



# Analysing Contributions of Ages and Causes of Death to Gender Gap in Life Expectancy using Functional Data Analysis

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# Gender Gap in Life Expectancy (GGLE)

- **Narrowing** in most of low-mortality countries
- Mainly concentrated at **old ages**

Where some convergence has taken place, men have experienced more rapid gains in survival than women

(Meslé & Vallin, 2011)

Studies on GGLE

- **Causes of death** (narrow or widen the gap)
- **Age trajectories** of cause-specific death rates
- **Age-cause decomposition** of gap in aggregated mortality measures (e.g. life expectancy, lifespan variation)

## Functional Data Analysis (FDA)

- Cause-specific relative age contributions to the GGLE (i.e. contributions are realizations of same stochastic process)  
(Age-cause contribution obtained through **Arriaga's age- and cause-specific decomposition**)
- **Functional Principal Component Analysis (FPCA)** → Distribution of contributions (curves) synthesized by the first  $q$  terms

Data:

- Human Mortality Database (**HMD**) & Human Causes-of-death Database (**HCD**)
- Set of **16 causes of death**
- 3 geographical areas (Eastern, Western and Extra-European) - **14 countries**
- **15 years** available for each country (Overall period: 1998-2016)

# Results - Conclusion

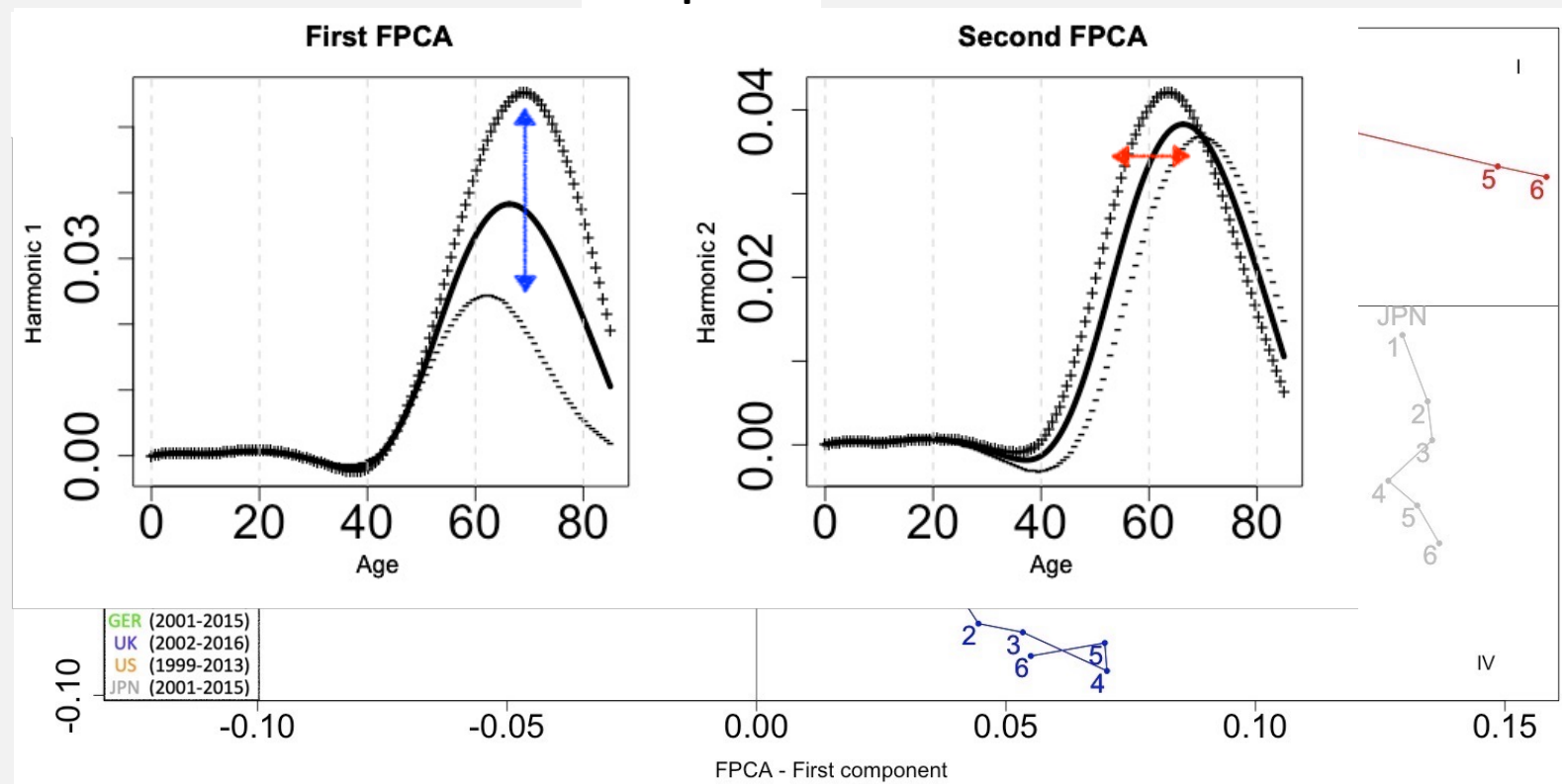
## Decomposition

- Largest contributions:
- **Neoplasms, Heart diseases & External causes** (70% of GGLE)
  - **Old ages (60+)** (50% of GGLE)

## FPCA

- **FPC1** and **FPC2** capture most of the variability of the distribution (>90%)
- **FPC1**: Cause-specific difference
- **FPC2**: Age patterns (shift)

## Neoplasm



- **FDA** highlights country-specific patterns & shift towards older ages (especially in France, transition → further analyses)
  - **Heart diseases**: Increasing contributions & shift towards older ages in EE countries
  - **External causes**: Decreasing contributions
- Increase the use of FDA approach in population studies

**THANK YOU!**