

Appendix

Gestational Weight Change in a Diverse Observational Pregnancy Cohort and Mortality Over 50 Years

Stefanie N. Hinkle, PhD^{1,2}, Sunni L. Mumford, PhD^{1,2}, Katherine L. Grantz, MD³, Pauline Mendola, PhD⁴, James L. Mills, MD³, Edwina H. Yeung, PhD³, Anna Z. Pollack, PhD⁵, Sonia M. Grandi, PhD^{6,7}, Rajeshwari Sundaram, PhD⁸, Yan Qiao, MPH⁹, Enrique F. Schisterman, PhD^{1,2*}, Cuilin Zhang, PhD^{10,11*}

AFFILIATIONS:

¹ Department of Biostatistics, Epidemiology and Informatics, Perelman School of Medicine, University of Pennsylvania, 423 Guardian Drive, 812 Blockley Hall, Philadelphia, PA 19140, USA

² Department of Obstetrics and Gynecology, Perelman School of Medicine, University of Pennsylvania, 3701 Market Street, Philadelphia, PA 19104

³ Epidemiology Branch, Division of Population Health Research, Division of Intramural Research, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, National Institutes of Health, 6710B Rockledge Drive, Bethesda, Maryland 20817, USA

⁴ Department of Epidemiology and Environmental Health, School of Public Health and Health Professions, University at Buffalo, 270 Farber Hall, Buffalo, New York 14214, USA

⁵ Global and Community Health Department, College of Public Health, George Mason University, 4400 University Drive, Fairfax, Virginia 22030 USA

⁶ Child Health Evaluative Sciences, The Hospital for Sick Children, 686 Bay Street, Toronto, Ontario, M5G 0A4, Canada

⁷ Division of Epidemiology, Dalla Lana School of Public Health, University of Toronto, 155 College St Room 500, Toronto, Ontario, M5T 3M7, Canada

⁸ Biostatistics and Bioinformatics Branch, Division of Population Health Research, Division of Intramural Research, *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, National Institutes of Health, 6710B Rockledge Drive, Bethesda, Maryland 20817, USA

⁹ The Prospective Group, 8280 Willow Oaks Corporate Dr, Ste. 600, Fairfax, VA 22031, USA

¹⁰ Global Center for Asian Women's Health and Bia-Echo Asia Centre for Reproductive Longevity & Equality, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

¹¹ Department of Obstetrics and Gynecology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

* Joint senior authors for the study

CORRESPONDING AUTHOR: Dr. Stefanie N. Hinkle, Department of Biostatistics, Epidemiology and Informatics, Department of Obstetrics and Gynecology, Perelman School of Medicine, University of Pennsylvania. Email: stefanie.hinkle@penmedicine.upenn.edu.

Figure S1. Study sample flow chart.

Enrolled Pregnant Participants (n=48,197 participants; 55,908 pregnancies)

- *Limit to last CPP Pregnancy*

n=48,197 participants; n=48,197 pregnancies

- *Exclude participants missing critical identifiable linkage information (n=1637)*
- *Exclude participants who died during pregnancy (n=9)*
- *Exclude participants with a non-singleton birth (n=524)*

Analytic Sample (n=46,042)

Figure S2. Comparison of gestational weight change quintiles to the 2009 National Academy of Medicine recommendations by pre-pregnancy body mass index category.

Pre-pregnancy BMI, kg/m ²	Gestational Weight Change, kg																																															
	-12	-11	-10	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
< 18.5 ^a	Quintile 1											Quintile 2					Quintile 3			Quintile 4			Quintile 5																									
	Below																Within						Above																									
18.5-24.9 ^b	Quintile 1											Quintile 2					Quintile 3			Quintile 4			Quintile 5																									
	Below																Within						Above																									
25.0-29.9 ^c	Quintile 1											Quintile 2					Quintile 3			Quintile 4			Quintile 5																									
	Below																Within						Above																									
≥ 30.0 ^d	Quintile 1											Quintile 2					Quintile 3			Quintile 4			Quintile 5																									
	Below																Within						Above																									

Abbreviations: BMI, body mass index; National Academy of Medicine, NAM.

Note: Cutoffs are approximated in the figure for visualization.

^a The NAM recommends¹ that pregnant people with a pre-pregnancy BMI < 18.5 kg/m² gain between 12.5 to 18.0 kg; the cutoffs for quintiles 1 to 5 are: -12.7 to 7.3, 7.7 to 9.5, 10.0 to 11.8, 12.2 to 14.1, and 14.5 to 34.5 kg, respectively.

