Sociální epidemiologie

Úvodní přednáška

Martin Bobák

2022

Social epidemiology

= branch of epidemiology focusing on:

- Influences of societal, social and psychosocial factors on health

- Differences in health between socioeconomic groups

- Pathways linking social factors and health

- **Using epidemiological methods and concepts**

Objectives

At the end of the course students should be able to:

- Describe differences in health between populations, groups and individuals
- Understand most important indicators of population health
- Describe the concept of social determinants o health
- Discuss main features of demographic and epidemiological transition
- Understand the concept and measurement of socioeconomic status
- Describe the main pathways linking socioeconomic factors with health, chains of causes ("causes of the causes")
- Understand the concept of life course influences on health
- Discuss the main aspects of the societal transformation in Central and Eastern Europe

Why are some people healthier than others?

- Epidemiology:
  - Biological factors
  - Health behaviours
  - Environment (climate, contamination, pollution)
- Social epidemiology
  - Societal / social structure
  - Psychosocial / psychological factors

Outline of introductory session

- Part 1
  - Basic measures of population health
  - How to study influences on health
  - Large differences in health between groups of people
- Part 2
  - Factors influencing health of individuals (risk factors)
- Part 3
  - Chains of causes

Part 1

# Introduction to population health

Measures of population health

- **Mortality**: rates (deaths / total number of people, per 100,000 persons)
- **Life expectancy**: average number of subsequent years of life for someone now aged *x* if current mortality rates apply (years)
- **Morbidity**: rates or proportions (number with disease / total number of people, per 100 persons, %)
  - Incidence (risk of new disease)
 - Prevalence (proportion with existing disease)

How long people live

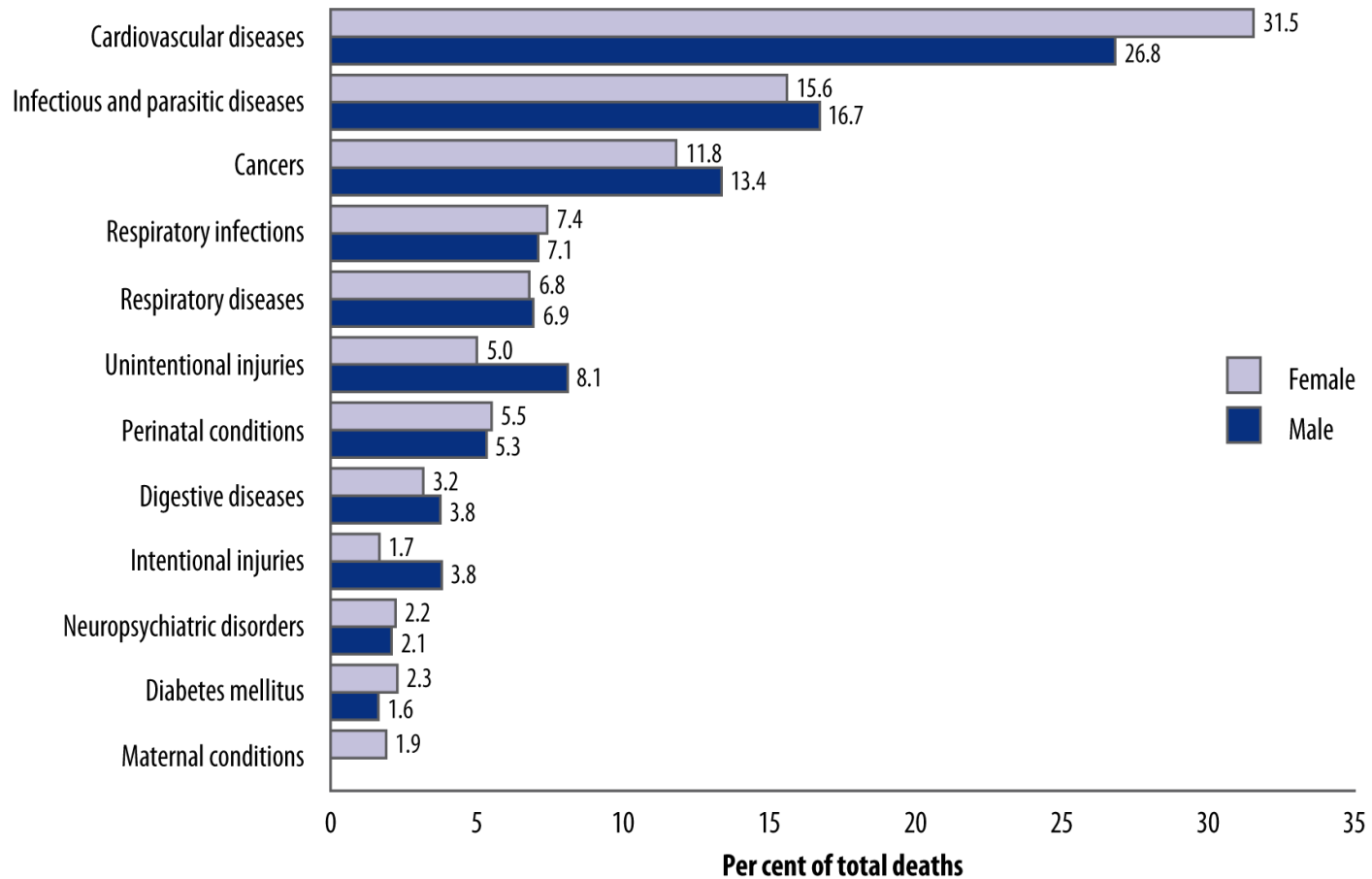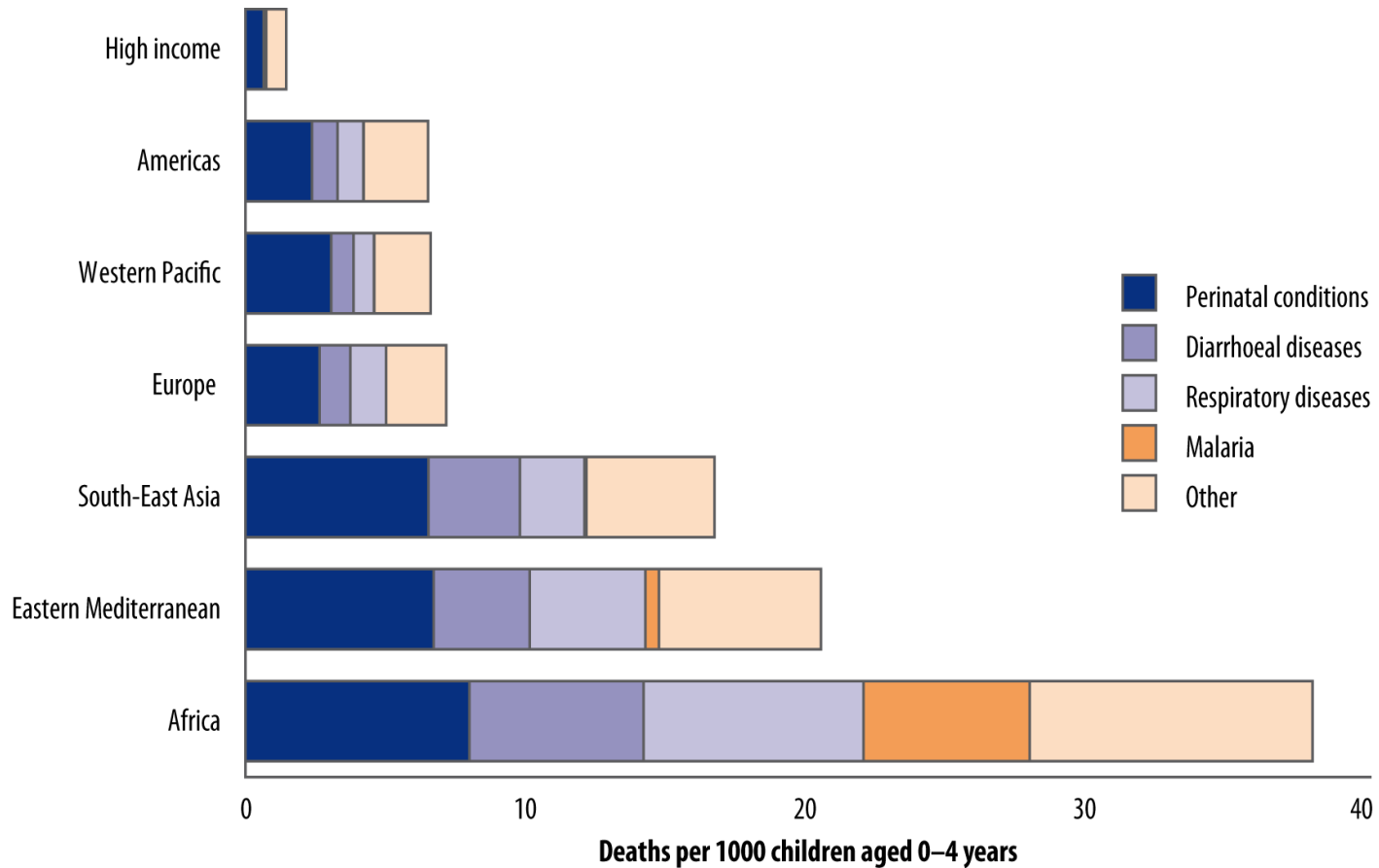| Era	Life Expectancy at Birth (years)
Upper Paleolithic	33
Neolithic	20
Bronze Age and Iron Age	26
Classical Greece	28
Classical Rome	28
Pre-Columbian North America	25–30
Medieval Islamic Caliphate	35+
Medieval Britain	30
Early Modern Britain	25–40
Early 20th Century	31
2010 world average	67
2020 Japan	84.5

