UNIT 2 – PART IB: POPULATION

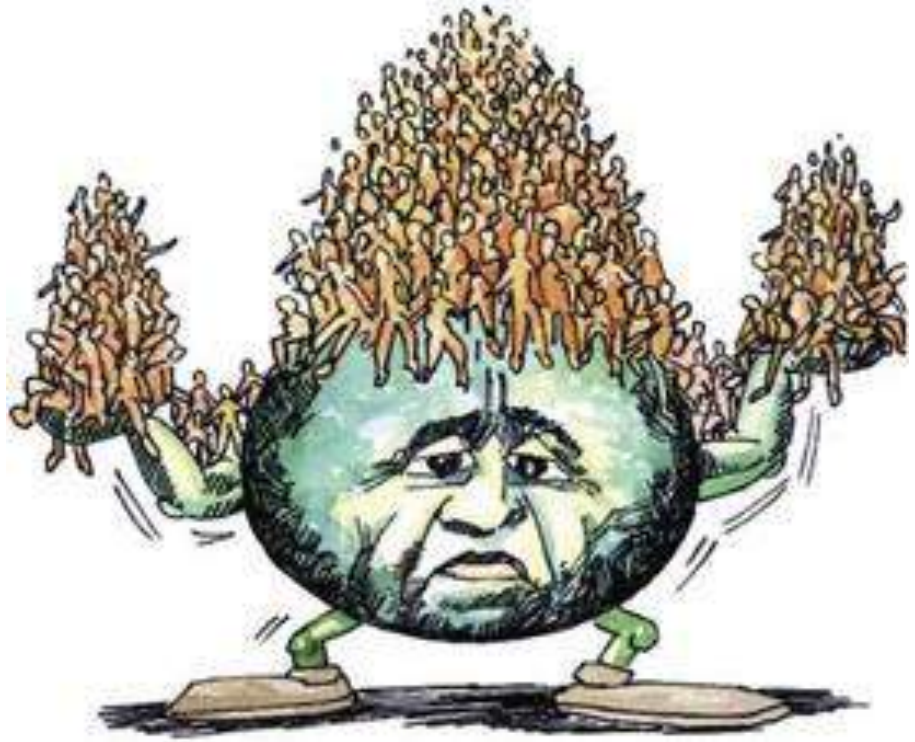
POPULATION AND MIGRATION

ENDURING UNDERSTANDING (2.B)

- By the end of this section, you will *understand* that **populations grow and decline over time and space.**

ENDURING UNDERSTANDING (2.B)

- **Essential Question**
  - What are the political, social, and economic consequences of the rapid population growth of the past 200 years?



LEARNING OBJECTIVE (2.B.1)

- By the end of this section, you will *be able to* **explain contemporary and historical trends in population growth and decline.**
    a. Demographic factors that determine population growth and decline are fertility, mortality, and migration.
    b. Rates of natural increase and population-doubling times are used to explain population growth and decline.
    c. Social, cultural, political, and economic factors influence fertility, mortality, and migration rates.

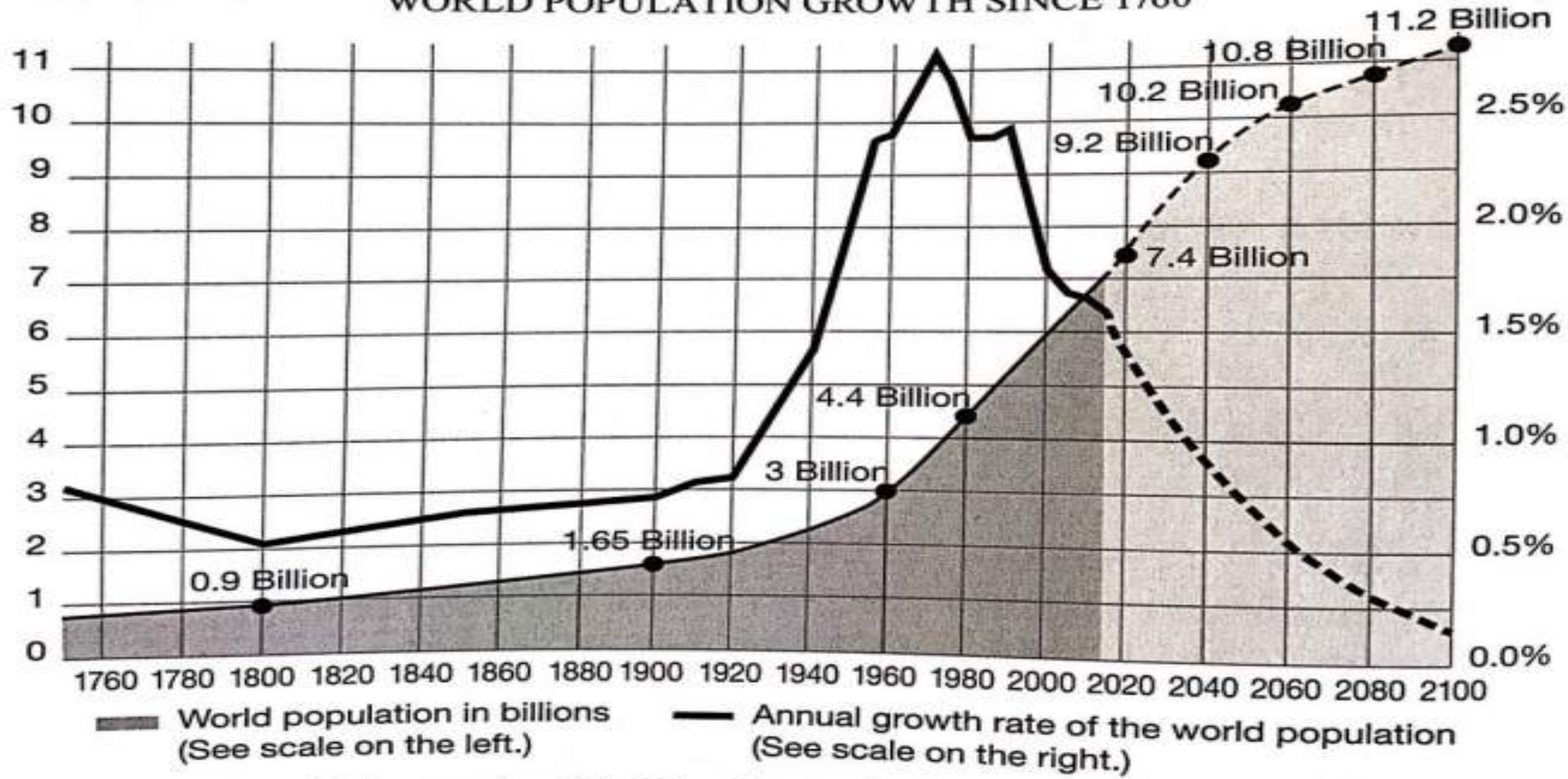
POPULATION GROWTH AND DECLINE

- *"A finite world can support only a finite population; therefore, population growth must eventually equal zero."* –Gerrett Hardin, "The Tragedy of the Commons," 1968
- Before the 19th century, the total human population grew very slowly
- Improvements to farming techniques, clearing forested land to expand land for crops, and finding new regions of the ocean dense in fish allowed people to become more efficient at extracting energy from the environment

POPULATION GROWTH AND DECLINE

- 1800 – population reached 1 billion people
- In the 200+ years since then, world population exploded – around 7.4 billion today
- Prediction – nearly 11 billion by 2100

WORLD POPULATION GROWTH SINCE 1760



Source: Population projections come from "World Population Prospects: The 2015 Revision," UN Department of Economic and Social Affairs, 2015.

