Age pyramids

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Age pyramids

- There is theory to deal with age structure
  - It accounts for the relative numbers of young and old men and women in a population
- Basic idea is to obtain formulas for how a population will be theoretically distributed by age
  - If population has been closed to migration
  - If its birth and death rates have been unchanging for a long time

Actual ≠ Theoretical

- The actual age distribution of the population naturally differs from the theoretical age distribution

- Deviations are explained by
  - Events of migration
  - Changes in rates in the prior history of the population

General and special features

- The age distribution of each population has

- General features
  - Which it shares with populations with the same vital rates

- Special features
  - Which are derived from its own particular history

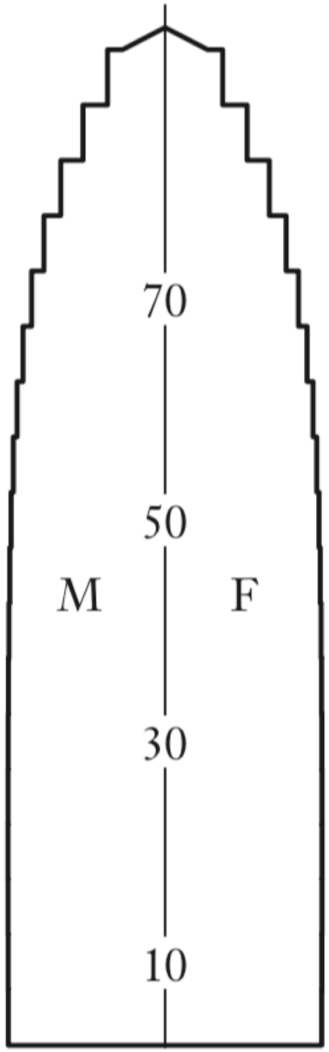
Graphical diagrams

- Age pyramid, age distribution, age structure
  - They represent the distribution of the population by age and sex
  - They are made up of a pair of bar graphs, one for men and one for women, turned on their sides and joined
- The vertical axis corresponds to age
  - The young are toward the bottom, the elderly toward the top
  - The open-ended age group at the very top is sometimes drawn with a triangle instead of bars
- For each age group
  - The bar coming off the axis to the right represents the number of women in that age group
  - The bar to the left the number of men

Idealized age pyramids

- Examples of idealized stable pyramids that occur in closed populations with unchanging vital rates
- Tall and slender
  - It is a case for a long-lived population with near zero growth
- Quite pyramidal in shape
  - It is a case for a population with heavy mortality and rapid growth

