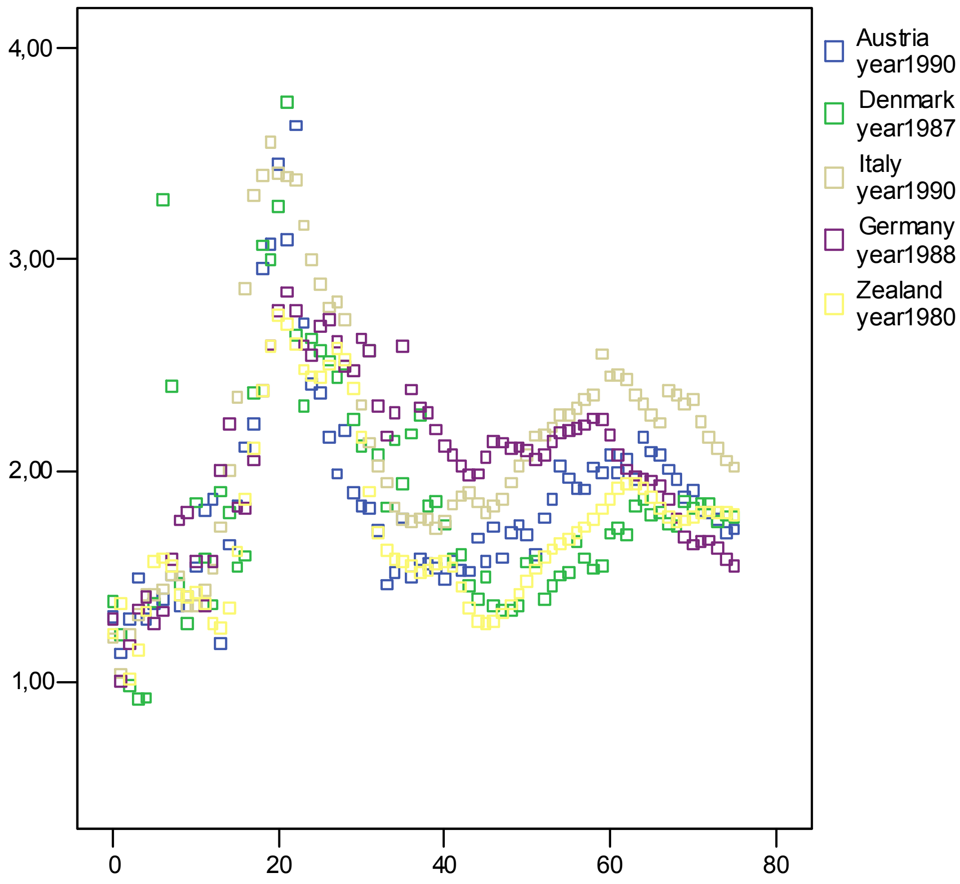
Extended abstract

It is generally accepted that, on the average, females live longer than males. If one studies the age specific mortality rates of any male population, easily observes that they follow the same typical pattern as the corresponding female one, with roughly the same shape though with different slopes and levels which also varies in the various parts of the total age interval.

However, empirical observation led us to be aware that there is an underlying consistent pattern that relates the age-specific mortality of the two sexes in any human population and at any time point. Studying the quotients between the age-specific male and female mortality rates, one can easily observe that they follow a typical shape by age. Figure 1 below exhibit this shape in a variety of populations.

Figure 1: Quotients of male and female mortality rates



It is obvious in this figure that the quotients follow a typical pattern by age that exhibits two roughly humps placed in the neighborhood of ages 20 and 60 respectively. The first hump is much more intense and narrower than the second one. A second look allows us to observe that the first hump is sharper in its left part. This interesting feature allows us to fit a parametric model in order to adequately describe this shape. For this purpose we propose the following formula,

$$\frac{q_x^M}{q_x^F} = c_0 + c_1 \exp(\frac{-(x-m_1)^2}{\sigma_1^2(x)} + c_2 \exp(\frac{-(x-m_2)^2}{\sigma_2^2},$$

where,

$\sigma_1^2(x) = \sigma_{11}^2, \quad if \quad x < m_1, \quad while \quad \sigma_1^2(x) = \sigma_{12}^2, \quad if \quad x > m_1,$

and $c_0, c_1, c_2, \ m_1, m_2, \sigma_{11}^2, \sigma_{12}^2, \sigma_2^2$ are parameters to be estimated.

c_0 is related to the basic level of the quotients,

c_1, c_2 are related with the base level of the first and the second hump respectively,

m_1, m_2 reflect the location of of the first and the second hump respectively, while

$\sigma_{11}^2, \sigma_{12}^2$ reflect the spread of the first hump before and after its peak,

and, σ_2^2 reflects the spread of the second hump.

In order to evaluate the adequacy of this formula, we fit it to a number of data sets of different populations and different time periods. Our results have shown that the formula proposed can adequately describe the pattern considered. The parameter estimates allow us for making comparison between populations and time periods.