Supplementary Materials

Lifestyle factors as mediators in the relationship between depression, obesity, and blood pressure in the post-pandemic era

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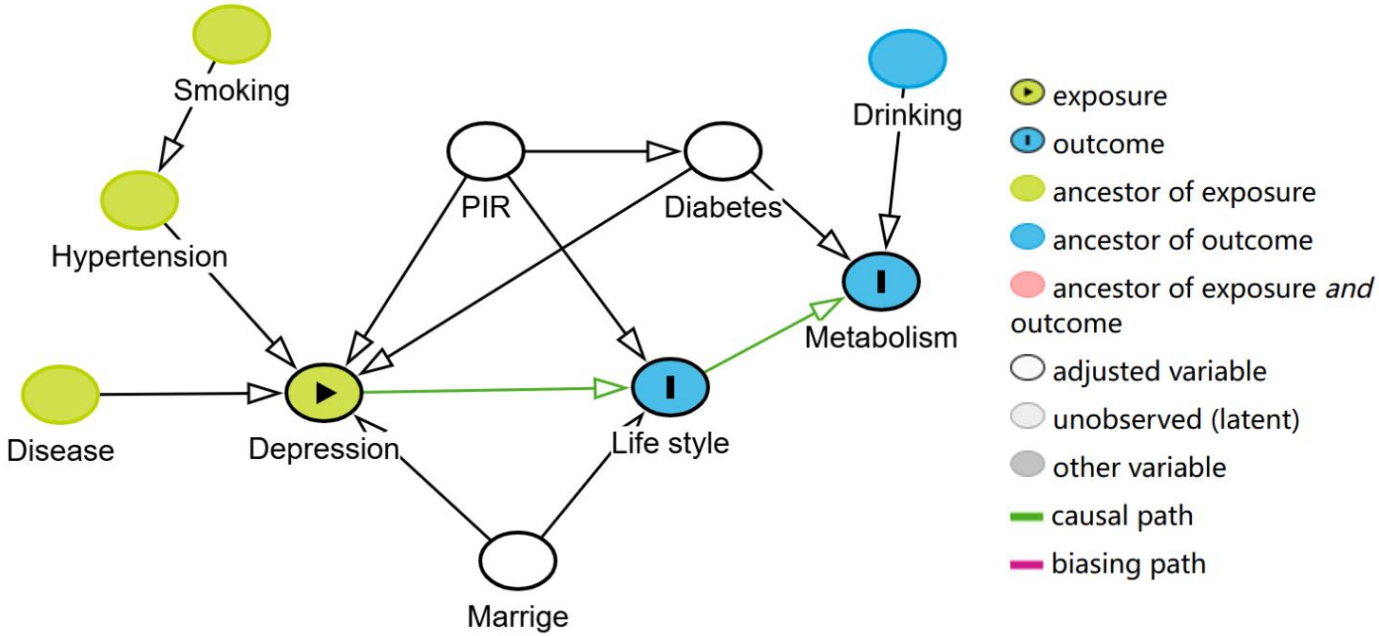
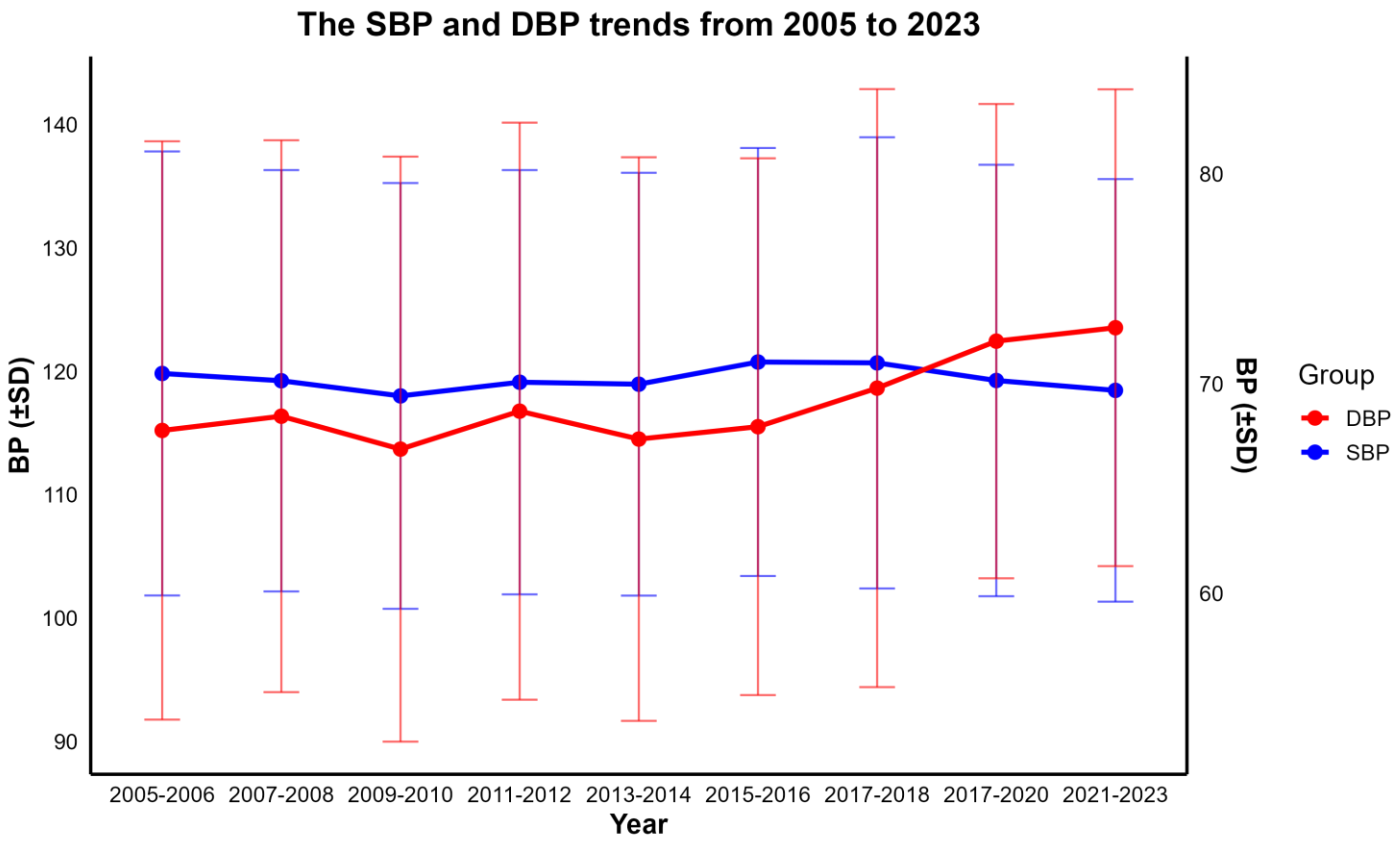
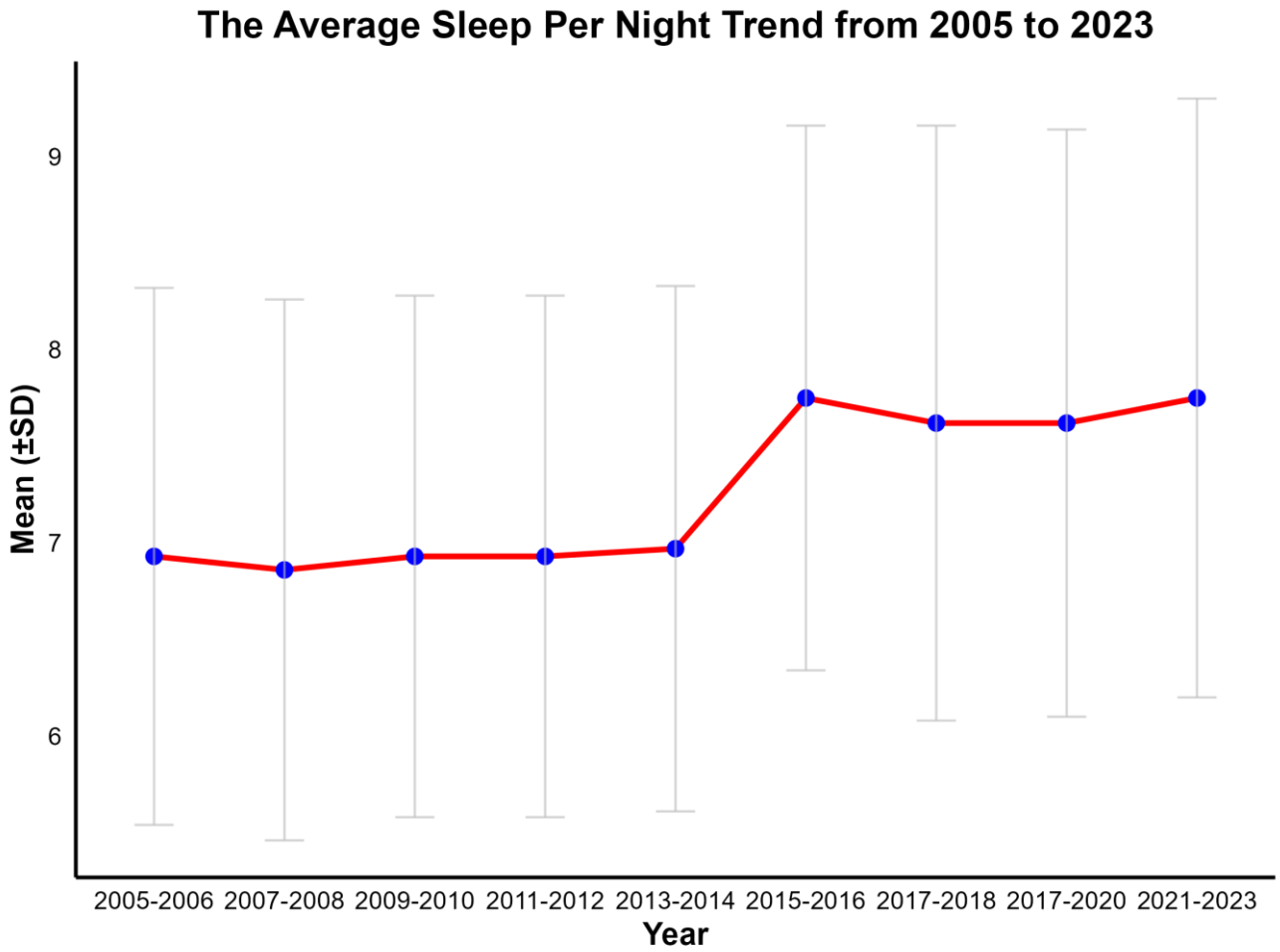


