POPULATION GEOGRAPHY

Instructor: Dr. Carr
TA: Amy Lerner

Geography 141/241

Winter 2007

Today's Objectives

- Understand the objectives for the course and my expectations of me and of you

- Introduce population concepts and their importance

- Learn key concepts and language of Mortality

Today's Agenda

I. Introduction to course (45 minutes)

II. Introduction to Pop. Geography (40 minutes)
- Quiz#1 (10 minutes)

III. Population Activities (20 minutes)
- 5 minute break

IV. Mortality (40 minutes)
- Quiz#2 (10 minutes)
- Wrap-up

Course Objectives

- *Master the language and methods of Demography*
- *Analyze and interpret interactions among population dynamics with a critical historical and spatial lens*
- *Critically evaluate interactions among human and physical geographical processes and population dynamics across time and space*

Population Studies

- What is Demography?

Demography is:

- **The statistical study of human populations, especially with reference to size and density, distribution and vital statistics.**
www.worldbank.org/html/schools/glossary.htm

- **The study of the characteristics of populations, such as size, growth, density, distribution, and vital statistics.**
www.hubbardbrook.org/education/Glossary/Glossary.htm

- **the study of population.**
www.geoexplorer.co.uk/sections/dictionary/d.htm

What is <u>Population Geography</u>?

Population Geography is:

a subset of Population Studies that focuses on:

- Spatial patterns and processes
- Geographers tend to study migration more than fertility and mortality
- Geographers wish to know why that distribution?
- What are the environmental impacts?

HOW DOES POPULATION CHANGE?

Population Change =

Fertility – Mortality +/- Migration

<u>Crude Birth Rate</u> (CBR): Births/1000 individuals in a year

<u>Crude Death Rate</u> (CDR): Deaths/1000 individuals in a year

- Crude rates may be misleading:

    - e.g., CDR, US (8) vs. Mexico (5)

    -What's going on here?

    -Are tortillas the elixir of youth?

Putting it all together
(accounting for migration)

Population Growth Rate

$$\frac{CBR - CDR +/- \text{Net Migration Rate}}{1,000}$$

Rate of Natural Increase

Rate of Natural Increase (RNI) =

CBR-CDR (No Migration)

CBR>CDR = ↑ population

RNI usually expressed as % e.g., 2% = 2/100 = 20/1000

RNI ≠ population growth if migration significant

RNI U.S. vs. Mexico

Mexico

CBR (22), CDR (5)

RNI = 17/1000 or 1.7%

yet…annual population growth rate of %1.3

US

CBR (14), CDR (8)

RNI=6/1000 or 0.6%

yet…annual population growth rate at nearly %1.0 –v. close to Mexico's!

Why?

+ net migration of 3 migrants/1000

vs. Mexico – net migration of 4/1000

Why do we care?

Who said this?…

"Population, when unchecked, increases in a geometrical ratio. Subsistence only increases in an arithmetical ratio."

Is it true?

Answers on the next page…

Answer Key:

Who said this?…

Thomas Malthus 1766 – 1834, *The Principle of Population* (1798).

Is it true?
1. Sometimes
2. We don't know
3. Maybe in the future
4. All of the above
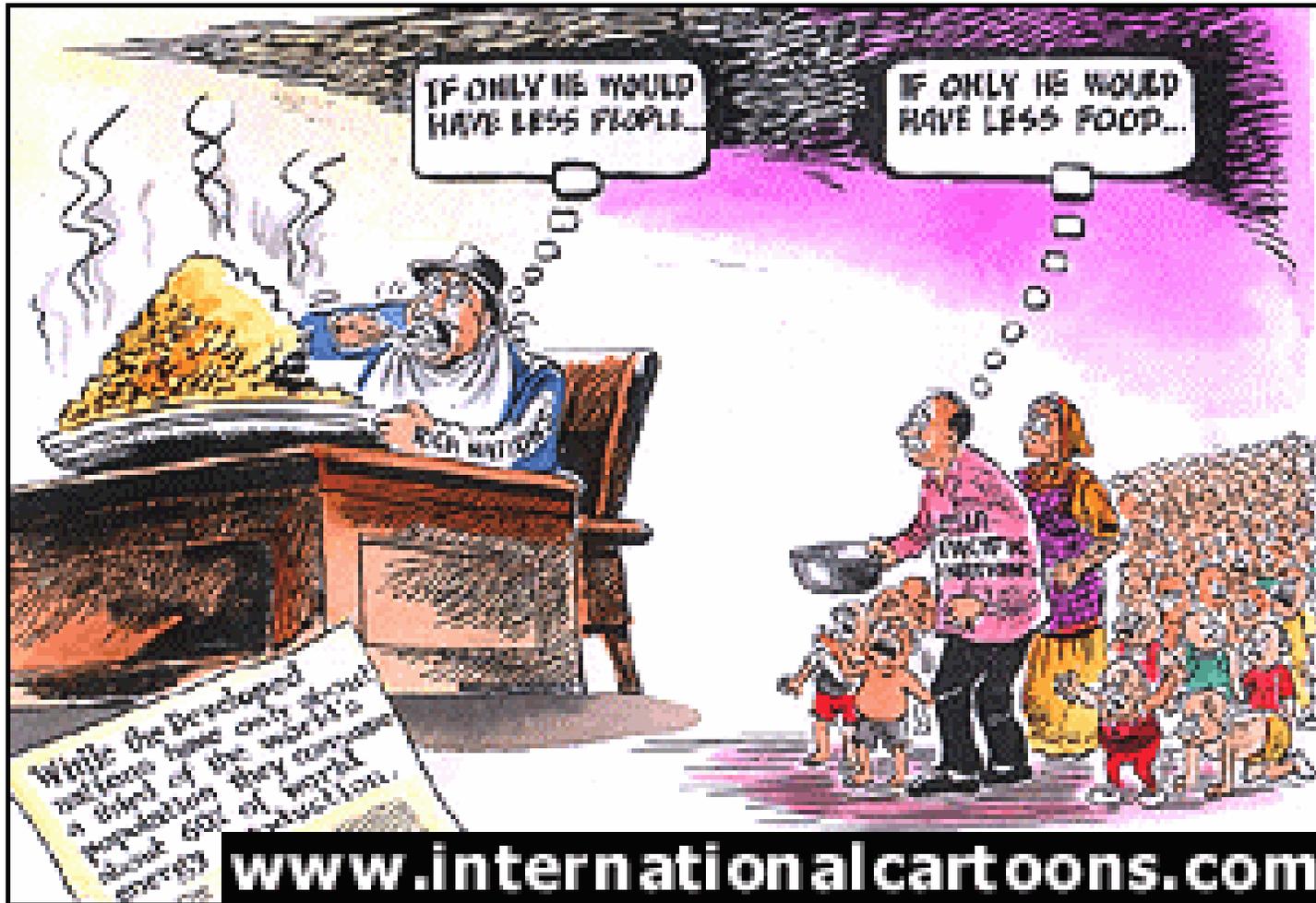
Quote of the day

At first there is only one lily pad in the pond, but the next day it doubles, and thereafter each of its descendants doubles. The pond completely fills up with lily pads in 30 days. When is the pond exactly half full? -
-Old French riddle

Not just lily pads:
What else grows like this?

1. In a matter of seconds…

2. At a decadal scale…

Population Doubling Time

Doubling Times and the Rule-of-70

The **Rule-of-70** provides a simple way to calculate the approximate number of years it takes for the level of a variable growing at a constant rate to double. This rule states that the approximate number of years n for a variable growing at the constant growth rate of R percent, to double is

$$n = \frac{70}{R}.$$

Source: Klein, M. W. 2002. *Mathematical Methods for Economics*, Second Edition. Addison-Wesley Higher Education Group, Upper Saddle River, New Jersey.

Examples

- CD rates: e.g., 3% annually

- S&P 500 average gains historically: e.g., 7% annually

- Late 90's NASDAQ: 30% annually

- World's population growth until 10,000 years ago: The rate was 0.0005% annually (What happened 10,000 years ago?)

