

APES Ch. 5 Notes ~ The Human Population: Dimensions

5.1 Notes

- I. Human Population Expansion and Its Cause
 - A. The expansion trend

From GeoHive.com: Milestones (when did/will we reach the next billion)

<u>year (estimate/projected)</u>	<u>amount</u>	<u>years in between</u>
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
2028	8,000,000,000	17
2050	9,000,000,000	22

B. Reasons for the growth patterns

1) Pre-1800:

a) Higher *infant mortality* rates

b) *Diseases* : measles, scarlet fever, smallpox, Black Plague, cholera, typhus...

2) Louis Pasteur (1822-1895)

Advances in microbiology, sanitation, hygiene...

From scienceworld.wolfram.com:

“...[Pasteur] demonstrated that each sort of fermentation is linked to the existence of a specific microorganism-- a living being that one can study by cultivation in an appropriate, sterile medium. This insight is the basis of microbiology.

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

TABLE 5-1 p. 126 *important vocabulary*

5.2 Notes

II. Different Worlds

A. Rich Nations, Poor Nations

1) Categories from the World Bank:

a) Category A: High-income countries
<ul style="list-style-type: none"> • Highly developed; industrialized • ~ 20% of the global population; ~ 80% of the wealth
b) Category B: Upper-middle income countries
<ul style="list-style-type: none"> • moderately developed
c) Category C: Lower-middle income countries
<ul style="list-style-type: none"> • moderately developed
d) Category D: Low-income countries
<ul style="list-style-type: none"> • over 1,000,000,000 people live in extreme poverty

<p>Category A: High-income countries http://data.worldbank.org/income-level/high-income Andorra, Antigua and Barbuda, Aruba, Australia, Austria, Bahamas, Bahrain, Belgium, Bermuda, British Virgin Islands, Brunei Darussalam, Canada, Cayman Islands, Channel Islands, Chile, Croatia, Curacao, Cyprus, Czech Republic, Denmark, Estonia, Faeroe Islands, Finland, France, French Polynesia, Germany, Gibraltar, Greece, Greenland, Guam, Hong Kong Sar (China), Hungary, Iceland, Ireland, Isle of Man, Israel, Italy, Japan, Korea (Rep.), Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Macao Sar (China), Malta, Monaco, Nauru, Netherlands, New Caledonia, New Zealand, Northern Mariana Islands, Norway, Oman, Poland, Portugal, Puerto Rico, Qatar, San Marino, Saudi Arabia, Seychelles, Singapore, Sint Maarten (Dutch part), Slovak Republic, Slovenia, Spain, St. Kitts and Nevis, St. Martin (French part), Sweden, Switzerland, Trinidad and Tobago, Turks and Caicos Islands, United Arab Emirates, United Kingdom, <u>United States</u>, Uruguay, Virgin Islands (U.S.)</p> <p>Category B: Upper-middle income countries http://data.worldbank.org/income-level/upper-middle-income Albania, Algeria, American Samoa, Angola, Argentina, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Grenada, Guyana, Iran (Islamic Rep.), Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Macedonia, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Montenegro, Namibia, Palau, Panama, Paraguay, Peru, Romania, Russian Federation, Serbia, South Africa, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Turkey, Turkmenistan, Tuvalu, Venezuela</p> <p>Category C: Lower-middle income countries http://data.worldbank.org/income-level/lower-middle-income Armenia, Bangladesh, Bhutan, Bolivia, Cape Verde, Cambodia, Cameroon, Congo (Rep.), Cote D'Ivoire, Djibouti, Egypt, El Salvador, Ghana, Guatemala, Honduras, India, Indonesia, Kenya, Kiribati, Kosovo, Kyrgyz Repub., Lao PDR, Lesotho, Mauritania, Micronesia, Fed. Sts., Moldova, Mongolia, Morocco, Myanmar, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Samoa, Sao Tome and Principe, Solomon Islands, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Tajikistan, Timor-Leste, Tonga, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Yemen Rep, Zambia</p> <p>Category D: Low income countries http://data.worldbank.org/income-level/low-income Afghanistan, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Congo (Dem. Rep.), Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Korea (Dem Rep.), Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Niger, Rwanda, Senegal, Sierra Leone, Somalia, South Sudan, Tanzania, Togo, Uganda, Zimbabwe</p>

