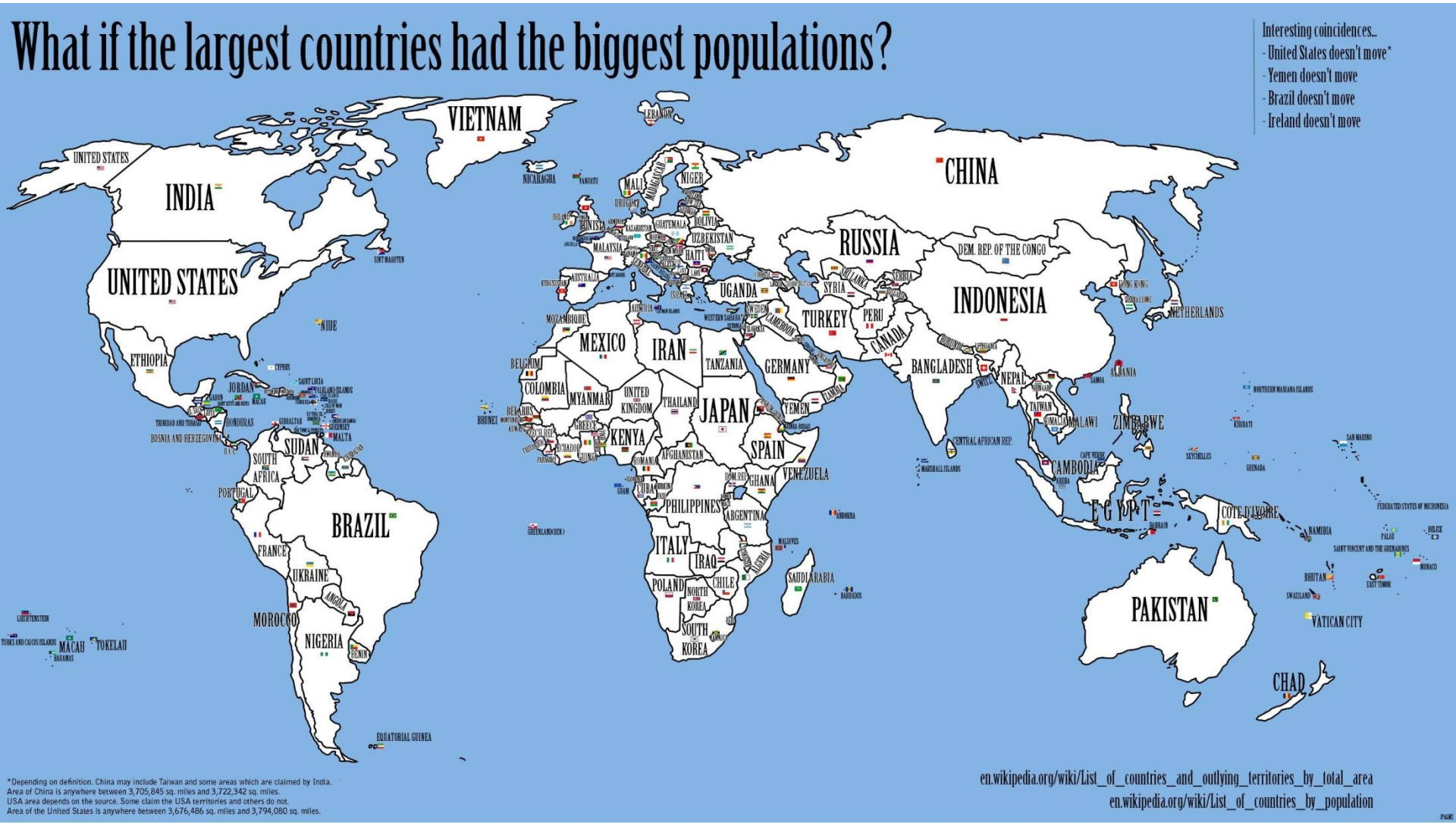
# GC2
# Human Demographics



# Humans Demographics
# We discuss …

- World Population
- Growth curves
- Population pyramids
- Demographic Trends (e.g., nations, urbanization)
- Demographic transition
- Health and societal well-being
- (Wealth)

# GAPMINDER Database

Global Change

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## Downloads

### Gapminder Desktop


**New:** Gapminder Desktop allows you to show animated statistics from your own laptop. In short:

- Use Gapminder World without internet access.
- Save a list of your own favorite g
- Updat automat al wh ev dat s rail ble

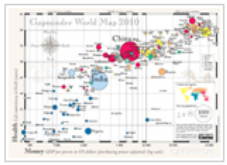
k her to learn m nstall



### Handouts & Lesson plans (PDF)


**Teacher's guide: 200 years that changed the world**

Use Gapminder World to teach global development from 1800 until today.

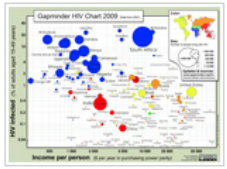


**Gapminder World Map (2010)**

Health and wealth for all the countries of the world. Excellent for print (PDF).


**Teacher's guide: Global Development Quiz**

Stimulates understanding of the world through statistics. A good starting point for teaching global development.




**Gapminder HIV Chart**

Percent of HIV infected adults in all countries of the world. Excellent for print.

### Help us cross the river of myths

Please read Hans Rosling's personal appeal. Read

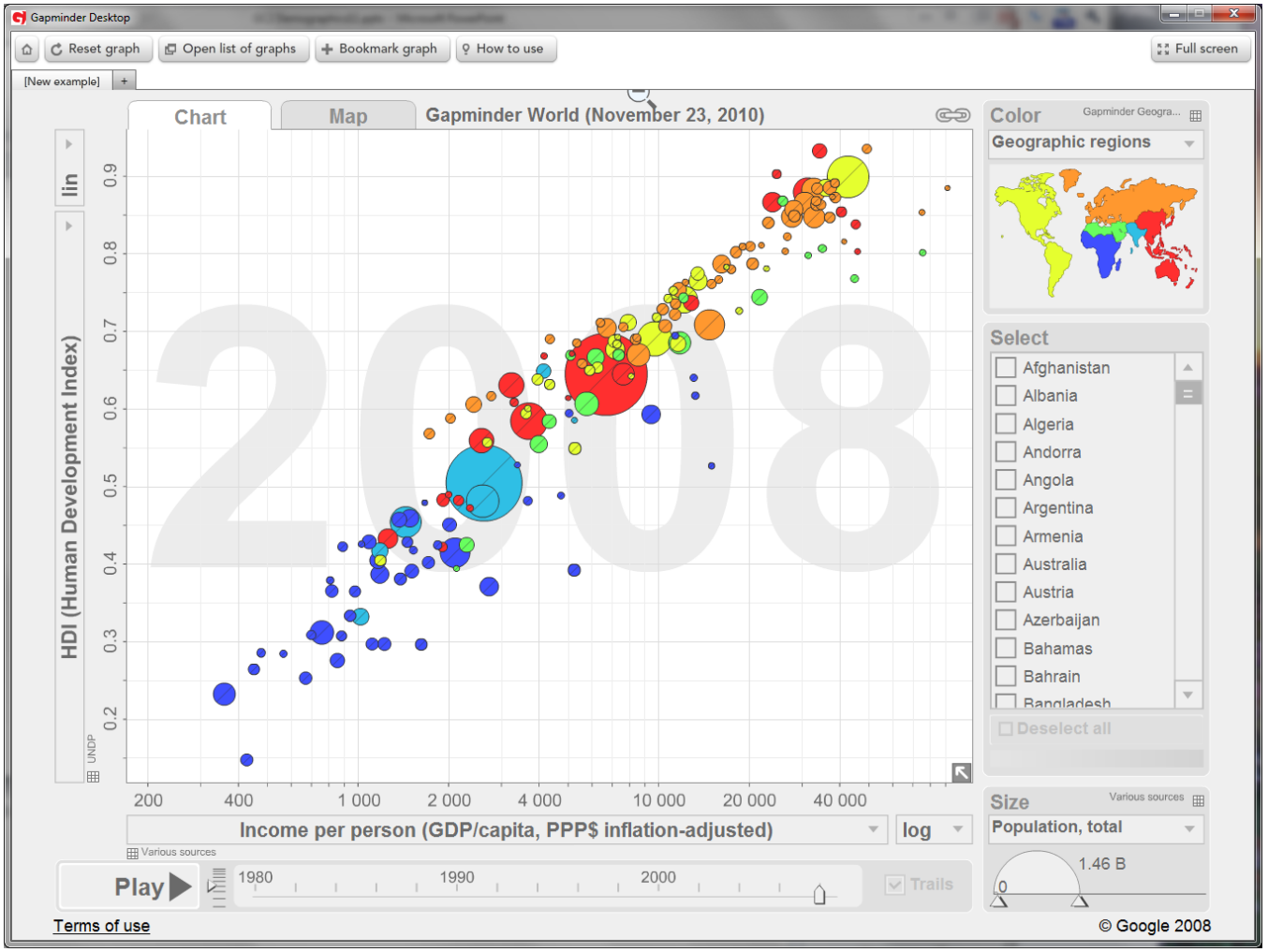
Like 186 Tweet 23

### Most downloaded

Gapminder Desktop

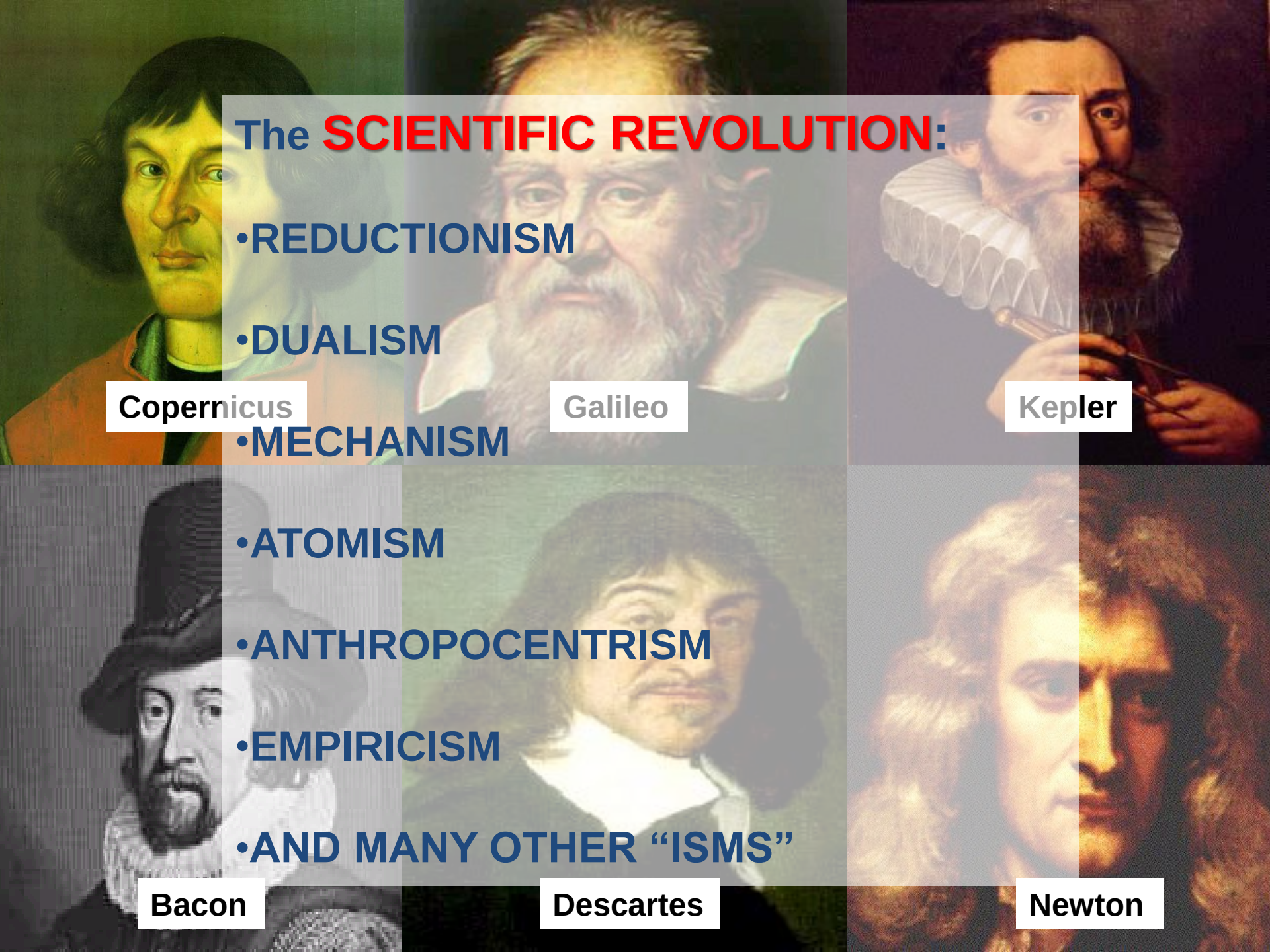
Gapminder World Map (2010)

# GAPMINDERworld




Human Development Index: “human well-being” (health, education, employment, wealth)

[website]



# The SCIENTIFIC REVOLUTION:

- REDUCTIONISM
- DUALISM
- MECHANISM
- ATOMISM
- ANTHROPOCENTRISM
- EMPIRICISM
- AND MANY OTHER "ISMS"

Copernicus

Galileo

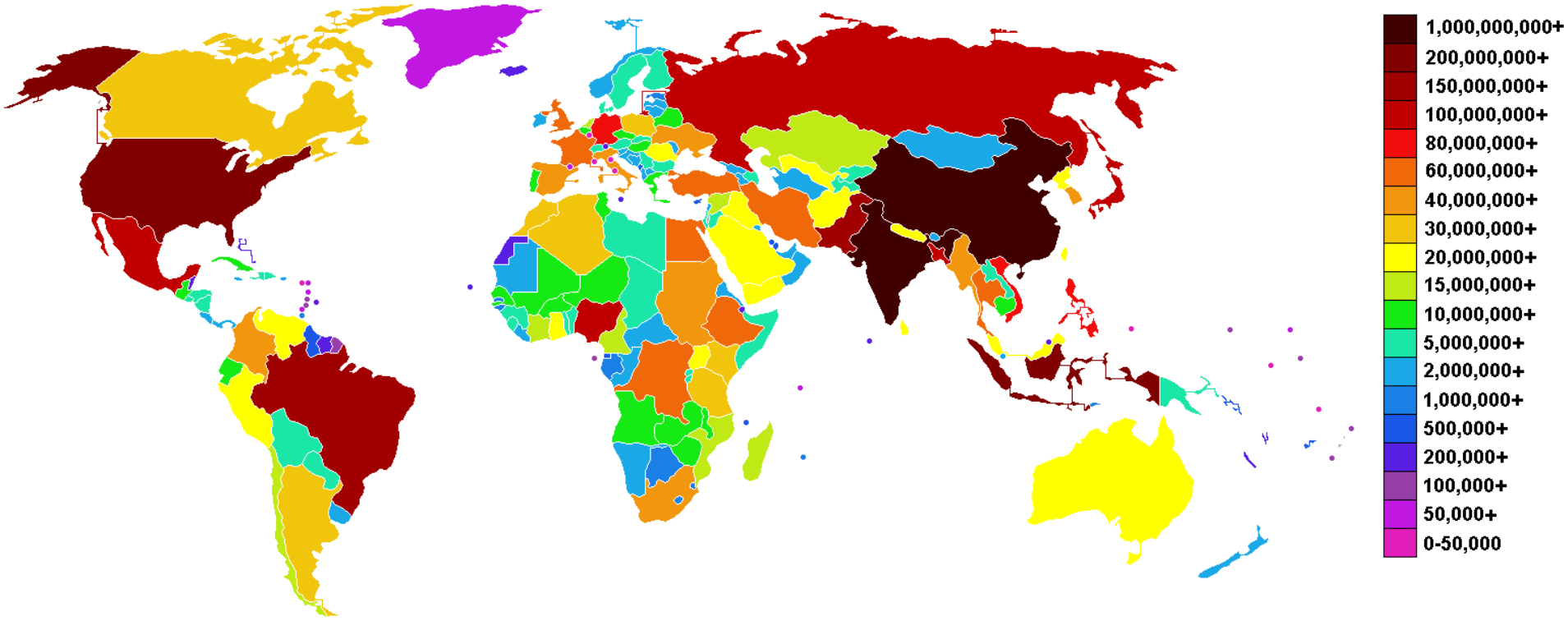
Kepler

Bacon

Descartes

Newton

# World Population




**U.S. 311,885,858**

**World 6,893,308,455**

19:54 UTC (EST+5) Jan 13, 2011

# Humans through time

HUMAN NUMBERS THROUGH TIME

NOVA

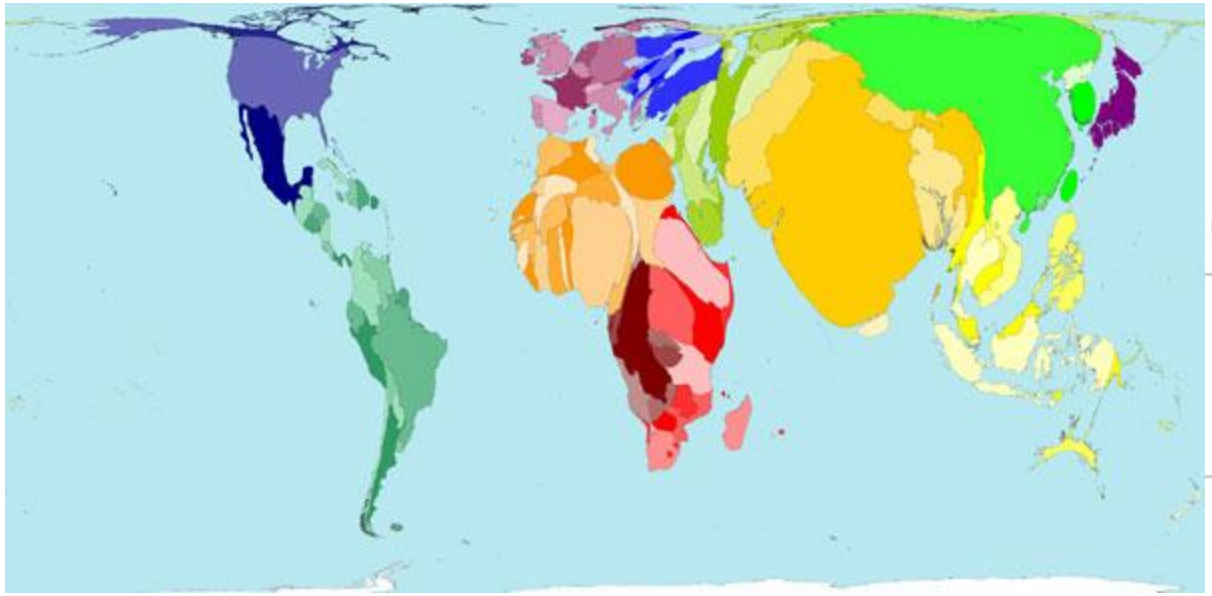
## 2,000 YEARS AGO...

