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Featured graphic. Logs, lifelines, and lie factors

In a recent article I turned data from the Human Mortality Database into contour maps, showing how the mortality landscape—the mortality risk encountered at each year of life—has changed in almost forty countries, and in some cases over more than three hundred years. (Ebrahim, 2013; Human Mortality Database, 2011; Minton et al, 2013) These maps show how the mortality 'bathtub'—high mortality rates in both infancy and old age—has been 'broken' on the left side (infancy) and flattened on the right side (older age), meaning

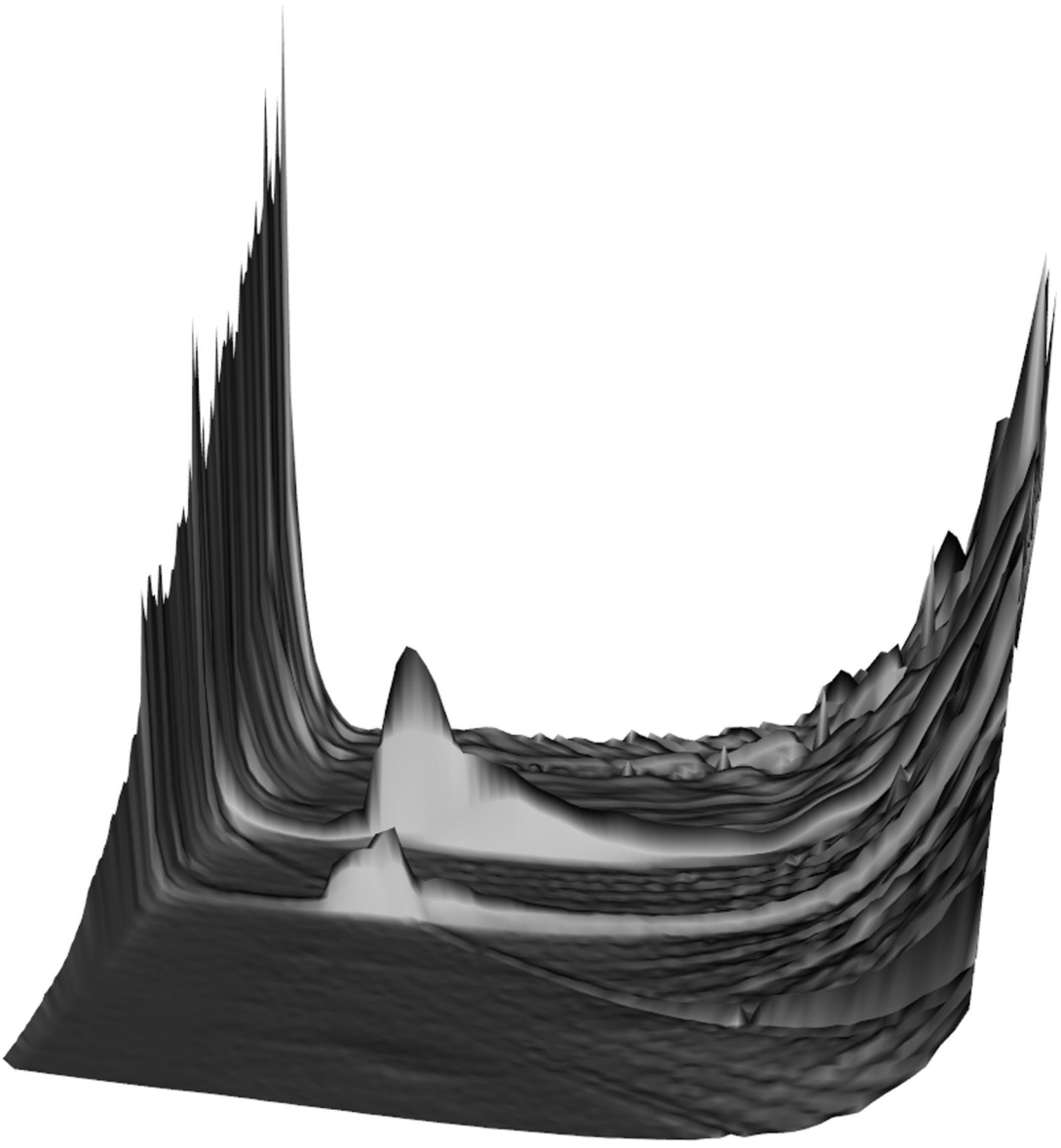

Figure 1. Three-dimensional visualisation of the mortality landscape, Italian males. Height is proportional to mortality rate. Depth corresponds to year: 1872 is furthest back and 2008 is nearest to the reader. The left-hand side corresponds to ages of zero years and the right-hand side to 80 years. Infant mortality is on the left side of the mortality surface, and old age mortality on the right side.

typical life experiences and changes have been transformed for the better (Gompertz, 1825; Minton, 2013).

