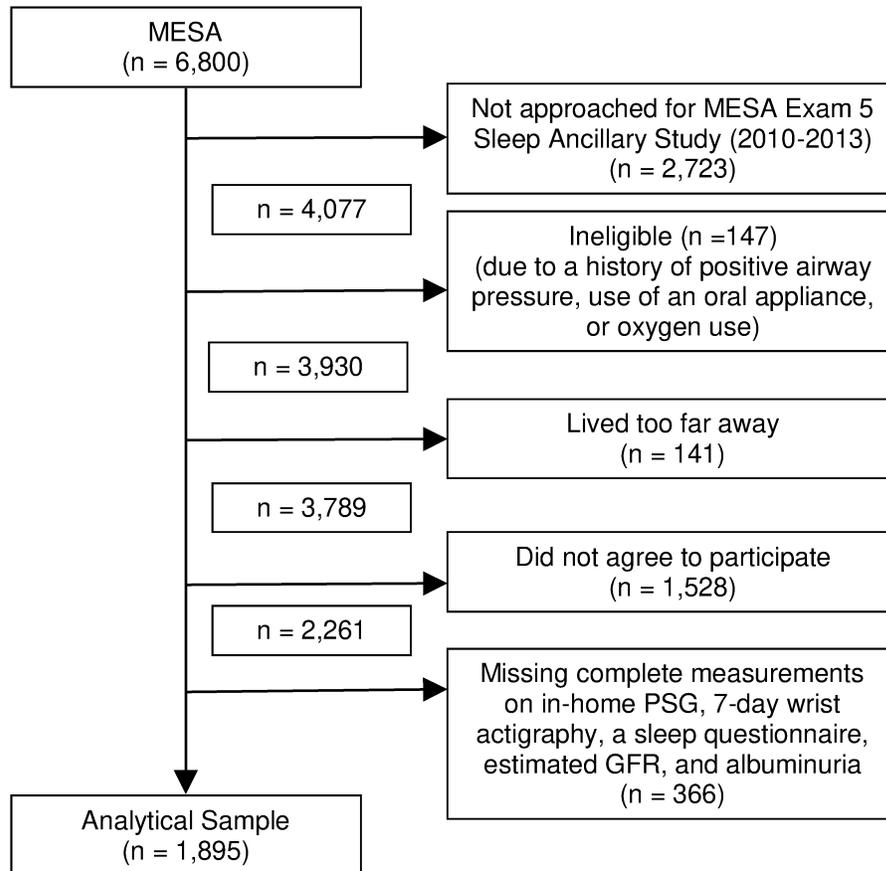


Supplemental Figure 1. Flow Chart Diagram of Final Analytic Sample Derivation

MESA = Multi-ethnic Study of Atherosclerosis; GFR = glomerular filtration rate

Supplemental Table 1. Comparison of MESA Sleep Ancillary Study Participants in Analyses (N=1,895), versus Other MESA Exam 5 Participants (N=2,479)

	Other Exam 5 Participants n=2,479 (56.7%)	Sleep Study Participants n=1,895 (43.3%)	p-value
Age, mean years ± SD	71.0 (9.6)	68.2 (9.1)	<0.0001
Mean age categories			
54 to 64 years	737 (29.7)	778 (41.1)	<0.001
≥65 years	1,742 (70.3)	1,117 (58.9)	
Sex/gender (female)	1,316 (53.1)	1,018 (53.7)	0.677
Race/ethnicity			
White	1,096 (44.2)	696 (36.7)	<0.001
Black	634 (25.6)	531 (28.0)	
Hispanic/Latino	473 (19.1)	453 (23.9)	
Asian	276 (11.1)	215 (11.4)	
Marital status			
Married/Living with Partner	1,375 (57.9)*	1,137 (61.3)	0.067
Widowed/Divorced/Separated	805 (33.9)*	584 (31.5)	
Never married	197 (8.3)*	134 (7.2)	
Educational attainment			
<High school	345 (13.9)	274 (14.5)	0.377
High School / GED	449 (18.1)	305 (16.1)	
Some college or technical degree	717 (29.0)	563 (29.8)	
≥College	964 (39.0)	749 (39.6)	
Total annual gross household income			
<\$25,000	655 (28.1)	481 (26.1)	0.411
\$25,000 - \$34,999	295 (12.6)	222 (12.1)	
\$35,000 - \$74,999	740 (31.7)	614 (33.3)	
≥\$75,000	645 (27.6)	526 (28.5)	
Employment (yes)	483 (19.9)	455 (24.1)	0.001
Smoking status			
Never	1,231 (51.2)	1,021 (54.6)	0.073
Former	990 (41.2)	728 (38.9)	
Current	182 (7.6)	122 (6.5)	
Current alcohol use			
Yes	1,049 (43.1)	831 (44.1)	0.524
Moderate/vigorous physical activity ^a			
Low	871 (36.0)	563 (29.9)	<0.001
Medium	807 (33.4)	618 (32.8)	
High	740 (30.6)	702 (37.3)	
Blood pressure categories (systolic/diastolic) ^b			
Optimal (<120 & < 80)	1,107 (46.2)	930 (49.1)*	0.001
Normal (<130 & <85) or High-Normal (130-139) or (85-89)	715 (29.9)	618 (32.6)*	
Stage 1 (140-159) or (90-99)	415 (17.3)	255 (13.5)*	
Stage 2 (160-179) or (100-109)	120 (5.0)	70 (3.7)*	
Stage 3 (≥180 or ≥110)	37 (1.6)	22 (1.2)*	
Diabetes ^c			
Normal: fasting plasma glucose (fpg) <100 mg/dl	1,411 (59.2)	1,144 (60.4)	0.739

Impaired Fasting Glucose: fpg=100–125 mg/dl	490 (20.6)	381 (20.1)	
Treated or untreated diabetes: fpg ≥ 126 mg/dl	482 (20.2)	370 (19.5)	
Cholesterol (mg/dL)			
Desirable (<200 mg/dL)	1,632 (68.7)*	1,278 (67.5)	0.668
Borderline high (200-239mg/dL)	573 (24.1)*	478 (25.2)	
High (≥240mg/dL)	169 (7.1)*	138 (7.3)	
Medication use			
Total number of medications, mean ± SD	4.9 (3.7)	4.6 (3.6)	0.0179
Diuretics (yes)	501 (20.3)	361 (19.1)	0.314
Lipid-lowering drugs (yes)	996 (40.3)	709 (37.4)	0.052
Anti-HTN (yes)	1,405 (56.9)	1,007 (53.1)	0.014
Cholesterol-lowering medications – visit 1 (yes)	409 (16.5)	296 (15.6)	0.434
Body Mass Index (kg/m²), mean ± SD	28.3 (5.7)	28.8 (5.6)	0.0051
Underweight (<18.5 kg/m ²)	29 (1.2)*	12 (0.6)	0.016
Normal (18.5-<25.0 kg/m ²)	705 (29.3)*	494 (26.1)	
Overweight (25.0-29.9 kg/m ²)	891 (37.0)*	716 (37.8)	
Obese (≥30 kg/m ²)	785 (32.6)*	672 (35.5)	
N (%) with moderate-to-severe CKD (GFR < 60 mL/ min/1.73 m ² or albuminuria ≥ 30 mg/g of creatinine)	649 (27.6)	380 (20.1)	<0.001
N (%) with CKD (GFR < 90 mL/ min/1.73 m ² , or albuminuria ≥ 30 mg/g of creatinine)	1,787 (75.2)	1,302 (68.7)	<0.001
N (%) with self-reported CKD	44 (1.8)	23 (1.2)	0.124

Data shown as mean ± standard deviations or n (%)

Note: CKD and moderate-to-severe CKD are not mutually exclusive

Abbreviations: MESA=Multiethnic Study of Atherosclerosis; CKD=Chronic Kidney Disease; SD=standard deviation;

*Rounded percentages do not add to 100.

^aBased on Physical Activity Guidelines for Americans by the U.S. Department of Health and Human Services

^bJNC VI Hypertension criteria (1979)

^c2003 ADA fasting criteria for diabetes

Supplemental Table 2. Prevalence Ratios (and 95% Confidence Intervals) of CKD and Moderate-to-Severe Chronic Kidney Disease for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA Sleep Ancillary Study, N=1,895

