Race, Ethnicity, Sex, and Obesity: Is It Time to Personalize the Scale?

To the Editor: Obesity is the most prevalent chronic disease in the United States and throughout the world, but there is considerable variation in the prevalence of obesity among racial/ethnic groups. Body mass index (BMI; calculated as the weight in kilograms divided by the height in meters squared) has been the standard measure for defining obesity because it is quick, inexpensive, and noninvasive, and has some correlation to metabolic disease prevalence.[1] The BMI cutoffs differ in Asian Americans who have a higher risk of metabolic disease at lower BMI values. As such, the BMI criteria for Asian Americans have been adjusted to lower values for all weight classes.[2] There are some conundrums associated with the use of BMI. For example, previous studies suggest that men with an overweight BMI without central adiposity have elevated cardiovascular risk factors but lower all-cause mortality risk than do men of other weight categories.[3] In addition, there is so-called obesity paradox in which there appear to be protective effects of obesity in patients who have a history of previously diagnosed heart failure.[4]

Current BMI cutoffs originated from historical Metropolitan Life Insurance Company (MLIC) actuarial data. In 1942, they developed standard tables to determine "ideal" weight, in 1959 "desirable" weight, and in 1983 "height to weight" tables became the standard.[5] To develop their first tables in 1942, they used data from 4,000,000 MLIC policyholders from 1911 to 1935 to assess "ideal" weight on the basis of longevity according to sex, height, and weight. To create a normal distribution curve, they characterized policyholders into small, medium, and large body frames, with obesity being defined as a weight of over 20% to 25%, and severe obesity 70% to 100% over "ideal." In 1959, they discerned the association between body weight and mortality to define "desirable" weight. With information from the Fogarty International Center Conference on Obesity in 1973 and the National Institutes of Health National Health and Nutrition Examination Survey (NHANES), the current BMI tables were developed.

We sought to redefine BMI's threshold by sex and race/ethnicity based on association with metabolic disease, thereby linking the definition of obesity to future prediction of medical morbidity and mortality. To determine adjusted BMI thresholds by race and sex, we took an approach similar to that used by Wildman et al[6] to recalibrate adjusted BMI cutoffs for Asians. US NHANES data from 1999 to 2016 were used to estimate the distribution of BMI, as well as 3 metabolic disease risk factors: hypertension, dyslipidemia, and diabetes. The projected changes in population prevalence with the adoption of new thresholds in the prevalence of obesity for each population subgroup were determined. All data analyses were conducted using the R statistical platform.

When obesity is defined by a correlation with the presence of metabolic risk factors, the BMI cutoffs to define obesity would change for specific race/ethnicity and sex subgroups instead of a single BMI threshold based on historical statistical data from more than 60 years ago. We believe that our proposed recalibration of BMI values that defines obesity in a more biologically based approach allows for a more individualized approach rather than the current "one-size fits all."

The validation of additional precision biomarkers that can accurately predict future disease can further clarify the appropriate BMI thresholds and potentially other appropriate biomarkers to define obesity, which may obviate the use of BMIs completely. In the meantime, we implore race/ethnic-based definitions to prevent underdiagnosis and overdiagnosis, which have considerable clinical, psychological, and financial implications for patients.[7]

The Table indicates that men would undergo a shift toward lower BMI cutoff. Although the projected new BMI cutoffs vary by race/ethnicity and disease risk factor,

TABLE. Cutoffs for BMI Based on ROC Curve Analysis

	BMI (kg/m^2)					
	Men			Women		
Obesity Co-morbidity	Black	Hispanic	White	Black	Hispanic	White
Hypertension	28	29	28	31	28	27
Dyslipidemia	27	26	27	29	27	25
Diabetes	29	29	30	33	30	29
≥2 risk factors	28	29	29	31	30	28
Average	28	28	29	31	29	27

BMI = body mass index; ROC = receiver operating characteristic.

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the overall trend is in the same direction. For women, the BMI shift for black women would be to higher cutoffs, whereas it would generally be lower for Hispanic and white women. For all groups studied, there would be a change in the prevalence of obesity.

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Effective Lowering of Cholesterol With Portfolio Diet in a Highly Trained Young Man

To the Editor: Statins are among the most commonly prescribed medications in the world. Myalgia is frequently reported in up to 25% of users,[1] and more serious adverse effects on muscle such as rhabdomyolysis are seen in 0.04% to 0.2% of users.[1] Muscle rupture has also been reported.[2] Furthermore, subgroups such as professional athletes appear to be especially intolerant to statin drugs.[3] Dietary interventions such as the portfolio diet have also been reported to cause marked reductions in cholesterol.[4]

A highly trained (maximum oxygen consumption, ∼70 mL/kg per minute), nonsmoking, normotensive, 29-year-old man (188 cm, 79.5 kg) was referred to a community lipid clinic after routine blood testing revealed an elevated low-density lipoprotein (LDL) cholesterol level. The motivation for the initial blood testing was to obtain baseline values because of a family history of type 2 diabetes and cerebrovascular disease. The patient's physical activity habits focused on training for and competing in track and road cycling races. His training included approximately 15 hours per week of cycling at varying intensities with 2 weekly strength training sessions.

On consultation, the clinic's cardiologist recommended initiation of a low-dose statin on 2 occasions. The patient feared that statins would impact his athletic performance and sought second opinions. After discussion with other practitioners, the patient implemented the portfolio diet,[4] composed of multiple foods known to lower cholesterol (oats, viscous fiber vegetables, soy, almonds, sterol supplements, or fortified foods) and 30 g/d of ground flaxseed. Serum cholesterol levels were retested 10 months later. Overall adherence was good. His total cholesterol decreased from 207 mg/dL to 142 mg/dL, LDL cholesterol decreased 43% from 135 mg/dL to 76 mg/dL, and high-density lipoprotein cholesterol was unchanged (∼58 mg/dL) as was apolipoprotein B. Body weight increased from 79.5 to 81.5 kg. This increase in body weight was intentional as the athlete shifted his focus to track racing and intensified his strength training program. He reported no major adverse effects from the diet. A minor adverse effect was feeling bloated or "full" at times; he slightly diverged from higher-fiber foods for 1 to 2 days before and during important competitions. His power output over 20 minutes increased from 401 W to 413 W, a 3% improvement over the dietary intervention period.

The marked reduction in LDL cholesterol seen in this case was similar to that seen in the JUPITER (Justification for the Use of Statins in Prevention: an Intervention Trial Evaluating Rosuvastatin) trial in which a median reduction of 50% was seen with 20-mg rosuvastatin[5] and greater than the average values