

Working characteristics and cardiovascular disease risk

What are the relationships?

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Background

- **Employment is a key determinant of health and well-being**
 - Large proportion of incapacity benefit for mental health
 - “Working for a healthier tomorrow”

C. Black (2008, TSO, London)

- **Physical health:**
 - health selection
- **Working conditions**
 - Psychosocial work stress (low job control; job strain)
 - Shift (night) work
 - Length of working hours
 - Atypical hours (evening, weekends)

Background

- **Shift work:**

- **HSE 2007: 3.5 million shift workers in UK**
- **Employment outside standard hours (mon-fri, 7am-6pm)**
- **Focus on night work, little on evening or weekend.**

- **Night workers:**

- **Sleep disturbances**
- **Gastrointestinal complaints**
- **40% increased risk of coronary heart disease**

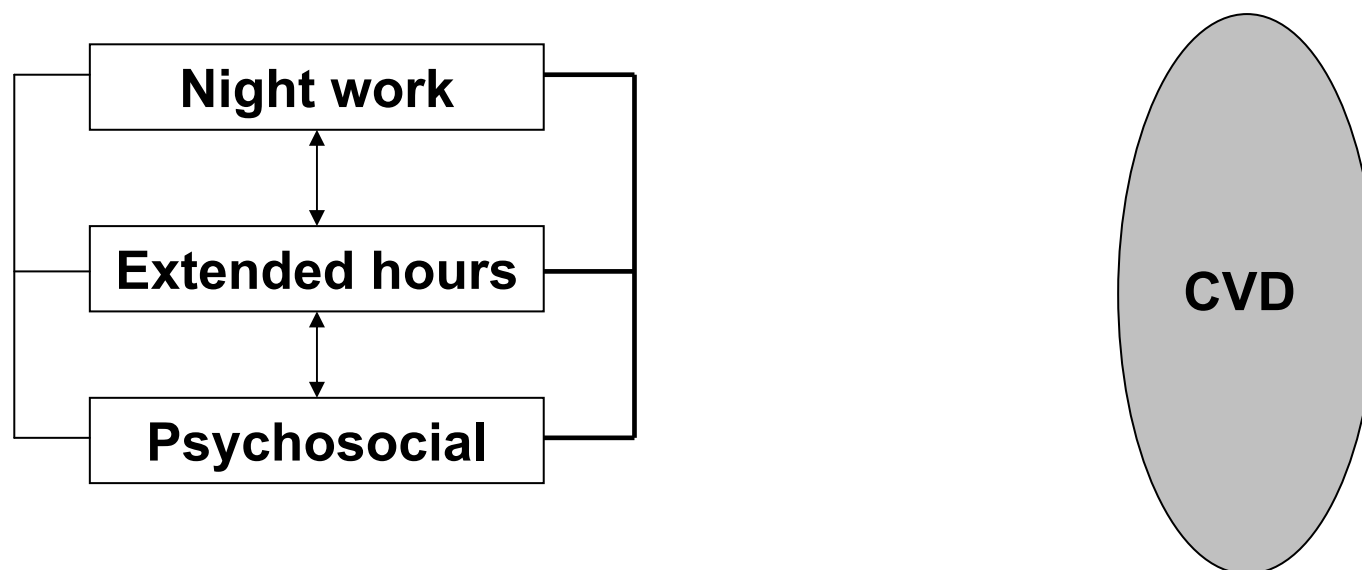
(Boggild & Knutsson, 1999, Scand J Wk Env Hlth)

- **Metabolic alterations – CVD risk**
- **Small studies**

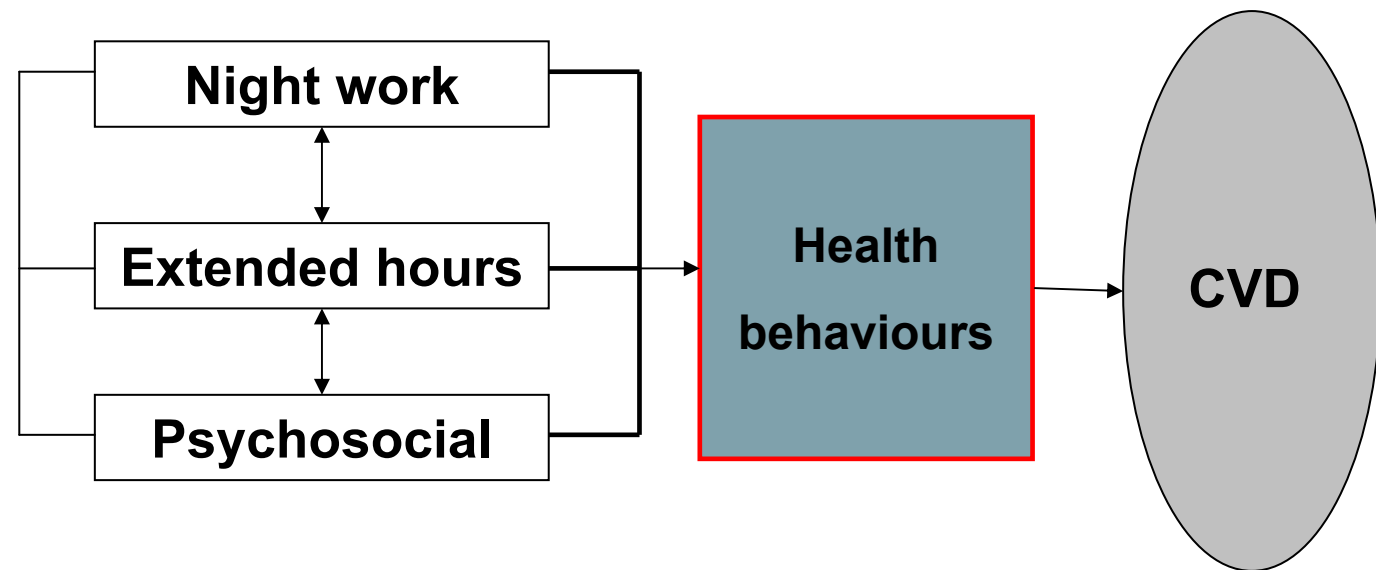
Background

- **Working hours:**
 - **European Directive on Working Hours (1993)**
 - **came into effect in Britain 1998**
 - **no more than 48h/week**
 - **workers can “opt out”**
- **Long work hours (e.g. >50h/week):**
 - **self-reported health, fatigue**
 - **CVD & diabetes**
 - **health-related behaviour**
 - **evidence weak and inconsistent**

