Explanations for socio-economic differences in health

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University of Bristol

Mortality ratios (number of living people for each death) in Chorton-on-Medlock, Manchester, 1840

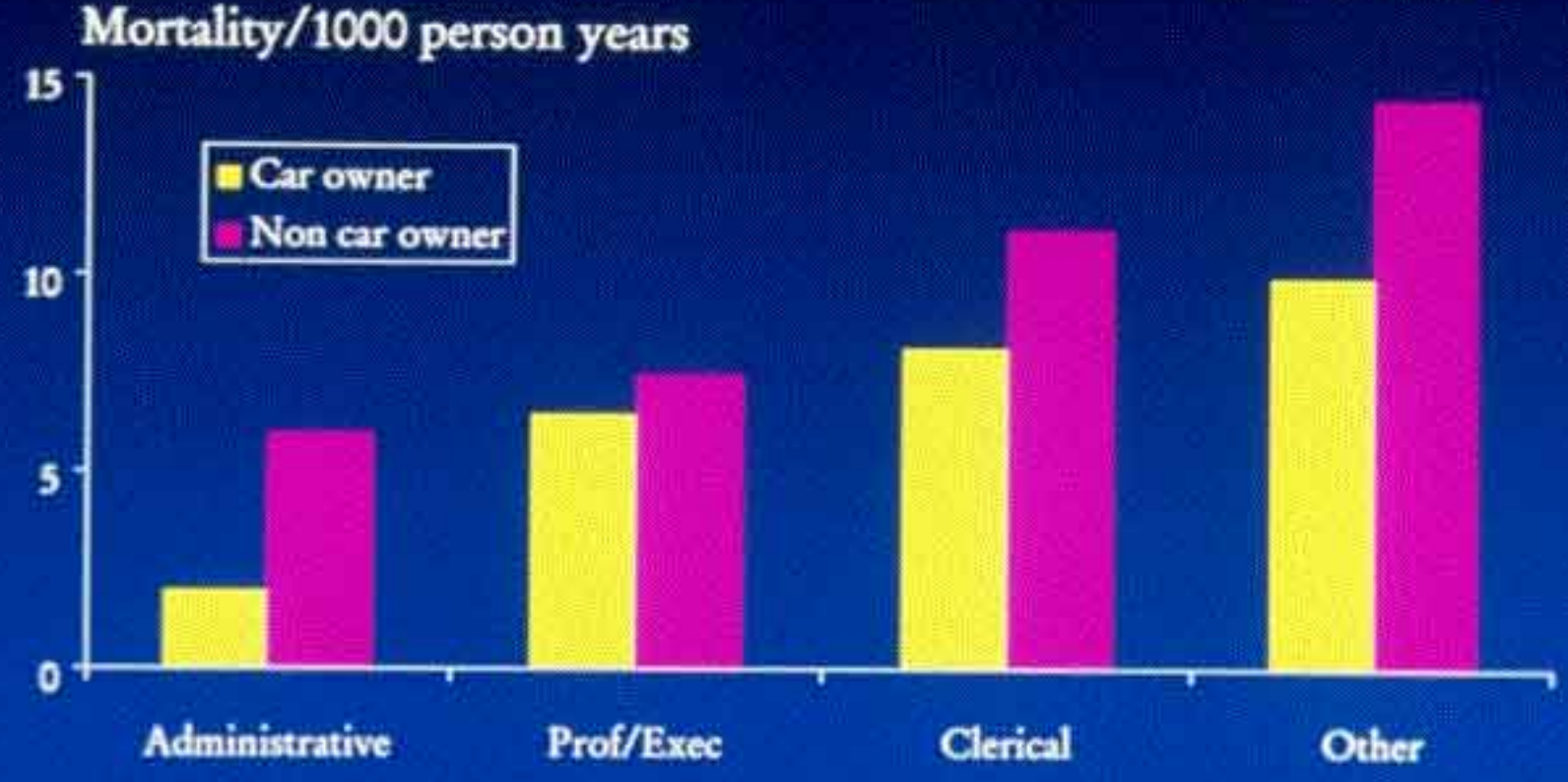
	Class of house		
Class of street	1st (Best)	2nd	3rd (Worst)
1st (Best)	51	45	36
2nd	55	38	35
3rd (Worst)	*	35	25

* No data

Source: Engels, 1845

All-cause mortality by employment grade and car ownership in the Whitehall Study of London civil servants

All-cause mortality by employment grade and car ownership in the Whitehall study of London civil servants, excluding subjects with prevalent disease at the time of study entry



Father's social class	First social class	Social class at screening	Follow up
1914-46	1922-54	1970-73	1994

Age adjusted relative rates of CVD mortality by father's social class and screening social class

	Screening social class	
Father's social class	Non manual	Manual
Non manual	1	1.45 (1.04-2.01)
Manual	1.56 (1.29-1.88)	1.86 (1.56-2.22)

Explanations for health inequalities

1. Artefact
2. Social selection
3. Behaviour and life style
4. Social condition

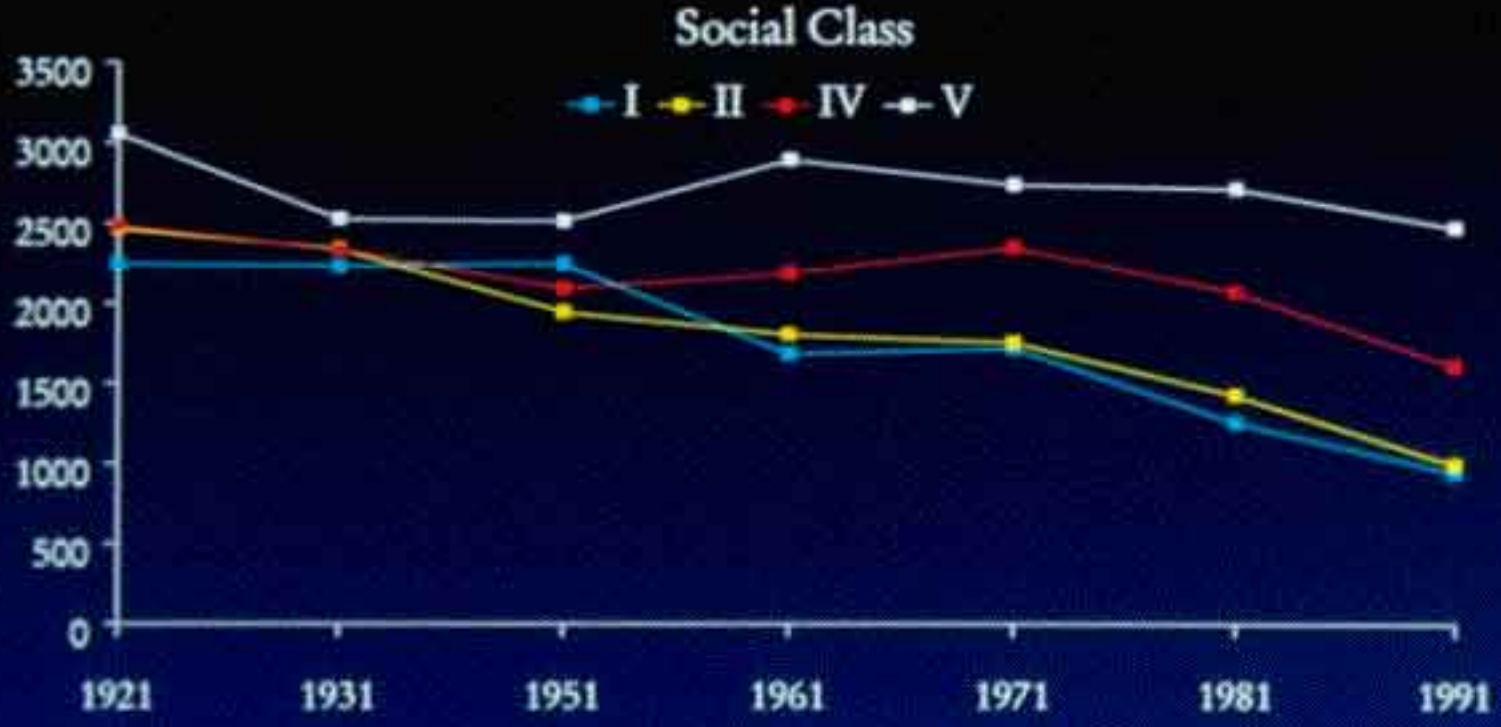
Artefact Explanations

- Numerator-denominator bias
- Social class categorization
- Size of social class groups
- Who gets measured?
- Measures of SES
- Measures of ill-health
- Measures of mortality

"Is it not a mis-reading of the social structure of this country to dwell on class divisions, when in respect of dress, speech, and use of leisure, all members of the community are obviously coming to resemble one another?"

A.M.Carr-Saunders and D.Caradog Jones, 1937

Death Rates (all causes) per 100,000 men aged 55 - 64 by social class for England & Wales



Sources: Decennial Supplements on Occupational Mortality

Cardiovascular mortality and parental social class: male Glasgow students 1948-68

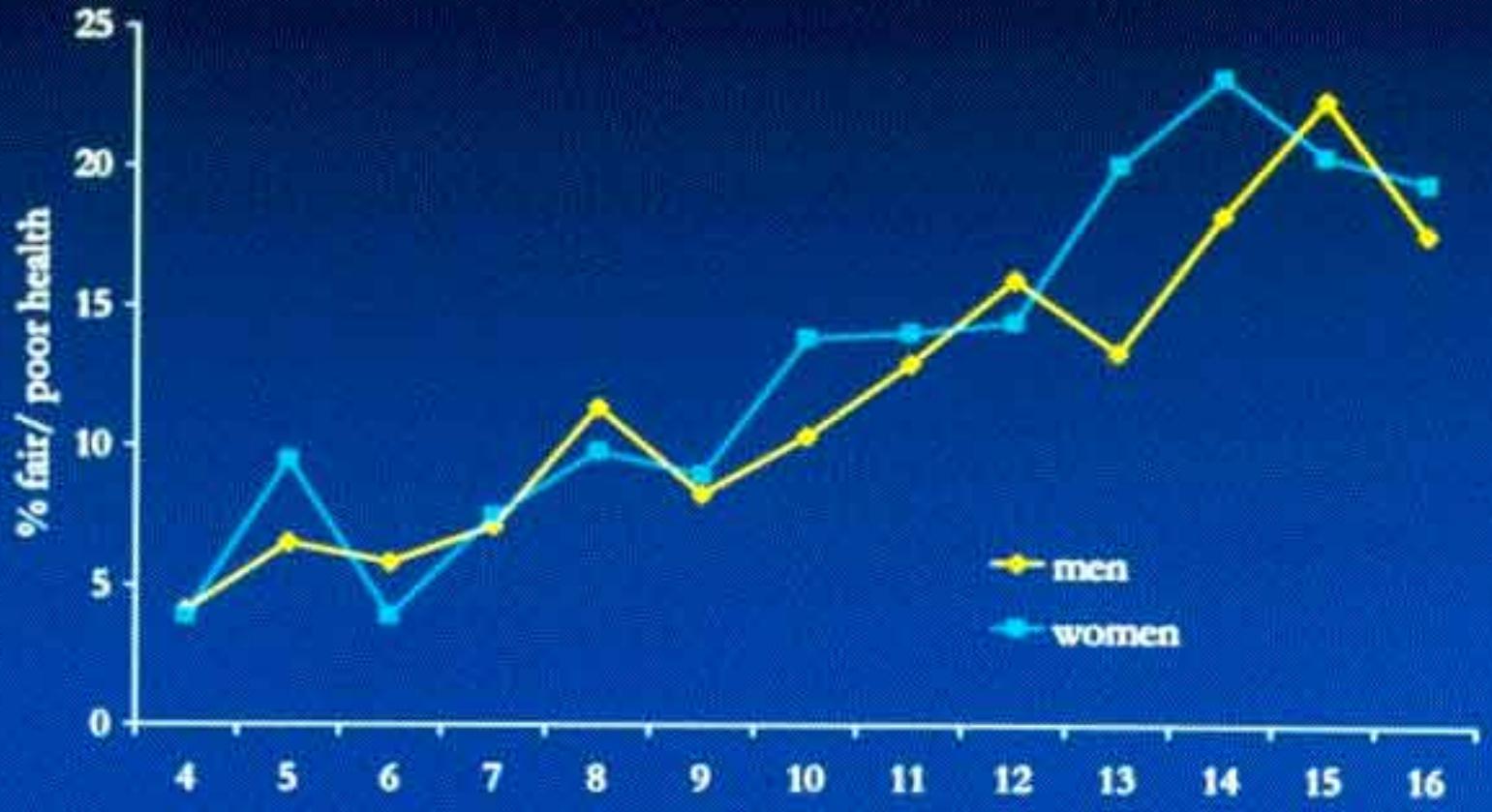
Social class	R.R	R.R.*
I	1.0	1.0
II	1.5	1.46
III	1.62	1.65
IV	1.82	1.89
V	2.36	2.33
P trend	0.002	0.001

* Adjusted for smoking and blood pressures

BMI by father's social class: male Glasgow university students at age 23 and 39 years

Social class	BMI at 23 years	BMI at 39 years
I	baseline	baseline
II	0.03	1.18
III	0.11	1.72
IV/V	0.09	2.29
p for trend	0.62	0.011

Poor health at age 33 & cumulative SES (birth - 33yrs)



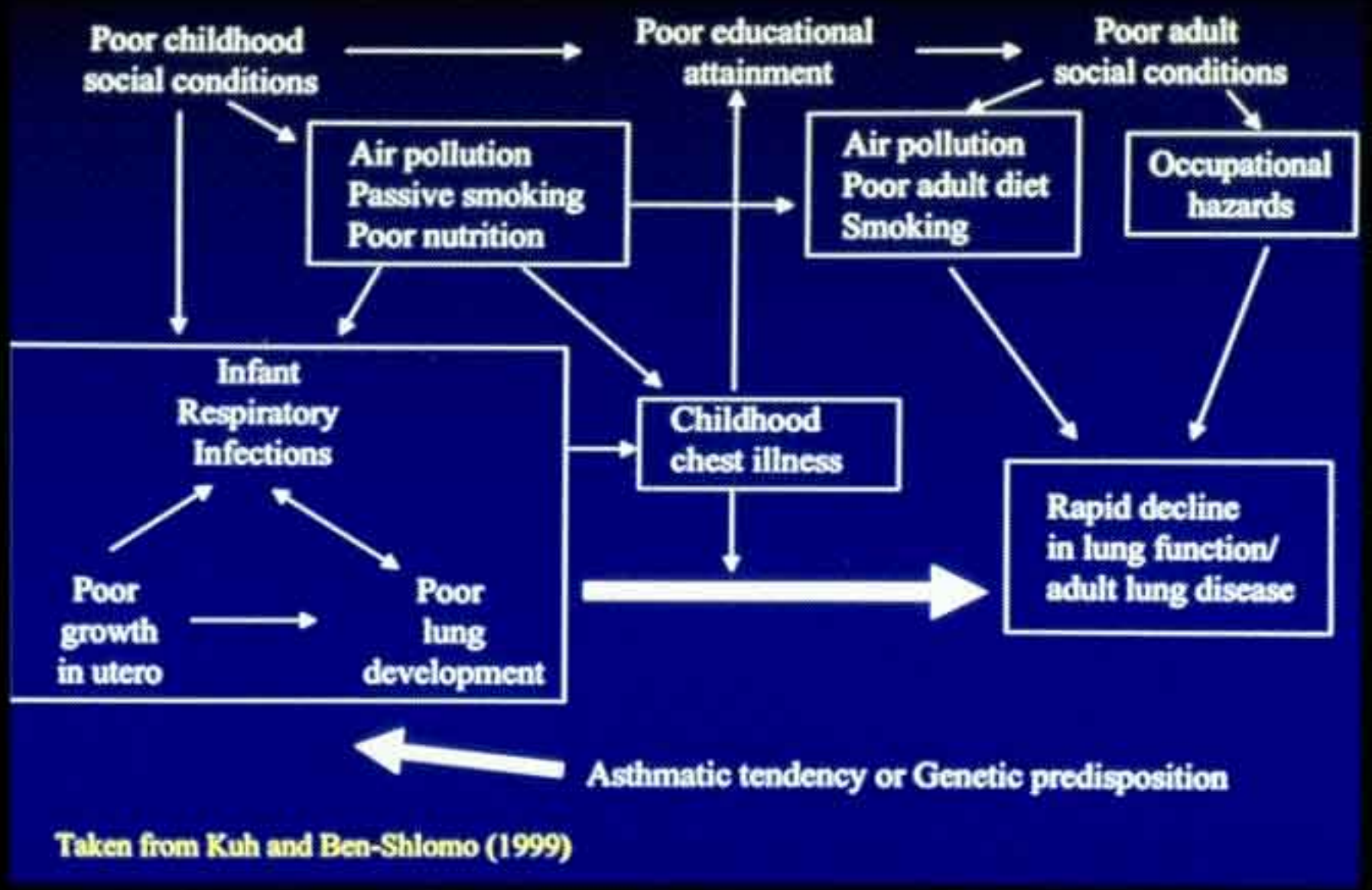
Source: Power et al, 1999

Lifecourse risk CVD and diabetes

men	I&II	IIInm	IIIm	IV&V
birthweight (g)	3415	3406	3348	3343
height at 7 (m)	1.24	1.24	1.23	1.22
bmi at 7	15.9	15.8	16.0	15.9
bmi at 33	25.0	25.2	25.8	26.1
own smoking*	20	23	27	30
no reg fruit/veg*	21	27	32	36
job strain*	15	18	22	27

