Neolithic life tables de

Providing and presenting data on human age at death.

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Contents

1 Introduction

The dataset contains mortality data of humans taken from the literature. Therefore, the data is heterogeneous in many respects, especially with regard to the quality of the anthropological information. However, the data is simplified and classified to fit into a limited number of columns, e.g. a general archaeological classification.

I collected the data to get a general impression of the differences in mortality during the Neolithic in different communities in relation to archaeological periods and regions within Germany. I did not intend to build up a comprehensive database of all mortality data, nor to create a well-founded collection of information from physical anthropology. Due to the easy availability of the data, I also integrated data from an Early Neolithic cemetery in Austria.

Important note: Most anthropologists will reject extrapolations, especially of life expectancy, based on this data. The attribute "(archaeological) culture" serves as a label for a number of features related to the way of life, e.g. houses, settlement structure, economy and burial practices. The attribute "period" is based on the previous entity. Both must be placed in an archaeological framework and a current absolute dating, depending on the research question. Please bear in mind that collective burials can be used over a long period of time.

The data is provided as a sqlite database in a very simple form, not normalised or as implemented relations. This documentation is provided as an R-markdown with a resulting pdf to give a first overview of the data in the database. At the same time, a simple workflow for data processing in R with the R package [mortAAR] (https://cran.r-project.org/web/packages/mortAAR/index.html) for calculating life tables is described. The literature used and cited is provided as a Bibtex file.

The data collection is available via the LandMan portal of CRC 1266[1]. Subproject: "Regional and Local Patterns of 3rd Millennium Transformations of Social and Economic Practices in the Central German Mountain Range (D2)" https://gepris.dfg.de/gepris/projekt/316739879]. In addition, I have decided to set up this Github repository to make updates traceable and further additions to the database more easily accessible https://github.com/chrinne/lifetables4archeologists.

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[1]"Scales of Transformation - Human-Environmental Interaction in Prehistoric and Archaic Societies." Deutsche Forschungsgemeinschaft (DFG) - project number 290391021 https://gepris.dfg.de/gepris/projekt/290391021

2 Data presentation

All code chunks will be visible, this is part of the reproducibility. The documentation uses some R packages:

```
knitr::opts_chunk$set(echo = TRUE, include = TRUE)
require(pacman) || install.packages("pacman")
```

```
## Lade nötiges Paket: pacman
```

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

```
pacman::p_load(dplyr, ggplot2, knitr, mortAAR, RSQLite)
```

Please set the working directory to the folder with the data, e.g.:

```
setwd('d:/data/folder/')
```

Set up the database connection.

```
db01 <- dbConnect(RSQLite::SQLite(), dbname = "./de_lifetable_neol.sqlite")
```

2.1 Data structure

The data is provided in three tables – two tables for individual and tabled mortality data and one with cooridinates for the nearby places.

```
select name  as 'Name' from sqlite_master where type = 'table' order by 1;
```

Table 1: 6 records

Name
citations
import
lifedata_ind
lifedata_tbl
metadata
places

Import the data into the R environment.

```
tables<- dbGetQuery(db01, "select name from sqlite_master
                    where type = 'table' order by 1;")[,1]
for (tbl in tables){
  assign(tbl, dbReadTable(db01, tbl))
}
```

Most sqlite columns are set to TXT due to type affinity in sqlite, one exception is 'count'. You might need to adjust this (sb).

2.1.1 lifetable_ind and lifetable_tbl

The structure of the mortality data tables for individual and tabled data is identical for the easy combination (*rbind()*). The column names are self-explanatory in general.

```
paste(colnames(get(tables[2])), collapse = ", ")
```

[1] "place, site, grave, sex.orig, sex, from, to, ageclass.orig, count, culture, period, literature, comment"

The column 'count' is always 1 for individual data and can provide a float for tabled data due to interpolation in the original life tables. The column 'sex' provides a simplified English version of the original sex determination in the column 'sex.orig'. The columns 'from' and 'to' are derived from the original age classification in 'ageclass.orig' to fulfil the needs of mortAAR.

2.1.2 places

The table 'places' provides coordinates (WGS84) of nearby places to allow spatial differentiation. The 'id' is related to 'places' in the lifetables.

```
paste(colnames(get(tables[5])), collapse = ", ")
```

[1] "name, content"

2.2 Content of places

The nearby places are distributed from Hildesheim south of Hannover to the Alps and from the Rhine to Straubing in Southeast Bavaria. The site of Kleinhadersdorf is an outlier in Eastern Austria. You can notice a significant agglomeration of places and thus of nearby sites around the Harz region.

```
plot(places$longitude, places$latitude, cex = 0.2,
     xlab = "Longitude", ylab = "Latitude")
text(places$longitude, places$latitude, places$name, cex = 0.6)
```

