



The Myth of the Great Divide: All Health IS Occupational Health

Mark R. Cullen, MD

**Occupational Medicine Grand Rounds
OHSU CROET Healthy Workplace Conf
June4, 2010**



A (slightly apocryphal) history of
Occupational Medicine in the
US...

Pre 1910:

All services to workers at (large) workplaces was “occupational health”

1910 – 1920:

- Worker's compensation laws
- Birth of occupational medicine as a specialty practice

1930's:

- Lawyers discover occupational medicine after Gauley Bridge disaster.
- Rebirth of occupational medicine

1950's:

- Unions win general health insurance and AMA carves up the patient.
- Re-death of occupational medicine

1970's:

- Lawyers rediscover occupational disease (Asbestos) and occupational medicine returns to academia

1980's – 1990's:

- General health hits (and breaks) the corporate radar screen

Workplace Injury: Systemic Causes

- **Physical Demand**

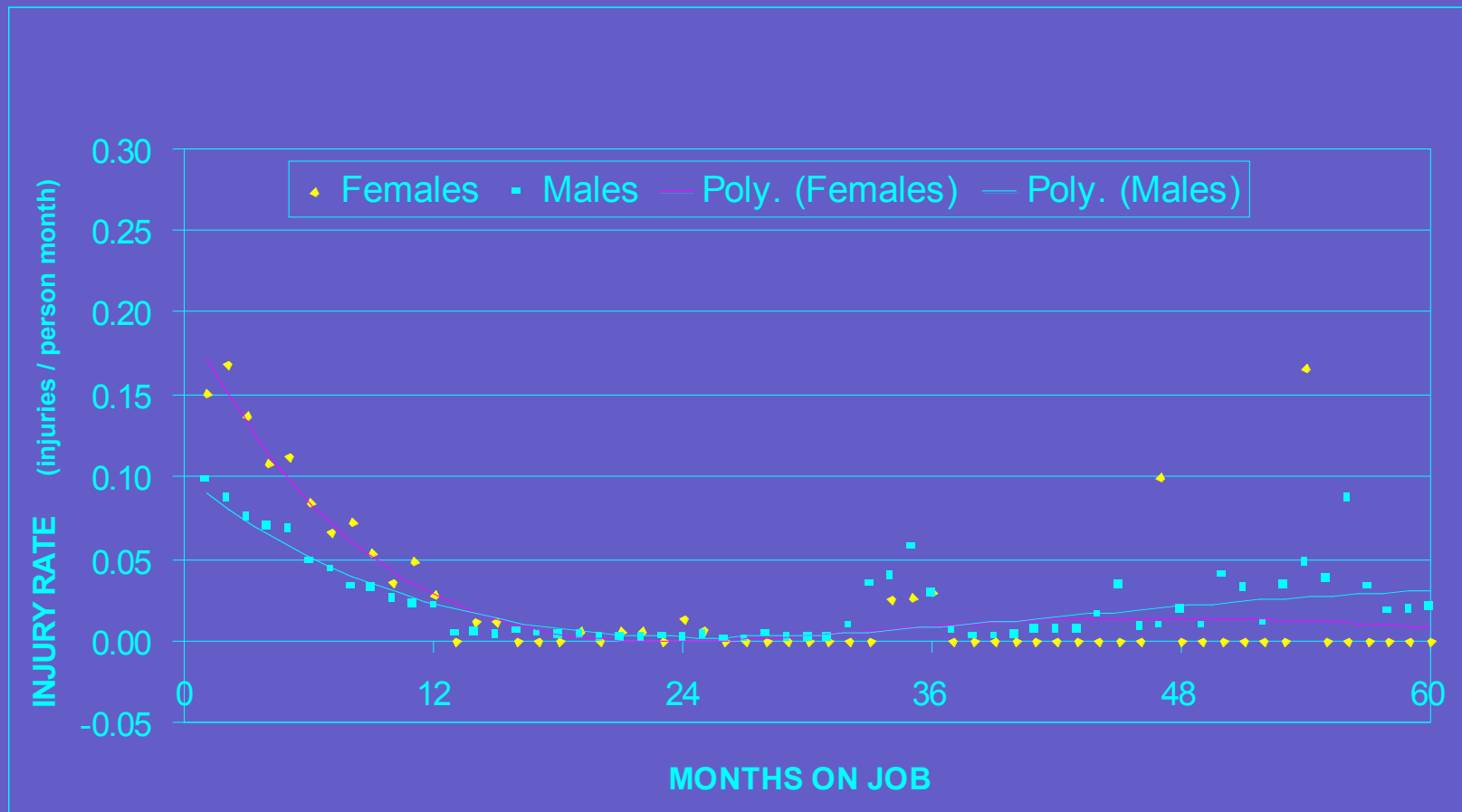
Multivariate logistic regression for OSHA-recordable injuries only among hourly manufacturing workers (N=9,101)

Physical Demand	Multivariate Odds Ratios	95%
Very heavy	4.14	2.13 – 8.06
Heavy	3.69	2.09 – 6.51
Medium	2.23	1.28 – 3.86
Light	1.58	0.91 – 2.76
Sedentary	1.00	

Workplace Injury: Systemic Causes

- Physical Demand
- **Time-on-job (experience)**

Rates of first injury, by sex for six smelters, 1996-2000



Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- **Psycho-social job demand**

Psychological Job Factors: Job Demand Survey

■ Job demand (psychological)

As one has to work without mistakes, more often the probability of recordable injury increases (Odds Ratio 1.04 p=0.0017)

How often is it extremely important to do the work without mistakes?

Often			Sometimes			Seldom			Never		
1	2	3	4	5	6	7	8	9	10	11	12

■ Job control

As one has less control over when work is done, the probability of recordable injury increases (Odds Ratio 1.10 p=0.03)

How often does the job permit complete discretion and independence in determining when the work is done?

Often			Sometimes			Seldom			Never		
1	2	3	4	5	6	7	8	9	10	11	12

Workplace Injury: Systemic Causes

- Physical Demand
- Time – on – job (experience)
- Psycho-social job demand
- **Overtime**

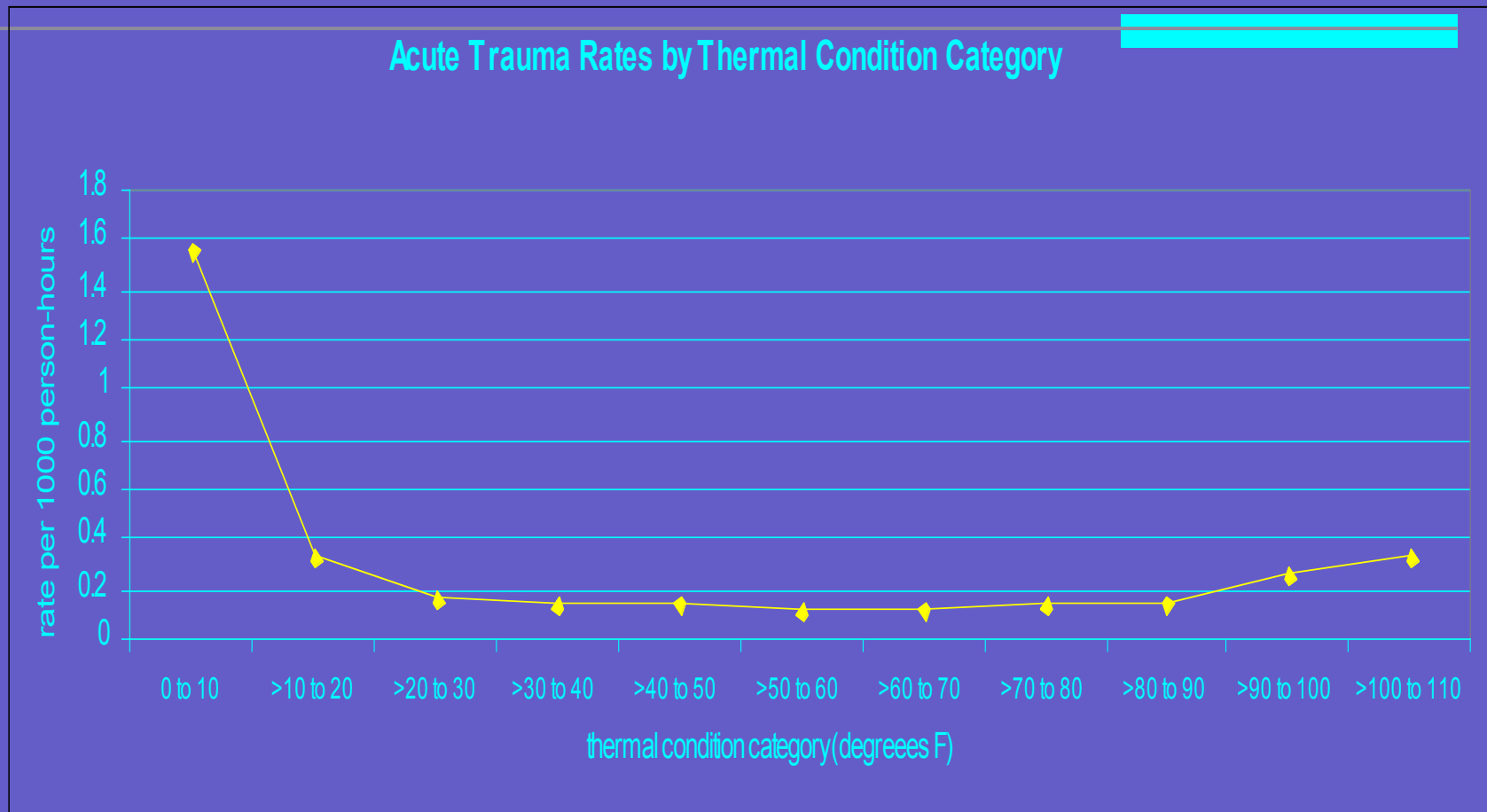
Case-crossover comparison of hours worked in injury vs. control week for all cases using conditional logistic regression modeling

Day -1	0 Hrs	GT 0 to 8	GT 8 to 12	Over 12		p for trend	
Injury	451	1687	464	308			
Control	474	1714	441	281			
Hazard Ratio	.81 (.61 -1.07)	Reference	1.18 (.79 -1.84)	1.13 (.91 -1.42)		0.09	
Day -2	0 Hrs	GT 0 to 16	16-20	20-24	over 24	p for trend	
Injury	371	1761	196	415	167		
Control	396	1802	194	372	146		
Hazard Ratio	.81 (.62 -1.07)	Reference	1.16 (0.81 -1.64)	1.24 (.99 -1.54)	1.43 (.97 -2.10)	0.03	
Day -3	0 Hrs	GT 0 to 24	24-32	Over 32		p for trend	
Injury	120	2054	460	276			
Control	135	2095	438	242			
Hazard Ratio	.83 (.54 -1.27)	Reference	1.17 (.97 -1.40)	1.20 (.88 -1.64)		0.08	
Day -7	0 Hrs	GT 0 to 40	40-48	48-56	56-64	Over 64	p for trend
Injury	15	1097	687	488	290	333	
Control	19	1195	667	478	267	284	
Hazard Ratio	1.00 (.35 -2.85)	Reference	1.26 (1.03 -1.54)	1.19 (.92 -1.52)	1.21 (.84 -1.75)	1.88 (1.16 -3.05)	0.04

Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- Psycho-social job demand
- Overtime
- **Temperature**

Risk Factors for Injury: Temperature



- Step increase in injury rates at colder temperatures
- 2-Fold increase in injury rates at the highest temperatures

