



Development Economics
In 90 Minutes or less or it's Free!

Dennis Nall & Aziz Madjido

Are You Smarter than a Chimpanzee?



http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html

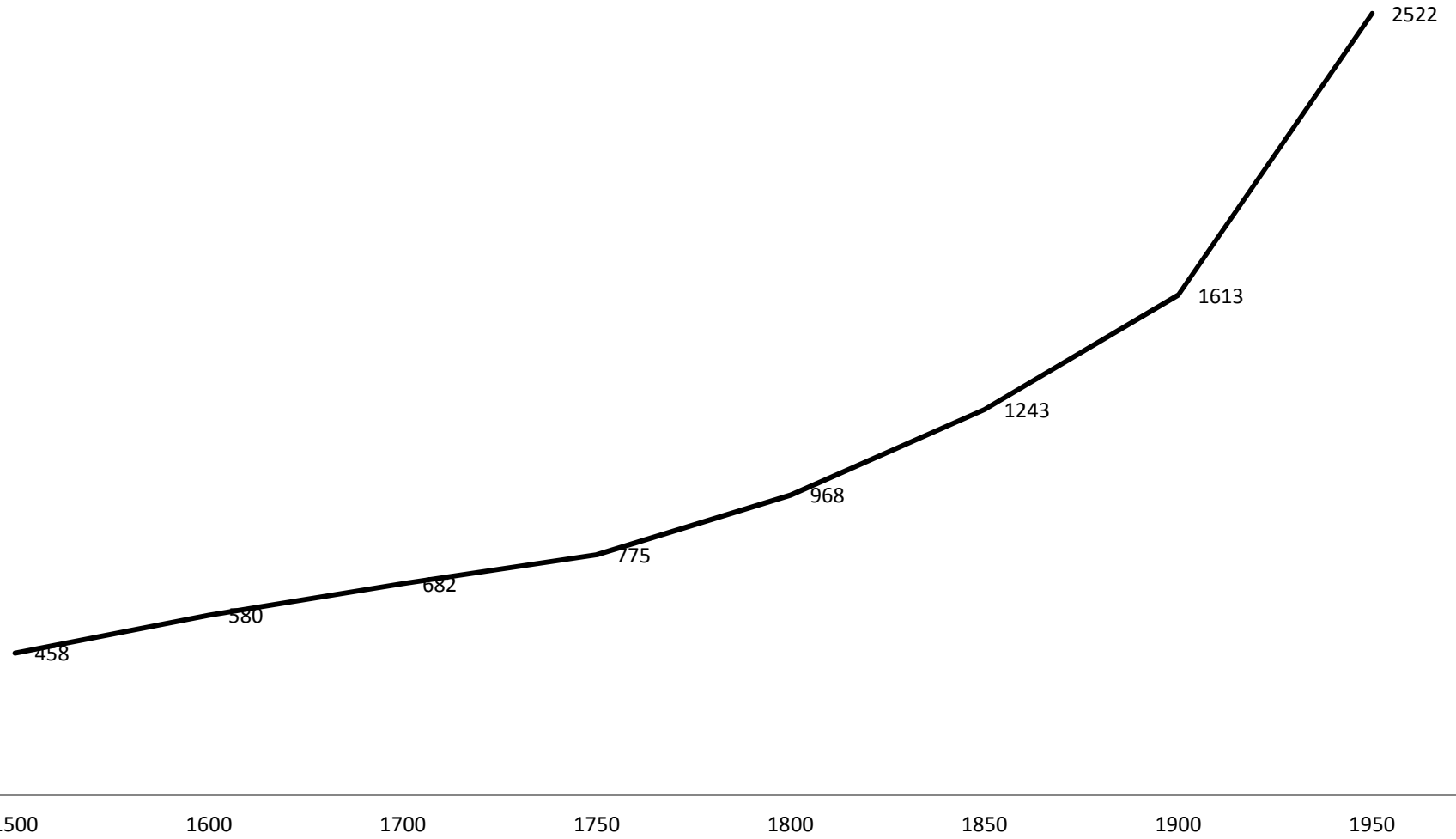


Population, Maternal, & Child Mortality

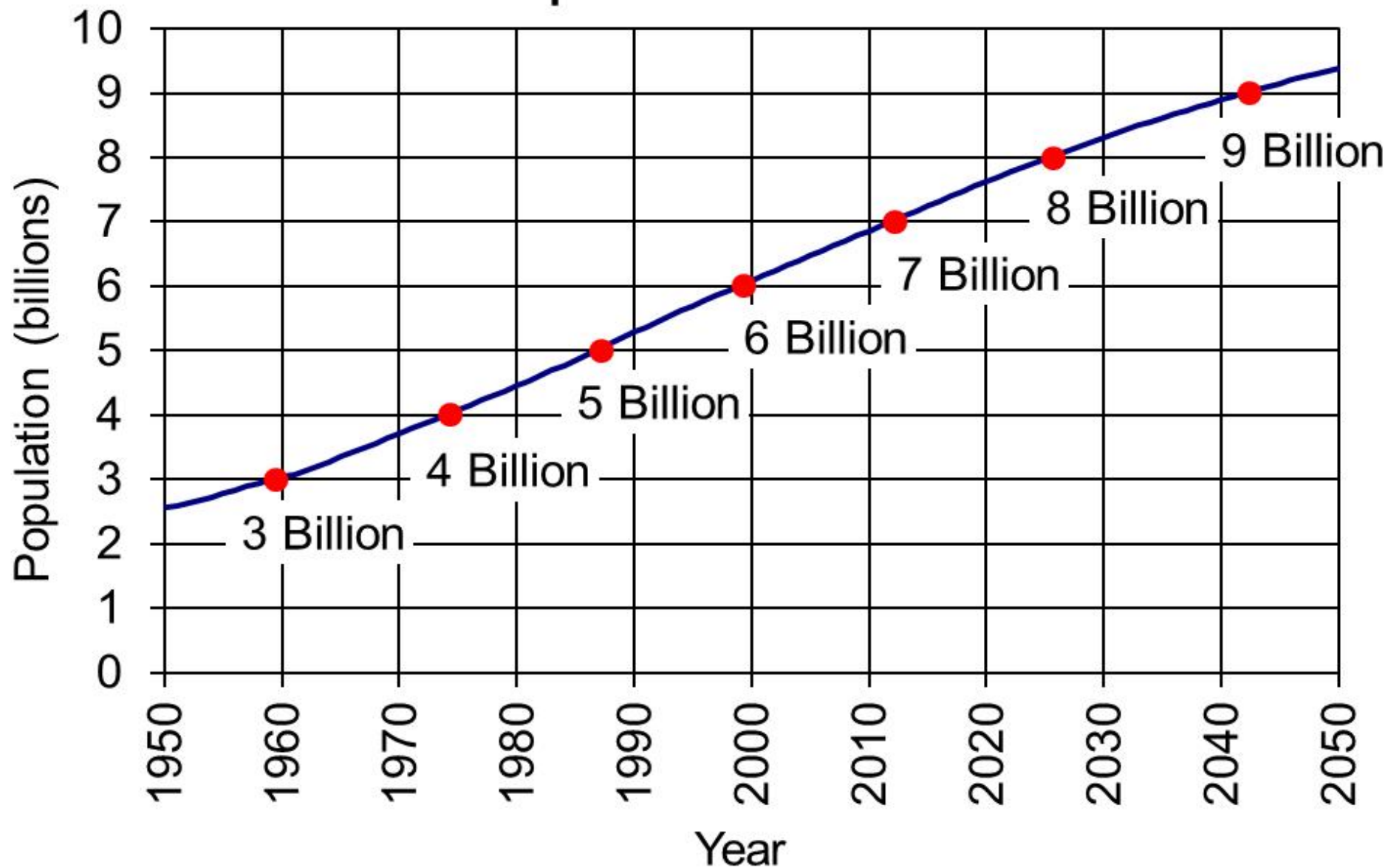


Population (Millions)

1500 - 1950



World Population: 1950-2050



Source: U.S. Census Bureau, International Data Base, June 2012 Update.

2013 7 Billion and Counting

U.S. and World Population Clock

Note: The Population Clock is consistent with 2010 Census data and the most recent national population estimates.

Oct 30, 2013 18:10 UTC (Eastern-5)

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U.S. Population

3 1 6 , 9 7 6 , 0 4 5



World Population

7 , 1 2 1 , 0 9 7 , 9 8 1

COMPONENTS OF POPULATION CHANGE

18:10:42 UTC

One birth every 8 seconds



One death every 12 seconds



One international migrant (net) every 44 seconds



Net gain of one person every 14 seconds

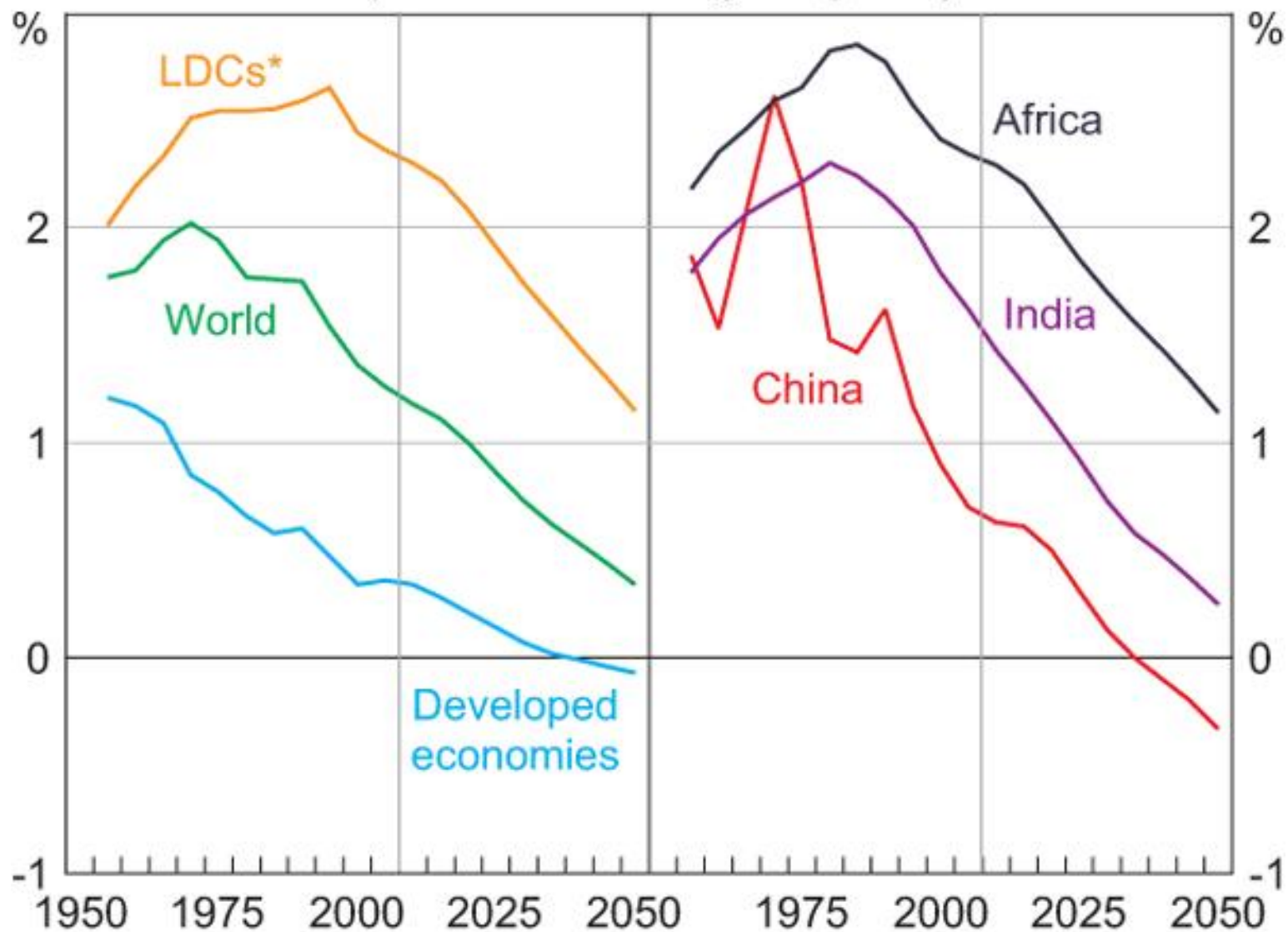


TOP 10 MOST POPULOUS COUNTRIES

1. China	1,349,585,838	6. Pakistan	193,238,868
2. India	1,220,800,359	7. Nigeria	174,507,539
3. United States	316,668,567	8. Bangladesh	163,654,860
4. Indonesia	251,160,124	9. Russia	142,500,482
5. Brazil	201,009,622	10. Japan	127,253,075

Population Growth

Five-year annual average to given year



* The world's 49 least developed countries

Source: United Nations

Trends in Life Expectancy



LIFE EXPECTANCY THROUGH THE AGES

Early humans did not generally live long enough to develop heart disease, cancer or loss of mental function. A snapshot of how life expectancy has changed, and the big killers of each era:

AVERAGE LIFE EXPECTANCY

30 years



Neanderthals (30,000 years ago): Died of injuries caused by rock falls, hunting accidents and conflicts. Food scarcity led to malnutrition. These hunter-gatherer groups contracted diseases that spread from animals. Rabies, tuberculosis, brucellosis, yellow fever and encephalitis were widespread.

38

Neolithic (8500 BC to 3500 BC): Agriculture, irrigation and urbanization brought problems associated with settled populations, such as fecal contamination of water and diseases such as cholera, smallpox, typhoid, polio and influenza. Malaria and other diseases carried by mosquitoes and insects, which fed on domesticated animals, appeared.



35 **Classical Greece and Rome**

(500 BC to 500 AD): Tuberculosis, typhoid fever, smallpox and scarlet fever spread among the denser urban populations. Malnutrition, gastroenteritis and violence were also big killers.

48 **EARLY MEDIEVAL**



Medieval period (500 AD to 1500 AD): Life expectancy grew with urbanization, but famine caused by crop failures and bubonic plague were the big killers. The Black Death (1347-1351) wiped out 25 million people in Europe and 60 million in Asia, returning several times, culminating in the Great Plague of London (1664-1666). By 1500, life expectancy had dropped back to 38.

38 **LATE MEDIEVAL**

40

Victorian (1850s to 1900): Typhus, typhoid fever, rickets, diphtheria, tuberculosis, scarlet fever and cholera raged in crowded cities.



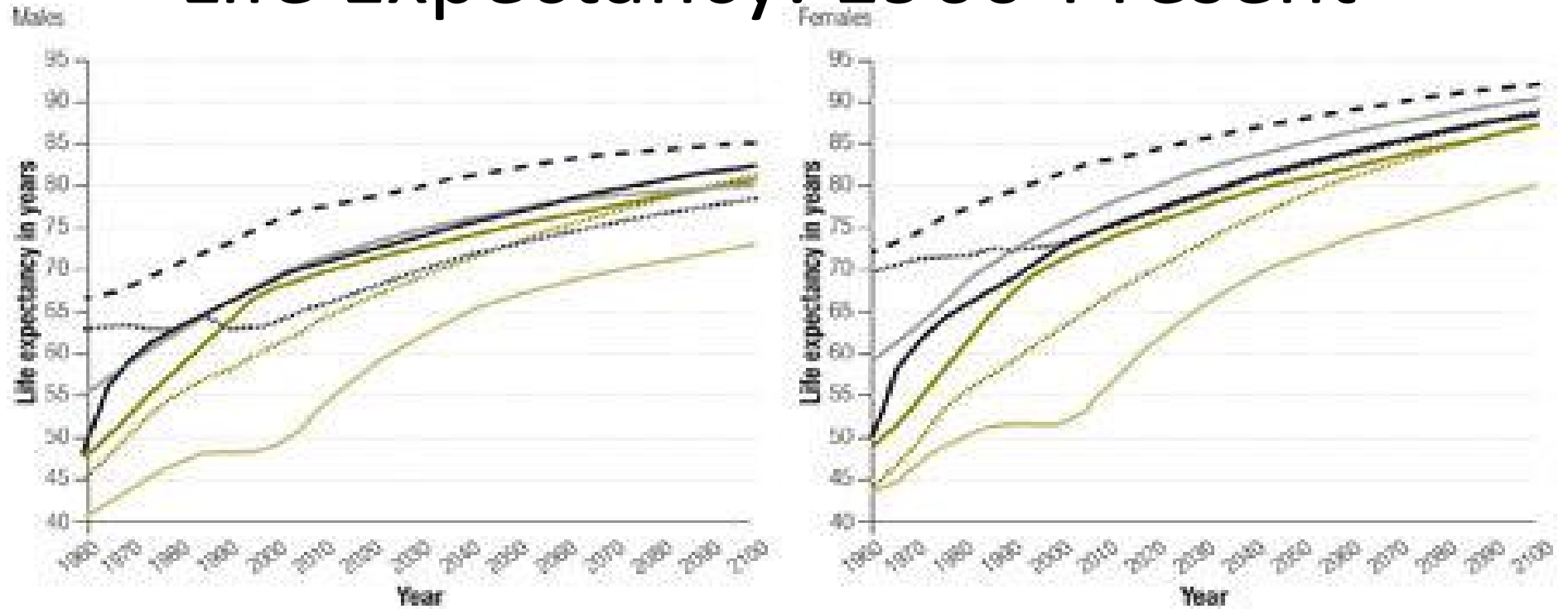
MEN **70** **WOMEN** **75**

1900s: Better health care, sanitation and living conditions boosted life expectancy to 70 for men and 75 for women by 1950.

CANADA: MEN **82** **WOMEN** **85**

Today: Cancer, heart disease and stroke are the biggest killers in the developed world. Our longer lifespan also comes with unprecedented loss of mental function and mobility problems.