Causes of death, E&W 2011, men
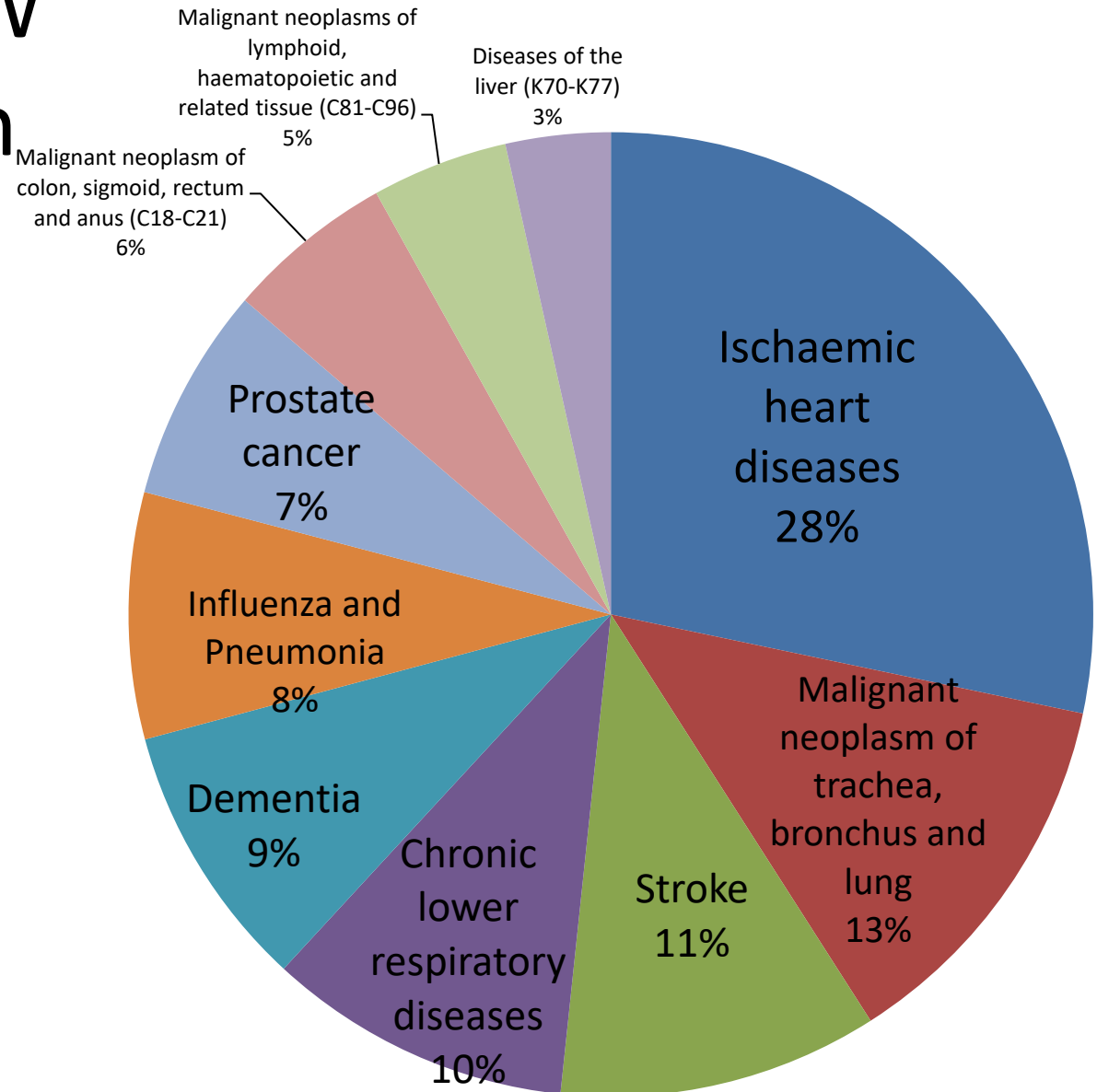
Leading causes of death by age group, England &Wales 2009
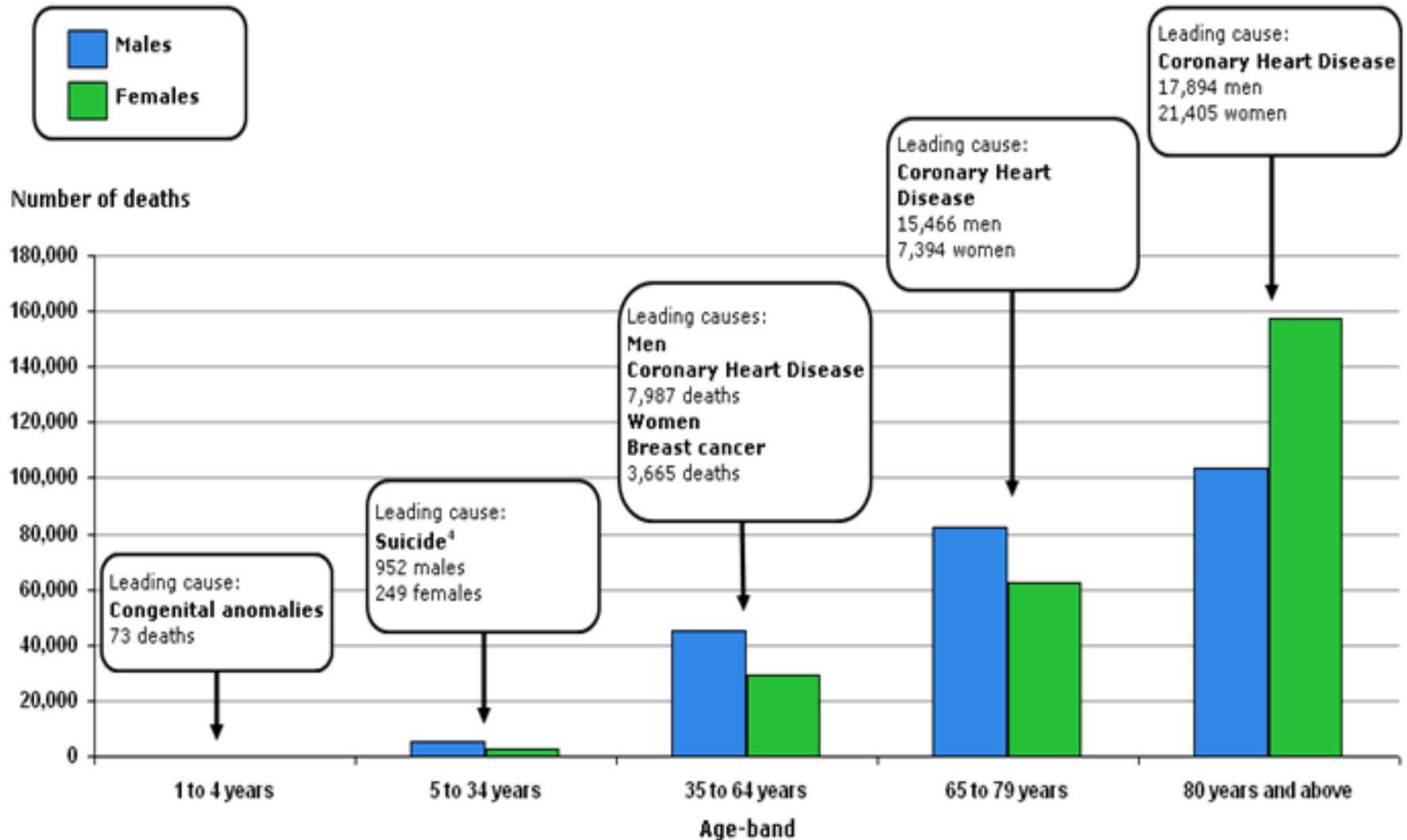
Distribution of deaths by leading cause groups, males and females, world, 2004

Child mortality rates by cause and region, 2004

Legend:
- Perinatal conditions
- Diarrhoeal diseases
- Respiratory diseases
- Malaria
- Other

Regions (top to bottom): High income, Americas, Western Pacific, Europe, South-East Asia, Eastern Mediterranean, Africa

X-axis: Deaths per 1000 children aged 0–4 years (0, 10, 20, 30, 40)

Adult mortality rates by major cause group and region, 2004

Legend:
- Cardiovascular diseases
- Cancers
- Other noncommunicable diseases
- Injuries
- HIVAIDS
- Other infectious and parasitic diseases
- Maternal and nutritional conditions

Regions (top to bottom): High income, Western Pacific, Americas, Eastern Mediterranean, South East Asia, Europe, Africa