- 2) Updated classification: developed vs. developing
 - a) **developed countries** = *high-income* countries
 - b) **developing countries** = *middle- and low-income* countries
- 3) Outdated classification: MDCs, LDCs, Second World, Third World
- 4) misc. info from www.m-w.-org:
 - a) *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)
 - b) “*per capita*”: *per unit of population; by or for each person*

B. Population Growth in Rich and Poor Nations

Over 99% of the global population growth is in developing countries!

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

From www.overpopulation.com:

<u>Region</u>	<u>Total Fertility Rate - 1998</u>
World	2.9
Less Developed Countries	3.2
More Developed Countries	1.6

U.S. Census Bureau projections:

<u>Region</u>	<u>1990 TFR</u>	<u>2000 TFR</u>	<u>2010 TFR</u>	<u>2025 TFR</u>
World	3.4	2.8	2.5	2.3
Less developed countries	4.7	3.1	2.7	2.4
More developed countries	1.9	1.6	1.7	1.7

C. Different Populations, Different Problems

1) General factors involved

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

2) *environmental impact is proportional to population size and affluence of lifestyle, mitigated by stewardship*

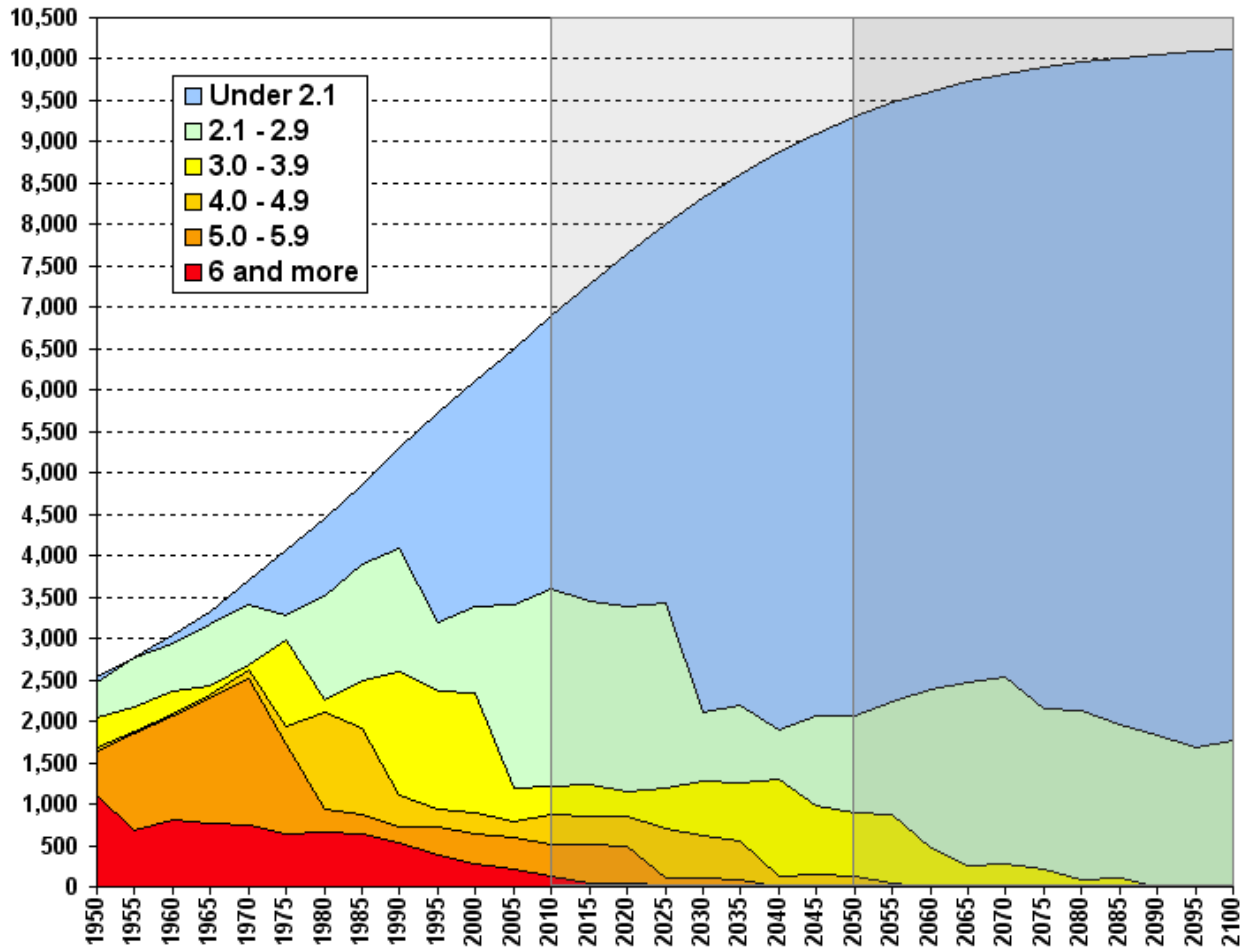
3) What to do

- a) *stabilize population size*
- b) *decrease consumption*
- c) *increase stewardship*

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/>



5.3 Notes

III. Consequences of Population Growth and Affluence

A. The Growing Populations of Developing Countries – impacts/options

1) *Subdividing farms and intensifying cultivation*

a) dividing and subdividing land

- dividing up the farm for the next generation, or increasing present cultivation of the land
- *eventually you have too little to produce enough to survive (Africa and Asia)*
- not enough to sell/barter either
- *land continuously used, mostly without proper fertilization or crop rotation*

b) 60% of the world's population relies on burning wood for fuel

