

Work organization, stress, the changing nature of work, and cardiovascular disease

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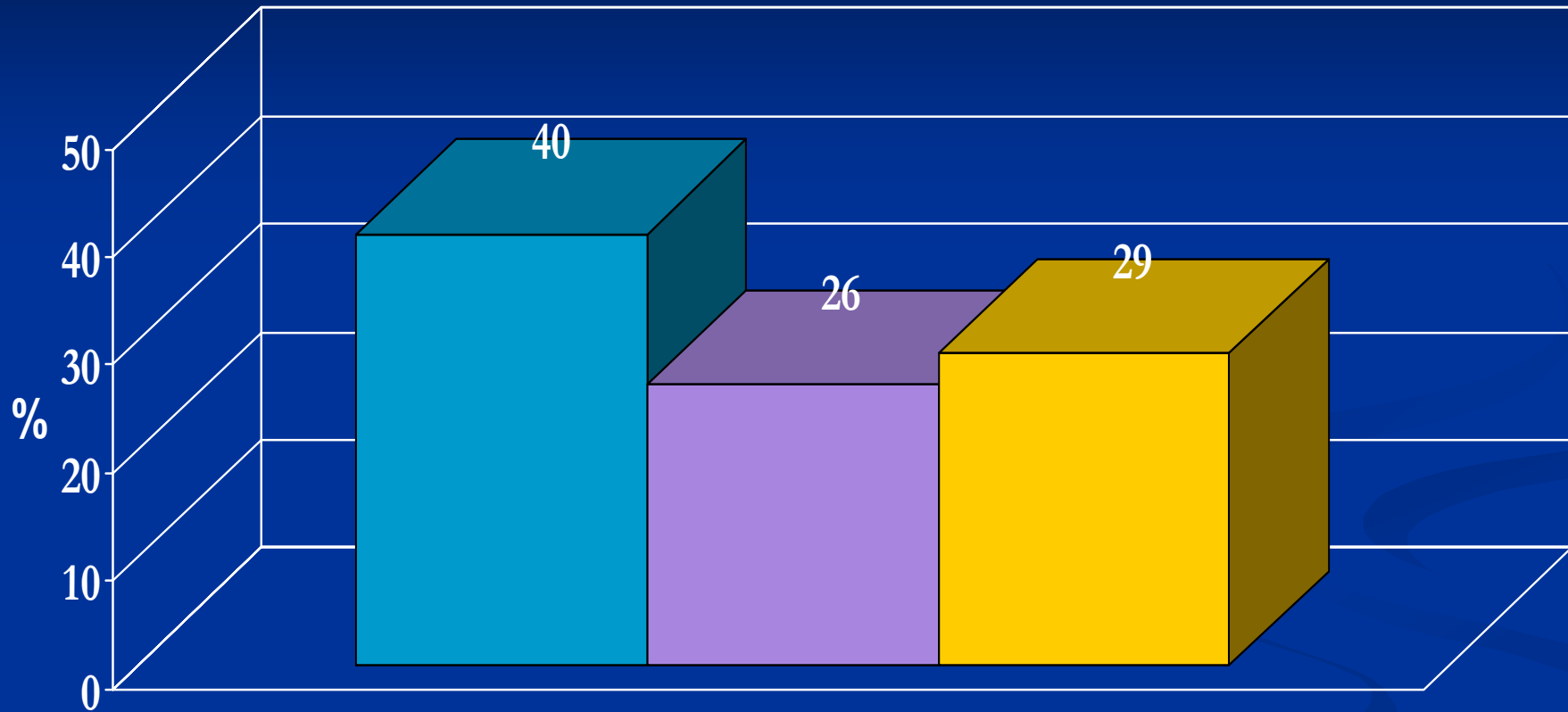
Partnership for Heart Healthy Stroke Free Massachusetts

Worcester, MA

June 2, 2006



% of workers reporting “very stressful jobs”



■ Northwestern National Life 1992 ■ Families and Work Institute 1997 ■ Yale University 1997

What are the sources of stress on your job?



TYPICAL MEASURES OF JOB STRESSORS IN RESEARCH STUDIES

■ Work schedules

- Long work hours
- Rotating, night shifts

■ Job characteristics

- High job demands-low job control (“job strain”)
- High effort-low reward jobs
- Low social support
- Threat-avoidant vigilant work
- Piece-rate work

■ Workplace climate

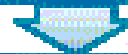
- Threat of violence
- Discrimination, harassment, bullying
- Lack of work-family programs
- Job insecurity

Organization of Work

External Context

Economic, legal, political, technological, and demographic forces at the national/international level

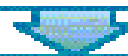
- Economic developments (e.g., globalization of economy)
- Regulatory, trade, and economic policies (e.g., deregulation)
- Technological innovations (e.g., information/computer technology)
- Changing worker demographics and labor supply (e.g., aging populations)



Organizational Context

Management structures, supervisory practices, production methods, and human resource policies

- Organizational restructuring (e.g., downsizing)
- New quality and process management initiatives (e.g., high performance work systems)
- Alternative employment arrangements (e.g., contingent labor)
- Work/life/family programs and flexible work arrangements (e.g., telecommuting)
- Changes in benefits and compensation systems (e.g., gainsharing)



Work Context

Job Characteristics

- Climate and culture
- Task attributes: temporal aspects, complexity, autonomy, physical, and psychological demands, etc.
- Social-relational aspects of work
- Worker roles
- Career development

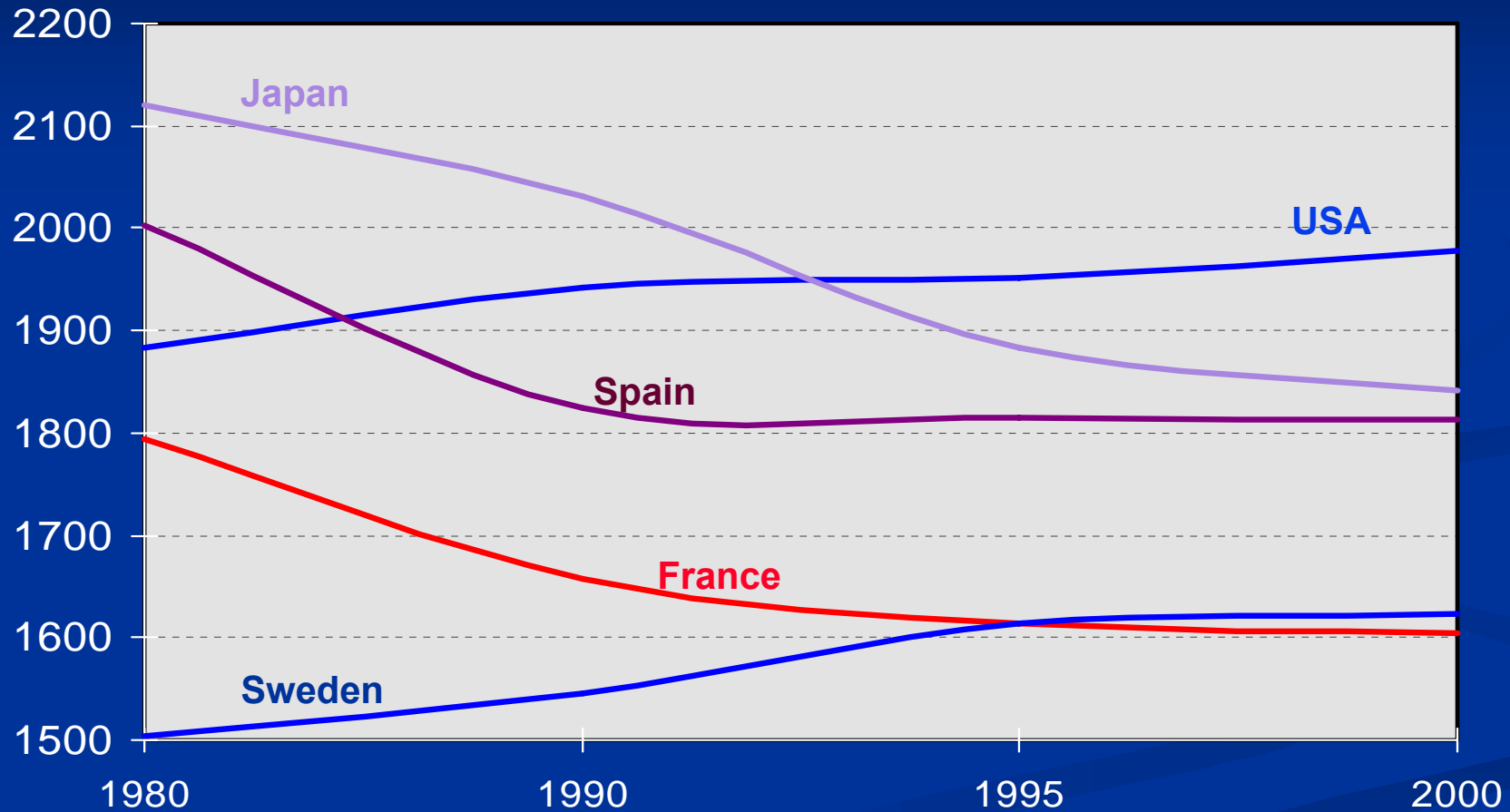
Figure 1. Organization of work.

THE CHANGING WORLD OF WORK:

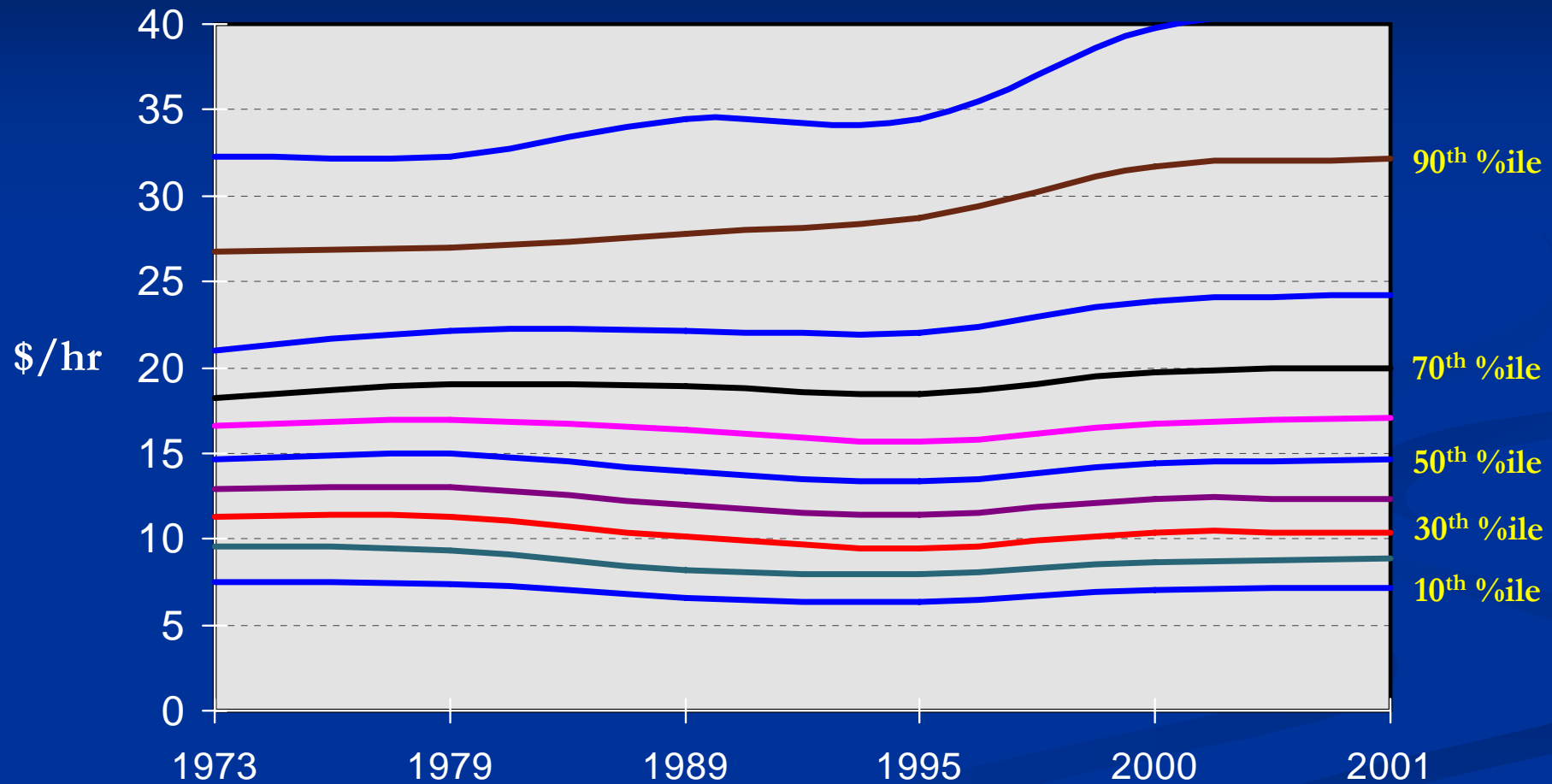
What trends appear in the data?

