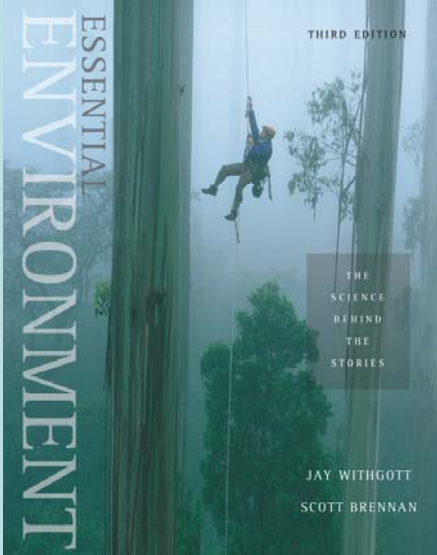


Chapter 6

Human Population

PowerPoint® Slides prepared by
Jay Withgott and Heidi Marcum

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This lecture will help you understand:

- The scope of human population growth
- The effect of population, affluence, and technology on the environment
- Fundamentals of demography
- The demographic transition
- Factors that affect population growth



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Case study: China's one-child policy

- In 1970, China's 790 million people faced starvation.
 - The average Chinese woman gave birth to 5.8 children.
- The government instituted a one-child policy.
 - China's growth rate plummeted.
 - The government first used education and outreach and later instituted rewards and punishments.
 - In 1984, the policy exempted ethnic minorities and farmers.
- The program has been both successful and controversial.
 - The low growth rate makes it easier to deal with challenges.
 - It has produced unintended consequences: killing female infants and a black-market trade in teenage girls.

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Human population growth: 7 billion

- Populations continue to rise in most countries.
 - Particularly in poverty-stricken developing nations
- Although the rate of growth is slowing, we are still increasing in absolute numbers.



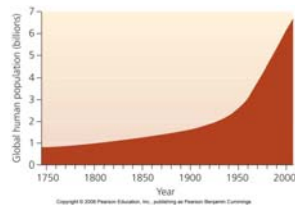
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It would take 30 years, counting once each second, to count to a billion!

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The human population is still growing rapidly

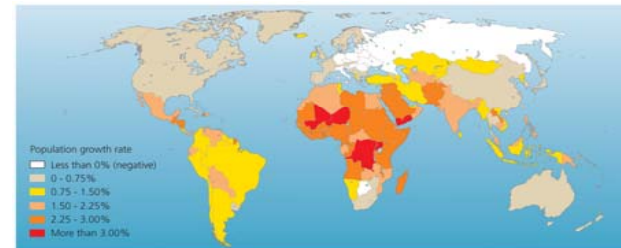
- It took all of human history to reach 1 billion.
- In 1930, 130 years later, we reached 2 billion, and added the most recent billion in 12 years.
 - We add 80 million people each year (2.5 people/second).



Due to exponential growth, even if the growth rate remains steady, population will continue to grow.

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Rates of growth vary from region to region



- At today's 1.2% global growth rate, the population will double in 58 years ($70/1.2 = 70$).
- If China's rate continued at 2.8%, it would have had 2 billion people in 2004.

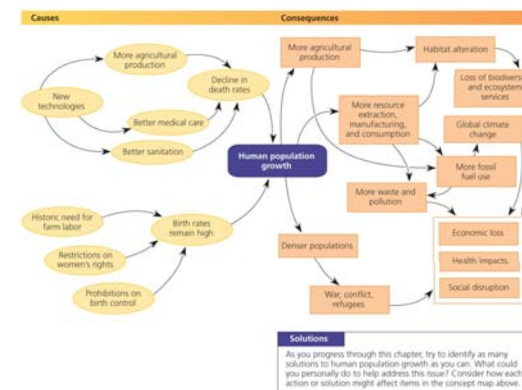
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Is population growth really a problem?

- Population growth results from technology, medical care, sanitation, and food.
 - Death rates drop, but not birth rates.
- Some people say growth is no problem.
 - New resources will replace depleted ones.
 - But some resources (i.e., biodiversity) are irreplaceable.
- Quality of life will suffer with unchecked growth.
 - Less food, space, wealth per person

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Causes and consequences of population growth



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Some people fear falling populations

- Population growth is correlated with poverty, not wealth.
- Policymakers believe growth increases economic, political, and military strength.
 - They offer incentives for more children.
 - 67% of European nations think their birth rates are too low.
 - In non-European nations, 49% feel their birth rates are too high.

