THE LANCET
Respiratory Medicine

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Boulos MI, Jairam T, Kendzerska T, Im J, Mekhael A, Murray BJ. Normal polysomnography parameters in healthy adults: a systematic review and meta-analysis. *Lancet Respir Med* 2019; published online April 18. http://dx.doi.org/10.1016/S2213-2600(19)30057-8.

SUPPLEMENTARY APPENDIX

Normal Polysomnography Parameters in Healthy Adults: A Systematic Review and Meta–Analysis

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1. METHODOLOGICAL DETAILS

1.1 Prediction Intervals

To address heterogeneity in sleep parameters unexplained by mean age, sex, and night of sleep study, 95% Higgins-Thompson-Spiegelhalter prediction intervals (PIs) were computed based on a Students *t*-distribution with k-2 degrees of freedom (k representing the number of studies or in this meta-analysis, the number of healthy control groups).[1] We chose the Higgins PI because a t-distribution has been recommended to reduce the effect of outlying studies.[1] This interval is wider than that which would be seen with a confidence interval and provides information about individual values within a random effects distribution. Confidence intervals, in contrast, strictly provide information about the mean of a random effects distribution.

The width of the Higgins-Thompson-Spiegelhalter PI is proportional to the square root of the sum of the between-study variance (tau^2) and square of the standard error of the pooled estimate.[1] Its validity strongly depends upon approximation of a large sample[2] and needs to be interpreted with caution when the number of studies is less than 20. Estimates with 95% PIs are presented below (Tables S3A-D and S6A-B).

1.2 Mixed Effects Models

Most mixed effects meta-regression models were multivariate, consisting of mean age, % male participants, and night of sleep study (first night vs. second night or later). Because most studies reporting AHI, mean SaO_2, minimum SaO_2, and PLMI were performed for a single night in the sleep laboratory, only mean age and percentage of male participants were included in these models. In addition, univariate models were also created for percentage of N1 and N2 because of non–significant omnibus tests in the multivariate models for these parameters. Finally, as mean AHI varied substantially above a mean age of 50 years and the mixed effect model was not robust, an alternative model was created exclusively for control groups with a mean age of less than 50 years.

Model coefficients provided a means of quantifying the degree to which each moderator was associated with changes in a given sleep parameter while controlling for other moderators. Omnibus tests of all model coefficients were based on a χ^2 distribution with m degrees of freedom (m being the number of coefficients) and Q statistics were computed.[3] For individual model coefficients, tests of significance were based on the normal distribution and z scores were computed.[3] The amount of heterogeneity accounted by the moderators (R^2) was also calculated for each mixed effect model.

A secondary analysis was also performed to assess whether age-related changes in sleep parameters differed between males and females. For this analysis, control groups were stratified by sex (total, male only, and female only) and the influence of mean age was analyzed independently within each subgroup using univariate mixed effects models.

1.3 Influence Analyses

To identify particularly influential studies included in our random effects and mixed effects models, the following diagnostic values were examined: DFFITS (Difference in fits) values, Cook's distance, hat values, and DFBETAS. Influential studies were identified as studies meeting at least one of the following cut-offs defined in the "metafor" package:[3] absolute DFFITS value larger than $3\sqrt{(p/(k-p))}$, where p is the number of model coefficients and k is the number of studies; lower tail area of a chi-square distribution with p degrees of freedom cut off by Cook's distance larger than 50%; hat value larger than 3(p/k); or any DFBETAS value larger than 1. For any attempts to stabilize models, a maximum of four studies were removed. A robust model was defined as one without any overly influential studies.

SUPPLEMENTARY TABLES

Table S1. Sample excluded health conditions and experimental treatments

Main confound	Examples
Health conditions	Cardiovascular/hematological disorders and risk factors - Heart failure - Obesity (defined as mean body mass index (BMI) > 30 kg/m^2) - Sickle cell disease Endocrine disorders - Acromegaly Infectious diseases - Tonsillitis Neurological conditions - Alzheimer's disease - Amyotrophic lateral sclerosis (ALS) - Epilepsy - Huntington's disease - Parkinson's disease Pulmonary disorders - Chronic obstructive pulmonary disease (COPD) Psychological conditions - Anxiety - Depression - Post–traumatic stress disorder Pregnancy Sleep disorders - Insomnia - Narcolepsy - Rapid eye movement (REM) sleep behavior disorder - Restless legs syndrome - Sleep apnea
Experimental treatments	- Drugs other than placebo - Hot temperatures - Hypoxic conditions - Significant noise - Split sleep schedules

Table S2. Quality Appraisal. Values are reported as number of subjects (% of total subjects in that row)

	Total	Exclusion criteria stated for sleep complaints and/or disorders*	Exclusion criteria stated for medical disorders†	Exclusion criteria stated for psychiatric disorders‡	Recruited from population-based studies
Total sample	5273 k = 202	3030 (57·5%) k = 124	2331 (44·2%) k = 101	1985 (37·5%) k = 75	1230 (23·3%) k = 29
Sample characteristic					
Mean age, years					
18–34	2139 k = 88	1555 (72·7%) k = 70	1006 (47·0%) k = 55	814 (38·1%) k = 39	380 (17·8%) k = 7
35–49	1268 k =48	566 (44·6%) k = 28	568 (44·8%) k = 25	442 (34·9%) k = 20	373 (29·4%) k = 6
50–64	1353 k = 41	744 (55·0%) k = 17	643 (47·5%) k = 14	604 (44·6%) k = 9	314 (23·2%) k = 7
65-79	408 k =18	93 (22·8%) k = 5	29 (7·1%) k = 2	63 (15·4%) k = 4	153 (37·5%) k = 8
80+	10 k = 1	0 (0·0%) k = 0	0 (0·0%) k = 0	0 (0·0%) k = 0	10 (100·0%) k = 1
Sex					
Both	3417 k = 136	2446 (71·6%) k = 95	1822 (53·3%) k = 75	1619 (47·4%) k = 61	150 (4·4%) k = 2
Males only	939 k = 38	389 (41·4%) k = 19	258 (27·5%) k = 14	221 (23·5%) k = 7	506 (53·9%) k = 15
Females only	816 k = 23	148 (18·1%) k = 7	185 (22·7%) k = 9	105 (12·9%) k = 5	574 (70·3%) k = 12
Night of sleep study					
First night	3053 k = 116	1199 (39·3%) k = 57	1137 (37·2%) k = 52	712 (23·3%) k = 33	1230 (40·3%) k = 29
Second night or later	1192 k = 54	1012 (84·9%) k = 45	578 (48·5%) k = 32	604 (50·7%) k = 30	0 (0·0%) k = 0

*A study would meet our criteria for explicitly excluding subjects with sleep complaints and/or disorders if: (a) included subjects were explicitly screened using standardized questionnaires (e.g. Pittsburgh sleep quality index, Epworth sleep sleepiness), (b) included subjects were explicitly screened using a diagnostic overnight PSG, or (c) subjects with sleep complaints and/or disorders were stated to be excluded.

†A study would meet our criteria for explicitly excluding subjects with medical disorders if: (a) included subjects were explicitly screened for medical illnesses (e.g. clinical examination, laboratory tests, etc.) or (b) subjects with medical illnesses were stated to be excluded.

‡A study would meet our criteria for explicitly excluding subjects with psychiatric disorders if: (a) included subjects were screened using standardized procedures (e.g. structured clinical interview for DSM-V [SCID]) or (b) subjects with psychiatric disorders were stated to be excluded. Note: Excluding only one type of psychiatric disorder (e.g. anxiety) would not suffice.

Table S3A. Means and 95% prediction intervals* for total sleep time (TST), sleep efficiency (SE), and wake after sleep onset (WASO) for total sample and by age, sex and night of sleep study based on random effects models.

	TST, minutes	SE, %	WASO, minutes
Total sample	394·6 (319·8-469·3) k = 158 n = 4038 I^2 = 98·3%	85·7 (75·1-96·3) k = 147 n = 4217 I^2 = 94·0%	48·2 (7·1-89·3) k = 94 n = 2757 I^2 = 94·8
Sample characteristic			
Mean age, years			
18–34	410·6 (360·8-460-3) k = 76 n = 1815	89·0 (81·6-96·4) k = 65 n = 1635	32·1 (8·3-55·9) k = 42 n = 1226
35–49	386·6 (298·2-475·0) k = 32 n = 955	85·4 (75·6-95·2) k = 35 n = 1040	51·1 (2·2-100·0) k = 22 n = 728
50–64	372·0 (301·0-442·9) k = 26 n = 712	83·2 (71·6-94·9) k = 27 n = 1099	64·0 (26·7-101·3) k = 17 n = 547
65-79	346·0 (262·8-429·3) k = 17 n = 399	77·5 (58·3-96·6) k = 16 n = 386	77·1 (-1·4-155·6) k = 12 n = 185
80+	-	-	-
Sex			
Both	405·2 (343·4-467·0) k = 101 n = 2286	86·7 (76·2-97·1) k = 96 n = 2695	43·3 (3·6-83·1) k = 56 n = 1494
Males only	374·6 (277·0-472·2) k = 30 n = 786	84·3 (72·3-96·3) k = 27 n = 678	51·8 (7·0-96·5) k = 20 n = 587
Females only	356·0 (269·2-442·9) k = 19 n = 748	84·1 (72·9-95·3) k = 20 n = 768	55·0 (18·0-92·0) k = 17 n = 668
Night of sleep study			
First night	371·7 (281·8-461·3) k = 89 n = 2447	84·2 (73·7-94·6) k = 88 n = 2491	52·7 (8·3-97·1) k = 57 n = 1895
Second night or later	419·7 (368·1-471·4) k = 48 n = 1092	89·3 (81·9-96·6) k = 39 n = 942	37·9 (0·0-75·7) k = 26 n = 674

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

*Higgins 95% prediction intervals were calculated based on a t-distribution with k-2 degrees of freedom.[1] The validity of this metric strongly depends upon approximation using a large sample size and needs to be interpreted with caution when k<20; this explains why the lower bound of some prediction intervals are less than 0. We do not report data where k<10.

Table S3B. Means and 95% prediction intervals* for sleep onset latency (SOL), REM latency (REML), and arousal index (AI) for total sample and by age, sex and night of sleep study based on random effects models.

	SOL, minutes	REML, minutes	AI, events/h
Total sample	15·4 (3·2-27·6) k = 124 n = 3828 I^2 = 91·9	97·4 (70·9-123·8) k = 89 n = 2859 I^2 = 81·6	12·6 (6·1-19·1) k = 89 n = 2847 I^2 = 94·2
Sample characteristic			
Mean age, years			
18–34	14·3 (2·1-26·5) k = 58 n = 1517	96·4 (65·5-127·3) k = 42 n = 1195	9·6 (5·2-14·1) k = 32 n = 984
35–49	14·4 (4·5-24·3) k = 25 n = 856	93·4 (77·5-109·4) k = 18 n = 644	12·5 (3·3-21·6) k = 25 n = 827
50–64	15·7 (7·5-24·0) k = 19 n = 930	101·3 (73·2-129·3) k = 14 n = 702	16·5 (10·0-23·1) k = 19 n = 800
65-79	19·5 (3·2-35·9) k = 16 n = 340	99·7 (55·2-144·2) k = 11 n = 243	-
80+	-	-	-
Sex			
Both	15·4 (2·2-28·6) k = 76 n = 2301	96·7 (80·2-113·3) k = 44 n = 1369	11·3 (4·3-18·3) k = 47 n = 1424
Males only	14·7 (8·3-21·1) k = 25 n = 647	92·5 (64·1-121·0) k = 24 n = 687	14·5 (6·3-22·8) k = 20 n = 573
Females only	13·5 (7·5-19·4) k = 20 n = 768	99·5 (86·6-112·5) k = 20 n = 768	12·7 (6·1-19·3) k = 15 n = 596
Night of sleep study			
First night	14·7 (5·0-24·4) k = 68 n = 2048	99·5 (83·9-115·0) k = 49 n = 1487	13·5 (6·1-21·0) k = 62 n = 1751
Second night or later	14·4 (2·4-26·3) k = 41 n = 966	87·3 (65·9-108·7) k = 28 n = 510	9·6 (3·5-15·7) k = 14 n = 435

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

*Higgins 95% prediction intervals were calculated based on a t-distribution with k-2 degrees of freedom.[1] The validity of this metric strongly depends upon approximation using a large sample size and needs to be interpreted with caution when k<20; this explains why the lower bound of some prediction intervals are less than 0. We do not report data where k<10.

Table S3C. Means and 95% prediction intervals* for duration of sleep stages (expressed as a percentage of total sleep time [%TST]) for total sample and by age, sex and night of sleep study based on random effects models.

	N1, %TST	N2, %TST	N3, %TST	REM, %TST
Total sample	7·9 (2·1-13·7) k = 104 n = 2940 I^2 = 95·4	51·4 (39·7-63·2) k = 104 n = 2940 I^2 = 93·2	20·4 (6·4-34·4) k = 107 n = 2995 I^2 = 96·5	19·0 (13·7-24·4) k = 108 n = 3012 I^2 = 87·7
Sample characteristic				
Mean age, years				
18–34	6·0 (1·8-10·2) k = 38 n = 871	51·3 (41·3-61·2) k = 39 n = 886	21·4 (12·7-30·2) k = 42 n = 937	19·8 (13·7-26·0) k = 44 n = 958
35–49	8·0 (2·4-13·6) k = 23 n = 750	52·2 (44·7-59·7) k = 24 n = 794	20·4 (11·5-29·2) k = 23 n = 774	19·3 (14·2-24·3) k = 24 n = 776
50–64	8·7 (2·3-15·1) k = 22 n = 876	52·8 (38·1-67·5) k = 22 n = 876	18·1 (2·5-33·7) k = 23 n = 896	18·7 (14·6-22·7) k = 23 n = 896
65-79	9·3 (0·7-17·9) k = 11 n = 256	53·3 (41·7-65·0) k = 11 n = 256	19·9 (13·1-26·8) k = 11 n = 256	17·7 (16·7-18·7) k = 10 n = 221
80+	-	-	-	-
Sex				
Both	9·7 (2·7-16·6) k = 59 n = 1533	50·6 (36·0-65·2) k = 59 n = 1533	19·5 (4·3-34·6) k = 62 n = 1588	19·2 (14·1-24·3) k = 63 n = 1576
Males only	5·3 (1·5-9·1) k = 23 n = 609	52·1 (43·2-60·9) k = 24 n = 617	21·0 (14·0-27·9) k = 24 n = 617	19·9 (13·3-26·4) k = 24 n = 627
Females only	4·2 (1·9-6·4) k = 16 n = 662	55·1 (51·0-59·2) k = 16 n = 688	22·1 (16·9-27·3) k = 17 n = 708	18·6 (16·0-21·2) k = 17 n = 708
Night of sleep study				
First night	7·0 (2·9-11·1) k = 63 n = 1734	52·1 (42·4-61·8) k = 69 n = 1916	20·7 (12·4-29·0) k = 69 n = 1907	18·3 (14·6-21·9) k = 68 n = 1870
Second night or later	6·9 (0·4-13·5) k = 23 n = 426	48·2 (35·5-60·9) k = 24 n = 457	22·3 (1·9-42·8) k = 25 n = 469	21·4 (14·5-28·2) k = 26 n = 476

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

*Higgins 95% prediction intervals were calculated based on a t-distribution with k-2 degrees of freedom.[1] The validity of this metric strongly depends upon approximation using a large sample size and needs to be interpreted with caution when k<20; this explains why the lower bound of some prediction intervals are less than 0. We do not report data where k<10.

Table S3D. Means and 95% prediction intervals* for apnea-hypopnea index (AHI), mean and minimum arterial oxygen saturation (SaO_2), and periodic limb movement index (PLMI) for total sample and by age, sex and night of sleep study based on random effects models.