	Moderate-to-Severe Chronic Kidney Disease	Total N=1,895**	Race/ethnicity interaction p-value	White n=696 (37%)	Black n=531 (28%)	Hispanic /Latino n=453 (24%)	Chinese n=215 (11%)
Overall n (%) with CKD	CKD ^a	1,302 (68.7)		525 (75.4)	348 (65.5)	297 (65.6)	132 (61.4)
	Moderate/severe CKD ^a	380 (20.1)		132 (19.0)	117 (22.0)	89 (19.7)	42 (19.5)
Short vs. recommended sleep (actigraphy-measured) ^b	CKD	1.01 (0.95-1.07)	0.743	1.04 (0.96-1.13)	0.92 (0.80-1.06)	1.02 (0.89-1.16)	1.03 (0.84-1.25)
	Moderate/severe CKD	0.99 (0.81-1.20)	0.956	0.97 (0.71-1.32)	1.02 (0.71-1.48)	1.05 (0.70-1.57)	0.85 (0.47-1.51)
Very short (≤5 hours) ^b vs recommended sleep	CKD	0.97 (0.88-1.07)	0.911	0.98 (0.86-1.13)	0.94 (0.78-1.14)	0.94 (0.73-1.20)	1.05 (0.77-1.44)
	Moderate/severe CKD	1.40 (1.06-1.83)	0.810	1.16 (0.71-1.89)	1.50 (0.96-2.34)	1.72 (0.97-3.04)	1.19 (0.53-2.63)
Low sleep maintenance efficiency (<85%) ^c	CKD	0.92 (0.80-1.06)	0.080	1.01 (0.84-1.22)	0.86 (0.65-1.14)	0.68 (0.48-0.96)	1.38 (0.93-2.06)
	Moderate/severe CKD	0.89 (0.58-1.35)	0.238	1.38 (0.70-2.71)	1.17 (0.64-2.15)	0.44 (0.14-1.39)	0.34 (0.05-2.63)
Sleep fragmentation (>15%) ^d	CKD	1.00 (0.93-1.07)	0.342	0.95 (0.87-1.04)	1.10 (0.91-1.33)	0.98 (0.84-1.14)	1.07 (0.83-1.36)
	Moderate/severe CKD	1.05 (0.84-1.32)	0.822	1.08 (0.76-1.54)	1.22 (0.77-1.93)	1.00 (0.61-1.64)	0.82 (0.44-1.54)
Insomnia symptoms ^e	CKD	0.97 (0.92-1.03)	0.362	0.96 (0.88-1.04)	0.91 (0.80-1.04)	1.02 (0.90-1.16)	1.05 (0.86-1.29)
	Moderate/severe CKD	1.02 (0.85-1.23)	0.504	1.23 (0.90-1.66)	0.91 (0.65-1.28)	0.99 (0.68-1.44)	1.04 (0.58-1.88)
Obstructive sleep apnea ^f	CKD	1.04 (0.98-1.10)	0.768	1.02 (0.94-1.10)	1.04 (0.93-1.18)	1.05 (0.93-1.20)	1.05 (0.84-1.30)

	Moderate/severe CKD	1.20 (1.00-1.44)	0.815	1.22 (0.89-1.66)	1.30 (0.94-1.79)	1.01 (0.68-1.49)	1.44 (0.80-2.59)
Sleep apnea-specific hypoxic burden (SASHB): % min/hour ^g (quintile 1 [0.02 – 16.24] is reference)							
Quintile 2 [16.25 – 29.29]	CKD	1.01 (0.92-1.12)	0.383	1.09 (0.94-1.26)	1.01 (0.84-1.22)	0.94 (0.73-1.20)	0.92 (0.63-1.35)
	Moderate/severe CKD	0.99 (0.72-1.36)	0.867	0.79 (0.46-1.35)	1.23 (0.73-2.07)	0.99 (0.50-1.96)	0.80 (0.22-2.83)
Quintile 3 [29.30 – 47.65]	CKD	1.07 (0.97-1.18)	see above, Quintile 2	1.05 (0.91-1.22)	1.01 (0.83-1.22)	1.10 (0.88-1.36)	1.30 (0.95-1.77)
	Moderate/severe CKD	1.20 (0.88-1.63)		0.84 (0.49-1.43)	1.45 (0.87-2.43)	1.13 (0.61-2.11)	1.84 (0.66-5.13)
Quintile 4 [47.66 – 84.23]	CKD	1.03 (0.93-1.14)		1.06 (0.92-1.23)	0.98 (0.81-1.19)	1.10 (0.89-1.38)	0.89 (0.60-1.32)
	Moderate/severe CKD	1.24 (0.92-1.69)		1.14 (0.69-1.89)	1.49 (0.90-2.48)	0.79 (0.39-1.60)	1.92 (0.65-5.70)
Quintile 5 [>84.24 – 1099.61]	CKD	1.10 (0.99-1.21)		1.06 (0.92-1.24)	1.18 (0.99-1.42)	1.08 (0.87-1.35)	1.04 (0.73-1.48)
	Moderate/severe CKD	1.36 (1.00-1.86)		1.15 (0.67-1.96)	1.60 (0.92-2.77)	1.09 (0.57-2.07)	2.16 (0.78-5.96)
Box-cox normalized SASHB ^h	CKD	1.01 (1.00-1.03)	0.675	1.00 (0.98-1.03)	1.02 (0.99-1.05)	1.02 (0.99-1.06)	0.99 (0.94-1.04)
	Moderate/severe CKD	1.06 (1.02-1.12)	0.707	1.04 (0.96-1.14)	1.07 (0.99-1.15)	1.05 (0.95-1.16)	1.18 (1.02-1.35)
Sleep apnea plus highest quintile SASHB ⁱ	CKD	1.07 (0.99-1.15)	0.512	1.01 (0.91-1.12)	1.17 (1.00-1.37)	1.06 (0.90-1.24)	1.05 (0.82-1.36)
	Moderate/severe CKD	1.28 (1.01-1.63)	0.982	1.29 (0.86-1.93)	1.39 (0.88-2.20)	1.08 (0.67-1.75)	1.67 (0.84-3.32)
Short sleep plus insomnia symptoms ^j	CKD	0.98 (0.90-1.06)	0.506	1.01 (0.89-1.13)	0.85 (0.71-1.03)	1.01 (0.84-1.22)	1.12 (0.84-1.50)
	Moderate/severe CKD	0.98 (0.75-1.28)	0.593	1.15 (0.74-1.81)	0.94 (0.56-1.57)	1.00 (0.59-1.71)	0.94 (0.45-1.97)

Short sleep plus low sleep maintenance efficiency ^k	CKD	0.95 (0.82-1.12)	0.328	1.13 (0.95-1.34)	0.82 (0.60-1.11)	0.72 (0.49-1.06)	1.45 (0.89-2.38)
	Moderate/severe CKD	1.01 (0.65-1.56)	0.527	1.70 (0.86-3.33)	1.23 (0.63-2.38)	0.56 (0.17-1.80)	0.38 (0.05-2.90)
Sleep apnea and fragmentation ^l	CKD	1.06 (0.96-1.17)	0.494	0.98 (0.87-1.10)	1.23 (0.95-1.61)	1.04 (0.82-1.32)	1.17 (0.83-1.64)
	Moderate/severe CKD	1.26 (0.92-1.72)	0.980	1.26 (0.79-2.03)	1.66 (0.90-3.05)	1.01 (0.49-2.11)	1.17 (0.49-2.78)
“Suboptimal” sleep ^m	CKD	1.02 (0.94-1.12)	0.659	1.03 (0.92-1.16)	0.92 (0.78-1.10)	1.08 (0.85-1.38)	1.08 (0.73-1.59)
	Moderate/severe CKD	1.14 (0.85-1.53)	0.896	1.14 (0.74-1.77)	1.15 (0.68-1.96)	0.91 (0.46-1.79)	1.45 (0.46-4.61)
Daytime sleepiness (Exam 4): often/almost always versus never / rarely / sometimes	CKD	1.06 (0.98-1.14)	0.190	0.99 (0.89-1.11)	1.08 (0.92-1.28)	1.06 (0.89-1.25)	1.22 (0.98-1.52)
	Moderate/severe CKD	1.06 (0.83-1.36)	0.213	1.38 (0.95-2.00)	0.71 (0.41-1.22)	0.90 (0.53-1.52)	1.72 (0.88-3.38)

Note 1: CKD and moderate-to-severe CKD are not mutually exclusive

Note 2: Models are adjusted for age, sex/gender, race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more), smoking (ever v. never), and current alcohol use (yes/no).

^a CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g; Moderate-to-severe CKD is defined as glomerular filtration rate (GFR) <60 mL/min/1.73m², or albuminuria >30 mg/g.

^b Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^c Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^d Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^e Insomnia symptoms based on self-reported questionnaire using a Women’s Health Initiative Insomnia Rating Scale score of ≥9 (range: 0-20)

^f Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) ≥ 15 (i.e. the number of all apneas and hypopneas with ≥ 3% oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥15 events per hour

^g SASHB calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time

^h SASHB continuous measure was transformed to a normal distribution using a Box-cox transformation

ⁱ AHI ≥15 and highest quintile of SASHB

^j Short sleep <7 hours and insomnia symptoms based on WHIR of ≥9 (range:0-20)

^k Short sleep <7 hours and low sleep maintenance efficiency <85%

^l AHI ≥15, and fragmentation <15%

^m “Suboptimal” sleep is coded positive if any of the following exists: short sleep (<7 hours), long sleep (>9 hours), low sleep maintenance efficiency (<85%), and insomnia symptoms

** N with actigraphy data = 1,862: 684 White, 525 Black, 444 Hispanic/Latinx, and 209 Chinese

Supplemental Table 3a. Fully-adjusted Prevalence Ratios (and 95% Confidence Intervals) of Chronic Kidney Disease (CKD) for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA – Sleep Quality Ancillary Study 5, Stratified by Age. Age 54-64: N= 778