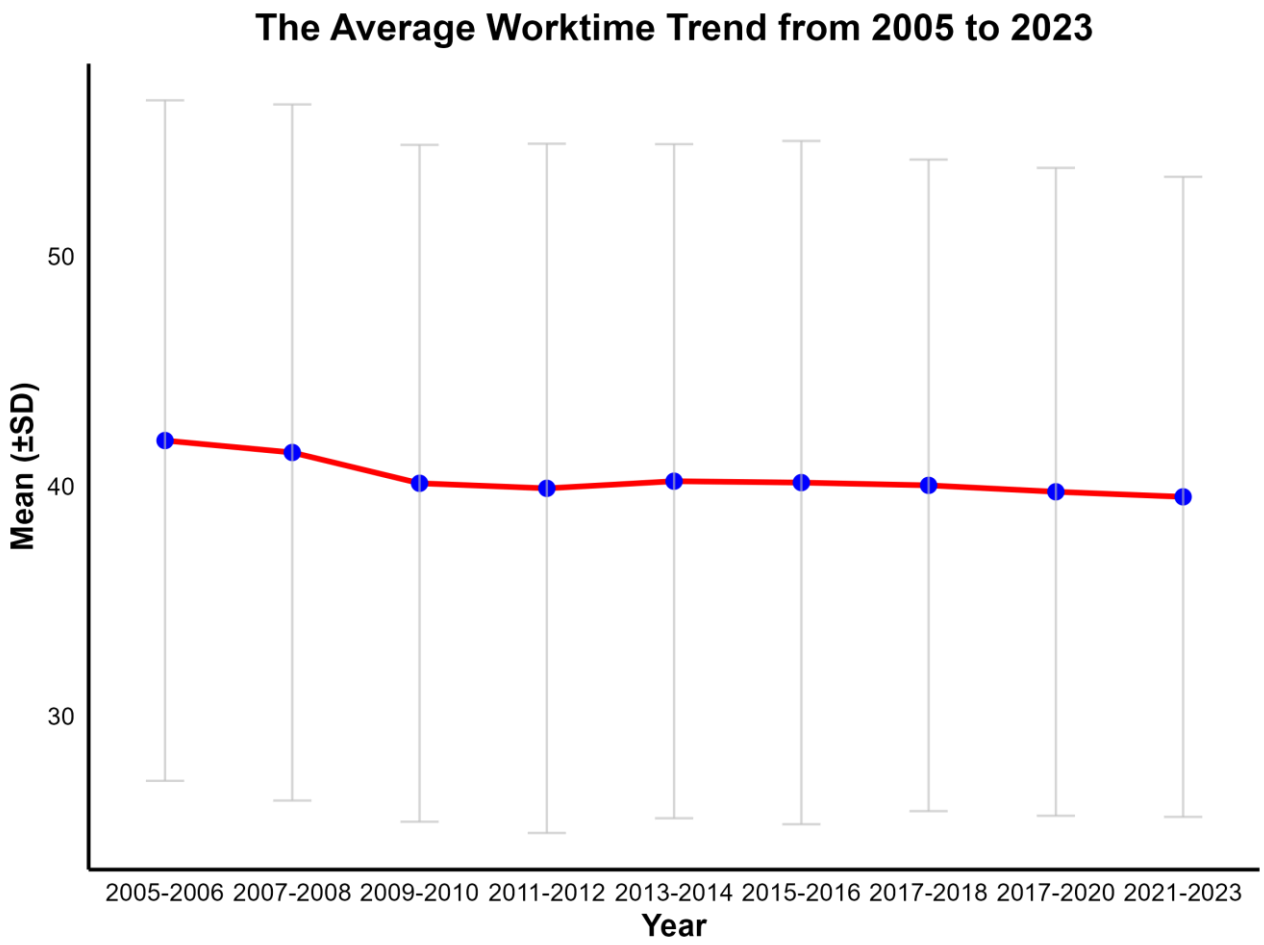
Supplementary Figure 1. Directed acyclic graph (DAG) of depression, lifestyle, and metabolic status. PIR Family income poverty ratio, Life style including sleep time, worktime, exercise metabolic equivalent, Metabolism including obesity and blood pressure. PIR, marital status, diabetes, and hyperlipidemia were considered as confounding factors. Smoking, alcohol consumption, hypertension, and chronic conditions such as coronary heart disease, congestive heart failure, stroke, poorly controlled asthma, liver disease, arthritis, and cancer were considered as potential confounders.