^b The NAM recommends that pregnant people with pre-pregnancy BMI of 18.5-24.9 kg/m² gain between 11.5-16.0 kg; the cutoffs for quintiles 1 to 5 are: -12.7 to 6.4, 6.8 to 8.6, 9.1 to 10.9, 11.3 to 13.2, 13.6 to 34.5 kg, respectively.

^c The NAM recommends that pregnant people with pre-pregnancy BMI of 25.0-29.9 kg/m² gain between 7.0-11.5 kg; the cutoffs for quintiles 1 to 5 are: -12.7 to 4.5, 5.0 to 7.3, 7.7 to 10.0, 10.4 to 12.7, 13.2 to 34.0, respectively.

^d The NAM recommends that pregnant people with pre-pregnancy BMI of ≥ 30.0 kg/m² gain between 5.0-9.0 kg; the cutoffs for quintiles 1 to 5 are: -12.7 to 1.4, 1.8 to 5.0, 5.4 to 8.2, 8.6 to 11.8, 12.2 to 34.0, respectively.

Table S1. List of International Classification of Disease-10 Codes for Cause-Specific Mortality.

Cause of Death	ICD-10^a
Cardiovascular	I00-I78, I80-I99
Cancer	C00-C97
Diabetes	E10-E14
Respiratory ^b	J09-J18, J40-J47
Infections ^c	A00-B99
Dementia	F01, F03, G30, G31.0, G31.83
Kidney disease	N00-N07, N17-N19, N25-N27
Chronic liver disease	K70, K73-K74
Cardiovascular Causes	
Hypertensive disease	I10-I13
Ischemic heart disease	I20-I25
Arrhythmia	I44-I49
Heart failure	I50
Cerebrovascular disease	I60-I69
Atherosclerosis or other disease of the arteries	I70-I78

^a Comparable ICD-9 codes were used for deaths that occurred prior to the inception of ICD-10 codes.

^b Includes pneumonia, influenza, chronic obstructive pulmonary disease, and allied conditions

^c Other than pneumonia/influenza

^d The dementia category of death was based on the CDC definition of dementia mortality including deaths due to Alzheimer's disease, unspecified dementia, vascular dementia, and other degenerative diseases of nervous system, not elsewhere classified.²

Table S2. List covariates, their definition, and functional form.

Covariate at index pregnancy (last CPP pregnancy)	Definition and Functional Form in Models
Age, years	Continuous.
Smoking status	Categorical: Non-smoking (< 1 cigarette per day at enrollment; reference), 1-4 cigarettes per day, 5-9 cigarettes per day, 10-19 cigarettes per day, ≥20 cigarette per day. Cut points determined according to quartiles among smokers.
Pre-pregnancy body mass index, kg/m ²	Calculated from self-reported pre-pregnancy weight and self-reported pre-pregnancy height. Continuous.
Race/ethnicity	Categorical: White (reference); Black; Puerto Rican; other ^a
Education	Categorical: <High School; Some high school (reference); High School Graduate; Some College.
Family income (yearly)	Categorical: ≤\$1999; \$2000-3999 (reference); \$4000-5999; \$6000-7999; \$8000-9999; ≥\$10000.
Parity	Categorical: 0 (reference); 1; 2; 3; ≥4.
Pregnancy loss	Categorical: 0 (reference); ≥1.
Marital status	Categorical: single; married/common law (reference); other.
Pre-pregnancy diabetes	Categorical: Yes, No (reference)
Pre-pregnancy cardiovascular conditions	Cardiovascular conditions included hypertension, rheumatic fever, and any other cardiovascular diseases. Categorical: Yes, No (reference)
Pre-pregnancy respiratory conditions	Respiratory conditions included tuberculosis, asthma, other chronic pulmonary diseases, and other conditions requiring thoracic surgery. Categorical: Yes, No (reference)
Pre-pregnancy renal conditions	Renal conditions included pyelitis, glomerulonephritis and other conditions requiring kidney, urinary, or bladder surgery. Categorical: Yes, No (reference)
Pre-pregnancy neurological conditions	Neurological conditions included neuromuscular diseases, convulsive disorders, psychosis, alcohol or drug addiction, or other neurological diseases. Categorical: Yes, No (reference)
Pre-pregnancy cancer/tumors	Cancer and tumors included any history of cancer, and gastrointestinal, kidney, urinary, bladder, or gynecological tumors. Categorical: Yes, No (reference)
Gestational weeks at delivery	Calculated using date of last menstrual period. Continuous.
Site	Categorical: Boston (reference); Buffalo; New Orleans; NY/Columbia; Baltimore; Virginia; Minnesota; NY/Medical; Oregon; Pennsylvania; Providence; Tennessee
Year	Continuous.

