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The Gravity of Weight

Fatal Flaws: Determining Who Is Overweight and Who Is Obese

How flawed measurement may underestimate the true prevalence of obesity

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The "obesity crisis" may be worse than we think
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The obesity crisis has reached epidemic proportions, not only in the U.S. but worldwide. An article last year by Boyd Swinburn and his colleagues in the prestigious British journal *The Lancet* has called it a "global pandemic." In the U.S. alone, for example, almost 17% (12.5 million!) of children and adolescents are now considered obese; about 1/3 of adults are obese and another 1/3 are overweight.

How do we determine who is obese and who is overweight? Typically, in adults, we use body mass index (BMI), which is our weight in kilograms divided by our height in meters squared. It is an equation, popularized by Ancel Keys in the 1970s, that dates back to the Belgian 19th century mathematician (and father of modern statistics), Adolphe Quetelet. By today's standards, established in the late 1990s, a BMI of 25 kg/m^2 to 29.9 kg/m^2 is overweight, and a BMI greater or equal to 30 kg/m^2 is obese, with further divisions into Class I, II, III (morbid or extreme obesity), and Class IV (super morbid obesity), depending on increasing levels of BMI. As I have noted previously, researcher Jeffrey Friedman, from Rockefeller University, explains that obesity is a "threshold" measurement. In other words, it is defined when BMI "exceeds a defined threshold" such that "a relatively small increase in average weight has a disproportionate effect on the incidence of obesity." BMI is only an approximate measure of fatness, and most researchers today believe it is an imprecise measurement, even in adults, because it does not factor in muscle and lean body mass. An athlete with considerable muscle

may be considered obese whereas an elderly person with muscle wasting (sarcopenia) may be considered of normal weight when he or she is actually overweight or even obese.

Obesity rates in children have continued to increase exponentially in the past 30 years

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Is the obesity crisis even worse than we have imagined? Recently Shah and Braverman, writing in the journal *PLoS One* (2012) have suggested that BMI is so inaccurate a measure that it significantly underestimates the actual prevalence of obesity. Because increasing levels of obesity are associated with major health morbidity (e.g. many cancers, osteoarthritis, type 2 diabetes, dyslipidemias, cardiac disease, stroke, sleep apnea, etc), these researchers contend that we need to identify clinically useful biomarkers and clarify what exactly we are measuring when we use BMI. BMI has become so popular and widespread as a diagnostic tool because of its "convenience, safety, and minimal cost," but its cutoffs are "arbitrary." Instead, Shah and Braverman suggest that a more accurate and direct measure of body fat can be obtained by using DXA (dual-energy X-ray absorptiometry), the same machine that measures bone density. Because this machine uses X-rays, it obviously cannot, though, be used with pregnant women. They also suggest that fasting leptin blood levels should be used to indicate body fat percentages. Leptin, as I have mentioned previously, is the hormone (isolated in Jeffrey Friedman's lab) that is secreted primarily by fat cells (adipocytes) and among its many functions, regulates energy balance. Just as obese people who have the metabolic syndrome, (e.g. abdominal obesity, abnormal blood lipid levels, hypertension, and abnormal glucose levels) have high, though insensitive levels of insulin (i.e. a state of insulin resistance), so they can have high blood levels of leptin and a state of leptin insensitivity (i.e., resistance.)

What about diagnosing obesity in children? Measurement of weight and specifically fat in children is even more "complex and confusing," according to researchers Katherine Flegal and Cynthia Ogden, writing in the journal, *Advances in Nutrition* last year. In children BMI varies not just with height but with age as well.

Flegal and Ogden note that both terms "overweight" and "obesity," though used extensively, "can be ambiguous" and sometimes even used interchangeably. In other words, the "terminology is far from standard." Though there

Measuring fat is hardly child's play
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are some variations, "overweight" is considered a BMI from the 85th to 95th percentile above age and gender and "obesity" as above the 95th percentile for children, but "these cutoff values are not necessarily exact." These are statistical, though, rather than clinical distinctions. They also note that we don't even have "any well accepted standards for body fatness" or "even strong evidence for any precise definition" for children. In other words, say Flegal and Ogden, these numbers still do not necessarily tell us which children are necessarily at risk for future adverse health consequences, even though, for example, higher levels of BMI in children have been associated with morbidity such as increased blood pressure or abnormal lipid profiles, etc. that have been associated with cardiac disease in adults.

Bottom line: BMI is a screening, rather than diagnostic, imprecise measure of fat for children, adolescents, and adults, and its cutoff levels are arbitrary and statistical rather than clinical. Consider requesting blood leptin levels and DXA scans for more accurate assessment of body fat.

About the Author

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In Print: *The Gravity of Weight: A Clinical Guide to Weight Loss and Maintenance*

Online: my own website