APES Chapter 12 Outline
Human Population Growth, Demography and Carrying Capacity

I. Factors affecting Human Population Size
Crude Birth Rate (CBR) = # births/ 1000 people
Crude Death Rate (CDR) = # deaths/ 1000 people

China (1 in 5 people) and India make up 38% of the world's population. U.S. is the world's third largest population, but has only 4.6% of the world's population.

A. Global Fertility Rates
1. Replacement level fertility = # of children a couple must bear to replace themselves (2.1 in developed countries/may be 2.5 in developing countries)
2. Population momentum = # of people entering their childbearing years. (This causes population growth to continue for decades)
3. Total Fertility Rate (TFR) = estimate of the average number of children a women will have during her childbearing years under current age specific birth rates. (Africa=5.6 children/women
rate must be 2.1 for all countries for the population to stabilize during the next century)

B. U.S. Fertility Rates
1. 76 million in 1900 -→270 million in 1998
2. U.S. has the highest fertility rate & the highest immigration rate of any industrialized country.

The population is still growing faster than most of the developed countries and is not close to zero population growth. 1.8 million more births than deaths (60% of growth); 935,000 legal immigrants & refugees; 400,000 illegal immigrants (add another California every 10 years). The U.S. population will increase from 270 million to 383 million by 2050 (41% increase & no stabilization) or less conservative- 507 million by 2050 which is double the population in 1998. This has an enormous impact on the environment. In the Pacific Northwest, the population growth rate is higher that that of India.

3. Reasons for the projected growth
a. large # of baby boomer women who are still in their child bearing years.
b. increase in the number of unmarried mothers.
c. continuation of higher fertility rates for women in some racial and ethnic groups than for Caucasian women.
d. high levels of legal and illegal immigration (43% of current U.S. population growth)
e. inadequate family planning services - especially for the poor.

If immigration continues at the current level, new immigrants and their descendants would account for 80 million or 71% of projected 112 million increase in U.S. between 1998 & 2050.

C. Increasing fertility rate & environmental problems in California (most populous U.S. state) is projected to reach 49 million by 2020- a 63% increase. TFR rose from 1.9

to 2.5 between 1985 & 1998 (much of this came from the high fertility rate of its immigrants-California takes in a higher proportion of the country's legal and illegal immigrants)

IMPACT:

1. most of the wetlands are gone
2. proportion of endangered & threatened species is higher than in any of the other 48 states.
3. sewage systems are nearing capacity
4. water shortage from prolonged droughts remains a long range threat- especially in southern California.
5. a growing portion of irrigated cropland is losing productivity because of salinization & waterlogging of soil.
6. air pollution costs California farmers $100 million a year in damaged & lost crops.
7. 83% increase in motor vehicles & 150% increase in the total annual distance vehicles traveled between 1971 & 1995.

D. Factors affecting birth and fertility rates

1. average level of education & affluence (women w/ no education have 2 more children than women with a secondary education).
2. higher # of births where children begin working at an early age.
3. people living in urban areas have better access to family planning services & tend to have fewer children.
4. rates are lower in countries where raising children is more costly.
   2.7 million for high income
   1.5 million for middle income
   $762,000 for low income
5. educational & employment opportunities for women - low birth rate when women are educated and employed.
6. in areas of low infant mortality rate - people have fewer children
7. age at marriage (age when women have their first child) fewer children when women are 25 or older.
8. private & public pension systems - eliminates the need for parents to have many children to help support them in their old age.
9. availability of legal abortions - 30 million are legal & 11-22 million illegal abortions worldwide each year.
10. availability of reliable methods of birth control.
11. religious beliefs, traditions & cultural norms - these factors favor large families and strongly oppose abortion & some forms of birth control.

E. Factors affecting death rates

Population growth is the result of the decline of the crude death rate, especially in developing countries, due to increased food supply & higher living standards, such as safer drinking water, better nutrition, medical & public health technology (immunizations & antibiotics), sanitation, personal hygiene.

1. life expectancy (# of years a newborn is expected to live)
2. infant mortality rate (# of infants out of 1000 born that die within a year) This is the single most important measure of a society's quality of life (insufficient food, poor nutrition, high infectious disease rate). In the U.S. mortality is 7/1000 due to inadequate health care, drug addiction & high birth rate among teenage women.

F. Migration/Environmental degradation/Environmental refugees
The economics of many receiving countries can benefit from migrant labor.

