
Sports Participation and Physical Education in American Secondary Schools

Current Levels and Racial/Ethnic and Socioeconomic Disparities

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Background: The purpose of this study was to determine the current levels of physical education (PE) and sports participation among American secondary school students, and to establish the extent to which they vary by grade level, racial/ethnic background, and socioeconomic status (SES) of the students.

Methods: Nationally representative data were used from over 500 schools and 54,000 students surveyed in 2003, 2004, and 2005 as part of the Youth, Education, and Society (YES) study and the Monitoring the Future (MTF) study. As part of YES, school administrators completed questionnaires on physical activity (including rates of sports and PE participation) of students in their schools. Students in the same schools completed self-administered questionnaires in the same year as part of MTF, providing individual background data, including their gender, racial/ethnic identification, and parents' education level. Data were analyzed in 2006.

Results: Physical education requirements, and actual student participation rates, decline substantially between 8th and 12th grades. About 87% of 8th graders were in schools that required them to take PE, compared to only 20% of 12th graders. Principals estimate that over 90% of 8th graders actually take PE, compared to 34% of 12th graders. Subgroup differences in PE participation rates were small. Only a fraction of all students participate in varsity sports during the school year, with girls participating only slightly less than boys (33% vs 37%). Participation correlates negatively with SES and was lower among black and Hispanic students than white students, even after controlling for other variables. Participation rates in intramural sports were even lower, declined in higher grades, and were lower among low-SES and Hispanic students (after controlling for other variables).

Conclusions: Physical education is noticeably lacking in American high schools for all groups. Racial/ethnic minorities and low-SES youth, who are at higher than average risk of being overweight in adolescence, are getting less exercise due to their lower participation in school sports. Disparities in resources available to minorities and lower-SES youth may help explain the differences in participation rates.

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Introduction

Involvement in physical activity is considered a primary contributor to preventing youth from gaining weight and becoming overweight.^{1–3} Because youth spend much of their time in schools, these settings provide unique opportunities to encourage and facilitate physical activity, including the formation of long-term healthy activity behaviors.⁴ Yet, despite the growing prevalence of obesity among the nation's youth,^{5–9} schools in the past decade have substantially

reduced the opportunities for them to be physically active by shortening or eliminating recess, physical activity classes, and/or intramural and extracurricular sports activities,^{10,11} very likely resulting in a substantial decrease in the percentage of youth who are physically active.^{6,12,13} These reductions may have resulted largely from a combination of budget shortages that schools and school districts have experienced as well as from the increasing pressure schools have received to direct their resources toward meeting academic standards imposed by the federal government, or face losing funds or suffering other consequences if these standards are not met.

As young people progress into higher grades, participation in physical activity appears to decrease steadily.^{14–18} Clearly, attending to the growing problems of over-

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weight and obesity among youth has become a growing challenge facing today's schools and communities. Consistent with the burden of disease falling on racial/ethnic minorities and on economically disadvantaged populations,^{19,20} there is an overrepresentation of overweight and obese youth among some racial and ethnic minority youth (e.g., African-American females and Hispanic males) and among youth of lower-socioeconomic backgrounds.^{5,7,9,21–24} In light of these concerns, and in order to inform policy, it is important to examine and track what the nation's schools are doing to facilitate youth participation in physical education classes and in athletic activities. Specifically, the purpose of this study was to examine the extent to which students are engaged in physical activities provided by their schools and to examine how their levels of participation vary by grade level, racial/ethnic background, and socioeconomic status (SES). Gender differences in sports participation are also examined.

Methods

Samples and Survey Methods

Data from two studies were utilized—Monitoring the Future (MTF) and Youth, Education, and Society (YES). MTF provides annual surveys of nationally representative samples of 8th-, 10th-, and 12th-grade students located in an average of 410 public and private schools; each school participates for two consecutive years. In YES, administrators in schools that are in the half-sample of schools cycling out of the MTF survey each year (about 205 per year) are asked to complete a lengthy questionnaire describing school policies and programs related to various health issues, including physical education, food services, and substance use. Each such half-sample was a nationally representative replicate sample. Data were analyzed in 2006.

