Weight Classification: Normal Weight to Overweight without Gaining a Pound

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ABSTRACT

Nearly one-third of children and adolescents are overweight or obese. Overweight adolescents are at elevated risk of becoming overweight adults. However, evaluation of weight problems and weight development in adolescents is difficult. Since the CDC defines weight categories differently for adolescents than for adults, measurement issues arise. Prior to age 20, BMI is evaluated as a percentile factoring in a forecast of future weight (BMI) gain and after age 20 as a raw value. However, these standards lack consistency. At age 19 a male with a BMI of 26 is considered healthy weight, but at age 20, the same BMI is considered overweight. Which standard is correct? Which standard do adolescents use to evaluate themselves? This study explores the inconsistency in weight standards and their misalignment during the adolescent years. It examines the concordance of perceived and actual weight (BMI), using self-reported height and weight and responses to questions on perception of weight-to-height proportionality. Men and women appear to differ in the standard they use, with males seemingly using the adult standards, females the youth standards irrespective of age.

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Introduction

Adolescence is a time of transition from childhood to adulthood. Youth complete physical maturity, development a sense of self and establish their place in the world. Adolescents are not fully adults nor are they children—making weight categorization difficult. When research spans childhood and adulthood, discrepancies between the child/adolescent and adult definitions of overweight become apparent.

While the Centers for Disease Control (CDC) defines weight categories differently for adolescents than adults, how do adolescents view themselves? Do their perceptions align more closely with the “child” classification or the “adult” classification? This paper explores not only the discontinuity between adult and child weight-to-height proportionality (BMI) classifications, but also the relationship between adolescent perception of weight and their actual weight. Determining whether adolescent perception more closely matches the child, adult or neither classification could have important policy implications.

If youth systematically underestimate this key measure, educating them on more appropriate estimates may be an effective intervention into the adolescent weight epidemic. If perception of weight (BMI) is accurate, however, then more aggressive measures may be required. For example, setting up incentive schemes and explicitly outlining the health damage caused by excess weight could be effective. A variety of policies have been proposed to ease high obesity rates, from

1 From the respondent’s point of view that is typically considered a question about his or her weight, with height a datum.

2 Dorsey, Eberhardt, and Ogden (2009, p.790), for example, argue that “Understanding weight perception may be a key tool in developing interventions to reduce obesity and racial/ethnic disparities in obesity.” Paeratakul, White, Williamson, Ryan and Bray (2002, p.345) and Perkins, Perkins, and Craig (2010, p.965) express similar policy conjectures.

3 Casual empiricism suggests that social stigma have been relied upon less vigorously than in the earlier campaign against smoking.

4 Both adult BMI—Flegal, Carroll, Ogden, and Curtin (2010) -- and child and adolescent BMI--Fryar, Carroll and Ogden
education to taxation of soda drinks. This study focuses on the weight perception among youth in their teens and twenties, assessing the likelihood that the problem is informational, and that more accurate information would help “solve” the obesity problem.

This paper explores (i) the weight classification standards for adolescent BMI, (ii) the extent of weight (BMI) misperceptions among adolescents and (iii) alignment between youth weight perception and BMI classification standard. The analysis utilizes the National Longitudinal Surveys of Youth 1997, a panel survey of American youth age 12-17 when first surveyed in 1997 and then surveyed annually thereafter. This study explores data through 2011, at which time the respondents were 25 to 31 years old. After 2011, NLSY97 was only conducted biennially. This study focuses only on consecutive years of observation in year 1997 through 2011. NLSY97 includes self-reported weight and height in year as well as the respondent’s perception of his or her weight-to-height proportionality.

This paper proceeds in the following way. Section II briefly discusses the issue of weight category inconsistency between adolescents and adults and related literature. Section III considers whether youth in their teens and twenties consider themselves as “adults” or “adolescents” by comparing their BMI against both standards. Section IV examines the alignment of perception with actual BMI. Finally, Section V provides a brief policy discussion and conclusion.

II. Methodology of BMI Categorization

In the United States, the prevalence of overweight among children/adolescents increased between 1980 and 2004, but has plateaued in recent years (Ogden, Carroll and Flegal 2008). This becomes problematic due to the high association between childhood and adolescent BMI levels and adult BMI/adiposity (Freedman, et al 2005).

Among adults, BMI is a satisfactory measure of body fat (Mei, et al. 2002). Although far from perfect, measurements closely resemble more reliable body fat assessments such as skin fold measures, especially if comparing measures across race and ethnicity (Burkhauser and Cawley 2008)

6. Percentiles, rather than raw BMI scores, are used to measure adolescent body fat. From age two to 20, the Centers for Disease Control (CDC) evaluates adolescent weight as a percentile among others of the same age and gender. The CDC child and adolescent BMI thresholds are designed to capture the idea that BMI is growing more rapidly and in a more predictable direction among children and adolescents than adults. Percentiles are intended to capture the category the individual would be in upon reaching young adulthood, approximately age 20, if staying in the same BMI percentile.

