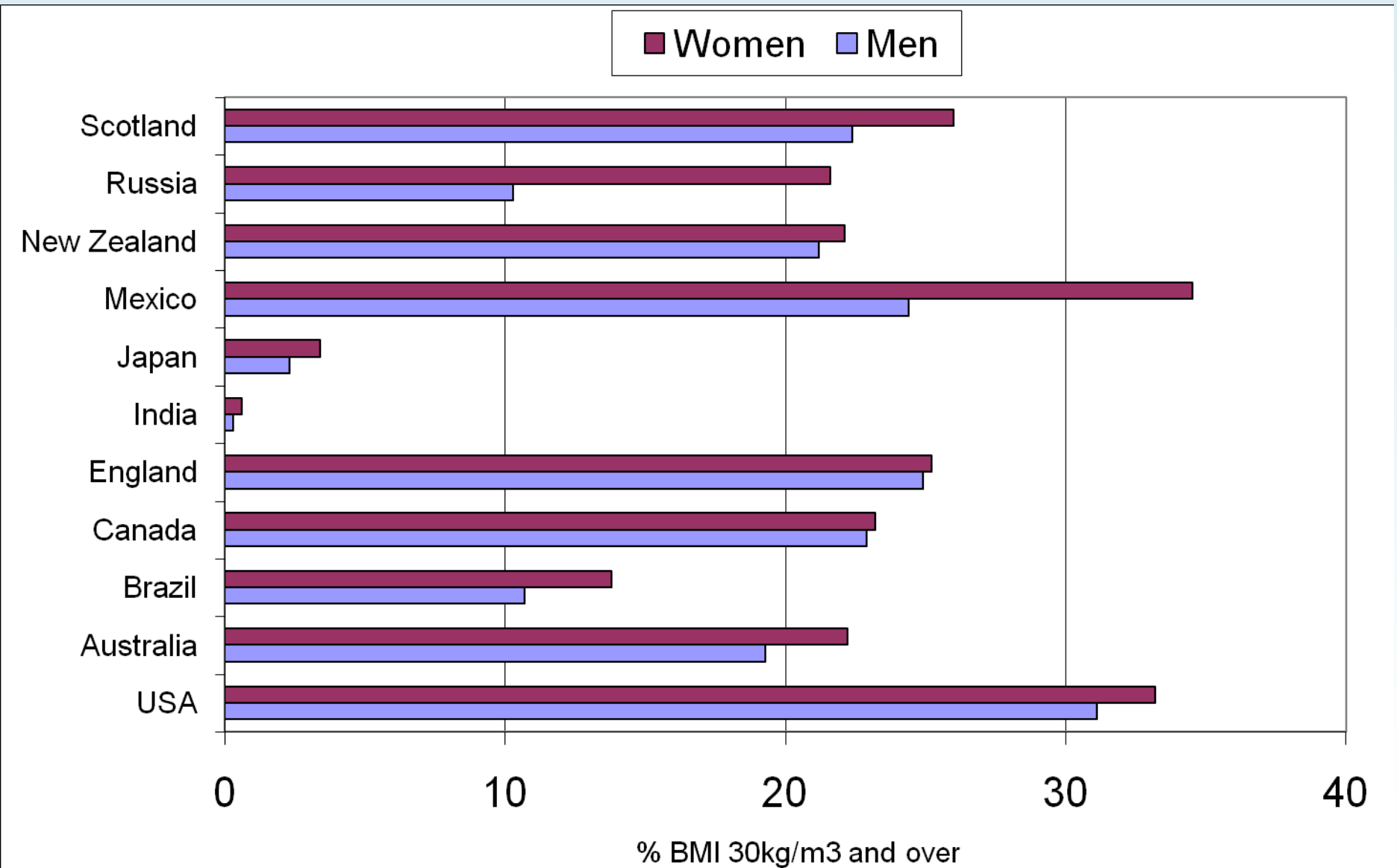


# Subordination, stress and obesity

Michael Marmot  
UCL

**Oxford Obesity**  
**27<sup>th</sup> Nov 2009**

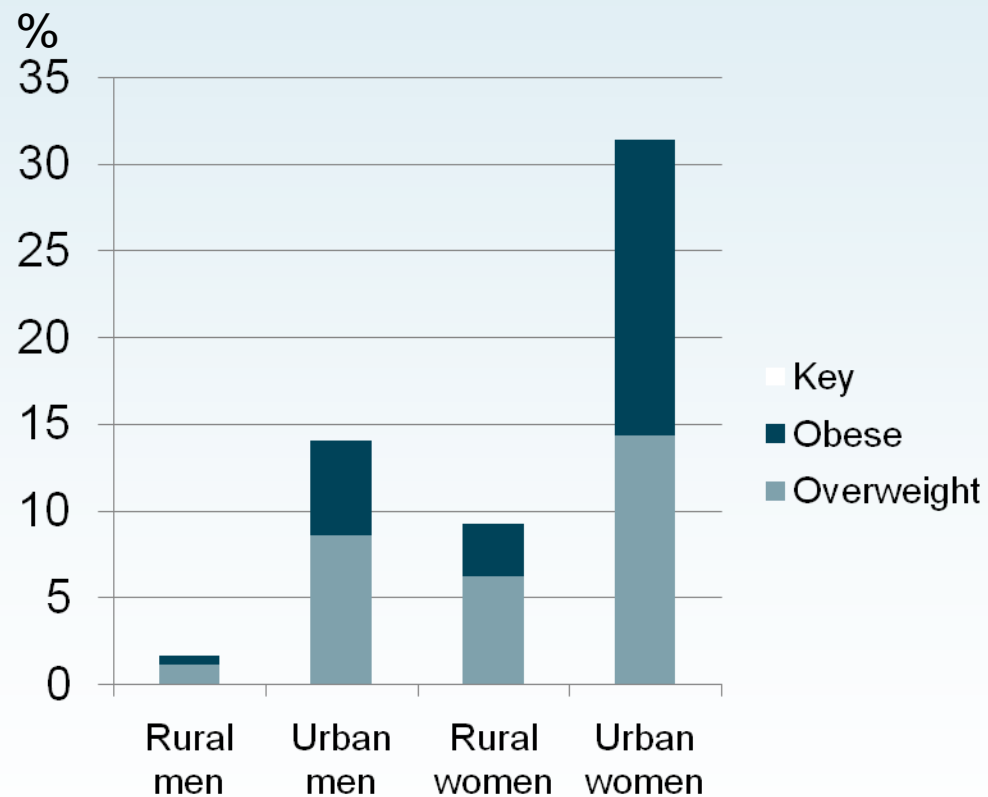
# Obesity - selected countries



# Cameroon

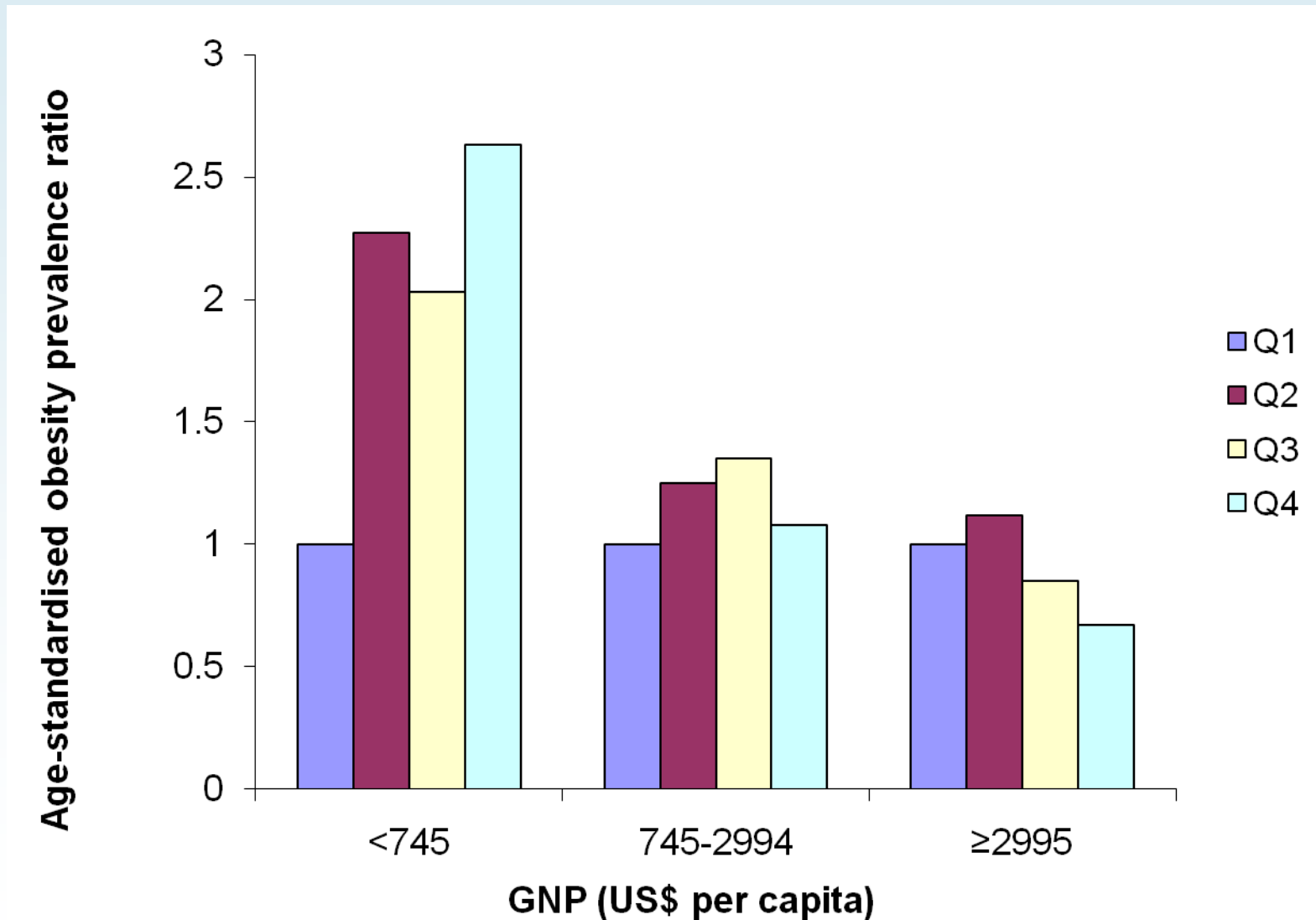
- Increasing obesity in urban areas (49% of the population lived in urban areas in 2000)
- Decreasing physical activity
- Change from traditional diet to westernized diet