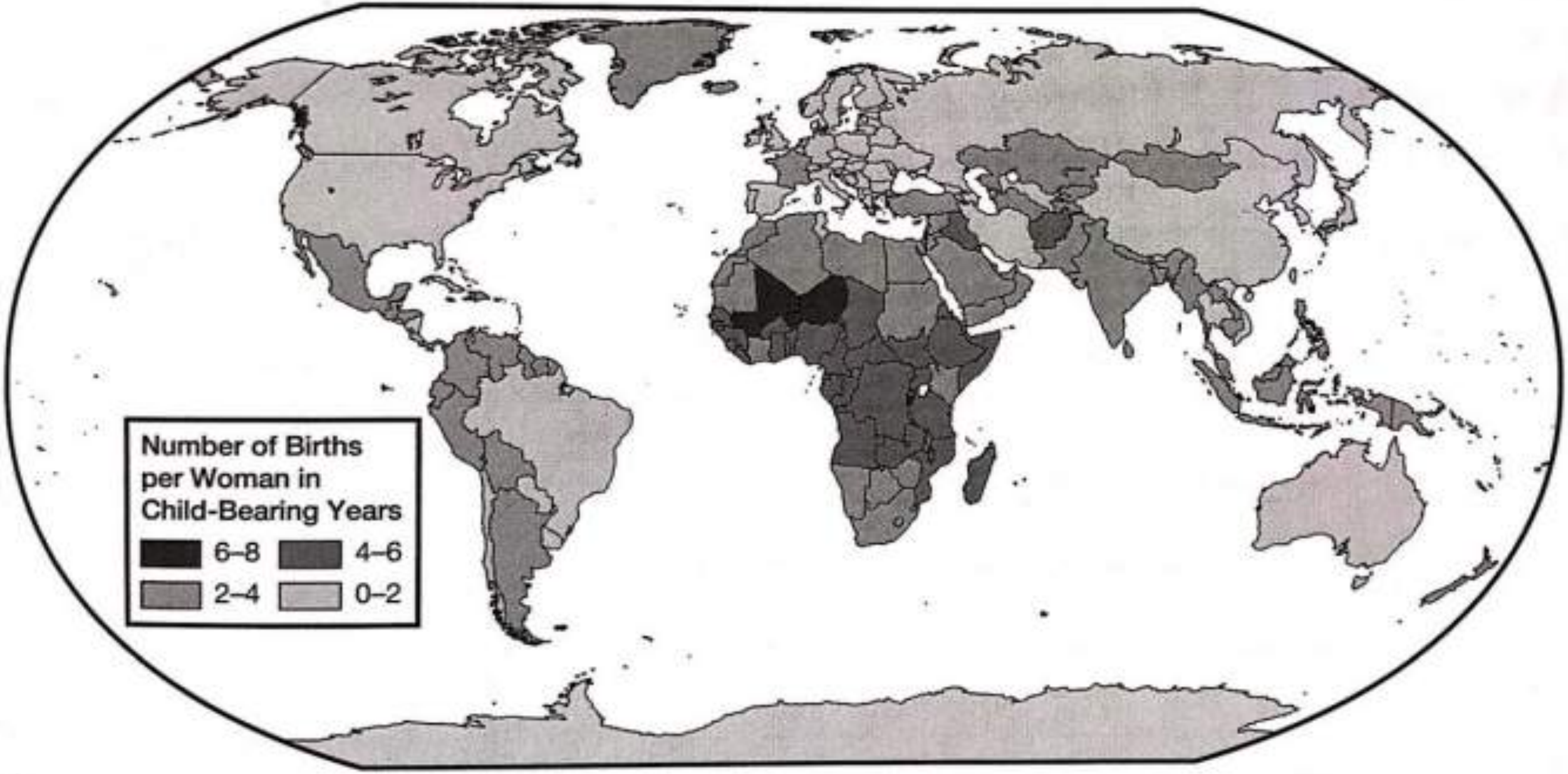
MEASURING NUMBER OF BIRTHS

- Geographers commonly use two different statistics to describe the rate and which children are born
  - **Crude birth rate (CBR)** – the number of live births per year for each 1,000 people
  - **Total fertility rate (TFR)** – the average number of children who would be born per woman of that group in a country, assuming every woman lived through her childbearing years
- TFR more accurately reflects cultural norms

MEASURING NUMBER OF BIRTHS

- In most of the world, the TFR was higher in the past than it is today.
- Parts of Europe before 1800s – 6.2 children; more children meant more people to work the land
- However, so many children died as infants and people lived, on average, about 40 years.
- Despite the high TFR, population growth was slow

TOTAL FERTILITY RATES



Total fertility rates (TFRs) generally decline as countries become wealthier.

CHANGES IN FERTILITY

- Beginning in the 1800s, Europeans began having less children
- Unintentional – countries began keeping larger standing armies so men were away from home for longer periods
- Intentional – with the Industrial Revolution replacing manual labor with machinery, fewer children were needed; however, industrialization also enabled people to live longer so even though TFR declined, population growth increased

CHANGES IN FERTILITY – ROLE OF WOMEN

- Cultural, economic, political, and environmental realities have always shaped decisions about whether to have children
- As countries have industrialized, women have begun working in factories – lived in small houses near the cities and families became smaller
- Children worked in the factories until outlawed by the government – public schools were opened and young women became educated, expanding their work opportunities
- More work and school – fewer children

CHANGES IN FERTILITY – ROLE OF WOMEN

TFR AND SCHOOLING FOR GIRLS IN GHANA		
Years of Schooling	**TFR, 1990**	**TFR, 2007**
0	7.0	6.1
4	6.4	5.0
8	5.6	3.7
12	2.7	2.0

Source: worldbank.org

Between 1990 and 2007, as young women gained more education, the number of children they had decreased

CHANGES IN FERTILITY – FAMILY PLANNING

- Throughout the 20th century, the spread of family planning information and changes in technology aided people who wanted to choose the number of children they had
- With access: had their first child later in life, had fewer children, had fewer unintended pregnancies, and had larger intervals between having children
- In these places, the TFR continued a decline that began with the Industrial Revolution

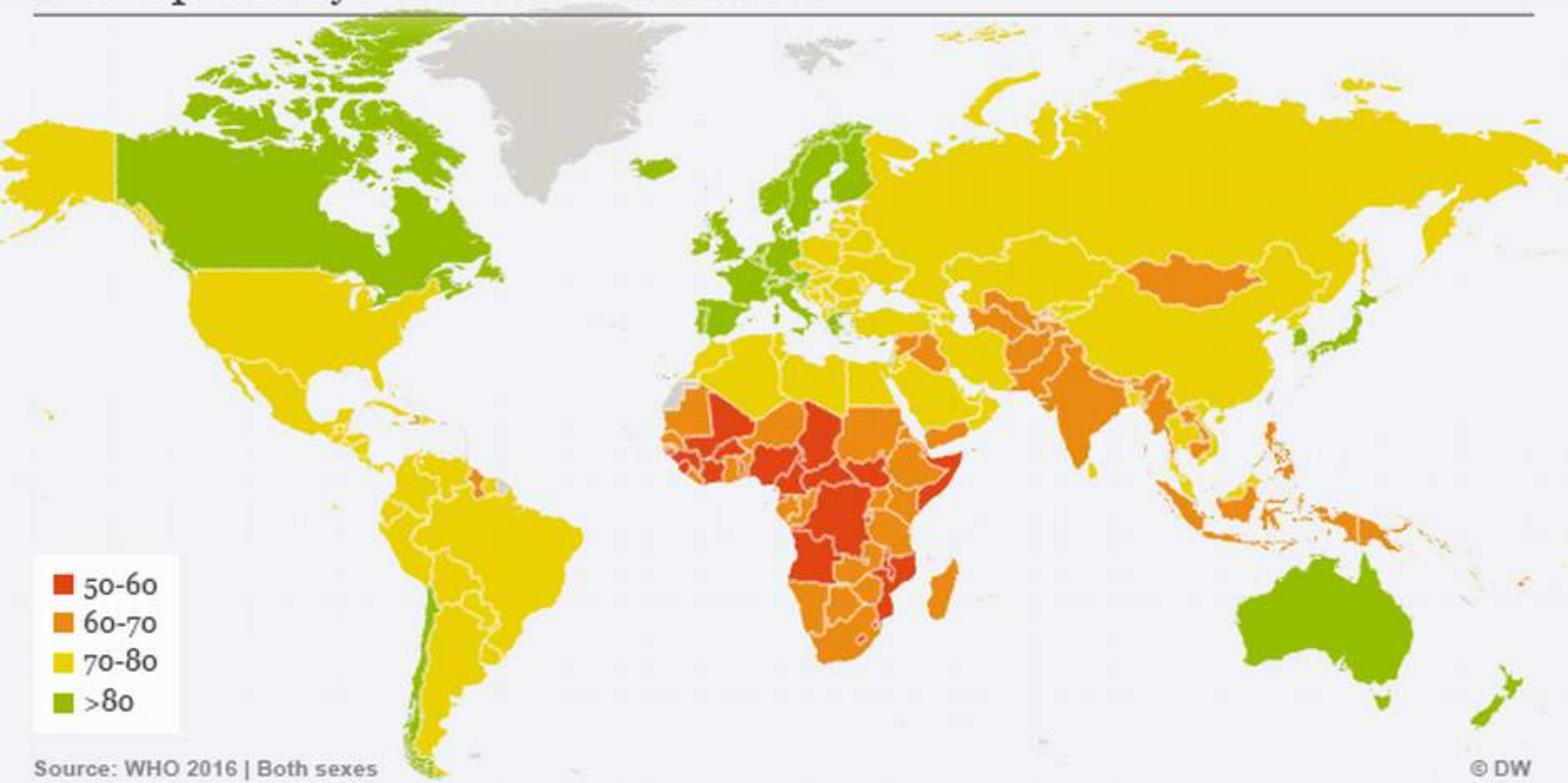
CHANGES IN FERTILITY – FAMILY PLANNING

- Religion
  - Some traditions oppose certain forms of family planning
  - Women who follow traditional religious beliefs, regardless of the religion, have higher fertility rates than those who do not
  - Less likely to use birth control and less likely to be employed outside the home

LIFE EXPECTANCY

- Global Population Increase
  - The most important factor in the increase in global population is the rise in **life expectancy** – the number of years the average person will live
  - The most important factor increasing life expectancy is the drop in the **infant mortality rate** – the number of children who die before their first birthday
  - Example: Massachusetts – In the 1850s, the IMR was 130 per 1,000. Today, the IMR is about 4 per 1,000.

Life expectancy from the time of birth



Source: WHO 2016 | Both sexes

LIFE EXPECTANCY

- Better Food Production and Nutrition
  - Agricultural advances
    - Mechanized food production, such as replacing horses with tractors
    - Improving seeds, fertilizers, and farming techniques
    - Transporting products more efficiently
  - In the US in 1800, almost everyone farmed. Today, only 3% of the population are farmers, yet they produce enough food to feed everyone in the country and export vast quantities

LIFE EXPECTANCY

- Better Food Production and Nutrition
  - Effects of these Advances
    - Allowed people to work outside of farming
    - Food security improved around the world
    - Farm families became smaller
    - Small farms were consolidated into one large farm allowing people to move to urban areas

LIFE EXPECTANCY

- Advances in Public Sanitation
  - As industrial cities grew, so did the problems
    - Spread of cholera and other diseases through water contaminated by human waste
    - Plague carried by fleas that lived on rodents
  - Creation of public sewer systems – people used to dump human waste into streets and rivers, contaminating the water and making people sick, especially children and the elderly
  - Boil water before paying for clean water through taxes
  - Created Department of Public Sanitation – trash pickup (less rodents)

