# About Homework III

## Life tables and so on

Master I MIDS

Université de Paris

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# Questions

Data: a universal table constructed by stacking life tables across countries and genders. Each row is identified by the content of columns `Year`, `Country` and `Gender`. Other columns correspond to Ages. The content of each cell is the logarithm of *central death rate* at given `Age` for given `Year`, `Country` and `Gender`

This is the *pivoted* table.

- How do we compute *central death rate*?
- How does central death rate compare with a hazard rate (probabilistic language)?
- Can we compute mortality rates from life tables?
- Can we compute life expectancy from life tables?

# Looking at a country/gender pair

# Questions (continued)

Looking for relationships

- For a given Year, Gender and Country. How smooth is log central death rate as a function of age?
- As functions of Age do central death rates share a common shape?
- What kind of modeling can be used to describe such shapes ? (there is a large body of work called *shape-constrained inference*)
- What kind of relationships can we spot using PCA?
- Have a look at the paper by Lederman and Breas. *Les dimensions de la mortalité*

# Questions (continued)

- How do central death rates change with time ? Do they change ? (the same question arises about global warming)
- Are there global trends ?
- Are there outliers ?

# PCA for given Country and Gender

# About PCA

Ask yourself:

- Should we center and standardize the data or not ? The safest way to answer the question is explore the four possible settings, interpret the results and keep the ones that look most relevant.
- What kind of message does the correlation circle convey ?
- What can we read on the biplot ? Concerning years and ages ?
- Anything interesting beyond the first two principal componants ? Try to visualize how faithful is the approximation of the year-age index matrix by a rank two matrix.

# CCA

- What do you expect from CCA? (in general)
- What do you expect from CCA when handling collections of life tables?
- How would like to display the results of CCA?

# Questions

- Within one country, compare life tables for women and men.
    - Can we predict the evolution of men's death rates from the evolution of women's death rates?
- Across different countries.
    - All countries from Western Europe (except Sweden) went through a reconstruction period
    - They did not start from the same position
    - Do you observe catching up? divergence?
- Around 1980, both the US and the UK turned their back to the Welfare State policy. Does it show?

# Lee-Carter model

- Have a look at the paper (see Moodle)
- Do you agree with the objectives of this paper?
- If the Lee-Carter were correct, what kind of picture would be delivered by PCA?
- Is the *linear decline of* $k$ (Section 4) observed between 1900 and 1989 in the US still observed in the US?
- Is the *linear decline of* $k$ observed between 1900 and 1989 in the US also observed in Western Europe?
- Asses the role of imputation for death rates at age $85+$

# Talk

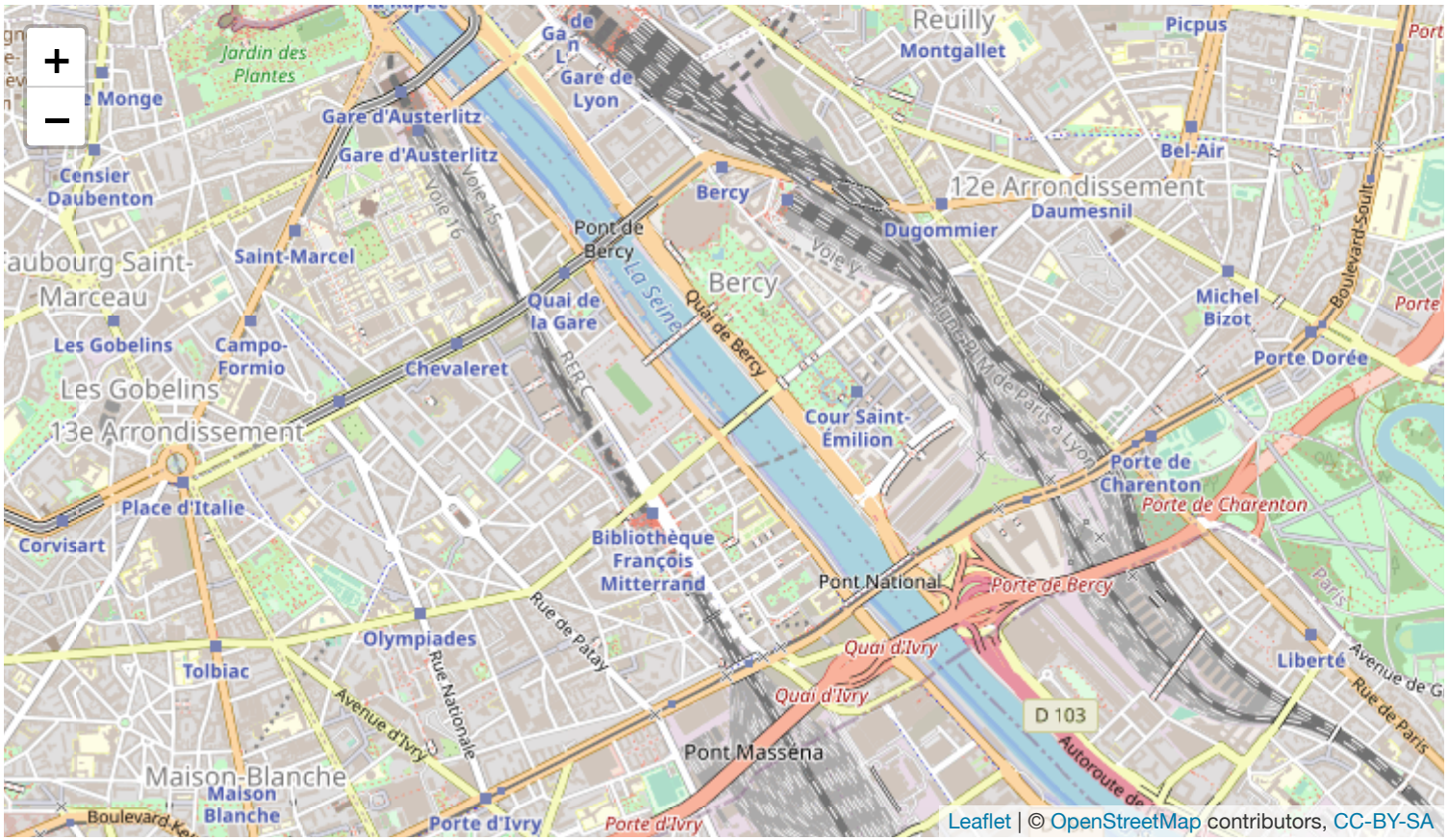
- 20 minutes: this is very short. You have to cherrypick your material
- During the talk, keep control on your pace. Speek slowly.
- Silence is more eloquent than stammer
- Silence is punctuation
- Don't forget to breathe (this is not about apnea)
- Prepare for stress: learn your pitch. When giving your talk, you will not look for words,

- Number tables are boring
- In Natural Sciences, people organize talks around pictures. It is a good idea
- A plot should be self-contained (with an appealing title, )
- Do not prepare too many slides. Consider at least two minutes per meaningful slide
- Beyond ggplot

# Package `demography`

- R package
- Rob Hyndman
- Provides Lee-Carter modeling and prediction
- ...

```
library(leaflet)
leaflet() %>% addTiles() %>% setView(2.3799991607666016, 48.832704243
```



# Thanks!

Slides created via the R package **xaringan**.

The chakra comes from remark.js, **knitr**, and R Markdown.