

Supplementary Table 1. Baseline characteristics of participants included and excluded in the study

Variables	Included N=8252	Excluded N=31878
Age (mean [SD] in years)	58.6 (5.6)	53.7 (17.9)
Sex (%)		
Men	3446 (41.8)	14053 (44.1),
Women	4806 (58.2)	17825 (55.1)
Race/Ethnicity (%)		
Non-Hispanic White	6492 (78.7)	19463 (61.2)
Non-Hispanic Black	1024 (12.4)	6487 (20.4)
Non-Hispanic Other	146 (1.8)	1367 (4.3)
Hispanic	590 (7.2)	4483 (14.1)
Educational Attainment (%)		
Lower Than High-school	1548 (18.8)	8230 (25.8)
GED	418 (5.1)	1567 (4.9)
High-school graduate	2817 (34.1)	8469 (26.6)
Some College	1796 (21.8)	7390 (23.2)
College and above	1673 (20.3)	6204 (19.5)
Labor Status (%)		
Employed	726 (8.8)	1354 (13.9)
Unemployed	166 (2.0)	65 (0.7)
Retired	2796 (33.9)	6550 (67.3)
Disabled	258 (3.1)	390 (4.0)
Not in labor force	4306 (52.2)	1380 (14.2)
Insurance (%)		
Yes	7436 (90.6)	9266 (95.6)
No	773 (9.4)	426 (4.4)
Smoking (%)		
No smoke	3111 (39.5)	4202 (44.3)
Ever smoke	3117 (39.5)	3980 (41.9)
Current smoke	1659 (21.0)	1311 (13.8)
Depression (%)		
Yes	7254 (87.9)	1595 (19.7)
No	995 (12.1)	6495 (80.3)
BMI (mean [SD])	27.3 (5.1)	25.9 (5.0)
Number of Chronic Diseases (mean [SD])	0.8 (0.9)	1.3 (1.1)

Supplementary Table 2. The association between cumulative average BMI and memory decline

	Model 1 Coefficient 95% CI	p-value	Model 2 Coefficient 95% CI	p-value	Model 3 Coefficient 95% CI	p-value
caBMI	-0.0074 -0.0411, 0.0262	0.665	0.0022 -0.0317, 0.0360	0.900	0.0029 -0.0316, 0.0374	0.869
caBMI*Time	-0.0016 -0.0021, -0.0011	<0.001	-0.0018 -0.0023, -0.0012	<0.001	-0.0017 -0.0023, -0.0011	<0.001
Race/Ethnicity						
Non-Hispanic White	ref		ref		ref	
Non-Hispanic Black	-0.0184 -0.0238, -0.0130	<0.001	-0.0170 -0.0224, -0.0115	<0.001	-0.0167 -0.0222, -0.0112	<0.001
Non-Hispanic Other	-0.0080 -0.0148, -0.0013	0.010	-0.0163 -0.0289, -0.0036	0.012	-0.0151 -0.0278, -0.0023	0.021
Hispanic	-0.0080 -0.0148, -0.0013	0.019	-0.0025 -0.0095, 0.0045	0.482	-0.0028 -0.0100, 0.0043	0.440
Age	-0.0025 -0.0028, -0.0021	<0.001	-0.0024 -0.0028, -0.0021	<0.001	-0.0025 -0.0029, -0.0022	<0.001
Sex						
Men	ref		ref		ref	
Women	-0.0018 -0.0054, 0.0018	0.332	-0.0004 -0.0041, 0.0033	0.838	-0.0014 -0.0052, 0.0024	0.469
Educational Attainment						
Lower Than High-school GED			ref		ref	
			0.0076 -0.0011, 0.0164	0.089	0.0077 -0.0012, 0.0165	0.088
High-school graduate			0.0096 0.0044, 0.0148	0.000	0.0083 0.0029, 0.0136	0.002
Some College			0.0107 0.0050, 0.0164	0.000	0.0098 0.0041, 0.0156	0.001
College and above			0.0144 0.0086, 0.0202	<0.001	0.0121 0.0062, 0.0181	0.000
Labor Status						
Not in labor force			ref		ref	
Employed			0.0035 0.000002, 0.0069	0.050	0.0035 0.00005, 0.0070	0.050