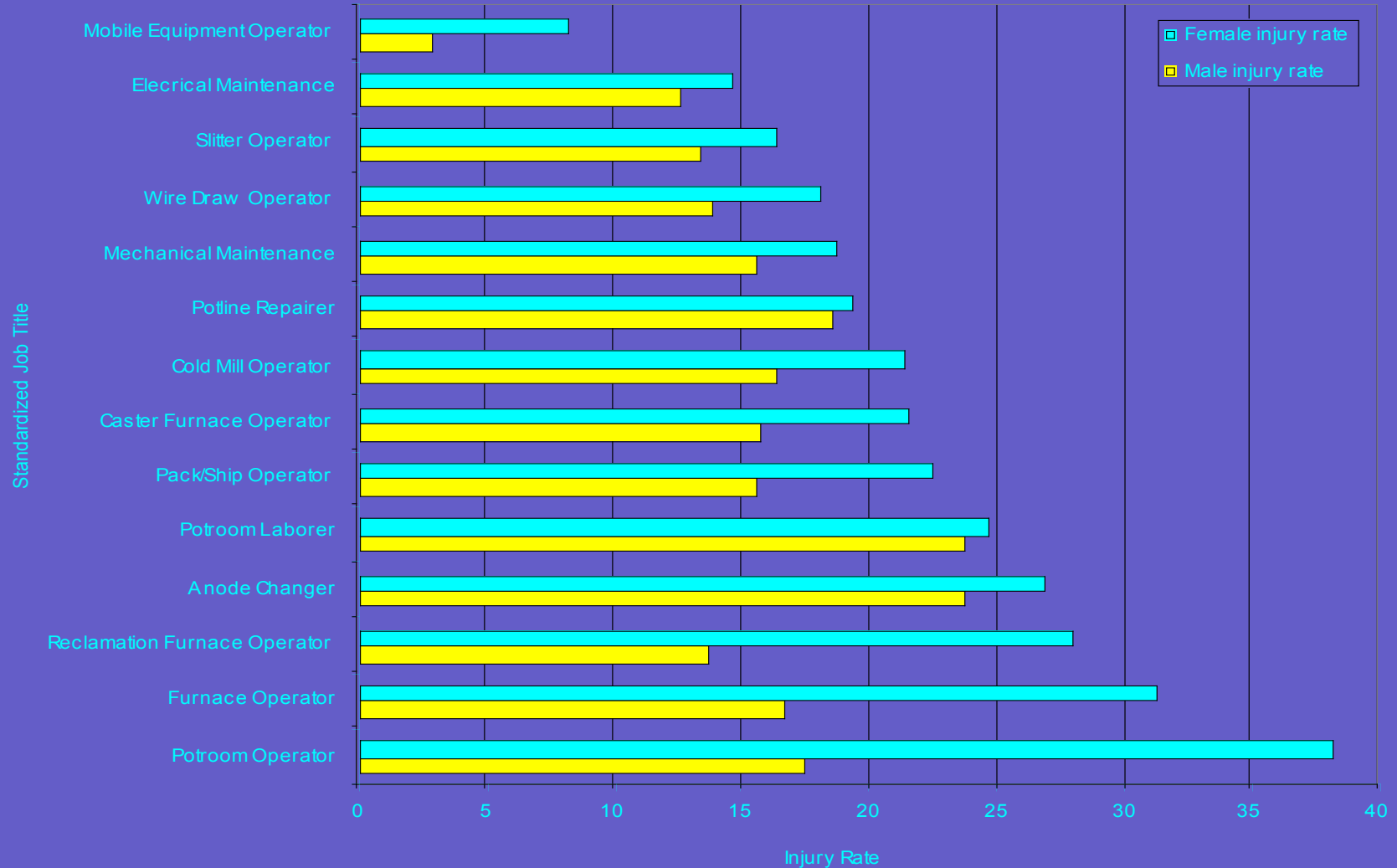
Study conducted by T. Bernard

Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- Psycho-social job demand
- Overtime
- Temperature
- **Gender**

Risk Factors for Injury: Gender

Injury Rates for Males and Females by Standardized Job Title



Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- Psycho-social job demand
- Overtime
- Temperature
- Gender
- **Age**

Injury Severity Rates by Age

Age Group	Person-years	FA	MT	RW	LW
Under 35	5494	9.88	3.50	2.24	0.62
35-49	19350	8.17	3.44	1.59	0.61
50 and over	14976	8.27	2.70	0.89	0.60
Total	39820	8.44	3.17	1.42	0.61

Age in Decades	Person-years	FA	MT	RW	LW
<20	56	12.5	7.14	0	3.57
20-29	2444	11.37	3.27	2.37	0.74
30-39	7732	8.42	3.60	1.88	0.59
40-49	14612	8.12	3.40	1.56	0.60
50-59	13042	8.61	2.84	0.93	0.61
60-69	1912	5.91	1.78	0.68	0.52
70+	22	9.09	0	0	0
Total	39820	8.44	3.17	1.42	0.61

Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- Psycho-social job demand
- Overtime
- Temperature
- Gender
- Age
- **Obesity**

Hazard ratios for average risk of any first injury among 7,690 hourly manufacturing employees by body mass index, 2002-2004*

Hazard Ratios (95% Confidence Intervals)

	Normal (18.5-24.9 kg/m ³)	Overweight (25.0-29.9 kg/m ³)	Obesity I & II (30.0-39.9 kg/m ³)	Obesity III (>40 kg/m ³)	P value (trend)
Univariate	1	1.05 (.927-1.19)	1.13 (1.00-1.28)	1.31 (1.05-1.64)	0.04
Multivariate Model	1	1.11 (0.98-1.26)	1.21 (1.06-1.38)	1.38 (1.11-1.72)	0.03
Multivariate model stratified by type of traumatic injury					
Sprains and strains	1	1.26 (0.99-1.59)	1.48 (1.17-1.88)	1.62 (1.08-2.44)	0.03
Sprains, strains, contusions and abrasions	1	1.14 (0.97-1.35)	1.37 (1.16-1.62)	1.58 (1.19-2.11)	0.03
All injuries except for sprains and strains	1	1.07 (0.92-1.25)	1.14 (0.97-1.33)	1.36 (1.04-1.78)	0.04

Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- Psycho-social job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
- **Chronic Disease status**

Relative risk of injury associated with chronic disease (15 locations, 1996-1997)

Chronic disease	OR (CI)	LW / RWT OR (CI)	Multiple injuries OR (CI)
Depression	1.45 (1.20-1.75)	1.52 (1.17-1.98)	1.79 (1.45-2.20)
Diabetes	1.20 (1.04-1.39)		
Asthma	1.38 (1.13-1.68)		
Heart disease	1.02 (0.87-1.19)		
Chronic lung disease	0.91 (0.72-1.16)		
Hypertension	1.08 (0.99-1.20)		

Workplace Injury: Systemic Causes

- Physical Demand
- Time-on-job (experience)
- Psycho-social job demand
- Overtime
- Temperature
- Gender
- Age
- Obesity
- Chronic Disease status
- **Work Organization**

Working Condition Items (2006)

Answer Questions using the following scale :

Always (1) Often (2) Sometimes (3) Rarely (4) Never (5)

- *I find my work stressful.*
- *I find that I am worn out at the end of the day*
- *I find that my work demands often interfere with my family life*
- *I find that work issues remain on my mind after hours.*

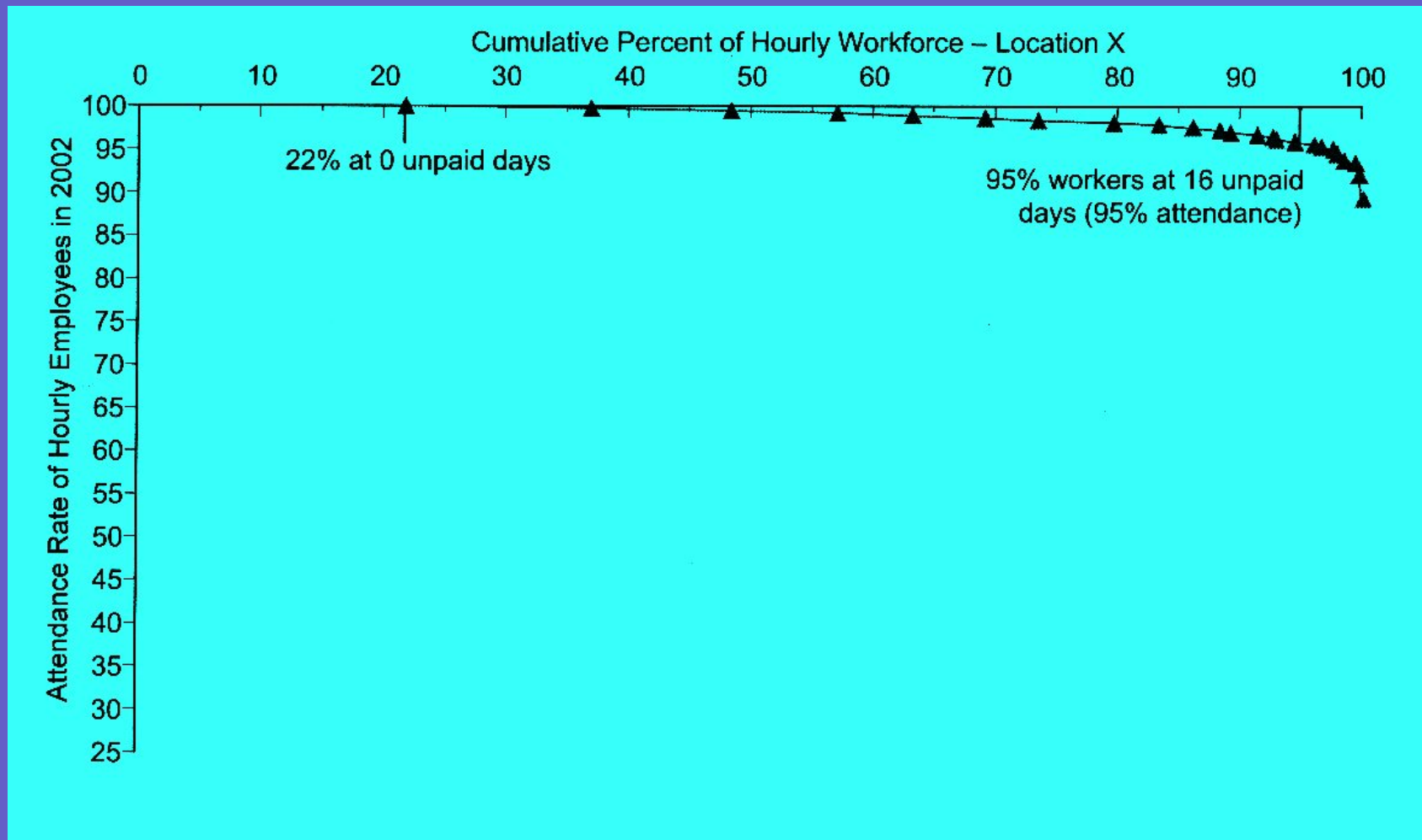
Table 5. Effect estimates: Univariable and multivariable results

Variable	Incidence Rate Ratio, 95% Confidence Intervals and p-values	
	Multivariable model	
<u>Sex</u>		
Female	1.44	1.23, 1.67, p<.0001
Male	1.0	--
<u>Race</u>		
Black	1.07	0.91, 1.27, p=0.397
Hispanic	1.30	1.08, 1.57, p=0.007
Asian	0.85	0.57, 1.28, p=0.429
White	1.0	--
<u>Time since hire</u>		
Less than one yr.		
1-2 yrs	2.44	2.00, 2.97, p<.0001
3-5 yrs	2.08	1.57, 2.75, p<.0001
6-10 yrs	1.64	1.31, 2.06, p<.0001
11-20 yrs	1.65	1.38, 1.98, p<.0001
Over 20 yrs	1.29	1.08, 1.54, p=0.005
<u>Work Organization Survey</u>		
Satisfaction scale (tertiles)	0.94	0.46, 1.95, p=0.876
Work environment scale (tertiles)	0.49	0.22, 1.22, p=0.090
Supervisor scale (tertiles)	0.70	0.25, 2.02, p=0.516
Stress scale (tertiles)	0.50	0.28, 0.90, p=0.021