^a Race and ethnicity were collected from participants during study enrollment by in-person interview. The original CPP forms categorized race as ‘White’, ‘Negro’ (herein referred to as ‘Black’), ‘Oriental’ (herein referred to as ‘Asian’), ‘Puerto Rican’, and ‘Other’. For this manuscript ‘other’ and ‘Asian’ are collapsed into a single ‘other’ category due to a small number of women who identified as Asian.

Table S3. Missing exposure, covariate, and cause of death data.

Variable	n (% missing)
Total weight change	6284 (13.6%)
Age	2 (<0.0%)
Smoking status	1612 (3.5%)
Pre-pregnancy body mass index	5353 (11.6%)
Race	0 (0.0%)
Education	2415 (5.3%)
Family income	4773 (10.4%)
Parity	1645 (3.6%)
Pregnancy loss	1380 (3.0%)
Marital status	5 (<0.0%)
Pre-pregnancy diabetes	661 (1.4%)
Pre-pregnancy cardiovascular conditions	717 (1.6%)
Pre-pregnancy respiratory conditions	717 (1.6%)
Pre-pregnancy renal conditions	717 (1.6%)
Pre-pregnancy neurological conditions	717 (1.6%)
Pre-pregnancy cancer/tumors	717 (1.6%)
Gestational weeks at delivery	2591 (5.6%)
Site	0 (0.0%)
Year	0 (0.0%)
Cause of death ^a	2003 (11.2%)

^a Percentage of missing cause of death estimated among deaths (n=17,901).

^b All variables listed were included in the imputation model.

Table S4. Demographic and pregnancy characteristics of study participants, n=46042.

Characteristics ^a	n (%)
Age, years	
< 20	10144 (22.0)
20-24	16666 (36.2)
25-29	9917 (21.5)
30-34	5415 (11.8)
≥ 35	3898 (8.5)
Race/ethnicity	
White	21287 (46.2)
Black	20839 (45.3)
Puerto Rican	3440 (7.5)
Other	476 (1.0)
Pre-pregnancy BMI Status, kg/m ²	
<18.5	3809 (9.4)
18.5-24.9	27921 (68.6)
25.0-29.9	6251 (15.4)
≥ 30.0	2708 (6.7)
Parity	
0	13241 (29.8)
1	10071 (22.7)
2	7236 (16.3)
3	4934 (11.1)
≥ 4	8915 (20.1)
Marital Status	
Single	6886 (15.0)
Married/common law	35154 (76.4)
Other	3997 (8.7)
Smoking ^b , cigarettes per day	
Non-smoking	24543 (55.2)
1-4	4533 (10.2)
5-9	3196 (7.2)
10-19	5510 (12.4)
≥20	6648 (15.0)
Income, annual USD	
≤1999	5859 (14.2)
2000-3999	18232 (44.2)
4000-5999	10085 (24.4)
6000-7999	4412 (10.7)
8000-9999	1568 (3.8)
≥10000	1113 (2.7)
Education	
<High School	7983 (18.3)
Some high school	17141 (39.3)
High School Graduate	13103 (30.0)
Some College	5400 (12.4)
Prior Pregnancy Loss	
No	22405 (50.2)
Yes	22257 (49.8)
Preexisting diabetes ^c	
No	44644 (98.4)
Yes	737 (1.6)
Preexisting cardiovascular conditions ^d	
No	39981 (88.2)
Yes	5344 (11.8)
Preexisting respiratory conditions ^e	
No	41901 (92.5)
Yes	3424 (7.6)
Preexisting renal conditions	
No	41418 (91.4)
Yes ^f	3907 (8.6)
Preexisting neurological conditions ^g	
No	40808 (90.0)
Yes	4517 (10.0)
Preexisting cancer/tumors	
No	43587 (96.2)

Yes ^h	1738 (3·8)
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Abbreviations: BMI, body mass index; USD, United States dollars.

