Health and Wealth: the challenge of the gradient

Michael Marmot
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The Royal Swedish Academy of Sciences
May 29th 2007

- The gradient
- Poverty?
- Not inevitable
- Selection?
- Causal pathways
- Action

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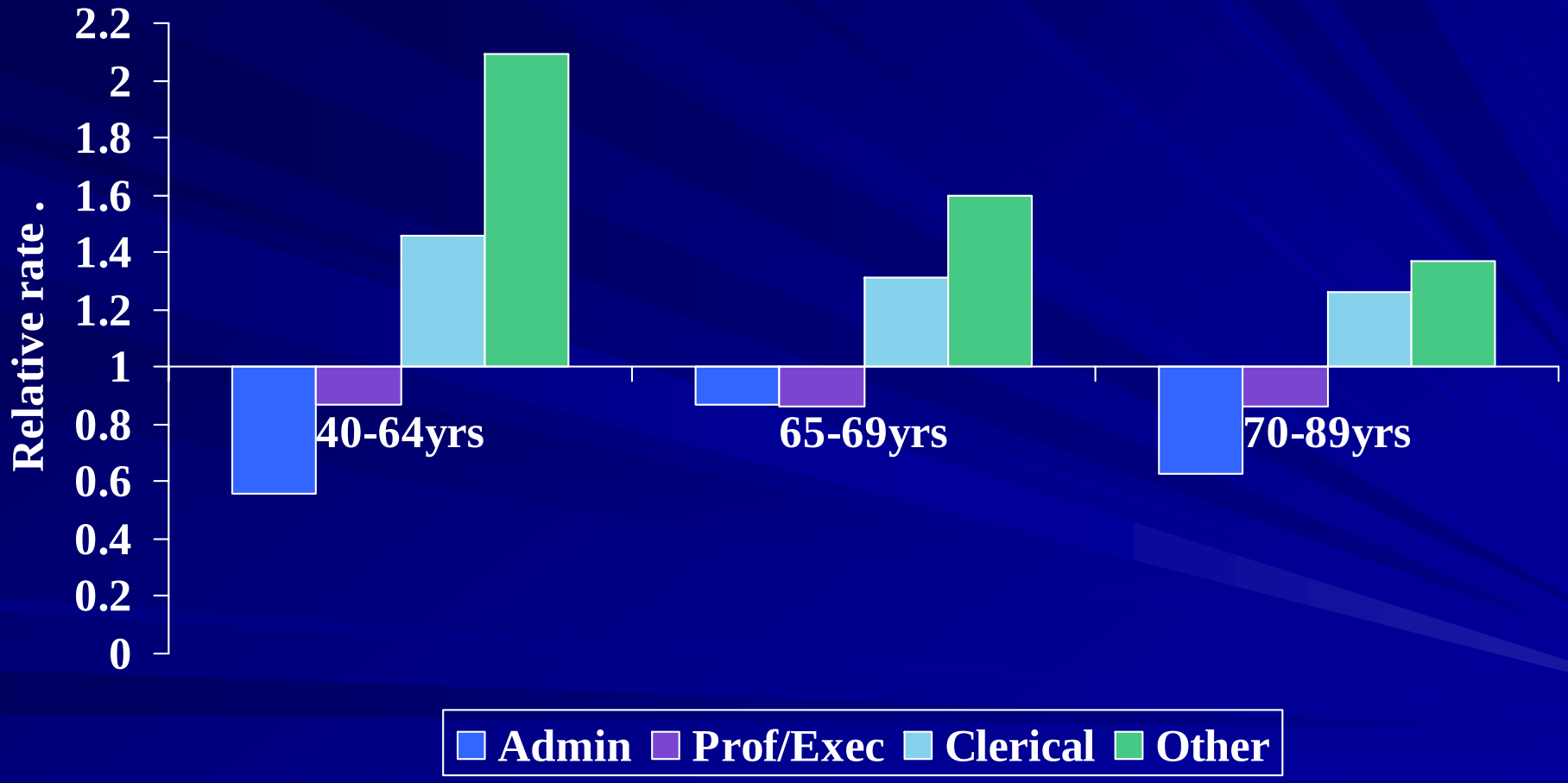
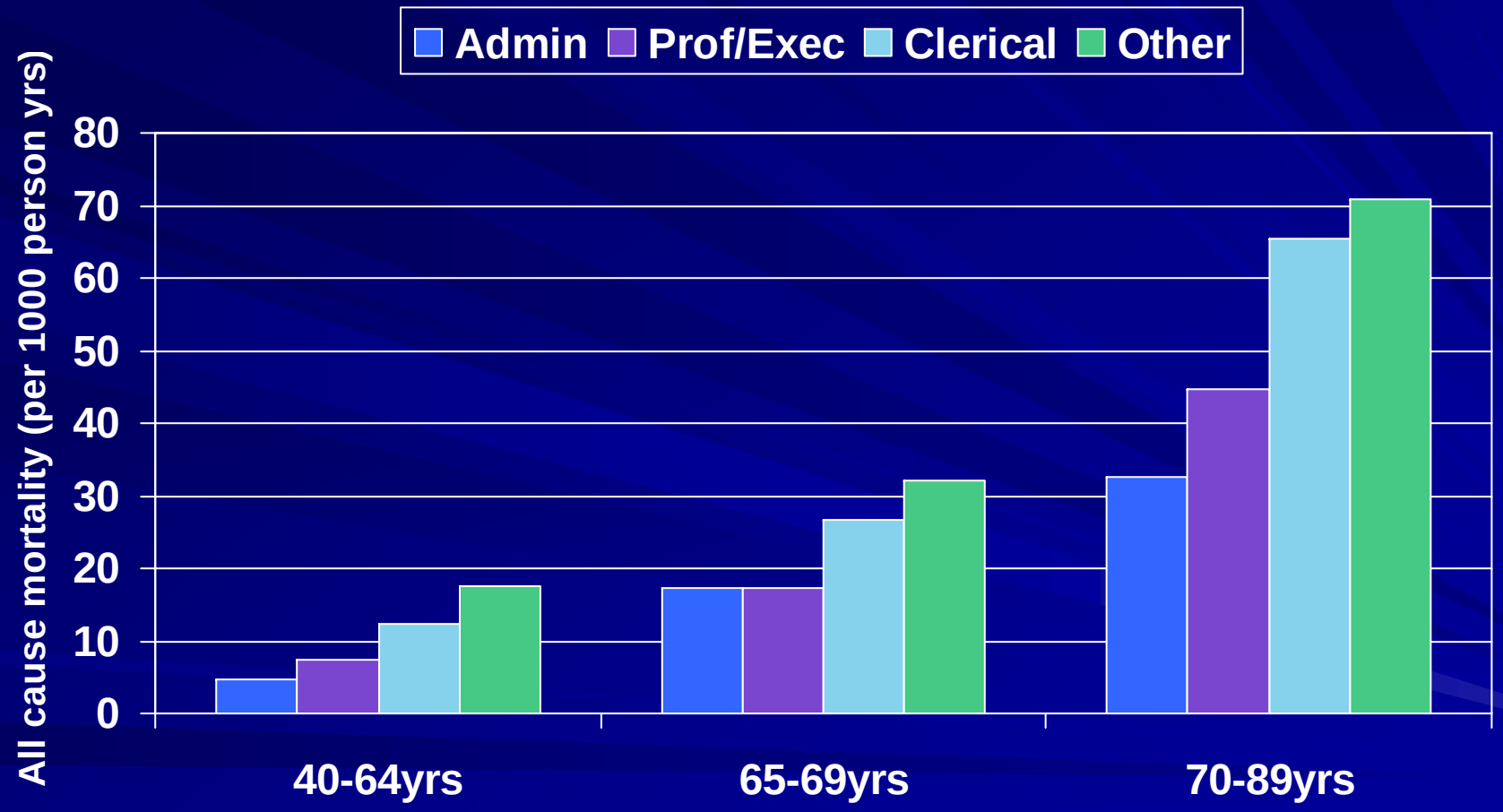
MORTALITY OVER 25 YEARS ACCORDING TO LEVEL IN THE OCCUPATIONAL HIERARCHY:WHITEHALL



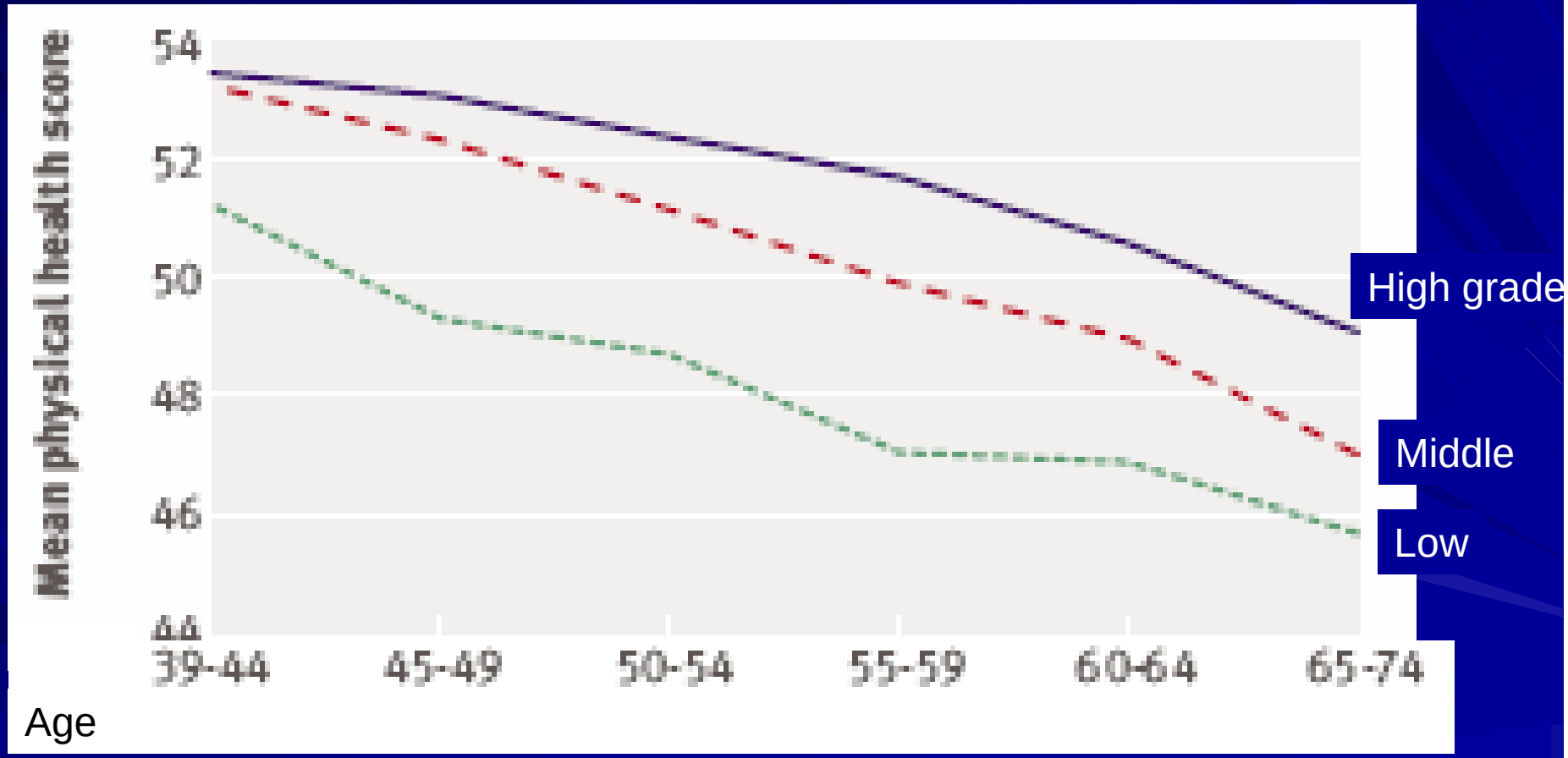
(Marmot & Shipley, 1996)

Mortality over 25 years according to level in the occupational hierarchy: Whitehall



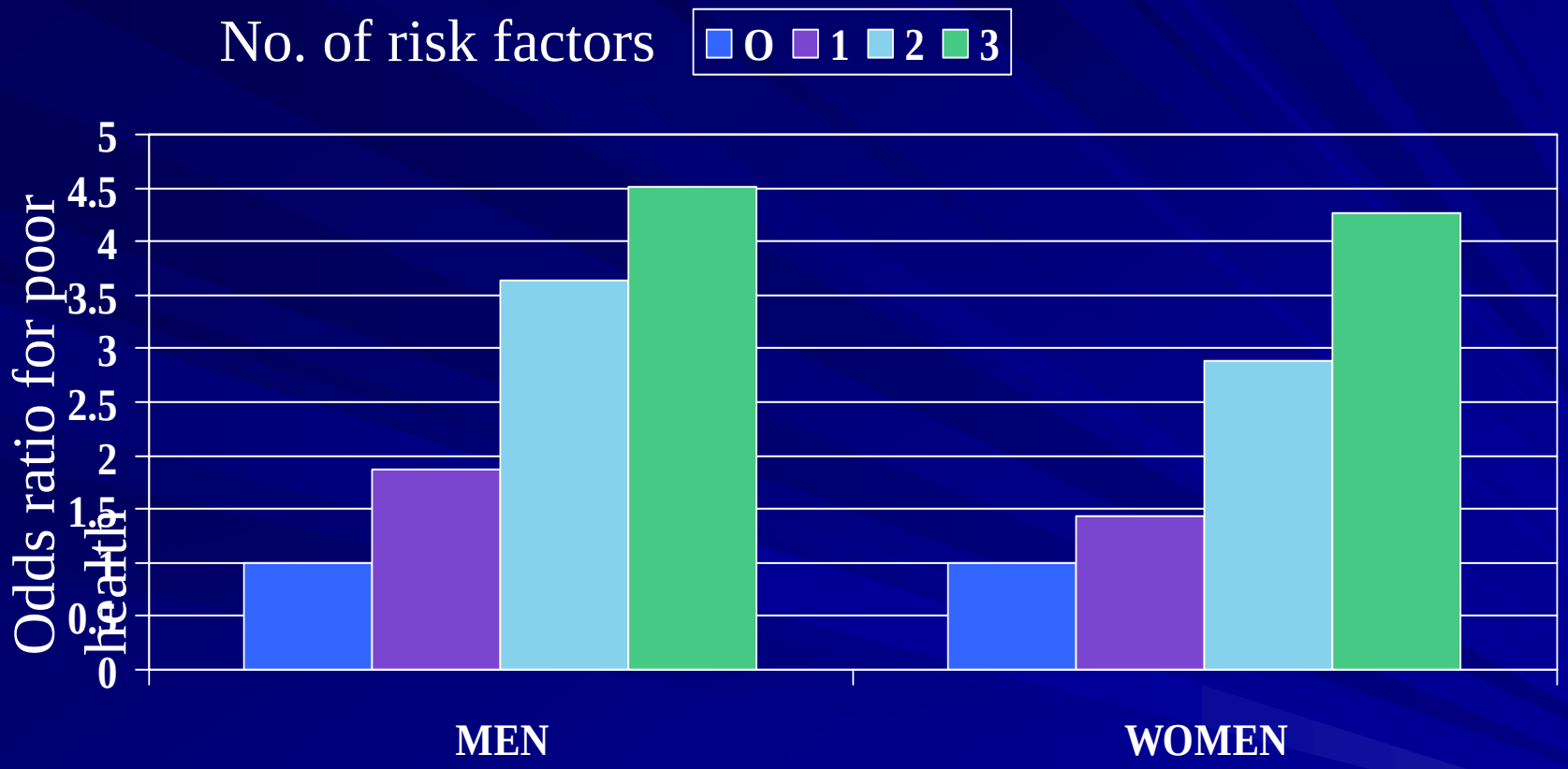
(Marmot & Shipley, BMJ, 1996)

Self-reported physical health in older people: WII study



Chandola et al 2007

Poor self-rated health at age 50+ and accumulation of socio-economic risk factors over life course in Russia

