Global Health Trends

Lecture 1
Social Determinants of Health and Health Inequalities

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History .....

What did the world look like in 1800?

	1800	Today
Population size		
Average life expectancy at birth		
Infant mortality rate		

What did the world look like in 1800?

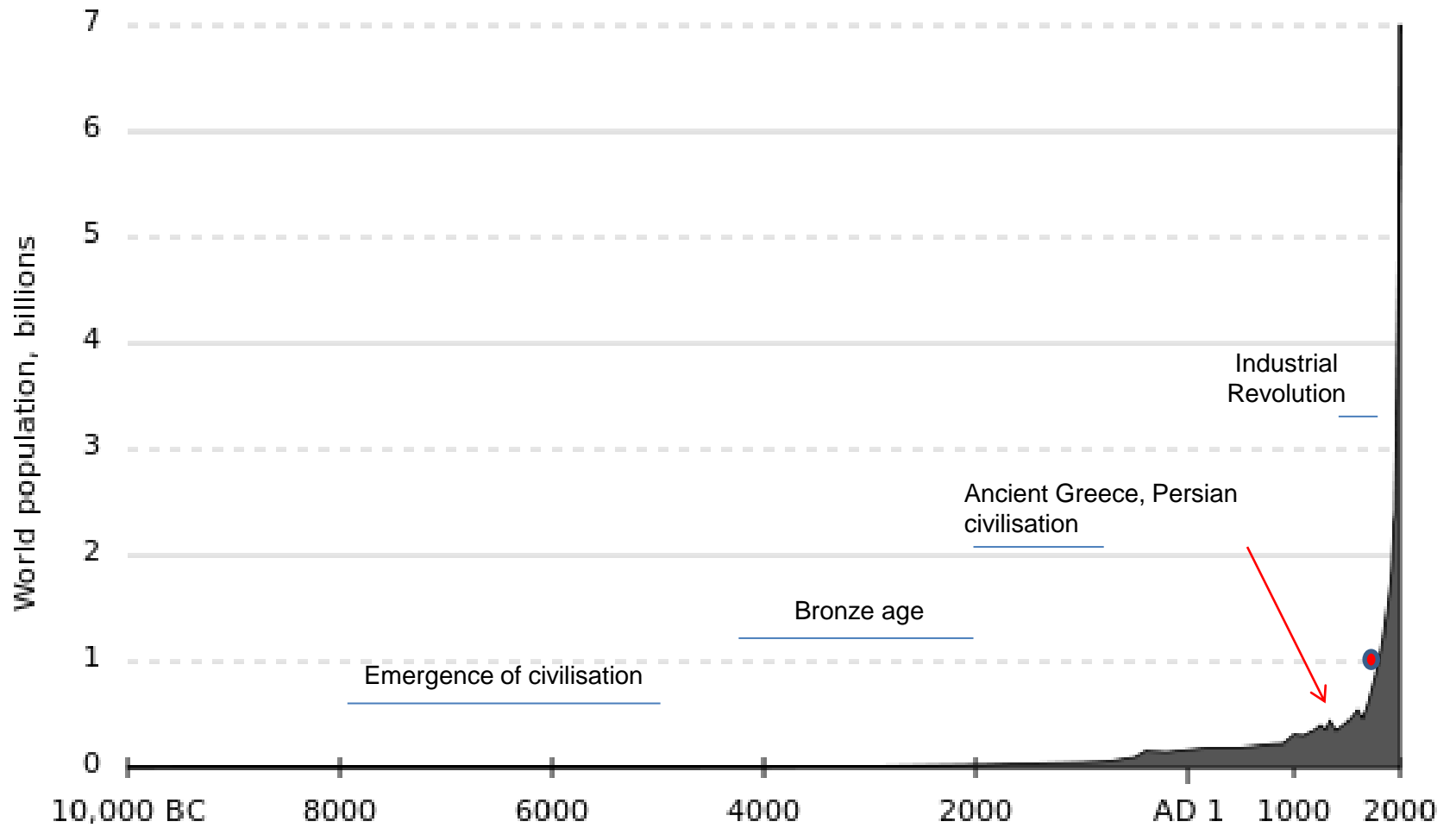|	1800	Today
Population size		7 billion
Average life expectancy at birth		~ 67 years
Infant mortality rate		~ 45

What did the world look like in 1800?

	1800	Today
Population size	1 billion	7 billion
Average life expectancy at birth	~ 33 years	~ 67 years
Infant mortality rate	> 220	~ 45

Life Expectancy at birth

80 Years ← 2003
75 Years ← 1980

50 Years ← 1900

30 Years ← 1700
Bronze Age

World Health Report 2006

World population, billions

- Industrial Revolution
- Ancient Greece, Persian civilisation
- Bronze age
- Emergence of civilisation

7
6
5
4
3
2
1
0

10,000 BC   8000   6000   4000   2000   AD 1   1000   2000
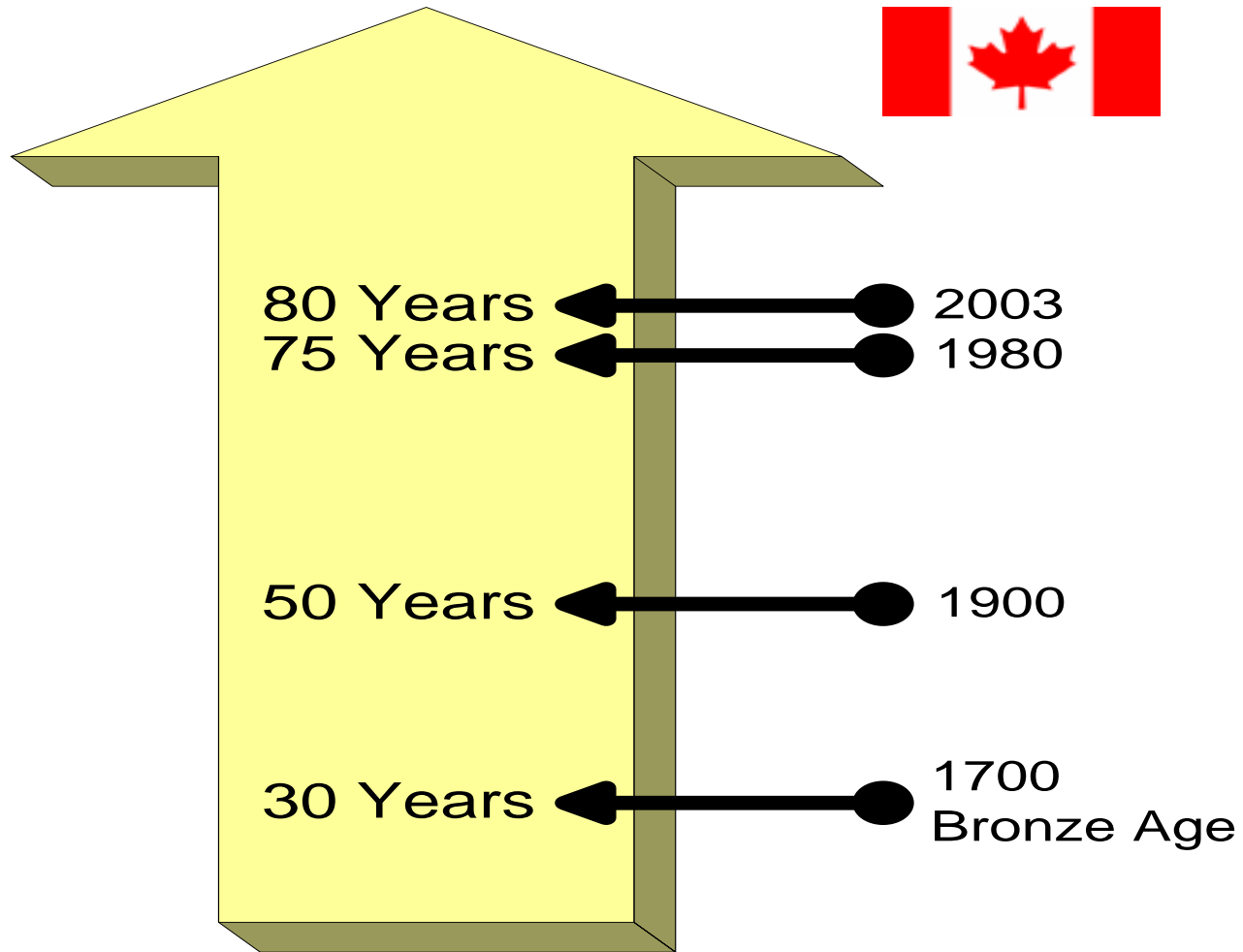
World Population Growth

Number of years to add each billion (year)

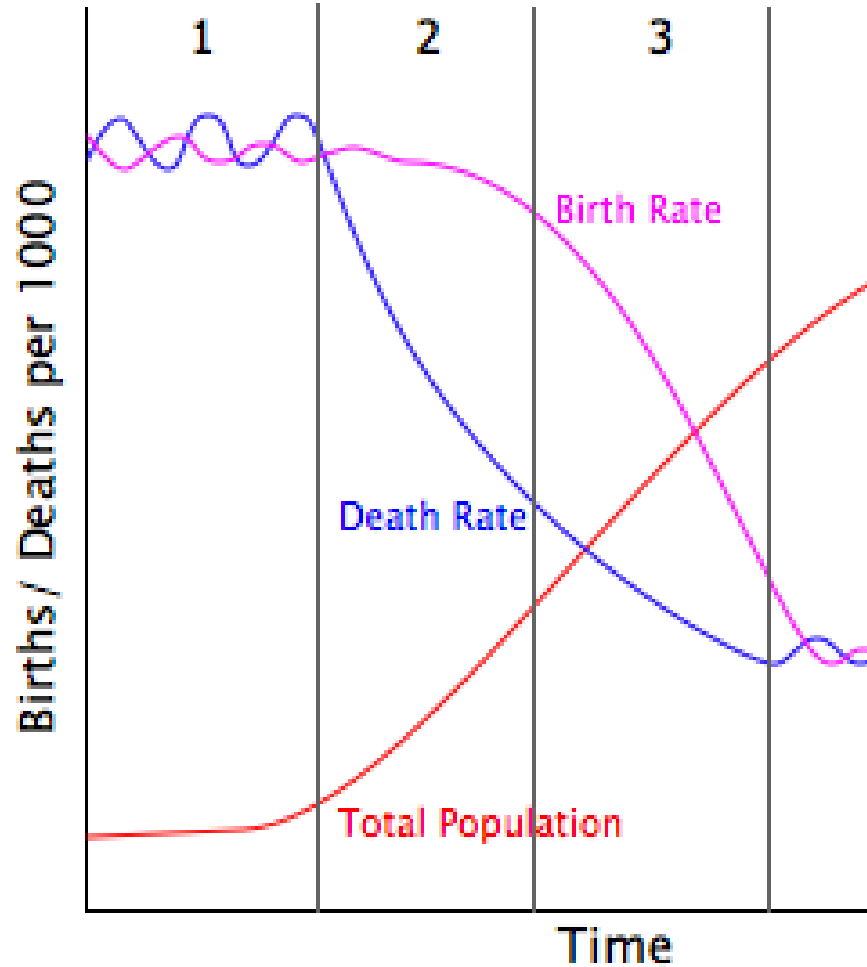|	
First Billion	All of Human History — (1800)
Second	130 (1930)
Third	30 (1960)
Fourth	15 (1975)
Fifth	12 (1987)
Sixth	12 (1999)
Seventh	14 (2013)
Eighth	14 (2027)
Ninth	21 (2048)
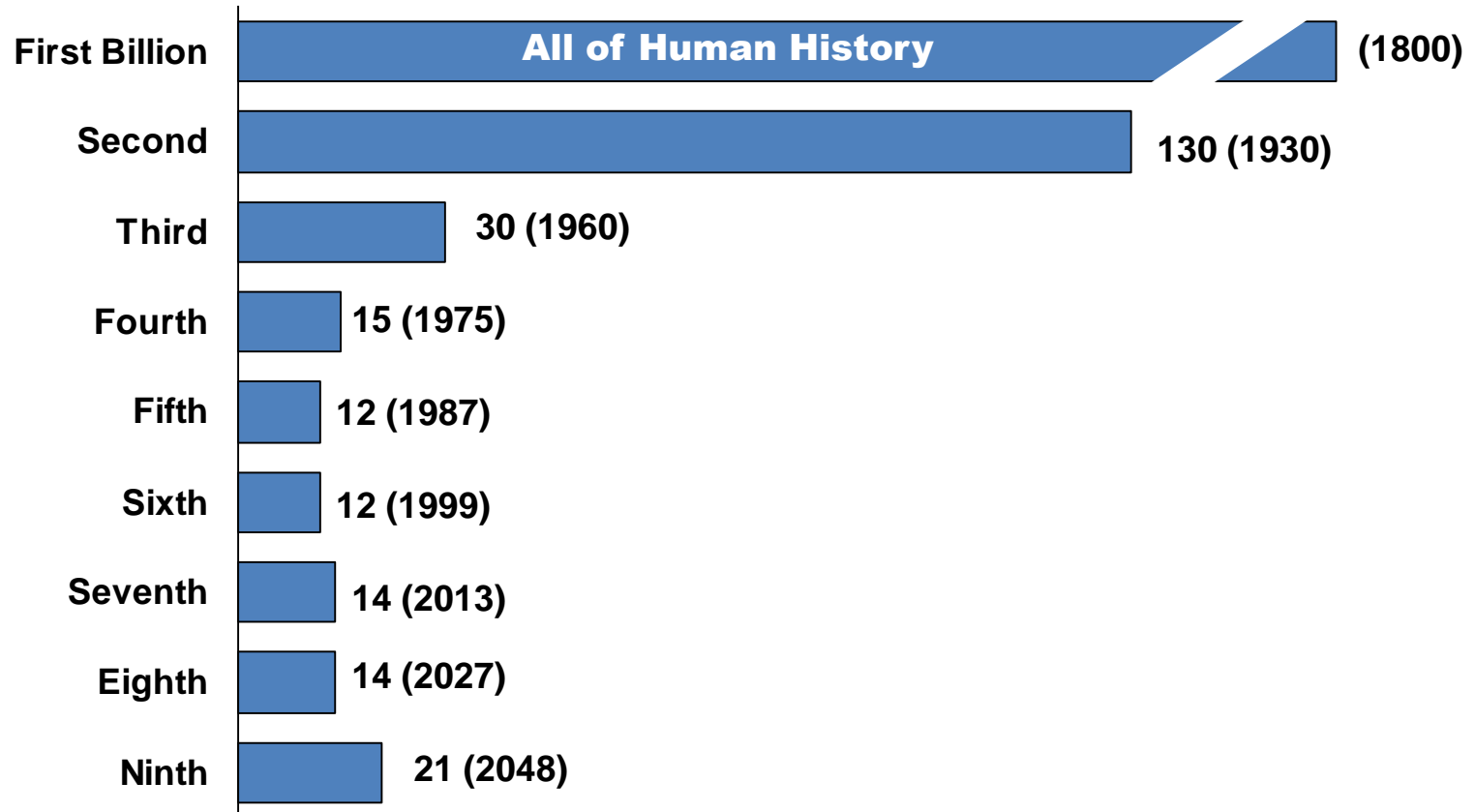
Sources: First and second billion: Population Reference Bureau. Third through ninth billion: United Nations, *World Population Prospects: The 2004 Revision* (medium scenario), 2005.

Why and how did population grow so rapidly in last two centuries?