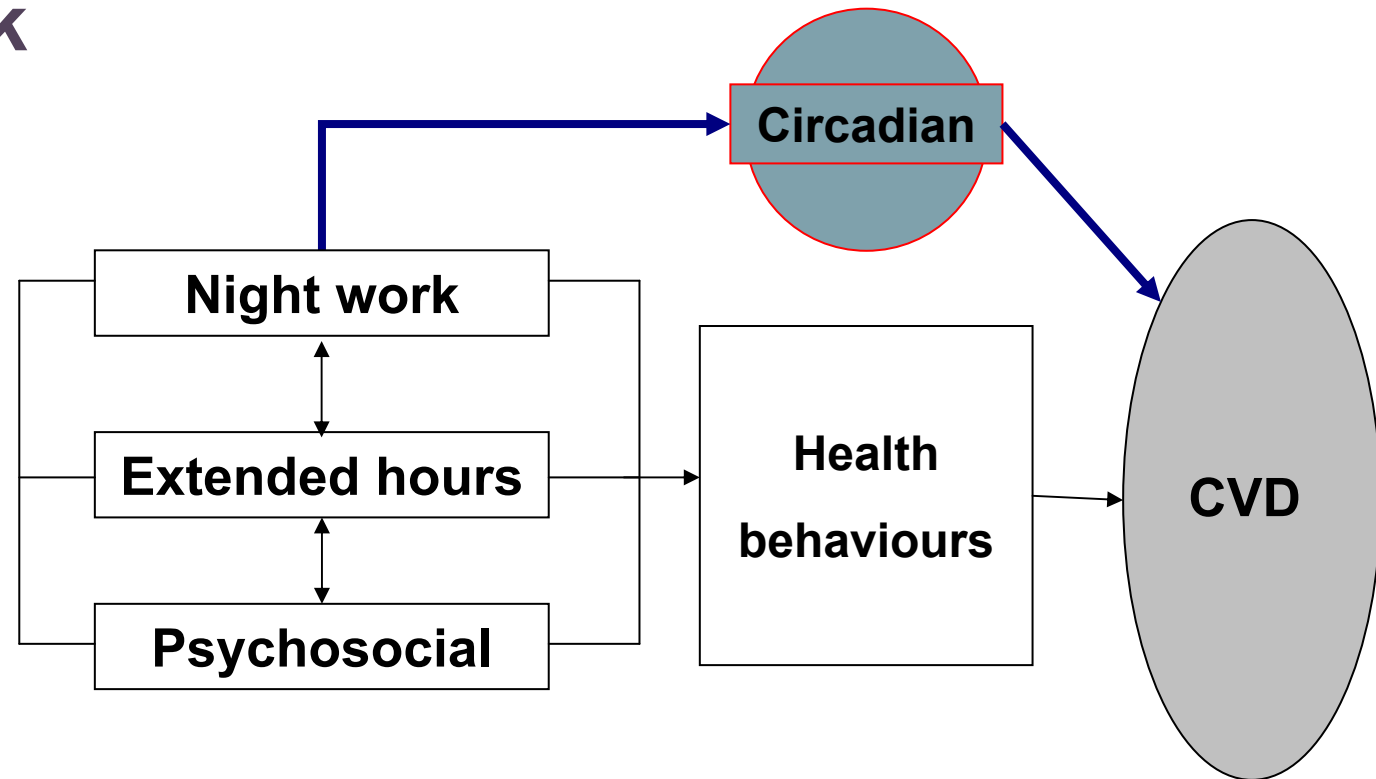
Framework



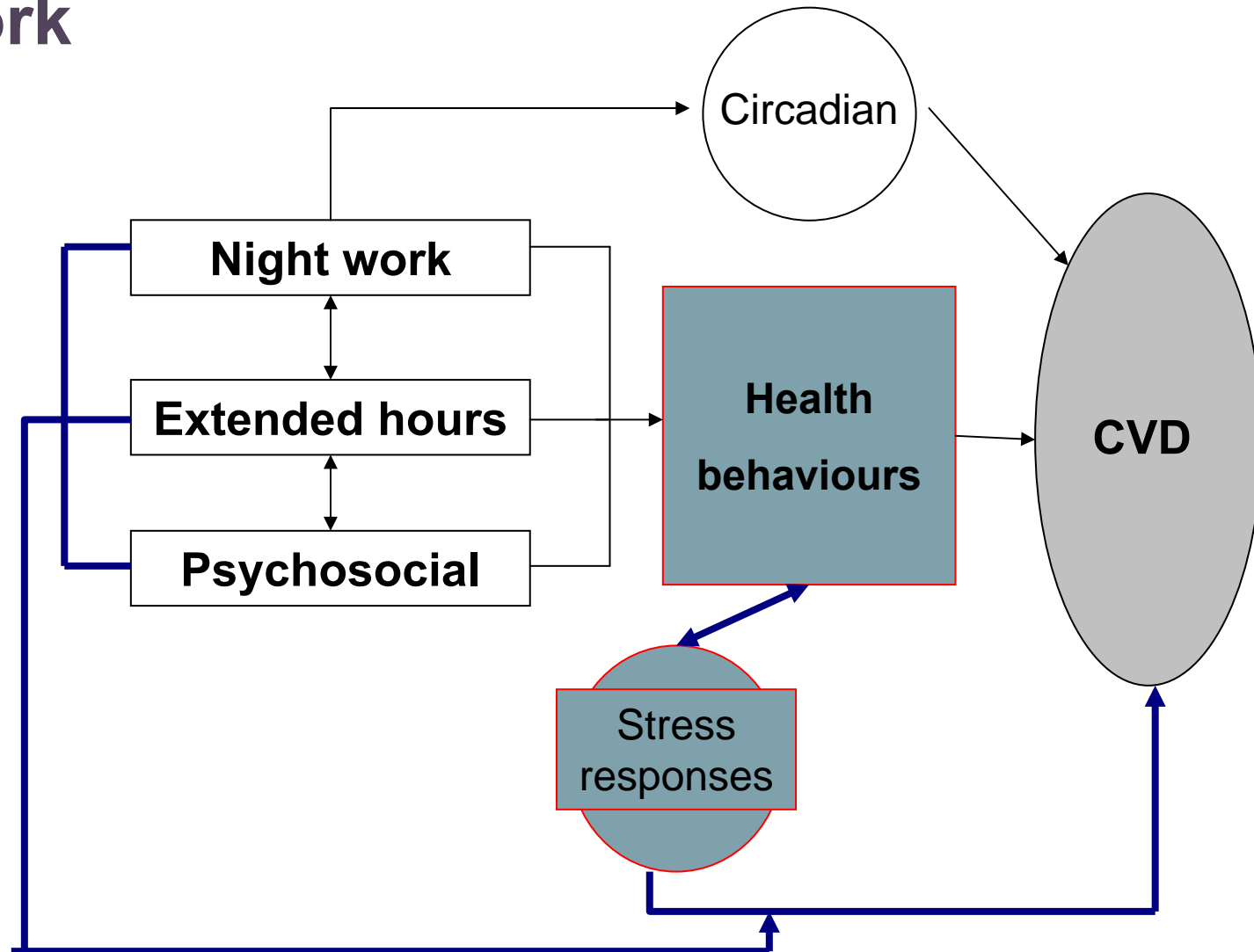
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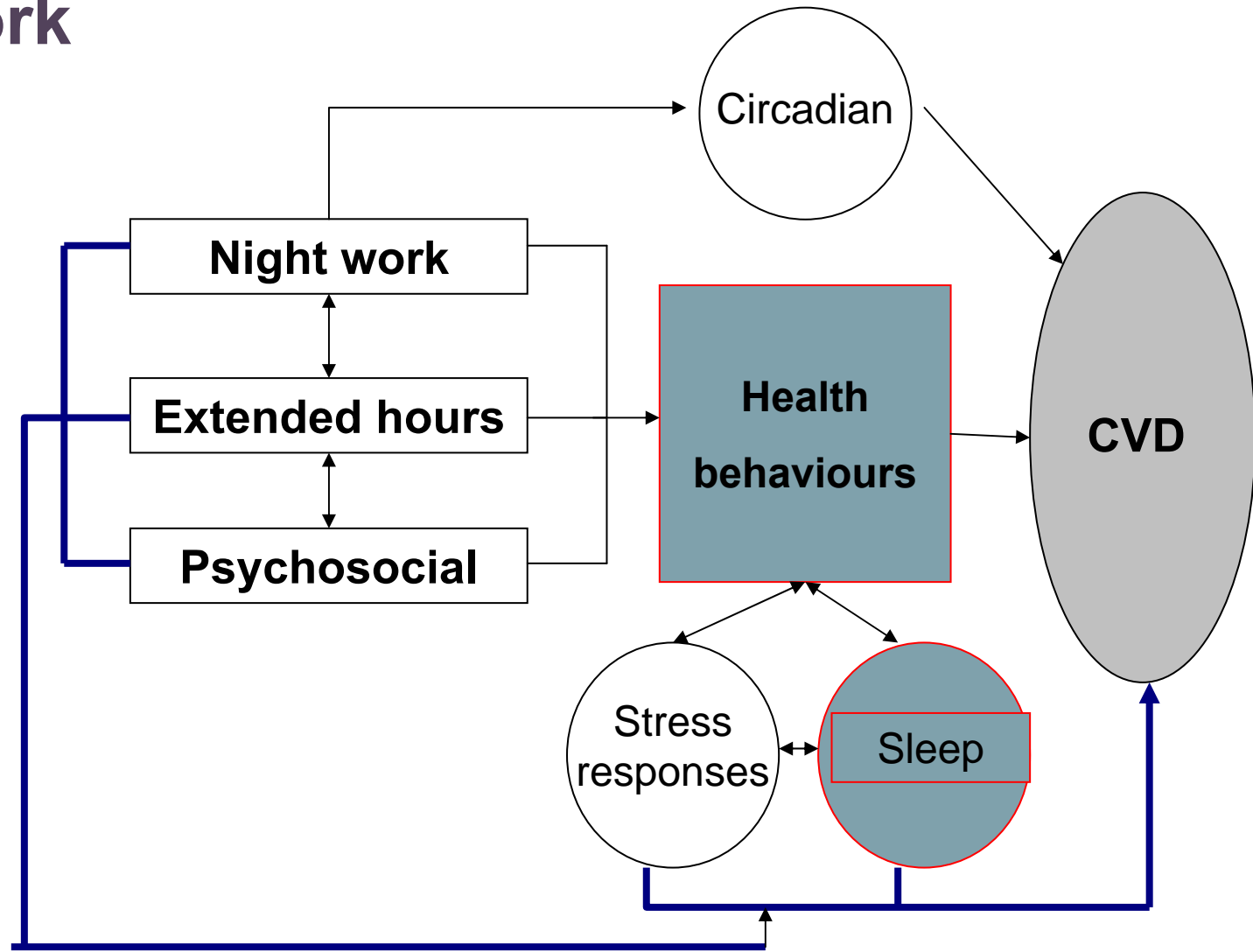
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