Job Strain and Cardiovascular Disease

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SUDDEN CARDIAC DEATH

- Most common mode of death among adults under the age of 65 in industrialized countries
- In the U.S. ½ of all cardiovascular mortality, 250,000 to 350,000 deaths/year
- Up to 50% had no previous history of known heart disease:

  The first cardiac episode proves to be the last

ESSENTIAL HYPERTENSION

- Approximately ½ of the adult population in industrialized countries has a persistently elevated BP >140/90mmHg by age 60

- Although risk factors such as age, obesity, alcohol intake etc., have been identified, these factors explain only a part of the risk

- The definition of essential hypertension remains:

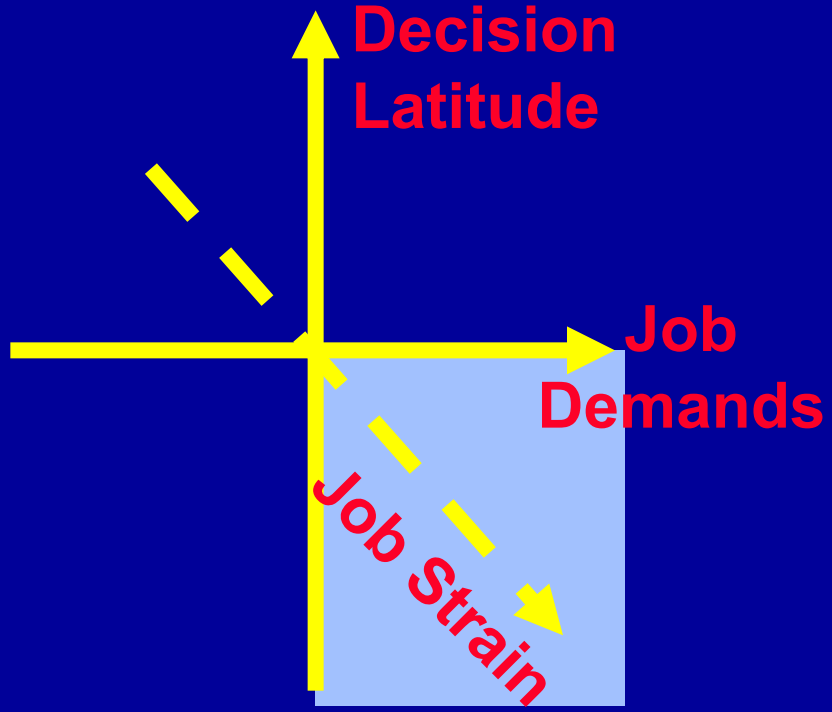
PATIENTS WITH ARTERIAL HYPERTENSION AND NO DEFINABLE CAUSE

A new model – Job strain

- A psychosocial model which might be helpful
- Relates work (work organization) to physiological outcome
- Relevant to the social changes in the organization of work during the past century
- Job strain a way to model the relationship between psychosocial stressors at work and bp
- Validated model, well-operationalized

Job Strain (Karasek)

The combination of: HIGH Psychological Job Demands and LOW Job Decision Latitude



Work Site BP Study

Job Content Questionnaire Items (Karasek)

Psychological Workload 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 (cont'd)

Job Decision Latitude

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 a lot to say about what happens on my job**
6. **My job involves a lot of repetitive work** *
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**

* item reverse coded

The New York City Work Site Blood Pressure (BP) Study

- Based at Weill Medical College of Cornell University-New York Presbyterian Hospital
- Began in 1985 as a case-control study
- 283 men initially enrolled at 8 large NYC work sites
- Now prospective study with 10 years of follow-up
- 472 subjects enrolled at 10 sites (38% women)

Source: Schnall et al. *JAMA* 1990;263(14):1929-1935.

Work Site BP Study

The New York City Work Site BP Study: First 8 participating work sites

- Newspaper typography department
- Federal health agency
- Stock brokerage firm
- Liquor marketer
- Private hospital
- Sanitation collection and repair facility
- Department store warehouse
- Insurance company

The New York City Work Site BP Study: Enrollment procedures

Initial BP screening at work

- **3 sitting readings of BP using the AHA protocol**
- **eligibility determined**

Recruitment BP measurements at work (4-6 wks later)

- **to confirm cases (>85 DBP on both occasions or meds) and controls (≤85 DBP on both occasions)**

Stratified sampling of cases (first 7 sites)

- **All cases & a random sample of controls**
- **case-control ratio 2:3**

Source: Schnall et al. *Hypertension* 1992;19:488-494.