Rise in fertility, or decrease in mortality?
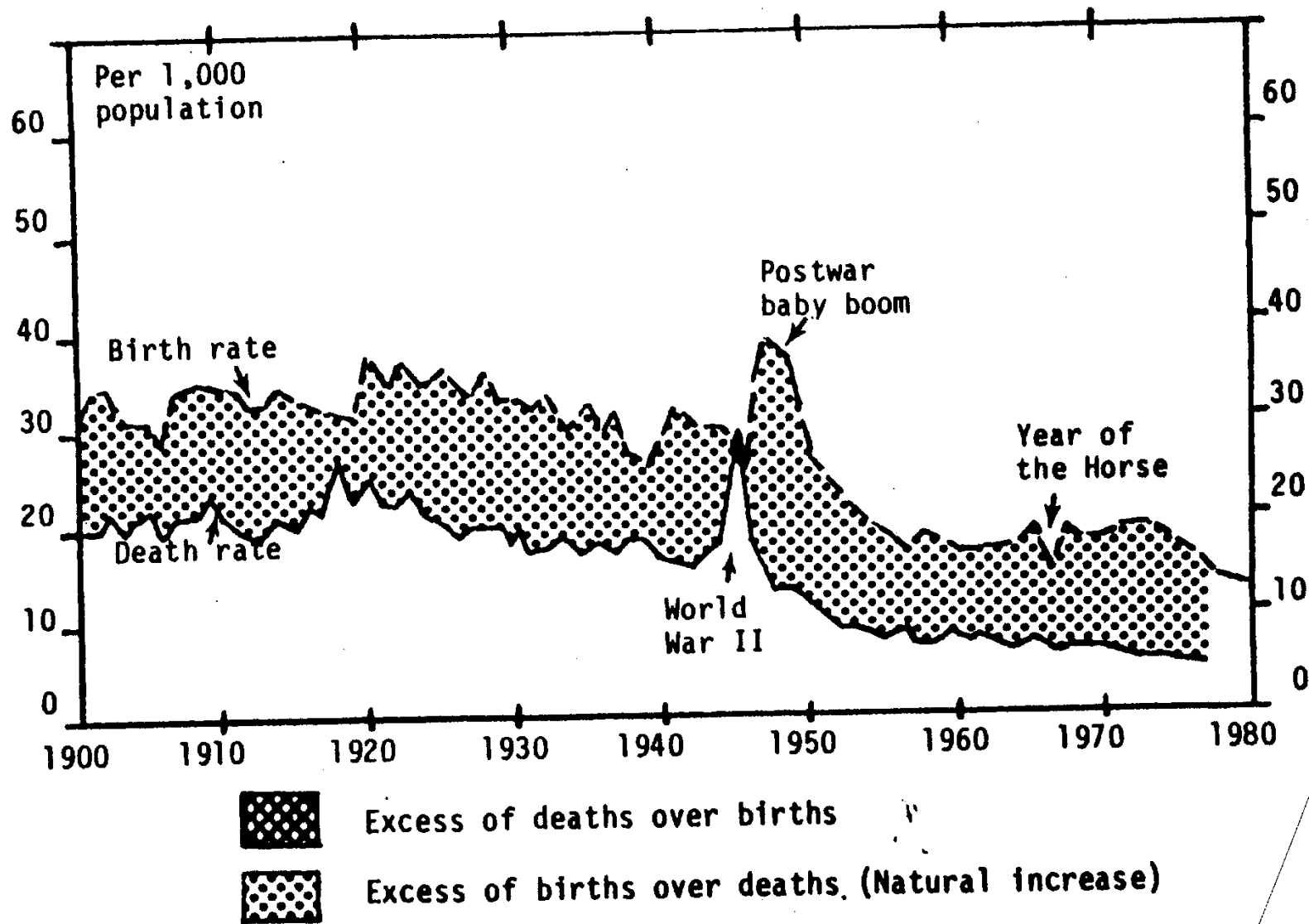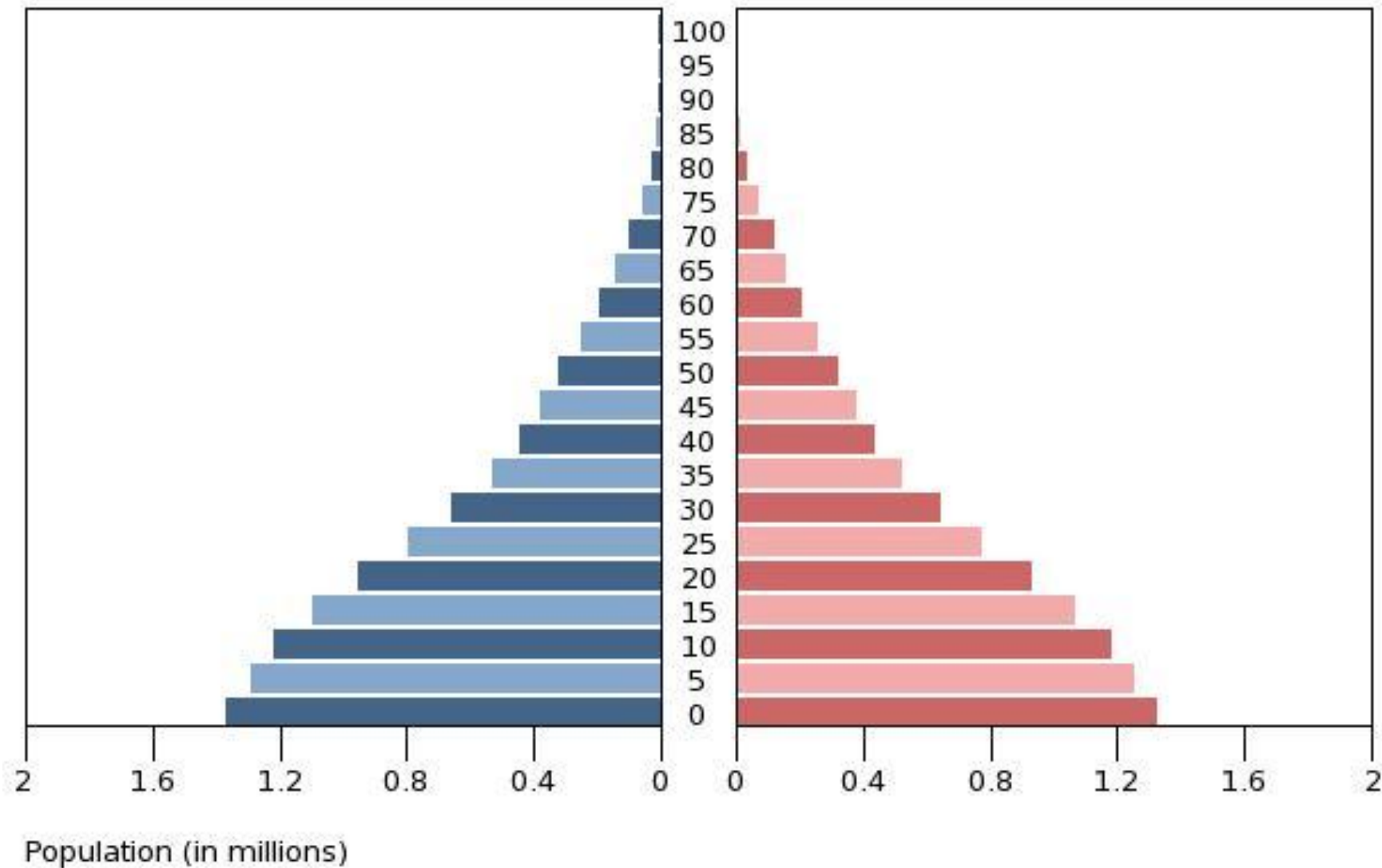
The demographic transition model

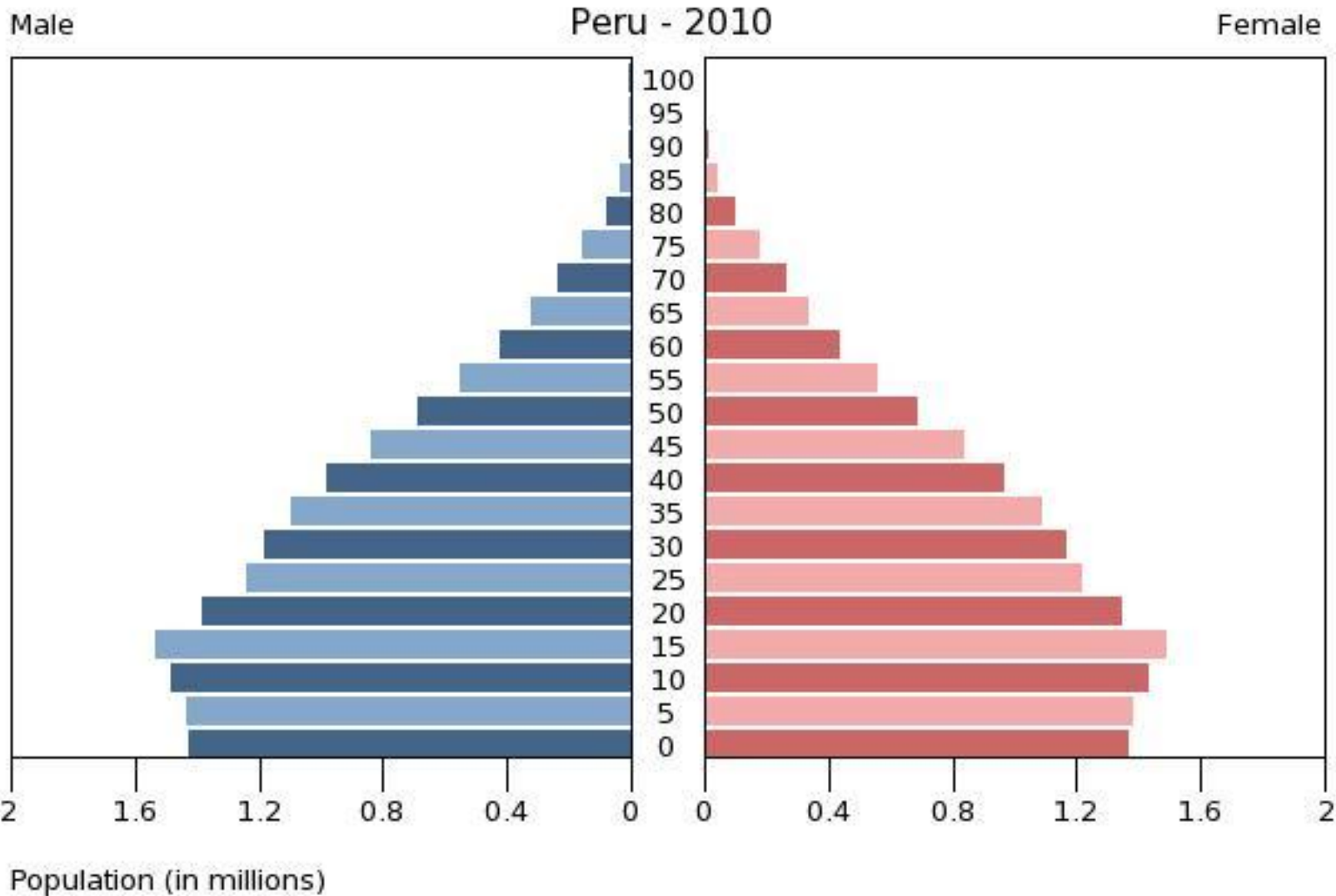FIG. 7. The balance of births and deaths, Japan 1900–1978.

Legend:
- Excess of deaths over births
- Excess of births over deaths (Natural increase)

Chart labels: Per 1,000 population · Birth rate · Death rate · Postwar baby boom · World War II · Year of the Horse

Peru - 1985

Male | Female

Population (in millions)

Source: US Census Bureau, Population Division

Peru - 2010

Male — Female

Population (in millions)