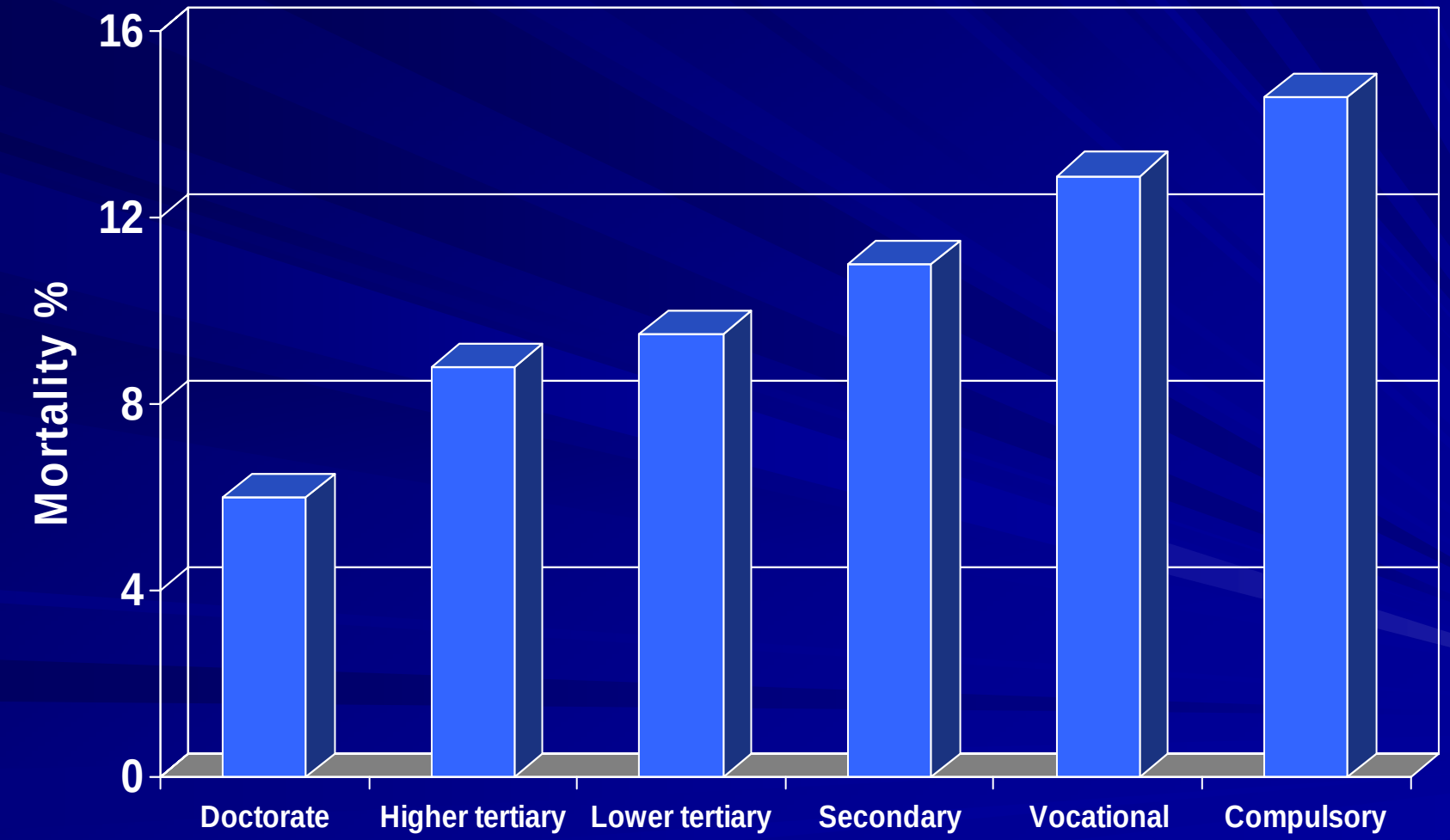


Risk factors:

- Ever hungry to bed aged 15 yr
- Elementary /vocational education
- Adult household income below median

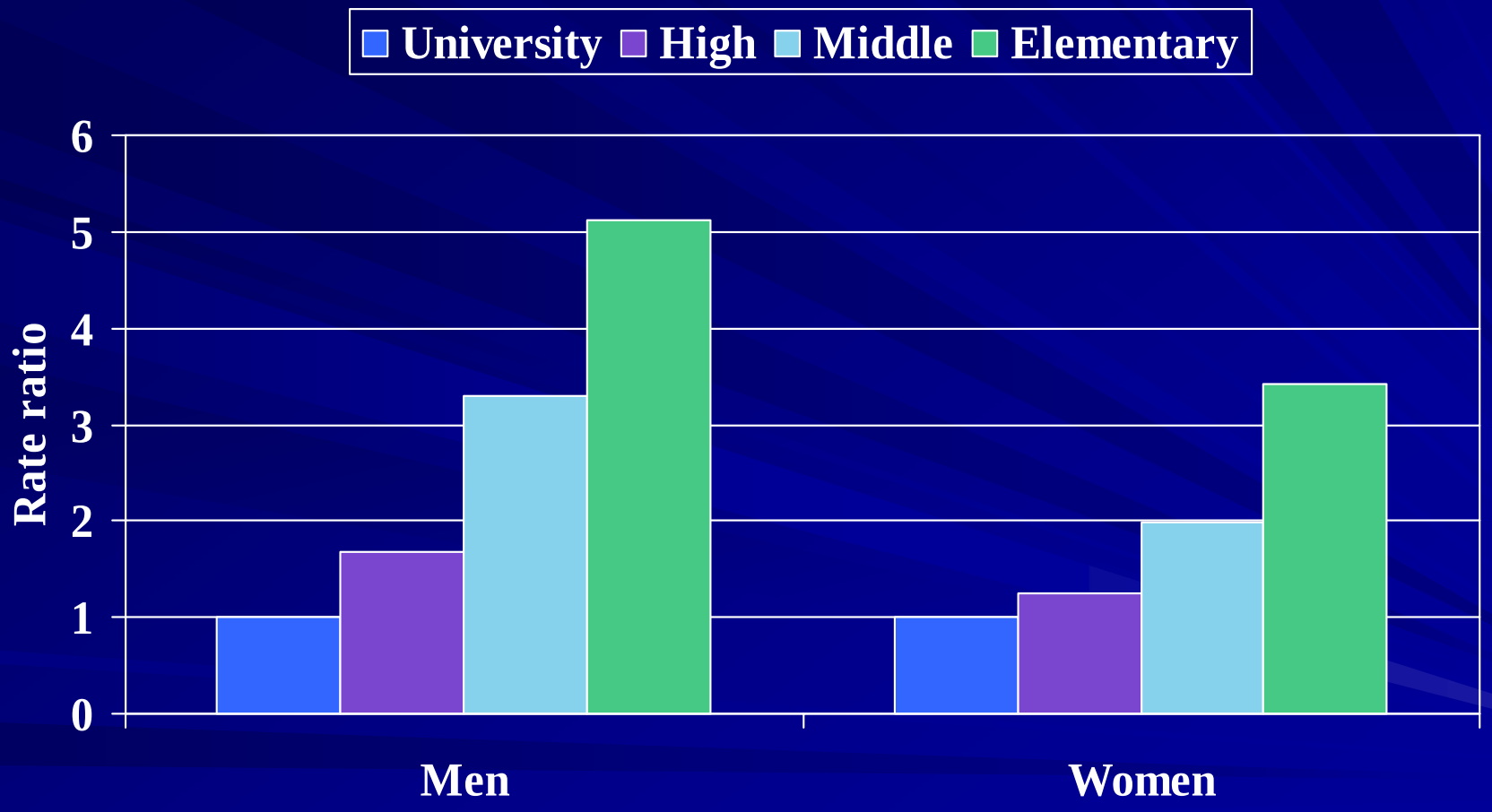
(Nicholson et al)

MEN AGED 64 IN 1990 WHO DIED UP TO 1996 BY EDUCATION SWEDISH NATIONAL SAMPLE



Erikson 2001

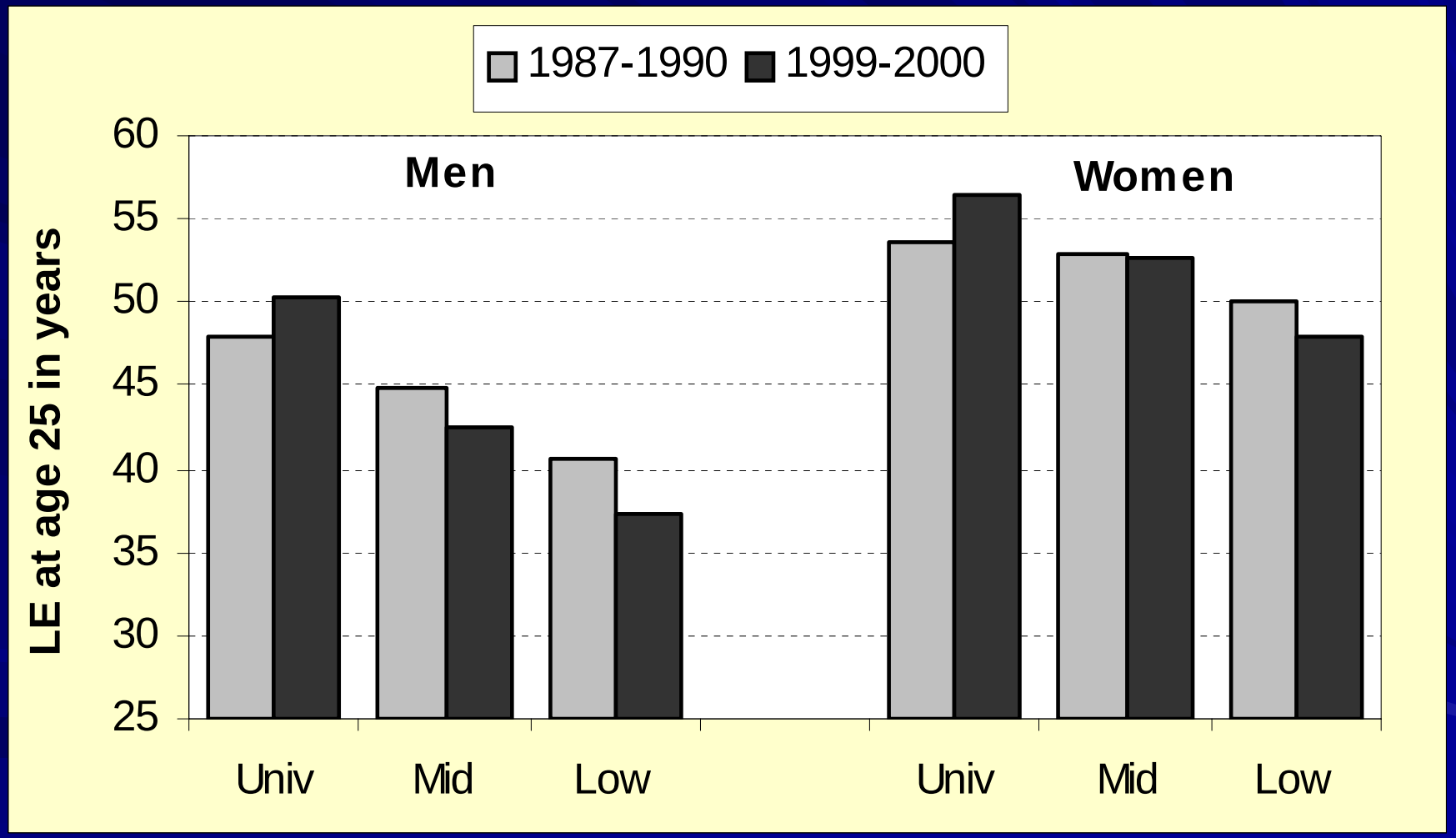
MORTALITY* AND EDUCATION, SOUTH KOREA



*Mortality in Korean working population aged 20-64, 1993-1997, adjusted for age
(Source: Son et al. JECH 56:798, 2002)

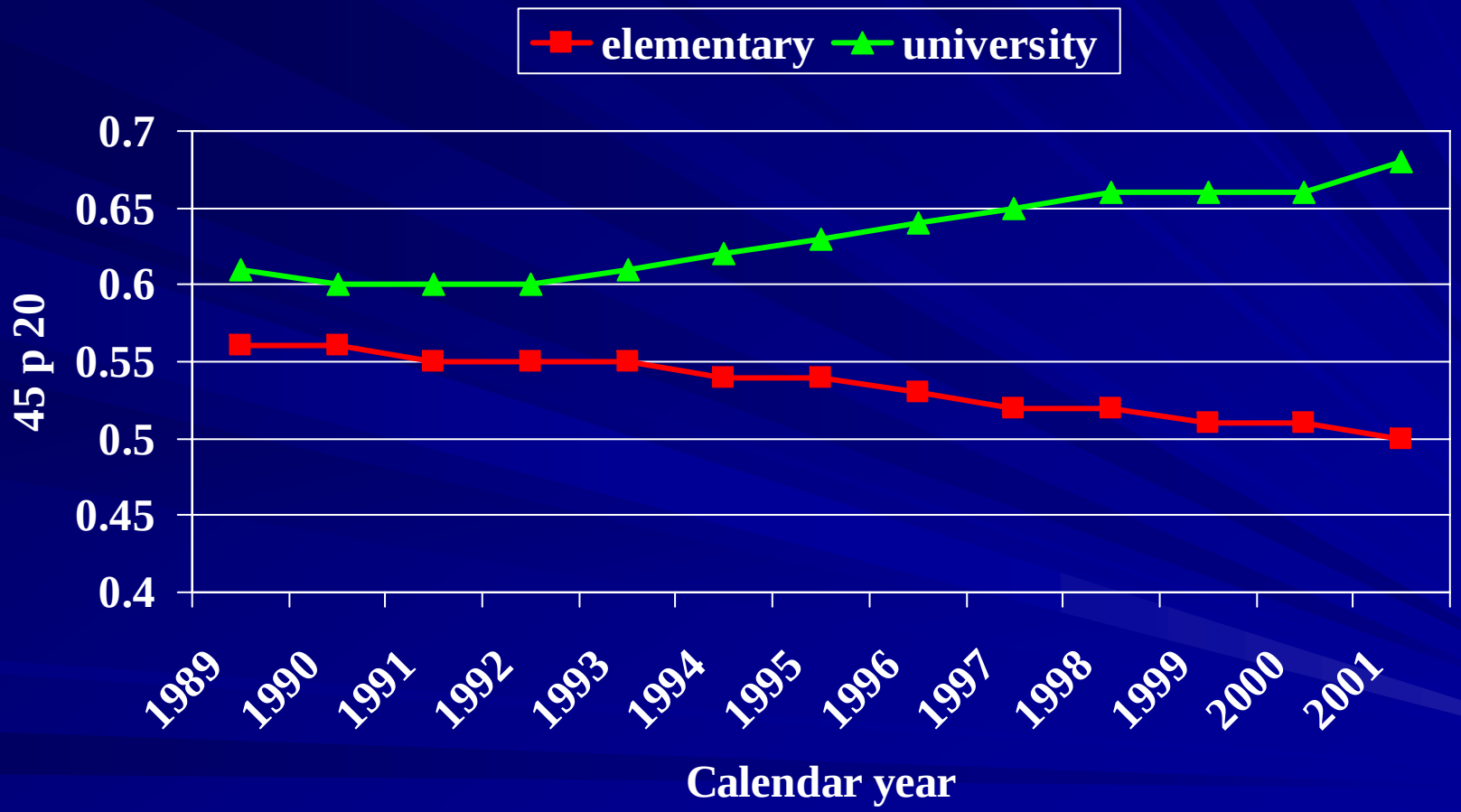
- Oscar winning actors and actresses lived an astonishing 4 years longer than their co-stars and the actors nominated who did not win. (Redelmeier & Singh)
- Winning the Oscar is like reducing your chance of dying from a heart attack from about average to zero.

Change in Life Expectancy at age 25 by Educational Level 1989-2000 in Estonia



(Leinsalu, Vagero & Kunst, Int J Epidemiol 2003)

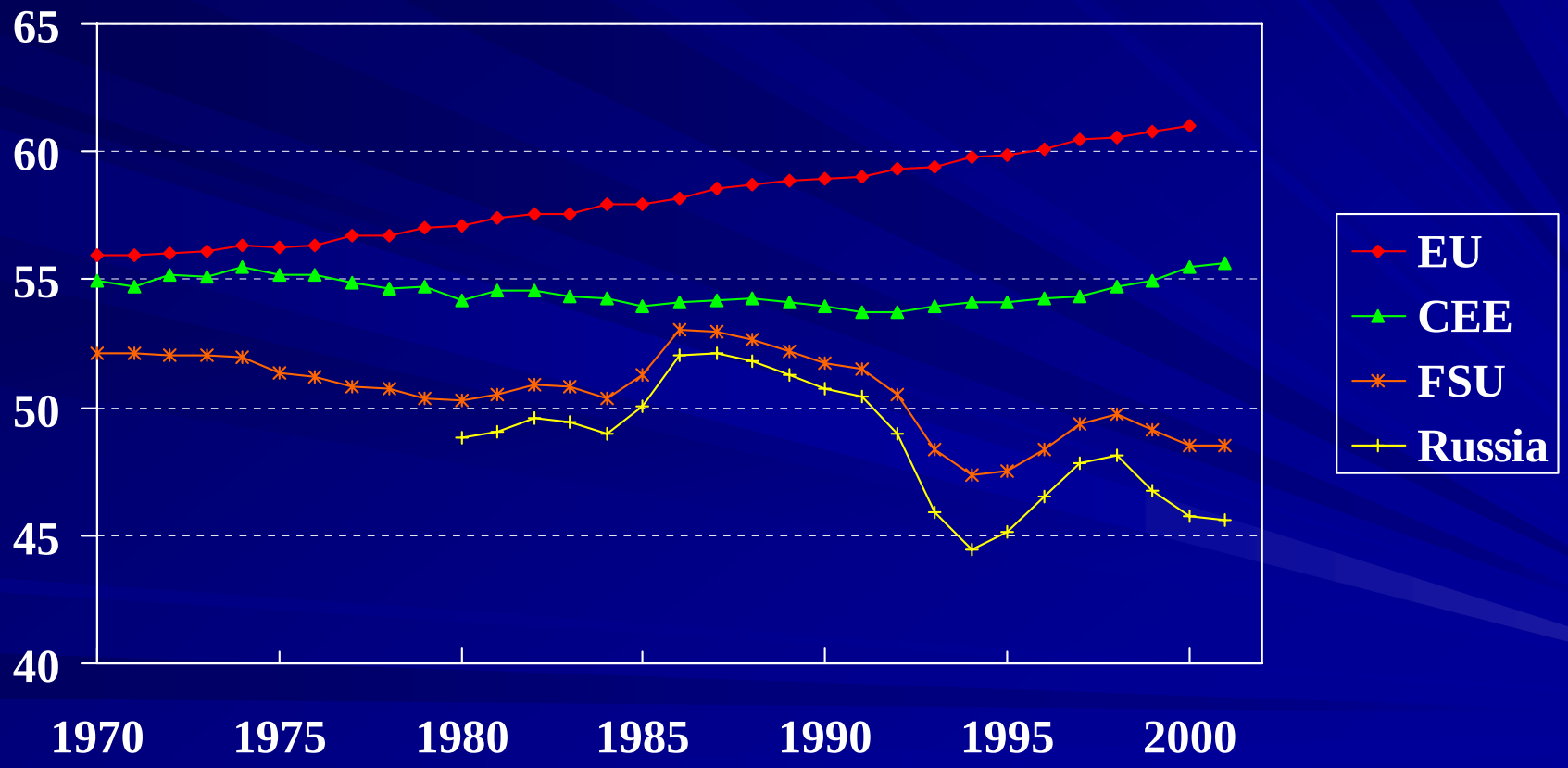
The widening trend in mortality by education in Russia, 1989-2001



