The University of Manchester
Institute of
Health Sciences

MANCHESTER 1824

Ageing and Sleep:
the biological clock and sleep disturbance

Biological clocks, sleep and ageing: from genes to drugs
- Dr Qing-Jun Meng, Medical Research Council Fellow in Neurosystems

The effects of sleep duration and sleep disturbance on ageing
- Tarani Chandola, Professor of Medical Sociology

Discussant – Dr Mike Horan, Professor of Geriatric Medicine

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The effects of sleep duration and sleep disturbance on ageing

Tarani Chandola

CCSR **MICRA**

Outline

- Sleep duration and disturbance in older adults.
- Which is worse: too little or too much sleep?
- Who has sleep problems?
- Sleep, stress and ageing.

Measuring Sleep duration and disturbance

- Laboratory measures: ECG, EEG, EMG, EOG, etc
- Actigraphy
- Sleep diaries
- Sleep questionnaires

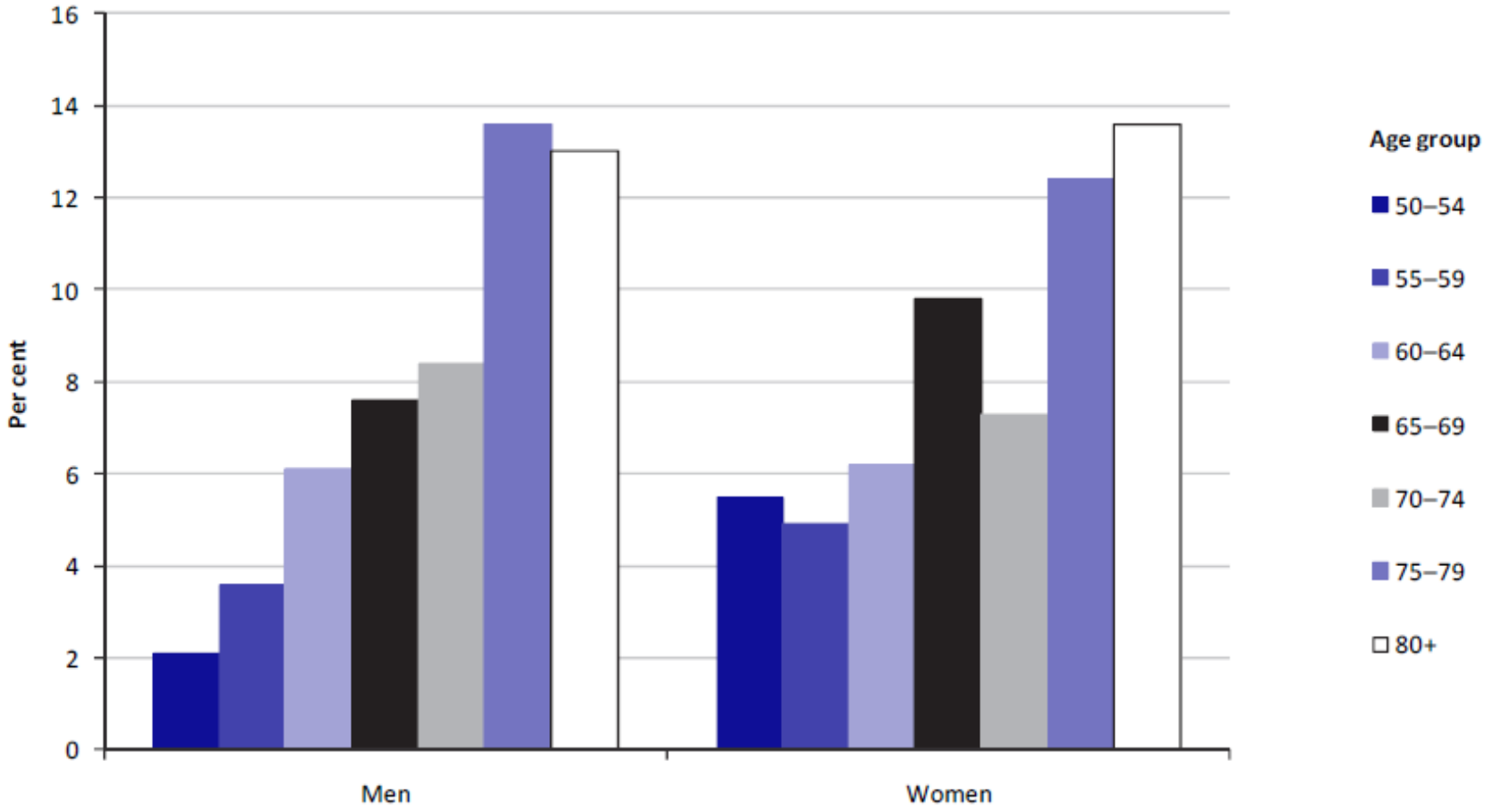
Box 1: Typical sleep changes with aging

- Decreased total nocturnal sleep time
- Delayed onset of sleep
- Advanced circadian phase: early to bed, early to rise
- Reduced slow-wave sleep
- Reduced rapid-eye-movement (REM) sleep
- Reduced threshold for arousal from sleep
- Fragmented sleep with multiple arousals
- Daytime napping

Wolkove, N. et al. CMAJ 2007;176:1299-1304

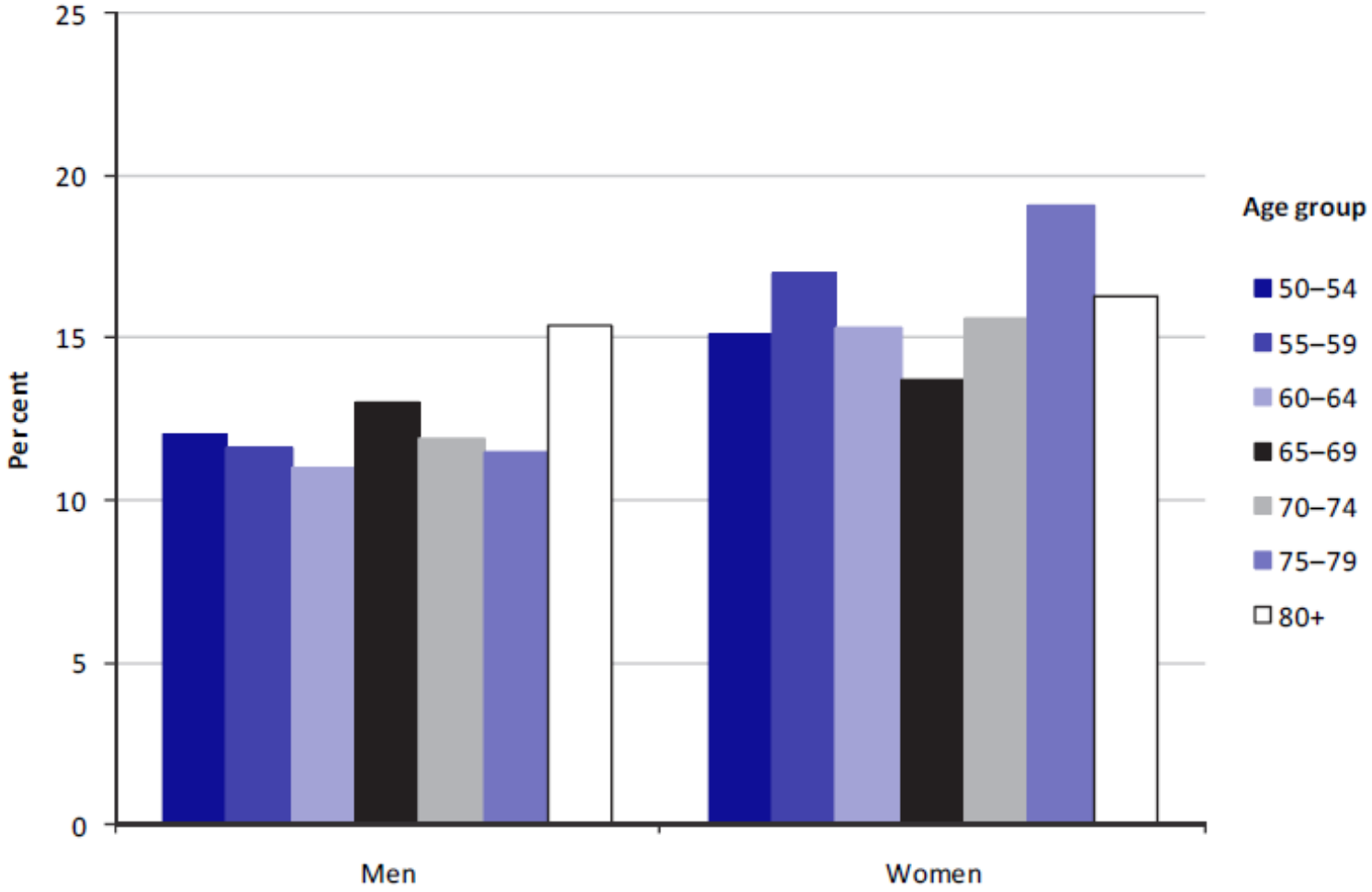
CMAJ·JAMC

Percentage of men and women who report long sleep duration (8 hrs or more) by age group



