

160 years of increasing life expectancy.

Will it ever end?

EuroPRevent 2009

Stockholm, 6–9 May 2009

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of Cardiovascular and Other Chronic Diseases

Das Organ der Ärzteschaft

Gegründet 1872

Ausgabe A

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Contents

- Changes of life expectancy in the western world
- Contributions of different age groups and disease-specific causes of death to the changes in life expectancy in Germany
- Are CVD mortality declines in the western world due to primary prevention or improvements in treatment?
- Will life expectancy in the western world increase forever?
What role might the rising epidemic of obesity play?

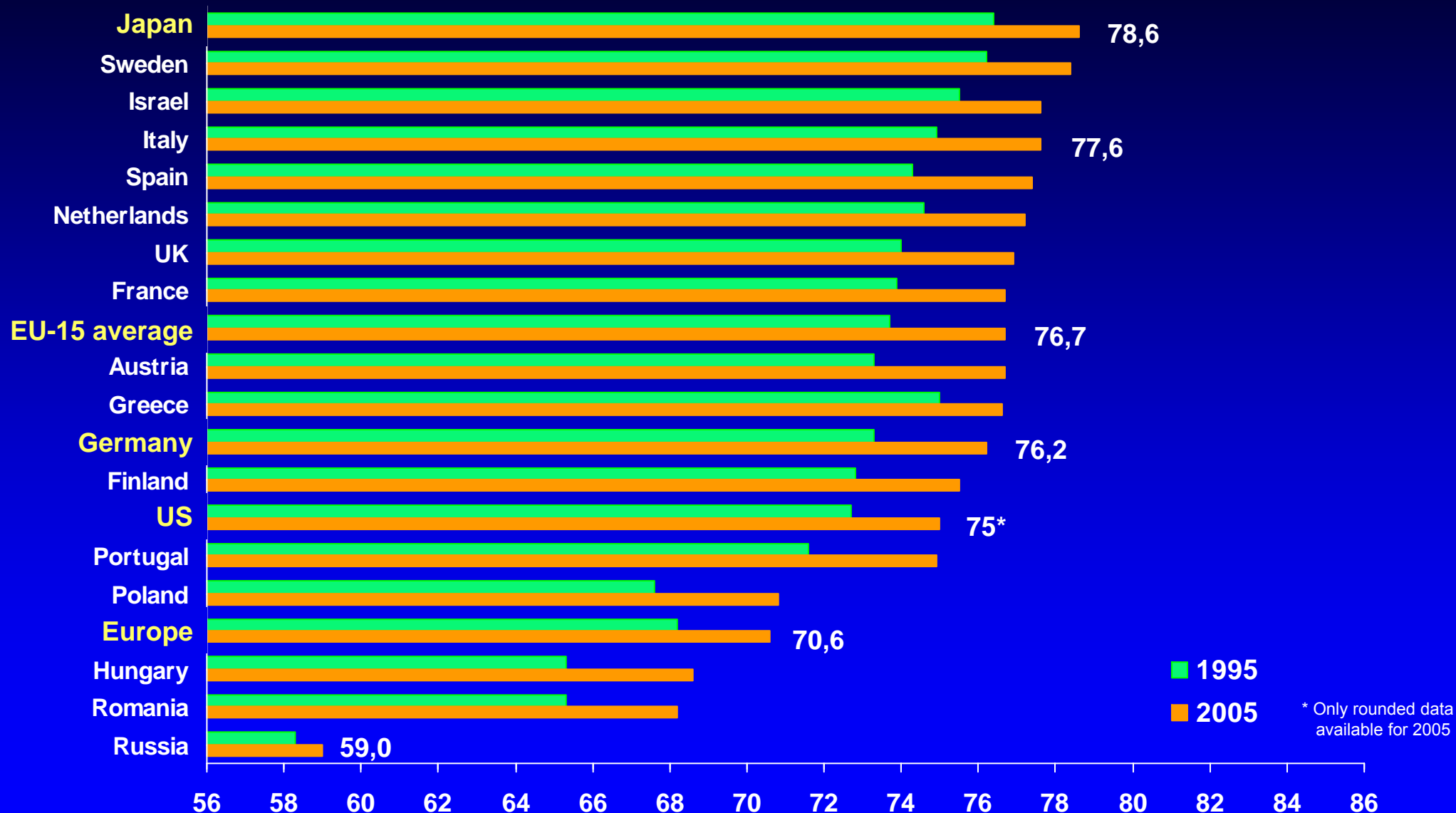


Average life expectancy at birth

The level of mortality within a population can be expressed as average life expectancy.

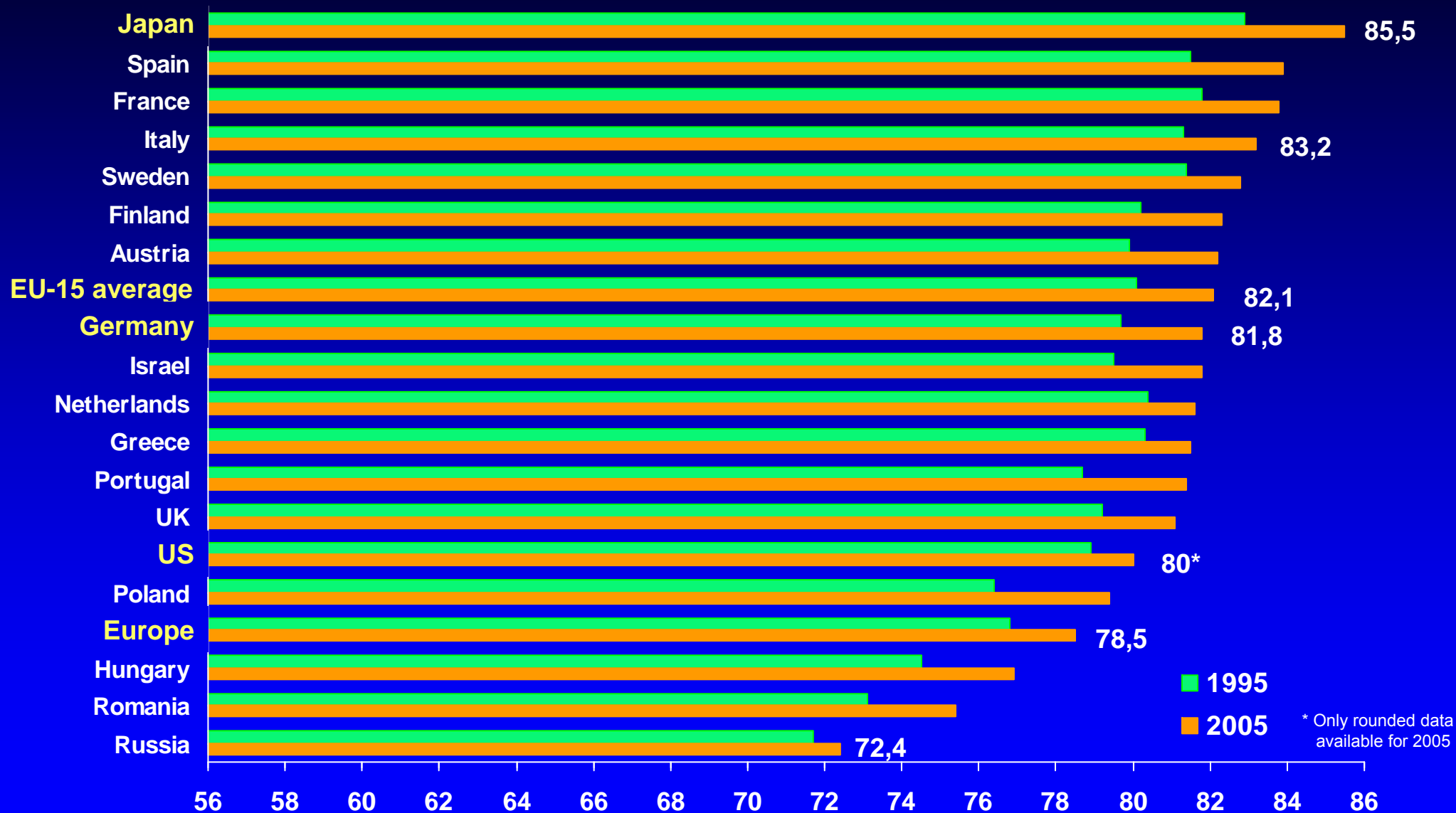
The average life expectancy of a specific calendar year is calculated using mortality rates of each age group within the observed year.

Life expectancy at birth for men in Europe, Japan, and in the United States 1995 und 2005



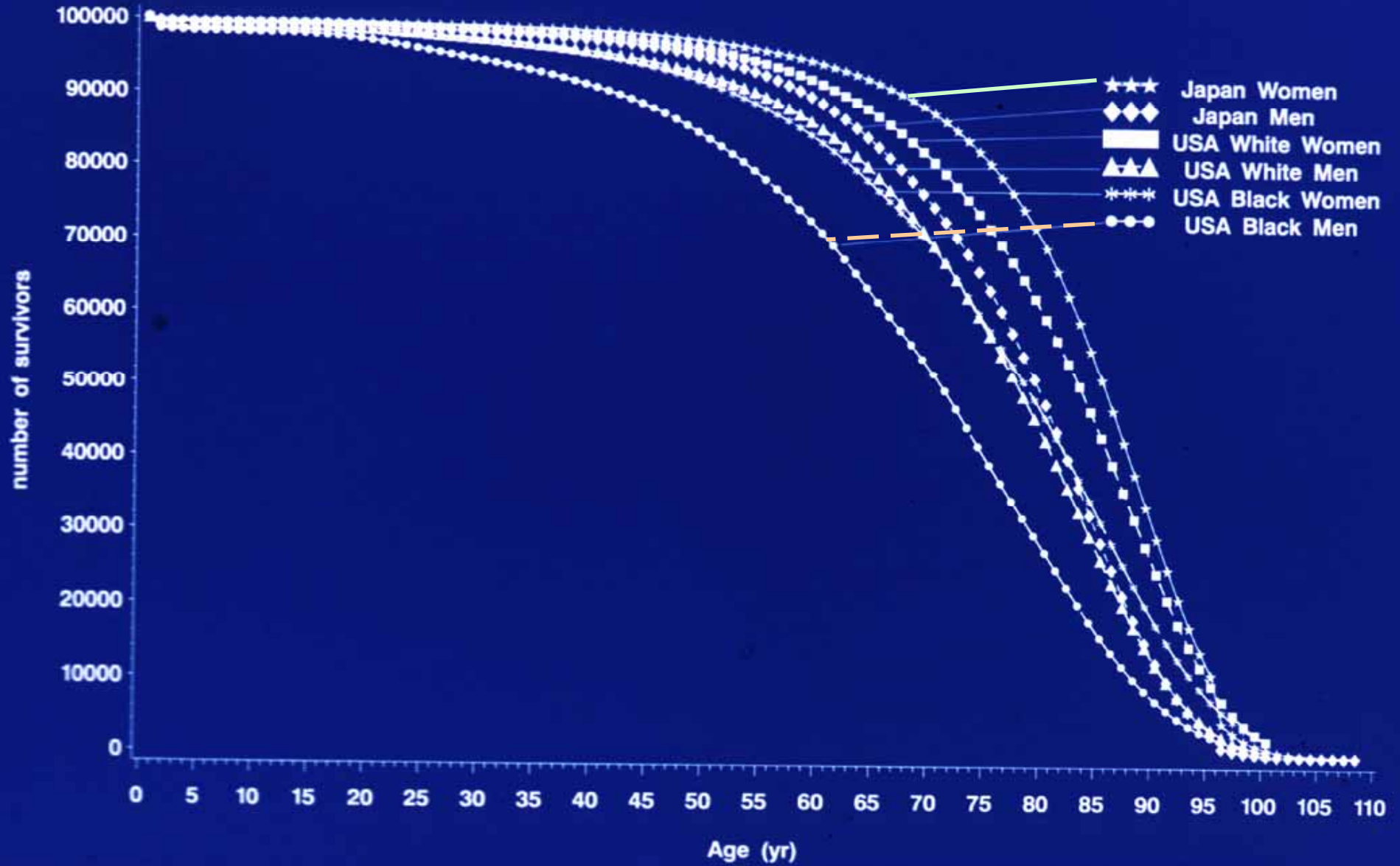
UNECE Statistical Division Database, compiled from national and international official sources (WHO, EUROSTAT, UNICEF Transmonee) (www.unece.org/stats/data, accessed 9 August 2007). WHO Statistical Information System (WHOSIS) / World Health Statistics 2007.

Life expectancy at birth for women in Europe, Japan, and in the United States 1995 und 2005