45 p20 = probability of living to 65 yrs when aged 20 yrs

Source: Murphy et al, AJPH, 96, 1293-9, 2006

LIFE EXPECTANCY AT AGE 15 IN EUROPE, MEN, 1970-2001



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LIFE EXPECTANCY AT BIRTH

	MALE	FEMALE
INDIGENOUS AUSTRALIAN*	59.4	64.8
NON INDIGENOUS AUSTRALIAN*	76.6	82.0
INDIA**	61.8	65.0
RUSSIA**	59.0	72.1

(*http://www.hreoc.gov.au, Social Justice Report 2005;**Human Development report 2005)

INFANT MORTALITY/1000 LIVE BIRTHS

	INFANT MORTALITY PER 1000 LIVE BIRTHS
ABORIGINAL*	12.7
AUSTRALIAN	5.2
SIERRA LEONE	181
ICELAND	3

*Aboriginal and Torres Strait Islanders

GDP PER CAPITA AND LIFE EXPECTANCY: SELECTED COUNTRIES

	GDP PER CAPITA (PPP US$)	LIFE EXPECTANCY AT BIRTH (MALES)
SRI LANKA	3,778	68
COSTA RICA	9,606	75
RUSSIA	9,230	58
CHILE	10,274	74

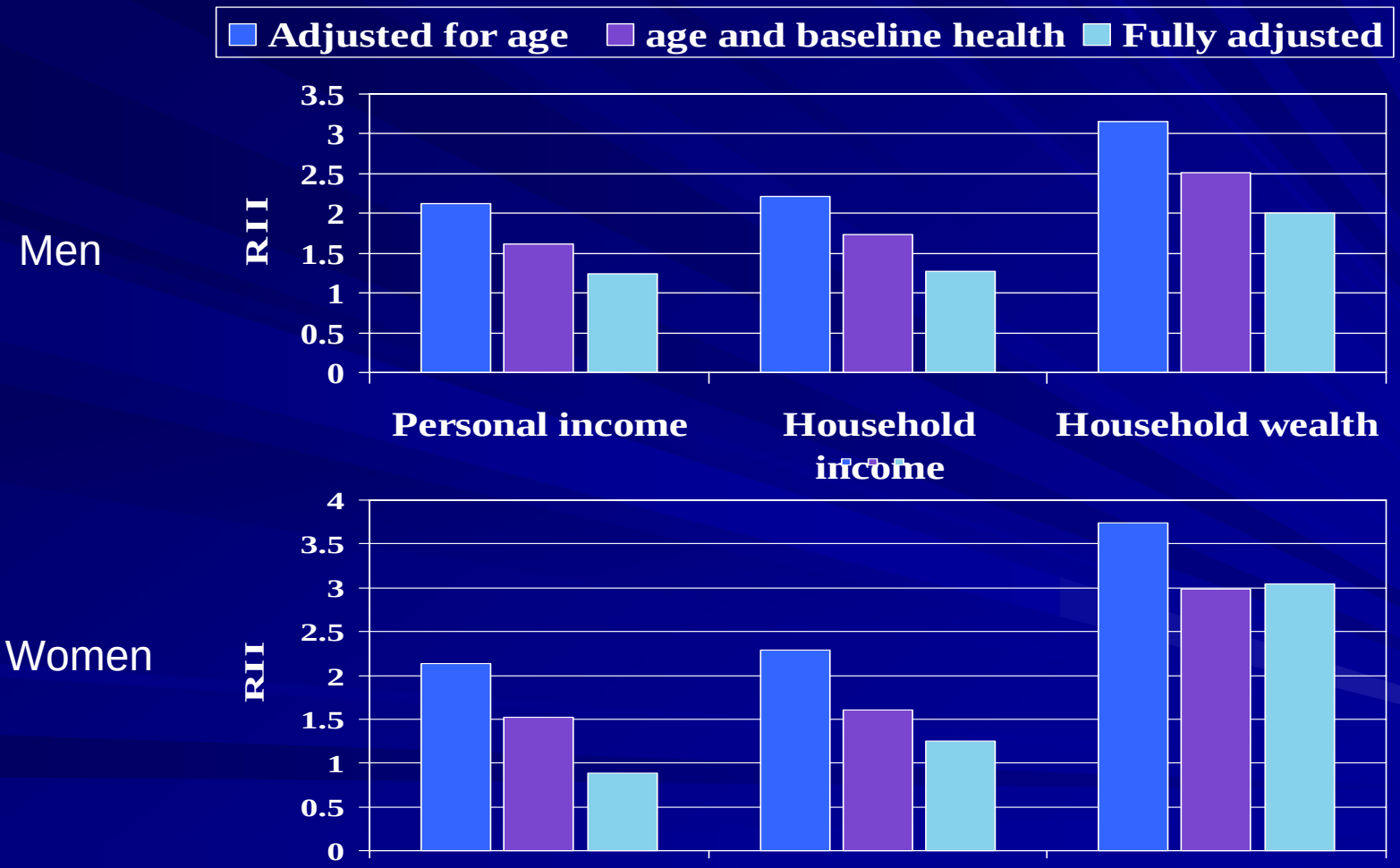
Source: Human Development Report 2005 and World Health Report 2005

Life expectancy and GDP per capita in $US (PPP) in 2004

	LE at birth	GDP
Japan	82.2	29,251
Switzerland	80.7	33,040
Sweden	80.3	29,541
Spain	79.7	25,047
France	79.6	29,300
UK	78.3	30,821
Greece	78.3	22,205
Costa Rica	78.3	9,481
Chile	78.1	10,874
Cuba	77.6	5,700
US	77.5	39,676

(Human Development Report 2006)

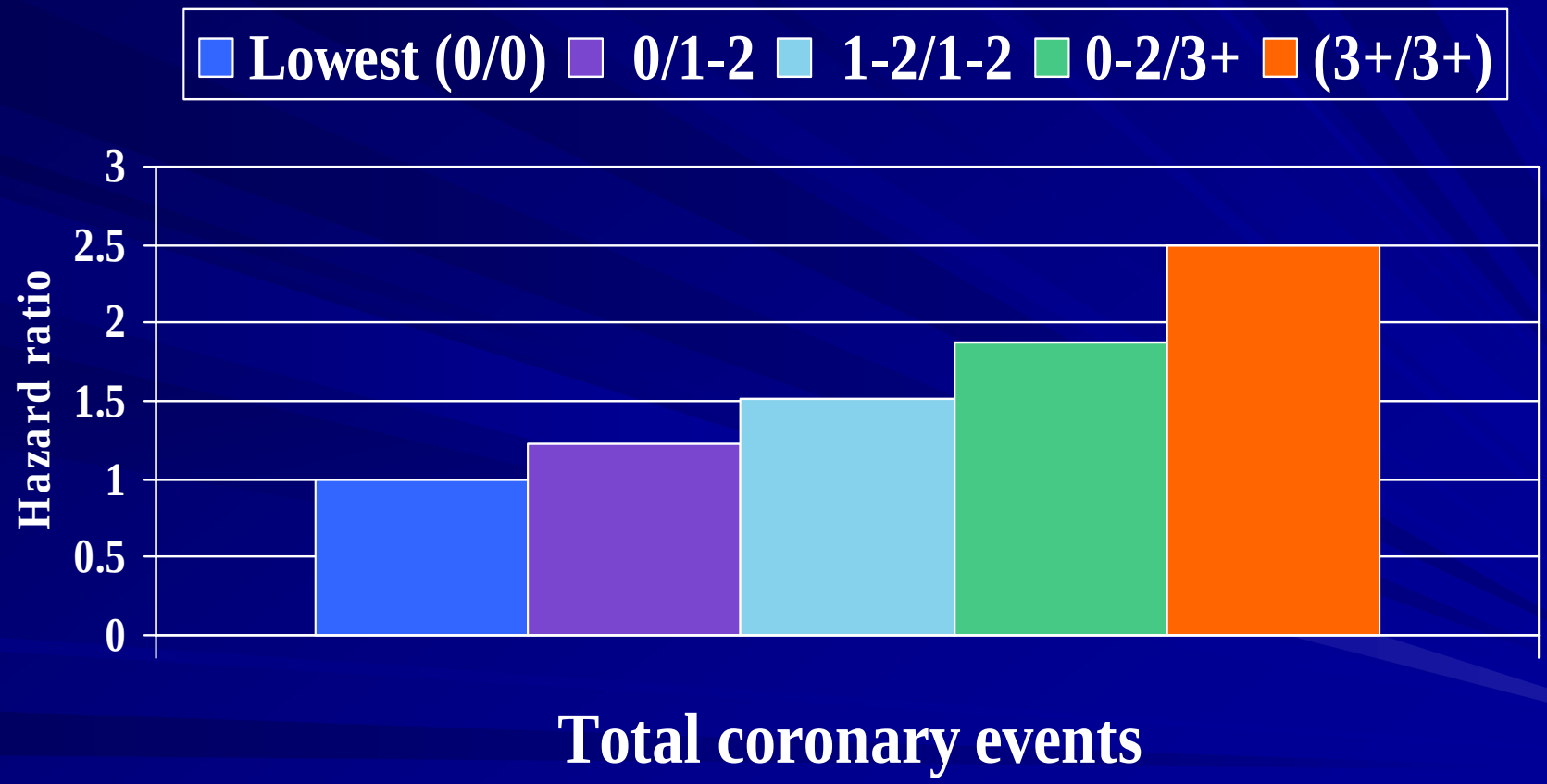
Changes in RII for income and wealth on ***poor self-rated health*** among men and women after adjustments: WII



Martikainen et al, 2003

Coronary events by economic difficulties: WII

(adjusted for age)



Relative hazard ratio between the bottom and the top hierarchies	**2.8 (1.9-2.4)**	**P-value for RII**	**< 0.001**

Ferrie et al, 2005

Hazard ratios for RII for economic difficulties and coronary events after adjustments

Adjustments	Total coronary events
Age	2.80 (1.9-4.2)
Model 1: age + SES measures	2.67 (1.7-4.1)
Model 2: model 1 + early life factors	2.70 (1.8-4.1)
Model 2 + psychosocial work characteristics	2.56 (1.7-3.9)
Model 2 + health-related behaviours	2.60 (1.7-4.0)
Model 2 + biological factors	2.42 (1.6-3.7)
All	2.28 (1.5-3.5)

Ferrie et al, 2005

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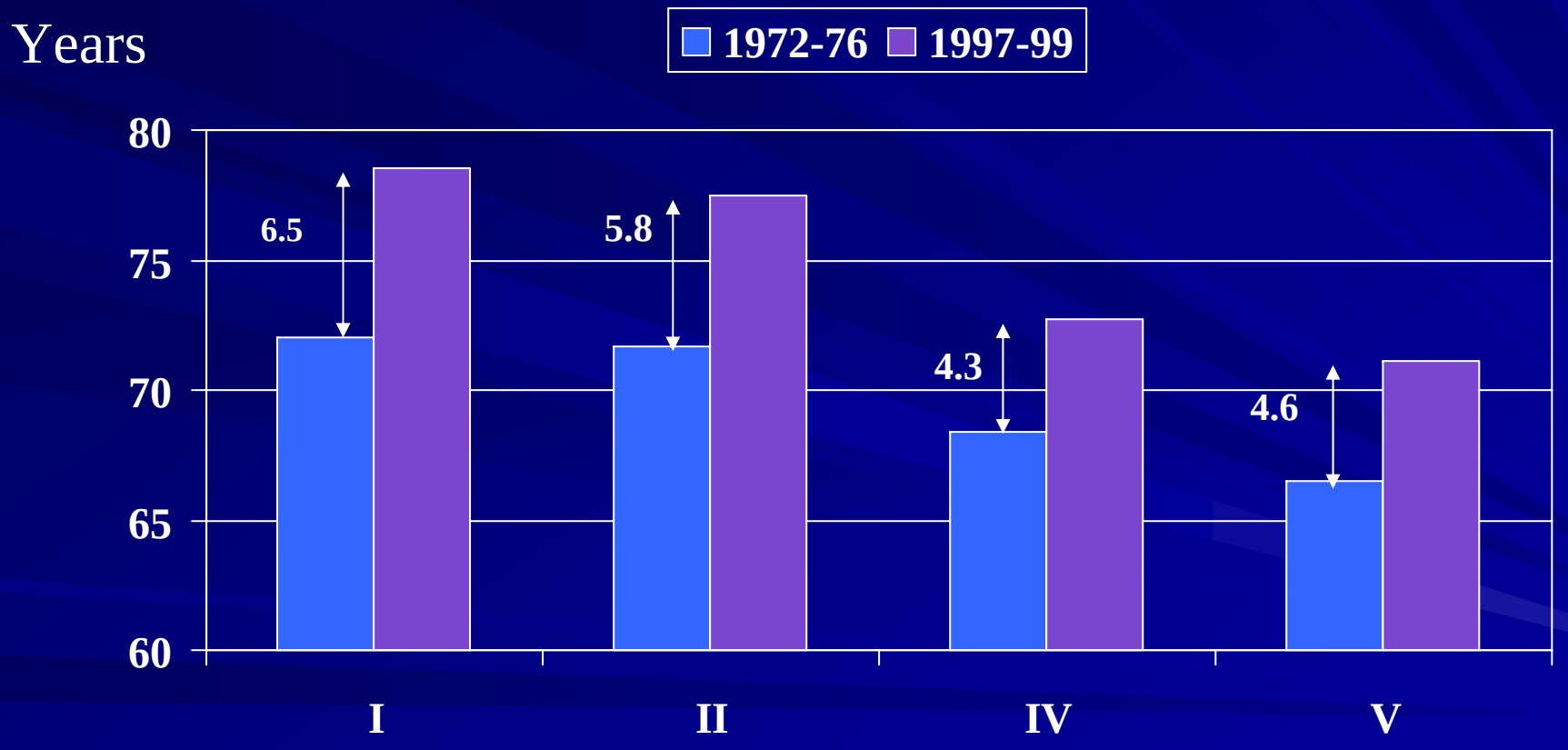
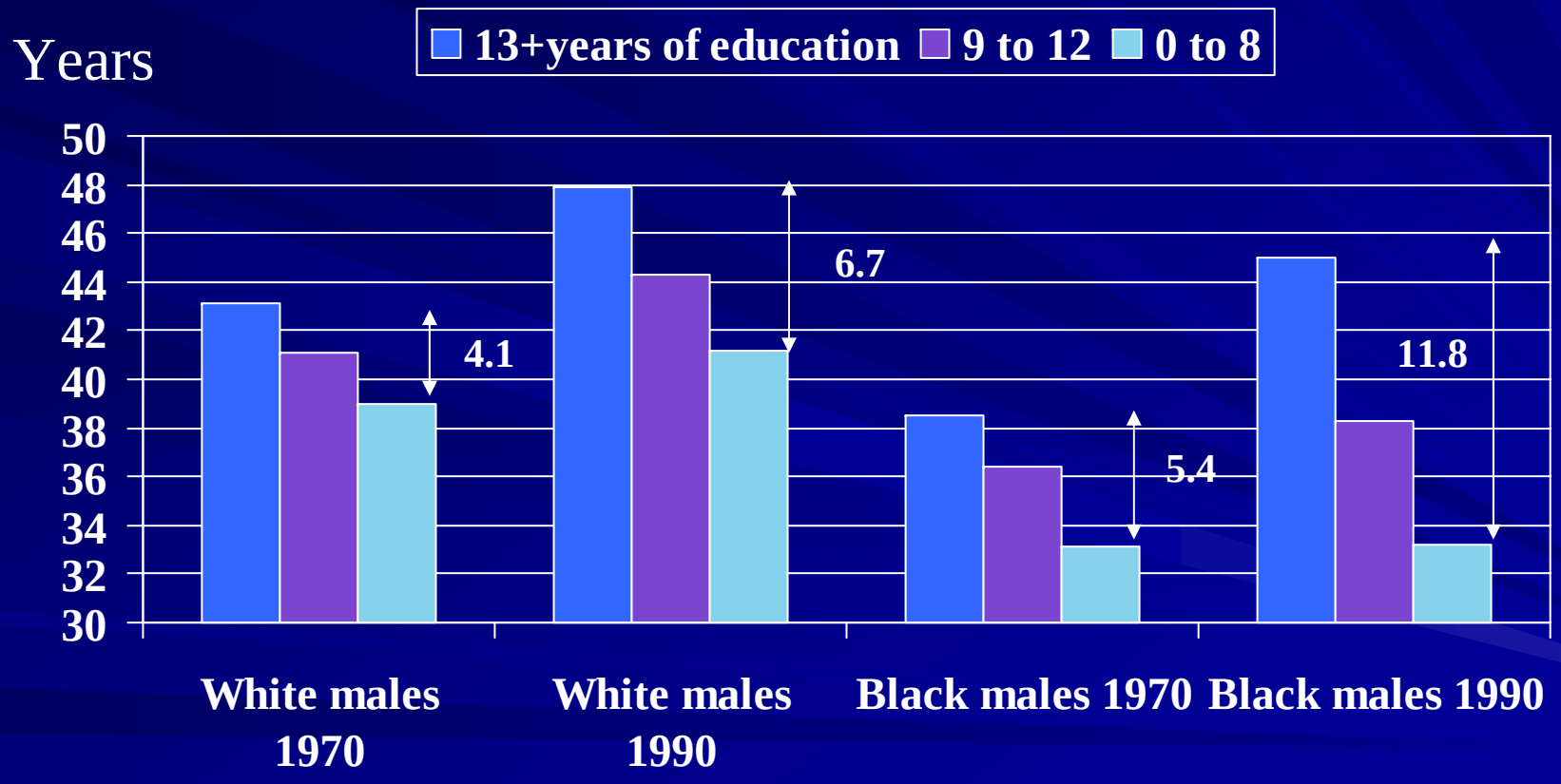
Life expectancy at birth for men by social class in England and Wales