^a Missing data: total weight change n=6284; age, n=2; pre-pregnancy BMI, n=5353; parity n=1645; marital status, n=5; smoking, n=1612; income, n=4773; education, n=2415; prior pregnancy loss, n=1380; Preexisting diabetes, n=661; Preexisting cardiovascular conditions, n=717; Preexisting respiratory conditions, n=717; Preexisting renal conditions, n=717; Preexisting neurological conditions, n=717; Preexisting cancer/tumors, n=717.

^b Categories determined according to quartiles among smokers.

^c Type unknown.

^d Cardiovascular conditions included hypertension, rheumatic fever, and any other cardiovascular diseases.

^e Respiratory conditions included tuberculosis, asthma, other chronic pulmonary diseases, and other conditions requiring thoracic surgery.

^f Renal conditions included pyelitis, glomerulonephritis and other conditions requiring kidney, urinary, or bladder surgery.

^g Neurological conditions included neuromuscular diseases, convulsive disorders, psychosis, alcohol or drug addiction, or other neurological diseases.

^h Cancer and tumors included any history of cancer, and gastrointestinal, kidney, urinary, bladder, or gynecological tumor.

Table S5. Total gestational weight change classified according to the 2009 National Academy of Medicine recommendations and the association with all-cause mortality (n=46,042).

Pre-pregnancy BMI Status, kg/m ²	Weight Change by 2009 NAM Recommendation		
	Below	Within	Above
< 18·5	All-Cause Mortality		
%	68·2%	26·6%	5·3%
Mortality rate per 1000 person years (95% CI) ^b	6·9 (6·5, 7·3)	5·9 (5·3, 6·6)	6·5 (5·2, 8·2)
Unadjusted HR (95% CI)	1·18 (1·04, 1·33)	1 (Reference)	1·09 (0·80, 1·47)
Adjusted HR (95% CI) ^c	1·11 (0·97, 1·26)	1 (Reference)	1·14 (0·86, 1·51)
18·5 – 24·9			
%	67·4%	24·5%	8·2%
Mortality rate per 1000 person years (95% CI) ^b	7·3 (7·1, 7·5)	7·1 (6·8, 7·3)	7·8 (7·4, 8·3)
Unadjusted HR (95% CI)	1·04 (0·99, 1·09)	1 (Reference)	1·11 (1·02, 1·20)
Adjusted HR (95% CI) ^c	0·98 (0·93, 1·03)	1 (Reference)	1·09 (1·01, 1·18)
25·0 – 29·9			
%	37·8%	34·5%	27·7%
Mortality rate per 1000 person years (95% CI) ^b	11·1 (10·6, 11·7)	10·0 (9·4, 10·6)	10·3 (9·7, 11·0)
Unadjusted HR (95% CI)	1·12 (1·03, 1·23)	1 (Reference)	1·03 (0·94, 1·14)
Adjusted HR (95% CI) ^c	1·08 (0·99, 1·18)	1 (Reference)	1·12 (1·01, 1·24)
≥ 30·0			
%	40·7%	24·5%	34·7%
Mortality rate per 1000 person years (95% CI) ^b	14·9 (13·9, 16·0)	14·1 (12·8, 15·4)	14·0 (12·9, 15·1)
Unadjusted HR (95% CI)	1·09 (0·97, 1·23)	1 (Reference)	1·00 (0·88, 1·14)
Adjusted HR (95% CI) ^c	1·01 (0·89, 1·15)	1 (Reference)	1·03 (0·90, 1·18)

Abbreviations: BMI, body mass index; CI, confidence interval; HR, hazard ratio; National Academy of Medicine, NAM.

^a Recommendations for total gestational weight gain (2009): Pre-pregnancy BMI <18·5 kg/m² (12·5-18·0 kg); 18·5-24·9 kg/m² (11·5-16·0 kg); 25·0-29·9 kg/m² (7·0-11·5 kg); ≥ 30·0 kg/m² (5·0-9·0 kg).

^b Mortality rate estimated obtained from a single imputed dataset.

^c Analyses adjusted for the following index pregnancy variables: age, smoking, race/ethnicity, parity, marital status, income, education, preexisting diabetes, preexisting cardiovascular conditions, preexisting cancer/tumors, preexisting neurological conditions, preexisting renal conditions, preexisting respiratory conditions, prior pregnancy loss, site, study year, pre-pregnancy body mass index, gestational week at delivery. Missing data multiply imputed.

Table S6. Total gestational weight change in pre-pregnancy body mass index specific quintiles and the adjusted association with all-cause mortality stratified by pre-pregnancy body mass index (n=46,042).

