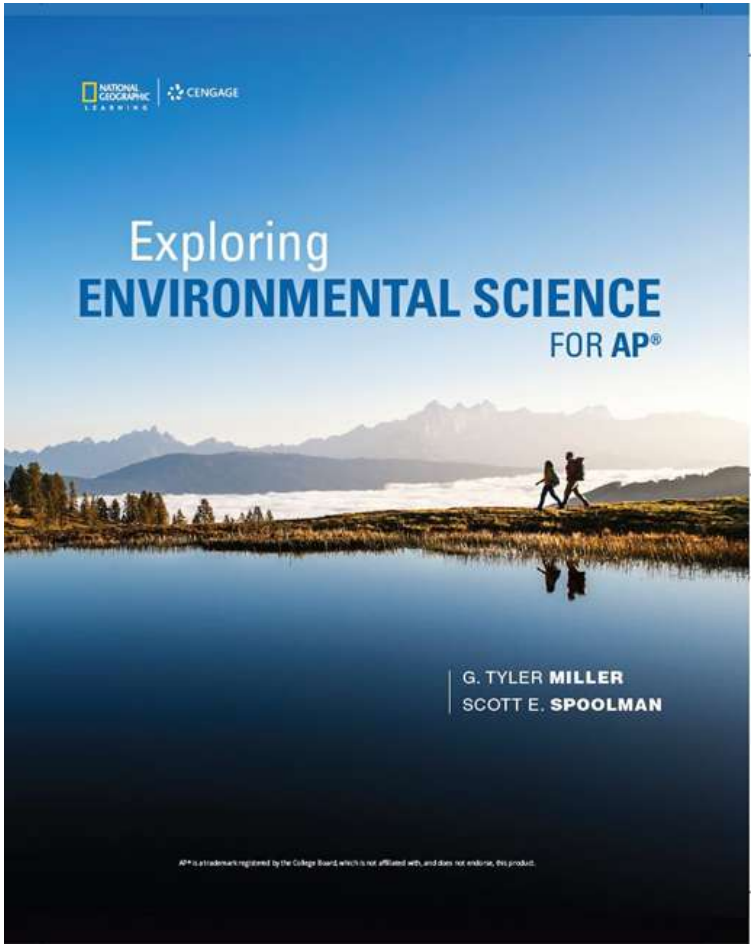
# Exploring Environmental Science for AP®

1st Edition




## Chapter 8
## The Human Population

# Core Case Study: Planet Earth: Population 7.5 Billion (1 of 2)

- From the evolution of Homo sapiens to a total population of two billion took 200,000 years
  - It took less than 50 years to add another two billion
  - It took 25 years to add the third two billion
  - Eighteen years later, the earth had 7.5 billion people

# Core Case Study: Planet Earth: Population 7.3 Billion (2 of 2)

- Factors impacting rapid rise of human population
  - Emergence of agriculture increased food production
  - Technologies help humans expand into almost all the planet's climates and habitats
  - Drop in death rates with improved sanitation and health care
- What is a sustainable human population?

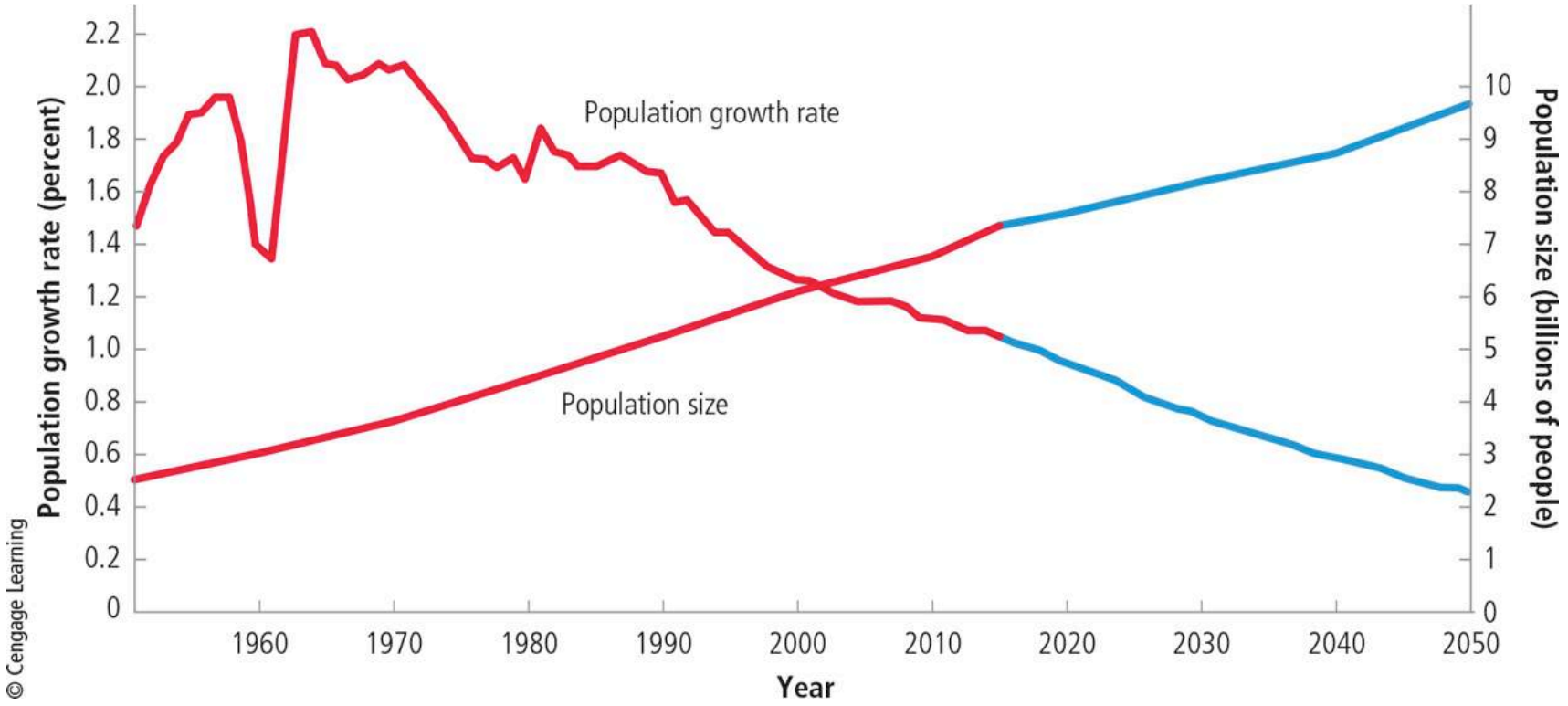
# 8.1 How Many People Can the Earth Support?

