Reviewer's report

Title: Who counts as normal? Using maximum weight to redefine body mass index categories in studies of the mortality risks of obesity

Version: 1 Date: 8 January 2014

Reviewer: Lennert Veerman

Reviewer's report:

This is a good paper on an important and controversial topic. The question is well-defined, the methods are appropriate and well described. The data are sound and publicly available. The limitation of self-reported maximum BMI acknowledged and the direction of any potential bias is discussed, though perhaps not fully (see below). The discussion and conclusion are balanced and supported by the findings. The title is okay although it suggests a discussion piece rather than a study that proves the concept. The abstract is fine and the article is well-written and easy to read. On the whole, I find this a very insightful paper and have only a few minor comments.

Compulsory revisions

Table 1 displays standard deviations that are remarkably wide. I have no problem with those for age, but can't explain the SDs for the remaining characteristics. And since this table describes the study sample, SDs are irrelevant. The sample is what it is, and I don't think it is appropriate to apply weights to account for the survey design, which I suppose accounts for the large SDs. Please consider removing it, and if need be, add (a) column(s) for the population-weighted characteristics.

More of a clarification than necessarily a revision: in Table 3, the HRs are consistently lower than expected based on the ratio of the mortality rates, except for the 2.69 for the obese class 1 who had a normal weight at the time of survey. I assume this is because the HRs are not based on the mortality rates, but on separate calculations in which adjustment is made for gender, race/ethnicity, etc.? If so, I am reassured. For the benefit of other readers, perhaps this could be explained in the legend or footnote.

Discretionary Revisions

Estimates of p for trend could be added to Table 2, although they would change nothing in the interpretation, so I'd consider this optional.

I would argue that subjects are more likely to have underestimated their maximum BMI rather than overestimated it, which would lead to under-estimation of the mortality rates in the obese categories and over-estimation in the normal weight reference group, with inflated hazard ratios as a result. Unless there is good evidence to make such underestimation of BMI unlikely, I would recommend commenting on this in the discussion section.
In the discussion where prior studies that have introduced alternative measures of BMI are discussed, I would suggest that also Davey-Smith’s BMJ paper that uses off-spring BMI as exposure measure merits mention (BMJ 2009;339:b5043).

**Level of interest:** An article of outstanding merit and interest in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**
I declare that I have no competing interests. At worst I could be biased on account of my BMI, which is in the low-normal range, and always has been.