Source: US Census Bureau, Population Division

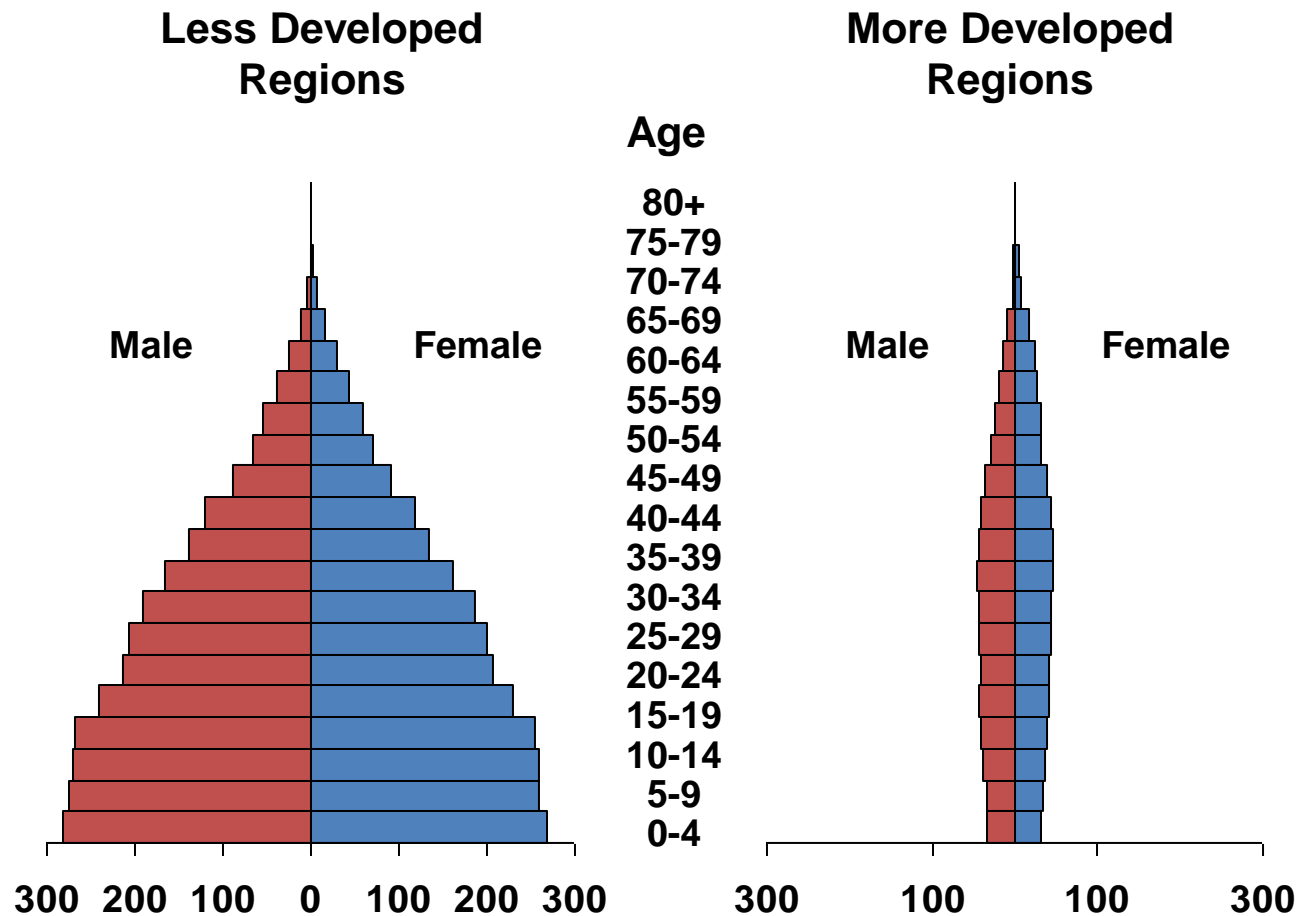Peru - 2050

Male | Female

Population (in millions)
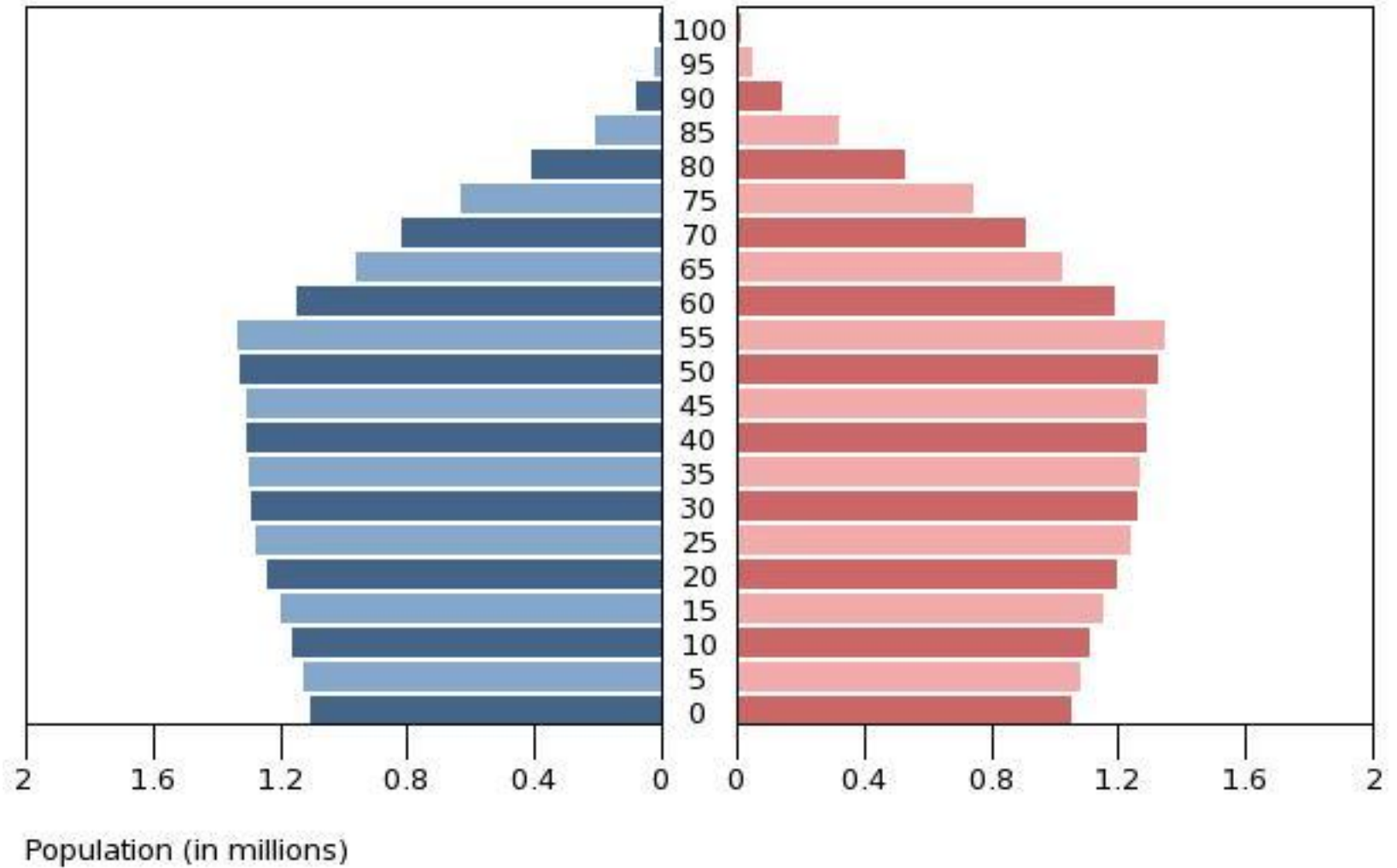
Source: US Census Bureau, Population Division

Age Distribution of the World's Population

Population Structures by Age and Sex, 2005
Millions

Less Developed Regions

Male / Female

More Developed Regions

Male / Female

Age: 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

300 200 100 0 100 200 300

300 100 100 300

Source: United Nations, *World Population Prospects: The 2004 Revision*, 2005.

The epidemiologic transition

- long-term shift in mortality and disease patterns

The age of pestilence and famine	High mortality and fertility. Life expectancy at birth <45 years. TFR > 6. Death from malnutrition, infectious disease, complications of pregnancy and child birth. Low but fluctuating population growth.
The age of receding pandemics	Mortality declines as epidemics decrease. Life expectancy at birth 45 to 55. TFR is still high with gap between birth and death rate widening. Fertility declines typically several decades later.
The age of degenerative and man made diseases	Mortality declines further. Life expectancy at birth 65 to 75. Increase in chronic diseases. Fertility may fall below replacement level leading to population decline.

Omran 1971

Health transition: mortality rates (US, 1910-1970)
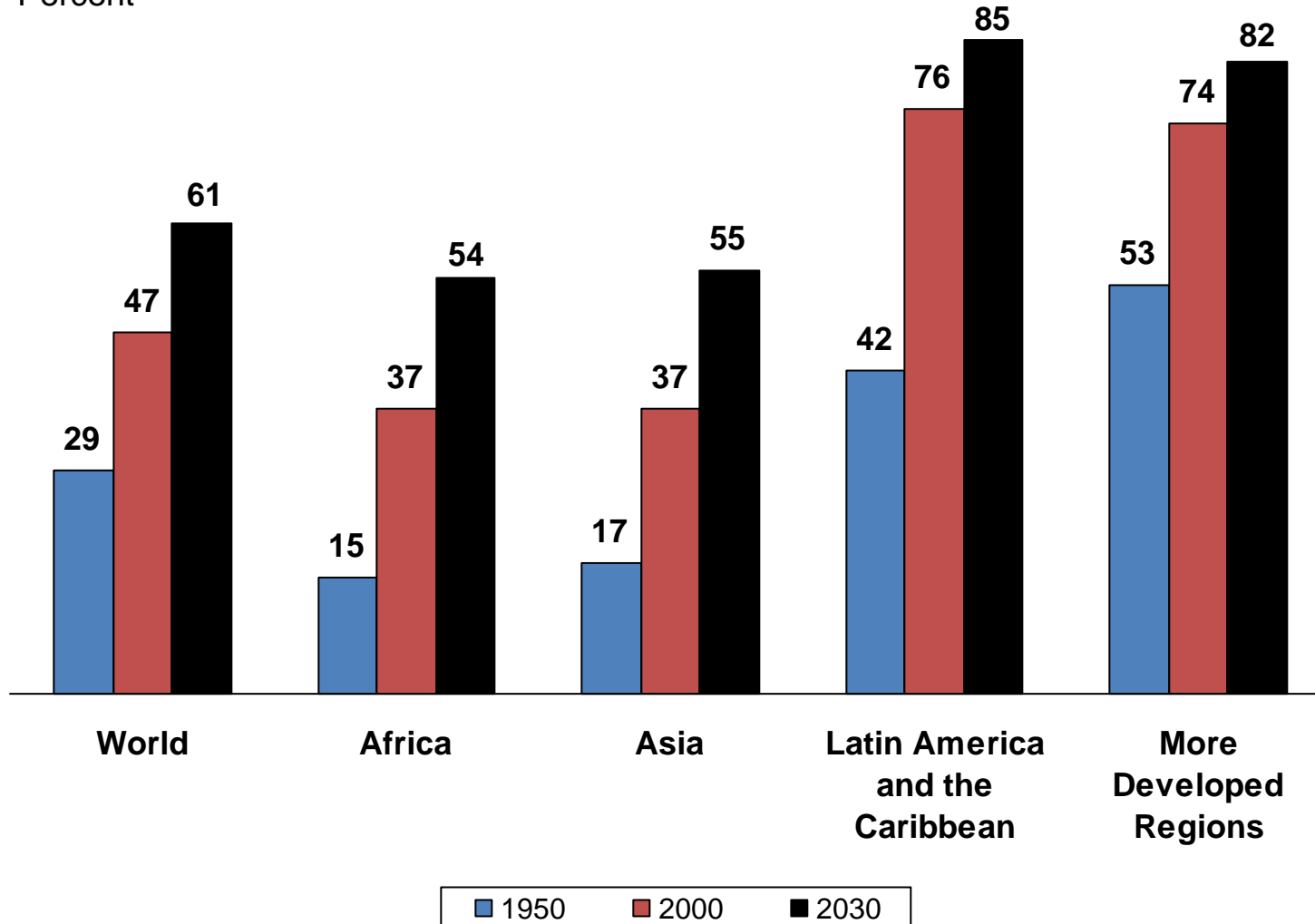
(up to >1000 earlier)
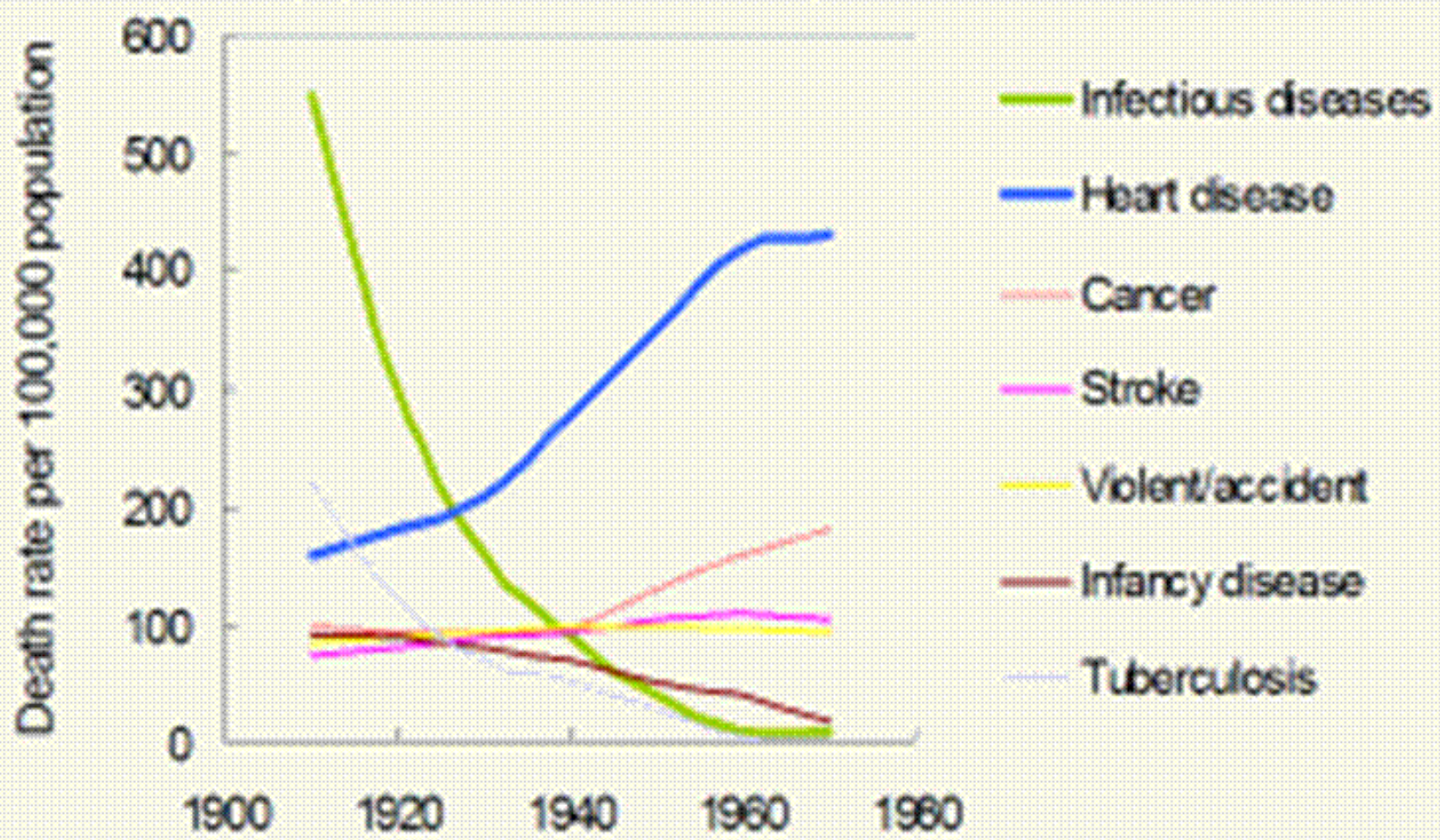
Gapminder

Other "transitions"

- Urbanisation / de-ruralisation

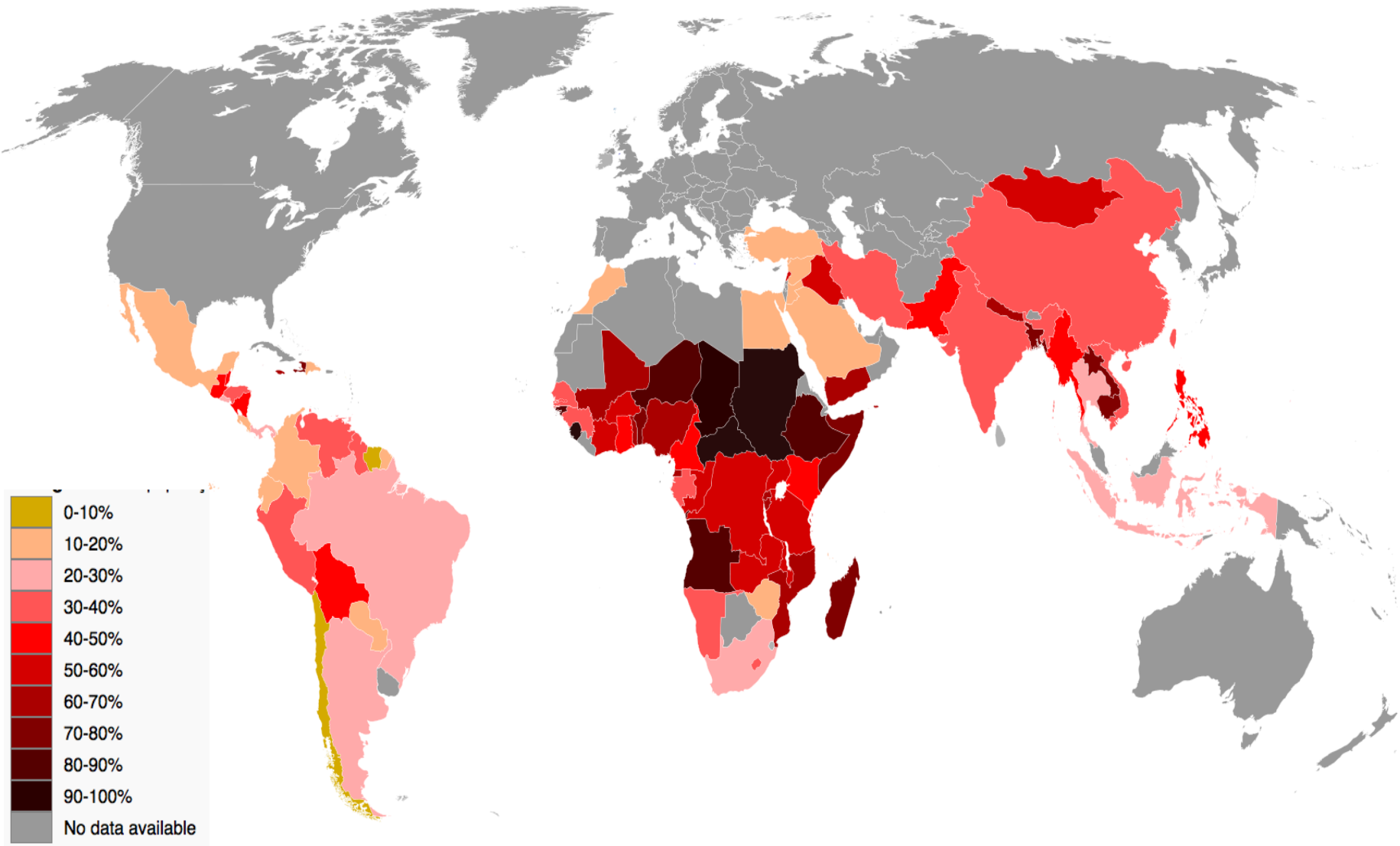- Nutrition

Trends in Urbanisation, by Region

Urban Population

Percent

Legend: ■ 1950 ■ 2000 ■ 2030

Region	1950	2000	2030
World	29	47	61
Africa	15	37	54
Asia	17	37	55
Latin America and the Caribbean	42	76	85
More Developed Regions	53	74	82

Source: United Nations, *World Urbanization Prospects: The 2003 Revision* (medium scenario), 2004.

Urban population living in slums

|	
0-10%	
10-20%	
20-30%	
30-40%	
40-50%	
50-60%	
60-70%	
70-80%	
80-90%	
90-100%	
No data available	

# So what caused the epidemiological transition?

What led to reductions in mortality in the UK?

- Was it industrial development / industrial revolution?
- Was it growth in income and wealth?
- What is better nutrition?
- Was it better sanitation and access to water?
- Was it better health care?
- Was it less virulent organisms?

