Reply to Reviewers of submission 2518: "The force of mortality by life lived is the force of increment by life left in stationary populations"

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Thanks for the useful comments, which improved the paper. I hope that concerns are now met with the current revision.

Reviewer A gave math and notation suggestions, which were correct and which I heeded. I think the primary concern is mended by changing former equation (4) (now equation (5)) to:

$$l^\star(y) = \int_\omega^y f(t)\, \mathrm{d}t \quad .$$

Reviewer B suggested I add detail to the applications section. Admittedly, these applications have to do with the thanatological age perspective in general rather than the neatness of symmetry with respect to chronological decrement and thanatological renewal within the lifetable. I hope my suggested applications are an acceptable ersatz. The specific case I now add is for the measurement of morbidity patterns in order to approach the question of whether or not there has been compression of morbidity. This question has been asked many times, and it appears that the usual approach is to simply compare $e(65)$ with average disability rates at ages 65+. That is a very rough gauge. Measuring morbidity in thanatological age would help disentangle morbidity change from lifespan change, which is what we really want in order to say something about compression.

Reviewer C likened the thanatological perspective change to viewing the contents of a room from above. This is a good analogy in the case of stationary populations, but note that it only works for the marginal profile of lifetable functions. The perspective change is more complex than that, bearing in mind that the functions are decomposable into chronological and thanatological age (described for the case of the pyramid). For an image of such heterogeneity, see the colored images in this abstract to PAA, 2014: `http://paa2014.princeton.edu/papers/141036` (before I knew about (Brouard 1986)). I don't think an image is necessary in this paper, to appreciate this, though, but I will oblige if the wish is echoed further. I added a line at the end of the proof section "The main contribution of this relationship is to point out the symmery of

chronological decrement and thanatological renewal processes in the case of stationary populations." This contribution isn't revolutionary or of great use, but the lifetable, stationary and stable populations, and the renewal model stand at the core of demography, which ought to be solid. I think tiny observations about them are worthy of publishing, and moreso in this series, which values aesthetics.

Note that the stationary age structure finding, on which this result builds, has appeared in the literatute again, since this paper was submitted (Rao and Carey 2014). These and previous authors were apparently also not aware of Brouard's contributions. I hope to subtly set the record straight.

References

Nicolas Brouard. Structure et dynamique des populations. la pyramide des années à vivre, aspects nationaux et exemples régionaux. *Espace, populations, sociétés*, 4(2):157–168, 1986.

Arni SR Srinivasa Rao and James R Carey. Generalization of careys equality and a theorem on stationary population. *Journal of mathematical biology*, pages 1–12, 2014.