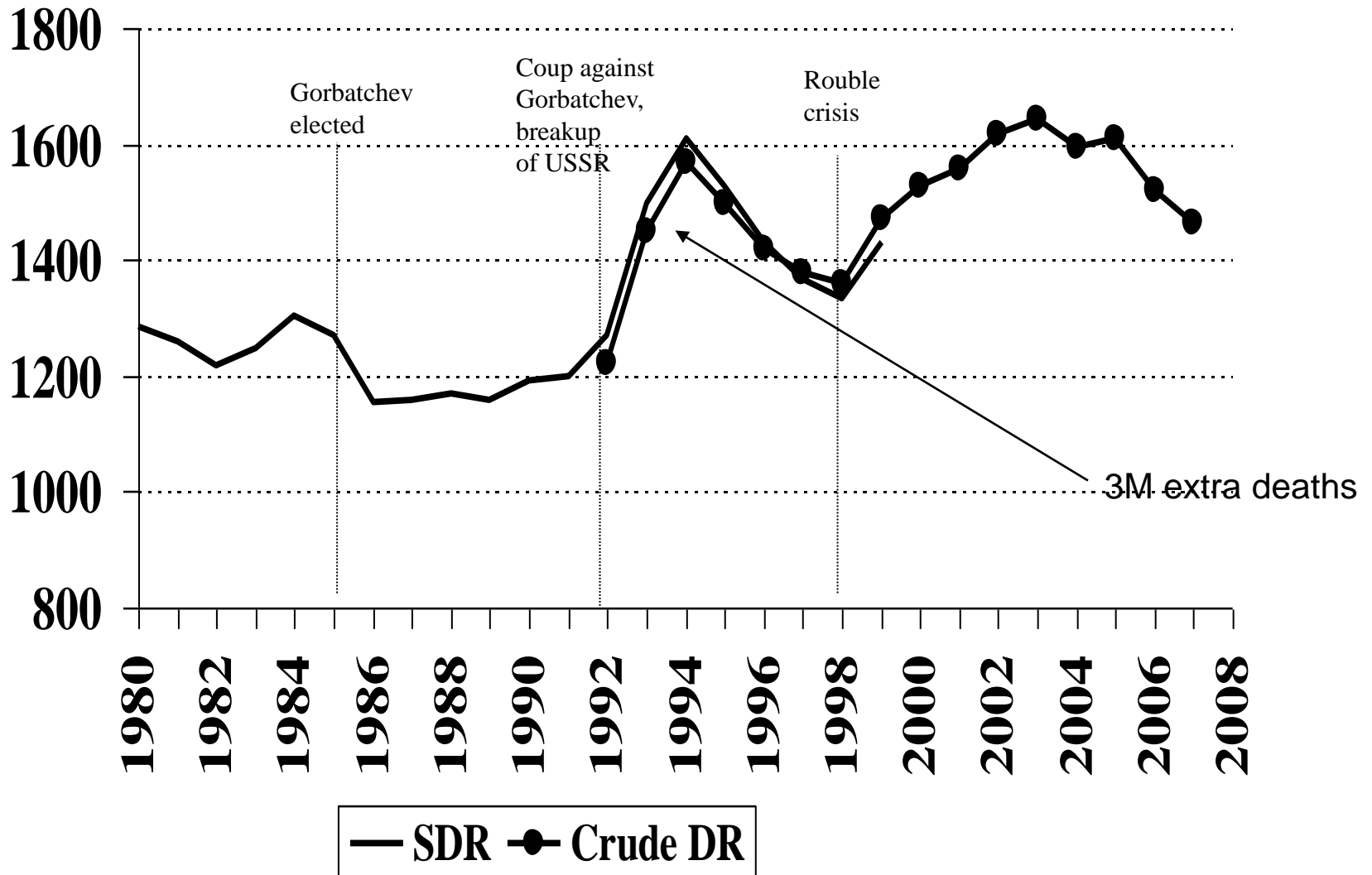X-axis: Death rate per 1000 adults aged 15–59 years (0, 2, 4, 6, 8, 10, 12)
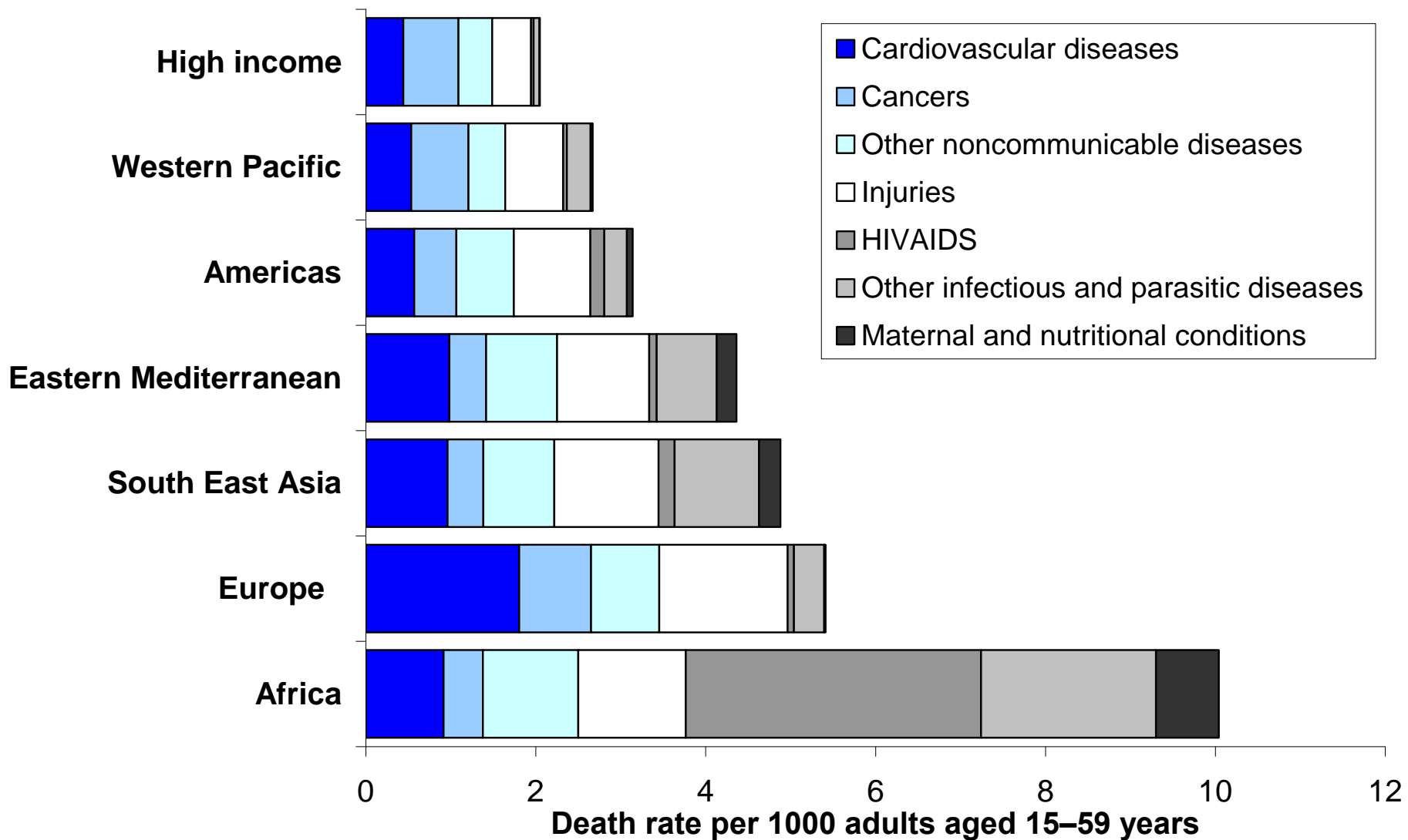
Life expectancy in Sub-Saharan Africa
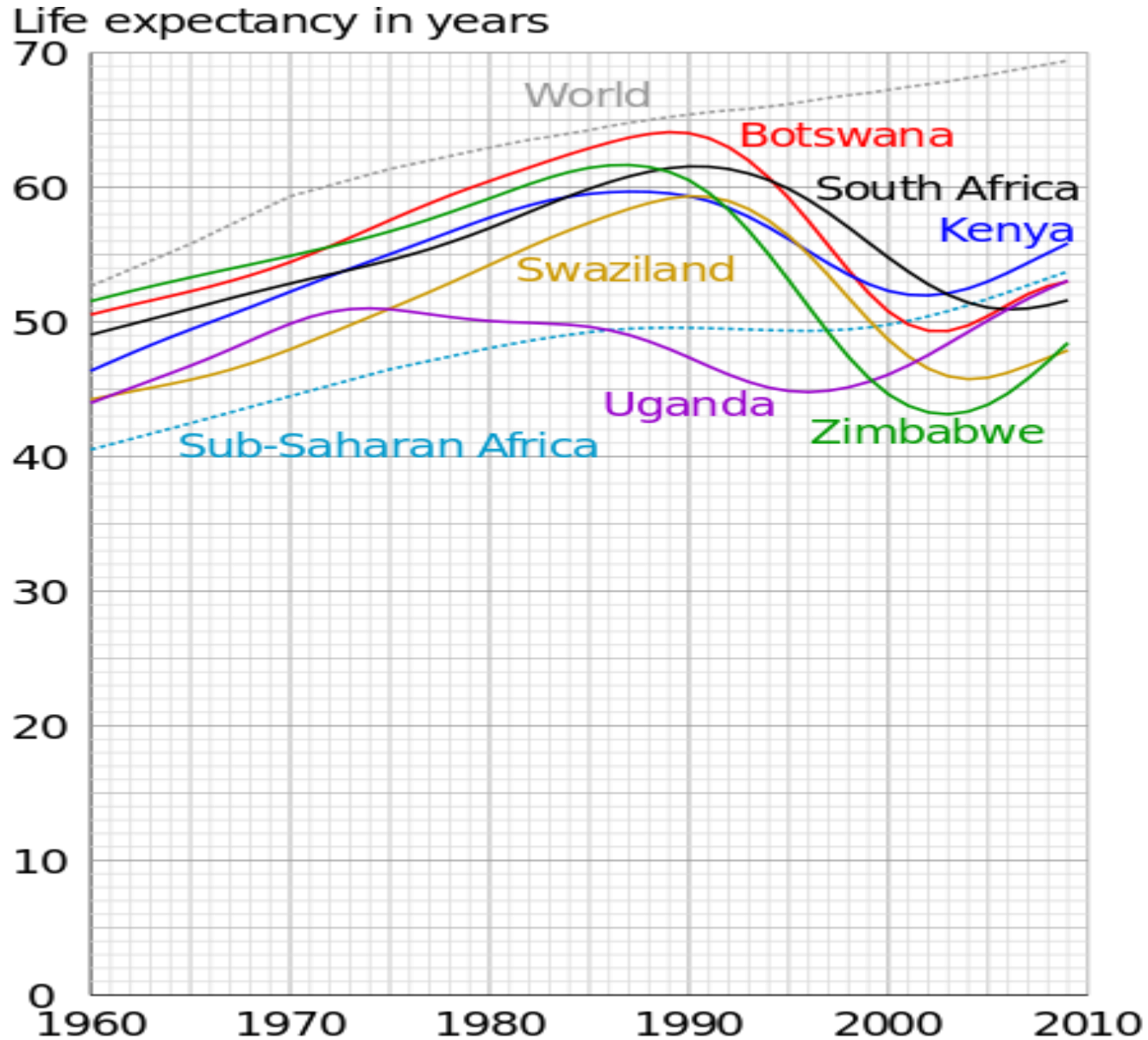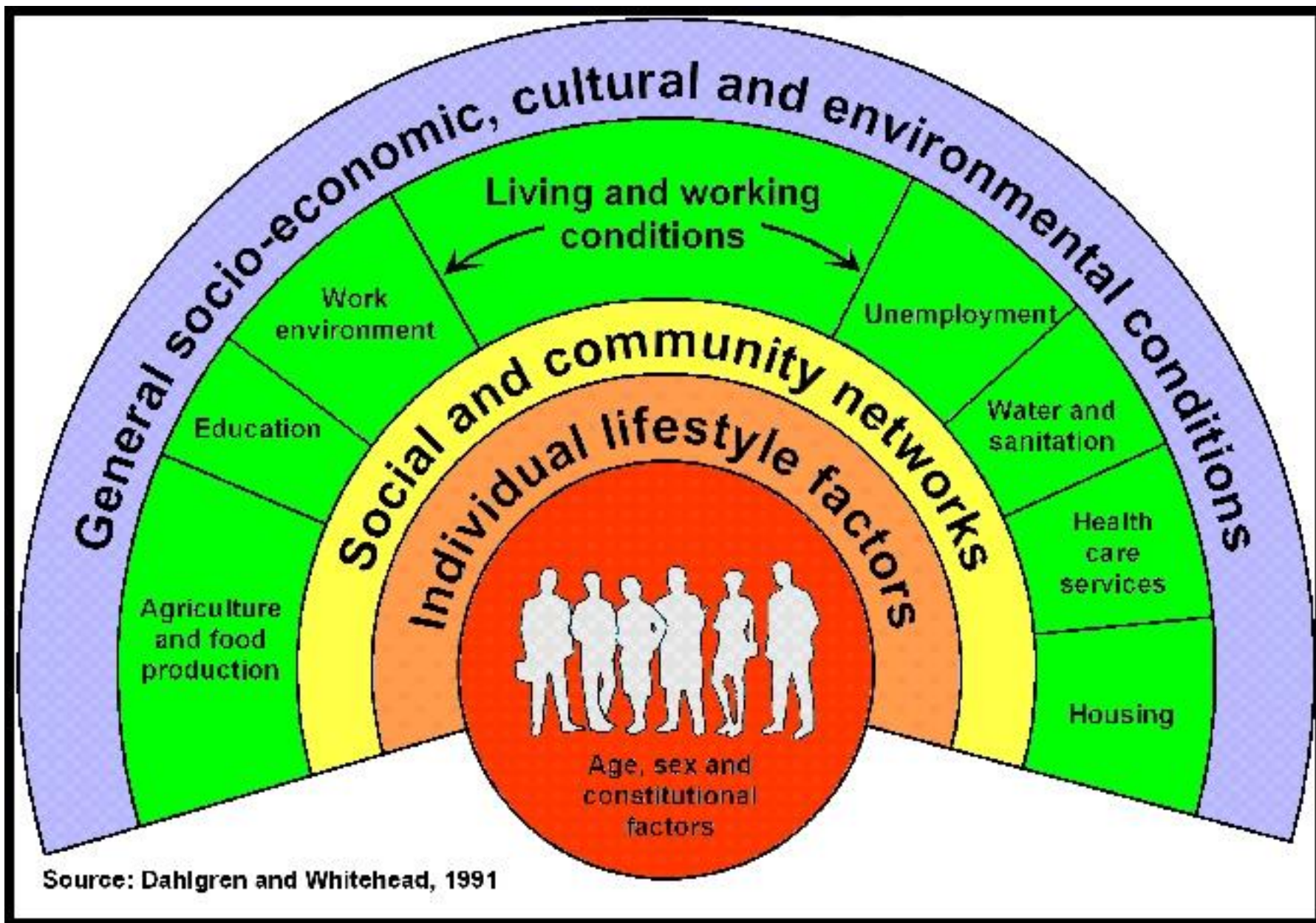
Death rates in Russia 1980-2007
both genders, per 100,000