The New York City Work Site BP Study: Eligibility criteria

- aged 30-60 at recruitment
- full-time employee (30+ hours/wk)
- no second job requiring more than 15 hours/wk
- no evidence of CHD
- screening BPs less than 160/105 mm Hg
- able to read and speak English
- body mass index $\leq$ 32.5 kg/m^2 at screening
- at current worksite $\geq$3 yrs before recruitment and before Dx of high BP (1 yr at 8th site)

Source: Schnall et al. *Hypertension* 1992;19:488-494.

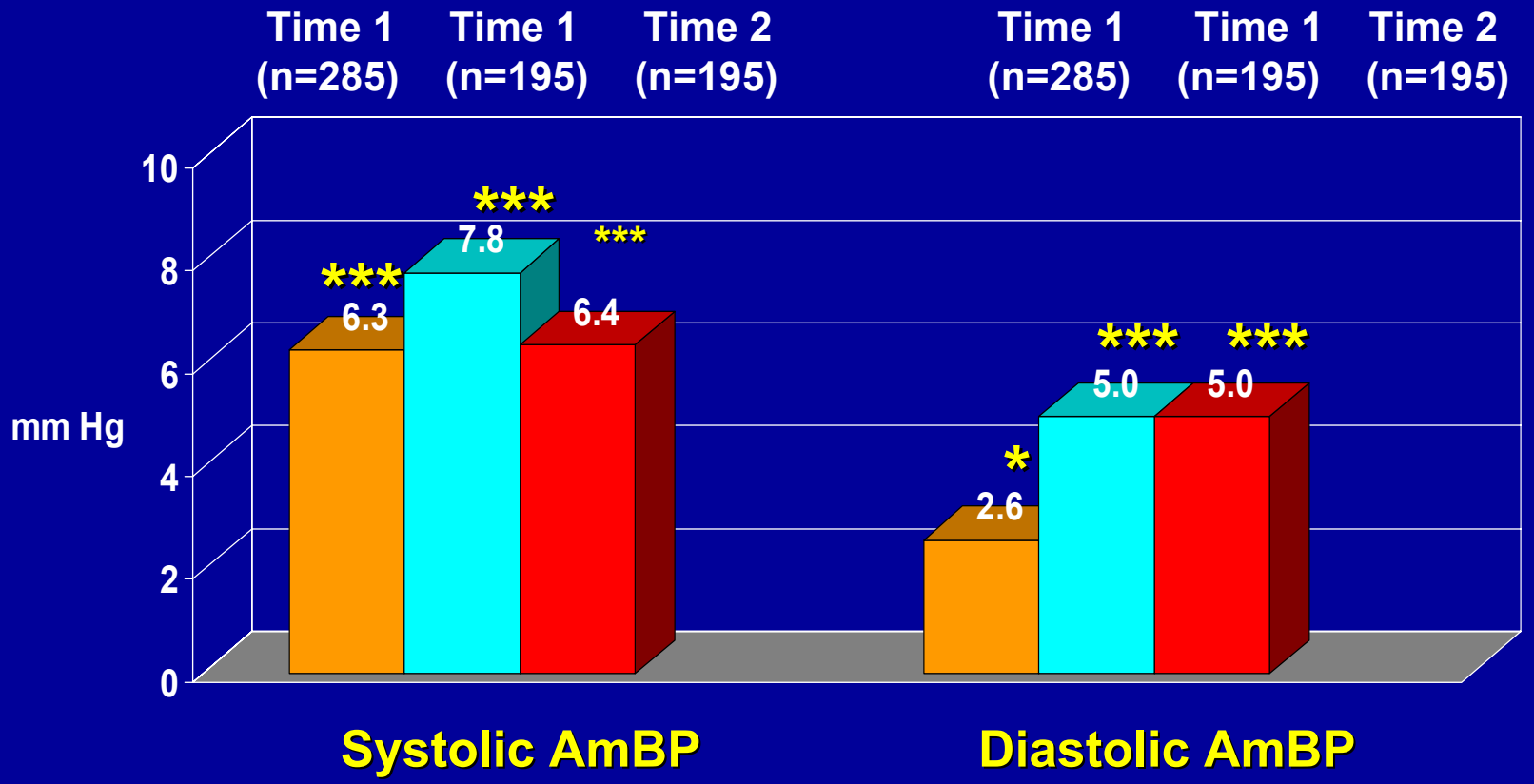
The New York City Work Site BP Study: Protocol

