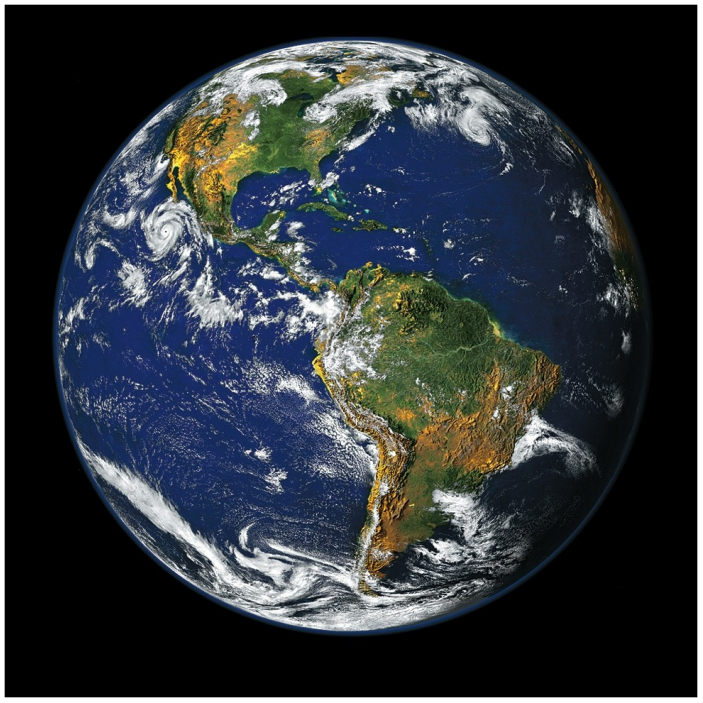


Our Climate: A Global Challenge

Academy of Lifelong Learning

Denver, CO

March 12, 2015

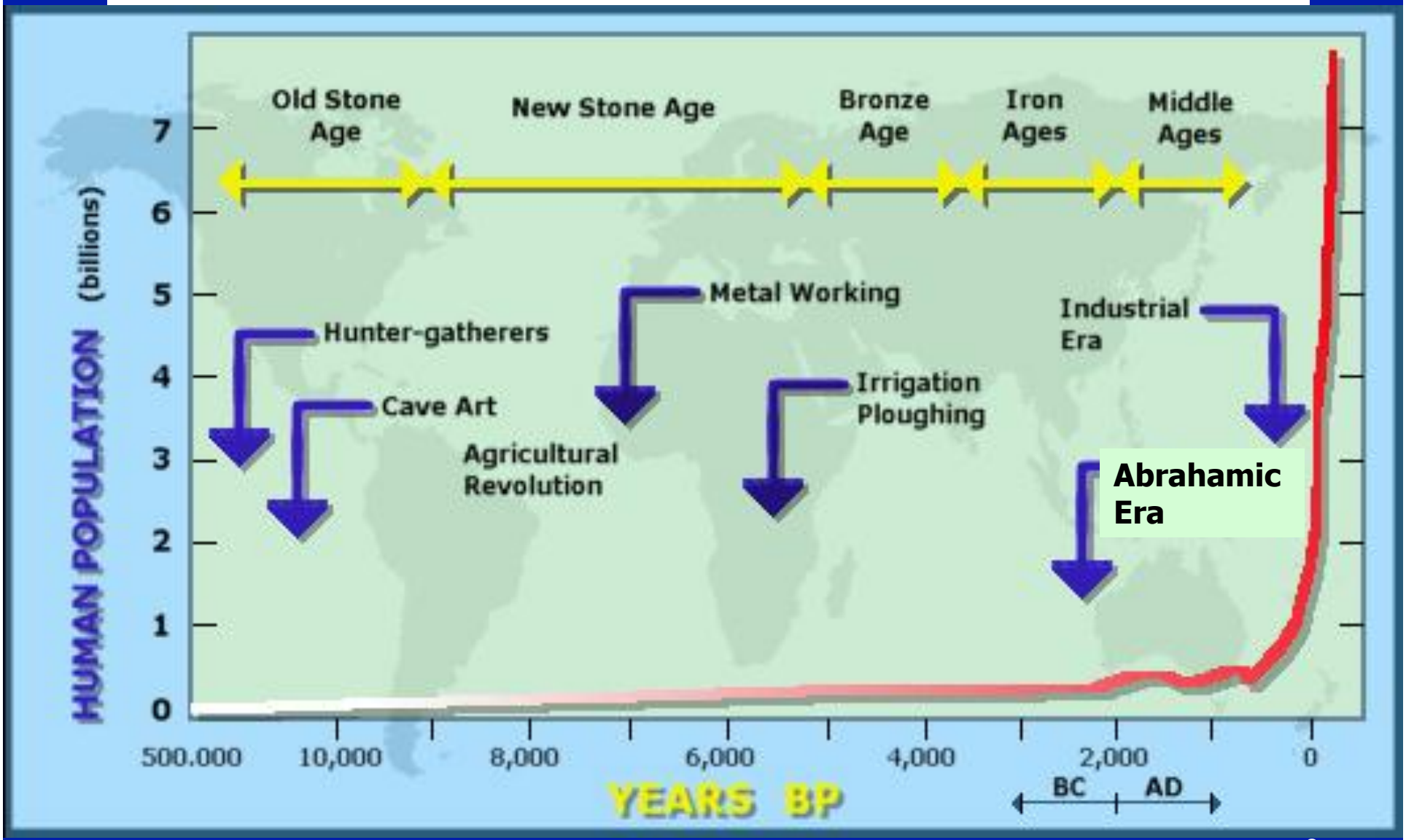
JFOrmes@comcast.net

Population

Hominids first appeared in the Neogene Period, about 3.5 M years ago.

Identifiable cultures started 10-20,000 years ago.

