Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Cohort Characteristics Split by Sleep Duration Category

Characteristic	Daily Sleep Duration in Hours, n (%)			
	7-8	**6**	**5**	**3-4**
Participants	187 275 (75.5)	49 022 (19.8)	9 654 (3.9)	1 916 (0.8)
Time at risk, days, mean ± SD	4 472 ± 644	4 447 ± 672	4 400 ± 748	4356 ± 788
Incident T2DM cases during follow-up	5 544 (3.0)	1 763 (3.6)	460 (4.8)	138 (7.2)
Age at baseline, years, mean ± SD	55.9 ± 8.1	55.9 ±7.8	56.5 ± 7.8	56.7 ± 7.7
Sex				
Female	98 412 (52.5)	24 711 (50.4)	5 314 (55.0)	1 096 (57.2)
Male	88 863 (45.5)	24 311 (49.6)	4 340 (45.0)	820 (42.8)
BMI at baseline, kg/m^2, mean ± SD	26.4 ± 3.6	26.9 ±3.7	27.2 ± 3.8	27.4 ± 4.0
Systolic blood pressure at baseline, mmHg, mean ± SD	137.6 ± 17.1	137.7 ± 16.7	138.4 ±16.9	137.8 ± 16.9
HbA1c at baseline, mmol/mol, mean ± SD	34.8 ± 3.7	35.1 ± 3.7	35.3 ± 3.8	35.6 ± 3.8
On antidepressant pharmacotherapy at baseline	5 105 (2.7)	1 385 (2.8)	406 (4.2)	115 (6.0)
Townsend Index, mean ± SD	-2.02 ± 2.41	-1.78 ± 2.49	-1.53 ± 2.56	-1.04 ± 2.72
Ethnicity				
White European	176 202 (94.1)	45 224 (92.3)	8 843 (91.6)	1 697 (88.6)
Asian	3 000 (1.6)	1 047 (2.1)	202 (2.1)	68 (3.5)
Caribbean or African	1 206 (0.6)	756 (1.5)	262 (2.7)	63 (3.3)
Others	6 867 (3.7)	1 995 (4.1)	347 (3.6)	88 (4.6)
Region of the assessment center				
England	172 316 (92.0)	45 207 (92.2)	8 883 (92.0)	1781 (93.0)
Scotland	7 936 (4.2)	2 220 (4.5)	459 (4.8)	80 (4.2)
Wales	7 023 (3.8)	1 595 (3.3)	312 (3.2)	55 (2.9)
Physical activity level				
Low	32 880 (17.6)	9 325 (19.0)	1 955 (20.3)	452 (23.6)
Moderate	78 560 (41.9)	19 596 (40.0)	3 634 (37.7)	657 (34.3)
High	75 835 (40.5)	20 101 (41.0)	4 065 (42.0)	807 (42.1)
Smoking at baseline				
Never	107 261 (57.3)	26 669 (54.4)	5 120 (53.0)	1 029 (53.7)
Former	63 744 (34.0)	17 143 (35.0)	3 338 (34.6)	598 (31.2)
Current	16 270 (8.7)	5 210 (10.6)	1 196 (12.4)	289 (15.1)
Alcohol intake frequency				
Not current	9 981 (5.3)	3 063 (6.2)	887 (9.2)	267 (13.9)
Less than 3 times a week	84 880 (45.3)	23 178 (47.3)	4 784 (49.5)	984 (51.4)
3 times a week or more	92 414 (49.4)	22 781 (46.5)	3 983 (41.3)	665 (34.7)
Educational level				
No qualification	72 141 (38.5)	16 816 (34.3)	2 559 (26.5)	374 (19.5)
Any other qualification	94 275 (50.3)	25 590 (52.2)	5 250 (54.4)	1 013 (52.9)
University degree	20 859 (11.2)	6 616 (13.5)	1 845 (19.1)	529 (27.6)
Insomnia symptoms frequency				
Never/rarely	53 112 (28.4)	8 626 (17.6)	946 (9.8)	85 (4.4)
Sometimes	97 157 (51.8)	19 159 (39.1)	2 035 (21.1)	165 (8.6)
Usually	37 006 (19.8)	21 237 (43.3)	6 673 (69.1)	1 666 (87.0)

Abbreviations: BMI, body mass index; HbA1c, hemoglobin A1c.

