Lexis Diagram

Vladimir Canudas-Romo

School of Demography

Research School of Social Sciences

ANU School of Demography

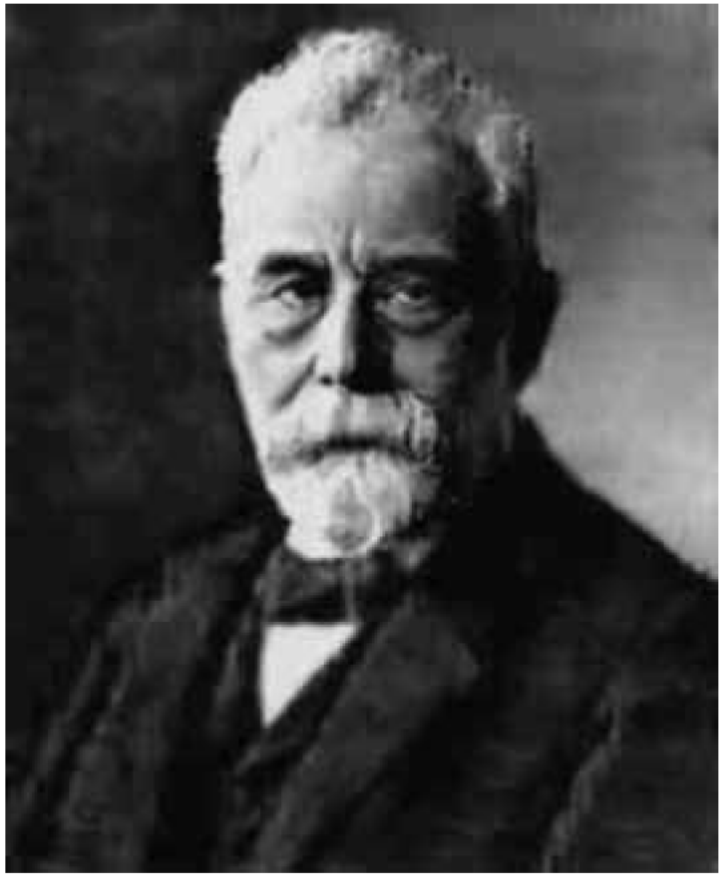
Lexis Diagrams: Construction.

- A graphical representation of demographic events

- Every demographic event has two numbers: the time and age at which it occurs

Demography is Two-Dimensional.

Lexis Diagram



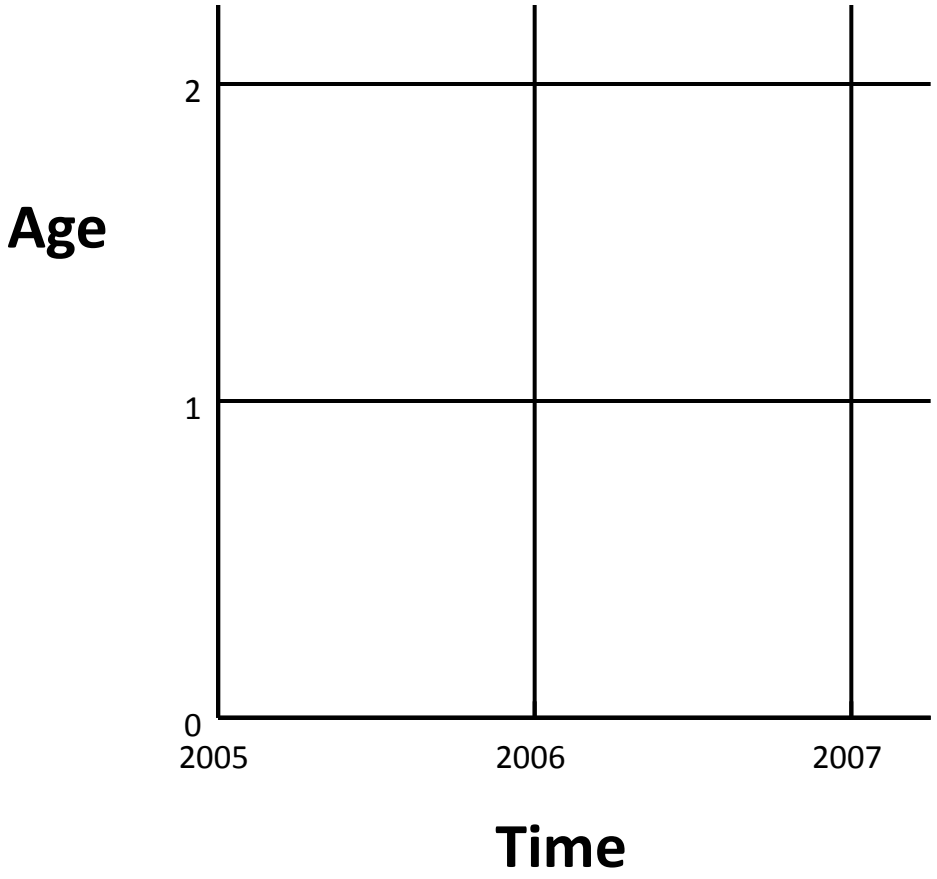
(1837, Eschweiler –1914, Gottingen)

Wilhelm Lexis published 1875 "Einleitung in die Theorie der Bevölkerungsstatistik", where he devised the Lexis-diagram.

(Actually his diagram was slightly different).

Demography is Two-Dimensional.