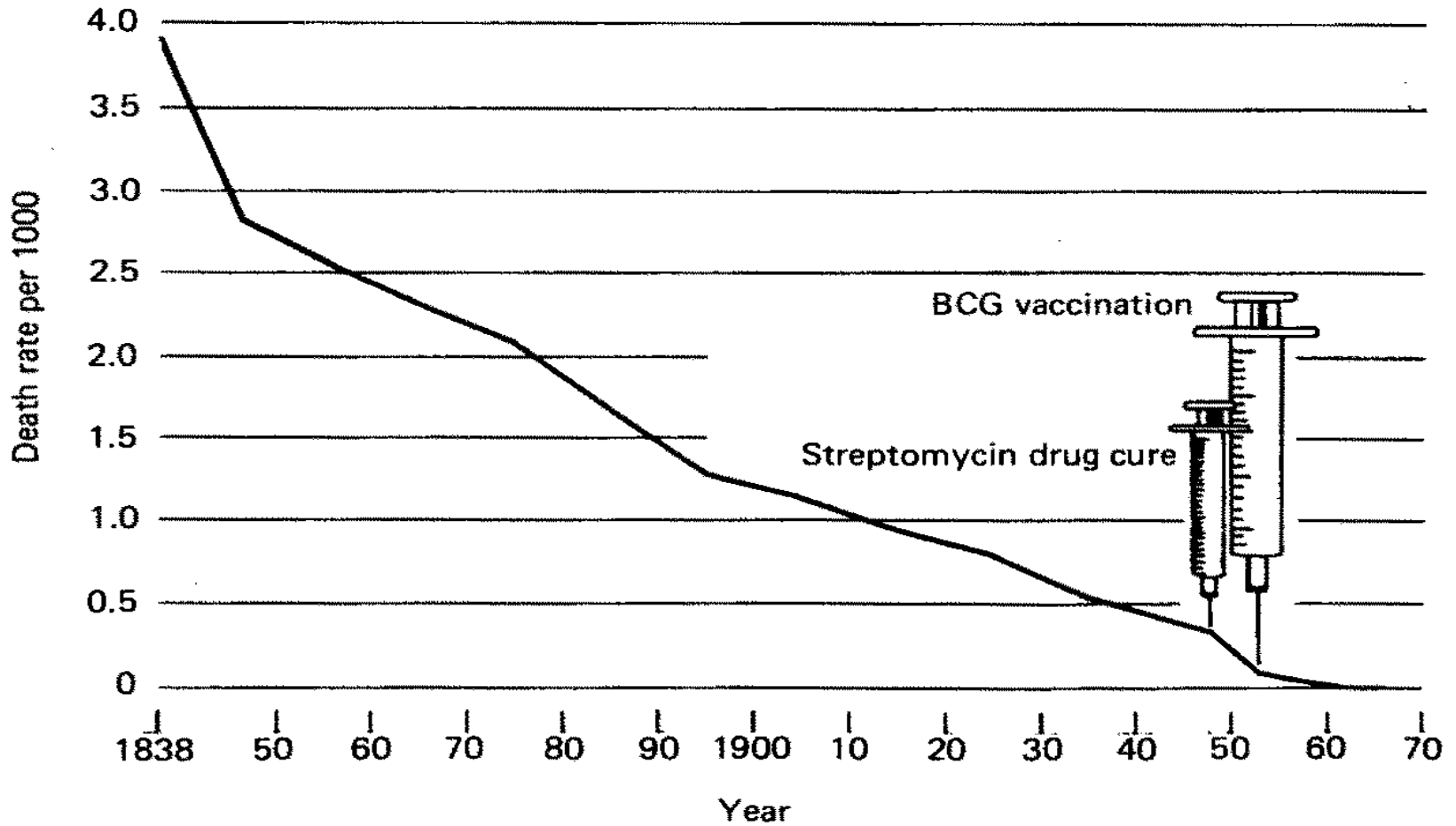# Deaths of children < 15 yrs from scarlet fever, diphtheria, whooping cough and measles
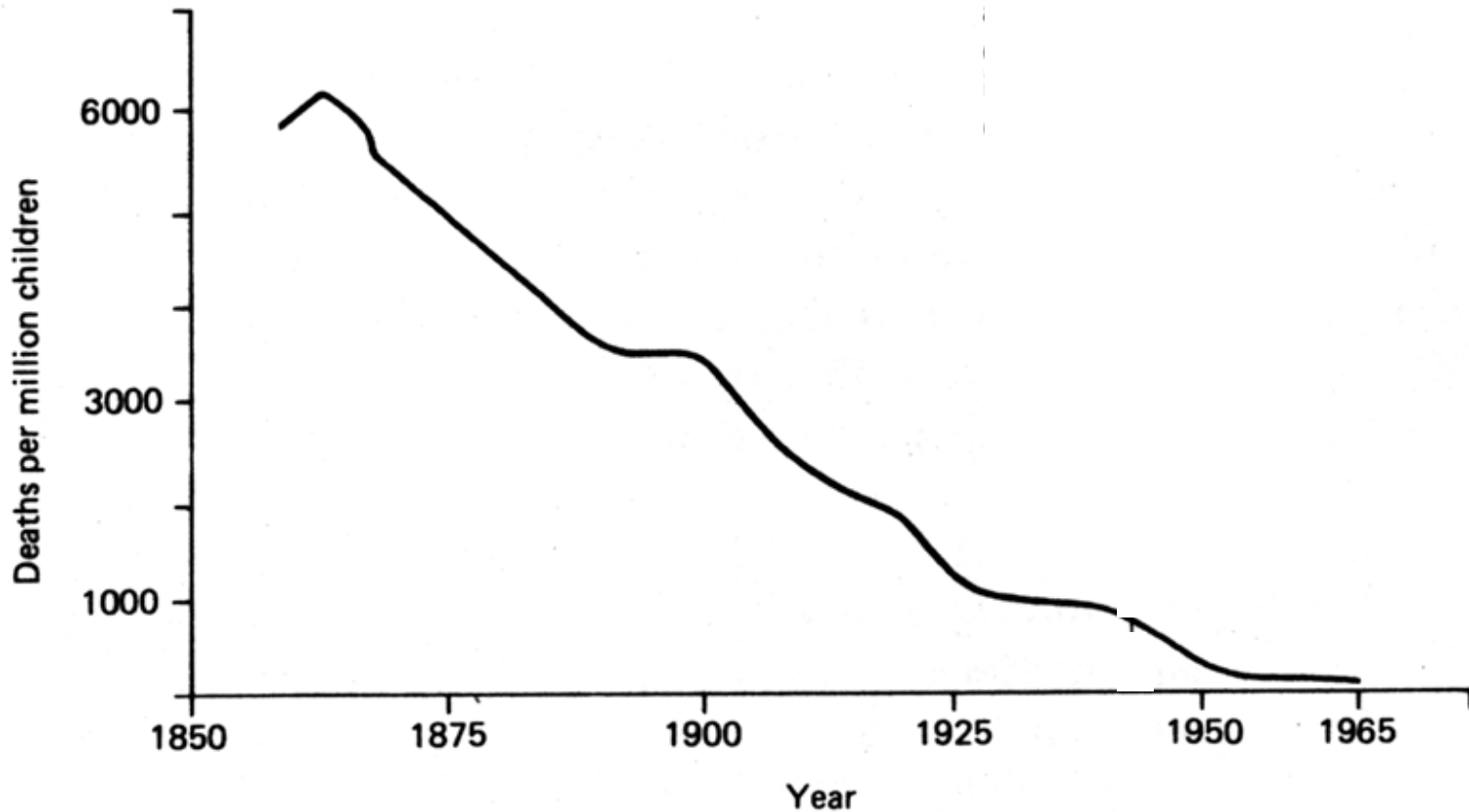
Deaths of children < 15 yrs from scarlet fever, diphtheria, whooping cough and measles
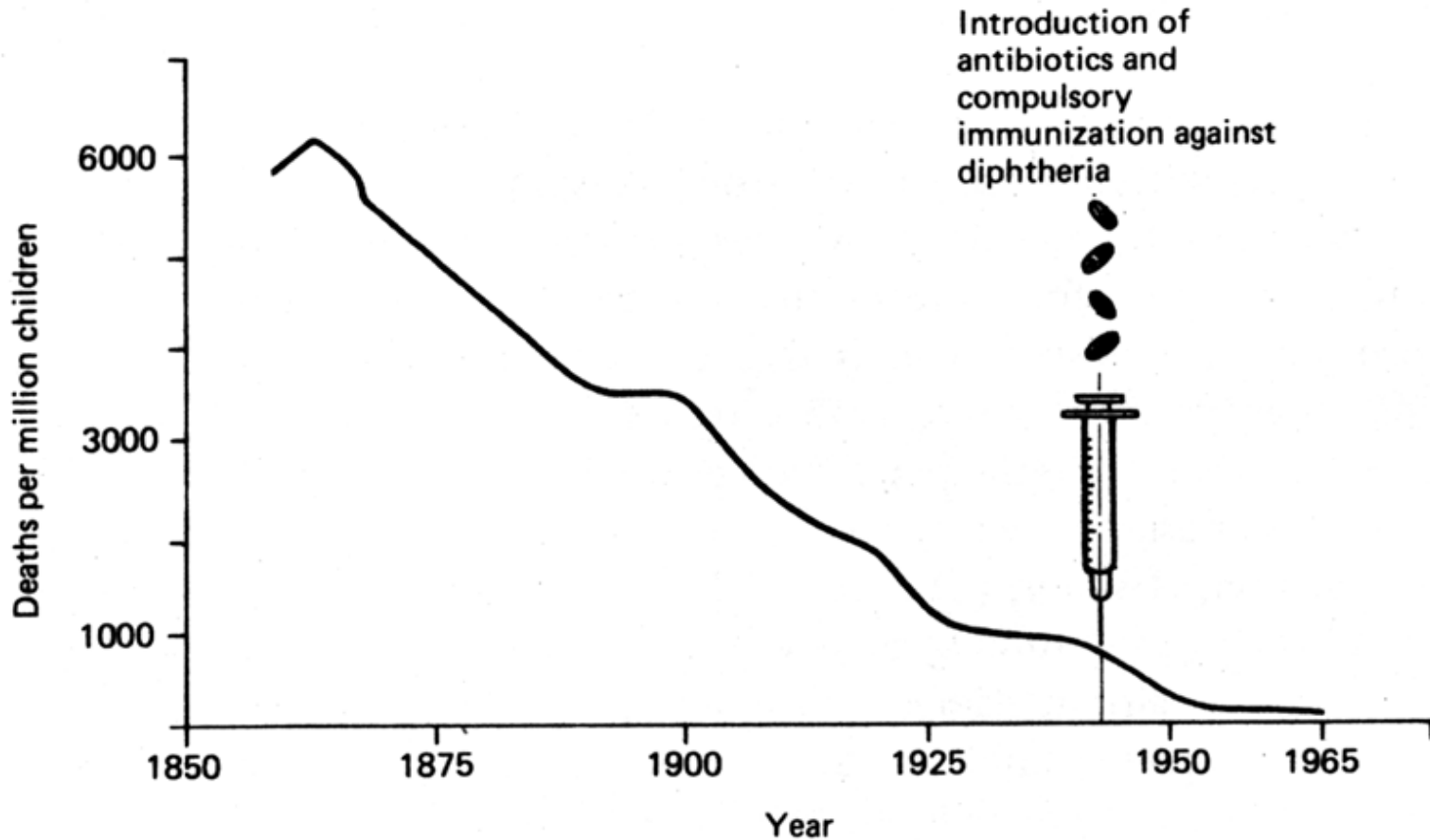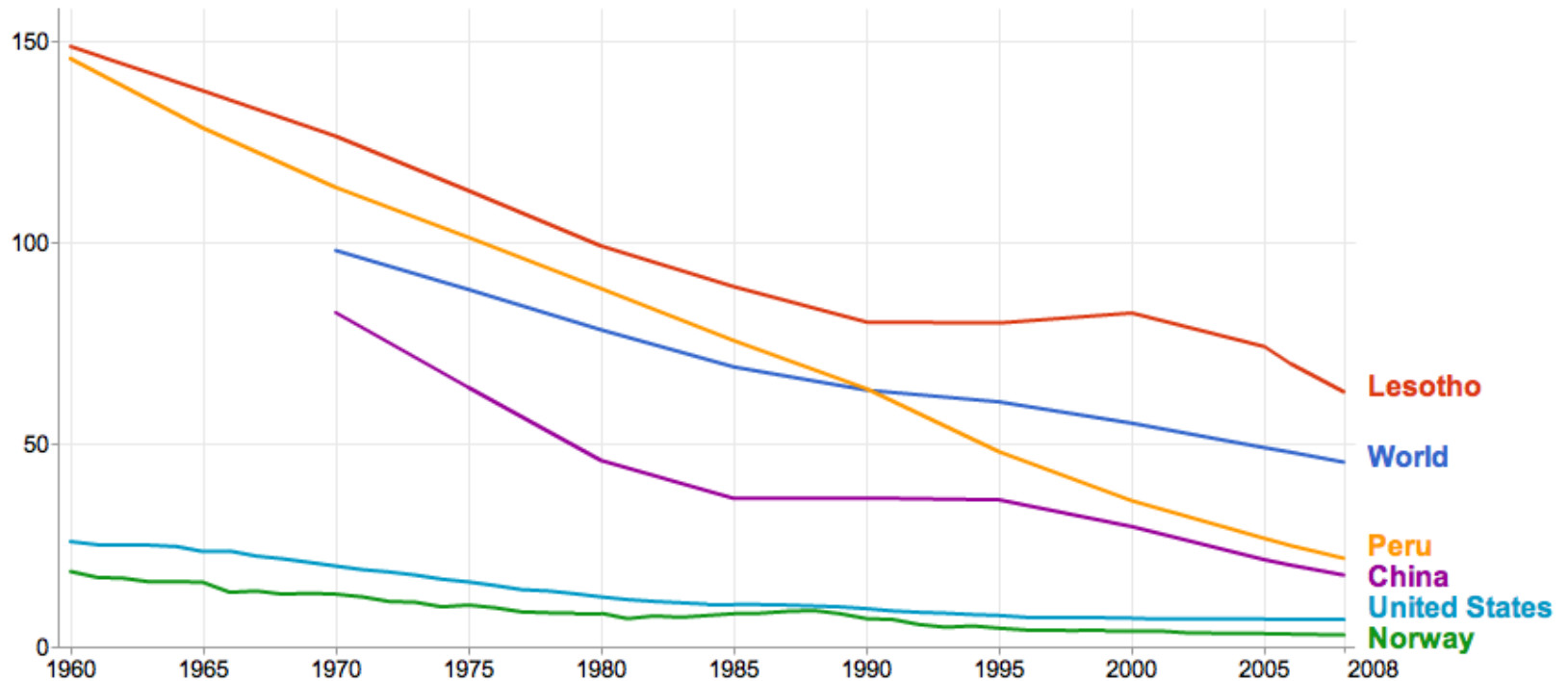
Decline in TB (England and Wales)