Tall and slender



Quite pyramidal in shape

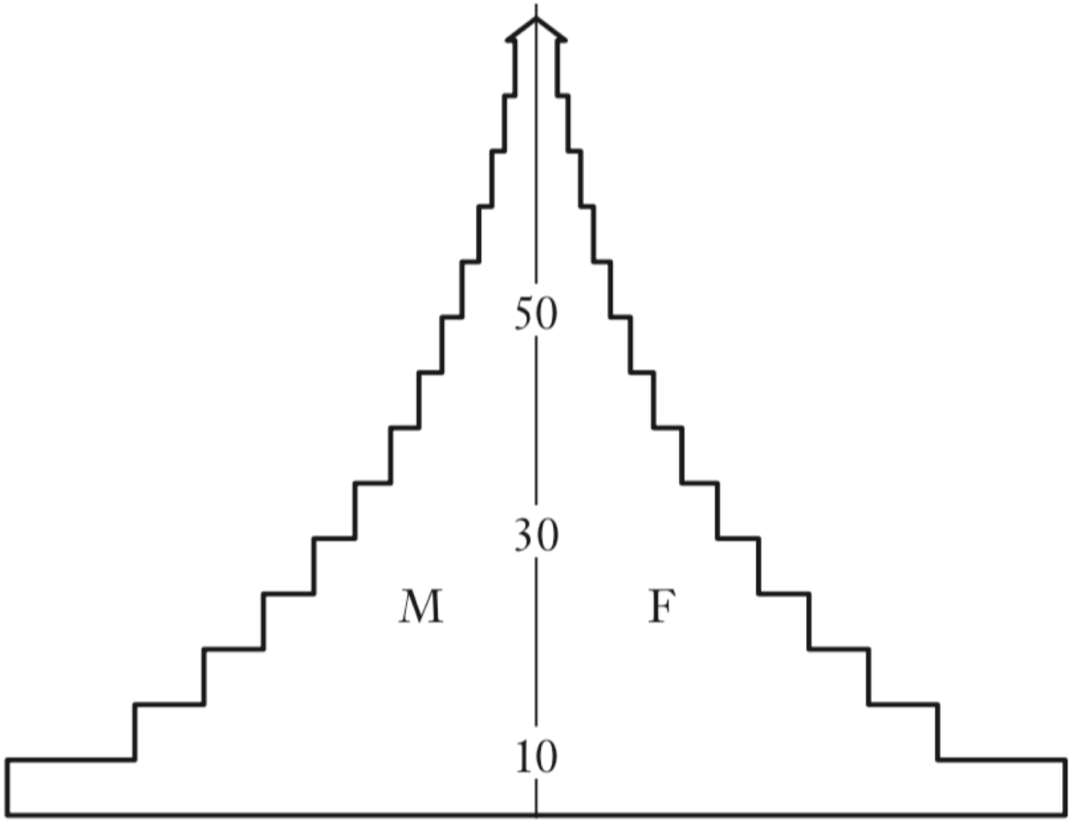


Figure 10.1 Examples of stable age pyramids

Observed age pyramids

- Examples of observed age pyramids
- France in 1960
  - It shares overall shape with the low-growth sable case
  - But notches among 20 and 40 years of age due to low births during World Wars I and II
- Mauritius in 1963
  - It shares overall shape with high-growth stable case
  - But indentations at working ages hint at changes around 1945 from increasing growth
    - Gains against infant mortality

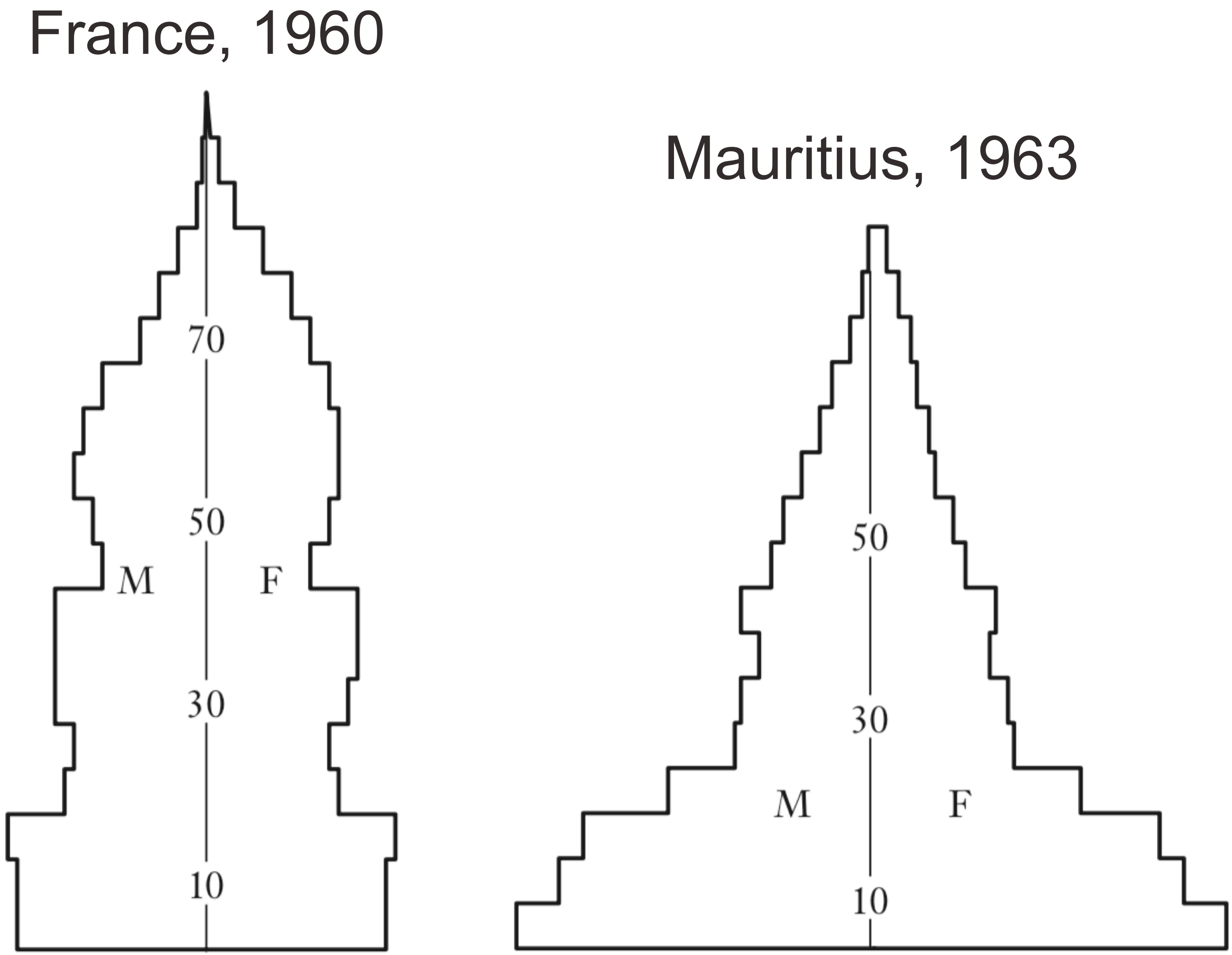


Figure 10.2 Examples of observed age pyramids

Idealized ≠ Observed

- Stable theory captures general features well

- Observable differences from stable shapes due to each nation’s own history
  - Changing rates
  - Movements across borders

