APES CHAPTER 7 NOTES (MRS. BAUCK): THE HUMAN POPULATION

MODULE 22: Human Population Numbers

I. Human Population

A. Trends from GeoHive archives and https://www.worldometers.info/world-population/world-population-projections/ (estimates may vary slightly)

Year (estimate/projected)	Amount	Years in between
1804	1,000,000,000	-
1927	2,000,000,000	123
1960	3,000,000,000	33
1974	4,000,000,000	14
1987	5,000,000,000	13
1999	6,000,000,000	12
2011	7,000,000,000	12
2022	8,000,000,000	11
2037	9,000,000,000	16
2055	10,000,000,000	18
2100	10,900,000 000**	projected maximum

B. Scientists disagree on Earth's carrying capacity (K)

1) some say we have already outgrown it
2) some say we will soon outgrow it
3) some say we will eventually outgrow it
4) some say a growing population means potential for increased innovation to deal with challenges

C. reasons for the population growth patterns

1) pre-1800:
   a) higher *infant mortality* rates
   b) *diseases*: scarlet fever, smallpox, Black Plague, cholera, typhus…
2) Louis Pasteur (1822-1895)

From scienceworld.wolfram.com:

"…Pasteur delivered the fatal blow to the doctrine of spontaneous generation, the theory that life could arise spontaneously... He also developed a germ theory. At the same time, he discovered the existence of life without oxygen: 'Fermentation is the consequence of life without air.' *The discovery of anaerobic life* paved the way for the study of germs that cause septicemia and gangrene, among other infections. Thanks to Pasteur, it became possible to *devise techniques to kill microbes and to control contamination.*

…Elaborating on his study of fermentation, he could now confirm that *each disease is caused by a specific microbe and that these microbes are foreign elements*. With this knowledge, Pasteur was able to establish the *basic rules of sterilization or asepsis*. Preventing contagion and infection, his method of sterilization revolutionized surgery and obstetrics.

…He went on to discover three bacteria responsible for human illnesses: staphylococcus, streptococcus and pneumococcus…"

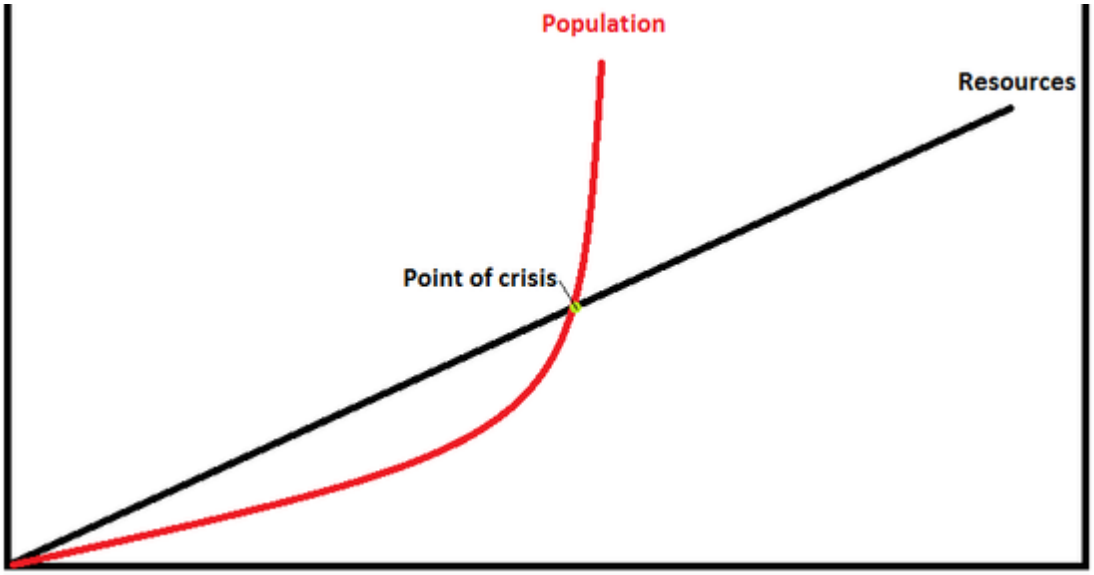
3) 1928 penicillin action discovered by Sir Alexander Fleming

