Supplementary Material

Association of obesity level based on the EASO framework, sleep pattern and the risk of all-cause mortality and cardiovascular mortality

Supplementary Table S1 **Definition of seven chronic conditions in UK Biobank.**

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Supplementary Figure S4 **Association of Sleep patterns and Obesity level with the All-cause mortality by potential risk factors.**

Supplementary Table S1. Definition of seven chronic conditions in UK Biobank.

chronic conditions	Item	Trait	ICD 10	UKB Data-Field	Total
Hypertension	1	essential(primary) hypertension	I10,I15	131286	209,310
		secondary hypertension		131294	321
	2	Diastolic blood pressure, automated reading		4079	476,035
	3	Systolic blood pressure, automated reading		4080	476,030
	4	Medication for blood pressure		6153	271,176
				6177	227,283
Cardiovascular disease	5	Currently suffering from heart issues	I05-I79	28675	195,447
	6	Standard PRS for coronary artery disease (CAD)		26227	485,717
	7	Enhanced PRS for coronary artery disease (CAD)		26228	148,765
Angina	8	Date I20 first reported (angina pectoris)	I20	131296	39,372
	9	Age angina diagnosed		3627	17,776
Heart disease			I21-I25	131296	489,010
				3627	499,696
					498,560
Stroke			I63,I64	4056	501,996
				131368	
				42008	501,080
				42006	

chronic conditions	Item	Trait	ICD 10	UKB Data-Field	Total
Diabetes			E10-E14	2976	490,547
				2443	501,635
				23470	
				30740	501,160
				30750	
Chronic kidney disease			N18	132032	501,639
Arthritis			M05-M14	131840,131848	501,197
				131850,131854	
				131856	501,630
				120001,120000	
COPD			J44	22150	501,983
				22170	
			J43	22130	501,503
			J41,J42		
depression			Chest pain	2335	495,551

Supplementary Table S2. Information of sleep pattern and obesity level in UK Biobank.

Individual sleep pattern components	Criteria	UK Biobank data field
Sleep duration	Self-reported: “About how many hours sleep do you get in every 24 hours? (please include naps)” Response: Low risk-7-8 hours/day; High risk-<7 or >=9 hours/day. Do not know/Prefer not to answer = missing data.	1160
Chronotype	Self-reported: “One hears about "morning-types" and"evening-types." Which one of these types do you consider yourself to be?? ” Response: Low risk-Definitely a “morning” person; More a “morning” than “evening” person； High risk-More an “evening” than a “morning” person; Definitely an “evening” person. Do not know/Prefer not to answer = missing data.	30429
Insomnia	Self-reported: “Do you have trouble falling asleep at night or do you wake up in the middle of the night?” Response:Low risk-Never/rarely/ Sometimes; High risk-Usually. Do not know/Prefer not to answer = missing data.	1200
Snoring	Self-reported:Does your partner or a close relative or friend complain about your snoring? Response: Low risk-No; High risk-Yes. Do not know/Prefer not to answer = missing data.	1210
Daytime dozing	Self-reported:How likely are you to doze off or fall asleep during the daytime when you don't mean to? (e.g. when working, reading or driving). Response:Low risk-Never/rarely; High risk-Sometimes; Often; All the Time. Do not know/ Prefer not to answer = missing data.	1220