LIFE EXPECTANCY

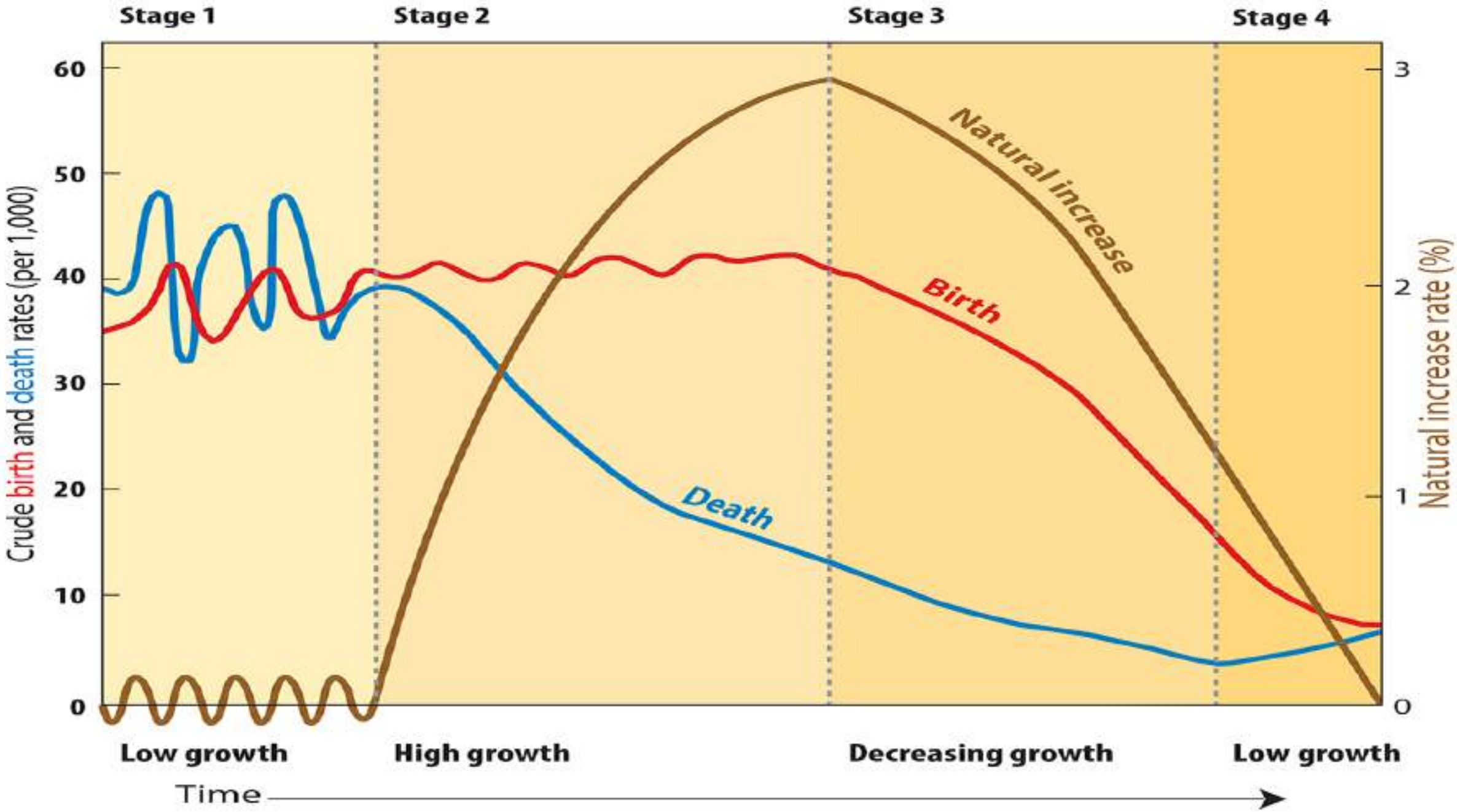
- Improvements in Healthcare
  - Improvements in food production kept people healthier
  - Vaccines prevented disease, antibiotics cured disease, and improved medical procedures boosted life expectancy
  - Before 1800s – smallpox killed 400,000 people each year but due to the vaccine being administered around the world, no case of smallpox has been reported since 1977
  - Antibiotics – penicillin in the mid 1900s; before this, in the mid 1300s, the plague killed 20 million Europeans

LEARNING OBJECTIVE (2.B.2)

- By the end of this section, you will *be able to* **interpret and apply theories of population growth and decline.**
  - The demographic transition model (DTM) may be used to explain population change over time and space
  - Malthusian theory is used to analyze population change and its consequences
  - The epidemiologic transition explains causes of changing death rates

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Changes in birth rate and death rate in a country are shaped by how a country changes from an agrarian (agricultural) society to an industrial society.
- The DTM shows five typical stages of population change as countries modernize
- MDCs passed through these stages first while LDCs are still passing through the early and middle stages

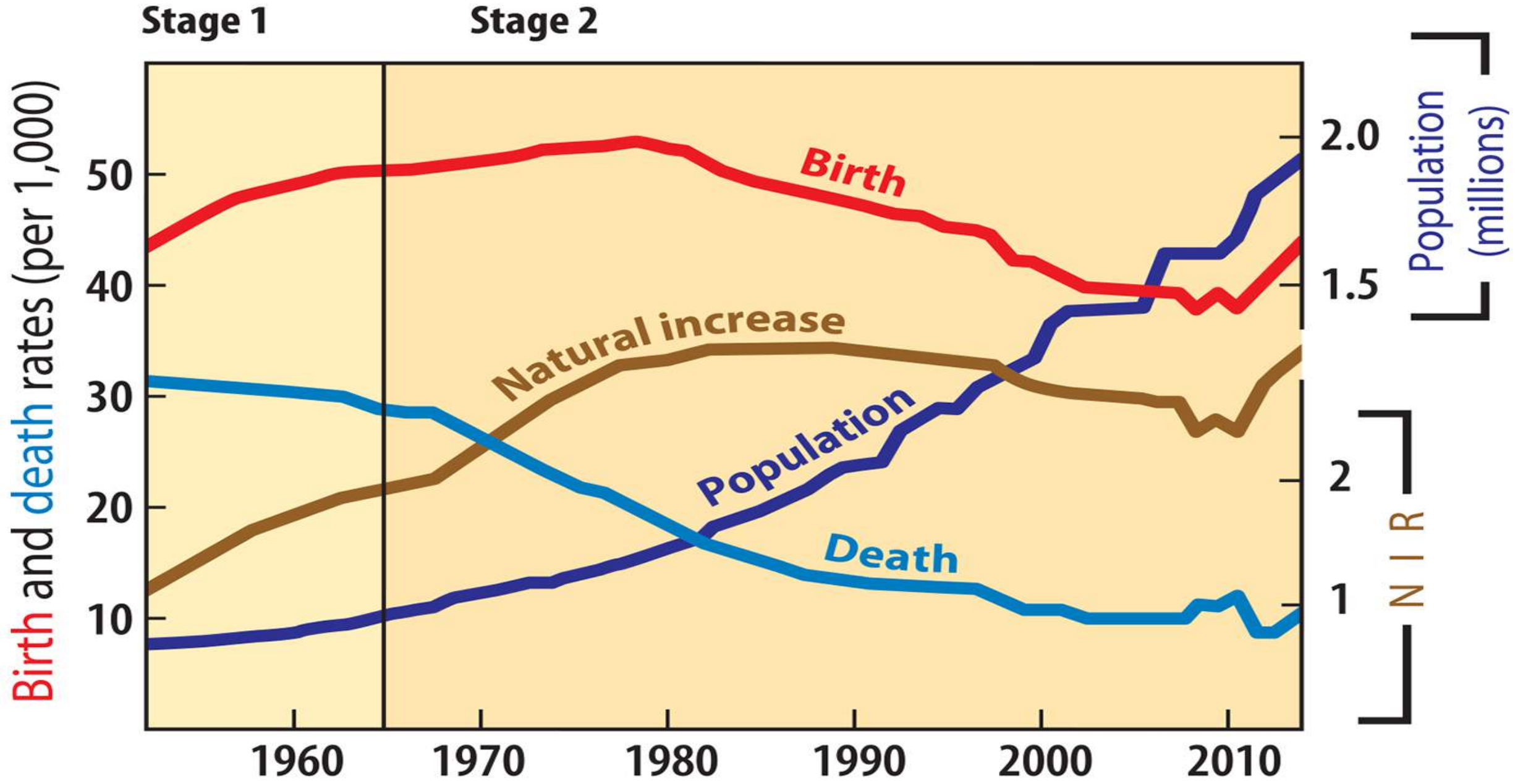

Stage 1
Stage 2
Stage 3
Stage 4
Crude birth and death rates (per 1,000)
Natural increase rate (%)
60
50
40
30
20
10
0
3
2
1
0
Natural increase
Birth
Death
Low growth
High growth
Decreasing growth
Low growth
Time

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Stage 1
  - Factor: high stationary
  - Birth rate: high, but fluctuating as need for farm labor changes
  - Death rate: high, but fluctuating to reflect diseases and poor sanitation
  - Population change: very low growth (CBR and CDR are both high)
  - Examples today: scattered isolated groups – “nobody is in stage 1”
  - Population structure: very young

DEMOGRAPHIC TRANSITION MODEL (DTM)