- **Work hours**
- **Real income**
- **Psychological job demands**
- **Job decision latitude**
- **Job strain**

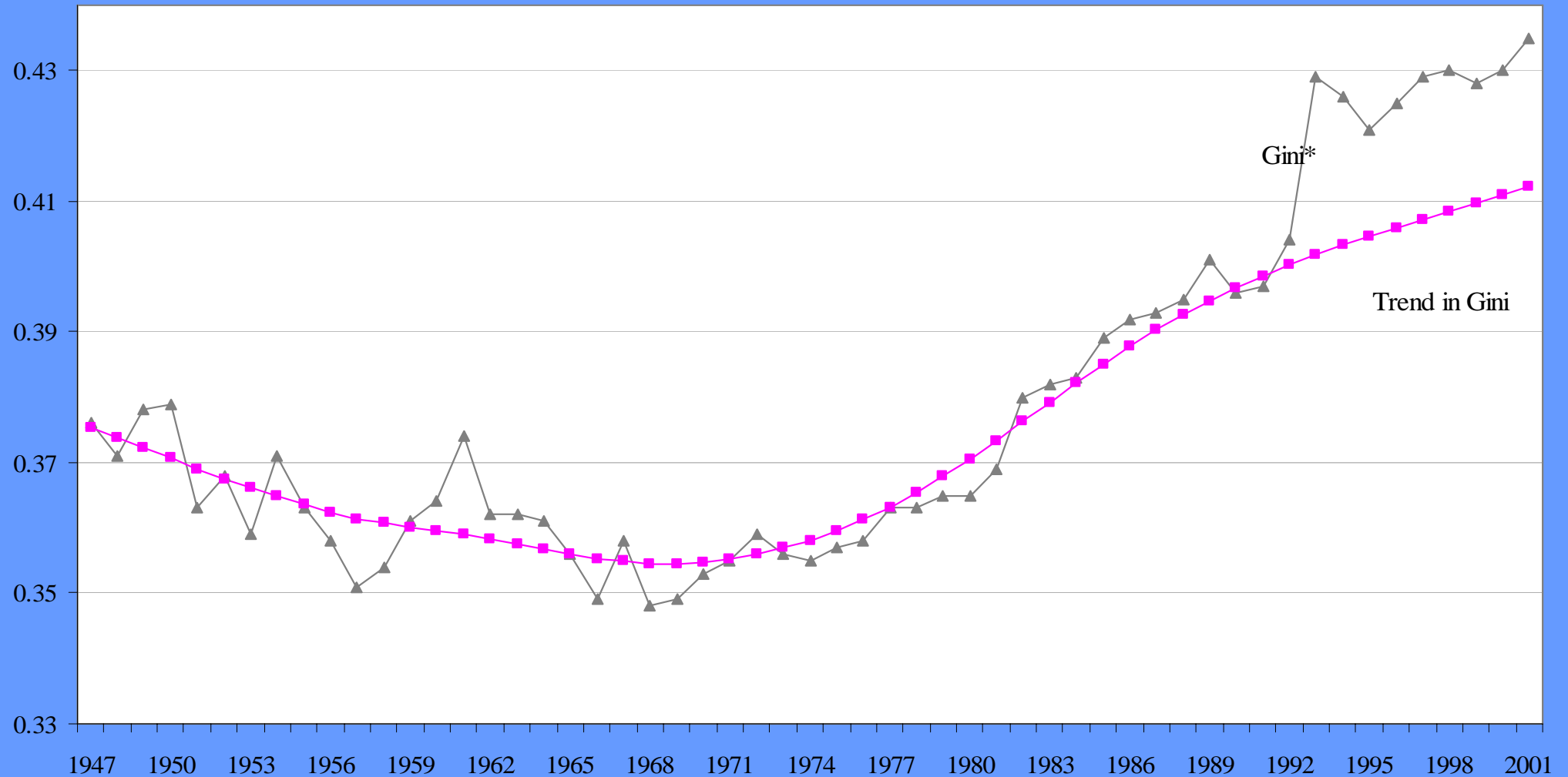
HOURS WORKED PER YEAR



Changes in real wages, male workers, by wage percentile, 1973-2001 (2001 dollars)

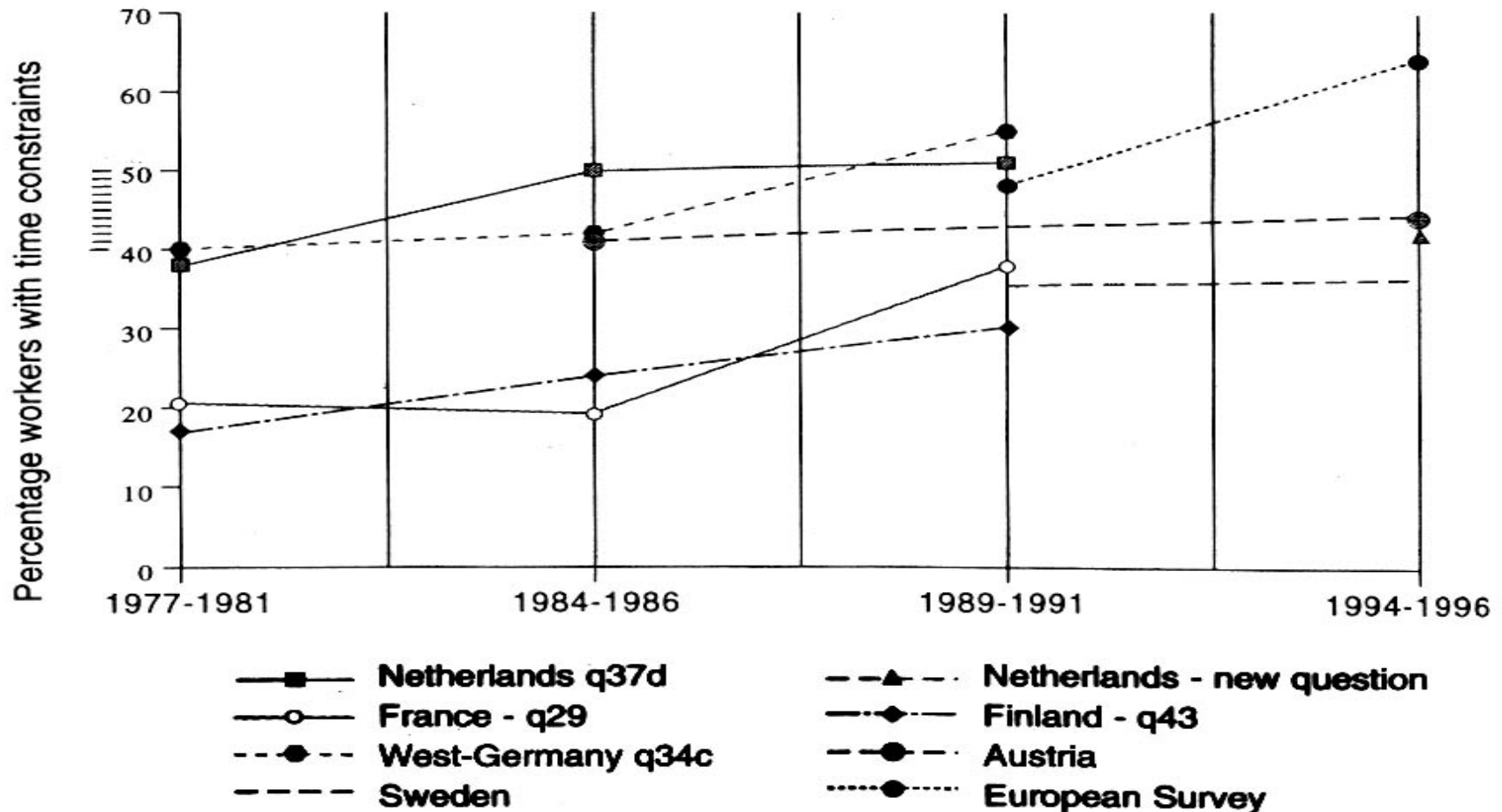


Family income inequality, Gini coefficient, 1947-00



*After 1993 the coefficients reflect a change in survey methodology leading to greater inequality.

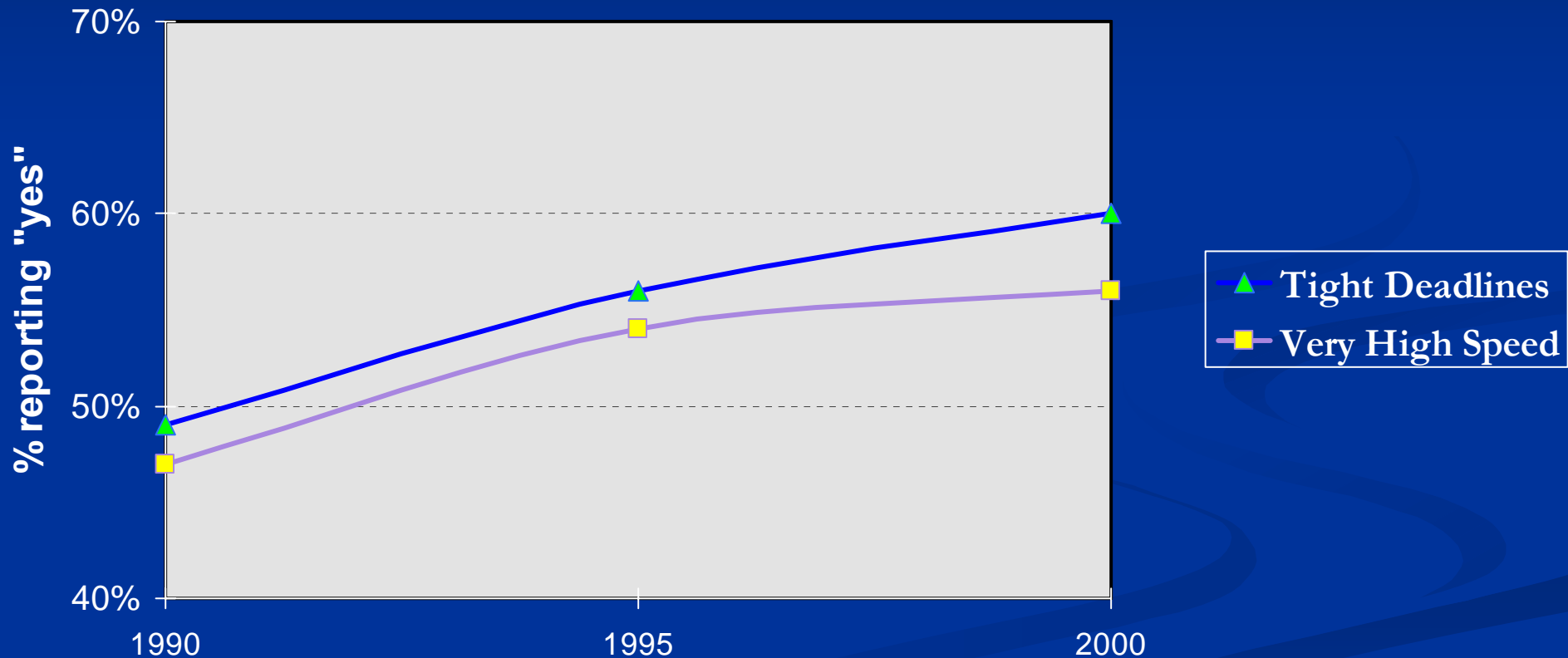
Source: U.S. Bureau of the Census.



