

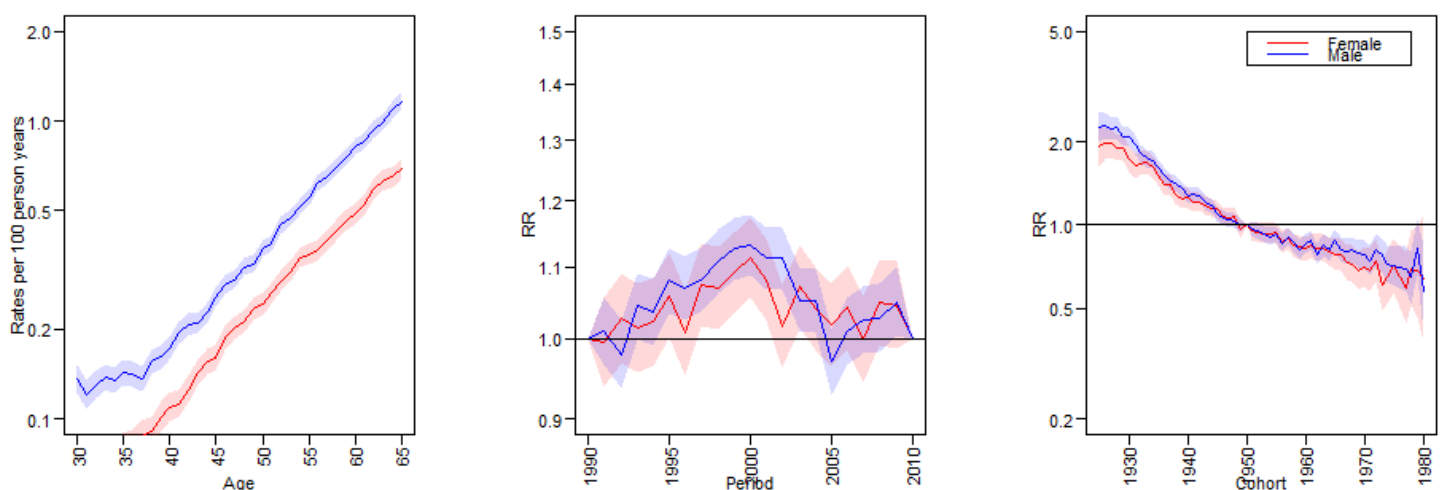
APC Model – Assignment

1. The answer to this question and all the R codes can be seen in the file attached by email.

2. The age-period-cohort analysis for Irish males and Irish females are shown in the graph below. The APC models assume that age, period, and cohort have a linear relationship with mortality and cohort effects are independent of age and period effects. Besides of that, “no statistical model can simultaneously estimate age, period, and cohort effects because of the collinearity among the three variables ($\text{Cohort} = \text{Period} - \text{Age}$)” (Keyes et al, 2010). According to Keyes et al (2010), this collinearity results in a statistically non-identifiable design matrix, making simultaneous mathematical modeling of the linear functions of three effects impossible without additional restrictions in the model.

The parametrization chosen here is the ACP model, which has an age-effects as rates for the reference cohort. Cohort effects as RR relative to the reference cohort and period effects constrained to be 0 on average with 0 slope.

Graph 1: Male VS Female Rates Ratio: Ireland

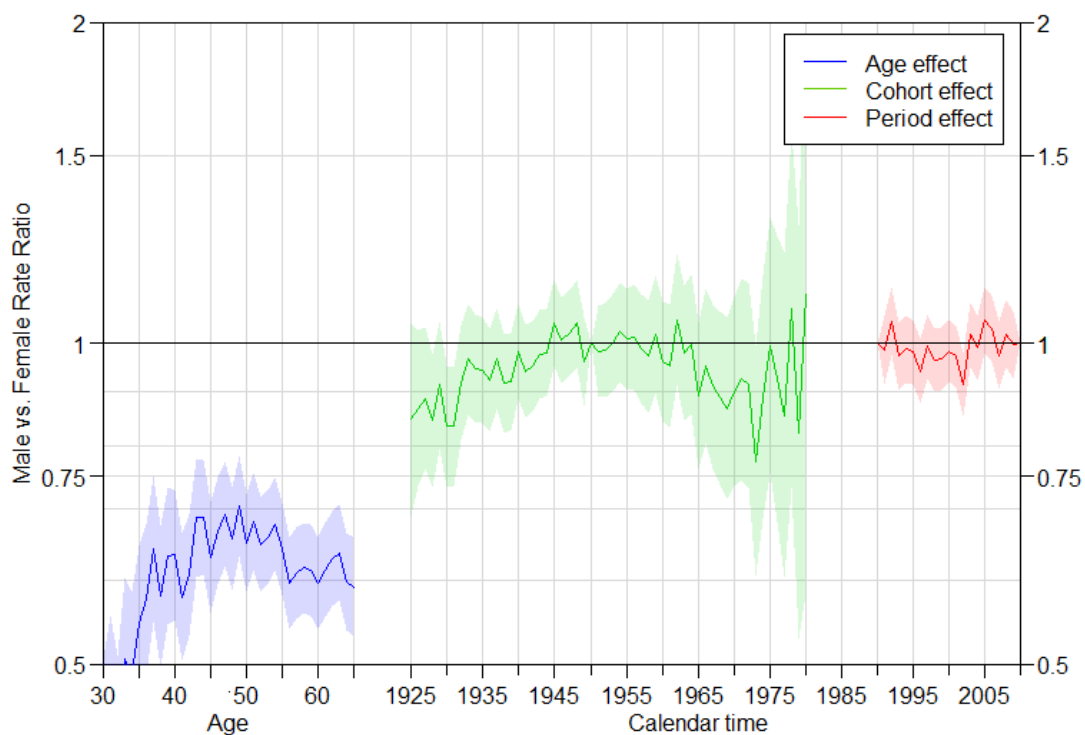


Source: HMD

3. The age-specific mortality patterns shows a linear increase by age in which Irish man has a higher mortality rates than Irish women between age 30 to age 65. We can see that the difference among sex are larger in younger ages and keeps the constant gap until 65. When looking to the period, the Rates Ratio shows that for both sexes, the period mortality rate was higher than the reference period. Between 1998 and 2003, both sexes experienced an increase in period mortality rate, but man mostly with higher mortality than women. Finally, the cohort mortality RR shows a linear decline among the years compared with the reference cohort (1950). The decline is greater for females.

4.

Graph 2: M/F mortality rate-ratio: Ireland



Source: HMD

5. When RR is equal to one, male and female has the same mortality effect. Given that, all the curves are under the $y = 1$, that indicates a higher males age, period or cohort mortality effect compared to women. The age effect on mortality is higher for men in younger ages, then there is a decrease in sexes difference and another gain in men's mortality age effect in older ages. The cohort mortality effect is higher for men until 1945, when the cohort effect was almost the same as women, however cohorts born after 1960

has greater cohort effect on mortality for men. Finally, the period effect on mortality had smaller differences between sexes if compared to age and cohort effects. We can highlight 1992/1992 and 2005/2006 when women had higher period effect on mortality than man, while during 1993 to 2004 the period had greater effect on men's mortality compared by woman.

References

Keyes, Katherine M., et al. "What is a cohort effect? Comparison of three statistical methods for modeling cohort effects in obesity prevalence in the United States, 1971–2006." *Social science & medicine* 70.7 (2010): 1100-1108.