Infant mortality rate

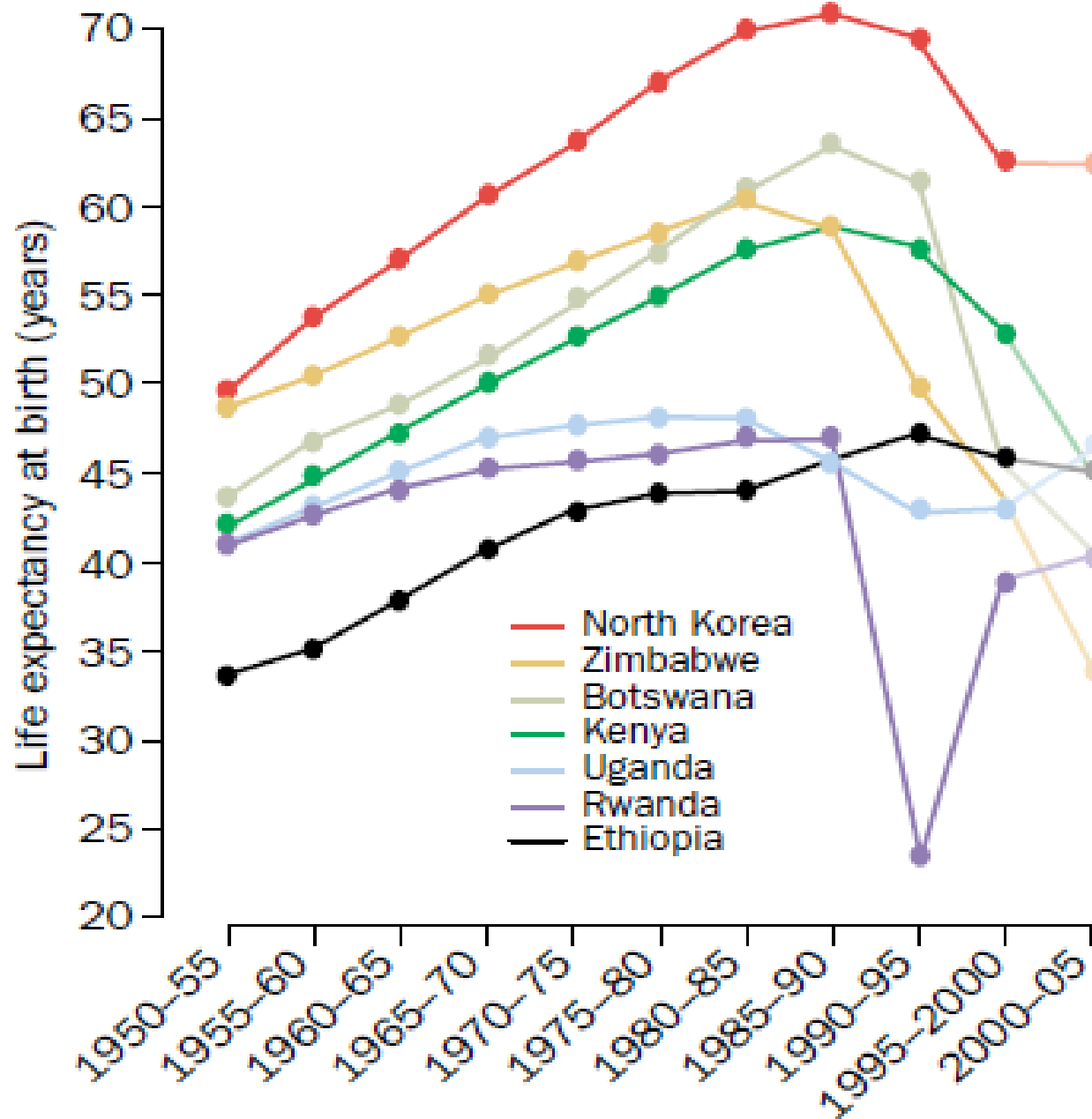Number of infants dying before reaching one year of age, per 1,000 live births.

Life expectancy

The average number of years a newborn is expected to live with current mortality patterns remaining the same

Life expectancy at birth (years)

Legend:
- North Korea
- Zimbabwe
- Botswana
- Kenya
- Uganda
- Rwanda
- Ethiopia

X-axis: 1950-55, 1955-60, 1960-65, 1965-70, 1970-75, 1975-80, 1980-85, 1985-90, 1990-95, 1995-2000, 2000-05
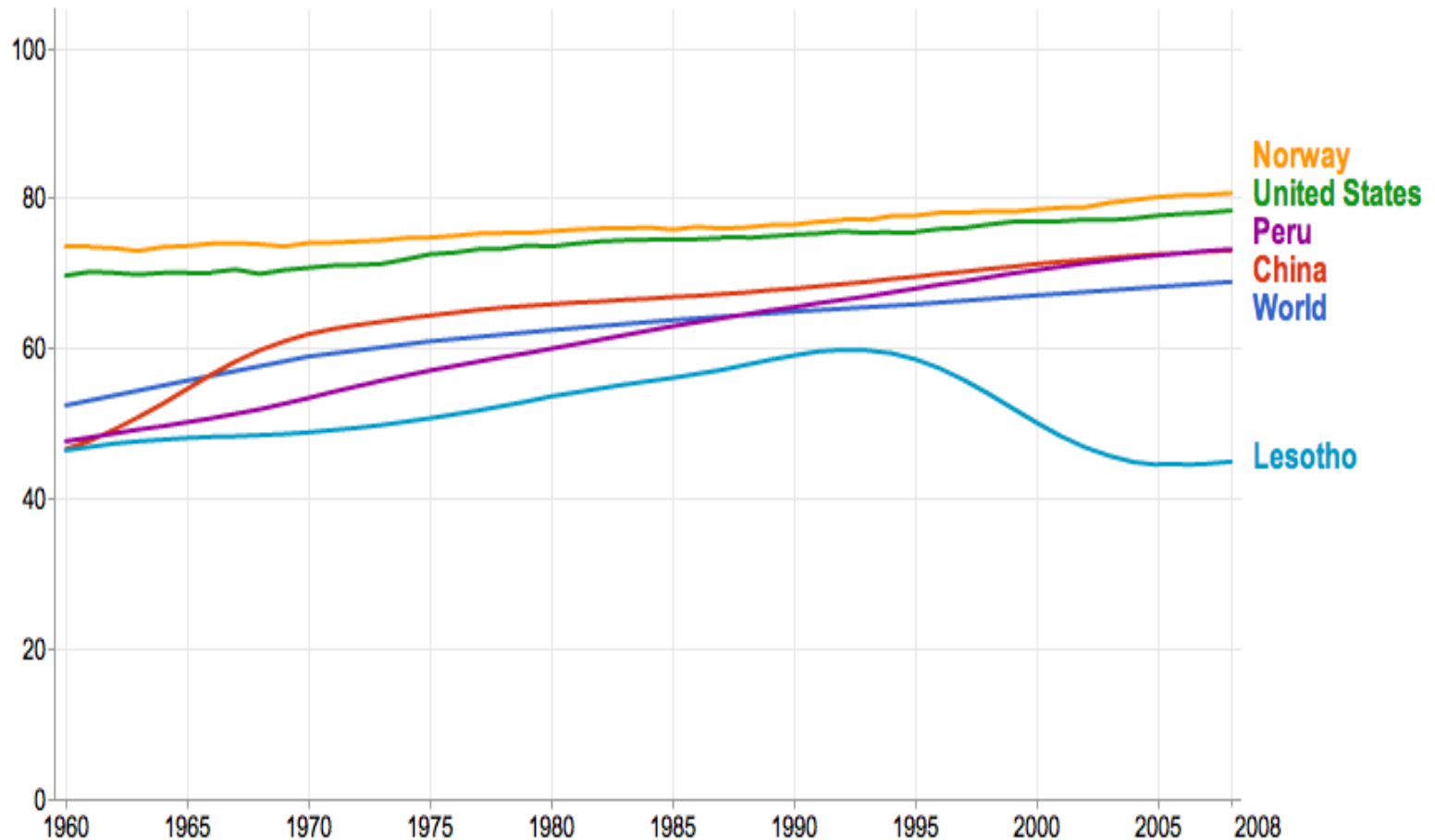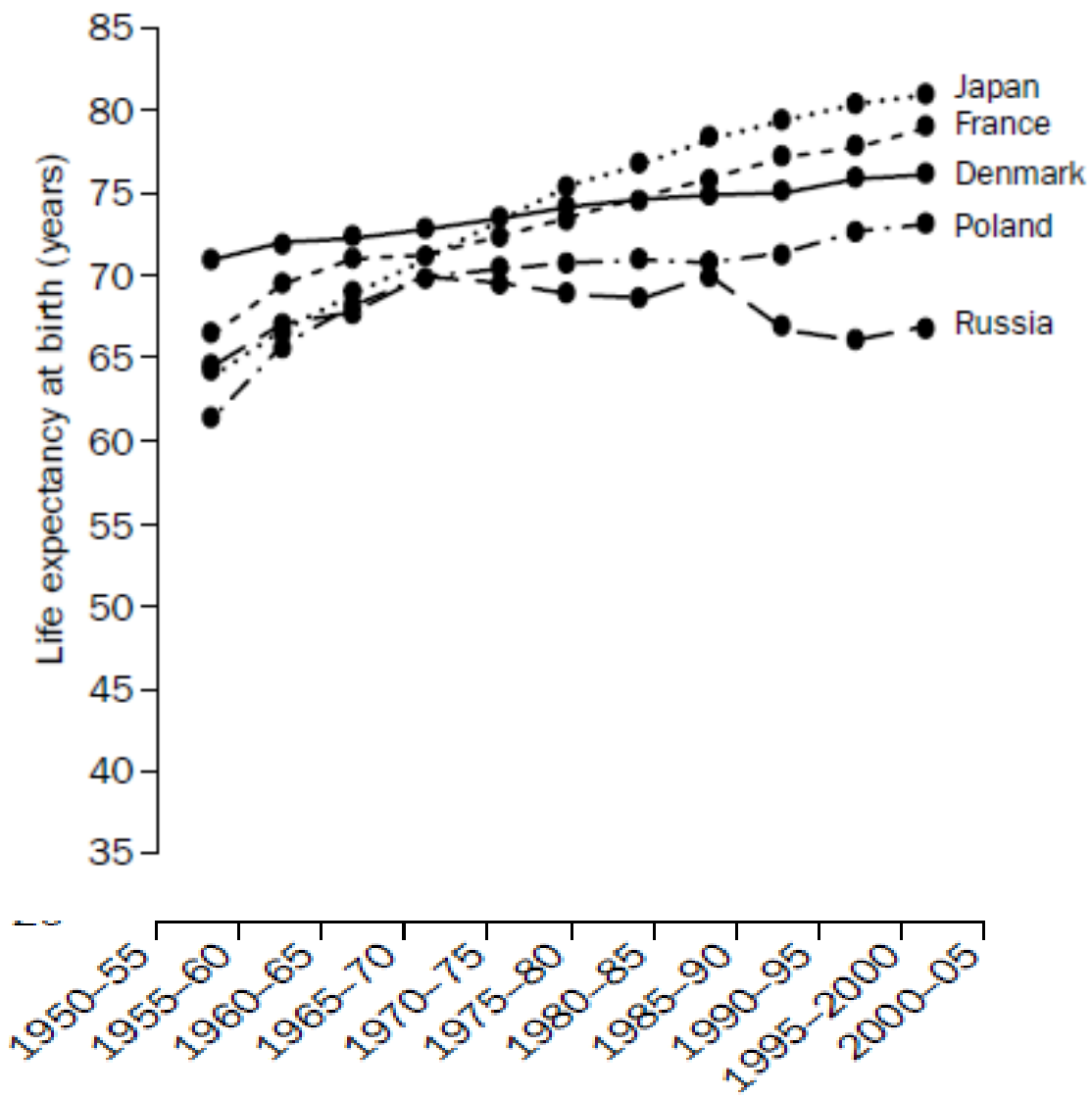
Seminar Readings

- Szreter S. Rapid economic growth and "the four Ds": public health lessons from nineteenth-century Britain for twenty-first century China?

- Cook IG and Dummer TJB, 2004. Changing health in China: re-evaluating the epidemiological transition model. Health Policy 67 (2004): 329–343.

- McMichael AJ, McKee M, Shkolnikov V and Valkonen T, 2004. [Mortality trends and setbacks: Global convergence or divergence?](#) *Lancet* 363: 1155–59

Seminar

- What are the critiques of the epidemiological transition?

- What have been the causes of reversals in life expectancy; and where have such reversals been observed?

- Are we likely to see more or less worldwide convergence of mortality trends? (McMichael)

- What mortality trends underlie the widening disparities in the UK and US (McMichael et al)

- What are the major public health challenges facing China. You are Minister of Health for China. How should China's current epidemiological profile inform policy?

- What are the 4 Ds of Sretzer; an the core messages of his analysis of mortality rates in 19th century Britain?

Today's "Burden of Disease"

- What do most people die of today?

- What causes the most ill health and suffering?

Mortality and Burden of Disease worldwide, 2004

Mortality

		%
1.	Ischaemic heart disease	12.2
2.	Cerebrovascular disease	9.7
3.	Lower respiratory infections	7.1
4.	COPD	5.1
5.	Diarrhoeal diseases	3.7
6.	HIV/AIDS	3.5
7.	Tuberculosis	2.5
8.	Trachea, bronchus, lung cancers	2.3
9.	Road traffic accidents	2.2
10.	Prematurity, low birth weight	2.0

Global Burden of Disease Study

- Developed for the 1990 Global Burden of Disease Study by WHO, Harvard and World Bank to guide investment in health

- Measures of health outcomes using Disability Adjusted Life Years (DALYs)
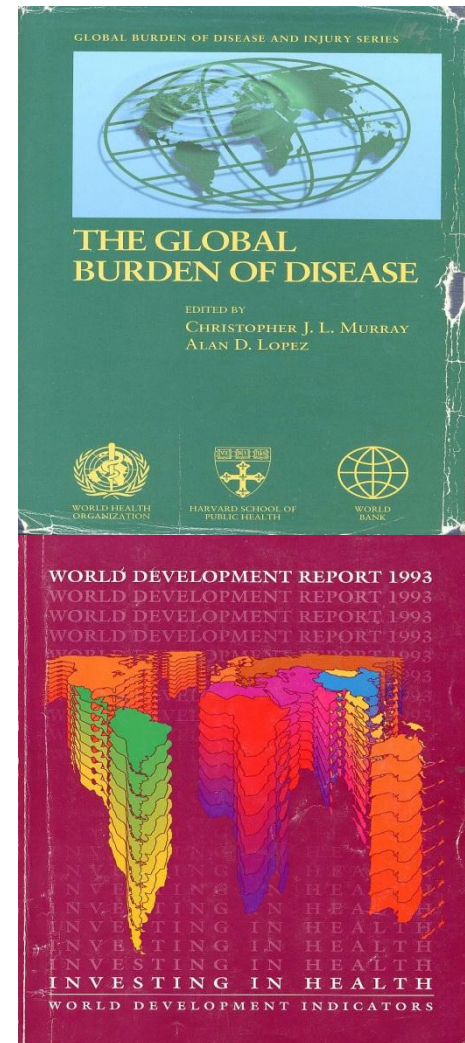
YLL – years of life lost

YLD – years lived with disability

DALY = YLD + YLL

Assumptions and values:

- expected life span
- standardised disability weights
- age weights (life years of children and old people are counted less)
- discounting (the value of a life year tomorrow is more than the value of a life year in ten years time**)**

