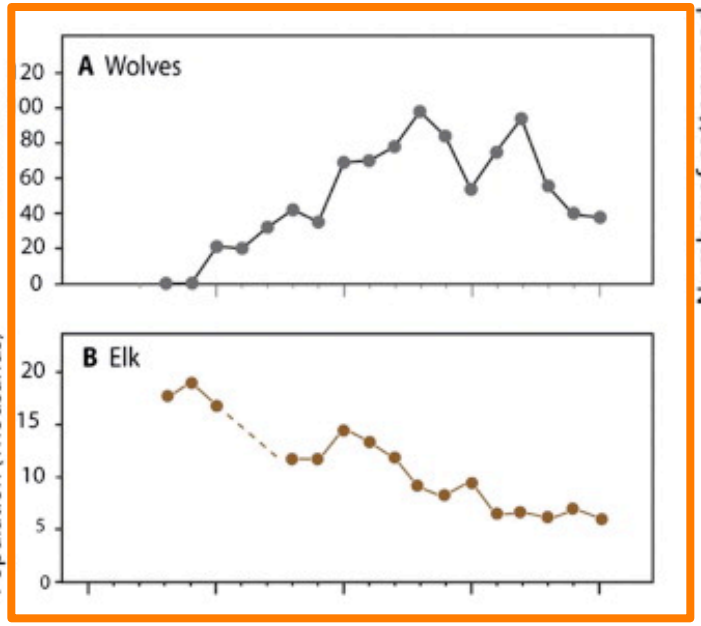
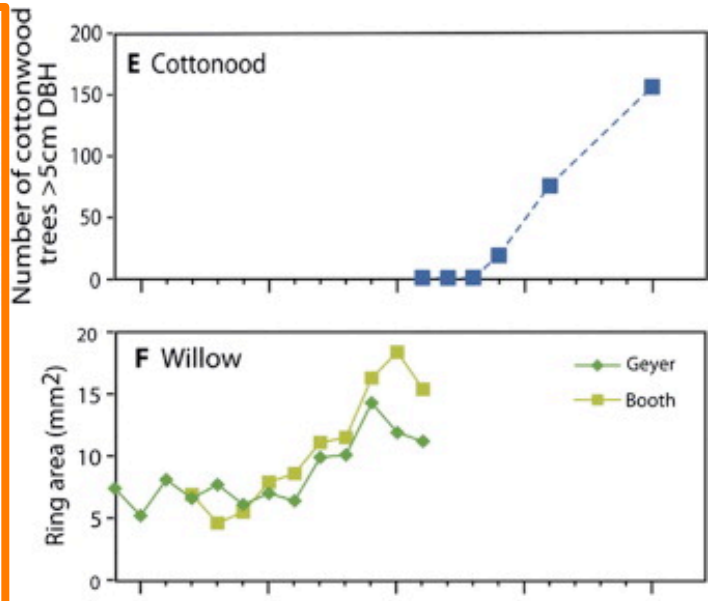
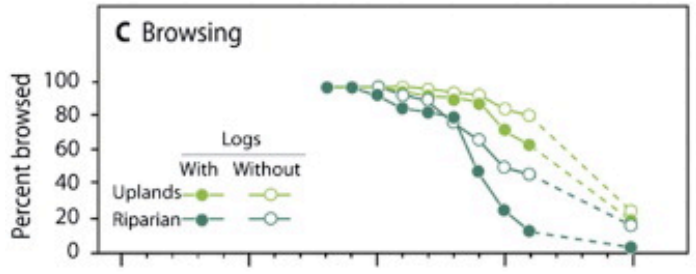
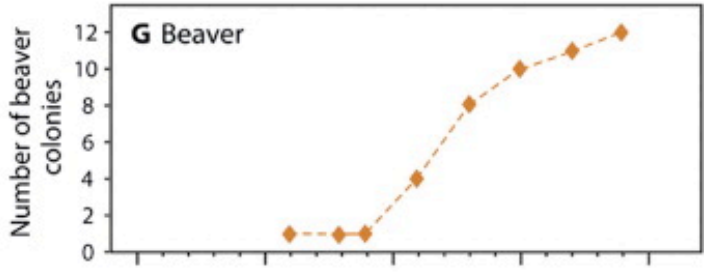
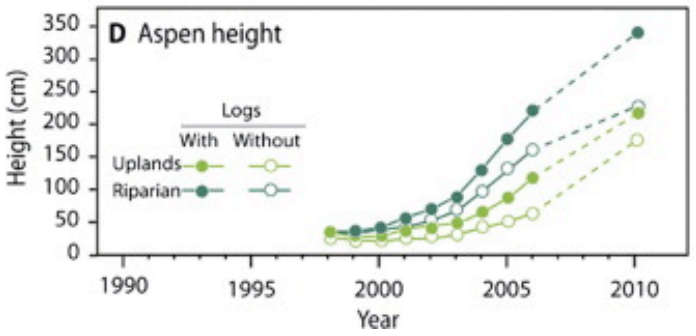
5.1-2 - Populations

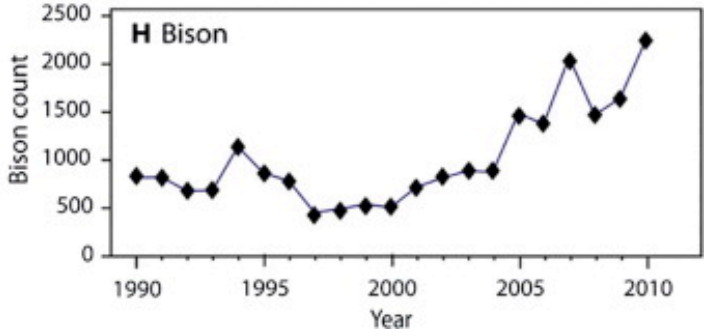

A Wolves
Population
B Elk
Population (Thousands)


E Cottonood
Number of cottonwood trees >5cm DBH
F Willow
Ring area (mm2)
Geyer
Booth