- the bacterium *Staphylococcus aureus* was destroyed by the mold *Penicillium notatum*, proving that there was an antibacterial substance present

4) other reasons: *improved nutrition, advances in medicine, increased access to good medical care , more widespread immunizations*
5) *fertility rates* (number of babies born to a woman during her lifetime) have decreased

D. *Thomas Malthus* (1766-1834)—*human population would eventually outgrow food supply*

MALTHUS' THEORY: population/food vs time



Source: ibgeograph

E. demographics

1) **demography**—the *study of population characteristics* through data collection and interpretation
2) **demographers** *gather information and interpret census data*
3) **age structure**—the *breakdown of people in each age group at a given time* (a "snapshot" of the population's demographics)
4) **cohort** – group of people
5) cohorts for U.S. generations (date ranges are approximate)
   a) Greatest Generation – 1901-1927
   b) Silent Generation – 1928-1945
   c) Baby Boomers – 1946-1964
   d) Generation X – 1965-1979
   e) Millennials/Generation Y – 1980-1994
   f) Generation Z – 1995-2009
   g) Generation Alpha – 2010-2024
   h) Generation Beta – 2025-2039
6) pop. profiles help us to *analyze the past and prepare for the future:* job market, school-age people, elderly population (health care; nursing homes and related facilities…)
7) **graying**—increasing proportions of elderly people
8) *age-specific marketing* (clothing, cars, electronics, toys, etc.)

II. Changes in Human Population Size

A. **immigration**

1) *people moving into a country or region from a different area*
2) input = births and immigration

B. **emigration**

1) *people moving out of a country or region to a different area*
2) output = deaths and emigration

C. *** birth rates and death rates ***

1) **CBR** = **crude birth rate** = *# births per 1000, per year*
2) **CDR** = **crude death rate** = *# deaths per 1000, per year*
3) **(CBR – CDR) / 10 = percent change**

GLOBAL POPULATION GROWTH RATE (%) = (CBR - CDR) / 10

NATIONAL POPULATION GROWTH RATE (%) = [(CBR + IMM.) - (CDR + EM.)] / 10

4) **doubling time**—*the time it takes (yrs.) for a population to double in size*
5) **Rule of 70: (70 / percentage growth rate) = doubling time**

- Example: If a population is growing at a rate of 4%, the population will double in 17.5 years. (70 / 4)

D. fertility

1) **TFR = total fertility rate**—*the average number of babies born to a woman during her reproductive years (puberty to menopause)*
http://data.worldbank.org/indicator/SP.DYN.TFRT.IN
2) **replacement-level fertility**—the population size is *maintained*
***** TFR = 2.1** *is considered to be the replacement rate* ***

Archival stats from www.overpopulation.com:

Region	Total Fertility Rate - 1998
World	2.9
"Less Developed Countries"	3.2
"More Developed Countries"	1.6

U.S. Census Bureau:

Region	1990 TFR	2000 TFR	2010 TFR	2025 TFR projection
World	3.4	2.8	2.5	2.3
Developing	4.7	3.1	2.7	2.4
Developed	1.9	1.6	1.7	1.7

3) rich vs. poor countries: categories from the World Bank:

Category A: High-income countries http://data.worldbank.org/income-level/high-income

- highly developed; industrialized
- *~ 20% of the global population; ~ 80% of the wealth*

Category B: Upper-middle income countries http://data.worldbank.org/income-level/upper-middle-income

- moderately developed

Category C: Lower-middle income countries http://data.worldbank.org/income-level/lower-middle-income