	Model ^a	Total (N = 778)**	Race/ethnicity interaction p-value	White (N = 282)	Black (N = 214)	Hispanic/ Latino (N = 187)	Chinese (N = 95)
Overall n (%) with CKD ^b		387 (49.7)		158 (56.0)	112 (52.3)	83 (44.4)	34 (35.8)
Short vs. recommended sleep (actigraphy-measured) ^c	1	1.05 (0.90-1.23)	0.901	1.05 (0.85-1.31)	0.93 (0.66-1.31)	1.13 (0.80-1.61)	1.21 (0.63-2.32)
	2	1.04 (0.89-1.22)	0.917	1.05 (0.84-1.30)	0.94 (0.67-1.33)	1.07 (0.75-1.53)	1.31 (0.67-2.55)
	3	1.04 (0.89-1.22)	0.917	1.05 (0.85-1.31)	0.94 (0.67-1.32)	1.08 (0.75-1.55)	1.20 (0.60-2.41)
Very short (≤ 5 hours) vs. recommended sleep (actigraphy-measured)	1	1.05 (0.78-1.40)	0.764	0.96 (0.54-1.71)	0.86 (0.54-1.38)	1.24 (0.70-2.17)	1.48 (0.67-3.29)
	2	1.02 (0.76-1.36)	0.673	0.88 (0.53-1.47)	0.94 (0.58-1.53)	1.22 (0.73-2.05)	1.55 (0.68-3.53)
	3	1.01 (0.76-1.35)	0.655	0.901 (0.53-1.54)	0.95 (0.59-1.54)	1.08 (0.61-1.92)	1.51 (0.60-3.78)
Low sleep maintenance efficiency (<85%) ^d	1	1.23 (0.91-1.67)	0.241	1.45 (0.96-2.20)	0.96 (0.61-1.51)	0.87 (0.28-2.73)	2.30 (0.97-5.47)
	2	1.24 (0.91-1.69)	0.270	1.42 (0.96-2.10)	0.98 (0.60-1.60)	0.92 (0.26-3.21)	2.45 (1.02-5.88)
	3	1.23 (0.91-1.68)	0.238	1.45 (0.94-2.24)	0.99 (0.60-1.63)	0.90 (0.26-3.04)	2.45 (1.01-5.97)
Sleep fragmentation (>15%) ^e	1	1.04 (0.88-1.22)	0.254	0.88 (0.71-1.09)	1.26 (0.85-1.87)	1.19 (0.78-1.80)	1.08 (0.52-2.24)
	2	1.03 (0.87-1.21)	0.228	0.86 (0.70-1.06)	1.28 (0.87-1.88)	1.24 (0.82-1.88)	1.06 (0.50-2.26)
	3	1.03 (0.88-1.22)	0.235	0.87 (0.70-1.07)	1.32 (0.89-1.94)	1.25 (0.82-1.90)	1.24 (0.53-2.90)
Insomnia ^f	1	0.90 (0.78-1.05)	0.664	0.81 (0.65-1.03)	0.90 (0.68-1.20)	1.03 (0.74-1.43)	1.13 (0.61-2.09)

	2	0.90 (0.78-1.05)	0.655	0.82 (0.65-1.03)	0.88 (0.66-1.16)	1.04 (0.75-1.43)	1.08 (0.56-2.07)
	3	0.91 (0.78-1.06)	0.667	0.81 (0.64-1.03)	0.88 (0.66-1.17)	1.04 (0.75-1.43)	1.29 (0.68-2.46)
Sleep apnea ^g	1	1.16 (1.00-1.33)	0.672	1.07 (0.87-1.33)	1.16 (0.90-1.51)	1.34 (0.95-1.89)	1.05 (0.63-1.76)
	2	1.09 (0.94-1.27)	0.695	1.01 (0.80-1.26)	1.23 (0.92-1.65)	1.14 (0.79-1.63)	1.00 (0.59-1.70)
	3	1.09 (0.94-1.27)	0.689	1.02 (0.81-1.27)	1.24 (0.93-1.67)	1.13 (0.79-1.62)	1.01 (0.62-1.67)
Sleep apnea-specific hypoxic burden: % min/hour (SASHB) ^h ; (highest [84.24 – 1099.61] vs lowest [0.02 – 16.24] quintile)	1	1.21 (0.96-1.51)	0.898	1.12 (0.77-1.63)	1.30 (0.90-1.89)	1.32 (0.78-2.25)	0.92 (0.37-2.31)
	2	1.11 (0.87-1.41)	0.910	0.99 (0.67-1.46)	1.42 (0.94-2.15)	1.10 (0.64-1.88)	0.83 (0.29-2.35)
	3	1.10 (0.87-1.41)	0.894	1.00 (0.68-1.48)	1.45 (0.96-2.20)	1.14 (0.66-1.96)	0.90 (0.33-2.51)
Sleep apnea plus highest quintile SASHB ⁱ	1	1.14 (0.94-1.38)	0.814	1.00 (0.73-1.38)	1.25 (0.91-1.71)	1.24 (0.79-1.96)	0.98 (0.50-1.92)
	2	1.06 (0.87-1.30)	0.850	0.93 (0.67-1.29)	1.31 (0.92-1.85)	1.08 (0.68-1.71)	0.95 (0.47-1.93)
	3	1.06 (0.87-1.30)	0.866	0.94 (0.67-1.32)	1.33 (0.94-1.88)	1.11 (0.70-1.77)	1.00 (0.52-1.92)
Short sleep plus insomnia ^j	1	0.94 (0.75-1.16)	0.655	0.86 (0.63-1.19)	0.88 (0.55-1.40)	1.13 (0.69-1.83)	1.38 (0.59-3.25)
	2	0.93 (0.75-1.16)	0.693	0.86 (0.63-1.19)	0.86 (0.54-1.36)	1.08 (0.66-1.75)	1.41 (0.59-3.37)
	3	0.93 (0.75-1.16)	0.682	0.87 (0.63-1.20)	0.86 (0.54-1.37)	1.09 (0.67-1.78)	1.49 (0.62-3.59)
Short sleep plus poor sleep maintenance efficiency ^k	1	1.30 (0.94-1.79)	0.627	1.49 (0.96-2.29)	0.94 (0.55-1.60)	0.95 (0.30-3.03)	2.46 (0.96-6.32)

	2	1.30 (0.94-1.80)	0.677	1.44 (0.95-2.18)	0.98 (0.56-1.72)	0.96 (0.27-3.40)	2.82 (1.07-7.46)
	3	1.29 (0.93-1.79)	0.642	1.49 (0.95-2.33)	0.99 (0.56-1.74)	0.94 (0.27-3.23)	2.60 (1.00-6.78)
Sleep apnea and fragmentation ¹	1	1.21 (0.97-1.51)	0.130	0.94 (0.69-1.28)	1.53 (0.89-2.64)	1.43 (0.82-2.51)	1.38 (0.51-3.71)
	2	1.14 (0.91-1.44)	0.124	0.87 (0.64-1.19)	1.65 (0.96-2.83)	1.23 (0.70-2.16)	1.28 (0.46-3.53)
	3	1.14 (0.91-1.43)	0.137	0.88 (0.64-1.21)	1.69 (0.97-2.94)	1.25 (0.71-2.20)	1.47 (0.50-4.32)
“Suboptimal” sleep ^m	1	1.08 (0.87-1.34)	0.833	1.03 (0.78-1.36)	1.06 (0.64-1.75)	1.7 (0.76-2.85)	0.94 (0.39-2.24)
	2	1.05 (0.84-1.32)	0.878	1.02 (0.77-1.35)	1.6 (0.65-1.70)	1.28 (0.64-2.57)	0.94 (0.40-2.25)
	3	1.05 (0.84-1.31)	0.840	1.03 (0.78-1.37)	1.07 (0.66-1.72)	1.37 (0.67-2.80)	0.90 (0.37-2.16)
Daytime sleepiness (Exam 4): often/almost always versus never/rarely/sometimes	1	1.15 (0.97-1.36)	0.906	1.09 (0.85-1.40)	1.16 (0.86-1.58)	1.24 (0.85-1.81)	1.22 (0.54-2.78)
	2	1.14 (0.96-1.34)	0.868	1.08 (0.84-1.37)	1.11 (0.82-1.51)	1.21 (0.83-1.76)	1.17 (0.50-2.73)
	3	1.14 (0.97-1.34)	0.873	1.07 (0.84-1.37)	1.12 (0.82-1.51)	1.20 (0.82-1.74)	1.27 (0.62-2.61)

^a Model 1: Adjusting for demographics and health behaviors (sex/gender, race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more), smoking (ever v. never), current alcohol use (yes/no), and night or irregular shift work (yes/no));

Model 2: Model 1 + body mass index (underweight, overweight, obese vs. normal weight);

Model 3: Model 2 + blood pressure (optimal/normal v. high/stages 1-3) and diabetes (normal v. impaired fasting glucose or untreated or treated diabetes)).

^b CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g

^c Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^d Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^e Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^f Insomnia based on self-reported questionnaire using a Women’s Health Initiative Insomnia Rating Scale score of ≥9 (range: 0-20)

^g Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) ≥ 3% (i.e. the number of all apneas and hypopneas with ≥ 3% oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥15 events per hour

^h Hypoxic burden calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time: highest and lowest quintiles are compared.