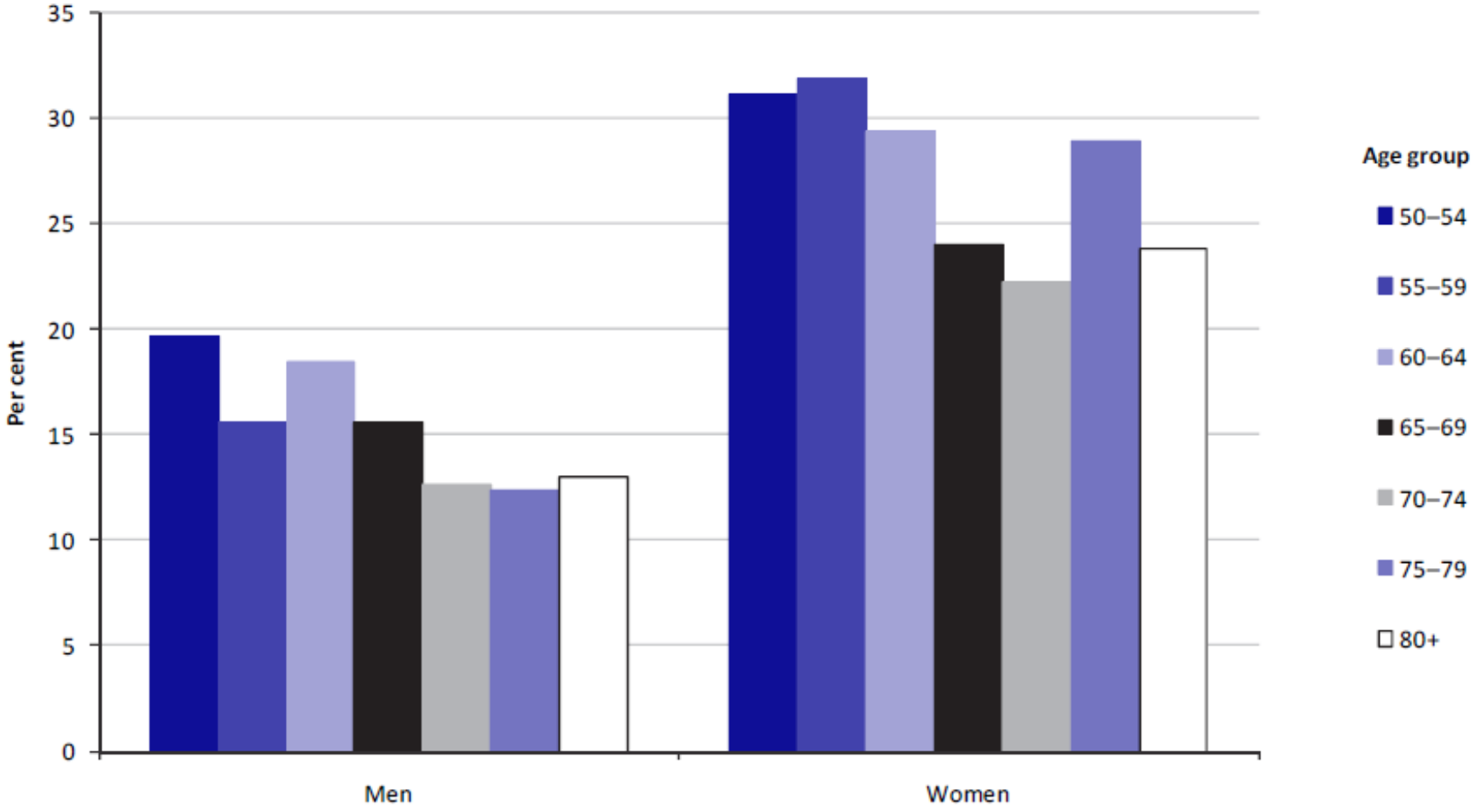
Kumari et al. (2010) *ELSA wave 4 report*

Percentage of men and women who report short sleep duration (5 hrs or less) by age group



Kumari et al. (2010) *ELSA wave 4 report*

Percentage of men and women in the worst quartile of sleep disturbance by age group

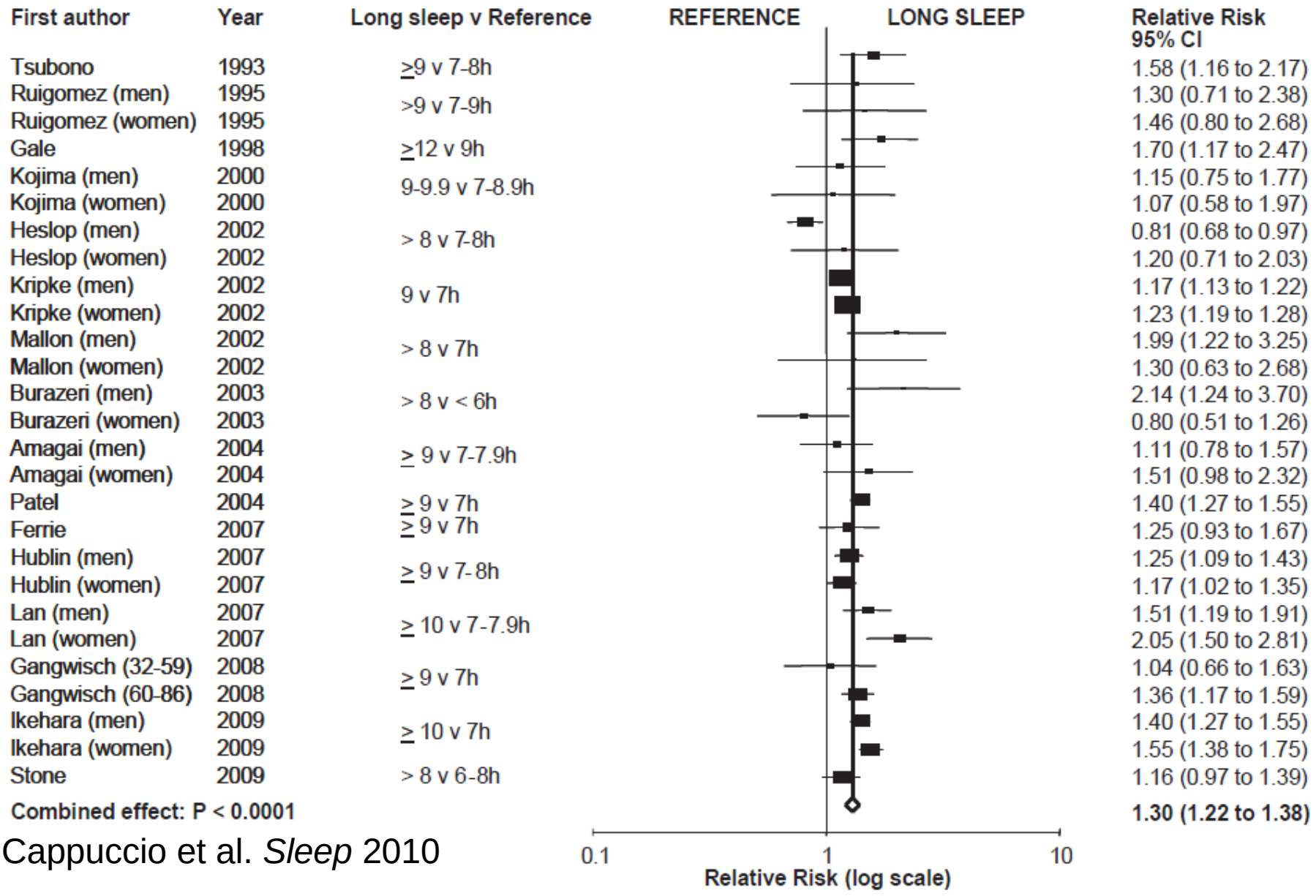


Kumari et al. (2010) *ELSA wave 4 report*

Which is worse for your health?