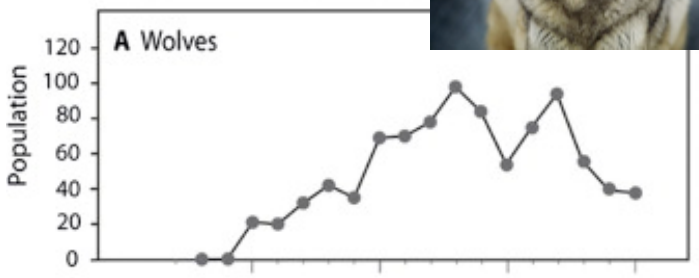

C Browsing
Percent browsed
Logs
With Without
Uplands
Riparian

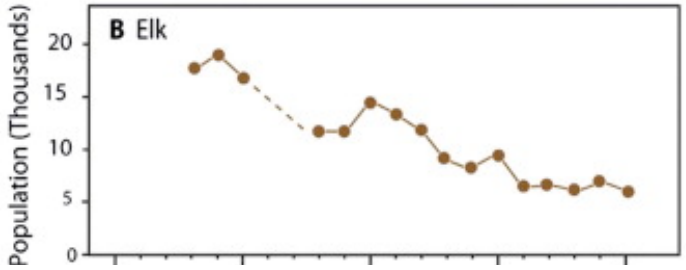

G Beaver
Number of beaver colonies

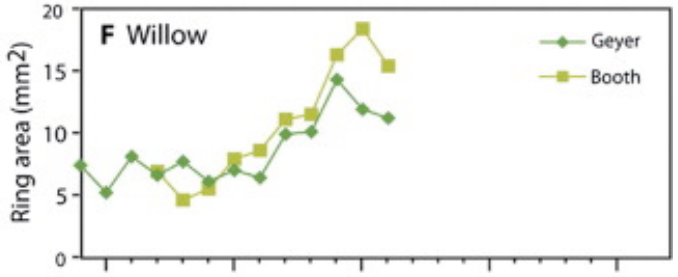

D Aspen height
Height (cm)
Logs
With Without
Uplands
Riparian
1990
1995
2000
2005
2010
Year


H Bison
Bison count
1990
1995
2000
2005
2010
Year

Yellowstone Before and After Wolves







Objectives

- Examine the 3 **key features** of a population.
- Contrast **exponential growth** and **logistic growth**.
- Differentiate ***r*-strategists** from ***K*-strategists**.

Population

- A **population** consists of all the individuals of ONE species that live together in one place and use the same resources.

- What factors affect the growth of a population? How will a population change?...
- **Population ecology**

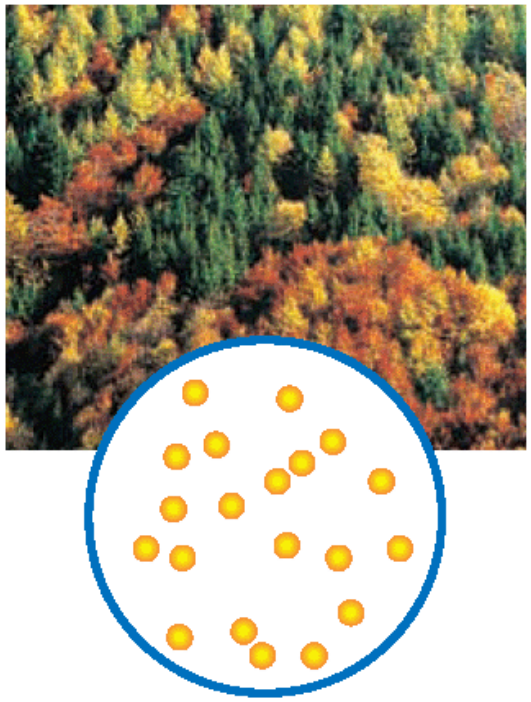
3 Key Features of Populations

1) Population Size – the number of individuals in a population

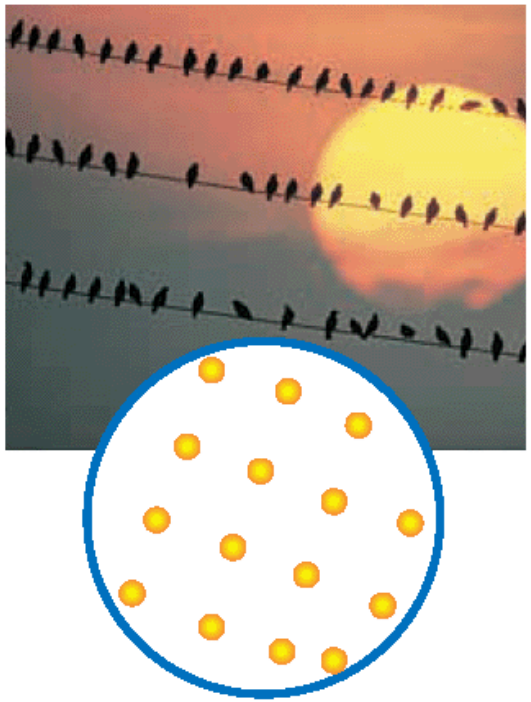
2) Population density – the number of individuals that live in a given area.