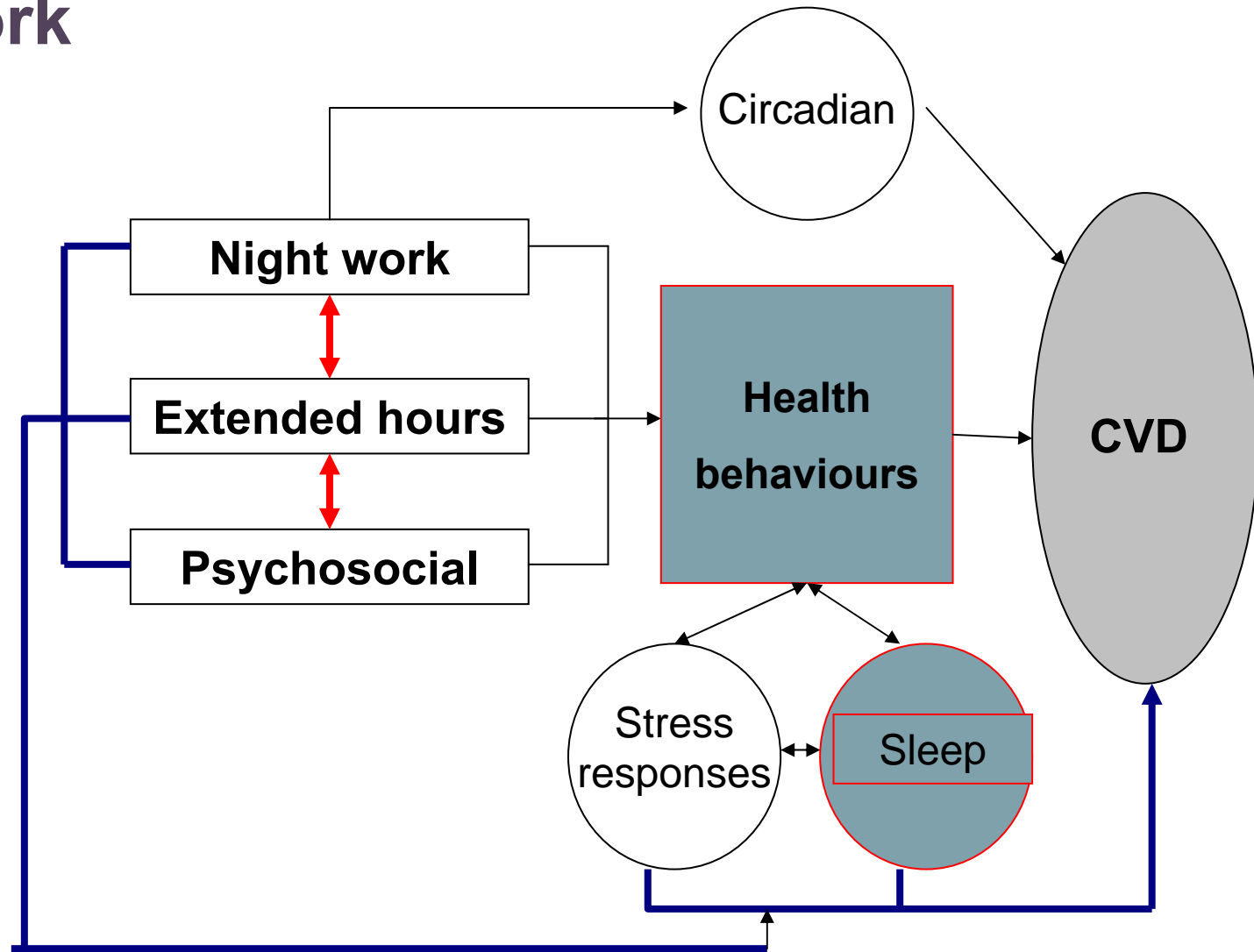
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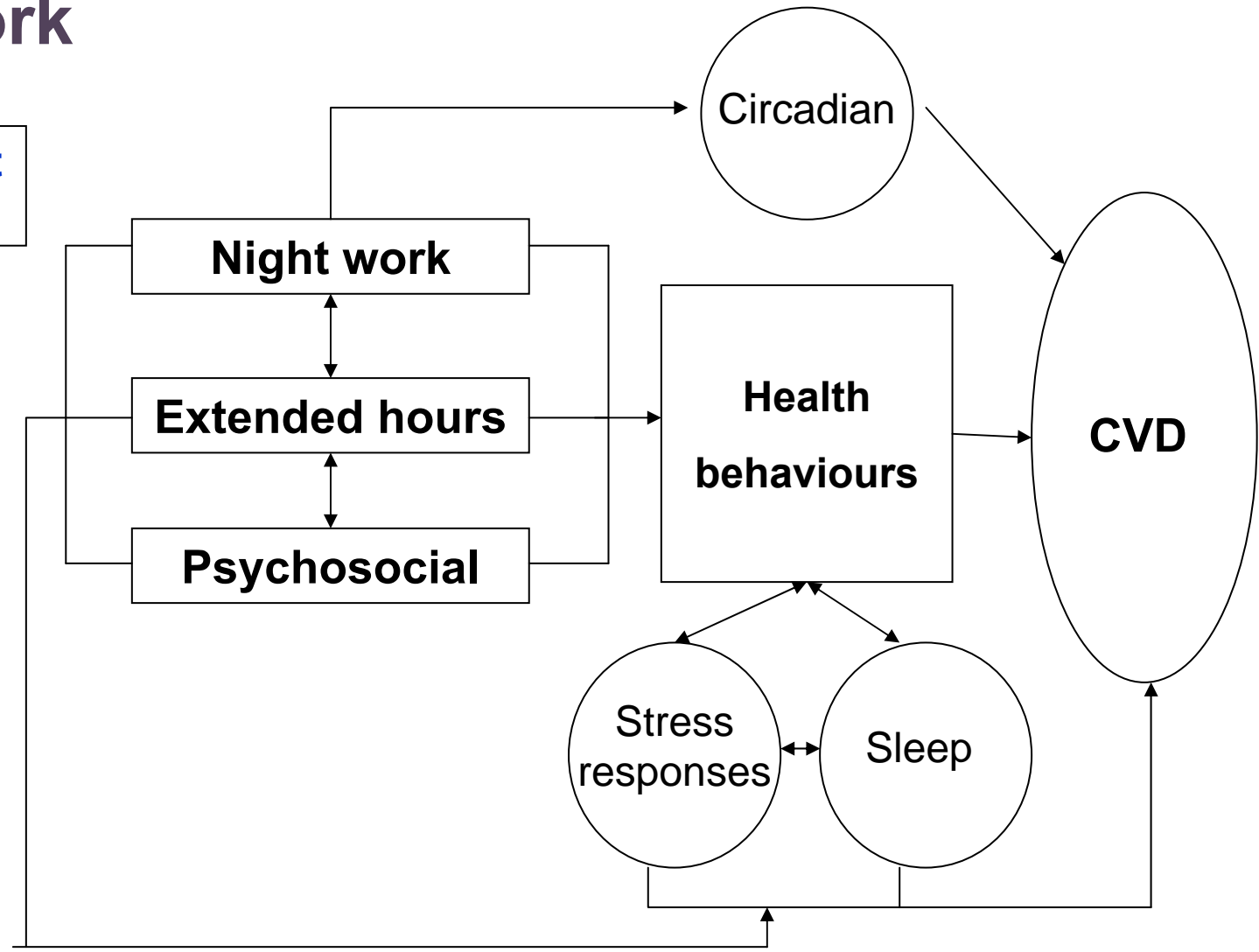
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Pre-employment factors:

- SEP
- Education
- Cognition
- Mental health
- Obesity
- Behaviours
- Prenatal



Project aims

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2. Do combinations of exposures to workplace factors (nights, long hours, work stress) carry particular risk for CVD?
3. **What are the causal mechanisms underlying the associations?**

1958 British birth cohort

- All births one week in March 1958
- England, Scotland and Wales
- ~17,000
- Follow-ups at 7y, 11y, 16y, 23y, 33y, 42y
- Clinical evaluation at 45y (MRC)
 - 9377/12069 (78%) eligible (i.e. alive and living in Britain)
 - Physical measurements (e.g. height, weight, BP, WC)
 - Blood collection (lipids, glucose, inflammatory)
 - Saliva samples: post-waking and 3hr cortisol levels

Shift work and CVD risk

Shift work and CVD risk

- **Is working outside the standard 8am-5pm day associated with risk factors for CVD in mid-adulthood?**
- **What are the causal mechanisms underlying the associations?**

Do health behaviours mediate the associations?

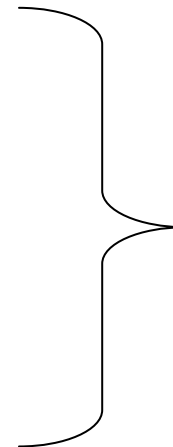
Shift work measurement

- “any regular employment outside the hours of 7am to 6pm”

Monk T & Folkard S. Making Shift Work Tolerable, 1992

- 1958 cohort reported frequency of working (42y) in their MAIN job:

- nights (between 10pm-4am)
- early mornings (4am-7am)
- evenings (6pm-10pm)
- weekends (Saturday or Sunday)



<p>Never</p> <p><1/month</p> <p>≥1/month</p> <p>≥1/week</p>
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Shift work

	Overall	Nights (2200-0400)	Mornings (0400-0700)	Evenings (1800-2200)	Weekends
MEN (n=4138)					
Any shift work	65.5				
Nights	16.0				
Mornings	18.7				
Evenings	53.8				
Weekends	32.8				
WOMEN (n=3696)					
Any shift work	45.0				
Nights	10.0				
Mornings	8.1				
Evenings	36.7				
Weekends	23.4				

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Any shift work	65.5	24.0	28.6	82.0	50.1
Nights	16.0	-	53.8	94.0	63.1
Mornings	18.7	45.9	-	72.3	53.5
Evenings	53.8	28.0	25.2	-	44.8
Weekends	32.8	30.8	30.6	73.5	-
WOMEN (n=3696)					
Any shift work	45.0	22.1	18.0	81.5	51.9
Nights	10.0	-	47.5	94.6	63.6
Mornings	8.1	58.3	-	76.7	54.3
Evenings	36.7	25.6	16.9	-	43.9
Weekends	23.4	27.1	18.9	69.0	-