Mortality and Burden of Disease worldwide, 2004

	Mortality	%
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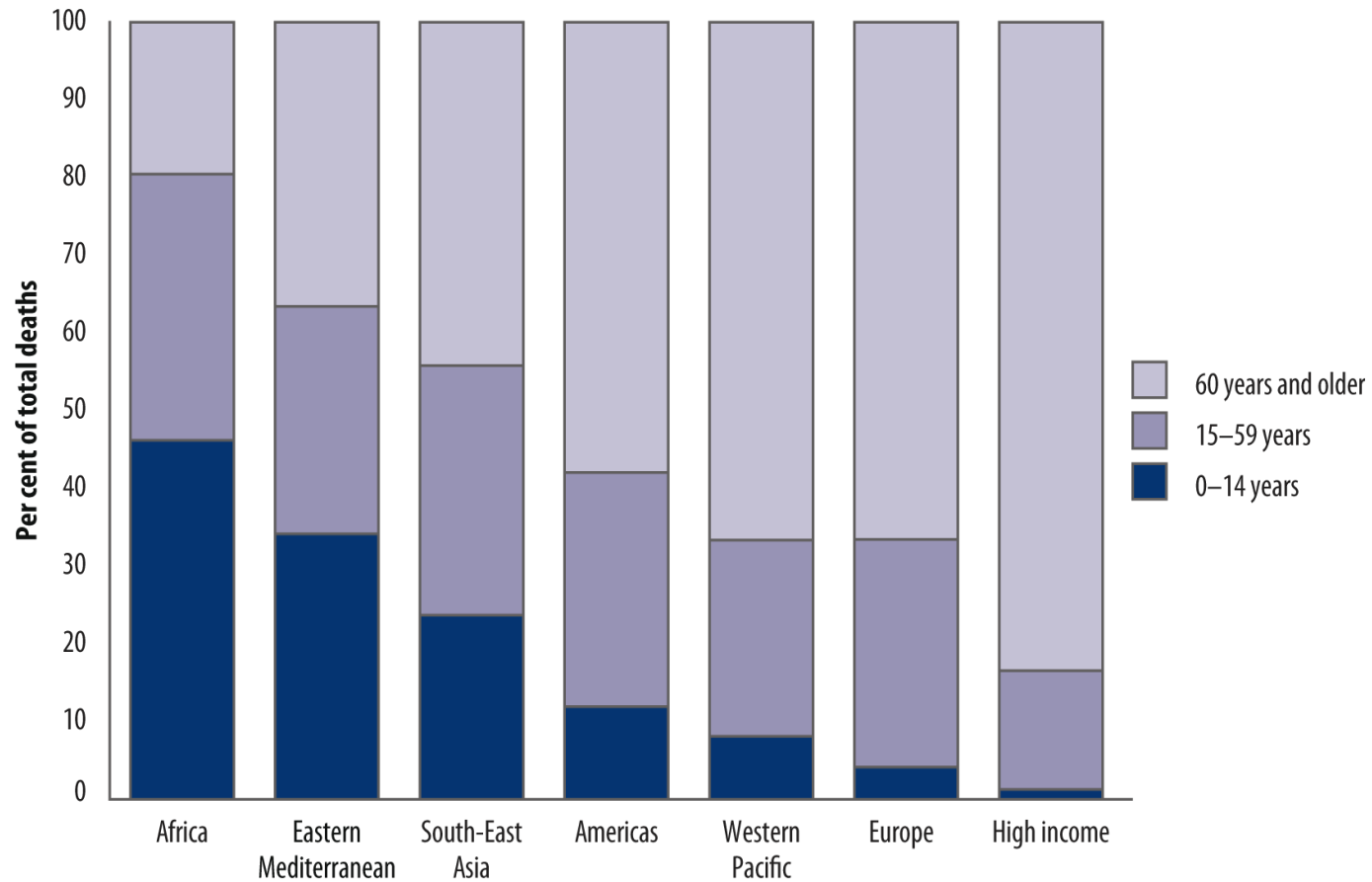|	DALYs	%
1.	Lower respiratory infections	6.2
2.	Diarrhoeal diseases	4.8
3.	Depression	4.3
4.	Ischaemic heart disease	4.1
5.	HIV/AIDS	3.8
6.	Cerebrovascular disease	3.1
7.	Prematurity, low birth weight	2.9
8.	Birth asphyxia, birth trauma	2.7
9.	Road traffic accidents	2.7
10.	Neonatal infections and other	2.7

Leading causes of death by income group, 2004

	Disease or injury	Deaths (millions)	Per cent of total deaths		Disease or injury	Deaths (millions)	Per cent of total deaths
	World				*Low-income countries[a]*		
1	Ischaemic heart disease	7.2	12.2	1	Lower respiratory infections	2.9	11.2
2	Cerebrovascular disease	5.7	9.7	2	Ischaemic heart disease	2.5	9.4
3	Lower respiratory infections	4.2	7.1	3	Diarrhoeal diseases	1.8	6.9
4	COPD	3.0	5.1	4	HIV/AIDS	1.5	5.7
5	Diarrhoeal diseases	2.2	3.7	5	Cerebrovascular disease	1.5	5.6
6	HIV/AIDS	2.0	3.5	6	COPD	0.9	3.6
7	Tuberculosis	1.5	2.5	7	Tuberculosis	0.9	3.5
8	Trachea, bronchus, lung cancers	1.3	2.3	8	Neonatal infections[b]	0.9	3.4
9	Road traffic accidents	1.3	2.2	9	Malaria	0.9	3.3
10	Prematurity and low birth weight	1.2	2.0	10	Prematurity and low birth weight	0.8	3.2
	Middle-income countries				*High-income countries*		
1	Cerebrovascular disease	3.5	14.2	1	Ischaemic heart disease	1.3	16.3
2	Ischaemic heart disease	3.4	13.9	2	Cerebrovascular disease	0.8	9.3
3	COPD	1.8	7.4	3	Trachea, bronchus, lung cancers	0.5	5.9
4	Lower respiratory infections	0.9	3.8	4	Lower respiratory infections	0.3	3.8
5	Trachea, bronchus, lung cancers	0.7	2.9	5	COPD	0.3	3.5
6	Road traffic accidents	0.7	2.8	6	Alzheimer and other dementias	0.3	3.4
7	Hypertensive heart disease	0.6	2.5	7	Colon and rectum cancers	0.3	3.3
8	Stomach cancer	0.5	2.2	8	Diabetes mellitus	0.2	2.8
9	Tuberculosis	0.5	2.2	9	Breast cancer	0.2	2.0
10	Diabetes mellitus	0.5	2.1	10	Stomach cancer	0.1	1.8

Distribution of age at death and numbers of deaths, world, 2004

0–4 years:
10.4 million
18%

5–14 years:
1.5 million
3%

60 years and over:
30.2 million
51%

15–59 years:
16.7 million
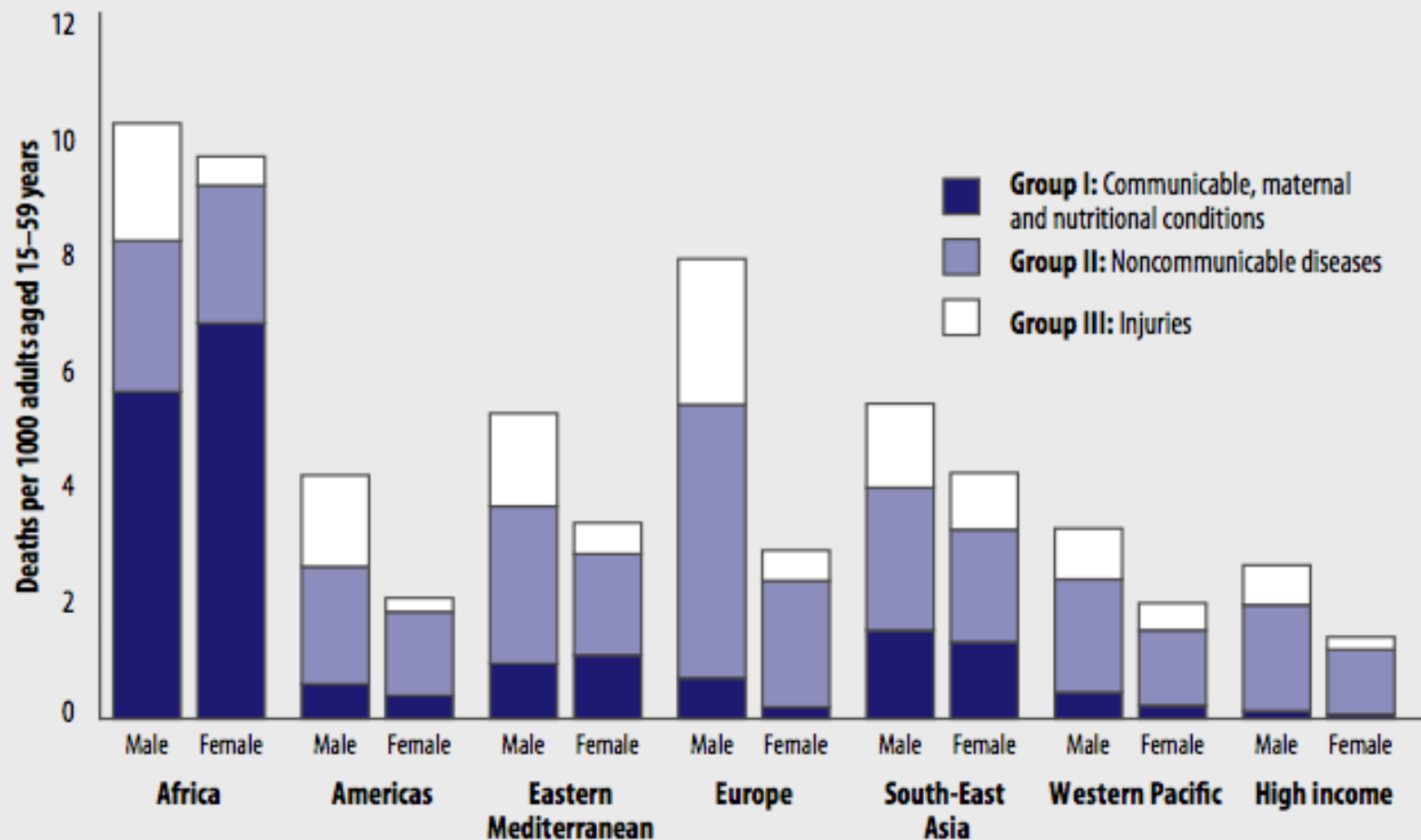28%
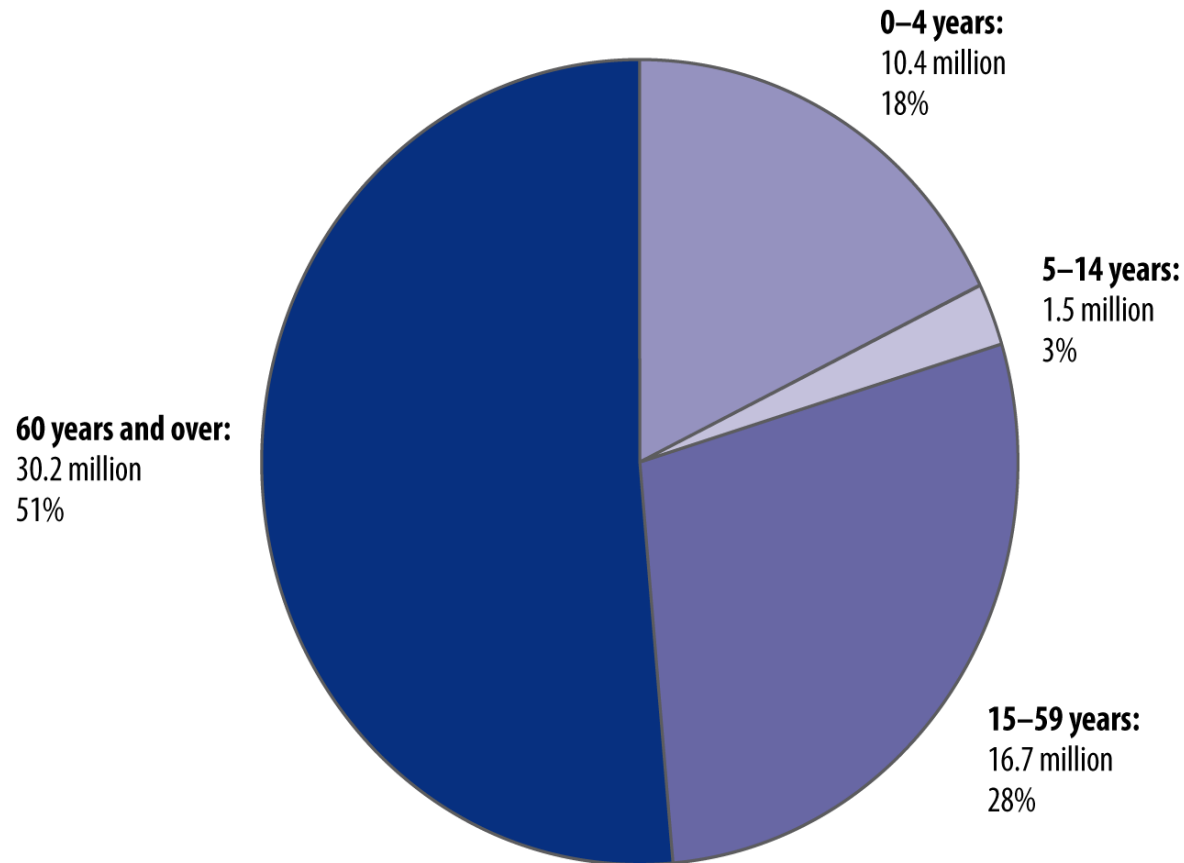
Per cent distribution of age at death by region, 2004

Child mortality rates by cause and region, 2004
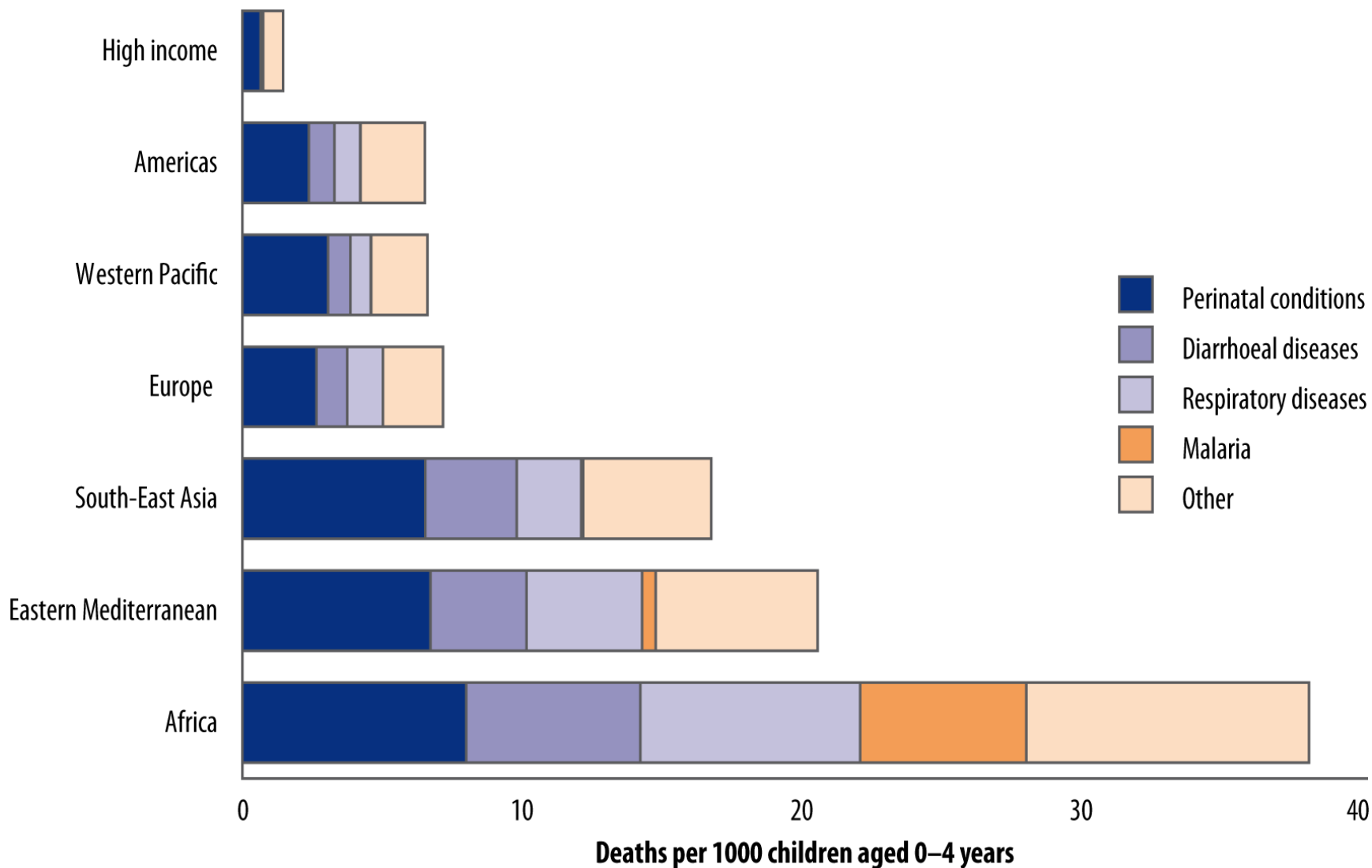
Figure 8: Mortality rates among men and women aged 15–59 years, region and cause-of-death group, 2004

Source: The global burden of disease: 2004 update. WHO

Some words of caution ….