D'Fleur
Anita

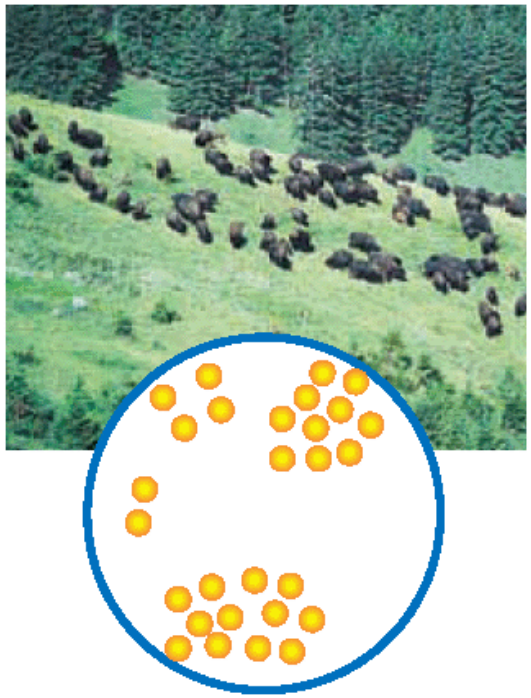
3) **Dispersion** – how individuals of the population are arranged in space



Pine trees in a *random distribution*



Birds in an *even distribution*



Buffalo in a *clumped distribution*

Factors that Affect Population Size

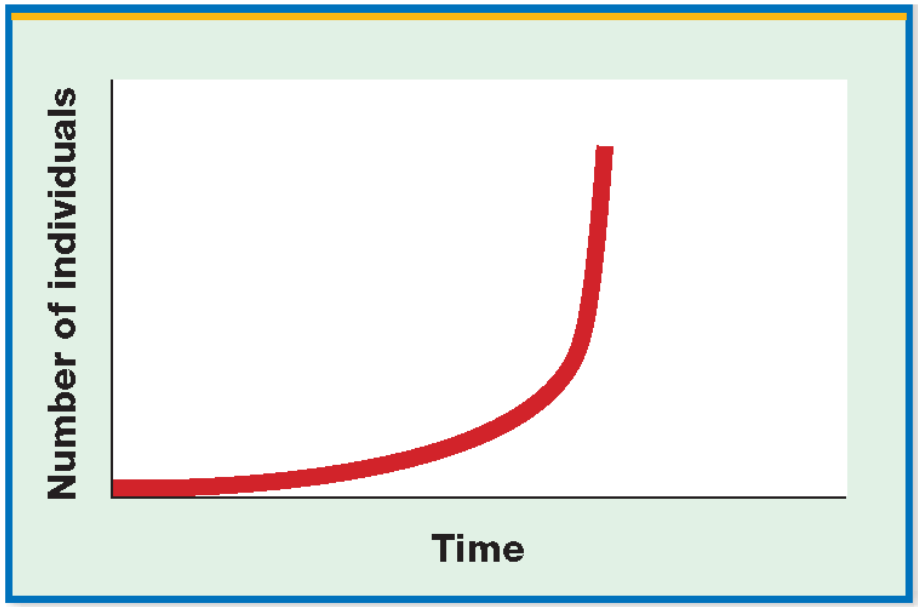
- **Births**
- **Deaths**
- **Immigration** – movement of individuals INTO a population
- **Emigration** – movement of individuals OUT of a population

Change in population size = Births + Immigration – Deaths – Emigration

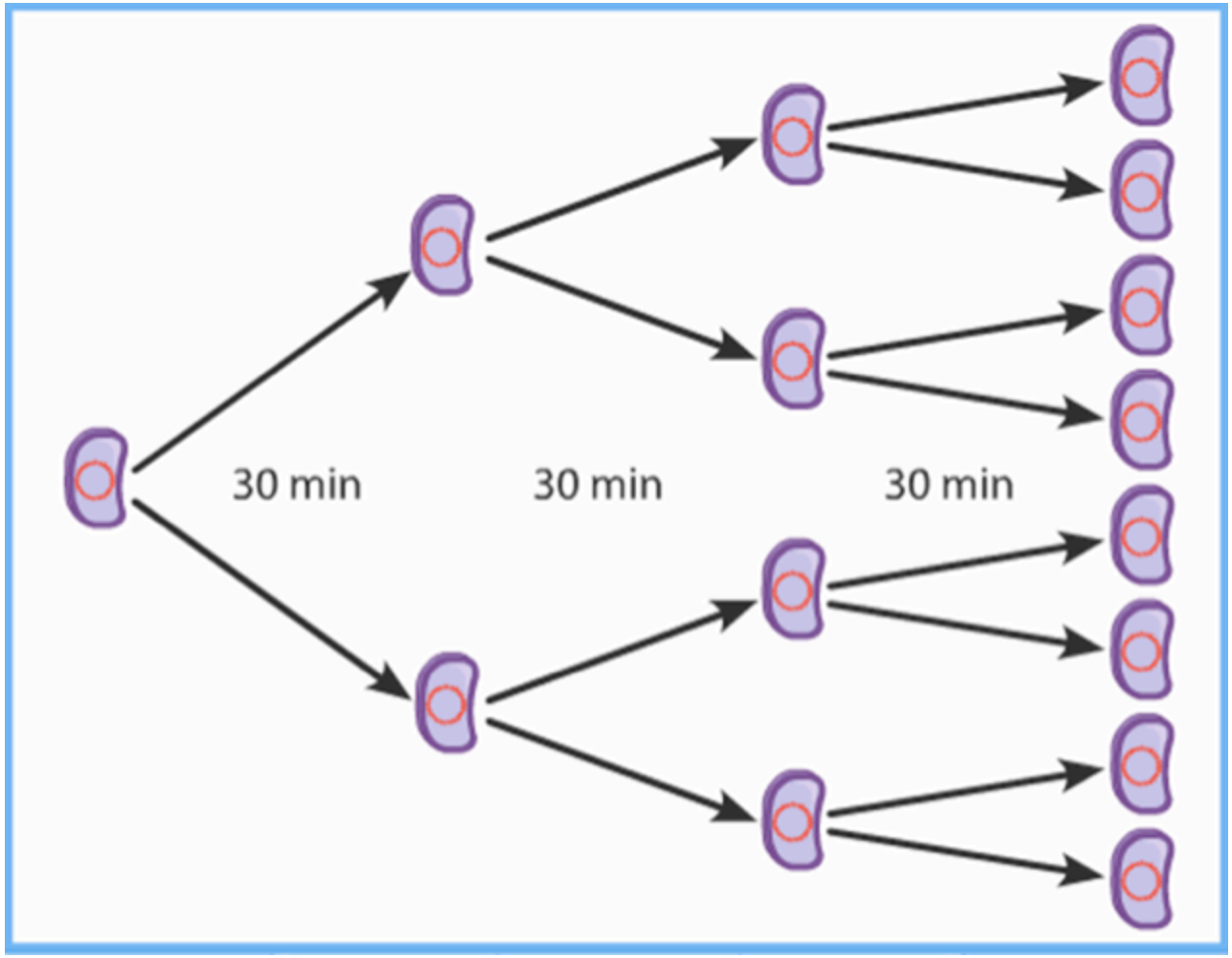
Exponential Growth Model

- A population of a few individuals in an environment with unlimited food, space, no disease or predator will... increase over time.