	AHI, events/h	Mean SaO_2, %	Minimum SaO_2, %	PLMI, events/h
Total sample	2·9 (0·7-5·0) k = 99 n = 3229 I^2 = 95·7	95·0 (93·0-97·0) k = 48 n = 1512 I^2 = 95·2	89·2 (84·3-94·1) k = 58 n = 2004 I^2 = 97·9	2·5 (0·6-4·4) k = 58 n = 2198 I^2 = 90·2
Sample characteristic				
Mean age, years				
18–34	1·6 (-0·2-3·4) k = 28 n = 1039	96·2 (95·0-97·4) k = 15 n = 540	91·8 (91·3-92·3) k = 17 n = 569	1.1 (-0·2-2·4) k = 11 n = 411
35–49	3·1 (0·2-6·0) k = 28 n = 836	95·3 (93·3-97·3) k = 13 n = 532	90·5 (84·8-96·2) k = 19 n = 622	3·1 (-0·9-7·0) k = 14 n = 600
50–64	4·2 (1·5-6·8) k = 28 n = 1054	94·3 (93·0-95·7) k = 11 n = 292	87·0 (78·1-95·9) k = 12 n = 648	6·2(-0·8-13·2) k = 13 n = 628
65-79	15·5 (9·8-21·3) k = 10 n = 211	-	-	-
80+	-	-	-	-
Sex				
Both	2·2 (0·2-4·2) k = 54 n = 1698	95·4 (93·0-97·7) k = 14 n = 324	91·7 (88·3-95·0) k = 21 n = 746	4·4 (0·3-8·5) k = 26 n = 981
Males only	5·2 (1·4-8·9) k = 23 n = 673	94·7 (92·9-96·5) k = 18 n = 566	87·9 (82·0-93·7) k = 19 n = 586	2·1 (-0·5-4·7) k = 16 n = 439
Females only	3·1 (0·6-5·6) k = 16 n = 668	95·0 (92·7-97·4) k = 14 n = 605	87·6 (81·0-94·2) k = 14 n = 605	2·1 (0·1-4·1) k = 15 n = 659
Night of sleep study				
First night	3·4 (1·0-5·8) k = 72 n = 2184	95·0 (92·9-97·1) k = 40 n = 1392	89·0 (83·3-94·6) k = 49 n = 1518	2·2 (0·6-3·9) k = 45 n = 1507
Second night or later	-	-	-	-

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

*Higgins 95% prediction intervals were calculated based on a t-distribution with k-2 degrees of freedom.[1] The validity of this metric strongly depends upon approximation using a large sample size and needs to be interpreted with caution when k<20; this explains why the lower bound of some prediction intervals are less than 0. We do not report data where k<10.

Table S4A. The effect of age, sex and night of sleep study on total sleep time (TST), sleep efficiency (SE), and wake after sleep onset (WASO) based on mixed effects models.

		Mixed effect model		
		Estimate	**95% CI**	**p**
TST, minutes k = 128	Omnibus test			**<·0001**
R^2 = 70·67	(Intercept)	414·06	339·1 – 429·0	**<·0001**
	Mean age, years	-1·01	-1·28 – -0·75	**<·0001**
	Sex, % male	0·03	-0·10 – 0·16	·66
	Night of sleep study (second night or later)	38·30	29·44 – 47·16	**<·0001**
SE, % k = 122	Omnibus test			**<·0001**
R^2 = 29·48	(Intercept)	93·92	90·97 – 96·87	**<·0001**
	Mean age, years	-0·21	-0·26 – -0·15	**<·0001**
	Sex, % male	-0·01	-0·04 – 0·01	·30
	Night of sleep study (second night or later)	2·65	0·86 – 4·44	**0·0037**
WASO, minutes k = 82	Omnibus test			**<·0001**
R^2 = 24·07	(Intercept)	11·44	-3·33 – 26·21	·13
	Mean age, years	0·97	0·69 – 1·24	**<·0001**
	Sex, % male	0·00	-0·12 – 0·12	·94
	Night of sleep study (second night or later)	-5·59	-14·92 – 3·75	·24

Bold values indicate $p < 0·05$.

Table S4B. The effect of age, sex and night of sleep study on sleep onset latency (SOL), REM latency (REML), and arousal index (AI) based on mixed effects models.

		Mixed effect model		
		Estimate	**95% CI**	**p**
SOL, min k = 107 $R^2 = 30·98$	Omnibus test			**·026**
	(Intercept)	9·87	5·62 –14·12	**<·0001**
	Mean age, years	0·11	0·03 – 0·19	**·0051**
	Sex, % male	0·02	-0·02 – 0·05	·34
	Night of sleep study (second night or later)	-0·15	-2·70 – 2·41	·91
REML, min k = 75 $R^2 = 39·52$	Omnibus test			**·00031**
	(Intercept)	104·55	92·96 – 116·15	**<·0001**
	Mean age, years	0·01	-0·22 – 0·25	·90
	Sex, % male	-0·09	-0·16 – -0·01	**·027**
	Night of sleep study (second night or later)	-11·14	-17·87 – -4·42	**·0012**
AI, events/h k = 73 $R^2 = 0·00$	Omnibus test			**<·0001**
	(Intercept)	3·58	-0·66 – 6·50	**·016**
	Mean age, years	0·21	0·15 – 0·26	**<·0001**
	Sex, % male	0·03	0·00 – 0·05	**·029**
	Night of sleep study (second night or later)	-1·60	-3·87 – 0·68	·17

Bold values indicate $p < 0·05$.

Table S4C. The effect age, sex and night of sleep study on duration of N1 and N2 sleep, as a percentage of total sleep time (%TST), based on mixed effects models.

		Mixed effects model 1 Multivariate (age, sex, night of study)			**Mixed effects model 2 Univariate* (only age or night of study)**		
		Estimate	**CI**	**p**	**Estimate**	**CI**	**p**
N1, %TST	Omnibus test			·05			**·0018**
Model 1 k = 82 $R^2 = 4·30$	(Intercept)	4·95	3·04 – 6·86	**<·0001**	5·05	3·51 – 6·58	**<·0001**
Model 2 k = 84 $R^2 = 10·83$	Mean age, years	0·05	0·01 – 0·08	**·0069**	0·05	0·02 – 0·09	**·0018**
	Sex, % male	0·00	-0·01 – 0·02	0·57			
	Night of sleep study (second night or later)	0·68	-0·70 – 2·05	0·34			
N2, %TST	Omnibus test			·07			**·0051**
Model 1 k = 84 $R^2 = 2·79$	(Intercept)	52·6	48·86 – 56·32	**<·0001**	52·08	50·82 – 53·34	**<·0001**
Model 2 k = 91 $R^2 = 7·59$	Mean age, years	0·00	-0·06 – 0·07	·90			
	Sex, % male	-0·01	-0·04 – 0·03	·71			
	Night of sleep study (second night or later)	-3·44	-6·18 – -0·70	**·014**	-3·66	-6·23 – -1·10	**·0051**

*Univariate models (incorporating only age or night of study) were created for percentage of N1 and N2 because of non-significant omnibus tests in the multivariate models for these parameters, which indicated statistically insignificant multivariate models.

Bold values indicate $p < 0·05$.

Table S4D. The effect of age, sex and night of sleep study on duration of N3 and REM sleep, as a percentage of total sleep time (%TST) based on mixed effects models.

		Mixed effect model		
		Estimate	**95% Cl**	**p**
N3, %TST	Omnibus test			·15
k = 85 R^2 = 6·09	(Intercept)	23·75	20·40 –27·10	**<·0001**
	Mean age, years	-0·06	-0·12 – 0·01	·08
	Sex, % male	-0·02	-0·04 – 0·01	·30
	Night of sleep study (second night or later)	0·74	-1·74 – 3·22	·56
REM, %	Omnibus test			**<·0001**
k = 88 R^2 = 38·99	(Intercept)	18·68	17·02 – 20·34	**<·0001**
	Mean age, years	-0·03	-0·06 – 0·00	·08
	Sex, % male	0·01	0·00 – 0·03	·11
	Night of sleep study (second night or later)	3·52	2·32 – 4·72	**<·0001**

Bold values indicate p < 0·05.

Table S4E. The effect of age and sex on apnea-hypopnea index (AHI) and mean arterial oxygen saturation (SaO_2) based on mixed effects models.

		Mixed effect model *All ages*			**Mixed effect model 2** *Mean age < 50 years**		
		Estimate	**95% CI**	**p**	**Estimate**	**95% CI**	**p**
AHI, events/h	Omnibus test			**<·0001**			**<·0001**
Model 1 k = 93 $R^2 = 0·00$	(Intercept)	-2·61	3·68 –1·53	**<·0001**	-1·74	-3·11 – -0·37	**·013**
Model 2 k = 52 $R^2 = 0·00$	Mean age, years	0·12	0·09 –0·14	**<·0001**	0·09	0·05 – 0·13	**<·0001**
	Sex, % male	0·02	0·01 – 0·03	**·00043**	0·02	0.01 – 0·03	**·00030**
Mean SaO_2, %	Omnibus test			**<·0001**			
k = 46 $R^2 = 83·17$	(Intercept)	98·16	97·69 – 98·64	**<·0001**			
	Mean age, years	-0·06	-0·07 – -0·05	**<·0001**			
	Sex, % male	-0·01	-0·01 – 0·00	**·0017**			

*As the mean AHI varied substantially above a mean age of 50 years and the mixed effect model was not robust, an alternative model was created exclusively for control groups with a mean age of less than 50 years.

Bold values indicate $p < 0·05$.

Table S4F. The effect of age and sex on minimum arterial oxygen saturation (SaO_2) and periodic limb movement index (PLMI) based on mixed effects models.

		Mixed effect model		
		Estimate	**95% Cl**	**p**
Minimum SaO_2, %	Omnibus test			**<·0001**
k = 53	(Intercept)	97·60	94·92 – 100·27	**<·0001**
R^2 = 0·00				
	Mean age, years	-0·18	-0·23 – -0·13	**<·0001**
	Sex, % male	-0·01	-0·03 – 0·01	·54
PLMI, events/h	Omnibus test			**<·0001**
k = 50	(Intercept)	-1·88	-3·80 – 0·05	·06
R^2 = 13·21				
	Mean age, years	0·12	0·08 – 0·16	**<·0001**
	Sex, % male	0·00	-0·01 – 0·01	·96

Bold values indicate p < 0·05.

Table S5A. Mean and 95% confidence interval for total sleep time (TST), sleep efficiency (SE), and duration of REM sleep as a percentage of total sleep time (%TST) stratified by night of sleep study and mean age based on random effects models.

Night of sleep study and mean age, years	TST, minutes	SE, %
First night		
18–34	393·4 (380·0–406·9) k = 33 n = 878	87·4 (86·4–88·3) k = 31 n = 843
35–49	369·8 (351·5–388·2) k = 21 n = 685	84·6 (82·3–86·9) k = 25 n = 780
50–64	366·6 (348·0–385·3) k = 19 n = 544	83·1 (80·2–86·1) k = 18 n = 551
65-79	331·9 (311·6–352·2) k = 13 n = 303	75·3 (72·0–78·7) k = 12 n = 290
80+	198·6 (142·5-254·7) k = 1 n = 10	45·7 (33·7-57·7) k = 1 n =10
Second night or later		
18–34	429·6 (423·5–435·7) k = 31 n = 681	90·5 (89·1–91·9) k = 27 n = 625
35–49	419·6 (399·6–439·6) k = 7 n = 197	88·3 (86·1–90·5) k = 6 n = 187
50–64	398·2 (392·5–403·9) k = 4 n = 88	84·1 (81·9–86·3) k = 3 n = 63
65-79	380·5 (364·9–396·0) k = 3 n = 66	81·2 (76·2–86·3) k = 3 n = 66
80+	-	-

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

Table S5B. Mean and 95% confidence interval for REM latency (REML) stratified by night of sleep study and sex based on random effects models.

Night of sleep study and sex	REML, minutes
First night	
Females only	102·7 (98·0–107·5) k = 15 n = 642
Males only	96·0 (91·4–100·6) k = 17 n = 542
Second night or later	
Females only	89·8 (83·6–96·0) k = 5 n = 126
Males only	78·3 (69·0–87·6) k = 6 n = 66

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

Table S6A. Mean and 95% prediction interval for total sleep time (TST), sleep efficiency (SE), and duration of REM sleep as a percentage of total sleep time (%TST) stratified by night of sleep study and mean age based on random effects models.

Night of sleep study and mean age, years	TST, minutes	SE, %
First night		
18–34	393·4 (316·3-470·6) k = 33 n = 878	87·4 (83·3-91·5) k = 31 n = 843
35–49	369·8 (281·4-458·2) k = 21 n = 685	84·6 (72·8-96·3) k = 25 n = 780
50–64	366·6 (281·1-452·1) k = 19 n = 544	83·1 (70·0-96·3) k = 18 n = 551
65-79	331·9 (254·7-409·0) k = 13 n = 303	75·3 (63·5-87·2) k = 12 n = 290
80+	-	-
Second night or later		
18–34	429·6 (398·8-460·4) k = 31 n = 681	90·5 (83·5-97·5) k = 27 n = 625
35–49	-	-
50–64	-	-
65-79	-	-
80+	-	-

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

*Higgins 95% prediction intervals were calculated based on a t-distribution with k-2 degrees of freedom.[1] The validity of this metric strongly depends upon approximation using a large sample size and needs to be interpreted with caution when k<20. We do not report data where k<10.

Table S6B. Mean and 95% prediction interval* for REM latency (REML) stratified by night of sleep study and sex based on random effects models.

Night of sleep study and sex	REML, minutes
First night	
Females only	102·7 (91·3-114·1) k = 15 n = 642
Males only	96·0 (86·0-106·0) k = 17 n = 542
Second night or later	
Females only	-
Males only	-

Note: "k" represents number of control groups combined to reach the pooled estimate. Some studies included more than one control group. "n" represents the total number of individuals included.

*Higgins 95% prediction intervals were calculated based on a t-distribution with k-2 degrees of freedom.[1] The validity of this metric strongly depends upon approximation using a large sample size and needs to be interpreted with caution when k<20. We do not report data where k<10.

Table S7A. Change in sleep parameters (TST, SE, WASO) with older age stratified by sex. All differences are relative to the 18-34 year-old cohorts. Estimates and 95% CI reported are based on mixed-effects models.

		TST, minutes	SE, %	WASO, minutes
35-49 vs 18-34	Total	-17·5 (-30·6 to -4·4) †	-3·5 (-5·6 to -1·5) *	17·2 (6·9 to 27·5) †
	Male	-61·1 (-95·3 to -26·9) *	-7·8 (-12·3 to -3·3) *	30·4 (12·8 to 48·0) *
	Female	-26·6 (-61·9 to 8·8)	-2·7 (-7·1 to 1·7)	20·2 (9·3 to 31·0) *
50-64-vs 18-34	Total	-35·2 (-49·5 to -20·9) *	-5·6 (-7·9 to -3·4) *	30·4 (18·9 to 41·8) *
	Male	-84·5 (-122·8 to -46·3) *	-10·6 (-15·7 to -5·5) *	40·8 (21·3 to 60·4) *
	Female	-62·4 (-100·7 to -24·0) †	-8·5 (-13·3 to -3·7) *	30·4 (19·6 to 41·2) *
65-79- vs 18-34	Total	-64·5 (-82·0 to -47·0) *	-10·7 (-13·7 to -7·8) *	41·1 (27·8 to 54·4) *
	Male	-86·1 (-124·9 to -47·2) *	-16·5 (-22·2 to -10·7) *	64·2 (42·5 to 85·9) *
	Female	-98·1 (-142·4 to -53·8) *	-17·0 (-23·2 to -10·7) *	52·3 (37·0 to 67·6) *
80+ vs 18-34 §	Male	-208·9 (-290·8 to -127·1) *	-43·0 (-57·0 to -28·9) *	-
	Female	-	-	-

*indicates p < 0·0001

† indicates p < 0·001

‡ indicates p <0·01

§ Only one study (n = 10 males) examined participants with a mean age greater than 80 years.