**Urban – rural differences in adult obesity**

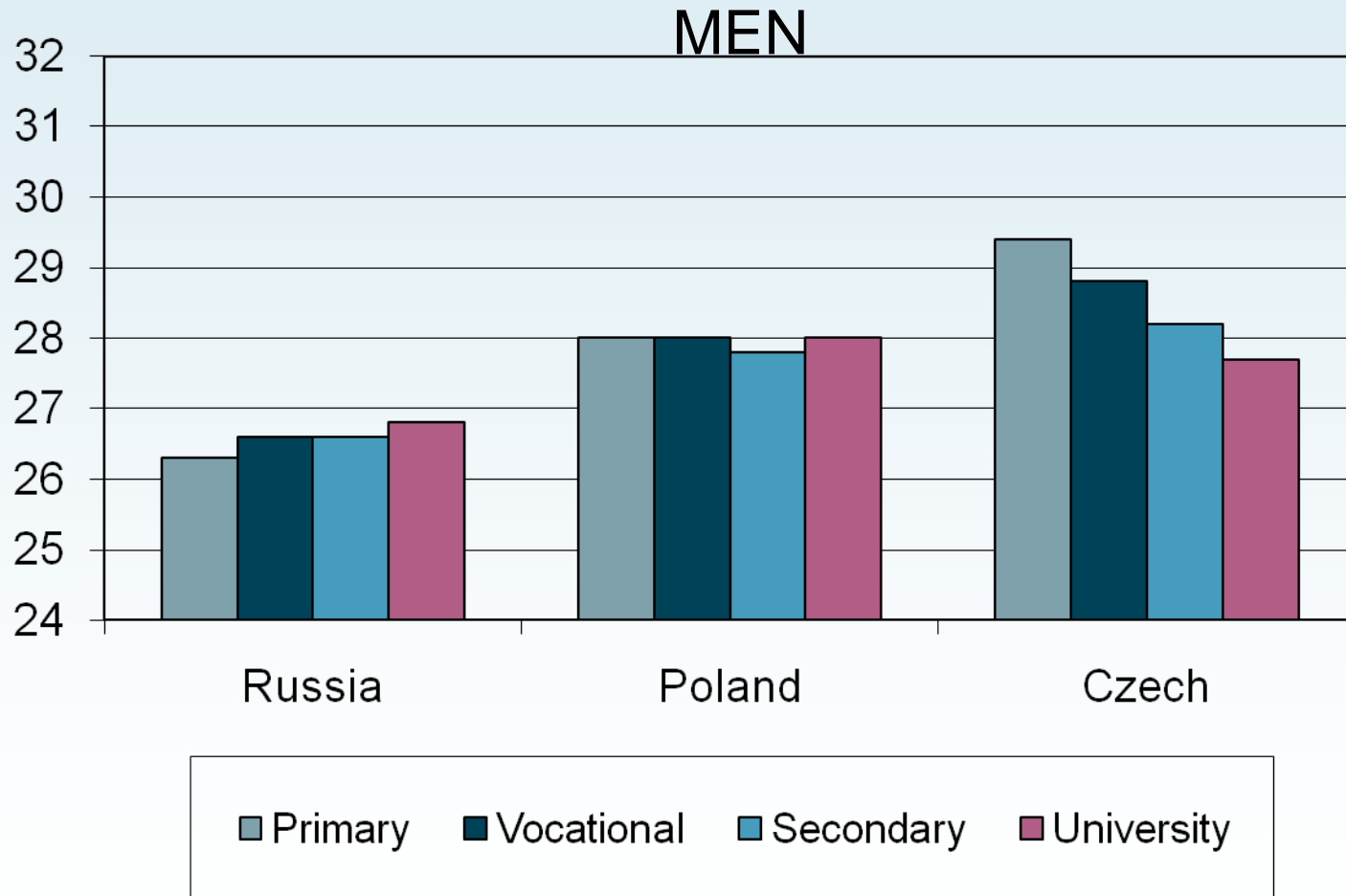


- Social gradient within countries
  - Lower socioeconomic groups in high income countries generally have a greater prevalence of risk factors and obesity
  - A similar pattern is emerging as the obesity epidemic evolves in low and middle income countries

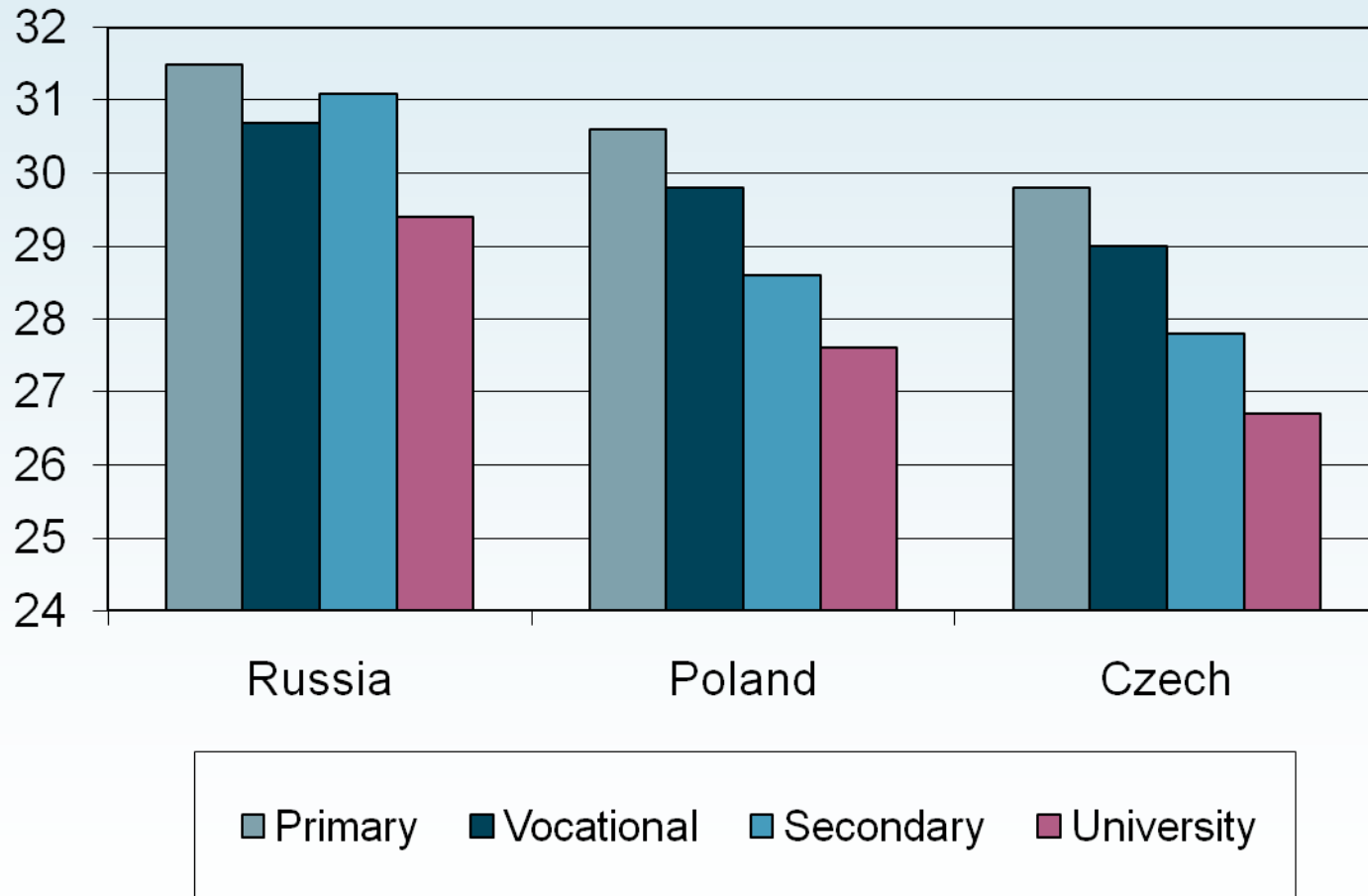
# Economic Growth, Female Education & Obesity