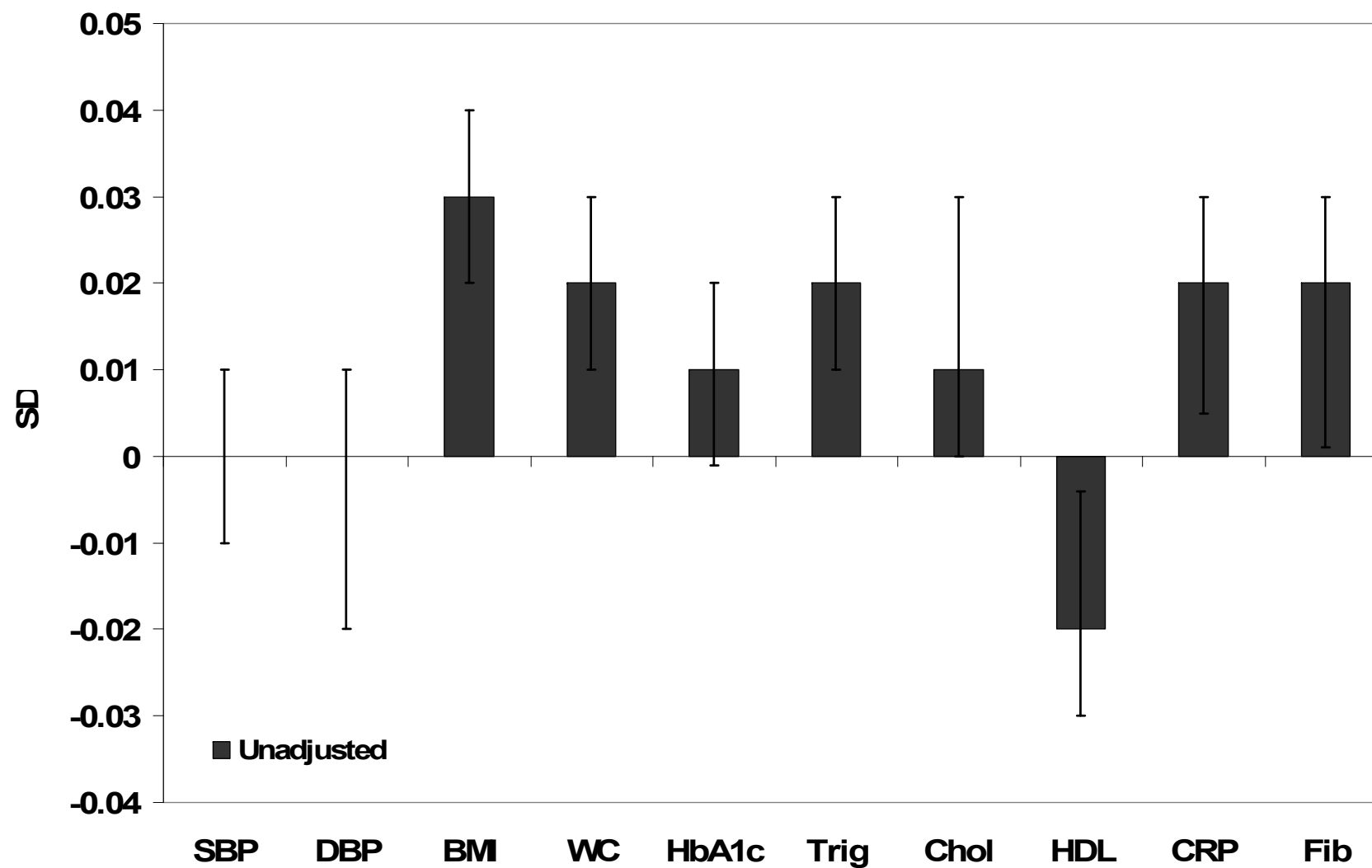
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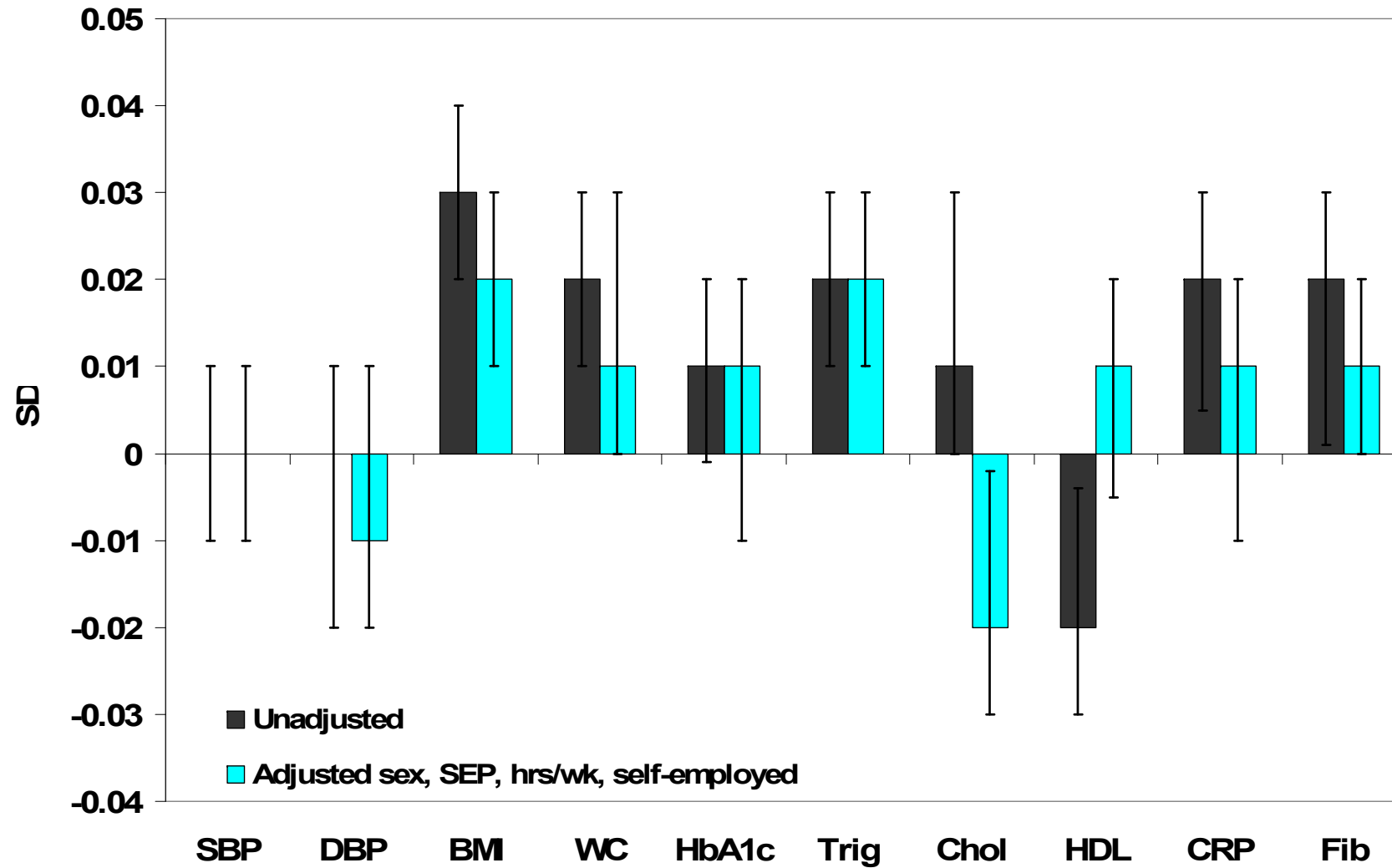
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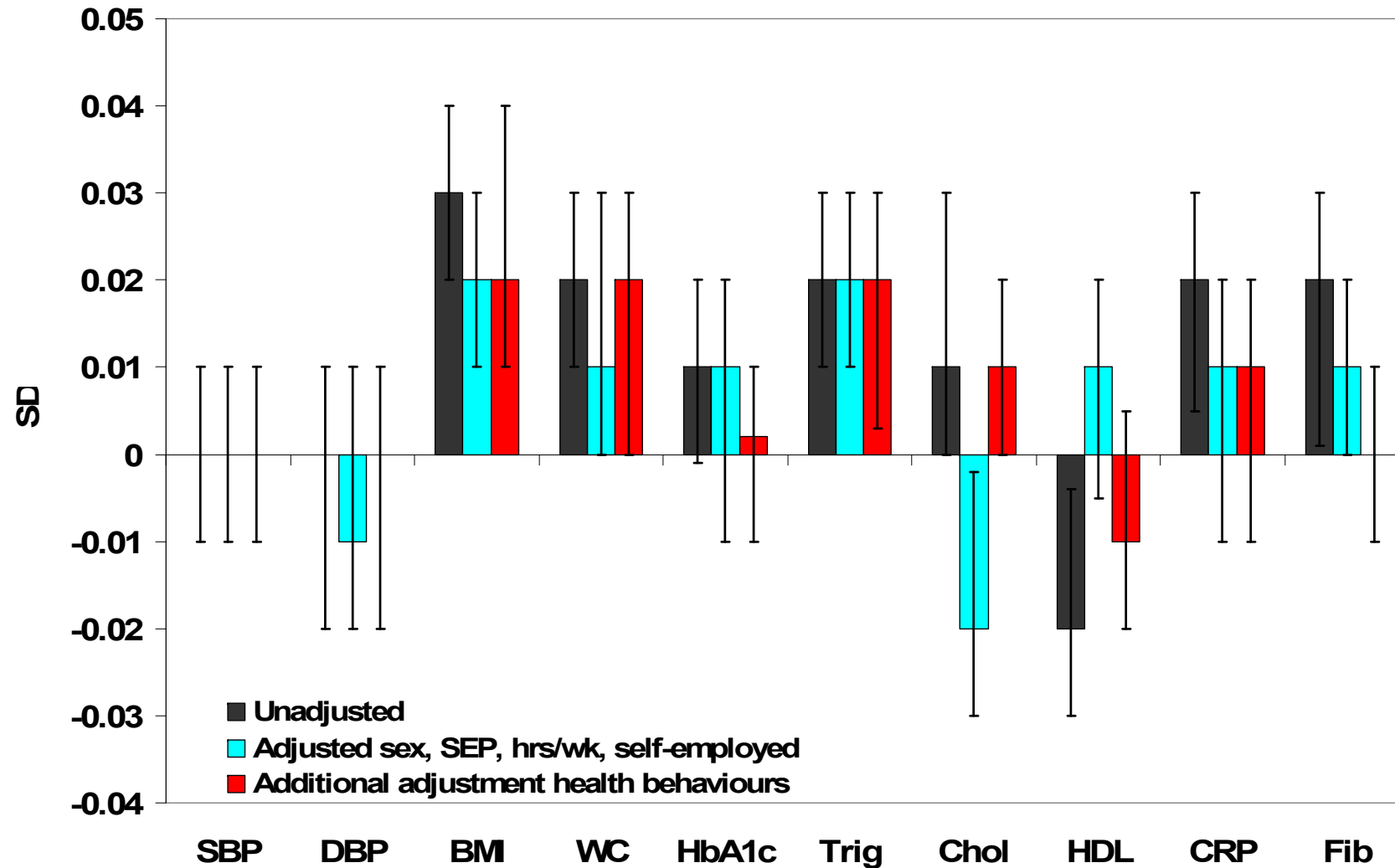
Night/morning work: SD change (95%CI)