I am not a demographer, so when I first produced the contour maps I had no idea if this visualisation ground had already been covered. After over a year of informal and then formal peer review from a range of experts in demography, epidemiology, and visualisation, and no one saying "I've seen this before", I thought that, perhaps, it really was new ground.

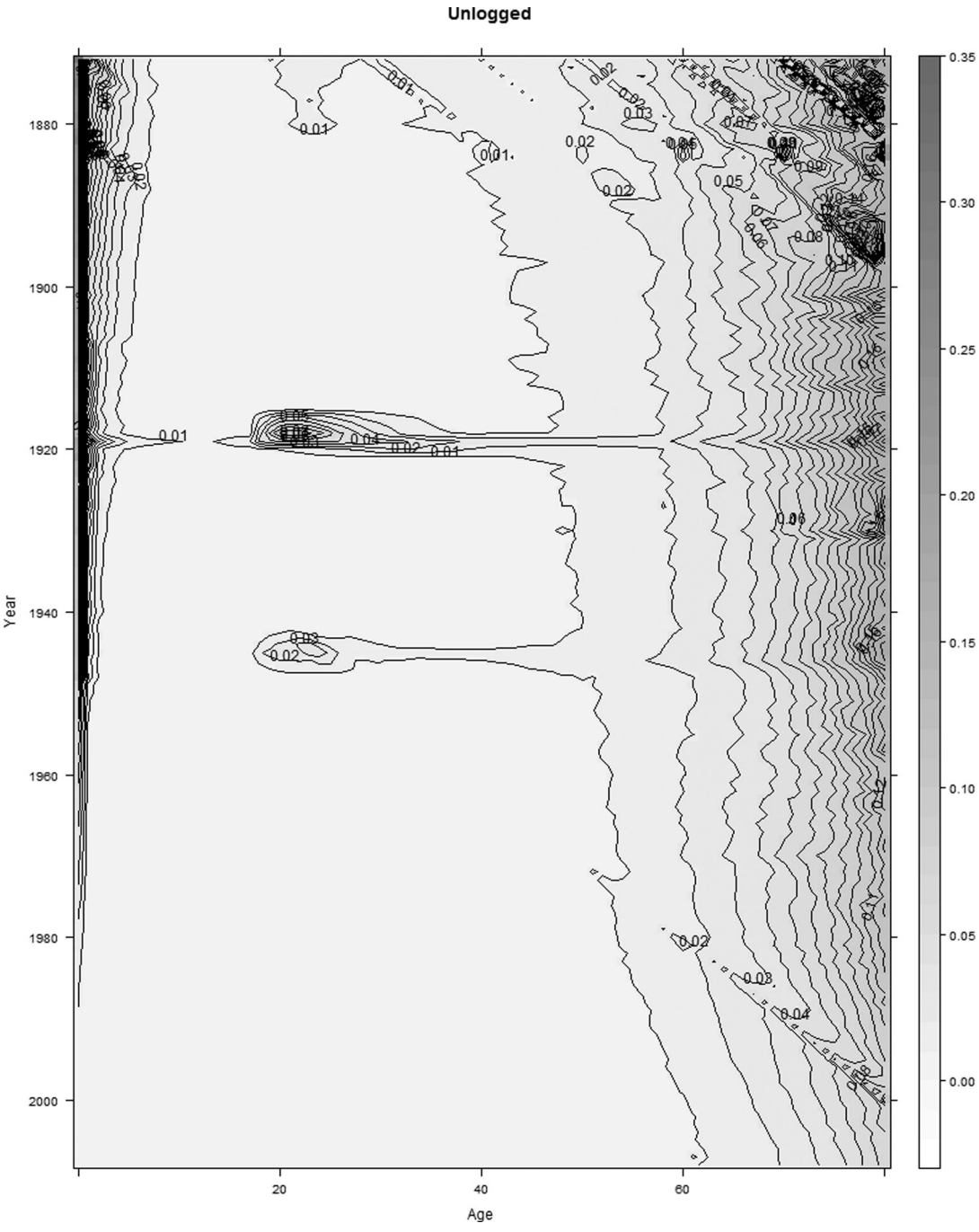

Figure 2. Shaded contour map of figure 1. The contour lines link spaces on the age–year surface with approximately equal mortality rates, and are individually labelled.

