word ethnicity in the paper or in any of the tables. If it was included, then you need to define the variable and include it in the tables. In the discussion, you also mention “ethno-religious” among other variables that might explain the high rate in the SS region which suggests you didn’t include either variable in the analysis. If you didn’t include ethnicity or religion, my previous question remains: why not?

Minor Essential Revision:

P 8 refers to “the multilevel logistic regression.” Is this a different model than the Cox model mentioned earlier? I assume it isn’t. Why confuse the reader by using different names for the same technique?

Level of interest: An article of importance in its field

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.