Social determinants of sleep and circadian health

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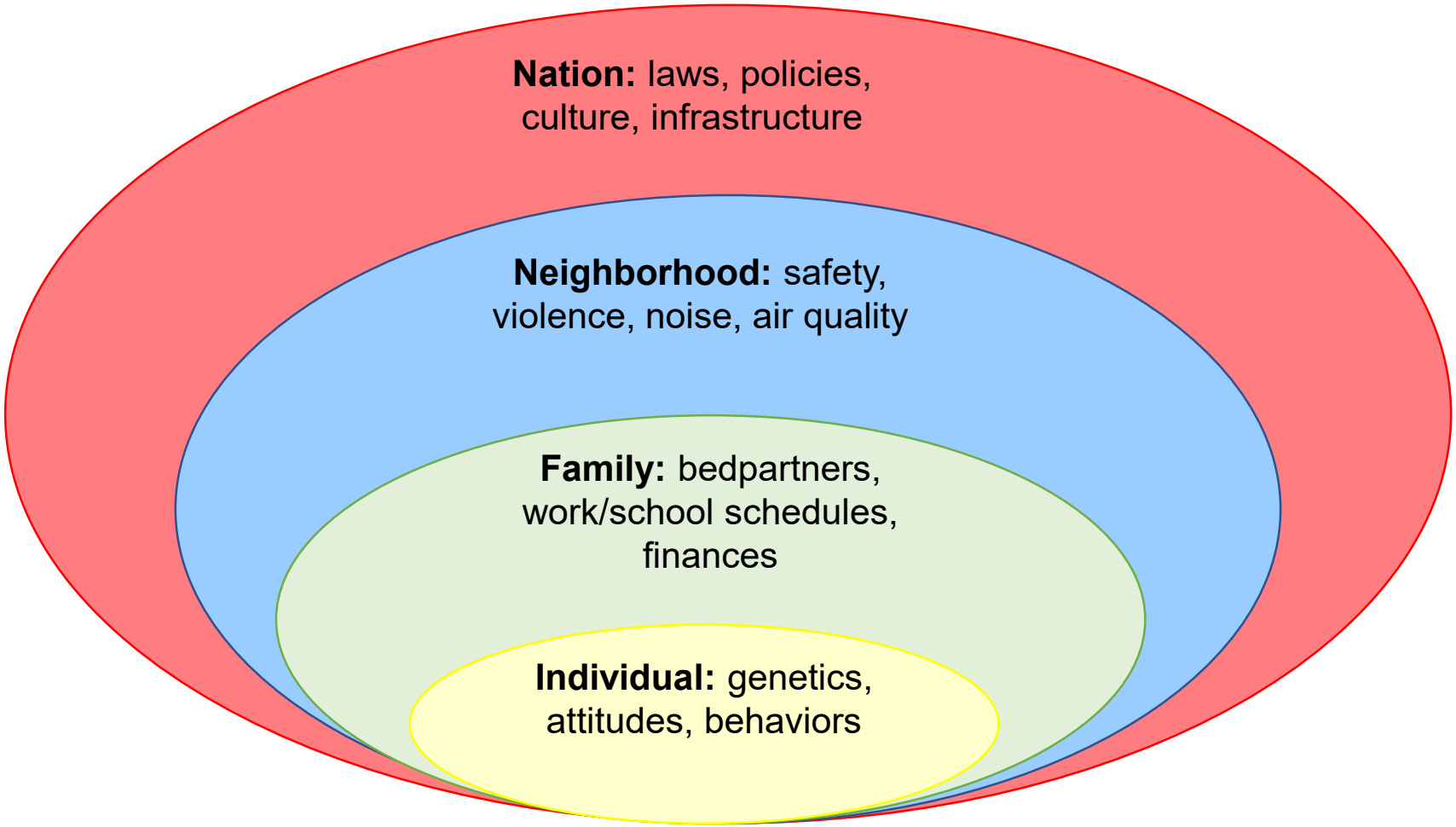
Buysse DJ et al, Sleep 2014; 37:9-17.

Socioecological model



Environment conducive to sleep

- Physical environment
  - Homelessness, housing quality
  - Light – devices, neighborhood, detention facilities
  - Temperature – heating/air conditioning
  - Noise – family members, traffic
  - Air pollution – sleep apnea
  - Pests – bedbugs, cockroaches
- Safe environment
  - Physical violence – homeless, prison, domestic abuse
  - Property loss – slums, homeless shelter, neighborhood crime

Geography and sleep

Data from 1990 National Health Interview Survey of 32,749 US adults

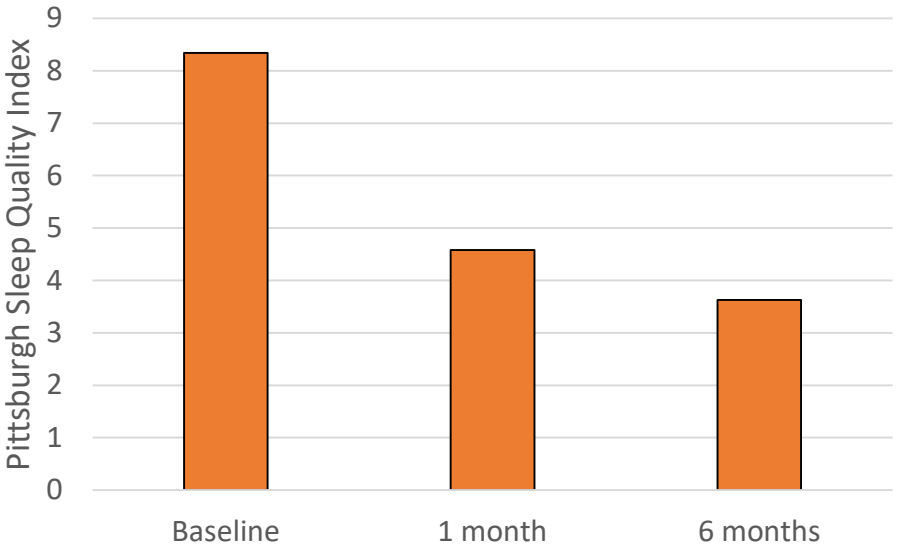
Location	Short sleep duration (≤ 6hrs)	Long sleep duration (≥ 9 hrs)
Rural (Non-MSA)	1.00	1.00
MSA, central-city > 1 million	1.43	0.84

Adjusted for age, gender, race, marital status, education, household income, household size, employment, stress, smoking, exercise, activity limitation, alcohol, weight, number of disability days in past year, residence type, region of US.

Hale L and Do D. Sleep 2007; 30:1096-103.

