

SUPPLEMENTAL MATERIAL

Data S1.

Literature Search strategy:

PubMed:

((sleep duration) OR sleep length) AND (((cardiovascular disease) OR myocardial infarction) OR coronary OR stroke OR death OR mortality OR mortalities OR fatal) AND (cohort OR prospective OR (follow-up))

Embase:

'sleep'/exp OR sleep AND duration OR (sleep AND length) AND (cardiovascular AND disease OR (myocardial AND infarction) OR coronary OR stroke OR death OR mortality OR mortalities OR fatal) AND (cohort OR prospective OR 'follow-up')

Literature Search result:

After exclusion of duplicates and studies that did not fulfill the inclusion criteria, 101 remaining articles seemed to be relevant for this meta-analysis. After evaluating the full texts of these 101 publications, we excluded 35 articles as follows:

Ten articles⁶⁸⁻⁷⁷ were excluded owing to lack of sufficient data for estimation of RRs.

Three articles⁷⁸⁻⁸⁰ were excluded because they reported all-cause mortality or cardiovascular events combining with other diseases, and another four articles were excluded because they did not separately report sleep duration⁸¹⁻⁸⁴. Fourteen studies were excluded for providing less than three categories of sleep duration⁸⁵⁻⁹⁸. We also excluded two reports because only their abstracts were written in English^{99, 100}. Two studies^{101, 102} were excluded because they respectively reported the intermediate follow-up results of the JACC Study and the Whitehall II cohort. After counting one

study obtained by hand searching⁴⁰, the final meta-analysis included 67 articles with 141 independent reports. Among these 67 articles, 43 articles with 57 reports provided statistical effects relevant to the meta-analyses on all-cause mortality¹⁻⁴³, 26 articles with 37 reports on total CVD^{4, 7-9, 12-14, 17, 18, 23, 25-28, 31, 33, 34, 38, 44-51}, 22 articles with 27 reports on CHD^{3, 11, 12, 16, 17, 28, 36, 44, 46, 47, 49-60}, and 16 articles with 20 reports on stroke^{4, 12, 17, 28, 47, 50, 51, 55, 60-67}.

Table S1. Sleep duration and all-cause mortality

Author, publication year, country	Study name	Age at baseline (years)	Follow-up (years)	Exposure	Exposure assessment	Sex, Sample size(cases)	Sleep categories	corresponding relative risk (95% CI)	Covariates in fully adjusted model
Nisha Aurora et al, 2016, US ¹	Sleep Heart Health Study	≥40	10.8	Nighttime sleep	Interview	Both: 5784 (1509)	<7 7-8 ≥9	0.98 (0.87 to 1.10) 1 1.25 (1.05 to 1.47)	Age, sex, race, BMI, smoking status, and prevalent hypertension, cardiovascular disease, diabetes, AHI, and antidepressant medications
Wei-Ju Lee et al, 2016, Taiwan ²	The Social Environment and Biomarkers of Aging Study	≥53	4.7	Nighttime sleep	Interview	Both: 937 (72)	<6 6-7 ≥8	1.18 (0.66 to 2.12) 1 2.37 (1.35 to 4.19)	Age, sex, body mass index, education years, smoking, drinking, and number of chronic diseases, frailty states, use of hypnotics
Xizhu Wang et al, 2016, China ³	Kailuan study	18-98	3.98	Nighttime sleep	Questionnaire	Both: 95903 (1793)	≤5 6 7 8 ≥9	1.23 (1.03 to 1.8) 1.95 (0.81 to 1.12) 1 1.06 (0.92 to 1.2) 1.65 (1.22 to 2.22)	Age, sex, family per member monthly income, education level, marital status, smoking status, drinking status, physical activity, history of hypertension, diabetes mellitus, and hyperlipidemia
Hui Cai et al, 2015, China ⁴	Shanghai Women's and Men's Health Studies	Male: 40-75 Female: 44-79	Male: 6.07 Female: 7.12	24-hour sleep	Interview	Both: 113138 (4277) Male: 44590 (1921) Female: 68548 (2356)	Both: 4-5 6 7 8 9 ≥10 Male: 4-5 6 7 8 9 ≥10 Female: 4-5 6 7 8 9 ≥10	Both: 1.11 (1.00 to 1.23) 1.06 (0.97 to 1.16) 1 1.15 (1.05 to 1.26) 1.34 (1.17 to 1.54) 1.81 (1.59 to 2.06) Male: 1.06 (0.90 to 1.25) 1.07 (0.94 to 1.23) 1 1.13 (1.00 to 1.28) 1.34 (1.10 to 1.62) 1.55 (1.29 to 1.86) Female: 1.15 (1.01 to 1.32) 1.06 (0.94 to 1.20) 1 1.17 (1.04 to 1.32) 1.36 (1.13 to 1.64) 2.11 (1.77 to 2.52)	Age, education, income, smoking, alcohol consumption, tea consumption, comorbidity score, history of night-shift work, participation in regular exercise, body mass index, and waist-to-hip ratio, cardiovascular disease, upper gastrointestinal tract

Lisette A. Zuurbier et al, 2015, Netherlands ⁵	Rotterdam Study	45-98	7.3	Nighttime sleep	Questionnaire	Both: 1734 (154)	<6 6-7.5 >7.5	1.41(0.93 to 2.13) 1 1.10(0.74 to 1.64)	Age, sex, activities of daily living score, current smoking, diabetes, myocardial infarction, stroke, cognitive functioning, depressive symptoms, body mass index, use of sleep medication, possible sleep apnea, and napping
Martica H. Hall et al, 2015, US ⁶	Health, Aging and Body Composition (Health ABC) Study	70-79	8.2	Nighttime sleep	Interview	Both: 3013 (953)	<6 6 7 8 >8	1.06 (0.83 to 1.34) 1.00 (0.82 to 1.22) 1 1.10 (0.91 to 1.33) 1.23 (0.93 to 1.63)	Age, sex, race, education, BMI, smoking status, alcohol consumption, physical activity, consumption per week, site, chronic conditions, medication use
Naja Hulvej Rod et al, 2014, British ⁷	British Whitehall II prospective cohort study	35-55	22	Nighttime sleep	Questionnaire	Male: 6114 (538) Female: 2984 (266)	Male: ≤5 6 7 8 >9 Female: ≤5 6 7 8 >9	Male: 1.11 (0.73 to 1.68) 1.23 (1.01 to 1.50) 1 1.18 (0.92 to 1.50) 1.44 (0.59 to 3.50) Female: 1.21 (0.76 to 1.91) 1.14 (0.86 to 1.52) 1 0.91 (0.63 to 1.30) 1.48 (0.60 to 3.65)	Age, employment grade, ethnicity, and marital status
Qian Xiao et al, 2014, US ⁸	National Institutes of Health-AARP Diet and Health Study	51-72	14	Nighttime sleep	Questionnaire	Both: 239896 (44100)	<5 5-6 7-8 ≥9	1.16(1.10 to 1.23) 1.04(1.02 to 1.06) 1 1.11(1.06 to 1.19)	Sex , age, race/ethnicity , marital status, education, self-reported health, smoking, smoking dose, years since quitting smoking, alcohol drinking, moderate-to-vigorous physical activity, TV viewing, and baseline BMI
Andrea Bellavia et al, 2014, Sweden ⁹	Cohort of Swedish Men and the Swedish Mammography Cohort	45-83	15	24-hour sleep	Questionnaire	Both: 70973 (14575)	<6 6-6.5 6.6-7.4 7.5-8 >8	1.25(1.13 to 1.37) 1.10(1.04 to 1.17) 1 1.03(0.98 to 1.08) 1.14(1.05 to 1.24)	Sex, age , body mass index , smoking status and pack-years of smoking , alcohol consumption, total physical activity, and educational level, total physical activity

Christopher A. Magee et al, 2013, Australia ¹⁰	45 and Up Study	≥45	2.8	24-hour sleep	Questionnaire	Both: 227815 (8782)	<6 6 7 8 9 ≥10	1.13(1.01 to 1.25) 0.99(0.91 to 1.06) 1 1.02(0.96 to 1.08) 1.04(0.96 to 1.12) 1.26(1.16 to 1.36)	Age, sex, marital status, private health insurance, smoking status, alcohol consumption, body mass index, sufficient physical activity, and baseline health status
Garde AH et al, 2013, Denmark ¹¹	Copenhagen Male Study	40-59	30	24-hour sleep	Questionnaire	Both: 4943 (2663)	<6 6-7 ≥8	1.06(0.90 to 1.25) 1 0.99(0.84 to 1.09)	Age, BMI, systolic BP, diastolic BP, diabetes , hypertension , physical fitness , alcohol use, smoking, leisure-time physical activity, and social class
Masako Kakizaki et al, 2013, Japan ¹²	Ohsaki Cohort Study	40-79	10.8	24-hour sleep	Questionnaire	Both: 49256 (8447)	≤6 7 8 9 ≥10	1.01 (0.93 to 1.09) 1 1.07 (1.01 to 1.14) 1.14 (1.06 to 1.24) 1.37 (1.27 to 1.47)	Age, sex, total caloric intake, body mass index, marital status, level of education, job status, history of myocardial infarction, history of cancer, history of stroke, history of hypertension, history of diabetes mellitus, smoking status, alcohol drinking, time spent walking, perceived mental stress, self-rated health, physical function
Yohwan Yeo et al, 2013, Korea ¹³	Korean Multi-center Cancer Cohort study	>20	9.44	24-hour sleep	Interview	Both: 13164 (1580) Male: 5447 (923) Female: 7717 (657)	Both: ≤5 6 7 8 9 ≥10 Male: ≤5 6 7 8 9 ≥10 Female: ≤5 6 7 8 9 ≥10	Both: 1.21 (1.03 to 1.41) 1.10 (0.95 to 1.27) 1 1.03 (0.89 to 1.19) 1.36 (1.11 to 1.67) 1.36 (1.07 to 1.72) Male: 1.10 (0.89 to 1.36) 1.09 (0.90 to 1.30) 1 1.02 (0.85 to 1.23) 1.28 (0.97 to 1.69) 1.15 (0.85 to 1.56) Female: 1.41 (1.12 to 1.79) 1.16 (0.92 to 1.46) 1 1.03 (0.81 to 1.30) 1.50 (1.11 to 2.02) 1.87 (1.28 to 2.73)	Age, sex, educational attainment, body mass index, cigarette smoking, alcohol consumption, past history of hypertension, type 2 diabetes, CVD and metabolic syndrome

Hsi-Chung Chen et al, 2013, Taiwan ¹⁴	Shih-Pai Sleep Study	>65	9	Nighttime sleep	Interview	Both: 4064 (1004)	≤ 4 5 6 7 8 9	1.00 (0.75 to 1.33) 0.92 (0.74 to 1.15) 0.88 (0.73 to 1.06) 1 1.26 (1.04 to 1.53) 1.66 (1.28 to 2.17)	Sex, age, education, marital status, living status, depression, body mass index, insomnia, hypnotics use, total sleep time, excessive daytime sleepiness, pain, smoking, alcohol drinking, snorers, diabetes mellitus, hypertension, cardiovascular disease, stroke, and gouty arthritis
Kyu-In Jung et al, 2013, US ¹⁵	Rancho Bernardo Study	60-96	19	Nighttime sleep	Questionnaire	Male: 889 (632) Female: 1112 (592)	Male: <6 6.0-6.9 7.0-7.9 8.0-8.9 ≥ 9 Female: <6 6.0-6.9 7.0-7.9 8.0-8.9 ≥ 9	Male: 0.98 (0.67 to 1.43) 1.12 (0.85 to 1.48) 1 0.98 (0.79 to 1.22) 1.09 (0.82 to 1.45) Female: 1.11 (0.77 to 1.60) 1.17 (0.85 to 1.61) 1 1.19 (0.90 to 1.57) 1.51 (1.05 to 2.18)	Age, nap duration, Beck Depression Inventory (only in men), education (only in men), exercise (only in men), smoking (only in women), alcohol consumption, and medical history of hypertension, diabetes, coronary heart disease, stroke, and cancer, sleep-related medications (sedating antidepressants, antianxiety drugs, and hypnotics) and postmenopausal estrogen (only in women)
Lauren Hale et al, 2013, US ¹⁶	Women's Health Initiative (WHI) clinical trial (CT) and observational study (OS)	50-79	12-15	Nighttime sleep	Questionnaire	Female: 3942 (335)	≤ 5 6 7-8 ≥ 9	1.01 (0.68 to 1.51) 0.94 (0.71 to 1.24) 1 1.55 (0.92 to 2.60)	Age, ethnicity, education, income, fibrinogen, body mass index, low physical exercise, high alcohol intake, ever smoke, elevated blood pressure, diabetes, depression, general health, life satisfaction scale
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	45-75	12.9	24-hour sleep	Questionnaire	Male: 61936 (10738) Female: 73749 (8597)	Male: ≤ 5 6 7 8 ≥ 9 Female: ≤ 5 6 7 8 ≥ 9	Male: 1.15 (1.06 to 1.23) 1.04 (0.99 to 1.10) 1 1.07 (1.01 to 1.12) 1.19 (1.12 to 1.27) Female: 1.15 (1.06 to 1.23) 1.05 (0.99 to 1.12) 1 1.02 (0.96 to 1.08) 1.22 (1.13 to 1.31)	5-year age groups at cohort entry, sex, ethnicity, education, marital status, history of hypertension or diabetes at enrollment, alcohol consumption, energy intake, body mass index, physical activity, hours spent daily watching television, and smoking history

Ying Li et al, 2013, Japan ¹⁸	SAKU cohort	20-79	7	Nighttime sleep	Questionnaire	Both: 9455 (male: 181; female: 131)	Male: ≤5 6 7 8 9 Female: ≤5 6 7 8 9	Male: 1.44 (0.65 to 3.19) 0.86 (0.50 to 1.48) 1 1.05 (0.72 to 1.53) 1.70 (1.07 to 2.70) Female: 1.01 (0.42 to 2.39) 1.01 (0.42 to 2.39) 1 1.01 (0.63 to 1.60) 1.85 (1.09 to 3.13)	Age, body mass index, systolic blood pressure, diastolic blood press, smoking status, drinking habits and physical activity
Jiska Cohen-Mansfield et al, 2012, Israel ¹⁹	Cross-Sectional and Longitudinal Aging Study	75-94	20	Nighttime sleep	Interview	Both: 1166 (1108)	<7 7-9 >9	0.98(0.84 to 1.13) 1 1.32(1.09 to 1.58)	Age, sex, country of origin, education, financial status, having children, demographics, health and function variables
Chul Woo Rhee et al, 2012, Korea ²⁰	Seoul Male Cohort Study	40-59	15	24-hour sleep	Questionnaire	Male: 14095 (935)	≤5 6-7 ≥8	1.53 (1.11 to 2.12) 1.04 (0.88 to 1.22) 1	Age, smoking, alcohol drinking, BMI, regular exercise, education level, hypertension, diabetes mellitus
Castro-Costa et al, 2011, Brasil ²¹	Bambui Health and Ageing Study (BHAS)	≥60	7.5	Nighttime sleep	Interview	Both: 1512 (440)	<6 6-7 7-8 8-9 ≥9	1.09 (0.78 to 1.53) 0.84 (0.60 to 1.17) 1 1.31 (0.97 to 1.78) 1.53 (1.12 to 2.09)	Age, schooling marital status, working status, education, alcohol consumption, coffee consumption, smoking, physical exercises, depressive symptoms, cognitive functioning, psychoactive medications, physical functioning, arthritis ascertainment, systolic blood pressure, high-density lipoprotein cholesterol ratio, diabetes mellitus and body mass index

Li Qiu et al, 2011, China ²²	Chinese Longitudinal Healthy Longevity Survey	>65	3	24-hour sleep	Interview	Both: 20143 (8254) Male: 8774 (3343) Female: 11369 (4911)	Both: ≤5 6 7 8 9 ≥10 Male: ≤5 6 7 8 9 ≥10 Female: ≤5 6 7 8 9 ≥10	Both: 0.97 (0.88 to 1.08) 1.05 (0.95 to 1.16) 1.00 (0.90 to 1.11) 1 0.95 (0.83 to 1.07) 1.09 (1.00 to 1.18) Male: 1.17 (1.01 to 1.38) 1.06 (0.91 to 1.25) 1.17 (0.99 to 1.37) 1 1.08 (0.89 to 1.31) 1.22 (1.08 to 1.38) Female: 0.85 (0.75 to 0.98) 1.02 (0.90 to 1.15) 0.88 (0.76 to 1.01) 1 0.86 (0.72 to 1.02) 1.00 (0.90 to 1.11)	Age, ethnicity, urban–rural residence, and geographic region, SES, family/social support, and health practices, health condition
Erkki Kronholm et al, 2011, Finland ²³		25-59,30-64	29–34	Nighttime sleep	Questionnaire	Male: 11373 (5241) Female: 11917 (3747)	Male: <5 6 7-8 9 >10 Female: <5 6 7-8 9 >10	Male: 1.32(1.15 to 1.50) 1.09(0.99 to 1.20) 1 1.1 (0.99 to 1.21) 1.61(1.36 to 1.89) Female: 1.25 (1.08 to 1.44) 1.14 (1.03 to 1.26) 1 1.18(1.05 to 1.32) 1.62(1.37 to 1.91)	Age, smoking, BMI, systolic blood pressure and total cholesterol

Arthur Eumann Mesas et al, 2010, Spain ²⁴		≥60	6.8	24-hour sleep	Interview	Both: 3820 (897)	Both: ≤5 6 7 8 9 10 ≥11	Both: 1.42 (1.04 to 1.96) 1.23 (0.90 to 1.69) 1 1.34 (1.02 to 1.76) 1.48 (1.12 to 1.96) 1.73 (1.30 to 2.29) 1.66 (1.23 to 2.24)	Age, BMI, educational level, municipality of residence, physical activity, smoking, alcohol consumption, coffee consumption, social links, perceived health, MEC score, depression, SF-36 PCS and MCS scores, IADL limitations, hypertension, ischemic heart disease, stroke, diabetes mellitus, cancer at any site, chronic obstructive pulmonary disease, Parkinson's disease, arousal from sleep at night, and use of anxiolytic medication
Kuo-Liong Chien et al, 2010, Taiwan ²⁵	Chin-shan Community Cardiovascular Cohort Study	35	15.9	Nighttime sleep	Interview	Both: 3430 (901)	≤5 6 7 8 ≥9	1.15 (0.90 to 1.46) 0.97 (0.79 to 1.21) 1 1.04 (0.86 to 1.27) 1.34 (1.08 to 1.67)	Age, sex, BMI, smoking, current alcohol drinking, marital status, education level, occupation, regular exercise, family history of coronary heart disease, hypertension, diabetes, cholesterol, HDL, triglyceride, glucose, and uric acid level
Katie L. Stone et al, 2009, US ²⁶	Study of Osteoporotic Fractures prospective cohort study	≥69	7	Nighttime sleep and 24-hour sleep	Questionnaire	Female: 8101 (1922)	nighttime sleep: <6 6-8 >8 24h sleep: <6 6-8 8-9 9-10 ≥10	nighttime sleep: 1.02 (0.87 to 1.19) 1 1.16 (0.97 to 1.39) 24h sleep: 0.95 (0.76 to 1.18) 1.07 (0.94 to 1.22) 1 1.28 (1.08 to 1.52) 1.58 (1.27 to 1.95)	Age, body mass index, history of at least one medical condition including diabetes mellitus, Parkinson's disease, dementia, chronic obstructive pulmonary disease, non-skin cancer, and osteoarthritis, history of cardiovascular disease, history of hypertension, walks for exercise, alcohol use, smoking status, depression, cognitive impairment, estrogen use, and benzodiazepine use

Etsuji Suzuki et al, 2009, Japan ²⁷	Shizuoka Study	65-85	5.3	Nighttime sleep	Questionnaire	Both: 11395 (1004) Male: 5825 (689) Female: 5570 (315)	Both: ≤5 6 7 8 9 ≥10 Male: ≤5 6 7 8 9 ≥10 Female: ≤5 6 7 8 9 ≥10	Both: 0.92 (0.66 to 1.28) 1.06 (0.80 to 1.39) 1 1.36 (1.09 to 1.70) 1.41 (1.05 to 1.90) 1.96 (1.49 to 2.57) Male: 1.08 (0.72 to 1.61) 1.05 (0.75 to 1.47) 1 1.36 (1.04 to 1.78) 1.52 (1.08 to 2.15) 1.86 (1.34 to 2.56) Female: 0.71 (0.39 to 1.29) 1.08 (0.67 to 1.74) 1 1.39 (0.92 to 2.09) 1.15 (0.64 to 2.09) 2.27 (1.37 to 3.76)	Age, sex (only in the models for all participants), body mass index, smoking status, alcohol consumption, the frequency of physical activity, socioeconomic status, and mental health, hypertension and diabetes mellitus
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	40-79	14.3	24-hour sleep	Questionnaire	Male: 41489 (8548) Female: 57145 (5992)	Male: <4 5 6 7 8 9 ≥10 Female: <4 5 6 7 8 9 ≥10	Male: 1.29 (1.02 to 1.64) 1.02 (0.90 to 1.16) 1.08 (1.00 to 1.16) 1 1.06 (1.00 to 1.12) 1.13 (1.05 to 1.22) 1.41 (1.29 to 1.54) Female: 1.28 (1.03 to 1.60) 1.11 (0.98 to 1.25) 1.05 (0.97 to 1.14) 1 1.16 (1.08 to 1.24) 1.32 (1.20 to 1.45) 1.56 (1.40 to 1.75)	Age, body mass index (quintiles), history of hypertension, history of diabetes, alcohol consumption, smoking, education level, hours of exercise, hours of walking, regular employment, perceived mental stress, depressive symptoms and frequency of fresh fish intake

James E. Gangwisch et al, 2008, US ²⁹	NHANES I Epidemiologic Follow-up Study	32-86	8-10	Nighttime sleep	Interview	Both: 9789 (1877)	≤5 6 7 8 ≥9	1.17 (0.99 to 1.39) 0.95 (0.81 to 1.11) 1 1.23 (1.08 to 1.39) 1.34 (1.15 to 1.56)	Age, physical activity, smoking, depression, sex, education, living alone, low income, daytime sleepiness, nighttime awakening, ethnicity, and sleeping pill use, body weight, diabetes, and hypertension, general health and cancer
Christer Hublin et al, 2007, Finland ³⁰	Finnish Twin Cohort	≥18	22	24-hour sleep	Questionnaire	Male: 10140 (2023) Female: 11128 (1672)	Men: <7 7-8 >8 Women: <7 7-8 >8	Men: 1.26 (1.11 to 1.43) 1 1.24 (1.09 to 1.41) Women: 1.21 (1.05 to 1.40) 1 1.17 (1.03 to 1.34)	Age, education, marital status, working status, social class, BMI, smoking status, binge drinking, grams of alcohol consumed daily, conditioning physical activity, and life satisfaction
Tzuo-Yun Lan et al, 2007, Taiwan ³¹	Survey of Health and Living Status of the Elderly in Taiwan	≥64	8.4	Nighttime sleep	Interview	Male: 1748 (816) Female: 1331 (522)	Male: <7 7-7.9 8-8.9 9-9.9 ≥10 Female: <7 7-7.9 8-8.9 9-9.9 ≥10	Male: 0.98 (0.76 to 1.25) 1 1.09 (0.89 to 1.33) 1.14 (0.91 to 1.42) 1.51 (1.19 to 1.92) Female: 1.14 (0.77 to 1.67) 1 1.36 (1.01 to 1.84) 1.86 (1.36 to 2.53) 2.06 (1.50 to 2.83)	Age at 1993, marital status, monthly income, cigarettes smoking, alcohol consumption, body mass index, exercise, disease history, depression, afternoon nap duration
Yoko Amagai et al, 2004, Japan ³²	Jichi Medical School Cohort Study	19-93	8.2	Nighttime sleep	Interview	Male: 4419 (289) Female: 6906 (206)	Male: <5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0- Female: -5.9 6.0-6.9 7.0-7.9 8.0-8.9 >9.0	Male: 2.4 (1.3 to 4.2) 1.1 (0.7 to 1.8) 1 0.9 (0.6 to 1.2) 1.1 (0.8 to 1.6) Female: 0.7 (0.2 to 2.3) 1.3 (0.8 to 2.1) 1 1.1 (0.8 to 1.6) 1.5 (1.0 to 2.4)	Age, systolic blood pressure, total cholesterol, body mass index, smoking habits, alcohol drinking habits, education, and marital status