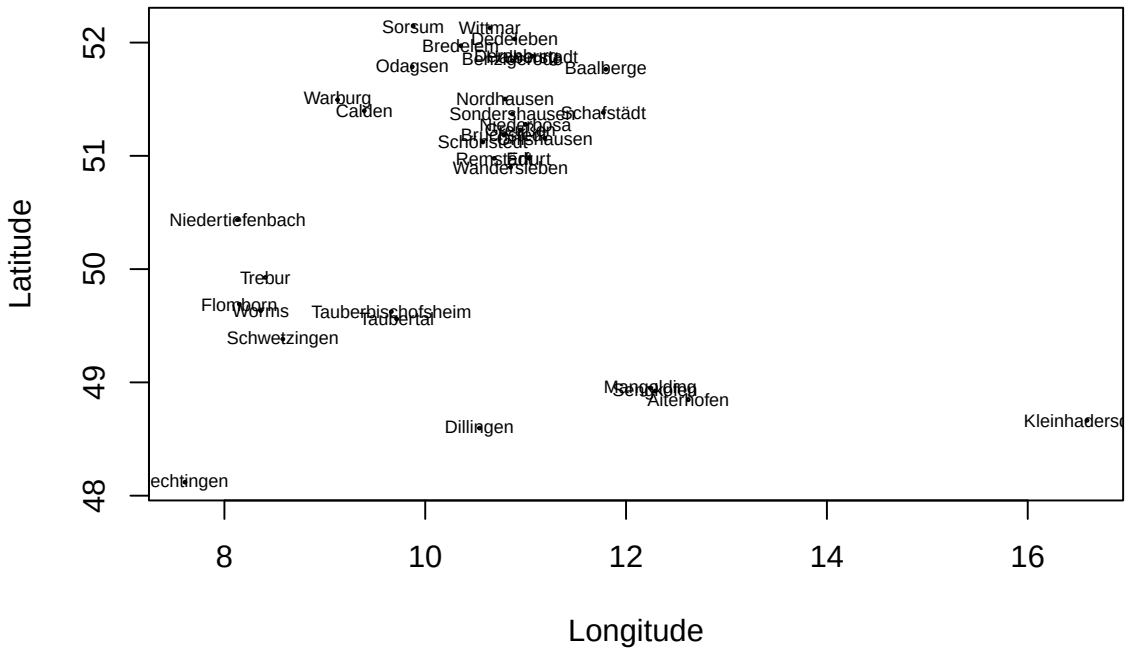


Figure 1: Plot of nearby places.

```
paste(places[,2], collapse = ", ")
```

[1] "Aiterhofen, Baalberge, Benzigerode, Bredelem, Bruchstedt, Calden, Dedeleben, Derenburg, Dillingen, Erfurt, Flomborn, Greußen, Halberstadt, Jechtingen, Kleinhadersdorf, Mangolding, Niederbösa, Niedertiefenbach, Nordhausen, Odagsen, Orlishausen, Remstädt, Schafstädt, Schwetzingen, Schönstedt, Sengkofen, Sondershausen, Sorsum, Tauberbischofsheim, Taubertal, Trebur, Wandersleben, Warburg, Wittmar, Worms"

In some cases, the tabular data is derived from regional summaries, e.g. for the Late Neolithic Corded Ware in the Tauber Valley or the Middle Neolithic Baalberge burials from a region, localised with the eponymous site.

2.3 Content of life tables

The general overview is comprised of two tables for individual and tabled data.

```
ld <- rbind(lifedata_ind, lifedata_tbl)
ld$from <- as.numeric(ld$from)
```

```
## Warning: NAs durch Umwandlung erzeugt
```

```
ld$to <- as.numeric(ld$to)
```

```
## Warning: NAs durch Umwandlung erzeugt
```

There are cases where I first entered the tabulated data and then the individual data. Both datasets have advantages and disadvantages, which is why both are offered. These duplicate sites are not excluded from the subsequent data presentation. Duplicate site names are:

```
ind.sites <- unique(lifedata_ind$site)
tab.sites <- unique(lifedata_tbl$site)
sort(as.character(factor(tab.sites, levels = ind.sites)))
```

```
## [1] "Schwetzingen"
```

Neolithic periods are abbreviated: **E**arly, **M**iddle, **Y**ounger, **L**ate and **F**inal.

```
ld$period <- factor(ld$period, levels = c("EN","MN", "YN", "LN","FN"))
ld %>%
  group_by(., period) %>%
  summarise(count = sum(count)) %>%
  knitr::kable(caption = "Number of individuals in each period.",
               col.names = c("Period", "Count"))
```

Table 2: Number of individuals in each period.

Period	Count
EN	1129.80
MN	258.00
YN	233.98
LN	863.68
FN	263.00

Archaeological cultures per period.

```
ld %>%
  group_by(., period, culture) %>%
  summarise(count = sum(count)) %>%
  knitr::kable(caption = "Number of individuals in each archaeological culture.",
               col.names = c("Period", "Culture", "Count"))
```

```
## `summarise()` has grouped output by 'period'. You can override using the
## `.groups` argument.
```

Table 3: Number of individuals in each archaeological culture.

Period	Culture	Count
EN	LBK	1129.80
MN	Großgartach	49.00
MN	Hinkelstein	112.00
MN	Rössen	2.00
MN	Rössen, Großgartach	95.00
YN	Baalberge	233.98

Period	Culture	Count
LN	Bernburg	415.70
LN	TRB	157.98
LN	Wartberg	290.00
FN	Corded Ware	263.00

Number of individuals per simplified sex determination. The high proportion of undetermined sex results from the tabular data and the subadult individuals.

```
ld %>%
  group_by(., sex) %>%
  summarise(count = sum(count)) %>%
  knitr::kable(caption = "Number of individuals per sex.",
               col.names = c("Sex", "Count"))
```

Table 4: Number of individuals per sex.

