

## Supplementary Online Content

Xie, W, Lundberg DJ, Collins JM, et al. Association of weight loss between early adulthood and midlife with all-cause mortality risk in the US. *JAMA Netw Open*. 2020;3(8):e2013448. doi:10.1001/jamanetworkopen.2020.13448

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

**eTable 1.** Weight Change Categories from Young Adulthood to Midlife

<b>Category</b>	<b>Patterns</b>	<b>BMI at age 25 (Young adulthood)</b>	<b>BMI at 10 years before baseline (Midlife)</b>
<b>Weight maintenance</b>	Normal-normal	18.5-24.9 kg/m <sup>2</sup>	18.5-24.9 kg/m <sup>2</sup>
	Overweight-overweight	25.0-29.9 kg/m <sup>2</sup>	25.0-29.9 kg/m <sup>2</sup>
	Obese-obese	≥ 30.0 kg/m <sup>2</sup>	≥ 30.0 kg/m <sup>2</sup>
<b>Weight gain</b>	Normal-overweight	18.5-24.9 kg/m <sup>2</sup>	25.0-29.9 kg/m <sup>2</sup>
	Normal-obese	18.5-24.9 kg/m <sup>2</sup>	≥ 30.0 kg/m <sup>2</sup>
	Overweight-obese	25.0-29.9 kg/m <sup>2</sup>	≥ 30.0 kg/m <sup>2</sup>
<b>Weight loss</b>	Overweight-normal	25.0-29.9 kg/m <sup>2</sup>	18.5-24.9 kg/m <sup>2</sup>
	Obese-Normal	≥ 30.0 kg/m <sup>2</sup>	18.5-24.9 kg/m <sup>2</sup>
	Obese-overweight	≥ 30.0 kg/m <sup>2</sup>	25.0-29.9 kg/m <sup>2</sup>