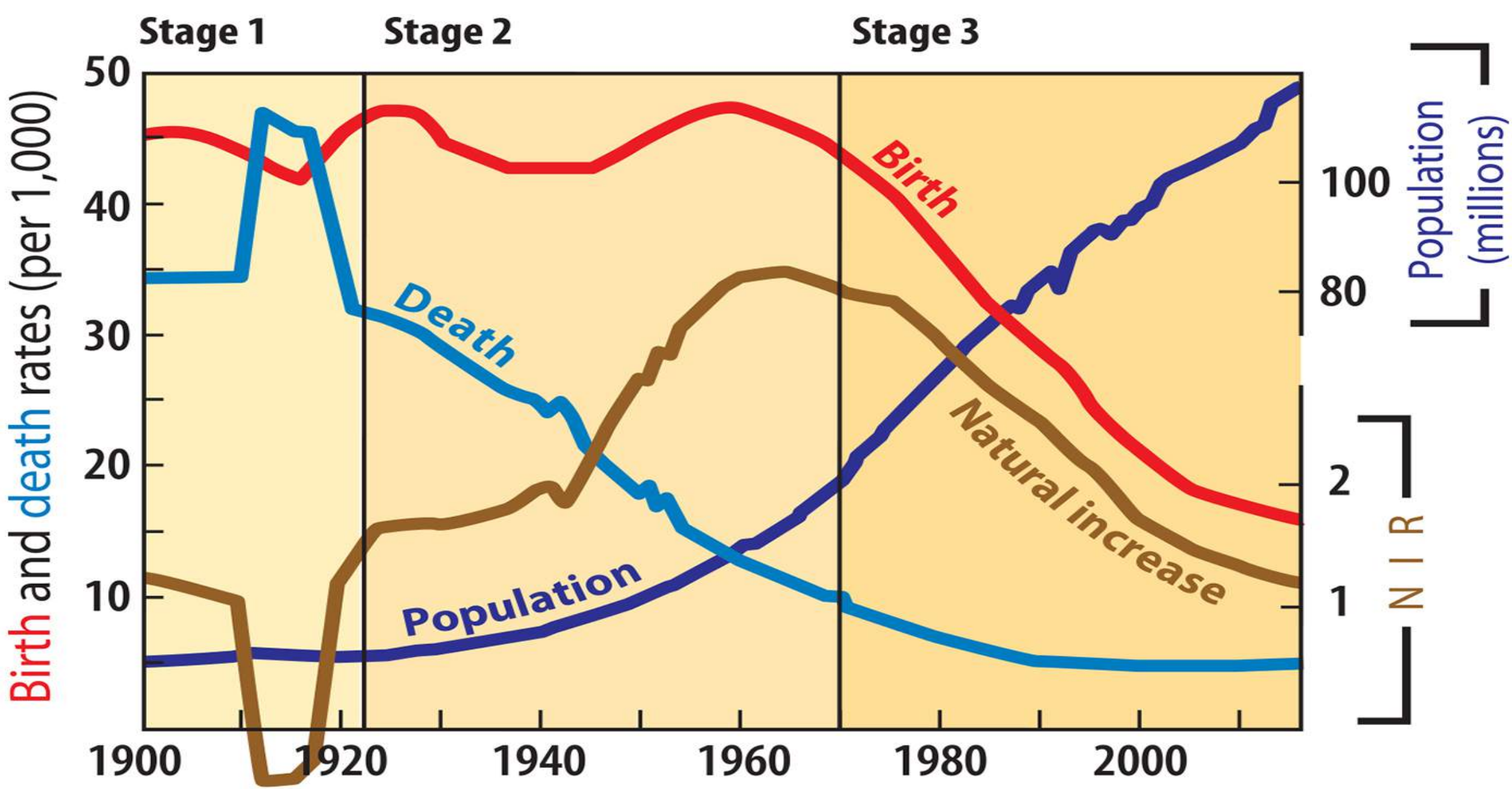
- Stage 2
  - Factor: early expanding
  - Birth rate: high, but fluctuating to reflect desires for big families
  - Death rate: rapidly declining as nutrition, sanitation, and medicine improve
  - Population change: rapid growth as CDRs fall faster than CBR
  - Examples today: Mali, South Sudan, The Gambia
  - Population structure: very young



(a) Stage 2: The Gambia

DEMOGRAPHIC TRANSITION MODEL (DTM)

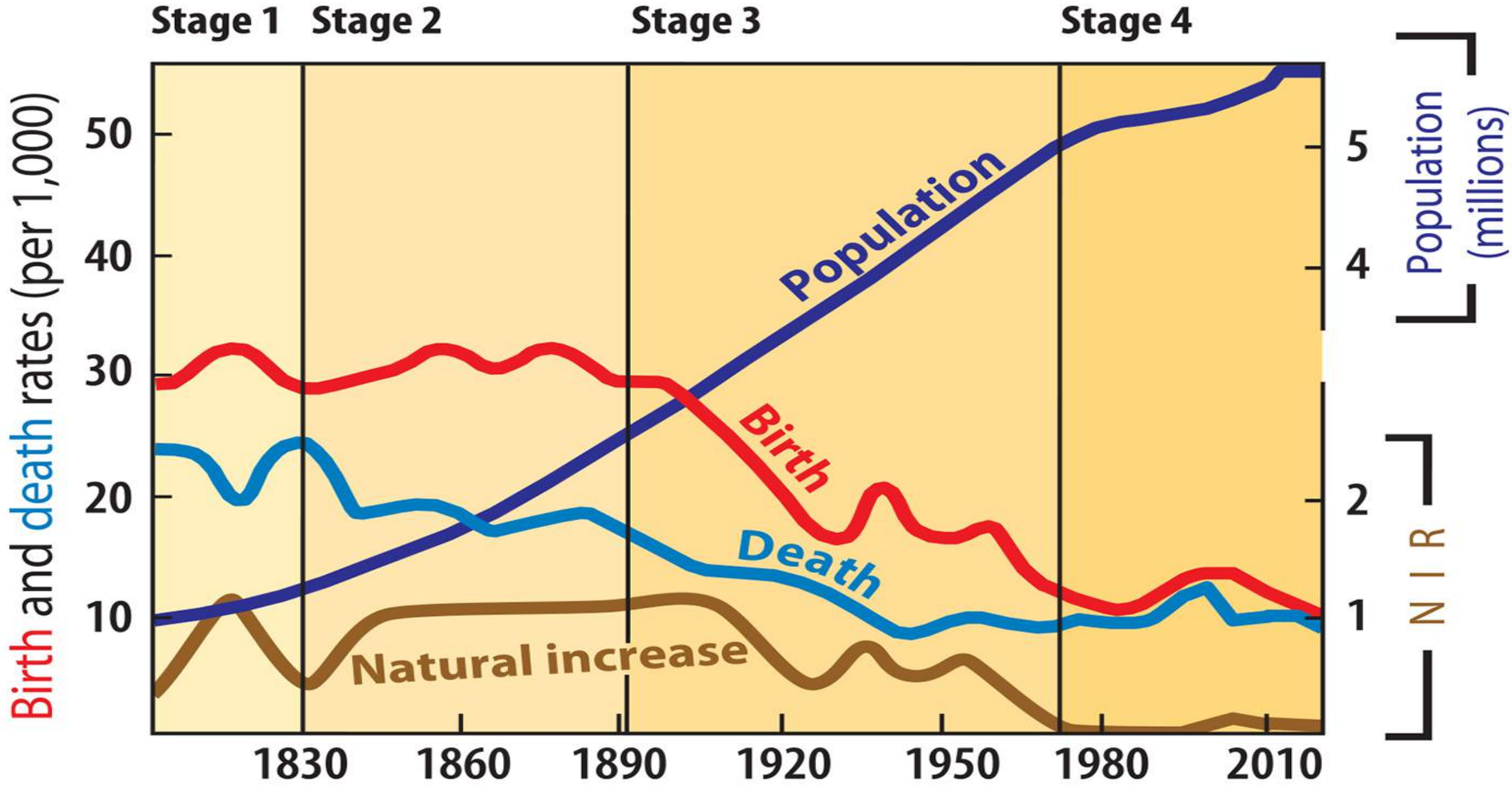
- Stage 3
  - Factor: late expanding
  - Birth rate: declining as urbanization decreases the need for child labor
  - Death rate: declining, but not as fast as in Stage 2
  - Population change: rapid but slowing growth as CBR declines
  - Examples today: Mexico, Turkey, Indonesia
  - Population structure: young, with rising life expectancy



(b) Stage 3: Mexico

DEMOGRAPHIC TRANSITION MODEL (DTM)

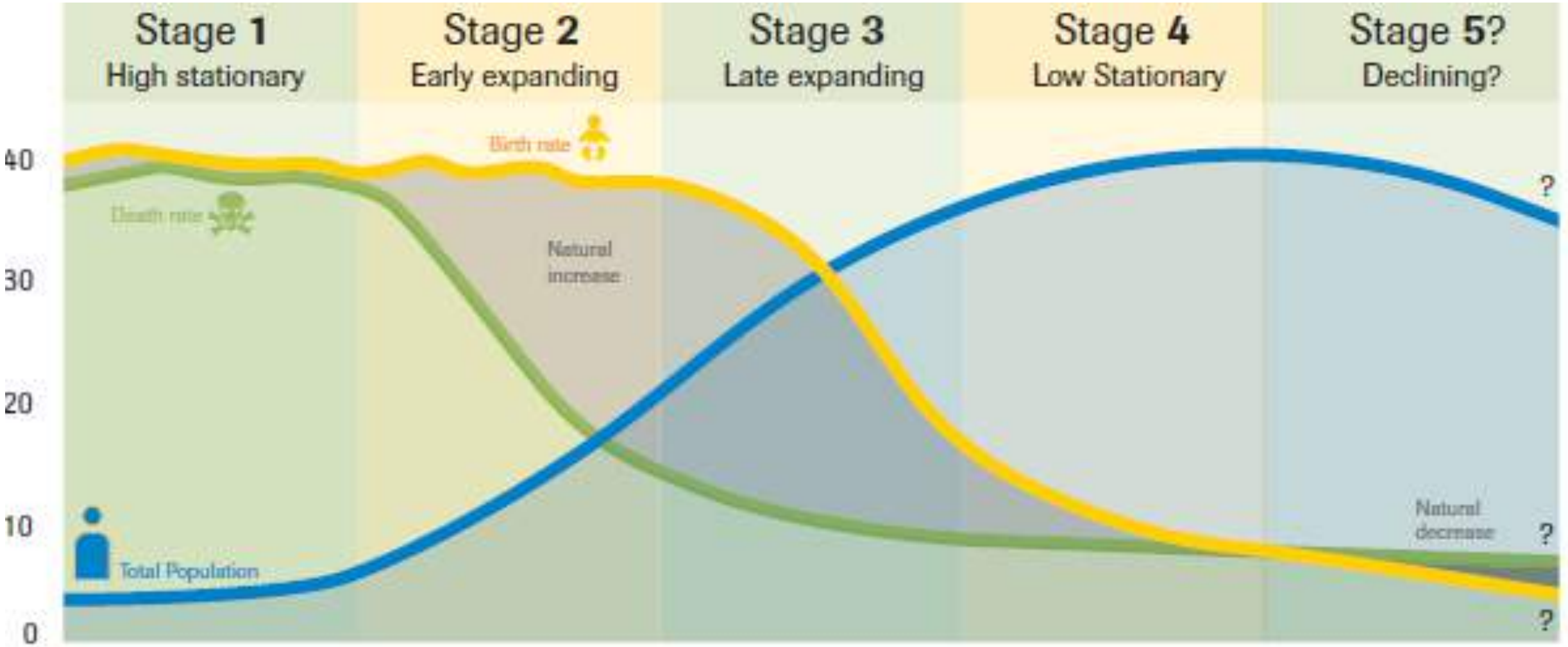
- Stage 4
  - Factor: low stationary
  - Birth rate: low, but enough to keep the population stable
  - Death rate: low and stable
  - Population change: very low growth because CBR and CDR are low
  - Examples today: United States, China, Denmark
  - Population structure: balanced, with more aging