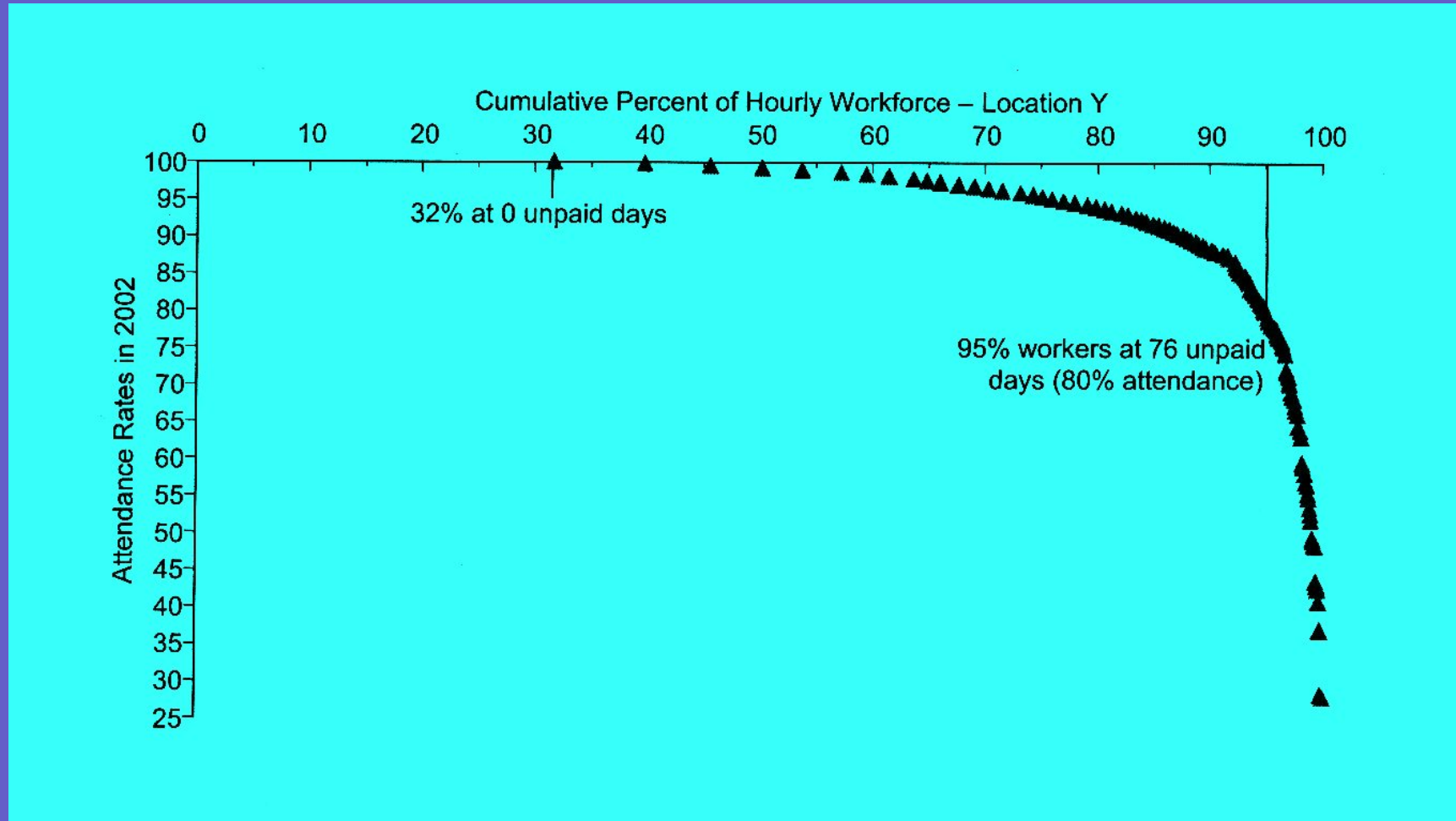
Absenteeism: Patterns



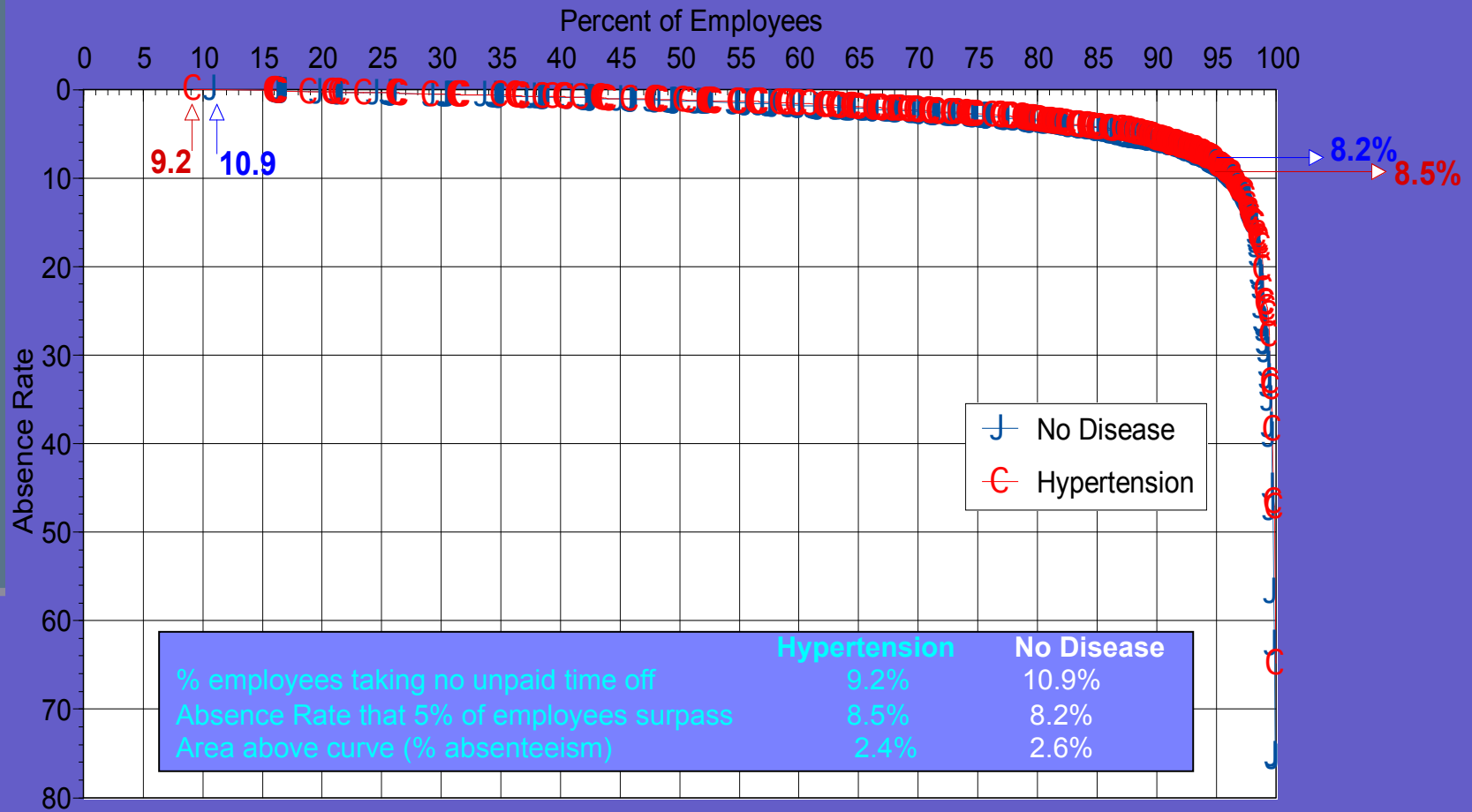
Absenteeism: Cumulative WLR



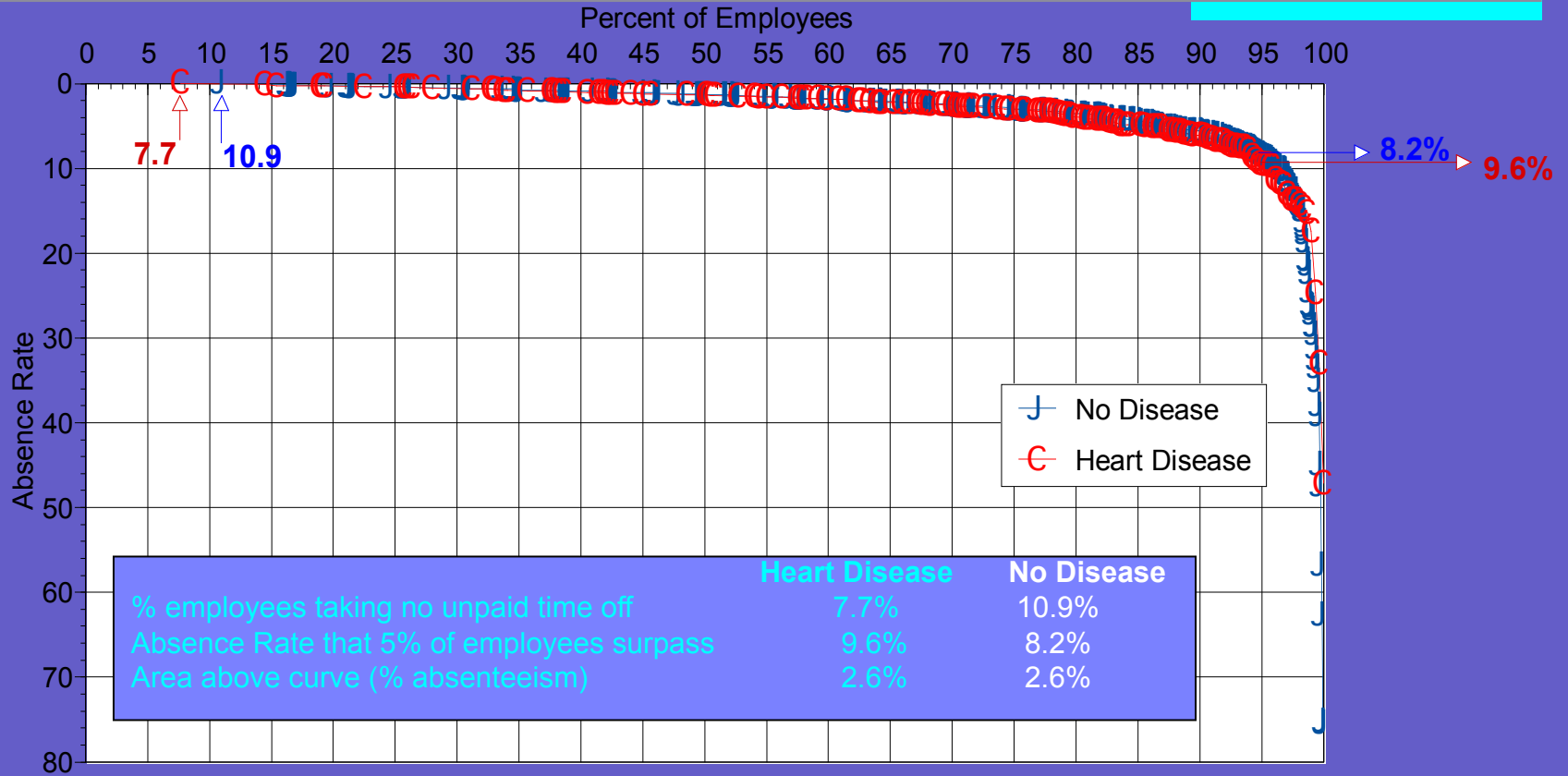
Absenteeism: Cumulative WLR



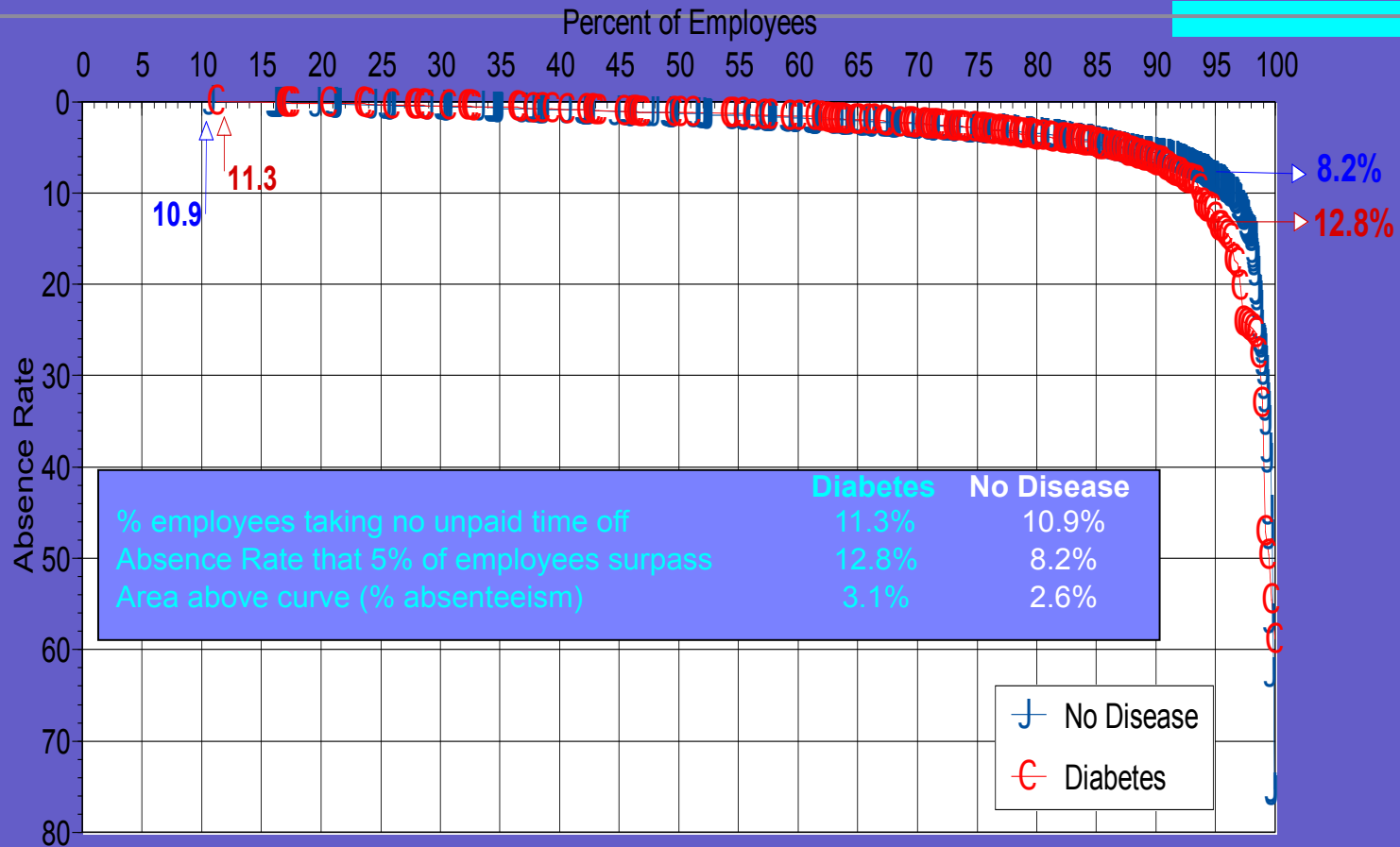
Personal Absence Rate at ALC, BAD, ROK, WAR and WEN during 2001-2002 Comparing Employees without Chronic Disease and Employees with Hypertension