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Population growth affects the environment

- The IPAT model: $I = P \times A \times T$
 - Our total impact (I) on the environment results from the interaction of population (P), affluence (A), and technology (T).
 - Population: individuals need space and resources and produce waste
 - Affluence: per capita resource use
 - Technology: allows increased exploitation of resources
 - But can also reduce our impact (e.g., decrease emissions)
 - Further model refinements include: sensitivity of the environment to impacts, education, laws, ethics

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Demography

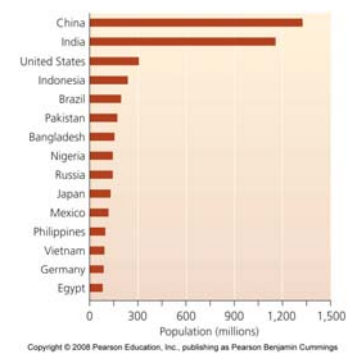
- All population principles apply to humans.
 - Environmental factors limit population growth.
 - The environment has a carrying capacity for humans.
- Humans can raise the environment's carrying capacity through technology.
 - How many humans can the world sustain?
 - 1–33 billion
 - Population growth can't continue forever.



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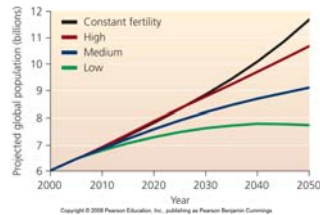
Demography studies human populations

- **Demography:** the application of population ecology to the study of human populations
 - Population size
 - Density and distribution
 - Age structure, sex ratio
 - Birth, death, immigration, and emigration rates



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Population size and density



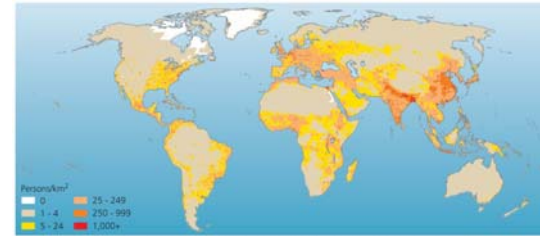
Predictions of population size depend on different assumptions about fertility rates.

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- Nobody knows the ultimate human population size.
 - But numbers are not the only important aspect.
- Highest population density is in temperate, subtropical, and tropical biomes.
 - Density increases near coasts, waterways, and cities.

Population density and distribution

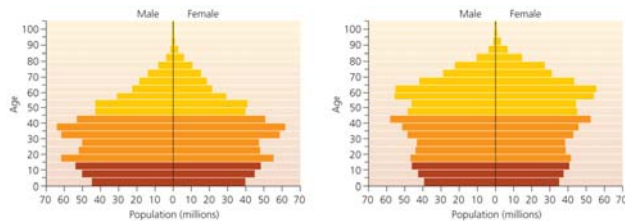
- Increased density impacts the environment, but relieves pressure in less-populated areas.
- Humans are unevenly distributed around the globe.
 - Unpopulated areas tend to be environmentally sensitive (i.e., deserts).



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A changing age structure poses challenges

- Many populations are getting older.
 - Older people need care and financial assistance.
 - But also reduces the number of dependent children and crime rates



(a) Age pyramid of China in 2005

(b) Projected age pyramid of China in 2030

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Sex ratios

- Naturally occurring sex ratios for humans slightly favor males (100 females born to 106 males).
 - Males are slightly more prone to death.
- In China, 120 boys were reported for 100 girls.
 - Cultural gender preferences, combined with the government's one-child policy, led to selective abortion of female fetuses.
 - Had the undesirable social consequences of leaving many single Chinese men
 - Teenage girls are kidnapped and sold as brides.

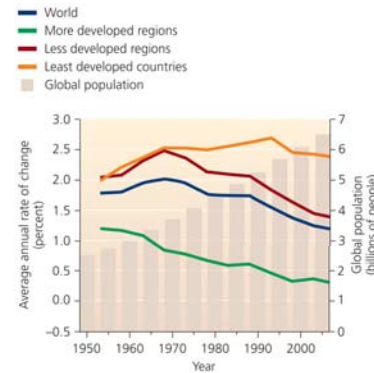
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Population growth depends on various factors

- Whether a population grows, shrinks, or remains stable depends on:
 - Rates of birth, death, and migration
 - Birth and immigration add individuals.
 - Death and emigration remove individuals.
- Technological advances led to dramatic decline in human death rates.
 - Widening the gap between birth rates and death rates resulting in population expansion

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Growth rates are decreasing, but...



Falling growth rates do not mean a decreasing population, but only that rates of increase are slowing.

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Factors affecting total fertility rate

- **Total fertility rate (TFR):** the average number of children born per female
- **Replacement fertility:** TFR that keeps the size of a population stable
 - For humans, replacement fertility = 2.1
- Urbanization decreases TFR.
 - Access to medical care
 - Children attend school and impose economic costs
- With social security, elderly parents need fewer children to support them.
- Greater education allows women to enter the labor force, with less emphasis on child rearing.