TST, total sleep time; SE, sleep efficiency; WASO, wake after sleep onset

Table S7B. Change in sleep parameters (SOL, REML, AI) with older age stratified by sex. All differences are relative to the 18-34 year-old cohorts. Estimates and 95% CI reported are based on mixed-effects models.

		SOL, minutes	REML, minutes	AI, events/h
35-49 vs 18-34	Total	1·1 (-2·0 to 4·7)	-1·1 (-9·8 to 7·6)	2·4 (0·7 to 4·1) †
	Male	-0·1 (-6·6 to 6·4)	3·6 (-13·6 to 20·9)	5·0 (1·7 to 8·3) †
	Female	-0·5 (-3·3 to 4·2)	-5·1 (-15·7 to 5·5)	3·6 (1·3 to 6·0) †
50-64 vs 18-34	Total	2·3 (-0·9 to 5·6)	5·2 (-5·1 to 15·5)	6·6 (4·6 to 8·5) *
	Male	-0·4 (-7·0 to 6·2)	12·8 (-7·6 to 33·2)	12·2 (7·8 to 16·7) *
	Female	4·9 (0·5 to 9·3) ‡	5·1 (-8·0 to 18·1)	9·5 (6·4 to 12·6) *
65-79 vs 18-34	Total	5.0 (1.0 to 9·0) ‡	8·3 (-3·9 to 20·4)	8·3 (5·5 to 11·1) *
	Male	2·7 (-5·7 to 11·0)	12·5 (-11·3 to 36·4)	12·8 (8·2 to 17·4) *
	Female	12·1 (3·6 to 20·7) †	8·0 (-10·5 to 26·5)	9·2 (5·5 to 12·9) *
80+ vs 18-34 §	Male	25·5 (-3·2 to 54·3)	93·6 (25·5 to 161·7) †	20·9 (4·0 to 37·8) ‡
	Female	-	-	-

*indicates p < 0·0001

† indicates p < 0·001

‡ indicates p <0·01

§ Only one study (n = 10 males) examined participants with a mean age greater than 80 years.

SOL, sleep onset latency; REML, rapid eye movement sleep latency; AI, arousal index

Table S7C. Change in sleep parameters (N1, N2, N3, REM) with older age stratified by sex. All differences are relative to the 18-34 year-old cohorts. Estimates and 95% CI reported are based on mixed-effects models.

		N1, %TST	N2, %TST	N3, %TST	REM, %TST
35-49 vs 18-34	Total	2·2 (0·8 to 3·7) †	0·9 (-2·0 to 3·8)	-2·2 (-5·5 to 1·1)	-0·9 (-2·3 to 0·5)
	Male	-0·6 (-3·2 to 2·0)	4·2 (-2·4 to 10·8)	-2·1 (-8·4 to 4·1)	-0·9 (-5·0 to 3·2)
	Female	1·4 (-0·01 to 2·8).	-1·9 (-4·7 to 0·9)	-0·3 (-3·4 to 2·9)	0·6 (-0·7 to 2·0)
50-64-vs 18-34	Total	2·0 (0·5 to 3·6) †	2·1 (-0·9 to 5·1)	-3·9 (-7·2 to -0·6) *	-1·2 (-2·7 to 0·3)
	Male	-0·01 (-2·7 to 2·7)	6·6 (-0·2 to 13·3)	-3·4 (-9·7 to 3·0)	-2·7 (-7·0 to 1·5)
	Female	0·9 (-0·6 to 2·3)	1·1 (-2·0 to 4·2)	-1·0 (-4·4 to 2·3)	-1·1 (-2·6 to 0·5)
65-79 vs 18-34	Total	2·5 (0·6 to 4·5) ‡	2·6 (-1·4 to 6·6)	-2·1 (-6·5 to 2·4)	-2·7 (-4·8 to -0·7) †
	Male	3·0 (-0·6 to 4·6)	2·7 (-4·1 to 9·5)	-4.0 (-10·2 to 2·2)	-2·3 (-6·3 to 1·7)
	Female	1·3 (-0·3 to 3·0)	0·9 (-3·1 to 4·9)	0·4 (-3·8 to 4·6)	-2·8 (-4·8 to -0·8) †
80+ vs 18-34 §	Male	22·0 (8·8 to 35·1) †	-6·5 (-18·4 to 5·3)	-3·8 (-18·5 to 10·8)	-11·1 (-19·5 to -2·7) †
	Female	-	-	-	-

*indicates p < 0·0001

† indicates p < 0·001

‡ indicates p <0·01

§ Only one study (n = 10 males) examined participants with a mean age greater than 80 years.

N1, stage N1 sleep; N2, stage N2 sleep; N3, stage N3 sleep; REM, rapid eye movement sleep

Table S7D. Change in sleep parameters (AHI, mean SaO2, minimum SaO2, PLMI) with older age stratified by sex. All differences are relative to the 18-34 year-old cohorts. Estimates and 95% CI reported are based on mixed-effects models.

		AHI, events/h	Mean SaO_2, %	Minimum SaO_2, %	PLMI, events/h
35-49 vs 18-34	Total	1·3 (0·6 to 2·0) *	-0·9 (-1·4 to -0·4) †	-1·1 (-2·7 to 0·5)	1·9 (0·7 to 3·0) †
	Male	1·7 (-0·3 to 3·6)	-1·3 (-1·9 to -0·7) *	-4·4 (-6·1 to -2·8) *	1·2 (-0·2 to 2·6)
	Female	2·4 (0·8 to 4·0) †	-0·9 (-1·4 to -0·4) *	-2·6 (-4·0 to -1·2) *	3·4 (1·7 to 5·1) *
50-64-vs 18-34	Total	2·4 (1·6 to 3·1) *	-1·9 (-2·4 to -1·3) *	-4·4 (-6·2 to -2·5) *	4·0 (2·7 to 5·3) *
	Male	8·4 (5·5 to 11·4) *	-1·7 (-2·4 to -1·1) *	-5·9 (-8·1 to -3·8) *	7·1 (4·0 to 10·3) *
	Female	3·4 (1·6 to 5·2) *	-2·2 (-2·7 to -1·7) *	-6·8 (-8·2 to -5·4) *	2·7 (1·0 to 4·4) †
65-79 vs 18-34	Total	13·7 (11·4 to 16·1) *	-2·9 (-3·5 to -2·2) *	-8·4 (-10·6 to -6·1) *	6·4 (4·2 to 8·6) *
	Male	16·2 (10·7 to 21·8) *	-2·4 (-3·2 to -1·6) *	-6·6 (-8·7 to -4·5) *	15·4 (7·7 to 23·1) *
	Female	14·8 (10·8 to 18·8) *	-3·6 (-4·3 to -2·9) *	-9·3 (-11·4 to -7·3) *	3·9 (1·3 to 6·5) †
80+ vs 18-34 §	Male	27·6 (9·2 to 45·9) †	-1·7 (-3·6 to 0·2)	-3·3 (-7·7 to 1·2)	13·7 (4·8 to 22·6) †
	Female	-	-	-	-

*indicates p < 0·0001

† indicates p < 0·001

‡ indicates p <0·01

§ Only one study (n = 10 males) examined participants with a mean age greater than 80 years.

AHI, apnea-hypopnea index; mean SaO2, mean oxygen saturation; minimum SaO2, oxygen saturation; PLMI, periodic limb movement index

Table S8A. Mixed effects models examining effect of age, sex, and night of sleep study on total sleep time (TST), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	-1·01 (-1·28 to -0·75)	**<·0001**	0·03 (-·1·28 to -0·75)	·66	38·3 (29·4 to 47·2)	**<·0001**
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	-0·74 (-1·00 to -0·50)	**<·0001**	0·08 (-0·04 to 0·20)	·21	29·1 (20·7 to 37·6)	**<·0001**
Exclusion criteria stated for medical disorders	-0·79 (-1·09 to -0·48)	**<·0001**	0·05 (-0·09 to 0·19)	·46	36·4 (26·8 to 45·9)	**<·0001**
Exclusion criteria stated for psychiatric disorders	-0·94 (-1·19 to -0·70)	**<·0001**	0·09 (-0·03 to 0·21)	·15	32·0 (23·5 to 40·5)	**<·0001**
Recruited from population-based studies	-0·83 (-1·08 to -0·58)	**<·0001**	0·03 (-0·09 to 0·15)	·57	24·2 (15·4 to 32·9)	**<·0001**

Table S8B. Mixed effects models examining effect of age, sex, and night of sleep study on sleep efficiency (SE), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	-0·21 (-0·26 to -0·15)	**<·0001**	-0·01 (-0·04 to 0·01)	·30	2·65 (0·76 to 4·44)	**·0037**
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	-0·19 (-0·5 to -0·14)	**<·0001**	-0·01 (-0·04 to 0·01)	·38	2·15 (0·34 to 3·96)	**·020**
Exclusion criteria stated for medical disorders	-0·18 (-0·23 to -0·13)	**<·0001**	-0·01 (-0·04 to 0·01)	·32	2·60 (0·92 to 4·28)	**·0024**
Exclusion criteria stated for psychiatric disorders	-0·20 (-0·25 to -0·15)	**<·0001**	-0·01 (-0·03 to 0·02)	·46	2·23 (0·47 to 3·98)	**0·013**
Recruited from population-based studies	-0·19 (-0·24 to -0·14)	**<·0001**	-0·01 (-0·04 to 0·01)	·21	1·28 (-0·45 to 3·00)	·15

Table S8C. Mixed effects models examining effect of age, sex, and night of sleep study on wake after sleep onset (WASO), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	0·97 (0·69 to 1·24)	**<·0001**	0·00 (-0·11 to 0·12)	·94	-5·58 (-14·92 to 3·75)	·24
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	0·88 (0·62 to 1·14)	**<·0001**	0·00 (-0·11 to 0·10)	·97	-2·22 (-10·93 to 6·48)	·62
Exclusion criteria stated for medical disorders	0·90 (0·63 to 1·17)	**<·0001**	0·00 (-0·11 to 0·11)	1·00	-4·54 (-13·4 to 4·33)	·32
Exclusion criteria stated for psychiatric disorders	0·94 (0·65 to 1·23)	**<·0001**	0·00 (-0·12 to 0·12)	·98	-5·00 (-14·6 to 4·60)	·31
Recruited from population-based studies	0·87 (0·63 to 1·11)	**<·0001**	0·00 (-0·10 to 0·10)	·96	0·07 (-8·44 to 8·59)	·99

Table S8D. Mixed effects models examining effect of age, sex, and night of sleep study on sleep onset latency (SOL), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	0·11 (0·03 to 0·19)	**0·0051**	0·02 (-0·02 to 0·05)	0·34	-0·15 (-2·70 to 2·41)	0·91
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	0·11 (0·03 to 0·19)	**0·0064**	0·02 (-0·02 to 0·05)	0·34	-0·17 (-2·82 to 2·49)	0·90
Exclusion criteria stated for medical disorders	0·11 (0·02 to 0·19)	**0·011**	0·02 (-0·02 to 0·05)	0·36	-0·09 (-2·69 to 2·51)	0·95
Exclusion criteria stated for psychiatric disorders	0·10 (0·03 to 0·18)	**0·0093**	0·01 (-0·02 to 0·05)	0·44	0·07 (-2·54 to 2·69)	0·96
Recruited from population-based studies	0·10 (0·03 to 0·18)	**0·0081**	0·02 (-0·02 to 0·05)	0·33	0·78 (-1·95 to 3·51)	0·58

Table S8E. Mixed effects models examining effect of age, sex, and night of sleep study on REM latency (REML), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	0·02 (-0·22 to 0·25)	·90	-0·09 (-0·16 to -0·01)	**·027**	-11·14 (-17·87 to -4·42)	**·0012**
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	0·02 (-0·22 to 0·26)	·88	-0·09 (-0·16 to -0·01)	**·030**	-11·33 (-18·72 to -3·94)	**·0026**
Exclusion criteria stated for medical disorders	-0·02 (-0·24 to 0·22)	·91	-0·09 (-0·17 to -0·02)	**·016**	-9·96 (-16·7 to -3·24)	**·0037**
Exclusion criteria stated for psychiatric disorders	0·02 (-0·22 to 0·26)	·87	-0·08 (-0·16 to 0·00)	**·042**	-11·71 (-18·89 to -4·53)	**·0014**
Recruited from population-based studies	0·01 (-0·22 to 0·25)	·90	-0·09 (-0·16 to -0·01)	**·027**	-10·69 (-19·82 to -2·56)	**·010**

Table S8F. Mixed effects models examining effect of age, sex, and night of sleep study on arousal index (AI), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	-0·21 (0·15 to 0·26)	**<·0001**	0·03 (0·00 to 0·05)	**·029**	-1·60 (-3·87 to 0·68)	·17
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	0·20 (0·14 to 0·26)	**<·0001**	0·03 (0·00 to 0·05)	**·031**	-1·46 (-3·95 to 1·03)	·25
Exclusion criteria stated for medical disorders	0·19 (0·13 to 0·25)	**<·0001**	0·03 (0·00 to 0·05)	**·026**	-1·58 (-3·85 to 0·69)	·17
Exclusion criteria stated for psychiatric disorders	0·20 (0·14 to 0·26)	**<·0001**	0·02 (0·00 to 0·05)	**·042**	-1·29 (-3·64 to 1·06)	·28
Recruited from population-based studies	0·20 (0·14 to 0·25)	**<·0001**	0·03 (0·00 to 0·05)	**·022**	-0·74 (-3·15 to 1·68)	·55

Table S8G. Mixed effects models examining effect of age, sex, and night of sleep study on duration of N1 sleep, as a percentage of total sleep time (%TST), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	0·05 (0·01 to 0·08)	**·0069**	0·00 (-0·01 to 0·02)	·57	0·68 (-0·70 to 2·05)	·34
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	0·07 (0·03 to 0·11)	**·00015**	0·01 (-0·01 to 0·02)	·44	-0·27 (-1·71 to 1·16)	·71
Exclusion criteria stated for medical disorders	0·07 (0·03 to 0·10)	**·00051**	0·01 (-0·01 to 0·02)	·48	0·38 (-1·01 to 1·78)	·59
Exclusion criteria stated for psychiatric disorders	0·06 (0·03 to 010)	**·00023**	0·01 (-0·01 to 0·02)	·22	0·14 (-1·15 to 1·43)	·83
Recruited from population-based studies	0·07 (0·03 to 0·10)	**·00016**	0·01 (-0·01 to 0·02)	·37	-1·15 (-2·54 to 0·25)	·11

Table S8H. Mixed effects models examining effect of age, sex, and night of sleep study on duration of N2 sleep, as a percentage of total sleep time (%TST), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	0·00 (-0·06 to 0·07)	·90	-0·01 (-0·04 to 0·03)	·71	-3·44 (-6·18 to -0·70)	**·014**
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	-0·01 (-0·08 to 0·07)	·86	-0·01 (-0·04 to 0·02)	·67	-2·95 (-5·85 to -0·06)	**·046**
Exclusion criteria stated for medical disorders	0·00 (-0·08 to 0·07)	·94	-0·01 (-0·04 to 0·03)	·70	-3·38 (-6·15 to -0·60)	**·017**
Exclusion criteria stated for psychiatric disorders	0·01 (-0·07 to 0·08)	·87	-0·01 (-0·04 to 0·03)	·72	-3·47 (-6·26 to -0·68)	**·015**
Recruited from population-based studies	-0·01 (-0·07 to 0·06)	·88	-0·01 (-0·04 to 0·02)	·65	-2·37 (-5·29 to 0·56)	·11