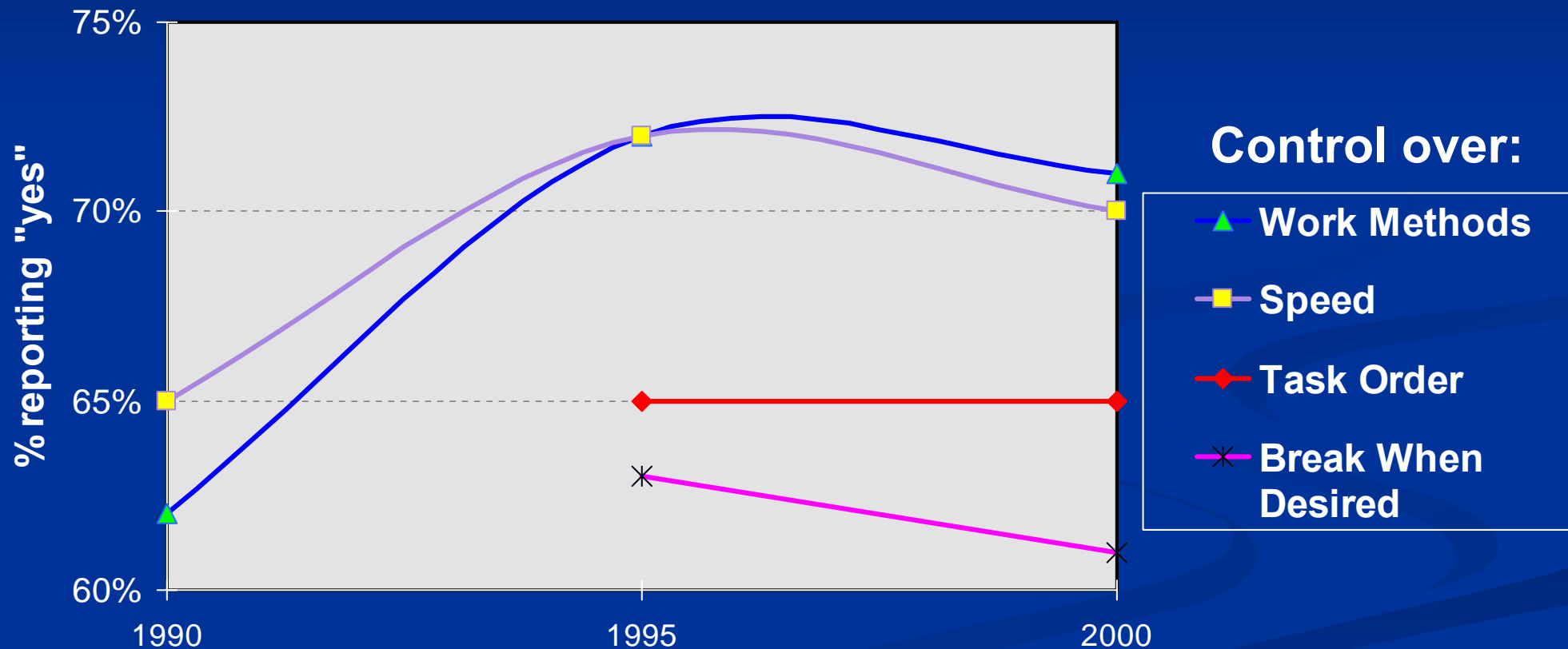
The development of time constraints in Europe

“Time constraints” are similar to job pressures or job demands, and include deadlines and work speed. Time constraints and autonomy at work in the European Union. Dublin: European Foundation for the Improvement of Living and Working Conditions, 1997.

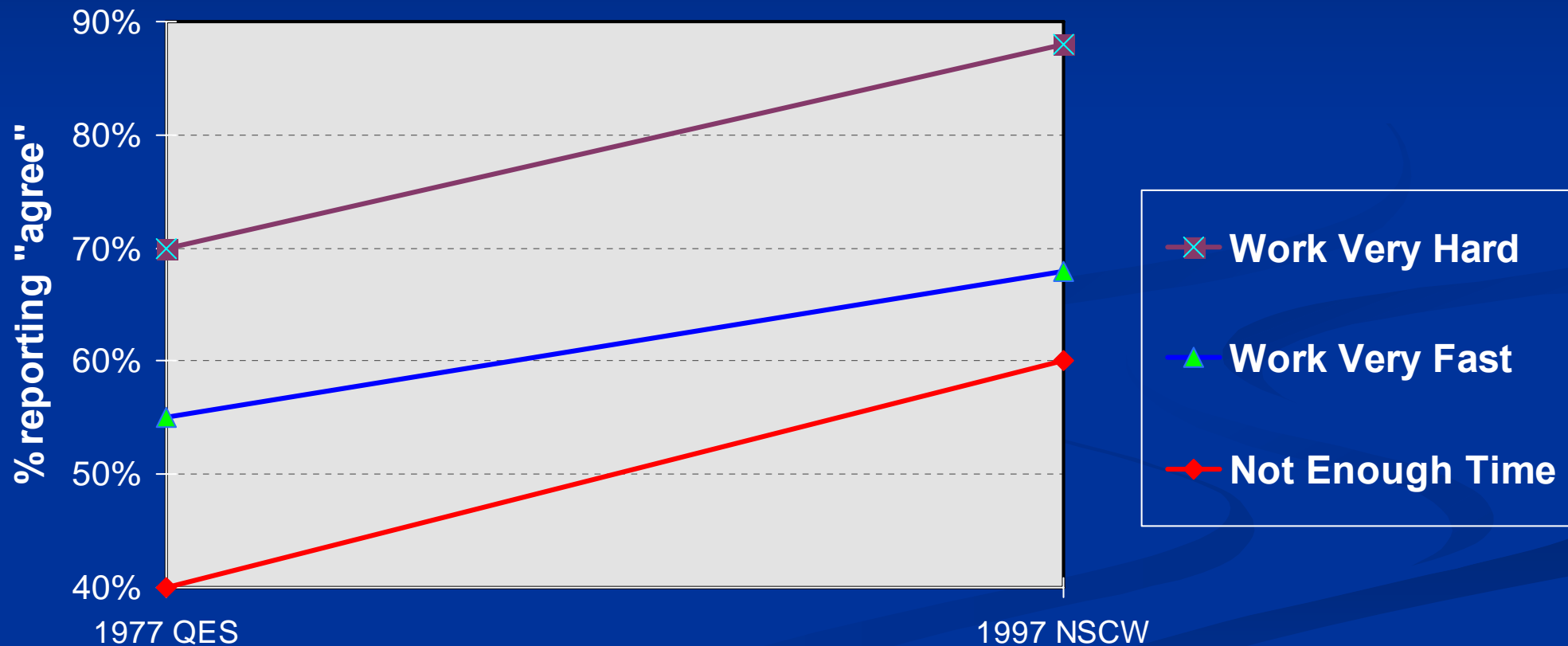
European Foundation surveys: work intensity



European Foundation surveys: job control (autonomy)



U.S. national surveys: job demands

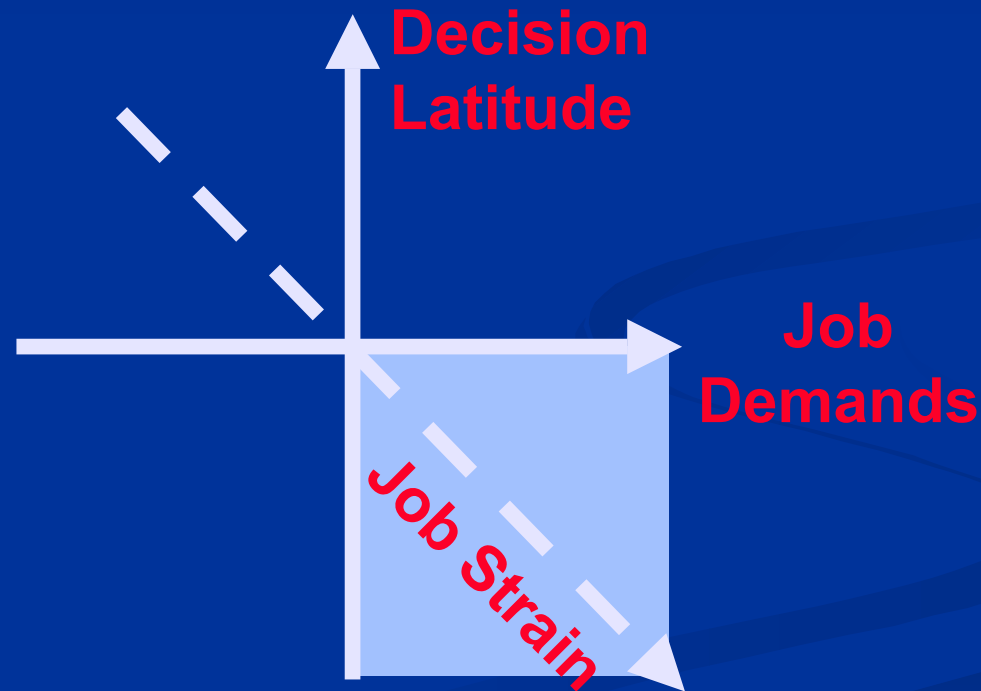


HEALTH IMPACTS OF STRESSFUL WORK ORGANIZATION:

- **Most widely studied**
 - Cardiovascular disease (including hypertension)
- **Existing evidence**
 - Musculoskeletal disorders
 - Psychological disorders
 - Health behaviors
 - Sleeping problems
 - Injuries
- **More research needed on other outcomes**
 - Immune system
 - Reproductive health

Job Demand-Control Model

Combination of HIGH Psychological Job Demands + LOW Job Decision Latitude (decision-making authority and skill use)



Job Content Questionnaire (Karasek)

Definition: Job Strain is the combination of HIGH Job Demands and LOW Job Decision Latitude

Job Demands

1. My job requires working very fast
2. My job requires working very hard
3. I am not asked to do an excessive amount of work *
4. I have enough time to get the job done *
5. I am free from conflicting demands others make *

* item reverse coded

Job Content Questionnaire

Job Decision Latitude

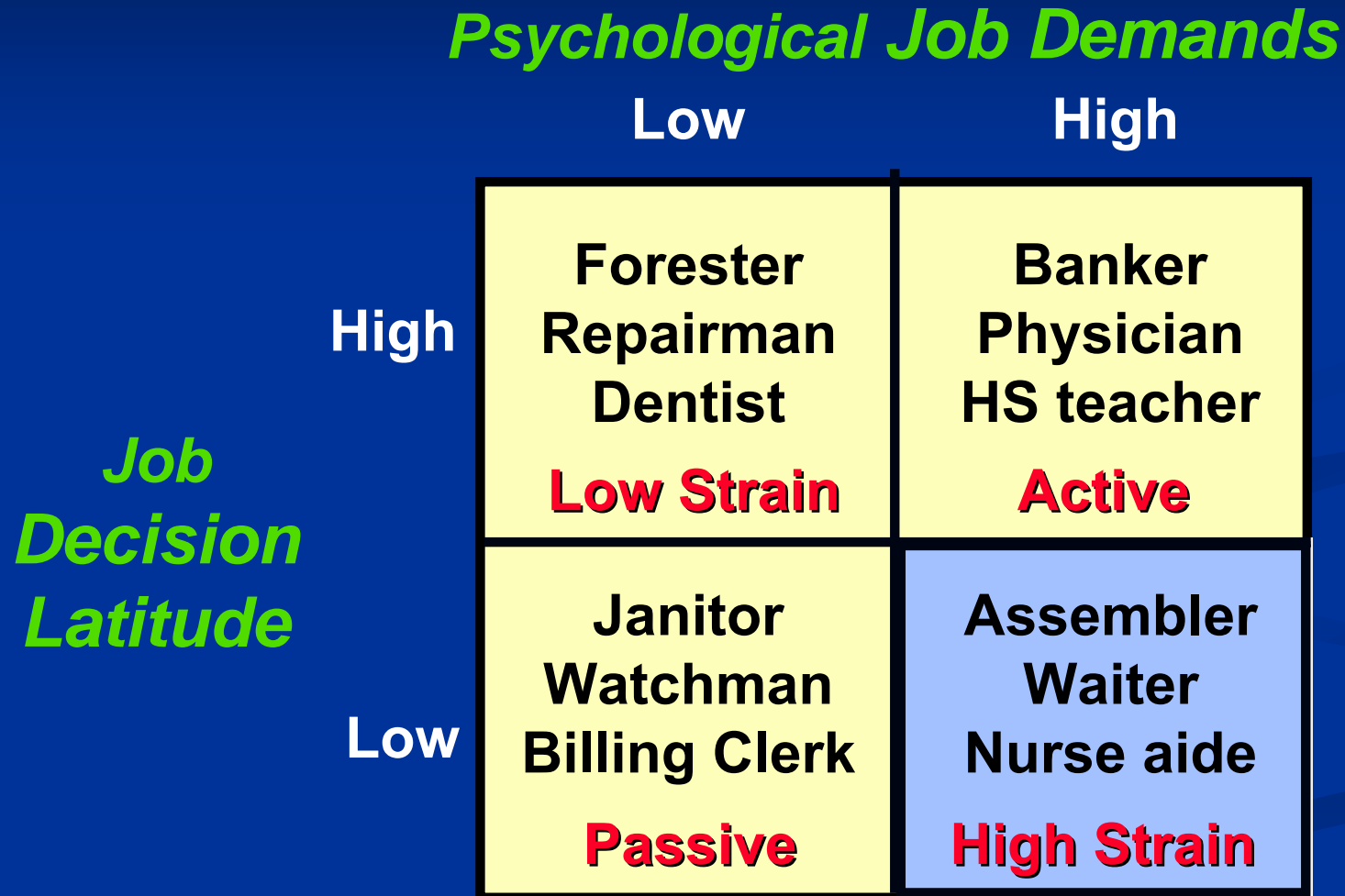
Skill development

1. My job requires that I learn new things
2. My job requires me to be creative
3. My job requires a high level of skill
4. I get to do a variety of things on my job
5. I have an opportunity to develop my own special abilities
6. My job involves a lot of repetitive work (reverse coded)

Decision-making authority

7. My job allows me to make a lot of decisions on my own
8. On my job, I am given a lot of freedom to decide how I do my work
9. I have a lot to say about what happens on my job

Typical occupations found in four quadrants of Karasek's job strain model (1969-1977 data)