**eTable 2.** Adjusted Hazard Ratios of All-cause Mortality for Weight Change Patterns from Midlife to Late Adulthood

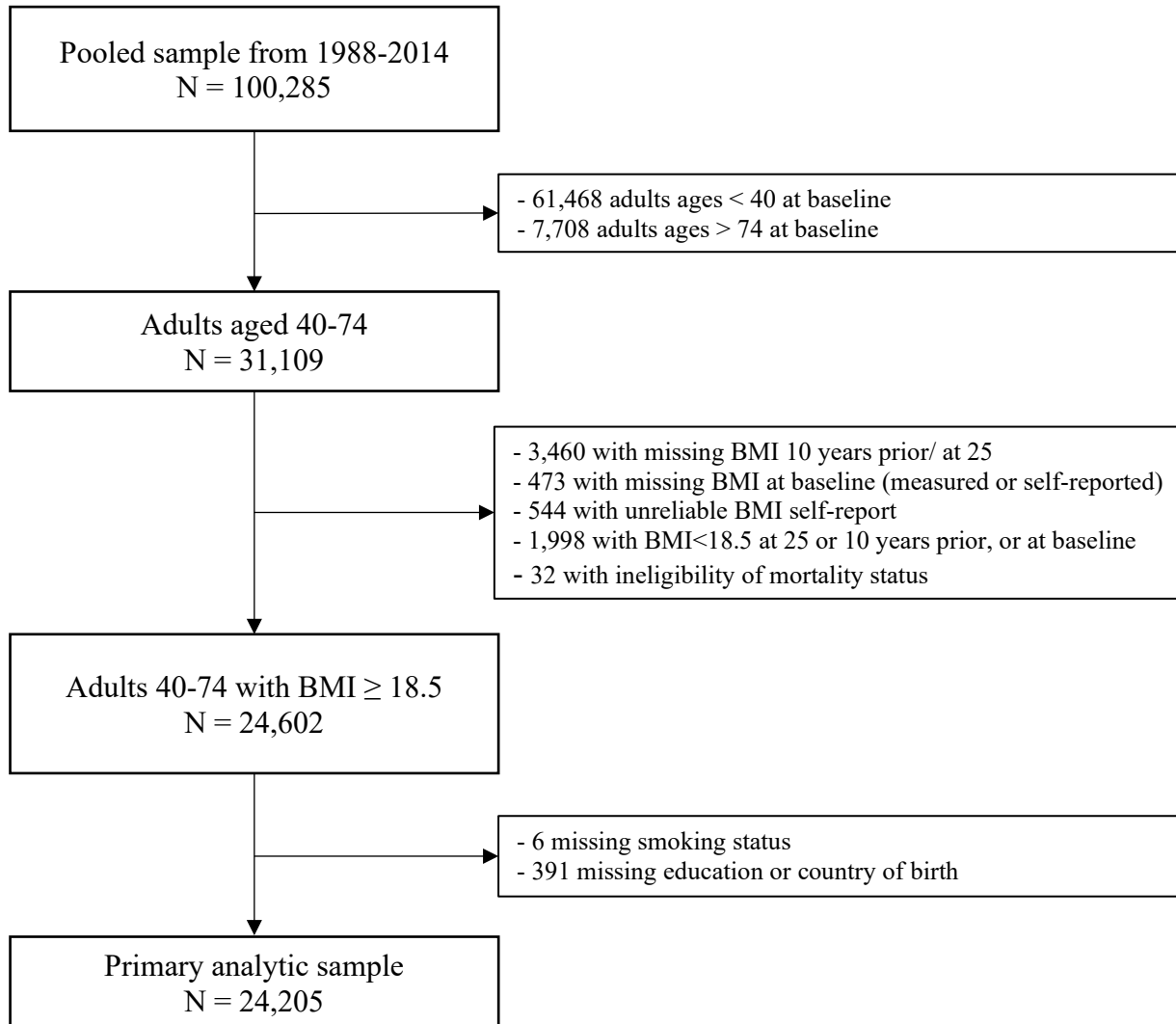
	Weight Change Patterns								
	Weight Maintenance			Weight Gain			Weight Loss		
	Normal - normal	Overweight - overweight	Obese – obese	Normal - overweight	Normal - obese	Overweight - obese	Overweight - normal	Obese - Normal	Obese - overweight
<i>Full sample</i>									
No. of events	1083	1079	1060	595	163	666	389	84	361
Events/1000 py	18.2	19.9	22.3	14.8	15.3	16.8	36.0	50.4	32.2
Age-adjusted HR <sup>‡</sup> (95% CI)	1 [Reference]	1.02 (0.91-1.15)	1.51 (1.34-1.69)	0.95 (0.83-1.08)	1.54 (1.26-1.88)	1.18 (1.06-1.32)	1.73 (1.43-2.09)	2.87 (1.94-4.25)	1.77 (1.44-2.17)
Multivariable adjusted HR (95% CI) <sup>†</sup>	1 [Reference]	0.96 (0.85-1.09)	1.54 (1.37-1.73)	0.97 (0.85-1.11)	1.52 (1.24-1.87)	1.20 (1.06-1.35)	1.44 (1.19-1.75)	2.04 (1.33-3.15)	1.58 (1.30-1.92)
<i>Never smokers</i>									
No. of events	299	369	425	174	54	243	113	16	142
Events/1000 py	11.1	14.6	16.9	8.9	11.6	11.9	28.1	34.2	29.8
Age-adjusted HR <sup>‡</sup> (95% CI)	1 [Reference]	1.21 (0.98-1.51)	1.87 (1.58-2.21)	1.01 (0.77-1.33)	1.75 (1.15-2.67)	1.27 (1.02-1.56)	1.87 (1.39-2.51)	3.94 (1.70-3.54)	2.45 (1.70-3.54)
Multivariable adjusted HR (95% CI) <sup>†</sup>	1 [Reference]	1.09 (0.87-1.36)	1.66 (1.38-1.98)	0.96 (0.72-1.27)	1.60 (1.04-2.46)	1.15 (0.93-1.42)	1.68 (1.24-2.27)	3.09 (1.65-5.79)	2.06 (1.41-3.01)
Abbreviations: HR, hazard ratio; CI, confidence interval									
<sup>‡</sup> Age at baseline (continuous).									
<sup>†</sup> Adjusted for age at baseline (years); sex (male, female); race (non-Hispanic white, non-Hispanic black, Hispanic, and other), education (less than high school, high school or equivalent, college and above), nativity (U.S.-born, and non-U.S.-born), smoking status (never, former and current) and survey year (continuous).									

<b>eTable 3.</b> Adjusted Hazard Ratios of All-cause Mortality for Risk Reduction and Residual Risk Hypotheses, Assessing Weight Change from Midlife to Late Adulthood							
		Full sample			Never smokers		
		HR <sup>†</sup>	95% CI		HR <sup>†</sup>	95% CI	
	<i>Risk reduction</i>						
	Obese-overweight (ref: obese-obese)	1.02	0.85	1.23	1.25	0.87	1.79
	Overweight-normal (ref: overweight-overweight)	1.50	1.26	1.78	1.54	1.17	2.03
	<i>Residual risk</i>						
	Obese-overweight (ref: overweight-overweight)	1.64	1.38	1.95	1.89	1.35	2.66
	Overweight-normal (ref: normal-normal)	1.44	1.19	1.75	1.68	1.24	2.27