Sex	Count
female	560.10
indet	1663.36
male	525.00

Sites, related citations and count of individuals.

```
ld %>%
  group_by(., site, literature) %>%
  summarise(count = sum(count)) %>%
  knitr::kable(caption = "Number of individuals per site",
               col.names = c("Site", "Literature", "Count"))
```

```
## `summarise()` has grouped output by 'site'. You can override using the
## `.groups` argument.
```

Table 5: Number of individuals per site

Site	Literature	Count
Aiterhofen-Ötmühlen	Baum 1990, 186 Tab. 10	98.000
Baalberge-cemeteries	Funke 2006, Tab. 8	58.990
Baalberge-grave-sites	Funke 2006, Tab. 9	174.990
Benzigerode	Berthold et al. 2008, 113	43.000
Bredelem	mortAAR::gallery_graves	13.000
Bruchstedt	Bach 1978, Tab. 2	34.000
Bruchstedt	Bach 1978, Tab. 3	15.000
Calden I	mortAAR::gallery_graves	24.000
Calden II	Pasda 2000, 319 Tab. 7	110.000
Dedeleben	Gall et al 1983, Tab. 1	23.000
Derenburg	Bach 1981, Tab. 1	90.000
Derenburg-Meerenstieg	Fritsch et al. 2011, Tab. 3	48.000
Dillingen-Steinheim	Nieszery 1995, 312 ff.	27.000
Erfurt-Nordhäuser Str.	Bücke et al. 1989, 41-45	13.000
Flomborn	Richter 1968/69, 160-174	32.000
Greußen-LPG-Kiesgrube	Feustel et al 1966, 49-60	7.000
Halberstadt-Sonntagsfeld	Fritsch et al. 2011, Tab. 8	42.000
Jechtingen-Humbergäcker	Alt et al. 2014, Tab. 1	95.000
Kleinhadersdorf	Neugebauer-Maresch/Lenneis 2015, 359 f.	51.000
Mangolding	Nieszery 1995, 310 f.	13.000

Site	Literature	Count
Niederbösa	Feustel/Ullrich 1964/65, 135	99.700
Niedertiefenbach	mortAAR::gallery_graves	50.000
Nordhausen	Feustel/Ullrich 1964/65, 134	50.000
Odagsen	Rinne 2003, 67 Tab. 17	102.980
Orlishausen/Otterzunge	Bach et al 1975, 50-52	12.000
Remstädt	Fuchs 2013, 56-73	11.000
Schafstädt	Hummel 2000	70.000
Schwetzingen	Gerling 2012, Katalog.	211.000
Schwetzingen	Gerling/Francken 2007, Abb. 6	210.800
Schönstedt	Bach / Bach 1972, 78	64.000
Sengkofen	Nieszery 1995, 305 f.	31.000
Sondershausen	Bach 1978, Tab. 2	34.000
Sondershausen	Bach 1978, Tab. 3	25.000
Sorsum	mortAAR::gallery_graves	42.000
Tauberbischofsheim-Dittigheim	Dresely 2004, Tab. 42	58.004
Tauberbischofsheim-Impfingen	Dresely 2004, Tab. 43	32.992
Taubertal	Dresely 2004, Tab. 45	58.004
Trebur	Spatz 1999, Tab. 72-79	124.000
Wandersleben	Gall et al 1983, Tab. 1	46.000
Wandersleben-Cobstädter Str.	Bach 1986, Tab. 3	246.000
Warburg I	Löwen 1997, 44, Tab. 6	32.000
Warburg III	Löwen 1997, 44, Tab. 6	44.000
Warburg IV	Löwen 1997, 44, Tab. 6	30.000
Wittmar	Rötting 1983, 142	15.000
Worms-Rheindürkheim	Meier-Arendt 1975, 213-223.	17.000
Worms-Rheingewann	Meier-Arendt 1975, 191-212.	20.000

The age ranges depend mainly on the traditional age groups and the usual 5-year-intervals in life tables. Two different illustrations can show the dependence between the determined age at death and the accuracy of the age range.

```
ld %>%
  select(., from, to) %>%
  filter(., !is.na(from)) %>%
  filter(., !is.na(to)) %>%
  mutate(., range = to - from) %>%
  mutate(., agegroup = ifelse(to < 20, 'subadult', 'adult')) %>%
  arrange(., from, to) -> ages
id <- seq(nrow(ages))
plot(c(0,100), c(0,nrow(ages)), xlab = "Age from to", ylab = "Individual", type = "n") +
segments(ages$from[id], id, ages$to[id], id)
```

```
## integer(0)
```

```
boxplot(range~agegroup, data = ages, xlab = "Age group", ylab = "Age range")
```