Why does health differ so much between people, places, times…?

Part 2

Factors influencing health

Source: Dahlgren and Whitehead, 1991

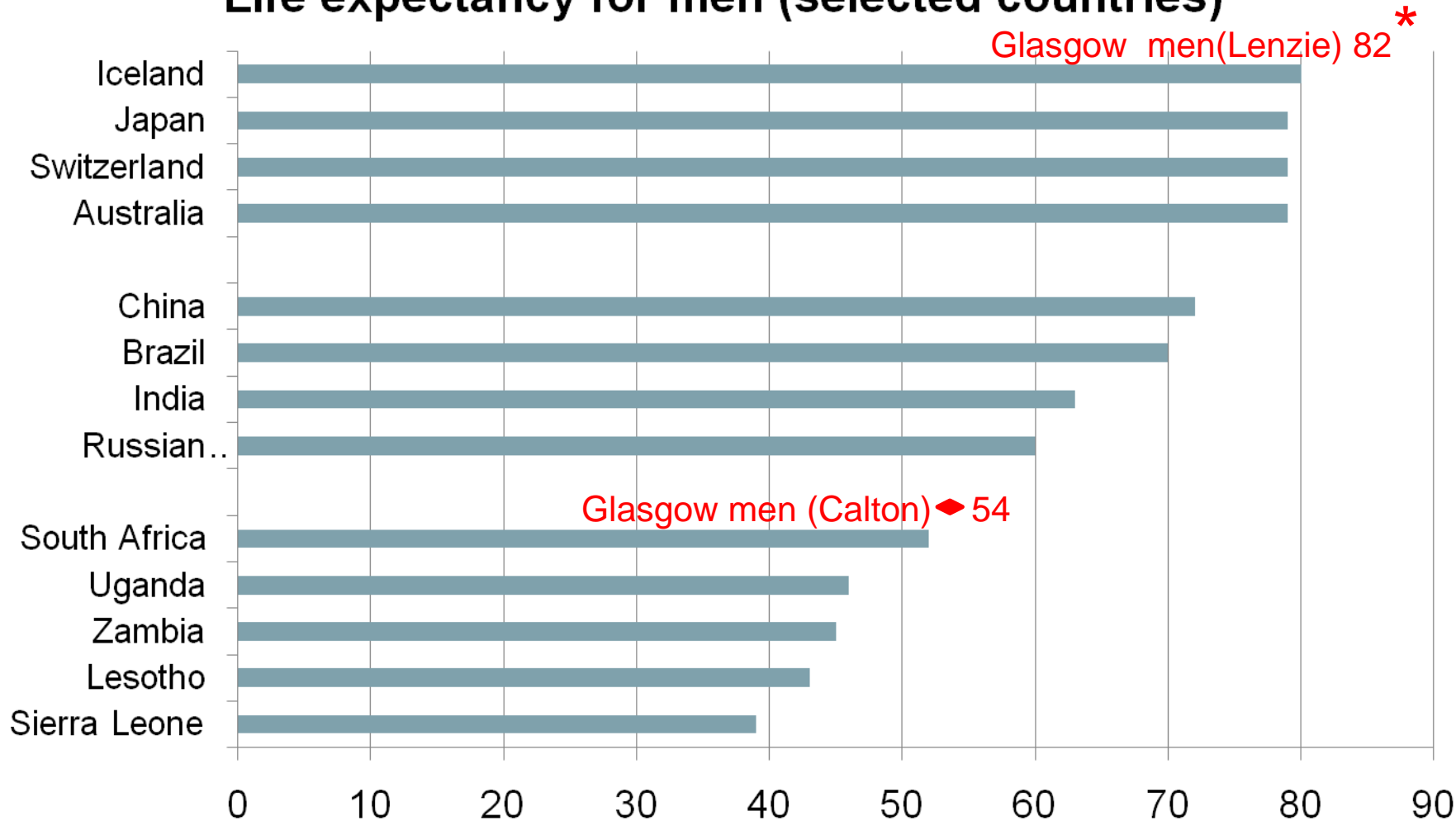# Differences between groups of people

Differences between countries

Life expectancy for men (selected countries)