Effect of a Housing Intervention on Sleep

Buenos Aires slums



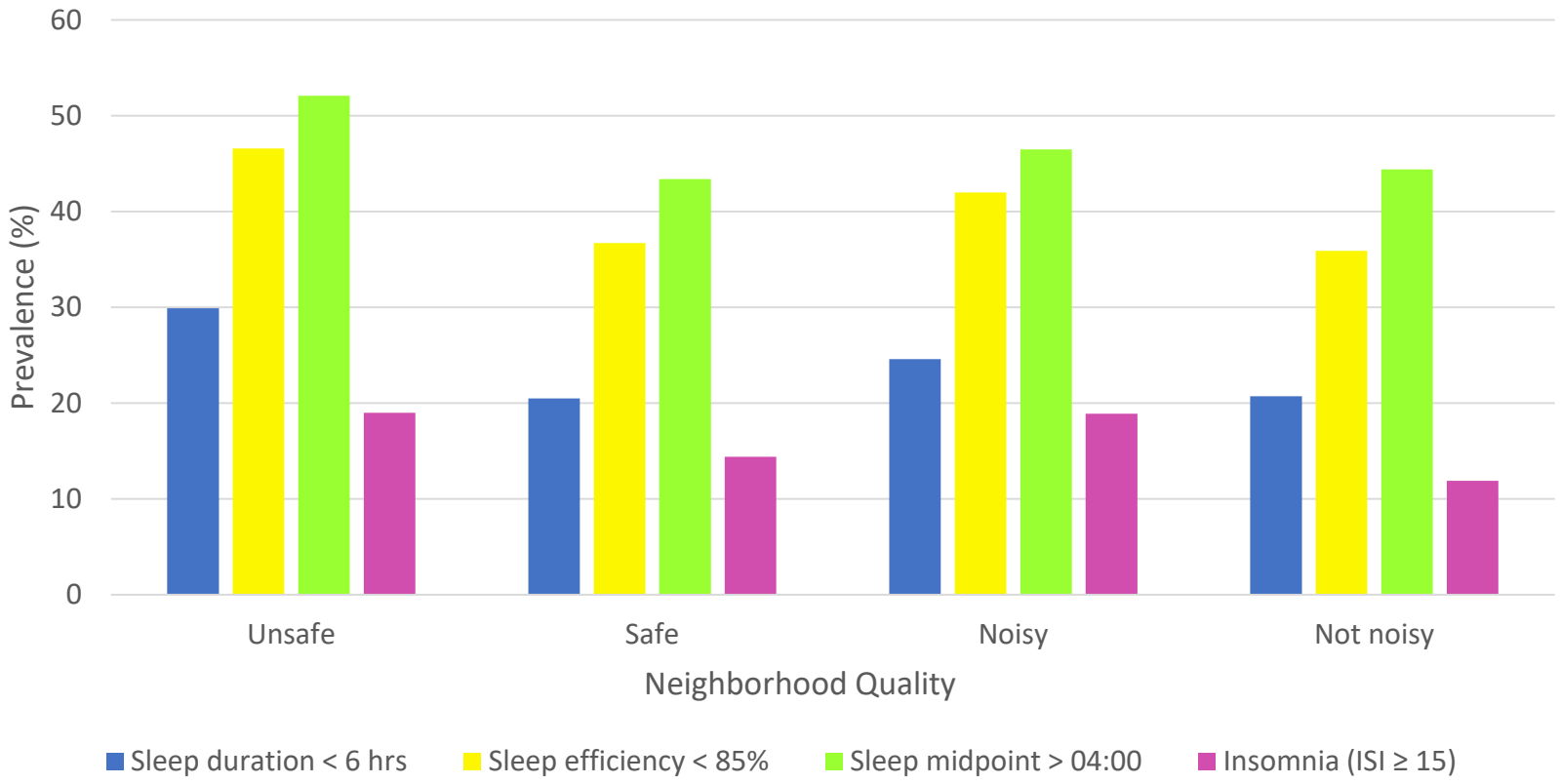
Qualitative Themes:

- Increased security from weather
- Decreased worry about loss of property
- Decreased worry about violence
- Increased hopefulness

Simonelli G et al. Sleep 2013; 36:1669-76.

Neighborhood and sleep

2156 middle-aged participants undergoing actigraphy in Hispanic Community Health Study



Analyses adjusted for age and sex.

Simonelli G et al. Sleep 2017;40:zsw025.

Traffic noise and sleep

- Acutely, noise during the sleep period interrupts sleep but there is habituation over time.
- However, habituation is incomplete.

Polysomnographic field studies of sleep continuity in long time residents near airports and railroad lines in Germany.

	Road traffic	Air traffic	Rail traffic
OR for sleep stage transition per 10 dBA	1.32 (1.15-1.50)	1.32 (1.19-1.47)	1.34 (1.19-1.51)

Odds ratio for transition to wake or N1 adjusting for age, sex, day of week, and time from sleep onset.

Basner M and McGuire S. IJERPH 2018; 15:519.

Social environment and sleep

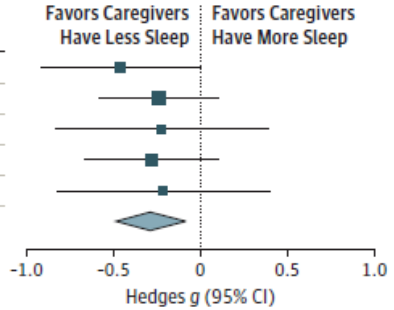
- Others in home / Household density
  - Dyssynchronous rhythms
  - Sleeping in living spaces
- Others in bed
  - Partner – reassurance / nuisance (e.g., snoring)
  - Child/sibling
  - Pet
- Caregiving responsibilities
  - Infant
  - Family member with chronic disease

Caregiving and sleep

Meta-analysis of sleep duration and quality in caregivers of patients with dementia

A Total sleep time

Source	Hedges *g* (95% CI)	Measure
Willette-Murphy et al,[24] 2006	-0.46 (-0.92 to 0.00)	Self-report
Kiecolt-Glaser et al,[33] 2011	-0.24 (-0.58 to 0.11)	Self-report
Sakurai et al,[39] 2015	-0.22 (-0.83 to 0.39)	Actigraphy
McKibbin et al,[20] 2005	-0.28 (-0.66 to 0.11)	PSG
Fonareva et al,[31] 2011	-0.21 (-0.82 to 0.40)	PSG
Overall	-0.29 (-0.48 to -0.09)	



