Reviewer’s report

Title: Tracking Pregnant Women Displacements in Sao Paulo, Brazil: A Complex Systems Approach to Regionalization through the Emergence of Patterns

Version: 0 Date: 17 Apr 2019

Reviewer: Janet Cameron Long

Reviewer's report:

Dear Authors,

This very interesting paper takes a complexity view of regional health services by quantifying and investigating the emergent flow of maternity patients across municipalities in São Paulo, Brazil. It shows how a systems perspective can allow a much more nuanced and comprehensive analysis of the sufficiency of services for a particular cohort of patients. They use network analysis and geospatial mapping to reveal the patterns they uncover. Overall, I found the paper well written and structured with appropriate references, Figures and Tables to support the text. I have very little else to suggest by way of improvement; just a few comments below. Congratulations on an excellent paper.

Introduction:
Good background and rationale for using a complexity perspective, and all concepts are well explained.

Methods:
Very clear and easy to follow.

Results:
Maps are most engaging and immediately tell the story of the patterns of patient flow from outside the "legal" boundaries. I was not familiar with the concept of LIFO and LOFI but your explanation was clear; a most useful concept to determine sufficiency of a service.

Discussion:
The structuring of the discussion around the four engines driving patterns of flow was extremely useful to emphasise the perils of basing service-level decisions on only one viewpoint. Some evidence is given from other studies to support the relevance of the engines but when applying it to your study, it could have been strengthened a bit. For example, there was no supporting evidence for patient preference (or is it physician/midwife preference?) in your cohort being a driver of the patterns. The popularity of the Ribeirão Preto hospitals were mentioned but not supported with any evidence. If there is none then maybe a word or two added about the speculative nature of your comments would be
useful. The discussion around accessible transit routes could have been fleshed out with an extra sentence or two providing evidence from your study sites too.

There was no section on limitations. In the Methods we were told the data set was chosen because it was fairly complete. Are you able to be more specific about the extent of missing data and the likely bias this may have introduced to the analysis?

While overall the text is clear and very well written there are a number of typos that should be fixed. A couple of examples I noted: your line 187 'urgency' should be 'urgent' and 216 'the this'.

I wish you well in your future research,

Janet Long

Addition: Thanks for providing Figures 5 and 6. I found them interesting and I think they add to the overall story. The quality is not high and that means I cannot read the labels on Fig 6. Did you use NetDraw? Try regenerating them and saving as a Metafile (.emf) rather than a jpeg. JL

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Not applicable

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

Yes

Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?
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