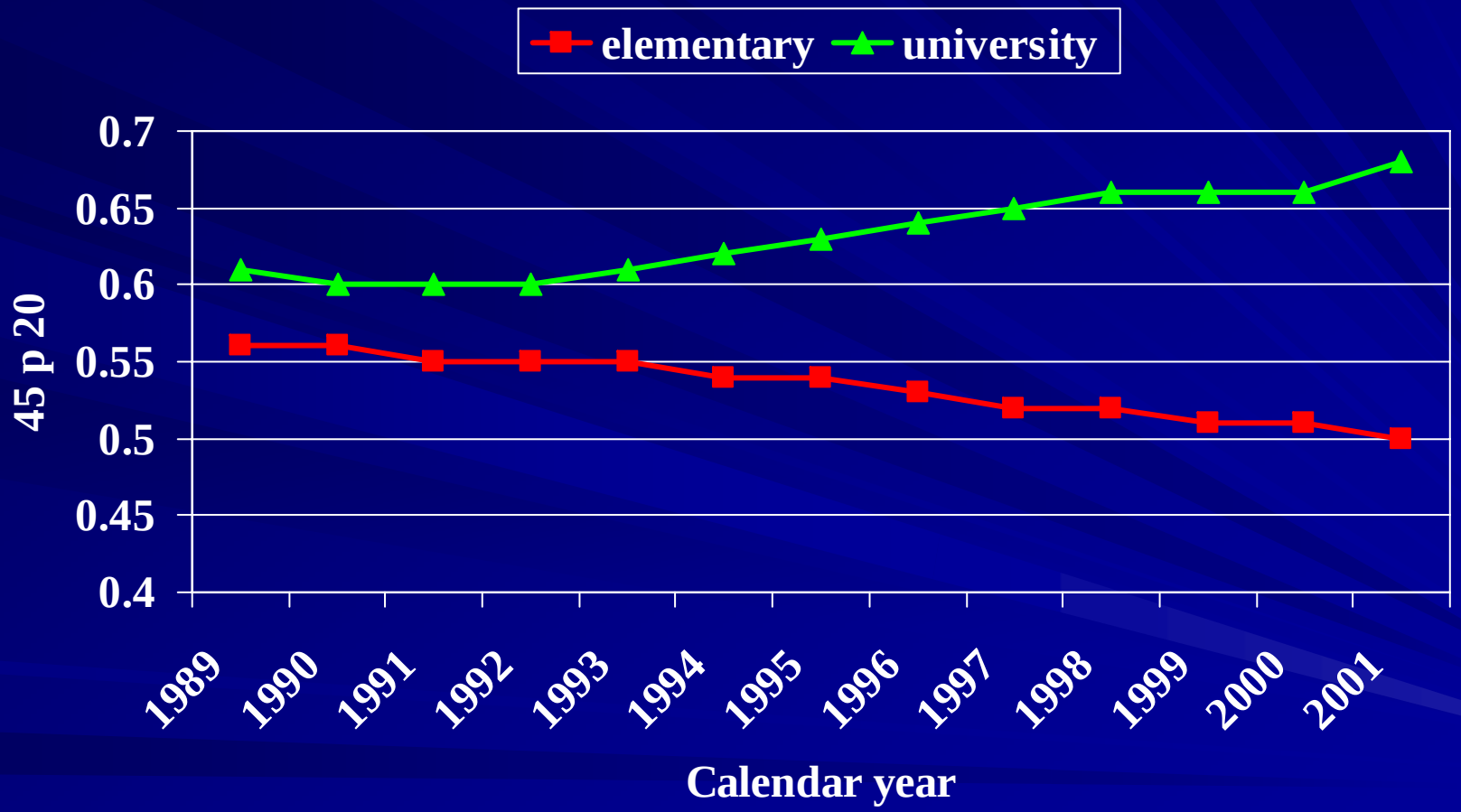
Source: Donkin, Goldblatt, and Lynch 2002

Life expectancy at age 30 by education for men in the US



Source: Crimmins and Saito 2001

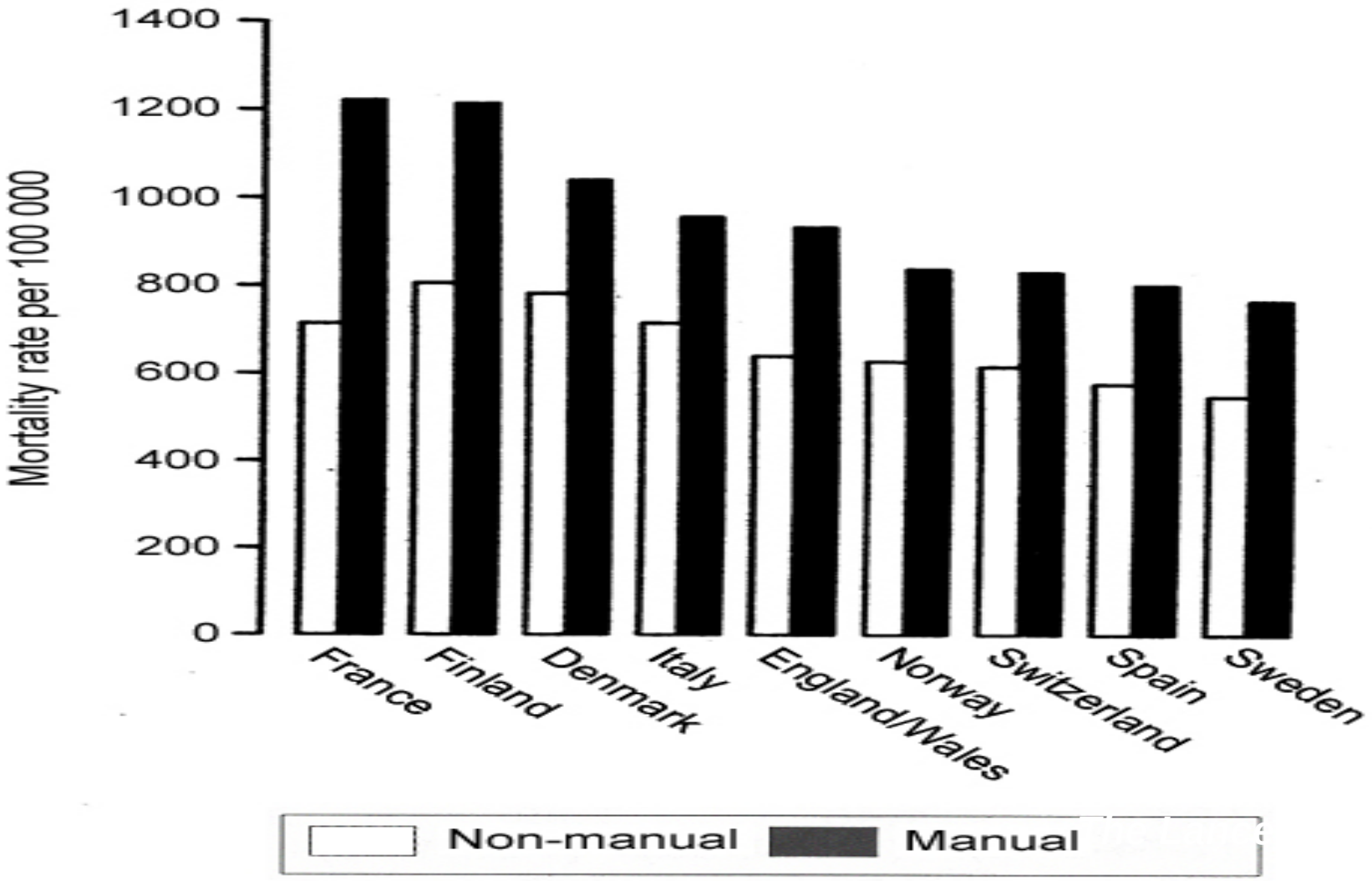
The widening trend in mortality by education in Russia, 1989-2001



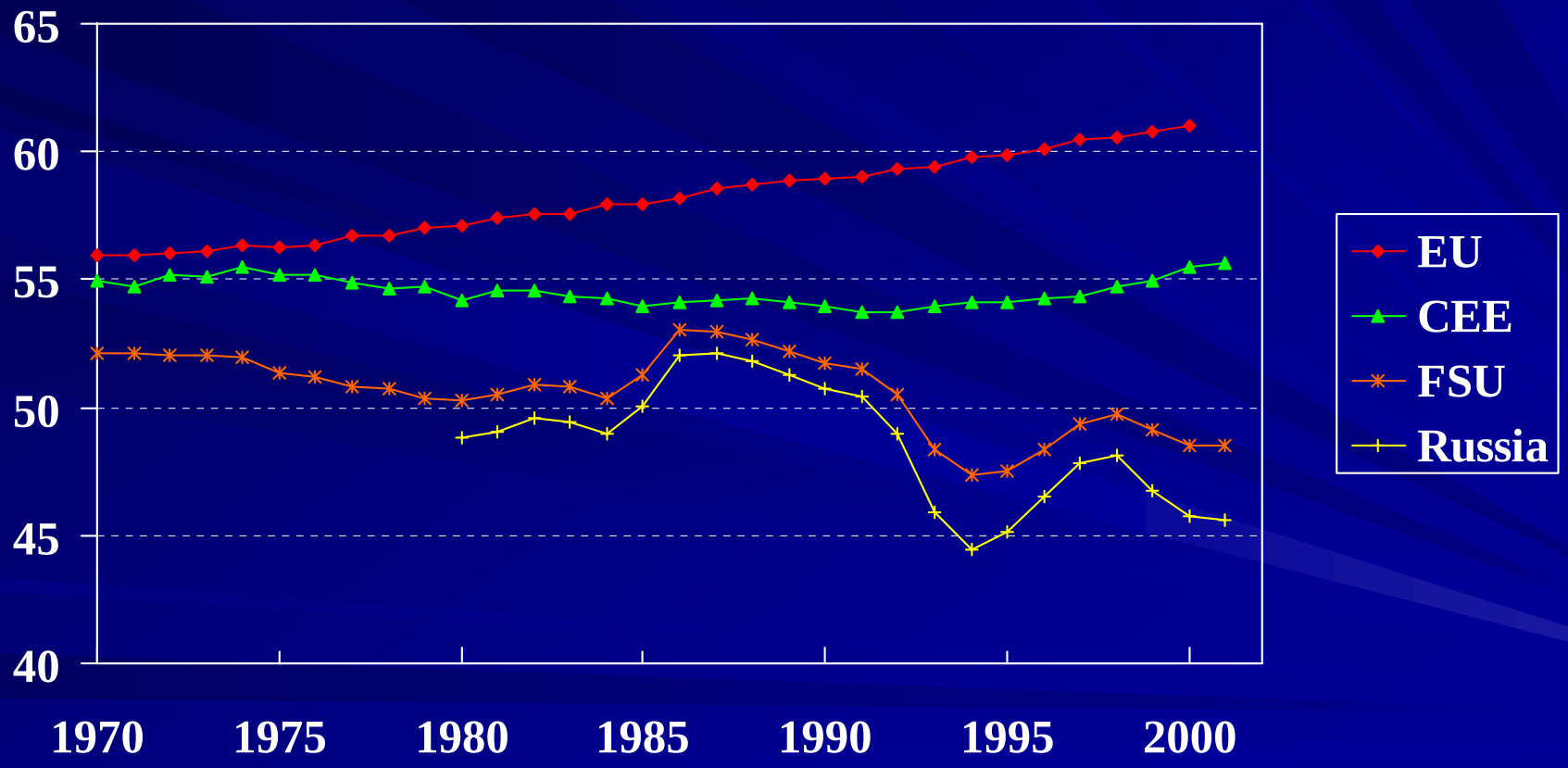
45 p20 = probability of living to 65 yrs when aged 20 yrs

Source: Murphy et al, AJPH, 96, 1293-9, 2006

Mortality for non-manual and manual workers in nine European countries
Ranked by absolute level of mortality of manual workes; age groups 45-59



LIFE EXPECTANCY AT AGE 15 IN EUROPE, MEN, 1970-2001



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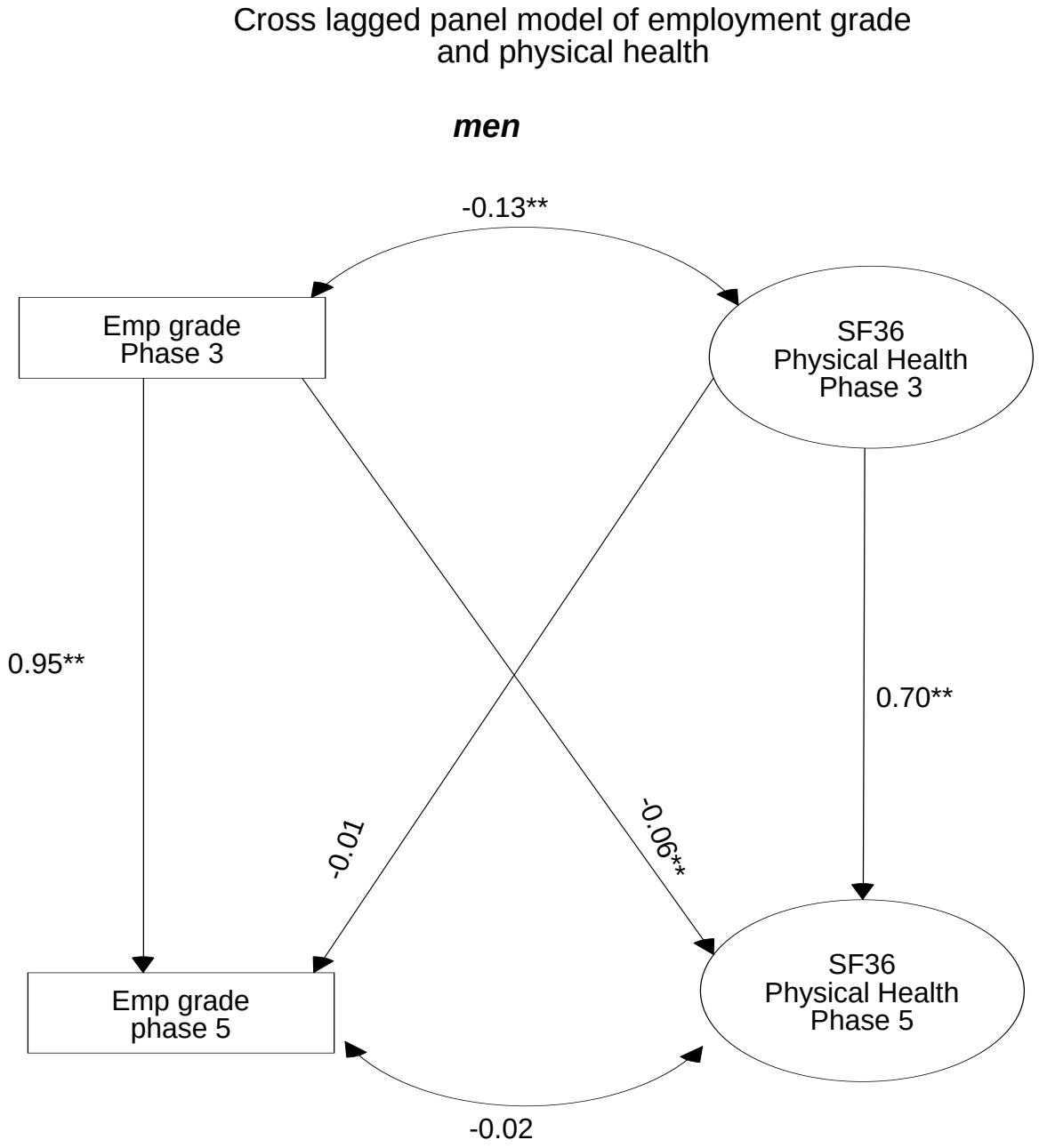
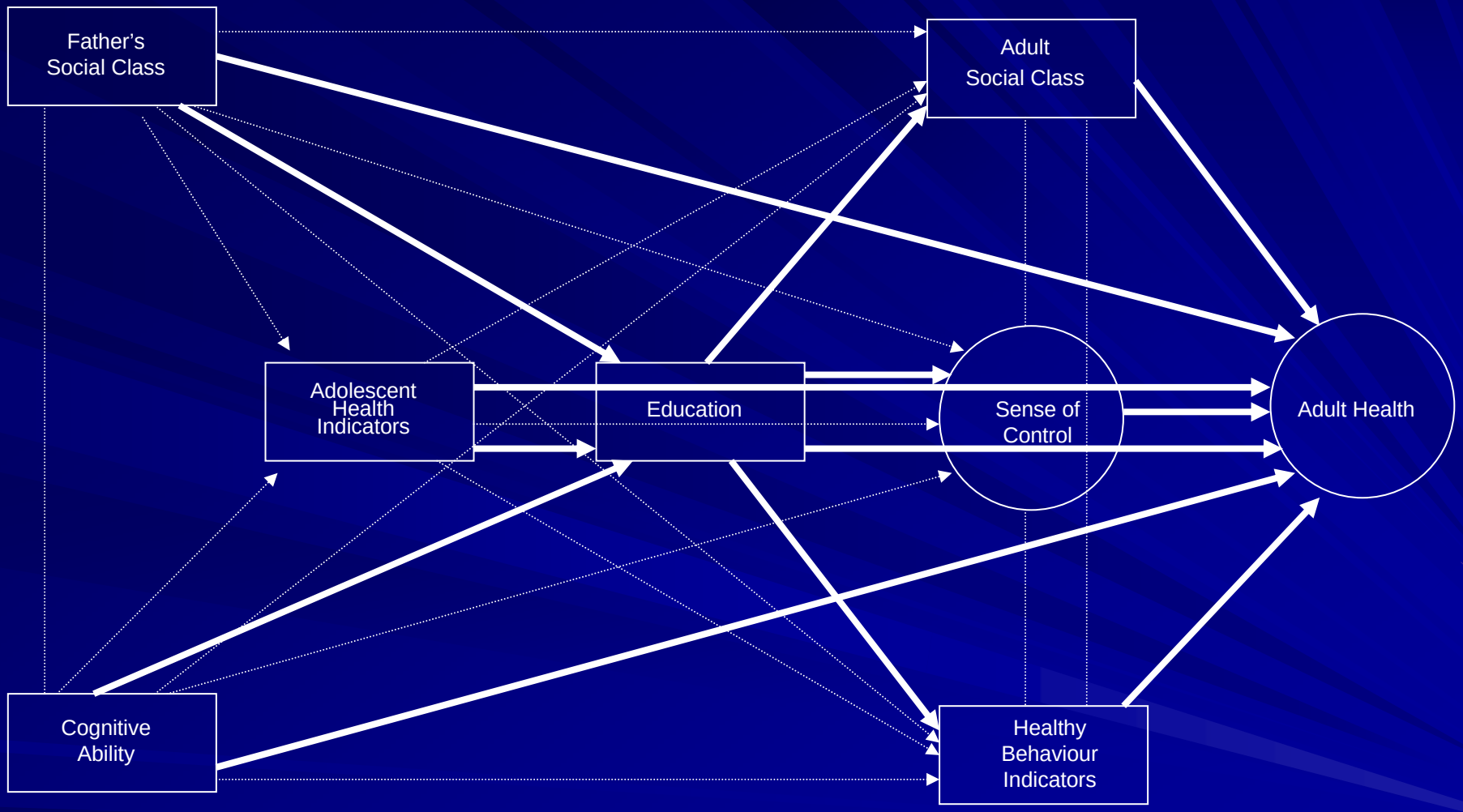


