
Impact of the COVID-19 pandemic on cohort life expectancy

Silvia Rizzi¹

¹ The Interdisciplinary Centre on Population Dynamics, University of Southern Denmark

**Royal Statistical Society International Conference
Edinburgh 1st-4th September 2025**



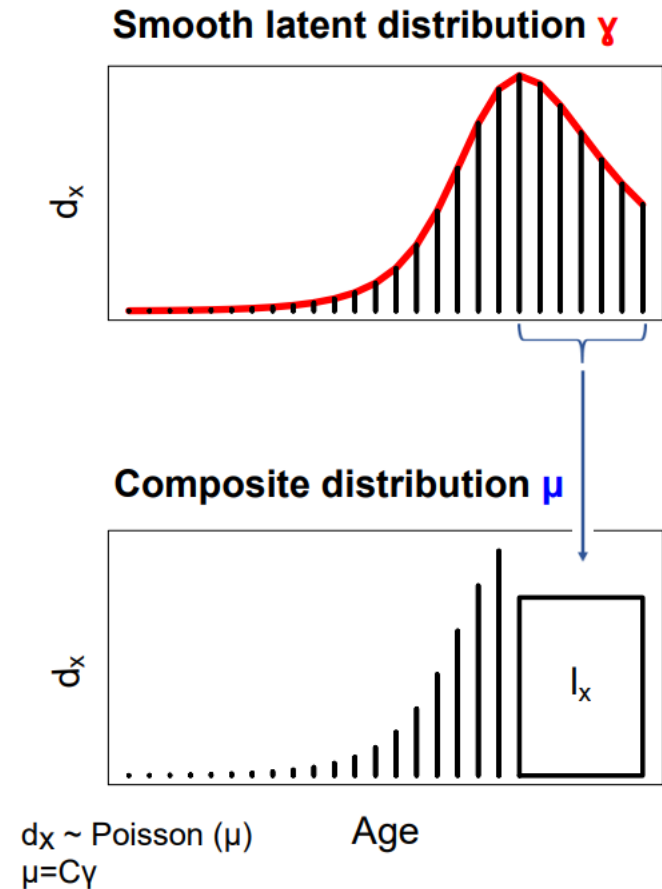
Context and Aim - Mortality due to the COVID-19 pandemic

- Remarkable **increase in mortality** between 2020 and 2023 with geographic and demographic variations due to the COVID-19 pandemic.
- **What we know:** short-term impact of the COVID-19 pandemic on mortality.
 - **period life expectancy** exhibited a drop in most of the Western countries - e.g., 2.2 years for males in one year in the US (*Aburto et al., 2021*).
 - reductions were mostly attributable to increased mortality above age 60 years and to official COVID-19 deaths.
- **What we do not yet know:** long-term consequences of the COVID-19 pandemic on mortality.
 - What will the actual **life expectancy** of cohorts not yet extinct be?
 - Our target: forecast mortality of cohorts born up to 1960.

Model – A Penalized Composite Link Model (PCLM) to Forecast Not Extinct Cohorts

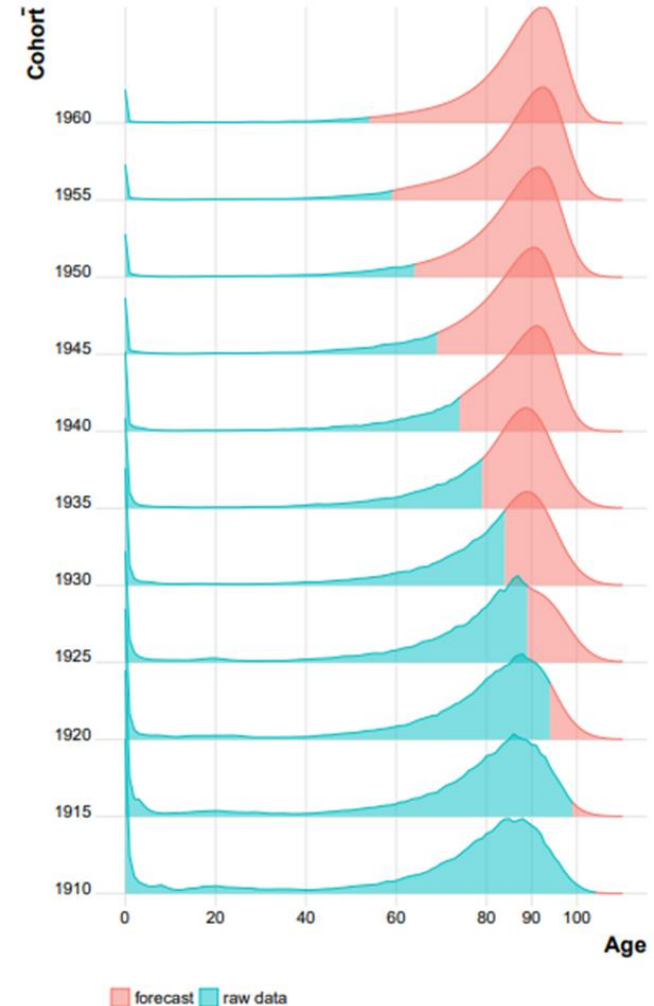
The number of survivors from a given birth cohort at the age of truncation can be considered as a coarsely grouped death count not yet observed. The remaining deaths can be ungrouped (forecast) by age using the PCLM:

- Cohort deaths d_x assumed to be Poisson distributed with $E(d_x) = \mu$.
- Vector μ results from grouping the observed counts such that $\mu = C\gamma$.
- Vector γ to be estimated is assumed to be smooth.
- Estimation by penalized maximum likelihood (Eilers, 2007).
- Incorporation in the model of demographic information to estimate more recent cohorts:
 - Forecast of the modal age at death and the number of deaths at the mode with a random walk with drift model (RWD)
 - Forecast of the proportion of deaths after the mode with an autoregressive moving average (ARMA) model.