Sanjay R. Patel et al, 2003, US ³³	Nurses' Health Study (NHS) Cohort	30-55	14	24-hour sleep	Questionnaire	Female: 82969 (5409)	Female: ≤5 6 7 8 ≥9	Female: 1.08 (0.96 to 1.22) 0.99 (0.92 to 1.06) 1 1.11 (1.03 to 1.19) 1.40 (1.25 to 1.55)	Age, smoking status, alcohol consumption, physical activity, depression, history of snoring, body mass index, history of cancer, cardiovascular disease, hypertension, or diabetes, and shift-working history
Genc Burazeri et al, 2003, Israel ³⁴	Kiryat Yovel Community Health Study	≥50	10	Nighttime sleep and 24-hour sleep	Questionnaire	Male: 841 (198) Female: 1001 (205)	nighttime sleep: Male: <6 6-8 >8 Female: <6 6-8 >8 24h sleep : Male : <6 6-8 >8 Female: <6 6-8 >8	nighttime sleep: Male: 1 1.25(0.83 to 1.87) 1.91(1.16 to 3.13) Female: 1 0.80(0.54 to 1.17) 1.08(0.70 to 1.66) 24h sleep : Male : 1 1.41 (0.83 to 2.39) 2.13 (1.23 to 3.71) Female: 1 0.64 (0.42 to 0.97) 0.80 (0.51 to 1.24)	Men: age, self-appraised health, activities of daily living, CHD, alcohol consumption, systolic blood pressure, homocysteine and glucose, siesta and its duration women: age, diabetes, congestive heart failure, BMI, systolic blood pressure, and albumin, siesta and its duration
Aya Goto et al, 2003, Japan ³⁵		≥65	12	Nighttime sleep	Questionnaire	Male: 251 (139) Female: 473 (166)	Male: <6 6-7 >7 Female: <6 6-7 >7	Male: 1.29(0.50 to 3.34) 1 1.54(0.92 to 2.58) Female: 2.62(1.36 to 5.07) 1 1.40(0.91 to 2.15)	Women: exercise, smoking, drinking, and social role, age, presence of spouse, education, and working status, activities of daily living, hearing, vision, and basic activities of daily living, body mass index, hemoglobin, serum albumin, total cholesterol, creatinine, blood pressure, and electrocardiograph abnormality Men: exercise, smoking, drinking, and social role, age, presence of spouse, education, and working status, cerebrovascular disease, hypertension, activities of daily living, hearing, vision, and basic activities of daily living, body mass index, hemoglobin, serum albumin, total cholesterol, creatinine, blood pressure, and electrocardiograph abnormality

L. MALLON et al, 2002, Sweden ³⁶		45-65	12	Nighttime sleep	Questionnaire	Male: 906 (165) Female: 964 (101)	Male: <6 6-8 >8 Female: <6 6-8 >8	Male: 1.1 (0.6 to 7.0) 1 2.0 (1.2 to 3.2) Female: 1.0 (0.6 to 1.8) 1 1.3 (0.6 to 2.6)	Age
Daniel F. Kripke et al, 2002, US ³⁷	Cancer Prevention Study II	30-102	6	Nighttime sleep	Questionnaire	Male: 480841 (45199) Female: 636095 (32440)	Male: 3 4 5 6 7 8 9 ≥10 Female: 3 4 5 6 7 8 9 ≥10	Male: 1.19(0.96 to 1.47) 1.17(1.06 to 1.28) 1.11(1.05 to 1.18) 1.08(1.04 to 1.11) 1 1.12(1.09 to 1.15) 1.17(1.13 to 1.21) 1.34(1.28 to 1.40) Female: 1.33(1.08 to 1.64) 1.11(1.01 to 1.22) 1.07(1.01 to 1.13) 1.07(1.03 to 1.11) 1 1.13(1.09 to 1.16) 1.23(1.17 to 1.28) 1.41(1.34 to 1.50)	Age, race education, occupation, marital status, exercise level, smoking at intake, years of smoking, churchgoing, fat in diet, fiber in diet, insomnia frequency, health, body mass index, leg pain, history of heart disease, history of hypertension, history of cancer, history of diabetes, history of stroke, history of bronchitis, history of emphysema, history of kidney disease, medications
Pauline Heslop et al, 2002, British ³⁸		65	25	24-hour sleep	Questionnaire	Male: 5819 (2303) Female: 978(262)	Male: <7 7-8 >8 Female: <7 7-8 >8	Male: 1.00(0.89 to 1.12) 1 0.81(0.67 to 0.97) Female: 0.98(0.70 to 1.37) 1 1.20(0.71 to 2.04)	Age, marital status, social class, known risk factors for disease and self-perceived stress

Masayo Kojima et al, 2000, Japan ³⁹		20-67	11.9	Nighttime sleep	Questionnaire	Male: 2438 (149) Female: 2884(109)	Male: -6.9 7.0-8.9 9.0-9.9 10.0- Female: -6.9 7.0-8.9 9.0-9.9 10.0-	Male: 1.93(1.12 to 3.35) 1 1.15(0.74 to 1.77) 1.77(0.88 to 3.54) Female: 0.90(0.50 to 1.61) 1 1.07(0.58 to 1.95) 0.40(0.06 to 2.92)	Baseline age, present and past history of hypertension, cerebrovascular, heart and renal diseases and diabetes, and use of sleeping pills (smoking and drinking habits only in males)
Catharine Gale et al, 1998, British ⁴⁰		≥65	23	Nighttime sleep	Interview	Both: 1229 (1158)	≤7 8 9 10 11 ≥12	1.0 (0.7 to 1.4) 0.8 (0.7 to 1.0) 1 1.2 (1.0 to 1.4) 1.3 (1.0 to 1.7) 1.7 (1.2 to 2.5)	Age, sex, geriatrician's diagnoses of illness, social class, systolic blood pressure, and body mass index
Ana Ruigomez et al, 1995, Spain ⁴¹	Health Interview Survey of Barcelona	65	4.6	24-hour sleep	Interview	Both: 1219 (224) Male: 470 (115) Female: 749(109)	Both: <7 7-9 >9 Male: <7 7-9 >9 Female: <7 7-9 >9	Both: 0.83(0.56 to 1.23) 1 1.37(0.89 to 2.11) Male: 1.06(0.61 to 1.83) 1 1.30(0.71 to 2.38) Female: 0.66(0.37 to 1.16) 1 1.46(0.79 to 2.70)	Age, sex, education level and self perceived health status
Yoshitaka Tsubono et al, 1993, Japan ⁴²	National Collaborative Cohort Study	≥40	4	Nighttime sleep	Questionnaire	Both: 4318 (207)	≤6 7-8 ≥9	1.26(0.81 to 1.97) 1 1.58(1.16 to 2.15)	Age, sex
Roger Rumble et al, 1992, England ⁴³	Nottingham Longitudinal Study of Activity	≥65	5	24-hour sleep	Interview	Both: 1042 (352)	<4 4.0-9.9 ≥10	1.12(0.47 to 2.69) 1 1.60(0.74 to 3.47)	Sex, sleep pills, health

AHI; apnea hypopnea index, BMI; body mass index, BP; blood pressure, CVD; cardiovascular disease, CHD; coronary heart disease, HDL; high density lipoprotein, MEC; mini ex-amen cognoscitivo, MCS; mental component summary, PCS; physical component summary, SES; socioeconomic status, SF-36; 36-item short form survey

Table S2. Sleep duration and total cardiovascular disease

Author, publication year, country	Study name	Age at baseline (years)	Follow-up (years)	Exposure	Exposure assessment	CVD incidence or mortality	Sex, Sample size(cases)	Sleep categories	corresponding relative risk (95% CI)	Covariates in fully adjusted model
Francesco Gianfagna et al, 2016, Italy ⁴⁴	MONICA Brianza and PAMELA	35-74	17	Nighttime sleep	Questionnaire	Incidence	Male: 2277 (293)	≤6 7-8 ≥9	1.14 (0.84 to 1.53) 1 1.55 (1.08 to 2.21)	Age, systolic BP, total cholesterol, HDL cholesterol, diabetes, smoking habits, and educational level, sleep disturbances, LTPA and depression
Hui Cai et al, 2015, China ⁴	Shanghai Women's and Men's Health Studies	Male: 40-75 Female: 44-79	male: 6.07 Female: 7.12	24-hour sleep	Interviews	Mortality	Both: 113138 (1389)	Both: 4-5 6 7 8 9 ≥10 Male: 4-5 6 7 8 9 ≥10 Female: 4-5 6 7 8 9 ≥10	Both: 1.05 (0.87–1.26) 1.10 (0.94–1.29) 1 1.22 (1.05 to 1.43) 1.47 (1.17 to 1.85) 2.04 (1.65 to 2.53) Male: 1.09 (0.82 to 1.46) 1.06 (0.83 to 1.34) 1 1.25 (1.00 to 1.56) 1.68 (1.23 to 2.30) 1.58 (1.14 to 2.18) Female: 1.02 (0.80 to 1.30) 1.12 (0.91 to 1.39) 1 1.20 (0.96 to 1.50) 1.28 (0.91 to 1.82) 2.64 (1.99 to 3.52)	Age, education, income, smoking, alcohol consumption, tea consumption, comorbidity score, history of night-shift work, participation in regular exercise, body mass index, and waist-to-hip ratio, cardiovascular disease, upper gastrointestinal tract
Catarina Canivet et al, 2014, Sweden ⁴⁵	Malmö Diet and Cancer Study	45-64	12	Nighttime sleep	Questionnaire	Incidence	Male: 5875 (952) Female: 7742 (650)	Male: ≤6 7-8 ≥9 Female: ≤6 7-8 ≥9	Male: 1.1 (0.96 to 1.3) 1 1.3 (1.01 to 1.7) Female: 1.3 (1.1 to 1.5) 1 1.5 (1.1 to 2.1)	Age

Qian Xiao et al, 2014, US ⁸	National Institutes of Health-AARP Diet and Health Study	51-72	14	Nighttime sleep	Questionnaire	Mortality	Both: 239896 (11635)	<5 5-6 7-8 ≥9	1.25(1.13 to 1.38) 1.06(1.02 to 1.10) 1 1.07(0.97 to 1.17)	Sex , age, race/ethnicity, marital status, education, self-reported health, smoking, smoking dose, years since quitting smoking, alcohol drinking, moderate-to-vigorous physical activity, TV viewing, and baseline BMI
Naja Hulvej Rod et al, 2014, British ⁷	British Whitehall II prospective cohort study	35-55	22	Nighttime sleep	Questionnaire	Mortality	Male: 6114 (167) Female: 2984 (54)	Male: ≤6 7-8 >9 Female: ≤6 7-8 >9	Male: 1.18 (0.87 to 1.63) 1 1.61 (0.40 to 6.59) Female: 1.81 (1.05 to 3.10) 1 NA(n=0)	Age, employment grade, ethnicity, and marital status
Andrea Bellavia et al, 2014, Sweden ⁹	Cohort of Swedish Men and the Swedish Mammography Cohort	45-83	15	24-hour sleep	Questionnaire	Mortality	Both: 70973 (3981)	<6 6-6.5 6.6-7.4 7.5-8 >8	1.44(1.20 to 1.73) 1.23(1.09 to 1.38) 1 1.02(0.92 to 1.12) 1.11(0.95 to 1.31)	Sex, age, body mass index ,smoking status and pack-years of smoking, alcohol consumption, total physical activity, and educational level, total physical activity
Megan Sands-Lincoln et al, 2013, US ⁴⁶	Women's Health Initiative Observational Study	50-79	10.3	Nighttime sleep	Questionnaire	Incidence	Female: 86329 (7257)	≤5 6 7-8 9 ≥10	1.06(0.96 to 1.16) 1.00(0.95 to 1.06) 1 0.95(0.83 to 1.08) 1.23(0.89 to 1.70)	Age, race, education, income, smoking, BMI, physical activity, alcohol intake, depression, diabetes, high blood pressure, hyperlipidemia, comorbid conditions
Anna Westerlund et al, 2013, Sweden ⁴⁷	National March Cohort Study	≥18	13.2	24-hour sleep	Questionnaire	Incidence and mortality	CVD incidence, Both: 41192 (4031) CVD mortality, Both: 41192 (857)	≤5 6 7 ≥8 5 6 7 ≥8	1.05 (0.88 to 1.26) 0.97 (0.86 to 1.09) 1 1.00 (0.89 to 1.13) 1.11 (0.76 to 1.64) 1.17 (0.88 to 1.55) 1 1.12 (0.85 to 1.47)	Age, sex, education, employment status, smoking, alcohol, snoring, work schedule, depressive symptoms, self-rated health, physical activity, BMI, diabetes, lipid disturbance, and hypertension

Elizabeth G. Holliday et al, 2013, Australia ⁴⁸	45 and Up Study	≥45	2.3	Nighttime sleep	Questionnaire	Incidence	Both: 156902 (4852)	<6 6 7 8 9 ≥10	1.03 (0.88 to 1.21) 1.06 (0.96 to 1.17) 1 0.98 (0.91 to 1.05) 0.98 (0.89 to 1.09) 1.00 (0.88 to 1.14)	Age, sex, education, marital status, residential remoteness, alcohol consumption, smoking status, health insurance status, income, body mass index, physical activity and baseline health status
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	45-75	12.9	24-hour sleep	Questionnaire	Mortality	Male: 61936 (3772) Female: 73749 (2838)	Male: ≤5 6 7 8 ≥9 Female: ≤5 6 7 8 ≥9	Male: 1.13 (1.00 to 1.28) 1.01 (0.92 to 1.11) 1 1.05 (0.96 to 1.14) 1.22 (1.09 to 1.35) Female: 1.20 (1.05 to 1.36) 1.06 (0.96 to 1.18) 1 1.08 (0.98 to 1.20) 1.29 (1.13 to 1.47)	5-year age groups at cohort entry, sex, ethnicity, education, marital status, history of hypertension or diabetes at enrollment, alcohol consumption, energy intake, body mass index, physical activity, hours spent daily watching television, and smoking history
Hsi-Chung Chen et al, 2013, Taiwan ¹⁴	Shih-Pai Sleep Study	>65	7	Nighttime sleep	Interviews	Mortality	Both: 4064 (259)	≤4 5 6 7 8 9	1.05 (0.61 to 1.79) 0.95 (0.62 to 1.48) 0.79 (0.54 to 1.16) 1 1.36 (0.92 to 2.01) 2.36 (1.46 to 3.80)	Sex, age, education, marital status, living status, depression, body mass index, insomnia, hypnotics use, total sleep time, excessive daytime sleepiness, pain, smoking, alcohol drinking, snorers, diabetes mellitus, hypertension, cardiovascular disease, stroke, and gouty arthritis

Yohwan Yeo et al , 2013, Korea ¹³	Korean Multi-center Cancer Cohort study	>20	9.44	24-hour sleep	Interviews	Mortality	Both: 13164 (363) Male: 5447 (169) Female: 7717 (194)	Both: ≤5 6 7 8 9 ≥10 Male: ≤5 6 7 8 9 ≥10 Female: ≤5 6 7 8 9 ≥10	Both: 1.40 (1.02 to 1.93) 1.25 (0.92 to 1.69) 1 1.04 (0.76 to 1.42) 1.26 (0.81 to 1.96) 1.37 (0.82 to 2.29) Male: 1.43 (0.89 to 2.30) 1.21 (0.77 to 1.91) 1 1.06 (0.68 to 1.67) 1.05 (0.51 to 2.19) 1.53 (0.79 to 2.95) Female: 1.48 (0.97 to 2.28) 1.32 (0.87 to 2.00) 1 1.00 (0.64 to 1.55) 1.40 (0.80 to 2.46) 1.13 (0.48 to 2.67)	Age, sex, educational attainment, body mass index, cigarette smoking, alcohol consumption, past history of hypertension, type 2 diabetes, CVD and metabolic syndrome
Masako Kakizki et al, 2013, Japan ¹²	Ohsaki Cohort Study	40-79	10.8	24-hour sleep	Questionnaire	Mortality	Both: 49256 (2549)	≤6 7 8 9 ≥10	1.10 (0.96 to 1.28) 1 1.21 (1.08 to 1.36) 1.32 (1.15 to 1.52) 1.49 (1.30 to 1.71)	Age, sex, total caloric intake, body mass index in, marital status, level of education, job status , history of myocardial infarction, history of cancer, history of stroke, history of hypertension, history of diabetes mellitus, smoking status, alcohol drinking, time spent walking, perceived mental stress, self-rated health, physical function

Ying Li et al, 2013, Japan ¹⁸	SAKU cohort	20-79	7	Nighttime sleep	Questionnaire	Mortality	Both: 9455 (NA)	Male: ≤5 6 7 8 ≥9 Female: ≤5 6 7 8 ≥9	Male: 1.57 (0.35 to 7.15) 0.60 (0.17 to 2.15) 1 1.04 (0.49 to 2.21) 2.73 (1.22 to 6.11) Female: 0.80 (0.18 to 3.47) 0.91 (0.38 to 2.23) 1 1.13 (0.57 to 2.23) 1.72 (0.76 to 3.89)	Age, body mass index, systolic blood pressure, diastolic blood press, smoking status, drinking habits and physical activity
Marieke P. Hoevenaar-Blom et al, 2011, Netherlands ⁴⁹	MORGEN Study	20-65	11.9	24-hour sleep	Questionnaire	Incidence	Both: 20432 (1486)	≤6 7 8 ≥9	1.11 (0.97 to 1.27) 1 0.95 (0.84 to 1.08) 0.96 (0.77 to 1.18)	Age, sex, smoking, alcohol, coffee, subjective health, educational level, BMI, total-/HDL cholesterol ratio, systolic blood pressure, CVD risk factor medication, and prevalence of type 2 diabetes
Yuko Hamazaki et al, 2011, Japan ⁵⁰		35-54	14	24-hour sleep	Questionnaire	Incidence	Male: 2282 (64)	<6 6-6.9 7-7.9 ≥8	3.49(1.30 to 9.40) 1.11(0.55 to 2.25) 1 1.71(0.90 to 3.24)	Age, type of job, working hours, mental workload, body mass index, mean blood pressure, HbA1c, total cholesterol, current smoking habit, drinking habit, leisure-time physical activity , medication for hypertension, diabetes, and hypercholesterolemia
Erkki Kronholm et al, 2011, Finland ²³		25-59,30-64	29-34	Nighttime sleep	Questionnaire	Mortality	Male: 10851 (1830) Female: 11633 (1344)	Male: < 5 6 7-8 9 > 10 Female: < 5 6 7-8 9 > 10	Male: 1.20 (0.96 to 1.50) 1.12 (0.96 to 1.31) 1 0.95 (0.80 to 1.14) 1.27 (0.94 to 1.75) Female: 1.33 (1.06 to 1.67) 1.20 (1.01 to 1.42) 1 1.20 (1.00 to 1.45) 1.76 (1.34 to 2.32)	Age, smoking, BMI, systolic blood pressure and total cholesterol

Kuo-Liong Chien et al, 2010, Taiwan ²⁵	Chin-shan Community Cardiovascular Cohort study	>35	15.9	Nighttime sleep	Interview	Incidence	Both: 3430 (420)	≤5 6 7 8 ≥9	0.94 (0.65 to 1.35) 0.91 (0.67 to 1.24) 1 1.05 (0.80 to 1.39) 1.12 (0.81 to 1.55)	Age, sex, BMI, smoking, current alcohol drinking, marital status, education level, occupation, regular exercise, family history of coronary heart disease, baseline hypertension, diabetes, cholesterol, HDL, triglyceride, glucose, and uric acid level
Yoko Amagai et al, 2010, Japan ⁵¹	Jichi Medical School Cohort Study	18-90	10.7	Nighttime sleep	Interview	Incidence	Male: 4413 (255) Female: 6954 (226)	Male: <5.9 6.0–6.9 7.0–7.9 8.0–8.9 9.0 Female: <5.9 6.0–6.9 7.0–7.9 8.0–8.9 9.0	Male: 2.14 (1.11 to 4.13) 1.04 (0.61 to 1.76) 1 0.98 (0.69 to 1.40) 1.33 (0.93 to 1.92) Female: 1.46 (0.70 to 3.04) 0.64 (0.38 to 1.10) 1 0.85 (0.60 to 1.20) 1.28 (0.88 to 1.87)	Age, systolic blood pressure, total cholesterol, body mass index, smoking habits, and alcohol drinking habits
Katie L. Stone et al, 2009, US ²⁶	Study of Osteoporotic Fractures Prospective Cohort study	≥69	7	Nighttime sleep and 24-hour sleep	Questionnaire	Mortality	Female: 8101 (723)	<6 6-8 >8	1.03 (0.80 to 1.31) 1 1.21 (0.92 to 1.61)	Age, body mass index, history of at least one medical condition including diabetes mellitus, Parkinson's disease, dementia, chronic obstructive pulmonary disease, non-skin cancer, and osteoarthritis, history of cardiovascular disease, history of hypertension, walks for exercise, alcohol use, smoking status, depression, cognitive impairment, estrogen use, and benzodiazepine use

Etsuji Suzuki et al, 2009, Japan ²⁷	Shizuoka Study	65-85	5.3	Nighttime sleep	Questionnaire	Mortality	Both: 11395 (310) Male: 5825 (184) Female: 5570 (126)	Both: ≤5 6 7 8 9 ≥10 Male: ≤5 6 7 8 9 ≥10 Female: ≤5 6 7 8 9 ≥10	Both: 1.10 (0.62 to 1.93) 0.85 (0.50 to 1.45) 1 1.52 (1.01 to 2.29) 1.55 (0.91 to 2.63) 1.95 (1.18 to 3.21) Male: 0.97 (0.46 to 2.05) 0.75 (0.38 to 1.48) 1 1.05 (0.63 to 1.75) 1.26 (0.65 to 2.45) 1.71 (0.94 to 3.11) Female: 1.48 (0.59 to 3.67) 1.08 (0.44 to 2.66) 1 2.83 (1.39 to 5.76) 2.32 (0.93 to 5.77) 2.31 (0.91 to 5.82)	Age, sex (only in the models for all participants), body mass index, smoking status, alcohol consumption, the frequency of physical activity, socioeconomic status, and mental health, hypertension and diabetes mellitus
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	40-79	14.3	24-hour sleep	Questionnaire	Mortality	Male :41489 (2297) Female: 57145 (1990)	Male: <4 5 6 7 8 9 ≥10 Female: <4 5 6 7 8 9 ≥10	Male: 1.11 (0.67 to 1.83) 0.99 (0.77 to 1.27) 1.01 (0.87 to 1.18) 1 1.11 (1.00 to 1.24) 1.14 (0.99 to 1.32) 1.56 (1.33 to 1.83) Female: 1.28 (0.88 to 1.86) 1.22 (1.00 to 1.50) 1.00 (0.86 to 1.16) 1 1.28 (1.14 to 1.44) 1.37 (1.17 to 1.62) 1.54 (1.28 to 1.86)	Age, body mass index (quintiles), history of hypertension, history of diabetes, alcohol consumption, smoking, education level, hours of exercise, hours of walking, regular employment, perceived mental stress, depressive symptoms and frequency of fresh fish intake