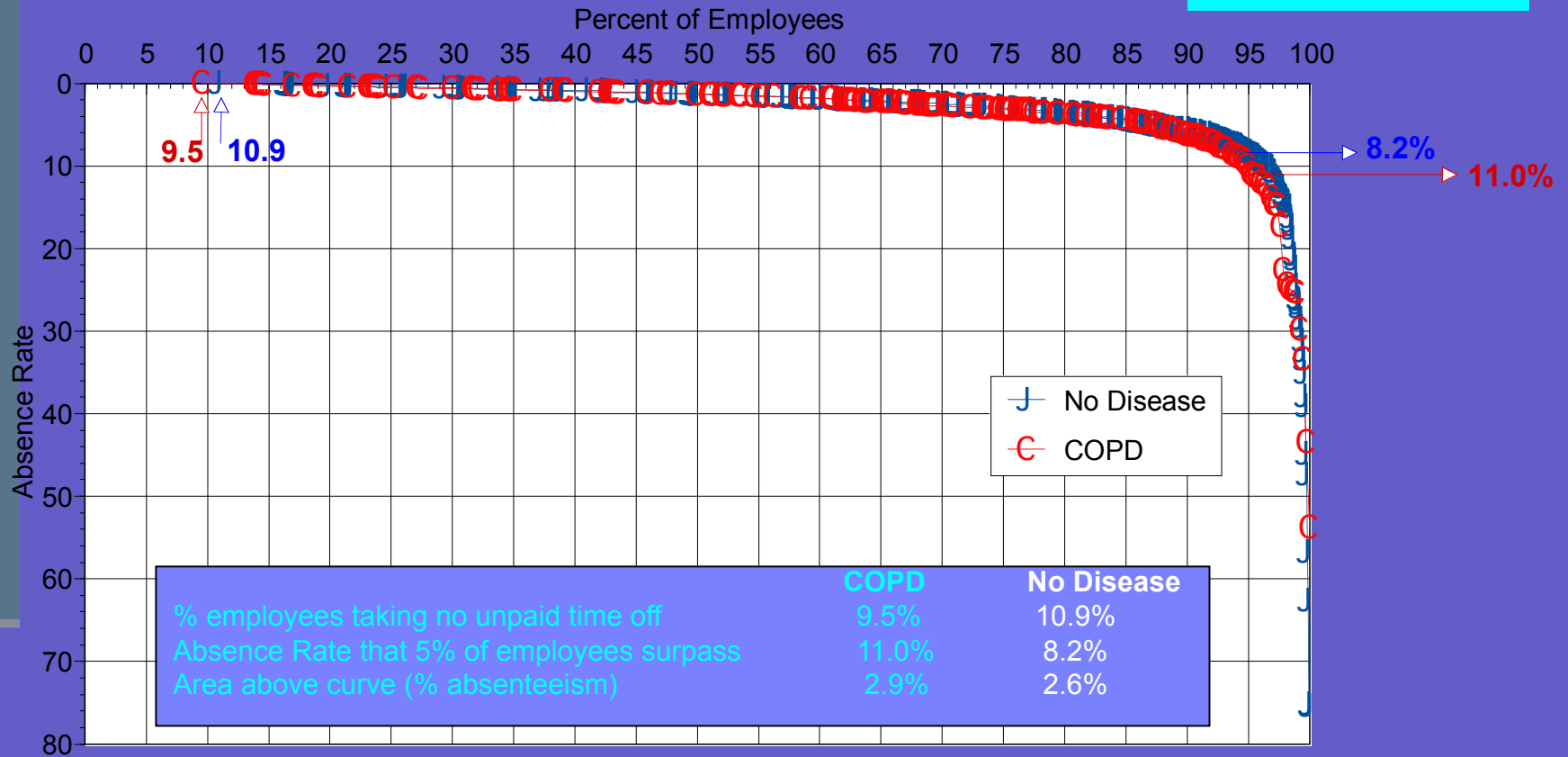
Personal Absence Rate at ALC, BAD, ROK, WAR and WEN during 2001-2002 Comparing Employees without Chronic Disease and Employees with Heart Disease



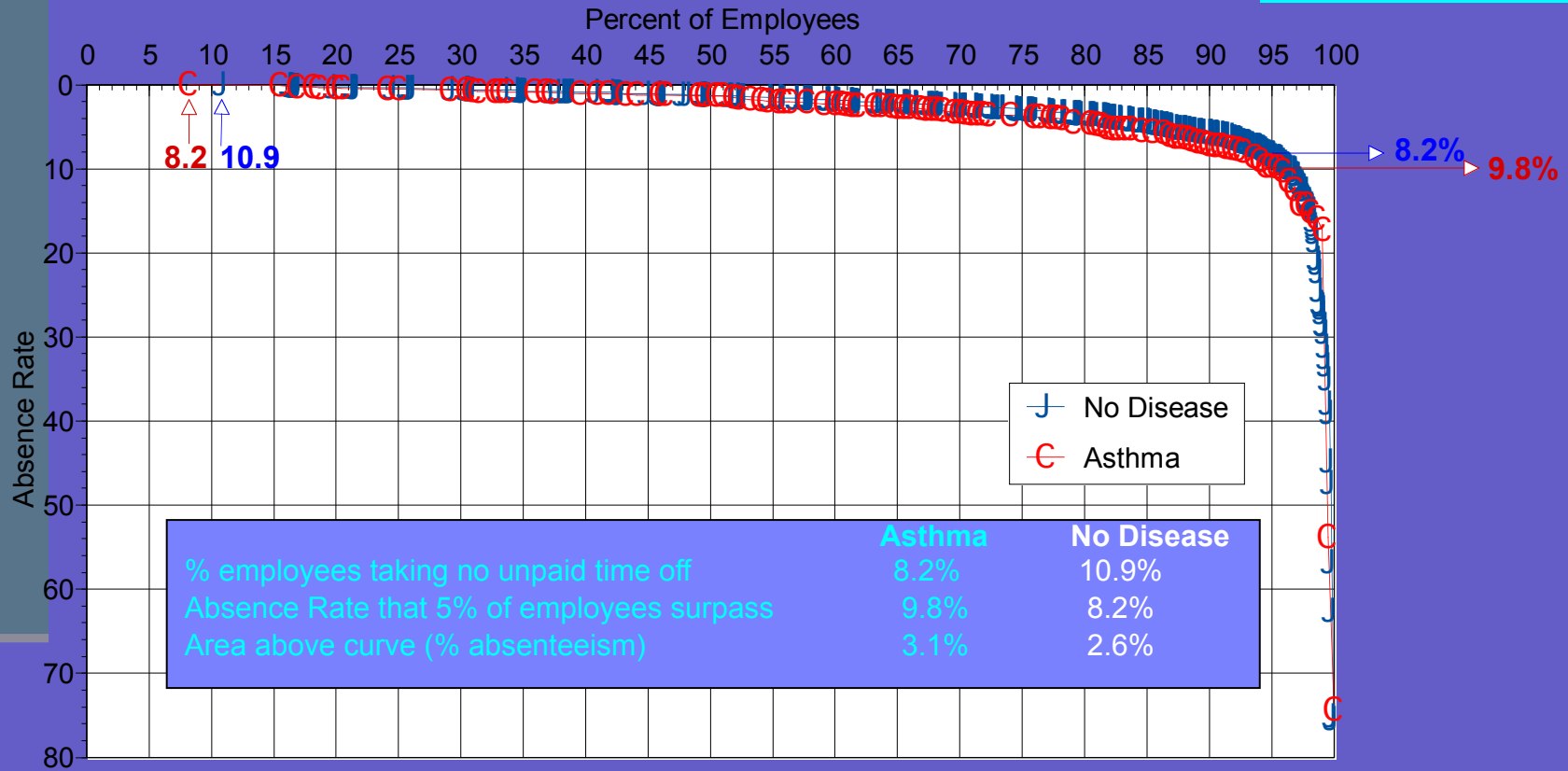
Personal Absence Rate at ALC, BAD, ROK, WAR and WEN during 2001-2002 Comparing Employees without Chronic Disease and Employees with Diabetes