- World's population growth today: 1.2% annually

Human Population Growth Over Time
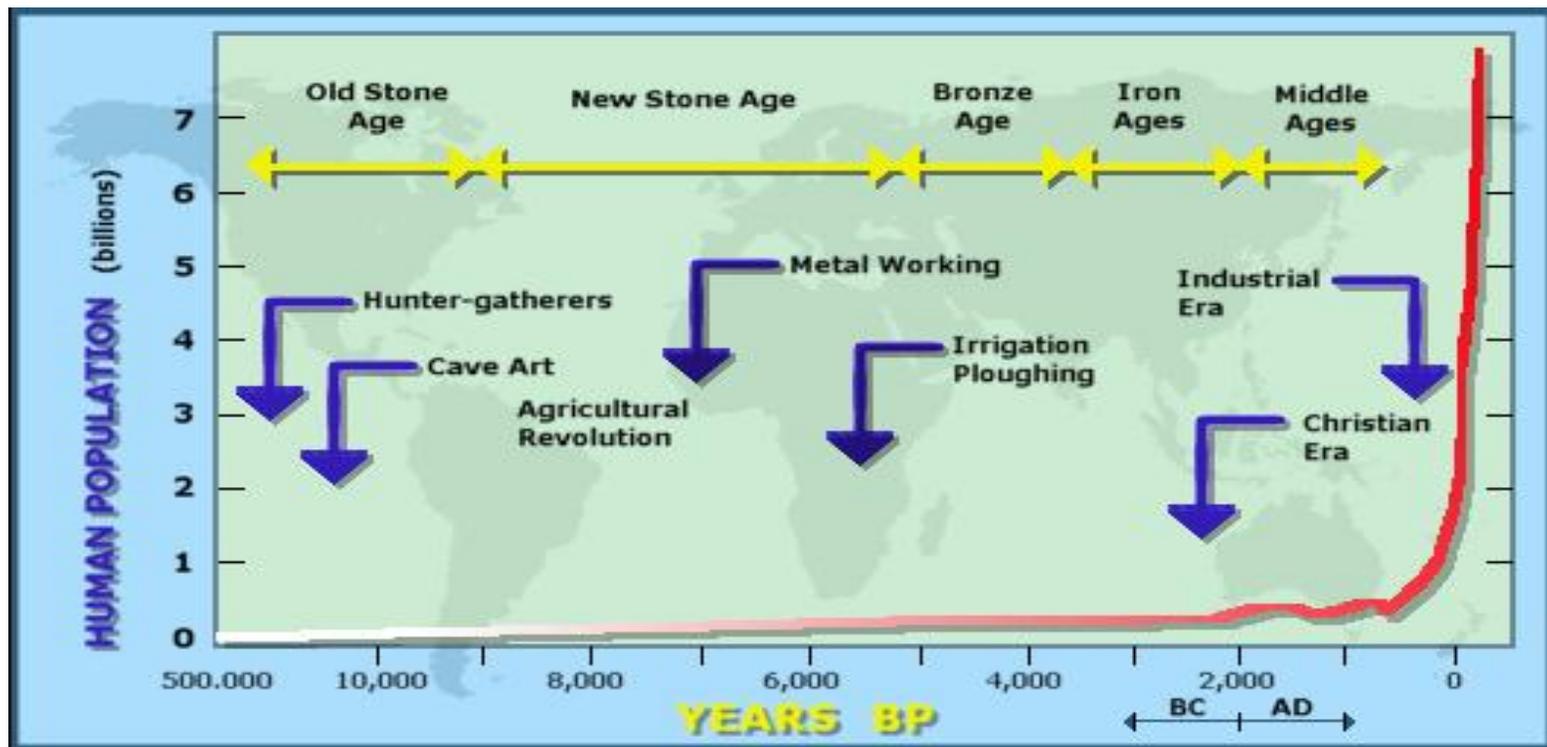
So is the *rate* of growth of the global population increasing?

1 Million Years of Population Growth: Deevey's Logarithmic Growth Curve
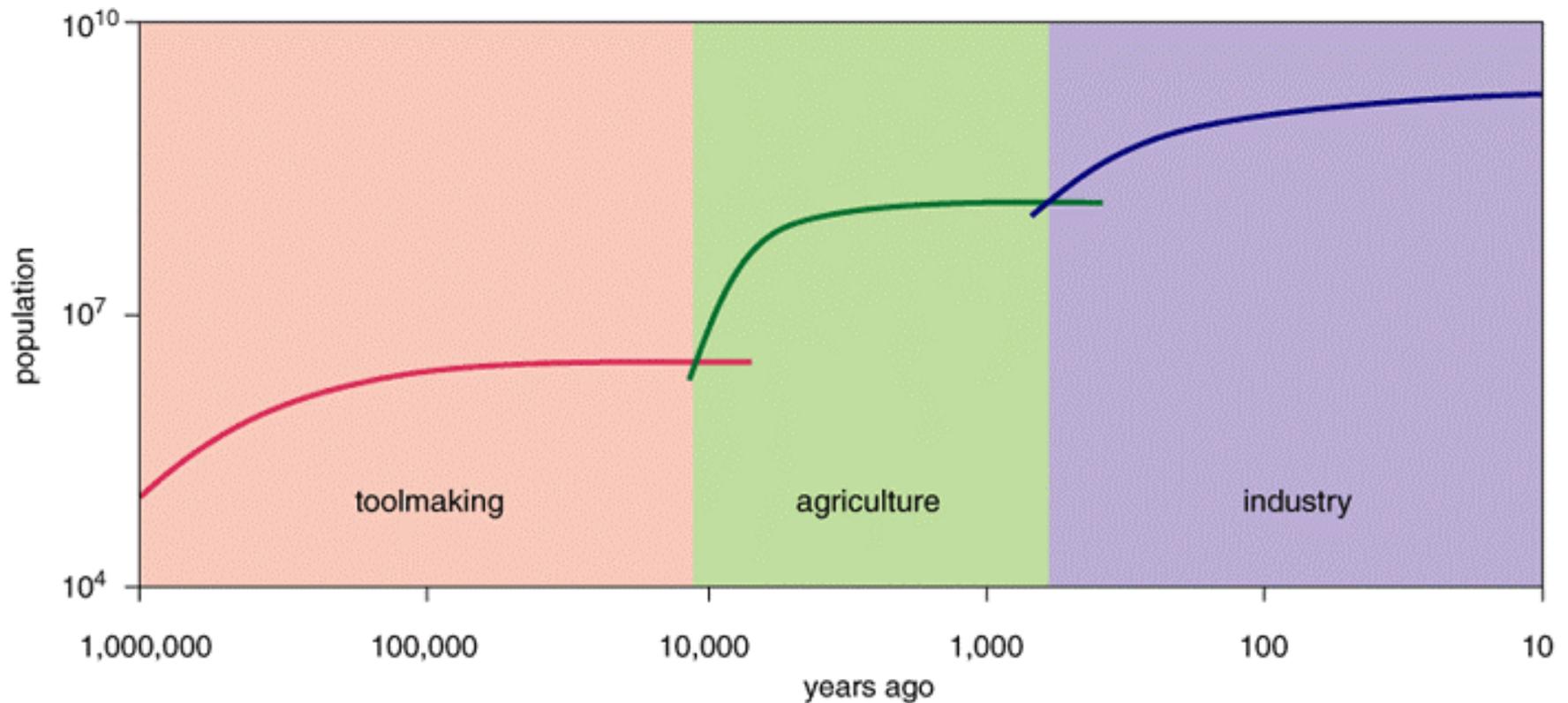
Deevey, E.S. Scientic American, Sept. 1960.

World Population Growth
1750–2150
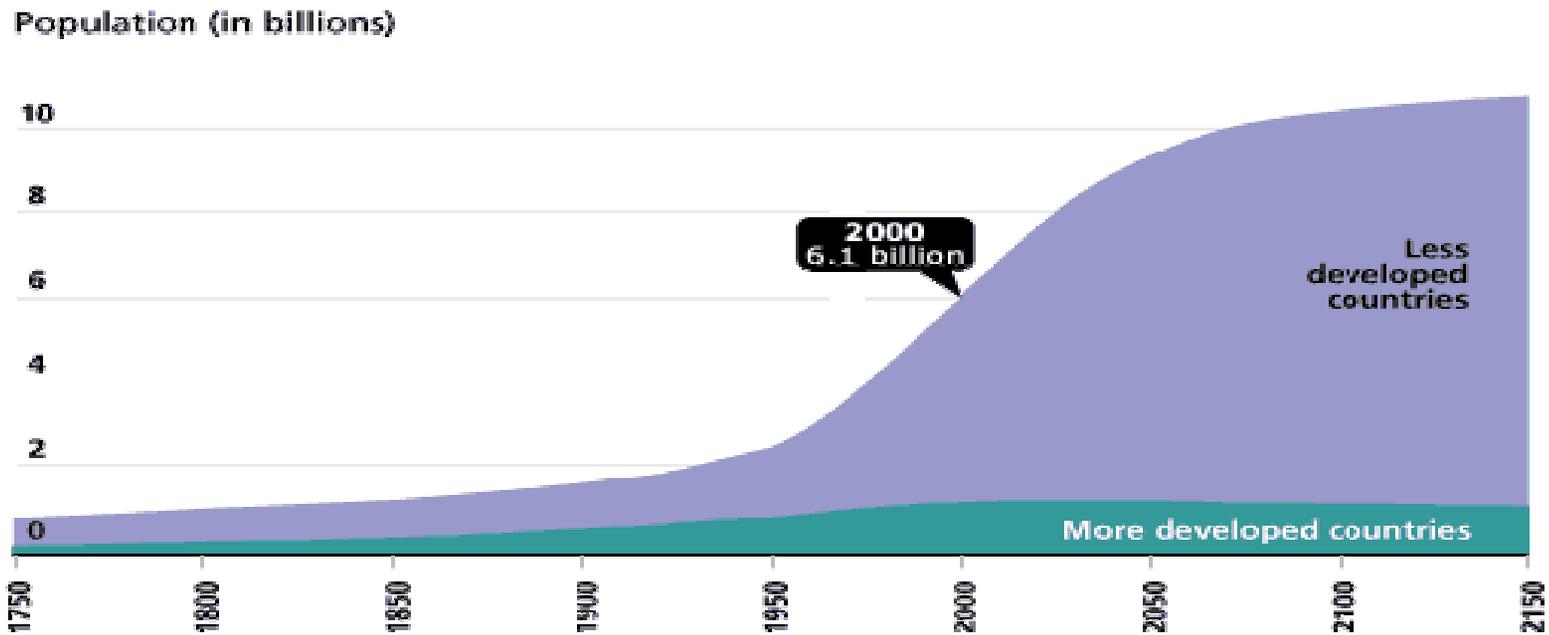
Source: United Nations, *World Population Prospects, The 1998 Revision*; and estimates by the Population Reference Bureau.