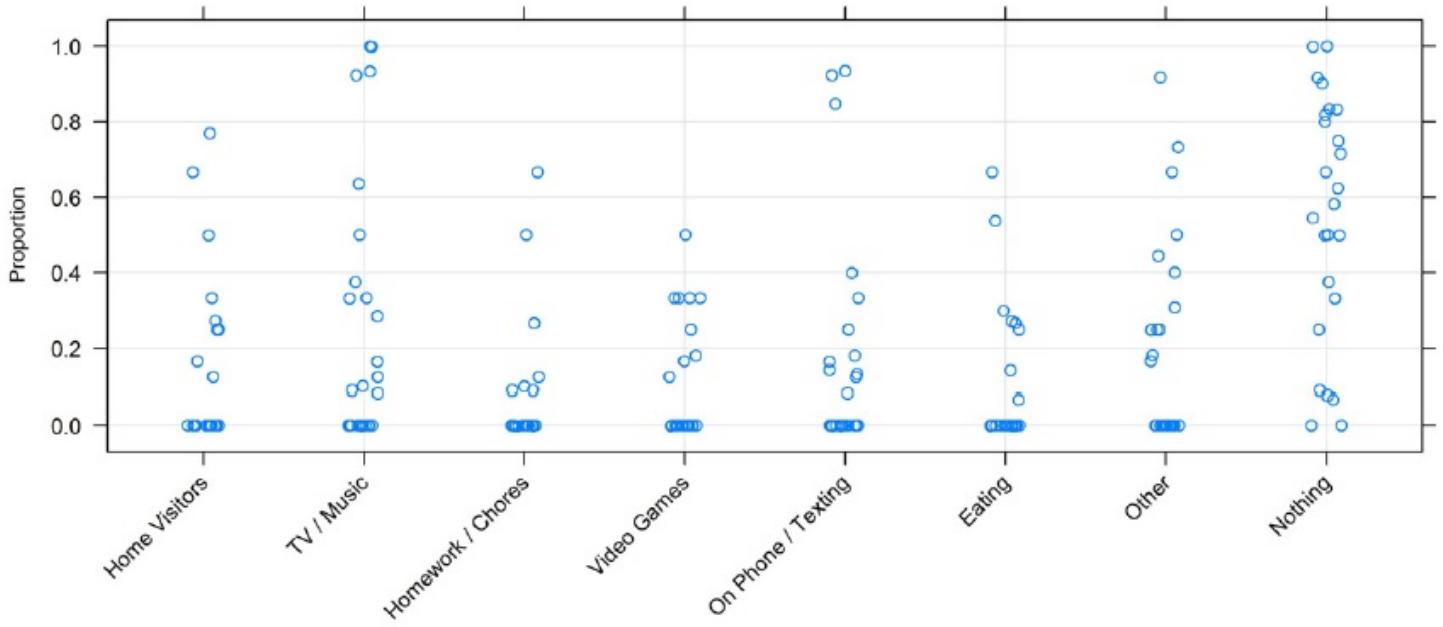
B Sleep quality

Source	Hedges *g* (95% CI)	Measure
McKibbin et al,[20] 2005	-0.18 (-0.57 to 0.20)	PSQI
Brummett et al,[22] 2006	-0.50 (-0.71 to -0.28)	PSQI
Fonareva et al,[31] 2011	-1.34 (-2.02 to -0.67)	PSQI
Kiecolt-Glaser et al,[33] 2011	-0.16 (-0.51 to 0.18)	PSQI
Oken et al,[6] 2011	-1.72 (-2.33 to -1.11)	PSQI
Cupidi et al,[34] 2012	-0.46 (-0.81 to -0.11)	PSQI
Sakurai et al,[39] 2015	-0.95 (-1.59 to -0.31)	PSQI
Caswell et al,[17] 2003	-0.49 (-0.87 to -0.10)	SPQ
Vitaliano et al,[21] 2005	-0.54 (-0.83 to -0.25)	PSDQ
Willette-Murphy et al,[24] 2006	-1.02 (-1.50 to -0.54)	MDSD
Overall	-0.66 (-0.89 to -0.42)	

Gao C et al. JAMA Network Open 2019:e199891.

Household chaos and sleep

Chaos OR 1.6 1.8 1.3 1.2 1.7 1.4 0.8 0.6



Item

1. There is very little commotion in our home
2. We can usually find things when we need them
3. We almost always seem to be rushed
4. We are usually able to stay on top of things
5. No matter how hard we try, we always seem to be running late
6. It's a real zoo in our home
7. At home we can talk to each other without being interrupted
8. There is often a fuss going on at our home
9. No matter what our family plans, it usually doesn't seem to work out
10. You can't hear yourself think in our home
11. I often get drawn into other people's arguments at home
12. Our home is a good place to relax
13. The telephone takes up a lot of our time at home
14. The atmosphere in our home is calm
15. First thing in the day, we have a regular routine at home

26 black 11-12 year-olds tracking sleep for 2 weeks.
Analyses adjusted for school/off night.

Spilsbury JC et al. Sleep Health 2017; 3:84-9.

Stress and sleep

Social stressors

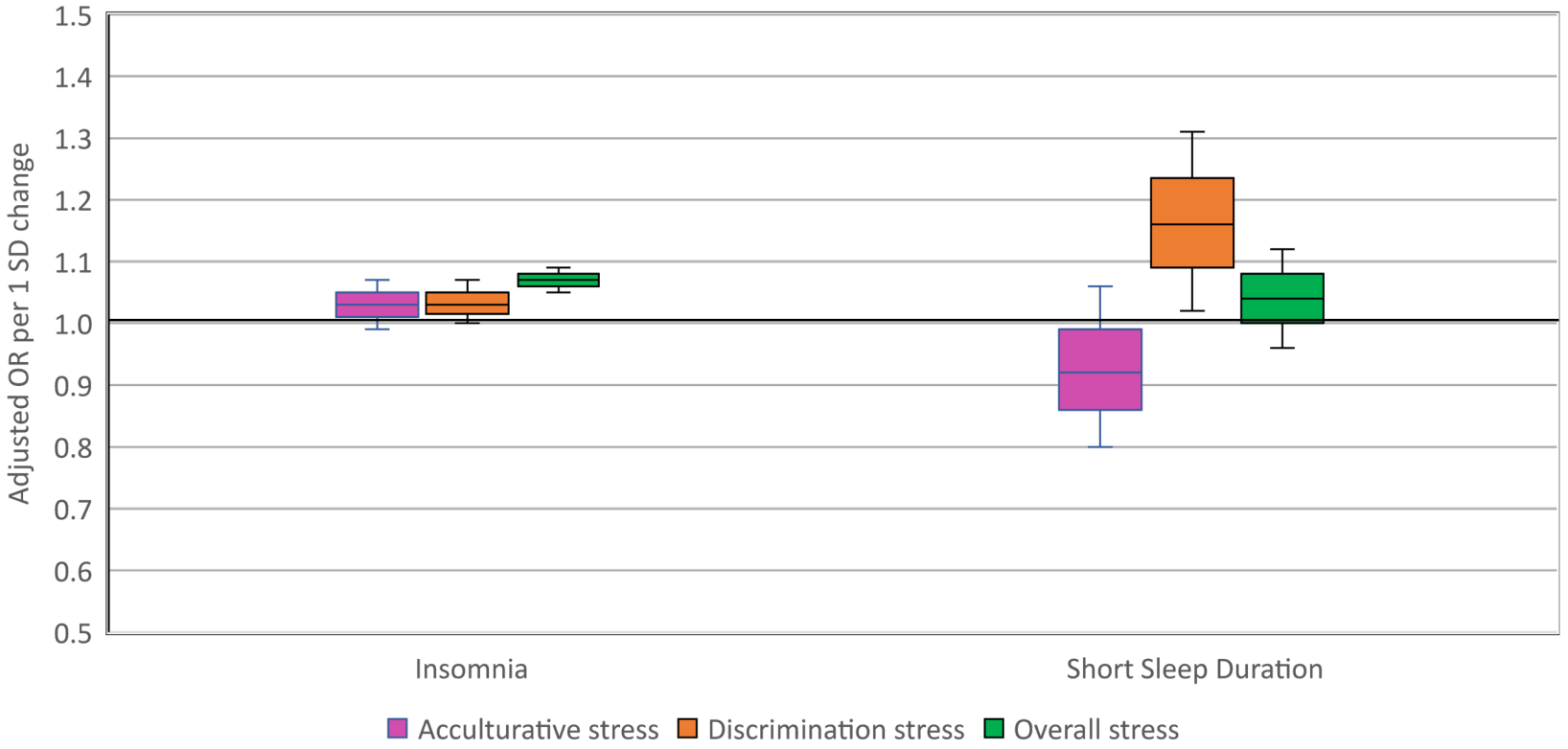
- Financial stress
- Job stress
- Discrimination stress
- Acculturative stress