eTable 2. Cohort Characteristics Split by Healthy Diet Score

Characteristic	Healthy Diet Score (0 = Least Healthy; 5 = Most Healthy), n (%)					
	0	1	2	3	4	5
Participants	3 757 (1.5)	18 356 (7.4)	43 692 (17.6)	68 033 (27.5)	71 975 (29.0)	42 054 (17.0)
Time at risk, days, mean ± SD	4 414 ±739	4 438 ± 702	4 452 ± 676	4 457 ± 672	4 474 ± 634	4 483 ± 613
Incident T2DM cases during follow-up	173 (4.6)	708 (3.9)	1 554 (3.6)	2 315 (3.4)	2 116 (2.9)	1 039 (2.5)
Age at baseline, years, mean ± SD	53.8 ± 8.1	54.1 ± 8.2	54.8 ± 8.2	55.7 ± 8.1	56.4 ± 8.0	57.2 ± 7.7
Sex						
Female	836 (22.3)	5 442 (29.6)	17 610 (40.3)	33 969 (49.9)	42 911 (59.6)	28 765 (68.4)
Male	2 921 (77.7)	12 921 (70.4)	26 077 (59.7)	34 062 (50.1)	29 065 (40.4)	13 288 (31.6)
BMI at baseline, kg/m^2, mean ± SD	27.3 ± 3.7	27.1 ± 3.7	26.9 ± 3.7	26.6 ± 3.6	26.4 ± 3.7	26.1 ± 3.6
Systolic blood pressure at baseline, mmHg, mean ± SD	138.6 ± 16.4	138.1 ± 16.4	137.6 ± 16.8	137.7 ± 17.0	137.5 ± 17.2	137.4 ± 17.3
HbA1c at baseline, mmol/mol, mean ± SD	35.1 ± 3.9	35.0 ± 3.9	34.9 ± 3.8	34.8 ± 3.8	34.8 ± 3.7	34.8 ± 3.7
On antidepressant pharmacotherapy at baseline	94 (2.5)	445 (2.4)	1 251 (2.9)	1 918 (2.8)	2 093 (2.9)	1 210 (2.9)
Townsend Index, mean ± SD	-1.57 ± 2.56	-1.80 ± 2.51	-1.88 ± 2.47	-1.97 ± 2.43	-1.99 ± 2.41	-2.01 ± 2.42
Ethnicity						
White European	3 559 (94.7)	17 418 (94.3)	41 208 (94.3)	63 791 (93.8)	66 843 (92.9)	39 147 (93.0)
Asian	46 (1.2)	245 (1.3)	651 (1.5)	1 209 (1.8)	1 544 (2.1)	622 (1.5)
Caribbean or African	40 (1.1)	177 (1.0)	400 (0.9)	609 (0.9)	654 (0.9)	407 (1.0)
Others	112 (3.0)	523 (2.8)	1 428 (3.3)	2 422 (3.6)	2 935 (4.1)	1 877 (4.5)
Region of the assessment center						
England	3 413 (90.9)	16 772 (91.4)	40 097 (91.8)	62 619 (92.0)	66 350 (92.2)	38 936 (92.6)
Scotland	143 (3.8)	780 (4.2)	1 832 (4.2)	2 916 (4.3)	3 161 (4.4)	1 863 (4.4)
Wales	201 (5.3)	811 (4.4)	1 758 (4.0)	2 496 (3.7)	2 465 (3.4)	1 254 (3.0)
Physical activity level						
Low	1 024 (27.3)	4 721 (25.7)	9 865 (22.5)	12 802 (18.8)	10 905 (15.2)	5 295 (12.6)
Moderate	1 478 (39.3)	7 488 (40.8)	18 329 (42.0)	28 746 (42.3)	29 736 (41.3)	16 670 (39.6)
High	1 255 (33.4)	6 154 (33.5)	15 493 (35.5)	26 483 (38.9)	31 335 (43.5)	20 088 (47.8)
Smoking at baseline						
Never	1 781 (47.4)	9 422 (51.3)	24 025 (55.0)	38 760 (57.0)	41 726 (58.0)	24 365 (57.9)
Former	1 131 (30.1)	5 848 (31.9)	14 299 (32.7)	23 127 (34.0)	25 168 (35.0)	15 250 (36.3)
Current	845 (22.5)	3 093 (16.8)	5 363 (12.3)	6 144 (9.0)	5 082 (7.0)	2 438 (5.8)
Alcohol intake frequency						
Not current	185 (4.9)	937 (5.1)	2393 (5.5)	3 873 (5.7)	4 366 (6.1)	2 444 (5.8)
Less than 3 times a week	1 461 (38.9)	7 804 (42.5)	19 446 (44.5)	31 044 (45.6)	33 890 (47.1)	20 181 (48.0)
3 times a week or more	2 111 (56.2)	9 622 (42.4)	21 848 (50.0)	33 114 (48.7)	33 720 (46.9)	19 428 (46.2)

Educational level, n (%)						
No qualification	540 (14.4)	2 480 (13.5)	5 480 (12.5)	8 300 (12.2)	8 245 (11.4)	4 804 (11.5)
Any other qualification	2 083 (55.4)	10 134 (55.2)	23 118 (52.9)	34 757 (51.1)	35 456 (49.3)	20 580 (48.9)
University degree	1 134 (30.2)	5 749 (31.3)	15 089 (34.5)	24 974 (36.7)	28 275 (39.3)	16 669 (39.6)
Insomnia symptoms frequency						
Never/rarely	1 003 (26.7)	4 844 (26.4)	11 535 (26.4)	17 352 (25.5)	17 914 (24.9)	10 121 (24.1)
Sometimes	1 721 (45.8)	8 538 (46.5)	20 498 (46.9)	32 579 (47.9)	34 601 (48.1)	20 579 (48.9)
Usually	1 033 (27.5)	4 981 (27.1)	11 654 (26.7)	18 100 (26.6)	19 461 (27.0)	11 353 (27.0)

Abbreviations: *BMI, body mass index; HbA1c, hemoglobin A1c.*

eTable 3. Association of Short Sleep Duration and Adherence to Consumption of Individual Food Groups With Incident Type 2 Diabetes Mellitus