1. **environmental refugees** - moved because of drought, desertification, deforestation, soil erosion, resource shortages = 27 million
2. **traditional refugees** - moved from political oppression, religious persecution, ethnic strife & war = 23 million
3. **natural disasters** - earthquakes, hurricanes, floods, & landslides = 50 million

II. Population Age Structure = proportion of the population at each age level.
Preproductive = 0-14 yrs
Productive = 15-44 yrs
Postproductive = 45→up

A. Age structure and population growth
Preproductive - represents a wide base & has a built in momentum to increase the population size (Even if women have only 1 or 2 children).
In 1998 - 32% of the world's population were preproductive; 35% in developing/ 19% in developed countries. In Africa, 44% are under 15 years of age.

B. Age structure and economic projections
Baby boomers (1946-1964)= nearly 1/2 of all adults.

Baby Boomers determine who gets elected and what laws are passed. Between 1996 & 2040 those aged 65 and older will increase from 13% to 21%. There will be between 4 to 18 million over the age of 85. The economic burden will fall on the younger generation. The baby bust generation may pay higher income, health care, & social security taxes. Age structure creates social and economic changes that ripple through society for ages.

C. Age structure and population decline
12% of humanity has a stable population. Between 1998 & 2150, as 65 year olds increase, more countries will experience a population decline. Rapid population decline is just as serious as rapid population growth. Medical care, social security, and labor shortages needs occur. Consequently, more countries have encouraged more births with economic incentives. Massive immigration is also a solution.

D. Japan and its decline
Between 1949 & 1956 Japan cut its birth, total fertility, and population growth rates in half. Cramped housing, high land prices, late marriages, and high cost of education caused the rate to decline. 43% of the national income was used on

health insurance and pension systems. This is expected to rise to 60% in 2020, which could discourage economic growth and produce a declining workforce. Consequently, Japan has become increasing dependent on illegal immigrants to keep the economy running.

III. Solutions to Population Size

A. Immigration in the U.S. accounts for 43% of the growth of the United States.

1. More than 75% of legal immigrants live in 6 states: California, Florida, Illinois, New York, New Jersey, & Texas. If we include illegal immigrants than the number is 90%. GOOD or BAD? This depends on the time frame.
2. High unemployment - immigrants are willing to work for lower wages, They do take jobs away from citizens but they will do menial jobs that native-born Americans refuse to do.
3. In the long run they boost the economy by paying taxes, increase the supply of goods and services and increase the demand for goods and services. According to a study by the National Academy of Sciences, each immigrant will pay an average of $80,000 more in taxes than he or she costs in services. The Federal government gets most of the taxes while the states pay most of the costs.
4. Between 1820 & 1960 most legal immigrants to the U.S. came from Europe. Since then most have come from Asia & Latin America. By 2050, 25% of Americans will be Hispanic and 56% will be Caucasian.
5. In 1995, the U.S. Commission on Immigration recommended reducing the number of legal immigrants & refugees to 700,000/ yr. & then 550,000/yr. Some say 300,000 to 450,000 is best or limit the immigration numbers to 20% of the annual population growth.

B. Reduction of Births: Pro and Con

93% of the world's population lives in countries with fertility reduction programs, spending only 1% of the annual budget.

1. Can we provide enough food, energy, water, sanitation, education, health care & housing for twice as many people?
2. Can we reduce serious poverty without being forced to use renewable resources unsustainable to survive?
3. Can we maintain our standard of living without causing massive environmental damage?
4. Can our social and political structures adapt to such a crowded & stressful world? (This is like asking, "how many cigarettes can you smoke without getting lung cancer?)
5. What is the optimum sustainable population of the earth?
6. Are people the world's most valuable resource and is poverty the result of a lack of a free and productive economic system in developing countries?

C. Computer models to evaluate limits to growth and a more sustainable society.

System Dynamics Computer Modeling - has been used to make projections using key variable.

1. mathematical equations representing feedback loops, time delays synergistic interactions.
2. it tests for the potential effects of various policy decisions.
    Population
    Pollution
    Use of nonrenewable resources
    Industrial output per capita
    Food output per capita
3. Results indicate that limits to physical growth would be reached in 100 years if economic, resource use, & population trends remain unchanged resulting in economic & ecological collapse.
4. 1992 update "Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future"
    World has already overshot some limits
    Global & environmental collapse will come sometime in the 21st century.
    By using policy decisions on population, resource use, population control, per capita industrial and food output researchers came up with WHAT IF questions:

WHAT IF

1. There is no change in world population growth and industrial output?
    a. collapse within 100 yrs caused by depletion of non-renewable resources & environmental overload.
    b. doubling the projected supply would delay collapse by 20 years
    c. 2 children/family delays the collapse by 20 yrs.
    d. NO children still only delays the collapse.
2. we use technology to double the non renewable resource supplies, control pollution, soil erosion, make birth control available for all & stabilize per capita output at 1990 levels?
    the model shows that a collapse is avoided and results in a fairly smooth transition to a sustainable future.