A.D. 0

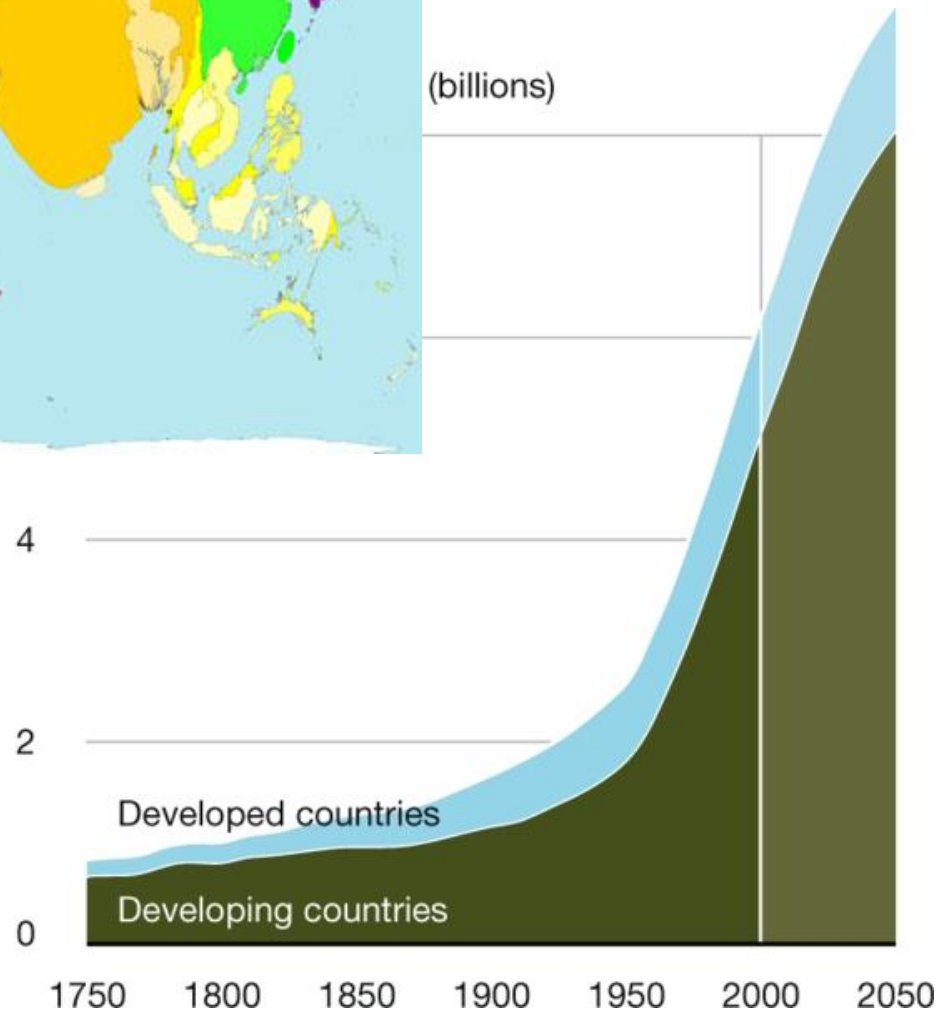
...at the dawn of the first millennium A.D., the world's population was around 300 million people.

< BACK 1 OF 9 NEXT >

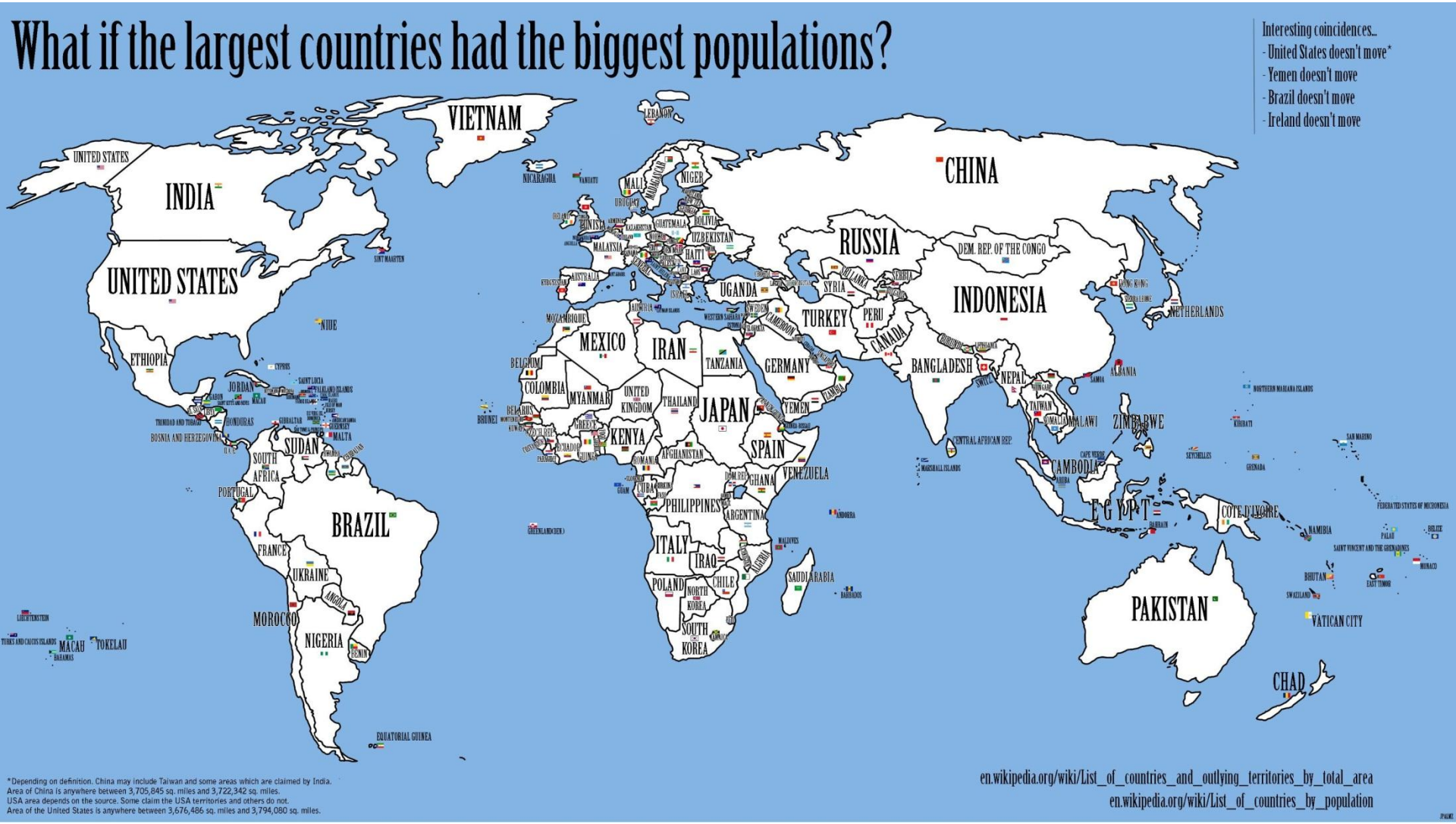
# World Population 1900, 2000, 2050



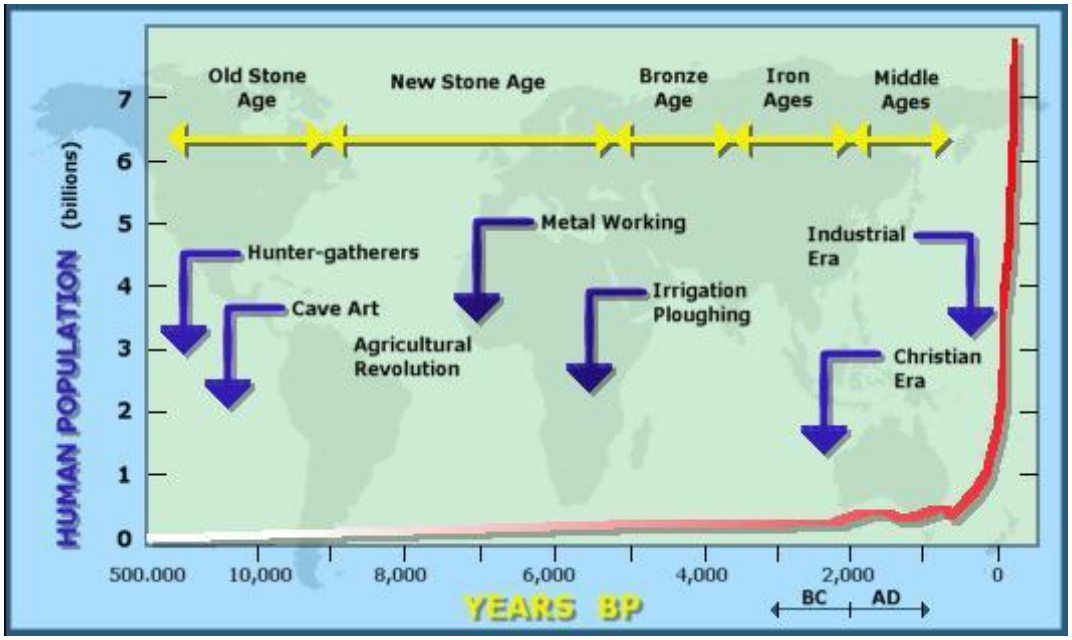
- 1900
- 2000
- 2050



# What if ….

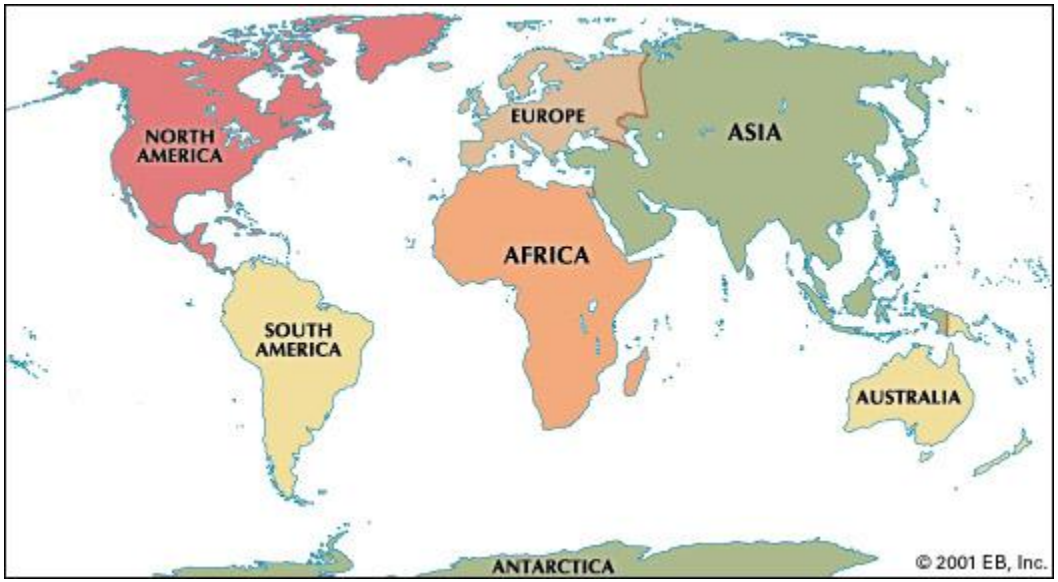

What if the largest countries had the biggest populations?
Interesting coincidences...
- United States doesn't move*
- Yemen doesn't move
- Brazil doesn't move
- Ireland doesn't move
VIETNAM
CHINA
INDIA
UNITED STATES
RUSSIA
DEM. REP. OF THE CONGO
INDONESIA
MEXICO
IRAN
BRAZIL
JAPAN
PAKISTAN
NIGERIA
BANGLADESH
*Depending on definition. China may include Taiwan and some areas which are claimed by India.
Area of China is anywhere between 3,705,845 sq. miles and 3,722,342 sq. miles.
USA area depends on the source. Some claim the USA territories and others do not.
Area of the United States is anywhere between 3,676,486 sq. miles and 3,794,080 sq. miles.
en.wikipedia.org/wiki/List_of_countries_and_outlying_territories_by_total_area
en.wikipedia.org/wiki/List_of_countries_by_population

# Population Growth over Human History

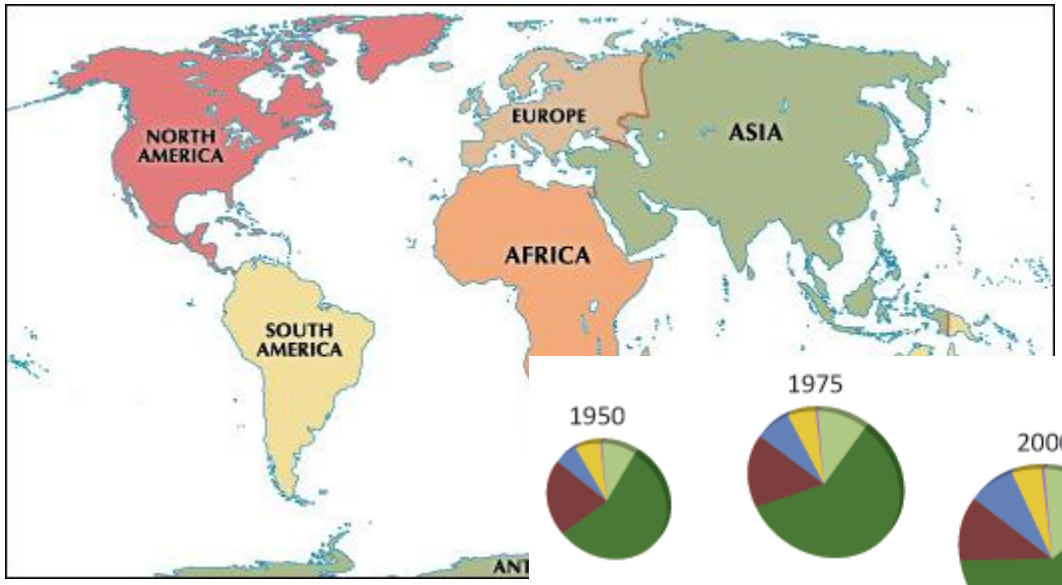


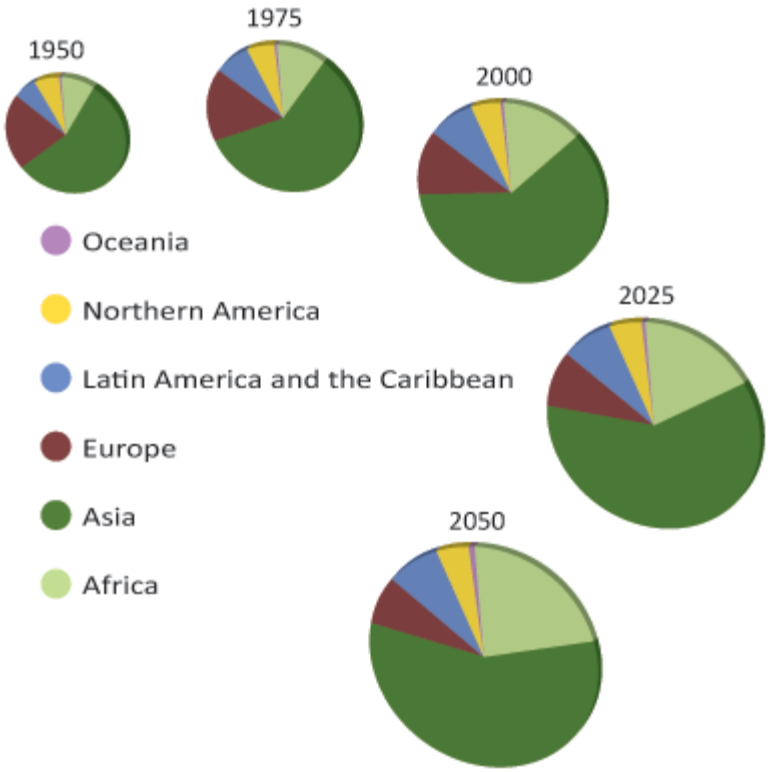

At onset of the agricultural revolution, 10,000 years ago, there were about 133 million people. By 1650, there were four times as many (~0.5 billion). The world population reached one billion in 1804, two billion in 1927, three billion in 1960, four billion in 1974, five billion in 1987, and passed six billion in 1999. It'll be 7 billion in 2011.

# Activity: Population by Continent



# Activity: Population by Continent




#1 Asia - (4.16B)
#2 Africa - (1.03B)
#3 Europe - (733M)
#4 South America - (589M)
#5 North America - (351M)
#6 Australia/Oceania - (36M)
#7 Antarctica - (0)
TOTAL – 6.9B

# World population growth rate

Global Change

*TABLE 1.2 World Population and Growth Rate, 1950–2002

| Year | Population, Billions | Growth Rate, %* |
|---|---|---|
| 1950 | 2.52 | |
| 1955 | 2.75 | 1.77 |
| 1960 | 3.03 | 1.95 |
| 1965 | 3.34 | 1.99 |
| 1970 | 3.77 | 1.90 |
| 1975 | 4.08 | 1.84 |
| 1980 | 4.45 | 1.81 |
| 1985 | 4.85 | 1.75 |
| 1990 | 5.30 | 1.70 |
| 1995 | 5.76 | 1.68 |
| 2002 | 6.26 | 1.56 |

*Average annual rate for the previous five-year period.
Sources: Estimates in United Nations, *Demographics Yearbooks* for 1985 and 1990, and in *World Resources, 1994–95* (New York: Oxford University Press).

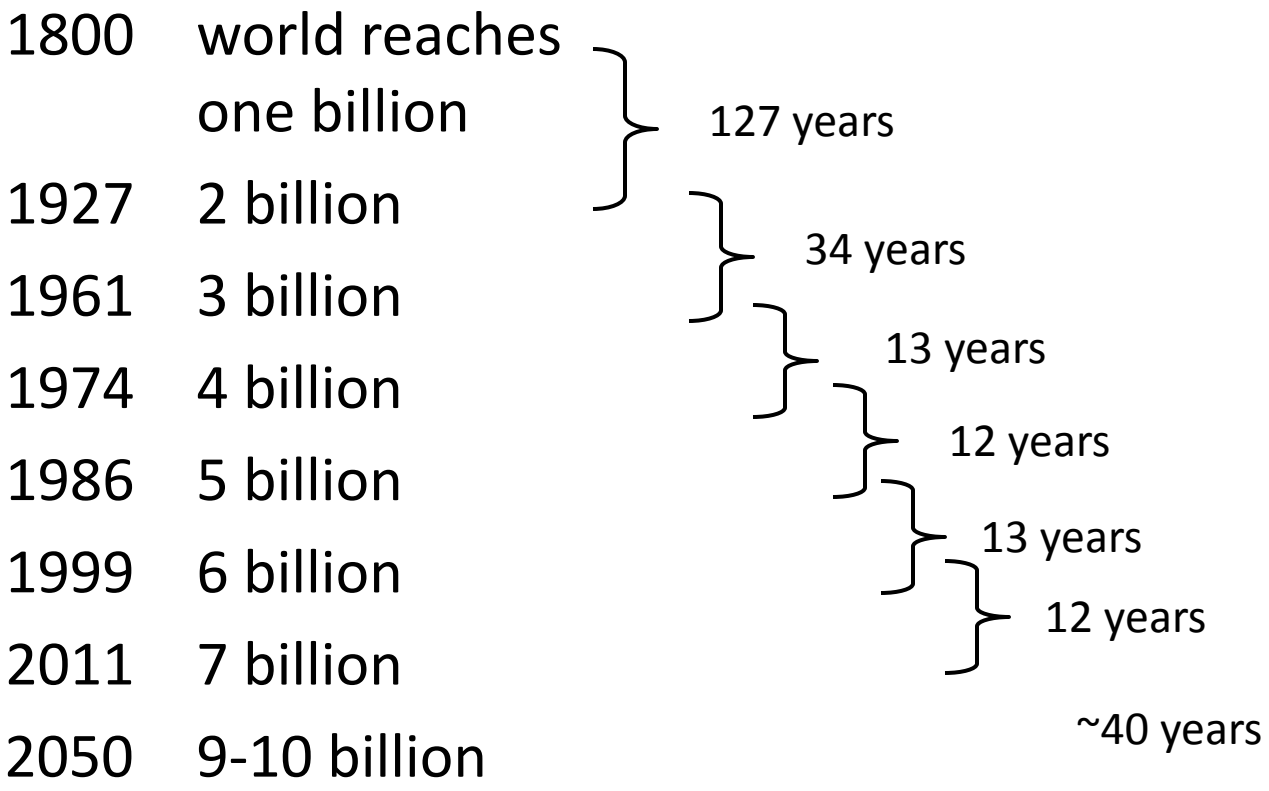


*TABLE 1.1 How Populations Grow

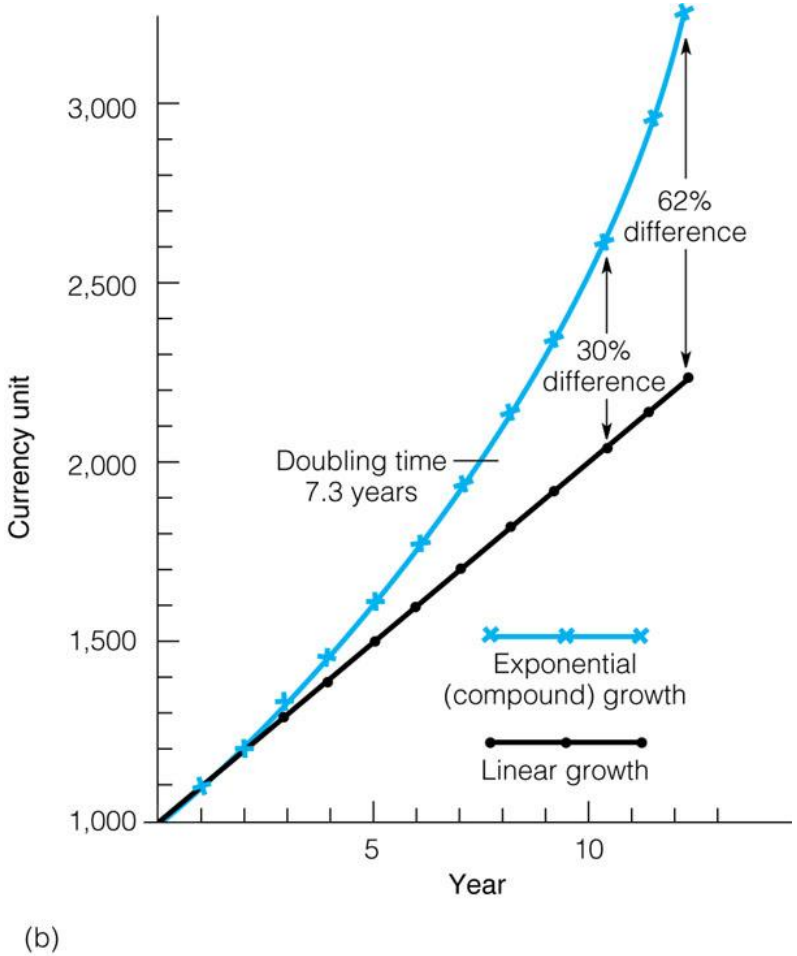
| Growth Rate, % | Doubling Time, Years* |
|---|---|
| 1.0 | 70.0 |
| 2.0 | 35.0 |
| 3.0 | 23.3 |
| 4.0 | 17.5 |
| 5.0 | 14.0 |
| 6.0 | 11.7 |
| 7.0 | 10.0 |

*Calculated by using the formula 70 ÷ growth rate (%), which yields a close approximation up to a growth rate of 10%.