- Data is very poor
- Cause of death not always known
- No clean systems of categorization

Distinction between communicable and non-communicable diseases

- Chronic disease risks such as tobacco and indoor air pollution – increase risk TB

- Diabetes increases risk of TB

- Chagas disease – increase risk of CVD

- HIV increases risk of cancer

- HIV treatment – increase risk of CVD and diabetes

Causes of attributable global mortality and burden of disease, 2004

Attributable Mortality

		%
1.	High blood pressure	12.8
2.	Tobacco use	8.7
3.	High blood glucose	5.8
4.	Physical inactivity	5.5
5.	Overweight and obesity	4.8
6.	High cholesterol	4.5
7.	Unsafe sex	4.0
8.	Alcohol use	3.8
9.	Childhood underweight	3.8
10.	Indoor smoke from solid fuels	3.3

59 million total global deaths in 2004

Causes of attributable global mortality and burden of disease, 2004

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9.	Childhood underweight	3.8
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59 million total global deaths in 2004

Attributable DALYs

|		%
1.	Childhood underweight	5.9
2.	Unsafe sex	4.6
3.	Alcohol use	4.5
4.	Unsafe water, sanitation, hygiene	4.2
5.	High blood pressure	3.7
6.	Tobacco use	3.7
7.	Suboptimal breastfeeding	2.9
8.	High blood glucose	2.7
9.	Indoor smoke from solid fuels	2.7
10.	Overweight and obesity	2.3

1.5 billion total global DALYs in 2004

## Table 2: Ranking of selected risk factors: 10 leading risk factor causes of DALYs by income group, 2004

	Risk factor	DALYs (millions)	Percentage of total		Risk factor	DALYs (millions)	Percentage of total
	World				**Low-income countries[a]**		
1	Childhood underweight	91	5.9	1	Childhood underweight	82	9.9
2	Unsafe sex	70	4.6	2	Unsafe water, sanitation, hygiene	53	6.3
3	Alcohol use	69	4.5	3	Unsafe sex	52	6.2
4	Unsafe water, sanitation, hygiene	64	4.2	4	Suboptimal breastfeeding	34	4.1
5	High blood pressure	57	3.7	5	Indoor smoke from solid fuels	33	4.0
6	Tobacco use	57	3.7	6	Vitamin A deficiency	20	2.4
7	Suboptimal breastfeeding	44	2.9	7	High blood pressure	18	2.2
8	High blood glucose	41	2.7	8	Alcohol use	18	2.1
9	Indoor smoke from solid fuels	41	2.7	9	High blood glucose	16	1.9
10	Overweight and obesity	36	2.3	10	Zinc deficiency	14	1.7
	Middle-income countries[a]				**High-income countries[a]**		
1	Alcohol use	44	7.6	1	Tobacco use	13	10.7
2	High blood pressure	31	5.4	2	Alcohol use	8	6.7
3	Tobacco use	31	5.4	3	Overweight and obesity	8	6.5
4	Overweight and obesity	21	3.6	4	High blood pressure	7	6.1
5	High blood glucose	20	3.4	5	High blood glucose	6	4.9
6	Unsafe sex	17	3.0	6	Physical inactivity	5	4.1
7	Physical inactivity	16	2.7	7	High cholesterol	4	3.4
8	High cholesterol	14	2.5	8	Illicit drugs	3	2.1
9	Occupational risks	14	2.3	9	Occupational risks	2	1.5
10	Unsafe water, sanitation, hygiene	11	2.0	10	Low fruit and vegetable intake	2	1.3

[a] Countries grouped by 2004 gross national income per capita — low income (US$ 825 or less), high income (US$ 10 066 or more).

Deaths attributed to 19 leading factors, by country income level, 2004
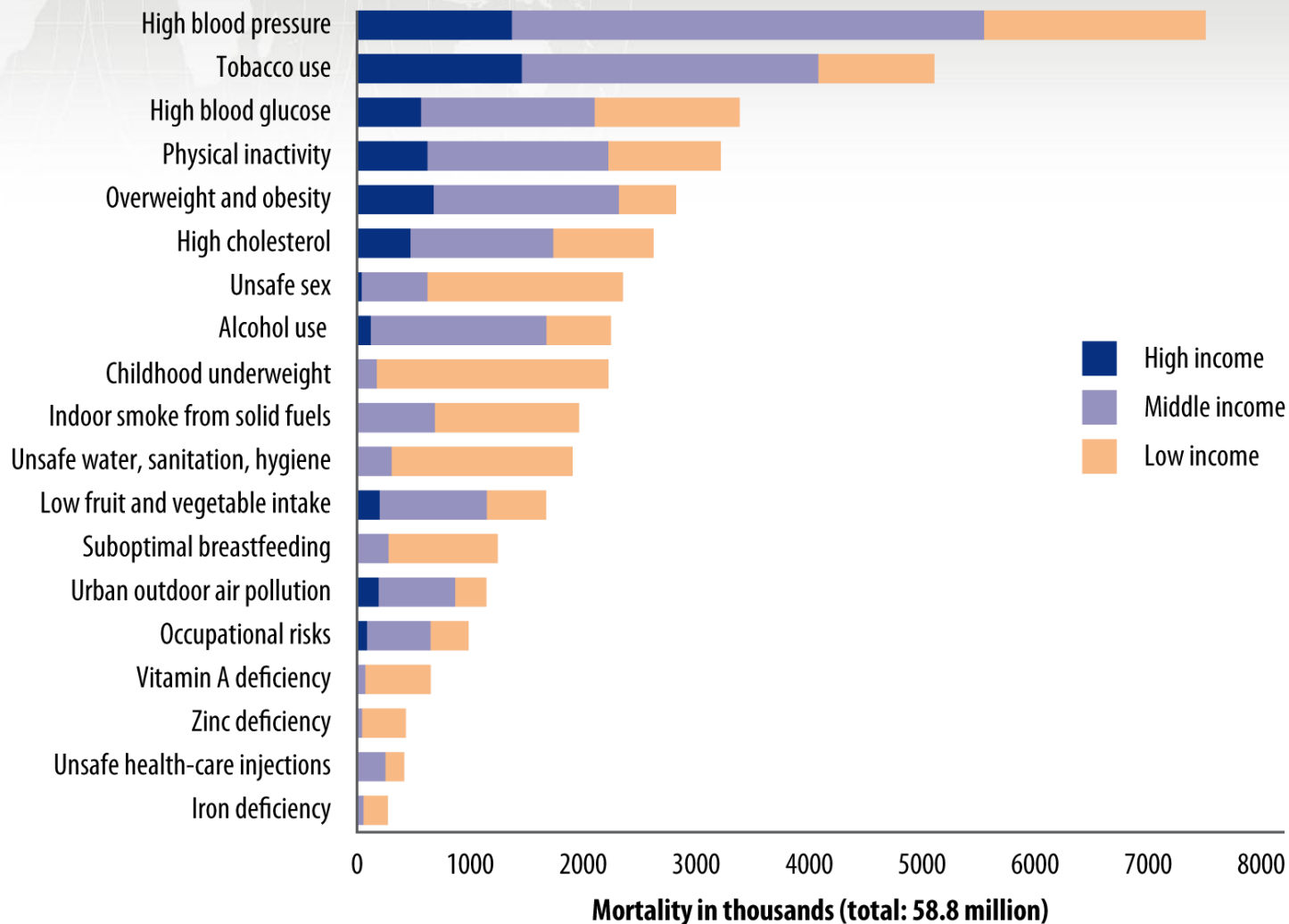
Percentage of disability-adjusted life years (DALYs) attributed to 19 leading risk factors, by country income level, 2004
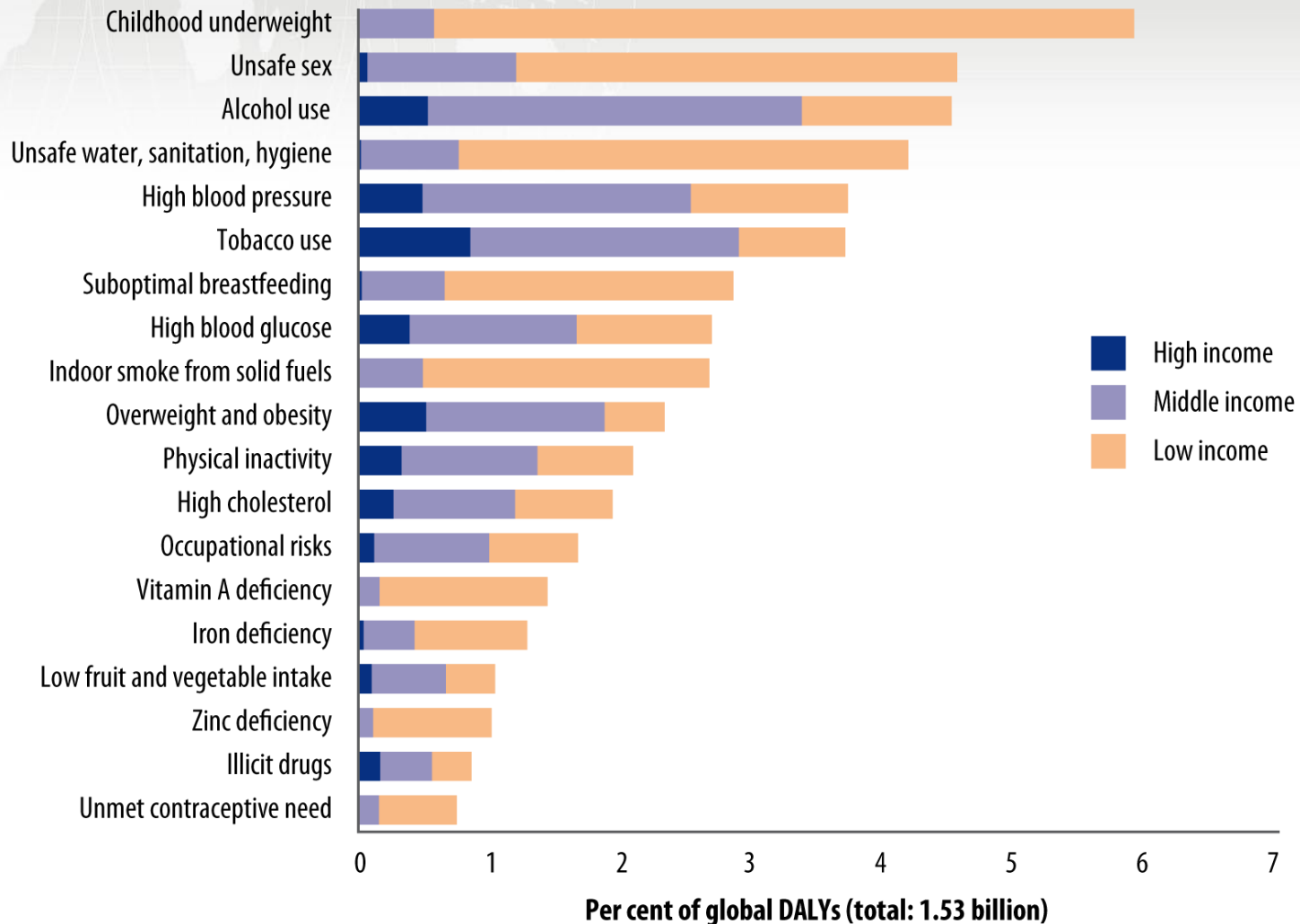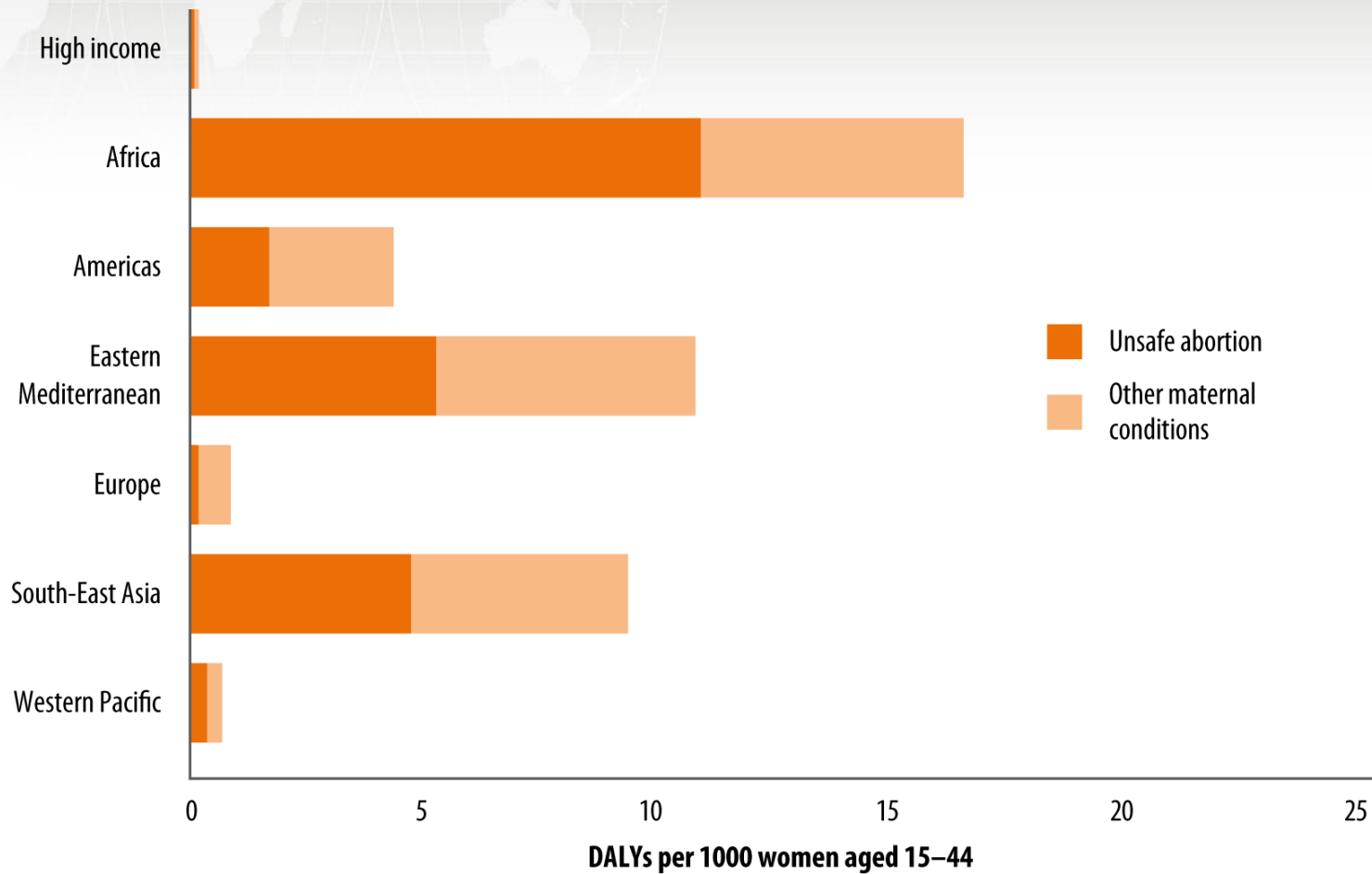
Major causes of death in children under 5 with disease-specific contribution of undernutrition, 2004


Shaded area indicates contribution of undernutrition to each cause of death.