* percentages

Power & Matthews, 1997

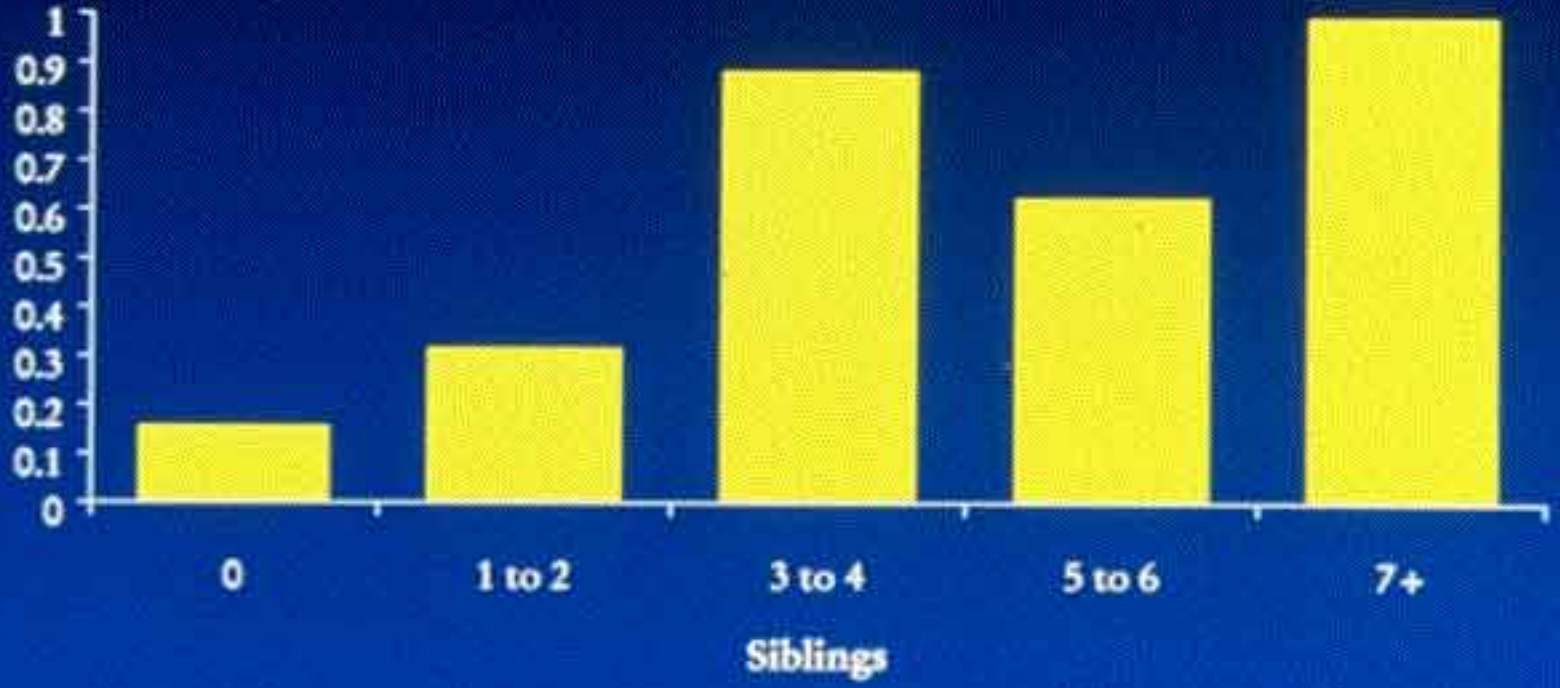

Poor childhood social conditions
Poor educational attainment
Poor adult social conditions
Air pollution
Passive smoking
Poor nutrition
Air pollution
Poor adult diet
Smoking
Occupational hazards
Infant Respiratory Infections
Childhood chest illness
Rapid decline in lung function/ adult lung disease
Poor growth in utero
Poor lung development
Asthmatic tendency or Genetic predisposition
Taken from Kuh and Ben-Shlomo (1999)

Relative rates of mortality according to social class in childhood: manual vs non-manual

	CHD	Stroke	Stomach Cancer	Lung Cancer
Adjusted for age	1.52†	1.83†	2.06*	1.65†
Age, adult SES	1.28†	1.87†	2.03*	1.23
Age, adult SES risk factors	1.26†	1.74†	2.03*	1.23

† $p < 0.05$ manual vs non-manual and trend across social class groups
* $p < 0.05$ trend across social class groups

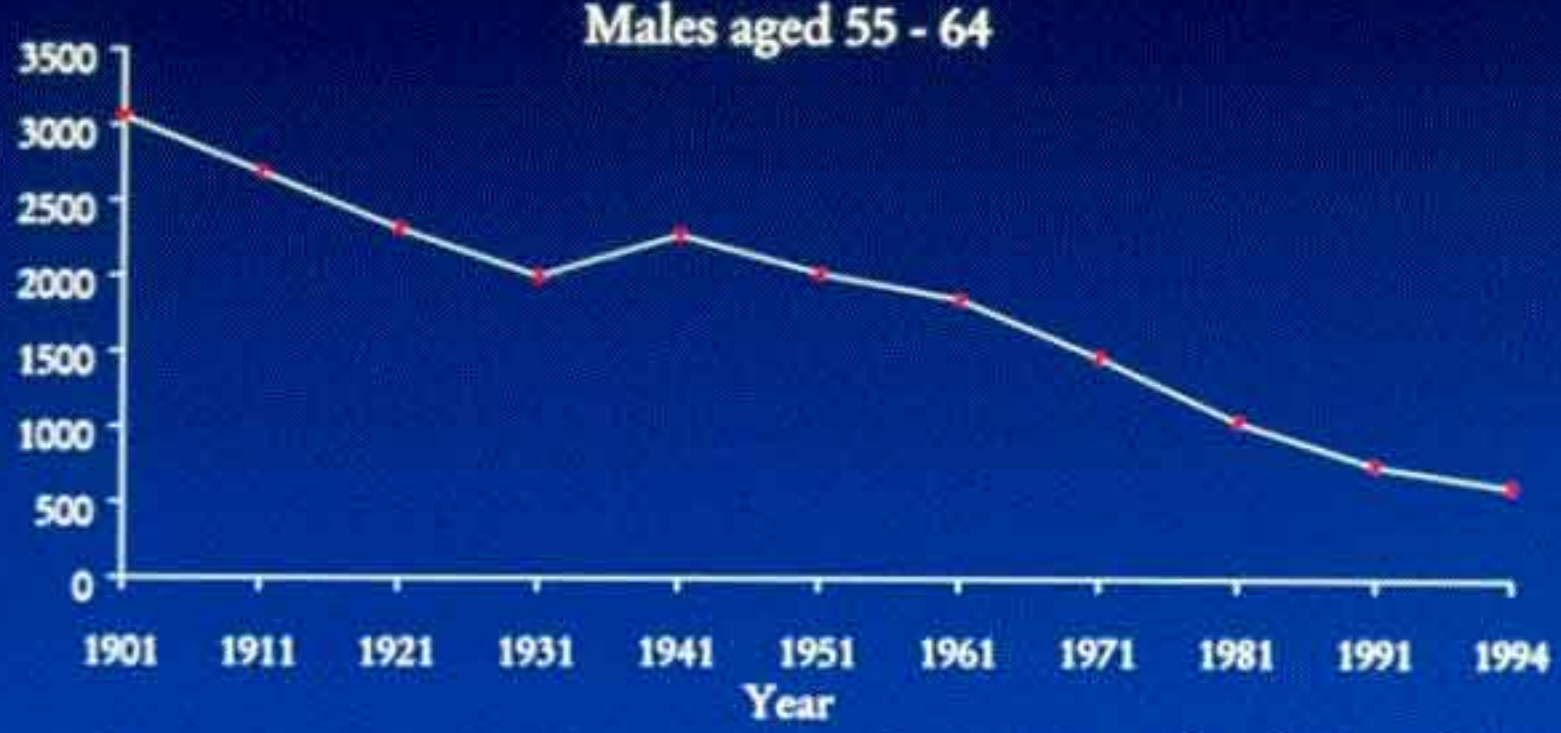
Relative rate of stomach cancer mortality by number of siblings

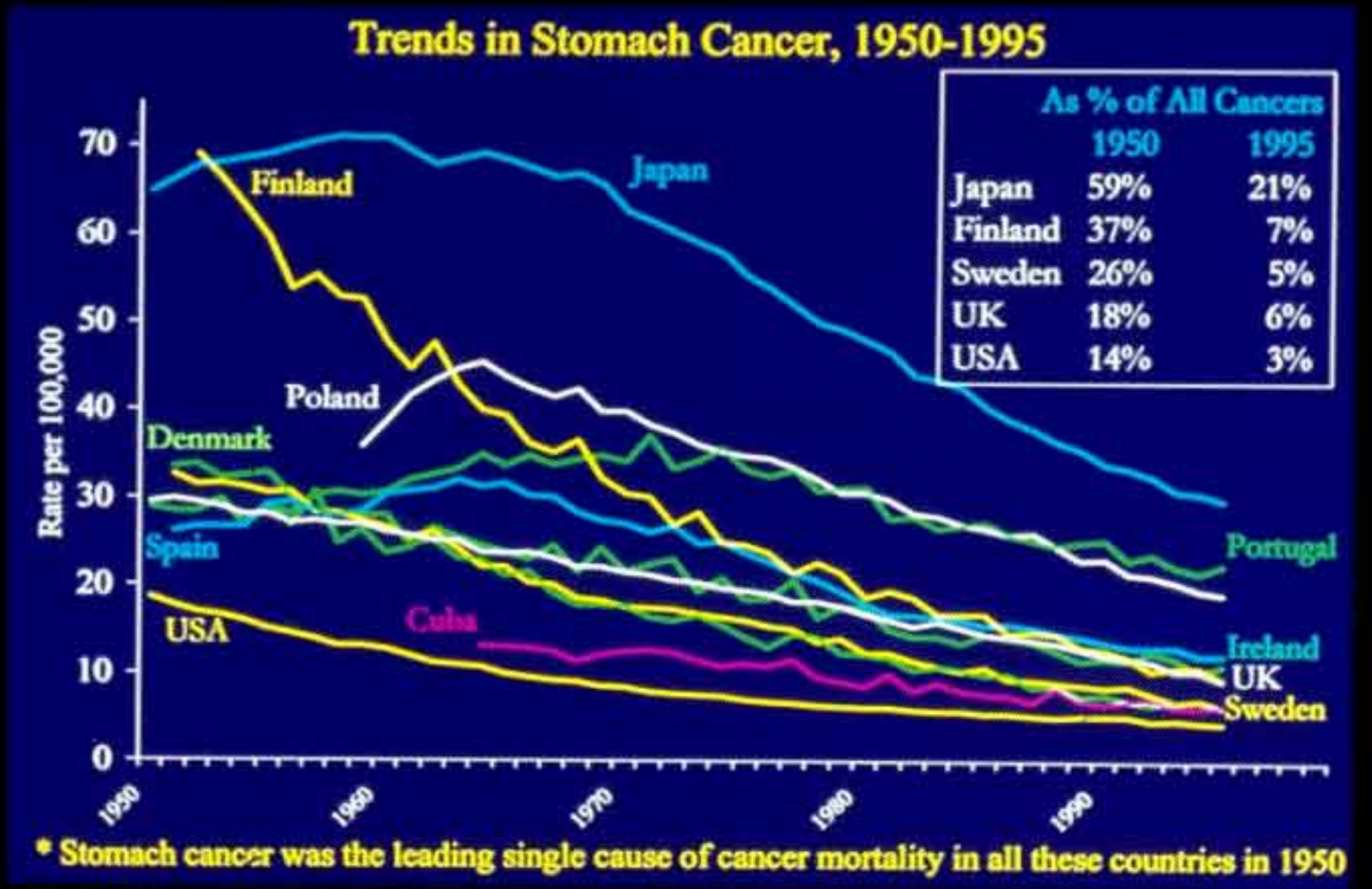


Relative rates of childhood diarrhoea in Villa Carlos Forseca, Nicaragua

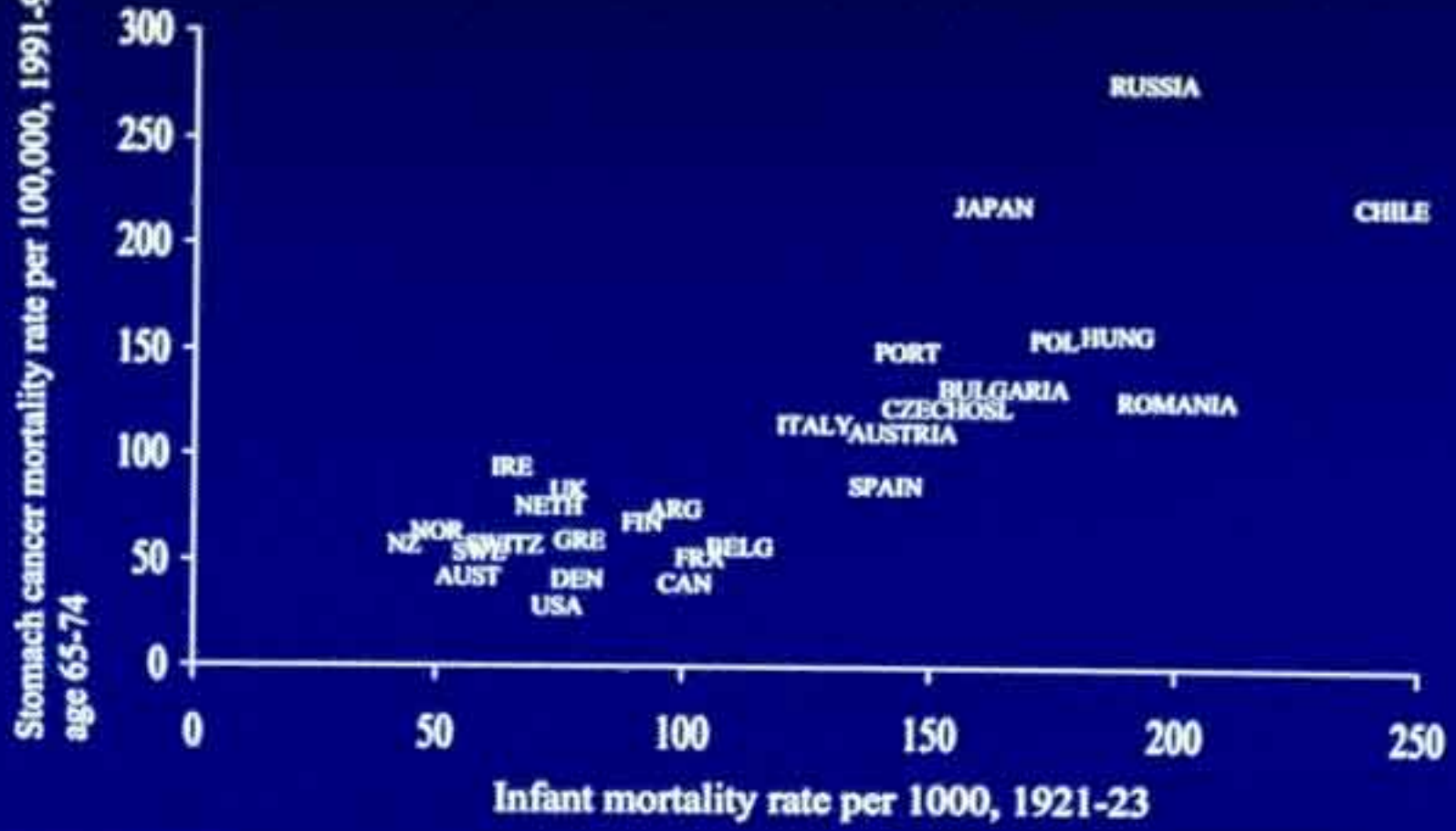
Stroke mortality rates 1901-94, England & Wales

Age-standardised rates per million




Trends in Stomach Cancer, 1950-1995
As % of All Cancers
1950 1995
Japan 59% 21%
Finland 37% 7%
Sweden 26% 5%
UK 18% 6%
USA 14% 3%
Rate per 100,000
70
60
50
40
30
20
10
0
1950
1960
1970
1980
1990
Finland
Japan
Poland
Denmark
Spain
USA
Cuba
Portugal
Ireland
UK
Sweden
* Stomach cancer was the leading single cause of cancer mortality in all these countries in 1950

Plot of infant mortality 1921-23 against stomach cancer mortality 1991-93 for men aged 65-74 in 28 countries



Correlation coefficients (p-values) of adult mortality age 65-74 years in 1991-93 with infant mortality at time of birth and at time of death for 29 countries