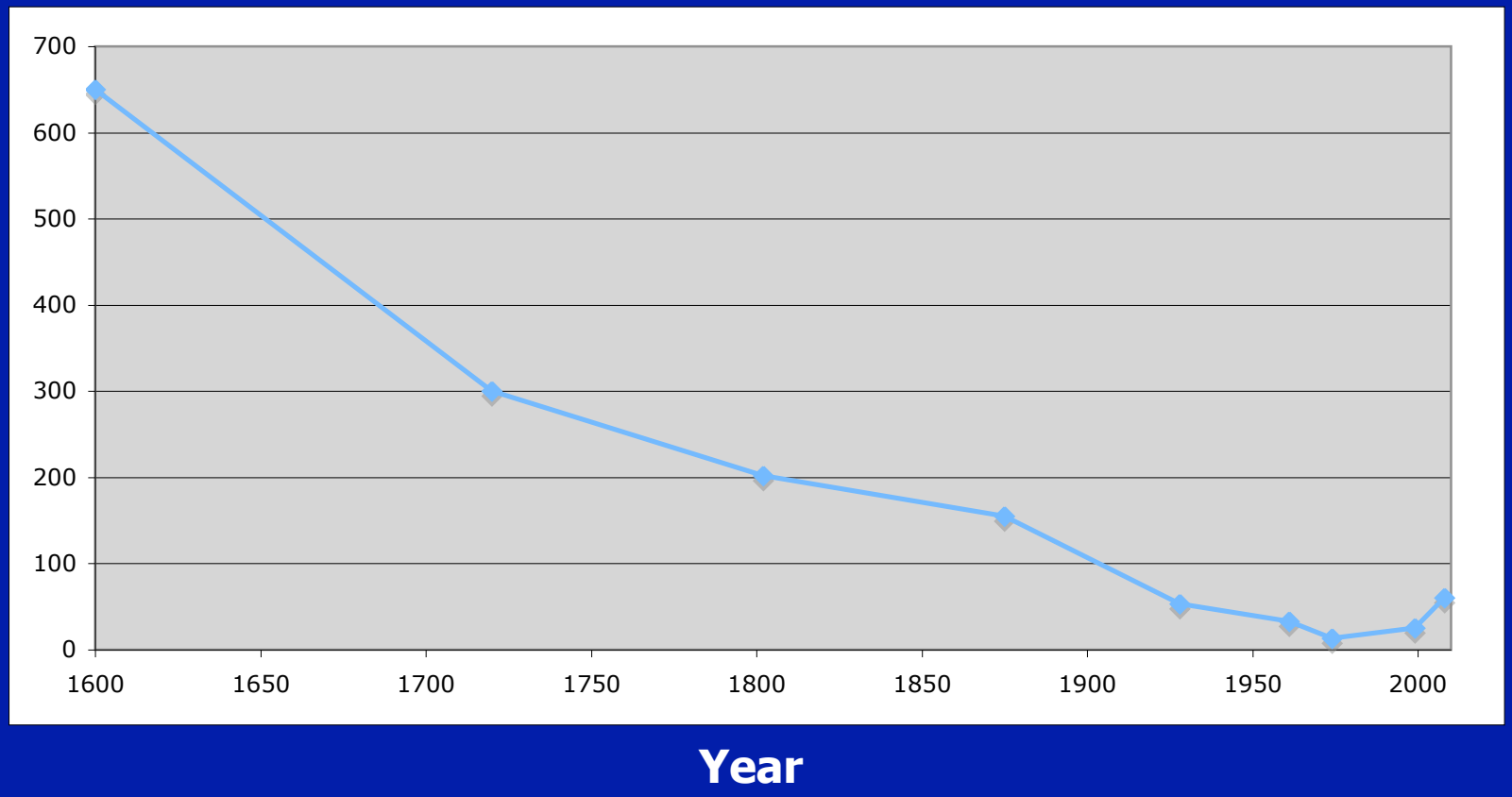
World Population Growth Through History



Population doubling

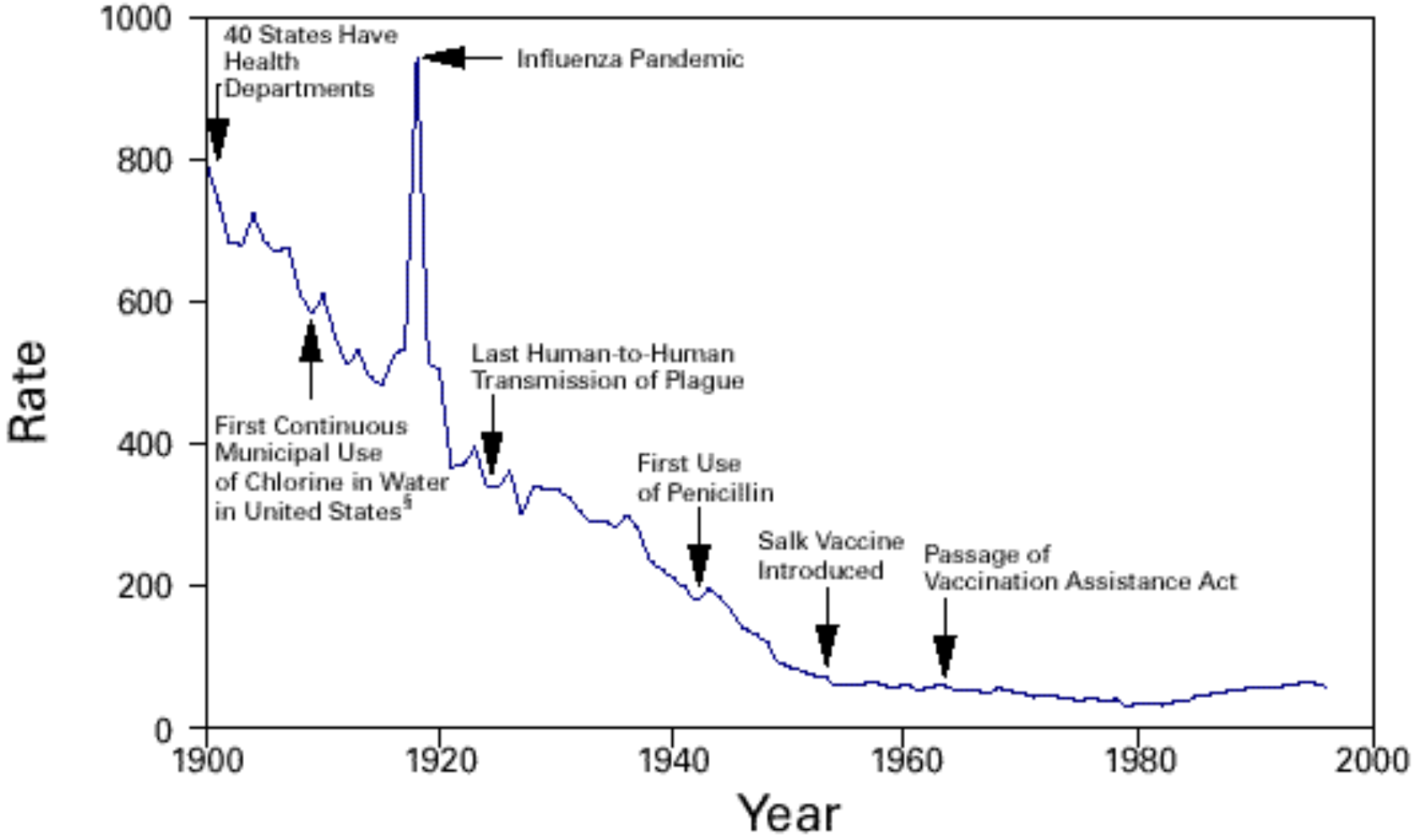
20th Century growth rate was "super exponential" up to about 1975.
Now it is linear at about 1 billion/(12 years)

Population doubling time



20th Century growth rate was “super exponential”

FIGURE 1. Crude death rate* for infectious diseases — United States, 1900–1996†

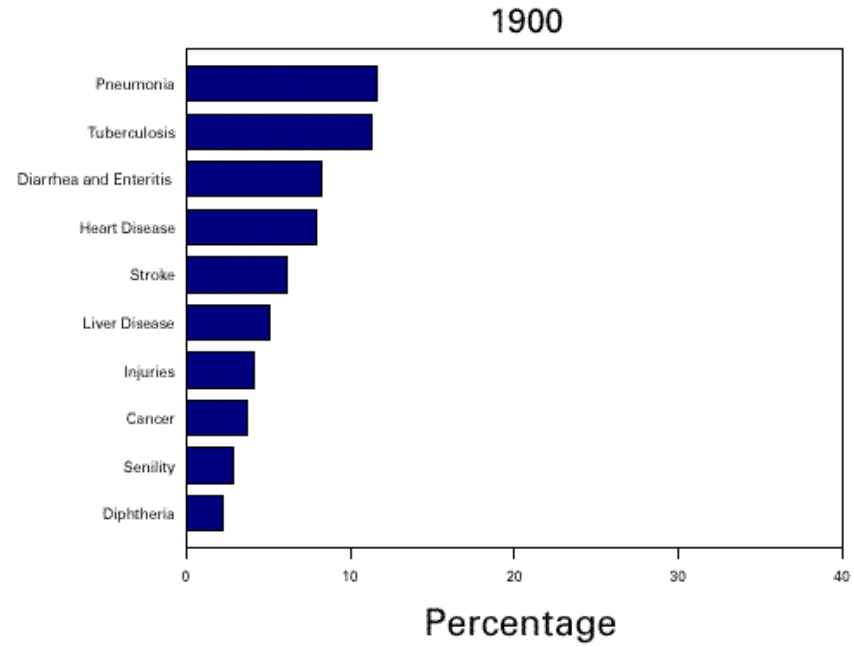


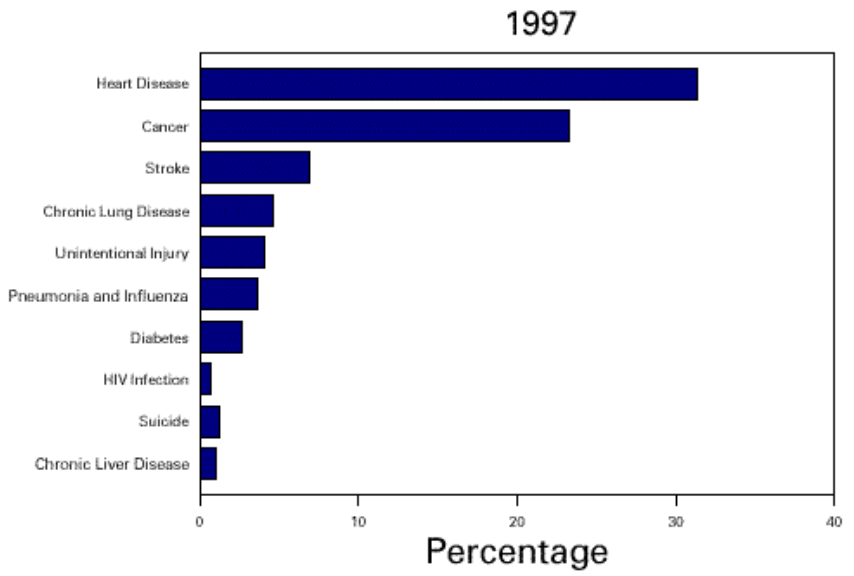
*Per 100,000 population per year.

†Adapted from Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th century. JAMA 1999:281;61–6.

§American Water Works Association. Water chlorination principles and practices: AWWA manual M20. Denver, Colorado: American Water Works Association, 1973.

FIGURE 2. The 10 leading causes of death as a percentage of all deaths — United States, 1900 and 1997