A BMI of 30 is the threshold for obesity in adults, that represents the 95th percentile at age 19. One could then define a seventeen-year-old as obese if his or her BMI is in the 95th percentile, or 28.26. Because teenagers are still going through puberty and growing, they can be healthy even if their BMI falls a bit outside what's considered healthy for an adult. The healthy BMI range for 13-year-olds is 15.5 to 22.6 for boys and 15.3 to 23.3 for girls. By the age of 18, the healthy range is 18.2 to 26.3 for boys and 17.6 to 26.1 for girls. After age 20, BMI is interpreted as the raw value with healthy BMI falling from 18.5 and 24.9, regardless of age or gender. Anything over is considered overweight.

Several studies have explored the accuracy of using BMI to classify adolescent weight. They found that, while BMI calculated from self-reported height and weight was highly reliable, the percentile classification associated with measurements underestimated the prevalence of overweight in adolescent population (Brener, et al 2003). Despite the likelihood of misclassifying the small percentage of individuals whose high BMI is due to lean muscle mass, most individuals with high BMI have excess body fat (Freedman, et al 2004). In fact, 70% of children with a BMI for age between the 85th and 94th percentiles had a body fatness corresponding to BM- for-age classification (Freedman, Wang, and Thornton 2009).

Of the various reference standards currently used for classification, few provide a smooth transition from childhood/adolescence to adulthood. While some propose cutoff points at various locations in the BMI distribution, others utilize varying points on the percentile spectrum. Others have used the age-related BMI z-score for classification for individuals 20 years of age and older (Must and Anderson 2006). Some feel that it might be more effective to consider factors such as race-ethnicity and family history (Flegal and Ogden 2011).

For both genders and all racial/ethnic groups, BMI increases with age (Figure I) growing from an average of roughly 20 to over 30 between the ages of 12 and 22. Additionally, the proportion of normal weight respondents decreases, while the proportion of overweight and obese males and females
increases (Figure II). Most respondents are normal or slightly under weight at the beginning of the panel; however, this proportion gradually declines to less than half. The most surprising change is the increase in the proportion of obese respondents. At age 12, no respondents are obese, but the proportions of overweight and obese increase exponentially growing from close to zero to thirty and forty percent of females and males, respectively, as they age.

Figure I: Average Annual Male BMI

![Figure I: Average Annual Male BMI](image)

To best illustrate the discontinuity in weight classification, Figure III provide the average BMI by age in months along with the two classification standards. Black lines represent the healthy weight standards—observations between denote normal or healthy weight, while observations above and below represent under or overweight/obese respectively. The standards increase gradually until age 20 representing the rising standards of healthy BMI using the child/adolescent growth chart for classification. After age 20, the adult standard becomes applicable. For children/adolescents, healthy BMI lies between the 5th and 85th percentiles of the BMI distribution. After age 20, the adult standards consider healthy or normal weight between 18.5 and 25 BMI—a constant range. These standards are represented by the flat portions of the black lines.

Prior to age 20, most respondents fall within the normal weight parameters. However, the adult classification at age 20 systematically lowers the normal weight standards. The downward shift results in an increase in the proportion of overweight and a decrease in normal weight. At full growth, BMI can increase from higher body fat or increased muscle mass, but the difference cannot be distinguished. It is valid to assume that most adult BMI increases result from body fat increases. The dramatic increase in overweight at 20 can be attributed to both the changing weight standard increases in body fat.

III. Analysis of Body Perception and BMI Standards

In this analysis, the adult standard will be denoted ADULT and the youth standard will be denoted CHILD. Let the ADULT standard suggest that the individual compares himself to adults, while the CHILD standard indicate what he will become as an adult if remaining in the same relative position of the BMI distribution. This analysis examines which standard an individual uses to evaluate himself. In other words, does one’s own body perception align more closely with the CHILD or ADULT classification. This correspondence between BMI categorization and body perception is explored at three points in the age distribution: early adolescents (age 12-14), mid-adolescents (age 20-22) and older adolescence/young adult (age 28-30).

