

## Chapter 8: The Human Population



[World Dot Clip](#)

[World Population. Don't Panic Video](#)

## Case study: China's one-child policy

In 1970, China's 790 million people faced starvation

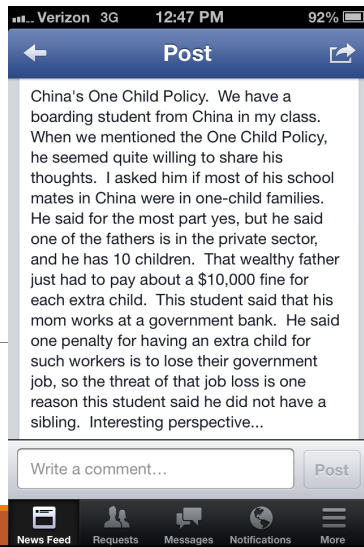
The government instituted a one-child policy

Unintended consequences: killing female infants and a black-market trade in teenage girls



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[Video](#)



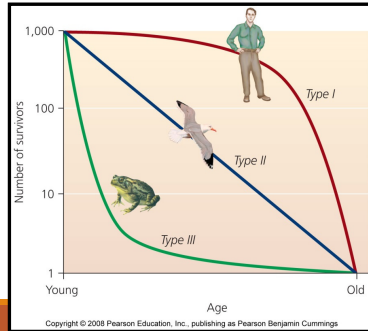
## Two General Categories of Countries:

Developed Countries:	Developing Countries:
1. Higher average incomes	1. Lower average incomes
2. Industrial economies	2. Agriculture-based economies
3. Slower population growth	3. Rapid population growth
Examples: USA, France, Japan	Examples: India & Ethiopia

## Survivorship Curves

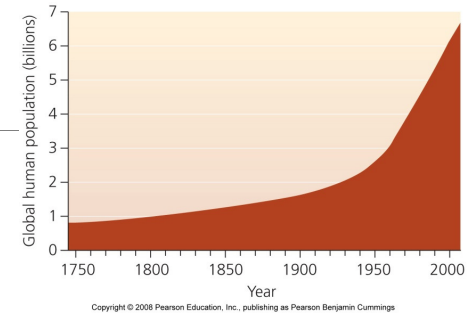
**Survivorship curves** = the likelihood of death varies with age

- Type I: More deaths at older ages (**Humans**)
- Type II: Equal number of deaths at all ages (**Birds, Reptiles**)
- Type III: More deaths at young ages (**Amphibians, fish**)



## Population Growth Rate

1800 = 1 billion  
 1930 = 2 billion  
 1960 = 3 billion  
 1975 = 4 billion  
 1987 = 5 billion  
 1999 = 6 billion  
 2011 = 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 due to **exponential growth**

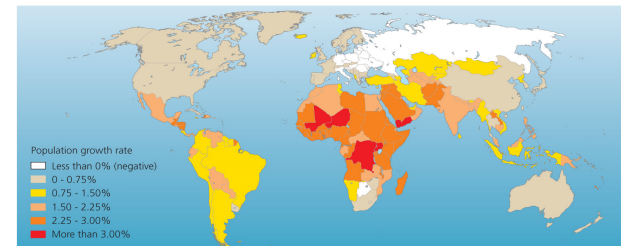
## Population Growth Rate Formulas

$$\text{Growth Rate} = \frac{(\text{Births} - \text{Deaths})}{\text{Total Population}} \times 100\%$$

$$\text{Growth Rate} = \frac{\text{Crude Births} - \text{Crude Deaths}}{10}$$

Crude birth/death rates = rates per 1000 individuals

## Rates of growth vary from region to region



At today's 1.2% global growth rate, the population will double in 58 years  
 $(58 \times 1.2 = 70) \quad 70/1.2 = 58$

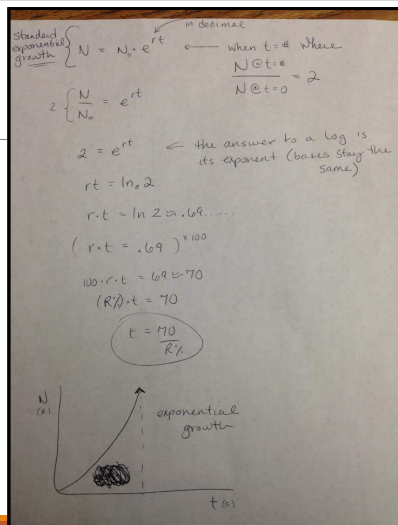
If China's rate continued at 2.8%, it would have had 2 billion people in 2004.

