Work and Obesity in US Workers

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Outline

- Definitions, measures, and risk of obesity
- Recent US obesity statistics
- Work and obesity: Mechanisms
- Four empirical studies using a US national dataset (MIDUS data)
- Related CDC/NIOSH programs

DEFINITIONS, MEASURES, AND RISK OF OBESITY

Definitions and measures of obesity

- "A condition of abnormal or excessive fat accumulation in adipose tissue to the extent that health may be impaired"

Field anthropometric methods

- Height and weight: Body Mass Index (BMI, kg/m^2) – general obesity ($r = 0.7$-0.8 with body fat %)
- Waist circumference: central obesity (40 inches for men and 35 inches for women; WHO, 2000)
- Skinfold thickness: body fat % (> 25% for men and > 35-40% for women)


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Classification of overweight and obesity in adults according to BMI (WHO, 2000)

Classification	BMI (kg/m²)	Risk of co-morbidities
Underweight	<18.5	Low (but risk of other clinical problems increased)
Normal range	18.5–24.9	Average
Overweight	25.0–29.9	Mildly increased
Obese	**>30.0**	
Class I	30.0–34.9	Moderate
Class II	35.0–39.9	Severe
Class III severe (or 'morbid obesity' or 'super obesity')	>40.0	Very severe

Source: International Obesity Task Force

Risk of Obesity (WHO, 2000)

- Relative risk, ≥ 3
  - Type 2 diabetes, Insulin resistance
  - Gallbladder disease
  - Dyslipidemia
  - Sleep apnea and respiratory problems
- Relative risk, 2-3
  - Coronary heart disease
  - Hypertension
  - Osteoarthritis (knees)
  - Gout
- Relative risk, 1-2
  - Menstrual irregularities and infertility
  - Some cancers (endometrial, breast, and colon)
  - Low back pain

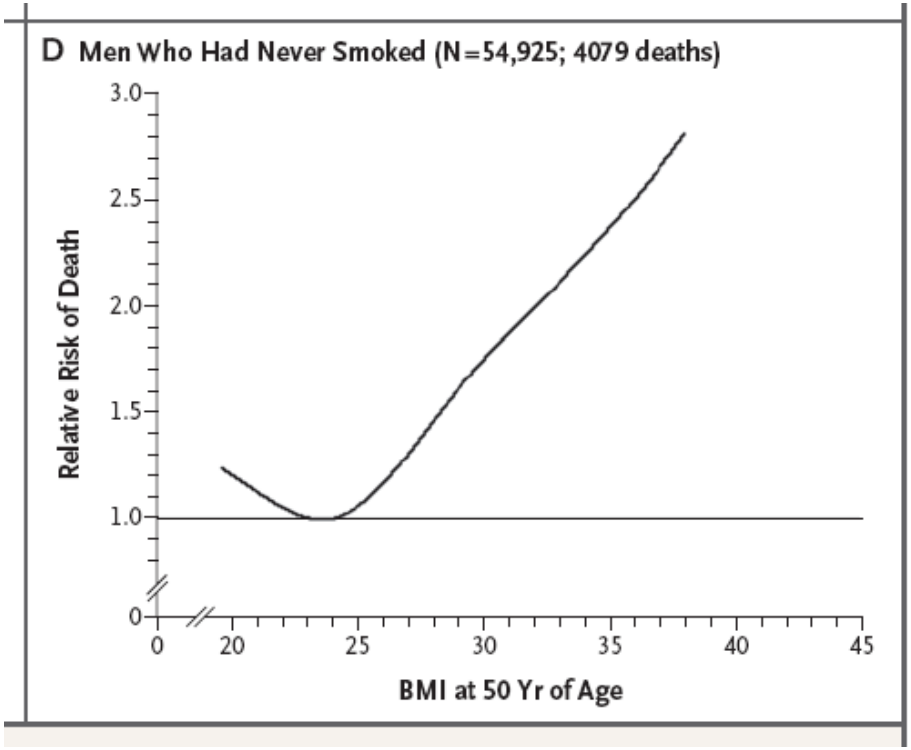
The NEW ENGLAND JOURNAL of MEDICINE

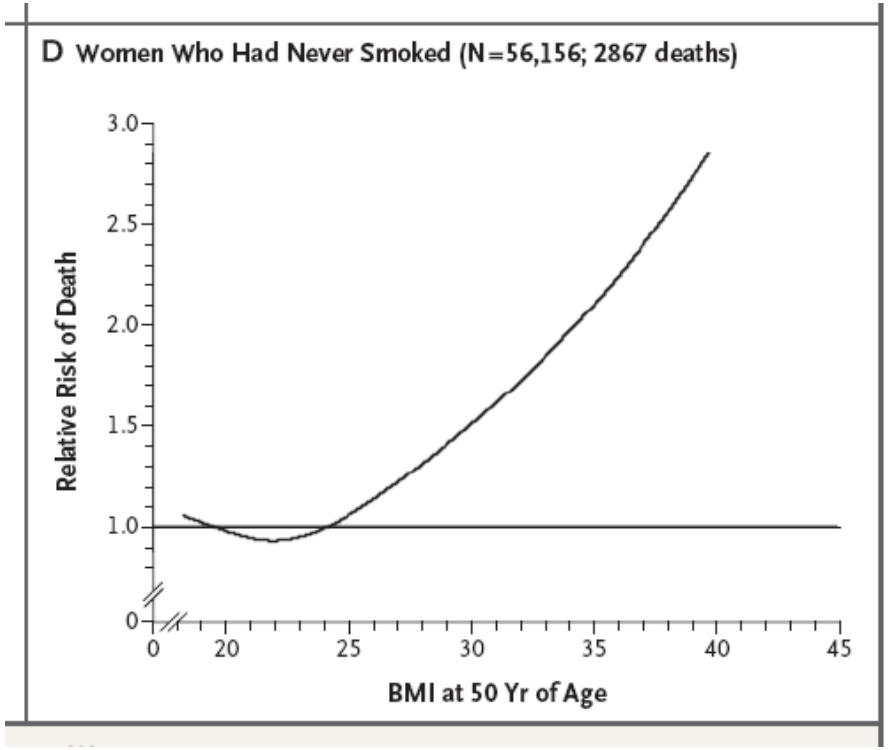
ESTABLISHED IN 1812 AUGUST 24, 2006 VOL. 355 NO. 8

Overweight, Obesity, and Mortality in a Large Prospective Cohort of Persons 50 to 71 Years Old

Kenneth F. Adams, Ph.D., Arthur Schatzkin, M.D., Tamara B. Harris, M.D., Victor Kipnis, Ph.D., Traci Mouw, M.P.H., Rachel Ballard-Barbash, M.D., Albert Hollenbeck, Ph.D., and Michael F. Leitzmann, M.D.

N Engl J Med 2006;355:763-78.





models are adjusted for age, race or ethnic group, level of education, alcohol consumption, and physical activity.

Limitations of BMI

(Prentice and Jebb, 2001)

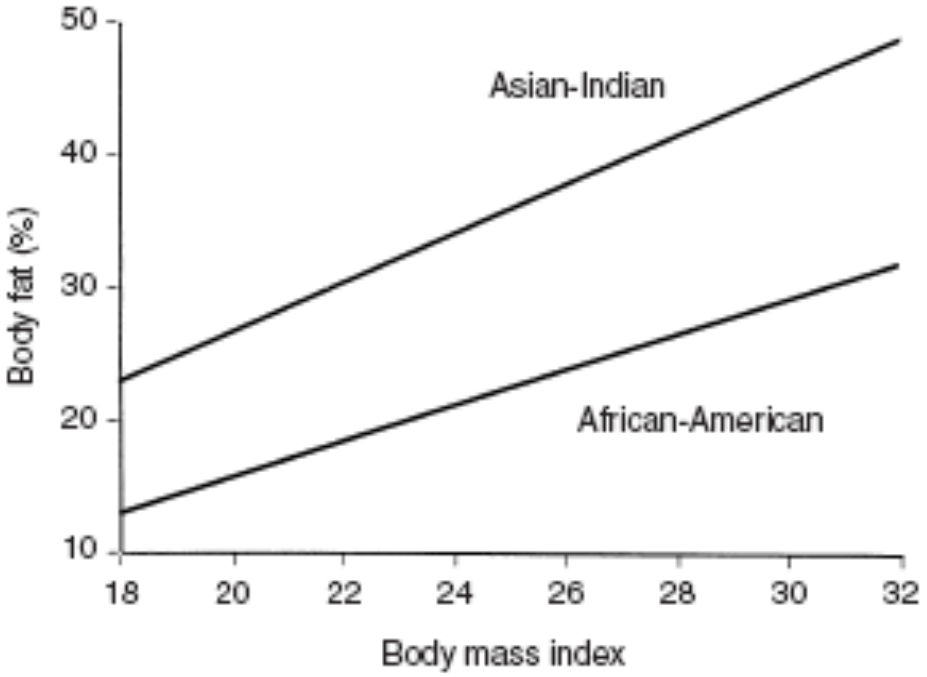


Figure 2 Racial differences in the relationship between body mass index (BMI) and body fat.

Survey participants in the FORWARD study (n=60 FFs)

- **They participated in the surveys between March and July 2011**
  - **Participation rate: 84.5 %**
  - 57 male (age, Mean = 42.7 yrs) and 3 female (age, Mean = 36.7 yrs) firefighters.
  - 53 White/Non-Hispanic, 3 Hispanic/Latino, and 4 Asian
- **3 obesity measures using standard protocols**
  - Body mass index (general obesity, ≥ 30 kg/m2)
  - 3-site skin-fold Body Fat %
    - chest, abdominal, and thigh skinfold measurements for men (≥ 25%)
    - triceps, suprailiac, and thigh skinfold measurements for women (≥ 35%)
  - Waist circumference at the uppermost lateral border of the iliac crest
    - Central obesity (WHO, 2000): ≥ 102 cm for men and ≥ 88 cm for women

Obesity prevalence

- Obesity info - missing in 2 male FFs

BMI	Men n=55 (%)	Women n=3 (%)
Normal (18.5 to 24.9)	12 (21.8%)	2 (66.7%)
Overweight (25.0 to 29.9)	32 (58.2%)	1 (33.3%)
Obesity (≥ 30.0)	11 (20.0%)	

Waist Circumference	Men n=55 (%)	Women n=3 (%)
Normal	41 (74.5%)	2 (66.7%)
Central Obesity	14 (25.5%)	1* (33.3%)

Skin-fold Body fat %	Men n=55 (%)	Women n=3 (%)
Normal (18.5 to 24.9)	43 (78.2%)	3 (100.0%)
Obesity (25.0 to 29.9)	12 (21.8%)	0 (0.0%)

* The border line value = 88 cm.

Spearman correlations between three obesity measures among 55 male FFs

	BMI (cont.)	BMI (obesity)	Waist Circumference (cont.)	WC (obesity)	Skin-fold Body Fat % (cont.)	Body fat % (obesity)
Age	-.03	.26	.18	.32*	.35**	.41**
BMI (obesity)						
WC	.86***					
WC (obesity)		.86***				
Body fat %	.69***		.82***			
Body fat (obesity)		.40**		.50***		

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$

Agreement level of obesity between BMI and skin-fold body fat % among 55 male FFs

		Body fat % (the reference)		Total
		Non-obesity	Obesity	
BMI	Non-obesity	38	6	44
	Obesity	5	6	11
Total		43	12	**55**

Total misclassification = 11/55 (20.0%)

False positive rate = 5/11 (45.5%)

False negative rate = 6/44 (13.6%)

Sensitivity = 6/12 (50.0%)

Specificity = 38/43 (88.4%)

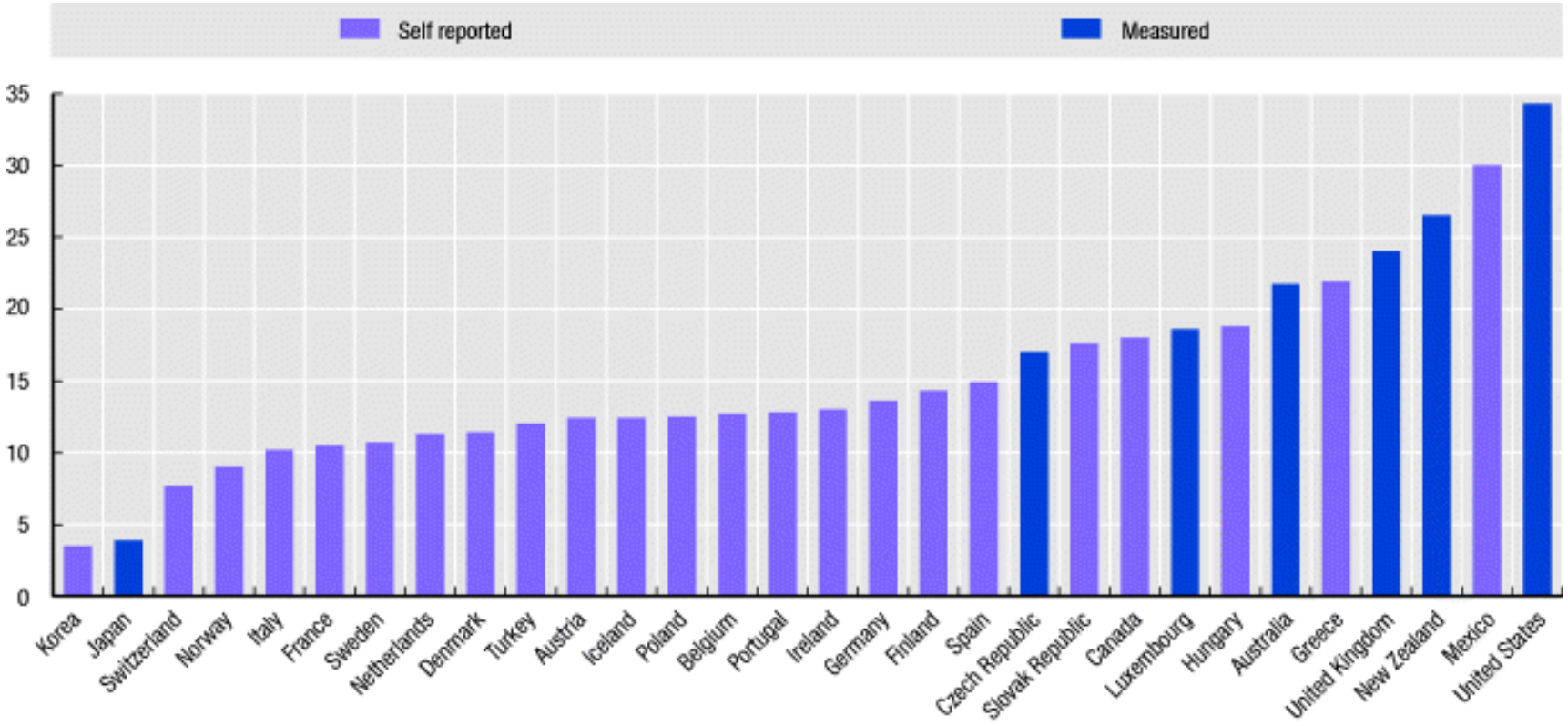
Age-adjusted Spearman correlations of obesity measures with other CVD risk factors among 41 male FFs