Correlation betwee
adult health
and adult SES whe
health related mobi
path is removed
-0.02

social causation
path is removed
-0.02

both cross lagged
paths are removed
-0.02

'Health Selection
in the Whitehall II
study',
Chandola et al.
Soc Sci Med 2003



Chandola T, Clarke P, Morris, J N, Blane D. (2006) "Pathways between education and health: a causal modelling approach", *Journal of the Royal Statistical Society, Series A*, 169(2):337-359

1958 Birth Cohort

- The correlation between adult social class and adult health among men in the 1958 NCDS cohort reduced from -0.19 to -0.07 when adjusted for educational qualifications, father's social class and cognitive ability. Adolescent health (at age 16) did not contribute to reducing the social gradient in adult health.

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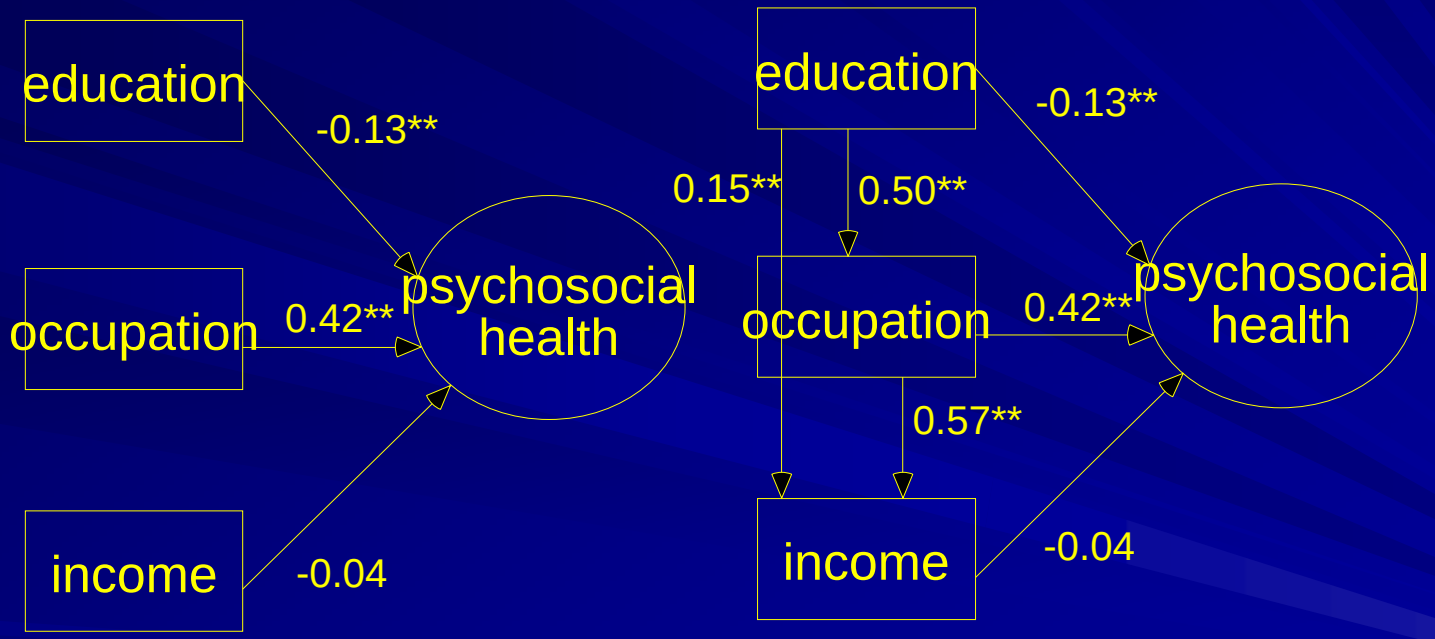
Causation

- Life course
- Behaviours
- Medical care
- Control
- Social supports
- Biology

Whitehall II – Is education related to health?

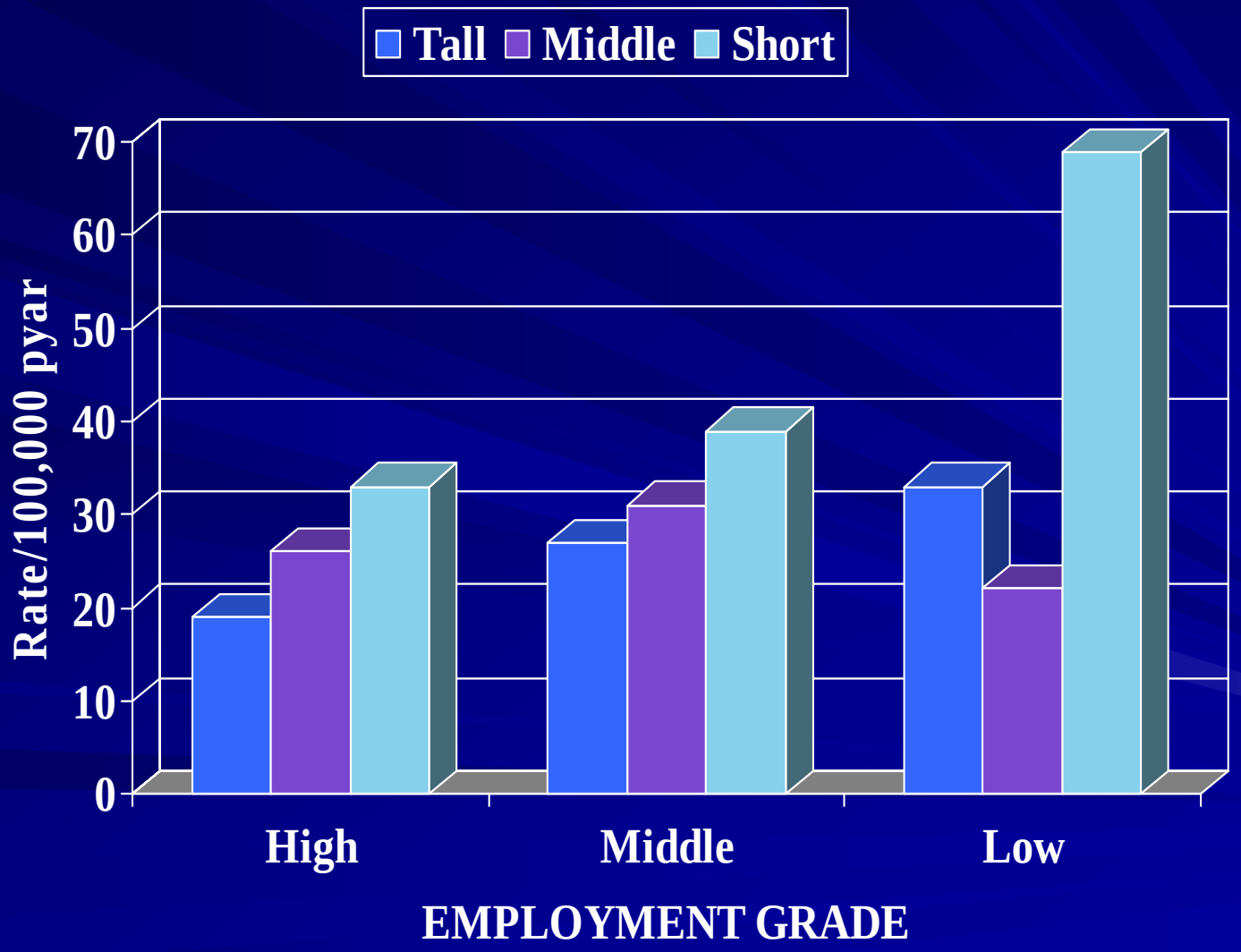


Multiple regression

Path analysis

Source: Singh-Manoux ,Clarke & Marmot
Multiple measures of socio-economic position and psychosocial health: proximal and distal Measures; Int. J. Epidemiol. 31: 1192-1199.

CHD death/MI incidence in 10 years by grade and height: M Whitehall II



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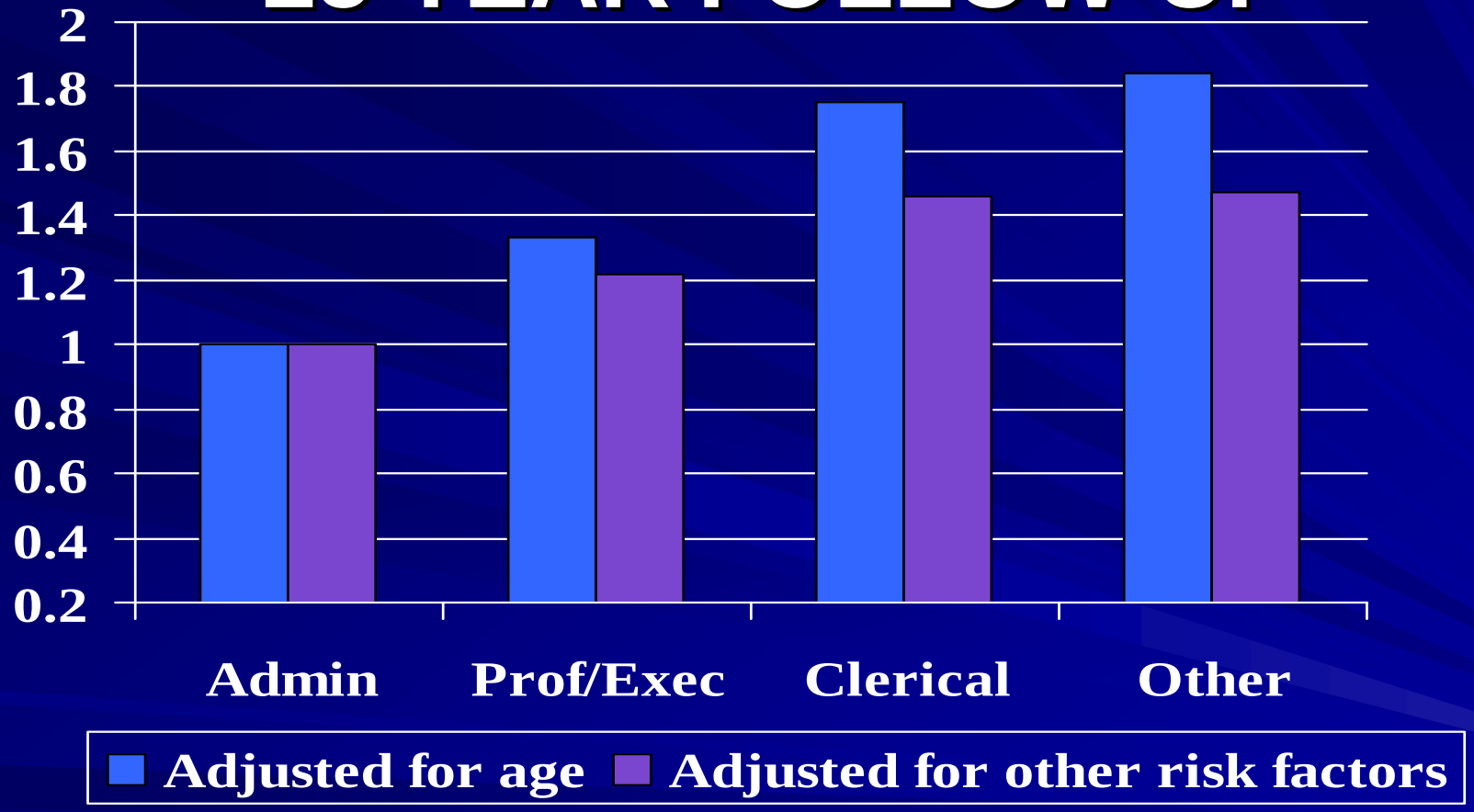
WHITEHALL CHD MORTALITY 25 YEAR FOLLOW-UP



controlling for (a) age, and (b) age, smoking systolic blood pressure, plasma cholesterol concentration, height and blood sugar

Causation

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Total expenditure on health as % of GDP (2003)

	%	LE at birth 2004 (both sexes)
USA	15.2	78
UK	8	79
Cuba	7.3	78
Japan	7.9	82
Sweden	9.4	81
Iceland	10.5	81

World Health Report 2006

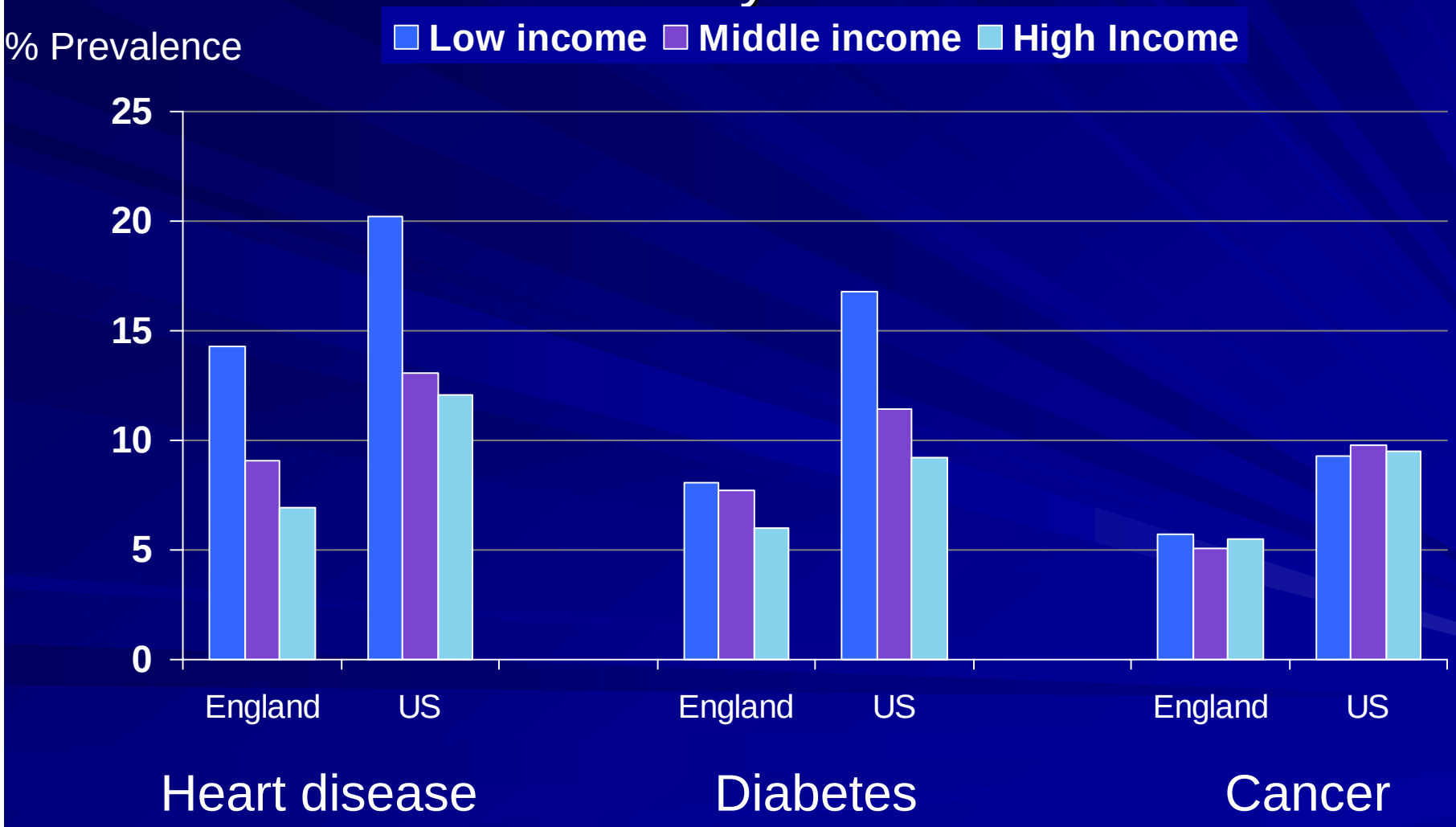
EXPENDITURE ON MEDICAL CARE PER CAPITA IN US AND UK