Life Expectancy: 1960-Present



— Eastern Asia and Pacific
 ⋯ Europe and central Asia
 — Latin America and the Caribbean
 — Middle East and Northern Africa
⋯ Southern Asia
— Sub-Saharan Africa
- - - High-income countries

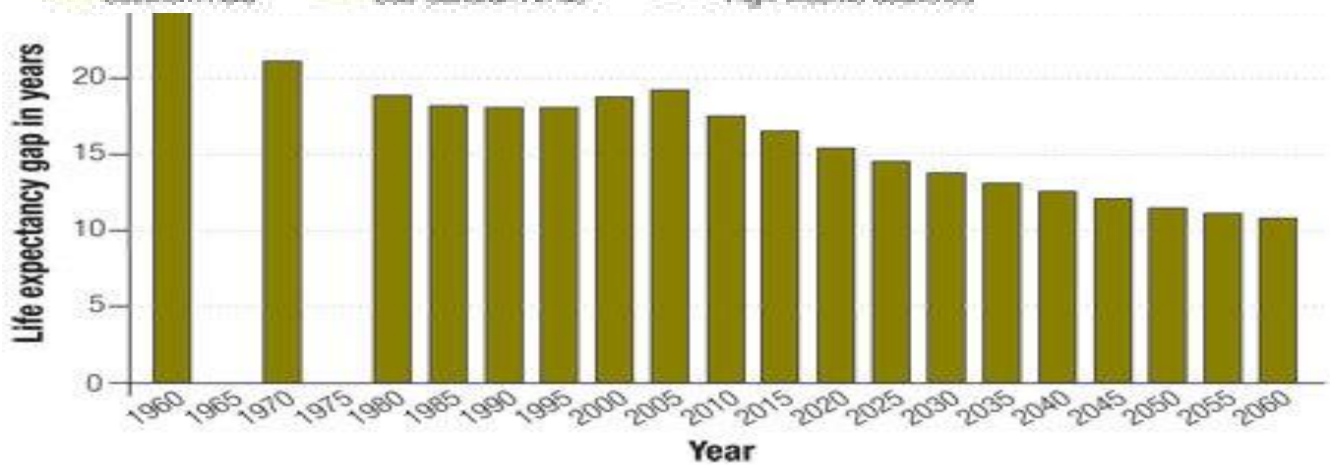
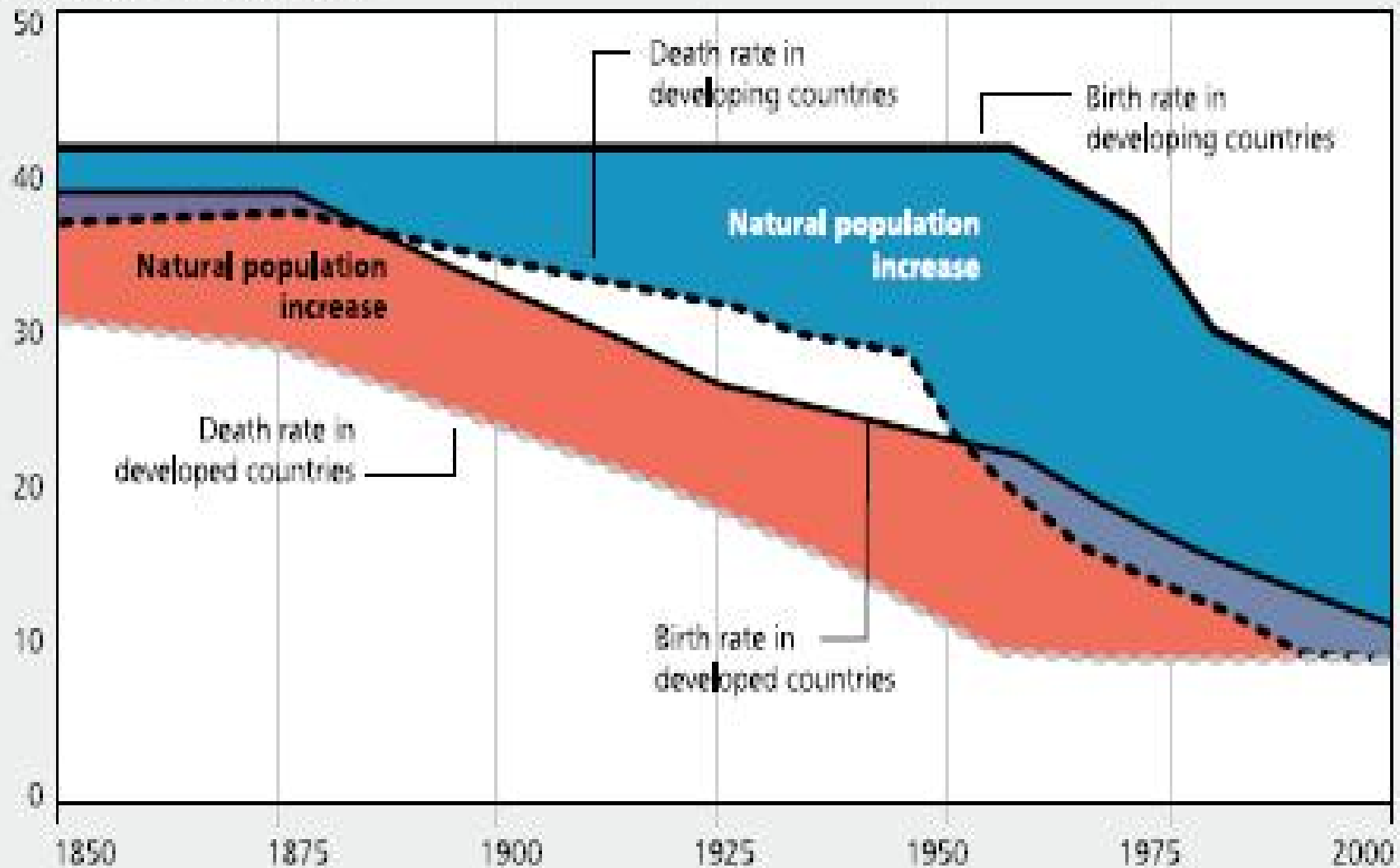


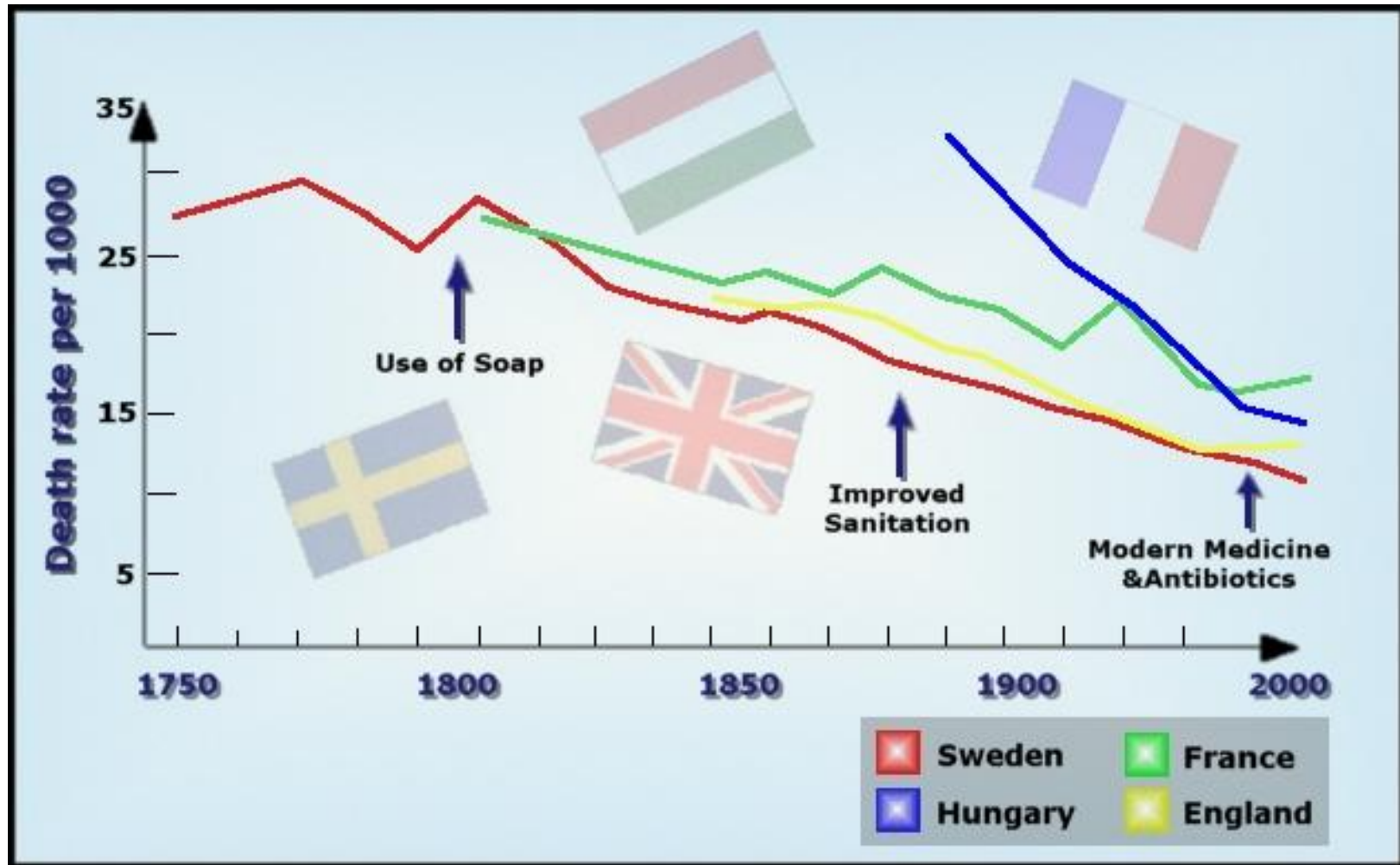
Figure 3.2

Trends in birth and death rates, 1850 – 2000

Births/deaths per 1,000 people



Note: Developed countries include high-income countries and present-day transition economies.



Source: Human Populations: Global Change,
http://www.globalchange.umich.edu/globalchange2/current/lectures/human_pop/human_pop.html



THE MILLENNIUM DEVELOPMENT GOALS (MDGs) ARE THE MOST SUCCESSFUL GLOBAL ANTI-POVERTY PUSH IN HISTORY.

AS WE APPROACH THE 2015 TARGET DATE OF THE MDGs, LET'S RALLY OUR WORLD TO AIM HIGHER AND STEP UP **#MDGMOMENTUM**

MDG5



IMPROVE MATERNAL HEALTH

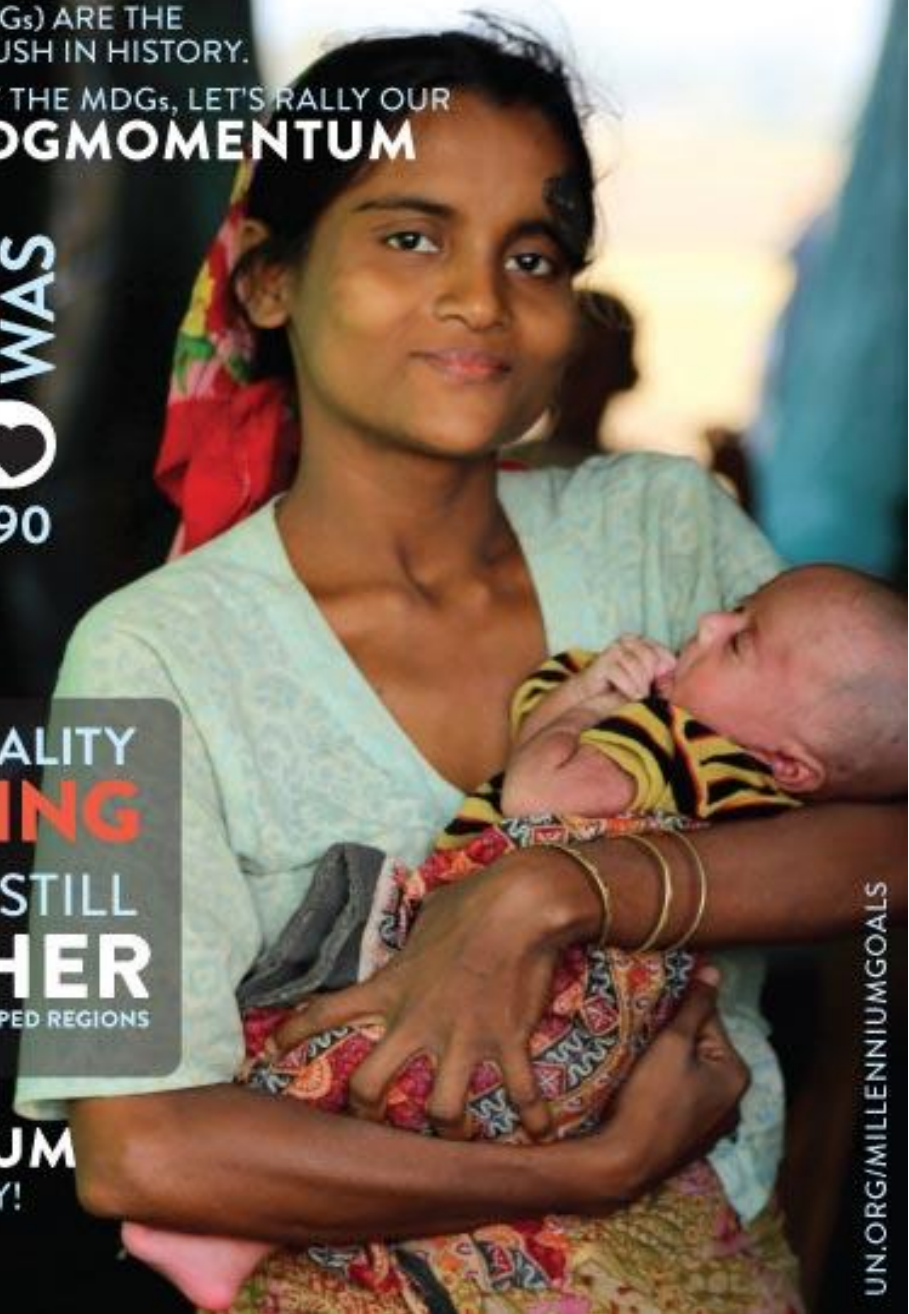
MATERNAL MORTALITY WAS REDUCED BY 47% SINCE 1990

LET'S STEP UP OUR EFFORTS

MATERNAL MORTALITY IN **DEVELOPING REGIONS** IS STILL **15X HIGHER** THAN IN DEVELOPED REGIONS

SHARE

#MDGMOMENTUM WITH YOUR COMMUNITY!

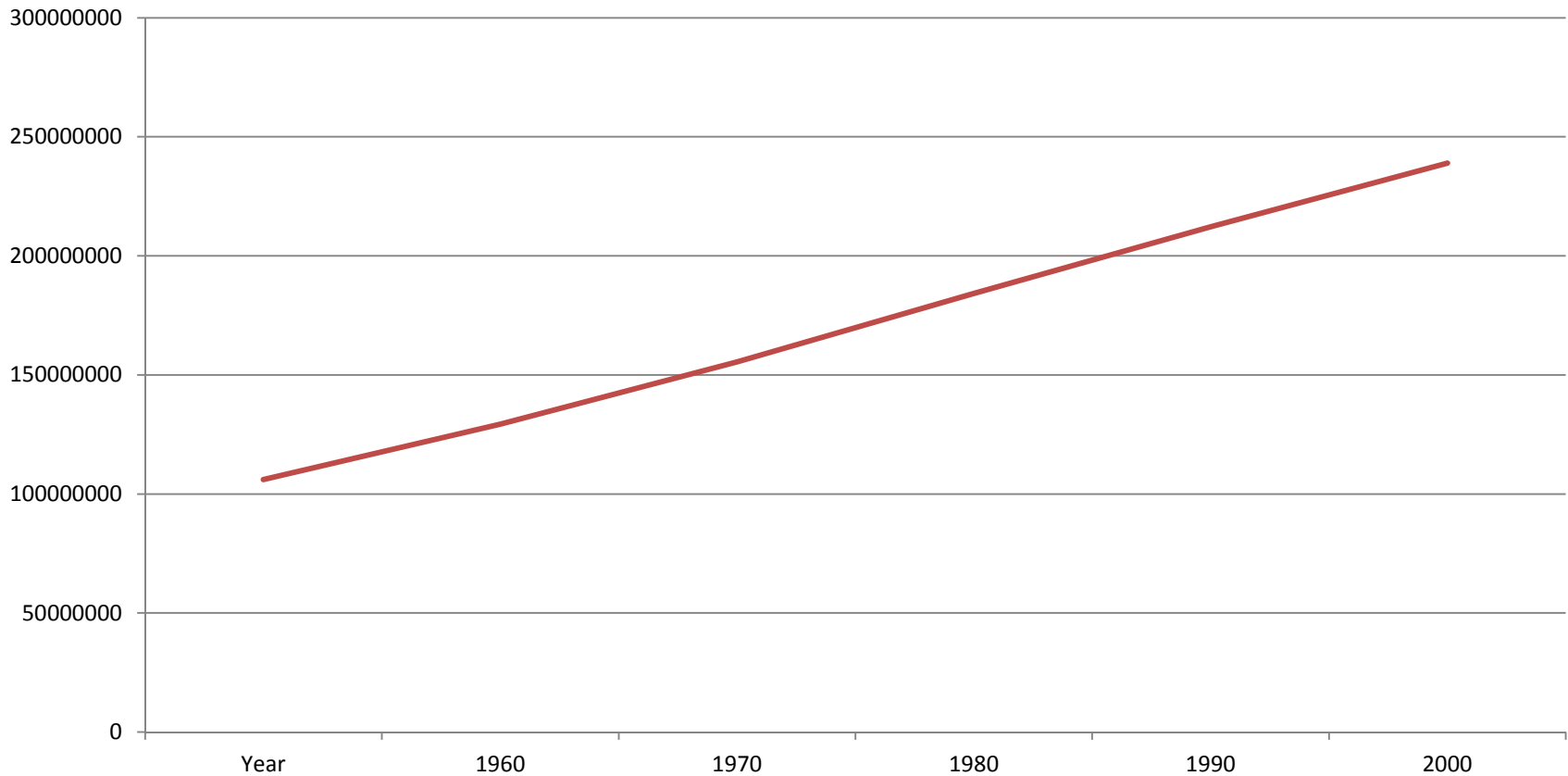


© 2014 United Nations. All rights reserved. Photo: UN Photo/Markus Söderberg

UN.ORG/MILLENNIUMGOALS

How Many More Born (1960 Rate)

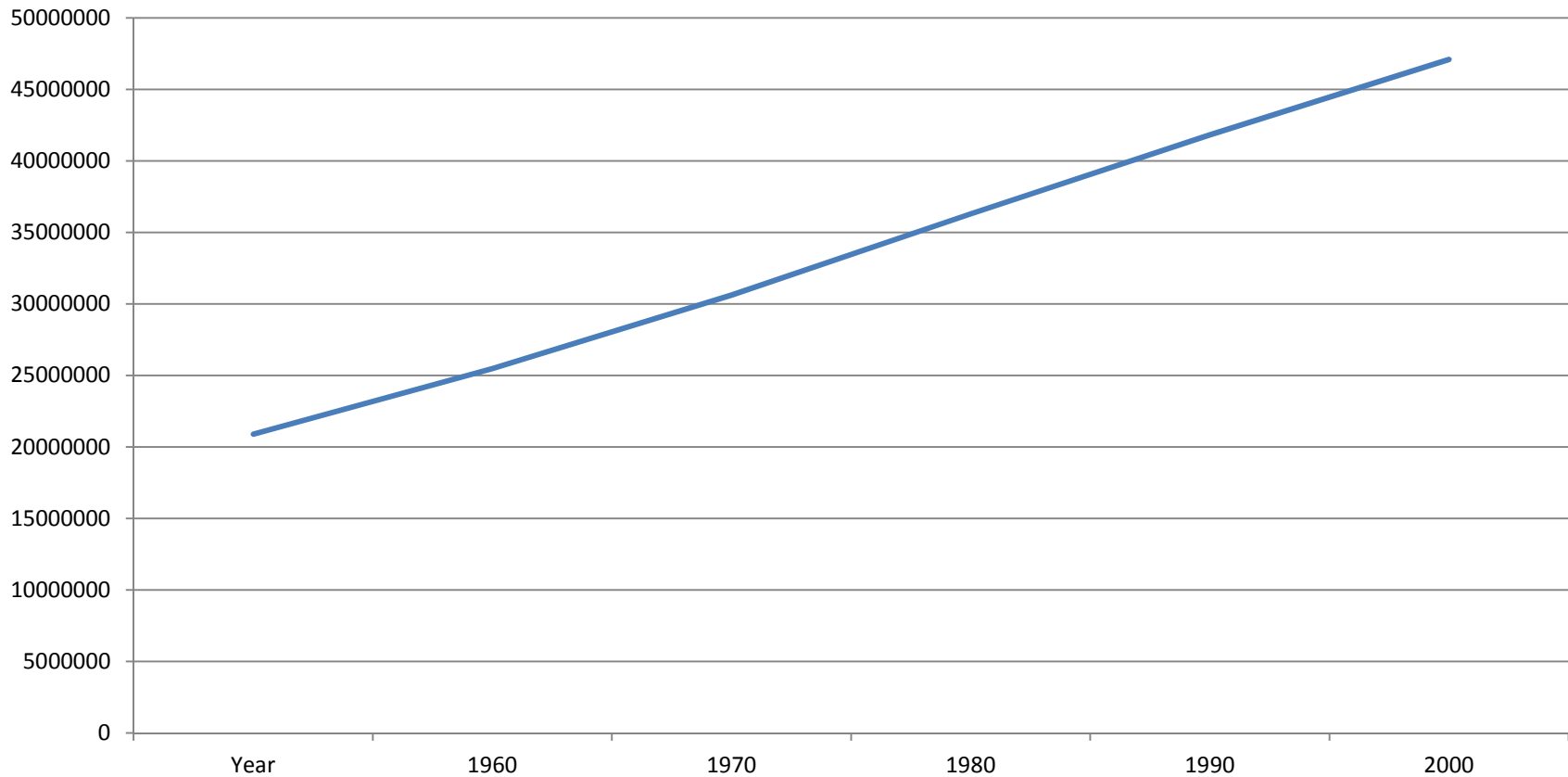
Projected Births (1960 Rate)