Other CVD risk factors	BMI (cont.)	Waist Circumference (cont.)	Skin-fold Body Fat % (cont.)
SBP	.45**	.43**	.32*
DBP	.58***	.61***	.46**
VO2max	-.25	-.36*	-.43**
Total cholesterol	-.02	.01	.06
HDL	-.52***	-.55***	-.47**
LDL	.00	.03	.10
Triglycerides	.65***	.62***	.54***

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$

RECENT US OBESITY STATISTICS

Obesity (BMI ≥ 30 kg/m^2) prevalence rates of OECD countries



Source - Organization for Economic Cooperation and Development (OECD) Fact book 2009: Economic, Environmental and Social Statistics - Obese population aged 15 yrs and older

Asian-Pacific Perspective: (WHO Western Pacific region, 2000)

Table 2.2. Proposed classification of weight by BMI in adult Asians

Classification	BMI (kg/m^2)	Risk of co-morbidities
Underweight	*< 18.5*	*Low (but increased risk of other clinical problems)*
Normal range	*18.5-22.9*	*Average*
Overweight:	*≥ 23*	
At risk	*23-24.9*	*Increased*
Obese I	*25-29.9*	*Moderate*
Obese II	*≥ 30*	*Severe*

Prevalence of obesity (BMI ≥ 25 kg/m^2) in Korea: Kim et al. (2005)

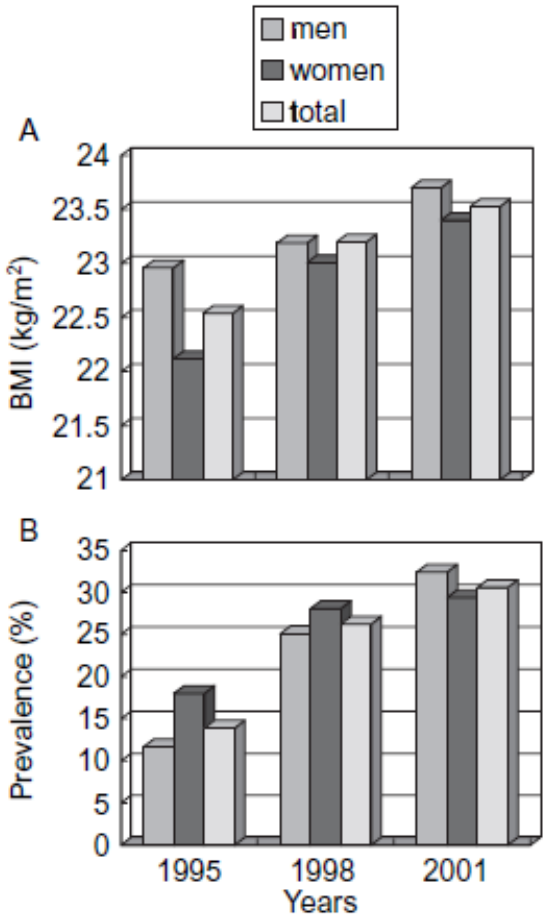
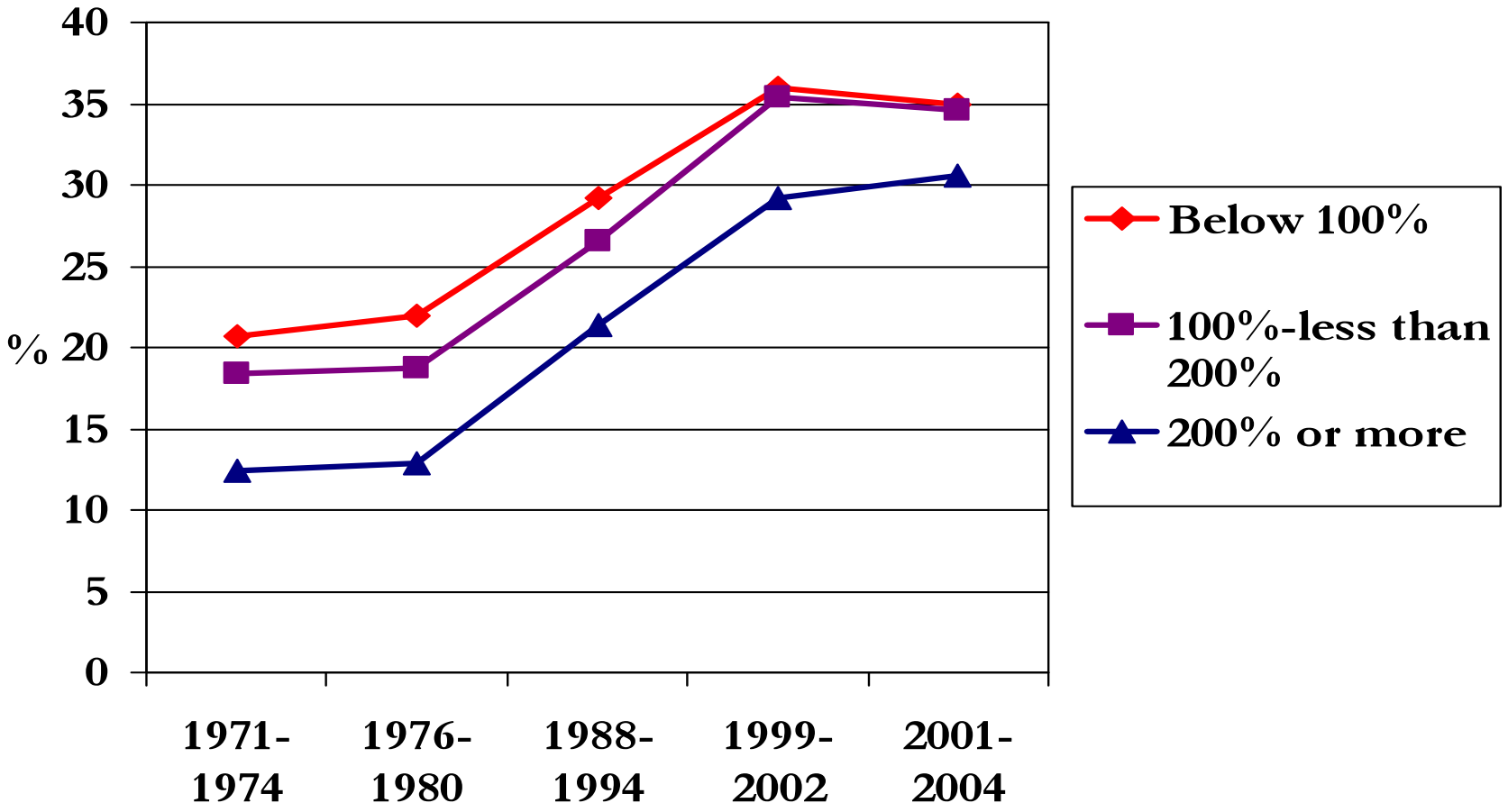


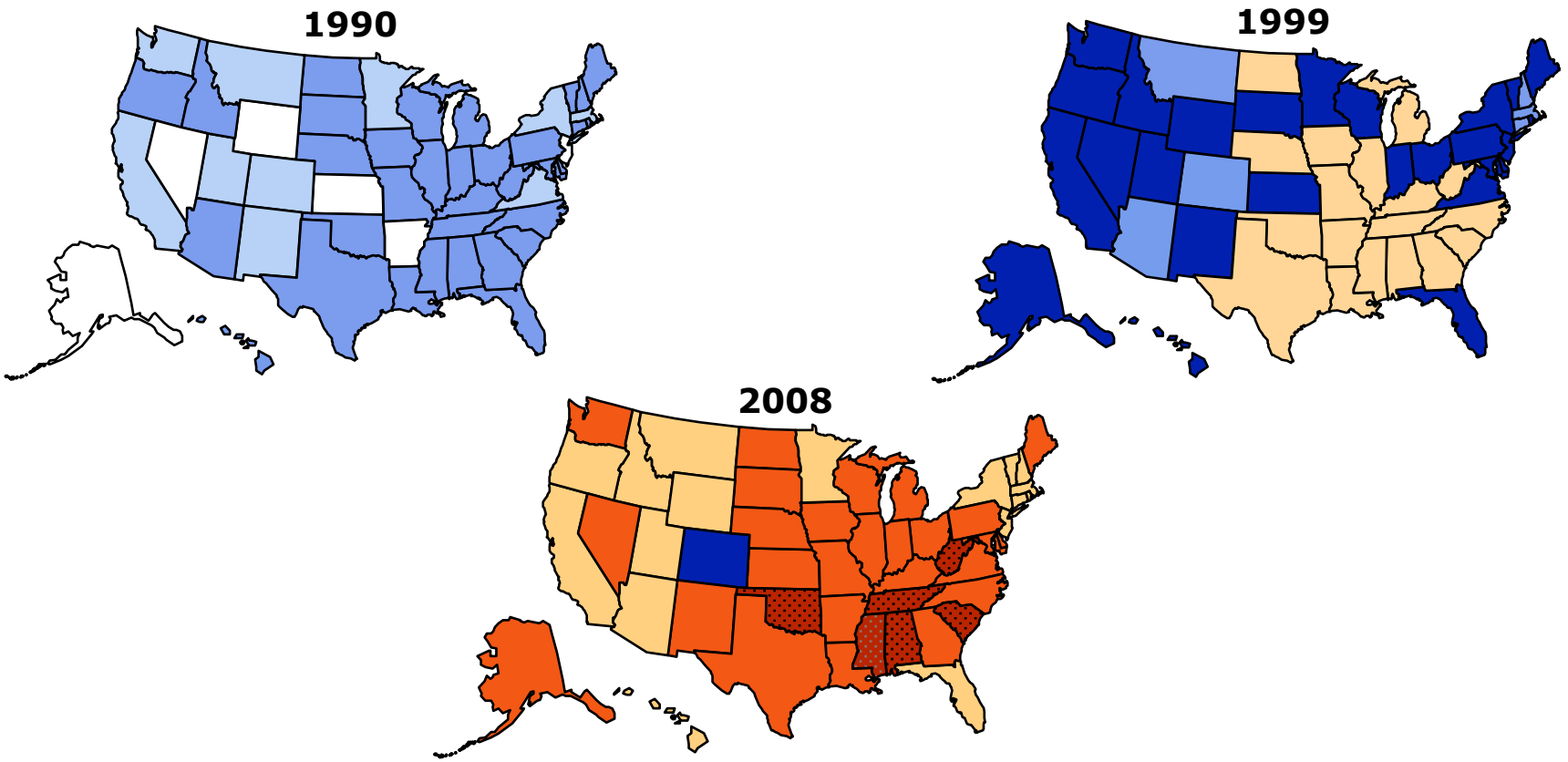
Figure 1 The prevalence of obesity according to body mass index (BMI) in Korean adults, based on the national health and nutrition survey from 1995 to 2001, a secular trend in mean BMI of Korean adults (A), a secular trend in prevalence of obesity (BMI ≥ 25 kg m^{-2}) in Korean adults (B).

Obesity, age 20-74, by income, NHANES, U.S. (BMI ≥30)



National Center for Health Statistics. Health, United States, 2006. Hyattsville, MD: 2006

Obesity* Trends Among US Adults
BRFSS, 1990, 1999, 2008



BRFSS: Behavioral Risk Factor Surveillance System

*BMI ≥30 kg/m2

Obesity Statistics:

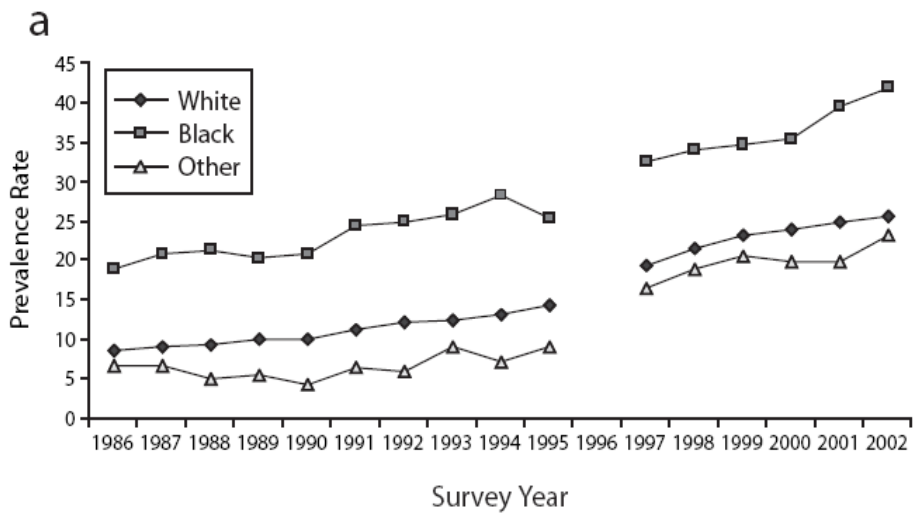
US National Center For Health Statistics (November. 2007)

- **More than one-third of U.S. adults -– over 72 million people -- were obese** in 2005-2006: 33.3 percent of men and 35.3 percent of women.

