



Technical Note 10

Measuring Overweight and Obesity: Need for Harmonization and Refinement

Rachel Nugent, Mercedes de Onis, Komal Bhatia, Kamilla Gehrt Eriksen, Gretchen Stevens, and Yves Martin-Prevel

University of Washington, Seattle; World Health Organisation, Geneva; Institute of Development Studies, Brighton UK; University of Cambridge, UK; World Health Organization, Geneva; Institut de Recherche pour le Développement (IRD), Marseille, France

Malnutrition in its many forms is notoriously difficult to measure. Unlike stunting and wasting, overweight and obesity do not enjoy the same level of accepted definitions and measures.

In recent years, interest in estimates of overweight and obesity has increased. These conditions are usually measured using body mass index (BMI), waist circumference, and waist–hip ratio. BMI, which is weight in kilograms divided by height in meters squared, is the easiest and most common measure to obtain and is now available for many populations. However, it is a crude measure—meant to represent a condition of excess fat—and ignores distinctions about body composition and shape, which are important in assessing disease risk. Importantly, a specific BMI doesn't indicate the same level of disease risk in every person. According to the Food and Agriculture Organization of the United Nations (FAO), the international BMI classifications are most likely to break down in Asian populations. Lower measured BMI comes with higher body fat, higher disease risk, and different distribution of fat among Asians, and the differences don't readily generalize across Asian nationalities.¹ A World Health Organization (WHO) expert consultation recommended to maintain the current adult BMI cutoff points but proposed methods by which Asian countries could make decisions about the definitions of increased risk for their populations.²

Population-level surveillance for overweight and obesity is not universal. Some middle- and high-income countries have measured adult overweight and obesity in repeated cross-sectional surveys, including decades of periodic measurement in Japan, the United Kingdom, and the United States. Demographic and Health Surveys (DHS) in low- and middle-income countries have been measuring height and weight of mothers of young children since the early 1990s. These countries are increasingly measuring height and weight of all women of reproductive age, and a handful of countries measure all adults. Data on self-reported height and weight are also available, though these data have important biases.³ For preschool-aged children, the pool of available country data is much larger, as information for deriving overweight and obesity estimates in this age group comes from the same national surveys conducted to collect data on stunting and wasting.⁴

¹ FAO, *The State of Food and Agriculture*, 2013.

² WHO Expert Consultation report. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet* Jan 10, 2004;363(9403):157–163.

³ <http://www.ncbi.nlm.nih.gov/pubmed/17578381>
<http://www.ncbi.nlm.nih.gov/pubmed/?term=20089678>
<http://www.ncbi.nlm.nih.gov/pubmed/?term=16672759>.

⁴ WHO Global Database on Child Growth and Malnutrition, <http://www.who.int/nutgrowthdb/en/> (Accessed 11 August 11, 2014).

The lack of trend data for many countries has prompted the development of modeled-based estimates. Publications from WHO in 2011⁵ and IHME (Institute for Health Metrics and Evaluation) in 2014⁶ provide estimates of overweight and obesity with different coverage, data sources, and model assumptions. WHO will publish new estimates of adults and school-aged children and adolescents underweight, overweight, and obese in late 2014. The Global Nutrition Report relies on the current WHO estimates, but in the interest of spurring further harmonization and refinement in methodologies, it offers a brief discussion of the differences between the two sets of modeled estimates.

Coverage

WHO estimated mean BMI, the prevalence of overweight (BMI \geq 25 kg/m²) and obesity (BMI \geq 30 kg/m²) in adults aged 20 years and older for 189 member states and 10 additional nonmember states and territories for the years 1980 to 2008. In addition, WHO, jointly with the United Nations Children's Fund (UNICEF) and the World Bank, annually publishes estimates of overweight among children under 5 years of age.⁷ IHME has published estimates for overweight (defined as BMI \geq 25 kg/m²) and obesity (BMI \geq 30 kg/m²) in adults aged 20 and older and children/adolescents aged 2–19 for 188 countries and territories for the years 1980–2013. An important difference between the IHME and WHO estimates is that while the former bases the estimates of overweight and obesity for children and adolescents (ages 2–19) on the International Obesity Task Force (IOTF) cutoff points, the latter uses the WHO Child Growth Standards (0–5 years) and the WHO Growth Reference for School-Aged Children and Adolescents (5–19 years).

Data Sources and Models

IHME gathered data from a systematic review of the literature, global databases, and survey series, including national and subnational data sources. Both measured data and self-reported data were included, and nearly 50 percent of data sources were self-reported. WHO's data search strategy was similar, the main difference being that self-report data were excluded.

To synthesize data and generate estimates for countries, years, and age groups with no data, both IHME and WHO fit complex statistical models to their datasets. Because IHME included self-reported data, they developed a model to adjust these data for reporting bias. WHO developed methods to adjust for exclusively urban or rural data and also allowed subnational data sources to influence estimates less than nationally representative data; IHME weighted all data sources by sample size but did not otherwise differentiate urban, rural, or subnational data in their dataset. Both WHO and IHME used time-varying covariates in their models.

Results

Comparisons of the latest estimates from both sources are in Table 1. Overall, when comparing BMI \geq 25 kg/m², IHME has estimated a slightly higher prevalence of adult overweight and obesity in 2013 than WHO

⁵ http://www.who.int/nmh/publications/ncd_report2010/en/; <http://www.ncbi.nlm.nih.gov/pubmed/21295846>.

⁶ <http://www.ncbi.nlm.nih.gov/pubmed/24880830>.

⁷ United Nations Children's Fund, World Health Organization, World Bank. UNICEF-WHO-The World Bank: 2012 Joint Child Malnutrition Estimates: Levels and Trends. UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC; 2013.

did for 2008. This may be due to differences in treatment of age-specific estimates: IHME has age-standardized estimates using a new standard population, which is not defined in their paper. It may also be due to differences in input data (for example, self-reported data), statistical methods, and their underlying assumptions, or a real increase in the prevalence.

Table 1 Comparison of estimates of the global prevalence of overweight and obesity (%)						
	WHO (2008)			IHME (2013)		
	Both sexes	Female	Male	Both sexes	Female	Male
Adult overweight & obesity (BMI \geq 25)	35	34	35	37	38	37
Adult obesity (BMI \geq 30)	11	14	10	12	14	10

Transparency and Data Availability

Neither WHO nor IHME have made their code and full raw dataset available. IHME did not identify which data sources were self-reported, but they do provide interactive fit plots where estimates are compared with input data. The WHO model does have more detailed information on methods in their appendix than the IHME model has. The joint UNICEF/WHO/World Bank child malnutrition estimates⁸ are more transparent and replicable. It is hoped that a “data revolution” would result in countries implementing standardized or harmonized data collection systems that would allow the use of good-quality empirical data to monitor trends of overweight and obesity. In the absence of this, future model-based obesity and overweight estimates should be based on processes that are transparent, replicable, and make methods and datasets fully accessible, and eventually incorporate more refined population-validated measures that provide consistent information about disease and mortality risk.

⁸United Nations Children’s Fund, World Health Organization, and World Bank. UNICEF-WHO-World Bank Joint Child Malnutrition Estimates. UNICEF, New York; WHO, Geneva; World Bank, Washington, DC, 2012 (www.who.int/nutgrowthdb/estimates2012/en/).