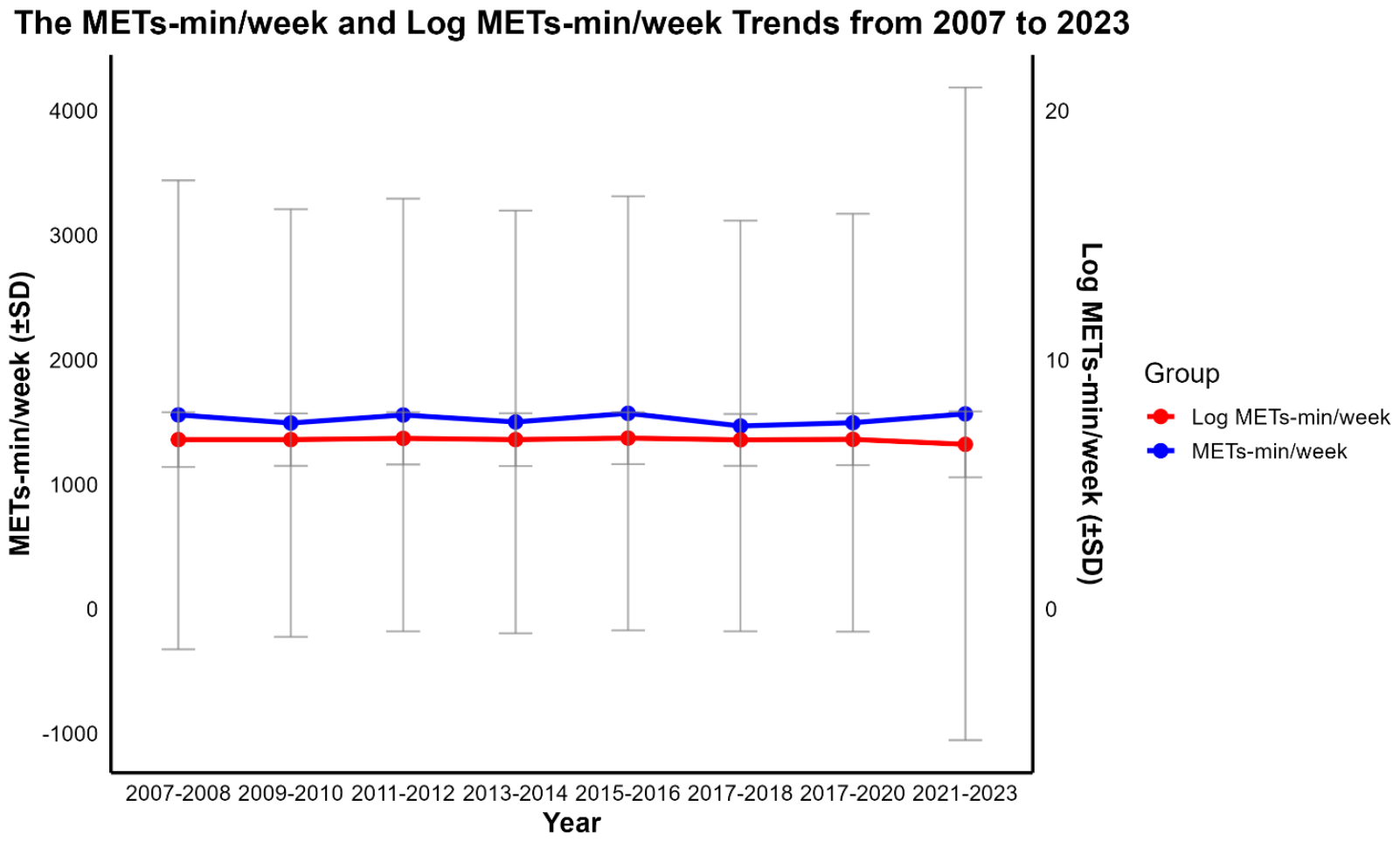
Supplementary Figure 2. Trends in SBP and DBP Among Americans from 2005 to 2023. SBP Systolic blood pressure; DBP diastolic blood pressure. Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.