# BMI (AGE ADJUSTED) – RUSSIA, POLAND, CZECH BY EDUCATION

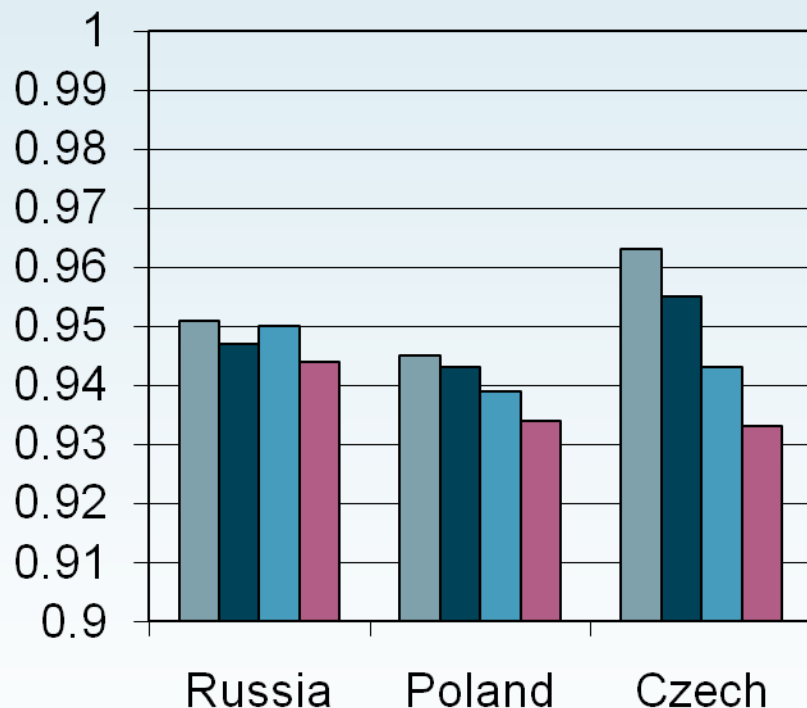


# BMI (AGE ADJUSTED) – RUSSIA, POLAND, CZECH BY EDUCATION WOMEN

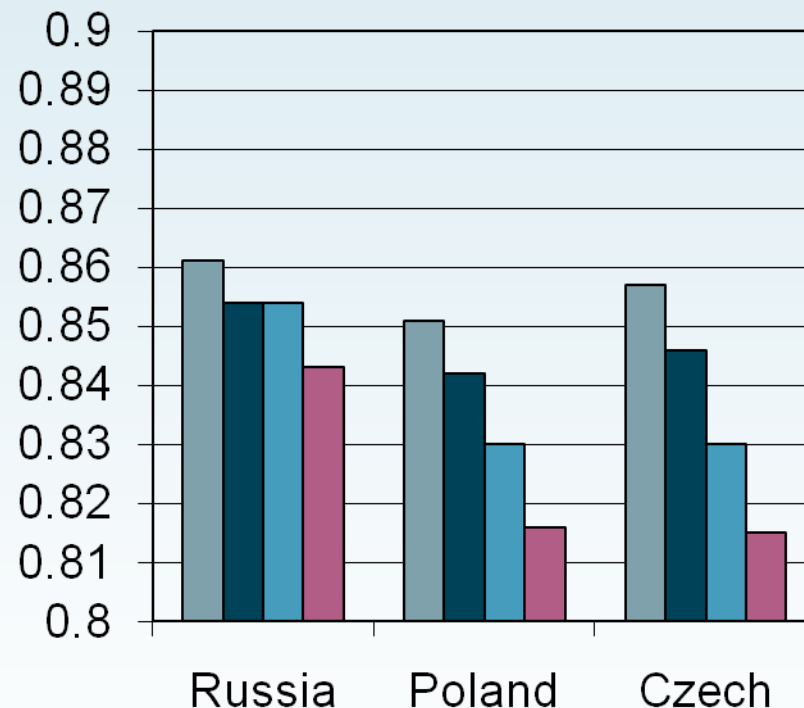


# WHR (AGE ADJUSTED) – RUSSIA, POLAND, CZECH BY EDUCATION

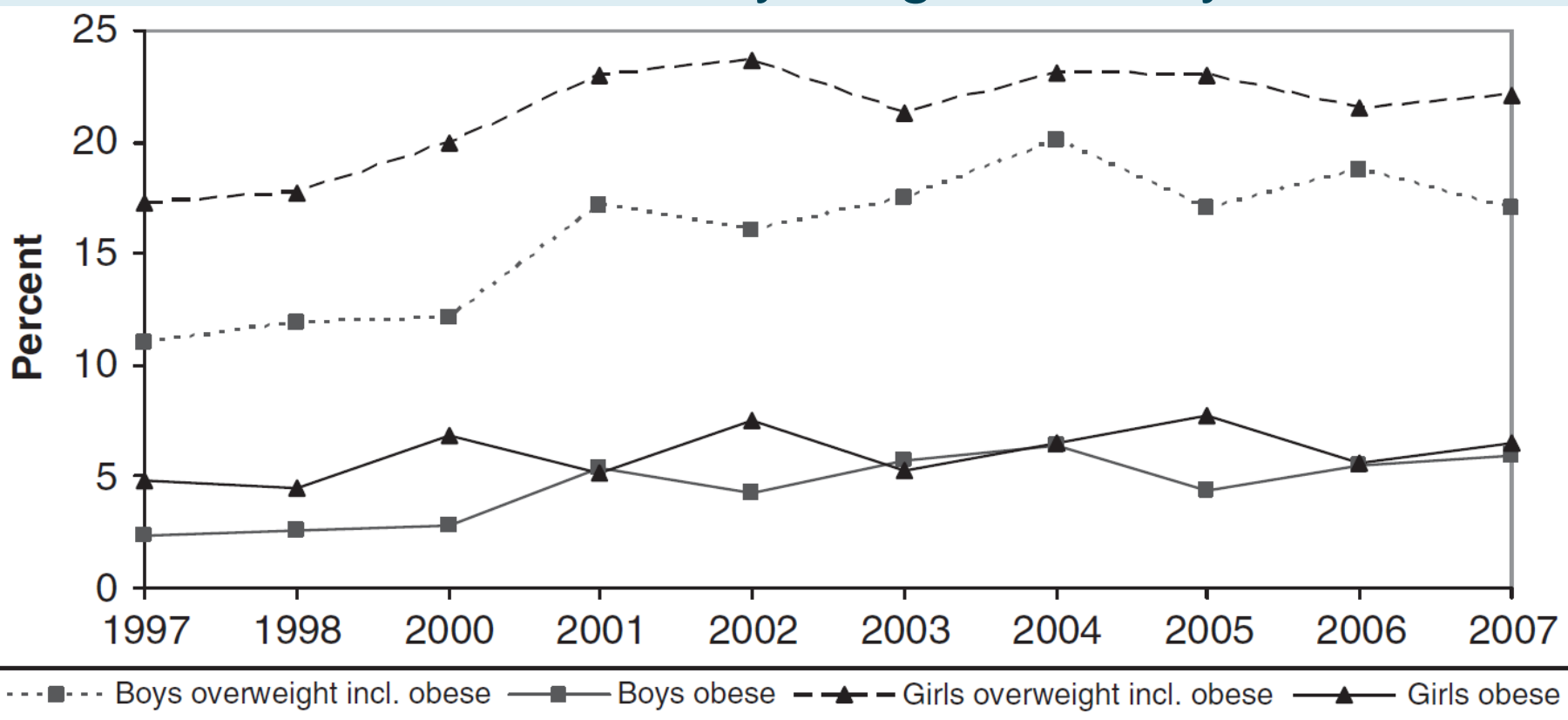
MEN



WOMEN

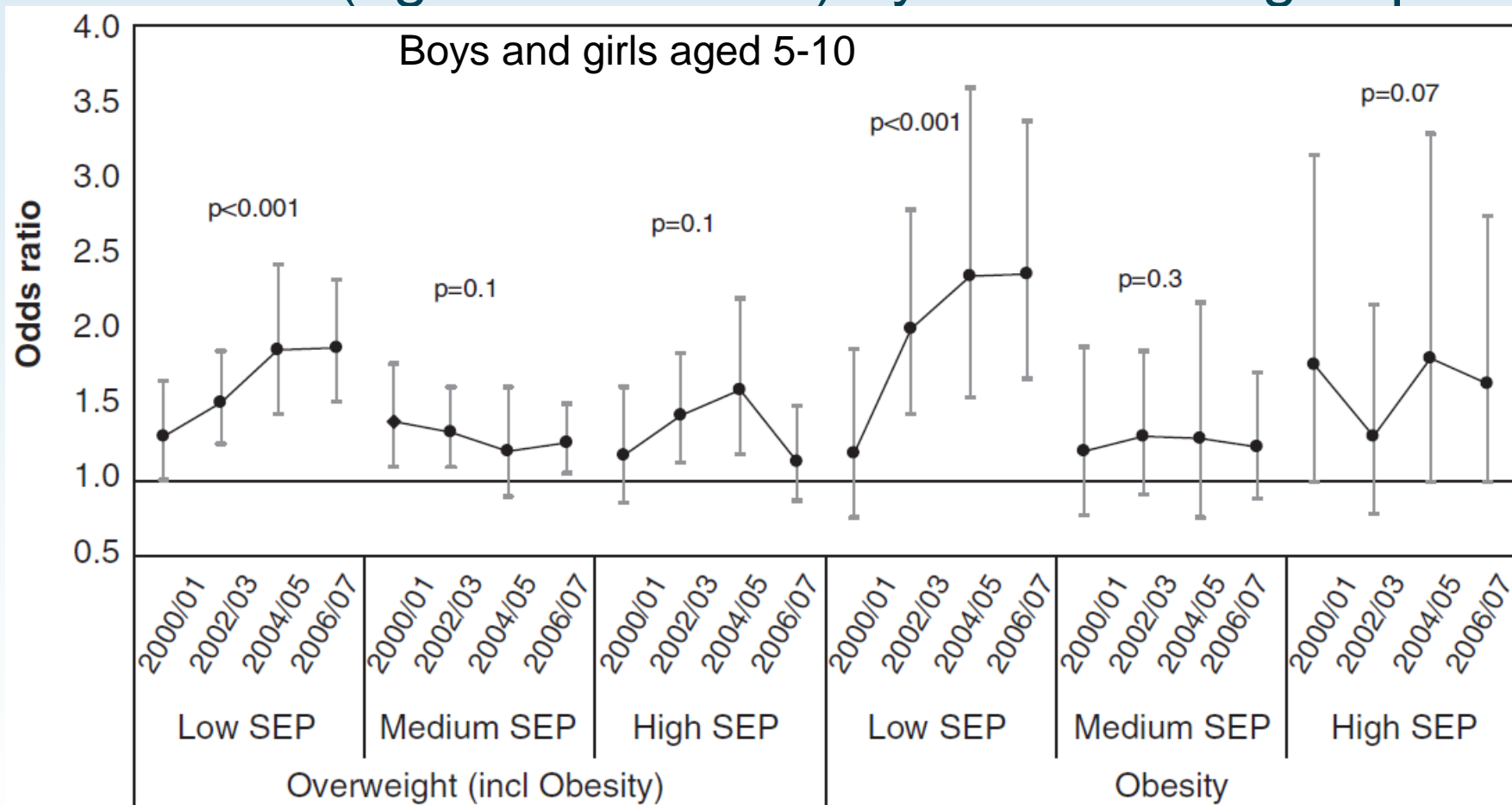


# Prevalence of overweight (including obesity) & obesity 1997 - 2007 for boys & girls 5–10 years



Source: Stamatakis et al. Int J of Obesity (2009)  
Data from Health Survey for England 1997–2007.

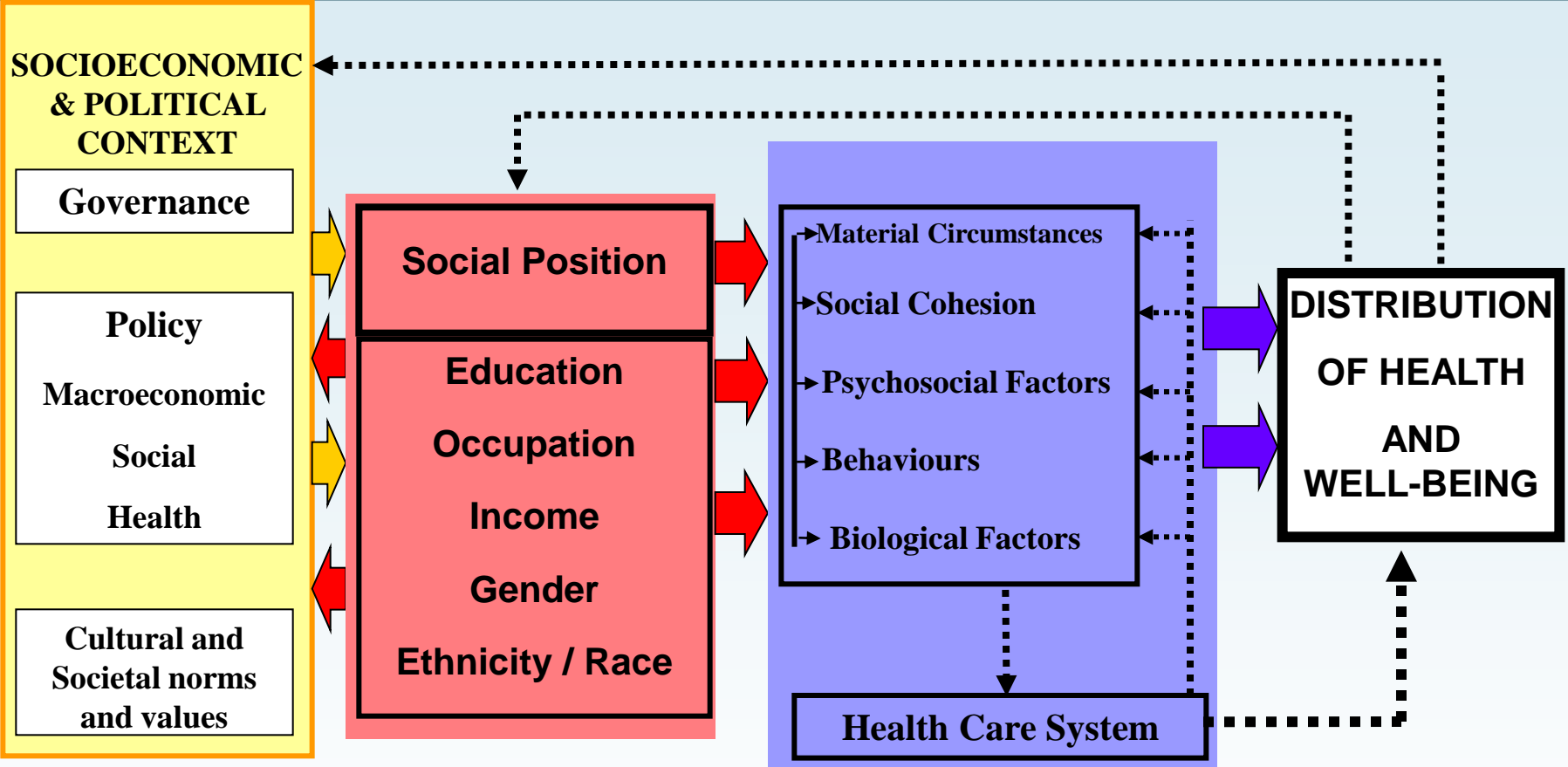
# Age & sex-adjusted odds overweight & obesity 2000/1-2006/7 (against 1997/98) by SEP score group



Source: Stamatakis et al. Int J of Obesity (2009)  
 Data from Health Survey for England

