Reviewer's report

Title: A set of indicators for dissecting the secular increase of life expectancy

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Reviewer: Samir Soneji

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Review of “A Set of Indicators for Dissecting the Secular Increase of Life Expectancy”

Overall comments
The authors address an important demographic issue regarding the contribution of rectangularization and longevity on gains in life expectancy. The issue is relevant for both developed countries with a history of increasing life expectancy and developing countries with recent gains in life expectancy. The authors develop and discuss a set of non-parametric indicators to decompose secular increases in life expectancy. Overall, the authors present a concise and convincing argument for their methodological development and situate their work well in the current literature. I found the current draft well written, well organized, and rigorous. My comments are mostly related to the expansion of this work.

Specific comments
1. Title. I wonder if the “decomposing” may be more appropriate than “dissecting”. The authors estimate the relative contribution of rectangularization and longevity on gains in life expectancy. Or perhaps another verb may be appropriate.
2. Abstract, Background paragraph. The authors discuss three main changes (i), (ii), and (iii), not two main changes.
3. Abstract, Results paragraph. Edit “Swiss data mortality” to “Swiss mortality data.”
4. Background. A brief sentence or two summarizing McKeown’s theory of mortality decline may provide readers with a richer understanding of this longstanding debate.
5. Background. Edit “since one century” to “in the last century”.
6. Background. I do not think “a finite life-span limit” needs to be in quotations in the text.
7. Background. Quotation of Wilmoth’s paper is not necessary. Instead, the authors may simply rephrase Wilmoth’s argument and cite accordingly.
8. Methods. It would be very helpful if each equation is numbered.
9. Methods. I am not sure what is meant by “not too dependent from the sample size.” Life table values that we observe in the Human Mortality Database are not
based on samples. Rather they are derived from a population’s vital statistics. There is no sampling uncertainty because the life tables values are from the population directly and not inferred from a sample of the population.

10. Methods. It seems the equations are blurry. Perhaps this may not be an issue once the manuscript has been typeset by the journal.


13. Methods. The derivation of the statistics R, CLE, and LEDAR were very clear.

14. Methods. In the paragraph starting with “Thus, any difference between…”. The statements in parantheses are a bit difficult to understand. Is the “difference in rectangularity” equal to “the average of T_Q(A) and T_Q(B)”?

15. Results. What is the recommendation citation for Human Mortality Database? On a related note, most citations in the manuscript appear as superscripts, a few citations in the manuscript are in parentheses. Please make consistent.

16. Results. The authors state the mean length of a generation is about twenty years. I imagine they mean the mean length of a generation was about twenty years at the end of the nineteenth century (e.g., 1876 to 1896, and 1877 to 1897). Now the mean length of a generation has risen to about twenty-eight years, I believe. Perhaps adding a timeframe at the end of “…because it corresponds to one generation.” may be helpful.

17. Discussion. A minor grammatical point. Is the comma between “our indicators are nonparametric” and “and do not rely on any model” necessary? At the end of this same sentence, is writing example models necessary (normal, Gompertz)?

18. Discussion. A minor grammatical point for the sentence starting with “When studying old age mortality…”, does “e.g.” normally have a comma afterwards? So it would be “e.g.,”.

19. Discussion. Edit “oldest olds” to “oldest old” and “is aimed stabilizing” to “stabilizes”.

20. Discussion. Remove “usual” in “usual life expectancy at birth”.

21. Discussion. Same comment about the recommendation citation for Human Mortality Database.

22. Discussion. What did Cheung et al find when they applied Kannisto’s recommendation. In other words, can you please add some more details about Cheung’s result?

23. Discussion. In the paragraph beginning with “One advantage of considering…”, the authors contrast their indicators R and t_Q with the modal age at death. The authors write, “In contrast, modal age at death is known to be more versatile and its appropriate determination is crucial.” What is meant by more versatile? This seems to imply the modal age at death is a good indicator, whereas it seems the authors need to indicate the indicator’s deficiencies. Please rework this sentence.
24. Discussion. I don’t think a quotation is necessary in the sentence starting with “However, model age at death…”. Instead, rephrase and appropriate cite the results of Kannisto or Cheung (I’m not sure who to whom the quotation is attributed).

25. Discussion. The last sentence of the last paragraph is very important. “It will be interesting to see…”. This is an important advantage of the authors’ methodology. They are well positioned to speculate about the contribution rectangularization and longevity on future gains in life expectancy. What factors would contribute to a greater importance of rectangularization? What factors would contribute to a greater importance of longevity? How will these sets of factors differ in Sweden and other highly industrialized advanced European countries versus other parts of the world? Instead of the current Conclusion paragraph, I would rather have read the authors’ opinions on the future regarding relative contribution of rectangularization and longevity on life expectancy gains.

26. Conclusion. The paragraph is not a concluding paragraph. Rather, it reads more as a paragraph belonging in the results section. I do not necessarily believe the paragraph even adds to the current manuscript.

27. Figures. The figures are well described in the captions. I assume the captions will eventually go underneath the figures?

28. Figures. Figure 1. If the authors add the following options to their plot statement in R, the figure may be slightly cleaner.

```
plot(…,las=1,bty="l")
```

The option `las=1` will make the survival probabilities be written horizontally. The option `bty="l"` will create fewer lines and allow the reader to focus on this important (and well made) figure. Also, please capitalize the x and y axis labels. Finally, the authors can make write subscripts by using the expression statement. For example:

```
plot(1:10,1:10,pch=NA)
text(5,5,expression(paste("S(t[0,]","=1")))
```

29. Figures. Same comments on figure 2. Capitalize x- and y-axis labels. The legend can include the `bty="n"` option. Use the expression statement to create subscripts.

30. Figures. Same comments on figures 3, 4, and 5. Capitalize x- and y-axis labels. The legend can include the `bty="n"` option. Use the expression statement to create subscripts. Instead of writing “male” and “female” as a legend, the authors may want to use the following commands just before the `dev.off()` command.

```
mtext("Male",side=3,line=0.0,outer=TRUE,at=1/4, cex=1.00)
mtext("Female",side=3,line=0.0,outer=TRUE,at=3/4, cex=1.00)
```

31. Figures. Figure 5. The bottom panel for LEDAR includes the estimated values and a smoothed function over time. Visually, this is hard to see. Instead, the authors could plot the estimated LEDAR values as open dots and then plot
the smoothed function as a line.

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

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare I have no competing interests.