Demographic Transition

THE DEMOGRAPHIC TRANSITION MODEL

Source: K. Montgomery, Department of Geography and Geology, University of Wisconsin.
http://www.uwmc.uwc.edu/geography/Demotrans/demtran.htm

Population Momentum

Mexico: 2005

MALE   FEMALE

80+	
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	

Population (in millions)

Source: U.S. Census Bureau, International Data Base.
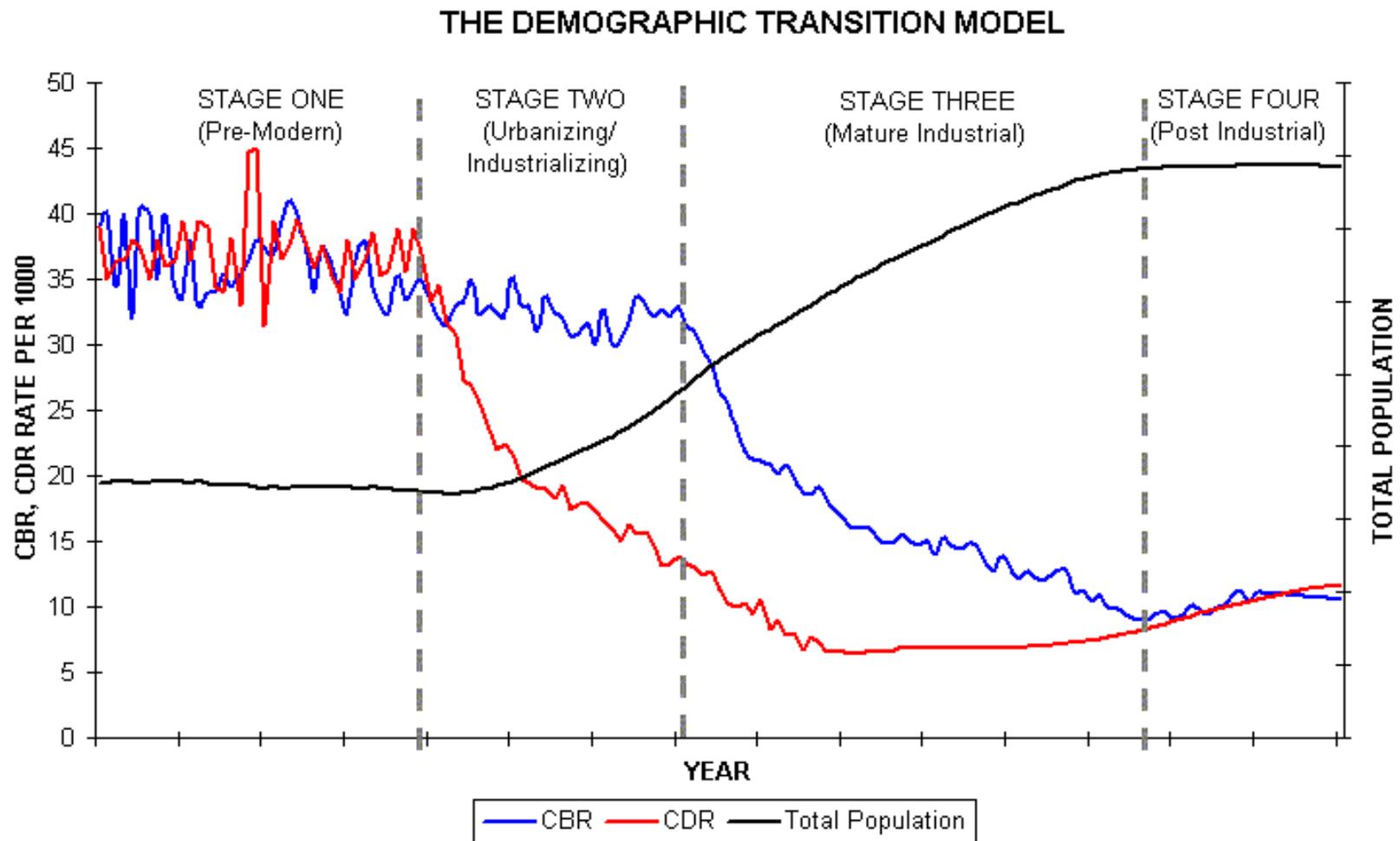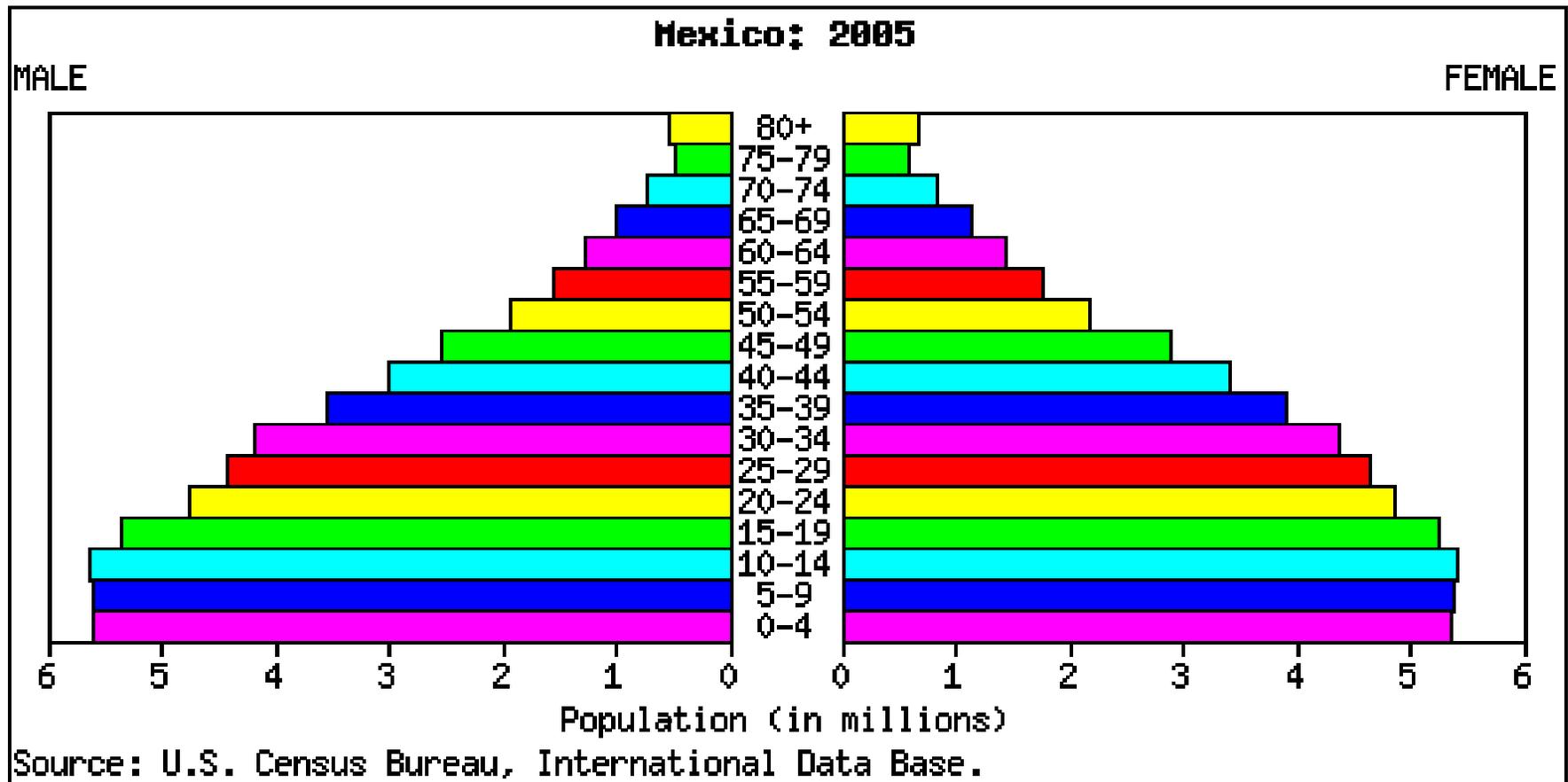
RATE vs RATIO

What's the difference?