- Throughout most of history, population rose slowly
  - Has grown rapidly for last 200 years
- China, India, and the United States are the top three countries in terms of population

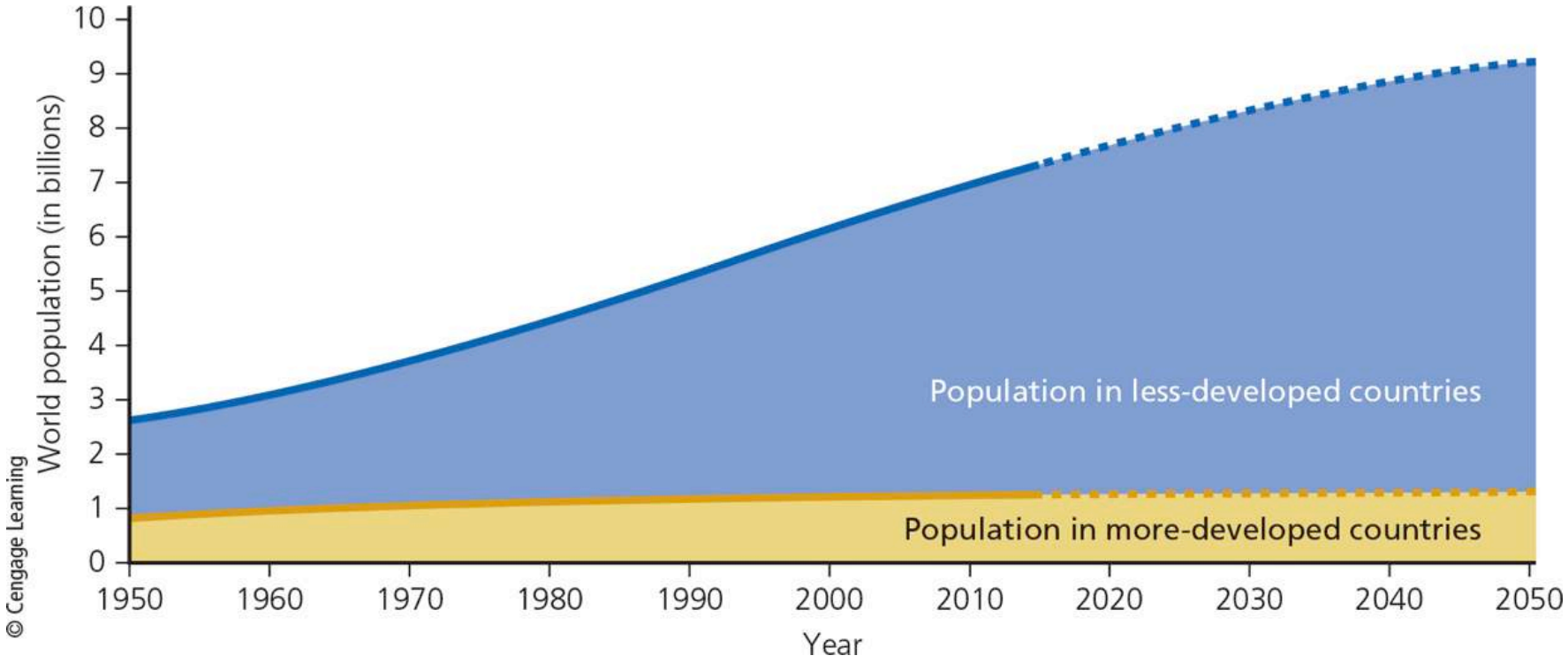
# Human Population Growth (1 of 3)

- Rate of population growth has slowed since 1960 to 1.2%
  - World's population is still growing
- Human population growth is unevenly distributed geographically
  - 2% added to more-developed countries
  - 98% added to less-developed countries
- People are moving from rural to urban areas

# Human Population Growth (2 of 3)



# Human Population Growth (3 of 3)



# Science Focus 8.1: How Long Can the Human Population Keep Growing? (1 of 2)

- Many differing views
  - We have already exceeded tipping points, or planetary boundaries
  - The main problem is the rapidly growing number of people in less-developed countries
  - The main problem is overconsumption in more-developed countries
  - Technological ingenuity will help find substitutes to resources we are depleting

# Science Focus 8.1: How Long Can the Human Population Keep Growing? (2 of 2)

- Proponents of slowing population growth
  - Basic needs for 1 billion people are not being met
  - Death rates could increase significantly and a population crash could result
  - As China, India, and Brazil increase their ecological foot[prints, greater resource use and environmental degradation may result

# Human Population Growth and Natural Capital (1 of 2)

- As the human population grows, so does the global human ecological footprint
- Cultural carrying capacity
  - Maximum number of people who could live in reasonable freedom and comfort indefinitely, without decreasing the ability of the earth to sustain future generations

# Human Population Growth and Natural Capital (2 of 2)

## Natural Capital Degradation

### Altering Nature to Meet Our Needs

Reducing biodiversity

Increasing use of net primary productivity

Increasing genetic resistance in pest species and disease-causing bacteria

Eliminating many natural predators

Introducing harmful species into natural communities

Using some renewable resources faster than they can be replenished

Disrupting natural chemical cycling and energy flow

Relying mostly on polluting and climate-changing fossil fuels

# 8.2 What Factors Influence the Size of the Human Population?

- Population size increases through births and immigration
  - Decreases through deaths and emigration
- Key factor that determines population size
  - Average number of children born to women in a population (total fertility rate)

# The Human Population Can Grow, Decline, or Stabilize

- Population change = (Births + Immigration) – (Deaths + Emigration)
- Crude birth rate
  - Number of live births per 1,000 people in a population per year
- Crude death rate
  - Number of deaths per 1,000 people in a population per year

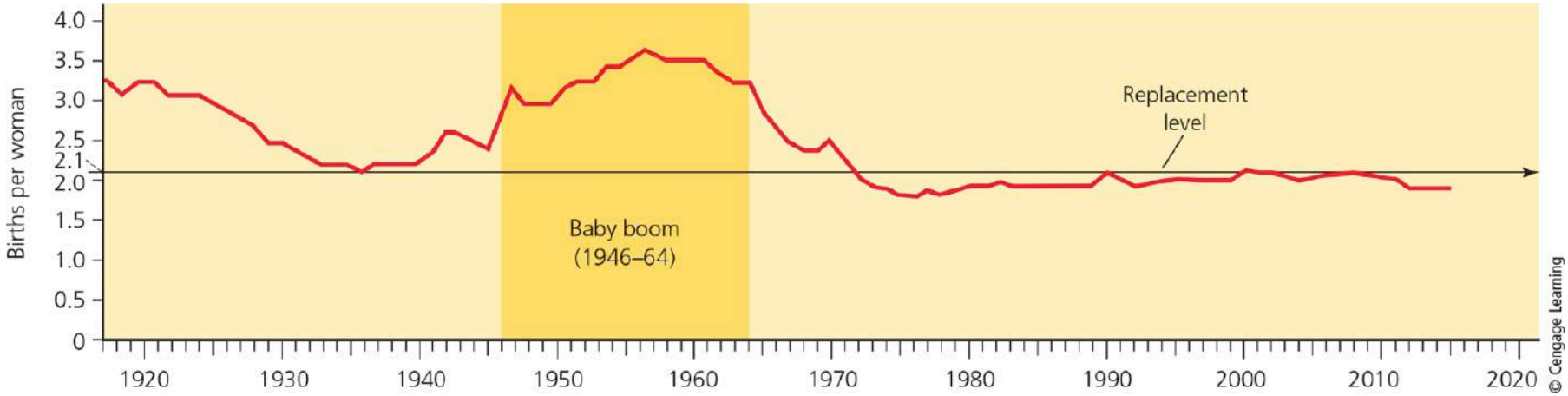
# Fertility Rates (1 of 2)