Exposure	Participants, n	T2DM cases[1], %	HR [95%-CI]	
			unadjusted	adjusted[2]
Sleep duration (hours/day)				
7-8	187 275	3.0	1	1
6	49 022	3.6	1.22 [1.16-1.29]	1.02 [0.97-1.08]
5	9 654	4.8	1.64 [1.49-1.81]	1.16 [1.05-1.28]
3-4	1 916	7.2	2.52 [2.12-2.98]	1.41 [1.19-1.68]
Weekly consumption of red meat				
> population median	81 048	3.8	1	1
≤ population median	166 819	2.9	0.75 [0.72-0.79]	0.90 [0.86-0.94]
Weekly consumption of processed meat				
> population median	150 797	3.5	1	1
≤ population median	97 070	2.7	0.75 [0.72-0.79]	0.95 [0.90-1.0]
Daily consumption of vegetables				
< population median	87 378	3.3	1	1
≥ population median	160 489	3.1	0.96 [0.92-1.01]	0.96 [0.91-1.01]
Daily consumption of fruits				
< population median	67 655	3.6	1	1
≥ population median	180 212	3.0	0.85 [0.81-0.89]	0.97 [0.92-1.02]
Weekly consumption of fish				
< population median	118 348	3.2	1	1
≥ population median	129 519	3.2	1.01 [0.97-1.06]	1.01 [0.96-1.06]

[1] during a median follow-up of 12.5 years

[2] hazard ratios (HR) [95%-CI] derived from a COX regression analysis including the following categorical and continuous independent variables: the five healthy diet components (binary), daily sleep duration (four levels), age, sex, ethnicity, smoking status, frequency of weekly alcohol intake, antidepressant use, assessment center region, BMI, systolic blood pressure, socioeconomic status, educational level, Insomnia symptoms frequency, and physical activity level.

eTable 4. Association Between Short Sleep Duration and Incident Type 2 Diabetes Mellitus Stratified by Adherence to Consumption of Individual Food Groups

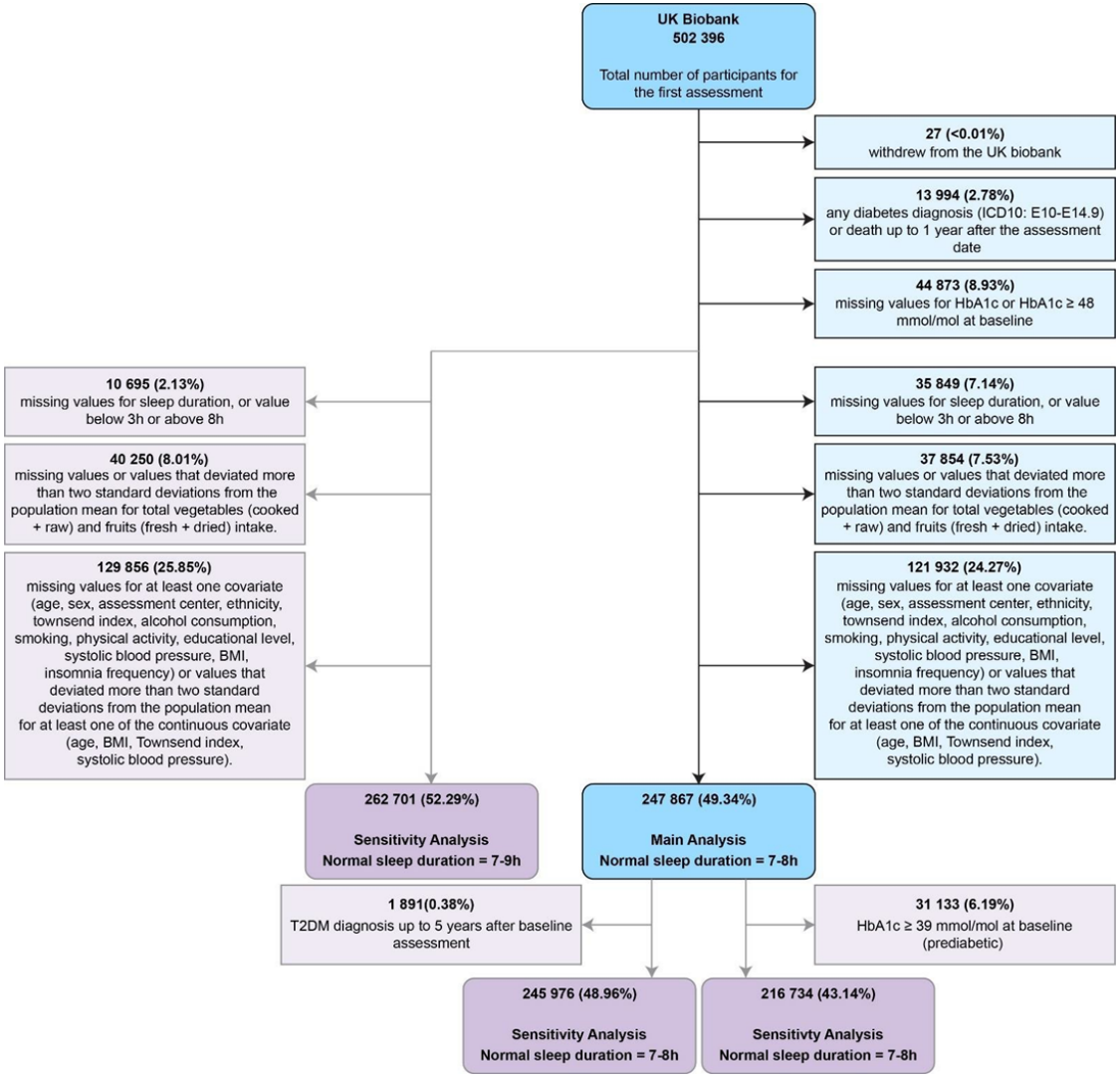
Exposure	Participants, n	T2DM cases[1], %	HR [95%-CI]	
			unadjusted	adjusted[2]
Sleep duration (hours/day) + Weekly consumption of red meat > population median				
7-8	61 375	3.6	1	1
6	15 810	4.1	1.15 [1.05-1.25]	0.95 [0.97-1.04]
5	3 209	5.5	1.56 [1.34-1.82]	1.14 [0.97-1.33]
3-4	654	9.3	2.62 [2.03-3.40]	1.48 [1.14-1.93]
Sleep duration (hours/day) + Weekly consumption of red meat ≤ population median				
7-8	125 900	2.7	1	1
6	33 212	3.4	1.27 [1.19-1.36]	1.07 [0.99-1.14]
5	6 445	4.4	1.68 [1.48-1.89]	1.17 [1.03-1.33]
3-4	1 262	6.1	2.36 [1.88-2.96]	1.34 [1.07-1.69]
Sleep duration (hours/day) + Weekly consumption of processed meat > population median				
7-8	114 273	3.3	1	1
6	29 807	3.9	1.18 [1.10-1.26]	1.00 [0.94-1.07]
5	5 586	5.5	1.68 [1.50-1.89]	1.21 [1.08-1.37]
3-4	1 131	7.6	2.34 [1.89-2.90]	1.37 [1.10-1.70]
Sleep duration (hours/day) + Weekly consumption of processed meat ≤ population median				
7-8	73 002	2.4	1	1
6	19 215	3.2	1.31 [1.20-1.44]	1.07 [0.97-1.18]
5	4 068	3.8	1.58 [1.34-1.87]	1.06 [0.90-1.26]
3-4	785	6.6	2.80 [2.13-3.70]	1.49 [1.12-1.98]
Sleep duration (hours/day) + Daily consumption of vegetables < population median				
7-8	65 277	3.0	1	1
6	17 889	3.8	1.29 [1.18-1.40]	1.06 [0.97-1.16]
5	3 480	5.2	1.75 [1.50-2.04]	1.22 [1.04-1.43]
3-4	732	6.8	2.35 [1.77-3.11]	1.26 [0.94-1.67]
Sleep duration (hours/day) + Daily consumption of vegetables ≥ population median				