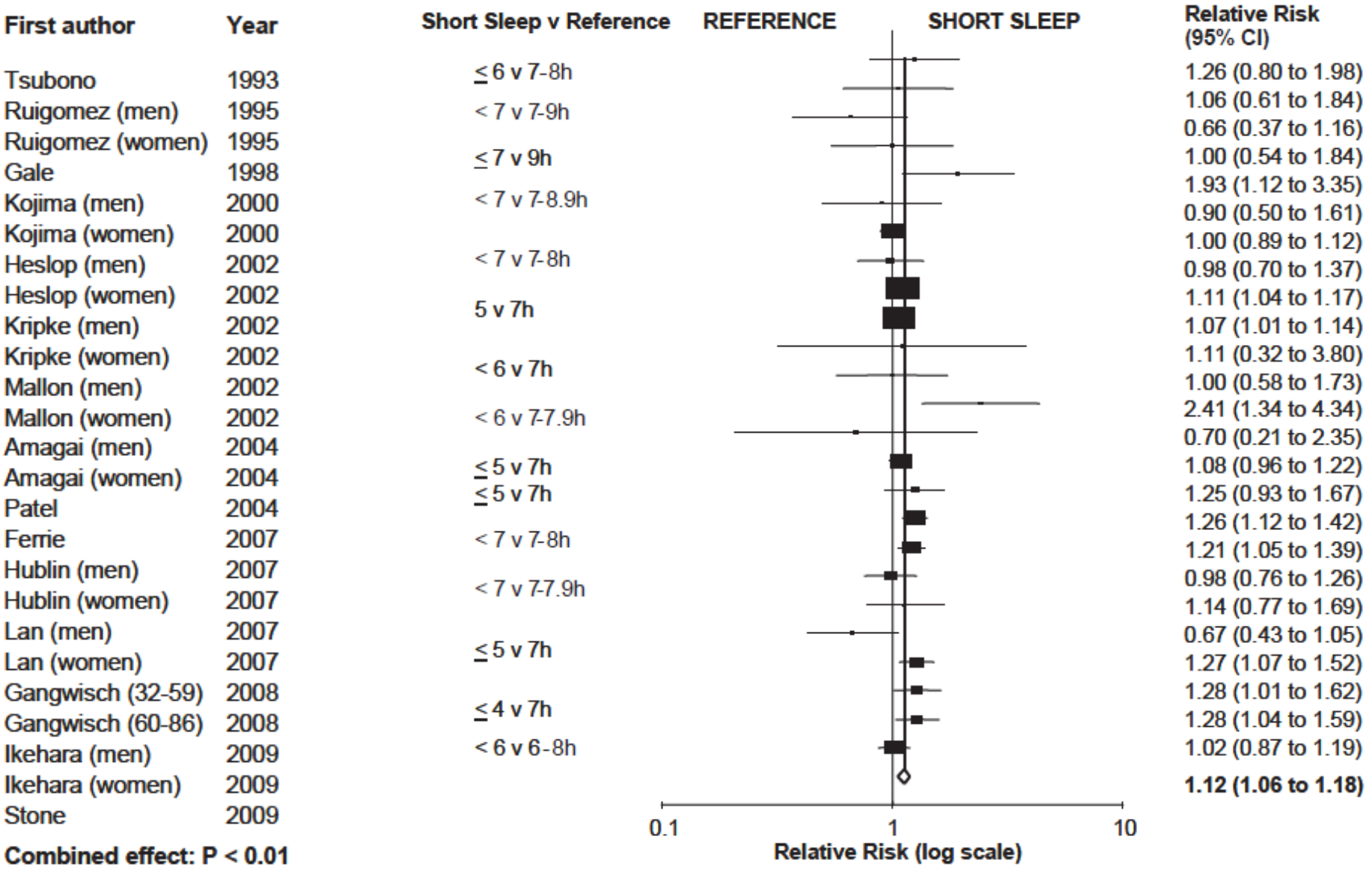
- Too much sleep?
- Too little sleep?
- Poor quality sleep?

Forest plot of the risk of death associated with long duration of sleep

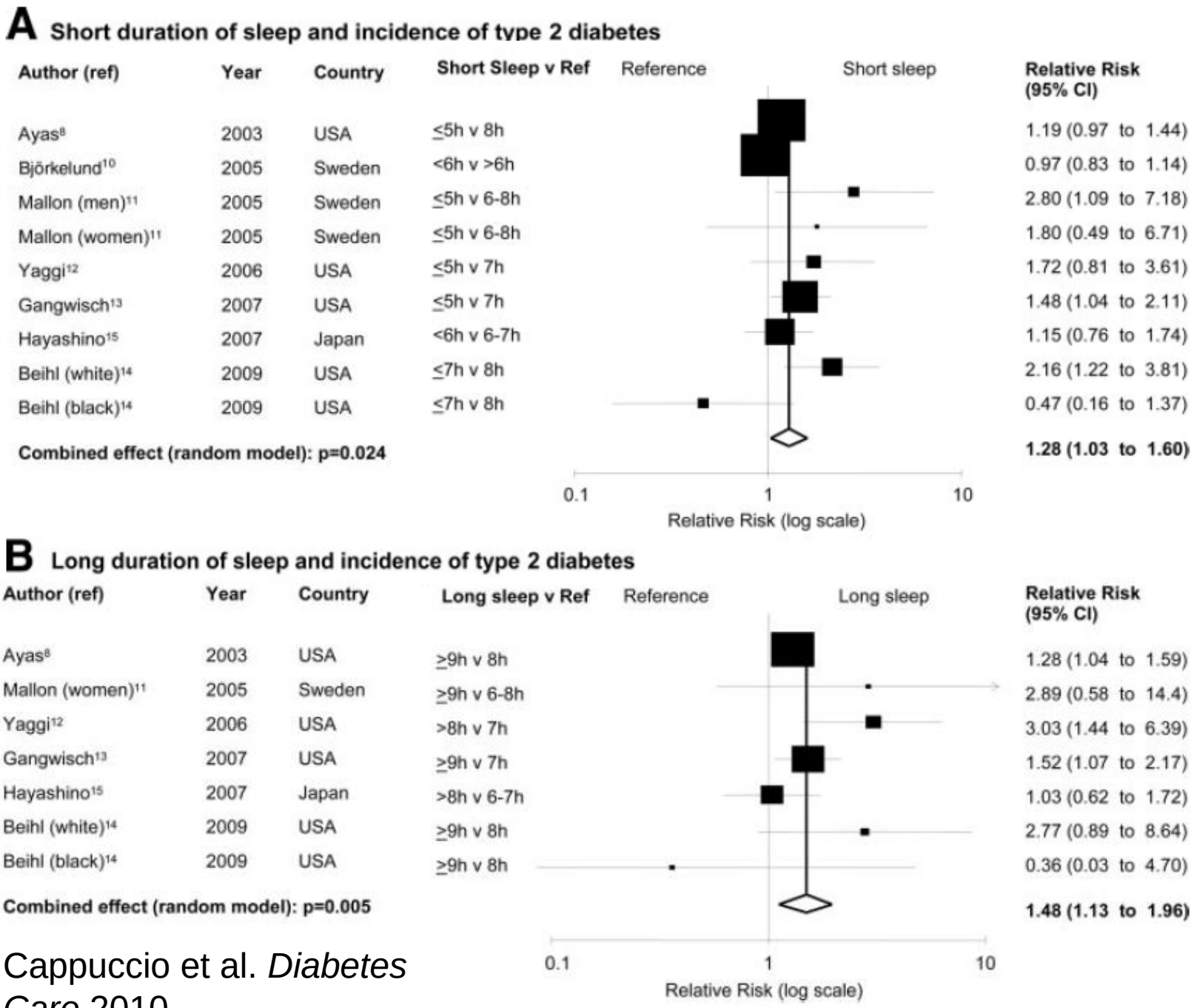


Cappuccio et al. *Sleep* 2010

Forest plot of the risk of death associated with short duration of sleep



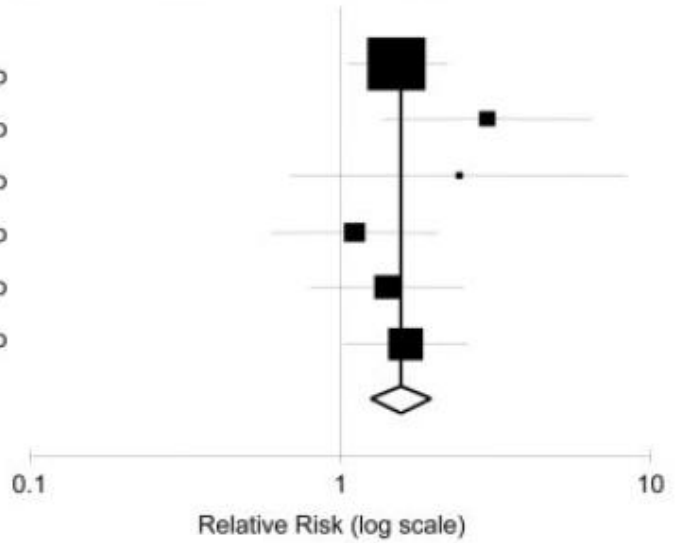
Cappuccio et al. *Sleep* 2010



Cappuccio et al. *Diabetes Care* 2010

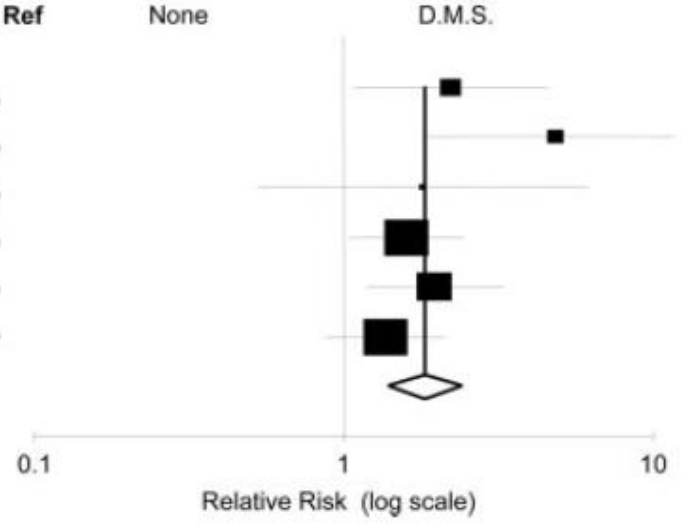
A **Difficulty in initiating sleep and incidence of type 2 diabetes**

Author (ref)	Year	Country	D.I.S. v Ref	Relative Risk (95% CI)
Nilsson[9]	2004	Sweden	Yes v No	1.52 (1.05 to 2.21)
Kawakami[16]	2004	Japan	Yes v No	2.97 (1.36 to 6.51)
Mallon (men)[11]	2005	Sweden	Yes v No	2.41 (0.69 to 8.45)
Meisinger (men)[17]	2005	Germany	Yes v No	1.11 (0.59 to 2.07)
Meisinger (women)[17]	2005	Germany	Yes v No	1.42 (0.80 to 2.51)
Hayashino[15]	2007	Japan	Yes v No	1.62 (1.01 to 2.59)
Combined effect (random model): p<0.0001				**1.57 (1.25 to 1.97)**