Pre-pregnancy BMI Status (kg/m ²)	Total Gestational Weight Change ^a				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
< 18.5					
Range of weight change, kg	-12.7 to 7.3	7.7 to 9.5	10.0 to 11.8	12.2 to 14.1	14.5 to 34.5
Median Weight Change (IQR), kg	5.9 (4.1, 6.8)	8.6 (8.2, 9.1)	10.9 (10.4, 11.3)	13.2 (12.7, 13.6)	16.3 (15.0, 18.1)
Mortality rate per 1000 person years (95% CI) ^b	7.4 (6.6, 8.2)	7.0 (6.2, 7.8)	6.4 (5.7, 7.1)	6.0 (5.2, 6.8)	6.2 (5.5, 7.0)
Unadjusted HR (95% CI)	1.18 (1.00, 1.39)	1.13 (0.95, 1.33)	1 (Reference)	0.95 (0.79, 1.15)	0.97 (0.82, 1.16)
Adjusted HR (95% CI) ^c	1.14 (0.95, 1.37)	1.13 (0.96, 1.34)	1 (Reference)	0.98 (0.82, 1.18)	1.04 (0.87, 1.24)
18.5 – 24.9					
Range of weight change, kg	-12.7 to 6.4	6.8 to 8.6	9.1 to 10.9	11.3 to 13.2	13.6 to 34.5
Median Weight Change (IQR), kg	4.5 (2.7, 5.9)	7.7 (7.3, 8.2)	10 (9.5, 10.4)	12.2 (11.8, 12.7)	15.4 (14.1, 17.7)
Mortality rate per 1000 person years (95% CI) ^b	8.1 (7.8, 8.4)	7.0 (6.7, 7.3)	6.8 (6.6, 7.1)	7.0 (6.7, 7.3)	7.4 (7.1, 7.8)
Unadjusted HR (95% CI)	1.20 (1.12, 1.27)	1.02 (0.96, 1.09)	1 (Reference)	1.01 (0.95, 1.08)	1.09 (1.02, 1.16)
Adjusted HR (95% CI) ^c	1.07 (1.01, 1.14)	0.98 (0.92, 1.04)	1 (Reference)	1.01 (0.95, 1.08)	1.09 (1.02, 1.16)
25.0 – 29.9					
Range of weight change, kg	-12.7 to 4.5	5.0 to 7.3	7.7 to 10.0	10.4 to 12.7	13.2 to 34.0
Median Weight Change (IQR), kg	2.3 (0.0, 3.6)	6.4 (5.4, 6.8)	9.1 (8.2, 9.5)	11.3 (10.9, 12.2)	15.9 (14.1, 18.1)
Mortality rate per 1000 person years (95% CI) ^b	11.3 (10.5, 12.1)	11.0 (10.2, 11.8)	9.8 (9.1, 10.5)	9.9 (9.2, 10.8)	10.5 (9.7, 11.3)
Unadjusted HR (95% CI)	1.15 (1.03, 1.28)	1.14 (1.01, 1.29)	1 (Reference)	1.01 (0.88, 1.15)	1.07 (0.95, 1.20)
Adjusted HR (95% CI) ^c	1.09 (0.98, 1.22)	1.15 (1.02, 1.30)	1 (Reference)	1.08 (0.95, 1.22)	1.18 (1.05, 1.32)
≥ 30.0					
Range of weight change, kg	-12.7 to 1.4	1.8 to 5.0	5.4 to 8.2	8.6 to 11.8	12.2 to 34.0
Median Weight Change (IQR), kg	-1.8 (-4.5, 0.0)	3.6 (2.7, 4.5)	6.8 (5.9, 7.7)	10.0 (9.1, 10.9)	15.0 (13.6, 18.6)
Mortality rate per 1000 person years (95% CI) ^b	14.8 (13.4, 16.3)	15.1 (13.6, 16.7)	14.0 (12.7, 15.4)	13.9 (12.5, 15.4)	14.2 (12.7, 15.7)
Unadjusted HR (95% CI)	1.10 (0.95, 1.27)	1.12 (0.96, 1.30)	1 (Reference)	1.01 (0.85, 1.18)	1.04 (0.89, 1.22)
Adjusted HR (95% CI) ^c	1.00 (0.85, 1.18)	1.05 (0.89, 1.24)	1 (Reference)	1.03 (0.87, 1.23)	1.09 (0.92, 1.29)

Abbreviations: BMI, body mass index; CI, confidence interval; IQR, interquartile range; HR, hazard ratio.