ⁱ AHI ≥ 15 and in highest quintile of SASHB (reference group has AHI < 15 and in lower 4 quintiles)

^j Short sleep < 7 hours and insomnia symptoms based on WHIR of ≥ 9 (range: 0-20); reference group has recommended sleep, no insomnia

^k Short sleep < 7 hours and sleep maintenance efficiency $< 85\%$; reference group has recommended sleep, with maintenance efficiency $\geq 85\%$

^l AHI ≥ 15 and fragmentation $> 15\%$; reference group has AHI < 15 and fragmentation $\leq 15\%$

^m "Suboptimal" sleep is coded positive if any of the following exists: short sleep (< 7 hours), long sleep (> 9 hours), poor sleep maintenance efficiency ($< 85\%$), or insomnia symptoms

** N age 54-64 with actigraphy data = 767: 277 White, 211 Black, 185 Hispanic/Latinx, 94 Chinese

Supplemental Table 3b. Fully-adjusted Prevalence Ratios (and 95% Confidence Intervals) of Chronic Kidney Disease (CKD) for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA – Sleep Quality Ancillary Study 5, stratified by Age. Age ≥ 65 : N = 1,117

	Model ^a	Total (N = 1,117)**	Race/ethnicity interaction p-value	White (N = 414)	Black (N = 317)	Hispanic/ Latino (N = 266)	Chinese (N = 120)
Overall n (%) with CKD ^b		915 (81.9)		367 (88.7)	236 (74.5)	214 (80.5)	98 (81.7)
Short vs. recommended sleep (actigraphy-measured) ^c	1	0.98 (0.93-1.04)	0.347	1.03 (0.96-1.11)	0.91 (0.79-1.05)	0.97 (0.86-1.10)	0.94 (0.79-1.13)
	2	0.99 (0.93-1.04)	0.337	1.03 (0.96-1.11)	0.90 (0.79-1.04)	0.97 (0.86-1.10)	0.93 (0.77-1.12)
	3	0.99 (0.93-1.04)	0.344	1.03 (0.96-1.11)	0.91 (0.79-1.05)	0.97 (0.86-1.10)	0.97 (0.80-1.17)
Very short (≤ 5 hours) vs. recommended sleep (actigraphy-measured)	1	0.95 (0.86-1.04)	0.596	1.00 (0.89-1.13)	0.96 (0.79-1.16)	0.87 (0.68-1.11)	0.89 (0.65-1.21)
	2	0.95 (0.86-1.05)	0.594	0.99 (0.88-1.12)	0.95 (0.77-1.16)	0.89 (0.69-1.14)	0.87 (0.62-1.21)
	3	0.95 (0.86-1.05)	0.618	0.99 (0.88-1.12)	0.95 (0.78-1.17)	0.89 (0.69-1.14)	0.88 (0.63-1.22)
Low sleep maintenance efficiency ($< 85\%$) ^d	1	0.84 (0.72-0.98)	0.295	0.94 (0.78-1.13)	0.79 (0.57-1.10)	0.66 (0.46-0.94)	1.00 (0.70-1.43)
	2	0.84 (0.72-0.98)	0.296	0.94 (0.77-1.13)	0.78 (0.56-1.09)	0.66 (0.46-0.95)	1.01 (0.71-1.43)
	3	0.84 (0.72-0.98)	0.311	0.93 (0.77-1.13)	0.78 (0.56-1.09)	0.67 (0.47-0.95)	0.95 (0.68-1.33)
Sleep fragmentation ($> 15\%$) ^e	1	0.99 (0.92-1.05)	0.550	0.99 (0.91-1.07)	1.04 (0.86-1.26)	0.93 (0.82-1.06)	1.01 (0.80-1.28)
	2	0.99 (0.92-1.06)	0.550	0.99 (0.91-1.08)	1.05 (0.87-1.27)	0.94 (0.82-1.07)	1.01 (0.80-1.27)
	3	0.99 (0.92-1.05)	0.540	0.99 (0.91-1.08)	1.06 (0.88-1.29)	0.93 (0.82-1.06)	1.02 (0.81-1.27)

Insomnia ^f	1	1.00 (0.95-1.06)	0.581	1.03 (0.96-1.10)	0.94 (0.82-1.08)	1.02 (0.90-1.15)	1.08 (0.90-1.29)
	2	1.00 (0.95-1.06)	0.577	1.03 (0.96-1.10)	0.95 (0.82-1.09)	1.02 (0.90-1.15)	1.09 (0.90-1.31)
	3	1.00 (0.95-1.06)	0.606	1.03 (0.96-1.10)	0.96 (0.83-1.10)	1.02 (0.91-1.15)	1.07 (0.87-1.30)
Sleep apnea ^g	1	0.99 (0.93-1.04)	0.754	1.00 (0.93-1.07)	0.99 (0.87-1.13)	0.95 (0.85-1.08)	1.00 (0.81-1.23)
	2	0.99 (0.94-1.05)	0.746	1.00 (0.93-1.07)	1.01 (0.88-1.15)	0.96 (0.86-1.09)	1.01 (0.82-1.24)
	3	0.99 (0.94-1.05)	0.737	1.00 (0.93-1.07)	1.01 (0.88-1.15)	0.96 (0.86-1.08)	1.02 (0.84-1.26)
Sleep apnea-specific hypoxic burden: % min/hour (SASHB) ^h ; (highest [84.24 – 1099.61] vs lowest [0.02 – 16.24] quintile)	1	1.02 (0.93-1.12)	0.709	1.01 (0.89-1.14)	1.15 (0.95-1.40)	0.94 (0.78-1.14)	1.05 (0.77-1.44)
	2	1.03 (0.94-1.13)	0.699	1.01 (0.89-1.15)	1.18 (0.97-1.43)	0.97 (0.80-1.17)	1.08 (0.80-1.46)
	3	1.03 (0.93-1.13)	0.711	1.00 (0.88-1.15)	1.17 (0.95-1.44)	0.95 (0.78-1.16)	1.09 (0.80-1.49)
Sleep apnea plus highest quintile SASHB ⁱ	1	1.03 (0.96-1.10)	0.569	1.01 (0.92-1.11)	1.16 (0.98-1.37)	0.96 (0.82-1.12)	1.08 (0.85-1.36)
	2	1.04 (0.97-1.11)	0.527	1.01 (0.92-1.11)	1.19 (0.99-1.41)	0.97 (0.83-1.14)	1.10 (0.87-1.38)
	3	1.03 (0.96-1.11)	0.532	1.01 (0.92-1.10)	1.19 (0.99-1.42)	0.97 (0.83-1.13)	1.11 (0.87-1.41)
Short sleep plus insomnia ^j	1	0.98 (0.91-1.07)	0.546	1.07 (0.97-1.18)	0.86 (0.71-1.04)	0.97 (0.81-1.15)	1.03 (0.79-1.34)
	2	0.98 (0.91-1.07)	0.546	1.07 (0.97-1.18)	0.86 (0.71-1.05)	0.97 (0.82-1.16)	1.02 (0.76-1.36)
	3	0.98 (0.91-1.07)	0.572	1.07 (0.97-1.18)	0.88 (0.73-1.07)	0.98 (0.82-1.16)	1.02 (0.75-1.39)

Short sleep plus poor sleep maintenance efficiency ^k	1	0.85 (0.71-1.01)	0.354	1.05 (0.89-1.22)	0.73 (0.51-1.05)	0.68 (0.46-1.00)	0.89 (0.54-1.45)
	2	0.85 (0.72-1.01)	0.344	1.05 (0.89-1.23)	0.72 (0.50-1.04)	0.68 (0.46-1.01)	0.88 (0.54-1.44)
	3	0.85 (0.72-1.01)	0.353	1.05 (0.89-1.23)	0.72 (0.50-1.05)	0.69 (0.47-1.00)	0.86 (0.53-1.37)
Sleep apnea and fragmentation ^l	1	0.98 (0.90-1.08)	0.424	0.97 (0.88-1.07)	1.11 (0.84-1.46)	0.92 (0.76-1.13)	1.00 (0.74-1.36)
	2	0.99 (0.91-1.09)	0.396	0.97 (0.88-1.08)	1.14 (0.86-1.51)	0.94 (0.77-1.14)	1.01 (0.75-1.37)
	3	0.99 (0.90-1.08)	0.396	0.97 (0.88-1.07)	1.17 (0.88-1.55)	0.92 (0.76-1.13)	1.03 (0.78-1.37)
“Suboptimal” sleep ^m	1	0.99 (0.91-1.07)	0.315	1.03 (0.93-1.15)	0.89 (0.76-1.04)	0.98 (0.81-1.20)	1.08 (0.73-1.59)
	2	0.99 (0.91-1.08)	0.302	1.04 (0.93-1.15)	0.89 (0.76-1.05)	0.99 (0.81-1.22)	1.06 (0.71-1.58)
	3	0.99 (0.91-1.07)	0.302	1.03 (0.93-1.15)	0.91 (0.77-1.08)	0.98 (0.80-1.20)	1.08 (0.73-1.60)
Daytime sleepiness (Exam 4): often/almost always versus never/rarely/sometimes	1	1.00 (0.93-1.08)	0.073	0.93 (0.83-1.04)	1.08 (0.91-1.28)	0.97 (0.82-1.14)	1.27 (1.06-1.53)
	2	1.01 (0.93-1.09)	0.078	0.93 (0.83-1.04)	1.08 (0.91-1.28)	0.97 (0.82-1.14)	1.31 (1.07-1.60)
	3	1.01 (0.93-1.09)	0.069	0.93 (0.83-1.04)	1.09 (0.92-1.30)	0.98 (0.83-1.15)	1.38 (1.13-1.68)

^a Model 1: Adjusting for demographics and health behaviors (sex/gender, race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more), smoking (ever v. never), current alcohol use (yes/no), and night or irregular shift work (yes/no));

Model 2: Model 1 + body mass index (underweight, overweight, obesity vs. normal weight);

Model 3: Model 2 + blood pressure (optimal/normal v. high/stages 1-3) and diabetes (normal v. impaired fasting glucose or untreated or treated diabetes)).

^b CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g

^c Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^d Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^e Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^f Insomnia based on self-reported questionnaire using a Women’s Health Initiative Insomnia Rating Scale score of ≥9 (range: 0-20)

^g Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) $\geq 3\%$ (i.e. the number of all apneas and hypopneas with $\geq 3\%$ oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥ 15 events per hour

^h Hypoxic burden calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time: highest and lowest quintiles are compared.

