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## Prevalence of Overweight Among High School Football Linemen

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of a control group, and lack of clarity as to the source population used to identify patients with psoriasis.

Second, studies of depression as an independent risk factor for MI have been inconsistent.<sup>3</sup> Studies that have been positive have found only a modest association with depression (an approximately 1.5-2.0 adjusted relative risk for the subsequent development of coronary artery disease), making it unlikely that depression is a strong enough confounder to explain our results. Finally, there is no indication that the relative risk of MI due to depression varies by age, as was observed in our study.<sup>4</sup>

Dr Malerba and colleagues suggest that the increased risk of MI we found may be due to elevated plasma homocysteine in patients with psoriasis. The increase in homocysteine levels in patients with psoriasis observed by Malerba et al<sup>5</sup> was modest (5.6  $\mu\text{mol/L}$ ) and the correlation of homocysteine level with psoriasis severity was weak ( $r=0.30$ ); therefore, homocysteine is unlikely to substantially explain our observations.<sup>6</sup>

Drs Ludwig and Boehncke have shown that psoriasis may be an independent risk factor for coronary artery calcification,<sup>7</sup> which provides important confirmatory data for our results. Furthermore, they provide data that psoriasis severity is strongly correlated with P-selectin ( $r=0.83$ ,  $P<.001$ ),<sup>8</sup> which is expressed on activated platelets and has been implicated in the pathogenesis of atherosclerosis in animal models. Further studies will be necessary to determine the mechanism by which psoriasis confers an independent risk of coronary artery disease and MI, and how best to minimize this risk.

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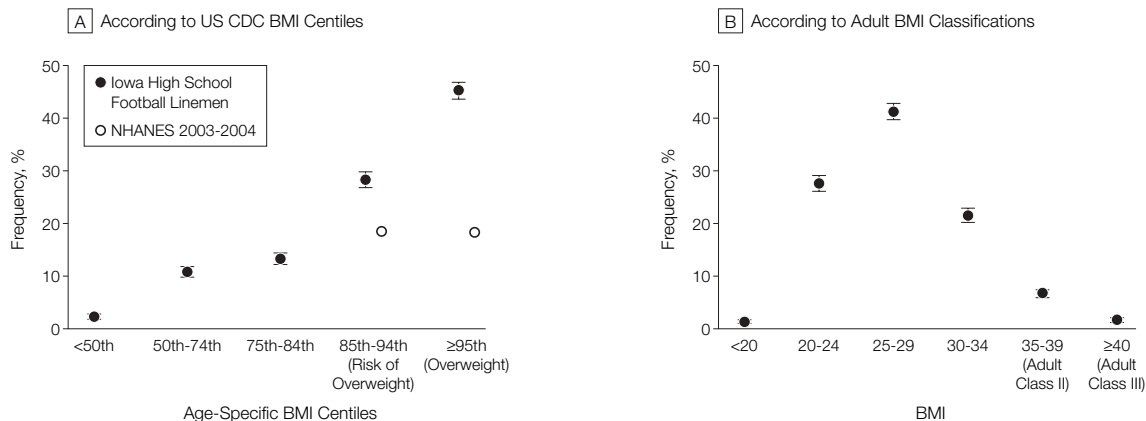
## RESEARCH LETTER

### Prevalence of Overweight Among High School Football Linemen

**To the Editor:** Obesity among professional football players has been documented, with recommendations that it be further investigated among amateur athletes.<sup>1</sup> Adolescent overweight is related to unfavorable cardiovascular disease risk factors and predicts overweight in young adulthood.<sup>2</sup> We therefore examined the prevalence of overweight and obesity in high school football linemen, the players who tend to be heaviest.

**Methods.** Data were obtained on 3683 linemen from publicly available varsity rosters,<sup>3</sup> including 100% of the players from 251 (69%) of the 364 Iowa high school teams during fall 2005. At least 2 teams from each of Iowa's 47 districts were included, making the sample likely to be representative of all players. Data for height, weight, and year in school were taken as reported on the roster. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Linemen were classified as at risk of overweight (BMI  $\geq 85$ th and  $< 95$ th percentile) or overweight (BMI  $\geq 95$ th percentile) based on age-specific percentiles using the 2000 US Centers for Disease Control and Prevention growth charts.<sup>4</sup> Prevalence was compared to 2003-2004 National Health and Nutrition Examination Survey (NHANES) data for boys aged 12 to 19 years (the group most closely matching the players' ages).<sup>5</sup>

Frequencies were also calculated for the percentage of players who would be classified as adult class II (BMI  $\geq 35$ ) and class III (BMI  $\geq 40$ ) obesity. Age (14.5 to 18.5 years) was assumed from the mid-age at each grade level (9 through 12); analyses using quarter-year ages did not change the results. Iowa high school football is categorized into classes based on school enrollment. These classes in decreasing enrollment size are 4A, 3A, 2A, 1A,

**Figure.** Distribution of Body Mass Indexes (BMIs) Among Iowa High School Football Linemen

Body mass index was calculated as weight in kilograms divided by height in meters squared. Error bars indicate 95% confidence intervals. A, Open circles indicate 85th-94th and ≥95th percentile BMI values among US 12- to 19-year-old males based on data from the National Health and Nutrition Examination Survey (NHANES) 2003-2004.<sup>5</sup> CDC indicates Centers for Disease Control and Prevention. B, Nine percent of participants were classified as having adult class II or III obesity.

A, and 8-Player. Differences in BMI were analyzed by factorial analysis of variance (class level  $\times$  grade), using the least significant difference method for multiple comparisons. Analyses were performed using SPSS version 11.0 (SPSS Inc, Chicago, Ill).

**Results.** The mean BMI was above the 85th percentile in every category of grade and class level. Of the players, 28% (95% confidence interval [CI], 26.8%-29.8%) were at risk of overweight and 45% (95% CI, 43.6%-46.8%) were overweight (FIGURE A). In comparison, the prevalence of overweight in the NHANES was 18.3%. Mean (SE) BMI was lowest in the 5 smallest class levels (27.2 [0.3]; range of means, 27.1-27.7) and highest in the 4A class (29.1 [0.2]). There were significant differences between all grades: freshmen (26.1 [0.3]), sophomores (27.4 [0.2]), juniors (28.1 [0.1]), and seniors (28.5 [0.1]). The class  $\times$  grade interaction was not significant ( $P = .40$ ). Of the players, 7% would be classified as adult class II obesity and 2% as class III obesity (Figure B). Main effects were found for class level ( $P < .001$ ) and grade ( $P < .001$ ).

**Comment.** While there are limitations in using BMI for assessing weight status in athletes, a study of boys aged 11 to 17 years found that the BMI correlated well with fat mass by dual x-ray absorptiometry ( $r = 0.85$ ), and this relationship was stronger in heavier boys compared with their lean counterparts.<sup>6</sup> Our results are also consistent with a study of 215 high school linemen that found a mean body fat of 25.7% by skinfold measurement.<sup>7</sup>

The prevalence of overweight in this group of high school linemen was 45%. Of these students, 9% would be classified with adult severe obesity. Severe obesity in adolescence can have an important impact on quality of life<sup>8</sup> and accompanies several comorbid conditions.<sup>9</sup> These risks must be considered by the athletes, their parents and physicians, and the athletic staff.

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**Author Contributions:** Mr Laurson had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analyses. *Study concept and design:* Laurson, Eisenmann.

*Acquisition of data:* Laurson.

*Analysis and interpretation of data:* Laurson, Eisenmann.

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*Statistical analysis:* Laurson, Eisenmann.

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