Tzuo-Yun Lan et al, 2007, Taiwan ³¹	Survey of Health and Living Status of the Elderly in Taiwan	≥64	8.4	Nighttime sleep	Interviews	Mortality	Male: 1748 (209) Female: 1331 (170)	Male: <7 7-7.9 8-8.9 9-9.9 ≥10 Female: <7 7-7.9 8-8.9 9-9.9 ≥10	Male: 0.91 (0.53 to 1.57) 1 1.40 (0.93 to 2.10) 1.26 (0.80 to 1.98) 1.81 (1.13 to 2.89) Female: 1.07 (0.54 to 2.15) 1 1.77 (1.05 to 2.98) 1.75 (1.00 to 3.07) 1.85 (1.04 to 3.27)	Age at 1993, marital status, monthly income, cigarettes smoking, alcohol consumption, body mass index, exercise, disease history (heart disease, stroke, and cancer), depression, afternoon nap duration
Sanjay R. Patel et al, 2004, US ³³	Nurses' Health Study (NHS) Cohort	30-55	14	24-hour sleep	Questionnaire	Mortality	Female: 82969 (1084)	≤5 6 7 8 ≥9	1.04 (0.79 to 1.35) 1.06 (0.91 to 1.25) 1 1.12 (0.95 to 1.31) 1.56 (1.25 to 1.96)	Age, smoking status, alcohol consumption, physical activity, depression, history of snoring, body mass index, history of cancer, cardiovascular disease, hypertension, or diabetes, and shift-working history
Genc Burazeri et al, 2003, Israel ³⁴	Kiryat Yovel Community Health Study	≥50	10	Nighttime sleep and 24-hour sleep	Questionnaire	Mortality	Male: 750 (77) Female: 910 (93)	Male: <6 6-8 >8 Female: <6 6-8 >8	Male: 1 1.35 (0.71 to 2.58) 1.91 (0.86 to 4.23) Female: 1 0.83 (0.47 to 1.45) 1.02 (0.54 to 1.93)	Men included: age, self-appraised health, activities of daily living, CHD, alcohol consumption, systolic blood pressure, homocysteine, glucose, siesta and its duration Women included: age, diabetes, congestive heart failure, BMI, systolic blood pressure, albumin, siesta and its duration
Pauline Heslop et al, 2002, British ³⁸		Male: 65 Female: 60	25	24-hour sleep	Questionnaire	Mortality	Male: 5819 (1182) Female: 978 (117)	Male: <7 7-8 >8 Female: <7 7-8 >8	Male: 1.00 (0.85 to 1.17) 1 0.82 (0.64 to 1.07) Female: 0.80 (0.47 to 1.37) 1 1.35 (0.62 to 2.95)	Age, marital status, social class, known risk factors for disease and self-perceived stress

BMI; body mass index, BP; blood pressure, CVD; cardiovascular disease, CHD; coronary heart disease, HDL; high density lipoprotein, LTPA; leisure time physical activity, NA; not available

Table S3. Sleep duration and coronary heart disease

Author, publication year, country	Study name	Age at baseline (years)	Follow-up (years)	Exposure	Exposure assessment	Outcome	Sex, Sample size(cases)	Sleep categories	Corresponding relative risk (95% CI)	Covariates in fully adjusted model
Francesco Gianfagna et al, 2016, Italy ⁴⁴	MONICA Brianza and PAMELA Population-based Cohorts	35-74	17	Nighttime sleep	Questionnaire	CHD incidence	Male: 2277 (213)	≤6 7-8 ≥9	1.14 (0.80 to 1.61) 1 1.32 (0.85 to 2.07)	Age, systolic BP, total cholesterol, HDL cholesterol, diabetes, smoking habits, and educational level, sleep disturbances, LTPA and depression
Liangle Yang et al, 2016, China ⁵²	Dongfeng-Tongji Cohort Study	62.8	3-5	Nighttime sleep	Questionnaire	CHD incidence	Both: 19370 (2058)	<7 7-<8 8-<9 9-<10 ≥10	1.08 (0.90 to 1.29) 1 1.04 (0.93 to 1.16) 1.03 (0.90 to 1.18) 1.33 (1.10 to 1.62)	Age, sex, BMI, education, smoking status, drinking status, physical activity, hypertension, hyperlipidemia, diabetes, family history of CHD, and midday napping
Xizhu Wang et al, 2016, China ³	Kailuan Study	18-98	3.98	Nighttime sleep	Questionnaire	MI mortality	Both: 95903 (423)	≤5 6 7 8 ≥9	0.89 (0.60 to 1.30) 0.84 (0.61 to 1.16) 1 0.86 (0.66 to 1.13) 1.12 (0.58 to 2.16)	Age, sex, family per member monthly income, education level, marital status, smoking status, drinking status, physical activity, history of hypertension, diabetes mellitus, and hyperlipidemia
Linn B. Strand et al, 2016, Taiwan ⁵³		≥20	9.7	Nighttime sleep	Questionnaire	CHD mortality	Both: 392164 (711) Male: 191656 (489) Female: 200508 (222)	Both: 0-4 4-6 6-8 >8 Male: 0-4 4-6 6-8 >8 Female: 0-4 4-6 6-8 >8	Both: 1.36 (0.88 to 2.10) 1.03 (0.85 to 1.24) 1 1.28 (1.05 to 1.56) Male: 1.03 (0.53 to 2.00) 1.06 (0.85 to 1.32) 1 1.11 (0.88 to 1.41) Female: 1.84 (1.03 to 3.29) 0.99 (0.72 to 1.37) 1 1.81 (1.28 to 2.56)	Age, sex, education, marital status, smoking, alcohol consumption, physical activity, history of hypertension, history of diabetes, history of heart disease, body mass index, systolic blood pressure, fasting glucose, total cholesterol, HDL cholesterol, triglycerides and use of hypnotics/sedatives
J. Liu et al, 2014, US ⁵⁴	Framingham Offspring Study	≥30	20	24-hour sleep	Questionnaire	CHD incidence	Both: 3086 (491)	<6 7-8 >9	1.29 (1.03 to 1.61) 1 1.13 (0.81 to 1.58)	Age, sex, current cigarette smoking, weekly alcohol drinking, systolic blood pressure, total cholesterol level, BMI, diabetes, treatment of hypertension, C-reactive protein

Megan Sands-Lincoln et al, 2013, US ⁴⁶	Women's Health Initiative Observational Study	50-79	10.3	Nighttime sleep	Questionnaire	CHD incidence	Female: 86329 (5359)	≤ 5 6 7-8 9 ≥ 10	1.08 (0.96 to 1.20) 1.00 (0.94 to 1.07) 1 0.93 (0.80 to 1.08) 1.33 (0.94 to 1.88)	Age, race, education, income, smoking, BMI, physical activity, alcohol intake, depression, diabetes, high blood pressure, hyperlipidemia, comorbid conditions
Lauren Hale et al, 2013, US ¹⁶	Women's Health Initiative (WHI) clinical trial (CT) and observational study (OS)	50-79	11-16	Nighttime sleep	Questionnaire	CHD incidence	Female: 3942 (132)	≤ 5 6 7-8 ≥ 9	1.09 (0.63 to 1.89) 0.66 (0.42 to 1.04) 1 1.88 (0.92 to 3.83)	Age, ethnicity, education, income, fibrinogen, body mass index, low physical exercise, high alcohol intake, ever smoke, elevated blood pressure, diabetes, depression, general health, life satisfaction scale
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	45-75	12.9	24-hour sleep	Questionnaire	CHD mortality, IHD mortality and MI mortality	CHD mortality, Male: 61936 (2096) Female: 73749 (1380) IHD mortality, Male: 61936 (1429) Female: 73749 (859) MI mortality, Male: 61936 (667) Female: 73749 (521)	Male: ≤ 5 6 7 8 ≥ 9 Female: ≤ 5 6 7 8 ≥ 9 Male: ≤ 5 6 7 8 ≥ 9 Female: ≤ 5 6 7 8 ≥ 9 Male: ≤ 5 6 7 8	Male: 1.20 (0.99 to 1.45) 0.98 (0.84 to 1.13) 1 1.01 (0.88 to 1.16) 1.16 (0.98 to 1.39) Female: 1.18 (0.94 to 1.49) 1.06 (0.88 to 1.29) 1 1.13 (0.94 to 1.36) 1.20 (0.95 to 1.53) Male: 1.24 (0.94 to 1.64) 0.92 (0.74 to 1.15) 1 0.98 (0.80 to 1.20) 1.16 (0.89 to 1.50) Female: 1.18 (0.87 to 1.59) 1.23 (0.96 to 1.56) 1 1.10 (0.86 to 1.40) 1.29 (0.94 to 1.75) 1.21 (1.04 to 1.42) Female: 0.96 (0.85 to 1.08) 1 1.00 (0.89 to 1.12) 1.16 (1.00 to 1.34)	5-year age groups at cohort entry, sex, ethnicity, education, marital status, history of hypertension or diabetes at enrollment, alcohol consumption, energy intake, body mass index, physical activity, hours spent daily watching television, and smoking history

								≥ 9 Female: ≤ 5 6 7 8 ≥ 9	Female: 1.18 (0.98 to 1.42) 1.13 (0.97 to 1.31) 1 1.12 (0.96 to 1.29) 1.23 (1.02 to 1.49)	
Masako Kakizki et al, 2013, Japan ¹²	Ohsaki Cohort Study	40-79	10.8	24-hour sleep	Questionnaire	IHD mortality	Both:49256 (561)	≤ 6 7 8 9 ≥ 10	1.38 (1.02 to 1.86) 1 1.36 (1.06 to 1.73) 1.49 (1.10 to 2.02) 1.41 (1.04 to 1.92)	Age, sex, total caloric intake, body mass index, marital status, level of education, job status, history of myocardial infarction, history of cancer, history of stroke, history of hypertension, history of diabetes mellitus, smoking status , alcohol drinking , time spent walking, perceived mental stress, self-rated health, physical function
Garde AH et al, 2013, Denmark ¹¹	Copenhagen Male Study	40-59	30	24-hour sleep	Questionnaire	IHD mortality	Male: 4943 (587)	Male: < 6 6-7 ≥ 8	Male: 1.46 (1.07 to 2.00) 1 1.20 (0.97 to 1.49)	Age, BMI, systolic BP, diastolic BP, diabetes, hypertension, physical fitness, alcohol use, smoking, leisure-time physical activity, and social class.
Anna Westerlund et al, 2013, Sweden ⁴⁷	National March Cohort Study	≥ 18	13.2	24-hour sleep	Questionnaire	MI incidence	Both: 41192 (1908)	5 6 7 ≥ 8	1.19 (0.92 to 1.55) 1.05 (0.88 to 1.25) 1 1.19 (1.00 to 1.41)	Age, sex, education, employment status, smoking, alcohol, snoring, work schedule, depressive symptoms, self-rated health, physical activity, BMI, diabetes, lipid disturbance, and hypertension
Anne von Ruesten et al, 2012, Germany ⁵⁵	European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam Study	Male: 65 Female: 60	7.8	24-hour sleep	Interview	MI incidence	Both: 23620 (197)	< 6 6-7 7-8 8-9 ≥ 9	1.44 (0.85 to 2.43) 0.80 (0.53 to 1.20) 1 0.82 (0.56 to 1.19) 0.89 (0.54 to 1.49)	Age, sex, sleeping disorders, sleep duration at night, alcohol intake from beverages, smoking status, walking, cycling, sports, employment status, and education, BMI, waist-to-hip ratio, history of high blood lipid levels at baseline.
Marieke P. Hoevenaer-Blom et al, 2011, Netherlands ⁴⁹	MORGEN Study	20-65	11.9	24-hour sleep	Questionnaire	CHD incidence	Both: 20432 (1148)	≤ 6 7 8 ≥ 9	1.19 (1.00 to 1.40) 1 0.85 (0.73 to 1.00) 0.78 (0.58 to 1.04)	Age, sex, smoking, alcohol, coffee, subjective health, educational level, BMI, total-/HDL cholesterol ratio, systolic blood pressure, CVD risk factor medication, and prevalence of type 2 diabetes

Yuko Hamazaki et al, 2011, Japan ⁵⁰		35-54	14	24-hour sleep	Questionnaire	CHD incidence	Male: 2282 (27)	<6 6-6.9 7-7.9 ≥8	4.95 (1.31 to 18.73) 1.12 (0.40 to 3.13) 1 1.78 (0.67 to 4.76)	Age, type of job, working hours, and mental workload, body mass index, mean blood pressure, HbA1c, total cholesterol, current smoking habit, drinking habit, leisure-time physical activity, and medication for hypertension, diabetes, and hypercholesterolemia
Tarani Chandola et al, 2010, British ⁵⁶	British Whitehall II Prospective Cohort Study	35-55	15	Nighttime sleep	Questionnaire	CHD incidence	Both: 8998 (1025)	≤5 6 7 ≥8	1.05 (0.92 to 1.20) 0.98 (0.83 to 1.16) 1 0.99 (0.77 to 1.27)	Sleep variables, age, sex, ethnicity, employment grade, car access, and housing tenure, self-rated health status, total cholesterol concentration, hypertension, body mass index, diabetes, smoking, alcohol consumption, vigorous and moderate exercise, and fruit and vegetable consumption
Yoko Amagai et al, 2010, Japan ⁵¹	Jichi Medical School Cohort Study	18-90	10.7	Nighttime sleep	Interview	MI incidence	Male: 4413 (55) Female: 6954 (25)	Male: <5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0 Female: <5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0	Male: 1.78 (0.50 to 6.28) 0.77 (0.25 to 2.33) 1 0.69 (0.34 to 1.41) 0.99 (0.47 to 2.06) Female: 4.93 (1.31 to 18.61) 0.59 (0.13 to 2.73) 1 0.59 (0.21 to 1.66) 0.84 (0.27 to 2.62)	Age, systolic blood pressure, total cholesterol, body mass index, smoking habits, and alcohol drinking habits.
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	40-79	14.3	24-hour sleep	Questionnaire	CHD mortality	Male: 41489 (508) Female: 57145 (373)	Male: <4 5 6 7 8 9 ≥10 Female: <4 5 6 7 8	Male: 0.29 (0.04 to 2.05) 1.02 (0.62 to 1.70) 0.86 (0.63 to 1.19) 1 1.02 (0.82 to 1.27) 0.96 (0.70 to 1.31) 1.12 (0.77 to 1.63) Female: 2.32 (1.19 to 4.50) 1.64 (1.07 to 2.53) 1.23 (0.88 to 1.72) 1 1.24 (0.94 to 1.64)	Age, body mass index, history of hypertension, history of diabetes, alcohol consumption, smoking, education level, hours of exercise, hours of walking, regular employment, perceived mental stress, depressive symptoms and frequency of fresh fish intake

								9 ≥10	1.52 (1.05 to 2.19) 1.04 (0.63 to 1.72)	
Anoop Shankar et al, 2008, Singapore ⁵⁷	Singapore Chinese Health Study	≥45	13	Nighttime sleep	Interview	CHD mortality	Both: 58044 (1416) Male: 25552 (846) Female: 32492 (570)	Both: ≤5 6 7 8 ≥9 Male: ≤5 6 7 8 ≥9 Female: ≤5 6 7 8 ≥9	Both: 1.57 (1.32 to 1.88) 1.13 (0.98 to 1.31) 1 1.12 (0.97 to 1.29) 1.79 (1.48 to 2.17) Male: 1.70 (1.35 to 2.15) 1.20 (0.99 to 1.45) 1 1.10 (0.92 to 1.32) 1.88 (1.48 to 2.40) Female: 1.43 (1.09 to 1.88) 1.04 (0.82 to 1.31) 1 1.15 (0.92 to 1.44) 1.67 (1.24 to 2.27)	Age, sex, dialect group, education, year of recruitment, body mass index, smoking , alcohol intake, moderate physical activity , dietary intakes of total calories , fruits, vegetables , fiber, total fat and cholesterol , weekly use of vitamin/mineral supplements (among women, menopausal status and ever use of postmenopausal hormone replacement therapy)
Christa Meisinger et al, 2007, Germany ⁵⁸	MONICA/KORA Augsburg Cohort Study	45-74	10.1	Nighttime sleep	Interview	MI incidence	Male: 3508 (295) Female: 3388 (85)	Male: 5 6 7 8 ≥9 Female: 5 6 7 8 ≥9	Male: 1.13 (0.66 to 1.92) 1.05 (0.71 to 1.55) 1.22 (0.92 to 1.61) 1 1.07 (0.75 to 1.53) Female: 2.98 (1.48 to 6.03) 1.05 (0.49 to 2.27) 1.34 (0.75 to 2.40) 1 1.40 (0.74 to 2.64)	Age, survey, BMI, education, dyslipidemia, alcohol intake, parental history of MI, physical activity, regular smoking, hypertension, diabetes, and menopause status (only women)
Najib T. Ayas et al, 2003, US ⁵⁹	Nurse's Health Study	35-55	10	Nighttime sleep	Questionnaire	CHD incidence , CHD mortality and MI incidence	CHD incidence, Female: 71617 (934) CHD mortality, Female: 71617 (271)	≤5 6 7 8 ≥9 5 6 7 8	1.39 (1.05 to 1.84) 1.18 (0.98 to 1.43) 1.10 (0.92 to 1.31) 1 1.37 (1.02 to 1.85) 1.12 (0.68 to 1.84) 0.91 (0.65 to 1.28) 0.83 (0.60 to 1.14) 1	Age, shift work, hypercholesterolemia, body mass index, smoking, snoring, exercise level, alcohol consumption, depression, aspirin use, postmenopausal hormone use, family history of MI, diabetes mellitus and hypertension

							MI incidence, Female: 71617 (663)	≥ 9 ≤ 5 6 7 8 ≥ 9	1.45 (0.89 to 2.36) 1.52 (1.08 to 2.14) 1.32 (1.05 to 1.65) 1.23 (0.99 to 1.52) 1 1.35 (0.93 to 1.95)	
L. MALLON et al, 2002, Sweden ³⁶		45-65	12	Nighttime sleep	Questionnaire	CHD incidence	Male: 906 (71) Female: 964 (20)	Male: <6 6-8 >8 Female: <6 6-8 >8 Female: <6 6-8 >8	Male: 0.7 (0.3 to 1.7) 1 2.2 (1.0 to 4.4) Female: 1.2 (0.4 to 4.2) 1 0.7 (0.1 to 5.2) Female: 1.2 (0.4 to 4.2) 1 0.7 (0.1 to 5.2)	Age
Adnan I. Qureshi et al, 1997, US ⁶⁰	First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study	32-74	10	Nighttime sleep	Questionnaire	CHD incidence	Both: 7844 (413)	<6 6-8 >8	1.3 (1.0 to 1.8) 1 1.1 (0.8 to 1.5)	Age, sex, race, education, cigarette smoking, systolic blood pressure, serum cholesterol level, diabetes, and body mass index

BMI; body mass index, BP; blood pressure, CVD; cardiovascular disease, CHD; coronary heart disease, HDL; high density lipoprotein, IHD; ischemic heart disease, LTPA; leisure time physical activity, MI; myocardial infarction

Table S4. Sleep duration and stroke

Author, publication year, country	Study name	Age at baseline (years)	Follow-up (years)	Exposure	Exposure assessment	Stroke incidence or mortality	Sex, Sample size(cases)	Sleep categories	corresponding relative risk (95% CI)	Covariates in fully adjusted model
Qiaofeng Song et al, 2016, China ⁶¹	The Kailuan Study	18-98	7.9	Nighttime sleep	Questionnaire	Incidence	Both: 95023 (3135)	<6 6-8 >8	0.92 (0.80 to 1.05) 1 1.29 (1.01 to 1.65)	Age, sex, marital status, family per member monthly income, education level, smoking status, drinking status, physical activity, family history of stroke, body mass index, systolic blood pressure, diastolic blood pressure, fasting blood glucose, total cholesterol, hypotensive drug use, lipid-lowering drug use, hypoglycemic drug use, history of myocardial infarction, and snoring status, sensitive C-reactive protein, and atrial fibrillation
Toshiaki Kawachi et al, 2016, Japan ⁶²	Takayama Cohort Study	≥35	16	Nighttime sleep	Questionnaire	Mortality	Both: 27896 (611) Male: 12875 (296) Female: 15021 (315)	Both: ≤6 7 8 ≥9 Male: ≤6 7 8 ≥9 Female: ≤6 7 8 ≥9	Both: 0.77 (0.59 to 1.01) 1 1.13 (0.91 to 1.40) 1.51 (1.16 to 1.97) Male: 0.51 (0.34 to 0.77) 1 0.88 (0.66 to 1.17) 1.23 (0.90 to 1.69) Female: 1.06 (0.75 to 1.50) 1 1.50 (1.10 to 2.04) 1.93 (1.38 to 2.70)	Sex, age, education years, marital status, histories of hypertension and diabetes, body mass index, physical activity score, smoking status, and alcohol consumption

A. Katharina Helbig et al, 2015, Germany ⁶³	MONICA/KORA Augsburg Cohort Study	25-74	14	24-hour sleep	Interview	Incidence and mortality	Stroke incidence, Male: 6157 (508) Female: 5974 (318) Stroke mortality, Male: 6157 (109) Female: 5974 (89)	Male: ≤5 6 7-8 9 ≥10 Female: ≤5 6 7-8 9 ≥10 Male: ≤5 6 7-8 9 ≥10 Female: ≤5 6 7-8 9 ≥10	Male: 1.36 (0.95 to 1.94) 0.92 (0.70 to 1.22) 1 1.05 (0.78 to 1.43) 1.38 (0.98 to 1.94) Female: 0.68 (0.40 to 1.18) 1.25 (0.91 to 1.70) 1 1.09 (0.76 to 1.57) 0.91 (0.55 to 1.51) Male: 1.36 (0.95 to 1.94) 0.92 (0.70 to 1.22) 1 1.05 (0.78 to 1.43) 1.38 (0.98 to 1.94) Female: 0.68 (0.40 to 1.18) 1.25 (0.91 to 1.70) 1 1.09 (0.76 to 1.57) 0.91 (0.55 to 1.51)	Age, survey, education, physical activity, alcohol consumption, current smoking, dyslipidemia activity, BMI, hypertension, diabetes
Yue Leng et al, 2015, British ⁶⁴	European Prospective Investigation of Cancer–Norfolk Cohort Study	42-81	9.5	24-hour sleep	Questionnaire	Incidence	Both: 9692 (346) Male: 4444 (198) Female: 5248 (148)	Both: <6 6-8 >8 Male: <6 6-8 >8 Female: <6 6-8 >8	Both: 1.18 (0.91 to 1.53) 1 1.46 (1.08 to 1.98) Male: 1.08 (0.75 to 1.57) 1 1.21 (0.80 to 1.82) Female: 1.25 (0.86 to 1.83) 1 1.80 (1.13 to 2.85)	Age, sex, social class, education, marital status, smoking, alcohol intake, hypnotic drug use, family history of stroke, body mass index, physical activity, depression, hypnotic drug use, systolic blood pressure, diastolic blood pressure, preexisting diabetes and myocardial infarction, cholesterol level, and hypertension drug use