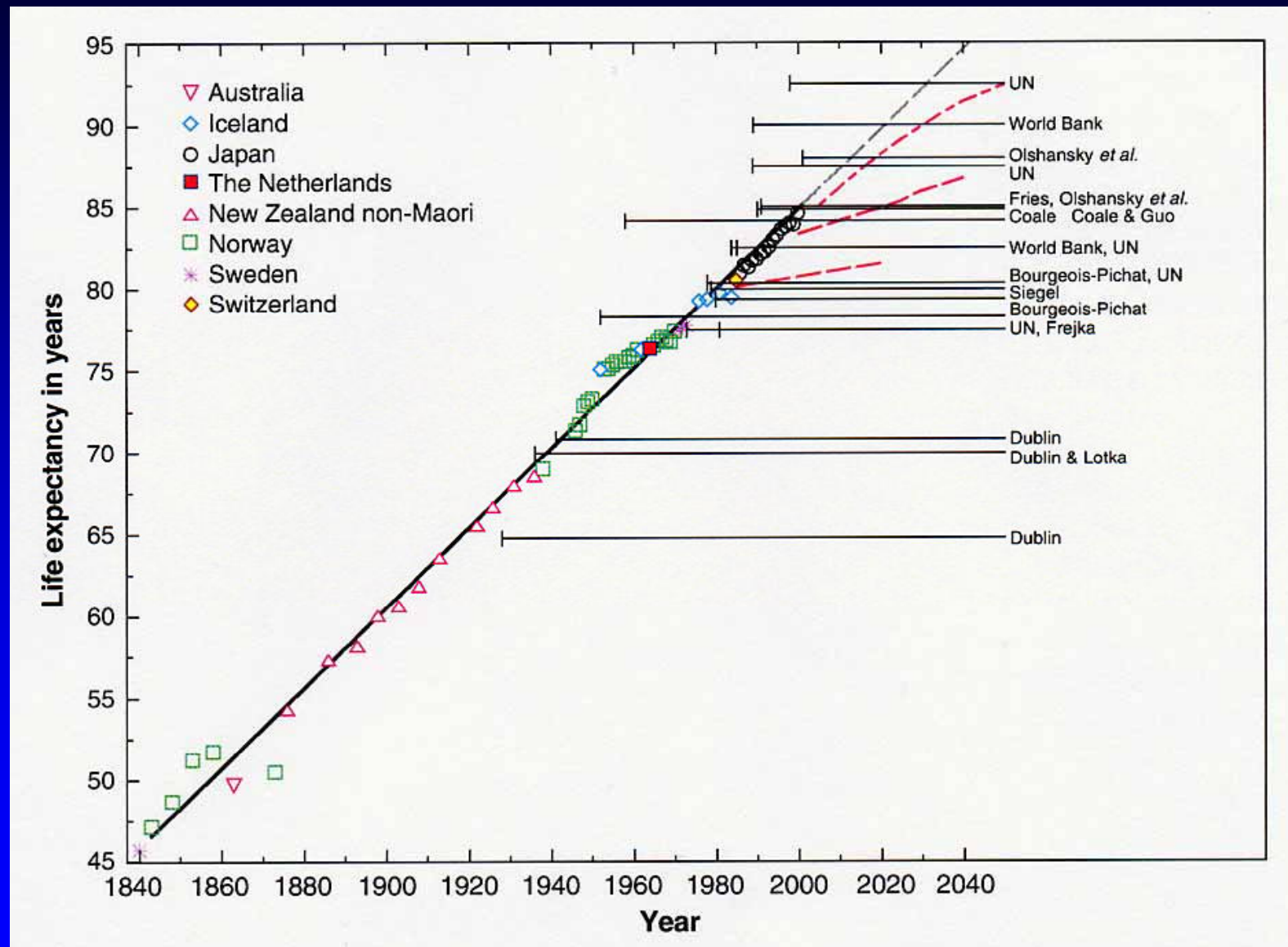


* Only rounded data available for 2005

JAPAN 1993 – USA 1997
number of survivors out of 100,000 born alive

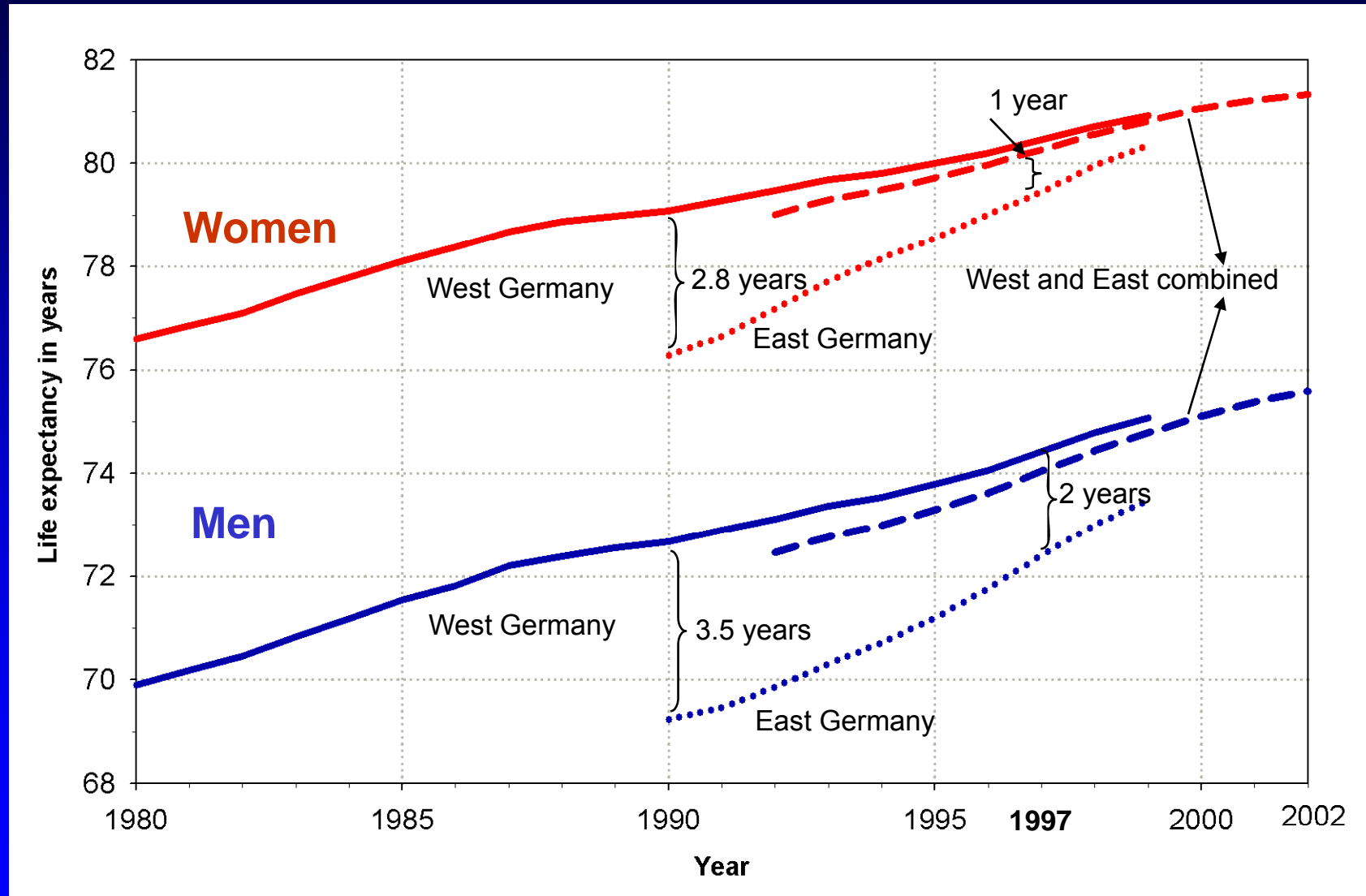


Record female life expectancy from 1840 to the present



Source: Oeppen J, Vaupel JW. Broken limits to life expectancy. *Science* 2002; 296: 1029–31

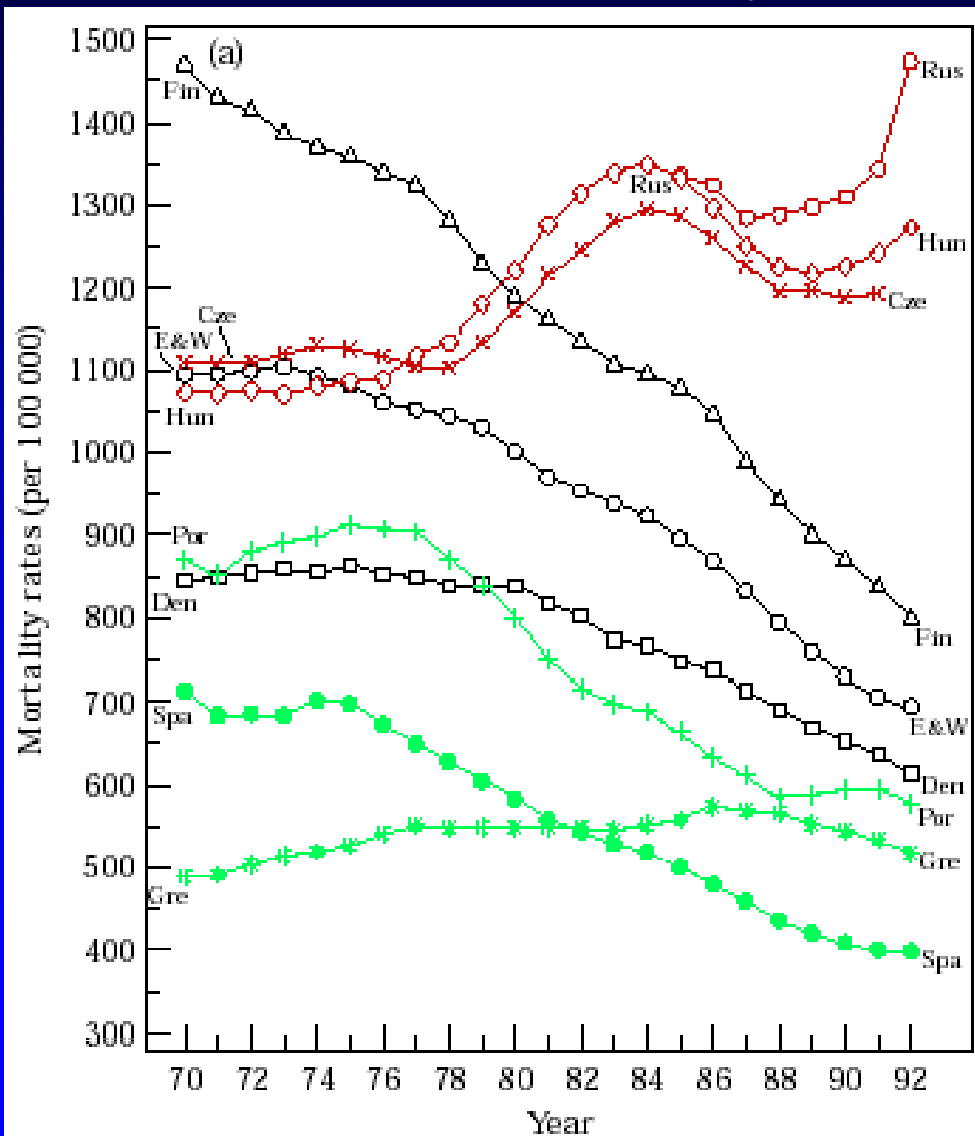
Average life expectancy in Germany between 1980 and 2002, men and women



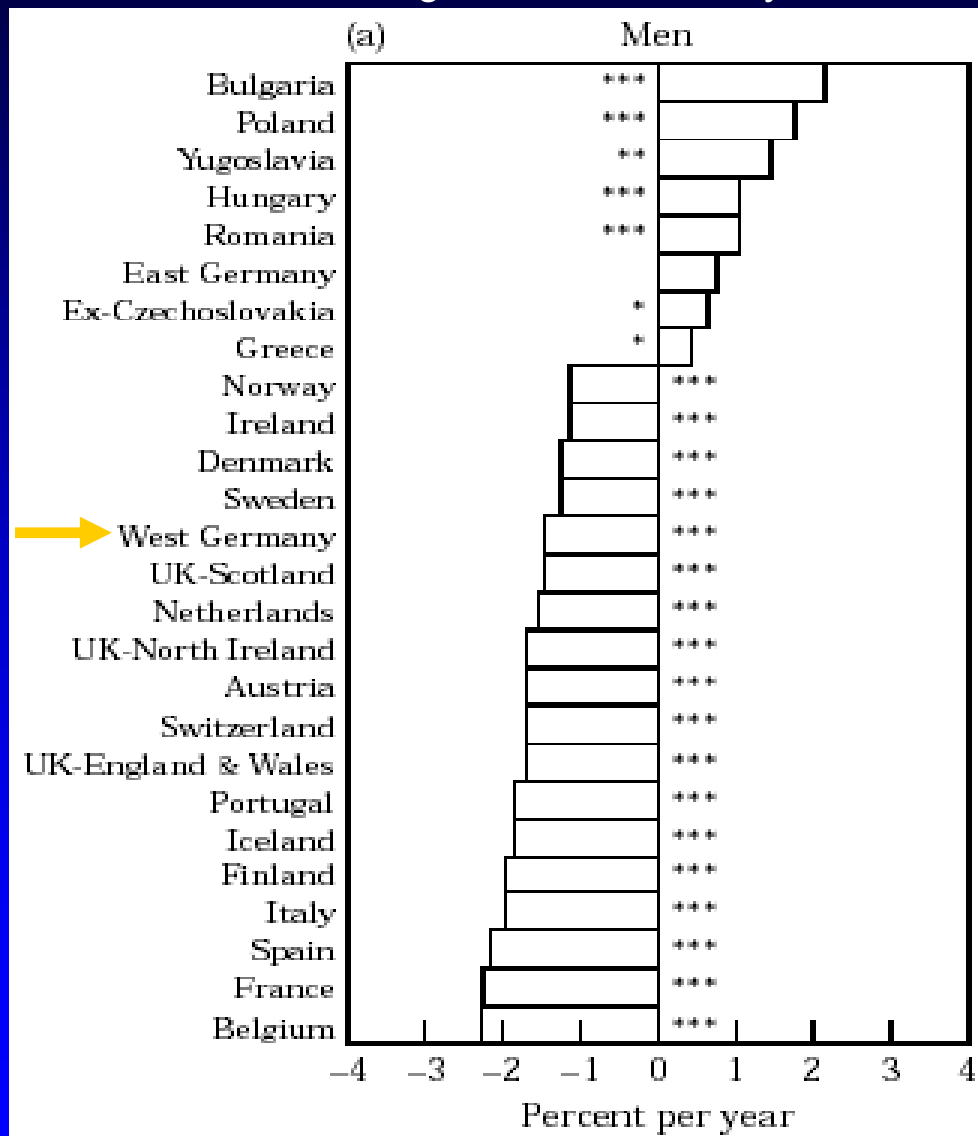
The burden of cardiovascular disease mortality in Europe, 1970–92

Men, age 45–74 years

Time trends in CVD mortality

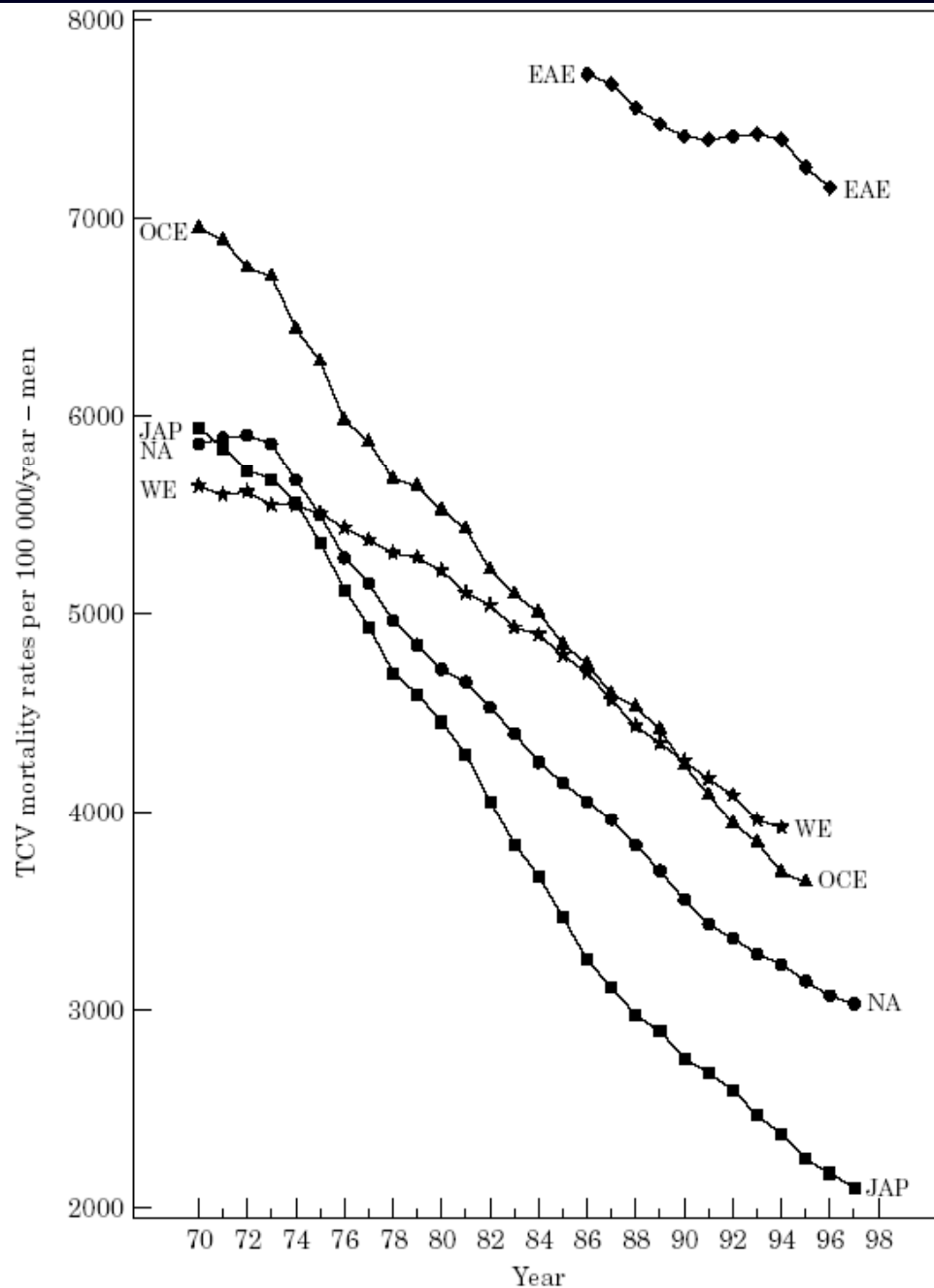


Annual % change in CVD mortality rates



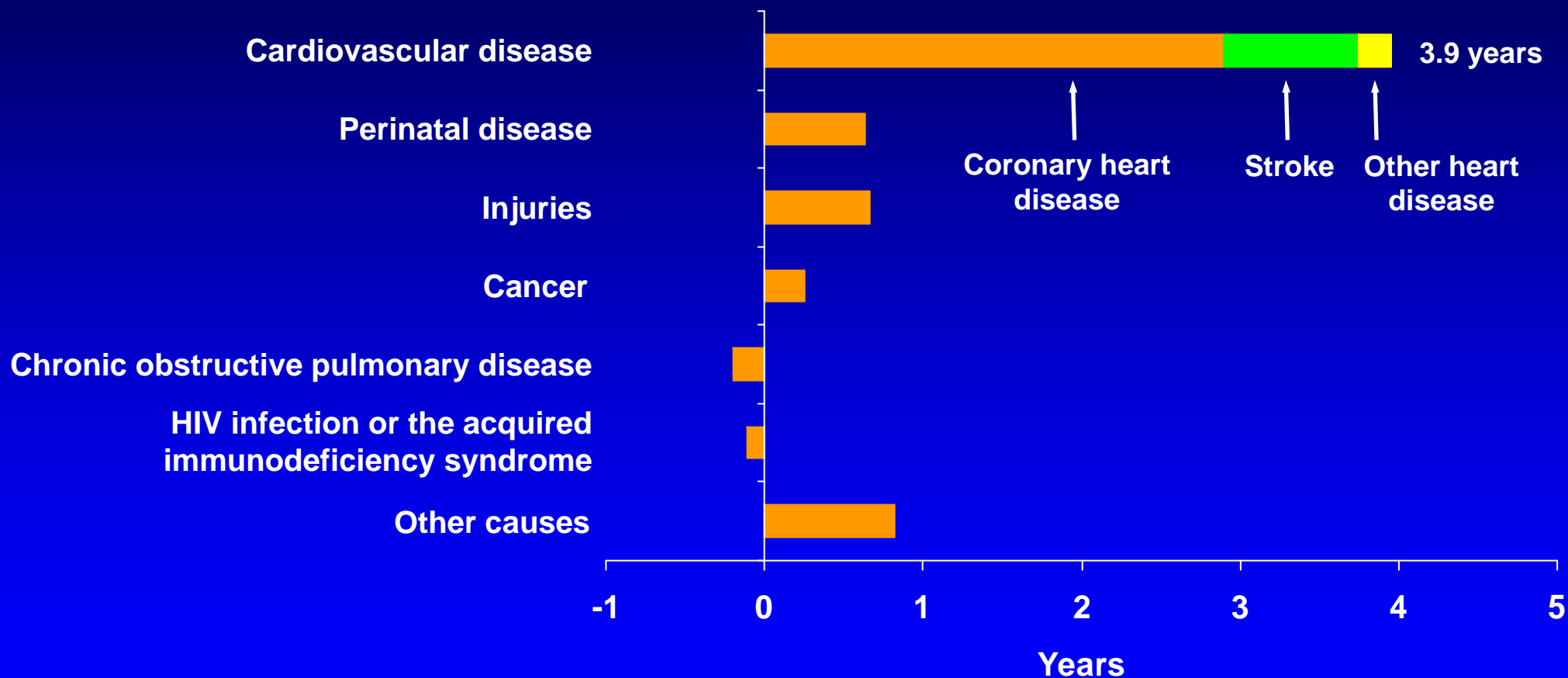
Evolution of mean age-adjusted mortality rates from total cardiovascular diseases in different world regions, 1970–1996 Men, age 75–84 years