Resiliency factors

- Social support

Stress sources and sleep

5313 Hispanic adults participating in the Hispanic Community Health Study



Analyses adjusted for age, sex, site, study site, background, nativity, income, education, BMI, hypertension, heart disease, lung disease, diabetes, alcohol, smoking, sleep apnea, depression, and other stresses.

Alcantara C et al. SSM Pop Health 2017; 3:713-21.

Work and sleep

- Work factors associated with sleep
  - Work hours
  - Work shift
  - Work autonomy
  - Work stress

- Unemployment associated with:
  - Longer sleep duration
  - Delayed timing
  - Decreased social jetlag (weekend/weekday variability)

Work hours and incident sleep disturbances

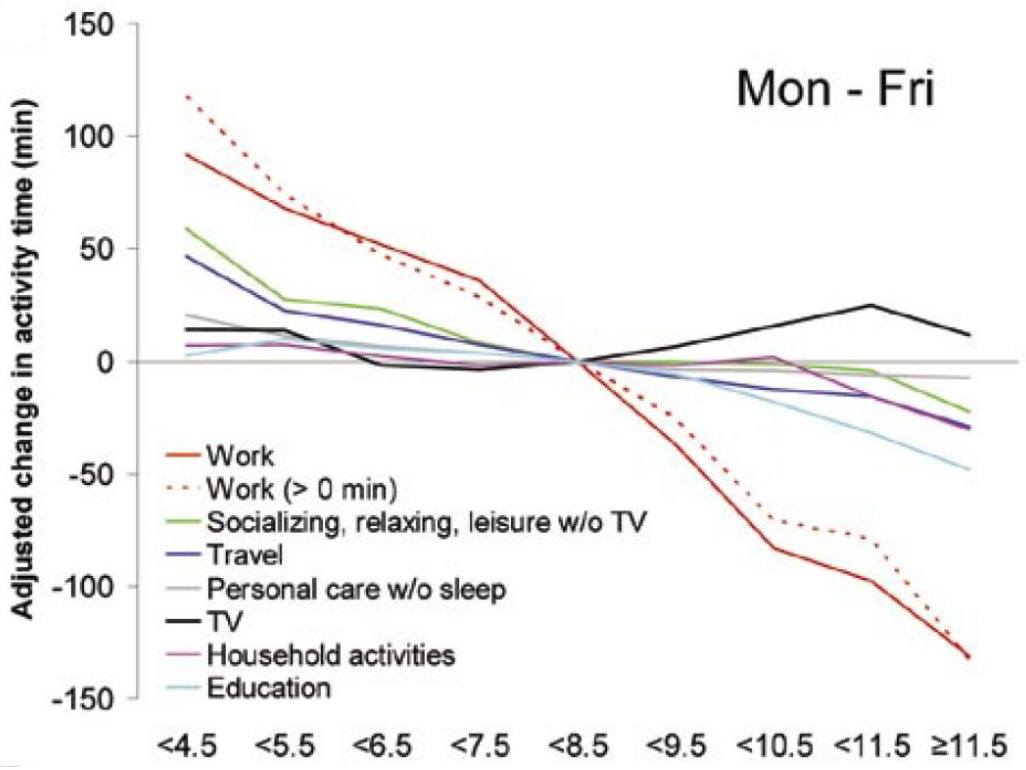
Whitehall II cohort of 900-1600 individuals with no prevalent sleep disturbance followed over 5 years for incident sleep problems.

Work hours	Short sleep (< 7 hrs)	Difficulty falling asleep	Early waking	Unrefreshing sleep
35-40	1.00	1.00	1.00	1.00
41-55	1.02	1.69	1.01	1.09
>55	1.76	4.12	1.44	1.82

Adjusted for age, sex, marital status, occupational grade, education, chronic illness, physical activity, body mass index, smoking, alcohol, and job demands.

Virtanen M et al. Sleep 2009; 32:737-45.

