# Title Page

**Title:**

If Europe were a country....

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These visualisations were produced using the graphics packages lattice and ggplot2 within the R statistical programming language. The code available to reproduce these figures is available from the following url: <https://github.com/JonMinton/Europe_Contours>

# Main Text

If Europe were a country, what would its vital statistics show? Figure 1 show how crude mortality rates – the probability of being dead within the next twelve months – have varied with age and with time, for both males and females, within European nations from 1751 to 2011. The data are arranged to form a Lexis surface, a statistical canvas where one of the axes represents year and the other represents age (Lexis, 1875) At each combination of age and year is a value, mortality rate. Conceptually, the mortality rate is the ‘height’ of the Lexis surface at each of many tens of thousands of combinations of age and year, meaning the shaded contour plots here allow the visualisation of tens of thousands of values ‘at a glance’. (Vaupel et al., 1987, 1997) By investing a little more than a glance-worth of time to these visualisations it becomes possible to use them to identify a large number of complex features and patterns in the data.(Minton, 2013, 2014; Minton et al., 2013)

All available data of European countries from the Human Mortality Database (HMD) were used. (Human Mortality Database, 2014) For almost three quarters of a century, from 1751 to 1815, this was just Sweden. From 1816 to 1850, six more countries’ records became available, then another three during the second half of the nineteenth century. Data for the latter half of the twentieth century were drawn from over twenty nations, a combined population size of almost half a billion citizens. (See Figure 2)

The contour plots involved bolting together data from many different countries, and required relying on a few countries to tell the start of the story of Europe. Despite this, and despite being the main arena of two world wars and the deadliest infectious disease outbreak ever recorded, the contour plots seem to tell a single, cohesive, positive story, of vastly reduced infant mortality and the emergence of a childhood ever safer from harm, reduced risk of death during adulthood, and the pushing back of biological ageing to ever great chronological ages. Not quite ‘forever young’, but ‘younger, longer’.

**Word count** (including references): 350 words

# References

Human Mortality Database, 2014 *University of California, Berkeley (USA), and Max Plank Institute for Demographic Research (Germany)*, www.mortality.org.

Lexis, W, 1875 *Einleitung in die Theorie der Bevölkerungsstatistik*, http://www.worldcat.org/title/einleitung-in-die-theorie-der-bevolkerungsstatistik/oclc/27127671.

Minton, J, 2013, “Logs, lifelines, and lie factors” *Environment and Planning A* **45**(11) 2539–2543, http://www.envplan.com/abstract.cgi?id=a130208g.

Minton, J, 2014, “Real geographies and virtual landscapes: Exploring the influence on place and space on mortality Lexis surfaces using shaded contour maps.” *Spatial and spatio-temporal epidemiology* **10** 49–66, http://www.ncbi.nlm.nih.gov/pubmed/25113591.

Minton, J, Vanderbloemen, L, and Dorling, D, 2013, “Visualizing Europe’s demographic scars with coplots and contour plots” *International Journal of Epidemiology* **42**(4) 1164–1176, http://ije.oxfordjournals.org/content/42/4/1164.full.

Vaupel, J W, Gambill, B A, and Yashin, A I, 1987 *Thousands of Data at a Glance: Shaded Contour Maps of Demographic Surfaces* (Laxenburg, Austria), http://user.demogr.mpg.de/jwv/pdf/Vaupel-IIASA-RR-87-016.pdf.

Vaupel, J W, Wang, Z, Andreev, K, and Yashin, A I, 1997 *Population Data at a Glance: Shaded Contour Maps of Demographic Surfaces over Age and Time* (University Press of Southern Denmark), http://www.abebooks.co.uk/servlet/BookDetailsPL?bi=2944819605.

# Legends

**Figure 1**: Shaded contour map of Lexis surfaces of crude mortality rates, for each age from 0 to 80 years, and each year from 1751 to 2011, for males and females within Europe. Darker shades indicate higher mortality rates; the legend on the right shows the correspondence between shade and mortality rate. Contours connect points within the Lexis surfaces where the mortality rates are equal; each contour line is labelled with its corresponding mortality rate.

**Figure 2**. The number of countries (a) and total population counts (b) used to calculate the mortality rates plotted in the Lexis surfaces, for each year from 1751 to 2011.