^a Quintiles of gestational weight change were defined within each pre-pregnancy BMI category. The minimum weight change was -12.7 kg; however, the 5th percentile was -4.5 kg. The maximum weight change was 34.0 kg; however, the 95th percentile was 18.1 kg.

^b Mortality rate estimated obtained from a single imputed dataset.

^c Analyses adjusted for the following index pregnancy variables: age, smoking, race/ethnicity, parity, marital status, income, education, preexisting diabetes, preexisting cardiovascular conditions, preexisting cancer/tumors, preexisting neurological conditions, preexisting renal conditions, preexisting respiratory conditions, prior pregnancy loss, site, study year, pre-pregnancy body mass index, gestational week at delivery. Missing data multiply imputed.

Table S7. Total pregnancy weight change classified according to the 2009 National Academy of Medicine recommendations and the association with cause specific mortality due to cancer, respiratory disease, infection, dementia, kidney disease, and liver disease stratified by pre-pregnancy body mass index.

Mortality Cause by Pre-pregnancy BMI, kg/m ²	Adjusted ^a HR (95% CI)		
	Weight Change by 2009 NAM Recommendations		
	Below	Within	Above
Cancer			
<18.5	1.03 (0.80, 1.31)	1 (Reference)	0.98 (0.60, 1.60)
18.5-24.9	1.02 (0.94, 1.10)	1 (Reference)	1.06 (0.92, 1.23)
25.0-29.9	1.07 (0.91, 1.26)	1 (Reference)	0.98 (0.82, 1.17)
≥30.0	0.92 (0.69, 1.22)	1 (Reference)	0.90 (0.66, 1.23)
Respiratory Disease			
<18.5	0.96 (0.64, 1.42)	1 (Reference)	0.37 (0.08, 1.66)
18.5-24.9	1.22 (1.02, 1.46)	1 (Reference)	1.05 (0.76, 1.44)
25.0-29.9	1.39 (0.97, 2.00)	1 (Reference)	1.16 (0.76, 1.76)
≥30.0	1.07 (0.63, 1.83)	1 (Reference)	1.10 (0.59, 2.04)
Infection			
<18.5	-- ^b	1 (Reference)	--
18.5-24.9	0.92 (0.69, 1.22)	1 (Reference)	1.18 (0.77, 1.81)
25.0-29.9	1.41 (0.82, 2.41)	1 (Reference)	1.58 (0.92, 2.72)
≥30.0	0.77 (0.40, 1.48)	1 (Reference)	
Dementia			
<18.5	1.03 (0.50, 2.14)	1 (Reference)	0.84 (0.16, 4.33)
18.5-24.9	1.03 (0.75, 1.40)	1 (Reference)	1.24 (0.77, 1.97)
25.0-29.9	1.04 (0.67, 1.60)	1 (Reference)	1.04 (0.64, 1.69)
≥30.0	1.03 (0.47, 2.25)	1 (Reference)	
Kidney Disease			
<18.5	--	1 (Reference)	--
18.5-24.9	1.01 (0.69, 1.47)	1 (Reference)	1.02 (0.53, 1.96)
25.0-29.9	0.85 (0.50, 1.45)	1 (Reference)	0.99 (0.56, 1.76)
≥30.0	1.17 (0.56, 2.47)	1 (Reference)	
Liver Disease			
<18.5	1.17 (0.39, 3.50)	1 (Reference)	1.99 (0.27, 14.86)
18.5-24.9	1.11 (0.76, 1.62)	1 (Reference)	0.90 (0.41, 1.95)
25.0-29.9	1.05 (0.47, 2.38)	1 (Reference)	1.28 (0.57, 2.91)
≥30.0	--	1 (Reference)	--

Abbreviations: BMI, body mass index; CI, confidence interval; HR, hazard ratio; National Academy of Medicine, NAM.

^a Analyses adjusted for the following index pregnancy variables: age, smoking, race, parity, marital status, income, education, preexisting diabetes, preexisting cardiovascular conditions, preexisting cancer/tumors, preexisting neurological conditions, preexisting renal conditions, preexisting respiratory conditions, prior pregnancy loss, site, study year, pre-pregnancy body mass index, gestational week at delivery. Missing data multiply imputed.

^b Outcome could not be assessed due to small number of outcomes.