7-8	121 998	3.0	1	1
6	31 133	3.5	1.18 [1.10-1.27]	1.00 [0.93-1.07]
5	6 174	4.5	1.56 [1.38-1.76]	1.13 [1.00-1.28]
3-4	1 184	7.4	2.56 [2.07-3.17]	1.51 [1.22-1.88]
Sleep duration (hours/day) + Daily consumption of fruits < population median				
7-8	50 290	3.3	1	1
6	13 786	3.9	1.17 [1.06-1.29]	0.98 [0.88-1.08]
5	2 951	5.8	1.77 [1.51-2.07]	1.29 [1.09-1.52]
3-4	628	6.8	2.11 [1.56-2.86]	1.29 [0.94-1.76]
Sleep duration (hours/day) + Daily consumption of fruits ≥ population median				
7-8	136 985	2.8	1	1
6	35 236	3.5	1.24 [1.16-1.32]	1.04 [0.97-1.11]
5	6 703	4.3	1.55 [1.38-1.75]	1.09 [0.97-1.24]
3-4	1 288	7.4	2.65 [2.16-3.25]	1.46 [1.18-1.80]
Sleep duration (hours/day) + Weekly consumption of fish < population median				
7-8	88 892	2.9	1	1
6	23 963	3.7	1.28 [1.19-1.38]	1.03 [0.95-1.11]
5	4 573	5.1	1.80 [1.57-2.06]	1.19 [1.04-1.37]
3-4	920	7.1	2.50 [1.95-3.20]	1.30 [1.01-1.67]
Sleep duration (hours/day) + Weekly consumption of fish ≥ population median				
7-8	98 383	3.0	1	1
6	25 059	3.5	1.17 [1.08-1.27]	1.02 [0.94-1.10]
5	5 081	4.5	1.49 [1.30-1.70]	1.14 [0.99-1.31]
3-4	996	7.3	2.47 [1.95-3.12]	1.53 [1.20-1.94]