(c) Stage 4: Denmark

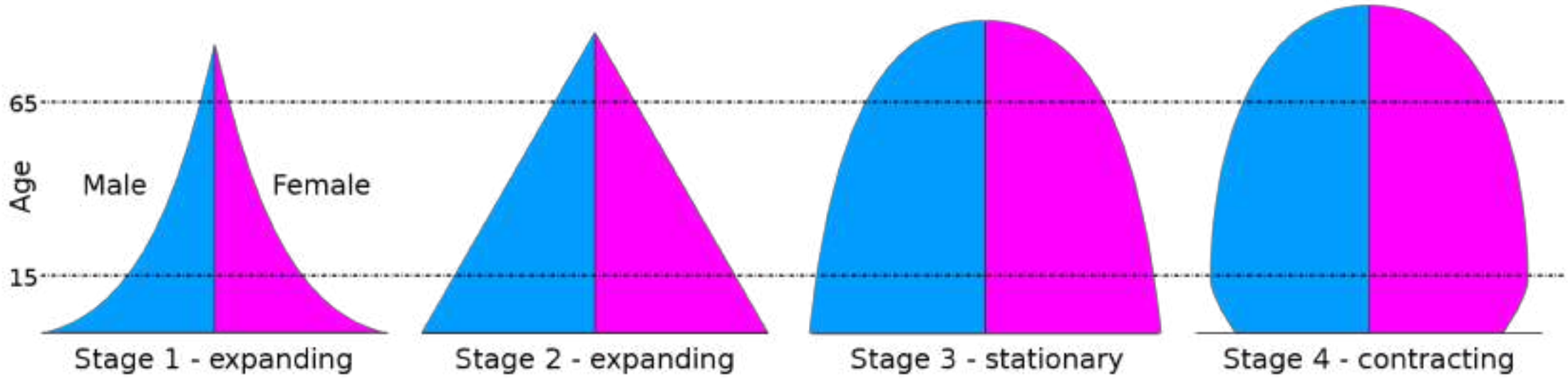
DEMOGRAPHIC TRANSITION MODEL (DTM)

- Stage 5
  - Factor: declining
  - Birth rate: so low it falls below the death rate
  - Death rate: low, sometimes increasing as the population ages
  - Population change: very low decline as CBR fall below CDR
  - Examples today: Japan, Germany
  - Population structure: very old


Stage 1
High stationary
Stage 2
Early expanding
Stage 3
Late expanding
Stage 4
Low Stationary
Stage 5?
Declining?
40
30
20
10
0
Birth rate
Death rate
Natural increase
Total Population
Natural decrease
?
?
?

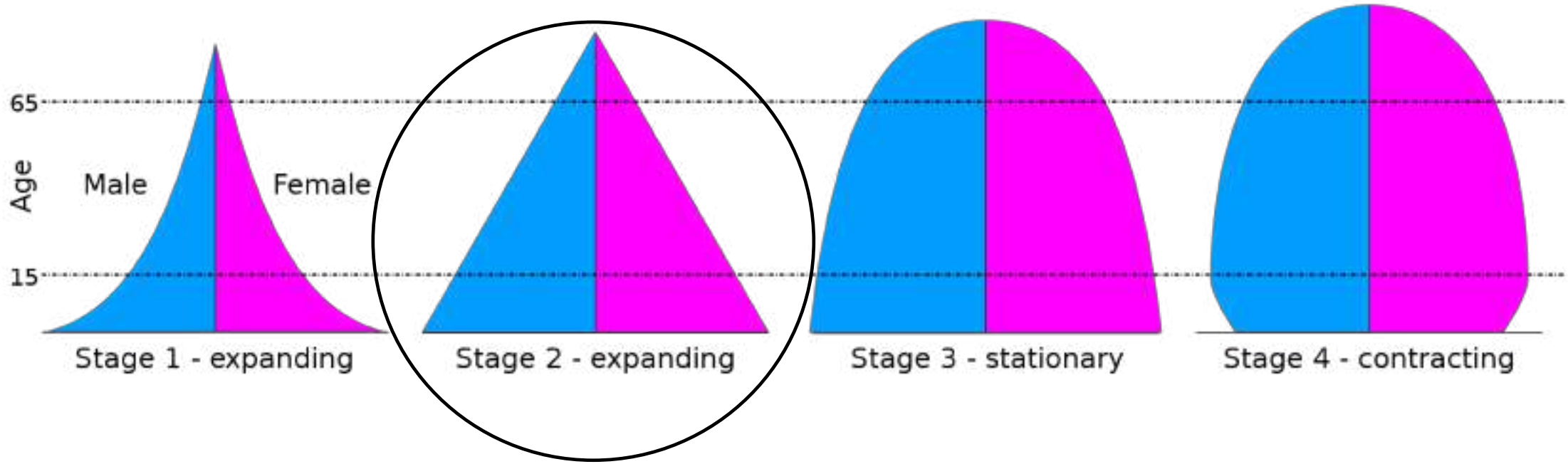
DEMOGRAPHIC TRANSITION MODEL (DTM)

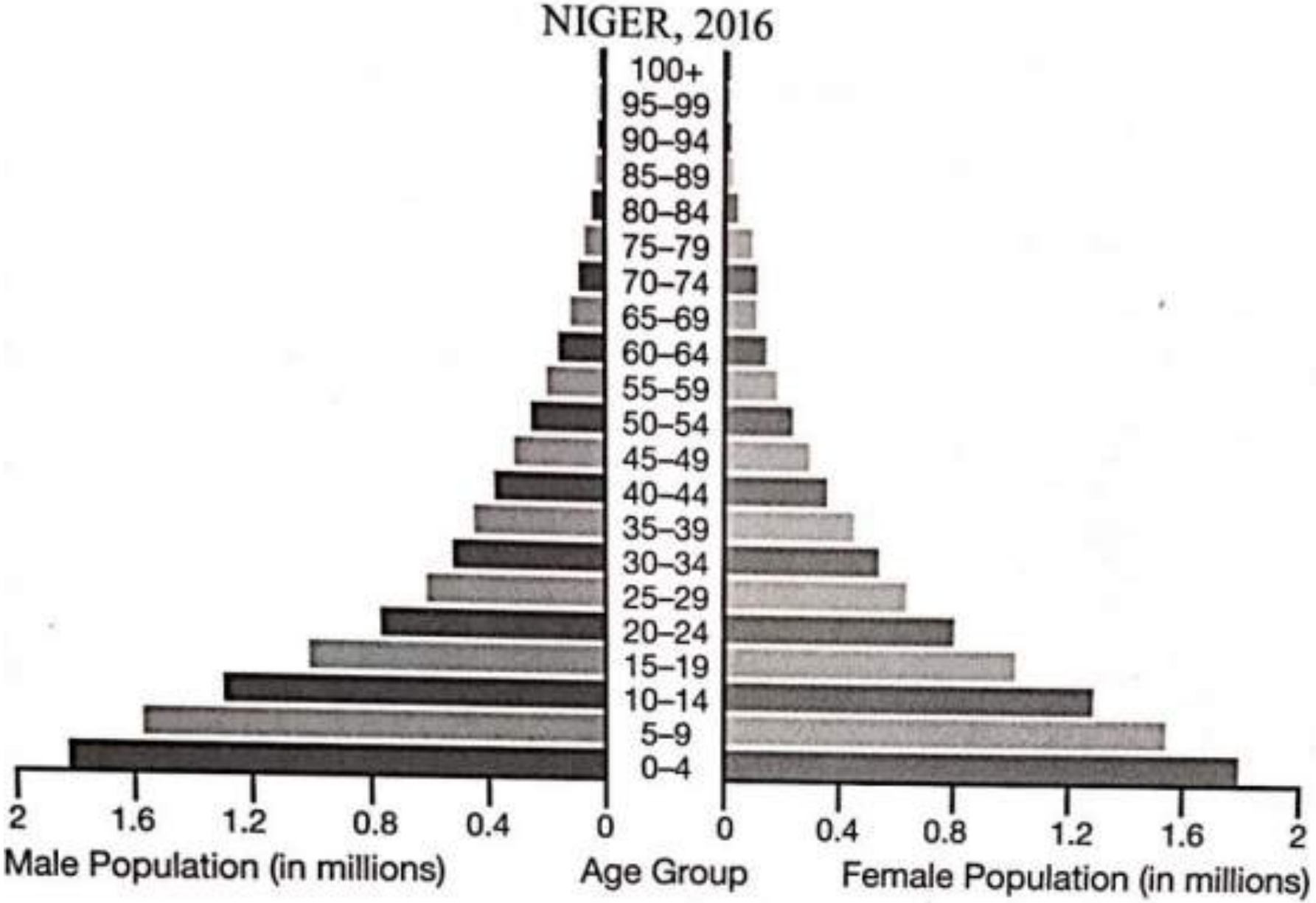
- DTM and Population Pyramids
  - Stages 2-5 of the DTM each tend to produce a different shaped population pyramid



DEMOGRAPHIC TRANSITION MODEL (DTM)