- fuel (wood) shortage
- leads to more deforestation
- leads to soil erosion and depletion

- 2) *Opening up new lands for agriculture*
 - “new land” = natural land converted for human use
 - a) ~ 1/3 to 1/2 of cleared land can become unproductive in 3-5 years (people lack the skills or resources to take care of tropical soils)
 - b) ~ 2/3 of tropical deforestation is for agricultural use
 - c) increased erosion and desertification
- 3) *Migration to cities to seek employment*
 - a) large influx of people, living shanty towns or slums
 - b) overcrowding
 - c) increase in cholera, infectious diseases
 - d) too many laborers for too few jobs
 - e) people scavenging in the streets and dumps
- 4) *Illicit activities*
 - a) *drugs*—growing illegal crops or synthesizing the illegal compounds
 - b) increased prostitution and other crimes as people become desperate
 - c) *wildlife poaching*
 - selling them to be used as exotic pets
 - selling parts into the black market (shark fins; bear paws...)

Convention on International Trade in Endangered Species (CITES) <http://www.cites.org>
 Set up in 1975 following growing international concern about species at risk of extinction because of international trade, CITES places degrees of restriction on trade depending on the perceived risk to a species. Those in imminent danger of extinction are listed on “Appendix I,” which bars all international trade. Less endangered species are placed on “Appendix II,” which allows controlled trade subject to permits, and on “Appendix III,” which restricts trade on a regional level

- 5) *Emigration and Immigration*
 - a) Emigration = moving out and Immigration = moving in
 - b) “environmental refugees”
 - c) 1/3+ of the U.S. population growth is from immigrants
- 6) *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

B. Effects of Increasing Affluence

- 1) some pros
 - 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...