- EAE** = Eastern Europe
- WE** = Western Europe
- OCE** = Oceania
- NA** = North America
- JAP** = Japan



Source: Kesteloot H et al. Evolution of all-causes and cardiovascular mortality in the age-group 75–84 years in Europe during the period 1970–1996. *Eur Heart J* 2002; 23: 392

Change in US life expectancy between 1970 and 2000



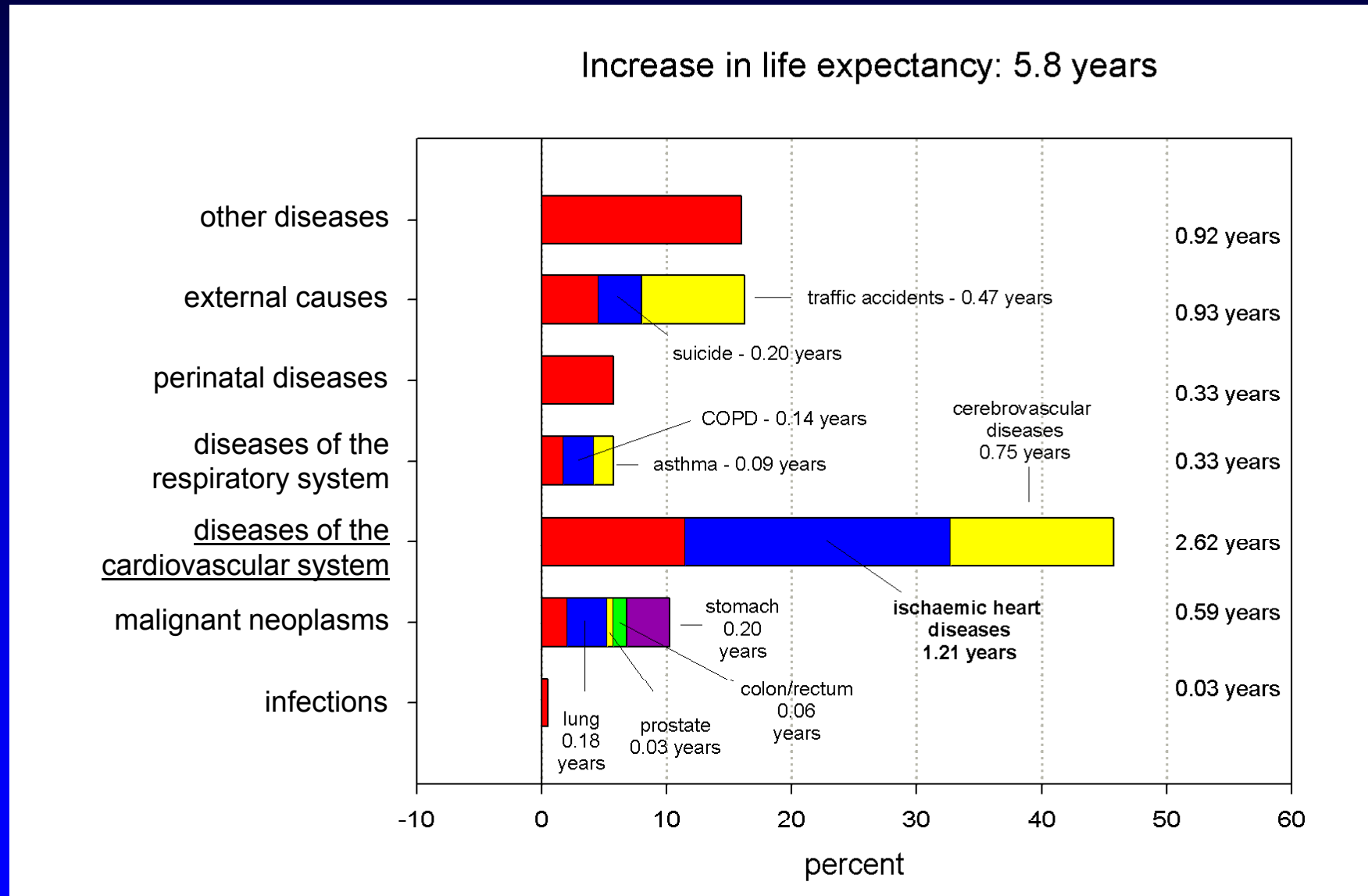
Source: Lenfant C. Clinical Research to Clinical Practice — Lost in Translation? N Engl J Med 2003; 349: 868–874



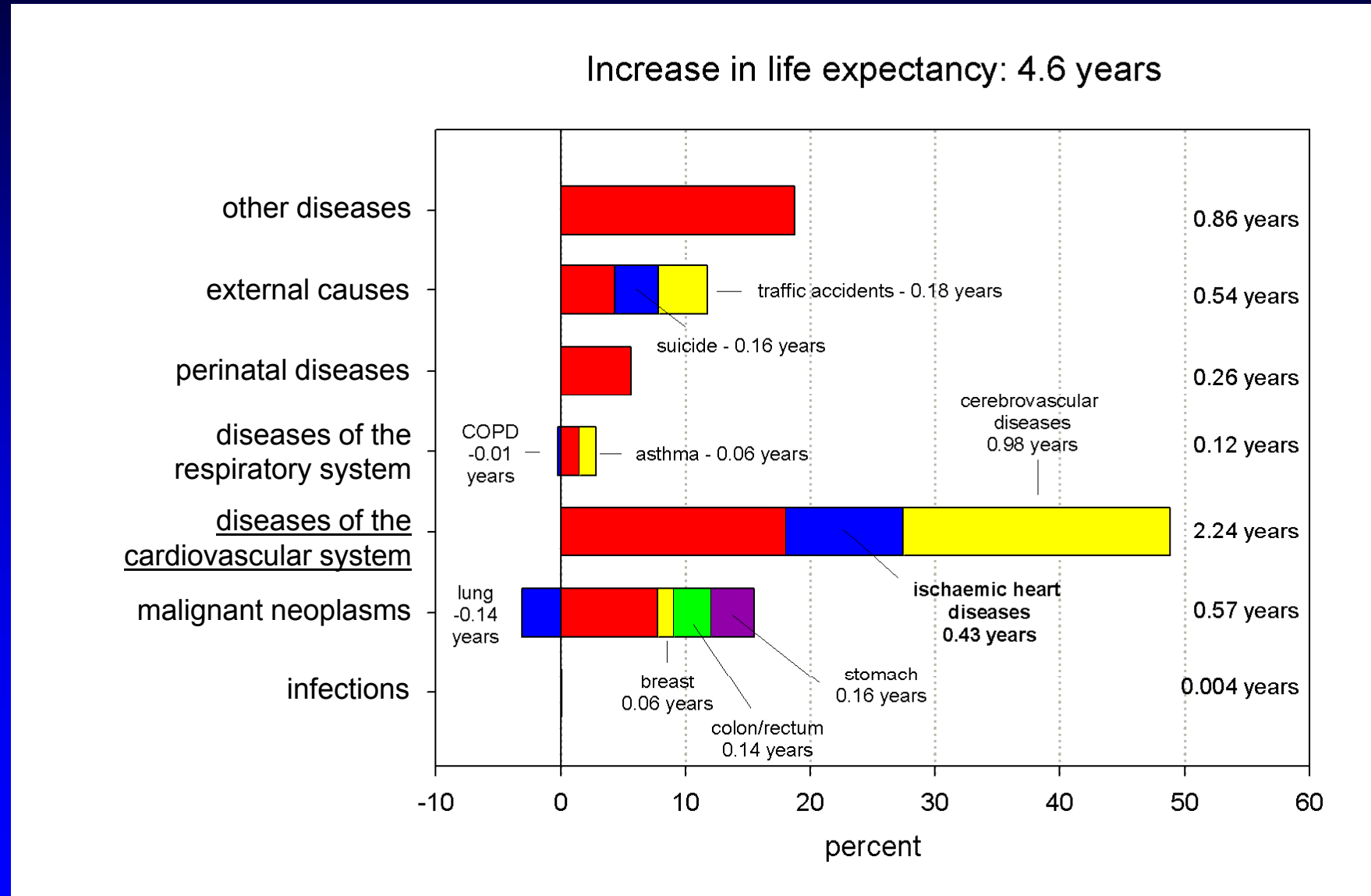
To analyse changes of life expectancy between two points in time, Pollard's method calculates the contribution of each age group and within this group of each cause of death to the observed changes of life expectancy.

Pollard JH: The expectation of life and its relationship to mortality.
J Inst Actuaries 1982; 109: 225–40

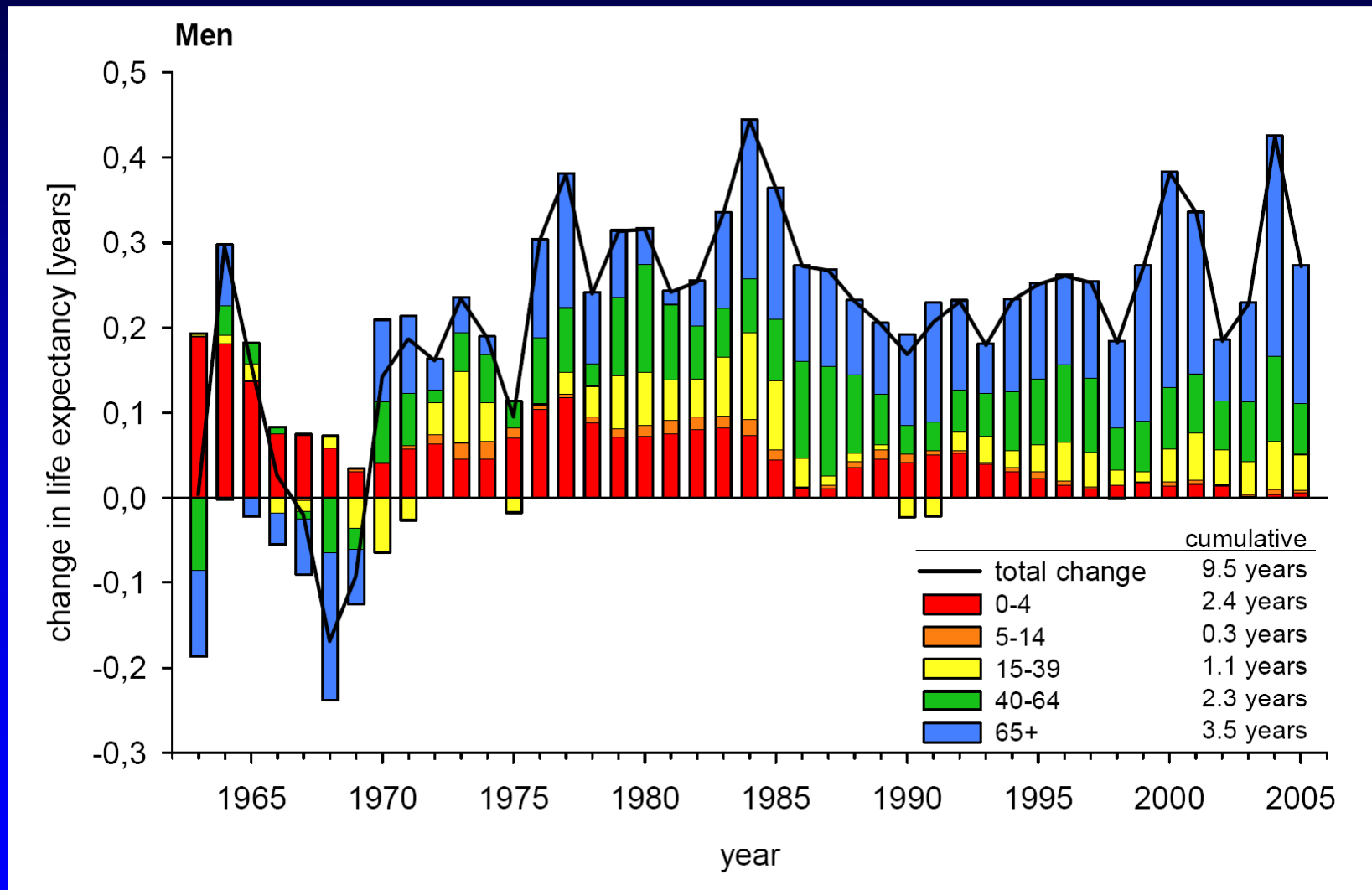
Contribution of different disease groups on the increase in average life expectancy for men between 1980 and 2002 in Germany



Contribution of different disease groups on the increase in average life expectancy for women between 1980 and 2002 in Germany

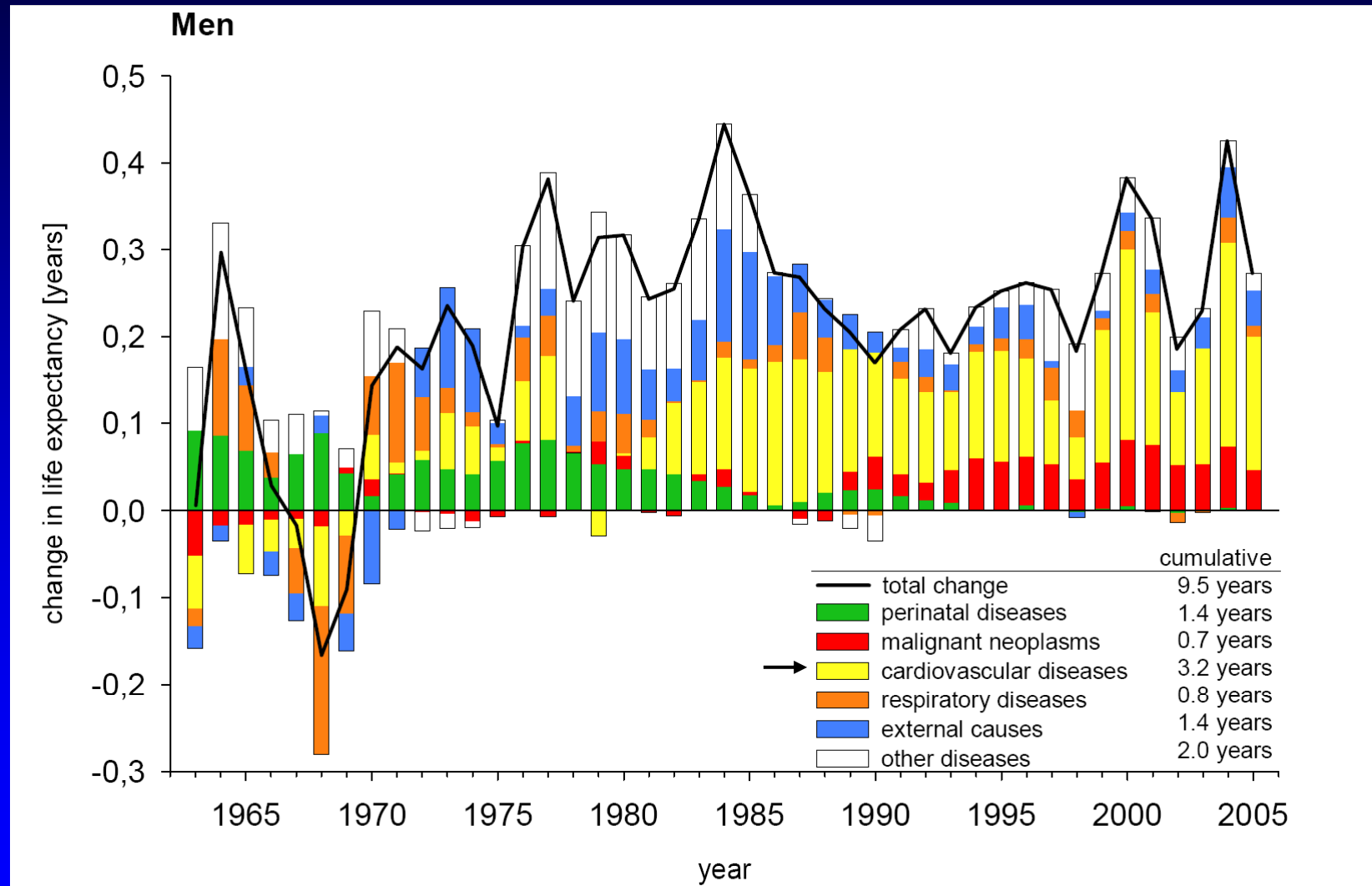


Annual and cumulative contribution of different age groups to the changes in life expectancy between 1962 and 2005 in Germany, men