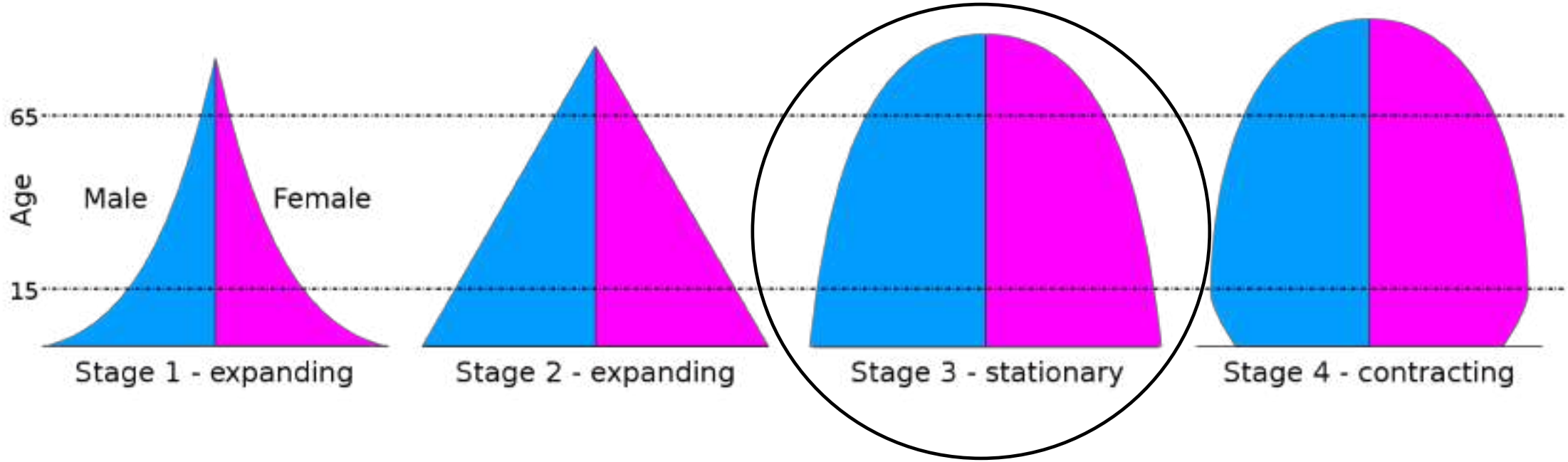
- Stage 2: Niger has a high birth rate (wide base) and a low life expectancy (narrows earlier) = rapid population growth

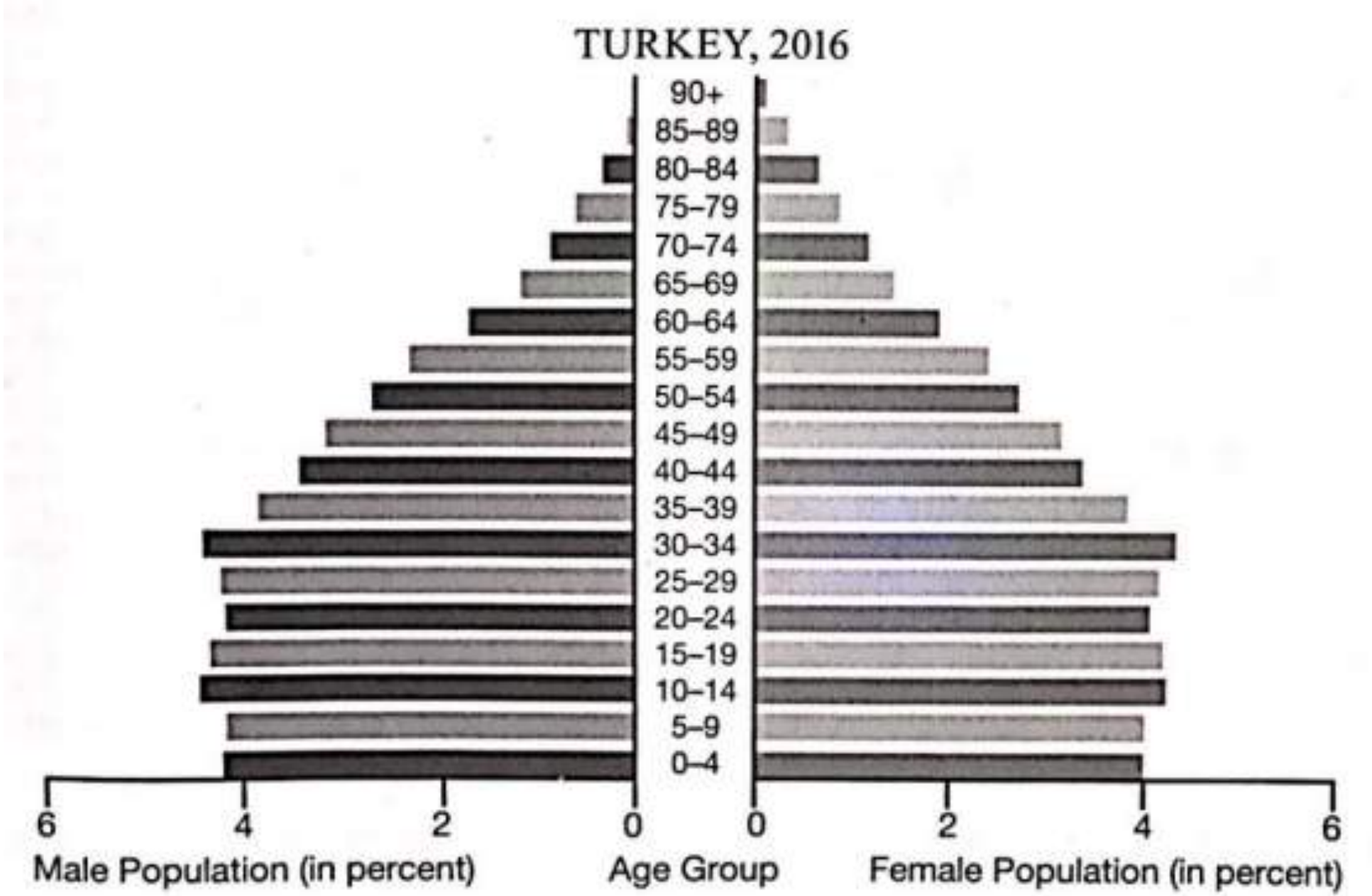



NIGER, 2016
100+
95–99
90–94
85–89
80–84
75–79
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4
2
1.6
1.2
0.8
0.4
0
0
0.4
0.8
1.2
1.6
2
Male Population (in millions)
Age Group
Female Population (in millions)

DEMOGRAPHIC TRANSITION MODEL (DTM)

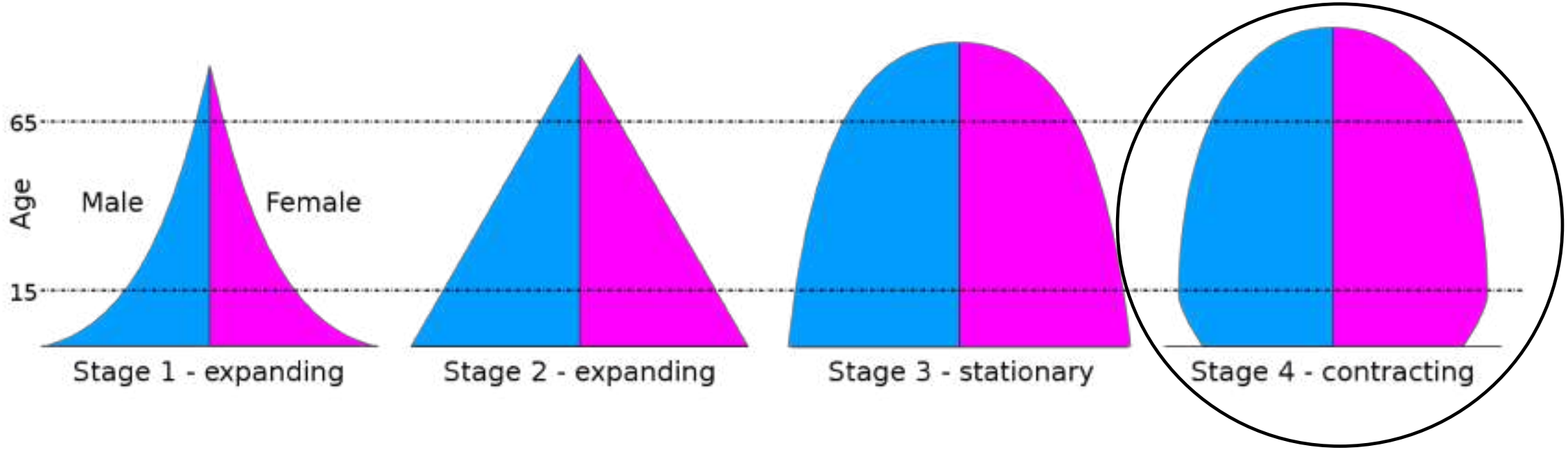
- Stage 3: Turkey has a declining CBR and a more slowly declining CDR – most are under 34 but percentage of elderly is increasing as life expectancy goes up