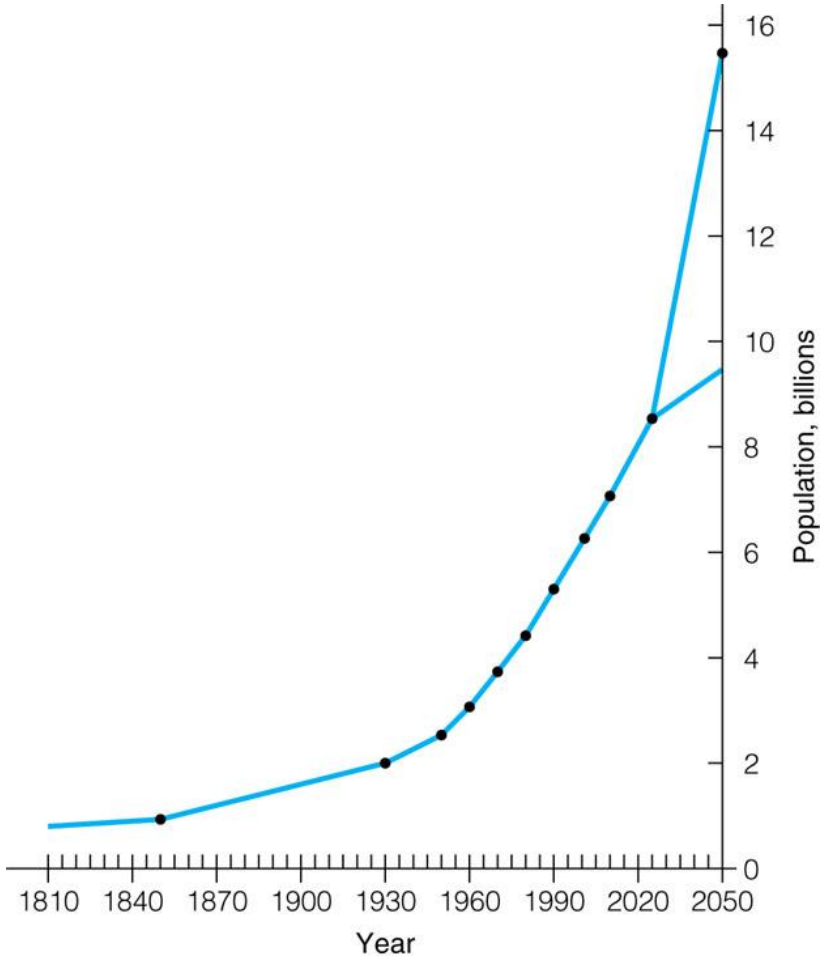
# Human Population Growth



# Linear versus exponential growth








From J- to S-shaped

**Fig. 1-7b, p. 6**

# The Mathematics of Population Growth

Overall growth rate is a function of births, deaths, current population size, and time

- crude birth rate = births/1000 individ./year
- crude death rate = deaths/1000 individ./year
- crude growth rate = CBR - CDR
  (per 1000 per yr)
- percent growth rate = crude rate/10
- doubling time = ~70/percent rate

# Some Examples of Crude Birth and Death Rates

| Country | C.B.R. | C.D.R. | %GR | DT |
|---|---|---|---|---|
| USA-1975 | 15.7 | 9.2 | 0.65 | 107 yrs |
| USA-1995 | 15.9 | 8.8 | 0.71 | 98 |
| Kenya-1975 | 52.9 | 17.3 | 3.56 | 19 |
| Kenya-1995 | 44.5 | 11.7 | 3.28 | 21 |
| Thailand-1975 | 35.1 | 9.3 | 2.58 | 27 |
| Thailand-1995 | 19.4 | 6.1 | 1.33 | 52 |

# Crude Birth and Death Rates

doubling time (DT) ≅ 70/percent growth rate

| Country | C.B.R. | C.D.R. | %GR | DT |
|---|---|---|---|---|
| Italy-1975 | 13.0 | 9.8 | 0.32 | 217 yrs |
| Italy-1995 | 9.7 | 9.6 | 0.01 | ~ |
| Ghana-1995 | 47.2 | 14.9 | 2.68 | 26 |
| Mexico-1995 | 27.0 | 5.2 | 2.18 | 32 |
| Kuwait-1995 | 40.1 | 4.2 | 3.59 | 19 |
| Bangladesh-1995 | 19.4 | 6.1 | 1.33 | 52 |

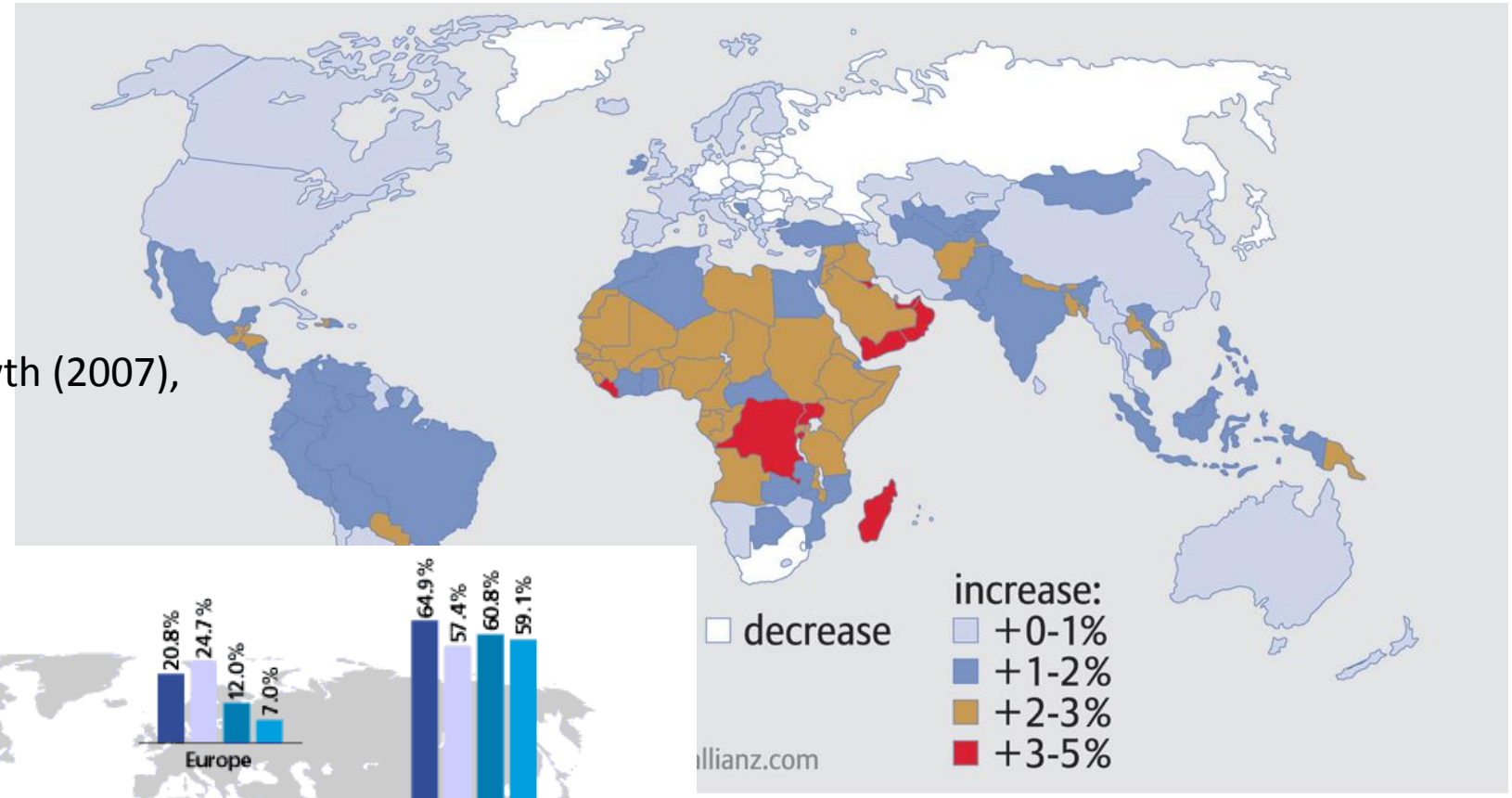
Data from http://esa.un.org/unpp/

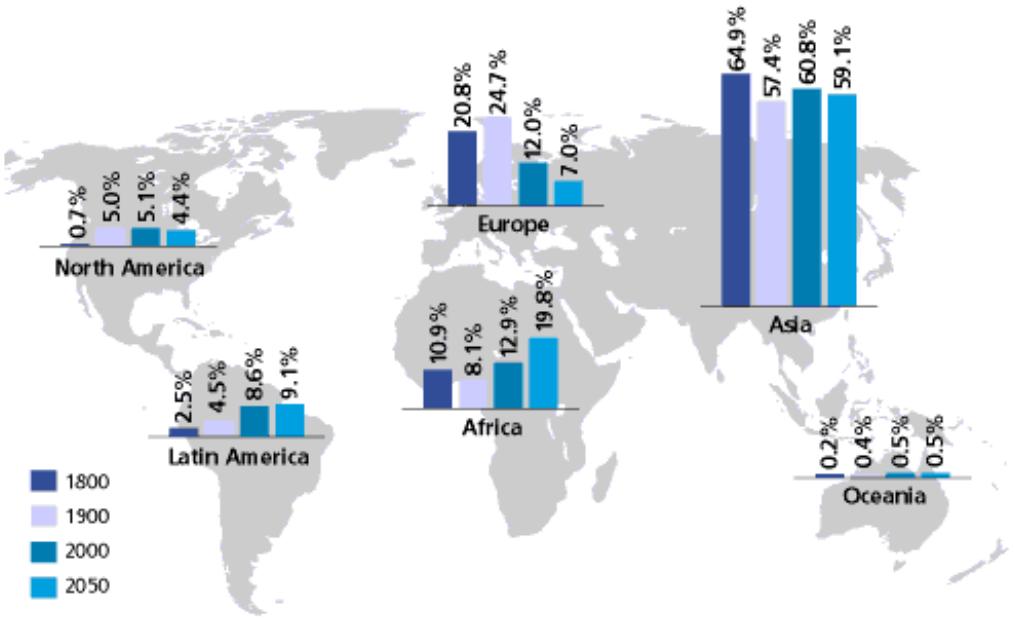
# Human Population Growth

- J-shaped over human history, hardly affected by wars and plagues
- doubling time today is ~ 55 years
- current growth rate of ~1.4% per year is down from peak of ~2% in 1965-70
- each hour >14,500 people are born

# Population Change

Annual growth (2007), percentages



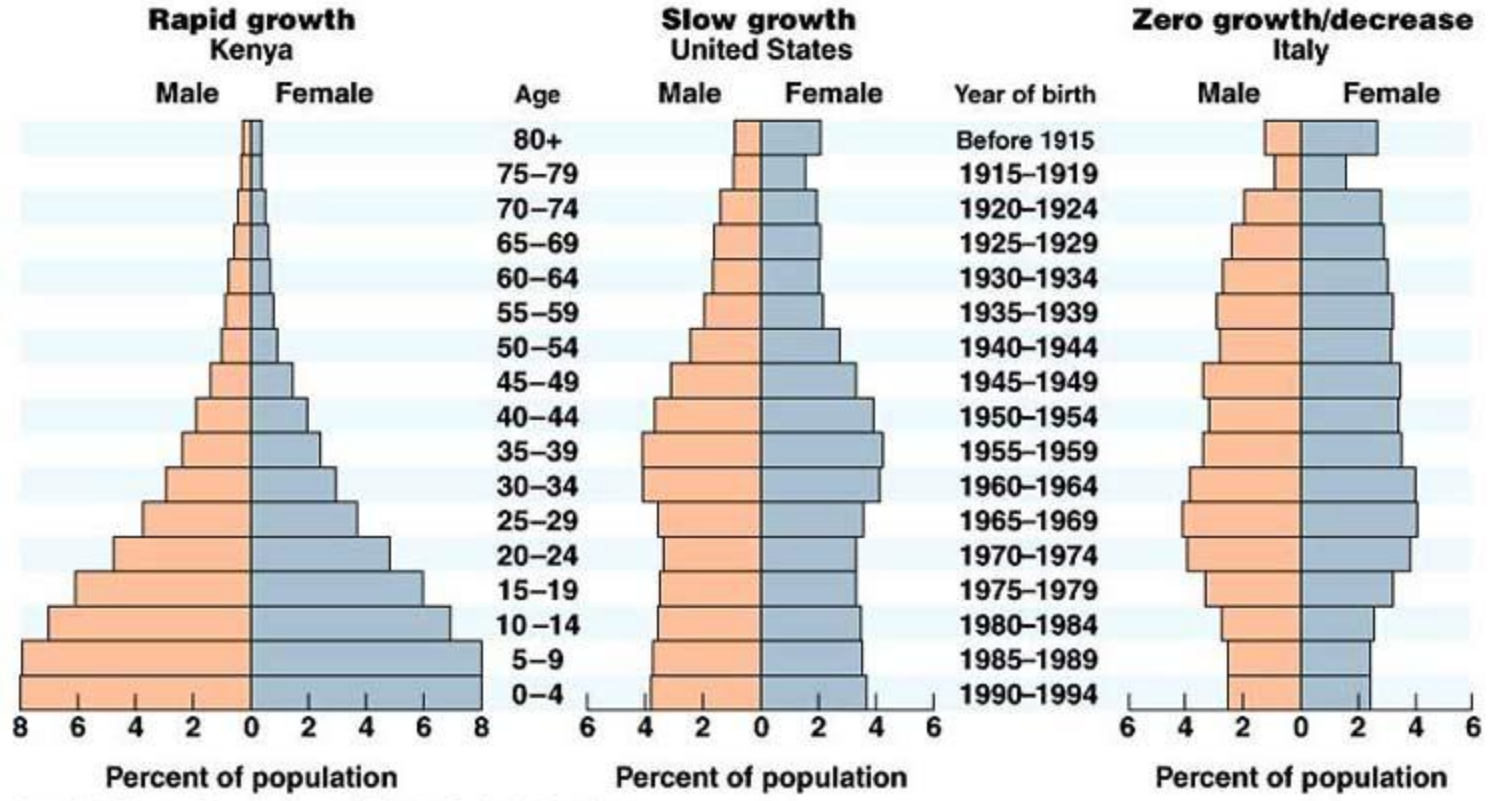




Population by continent, percentages

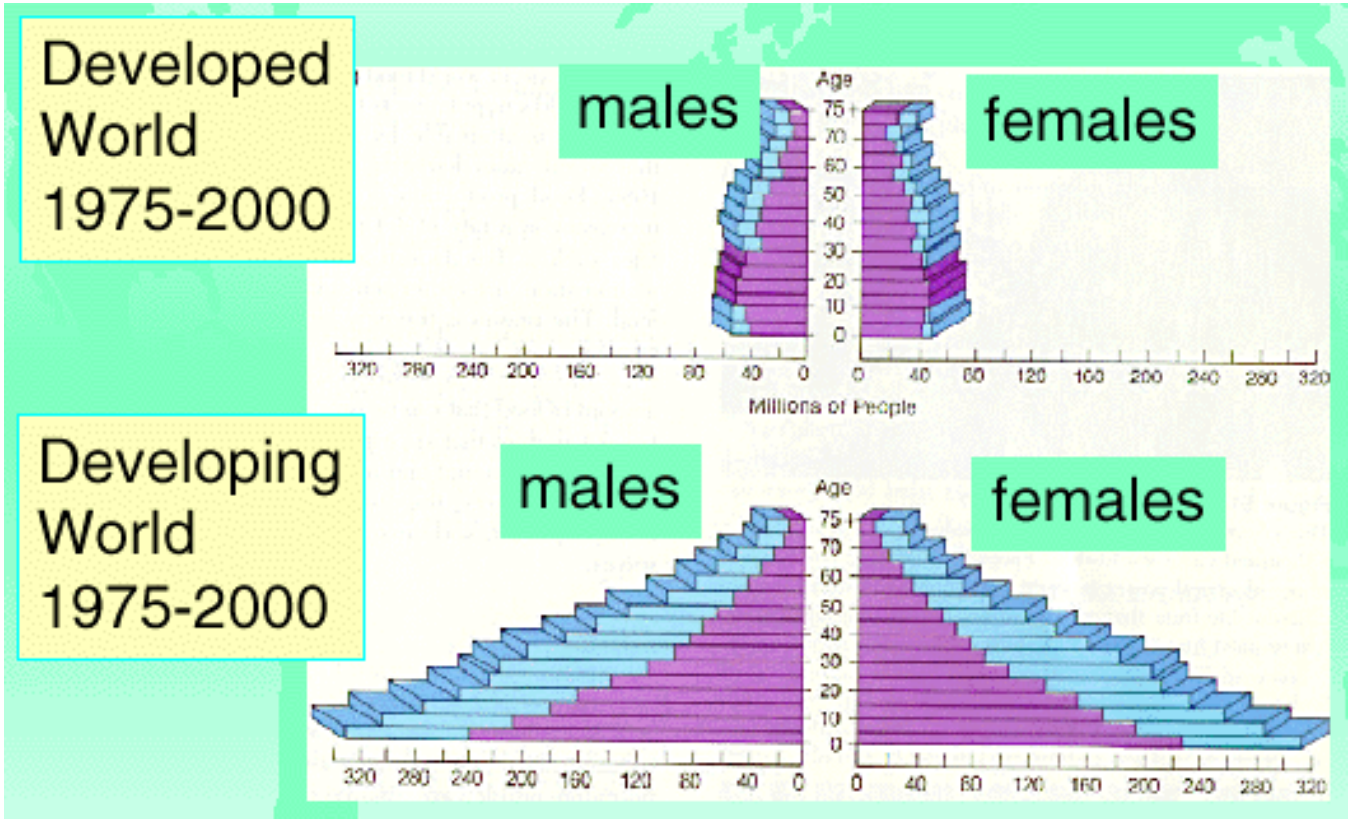
# Population Age Pyramids

- Age pyramids are useful descriptor and forecaster of a population's growth pattern
- sort individuals into (usually) 5-year groupings, by males and by females
- a steeply triangular pyramid depicts a population that has experienced rapid growth, and will continue for one or more generations
- a rectangular pyramid depicts slow or zero growth
- A narrow base reflects negative growth