Hui Cai et al, 2015, China ⁴	Shanghai Women's and Men's Health Studies	Male: 40-75 Female: 44-79	male: 6.07 Female: 7.12	24-hour sleep	Interview	Mortality	Both: 113138 (746)	Both: 4-5 6 7 8 9 ≥10 Male: 4-5 6 7 8 9 ≥10 Female: 4-5 6 7 8 9 ≥10	Both: 0.91 (0.70 to 1.18) 0.99 (0.79 to 1.23) 1 1.28 (1.04 to 1.58) 1.31 (0.94 to 1.82) 2.35 (1.78 to 3.09) Male: 0.93 (0.62 to 1.40) 0.78 (0.55 to 1.10) 1 1.20 (0.89 to 1.62) 1.62 (1.06 to 2.48) 1.73 (1.14 to 2.64) Female: 0.92 (0.65 to 1.29) 1.14 (0.85 to 1.52) 1 1.36 (1.01 to 1.82) 0.98 (0.58 to 1.66) 3.09 (2.14 to 4.47)	Age, education, income, smoking, alcohol consumption, tea consumption, comorbidity score, history of night-shift work, participation in regular exercise, body mass index, and waist-to-hip ratio, cardiovascular disease, upper gastrointestinal tract
Megan E. Ruiters et al, 2014, US ⁶⁵	Reasons for Geographic And Racial Differences in Stroke (REGARDS) Study	≥45	3	Nighttime sleep	Questionnaire	Incidence	Both: 5666 (224)	< 6 6-6.9 7-7.9 8-8.9 ≥ 9	1.43 (0.88 to 2.32) 1.16 (0.79 to 1.69) 1 1.17 (0.84 to 1.62) 1.44 (0.86 to 2.42)	Age, race, sex, income, education, region

An Pan et al, 2014, Singapore ⁶⁶	Singapore Chinese Health Study	45-74	14.7	24-hour sleep	Questionnaire	Mortality	Both: 63257 (1381) Male: 27954 (693) Female: 35303 (688)	Both: ≤5 6 7 8 ≥9 Male: ≤5 6 7 8 ≥9 Female: ≤5 6 7 8 ≥9	Both: 1.25 (1.05 to 1.50) 1.01 (0.87 to 1.18) 1 1.09 (0.95 to 1.26) 1.54 (1.28 to 1.85) Male: 1.13 (0.86 to 1.47) 0.93 (0.75 to 1.16) 1 0.98 (0.80 to 1.20) 1.49 (1.16 to 1.92) Female: 1.37 (1.08 to 1.75) 1.10 (0.88 to 1.37) 1 1.23 (1.00 to 1.51) 1.62 (1.24 to 2.13)	Age, year of recruitment, sex, dialect, education, body mass index, alcohol drinking, years of smoking, dose of smoking, moderate activity, energy intake, dietary intakes of vegetables, fruits, fiber, polyunsaturated fatty acids, self-reported history of physician-diagnosed hypertension, diabetes, stroke and coronary heart disease, and history of cancer reported by the nationwide cancer registry
Anna Westerlund et al, 2013, Sweden ⁴⁷	National March Cohort Study	≥18	13.2	24-hour sleep	Questionnaire	Incidence	Both: 41192 (1685)	5 6 7 ≥8	1.05 (0.80 to 1.37) 0.95 (0.79 to 1.14) 1 0.87 (0.72 to 1.04)	Age, sex, education, employment status, smoking, alcohol, snoring, work schedule, depressive symptoms, self-rated health, physical activity, BMI, diabetes, lipid disturbance, and hypertension
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	45-75	12.9	24-hour sleep	Questionnaire	Mortality	Male: 61936 (627) Female: 73749 (632)	Male: ≤5 6 7 8 ≥9 Female: ≤5 6 7 8 ≥9	Male: 1.14 (1.06 to 1.23) 1.10 (0.88 to 1.37) 1 1.13 (0.91 to 1.39) 1.35 (1.03 to 1.75) Female: 1.16 (0.88 to 1.52) 0.99 (0.79 to 1.23) 1 1.07 (0.87 to 1.33) 1.39 (1.06 to 1.83)	5-year age groups at cohort entry, sex, ethnicity, education, marital status, history of hypertension or diabetes at enrollment, alcohol consumption, energy intake, body mass index, physical activity, hours spent daily watching television, and smoking history

Masako Kakizki et al, 2013, Japan ¹²	Ohsaki Cohort Study	40-79	10.8	24-hour sleep	Questionnaire	Mortality	Both: 49256 (1165)	≤6 7 8 9 ≥10	1.05 (0.84 to 1.30) 1 1.17 (0.99 to 1.39) 1.30 (1.06 to 1.60) 1.51 (1.24 to 1.85)	Age, sex, total caloric intake, body mass index, marital status, level of education, job status, history of myocardial infarction, history of cancer, history of stroke, history of hypertension, history of diabetes mellitus, smoking status, alcohol drinking, time spent walking, perceived mental stress, self-rated health, physical function
Anne von Ruesten et al, 2012, Germany ⁵⁵	European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam Study	35-65	7.8	24-hour sleep	Interview	Incidence	Both: 23620 (169)	<6 6-7 7-8 8-9 ≥9	2.06 (1.18 to 3.59) 1.13 (0.72 to 1.77) 1 1.16 (0.77 to 1.73) 1.65 (1.00 to 2.73)	Sex, age, education, marital status, living status, depression, body mass index, insomnia, hypnotics use, total sleep time, excessive daytime sleepiness, pain, smoking, alcohol drinking, snorers, diabetes mellitus, hypertension, cardiovascular disease, stroke, and gouty arthritis
Yuko Hamazaki et al, 2011, Japan ⁵⁰		35-54	14	24-hour sleep	Questionnaire	Incidence	Male: 2282 (30)	<6 6-6.9 7-7.9 ≥8	1.84 (0.23 to 14.90) 0.96 (0.30 to 3.10) 1 2.25 (0.91 to 5.57)	Age, sex, education, employment status, smoking, alcohol, snoring, work schedule, depressive symptoms, self-rated health, physical activity, BMI, diabetes, lipid disturbance, and hypertension
Yoko Amagai et al, 2010, Japan ⁵¹	Jichi Medical School Cohort Study	18-90	10.7	Nighttime sleep	Interview	Incidence	Male: 4413 (207) Female: 6954 (204)	Male: <5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0 Female: <5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0	Male: 2.00 (0.93 to 4.31) 1.13 (0.63 to 2.03) 1 1.03 (0.69 to 1.53) 1.39 (0.92 to 2.10) Female: 0.97 (0.39 to 2.41) 0.68 (0.39 to 1.18) 1 0.86 (0.60 to 1.23) 1.29 (0.86 to 1.91)	Age, sex, educational attainment, body mass index, cigarette smoking, alcohol consumption, past history of hypertension, type 2 diabetes, CVD and metabolic syndrome

Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	40-79	14.3	24-hour sleep	Questionnaire	Mortality	Male: 41489 (1038) Female: 57145 (926)	Male: <4 5 6 7 8 9 ≥10 Female: <4 5 6 7 8 9 ≥10	Male: 1.56 (0.82 to 2.94) 0.85 (0.58 to 1.26) 0.95 (0.76 to 1.20) 1 1.11 (0.95 to 1.30) 1.14 (0.92 to 1.42) 1.66 (1.31 to 2.08) Female: 1.07 (0.59 to 1.91) 0.99 (0.72 to 1.37) 0.93 (0.75 to 1.16) 1 1.24 (1.05 to 1.47) 1.29 (1.01 to 1.64) 1.69 (1.29 to 2.20)	Age, body mass index (quintiles), history of hypertension, history of diabetes, alcohol consumption, smoking, education level, hours of exercise, hours of walking, regular employment, perceived mental stress, depressive symptoms and frequency of fresh fish intake
Jiu-Chiuan Chen et al, 2008, US ⁶⁷	Women's Health Initiative Observational Study Cohort	50-79	7.5	Nighttime sleep	Questionnaire	Incidence	Female: 93175 (1166)	≤6 7 8 ≥9	1.14 (0.97 to 1.33) 1 1.24 (1.04 to 1.47) 1.70 (1.32 to 2.21)	Age, sex, total caloric intake, body mass index in, marital status, level of education, job status, history of myocardial infarction, history of cancer, history of stroke, history of hypertension, history of diabetes mellitus, smoking status, alcohol drinking, time spent walking, perceived mental stress, self-rated health, physical function
Yoko Amagai et al, 2004, Japan ³²	Jichi Medical School Cohort Study	19-93	8.2	Nighttime sleep	Interview	Mortality	Male: 4419 (34) Female: 6906 (29)	Male: -5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0- Female: -5.9 6.0-6.9 7.0-7.9 8.0-8.9 9.0-	Male: 1.3 (0.2 to 11.0) 0.8 (0.2 to 3.9) 1 0.2 (0.1 to 0.8) 1.2 (0.5 to 3.0) Female: NA(n=0) 3.2 (1.0 to 10.5) 1 1.4 (0.4 to 4.3) 2.5 (0.8 to 8.2)	Age, systolic blood pressure, total cholesterol, body mass index, smoking habits, alcohol drinking habits, education, and marital status

Adnan I. Qureshi et al, 1997, US ⁶⁰	First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study	32-74	10	Nighttime sleep	Questionnaire	Incidence	Both: 7844 (285)	<6 6-8 >8	1.0 (0.7 to 1.5) 1 1.5 (1.1 to 2.0)	Age, body mass index, systolic blood pressure, diastolic blood press, smoking status, drinking habits and physical activity
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BMI; body mass index, CVD; cardiovascular disease

Table S5. Study quality of studies included in the analysis of sleep duration and all-cause mortality

Author, publication year, country	Study	Selection	Comparability	Outcome	Total Score
Nisha Aurora et al, 2016, US ¹	Sleep Heart Health Study	***	**	***	8
Wei-Ju Lee et al, 2016, Taiwan ²	The Social Environment and Biomarkers of Aging Study	***	**	*	6
Xizhu Wang et al, 2016, China ³	Kailuan study	***	**	*	6
Hui Cai et al, 2015, China ⁴	Shanghai Women's and Men's Health Studies	***	**	***	8
Lisette A. Zuurbier et al, 2015, Netherlands ⁵	Rotterdam Study	***	**	***	8
Martica H. Hall et al, 2015, US ⁶	Health, Aging and Body Composition (Health ABC) Study	****	**	***	9
Naja Hulvej Rod et al, 2014, British ⁷	British Whitehall II Prospective Cohort Study	***	**	***	8
Qian Xiao et al, 2014, US ⁸	National Institutes of Health-AARP Diet and Health Study	**	**	**	6
Andrea Bellavia et al, 2014, Sweden ⁹	Cohort of Swedish Men and the Swedish Mammography Cohort	***	**	***	8
Christopher A. Magee et al, 2013, Australia ¹⁰	45 and Up Study	**	**	**	6
Garde AH et al, 2013, Denmark ¹¹	Copenhagen Male Study	**	**	***	7
Masako Kakizaki et al, 2013, Japan ¹²	Ohsaki Cohort Study	**	**	***	7
Yohwan Yeo et al, 2013, Korea ¹³	Korean Multi-center Cancer Cohort study	***	**	**	7
Hsi-Chung Chen et al, 2013, Taiwan ¹⁴	Shih-Pai Sleep Study	***	**	**	7
Kyu-In Jung et al, 2013, US ¹⁵	Rancho Bernardo Study	**	**	***	7
Lauren Hale et al, 2013, US ¹⁶	Women's Health Initiative (WHI) clinical trial (CT) and observational study (OS)	**	*	**	5
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	***	**	**	7
Ying Li et al, 2013, Japan ¹⁸	SAKU Cohort	**	**	**	6
Jiska Cohen-Mansfield et al, 2012, Israel ¹⁹	Cross-Sectional and Longitudinal Aging Study	***	**	***	8
Chul Woo Rhee et al, 2012, Korea ²⁰	Seoul Male Cohort Study	**	**	**	6
Castro-Costa et al, 2011, Brasil ²¹	Bambui Health and Ageing Study (BHAS)	***	**	***	8
Li Qiu et al, 2011, China ²²	Chinese Longitudinal Healthy Longevity Survey	***	**	**	7
Erkki Kronholm et al, 2011, Finland ²³		**	**	***	7
Arthur Eumann Mesas et al, 2010, Spain ²⁴		***	**	***	8
Kuo-Liong Chien et al, 2010, Taiwan ²⁵	Chin-shan Community Cardiovascular Cohort Study	***	**	***	8
Katie L. Stone et al, 2009, US ²⁶	Study of Osteoporotic Fractures Prospective Cohort Study	**	**	**	6
Etsuji Suzuki et al, 2009, Japan ²⁷	Shizuoka Study	**	**	***	7
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	***	**	**	7
James E. Gangwisch et al, 2008, US ²⁹	NHANES I Epidemiologic Follow-up Study	***	**	**	7
Christer Hublin et al, 2007, Finland ³⁰	Finnish Twin Cohort	*	**	**	5
Tzuo-Yun Lan et al, 2007, Taiwan ³¹	Survey of Health and Living Status of the Elderly in Taiwan	***	**	***	8
Yoko Amagai et al, 2004, Japan ³²	Jichi Medical School Cohort Study	****	**	**	8
Sanjay R. Patel et al, 2003, US ³³	Nurses' Health Study (NHS) Cohort	*	**	**	5
Genc Burazeri et al, 2003, Israel ³⁴	Kiryat Yovel Community Health Study	***	**	**	7
Aya Goto et al, 2003, Japan ³⁵		**	**	***	7
L. MALLON et al, 2002, Sweden ³⁶		**	**	**	6

Daniel F. Kripke et al, 2002, US ³⁷	Cancer Prevention Study II	**	**	***	7
Pauline Heslop et al, 2002, British ³⁸		*	**	**	5
Masayo Kojima et al, 2000, Japan ³⁹		**	**	**	6
Catharine Gale et al, 1998, British ⁴⁰		***	**	***	8
Ana Ruigomez et al, 1995, Spain ⁴¹	Health Interview Survey of Barcelona	***	**	*	6
Yoshitaka Tsubono et al, 1993, Japan ⁴²	National Collaborative Cohort Study	**	**	**	6
Roger Rumble et al, 1992, England ⁴³	Nottingham Longitudinal Study of Activity	**	*	***	6

Selection: 1) Representativeness of the exposed cohort; 2) Selection of the non-exposed cohort; 3) Ascertainment of exposure; 4) Demonstration that outcome of interest was not present at start of study (cardiovascular events);

Comparability: 1a) study controls for age (the most important factor); 1b) study controls for any additional factor;

Outcome: 1) Assessment of outcome; 2) Was follow-up long enough (≥ 5 years) for outcomes to occur; 3) Adequacy of follow up of cohorts ($\geq 80\%$)

Table S6. Study quality of studies included in the analysis of sleep duration and total CVD

Author, publication year, country	Study	Selection	Comparability	Outcome	Total Score
Francesco Gianfagna et al, 2016, Italy ⁴⁴	MONICA Brianza and PAMELA	***	**	***	8
Hui Cai et al, 2015, China ⁴	Shanghai Women's and Men's Health Studies	***	**	***	8
Catarina Canivet et al, 2014, Sweden ⁴⁵	Malmö Diet and Cancer Study	***	**	**	7
Qian Xiao et al, 2014, US ⁸	National Institutes of Health-AARP Diet and Health Study	**	**	**	6
Naja Hulvej Rod et al, 2014, British ⁷	British Whitehall II Prospective Cohort Study	***	**	***	8
Andrea Bellavia et al, 2014, Sweden ⁹	Cohort of Swedish Men and the Swedish Mammography Cohort	***	**	***	8
Megan Sands-Lincoln et al, 2013, US ⁴⁶	Women's Health Initiative Observational Study	***	**	**	7
Anna Westerlund et al, 2013, Sweden ⁴⁷	National March Cohort Study	***	**	**	7
Elizabeth G. Holliday et al, 2013, Australia ⁴⁸	45 and Up Study	***	**	**	7
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	***	**	**	7
Hsi-Chung Chen et al, 2013, Taiwan ¹⁴	Shih-Pai Sleep Study	***	**	**	7
Yohwan Yeo et al, 2013, Korea ¹³	Korean Multi-center Cancer Cohort study	***	**	**	7
Masako Kakizki et al, 2013, Japan ¹²	Ohsaki Cohort Study	**	**	***	7
Ying Li et al, 2013, Japan ¹⁸	SAKU Cohort	**	**	**	6
Marieke P. Hoevenaer-Blom et al, 2011, Netherlands ⁴⁹	MORGEN Study	***	**	**	7
Yuko Hamazaki et al, 2011, Japan ⁵⁰		**	**	***	7
Erkki Kronholm et al, 2011, Finland ²³		**	**	***	7
Kuo-Liong Chien et al, 2010, Taiwan ²⁵	Chin-shan Community Cardiovascular Cohort study	***	**	***	8
Yoko Amagai et al, 2010, Japan ⁵¹	Jichi Medical School Cohort Study	****	**	**	8
Katie L. Stone et al, 2009, US ²⁶	Study of Osteoporotic Fractures Prospective Cohort Study	**	**	**	6
Etsuji Suzuki et al, 2009, Japan ²⁷	Shizuoka Study	**	**	***	7
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	***	**	**	7
Tzuo-Yun Lan et al, 2007, Taiwan ³¹	Survey of Health and Living Status of the Elderly in Taiwan	***	**	***	8
Sanjay R. Patel et al, 2004, US ³³	Nurses' Health Study (NHS) Cohort	*	**	**	5
Genc Burazeri et al, 2003, Israel ³⁴	Kiryat Yovel Community Health Study	***	**	**	7
Pauline Heslop et al, 2002, British ³⁸		*	**	**	5

Selection: 1) Representativeness of the exposed cohort; 2) Selection of the non-exposed cohort; 3) Ascertainment of exposure; 4) Demonstration that outcome of interest was not present at start of study;

Comparability: 1a) study controls for age (the most important factor); 1b) study controls for any additional factor;

Outcome: 1) Assessment of outcome; 2) Was follow-up long enough (≥ 5 years) for outcomes to occur; 3) Adequacy of follow up of cohorts ($\geq 80\%$)

Table S7. Study quality of studies included in the analysis of sleep duration and CHD

Author, publication year, country	Study	Selection	Comparability	Outcome	Total Score
Francesco Gianfagna et al, 2016, Italy ⁴⁴	MONICA Brianza and PAMELA Population-based Cohorts	***	**	***	8
Liangle Yang et al, 2016, China ⁵²	Dongfeng-Tongji Cohort Study	**	**	**	6
Xizhu Wang et al, 2016, China ³	Kailuan Study	***	**	*	6
Linn B. Strand et al, 2016, Taiwan ⁵³		**	**	**	6
J. Liu et al, 2014, US ⁵⁴	Framingham Offspring Study	***	**	**	7
Megan Sands-Lincoln et al, 2013, US ⁴⁶	Women's Health Initiative Observational Study	***	**	**	7
Lauren Hale et al, 2013, US ¹⁶	Women's Health Initiative (WHI) clinical trial (CT) and observational study (OS)	**	*	**	5
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	***	**	**	7
Masako Kakizki et al, 2013, Japan ¹²	Ohsaki Cohort Study	**	**	***	7
Garde AH et al, 2013, Denmark ¹¹	Copenhagen Male Study	**	**	***	7
Anna Westerlund et al, 2013, Sweden ⁴⁷	National March Cohort Study	***	**	**	7
Anne von Ruesten et al, 2012, Germany ⁵⁵	European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam Study	****	**	***	9
Marieke P. Hoeveraar-Blom et al, 2011, Netherlands ⁴⁹	MORGEN Study	***	**	**	7
Yuko Hamazaki et al, 2011, Japan ⁵⁰		**	**	***	7
Tarani Chandola et al, 2010, British ⁵⁶	British Whitehall II Prospective Cohort Study	***	**	**	7
Yoko Amagai et al, 2010, Japan ⁵¹	Jichi Medical School Cohort Study	****	**	**	8
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	***	**	**	7
Anoop Shankar et al, 2008, Singapore ⁵⁷	Singapore Chinese Health Study	****	**	***	9
Christa Meisinger et al, 2007, Germany ⁵⁸	MONICA/KORA Augsburg Cohort Study	****	**	**	8
Najib T.Ayas et al, 2003, US ⁵⁹	Nurse's Health Study	**	**	**	6
L. MALLON et al, 2002, Sweden ³⁶		**	**	**	6
Adnan I. Qureshi et al, 1997, US ⁶⁰	First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study	***	**	**	7

Selection: 1) Representativeness of the exposed cohort; 2) Selection of the non-exposed cohort; 3) Ascertainment of exposure; 4) Demonstration that outcome of interest was not present at start of study;

Comparability: 1a) study controls for age (the most important factor); 1b) study controls for any additional factor;

Outcome: 1) Assessment of outcome; 2) Was follow-up long enough (≥ 5 years) for outcomes to occur; 3) Adequacy of follow up of cohorts ($\geq 80\%$)

Table S8. Study quality of studies included in the analysis of sleep duration and stroke

Author, publication year, country	Study	Selection	Comparability	Outcome	Total Score
Qiaofeng Song et al, 2016, China ⁶¹	The Kailuan Study	**	**	**	6
Toshiaki Kawachi et al, 2016, Japan ⁶²	Takayama Cohort Study	***	**	***	8
A. Katharina Helbig et al, 2015, Germany ⁶³	MONICA/KORA Augsburg Cohort Study	****	**	**	8
Yue Leng et al, 2015, British ⁶⁴	European Prospective Investigation of Cancer–Norfolk Cohort Study	***	**	**	7
Hui Cai et al, 2015, China ⁴	Shanghai Women’s and Men’s Health Studies	***	**	***	8
Megan E. Rutter et al, 2014, US ⁶⁵	Reasons for Geographic And Racial Differences in Stroke (REGARDS) Study	***	*		4
An Pan et al, 2014, Singapore ⁶⁶	Singapore Chinese Health Study	**	**	***	7
Anna Westerlund et al, 2013, Sweden ⁴⁷	National March Cohort Study	***	**	**	7
Yeonju Kim et al, 2013, US ¹⁷	Multiethnic Cohort Study	***	**	**	7
Masako Kakizaki et al, 2013, Japan ¹²	Ohsaki Cohort Study	**	**	***	7
Anne von Ruesten et al, 2012, Germany ⁵⁵	European Prospective Investigation into Cancer and Nutrition (EPIC)-Potsdam Study	****	**	***	9
Yuko Hamazaki et al, 2011, Japan ⁵⁰		**	**	***	7
Yoko Amagai et al, 2010, Japan ⁵¹	Jichi Medical School Cohort Study	****	**	**	8
Satoyo Ikehara et al, 2009, Japan ²⁸	JACC Study	***	**	**	7
Jiu-Chiuan Chen et al, 2008, US ⁶⁷	Women’s Health Initiative Observational Study Cohort	***	**	**	7
Adnan I. Qureshi et al, 1997, US ⁶⁰	First National Health and Nutrition Examination Survey Epidemiologic Follow-up Study	***	**	**	7

Selection: 1) Representativeness of the exposed cohort; 2) Selection of the non-exposed cohort; 3) Ascertainment of exposure; 4) Demonstration that outcome of interest was not present at start of study;

Comparability: 1a) study controls for age (the most important factor); 1b) study controls for any additional factor;

Outcome: 1) Assessment of outcome; 2) Was follow-up long enough (≥ 5 years) for outcomes to occur; 3) Adequacy of follow up of cohorts ($\geq 80\%$)

Table S9. Subgroup analyses of sleep duration and all-cause mortality, per hour per day