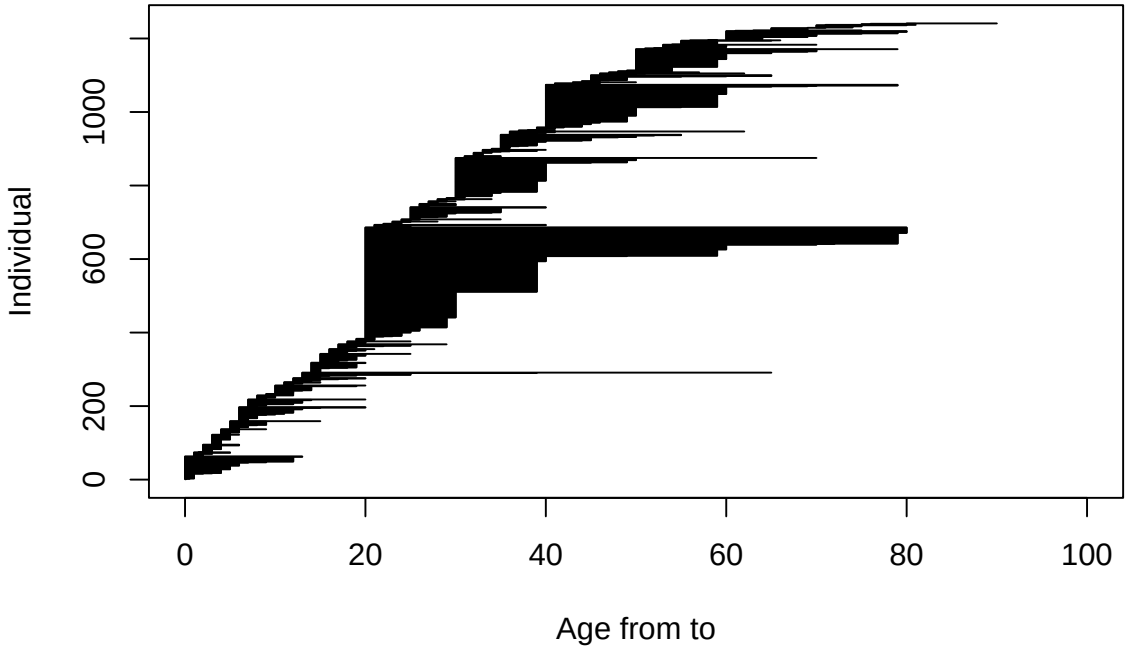


Figure 2: Age range per individual.

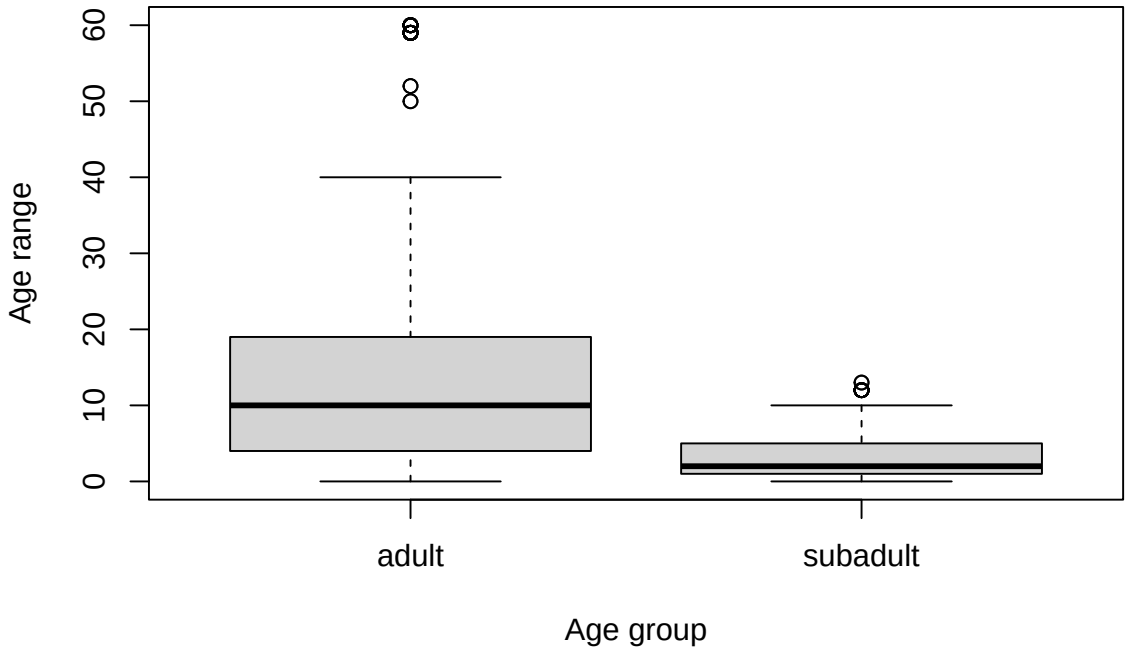


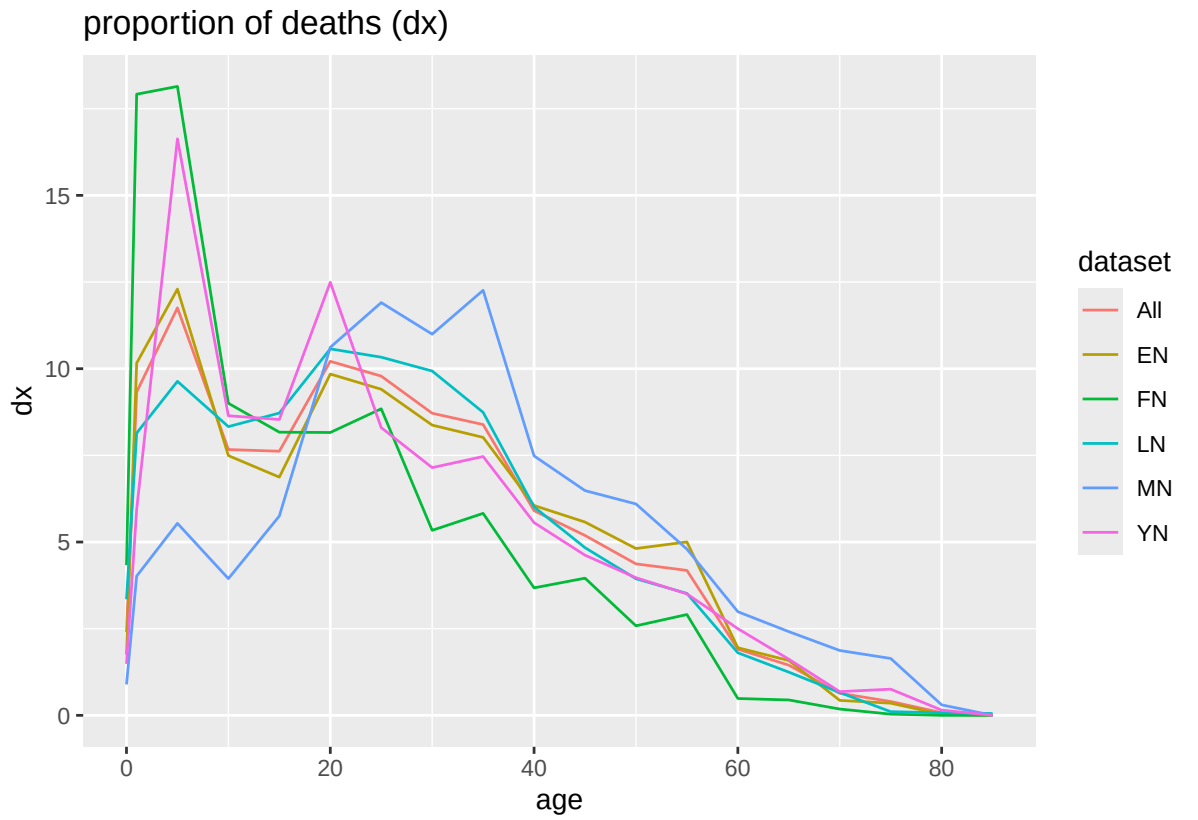
Figure 3: Age range for subadult (< 20) and adult individuals.