- 2) some cons
 - 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

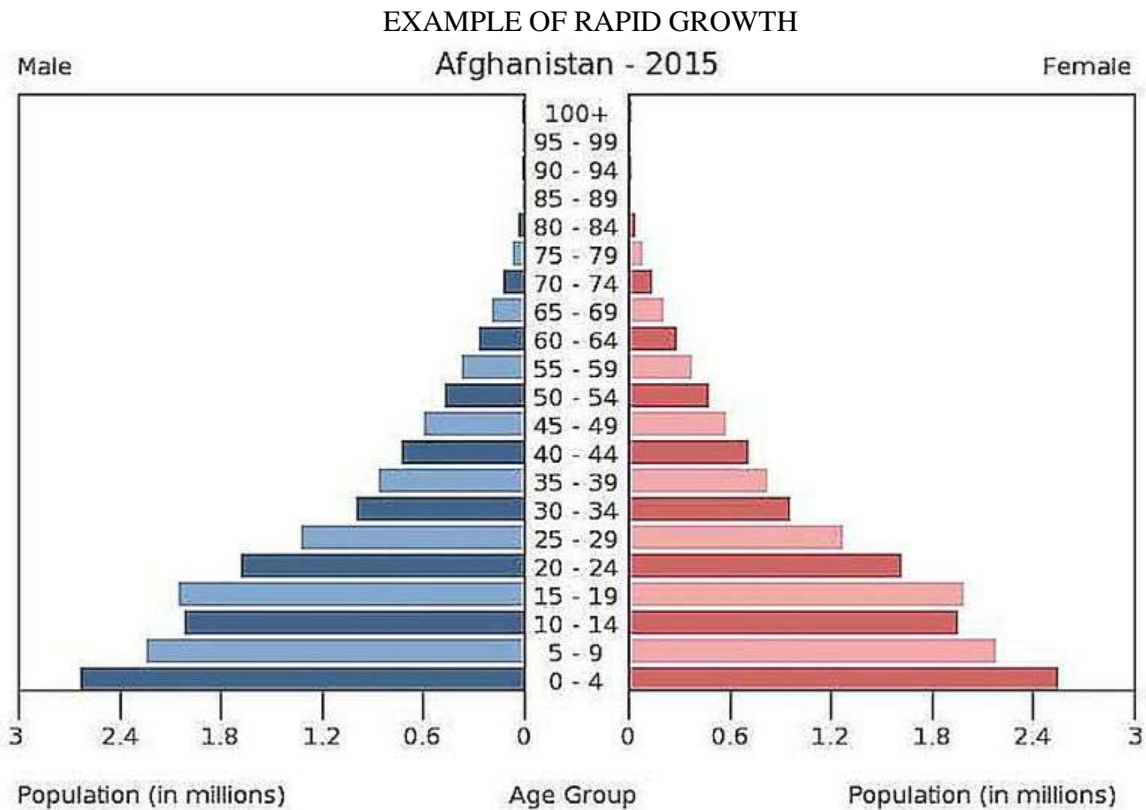
5.4 Notes

IV. Dynamics of Population Growth

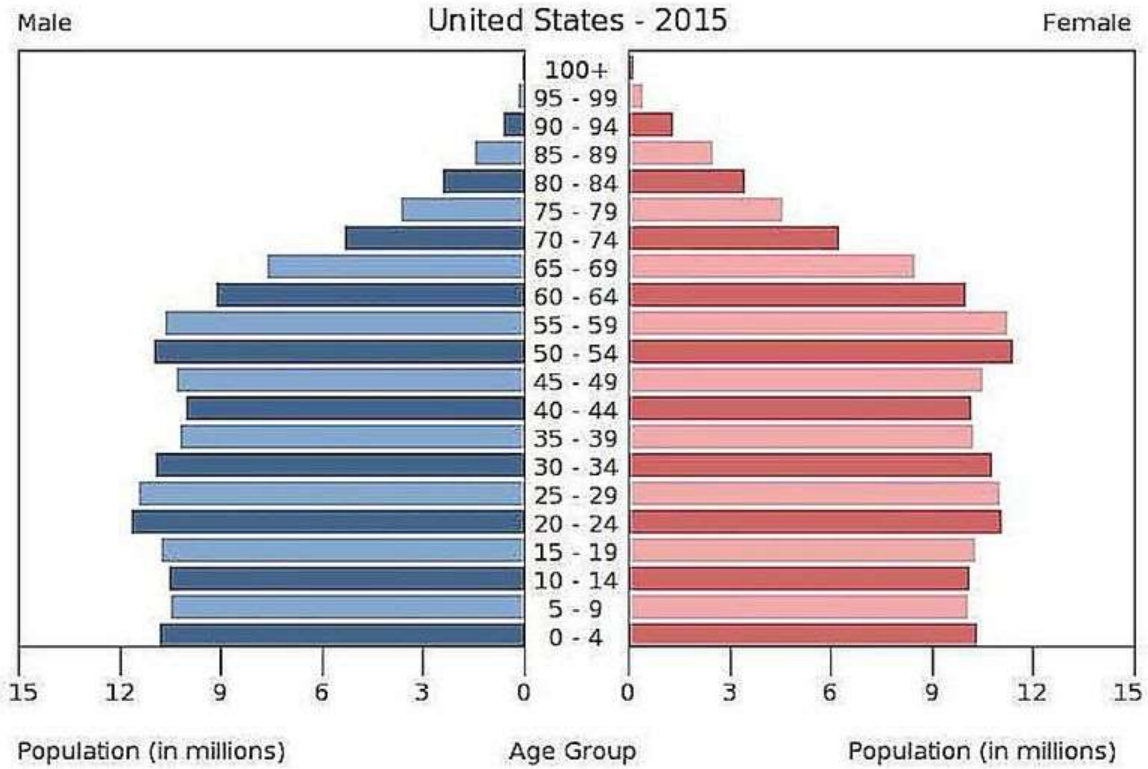
A. Population profiles

- 1) **longevity**—*lifespan* or lifetime of an individual
- 2) **population profile**
 - a *horizontal bar graph* of the age breakdowns of males and females for a population
