Reviewer's report

Title: Spatio-temporal trends of mortality in small-areas of Southern Spain

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Reviewer: Guilherme Loureiro Werneck

Reviewer's report:

This is an interesting manuscript applying spatio-temporal hierarchical Bayesian models to analyze mortality rates for all causes in Southern Spain. In general, their statistical approach to the problem is appropriate and the results provide a more adequate description of the spatial distribution and time trends of mortality in that region. Their results might be useful for informing health planners.

Major Compulsory Revisions

1) Although the approach is interesting, it should be noted that many other papers used this sort of spatio-temporal models to analyze health and environmental data. Therefore, I see their work as a nice application of well-known methods more than proposing “a disease mapping method” (page 4, 3rd paragraph). I think they should restrict their objective just to the description of the spatial distribution and time trends of mortality.

2) Although authors state many limitations of their study, discussion section is very poor in terms of possible explanations of the geographical and temporal patterns identified. In my point of view, authors try to make this a “methods” paper in which data analyses are just examples used to show the models. I think, again, that we have already many excellent methods papers on that issue, what the reader might expect here is to see a nice application of a methodology that help them better understand the spatio-temporal dynamics of mortality in that region vis-a-vis what happens in Spain as a whole.

3) Clearly, data have some important limitations, as illustrated by many situations in which the deaths registered for a municipality outnumbered the residents. To overcome this problem they decided not to analyze data for age group 85+ years and to set as missing the rate in those municipalities showing such problem. This issue should be better explored in the discussion section (is this problem also related to problems in getting good estimates of population in small areas?). Also, the criterion for setting as missing only the municipalities with number of deaths higher than the population is not too sensitive. Since this is an important issue, I would like to see a more detailed description of other “strange” situations, such as the number of municipalities with number of deaths unexpectedly too high but that does not outnumbered the population.

Minor Essential Revisions

1) Page 3, 2nd paragraph: add a reference for “Some studies have even used
periods spanning over 20 years…"

2) Page 3, 3rd paragraph, 2nd line: a typo “stratum” not “straum”

3) Page 4, 2nd paragraph, 6th line: Is this really “the only way”? I would at least include a “probably” in the sentence.

4) I do not think you need to define “study subjects” for this type of ecologic analysis. Anyway, I do not think that “deaths” are the subjects. I suggest describing only the data and variables and eliminate this sub-section.

5) In many parts of the text, but mainly in the statistical data analysis sub-section, authors use many different terms for indicating “municipality” (e.g., area, town). This makes things difficult to the reader, mainly because in a spatial analysis setting we always think that municipalities are connected with other municipalities in a sense that those closer in space share some characteristics and perform more similarly in terms of health outcomes as compared to those municipalities farther apart. So, “municipalities” are embedded within regions or areas of influence. I suggest that when they want to refer to “municipalities”, they try to use always the same term and reserve the terms “areas” or “regions” to something greater than municipalities. For instance (page 6, 3rd paragraph, 5th-6th lines) they say: “One of these is unstructured and captures heterogeneity between areas, while the other is structured to account for the clustering of cases in a given area.”. I think the first “area” means “municipality”, but the second “area” is not municipality, but really a group of municipalities that behave similarly in terms of mortality.

6) Some descriptions of results need to get into more detail. For instance (page 9, 1st paragraph of the sub-section “Trends…”), they argue that between 1981 and 2006 most municipalities in Andalusia had mortality rates lower or similar to those for Spain for people under 45 years of age. Yes, this is true, but we are also interested in possible clusters of high and low incidence, why not saying something about this also?

7) Reference 6: a typo “before” not “befote”

8) Title of table 1 seems inappropriate; I suggest something like “Specification and parameterization of models for the spatio-temporal …”

Discretionary Revisions

1) Page 5, last paragraph, 3rd line: I suggest using “provided” instead of “conducted”.

2) Page 6, 2nd paragraph, first line: I suggest using “fitted” instead of “estimated”.

3) Page 7, results section, 5th line: I suggest using “pattern” instead of “trend”.

**Level of interest:** An article of importance in its field
Quality of written English: Needs some language corrections before being published

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 interests