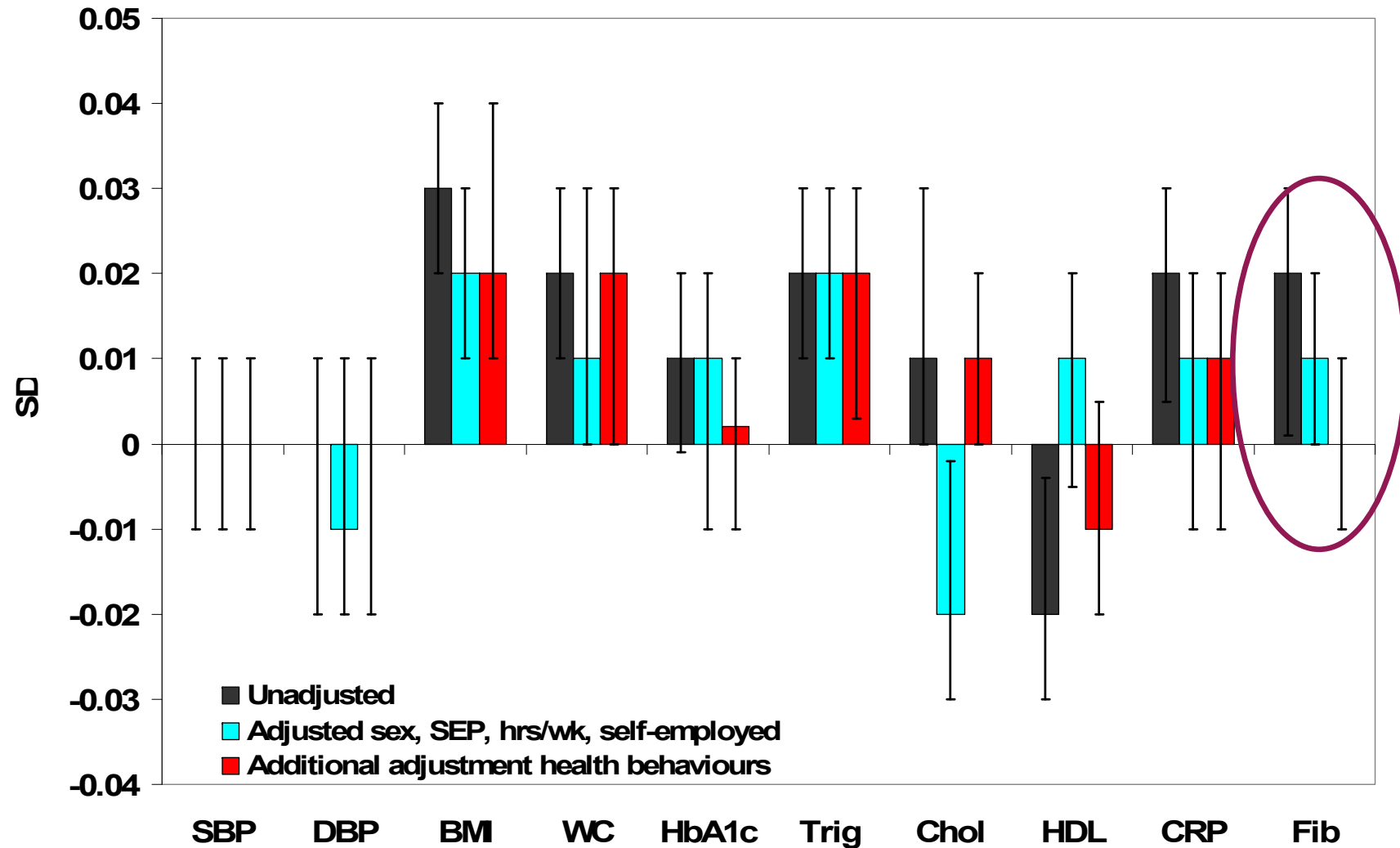
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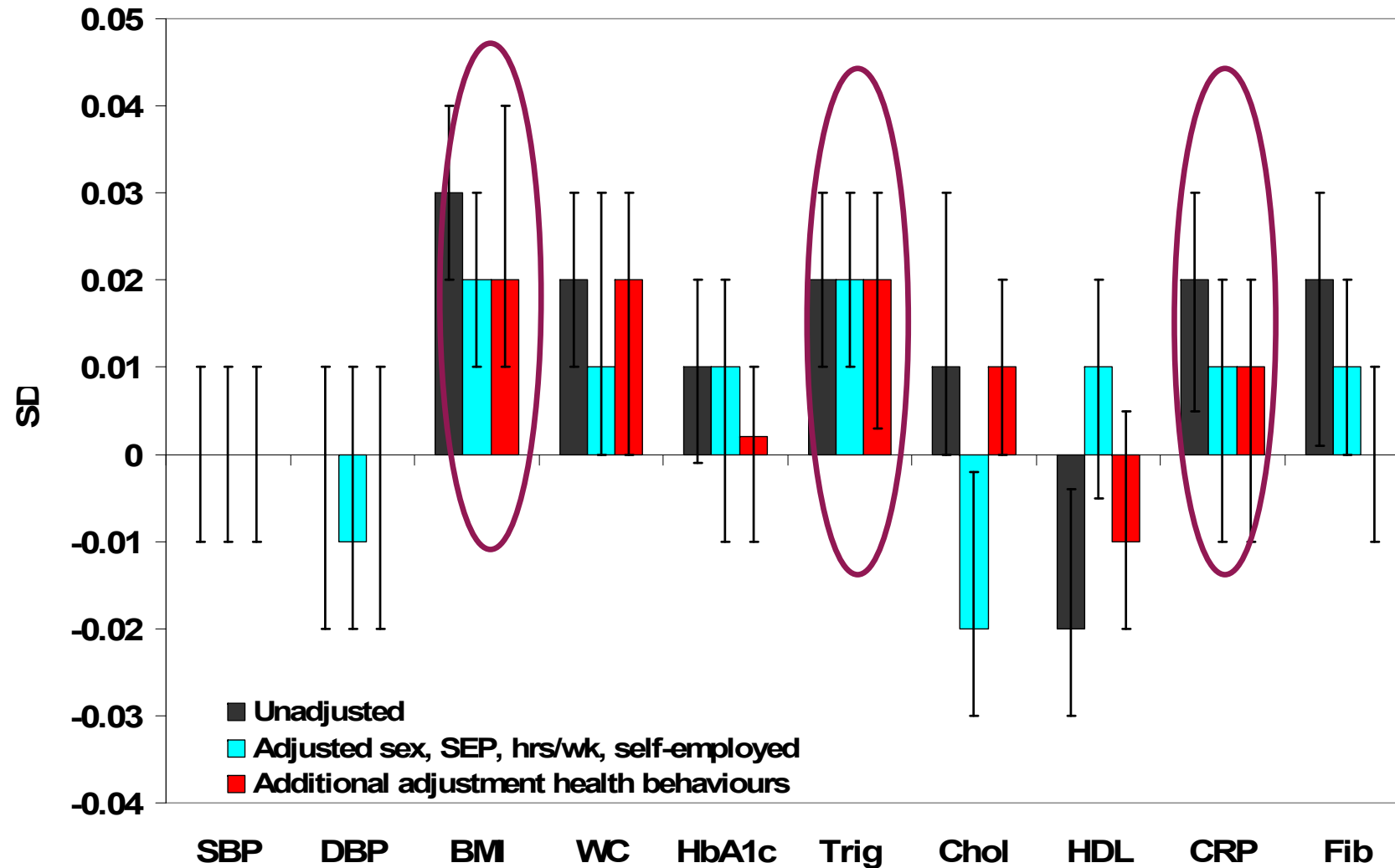
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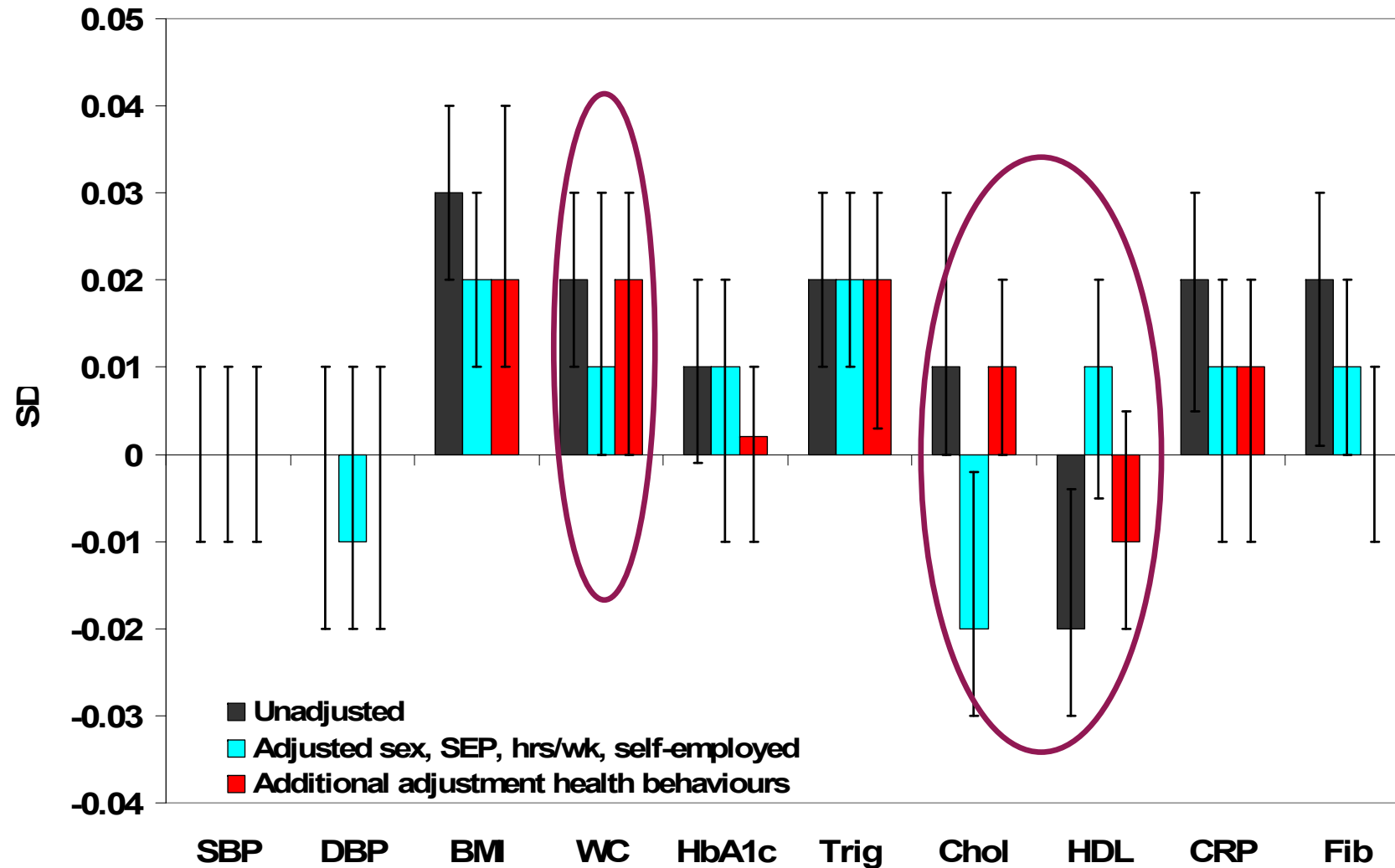