Studies of Job Strain and Coronary Heart Disease

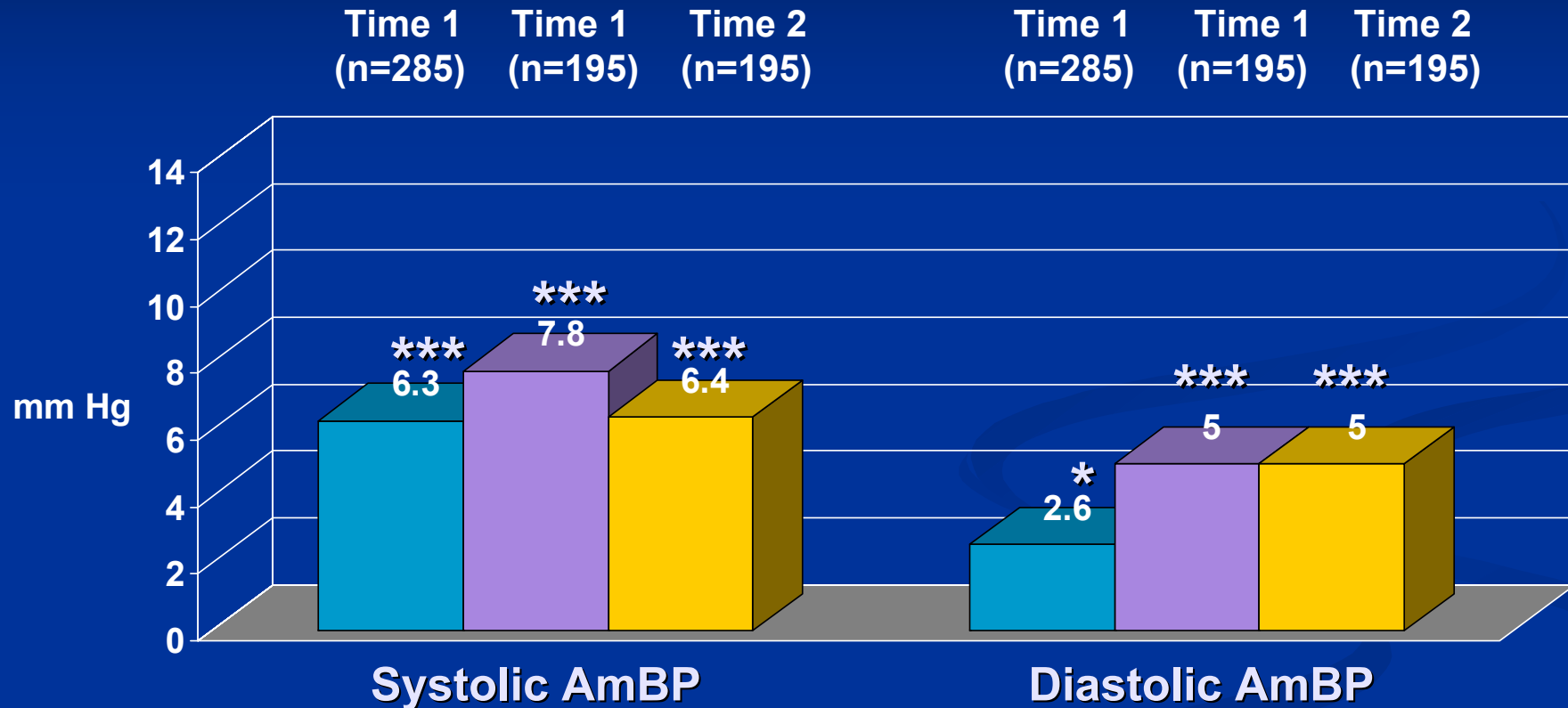
- 34 studies published between 1981 and 2002
 - 16 from Sweden (many using national data bases)
 - 7 from U.S. (2 using national data bases)
 - Also: Czech Republic, Denmark, England, Finland, Japan

	<u>Significant positive associations</u>	<u>Mixed positive and null associations</u>	<u>Total # of studies</u>
Cohort studies	8	3	17
Case-control studies	6	0	9
Cross-sectional studies	4	0	8

PAR% = 10-30%

Job Strain and Work Ambulatory BP

(men, Time 1 and Time 2)

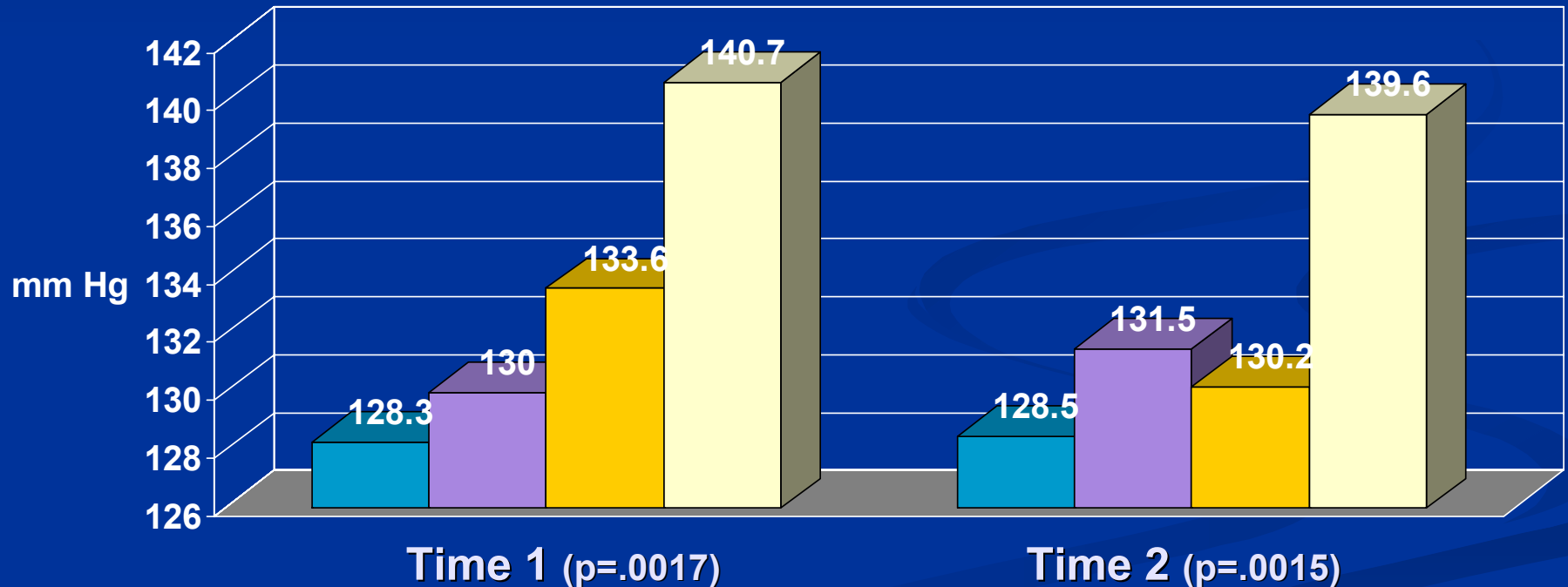


controlling for age, education, body mass index, race, smoking, alcohol use, work site

***p<.001, *p<.05

Job Strain change and Work Systolic Ambulatory BP (n=195 men, Time 1 and 2)

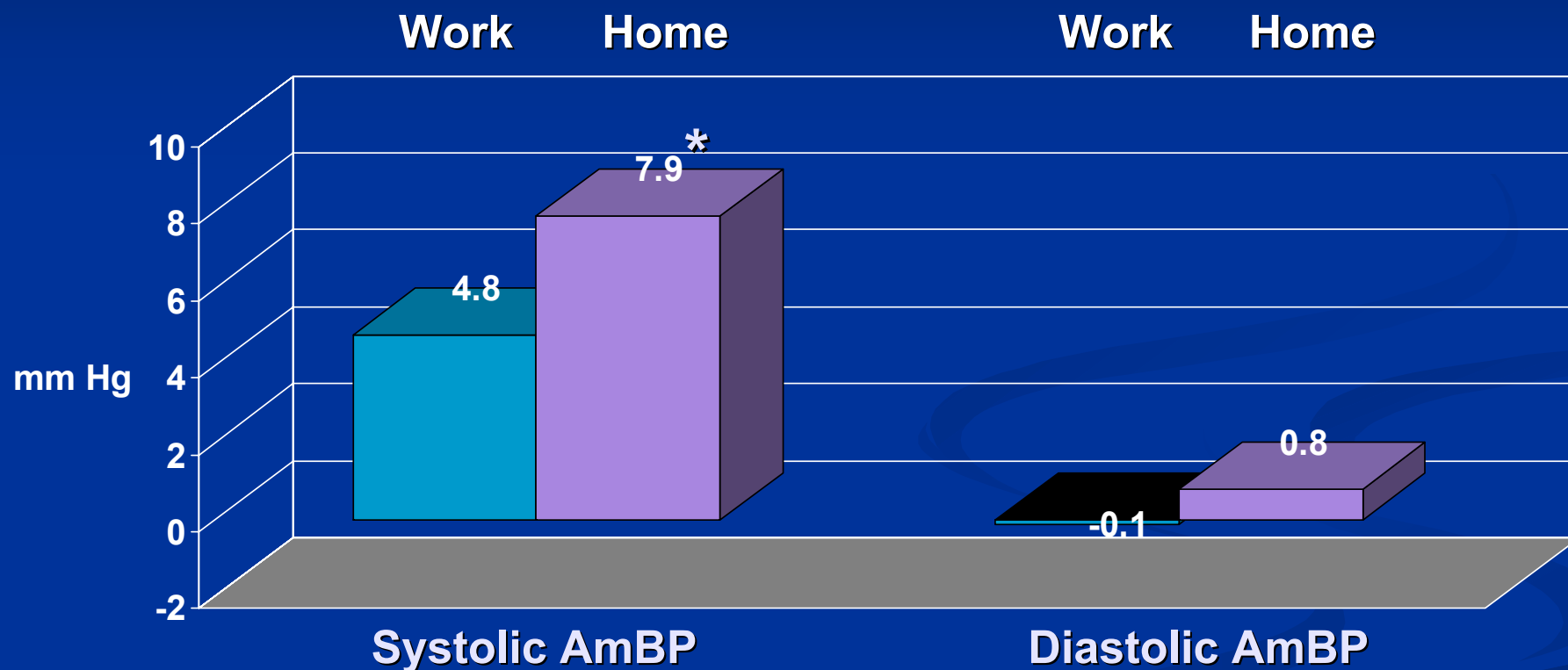
Strain-T1:	no	no	yes	yes		no	no	yes	yes
Strain-T2:	no	yes	no	yes		no	yes	no	yes



controlling for age, education, body mass index, race, smoking, alcohol use, work site

50% (vs. 0%) of work life exposed to job strain and Ambulatory BP

(n=213 men, age 30-60, 9 NYC work sites, 1985-95,
analysis restricted to 87 men with ≥ 25 yrs of employment)



* adjusted for age, education, body mass index, race, smoking, alcohol use, winter season, standing position, work site, and **job strain at entry into the study**
* $p < .05$

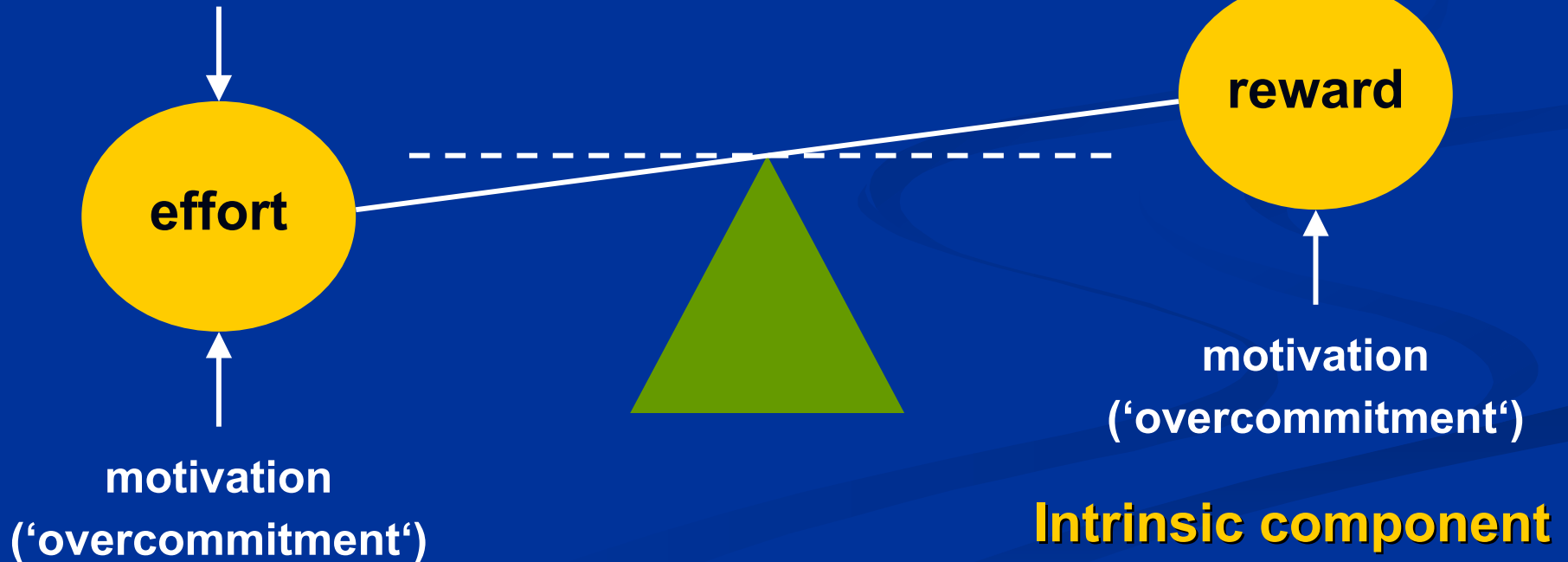
Landsbergis PA, Schnall PL, Pickering TG, Warren K, Schwartz JE. American Journal of Epidemiology 2003;157:998-1006.