Unemployed	0.0046 -0.0019, 0.0112	0.166	0.0052 -0.0015, 0.0118	0.129
Retired	0.0033 0.0001, 0.0065	0.046	0.0041 0.0008, 0.0073	0.015
Disabled	-0.0006 -0.0069, 0.0056	0.840	0.0016 -0.0049, 0.0080	0.632
Insurance				
No	ref		ref	
Yes	0.0055 0.0019, 0.0092	0.003	0.0055 0.0017, 0.0092	0.004
Smoking				
No smoked			ref	
Ever smoked			-0.0028 -0.0065, 0.0009	0.138
Current smoking			-0.0057 -0.0101, -0.0012	0.012
Depression				
No			ref	
Yes			-0.0030 -0.0053, -0.0006	0.014
Number of Chronic Diseases			-0.0012 -0.0023, -0.0001	0.032

Note. the caBMI was measured in 100-unit scale.

Abbreviations: SD: standard deviation; BMI: Body Mass Index; GED: General Educational Development

Supplementary Table 3. The association between cumulative average BMI and decline in executive function

	Model 1		Model 2		Model 3	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
	95% CI		95% CI		95% CI	
caBMI	0.0043	0.793	0.0162	0.324	0.0223	0.180
	-0.0278, 0.0364		-0.0160, 0.0484		-0.0103, 0.0550	
caBMI*Time	-0.0029	<0.001	-0.0031	<0.001	-0.0028	<0.001
	-0.0034, -0.0024		-0.0036, -0.0025		-0.0034, -0.0021	
Race/Ethnicity						
Non-Hispanic White	ref		ref		ref	
Non-Hispanic Black	-0.0179	<0.001	-0.0154	<0.001	-0.0149	<0.001
	-0.0230, -0.0127		-0.0206, -0.0103		-0.0200, -0.0097	
Non-Hispanic Other	0.0023	0.711	0.0024	0.696	0.0049	0.419
	-0.0097, 0.0143		-0.0096, 0.0144		-0.0071, 0.0170	
Hispanic	-0.0072	0.027	-0.0001	0.984	0.0009	0.783
	-0.0136, -0.0008		-0.0067, 0.0066		-0.0058, 0.0077	
Age	-0.0017	<0.001	-0.0017	<0.001	-0.0016	<0.001
	-0.0021, -0.0014		-0.0020, -0.0014		-0.0020, -0.0013	
Sex						
Men	ref		ref		ref	
Women	-0.0052	0.003	-0.0035	0.050	-0.0038	0.037
	-0.0087, -0.0017		-0.0070, -0.00005		-0.0074, -0.0002	
Educational Attainment						
Lower Than High-school GED			ref		ref	
			0.0132	0.002	0.0137	0.001
			0.0049, 0.0215		0.0054, 0.0220	
High-school graduate			0.0126	<0.001	0.0126	<0.001
			0.0076, 0.0175		0.0076, 0.0176	
Some College			0.0151	<0.001	0.0157	<0.001
			0.0097, 0.0205		0.0102, 0.0211	
College and above			0.0199	<0.001	0.0195	<0.001
			0.0144, 0.0254		0.0139, 0.0251	
Labor Status						
Not in labor force			ref		ref	
Employed			0.0029	0.091	0.0029	0.099
			-0.0005, 0.0063		-0.0005, 0.0063	
Unemployed			0.0077	0.019	0.0081	0.015