# Examples of Population Pyramid Distributions

# Population Age Pyramids

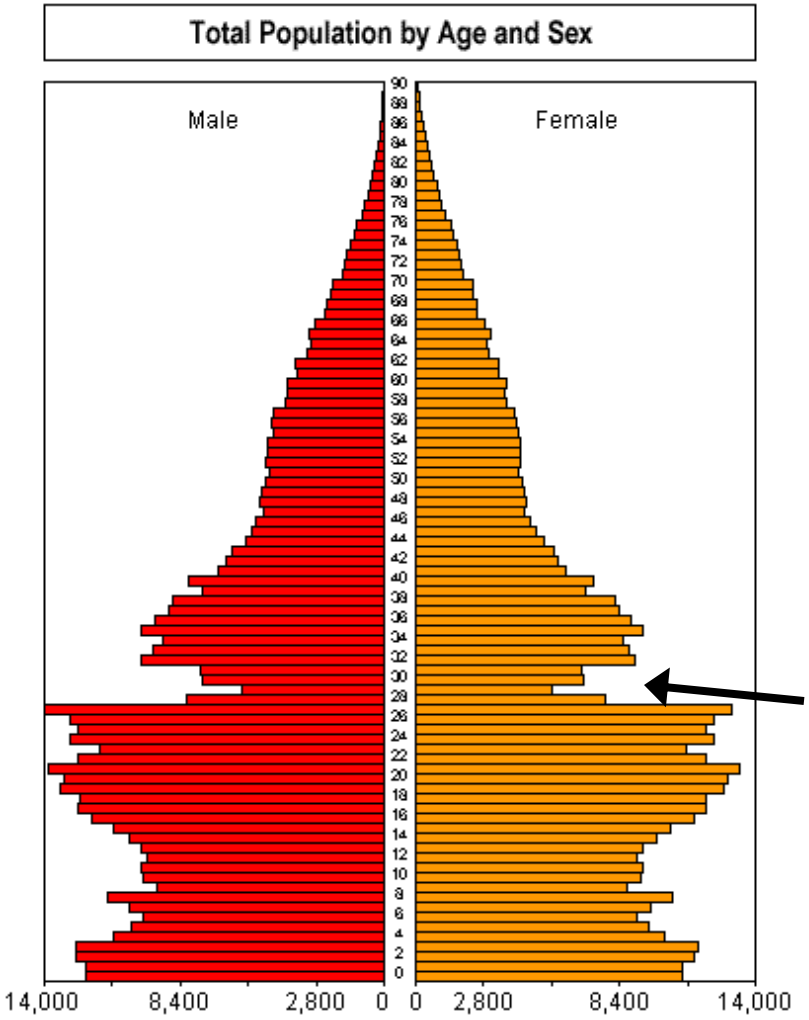



Magenta bar = 1975

Blue bar = 2000

Note greater number of younger, relative to older people in developing world. As 0-15 year-olds become 15-30 year-olds, population will increase further.

# Population Age Pyramids

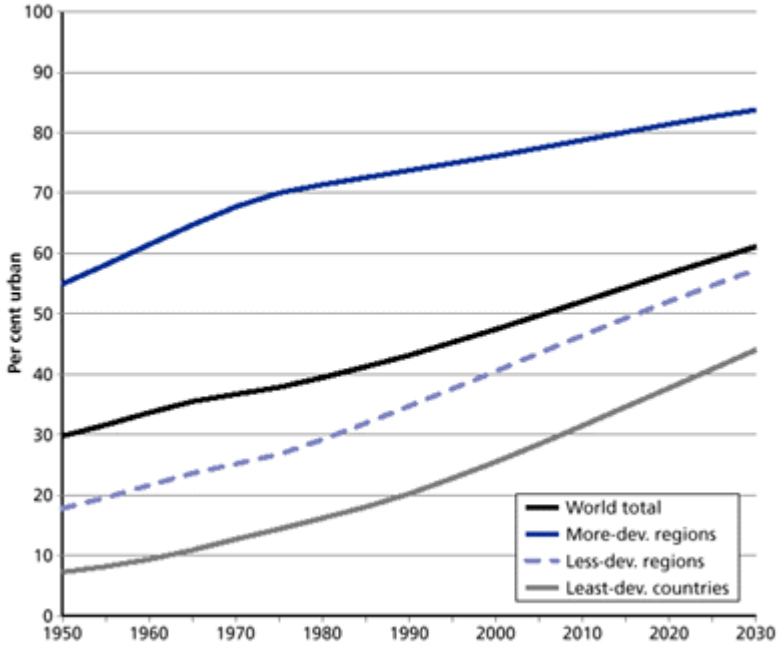



The Great Leap Forward 1959-61, was a social experiment of Chairman Mao to modernize the country by requiring peasants to work in factories, taking them away from their farms. Crops failed, famine resulted, the country was in upheaval.

Some 25-40 million premature deaths due to famine and disease are attributed to this social experiment. As of 1990, the deficit in people aged 28-31 (born 1959-63) can clearly be seen.

# Global Trend toward Urbanization

Another global trend is towards increased urbanization, most dramatically in less-developed countries. In 1960, only New York and Tokyo were “megacities” (10 million people). By 1999 there were 17 megacities, 13 in less-developed regions. By 2015, there will be 26.



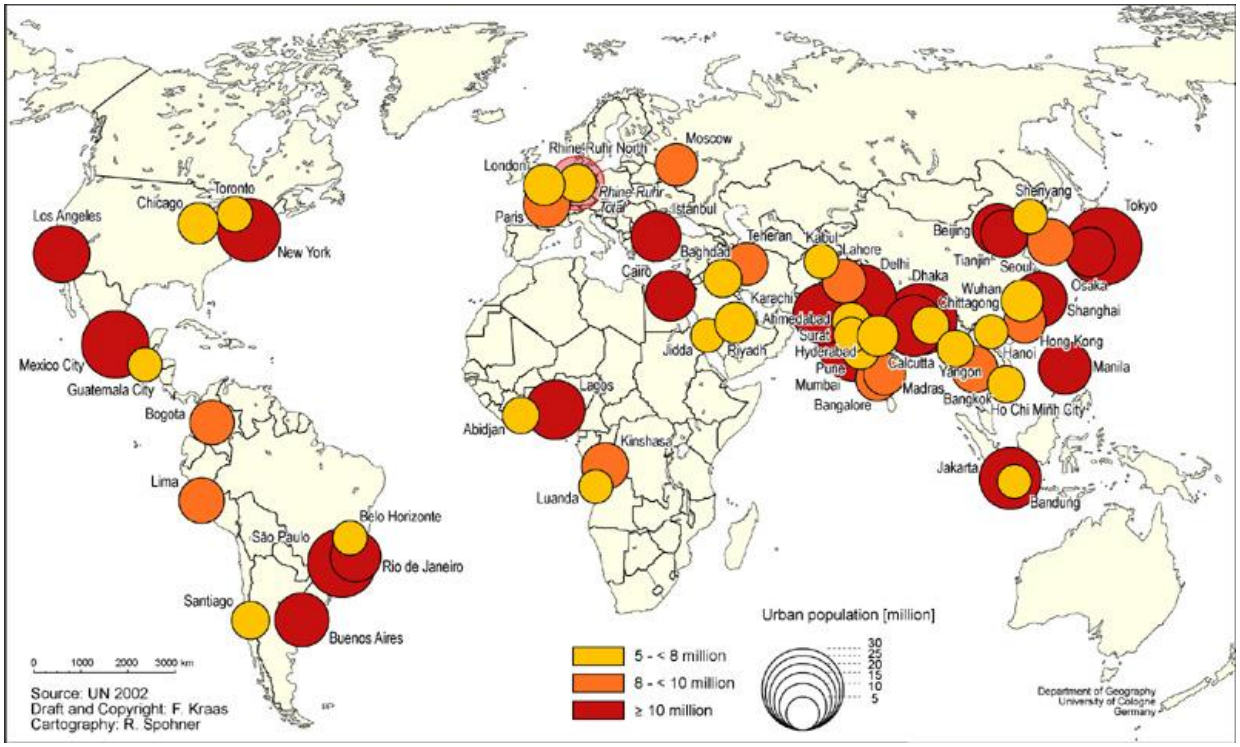

Movement of people towards cities is accelerating, particularly in less developed countries.

Due to increased births, and migration from rural surround.

Urban share has grown from 1/3 (1960) to half (2000), and projected to be >60% by 2030.

# Changing Distribution of World Population

Global trend is towards increased urbanization, most dramatically in less-developed countries. In 1960, only New York and Tokyo were “megacities” (10 million people). By 1999 there were 17 megacities, 13 in less-developed regions. By 2015, 26 or more megacities.




2015 Top cities:

| | |
|---|---|
| Tokyo | 35M |
| Seoul | 23M |
| Mumbai (Ind) | 22M |
| Mexico City | 22M |
| São Paulo | 21M |
| New York | 20M |

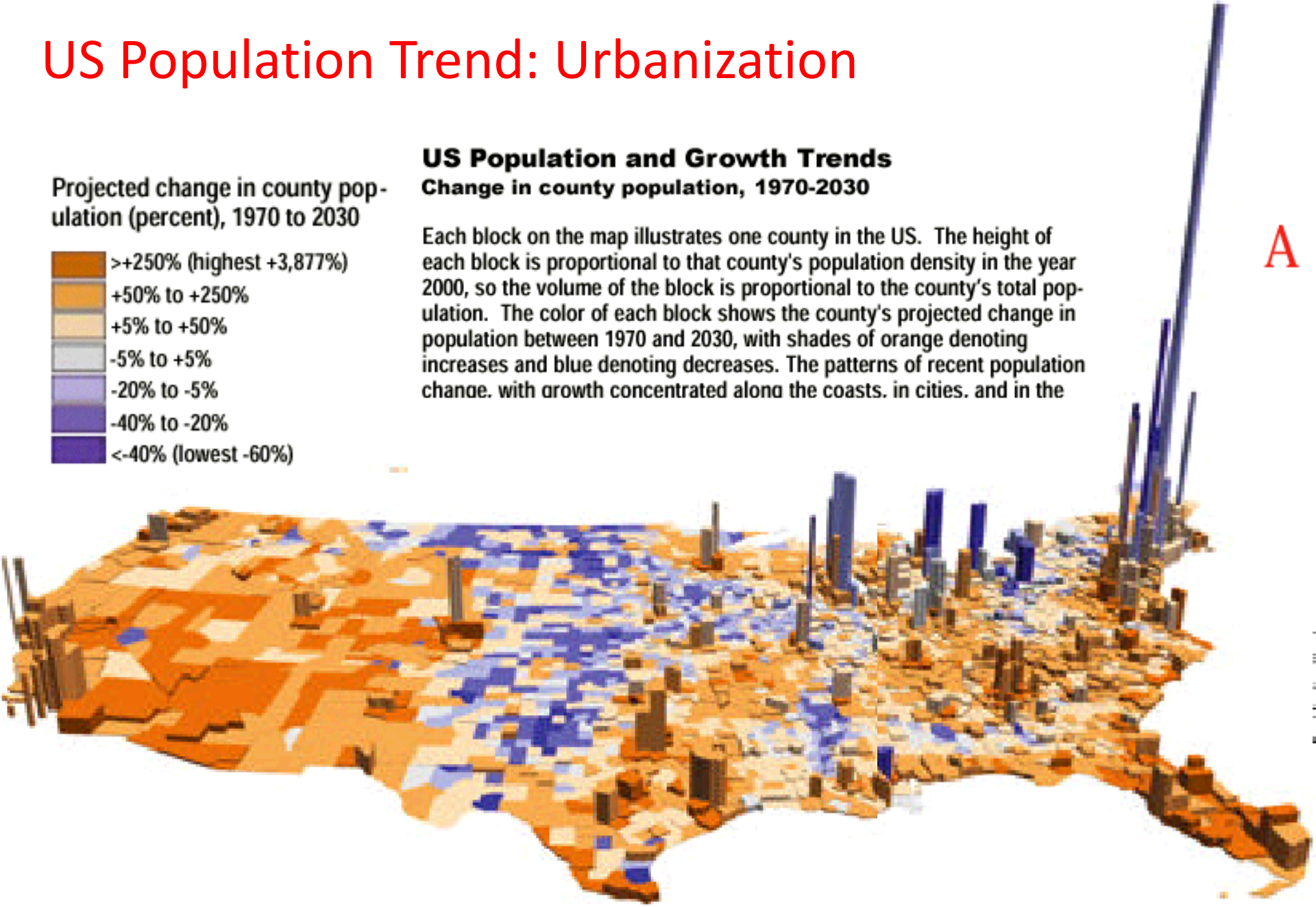
Delhi, Shanghai, Jakarta..

http://www.citypopulation.de/World.html

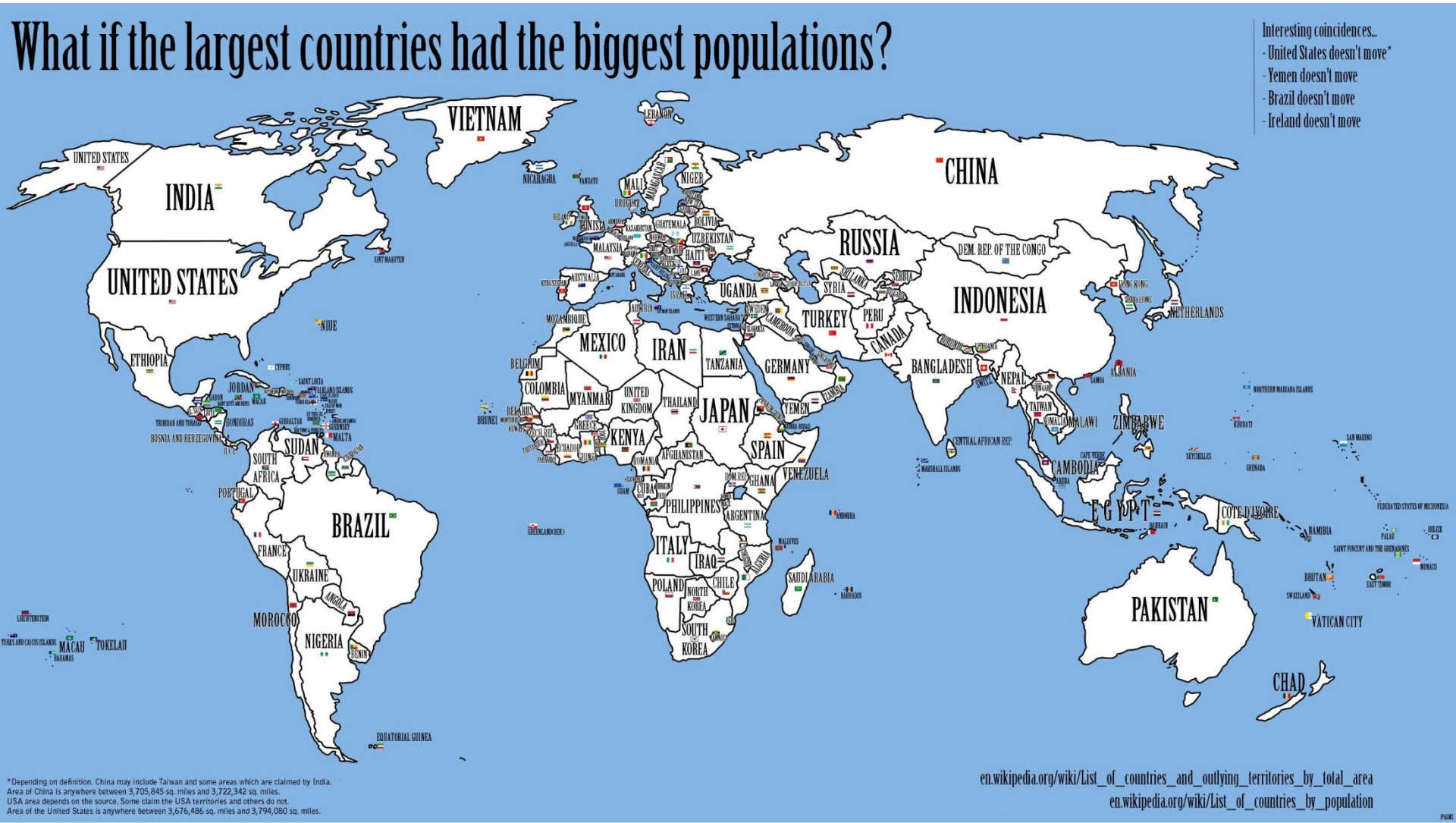
# Developed means Urbanization


Developed countries are more urbanized than poorer countries.

# US Population Trend: Urbanization



# GC2
# Human Demographics



# The Demographic Transition

Will population continue to grow?

What differences might we expect among different regions and societies?

To address these questions we to a universal pattern of the modern world:

**the Demographic Transition**

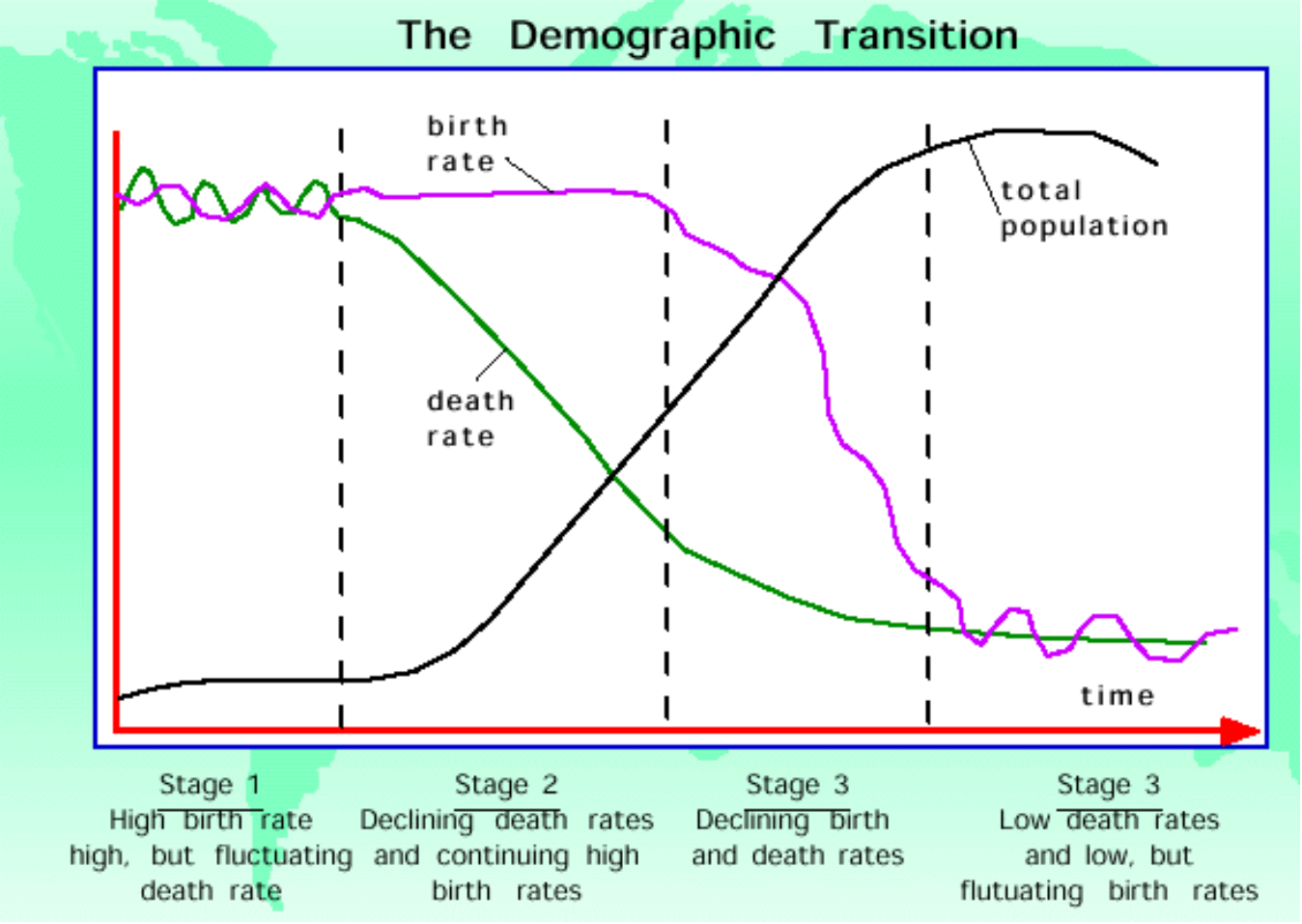
This is transition from high to low birth and death rates.