- Replacement-level fertility rate
  - Average number of children a couple must bear to replace themselves
  - Approximately 2.1
    - Higher than 2 because some children die before reaching reproductive years

# Fertility Rates (2 of 2)

- Total fertility rate (TFR)
  - Average number of children born to women of childbearing age in a population
  - Between 1955 and 2012, the global TFR dropped from 5 to 2.5
  - To eventually halt population growth, the global TFR must drop to the fertility replacement level of 2.1

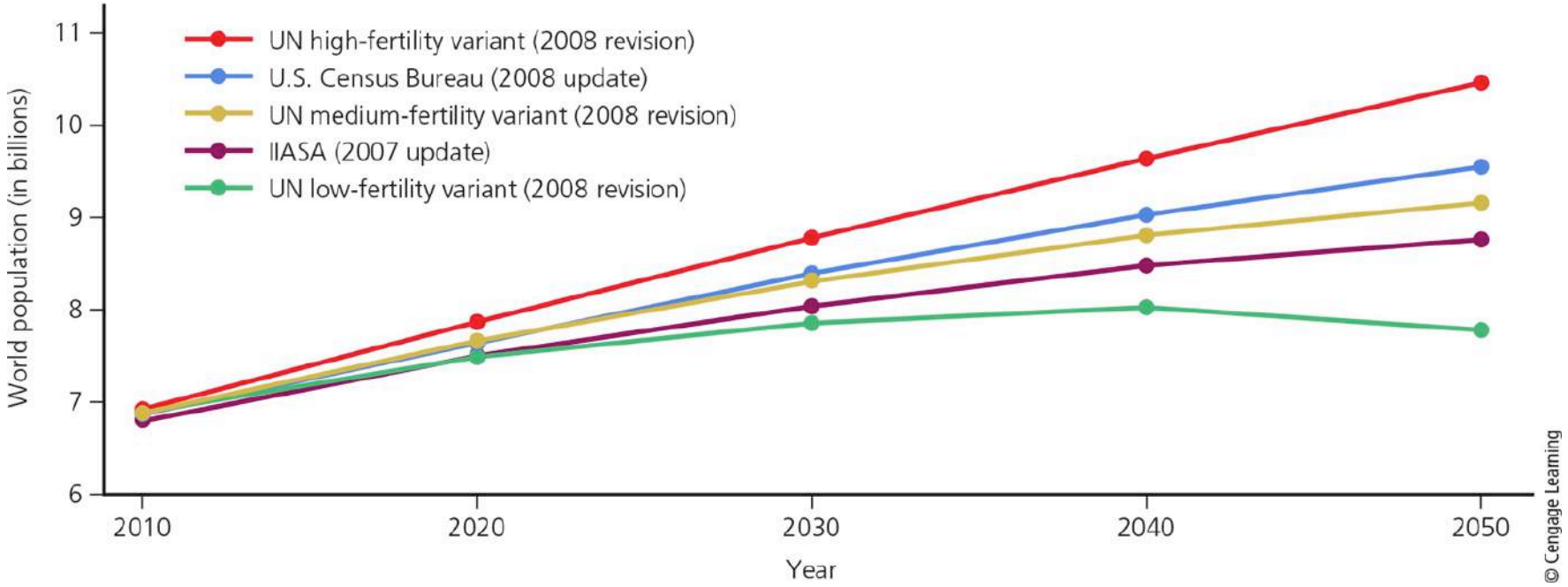
# Fertility Rates (3 of 3)



# Science Focus 8.2: Projecting Population Change (1 of 2)

- Human population size in 2050 is estimated to be between 7.8 billion and 10.8 billion people
- Factors influencing the range of estimates
  - Reliability of current population estimates
  - Assumptions about trends in fertility
  - Different organizations who estimate populations use different methods and data

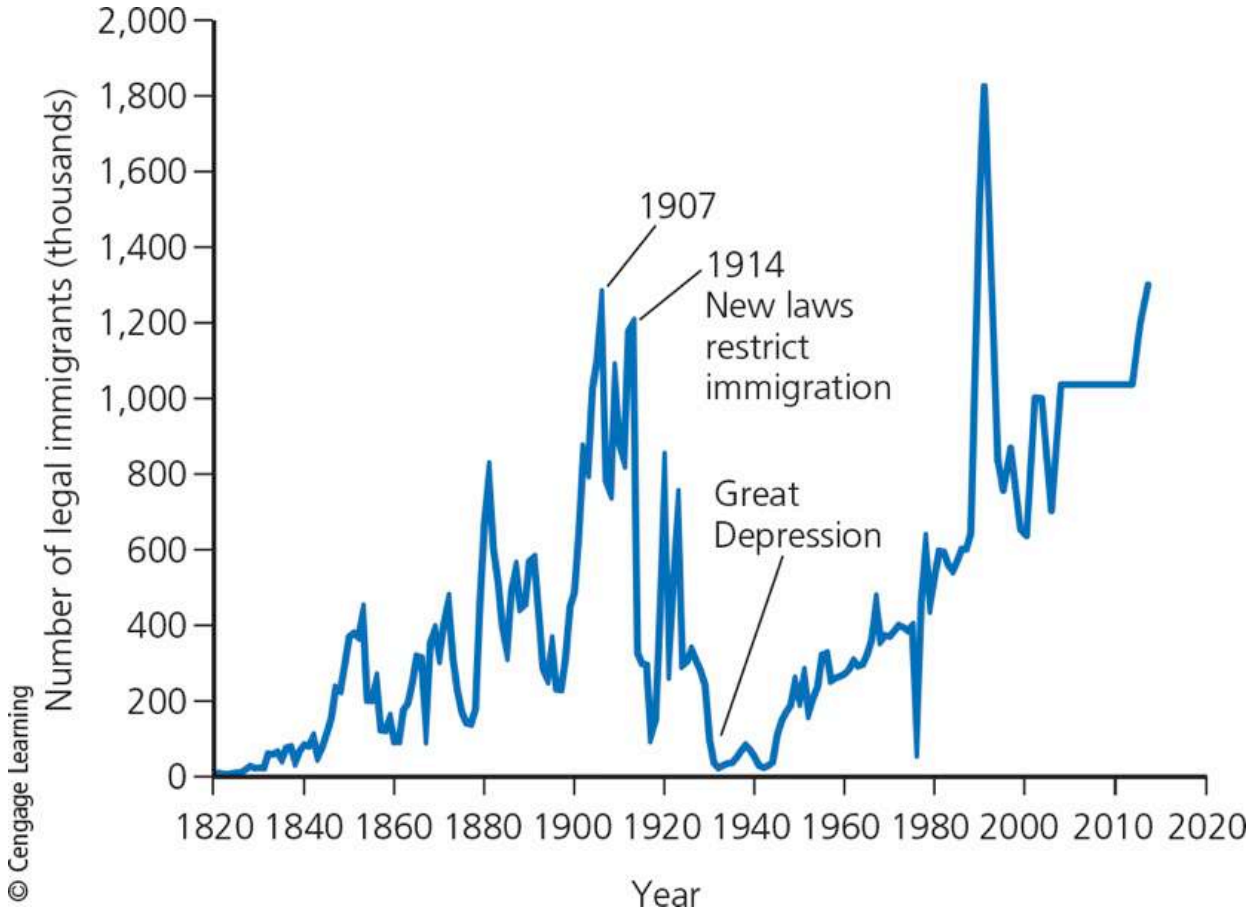
# Science Focus 8.2: Projecting Population Change (2 of 2)