1. **Job Content Questionnaire to measure Job Strain**
2. **Detailed psychosocial + health behavior questionnaire**
3. **Wear an ambulatory BP monitor for 24 hours, including a work shift, plus diary**
4. **Complete cardiovascular work-up**
   - **physical exam**
   - **blood sample (cholesterol)**
   - **EKG**
   - **echocardiogram**
   - **exercise stress test**

Source: Schnall et al. *Hypertension* 1992;19:488-494.

Work Site BP Study

Effect of Job Strain on Work Ambulatory BP in Men (c-s analyses)



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

***p<.001, **p<.01, *p<.05

Source: Schnall et al. *Psychosomatic Medicine* 1998;60:697-706.

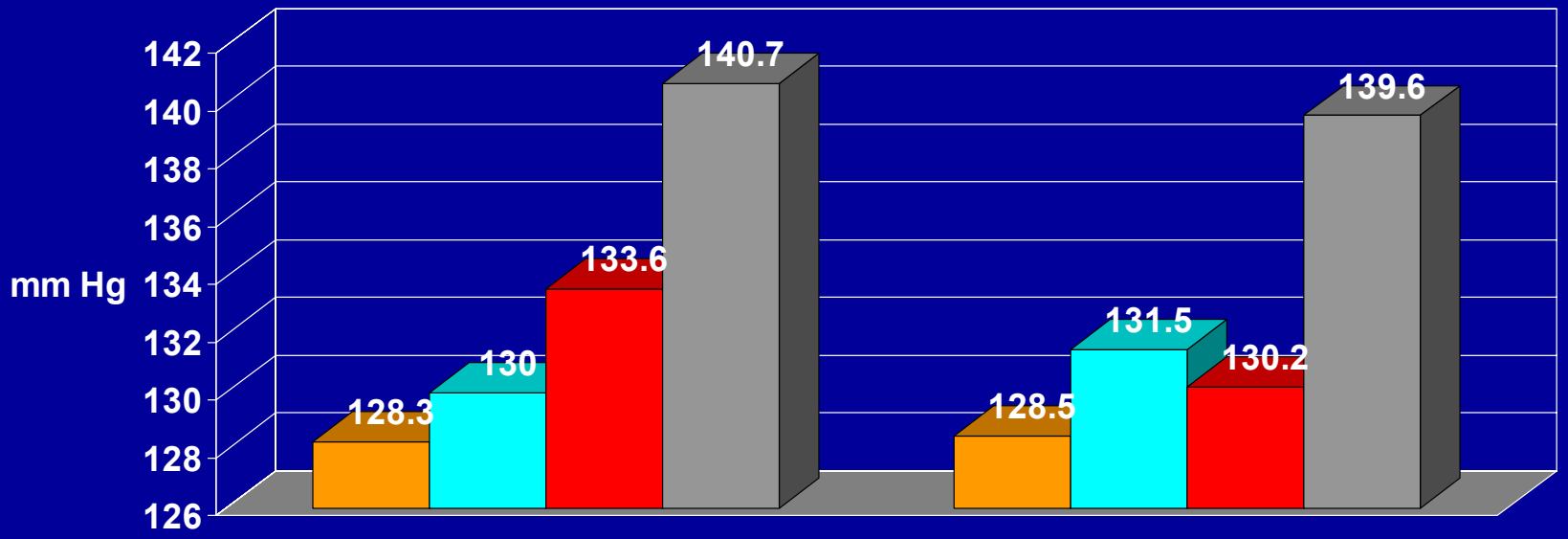
Job Strain Change Variable

Work Site BP Study

Source: Schnall et al. *Psychosomatic Medicine* 1998;60:697-706

Job Strain change and Work Systolic Ambulatory BP
(n=195 men, cross-sectional analyses)