1) **Exponential growth curve (J-curve)** is a model in which a population **grows RAPIDLY** with **unlimited** resources.

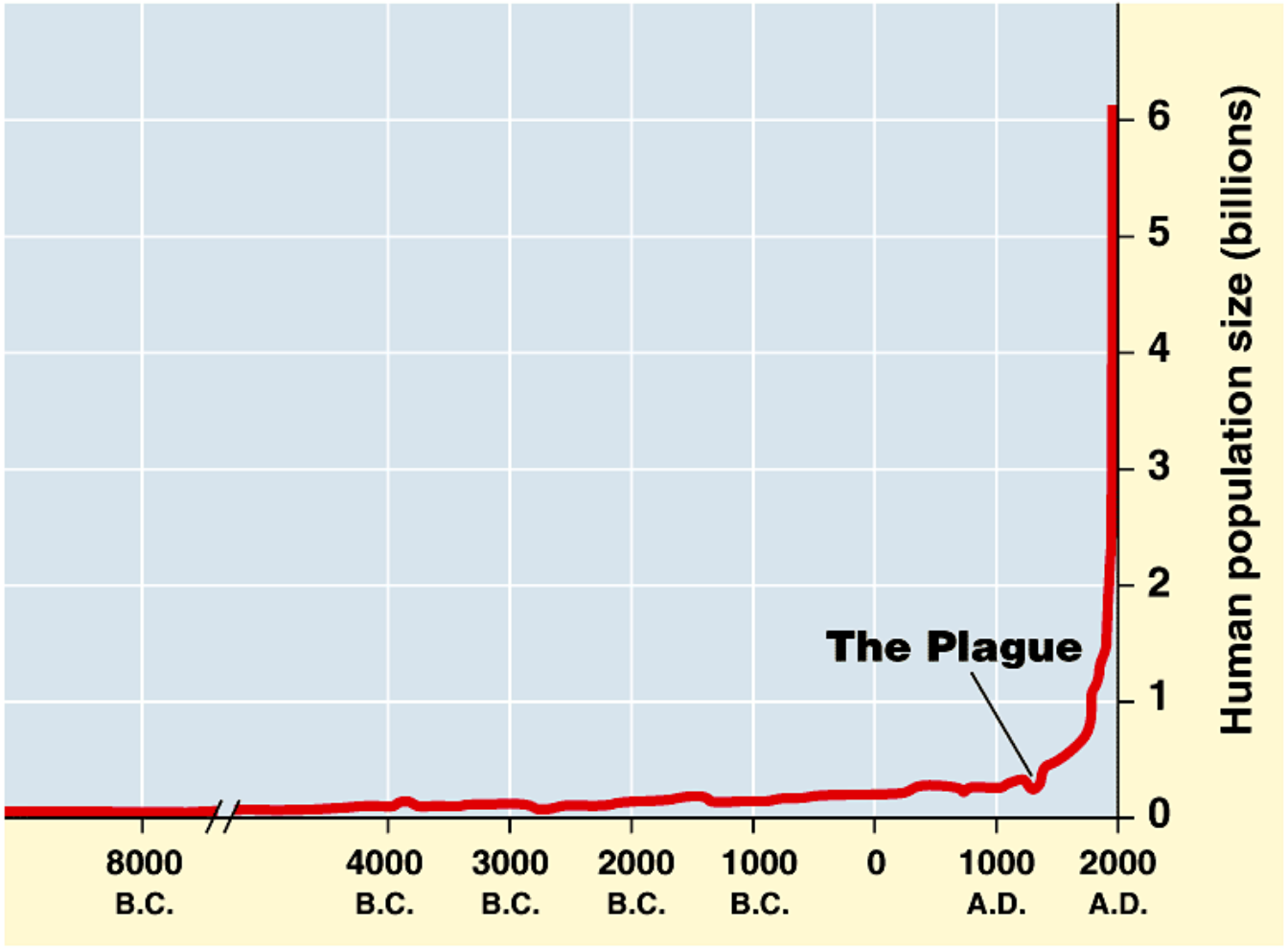


Exponential Growth of Bacteria

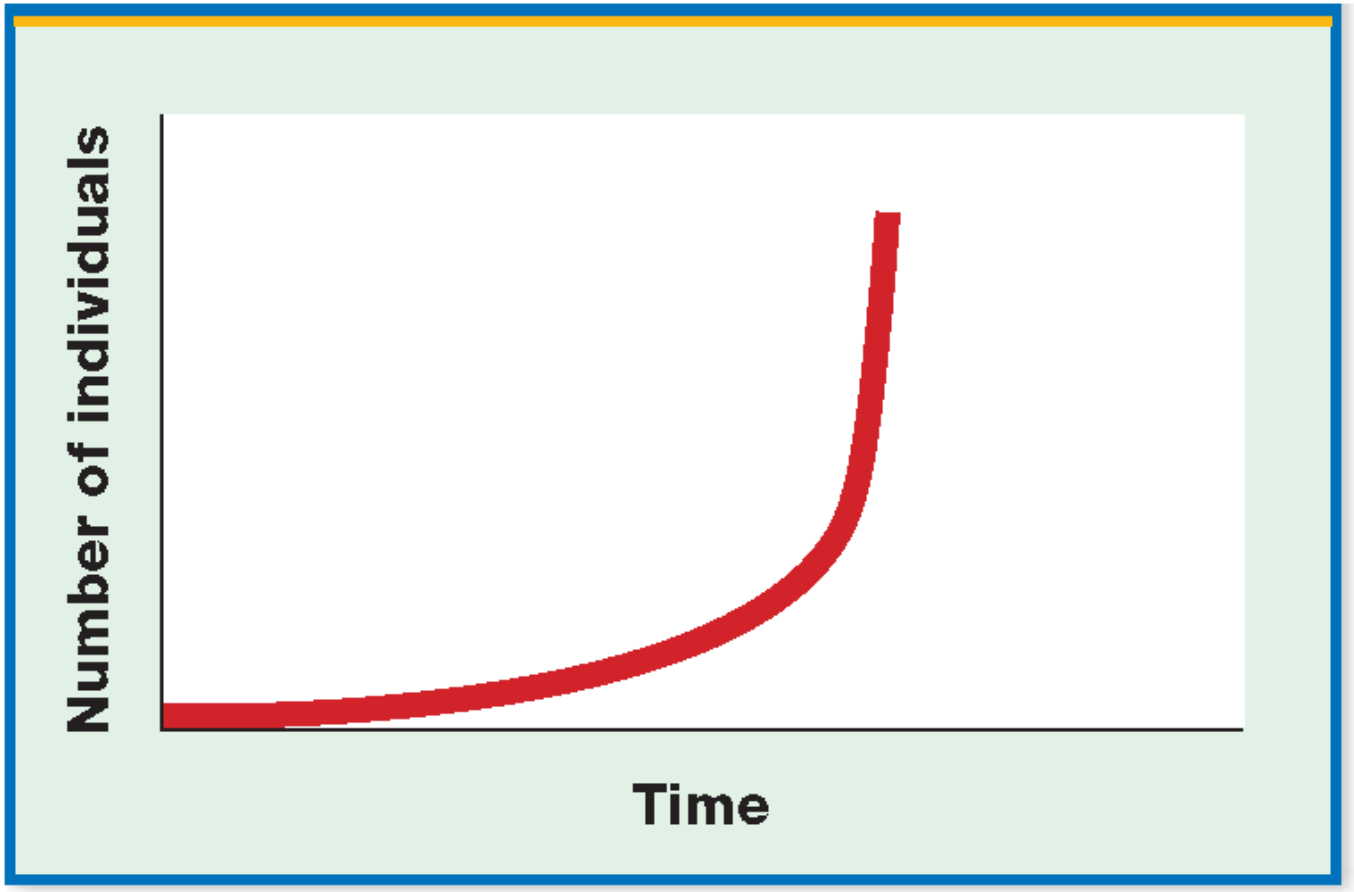


Bacterial Exponential Growth