Table S8I. Mixed effects models examining effect of age, sex, and night of sleep study on duration of N3 sleep, as a percentage of total sleep time (%TST), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	-0·06 (-0·12 to 0·01)	·08	-0·01 (-0·04 to 0·01)	·30	0·74 (-1·74 to 3·22)	·56
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	-0·08 (-0·14 to -0·01)	**·020**	-0·02 (-0·05 to 0·01)	·25	1·50 (-1·06 to 4·10)	·25
Exclusion criteria stated for medical disorders	-0·08 (-0·14 to -0·01)	**·016**	--0·02 (-0·04 to 0·01)	·27	0·96 (-1·44 to 3·36)	·43
Exclusion criteria stated for psychiatric disorders	-0·07 (-0·13 to -0·01)	**·034**	-0·02 (-0·05 to 0·01)	·24	-0·91 (-·156 to 3·38)	·57
Recruited from population-based studies	-0·07 (-0·13 to -0·01)	**·029**	-0·02 (-0·04 to 0·01)	·25	1·70 (-0·83 to 4·23)	·19

Table S8J. Mixed effects models examining effect of age, sex, and night of sleep study on duration of REM sleep, as a percentage of total sleep time (%TST), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**		**Night of sleep study (second night or later)**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**	Estimate (95% CI)	**p**
Tri-variate mixed effects model with mean age, sex, and night of sleep study	-0·03 (-0·06 to 0·00)	·08	-0·01 (0·00 to 0·03)	·11	3·52 (2·32 to 4·72)	**<·0001**
Quality-related variable added to model						
Exclusion criteria stated for sleep complaints and/or disorders	-0·03 (-0·06 to 0·00)	·10	0·01 (0·00 to 0·03)	·12	3·53 (2·23 to 4·81)	**<·0001**
Exclusion criteria stated for medical disorders	-0·02 (-0·05 to 0·01)	·20	0·01 (0·00 to 0·03)	·12	3·43 (2·21 to 4·65)	**<·0001**
Exclusion criteria stated for psychiatric disorders	-0·03 (-0·06 to 0·00)	·07	0·01 (0·00 to 0·03)	·12	3·55 (2·34 to 4·76)	**<·0001**
Recruited from population-based studies	-0·03 (-0·06 to 0·00)	**·046**	0·01 (0·00 to 0·02)	·12	3·92 (2·66 to 5·19)	**<·0001**

Table S8K. Mixed effects models examining effect of age and sex on apnea-hypopnea index (AHI), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**
Bivariate mixed effects model with mean age and sex	0·12 (0·09 to 0·14)	**<·0001**	0·02 (0·01 to 0·03)	**·00043**
Quality-related variable added to model				
Exclusion criteria stated for sleep complaints and/or disorders	0·11 (0·09 to 0·14)	**<·0001**	0·02 (0·01 to 0·03)	**<·0001**
Exclusion criteria stated for medical disorders	0·12 (0·09 to 0·14)	**<·0001**	0·02 (0·01 to 0·03)	**<·0001**
Exclusion criteria stated for psychiatric disorders	0·12 (0·09 to 0·14)	**<·0001**	0·02 (0·01 to 0·03)	**·00022**
Recruited from population-based studies	0·13 (0·11 to 0·15)	**<·0001**	0·02 (0·02 to 0·03)	**<·0001**

Table S8L. Mixed effects models examining effect of age and sex on mean arterial oxygen saturation (SaO2), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**
Bivariate mixed effects model with mean age and sex	-0·06 (-0·07 to -0·05)	**<·0001**	-0·01 (-0·01 to 0·00)	**·0017**
Quality-related variable added to model				
Exclusion criteria stated for sleep complaints and/or disorders	-0·06 (-0·07 to -0·05)	**<·0001**	-0·01 (-0·01 to 0·00)	**·0017**
Exclusion criteria stated for medical disorders	-0·06 (-0·07 to -0·05)	**<·0001**	-0·01 (-0·01 to 0·00)	**·0011**
Exclusion criteria stated for psychiatric disorders	-0·06 (-0·07 to -0·05)	**<·0001**	-0·01 (-0·01 to 0·00)	**·00071**
Recruited from population-based studies	-0·06 (-0·07 to -0·05)	**<·0001**	-0·01 (-0·01 to 0·00)	**·00080**

Table S8M. Mixed effects models examining effect of age and sex on minimum arterial oxygen saturation (SaO2), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**
Bivariate mixed effects model with mean age and sex	-0·18 (-0·23 to 0·13)	**<·0001**	-0·01 (-0·03 to 0·01)	·54
Quality-related variable added to model				
Exclusion criteria stated for sleep complaints and/or disorders	-0·17 (-0·23 to -0·12)	**<·0001**	-0·01 (-0·03 to 0·01)	·52
Exclusion criteria stated for medical disorders	-0·17 (-0·21 to -0·13)	**<·0001**	-0·01 (-0·02 to 0·01)	·32
Exclusion criteria stated for psychiatric disorders	-0·19 (-0·24 to -0·13)	**<·0001**	-0·01 (-0·03 to 0·02)	·55
Recruited from population-based studies	-0·17 (-0·21 to -0·13)	**<·0001**	-0·01 (-0·02 to 0·01)	·31

Table S8N. Mixed effects models examining effect of age and sex on periodic limb movements index (PLMI), after controlling for quality-related variables.

	Mean age, years		**Sex, % male**	
	Estimate (95% CI)	p	Estimate (95% CI)	**p**
Bivariate mixed effects model with mean age and sex	0·12 (0·08 to 0·16)	**<·0001**	0·00 (-0·01 to 0·01)	·96
Quality-related variable added to model				
Exclusion criteria stated for sleep complaints and/or disorders	0·12 (0·08 to 0·16)	**<·0001**	0·00 (-0·01 to 0·01)	·96
Exclusion criteria stated for medical disorders	0·12 (0·08 to 0·16)	**<·0001**	0·00 (-0·01 to 0·01)	·98
Exclusion criteria stated for psychiatric disorders	0·12 (0·08 to 0·16)	**<·0001**	0·00 (-0·01 to 0·01)	·97
Recruited from population-based studies	0·13 (0·09 to 0·17)	**<·0001**	0·00 (-0·01 to 0·02)	·88

Table S9. Summary of findings for sleep parameters by age, sex, and night of the sleep study

	Change per 10 years of ageing	Change for every 10% increase in percentage of male participants	Change when sleep study was done on second or later night compared with first night	Appendix table reporting normative data as prediction intervals
Total sleep time, min	**−10·1 (−12·8 to −7·5); p<0·0001**	0·3 (−1·0 to 1·6); p=0·66	**38·3 (29·4 to 47·2); p<0·0001**	Table 3A*, p 8
Sleep efficiency	**−2·1% (−2·6 to −1·5); p<0·0001**	−0·1% (−0·4 to 0·1); p=0·30	**2·7% (0·9 to 4·4); p=0·0037**	Table 3A*, p 8
Wake after sleep onset, min	**9·7 (6·9 to 12·4); p<0·0001**	0·0 (−1·2 to 1·2); p=0·94	−5·6 (−14·9 to 3·8); p=0·24	Table 3A, p 8
Sleep onset latency, min	**1·1 (0·3 to 1·9); p=0·0051**	0·2 (−0·2 to 0·5); p=0·34	−0·2 (−2·7 to 2·4); p=0·91	Table 3B, p 9
REM latency, min	0·1 (−2·2 to 2·5); p=0·90	**−0·9 (−1·6 to −0·1); p=0·027**	**−11·1 (−17·9 to −4·4); p=0·0012**	Table 3B†, p 9
Arousal index, events per h	**2·1 (1·5 to 2·6); p<0·0001**	**0·3 (0·0 to 0·5); p=0·029**	−1·6 (−3·9 to 0·7); p=0·17	Table 3B‡, p 9
Percentage of time total sleep time in sleep stages				
N1	**0·5% (0·1 to 0·8); p=0·0069**	0·0% (−0·1 to 0·2); p=0·57	0·7% (−0·7 to 2·1); p=0·34	Table 3C, p 10
N2	0·0 (−0·6 to 0·7); p=0·90	−0·1% (−0·4 to 0·3); p=0·71	**−3·7% (−6·2 to −1·1); p=0·0051**	Table 3C, p 10
N3	−0·6 (−1·2 to 0·1); p=0·08	−0·2% (−0·4 to 0·1); p=0·30	0·7% (−1·7 to 3·2); p=0·56	Table 3C, p 10
REM	−0·3 (−0·6 to 0·0); p=0·08	0·1% (0·0 to 0·3); p=0·11	**3·5% (2·3 to 4·7); p<0·0001**	Table 3C, p 10
AHI, events per h	**1·2 (0·9 to 1·4); p<0·0001**	**0·2 (0·1 to 0·3); p=0·00043**	··	Table 3D‡, p 11
Mean SaO_2	**−0·6% (−0·7 to −0·5); p<0·0001**	**−0·1% (−0·1 to 0·0); p=0·0017**	··	Table 3D‡, p 11
Minimum SaO_2	**−1·8% (−2·3 to −1·3); p<0·0001**	−0·1% (−0·3 to 0·1); p=0·54	··	Table 3D, p 11
PLMI, events per h	**1·2 (0·8 to 1·6); p<0·0001**	0·0 (−0·1 to 0·1); p=0·96	··	Table 3D, p 11

Note: Mixed effects coefficients are reported as estimate (95% CI); p value. Bold values are statistically significant. Because most studies reporting AHI, mean and minimum SaO2, and PLMI were first-night studies, only mean age and percentage of male participants were included in mixed-effects models. SaO2=arterial oxygen saturation. AHI=apnea-hypopnea index. PLMI=periodic limb movement index.

*See Table 6A (p 20) for data stratified by age and night of sleep study.

†See Table 6B (p 21) for data stratified by sex and night of sleep study.

‡Due to low number of studies reporting male and female parameters separately, normative data stratified by age and sex was not tabulated.

SUPPLEMENTARY FIGURES

Figure S1A. Forest plot showing the effect of sex on REM latency (REML) for control groups assessed on the first night in the sleep laboratory. Control groups are divided into three subgroups: female, mixed (sorted by % male), and male. The mean REML for each control group is represented by a square (size proportional to random effects weight), and the 95% confidence interval (CI) by the horizontal line passing through. Pooled REML estimates are represented by diamonds (width indicating associated 95% CI). A dashed vertical line is positioned at the total pooled REML estimate.

A

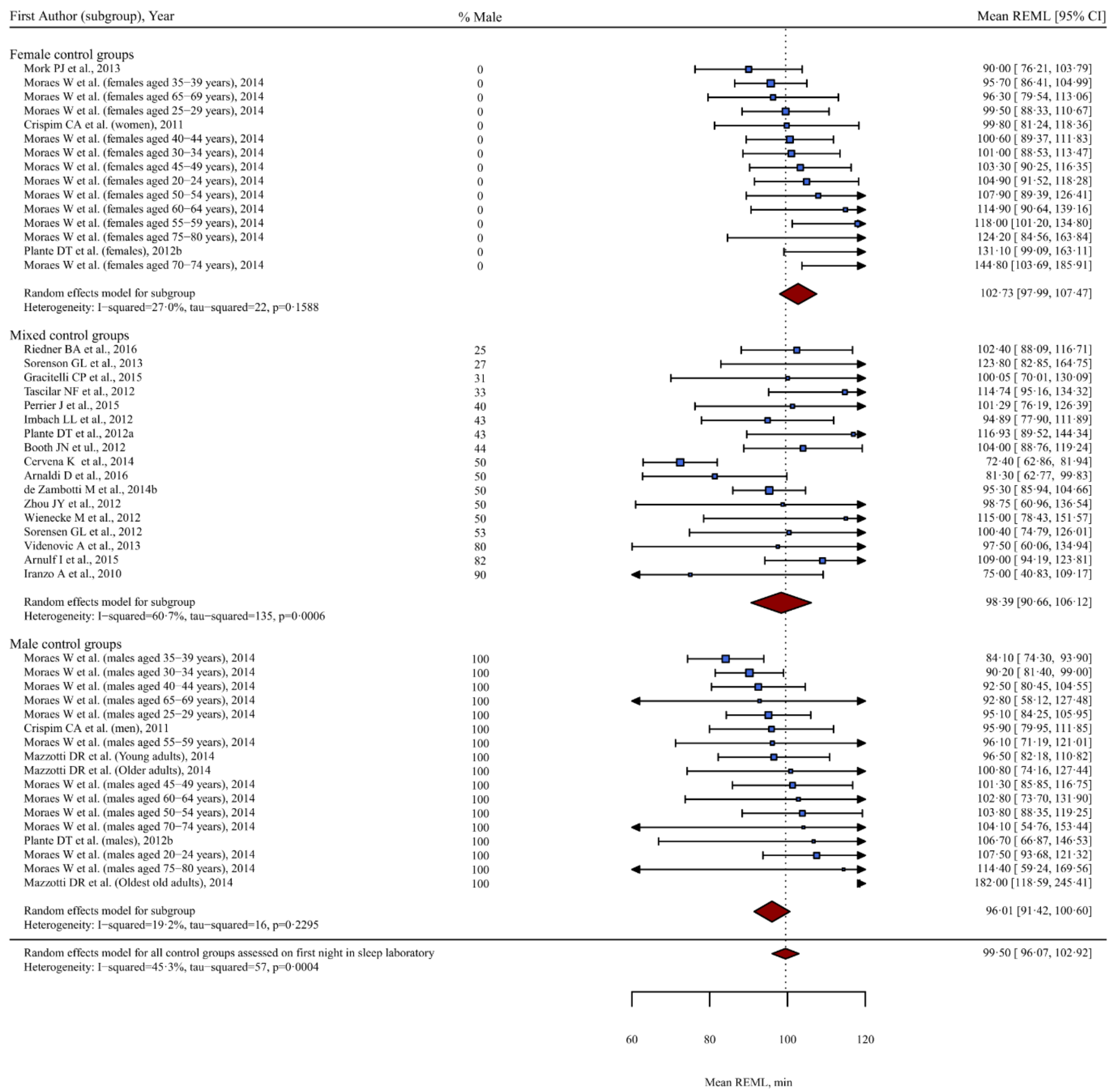

Figure S1B. Forest plot showing the effect of sex on REML for control groups assessed on the second night or later in the sleep laboratory. Legend is as for Fig S1A.