Glasgow men(Lenzie) 82 *

Glasgow men (Calton) ◆ 54

National data WHO 2009, Glasgow data: Hanlon et al. 2006

Life expectancy at birth and income

$$LE = 7{,}02 \ln(GDP_{pc}) + 6{,}90$$
$$R^2 = 0{,}6921$$

Life expectancy [years, 2009] vs. GDP per capita (PPP) [US$, 2009]
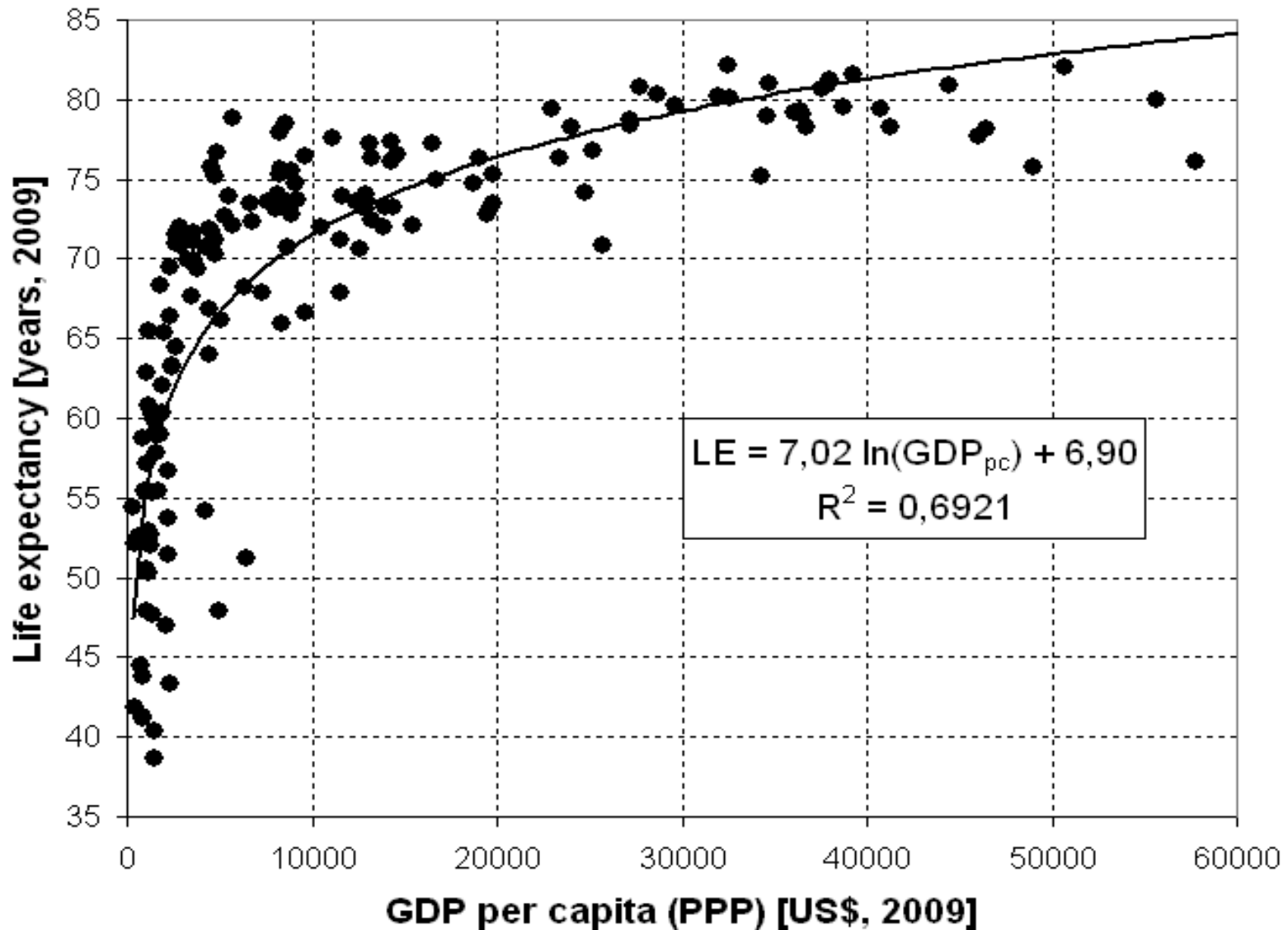
Life expectancy at birth and percentage of income received by least well off 70% of families, 1981 (Wilkinson, BMJ 1992)

r=0.86, p<0.001
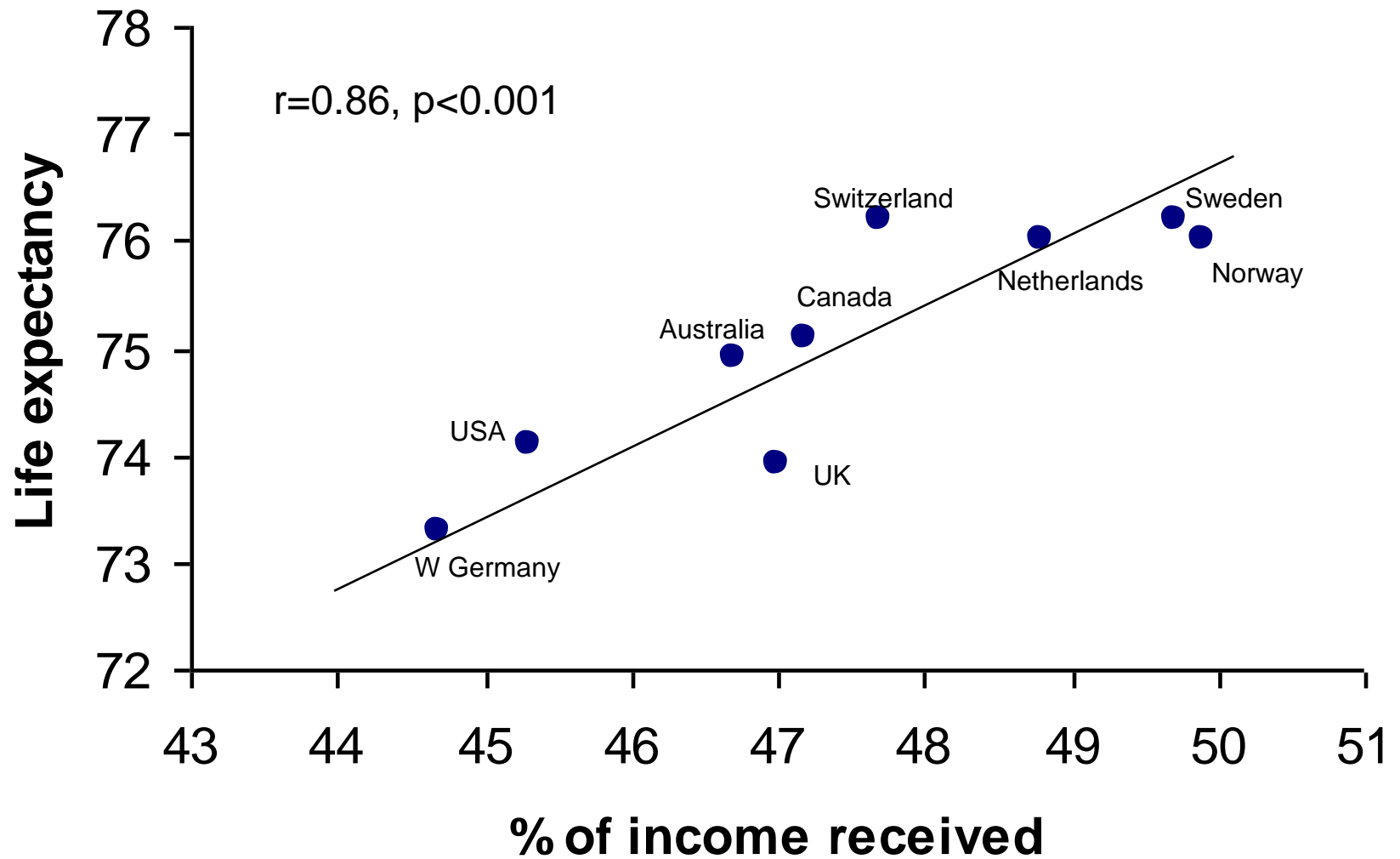
Life expectancy and disability-free life expectancy at birth by neighbourhood income deprivation, 1999-2003
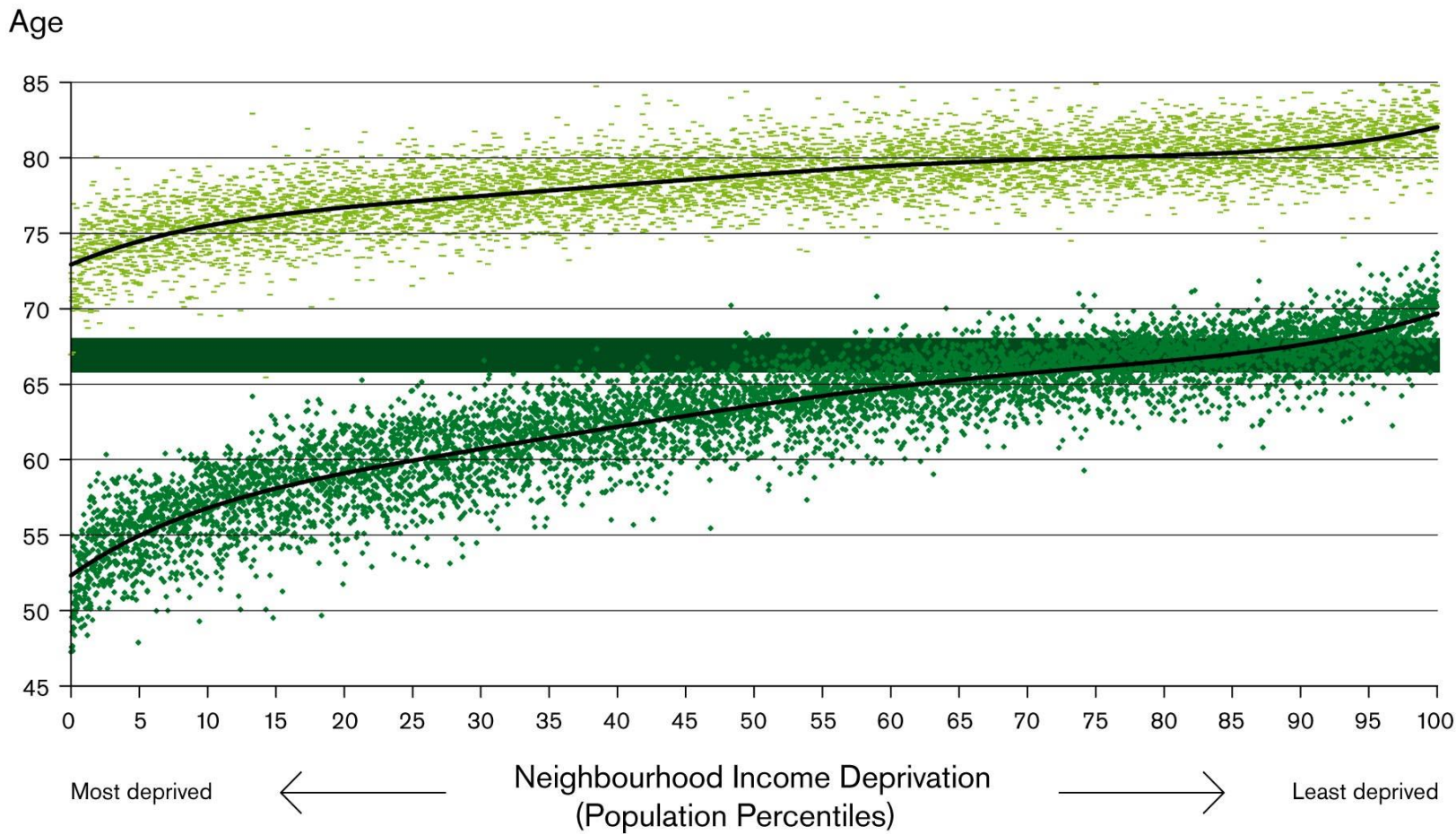
Source: Office for National Statistics[5]