# Causes of the causes

# Conceptual Framework

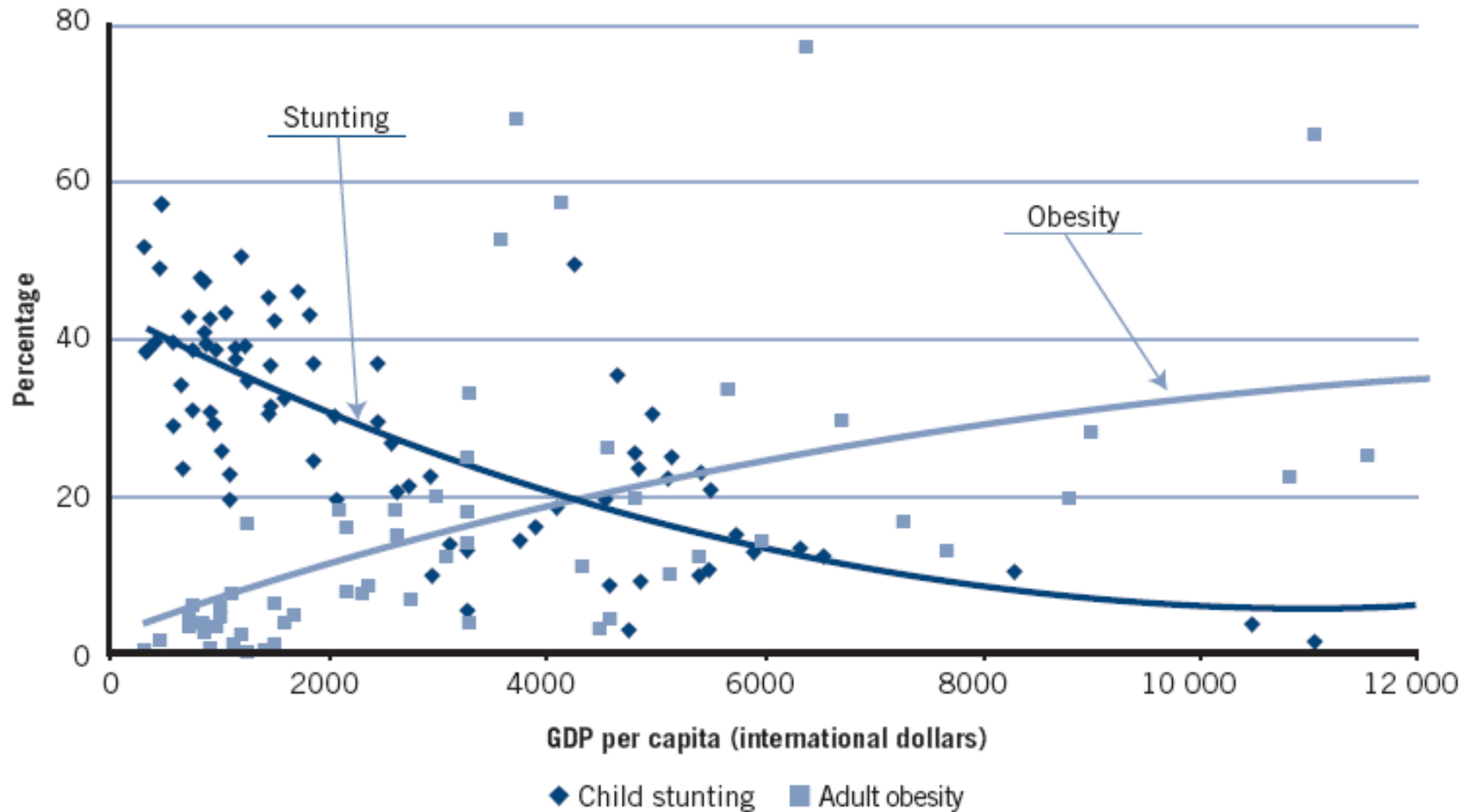


**SOCIAL DETERMINANTS OF HEALTH AND HEALTH INEQUITIES**

# Importance of external environment

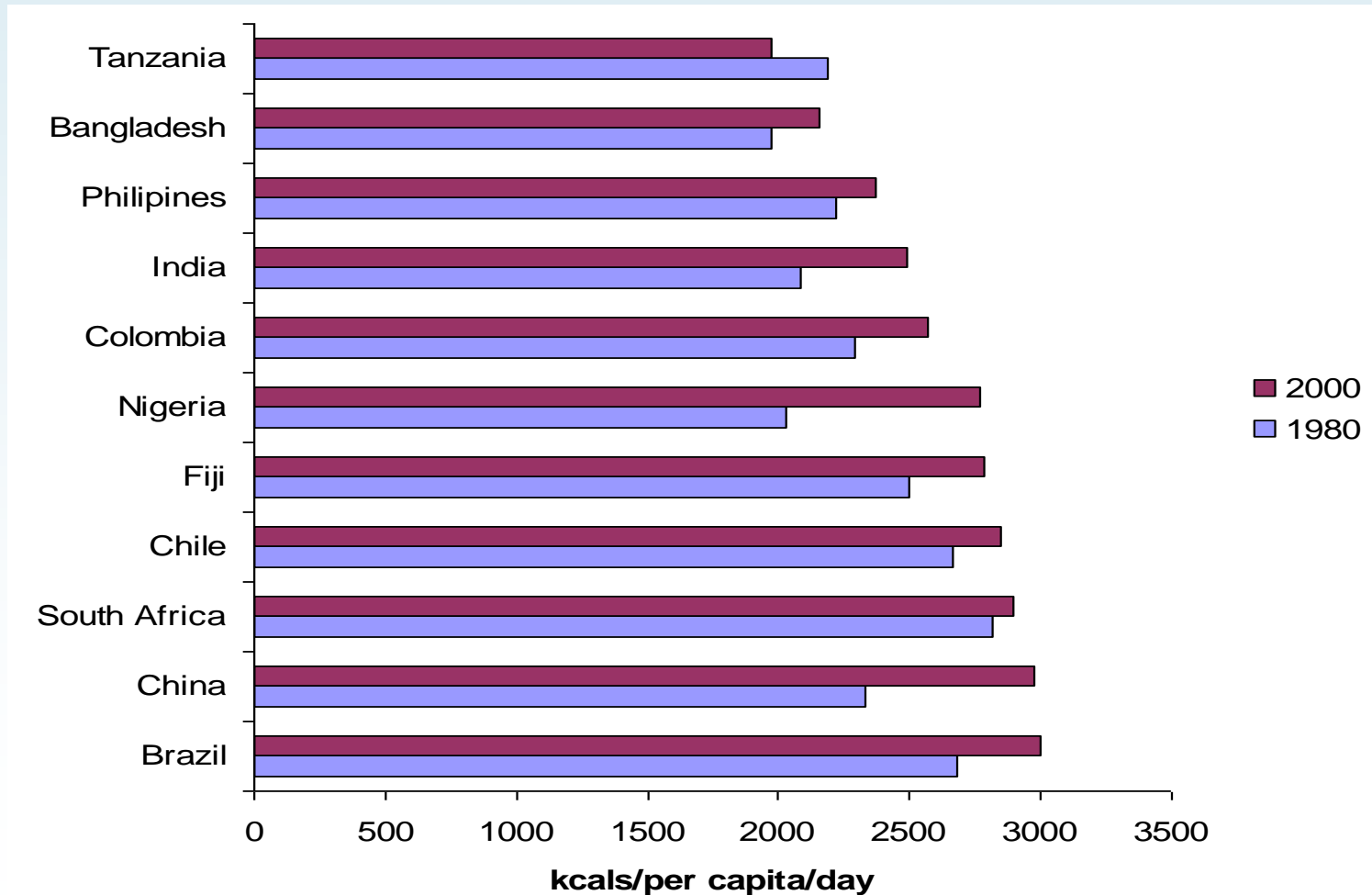
# Nutrition Transition

Undernutrition and obesity by the level of GDP per capita



# Rapid Changes in Diet

## Increasing energy density of food supply



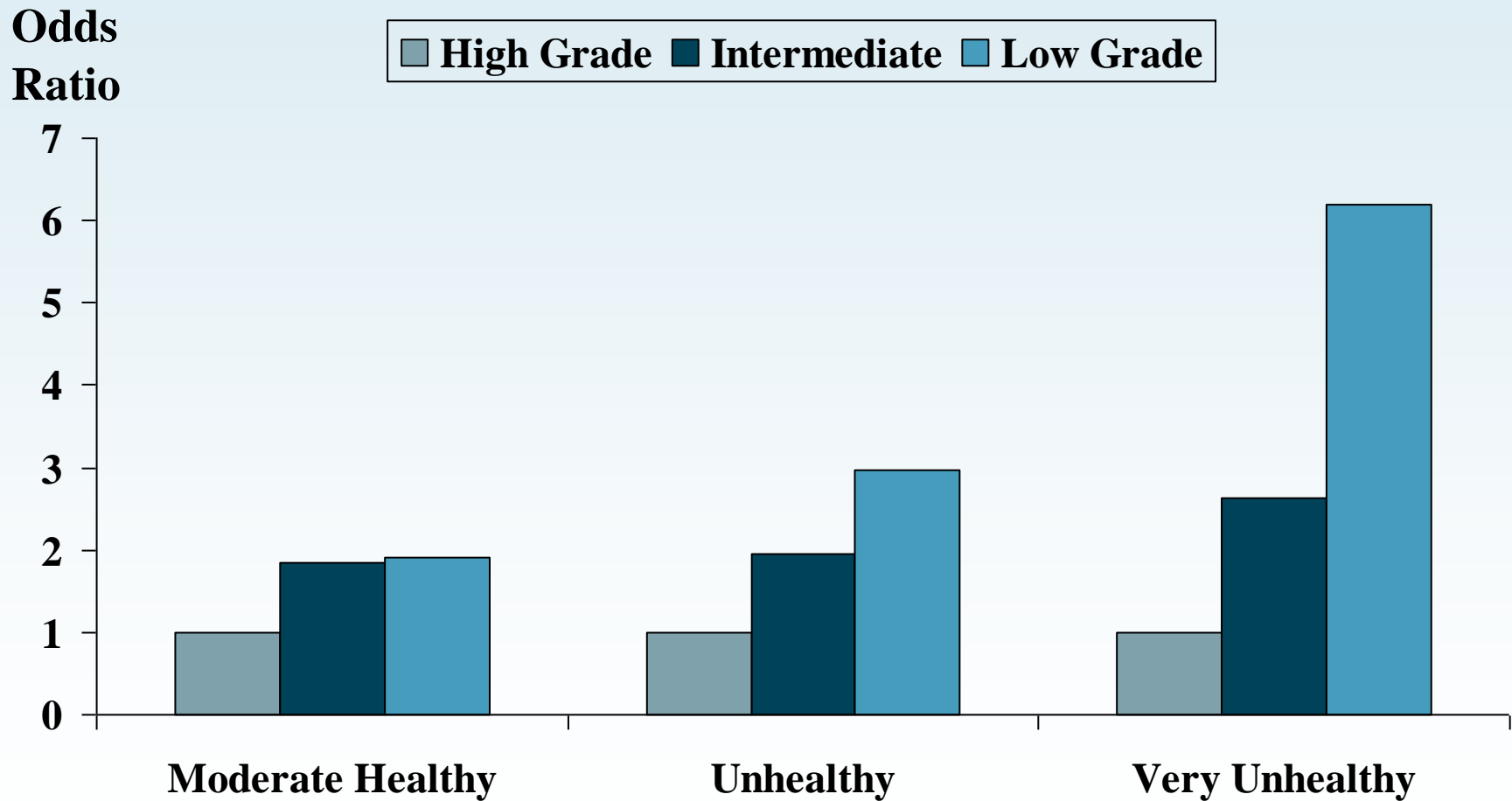
## Importance of external environment

	<b>Calories</b>	<b>Calories from fat</b>	<b>Cost per calorie</b>
<b>Tall (12 fl oz)</b>	<b>110</b>	<b>50</b>	<b>1.77</b>
<b>Grande (16 fl oz)</b>	<b>140</b>	<b>60</b>	<b>1.64</b>
<b>Venti (20 fl oz)</b>	<b>180</b>	<b>80</b>	<b>1.42</b>