Is a rate a ratio?

…All rates are ratios

Rate: A comparison of 2 measurements with different units (often with time in the denominator).

-e.g. miles/hour

-But: could also be CBR = births/1000 people

Rate of increase:

-Percent increase in a rate

-e.g. a car traveling at 25 mph then travels at 50mph, a 100% increase.

-e.g. a CDR of 20 decreases to 10, a 50% decrease.

Ratio: A comparison of numbers with the same units

-e.g., sex ratio= men/women (are these the same units?…what if they're *eunichs*!)

Population composition measures + concepts

- <u>**Sex Ratio = #males/100 females**</u>
- **105 at birth naturally**

Saudi Arabia 122

China 116! (at birth, 2004 UN report)

Germany 96 (at birth 106)

Russia 87

Population composition measures + concepts

- Age Structure (key to understanding population momentum)

- Fertility most important, also mortality and migration

- Median age (Africa teens; US mid 30s)

# Population composition measures + concepts

<u>Dependency Ratio</u>

$$(P_{(<15)}+P_{(>65)})/P_{(15-65)})*100$$

● What is the consequence of a rapid Demographic Transition on the Dependency Ratio?

Population Pyramid for Kenya
<u>Expanding</u>

Kenya: 2004
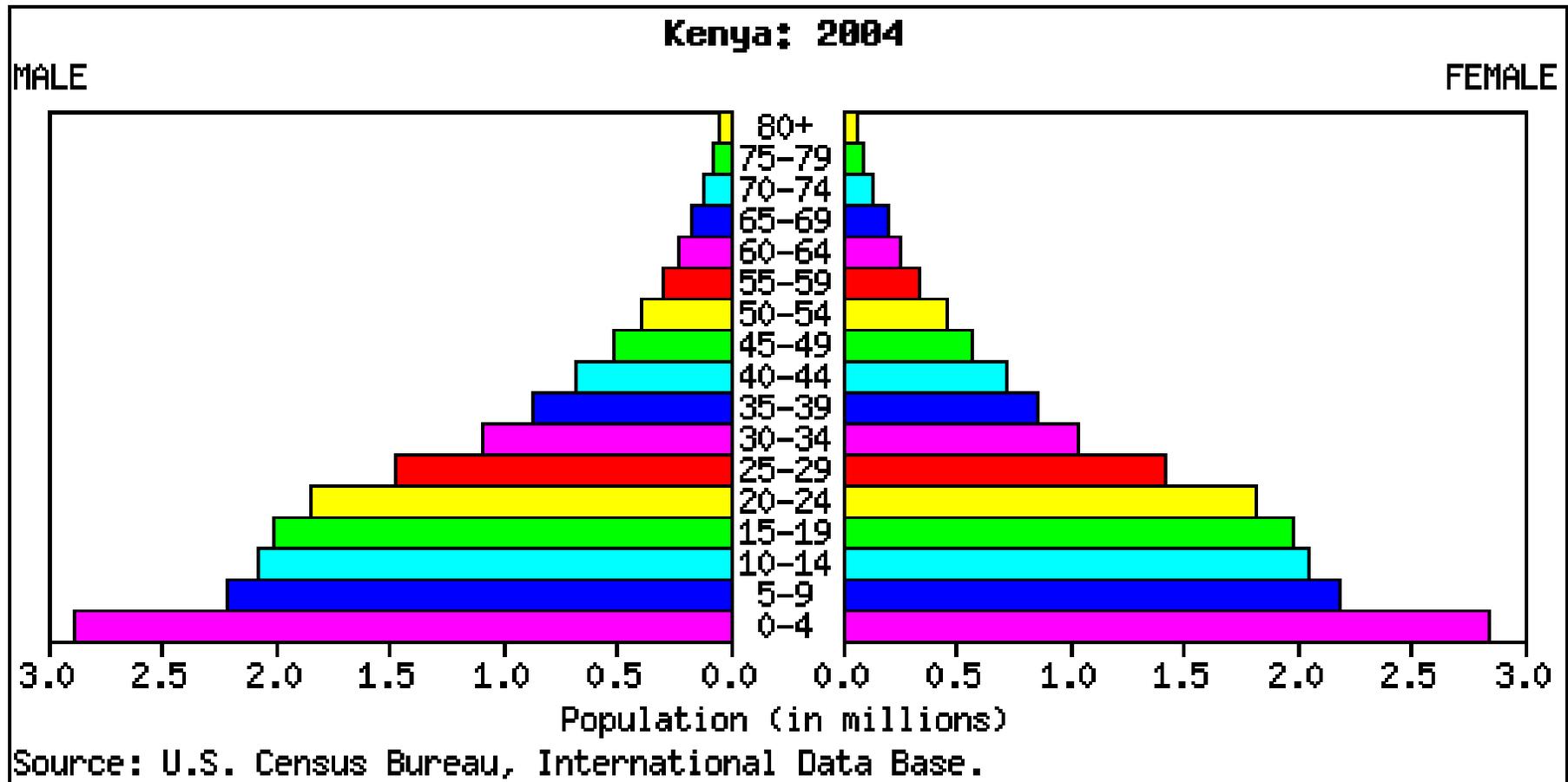
Population Pyramid for Mexico

Mexico: 2004

MALE

FEMALE

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

Population (in millions)

Source: U.S. Census Bureau, International Data Base.
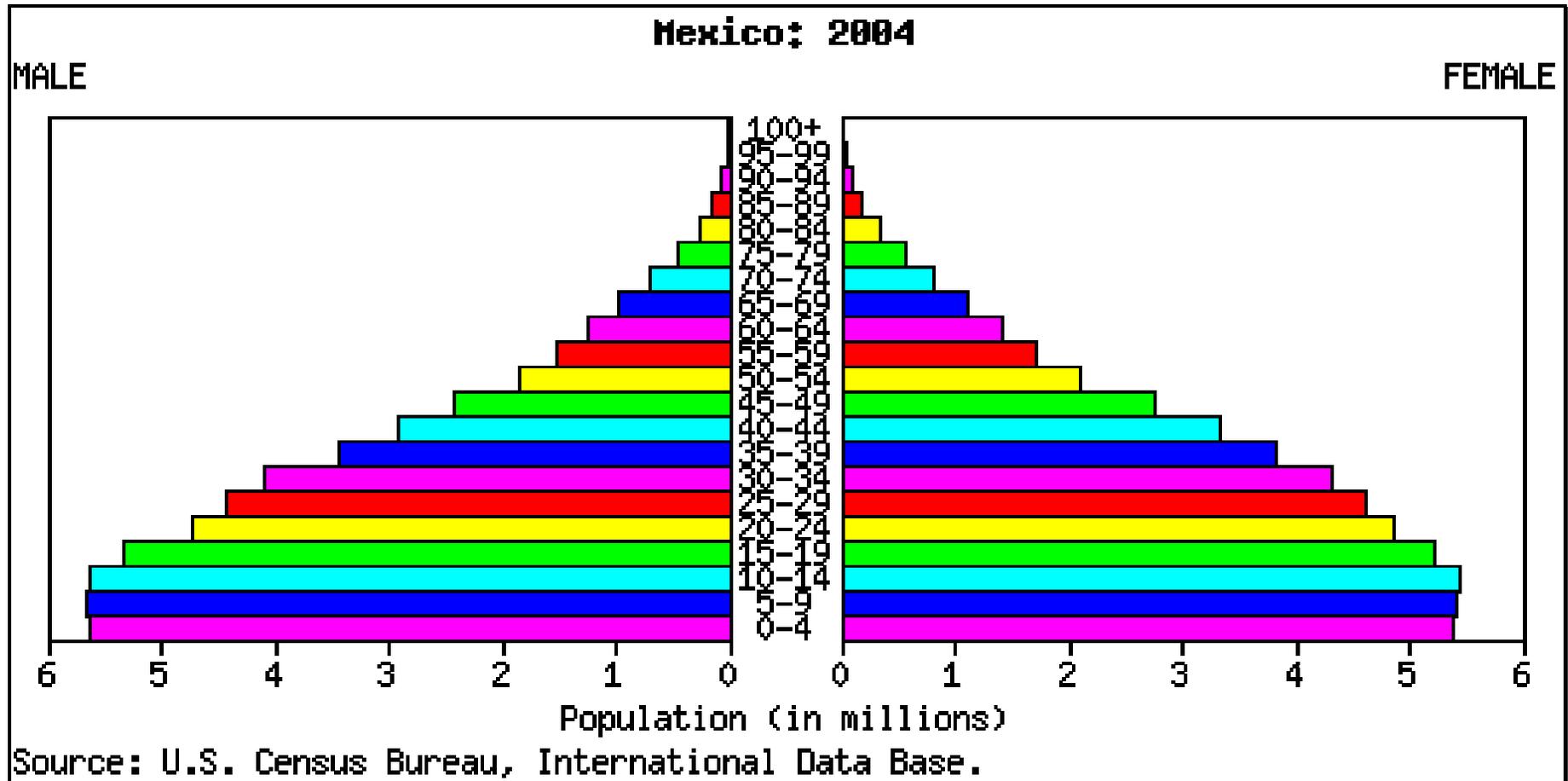
Population Pyramid for United States