2.4 Overview of age at death (dx).

The following plots are created with the R-package mortAAR[2] without an interpolation (method = standard) for various groupings.

2.4.1 Periods

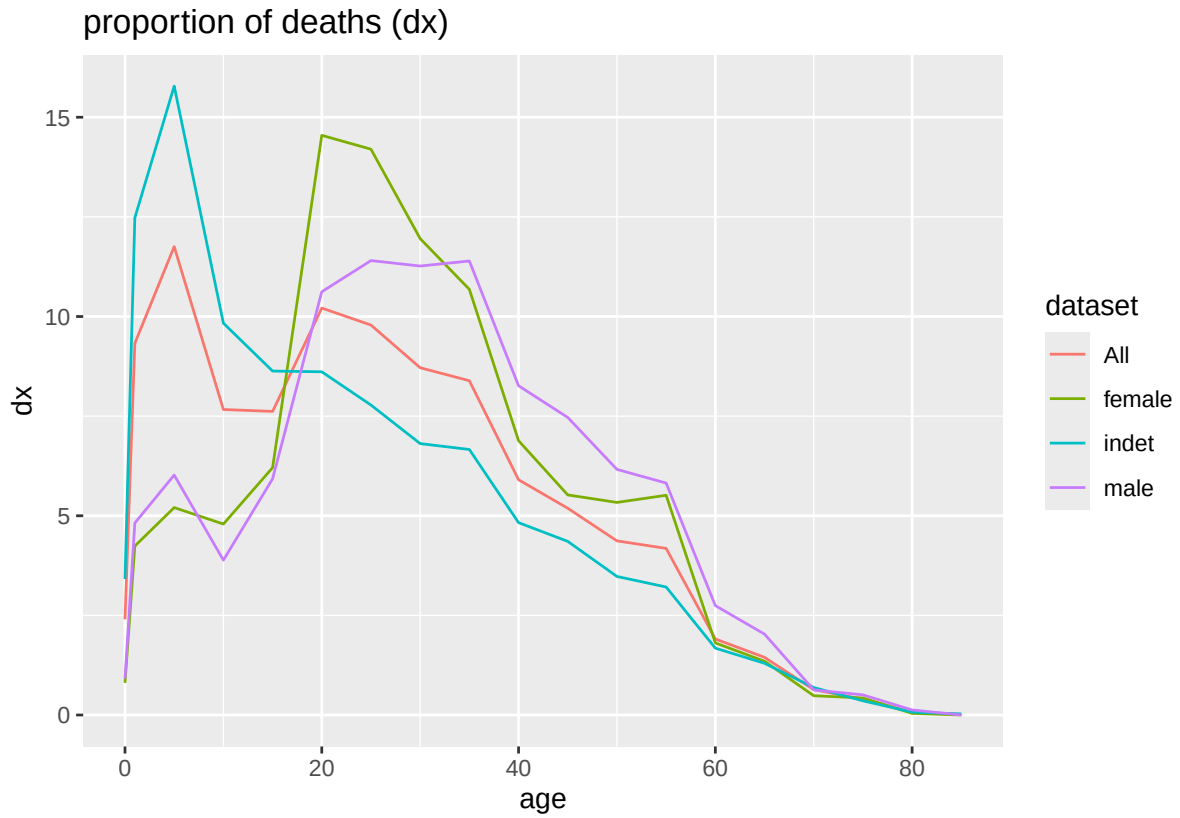
```
prep.life.table(ld, dec = "count", agebeg = "from", ageend = "to",
  group = "period", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```



2.4.2 Sex

```
prep.life.table(ld, dec = "count", agebeg = "from", ageend = "to",
  group = "sex", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```

[2]If you observe strange plot lines in the ggplots of mortAAR, please consider the installation of the latest version of mortAAR from github.