Monitoring the Future design and methods. The design and methods for the MTF project are summarized briefly here; a detailed description is available elsewhere.²⁵ At each of three grade levels (8th, 10th, 12th), an independent sample was drawn using a multistage sampling design to obtain nationally representative samples of students in each grade from the 48 contiguous states. The stratified random sampling procedure involves three stages²⁶: (1) geographic regions are selected, (2) schools are selected within regions with probability proportional to the estimated number of students in the target grade, and (3) students are selected within schools, usually by means of randomly selecting whole classrooms. Between 42,000 and 49,000 students make up the full sample each year across grades. Sample weights are assigned to each student to take into account the variations in selection probabilities that occur at all stages of the sampling procedures. Participating students complete a self-administered questionnaire during a normal class period.

For the current study, the student data included grade level and the self-reported gender, racial/ethnic background, and parental education (a proxy for SES). Gender was measured by the question, What is your sex? Racial/ethnic background was measured by the item, How do you describe yourself?

Students were coded as being of white, black, Hispanic, or other background. There were insufficient cases for other racial/ethnic groups to make reliable estimates. Parent education was defined as an average of father's and mother's educational attainment (with one missing data case permitted). The measures were: completed grade school or less, some high school, completed high school, some college, completed college, and graduate or professional school after college. Parent education was utilized as a proxy for SES. (Parent education was chosen as a measure of SES because students are generally unable to provide accurate information on family income and because it has been found to be valid in large-scale surveys when compared to other measures of SES.²⁷) Grade refers to the grade in which the student was enrolled: 8th, 10th, or 12th. In this paper, the 10th- and 12th-grade students are sometimes referred to as high school students and 8th graders as middle school students. Region and urbanicity are derived from the sampling data from which the school was drawn. Four regions of the country are distinguished (Northeast, North Central, South, and West) based on United States Census Bureau classifications. Three levels of population density are coded (large metropolitan statistical areas [MSAs], corresponding to the sixteen largest cities; other metropolitan statistical areas, corresponding to other cities as defined by the Census Bureau; and non-MSAs, corresponding to all other areas).

Youth, Education, and Society design and methods. The half-samples of nationally representative schools that were cycling out of the MTF study in 2003, 2004, and 2005 made up the target sample for the current study. School administrators were asked to complete a self-administered questionnaire that contained, among other things, questions related to student participation rates in physical education (PE) classes, varsity sports, intramural sports, and walking or bicycling to and from school. For some of the questions it was recommended that a person other than the school administrator (e.g., health counselor) answer those sections if they were more likely to know the information. Over 85% of respondents were school administrators (e.g., mostly school principals, but also some vice-principals) followed by teachers and other school personnel.

The combined number of secondary schools that participated in the YES nationwide surveys in 2003–2005 was 509, reflecting a combined response rate from school administrators of 83.2%. School and student data were available on the variables of relevance to the present analyses from over 54,000 student respondents surveyed in the same years in those schools. The racial/ethnic composition of the resulting student samples was 67% white, 12% black, 10% Hispanic, and 11% from other racial/ethnic backgrounds. Female students make up 51.6% of the combined samples (Table 1).

The primary data for this study include the answers to questions on physical activity. First, respondents (most of whom were principals) were asked whether students in the target grade surveyed in the school (8th, 10th, or 12th) were required to take physical education, followed by the question, About what percent of students in [target] grade actually took a PE class in [target] grade? For those students who take PE, the respondents were asked how many days a week the students participated in PE. The duration of a PE class in minutes was asked, permitting a calculation of the total

Table 1. Weighted sample sizes and percentage distributions on student characteristics, by grade: 2003–2005

Demographic characteristic	8th	10th	12th	Total
Total	19,225	18,933	16,027	54,185
Gender				
Male	48.7	48.8	47.7	48.4
Female	51.3	51.2	52.3	51.6
Race/ethnicity				
White	65.4	64.9	72.4	67.3
Black	11.9	14.7	10.5	12.4
Hispanic	9.4	10.7	8.8	9.7
Other	13.3	9.7	8.3	10.6
SES				
1 (Low)	7.6	8.1	7.2	7.7
2	22.5	22.1	24.1	22.8
3	24.6	27.0	29.2	26.8
4	28.8	27.8	25.8	27.6
5 (High)	16.5	15.0	13.7	15.1
Urbanicity				
Large MSA	30.6	25.6	27.0	27.8
Other MSA	43.7	52.5	46.7	47.7
Non-MSA	25.7	21.9	26.3	24.5
Region				
Northeast	19.3	16.6	18.8	18.2
North Central	24.7	28.3	27.0	26.6
South	36.0	34.9	37.4	36.0
West	20.0	20.2	16.8	19.2