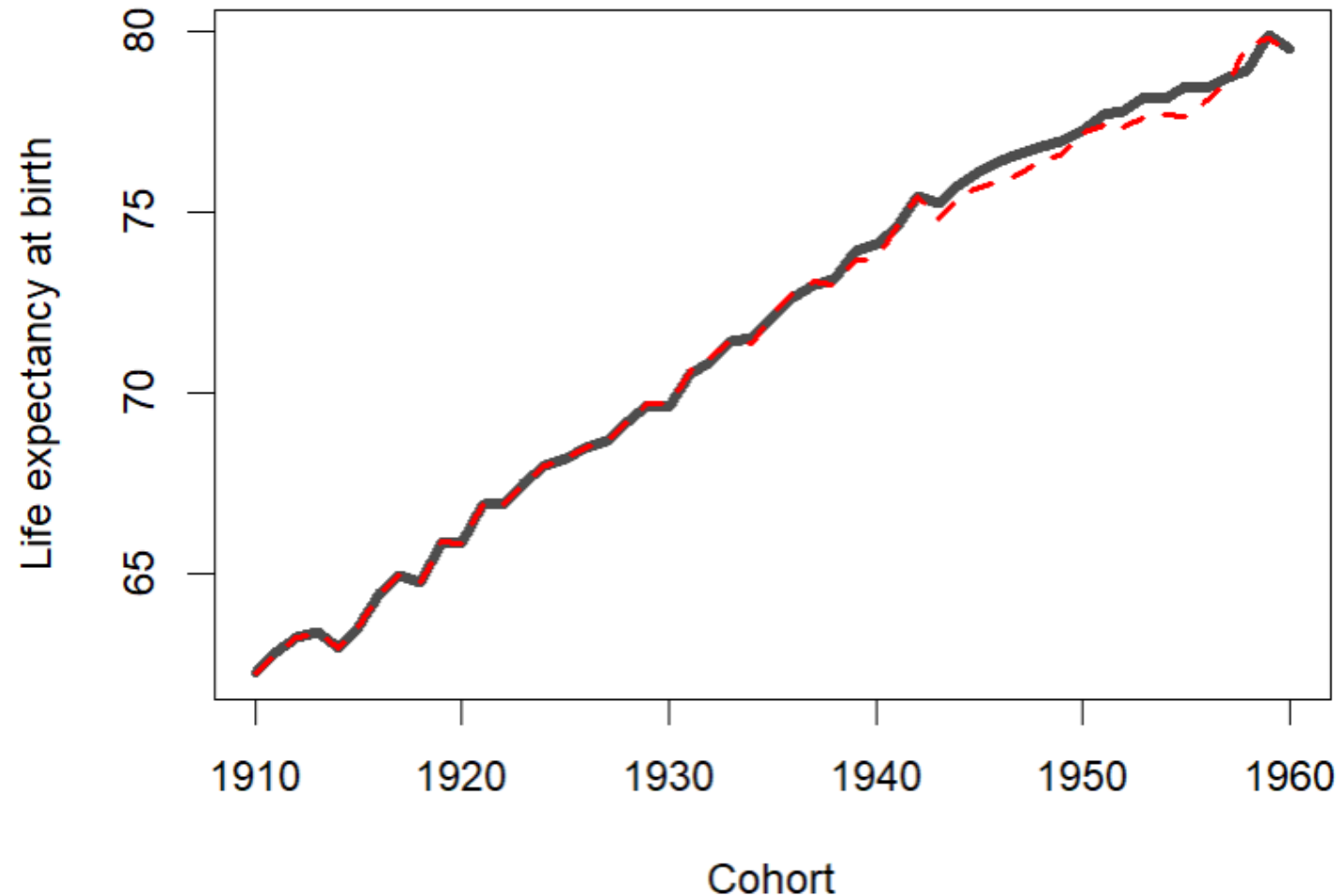


Data and Application – Human Mortality Database

- **Cohort death rates** from the Human Mortality Database (HMD) for **Swedish males 1910 – 1960**.
- Construction of cohort life tables (*Preston et al., 2021*).
- **Forecast** cohort age-at-death distributions with the penalized composite link mode PCLM (*Rizzi et al., 2021*).
- Method applied to data **pre- and post- COVID-19** pandemic: Changes in cohort life expectancy due to the COVID-19 as the difference between forecast cohort life expectancy using data up to and including 2019 and forecast cohort life expectancy using data up to 2024.



Preliminary Results – Long-term cohort life expectancy forecast for Swedish males pre- (black line) and post- (red dashed line) COVID-19



Thank you.



srizzi@sdu.dk