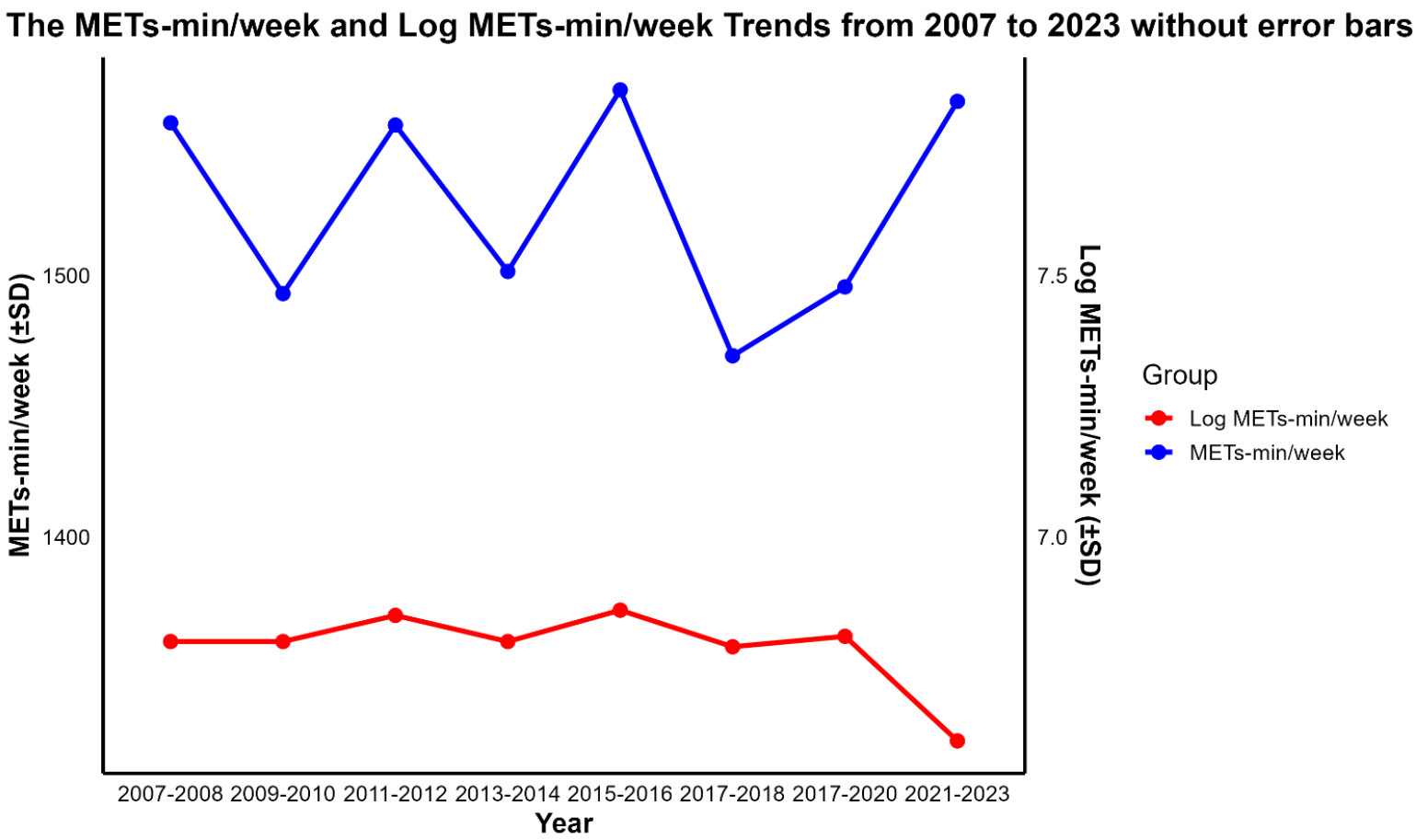
Supplementary Figure 3. Trends in average sleep duration per night Among Americans from 2005 to 2023. Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.