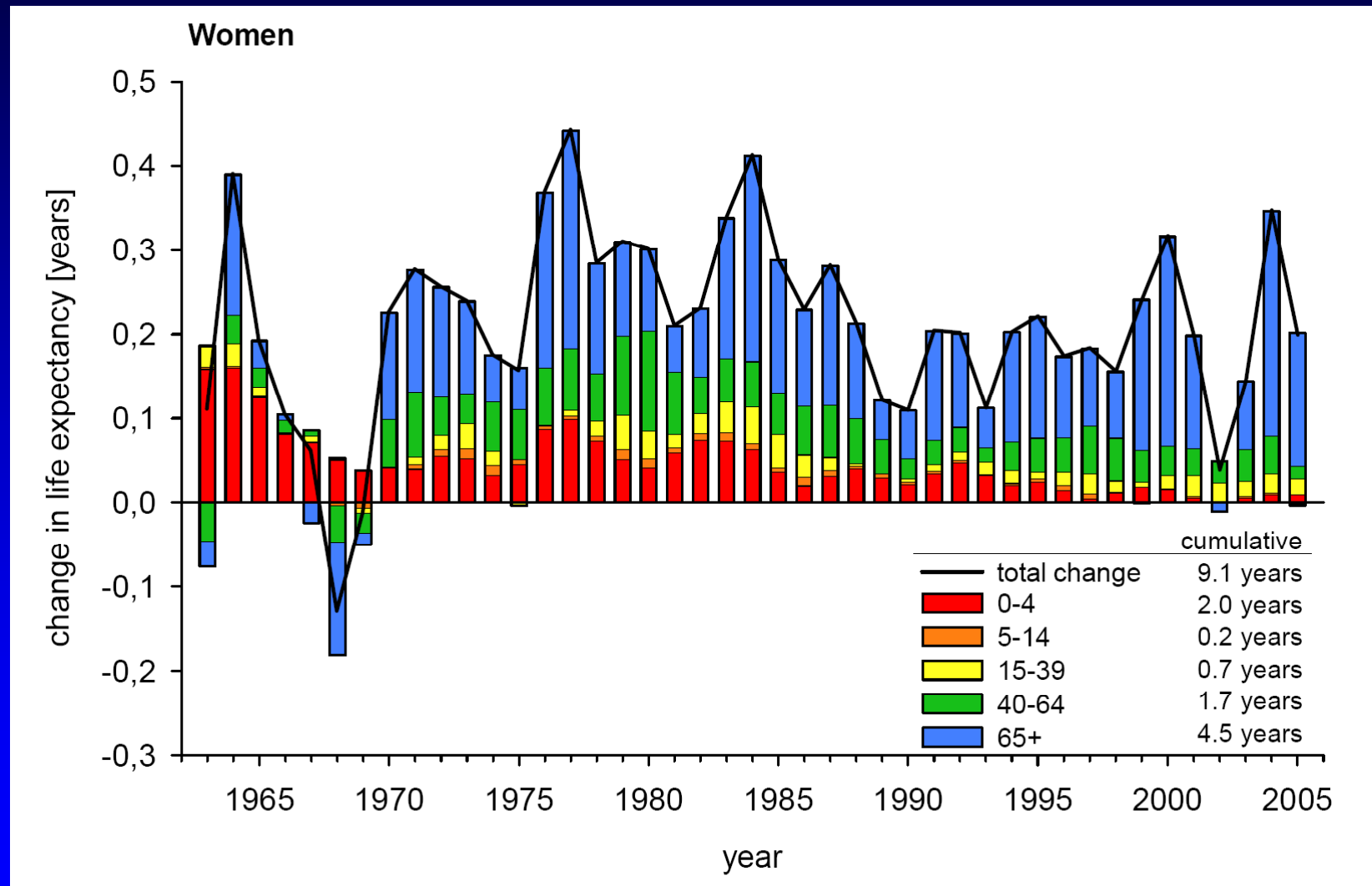
Analog zu: Klenk J, Rapp K, Büchele G, Keil U, Weiland SK. Increasing life expectancy in Germany: quantitative contributions from changes in age- and disease-specific mortality. Eur J Public Health 2007; 17:587–592.

Annual and cumulative contribution of different disease groups to the changes in life expectancy between 1962 and 2005 in Germany, men



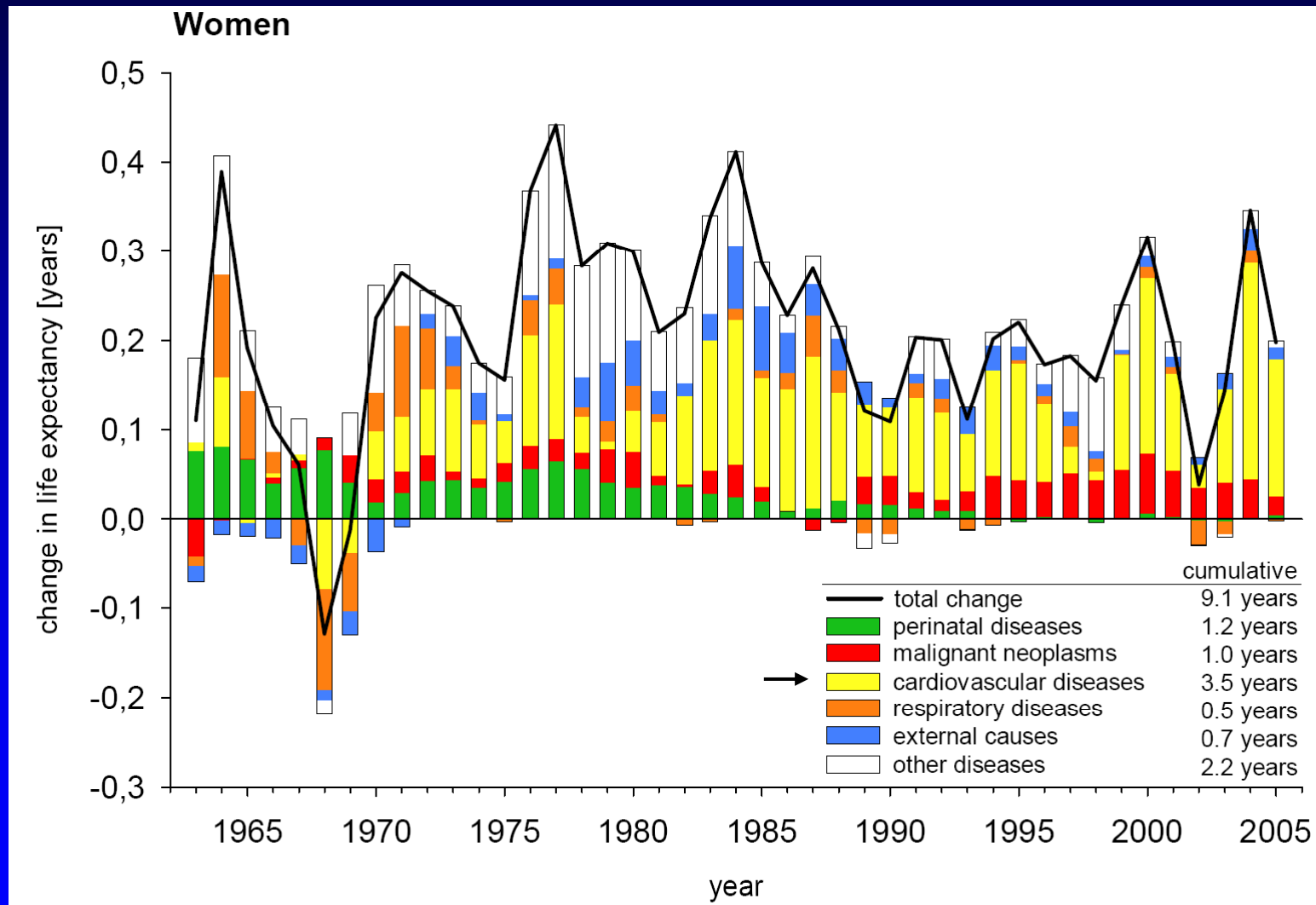
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Annual and cumulative contribution of different age groups to the changes in life expectancy between 1962 and 2005 in Germany, women



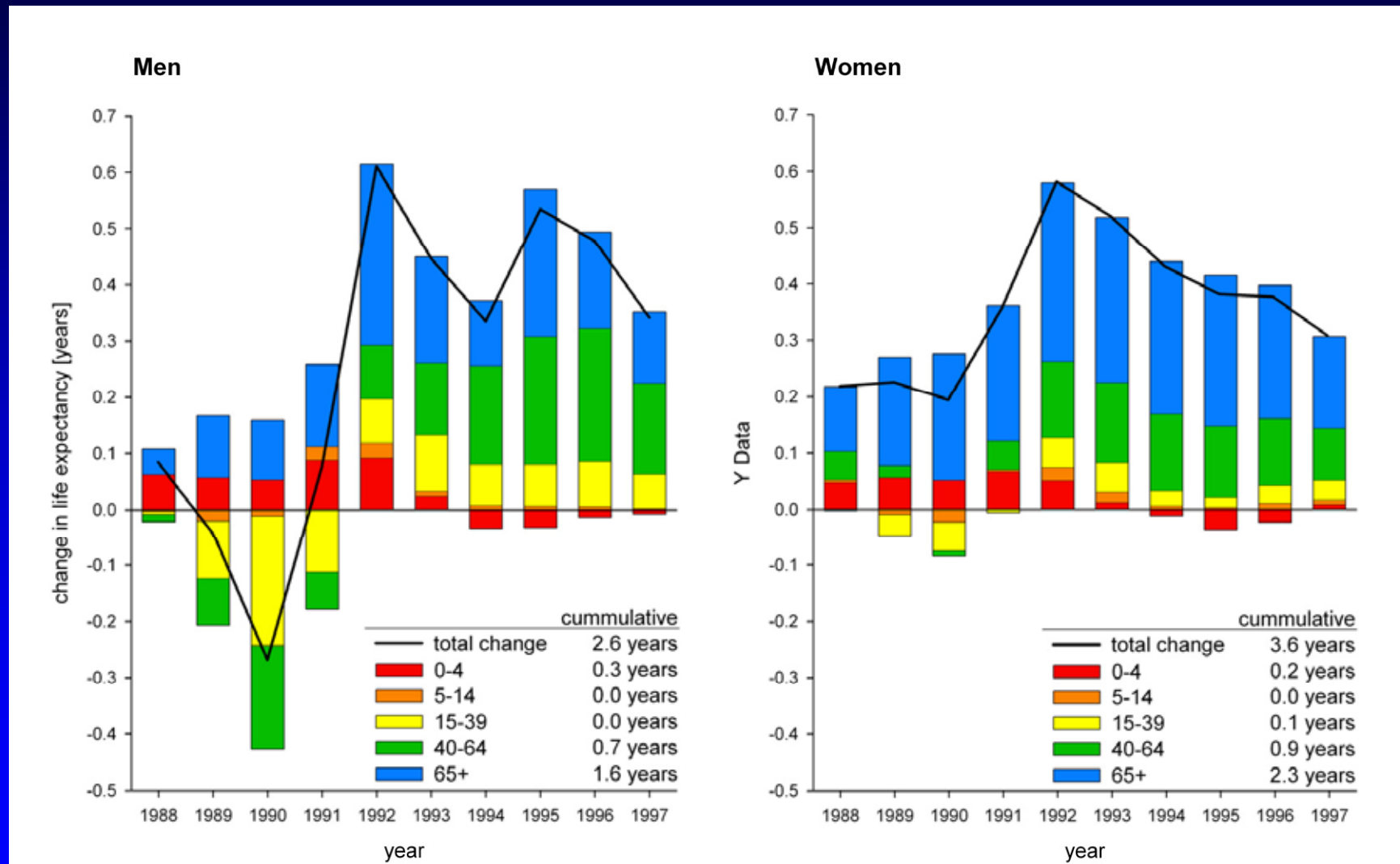
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Annual and cumulative contribution of different disease groups to the changes in life expectancy between 1962 and 2005 in Germany, women



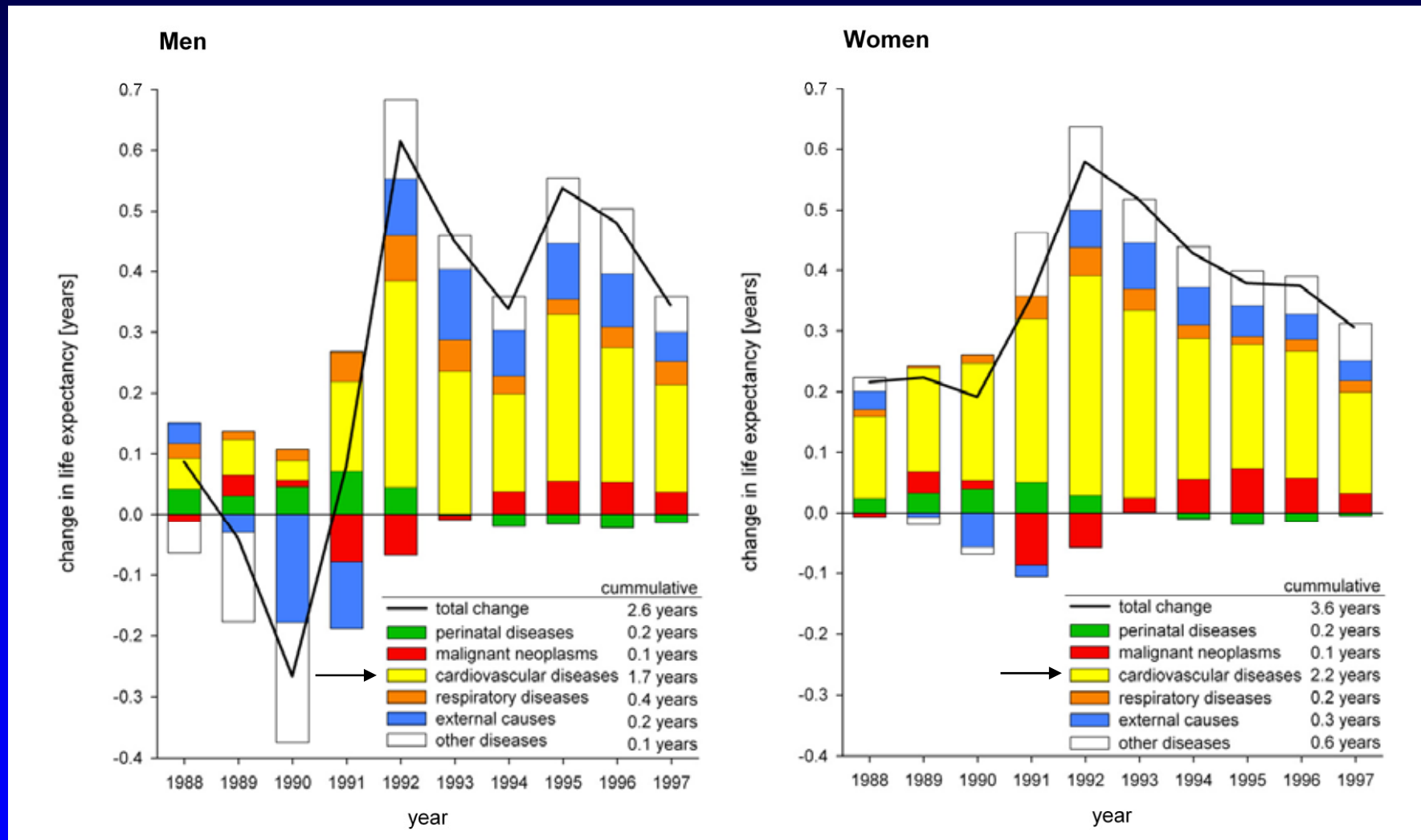
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Annual and cumulative contribution of different age groups to the changes in life expectancy by sex between 1987 and 1997 in East Germany



Klenk J, Rapp K, Büchele G, Keil U, Weiland SK. Increasing life expectancy in Germany: quantitative contributions from changes in age- and disease-specific mortality. Eur J Public Health 2007; 17:587–592.

Annual and cumulative contribution of different disease groups to the changes in life expectancy by sex between 1987 and 1997 in East Germany



Klenk J, Rapp K, Büchele G, Keil U, Weiland SK. Increasing life expectancy in Germany: quantitative contributions from changes in age- and disease-specific mortality. Eur J Public Health 2007; 17:587–592.