	Short sleep					Long sleep					
	No	RR (95% CI)	P _{het} [*]	I ²	P _{het} [†]	No	RR (95% CI)	P _{het} [*]	I ²	P _{het} [†]	
Total	32	1.06 (1.04 to 1.07)	0.00	58.0%	NC	37	1.13 (1.11 to 1.15)	0.00	76.5%	NC	
Sex											
Men	11	1.06 (1.05 to 1.08)	0.57	0.0%	0.57/0.97	13	1.10 (1.09 to 1.11)	0.54	0.0%	0.21/0.49	
Women	13	1.05 (1.04 to 1.07)	0.30	14.9%		14	1.15 (1.11 to 1.18)	0.00	81.5%		
Mix	14	1.06 (1.03 to 1.09)	0.00	64.2%		16	1.13 (1.10 to 1.16)	0.00	75.8%		
Location											
Asia	13	1.05 (1.02 to 1.09)	0.02	52.1%	0.05	18	1.15 (1.11 to 1.18)	0.00	70.9%	0.41	
Europe	6	1.12 (1.09 to 1.15)	0.38	6.5%		7	1.14 (1.10 to 1.17)	0.22	27.9%		
USA	11	1.04 (1.03 to 1.06)	0.05	45.2%		10	1.12 (1.09 to 1.15)	0.00	87.0%		
Others	2	1.04 (0.99 to 1.09)	0.92	0.0%		2	1.13 (0.98 to 1.30)	0.00	70.7%		
Duration of follow-up											
<10 years	17	1.05 (1.03 to 1.07)	0.02	45.9%	0.40	20	1.13 (1.10 to 1.16)	0.00	73.9%	0.78	
≥10 years	15	1.07 (1.04 to 1.09)	0.00	66.6%		17	1.13 (1.10 to 1.15)	0.00	75.1%		
No of participants											
<10000	15	1.05 (1.02 to 1.09)	0.55	0.0%	1.00	20	1.16 (1.13 to 1.19)	0.06	34.9%	0.05	
≥10000	17	1.06 (1.04 to 1.07)	0.00	73.6%		17	1.13 (1.11 to 1.15)	0.00	77.5%		
No of cases											
<1000	13	1.07 (1.02 to 1.13)	0.65	0.0%	0.51	17	1.15 (1.11 to 1.19)	0.04	40.3%	0.31	
≥1000	19	1.06 (1.04 to 1.07)	0.00	71.2%		20	1.12 (1.10 to 1.14)	0.00	75.5%		
Sleep assessment											
Self-report questionnaire	21	1.06 (1.04 to 1.08)	0.00	63.7%	0.29	23	1.12 (1.10 to 1.14)	0.00	78.7%	0.16	
Interview	11	1.06 (1.02 to 1.11)	0.17	44.0%		14	1.16 (1.11 to 1.20)	0.00	71.0%		
Sleep duration type											
Nighttime sleep	21	1.06 (1.04 to 1.08)	0.00	53.3%	0.93	24	1.16 (1.13 to 1.18)	0.00	73.0%	0.01	
24-hour sleep	11	1.06 (1.03 to 1.08)	0.00	64.4%		13	1.11 (1.10 to 1.13)	0.00	78.4%		
Study quality score											
<7	8	1.04 (1.01 to 1.07)	0.05	35.1%	0.30	8	1.14 (1.08 to 1.20)	0.01	60.5%	0.85	
≥7	24	1.06 (1.05 to 1.08)	0.01	46.2%		29	1.13 (1.11 to 1.15)	0.00	78.8%		
Adjustment for confounders											
Age	Yes	32	1.06 (1.04 to 1.07)	0.00	58.0%	NC	37	1.13 (1.11 to 1.15)	0.00	76.5%	NC
	No	0					0				
Education	Yes	21	1.06 (1.04 to 1.08)	0.00	63.0%	0.81	20	1.12 (1.10 to 1.14)	0.00	59.4%	0.43
	No	11	1.06 (1.03 to 1.09)	0.23	22.3%		17	1.14 (1.10 to 1.19)	0.00	82.6%	
Hypertension, blood pressure	Yes	24	1.06 (1.05 to 1.07)	0.24	16.0%	0.37	28	1.13 (1.11 to 1.15)	0.00	72.7%	0.32
	No	8	1.05 (1.02 to 1.10)	0.00	67.8%		9	1.12 (1.06 to 1.18)	0.00	83.1%	
	Yes	7	1.10 (1.06 to 1.15)	0.25	23.3%	0.02	7	1.15 (1.12 to 1.19)	0.83	0.0%	0.36

Hypercholesterolemia, serum cholesterol	No	25	1.05 (1.04 to 1.07)	0.00	47.9%		30	1.13 (1.11 to 1.15)	0.00	80.2%	
Diabetes	Yes	18	1.06 (1.04 to 1.07)	0.41	3.9%	0.66	21	1.13 (1.11 to 1.15)	0.00	77.6%	0.96
	No	14	1.07 (1.04 to 1.10)	0.00	68.9%		16	1.14 (1.10 to 1.18)	0.00	76.2%	
Smoke	Yes	28	1.06 (1.05 to 1.08)	0.00	60.0%	0.15	31	1.13 (1.11 to 1.15)	0.00	77.3%	0.30
	No	4	1.03 (0.97 to 1.03)	0.27	23.5%		6	1.10 (1.00 to 1.21)	0.00	67.7%	
Alcohol	Yes	24	1.06 (1.04 to 1.08)	0.00	55.5%	0.93	26	1.13 (1.11 to 1.16)	0.00	77.5%	0.57
	No	8	1.06 (1.03 to 1.08)	0.00	62.7%		11	1.12 (1.09 to 1.15)	0.00	67.8%	
Physical activity	Yes	20	1.06 (1.04 to 1.08)	0.00	55.5%	0.97	23	1.13 (1.11 to 1.16)	0.00	79.4%	0.67
	No	12	1.05 (1.03 to 1.07)	0.00	59.9%		14	1.12 (1.09 to 1.15)	0.00	63.6%	
BMI	Yes	26	1.06 (1.04 to 1.08)	0.00	59.8%	0.84	28	1.13 (1.11 to 1.14)	0.00	67.4%	0.63
	No	6	1.08 (1.01 to 1.15)	0.02	60.7%		9	1.13 (1.11 to 1.15)	0.00	81.8%	
Sleep disorder	Yes	5	1.05 (1.03 to 1.07)	0.22	29.7%	0.52	5	1.12 (1.09 to 1.15)	0.01	68.4%	0.83
	No	27	1.06 (1.04 to 1.08)	0.00	57.0%		32	1.13 (1.11 to 1.15)	0.00	76.7%	
Depression	Yes	9	1.04 (1.02 to 1.06)	0.77	0.0%	0.11	11	1.15 (1.12 to 1.19)	0.00	64.6%	0.15
	No	23	1.07 (1.05 to 1.09)	0.00	66.0%		26	1.12 (1.10 to 1.14)	0.00	79.4%	
Sleeping pills	Yes	6	1.04 (0.99 to 1.09)	0.44	0.0%	0.64	8	1.18 (1.14 to 1.21)	0.26	20.9%	0.10
	No	26	1.06 (1.04 to 1.08)	0.00	61.4%		29	1.20 (1.10 to 1.14)	0.00	68.8%	

No denotes the number of studies.

P_{het}^* for heterogeneity within each subgroup,

P_{het}^\dagger for heterogeneity between subgroups with meta-regression analysis,

NC = not calculable

Table S10. Subgroup analyses of sleep duration and total cardiovascular disease, per hour per day

	Short sleep					Long sleep					
	No	RR (95% CI)	P _{het} *	I ²	P _{het} †	No	RR (95% CI)	P _{het} *	I ²	P _{het} †	
Total	21	1.06 (1.03 to 1.09)	0.00	52.0%	NC	23	1.12 (1.08 to 1.16)	0.00	75.3%	NC	
Sex											
Men	7	1.07 (1.01 to 1.13)	0.19	31.0%	0.57/0.63	7	1.11 (1.08 to 1.14)	0.53	0.0%	0.66/0.99	
Women	8	1.07 (1.02 to 1.12)	0.06	48.7%		9	1.14 (1.08 to 1.19)	0.04	51.0%		
Mix	8	1.05 (1.03 to 1.08)	0.00	63.2%		9	1.12 (1.04 to 1.20)	0.00	87.4%		
Location											
Asia	11	1.06 (1.01 to 1.11)	0.25	20.0%	0.34	13	1.16 (1.13 to 1.20)	0.24	19.7%	0.01	
Europe	4	1.12 (1.01 to 1.23)	0.00	82.3%		4	1.06 (0.97 to 1.16)	0.01	75.2%		
USA	5	1.04 (1.02 to 1.06)	0.24	27.6%		5	1.11 (1.05 to 1.17)	0.02	64.3%		
Others	1	1.03 (0.96 to 1.10)				1	1.00 (0.96 to 1.03)				
Duration of follow-up											
<10 years	6	1.04 (0.99 to 1.09)	0.56	0.0%	0.75	9	1.17 (1.07 to 1.28)	0.00	85.1%	0.24	
≥10 years	15	1.06 (1.03 to 1.09)	0.00	62.9%		14	1.10 (1.07 to 1.14)	0.00	60.1%		
No of participants											
<10000	7	1.12 (1.00 to 1.26)	0.13	39.1%	0.47	10	1.18 (1.12 to 1.24)	0.24	21.9%	0.08	
≥10000	14	1.05 (1.03 to 1.08)	0.00	57.4%		13	1.10 (1.05 to 1.14)	0.00	80.8%		
No of cases											
<1000	8	1.11 (1.00 to 1.22)	0.19	30.5%	0.53	10	1.15 (1.10 to 1.21)	0.60	0.0%	0.22	
≥1000	13	1.05 (1.03 to 1.08)	0.00	60.7%		13	1.10 (1.06 to 1.15)	0.00	84.5%		
Sleep assessment											
Self-report questionnaire	14	1.06 (1.03 to 1.09)	0.00	61.8%	0.95	15	1.11 (1.01 to 1.16)	0.00	82.6%	0.40	
Interview	7	1.06 (0.98 to 1.14)	0.27	21.4%		8	1.15 (1.08 to 1.23)	0.45	0.0%		
Sleep duration type											
Nighttime sleep	10	1.04 (1.02 to 1.07)	0.18	28.7%	0.43	11	1.11 (1.04 to 1.18)	0.00	72.4%	0.71	
24-hour sleep	11	1.08 (1.03 to 1.13)	0.00	61.4%		12	1.13 (1.09 to 1.17)	0.00	60.2%		
Study quality score											
<7	2	1.04 (1.02 to 1.06)	0.95	0.0%	0.58	1	1.21 (1.09 to 1.34)			0.33	
≥7	19	1.07 (1.03 to 1.10)	0.00	56.1%		22	1.11 (1.07 to 1.15)	0.00	75.3%		
Incidence or mortality											
Incidence	7	1.02 (0.98 to 1.07)	0.20	30.0%	0.10	6	1.00 (0.97 to 1.03)	0.50	0.0%	0.00	
Mortality	16	1.08 (1.04 to 1.11)	0.00	53.8%		19	1.15 (1.12 to 1.18)	0.01	46.3%		
Adjustment for confounders											
Age	Yes	21	1.06 (1.03 to 1.09)	0.00	52.0%	NC	23	1.12 (1.08 to 1.16)	0.00	75.3%	NC
	No	0					0				
Education	Yes	16	1.05 (1.02 to 1.08)	0.00	54.2%	0.36	16	1.10 (1.06 to 1.15)	0.00	80.1%	0.26
	No	5	1.09 (1.03 to 1.15)	0.31	16.1%		7	1.15 (1.10 to 1.21)	0.18	32.0%	

Hypertension, blood pressure	Yes	17	1.06 (1.03 to 1.09)	0.07	36.0%	0.77	18	1.12 (1.08 to 1.15)	0.00	57.1%	0.88
	No	4	1.08 (1.00 to 1.16)	0.00	82.0%		5	1.12 (0.99 to 1.26)	0.00	89.8%	
Hypercholesterolemia, serum cholesterol	Yes	8	1.05 (1.00 to 1.11)	0.02	58.8%	0.69	7	1.06 (0.99 to 1.13)	0.02	60.4%	0.06
	No	13	1.06 (1.03 to 1.10)	0.03	48.7%		16	1.14 (1.10 to 1.19)	0.00	77.6%	
Diabetes	Yes	13	1.04 (1.01 to 1.07)	0.18	25.9%	0.29	14	1.12 (1.08 to 1.16)	0.00	61.1%	0.86
	No	8	1.09 (1.03 to 1.14)	0.00	70.9%		9	1.20 (1.03 to 1.21)	0.00	83.3%	
Smoke	Yes	21	1.06 (1.03 to 1.09)	0.00	52.0%	NC	23	1.12 (1.08 to 1.16)	0.00	75.3%	NC
	No	0					0				
Alcohol	Yes	19	1.06 (1.03 to 1.08)	0.00	53.2%	0.38	21	1.12 (1.08 to 1.16)	0.00	75.9%	0.90
	No	2	1.10 (1.05 to 1.16)	0.10	0.0%		2	1.11 (0.96 to 1.29)	0.01	83.3%	
Physical activity	Yes	14	1.05 (1.02 to 1.08)	0.00	58.6%	0.17	15	1.12 (1.08 to 1.17)	0.00	79.4%	0.76
	No	7	1.10 (1.01 to 1.15)	0.50	0.0%		8	1.12 (1.03 to 1.22)	0.00	66.5%	
BMI	Yes	21	1.06 (1.03 to 1.09)	0.00	52.0%	NC	23	1.12 (1.08 to 1.16)	0.00	75.3%	NC
	No	0					0				
Sleep disorder	Yes	1	1.01 (0.86 to 1.18)			0.64	1	1.51 (1.20 to 1.90)			0.03
	No	20	1.06 (1.03 to 1.09)	0.00	54.2%		22	1.11 (1.07 to 1.15)	0.00	74.4%	
Depression	Yes	7	1.02 (0.99 to 1.04)	0.81	0.0%	0.09	9	1.15 (1.10 to 1.21)	0.00	61.3%	0.16
	No	14	1.08 (1.04 to 1.12)	0.00	60.9%		14	1.10 (1.05 to 1.15)	0.00	78.4%	
Sleeping pills	Yes	1	1.01 (0.86 to 1.18)			0.64	1	1.51 (1.20 to 1.90)			0.03
	No	20	1.06 (1.03 to 1.09)	0.00	54.2%		22	1.12 (1.07 to 1.15)	0.00	74.4%	

No denotes the number of studies.

P_{het}^* for heterogeneity within each subgroup,

P_{het}^\dagger for heterogeneity between subgroups with meta-regression analysis,

NC = not calculable

Table S11. Subgroup analyses of sleep duration and coronary heart disease, per hour per day

	Short sleep					Long sleep					
	No	RR (95% CI)	P _{het} [*]	I ²	P _{het} [†]	No	RR (95% CI)	P _{het} [*]	I ²	P _{het} [†]	
Total	18	1.07 (1.03 to 1.12)	0.00	59.3%	NC	16	1.05 (1.00 to 1.10)	0.00	64.2%	NC	
Sex											
Men	7	1.08 (0.98 to 1.19)	0.01	66.1%	0.23/0.60	5	1.07 (0.95 to 1.20)	0.00	75.8%	0.23/0.58	
Women	9	1.10 (1.03 to 1.18)	0.01	63.6%		7	1.09 (1.03 to 1.16)	0.17	33.8%		
Mix	6	1.07 (0.99 to 1.15)	0.01	68.1%		6	1.04 (0.93 to 1.17)	0.00	84.6%		
Location											
Asia	8	1.13 (1.00 to 1.27)	0.00	73.6%	0.36	8	1.09 (1.02 to 1.18)	0.01	63.3%	0.02	
Europe	5	1.04 (0.98 to 1.09)	0.48	0.0%		4	0.89 (0.82 to 0.97)	0.94	0.0%		
USA	5	1.05 (1.00 to 1.09)	0.23	28.1%		4	1.07 (1.03 to 1.11)	0.35	9.0%		
Duration of follow-up											
<10 years	3	1.03 (0.97 to 1.09)	0.48	0.0%	0.38	3	1.03 (0.95 to 1.11)	0.30	18.0%	0.48	
≥10 years	15	1.09 (1.03 to 1.14)	0.00	64.8%		13	1.06 (1.00 to 1.12)	0.00	69.0%		
No of participants											
<10000	7	1.08 (0.94 to 1.25)	0.07	48.1%	0.65	4	0.92 (0.81 to 1.06)	0.98	0.0%	0.15	
≥10000	11	1.08 (1.03 to 1.13)	0.00	66.1%		12	1.06 (1.01 to 1.12)	0.00	70.4%		
No of cases											
<500	9	1.12 (0.97 to 1.30)	0.01	59.2%	0.74	7	1.00 (0.92 to 1.08)	0.52	0.0%	0.18	
≥500	9	1.07 (1.02 to 1.11)	0.01	62.9%		9	1.07 (1.01 to 1.13)	0.00	76.2%		
Sleep assessment											
Self-report questionnaire	12	1.05 (1.01 to 1.09)	0.04	45.9%	0.05	10	1.05 (1.01 to 1.09)	0.03	50.9%	0.98	
Interview	6	1.17 (1.02 to 1.35)	0.14	39.9%		6	1.00 (0.83 to 1.21)	0.00	75.3%		
Sleep duration type											
Nighttime sleep	11	1.06 (1.00 to 1.12)	0.00	63.9%	0.48	9	1.06 (0.98 to 1.14)	0.00	67.5%	0.82	
24-hour sleep	7	1.10 (1.02 to 1.18)	0.10	43.9%		7	1.04 (0.97 to 1.11)	0.01	64.0%		
Study quality score											
<7	4	1.03 (0.97 to 1.10)	0.32	14.4%	0.29	4	1.08 (1.04 to 1.12)	0.39	1.4%	0.54	
≥7	14	1.09 (1.03 to 1.16)	0.00	65.7%		12	1.03 (0.96 to 1.11)	0.00	71.2%		
Incidence or mortality											
Incidence	11	1.04 (1.00 to 1.10)	0.15	30.8%	0.42	9	1.00 (0.94 to 1.06)	0.04	50.5%	0.03	
Mortality	8	1.10 (1.02 to 1.17)	0.00	66.3%		8	1.12 (1.05 to 1.19)	0.01	62.4%		
Adjustment for confounders											
Age	Yes	18	1.07 (1.03 to 1.12)	0.00	59.3%	NC	16	1.05 (1.00 to 1.10)	0.00	64.2%	NC
	No	0					0				
Education	Yes	12	1.07 (1.01 to 1.12)	0.00	66.4%	0.69	12	1.05 (1.00 to 1.11)	0.00	71.5%	0.69
	No	6	1.04 (0.99 to 1.24)	0.11	44.6%		4	1.06 (0.97 to 1.15)	0.35	8.2%	
	Yes	16	1.05 (1.01 to 1.10)	0.03	44.7%		0.03	14	1.04 (1.00 to 1.08)	0.05	

Hypertension, blood pressure	No	2	1.22 (1.12 to 1.32)	0.33	0.0%		2	1.10 (0.78 to 1.54)	0.00	87.0%	
Hypercholesterolemia, serum cholesterol	Yes	12	1.04 (1.00 to 1.08)	0.18	26.5%	0.17	10	1.00 (0.94 to 1.06)	0.05	46.0%	0.02
	No	6	1.10 (1.01 to 1.20)	0.00	69.7%		6	1.12 (1.05 to 1.19)	0.01	66.1%	
Diabetes	Yes	14	1.05 (1.01 to 1.09)	0.04	43.6%	0.01	12	1.04 (1.00 to 1.09)	0.03	49.0%	0.29
	No	4	1.22 (1.11 to 1.34)	0.37	5.2%		4	1.04 (0.82 to 1.33)	0.01	71.7%	
Smoke	Yes	18	1.07 (1.03 to 1.12)	0.00	59.3%	NC	16	1.05 (1.00 to 1.10)	0.00	64.2%	NC
	No	0					0				
Alcohol	Yes	18	1.07 (1.03 to 1.12)	0.00	59.3%	NC	16	1.05 (1.00 to 1.10)	0.00	64.2%	NC
	No	0					0				
Physical activity	Yes	16	1.07 (1.02 to 1.12)	0.00	60.3%	0.19	13	1.07 (1.02 to 1.12)	0.00	58.6%	0.03
	No	2	1.52 (0.92 to 2.50)	0.25	23.0%		3	0.88 (0.79 to 0.98)	0.83	0.0%	
BMI	Yes	17	1.08 (1.03 to 1.13)	0.00	59.9%	0.27	15	1.05 (1.00 to 1.11)	0.00	70.0%	0.49
	No	1	0.95 (0.81 to 1.10)				1	0.95 (0.77 to 1.18)			
Sleep disorder	Yes	1	1.09 (0.86 to 1.38)			0.94	1	0.91 (0.72 to 1.14)			0.33
	No	17	1.07 (1.02 to 1.12)	0.00	61.6%		15	1.06 (1.01 to 1.11)	0.00	65.0%	
Depression	Yes	6	1.06 (0.98 to 1.14)	0.03	61.0%	0.71	4	1.06 (1.00 to 1.11)	0.31	15.6%	0.80
	No	12	1.08 (1.02 to 1.15)	0.00	57.4%		12	1.04 (0.97 to 1.11)	0.00	71.1%	
Sleeping pills	Yes	1	1.04 (0.97 to 1.11)			0.72	0				NC
	No	17	1.08 (1.02 to 1.13)	0.00	61.6%		16	1.05 (1.00 to 1.10)	0.00	64.2%	

No denotes the number of studies.