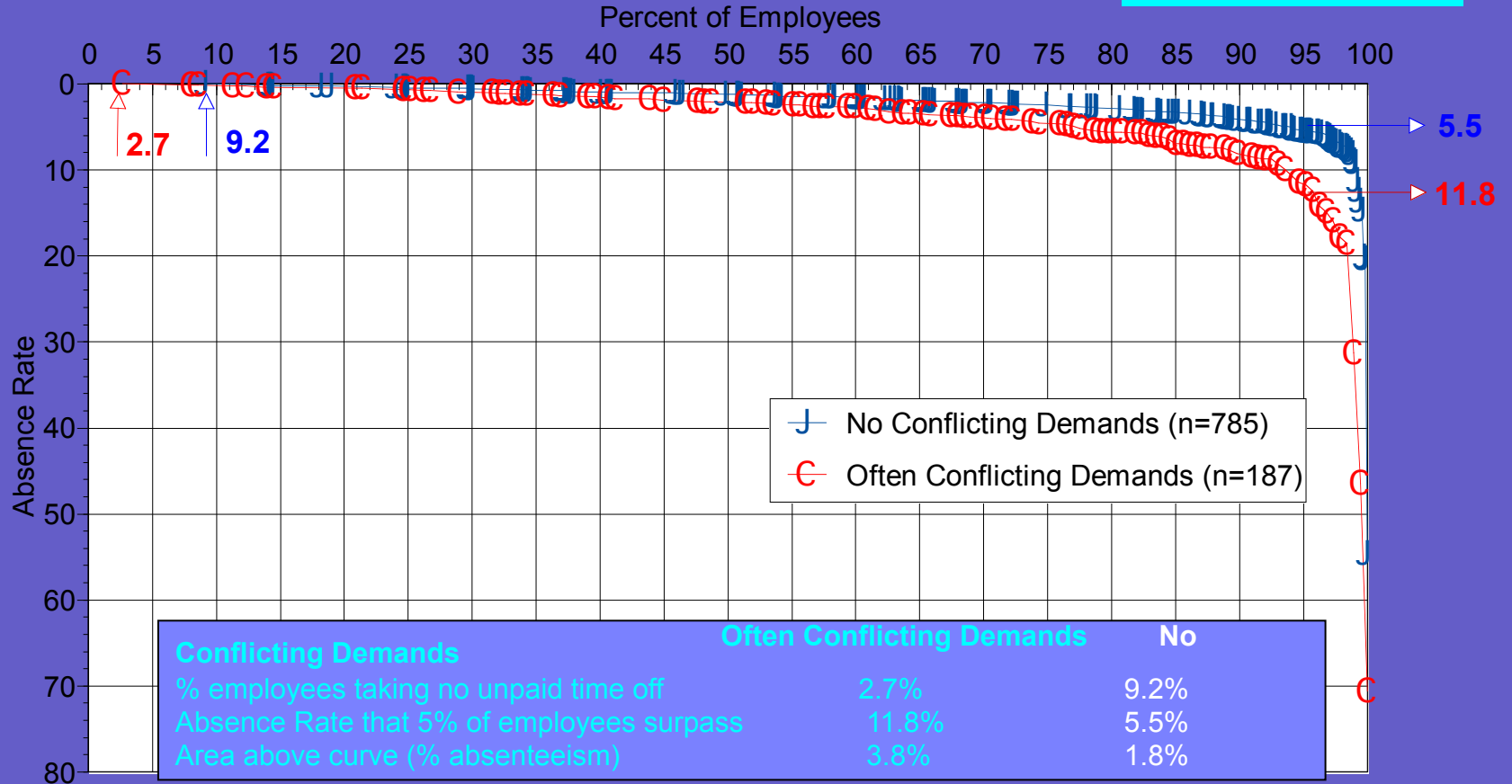
Personal Absence Rate at ALC, BAD, ROK, WAR and WEN during 2001-2002 Comparing Employees without Chronic Disease and Employees with COPD




Personal Absence Rate at ALC, BAD, ROK, WAR and WEN during 2001-2002 Comparing Employees without Chronic Disease and Employees with Asthma



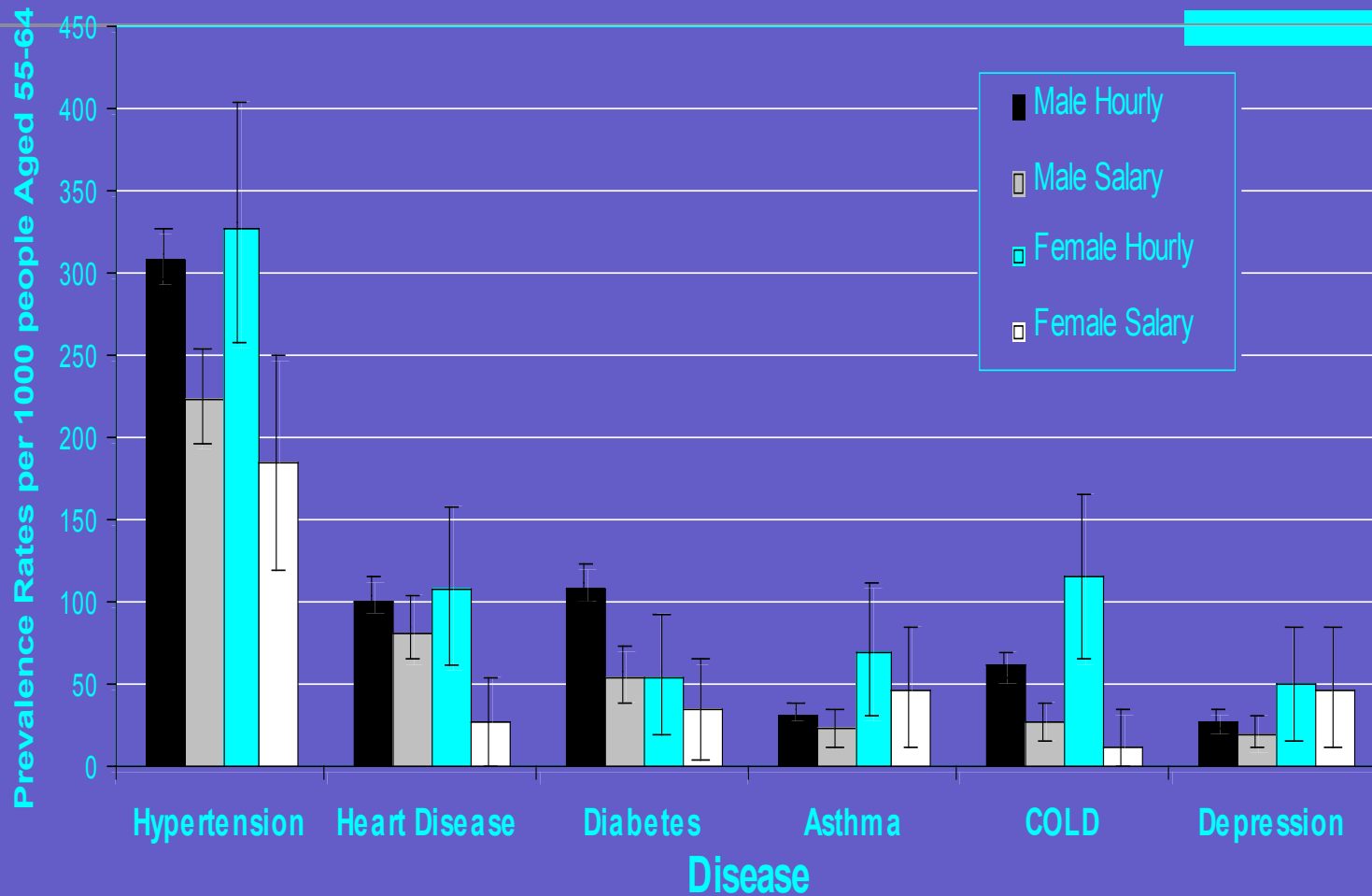
Personal Absence Rate at ALC, BAD, ROK, WAR and WEN during 2001-2002 Comparing Employees Answering Q15 on The Job Demand Survey



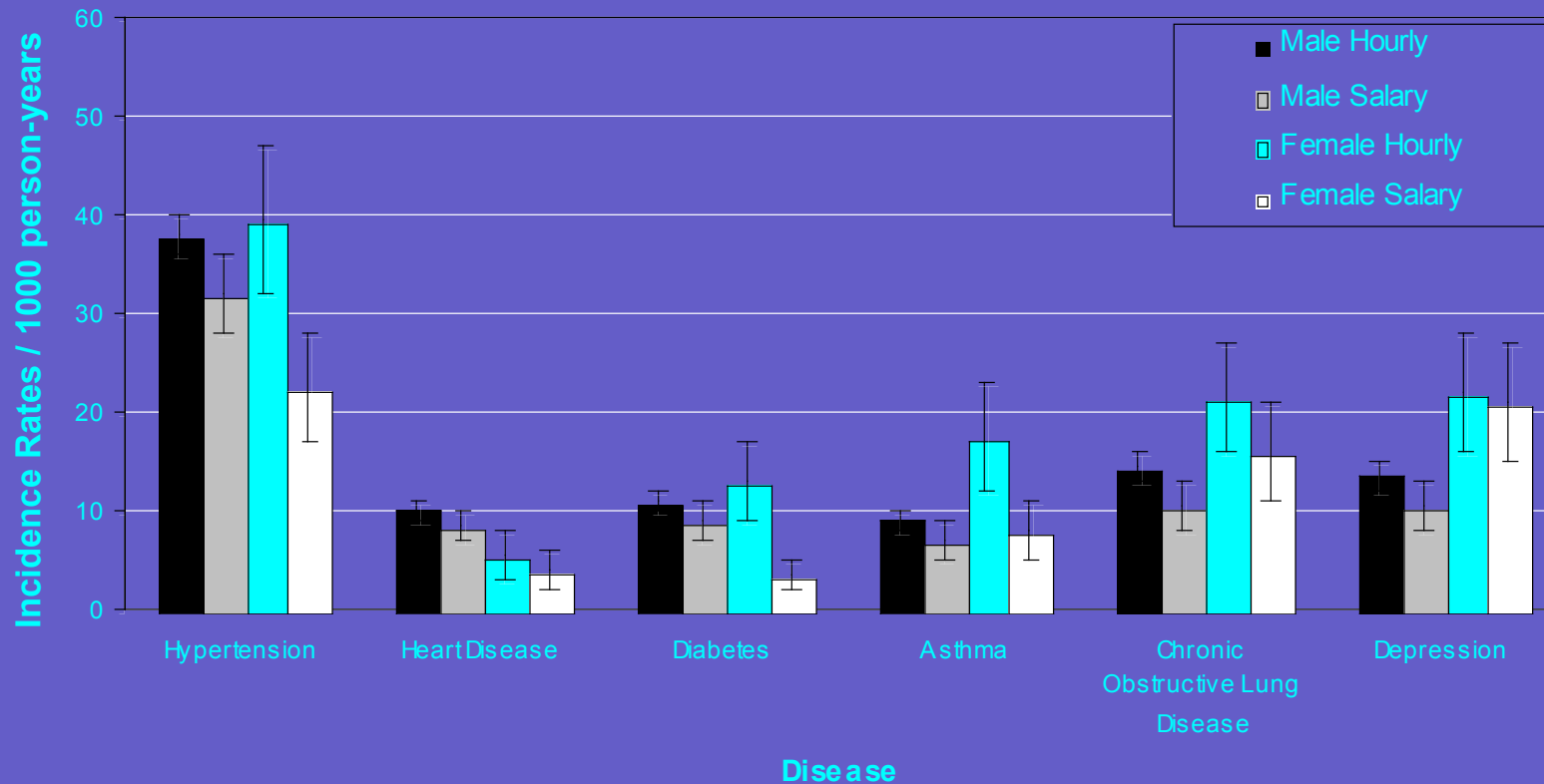


The causes of chronic disease in working populations

Prevalence of six chronic diseases in employees between the ages of 55-64 at 11 study plants located in nine states



Age-adjusted incidence of six chronic disease among employees at 11 study plants located in 9 states, 1998-2003