ⁱ AHI ≥ 15 and in highest quintile of SASHB (reference group has AHI < 15 and in lower 4 quintiles)

^j Short sleep < 7 hours and insomnia symptoms based on WHIR of ≥ 9 (range: 0-20); reference group has recommended sleep, no insomnia

^k Short sleep < 7 hours and sleep maintenance efficiency $< 85\%$; reference group has recommended sleep, with maintenance efficiency $\geq 85\%$

^l AHI ≥ 15 and fragmentation $> 15\%$; reference group has AHI < 15 and fragmentation $\leq 15\%$

^m "Suboptimal" sleep is coded positive if any of the following exists: short sleep (< 7 hours), long sleep (> 9 hours), poor sleep maintenance efficiency ($< 85\%$), or insomnia symptoms

** N age 65+ with actigraphy data = 1,096: 407 White, 314 Black, 259 Hispanic/Latinx, 115 Chinese

Supplemental Table 4a. Fully-Adjusted Prevalence Ratios (and 95% Confidence Intervals) of Chronic Kidney Disease (CKD) for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA – Sleep Quality Ancillary Study 5. Stratified by Sex/Gender. Female N = 1,018

	Model ^a	Total (N = 1,018)**	Race/ethnicity interaction p-value	White (N = 372)	Black (N = 294)	Hispanic/ Latino (N = 239)	Chinese (N = 113)
Overall n (%) with CKD ^b		679 (66.7)		272 (73.1)	184 (62.6)	156 (65.3)	67 (59.3)
Short vs. recommended sleep (actigraphy) ^c	1	0.97 (0.90-1.06)	0.227	1.06 (0.94-1.19)	0.83 (0.70-0.98)	0.94 (0.80-1.12)	0.95 (0.71-1.27)
	2	0.97 (0.89-1.05)	0.220	1.06 (0.94-1.19)	0.84 (0.70-1.00)	0.94 (0.80-1.12)	0.94 (0.69-1.27)
	3	0.97 (0.89-1.05)	0.185	1.06 (0.94-1.20)	0.83 (0.69-0.99)	0.94 (0.80-1.11)	0.97 (0.71-1.32)
Very short (≤ 5 hours) ^c vs. recommended sleep	1	0.97 (0.84-1.12)	0.580	1.02 (0.79-1.31)	0.85 (0.66-1.11)	1.10 (0.85-1.44)	0.90 (0.59-1.36)
	2	0.97 (0.83-1.13)	0.575	1.03 (0.79-1.34)	0.88 (0.67-1.16)	1.11 (0.84-1.45)	0.88 (0.54-1.43)
	3	0.95 (0.81-1.11)	0.501	1.03 (0.78-1.37)	0.88 (0.66-1.17)	1.10 (0.84-1.43)	0.80 (0.48-1.34)
Low sleep maintenance efficiency (<85%) ^d	1	0.91 (0.71-1.17)	NE ^e	1.16 (0.87-1.54)	0.56 (0.26-1.20)	0.83 (0.57-1.21)	4.25 (2.44-7.37)
	2	0.91 (0.71-1.17)	NE	1.15 (0.86-1.53)	0.56 (0.25-1.21)	0.83 (0.57-1.21)	4.82 (2.85-8.17)
	3	0.92 (0.72-1.17)	NE	1.14 (0.87-1.51)	0.56 (0.26-1.21)	0.84 (0.58-1.23)	4.54 (2.64-7.80)
Sleep fragmentation ^e (>15%)	1	1.02 (0.93-1.11)	0.821	0.98 (0.86-1.10)	1.07 (0.86-1.35)	1.01 (0.84-1.21)	1.03 (0.77-1.38)
	2	1.02 (0.93-1.11)	0.829	0.97 (0.86-1.10)	1.10 (0.88-1.38)	1.02 (0.85-1.23)	1.04 (0.78-1.39)

	3	1.01 (0.92-1.11)	0.773	0.97 (0.85-1.09)	1.12 (0.89-1.41)	1.02 (0.84-1.22)	1.03 (0.78-1.37)
Insomnia ^f	1	1.00 (0.92-1.09)	0.619	0.95 (0.85-1.07)	1.03 (0.87-1.23)	1.00 (0.85-1.18)	1.14 (0.86-1.51)
	2	1.00 (0.92-1.09)	0.594	0.95 (0.84-1.07)	1.04 (0.88-1.24)	1.01 (0.85-1.19)	1.23 (0.90-1.69)
	3	1.00 (0.92-1.09)	0.554	0.95 (0.84-1.07)	1.06 (0.89-1.27)	1.01 (0.86-1.19)	1.16 (0.85-1.57)
Sleep apnea ^g	1	1.06 (0.98-1.15)	0.984	1.06 (0.94-1.19)	1.06 (0.89-1.26)	1.04 (0.87-1.23)	1.03 (0.76-1.38)
	2	1.06 (0.98-1.16)	0.982	1.04 (0.92-1.18)	1.09 (0.91-1.30)	1.05 (0.89-1.24)	0.98 (0.75-1.29)
	3	1.05 (0.97-1.15)	0.975	1.04 (0.92-1.18)	1.08 (0.90-1.30)	1.05 (0.88-1.24)	1.04 (0.79-1.37)
Sleep apnea-specific hypoxic burden: % min/hour (SASHB) ^h ; (highest [84.24 – 1099.61] vs lowest [0.02 – 16.24] quintile)	1	1.10 (0.96-1.26)	0.271	1.09 (0.89-1.34)	1.30 (1.01-1.67)	0.95 (0.72-1.26)	1.03 (0.63-1.66)
	2	1.11 (0.97-1.27)	0.256	1.06 (0.86-1.31)	1.36 (1.05-1.75)	0.98 (0.74-1.29)	0.91 (0.59-1.42)
	3	1.09 (0.95-1.25)	0.300	1.05 (0.85-1.31)	1.35 (1.02-1.77)	0.98 (0.74-1.29)	0.95 (0.56-1.59)
Sleep apnea plus highest quintile SASHB ⁱ	1	1.09 (0.96-1.22)	0.241	1.03 (0.86-1.22)	1.33 (1.07-1.67)	0.93 (0.73-1.18)	1.04 (0.62-1.73)
	2	1.09 (0.97-1.23)	0.209	1.02 (0.85-1.23)	1.39 (1.10-1.75)	0.95 (0.75-1.20)	0.94 (0.58-1.53)
	3	1.08 (0.96-1.21)	0.272	1.01 (0.84-1.22)	1.38 (1.08-1.78)	0.94 (0.74-1.20)	1.08 (0.61-1.92)
Short sleep plus insomnia ^j	1	0.98 (0.87-1.10)	0.619	1.01 (0.85-1.20)	0.88 (0.70-1.11)	0.92 (0.73-1.16)	1.12 (0.76-1.66)
	2	0.98 (0.87-1.09)	0.600	1.00 (0.85-1.19)	0.89 (0.70-1.13)	0.92 (0.73-1.17)	1.17 (0.77-1.77)

	3	0.97 (0.87-1.09)	0.578	1.00 (0.84-1.19)	0.90 (0.71-1.14)	0.92 (0.73-1.16)	1.14 (0.75-1.72)
Short sleep plus poor sleep maintenance efficiency ^k	1	0.94 (0.74-1.21)	NE	1.35 (1.16-1.57)	0.53 (0.25-1.14)	0.80 (0.52-1.21)	4.18 (2.36-7.41)
	2	0.94 (0.73-1.20)	NE	1.34 (1.14-1.57)	0.54 (0.25-1.16)	0.81 (0.54-1.23)	4.68 (2.73-8.01)
	3	0.94 (0.74-1.20)	NE	1.33 (1.14-1.54)	0.53 (0.25-1.15)	0.82 (0.54-1.23)	4.48 (2.55-7.85)
Sleep apnea and fragmentation ^l	1	1.08 (0.96-1.22)	0.393	1.03 (0.88-1.20)	1.17 (0.85-1.61)	1.03 (0.78-1.35)	1.03 (0.68-1.57)
	2	1.08 (0.96-1.22)	0.369	1.01 (0.86-1.19)	1.27 (0.91-1.76)	1.05 (0.80-1.39)	0.97 (0.65-1.46)
	3	1.07 (0.94-1.21)	0.378	1.00 (0.85-1.18)	1.28 (0.91-1.79)	1.05 (0.79-1.38)	1.01 (0.69-1.48)
“Suboptimal” sleep ^m	1	1.03 (0.92-1.15)	0.772	1.06 (0.91-1.24)	0.93 (0.74-1.16)	1.01 (0.78-1.31)	1.06 (0.71-1.57)
	2	1.03 (0.92-1.15)	0.760	1.06 (0.91-1.23)	0.95 (0.75-1.20)	1.02 (0.79-1.33)	1.04 (0.71-1.53)
	3	1.02 (0.91-1.14)	0.786	1.05 (0.91-1.23)	0.96 (0.75-1.22)	1.01 (0.78-1.31)	1.06 (0.71-1.60)
Daytime sleepiness (Exam 4): often/almost always versus never/rarely/sometimes	1	1.08 (0.98-1.20)	0.665	1.06 (0.91-1.22)	1.11 (0.90-1.37)	1.02 (0.83-1.26)	1.30 (0.92-1.84)
	2	1.08 (0.98-1.20)	0.699	1.05 (0.91-1.22)	1.12 (0.91-1.39)	1.03 (0.83-1.26)	1.24 (0.85-1.79)
	3	1.08 (0.98-1.20)	0.693	1.06 (0.91-1.22)	1.12 (0.90-1.39)	1.03 (0.83-1.27)	1.32 (0.92-1.89)

^a Note: Three models were run for each exposure, the first adjusting for demographics and health behaviors (age (45-64 versus 65+), race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more), smoking (ever v. never), current alcohol use (yes/no), and night or irregular shift work (yes/no)); the second model adding BMI (underweight, normal weight, overweight, obesity); and the third model adding blood pressure (optimal/normal v. high/stages 1-3), and diabetes (normal v. impaired fasting glucose or untreated or treated diabetes)).