**Rule of 70**

## Rule of 70

### Doubling Time

- When a population grows exponentially, the time it takes for the population to double.
- symbol "dt", can be approximately calculated using the "Rule of 70,"
- Formula for Rule of 70
  - dt = 70/r
  - "r" is sometimes written as "k"
- Doubling time (usually in years)
- r (or "k") = the growth rate expressed as a percentage.
  - NOTE: 5% must be entered as 5 instead of 0.05.**



## Rule of 70 Practice Problems

- If country X has a rate of 3%, how many years will this country take to double in size?

$$70/3 = 23 \text{ years}$$

- If country Y has a rate of 6%, how many years will this country take to double in size?

$$70/6 = 12 \text{ years}$$

- If country Y has a rate growth of 1.28%, how many years will this country take to double in size?

$$70/1.28 = 54.7 \text{ years}$$

## Population growth affects the environment

The IPAT model:  $I = P \times A \times T \times S$

- I = environmental impact
  - Population = individuals need space and resources
  - Affluence = greater per capita resource use
  - Technology = increased exploitation of resources
  - Sensitivity = how sensitive an area is to human pressure
- \*Education, laws, ethics are also taken into consideration

*Humanity uses 1/3 of all the Earth's net primary production*

**Demography:** study of populations, especially human populations.

### Demographers study

- historical size and makeup of the populations
- density & distribution
- age structure
- sex ratios
- fertility rates
- migration patterns

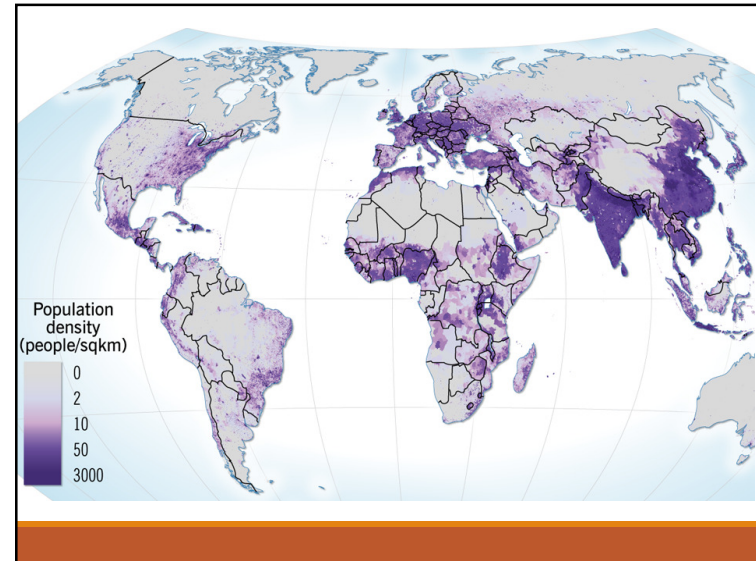
\*Prediction may be inaccurate, because human behavior changes suddenly and is hard to predict.

# Population Density

Density is just as important as numbers:

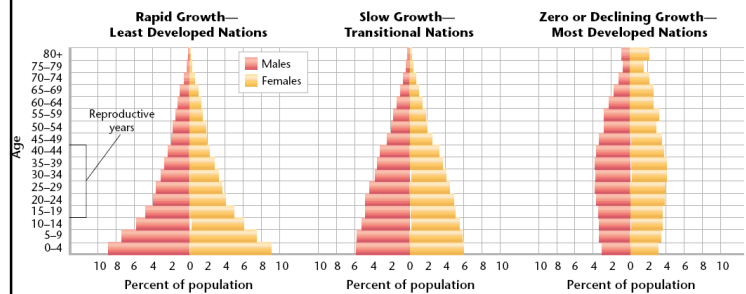
- tends to be higher in temperate, tropical, and subtropical regions and along rivers coastlines
- Certain areas bear far more environmental impact than others and denser areas may experience more issues due to urbanization (ch. 13), pollution, and resource extraction

$$\text{Population Density} = \text{Population} / \text{Area}$$

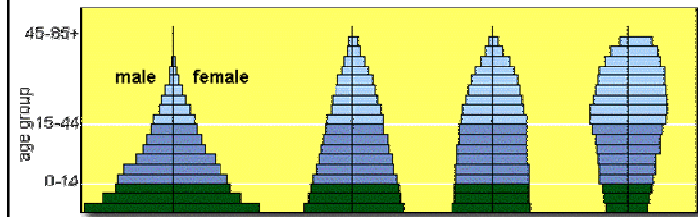


**Age structure** : distribution of ages in a population at a particular time

- Countries with high rates of growth = more young than old
- Countries with slow/no growth = even distribution of ages