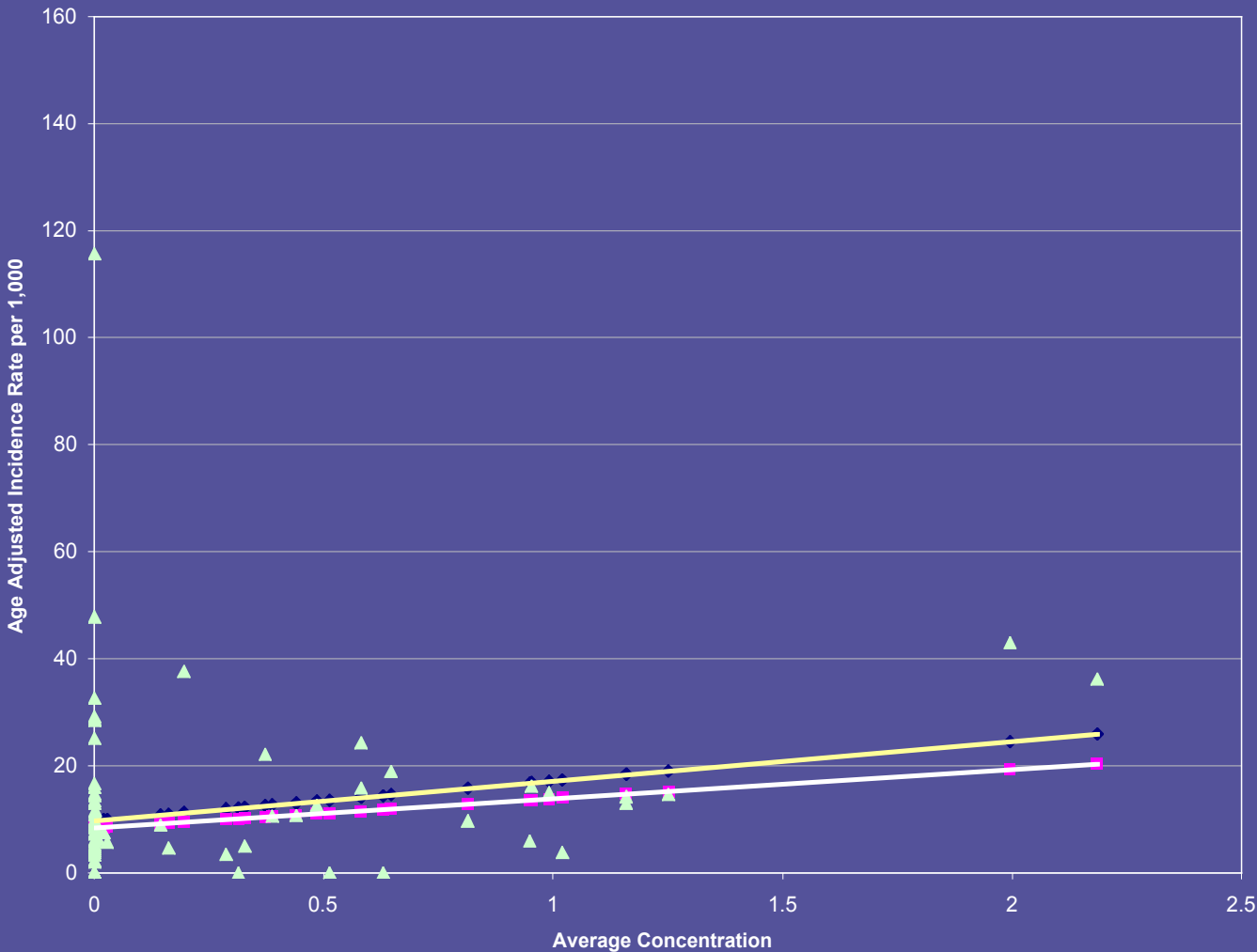


Population Attributable Risk by Individual Risk Factor

Disease	Tobacco (Pack Years)		Obesity (BMI)		Cholesterol (HDL)		Education
	Never = 1		< 25 = 1		>50 = 1		>High School = 1
	1-20.5	>20.5	25-30	>30	40-50	<40	< High School
Hypertension	0.95	1.36†	1.64†	3.32†	*	*	1.59†
Diabetes	*	*	1.54†	3.36†	*	*	1.67†
Ischemic Heart Disease	1.31†	3.23†	0.98	1.55†	1.4†	1.36†	1.46†
COPD	3.19†	7.52†	*	*	*	*	1.86†
Asthma	1.03	0.94	1.11	1.71†	*	*	0.77

* Not in Model due to Bi-directionality Concern
†Significantly greater than 1

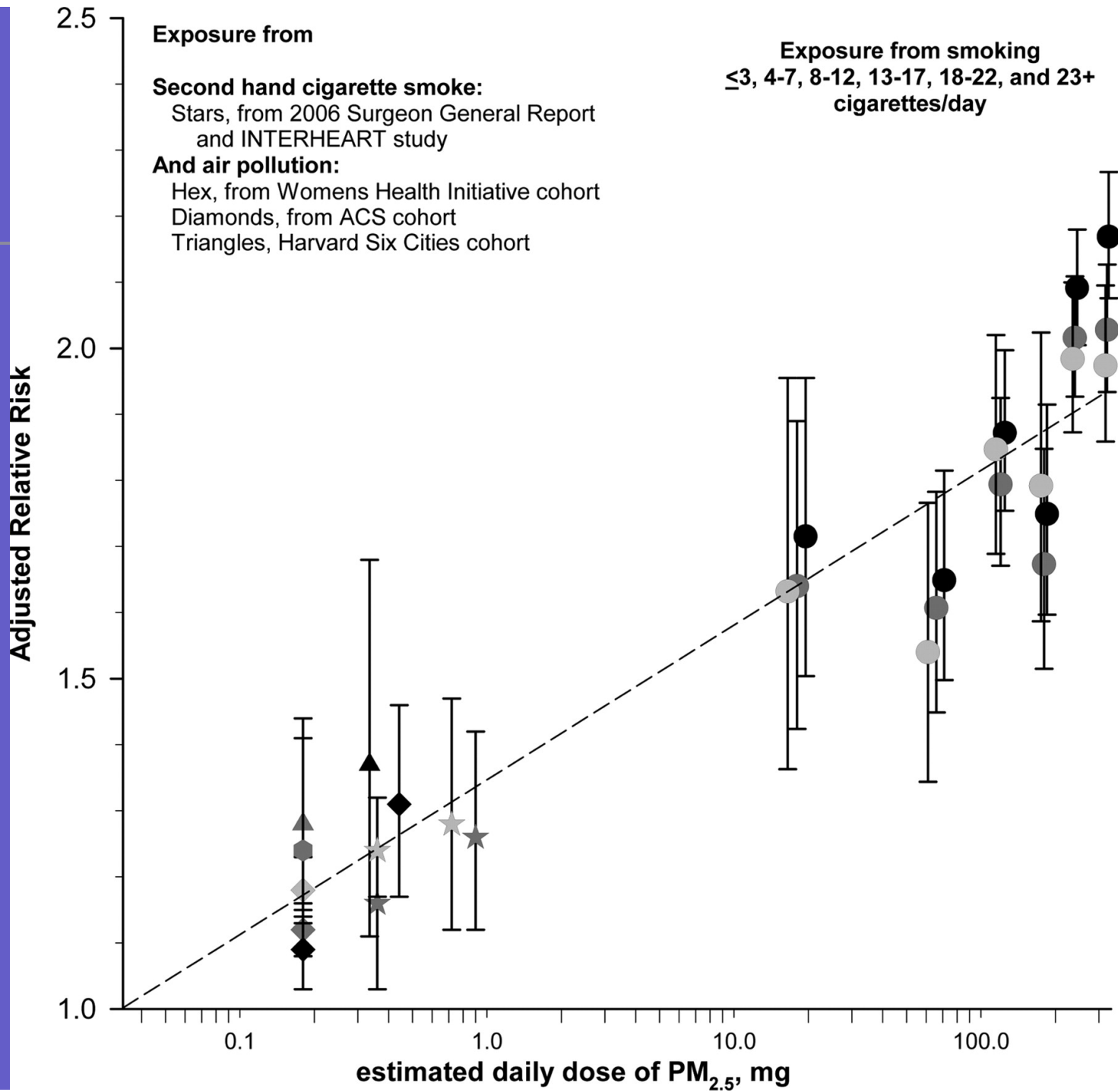
Fluoride & Asthma (Male Hourly)



◆ Not Weighted
■ Weighted
▲ Raw Data

R-Squared:
Not Weighted: 0.0121
Weighted: 0.0873

p-value:
Not Weighted: 0.0615
Weighted: 0.0078



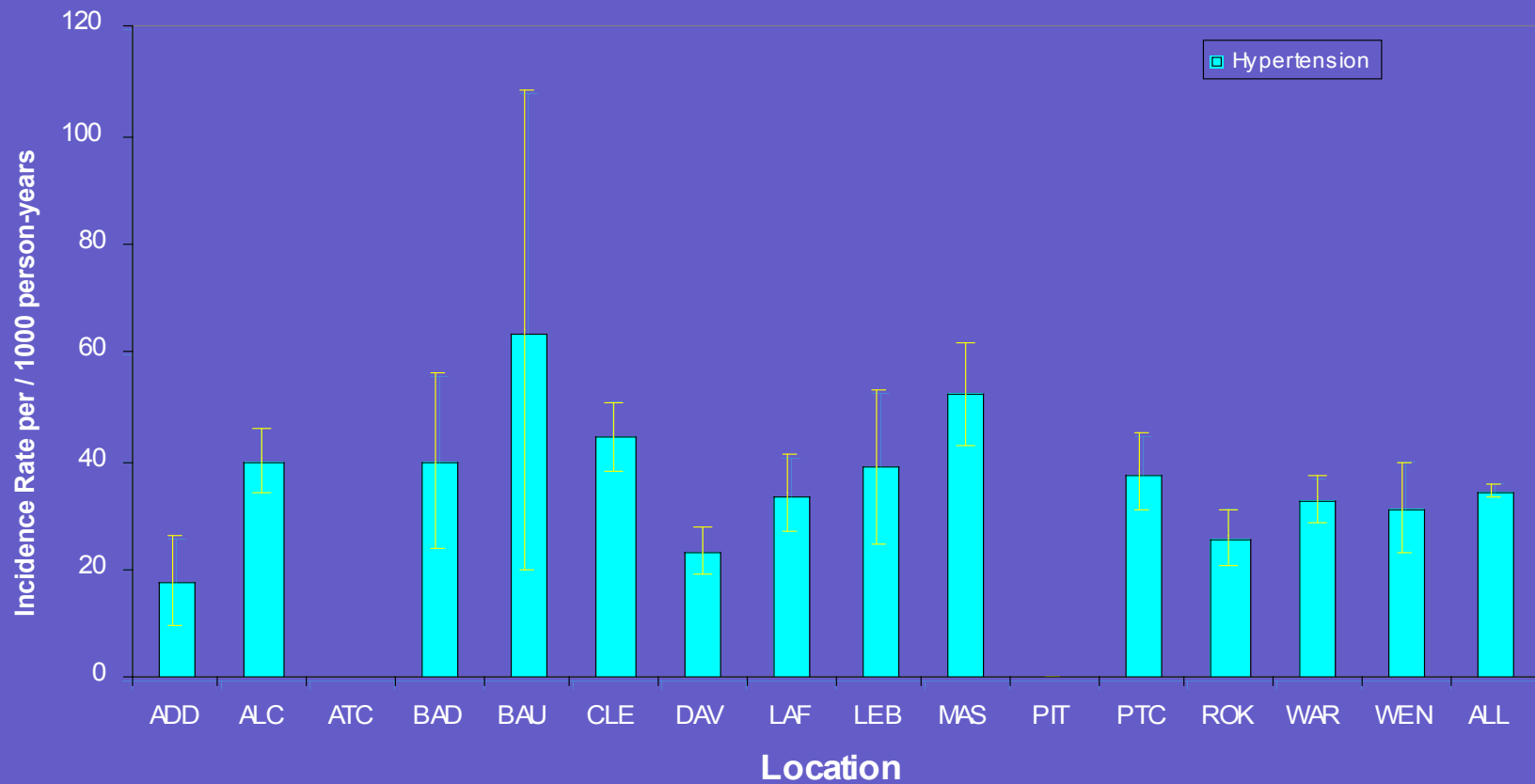
Adjusted logistic models of depression diagnosis using tertiles of demand and control exposure with interaction term (full model stratified by location, 1998-2003 (N=7566))