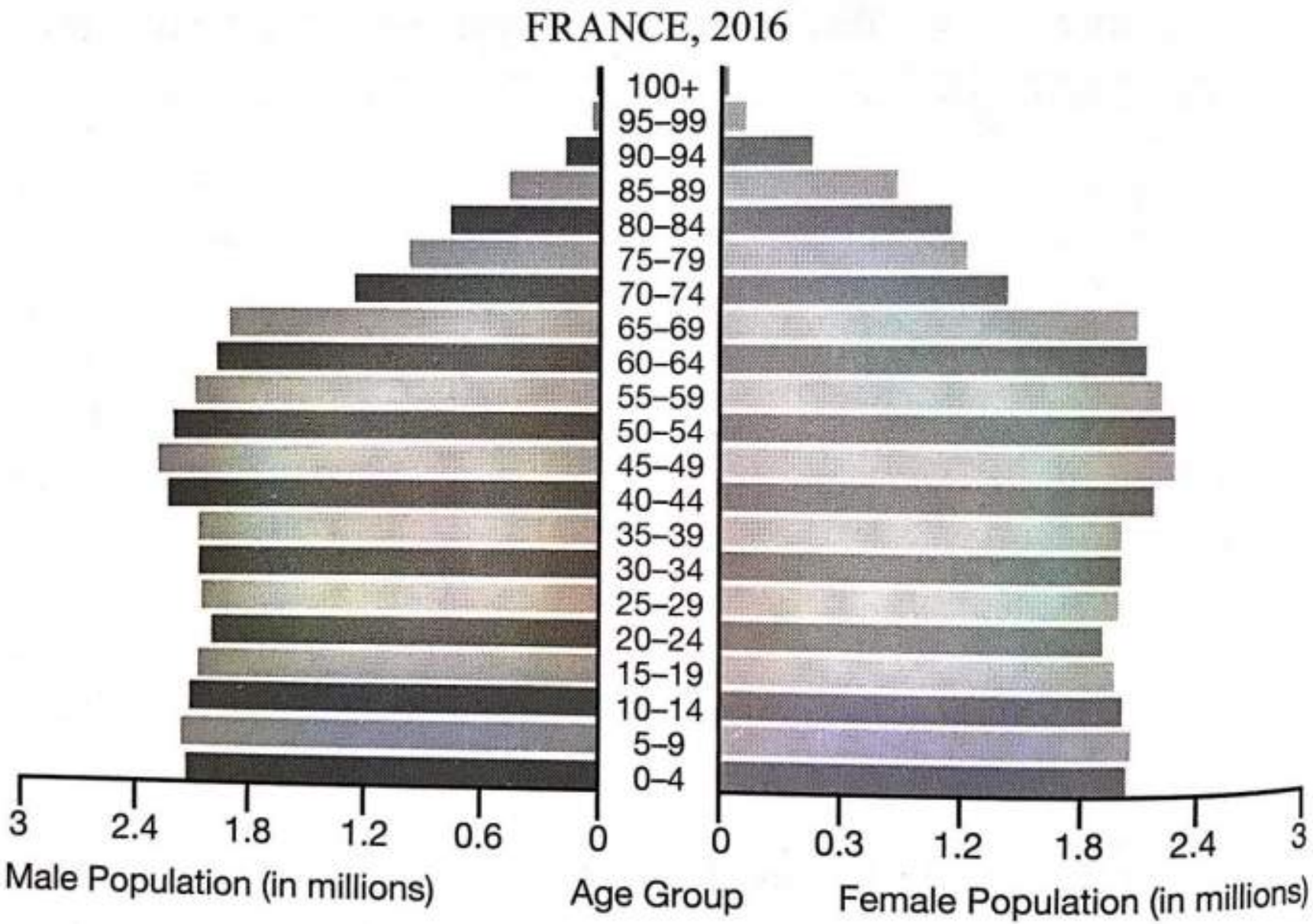



TURKEY, 2016
90+
85–89
80–84
75–79
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4
6
4
2
0
0
2
4
6
Male Population (in percent)
Age Group
Female Population (in percent)

DEMOGRAPHIC TRANSITION MODEL (DTM)

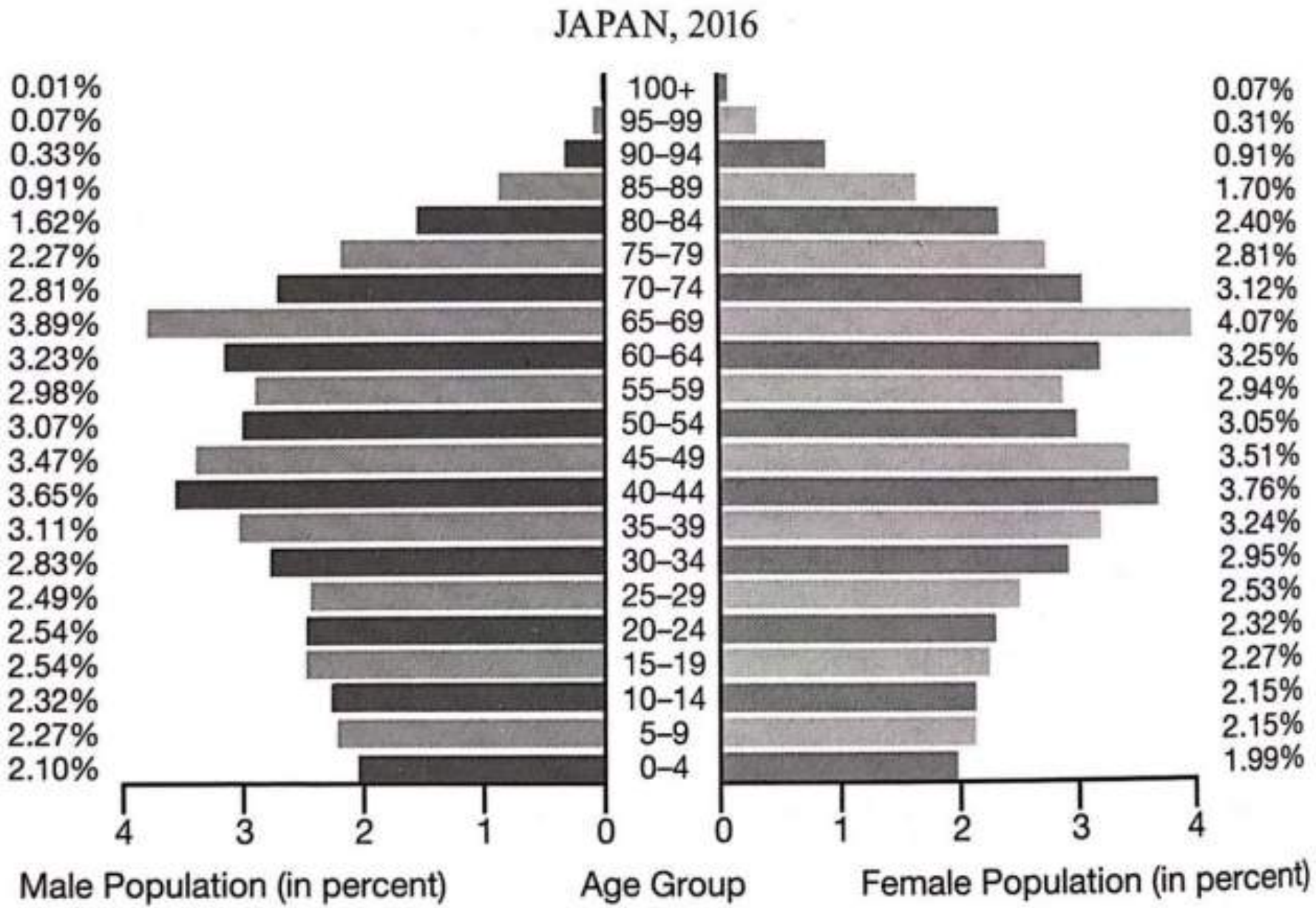
- Stage 4: France's pyramid indicates a population that is not growing or shrinking – CBR is low but steady and CDR is low




FRANCE, 2016
100+
95–99
90–94
85–89
80–84
75–79
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4
3
2.4
1.8
1.2
0.6
0
0
0.3
1.2
1.8
2.4
3
Male Population (in millions)
Age Group
Female Population (in millions)

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Stage 5: Japan's pyramid represents Stage 5; the narrow base reflects a decreasing CBR – the population is aging and declining slightly overall. The largest age group is 65-69.


JAPAN, 2016
0.01%
0.07%
0.33%
0.91%
1.62%
2.27%
2.81%
3.89%
3.23%
2.98%
3.07%
3.47%
3.65%
3.11%
2.83%
2.49%
2.54%
2.54%
2.32%
2.27%
2.10%
100+
95–99
90–94
85–89
80–84
75–79
70–74
65–69
60–64
55–59
50–54
45–49
40–44
35–39
30–34
25–29
20–24
15–19
10–14
5–9
0–4
0.07%
0.31%
0.91%
1.70%
2.40%
2.81%
3.12%
4.07%
3.25%
2.94%
3.05%
3.51%
3.76%
3.24%
2.95%
2.53%
2.32%
2.27%
2.15%
2.15%
1.99%
4
3
2
1
0
0
1
2
3
4
Male Population (in percent)
Age Group
Female Population (in percent)

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Policy Implications
  - As countries move from stage to stage, they face different challenges
  - Stage 2 or 3 with a relatively high percentage of young people often lacks the resources to educate all children
  - Stage 4 with a relatively high percentage of old people often faces problems funding healthcare
  - However, the elderly can vote and therefore have more influence than children

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Rate of Population Increase
  - Population increase or decrease is measured by subtracting the number of deaths from the number of births
  - To compare countries of different sizes, demographers use rates instead of numbers
  - CBR and CDR are per 1,000 people
  - The percentage at which a country's population is growing or declining, *without the impact of migration*, is the **rate of natural increase (RNI).**

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Use this formula:
  - RNI = (CBR-CDR)/10
  - For the entire world, the CBR is about 20 and the CDR is about 8.
  - RNI = (20-8)/10 = 1.2%
- Note: RNI tends to be less than 1% in MDCs and greater than 1% in LDCs

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Demographic Balancing Equation
  - Natural increase is only part of a country's total population change
  - Migration plays a major part and must be added to the equation
    - Immigration – people who move INTO the country
    - Emigration – people who move OUT of the country
  - This formula is called the **demographic balancing equation**

Total Population Change = Births – Deaths + Immigrants - Emigrants

DTM – POPULATION DOUBLING TIME

- **Arithmetic** growth
  - When the increase is a constant number each period
  - Ex: 1, 2, 3, 4 (*add* 1) or 1, 5, 9, 13, 17 (*add* 4)
- **Exponential** growth
  - When the increase is a constant factor each period
  - Ex: if the factor is 2, the number doubles each period (1, 2, 4, 8).
  - Growth by 5 would be 1, 5, 25, 125, etc.

DTM – POPULATION DOUBLING TIME

- Since the early 1800s, global population has been growing *exponentially*.
- The time it takes to double in size can be estimated using the Rule of 70: assuming the growth rate remains steady, the approximate doubling time in years will be 70 divided by the growth rate per year
- Example: in 2014, the Ivory Coast had a population growth rate of about 2.0 and since 70/2 = 35, if the growth rate stays the same, the population will double in 35 years.
- Example: the US had a population growth rate of .77. What is the doubling time? About 91 years.