^b CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g

^c Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^d Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^e Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^f Insomnia based on self-reported questionnaire using a Women's Health Initiative Insomnia Rating Scale score of ≥ 9 (range: 0-20)

^g Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) $\geq 3\%$ (i.e. the number of all apneas and hypopneas with $\geq 3\%$ oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥ 15 events per hour

^h Hypoxic burden calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time: highest and lowest quintiles are compared.

ⁱ AHI ≥ 15 and in highest quintile of SASHB (reference group has AHI < 15 and in lower 4 quintiles)

^j Short sleep < 7 hours and insomnia symptoms based on WHIR of ≥ 9 (range: 0-20); reference group has recommended sleep, no insomnia

^k Short sleep < 7 hours and sleep maintenance efficiency $< 85\%$; reference group has recommended sleep, with maintenance efficiency $\geq 85\%$

^l AHI ≥ 15 and fragmentation $> 15\%$; reference group has AHI < 15 and fragmentation $\leq 15\%$

^m "Suboptimal" sleep is coded positive if any of the following exists: short sleep (< 7 hours), long sleep (> 9 hours), poor sleep maintenance efficiency ($< 85\%$), or insomnia symptoms

ⁿ NE = not estimable

** N female with actigraphy data = 1,000: 365 White, 290 Black, 233 Hispanic/Latinx, 112 Chinese

Supplemental Table 4b. Fully-Adjusted Prevalence Ratios (and 95% Confidence Intervals) of Chronic Kidney Disease (CKD) for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA – Sleep Quality Ancillary Study 5. Stratified by Sex/Gender. Male N = 877

	Model ^a	Total (N = 877)**	Race/ethnicity interaction p-value	White (N = 324)	Black (N = 237)	Hispanic/ Latino (N = 214)	Chinese (N = 102)
Overall n (%) with CKD ^b		623 (71.0)		253 (78.1)	164 (69.2)	141 (65.9)	65 (63.7)
Short vs. recommended sleep (actigraphy) ^c	1	1.04 (0.95-1.14)	0.861	1.03 (0.901-1.15)	1.09 (0.87-1.38)	1.10 (0.89-1.36)	1.08 (0.81-1.42)
	2	1.03 (0.94-1.13)	0.938	1.02 (0.91-1.15)	1.06 (0.84-1.34)	1.07 (0.86-1.33)	1.13 (0.84-1.54)
	3	1.04 (0.94-1.14)	0.966	1.03 (0.92-1.17)	1.07 (0.85-1.36)	1.07 (0.86-1.33)	1.14 (0.83-1.58)
Very short (≤ 5 hours) ^c vs. recommended sleep	1	0.97 (0.85-1.12)	0.757	1.01 (0.85-1.20)	1.06 (0.80-1.40)	0.82 (0.57-1.19)	1.09 (0.71-1.66)
	2	0.96 (0.83-1.10)	0.799	1.01 (0.85-1.20)	1.03 (0.78-1.37)	0.80 (0.54-1.19)	1.11 (0.73-1.69)
	3	0.96 (0.84-1.10)	0.793	1.03 (0.86-1.23)	1.02 (0.76-1.36)	0.78 (0.53-1.14)	1.14 (0.72-1.81)
Low sleep maintenance efficiency (<85%) ^d	1	0.92 (0.78-1.10)	0.156	0.95 (0.75-1.20)	1.02 (0.78-1.34)	0.53 (0.29-0.97)	1.30 (0.88-1.93)
	2	0.92 (0.77-1.09)	0.167	0.94 (0.75-1.19)	1.01 (0.77-1.34)	0.52 (0.28-0.98)	1.30 (0.88-1.93)
	3	0.92 (0.77-1.09)	0.164	0.95 (0.75-1.20)	1.03 (0.78-1.36)	0.53 (0.29-0.95)	1.35 (0.90-2.01)
Sleep fragmentation ^e (>15%)	1	0.97 (0.87-1.09)	0.777	0.92 (0.81-1.06)	1.09 (0.79-1.51)	0.95 (0.72-1.23)	1.04 (0.67-1.63)
	2	0.97 (0.87-1.09)	0.766	0.92 (0.81-1.06)	1.09 (0.79-1.50)	0.94 (0.73-1.23)	1.04 (0.67-1.60)
	3	0.98 (0.87-1.09)	0.758	0.93 (0.81-1.06)	1.09 (0.79-1.51)	0.94 (0.73-1.23)	1.23 (0.76-2.01)

Insomnia ^f	1	0.94 (0.86-1.03)	0.215	0.98 (0.87-1.10)	0.79 (0.65-0.96)	1.01 (0.83-1.24)	0.97 (0.71-1.32)
	2	0.95 (0.87-1.04)	0.234	0.98 (0.88-1.11)	0.79 (0.65-0.96)	1.02 (0.84-1.25)	0.96 (0.70-1.32)
	3	0.95 (0.87-1.04)	0.204	0.99 (0.88-1.11)	0.79 (0.65-0.96)	1.03 (0.85-1.25)	1.03 (0.74-1.45)
Sleep apnea ^g	1	1.01 (0.93-1.10)	0.791	1.00 (0.89-1.11)	1.02 (0.86-1.21)	1.02 (0.83-1.25)	1.11 (0.79-1.57)
	2	0.99 (0.91-1.08)	0.771	0.98 (0.88-1.09)	1.04 (0.87-1.24)	0.97 (0.79-1.20)	1.15 (0.80-1.64)
	3	0.99 (0.91-1.08)	0.788	0.99 (0.89-1.10)	1.03 (0.86-1.24)	0.99 (0.80-1.21)	1.08 (0.76-1.51)
Sleep apnea-specific hypoxic burden: % min/hour (SASHB) ^h ; (highest [84.24 – 1099.61] vs lowest [0.02 – 16.24] quintile)	1	1.06 (0.91-1.25)	0.967	1.02 (0.79-1.30)	1.14 (0.88-1.47)	1.08 (0.73-1.61)	1.45 (0.52-4.06)
	2	1.03 (0.87-1.21)	0.954	0.97 (0.75-1.24)	1.16 (0.89-1.52)	1.01 (0.68-1.51)	1.50 (0.49-4.57)
	3	1.03 (0.88-1.22)	0.940	0.97 (0.76-1.25)	1.16 (0.88-1.52)	1.01 (0.68-1.49)	1.33 (0.47-3.81)
Sleep apnea plus highest quintile SASHB ⁱ	1	1.04 (0.94-1.14)	0.949	1.00 (0.88-1.15)	1.11 (0.91-1.36)	1.04 (0.82-1.31)	1.12 (0.79-1.58)
	2	1.01 (0.91-1.12)	0.960	0.98 (0.86-1.12)	1.11 (0.89-1.39)	0.98 (0.77-1.24)	1.17 (0.81-1.68)
	3	1.01 (0.91-1.12)	0.961	0.99 (0.86-1.13)	1.11 (0.89-1.38)	0.99 (0.78-1.25)	1.11 (0.79-1.57)
Short sleep plus insomnia ^j	1	0.97 (0.85-1.11)	0.647	1.01 (0.86-1.19)	0.83 (0.61-1.14)	1.10 (0.81-1.49)	1.04 (0.68-1.59)
	2	0.97 (0.85-1.10)	0.666	1.02 (0.87-1.20)	0.82 (0.60-1.12)	1.07 (0.79-1.47)	1.08 (0.69-1.70)
	3	0.97 (0.85-1.10)	0.613	1.03 (0.88-1.22)	0.83 (0.60-1.13)	1.07 (0.79-1.46)	1.18 (0.70-1.98)

Short sleep plus poor sleep maintenance efficiency ^k	1	0.97 (0.79-1.18)	0.662	1.02 (0.79-1.33)	1.10 (0.77-1.56)	0.62 (0.31-1.21)	1.41 (0.84-2.34)
	2	0.96 (0.78-1.17)	0.735	1.00 (0.77-1.30)	1.07 (0.75-1.52)	0.60 (0.30-1.20)	1.47 (0.86-2.51)
	3	0.96 (0.79-1.17)	0.743	1.02 (0.78-1.33)	1.09 (0.76-1.56)	0.60 (0.32-1.14)	1.49 (0.89-2.50)
Sleep apnea and fragmentation ^l	1	1.05 (0.88-1.26)	0.516	0.97 (0.79-1.18)	1.28 (0.80-2.05)	1.09 (0.63-1.89)	0.93 (0.44-1.93)
	2	1.04 (0.86-1.24)	0.490	0.96 (0.78-1.18)	1.28 (0.79-2.05)	1.01 (0.58-1.75)	0.91 (0.45-1.85)
	3	1.04 (0.87-1.25)	0.499	0.96 (0.79-1.18)	1.28 (0.79-2.05)	1.01 (0.57-1.77)	0.99 (0.45-2.20)
“Suboptimal” sleep ^m	1	1.00 (0.86-1.15)	0.770	1.00 (0.83-1.20)	0.92 (0.71-1.20)	1.22 (0.69-2.17)	0.86 (0.22-3.30)
	2	0.99 (0.85-1.15)	0.722	1.00 (0.83-1.20)	0.90 (0.69-1.17)	1.18 (0.67-2.09)	0.87 (0.24-3.14)
	3	0.99 (0.85-1.15)	0.652	1.01 (0.84-1.22)	0.91 (0.70-1.19)	1.20 (0.65-2.20)	0.84 (0.28-2.56)
Daytime sleepiness (Exam 4): often/almost always versus never/rarely/sometimes	1	1.02 (0.90-1.15)	0.171	0.91 (0.76-1.10)	1.07 (0.84-1.36)	1.08 (0.81-1.44)	1.32 (0.96-1.81)
	2	1.01 (0.89-1.14)	0.147	0.89 (0.74-1.08)	1.04 (0.82-1.32)	1.10 (0.82-1.48)	1.36 (0.99-1.86)
	3	1.00 (0.89-1.14)	0.142	0.89 (0.74-1.08)	1.05 (0.83-1.34)	1.10 (0.83-1.46)	1.46 (1.08-1.99)

^a Note: Three models were run for each exposure, the first adjusting for demographics and health behaviors (age (45-64 versus 65+), race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more), smoking (ever v. never), current alcohol use (yes/no), and night or irregular shift work (yes/no)); the second model adding BMI (underweight, normal weight, overweight, obesity); and the third model adding blood pressure (optimal/normal v. high/stages 1-3), and diabetes (normal v. impaired fasting glucose or untreated or treated diabetes)).

