Adult Mortality in the Metropolis of London 100–1850

Supplement: Code structure, data source and processing

Nils Müller-Scheeßel* Katharina Fuchs† Christoph Rinne‡

06. Oktober 2023

Contents

Prerequisites

The calculations were made in R using R-Studio. The structure of the code is essentially based on the structure of the text. The pure programme code is in the file order_of_code.R. The file extended with Markdown is order_of_code.RMD and the file order_of_code.pdf generated from it.

The code makes extensive use of the function `source` to call external code. Thus the main part of the code remains slim, well structured and readable.

Note: The base path for rmd files is the folder in which they are located, not the r-project. Consequently, order_of_code.R and order_of_code.RMD are both located in the base folder of the project.

Install required packages, set some options and link the sources for the helper functions.

Remarck: The current Version of osmplotr has to be installed from github using `devtools::install_github ("ropensci/osmplotr")`.

```
require(pacman) || install.packages("pacman")
```

```
## Lade nötiges Paket: pacman
```

```
## [1] TRUE
```

```
pacman::p_load(dplyr, fitdistrplus, flexsurv, ggplot2, gridExtra, kableExtra,
               mortAAR, nlme, osmplotr, reshape2, rgdal, HMDHFDplus, Metrics,
               svMisc, tibble, tidyr, cowplot, MortalityLaws, rio,
               coda, rjags, runjags, demogR, sf, rnaturalearth, readxl,
               ggrepel)

options(scipen = 999)
options(dplyr.summarise.inform = FALSE)
```

*Institute for Pre- and Proto History - Kiel University nils.mueller-scheessel@ufg.uni-kiel.de
†Institute of Clinical Molecular Biology - Kiel University, k.fuchs@ikmb.uni-kiel.de
‡Institute for Pre- and Proto History - Kiel University, crinne@ufg.uni-kiel.de

```
source("./functions/bayes_cat_poisson.R")
source("./functions/gomp_MLE.R")
source("./functions/gomp_MLE_adapted.R")
source("./functions/gomp_MLE_interval.R")
source("./functions/gomp_anthr_age.R")
source("./functions/gomp_anthr_age_r.R")
source("./functions/gomp_bayes_known_age.R")
source("./functions/gomp_known_age_r.R")
source("./functions/helper_functions.R")
source("./functions/lt_MC.R")
source("./functions/lt_MC_Gomp.R")
RNGkind("L'Ecuyer-CMRG") # conservative random number generator to avoid periodicity
```

Important for saving time: Decide to run extensive code anew (app. 6 h +). In addition, you can set the folder for preprocessed files.

```
runCodeNew <- FALSE
#runCodeNew <- TRUE

saveFileDir = "preprocessed_files"
if (saveFileDir %in% list.files(getwd()))
 {}else{
    dir.create(file.path(".", saveFileDir), showWarnings = FALSE )
 }
```