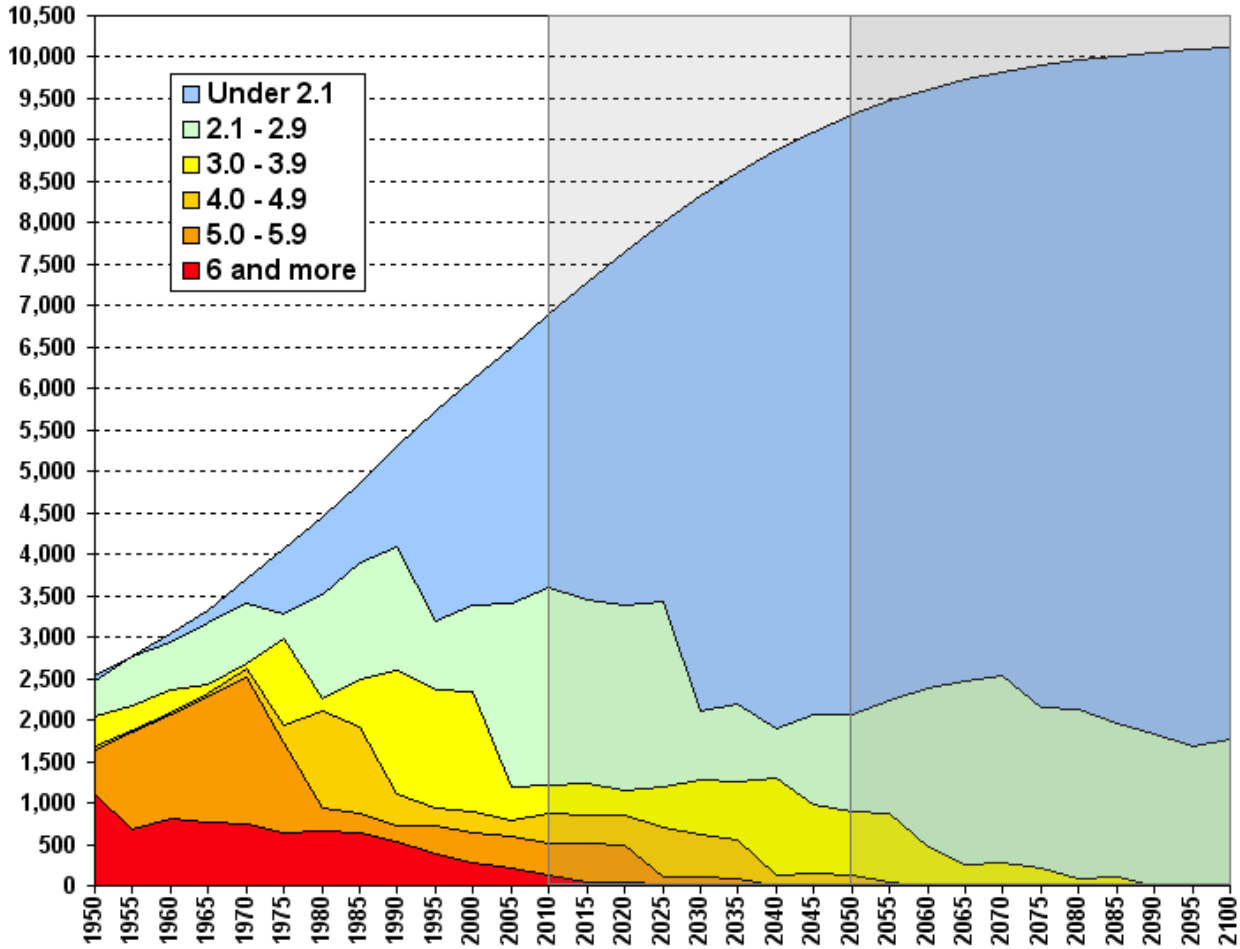
- moderately developed

Category D: Low-income countries http://data.worldbank.org/income-level/low-income

- over 1,000,000,000 people live in extreme poverty
- *Over 99% of the global population growth is in developing countries!*

4) updated classification: developed vs. developing
    a) **developed countries** = *high-income countries (TFR ~2)*
    b) **developing countries** = *middle- & low-income countries*
    c) outdated: MDCs, LDCs, Second World, Third World
5) *GNP: Gross National Product*— the total value of the goods and services produced by the residents of a nation during a specified period (as a year)
6) *"per capita"*: *per unit of population; by or for each person*

UN estimates and forecasts of the world population by total fertility (millions)
https://esa.un.org/unpd/wpp/ https://ourworldindata.org/future-world-population-growth/



E. Different populations, different issues
    1) general factors involved

- *diet: meat consumption, etc.*
- *energy: use of fossil fuels, etc.*
- *use of natural resources*
- *waste production and disposal*
- *land issues: erosion, overgrazing, deforestation, desertification…*
- *air pollution issues*
- *water quality issues*
- *available health care*
- *diseases*
- *climate changes*