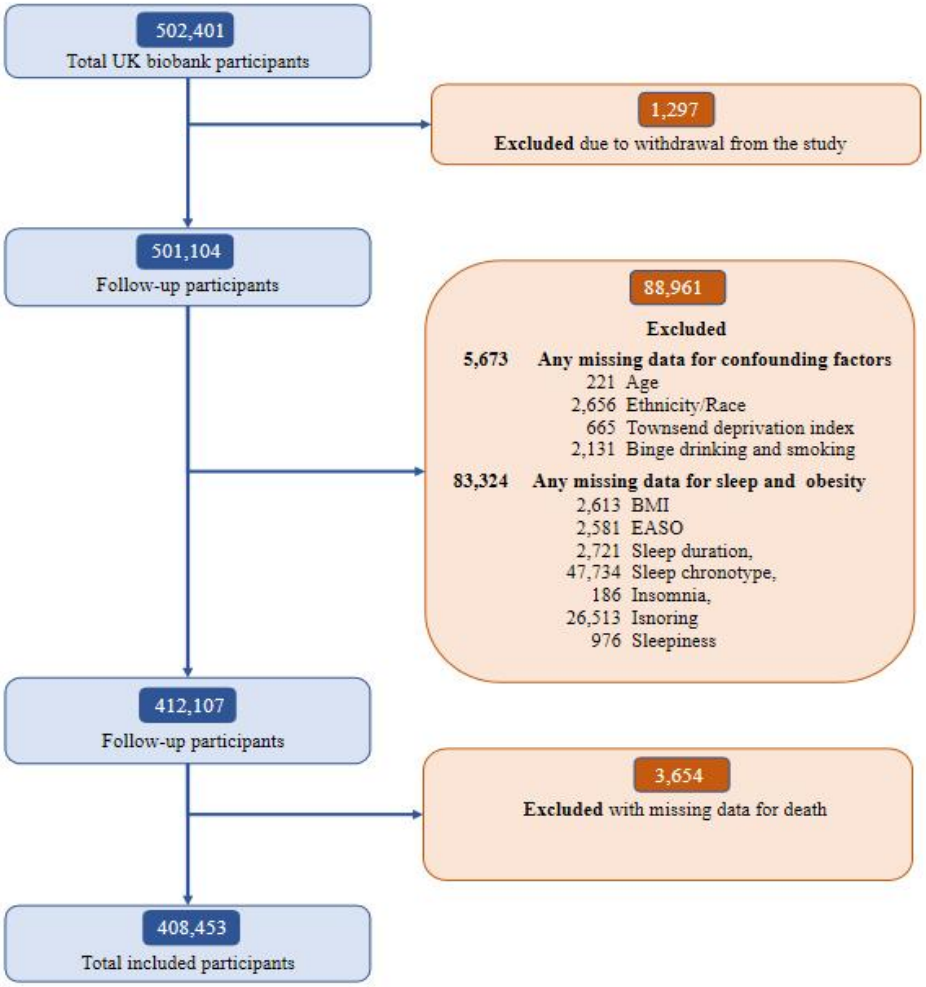
Supplementary Table S3. The definitions for CVD mortality and All-cause mortality.

	ICD-10 field code
CVD mortality	40001,40010
All-cause mortality	100093

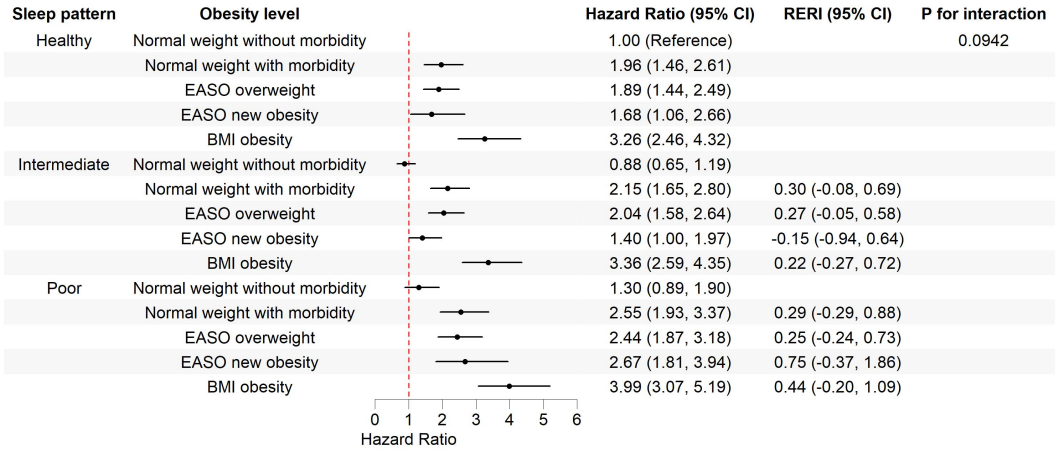
*Variable definitions constructed using ICD-10 as well as self-reported data fields with choice-, disease- or procedure-specific codes between brackets are shown.

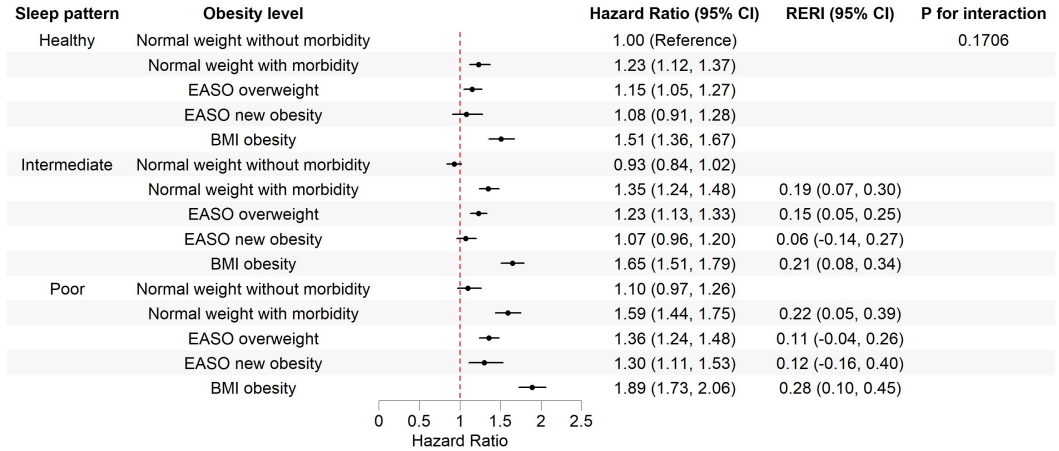
Abbreviations: ICD, International Classification of Disease