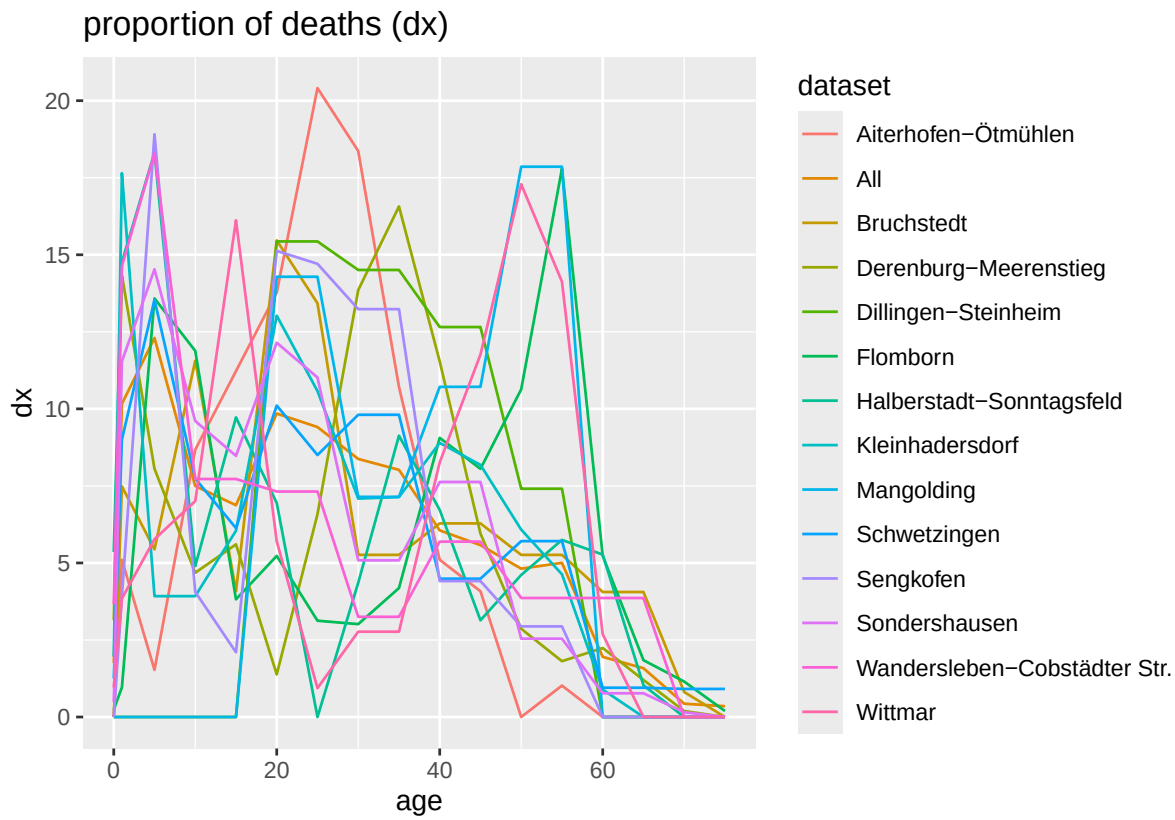


2.4.3 Sites per period

The following diagrams show very heterogeneous data. It is obvious that each data set has its own weaknesses and requires careful and detailed analysis. Furthermore, this does not rule out significant differences in their relation to previous living conditions.