## Age Structures



- | Rapid Growth   | Slow Growth   | Zero Growth  | Negative Growth  |
|--|---|--|--|
| Kenya<br>Nigeria<br>Saudi Arabia   | United States<br>Australia<br>Canada  | Denmark<br>Austria<br>Italy  | Germany<br>Bulgaria<br>Hungary   |
| <ul style="list-style-type: none"> <li>• High birth rates</li> <li>• High infant mortality rate</li> <li>• High child mortality rate</li> <li>• Low life expectancy</li> </ul> | <ul style="list-style-type: none"> <li>• Lower birth rates</li> <li>• Lower infant MR</li> <li>• Lower child MR</li> <li>• A little higher life expectancy</li> </ul> | <ul style="list-style-type: none"> <li>• Stable birth rates</li> <li>• Stable mortality rates</li> <li>• High life expectancy</li> </ul> | <ul style="list-style-type: none"> <li>• Very low birth rates</li> <li>• Very low infant MR</li> <li>• Very low child MR</li> <li>• Very high life expectancy</li> </ul> |

1. What type of country is presented in Sample A?

Developing

2. What type of age structure is Sample B?

Zero Growth

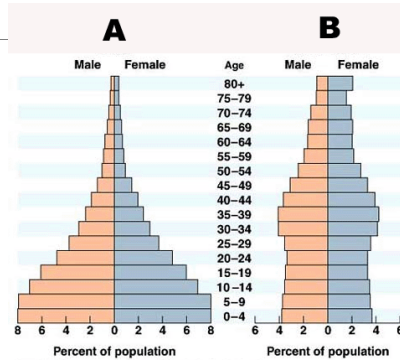
3. What percent of the population is female between the age of 20-24 in Sample A?

5%

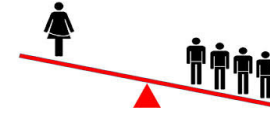
4. What is the total population percentage of people between the ages of 30-34 for Sample B?

8%

## Age Structure



## Sex ratios



\*Greatly distorted ratios can lead to problems

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 undesirable social consequences of many single Chinese men
- Teenage girls were kidnapped and sold as brides

## Immigration and emigration play large roles

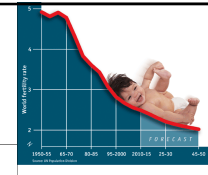
- Refugees flee their home country as a result of
  - war, civil strife, and poor environmental conditions
- U.S. has a TFR of 2.1 and an age structure diagram approaching a column shape but it has a high rate of immigration (may increase by 44% by 2050)
- When people move into developed countries their ecological footprints tend to increase

Currently the issue with ISIS and Syrians fleeing to Europe.

[Syrian Crisis Video](#)