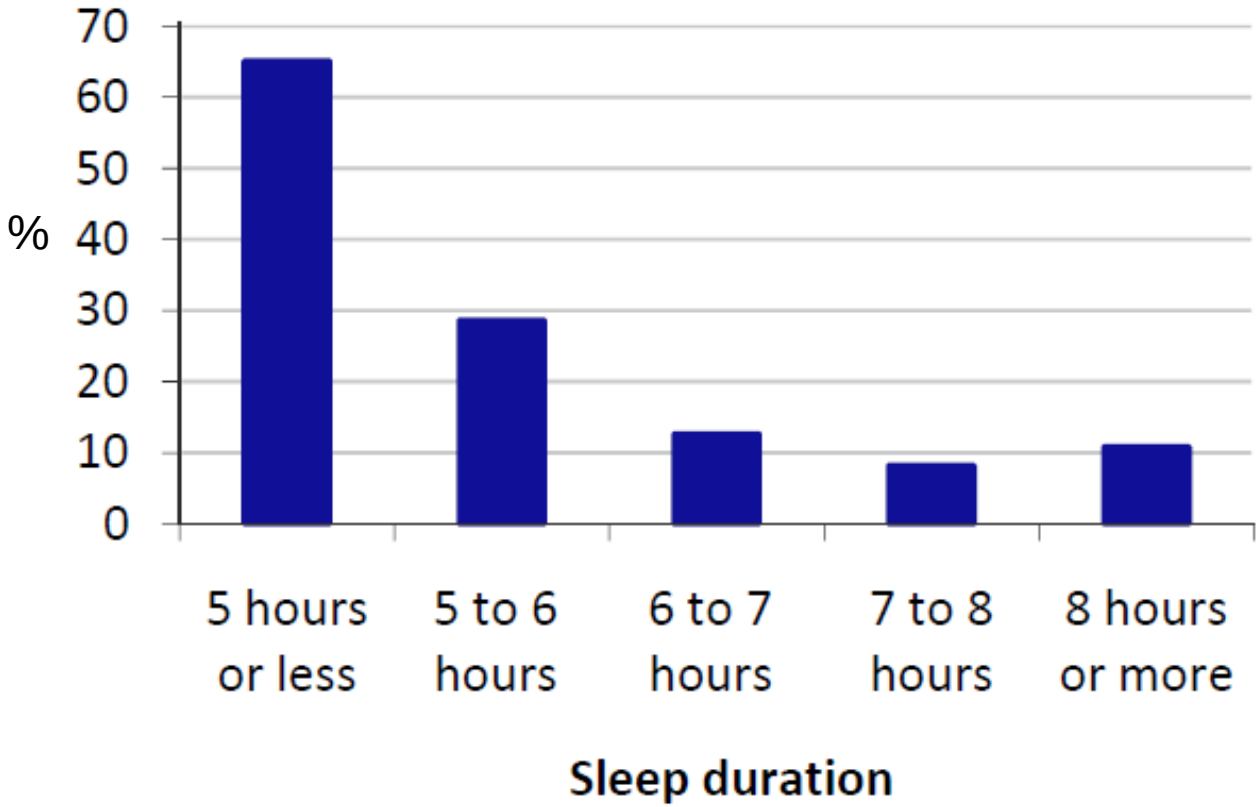
B **Difficulty in maintaining sleep and incidence of type 2 diabetes**

Author (ref)	Year	Country	D.M.S. v Ref	Relative Risk (95% CI)
Kawakami[16]	2004	Japan	Yes v No	2.23 (1.08 to 4.60)
Mallon (men)[11]	2005	Sweden	Yes v No	4.81 (1.88 to 12.3)
Mallon (women)[11]	2005	Sweden	Yes v No	1.80 (0.52 to 6.20)
Meisinger (men)[17]	2005	Germany	Yes v No	1.60 (1.04 to 2.46)
Meisinger (women)[17]	2005	Germany	Yes v No	1.97 (1.19 to 3.29)
Hayashino[15]	2007	Japan	Yes v No	1.36 (0.87 to 2.14)
Combined effect (random model): p<0.0001				**1.84 (1.39 to 2.43)**



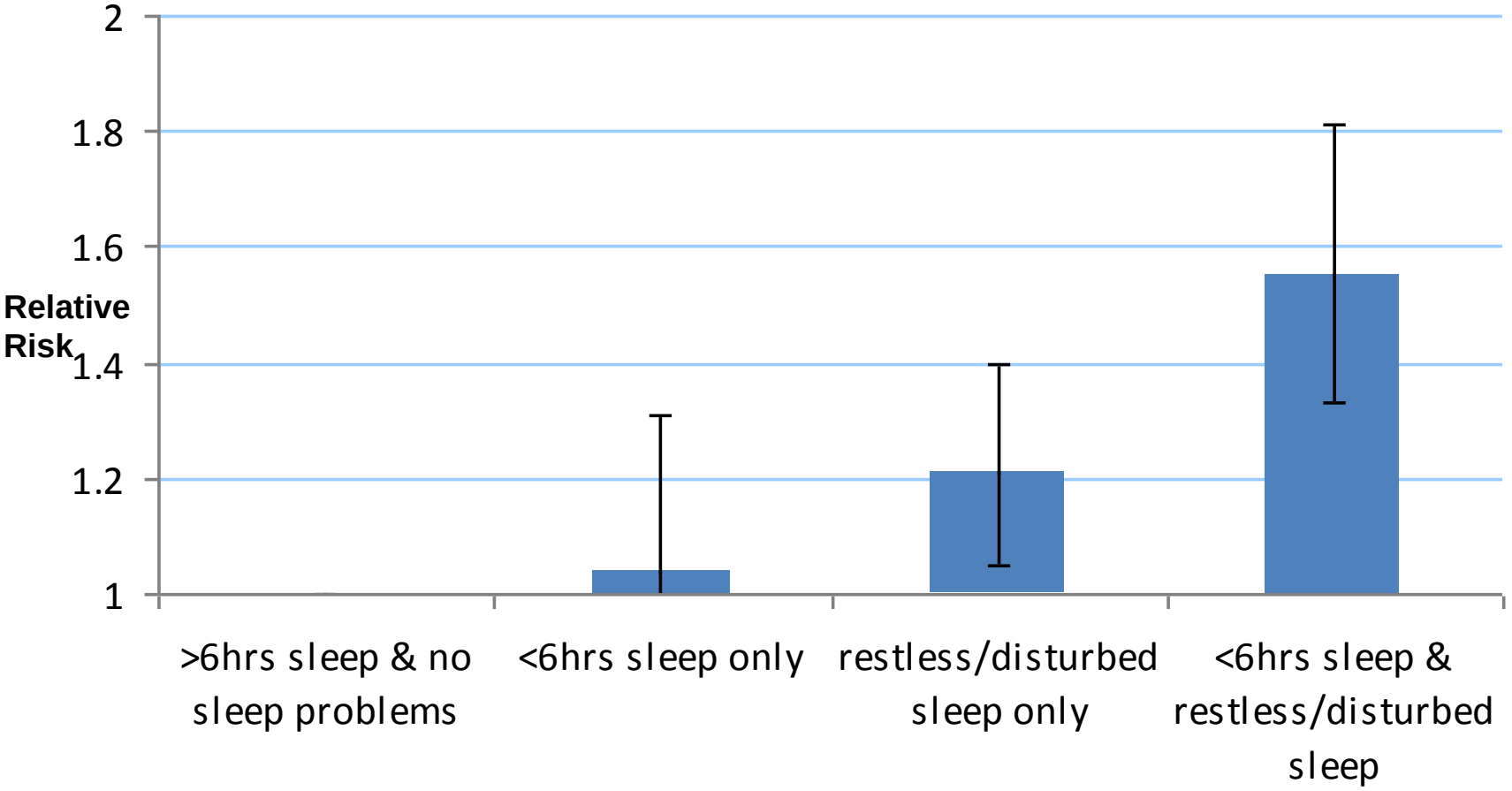
Cappuccio et al. *Diabetes Care* 2010

Percentage of ELSA participants classified as reporting high sleep disturbance (worst quartile) by sleep duration