LEARNING OBJECTIVE (2.B.2)

- By the end of this section, you will *be able to* **interpret and apply theories of population growth and decline.**
  - The demographic transition model (DTM) may be used to explain population change over time and space
  - Malthusian theory is used to analyze population change and its consequences
  - The epidemiologic transition explains causes of changing death rates

IDEAS OF THOMAS MALTHUS

- Malthus in His Time – **Malthusian theory**
  - Early 1800s - member of the clergy and an early economist
  - Focused on the relationship between people and the earth
  - During this time, people believed that new technology would make life better but Malthus was not so sure
  - Analyzed the relationship between *agricultural output and the growing number of people* – concluded that society was on a path toward massive starvation
  - Food production was growing **arithmetically** while population would grow **exponentially**

IDEAS OF THOMAS MALTHUS

- Malthus Today
  - Geographers and social scientists have debated his theory
  - Food production grew more quickly than predicted – so famine did not reach the scale he predicted
  - **Neo-Malthusians** are people today who have adapted his ideas to modern conditions and argue that global population is a serious issue
  - Will lead to depletion of nonrenewable resources (petroleum and metals), pollution of air and water, and shortages of food

IDEAS OF THOMAS MALTHUS

- Ester Boserup
  - Economist whose work turned out to be first real opposition to Malthus.
  - Said Malthus did not take technology into account and said we would find alternatives.
  - Made a point that widespread misery forecast by Malthus hadn't occurred.
  - In 1965, published "The Conditions of Agricultural Growth". Also came up with a model of agricultural development.

LEARNING OBJECTIVE (2.B.2)

- By the end of this section, you will *be able to* **interpret and apply theories of population growth and decline.**
  - The demographic transition model (DTM) may be used to explain population change over time and space
  - Malthusian theory is used to analyze population change and its consequences
  - The epidemiologic transition explains causes of changing death rates

DEMOGRAPHIC TRANSITION MODEL (DTM)

- Epidemiological Transition Model (ETM)
  - 1970s – epidemiologist Abdel Omran identified predictable stages in disease and life expectancy that countries experience as they develop
  - The stages of the ETM correspond with the stages of the demographic transition model

EPIDEMIOLOGICAL TRANSITION MODEL STAGES		
Stage	**Description**	**Effects on Population**
1. Pestilence and Famine	Parasitic or infectious diseases, accidents, animal attacks, or human conflicts cause most deaths.	A high death rate and low life expectancy
2. Receding Pandemics	The number of pandemics (widespread diseases that affect large populations) declines as a result of improved sanitation, nutrition, and medicine.	A decreasing death rate and increasing life expectancy
3. Degenerative and Human-Created Diseases	Infectious and parasitic diseases continue to decrease, but diseases associated with aging, such as heart disease and types of cancer—increase as people live.	Death rate stabilizes at a low level and life expectancy increases

EPIDEMIOLOGICAL TRANSITION MODEL STAGES		
Stage	**Description**	**Effects on Population**
4. Delayed Degenerative Diseases	Stage 4 is an extension of Stage 3, but the age-related diseases are put off as medical procedures delay the onset of these diseases through advanced procedures. Diseases such as Alzheimer's and dementia increase.	Death rate reaches its lowest level and life expectancy reaches a peak
5. Reemerging of Infectious and Parasitic Diseases	Infectious and parasitic diseases increase as some bacteria and parasites become resistant to antibiotics and vaccines.	Life expectancy decreases

LEARNING OBJECTIVE (2.B.3)

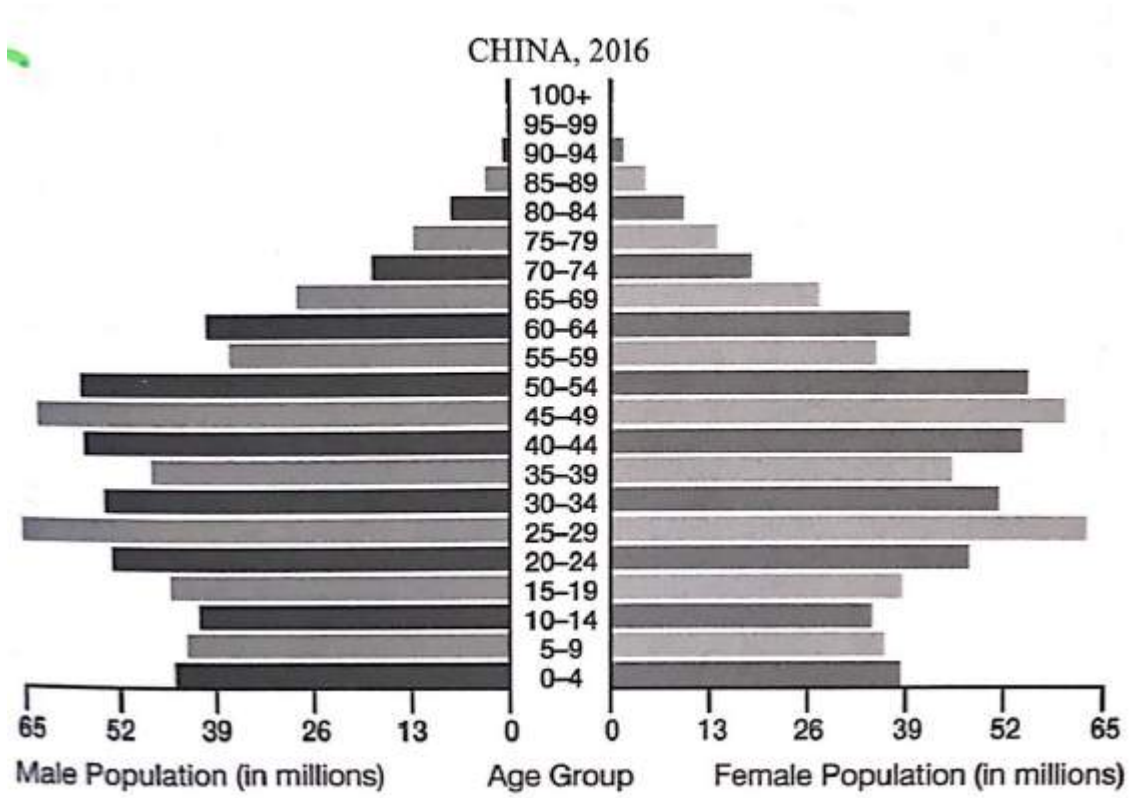
- By the end of this section, you will *be able to* **evaluate various national and international population policies.**
  - Types of population policies include those that promote or restrict population growth (pronatalist, antinatalist)

CHANGES IN FERTILITY

- Government Programs to *Reduce* Births
  - Concerns about **overpopulation** have led to **anti-natalist policies**, programs to decrease the number of births
  - China – two different policies in the 1970s
    - Later, longer, fewer
    - One Child Policy

CHANGES IN FERTILITY

- Later, longer, fewer
  - 1972, encouraged parents to get married later in life, wait longer between children, and as a result have fewer children
  - Impact – relatively shorter bars for the 40-44 and 35-39 cohorts
  - Resulted in reduced fertility but not as quickly as officials wanted → One Child Policy



CHANGES IN FERTILITY

- One Child Policy
  - 1979, parents who had more than one child were subject to fines, although the law made exceptions for rural couples and ethnic minorities; ended in 2016
  - Impact – fertility rate decreased but some argue other factors (educated women, etc.)
  - Impact – reduced number of adult workers and could potentially reduce economic growth and reduce workers to support the elderly
  - Impact – unbalanced gender ratio; some girls were aborted or orphaned without registering with the government allowing for another try
  - Ratio in 210 – 118 males to 100 females
- Males outnumber females globally and China accounts for *half* of that gap

CHANGES IN FERTILITY

- 2016 – modified to *two* children
- Other countries used more targeted programs
  - Europe – birth control education decreased teen pregnancy
  - Africa and South Asia – laws banning child marriage raised the average marriage age and the age that a woman had her first child

CHANGES IN FERTILITY

- Government Policies to *Encourage* Births
  - Throughout history, some governments have encouraged large families
  - Stimulate economic growth and increase military power
  - As fertility rates drop but people lived longer, the percentage of _____ increased?
  - To keep the economy vibrant, countries such as France, Sweden, and Japan instituted **pro-natalist policies** designed to increase fertility rate

CHANGES IN FERTILITY

- Examples
  - Paid time off from jobs held by mothers
  - Free childcare
  - Family discounts for government services
  - Free college tuition
  - Restrictions on birth control and abortions

Anti-natalist and natalist policies

ANTI-NATALIST (against birth)

- Prevention of births
  - Family planning clinics
  - Free contraception
  - Investment in sex education
  - Advertising / media
  - Encouraging later marriages
  - Financial incentives
- Termination of births
  - Promoting sterilisation
  - Legalising abortion

PRO-NATALIST (for birth)

- Birth bonuses, both cash and goods
- Lower tax rates with increasing numbers of children
- Favoured treatment for housing and welfare benefits

LEARNING OBJECTIVE (2.B.4)

- By the end of this section, you will *be able to* **analyze reasons for changes in fertility rates in different parts of the world.**
  - Changing social values and access to education, employment, health care, and contraception have reduced fertility rates in most parts of the world
  - Changing social, economic, and political roles for women have influenced the patterns of fertility, mortality, and migration.

LEARNING OBJECTIVE (2.B.4)

- By the end of this section, you will *be able to* **analyze reasons for changes in fertility rates in different parts of the world.**
  - Changing social values and access to education, employment, health care, and contraception have reduced fertility rates in most parts of the world
  - Changing social, economic, and political roles for women have influenced the patterns of fertility, mortality, and migration.

LEARNING OBJECTIVE (2.B.5)

- By the end of this section, you will *be able to* **explain the causes and implications of an aging population.**
  - Population aging is influenced by birth and death rates and life expectancy
  - An aging population has social (retirement), economic (dependency ratio), and political (voting patterns) implications.

LEARNING OBJECTIVE (2.B.5)

- By the end of this section, you will *be able to* **explain the causes and implications of an aging population.**
  - Population aging is influenced by birth and death rates and life expectancy
  - An aging population has social (retirement), economic (dependency ratio), and political (voting patterns) implications.