2) **** environmental impact is proportional to population size and affluence of lifestyle, mitigated by stewardship ****
3) what to do: *stabilize population size, decrease consumption, increase stewardship*

F. life and death
1) **life expectancy**—*the average number of years that an infant born in a specific year in a specific country can be expected to live, taking into account the country's current average life span and birth rate*
2) **longevity**—*lifespan or lifetime of an individual*

3) **infant mortality** = *# deaths of children < 1 year old) / 1000 live births*
4) **child mortality** = *# deaths of children 1-5 years old) / 1000 live births*

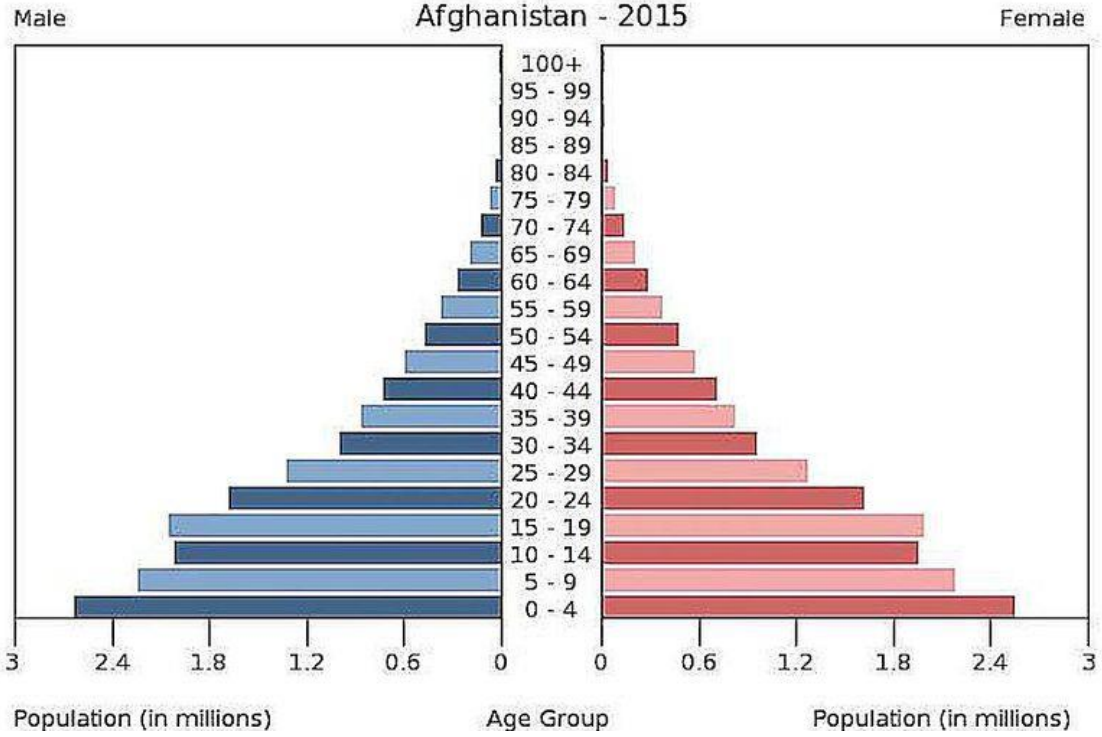
5) WHO: infectious diseases are the #2 worldwide killer , after heart disease http://www.who.int/topics/infectious_diseases/en/

G. migration
1) **net migration rate** = *immigration – emigration / 1000 (per year, per country)*
2) "environmental refugees": possible effects of migration to cities to seek employment
a) large influx of people, living shanty towns or slums
b) overcrowding
c) increase in infectious diseases
d) too many laborers for too few jobs
e) people scavenging in the streets and dumps