Effect	Unadjusted OR (95%CI)	Demographics Adjusted OR (95%CI)	Demographics & Lifestyle Adjusted OR (95%CI)	Demographics Lifestyle & Location Adjusted OR (95%CI)	Fully adjusted model with interaction term OR (95%CI)
DEMAND					
<i>High</i>	1.71 (1.29-2.25)	1.53 (1.15-2.03)	1.39 (1.04-1.86)	1.12 (0.78-1.60)	1.20 (0.66-2.20)
<i>Moderate</i>	1.33 (1.01-1.76)	1.42 (1.07-1.89)	1.33 (1.00-1.77)	1.26 (0.91-1.74)	1.03 (0.54-1.99)
<i>Low</i>	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
CONTROL					
<i>High</i>	1.07 (0.80-1.43)	0.69 (0.50-0.94)	0.78 (0.56-1.08)	0.98 (0.68-1.42)	1.00 (0.52-1.92)
<i>Moderate</i>	1.47 (1.12-1.93)	1.14 (0.86-1.51)	1.07 (0.81-1.43)	1.10 (0.79-1.54)	0.91 (0.47-1.76)
<i>Low</i>	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)
GENDER					
<i>Female</i>		2.41 (1.71-3.39)	2.39 (1.70-3.38)	2.29 (1.61-3.26)	2.32 (1.63-3.30)
<i>Male</i>		1 (Ref)	1 (Ref)	1 (Ref)	1 (Ref)

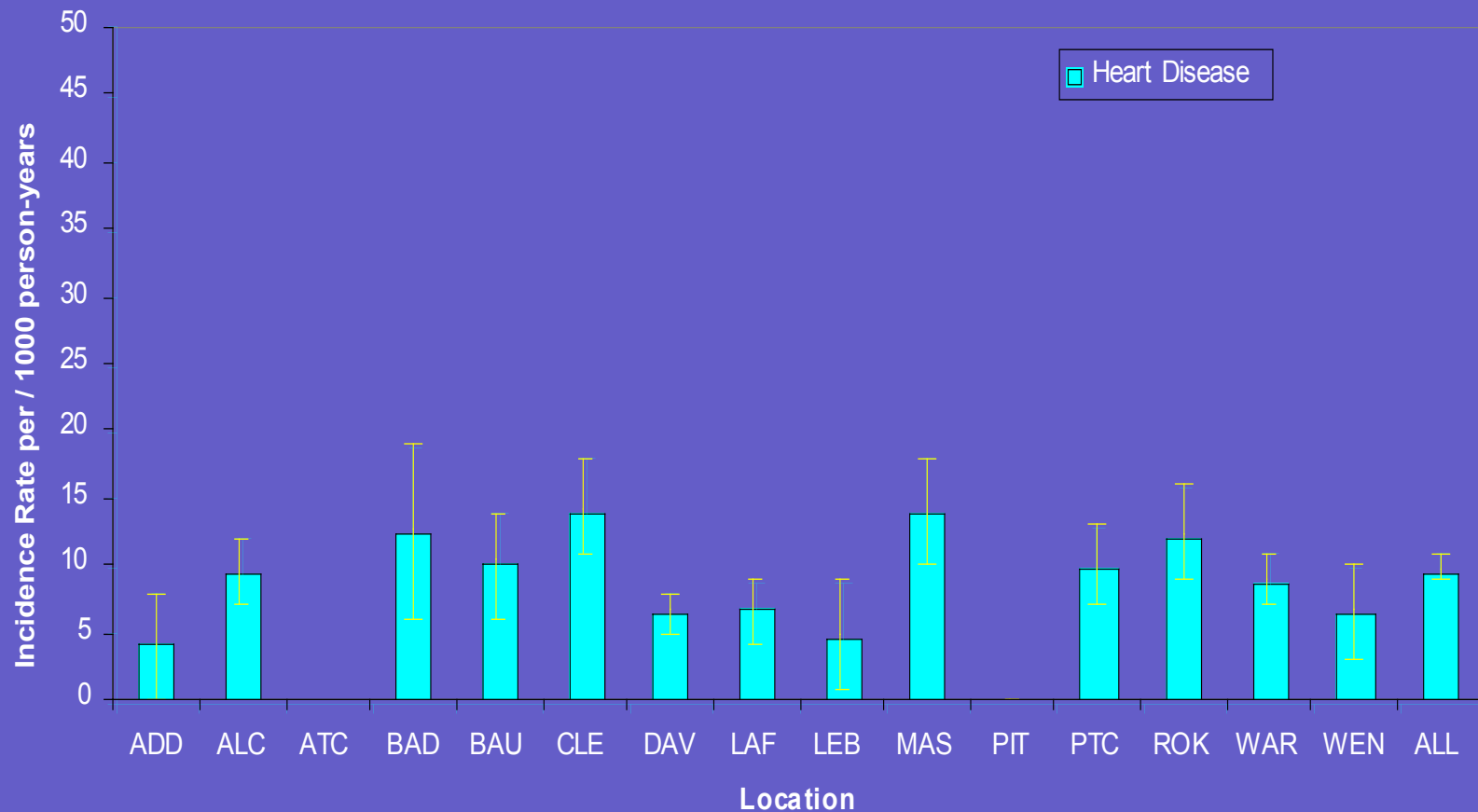
Table 5: Sex-stratified multivariate models for effect of hourly status and tenure on hypertension, adjusted for non-linear age effects.

	Male employees				Female employees			
	<i>Model 1:</i> Predicted hourly (Pr > 0.5; n = 10,662) (10,995 observed hourly) (1,991 cases total)		<i>Model 2:</i> Predicted salaried (Pr < 0.5; n = 1,607) (276 observed hourly) (130 cases total)		<i>Model 3:</i> Predicted hourly (Pr > 0.5; n = 831) (607 observed hourly) (95 cases total)		<i>Model 4:</i> Predicted salaried (Pr < 0.5; n = 1,185) (186 observed hourly) (68 cases total)	
	Adj OR	(95% CI)	Adj OR	(95% CI)	Adj OR	(95% CI)	Adj OR	(95% CI)
Hourly (vs. Salaried)	0.92	(0.85 – 1.003)	1.16	(0.88 – 1.52)	1.78	(1.34 – 2.35)	0.74	(0.53 – 1.04)
Tenure (per year)	1.013	(1.010 – 1.017)	0.995	(0.983 – 1.008)	1.028	(1.013 – 1.043)	1.019	(1.001 – 1.036)
Age (per year)	1.03	(1.02 - 1.04)	0.999	(0.97 – 1.03)	1.012	(0.984 - 1.041)	0.993	(0.96 – 1.02)
BMI: Above-median	2.39	(2.22 - 2.58)	2.52	(1.83 – 3.49)	1.79	(1.39 - 2.30)	2.45	(1.64 – 3.66)
Below-median	1.00	(ref)	1.00	(ref)	1.00	(ref)	1.00	(ref)
Income:								
Lowest tertile	1.22	(1.12 - 1.32)	1.49	(1.13 – 1.97)	0.94	(0.69 - 1.30)	1.92	(1.36 – 2.71)
Medium tertile	1.02	(0.94 - 1.11)	1.26	(1.01 – 1.59)	0.93	(0.67 - 1.29)	2.30	(1.64 – 3.22)
Highest tertile	1.00	(ref)	1.00	(ref)	1.00	(ref)	1.00	(ref)
Education:								
High school	0.95	(0.87 – 1.04)	N/A		0.91	(0.66 – 1.26)	0.64	(0.35 – 1.16)
More than high school	1.00	(ref)	1.00	(ref)	1.00	(ref)	1.00	(ref)
Race/ ethnicity:								
African-American	1.39	(1.28 – 1.52)	0.63	(0.33 – 1.21)	1.47	(1.18 – 1.84)	1.68	(1.12 – 2.52)
Hispanic	0.72	(0.61 – 0.84)	1.02	(0.51 – 1.96)	1.29	(0.72 – 2.31)	0.63	(0.25 – 1.61)
Caucasian	1.00	(ref)	1.00	(ref)	1.00	(ref)	1.00	(ref)
Smoking status:								
Current vs. Never	1.04	(0.95 – 1.14)	1.67	(1.10 – 2.53)	0.96	(0.70 - 1.32)	1.50	(0.89 – 2.53)

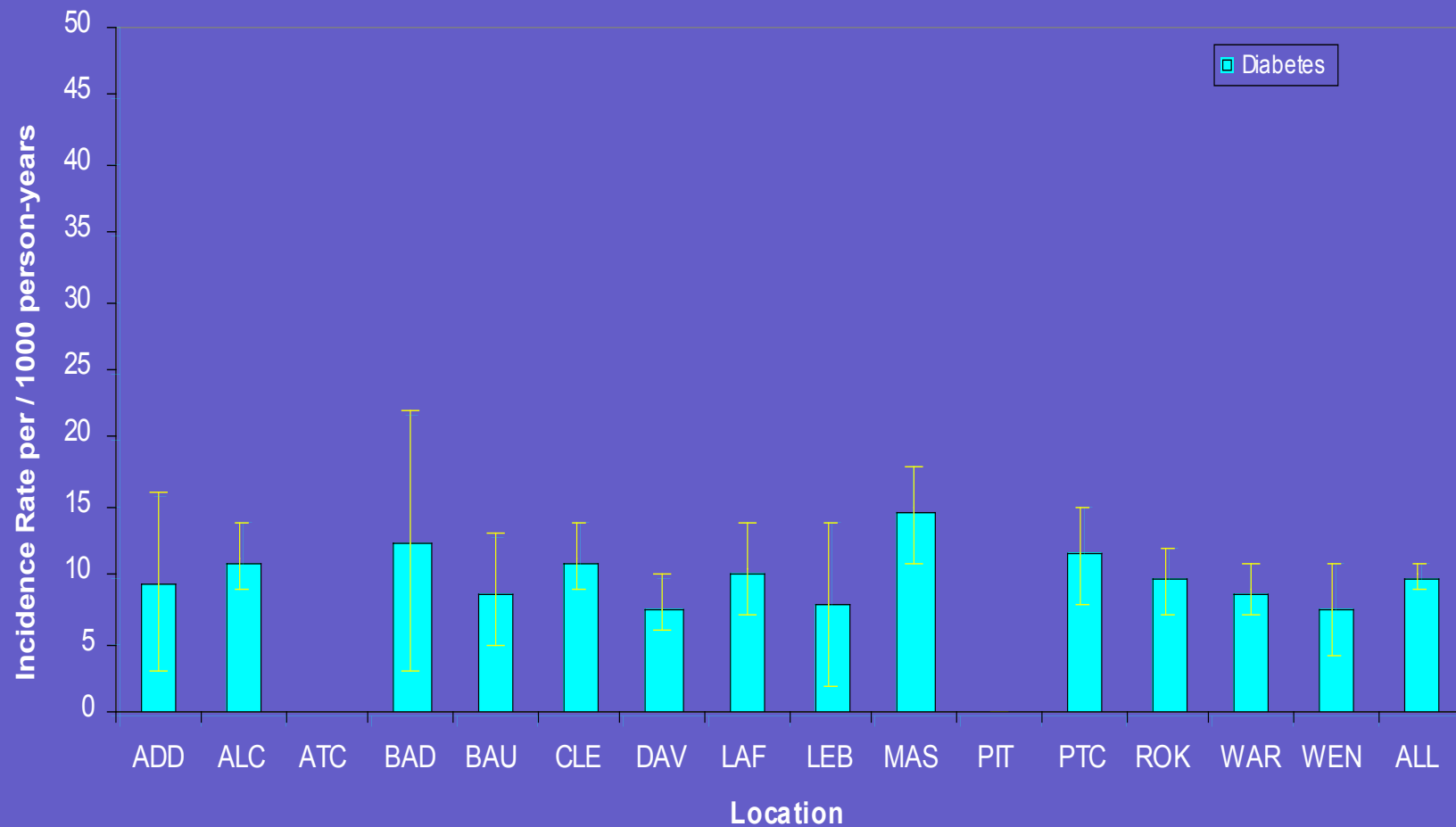
Age-adjusted incidence rates of hypertension in hourly males (1998-2003)