 - horizontal “layers” move up over time as that segment of the population ages
 - usually colored (blue for males and pink for females)
 - also called population pyramids, age pyramids, age structure diagrams

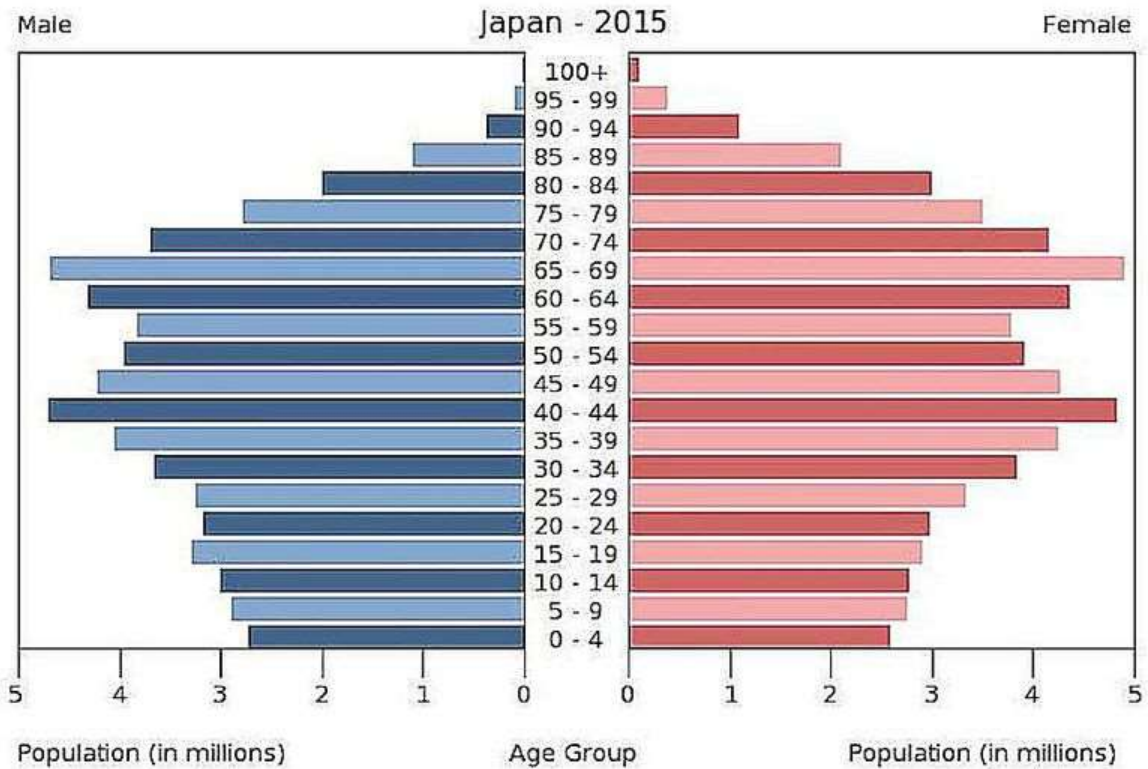
Images from <https://www.thoughtco.com/age-sex-pyramids-and-population-pyramids-1435272>