B

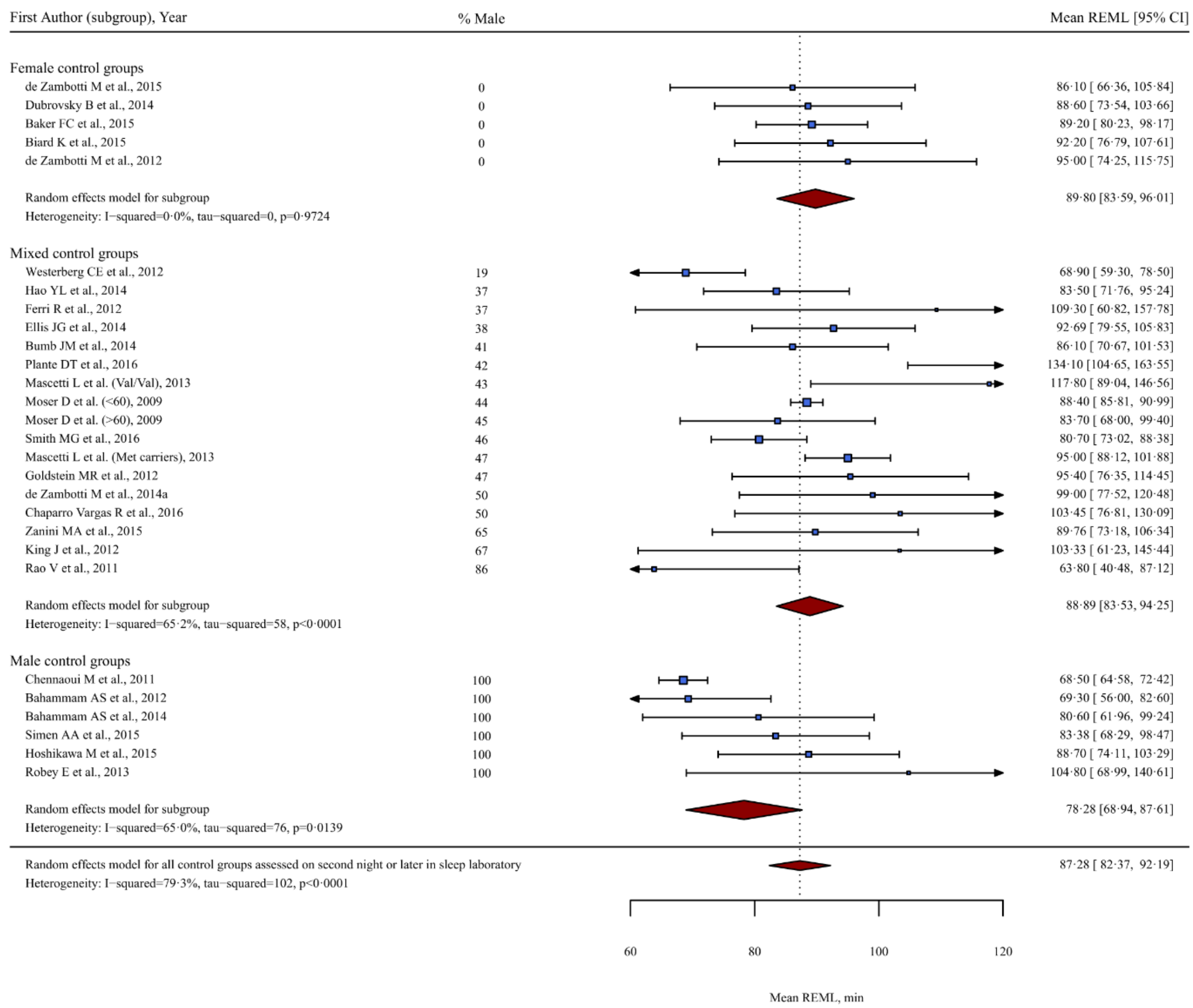

Figure S2A. Forest plot showing the effect of sex on mean arterial oxygen saturation (SaO2) for control groups with a mean age of 18–34 years. Control groups are divided into three subgroups: female, mixed (sorted by % male), and male. The mean SaO2 for each control group is represented by a square (size proportional to random effects weight), and the 95% confidence interval (CI) by the horizontal line passing through. Pooled mean SaO2 estimates are represented by diamonds (width indicating associated 95% CI). A dashed vertical line is positioned at the total pooled mean SaO2 estimate.

A

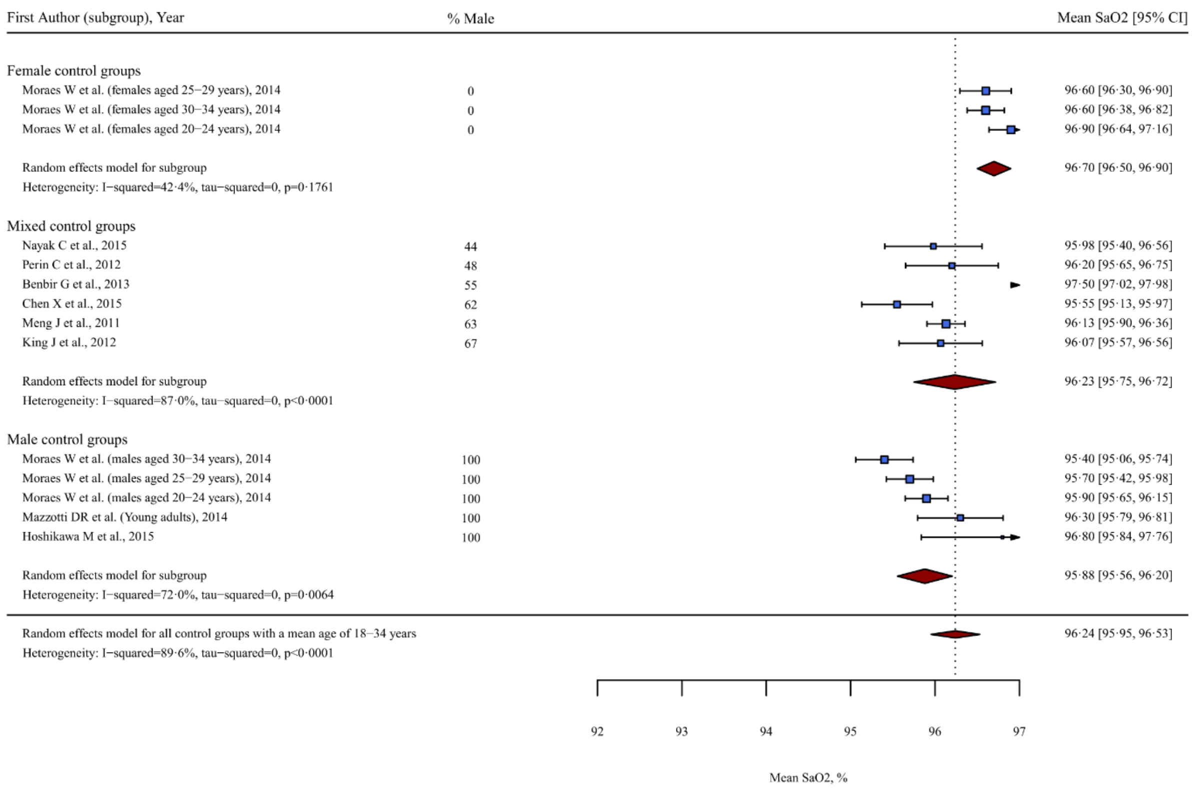

Figure S2B. Forest plot showing the effect of sex on mean SaO2 for control groups with a mean age of 35–49 years. Legend is as for Fig S2A.

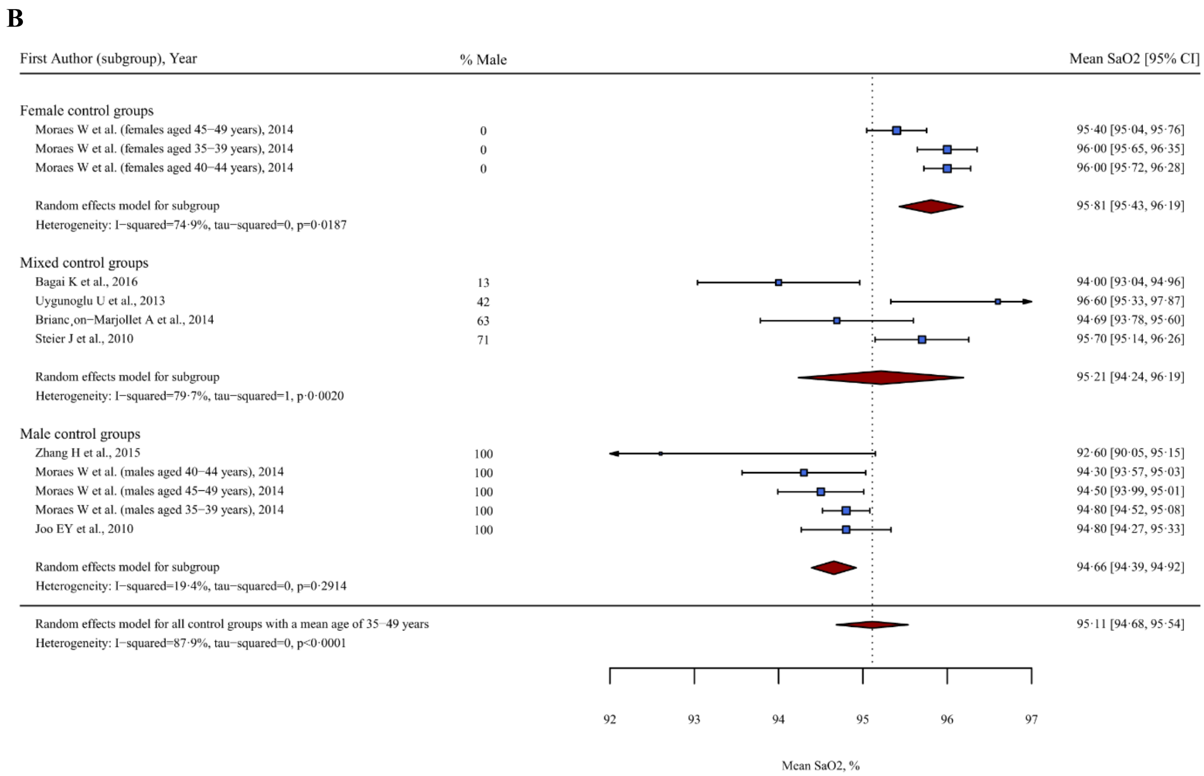

Figure S2C. Forest plot showing the effect of sex on mean SaO2 for control groups with a mean age of 50–64 years. Legend is as for Fig S2A.

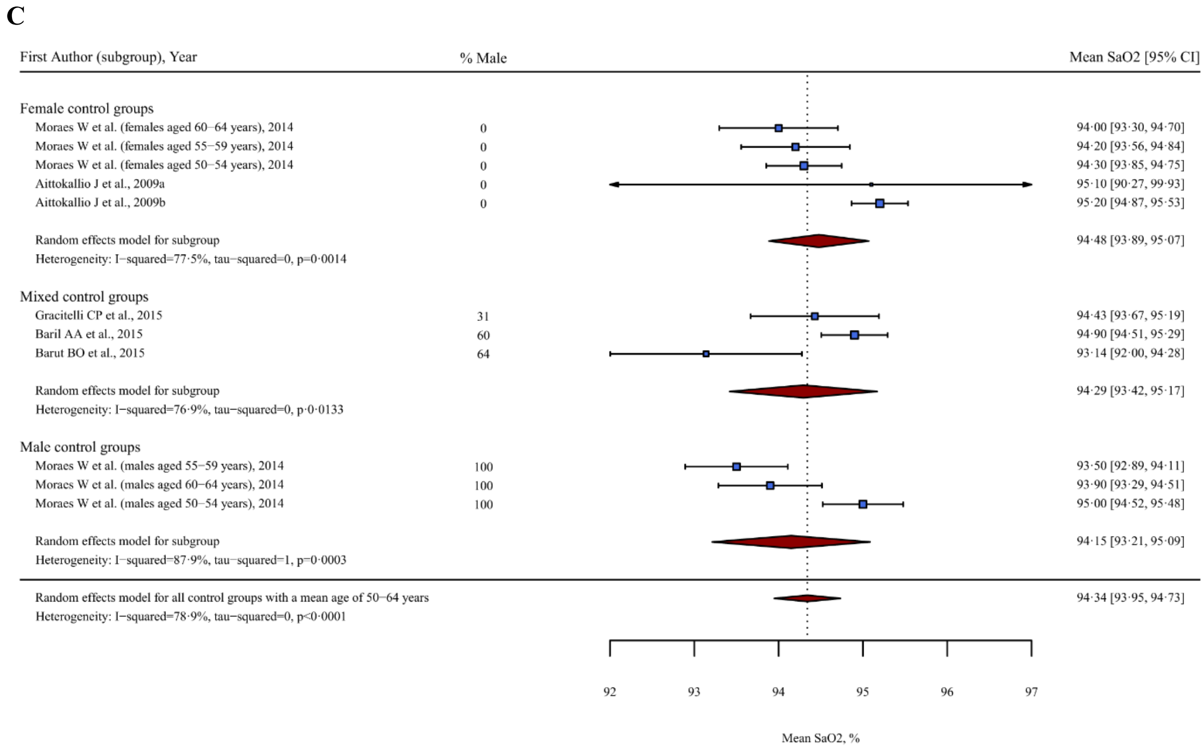

Figure S2D. Forest plot showing the effect of sex on mean SaO2 for control groups with a mean age of 65+ years. Legend is as for Fig S2A.

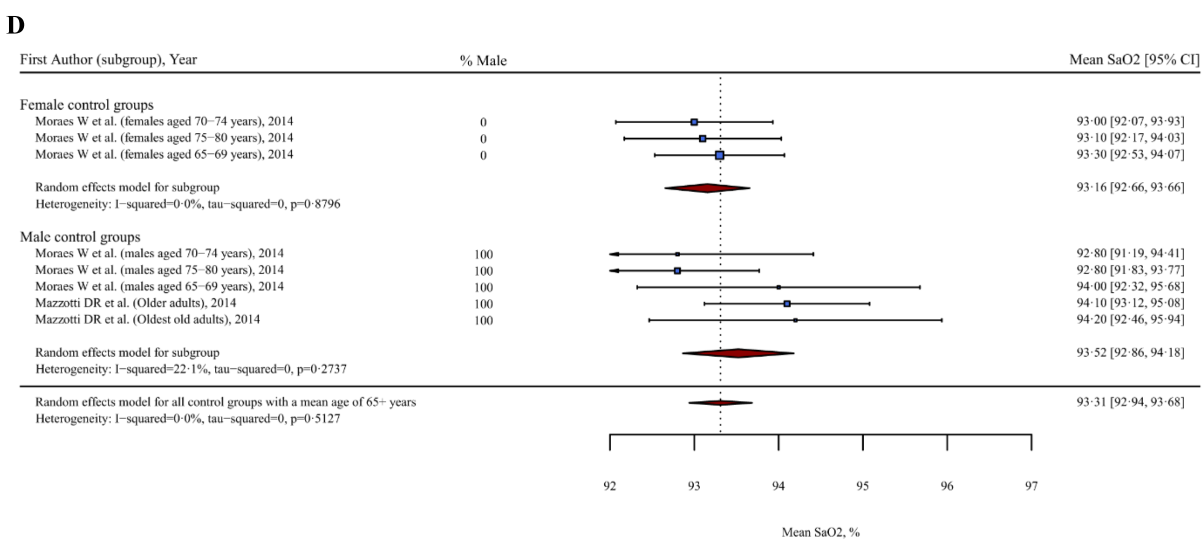

Figure S3A. Forest plot showing the effect of sex on arousal index (AI) for control groups with a mean age of 18–34 years. Control groups are divided into three subgroups: female, mixed (sorted by % male), and male. The mean AI for each control group is represented by a square (size proportional to random effects weight), and the 95% confidence interval (CI) by the horizontal line passing through. Pooled AI estimates are represented by diamonds (width indicating associated 95% CI). A dashed vertical line is positioned at the total pooled AI estimate.