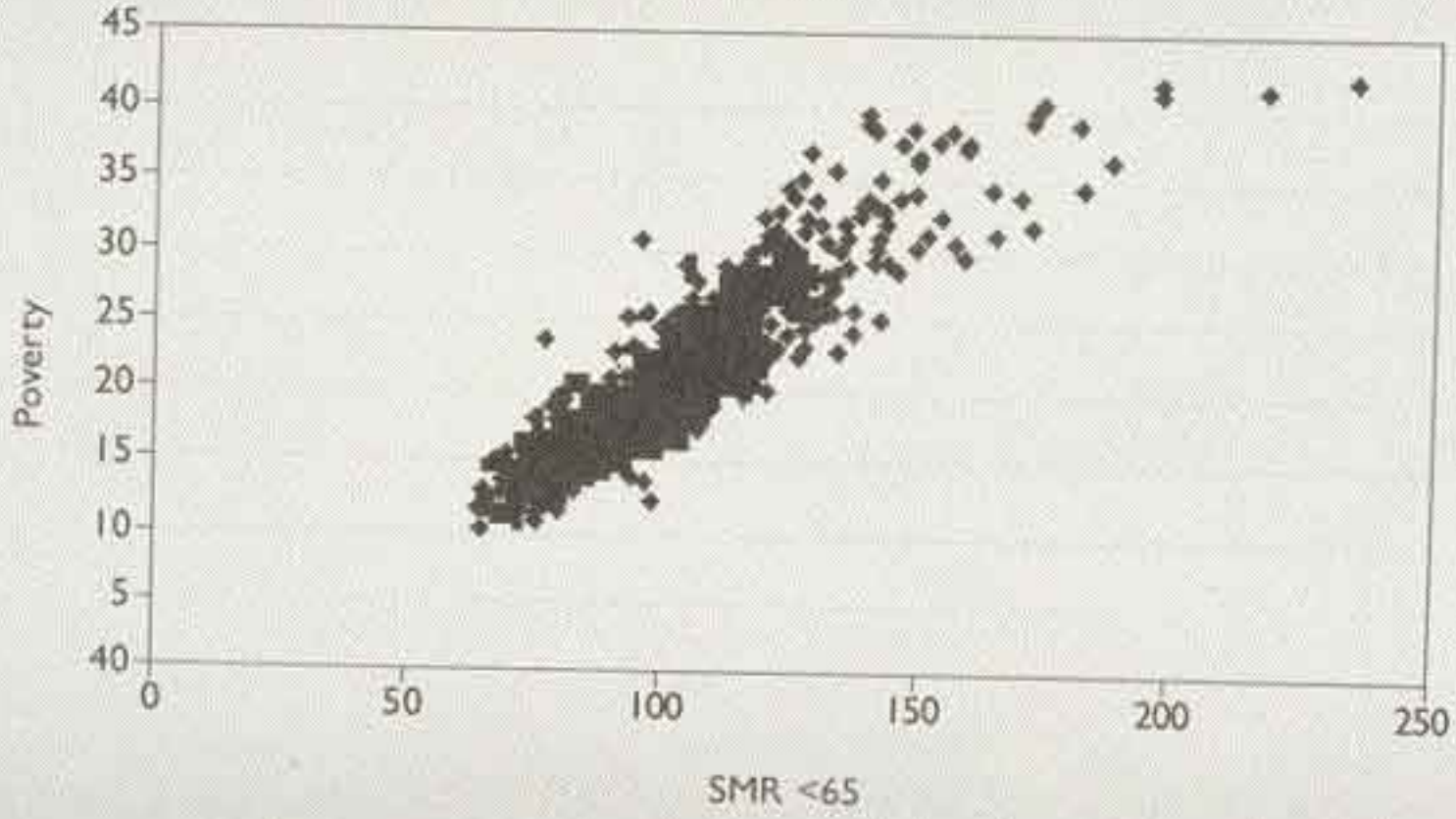
	Infant mortality 1921-23		Infant mortality 1991-93	
	Males	Females	Males	Females
	Simple correlation coefficients			
All causes	0.52	0.51	0.57	0.62
Respiratory TB	0.71	0.66	0.44	0.38
Stomach cancer	0.83	0.82	0.36	0.41
Lung cancer	-0.09	-0.46	-0.07	-0.26
CHD	-0.03	0.17	0.08	0.22
Stroke	0.66	0.63	0.60	0.62

Correlation coefficients (p-values) of adult mortality age 65-74 years in 1991-93 with infant mortality at time of birth and at time of death for 29 countries

	Infant mortality 1921-23		Infant mortality 1991-93	
	Males	Females	Males	Females
	Partial correlation coefficients*			
All causes	0.34	0.30	0.43	0.49
Respiratory TB	0.63	0.59	0.14	0.09
Stomach cancer	0.81	0.78	-0.09	0.02
Lung cancer	-0.06	-0.39	-0.03	-0.05
CHD	-0.08	0.08	0.11	0.16
Stroke	0.52	0.47	0.43	0.46

* Sex and cause-specific correlation coefficients estimated for each period of infant mortality taking the other into account

Figure 2.10: **Scatterplot of SMR for deaths under 65 and % of households living in poverty (*Breadline Britain* index), for parliamentary constituencies, Britain (1991-95)**



Source: Analysis by authors; see Appendix A for constituency data

Mortality by Social Class and Deprivation: men in Renfrew and Paisley

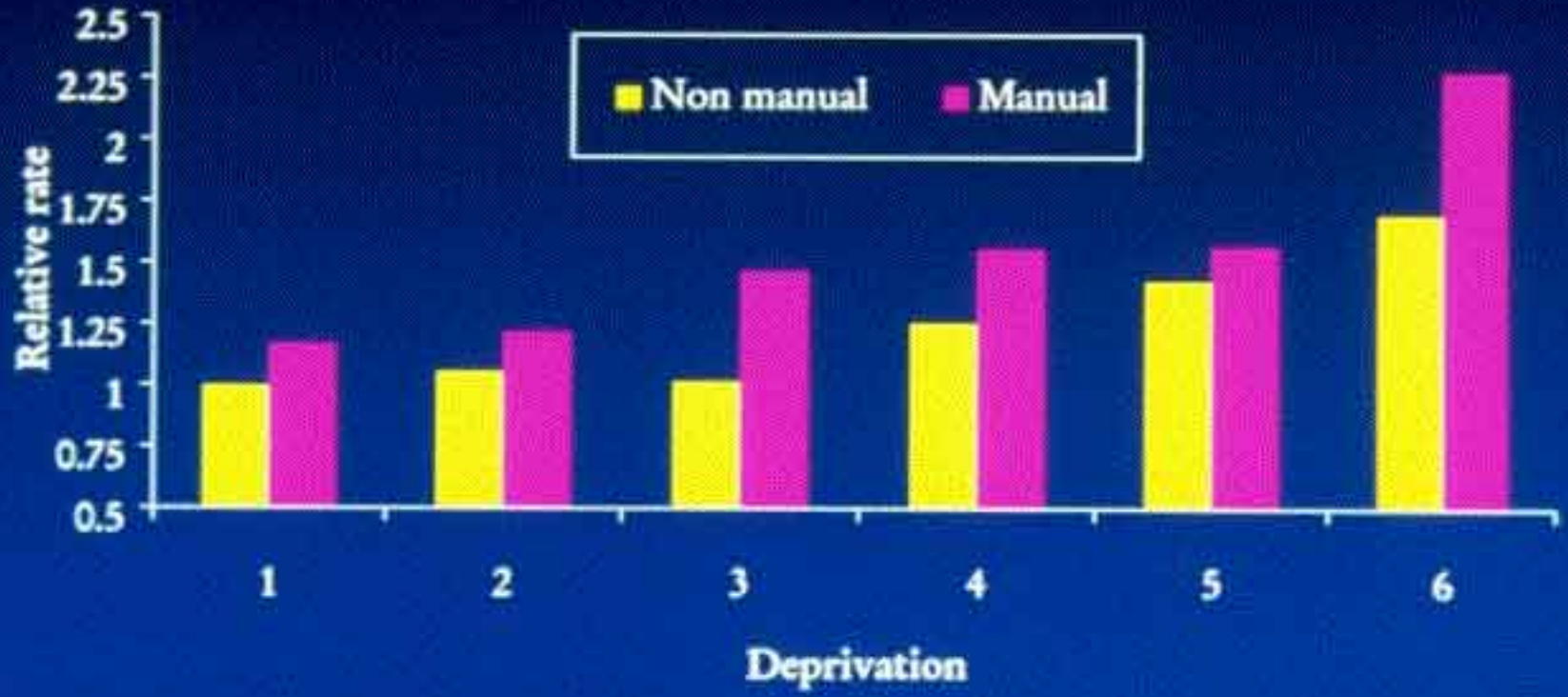
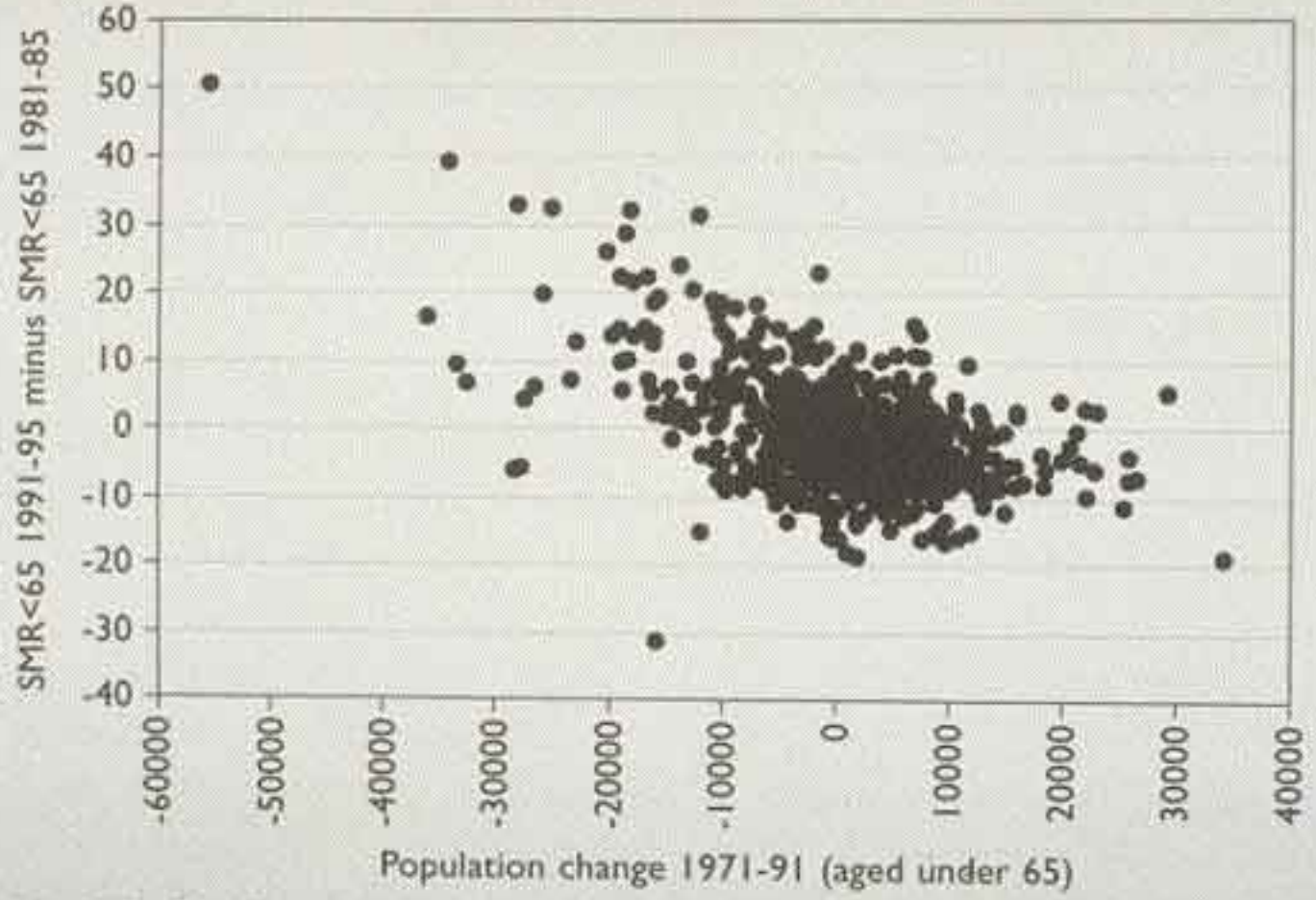
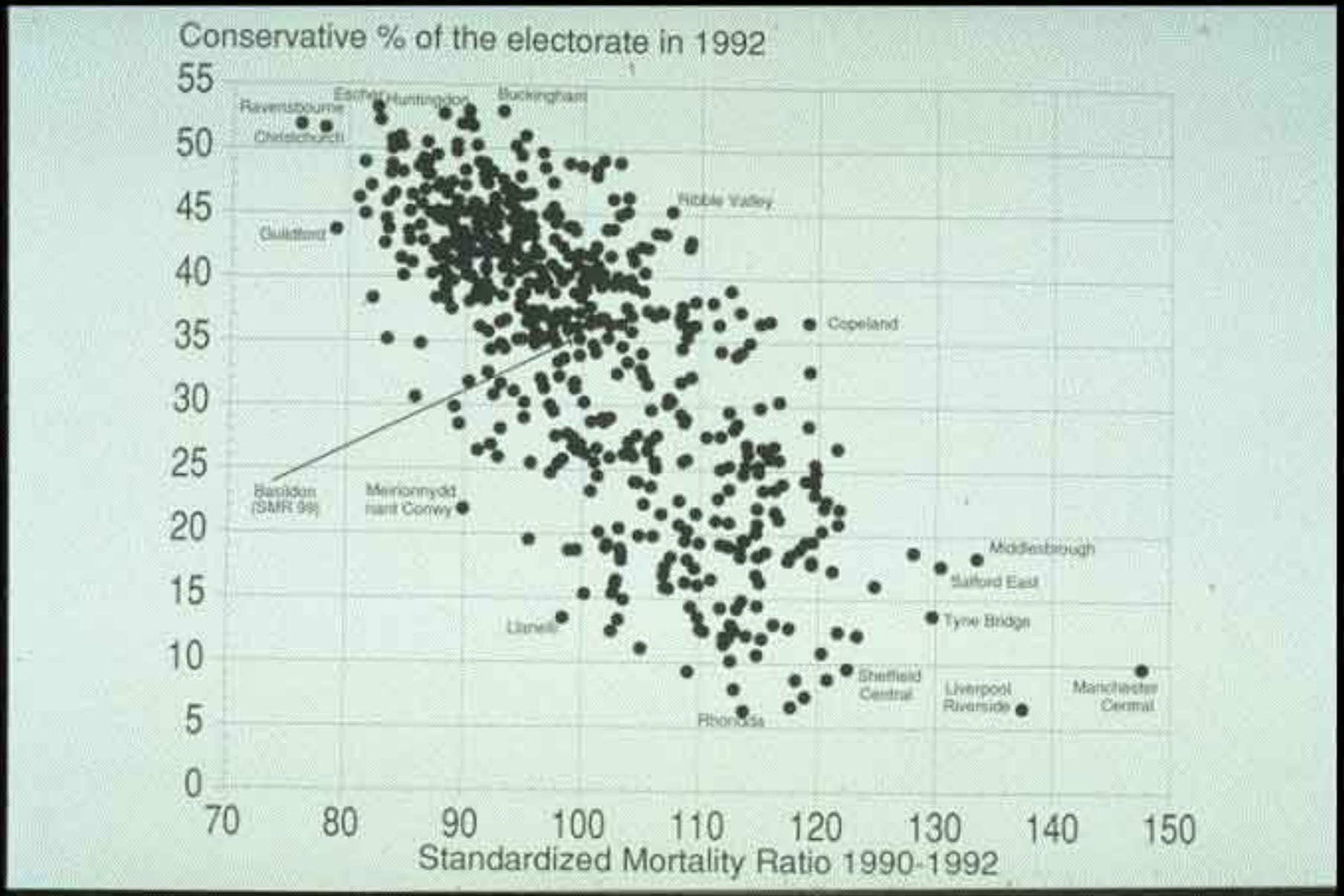
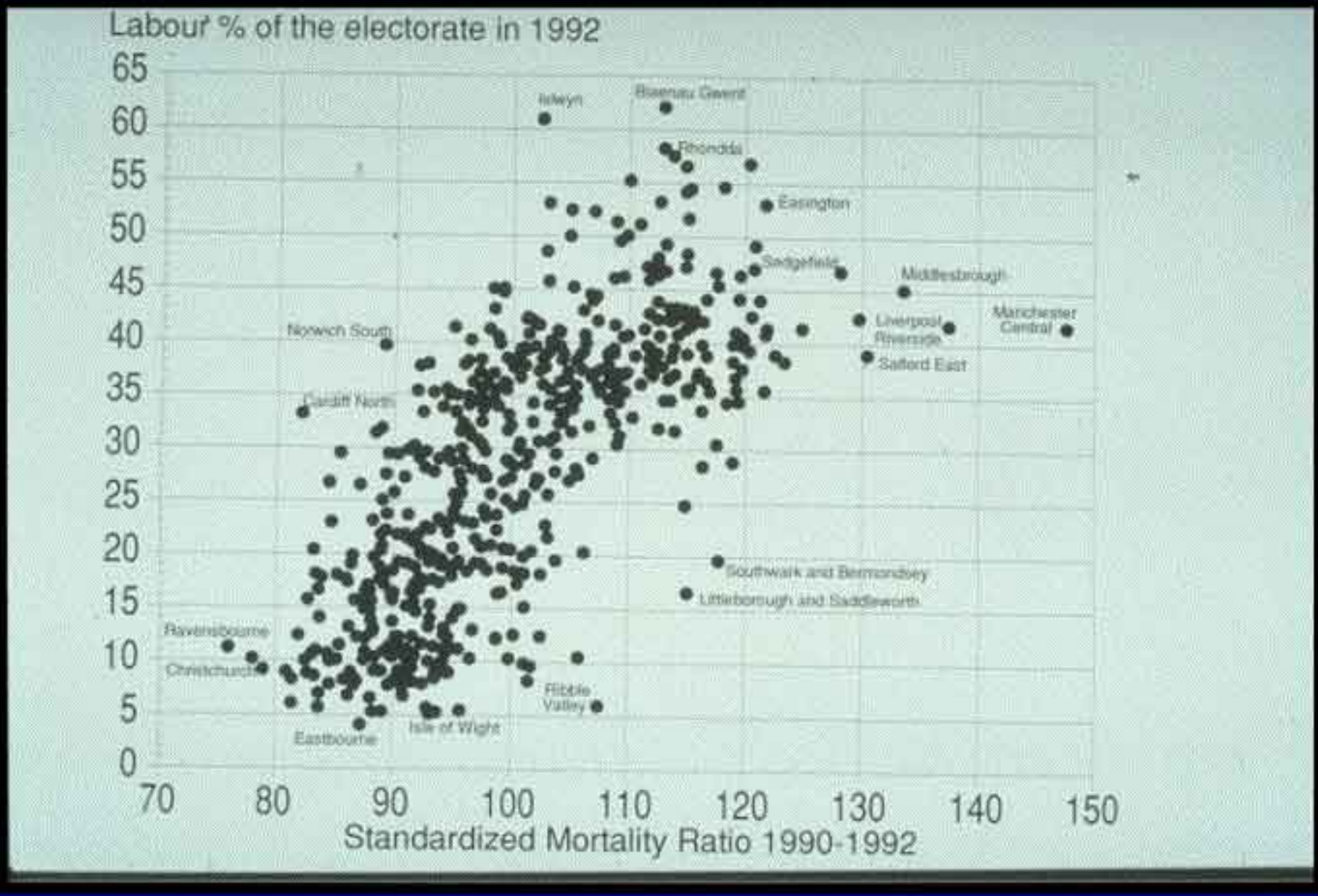