However, after acceptance but before publication, the Human Mortality Database demographer Tim Riffe[1] pointed out that James Vaupel and colleagues had applied this method to demographic data in the 1980s, and published a book on the approach in the 1990s—(Vaupel et al, 1987; 1997) (Of course, the precedent could be older still.) Riffe also pointed out that, from many demographers' perspective, I did something 'wrong': I did not log the mortality rates, meaning some of the contour lines were packed so close together that, in places, the maps were saturated with black.

Perhaps this 'mistake' is where the maps are original, and offer some new insights.

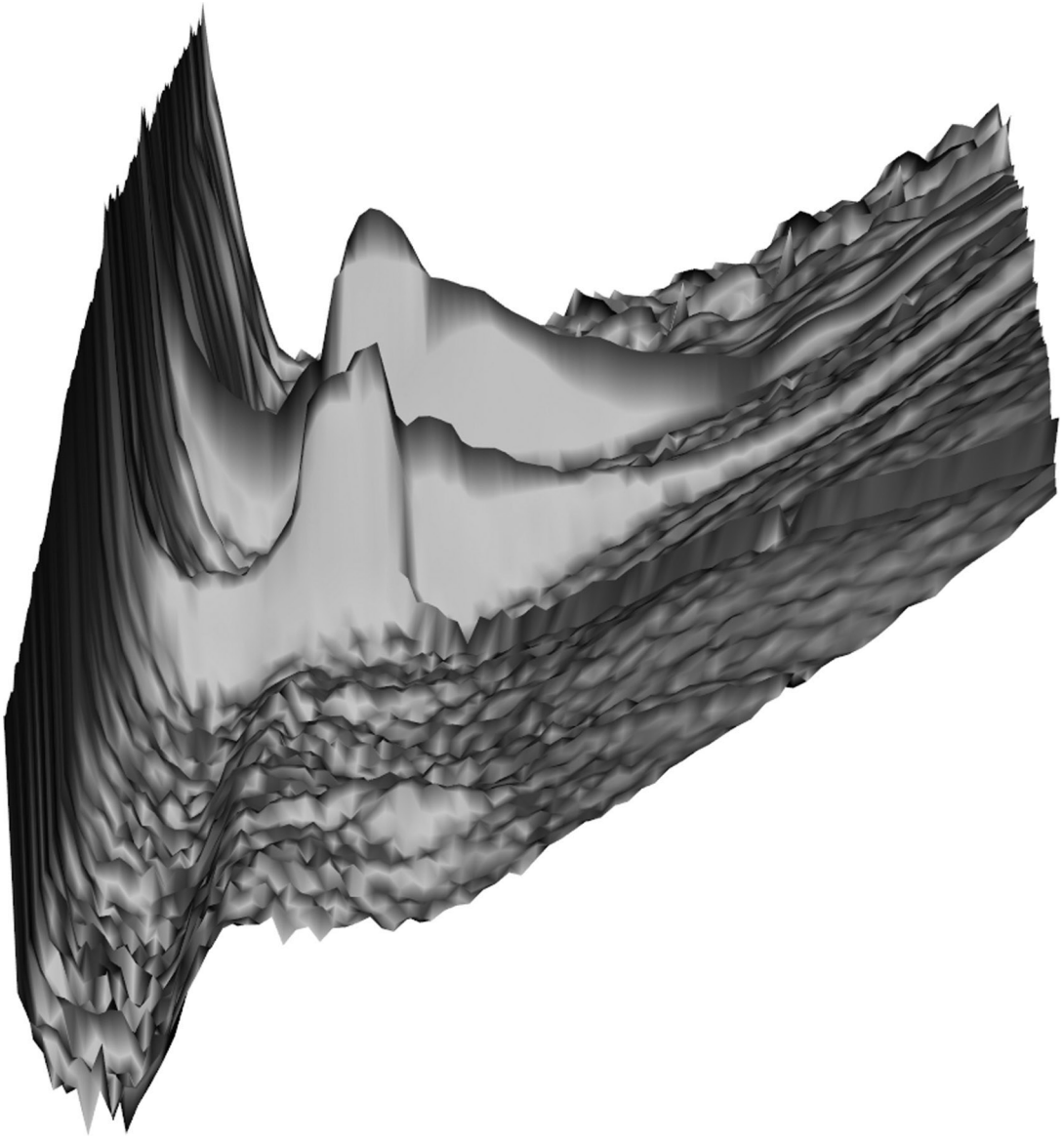

Figure 3. Three-dimensional surface plot of the log(mortality) surface using the same data. Height is now proportional to mortality rate. Depth corresponds to year: 1872 is furthest back and 2008 is nearest to the reader. The left-hand side corresponds to ages of zero years and the right-hand side to 80 years. Infant mortality is on the left side of the mortality surface, and old age mortality on the right side. Middle age looks more dangerous, and reductions in infant mortality look less impressive.