EXAMPLE OF SLOW GROWTH



EXAMPLE OF NEGATIVE GROWTH:



- 3) **demography**—the *study of population characteristics* through data collection and interpretation
- 4) **demographers**—*people who gather information and interpret census data*
- 5) **age structure**—the *breakdown of people in each age group at a given time* (a “snapshot” of the population’s demographics)
- 6) **cohort** – group of people
- 7) cohorts for the U.S. (date ranges are approximate)
 - a) “*baby boomers*” (born 1946 to 1964)
 - b) “*Generation X*” or “*Gen X*” (born 1965 to 1976 through 1988)
 - c) “*Millennials*” / “*Generation Y*” (born 1977 to 1989 through 1994 – the idea is that this group generally reaches adulthood at the turn on the century)
 - d) “*Generation Z*” (iGeneration, Post-Millennials, Plurals, Homeland Generation or the 9/11 Generation) - (born 1995 to 2000, through 2021)
- 8) pop. profiles help us to *analyze the past and prepare for the future*
 - a) job market
 - b) school-age people
 - c) elderly population (health care; nursing homes and related facilities...)
 - **graying**—increasing proportions of elderly people
 - d) *age-specific marketing* (clothing, cars, electronics, toys, etc.)

B. Population Projections

- 1) the *forecasting* technique (the farther into the future the projections are made, the more error is possible)
 - a) estimating births as a new bar at the bottom of the profile
(# woman coming into each age) x (% of women who have babies at that age)
 - b) estimating deaths
(# people coming into that age) x (% of people who die at that age)
- 2) *U.N. projections*
 - a) *high fertility scenario* (continuing the J-curve)
 - b) *medium-fertility scenario* (leveling off; steady top of S-curve)
 - c) *low-fertility scenario* (dropping off after ~2020)
- 3) population projections for developed countries
 - a) *lower fertility rate; lower number of young people; higher number of elderly people... What to do?*
 - Encourage immigration?
 - Give incentives for women to have children?
 - Deal with a shrinking population—cultural implications, etc.
 - b) *the U.S. is the only developed country to have increased fertility rates in current years*
- 4) population projections for developing countries
 - a) *in general, fertility rates are declining, but TFR > 2.1*
 - b) *pyramid-shaped population profile*: babies born in the next generation outnumber the previous generation
 - c) disproportionate number of young people < 15, ~40-50%

C. **Population Momentum**—the lag between declining fertility rate (below replacement level, <2.1) and changing population profile shape