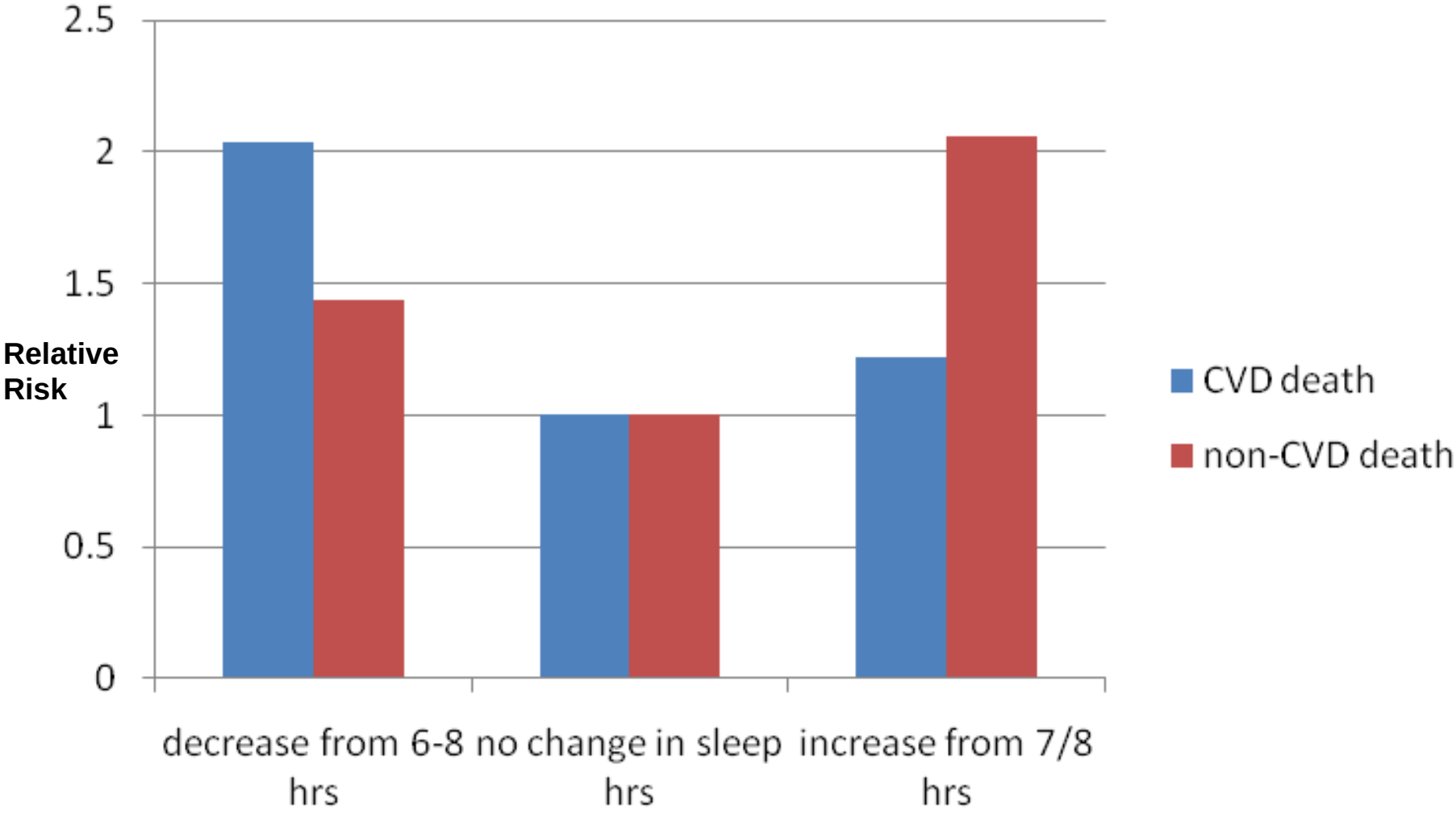
Kumari et al. (2010) *ELSA wave 4 report*

Interaction between short sleep hours and sleep quality on the risk of incident coronary heart disease