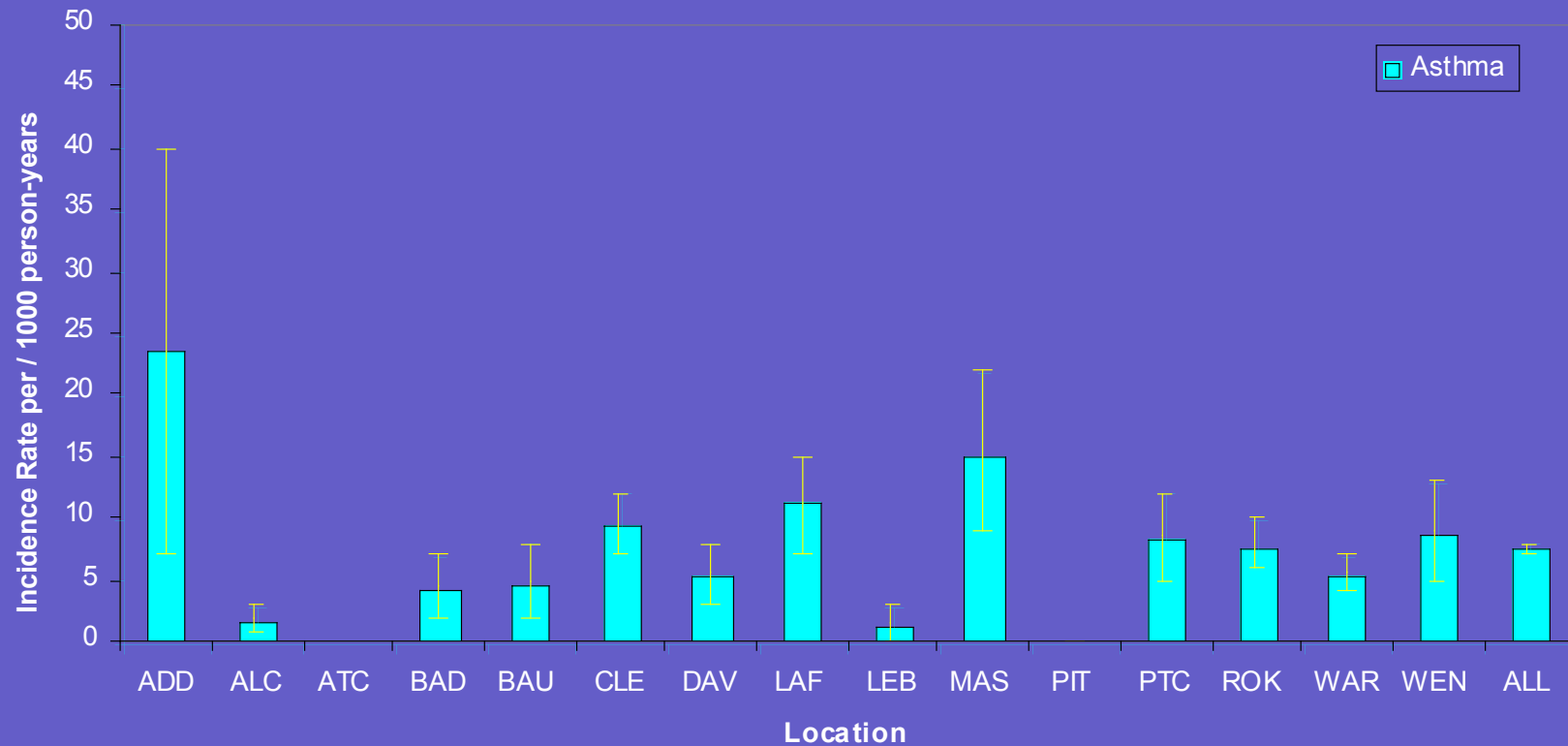
Age-adjusted incidence rates of heart disease in hourly males (1998-2003)



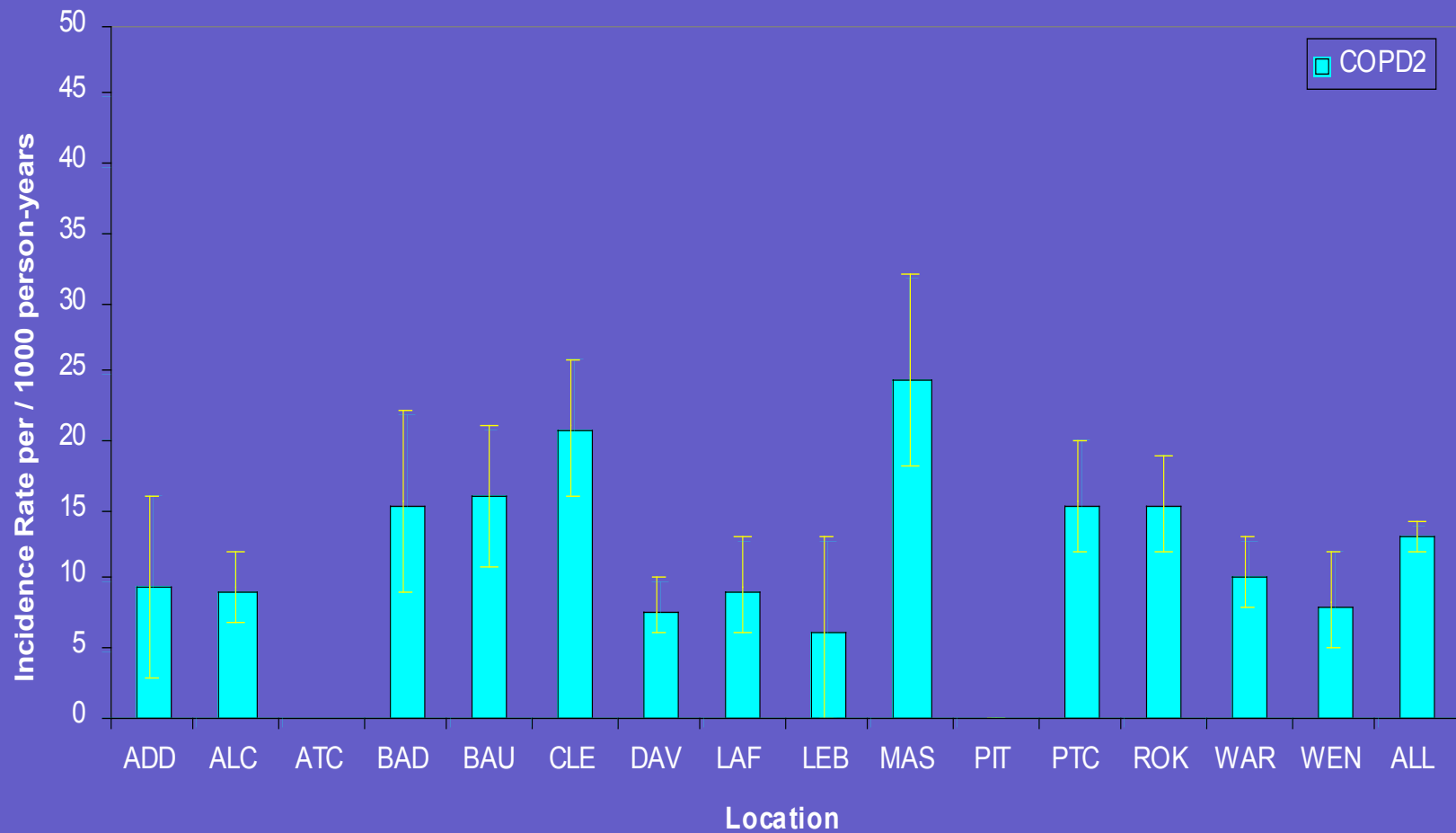
Age-adjusted incidence rates of diabetes in hourly males (1998-2003)



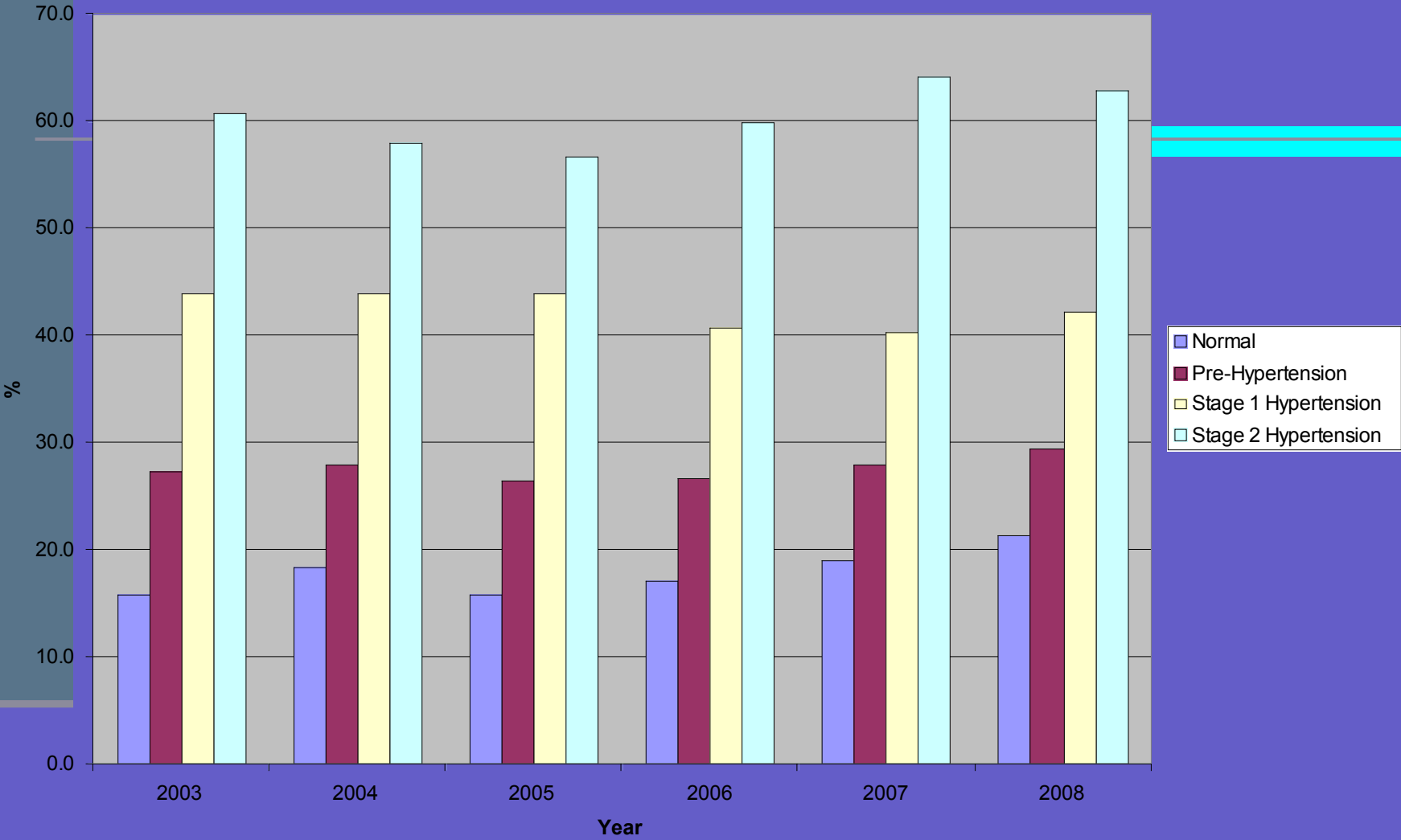
Age-adjusted incidence rates of asthma in hourly males (1998-2003)



Age-adjusted incidence rates of COPD in hourly males (1998-2003)



with >=1 hypertension claim or Rx





**All Health
IS
Occupational Health**



Thank You!