- UNITED STATES:
  - US$ 5274

- UNITED KINGDOM:
  - US$ 2164 (adjusted for purchasing power)

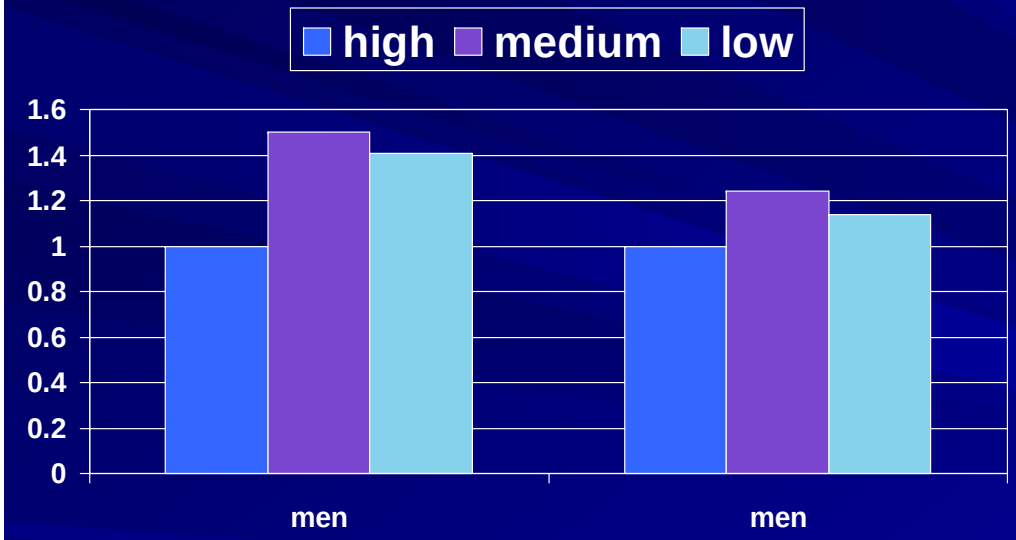
(Human Development Report 2005)

HEALTH DIFFERENCES BETWEEN ENGLAND AND THE US
55-64 year olds



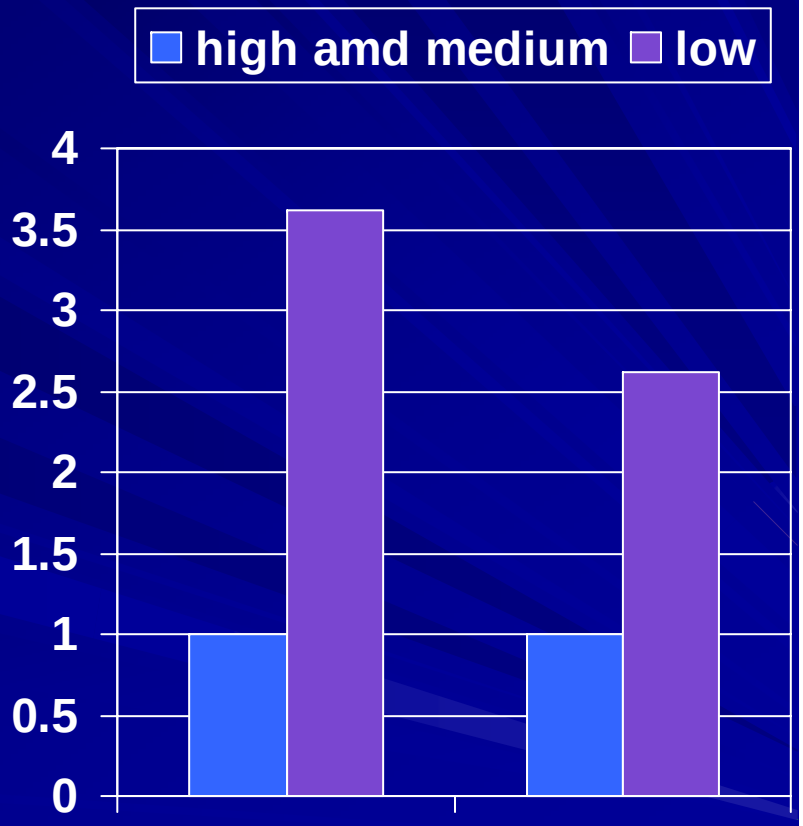
Source: Banks, Marmot, Oldfield and Smith; JAMA 2006

Medical care (revascularization) and employment grade: Whitehall II



Adj for age

Adj for age + CHD + risk factors

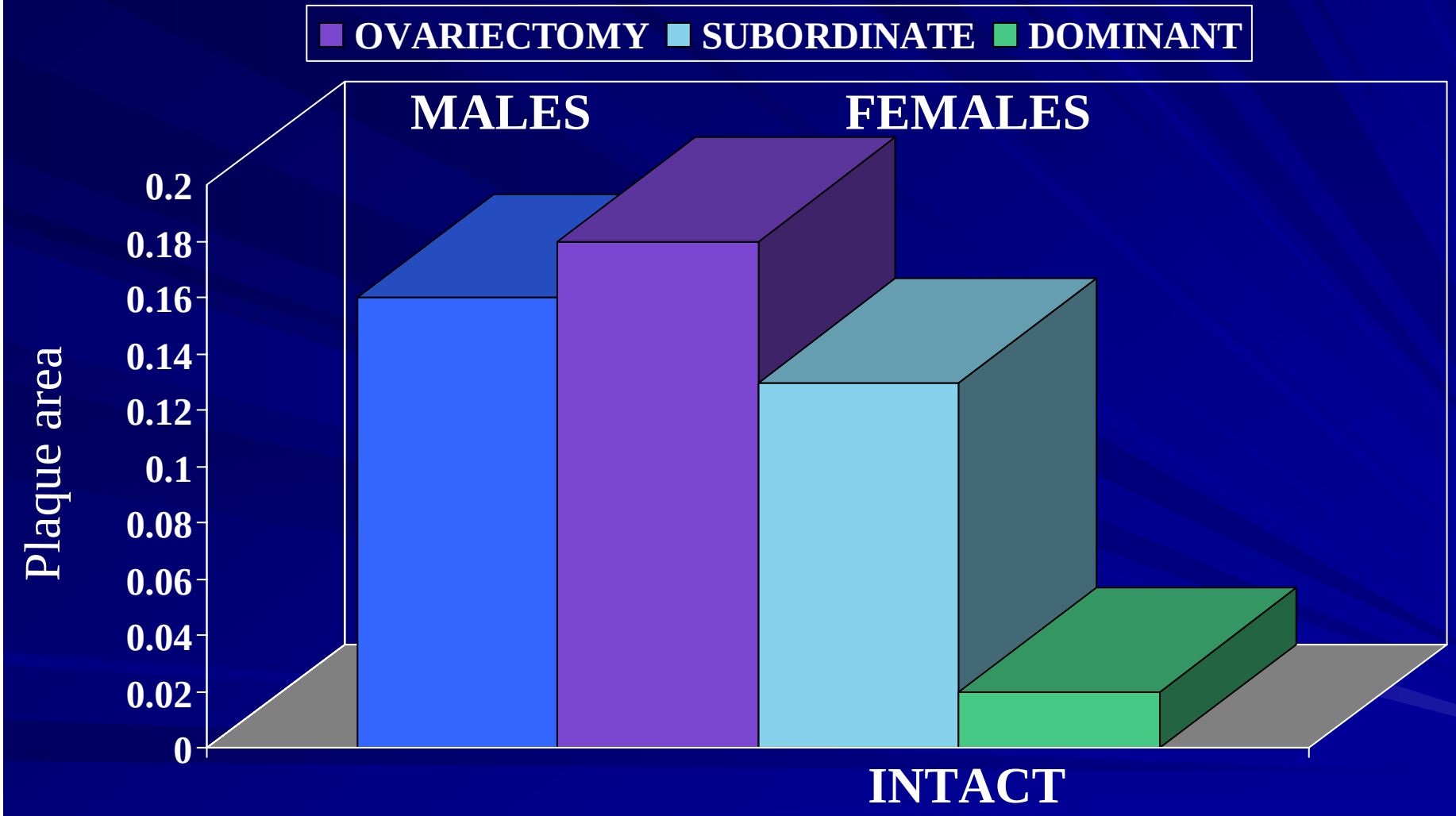


Adj for age

Adj for age + CHD + risk factors

Britton et al BMJ: 329, 381, 2004

ATHEROSCLEROSIS IN MONKEYS



Shively, 1999

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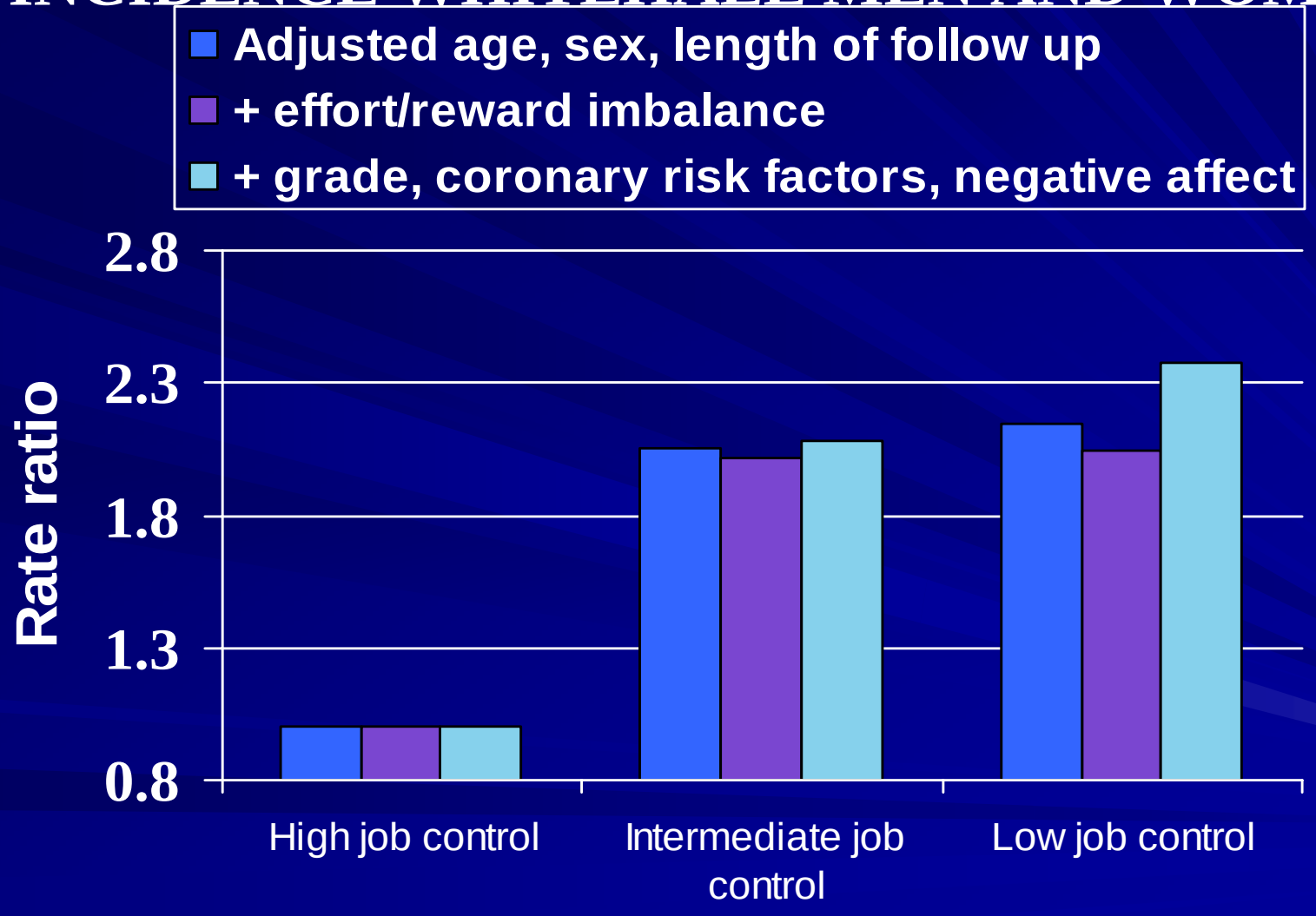
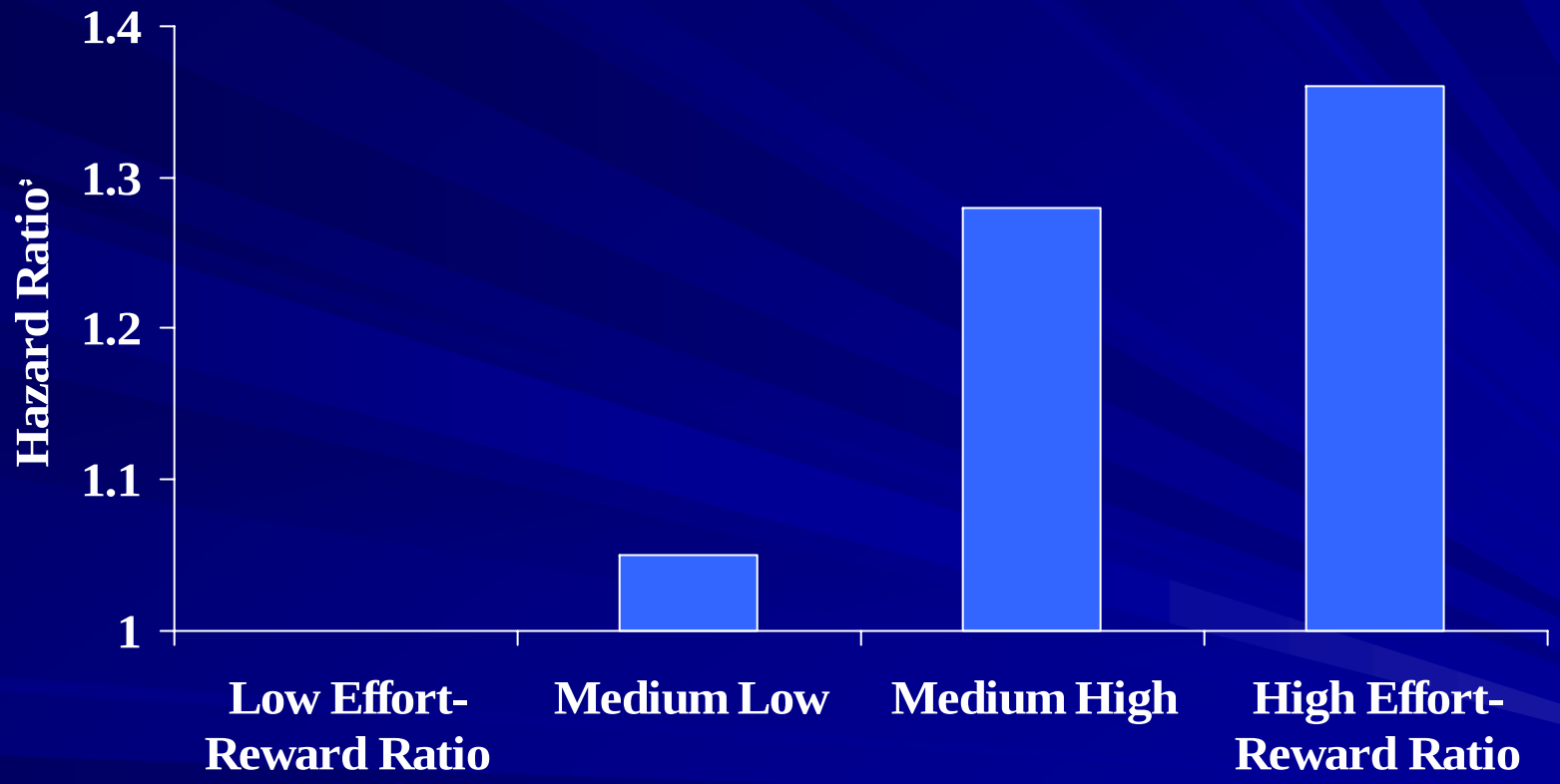
SELF-REPORTED JOB CONTROL AND CHD INCIDENCE WHITEHALL MEN AND WOMEN