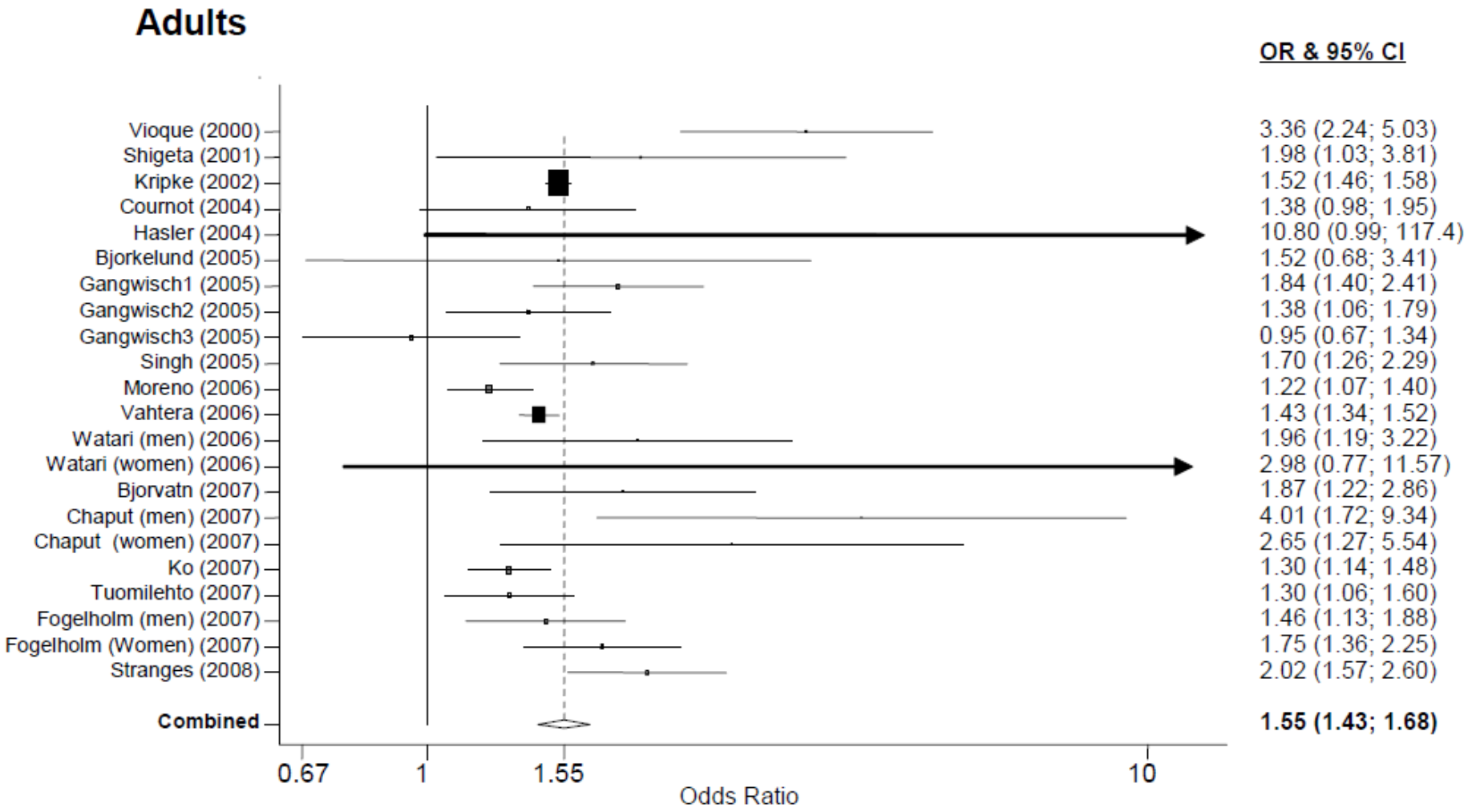
Chandola et al. (2010) *Sleep*

Change in sleep hours and risk of cardiovascular and non-cardiovascular death



Ferrie et al. (2007) *Sleep*

Forest plot of the risk of obesity associated with short duration of sleep

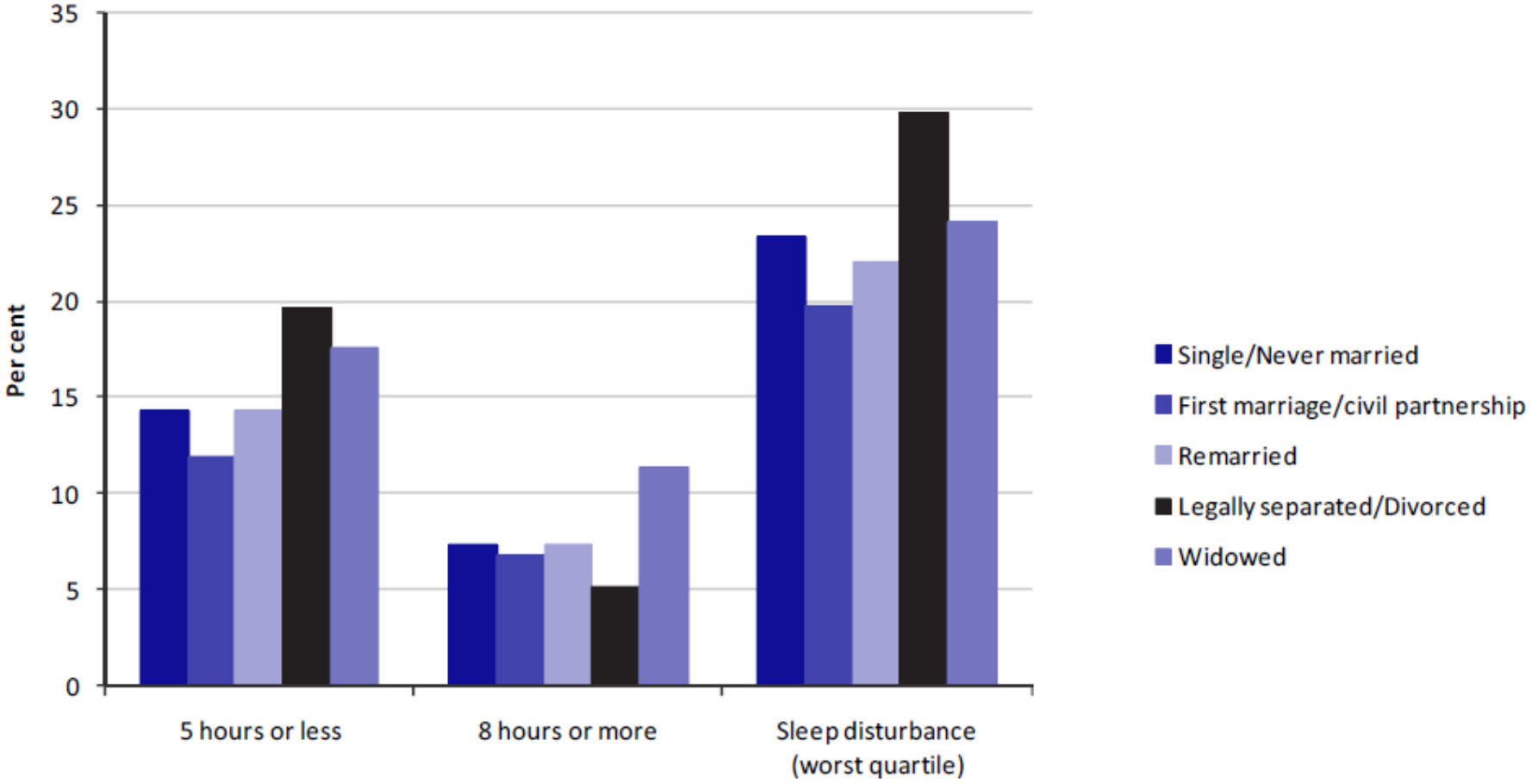


Cappuccio et al. (2008) *Sleep*

Different mechanisms for short vs. long sleep?

- Too much sleep:
  - Residual confounding
  - Comorbidities
  - Fatigue
- Too little sleep ~ Poor quality sleep:
  - Aetiological
  - Metabolic risk factors
  - Low grade inflammation
- If aetiological, what are the psychosocial determinants of sleep problems?

Percentage of ELSA respondents who report short sleep (5 hrs or less), long sleep (8 hrs or more) and sleep disturbance (highest quartile) by marital status

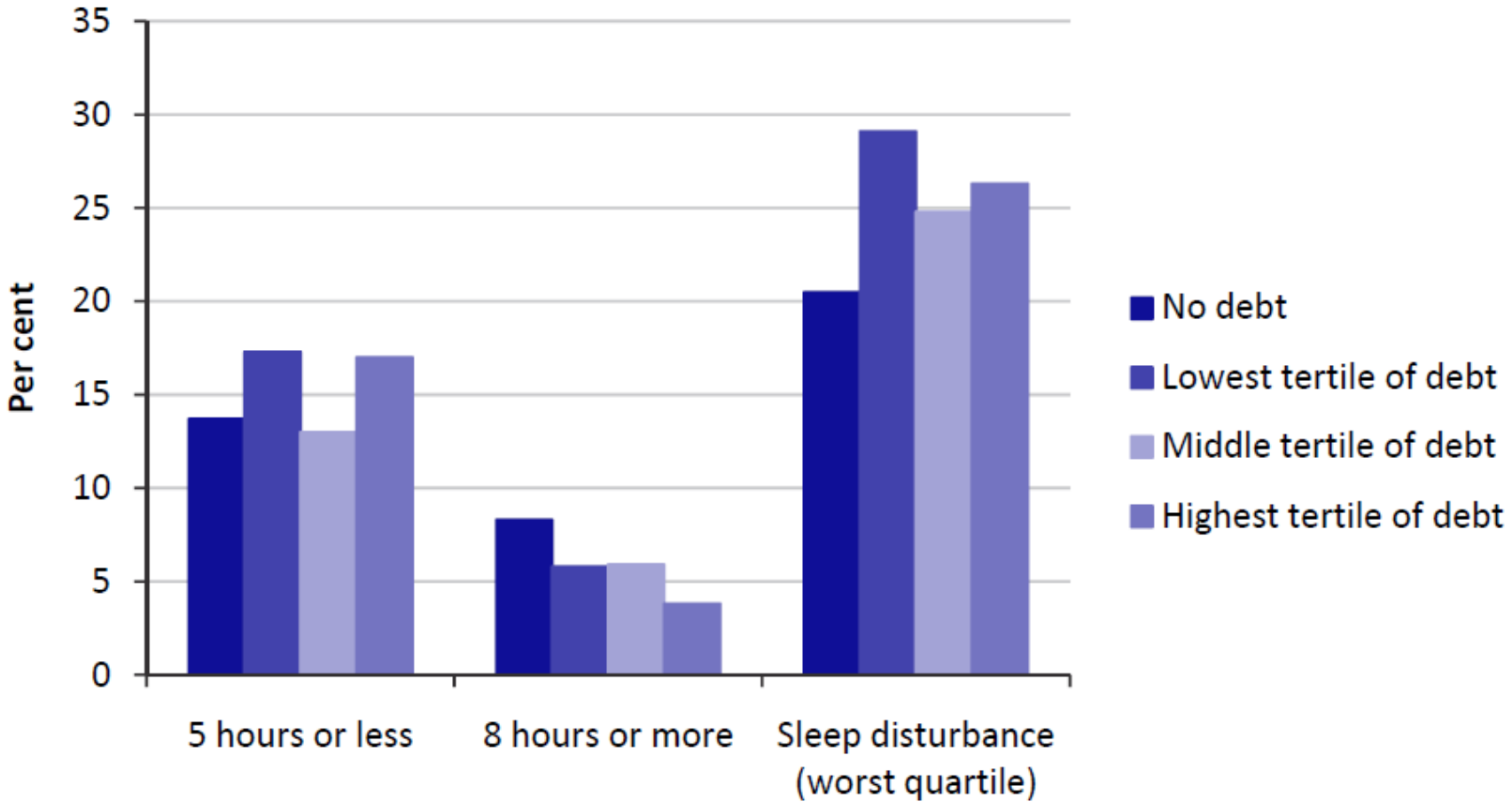


Kumari et al. (2010) *ELSA wave 4 report*

Percentage of ELSA respondents who report short sleep (5 hrs or less), long sleep (8 hrs or more) and sleep disturbance (highest quartile) by employment status

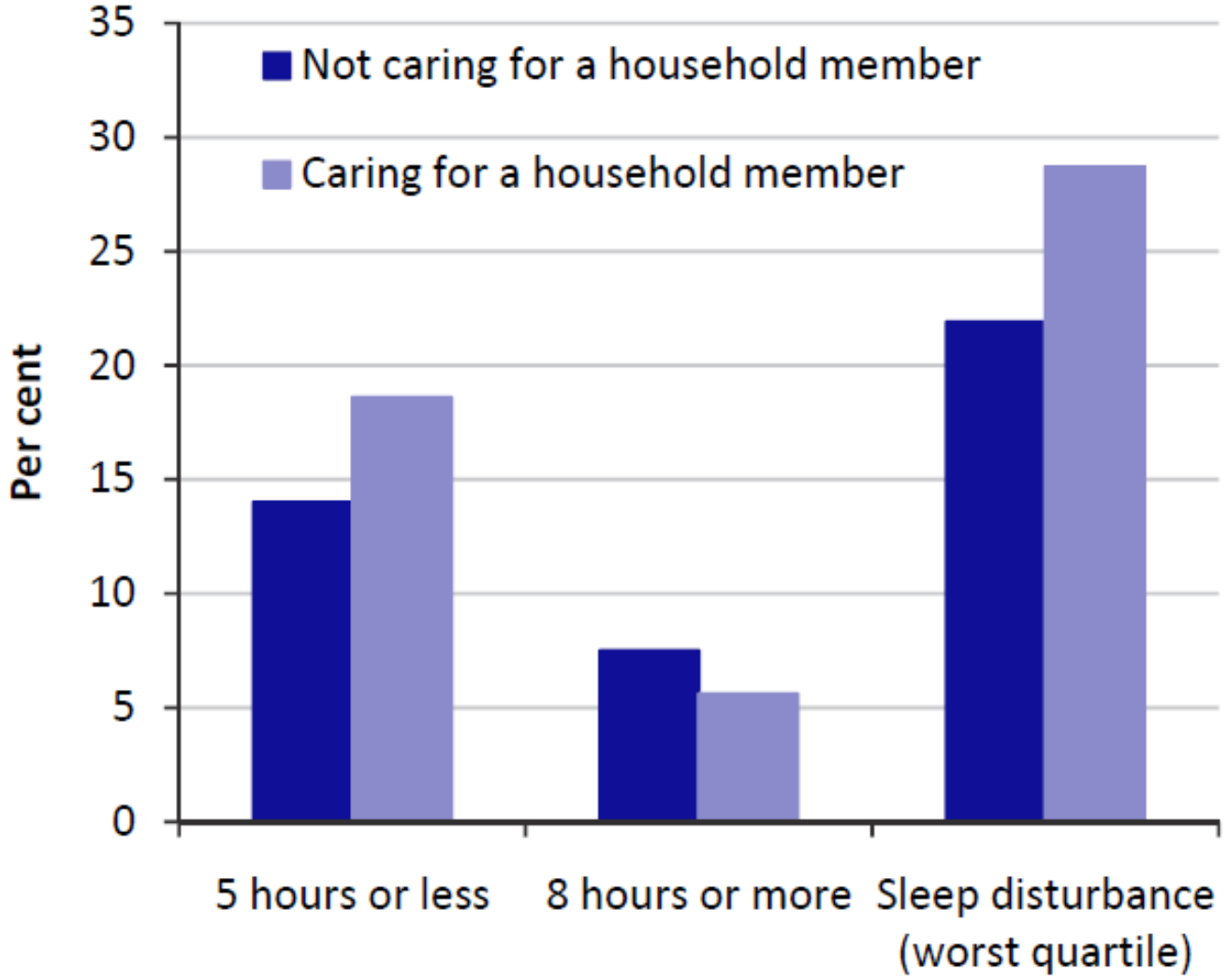
Kumari et al. (2010) *ELSA wave 4 report*