Human Population Growth



Exponential Growth Model



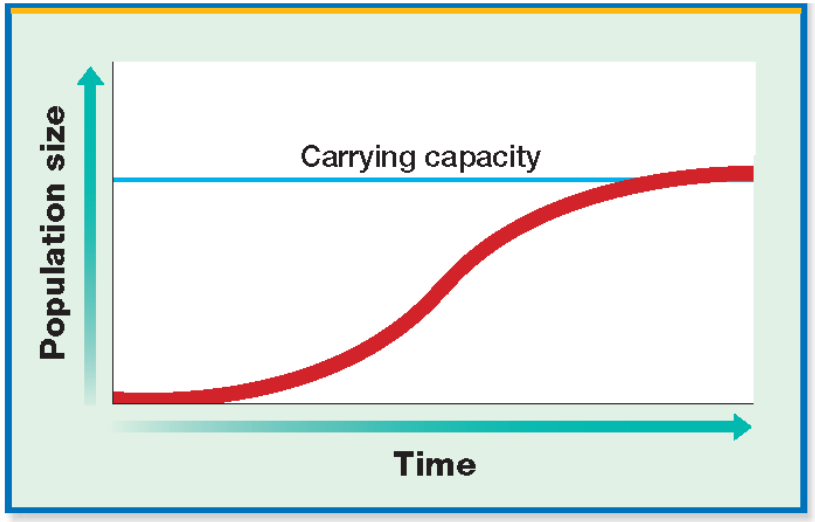
Logistic Growth Model

- Realistically, population size depends on resources or **density-dependent factors** (competition, predation, parasitism, disease, etc.)