A

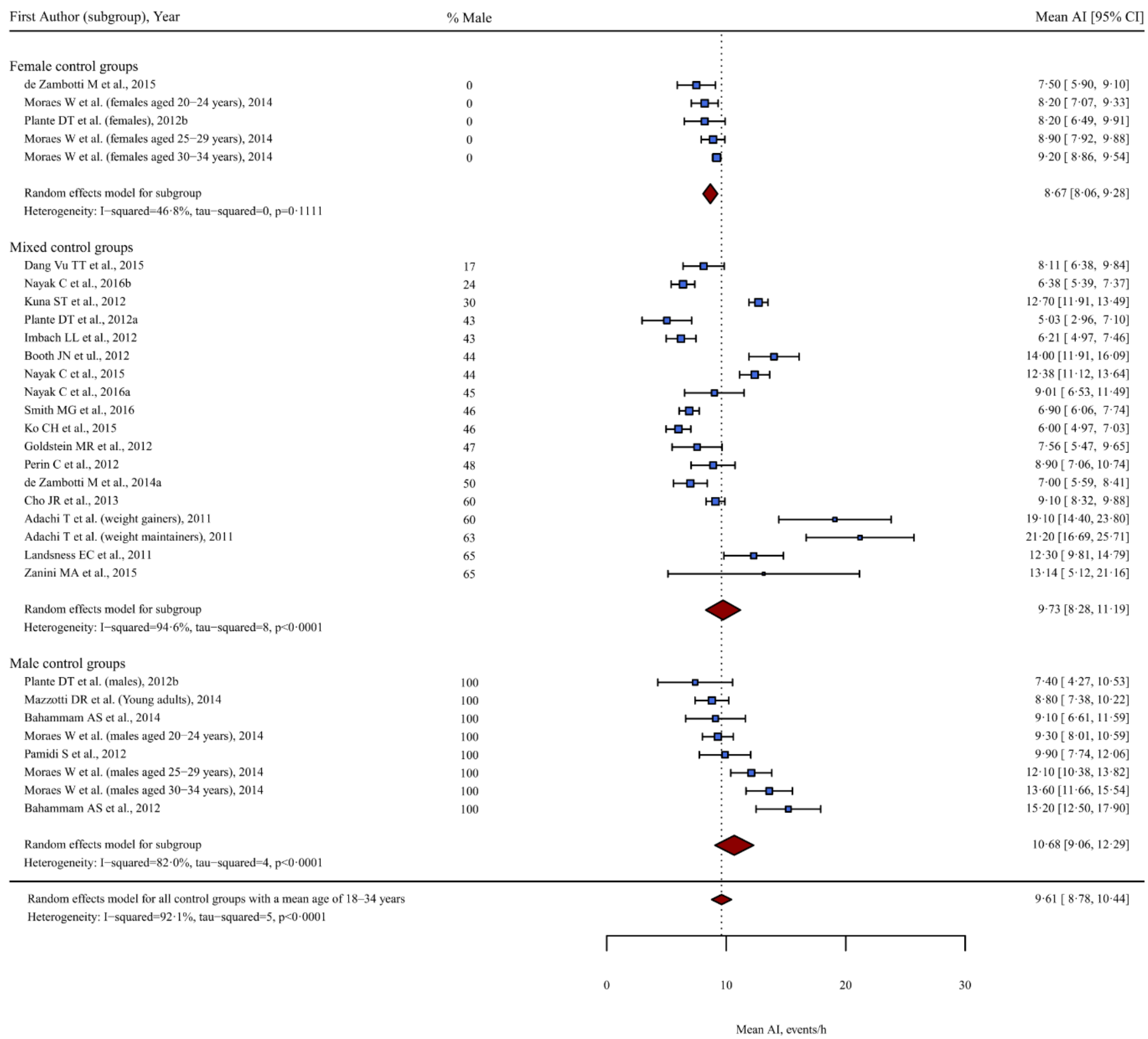

Figure S3B. Forest plot showing the effect of sex on AI for control groups with a mean age of 35–49 years. Legend is as for Fig S3A.

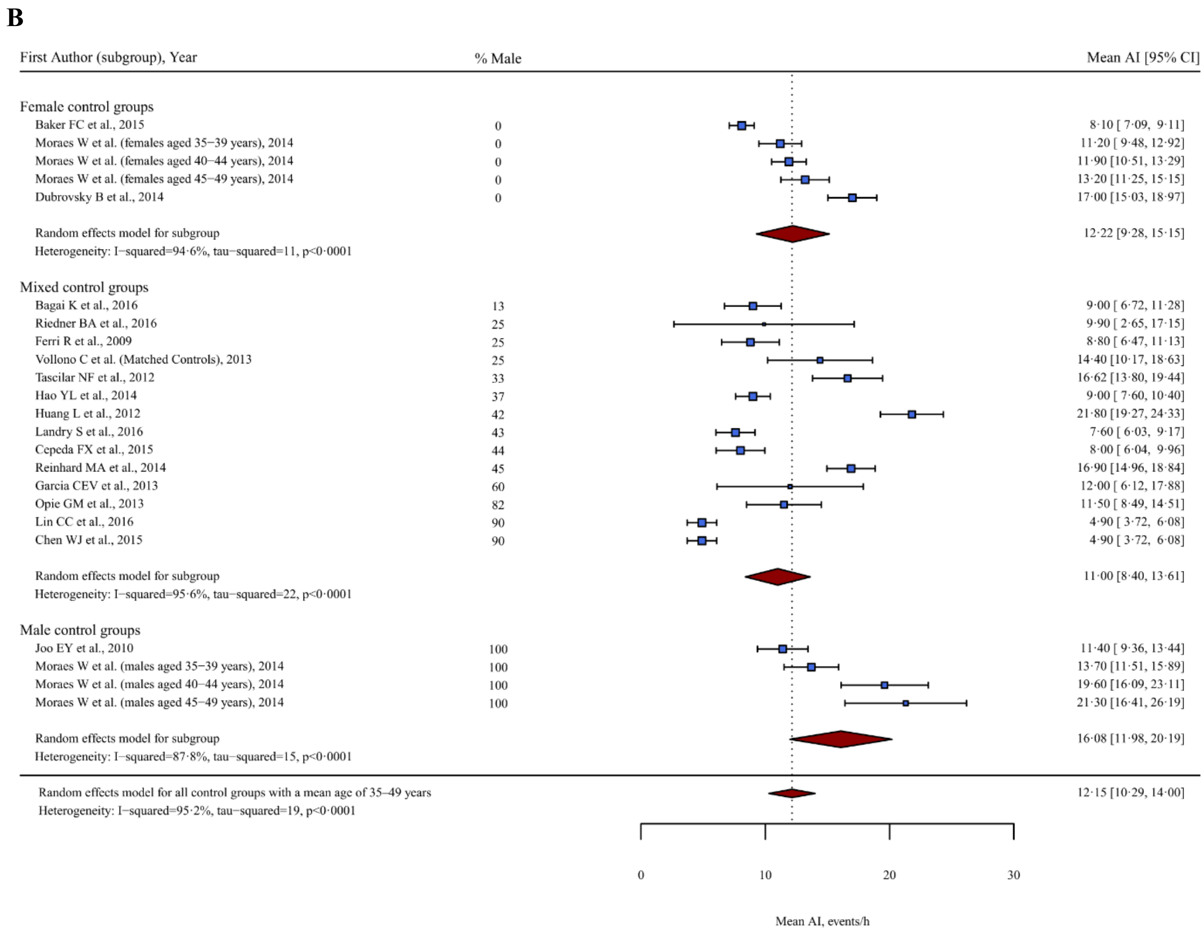

Figure S3C. Forest plot showing the effect of sex on AI for control groups with a mean age of 50–64 years. Legend is as for Fig S3A.

C

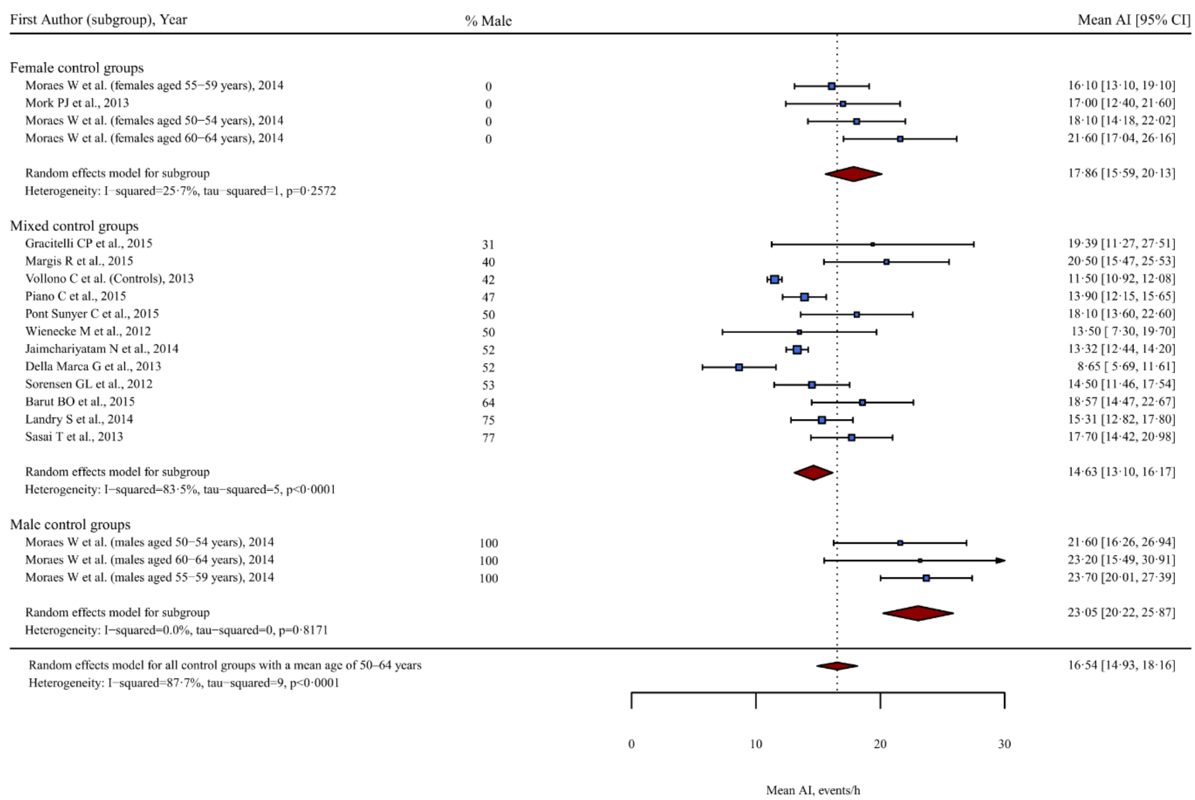

Figure S3D. Forest plot showing the effect of sex on AI for control groups with a mean age of 65+ years. Legend is as for Fig S3A.

D

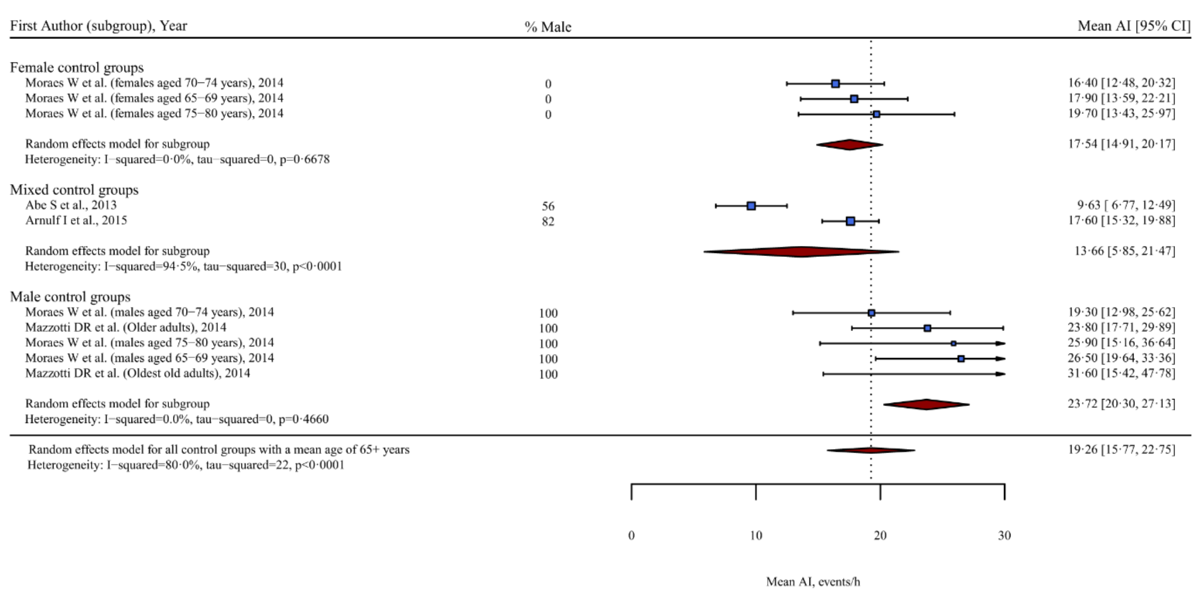

Figure S4A. Forest plot showing the effect of sex on apnea-hypopnea index (AHI) for control groups with a mean age of 18–34 years. Control groups are divided into three subgroups: female, mixed (sorted by % male), and male. The mean AHI for each control group is represented by a square (size proportional to random effects weight), and the 95% confidence interval (CI) by the horizontal line passing through. Pooled AHI estimates are represented by diamonds (width indicating associated 95% CI). A dashed vertical line is positioned at the total pooled AHI estimate.

A

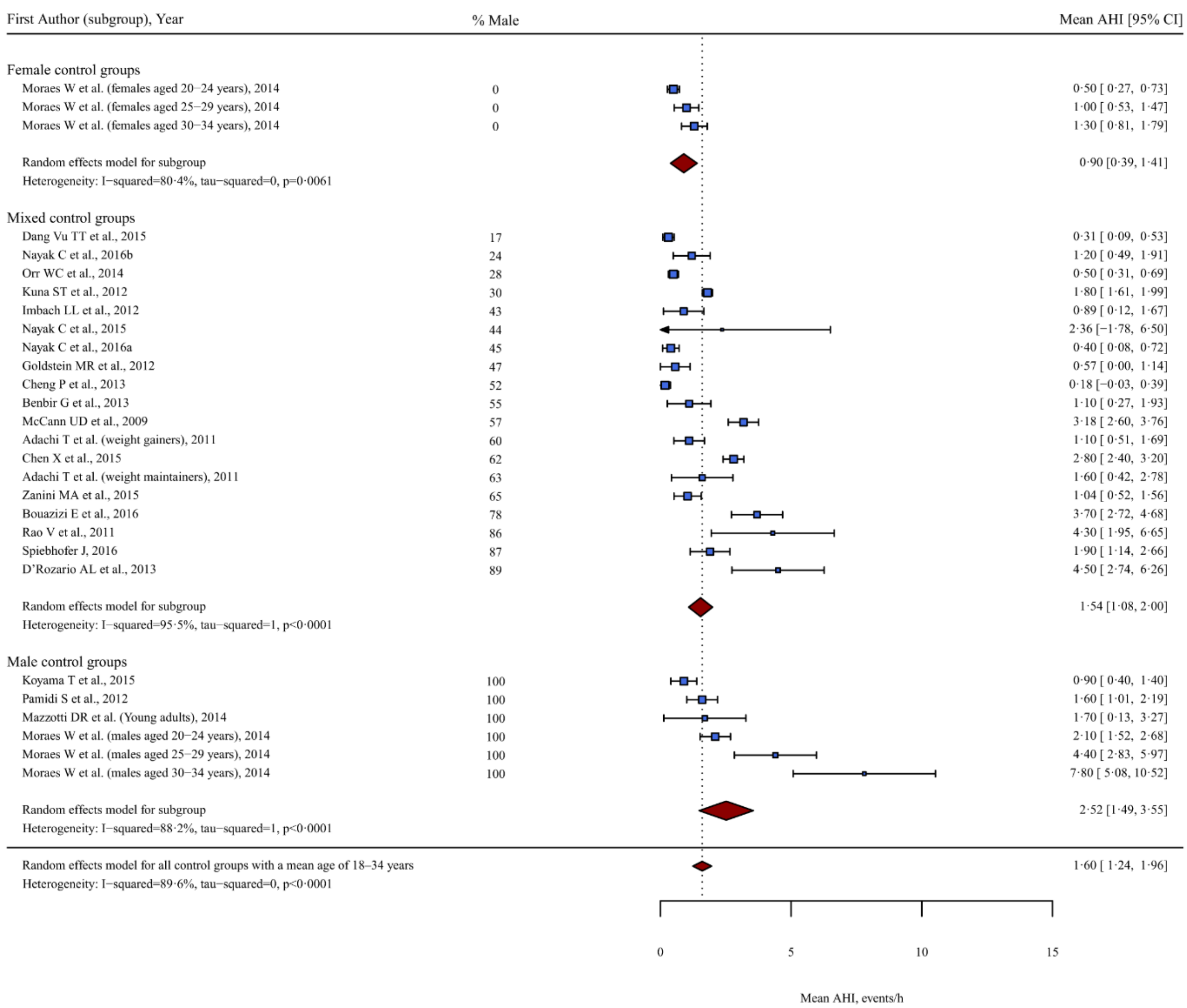

Figure S4B. Forest plot showing the effect of sex on AHI for control groups with a mean age of 35–49 years. Legend is as for Fig S4A.

