Reviewer's report

Title: Exploring the usefulness of Lexis diagrams for quality improvement

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Reviewer: Ralph Brinks

Reviewer's report:

Summary: The paper suggests the Lexis diagram as a tool for data visualization in chronic conditions. The suggestion is illustrated by data about cancer in Sweden. The topic is important and the paper contributes to the discussion. However, in some parts it should be written more concise and clearer.

Major points:

1. Background: The first paragraph after the epigraph has many breaks in contents. It jumps around quality, data, statistical significance, prediction, system behavior and graphical displays. All of these are important points, partly controversially discussed (see the recent debate about the p-value). However, I would recommend to write a few more sentences to bring these aspects together. In its current form, the reader will hardly be able to follow what is exactly meant.

2. For some chronic conditions, more than two time scales are important. For instance, Bendix Carstensen emphasis that, apart from age and period, duration of diabetes plays an important role for mortality. In this case, the idea of the Lexis diagram can be extended to a three dimensional visualization (see DOI 10.1371/journal.pone.0106043). Then, a simple planar representation as in Fig 1, 3b, 4-6 of the manuscript is not possible anymore. It remains open if a planar projection is capable to represent duration. A similar problem occurs in remission and relapse of cancer. I ask myself if in a graph like Fig 4 it is possible to assess if time to remission becomes shorter and/or time to relapse becomes longer. Due to medical progress (better treatment, better care), we would expect secular trends there. These aspects as well as dependency on the duration of the chronic condition should be discussed critically with regard to the visualization by planar Lexis diagrams.

Minor points:

1. It appears unusual that the Background section of a scientific article starts with an epigraph. In my opinion, this is more appropriate in book chapters. Thus, I recommend to remove the quotation.
2. The numbers of ordinate axis ("y-axis") in Fig 1 and Fig 3b should be rotated by 90 degree clockwise for better readability. In the used statistical software R, the command is "las = 1".

3. The manuscript is quite long. I think parts of it (e.g. the quotations of the process owners) can be put as supplementary information into the web appendix.

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.

Yes

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

Yes

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