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

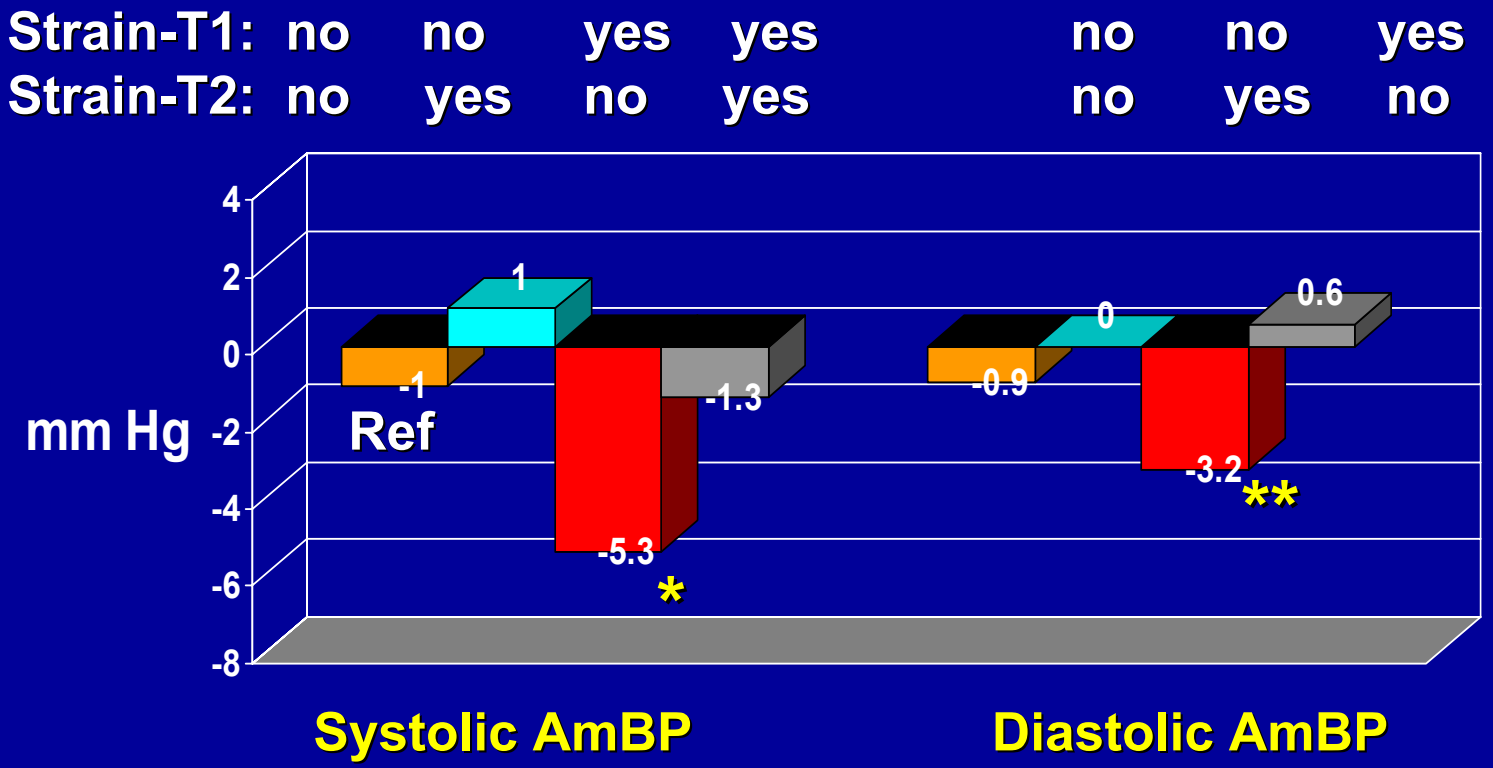


Time 1 (p=.0017) Time 2 (p=.0015)

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

Source: Schnall et al. *Psychosomatic Medicine* 1998;60:697-706.