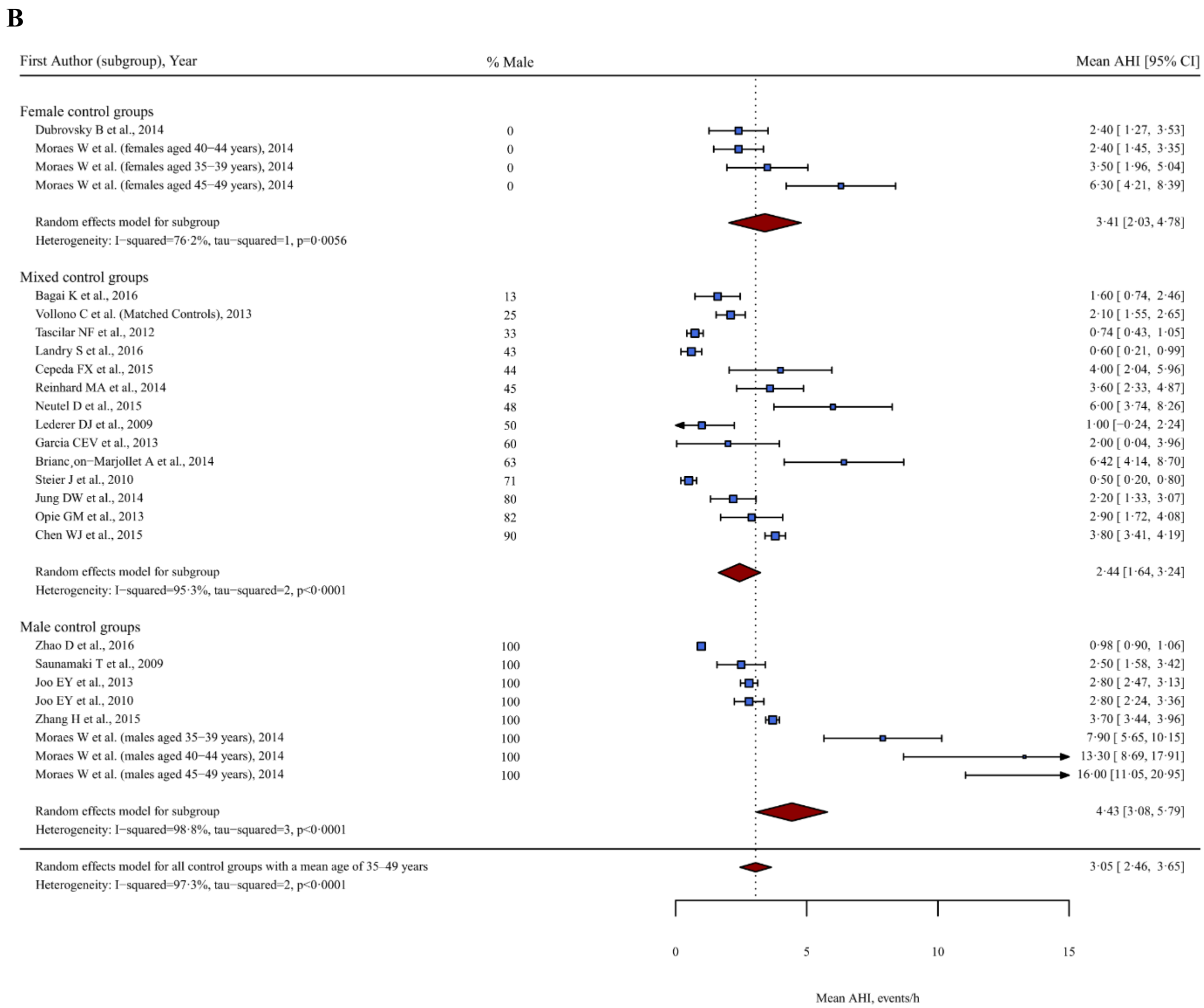

Table S10: Characteristics of studies included in meta-analysis.

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
1.	Adachi T et al.[4] (weight maintainers)	2011	16	29.6 (9.2)	63	TST, AHI, AI	YES	YES	NO	NO
	Adachi T et al. (weight gainers)	2011	20	29.7 (6.3)	60	TST, AHI, AI	YES	YES	NO	NO
2.	Aittokallio J et al.[5]	2009b	22	55.5 (1.2)	0	AHI, MSaO2, mSaO2	YES	YES	NO	NO
3.	Aittokallio J et al.[6]	2009a	9	55.6 (1.1)	0	AHI, MSaO2, mSaO2	NO	YES	NO	NO
4.	Bahammam AS et al.[7]	2014	8	26.6 (4.9)	100	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), PLMI, AI	YES	NO	NO	NO
5.	Bahammam AS et al.[8]	2012	8	32.0 (2.4)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	NO	NO
6.	Crispim CA et al.[9] (women)	2011	27	28.8 (6.6)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
	Crispim CA et al. (men)	2011	25	27.2 (5.9)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
7.	de Zambotti M et al.[10]	2012	15	22.3 (1.6)	0	TST, SOL, REML, SE, WASO	YES	YES	YES	NO
8.	Markwald RR et al.[11]	2016	29	24.0 (5.3)	72	TST, SOL, SE, WASO	YES	YES	YES	NO
9.	de Zambotti M et al.[12]	2014b	16	45.2 (9.1)	50	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
10.	de Zambotti M et al.[13]	2014a	14	24.4 (1.6)	50	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST),	YES	YES	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						REM(%TST), AI				
11.	Baker FC et al.[14]	2015	34	49.3 (2.6)	0	TST, SOL, REML, SE, WASO, AHI, mSaO2, PLMI, AI	YES	YES	YES	NO
12.	Cellini N et al.[15]	2014	13	24.3 (1.6)	46	TST, SOL, SE, WASO	YES	YES	YES	NO
13.	de Zambotti M et al.[16]	2015	11	29.1 (7.3)	0	TST, SOL, REML, SE, WASO, AI	YES	NO	NO	NO
14.	Petit E et al.[17]	2014	16	22.2 (1.7)	100	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
15.	Kuna ST et al.[18]	2012	200	29.9 (7.2)	30	TST, SOL, REML, SE, WASO, AHI, AI	YES	NO	NO	NO
16.	Leufkens TRM et al.[19]	2014	21	61.7 (5.0)	62	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST),	YES	YES	YES	NO
17.	Nayak C et al.[20]	2015	25	23.3 (3.7)	44	TST, SE, AHI, MSaO2, mSaO2, AI	YES	YES	NO	NO
18.	Nayak C et al.[21]	2016a	20	23.2 (3.8)	45	TST, SOL, SE, AHI, PLMI, AI	YES	YES	NO	NO
19.	Nayak C et al.[22]	2016b	25	26.3 (7.4)	24	TST, SE, AHI, PLMI, AI	YES	YES	NO	NO
20.	Kobayashi I et al.[23]	2012	23	22.6 (5.0)	65	TST, SOL, WASO	YES	YES	YES	NO
21.	St-Onge MP et al.[24]	2016	26	35.1 (5.1)	50	TST, SOL	YES	YES	NO	NO
22.	Perrier J et al.[25]	2015	10	46 (15)	40	TST, REML, SE	YES	YES	YES	NO
23.	Plante DT et al.[26]	2016	24	23.3 (4.0)	42	TST, SOL, REML, SE, WASO	YES	YES	YES	NO
24.	Landsness EC et al.[27]	2011	17	24.3 (3.7)	65	TST, REML, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	NO	NO	NO
25.	Hulse BK et al.[28]	2011	12	21.9 (1.7)	50	TST, SOL, SE	YES	NO	NO	NO
26.	Goldstein MR et al.[29]	2012	15	21.4 (1.6)	47	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, AI	YES	NO	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
27.	Plante DT et al.[30] (females)	2012b	19	23.1 (6.2)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	YES	NO
	Plante DT et al. (males)	2012b	11	29.4 (10.7)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	YES	NO
28.	Plante DT et al.[31]	2012a	7	22.0 (1.3)	43	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	YES	NO
29.	Riedner BA et al.[32]	2016	8	41.6 (13.6)	25	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI,	YES	YES	YES	NO
30.	Moraes W et al.[33] (males aged 20-24 years)	2014	60	20-24 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
	Moraes W et al. (males aged 25-29 years)	2014	60	25-29 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
	Moraes W et al. (males aged 30-34 years)	2014	65	30-34 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
	Moraes W et al. (males aged 35-39 years)	2014	59	35-39 (MP)	100	TST, SOL, REML, SE, WASO,	NO	NO	NO	YES

First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
					N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI				
Moraes W et al. (males aged 40-44 years)	2014	56	40-44 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (males aged 45-49 years)	2014	48	45-49 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (males aged 50-54 years)	2014	38	50-54 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (males aged 55-59 years)	2014	30	55-59 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (males aged 60-64 years)	2014	20	60-64 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (males aged 65-69 years)	2014	14	65-69 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2,	NO	NO	NO	YES

First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
					mSaO2, PLMI, AI				
Moraes W et al. (males aged 70-74 years)	2014	10	70-74 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (males aged 75-80 years)	2014	8	75-80 (MP)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 20-24 years)	2014	46	20-24 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 25-29 years)	2014	70	25-29 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 30-34 years)	2014	64	30-34 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 35-39 years)	2014	60	35-39 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 40-44 years)	2014	72	40-44 (MP)	0	TST, SOL, REML, SE, WASO,	NO	NO	NO	YES

First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
					N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI				
Moraes W et al. (females aged 45-49 years)	2014	78	45-49 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 50-54 years)	2014	49	50-54 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 55-59 years)	2014	49	55-59 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 60-64 years)	2014	28	60-64 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 65-69 years)	2014	26	65-69 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
Moraes W et al. (females aged 70-74 years)	2014	16	70-74 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2,	NO	NO	NO	YES