Retired	0.0013, 0.0141 0.0022	0.175	0.0016, 0.0146 0.0023	0.157
Disabled	-0.0010, 0.0053 -0.0067	0.032	-0.0009, 0.0055 -0.0061	0.059
Insurance	-0.0127, -0.0006		-0.0124, 0.0002	
No	ref		ref	
Yes	0.0052 0.0017, 0.0088	0.004	0.0052 0.0016, 0.0089	0.005
Smoking				
No smoked			ref	
Ever smoked			-0.0002 -0.0037, 0.0033	0.921
Current smoking			0.0006 -0.0036, 0.0048	0.776
Depression				
No			ref	
Yes			-0.0002 -0.0025, 0.0022	0.897
Number of Chronic Diseases			-0.0018 -0.0029, -0.0007	0.001

Note. the caBMI was measured in 100-unit scale.

Abbreviations: SD: standard deviation; BMI: Body Mass Index; GED: General Educational Development

Supplementary Table 4. The association between cumulative average BMI and cognitive decline among participants without chronic disease at baseline

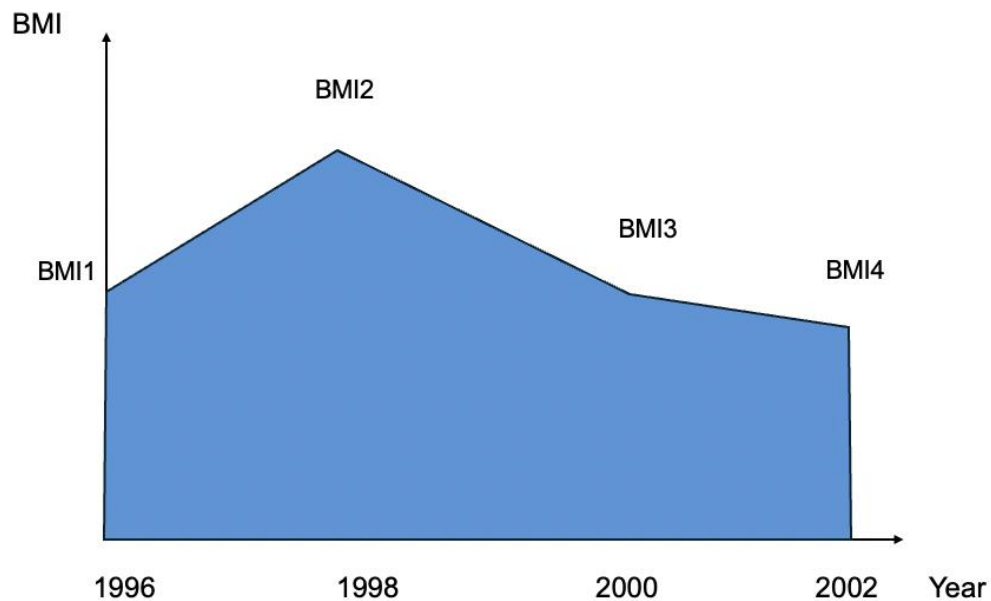
	Global Coeff. 95%CI p-value	Cognition Coeff. 95%CI p-value	Memory Coeff. 95%CI p-value	Executive Function Coeff. 95%CI p-value
caBMI	0.0216 -0.0361, 0.0792 0.464		0.0032 -0.0537, 0.0602 0.912	0.0362 -0.0164, 0.0888 0.177
caBMI*Time	-0.0030 -0.0038, -0.0021 <0.001		-0.0015 -0.0024, -0.0006 0.001	-0.0029 -0.0038, -0.0021 <0.001
Race/Ethnicity				
Non-Hispanic White	ref		ref	ref
Non-Hispanic Black	-0.0244 -0.0337, -0.0152 <0.001		-0.0204 -0.0296, -0.0113 <0.001	-0.0147 -0.0231, -0.0063 0.001
Non-Hispanic Other	-0.0039 -0.0220, 0.0142 0.672		-0.0087 -0.0266, 0.0092 0.339	0.0087 -0.0077, 0.0251 0.300
Hispanic	-0.0008 -0.0118, 0.0101 0.881		0.0017 -0.0091, 0.0125 0.757	-0.0058 -0.0157, 0.0042 0.255
Age	-0.0027 -0.0032, -0.0022 <0.001		-0.0024 -0.0029, -0.0019 <0.001	-0.0013 -0.0017, -0.0008 <0.001
Sex				
Men	ref		ref	ref
Women	0.0002 -0.0055, 0.0060 0.935		0.0003 -0.0054, 0.0060 0.915	-0.0002 -0.0054, 0.0050 0.941
Educational Attainment				
Lower Than High-school GED	ref		ref	ref
High-school graduate	0.0062 -0.0075, 0.0199 0.377		0.0065 -0.0070, 0.0200 0.347	0.0012 -0.0112, 0.0136 0.849
Some College	0.0050 -0.0033, 0.0133 0.240		0.0065 -0.0017, 0.0147 0.122	-0.0016 -0.0092, 0.0060 0.677