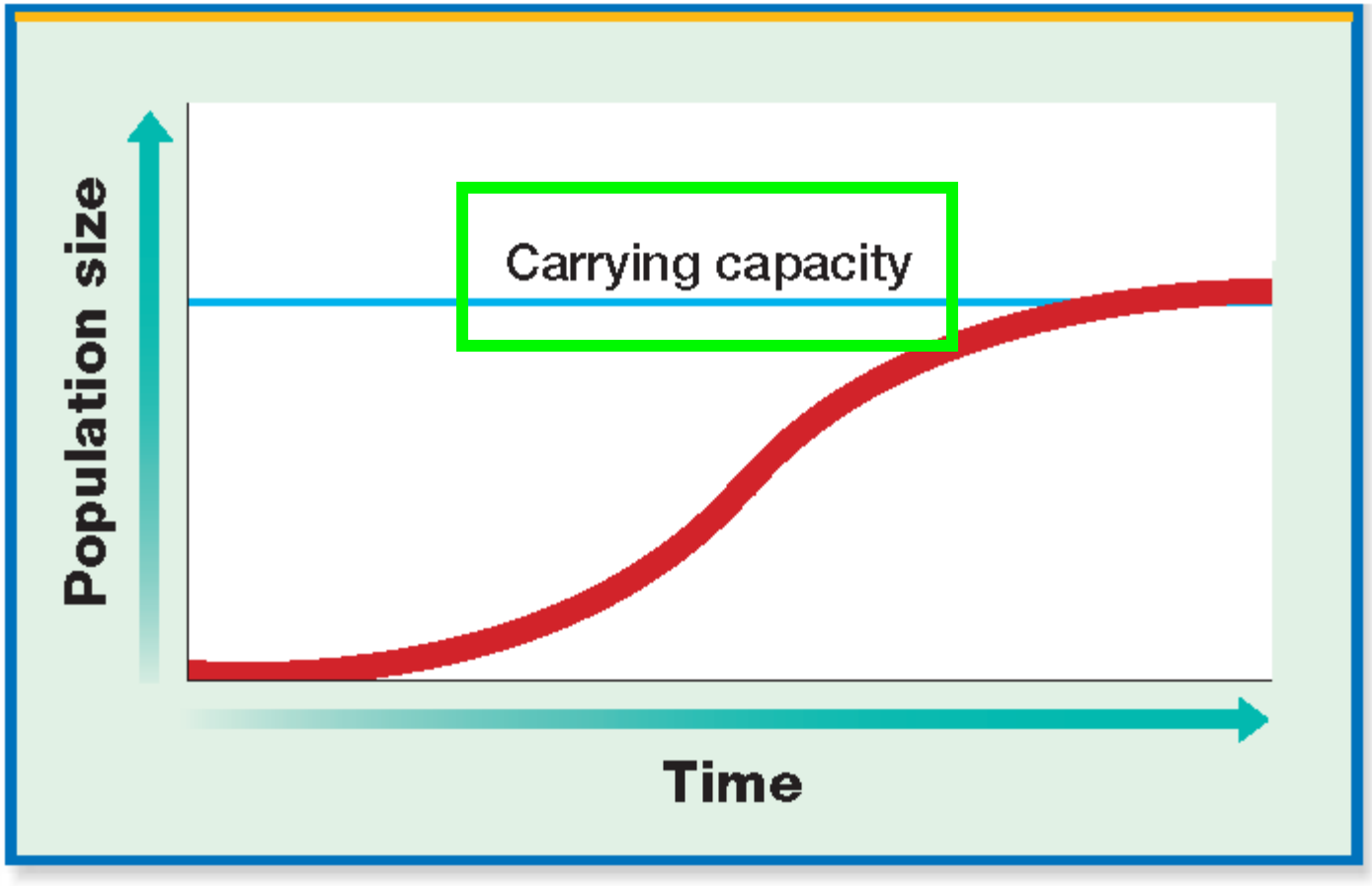
2) The **logistic growth curve (S-curve)** – (exponential) growth is limited by **density-dependent factor(s).**

- The population size that an environment can sustain is called the **carrying capacity (K)**.

Drought is **density-independent factor**.



Logistic Growth Model



Growth Patterns in Real Populations

- Environmental conditions (weather) and human disturbances are **density-independent factors**.
- The growth of many plants and insects is often described by an **exponential growth** model.
- The population growth of slower growing organisms is better described by the **logistic growth** model.

a. Rapid Growing Populations

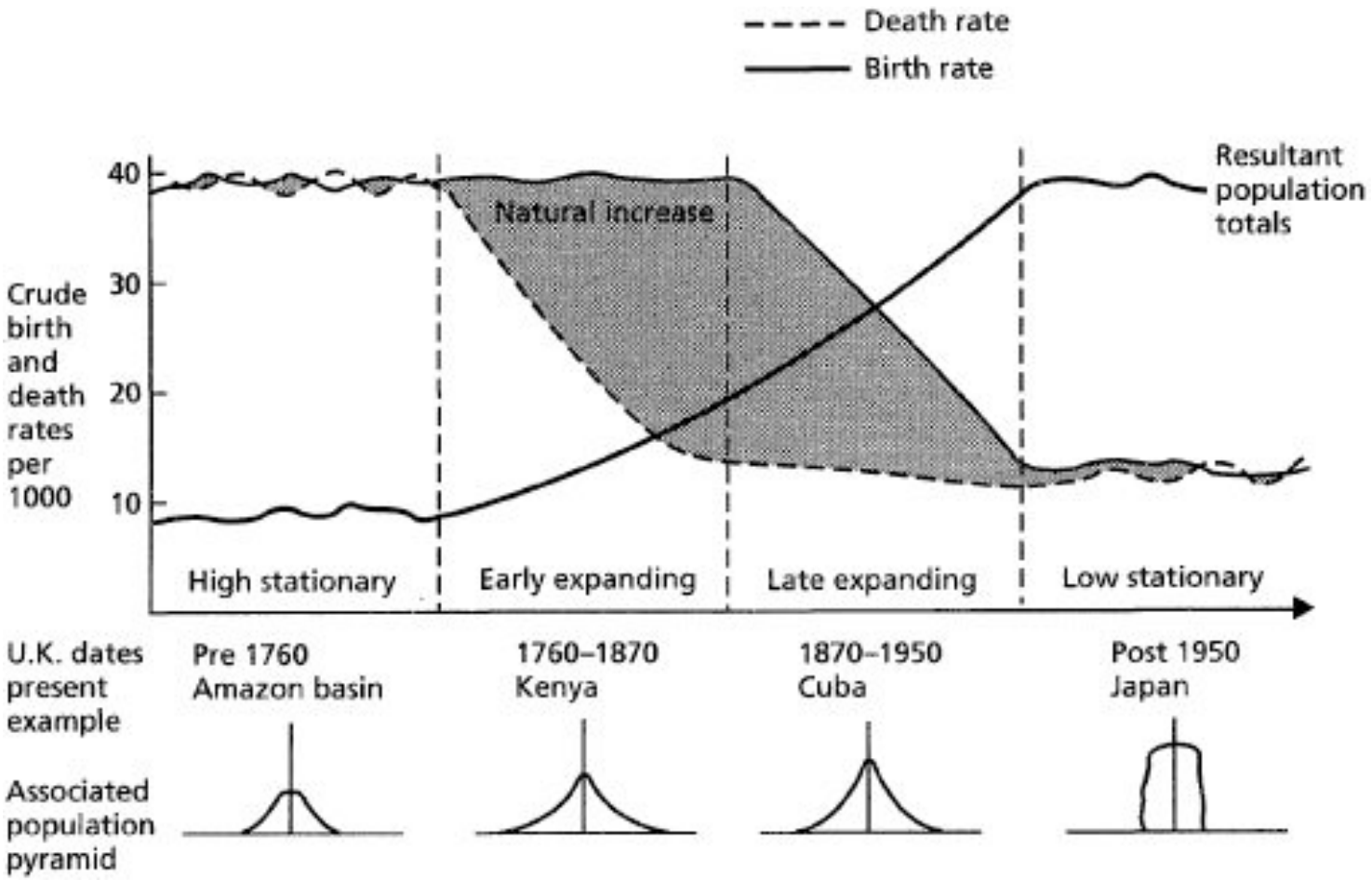
- ***r*-strategists**
- Populations of bacteria, some plants, many insects (cockroaches, mosquitoes) grow exponentially when environmental conditions allow them to reproduce.
- When environmental conditions worsen, the population size drops quickly.