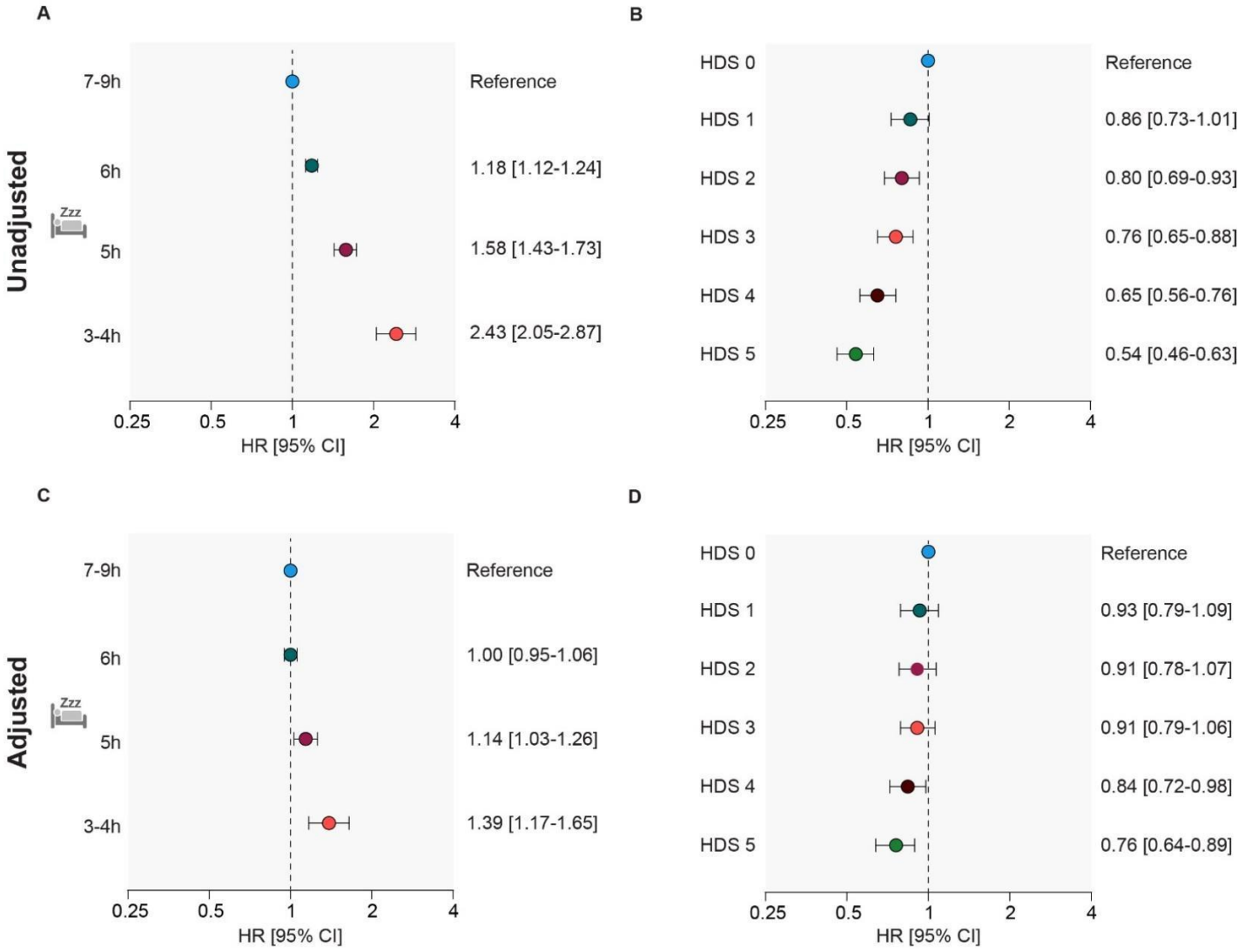
[1] during a median follow-up of 12.53 years

[2] hazard ratios (HR) [95%-CI] derived from a COX regression analysis including the following categorical and continuous independent variables: daily sleep duration (four levels), age, sex, ethnicity, smoking status, frequency of weekly alcohol intake, antidepressant use, assessment center region, BMI, systolic blood pressure, socioeconomic status, educational level, Insomnia symptoms frequency, and physical activity level.