Lexis Diagram



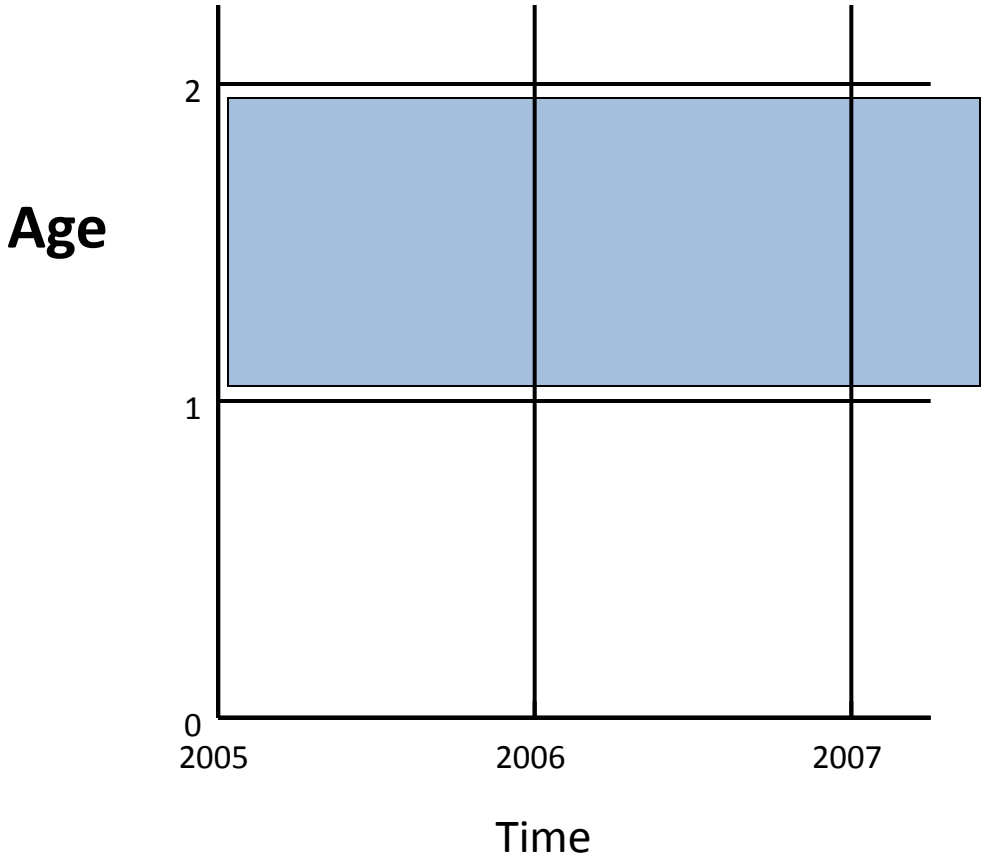
By convention

-Time is represented on the horizontal axis

-Age is represented on the vertical axis

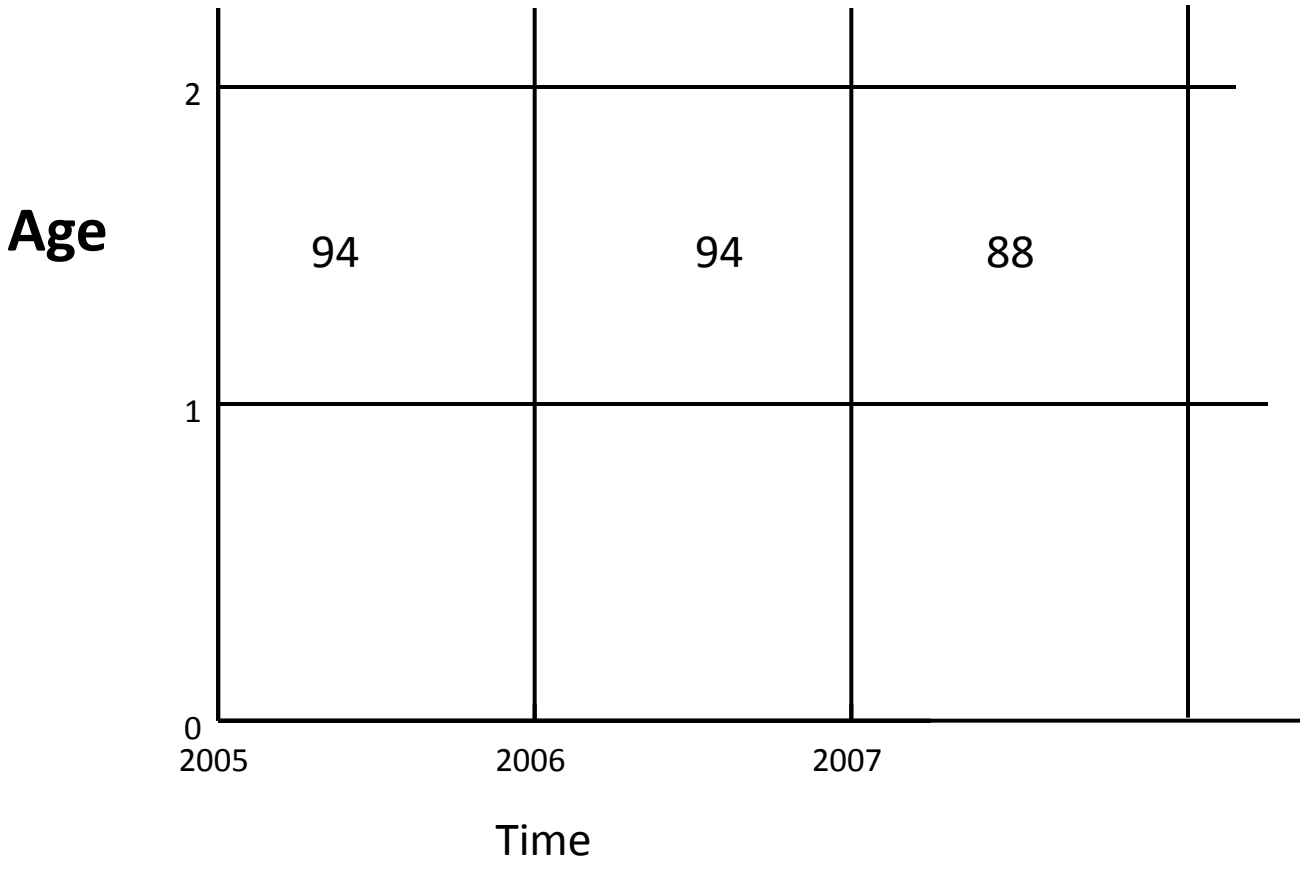
Demography is Two-Dimensional.

Lexis Diagram



Demography is Two-Dimensional.

Lexis Diagram : showing deaths at age 1 in Australia, 2005 to 2007



Source: Human Mortality Database

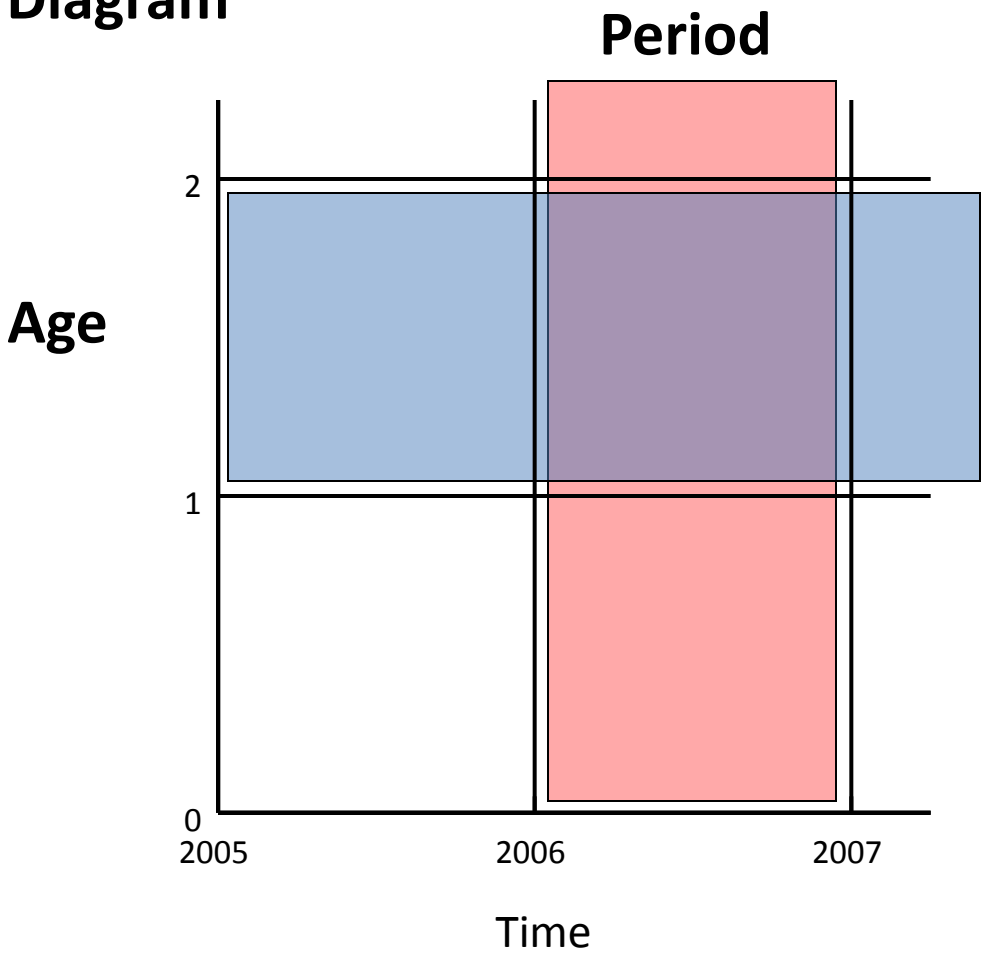
Period Data

- Most demographic data are period data

- Such data are usually represented by counts of events in squares or rectangles of the lexis diagram

