The Evolution of the Mortality Curve: Changes in the Age of Minimum Mortality

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Long Abstract

Introduction

Over the past 200 years, most human populations have escaped from a world dominated by infection and poor nutrition – the post-Darwinian Escape. Prior to this the human population lived, died, and evolved under very different environmental conditions. The mortality curve can be described a J-shaped with very high mortality at both ends of the age range and with lower levels of mortality after childhood and before the beginning of old age. Demographers have tended to focus their analysis on the ages of high mortality and paid little attention to the age at minimum mortality; biologists, on the other hand see the age at minimum mortality as the point in the lifespan when the organism has successfully passed through development and becomes subject to the forces of mortality that eventually result in senescence.

The environmental changes of the last 200 years have more than doubled life expectancy. They have also resulted in major changes in our physiological development and our physiological decline. We are born heavier, we reach maturity earlier, and we spend much less time with infectious conditions. These changes have also affected the shape of the age-specific curve of mortality. The age at minimum mortality is the age at which a cohort experiences the lowest mortality in its lifespan. It has been thought to represent the biologically significant age at which development ends and senescence begins. The earlier age of physical development or maturity that accompanies the epidemiological and nutritional revolutions should be accompanied by a lower age of minimum mortality. Because men and women reach physiological maturity at different ages and this difference in maturity may change with changing environmental conditions, we expect the age to differ by sex.

Data

Minimum age of mortality for cohorts by sex is examined for a number of countries with data going back as early as 1751 (Sweden). We limit our analysis to the minimum age up to age 20 in this paper. We have examined data for 16 countries from the Human Mortality Data Base In this abstract we present data for Sweden, England, and Switzerland. We show the level of mortality by single year of age for men and women, the age of minimum mortality for each cohort for men and women, and the difference between the minimum age of mortality for each cohort for men and women.

Results

The minimum level of mortality in cohorts has dropped fairly regularly over tie period examined (Figure 1). It drops below 1 in a 1000 by the late 1910s or 1920s in all three countries.

The age of minimum mortality is clearly reduced around 1940 in all three countries (Figure 2). It is rarely below age 10 before that in any country and much often below age 10 after that, especially for boys.

The difference in age at minimum mortality between boys and girls has changed markedly (Figure 3). Since the 1930s the difference between males and females has increased with the male age markedly younger than that female age.

Further work will consider the role of violent and accidental deaths in these age changes.

Conclusions

Age at minimum mortality has been reduced in low mortality countries after 1940. The reduction coincides with the widespread use of antibiotics and also with increasing levels of caloric intake.

Figure 1. Minimum Cohort qx up to age 20: Sweden, Switzerland, England

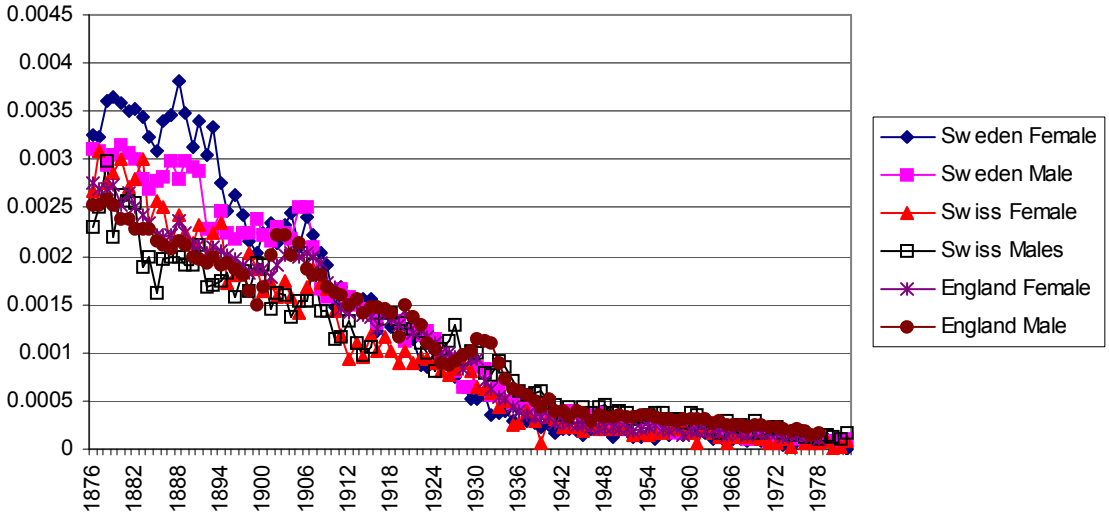

Figure 2. Cohort Age at Minimum qz: Sweden, Switzerland, England

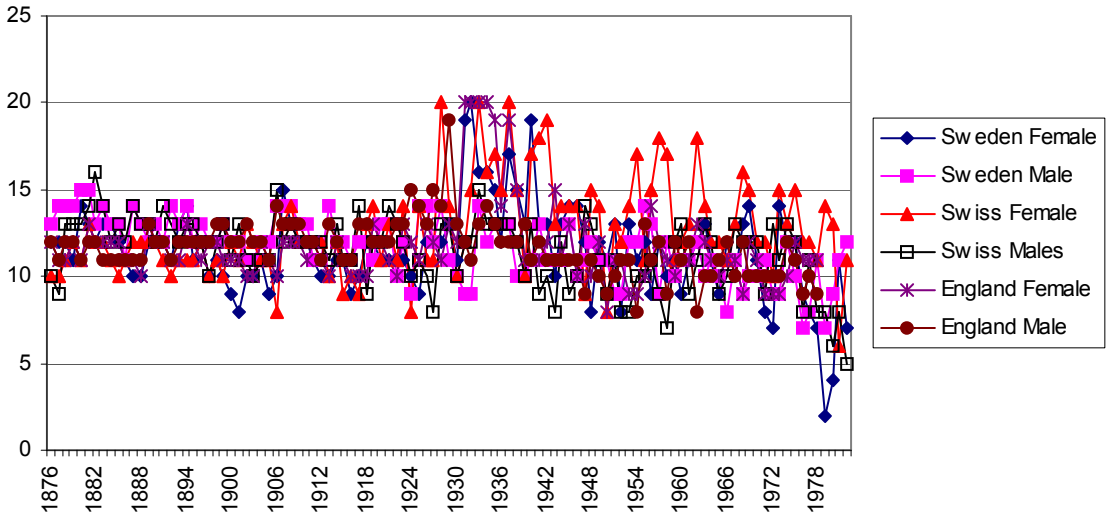

Figure 3. Sex Difference in Minimum qx: Sweden, Switzerland, England