+/- stable

United States: 2004

Source: U.S. Census Bureau, International Data Base.
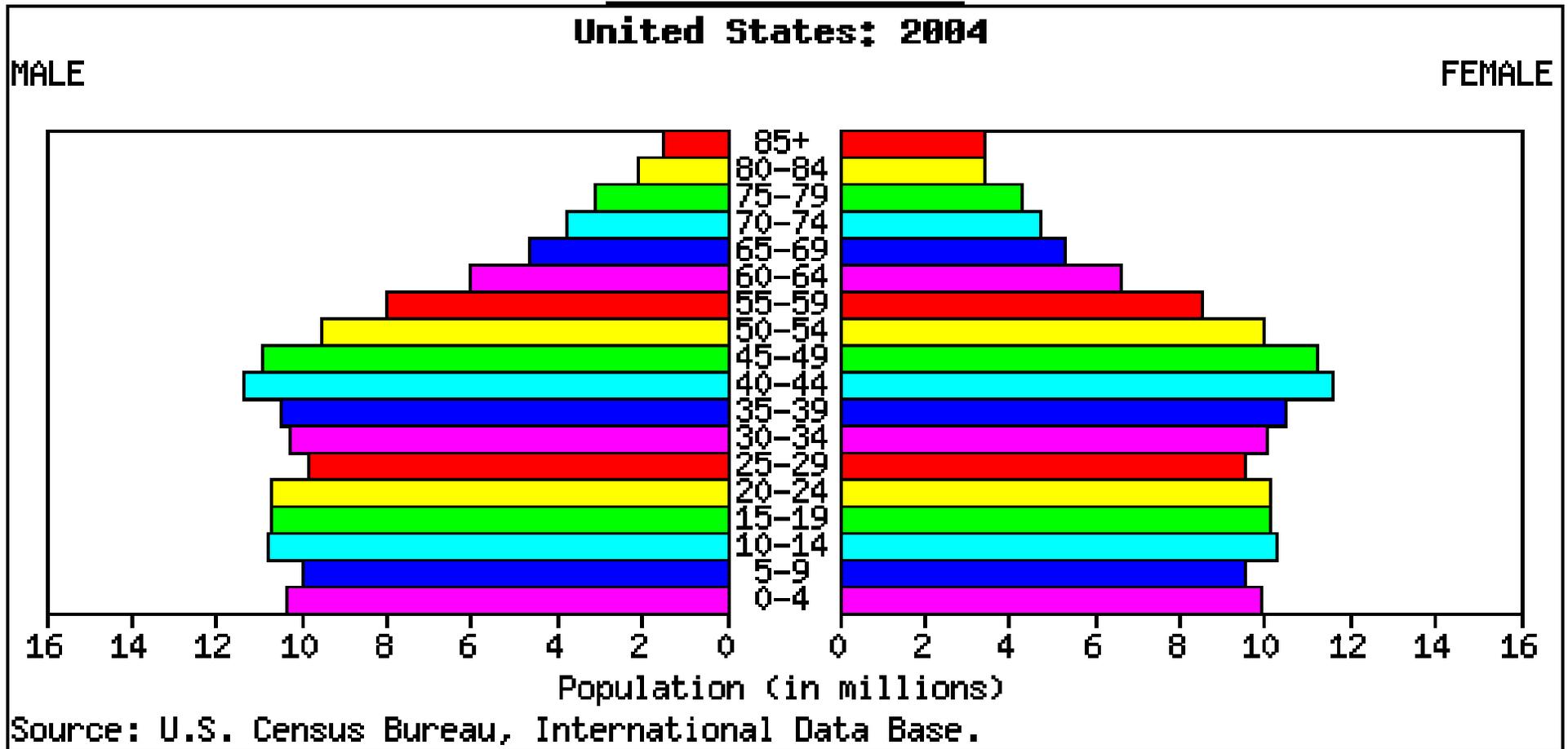
Population Pyramid for Denmark
Contracting

Denmark: 2004

MALE   FEMALE

	85+	
	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	

250   200   150   100   50   0   0   50   100   150   200   250

Population (in thousands)

Source: U.S. Census Bureau, International Data Base.
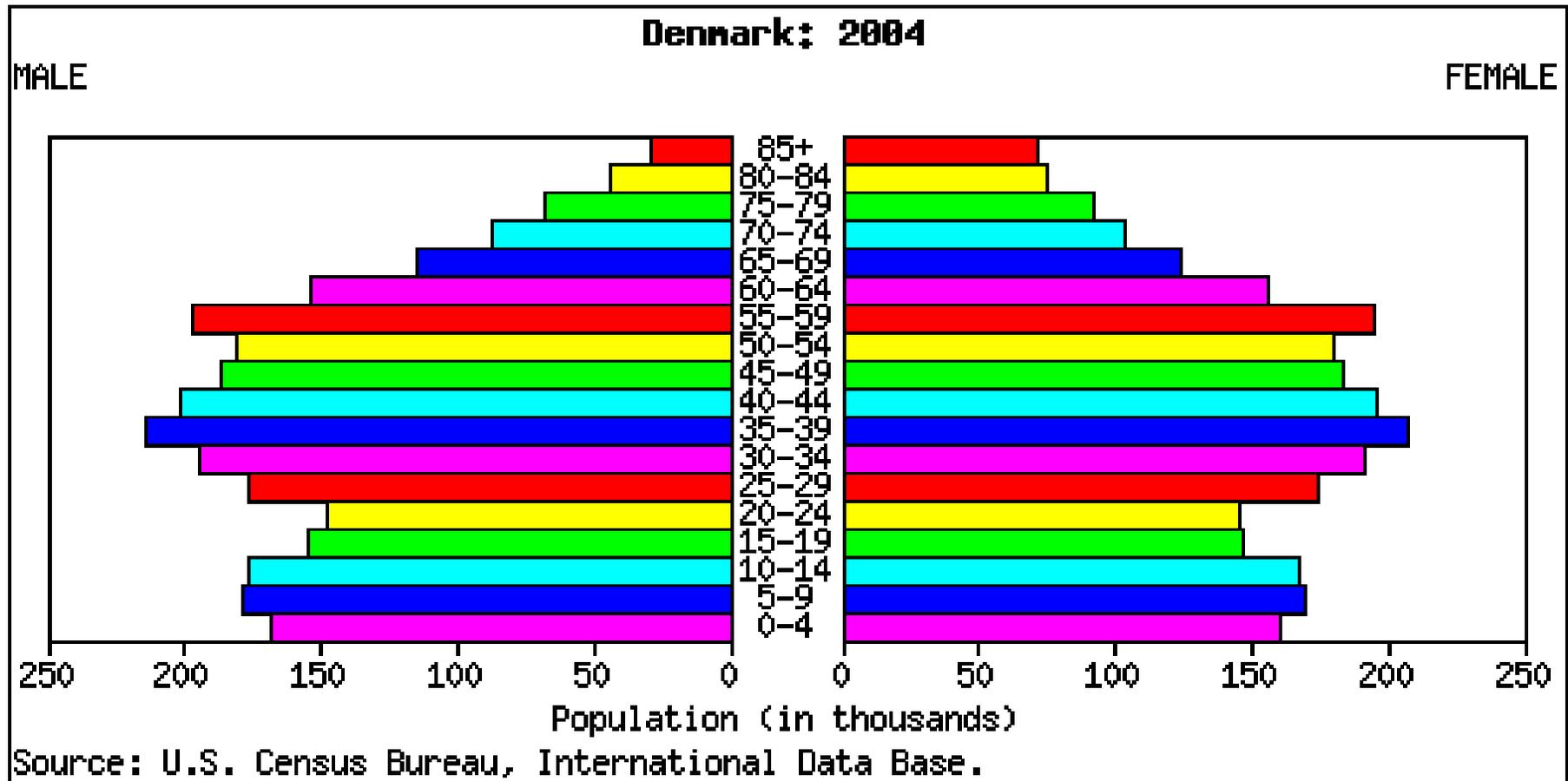
Quiz #1:

1. Explain the difference between crude and specific rates.

2. Define, calculate, and apply key measures in Demography: CDR, CBR, life expectancy, RNI, population growth rate, doubling of population

3. Understand how mortality is linked to population growth historically and implications for regional and global population growth in the near future

4. Relate Population Momentum & Age and Gender Structure to Population Change

Mortality

Life Expectancy at Birth

Life Expectancy (Eo) =

Average # years of life for people born in a given year based on current <u>age-specific</u> death rates (e.g. death rates for people at each year of age)

- Poorest LDCs E_o <50 (Southern Africa-35!)
- Sweden, Canada E_o = ~80 (US 78)