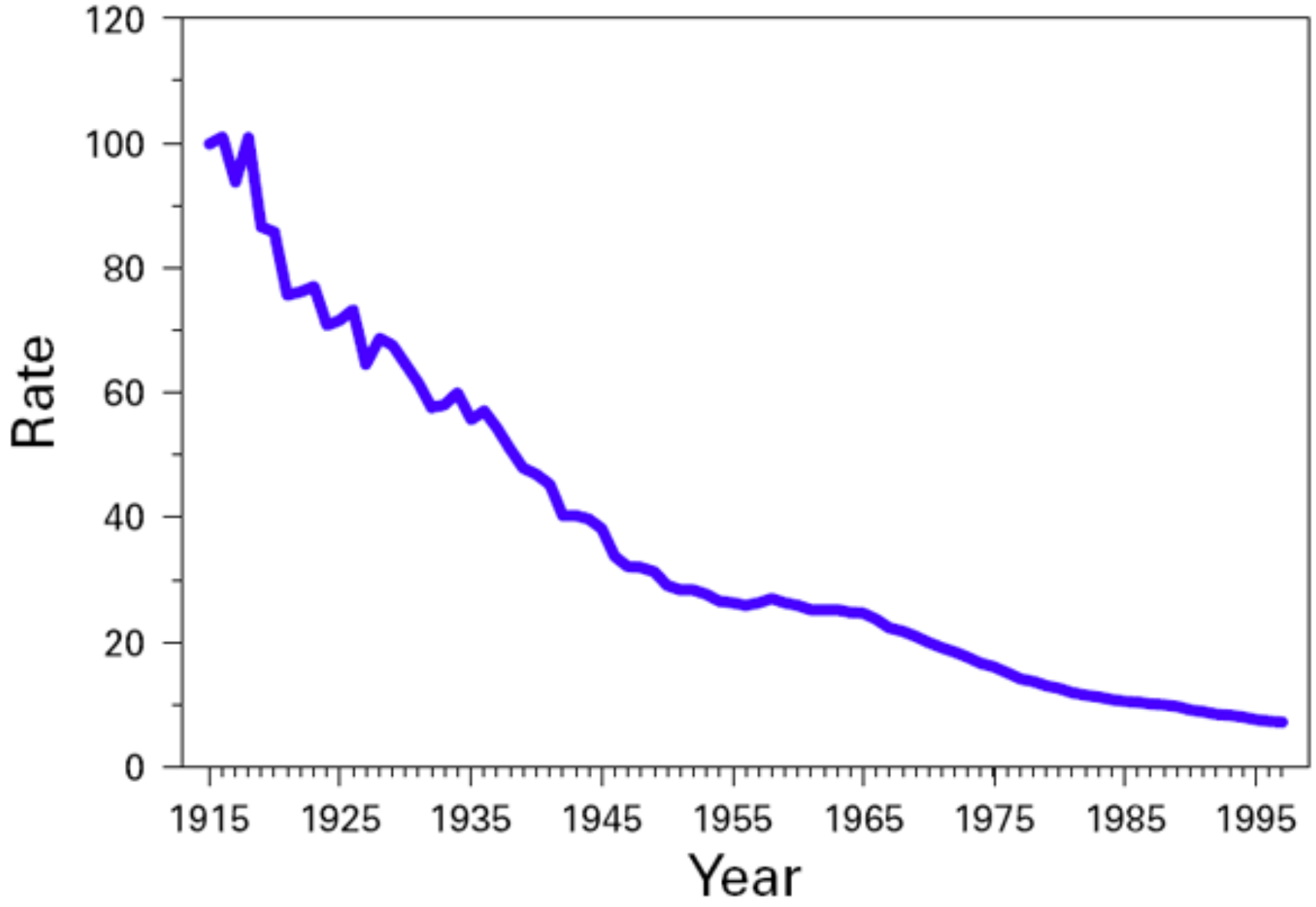




Causes of death "Saeculum XX" (aka 20th century)

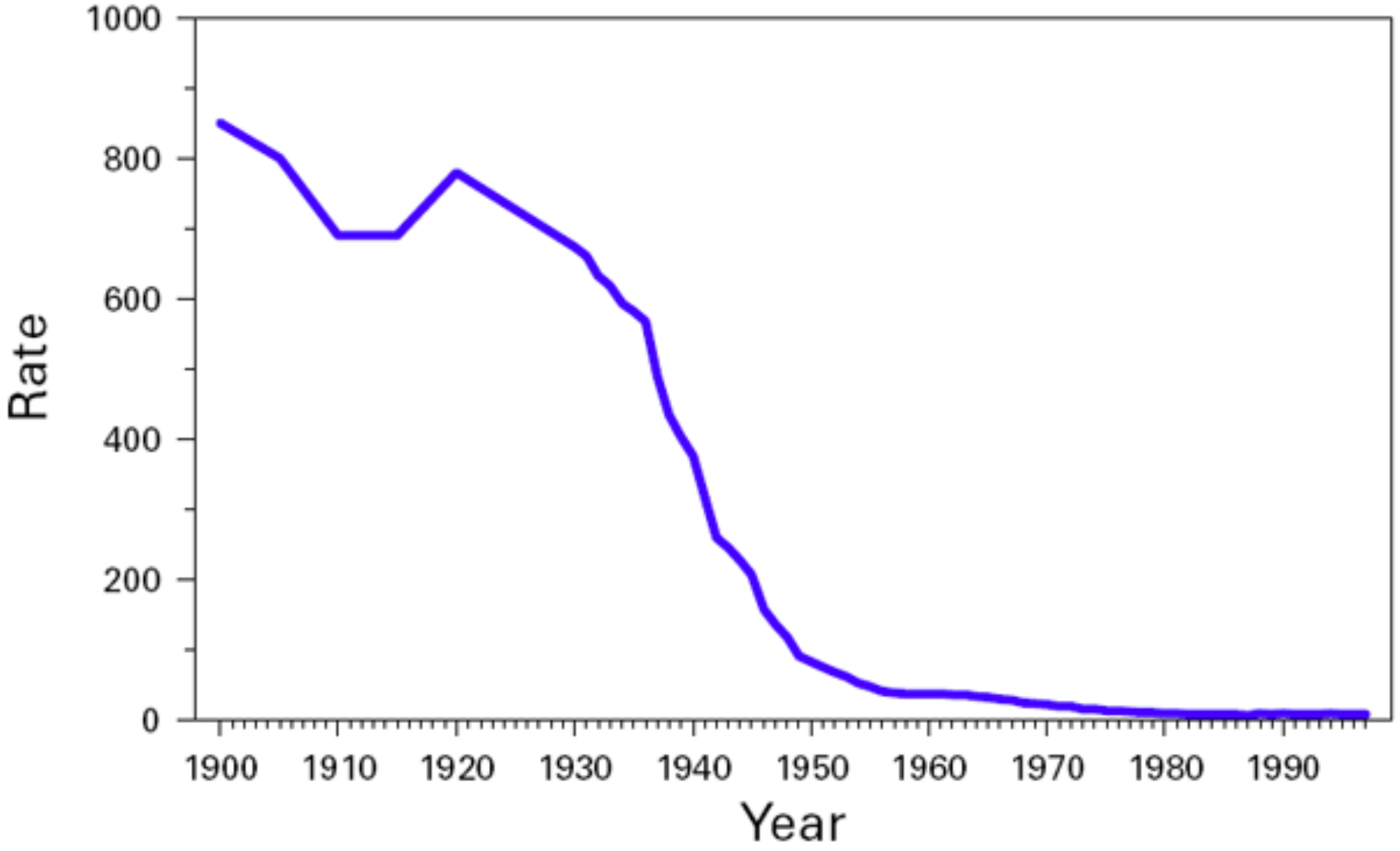
To compare rates, divide by ~20.

FIGURE 1. Infant mortality rate,* by year — United States, 1915–1997



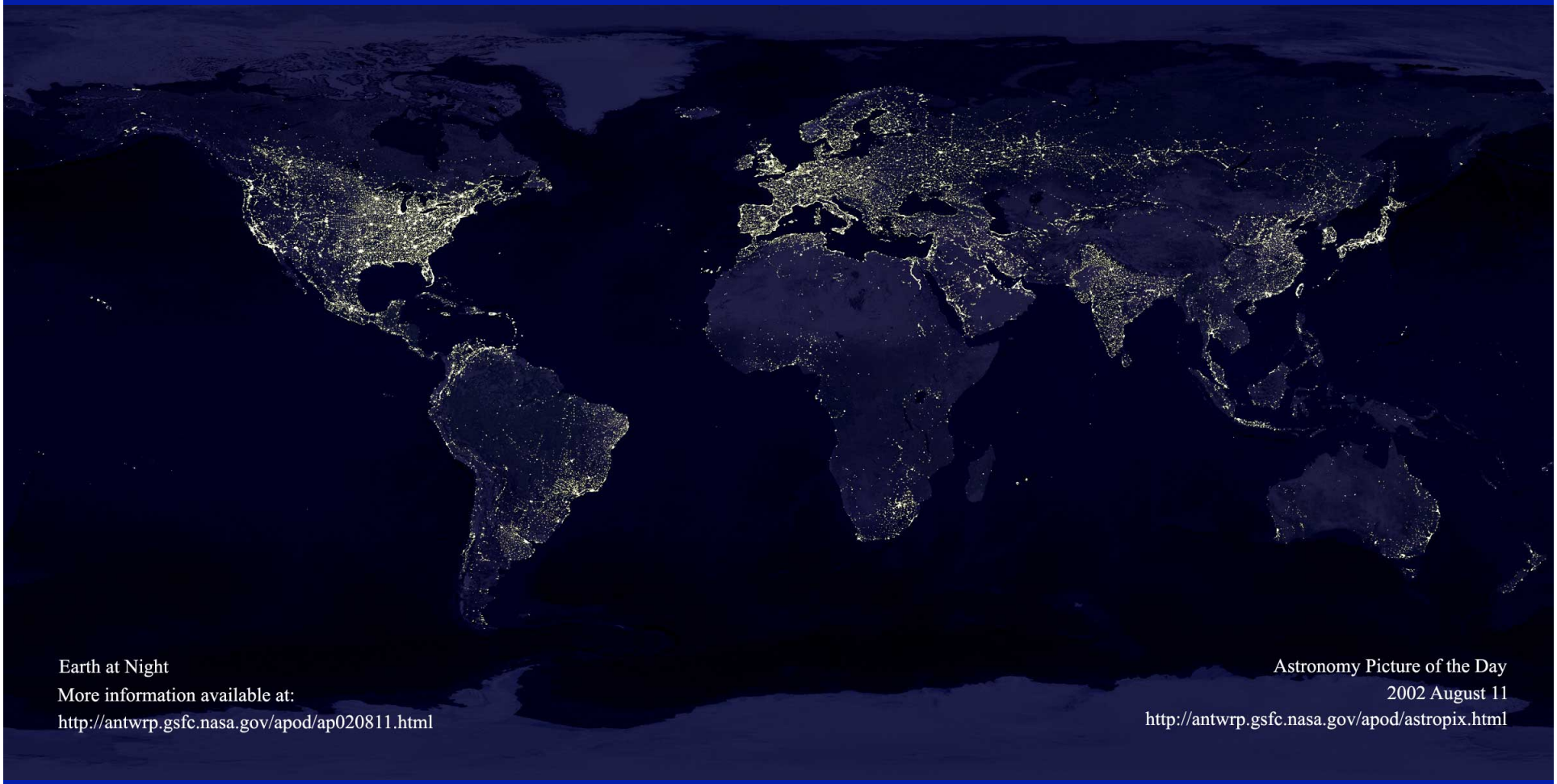
*Per 1000 live births.