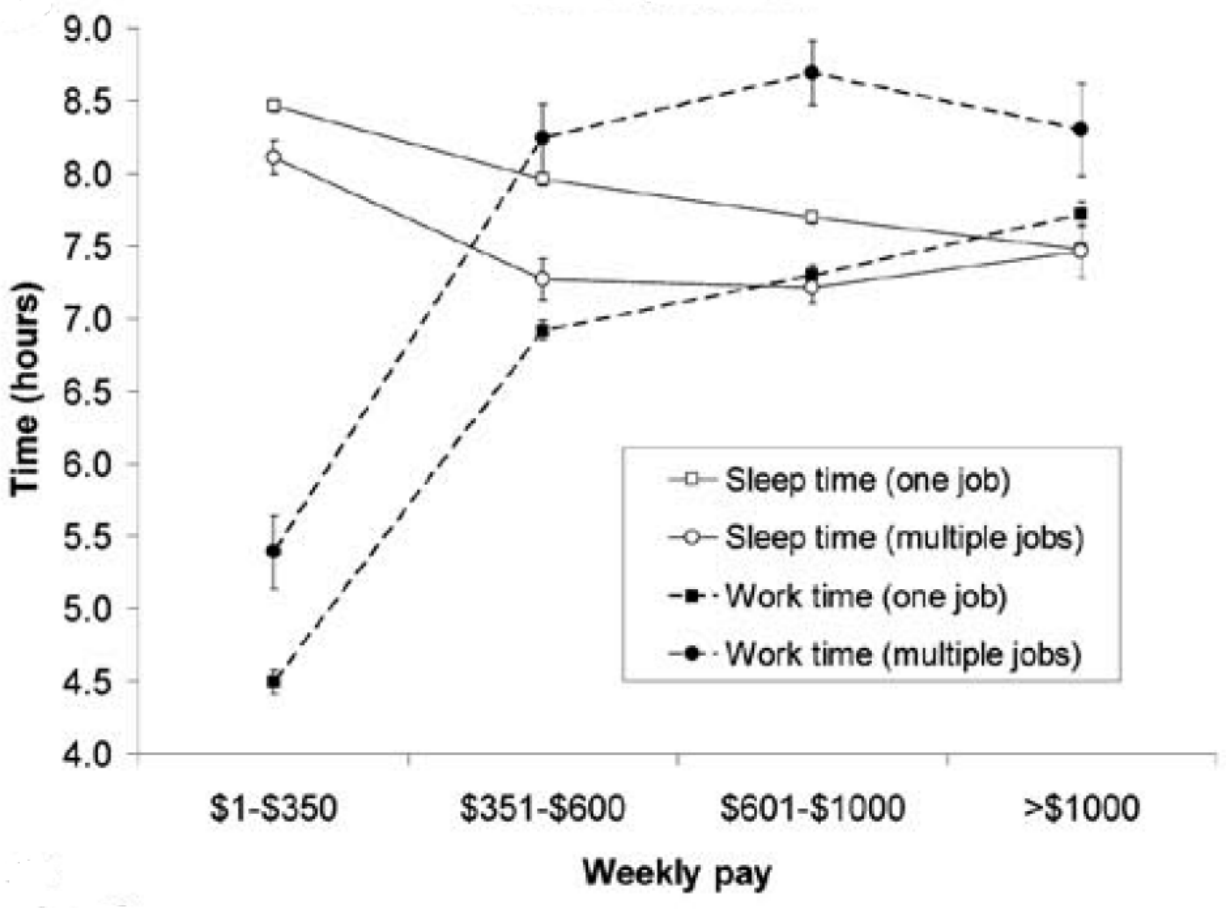
Time use surveys



Data from 24-hour recalls of 23,325 participants of American Time Use Survey 2003-2005 with analyses adjusted for age, sex, race, education, income, bedpartner, children.

Basner M et al. Sleep 2007; 30:1085-95.

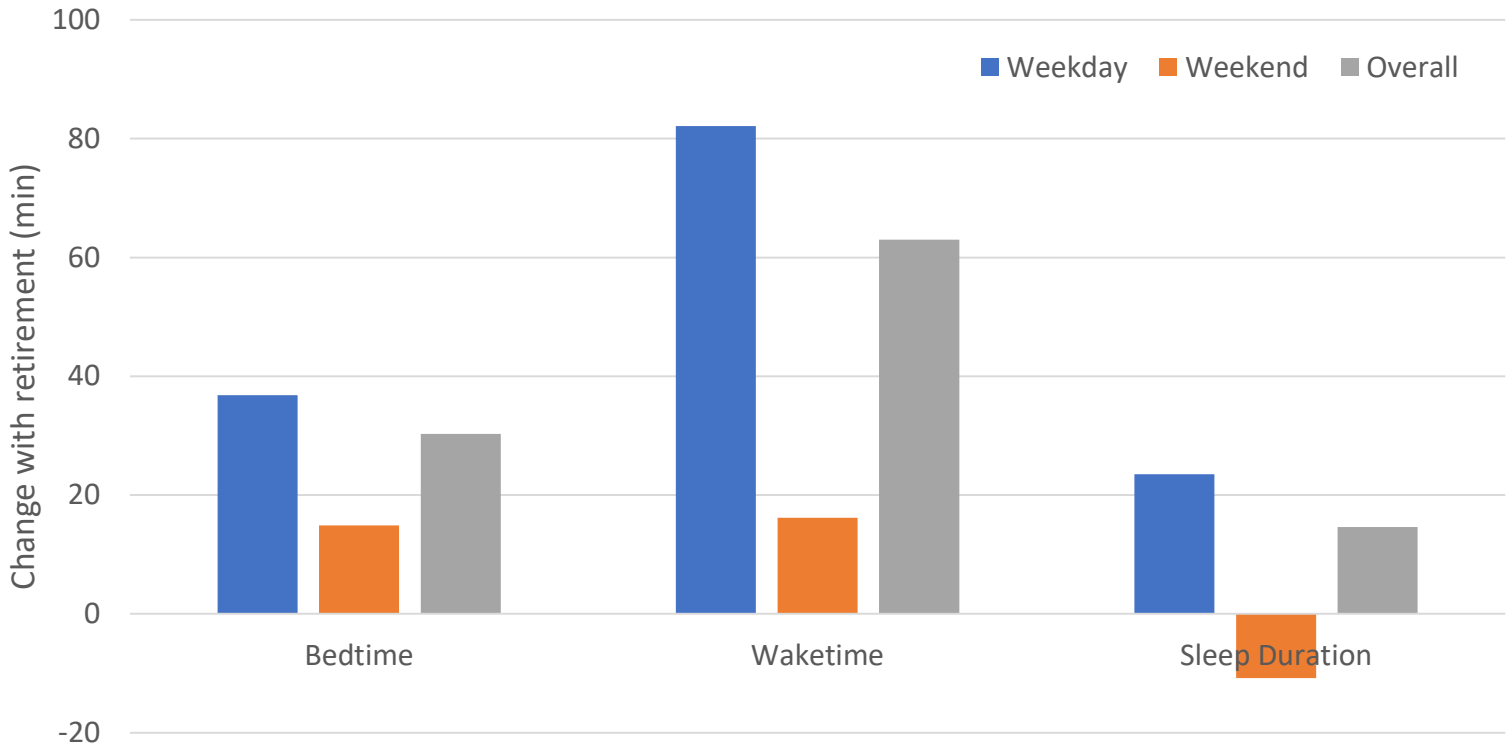
Income, work and sleep



Basner M et al. Sleep 2007; 30:1085-95.

Effect of retirement on sleep

Changes in self-reported sleep 1 year after retirement in 993 participants of Retirement and Sleep Trajectories (REST) cohort.



Adjusted for age, sex, health status, and circadian preference.

Hagen EW et al. Sleep 2016; 39:665-73.