Supplementary Figure S1. Selection of participants.



Supplementary Figure S2. Joint effects and interaction between sleep pattern and obesity level on the CVD mortality and All-cause mortality.





Abbreviations: HR, hazard ratio; CI, confidence interval; RERI, relative excess risk due to interaction; CVD, cardiovascular disease.

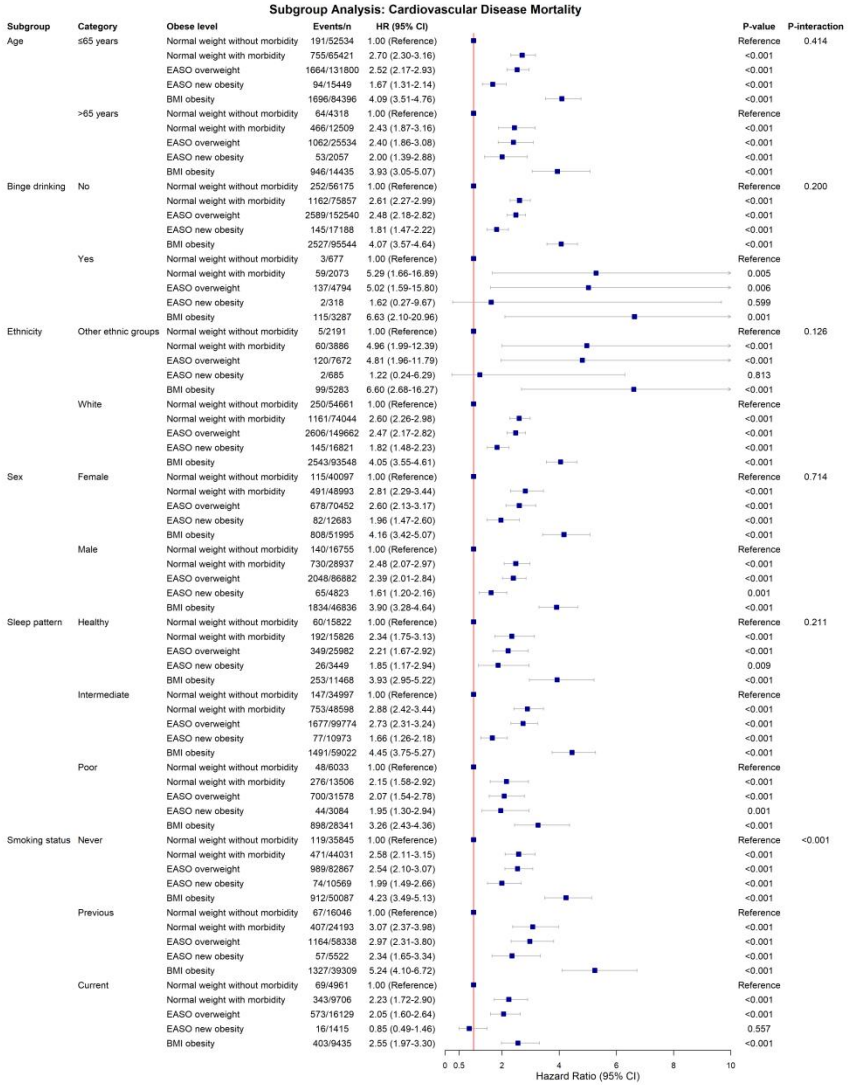
[a]All results were calculated adjusted by age, sex, ethnicity, Townsend deprivation index, binge drinking, and smoking status.

[b]The estimates of RERI were calculated based on the reference group with Normal weight without morbidity and healthy sleep pattern.

[c]Likelihood tests was applied to test the significance of interaction term by comparing the model with and without the interaction term.

[*]*P* value < 0.05

Supplementary Figure S3. Association of Sleep patterns and Obesity level with the CVD mortality by potential risk factors.



Supplementary Figure S4. Association of Sleep patterns and Obesity level with the All-cause mortality by potential risk factors.