FIGURE 2. Maternal mortality rate,* by year — United States, 1900–1997



*Per 100,000 live births.

Earth at night: humans everywhere



Moral: No good invention (e.g. the light bulb) fails to have an impact!

Population

Background on population
Past, present & future

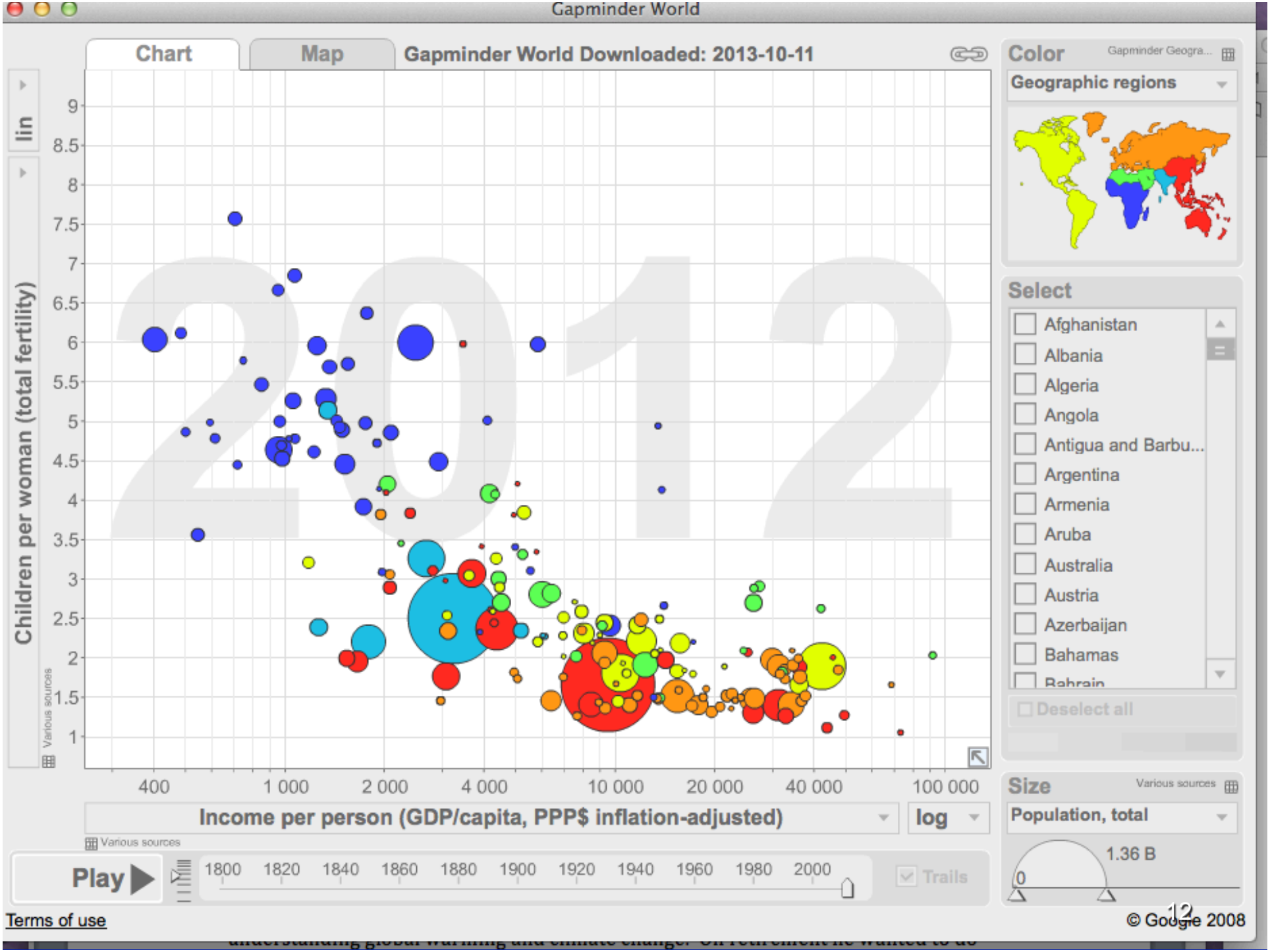
Recommend TED talks by Hans Rosling, Swedish Dr., academic, statistician, lecturer

http://www.ted.com/talks/hans_rosling_on_global_population_growth?language=en

http://www.ted.com/talks/hans_rosling_religions_and_babies?language=en

http://www.gapminder.org

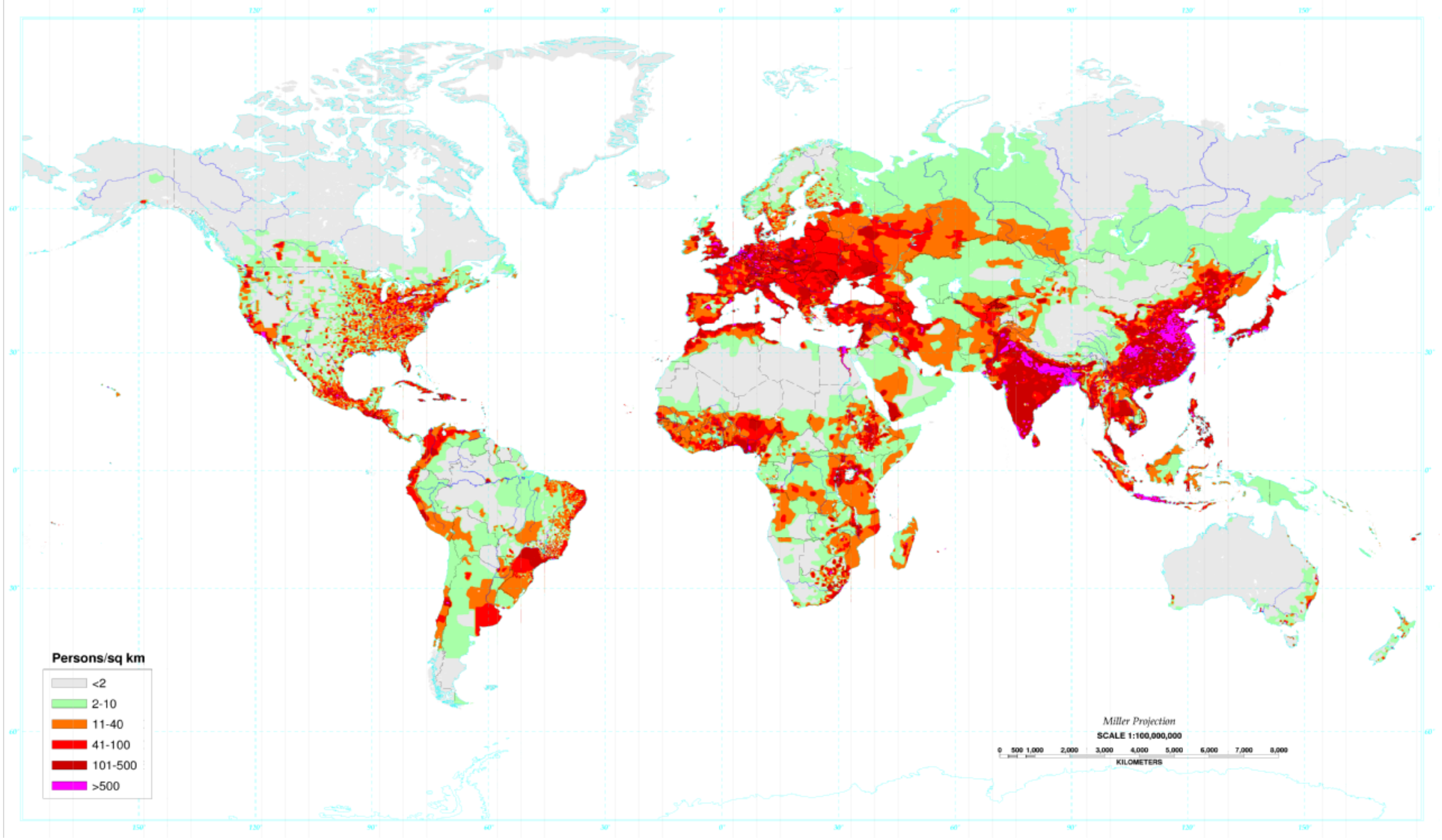
Population pyramids
http://www.worldlifeexpectancy.com/united-states-population-pyramid


Gapminder World
Chart
Map
Gapminder World Downloaded: 2013-10-11
lin
Children per woman (total fertility)
Various sources
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
2012
400
1 000
2 000
4 000
10 000
20 000
40 000
100 000
Income per person (GDP/capita, PPP$ inflation-adjusted)
log
Various sources
Play
1800
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
Trails
Color
Gapminder Geogra...
Geographic regions
Select
Afghanistan
Albania
Algeria
Angola
Antigua and Barbu...
Argentina
Armenia
Aruba
Australia
Austria
Azerbaijan
Bahamas
Deselect all
Size
Various sources
Population, total
1.36 B
0
Terms of use
© Google 2008