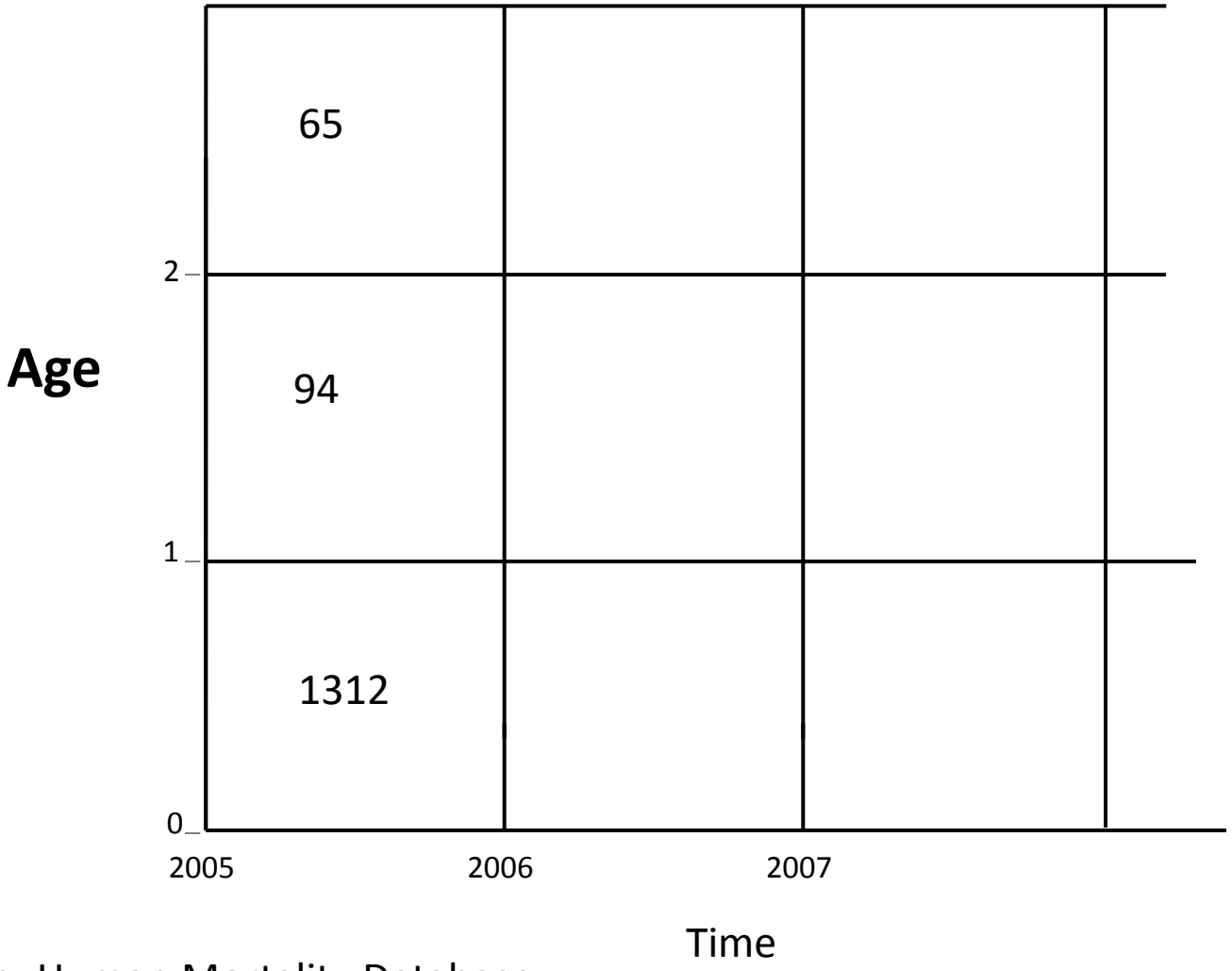
Demography is Two-Dimensional.

Lexis Diagram



Demography is Two-Dimensional.

Lexis Diagram : showing deaths in Australia in the year of 2005



Source: Human Mortality Database

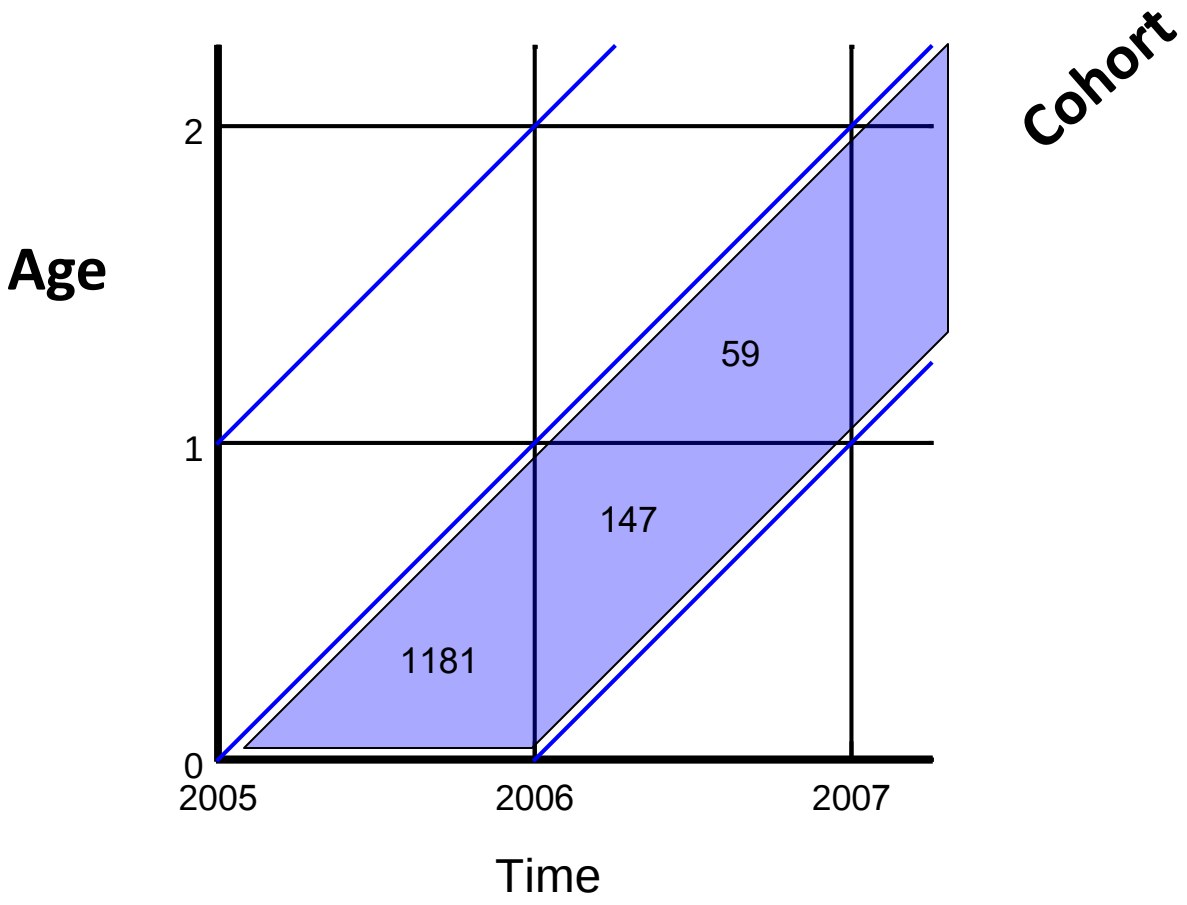
Cohort Data.

- *Cohort*—a group of persons who experience an event in the same time period (e.g., birth, marriage)

- The lexis diagram shows the experience of a cohort as it moves through life, represented by a parallelogram in the lexis diagram

Demography is Two-Dimensional.

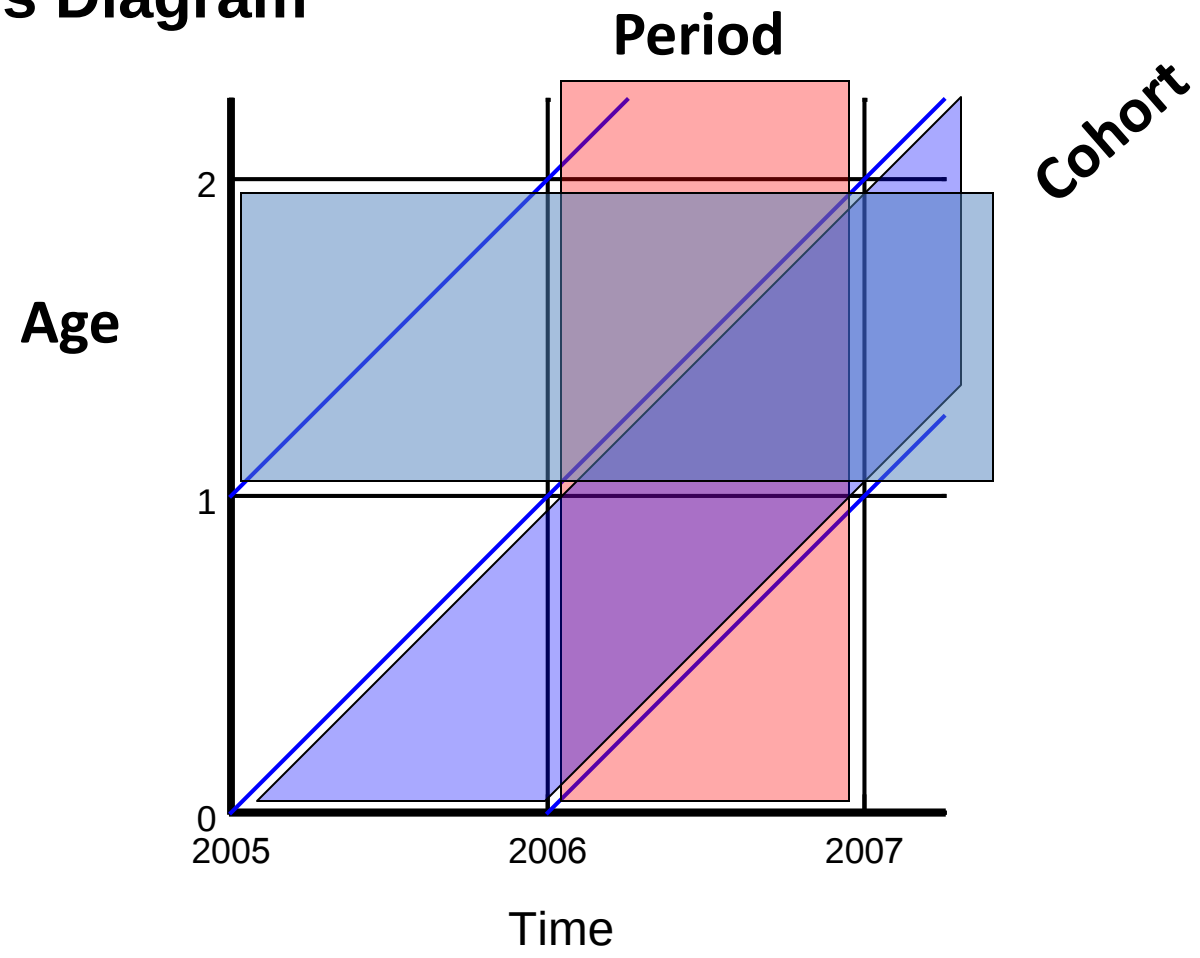
Lexis Diagram : showing deaths in Australia for the cohort of 2005