Increasing life expectancy

THE CONFERENCE ON THE DECLINE IN CORONARY HEART DISEASE MORTALITY

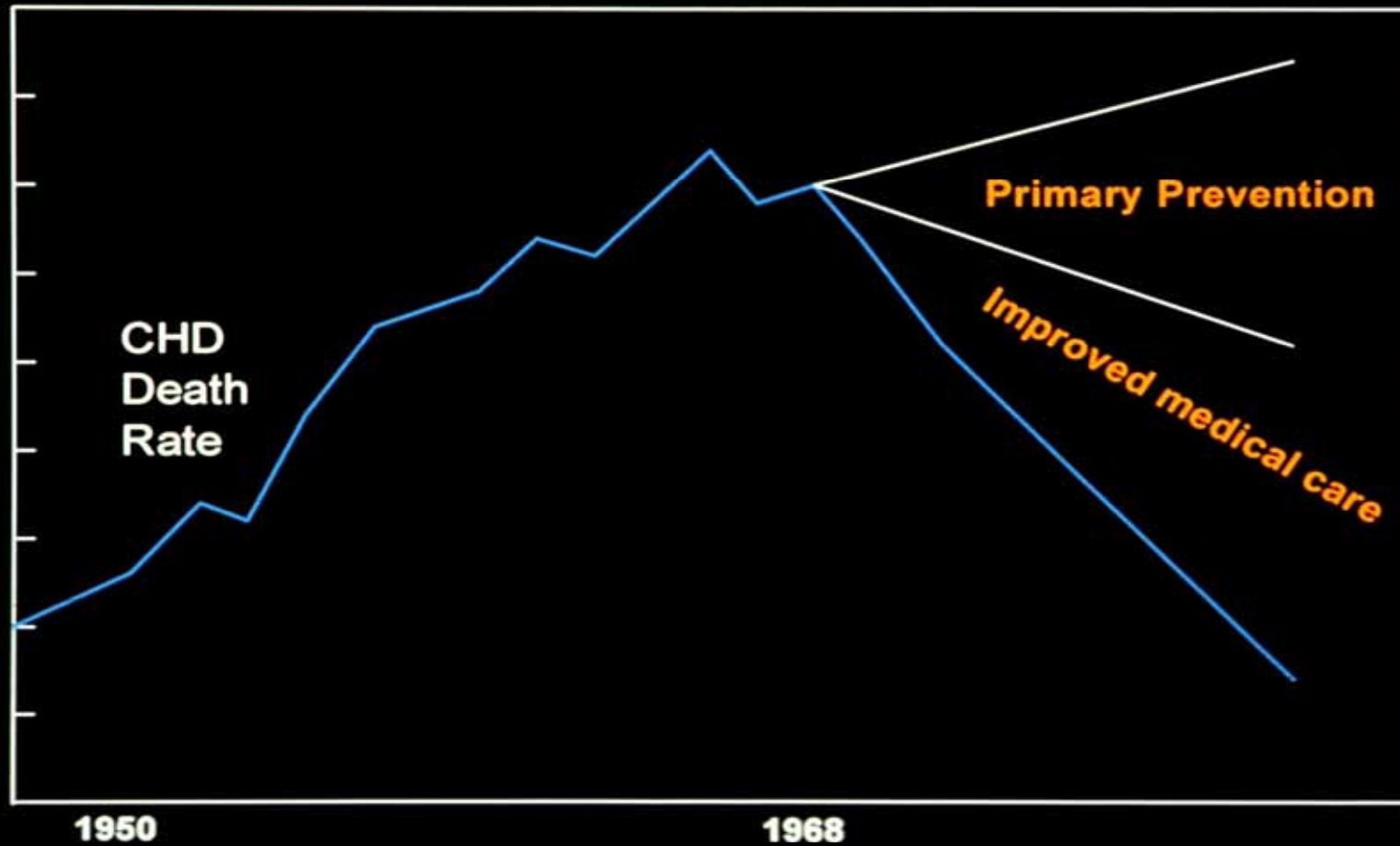
NATIONAL HEART, LUNG, AND BLOOD INSTITUTE

NATIONAL INSTITUTES OF HEALTH

BETHESDA (U.S.A.)

October 24 – 25, 1978

Can we identify factors causing the coronary mortality decline?

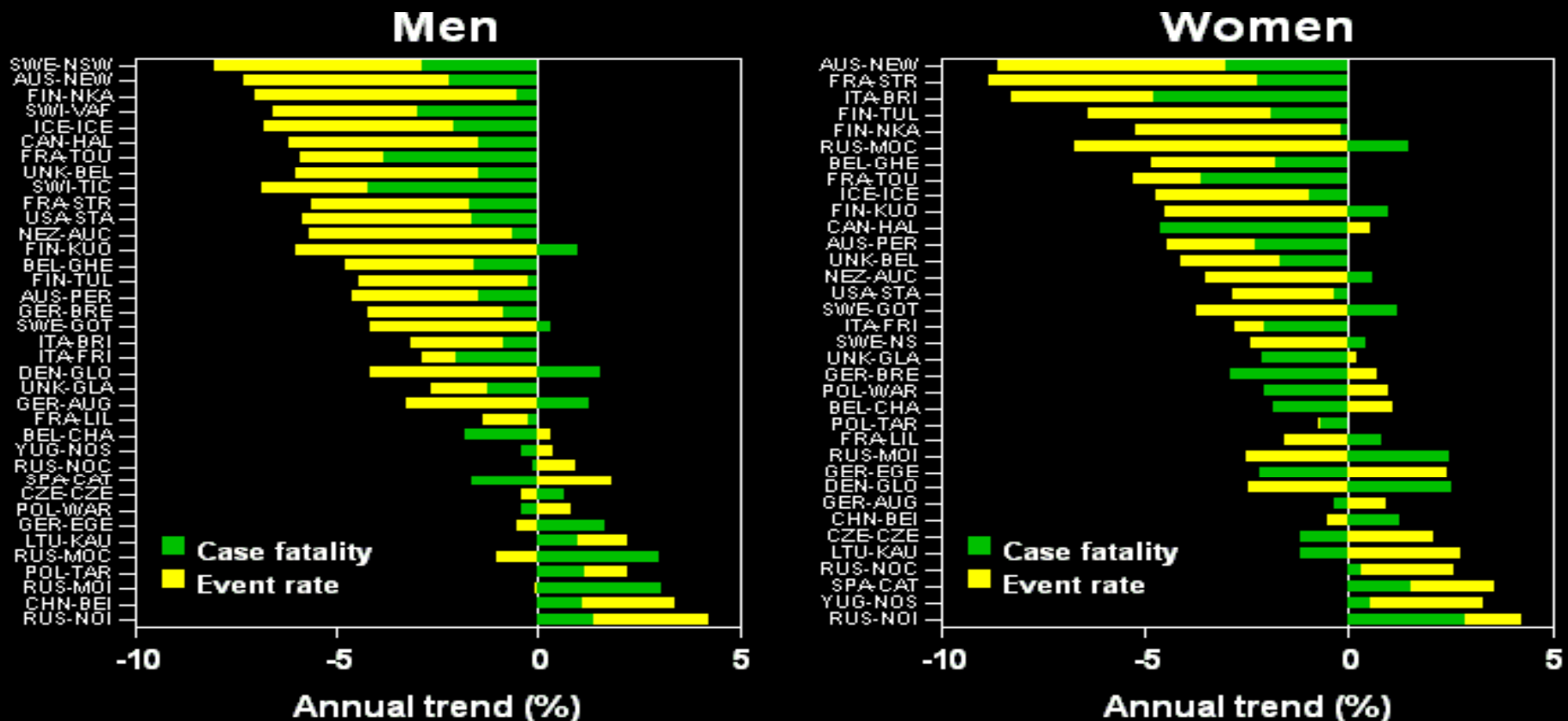


WHO-MONICA-Project

World Map of Collaborating Centres (MCC's)

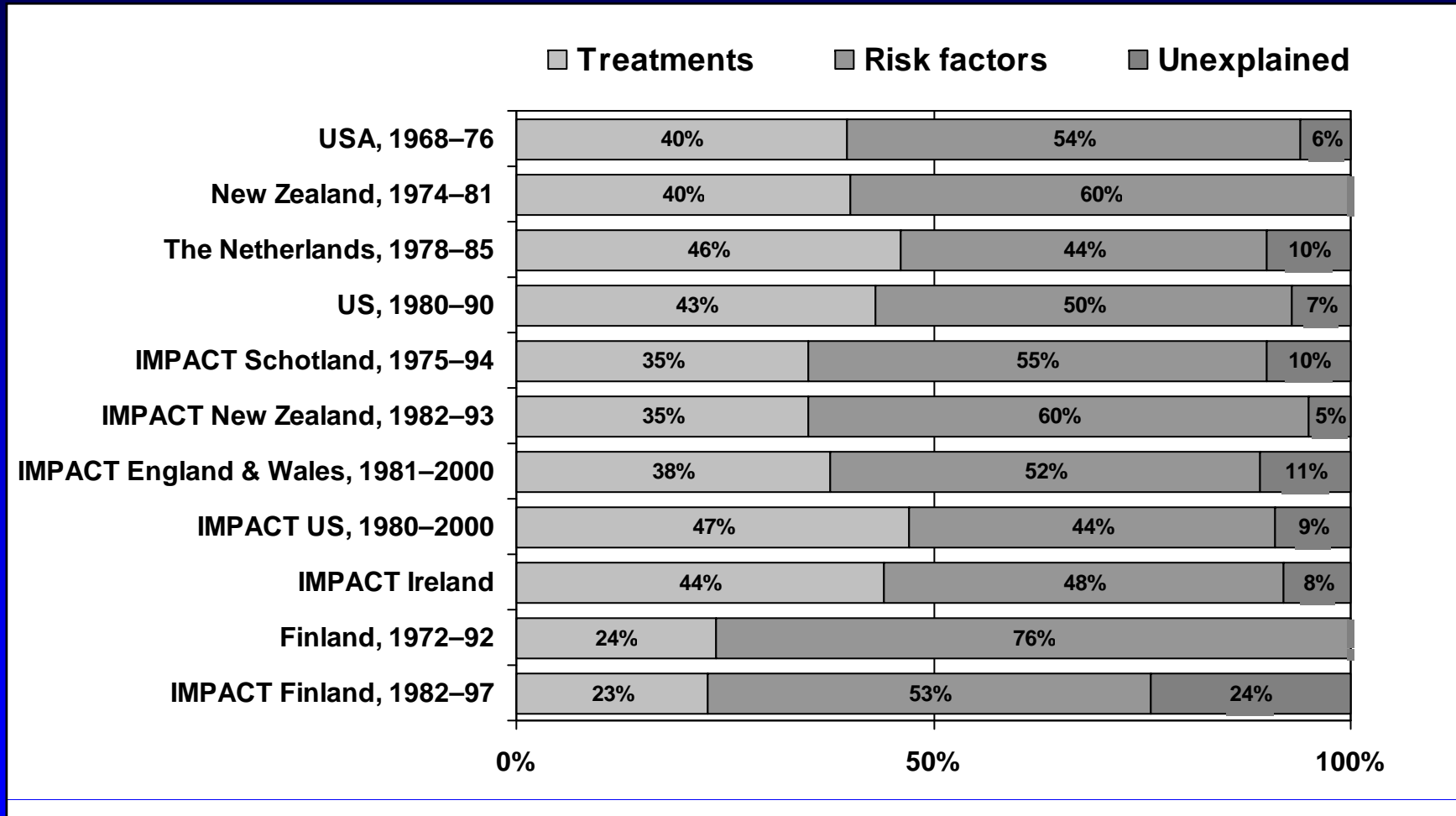


Trend in MONICA CHD mortality rate showing contribution of trends in coronary event rate and in case fatality



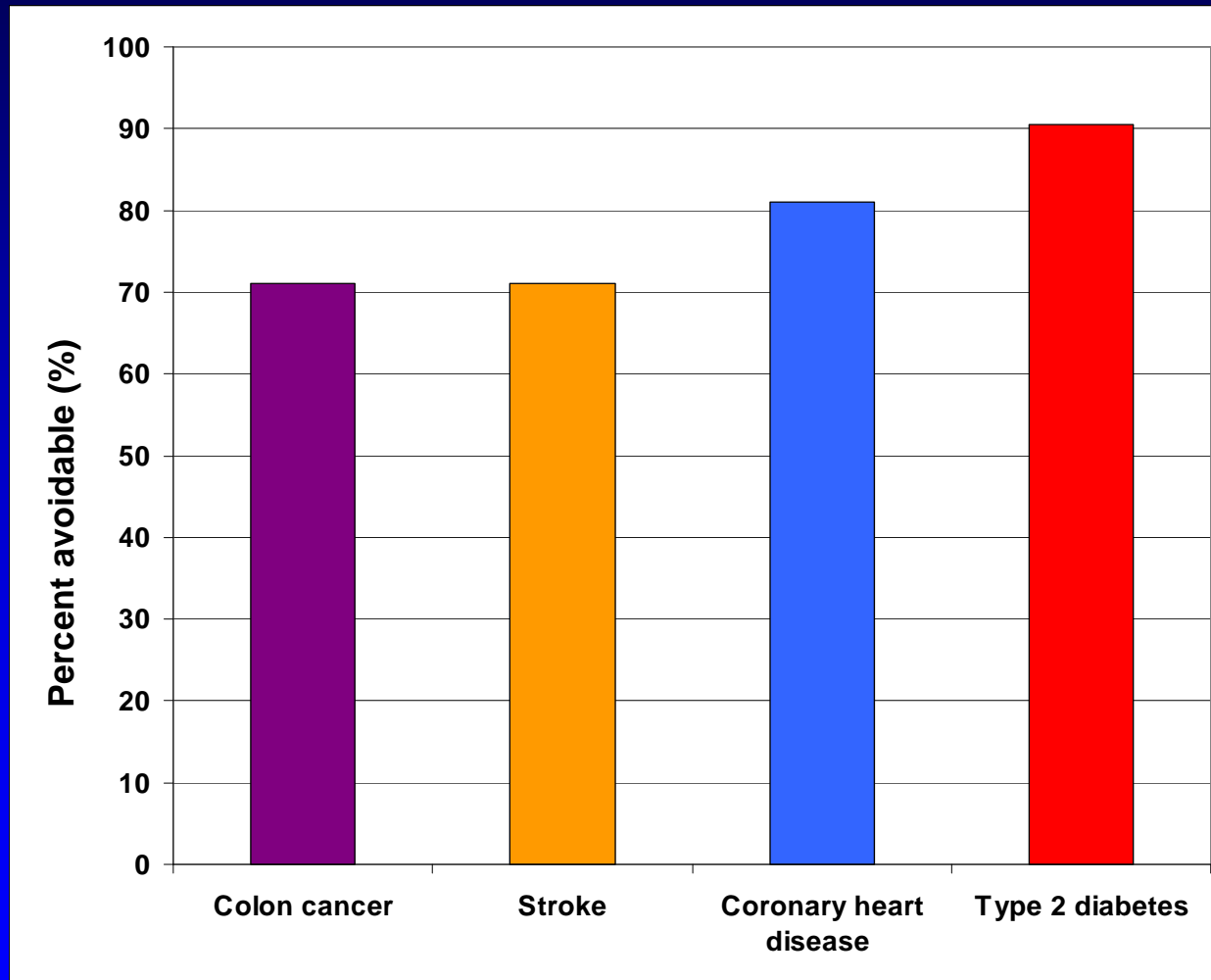


Decrease in deaths from CHD attributed to treatments and risk factor changes: Comparisons with other studies



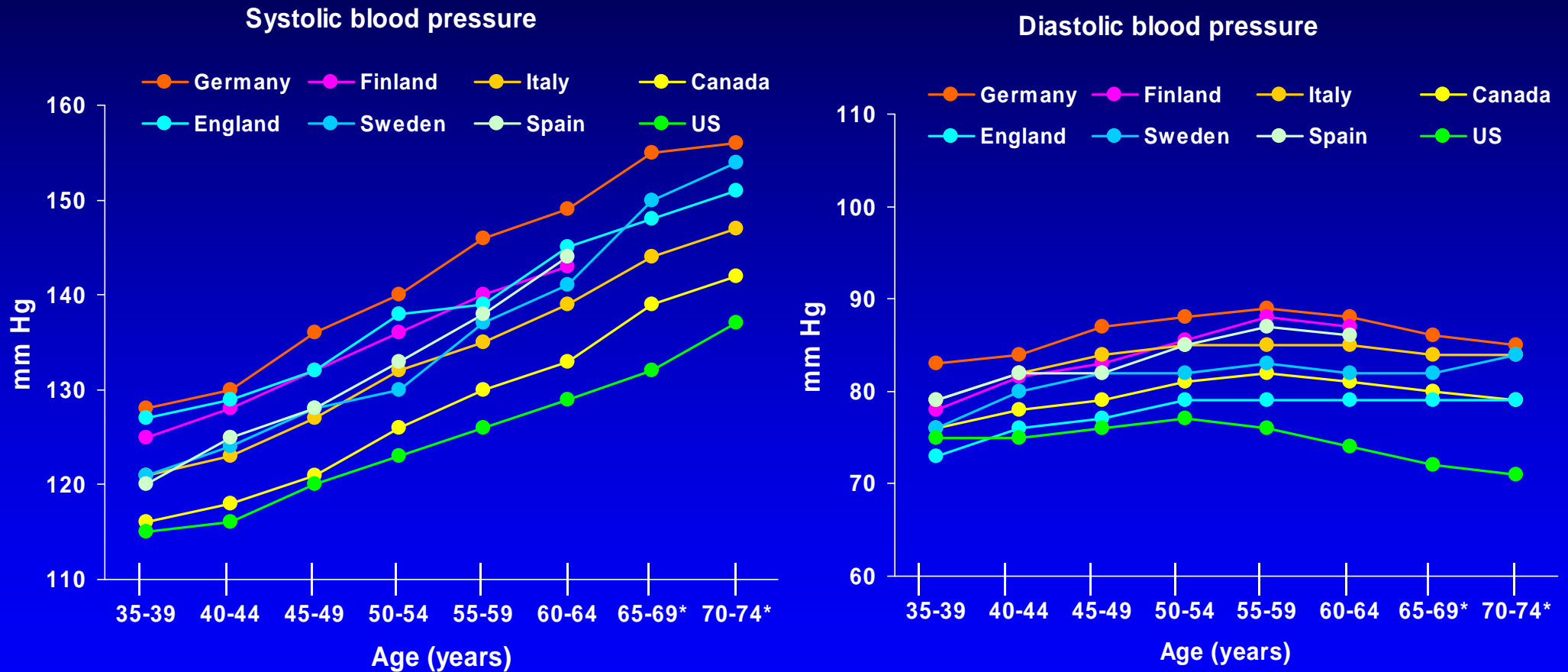
Source: Adapted from Ford ES et al. Explaining the Decrease in U.S. Deaths from Coronary Disease, 1980–2000. NEJM 2007; 356:2388–2398.