Supplementary Figure 4. Trends in average work time per week Among Americans from 2005 to 2023. Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.



Supplementary Figure 5. Trends in exercise (MET-minutes per week) among Americans from 2007 to 2023. MET metabolic equivalent. Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.



Supplementary Figure 6. Trends in exercise (MET-minutes per week) among Americans from 2007 to 2023 without error bars. MET metabolic equivalent. Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

Supplementary Table 1. Trends in PHQ-9 depression scores and depression status among Americans from 2005 to 2023.

Depression level	Overall	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2017-2020	2021-2023	*P*
No.	1818136185.28	19264801 0.11	19653445 1.10	19540506 6.80	20060847 7.36	21370995 1.66	21140970 8.99	22039553 5.02	21685604 6.56	17056893 7.69	
Score	3.20 (4.31)	2.68 (3.86)	3.19 (4.32)	3.17 (4.47)	3.00 (4.36)	3.18 (4.31)	3.12 (4.13)	3.22 (4.26)	3.22 (4.22)	4.13 (4.74)	<0.0 01
No	166302733 4.3 (91.5)	18139803 7.8 (94.2)	18005311 6.4 (91.6)	17985524 7.2 (92.0)	18445269 0.6 (91.9)	19490661 2.5 (91.2)	19543933 3.7 (92.4)	20089548 7.3 (91.2)	19789457 4.5 (91.3)	14813223 4.4 (86.8)	<0.0 01
Yes	155108851. 0 (8.5)	11249972. 3 (5.8)	16481334. 7 (8.4)	15549819. 6 (8.0)	16155786. 8 (8.1)	18803339. 1 (8.8)	15970375. 3 (7.6)	19500047. 7 (8.8)	18961472. 1 (8.7)	22436703. 3 (13.2)	

Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

Supplementary Table 2. Trends in obesity among Americans from 2005 to 2023.