57 Million More Children would have been Born than Actual

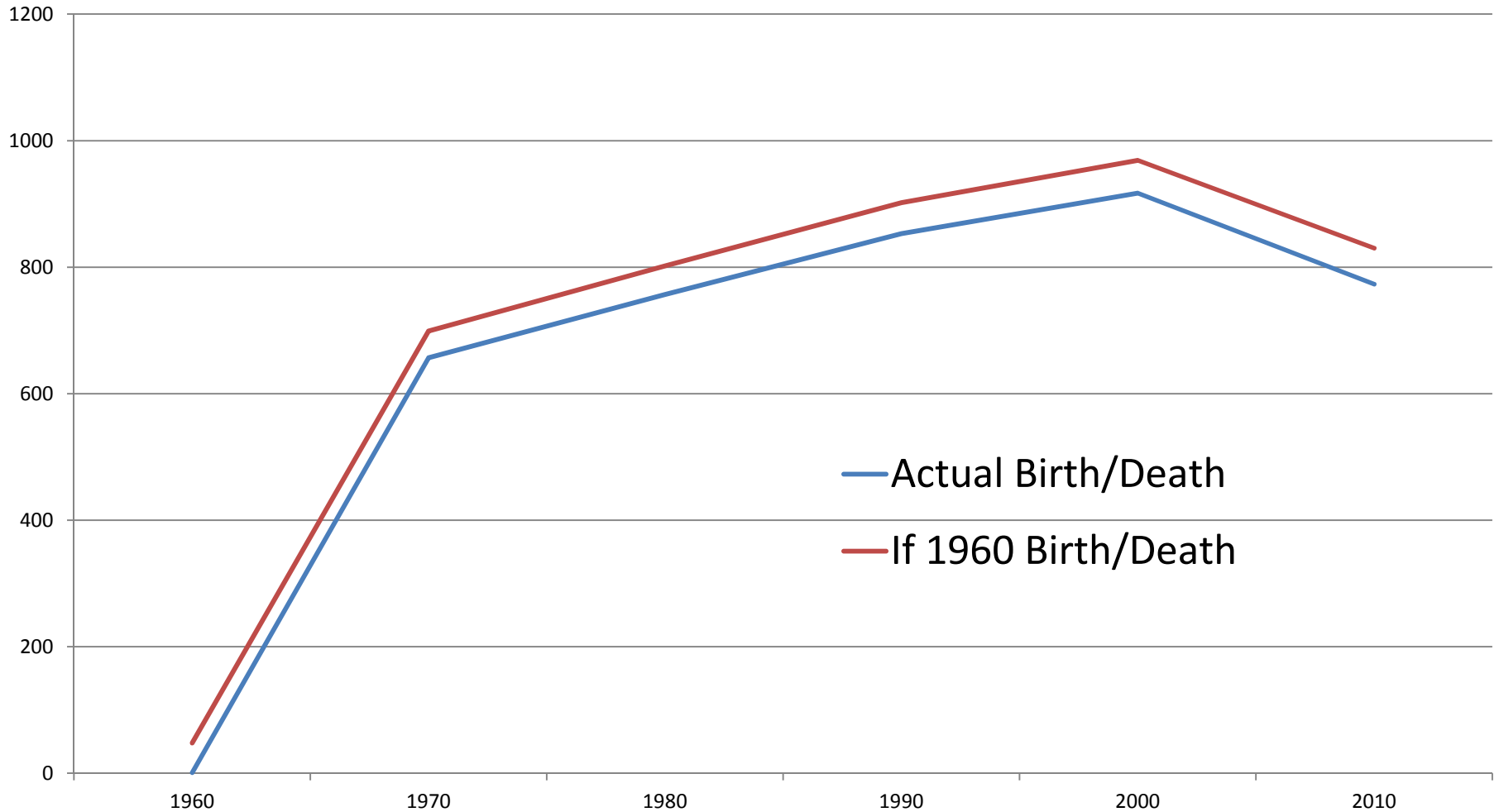
How Many More Dead (1960 Rate)

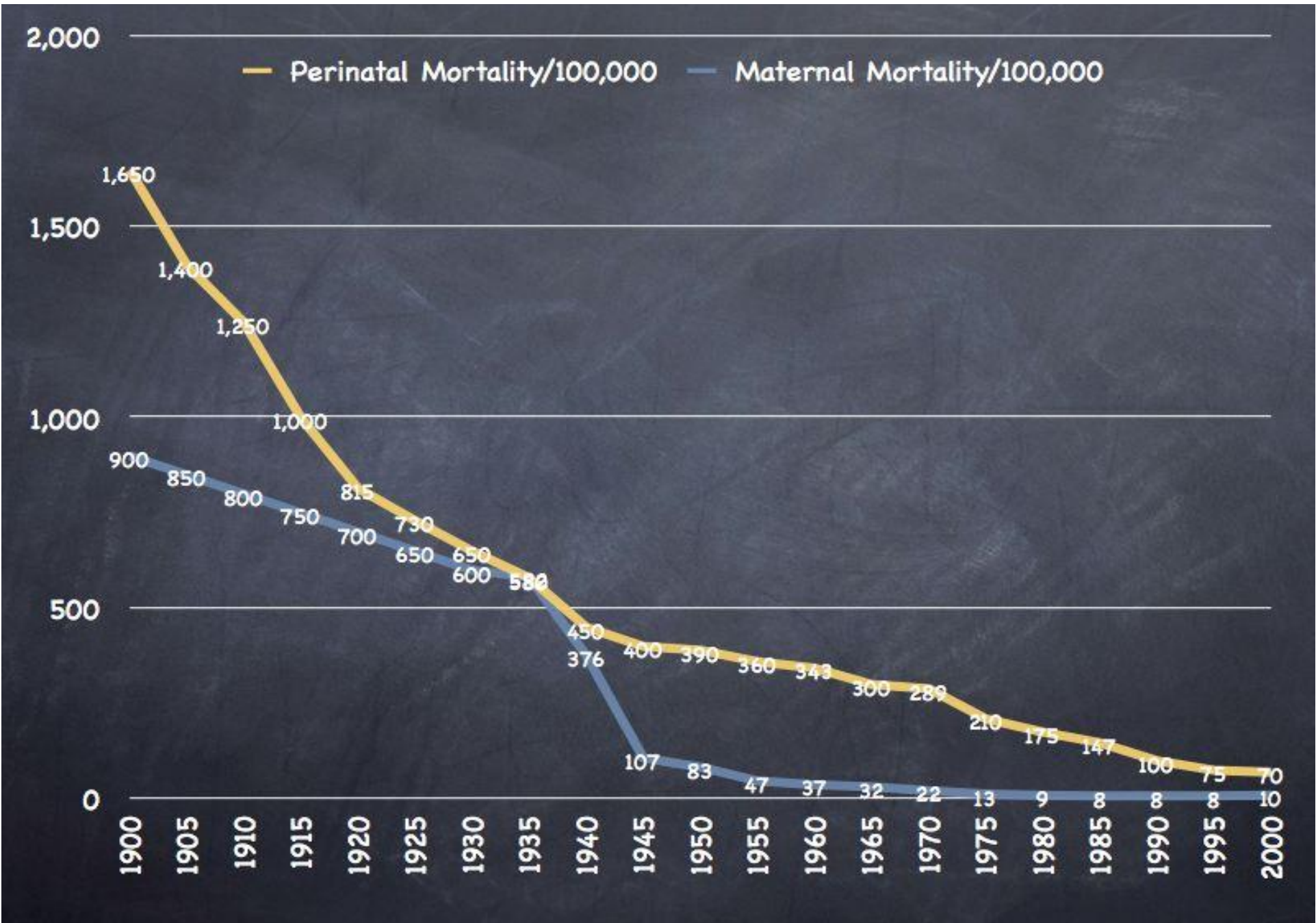
Projected Child Deaths (1960 Rate)



10,154,785 More Children Would Have Died than Actual

Projected 1960 Rate Compared to Reality





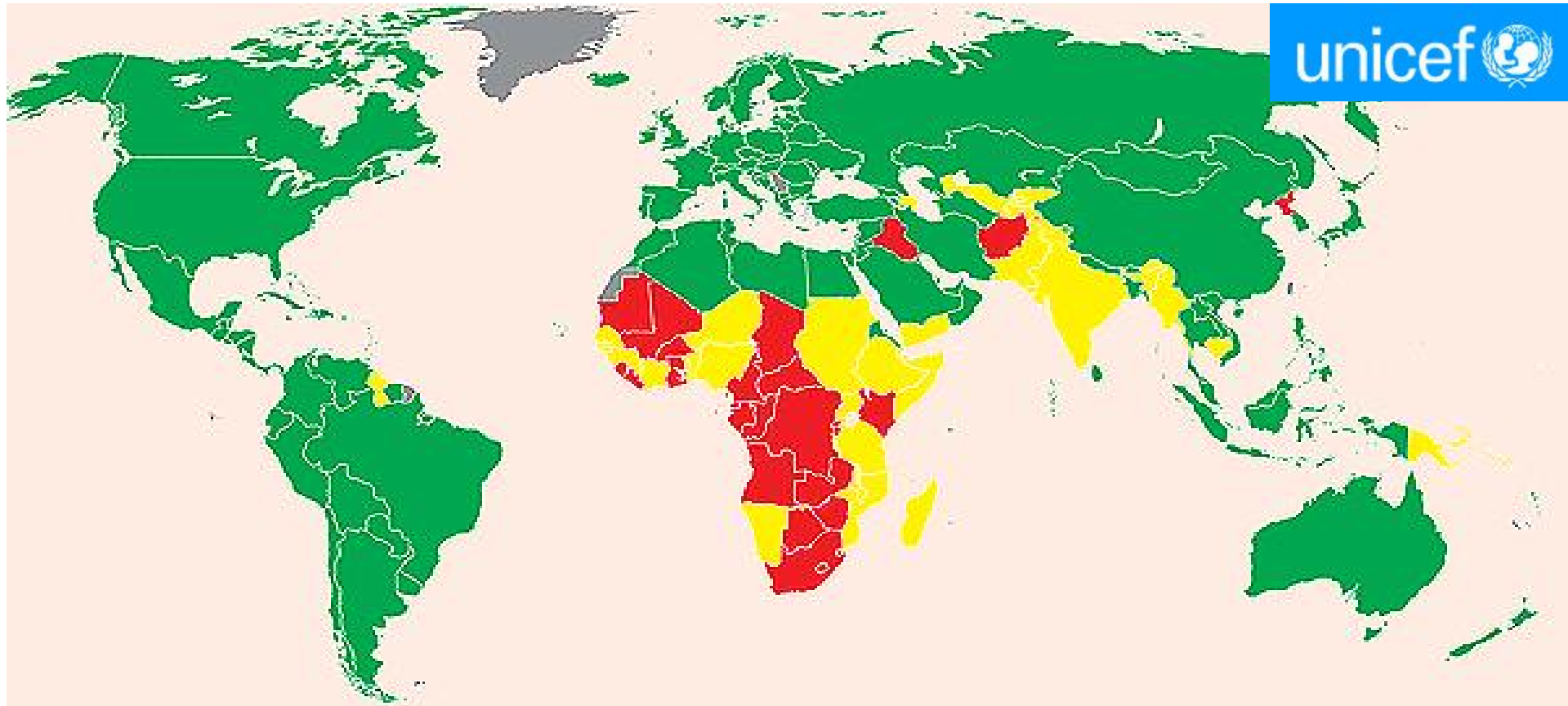
how long will you live?



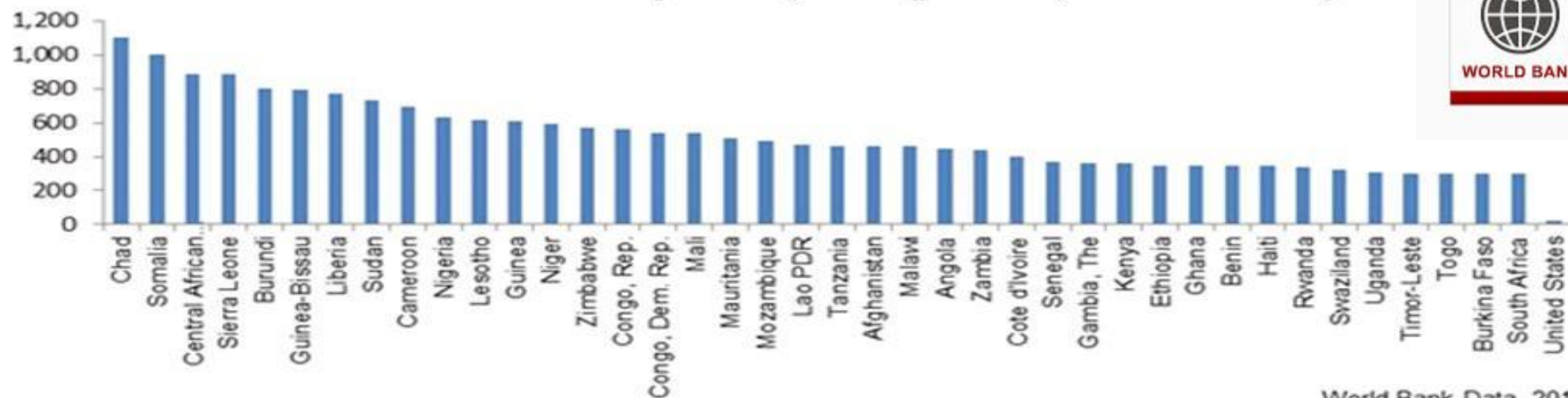
© Duncan Wilson

Every year more than 10M children in low- and middle-income countries die before they reach their fifth birthdays. Most die because they do not have access to effective interventions that would combat common and preventable childhood illnesses.

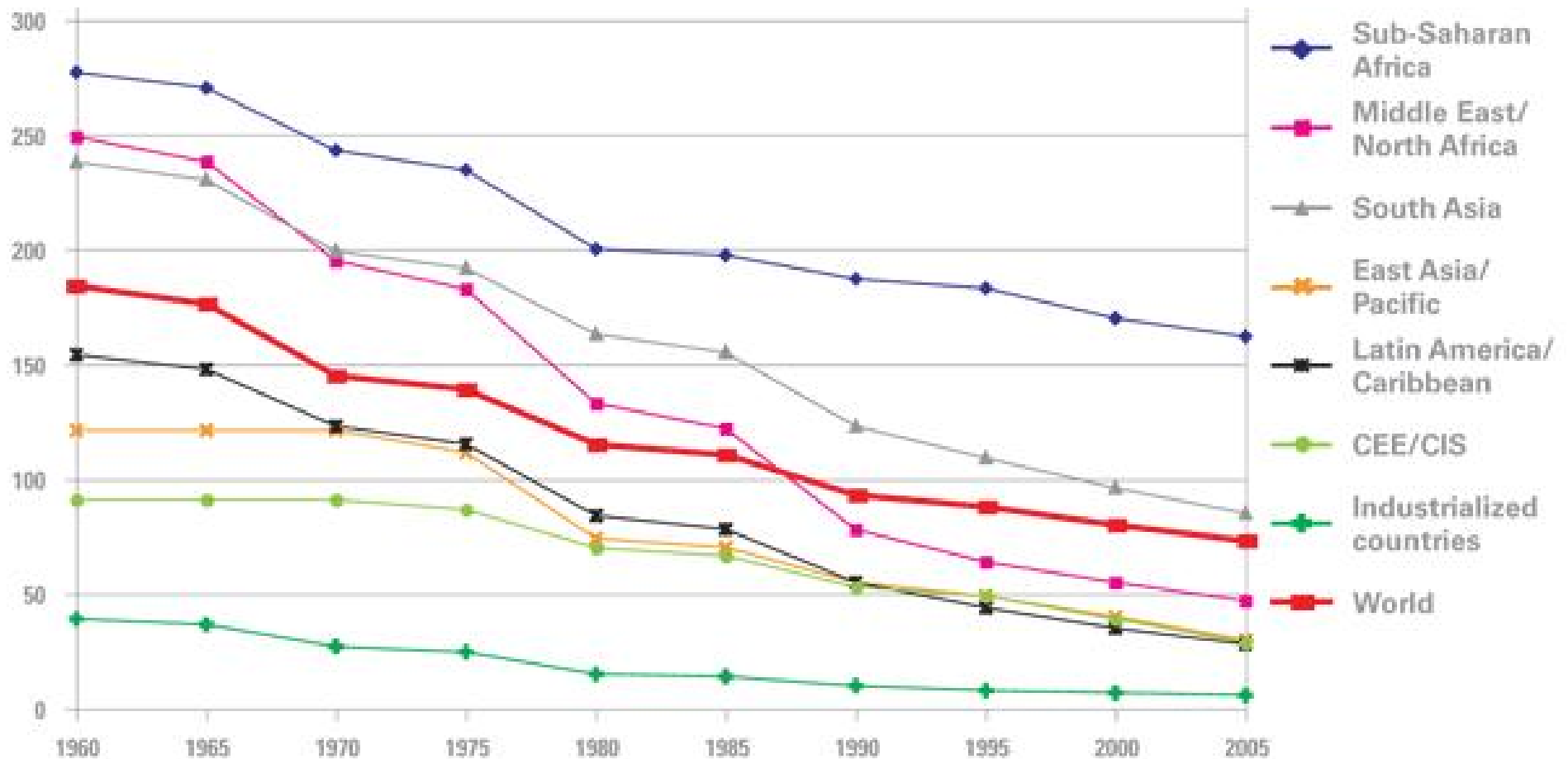
Source: World Health Organization, *An evaluation of infant immunization in Africa: is a transformation in progress?*
www.who.int/bulletin/volumes/85/6/06-031526/en/index.html#R1



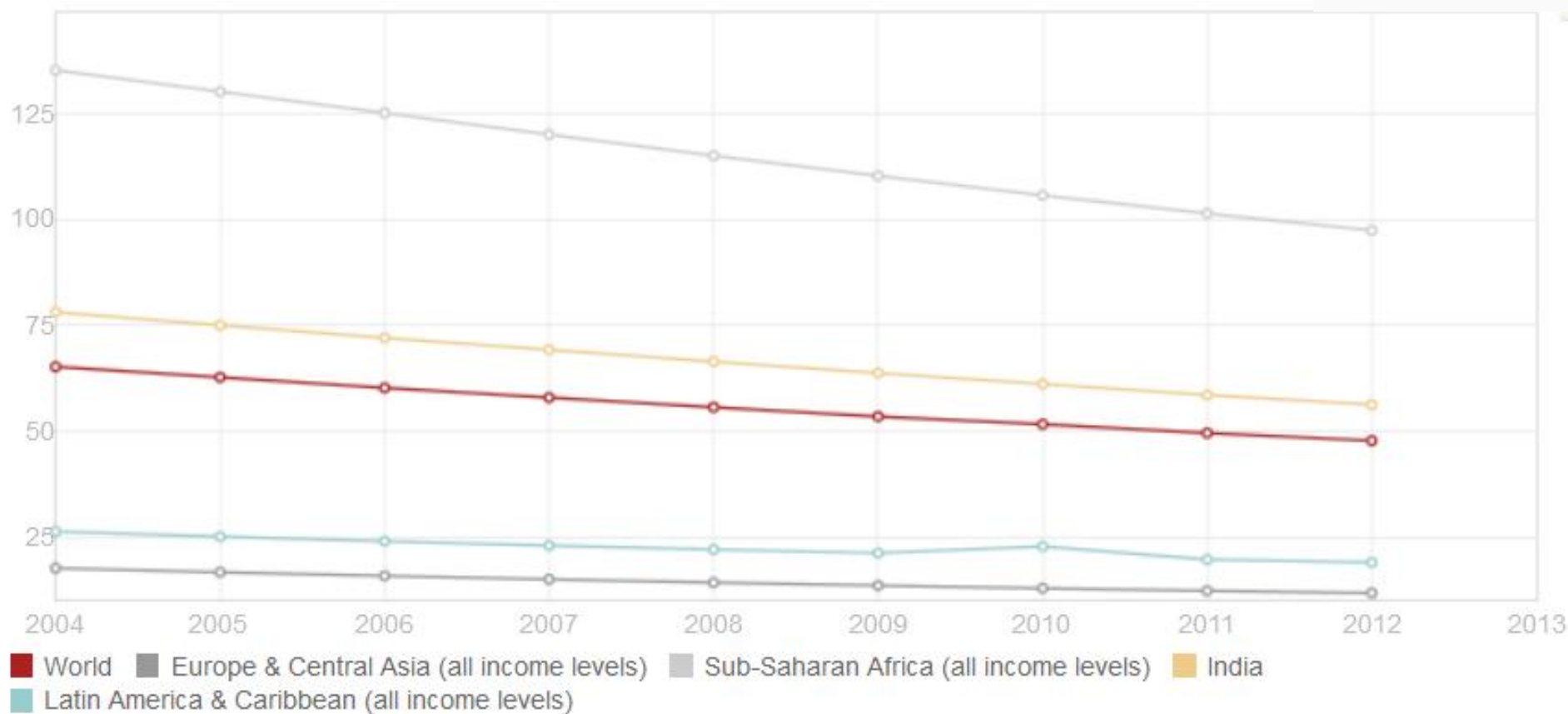
Maternal Mortality Ratio, 2010 (per 100,000 live births)



Child Mortality Rates 1960-2005



Child Mortality Rates: 2004-2012



Developments & Challenges

1800s

1 billion people in 1804



Industrial Revolution



Agricultural Revolution



Public Health

Food



Preservation

Mechanization of Agriculture




- One farmer could feed 3-5 people in 1800

Fertilizers

631.3

THE COMPLETE BONE PHOSPHATE



MANUFACTURED BY
THE ALLENTOWN M'F'G CO.
ALLENTOWN, Pa.