[1] Personal communication, 26 May 2013.

In not using logged values, the contour maps show the mortality landscape 'as is' (figure 1 and figure 2), rather than the much weirder transformed landscape of log(mortality) (figure 3 and figure 4). Just as people do not climb log(hill)s or fall off log(cliff)s, as we age, our mortality risk, not our log(mortality) risk, is what changes. 'Taming' variables with log transformations can hide the substantive meaning of numbers to lived experience. (Dorling, 2007). They also risk inflating the lie factor of a visual comparison, giving the impression to the intuiting self, the self that looks at maps and says "that looks steep", that one value is only (say) a fifth larger than another value, when instead it may be five times larger (Tufte, 2001). Sometimes, even with virtual surfaces, it is better to see things as they really are.

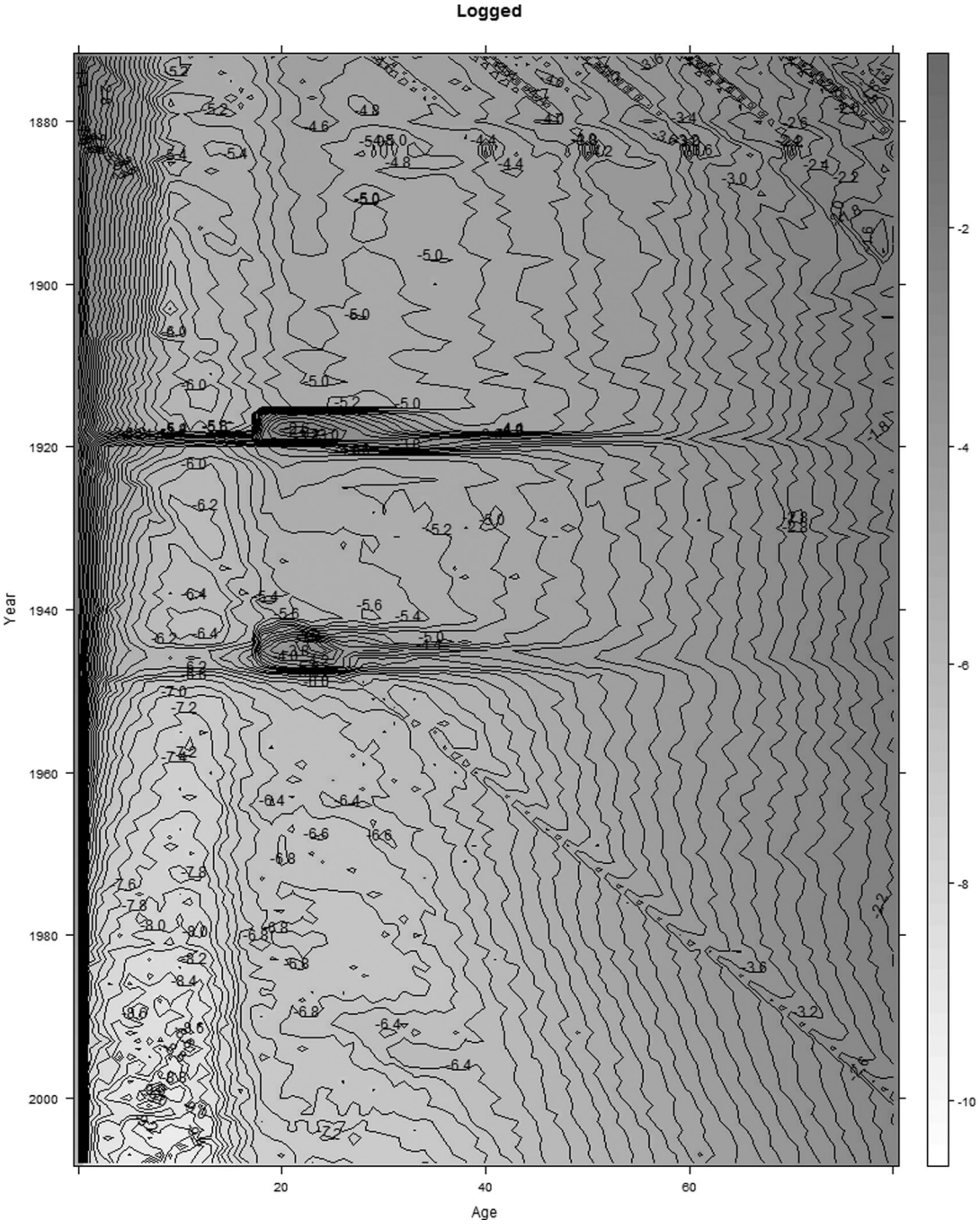

Figure 4. Contour map of the log(mortality) surface of figure 3.

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