- **Adults aged 40 - 74** had the highest obesity prevalence compared with other age groups

- Approximately 53 percent of non-Hispanic **black women** and 51 percent of **Mexican-American women** aged 40-59 were obese compared with about 39 percent of non-Hispanic white women of the same age.

Trends in obesity prevalence rates among working adults in the US



(*Am J Public Health.* 2005;95:1614–1622. doi:10.2105/AJPH.2004.050112)

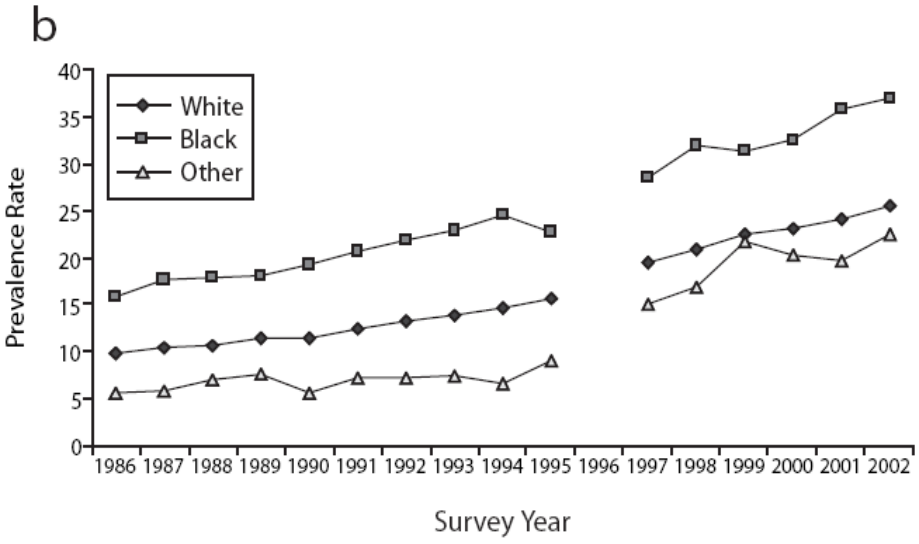


FIGURE 1—Trends in gender- and race-specific prevalence rates of obesity among working adults, (a) men and (b) women: the National Health Interview Survey, 1986 to 2002.

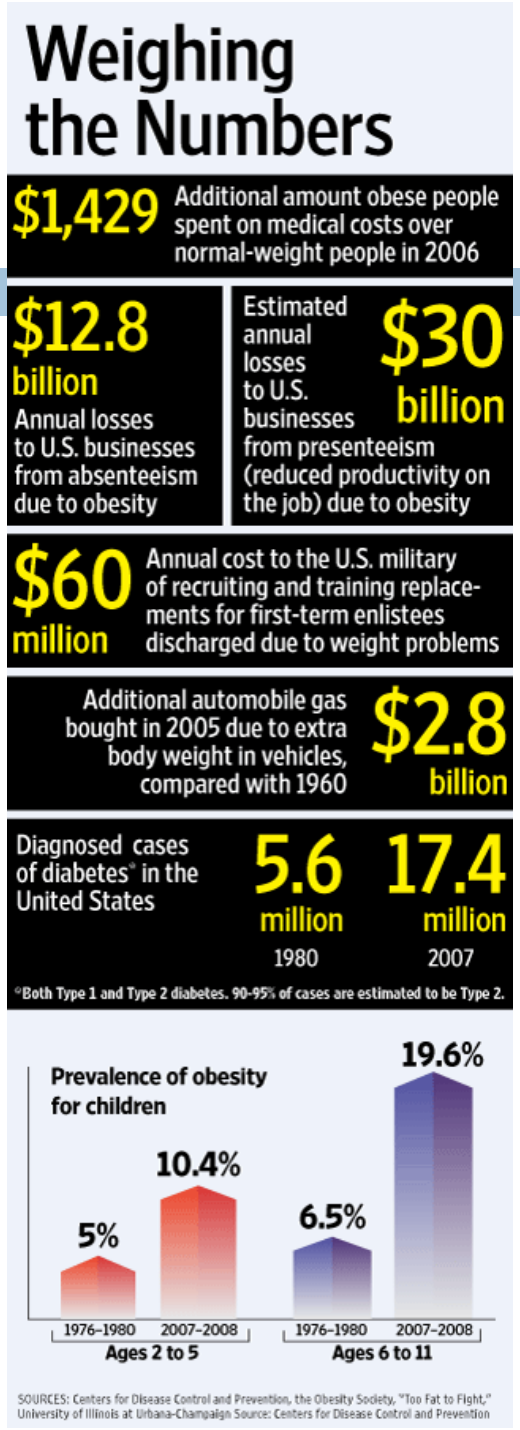
National Medical Spending Attributable To Overweight And Obesity: How Much, And Who's Paying?

Further evidence that overweight and obesity are contributing to the nation's health care bill at a growing rate.

by Eric A. Finkelstein, Ian C. Fiebelkorn, and Guijing Wang

ABSTRACT: We use a regression framework and nationally representative data to compute aggregate overweight- and obesity-attributable medical spending for the United States and for select payers. Combined, such expenditures accounted for 9.1 percent of total annual U.S. medical expenditures in 1998 and may have been as high as $78.5 billion ($92.6 billion in 2002 dollars). Medicare and Medicaid finance approximately half of these costs.

Source – Theodore Dalrymple. Our Big Problem. The Wall Street Journal (May 1, 2010)



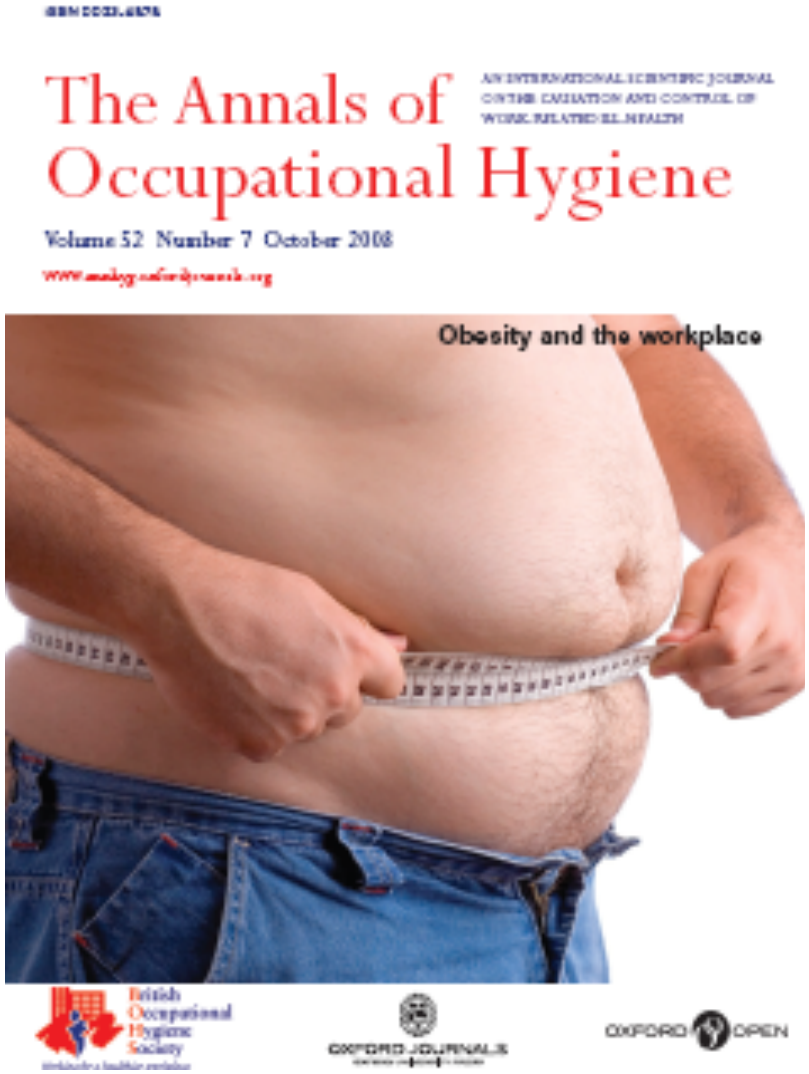
WORK AND OBESITY: MECHANISMS

Obesity: Contributing Factors

(by the US Centers for Disease Control and Prevention)

- Overweight and obesity result from an **energy imbalance**. This involves eating too many calories and not getting enough physical activity.
- Body weight is the result of **genes, metabolism, behavior, environment, culture, and socioeconomic status**.
- **Behavior and environment** play a large role causing people to be overweight and obese. These are the greatest areas for prevention and treatment actions.

Obesity and the workplace?



Top 3 and bottom 3 male occupations in obesity prevalence (from Caban et al., 2005)

- **Top 3 occupations:**
  - Motor vehicle operators (31.7%)
  - Private household occupations (31.3%)
  - **Firefighters and police** (29.8%) – the most active group in leisure-time physical activity (Caban et al., 2007)!!!

- **Bottom 3 occupations:**
  - Health-diagnosing occupations (11.2%)
  - Health technologists/technicians (13.7%)
  - Architects and surveyors (14.5%)

Work and Obesity: Mechanisms
(Choi et al., 2009: obesity in firefighters)

- **Working Conditions - Decreased Energy Expenditure**
  - Decreased work-related physical activity
  - Decreased leisure-time physical activity
- **Working Conditions - Increased Energy Consumption**
  - Stress-induced overeating
  - Sweet/chocolates over fruit/fish/vegetables (Oliver and Wardle, 1995)
- **Working Conditions - Chronic strain – Hypothalamus Dysfunction**
  - Alternations of the autonomic nervous system, endocrine systems, and circadian rhythms in relation to lipid metabolisms (Björntorp, 2001)
- **Combinations of the above**

EMPIRICAL STUDY 1 USING A US NATIONAL DATASET (THE MIDLIFE DEVELOPMENT IN THE UNITED STATES)

Work-related Physical Activity and Obesity

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 53:1088–1101 (2010)

Sedentary Work, Low Physical Job Demand, and Obesity in US Workers

BongKyoo Choi, ScD,[1]* Peter L. Schnall, MD,[1] Haiou Yang, PhD,[1] Marnie Dobson, PhD,[1] Paul Landsbergis, PhD,[2] Leslie Israel, DO,[1] Robert Karasek, PhD,[3,4] and Dean Baker, MD[1]

Workplace Changes in the US since the 1980s

- Decrease in routine manual tasks and strenuous jobs
- Increase in sedentary work
- Factors associated with these changes include:
  - Technology (mechanization, automation, or computerization)
  - Work organization (lean production)
  - Industrial structure (service-driven economy)
  - Labor relations (decreased rates of unionization)

Hypothesis

- **Work-related physical activity is associated with general and central obesity in US workers**
  - Well-known fact: Leisure-time sedentary lifestyle is associated with general obesity
  - Few studies look at both low levels of physical activity at work and obesity (general and central) in US workers

Methods: Study Design/population

- **Cross-sectional** and **secondary data analysis** study
- 2,019 **workers** (1,001 male/1,018 female) from the **Midlife Development in the United States II** (MIDUS II) dataset
  - From 1995 to 1996, the MacArthur Midlife Research Network carried out a national survey (MIDUS I study)
    - 7,000 Americans to investigate the role of behavioral, psychological, and social factors in understanding age-related differences in physical and mental health
    - Demographics comparable to the US population
  - The Institute on Aging at the University of Wisconsin, Madison performed a longitudinal follow-up interview/survey (2004-2006)

Methods: Exposure Variables
Work-related physical activity

- **Sedentary work (S)** (ie, "*how often does your job require you to sit for long periods of time during your work-shift?*")
- **Physical job demand (P)** (ie, "*how often does your job require a lot of physical effort during your work-shift?*")
  - Response set for exposure variables: Likert scale using **High** (all of the time, most of the time), **Middle** (some of the time), and **Low** (little of the time, and never)

- **Physical inactivity at work (P+S)**: combination of the above two variables due to a high ($r = 0.50$) inter-correlation
- **Stratification of working hours per week**: (40+ vs. 40 or less)