The model of effort-reward imbalance (J. Siegrist 1996)

Extrinsic components

- labour income
- career mobility / job security
- esteem, respect

demands / obligations



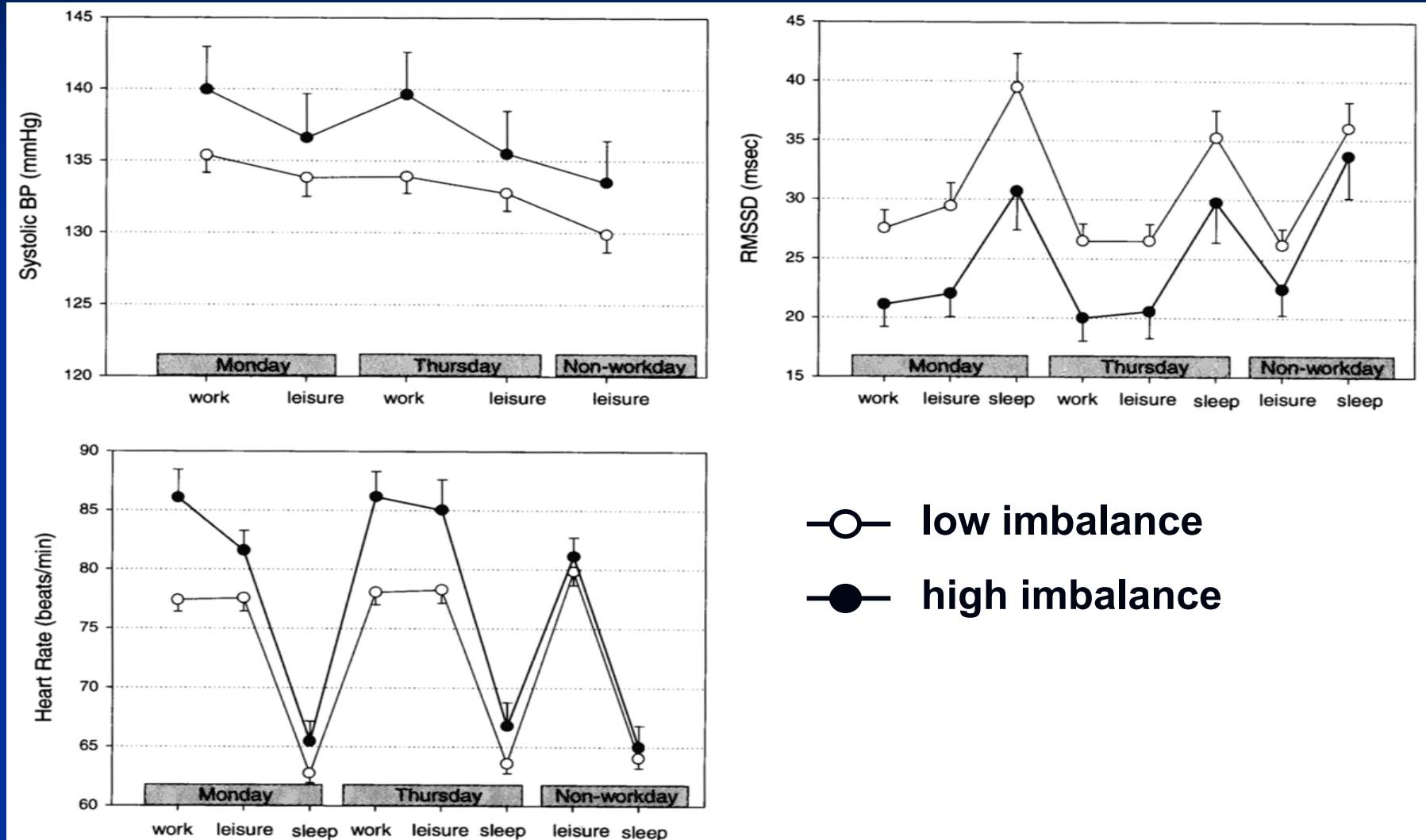
Intrinsic component

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

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

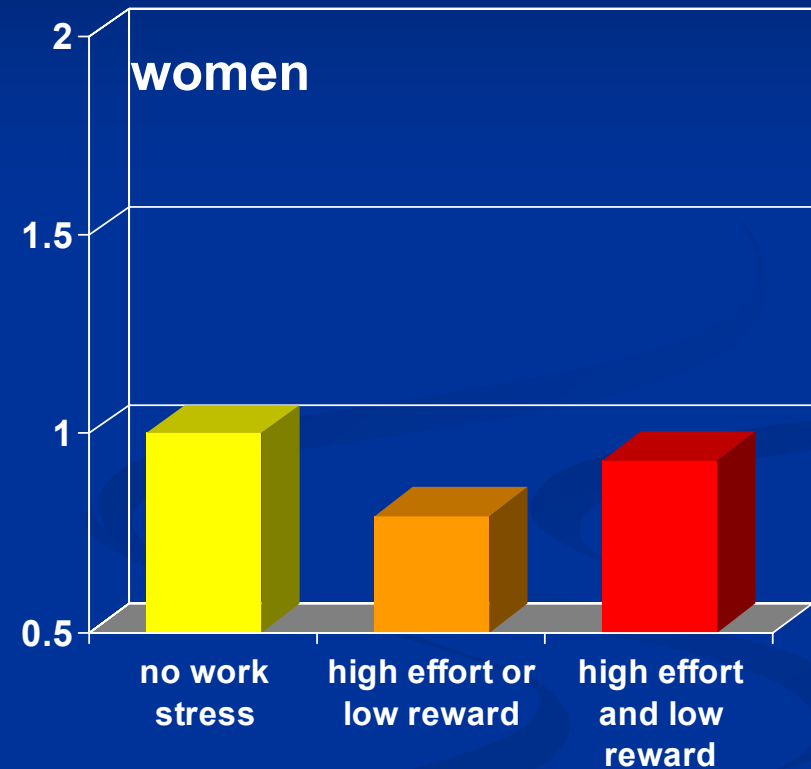


Ambulatory BP, HR and HR variability and work stress (effort-reward imbalance)



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

(odds ratios[#]; N=8067, mean follow-up: 12.5 years)



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

Threat-avoidant vigilant work

- Jobs which require a high level of vigilance in order to avoid disastrous consequences, which could occur with a momentary lapse of attention or a wrong decision
- Prominent feature of some high CVD risk jobs:
 - air traffic controllers
 - bus, taxi and truck drivers
 - sea pilots

High CVD risk occupations:

Occupations at increased risk of either acute MI or CHD mortality or morbidity in >1 study

MEN

Air traffic controllers	Lorry drivers
Bakers	Paper workers
Bus drivers	Police
Butchers	Prison wardens
Cannery workers	Rubber and plastics workers
Cooks	Sea pilots
Fire fighters	Taxi drivers
Fishermen	Waiters
Foundry workers	Warehousemen, storekeepers
Hairdressers	

WOMEN

Bus drivers
Cleaners
Home help
Rubber and plastics workers
Paper workers
Self-employed in hotel and catering
Taxi drivers
Unskilled workers in tube, sheet, steel construction
Waitresses

Professional drivers: Most consistent evidence of elevated CVD risk

- 34 of 40 studies confirm increased risk of CHD + HTN among professional drivers, particularly urban transit operators:
- Bus drivers greater risk of CHD as conductors on same routes
- Gothenberg, Sweden
 - 3x increased risk of heart disease compared to men in other jobs
- Denmark
 - high vs low traffic intensity → 2.7x increased risk of acute MI
- San Francisco
 - HTN ($\geq 160/95$) associated with experts' ratings of objective stressors: job barriers, time pressure

Tuchsen F. High risk occupations for cardiovascular disease. *Occupational Medicine: State of the Art Reviews* 2000;15(1):57-60.
Belkic K, Emdad R, Theorell T. Occupational profile and cardiac risk: possible mechanisms and implications for professional drivers. *International Journal of Occupational Medicine and Environmental Health* 1998;11: 37-57.
Tse JLM, Flin R, Mearns K. Bus driver well-being review: 50 years of research. *Transportation Research Part F* 9 (2006) 89–114.

Long work hours

- Most early research conducted in Japan
- “Sudden coronary death due to overwork” became part of popular culture

Van der Hulst et al. *Scand J Work Environ Health* 2003;29(3):171-88.

Harma M. *Scand J Work Environ Health* 2003;29(3):167-9.



Ogni anno in Giappone migliaia di persone saltano di colpo, come lampadine fulminate.

I colleghi li vedono scivolare dalla poltrona, accasciarsi come manichini ai piedi della scrivania o crollare sui macchinari...

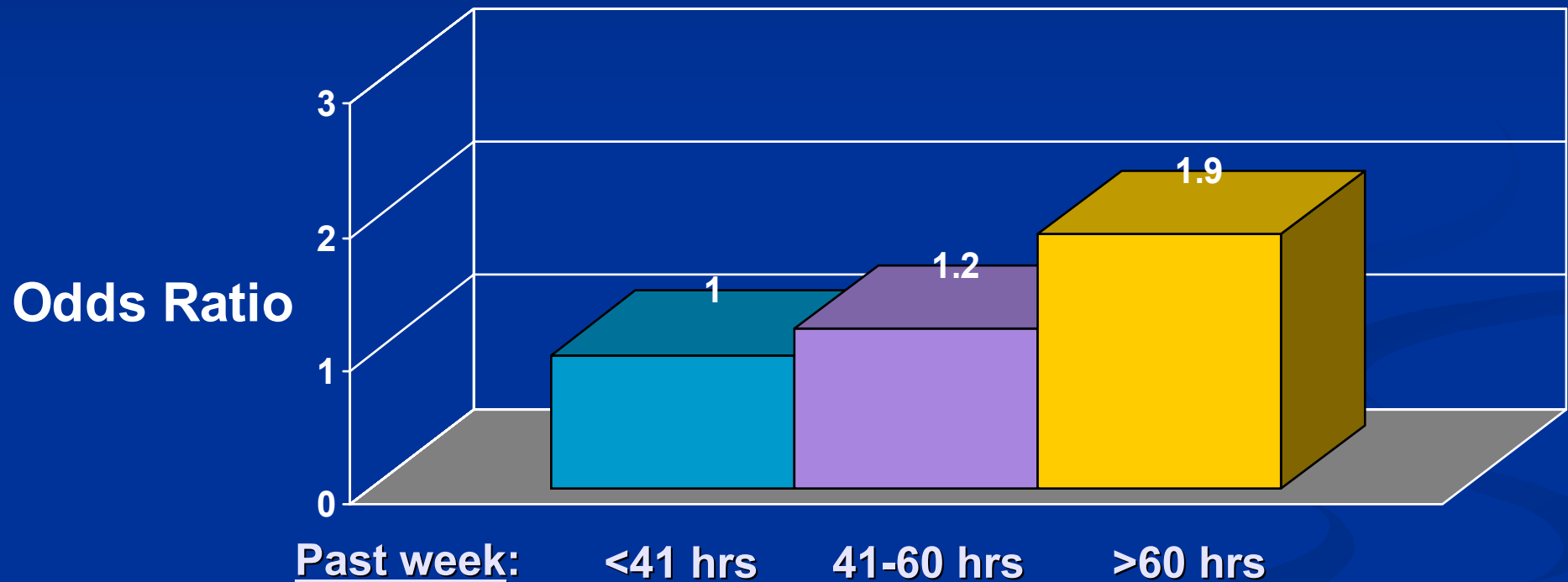
KAROSHI:

morte per eccesso di lavoro

Japanese men

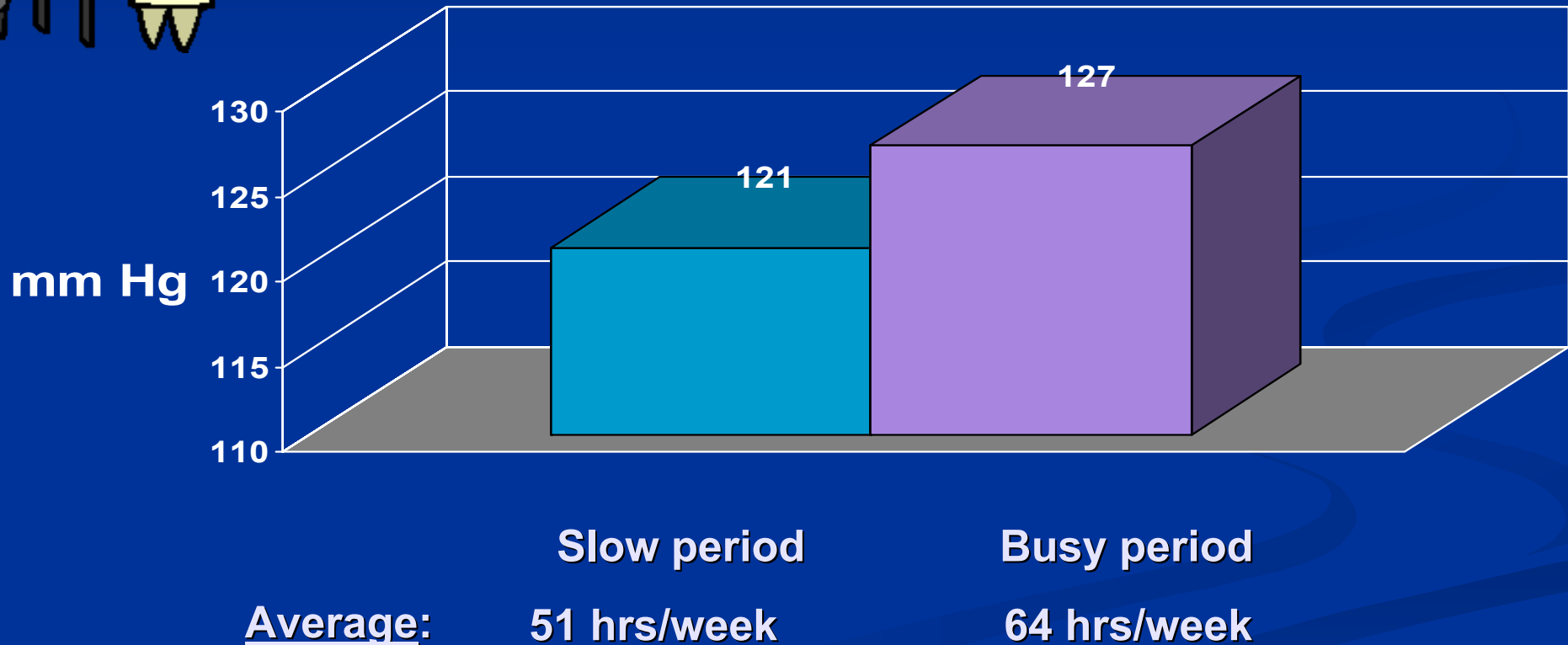
City of Fukuoka, 260 cases, 445 controls, 1996-1998

risk of heart attacks & weekly work hours



Controlling for smoking, alcohol, overweight, hypertension, diabetes, hyperlipidemia, parental heart disease, job type, sedentary job

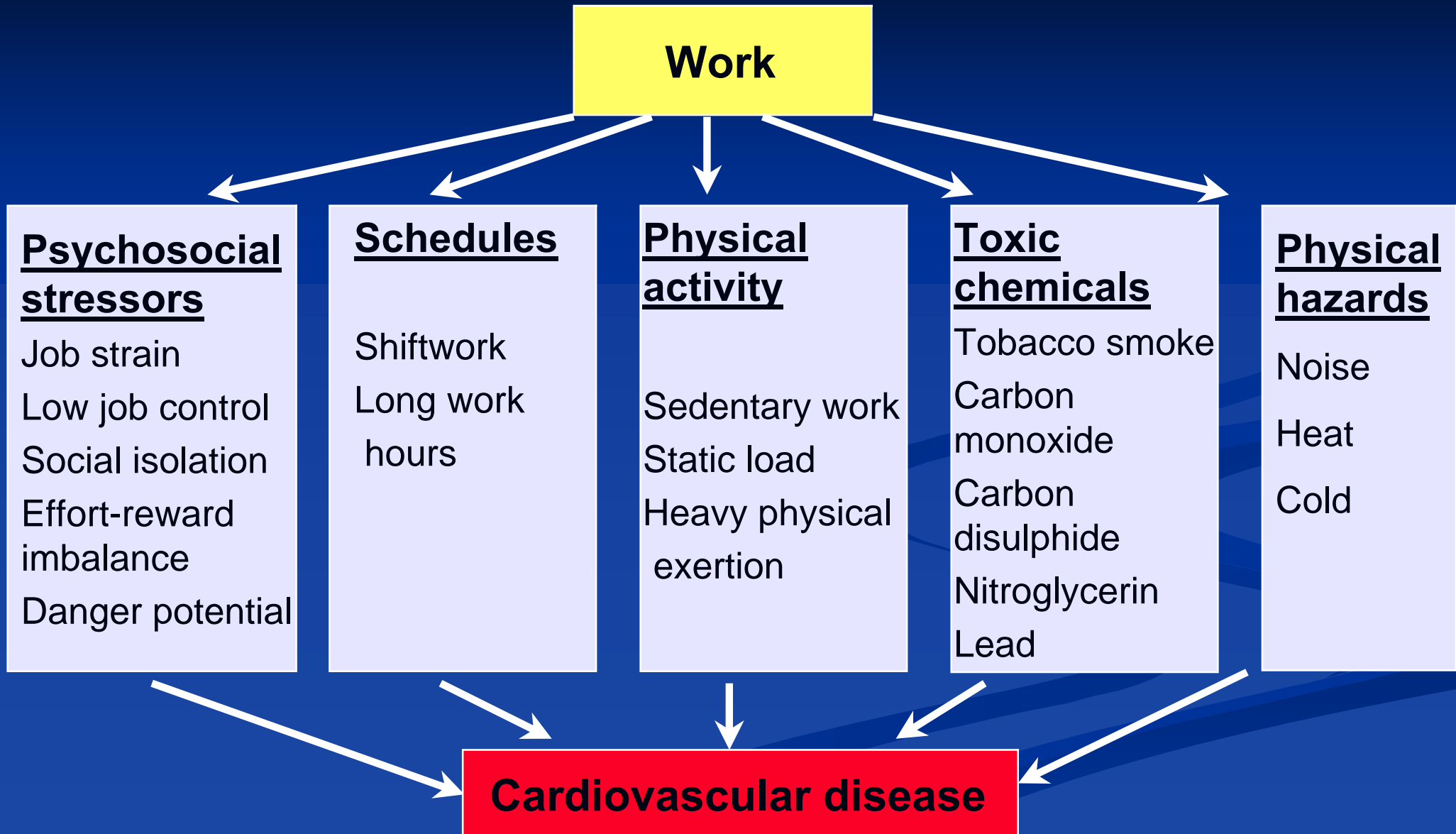
Japanese male middle-aged white-collar workers in manufacturing: 24-hr systolic blood pressure



Shorter sleeping hours

- One important way path to illness:
 - Lack of sleep → higher blood pressure, heart rate
 - 4-6 (vs. 7-8) hrs/day of sleep → increased risk of heart disease

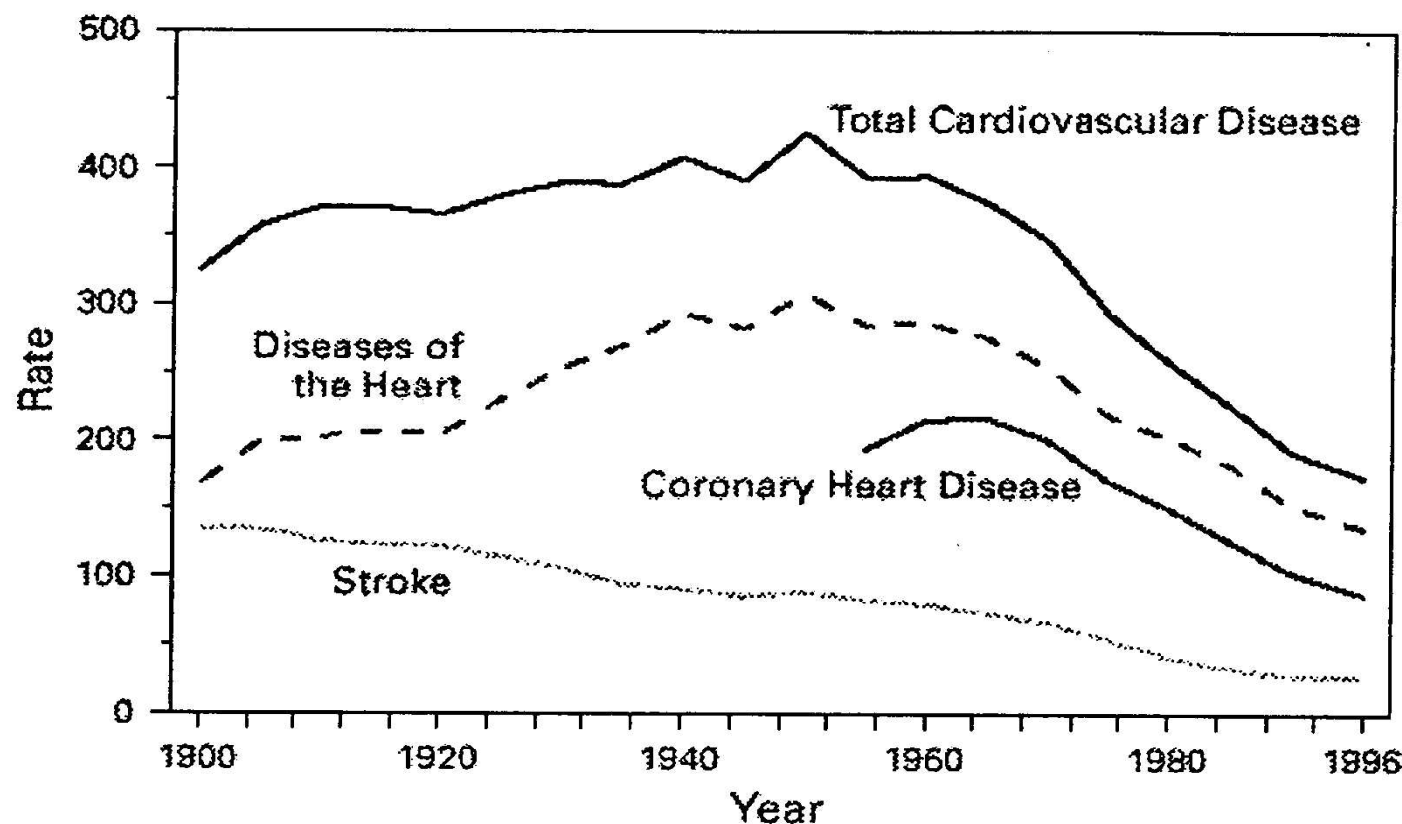
Workplace CVD risk factors



Trends in health status

- Job stressors increasing
- Job stressors associated w/ HTN, CVD
 - (+ other injuries, illnesses)
- What are trends in illness rates?

FIGURE 1. Age-adjusted death rates* for total cardiovascular disease, diseases of the heart, coronary heart disease, and stroke,† by year — United States, 1900-1996



*Per 100,000 population, standardized to the 1940 U.S. population.

†Diseases are classified according to *International Classification of Diseases* (ICD) codes in use when the deaths were reported. ICD classification revisions occurred in 1910, 1921, 1930, 1939, 1949, 1958, 1968, and 1979. Death rates before 1933 do not include all states. Comparability ratios were applied to rates for 1970 and 1975.

Source: Adapted from reference 1; data provided by the National Heart, Lung and Blood Institute, National Institutes of Health.