Figure 3.11: **Population change (aged under 65) between 1971 and 1991 and absolute change in SMR for deaths under 65 for British constituencies (1991-95 to 1981-85)**

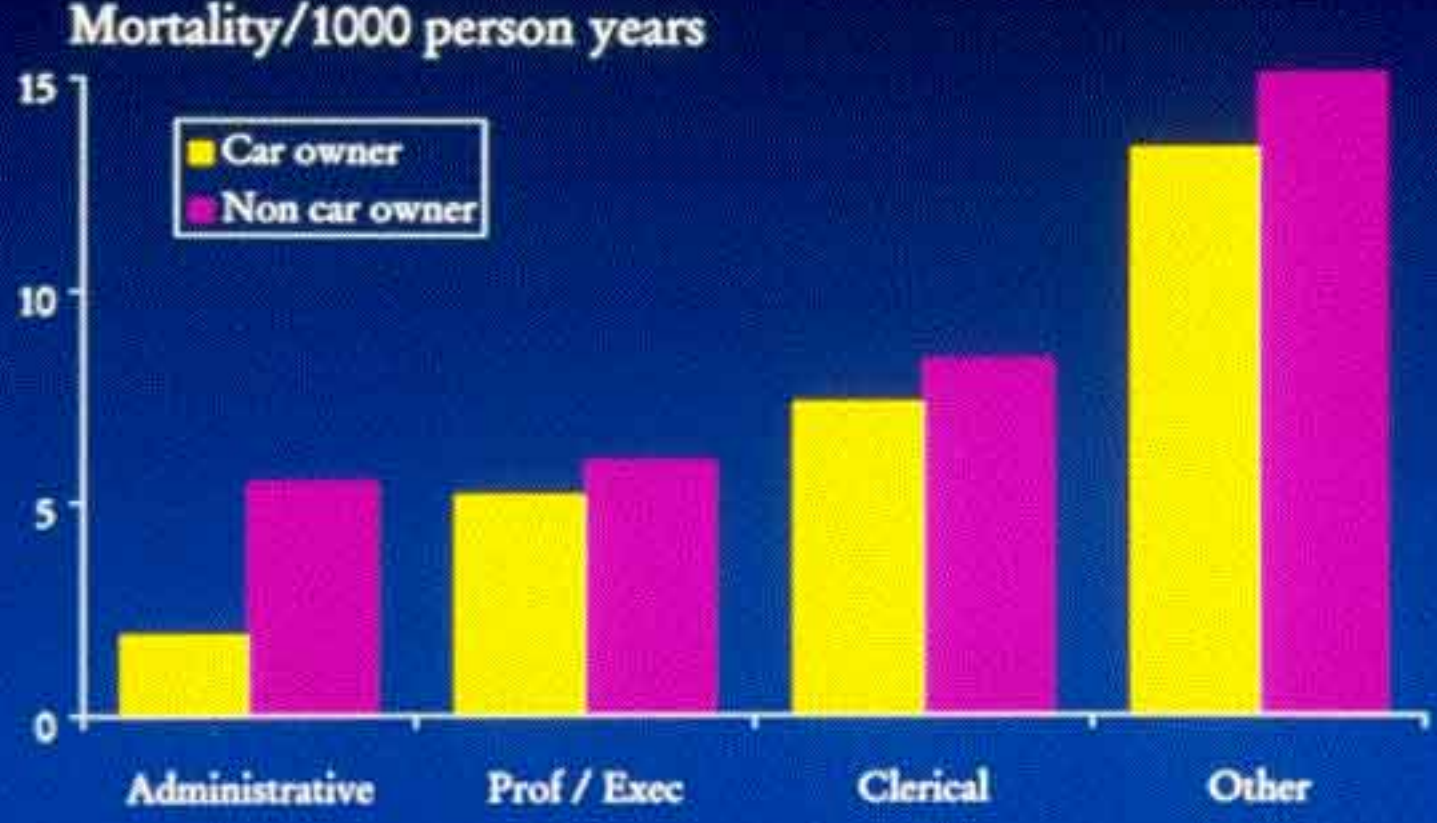


Source: Analysis by authors

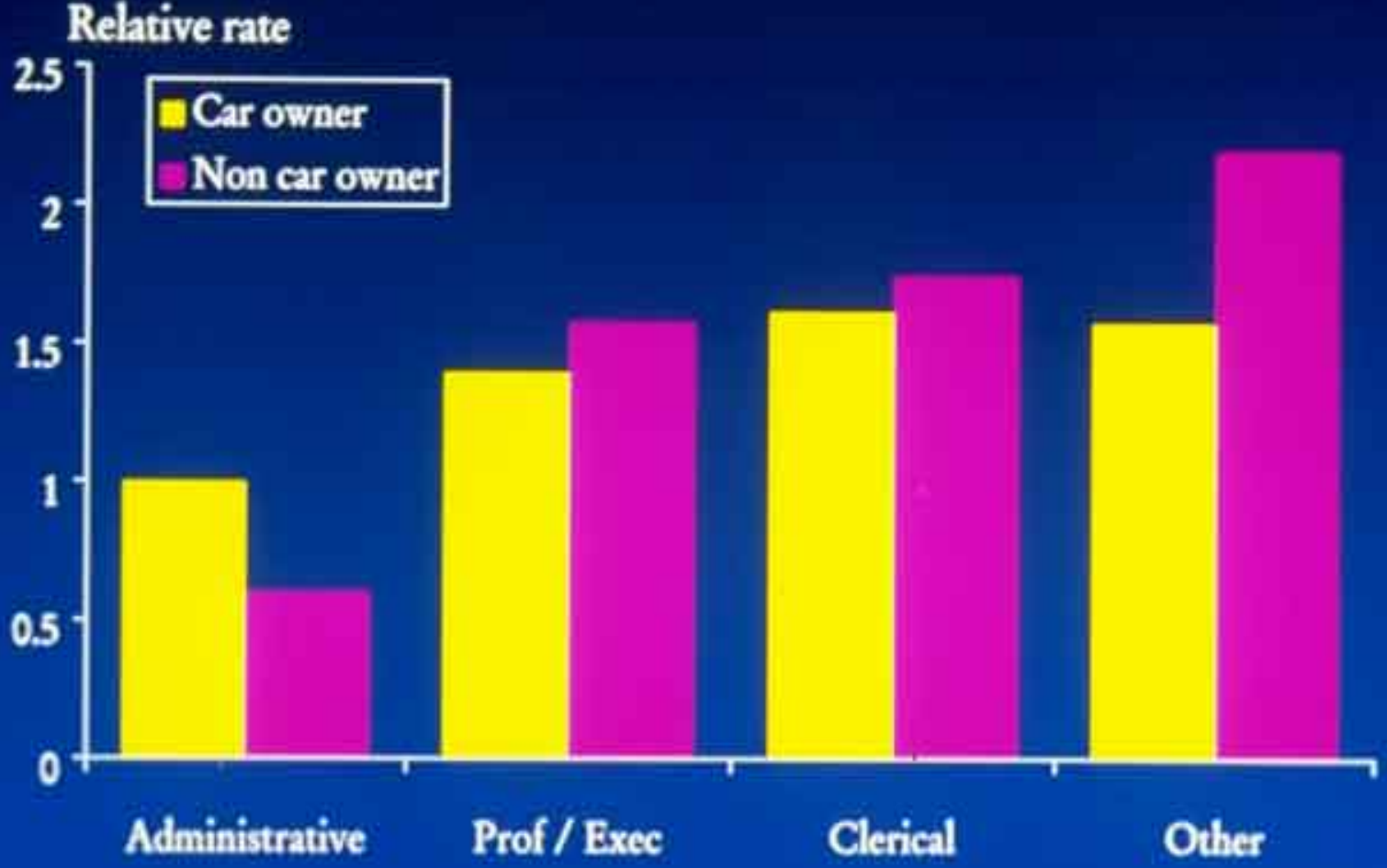

Conservative % of the electorate in 1992
55
50
45
40
35
30
25
20
15
10
5
0
Ravensbourne
Chelsea
Buckingham
Ribble Valley
Guildford
Copeland
Basildon (SMR 99)
Meirionnydd nant Conwy
Middlesbrough
Salford East
Tyne Bridge
Llanelli
Sheffield Central
Liverpool Riverside
Manchester Central
Rhondda
70
80
90
100
110
120
130
140
150
Standardized Mortality Ratio 1990-1992


Labour % of the electorate in 1992
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Islwyn
Rhondda
Easington
Sedgefield
Middlesbrough
Liverpool Riverside
Manchester Central
Salford East
Norwich South
Cardiff North
Southwark and Bermondsey
Littleborough and Saddleworth
Ravensbourne
Christchurch
Ribble Valley
Isle of Wight
Eastbourne
70
80
90
100
110
120
130
140
150
Standardized Mortality Ratio 1990-1992

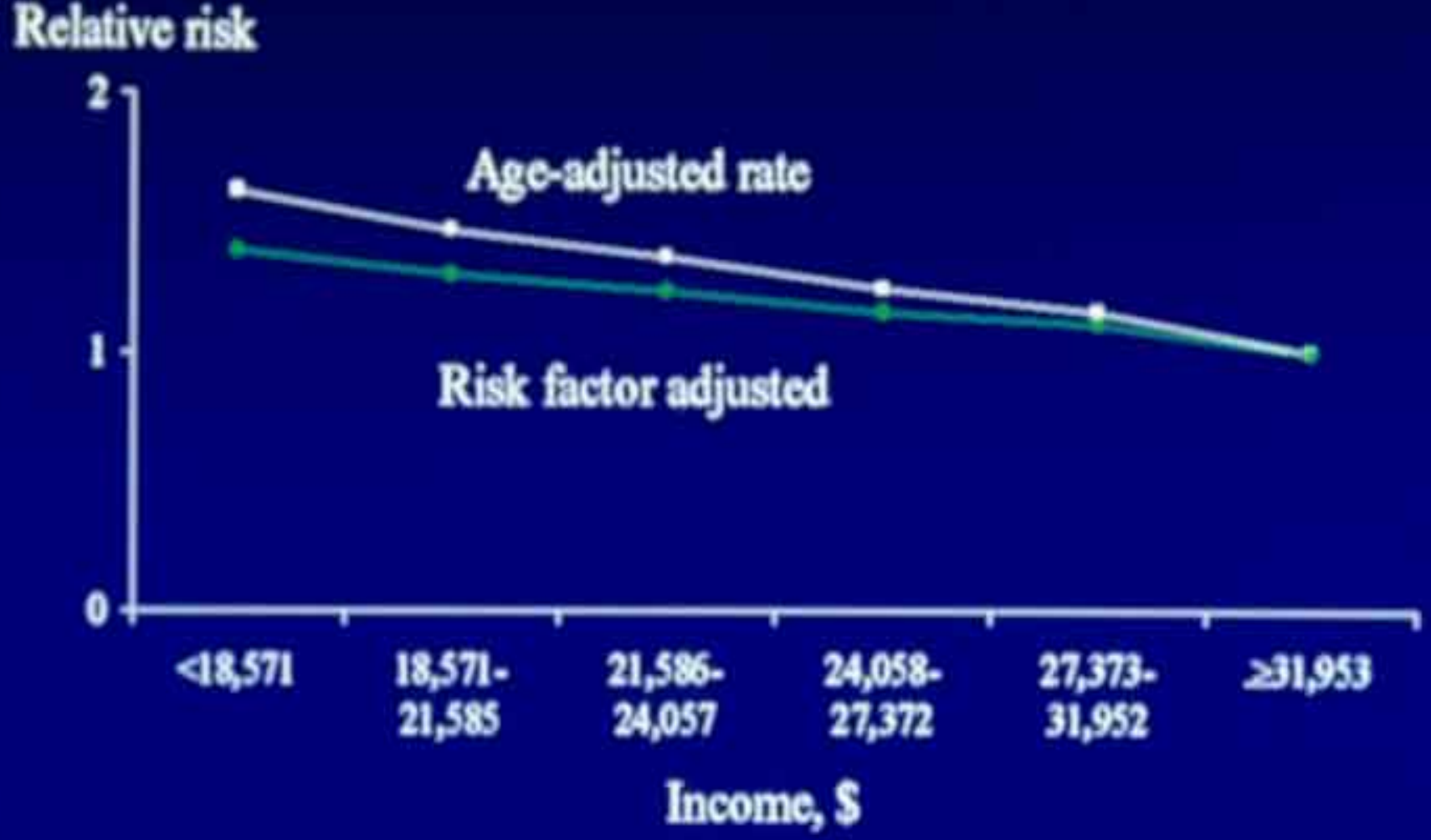
All-cause mortality by employment grade & car ownership among participants who had never smoked in the Whitehall Study of London civil servants



Relative rates of cardiovascular disease mortality, by employment grade & car ownership in the Whitehall Study of London civil servants. The relative rates have been adjusted for age, smoking behaviour, systolic blood pressure, plasma cholesterol concentration and glucose tolerance



CHD Mortality among White Men, by Median Family Income for Zip Code of Residential Area



Mortality by cumulative social class

	3 NM	2NM, 1M	1NM, 2M	3M	trend
All cause					
age	1	1.29**	1.45***	1.71***	p=0.0001
age + risk factors	1	1.30**	1.33**	1.57***	p=0.0001
Cardiovascular disease					
age	1	1.51**	1.90***	1.94***	p=0.0001
age + risk factors	1	1.57***	1.78***	1.92***	p=0.0001

The payment of wages on Saturday evening meant that the workers could only buy their food after the middle class had had first choice during Saturday morning. When the workers reached the market "the best has vanished and, if it was still there they would probably not be able to buy it. The potatoes which the workers buy are usually poor, the vegetables wilted, the cheese old and of poor quality, the bacon rancide, the meat lean, tough, taken from old, often diseased cattle, or such as have died a natural death, and not fresh even then, often half decayed".