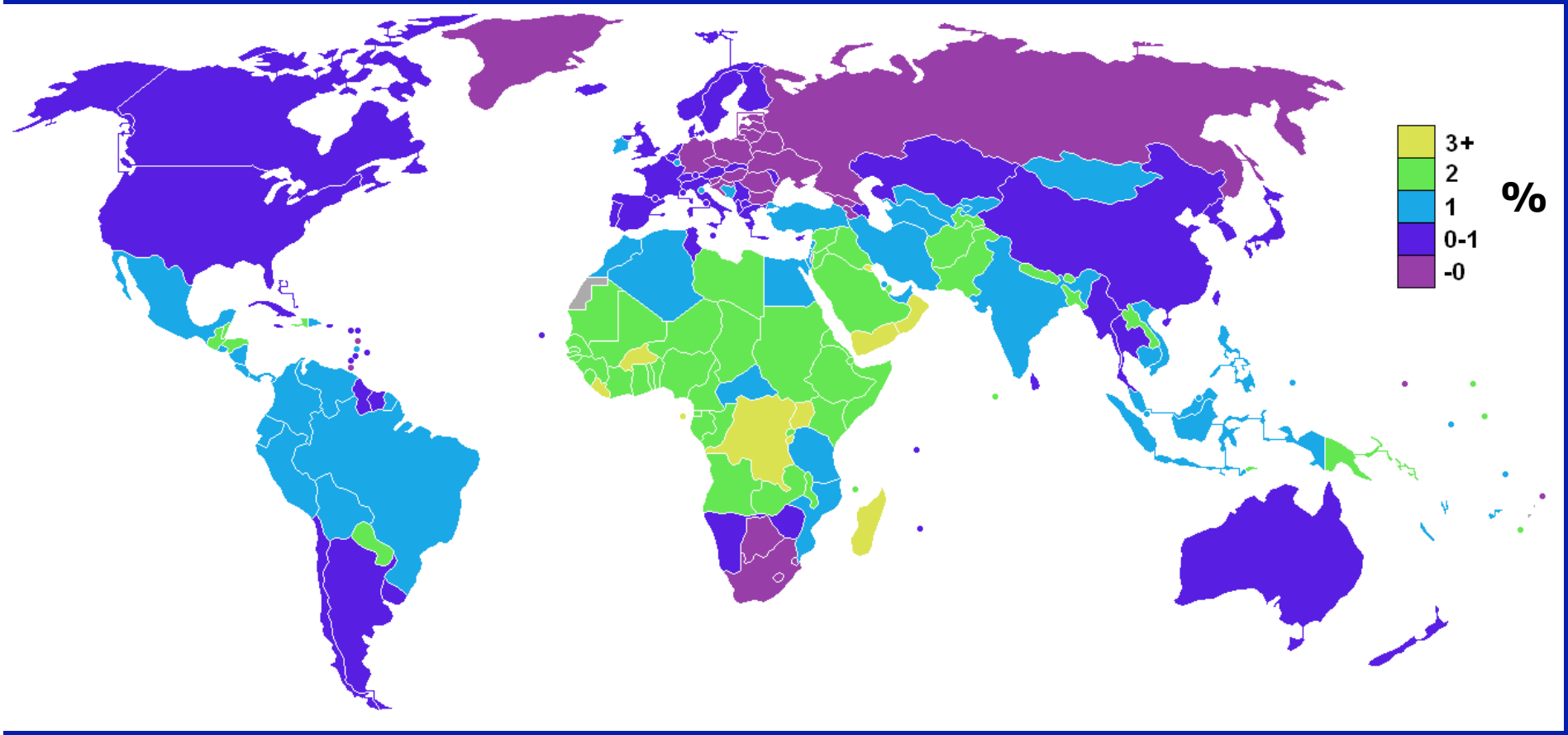
Population

Current status

Population density

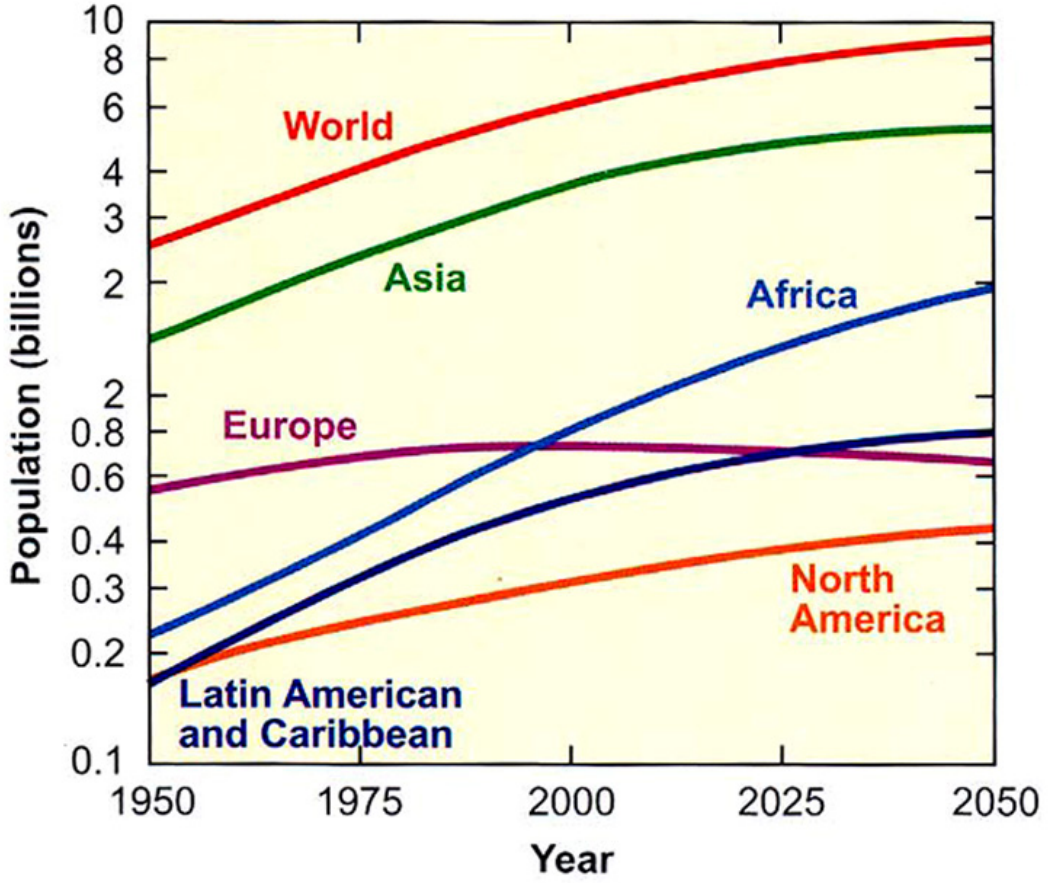


Where is the growth now?



Scale: % growth per annum (ZPG = 0)

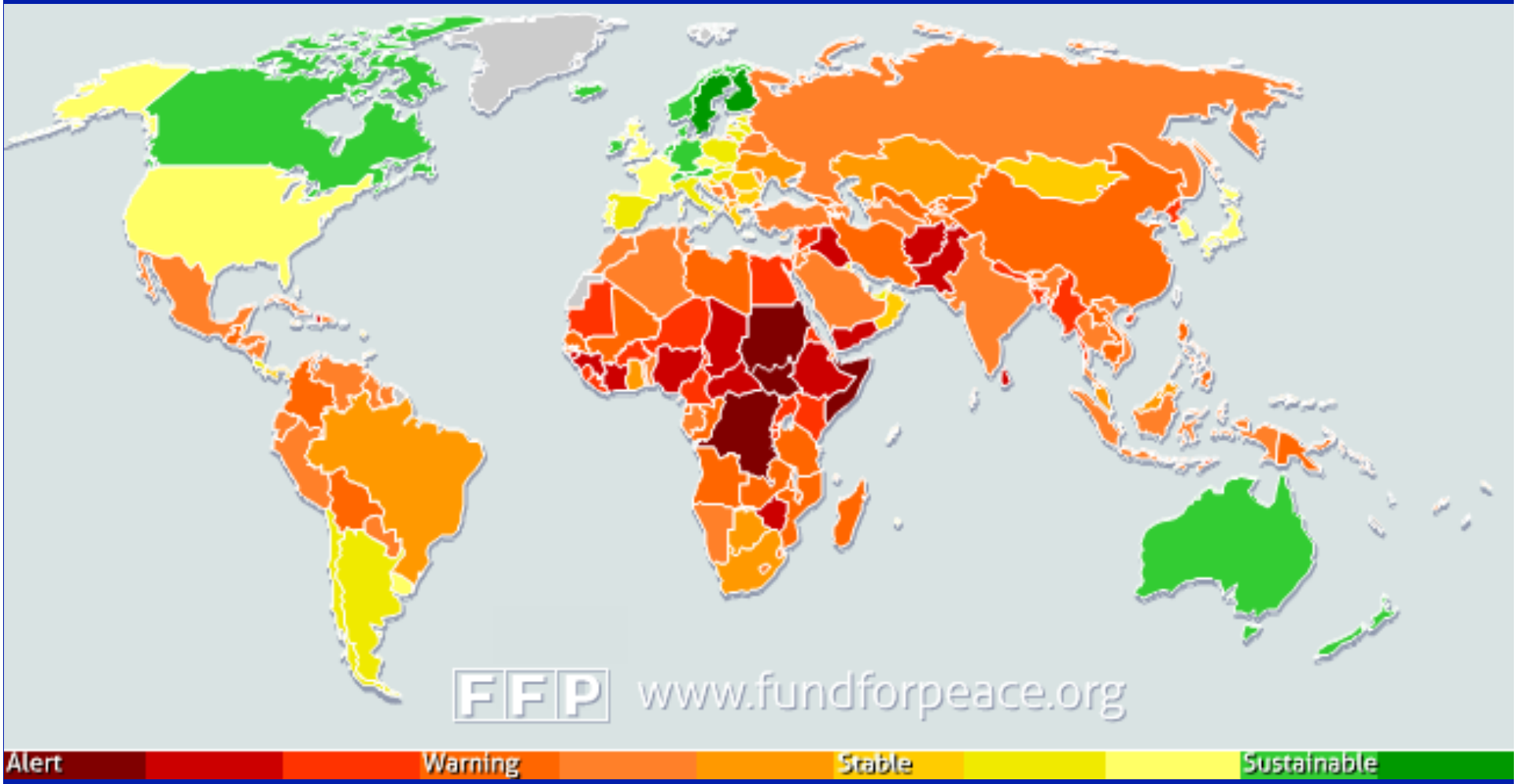
Population growth by region



Population evolution, 1950–2050, on different continents. The vertical axis is logarithmic. (Image courtesy Donal Reiskoffer/Wikipedia.)