	Obesity										
level	Overall	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2017-2020	2021-2023	*P*
No.	240606789 4.89	26116317 9.28	26394906 0.48	27106463 7.92	27239329 5.08	27868789 4.28	28029658 7.92	27964885 6.17	27119584 8.68	22766853 5.06	
HT	162.26 (19.21)	162.03 (19.95)	162.09 (19.95)	162.28 (19.70)	162.22 (19.52)	162.29 (19.27)	162.06 (19.07)	162.31 (18.49)	161.94 (19.00)	163.27 (17.57)	0.06 3
BMI	27.06 (7.57)	26.36 (7.27)	26.37 (7.23)	26.61 (7.26)	26.65 (7.29)	27.02 (7.60)	27.30 (7.63)	27.70 (7.85)	27.79 (8.06)	27.85 (7.75)	<0.0 01
WC	92.36 (20.91)	90.32 (20.46)	90.57 (20.45)	91.04 (20.49)	91.56 (20.46)	92.51 (20.99)	93.22 (21.18)	93.99 (21.49)	93.88 (21.33)	94.51 (20.82)	<0.0 01
Wht R	0.57 (0.10)	0.56 (0.10)	0.56 (0.10)	0.56 (0.10)	0.56 (0.10)	0.57 (0.10)	0.57 (0.10)	0.58 (0.11)	0.58 (0.11)	0.58 (0.11)	<0.0 01
High Wht R	172031406 9.3 (71.5)	17555714 4.3 (67.2)	18099210 8.7 (68.6)	18650361 9.4 (68.8)	19095885 1.1 (70.1)	20010586 0.8 (71.8)	20493244 9.4 (73.1)	20396569 0.1 (72.9)	20849999 3.8 (76.9)	16879835 1.7 (74.1)	<0.0 01
Normal Wht R	685753825 .6 (28.5)	85606035. 0 (32.8)	82956951. 8 (31.4)	84561018. 6 (31.2)	81434443. 9 (29.9)	78582033. 5 (28.2)	75364138. 5 (26.9)	75683166. 1 (27.1)	62695854. 9 (23.1)	58870183. 4 (25.9)	

BMI body mass index.

Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

Supplementary Table 3. Trends in BP among Americans from 2005 to 2023

	BP										
level	Overall	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2017-2020	2021-2023	p
No.	23954057 12.40	24856634 6.53	25140244 7.25	25731864 2.32	26337192 6.27	26945824 3.07	27736631 3.48	27621652 6.44	26510618 7.29	28659907 9.76	
SBP	119.38 (17.46)	119.83 (18.00)	119.24 (17.08)	118.01 (17.26)	119.12 (17.20)	118.96 (17.14)	120.76 (17.35)	120.69 (18.29)	119.26 (17.49)	118.46 (17.13)	<0.0 01
DBP	69.11 (13.26)	67.77 (13.79)	68.45 (13.16)	66.88 (13.95)	68.69 (13.76)	67.36 (13.44)	67.95 (12.80)	69.79 (14.26)	72.03 (11.31)	72.67 (11.37)	<0.0 01

BP blood pressure.

Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

Supplementary Table 4. Trends in sleep time per night among Americans from 2005 to 2023

Sleep Duration

level	Overall	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2017-2020	2021-2023	p
No.	219249485 6.95	22592296 4.63	23155292 1.09	23467897 6.97	23943997 8.54	24509475 5.34	24815861 1.07	25449704 2.88	25544901 1.94	25770059 4.49	
Day	7.28 (1.48)	6.93 (1.39)	6.86 (1.40)	6.93 (1.35)	6.93 (1.35)	6.97 (1.36)	7.75 (1.41)	7.62 (1.54)	7.62 (1.52)	7.74 (1.55)	<0.0 01

Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

Supplementary Table 5. Trends in work time per week among Americans from 2005 to 2023

Working hours											
level	Overall	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2017-2020	2021-2023	p
No.	1303151233.03	14146525 1.06	13946982 6.03	13583420 0.91	13749692 5.99	14289367 7.23	15053891 5.47	15113069 5.73	15502262 8.71	14929911 1.89	
Week	40.34 (14.61)	41.99 (14.81)	41.47 (15.15)	40.13 (14.73)	39.91 (15.00)	40.22 (14.67)	40.16 (14.87)	40.04 (14.18)	39.76 (14.10)	39.54 (13.93)	<0.001

Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

Supplementary Table 6. Trends in physical activity (MET-minutes per week) among Americans from 2007 to 2023

Physical Activity Level										
level	Overall	2007-2008	2009-2010	2011-2012	2013-2014	2015-2016	2017-2018	2017-2020	2021-2023	p
No.	1192839293.79	134094494.77	138028780.57	147693916.72	144553092.42	153121796.80	132672121.37	135261767.01	207413324.12	
MET-mins/week	1529.88 (1914.48)	1558.43 (1881.81)	1493.10 (1716.31)	1557.57 (1736.63)	1501.58 (1696.68)	1570.99 (1741.84)	1469.31 (1648.18)	1495.67 (1677.46)	1566.61 (2618.95)	0.609
Log transformed MET-mins/week	6.78 (1.11)	6.80 (1.10)	6.80 (1.05)	6.85 (1.05)	6.80 (1.06)	6.86 (1.04)	6.79 (1.04)	6.81 (1.04)	6.61 (1.32)	<0.001

MET metabolic equivalent.