There have been TWO major demographic transitions:

Past Demographic Transition

Present Demographic Transition

# The Demographic Transition




During stage 1, the country has not yet begun the demographic transition. At stage 4, the country has completed the transition.

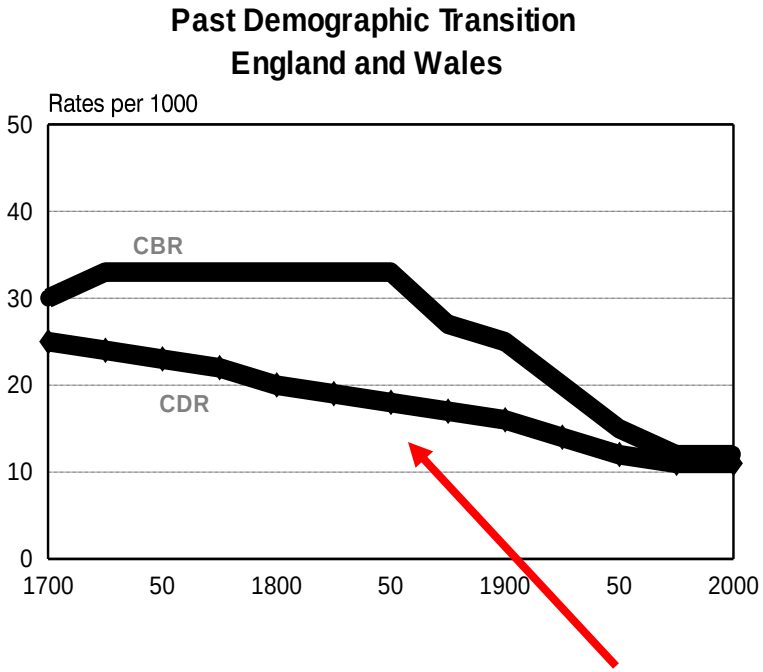
# Two Demographic Transitions

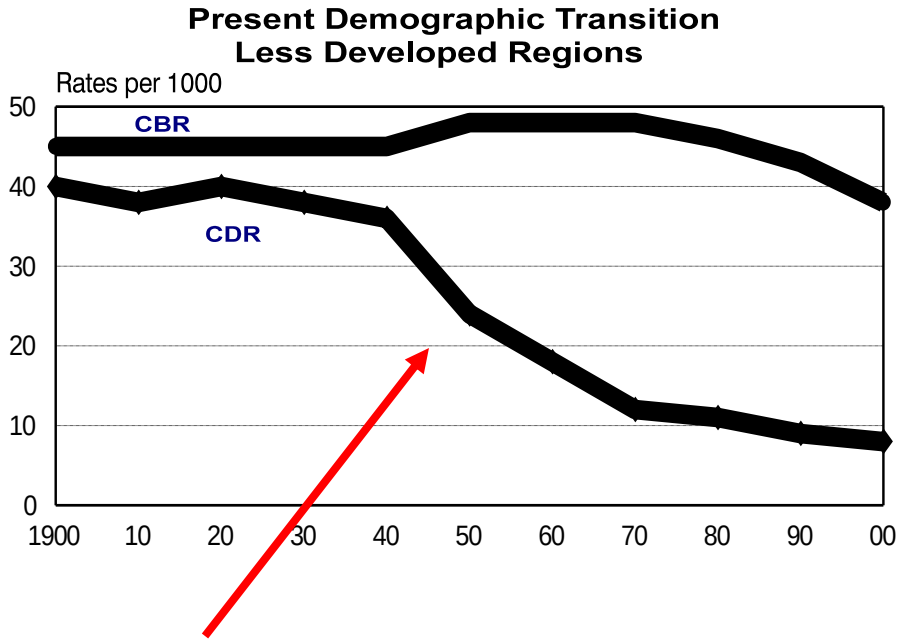
The Demographic Transition is the movement of a population from high to low birth and death rates

**Past** **and** **Present**

**The Past Demographic Transition occurred more gradually from lower original levels, bringing slower rates of population growth**

**The Present Demographic Transiton occurs more rapidly, from higher original levels, bringing higher rates of population growth.**

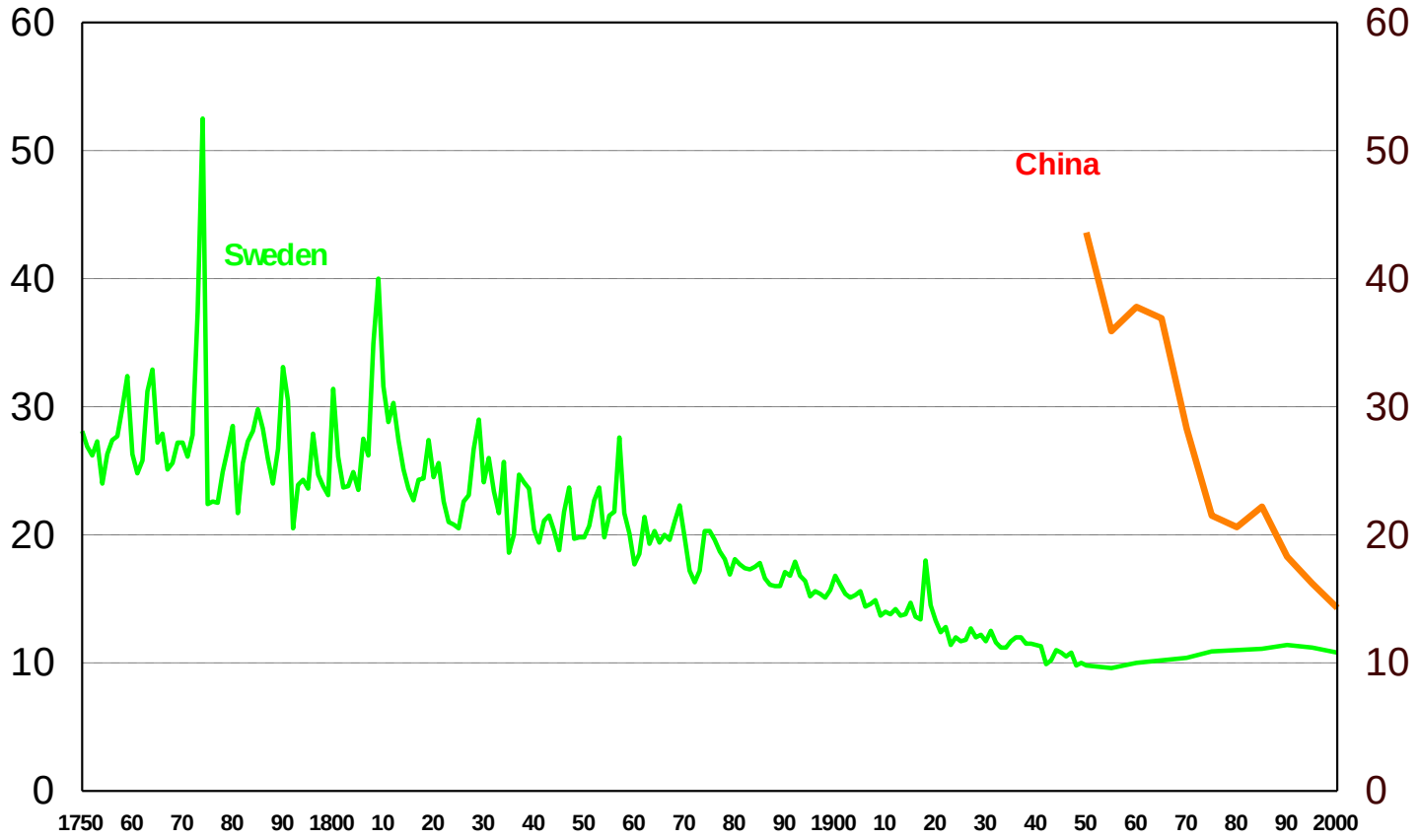


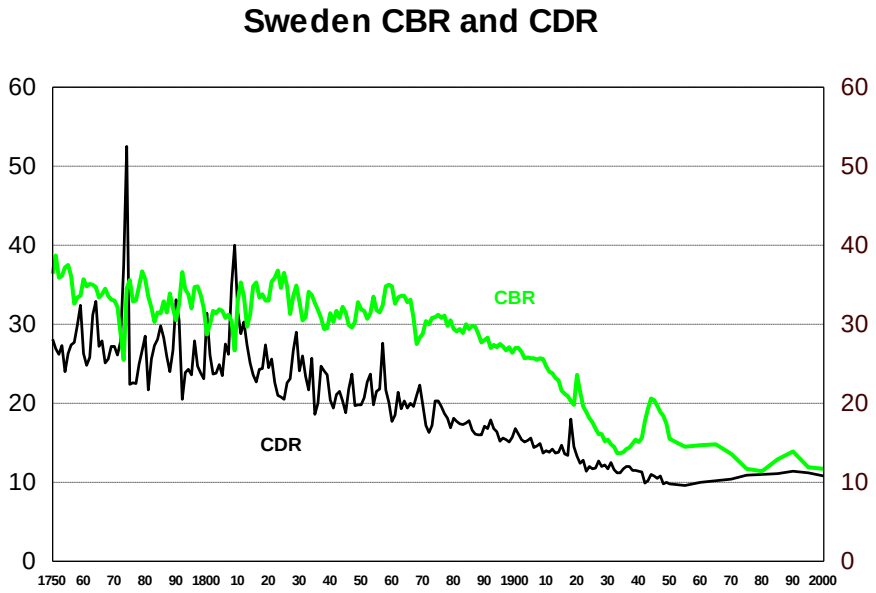

compare slopes

# Death rates (optional)

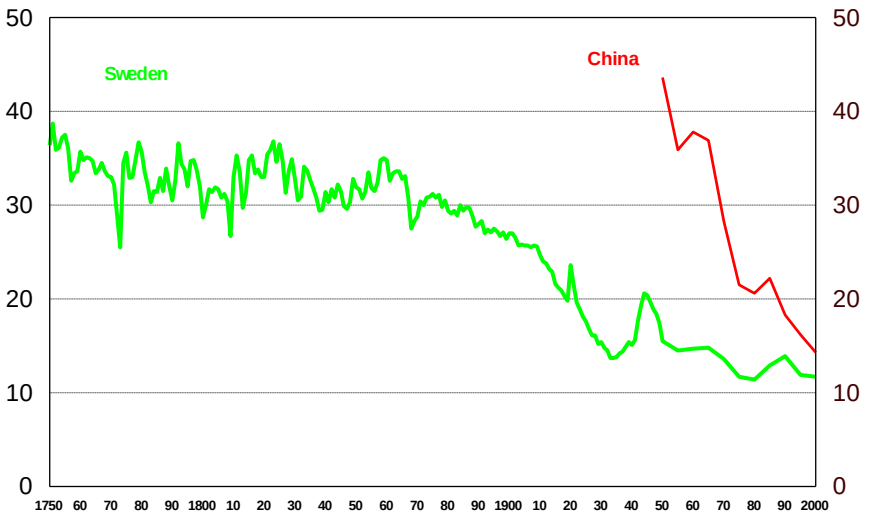
The past transition moved slowly from high, variable, death rates and infectious diseases to low, stable, death rates and degenerative diseases (e.g. Sweden). Today, death rates can be reduced more rapidly. China's DR fell more in 40 years than Sweden's did in 200 years



# Birth Rates (optional)



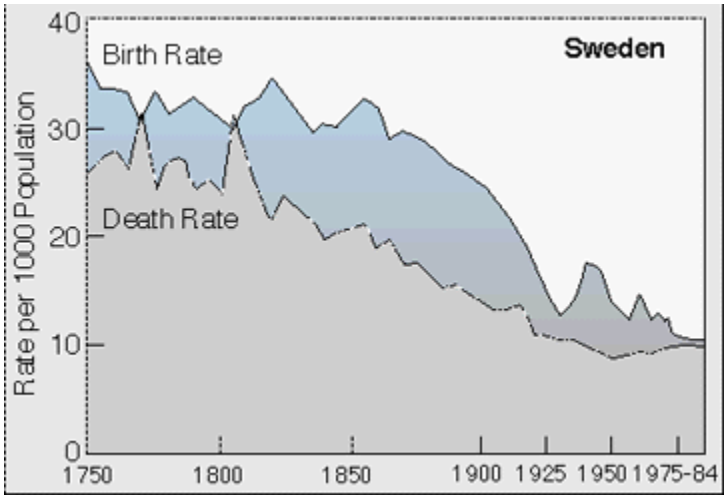

Sweden's birth date and death rate (past demographic transition)

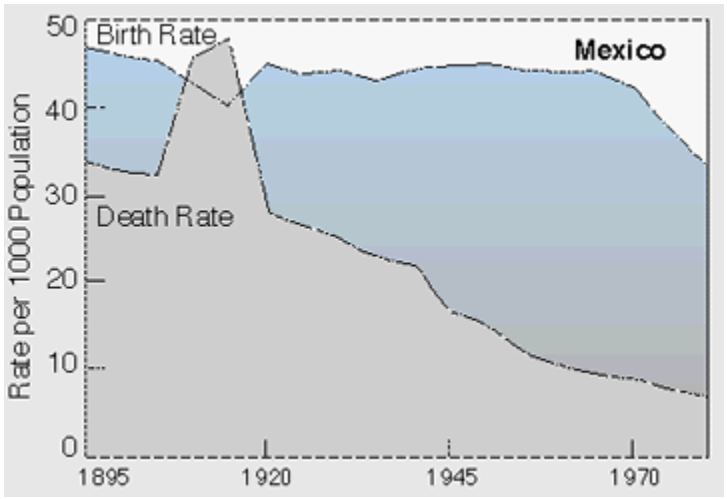



Sweden and China's birth rates

China's birth rate fell as much in 40 years as Sweden's fell in 200 years.

# Examples Full and Partial Demographic Transitions




Sweden shows **gradual** decline in both birth and death rates over nearly 200 years. Children have survived better, and economic circumstances including industrialization favors fewer children. Mexico has experienced a partial or first demographic transition - the **rapid** decline in death rates.

Images from: http://www.meto.umd.edu/~owen/CHPI/IMAGES/demog.html

# Regional Distinctions

Developing countries

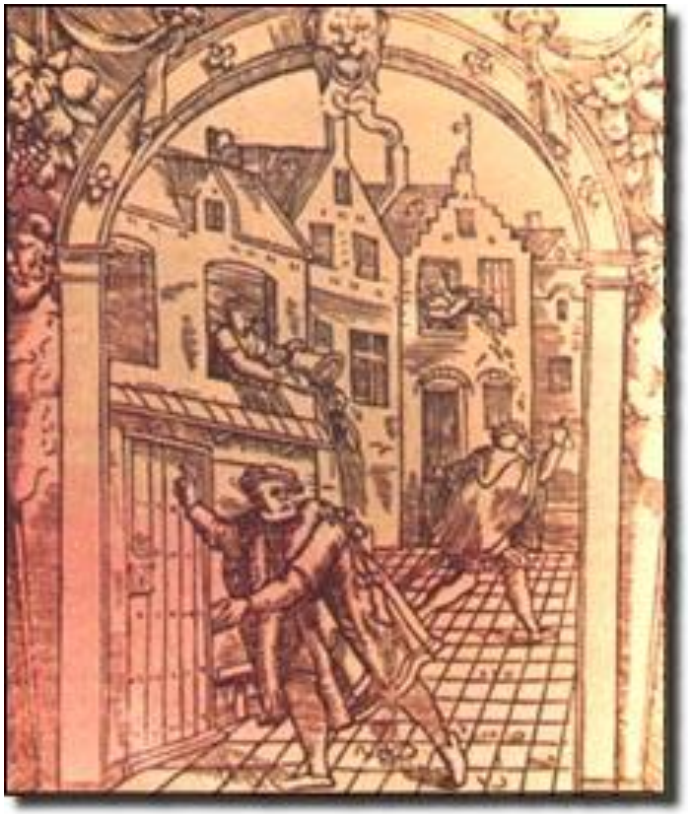
of Asia/Pacific, Africa, Latin America and Caribbean

Industrialized countries

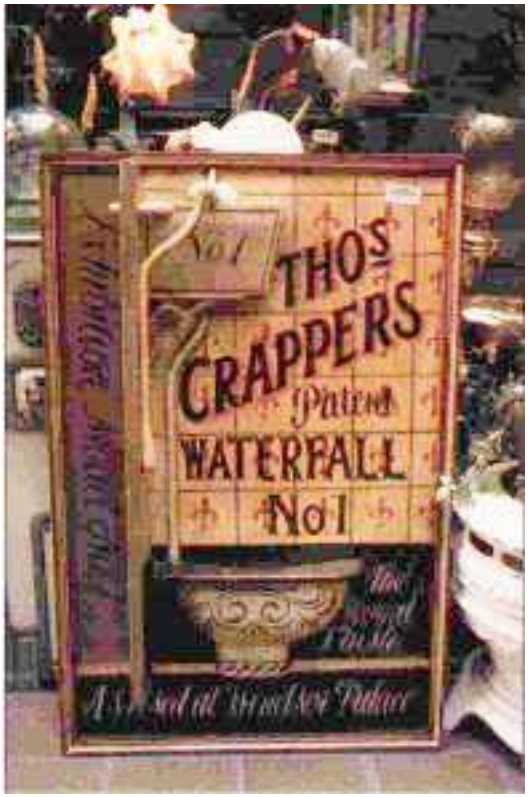
of Europe, N. America, Japan, Oceania

Roughly speaking, industrialized countries have completed their demographic transition (“past” model), while developing countries are in transition (“present” model)

# Advances in Health



Sanitation: flushing toilets, sewers, and sewage treatment, largely came to Europe in the mid-1800s