Failed states index 2013

Failed States according to the "Failed States Index 2013" of *Foreign Policy*



Alert Warning Stable Sustainable

Failed states

- Somalia
- Congo (D. R.)
- Sudan
- South Sudan
- Chad
- Yemen
- Afganistan
- Haiti
- Central African Rep.
- Zimbabwe
- Iraq
- Cote d'Ivoire
- Pakistan
- Guinea
- Guineau Bissau
- Nigeria

Scandinavian Countries tops; USA 20th

Indicators

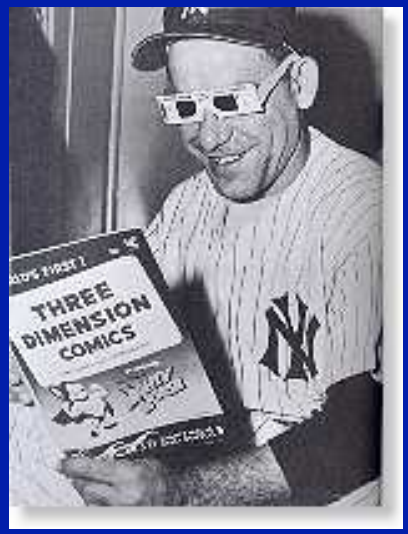
- Social
  - Demographic pressures
  - Refugees
  - Vengeance seeking/ Group grievance
  - Human flight/Brain drain
- Economic
  - Uneven Econ. Devel.
  - Poverty & Econ. Decline
- Political/Military
  - State legitimacy
  - Public services
  - Human rights
  - Security
  - Factionalized elites
  - External Intervention

Population

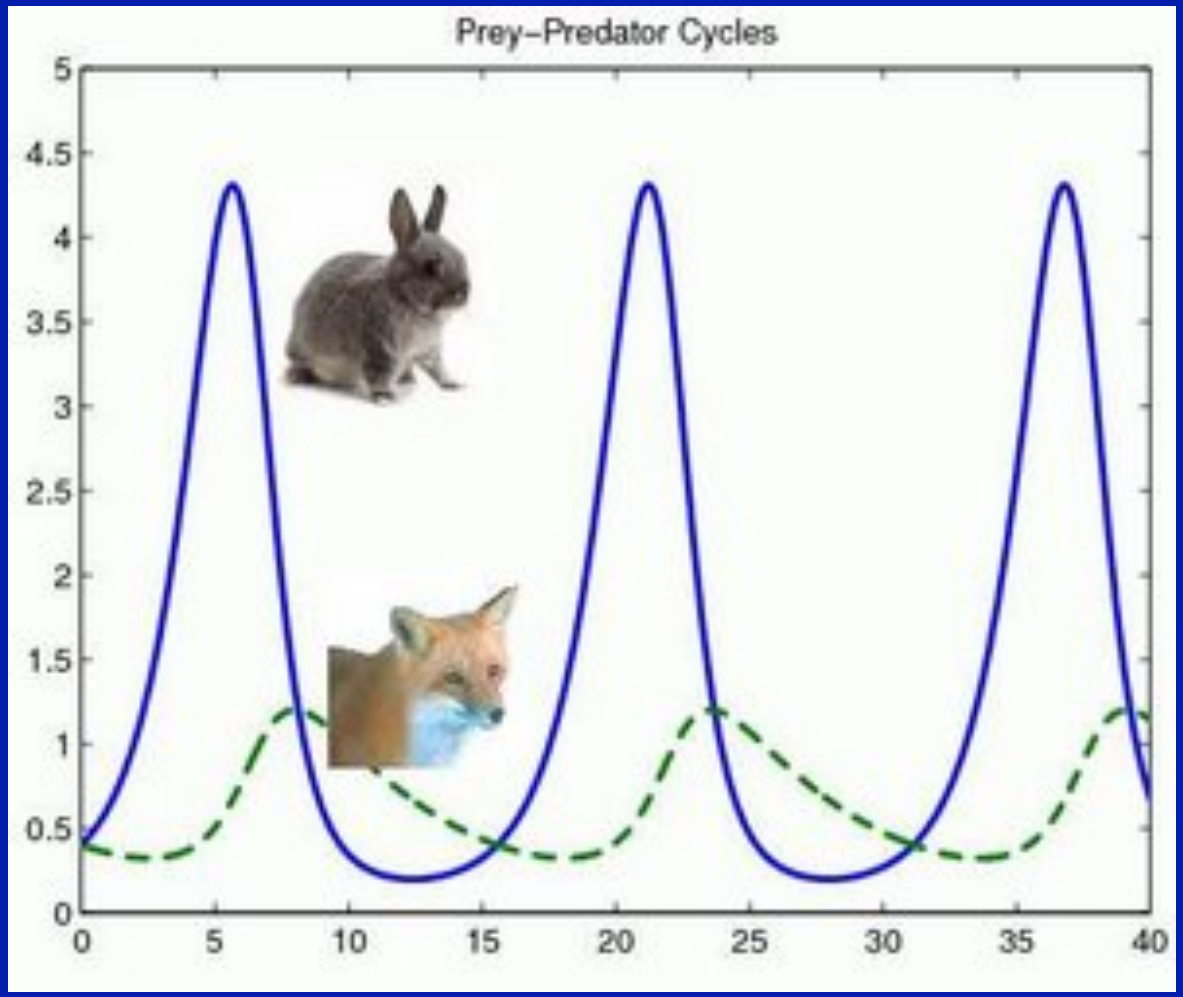
Projections

- “It’s hard to make predictions, especially about the future.”