Stable population

- Stable population is any population produced by age-specific rates of fertility and mortality constant over a long period of time
  - Its age pyramid is determined uniquely by its lifetable and its long-term growth rate
  - Proportions in each age group in a stable population do not change over time
  - Numbers in each age group may change over time
    - Population may be growing or declining in size
    - It depends on what the growth rate happens to be

Stable ≠ Stationary

- Stable population
  - Rates stay the same
  - Population size may change
- Stationary population
  - Rates and population size remain the same
  - Growth rate is zero
  - It is a special case of a stable population
  - It satisfies the extra condition of having zero population growth (ZPG)

Little more on stationary

- We can imagine complicated cases in which age-specific rates are changing in ways that cancel each other out
  - So that population size remains the same
  - Sometimes such a population is called stationary

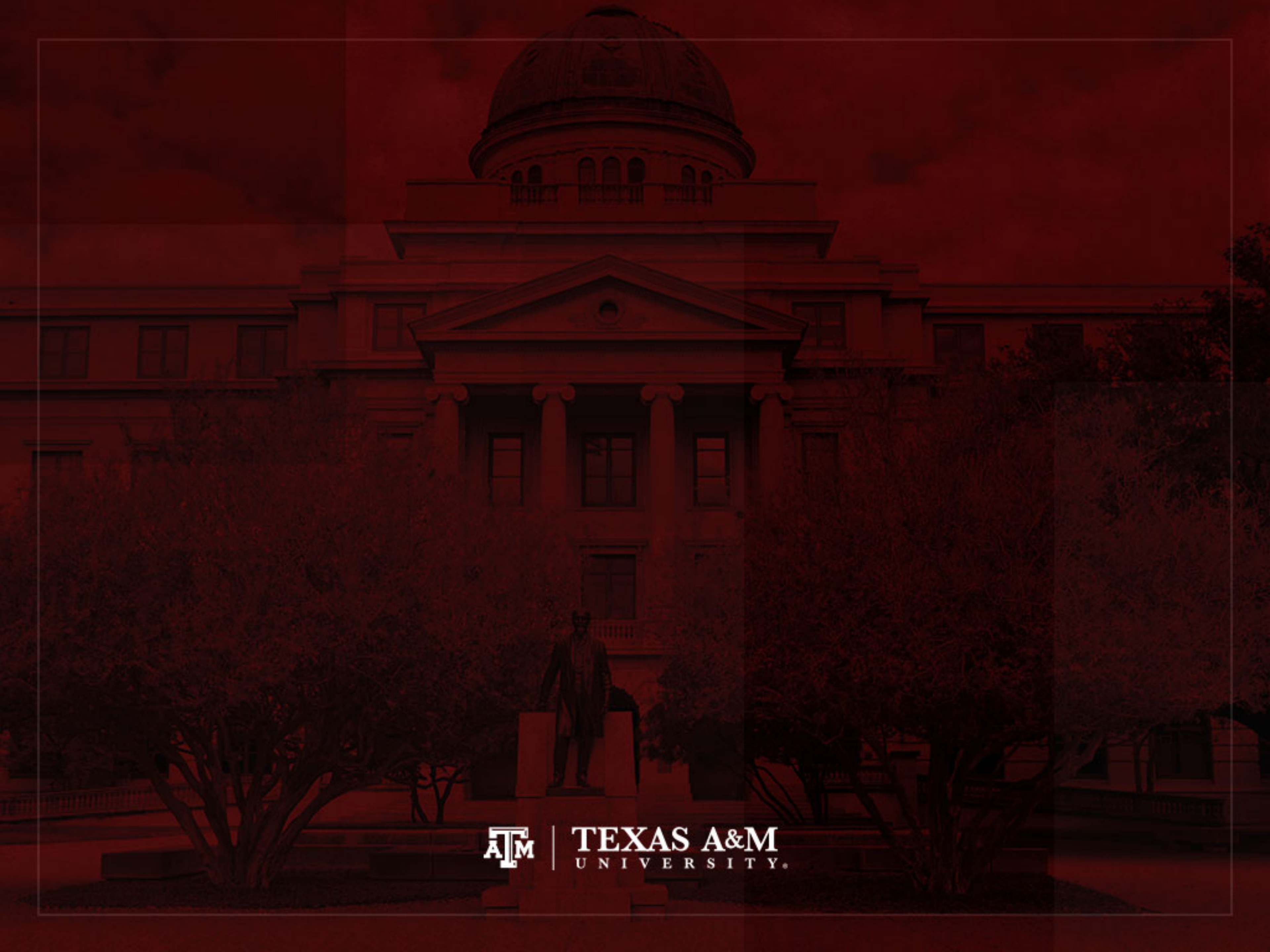
- But we reserve the word stationary for cases with
  - Unchanging rates
  - Unchanging size

Stable population theory

- Stable population theory is the mathematical analysis of stable age pyramids
- It is a theory that goes back to the work of Leonhard Euler in 1760
- It was extensively developed by
  - Alfred Lotka in the early 1900s
  - Nathan Keyfitz and Ansley Coale in the last half-century

References

Wachter KW. 2014. Essential Demographic Methods. Cambridge: Harvard University Press. Chapter 10 (pp. 218–249).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