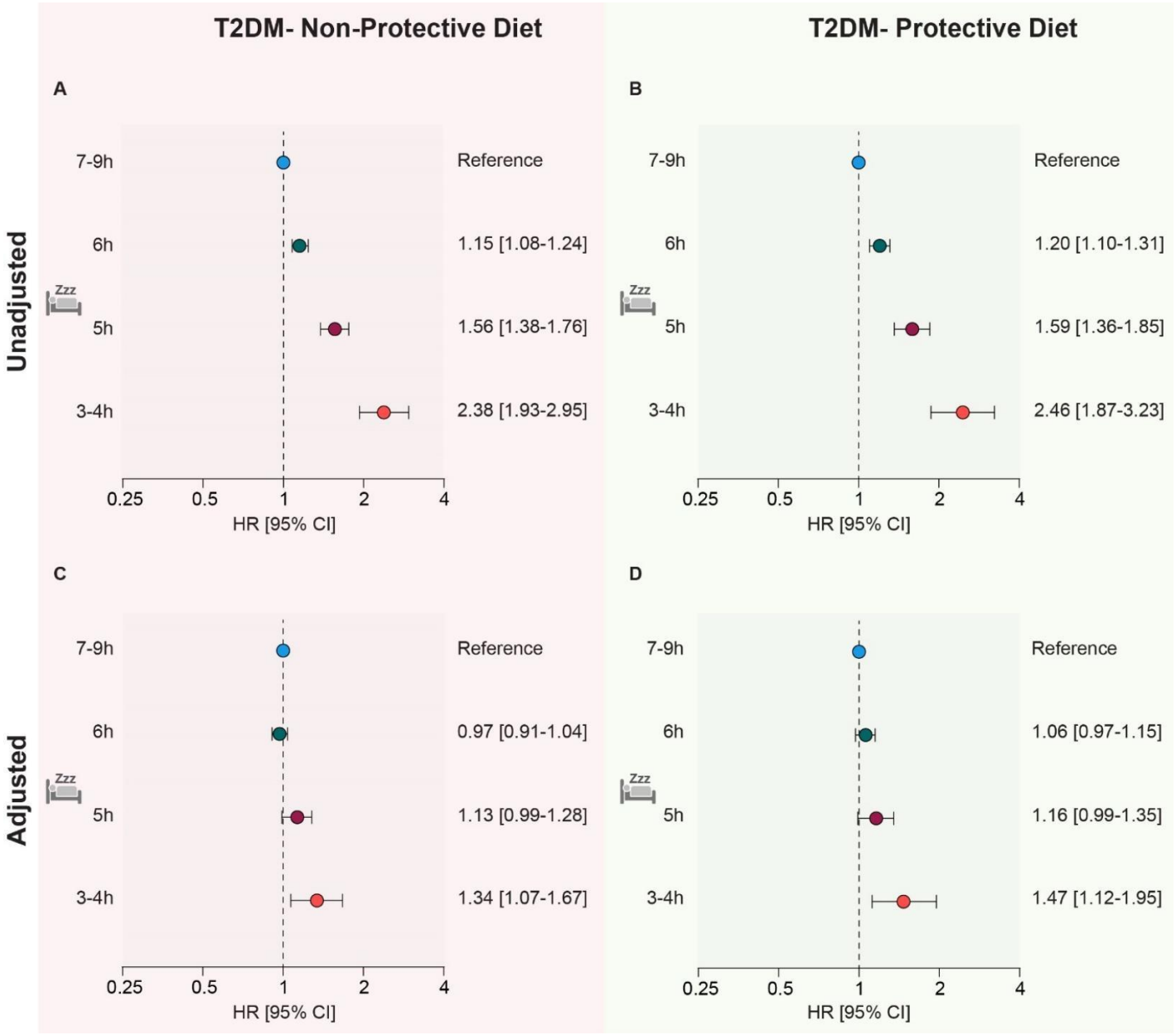
eFigure 1. Final Sample Estimation



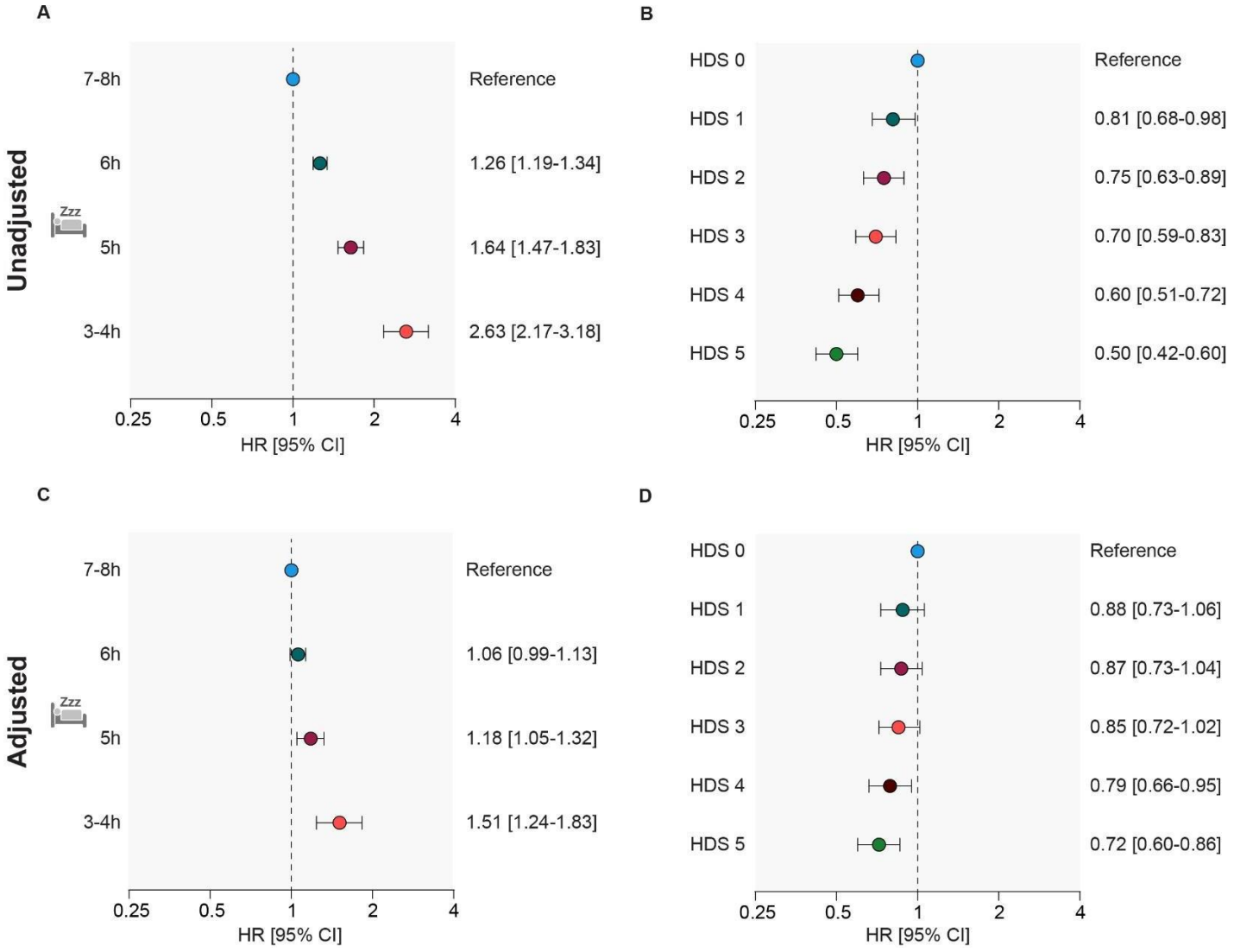
eFigure 2. Association of Short Sleep Duration (Using 7-9 h of Daily Sleep as the Sleep Duration Reference Category) and Adherence to Healthy Diet With Incident Type 2 Diabetes Mellitus (A) Unadjusted hazard ratios (HR) [95% CI] illustrating the link between sleep duration and incident type 2 diabetes mellitus (T2DM). (B) Unadjusted HR [95% CI] showcasing the relationship between healthy diet scores (HDS) and incident T2DM. (C) Adjusted HR [95% CI] presenting the association between sleep duration and incident T2DM. (D) Adjusted HR [95% CI] demonstrating the connection between HDS and incident T2DM.