Methods: Outcome Variables

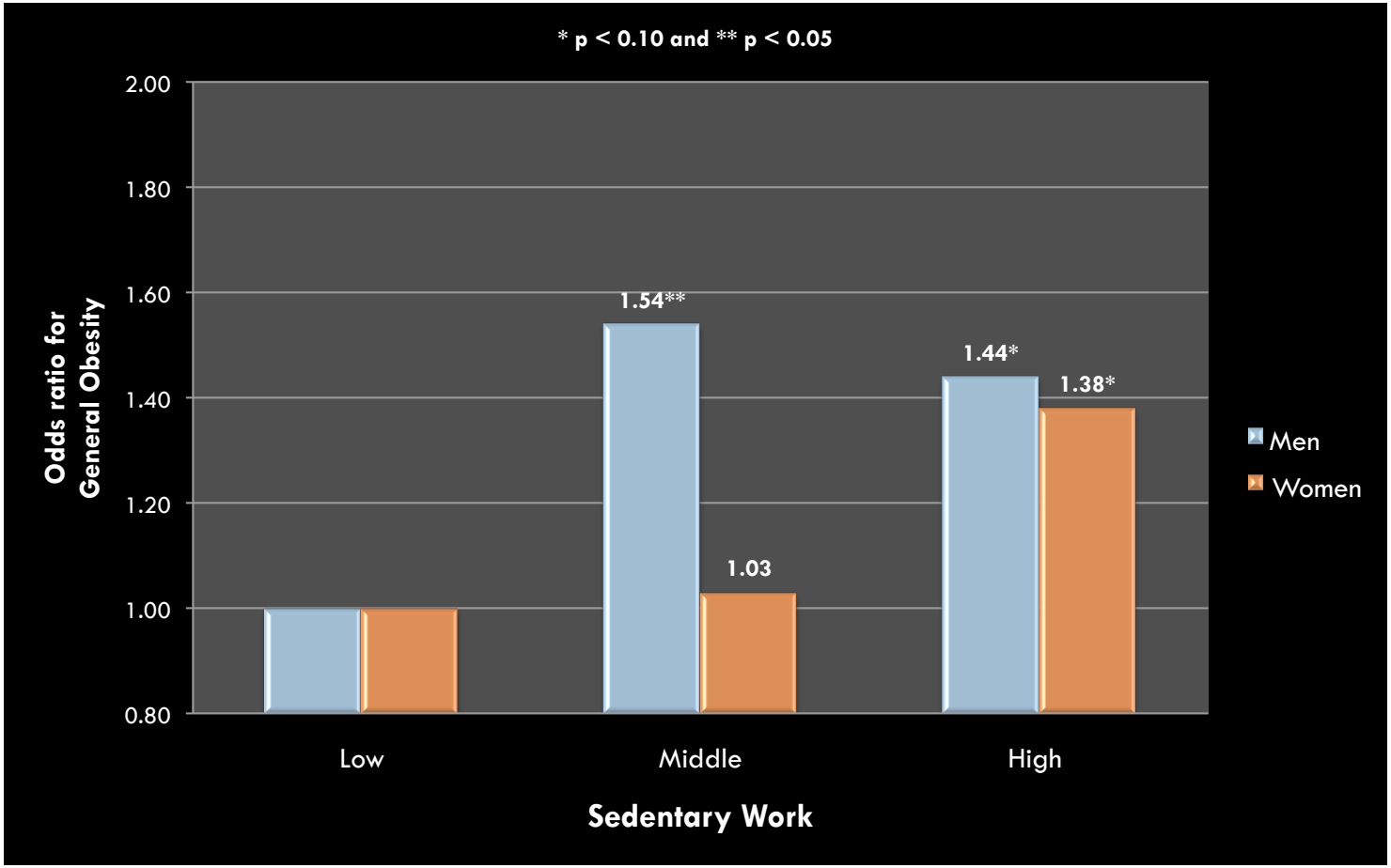
- **General obesity:** Self-reported BMI ($\geq$ 30 kg/m^2)

- **Central obesity:** Self-reported waist circumference (WC > 40 inches for men and WC > 35 inches for women)

Methods: Covariates

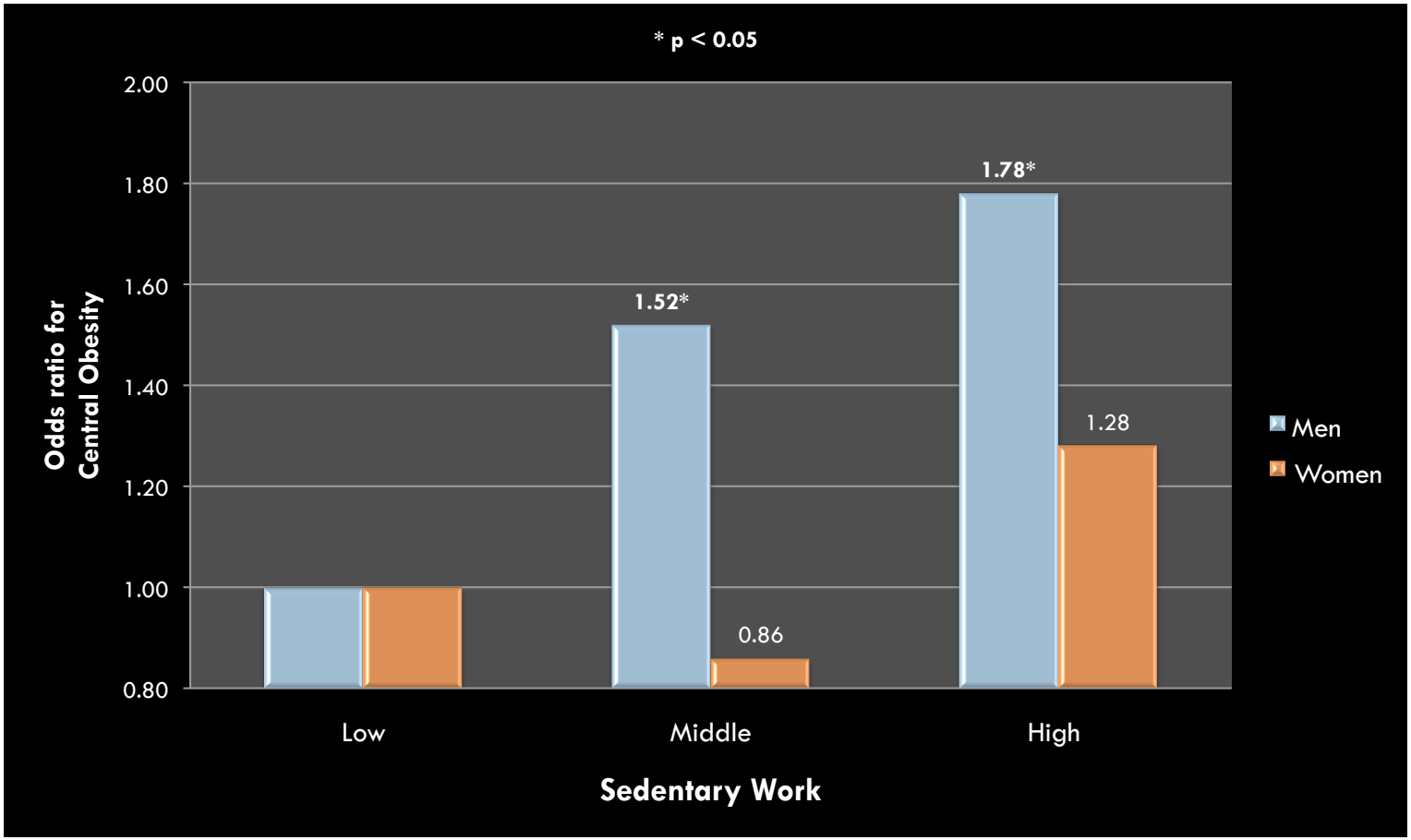
- **Socio-demographic** (i.e., age, household income, education)
- **Psychosocial working conditions** (i.e., job control, quantitative job demands, social support at work, working hrs per week)
- **Health status** (i.e., chronic diseases, major depression)
- **Health behaviors** (i.e., **leisure-time physical activity = LTPA, stress-related overeating,** smoking, alcohol).

Results: Sedentary work and general obesity – multivariate analysis*



*Controlled for socio-demographic variables, psychosocial working conditions, health status, and health behaviors

Results: Sedentary work and central obesity – multivariate analysis*



*Controlled for socio-demographic variables, psychosocial working conditions, health status, and health behaviors

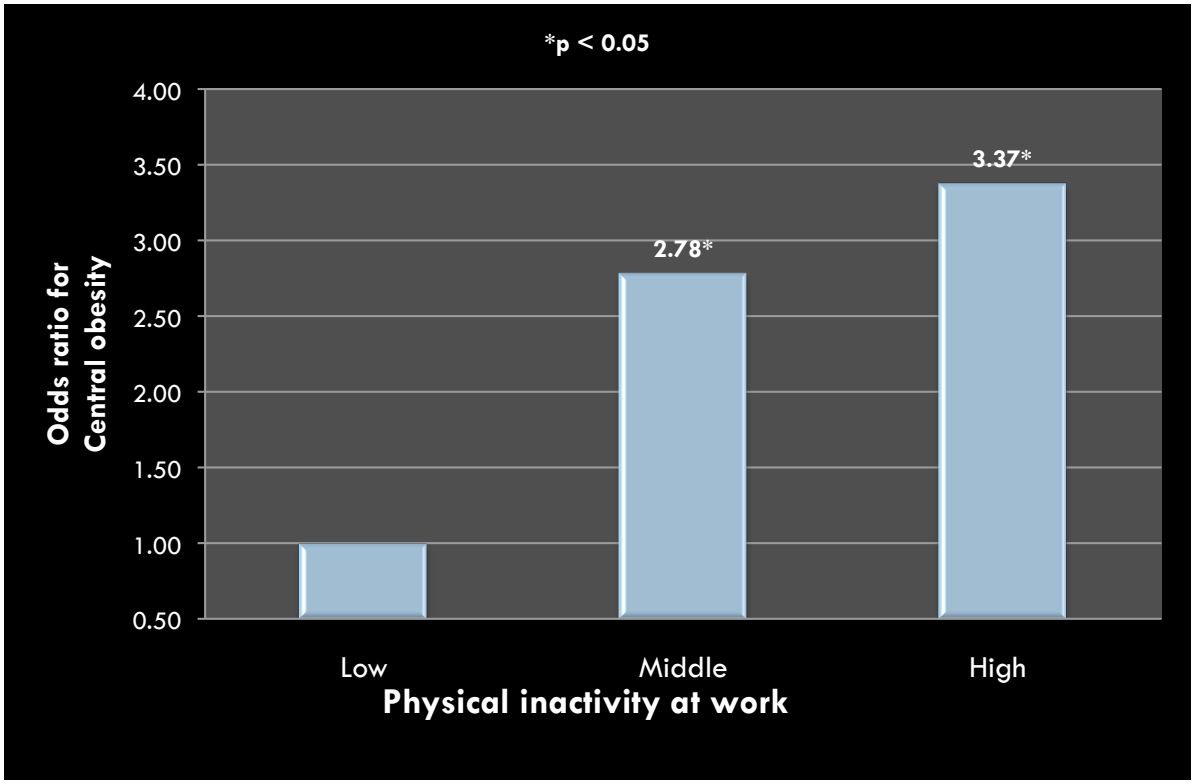
Results: Summary – Multivariate Analysis*

Variable	Men		Women	
	General obesity (BMI)	Central obesity (WC)	General obesity (BMI)	Central obesity (WC)
Sedentary Work (S)	+	+	+/-	+/-
Low Physical Job demand (P)	-	+	-	-
Low level Physical Inactivity at work (S+P)	+	+	-	-

+ significant ($p < 0.05$); +/- borderline ($p < 0.10$); and - non-significant ($p > 0.10$)

***Controlled for socio-demographic variables, psychosocial working conditions, health status, and health behaviors**

Results: Physical Inactivity at Work (S+P) and Central Obesity in male workers (40+ hrs per week) – multivariate analysis*



Odds ratios for central obesity: Non-active leisure-time physical activity: 1.67 and stress-induced overeating: 3.29

*Controlled for socio-demographic variables, psychosocial working conditions, health status, and health behaviors

Conclusions:

- Decreased physical activity at work (sedentary work, low physical job demand, or their combination) appears to be a major risk factor for general and central obesity in middle-aged male US workers, particularly when they worked longer than 40 hrs per week.

- In female US workers, only sedentary work appears to marginally increase the risks for general and central obesity.