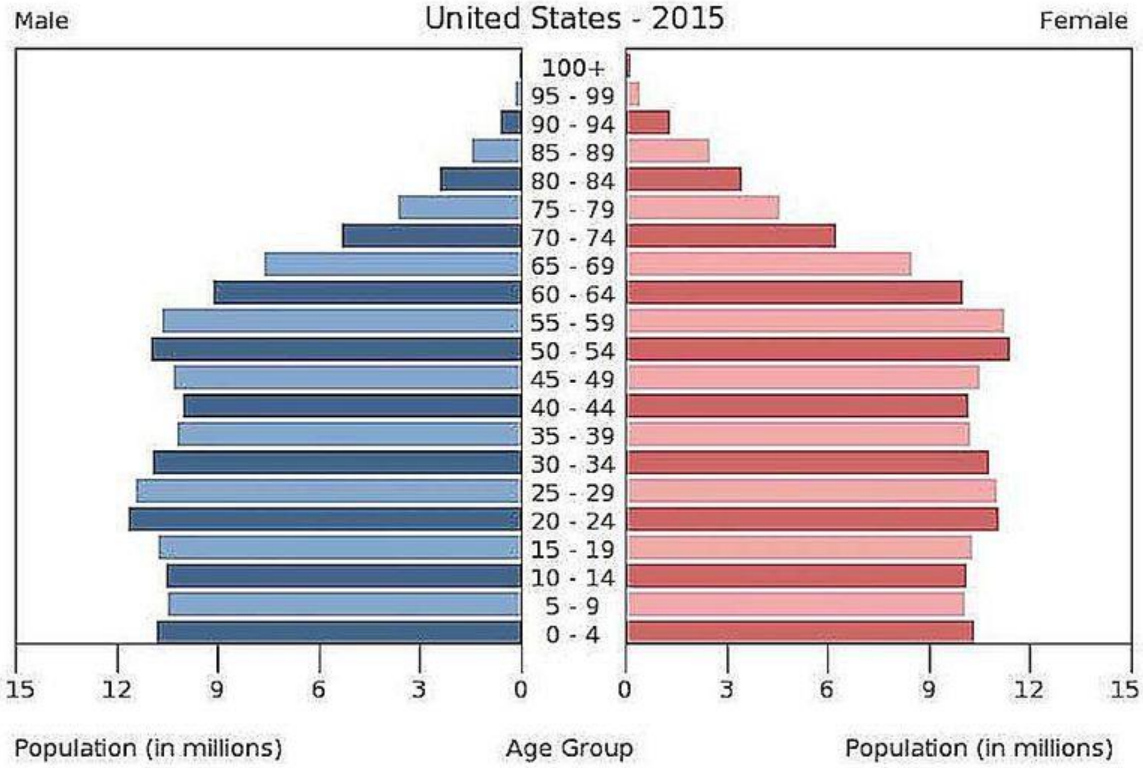
III. Age structure diagrams (population profiles)
A. characteristics
1) a *horizontal bar graph* of the age breakdowns of males and females for a population
2) horizontal "layers" move up over time as that segment of the population ages
3) usually colored (sometimes blue for males and pink for females)
B. shapes
1) developing country = pyramidal/triangle ("population/age pyramids")
2) developed country = more stable; tall rectangle
3) fluctuations in cohorts can be seen
C. **population momentum**
1) *continued population growth after growth reduction measures have been implemented*
2) *the lag between declining fertility rate (below replacement level, <2.1) and changing population profile shape*
3) Only a population at or below replacement level (TFR 2.1) for many decades will achieve a stable population.

Images from https://www.thoughtco.com/age-sex-pyramids-and-population-pyramids-1435272

