Rejoinder to discussion of the paper "Human life is unlimited – but short"

Holger Rootzén and Dmitrii Zholud*

Abstract

An updated version of LATool, the MATLAB toolbox for life length analysis, is available as electronic supplementary material. In the updated version, the estimate of the mean of the exponential distribution of excess life lengths was 1.42 with 95% confidence interval $(1.28, 1.56)$. Hence, the probability to survive one more year for a supercentenarian was estimated to be 0.50 with 95% confidence interval $(0.46, 0.53)$. The rest of this document contains updated versions of Figure 5, *left*, and of Tables 2-5 in Rootzén and Zholud (2017).
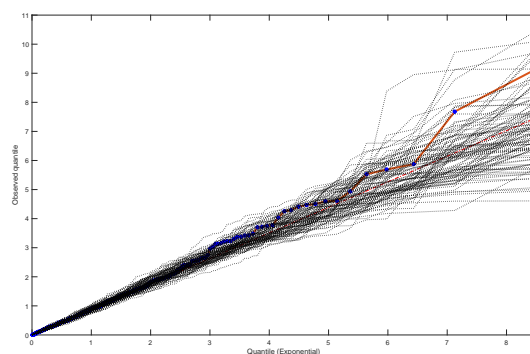

Figure 5. Illustration of effect of size-biased sampling, left plot: Empirical quantiles for IDL supercentenarians who died 1980-1999 in USA plotted against quantiles of exponential distribution with estimated mean (red line, with observations in blue). To illustrate the statistical variation of such plots, we have simulated 100 data sets with the estimated mean for the US 1980-1999 data, and with the same 110 year birth dates and truncations, and inserted the empirical quantile lines (dotted) for these data sets in the plot.

*Department of Mathematical Statistics
Chalmers University of Technology and University of Göteborg, Sweden.
E-mails: hrootzen@chalmers.se and dmitrii@chalmers.se

Table 2. p-values for likelihood ratio tests of the null hypothesis of no difference in mortality between women and men after age 110. Middle column assumes GP distribution, right column exponential distribution. There are only 5 men in the North Europe data set, and N/A means that GP fitting did not succeed for them. A "-" means that the test for exponential distribution of data rejects at the 0.001% level for the GRG data set.

ID	GP	exp
North Europe	N/A	0.81
South Europe	0.18	0.45
Europe	0.57	0.53
North America	0.32	0.61
Japan	0.19	0.61
Europe&America	0.29	0.41
World	0.26	0.33
GRG	0.06	-

Table 3. p-values for Wald tests of the null hypothesis of no difference in mortality between first and last half of data. "mean" is the estimated parameter of the exponential distribution, not the mean of the observed life lengths; tests assume an exponential distribution.

ID	death date	#	mean	death date	#	mean	p-value
North Europe	1968-1997	41	1.74	1998-2006	43	1.47	0.56
South Europe	1973-1997	50	1.62	1998-2007	64	1.19	0.25
Europe	1968-1997	91	1.68	1998-2007	107	1.30	0.18
North America	1962-1992	141	1.17	1993-2002	159	1.38	0.26
Japan	1996-2000	28	1.69	2001-2005	36	2.51	0.58
Europe&America	1962-1994	247	1.32	1995-2008	255	1.50	0.28
World	1962-1996	309	1.30	1997-2008	257	1.48	0.28

Table 4. p-values for likelihood ratio tests of the null hypothesis of no difference in mortality between groups of countries. Middle column assumes GP distribution, right column exponential distribution.

ID	GP	exp
North Europe vs south Europe	0.09	0.49
Europe vs north America	0.76	0.58
Europe&America vs Japan	0.09	0.46

Table 5. Estimates of shape parameter γ of the generalized Pareto distribution, with 95% asymptotic confidence intervals in parentheses, and p-values for likelihood ratio test of the null hypothesis that data follows an exponential distribution.

ID	shape parameter		p-value
North Europe	-0.18	(-0.44, 0.08)	0.25
South Europe	0.22	(-0.10, 0.54)	0.05
Europe	0.09	(-0.10, 0.28)	0.27
North America	0.10	(-0.08, 0.28)	0.23
Europe&America	0.09	(-0.07, 0.16)	0.10
Japan	-0.38	(-0.79 , 0.02)	0.11
World	0.07	(-0.05, 0.19)	0.20

References

GRG (2016). Gereontology Research Group list of validated deceased supercentenarians. URL: www.grg.org.

IDL (2016). International database on longevity. URL: www.supercentenarians.org.

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