- Increasing opportunities for physical activity at work may contribute to obesity prevention in US workers

EMPIRICAL STUDY 2 USING THE MIDUS II CROSS-SECTIONAL DATASET

Work and Leisure-Time Physical Activity

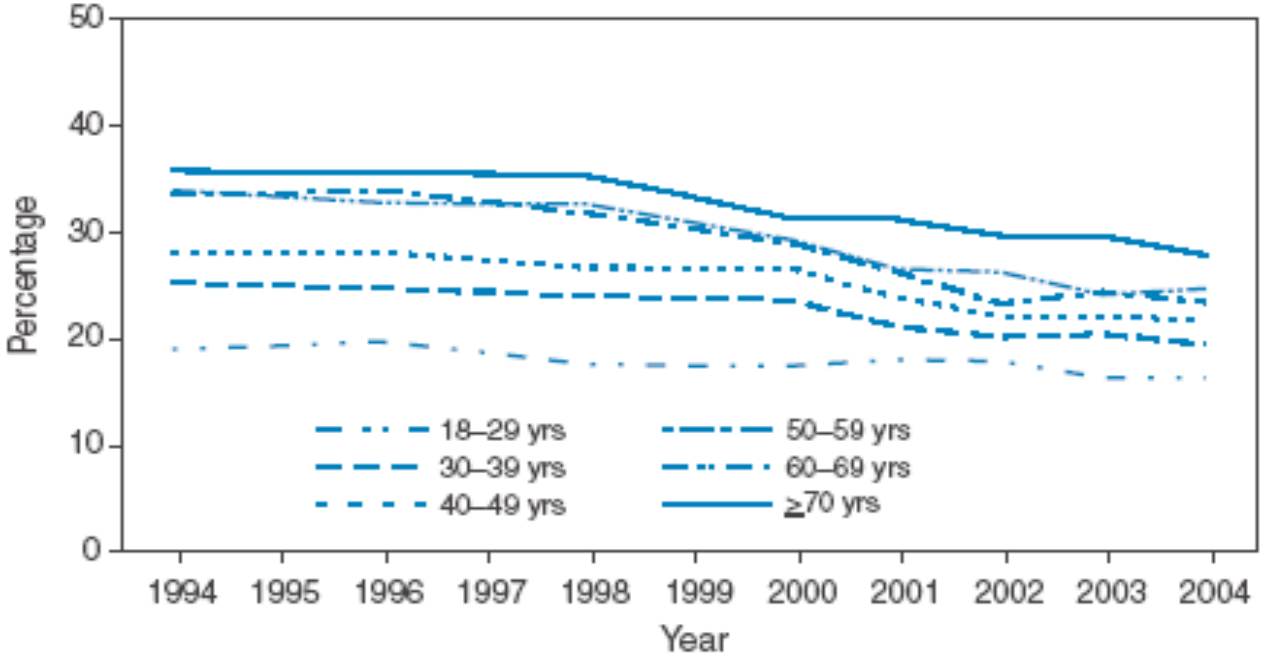
International Journal of Occupational Medicine and Environmental Health 2010;23(3):239–253
DOI 10.2478/v10001-010-0029-0

PSYCHOSOCIAL WORKING CONDITIONS AND ACTIVE LEISURE-TIME PHYSICAL ACTIVITY IN MIDDLE-AGED US WORKERS

BONGKYOO CHOI[1], PETER L. SCHNALL[1], HAIOU YANG[1], MARNIE DOBSON[1], PAUL LANDSBERGIS[2], LESLIE ISRAEL[1], ROBERT KARASEK[3,4], and DEAN BAKER[1]

Trends of leisure-time physical inactivity in US males

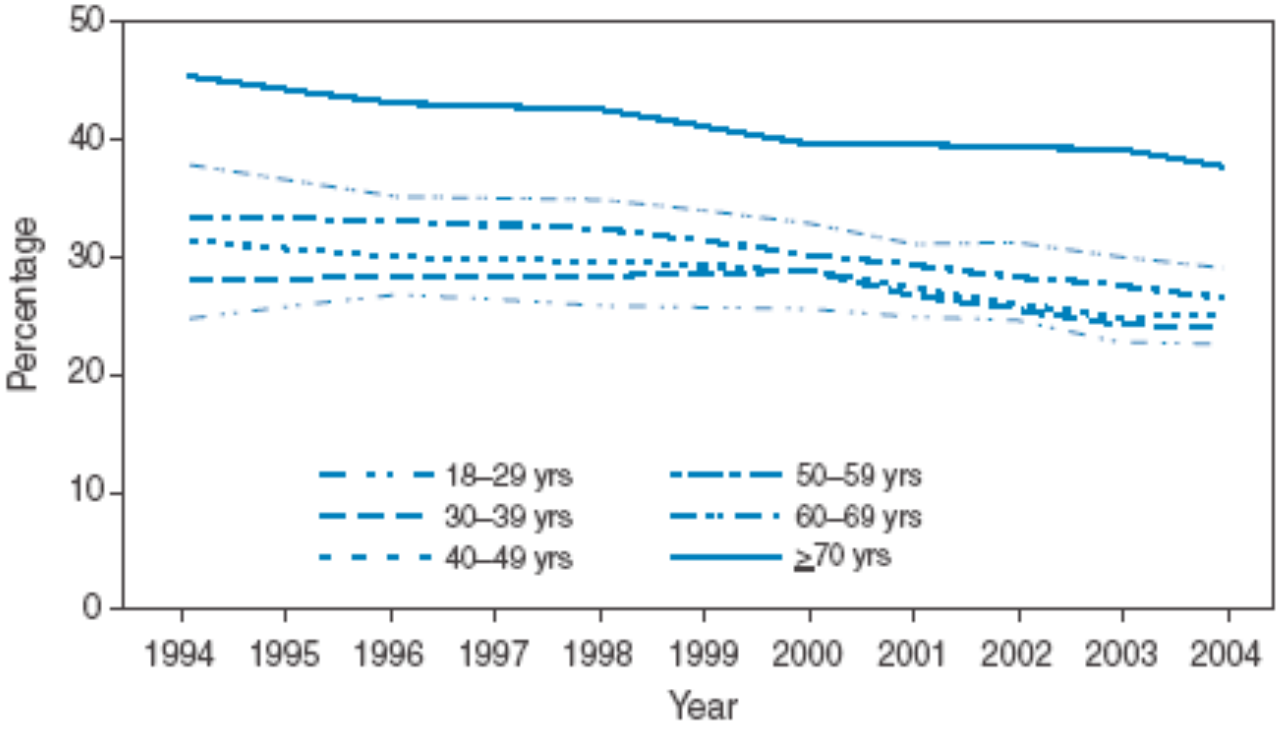
FIGURE 1. Prevalence of leisure-time physical inactivity among men, by age group and survey year — Behavioral Risk Factor Surveillance System, United States,* 1994–2004



* The survey question regarding leisure-time physical activity was not asked in Rhode Island in 1994.

Trends of leisure-time physical inactivity in US females

FIGURE 2. Prevalence of leisure-time physical inactivity among women, by age group and survey year — Behavioral Risk Factor Surveillance System, United States,* 1994–2004



*The survey question regarding leisure-time physical activity was not asked in Rhode Island in 1994.

Spillover vs. compensation: relationship between work and nonwork (Staines, 1980)

- **Spillover hypothesis:** Workers' experiences on the job carry over into the nonwork area and possibly vice versa (similarity).
  - Meissner (1971) – "the long arm of the job" at a Canadian wood product factory
  - Karasek's Demand-Control Model: active-passive axis

- **Compensation hypothesis:** A negative relationship between work and non-work.
  - High physical effort at work – Low physical activity during the leisure-time

Hypothesis

- **Are psychosocial working conditions associated with active leisure-time physical activity (LTPA) in the US workforce?**

Methods: Study Design/population

- **Cross-sectional** and **secondary data analysis** study
- 2,019 **workers** (1,001 male/1,018 female) from the **Midlife Development in the United States II** (MIDUS II: 2004-2006) dataset
  - From 1995 to 1996, the MacArthur Midlife Research Network carried out a national survey (MIDUS I study)
    - 7,000 Americans to investigate the role of behavioral, psychological, and social factors in understanding age-related differences in physical and mental health
    - Demographics comparable to the US population
  - The Institute on Aging at the University of Wisconsin, Madison performed a longitudinal follow-up interview/survey (2004-2006)

Methods: main exposures psychosocial job characteristics

- **Job control*** (skill discretion + decision authority) – 5 items, e.g.,
  - How often do you learn new things at work?
  - How often do you have a choice in deciding how you do your tasks at work?
- Quantitative **job demands*** - 3 items, e.g.,
  - How often do you have to work very intensively -- that is, you are very busy trying to get things done?
  - (How often) you have enough time to get everything done. (reversed for scoring)
- **Combination of job control and job demands:** eg, high job strain

*Items are similar to JCQ items

Methods: outcome
active leisure-time physical activity (LTPA)

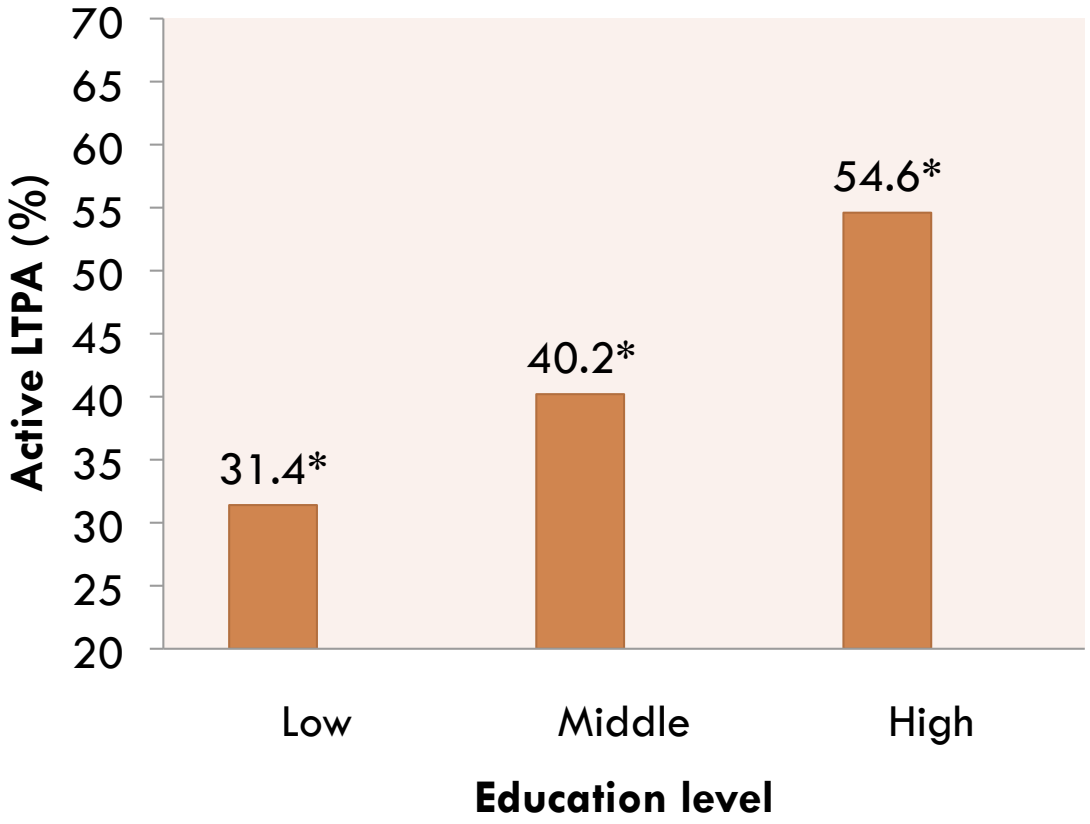
- Defined as "**vigorous or moderate** physical activity long enough to work up a sweat, several times a week or more during the summer or the winter"

- Consistent with the contemporary minimum recommendation of physical activity for US adults: at least 5 days of week for moderate physical activity and at least 3 days per week for vigorous physical activity

Methods: covariates

- **Socio-demographic** (eg, age, sex, household income, education)
- **Other psychosocial working conditions** (eg, social relationships at work, work hours per week, sedentary work, physical job demands)
- **Health status** (eg, chronic disease, major depression, obesity)
- **Health behaviors** (eg, smoking, alcohol, stress-related overeating).

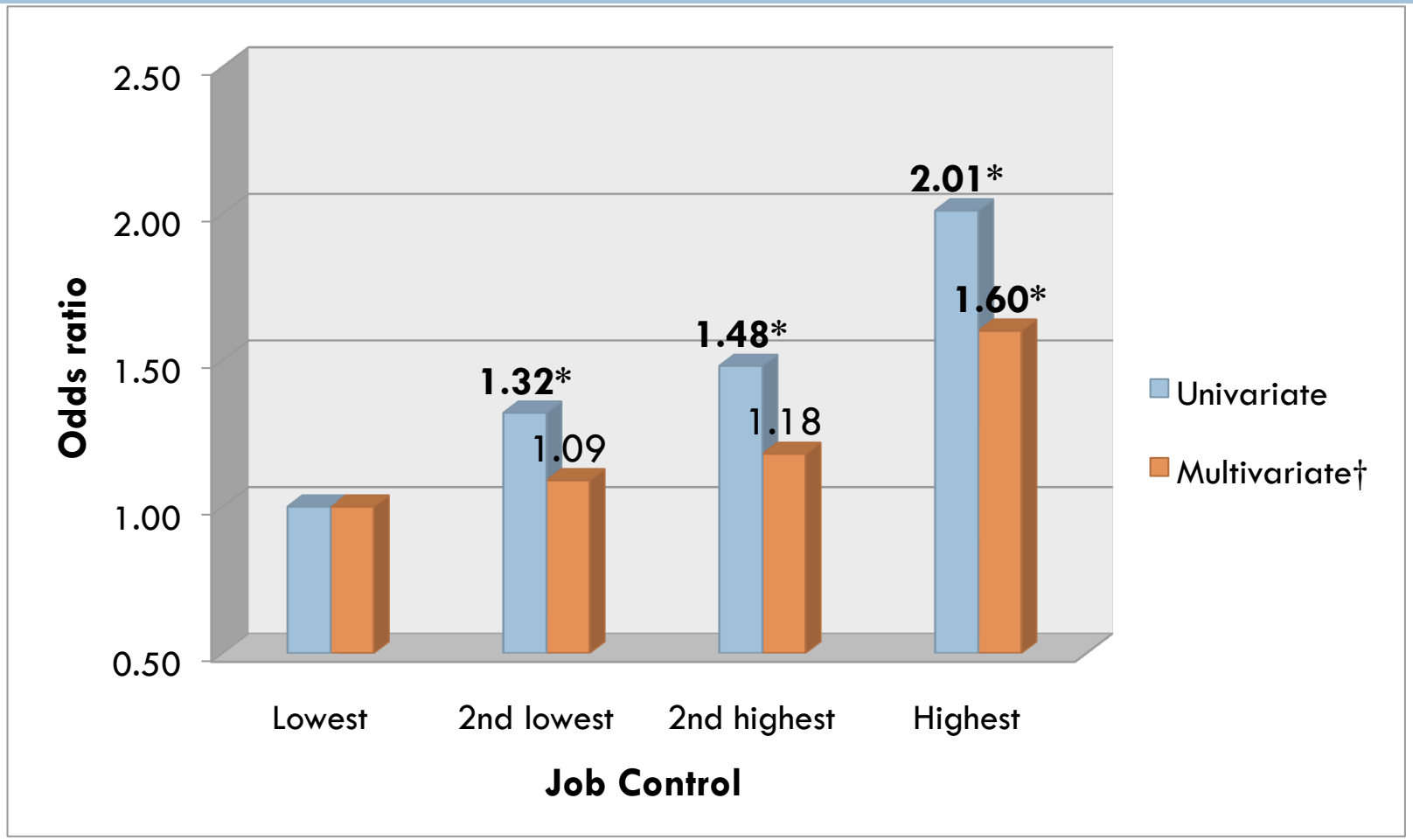
Results: Distribution of active LTPA by education
(*p < 0.001)