Job Strain change and 3-yr Work AmBP change (n=195 men, Time 1-2)

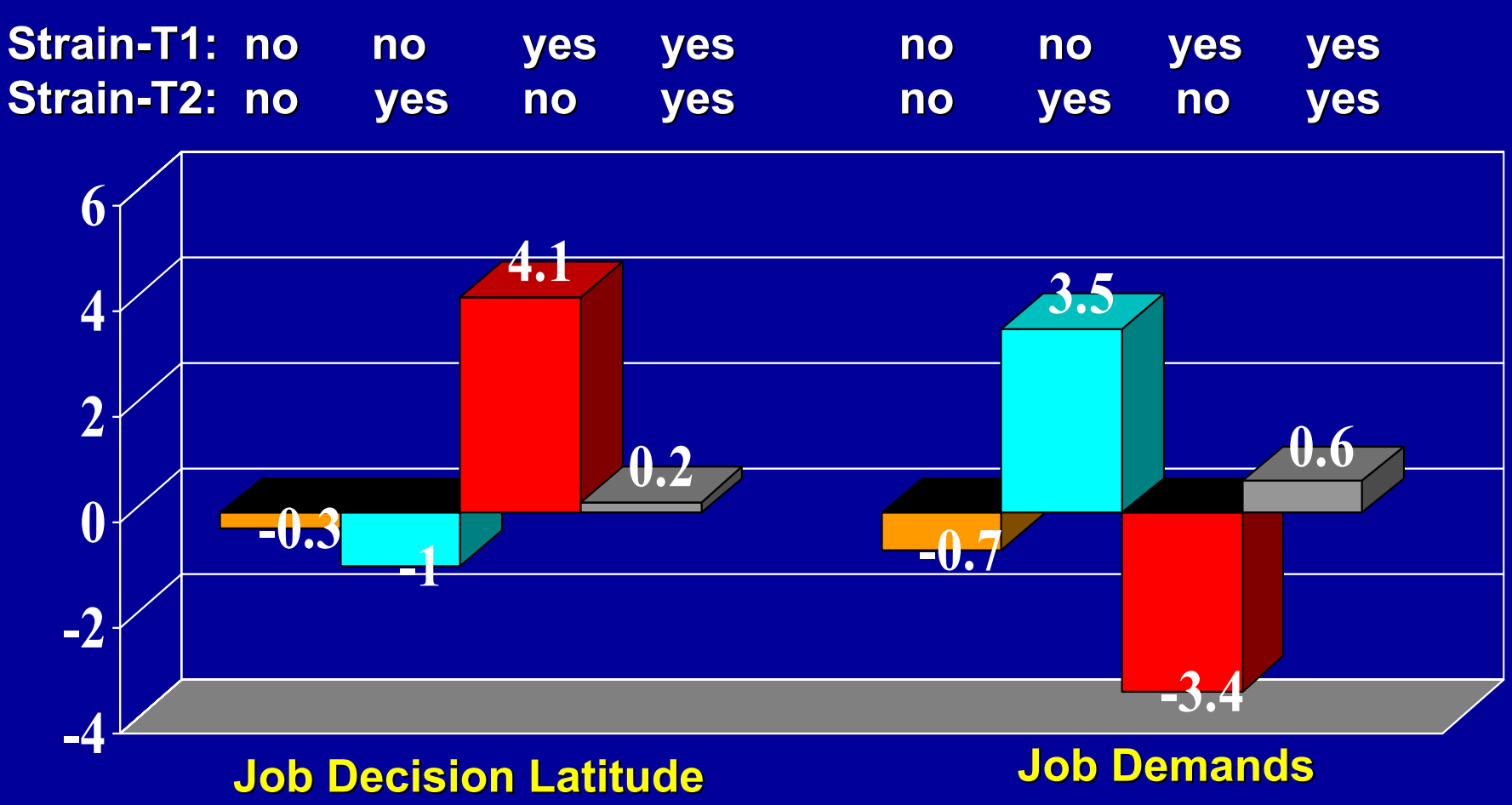


controlling for age, race, body mass index, smoking, alcohol use, work site

*p<.05, **p<.01, (vs Ref group)

Source: Schnall et al. *Psychosomatic Medicine* 1998;60:697-706.

3-year change in Job Decision Latitude and Job Demands by Job Strain change category (n=195 men, Time 1 to Time 2)



Source: Schnall et al. *Psychosomatic Medicine* 1998;60:697-706.