## Fertility Rate

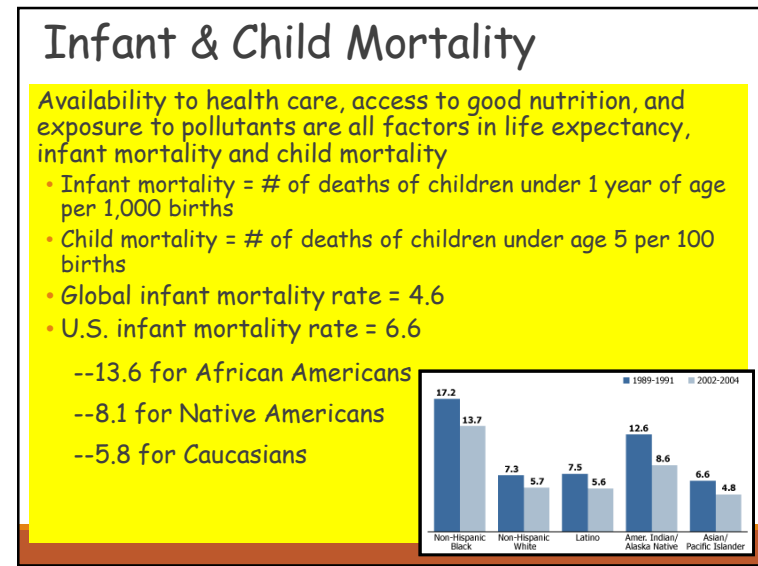
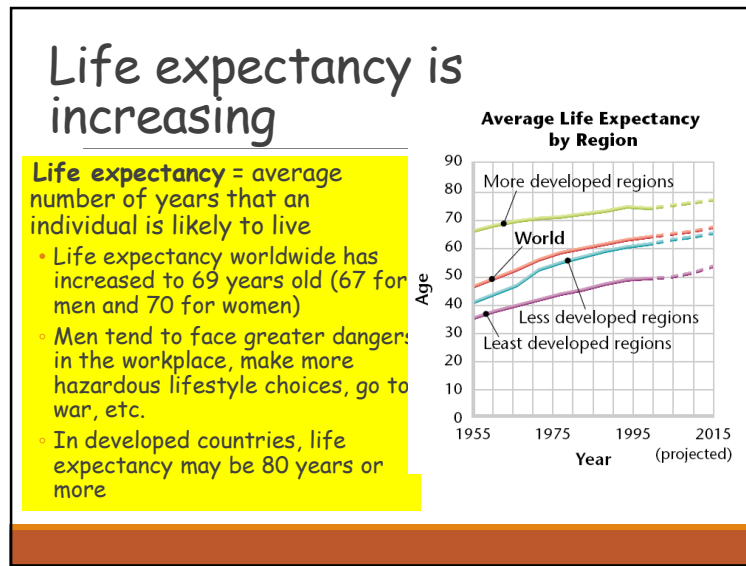
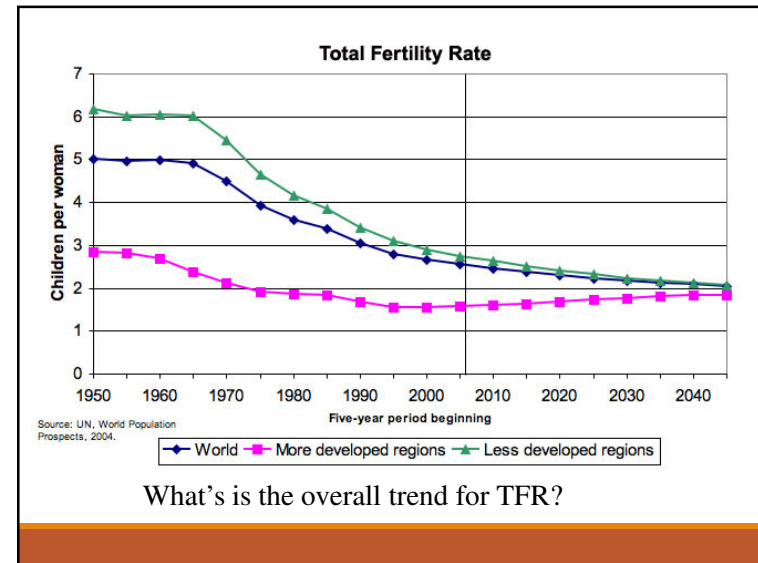
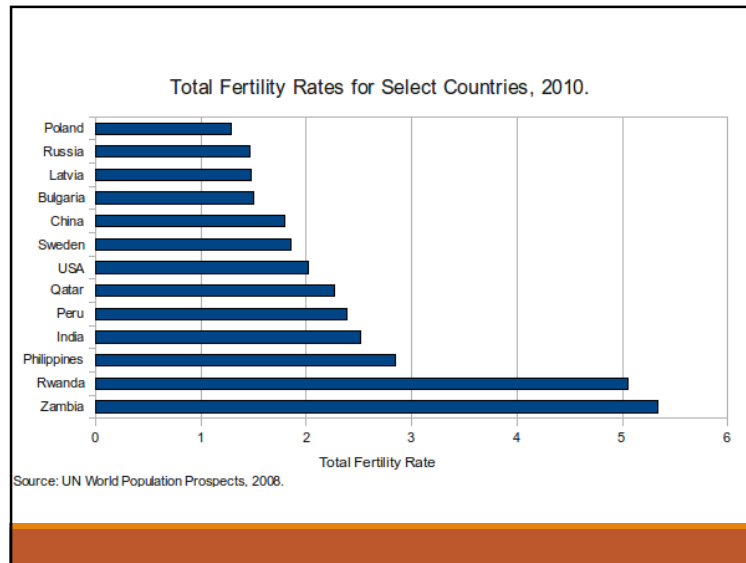