High = university/graduate school graduate;
Middle = some college education, but unfinished;
Low = high school graduate and lower education

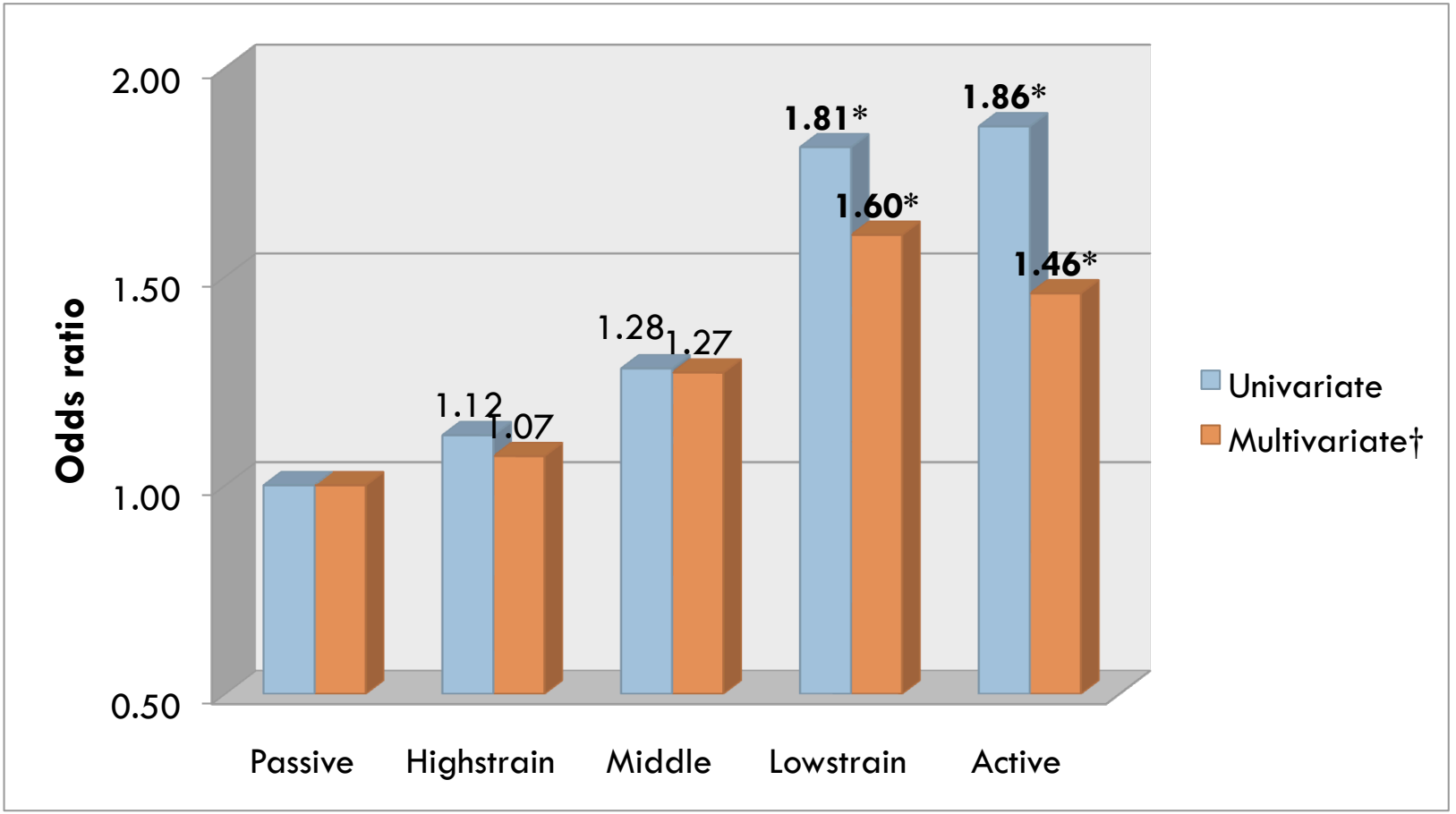
Odds ratios of job control for active LTPA

* p < 0.05



†Socio-demographic, psychosocial working conditions, health status, and health behaviors were controlled for.

Odds ratios of Demand-Control quadrants for active LTPA * p < 0.01 (the reference group: low strain)



†Socio-demographic, psychosocial working conditions, health status, and health behaviors were controlled for.

Education-level stratified multivariate analysis in men for active LTPA

- **High/middle education group** (n=761): very similar to the results of the non-education stratified analysis.

- **Low education group** (n=240): high job control and active job were not associated with active LTPA. Longer work hours (> 40 hours/week) and the low and middle levels of annual household income were associated with less active LTPA: OR (95% CI) = 0.46 (0.23–0.92); 0.20 (0.08–0.54); and 0.38 (0.16–0.89), respectively.

Education-level stratified multivariate analysis in women for active LTPA

- **High/middle education** (n=746): very similar to the results of the non-education stratified analysis. High physical effort at work was marginally (p = 0.06) associated with active LTPA: OR (95% CI) = 1.57 (0.98–2.50).

- **Low education** (n=272): very similar to the results of the non-education stratified analysis.

Conclusions

- **LTPA may be strongly influenced by the way in which work is organized.**

- **Low job control and passive job, risk factors for non-active LPTA: spill-over hypothesis (e.g., learned passiveness)**

- **Low-status male workers: TIME AND MONEY** as material resources for off-the-job participation

EMPIRICAL STUDY 3 USING THE MIDUS II CROSS-SECTIONAL DATASET

Work, Stress-related Overeating, and Central Obesity

TABLE 2 Mean daily energy intake (in kcal) for the U.S. population, 1971 to 2000[a]

Age/sex (years)	NHANES I 1971–74	NHANES II 1976–80	NHANES III 1988–94	NHANES 1999–2000
Both sexes				
1–2	1350	1287	1289	1511
3–5	1676	1569	1591	1622
6–11	2045	1960	1892	2025
Males				
12–15	2625	2490	2578	2460
16–19	3010	3048	3097	2932
20–39	2784	2753	2965	2828
40–59	2303	2315	2568	2590
60–74	1918	1906	2105	2123
20–74[b]	2450	2439	2666	2618
Females				
12–15	1910	1821	1838	1990
16–19	1735	1687	1958	1996
20–39	1652	1643	1958	2028
40–59	1510	1473	1736	1828
60–74	1325	1322	1522	1596
20–74[b]	1542	1522	1798	1877

[a]One-day intakes.

[b]Age-adjusted to 2000 population.

Hypotheses

- **Whether stress-induced overeating is associated with central obesity**

- **Whether psychosocial working conditions are associated with stress-related overeating in the US workforce.**

Methods: Study Design/population

- **Cross-sectional** and **secondary data analysis** study
- 2,019 **workers** (1,001 male/1,018 female) from the **Midlife Development in the United States II** (MIDUS II: 2004-2006) dataset
  - From 1995 to 1996, the MacArthur Midlife Research Network carried out a national survey (MIDUS I study)
    - 7,000 Americans to investigate the role of behavioral, psychological, and social factors in understanding age-related differences in physical and mental health
    - Demographics comparable to the US population
  - The Institute on Aging at the University of Wisconsin, Madison performed a longitudinal follow-up interview/survey (2004-2006)

Methods: main exposures
Psychosocial working conditions

- **Job control*** (skill discretion + decision authority)
- Quantitative **job demands***
- Combination of job control and job demands: eg, high job strain
- **Social relations at work***
- **Hours of work per week**

* Items are similar to JCQ items

Methods: outcomes

stress-induced overeating and central obesity

- **Stress-induced overeating**: those who endorsed either of the following two questionnaire items about "how you respond when you are confronted with difficult or stressful events in your life":
  - "I eat more than I usually do."
  - "I eat more of my favorite foods to make myself feel better."

  - Coping (Folkman & Lazarus, 1985): coping as a process (not coping styles or traits)or

- **Central obesity**: Self-reported waist circumference (> 40 inches for men and > 35 inches for women)

Methods: covariates

- **Socio-demographic** (eg, age, household income, education)
- **Psychosocial working conditions** (eg, sedentary work, physical job demands)
- **Health status** (eg, chronic diseases, major depression, obesity)
- **Health behaviors** (eg, smoking, alcohol, leisure-time physical activity).

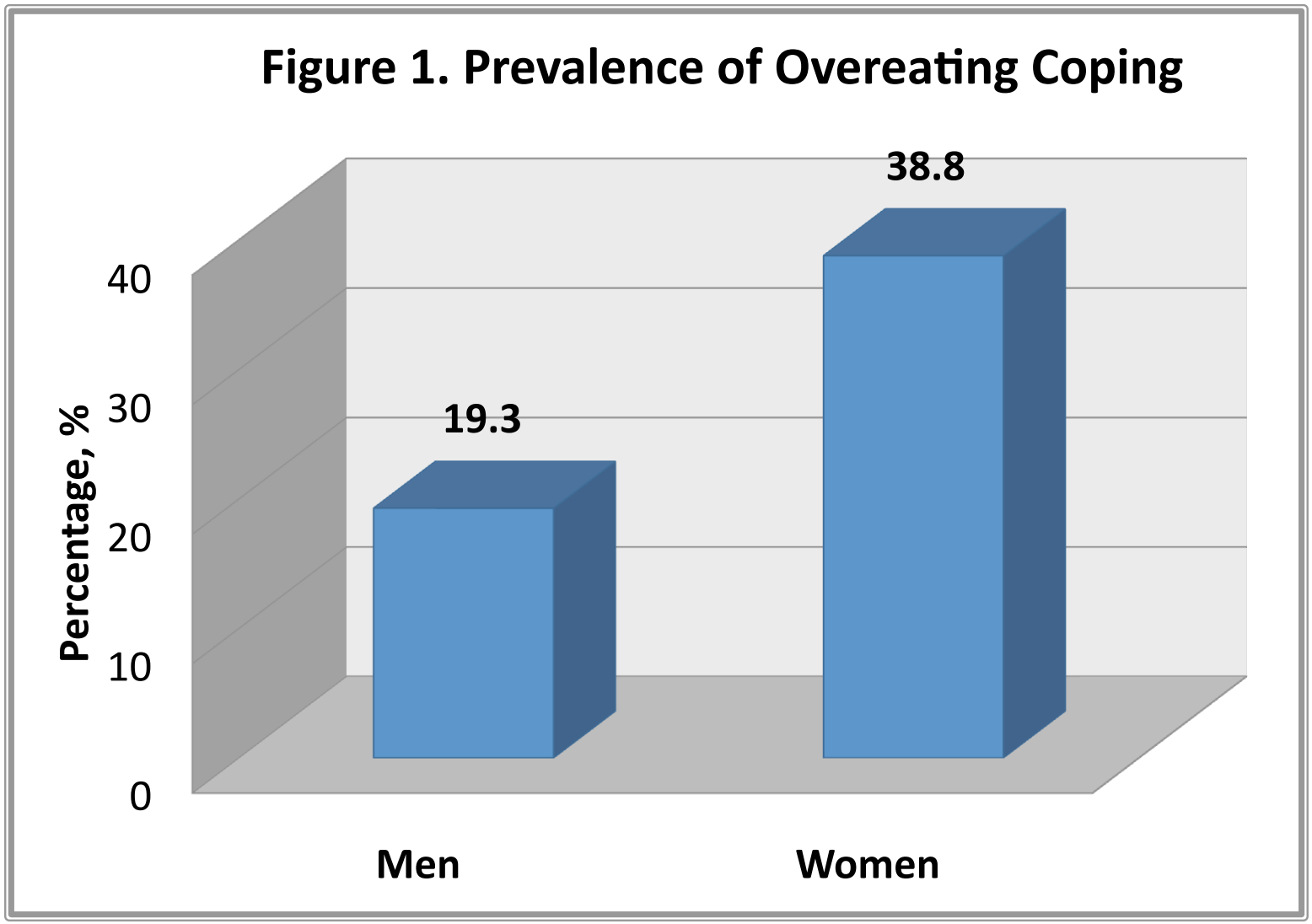


Figure 1. Prevalence of Overeating Coping
Percentage, %
40
30
20
10
0
19.3
38.8
Men
Women