Source: Human Mortality Database

Demography is Two-Dimensional.

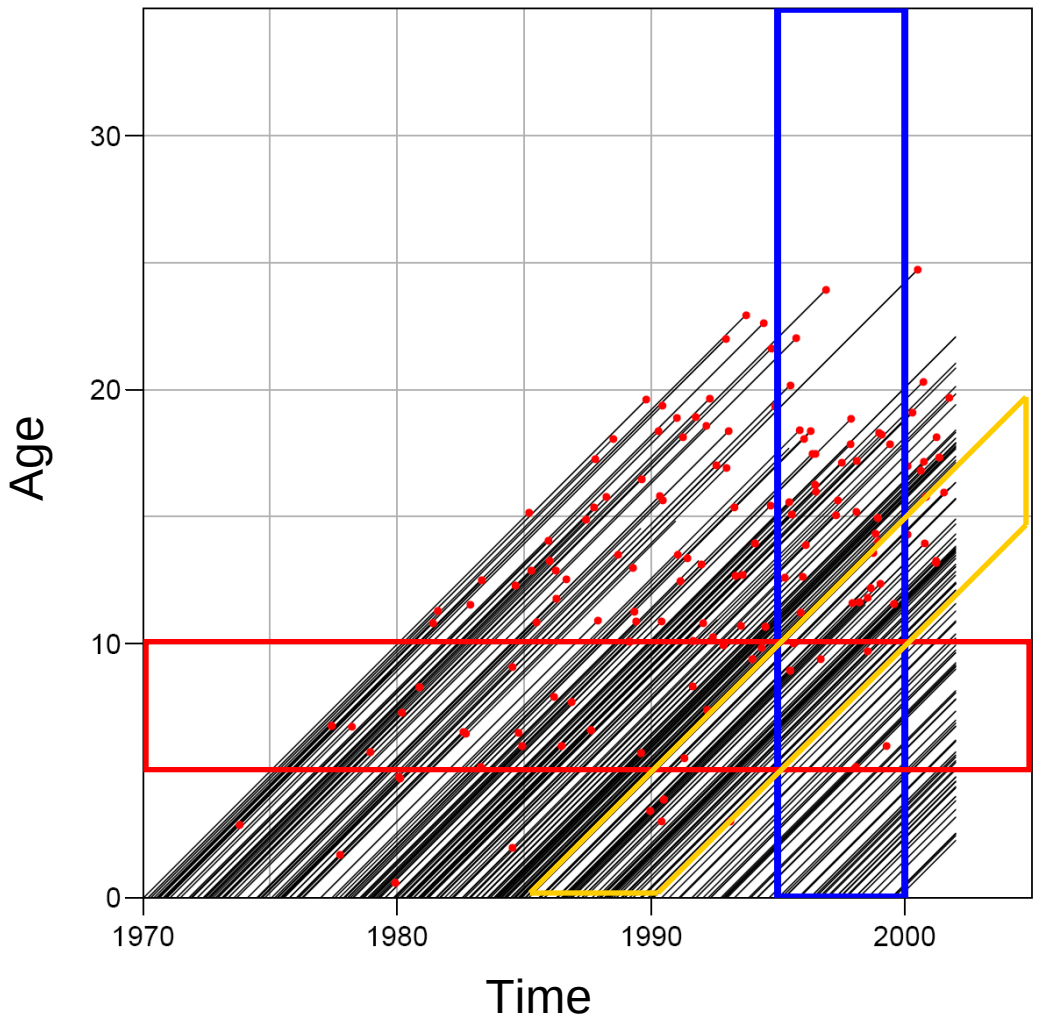
Lexis Diagram



Age = Period - Cohort

Demography is Two-Dimensional.

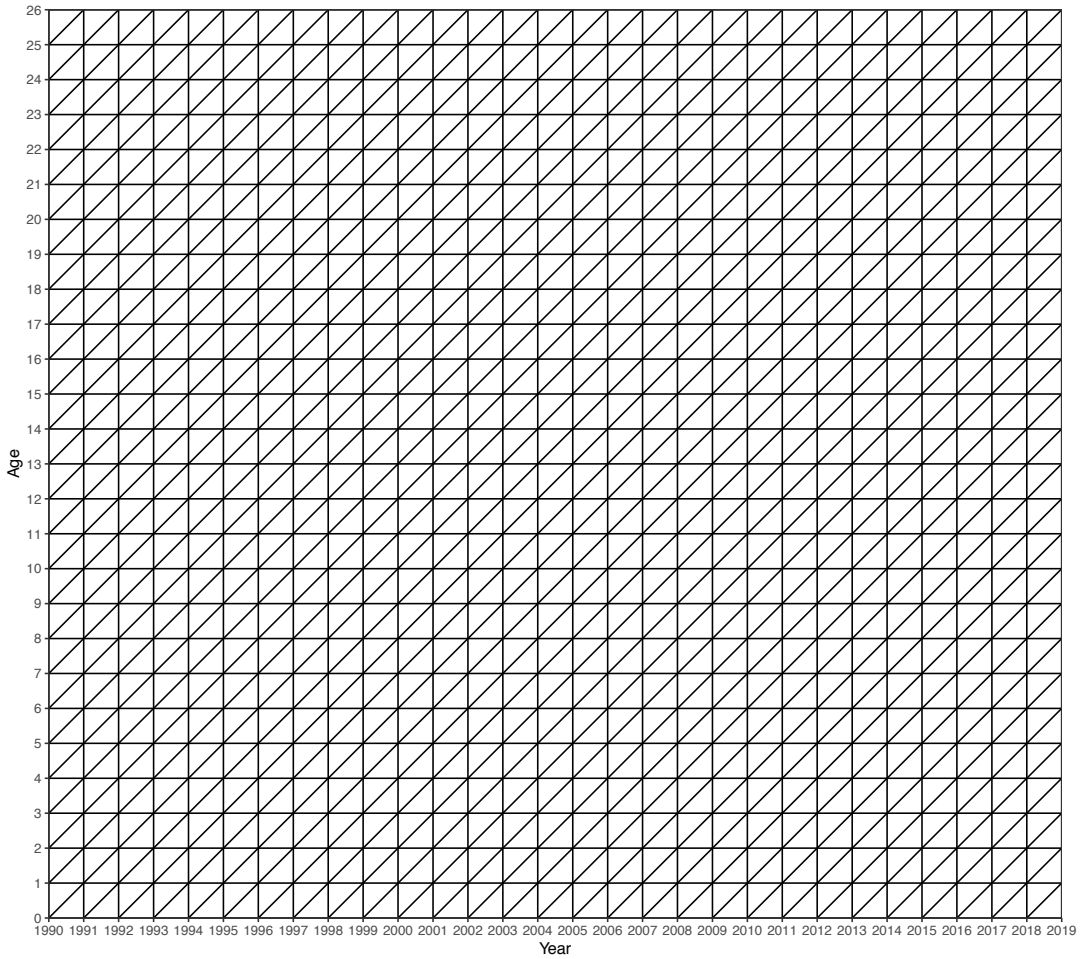
Lexis Diagram



Exercise 1.