**Cost per extra calorie (Venti vs Tall)**  
**= 0.86 pence**

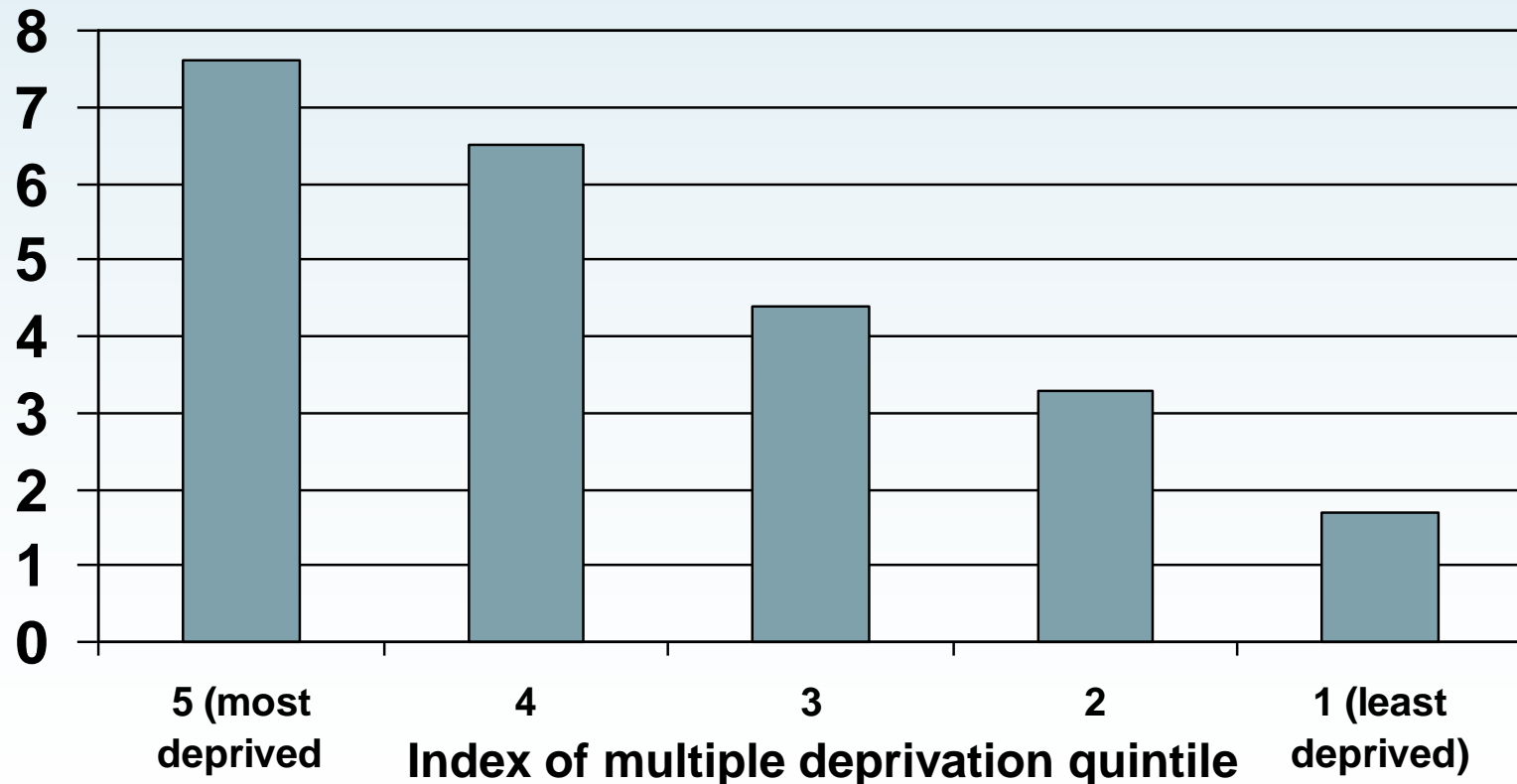
# DIET AND GRADE OF EMPLOYMENT WHITEHALL II WOMEN



*Martikainen et al. Soc.Sci.Med.,2003,56,1397-1410)*

# Fast food chains more common in deprived areas: England and Scotland

■ Mean number of fast food outlets\* per 100000 people



(\*McDonald's, Burger King, KFC and Pizza Hut)

# Psychosocial environment

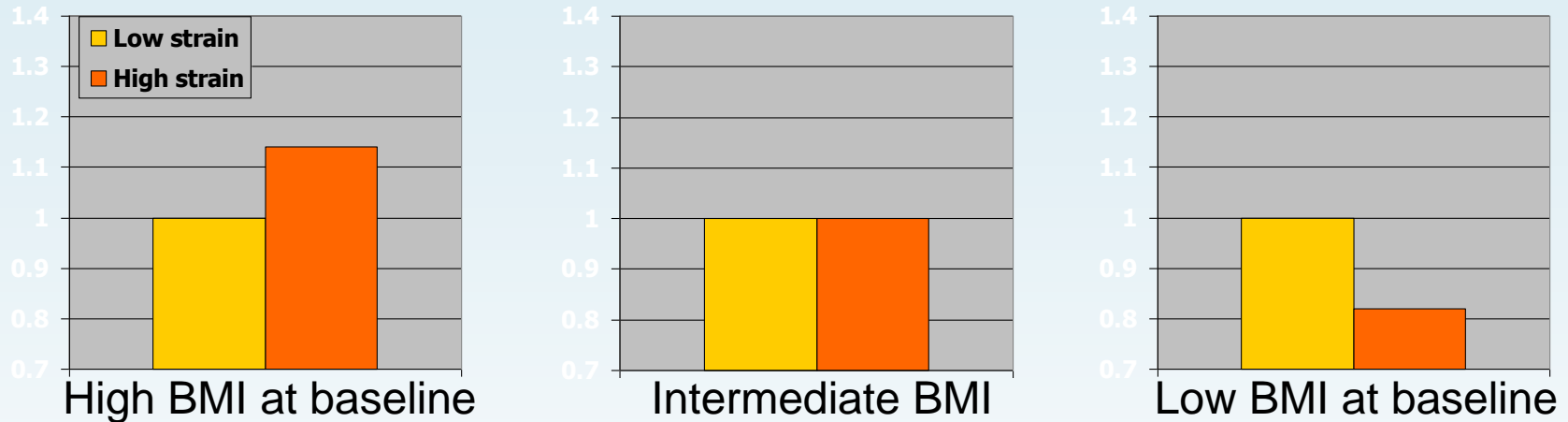
- Stress and subordination at work

# The Iso-strain concept of stress at work

- Socially isolated
  - (no supportive co-workers or supervisors)
- High strain
  - (High demands and low control)

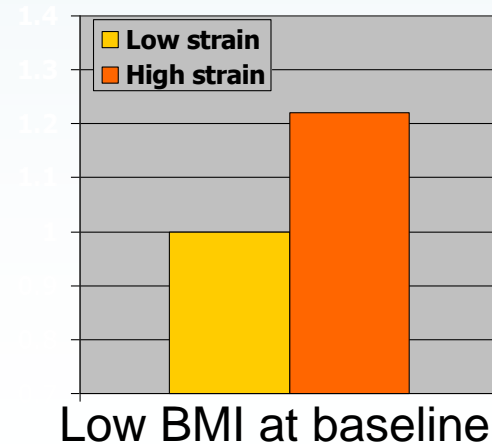
# Job strain and subsequent weight change

Odds ratio for weight gain (from Phase 1 to Phase 3)



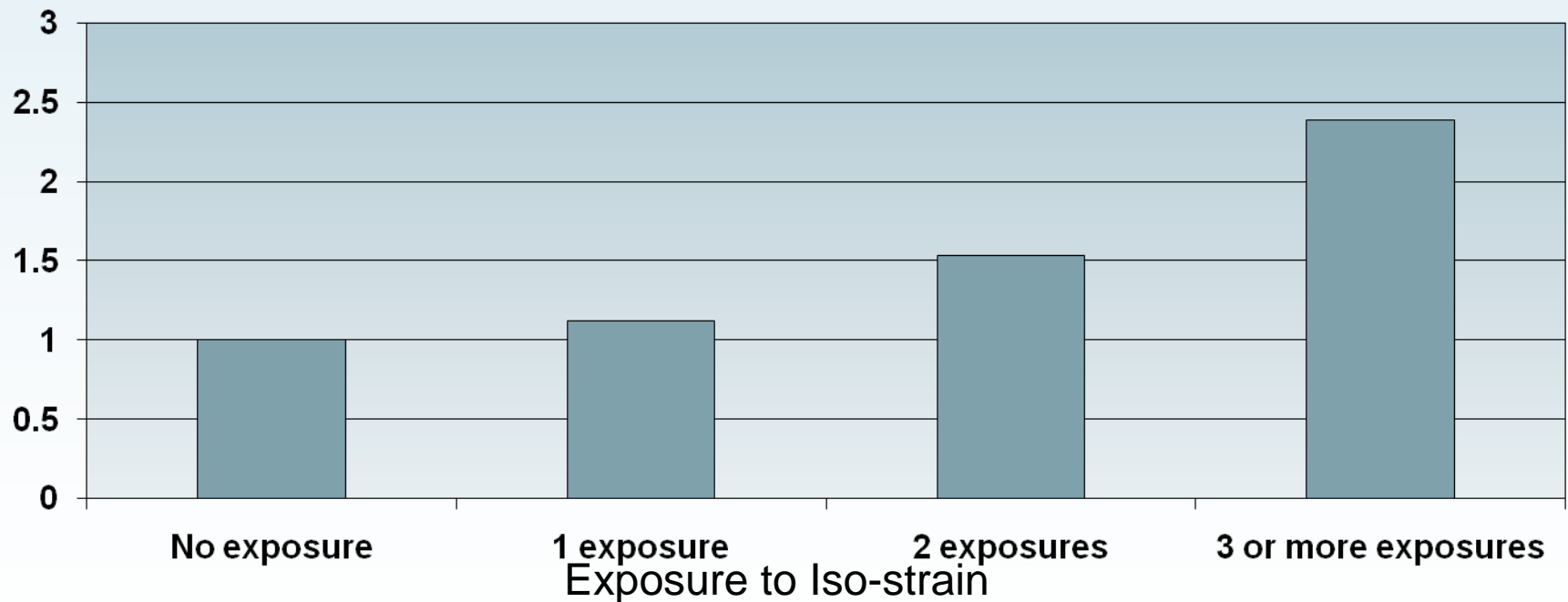
*P for interaction job strain x baseline BMI < 0.05*