^b CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g

^c Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^d Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^e Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^f Insomnia based on self-reported questionnaire using a Women’s Health Initiative Insomnia Rating Scale score of ≥9 (range: 0-20)

^g Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) $\geq 3\%$ (i.e. the number of all apneas and hypopneas with $\geq 3\%$ oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥ 15 events per hour

^h Hypoxic burden calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time: highest and lowest quintiles are compared.

ⁱ AHI ≥ 15 and in highest quintile of SASHB (reference group has AHI < 15 and in lower 4 quintiles)

^j Short sleep < 7 hours and insomnia symptoms based on WHIR of ≥ 9 (range: 0-20); reference group has recommended sleep, no insomnia

^k Short sleep < 7 hours and sleep maintenance efficiency $< 85\%$; reference group has recommended sleep, with maintenance efficiency $\geq 85\%$

^l AHI ≥ 15 and fragmentation $> 15\%$; reference group has AHI < 15 and fragmentation $\leq 15\%$

^m "Suboptimal" sleep is coded positive if any of the following exists: short sleep (< 7 hours), long sleep (> 9 hours), poor sleep maintenance efficiency ($< 85\%$), or insomnia symptoms

** N male with actigraphy data = 862: 319 White, 235 Black, 211 Hispanic/Latinx, 97 Chinese

Supplemental Table 5a. Fully-adjusted Prevalence Ratios (and 95% Confidence Intervals) of Chronic Kidney Disease (CKD) for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA – Sleep Quality Ancillary Study 5. Stratified by Obese and Normal BMI. Obese N = 672

	Model ^a	Total (N = 672)**	Race/ethnicity interaction p-value	White (N = 206)	Black (N = 259)	Hispanic/ Latino (N = 196)	Chinese (N = 11)
Overall n (%) with CKD ^b		455 (67.7)		156 (75.7)	162 (62.6)	131 (66.8)	6 (54.6)
Short vs. recommended sleep (actigraphy-measured) ^c	1	1.02 (0.90-1.14)	0.383	1.08 (0.92-1.26)	0.91 (0.73-1.14)	1.06 (0.84-1.33)	NE
	2	1.00 (0.89-1.12)	0.639	1.08 (0.92-1.27)	0.92 (0.73-1.15)	1.01 (0.80-1.27)	NE
Very short (≤ 5 hours) vs. recommended sleep (actigraphy-measured)	1	1.05 (0.89-1.24)	NE ^a	1.17 (0.95-1.44)	0.97 (0.75-1.27)	1.15 (0.84-1.58)	NE
	2	1.02 (0.87-1.21)	NE	1.20 (0.94-1.54)	0.97 (0.73-1.28)	1.18 (0.85-1.63)	NE
Low sleep maintenance efficiency (<85%) ^d	1	0.85 (0.66-1.10)	NE	1.22 (1.07-1.38)	0.84 (0.55-1.28)	0.55 (0.30-1.04)	NE
	2	0.84 (0.64-1.09)	NE	1.22 (1.05-1.41)	0.79 (0.49-1.28)	0.58 (0.31-1.06)	NE
Sleep fragmentation (>15%) ^e	1	0.96 (0.85-1.10)	0.716	0.92 (0.76-1.10)	1.04 (0.78-1.40)	1.00 (0.79-1.28)	0.72 (0.20-2.61)
	2	0.98 (0.86-1.13)	0.764	0.95 (0.78-1.14)	1.06 (0.78-1.45)	0.99 (0.76-1.27)	NE
Insomnia symptoms ^f	1	1.03 (0.93-1.14)	0.799	0.96 (0.81-1.13)	1.05 (0.86-1.27)	1.08 (0.89-1.31)	NE
	2	1.03 (0.93-1.15)	NE	0.96 (0.81-1.13)	1.03 (0.85-1.26)	1.10 (0.91-1.33)	NE
Sleep apnea ^g	1	1.01 (0.91-1.13)	0.601	0.98 (0.83-1.14)	1.11 (0.91-1.35)	0.92 (0.75-1.13)	1.24 (0.37-4.16)
	2	1.02 (0.92-1.14)	0.423	1.00 (0.85-1.18)	1.15 (0.93-1.40)	0.92 (0.75-1.13)	NE

Sleep apnea-specific hypoxic burden: % min/hour (SASHB) ^b ; (highest [84.24 – 1099.61] vs lowest [0.02 – 16.24] quintile)	1	1.05 (0.87-1.26)	NE	0.90 (0.66-1.24)	1.25 (0.92-1.70)	0.95 (0.67-1.33)	NE
	2	1.05 (0.87-1.27)	NE	0.92 (0.67-1.26)	1.34 (0.97-1.85)	0.91 (0.64-1.29)	NE
Sleep apnea plus highest quintile SASHB ⁱ	1	1.02 (0.90-1.16)	0.768	0.94 (0.77-1.14)	1.17 (0.92-1.47)	0.94 (0.74-1.19)	1.18 (0.33-4.16)
	2	1.01 (0.89-1.15)	0.095	0.97 (0.79-1.20)	1.22 (0.96-1.55)	0.90 (0.70-1.15)	NE
Short sleep plus Insomnia symptoms ^j	1	1.04 (0.88-1.22)	0.798	1.04 (0.83-1.31)	0.99 (0.71-1.36)	1.14 (0.83-1.58)	NE
	2	1.02 (0.87-1.20)	NE	1.05 (0.83-1.32)	0.98 (0.71-1.37)	1.12 (0.81-1.53)	NE
Short sleep plus low sleep maintenance efficiency ^k	1	0.88 (0.67-1.15)	NE	1.27 (1.07-1.49)	0.78 (0.49-1.24)	0.59 (0.28-1.21)	NE
	2	0.85 (0.65-1.12)	NE	1.27 (1.07-1.51)	0.75 (0.45-1.25)	0.60 (0.30-1.20)	NE
Sleep apnea and fragmentation ^l	1	0.99 (0.81-1.21)	NE	0.90 (0.72-1.14)	1.47 (0.77-2.81)	0.87 (0.57-1.32)	1.00 (0.22-4.57)
	2	1.01 (0.83-1.24)	NE	0.94 (0.75-1.19)	1.68 (0.83-3.43)	0.86 (0.57-1.30)	NE
“Suboptimal” sleep ^m	1	1.04 (0.85-1.27)	NE	1.05 (0.79-1.38)	1.02 (0.70-1.48)	1.06 (0.69-1.64)	NE
	2	1.02 (0.84-1.24)	NE	1.08 (0.81-1.43)	1.06 (0.72-1.54)	1.00 (0.67-1.49)	NE
Daytime sleepiness (Exam 4): often/almost always versus never/rarely/sometimes	1	1.10 (0.98-1.24)	0.303	1.05 (0.88-1.26)	1.21 (0.99-1.49)	1.01 (0.77-1.32)	0.83 (0.16-4.37)
	2	1.12 (0.99-1.27)	0.500	1.09 (0.90-1.31)	1.24 (1.00-1.53)	1.07 (0.81-1.41)	NE

^a Note: Two models were run for each exposure, the first adjusting for demographics (age (54 to 64 versus ≥ 65), sex/gender, race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more)), and the second model adding smoking (ever v. never), current alcohol use (yes/no), blood pressure (optimal/normal v. high/stages 1-3), diabetes (normal v. impaired fasting glucose or untreated or treated diabetes), and night or irregular shift work (yes/no).

^b CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g

^c Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^d Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^e Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^f Insomnia symptoms based on self-reported questionnaire using a Women's Health Initiative Insomnia Rating Scale score of ≥ 9 (range: 0-20)

^g Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) $\geq 3\%$ (i.e. the number of all apneas and hypopneas with $\geq 3\%$ oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥ 15 events per hour

^h Hypoxic burden calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time: highest and lowest quintiles are compared.