F. Engels, 1845

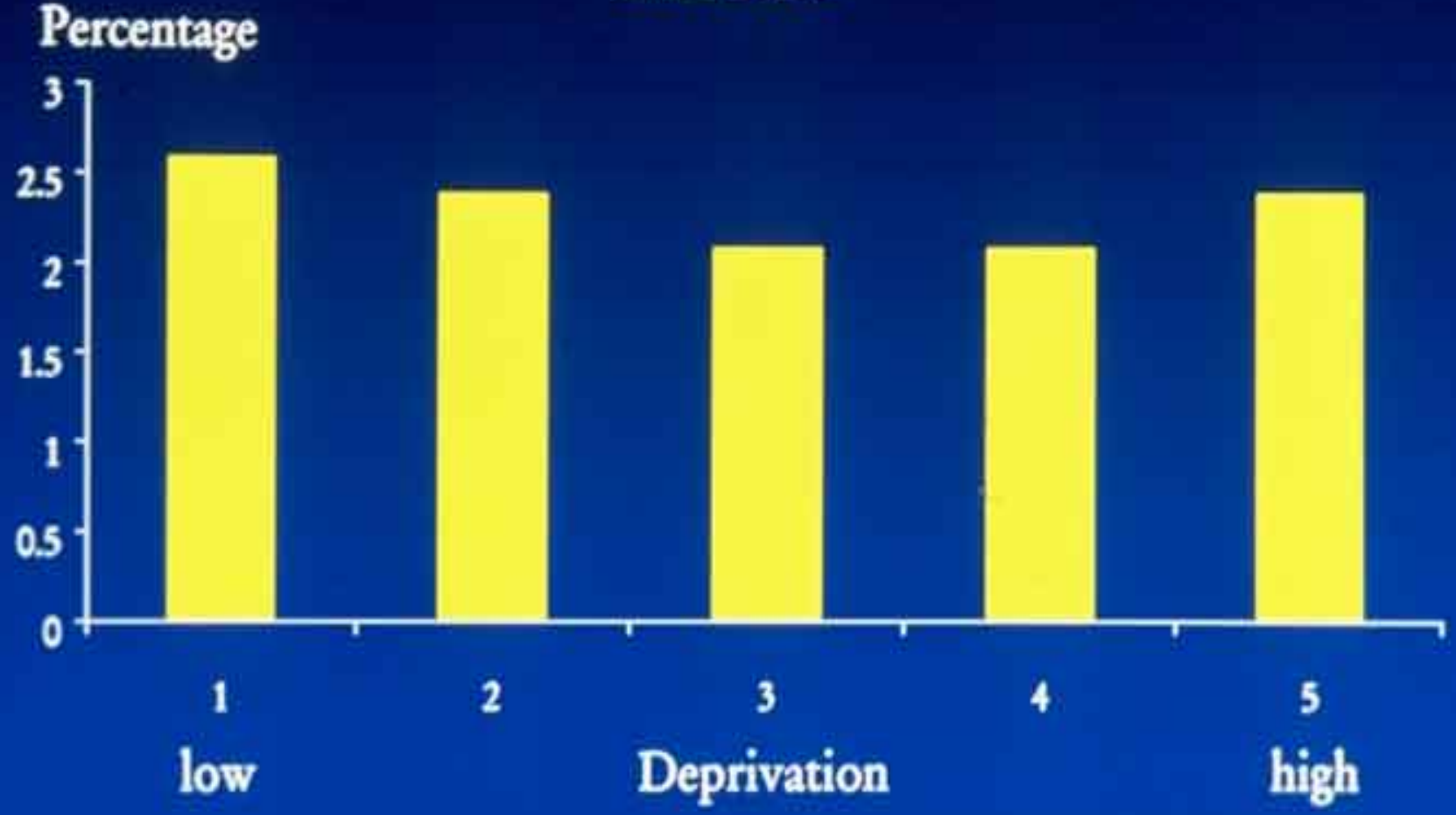
The working classes were more likely to be sold adulterated food, because while the rich developed sensitive palates through habitual good eating and could detect adulteration, the poor had little opportunity to cultivate their taste. The poor also had to deal with small retailers who could not sell "even the same quality of goods as cheaply as the largest retailers, because of their small capital and the large proportional expenses of their businesses, must knowingly or unknowingly buy adulterated goods in order to selll at the lower prices required and to meet the competition of the others".

F. Engels, 1845

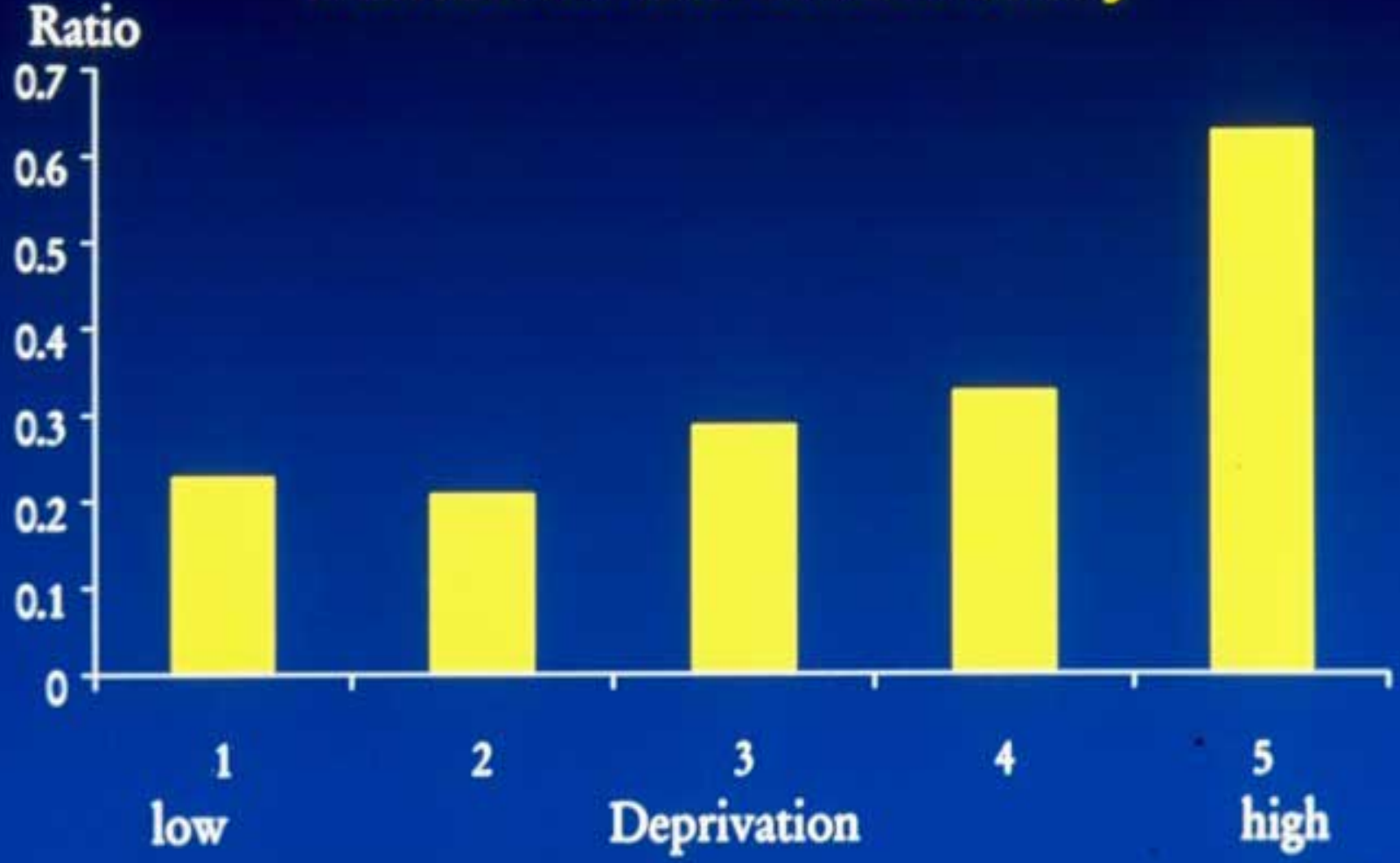
"smoking behaviour cannot be taken as a fundamental cause of ill-health, it is rather an epiphenomenon, a secondary symptom of deeper underlying features of economic society" and therefore policy makers needed to ask "about the social and economic factors which explain the … prevalence of smoking in the first place, and whether these, independent of individual education and counselling, have to be given priority in reducing the differentials".

DHSS, 1980

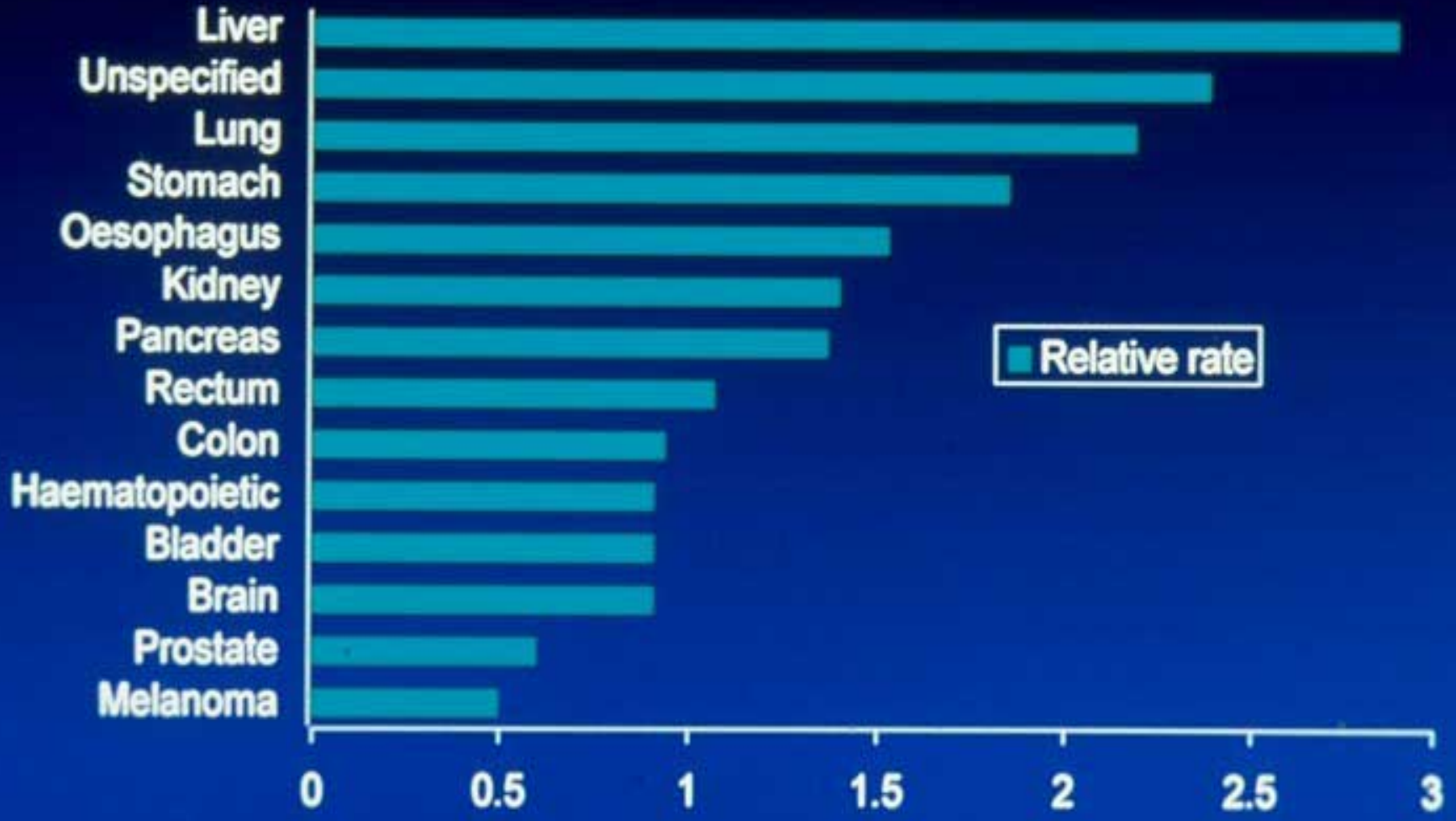
Morbidity by deprivation among women in the Somerset & Avon Survey of Health: diabetes



Ratio diabetic eye disease/diabetes: women in the SASH study



Site specific cancer mortality: Low/High employment grade relative rates



Causes of death and median income of Zip Code area of residence in the men screened for MRFIT: relative risk for $10,000 lower income

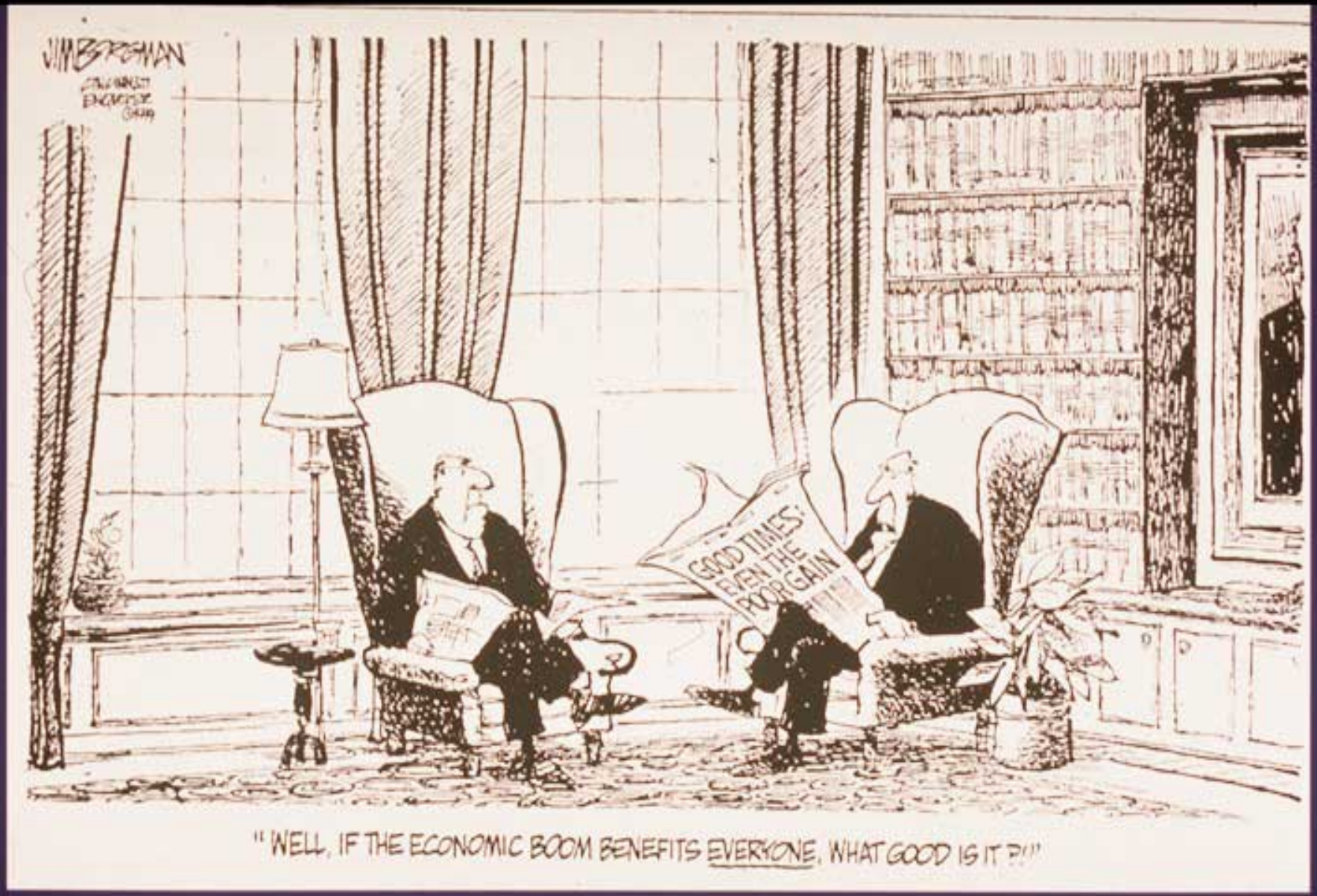
RR>1.50	RR 1.21-1.50	RR 1.00-1.20	RR<1.00
AIDS	Infection	Aortic aneurysm	Blood disease
Diabetes	Coronary Heart Disease	Suicide	Motor neurone disease
Rheumatic Heart Disease	Stroke	Nervous system disease	Flying accidents
Heart failure	Cirrhosis	Oesophageal cancer	Lymphoma
COPD	Genitourinary disease	Stomach cancer	Hodgkin's disease

Causes of death and median income of Zip Code area of residence in the men screened for MRFIT: relative risk for $10,000 lower income

RR>1.50	RR 1.21-1.50	RR 1.00-1.20	RR<1.00
Pneumonia/ Influenza	Symptoms/signs	Pancreatic cancer	Melanoma
Homicide	Accidents	Prostate cancer	Bone/connective tissue cancer
	Lung cancer	Bladder cancer	
	Liver cancer	Kidney cancer	
	Colorectal cancer	Brain cancer	
		Myeloma	
		Leukaemia	