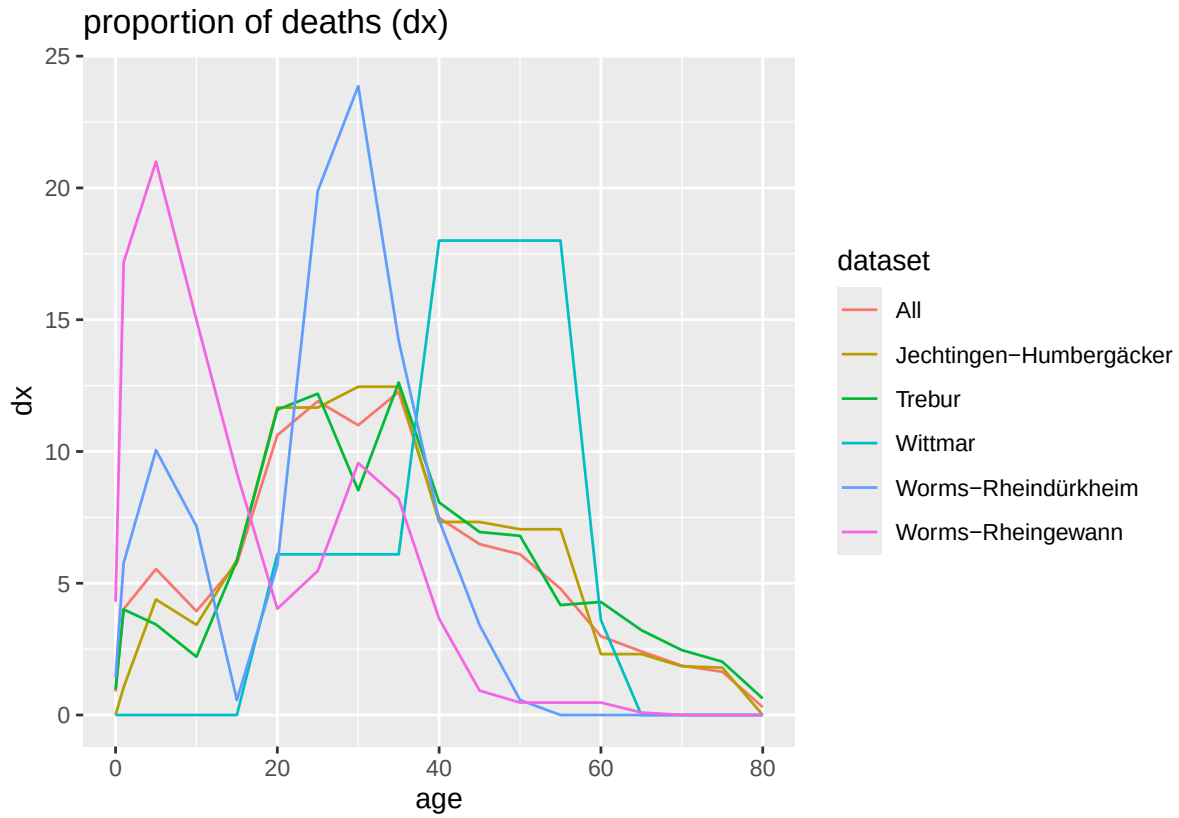
The sites from the **Early Neolithic**.

```
ld %>%
  filter(.,period == "EN") %>%
  prep.life.table(., dec = "count", agebeg = "from", ageend = "to",
  group = "site", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```



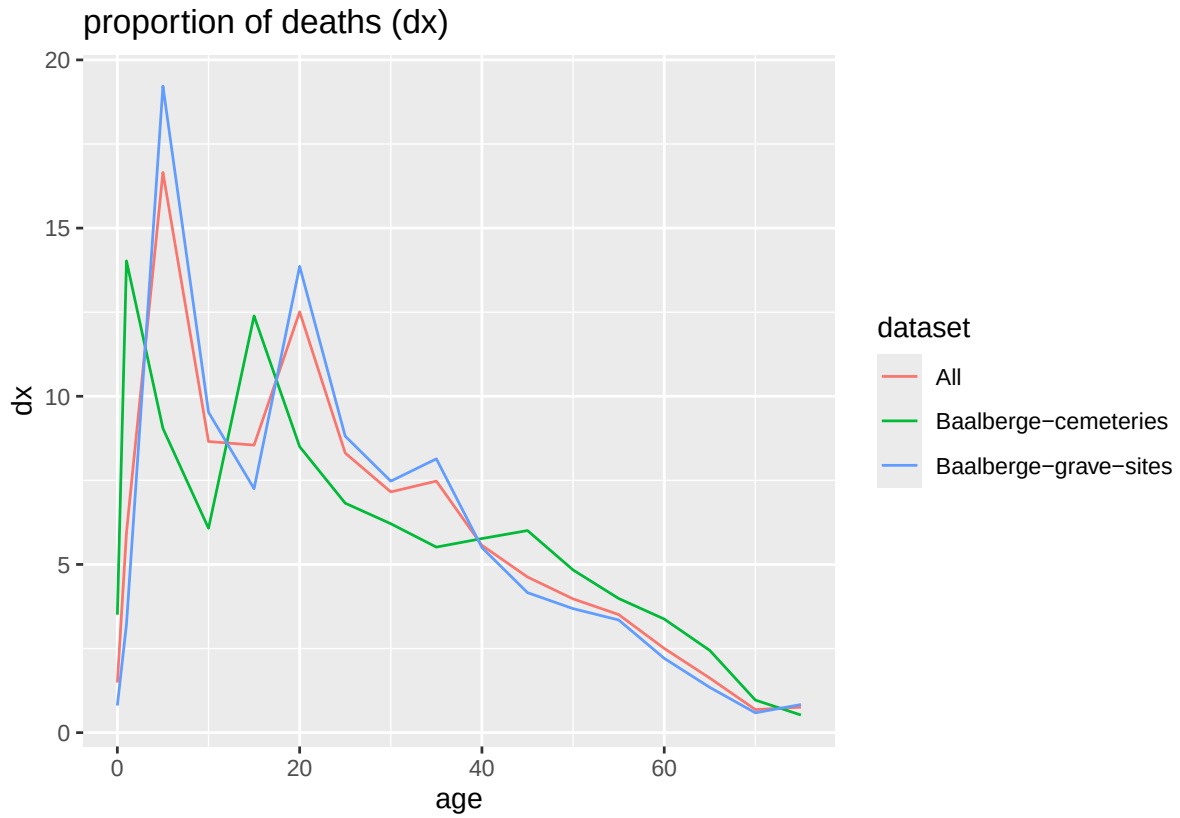
The sites from the **Middle Neolithic**.

```
ld %>%
  filter(.,period == "MN") %>%
  prep.life.table(., dec = "count", agebeg = "from", ageend = "to",
  group = "site", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```