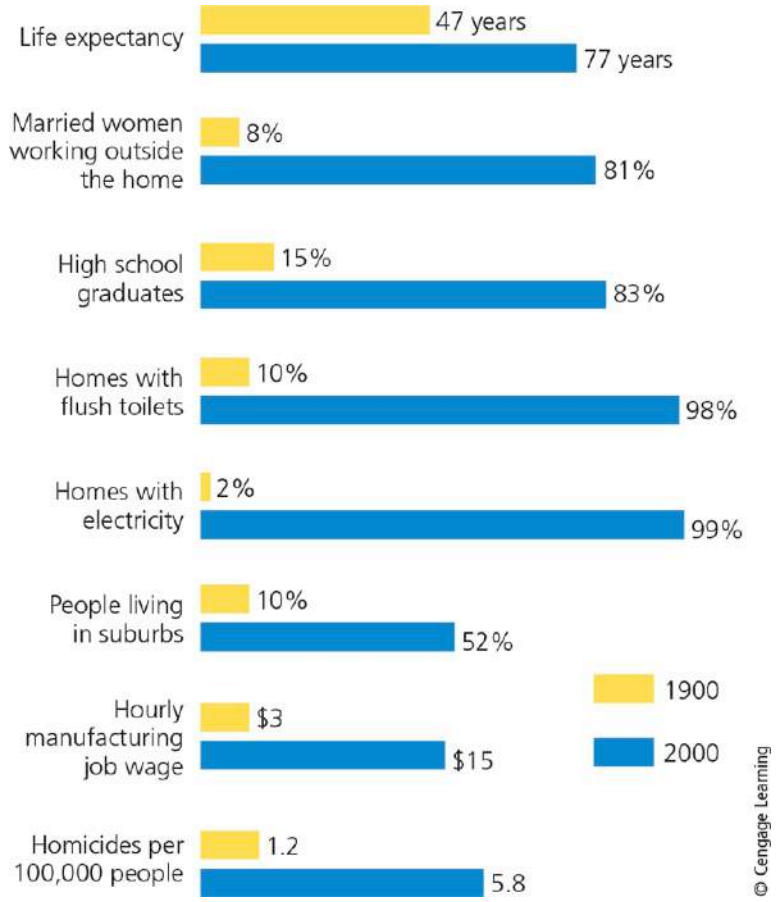
# Case Study: The U.S. Population–Third Largest and Growing (1 of 3)

- Population still growing
  - 76 million in 1900
  - 322 million in 2015
- Drop in TFR in the U.S.
  - Rate of population growth has slowed
- 40% of total U.S. population increase in 2015 came from legal immigration
  - China surpassed Mexico as largest source of new immigrants

# Case Study: The U.S. Population–Third Largest and Growing (2 of 3)



# Case Study: The U.S. Population–Third Largest and Growing (3 of 3)



# Factors That Affect Birth and Fertility Rates (1 of 3)

- Importance of children as part of the labor force
  - Especially in less-developed countries
- Cost of raising and educating children
- Availability of pension systems
- Urbanization
- Educational and employment opportunities for women

# Factors That Affect Birth and Fertility Rates (2 of 3)

- Average age at marriage
- Availability of reliable birth control methods
- Religious beliefs, traditions, and cultural norms

# Factors That Affect Birth and Fertility Rates (3 of 3)

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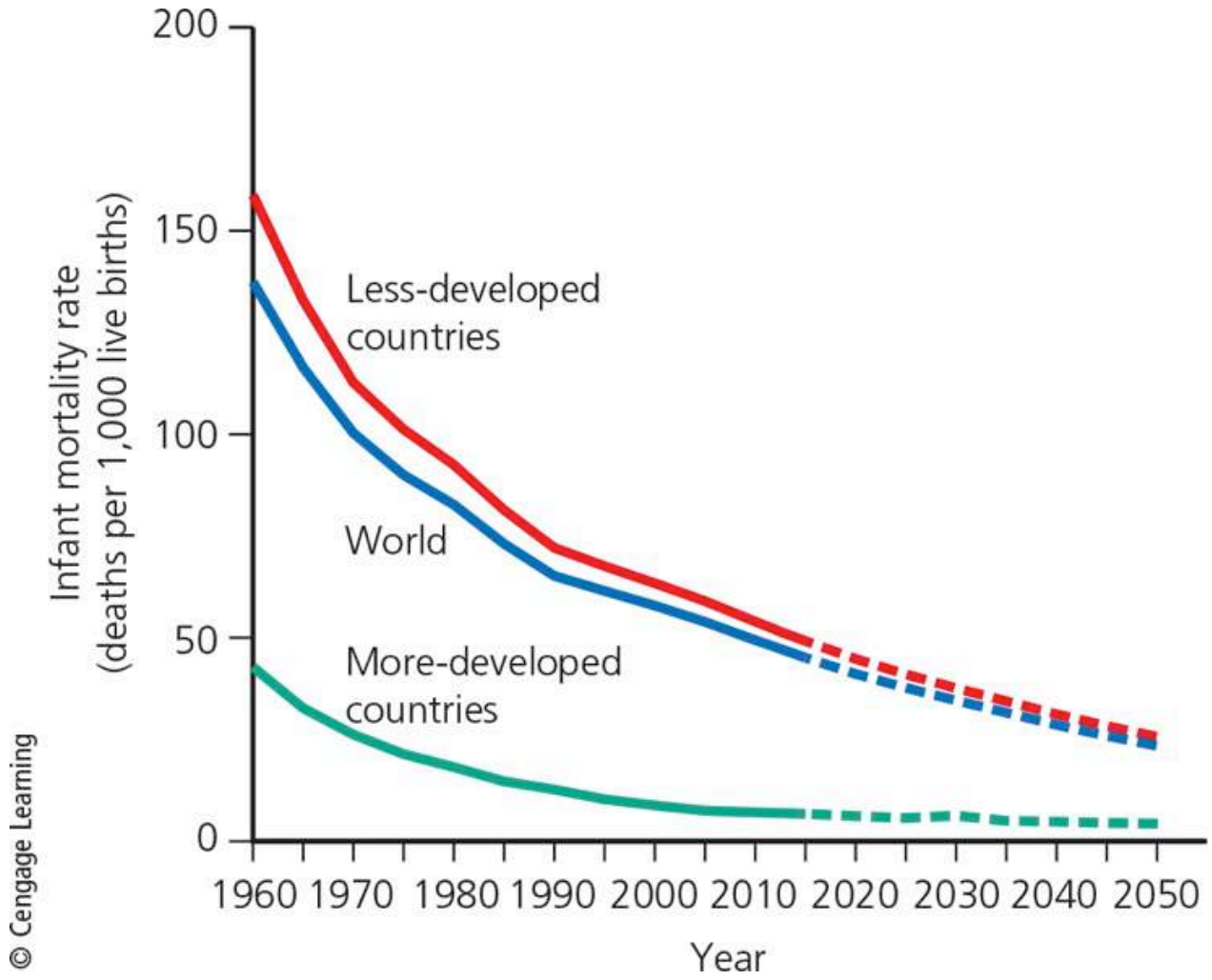
# Factors That Affect Death Rates (1 of 2)