Crude and Age-adjusted Death Rates
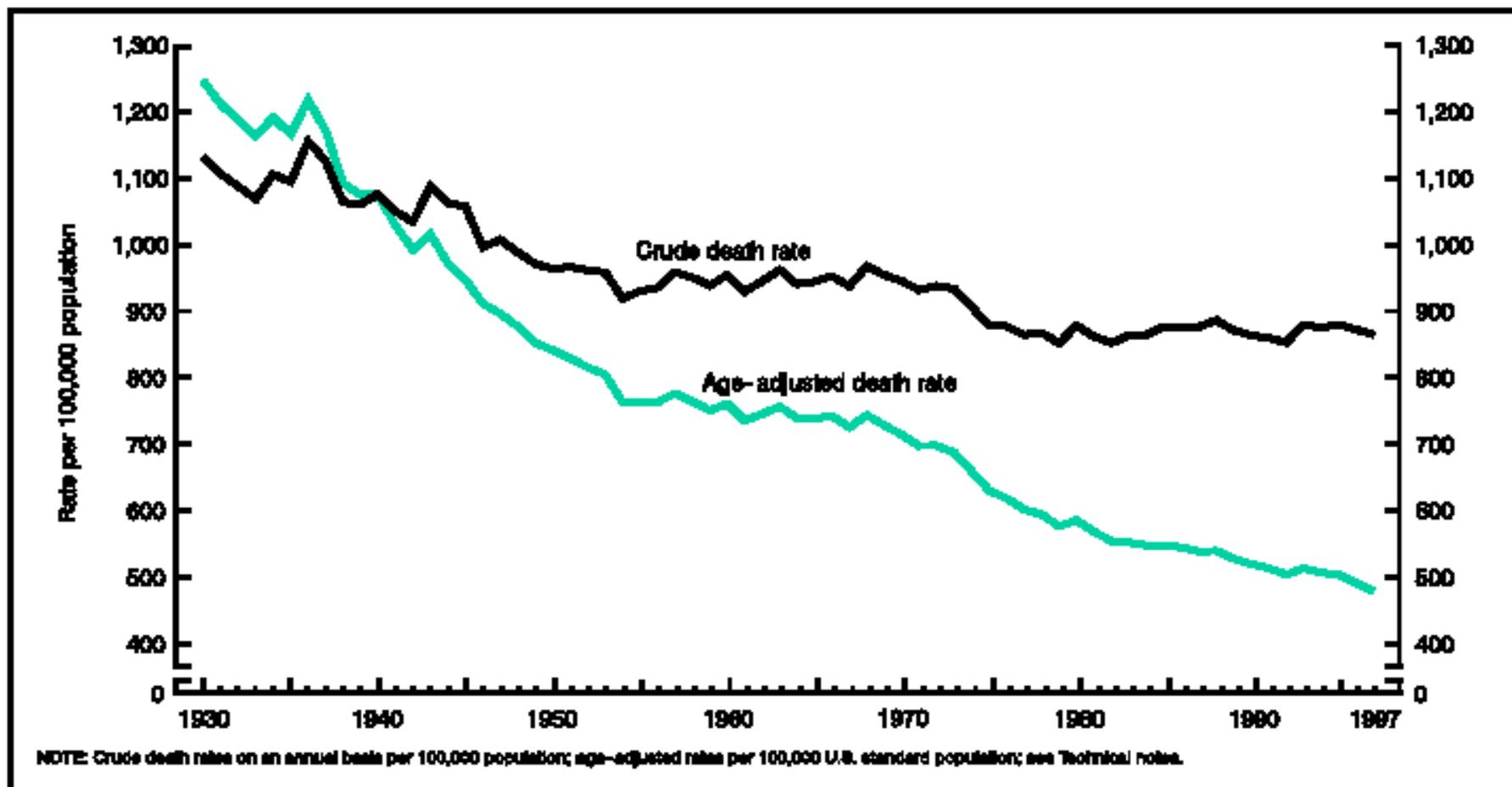
Figure 1. Crude and age-adjusted death rates: United States, 1930–97

United States Mortality Rates Per Age

* References: Historical Statistics of the United States – Colonial Times to 1970 Part 1, Bureau of the Census, p. 60

Legend:
- Total
- Under 1 year
- 1-4 years
- 5-14 years
- 15-24 years
- 25-34 years
- 35-44 years
- 45-54 years
- 55-64 years

Y-axis: Deaths per 1,000

X-axis: Year

www.healthsentinel.com
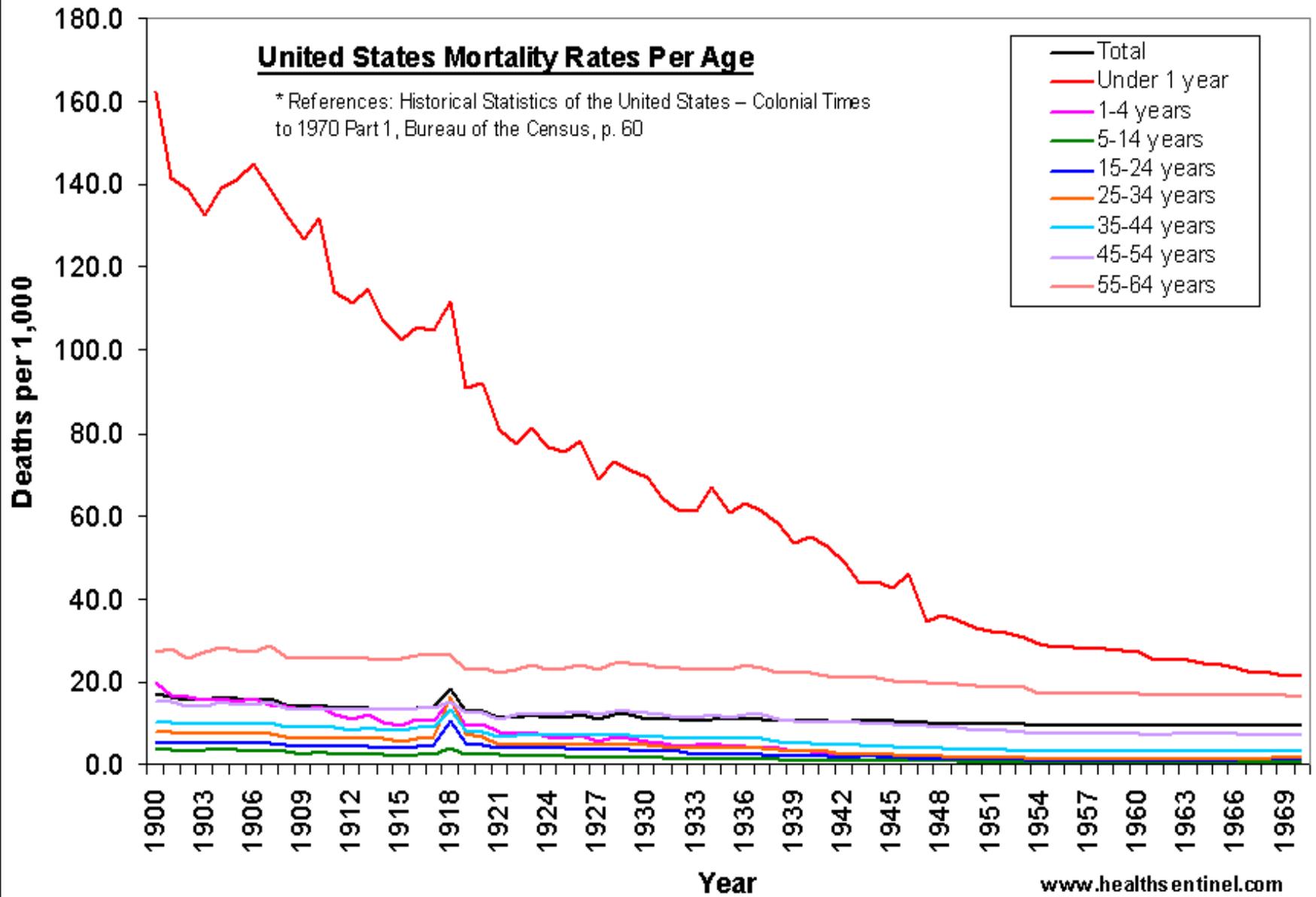
Infant Mortality Rate

**# of infant (< 1 year of age) deaths/live births in a given year**

- World: 50

- LDCs: 60

- Developed World: 7

- High IMR > 80 in countries w/ ~20% world's population
  - e.g. South Central Asia & Sub-Saharan Africa

- Low IMR < 10
  - United States (7)
  - Western Europe (4)
  - Sweden (2)

J & U curves

U=Developing world
(high death at early and young ages)
J=Developed world
(high death rates mostly at older ages)

	$E_o = 25$	$E_o = 50$	$E_o = 70$	Difference
IMR	300 (per 1000)	110 (per 1000)	40 (per 1000)	10xΔ
5 to 10	50 (per 1000)	20(per 1000)	3(per 1000)	17xΔ
65 to 70	500	300	200	2-3xΔ