Figure 2. Prevalence of Central Obesity

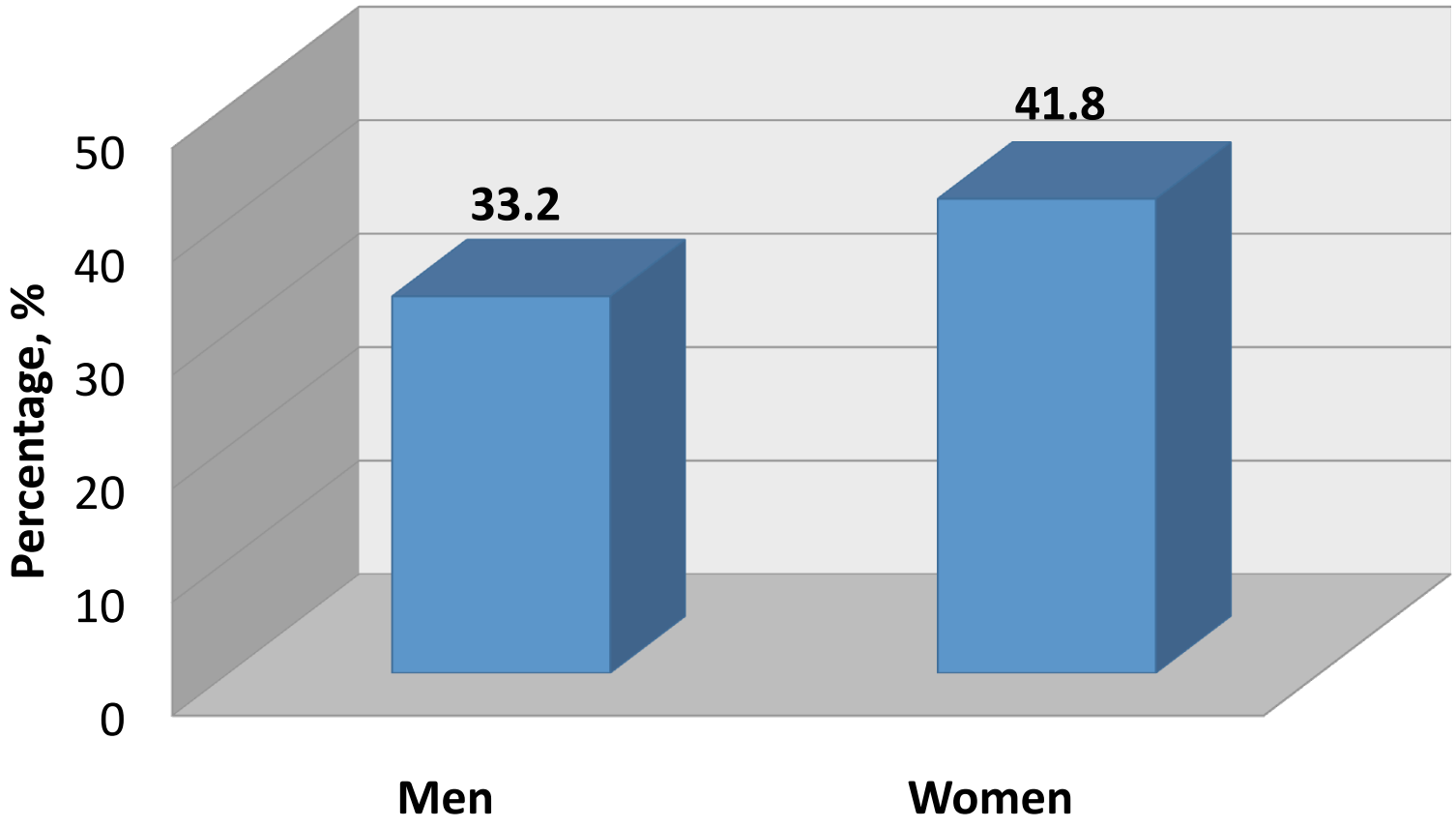
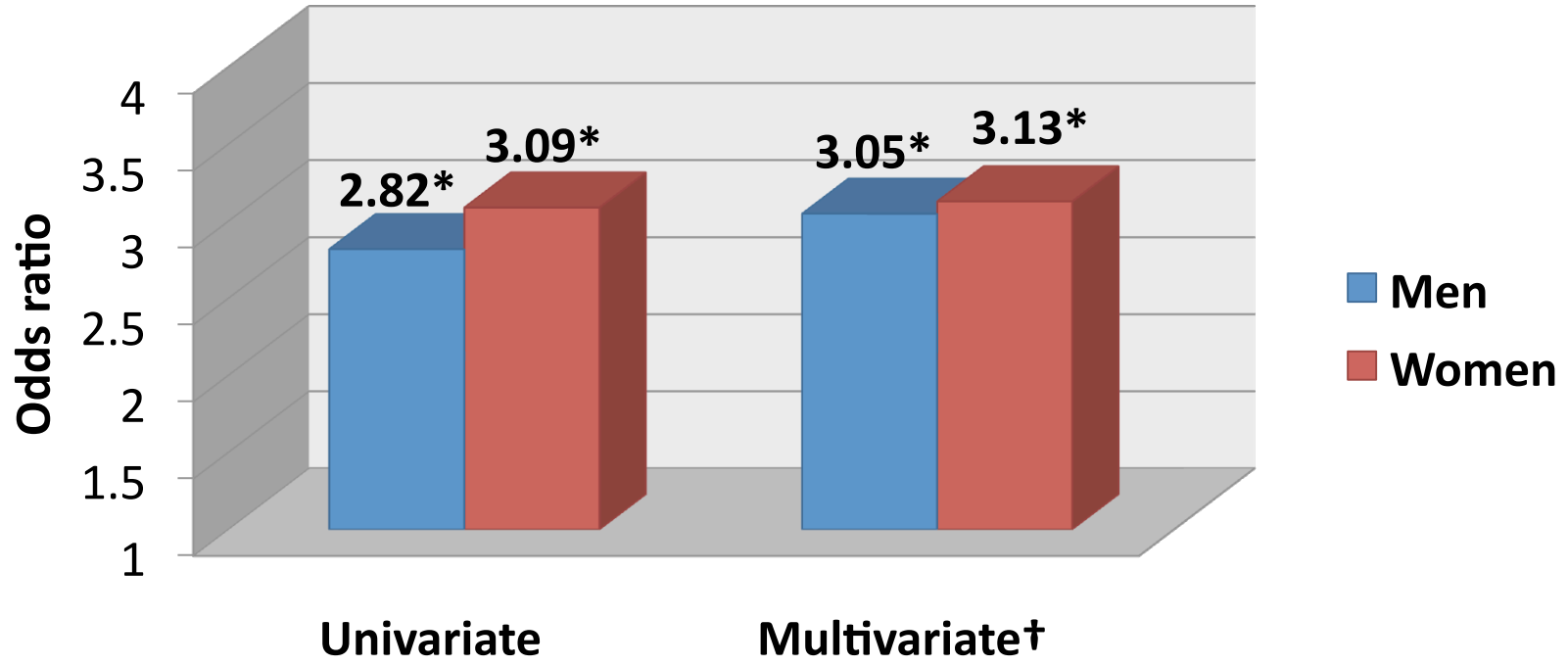
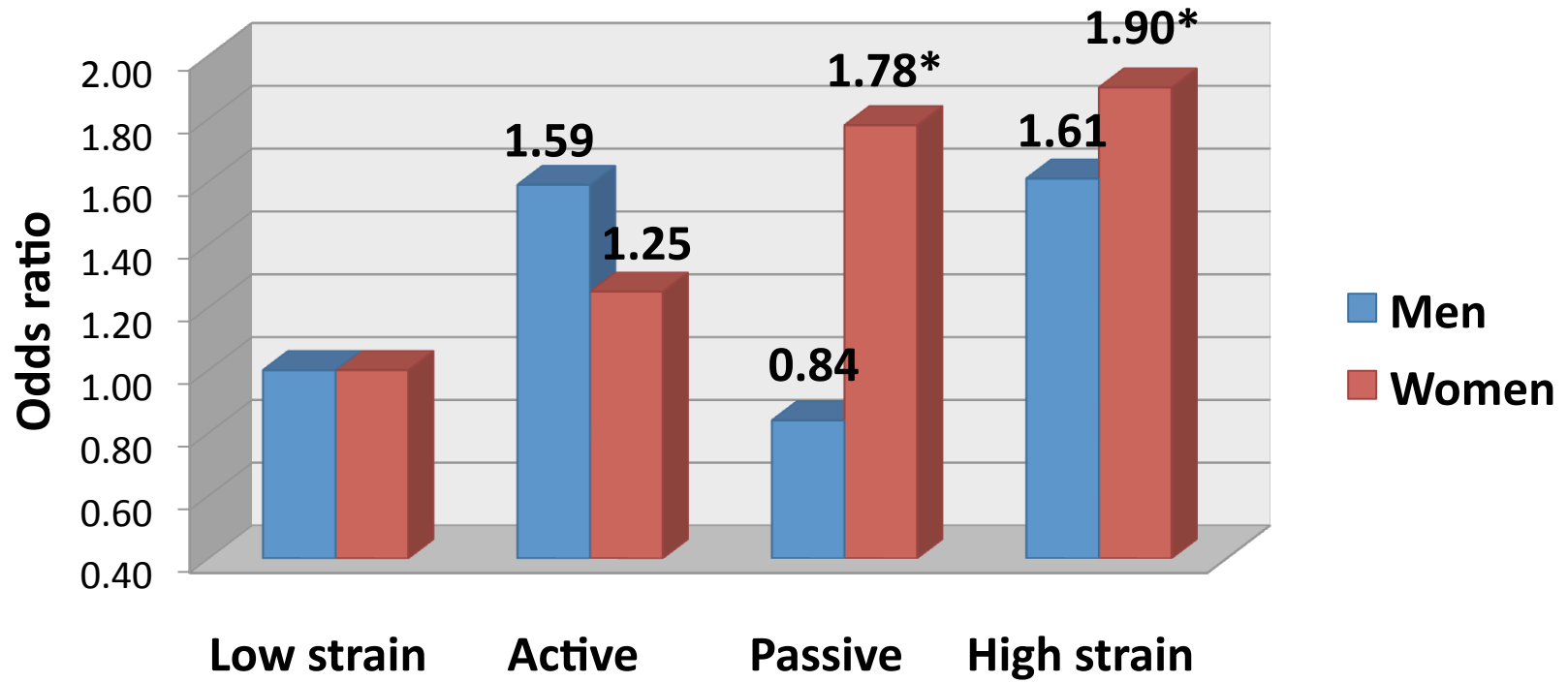


Figure 3. Odds ratios of overeating coping for central obesity (* p < 0.001)



†Socio-demographic, psychosocial working conditions, health status, and health behaviors were controlled for

Figure 4. Demand-Control quadrants and stress-related overeating† (* p < 0.01)



†Socio-demographic, psychosocial working conditions, health status, and health behaviors were controlled for

Odd ratios (95% confidence intervals) of psychosocial working conditions in multivariate logistic regression models

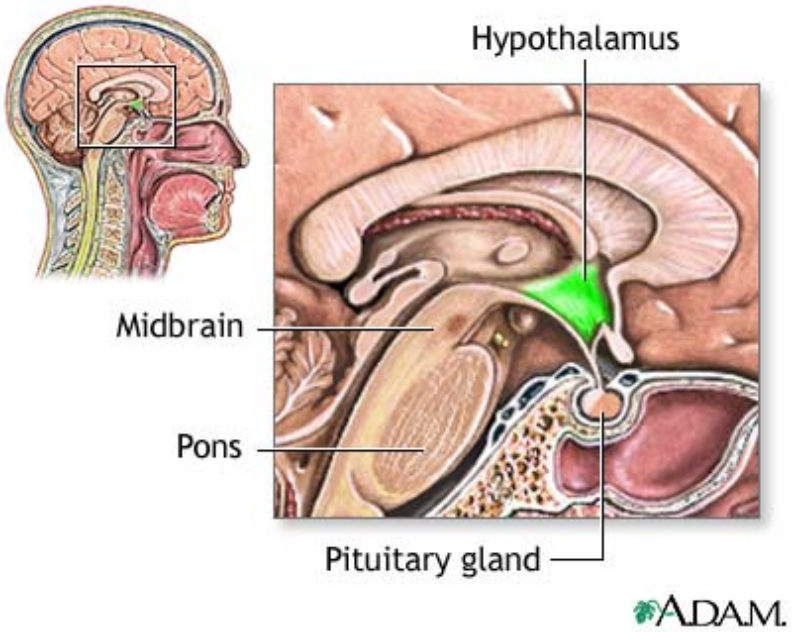
- **Men**
  - High job demands: 1.66 (1.16, 2.37)
  - Low supervisor support: 1.47 (0.99, 2.18), p = 0.06
- **Women**
  - Low job control: 1.63 (1.23-2.15)
  - Low coworker support: 1.35 (1.01-1.80)

Conclusions

- A substantial portion of the US workforce is relying on overeating as a way of stress coping.
- Stress-overeating, highly correlated with central obesity, seems to be conditioned by some psychosocial working conditions such as low job control, high job demands, passive and high strain jobs, and low coworker support.
- This study suggests that worksite health promotion programs (e.g., stress or weight management programs) need to be implemented and to include efforts to improve adverse psychosocial working conditions which promote stress-related overeating behavior.

EMPIRICAL STUDY 4 USING THE LONGITUDINAL MIDUS DATA

Work Stress and Central Obesity



Work Stress –
Dysfunction of Hypothalamus?