Percentage of ELSA respondents who report short sleep (5 hrs or less), long sleep (8 hrs or more) and sleep disturbance (highest quartile) by household non-mortgage debt



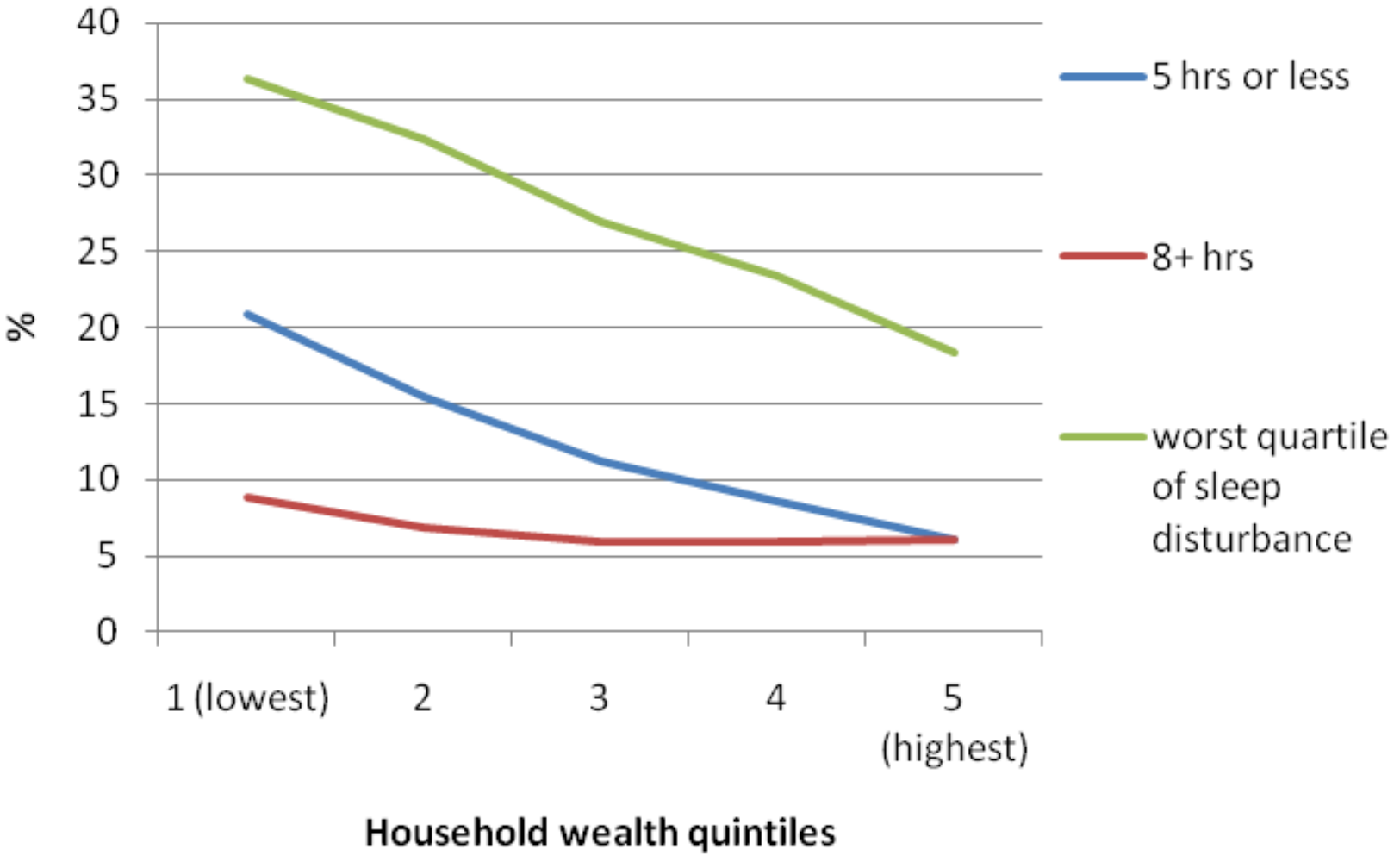
Kumari et al. (2010) *ELSA wave 4 report*

Percentage of ELSA respondents who report short sleep (5 hrs or less), long sleep (8 hrs or more) and sleep disturbance (highest quartile) by caring for a household member



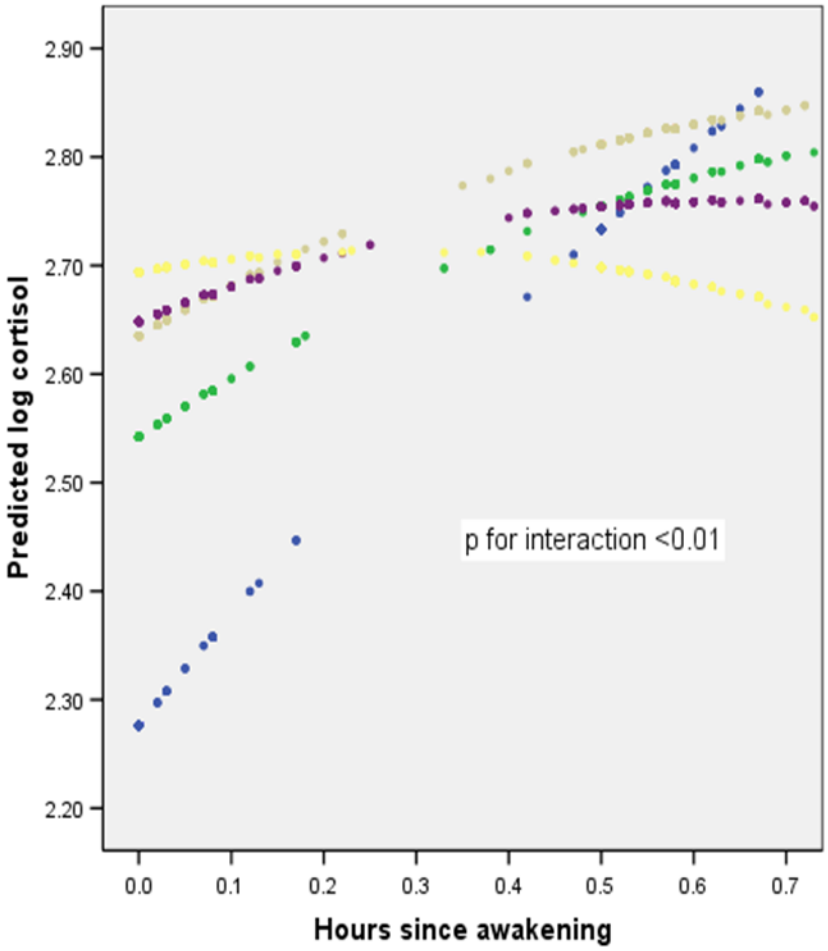
Kumari et al. (2010) *ELSA wave 4 report*

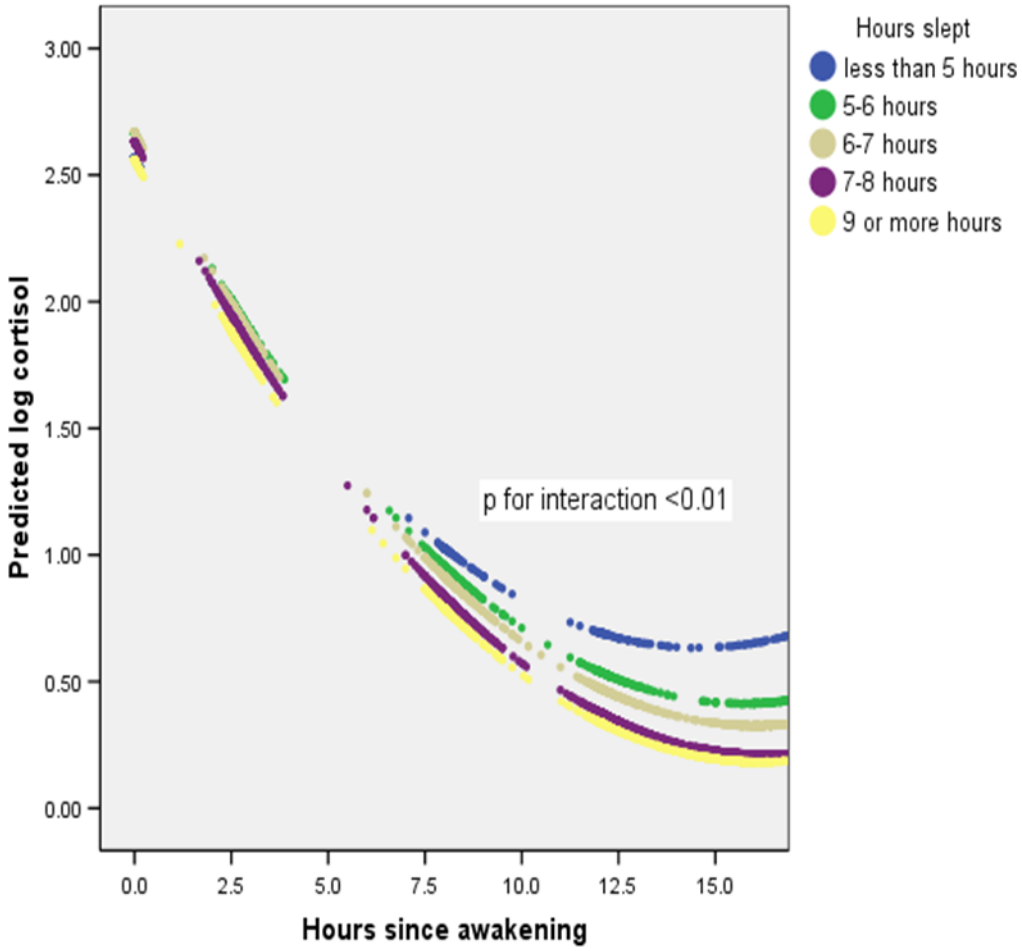
Percentage of ELSA respondents who report short sleep (5 hrs or less), long sleep (8 hrs or more) and sleep disturbance (highest quartile) by household wealth



