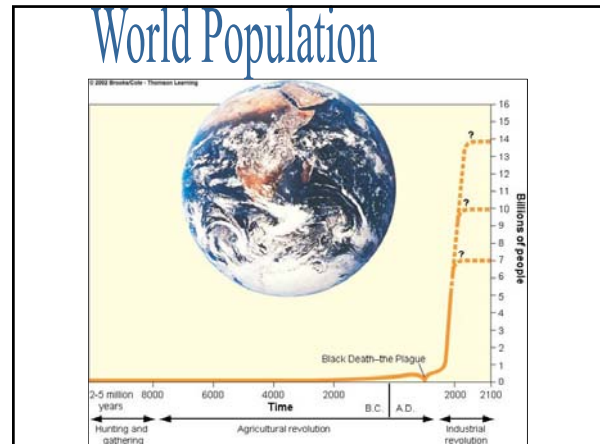# The Human Population

World Population

What are the principle reasons the human population has grown so rapidly in the 20th century?

A. Medical Advances
- Saving more babies at birth & neonataly

- Better and more available medicines have kept the people of the world (esp.developing countries) more healthy, so…..

    1. More people reach reproductive maturity.

    2. More people are reaching their maximum lifetimes.

B. Technological Advances
- Esp. the introduction of high yield agricultural crops to developing nations.
    - (1) This allowed developing countries to feed the people they already had, and provided the prospect of plenty of "extra" food to support a growing population.

    - (2) Provided jobs for people, offering prosperity.

    - (3) Well nourished people are healthier people and are better able to reproduce and support families.

Given a world population in 1990 of 5.3 billion w/ a growth rate of 1.8% what is the doubling time?

DT=   70   / % growth rate

DT=   70   / 1.8% = 38.8 ≈ 39 years

•so….. we can expect (based on this data) to see a world population of 10.6 billion in 2029.

•this may exceed carrying capacity of the Earth.

Basic Concepts

Population & Technology

- The population problem has two main components.
  1. The number of people.

  2. The environmental impact per person.

Modern technologies multiply the impact of people on the environment.

Tractors   Medicine   Plastics

Industrialization   Cars

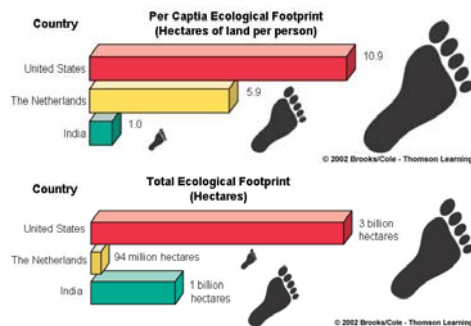•Total environmental impact of a population = population (# of people) x impact per person (technology)

$$TEIP = P \times I / P$$

Here is the dichotomy:

•**People in undeveloped nations have the most rapid population growth.**

•**People in developed nations have the most impact per person.**

Ecological Footprint

•Improving the standard of living in poor countries may negate the benefits of controlling the population growth.

Human Demography

•Demography is the study of populations.

•Studies in population dynamics (population & change) reveal principles which apply to all species.

Human Population Growth Rate

•There have been four main stages in human population growth.

1. Hunting & gathering

2. Agriculture

3. Industrial

4. Modern

•rapid human population growth occurred during the agricultural & industrial periods.

a. no change in max. lifetime but……

b. change in birthrate

c. change in death rate

d. change in age structure

Population Dynamics

Population- a group of members of the same species living in the same place.

Species- all individuals of a group capable of successfully interbreeding and bearing fertile offspring.

Growth Rate: birth rate – death rate

Crude birthrate: the number of births per 1,000 individuals.

Crude death rate: the number of deaths per 1,000 individuals.

Crude growth rate: CBR – CDR (net change in population of 1,000 individuals)

Maximum lifetime: maximum possible age for an individual of a species.

Life expectancy: avg. remaining years of an individual at a given age of an individual at a given age (lifespan).

Exponential Growth
•growth rates of the human population have increased in modern times, so our population has grown even faster than exponential growth curves had predicted.

•global human growth rates

  peaked to 2.1% 1965-1970

  currently at ≈ 1.5%

<u>**Projected Future Population Growth**</u>

Doubling Time

  •in a population w/ a constant growth rate the doubling time calculated by
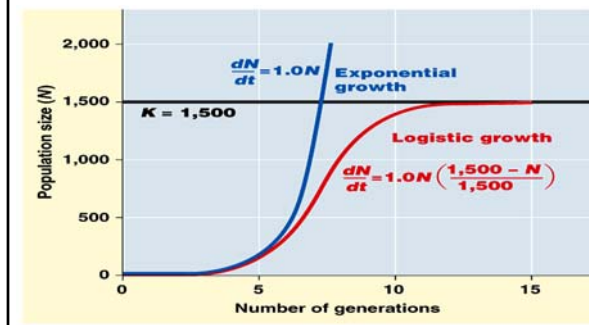
DT = 70 / growth rate

•Doubling time is sensitive to any changes in growth rate.

•Due to finite supplies of food and space, no population can grow at <u>any rate</u> indefinitely.

•Some species follow a logistic (S-shaped) growth curve.

•As the curve approaches the carrying capacity, the population stabilizes just below it.

•Because humans have been achieving declining death rates, our growth rates may continue to rise even as we approach carrying capacity, so our population may not follow this theoretical curve.

•Determining the inflection point for humans will be difficult because it must take into account the effects of environmental change & technology.

Demographic Transition

Industrially and economically developing western nations show a characteristic 3 stage pattern of changing growth rates.

    1st stage: high birthrate, high death rate

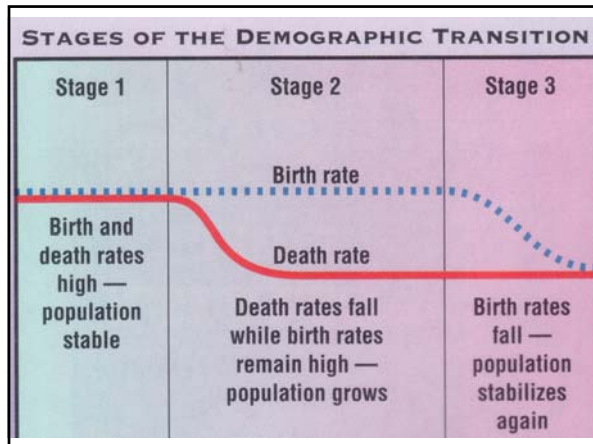   **2nd stage:** high birthrate, low death rate

    3rd stage: low birth rate, low death rate

•Historically, industrialization and improved living conditions has brought about a sudden decrease in death rates followed by a corresponding decrease in birthrates.

•As growth rates rise, educated more affluent populations tend to experience dropping birthrates until the growth rates become zero or nearly zero.

•Not all developing nations will undergo this same smooth transition to a zero population pattern.

•Nations can <u>ALWAYS</u> experience future growth spurts.

STAGES OF THE DEMOGRAPHIC TRANSITION

Stage 1	Stage 2	Stage 3

Birth rate

Death rate

Birth and death rates high — population stable

Death rates fall while birth rates remain high — population grows

Birth rates fall — population stabilizes again

Human Death Rates & the Rise of Industrial Society

•Overall, death rates in modern industrialized countries have dropped (largely due to cures for acute epidemic disease).

Total fertility rate(TFR)- avg. number of children expected during a women's lifetime.

   *estimated female reproductive years: 15 - 44

Population age structure- proportion of the population in a certain age class.

Replacement-level fertility- fertility rate required for the population to remain at a constant size.