The physiological roles of hypothalamus

- Linked to limbic system, midbrain, lower CNS, & pituitary
- Involved in hunger, satiety, and feeding behavior
- Autonomic nerve systems
- Endocrine systems (- pituitary-adrenals): cortisol and GH/sex hormones
- Interactions with leptin (from Greek word, "*thin*"), synthesized and secreted from adipose tissue; a long-term fat metabolism
- Control of body temperature
- Sleep (circadian rhythm) – *suprachiasmatic nucleus*

Job control and job demands as risk factors for central obesity in US workers: a 9-year follow-up study

BongKyoo Choi[1], Peter Schnall[1], Marnie Dobson[1], Haiou Yang[1], Paul Landsbergis[2], Dean Baker[1]

Awarded as BEST ABSTRACT at the ICOH-WOPS 2010 Amsterdam conference, June 14-17, 2010

Hypothesis

- **To investigate whether job control and job demands are associated with central obesity in US workers.**
  - Few studies have examined longitudinally the relationship between psychosocial work characteristics and central obesity

- Data from the National Survey of Midlife Development in the United States [**MIDUS I, 1995-1996 (T1) and II, 2004-2006 (T2)**]: an approximately representative sample of the US population: under-representing those who were black, young, or had less education (Ryff et al., 2007).
- **Inclusion criteria**:
  - Age range: 25-59 yrs old (T1)
  - Completed both the interview and questionnaire at baseline and follow-up (T2)
  - **Working at T1 and T2**
  - Valid exposure and outcome information at T1 and T2
- **Exclusion criteria**:
  - **Obese at baseline (T1)**
  - Cancer ever (T1) or cancer treatment (T2)
  - Weight loss (> 10 pounds) due to illness over past 10 yrs at T1 and T2

Measures of Job Control , Job Demands, and Job Strain at both T1 and T2

- **Job control*: (skill discretion + decision authority)** – 5 items
- **Job demands*** - 3 items

- **Creating 9 groups for cumulative exposure profiles of job control and job demands: (e.g., job control) -** Continuous job control scores both at T1 and at T2 were first divided into three groups (low, middle, and high) and they were used for creating 9 (=3x3) exposure combinations of job control between T1 and T2.
- **LowLow (low control at T1 and low control at T2); LowHigh; HighLow; HighHigh; and Middle** (LowMiddle, MiddleLow, MiddleMiddle, MiddleHigh, and HighMiddle – these 5 middle groups were combined into one group for a simpler analysis).
- **Job Strain**: A combination of job control and job demands (Karasek, 1979): high strain (low control and high demand) vs. low strain (the other three combinations).

Measure of central obesity at T2

- Central Obesity: Self-reported waist circumferences **(> 40 inches for men and > 35 inches for women), based on the WHO criteria** (2000).

Covariates

- **Socio-demographic:** data source (four subsamples – due to the complex sampling design of the MIDUS study), age, marital status, race, and education
- **Other working conditions:** physical activity at work (low, middle, and high).
- **Health behaviors:** smoking, alcohol consumption, stress-overeating coping, and leisure-time moderate/vigorous physical activity.

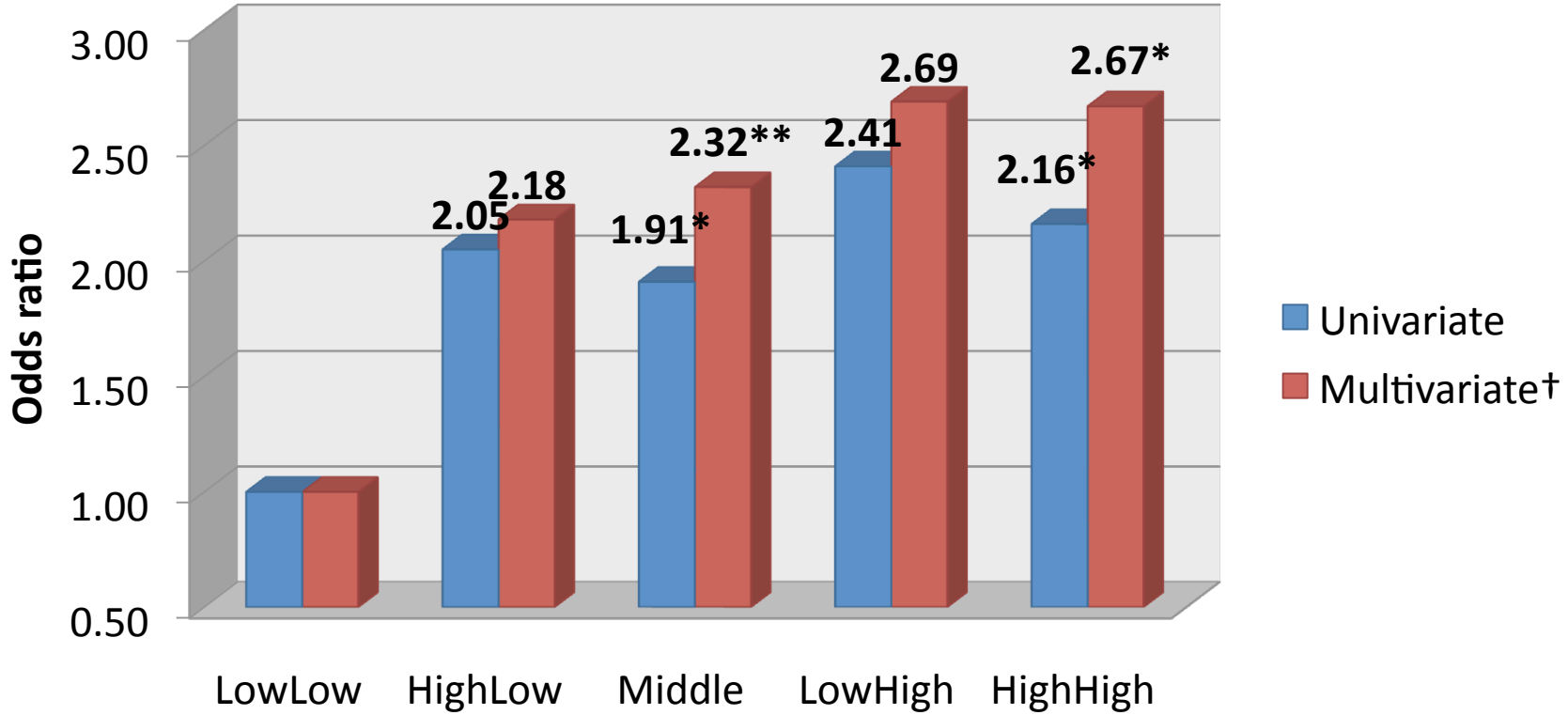
Socio-demographic characteristics of the study subjects

		Men (n = 648)	Women (n = 535)
Age (at T1), years		M = 41.0 (SD = 8.5)	M = 40.5 (SD = 8.5)
Race (at T1)	Whites	96.6%	95.5%
	Non-whites	3.4%	4.5%
Education (at T1)	High school or less	23.1%	25.8%
	Some college	26.4%	32.0%
	University or more	50.5%	42.2%

Changes in central obesity and waist circumference over 9 years

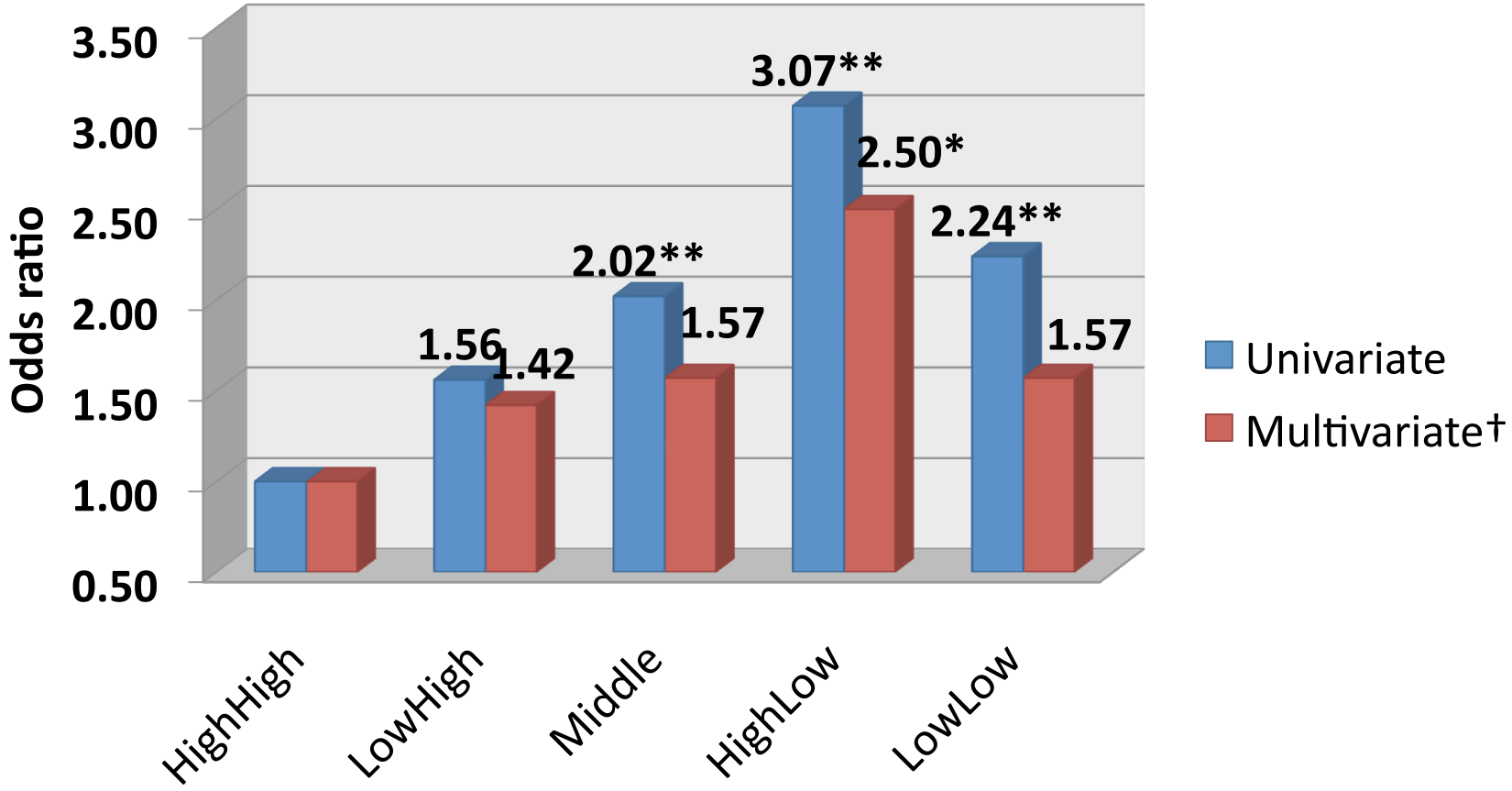
	Men (n = 648)	Women (n = 535)
Central obesity (at T2)	19.3 %	25.4%
Waist Circumference Difference (T2 – T1)	Mean = + 4.9 cm SD = 6.5	Mean = + 8.0 cm SD = 9.3

Figure 1. Odds ratios of job demands for central obesity in men: * p < 0.05 and ** p < 0.01



†Socio-demographic variables, physical activity at work, and health behaviors were controlled for.

Figure 2. Odds ratios of job control for central obesity in <u>women</u>: * p < 0.10, ** p < 0.05



†Socio-demographic variables, physical activity at work, and health behaviors were controlled for.

A summary of multivariate* analyses

	Men	Women
Job control	-	+
Job demands	+	-
Job strain	-	+

+ significant ($p < 0.05$); + no longer significant after controlling for health behaviors (possible mediation by health behaviors such as overeating coping and leisure-time physical activity); and - non-significant

*Controlled for socio-demographic variables, physical activity at work, and health behaviors

Conclusions

- Adverse psychosocial working conditions appear to play a significant role in obesity in men and women though by different mechanisms.
- Job control and job strain were risk factors for central obesity in US female workers, but it seems to affect central obesity indirectly via health behaviors (stress-related overeating and non-active leisure-time physical activity).
- Job demands was a risk factor for central obesity in US male workers, independent of the health behaviors.
- Improving psychosocial working conditions could contribute to preventing central obesity in US workers

CDC/NIOSH PROGRAMS FOR PREVENTING OBESITY AT WORKPLACES

Healthier Worksite Initiative (HWI):

http://www.cdc.gov/nccdphp/dnpao/hwi/aboutus/index.htm

- HWI first came about in October 2002 when CDC Director Julie Gerberding asked the National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) to develop a workforce health promotion (WHP) initiative focused on the four pillars of the President's HealthierUS Executive Order — physical activity, nutritious eating, preventive health screenings, and making healthy choices.

- The Web site was developed as a comprehensive one-stop shop for planners of Workforce Health Promotion (WHP) programs.

LEAN *Works!* – A Workplace Obesity Prevention Program

http://www.cdc.gov/leanworks/

- **"CDC's LEAN *Works!* Leading Employees to Activity and Nutrition" is a FREE web-based resource** that offers interactive tools and evidence-based resources to design effective worksite obesity prevention and control programs, including an obesity cost calculator to estimate how much obesity is costing your company and how much savings your company could reap with different workplace interventions.

LEAN *Works!*
LEADING EMPLOYEES TO ACTIVITY AND NUTRITION

NIOSH Total Worker Health

http://www.cdc.gov/niosh/TWH/

- Total Worker Health is intended to identify and support **comprehensive approaches to reduce workplace hazards and promote worker health and well being.** The premise of Total Worker Health is that comprehensive practices and policies that take into account the work environment--both physical and organizational-- while also addressing the personal health risks of individuals, are more effective in preventing disease and promoting health and safety than each approach taken separately.
- **Centers of Excellence:** NIOSH has funded four Centers for Excellence to support and expand multi-disciplinary research, training, and education in this area

FORWARD study: ht

forward/

- Firefighter Obesity Research: Workplace Assessment to Reduce Disease (FORWARD) is a 2-year project of the UCI-COEH, funded by the CDC/NIOSH (PI: Dr. BongKyoo Choi, Award #: R21 OH009911).

- The study will consider the unique working conditions and health behaviors of firefighters who work on a 24 hour-shift system. This will allow in the end to develop a firefighter-relevant work and health questionnaire along with several recommendations to reduce the obesity risk of firefighters.

SH@W Safety and Health at Work www.e-shaw.org

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Review

Exploring Occupational and Behavioral Risk Factors for Obesity in Firefighters: A Theoretical Framework and Study Design

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