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Worldwide, total fertility varies widely

TABLE 8.2 Total Fertility Rates for Major Continental Regions

Region	Total fertility rate (TFR)
Africa	5.0
Latin America and the Caribbean	2.5
Asia	2.4
Oceania	2.1
North America	2.0
Europe	1.5

Data from Population Reference Bureau, 2007, 2007 World population data sheet.
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- Every European nation now has a TFR < replacement level
- **Natural rate of population change:** population change due to birth and death rates alone
 - In countries with good sanitation, health care, and food, people live longer. (They have a higher **life expectancy**.)

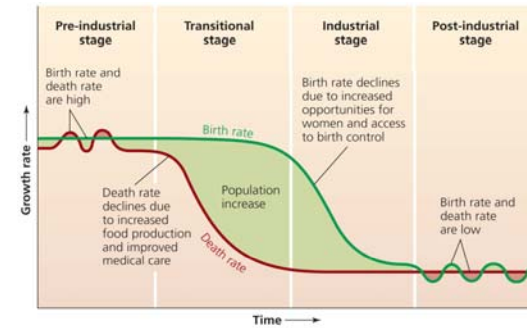
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The demographic transition

- **Demographic transition:** a model of economic and cultural change to explain the declining death and birth rates in industrialized nations
- Stable pre-industrial state of high birth and death rates changes to a stable post-industrial state of low birth and death rates
 - Industrialization causes these changes.
 - As mortality decreases, there is less need for large families, and parents invest in quality of life.
 - Because of high birth rates and low death rates, population growth occurs.

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The demographic transition's four stages



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In this model, population growth is seen as a temporary phenomenon as societies industrialize.

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Is the demographic transition universal?

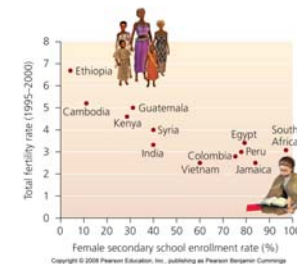
- It has occurred in Europe, U.S., Canada, Japan, and other nations over the past 200-300 years.
- But it may or may not apply to all developing nations.
- The transition could fail in cultures...
 - That place greater value on childbirth or
 - Grant women fewer freedoms

For people to attain the material standard of living of North Americans, we would need the natural resources of four and a half more Earths.

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Empowering women reduces growth rates

- Fertility rates drop when women gain access to contraceptives, family planning programs, and better educational opportunities.
- In 2007, 54% of married women worldwide used contraception.
 - China = 86%; the U.S. = 68%; 20 African nations < 10%



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Women with little power have unintended pregnancies.

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Population policies and family planning work

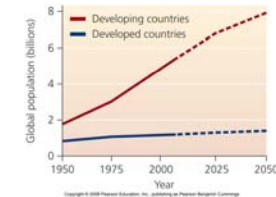
- Many countries provide incentives, education, contraception, and reproductive health care.
- Funding and policies that encourage family planning lower population growth rates in all nations.
 - Thailand has an educational based approach to family planning and its growth rate fell from 2.3% to 0.7%.
 - Brazil, Mexico, Iran, Cuba, and other developing countries have active programs.

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Poverty and population growth are correlated

- Poorer societies have higher growth rates than wealthier societies.
 - Consistent with the demographic transition theory
 - They have higher fertility and growth rates, with lower contraceptive use.
- Poverty results in environmental degradation.

99% of the next billion people added will be born in poor, less-developed regions that are least able to support them.



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Wealth also produces environmental impacts

- The population problem does not exist only within poor countries.
- Affluent societies have enormous resource consumption and waste production.
 - People use resources from other areas, as well as from their own.
 - Individuals' ecological footprints are huge.

One American has as much environmental impact as 6 Chinese or 12 Indians or Ethiopians.

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The wealth gap and population growth cause conflict

- The stark contrast between affluent and poor societies causes social and environmental stress.
- The richest 20% use 86% of the world's resources.
 - Leaves 14% of the resources for 80% of the world's people to share
- Tensions between "haves" and "have-nots" are increasing.



(a) A family living in the United States



(b) A family living in Egypt

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Wealthy nations must help others

- If developing countries cannot overcome their increasing social, economic, and environmental problems...
- And if developed nations do not help...
- Then these countries may not advance through the demographic transition, and instead will result in greater population growth, and worsening social and environmental conditions.
 - A profoundly negative outcome for humans and the environment

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Conclusion

- The human population is larger than at any time in the past.
- Populations are still rising, even with decreasing growth rates.
- Most developed nations have passed through the demographic transition.
- Expanding rights for women slows population growth.
- Will the population stop rising through the demographic transition, restrictive governmental intervention, or disease and social conflict caused by overcrowding and competition?
- Sustainability requires a stabilized population in time to avoid destroying natural systems.

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