P_{het}^* for heterogeneity within each subgroup,

P_{het}^\dagger for heterogeneity between subgroups with meta-regression analysis,

NC = not calculable

Table S12. Subgroup analyses of sleep duration and stroke, per hour per day

	Short sleep					Long sleep					
	No	RR (95% CI)	P _{het} *	I ²	P _{het} †	No	RR (95% CI)	P _{het} *	I ²	P _{het} †	
Total	14	1.05 (1.01 to 1.09)	0.55	0.0%	NC	15	1.18 (1.14 to 1.21)	0.40	4.9%	NC	
Sex											
Men	6	1.05 (0.98 to 1.11)	0.79	0.0%	0.53/0.63	6	1.14 (1.09 to 1.19)	0.94	0.0%	0.14/0.88	
Women	5	1.05 (0.97 to 1.13)	0.26	24.6%		7	1.20 (1.12 to 1.28)	0.07	48.7%		
Mix	5	1.08 (1.00 to 1.13)	0.18	35.5%		6	1.20 (1.15 to 1.26)	0.36	9.4%		
Location											
Asia	7	1.05 (0.99 to 1.10)	0.47	0.0%	0.71	8	1.18 (1.14 to 1.22)	0.43	0.5%	0.13	
Europe	4	1.06 (0.96 to 1.16)	0.18	38.7%		3	1.09 (0.99 to 1.21)	0.28	21.6%		
USA	3	1.07 (0.98 to 1.17)	0.60	0.0%		4	1.20 (1.20 to 1.29)	0.58	0.0%		
Duration of follow-up											
<10 years	3	1.15 (0.98 to 1.35)	0.12	53.8%	0.36	4	1.28 (1.20 to 1.37)	0.92	0.0%	0.01	
≥10 years	11	1.04 (1.00 to 1.09)	1.09	0.0%		11	1.15 (1.12 to 1.19)	0.83	0.0%		
No of participants											
<10000	6	1.06 (0.98 to 1.16)	0.49	0.0%	0.75	5	1.10 (1.02 to 1.18)	0.69	0.0%	0.08	
≥10000	8	1.05 (1.00 to 1.09)	0.41	2.4%		10	1.19 (1.15 to 1.22)	0.45	0.0%		
No of cases											
<500	6	1.13 (0.98 to 1.30)	0.20	32.0%	0.30	4	1.09 (1.00 to 1.20)	0.53	0.0%	0.16	
≥500	8	1.04 (1.00 to 1.09)	0.87	0.0%		11	1.18 (1.15 to 1.22)	0.42	2.1%		
Sleep assessment											
Self-report questionnaire	9	1.05 (1.00 to 1.09)	0.82	0.0%	0.57	10	1.19 (1.15 to 1.22)	0.47	0.0%	0.11	
Interview	5	1.09 (0.96 to 1.24)	0.14	42.6%		5	1.10 (1.03 to 1.19)	0.55	0.0%		
Sleep duration type											
Nighttime sleep	3	1.13 (0.90 to 1.42)	0.20	37.8%	0.35	5	1.22 (1.13 to 1.30)	0.73	0.0%	0.35	
24-hour sleep	11	1.05 (1.01 to 1.09)	1.09	0.0%		10	1.17 (1.13 to 1.21)	0.24	22.6%		
Study quality score											
<7	1	1.19 (0.95 to 1.49)			0.30	1	1.19 (0.95 to 1.50)			0.92	
≥7	13	1.05 (1.01 to 1.09)	0.56	0.0%		14	1.18 (1.14 to 1.21)	0.33	11.6%		
Incidence or mortality											
Incidence	8	1.07 (0.99 to 1.16)	0.25	22.6%	0.86	7	1.15 (1.08 to 1.24)	0.26	22.0%	0.60	
Mortality	10	1.05 (1.01 to 1.10)	0.66	0.0%		12	1.18 (1.14 to 1.21)	0.50	0.0%		
Adjustment for confounders											
Age	Yes	14	1.05 (1.01 to 1.09)	0.55	0.0%	NC	15	1.18 (1.14 to 1.21)	0.40	4.9%	NC
	No	0					0				
Education	Yes	11	1.05 (1.01 to 1.09)	0.56	0.0%	0.76	12	1.17 (1.14 to 1.21)	0.37	7.8%	0.41
	No	3	1.09 (0.79 to 1.50)	0.23	32.7%		3	1.22 (1.12 to 1.34)	0.37	0.0%	
	Yes	11	1.04 (1.00 to 1.09)	0.77	0.0%		0.36	12	1.16 (1.13 to 1.20)	0.63	

Hypertension, blood pressure	No	3	1.15 (0.98 to 1.35)	0.16	53.8%		3	1.28 (1.19 to 1.38)	0.78	0.0%	
Hypercholesterolemia, serum cholesterol	Yes	7	1.06 (0.97 to 1.16)	0.34	24.9%	0.96	6	1.15 (1.06 to 1.25)	0.18	34.5%	0.52
	No	7	1.05 (1.00 to 1.10)	0.71	0.0%		9	1.18 (1.15 to 1.22)	0.57	0.0%	
Diabetes	Yes	9	1.04 (1.00 to 1.09)	0.90	0.0%	0.34	10	1.16 (1.13 to 1.20)	0.48	0.0%	0.09
	No	5	1.32 (0.98 to 1.31)	1.22	45.0%		5	1.25 (1.16 to 1.33)	0.58	0.0%	
Smoke	Yes	13	1.05 (1.01 to 1.09)	0.56	0.0%	0.30	14	1.18 (1.14 to 1.21)	0.33	11.6%	0.92
	No	1	1.19 (0.95 to 1.49)				1	1.19 (0.95 to 1.49)			
Alcohol	Yes	13	1.05 (1.01 to 1.09)	0.56	0.0%	0.30	13	1.17 (1.14 to 1.20)	0.42	2.6%	0.18
	No	1	1.19 (0.95 to 1.49)				2	1.26 (1.14 to 1.40)	0.52	0.0%	
Physical activity	Yes	8	1.05 (0.99 to 1.10)	0.65	0.0%	0.74	9	1.18 (1.12 to 1.24)	0.10	40.1%	0.80
	No	6	1.06 (0.98 to 1.14)	0.25	24.0%		6	1.17 (1.12 to 1.22)	0.94	0.0%	
BMI	Yes	13	1.05 (1.01 to 1.09)	0.56	0.0%	0.30	14	1.18 (1.14 to 1.21)	0.33	11.6%	0.92
	No	1	1.19 (0.95 to 1.49)				1	1.19 (0.95 to 1.47)			
Sleep disorder	Yes	1	1.37 (1.05 to 1.77)			0.07	1	1.26 (0.99 to 1.60)			0.58
	No	13	1.05 (1.00 to 1.09)	0.80	0.0%		14	1.18 (1.14 to 1.21)	0.35	9.7%	
Depression	Yes	3	1.00 (0.93 to 1.07)	0.99	0.0%	0.11	3	1.18 (1.12 to 1.25)	0.30	25.9%	0.77
	No	11	1.07 (1.03 to 1.12)	0.55	0.0%		12	1.17 (1.13 to 1.22)	0.37	8.2%	
Sleeping pills	Yes	1	1.00 (0.89 to 1.12)			0.40	1	1.26 (0.99 to 1.60)			0.58
	No	13	1.06 (1.02 to 1.10)	0.53	0.0%		14	1.18 (1.14 to 1.21)	0.35	9.7%	

No denotes the number of studies.

P_{het}^* for heterogeneity within each subgroup,

P_{het}^\dagger for heterogeneity between subgroups with meta-regression analysis,

NC = not calculable

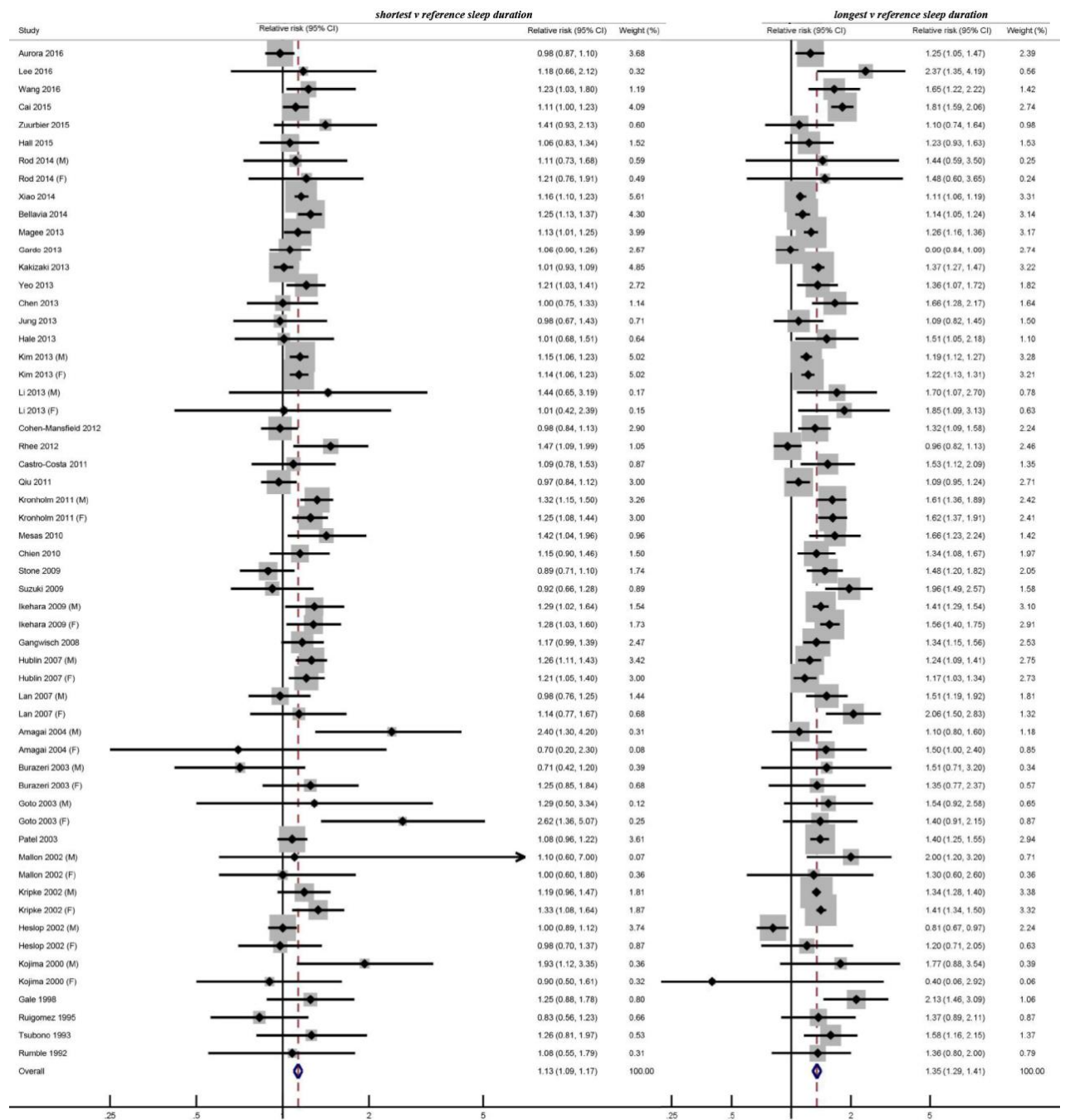


Figure S1. Sleep duration and all-cause mortality, shortest and longest vs. reference analysis

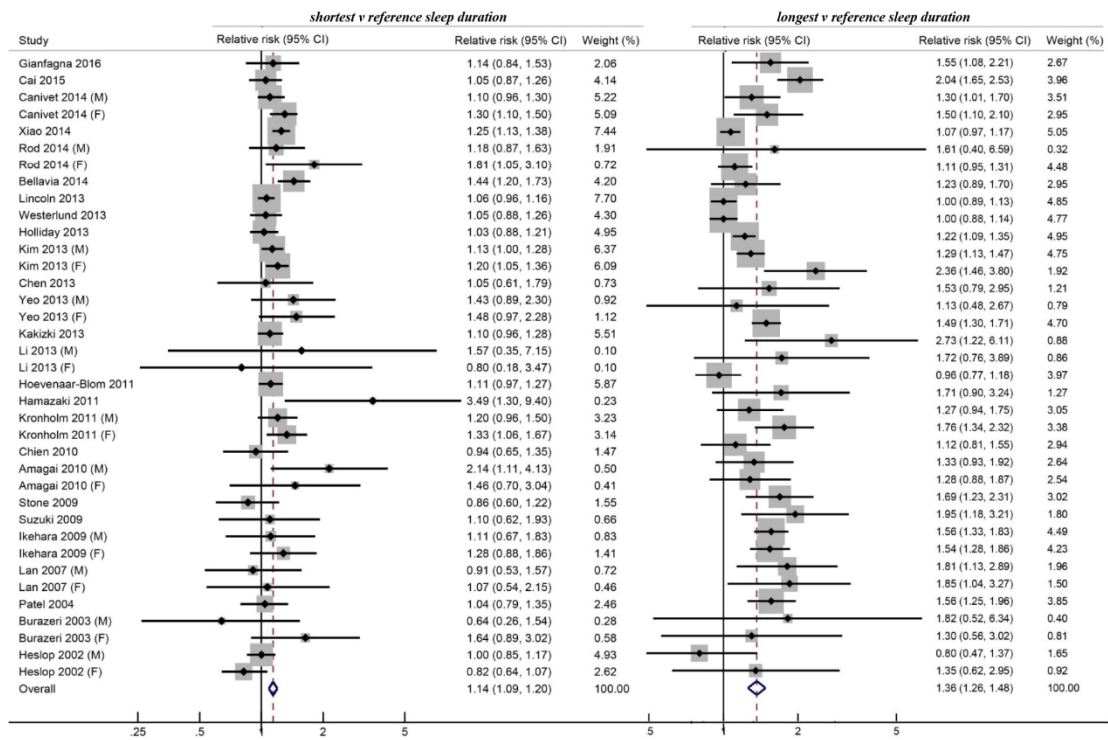


Figure S2. Sleep duration and total cardiovascular disease, shortest and longest vs. reference analysis

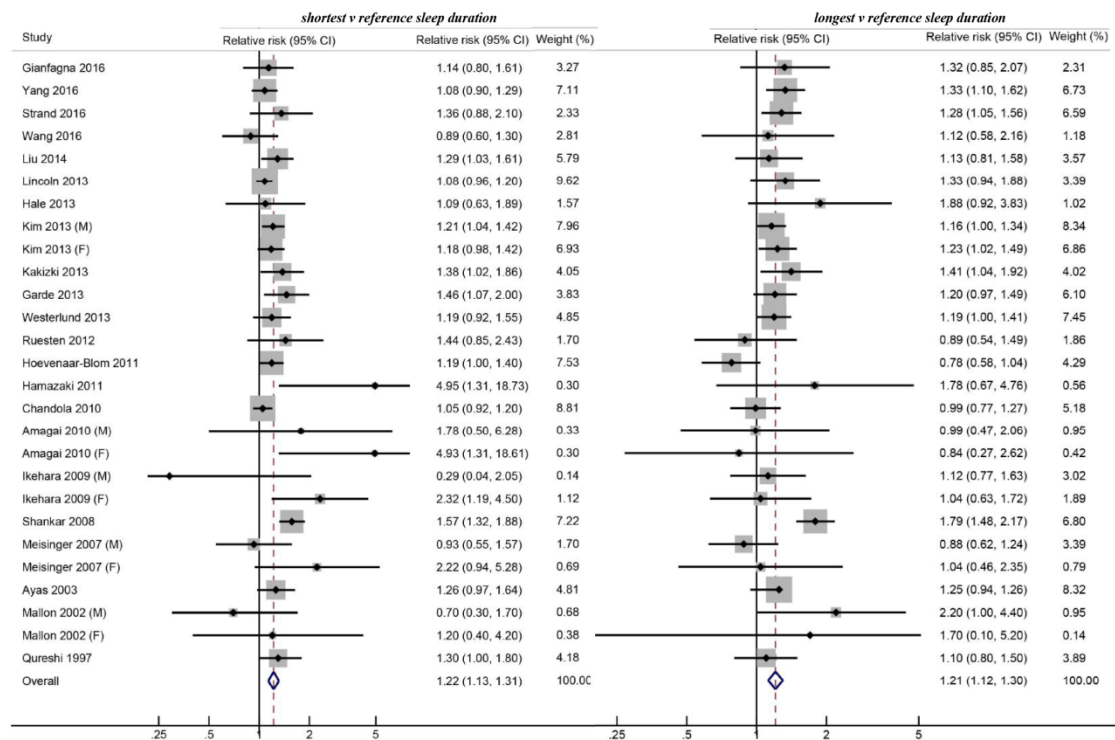


Figure S3. Sleep duration and coronary heart disease, shortest and longest vs. reference analysis

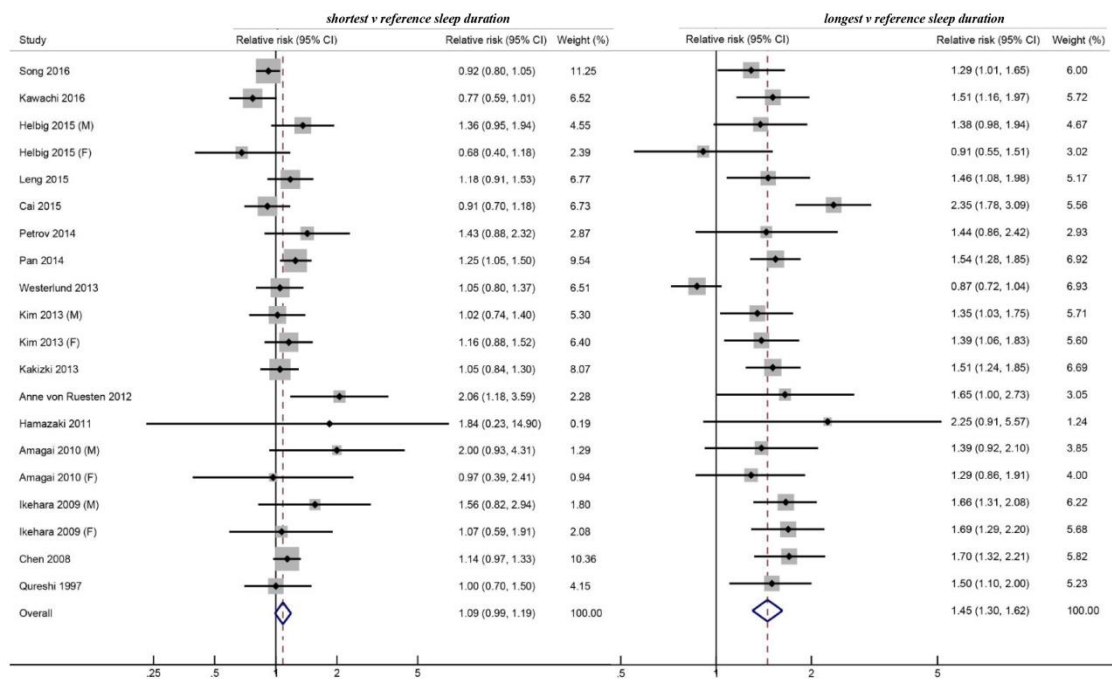


Figure S4. Sleep duration and stroke, shortest and longest vs. reference analysis

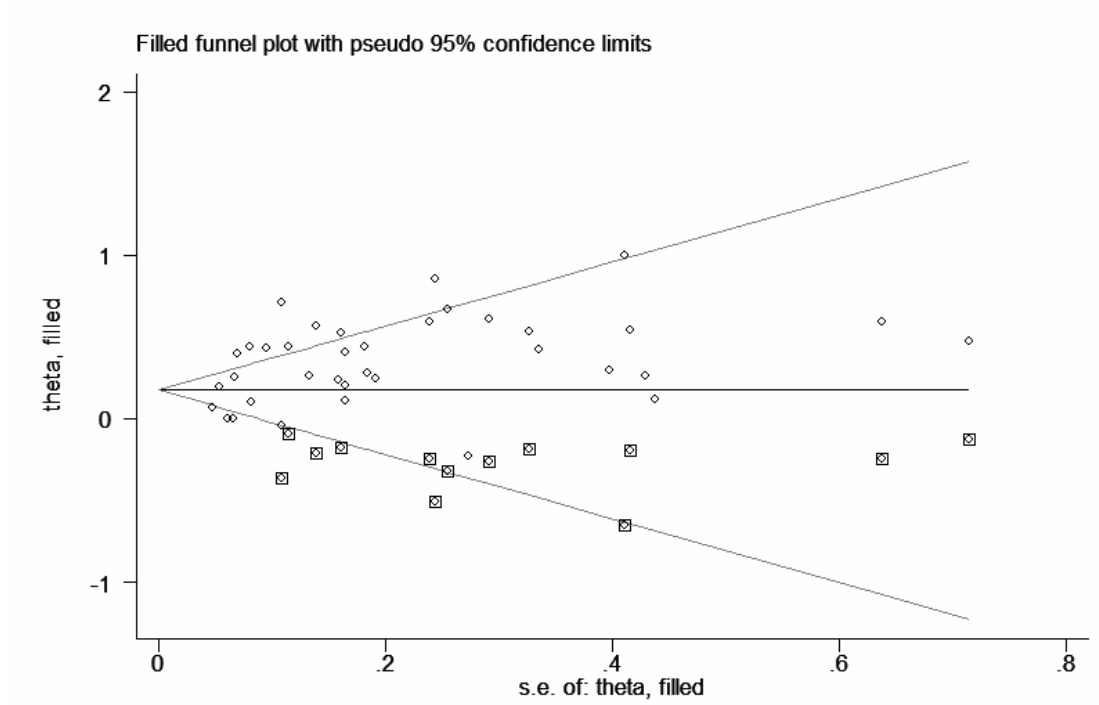


Figure S5. Trim-and-Fill correction for publication bias for total cardiovascular disease, longest vs. reference analysis

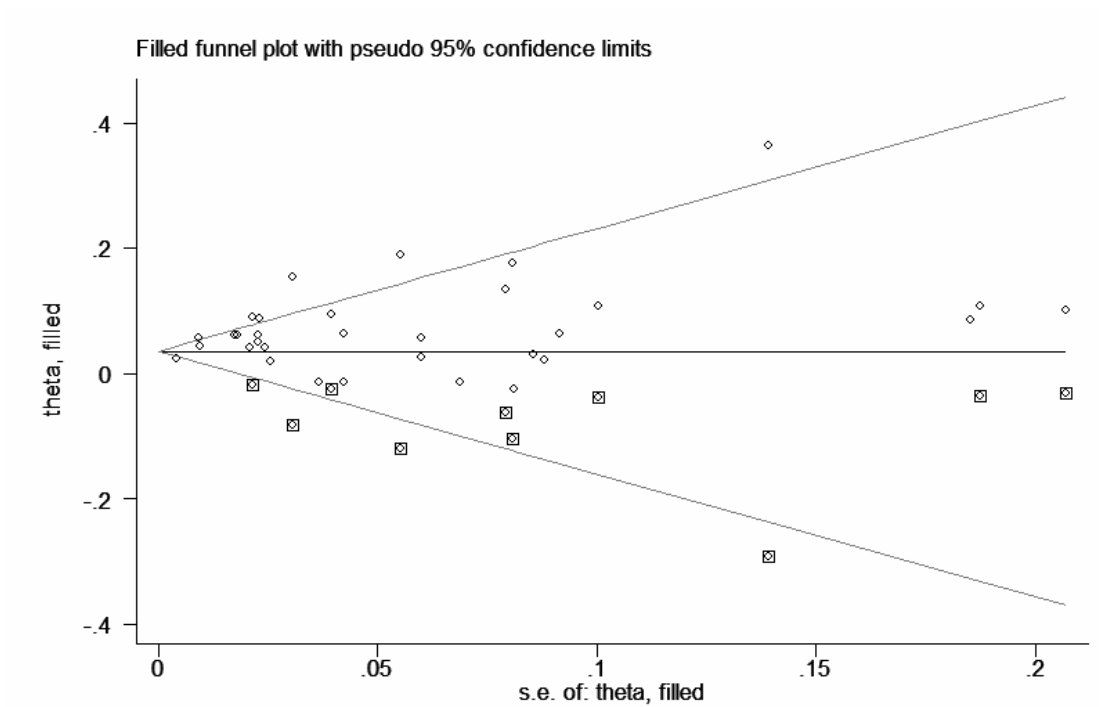


Figure S6. Trim-and-Fill correction for publication bias for all-cause mortality, dose-response analysis for short sleep