MSA, metropolitan statistical area; SES, socioeconomic status.

number of minutes per week a student would spend in PE. Rates of student participation in both varsity and intramural sports at the school were also determined. Respondents were asked to write in the approximate percentages of boys and girls, separately, who participated during the school year in (1) interscholastic or varsity sports and (2) intramural sports or physical activity clubs. An additional question, also with an open-ended response, asked, About what percent of [target]-grade students would you estimate walk or bike from home to school on an average school day? Finally, a yes–no question was asked about whether the school gives [target]-grade physical fitness tests, and if it does, what groups of students were tested. The answer alternatives to the latter part were: All [target]-grade students are tested, Only [target]-grade students who take PE are tested, and Other, please explain. If the school does give physical fitness tests, the respondent was asked to answer a yes–no question about whether the parents or guardians of the tested students were provided with the results. (Note that only the questions about interscholastic and intramural sports involve separate estimates for boys and girls.)

Data Analysis

A major analytic objective was to determine differences in the proportion of students participating in various physical activities by comparing (1) middle schools versus high schools, (2) different racial/ethnic groups, and (3) different socioeconomic levels as indicated by level of parental education. The distribution (percents and means) of these variables was compared between grades and across racial/ethnic and socioeconomic status groups. Chi-square and

t-test statistics were used to determine if the percents and means, respectively, varied according to the students' grade level. Pair-wise comparison tests were also run to see if these variables differ among white, black, and Hispanic youth. While percentages and means for students identified in the "other" racial/ethnic category are presented for completeness, they were not included in the inferential analyses because it was a catch-all category that included very different population groups, which substantially limited the conclusions that could be drawn.

Ordinary least squares regression analysis was used to determine the extent to which a linear association existed between each of the dependent variables and the five-category measure of parents' education. The full set of dependent variables is provided in Table 2. All analyses include weighted data and take into account design effects in calculating variance estimates using Stata version 8.0.

The association of gender, race/ethnicity, SES, and grade was also examined, while controlling for urbanicity and region, with each of the following three dependent variables: (1) the mean time (in minutes) each student spent in PE classes per week, (2) the mean percentage of students who participated in interscholastic or varsity sports during the year, and (3) the mean percentage of students who participated in intramural sports or physical activity clubs during the year. Three models were tested for each of these analyses. The first shows the bivariate association between each characteristic and the dependent variables (Model 1). In the second, gender, race/ethnicity, SES, and grade level were simultaneously entered into the regression analysis. In the third, region of the country and urbanicity were added into the regression analysis. As is the case with all of the analyses, these include weighted data (using weights that take into account any unequal selection probabilities at any stage of sampling) and design effects in calculating variance estimates using Stata version 8.0.

Results

Total and By Grade

Physical education. The requirement that students take PE drops sharply between 8th and 12th grades. In 8th grade, 87% of students attend schools that require PE in that grade; this rate falls to 47% in 10th grade ($p<0.05$) and to 20% by 12th grade ($p<0.05$, Table 2). The mean percentage of students in each grade who were estimated to take PE also decreased significantly with grade ($p<0.05$), from nearly all (91%) in 8th grade to less than two thirds (62%) in 10th grade, to one third (34%) by 12th grade. The mean number of days per week that students have PE, among those who took PE classes, differ very little by grade; however, there was some difference between 8th (3.8 days/week) and 10th graders (4.2 days/week, $p<0.05$), but not between 8th and 12th (3.9 days/week) or 10th and 12th grades (Table 2). Primarily because of their differential participation rates, the mean number of days per week that students take PE in all schools (not just those with a PE requirement) differ significantly across the three

Table 2. Physical education (PE) and other physical activities in all schools, and by grade level: 2003–2005