b. Slow Growing Populations

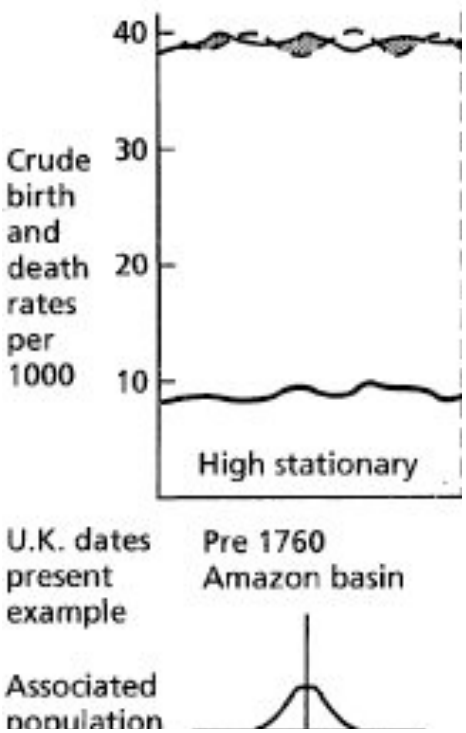
- Other organisms (whales, etc.) often have long life span, few young, slow maturing process and small populations.
- These species are called ***K*-strategists** because their population density is usually near the carrying capacity (*K*) of their environment.

5.3 - Human Population Growth

Demographic Transition Model



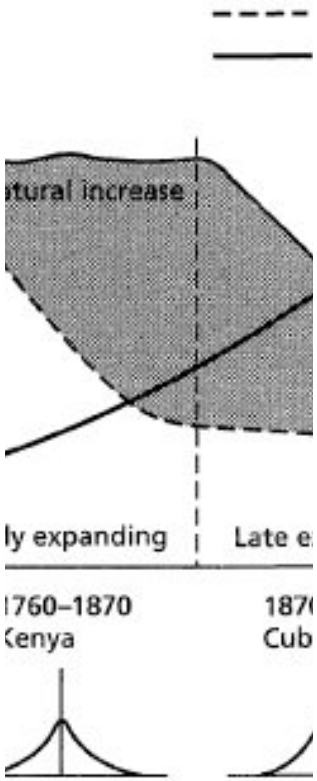
Stage 1 - High Stationary



- Low population, increasing very slowly (if at all)
- High birth rate
- High death rate

  Ex: Ethiopia, Niger

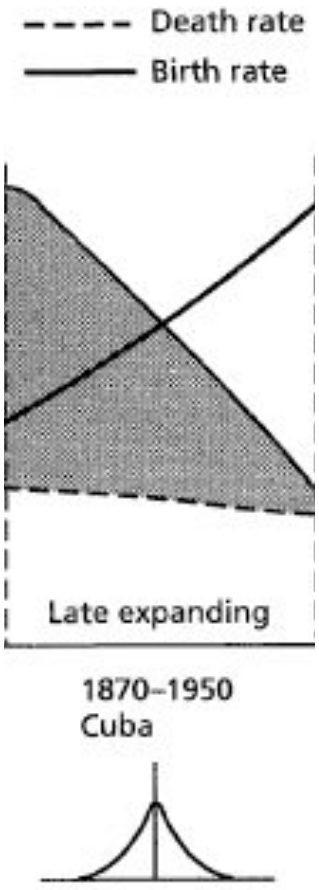
Stage 2 - Early Expanding



- Population growing at faster rate
- High but decreasing birth rate
- Decreasing death rate

  Ex: Sri Lanka, Bolivia

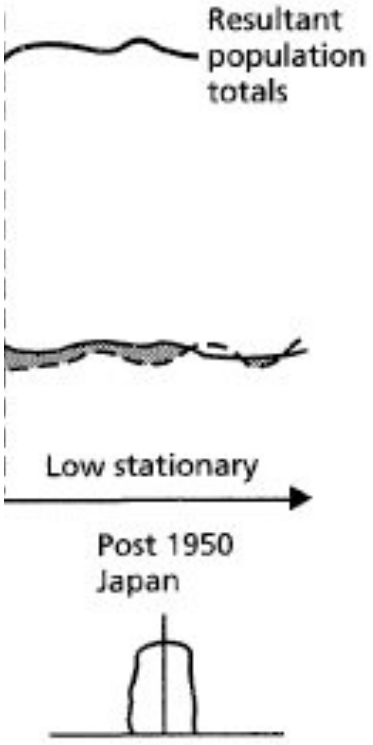
Stage 3 - Late Expanding



- Population still increasing but rate slowing down
- Decreasing birth rate
- Low death rate