Abbreviations: HR, hazard ratio; CI, confidence interval; ref, reference

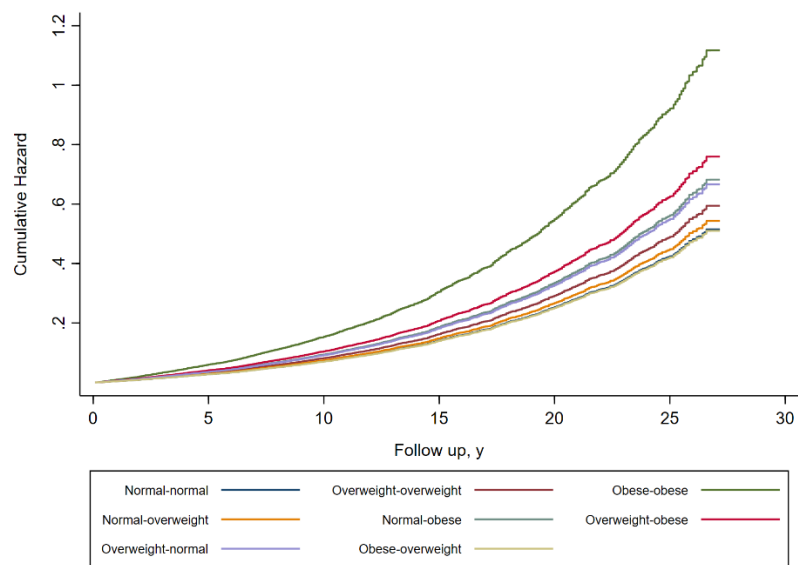
<sup>†</sup> Adjusted for age at baseline (years); sex (male, female); race (non-Hispanic white, non-Hispanic black, Hispanic, and other), education (less than high school, high school or equivalent, college and above), nativity (U.S.-born, and non-U.S.-born), smoking status (never, former and current) and survey year (continuous).

**eFigure 1.** Study Inclusion/Exclusion Criteria for Analytic Sample, NHANES 1988-1994 & 1999-2016



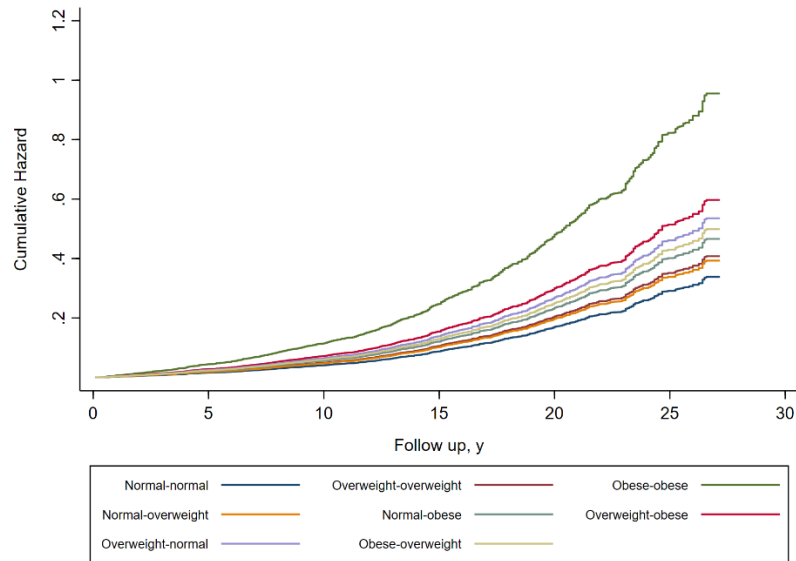
**eFigure 2.** Adjusted Cumulative Hazard Curves of All-cause Mortality for Selected Weight Change Patterns from Young Adulthood to Midlife

**A. Full sample**



No. at risk							
Normal-normal	8622	6694	4484	2519	1723	551	
Overweight-overweight	2836	2142	1328	701	426	148	
Obese-obese	1415	962	535	267	154	34	
Normal-overweight	6379	4890	3068	1598	980	269	
Normal-obese	2295	1633	893	402	229	62	
Overweight-obese	2404	1728	957	460	272	77	
Overweight-normal	363	275	187	104	67	21	
Obese-overweight	215	168	99	44	26	4	