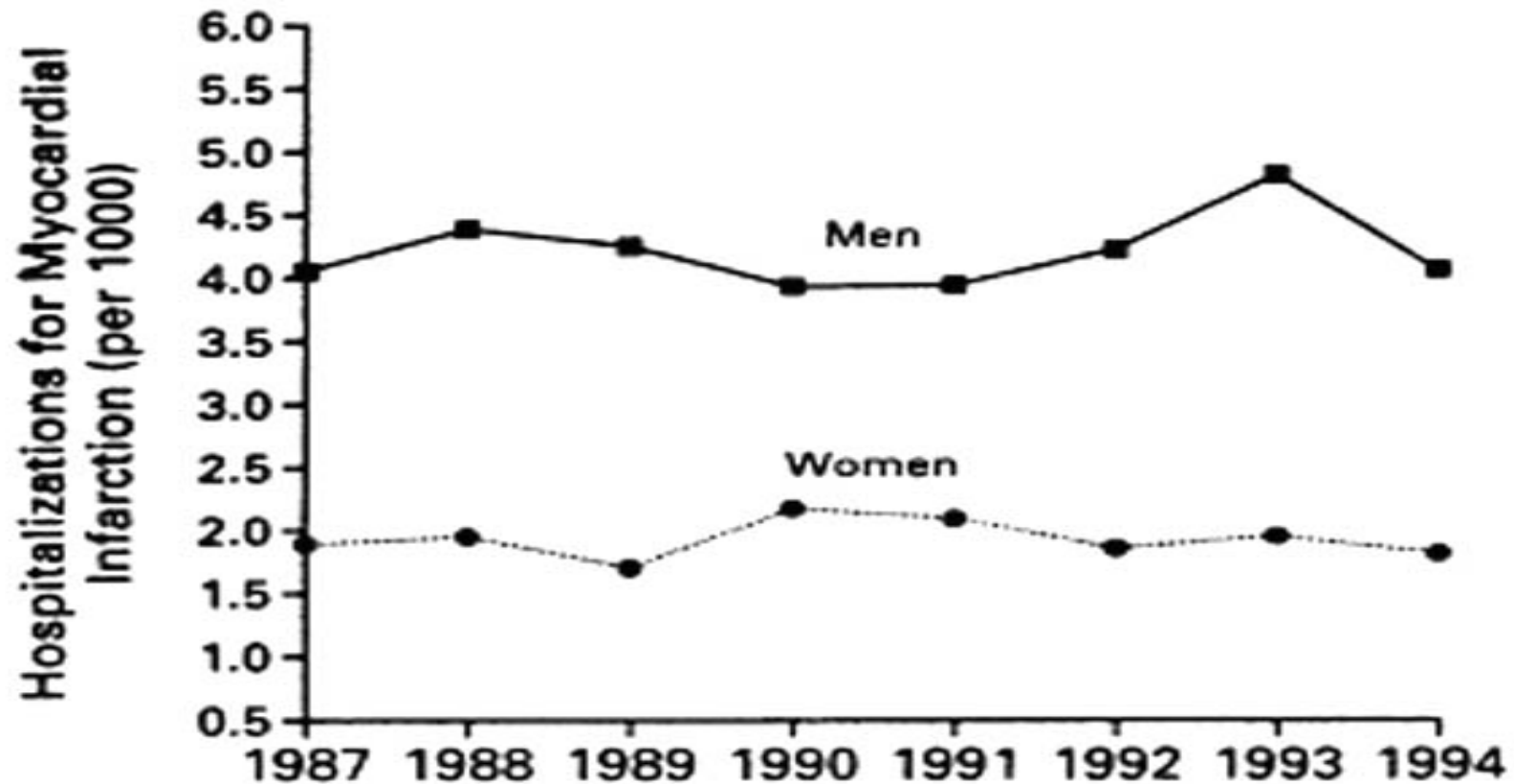


Figure 3. Age-Adjusted Incidence of Hospitalization for Acute Myocardial Infarction among Men and Women 35 to 74 Years Old, 1987 to 1994.

**Data from Jackson, MS, Forsyth County, NC, Minneapolis suburbs, Washington County, MD.
Source: Rosamond et al. NEJM 1998;339:861-7.**

CVD risk factor trends in U.S.

■ Decreases in

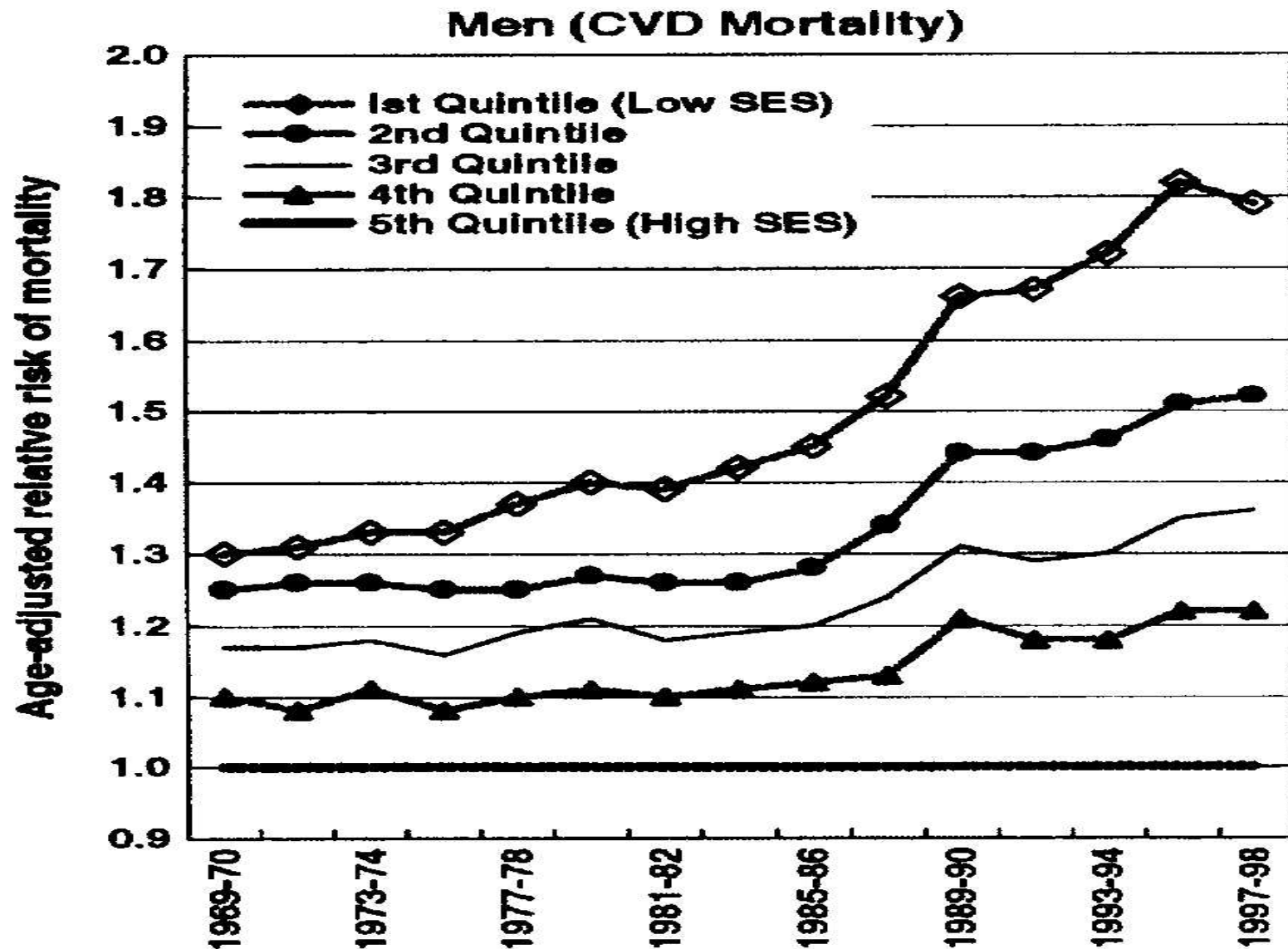
- Smoking
- Cholesterol

■ Increases in

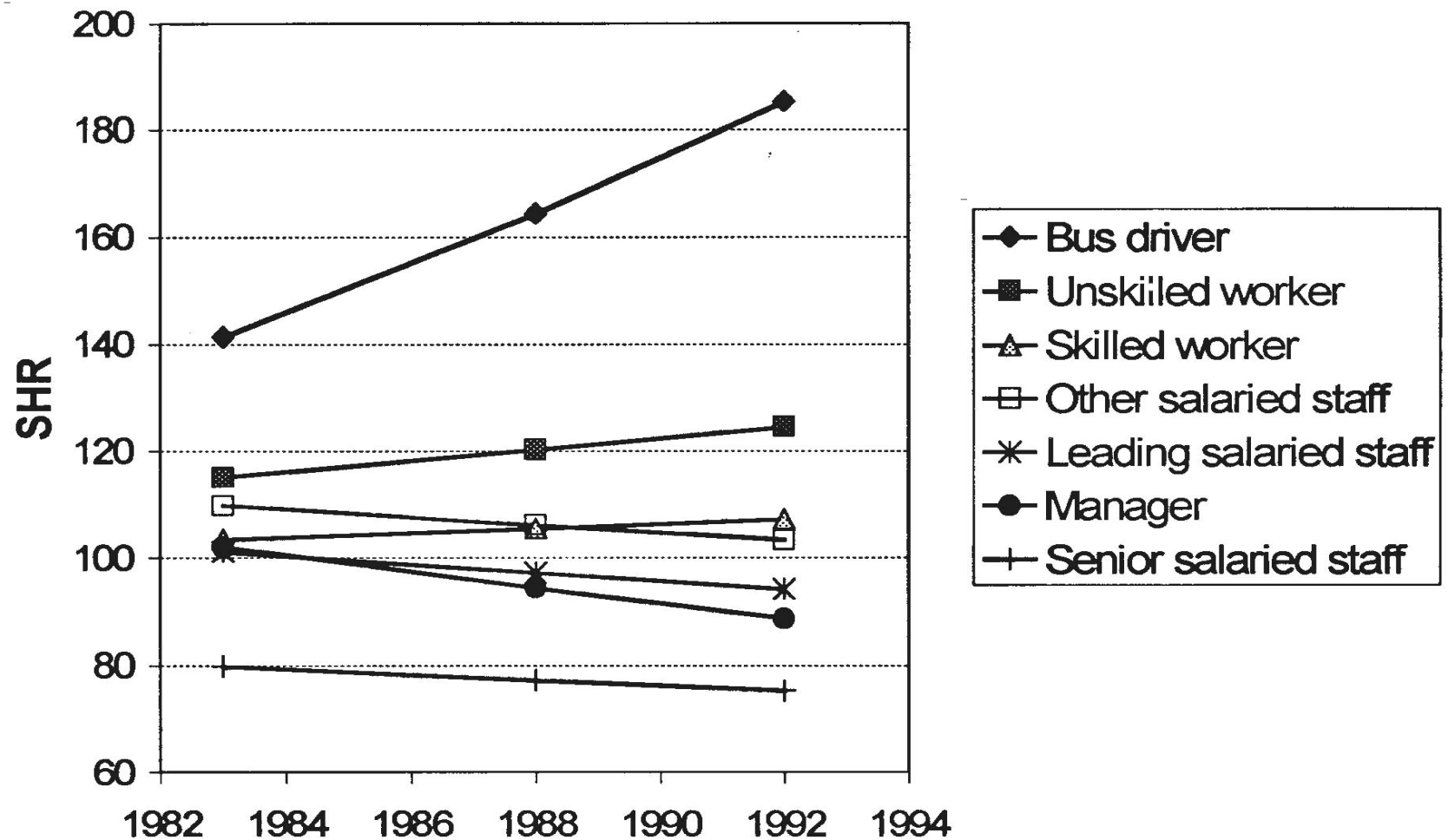
- Overweight
- Diabetes
- Hypertension
(NHANES III: 24%
NHANES IV: 29%)
- Job stressors?

CVD risk factor trends in U.S.

- Increase in SES disparities for
 - Physical inactivity
 - Smoking



Singh GK, Siahpush M. Increasing inequalities in all-cause and cardiovascular mortality among US adults aged 25-64 years by area socioeconomic status, 1969-1998. *International Journal of Epidemiology* 2002;31:600-613.