Shiftwork and actigraphic sleep measures

1253 working adults undergoing actigraphy in the Hispanic Community Health Study

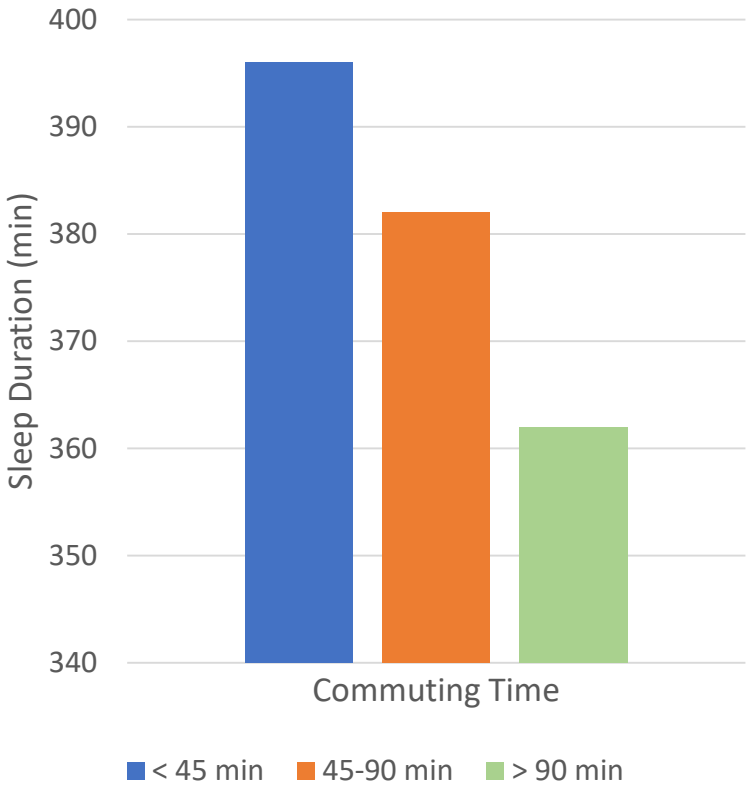
	Day (n=806)	Afternoon (n=128)	Night (n=74)	Split (n=68)	Irregular (n=130)	Rotating (n=47)
Sleep duration	6.7 hrs	6.7 hrs	6.1 hrs	6.7 hrs	6.5 hrs	6.6 hrs
Sleep midpoint	3:23 AM	4:34 AM	5:53 AM	4:17 AM	4:04 AM	4:19 AM
Interday stability	0.55	0.53	0.45	0.56	0.53	0.50
Napping	9 min	11 min	21 min	7 min	17 min	7 min

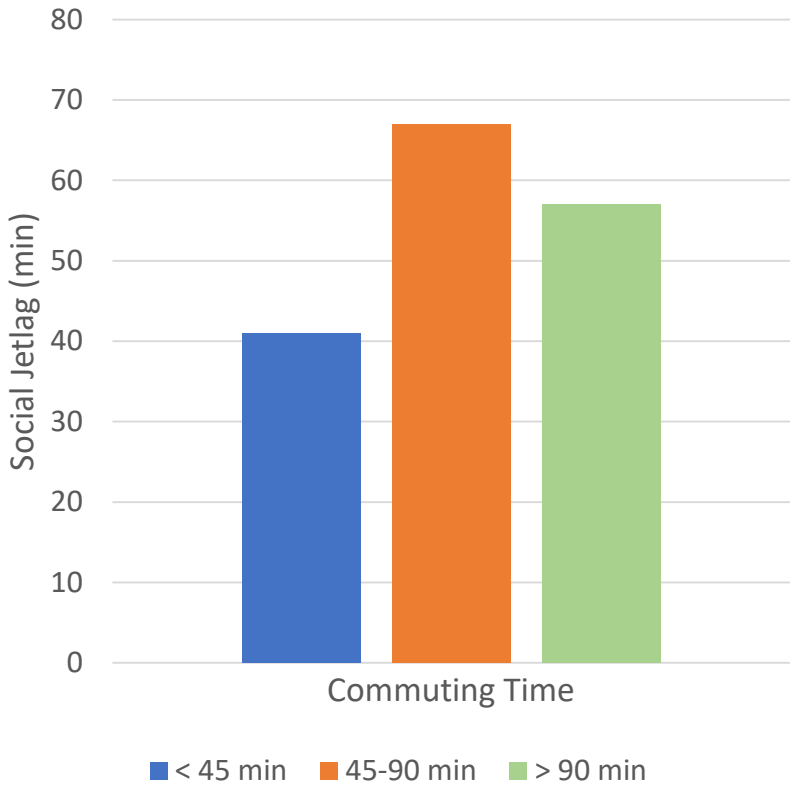
Analyses adjusted for age and sex.

Reid KJ et al. Sleep 2018; 41:zsy131.

Work commute and sleep

760 non-shift working adults undergoing actigraphy in the Hispanic Community Health Study