Percentage of colon cancer, stroke, coronary heart disease, and type 2 diabetes that is potentially preventable by life-style modifications



Willett WC. Balancing life-style and genomics research for disease prevention. *Science* 2002; 296:695–698.

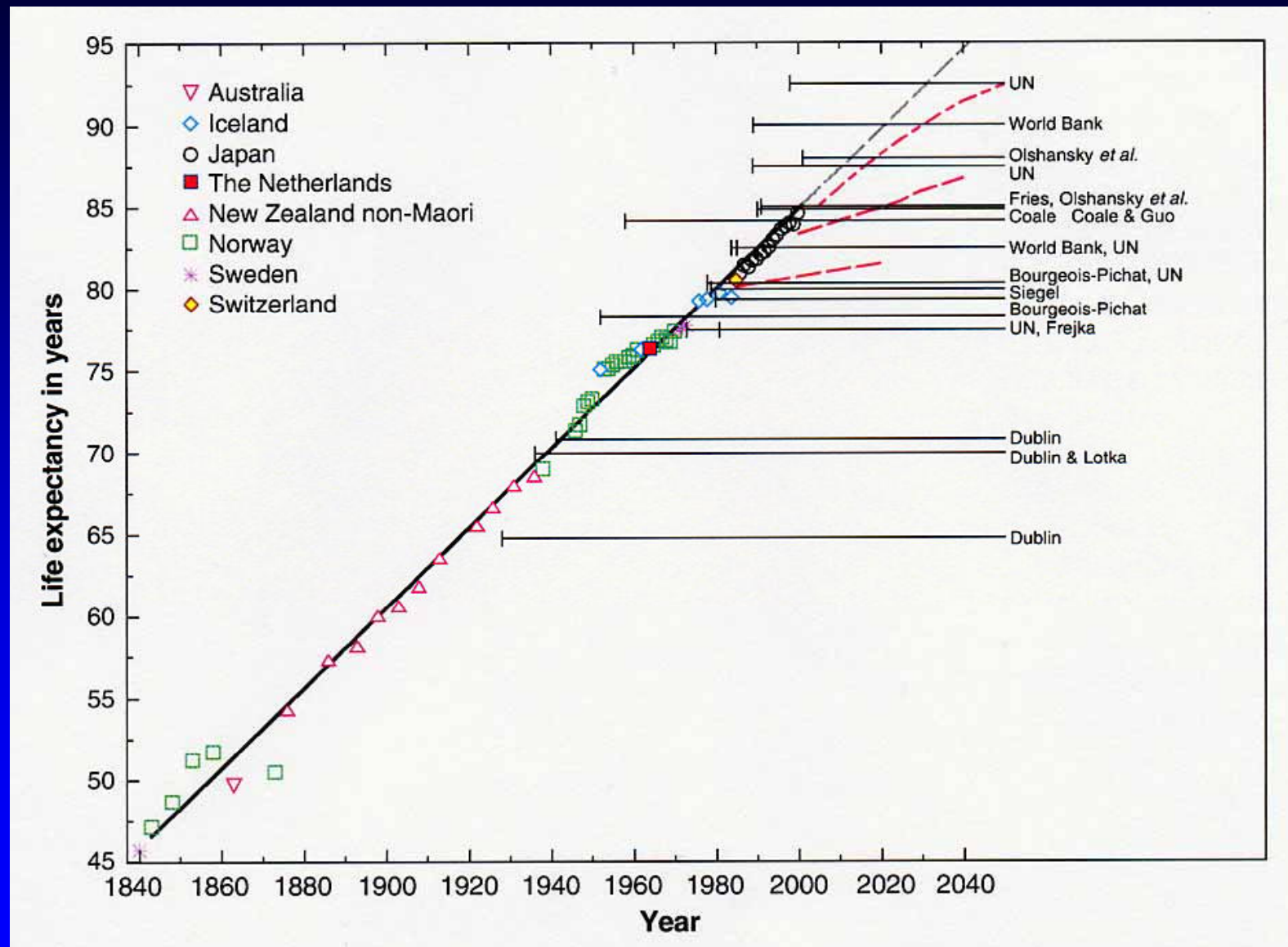
Mean systolic and diastolic BPs in 6 European and 2 North American countries, men and women combined, by age



* Asterisk indicates that data for Finland and Spain were not available in the 2 highest age groups.

Source: Wolf-Maier K et al. Hypertension prevalence and blood pressure levels in 6 European countries, Canada, and the United States. JAMA 2003; 289:2365

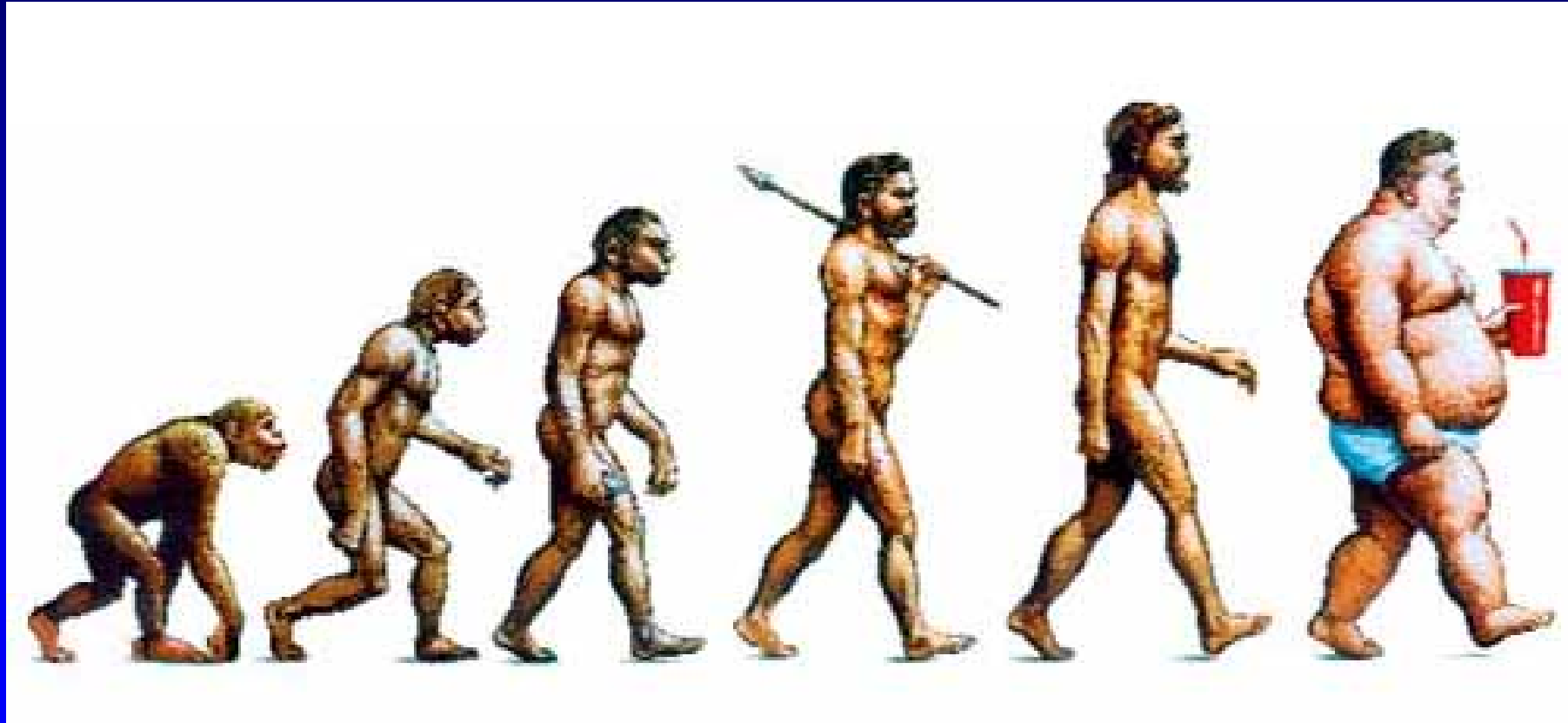
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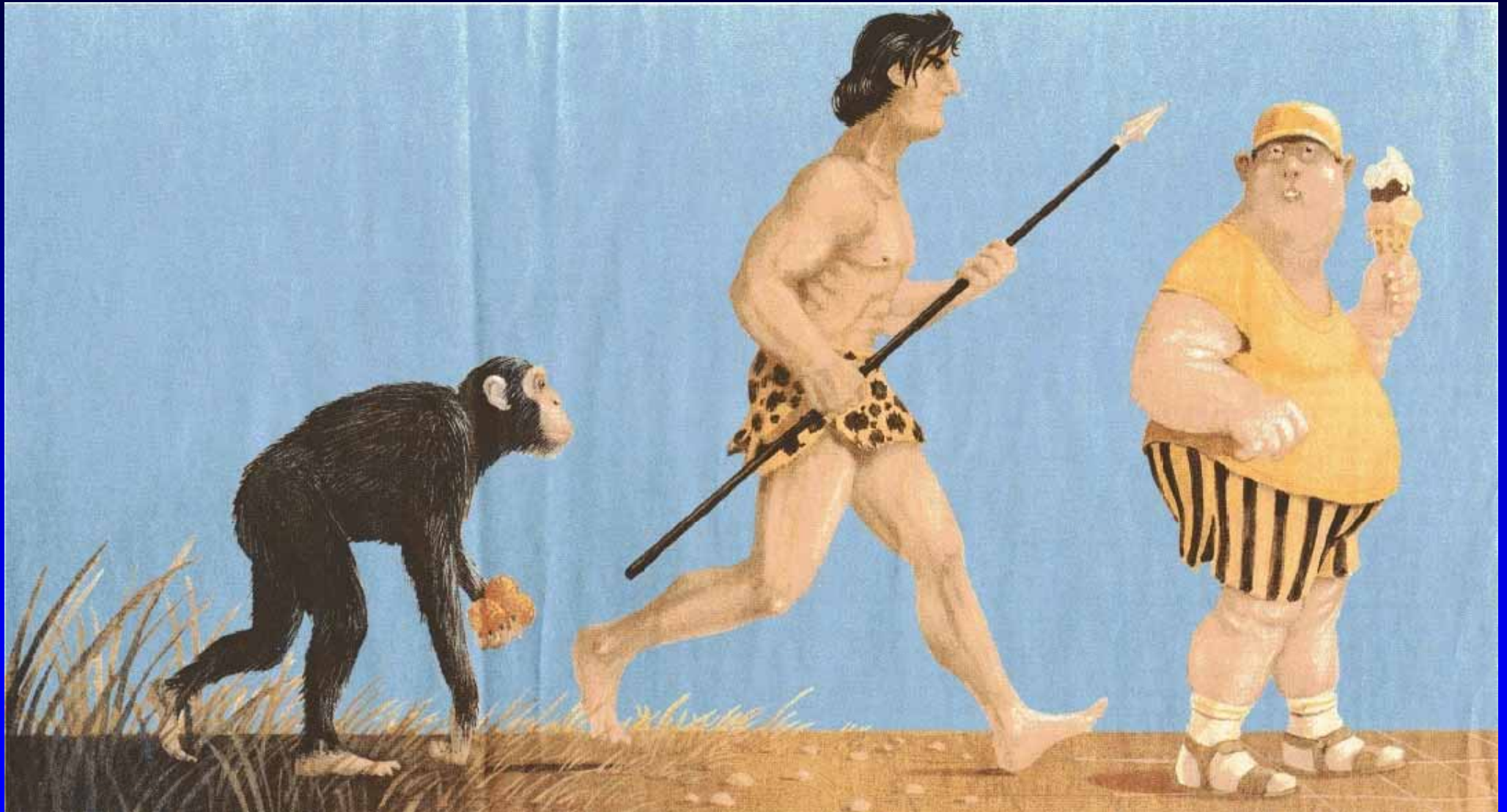