ⁱ AHI ≥ 15 and in highest quintile of SASHB (reference group has AHI < 15 and in lower 4 quintiles)

^j Short sleep < 7 hours and insomnia symptoms based on WHIR of ≥ 9 (range: 0-20); reference group has recommended sleep, no insomnia symptoms

^k Short sleep < 7 hours and low sleep maintenance efficiency $< 85\%$; reference group has recommended sleep, with low maintenance efficiency $\geq 85\%$

^l AHI ≥ 15 and fragmentation $> 15\%$; reference group has AHI < 15 and fragmentation $\leq 15\%$

^m "Suboptimal" sleep is coded positive if any of the following exists: short sleep (< 7 hours), long sleep (> 9 hours), low sleep maintenance efficiency ($< 85\%$), or insomnia symptoms

ⁿ NE = not estimable

** N obese with actigraphy data = 661: 204 White, 256 Black, 190 Hispanic/Latinx, 11 Chinese

Supplemental Table 5b. Fully-adjusted Prevalence Ratios (and 95% Confidence Intervals) of Chronic Kidney Disease (CKD) for White, Black, Hispanic/Latino, and Chinese participants with poor sleep characteristics compared to their counterparts with non-poor sleep characteristics, MESA – Sleep Quality Ancillary Study 5. Stratified by Obese and Normal BMI. Normal BMI N = 494

	Model ^a	Total (N = 494)**	Race/ethnicity interaction p-value	White (N = 213)	Black (N = 85)	Hispanic/ Latino (N = 68)	Chinese (N = 128)
Overall n (%) with CKD ^b		342 (69.2)		157 (73.7)	64 (75.3)	44 (64.7)	77 (60.2)
Short vs. recommended sleep (actigraphy-measured) ^c	1	1.00 (0.89-1.12)	0.622	1.04 (0.89-1.21)	0.86 (0.65-1.14)	0.90 (0.66-1.22)	1.08 (0.85-1.38)
	2	1.01 (0.90-1.13)	0.517	1.05 (0.90-1.23)	0.83 (0.64-1.07)	0.86 (0.64-1.17)	1.16 (0.90-1.51)
Very short (≤ 5 hours) vs. recommended sleep (actigraphy-measured)	1	0.98 (0.78-1.22)	0.238	0.76 (0.52-1.13)	1.04 (0.70-1.53)	0.69 (0.28-1.69)	1.26 (0.91-1.76)
	2	0.97 (0.78-1.21)	0.169	0.76 (0.52-1.11)	0.81 (0.55-1.19)	0.48 (0.20-1.17)	1.38 (0.99-1.93)
Low sleep maintenance efficiency (<85%) ^d	1	0.94 (0.67-1.31)	NE ⁿ	0.77 (0.33-1.81)	0.64 (0.34-1.19)	NE	1.66 (1.06-2.61)
	2	0.91 (0.65-1.26)	NE	0.75 (0.32-1.77)	0.58 (0.34-0.98)	NE	1.56 (0.99-2.47)
Sleep fragmentation (>15%) ^e	1	1.03 (0.91-1.17)	0.358	0.95 (0.82-1.12)	1.07 (0.77-1.48)	1.16 (0.85-1.60)	1.19 (0.85-1.67)
	2	1.03 (0.91-1.17)	0.313	0.95 (0.81-1.11)	1.06 (0.74-1.51)	1.11 (0.83-1.49)	1.21 (0.86-1.69)
Insomnia symptoms ^f	1	0.93 (0.83-1.04)	0.071	0.97 (0.83-1.13)	0.81 (0.61-1.08)	0.67 (0.47-0.95)	1.13 (0.89-1.44)
	2	0.91 (0.81-1.02)	0.106	0.94 (0.80-1.10)	0.84 (0.63-1.11)	0.63 (0.44-0.90)	1.13 (0.87-1.46)
Sleep apnea ^g	1	1.10 (0.99-1.23)	0.315	1.04 (0.88-1.21)	1.21 (0.91-1.60)	1.19 (0.90-1.56)	1.09 (0.84-1.41)
	2	1.08 (0.97-1.20)	0.294	1.02 (0.87-1.20)	1.19 (0.87-1.63)	1.13 (0.84-1.51)	1.04 (0.80-1.36)
Sleep apnea-specific hypoxic burden: % min/hour	1	1.17 (0.97-1.40)	0.156	0.95 (0.68-1.32)	1.22 (0.83-1.79)	1.44 (0.91-2.27)	1.10 (0.69-1.74)

(SASHB) ^b ; (highest [84.24 – 1099.61] vs lowest [0.02 – 16.24] quintile)	2	1.16 (0.96-1.40)	0.203	0.99 (0.70-1.41)	1.18 (0.74-1.86)	1.52 (0.95-2.43)	1.08 (0.66-1.76)
Sleep apnea plus highest quintile SASHB ⁱ	1	1.12 (0.97-1.30)	0.154	0.91 (0.68-1.21)	1.20 (0.84-1.73)	1.38 (1.03-1.85)	1.07 (0.79-1.45)
	2	1.11 (0.96-1.29)	0.250	0.93 (0.69-1.26)	1.15 (0.74-1.78)	1.43 (1.01-2.03)	1.04 (0.74-1.47)
Short sleep plus Insomnia symptoms ^j	1	0.93 (0.80-1.10)	0.176	1.03 (0.83-1.28)	0.72 (0.51-1.03)	0.59 (0.35-1.02)	1.25 (0.86-1.82)
	2	0.93 (0.79-1.09)	0.194	1.01 (0.81-1.26)	0.73 (0.52-1.02)	0.53 (0.30-0.93)	1.30 (0.86-1.98)
Short sleep plus low sleep maintenance efficiency ^k	1	0.99 (0.68-1.45)	NE	1.32 (1.04-1.68)	0.58 (0.28-1.21)	NE	1.74 (1.03-2.95)
	2	0.97 (0.66-1.42)	NE	1.40 (1.04-1.89)	0.49 (0.26-0.93)	NE	1.81 (1.06-3.09)
Sleep apnea and fragmentation ^l	1	1.16 (0.96-1.38)	0.466	0.99 (0.79-1.24)	1.26 (0.84-1.89)	1.68 (0.87-3.24)	1.45 (0.89-2.34)
	2	1.13 (0.94-1.35)	0.407	0.97 (0.77-1.22)	1.24 (0.79-1.95)	1.47 (0.81-2.66)	1.40 (0.87-2.24)
“Suboptimal” sleep ^m	1	1.02 ⁿ (0.85-1.22)	0.010	1.02 (0.85-1.23)	0.65 (0.52-0.82)	1.01 (0.68-1.49)	1.14 (0.65-2.01)
	2	1.02 ⁿ (0.85-1.22)	0.010	1.02 (0.85-1.22)	0.66 (0.52-0.84)	0.90 (0.65-1.26)	1.13 (0.58-2.18)
Daytime sleepiness (Exam 4): often/almost always versus never/rarely/sometimes	1	1.07 (0.92-1.26)	0.237	0.93 (0.74-1.18)	1.00 (0.68-1.47)	1.09 (0.72-1.65)	1.28 (0.93-1.75)
	2	1.05 (0.90-1.23)	0.189	0.92 (0.74-1.15)	0.94 (0.64-1.38)	1.02 (0.65-1.58)	1.32 (0.94-1.87)

^a Note: Two models were run for each exposure, the first adjusting for demographics (age (54 to 64 versus ≥ 65), sex/gender, race/ethnicity, education (high school or less v. some college/technical school v. college graduate or more)), and the second model adding smoking (ever v. never), current alcohol use (yes/no), blood pressure (optimal/normal v. high/stages 1-3), diabetes (normal v. impaired fasting glucose or untreated or treated diabetes), and night or irregular shift work (yes/no).

^b CKD is defined as glomerular filtration rate (GFR) <90 mL/min/1.73m², or albuminuria >30 mg/g

^c Average time spent asleep during main sleep periods (sum of all time asleep across recording divided by the total main sleep periods).

^d Average sleep maintenance efficiency in main sleeps (percentage of time spent asleep between falling asleep (sleep onset) and waking up (sleep offset))

^e Sum of percent mobile epochs and percent immobile bouts less than 1-minute duration to the number of immobile bouts for the given interval. Also known as the index of restlessness or movement and fragmentation index

^f Insomnia symptoms based on self-reported questionnaire using a Women's Health Initiative Insomnia Rating Scale score of ≥ 9 (range: 0-20)

^g Obstructive Sleep Apnea (OSA)/resp. sleep disturbance was measured using the Apnea-Hypopnea Index (AHI) $\geq 3\%$ (i.e. the number of all apneas and hypopneas with $\geq 3\%$ oxygen desaturations per hour of sleep); OSA was defined as an AHI ≥ 15 events per hour

^h Hypoxic burden calculated as the area under the oxygen saturation curve associated with each individual respiratory (airflow) disruption (individual apneas and hypopneas). These individual burden measures are summed and divided by total sleep time: highest and lowest quintiles are compared.

ⁱ AHI ≥ 15 and in highest quintile of SASHB (reference group has AHI < 15 and in lower 4 quintiles)

^j Short sleep < 7 hours and insomnia symptoms based on WHIR of ≥ 9 (range: 0-20); reference group has recommended sleep, no insomnia symptoms

^k Short sleep < 7 hours and low sleep maintenance efficiency $< 85\%$; reference group has recommended sleep, with low maintenance efficiency $\geq 85\%$

^l AHI ≥ 15 and fragmentation $> 15\%$; reference group has AHI < 15 and fragmentation $\leq 15\%$

^m "Suboptimal" sleep is coded positive if any of the following exists: short sleep (< 7 hours), long sleep (> 9 hours), low sleep maintenance efficiency ($< 85\%$), or insomnia symptoms

ⁿ NE = not estimable

^o These PRs come from models that included the statistically significant interaction term for race/ethnicity and "suboptimal" sleep; all other PRs in the "Total" column are from main effects models.

** N normal BMI with actigraphy data = 487: 210 White, 85 Black, 68 Hispanic/Latinx, 124 Chinese