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						mSaO2, PLMI, AI				
	Moraes W et al. (females aged 75-80 years)	2014	16	75-80 (MP)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
31.	Saunamaki T et al.[34]	2009	20	43	100	AHI	YES	YES	YES	NO
32.	Hanlon EC et al.[35]	2016	14	23.4 (3.0)	79	TST, SE	YES	YES	YES	NO
33.	Rao MN et al.[36]	2015	14	27 (5)	57	TST	YES	YES	YES	NO
34.	McCann UD et al.[37]	2011	43	23.6 (21.6)	53	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
35.	Zhou JY et al.[38]	2012	10	33.6 (13.1)	50	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	NO	YES	YES	NO
36.	Broussard JL et al.[39]	2015	19	23.5 (3.1)	100	TST, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
37.	Christensen JAE et al.[40]	2016	23	56.7 (9.2)	30	SE, PLMI	YES	NO	NO	NO
38.	Reinhard MA et al.[41]	2014	38	39.6 (8.9)	45	TST, SOL, SE, WASO, AHI, PLMI, AI	YES	YES	YES	NO
39.	Vandekerchkhove M et al.[42]	2012	28	22.4 (5.8)	54	TST, SOL, SE, WASO	YES	NO	YES	NO
40.	Jaimchariyatam N et al.[43]	2014	350	54.2 (19.8)	52	SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, mSaO2, PLMI, AI	YES	YES	YES	NO
41.	Mellman TA et al.[44]	2014	24	23.7 (5.8)	54	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
42.	Liu H et al.[45]	2014	26	40.5 (12.0)	38	TST, SOL, SE, WASO, N1(%TST),	YES	YES	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						N2(%TST), N3(%TST), REM(%TST)				
43.	Cervena K et al.[46]	2014	10	41.4 (13.1)	50	TST, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
44.	Zhang Z & Katami R[47]	2014	14	30.1 (10.7)	43	SE, N3(%TST), REM(%TST)	YES	NO	NO	NO
45.	Zinkhan M et al.[48]	2014	100	51.3 (13.0)	49	TST, SOL, SE, WASO, AHI, PLMI	NO	NO	NO	YES
46.	Bumb JM et al.[49]	2014	27	39.0 (13.1)	41	TST, SOL, REML, SE	YES	YES	YES	NO
47.	Mazzotti DR et al.[50] (Young adults)	2014	15	24.3 (2.2)	100	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
	Mazzotti DR et al. (Older adults)	2014	13	65.5 (3.1)	100	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
	Mazzotti DR et al. (Oldest old adults)	2014	10	91.9 (6.1)	100	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	YES
48.	Krishnan P et al.[51]	2014	25	23.2 (3.0)	76	TST, SOL, REML, SE, WASO	YES	NO	NO	NO
49.	Lafortune M et al.[52]	2014	58	63.1 (8.5)	57	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	NO	YES	NO
50.	Brayet P et al.[53]	2014	32	63.7 (6.6)	69	SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI	YES	YES	YES	NO
51.	Hao YL et al.[54]	2014	30	39.1 (7.5)	37	TST, SOL, REML, SE,	YES	YES	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI				
52.	dos Santos DF et al.[55]	2014	44	41.3 (10.0)	NR	SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, PLMI, AI	NO	YES	NO	NO
53.	Briançon-Marjollet A et al.[56]	2014	16	49.3 (11.8)	63	AHI, MSaO2, mSaO2	NO	NO	NO	NO
54.	Ellis JG et al.[57]	2014	21	34.1 (13.8)	38	TST, SOL, REML, SE, WASO	YES	YES	YES	NO
55.	Da Woon J. et al.[58]	2014	10	38.7 (14.6)	80	TST, SOL, SE, WASO, AHI	YES	YES	YES	NO
56.	Lorenz RA et al.[59]	2014	50	69.5 (8.8)	30	TST, SOL, SE, WASO	NO	NO	NO	YES
57.	Meng J et al.[60]	2011	30	32.7 (5.9)	63	SE, MSaO2, mSaO2	YES	YES	NO	NO
58.	Joo EY et al.[61]	2010	44	47.2 (5.4)	100	AHI, MSaO2, mSaO2, AI	YES	YES	YES	NO
59.	Iranzo A et al.[62]	2010	10	NR	90	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, PLMI	YES	NO	NO	NO
60.	Steier J et al.[63]	2010	21	36 (17)	71	TST, SE, AHI, MSaO2	NO	YES	NO	NO
61.	Calvin AD et al.[64]	2010	18	54.7 (16.8)	72	AHI	NO	NO	NO	NO
62.	McCann UD et al.[65]	2009	62	24.1	57	AHI	YES	YES	YES	NO
63.	Lederer DJ et al.[66]	2009	10	40 (9)	50	AHI, mSaO2	YES	YES	NO	NO
64.	Moser D et al. (<60)[67]	2009	25	39.2 (11.0)	44	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	NO	NO	NO
	Moser D et al. (>60)	2009	31	74.1 (7.6)	45	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	NO	NO	NO
65.	Ferri R et al.[68]	2009	12	46.7 (15.2)	25	AI	YES	YES	YES	NO
66.	Spiebhofer J[69]	2016	15	24.9 (3.8)	87	AHI	NO	YES	NO	NO
67.	Zhang H et al.[70]	2015	9	39 (7)	100	AHI, MSaO2, mSaO2	YES	NO	NO	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
68.	Qu Y et al.[71]	2015	10	44.7 (11.9)	NR	MSaO2, mSaO2	NO	NO	NO	NO
69.	Chowduri S et al.[72]	2015	14	62 (8)	43	AHI	NO	YES	NO	NO
70.	Orr WC et al.[73]	2014	25	27.3 (9.3)	28	TST, SOL, WASO, AHI	YES	YES	YES	NO
71.	Uygunoglu U et al.[74]	2013	44	35.4 (8.7)	42	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), RDI, MSaO2, mSaO2, PLMI	NO	NO	NO	NO
72.	Sasai T et al.[75]	2013	17	59.5 (5.6)	77	AHI, PLMI, AI	YES	NO	NO	NO
73.	Mork PJ et al.[76]	2013	22	54.2 (8.2)	0	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), PLMI, AI	NO	YES	NO	NO
74.	Zavalko IM et al.[77]	2013	6	NR	100	N1(%TST), N2(%TST), N3(%TST), AI	NO	YES	NO	NO
75.	Jung DW et al.[78]	2013	10	28.7 (3.2)	60	SOL	YES	YES	YES	NO
76.	Rauchs G et al.[79]	2013	14	75.1 (4.6)	56	TST, SOL, SE, WASO	YES	NO	YES	NO
77.	Videnovic A et al.[80]	2013	10	62.7 (11.5)	80	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	NO	NO	NO	NO
78.	Cheng P et al.[81]	2013	29	32.2	52	AHI	YES	NO	YES	NO
79.	Della Marca G et al.[82]	2013	25	61.9 (8.6)	52	TST, SOL, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	NO	NO	NO	NO
80.	Benbir G et al.[83]	2013	20	27.6 (11.2)	55	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI	NO	NO	NO	NO
81.	Joo EY et al.[84]	2013	36	43.7 (5.3)	100	AHI	YES	YES	YES	NO
82.	D'Rozario AL et al.[85]	2013	9	27.8 (3.7)	89	TST, SE, AHI, mSaO2, AI	YES	YES	YES	NO
83.	Vollono C et al.[86] (Matched	2013	8	46.7 (10.7)	25	TST, SOL, SE, WASO, AHI, AI	NO	NO	NO	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
	Controls)									
	Vollono C et al. (Controls)	2013	55	54.2 (13.0)	42	TST, SOL, SE, WASO, AHI, AI	YES	YES	YES	NO
84.	Robey E et al.[87]	2013	11	26.0 (4.4)	100	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	NO	NO	NO	NO
85.	Bruno RM et al.[88]	2013	20	51.0 (7.9)	75	AHI, mSaO2	YES	YES	NO	NO
86.	Opie GM et al.[89]	2013	11	43.0 (10.3)	82	SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, AI	YES	NO	YES	NO
87.	Wong SN et al.[90]	2013	12	25.2 (4.0)	25	TST, SOL, SE, WASO, N3(%TST), REM(%TST)	YES	YES	NO	NO
88.	Sorenson GL et al.[91]	2013	22	32.2 (8.4)	27	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	NO	NO	NO
89.	Shaikh ZF et al.[92]	2013	50	52 (11)	84	AHI	NO	NO	NO	NO
90.	Garcia-Lorenzo D et al.[93]	2013	19	60.2 (8.3)	53	TST, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	NO	NO	NO	NO
91.	Perin C et al.[94]	2012	25	25.5 (7.3)	48	SE, N3(%TST), REM(%TST), MSaO2, mSaO2, AI	YES	YES	NO	NO
92.	Huang L et al.[95]	2012	48	38 (12)	42	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	YES	NO
93.	Wienecke M et al.[96]	2012	10	63.4 (8.0)	50	TST, REML, SE, AHI, PLMI, AI	YES	NO	NO	NO
94.	Imbach LL et al.[97]	2012	14	30 (8)	43	TST, REML, SE, AHI, PLMI, AI	YES	NO	NO	NO
95.	Poirrier AL et al.[98]	2012	18	50.1 (6.6)	100	AHI	YES	NO	NO	NO
96.	Ferri R et al.[99]	2012	19	67.5 (7.3)	37	TST, SOL, REML, SE	YES	NO	YES	NO
97.	Tascilar NF et al.[100]	2012	21	38.2 (8.2)	33	TST, SOL, REML, SE, WASO, N1(%TST),	YES	NO	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						N2(%TST), N3(%TST), REM(%TST), AHI, mSaO2, PLMI, AI				
98.	Sorensen GL et al.[101]	2012	15	62.4 (9.7)	53	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	NO	NO	YES	NO
99.	King J et al.[102]	2012	6	24.7 (3.3)	67	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), MSaO2, mSaO2	YES	YES	NO	NO
100.	Benbir G et al.[103]	2012	35	65.7 (10.1)	69	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI	NO	NO	NO	NO
101.	Scatena M et al.[104]	2012	25	44.3 (18.4)	52	TST, SOL, SE	NO	NO	NO	NO
102.	Piano C et al.[105]	2015	30	56.5 (11.8)	47	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), mSaO2, AI	YES	YES	NO	NO
103.	Gracitelli CP et al.[106]	2015	13	56.8 (7.8)	31	TST, SOL, REML, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, mSaO2, PLMI, AI	NO	NO	NO	NO
104.	Chen WJ et al.[107]	2015	20	44 (8)	90	SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, mSaO2, AI	NO	YES	NO	NO
105.	Gunbey E et al.[108]	2015	15	50.2 (13.5)	73	AHI, mSaO2	NO	YES	NO	NO
106.	Pont Sunyer C et al.[109]	2015	14	50.8 (16.0)	50	TST, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, PLMI, AI	NO	NO	NO	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
107.	Chen X et al.[110]	2015	40	34.5 (10.0)	62	AHI, MSaO2, mSaO2	YES	YES	YES	NO
108.	Dang Vu TT et al.[111]	2015	12	21.1 (2.4)	17	TST, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, AI	YES	YES	YES	NO
109.	Neutel D et al.[112]	2015	29	47.5 (12.3)	48	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, PLMI	NO	NO	NO	NO
110.	Arnulf I et al.[113]	2015	74	66.6 (6.1)	82	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, PLMI, AI	NO	NO	NO	NO
111.	Margis R et al.[114]	2015	9	64.8 (6.3)	40	TST, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, AI	YES	NO	NO	NO
112.	Lin YH et al.[115]	2015	14	24.6 (3.6)	43	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
113.	Shin M et al.[116]	2015	9	23.3 (4.1)	67	TST, SOL, SE, WASO	YES	YES	NO	NO
114.	Koyama T et al.[117]	2015	10	21.9 (3.3)	100	AHI	YES	YES	NO	NO
115.	Mariotti P et al.[118]	2015	30	66.8 (10.0)	57	TST, SOL, SE, WASO	NO	NO	NO	NO
116.	Bioulac S et al.[119]	2015	19	36.3 (10.5)	47	TST, SE	YES	YES	YES	NO
117.	Baril AA et al.[120]	2015	20	64.1 (7.1)	60	SE, AHI, MSaO2, mSaO2	YES	YES	YES	NO
118.	Djonlagic I et al.[121]	2015	15	37.3 (10.5)	NR	TST, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, mSaO2, AI	YES	YES	YES	NO
119.	Fogel SM et al.[122]	2015	12	21.8 (2.9)	33	TST, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
120.	Goder R et al.[123]	2015	16	28.3 (6.1)	44	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST),	NO	NO	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						REM(%TST)				
121.	van Gilst MM et al.[124]	2015	20	58.5 (7.5)	58	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	NO	NO	YES	NO
122.	Lin CC et al.[125]	2016	20	43 (8)	90	SE, AI	NO	YES	NO	NO
123.	Eltawdy M et al.[126]	2016	20	40.3 (17.3)	75	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), mSaO2, PLMI	NO	NO	NO	NO
124.	Chaparro Vargas R et al.[127]	2016	10	31.5 (11.3)	50	SOL, REML	NO	NO	NO	NO
125.	Arnaldi D et al.[128]	2016	10	61 (7)	50	TST, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI	NO	NO	NO	NO
126.	Liao H et al.[129]	2016	20	59.9 (3.7)	55	TST, SOL, SE, N3(%TST), REM(%TST), AHI	NO	YES	NO	NO
127.	Bagai K et al.[130]	2016	15	35.3 (10.5)	13	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, MSaO2, PLMI, AI	YES	NO	NO	NO
128.	Zhao D et al.[131]	2016	10	36.5 (2.3)	100	AHI	YES	NO	NO	NO
129.	Lo JC et al.[132]	2014	14	66.6 (4.1)	50	TST, SOL, SE, WASO	NO	NO	YES	NO
130.	Ooms et al.[133]	2014	13	49.4 (5.5)	100	TST, SE, WASO	YES	NO	NO	NO
131.	Deliens G et al.[134]	2013	25	26.2 (4.7)	NR	TST, SOL	YES	NO	YES	NO
132.	Mascetti L et al.[135] (Val/Val)	2013	14	21.7 (1.6)	43	TST, REML	YES	YES	YES	NO
	Mascetti L et al. (Met carriers)	2013	15	21.6 (1.8)	47	TST, REML	YES	YES	YES	NO
133.	Broussard JL et al.[136]	2012	7	23.7 (3.8)	86	TST	YES	YES	NO	NO
134.	Booth JN et ul.[137]	2012	43	26 (4)	44	TST, SOL, REML, SE, WASO, AI	YES	YES	NO	NO
135.	Dubé J et al.[138] (Older adults)	2015	33	60.4 (5.7)	46	TST, SOL, SE, WASO, AHI, mSaO2, PLMI, AI	YES	NO	YES	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
	Dubé J et al. (Younger adults)	2015	30	23.5 (2.8)	53	TST, SOL, SE, WASO, AHI, mSaO2, PLMI, AI	YES	NO	YES	NO
136.	Ujma PP et al.[139]	2015	79	23.3 (2.6)	100	TST, SOL, REML	YES	NO	YES	NO
137.	Zanini MA et al.[140]	2015	20	19.1 (4.0)	65	TST, SOL, REML, SE, WASO, AHI, PLMI, AI	NO	YES	YES	NO
138.	Hoshikawa M et al.[141]	2015	7	23.8 (3.0)	100	TST, SOL, REML, SE, WASO, MSaO2, mSaO2	NO	NO	NO	NO
139.	Smith MG et al.[142]	2016	24	22.9 (2.8)	46	SOL, REML, SE, WASO, AI	YES	NO	NO	NO
140.	Bouazizi E et al.[143]	2016	55	26.6 (6.4)	78	TST, SE, AHI	NO	NO	NO	NO
141.	Dubrovsky B et al.[144]	2014	46	36.1 (13.5)	0	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, PLMI, AI	NO	NO	NO	NO
142.	Glos M et al.[145]	2014	11	24.5 (10.0)	100	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
143.	Wilhelm I et al.[146]	2014	17	21.3 (3.0)	82	TST, SOL, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	NO	YES	NO
144.	Hachul H et al.[147]	2011	17	NR	0	AHI, mSaO2, PLMI	NO	YES	YES	NO
145.	Biermasz NR et al.[148]	2011	17	NR	65	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AHI, mSaO2	YES	YES	NO	NO
146.	Donga E et al.[149]	2010	9	44.6 (14.7)	56	TST, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	NO	YES	NO
147.	Schytz HW et al.[150]	2013	13	52.0 (10.1)	77	AHI	NO	YES	NO	NO
148.	Garcia CEV et al.[151]	2013	10	39.0 (9.5)	60	AHI, mSaO2, AI	NO	YES	NO	NO
149.	Abe S et al.[152]	2013	9	65.1 (12.0)	56	AHI, PLMI, AI	NO	NO	NO	NO
150.	Wuyts J et al.[153]	2012	16	23.9 (3.2)	50	TST, SOL, SE, N1(%TST), N2(%TST), N3(%TST),	YES	YES	NO	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
						REM(%TST)				
151.	Montgomery-Downs HE et al.[154]	2012	24	26.1	60	TST, SE	YES	NO	NO	NO
152.	Biard K et al.[155]	2015	20	NR	0	TST, SOL, REML, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	YES	NO
153.	Guan W et al.[156]	2015	7	32.9 (22.0)	NR	TST, SE, N1(%TST), N2(%TST), N3(%TST), REM(%TST), MSaO2, mSaO2, AI	YES	YES	NO	NO
154.	Cepeda FX et al.[157]	2015	16	46.0 (6.8)	44	mSaO2, AI	NO	NO	NO	NO
155.	Hudson JD et al.[158]	2015	25	NR	59	N1(%TST), N2(%TST), N3(%TST), REM(%TST), PLMI, AI,s	YES	YES	YES	NO
156.	Ko CH et al.[159]	2015	13	20-23 (MP)	46	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	YES	NO
157.	Barut BO et al.[160]	2015	14	50.6 (8.6)	64	TST, SOL, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), MSaO2, mSaO2, PLMI, AI	YES	NO	NO	NO
158.	Varga AW et al.[161] (Younger subjects)	2016	18	20	44	TST, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
	Varga AW et al. (Older subjects)	2016	13	68.2	39	TST, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
159.	Landry S et al.[162]	2014	12	52.8 (6.7)	75	TST, WASO, AI	YES	NO	NO	NO
160.	Rao V et al.[163]	2011	7	25	86	TST, SOL, REML, SE, WASO, PLMI	YES	YES	YES	NO
161.	Pamidi S et al.[164]	2012	20	22.5 (2.7)	100	TST, SE, mSaO2, AI	YES	YES	NO	NO
162.	Simen AA et al.[165]	2015	20	33.9	100	TST, SOL, REML, SE, WASO	NO	NO	NO	NO
163.	Poryazova R et al.[166]	2015	8	51.9 (16.4)	38	TST, WASO	NO	NO	NO	NO

	First author (subgroup within study)	Year	N	Age (years)	Sex (% male)	Sleep parameters provided	Exclusion criteria stated for sleep disorders	Exclusion criteria stated for medical disorders	Exclusion criteria stated for psychiatric disorders	Recruited from population-based studies
164.	Lustenberger C et al.[167]	2015	20	23.3 (9.4)	100	TST, SOL, SE, WASO	YES	YES	YES	NO
165.	Landry S et al.[168]	2016	14	47.0 (10.1)	43	TST, SOL, SE, WASO, mSaO2, PLMI, AI	YES	YES	YES	NO
166.	Buchmann A et al.[169]	2011	20	25.2 (4.1)	55	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	NO	NO	NO	NO
167.	Chennaoui M et al.[170]	2011	12	29.1 (3.3)	100	TST, SOL, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST)	YES	YES	NO	NO
168.	Cho JR et al.[171]	2013	10	27	60	TST, REML, SE, WASO, N1(%TST), N2(%TST), N3(%TST), REM(%TST), AI	YES	YES	YES	NO
169.	Westerberg CE et al.[172]	2012	16	72.7 (5.1)	19	TST, SOL, REML, SE, WASO	YES	YES	YES	NO

Abbreviations: Total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), sleep onset latency (SOL), REM latency (REML), arousal index (AI), as a percentage of total sleep time (%TST), apnea-hypopnea index (AHI), mean arterial oxygen saturation ($MSaO_2$), minimum arterial oxygen saturation ($mSaO_2$), and periodic limb movement index (PLMI).

Parameter not reported (NR).

Age data expressed as mean (SD). For studies that did not provide a mean age, the midpoint of the provided age range was estimated to be the mean age in this meta-analysis; this is indicated by "MP" beside the age range listed above.

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