A decomposition of longevity inquality by deprivation quantiles

Rosie Seaman*[1], Hal Caswell[2], and Tim Riffe[1]

[1]Max Planck Institute for Demographic Research, Rostock, Germany
[2]University of Amsterdam

September 13, 2017

Abstract

Within-variance is way bigger than between variance we suppose. Let's see. And also see how it changes.

1 Hal's notes

Suppose we have 1000+ lifetables at four time points for subareas of Scotland that can be assigned to deprivation quantiles. The index k refers to subpopulations. Given $p_x = 1 - q_x$ for a subpopualtion, calculate:

$$\mathbf{U}_k = \begin{bmatrix} 0 & \dots & \dots & \dots & 0 \\ p_1 & & & & \vdots \\ 0 & \ddots & & & \vdots \\ \vdots & & \ddots & & 0 \\ 0 & \dots & 0 & p_{\omega-1} & p_\omega \end{bmatrix} \tag{1}$$

Then calculate the conditional remaining survivorship as

$$\mathbf{N}_k = (\mathbf{I} - \mathbf{U}_k)^{-1} \quad . \tag{2}$$

$\mathbf{N}_k$ ends up being 0s in the upper triangle, and conditional remaining survivorship in columns descending from the subdiagonal. The first moment is the same as remaining life expectancy, and can be calculated as:

$$\eta_1^{(k)} = (1^T \mathbf{N}_k)^T \tag{3}$$

The second moment is defined as:

$$\eta_2^{(k)} = \left[1^T \mathbf{N}_k (2\mathbf{N}_k - \mathbf{I})\right]^T \tag{4}$$

These can be used together to calculate the variance of remaining lifespan:

$$V(\eta^{(k)}) = \eta_2^{(k)} blABLA \tag{5}$$

*seaman@demogr.mpg.de