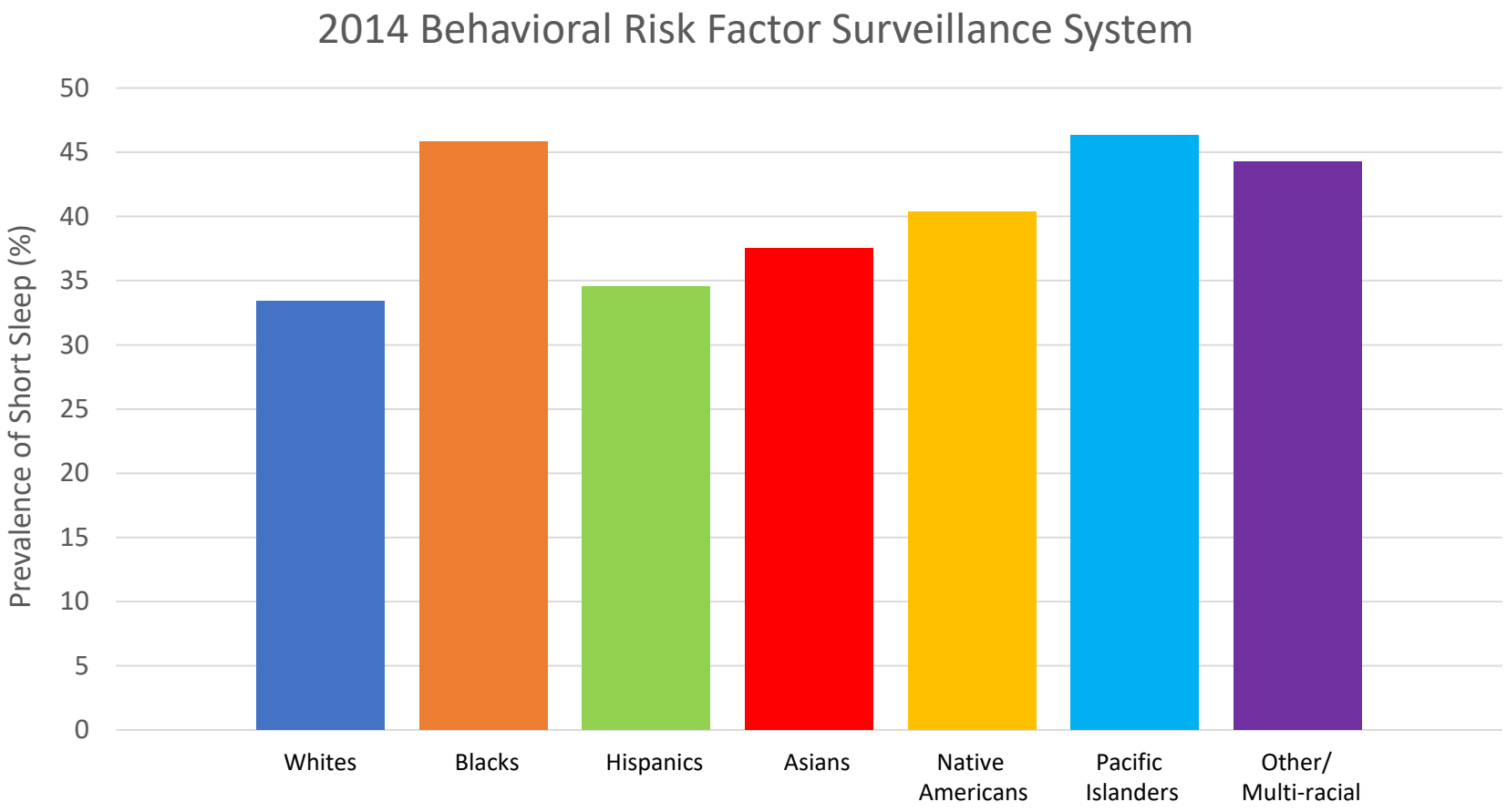
Analyses adjusted for age and sex.

Petrov M et al. Am J Prev Med 2018; 54:e49-57.

Access to sleep health care

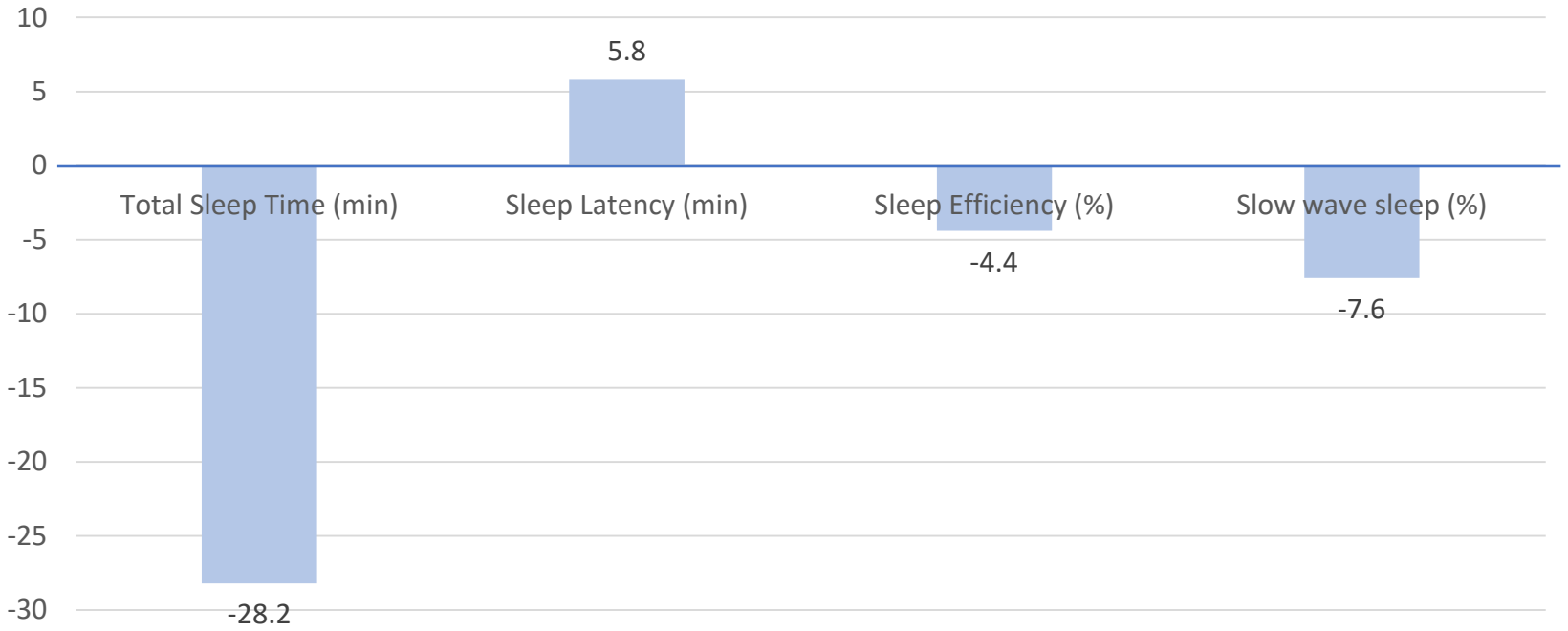
Disease	Care plan	Barriers	Solutions
Sleep Apnea	Sleep study CPAP titration study CPAP therapy	Sleeping in center Insurance coverage	Home testing and therapy
Insomnia	Cognitive behavioral therapy (CBT-I) by psychologist	Provider shortage Insurance coverage	Internet-based treatment