Bosma et al, 1998

EFFORT-REWARD IMBALANCE AND CHD WHITEHALL II

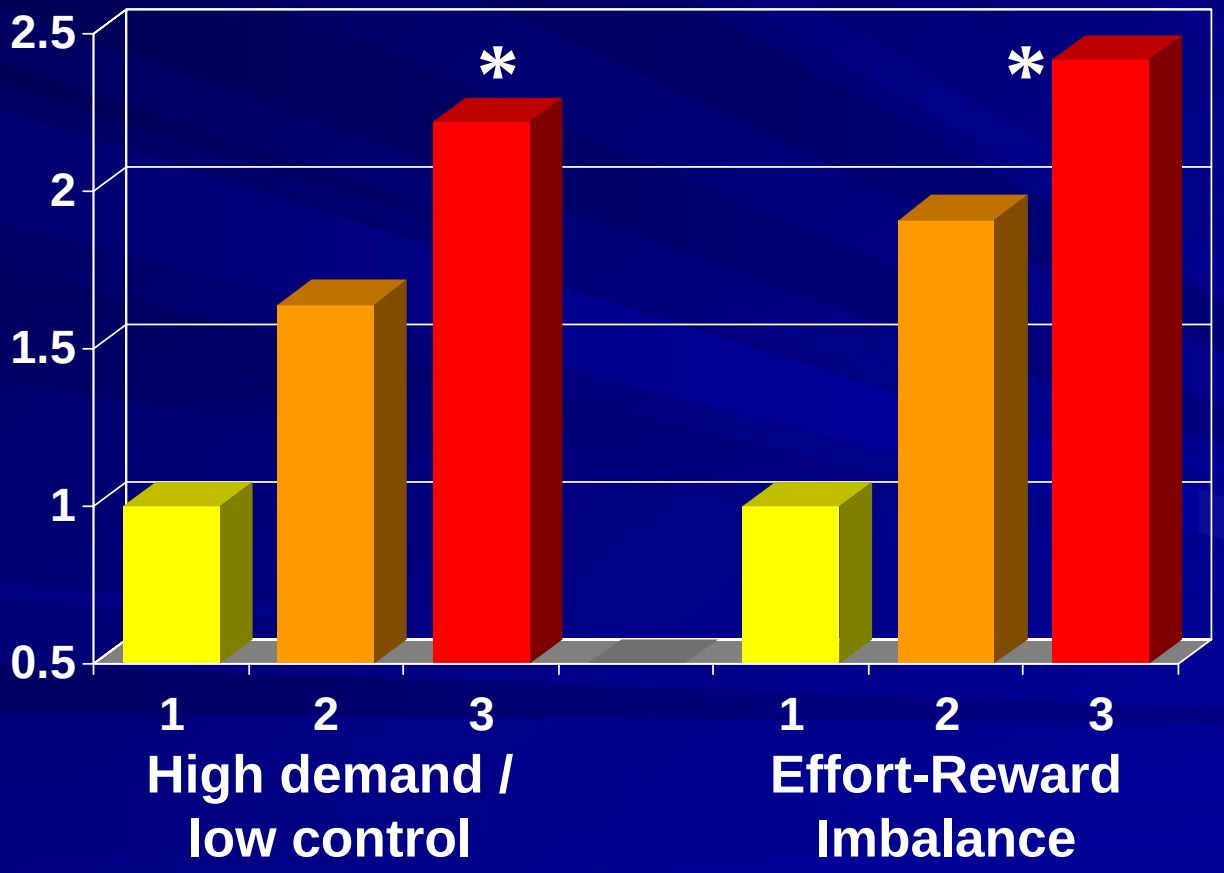


*Adjusted for age, sex and grade

(Kuper et al. 2002, Occup Environ Med, 59, 777-784)

Adjusted hazard ratios for cardiovascular mortality by levels of work stress#

Nmax=812 (73 deaths); mean follow-up 25,6 years



Tertiles
1 = low;
2 = intermediate;
3 = high

#adj. for age, sex, occupational group, smoking, physical activity, SBP, total chol., BMI

*** p < .05**

Source: M. Kivimäki et al. (2002), BMJ, 325: 857

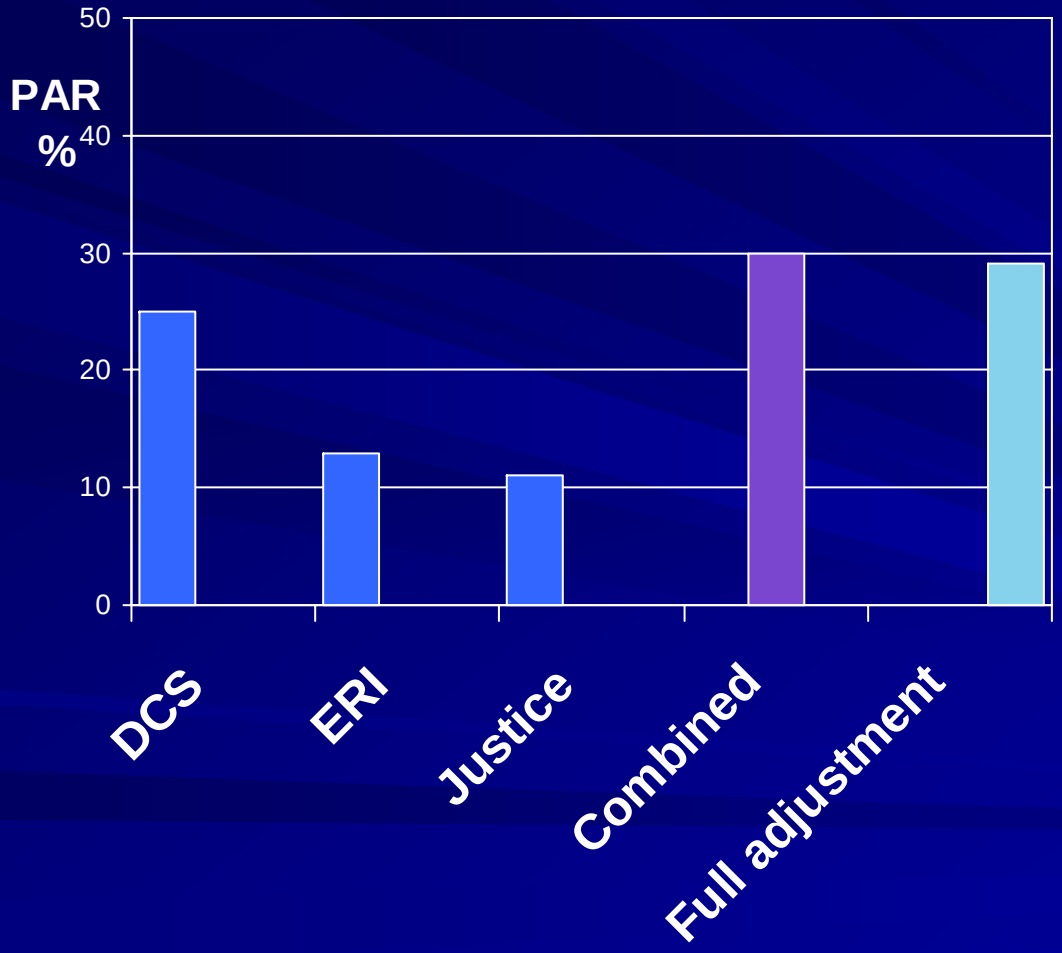
Meta-analysis

Work stress is associated with a 50% excess risk of coronary heart disease

Model	N	HR (age- & sex-djusted)
Job strain	83 014	1.45
ERI	11 528	1.58
Injustice	7 246	1.47

Kivimäki *et al*. *Scand J Work Environ Health* 2006

PAR* for coronary heart disease (fatal CHD/non fatal MI/definite angina)



Each domain
Combined
Full adjustment

PAR for all combined *

30% *95% CI 10%-46%*

adjusted for other predictors

29% *95% CI 9%-45%*

*Population attributable risk
odds ratios adjusted for age, sex, employment grade

J Head et al,2007

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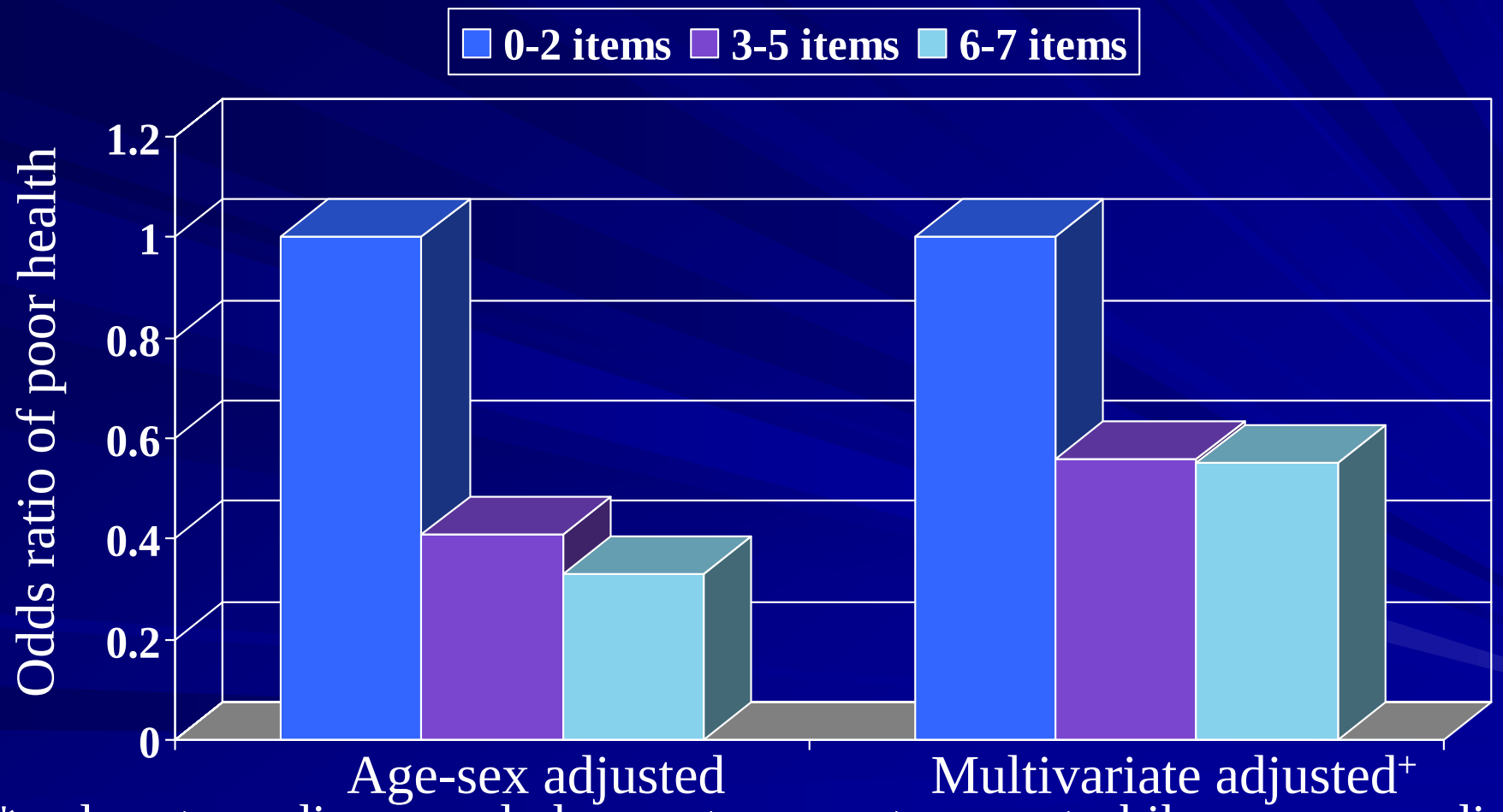
POOR HEALTH IN HUNGARY BY SOCIALLY* ORIENTED ITEMS



* colour tv, radio, record player, stereo system, motorbike, car, car radio

\+ age, sex, educ, marital, material deprivation

Pikhart 2000

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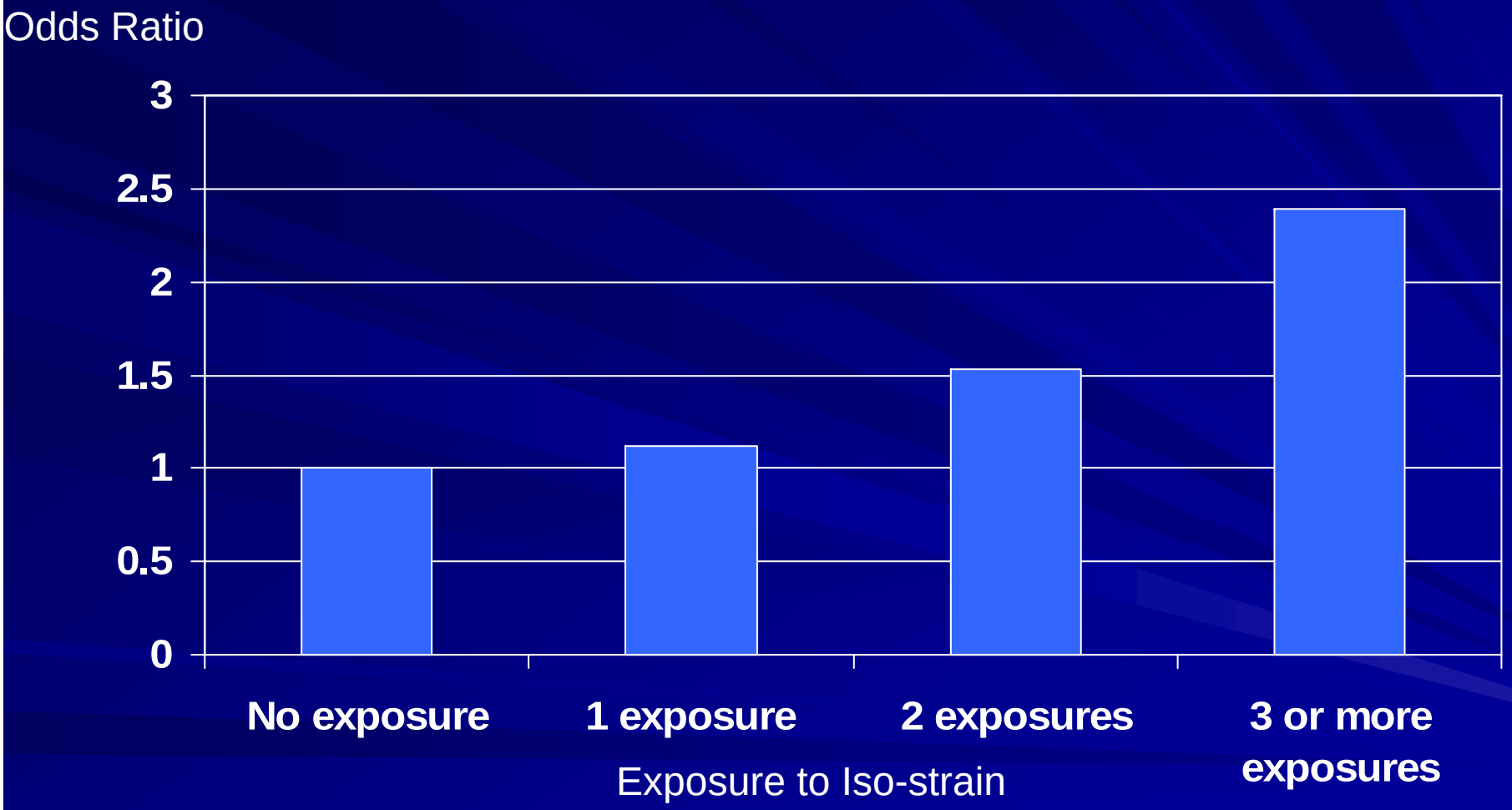
ODDS RATIO* OF METABOLIC SYNDROME BY EXPOSURE TO ISO-STRAIN: WHITEHALL II PHASES 1 TO 5



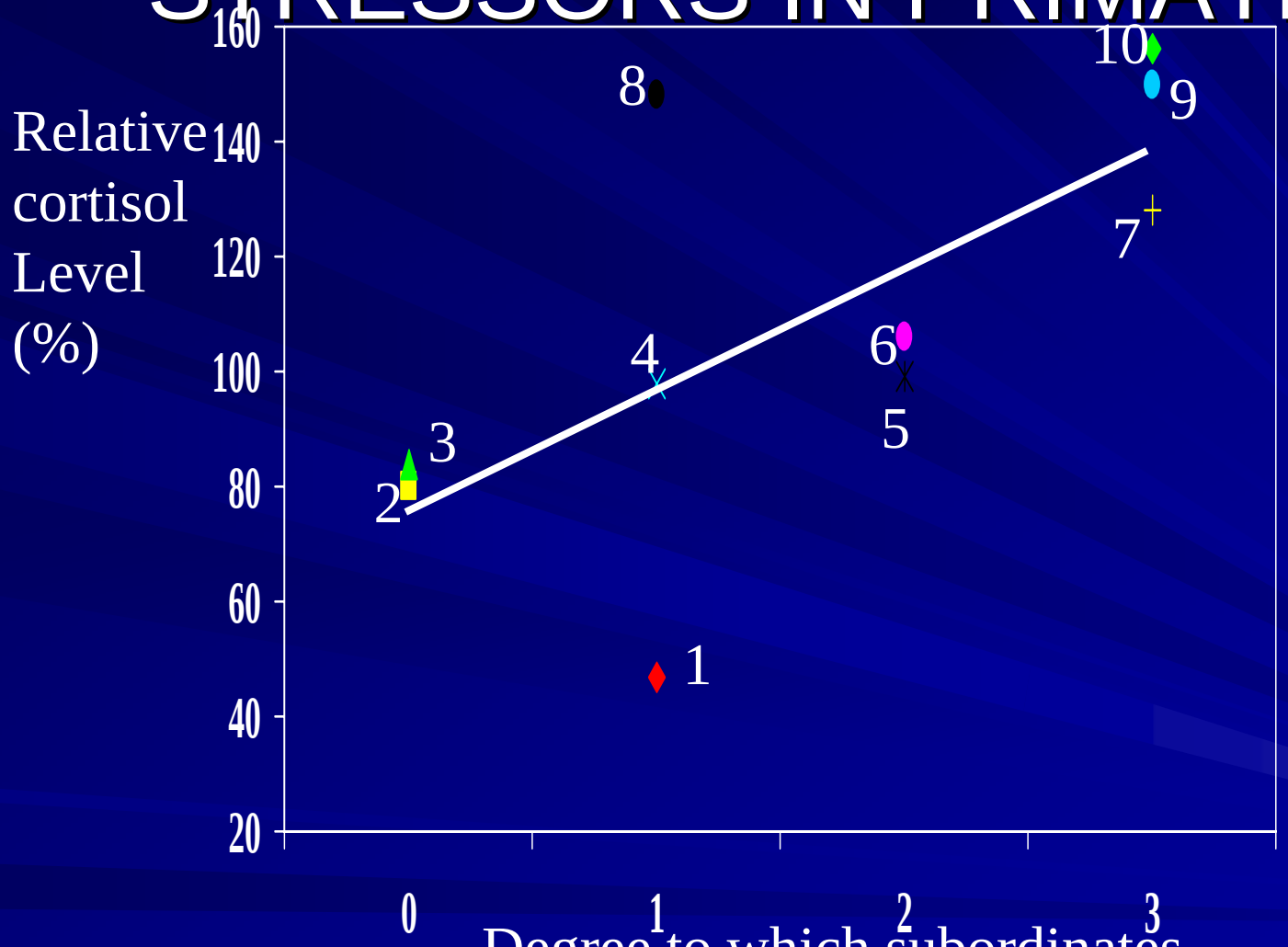
*Adj. for age, employment, grade and health behaviours