- Indicators of overall health of people in a country
  - Life expectancy
  - Infant mortality rate
    - Number of babies out of every 1,000 who die before their first birthday
- Factors that cause high infant mortality
  - Insufficient food, poor nutrition, and infectious disease

# Factors That Affect Death Rates (2 of 2)



# Migration

- The movement of people into and out of specific geographic areas
- Reasons for migration
  - Jobs and economic improvement
  - Religious persecution or ethnic conflict
  - Political oppression or war
  - Environmental refugees

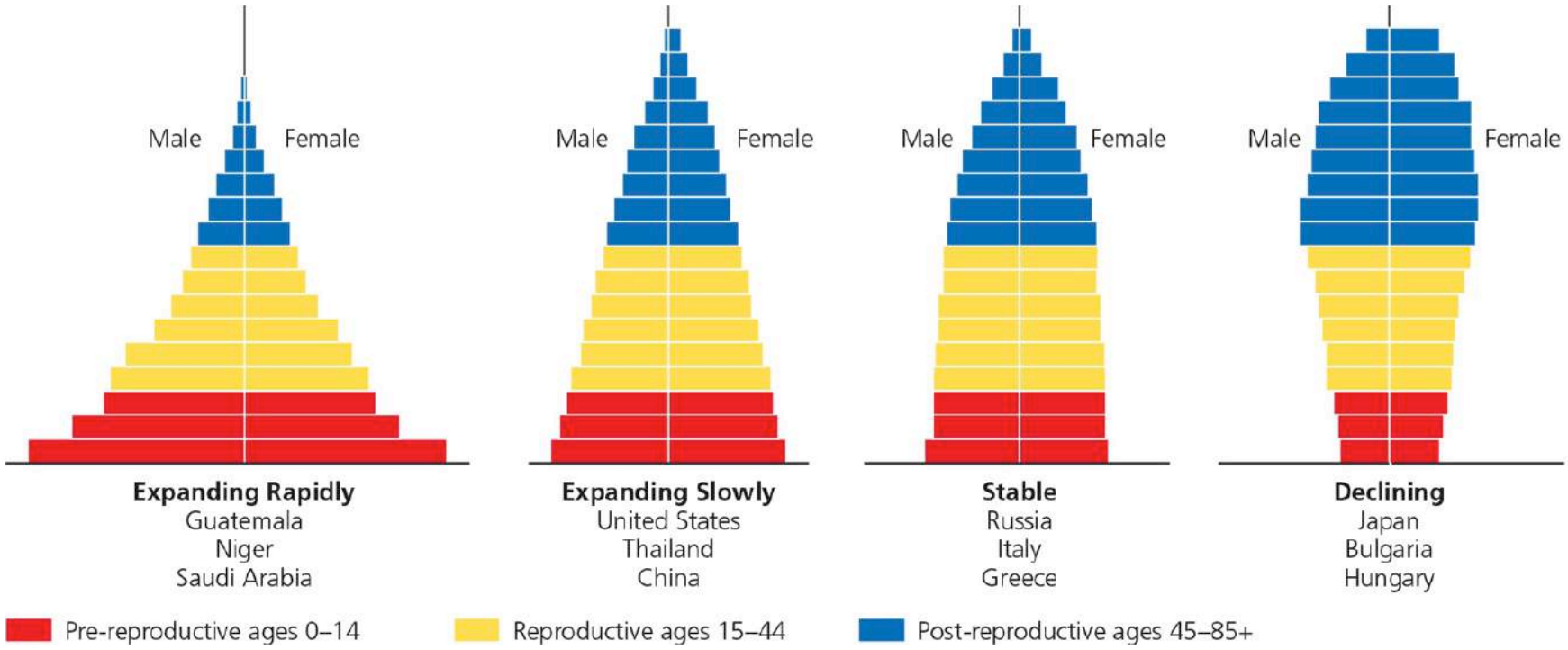
# 8.3 How Does a Population's Age Structure Affect Its Growth or Decline?

- Age structure
  - Number and percentages of males and females in young, middle, and older age groups in a population
  - Important factor in determining how fast a population grows or declines

# Age Structure (1 of 2)

- Age structure categories
  - Prereproductive (ages 0–14)
  - Reproductive (ages 15–44)
  - Postreproductive (ages 45 and older)
- Country with large percentage of people younger than age 15 will experience rapid population growth
- Global population of seniors expected to triple between 2015 and 2050