Table S8. Total pregnancy weight change z-score in pre-pregnancy body mass index specific quintiles and the adjusted association with all-cause mortality stratified by pre-pregnancy body mass index (n=46,042).

Pre-pregnancy BMI Status, kg/m ²	Total Pregnancy Weight Change Z-Score ^a				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
< 18.5					
Unadjusted HR (95% CI)	1.12 (0.94, 1.33)	1.08 (0.91, 1.28)	1 (Reference)	0.93 (0.77, 1.12)	0.99 (0.82, 1.19)
Adjusted HR (95% CI) ^b	1.10 (0.92, 1.31)	1.10 (0.92, 1.31)	1 (Reference)	0.98 (0.81, 1.18)	1.06 (0.88, 1.28)
18.5 – 24.9					
Unadjusted HR (95% CI)	1.17 (1.09, 1.25)	0.97 (0.91, 1.04)	1 (Reference)	1.00 (0.94, 1.07)	1.08 (1.01, 1.16)
Adjusted HR (95% CI) ^b	1.08 (1.01, 1.15)	0.96 (0.90, 1.02)	1 (Reference)	1.00 (0.93, 1.06)	1.08 (1.01, 1.16)
25.0 – 29.9					
Unadjusted HR (95% CI)	1.06 (0.94, 1.19)	1.06 (0.95, 1.19)	1 (Reference)	0.95 (0.85, 1.06)	1.01 (0.90, 1.13)
Adjusted HR (95% CI) ^b	1.04 (0.92, 1.17)	1.04 (0.93, 1.16)	1 (Reference)	1.01 (0.90, 1.13)	1.10 (0.97, 1.24)
≥ 30.0					
Unadjusted HR (95% CI)	1.04 (0.89, 1.21)	1.03 (0.88, 1.21)	1 (Reference)	1.02 (0.86, 1.20)	0.98 (0.83, 1.14)
Adjusted HR (95% CI) ^b	0.97 (0.83, 1.14)	0.99 (0.83, 1.17)	1 (Reference)	1.02 (0.85, 1.22)	0.98 (0.83, 1.16)

Abbreviations: BMI, body mass index; CI, confidence interval; HR, hazard ratio.

^a Quintiles of pregnancy weight change z-score were defined within each pre-pregnancy BMI category.

^b Analyses adjusted for the following index pregnancy variables: age, smoking, race, parity, marital status, income, education, preexisting diabetes, preexisting cardiovascular conditions, preexisting cancer/tumors, preexisting neurological conditions, preexisting renal conditions, preexisting respiratory conditions, prior pregnancy loss, site, study year, pre-pregnancy body mass index. Missing data multiply imputed.

Table S9. Quantitative bias analysis to examine the impact of exposure misclassification on the observed associations.

Pre-pregnancy BMI Status, kg/m ²	SE ^a	SP ^a	Below vs. Within 2009 NAM Recommendations			Above vs. Within 2009 NAM Recommendations		
			Bias Corrected Adjusted RR ^a	Observed Adjusted RR ^c	Observed Adjusted HR ^d	Bias Corrected Adjusted RR ^b	Observed Adjusted RR ^c	Observed Adjusted HR ^d
< 18.5								
Hypothesized bias estimates	0.9	0.9	1.08	1.06	1.11 (0.97, 1.26)	1.12	1.09	1.14 (0.86, 1.51)
Worse SE by .1	0.8	0.9	1.09			1.14		
Worse SP by .1	0.9	0.8	1.09			1.14		
Worse SE and SP by .1	0.8	0.8	1.11			1.16		
18.5 – 24.9								
Hypothesized bias estimates	0.9	0.9	0.97	0.98	0.98 (0.93, 1.03)	1.10	1.08	1.09 (1.01, 1.18)
Worse SE by .1	0.8	0.9	0.97			1.11		
Worse SP by .1	0.9	0.8	0.97			1.11		
Worse SE and SP by .1	0.8	0.8	0.96			1.13		
25.0 – 29.9								
Hypothesized bias estimates	0.9	0.9	1.07	1.06	1.08 (0.99, 1.18)	1.11	1.08	1.12 (1.01, 1.24)
Worse SE by .1	0.8	0.9	1.08			1.13		
Worse SP by .1	0.9	0.8	1.08			1.12		
Worse SE and SP by .1	0.8	0.8	1.09			1.14		
≥ 30.0								
Hypothesized bias estimates	0.9	0.9	1.02	1.02	1.01 (0.89, 1.15)	1.03	1.02	1.03 (0.90, 1.18)
Worse SE by .1	0.8	0.9	1.02			1.04		
Worse SP by .1	0.9	0.8	1.02			1.04		
Worse SE and SP by .1	0.8	0.8	1.03			1.04		

Abbreviations: BMI, body mass index; SE, sensitivity; SP, specificity. RR, relative risk; HR, hazard ratio; National Academy of Medicine, NAM.