Area	POPULATION BY AGE GROUP		
	% by age group:		
	< 15	15-64	> 65
Sub-Saharan Africa	44	53	3
Asia, excluding China	32	62	6
Europe	18	68	14
China	25	68	7
U.S.	21	66	13

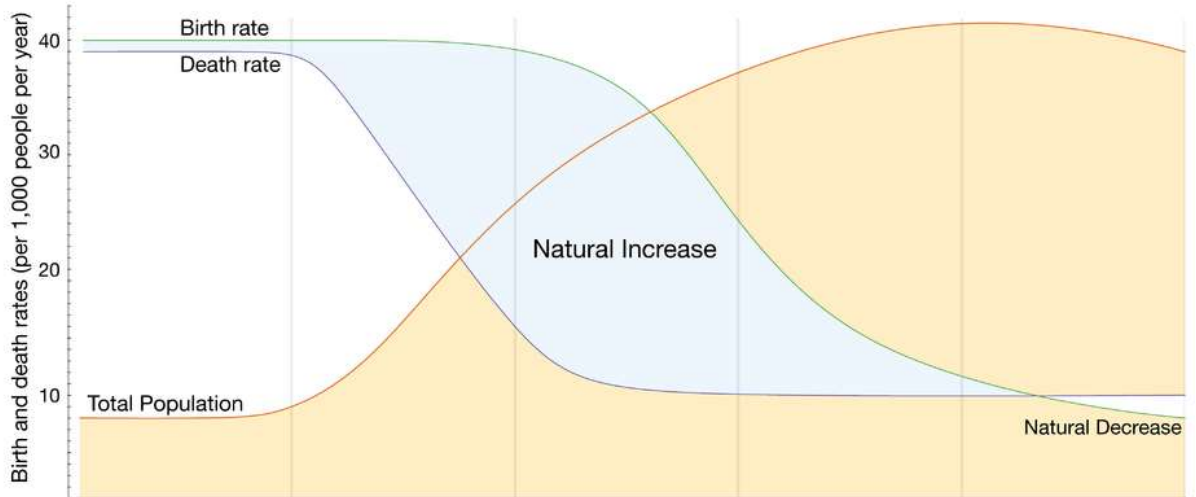
Only a population at or below replacement level (TFR 2.1) for many decades will achieve a stable population.

D. **Reproductive strategies**

- 1) **r-select**
 - a) reproduce early in life
 - b) have many offspring (enough will survive)
 - c) offer little or no parental care
 - d) examples: bacteria, mosquitoes, mice
- 2) **k-select**
 - a) reproduce later in life
 - b) have fewer offspring
 - c) nurture the offspring (preserve them)
 - d) examples: humans, lions, cows

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

- 1) birth rates and death rates
 - a) **CBR = crude birth rate** = # births per 1000, per year
 - b) **CDR = crude death rate** = # deaths per 1000, per year
 - **$(\text{CBR} - \text{CDR}) / 10 = \text{percent change}$**
 - c) **doubling time**—the time (in years) it takes for a population to double in size
 - **Rule of 70: $(70 / \text{percentage growth rate}) = \text{doubling time}$**
 - Example: If a population is growing at a rate of 4%, the population will double in 17.5 years. $(70 / 4)$
- 2) *epidemiologic transition*—pattern of changes in mortality factors
- 3) *fertility transition*—pattern of changes in fertility factors
- 4) phases of the demographic transition
 - a) **Phase I** - “primitive stability” with high CBR and high CDR
 - b) **Phase II** - *epidemiologic transition* with declining CDR
 - c) **Phase III** - declining CBR from *declining fertility rates*
 - d) **Phase IV** - “modern stability” with low CBR and low CDR
 - e) **Phase V** - *negative growth* - CDR is low but the CBR is even lower
- 5) developed countries have completed the demographic transition
- 6) developing countries are in Phase II and III



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

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