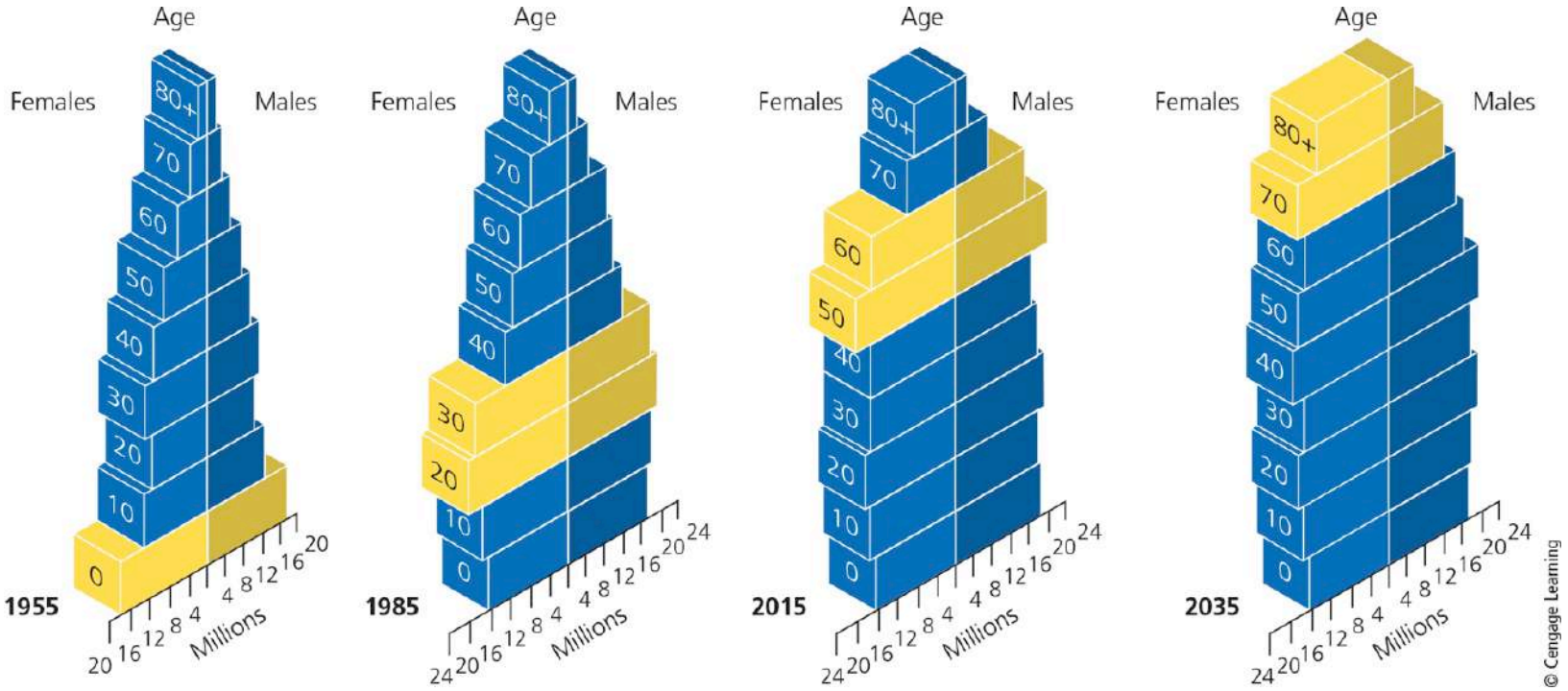
# Age Structure (2 of 2)



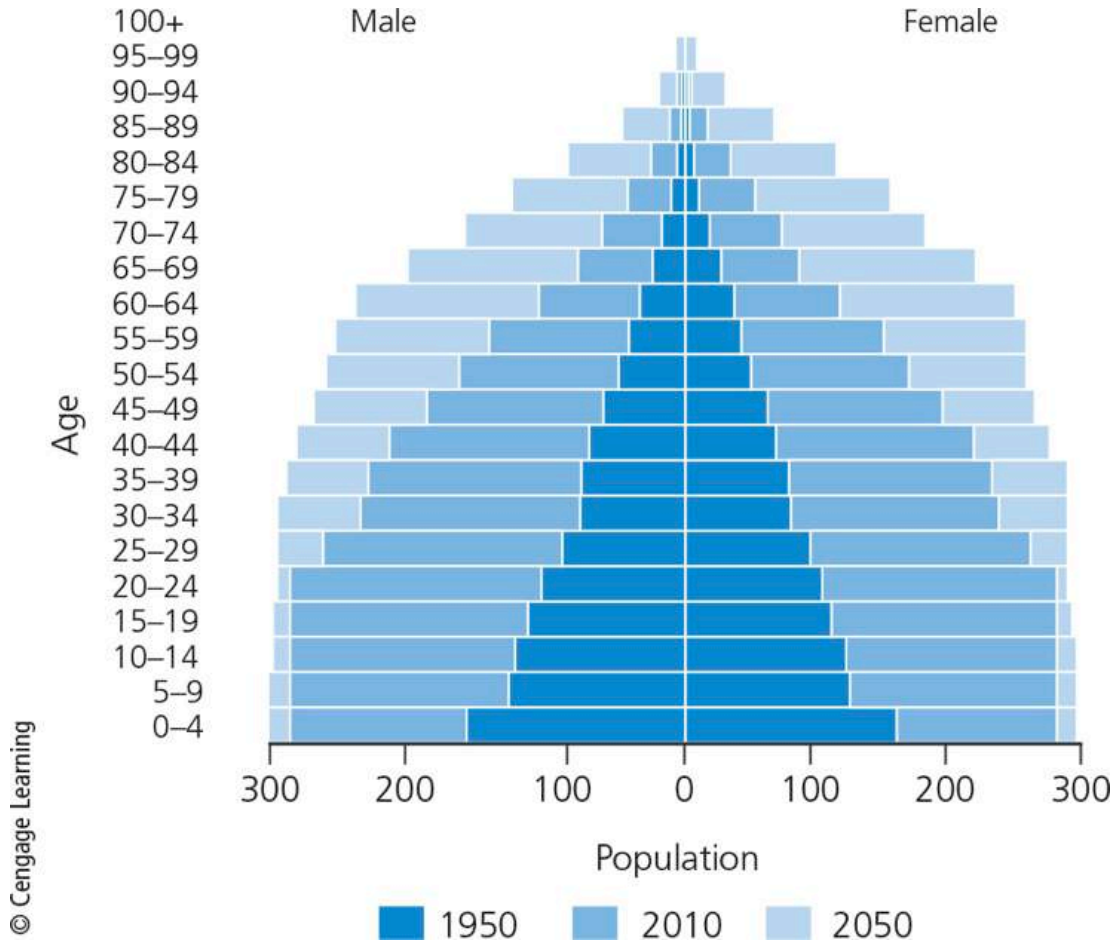
# Case Study: The American Baby Boom (1 of 3)

- 79 million people added from 1946–1964
  - Makes up 25% of the U.S. population
- Affect politics and economics
- Now becoming senior citizens
  - “Graying of America”
- Millennial generation (Americans born since 1980)
  - Now largest generation living in the U.S.

