The skinny on BMI and mortality

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Clinical question
How are body mass index (BMI) and mortality associated?

Bottom line
Normal (20-25 kg/m²) to overweight (25-30 kg/m²) BMI carries the lowest risk of mortality (lowest around 25 kg/m² [27.5 kg/m² in the elderly]). Mortality increases below 20 and above 30 kg/m² (more at the extremes).

Evidence
Various systematic reviews of observational studies in the general population evaluate all-cause mortality and BMI.1-10

- The review with the most studies1 (97 studies, 2.88 million participants) found the following relative risks (RRs) compared with normal BMI (18.5-24.9 kg/m²):
  - overweight (25.0-29.9 kg/m²), RR = 0.94;
  - obese, grade I (30.0-35.0 kg/m²), RR = 0.95; and
  - obese, grade II or higher (BMI > 35 kg/m²), RR = 1.29.

- The review with the most participants2 (8 studies, 5.8 million participants) found the following hazard ratios (HRs) for men compared with high-normal BMI (22.5-24.9 kg/m²):
  - low BMI (< 18.5 kg/m²), HR = 1.88;
  - low-normal BMI (18.5-19.9 kg/m²), HR = 1.39;
  - mid-normal BMI (20.0-22.4 kg/m²), HR = 1.15;
  - low overweight (25.0-27.4 kg/m²), HR = 0.97;
  - high overweight (27.5-29.9 kg/m²), HR = 1.04; and
  - obese, grade I (30.0-35.0 kg/m²), HR = 1.18.

- The third largest study3 (19 studies, 1.46 million participants) found the following HRs for women compared with high-normal BMI (22.5-24.9 kg/m²):
  - BMI below 18.5 kg/m², HR = 1.25;
  - BMI 20.0 to 27.4 kg/m², very similar risk throughout range (HR = 1.03-1.05); and
  - above 27.5 kg/m², mortality increases with BMI (27.5-30.0 kg/m²), HR = 1.14; 40.0-50.0 kg/m², HR = 2.13.

- Other studies had similar findings.4-6 Meta-analyses had similar findings for those with diabetes. For the elderly (≥65 years),1,8 being overweight lowered risk (best at 27.5 kg/m²).8 For those with pre-existing cardiovascular disease,9,10 chronic obstructive pulmonary disease,11 or hemodialysis,12 overweight and grade I obesity conferred similar risk4 or reduced risk10-12 relative to normal BMI.

Context
- Confidence intervals not presented above: trends of risk cannot prove causation.
- Observational studies cannot prove causation.
- The BMI indicates weight for height: weight (in kg) divided by height (in m²); BMI does not indicate fitness level.13
- Guidelines recommend BMI to assess obesity and need for intervention in those who are overweight or obese.14,15

Implementation
While BMI can be useful in population studies, application to individuals might not be ideal.16 The Edmonton Obesity Staging System,17 adopted by the World Obesity Federation, has been validated in large cohorts and predicts mortality better than BMI.17 It offers a useful approach to identifying those who might benefit from more clinical attention.18 New resources to help clinicians are available from the Canadian Obesity Network (www.obesitynetwork.ca).

References