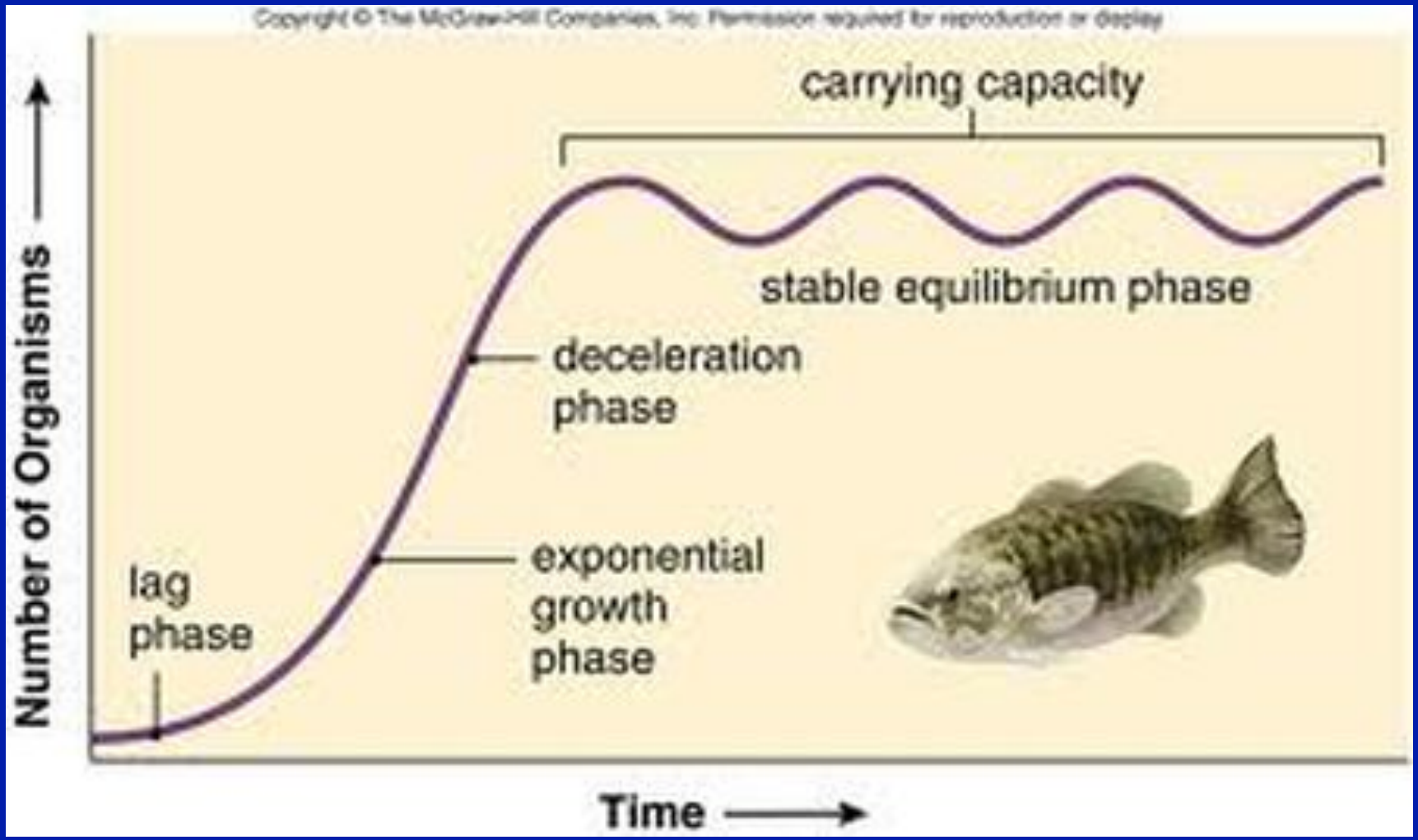
Lawrence Peter "Yogi" Berra



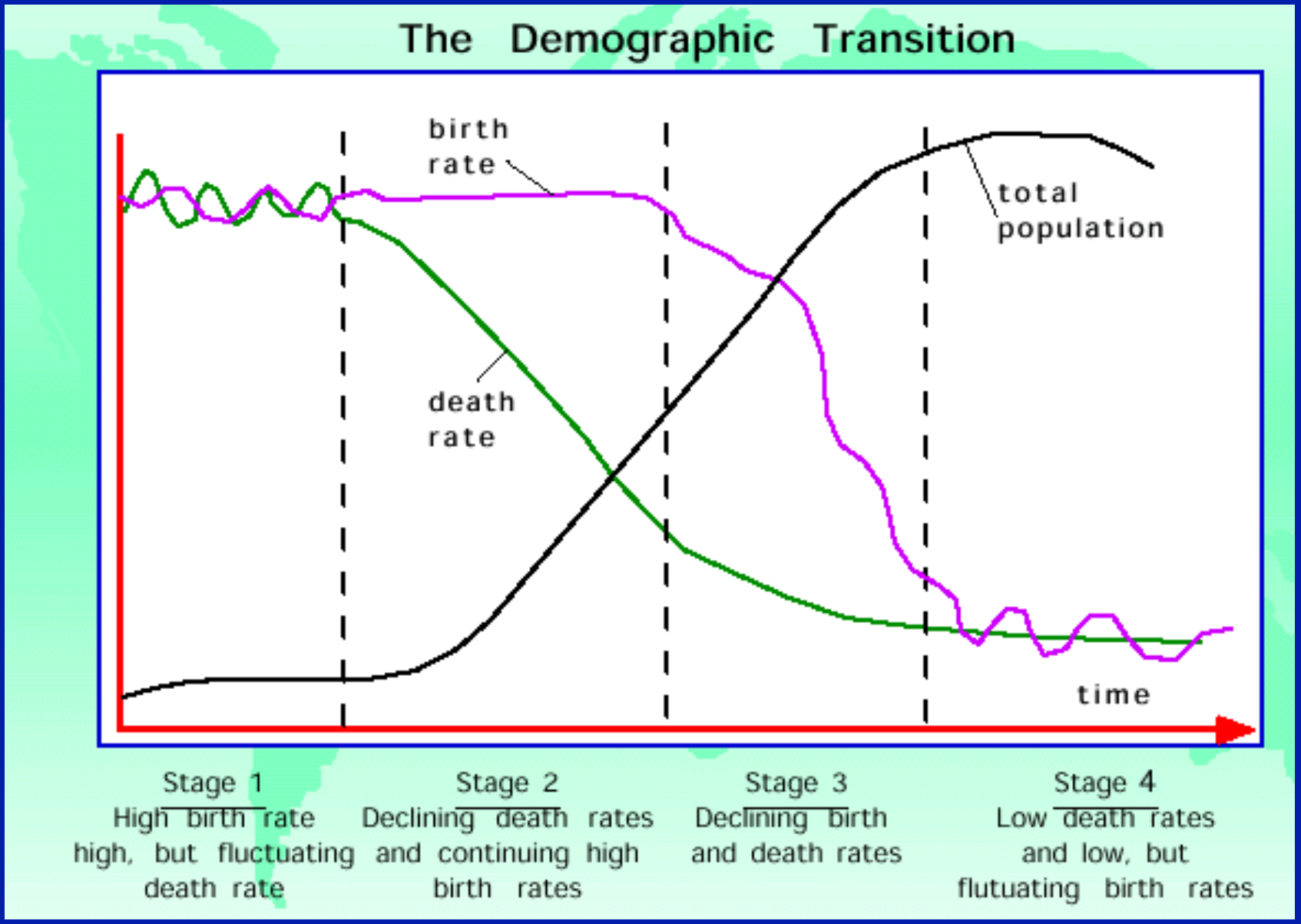
predator prey population cycle



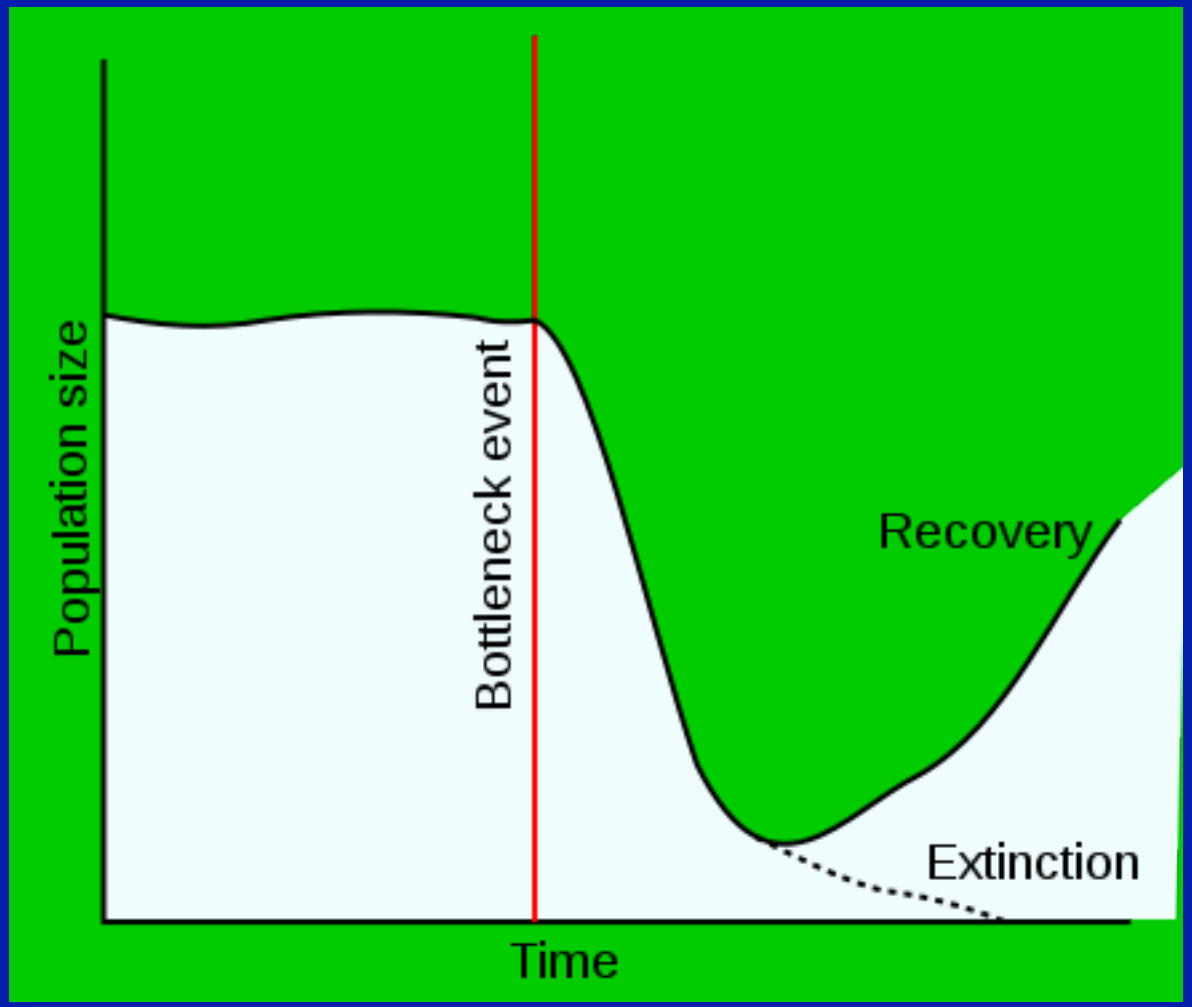
resource limited population model



Demographic transition: optimist's hope!



Population bottleneck



An external event suddenly decreases a population reducing the gene pool.

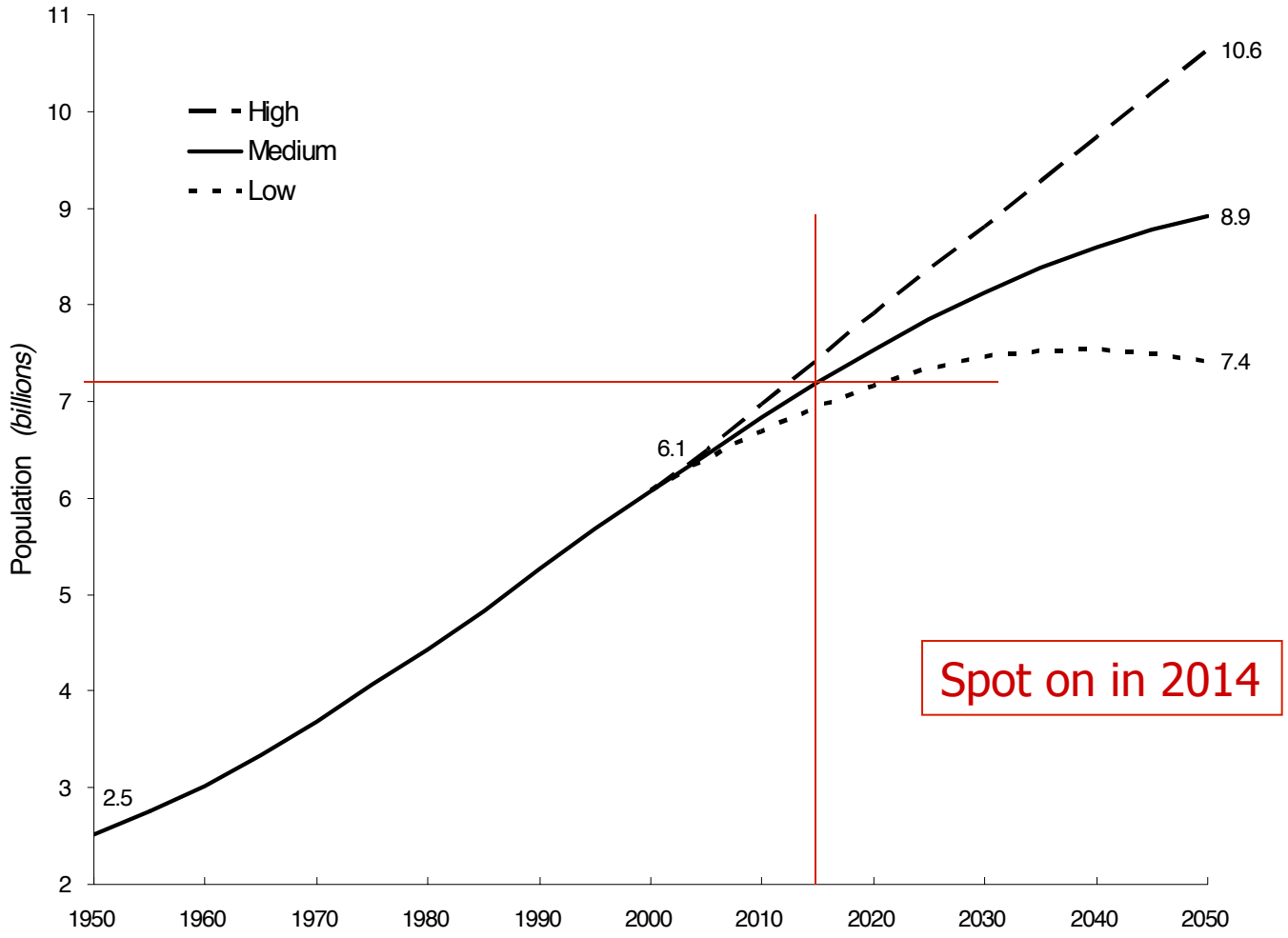
Human hunting has induced bottlenecks for many species.