Life Expectancy at Birth
Developing and Developed Nations

Figure 1.1 Life expectancy at birth: developed and developing countries, 1955–2002
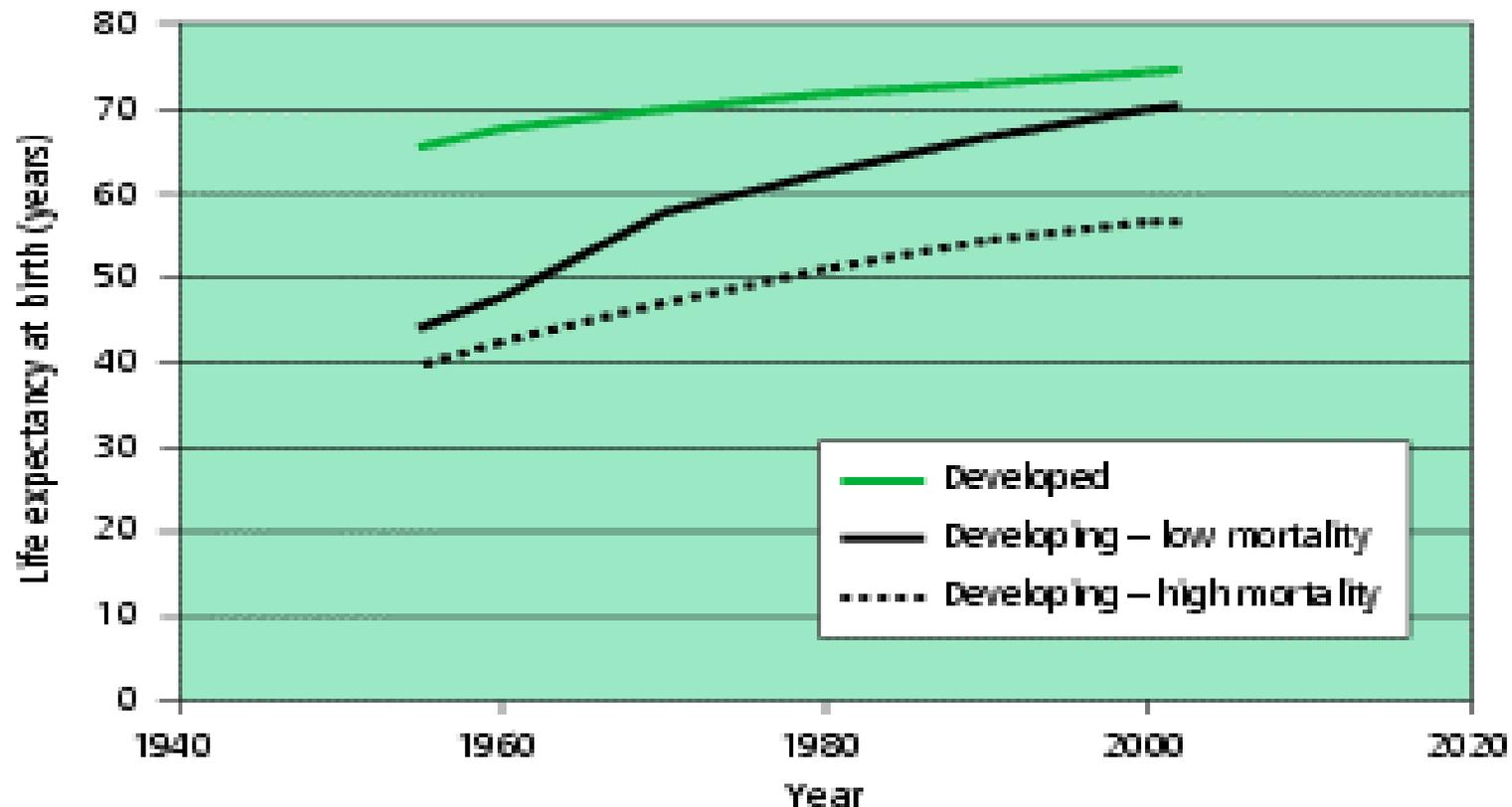
Note: The term developed countries includes: Australia, Canada, European countries, former Soviet countries, Japan, New Zealand and the USA. High-mortality developing countries include those in sub-Saharan Africa, and countries with high child and adult mortality in Asia, Central and South America and the Eastern Mediterranean. Other developing countries are referred to as "developing – low mortality".

Global Mortality
Trends and Regions

- **High E_o (> 75)**
  - North America, S,N,W Europe
- **Accelerated E_o (65-74)**
  - E. Europe, Latin America; W. Asia
- **Early stage of Mortality Transition (E_o = 50-65)**
  - N. Africa, SE & SC Asia
- **Scarcely started Mortality Transition (E_o < 50)**
  - Sub Saharan Africa

Infectious diseases (vs. non infectious, e.g. heart disease)

1) **Direct Transmission:** infectious agent moves directly from human to human (usually via aerosol)

   i) cold, flu, smallpox, measles, mumps ….

2) **Self immunizing diseases**: many direct transmission ones (virus mostly)

   i) (measles, mumps, smallpox …)

Infectious diseases cont.

3) Host—Vector: a disease with other means of transmission.

i) many G-I tract diseases – infectious agent lives in water, soil or food & is transmitted.

ii) Living host/vector diseases: infectious agent spends part of life cycle within another species.

eg. Malaria transmitted from human to human via mosquito (vector and host).

More on infectious diseases…

4) Several diseases vary in effect according to nutrition, but not all.

e.g. measles; TB; diarrhea; GI tract generally are sensitive to nutrition.

However, others, such as smallpox, malaria, plague, polio are little affected.

Important Definitions (mostly used for infectious diseases)

Epidemic v. Endemic

Epidemic = waves of disease w/ virtual absence in between waves.

**Endemic** = disease present +/- constantly at a low level.

Important Definitions Cont.

Morbidity: proportion infected in a population
infected/total population for a disease.

Case Fatality: #dead/ #infected for a given
disease (proportion dying if infected).

World Population Growth 1750–2150
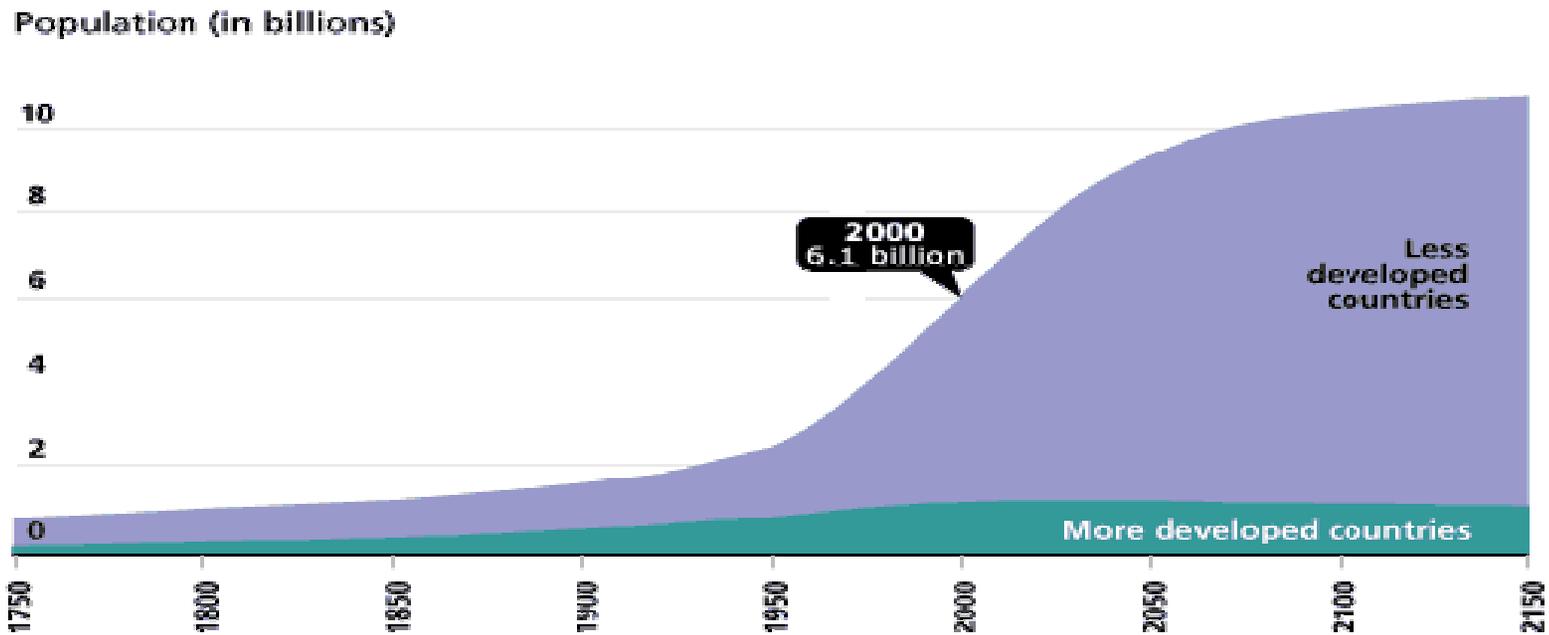
Population (in billions)

2000
6.1 billion

Less developed countries

More developed countries

Source: United Nations, *World Population Prospects, The 1998 Revision*; and estimates by the Population Reference Bureau.