Kumari et al. (2010) *ELSA wave 4 report*

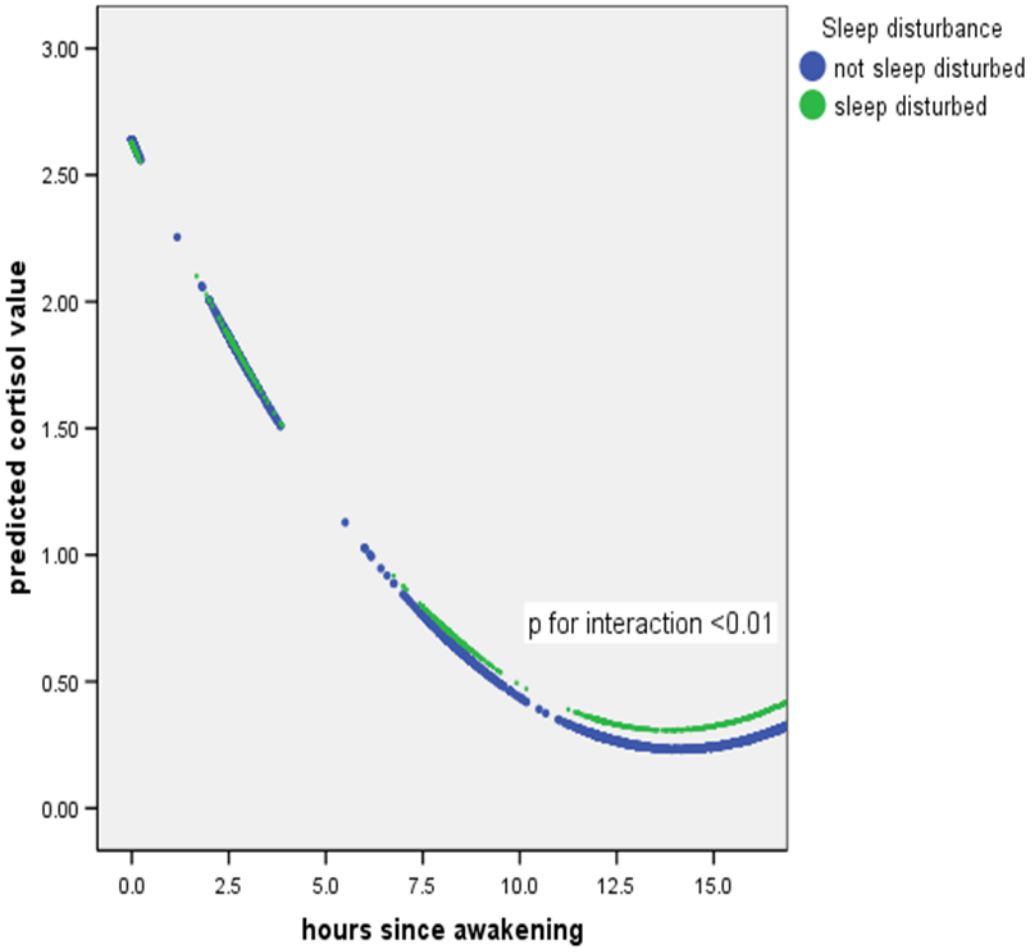
Stress, sleep and ageing- 1
Diurnal cortisol profile by sleep hours





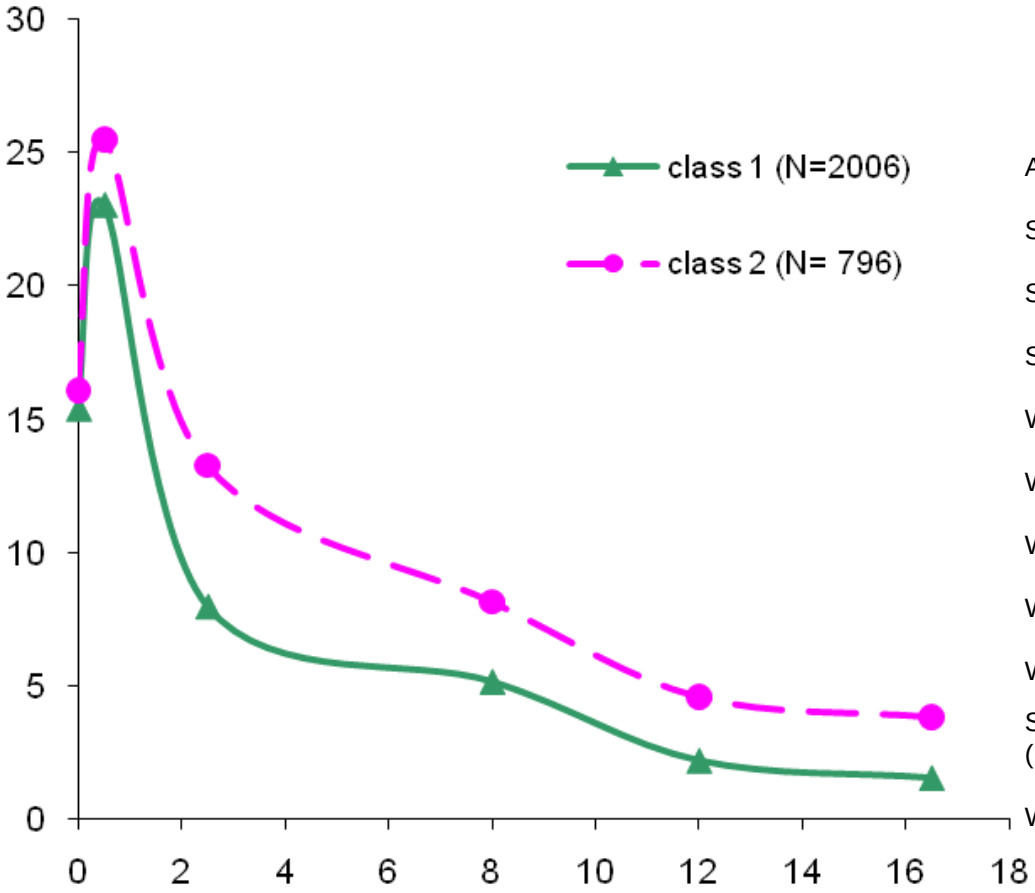
Kumari et al. (2009) *JCEM*

Stress, sleep and ageing- 2
Diurnal cortisol profile by sleep disturbance



Kumari et al. (2009) *JCEM*

Stress, sleep and ageing- 3
Predictors of diurnal patterns of cortisol secretion



Independent predictors of diurnal cortisol profile	Odds (95% CI) of being in class 2 vs. class 1
Age (years)	1.01 (0.99, 1.03)
Sex (1=men)	1.90 (1.48, 2.45)
Smoker (1=smoker)	2.02 (1.45, 1.90)
Sleep length (hours)	0.76 (0.69, 0.84)
Wake up time 5am or earlier	1.94 (0.99, 3.79)
Wake up time 5-6am	1.70 (1.11, 2.60)
Wake up time 6-7am	1.34 (0.95, 1.90)
Wake up time 7-8am	1.13 (0.79, 1.60)
Wake up time 8am or later (ref.)	1.00
Stress on day of sampling (1=stressed)	1.37 (1.04, 1.80)
Walking speed test (seconds)	1.21 (1.05, 1.39)

Kumari et al. (2009) *Psychoneuroendocrinology*

Conclusions

- Short sleep duration and sleep disturbance does NOT increase with age, whereas long sleep duration does.
- Short sleep duration and sleep disturbance may be aetiologically associated with cardiovascular risk.
- The association of long sleep duration with poor health may be due to undetected health problems and fatigue.
- Short sleep duration and sleep disturbance are associated with greater psychosocial stressors and flatter diurnal cortisol profiles.
- Short sleep duration and sleep disturbance may advance ageing processes and outcomes.