COMPLETE in essential plant-food,
FINE in chemical and mechanical condition,
ACTIVE in promoting growth,
LASTING in effects,
RELIABLE in quality.

Especially adapted for Drilling.

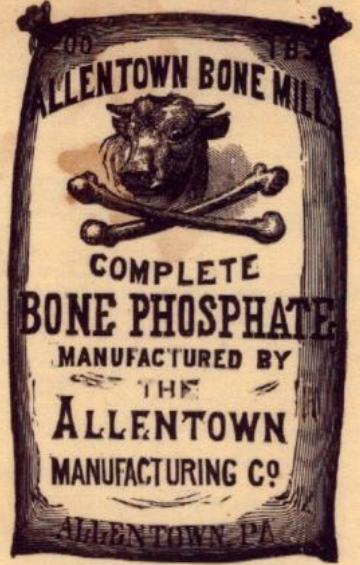
RECOMMENDED TO AND ENDORSED BY
Farmers, Planters, Gardeners,
—FOR ALL—
Farm Crops and Garden Vegetables.

BROWN & WOOD, Printers, 26 & 28 Vesey Street, New York.

631.3

**FEED THE SOIL
—AND—
IT WILL FEED YOU!**

*It does not pay to raise on TEN acres
what ought to grow on FIVE.*

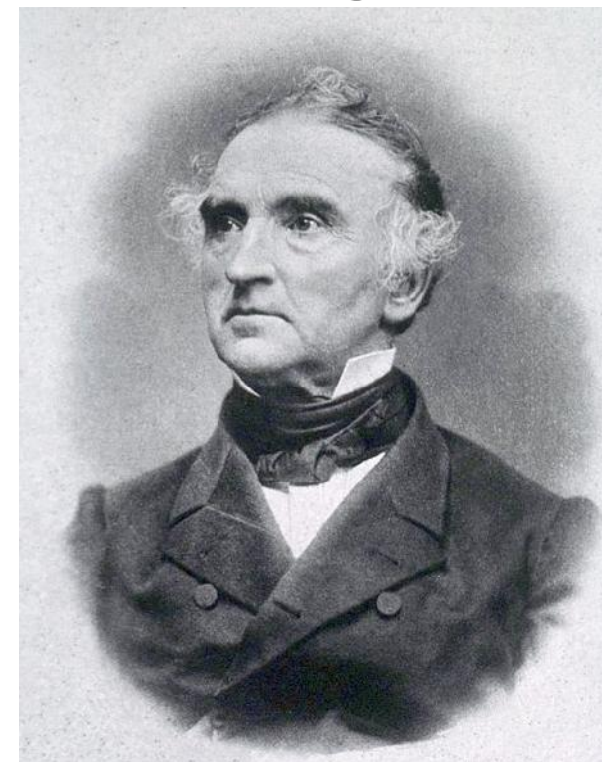


FOR SALE BY
H. C. SELDOMRIDGE,
LITITZ, PA.

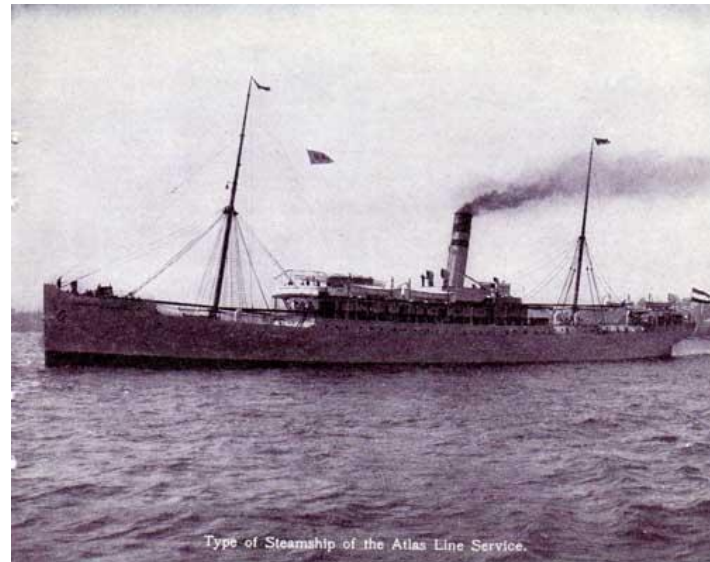
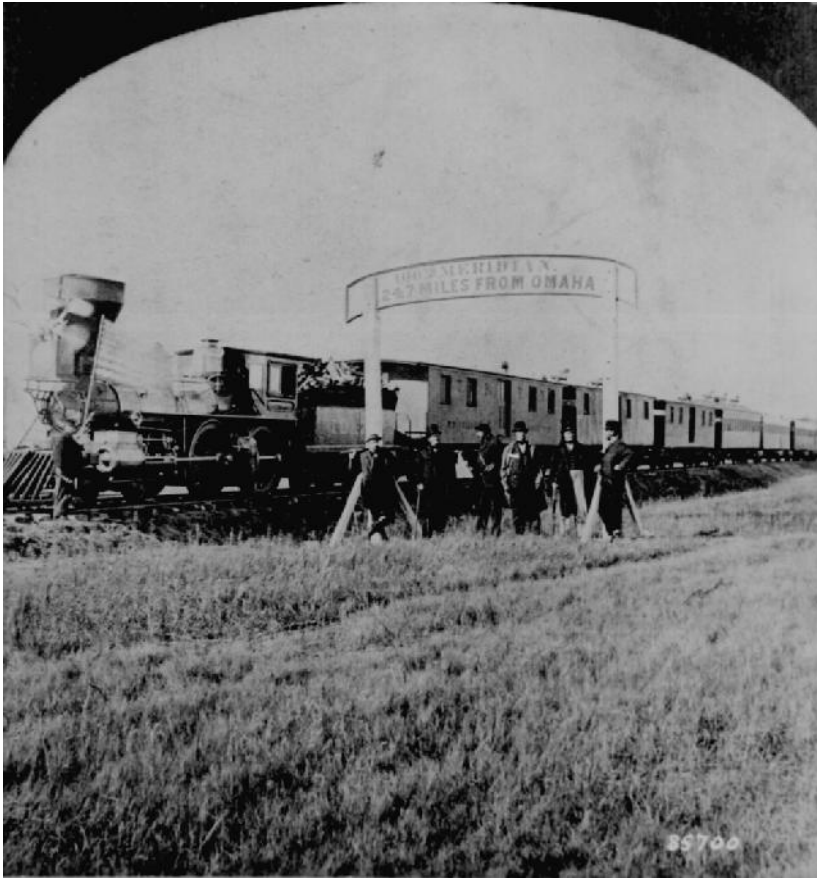


Guano digging on Laysan Island ca. 1890's

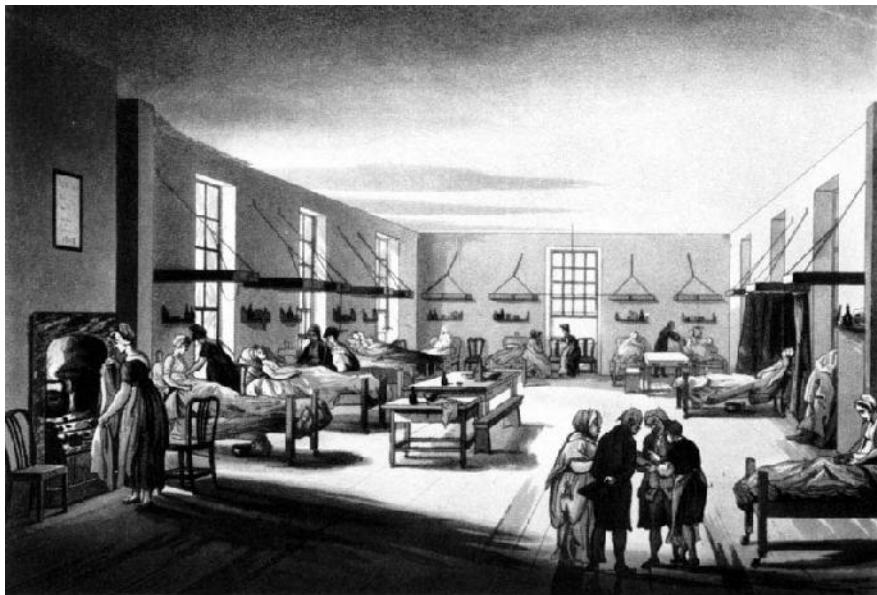
Leibig



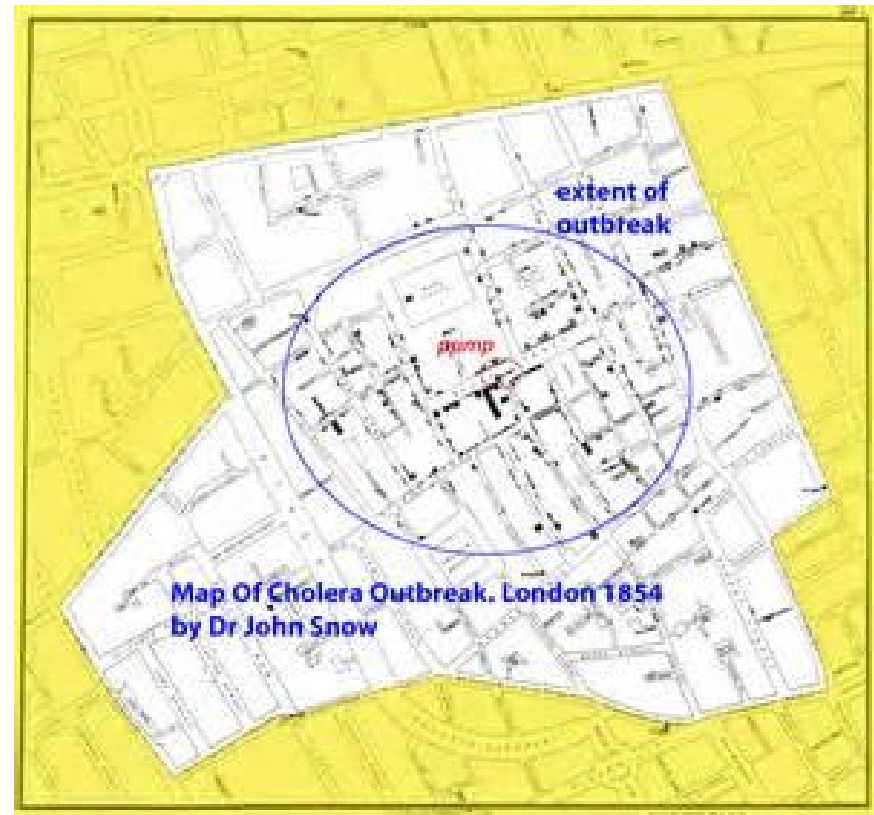
Transportation



Sanitation and Medicine




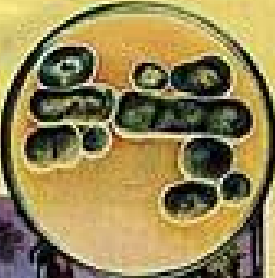
Ward at the Middlesex Hospital, London, early 19th century



1900-1950

- 2 billion people in 1927
- Continued improvements in agriculture and medicine
- One farmer could feed 10-15 people in 1900

Thanks to PENICILLIN
...He Will Come Home!



FROM ORDINARY MOLD—
the Greatest Healing Agent of this War!

On the green, grey and yellow mold stems, called *Penicillium notatum* in the laboratory, grew the substance which was first discovered by Florey and Chain in 1928. From this mold Fleming in 1929 found penicillin. In its pure form, it is the most potent weapon ever developed against many of the deadliest infectious bacteria. Its use, however, is limited by its instability in acid fluids. Schenley Laboratories were first able to solve the problem of large scale production of penicillin, when the great need for it arose.

When the thousands of bottles of this war hero were packed in pages of silver paper in a heavy box, the greatest news since World War II may well be the discovery and development of one of our most potent new weapons for defense — but of a weapon that saves lives. That weapon, of course, is penicillin.


Every day, penicillin is performing more unbelievable acts of healing in some 100 hospitals. Thousands of men will return home who otherwise would not have had a chance. Lives will, even and more of this precious drug is now available for civilian use — to save the lives of patients of every age.

A year ago, production of penicillin was difficult, costly. Today, due to specially devised methods of mass-production, as set by Schenley Laboratories, Inc. and the 50 other firms designed by the government to make penicillin, it is available in ever-increasing quantity, at progressively lower cost.

Look to "THE DOCTOR BRAND" against BACTERIAL INFECTION. Freedom comes. U.S.A. has your penicillin for this and other.

SCHENLEY LABORATORIES, INC.

Producers of PENICILLIN-Schenley



Drug advertising from the 1940s.

1950-2000

Green Revolution: Saved over 1 billion people from starvation

- Led by Norman Borlaug
- High-yielding varieties of cereal grain
- Expansion of irrigation projects
- Synthetic fertilizers
- Hybridized seeds
- Pesticides and herbicides



2000-2050

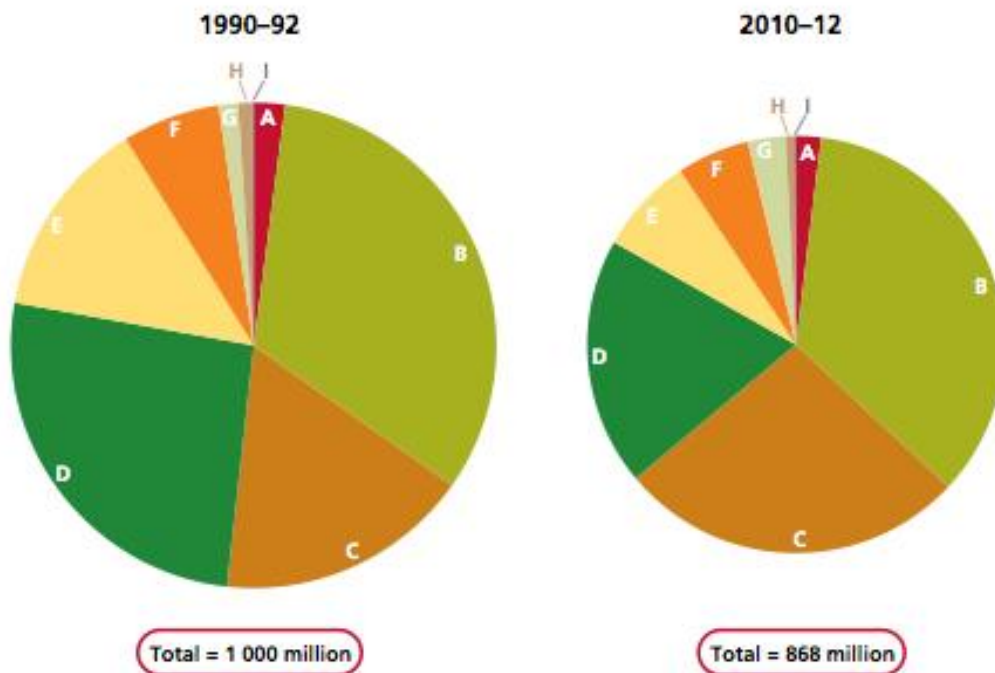
- 7 billion in 2012, 13 years since 1999
- 2.5 current fertility rate, 50% decrease since 1960
- Projected: 8 billion in 2025, 13 years since 2012
- Projected: 9 billion in 2040, 15 years since 2025



Hunger, Malnutrition, Poverty

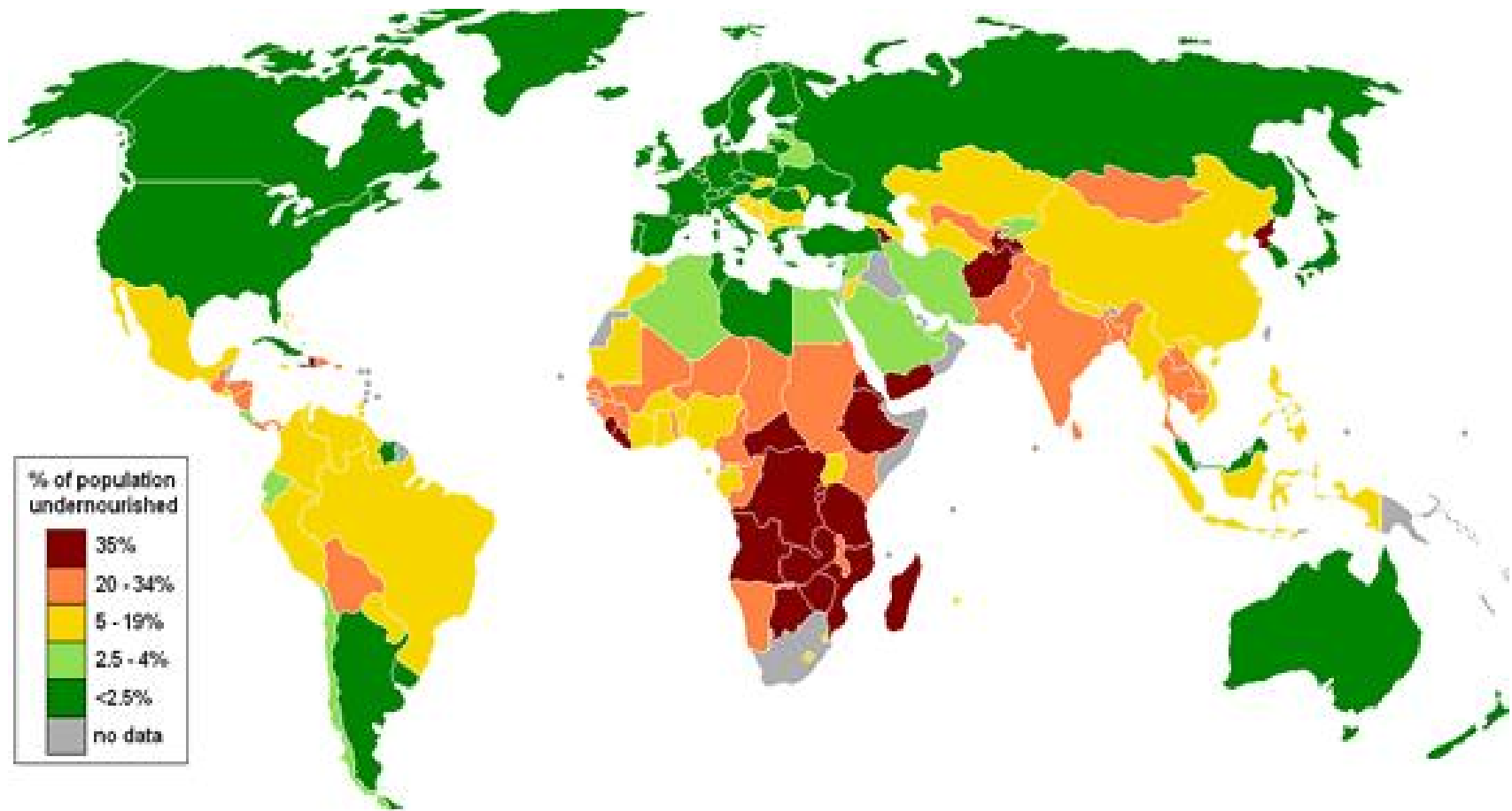
Distribution of Hunger

The distribution of hunger in the world is changing
 Number of undernourished by region, 1990–92 and 2010–12



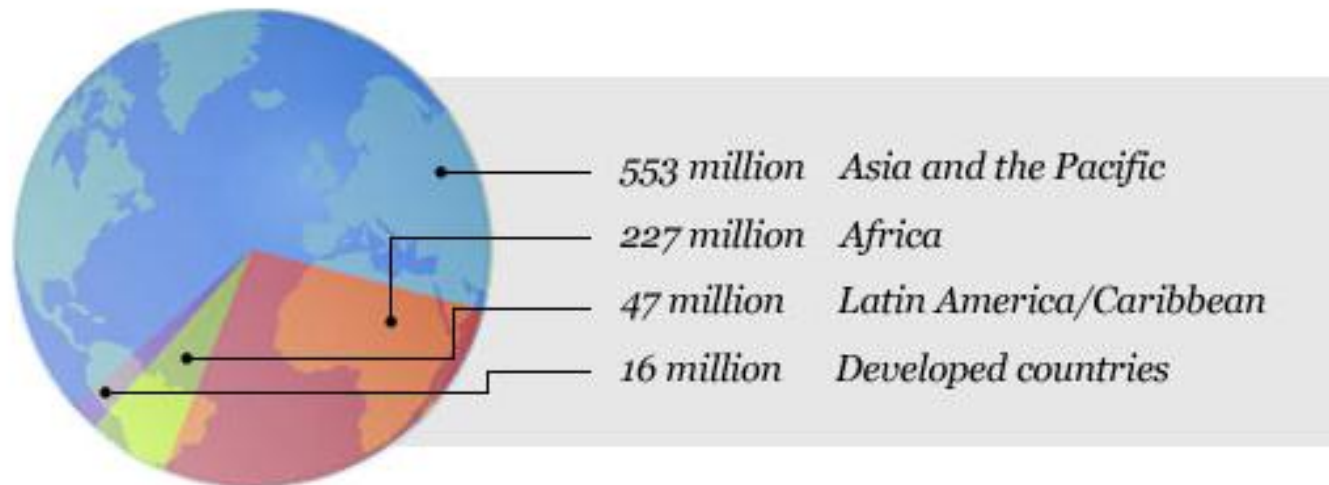
Number of undernourished (<i>millions</i>)		
	1990–92	2010–12
A Developed regions	20	16
B Southern Asia	327	304
C Sub-Saharan Africa	170	234
D Eastern Asia	261	167
E South-Eastern Asia	134	65
F Latin America and the Caribbean	65	49
G Western Asia and Northern Africa	13	25
H Caucasus and Central Asia	9	6
I Oceania	1	1

Map View of Hunger



Who are the hungry today?