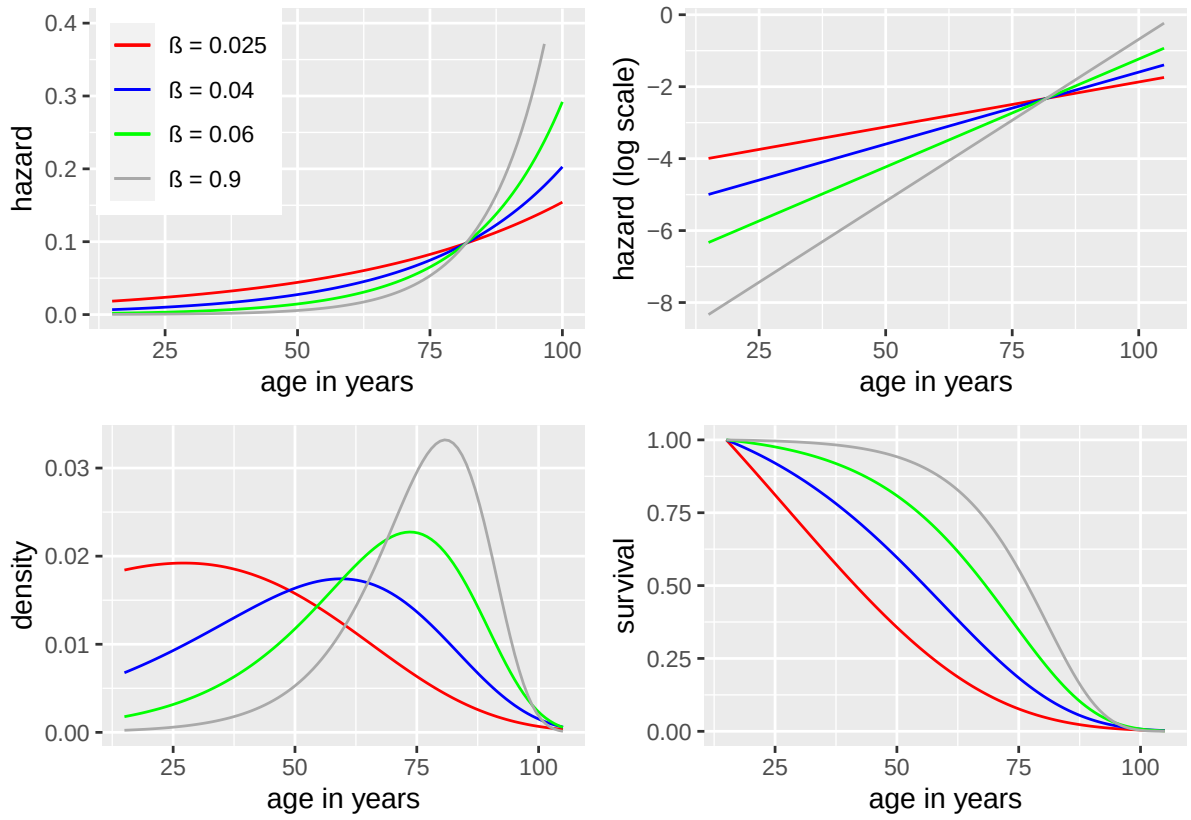
```
## NULL
```

1 Chapter 01 Introduction

Figure 1: Gompertz.

```
source("./chapter_01_introduction/gompertz_distribution.R")
```

```
## Saving 6.5 x 4.5 in image
```