Demographic Transition

Source: K. Montgomery, Department of Geography and Geology, University of Wisconsin.
http://www.uwmc.uwc.edu/geography/Demotrans/demtran.htm
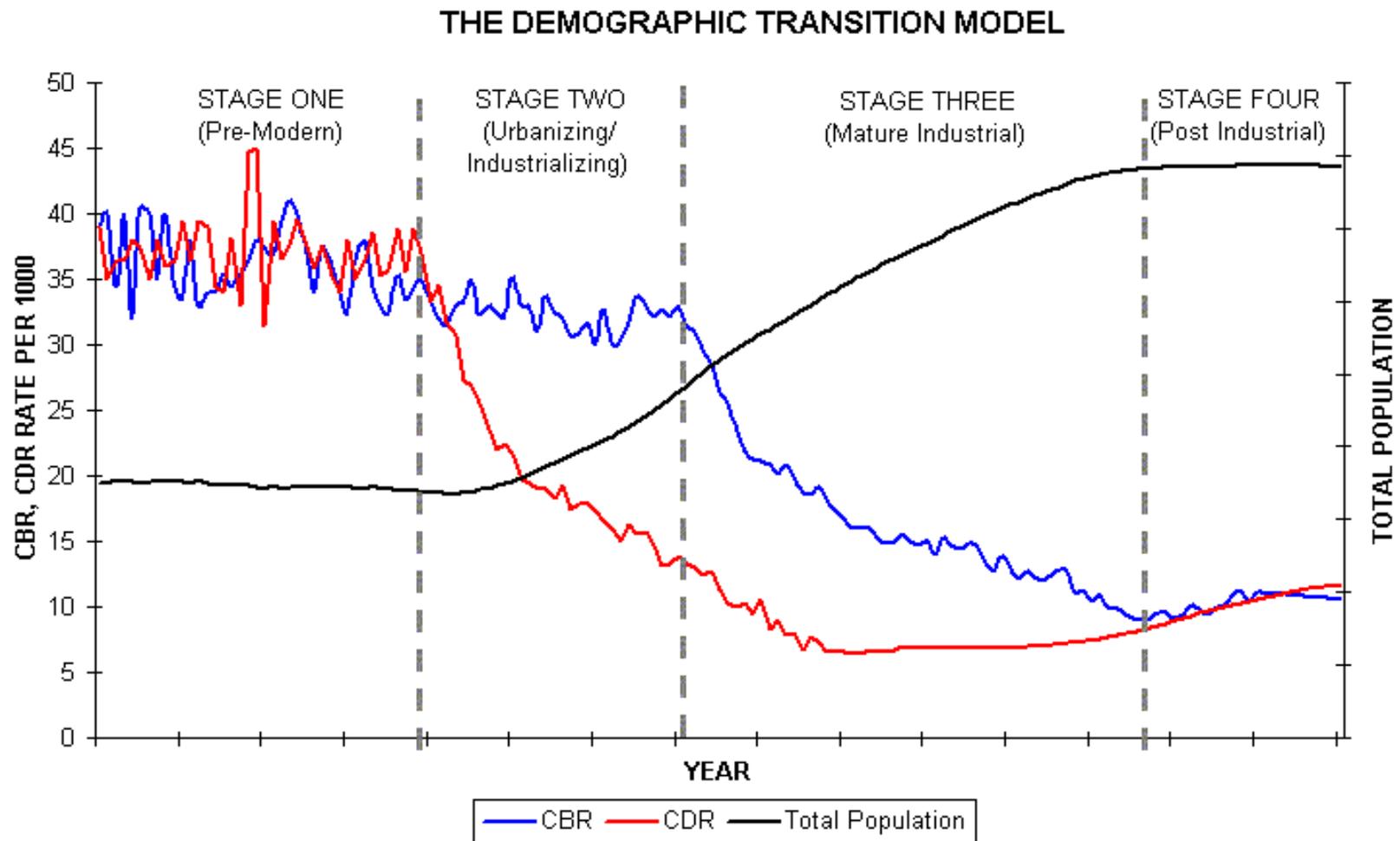
Confluence of Disease Pools

Columbian Encounter

30-70 million lives lost: the greatest demographic disaster in history!
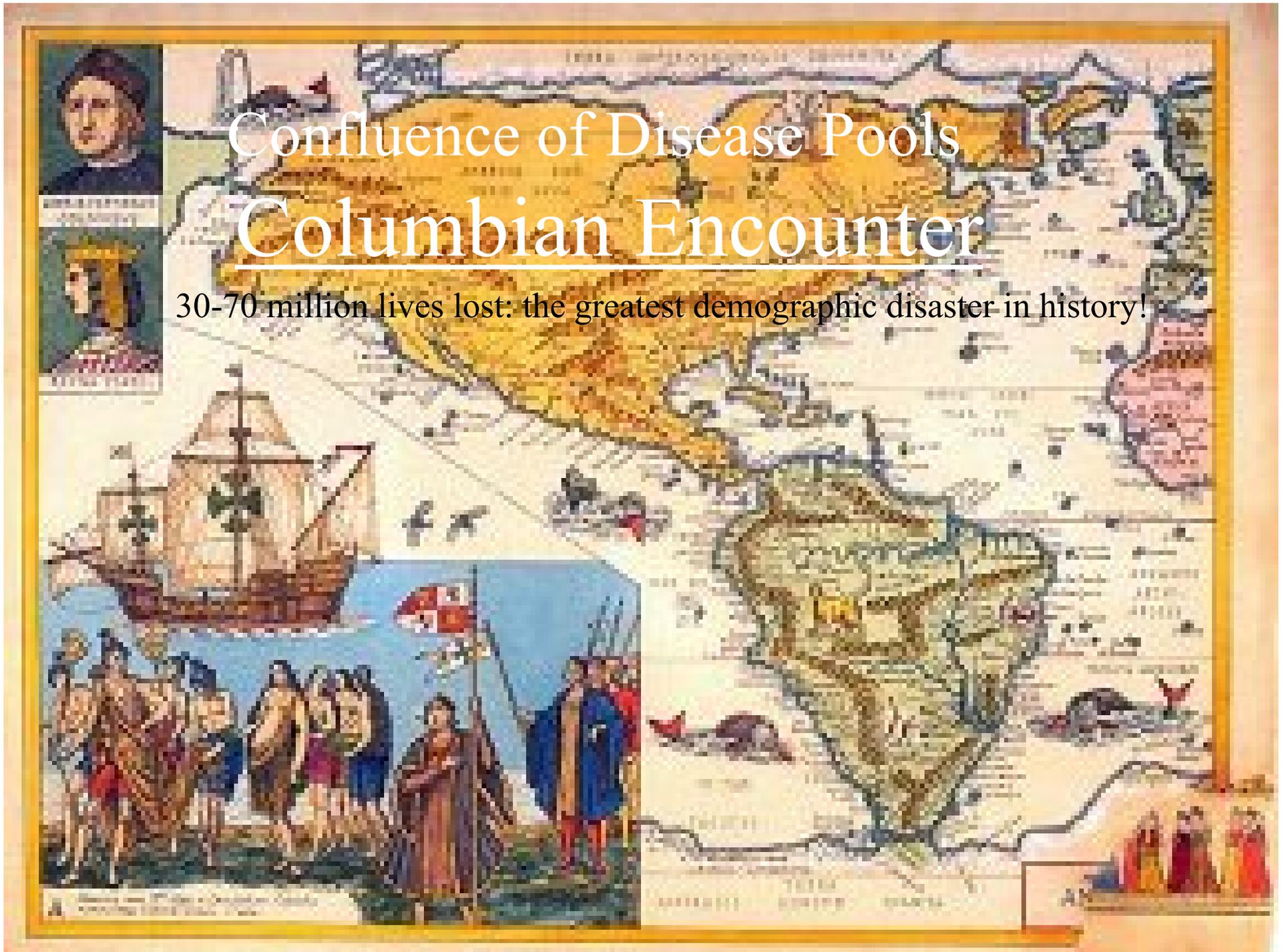
Confluence of Disease Pools

- Mortality Today: Technology and Changing Geographies

Quiz #2

1. Explain the difference between crude and specific rates.

2. Define, calculate, and apply 2 of these key measures in
    Demography: CDR, CBR, life expectancy, RNI,
    population growth rate, doubling of population

3. How is mortality linked to population growth historically?
    What are 2 implications for regional and global
    population growth in the near future

4. Relate Population Momentum & Age and Gender Structure
    to Population Change

Did We Meet Today's Objectives?

- Understand the objectives for the course and my expectations

- Introduce population concepts and their importance

- Learn key concepts and language of Mortality

Next Time

- Read Chapters 1, 2, 3, 5, 10 and others sent by email

- We will cover the rest of the mortality section of the course next class: Historical and Spatial elements of the Epidemiological Transition, and factors in Mortality today, including today's diseases, Infant mortality, nutrition, and AIDS.

- Next class is January 22 NOT January 15.

- Don't attend section unless announced in class.