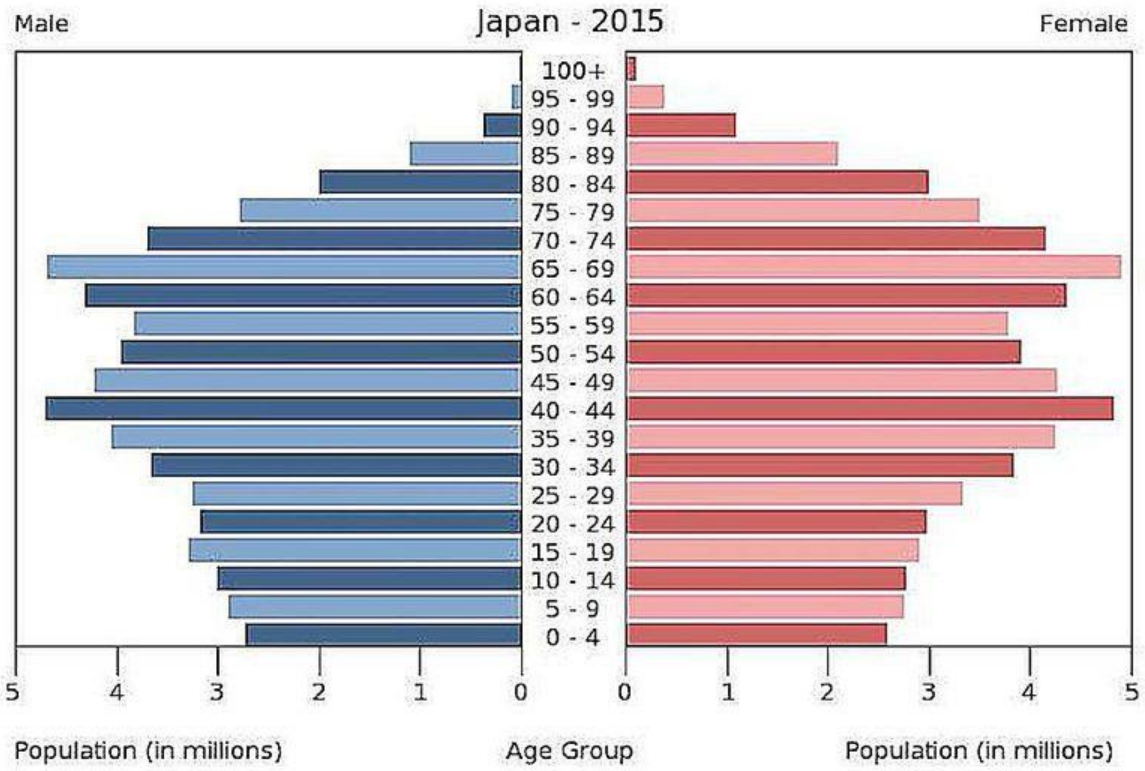
EXAMPLE OF RAPID GROWTH



EXAMPLE OF SLOW GROWTH



EXAMPLE OF NEGATIVE GROWTH



MODULE 23: ECONOMIC DEVELOPMENT, CONSUMPTION, AND SUSTAINABILITY

ANONYMOUS SURVEY…

1) a) Do you want to be married or in a committed relationship someday?
   b) If so, what would be the ideal age for you to do this?
   c) Why?
2) a) How many children would you like to have?
   b) Why?
3) a) If you want children, what age would you like to be when you have your first child?
   b) Why?

IV. **The Demographic Transition**—*there is a causal link between modernization and a decline in birth and death rates.*

A. *epidemiologic transition*—pattern of changes in mortality factors
B. *fertility transition*—pattern of changes in fertility factors
C. phases of the demographic transition

Phase I - *"primitive stability"* with high CBR and high CDR

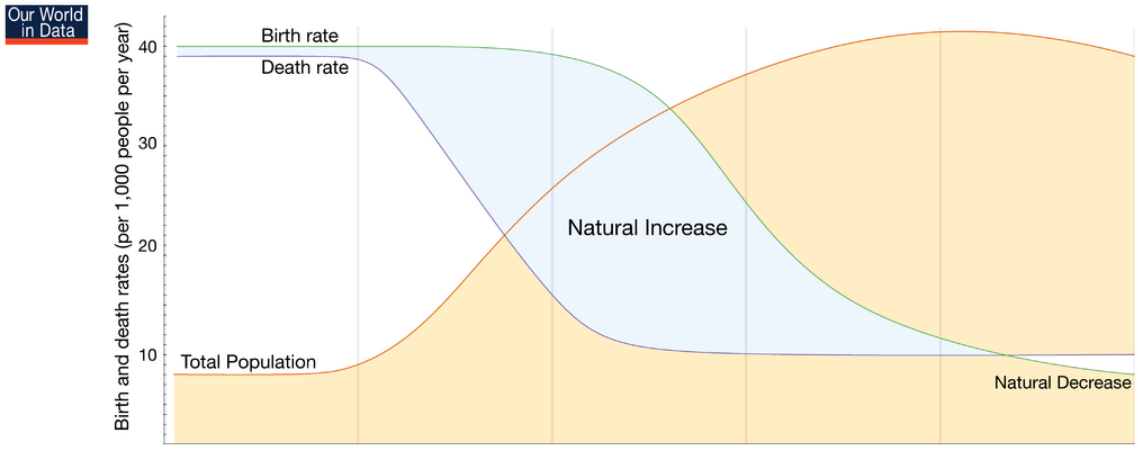
Phase II - *epidemiologic transition* with declining CDR