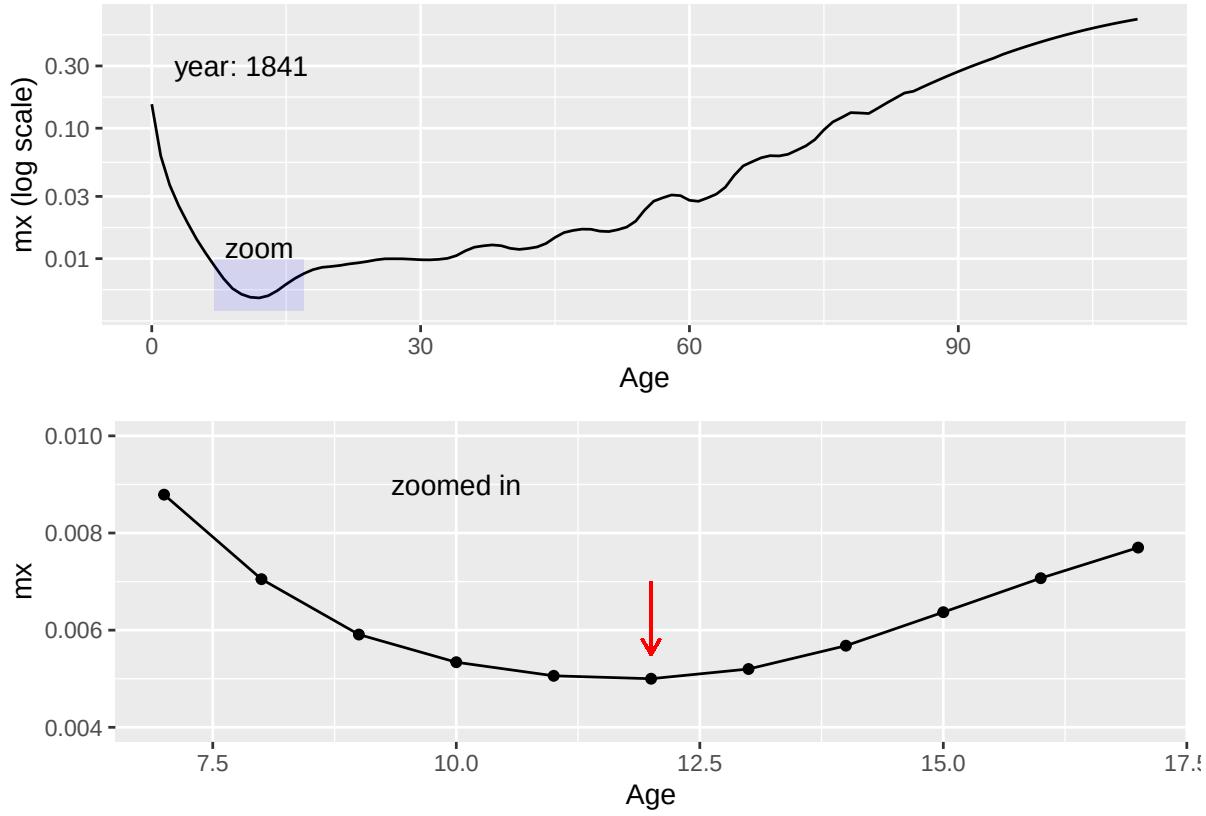


2 Chapter 02 Materials and methods

Figure 3 Hazard curve for HMD UK data of the year 1841.

```
source("./chapter_02_materials_and_methods/hazard_curve.R")
```

```
## Saving 6.5 x 4.5 in image
```



3 Chapter 03 Data

Figure 4 Major cemeteries in Greater London 1100–1850 used in the present study.

```
source("./chapter_03_data/London_places.R")
```

```
## Data (c) OpenStreetMap contributors, ODbL 1.0. https://www.openstreetmap.org/copyright
```

```
## Saving 6.5 x 4.5 in image
```