Complete the exercise by assigning the correct statement to the coloured areas of the lexis diagram.

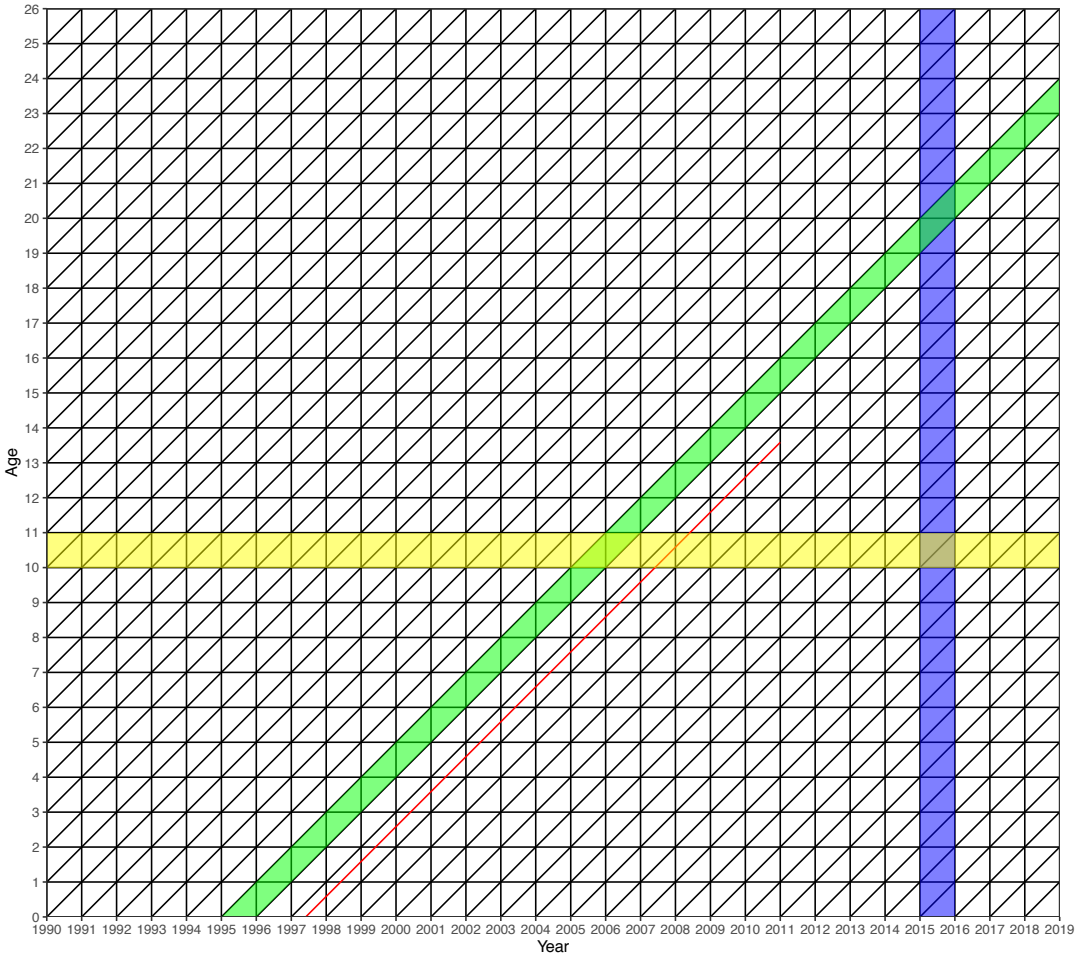
- Events happening in the year 2015
- Events happening to an individual born in June 1997 before the start of his or her reproductive life
- Events happening to the cohort born in 1995
- Events happening to the population aged 10, over time. When were these people born?



Exercise 1.

Complete the exercise by assigning the correct statement to the coloured areas of the lexis diagram.

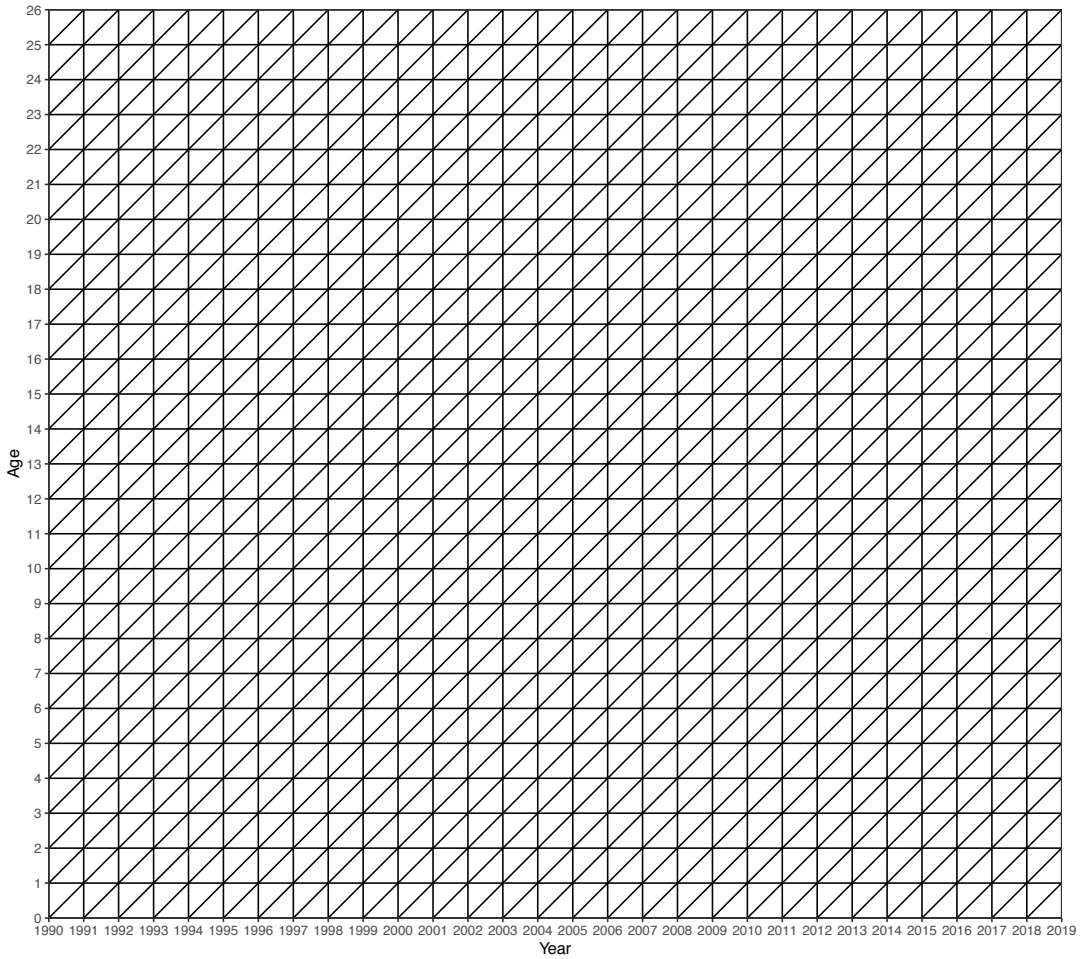
- Events happening in the year 2015
- Events happening to an individual born in June 1997 before the start of his or her reproductive life
- Events happening to the cohort born in 1995
- Events happening to the population aged 10, over time. When were these people born?



Exercise 2.

Complete the exercise by colouring the correct areas of the lexis diagram.

