Modelling cohort seasonal mortality effects in a compositional framework.

Jim Oeppen[1]

[1]Max Planck Institute for Demographic Research, Germany oeppen@demogr.mpg.de

In the late 20th century, the average age at death for Danes and Austrians aged 50 or above and born in the Spring was approximately 6 months older than those born in the Autumn (Doblhammer and Vaupel, 2001). The pattern was reversed for native-born Australians but, using British migrants to Australia as a natural experiment, these authors showed that the latter retained the northern hemisphere pattern indicating that it must have been an 'early life' effect. This indicates that the human body can experience damage or selection in early life that can be expressed as a mortality risk 50 or more years later. The problem is that month of birth is simply an indicator. We do not know if these effects occured during pregnancy or after birth. Those born in the Spring were *in utero* during the winter, which may have been bad for the mother's health and therefore their own development, but they also experienced the Spring peak in infant respiratory infections. Bengtsson and Lindström (2003) used historic data for southern Sweden to show that mortality risk after the age of 50 was higher if the person was born in a year with above average infant mortality. This suggests that, on balance, the survivors of a bad year were not more robust (selection) but had been damaged by the experience (debility).

The overall purpose of this research is to analyse Danish infant mortality by month of birth and month of age between 1925 and 1945 and to link this experience to the mortality risk of the survivors after 1953, based on individual death records of Danes which give age, sex and cause of death. The hypothesis is that individuals who lived through months of high infant mortality will have higher mortality risks at older ages and, second, that their deaths may be concentrated within the respiratory causes. There are also reasons to expect that any additional mortality risk will be higher if they were aged 6–12 months during a dangerous period rather than ages 0–6 months when they were protected by maternal immunity. The amplitude of monthly variation in mortality of newborn infants was low but increased to a peak when months in the late Spring interacted with ages 6–12 months.

The first purpose of this paper is to explore a compositional approach to the perturbation that takes place in mortality during the first year of life with respect to month of age and time. Indicators of the seasonal concentration of mortality are frequently based on data aggregated into weeks or months and expressed as proportions of the annual total so the compositional approach is natural. The second, and more speculative, purpose is to link a set of evolving compositions in early life effects to the mortality outcomes of adult cohorts.

References

Bengtsson, T. and M. Lindström (2003). Airborne infectious diseases during infancy and mortality in later life in southern Sweden, 1766-1894. *International Journal of Epidemiology 32*(2), 286–94.

Doblhammer, G. and J. W. Vaupel (2001). Lifespan depends on month of birth. *Proceedings of the National Academy of Sciences of the United States of America 98*(5), 2934–2940.

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