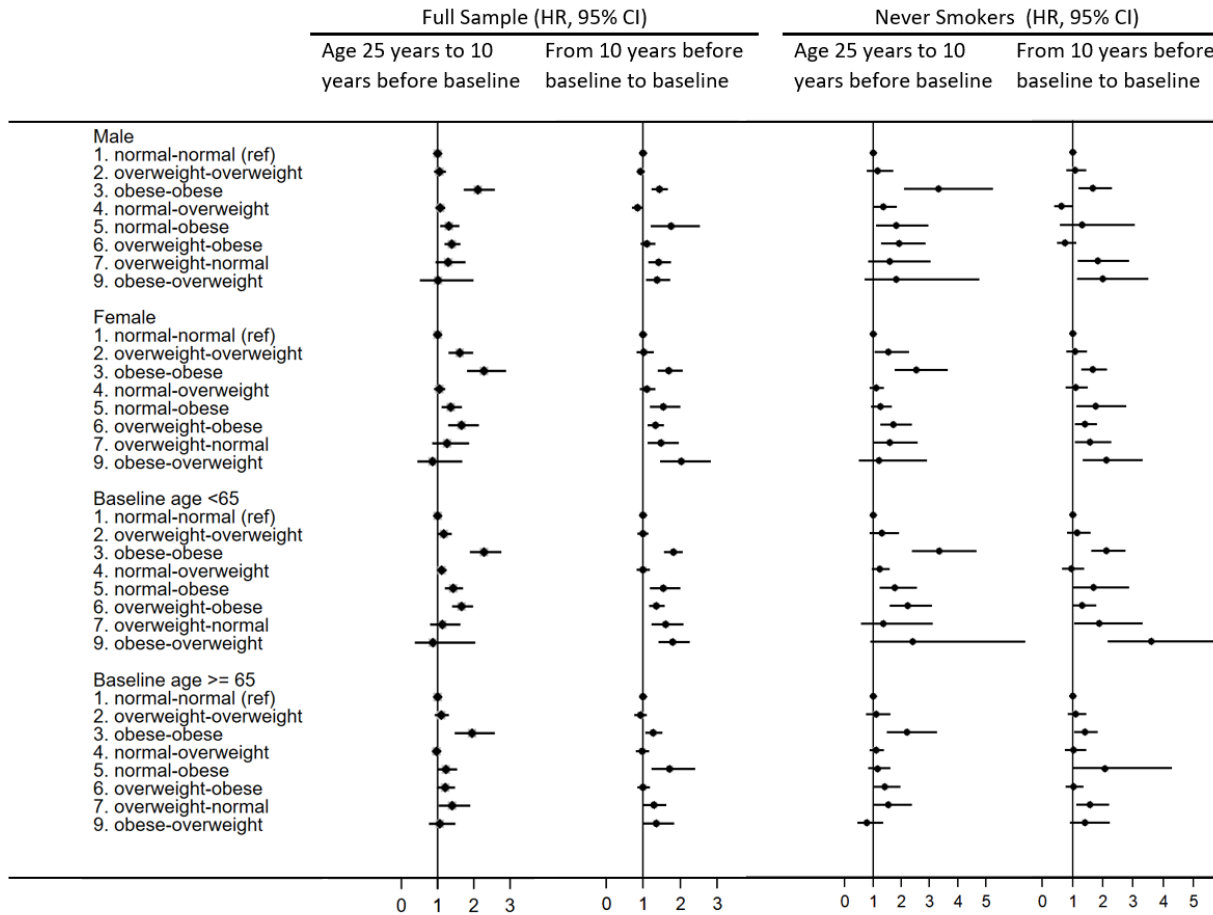
## B. Never smokers



No. at risk							
	Normal-normal	4023	3102	2049	1173	801	233
	Overweight-overweight	1277	951	570	293	173	55
	Obese-obese	735	495	274	130	68	15
	Normal-overweight	3146	2384	1484	777	476	124
	Normal-obese	1181	854	482	224	127	35
	Overweight-obese	1159	839	465	218	125	31
	Overweight-normal	139	109	70	39	26	7
	Obese-overweight	82	67	41	22	12	2

Notes: Curves were adjusted for age at baseline (years); sex (male, female); race (non-Hispanic white, non-Hispanic black, Hispanic, and other), education (less than high school, high school or equivalent, college and above), nativity (U.S.-born, and non-U.S.-born), smoking status (never, former and current) and survey year (continuous).

**eFigure 3.** Adjusted Hazard Ratios of All-cause Mortality for Weight Change Patterns across Adulthood by Baseline Age and Sex



Notes: estimated HRs were adjusted for age at survey (years); sex (male, female); race (non-Hispanic white, non-Hispanic black, Hispanic, and other), education (less than high school, high school or equivalent, college and above), nativity (U.S.-born, and non-U.S.-born), smoking status (never, former and current) and survey year (continuous).