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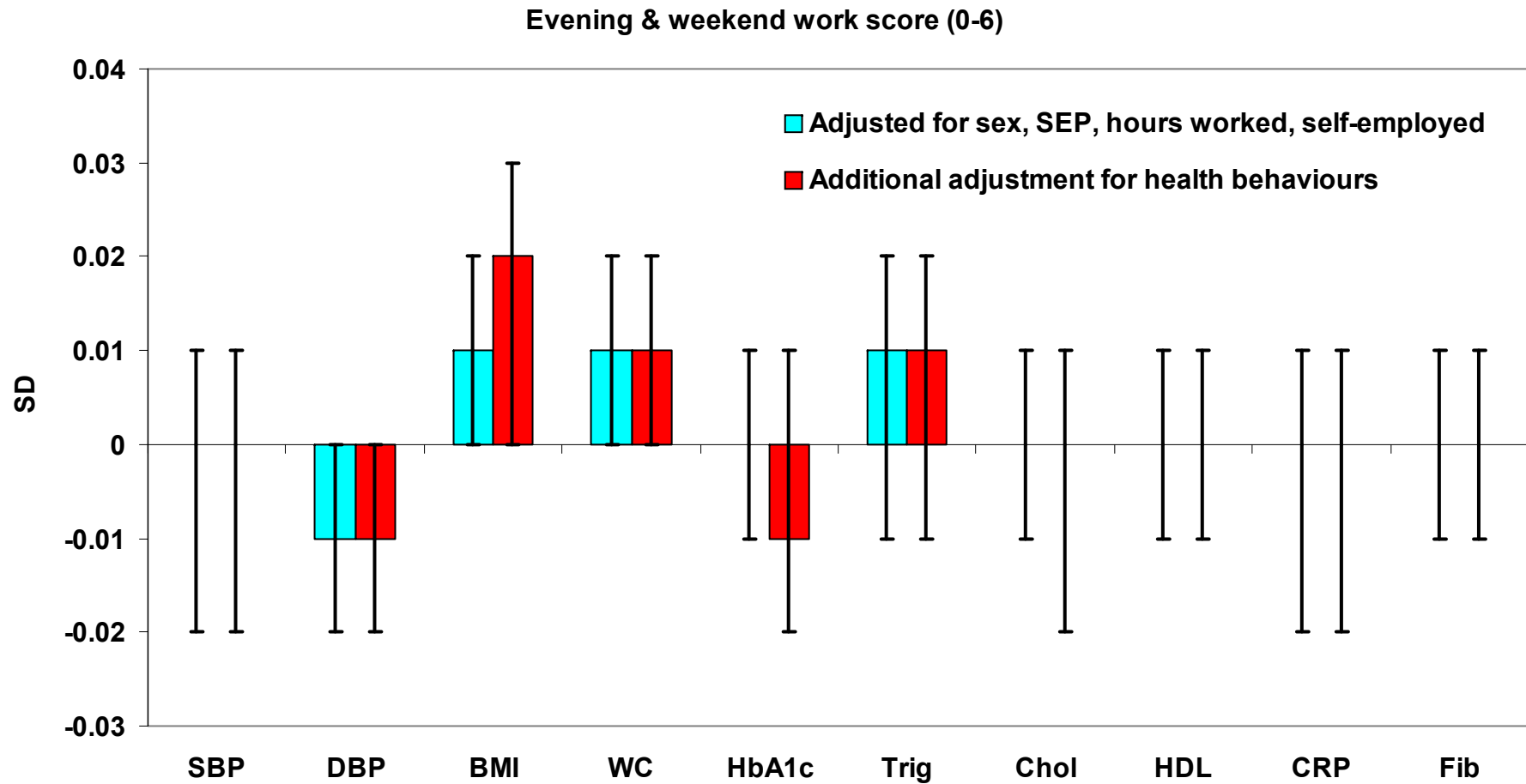
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Evening/weekend work: SD change (95%CI)