Most of the world's hungry live in developing countries. According to the latest Food and Agriculture Organization (FAO) statistics from 2013, there are 842 million hungry people in the world and 98 percent of them are in developing countries. They are distributed like this:



Malnutrition: Stunting

Restricted growth, height-for-age is below 2 standard deviations.

- Globally, an estimated 165 million children (26%) under 5 were stunted in 2011. This is a 35% decrease from about 253 million in 1990.
- High prevalence levels of stunting among these children are in Africa (36%) and Asia (27%) in 2011.
- More than 90% of the world's stunted children live in Africa and Asia. It remains as a public health problem and often goes unrecognized.

Underweight

- Weight-for-age is below 2 standard deviations.
- An estimated 101 million children (16%) were underweight in 2011, which is a 36% decrease from 159 million in 1990.
 - Underweight and stunting children worldwide has decreased, but overall progress is insufficient and millions of children remain at risk.

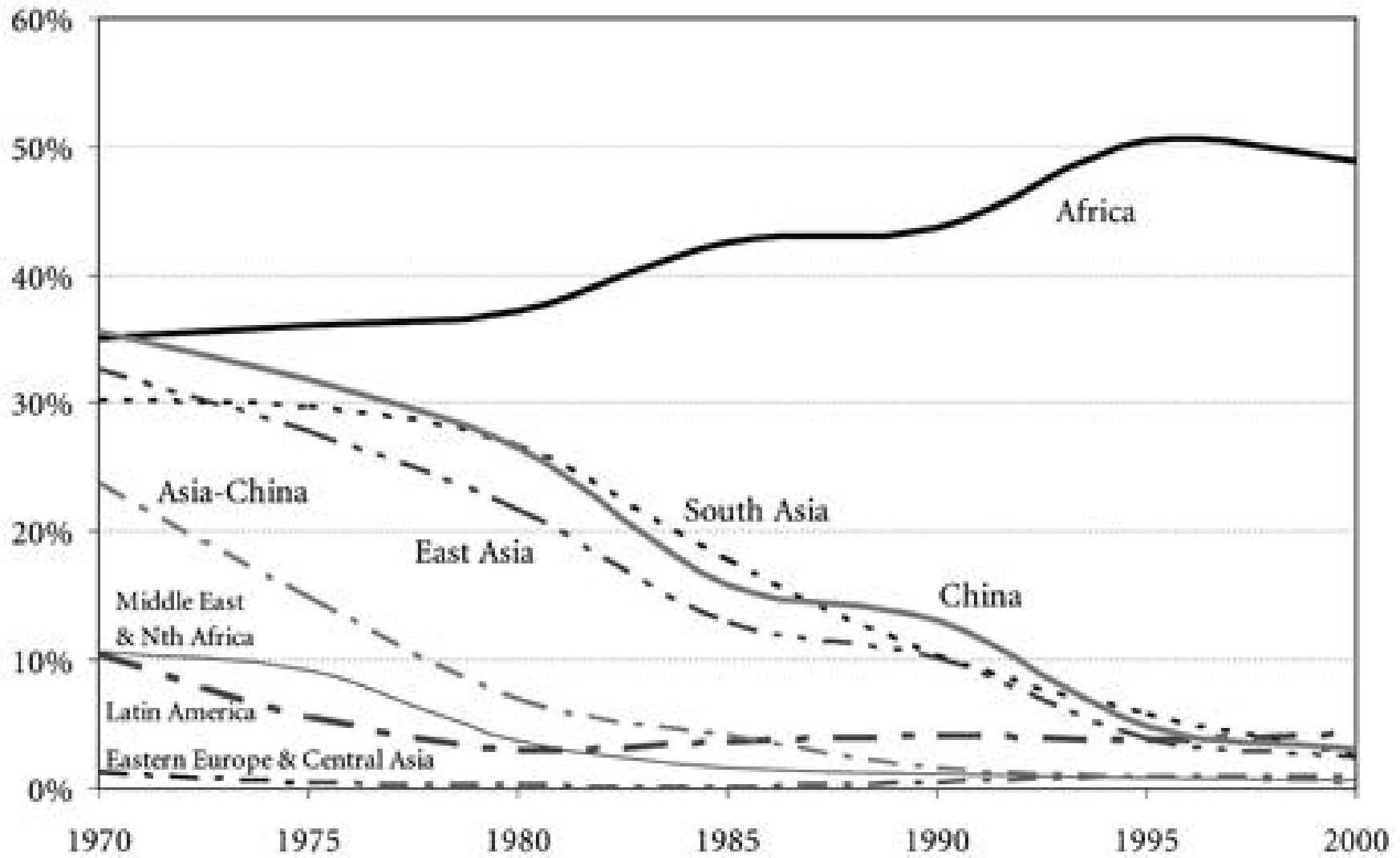
Overweight

- Weight-for-height is above 2 standard deviations.
- An estimated 43 million children (7%) were overweight in 2011, a 54% increase from 28 million in 1990.
 - Increasing trends in child overweight is noted in many regions. In Africa, it increased from 4% in 1990 to 7% in 2011. 5% in Asia which accounts for 17 million children, but the 7% in Africa is only 12 million children.

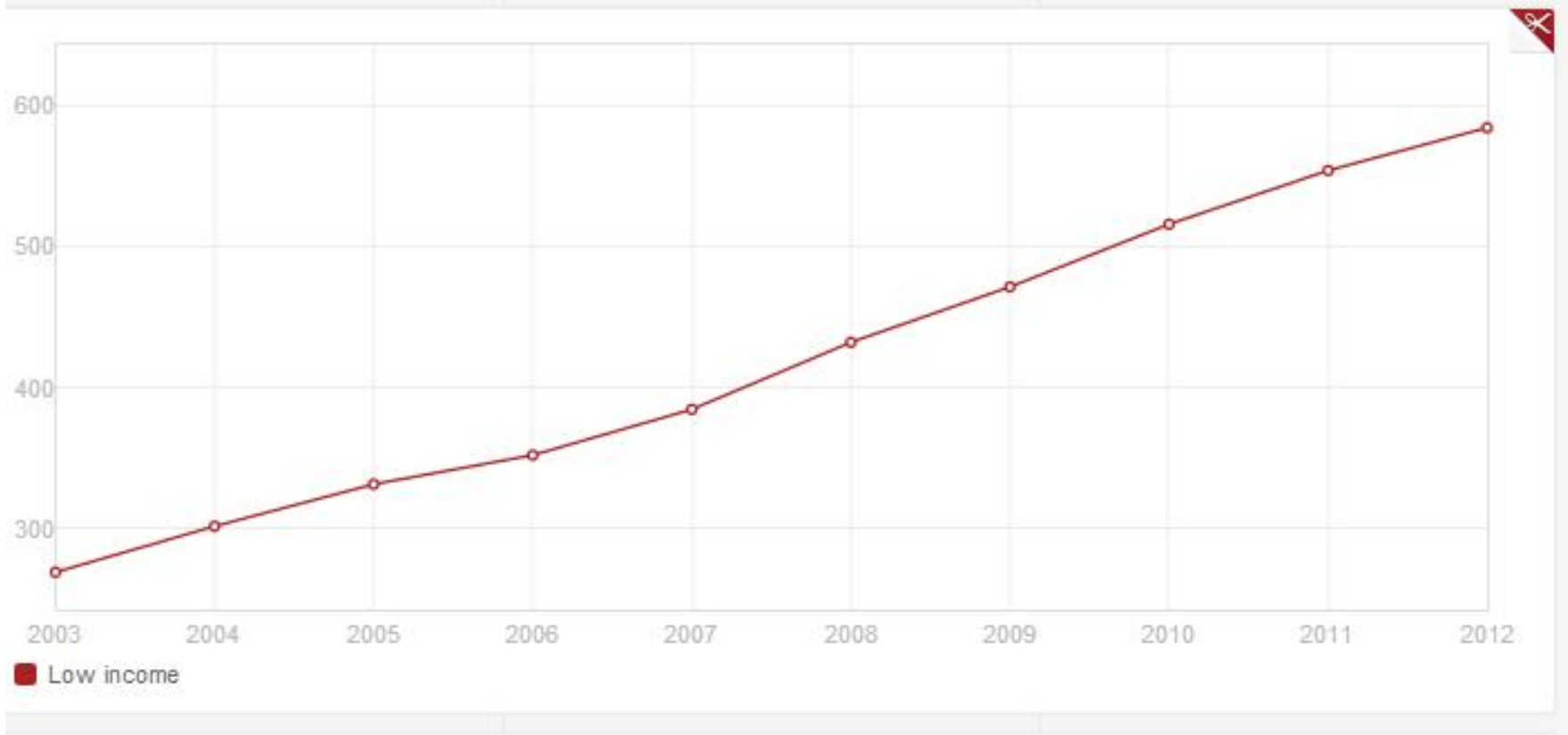
Global Malnutrition Trends (1990-2012)



Regional Poverty Rate



Recent Poverty Trends



X-Axis: Year

Y-Axis: GNI (Gross National Income) for Low- income nations

http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html

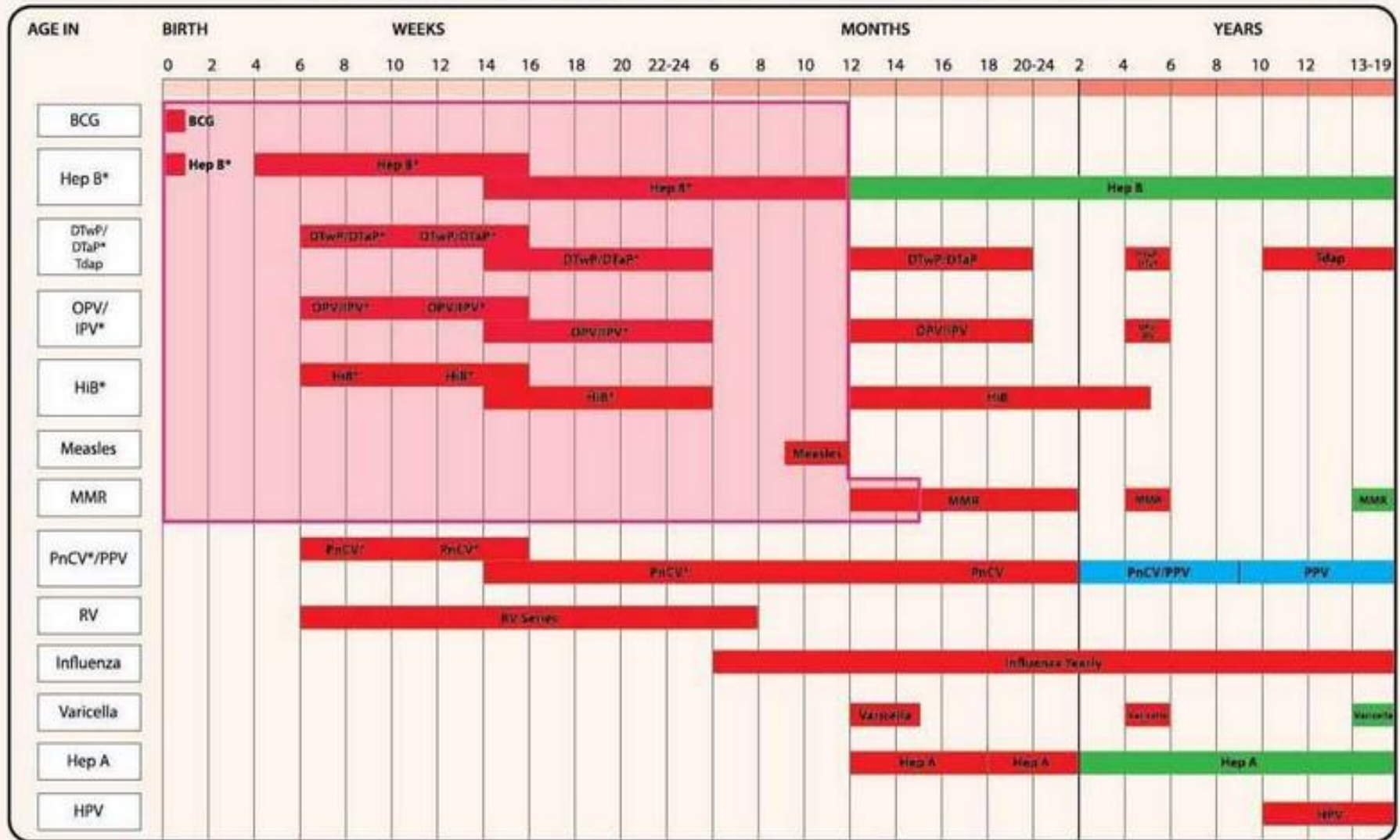
Vitamins & Disease

- Diarrhea
- Small Pox
- Cholera
- Polio
- Malaria
- HIV





Childhood Immunization Schedule 2011



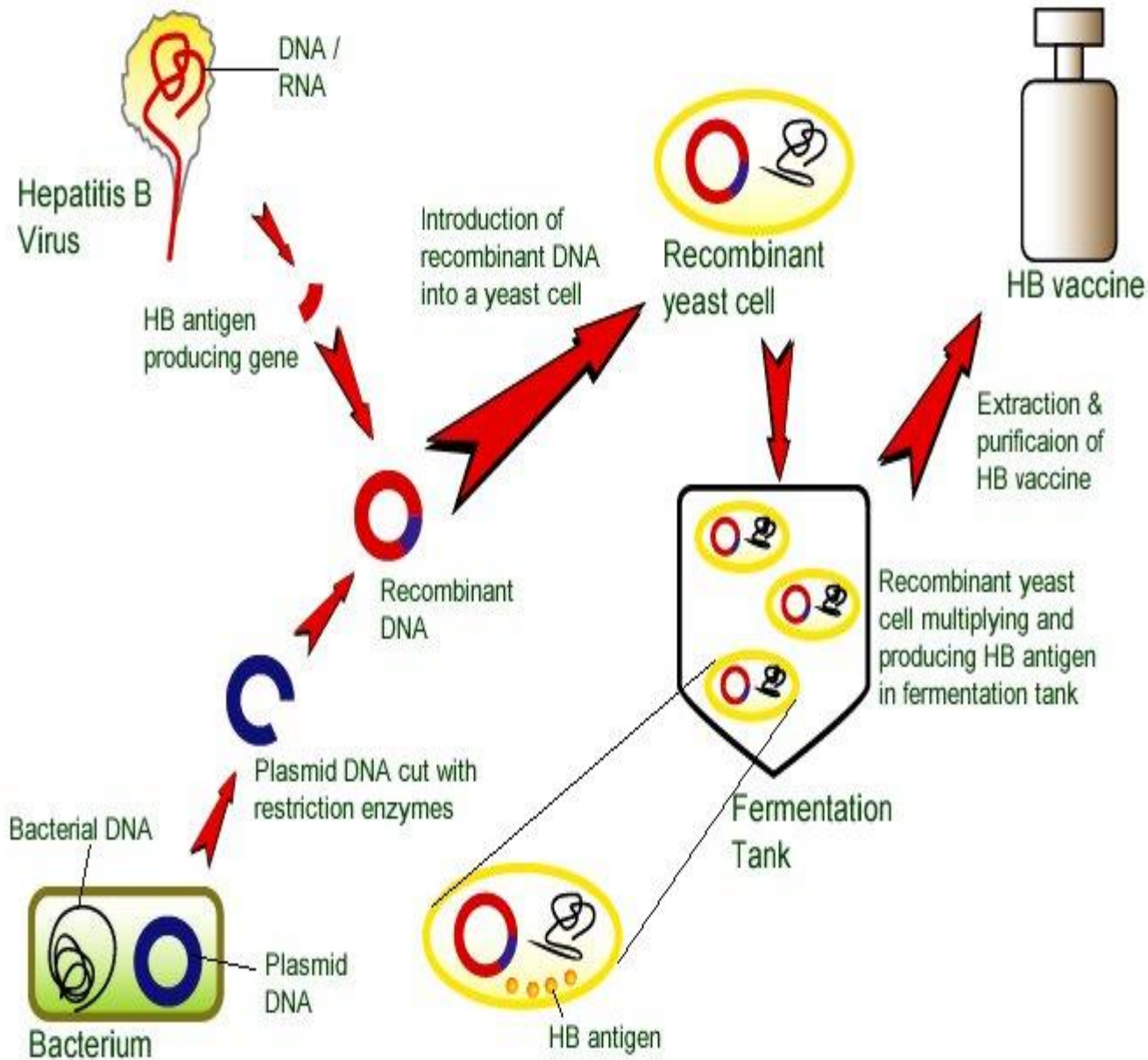
EPI Vaccines
 Range of Recommended Age
 Catch Up Immunization
 For High Risk Group
 * Primary doses are given at least 4 weeks apart

Vaccines & cold chains

Table 1.2: Recommended temperatures and length of storage at various levels of the cold chain

Vaccines	Primary (national) stores	Intermediate stores		Health facility	Health post
		Province	District		
	Maximum duration of storage			Maximum duration of storage	
	6–12 months	Maximum 3 months	1–3 months	1 month or less	according to session plan
OPV	Store at -15 °C to -25 °C. OPV is the only vaccine that can safely be frozen and unfrozen repeatedly .			Store at +2 °C to +8 °C	
BCG	Store these lyophilized vaccines at +2 °C to +8 °C. Under exceptional circumstances they can be temporarily stored at -15 °C to -25 °C (e.g. if there is a temporary shortage of storage space). Never freeze diluent.			Store at +2 °C to +8 °C	
Measles					
MMR					
MR					
Yellow fever					
Hib lyophilized					
Meningitis					
JE					
Hepatitis B					
DTP-HepB					
DTP-HepB-Hib liquid					
Hib liquid					
DTP					
DT/TT/Td					
Pneumococcal					
Rotavirus					

Production of Recombinant HB Vaccine



Vitamin A deficiency

- Examples of Micronutrient deficiency are:
 - Vitamin A deficiency which can cause:
 - ❖ Night blindness
 - ❖ And reduces the body's resistance to disease
 - ❖ Between 100 and 140 Millions Children are Vitamin A Deficient with 250,000 to 500,000 becoming blind every year; half of them dying within 12 months of losing their sight

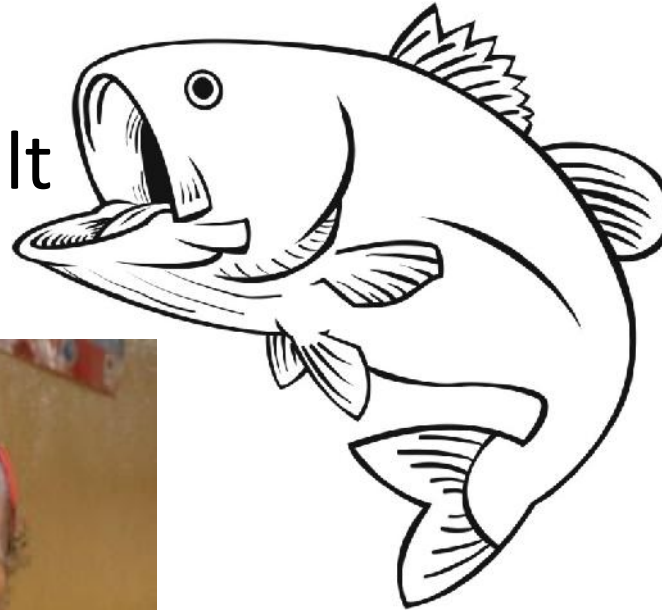
What is Golden Rice?