Probability of dying (per 1000) under age five years by wealth quintile in India, Bangladesh, Pakistan, Kenya and Uganda

Under-5 mortality rate

Lowest | 2nd | 3rd | 4th | Highest

India 2005/6 | Bangladesh 2007 | Pakistan 2006/7 | Kenya 2008/9 | Uganda 2006
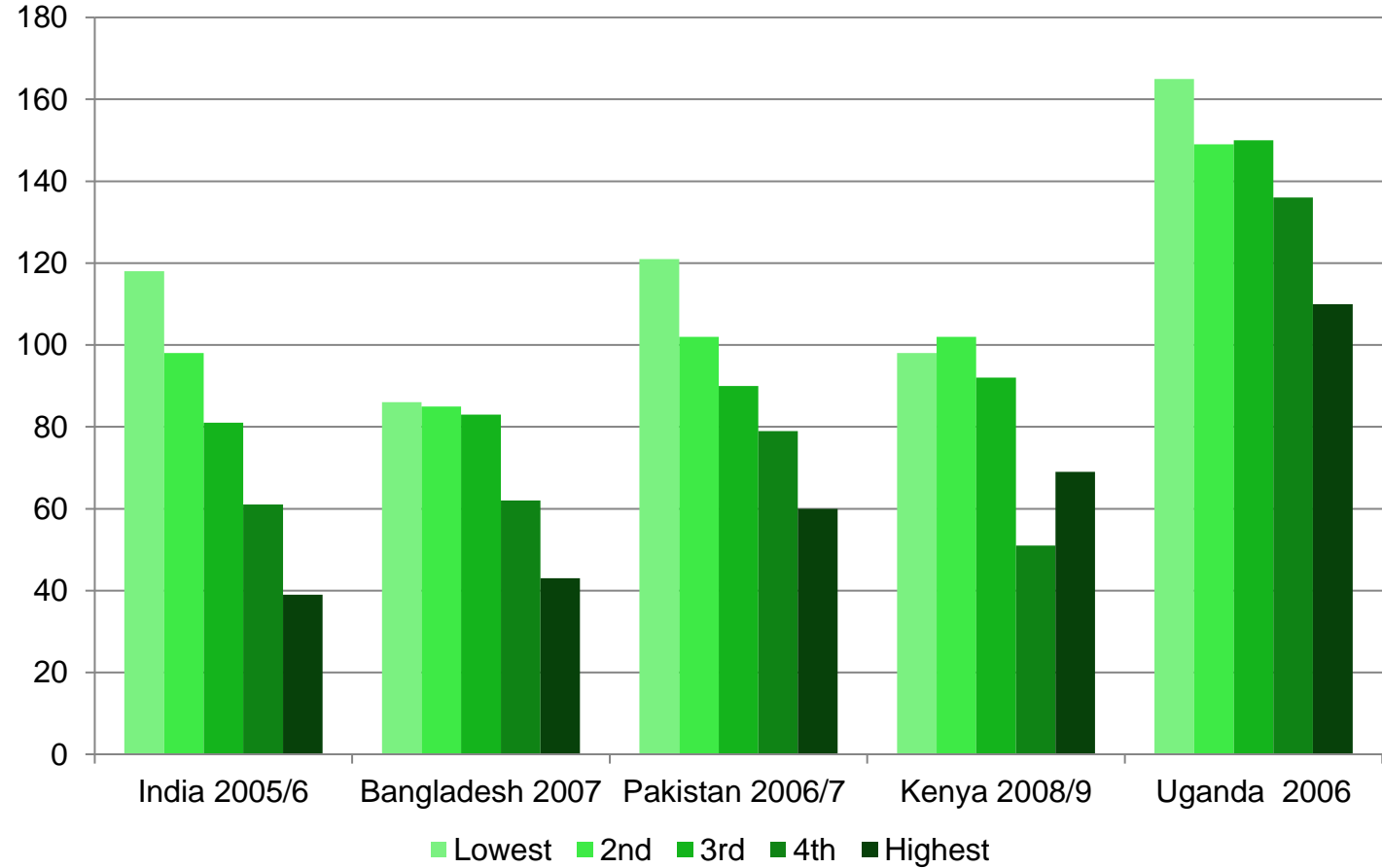
Source: Bell 2012 using DHS data

Influences on health of individuals

Risk factors for major diseases

Risk factors for major diseases

- Age
- Gender
- Genetic factors

  Not modifiable

- Smoking
- Excessive alcohol consumption
- Obesity
- High blood pressure
- High cholesterol
- Poor diet
- Low physical activity
- Poor access to medical care
- Drug misuse
- Poor hygiene
- … and many other factors

Figure 4.9 Global distribution of burden of disease attributable to 20 leading selected risk factors

Legend:
- Developing countries with high mortality
- Developing countries with low mortality
- Developed countries

Risk factors (top to bottom): Underweight, Unsafe sex, Blood pressure, Tobacco, Alcohol, Unsafe water, sanitation and hygiene, Cholesterol, Indoor smoke from solid fuels, Iron deficiency, Overweight, Zinc deficiency, Low fruit and vegetable intake, Vitamin A deficiency, Physical inactivity, Risk factors for injury, Lead exposure, Illicit drugs, Unsafe health care injections, Lack of contraception, Childhood sexual abuse

X-axis: 0% to 10%

Leading causes of DALYs, GBD 2017, Lancet 2018

A **Both sexes**

| Leading risks 1990	Leading risks 2007	Mean percentage change in number of DALYs, 2007–17	Mean percentage change in all-age DALY rate, 2007–17	Mean percentage change in age-standardised DALY rate, 2007–17	Leading risks 2017	Mean percentage change in number of DALYs, 2007–17	Mean percentage change in all-age DALY rate, 2007–17	Mean percentage change in age-standardised DALY rate, 2007–17
1 Child wasting	1 High systolic blood pressure	22·0	–2·8	–19·4	1 High systolic blood pressure	20·0	6·3	–8·0
2 Short gestation for birthweight	2 Short gestation for birthweight	–24·2	–39·6	–24·2	2 Smoking	8·2	–4·1	–16·4
3 Low birthweight for gestation	3 Smoking	10·3	–12·1	–25·8	3 High fasting plasma glucose	25·5	11·2	–3·2
4 Smoking	4 Child wasting	–47·7	–58·3	–47·9	4 High body-mass index	36·7	21·1	6·8
5 High systolic blood pressure	5 Low birthweight for gestation	–22·5	–38·2	–22·7	5 Short gestation for birthweight	–21·3	–30·3	–24·0
6 Unsafe water source	6 High fasting plasma glucose	51·4	20·7	0·8	6 Low birthweight for gestation	–21·8	–30·8	–24·7
7 Household air pollution	7 High body-mass index	66·2	32·5	11·7	7 Alcohol use	5·5	–6·6	–13·1
8 Child underweight	8 Alcohol use	37·4	9·5	–2·9	8 High LDL cholesterol	17·2	3·8	–9·3
9 Unsafe sanitation	9 Unsafe water source	–38·2	–50·7	–41·8	9 Child wasting	–40·1	–46·9	–43·1
10 Vitamin A deficiency	10 Unsafe sex	302·2	220·6	187·4	10 Ambient particulate matter	12·8	–0·1	–9·3
11 High fasting plasma glucose	11 High LDL cholesterol	17·2	–6·6	–22·8	11 Low whole grains	15·5	2·3	–9·7
12 No access to handwashing facility	12 Household air pollution	–37·1	–49·9	–47·0	12 High sodium	22·7	8·7	–5·9
13 Child stunting	13 Ambient particulate matter	17·3	–6·5	–8·8	13 Low fruit	7·7	–4·6	–15·7
14 Alcohol use	14 Low whole grains	23·4	–1·6	–17·0	14 Unsafe water source	–29·1	–37·2	–35·7
15 High LDL cholesterol	15 Unsafe sanitation	–41·2	–53·1	–44·6	15 Impaired kidney function	20·3	6·6	–5·4
16 High body-mass index	16 Low fruit				16 Household air pollution			
17 Ambient particulate matter	17 Child underweight				17 Unsafe sex			
18 Low whole grains	18 High sodium				20 Unsafe sanitation			
20 Low fruit	19 No access to handwashing facility							
30 Unsafe sex	20 Impaired kidney function							
	21 Vitamin A deficiency							
	23 Child stunting							

Smoking

- Compared to never-smokers, smokers have
  - About twice higher mortality from all causes
  - About twice higher mortality from CVD
  - About 20 times higher mortality from lung cancer
- The more and the longer you smoke, the higher the risk
- It takes several years for the risk to get down after quitting smoking
- Strong social gradient in smoking

Risk of heart diseases by alcohol consumption in 28 high quality cohort studies (Corrao et al 2000)