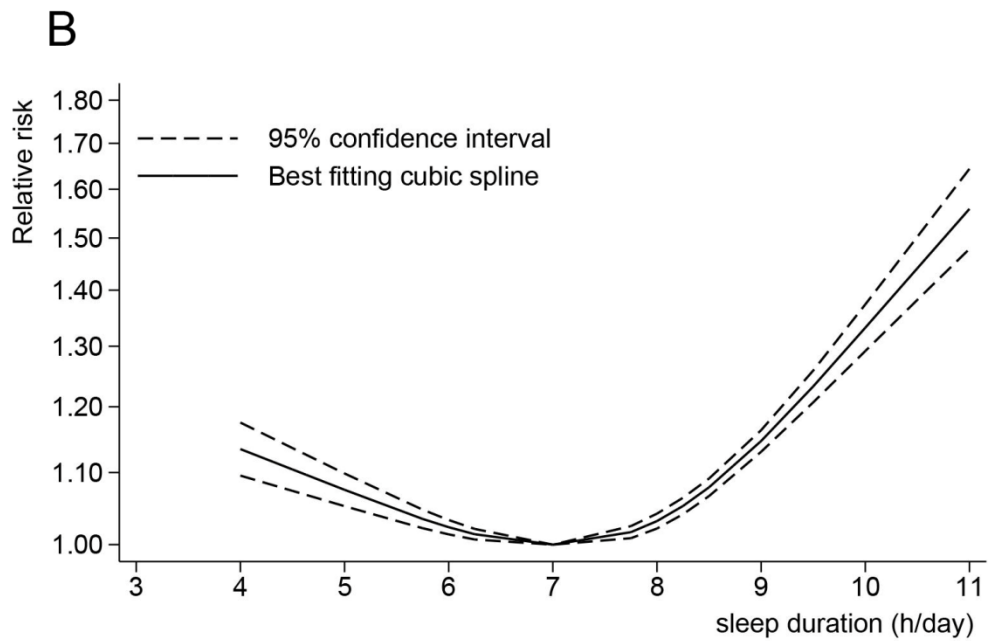
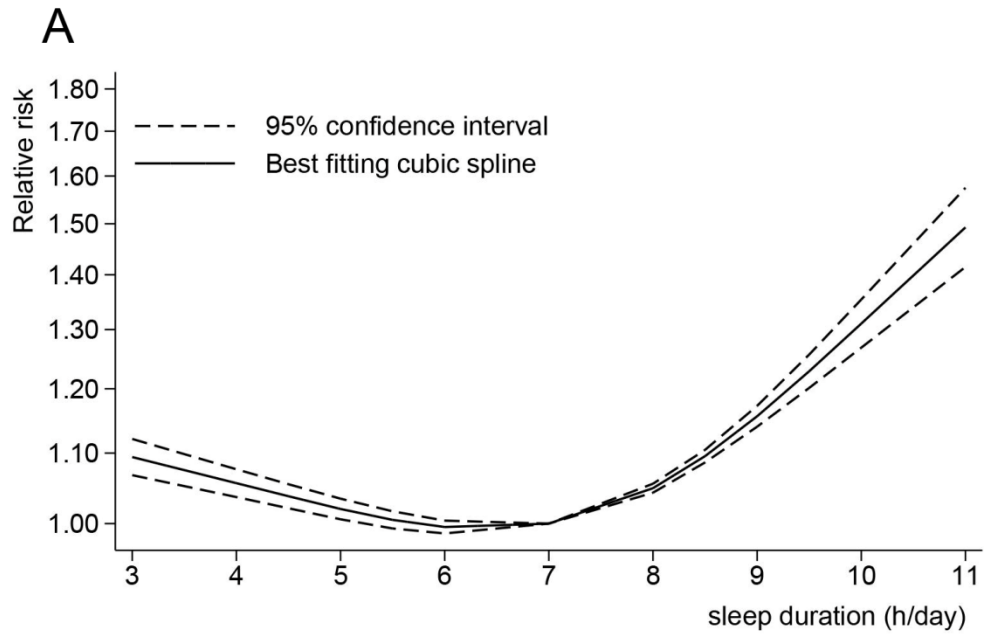


Figure S7. Non-linear dose-response analysis of sleep duration and all-cause mortality by nighttime sleep duration (A) and 24-hour sleep duration (B)

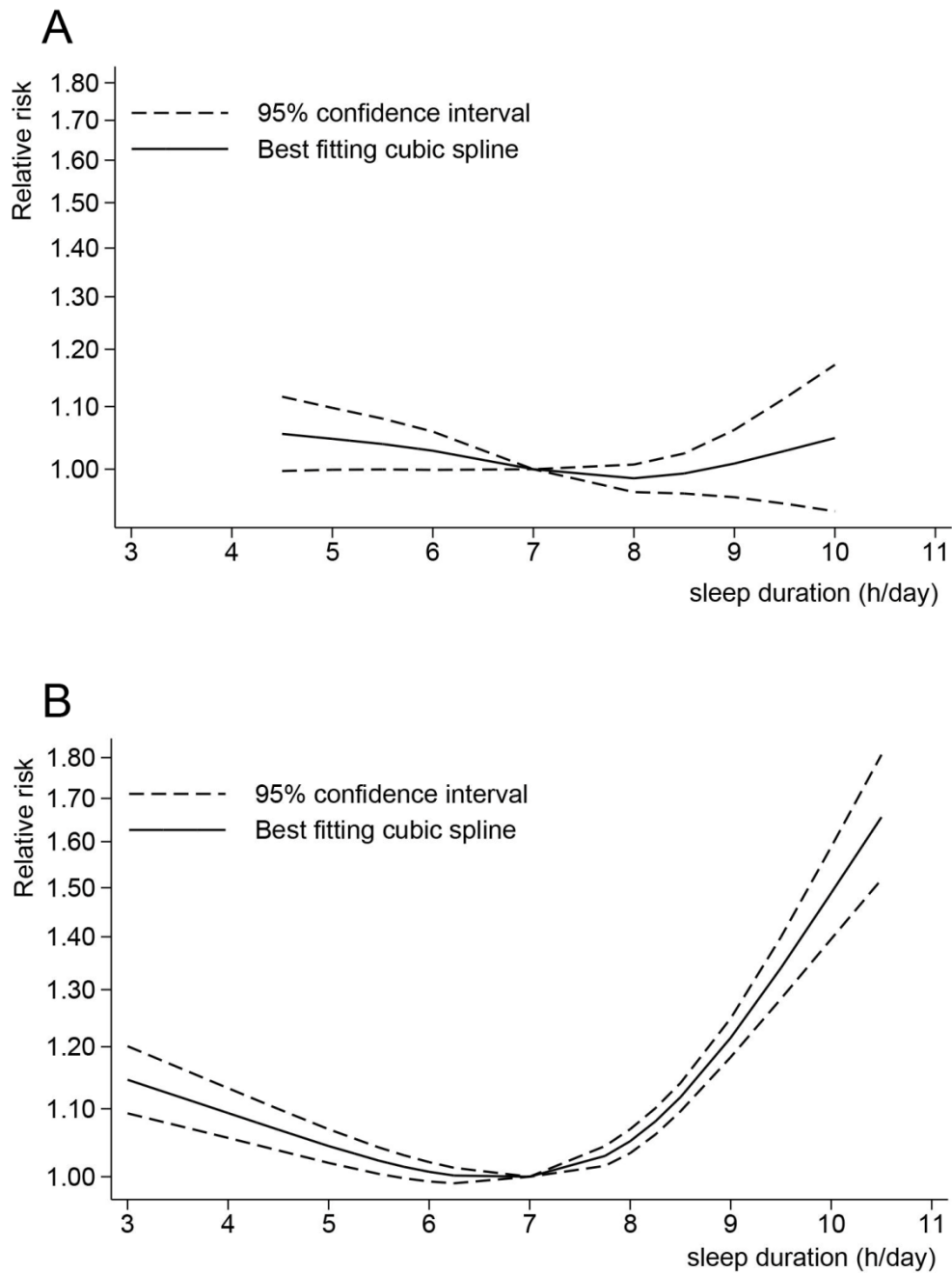


Figure S8. Non-linear dose-response analysis of sleep duration and total cardiovascular disease by incidence (A) and mortality (B)

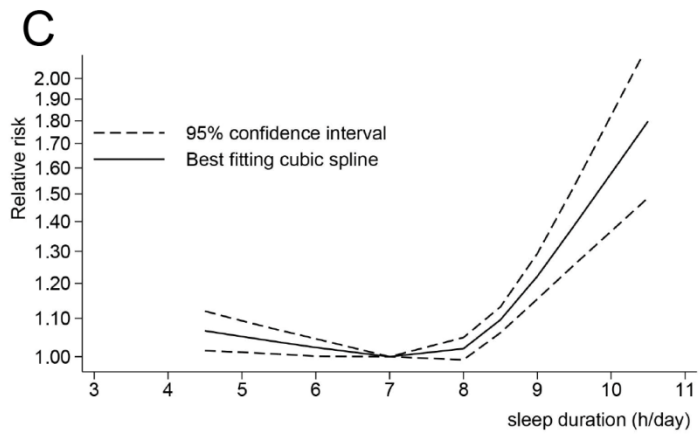
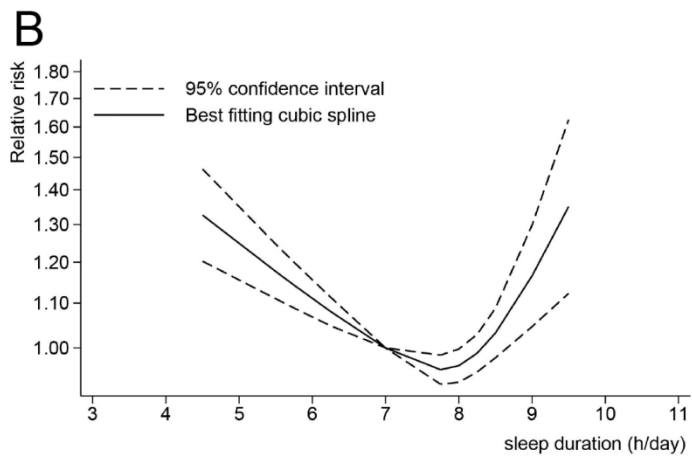
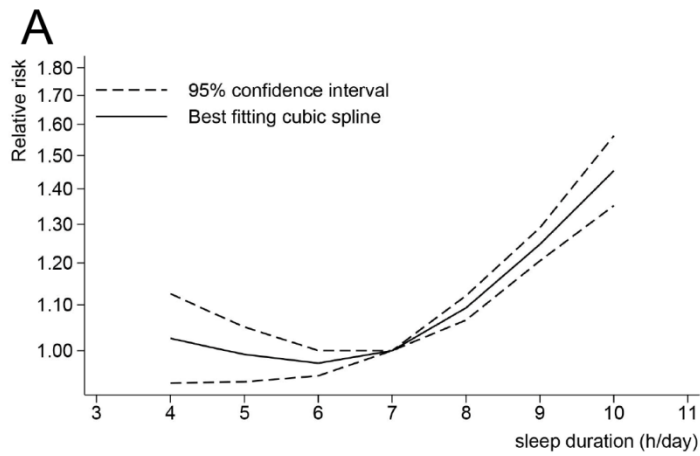


Figure S9. Non-linear dose-response analysis of sleep duration and total cardiovascular disease by Asia (A), Europe (B) and US (C).

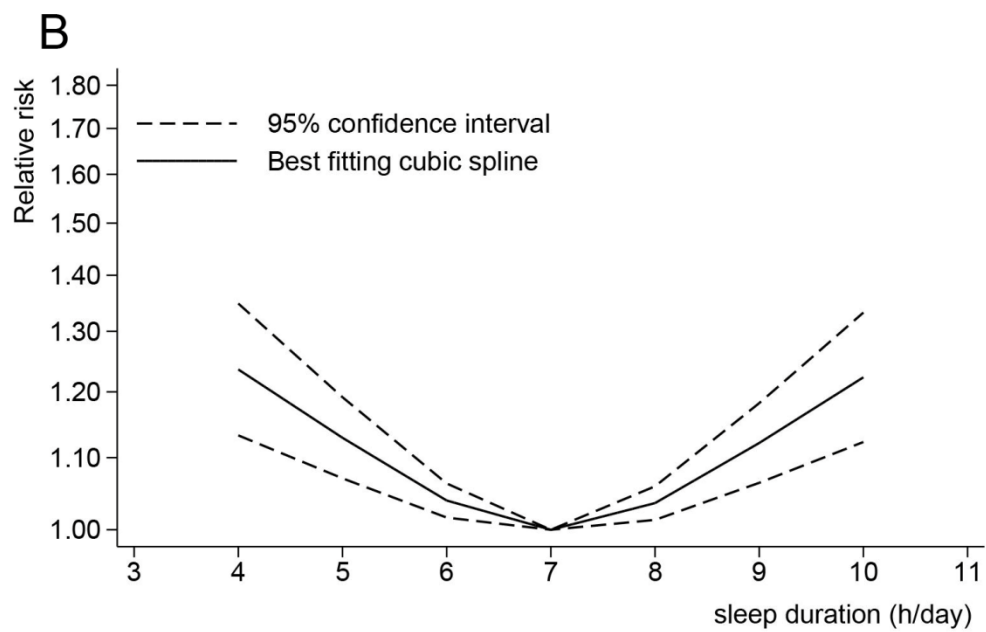
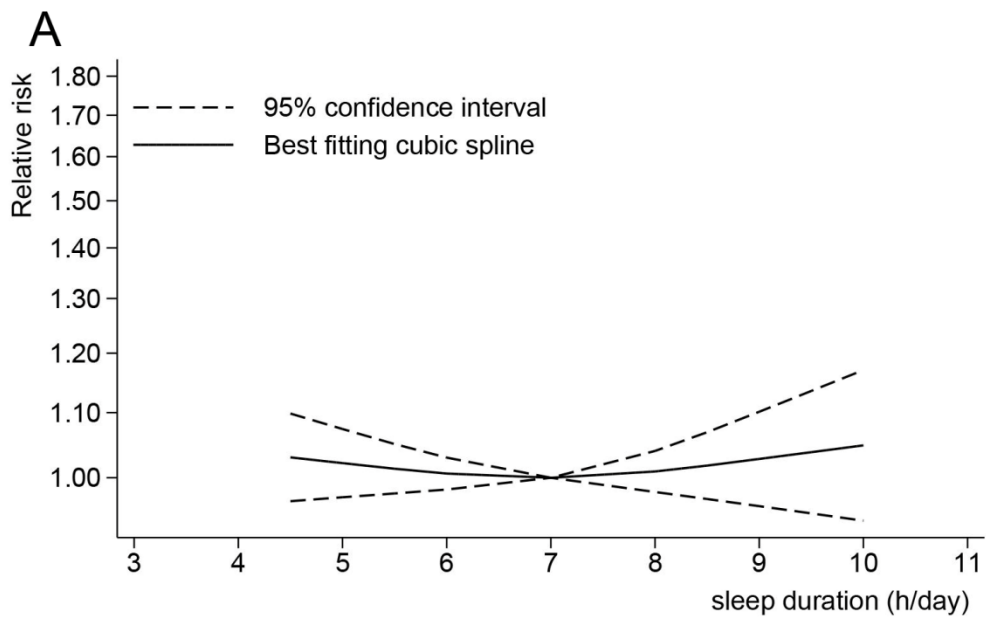


Figure S10. Non-linear dose-response analysis of sleep duration and coronary heart disease by incidence (A) and mortality (B)

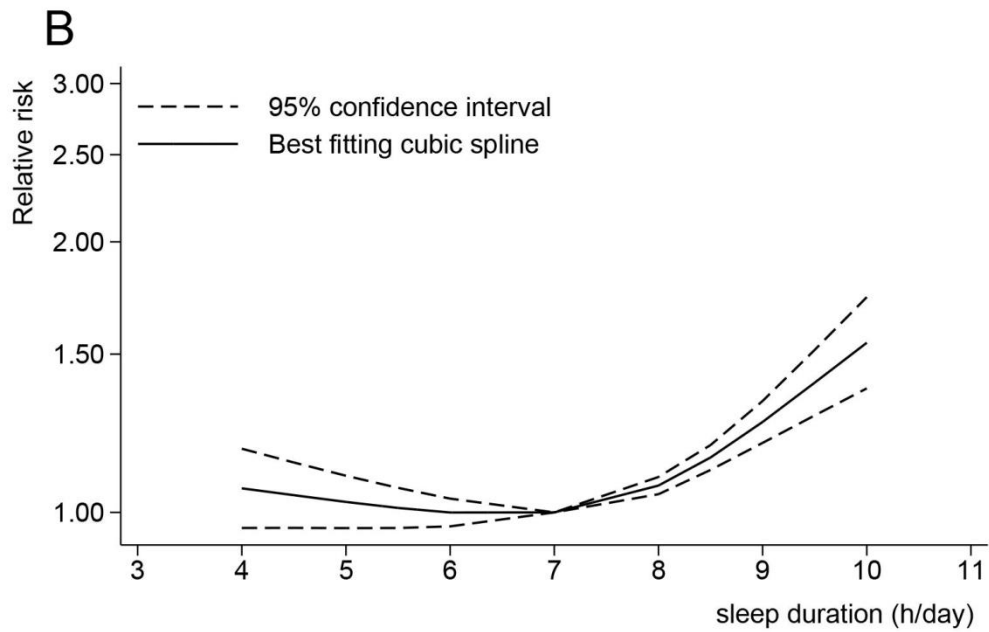
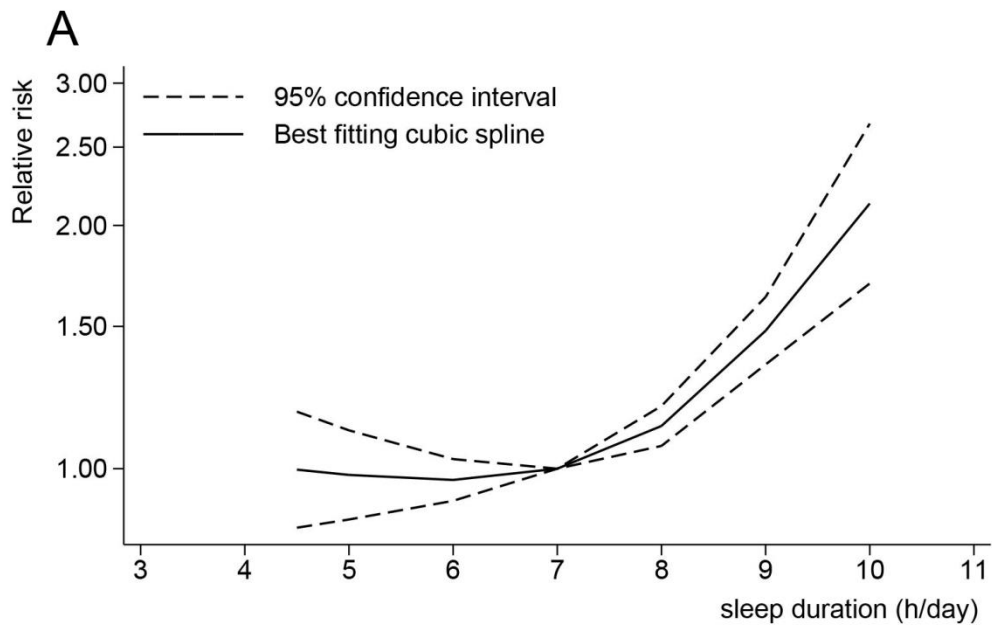


Figure S11. Non-linear dose-response analysis of sleep duration and stroke by follow-up duration <10 years (A), follow-up duration ≥ 10 years (B)

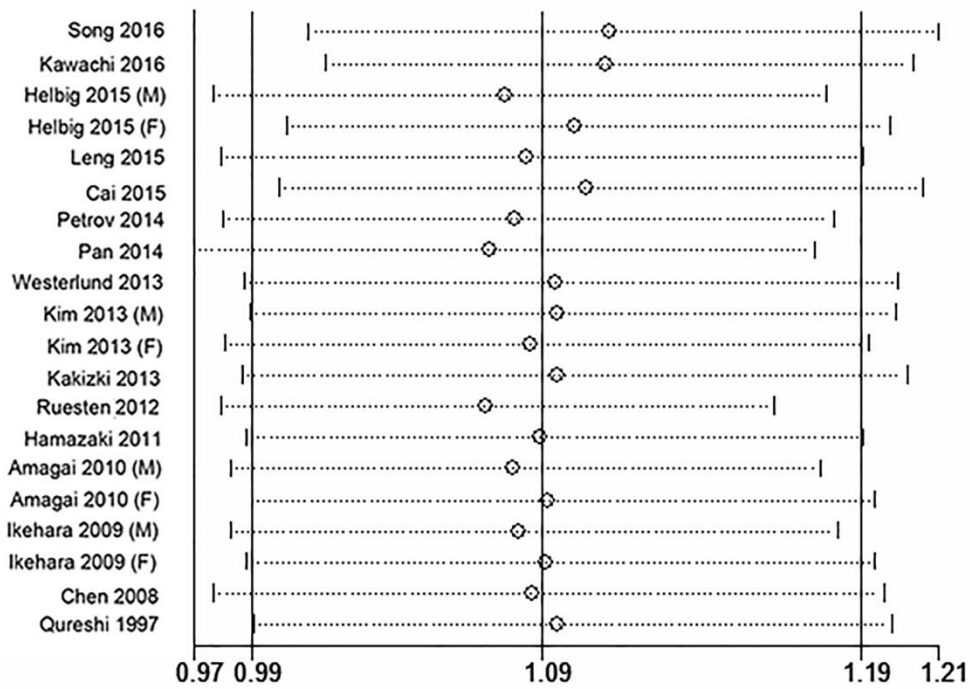


Figure S12. Sensitive analysis of stroke and sleep duration, shortest vs. reference analysis

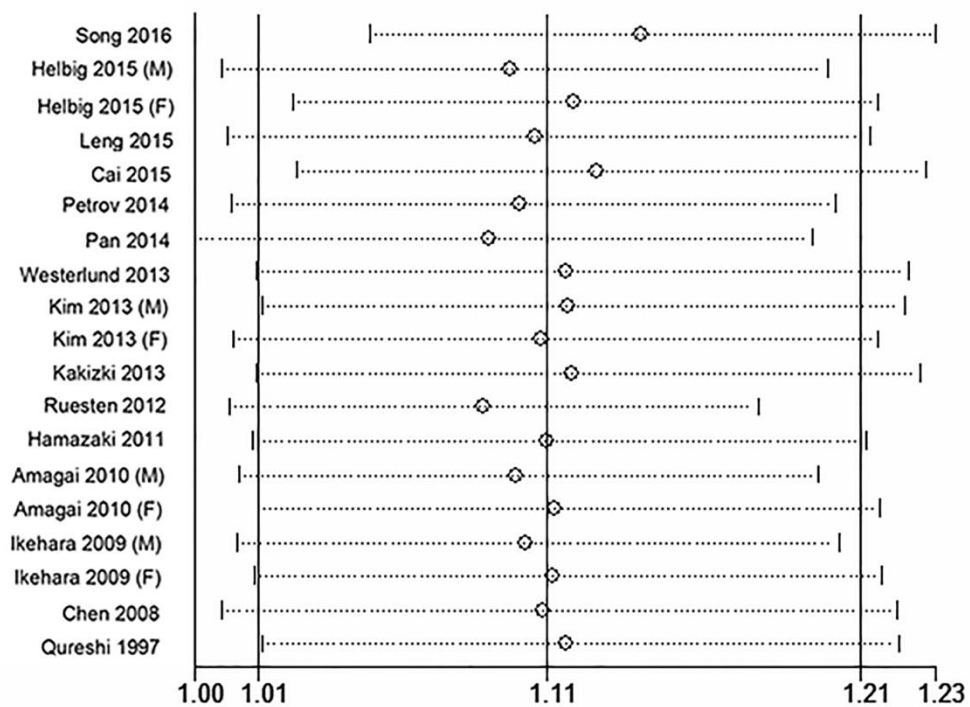


Figure S13. Sensitive analysis of stroke and sleep duration after excluding the study of Kawachi (2016), shortest vs. reference analysis

Supplemental References:

