[Letter to the Editor]

Dear Dr Wojtys,

We read with interest the article on body mass index (BMI) as an indicator of obesity among athletic adolescents, which appeared in the May/June 2011 issue of *Sports Health*.² While fully appreciative of the authors' extensive research and in support of the general message of their manuscript (ie, skinfold measurements provide a superior estimate of body composition in comparison to BMI, which is expressed as weight in kilograms divided by height in meters squared, otherwise known as the Quetelet index), we were surprised by a statement in the abstract's conclusion, which we think warrants attention. Specifically, the authors stated, "Because lean mass weighs far more than fat, many adolescent athletes are incorrectly classified as obese based on BMI." In regard to this statement, we believe the authors are referring to the density of lean tissue versus fat tissue, but the manner in which this comment is made is, in fact, erroneous. That is, 1 lb of lean tissue weighs 16 oz, as does 1 lb of fat tissue. The idea that lean tissue weighs more than fat tissue is a common misstatement.⁵

It is also important to note that skinfold measurement techniques are still field-based assessments, as are girth measurements, near-infrared interactance, and bioelectrical impedance. Depending on a variety of factors—including the skill level of the personnel taking the measurements, the quality of calipers being employed, and the number of sites being measured (ie, 3, 5, or 7)—skinfold measurements usually are associated with standard errors of estimation in the range of 3% to 4%.³ Additionally, as was done in the present study, the standard error of estimate may be even larger when using skinfold-derived algorithms in a population from which they were not derived. On the contrary, laboratory-based methods—such as hydrostatic weighing, whole-body air-displacement plethysmography (BodPod), and dual-energy X-ray absorptiometry (DEXA)—have slightly smaller standard errors of estimation (ie, 2% to 3%), generally rendering them superior to field-based techniques.³ Consequently, to draw firm conclusions about skinfold-derived body composition being more accurate than BMI assessment, these methods would need to be compared with a criterion reference, such as DEXA, using an appropriate statistical procedure, such as the Bland-Altman plot.¹

Last, similar to Etchison et al,² in our study of National Collegiate Athletic Association Division 1 female athletes in

which we employed BodPod and DEXA as well as BMI, we concluded, "Although popular and easy to compute, BMI alone can produce misleading results. For example, an athlete with a large amount of lean mass and a body fat percentage of 12% may be categorized as unhealthy in terms of her/his BMI, whereas a second person with an ideal BMI may actually be clinically obese."⁴

The assumption of BMI is that the higher one's BMI, the higher one's body fat percentage. However, this assumption is not always true. So, while BMI remains a convenient surrogate measure of obesity—especially in population-based, epidemiological studies—it is not a quality measure at the individual or clinical level, with standard estimation of errors in the 6% to 7% range.³

Clearly, there are various methods available for assessing body composition, and BMI is not one of them. This is true for everybody, especially those who engage in activities that result in higher-than-average levels of muscularity (eg, resistance training, weight lifting). Before strong recommendations on the superiority of skinfold assessment in athletic pediatrics can be made with certainty, this methodology needs to be compared with a gold standard reference.

Thank you for your consideration.

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