Retrospective Exposure to Job strain and Ambp[1]

- 213 employed men in New York City, aged 30-60 at entry into the Cornell Work Site Blood Pressure Study, completed a shortened version of Karasek's Job Content Questionnaire for each past job they have held.
- Results: The systolic blood pressure of men with at least 25 years of employment and 50% of work life exposed to job strain was 5.2 mm Hg (95% CI -3.2, 13.6) higher at work and 8.2 mm Hg (95% CI 1.2, 15.3) higher at home than men with no past exposure, independent of current exposure.

[1]Landsbergis etal 2001, under review.

Work Site BP Study

Effects of Work & Job Strain on Systolic AmBP

- Work vs. non work + 5 mm Hg
- Job Strain vs. no strain + 7 mm Hg
- Repeated exposure to job strain compared to one exposure + 5 mm Hg
- Cumulative exposure prior to entering study + 5 mm Hg

Evidence of a Causal Relation between Exposure to Job Strain and Elevated AmBP

- **Strong, consistent effects** of job strain on work AmBP (+ home and sleep).
- Some evidence (though not totally consistent), of a **dose-response** relation between AmBP & exposure to increasingly severe degrees of job strain.
- Cohort data: **expected temporal relationship** between exposure and outcome & the effect of **cumulative exposure**
- **Biologically plausible**
- Observational data: **decrease in exposure to job strain associated with a decrease AmBP**

Population Attributable Risk % for Elevated BP due to Job strain

- New York City
- Working Men
- 1985-1988

- 21% Exposed to Job Strain
- RR=2.8
- ***PAR%=27.4***

Schnall P, Belkic K, Landsbergis P, Baker D.Occup Med State of the Art Review 2000.

Other Potential Work-Related Pressors

Direct Epidemiologic Evidence

(& in some cases Physiologic Evidence):

- **Effort-Reward Imbalance**
- **Long Work Hours**
- **Shift Work**
- **Noise**
- **Lead**
- **Arsenic**

Physiologic & indirect epidemiologic evidence:

- **Threat Avoidant Vigilant Activity**

High Risk Occupations for Hypertension

- **Urban Transit Operators**
- **Truck Drivers**
- **Air Traffic Controllers**
- **Sea Pilots**

Physiologic Evidence:

- **Cold**
- **Heavy lifting**
- **Glare Exposure**

Job Strain and Risk of MI

- Swedish men 45-65 y.o.
- N=1047 cases,
- N=1450 population controls

- First Hospitalized and/or fatal MI

- Exposure to high job strain quartile

Working men:

RR=2.2 (95% CI=1.2- 4.1)

Manual workers:

RR=10.0 (95% CI=2.6- 38.4)

(Adjusted for hypertension, smoking, BMI)

Hallqvist J, Diderichsen F, et al. Soc Sci Med 1998.

Evidence from Longitudinal Studies of a relationship between Job Strain and CVD

Conclusion from Review of 14 studies:

"The evidence, particularly among men...is strong and consistent, that an association exists between exposure to job strain and risk of CV disease.

Since bias towards the null is present in most of these studies, the magnitude of this association appears to have been substantially underestimated."

- Belkic K, Landsbergis P, Schnall P, Baker D. ICOH 2002.

CONCLUSIONS

- **We have summarized the evidence and made the case for a causal relationship between the workplace and CVD.**
- **Data indicates that working conditions are deteriorating (e.g., lean production, downsizing, and longer work hours).**
- **There is reason for concern that these trends will result in greater exposure to psychosocial risk factors at the workplace which may, in turn, increase the CVD epidemic.**

Belkic K, Schnall P, Landsbergis P, Baker D. Conclusions and thoughts for a future agenda regarding the workplace and cardiovascular health. In: Schnall PL, Belkic KL, Landsbergis PA, Baker D, Eds. The Workplace and Cardiovascular Disease. Occupational Medicine: State of the Art Reviews. 2000;15(1).

Conclusions

- **Since the CVD epidemic is engendered, at least in part, by the social organization of work and other noxious workplace exposures, this raises the possibility of the primary prevention of cardiovascular disease via interventions aimed at improving the work environment.**

The End