- Passenger pigeons
- California condors

UN projections to 2050 (made 2000)

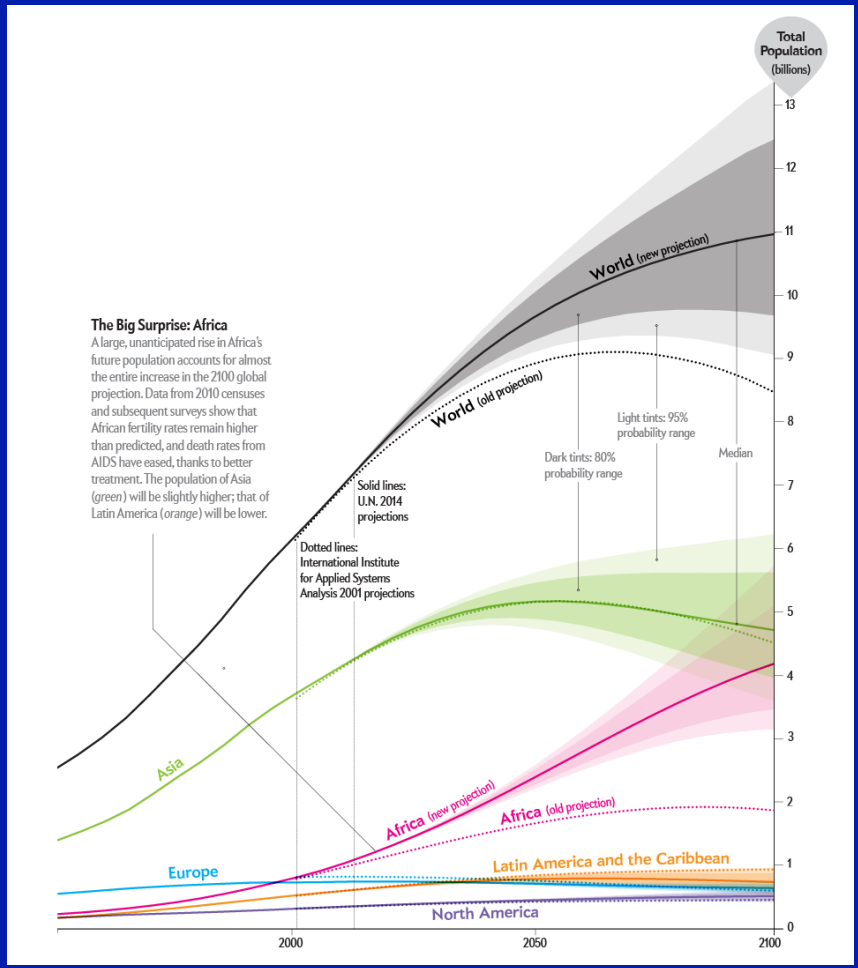
World Population to 2300

Figure 1. Estimated world population, 1950-2000, and projections: 2000-2050

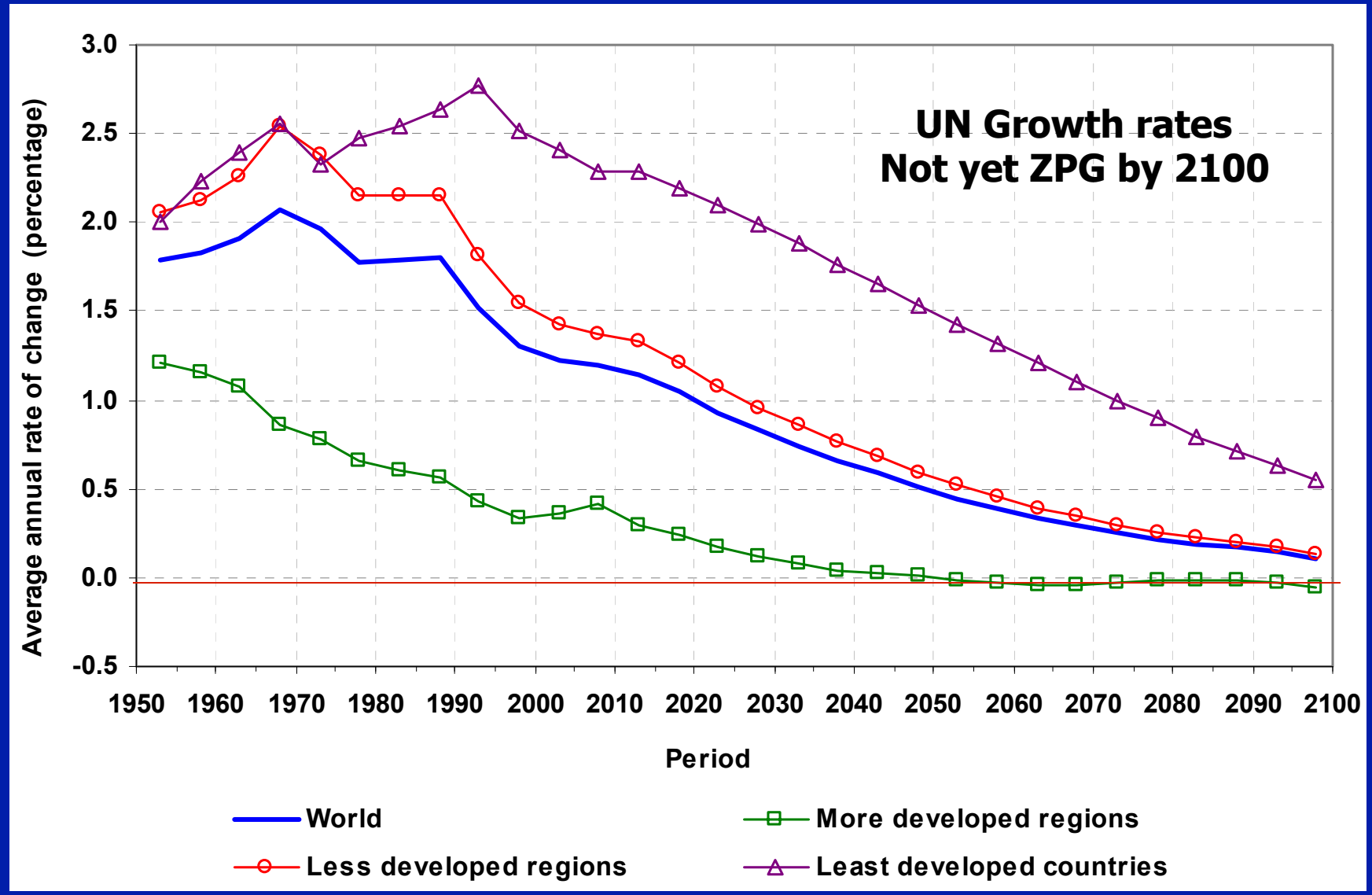


New projection Nov. 2014

Earlier models "had anticipated that fertility rates in Africa would drop quickly, but they haven't," says Adrian Raftery, a statistician at the University of Washington, who assessed the revised estimates. How the world will feed a few billion more people is the question of the day.



Scientific American
World population will hit nearly 11 billion by 2100
Nov 18, 2014 |By Mark Fischetti


UN Growth rates
Not yet ZPG by 2100
Average annual rate of change (percentage)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Period
World
More developed regions
Less developed regions
Least developed countries

Summary

The **high fertility curves** won't happen because the planet cannot support that many people.

Mother Nature will limit population

- How she does it might not be pretty

Population's future

- We will reach >10 billion unless some catastrophe
- Empower women to bring the poorest 2 B out of poverty, else growth will continue
- Assuming this happens the age distribution will become more uniform and potentially stable
- Main issue is the carrying capacity of the Earth: How many can we water and feed?

Babies per woman < 2 => stable population

Babies per woman decrease when

- Children survive
- Children not needed for work
- Empower women
- Family planning is accessible

If you're not pro birth control, you're not pro life!

Credit Hans Rosling, TED talk 2012