D. Births and Economic Development

1. demographic transition = hypothesis of population change.
    As countries become more industrialized, first their death rates, then birth rates decline. This is done in 4 stages.
    a. preindustrial stage - harsh living conditions contribute to high birth rate & death rate (little population growth)
    b. transitional stage - industrialization begins, food production rises, health care improves, death rates drop, births remain high, and population grows.
    c. industrial stage - industrialization is widespread, birth rate drops & approaches death rate (due to birth control) decline in infant mortality, increased job opportunities for women, high cost of raising children.

d. postindustrial stage - birth rates decline further = ZPG until the population growth rate decreases, shift to a sustainable form of economic development. (Most Western European countries are in this stage = 12% of the world's population.

E. Family Planning & Birth Reduction = provides educational and clinical services to help couples choose how many and when to have children.
   a. Family planning is responsible for a 40% drop in fertility rates in developing countries.
   b. helps to reduce the need for social services.
   c. may reduce legal and illegal abortions.
   d. coupled with prenatal care & health services, family planning can reduce the risk of childbearing.
   e. reduces the birth and fertility rates in populous countries such as China, Indonesia, Brazil, & Bangladesh.
      1. there has been a 6-fold increase in the use of contraceptives in the last 2 decades for married women.
      2. couples see fewer benefits of large families due to lack of available land, unstable farming conditions, extensive flooding & government supplied mass media messages.
      (U.S. has 1/5 of the abortions -242,000/yr)

F. Economic rewards & penalties for reduced births
   1. payments for using contraceptives or sterilization (either to women or their doctors).
   2. penalize couples for more than 1 or 2 children (raise their taxes, charge other fees, or eliminate income tax deductions for third child, loss of health care benefits, food allotment, job options.

G. Empowering women and reduced births
   1. women with an education & a job outside the Homes have fewer children.
   2. women work 2/3's of all hours worked and receive 1/10 of the world's income & own 0.01% of the world's property.
   3. In most developing countries, women don't have the legal rights to own land or borrow $.
   4. women make up 70% of the world's poor & 2/3's are illiterate.

IV. Slowing Population Growth
   A. India
      1. First national family planning program (1952).

2. 30% of the world's births
3. 36% of the people are under age 15
4. women average 3.5 children - down from 5.3 in 1970
5. growth is exponential and will overtake China in 2050.
6. India has the poorest people in the world.
   52% live on $1 /day
   30% live on less than 27c /day
   one half of the labor force is unemployed
7. 40% suffer from malnutrition/ Infant mortality = 72/1000
8. children get 3.5 yrs education = males;
   1.5 yrs for females.
   48% of those over 15 are illiterate
   70% have no access to toilets
   30% have no supply of safe water

B. China - World's largest population
(same land size as the U.S. but with 4.6 X's more people)

1. Since 1970, China has made an effort to feed its people and control population.
2. Since 1972, China has dropped its CBR from 32 to 17/1000 and its TFR dropped from 5.7 to 1.8 children/woman.
3. Infant mortality dropped by one half and the illiteracy rate dropped from 18.5 to 6 %.
4. Life expectancy = 71 (India is 59)
5. per capita income = twice India
6. Population Control program (extensive, intrusive, & strict)
   a. postpone marriage
   b. no more than one child
   c. married couples have access to sterilization, contraceptives, & abortion.
   d. couples with one child are given extra food; larger pensions, better housing, free medical care, salary bonuses, & child will be given free tuition & preference in the job market. Couples who break the pledge will lose all benefits. (81% of women use contraceptives, compared to 60 % in developed countries & 36% in developing countries)
   e. only alternative was mass starvation. China is a dictatorship, unlike India. China has a fairly homogeneous society with a widespread written language, which is an aid to education.

f. China has 21% of the world's population, 7% fresh water & croplands, 3% forests, 2% oil.

g. rivers are polluted; air pollution is causing health problems.

V. Cutting Global Population Growth & Sustainability
(Japan, Thailand, South Korea, Taiwan, & China have achieved replacement)

A. The best way to slow population growth is to invest in family planning, reduce poverty, & elevate the status of women.

B. How Governments reduce population growth
1994 - UN held conference on population & development in Cairo, Egypt.

Major Goals

1. Provide access to family planning & reproductive health care
2. Improve health care for infants, children & pregnant women
3. Encourage national population policies
4. Equity between men & women
5. Increase access to education, especially girls
6. Increase involvement of men in childcare responsibilities & family planning.
7. Strive to eradicate poverty
8. Reduce and eliminate unsustainable patterns of production & consumption.

Alternatives ???? increased pollution, environmental degradation, & dieback of people