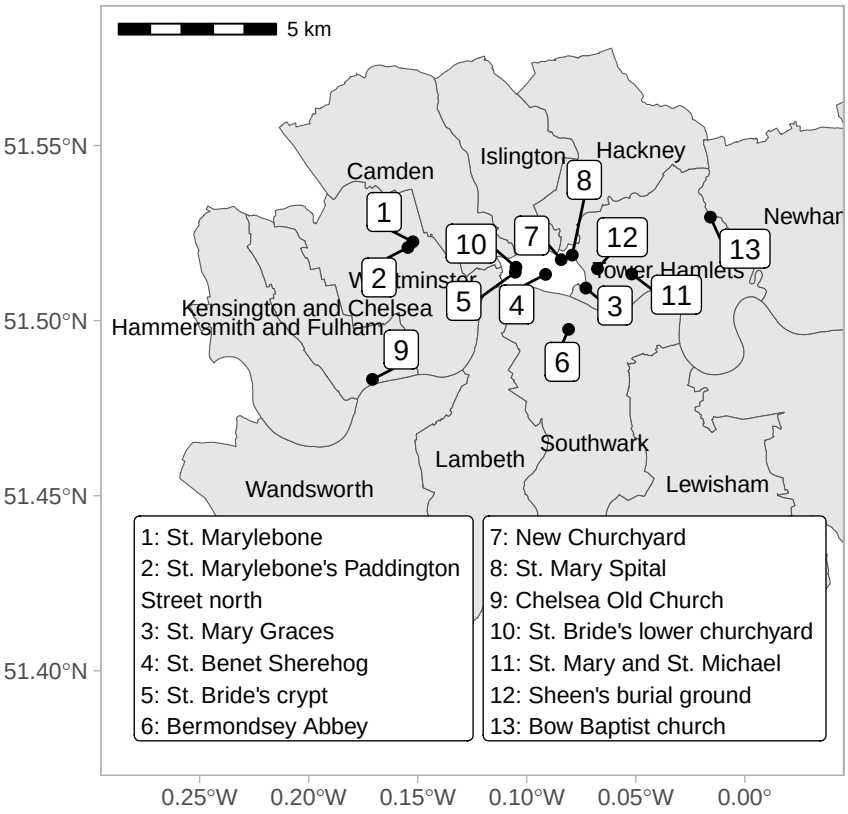
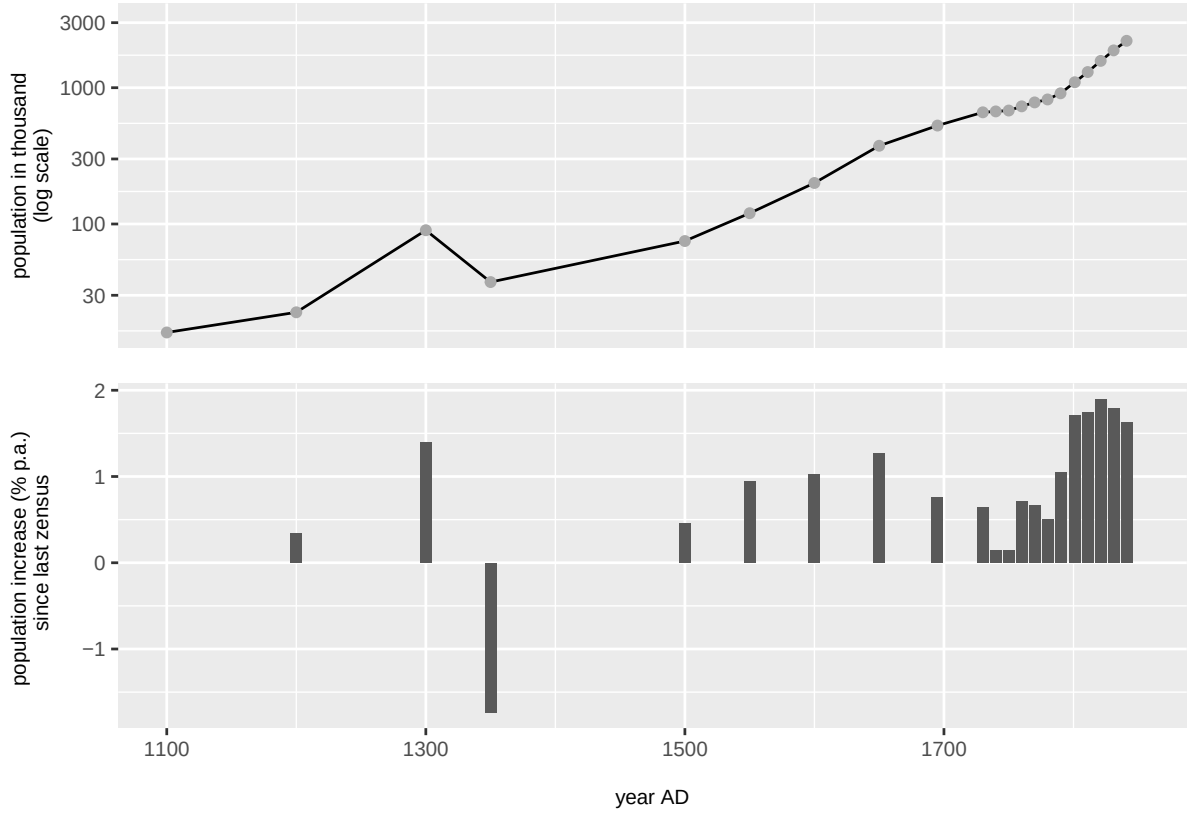


Figure 5 Population development of London

```
source("./chapter_03_data/London_population.R")
grid::grid.newpage()
grid::grid.draw(rbind(london_pop1, london_pop2))
```



Footnote 6 Re-calculation of rates for Razzell/Spence 2007 Calculated in ./chapter_03_data/London_population.R

```
knitr::kable(razz_df, caption = "Re-calculation of rates for Razzell/Spence 2007")%>%
  kable_styling(latex_options = "HOLD_position")
```

Table 1: Re-calculation of rates for Razzell/Spence 2007

date	population	rate.per.year
1520	55000	NA
1600	200000	0.016
1650	400000	0.014
1700	575000	0.007
1750	675000	0.003
1801	960000	0.007
1851	2685000	0.021

4 Chapter 04 Results

Preprocessing of data used in figure 6: Estimated modal ages.