Due to the COVID-19 pandemic, sampling was paused in 2019-2020. Because of the small sample size, the 2019-2020 period was combined with the 2017-2018 period as a single group. Participants in the 2017-2018 and 2017-2020 periods theoretically overlap.

No physical activity-related questions were collected in 2005-2006.

Supplementary Table 7. Weighted linear regression between depression scores, obesity, and blood pressure

	Model 1			Model 2			Model 3		
	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
BMI	0.14985	0.01201	**<0.0001**	0.14691	0.01228	**<0.0001**	0.09879	0.01106	**<0.0001**
WC	0.2939	0.0281	**<0.0001**	0.38987	0.02921	**<0.0001**	0.2462	0.0256	**<0.0001**
WhtR	0.0025723	0.0001673	**<0.0001**	0.0023632	0.0001764	**<0.0001**	0.0015330	0.0001559	**<0.0001**
SBP	-0.07388	0.02972	**0.0142**	-0.01990	0.02793	0.4774	-0.12027	0.02383	**<0.0001**
DBP	0.06487	0.01738	**0.00028**	0.12013	0.01758	**<0.0001**	0.0882364	0.0169584	**<0.0001**

SE Standard Error; BMI body mass index; WC waist circumference; WhtR waist-to-height ratio; SBP systolic pressure; DBP diastolic pressure.
A p-value less than 0.05 is statistically significant.
Model 1: unadjusted.
Model 2: Adjusted for age group, sex, race/ethnicity, education, marital status, family income poverty ratio.
Model 3: Model 2 plus further adjusted for smoking, drinking, hypertension, diabetes, and comorbidity model.

Supplementary Table 8. Weighted linear regression between depression scores and lifestyle

	Model 1			Model 2			Model 3		
	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
Sleep duration	-0.0237	0.0028	**<0.0001**	-0.0251	0.0028	**<0.0001**	-0.0219	0.0028	**<0.0001**
Working hours	-0.1918	0.0321	**<0.0001**	-0.0148	0.0296	0.6192	-0.0366	0.0306	0.2336
PA level	-0.0250	0.0031	**<0.0001**	-0.0266	0.0032	**<0.0001**	-0.0238	0.0031	**<0.0001**

SE Standard Error; MET metabolic equivalent; PA physical activity.

A p-value less than 0.05 is statistically significant.

Model 1: unadjusted.

Model 2: Adjusted for age group, sex, race/ethnicity, education, marital status, family income poverty ratio.

Model 3: Model 2 plus further adjusted for smoking, drinking, hypertension, diabetes, and comorbidity model.

Supplementary Table 9. Weighted linear regression between lifestyle, obesity, and blood pressure

	Sleep duration			Working hours			PA level		
	Estimate	SE	p	Estimate	SE	p	Estimate	SE	p
BMI	-0.15713	0.03057	**<0.0001**	0.031934	0.003885	**<0.0001**	-0.62212	0.05257	**<0.0001**
WC	-0.25017	0.08154	**0.002686**	0.06682	0.01004	**<0.0001**	-1.9618	0.1313	**<0.0001**
WhtR	-0.001508	0.000486	**0.00239**	0.000405	0.000059	**<0.0001**	-0.012135	0.000776	**<0.0001**
SBP	0.03479	0.05792	0.549209	-0.000975	0.007781	0.9005	-0.1143	0.1109	0.305208
DBP	0.08161	0.05007	0.105845	0.025174	0.006613	**0.000228**	-0.50900	0.08585	**<0.0001**

SE Standard Error; BMI body mass index; WC waist circumference; WhtR waist-to-height ratio; SBP systolic pressure; DBP diastolic pressure; PA physical activity.

A p-value less than 0.05 is statistically significant.

Adjusted for age group, sex, race/ethnicity, education, marital status, family income poverty ratio, smoking, drinking, hypertension, diabetes, and comorbidity model.