Selected studies

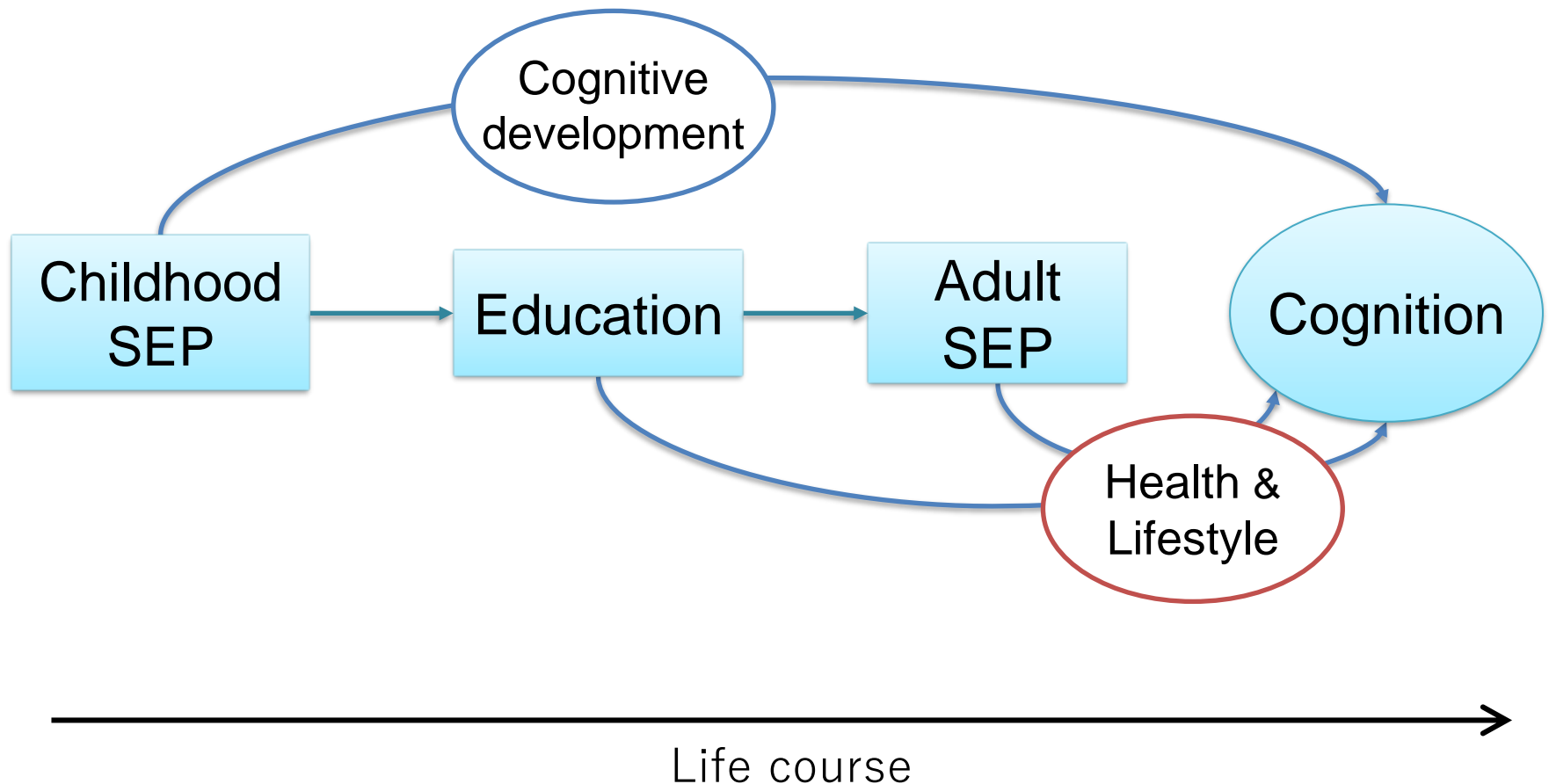$$\ln RR = 0.01110 \, (0.00070).alc - 0.09867 \, (0.00530). \sqrt{alc}$$
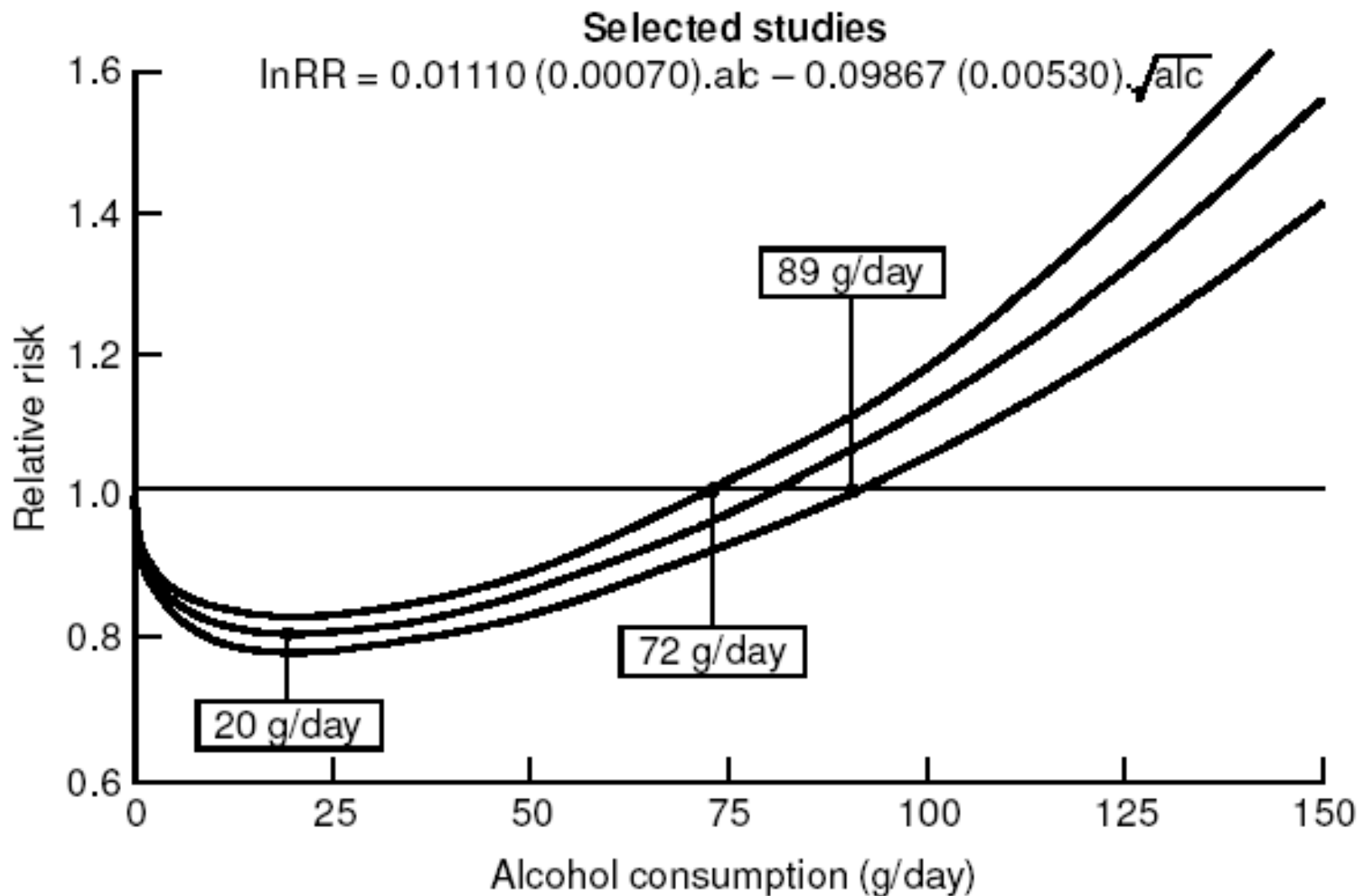
Part 3

Chains of causes

Chains of causes

- Temporal
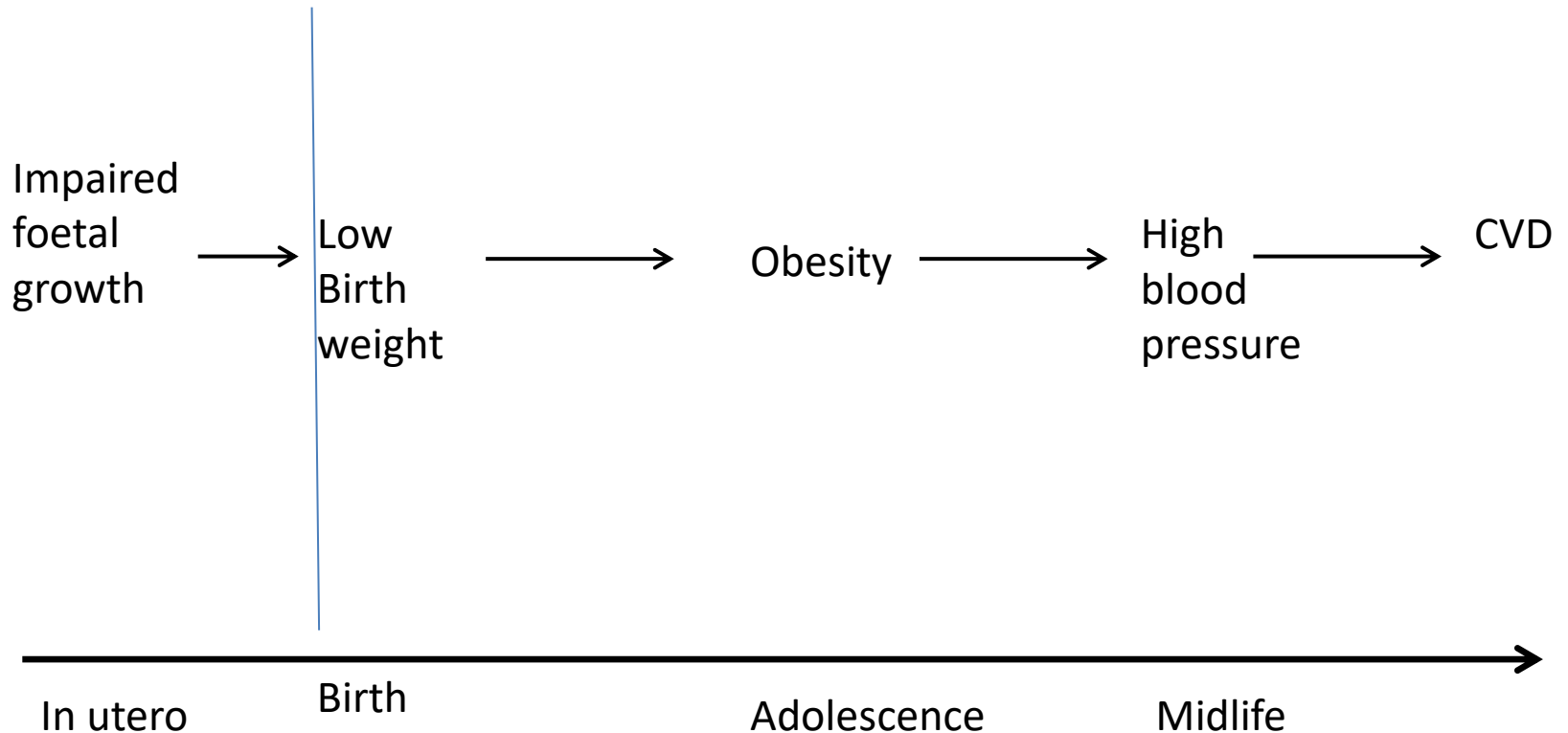- Psychosocial pathways
- Behavioural mechanisms
- Biological mechanisms
- Social causation ("causes of the causes")