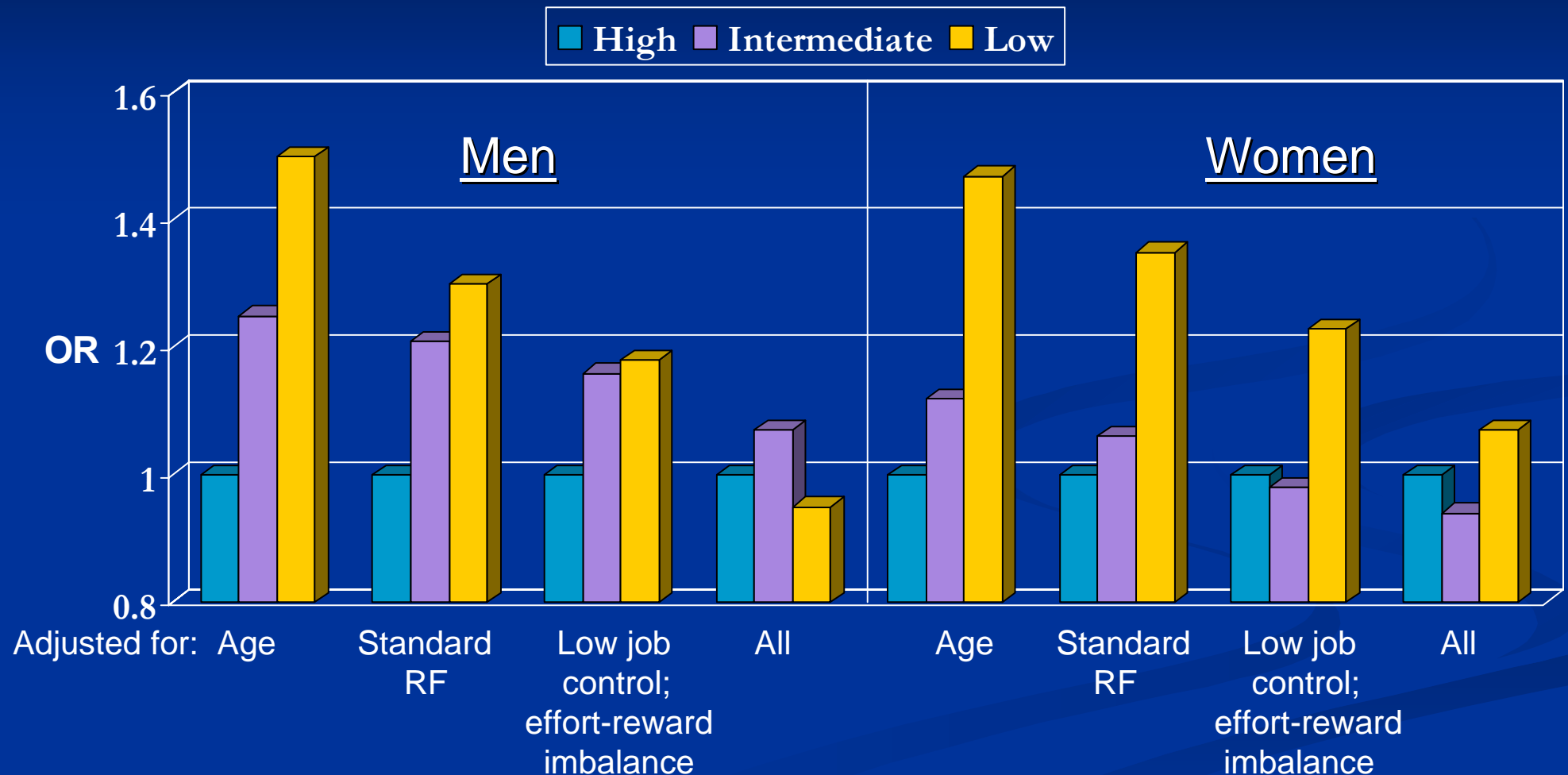


Standardized hospitalization ratios due to IHD among male employment status groups and single occupations, Denmark, 1981- 1993. Tuschsen F, Endahl LA. Int J Epidemiology 1999;28:640-644.

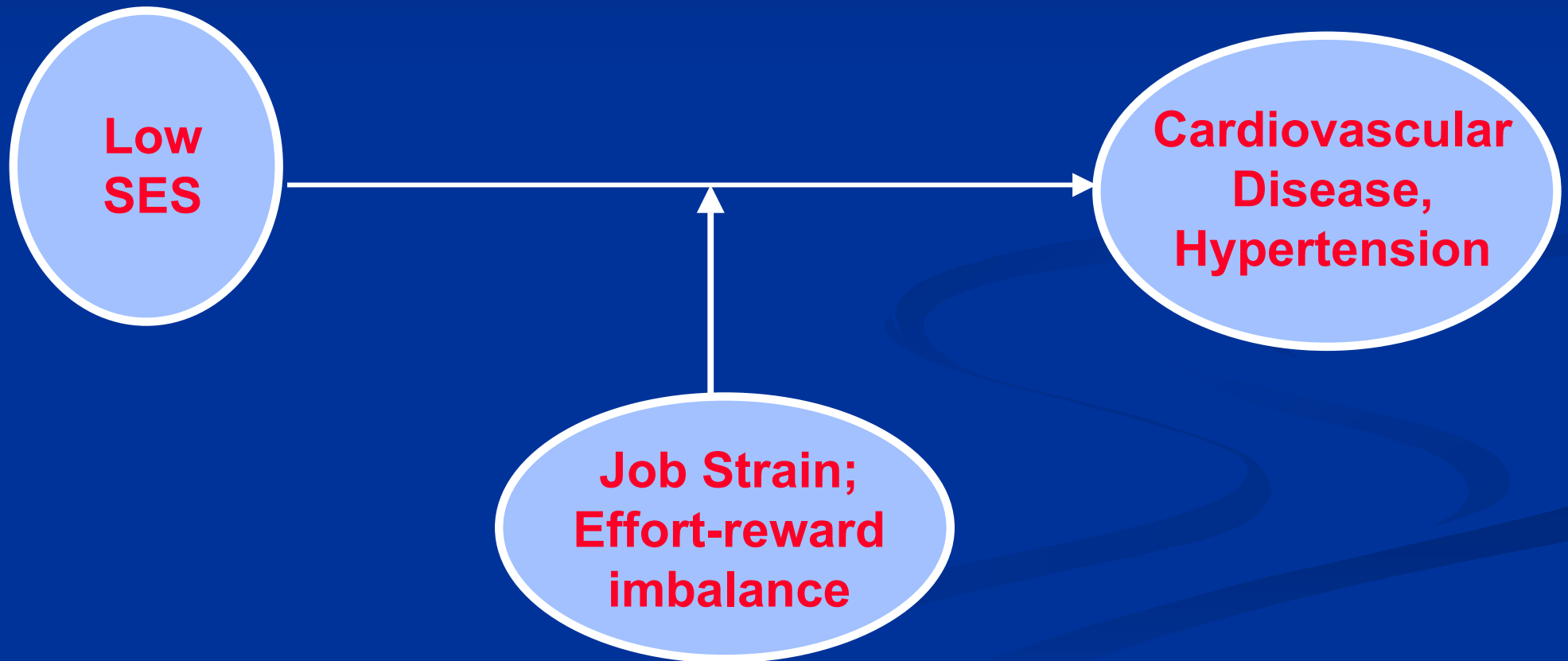
Low socioeconomic status (SES), CVD and hypertension: One potential pathway: mediation



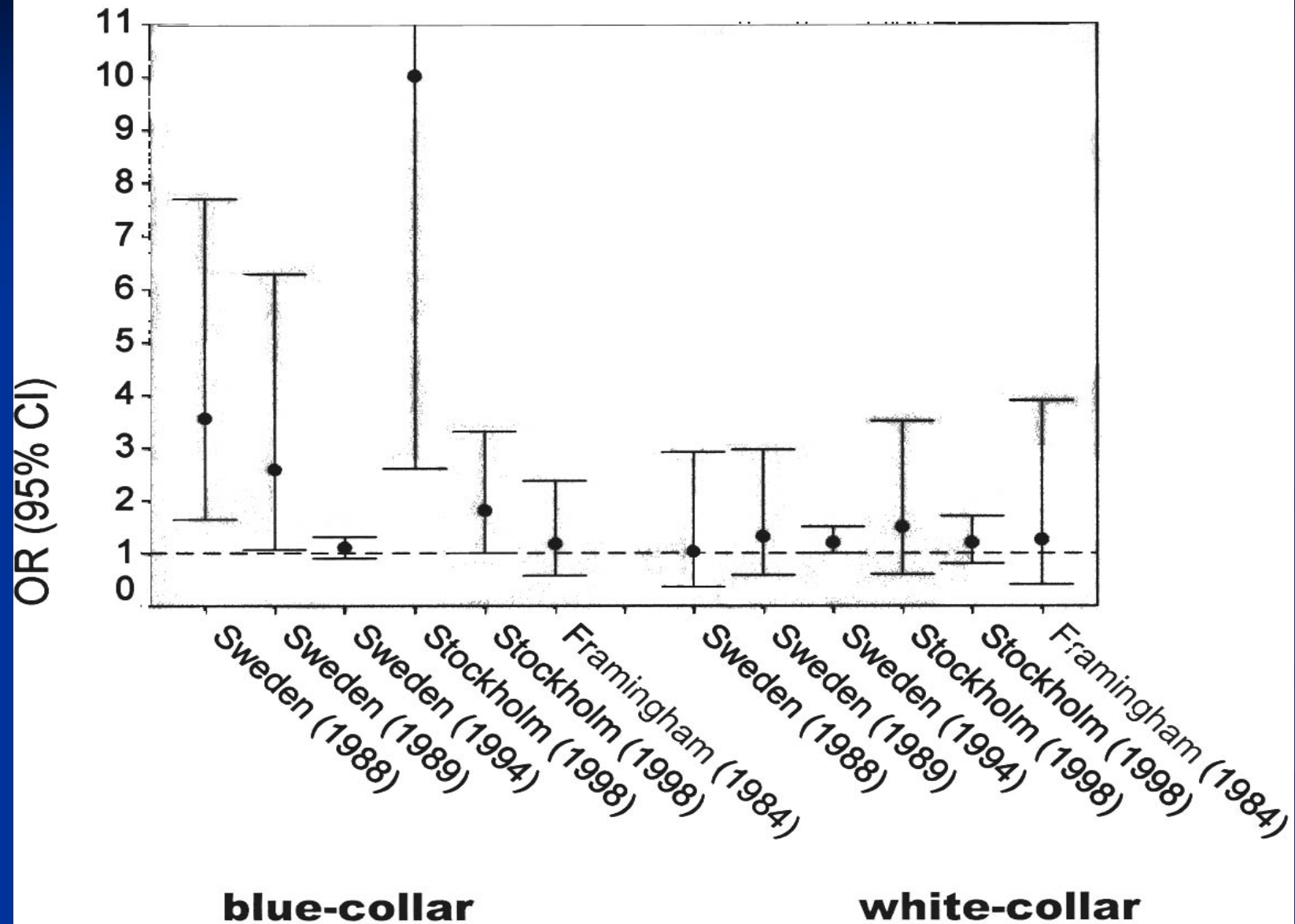
Association between occupational status and new CHD (British civil servants)



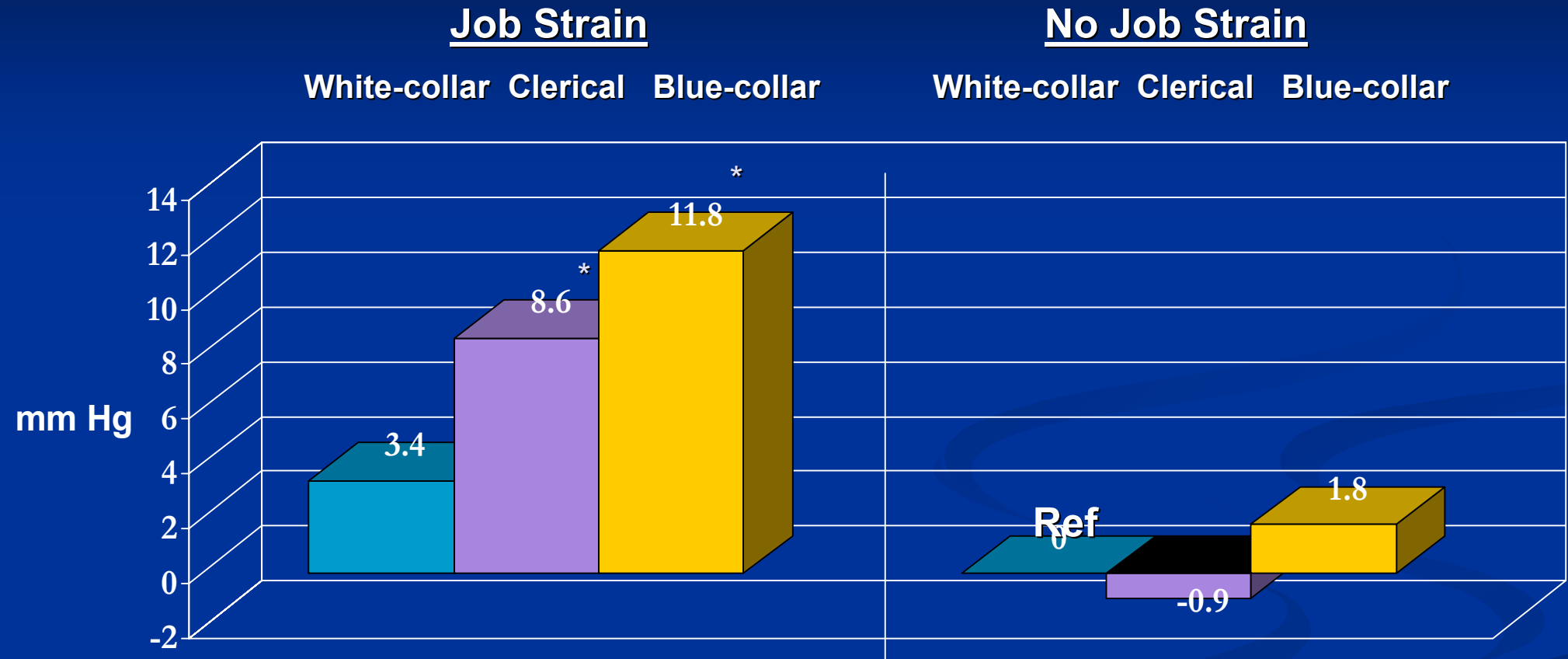
Low socioeconomic status (SES), CVD and hypertension: Another potential pathway: interaction



Job strain-CVD associations by SES -- men



Job Strain and Work Ambulatory Systolic BP by Occupational Status (n=283 men, Time 1)



controlling for age, body mass index, race, smoking, alcohol use and work site

*p<.05 (vs Ref group)