^a Bias corrected adjusted RR were estimated for each scenario of SE and SP using the quantitative bias analysis tools for exposure misclassification by Fox et al (2021).³

^b Because the readily available methods to assess exposure misclassification are based on estimating a relative risk and not a hazard ratio, we estimated a comparable adjusted relative risk based on the observed outcomes.

^c Observed adjusted HR reported in Figure 1 and Table S5.

Table S5. Quantitative bias analysis to examine the impact of outcome misclassification on the observed associations.

Pre-pregnancy BMI Status, kg/m ²	SE ^a	SP ^a	Below vs. Within 2009 NAM Recommendations			Above vs. Within 2009 NAM Recommendations		
			Bias Corrected Adjusted RR ^b	Observed Adjusted RR ^c	Observed Adjusted HR ^d	Bias Corrected Adjusted RR ^b	Observed Adjusted RR ^c	Observed Adjusted HR ^d
< 18·5								
Genealogist Bias Estimates	0·87	0·84	1·13	1·06	1·11 (0·97, 1·26)	1·20	1·09	1·14 (0·86, 1·51)
Perfect SE	1	0·84	1·13					
Perfect SP	0·87	1	1·06					
Worse SE by ·1	0·77	0·84	1·13					
Worse SP by ·1	0·87	0·74	1·38					
Worse SE and SP by ·1	0·77	0·74	1·38					
18·5 – 24·9								
Genealogist Bias Estimates	0·87	0·84	0·96	0·98	0·98 (0·93, 1·03)	1·14	1·08	1·09 (1·01, 1·18)
Perfect SE	1	0·84	0·96					
Perfect SP	0·87	1	0·98					
Worse SE by ·1	0·77	0·84	0·96					
Worse SP by ·1	0·87	0·74	0·92					
Worse SE and SP by ·1	0·77	0·74	0·92					
25·0 – 29·9								
Genealogist Bias Estimates	0·87	0·84	1·08	1·06	1·08 (0·99, 1·18)	1·13	1·08	1·12 (1·01, 1·24)
Perfect SE	1	0·84	1·08					
Perfect SP	0·87	1	1·06					
Worse SE by ·1	0·77	0·84	1·08					
Worse SP by ·1	0·87	0·74	1·12					
Worse SE and SP by ·1	0·77	0·74	1·12					
≥ 30·0								
Genealogist Bias Estimates	0·87	0·84	1·02	1·02	1·01 (0·89, 1·15)	1·03	1·02	1·03 (0·90, 1·18)
Perfect SE	1	0·84	1·02					
Perfect SP	0·87	1	1·02					
Worse SE by ·1	0·77	0·84	1·02					
Worse SP by ·1	0·87	0·74	1·03					
Worse SE and SP by ·1	0·77	0·74	1·03					

Abbreviations: BMI, body mass index; SE, sensitivity; SP, specificity. RR, relative risk; HR, hazard ratio; National Academy of Medicine, NAM.

^a We obtained estimates of sensitivity and specificity of 0·87 and 0·84, respectively, that are specific to our data by comparing the vital status classification used in the paper, which is a combination of the NDI and SSDMF, and compared it to the vital status determined by an expert genealogist among a random sample of 1250 participants. See Pollack et al (2020)⁴ for more details on the genealogist assessment. We have varied these estimates to make them either perfect (1·0) or worse by 10% to show how the RR could be altered depending on more or less varied scenarios of sensitivity and specificity.

^b Bias corrected adjusted RR were estimated for each scenario of SE and SP using the quantitative bias analysis tools for outcome misclassification by Fox et al (2021).³

^c Because the readily available methods to assess outcome misclassification are based on estimating a relative risk and not a hazard ratio, we estimated a comparable adjusted relative risk based on the observed outcomes.

^d Observed adjusted HR and 95% CI reported in Table 2.

SUPPLEMENTAL REFERENCES

1. Weight Gain During Pregnancy: Reexamining the Guidelines. Washington, DC: Institute of Medicine and National Research Council, 2009.
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