Phase III - declining CBR from *declining fertility rates*

Phase IV - *"modern stability"* with low CBR and low CDR

Phase V - *negative growth* - CDR is low but the CBR is even lower

D. developed countries have completed the demographic transition
E. developing countries are in Phase II and III



	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Birth rate	*High*	*High*	*Falling*	*Low*	*Very low*
Death rate	*High*	*Falls rapidly*	*Falls more slowly*	*Low*	*Low*
Natural increase	*Stable or slow increase*	*Very rapid increase*	*Increase slows down*	*Stable or slow increase*	*Stable or slow decrease*

What do the developing countries need to do to undergo the demographic transition?

Must the developing countries that are stuck in the demographic transition modernize before fertility will decline, or must they bring fertility down before they can modernize?

Answer: Population growth must be curtailed before true modernization can occur. Poverty reduction is a priority. Poverty is an insult to human dignity and should not be tolerated. Sustainable development is the answer.

V. Family Planning

A. **family planning—***using birth control methods to regulate the numbers or offspring or spacing of offspring*

B. difficult issues

"Why do poor people in developing countries continue to have so many children?"

1) *old-age security: children care for elderly parents and family members*
2) even with high infant and childhood mortality rates, there is still the desire to raise children
3) *helping hands:* more children = more helpers; economic asset
4) *inaccessible or discouraged education for females*
   - children become more of an economic liability as income increases
5) *status of women*: lack of opportunities for women's careers
   - *women may be seen as child-bearers only—sometimes the more children she has, the more worthy she is*
6) availability of *contraceptives*
   a) free clinics can be far away, crowded, or they run out of supplies
   b) misuse, improper use
   c) religious culture sometimes plays a factor

VI. Resource Use

A. general info.

1) U.S has the highest ecological footprint of any country!
2) IPAT equation

IMPACT = POPULATION x AFFLUENCE x TECHNOLOGY

B. impact of affluence

1) **GDP – gross domestic product**
   a) *the value of all products and services produced in a country per year*
   b) components: investments, consumer spending, government spending, (exports minus imports)
   c) generally, *GDP is proportional to ecological footprint* at first (more later)

2) **urban area**—*any place containing over 1000 people/ mi^2 (over 385 people /km^2)*

3) positive impacts

- stable food sources
- good food quality
- clean water supply
- steady access to fuel
- adequate medical care
- control of infectious diseases
- proper sanitation and waste disposal
- guaranteed education for children
- more educated population
- technology in everyday life

4) negative impacts

- production of Greenhouse gases
- contribution to the shortage of fossil fuels
- deforestation of rainforests
- radioactive nuclear waste
- overfishing
- habitat destruction
- species endangerment or extinction
- toxic waste

C. additional effects of poverty

1) *subdividing farms and intensifying cultivation*
   a) dividing up the farm for the next generation and/or
   b) land continuously used, mostly without proper fertilization or crop rotation
2) *fuelwood consumption*
   a) 60% of the world's population relies on burning wood for fuel
   b) fuel (wood) shortage
   c) leads to more deforestation and soil erosion
3) *opening up new lands for agriculture*
   a) "new land" = natural land converted for human use
   b) ~ 1/3 to 1/2 of cleared land can become unproductive in 3-5 years (people lack skills or resources to take care of tropical soils)
   c) ~ 2/3 of tropical deforestation is for agricultural use
   d) increased erosion and desertification
4) *migration to cities* for employment
5) *illicit activities*
   a) growing illegal crops or synthesizing the illegal compounds
   b) increased prostitution and other crimes as people become desperate
   c) *wildlife poaching* for exotic pets or parts for the black market

(shark fins; bear paws…)

6) *emigration and immigration* – "environmental refugees"
7) *impoverished women and children*
   a) men under the pressure of poverty
      - many men abandon their families to work on their own
      - unacknowledged pregnancies; unsupported children
   b) women begging, foraging in dumps and on the street, stealing, going into prostitution
   c) vicious cycle of poverty continues