- Genetically modified rice
- Beta-Carotene in the endosperm
- Vitamin A
- First developed in 2000
- Ingo Potrykus and Peter Beyer
- Produced by biosynthesizing 2 cells



Iron Deficiency

- Ionized Salt



Smallpox

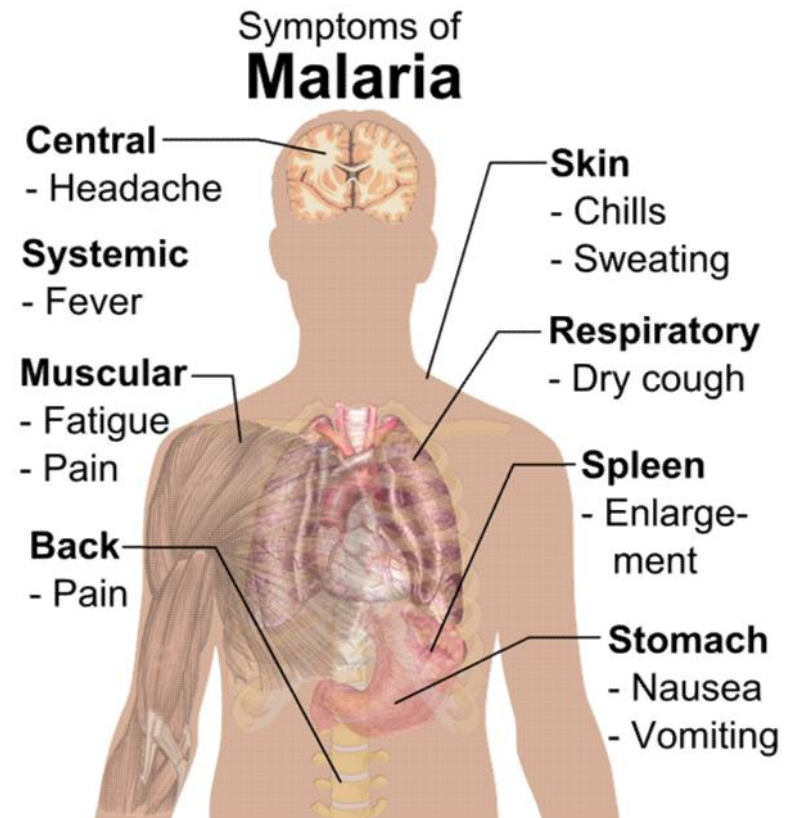
- Probably the deadliest disease in human history
- Responsible for an estimated 300–500 million deaths during the 20th century
- In the early 1950s an estimated 50 million cases of smallpox occurred in the world each year

Smallpox Eradication

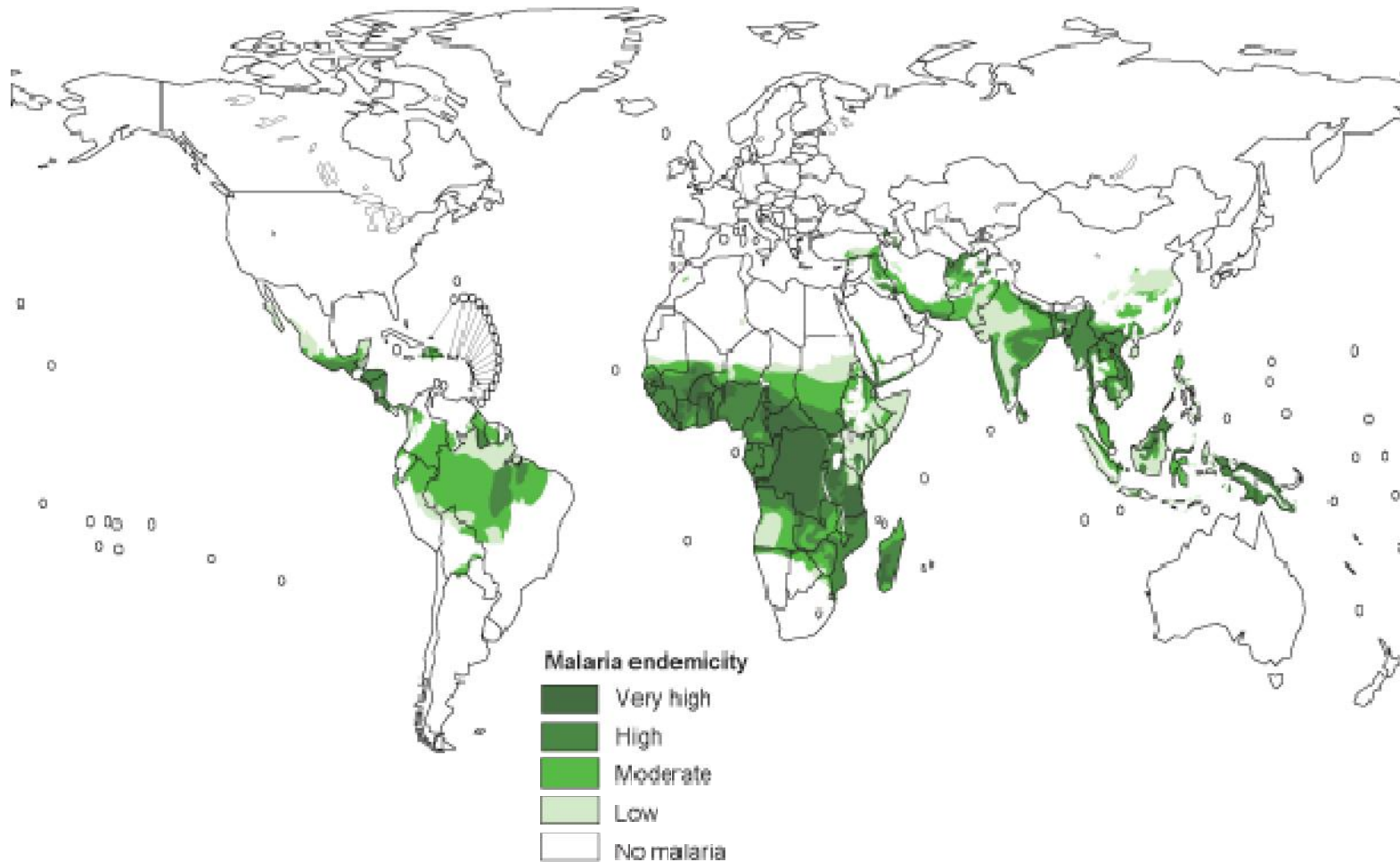
- By the end of 1975, smallpox persisted only in the Horn of Africa
- Last case by a Somali in 1977, fully recovered
- 1979 smallpox certified to be eradicated

Malaria

- is a mosquito-borne disease caused by a parasite.
- flu-like illness.
- Left untreated may cause death die.



Malaria on the Map



<http://aidontheedge.files.wordpress.com/2011/01/globalmalariaiskmap.jpg>

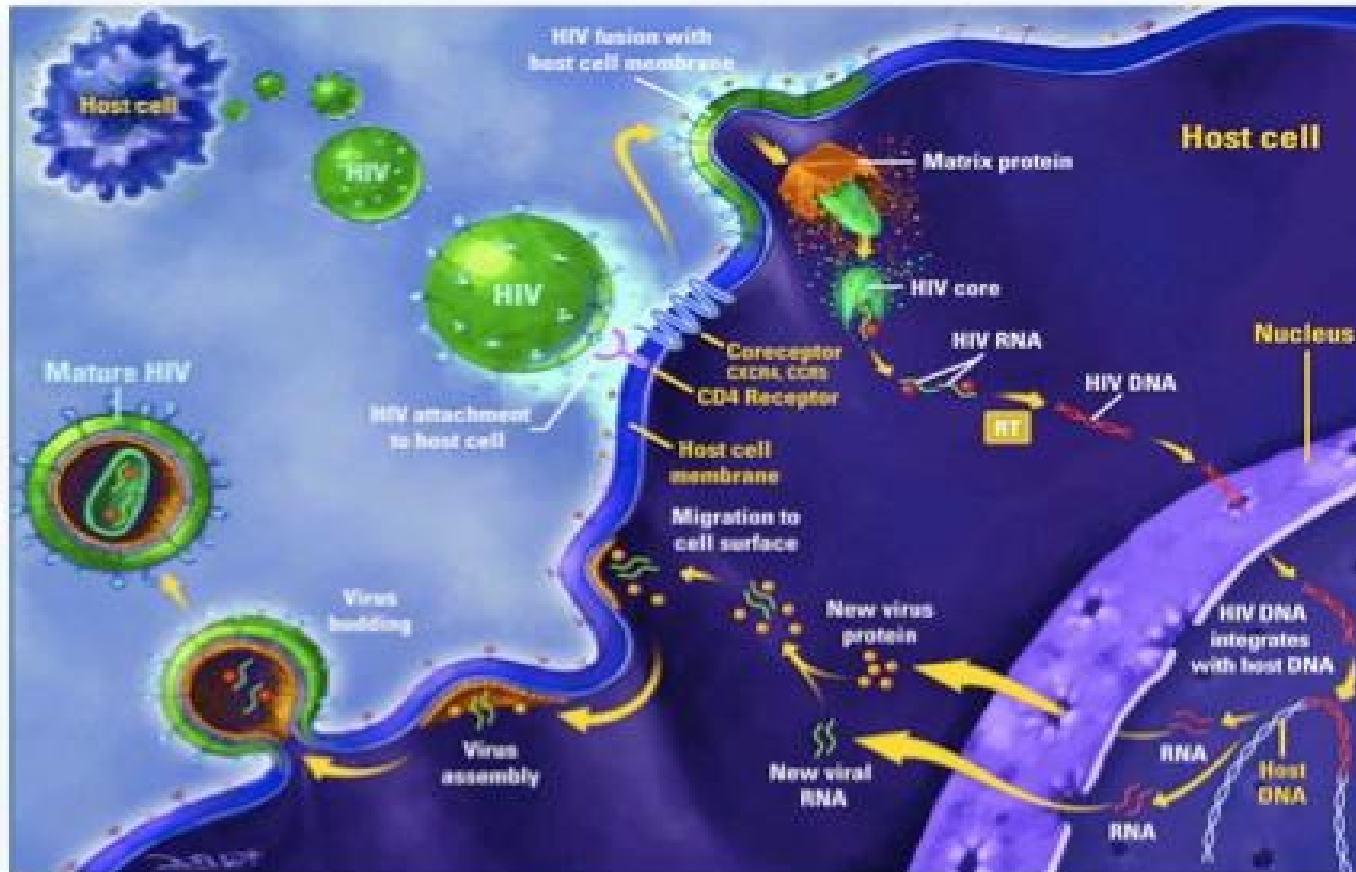
HIV

- Human immunodeficiency virus is a lentivirus that causes acquired immunodeficiency syndrome, a condition in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive.

H.I.V Infection Cycle

A simplified version of HIV-1 life cycle.

Further details can be found in relevant literature



HIV Web Study (www.HIVwebstudy.org)

H.I.V in Woman

HIV has Woman's Face

- 60% of sub-Saharan African women living with HIV

Natural STD protection for Women?

- Intervaginal ring w/ anti-retroviral drug had a 100% success rate protecting primates and will soon be tested on humans
- Possibly considering also mixing in contraceptives and other STI antiviral drug treatments
- Interferon: ϵ 's influence on other sexually transmitted infections, fungal infections, and even cancers so as to be able to find vaccines for STD's (being look at)

H.I.V in Men

H.I.V effects on Men

- Trials in Kenya and Uganda were stopped early by the National Institutes of Health because of overwhelming protection rate results

Natural Protection for Men:

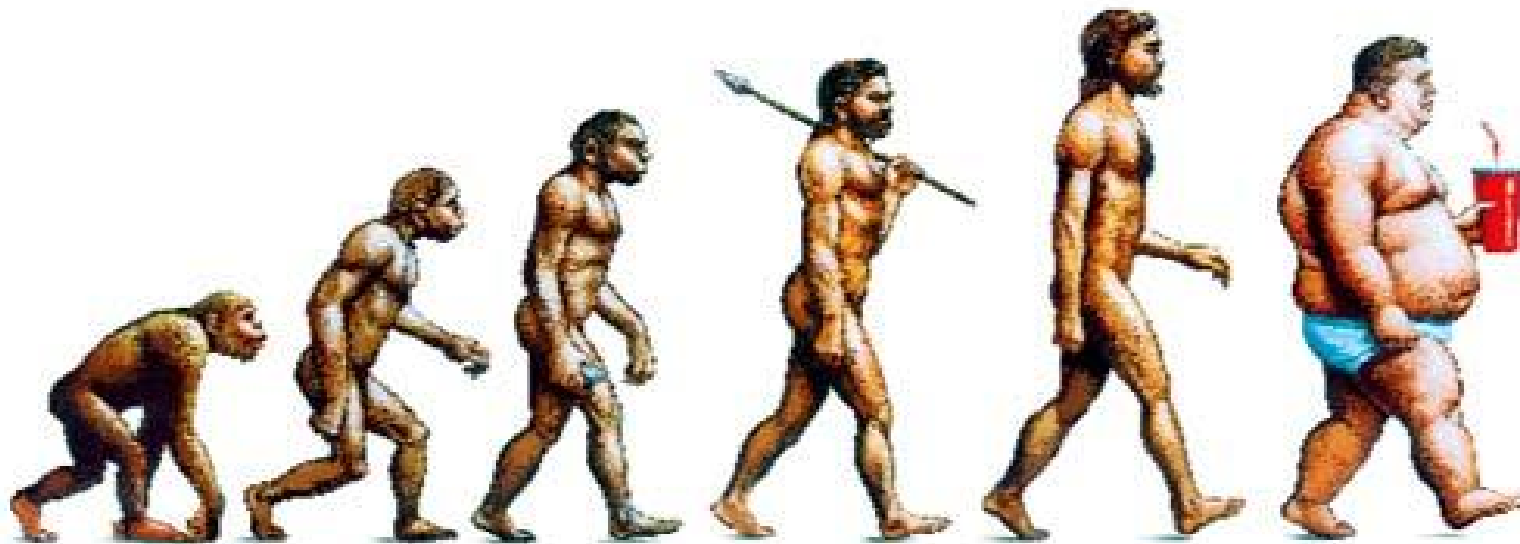
- Circumcision's Anti-AIDS effect found greater than first thought
- British medical journal (The Lancet) circumcision reduces men risk by 65%

Research Being Done

Revolutionizing HIV research

- Discovery of HIV “Invisibility cloak” reveals new treatment opportunities
- Experimental drug used in the study is based on cyclosporine, a drug that is widely used to prevent organ rejection – which works great on viruses but is not suitable for treating infected patients because of the negative effects on the immune system
- scientists have discovered a molecular invisibility cloak that enables HIV to hide inside cells of the body without triggering the body's natural defense systems

Evolution of Food Production



From Australopithecus to Now

US Before

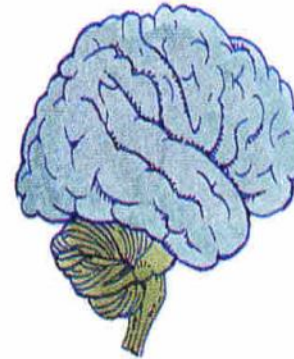


US Now:



Food and its Evolutionary Role

- Changes in our ancestral diet and current diet have changed our anatomy.
 - Large guts, small brains – Raw, plant based diets
 - Large brains, small guts – High density, protein based diets
- Expensive tissue theory – Trade off between energy used for digestion and brain function.
 - Gut tissue is expensive to function
 - 1 gm brain tissue 20x more expensive than gut tissue



Australopithecus robustus

Homo habilis

Homo erectus

Homo sapiens neanderthalensis

Homo sapiens sapiens

One important feature of nutrition transition reflected in the national diets of countries, is quantity and quality of the fats consumed in the diet.

According to the FAO report, there are big differences across the regions of world in amount of total fat.

Region	Supply of fat (g per capita per day)				
	1967 - 1969	1977 - 1979	1987 - 1989	1997 - 1999	Change between 1967 - 1969 and 1997 - 1999
World	53	57	67	73	20
North Africa	44	58	65	64	20
Sub-Saharan Africa ^a	41	43	41	45	4
North America	117	125	138	143	26
Latin America and the Caribbean	54	65	73	79	25
China	24	27	48	79	55
East and South-East Asia	28	32	44	52	24
South Asia	29	32	39	45	16
European Community	117	128	143	148	31
Eastern Europe	90	111	116	104	14
Near East	51	62	73	70	19
Oceania	102	102	113	113	11

^a Excludes South Africa

Source: FAOSTAT, 2003.

fat-to-energy ratio (FER)

The fat-to-energy ratio (FER) is defined as the percentage of energy derived from fat in the total supply of energy (in kcal). Country-specific analysis of FAO data for 1988-1990 (5) found a range for the FER of 7-46%. A total of 19 countries fell below the minimum recommendation of 15% dietary energy supply from fat, the majority of these being in sub-Saharan Africa and the remainder in South Asia. In contrast, 24 countries were above the maximum recommendation of 35%, the majority of these countries being in North America and Western Europe.

$$\text{Weight gained} = \frac{\text{weight after x days (g)} - \text{Initial weight(g)}}{\text{Initial weight (g)}}$$

$$\text{FER} = \frac{\text{Gain in body weight (g)}}{\text{Food intake (g)}}$$

$$\text{PER} = \frac{\text{Gain in body weight (g)}}{\text{Protein intake (g)}}$$

changes in consumption of animal products

The world's high population growing rate is putting an increasing pressure on the livestock sector to meet the growing demand for high-value animal protein. Annual meat production is projected to increase from 218 million tonnes in 1997-1999 to 376 million tonnes by 2030.