**Total fertility rate (TFR)** = the average number of children born per female

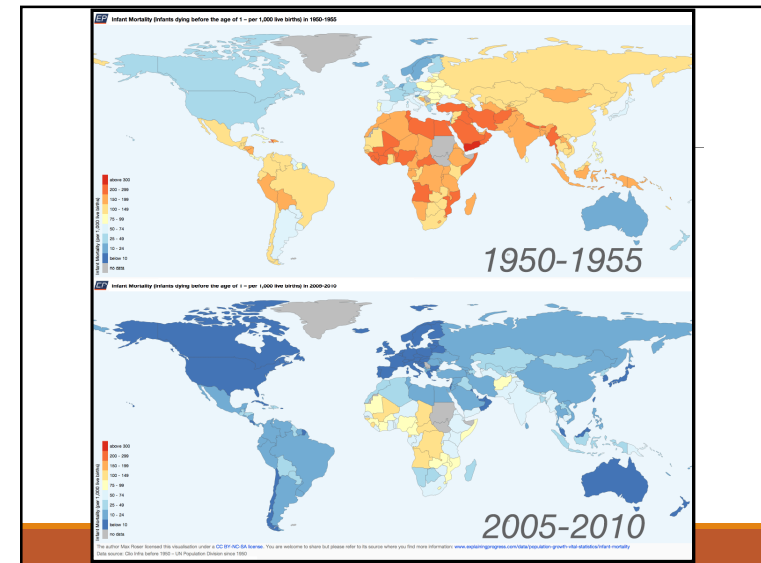
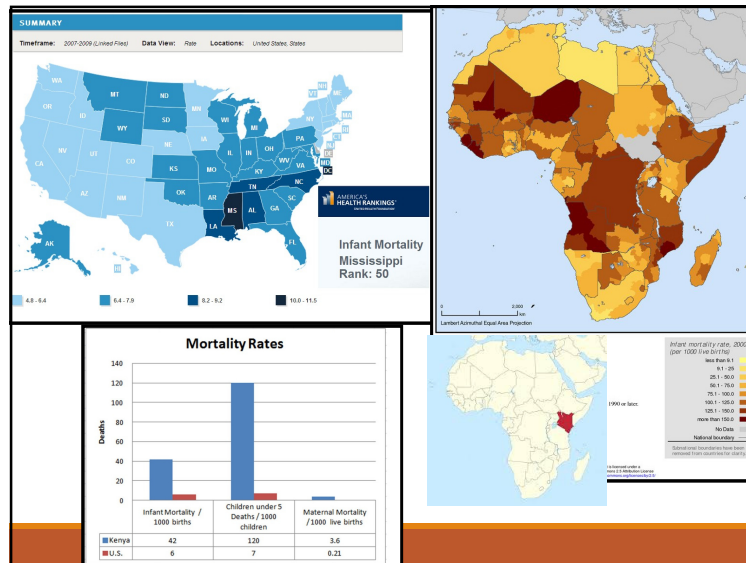
**Replacement level fertility** = TFR that keeps the size of a population stable (typically 2.1)

- depends on rates of *prereproductive mortality*, which depends on a economic status
- developed countries = 2.1
- developing = TFR > 2.1 may be needed for replacement level

Increasing urbanization decreases TFR







## Aging & Disease

U.S. has a high crude death (8/1000) rate even though life expectancy is high and infant mortality is low—due to 13% of population being 65 or older

Infectious diseases are 2<sup>nd</sup> biggest killer worldwide after heart disease

HIV more disruptive effect than any other illness b/c it infects people aged 15-49 (most productive years in life)



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## The demographic transition

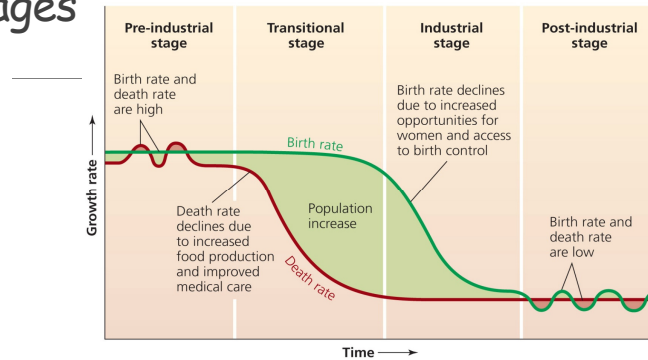
**Demographic transition** = a model of economic and cultural change to explain the declining death and birth rates in industrializing nations

Stable preindustrial state of high birth and death rates change to a stable post-industrial state of low birth and death rates

As mortality decreases, there is less need for large families

- Parents invest in quality of life

## The demographic transition's four stages



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\*takes one to three generations for the demographic transition to occur in most developed countries

## Is the demographic transition universal?

Would it really be a good thing if every country experienced the transition?