The CDC categorizes weight as (i) Underweight, (ii) Normal Weight, (iii) Overweight, and (iv) Obese. NLSY97 respondents classify their weight status as (i) Very Underweight, (ii) Slightly Underweight, (iii) Right Weight, (iv) Slightly Overweight, and (v) Very Overweight. Assume that these categories represent self-assessments of BMI and align with the CDC categories in the following way:

10 Both are CDC standards.
11 All statistics are unweighted and refer to sample values. Samples are partitioned by gender and race/ethnicity in all applications.
12 Indeed, self-reports of weight perceptions need not reflect the respondent’s true perceptions, though I will see below that reported misperceptions have plausible consequences.
IV. Results

Figures IV and V depicted the correspondence of perceived and actual weight categories at three age groups—12 to 14, 20 to 22 and 28 to 30. Figure IV shows the body perception of each age group beside the actual BMI using the CHILD classification. Figure V presents the body perception of each age group beside the actual BMI using the ADULT classification. Percentage representation in each column is written above the column. Due to small representation in the under and very underweight categories, these are combined for analytical purposes. One could hypothesize that perception among 20 to 22 and 28 to 30 age groups would correspond more closely with the ADULT classification, while ages 12 to 14 would correspond more closely to the CHILD standard.

Figure IV here

Others found comparable results. Brener, et al (2003) showed that females were more likely than males to misperceive weight. Blacks, especially black females, underrate overweight problems relative to whites, particularly when respondents are obese (Fletcher 2014). Others found young women more likely to underestimate weight relative to men. Evidence also shows that they adjust perception standards as their own weight increases (Paeratakul, et al. 2002; Perkins, Perkins, and Craig 2010).

V. Discussion and Conclusion

This study focuses on weight classifications and perceptions among youth in their teens and twenties, assessing the likelihood that standards do not appropriately reflect weight, or align with self-perception. Both inaccurate standards and misperceptions have the potential to contribute to the obesity problem. If the young underestimate their weight (relative to height) status, they may choose to be heavier than if they were fully aware of their condition. If adolescents are immediately classified as overweight after being considered a normal

weight adolescent, the standards do not accommodate increases in body fat and biological growth.

The benchmark for comparing perceptions with actual weight (BMI) categories is not as unambiguous for adolescents as it is for adults. For youth less than 20, the CDC offers a BMI-for-age standard that incorporates a projection of BMI into adulthood (CHILD). Given the strong upward trend BMI, the CHILD standard for being obese is systematically different than it is for adults. Whether adolescents perceive their BMI with this forecasting element—which amounts to them comparing themselves to others of their age rather than to an absolute standard—is an empirical question. At young ages, males do not adhere to the CHILD standard, but closer to the ADULT classifications. While females align more closely with the CHILD standard when they are young.

By the age of 20, a single standard applies to all individuals. Males and females systematically underestimate their weight categories relative to CDC standards. One serious misperception problem is apparent in both genders—the obese are reluctant to label themselves “very overweight.” This becomes more apparent as respondents age and more respondents become obese. By 20, many were obese, and the tendency to avoid labeling oneself as very overweight was clear.

While individuals are reluctant to classify themselves as very overweight in every age range, it is unclear whether misperceptions lead to the expected consequences. In other words, tendency under-perceive weight could exacerbate unhealthy weight over time. It could also be that respondents simply misreport their own perceptions—the very overweight understand their circumstance, but do not share that judgment in the interview.

The identification of weight misperception is perhaps clearer than policy implications. The existence of misperceptions potentially reveals educational avenues for weight control interventions. The most obvious, and most tenuous situation, at the policy level, is whether the individual has a clear idea of the tradeoffs between satisfaction from calorie rich foods and the health consequences that accompany long term overweight or obesity. Altering the weight choices of these individuals may require complete and thorough explanation of the individual’s current weight status (or the damage done by a given level of weight or BMI), which would be protective of future weight gain. Instilling fear or panic of hazardous consequences to induce a favorable outcome raises obvious ethical issues.

Educating the public on damage of being very overweight is plausible strategy, but the impact of this knowledge on behavior is limited by the individual’s willingness to perceive himself as very overweight and act to reverse their condition. One can assume that obese respondents avoid reality because they are happier under false assumptions. This raises a second issue—if self-esteem is itself of value to the individual, truth does not guarantee that the individual is better off.

Self-esteem issues limit the use of social opprobrium. The obesity problem lacks the simplicity of the smoking problem—from a health perspective less is better. Low weight as well as high are unhealthy. Unlike tobacco products, food is a biological necessity. Thus, food taxation becomes a delicate exercise; such taxation is potentially damaging to healthy individuals, while utility maximizing, for others. There appear to be few answers to the obesity problem. Greater individual and collective experience may be required.

REFERENCES


14 Perhaps because obesity is so diffuse in the population, there appears to be more sympathy for the obese than for smokers, the absence of which makes social opprobrium of smoking so effective.