There are two major factors related to animal protein demands

- 1. level of income



- 2. Urbanization



The fast growing economies in Asia (China and India) showing economic growth of over 7 % per year will cover this trajet in 20 years. This implies that within 20 years the meat eating population on earth will increase from 1 billion to 3 billion people

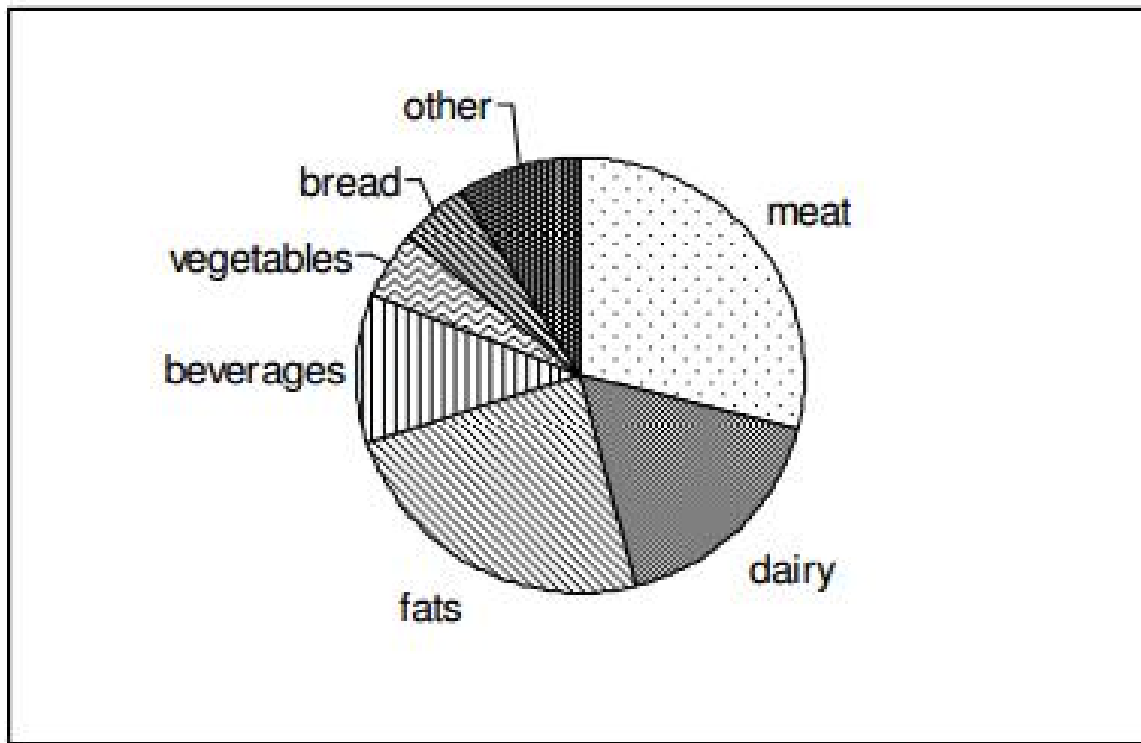
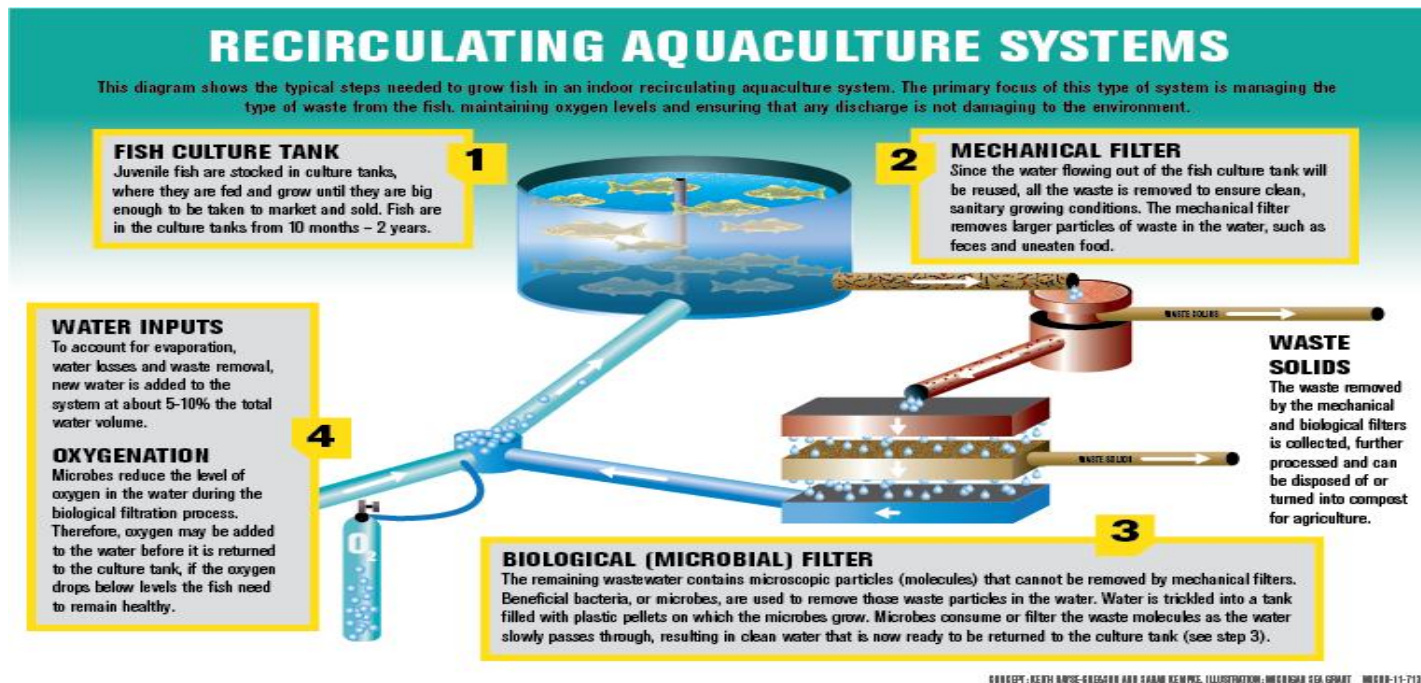


Figure 2 The land requirements of various food items in the Dutch consumption pattern as percentage of the total land required for food. (source 2)

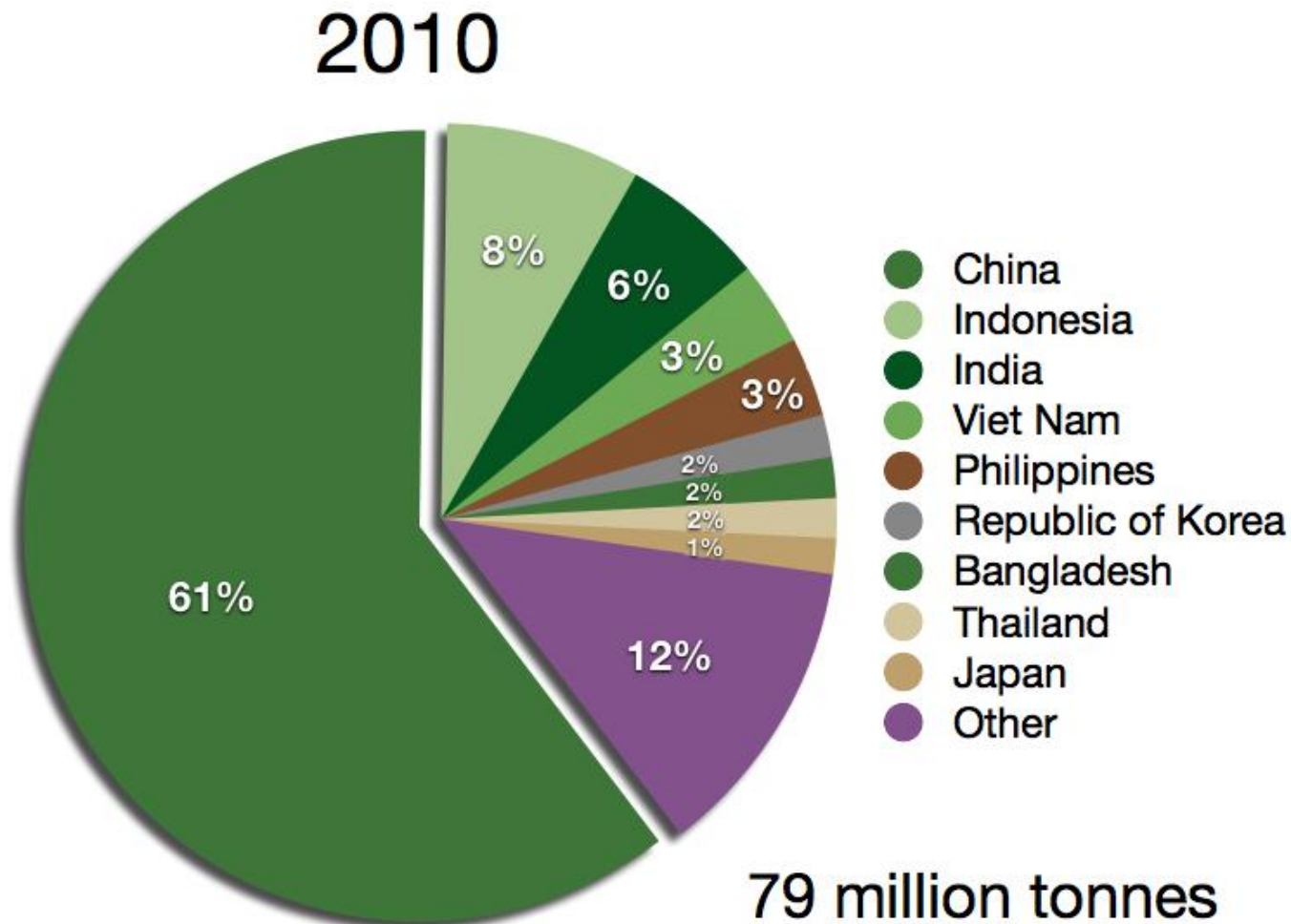
Changing consumption of fish

In fact, most sea livestock has been fully exploited. It is hardly to see substantial increases in total catch will be obtained in the future. In contrast, aquaculture production has followed the opposite path. Starting from an insignificant total production, inland and marine aquaculture production has been growing at a remarkable rate, offsetting part of the reduction in the ocean catch of fish.



Source: <http://www.miseagrant.umich.edu/explore/fisheries/what-is-aquaculture/>

Fish provides about 20-30 kcal per capita per day. Fish proteins are essential in the diet of some densely populated countries where the total protein intake level is low, and are very important in the diets of many other countries.



<http://en.wikipedia.org/wiki/Aquaculture>

Changing in consumption of fruits and vegetables

At present, only a small and negligible minority of the world's population consumes the generally recommended high average intake of fruits and vegetables. In 1998, only 6 of the 14 WHO regions had an availability of fruits and vegetables equal to or greater than the earlier recommended intake of 400 g per capita per day.

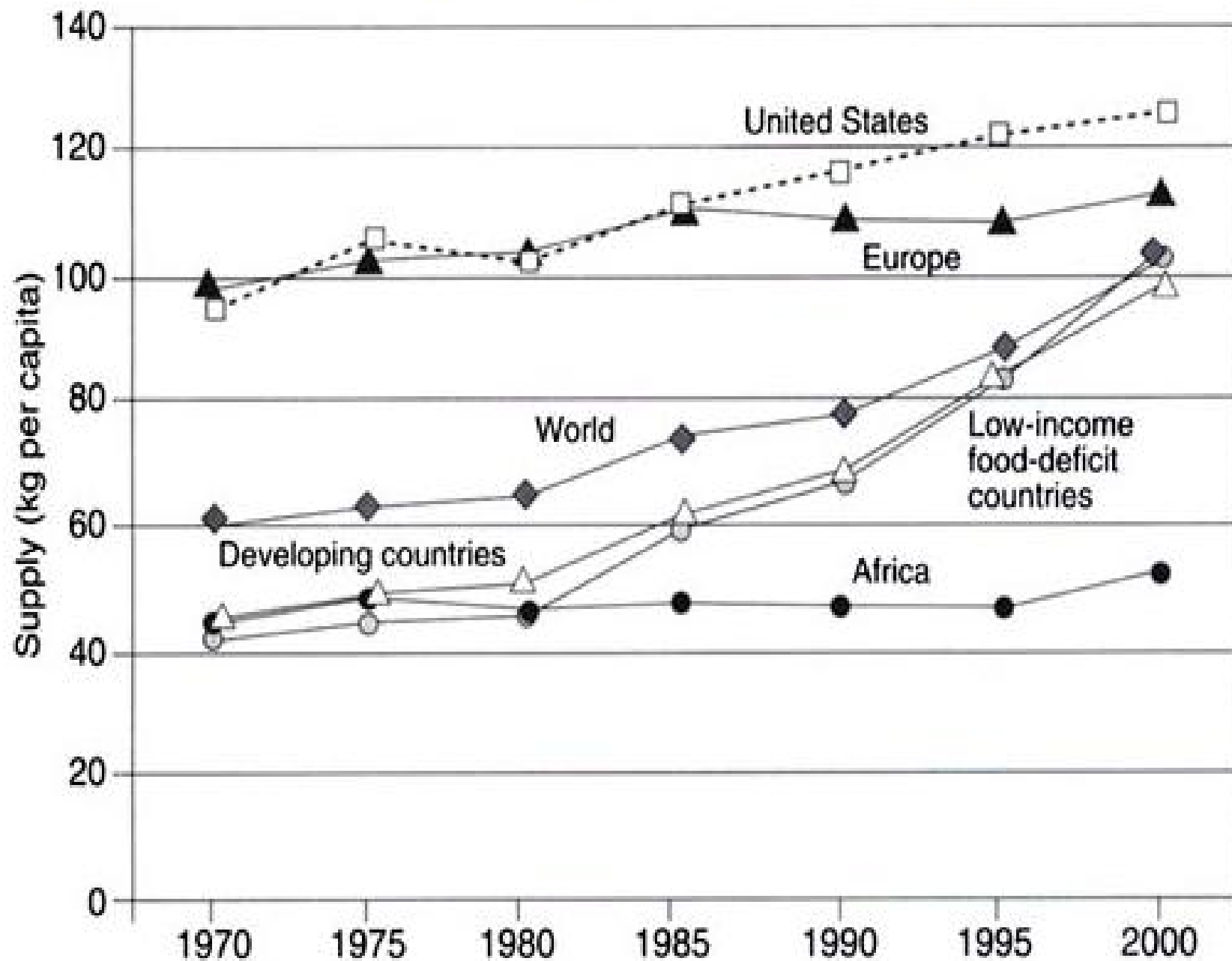
Global trends in the production and supply of vegetables indicate that the current production and consumption vary widely among regions

Table 5. **Supply of vegetables per capita, by region, 1979 and 2000 (kg per capita per year)**

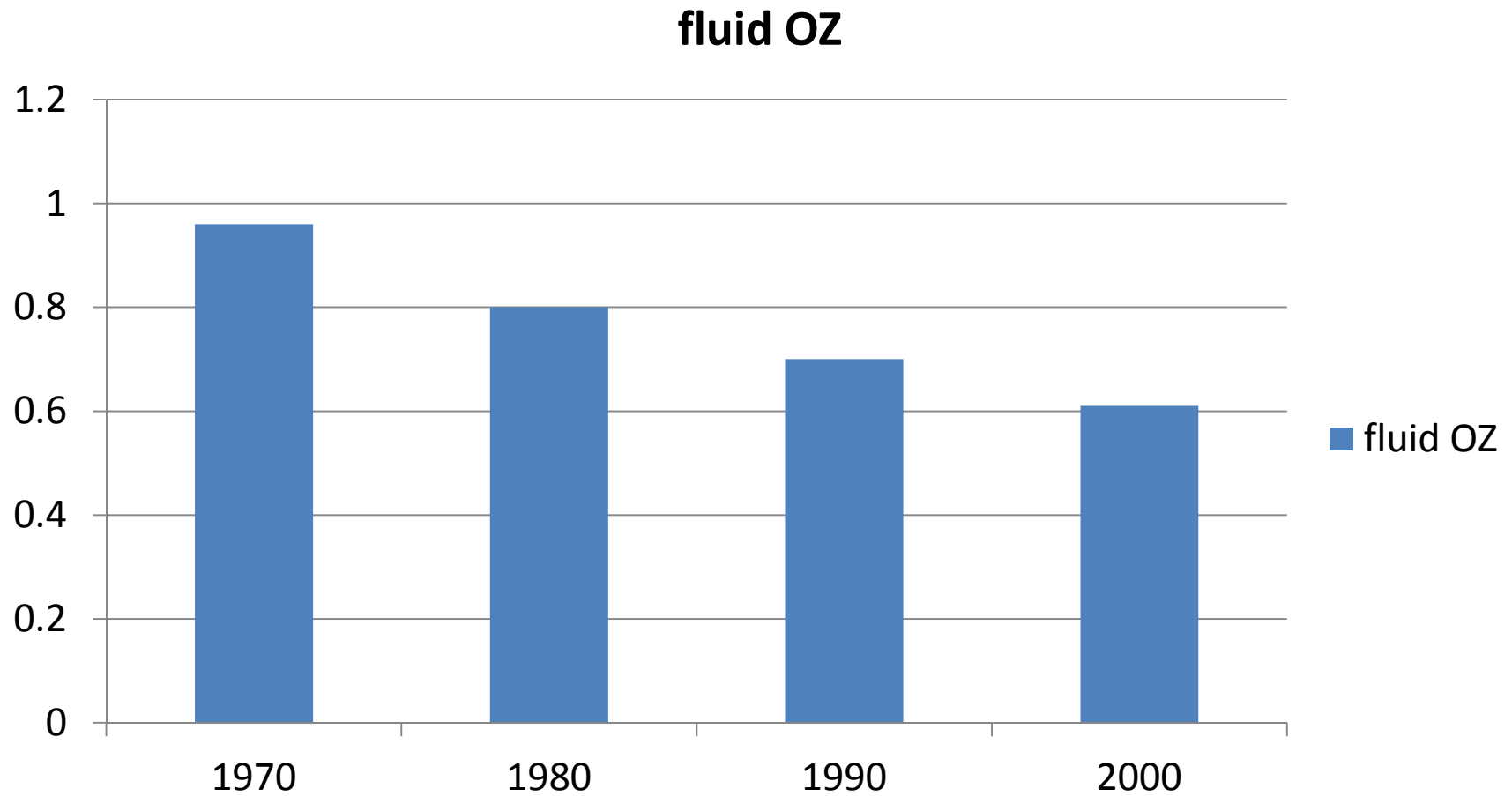
Region	1979	2000
World	66.1	101.9
Developed countries	107.4	112.8
Developing countries	51.1	98.8
Africa	45.4	52.1
North and Central America	88.7	98.3
South America	43.2	47.8
Asia	56.6	116.2
Europe	110.9	112.5
Oceania	71.8	98.7

Source: <http://www.fao.org>

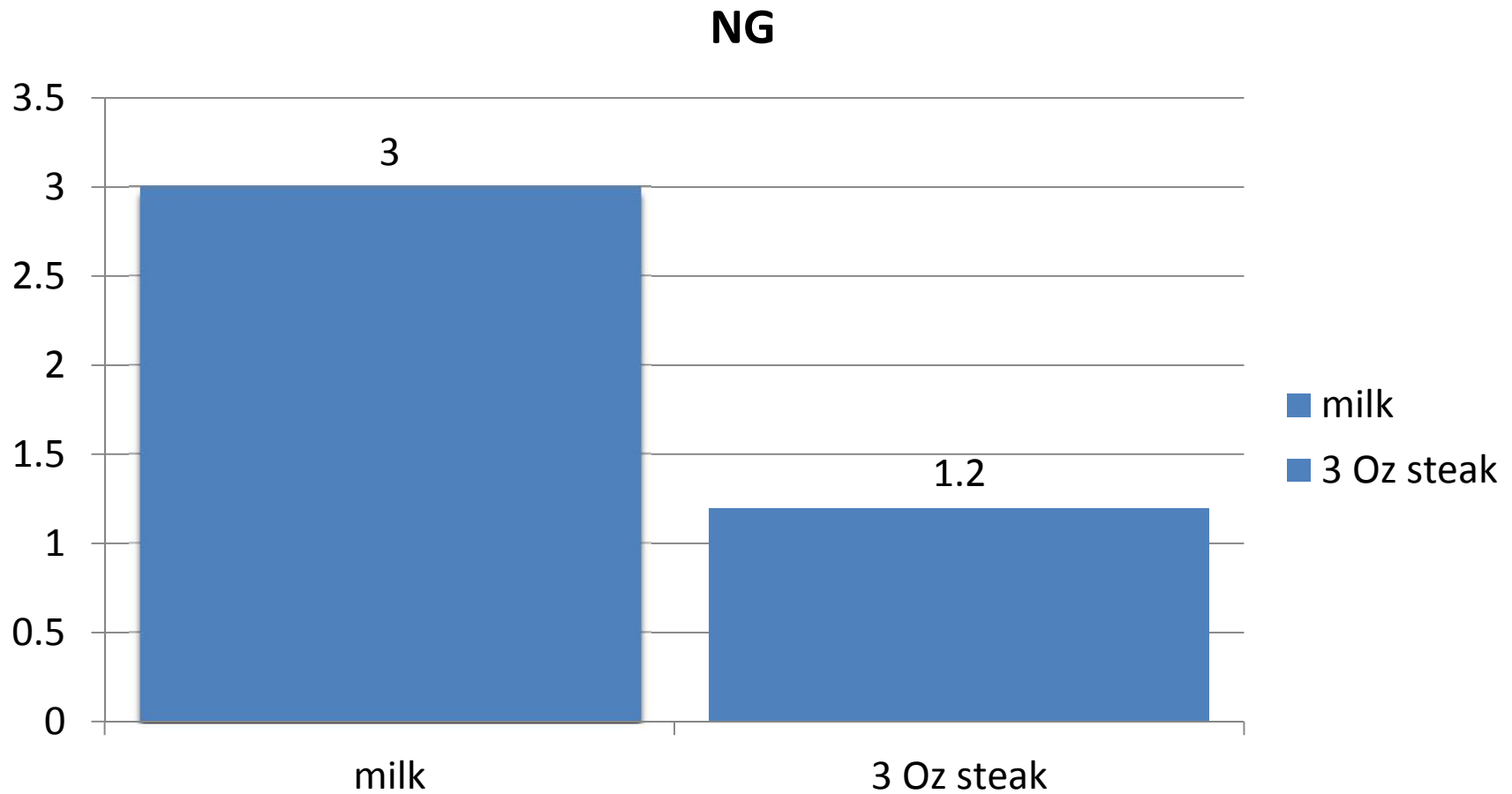
Figure 3. Trends in the supply of vegetables per capita, by region, 1970-2000



DECLINE IN MILK CONSUMPTION

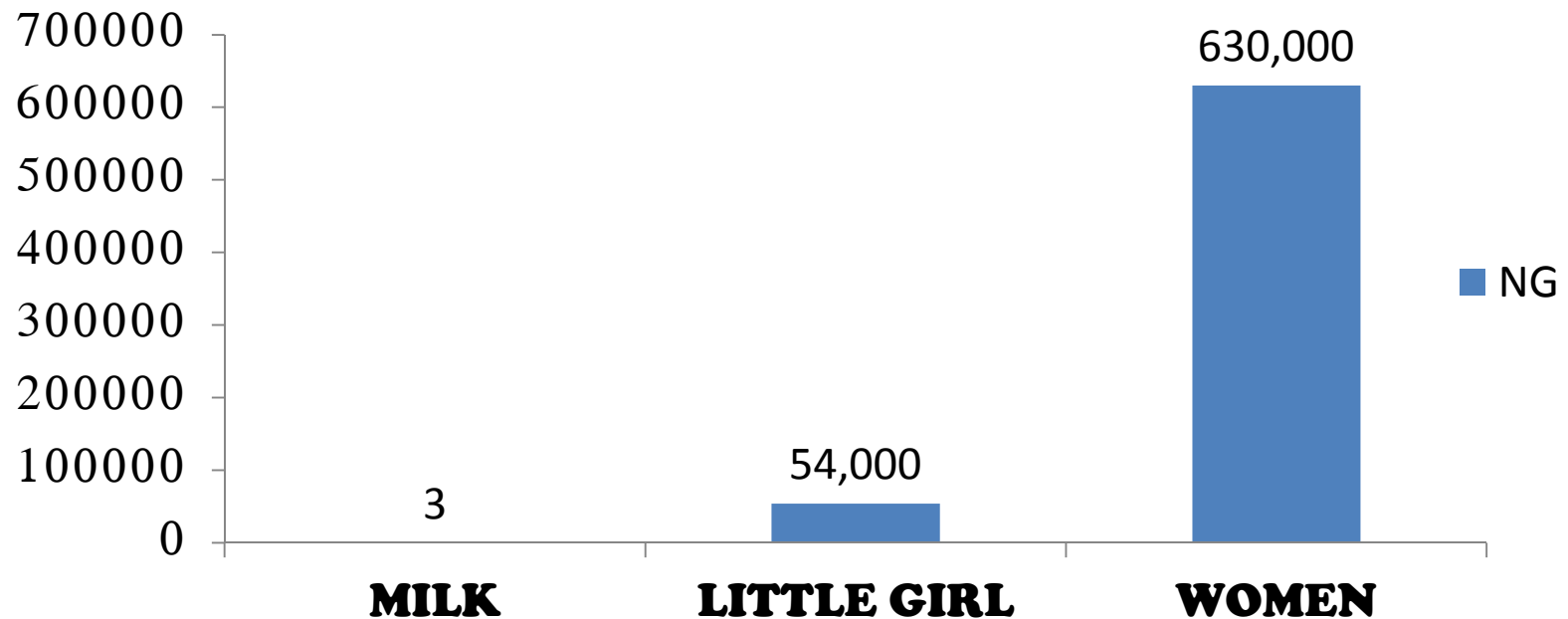


Hormones in COWS?