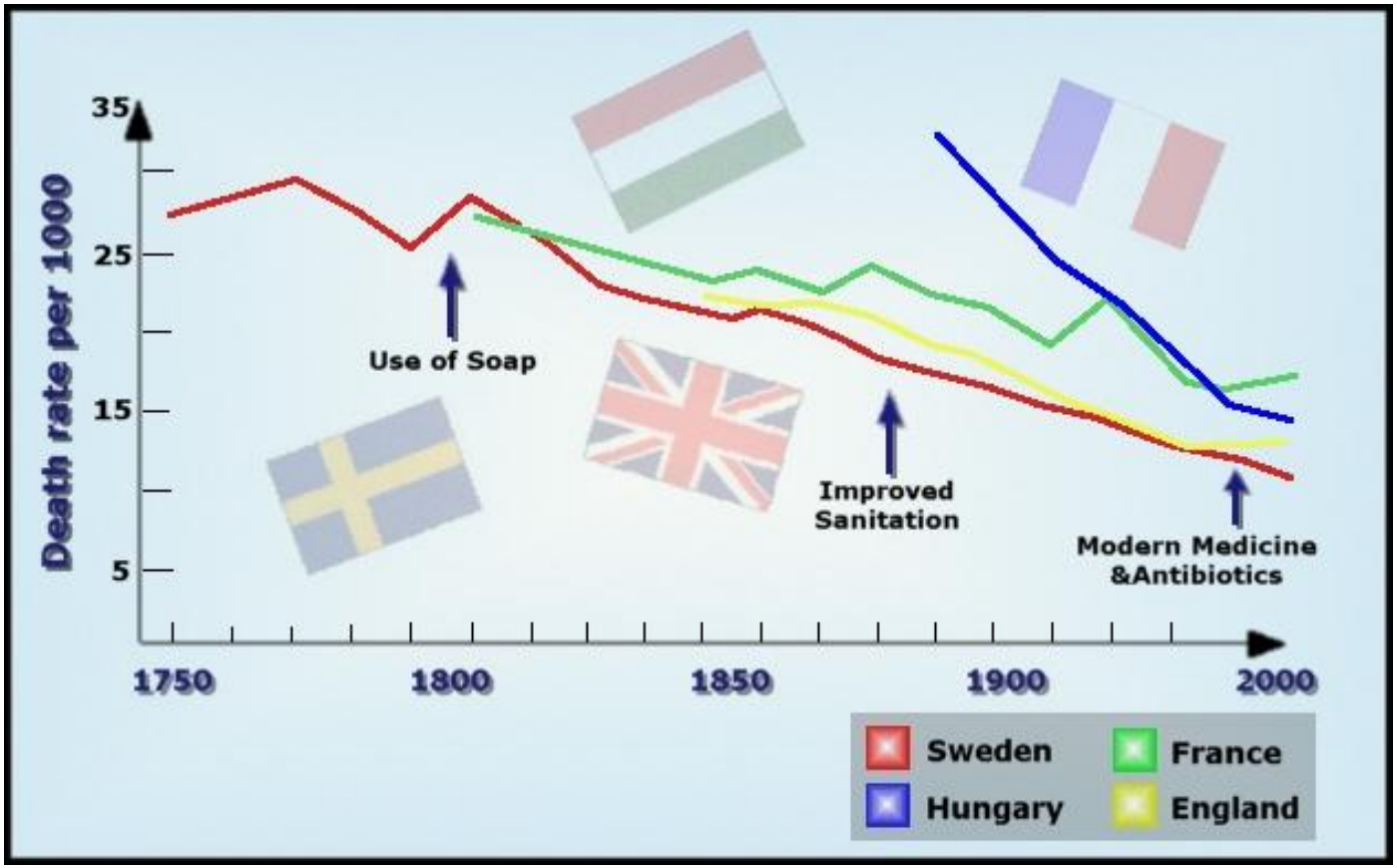

In the middle ages, even until the 1800's, chamber pots were emptied from windows. Walkers beware!

Thomas Crapper (b. 1836) is commonly, but erroneously, credited with invention of the toilet (17th C).

http://www.plumbingworld.com/toilethistoryindia.html

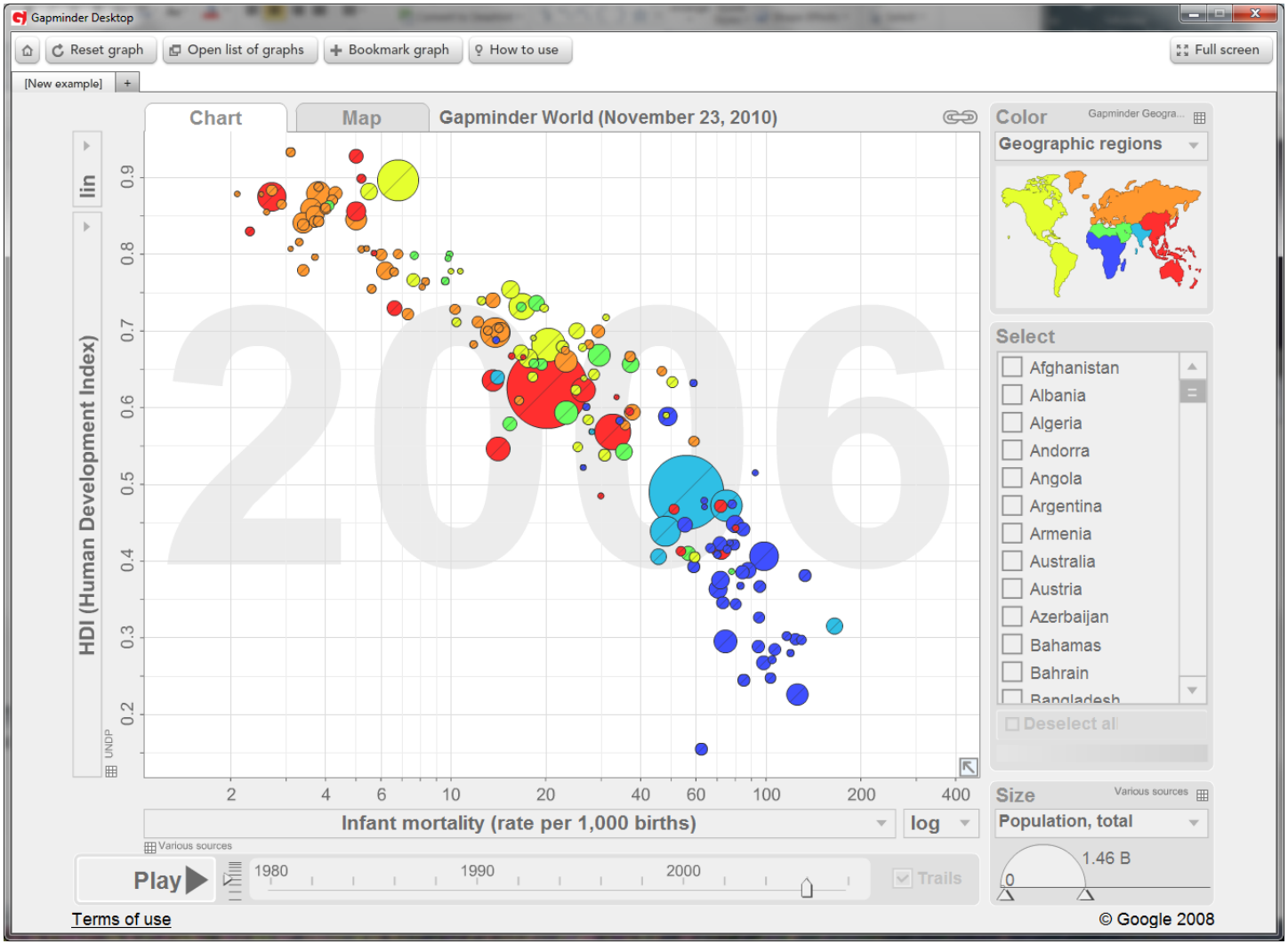
http://www.plumbingstore.com/psthomas.html

# European Death Rate History




Decline in death rate is attributed to improved sanitation and hygiene, medical advances and control of serious infectious diseases.

# Developed means Health




Greater human welfare, measured in lower infant mortality rates, correlates with development.

# The difference ....

There are major reasons for the increased speed of the new transition:

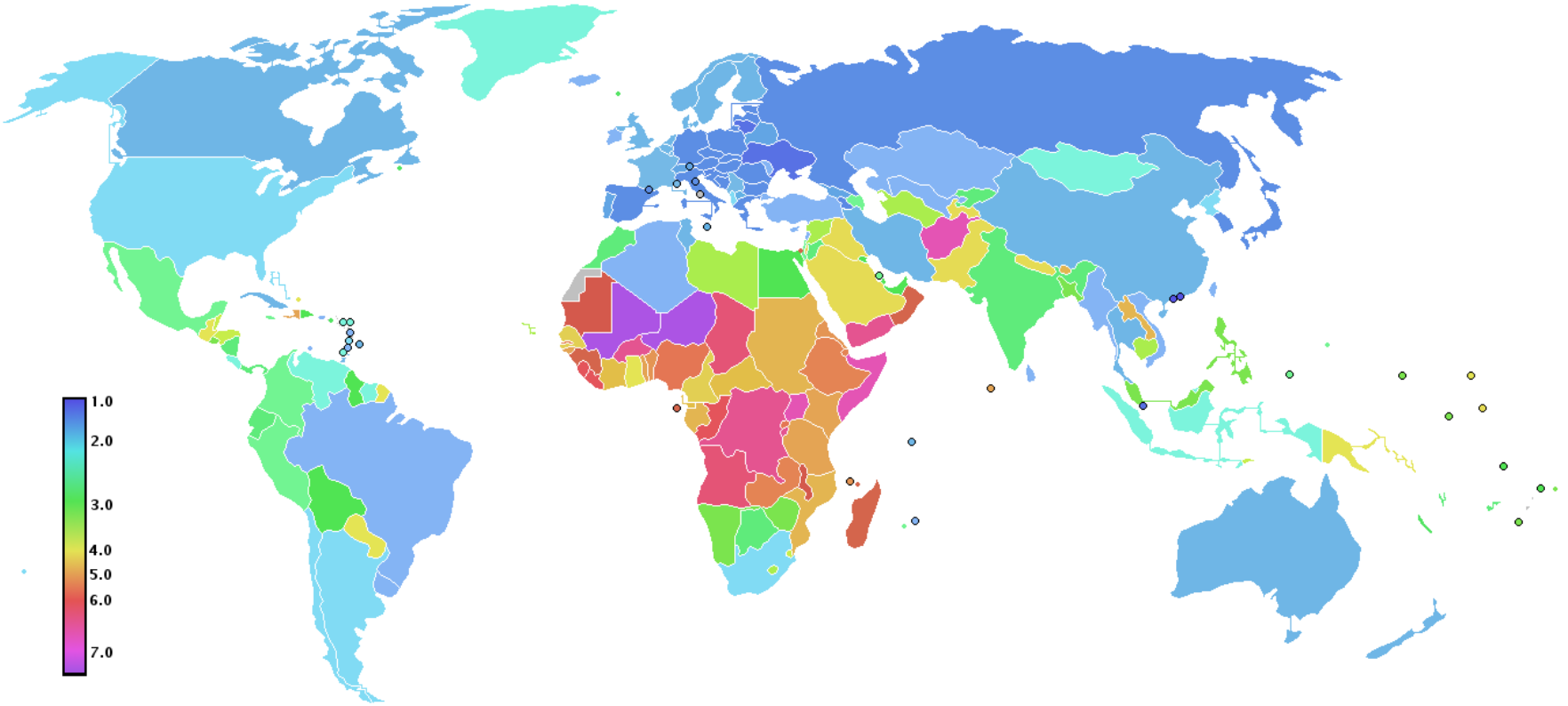
- New medical technology to attack infectious diseases
- Global organizations to spread that technology rapidly.
- Changes in fertility trends

World Health Organization

The UN World Health Organization played a major role, by bringing better health and education to millions of world's population.

The same holds for **fertility transition**.

# Total Fertility Rate




Fertility rate (births/woman) varies widely; higher in poorer countries, lower in wealthier countries (2006/07).

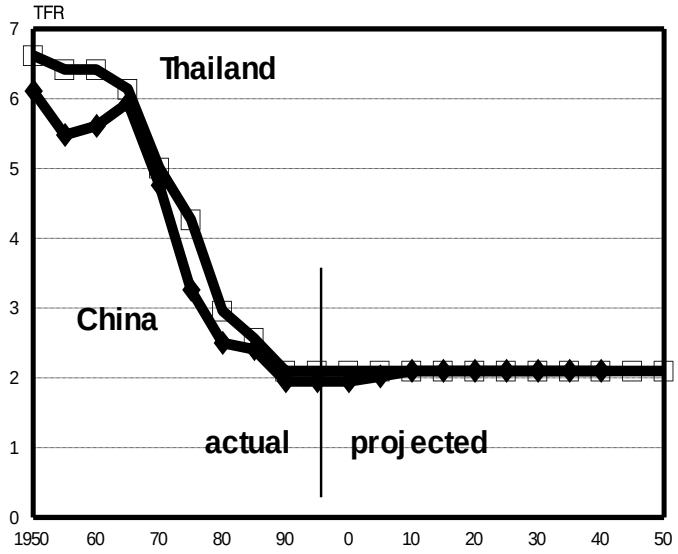
Influenced by: transition from agricultural to industrial-technical society, increasing affluence, increasing literacy and emancipation of women, birth control efforts.

# Fertility Rate

**The number of children a woman has in her child-bearing years.**

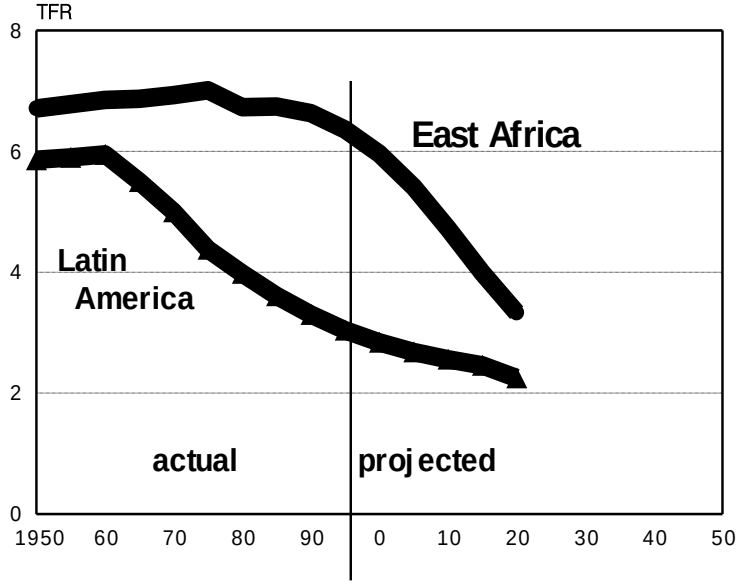
**Declined rapidly in China and Thailand, due to effective primary education, primary health care, and family planning programming**

**China and Thailand**

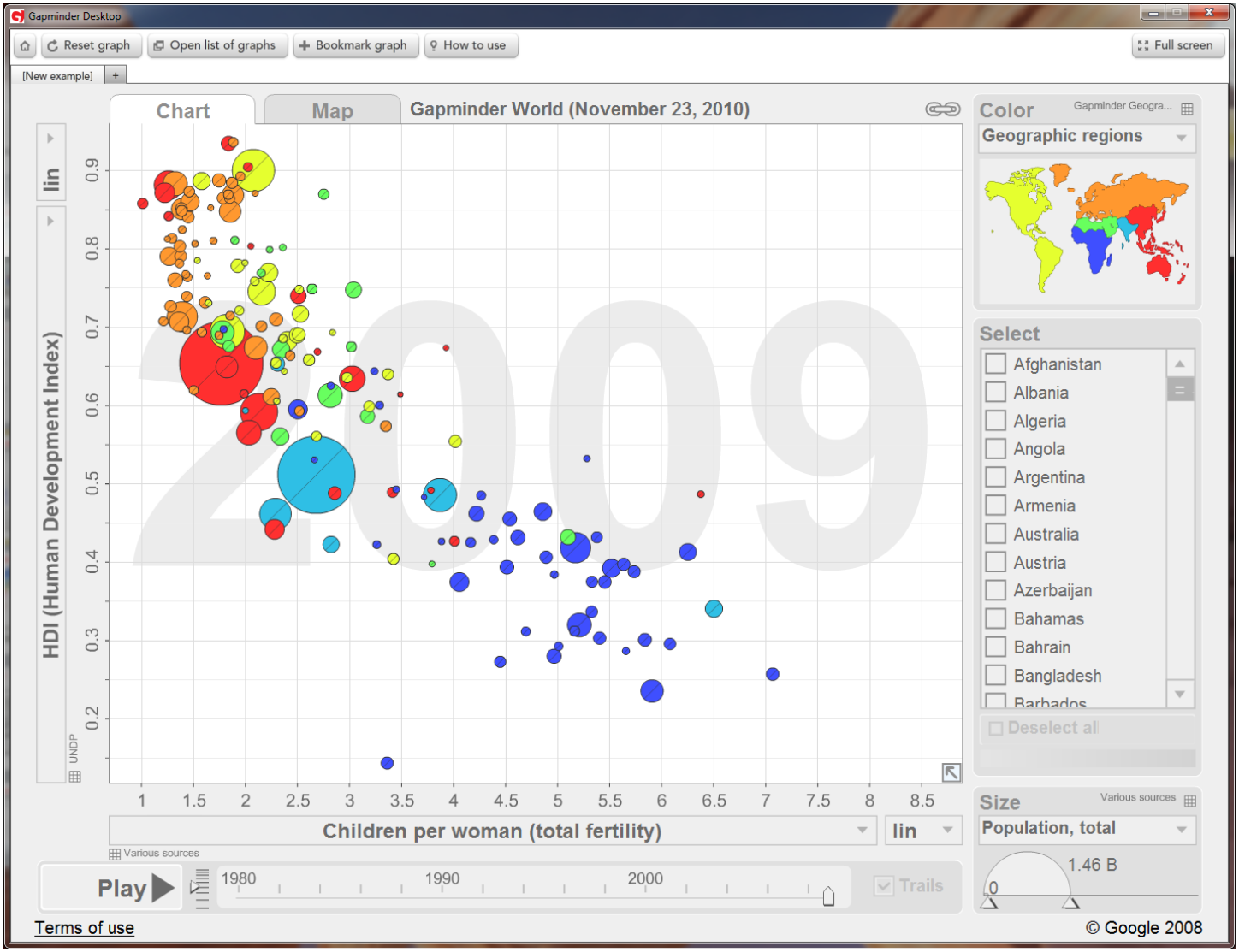



**Has declined only moderately in Latin America, and remains high in Africa. Weak government health, education and family planning programs are main causes.**

**Latin American and East Africa**

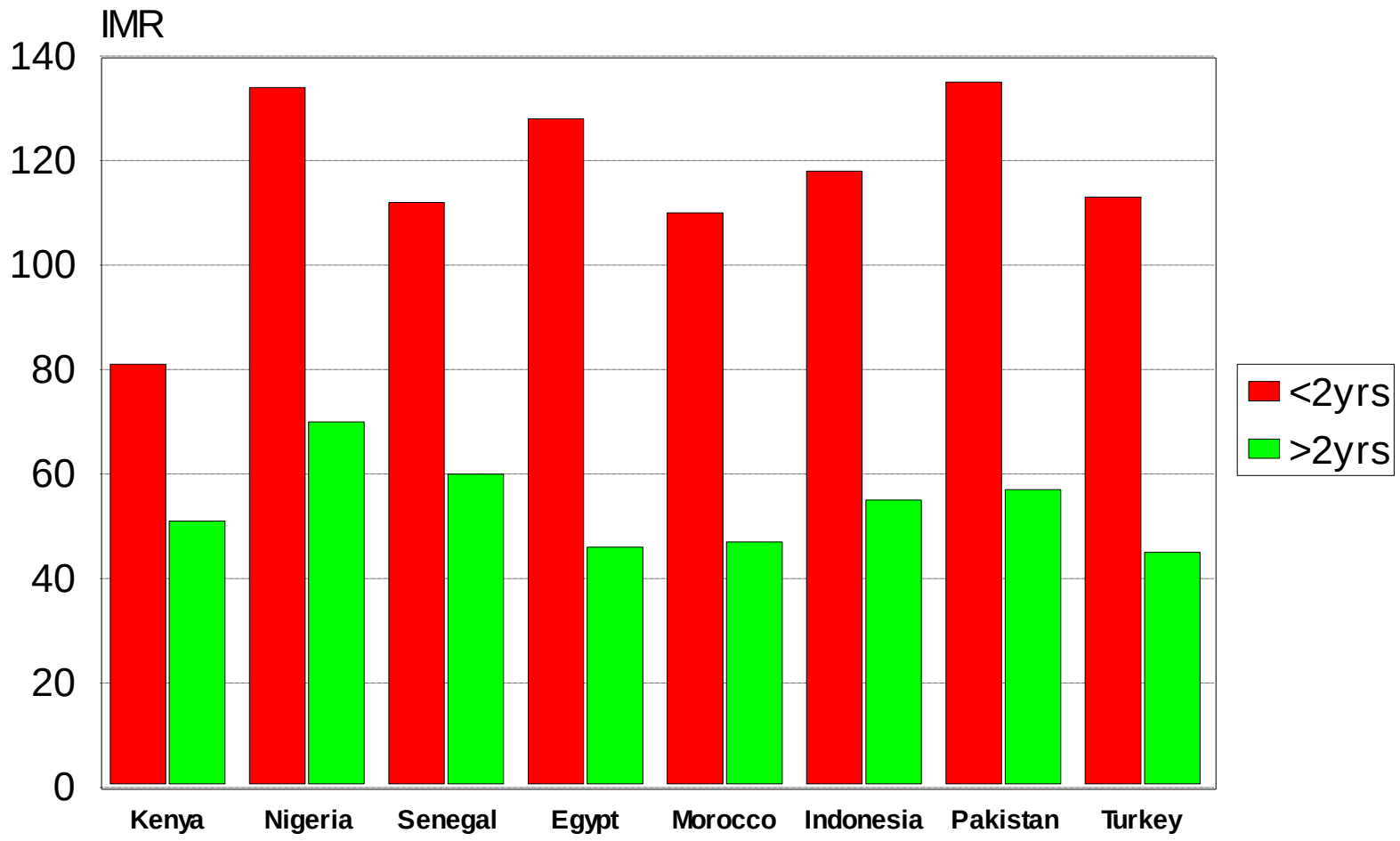


# Developed means Lower Fertility




Developed countries are growing more slowly because they have lower fertility than poor countries. (link)

