

# Some Amazing Facts About $\delta_t$

## Methods

### 1 Old notes

Importance of understanding mortality change

- Basic indicator of social wellbeing; success of health sector etc
- Forecasting - pensions, life insurance, population forecasts, aged care, health care

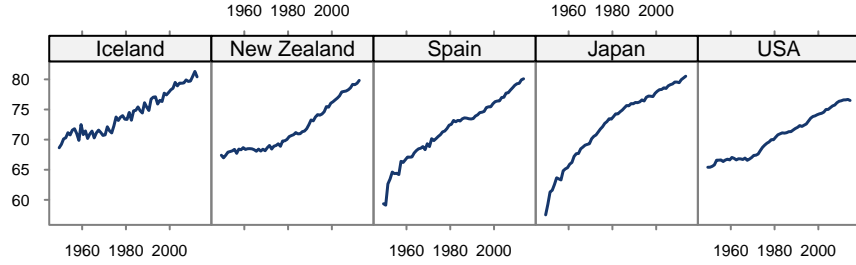
Expectations about mortality decline

- Lee and Carter, Oeppen and Vaupel etc, pointing out that tapering off in mortality decline not appearing. Governments, demographers systematically understating future declines.
- Has become the new orthodoxy.
- Actuaries pointing out that decline slowing - or reversed
- Case and Deaton in US

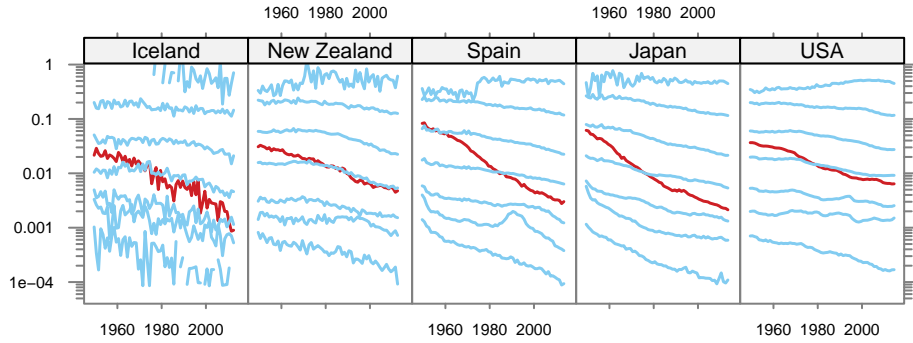
Mortality varies:

- Best practice life expectancy follows straight line
- Individual country life expectancy not straight lines - slow and fast periods
- individual mortality rates even more erratic

Hierarchical models



(a) Life expectancy at birth.



(b) Mortality rates. The rates shown in red are for age 0. The rates shown in blue are, from bottom to top, for ages 15–19, 30–34, 45–49, 60–64, 75–79, and 100+.

Figure 1: Life expectancies and age-specific mortality rates, for males, for 5 selected countries. The life expectancies come from the Human Mortality Database (HMD) [1]. The mortality rates were calculated by us from deaths and exposure data from the HMD. Life expectancies and mortality rates for females and males for our full sample of 22 countries are shown in Figure XXX of the Extended Data.

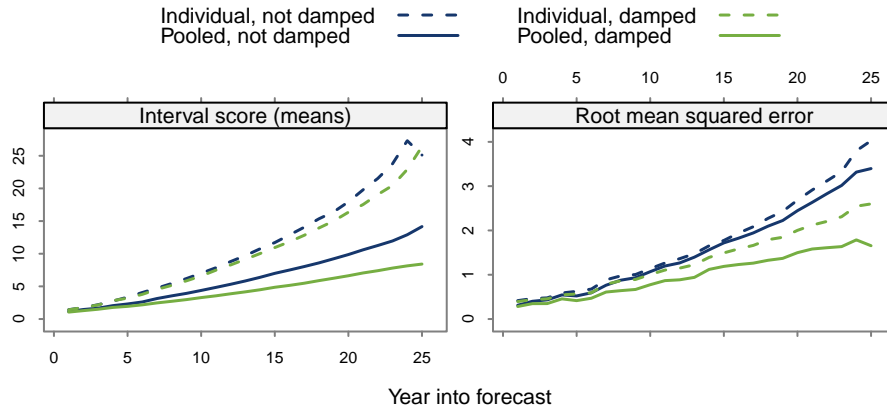


Figure 2: Bla bla

- despite very large dataset (0.43 billion deaths and 47 billion person-years of observation) have ‘small sample’ problem (paradox of big data)
- variability at different levels
- for any given country, limited number of years
- pool across countries
- similar but not identical–hierarchical models
- hierarchical models allow us to separate out and model different sources of variability
- sample of countries chosen to be approximately exchangeable - makes sense to pool across them
- Treat each country as an experiment

We don’t focus on sex differences.

Age-specific life expectancies deterministic function of age-specific mortality rates

## References

- [1] Human Mortality Database. Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany), 2017. [Online; accessed 13-September-2017].