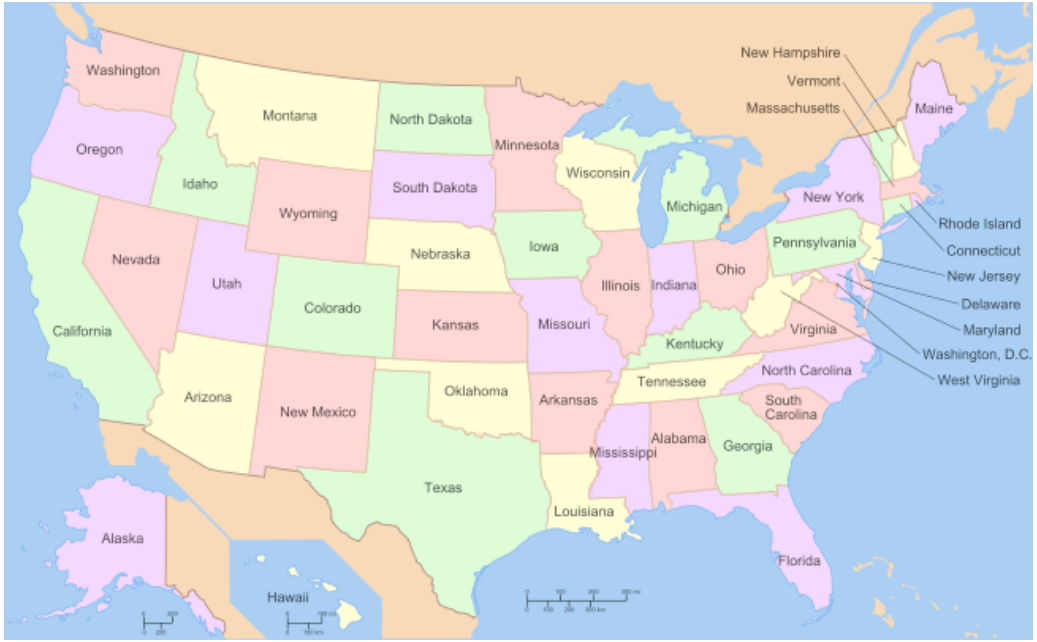
  Ex: China

Stage 4 - Low Stationary



- High population, almost stable
- Low birth rate
- Low death rate

Ex: Canada, USA, Europe



Population growth momentum

Family A: 8 individuals

Family B: 8 individuals

Population growth momentum

Family A: 8 individuals

Family A: 8 individuals

Family B: 8 individuals

Family B: 14 individuals

Population growth momentum

Family A: 8 individuals

Family A: 8 individuals

Family A: 6 individuals

Family B: 8 individuals

Family B: 14 individuals

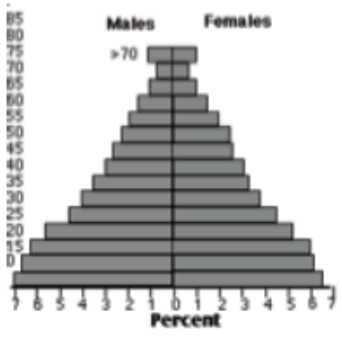
Family B: 18 individuals

Question

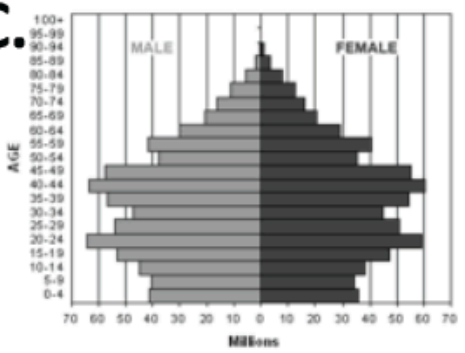
Which country has rapid population growth?

A.

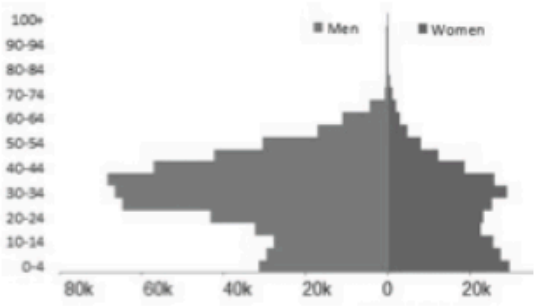
B.



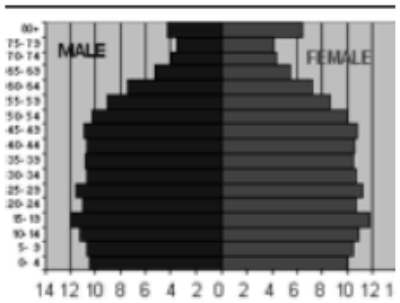
C.



D.



E.

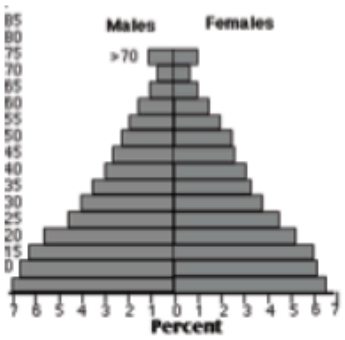


Question

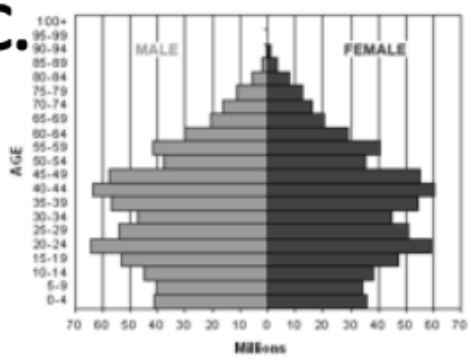
Which country is closest to zero population growth?

A.

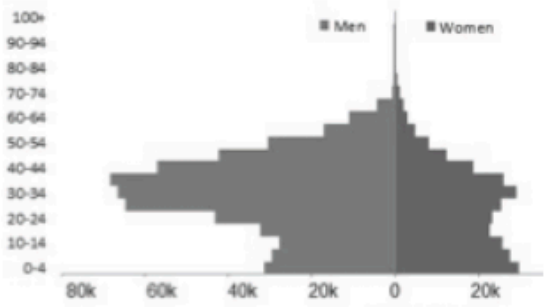
B.



C.



D.



E.