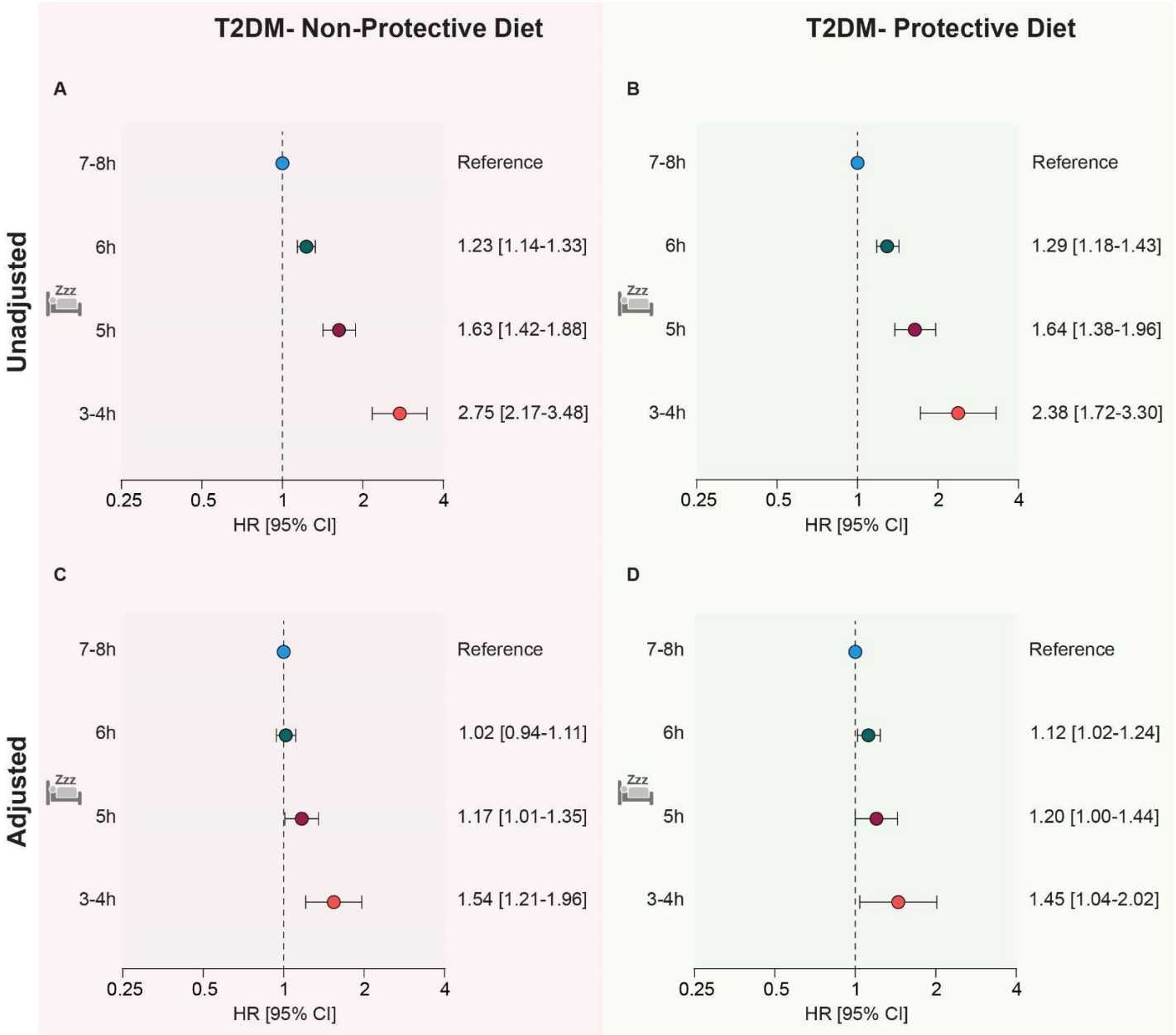
eFigure 3. Association Between Short Sleep Duration (Using 7-9 h of Daily Sleep as the Sleep Duration Reference Category) and Incident Type 2 Diabetes Mellitus Stratified by Diet Status. (A) Unadjusted Hazard Ratios HR [95% CI] illustrating the relationship between sleep duration and incident type 2 diabetes mellitus (T2DM) among participants with a T2DM- Non-Protective diet (B) Unadjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM-Protective diet. (C) Adjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM- Non-Protective diet. (D) Adjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM-Protective diet.