Odds ratio for weight loss



# ODDS RATIO\* OF METABOLIC SYNDROME BY EXPOSURE TO ISO-STRAIN: WHITEHALL II

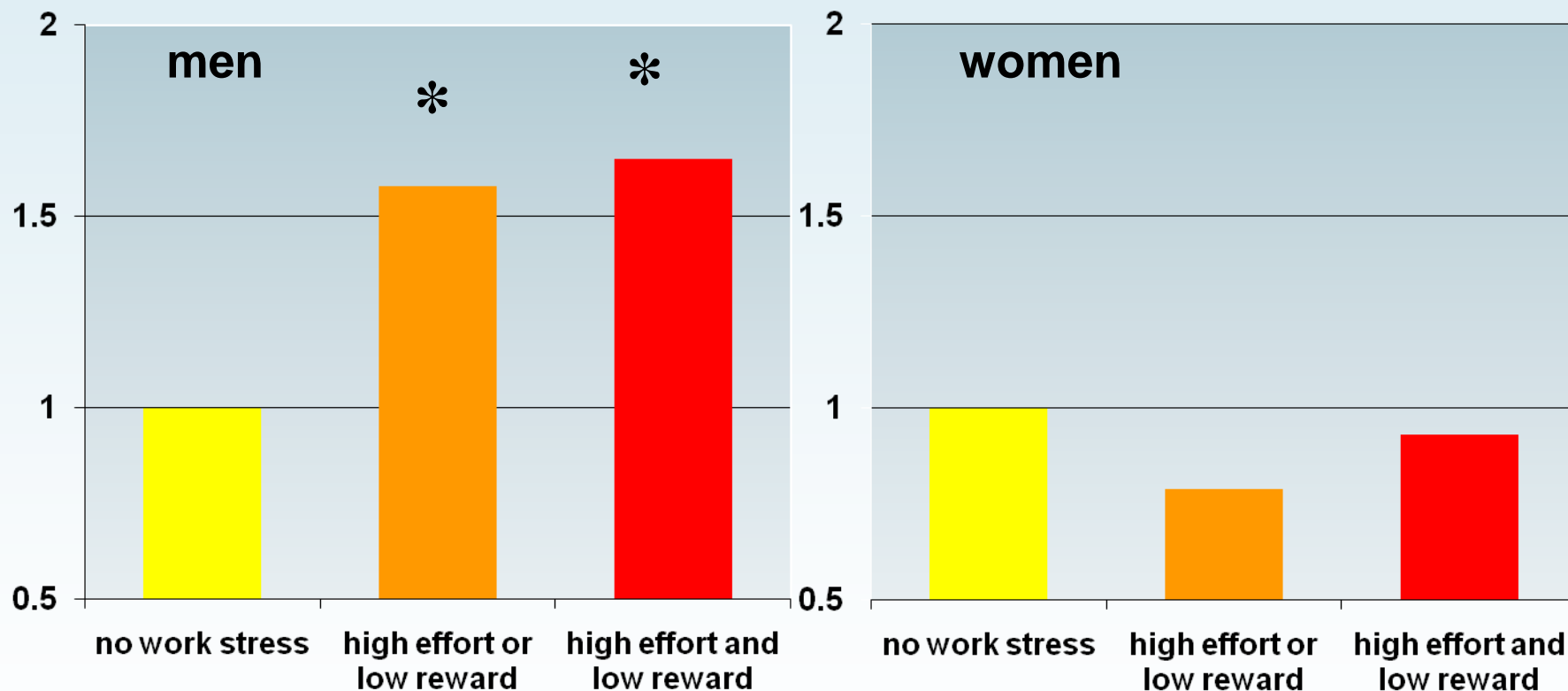
Odds Ratio



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

# Effort-reward imbalance and incident type 2 diabetes in the Whitehall II-Study

(odds ratios<sup>#</sup>; N=8067, mean follow-up: 12.5 years)



<sup>#</sup> adjusted for age, employment grade, ethnic group, length of follow up, ECG abnormalities, family history of diabetes, BMI, height, SBP, exercise, smoking, life events

Source: A. Kumari et al. (2004), Arch Intern Med, 164: 1873-80.

# Sense of Unfairness in the Whitehall II study

## Measure

Item question\*: “I often have the feeling that I am being treated unfairly”

Participants rated their response on a 6-point scale (1=strongly disagree; 2=moderately disagree; 3=slightly disagree; 4=slightly agree; 5=moderately agree; 6=strongly agree).

Four levels of unfairness:

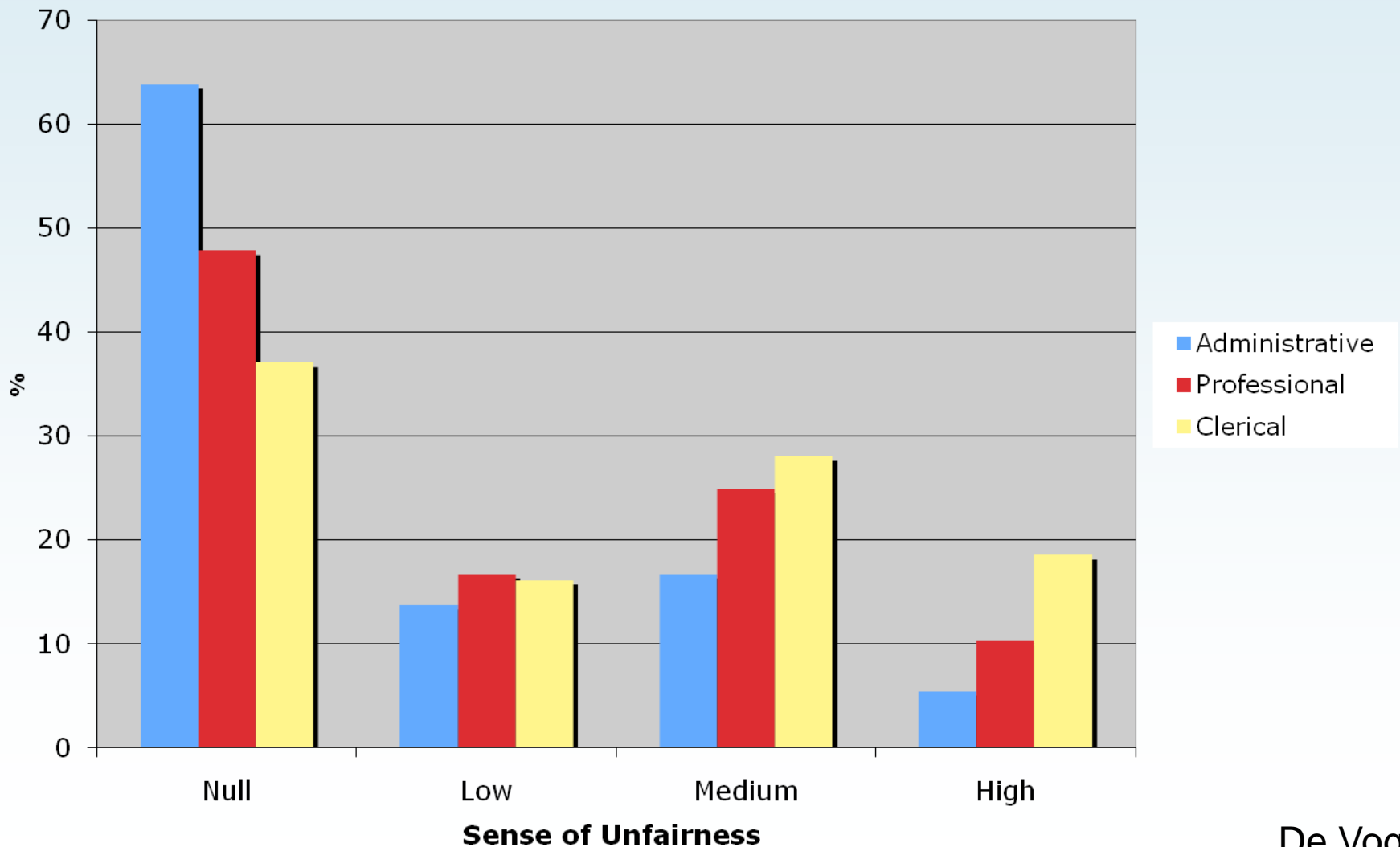
1 and 2= “null”

3= “low”

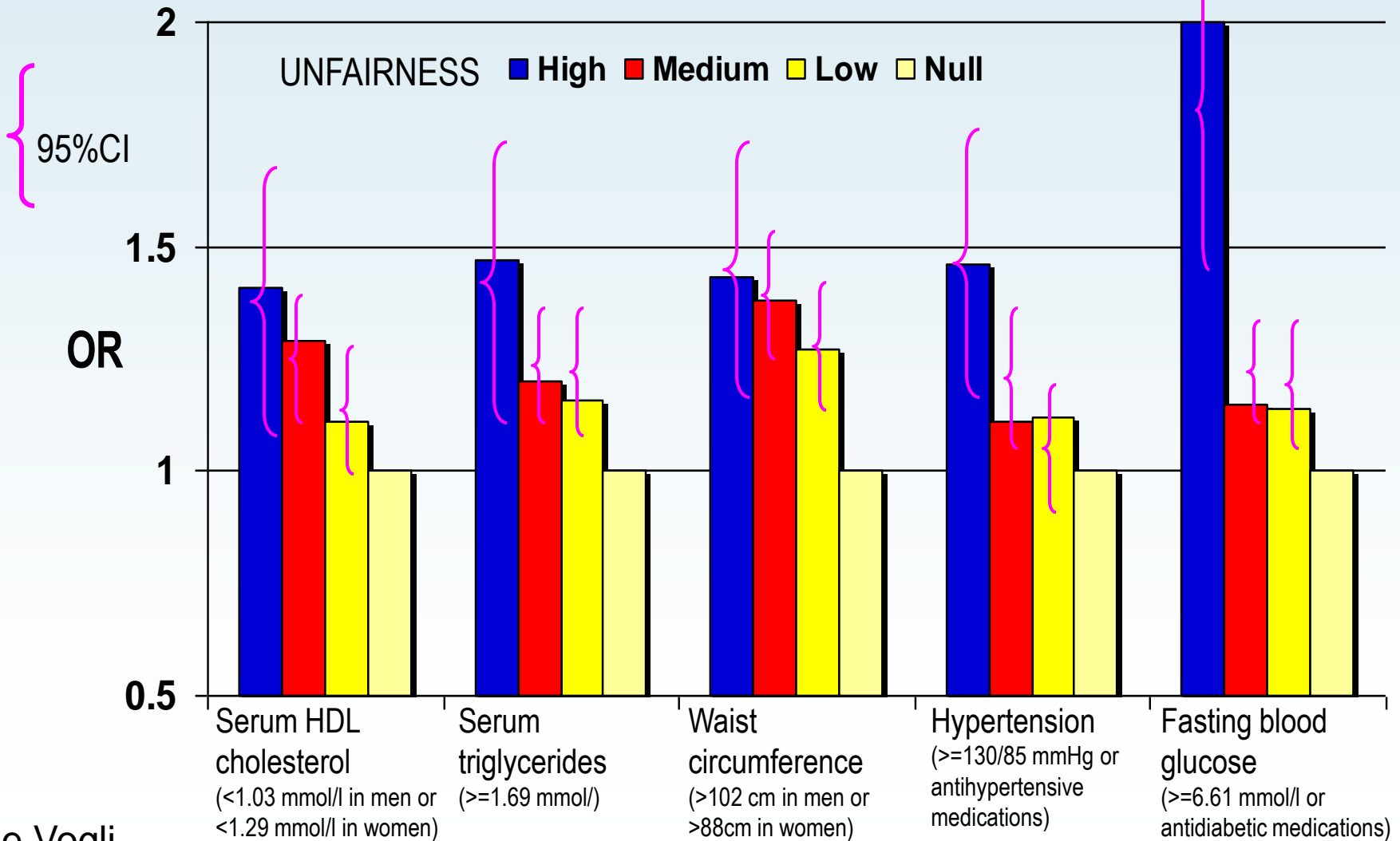
4= “medium”

5 and 6= “high”