Lets do the number Hormones in COWS

NG



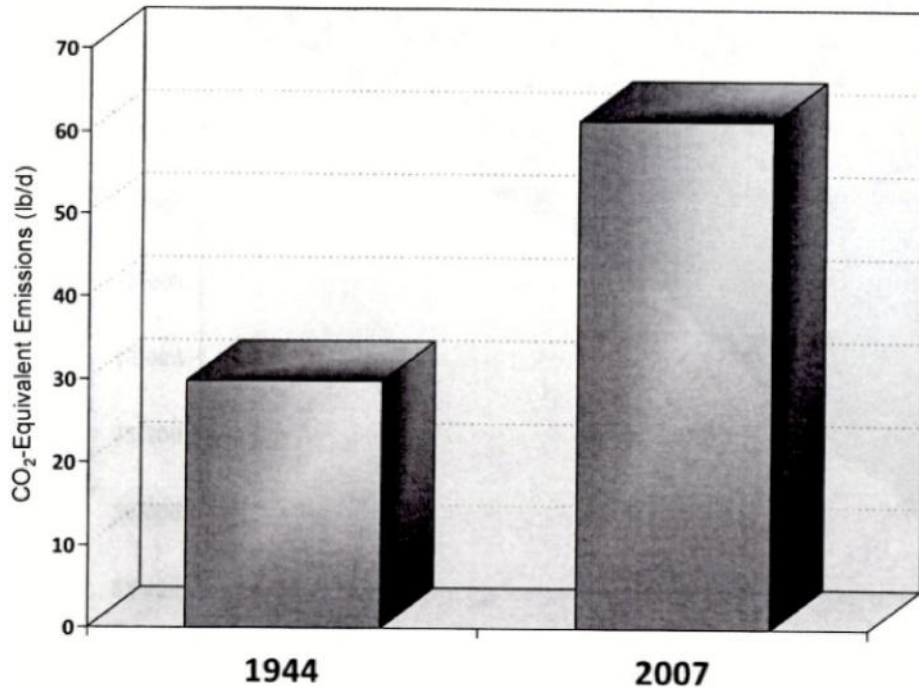
Anti! Pro! What's the difference?

- Antibiotics- used to treat infections and are very powerful in relation to probiotics.
- Probiotics- promote the growth of healthy bacteria in the animal

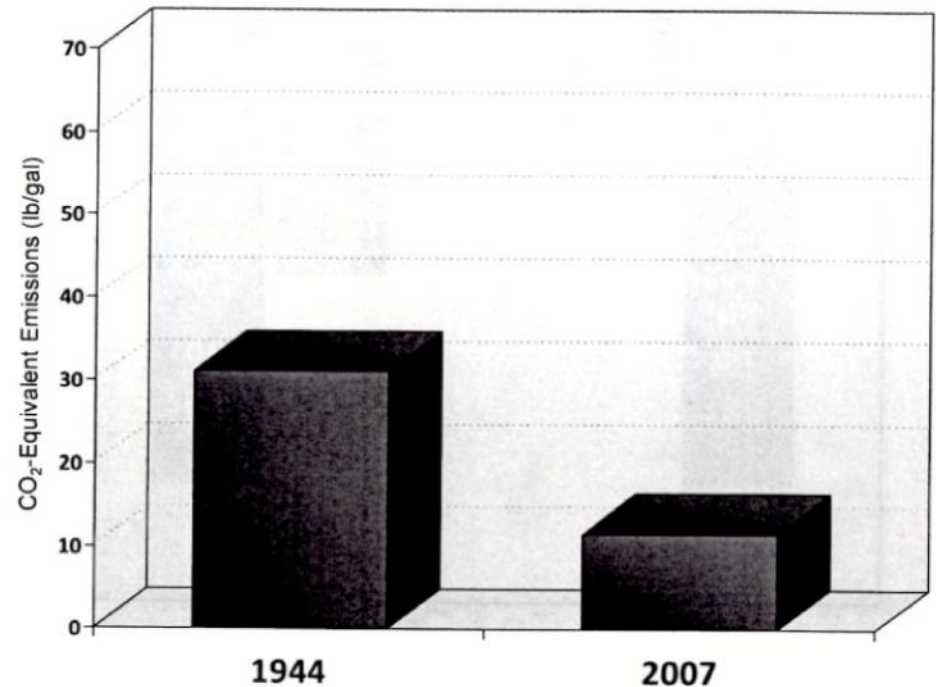


An Individual Cow's Carbon Footprint is Not Indicative of the Dairy Industry's Footprint

Carbon Footprint of the Cow Has Doubled



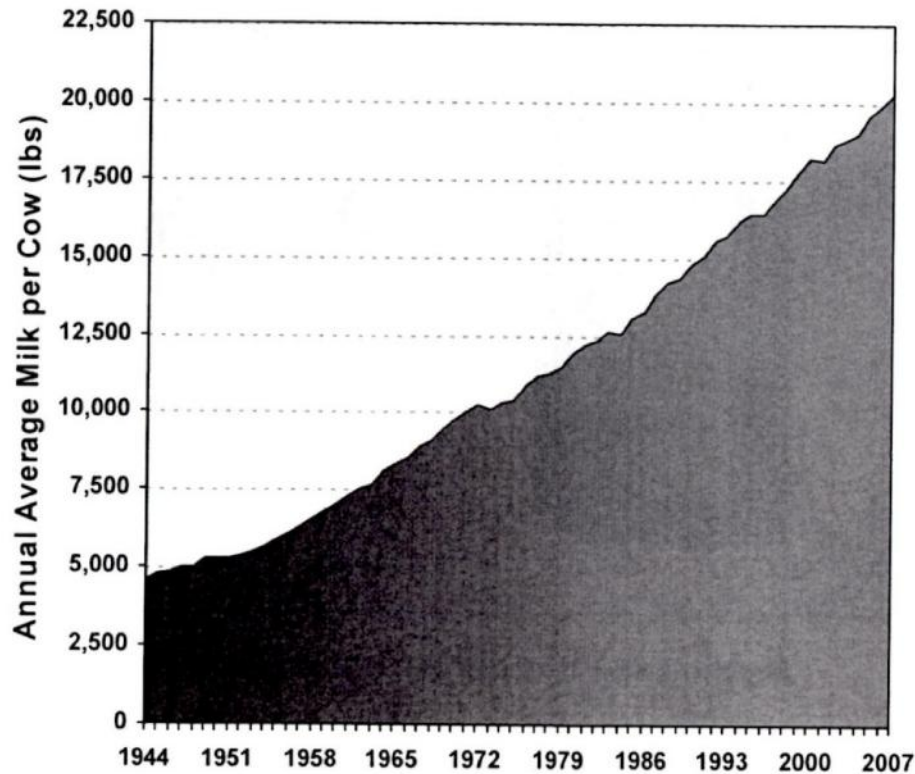
Carbon Footprint per Gallon of Milk Reduced 2/3



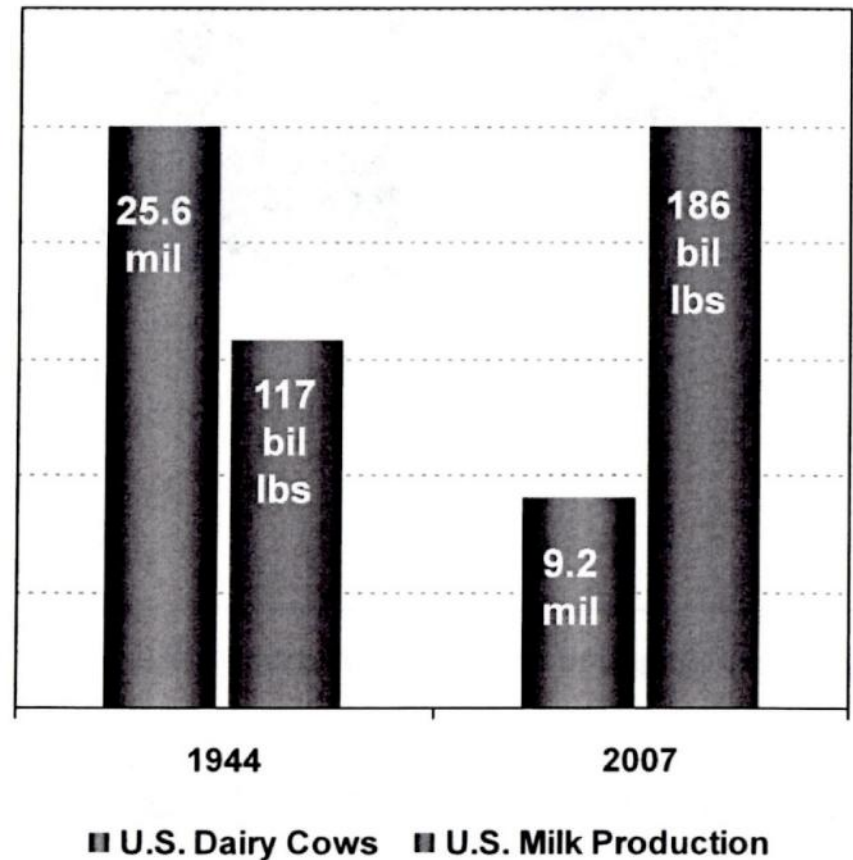
Net Result: U.S. Dairy Farm Industry has Reduced its Total Carbon Footprint by 41% Since 1944

Productivity is the Reason

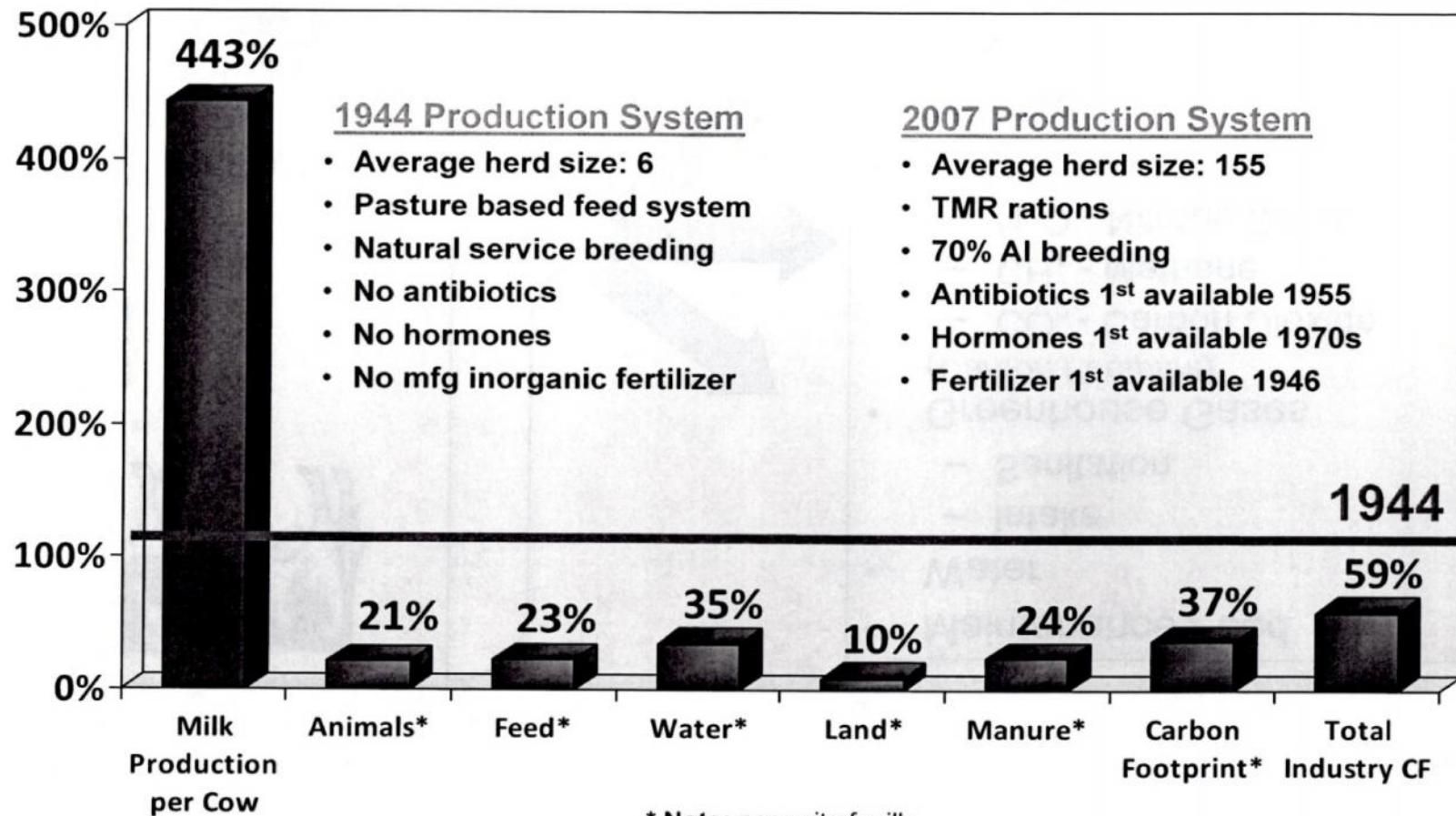
U.S. Milk Productivity has Quadrupled Since 1944



59% More Milk with 64% Fewer Cows



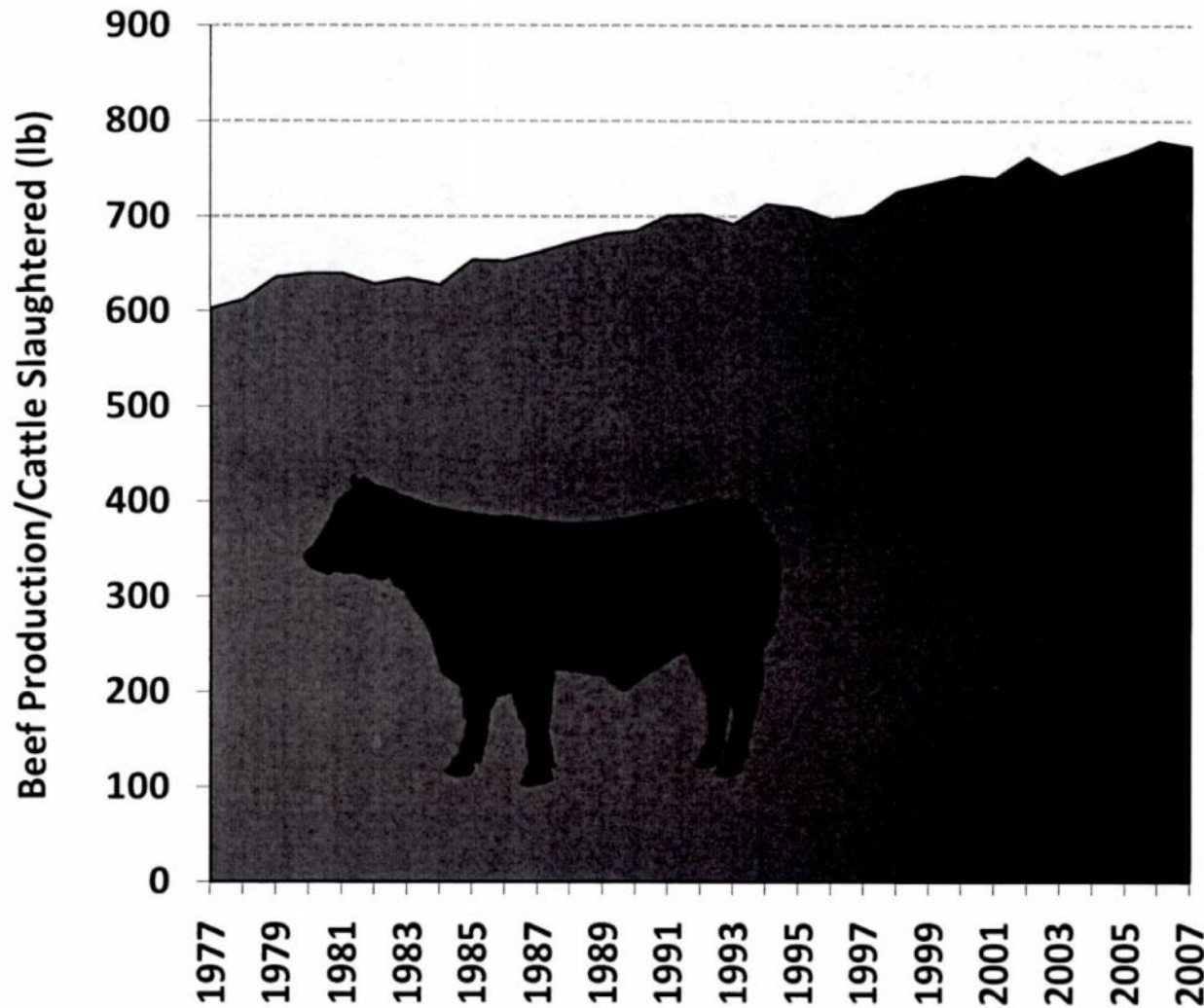
Environmental Impact of U.S. Milk Production Is Considerably Reduced Since 1944



Source: Capper et al. (2009) "The environmental impact of dairy production: 1944 compared with 2007" *J. Anim. Sci.*

DBM 0375

Beef Productivity Has Increased by 28% Since 1977



Beef/Animal:
1977 = 603 lb
2007 = 773 lb

Eggs

Seasonality & Eggs

- Birds are sensitive to seasonal & environmental changes
- They are prone to lay eggs in warmer weather
- Seasonality limited access to eggs
- Therefore before refrigeration eggs were scarce during winter times
- In addition, eggs deteriorate quickly when they are not stored in low temperatures
- Must be stored between 33°F and 41° F
- This was important because eggs are one of the only foods that contain naturally occurring vitamin D, are high in protein and nutrition, and can be used in fertilizers and animal feed.



Chicken: Free range or caged?