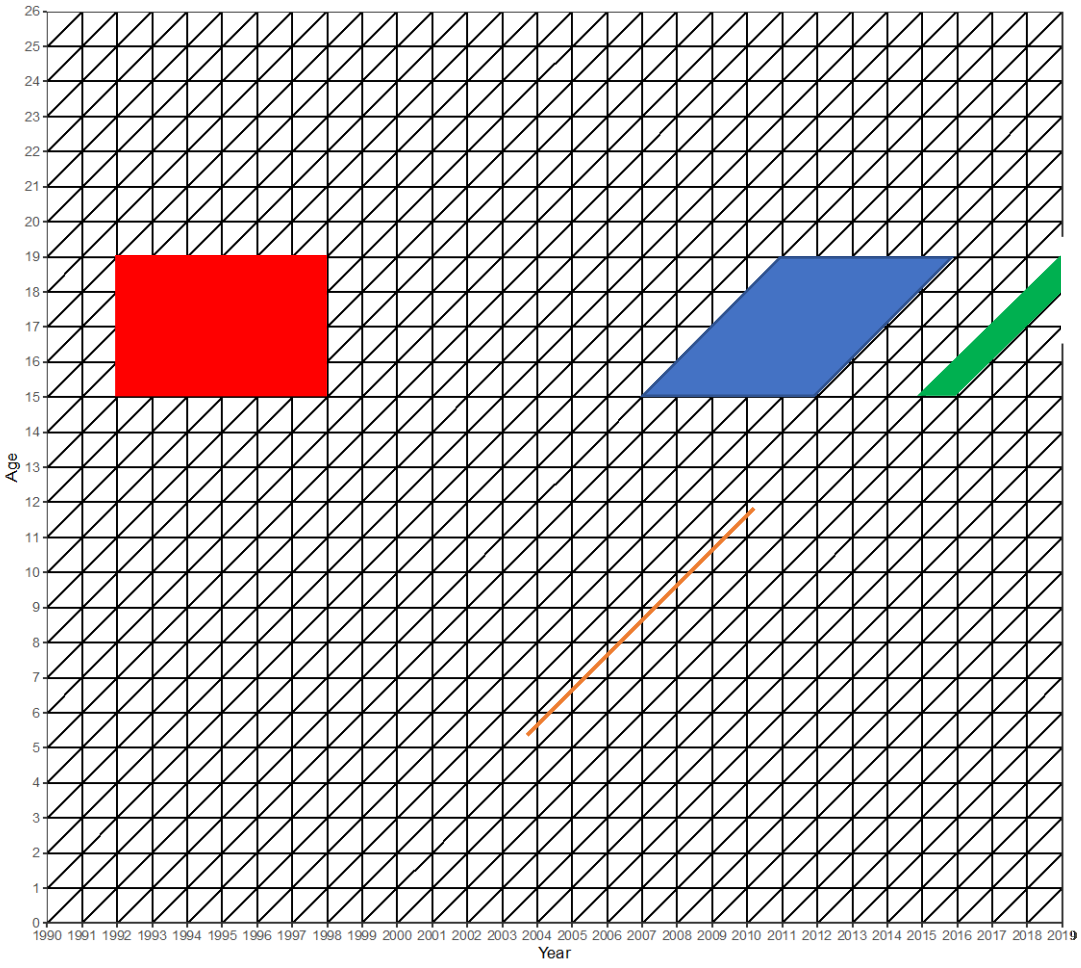
- Events happening to individuals aged 15-19 during the period 1992-1997.
- Events happening to individuals aged 15-19 born between 1992 and 1997.
- Events happening to the 2000 birth cohort after the beginning of their reproductive lifespan.
- Draw the lifeline of an individual born in 1998 entering at the age of 5 and exiting at the age of 11.



Exercise 2.

Complete the exercise by colouring the correct areas of the lexis diagram.

- Events happening to individuals aged 15-19 during the period 1992-1997.
- Events happening to individuals aged 15-19 born between 1992 and 1997.
- Events happening to the 2000 birth cohort after the beginning of their reproductive lifespan.
- Draw the lifeline of an individual born in 1998 entering at the age of 5 and exiting at the age of 11.



Overview

- Suggested reading:

- http://papp.iussp.org/

  PAPP101-session 02 and 03

Fertility

Vladimir Canudas-Romo

School of Demography

Research School of Social Sciences

ANU School of Demography


How Many?

Definitions

- *Fecundability*—Probability that a woman will conceive during a menstrual cycle
- *Fertility (natality)*—Manifestation of fecundity
- *Infertility*—Inability to bear a live birth
- *Natural fertility*—Fertility in the absence of deliberate parity-specific control

Highest number of children

Ismail Ibn Sharif (1634/45 - 1727), ruler of Morocco is said to have fathered at least 867 children (525 sons, 342 daughters).

Largest family

Ziona (1944/45 -) is the head of the largest contemporary family with 39 wives, 94 children and 33 grandchildren (as of 2011).

Highest recorded fertility

- Canadian hutterites (1920) 10.9 births on average per woman.

Crude Birth Rate (CBR)

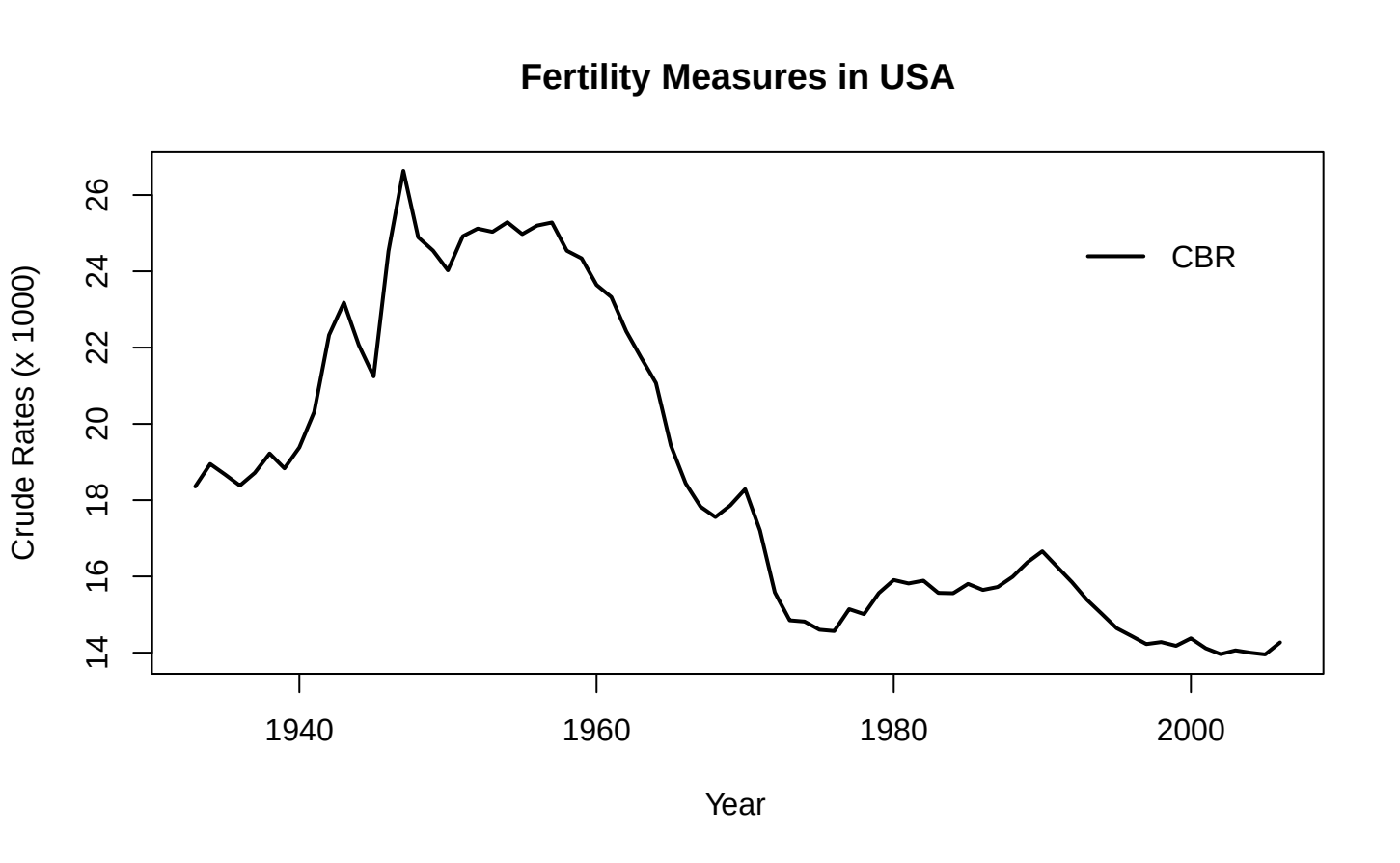
Crude Birth Rate—Number of births per 1,000 population

$$CBR =$$

Crude Birth Rate (CBR)

Crude Birth Rate—Number of births per 1,000 population

$$CBR = \frac{Births}{MdYr - Pop} = \frac{B}{PY}$$


Fertility Measures in USA
Crude Rates (x 1000)
14
16
18
20
22
24
26
1940
1960
1980
2000
Year
CBR

Age-specific fertility rates

Age	Births	Women PY
12	65	2055137
13	290	2036109
14	1432	2036533
15	4725	2035024
16	11862	2026947
17	24494	2031896
18	47473	2074089
...	...	...
54	9	2174438
55	0	2226462