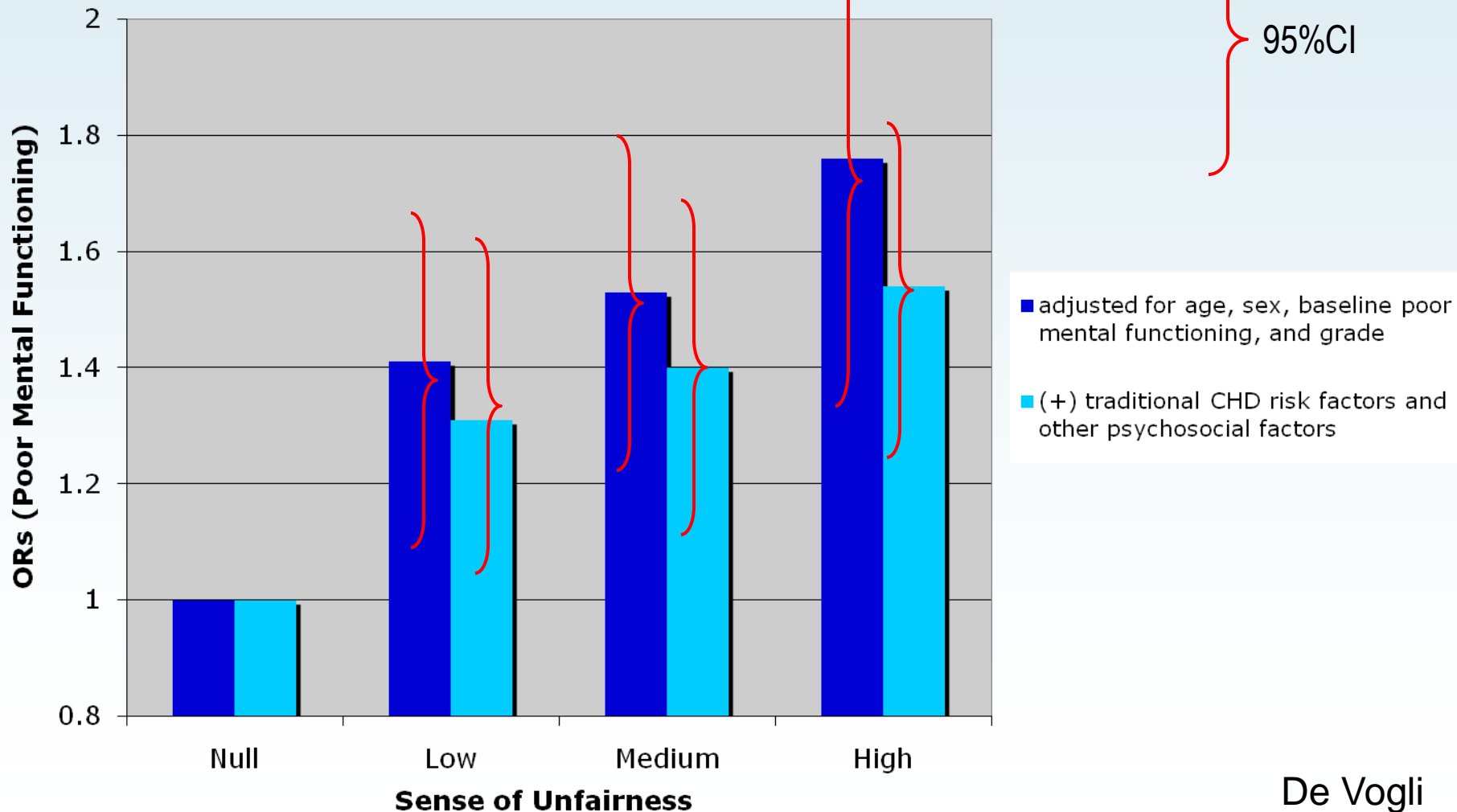
# Sense of Unfairness by Employment Grade:WII



# Unfairness and components of the metabolic syndrome: WII study

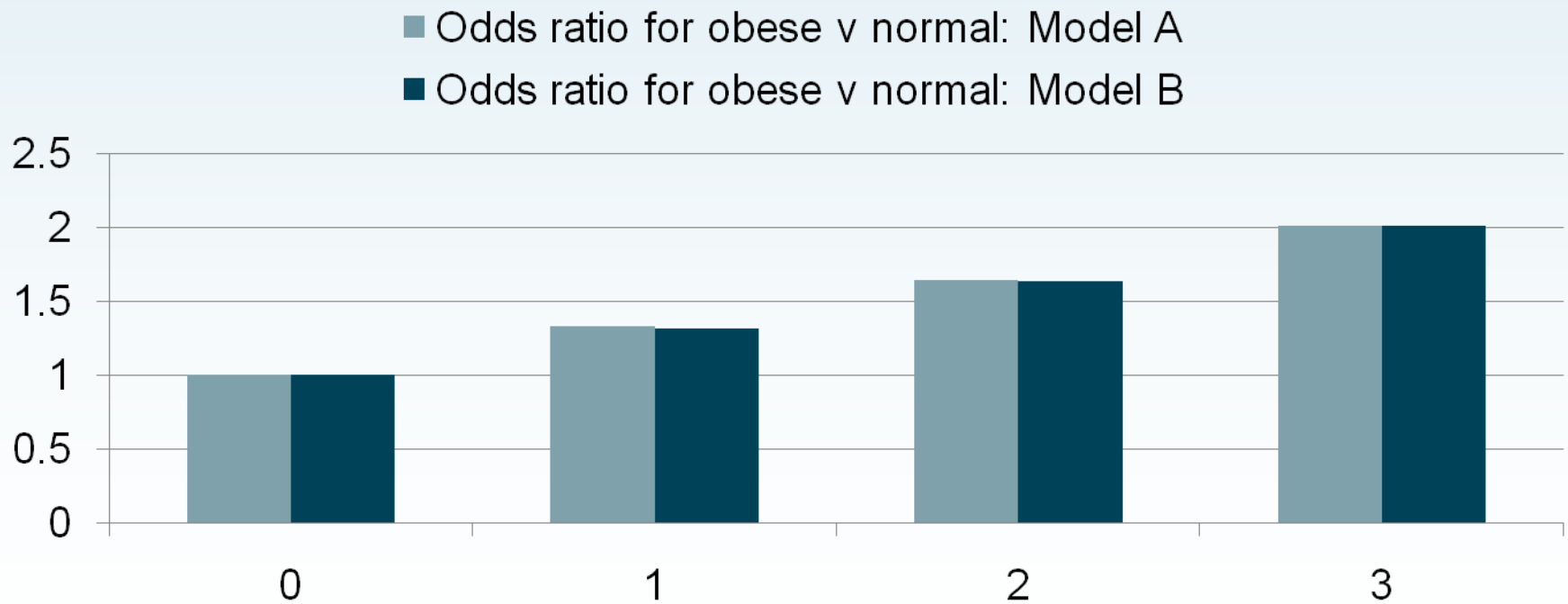


# Sense of Unfairness and Poor Mental Functioning: WII study



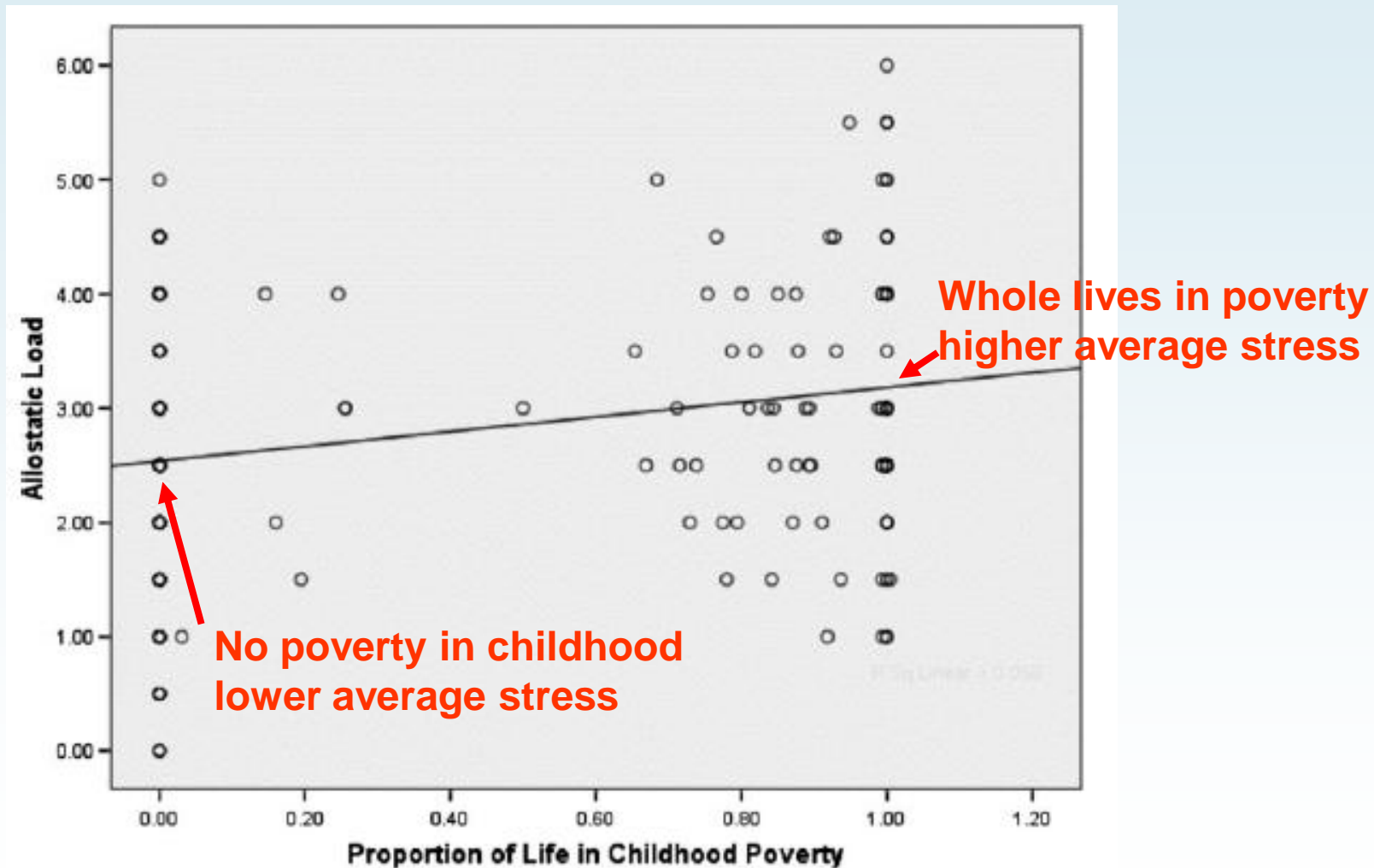
# Psychological distress and subsequent obesity: Whitehall II study

Model A: adjusted for age, sex and BMI at phase 1, Model B: additionally adjusted for ethnicity, marital status, socioeconomic position, smoking, alcohol intake, physical activity, systolic blood pressure, diastolic blood pressure, total cholesterol, diabetes, coronary heart disease, and use of psychotropic drugs at phase 1