The transition could fail in cultures

- That place greater value on childbirth or
- Grant women fewer freedoms



[Demographic Transition Video](#)

## Women and Fertility

The factors most clearly related to a decline in birth rates are

1. increasing education: educated women find that they do not need to bear as many children to ensure that some will survive. They may also learn family planning techniques.

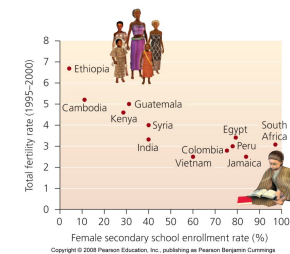
2. economic independence for women: women work to contribute to family's prosperity & spend less energy bearing and caring for children. If parents must pay for child care, children may become a financial burden rather than an asset.

## Empowering women reduces growth rates

- Fertility rates drop when women gain access to:
  - **Contraceptive**
  - **Family planning programs**
  - **Better educational opportunities**

In 2007, 54% of married women worldwide used contraception;

- China = 86%
- U.S. = 68%
- African nations < 10%



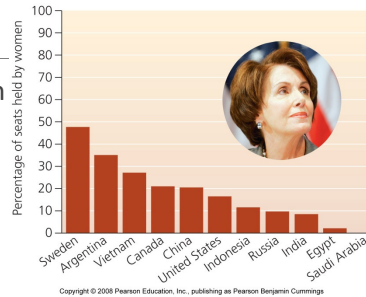
*Women with little power have unintended pregnancies*



## Gender equity

Women lack the information and personal freedom to achieve equal power with men

- 2/3 of people who cannot read, and 60% of those living in poverty are women



*We are still a long way from achieving gender equality*

## 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

## Managing Development and Population Growth

Many countries have created campaigns to reduce the fertility rates of their citizens.

These campaigns include

1. public advertising
2. family planning programs (birth control, abortion options, condoms)
3. economic incentives (better jobs, higher incomes)
4. or legal punishment (fines/taxes).



## International Conference on Population & Development Goals for 2015

1. Provide universal access to safe and reliable family-planning methods.
2. Reduce infant mortality and mortality rates of children under five.
3. Lower maternal mortality rates in developing countries.
4. Increase life expectancy to more than 75 years.
5. Achieve universal access to primary education and ensure access for girls and women to secondary education



## Wealth also produces severe environmental impacts

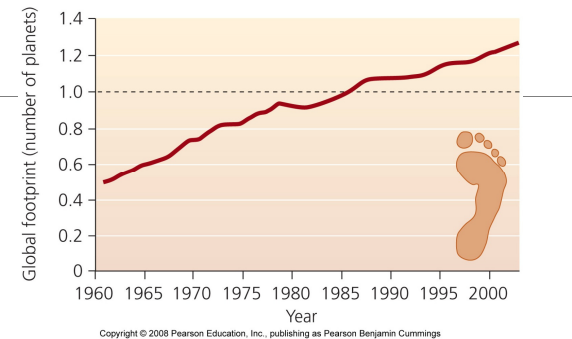
The population problem does not exist only within poor countries

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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*Humanity's global ecological footprint surpassed Earth's capacity to support us in 1987*

## The wealth gap and population growth cause conflict

The richest 20% use 86% of the world's resources

- Leaves 14% of the resources for 80% of the world's people to share



(a) A family living in the United States  
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(b) A family living in Egypt  
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## Demographic changes have severe effects

6,000 Africans die each day

- Increased infant mortality
- Life expectancy fell from 59 to 40
- Millions of orphans created

Young, productive people die

- Communities break down
- Income and food production decline
- Medical expenses and debt skyrocket.



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*AIDS undermines the transition of developing countries to modern technologies*

## Demographic fatigue



**Demographic fatigue** = governments face overwhelming challenges related to population growth.

- With the added stress of HIV/AIDS; governments are stretched beyond their capabilities
- Problems grow worse

Nations in Africa must take aggressive steps soon

- Or these countries will have rising death rates and increased birth rates
- It would cause a profoundly negative outcome, both for humans and the environment

## 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