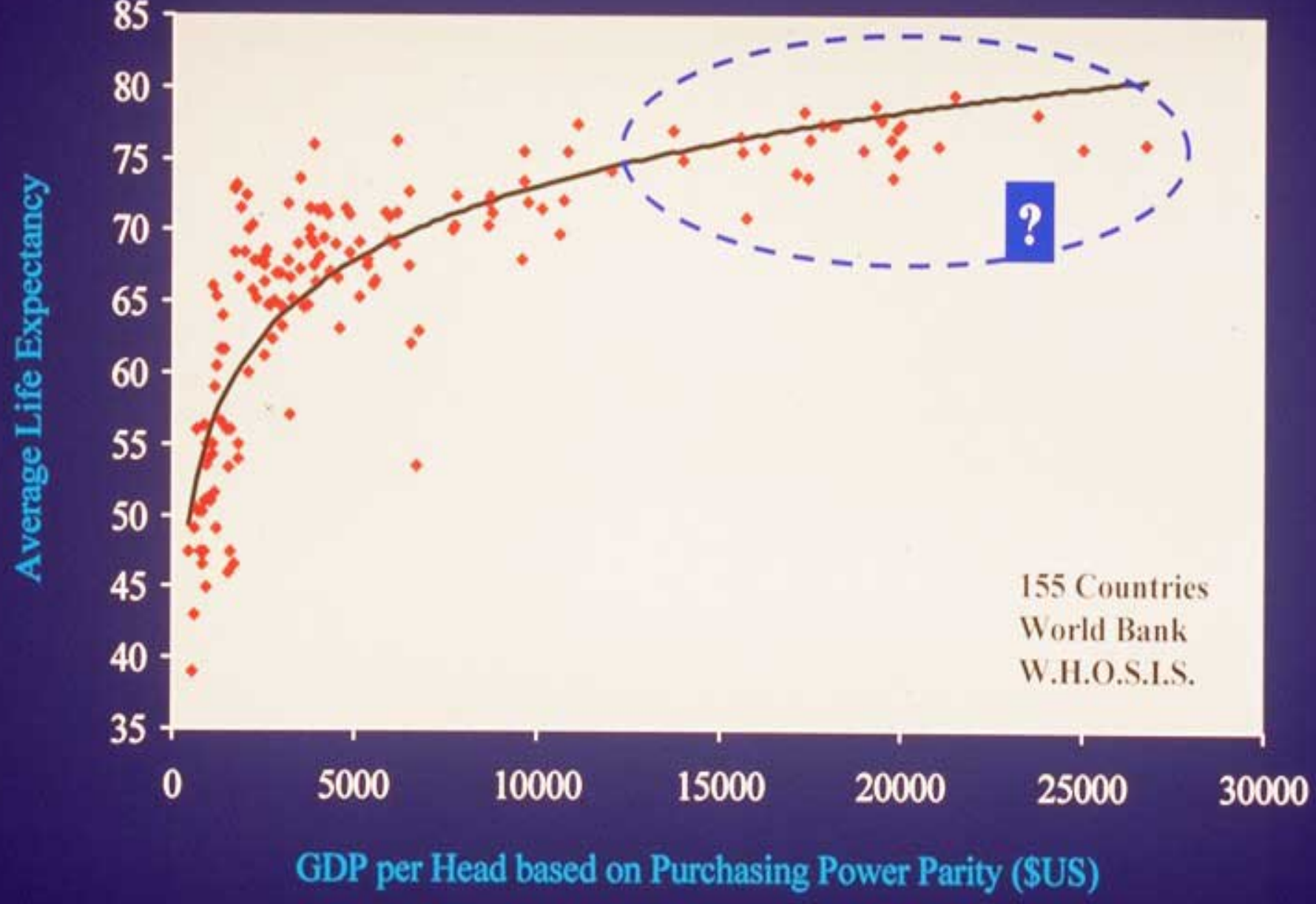
Lung cancer mortality 1931-1991: social class differences and contribution to total mortality among men of working age

	Social class						% all deaths
	I	II	IIIn	IIIm	IV	V	
1931	1.07	0.96		1.01	0.91	1.12	1.0%
1951	0.81	0.82		1.07	0.91	1.18	2.5%
1971	0.53	0.68	0.84	1.18	1.23	1.43	11.7%
1991	0.45	0.61	0.87	1.38	1.32	2.06	9.9%



"Well, if the economic boom benefits everyone, what good is it?"

GDP/head and Life Expectancy, 1993



The paradox is that

We know at the individual level,

income is strongly associated with health

within these rich countries

The big question

If average income (GDP/head) is

only weakly associated with life expectancy,

then what explains the health differences

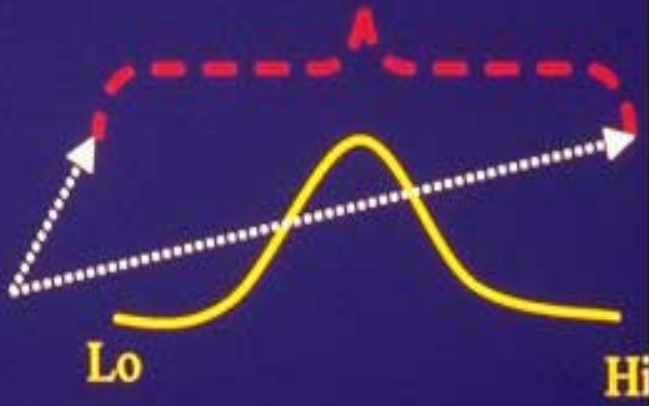
across the richest nations?

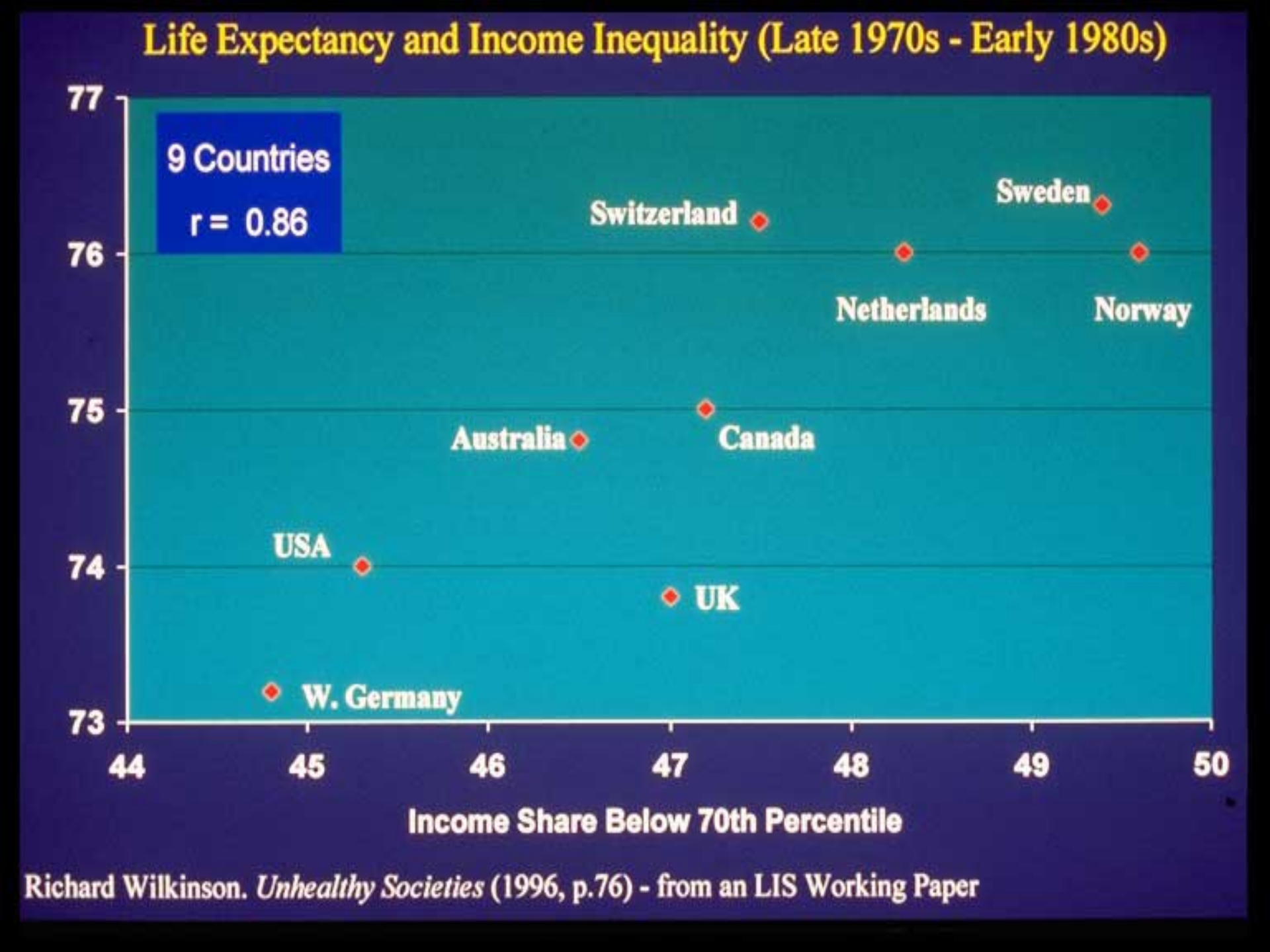
Average Income

Population

Total Income

How the total income is distributed across the population



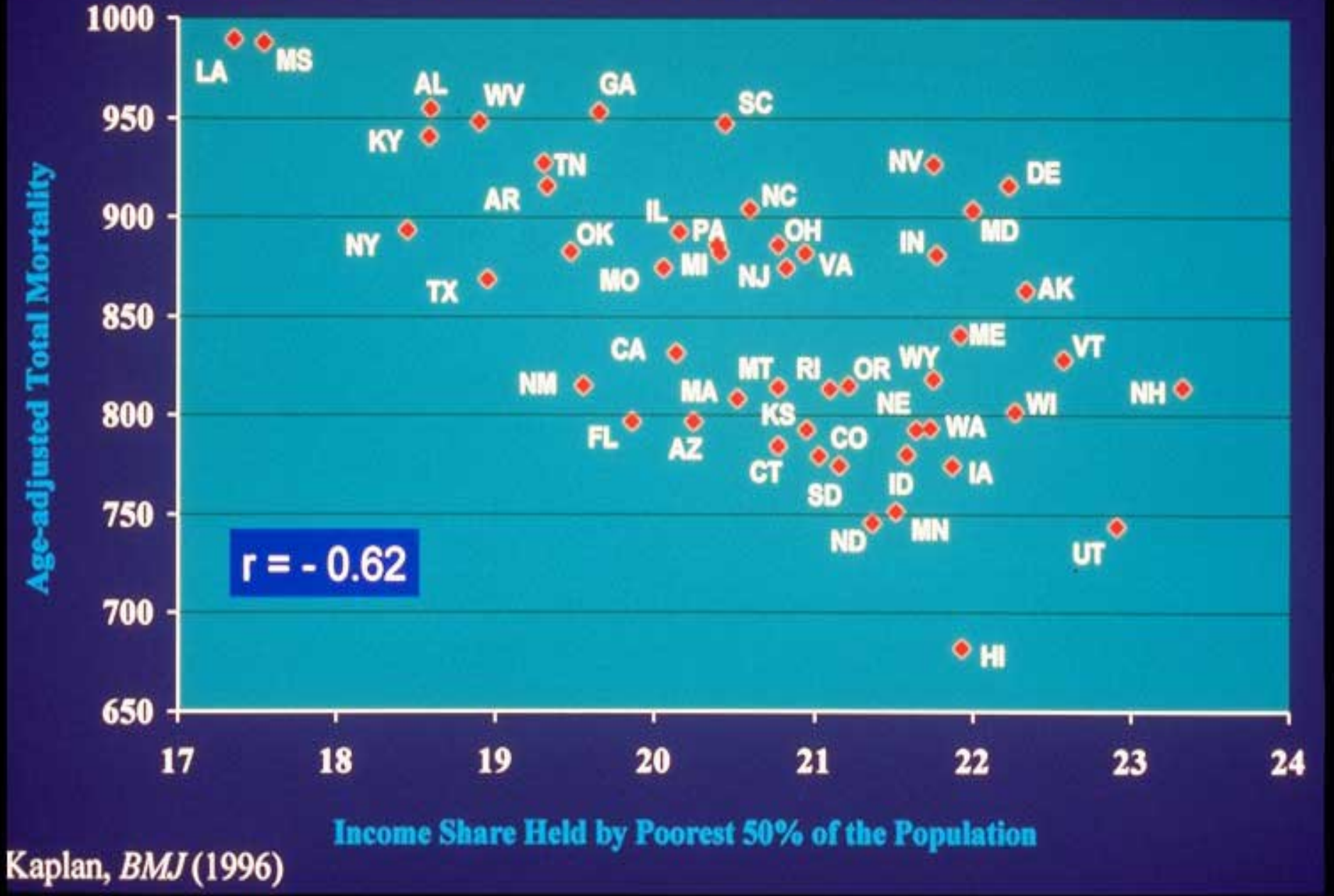

Life Expectancy and Income Inequality (Late 1970s - Early 1980s)
9 Countries
r = 0.86
Sweden
Switzerland
Netherlands
Norway
Australia
Canada
USA
UK
W. Germany
77
76
75
74
73
44
45
46
47
48
49
50
Income Share Below 70th Percentile
Richard Wilkinson. *Unhealthy Societies* (1996, p.76) - from an LIS Working Paper

Absolute and "Relative Income"

Absolute Income - the only income information that is relevant to health is where any individual or group sits on this scale

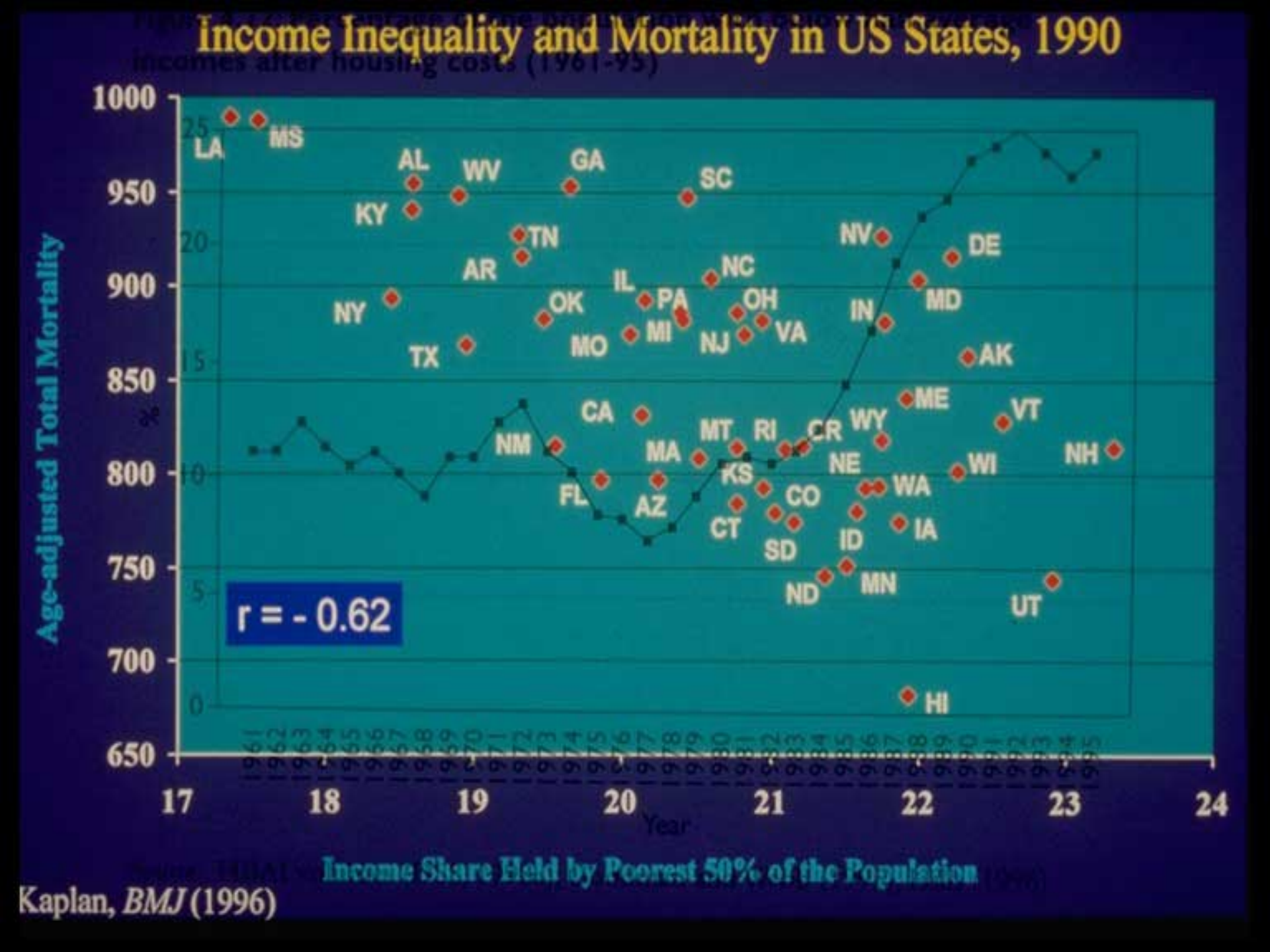
Relative Income - it is not the absolute position on this scale, but rather where an individual or groups sits relative to another that is important for health

Income Inequality and Mortality in US States, 1990



Kaplan, *BMJ* (1996)

