BMI: A comparison between self-reported and measured data in two population-based samples

Technical report

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1. BACKGROUND

Body Mass Index (BMI) is an index of weight-for-height that is used to classify underweight, overweight and obesity in adults. It is defined as weight in kilograms divided by the square of height in metres (kg/m^2). The classification of weight status according to BMI is found below in Table 1 (WHO, 1995).

Table 1: International classification of adult underweight, overweight, and obesity according to BMI

Classification	BMI (kg/m^2)
Underweight	<18.50
Normal range	18.50-24.99
Overweight	≥25.00
Obese	≥30.00

Source: Adapted from *World Health Organization: BMI classification* (World Health Organization, n.d.)

The validity of self-reported BMI data is a long-standing question posed by researchers from around the world. Some studies indicate that self-report data is not a valid measure due to social desirability bias or lack of knowledge or recall. Specifically, weight tends to be under-estimated while height is over-estimated, which can lead to a misclassification of BMI status (Bowman & DeLucia, 1992; Engstrom, Paterson, Doherty, Trabulsi, & Speer, 2003; Lin, 2007). Conversely, other authors have suggested that, overall, self-reported BMI can be a valid measure for population-level weight status (Stommel & Schoenborn, 2009).

Data from the 1989/1990 Life in New Zealand Survey were analysed to compare self-reported and measured BMI within the same sample of mostly European 40 to 50-year-olds. The findings suggest that height was slightly over-reported and weight was reported without statistically significant bias. While this resulted in a statistically significant underestimation of BMI, the classification of BMI categories had agreement between self-reported and measured data. It is recognised, however, that the age of the data and the lack of representativeness of the sample pose as limitations in this study (Sharples, Crutchley, Garcia, Gray, & Horwath, 2012).

In the absence of a recent, nationally representative, within-sample assessment of BMI validity, two New Zealand population surveys are available to compare self-reported BMI in one study with measured BMI in the other. The Health Promotion Agency (HPA) collected self-reported height and weight data in its 2012 Health and Lifestyles Survey (HLS) while the Ministry of Health collected measured height and weight data in its 20011-12 New Zealand Health Survey. As both surveys are nationally representative and methodologically rigorous, their findings are comparable for analytic purposes (Health Promotion Agency, 2013; Ministry of Health, 2012).

In the 2012 HLS, adults aged 15 and over were interviewed in their homes and asked to enter their height and weight on the interviewer's laptop computer. In order to reduce bias, the data were collected confidentially – the interviewer turned the computer around to the respondent for him or her to enter the information and, subsequently, the respondent progressed the screen so that the interviewer did not have the opportunity to view the height or weight data (Health Promotion

Agency, 2013). BMI was calculated during data analysis from the reported values for height and weight.

The Nutrition Survey used trained interviewers to measure the height and weight of adults aged over 15 years in an at-home interview. Standardised protocols helped to ensure that accurate, consistent data were measured using a portable stadiometer and electronic scale (Ministry of Health, 2012).

The objective of the current study was to assess the distribution of self-reported BMI in the HLS with measured BMI in the New Zealand Health Survey to evaluate the validity of the former as an indicator of weight category in subsequent analyses. The purpose of collecting BMI in the HLS was *not* to measure overweight/obese prevalence in the population. Rather, it was collected as a means of comparing health behaviours and attitudes by population sub-groups (for example, to compare eating or physical activity behaviours between BMI groups).

2. METHODOLOGY

The self-reported and measured BMI data were compared by the following population groups:

- gender
- age (15 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, 75 years and older)
- ethnicity (Māori, Pacific, Asian, New Zealand European/Other)
- socioeconomic deprivation quintile
- gender and age
- gender and ethnicity
- gender and socioeconomic deprivation quintile.

Chi Square tests were undertaken to compare the proportions of the observed (self-reported) and expected (measured) samples by each weight status group (underweight, normal weight, overweight, obese). The significance level used for statistical analyses was set to $\alpha=0.05$.

3. RESULTS

There were no statistically significant differences between the New Zealand Health Survey and HLS BMI values for each of the weight status groups as a total sample. While the HLS sample had a lower proportion of respondents classified as overweight and a higher proportion who were classified as underweight or obese compared with the New Zealand Health Survey sample, these differences were not statistically significant. The proportions of respondents classified as normal weight were similar. There were no statistically significant differences in BMI by gender, ethnicity, or socioeconomic deprivation.

There was a statistically significant difference in self-reported and measured BMI by age in the underweight category; however, there were no differences in the normal weight, overweight, and

obese categories. Among some of the combined population sub-groups, statistically significant differences in BMI were found. These include gender and age, gender and ethnicity, and gender and socioeconomic deprivation.

4. CONCLUSION

There is not an overall, statistically significant difference between self-reported BMI and measured BMI, as captured in two nationally representative surveys. This result remains when comparing the samples by gender, ethnicity, and socio-economic deprivation quintile. Self-reported BMI appears to be a sufficiently valid measure, particularly if it is treated in analyses as a dichotomous independent variable for the entire sample (ie, overweight/obese or not). For example, statistical tests to evaluate an association between BMI category and a health behaviour could be undertaken with confidence in the validity of the BMI classification.

The HLS self-reported BMI variable would not be appropriately used for reporting on combined sub-groups (e.g. overweight Asian women). Comparisons may be made, however, by gender, ethnicity, and socio-economic deprivation status independent of BMI classification (eg, "Women, Asians, and overweight/obese people were more likely to engage in X health behaviour").

One limitation of the available data is that this analysis does not assess differences between self-reported and measured BMI within the same sample of respondents, which potentially would have yielded a stronger indicator of self-reported BMI validity. Given the available data sets and the objective of the research, however, it is a useful exercise in assessing overall validity of self-reported BMI as an indicator of weight category in the 2012 HLS sample.

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APPENDIX A

See accompanying Excel spreadsheet.