4.1 Historical life tables

4.1.1 Written sources and pre-processing

The data is referenced and aggregated in "./chapter_04_results/historical_lifetables.R". In this file, all records from individual preprocessing files located in "./liftables_preprocessed/" are `sourced`. The corresponding data files are stored in "./data/".

English_Peers.R, russell.txt, `# Source: Hugo J. P. La Poutré & Fanny Janssen, A two-parameter hazard function to describe age patterns of mortality in ancient Northwestern Europe. Genus 77, 12 (2021), Tab. 2. https://genus.springeropen.com/articles/10.1186/s41118-021-00122-w/tabl`

```
source("./chapter_04_results/historical_lifetables.R")
kable(peers_ranges, caption = "English Peers") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 2: English Peers

parameter	modes	HDI.ranges
beta	0.0613	0.0559-0.0660
M	58.1758	56.4-59.8
e20	33.4148	NA
e25	29.4926	NA

Medieval_England.R, Christ_church_monks.txt, `# Source: John Hatcher, The Economic History Review , 1986, New Series, Vol. 39, No. 1, p. 28 tab. 2 (https://www.jstor.org/stable/2596099)`

```
kable(monks_ranges, caption = "Christ Church monks") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 3: Christ Church monks

parameter	modes	HDI.ranges
beta	0.0461	0.0398-0.0523
M	52.7659	48.9-56.0
e20	31.0948	NA
e25	27.7530	NA

London_1728_1840.R, Mortality_bills_1728_1840.txt, `# Source: C. A. Roberts/M. Cox, Health and disease in Britain: from prehistory to the present day  (Stroud 2003), 304 Table 6.5; > 100 years and < 1 collapsed`

```
kable(london_1728_1840_ranges,
      caption = "London Mortality bills 1728-1840, range of age modes M") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 4: London Mortality bills 1728-1840, range of age modes M

parameter	ranges
beta	0.0326-0.0418
M	43.3-54.8

```
kable(london_1728_1840_ranges_r,
      caption = "London Mortality bills 1728-1840, range of rate") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 5: London Mortality bills 1728-1840, range of rate

parameter	ranges
beta_r	0.034-0.0507
M_r	46-64.3
r	0.002-0.012
beta_r	-0.003-0.007
M_r	-0.003-0.007
r	0.002-0.012
beta_r	0.002-0.012
M_r	0.001-0.01
r	0.005-0.015
beta_r	0.012-0.021
M_r	0.012-0.022
r	0.014-0.024
beta_r	0.014-0.023
M_r	0.012-0.022
r	0.014-0.023

London_1841_raw_all.R, London_1841_raw.txt, `# Source: J. Landers, Death and the Metropolis: Studies in the Demographic History of London, 1670-1830. Cambridge Studies in Population, Economy and Society in Past Time (Cambridge 1993). DOI: https://doi.org/10.1017/CBO9`

```
kable(London_1841_ranges,
      caption = "census data for London from 1841, range of rate") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 6: census data for London from 1841, range of rate

parameter	modes	HDI.ranges
beta	0.0547	0.0510-0.0585
M	60.4164	58.9-61.7

English_Mortality.R, wrigley_et_al_1997_england_1640-1809.txt, `# Source: Wrigley u. a. 1997: E. A. Wrigley/R. S. Davies/J. E. Oeppen/R. S. Schofield, English Population History from Family Reconstitution 1580-1837. Cambridge Studies in Population, Economy and Society in Past Time 32 (Cambridge 1997), 290 tab. 6.19 . https://doi.org/10.1017/CBO9780511660344.`

```
kable(eng_mort_ranges,
      caption = "English mortality data") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 7: English mortality data

parameter	ranges
beta	0.0438-0.0608
M	52.2-67.4

HMD_UK_ranges.R The data from the Human Mortality Database (https://mortality.org/) were retrieved with a personal account using the R package HMDHFDplus. Therefore, we only provide the processed data here.

```
kable(HMD_UK_ranges, caption = "Human Mortality Database UK") %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 8: Human Mortality Database UK

parameter	ranges
beta	0.05-0.0654
M	64.2-70.2