Chandola, Brunner & Marmot, BMJ, 2006

MECHANISMS

- HYPOTHALAMIC PITUITARY AXIS HPA – CORTISOL
- SYMPATHETIC/PARASYMPATHETIC

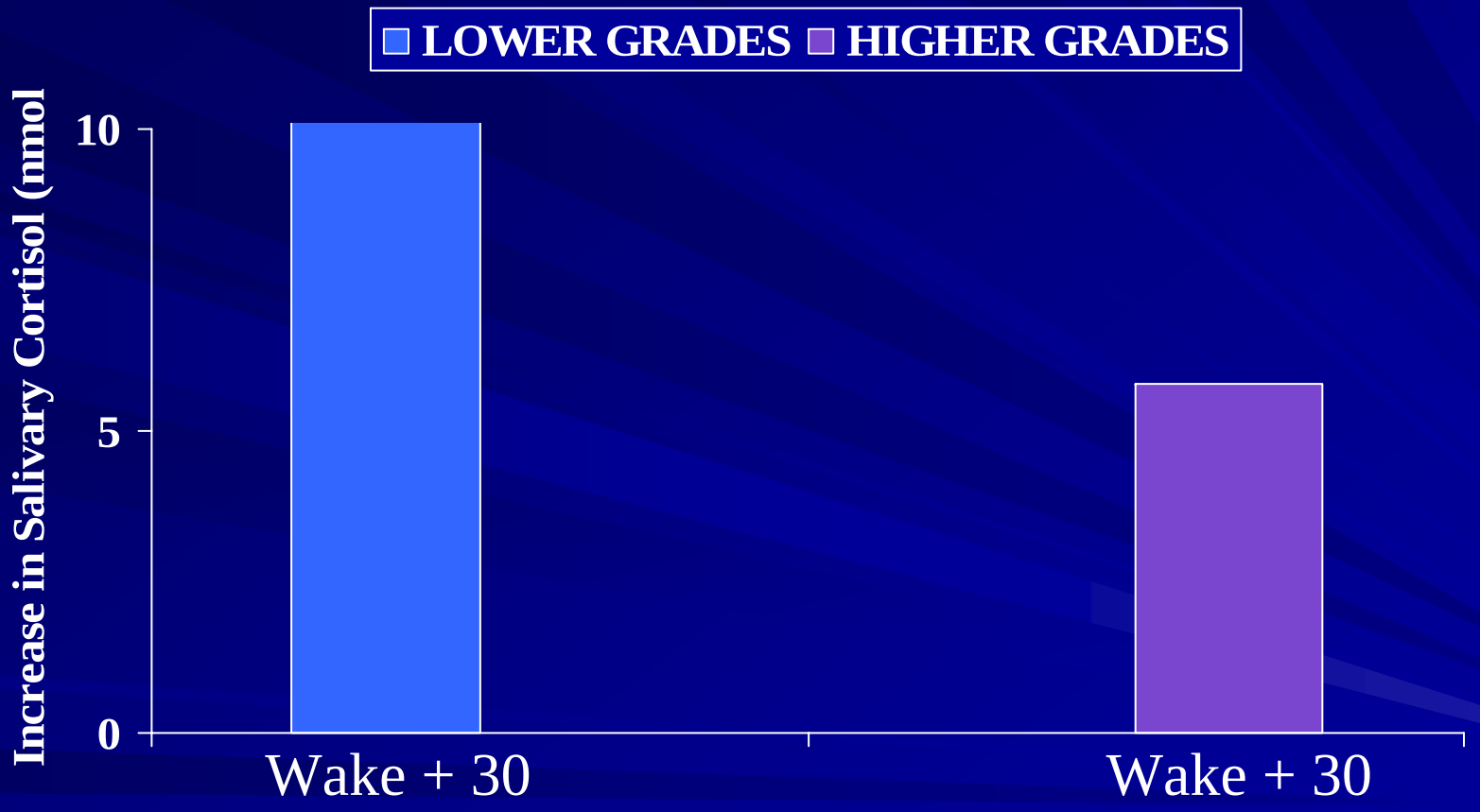
CORTISOL AND SOCIAL STRESSORS IN PRIMATES



Degree to which subordinates are exposed to social stressors

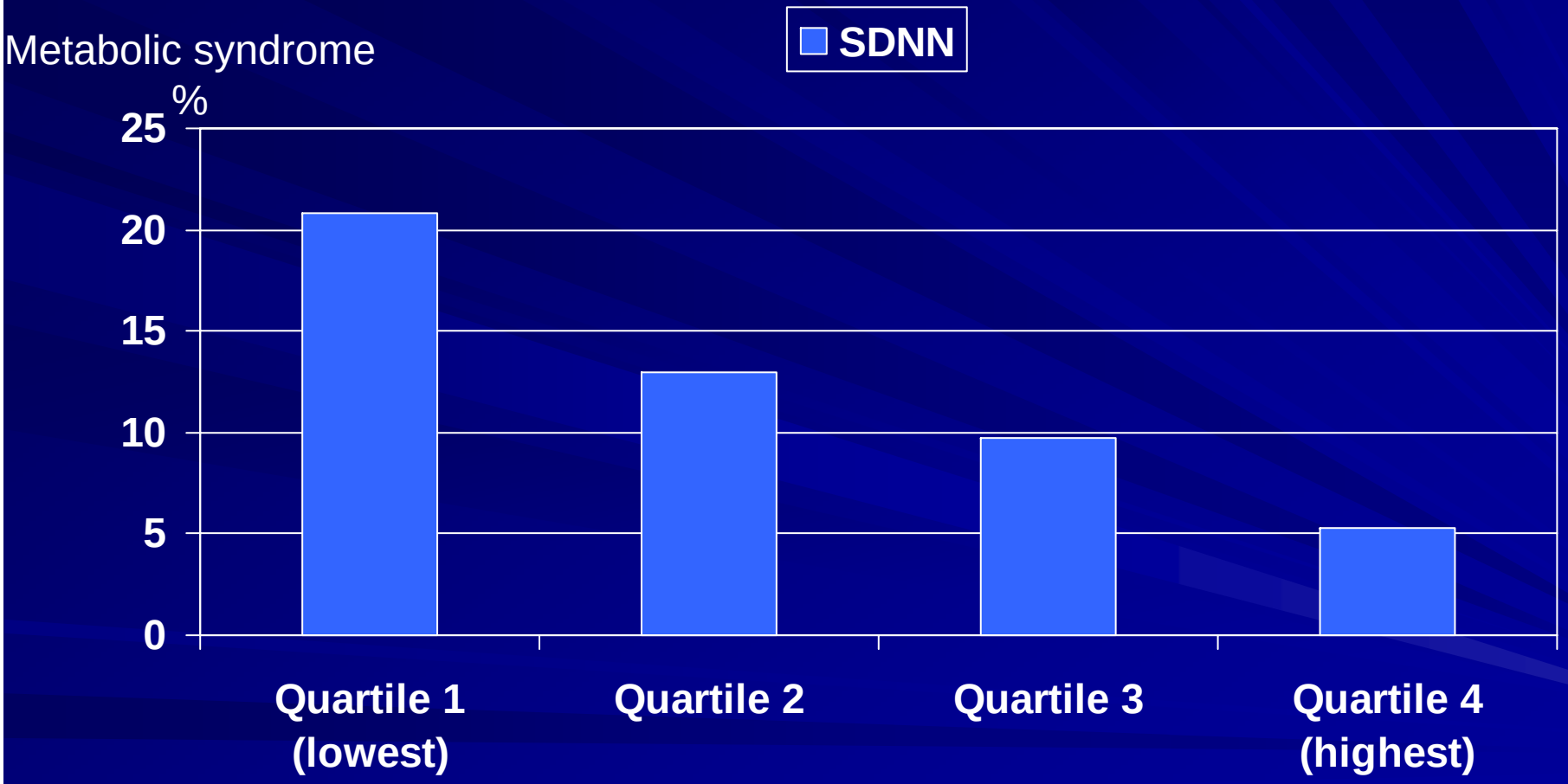
Adapted from: Abbott et al. Hormones and Behavior 43 (2003) 67-

CORTISOL AWAKENING RESPONSE AND EMPLOYMENT GRADE - WHITEHALL II



(Kunz-Ebrecht et al. Psychoneuroendocrinology, 2004)

METABOLIC SYNDROME AND HEART RATE VARIABILITY: W II STUDY MEN



(Hemingway et al. Circulation, 2005)

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Commission on Social Determinants of Health 2005 -2008

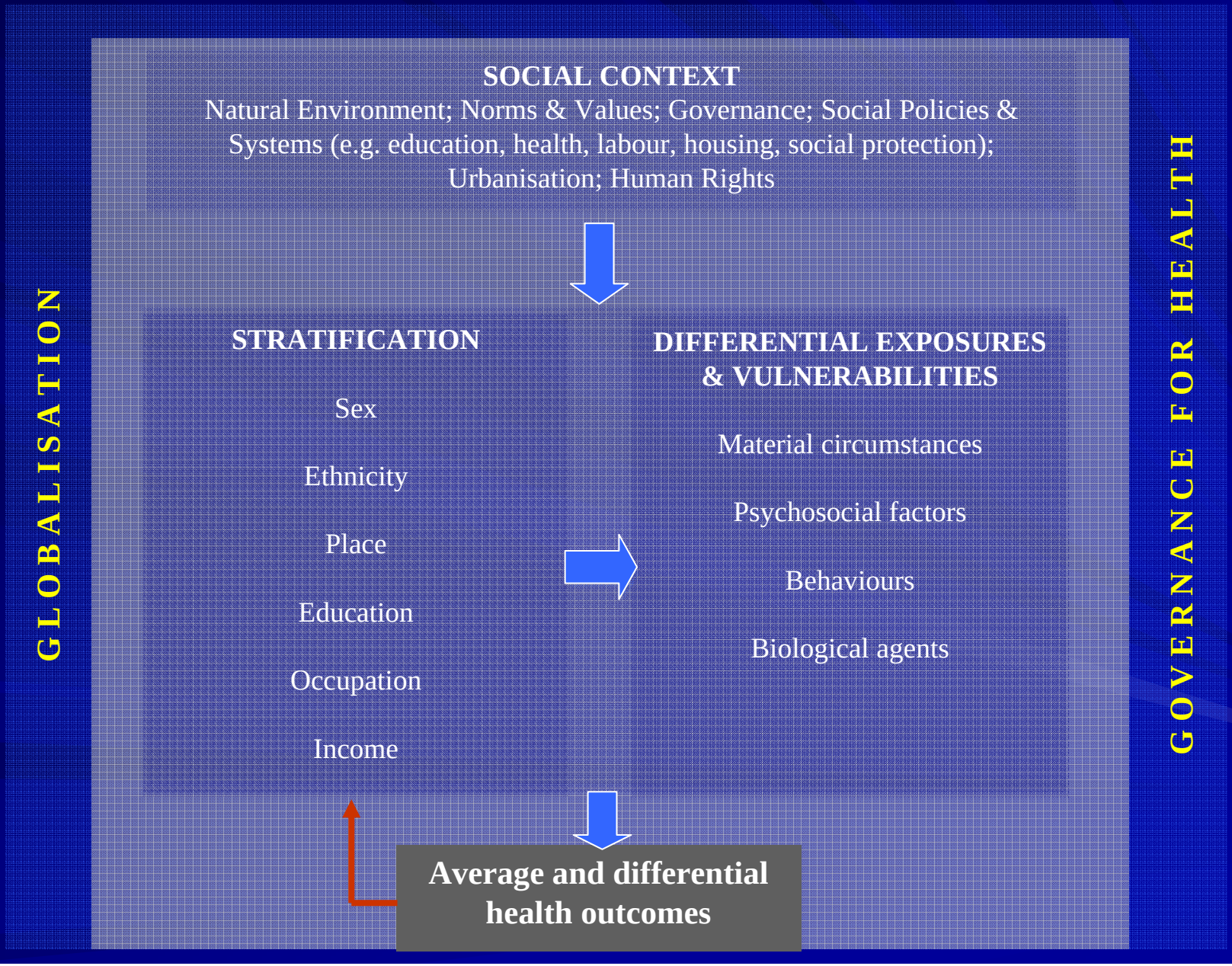
- Commissioners
- 9 Knowledge Networks
- Partner Countries
- Civil society work
- Global initiative
- WHO integration

Set up by the World Health Organisation

www.who.int/social_determinants

7th Commissioners meeting at WHO, Geneva, Jan 2007

Conceptualising the Social Determinants of Health



Policy Entry Points

- Social stratification – people's social position related to their health
- Differential exposure to health damaging conditions
- Differential vulnerability
- Differential consequences of ill health

Level

- Global
- Regional
- National
- Local
- Household
- Individual

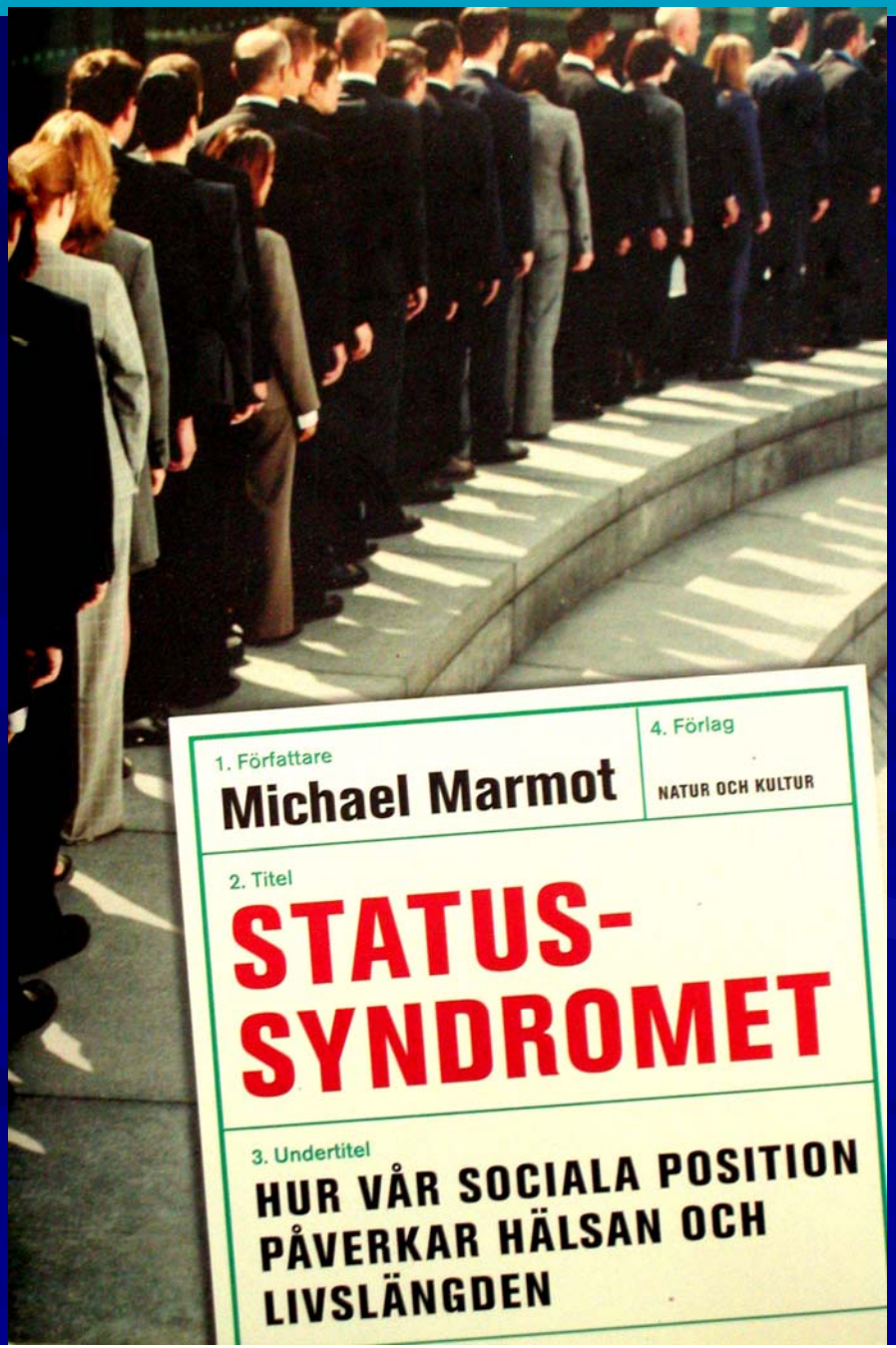
STATUS SYNDROME

MICHAEL MARMOT

STATUS SYNDROME

HOW OUR SOCIAL STANDING AFFECTS OUR HEALTH AND LONGEVITY

MICHAEL MARMOT


1. Författare
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2. Titel
STATUS-SYNDROMET
3. Undertitel
HUR VÅR SOCIALA POSITION PÅVERKAR HÄLSAN OCH LIVSLÄNGDEN