# Case Study: The American Baby Boom (2 of 3)



# Case Study: The American Baby Boom (3 of 3)



# Aging Populations Can Decline Rapidly (1 of 2)

- Slow decline is generally manageable
- Rapid decline leads to economic problems
  - Proportionally fewer young people working
  - Labor shortages
- Some countries with rapidly declining populations
  - Japan, Germany, Italy, Bulgaria, Hungary, Romania, Cuba, and Portugal

# Aging Populations Can Decline Rapidly (2 of 2)

## Some Problems with Rapid Population Decline

Can threaten economic growth


Labor shortages

Less government revenues with fewer workers


Less entrepreneurship and new business formation

Less likelihood for new technology development

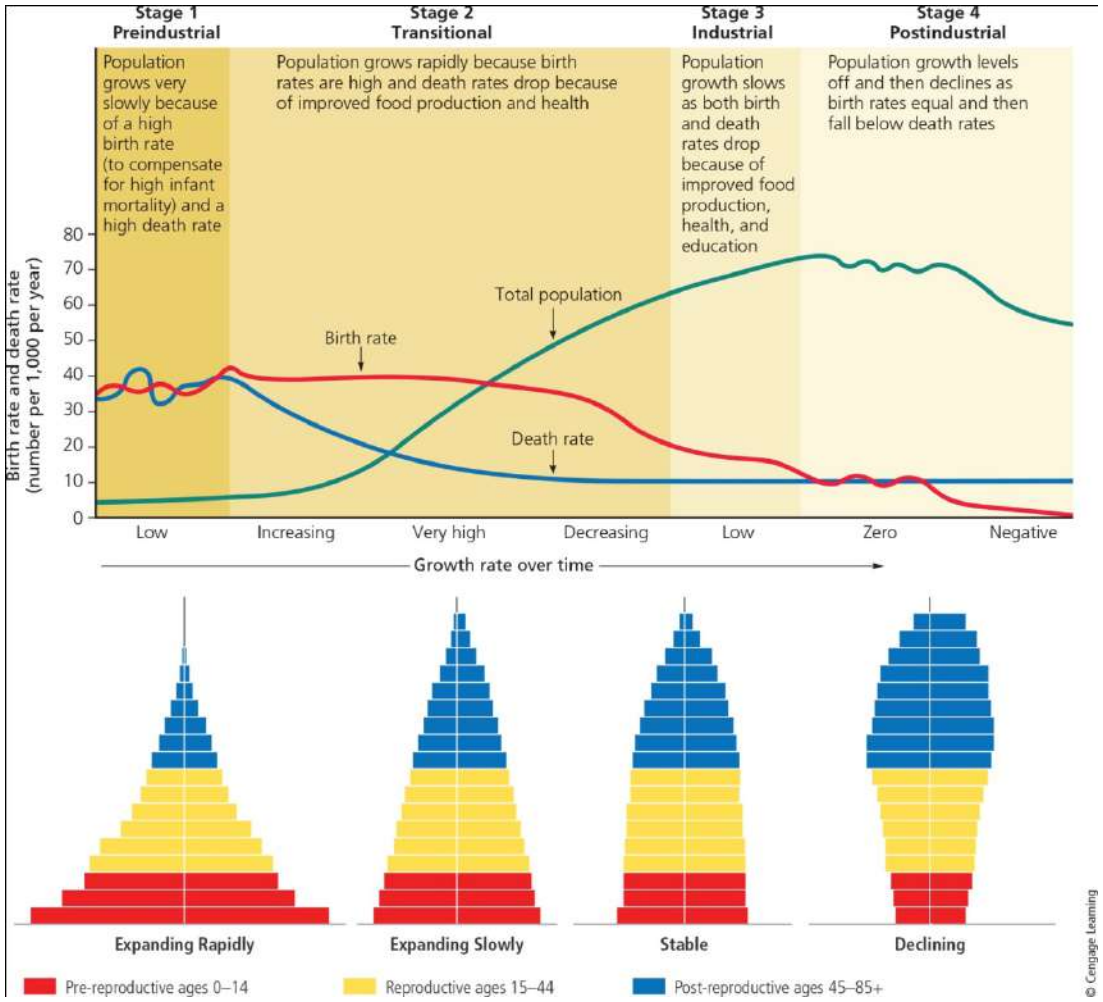
Increasing public deficits to fund higher pension and health-care costs

Pensions may be cut and retirement age increased

# 6.4 How Can We Slow Human Population Growth? (1 of 2)

- Controversy on whether population growth needs to slow
- Ways to slow human population growth
  - Reducing poverty through economic development
  - Elevating the status of women
  - Encouraging family planning

# 6.4 How Can We Slow Human Population Growth? (2 of 2)



# Economic Development

- Demographic transition
  - As countries become industrialized, poverty declines
  - Populations then tend to grow more slowly
- Threats to making a demographic transition
  - Extreme poverty and war
  - Environmental degradation and resource depletion

# Educating and Empowering Women (1 of 2)

- Women have fewer children if:
  - Educated
  - Able to earn an income
  - Society does not suppress their rights
- Women:
  - Do most of the domestic work and child care
  - Provide unpaid health care
  - Have fewer rights and educational opportunities than men

# Educating and Empowering Women (2 of 2)

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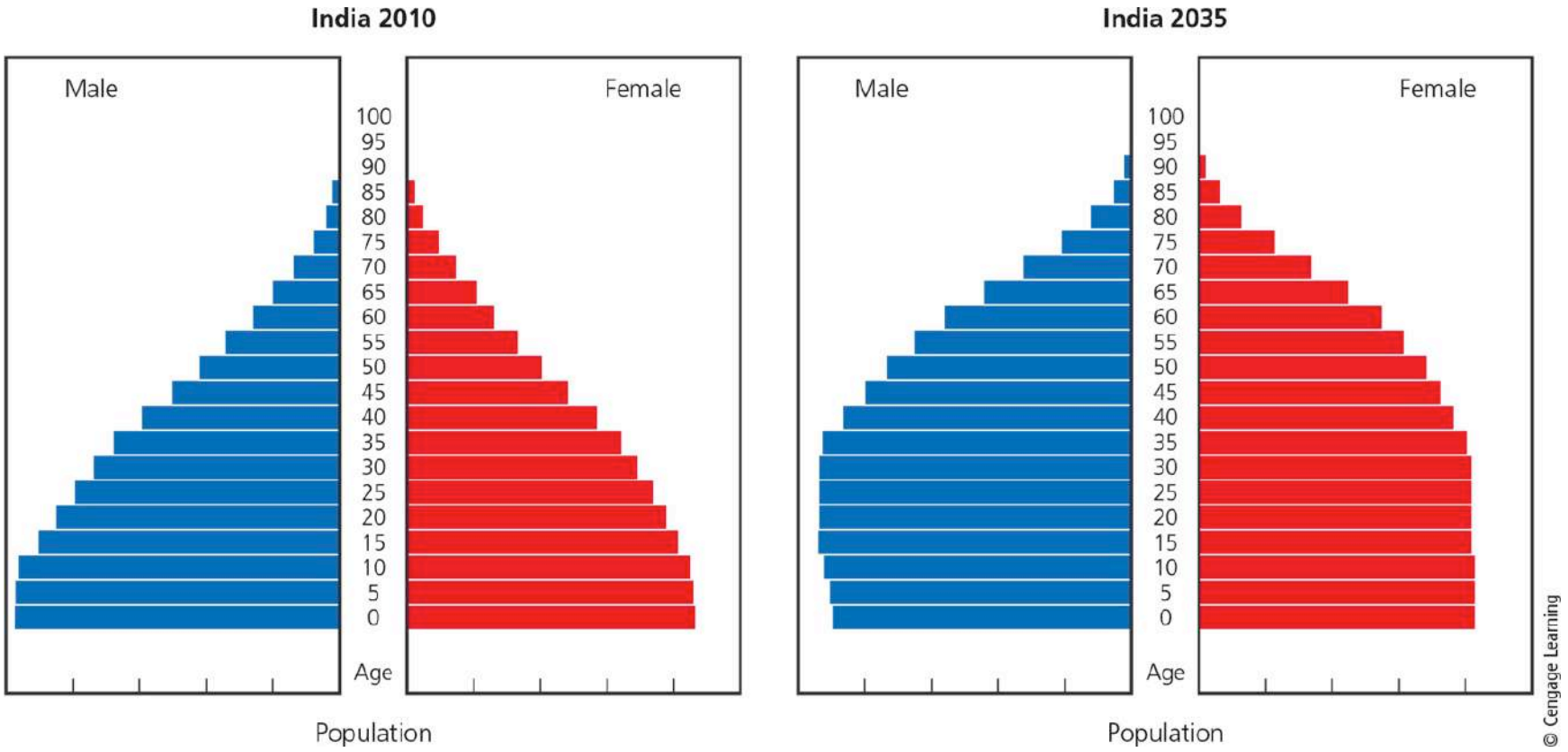
# Family Planning