CVD risk associated with work factor combinations

- **Do combinations of exposures to workplace factors (nights, long hours, work stress) carry particular risk for CVD?**

Workplace inter-relationships (%)

	Nights: No/Yes	>48h/wk : N/Y	Low control: N/Y	High demands : N/Y	Job strain: N/Y
Nights >1/mth	-	17/37*	42/41	58/60	21/21
>48h/wk	-	-	48/24*	53/75*	22/15*
Low control	-	-	-	64/49*	-

Job strain=low job control and high demands

p<0.05

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Patterns of exposure at 45y, %

	MEN	WOMEN
None	34.8	56.5
Nights only	17.4	11.5
>48h/week only	15.0	4.9
Job strain only	7.6	19.2
Nights & >48h/week	14.6	3.2
Nights & job strain	5.5	3.2
>48h/week & job strain	2.2	0.8
All three	2.8	0.7

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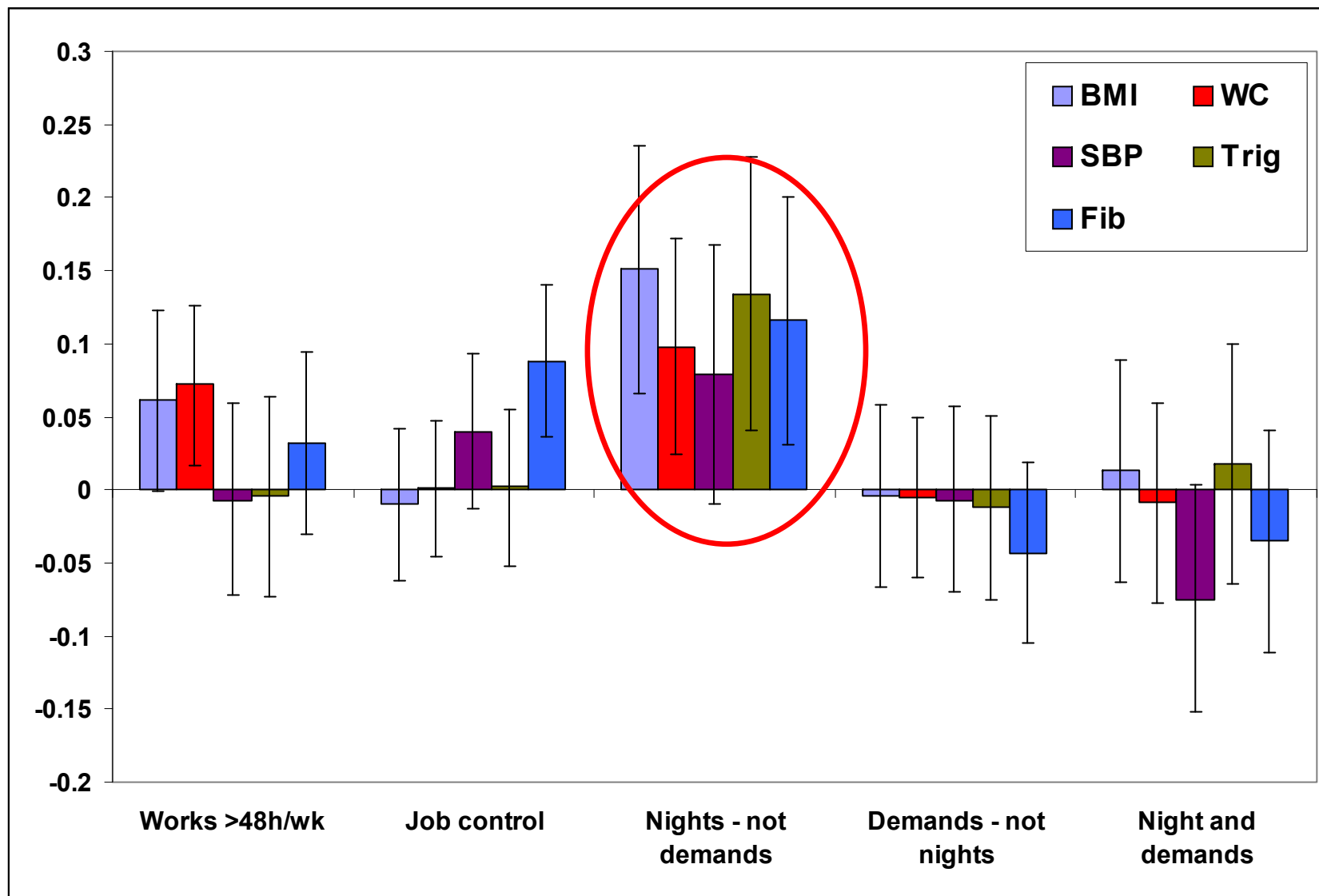
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HDL- cholesterol

- 3-way interaction: night, >48h/week, low control

	SD change (95%CI)
Nights only	-0.12 (-0.21, -0.02)
>48h/week only	0.01 (-0.09, 0.111)
Low control only	-0.03 (-0.10, 0.04)
Night + >48h/week	-0.06 (-0.16, 0.05)
Night + low control	-0.11 (-0.20, -0.01)
Hours and control	-0.32 (-0.48, -0.15)
All three	-0.03 (-0.18, 0.11)

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Cortisol

- Diurnal rhythm: post-waking peak (T1) and 3h later (T2)
- Can examine level and change
- Night work: increase overall (T1 and T2) secretion
- Night work *without* demands: increase T1
- Night work and low control: increased T2
- >48 hours: *lower* overall secretion for **MEN**

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- **Low job control:**
 - **Independently associated with blood glucose, fibrinogen**
 - **only in combination with nights or long hours for HDL**
 - **only in combination with nights for T2 cortisol**

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 - Only for jobs *without* high demands in some outcomes
 - Could be due to occupational, hence social gradients
 - Suggests not just circadian effects
- Low job control:
 - Independently associated with blood glucose, fibrinogen
 - only in combination with nights or long hours for HDL
 - only in combination with nights for T2 cortisol
- **Long hours: few findings**
 - **increased CRP: only in combination with strain**
 - **lower cortisol: men only**

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 - **circadian effects?**
 - **pre-existing risk?**

Overall conclusions

- Night workers at particular risk of CVD
 - dose-response relationship
 - not fully explained by health behaviours
 - neuro-endocrine effects (cortisol)
 - circadian effects?
 - pre-existing risk?
- **limitations to analysis:**
 - **cross-sectional**
 - **duration effects**
 - **other confounders e.g. occupation, pre-employment**
 - **other mediators e.g. sleep disturbances**

Acknowledgements

- **ESRC UPTAP Fellowship**
- **Professor Chris Power, ICH**
- **MRC – clinical investigation**
- **1958 cohort members**