The world is too fat. Too bad





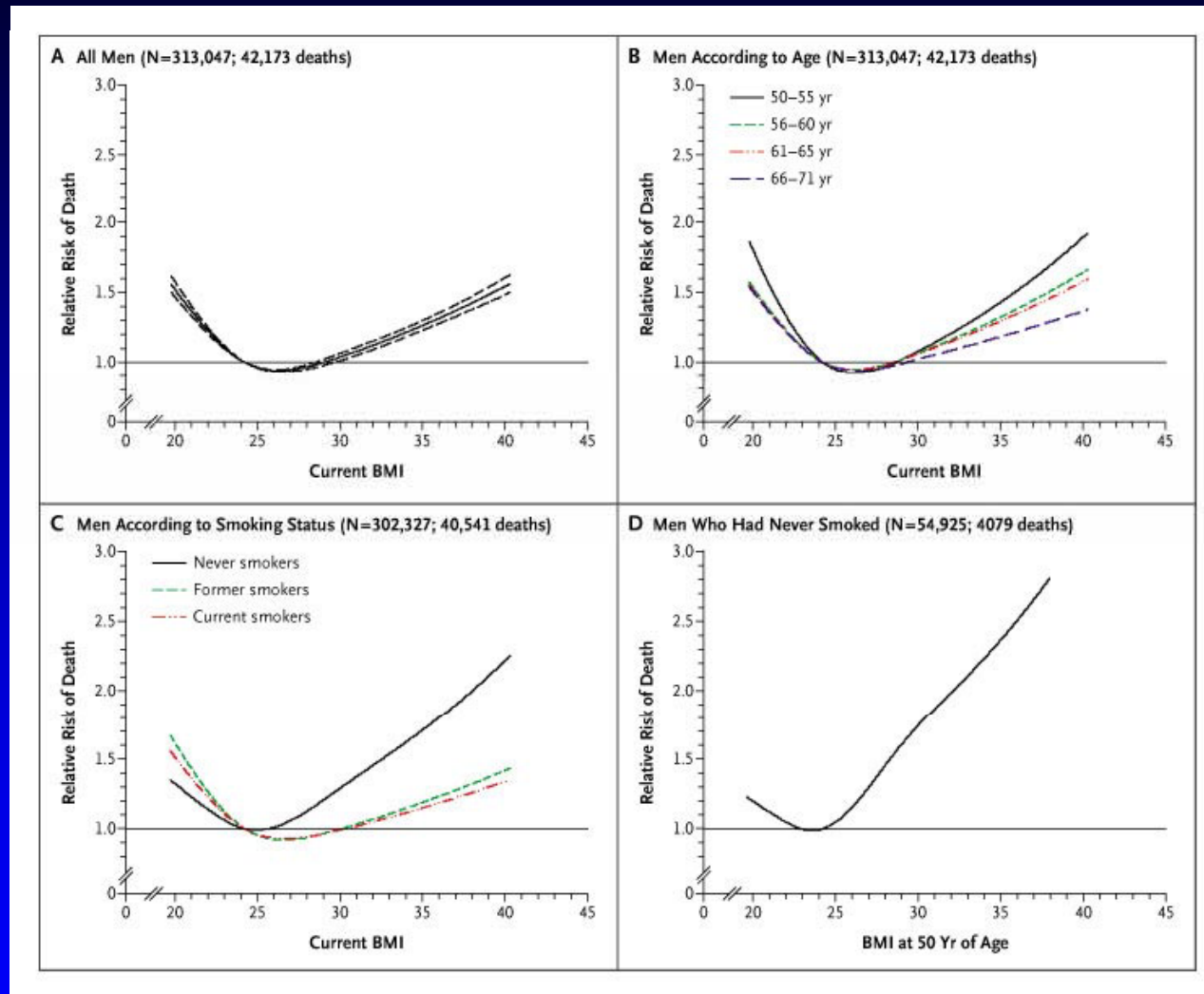
Increasing life expectancy



Source: Die Zeit. Nr. 15, 1. April 2004, S. 44

Stockholm 2009

Multivariate relative risks of death in relation to BMI among men



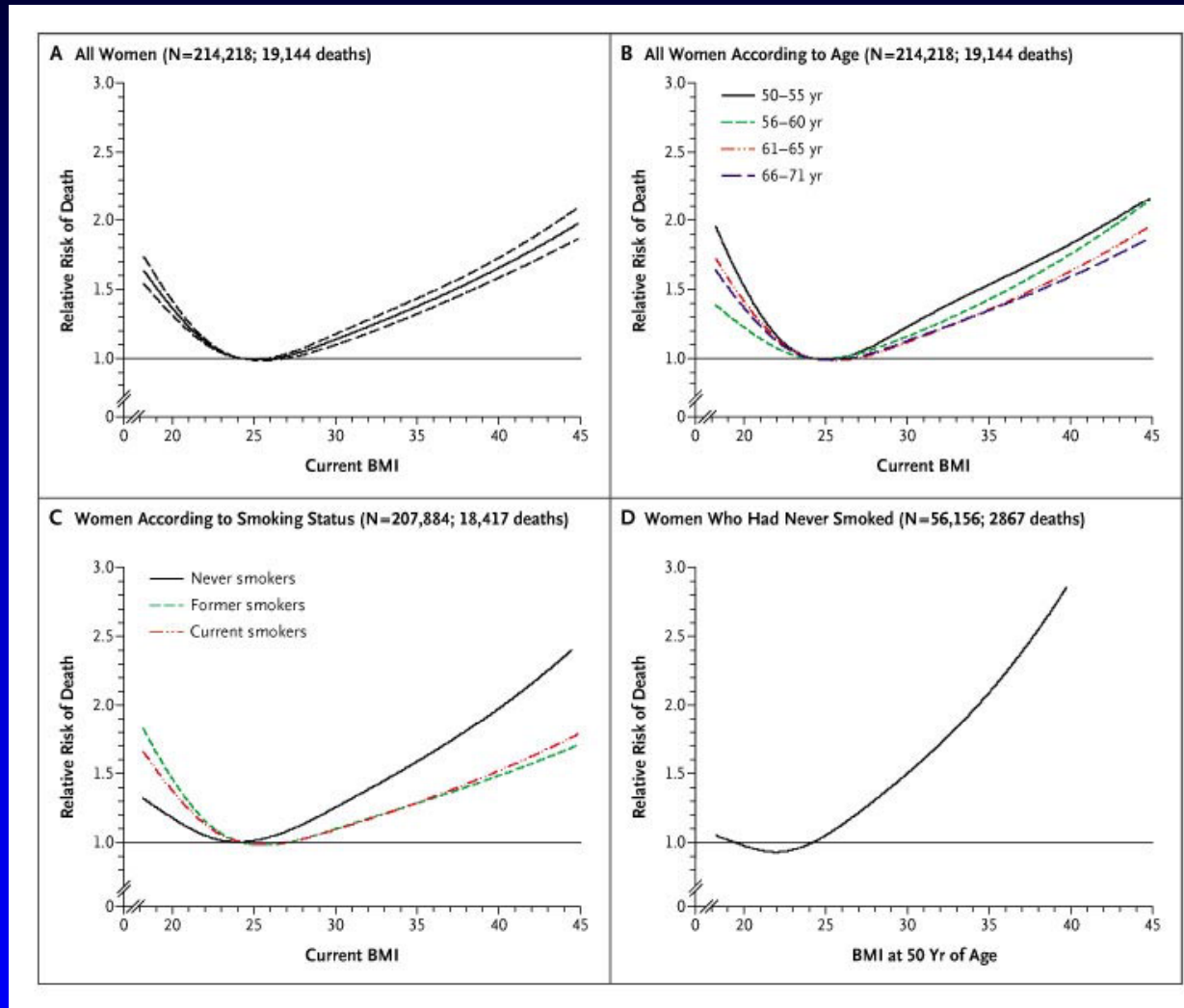
Reference group (BMI, 23.5 to 24.9) – adjusted for age, race or ethnic group, level of education, alcohol consumption, and physical activity.

Model A: adjusted for smoking status and the number of cigarettes smoked per day

Model C: adjusted for the number of cigarettes smoked per day (former or current smokers)

Source: Adams KF et al. N Eng J Med. 2006;355: 763–78.

Multivariate relative risks of death in relation to BMI among women



Reference group (BMI, 23.5 to 24.9) – adjusted for age, race or ethnic group, level of education, alcohol consumption, and physical activity.

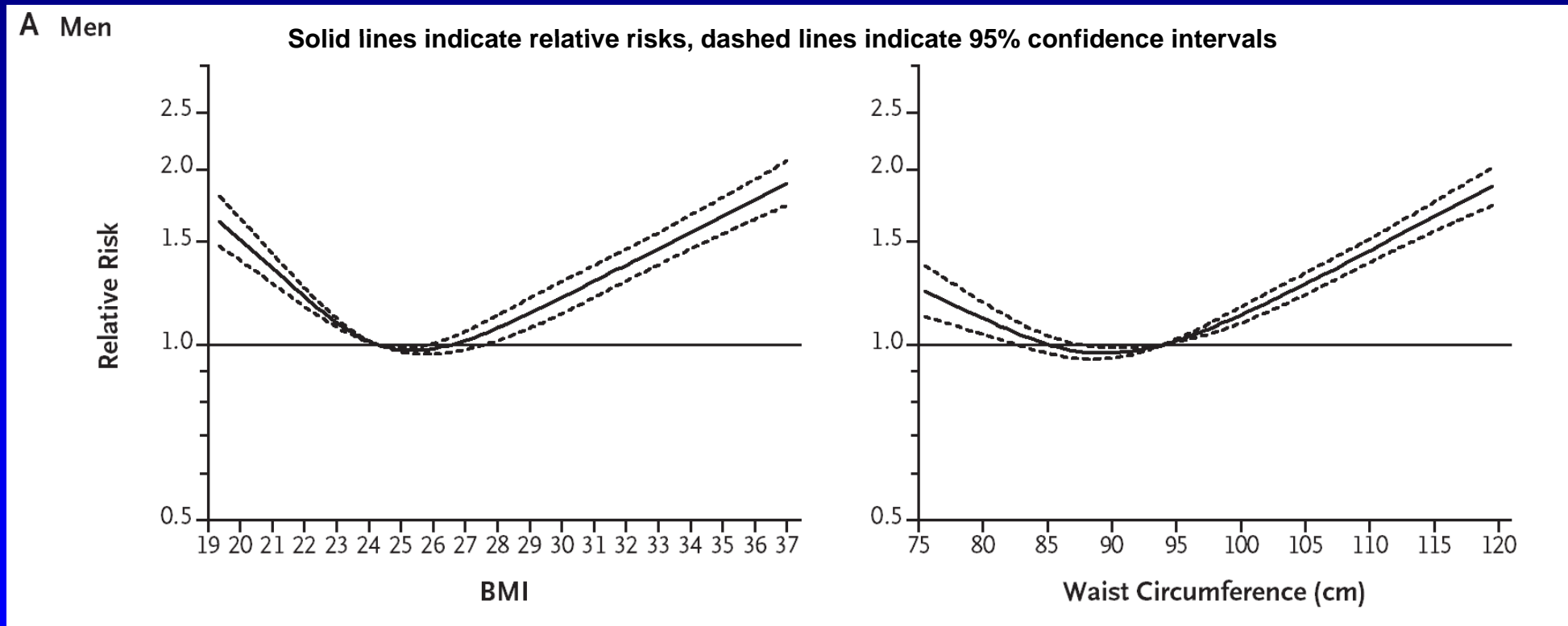
Model A: adjusted for smoking status and the number of cigarettes smoked per day

Model C: adjusted for the number of cigarettes smoked per day (former or current smokers)

Source: Adams KF et al. N Eng J Med. 2006;355: 763–78.



Adjusted relative risk of death among men in the European Prospective Investigation into Cancer and Nutrition (EPIC), according to BMI and waist circumference





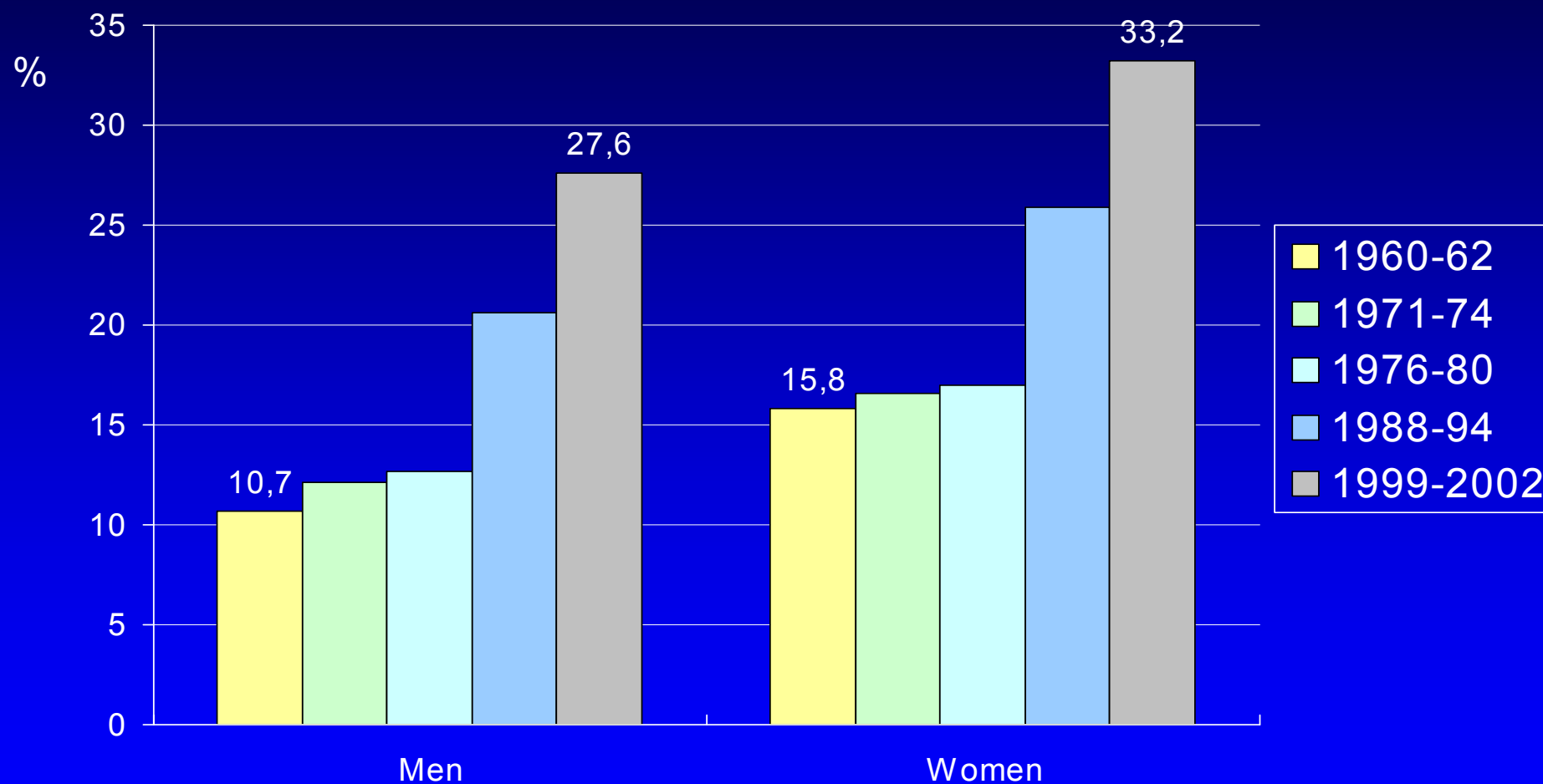
Relative risk of health problems associated with obesity (BMI \geq 30 kg/m²)

Greatly increased risk (Relative Risk > 3)	Moderately increased risk (Relative Risk 2–3)	Slightly increased risk (Relative Risk 1–2)
Diabetes	Coronary heart disease	Cancer (breast cancer, colon cancer, endometrial cancer)
Hypertension	Heart failure	Impaired fertility
Dyslipidaemia	Hyperuricaemia	Polycystic ovary syndrome
Breathlessness	Gout	Low back pain
Sleep apnoea	Osteoarthritis	Increased risk of anaesthesia complications
Gall bladder disease	Pre-eclampsia	

Source: adapted from WHO Technical Report Series 894, part 2, page 43.
Haslam D et al. BMJ 2006; 333: 640–642.

Prevalence (%) of obesity (BMI ≥ 30 kg/m²) among US adults aged 20 to 74 years, 1960–2002

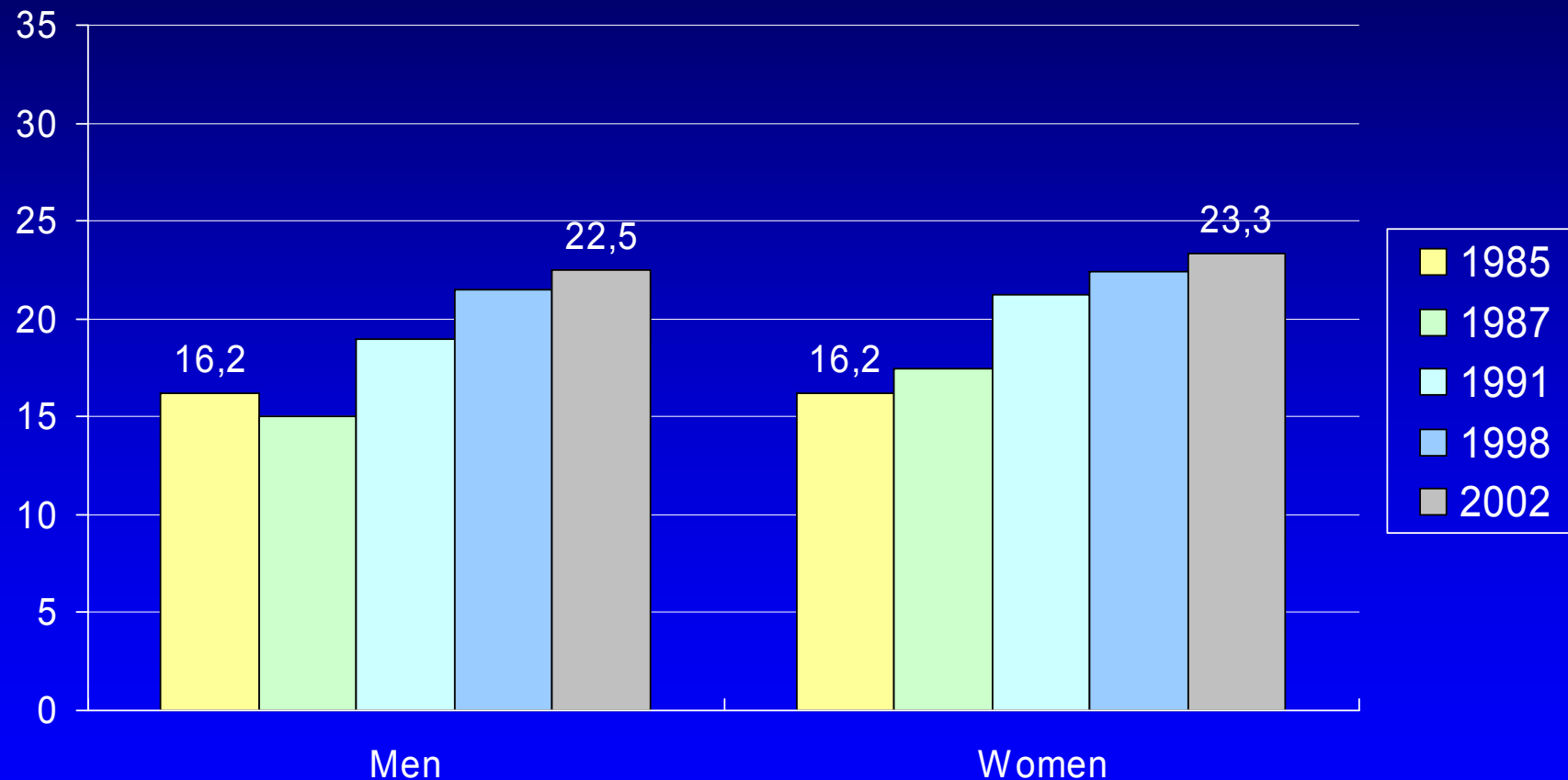
The National Health and Nutrition Examination Survey (NHANES)



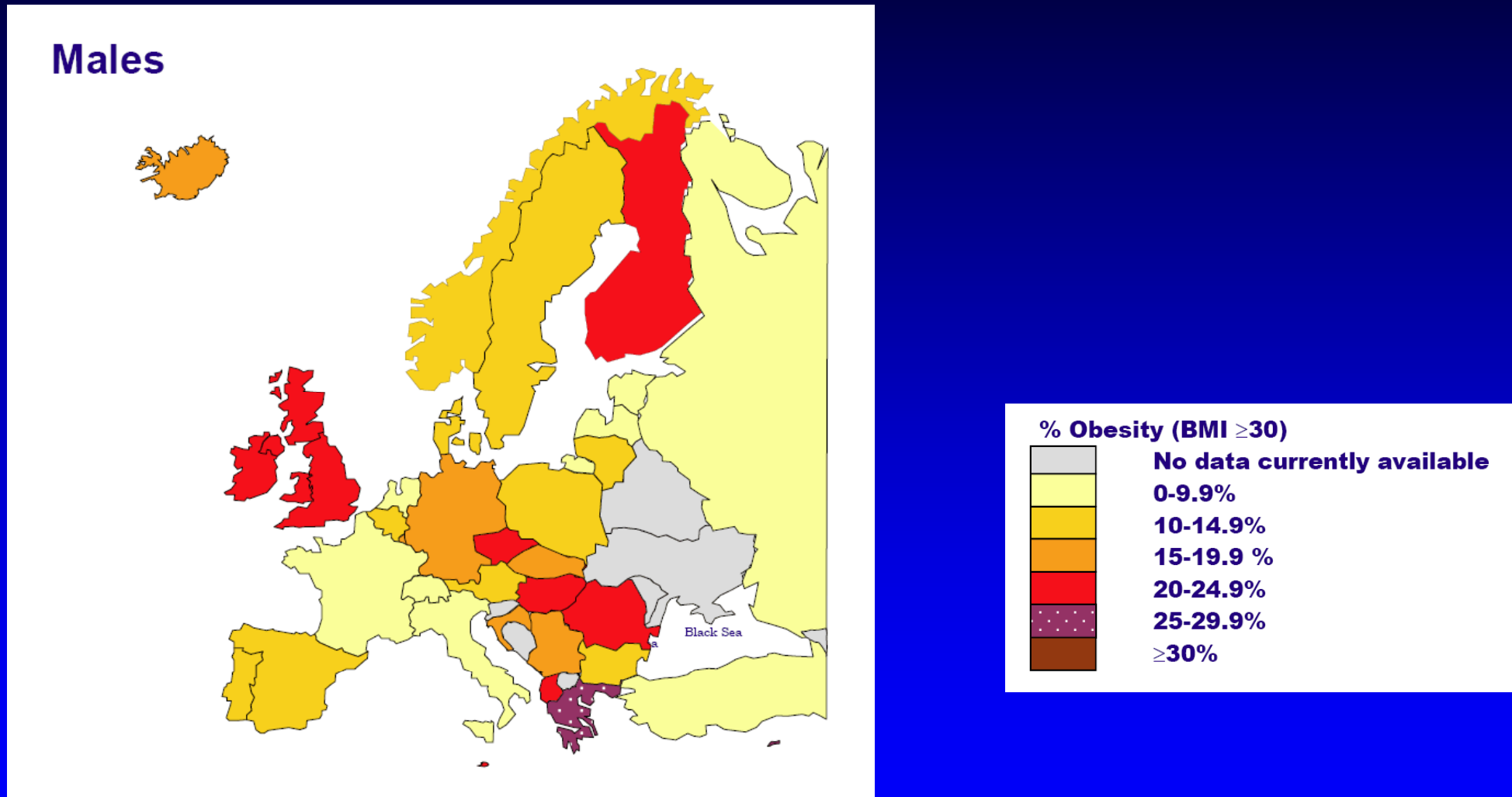
Source: Flegal KM et al. JAMA 2002; 288; 1723–27. Hedley AA et al. JAMA 2004; 291: 2847–50.