	Total	8th	10th	12th	Sig. grade level comparisons
Approx N schools	504	186	166	152	
Approx N students	54,185	19,225	18,933	16,027	
PE participation					
Percentage of students in each grade in schools that require PE in that grade	53.2	86.6	47.4	20.1	8v10, 8v12, 10v12
Mean % of students in each grade that take PE	64.5	91.3	62.9	34.1	8v10, 8v12, 10v12
Mean number of days/week students have PE, among those who take PE in each grade	4.0	3.8	4.2	3.9	8v10
Mean number of days/week that students in each grade have PE in all schools	2.6	3.5	2.7	1.4	8v10, 8v12, 10v12
Mean length of PE classes (in minutes) in each grade ^a	56.6	50.8	60.1	59.5	8v10, 8v12
Mean time students in all schools spend in PE classes (in minutes) per week ^a	145.0	172.3	163.9	88.6	8v12, 10v12
Varsity and intramural sports participation					
Mean % of boys who participate in interscholastic or varsity sports	37.4	36.8	38.6	36.6	
Mean % of girls who participate in interscholastic or varsity sports	33.3	33.5	33.8	32.4	
Mean % of boys who participate in intramural sports or physical activity clubs	19.2	24.0	16.9	15.8	8v12
Mean % of girls who participate in intramural sports or physical activity clubs	16.4	20.5	14.9	13.3	8v12
Walking or biking to school					
Mean % of students who walk or bike from home to school on an average school day	13.7	20.1	12.7	7.3	8v10, 8v12, 10v12
Physical fitness tests					
Percentage of students who attend schools that provide physical fitness tests to at least some students ^a	46.5	63.8	47.3	24.5	8v10, 8v12, 10v12
Percentage of students in schools in which at least some parents are provided with the results of physical fitness tests ^a	25.5	39.6	22.0	12.4	8v10, 8v12

Note: Between-grade differences are indicated in the column "Sig. Grade Level Comparison" by noting the particular grades that differ on the particular variable with a minimum significance level of $p < 0.05$.

^aThese questions were asked only in 2004 and 2005, thus the sample sizes are about one third less than the numbers shown.

grades. The average number of days per week that 8th, 10th, and 12th graders have PE was 3.5, 2.7, and 1.4, respectively. For those taking PE, there was also a significant difference among grades in the mean length of an average PE class, this time with shorter classes in middle school; there were significant differences between 8th (50.8 minutes) and 10th (60.1 minutes) grades and between 8th and 12th (59.5 minutes) grades (Table 2). Overall, the average time that American students spend in PE classes (in minutes per week) drops by about half as they pass through secondary school, from 172 minutes in 8th grade to 164 minutes in 10th, down to 89 minutes by 12th grade (the overall drop being significant at $p < 0.001$, Table 2).

Sports participation. No significant difference was found between grade levels in the percentage of boys or girls who were estimated to participate in interscholastic or varsity sports. Overall, respondents estimate that 37.4% of boys and 33.3% of girls in these three grades of secondary school participate in varsity sports, with negligible between-grade differences (Table 2).

Considerably fewer students were estimated to participate in intramural sports or physical activity

clubs than in varsity sports—on average only about 19% of the boys and 16% of girls in secondary school across the three grades combined. Unlike in varsity sports, there was a decline between middle school and high school in the percentage of both boys and girls who were estimated to participate in intramural sports or physical activity clubs. For example, 24% of boys in 8th grade were estimated to participate in these activities compared with 17% of 10th- and 16% of 12th-grade boys. Similarly, while 21% of girls in 8th grade participate in intramural sports or physical activity clubs, by 10th and 12th grades only 15% and 13%, respectively, did so. (For both genders the 8th- to 12th-grade declines were statistically significant at the $p < 0.05$ level.) Roughly two thirds of secondary school students were not involved in varsity sports during the school year, and more than 80% were not involved in intramural sports.

Walking or biking to school. Walking or biking to school represents another school-related activity from which students might derive an appreciable amount of exercise. However, the school administrator respondents estimate that only about one in seven (14%) of second-

ary school students walk or bike to school. While 20% do so in 8th grade, this proportion declines by nearly two thirds to 7% by 12th grade ($p<0.05$, Table 2).

Physical fitness tests. A fair proportion of secondary school students—roughly half on average (47%)—attend schools that provide physical fitness tests to at least some of their students. There was a significant decline with grade level, with the proportion attending such schools falling from 64% in 8th grade to 25% in 12th ($p<0.05$, Table 2). The percentage of students in schools in which at least some parents were provided with the results of fitness tests was even smaller (26% on average) and declines with grade level—40% in 8th grade versus only 12% by 12th grade ($p<0.05$, Table 2).