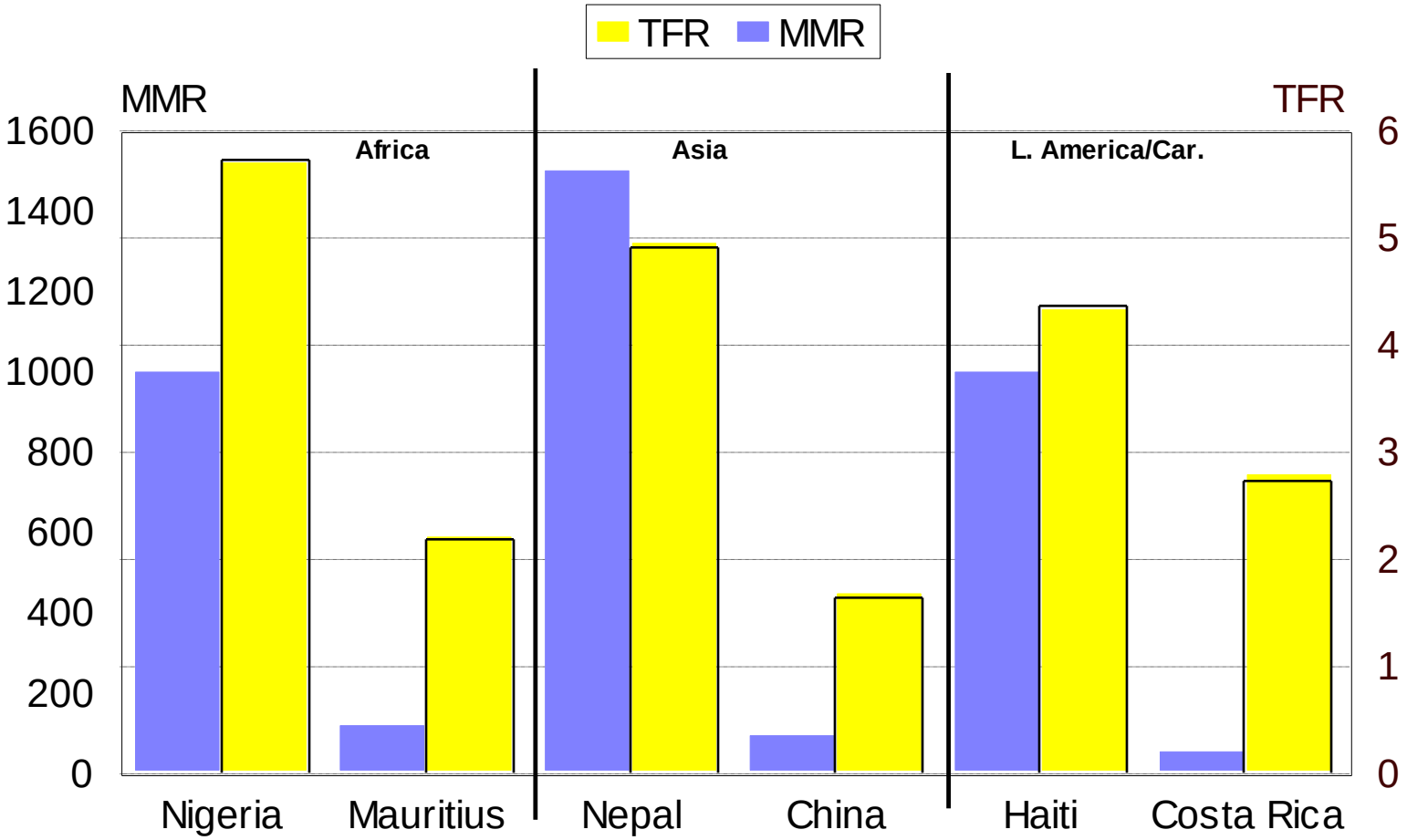
# Fertility and Women's health (optional)




Source: PRB 1997

Shorter birth interval (high fertility) has higher infant mortality

# Fertility and Women's health (optional)

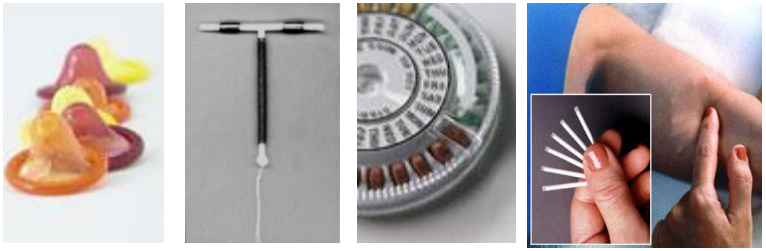



Higher fertility has higher maternal mortality (but more is involved in MM)

# Main Causes of Fertility Decline

**New medical technology**

Array of modern contraceptives available since about 1965.



The result has been a vast improvement in reproductive health, especially in the health of poor women and children

**Policy change**

Anti-natalist Policy, led by India, starting in 1952. Good family planning programs speed the demographic transition and improve health.


United Nations Population Fund
http://www.unfpa.org/

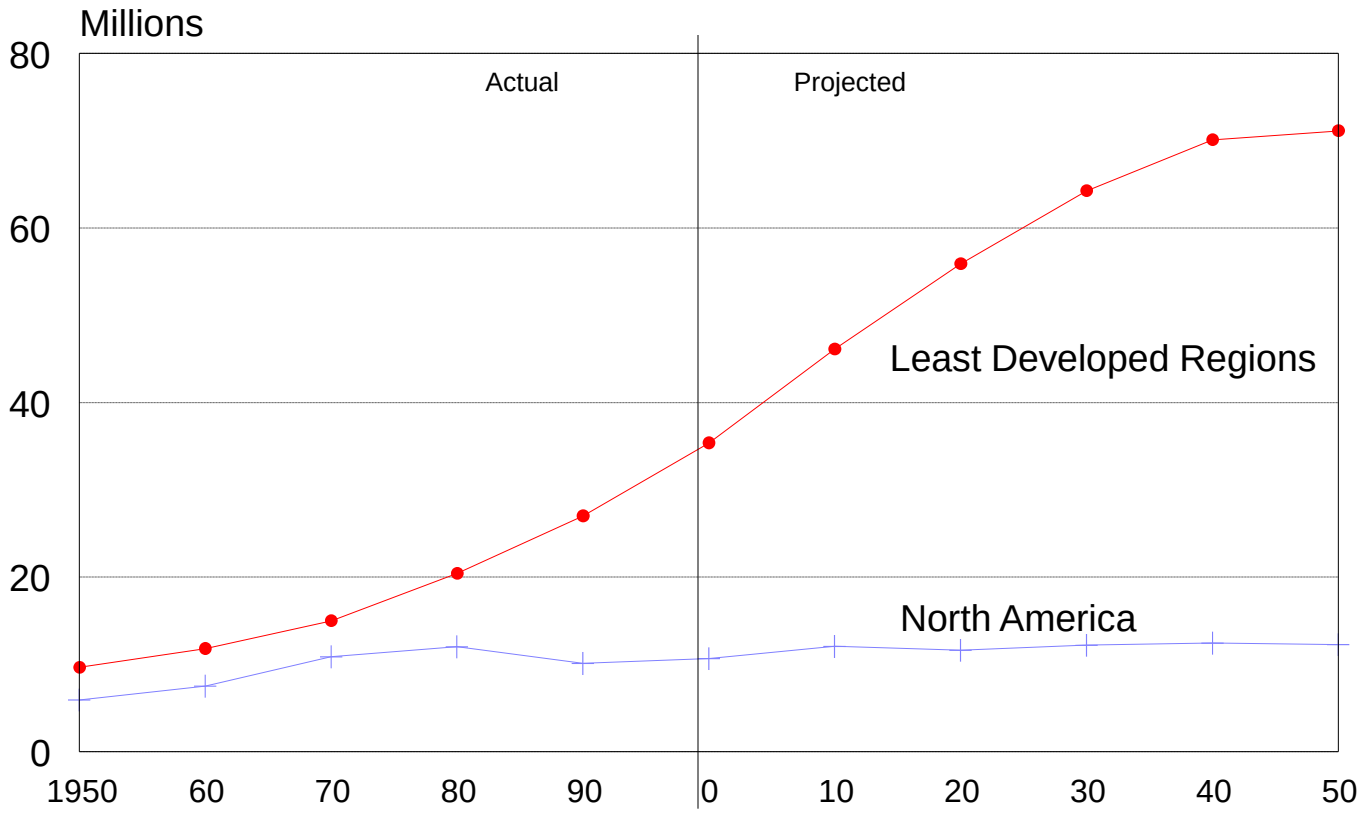
# Benefits of Family Planning

- Considered to be among the most cost-effective development and health programs we have.
- Provides immediate improvements in health of women and children – groups who usually benefit last and least from other types of development programs.
- Enhances social stability (“angry young men”).

# Young Males

- Young males (15-19 years old) are a highly energetic, inexperienced, and volatile population.
- They can be led to acts of heroism, making them attractive to armed forces.
- They can be led to acts of great altruism (self-sacrifice).
- They can also be led to acts of terrible violence, as we saw, for example, in the 1990's Rwandan (Tutsi-Hutu) genocide.
- Much depends on the leadership and social infrastructure that gives them some hope for the future.
- But demographics show their numbers will increase rapidly.

# Young Males

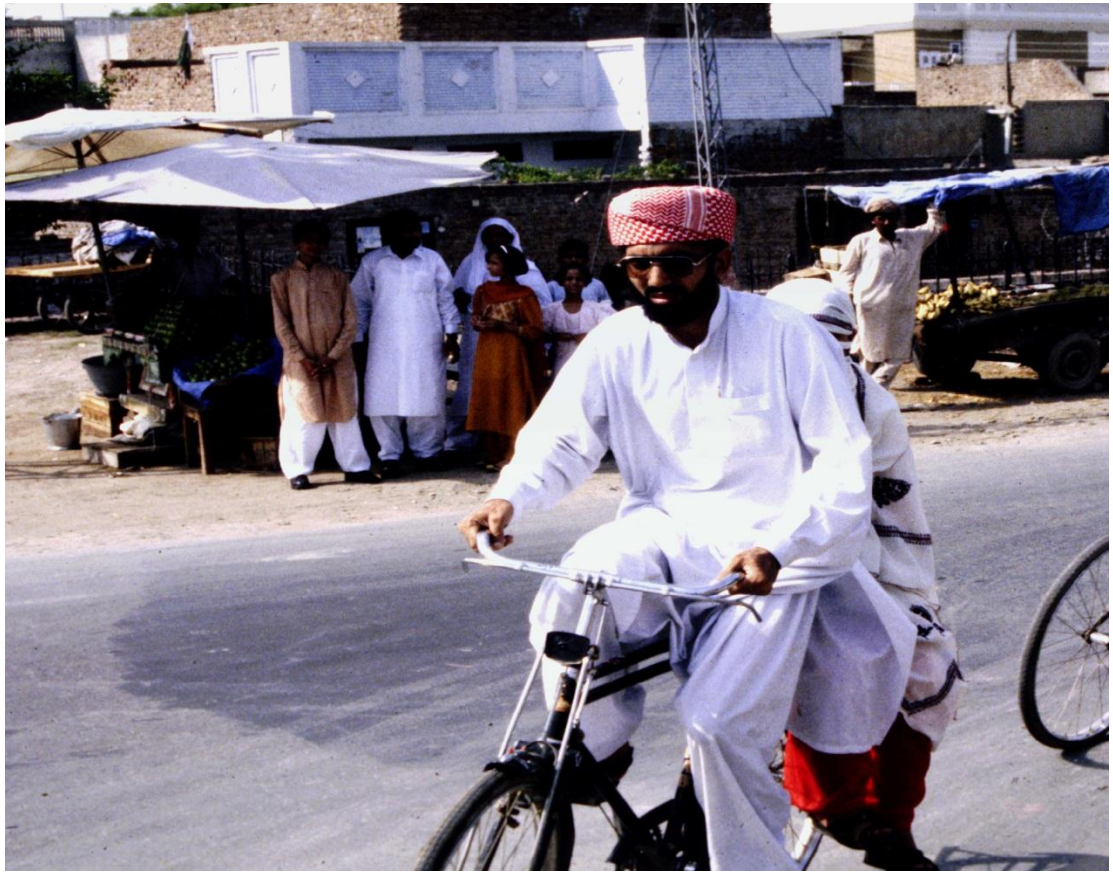



Growth of young males (15-19y) will be greatest in those regions least able to provide them with schools, jobs or hope. (link)

# Young Males: Thailand

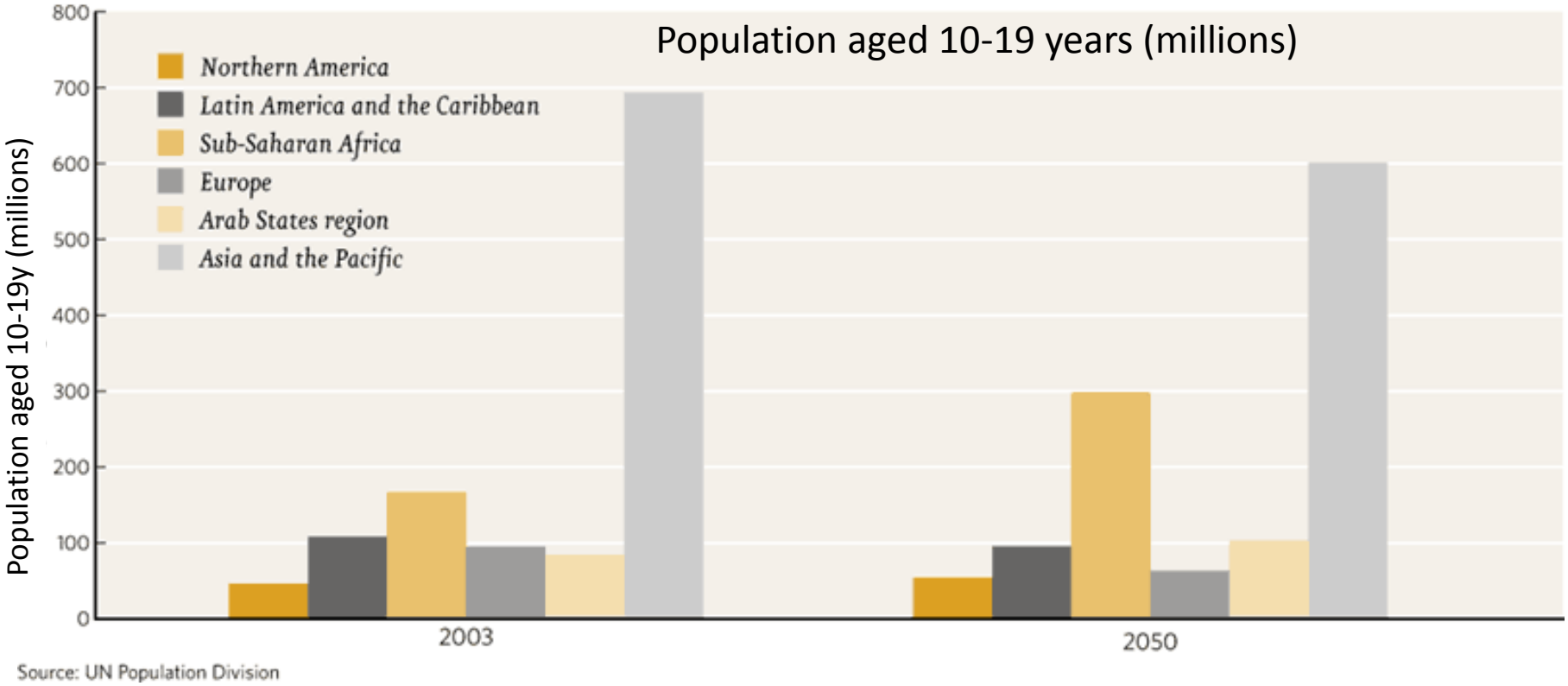
In Thailand, young men are in schools, sports and scouts, with reasonable chances for jobs. And their numbers are declining! There were 3.1 million in 1985 and 2.8 million in 2000.

# Young Males: Pakistan



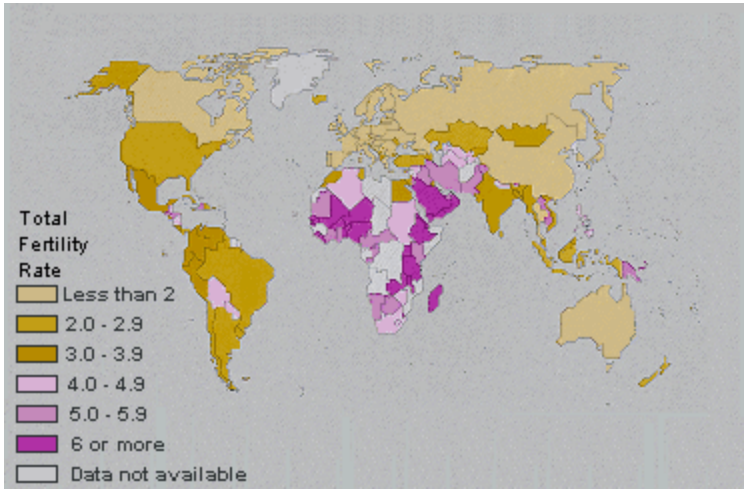
In Pakistan the scenario is less hopeful. Government expenditures are heavily weighted to the military. Education and health receive far lower priorities. There is also anger against western world.