		-0.0053, 0.0128	-0.0065, 0.0113	-0.0041, 0.0123
		0.419	0.591	0.330
College and above		0.0072	0.0052	0.0068
		-0.0018, 0.0163	-0.0038, 0.0141	-0.0014, 0.0150
		0.117	0.256	0.102
Labor Status				
Not in labor force	ref		ref	ref
Employed		0.0041	0.0039	0.0017
		-0.0010, 0.0092	-0.0011, 0.0089	-0.0031, 0.0065
		0.112	0.129	0.494
Unemployed		0.0058	0.0044	0.0046
		-0.0039, 0.0155	-0.0052, 0.0140	-0.0047, 0.0139
		0.243	0.368	0.330
Retired		0.0027	0.0036	-0.0009
		-0.0020, 0.0075	-0.0012, 0.0083	-0.0054, 0.0037
		0.253	0.139	0.703
Disabled		0.0052	0.0084	-0.0056
		-0.0074, 0.0179	-0.0042, 0.0209	-0.0177, 0.0065
		0.416	0.191	0.365
Insurance				
No	ref		ref	ref
Yes		0.0085	0.0052	0.0089
		0.0031, 0.0140	-0.0002, 0.0105	0.0038, 0.0141
		0.002	0.058	0.001
Smoking				
Never smoked	ref		ref	ref
Ever smoked		-0.0045	-0.0052	0.0006
		-0.0100, 0.0010	-0.0107, 0.0002	-0.0044, 0.0056
		0.111	0.058	0.820
Current smoking		-0.0065	-0.0068	-0.0009
		-0.0129, -0.00005	-0.0132, -0.0004	-0.0068, 0.0050
		0.048	0.036	0.758
Depression				
No	ref		ref	ref
Yes		-0.0026	-0.0025	-0.0010
		-0.0064, 0.0011	-0.0063, 0.0012	-0.0046, 0.0026
		0.170	0.184	0.581

Note. the caBMI was measured in 100-unit scale.

Abbreviations: SD: standard deviation; BMI: Body Mass Index; GED: General Educational Development

Supplementary Figure 1. Calculation of cumulative BMI and cumulative average BMI



The figure illustrates the calculation of cumulative BMI (cBMI) across multiple time points. For example, BMI values (BMI1, BMI2, BMI3, and BMI4) were recorded at different wave times (e.g., 1996, 1998, 2000, and 2002). According to the trapezoid rule, cumulative BMI was obtained by summing the area under curve. cBMI between 1996 to 2002 could be calculated as $(\text{BMI1} + \text{BMI2}) \times (1998 - 1996)/2 + (\text{BMI2} + \text{BMI3}) \times (2000 - 1998)/2 + (\text{BMI3} + \text{BMI4}) \times (2002 - 2000)/2$. The cumulative average BMI (caBMI) was then calculated by averaging cBMI values by the time intervals. caBMI for period between 1996 and 2002, a 6-year interval, was calculated by dividing the cBMI from 1996 to 2002 by the 6-year duration.