1) Construct age-specific measures of the intensity of fertility?
2) Summarize all the information of those age-specific measures in one number

data source: HFD, USA 2019

Age-Specific Fertility Rate (ASFR)

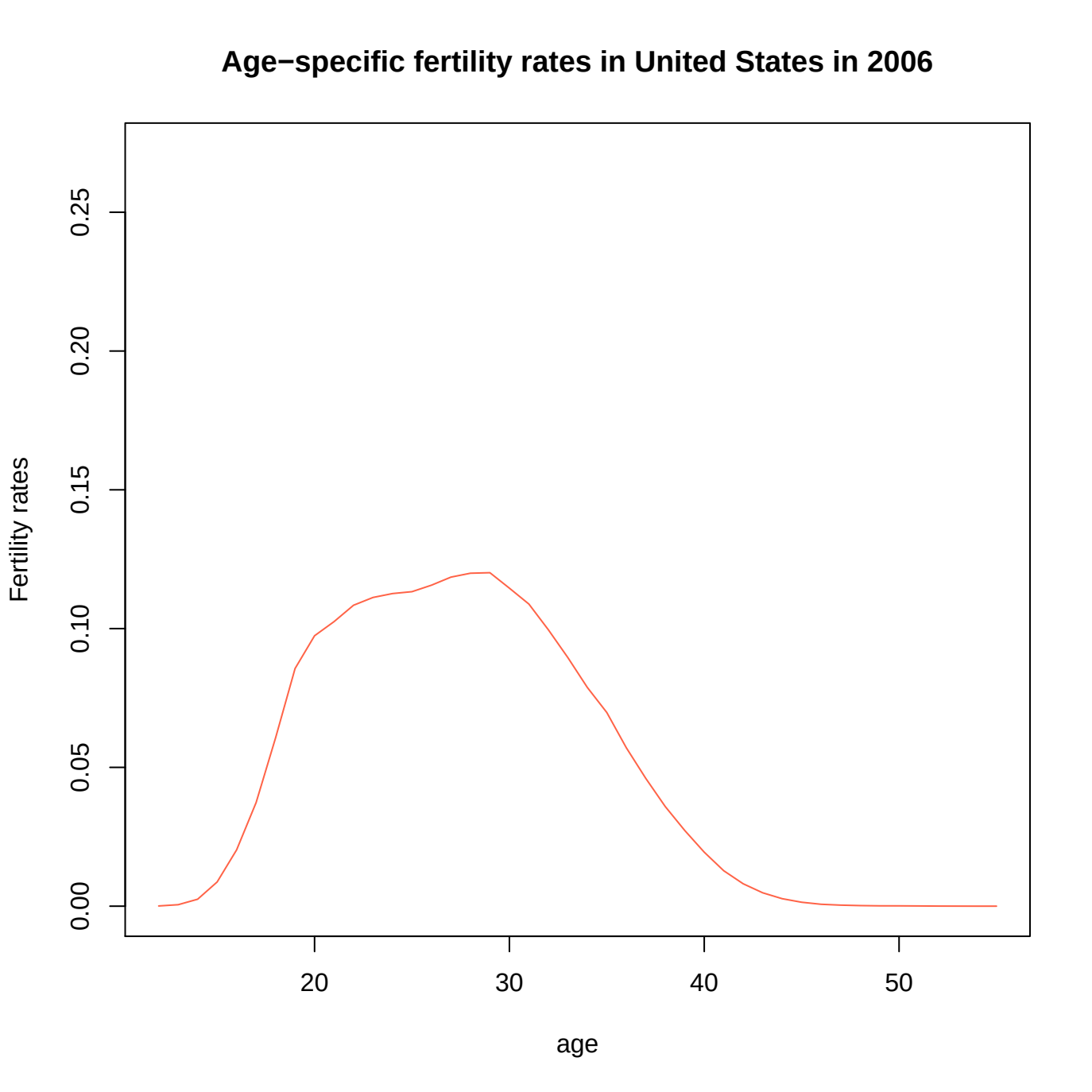
ASFR - Number of births per women of a specific age (group)

$$\frac{\qquad\qquad}{\qquad\qquad}$$

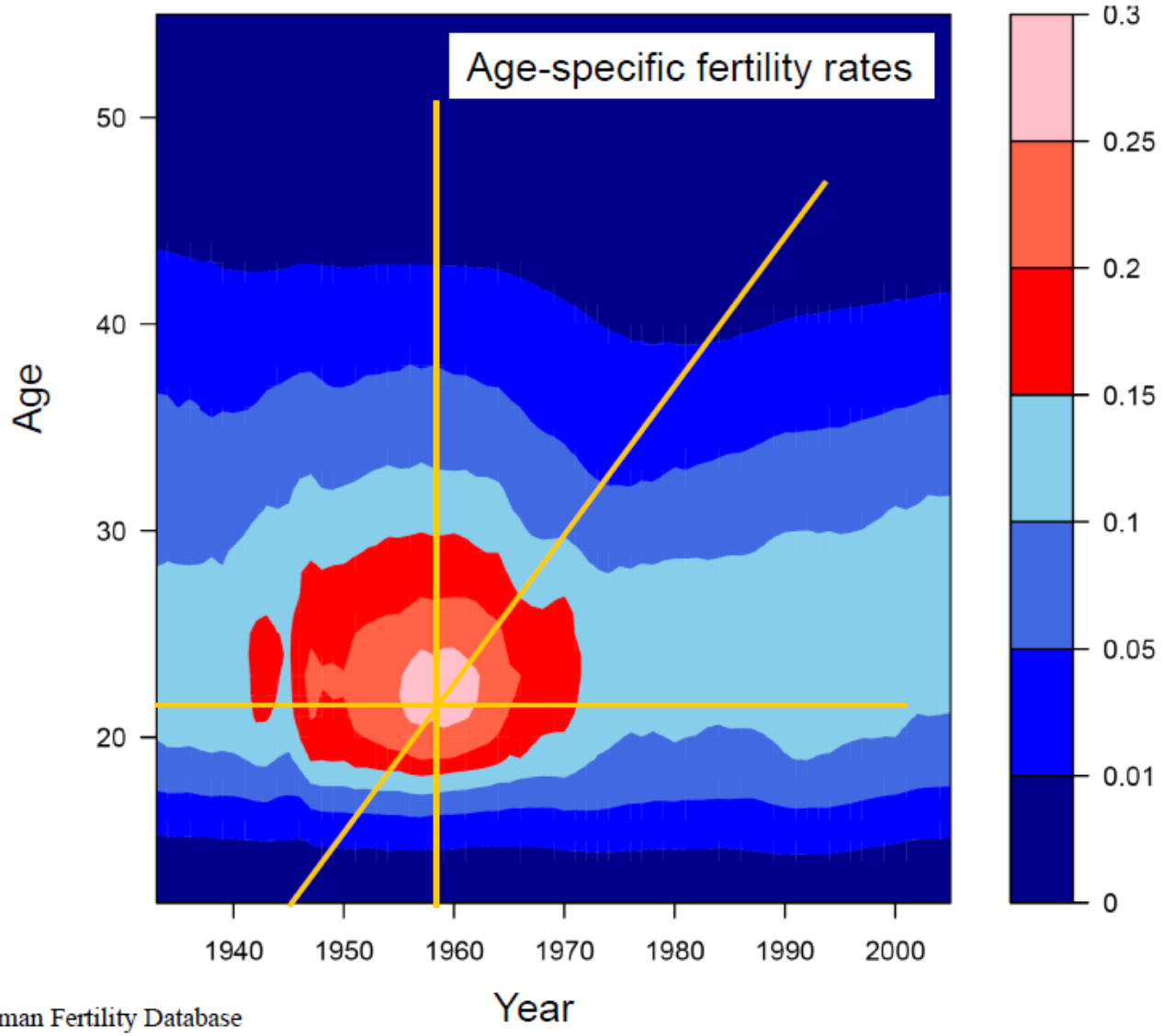
Age-Specific Fertility Rate (ASFR)

ASFR - Number of births per women of a specific age (group)

$$f(a) = \frac{B(a)}{W(a)}$$


Age−specific fertility rates in United States in 2006
Fertility rates
0.00
0.05
0.10
0.15
0.20
0.25
20
30
40
50
age