World Health Organization
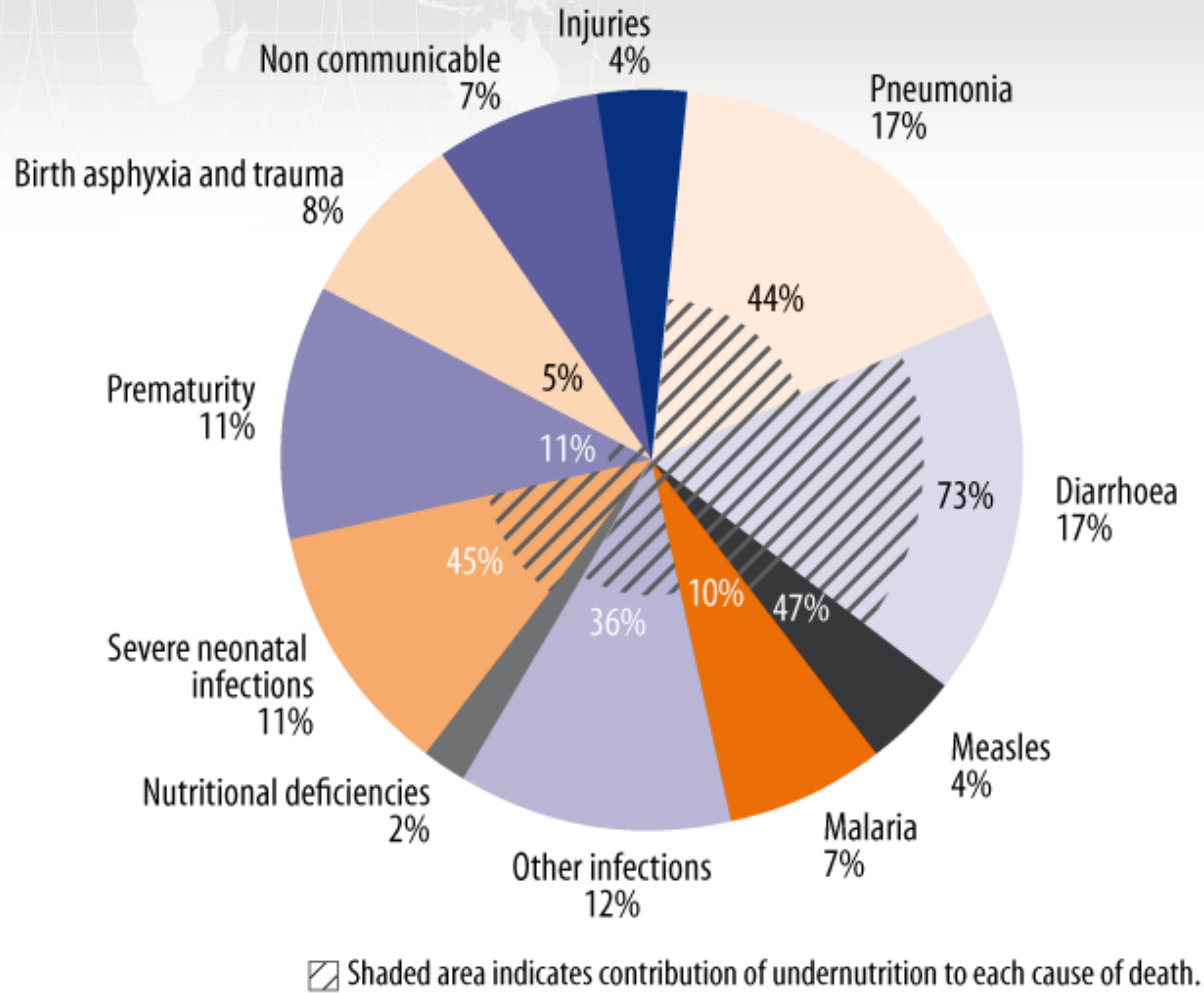
Burden of disease attributable to contraception by WHO region, 2004

Percentage of deaths over age 30 caused by tobacco, 2004

Legend:
- 0 – 4
- 5 – 9
- 10 – 14
- 15 – 19
- ≥ 20

World Health Organization
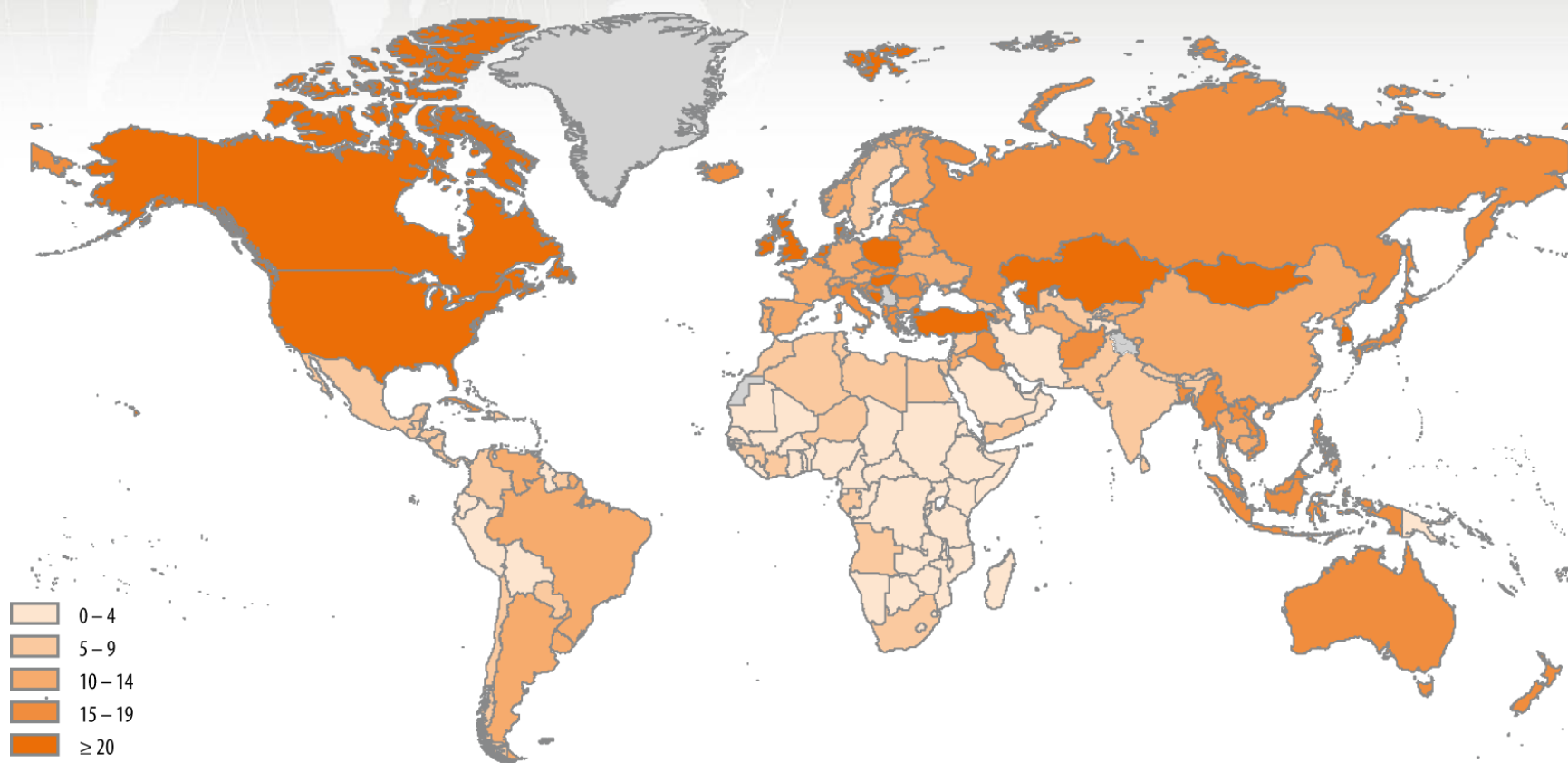
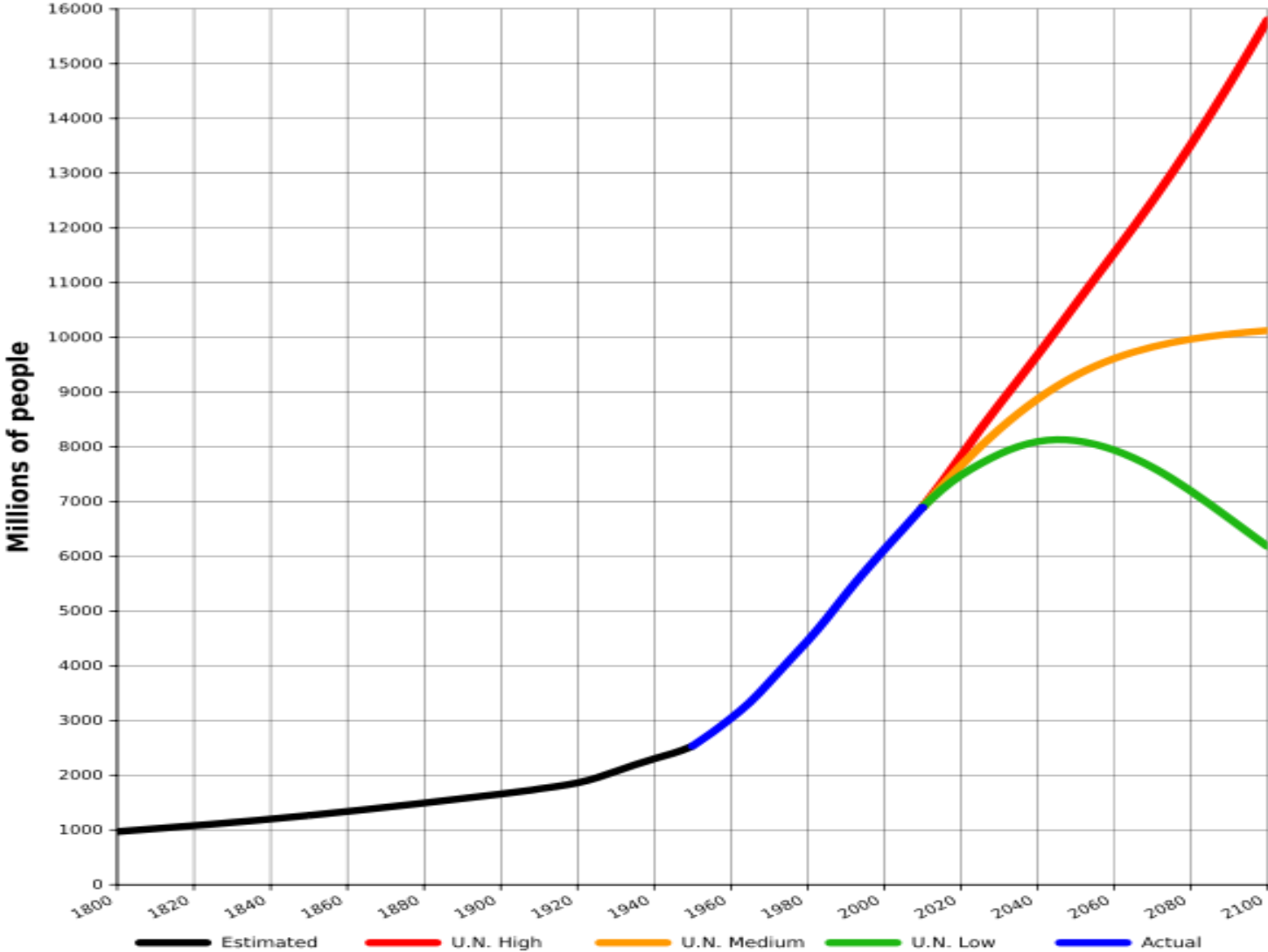Changes in cigarettes consumption (sales) in developing and developed countries, 1974-1992
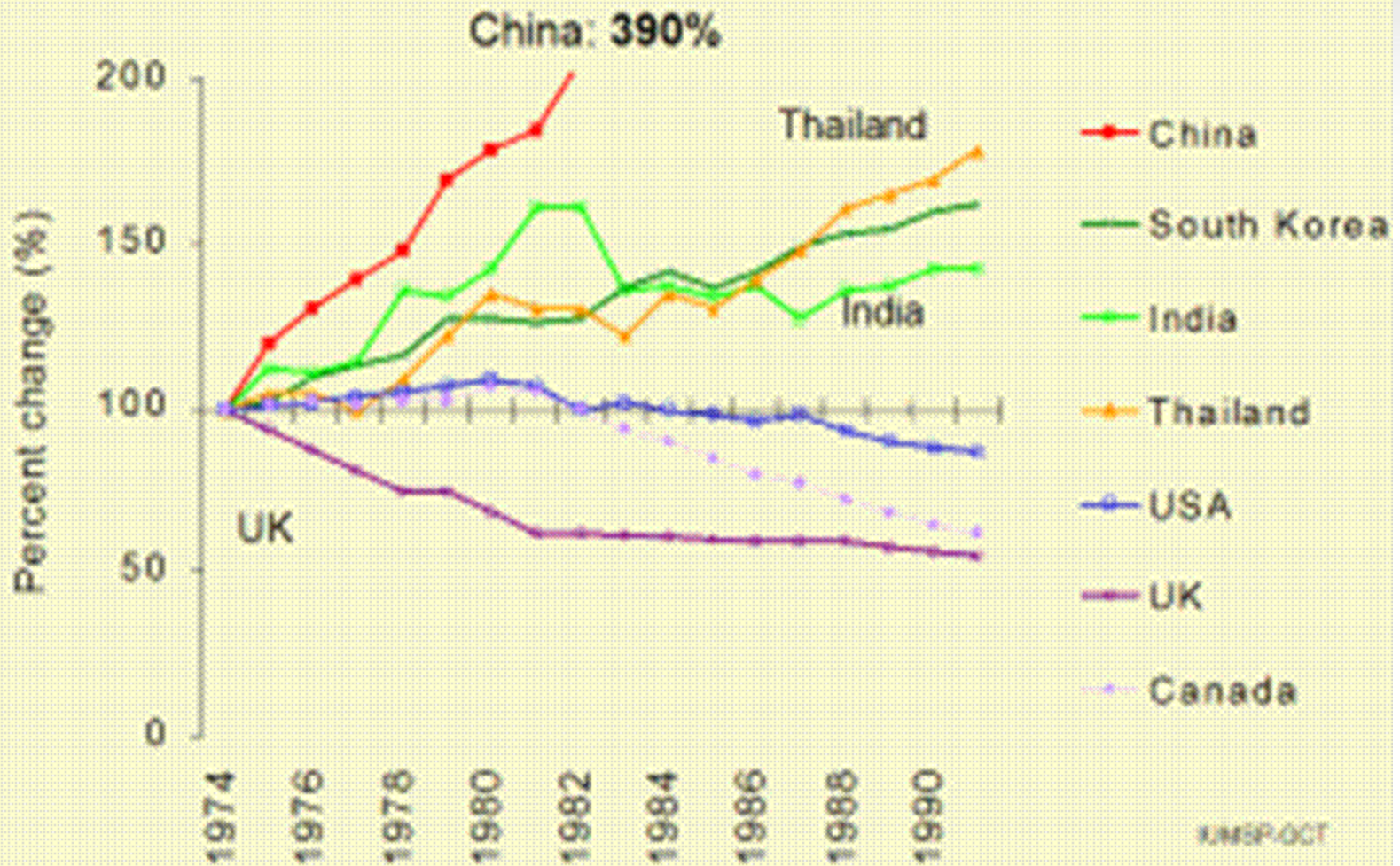
Future trends?

Ten leading causes of burden of disease, world, 2004 and 2030

2004 Disease or injury	As % of total DALYs	Rank		Rank	As % of total DALYs	2030 Disease or injury
Lower respiratory infections	6.2	1		1	6.2	Unipolar depressive disorders
Diarrhoeal diseases	4.8	2		2	5.5	Ischaemic heart disease
Unipolar depressive disorders	4.3	3		3	4.9	Road traffic accidents
Ischaemic heart disease	4.1	4		4	4.3	Cerebrovascular disease
HIV/AIDS	3.8	5		5	3.8	COPD
Cerebrovascular disease	3.1	6		6	3.2	Lower respiratory infections
Prematurity and low birth weight	2.9	7		7	2.9	Hearing loss, adult onset
Birth asphyxia and birth trauma	2.7	8		8	2.7	Refractive errors
Road traffic accidents	2.7	9		9	2.5	HIV/AIDS
Neonatal infections and other[a]	2.7	10		10	2.3	Diabetes mellitus
COPD	2.0	13		11	1.9	Neonatal infections and other[a]
Refractive errors	1.8	14		12	1.9	Prematurity and low birth weight
Hearing loss, adult onset	1.8	15		15	1.9	Birth asphyxia and birth trauma
Diabetes mellitus	1.3	19		18	1.6	Diarrhoeal diseases

Future demographic transitions?

The end ....