Income Inequality and Mortality in US States, 1990



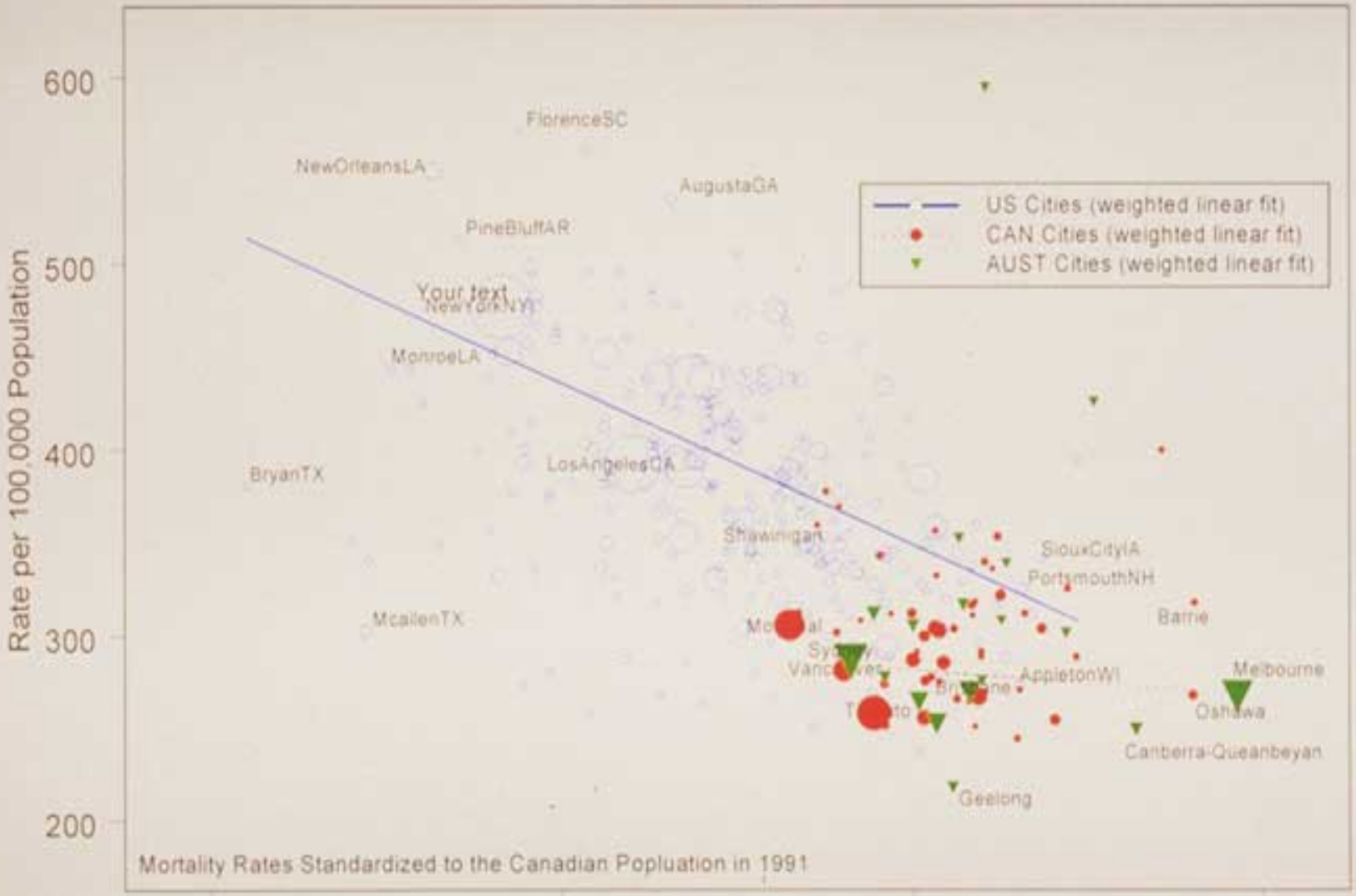
Kaplan, *BMJ* (1996)

Higher income inequality is associated with lots of things

Low birth weight	0.65
Homicide	0.74
Unemployment	0.48
Welfare	0.69
No health insurance	0.45
Per capita medical spending	-.67
High School graduation	-0.71
Library books per capita	-0.42

Kaplan, BMJ (1996)

Working Age (25-64) Mortality by Median Share
U.S., Canadian, and Australian Metropolitan Areas



Ross, et al., *BMJ* (2000)

Chapter 7
Re-examining the international evidence

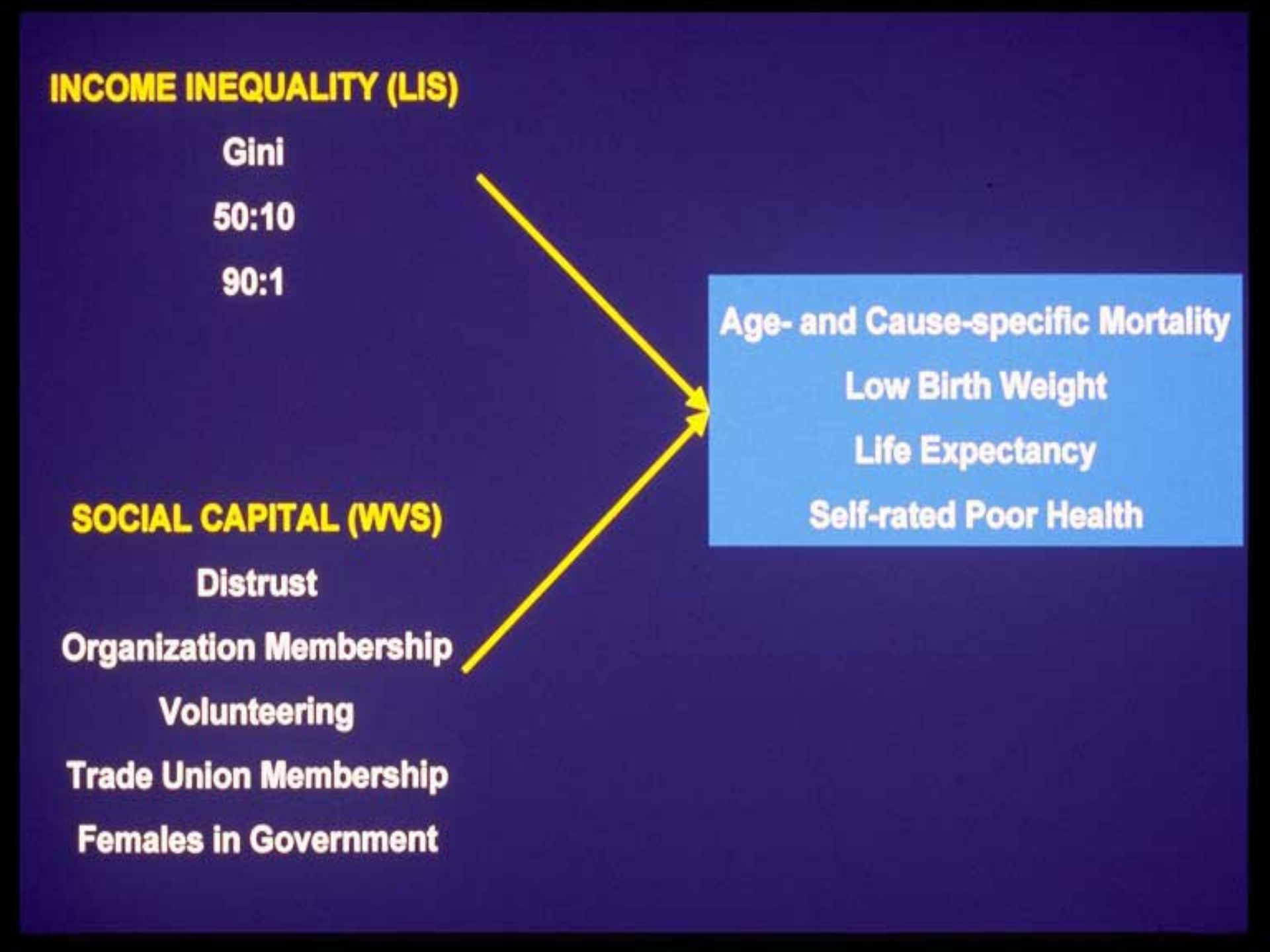
Lynch, Davey Smith, Hillemeier, Shaw, Raghunathan, Kaplan

Income inequality, psycho-social environment and health: comparisons across wealthy nations

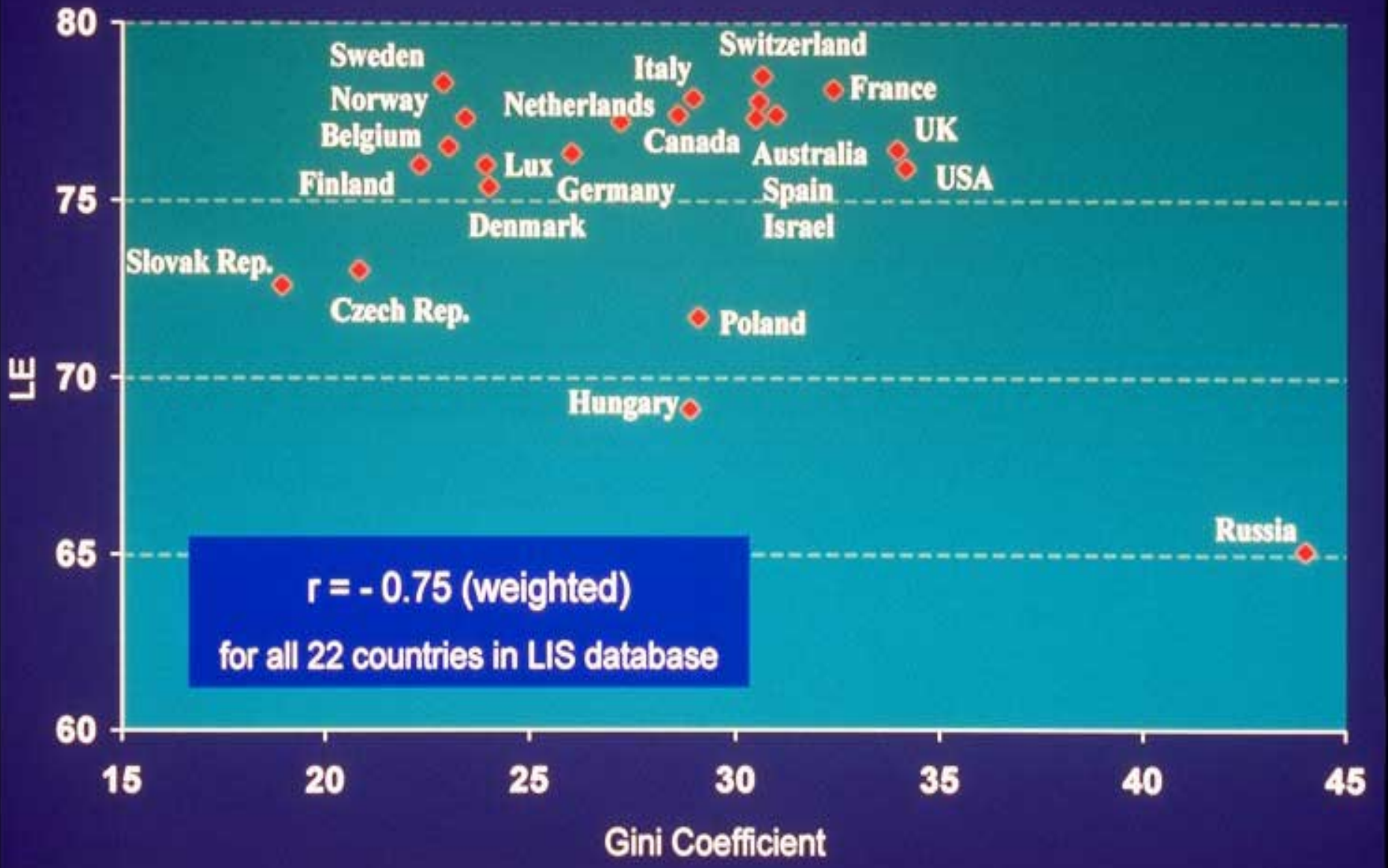
To be published in Lancet (2001)

Rationale for the study

- The results of Wilkinson's 1992 study continue to be cited as relatively undisputed "fact"
- Ideas about income inequality, relative deprivation and the attendant concepts of social cohesion and capital have been extremely influential in both research and policy, but how solid are the empirical foundations?


INCOME INEQUALITY (LIS)
Gini
50:10
90:1
SOCIAL CAPITAL (WVS)
Distrust
Organization Membership
Volunteering
Trade Union Membership
Females in Government
Age- and Cause-specific Mortality
Low Birth Weight
Life Expectancy
Self-rated Poor Health

Life Expectancy and Income Inequality (1991)



Data from Wave 3, LIS and WHOSIS (2000)

Life Expectancy and Income Inequality (1991)

Data from Wave 3, LIS and WHOSIS (2000)

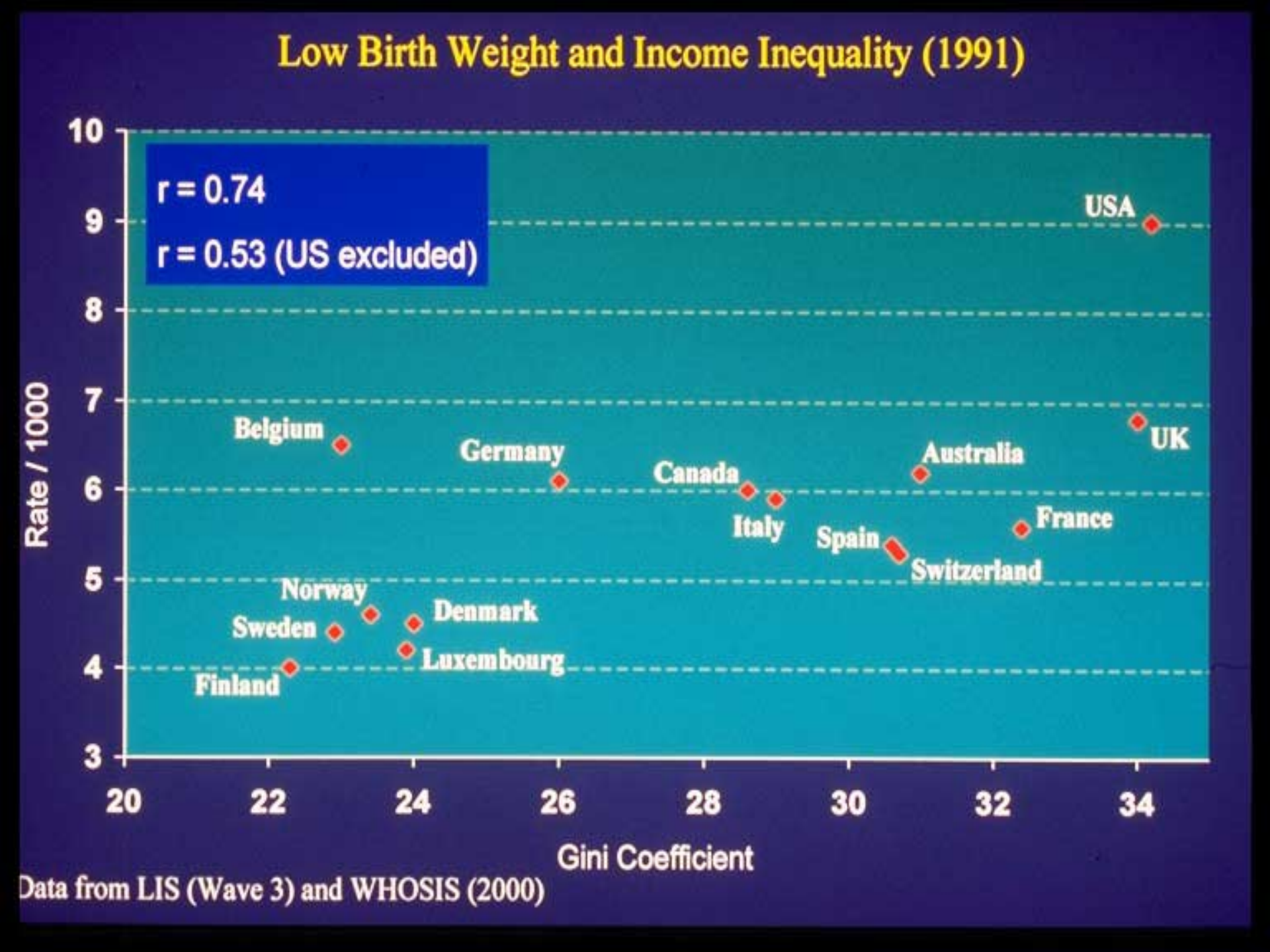
Income inequality and age-specific mortality (1991) – 16 countries

Age	Female	Male
0-1	0.69	0.74
1-14	0.53	0.60
15-44	0.46	0.45
45-64	0.35	0.09
65+	-0.41	-0.47
All ages	-0.28	-0.26

Income inequality and age-specific mortality (1991) – 16 countries*

Age	Female		Male	
0-1	0.69	0.26	0.74	0.41
1-14	0.53	-0.07	0.60	0.04
15-44	0.46	-0.13	0.45	-0.16
45-64	0.35	0.18	0.09	-0.19
65+	-0.41	-0.34	-0.47	-0.28
All ages	-0.28	-0.27	-0.26	-0.33

*USA excluded


Low Birth Weight and Income Inequality (1991)
r = 0.74
r = 0.53 (US excluded)
USA
UK
Belgium
Germany
Canada
Australia
Italy
France
Spain
Switzerland
Norway
Denmark
Sweden
Luxembourg
Finland
Rate / 1000
10
9
8
7
6
5
4
3
20
22
24
26
28
30
32
34
Gini Coefficient
Data from LIS (Wave 3) and WHOSIS (2000)

