Reviewer's report


Version: 1 Date: 16 February 2010

Reviewer: Peter Allebeck

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The research question is well posed, and the data set is impressive. Analysis of regional differences in a country like Nigeria and its determinants is of great interest. The use of DHS surveys for such purposes should be encouraged.

I have however several problems with this paper. The first relates to the aim and structure of the study. It seems as if a main aim or the study is to assess the regional differences per se. This could be of interest for national and regional public health purposes, but hardly for an international scientific community. Most analyses end up by estimating the remaining effect of region after having adjusted for lower level variables. The analyses show that a number of factors on various levels (community, individual) do influence regional differences, but I lack an attempt to disentangle these various factors for the regional differences. To show how regional level variation is built up from variation on various levels would have been a scientifically more interesting issue, but I cannot find such analyses in the rather lengthy reporting of results.

Another problem is the number of risk factors on various levels and how they are structured. Obviously, many of them are related, and some partly overlapping. It is relevant to structure risk factors on community and individual level, but this division is not pursued, and I do not see how the multi-level analysis is used to take care of the effects on various levels. I am not able to judge the statistics in detail, so I suggest a statistician looks closer at this. I find the analyses are impressive, but to what extent do they adequately reflect variation on the various levels and the contribution of different sets of risk factors?

The third problem relates to the methods for data collection that is not clearly described. The DHS surveys included consist of around 6000 live births in 5 regions. It is not clear how the children have been followed up through five years of age, usually DHS surveys are not cohorts followed over time. Sometimes parents are asked if a child has died in the past, but in that case it would have been difficult to estimate backwards number of birth, and the term "risk" of death would not be appropriate. In table 1, no of children born are shown, but the numbers in several cells are quite small, and I gather many cells have no under-5 death at all. Thus a limitation in the stratification is low number of deaths, if it is the deaths among the 6000 births that are analysed. Maybe the author have looked at official data from the region of under-5 deaths, but then it would have been an ecological study, with its limitations.
In summary, several questions regarding the method for data collection as well as the structure of the analyses need to be answered before I would recommend the paper for publication.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interest