1. Aurora RN, Kim JS, Crainiceanu C, O'Hearn D, Punjabi NM. Habitual sleep duration and all-cause mortality in a general community sample. *Sleep*. 2016;39:1903-1909.
2. Lee WJ, Peng LN, Liang CK, Chiou ST, Chen LK. Long sleep duration, independent of frailty and chronic inflammation, was associated with higher mortality: A national population-based study. *Geriatrics & gerontology international*. 2016 Sep 29. doi: 10.1111/ggi.12899. [Epub ahead of print].
3. Wang X, Liu X, Song Q, Wu S. Sleep duration and risk of myocardial infarction and all-cause death in a chinese population: The kailuan study. *Sleep medicine*. 2016;19:13-16
4. Cai H, Shu XO, Xiang YB, Yang G, Li H, Ji BT, Gao J, Gao YT, Zheng W. Sleep duration and mortality: A prospective study of 113 138 middle-aged and elderly chinese men and women. *Sleep*. 2015;38:529-536
5. Zuurbier LA, Luik AI, Hofman A, Franco OH, Van Someren EJ, Tiemeier H. Fragmentation and stability of circadian activity rhythms predict mortality: The rotterdam study. *American journal of epidemiology*. 2015;181:54-63
6. Hall MH, Smagula SF, Boudreau RM, Ayonayon HN, Goldman SE, Harris TB, Naydeck BL, Rubin SM, Samuelsson L, Satterfield S, Stone KL, Visser M, Newman AB. Association between sleep duration and mortality is mediated by markers of inflammation and health in older adults: The health, aging and body composition study. *Sleep*. 2015;38:189-195
7. Rod NH, Kumari M, Lange T, Kivimaki M, Shipley M, Ferrie J. The joint effect of sleep duration and disturbed sleep on cause-specific mortality: Results from the whitehall ii cohort study. *PloS one*. 2014;9:e91965
8. Xiao Q, Keadle SK, Hollenbeck AR, Matthews CE. Sleep duration and total and cause-specific mortality in a large us cohort: Interrelationships with physical activity, sedentary behavior, and body mass index. *American journal of epidemiology*. 2014;180:997-1006
9. Bellavia A, Akerstedt T, Bottai M, Wolk A, Orsini N. Sleep duration and survival percentiles across categories of physical activity. *American journal of epidemiology*. 2014;179:484-491
10. Magee CA, Holliday EG, Attia J, Kritharides L, Banks E. Investigation of the relationship between sleep duration, all-cause mortality, and preexisting disease. *Sleep medicine*. 2013;14:591-596
11. Garde AH, Hansen AM, Holtermann A, Gyntelberg F, Suadicani P. Sleep duration and ischemic heart disease and all-cause mortality: Prospective cohort study on effects of tranquilizers/hypnotics and perceived stress. *Scandinavian journal of work, environment & health*. 2013;39:550-558
12. Kakizaki M, Kuriyama S, Nakaya N, Sone T, Nagai M, Sugawara Y, Hozawa A, Fukudo S, Tsuji I. Long sleep duration and cause-specific mortality according to physical function and self-rated health: The ohsaki cohort study. *Journal of sleep research*. 2013;22:209-216
13. Yeo Y, Ma SH, Park SK, Chang SH, Shin HR, Kang D, Yoo KY. A prospective cohort study on the relationship of sleep duration with all-cause and disease-specific mortality in the korean multi-center cancer cohort study. *Journal of preventive medicine and public health = Yebang Uihakhoe chi*. 2013;46:271-281
14. Chen HC, Su TP, Chou P. A nine-year follow-up study of sleep patterns and mortality in community-dwelling older adults in taiwan. *Sleep*. 2013;36:1187-1198
15. Jung KI, Song CH, Ancoli-Israel S, Barrett-Connor E. Gender differences in nighttime sleep and daytime napping as predictors of mortality in older adults: The rancho bernardo study. *Sleep medicine*. 2013;14:12-19

16. Hale L, Parente V, Dowd JB, Sands M, Berger JS, Song Y, Martin LW, Allison MA. Fibrinogen may mediate the association between long sleep duration and coronary heart disease. *Journal of sleep research*. 2013;22:305-314
17. Kim Y, Wilkens LR, Schembre SM, Henderson BE, Kolonel LN, Goodman MT. Insufficient and excessive amounts of sleep increase the risk of premature death from cardiovascular and other diseases: The multiethnic cohort study. *Preventive medicine*. 2013;57:377-385
18. Li Y, Sato Y, Yamaguchi N. Potential biochemical pathways for the relationship between sleep duration and mortality. *Sleep medicine*. 2013;14:98-104
19. Cohen-Mansfield J, Perach R. Sleep duration, nap habits, and mortality in older persons. *Sleep*. 2012;35:1003-1009
20. Rhee CW, Kim JY, Park BJ, Li ZM, Ahn YO. Impact of individual and combined health behaviors on all causes of premature mortality among middle aged men in korea: The seoul male cohort study. *Journal of preventive medicine and public health = Yebang Uihakhoe chi*. 2012;45:14-20
21. Castro-Costa E, Dewey ME, Ferri CP, Uchoa E, Firmo JO, Rocha FL, Prince M, Lima-Costa MF, Stewart R. Association between sleep duration and all-cause mortality in old age: 9-year follow-up of the bambui cohort study, brazil. *Journal of sleep research*. 2011;20:303-310
22. Qiu L, Sautter J, Liu Y, Gu D. Age and gender differences in linkages of sleep with subsequent mortality and health among very old chinese. *Sleep medicine*. 2011;12:1008-1017
23. Kronholm E, Laatikainen T, Peltonen M, Sippola R, Partonen T. Self-reported sleep duration, all-cause mortality, cardiovascular mortality and morbidity in finland. *Sleep medicine*. 2011;12:215-221
24. Mesas AE, Lopez-Garcia E, Leon-Munoz LM, Guallar-Castillon P, Rodriguez-Artalejo F. Sleep duration and mortality according to health status in older adults. *Journal of the American Geriatrics Society*. 2010;58:1870-1877
25. Chien KL, Chen PC, Hsu HC, Su TC, Sung FC, Chen MF, Lee YT. Habitual sleep duration and insomnia and the risk of cardiovascular events and all-cause death: Report from a community-based cohort. *Sleep*. 2010;33:177-184
26. Stone KL, Ewing SK, Ancoli-Israel S, Ensrud KE, Redline S, Bauer DC, Cauley JA, Hillier TA, Cummings SR. Self-reported sleep and nap habits and risk of mortality in a large cohort of older women. *Journal of the American Geriatrics Society*. 2009;57:604-611
27. Suzuki E, Yorifuji T, Ueshima K, Takao S, Sugiyama M, Ohta T, Ishikawa-Takata K, Doi H. Sleep duration, sleep quality and cardiovascular disease mortality among the elderly: A population-based cohort study. *Preventive medicine*. 2009;49:135-141
28. Ikehara S, Iso H, Date C, Kikuchi S, Watanabe Y, Wada Y, Inaba Y, Tamakoshi A. Association of sleep duration with mortality from cardiovascular disease and other causes for japanese men and women: The jacc study. *Sleep*. 2009;32:295-301
29. Gangwisch JE, Heymsfield SB, Boden-Albala B, Buijs RM, Kreier F, Opler MG, Pickering TG, Rundle AG, Zammit GK, Malaspina D. Sleep duration associated with mortality in elderly, but not middle-aged, adults in a large us sample. *Sleep*. 2008;31:1087-1096
30. Hublin C, Partinen M, Koskenvuo M, Kaprio J. Sleep and mortality: A population-based 22-year follow-up study. *Sleep*. 2007;30:1245-1253
31. Lan TY, Lan TH, Wen CP, Lin YH, Chuang YL. Nighttime sleep, chinese afternoon nap, and mortality in the elderly. *Sleep*. 2007;30:1105-1110
32. Amagai Y, Ishikawa S, Gotoh T, Doi Y, Kayaba K, Nakamura Y, Kajii E. Sleep duration and mortality in japan: The jichi medical school cohort study. *Journal of epidemiology / Japan Epidemiological*

Association. 2004;14:124-128

33. Patel SR, Ayas NT, Malhotra MR, White DP, Schernhammer ES, Speizer FE, Stampfer MJ, Hu FB. A prospective study of sleep duration and mortality risk in women. *Sleep*. 2004;27:440-444
34. Burazeri G, Gofin J, Kark JD. Over 8 hours of sleep--marker of increased mortality in mediterranean population: Follow-up population study. *Croatian medical journal*. 2003;44:193-198
35. Goto A, Yasumura S, Nishise Y, Sakihara S. Association of health behavior and social role with total mortality among japanese elders in okinawa, japan. *Aging - Clinical and Experimental Research*. 2003;15:443-450
36. Mallon L, Broman JE, Hetta J. Sleep complaints predict coronary artery disease mortality in males: A 12-year follow-up study of a middle-aged swedish population. *Journal of internal medicine*. 2002;251:207-216
37. Kripke DF, Garfinkel L, Wingard DL, Klauber MR, Marler MR. Mortality associated with sleep duration and insomnia. *Arch Gen Psychiatry*. 2002;59:131-136
38. Heslop P, Smith GD, Metcalfe C, Macleod J, Hart C. Sleep duration and mortality: The effect of short or long sleep duration on cardiovascular and all-cause mortality in working men and women. *Sleep medicine*. 2002;3:305-314
39. Kojima M, Wakai K, Kawamura T, Tamakoshi A, Aoki R, Lin Y, Nakayama T, Horibe H, Aoki N, Ohno Y. Sleep patterns and total mortality: A 12-year follow-up study in japan. *Journal of epidemiology / Japan Epidemiological Association*. 2000;10:87-93
40. Gale C, Martyn C. Larks and owls and health, wealth, and wisdom. *BMJ (Clinical research ed.)*. 1998;317:1675-1677
41. Ruigomez A, Alonso J, Anto JM. Relationship of health behaviours to five-year mortality in an elderly cohort. *Age and Ageing*. 1995;24:113-119
42. Tsubono Y, Fukao A, Hisamichi S. Health practices and mortality in a rural japanese population. *Tohoku J Exp Med*. 1993;171:339-348
43. Rumble R, Morgan K. Hypnotics, sleep, and mortality in elderly people. *Journal of the American Geriatrics Society*. 1992;40:787-791
44. Gianfagna F, Veronesi G, Bertu L, Cesana G, Grassi G, Stranges S, Callegari C, Ferrario MM. Influence of sleep disturbances on age at onset and long-term incidence of major cardiovascular events: The monica-brianza and pamela cohort studies. *Sleep medicine*. 2016;21:126-132
45. Canivet C, Nilsson PM, Lindeberg SI, Karasek R, Östergren PO. Insomnia increases risk for cardiovascular events in women and in men with low socioeconomic status: A longitudinal, register-based study. *Journal of psychosomatic research*. 2014;76:292-299
46. Sands-Lincoln M, Loucks EB, Lu B, Carskadon MA, Sharkey K, Stefanick ML, Ockene J, Shah N, Hairston KG, Robinson JG, Limacher M, Hale L, Eaton CB. Sleep duration, insomnia, and coronary heart disease among postmenopausal women in the women's health initiative. *Journal of women's health (2002)*. 2013;22:477-486
47. Westerlund A, Bellocco R, Sundstrom J, Adami HO, Akerstedt T, Trolle Lagerros Y. Sleep characteristics and cardiovascular events in a large swedish cohort. *European journal of epidemiology*. 2013;28:463-473
48. Holliday EG, Magee CA, Kritharides L, Banks E, Attia J. Short sleep duration is associated with risk of future diabetes but not cardiovascular disease: A prospective study and meta-analysis. *PloS one*. 2013;8:e82305
49. Hoevenaer-Blom MP, Spijkerman AM, Kromhout D, van den Berg JF, Verschuren WM. Sleep

- duration and sleep quality in relation to 12-year cardiovascular disease incidence: The morgen study. *Sleep*. 2011;34:1487-1492
50. Hamazaki Y, Morikawa Y, Nakamura K, Sakurai M, Miura K, Ishizaki M, Kido T, Naruse Y, Suwazono Y, Nakagawa H. The effects of sleep duration on the incidence of cardiovascular events among middle-aged male workers in japan. *Scandinavian journal of work, environment & health*. 2011;37:411-417
51. Amagai Y, Ishikawa S, Gotoh T, Kayaba K, Nakamura Y, Kajii E. Sleep duration and incidence of cardiovascular events in a japanese population: The jichi medical school cohort study. *Journal of epidemiology / Japan Epidemiological Association*. 2010;20:106-110
52. Yang L, Yang H, He M, Pan A, Li X, Min X, Zhang C, Xu C, Zhu X, Yuan J, Wei S, Miao X, Hu FB, Wu T, Zhang X. Longer sleep duration and midday napping are associated with a higher risk of chd incidence in middle-aged and older chinese: The dongfeng-tongji cohort study. *Sleep*. 2016;39:645-652
53. Strand LB, Tsai MK, Gunnell D, Janszky I, Wen CP, Chang SS. Self-reported sleep duration and coronary heart disease mortality: A large cohort study of 400,000 taiwanese adults. *International journal of cardiology*. 2016;207:246-251
54. Liu J, Yuen J, Kang S. Sleep duration, c-reactive protein and risk of incident coronary heart disease--results from the framingham offspring study. *Nutrition, metabolism, and cardiovascular diseases : NMCD*. 2014;24:600-605
55. von Ruesten A, Weikert C, Fietze I, Boeing H. Association of sleep duration with chronic diseases in the european prospective investigation into cancer and nutrition (epic)-potsdam study. *PLoS one*. 2012;7:e30972
56. Chandola T, Ferrie JE, Perski A, Akbaraly T, Marmot MG. The effect of short sleep duration on coronary heart disease risk is greatest among those with sleep disturbance: A prospective study from the whitehall ii cohort. *Sleep*. 2010;33:739-744
57. Shankar A, Koh WP, Yuan JM, Lee HP, Yu MC. Sleep duration and coronary heart disease mortality among chinese adults in singapore: A population-based cohort study. *American journal of epidemiology*. 2008;168:1367-1373
58. Meisinger C, Heier M, Lowel H, Schneider A, Doring A. Sleep duration and sleep complaints and risk of myocardial infarction in middle-aged men and women from the general population: The monica/kora augsburg cohort study. *Sleep*. 2007;30:1121-1127
59. Ayas NT, White DP, Manson JE, Stampfer MJ, Speizer FE, Malhotra A, Hu FB. A prospective study of sleep duration and coronary heart disease in women. *Archives of internal medicine*. 2003;163:205-209
60. Qureshi AI, Giles WH, Croft JB, Bliwise DL. Habitual sleep patterns and risk for stroke and coronary heart disease: A 10-year follow-up from nhanes i. *Neurology*. 1997;48:904-911
61. Song Q, Liu X, Zhou W, Wang L, Zheng X, Wang X, Wu S. Long sleep duration and risk of ischemic stroke and hemorrhagic stroke: The kailuan prospective study. *Scientific reports*. 2016;6:33664
62. Kawachi T, Wada K, Nakamura K, Tsuji M, Tamura T, Konishi K, Nagata C. Sleep duration and the risk of mortality from stroke in japan: The takayama cohort study. *Journal of epidemiology / Japan Epidemiological Association*. 2016;26:123-130
63. Helbig AK, Stockl D, Heier M, Ladwig KH, Meisinger C. Symptoms of insomnia and sleep duration and their association with incident strokes: Findings from the population-based monica/kora augsburg cohort study. *PLoS one*. 2015;10:e0134480
64. Leng Y, Cappuccio FP, Wainwright NW, Surtees PG, Luben R, Brayne C, Khaw KT. Sleep duration and risk of fatal and nonfatal stroke: A prospective study and meta-analysis. *Neurology*. 2015;84:1072-

65. Ruitter Petrov ME, Letter AJ, Howard VJ, Kleindorfer D. Self-reported sleep duration in relation to incident stroke symptoms: Nuances by body mass and race from the regards study. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association*. 2014;23:e123-132
66. Pan A, De Silva DA, Yuan JM, Koh WP. Sleep duration and risk of stroke mortality among chinese adults: Singapore chinese health study. *Stroke; a journal of cerebral circulation*. 2014;45:1620-1625
67. Chen JC, Brunner RL, Ren H, Wassertheil-Smoller S, Larson JC, Levine DW, Allison M, Naughton MJ, Stefanick ML. Sleep duration and risk of ischemic stroke in postmenopausal women. *Stroke; a journal of cerebral circulation*. 2008;39:3185-3192
68. Tu X, Cai H, Gao YT, Wu X, Ji BT, Yang G, Li H, Zheng W, Shu XO. Sleep duration and its correlates in middle-aged and elderly chinese women: The shanghai women's health study. *Sleep medicine*. 2012;13:1138-1145
69. Smagula SF, Koh WP, Wang R, Yuan JM. Chronic disease and lifestyle factors associated with change in sleep duration among older adults in the singapore chinese health study. *Journal of sleep research*. 2016;25:57-61
70. Stamatakis E, Rogers K, Ding D, Berrigan D, Chau J, Hamer M, Bauman A. All-cause mortality effects of replacing sedentary time with physical activity and sleeping using an isotemporal substitution model: A prospective study of 201,129 mid-aged and older adults. *International Journal of Behavioral Nutrition and Physical Activity*. 2015;12
71. Azevedo Da Silva M, Singh-Manoux A, Shipley MJ, Vahtera J, Brunner EJ, Ferrie JE, Kivimaki M, Nabi H. Sleep duration and sleep disturbances partly explain the association between depressive symptoms and cardiovascular mortality: The whitehall ii cohort study. *Journal of sleep research*. 2014;23:94-97
72. Werle MH, Moriguchi E, Fuchs SC, Bruscatto NM, de Carli W, Fuchs FD. Risk factors for cardiovascular disease in the very elderly: Results of a cohort study in a city in southern brazil. *European journal of cardiovascular prevention and rehabilitation : official journal of the European Society of Cardiology, Working Groups on Epidemiology & Prevention and Cardiac Rehabilitation and Exercise Physiology*. 2011;18:369-377
73. Krueger PM, Saint Onge JM, Chang VW. Race/ethnic differences in adult mortality: The role of perceived stress and health behaviors. *Social science & medicine (1982)*. 2011;73:1312-1322
74. Kripke DF, Langer RD, Elliott JA, Klauber MR, Rex KM. Mortality related to actigraphic long and short sleep. *Sleep medicine*. 2011;12:28-33
75. Branch LG, Jette AM. Personal health practices and mortality among the elderly. *American journal of public health*. 1984;74:1126-1129
76. Kripke DF, Simons RN, Garfinkel L, Hammond EC. Short and long sleep and sleeping pills. Is increased mortality associated? *Archives of General Psychiatry*. 1979;36:103-116
77. Hammond EC. Some preliminary findings on physical complaints from a prospective study of 1,064,004 men and women. *American journal of public health and the nation's health*. 1964;54:11-23
78. Ford ES. Habitual sleep duration and predicted 10-year cardiovascular risk using the pooled cohort risk equations among us adults. *Journal of the American Heart Association*. 2014;3:e001454
79. Benito-Leon J, Louis ED, Villarejo-Galende A, Romero JP, Bermejo-Pareja F. Long sleep duration in elders without dementia increases risk of dementia mortality (nedices). *Neurology*. 2014;83:1530-1537
80. Eguchi K, Hoshida S, Ishikawa S, Shimada K, Kario K. Short sleep duration and type 2 diabetes

- enhance the risk of cardiovascular events in hypertensive patients. *Diabetes research and clinical practice*. 2012;98:518-523
81. Eguchi E, Iso H, Tanabe N, Yatsuya H, Tamakoshi A. Is the association between healthy lifestyle behaviors and cardiovascular mortality modified by overweight status? The japan collaborative cohort study. *Preventive medicine*. 2014;62:142-147
82. von Sarnowski B, Putaala J, Grittner U, Gaertner B, Schminke U, Curtze S, Huber R, Tanislav C, Lichy C, Demarin V, Basic-Kes V, Ringelstein EB, Neumann-Haefelin T, Enzinger C, Fazekas F, Rothwell PM, Dichgans M, Jungehulsing GJ, Heuschmann PU, Kaps M, Norrving B, Rolfs A, Kessler C, Tatlisumak T. Lifestyle risk factors for ischemic stroke and transient ischemic attack in young adults in the stroke in young fabry patients study. *Stroke; a journal of cerebral circulation*. 2013;44:119-125
83. Vgontzas AN, Liao D, Pejovic S, Calhoun S, Karataraki M, Basta M, Fernández-Mendoza J, Bixler EO. Insomnia with short sleep duration and mortality: The penn state cohort. *Sleep*. 2010;33:1159-1164
84. Huppert FA, Whittington JE. Symptoms of psychological distress predict 7-year mortality. *Psychological medicine*. 1995;25:1073-1086
85. Jackowska M, Steptoe A. Sleep and future cardiovascular risk: Prospective analysis from the english longitudinal study of ageing. *Sleep medicine*. 2015;16:768-774
86. Breslow L, Enstrom JE. Persistence of health habits and their relationship to mortality. *Preventive medicine*. 1980;9:469-483
87. Smagula SF, Stone KL, Redline S, Ancoli-Israel S, Barrett-Connor E, Lane NE, Orwoll ES, Cauley JA. Actigraphy- and polysomnography-measured sleep disturbances, inflammation, and mortality among older men. *Psychosomatic medicine*. 2016;78:686-696
88. Zawisza K, Tobiasz-Adamczyk B, Galas A, Brzyska M. Sleep duration and mortality among older adults in a 22-year follow-up study: An analysis of possible effect modifiers. *European journal of ageing*. 2015;12:119-129
89. Ding D, Rogers K, van der Ploeg H, Stamatakis E, Bauman AE. Traditional and emerging lifestyle risk behaviors and all-cause mortality in middle-aged and older adults: Evidence from a large population-based australian cohort. *PLoS medicine*. 2015;12:e1001917
90. Li Y, Sato Y, Yamaguchi N. Lifestyle factors as predictors of general cardiovascular disease: Use for early self-screening. *Asia-Pacific journal of public health / Asia-Pacific Academic Consortium for Public Health*. 2014;26:414-424
91. Lee JS, Auyeung TW, Leung J, Chan D, Kwok T, Woo J, Wing YK. Long sleep duration is associated with higher mortality in older people independent of frailty: A 5-year cohort study. *Journal of the American Medical Directors Association*. 2014;15:649-654
92. Hoevenaar-Blom MP, Spijkerman AM, Kromhout D, Verschuren WM. Sufficient sleep duration contributes to lower cardiovascular disease risk in addition to four traditional lifestyle factors: The morgen study. *European journal of preventive cardiology*. 2014;21:1367-1375
93. Piccolo RS, Yang M, Bliwise DL, Yaggi HK, Araujo AB. Racial and socioeconomic disparities in sleep and chronic disease: Results of a longitudinal investigation. *Ethnicity & disease*. 2013;23:499-507
94. Martínez-Gómez D, Guallar-Castillón P, León-Muñoz LM, López-García E, Rodríguez-Artalejo F. Combined impact of traditional and non-traditional health behaviors on mortality: A national prospective cohort study in spanish older adults. *BMC medicine*. 2013;11
95. Eguchi E, Iso H, Tanabe N, Wada Y, Yatsuya H, Kikuchi S, Inaba Y, Tamakoshi A. Healthy lifestyle behaviours and cardiovascular mortality among japanese men and women: The japan collaborative

cohort study. *European heart journal*. 2012;33:467-477

96. Dew MA, Hoch CC, Buysse DJ, Monk TH, Begley AE, Houck PR, Hall M, Kupfer DJ, Reynolds CF. Healthy older adults' sleep predicts all-cause mortality at 4 to 19 years of follow-up. *Psychosomatic medicine*. 2003;65:63-73
97. Kaplan GA, Seeman TE, Cohen RD, Knudsen LP, Guralnik J. Mortality among the elderly in the alameda county study: Behavioral and demographic risk factors. *American journal of public health*. 1987;77:307-312
98. Wingard DL, Berkman LF, Brand RJ. A multivariate analysis of health-related practices: A nine-year mortality follow-up of the alameda county study. *American journal of epidemiology*. 1982;116:765-775
99. Riemann D, Baglioni C, Spiegelhalder K. [Lack of sleep and insomnia. Impact on somatic and mental health]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*. 2011;54:1296-1302
100. Seki N. [relationships between walking hours, sleeping hours, meaningfulness of life (ikigai) and mortality in the elderly: Prospective cohort study]. *Nihon eiseigaku zasshi. Japanese journal of hygiene*. 2001;56:535-540
101. Tamakoshi A, Ohno Y. Self-reported sleep duration as a predictor of all-cause mortality: Results from the jacc study, japan. *Sleep*. 2004;27:51-54
102. Ferrie JE, Shipley MJ, Cappuccio FP, Brunner E, Miller MA, Kumari M, Marmot MG. A prospective study of change in sleep duration: Associations with mortality in the whitehall ii cohort. *Sleep*. 2007;30:1659-1666