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. Weight Change Categories from Young Adulthood to Midlife

| Category           | Patterns          | BMI at age 25 (Young adulthood) | BMI at 10 years before baseline (Midlife) |
|--------------------|-------------------|---------------------------------|------------------------------------------|
| **Weight maintenance** | Normal-normal     | 18.5-24.9 kg/m²                | 18.5-24.9 kg/m²                          |
|                    | Overweight-overweight | 25.0-29.9 kg/m²              | 25.0-29.9 kg/m²                          |
|                    | Obese-obese       | ≥ 30.0 kg/m²                  | ≥ 30.0 kg/m²                             |
| **Weight gain**    | Normal-overweight | 18.5-24.9 kg/m²                | 25.0-29.9 kg/m²                          |
|                    | Normal-obese      | 18.5-24.9 kg/m²                | ≥ 30.0 kg/m²                             |
|                    | Overweight-obese  | 25.0-29.9 kg/m²                | ≥ 30.0 kg/m²                             |
| **Weight loss**    | Overweight-normal | 25.0-29.9 kg/m²                | 18.5-24.9 kg/m²                          |
|                    | Obese-Normal      | ≥ 30.0 kg/m²                  | 18.5-24.9 kg/m²                          |
|                    | Obese-overweight  | ≥ 30.0 kg/m²                  | 25.0-29.9 kg/m²                          |
**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 - normal | Normal - obese | Overweight - obese | Overweight - normal | Obese - Normal | Obese - overweight |
| ***Full sample***       |                    |             |             |               |                |                |                   |               |                   |
| 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† (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)† | 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) |
| ***Never smokers***    |                    |             |             |               |                |                |                   |               |                   |
| 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† (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)† | 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
† Age at baseline (continuous).
‡ 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).
**eTable 3. Adjusted Hazard Ratios of All-cause Mortality for Risk Reduction and Residual Risk Hypotheses, Assessing Weight Change from Midlife to Late Adulthood**

|                   | Risk reduction                  | Residual risk                   |
|-------------------|--------------------------------|--------------------------------|
|                   | Full sample                     | Never smokers                   |
|                   | HR†  | 95% CI     | HR†  | 95% CI     |
| Obese-obese (ref:  | 1.02 | 0.85 1.23  | 1.25 | 0.87 1.79  |
| Overweight-normal (ref:  | 1.50 | 1.26 1.78  | 1.54 | 1.17 2.03  |
| Obese-obese (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
† 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

Pooled sample from 1988-2014
N = 100,285

- 61,468 adults ages < 40 at baseline
- 7,708 adults ages > 74 at baseline

Adults aged 40-74
N = 31,109

- 3,460 with missing BMI 10 years prior/ at 25
- 473 with missing BMI at baseline (measured or self-reported)
- 544 with unreliable BMI self-report
- 1,998 with BMI<18.5 at 25 or 10 years prior, or at baseline
- 32 with ineligibility of mortality status

Adults 40-74 with BMI ≥ 18.5
N = 24,602

- 6 missing smoking status
- 391 missing education or country of birth

Primary analytic sample
N = 24,205
eFigure 2. Adjusted Cumulative Hazard Curves of All-cause Mortality for Selected Weight Change Patterns from Young Adulthood to Midlife

A. Full sample

| Weight Change Pattern   | Baseline | 5-Year | 10-Year | 15-Year | 20-Year | 25-Year | 30-Year |
|-------------------------|----------|--------|---------|---------|---------|---------|---------|
| Normal-normal           | 8622     | 6694   | 4484    | 2519    | 1723    | 551     |
| Overweight-normal       | 2836     | 2142   | 1328    | 701     | 426     | 148     |
| Obese-normal            | 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       |

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B. Never smokers

| No. at risk          | 0  | 5  | 10 | 15 | 20 | 25 | 30 |
|----------------------|----|----|----|----|----|----|----|
| 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).
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).