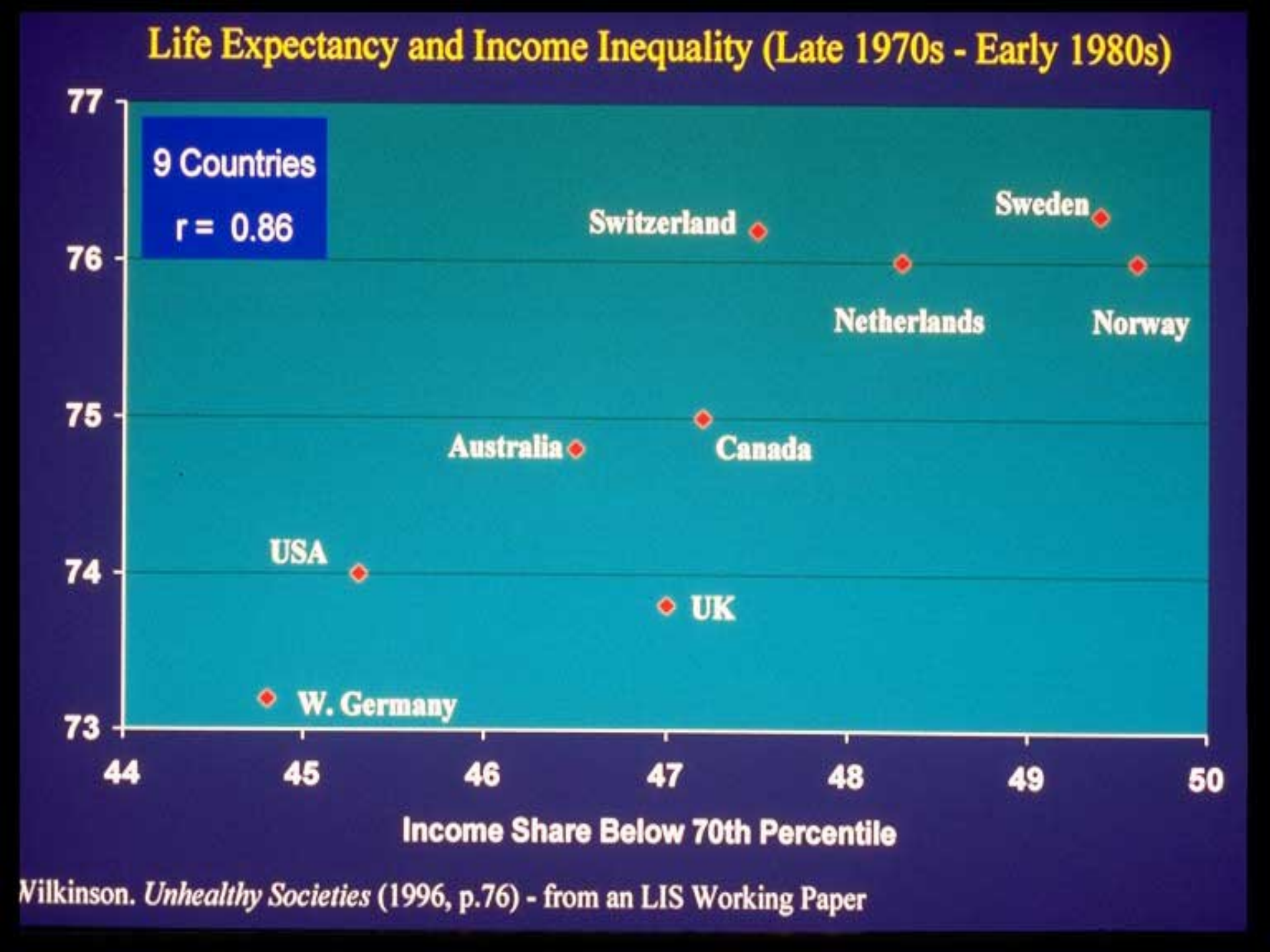
Income inequality and cause-specific mortality (1991) – 16 countries

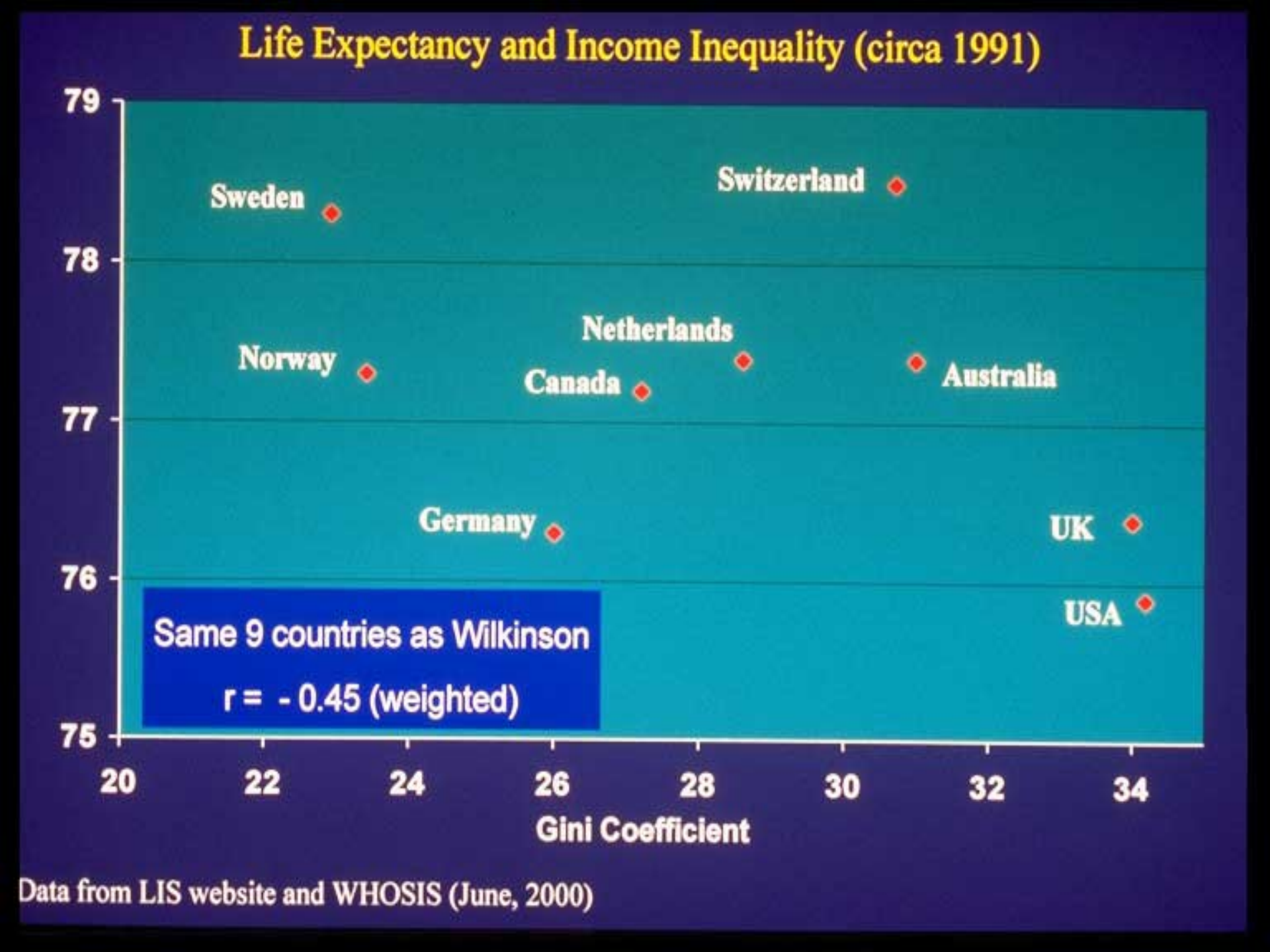
	Female	Male
CHD	0.03	-0.04
Stroke	-0.46	-0.56
Lung Cancer	0.65	0.21
Breast Cancer	0.04	
Prostate Cancer		-0.16
Diabetes	-0.21	-0.05
Infections	0.50	0.47
COPD	0.63	0.12

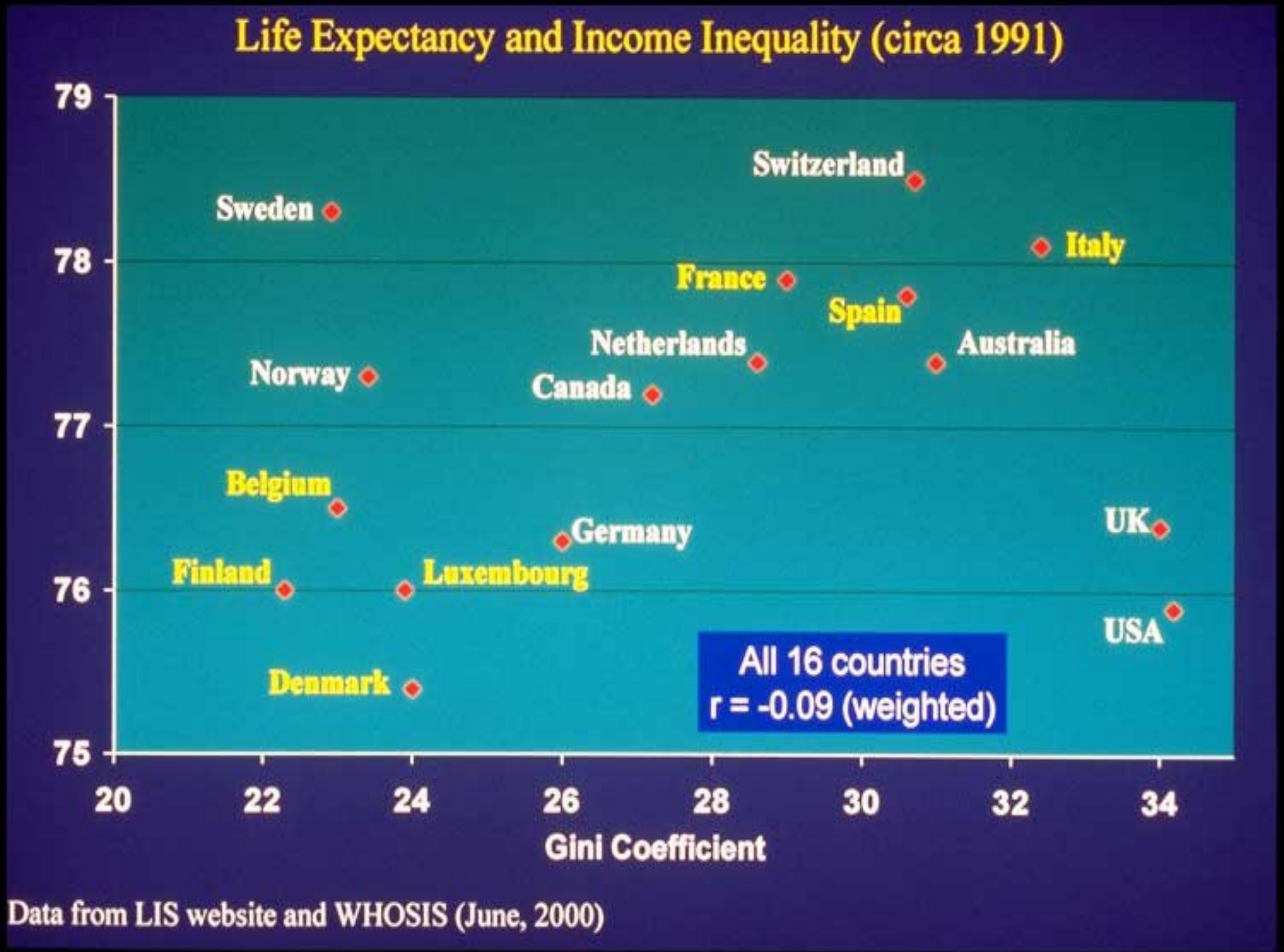
Income inequality and cause-specific mortality (1991) – 16 countries

	Female	Male
Cirrhosis	-0.31	-0.32
Unintentional		
<1	0.48	0.46
1-14	0.35	0.34
15-44	0.44	0.34
45-64	0.23	0.07
65+	-0.35	-0.20
Suicide	-0.49	-0.28
Homicide	0.66	0.65

Why are these results so different from Wilkinson's (1992) study?

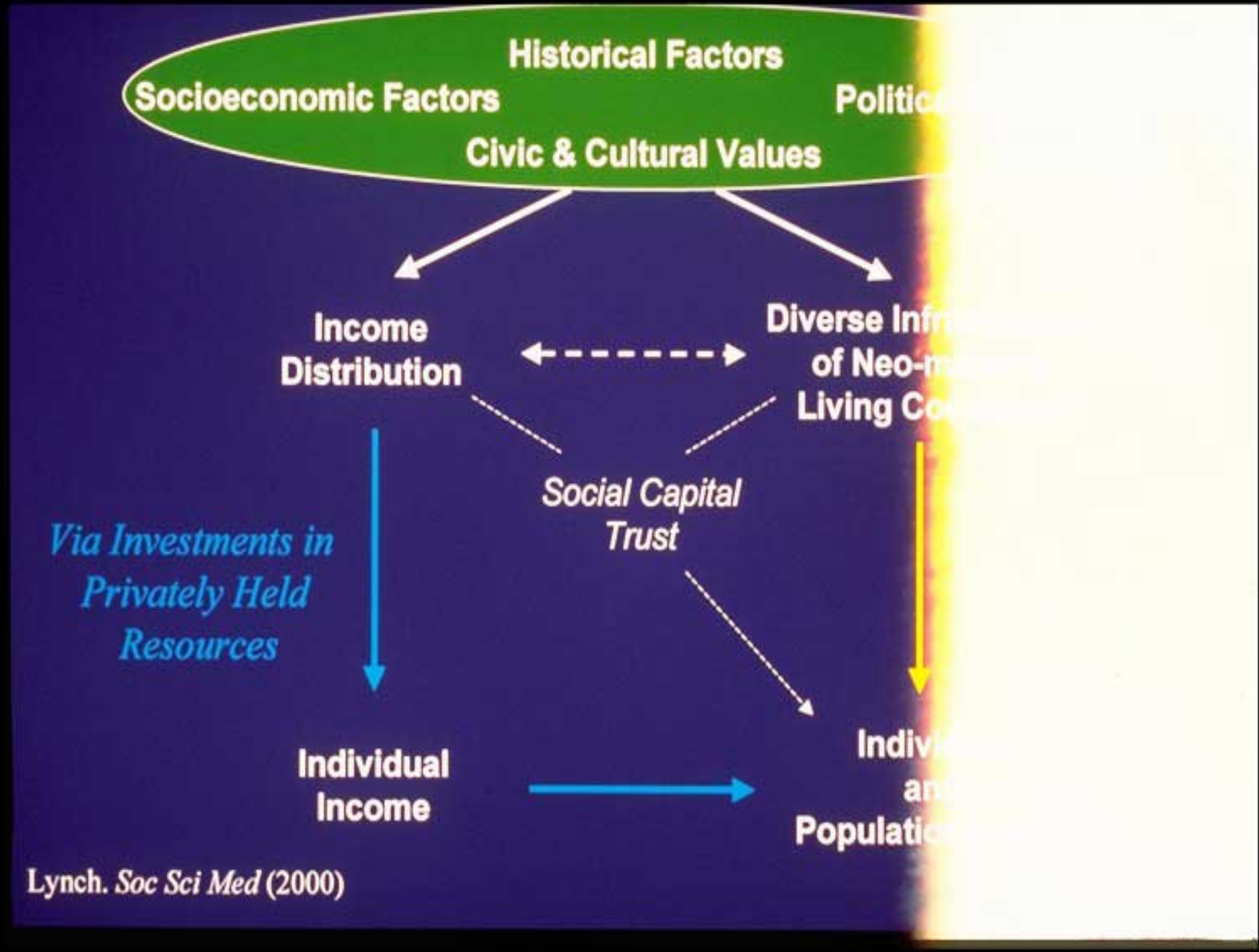

Life Expectancy and Income Inequality (Late 1970s - Early 1980s)
9 Countries
r = 0.86
77
76
75
74
73
Switzerland
Sweden
Netherlands
Norway
Australia
Canada
USA
UK
W. Germany
44
45
46
47
48
49
50
Income Share Below 70th Percentile
Wilkinson. Unhealthy Societies (1996, p.76) - from an LIS Working Paper


Life Expectancy and Income Inequality (circa 1991)
79
78
77
76
75
Sweden
Switzerland
Netherlands
Norway
Canada
Australia
Germany
UK
USA
Same 9 countries as Wilkinson
r = - 0.45 (weighted)
20
22
24
26
28
30
32
34
Gini Coefficient
Data from LIS website and WHOSIS (June, 2000)


Life Expectancy and Income Inequality (circa 1991)
79
78
77
76
75
Switzerland
Sweden
Italy
France
Spain
Netherlands
Australia
Norway
Canada
Belgium
Germany
UK
Finland
Luxembourg
USA
Denmark
All 16 countries
r = -0.09 (weighted)
20
22
24
26
28
30
32
34
Gini Coefficient
Data from LIS website and WHOSIS (June, 2000)

Conclusions

- There appears to be no general association between income inequality and health across wealthy nations
- The original observations was an artefact of the data available in the early 1990s
- The US is increasingly appearing to e the exception rather than the rule in attempts to unravel associations between income inequality and health


Historical Factors
Socioeconomic Factors
Civic & Cultural Values
Income Distribution
Diverse Infr
of Neo-m
Living Co
Social Capital
Trust
Via Investments in Privately Held Resources
Individual Income
Indiv
an
Populati
Lynch. Soc Sci Med (2000)

Box 3.1: Critical periods of the life course

- Fetal development
- Birth
- Nutrition, growth and health in childhood
- Educational career
- Leaving parental home
- Entering labour market
- Establishing social and sexual relationships
- Job loss or insecurity
- Parenthood
- Episodes of illness
- Labour market exit
- Chronic sickness
- Loss of full independence

Source: Adapted from Bartly et al, 1997