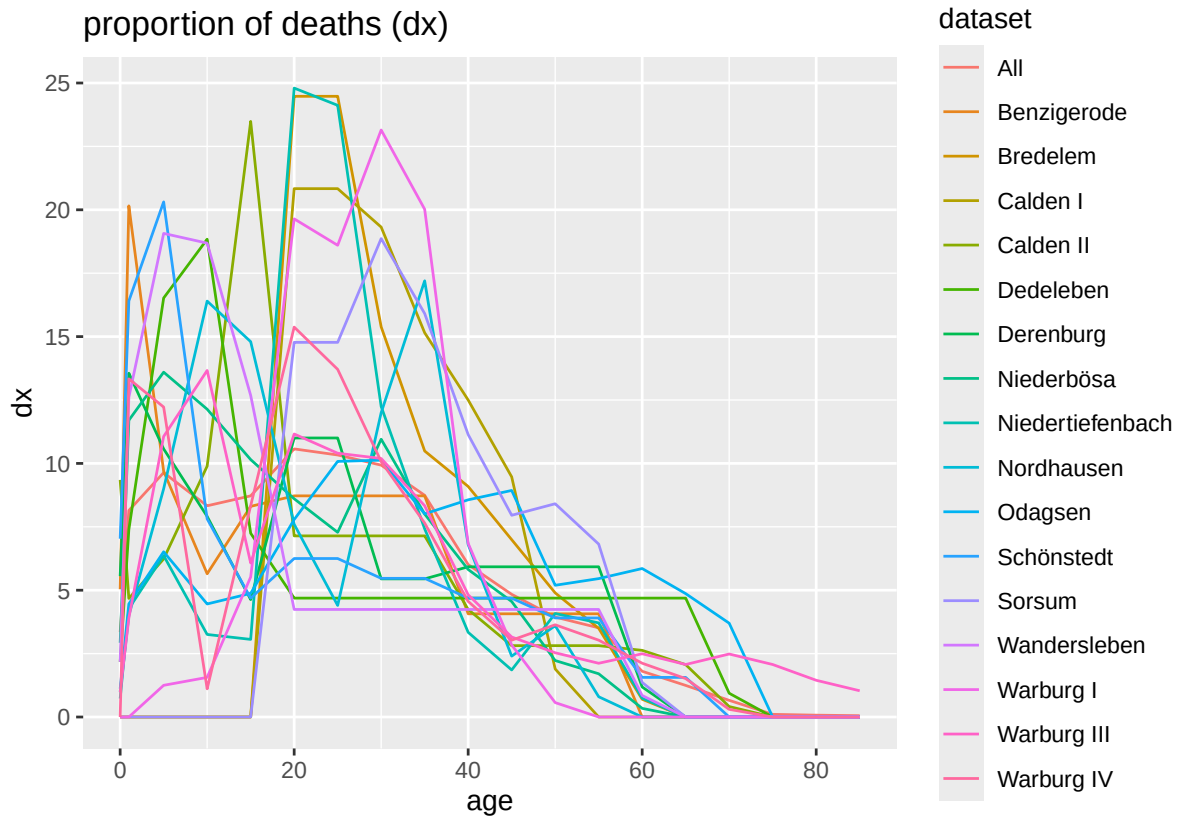
The sites from the **Younger Neolithic**.

```
ld %>%
  filter(.,period == "YN") %>%
  prep.life.table(., dec = "count", agebeg = "from", ageend = "to",
  group = "site", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```



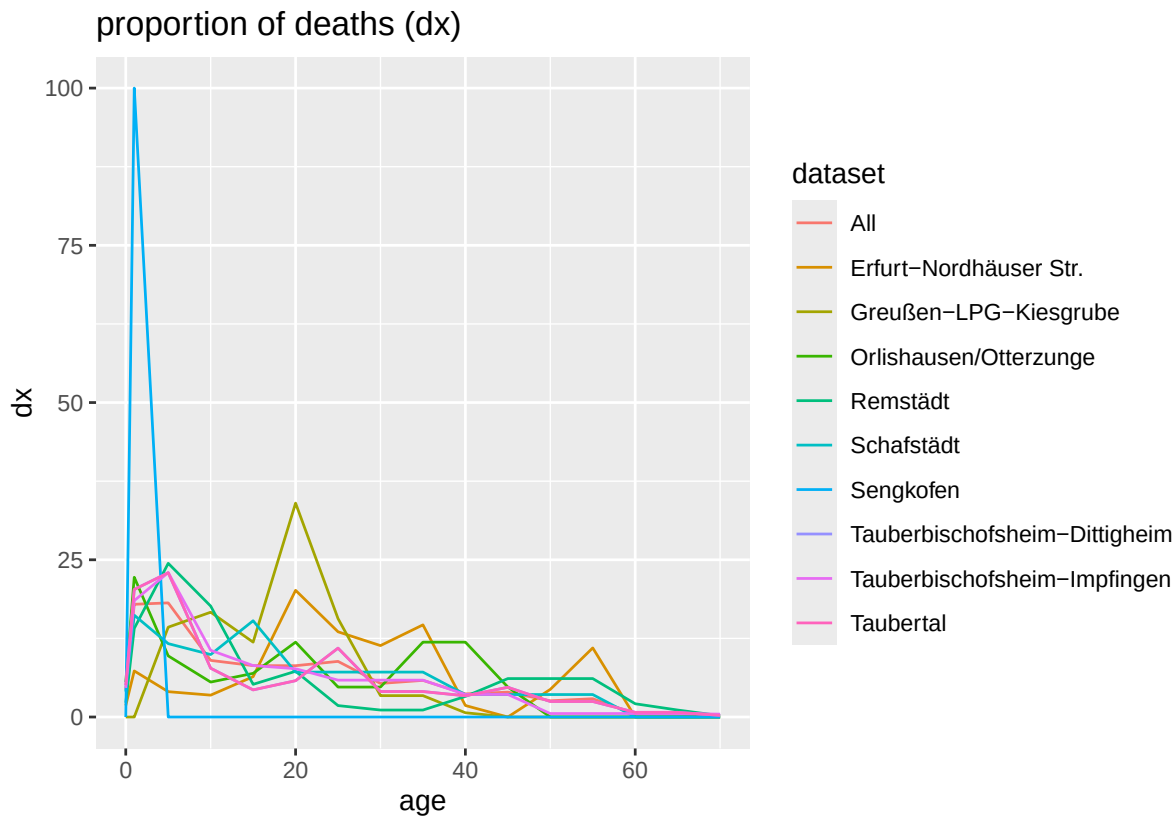
The sites from the **Late Neolithic**.

```
ld %>%
  filter(.,period == "LN") %>%
  prep.life.table(., dec = "count", agebeg = "from", ageend = "to",
  group = "site", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```



The sites from the **Final Neolithic**.

```
ld %>%
  filter(.,period == "FN") %>%
  prep.life.table(., dec = "count", agebeg = "from", ageend = "to",
  group = "site", method = "standard", agerange = "included") %>%
  life.table(.) %>%
  plot(., display = c("dx"), line_vis="color")
```


proportion of deaths (dx)
dx
100
75
50
25
0
0
20
40
60
age
dataset
All
Erfurt−Nordhäuser Str.
Greußen−LPG−Kiesgrube
Orlishausen/Otterzunge
Remstädt
Schafstädt
Sengkofen
Tauberbischofsheim−Dittigheim
Tauberbischofsheim−Impfingen
Taubertal