Tracking of causes of the life course: social position and cognition in later life

Critical periods (foetal programming)

Impaired foetal growth → Low Birth weight → Obesity → High blood pressure → CVD

In utero   Birth   Adolescence   Midlife

Psychosocial and behavioural pathways

- Direct effects:
  - mental health (depression, anxiety, quality of life etc)
  - Suicides, violence
- Indirect effects
  - Behaviours (smoking, drinking, substance misuse)
  - Diet and nutrition (leading to obesity, dislipidemias, diabetes)

"causes of the causes"

Smoking
Drinking a lot
Obesity
Physical inactivity
High blood pressure
High cholesterol
Unhealthy diet
Risk taking
Drugs
Not seeking medical
   care

→ Poor health

Chain of causes ("causes of the causes")

Low education
Bad job
Unemployment
Poverty
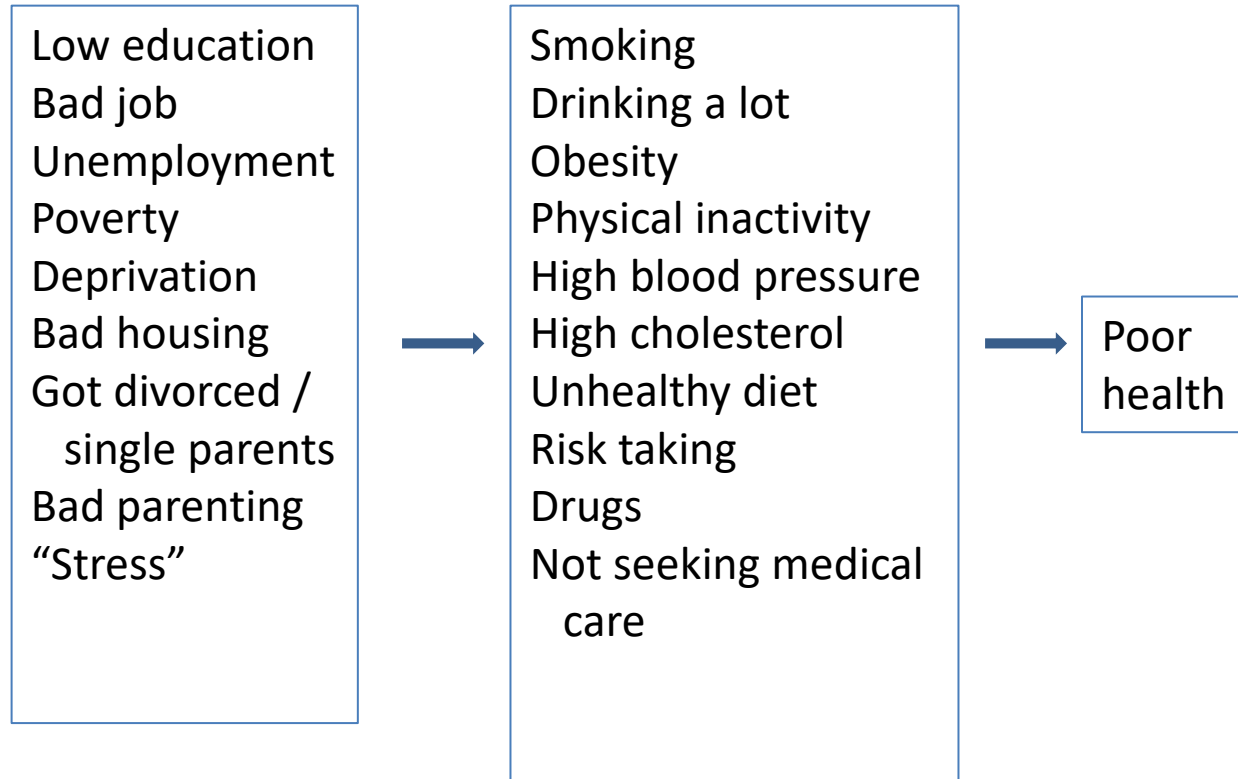Deprivation
Bad housing
Got divorced /
   single parents
Bad parenting
"Stress"

→

Smoking
Drinking a lot
Obesity
Physical inactivity
High blood pressure
High cholesterol
Unhealthy diet
Risk taking
Drugs
Not seeking medical
   care

→

Poor
health

Chain of causes ("causes of the causes")

Economy		Low education		Smoking		Poor health
Sanitation	→	Bad job	→	Drinking a lot	→	

Economy
Sanitation
Water supply
Educational system
Health care system
Employment policy
Social benefits
Public transport
Energy supply

→

Low education
Bad job
Unemployment
Poverty
Deprivation
Bad housing
Got divorced /
    single parents
"Stress"

→

Smoking
Drinking a lot
Obesity
Physical inactivity
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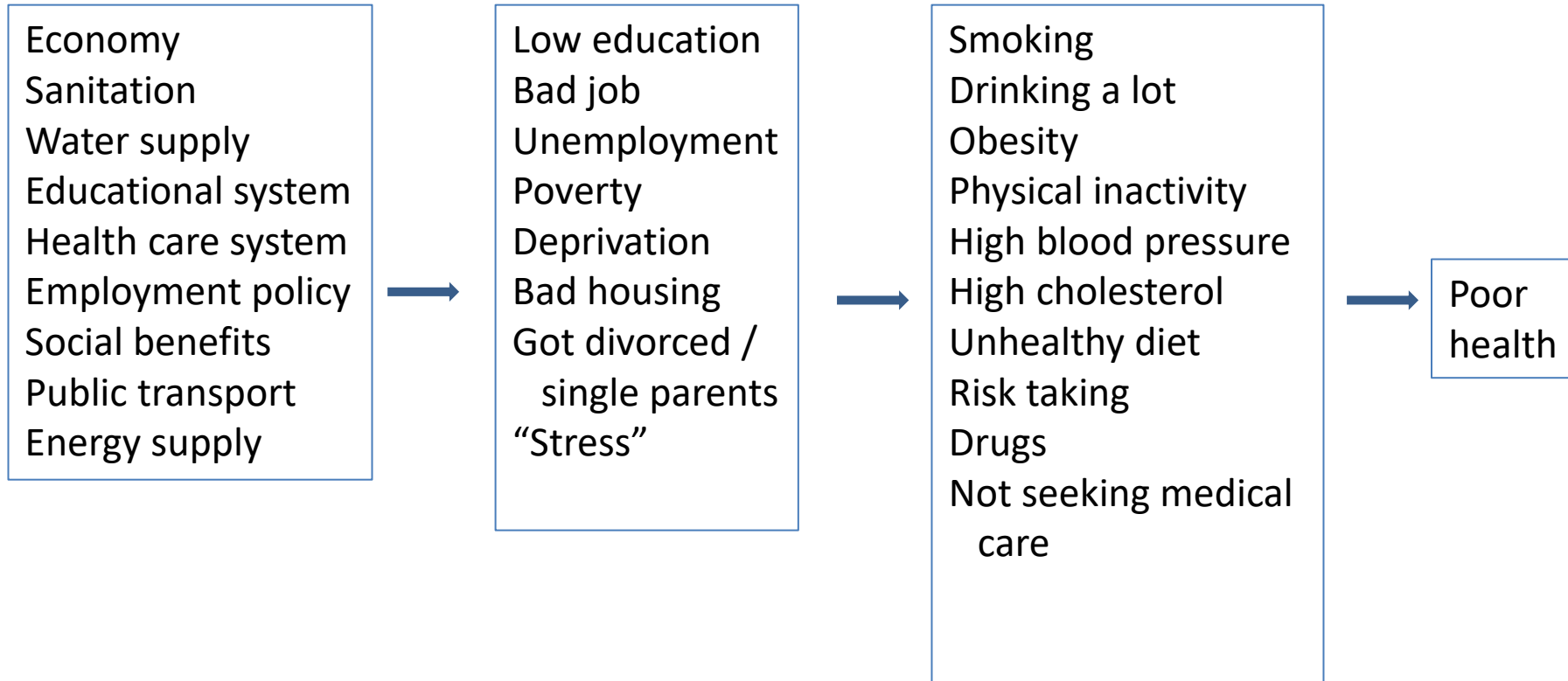Unhealthy diet
Risk taking
Drugs
Not seeking medical
    care

→

Poor
health

Chain of causes ("causes of the causes")

National

Economy
Sanitation
Water supply
Educational system
Health care system
Employment policy
Social benefits
Public transport
Energy supply

International
Economy & development
Trade
War & conflict
History

Group level

Low education
Bad job
Unemployment
Poverty
Deprivation
Bad housing
Got divorced /
  single parents
"Stress"

Personal level

Smoking
Drinking a lot
Obesity
Physical inactivity
High blood pressure
High cholesterol
Unhealthy diet
Risk taking
Drugs
Bad hygiene
Not seeking medical
  care

Poor
health

Conclusions

- Mortality and morbidity are distributed unequally between countries, groups and people
- Health is best in high income countries and high income groups and worst in low income countries and low income groups
- Proximal risk factors are important (prevention!)
- But proximal factors are powerfully influenced by more distant forces (social position, national and international environment)