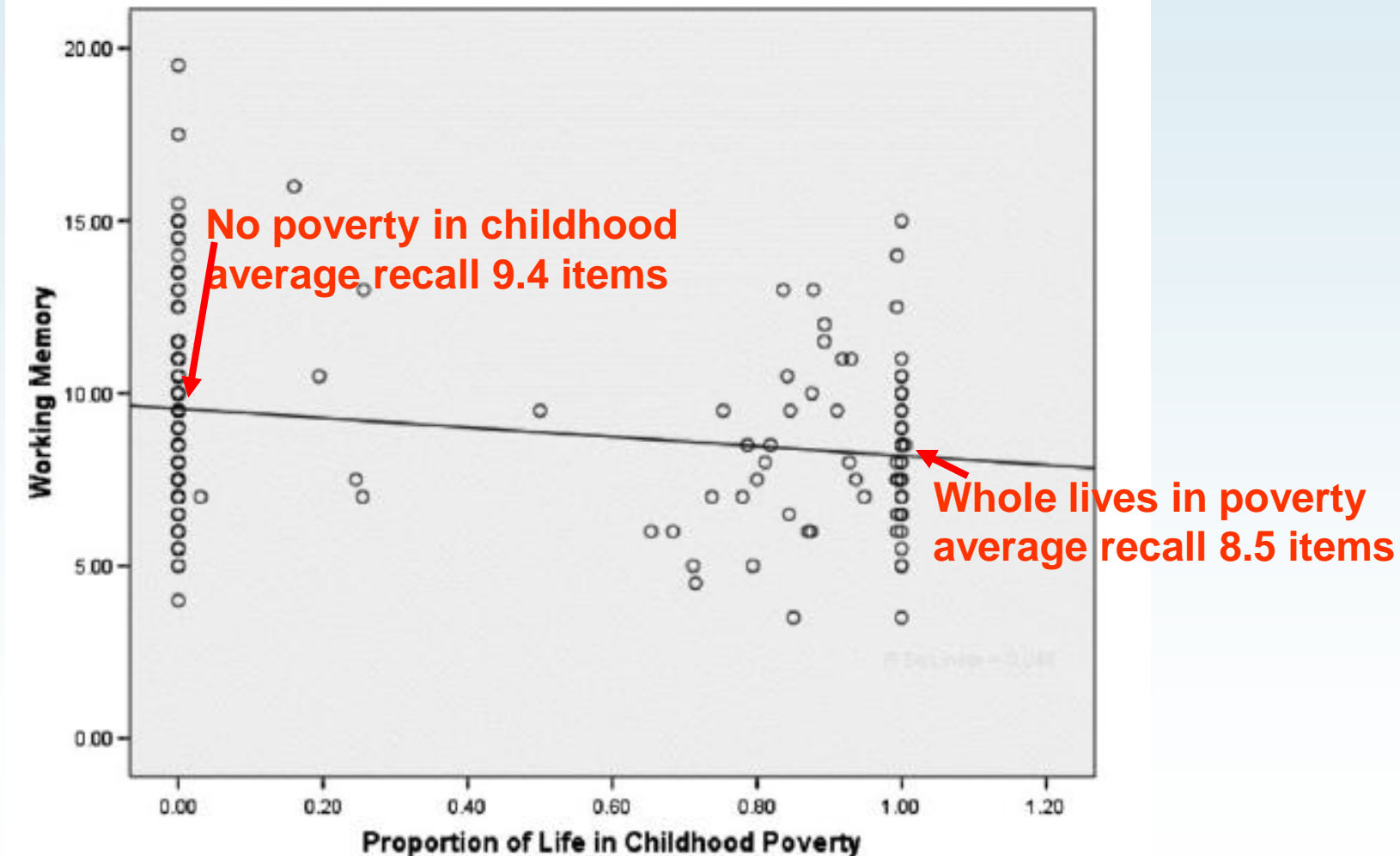


Number of times GHQ case (measure of psychological distress) at phases 1, 3, and 5

# Duration of childhood poverty and children's levels of chronic stress



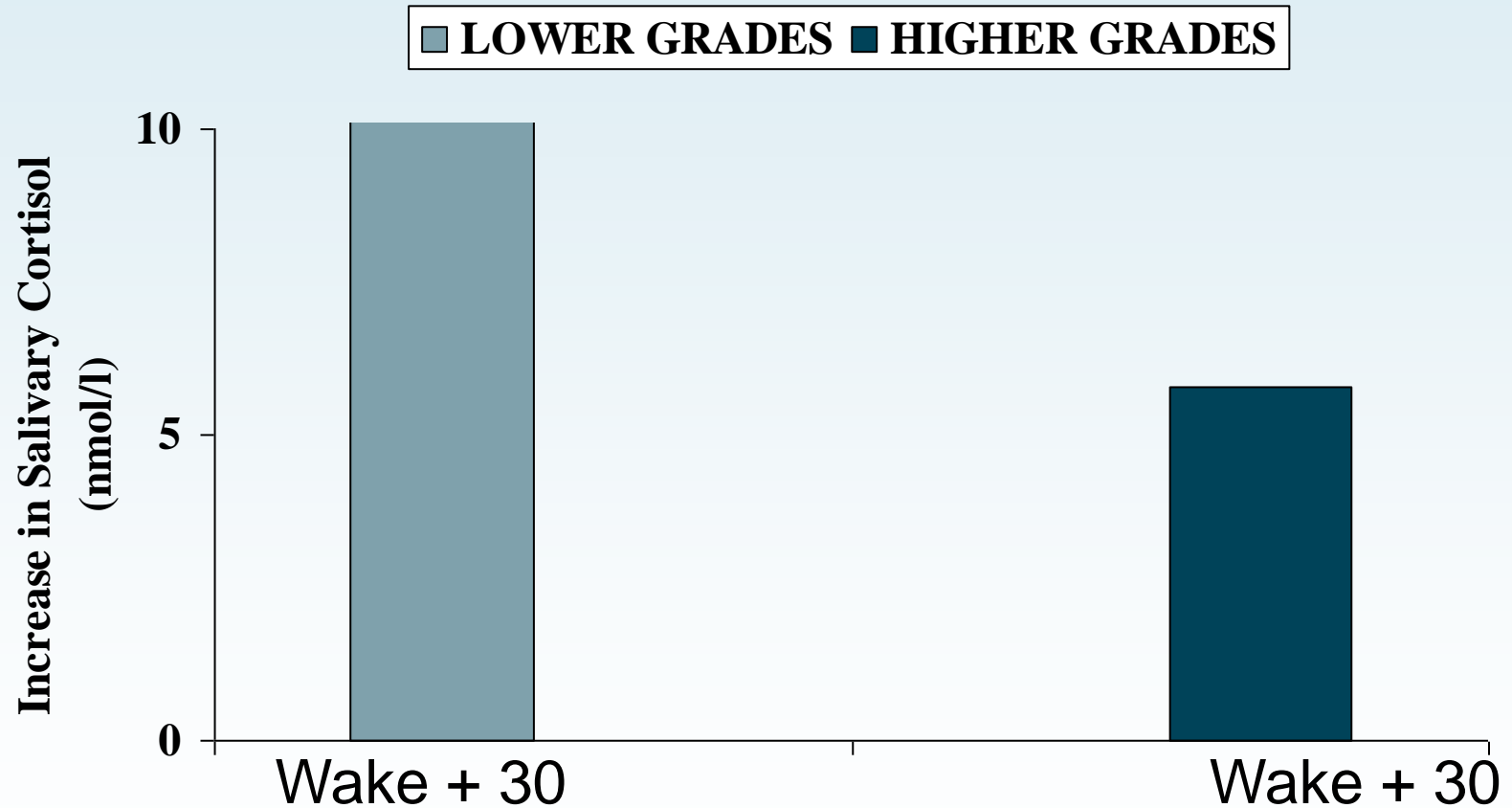
# Duration of childhood poverty and working memory in young adults



# MECHANISMS

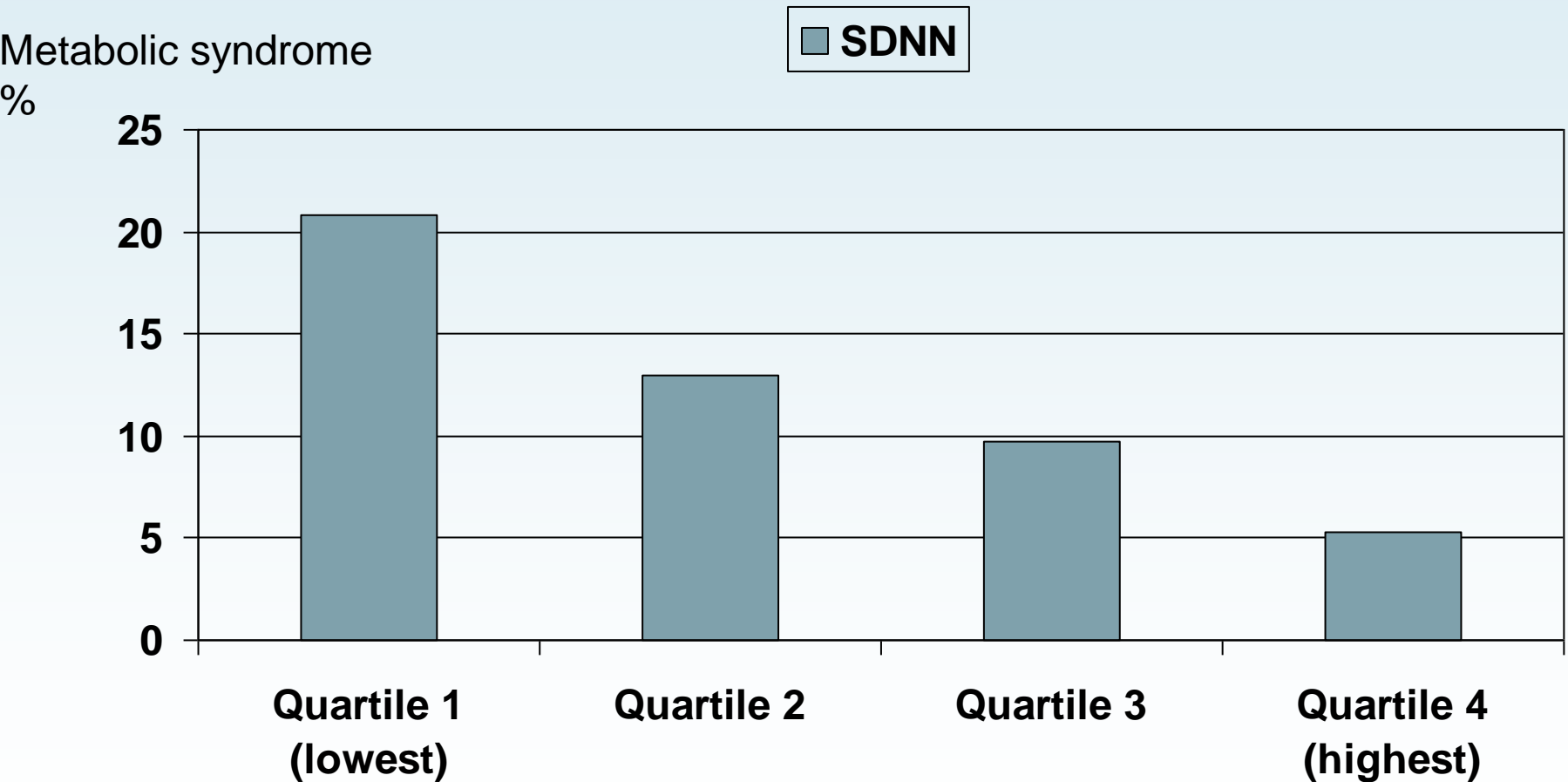
- HYPOTHALAMIC PITUITARY AXIS  
HPA – CORTISOL
- SYMPATHETIC/PARASYMPATHETIC

# 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)

# Closing the gap in a generation

Health equity through action on the social determinants of health



- Social justice
- Empowerment as a means – material, psychosocial, political
- Creating the conditions for people to take control of their lives