Prevalence (%) of obesity (BMI ≥ 30 kg/m²) among German adults aged 25 to 69 years, 1985–2002

Bundes-Gesundheitssurvey (National Health Survey)

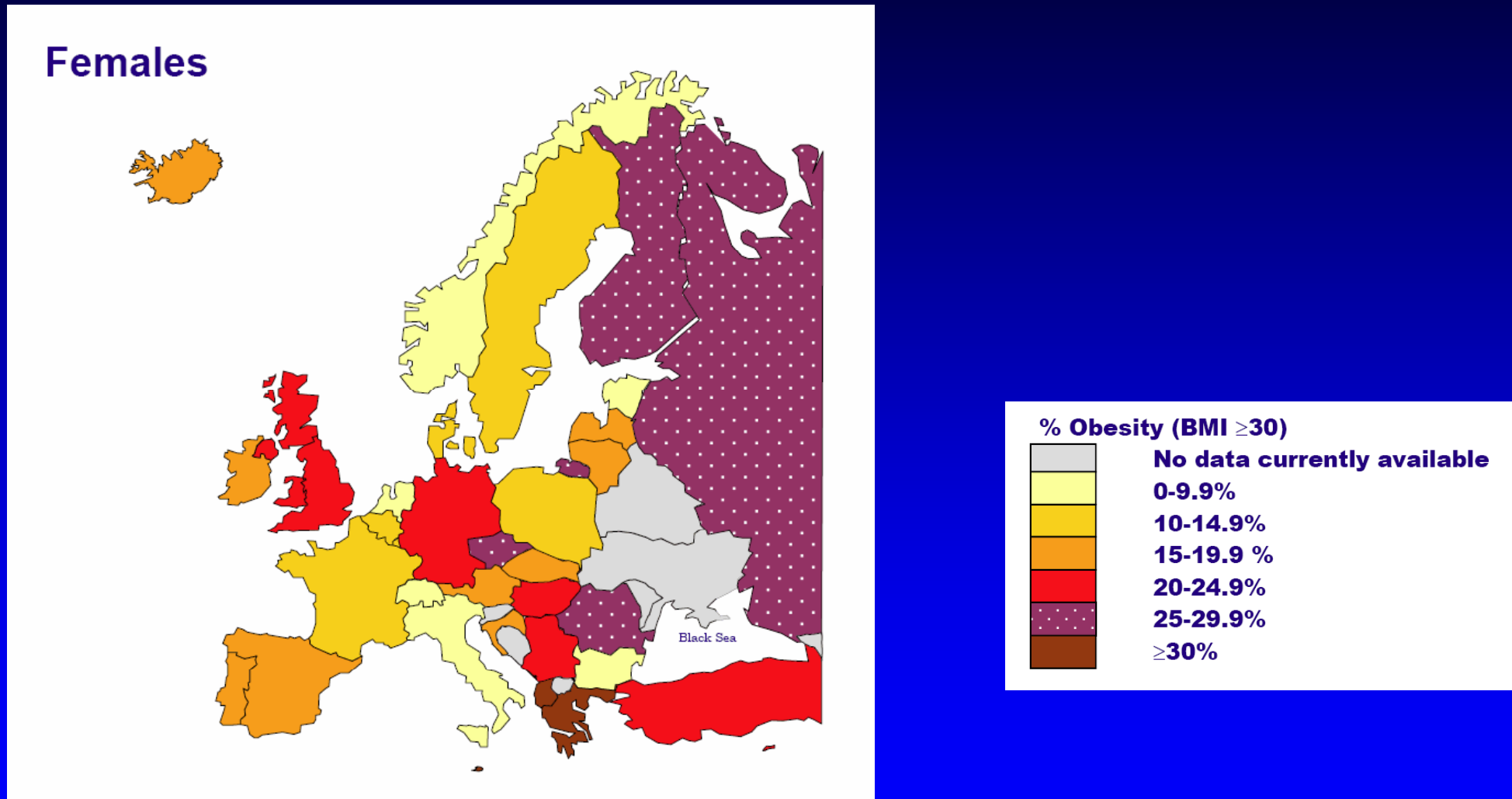


Prevalence (%) of adult obesity (BMI ≥ 30 kg/m²) in Europe (1)



Source: James PT, Rigby N, et al. The obesity epidemic, metabolic syndrome and future prevention strategies. EJCPR 2004; 11:5

Prevalence (%) of adult obesity (BMI ≥ 30 kg/m²) in Europe (2)



Source: James PT, Rigby N, et al. The obesity epidemic, metabolic syndrome and future prevention strategies. EJCPR 2004; 11:5

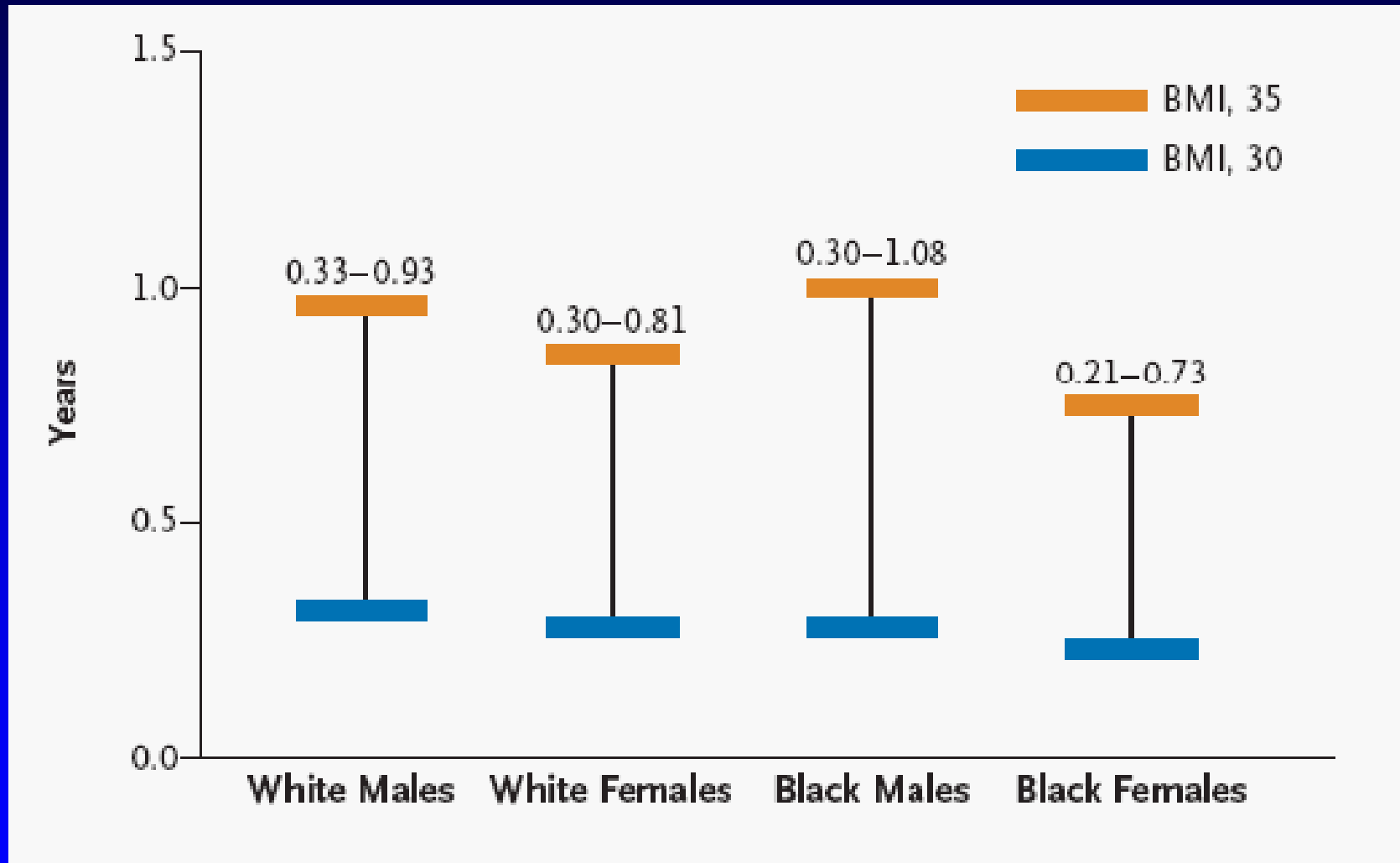
Prevalence (%) of obesity (BMI ≥ 30 kg/m²) and severe obesity (BMI ≥ 35 kg/m²) in Germany 2002, by sex and social risk score

Age group 25–69 years

Social risk score	Men (%)		Women (%)	
	BMI		BMI	
	≥ 30 kg/m ²	≥ 35 kg/m ²	≥ 30 kg/m ²	≥ 35 kg/m ²
Very low	12.8	2.2	10.8	3.0
Low	16.6	2.3	14.9	4.4
Moderate	22.6	3.0	24.3	6.8
High	20.3	2.9	28.3	9.0
Very high	21.4	5.2	29.1	10.2

Source: Adapted from Helmert U, Strube H. Gesundheitswesen 2004; 66:409–415.

Life-Shortening effect of obesity according to race and sex in the United States in 2000



Source: Olshanski et al. N Eng J Med 2005; 352:1138-1145.

Summary – Conclusions – Messages (1)

- Life expectancy at birth for men and women has been increasing in many western countries by more than 2 years per decade.
- Over the last 160 years life expectancy in those countries, who did best, increased by 2.5 years per decade for women (Science 2002).
- CVD mortality rates have been decreasing in western countries by 2–3% annually (since 1970); this is particularly true for higher age groups such as 75–84 years.
- From 1980–2002 life expectancy in Germany increased by 5.8 years in men and 4.6 years in women: nearly 50% of this increase in both men and women was due to declining CVD mortality rates; declining cancer mortality rates contributed by only 10% !

Summary – Conclusions – Messages (2)

- From 1990–1997 life expectancy in the eastern part of Germany increased by 3.2 years (!) for men and women. Declining CVD mortality rates contributed even more to this rapid increase than in the western part of Germany. There was no contribution from declining cancer mortality rates.
- Estimating the quantitative contributions from changes in age- and disease-specific mortality to life expectancy from 1962–2005 reveals that age groups 65+ and CVD contribute most to the increase in life expectancy (men 9.5 years; women 9.1 years).
- The 1962–2005 analyses also show that contributions to life expectancy from declining CVD mortality began rather late in Germany, around 1980.
- Life expectancy in Germany in men and women is very much dependent on socio-economic conditions such as income.

Summary – Conclusions – Messages (3)

- The WHO MONICA project showed that in western countries, where the CHD mortality decline was on average 2–3% annually, 2/3 of this decline could be explained by a decrease in CHD incidence and 1/3 by a decrease in CHD case fatality.
- Other studies support the view that about 2/3 of the decline in CHD mortality are attributable to population risk factor reductions = primary prevention, and 1/3 to improvements in treatment.
- In light of data from EUROASPIRE I, II and III and other surveys showing that risk factors are poorly controlled the question arises, how much more could be achieved in terms of declining CVD mortality, if guidelines would be adhered to by all parties of the health care system ?

Summary – Conclusions – Messages (4)

- In spite of the impressive increases in life expectancy in Germany in recent decades, every 5th man (18.4%) and every 10th woman (9.6%) are dying before reaching their 65th birthday (present pension age).
- Cardiovascular diseases are the most frequent causes of death in Germany and other western countries; however up to age 65–69 years, deaths from cancer are predominating in women and men.
- The rising epidemic of obesity (and diabetes mellitus type 2) in western countries challenges our optimism regarding ever increasing life expectancy in the western world.



Z uschauen (to watch)

E ntspannen (to relax)

N achdenken (to contemplate)



**Der Mensch ist, was er isst.
(Man is what he eats)**

Ludwig Feuerbach
1804 – 1872



Die größten Sünden werden in der Küche begangen
(The greatest sins are committed in the kitchen)

Friedrich Nietzsche

1844 – 1900



Increasing life expectancy



(c) allsport

bird flies

fish swims

man runs

Emil Zátopek

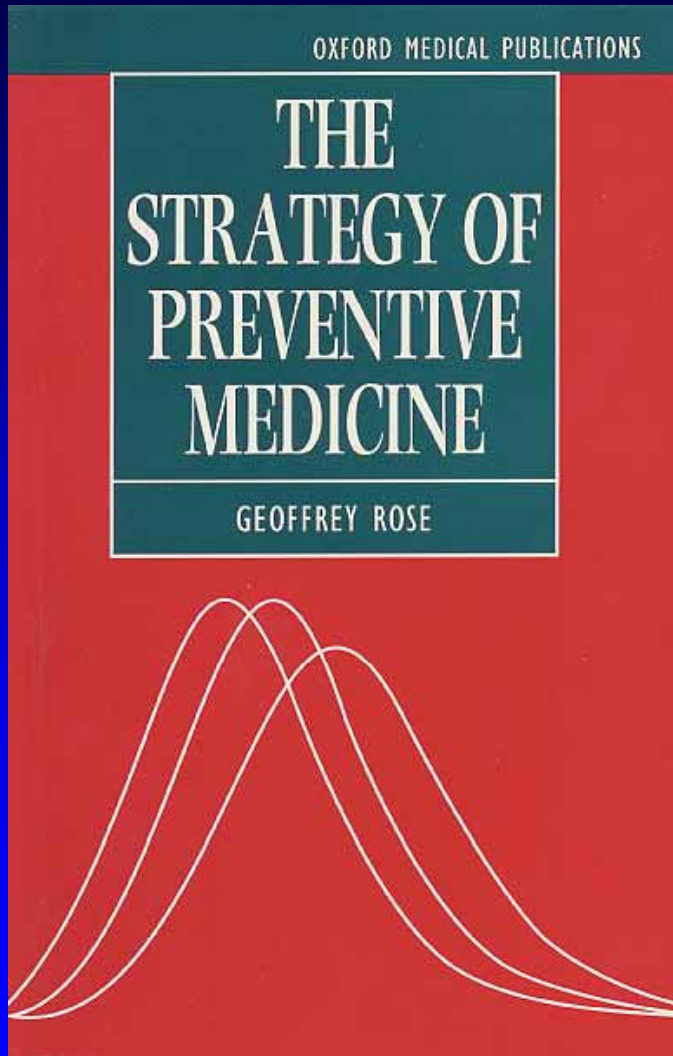
1922 – 2000



When the real causes have been removed,
individual susceptibility ceases to matter

Geoffrey Rose

The Strategy of Preventive Medicine, 1992



The primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social.

Medicine and politics cannot and should not be kept apart.

Geoffrey Rose

The Strategy of Preventive Medicine, 1992



Die Medizin ist eine soziale Wissenschaft
und die Politik ist nichts anderes
als eine Medizin im Großen.

Rudolf Virchow
1821 – 1902