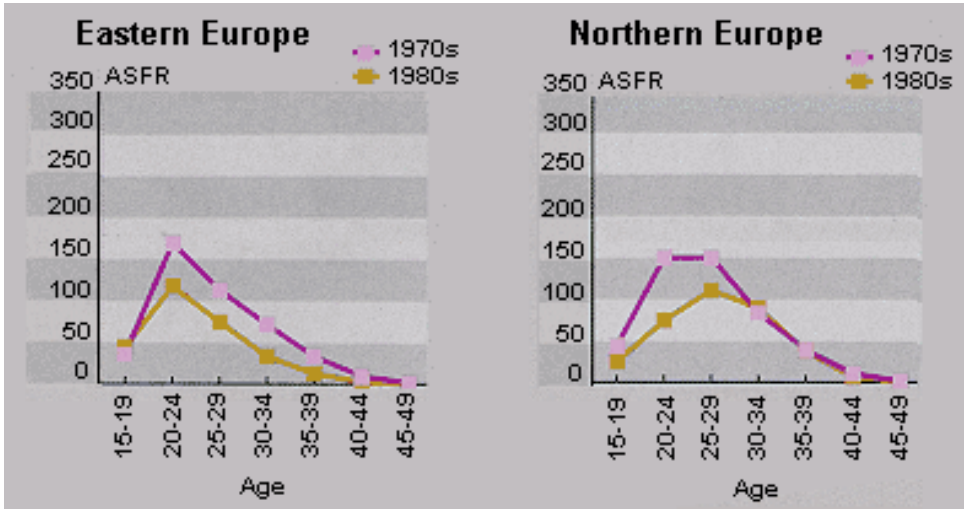
# Rapid Population Growth

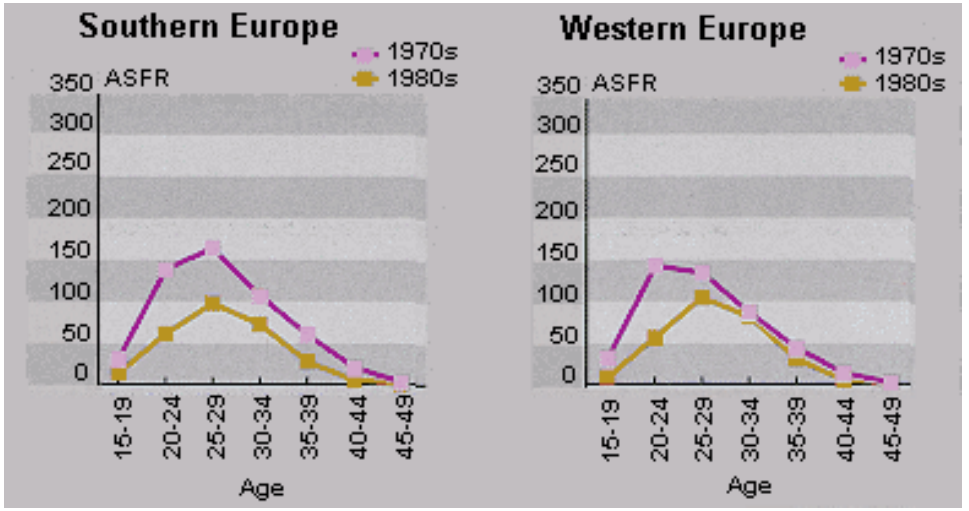



Rapid population growth reduces health and welfare AND produces a rapidly growing young population

# Too few people?
# Fertility rates in Europe (optional)




Age-specific fertility rates (births per 1,000 women) are low and declining everywhere in Europe

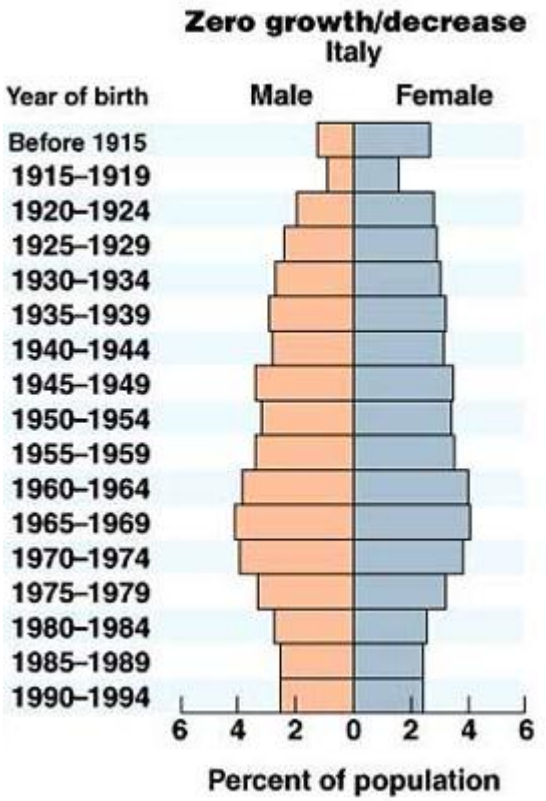
http://www.undp.org/popin/wdtrends/fer/fermap.htm

# An Upside Down Society ?

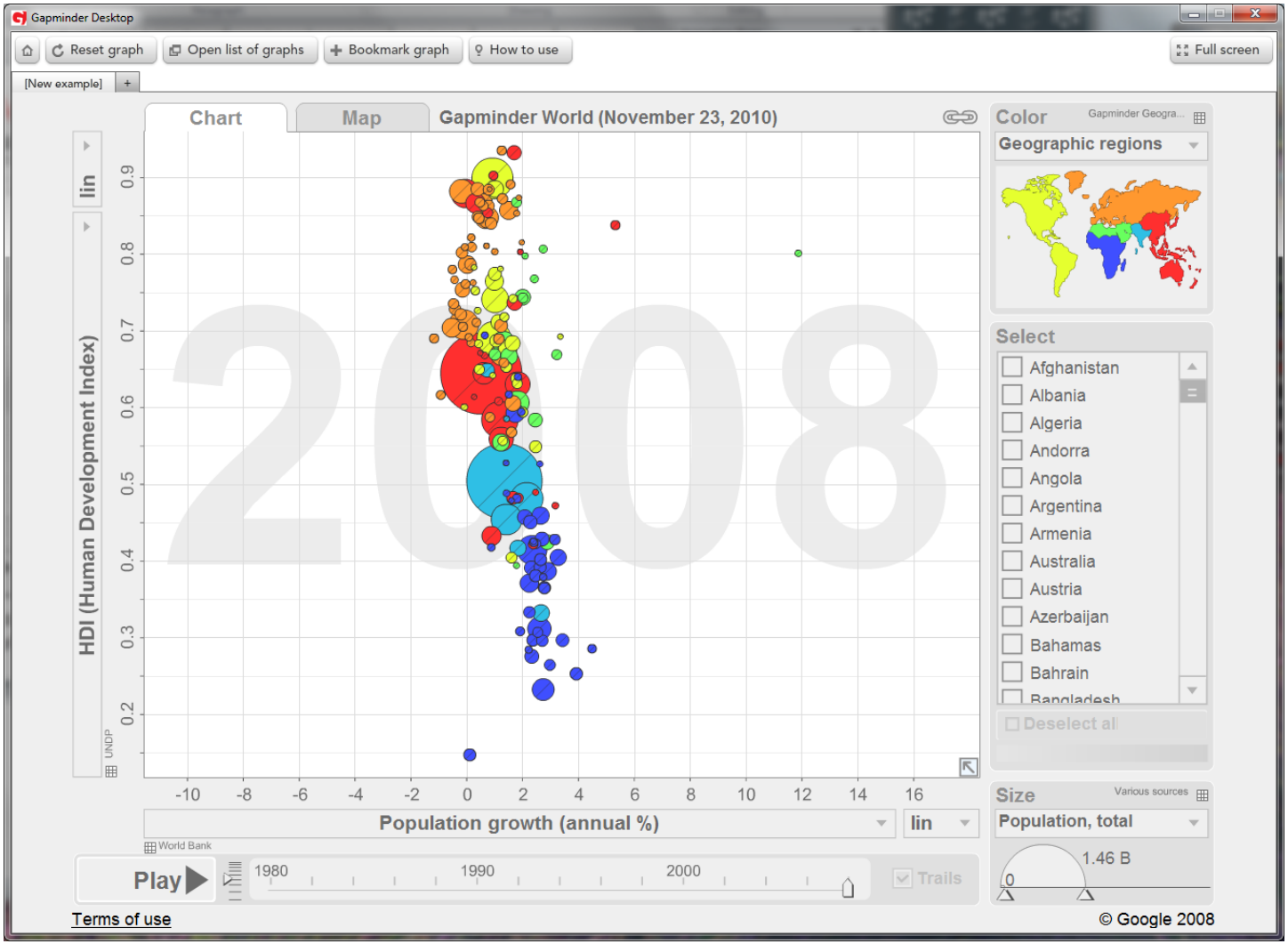
- Bologna, Italy, is ground zero for a social revolution: its fertility rate is ~0.8
- At present reproductive rates, in 20 years, for each child < 5 yrs there will be:
  - 25 adults > 50 yrs
  - 10 adults > 80 years
- Elsewhere, developed world may face a different future of aging and decline, unless births per woman increases, while less-developed world continues to grow dramatically.

# Consequences of a “Baby Bust”

- Leads to inverted pyramids in which a few young must support many old people. Schools, pensions, jobs, health care pose financial burdens that may be harder to meet.
- How can economic growth continue, if the number of consumers declines?
- A population that chooses not to have children is a different kind of society. “You cannot have a successful world without children in it.”
- This is a social revolution in some developed countries. Not one country in Europe has replacement reproduction.



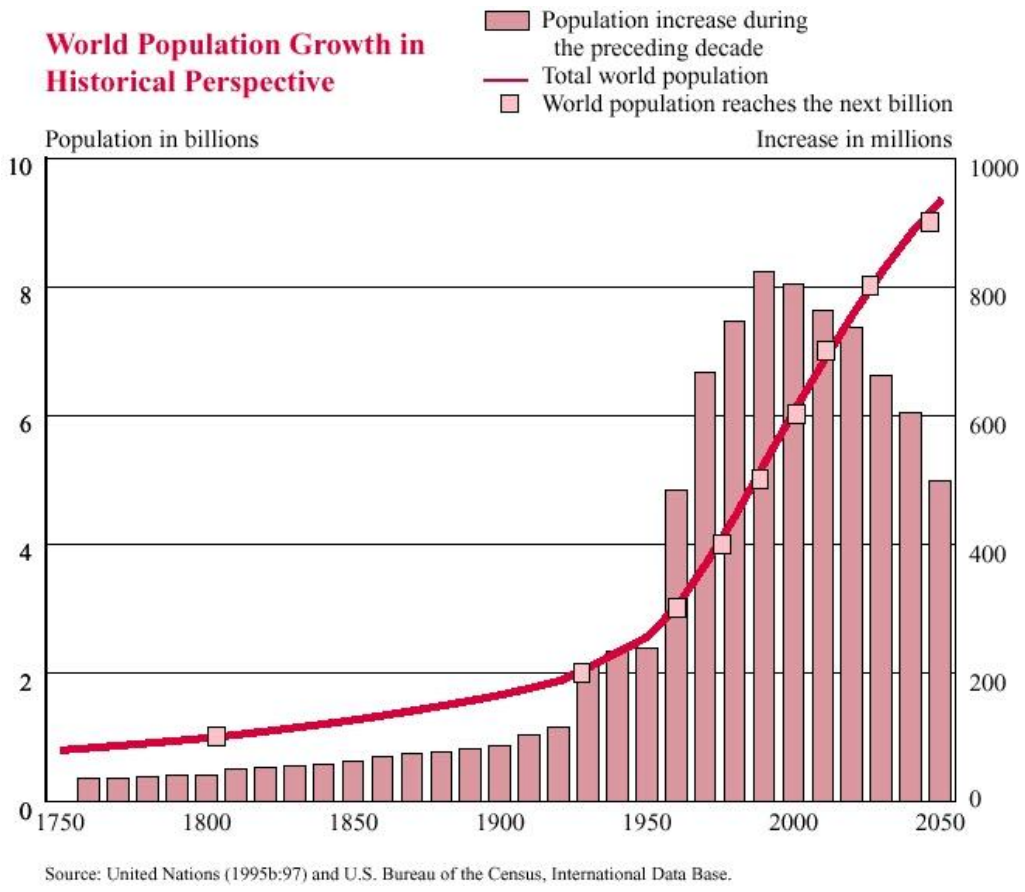
# Developed means Slow Population Growth



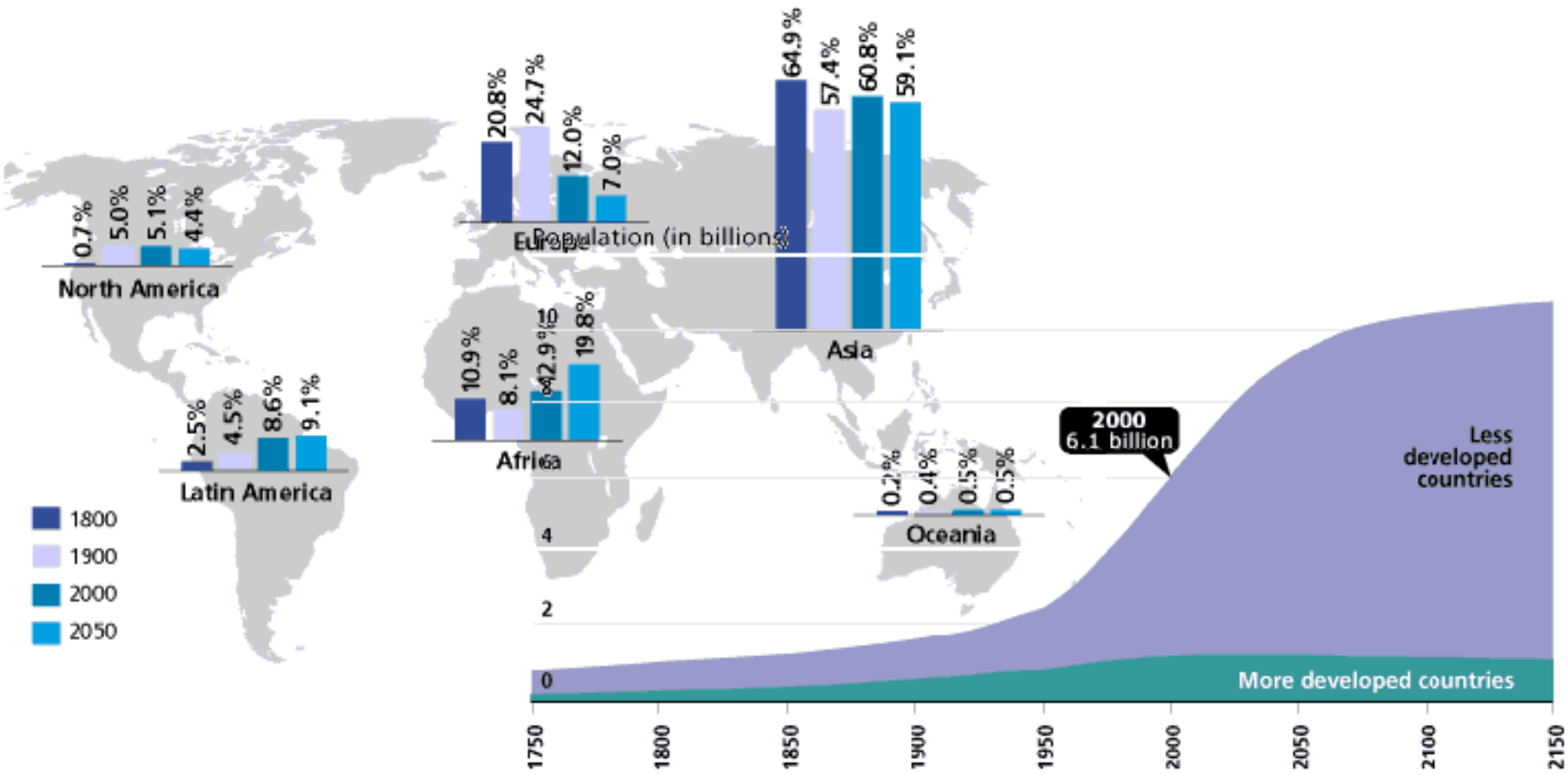

Developed countries are growing more slowly than poorer countries.
Problem of population growth is located in poor countries.

# Human Population - The Future

- Because of momentum represented by a steeply pyramidal age distribution, population growth surely will continue for one to several generations
- Because developing nations have greatest discrepancy between births and deaths (and steepest age pyramids), most growth will occur in developing nations
- Predications of ~9 billion in mid 21st C and 10-12 billion by late 21st C is the consensus, with more recent estimates favoring low range



# Changing Distribution of World Population




The less-developed regions of the world comprised 30% of the global population in 1900, 80% in 2000, and are projected to comprise >90% by 2025

# Some consequences of an (over-)populated world

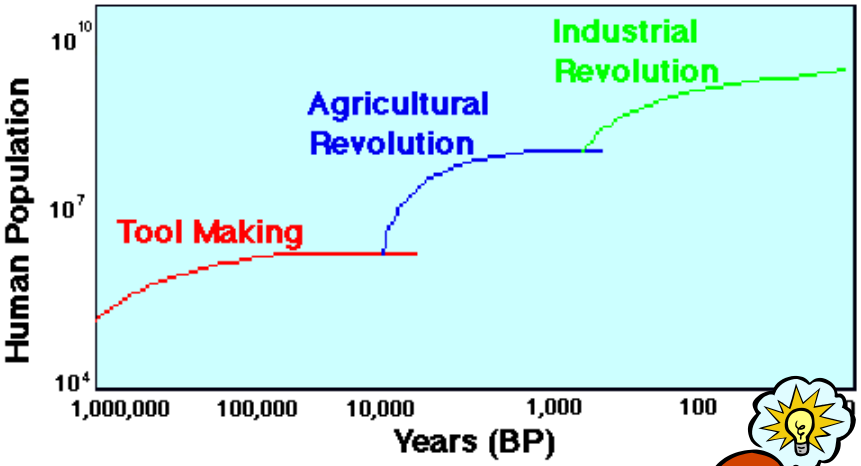
- Too little to eat
  - minimum:  700-1000 calories per day
  - a lot: 3,000 calories per day
  - Estimated that raising a child in US consumes 15-20 times the resources used in raising a child in a developing country
- High child mortality rates
  - low:  10 or fewer per 1,000 live births
  - high:  50-150 per 1,000 live births
- Damage to ecosystem goods and services

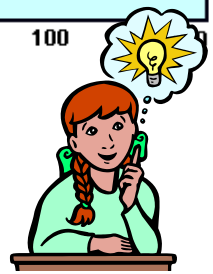
How many people can Earth support?

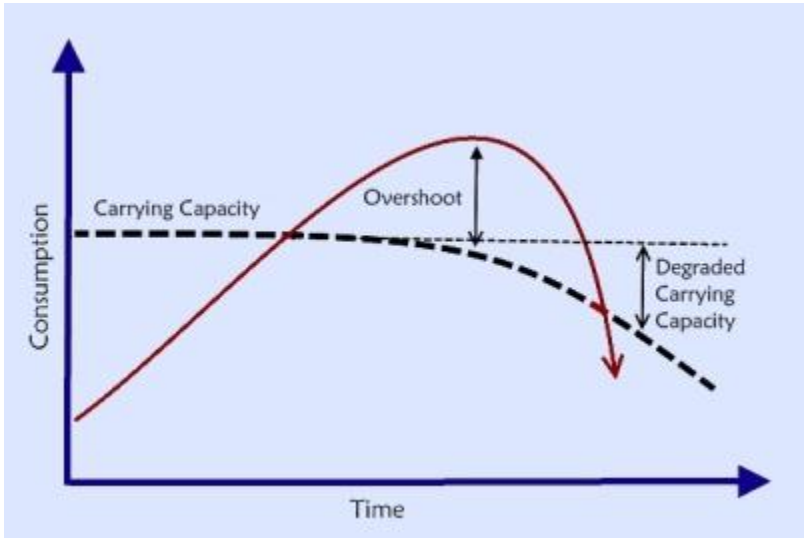
9B, 12B, 15B?

# Some Final Thoughts ....

- A log-based growth curve suggests (although speculative) that human innovations set off episodes of growth.
- Present demographic transition is unlike the past:
  - More rapid
  - Driven by new contraceptive technologies and family planning (e.g., delayed child birth)
- Nation's wealth and status of its population are intimately related
- Population/consumption overshoot leads to degraded carrying capacity
- Solutions to global environmental problems depend in large measure on twin issues of economic development and population limitation





# Life Expectancy 1800-today