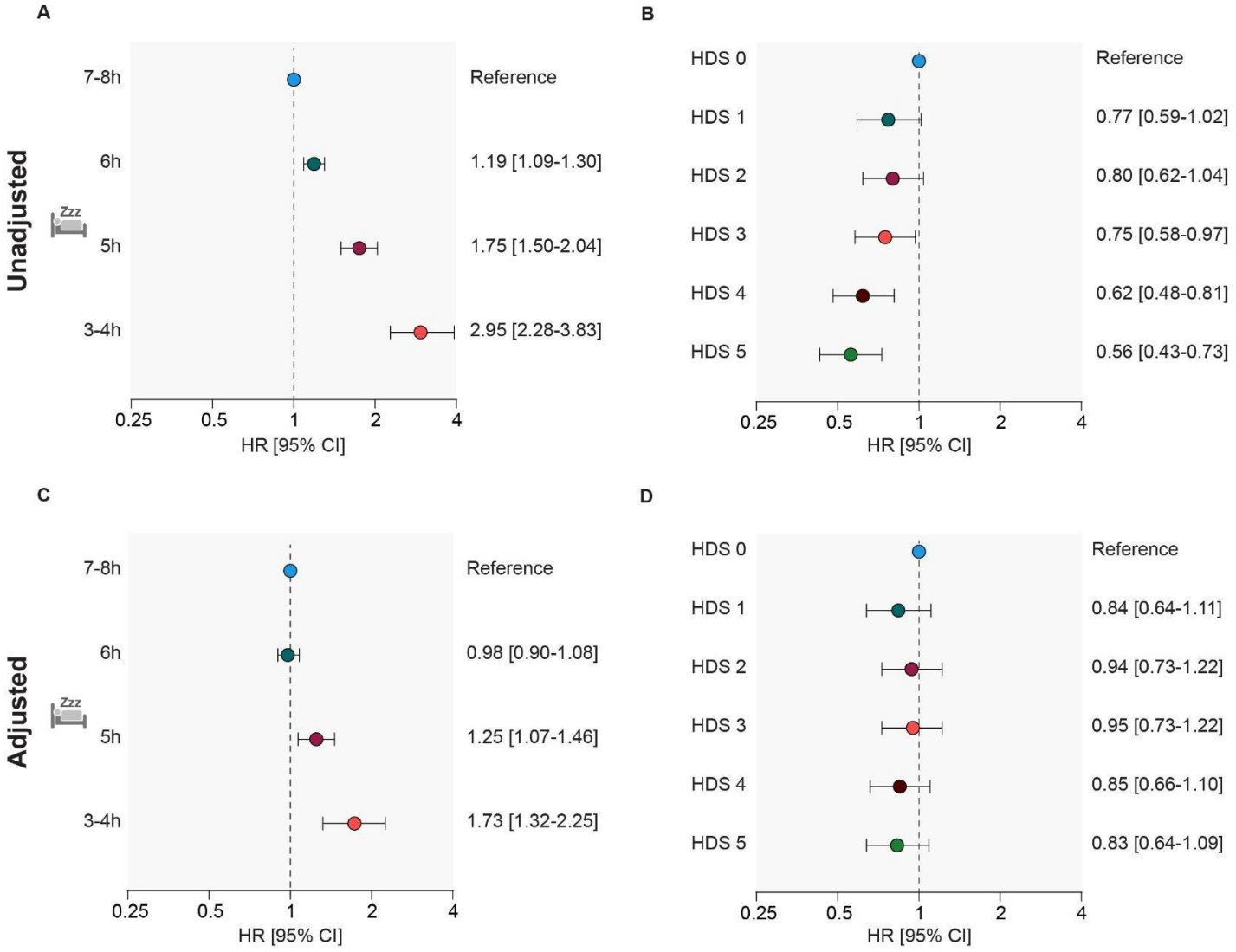
eFigure 4. Association of Short Sleep Duration and Adherence to Healthy Diet With Incident Type 2 Diabetes Mellitus (Without First 5 Years T2DM Incidence) (A) Unadjusted hazard ratios (HR) [95% CI] illustrating the link between sleep duration and incident type 2 diabetes mellitus (T2DM). (B) Unadjusted HR [95% CI] showcasing the relationship between healthy diet scores (HDS) and incident T2DM. (C) Adjusted HR [95% CI] presenting the association between sleep duration and incident T2DM. (D) Adjusted HR [95% CI] demonstrating the connection between HDS and incident T2DM.



eFigure 5. Association Between Short Sleep Duration and Incident Type 2 Diabetes Mellitus Stratified by Diet Status (Without First 5 Years T2DM Incidence). (A) Unadjusted Hazard Ratios (HR) [95% CI] illustrating the relationship between sleep duration and incident type 2 diabetes mellitus (T2DM) among participants with a T2DM- Non-Protective diet (B) Unadjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM-Protective diet. (C) Adjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM- Non-Protective diet. (D) Adjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM-Protective diet.



eFigure 6. Association of Short Sleep Duration and Adherence to Healthy Diet With Incident Type 2 Diabetes Mellitus (Without Prediabetic Individuals). (A) Unadjusted hazard ratios (HR) [95% CI] illustrating the link between sleep duration and incident type 2 diabetes mellitus (T2DM). (B) Unadjusted HR [95% CI] showcasing the relationship between healthy diet scores (HDS) and incident T2DM. (C) Adjusted HR [95% CI] presenting the association between sleep duration and incident T2DM. (D) Adjusted HR [95% CI] demonstrating the connection between HDS and incident T2DM.



eFigure 7. Association Between Short Sleep Duration and Incident Type 2 Diabetes Mellitus Stratified by Diet Status (Without Prediabetic Individuals). (A) Unadjusted Hazard Ratios (HR) [95% CI] illustrating the relationship between sleep duration and incident type 2 diabetes mellitus (T2DM) among participants with a T2DM- Non-Protective diet (B) Unadjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM-Protective diet. (C) Adjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM- Non-Protective diet. (D) Adjusted HR [95% CI] illustrating the relationship between sleep duration and incident T2DM among participants with a T2DM-Protective diet.