Race and sleep duration

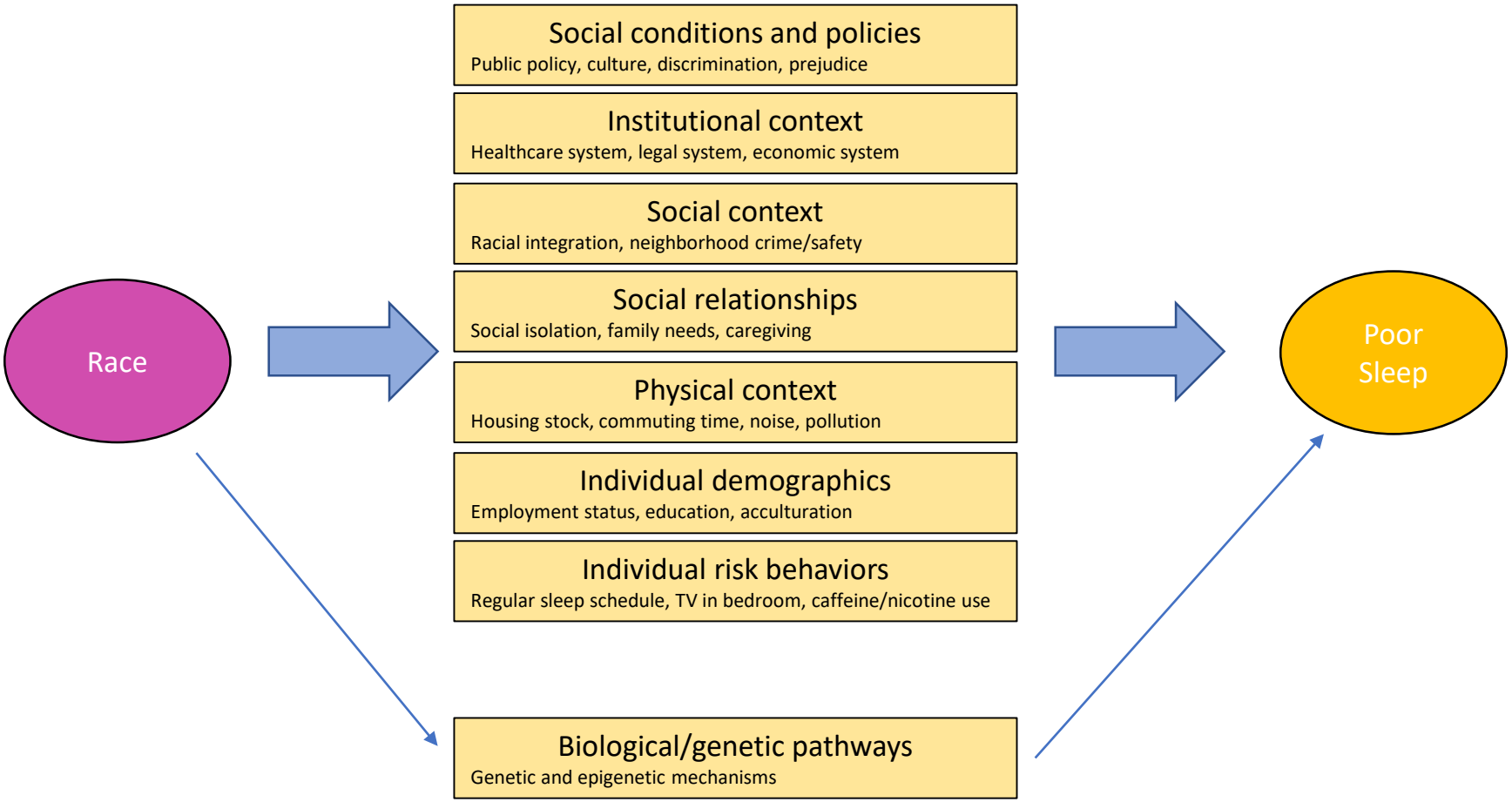


https://www.cdc.gov/sleep/data_statistics.html

Black – white differences in sleep

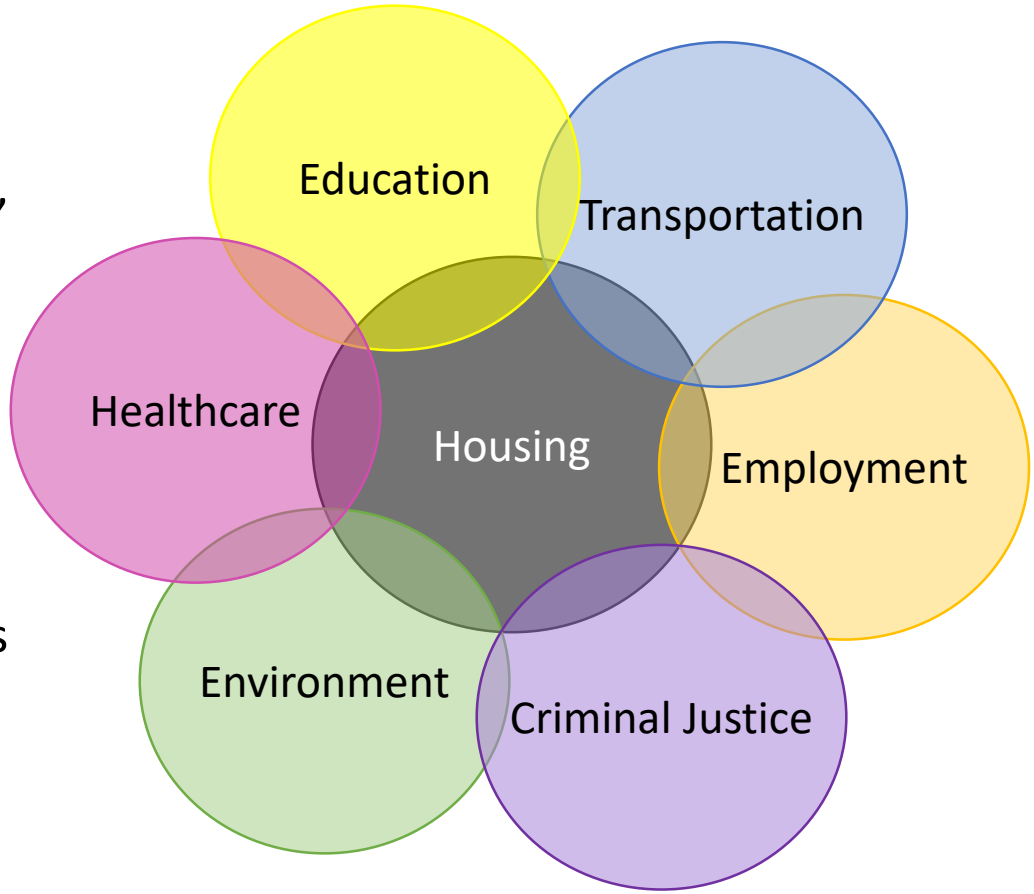


Ruiter ME et al, Sleep Med 2011; 12: 209-14.


Race
Social conditions and policies
Public policy, culture, discrimination, prejudice
Institutional context
Healthcare system, legal system, economic system
Social context
Racial integration, neighborhood crime/safety
Social relationships
Social isolation, family needs, caregiving
Physical context
Housing stock, commuting time, noise, pollution
Individual demographics
Employment status, education, acculturation
Individual risk behaviors
Regular sleep schedule, TV in bedroom, caffeine/nicotine use
Biological/genetic pathways
Genetic and epigenetic mechanisms
Poor Sleep

Structural racism

- “A system in which public policies, institutional practices, cultural representations and other norms work in various, often reinforcing ways to perpetuate racial group inequity.”
- Perpetuation of past inequities even if current policies and policy makers do not intend to be racist.



https://www.aspeninstitute.org/blog-posts/structural-racism-definition/

Sleep as a potential mediator of health disparities