Lexis surface ASFR the USA



Source: Human Fertility Database

Mean Age at Childbearing, MAC

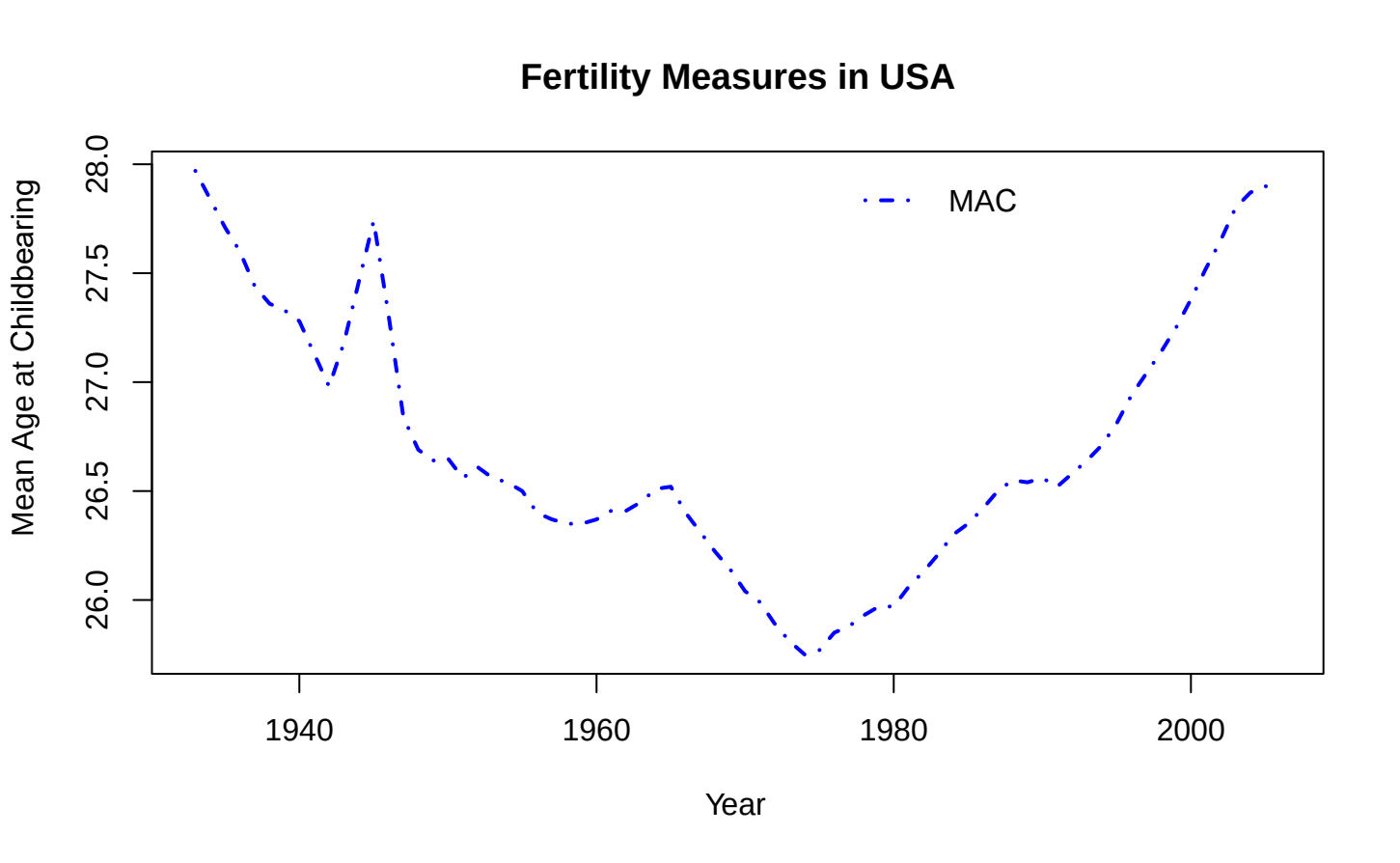
For single-year groups

$$MAC =$$

Mean Age at Childbearing, MAC

For single-year groups

$$MAC = \frac{\sum_{a=15}^{50} (a + .5) f(a)}{\sum_{a=15}^{50} f(a)}$$


Fertility Measures in USA
Mean Age at Childbearing
26.0
26.5
27.0
27.5
28.0
1940
1960
1980
2000
Year
MAC

Total Fertility Rate (TFR)

Total Fertility Rate—Number of children a woman will have **if** she lives through all the reproductive ages and follows the age-specific fertility rates of a given time period (usually one year)

Total Fertility Rate (TFR)

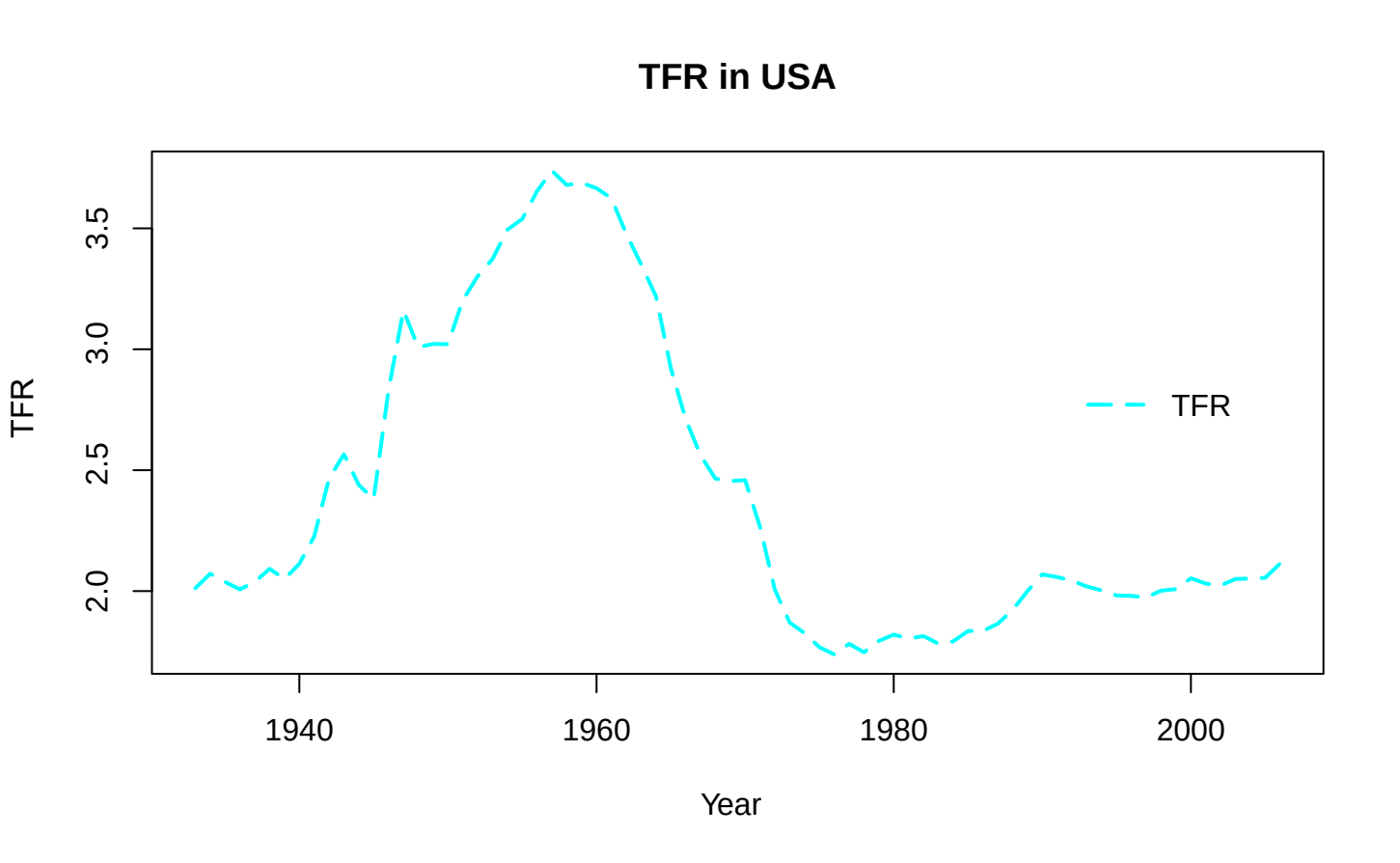
$$TFR =$$

For single age f(a)

Total Fertility Rate (TFR)

$$TFR = \sum_{a=12}^{55} f(a)$$

For single age f(a)


TFR in USA
TFR
2.0
2.5
3.0
3.5
1940
1960
1980
2000
Year
TFR

Recommended Reading

- Preston, et al. (2001). Demography: Chapter 5.

- PAPP101-session 04