POPULATION DYNAMICS

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Population Size

Four variables that govern population size:

1. Births
2. Deaths
3. Immigration
4. Emigration

Population change = [births + immigrations] - [deaths + emigration]

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Population Size

Population size is determined by the interplay between it biotic potential and environmental resistance.

Biotic Potential - capacity of a population for growth

Environmental Resistance - all the factors acting jointly to limit the growth of a population

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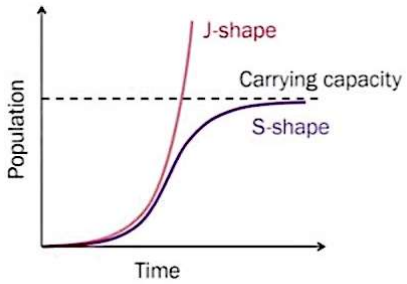
Logistic and Exponential

Logistic Growth - involves exponential growth when a population is small and a steady decrease in growth in time as the population approaches the carrying capacity

S-shaped curve

Exponential Growth - a population that does not have resource limitations

J-shaped curve



Carrying Capacity

Carrying Capacity (K) - the number of individuals of a given species that can be sustained indefinitely in a given space; determined by *biotic potential* and *environmental resistance*.

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Zero Population Growth

ZPG

when births plus immigration equal deaths plus emigration

K-Strategist and r-Strategist

K-Strategist Species (competitor) - reproduce late, have few offspring with long generation times (K)

- have big bodies, live for a long time, spend little of their energy on reproduction
- tend to do well in competitive conditions when pop. is near carrying capacity
- prone to extinction

r-Strategist Species (opportunist) - species with a high intrinsic rate of increase (r)

- Many small and unprotected young
- Most die before reaching reproductive age

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Doubling Time

the time it takes for a population to double

Rule of 70

$$\frac{70}{\text{GROWTH RATE}}$$

= *number of years to double*

Crude Birth Rate and Crude Death Rate

Crude Birth Rate (CBR) - number of live births per 1000 people in a population in a given year

Crude Death Rate (CDR) - number of deaths per 1000 people in a population in a given year

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Ten Years Ago….

2000 World Census

Average crude birth rate – 22

Average crude death rate - 9

- Rate of World's Population Change (%) = (Birth Rate - Death Rate)/1000 people x 100
  = (CBR - CDR)/10

1.3% Population growth

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Global Fertility Rate

There are two types of fertility rates

1. Total Fertility Rate (TFR)
   - TFR is an estimate of the average number of children a woman will have during here childbearing years under current age-specific birth rates.
2. Replacement Level Fertility
   - This is the number of children a couple must bear to replace themselves.(2.1 in developed countries and 2.5 in developing countries). These numbers are greater than 2 because some female children die before reaching their reproductive years.

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Age Structure Diagram

Age Structure Diagrams - show the proportion of the population at each age level.

- Three main age categories:
  - pre-reproductive (ages 0-14)
  - reproductive (15-44)
  - post-reproductive (45+)

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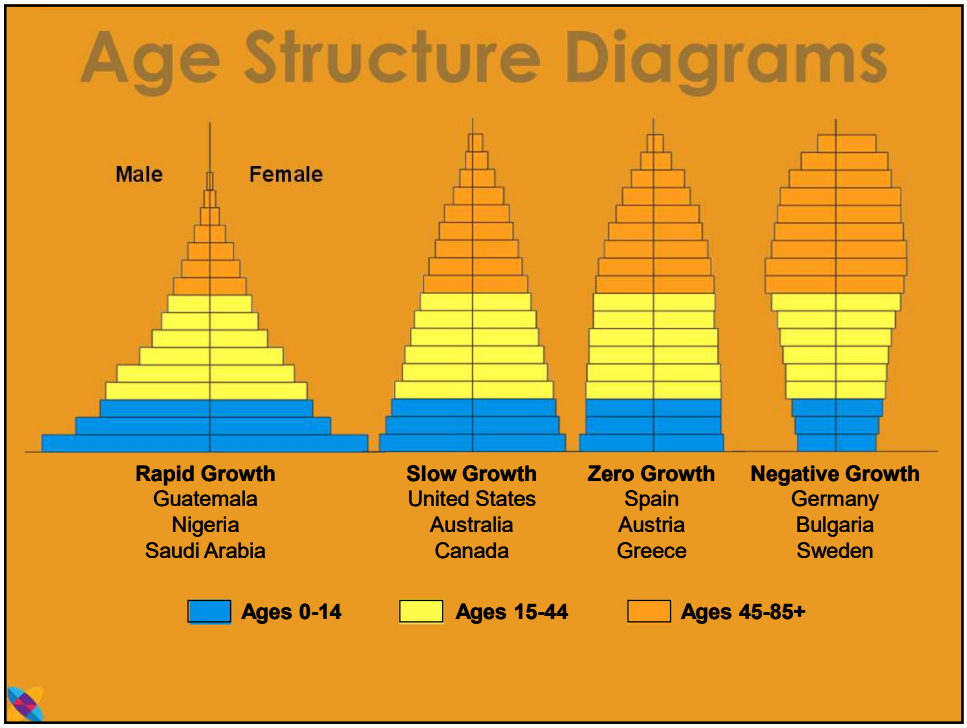

Demographic Transition

Demographic Transition: As countries become more industrialized, first their death rates and then their birth rates decline.

This Transition takes place in four stages:

1. pre-industrial stage - harsh living conditions, high infant mortality rates, high death rate; need a high birth rate .. pop. growth is small (or zero)
2. transitional stage - industrialization begins, rise in food production, improved health care, reduction in death rate, birth rate remains high .. pop. grows rapidly (2.5-3%/year)

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Demographic Transition(cont.)

3. industrial stage - industrialization is widespread. Birth rate drops and approaches the death rate. Better access to birth control, reduced infant mortality, incr. job opportunities for women, high cost of raising children, HS and college educations. Pop. grows but at a slower rate.
4. postindustrial stage - Birth rate declines further, equals death rate ==> ZPG.

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Demographic Transition