- Family planning benefits
  - Reduced unintended pregnancies, births, and abortions
  - Better maternal and child health care
  - Reduced rate of infant mortality
  - Financial benefits
- Problems
  - Lack of access to voluntary contraception
  - Child marriage customs

# Case Study: Population Growth in India (1 of 3)

- Population of 1.31 billion in 2015
- Problems
  - Poverty, malnutrition, and environmental degradation
- Causes
  - Most poor couples want many children
  - Bias toward having male children
  - Only 47% of couples use modern birth control methods

# Case Study: Population Growth in India (2 of 3)



# Case Study: Population Growth in India (3 of 3)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# Case Study: Slowing Population Growth in China (1 of 4)

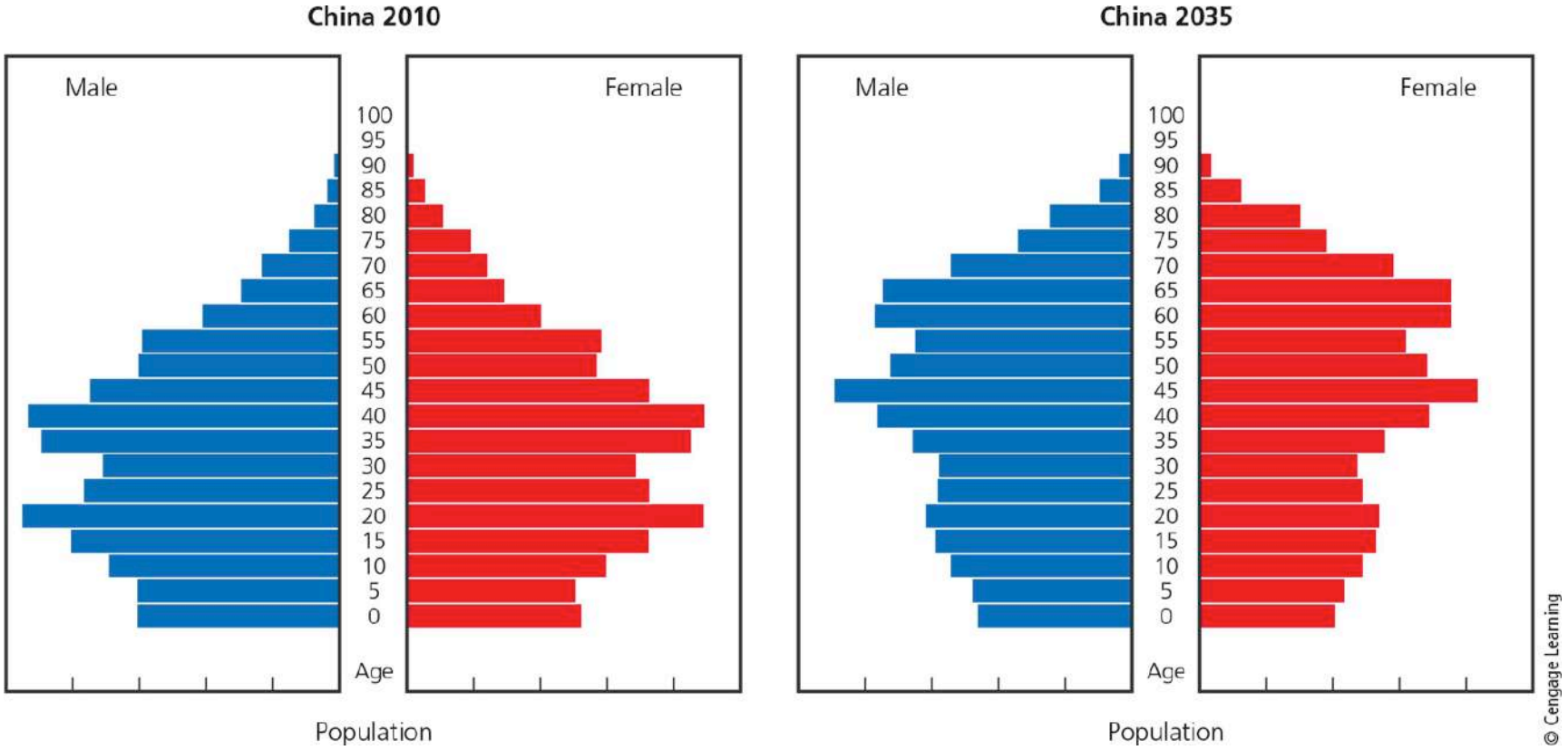
- World's most populous country
- Threat of mass starvation in the 1960s
- Government established strict family planning and birth control program in 1978
  - Reduced number of children born per woman from 3 to 1.7
  - TFR was already declining before 1978 due to increased education and employment opportunities for women

# Case Study: Slowing Population Growth in China (2 of 4)

- Negative effects of one-child policy
  - Preference for male children resulted in skewed population: too few females
  - Average population age increasing at one of the fastest rates ever recorded
  - By 2030, likely too few young workers to support aging population
- 2015: Chinese government replaced one-child policy with two-child policy

# Case Study: Slowing Population Growth in China (3 of 4)

# Case Study: Slowing Population Growth in China (4 of 4)



# Big Ideas (1 of 2)

- The human population is growing rapidly
  - May soon bump up against environmental limits
- Combination of population growth and increasing rate of resource use per person is expanding human ecological footprint
  - Strains the earth's natural capital

# Big Ideas (2 of 2)

- We can slow human population growth by reducing poverty, elevating the status of women, and encouraging family planning

# Tying It All Together: World Population Growth and Sustainability

- Many believe exponential growth is unsustainable in the long run
- Employing solar and other renewable technologies can help reduce:
  - Pollution
  - Emissions of climate-changing gases
- Reuse and recycle materials
- Focus on preserving biodiversity