Differences Among Racial/Ethnic Groups

Physical education. Among 8th graders, a lower percentage of Hispanic students (75.9%) than white students (89.3%) attend schools that require PE ($p<0.05$). Among 8th and 12th graders, the estimated percentage of students who take PE was lower in schools attended by Hispanic students than in those attended by white students (Table 3). There were no significant racial/ethnic differences in mean number of days/week that students have PE, nor in mean length of PE classes.

Sports participation. Rates of participation in interscholastic or varsity sports were significantly higher in schools attended by white students than those attended by black and Hispanic students (Table 3 and Figure 1). No significant differences between these groups were observed in the participation rates in intramural sports or physical activity clubs.

Walking or biking to school. The percentage of students estimated to walk or bike from home to school on an average school day was higher in schools attended by black and Hispanic students as opposed to those attended by white students across all three grades. Hispanics have the highest observed rates in all three grades (significantly higher than whites in grades 8 and 10, and across all three grades combined), and blacks were higher than whites in all three grades (although significantly so only in grade 10 and across all three grades combined). The differences at 12th grade were consistent with those at the lower grades, but not substantially, as the rates of walking or biking to school were quite low for all groups.

Physical fitness tests. Across the three grades combined, no racial/ethnic differences were observed in the percentage of students who attend schools that provide physical fitness tests to at least some of their students. In 8th and 12th grades, a slightly higher proportion of blacks than whites attend such schools (not significant), while at 10th grade a somewhat lower

proportion of blacks do ($p<0.05$, Table 3). The inconsistencies in the results across grades suggest that the differences may be due to sample fluctuations. Summing across all schools, there were no significant differences in the percentage of white, black, and Hispanic students who attended schools that provide their parents with the results of fitness tests. However, among 8th and 12th graders, a higher percentage of black than Hispanic students attend such schools ($p<0.05$), whereas in 10th grade blacks have the lowest rate of the three groups (not significant, Table 3).

Differences in SES

Physical education. Summing across all schools, there was a significant positive linear association between student SES and the mean percentage of students who were required to take PE ($p<0.01$) and who actually take PE ($p<0.05$, Table 4). These variables were also positively associated with SES at each grade level, but the associations were not statistically significant. (The differences across SES strata, while generally ordinal, were not large.) There was no significant linear association, however, between student SES and mean time per student spent (among all students) in PE classes per week in their school, at any of the three grade levels or summing across grades (Table 4).

Sports participation. Based on all three grades combined, there was a highly significant positive linear association between SES and the estimated percentage of male students participating in varsity sports ($p<0.001$), as well as in the estimated percentage of female students ($p<0.001$, Table 4 and Figure 2). These positive linear associations were also significant at 8th and 10th grades specifically, but not at 12th grade where the trend was less steep. Similarly, there was a significant positive linear association between SES and the mean percentages of both boys and girls estimated to participate in intramural sports or physical activity clubs ($p<0.001$ for all three grades combined for each gender, Table 4 and Figure 2). For boys, these linear associations were statistically significant only at 12th grade, and for girls they were significant at 8th and 12th grade.

Walking or biking to school. There was a negative linear association between SES and the estimated proportion of students in the school who walk or bike to school ($p<0.01$). Nearly all of that association was due to the lowest SES stratum having an appreciably higher rate than the other four strata. Given that minorities have a higher rate of walking or bicycling to school than whites, the question of whether this SES difference reflects a racial/ethnic effect is addressed in the multivariate analyses presented below.

Physical fitness testing. Finally, no significant linear association was observed between SES and attending

Table 3. Physical education (PE) and other physical activities by student race/ethnicity: 2003–2005

	Student race/ethnicity				Significant racial/ethnic comparison
	White	Black	Hispanic	Other	
Approx N total	36,450	6,744	5,247	5,743	
Approx N 8th	12,568	2,285	1,810	2,563	
Approx N 10th	12,277	2,778	2,032	1,845	
Approx N 12th	11,605	1,681	1,405	1,336	
PE participation					
Percent of students in each grade in schools that require PE in that grade					
Total	53.6	48.9	48.6	60.1	
8th	89.3	81.0	75.9	86.3	WH
10th	48.7	37.7	48.4	52.5	
12th	20.3	23.7	13.7	20.5	
Mean % of students in each grade that take PE					
Total	64.7	61.7	60.5	70.0	
8th	93.1	88.5	82.4	91.3	WH
10th	63.2	58.0	64.9	66.7	
12th	35.5	31.6	26.0	33.8	WH
Mean number of days/week students have PE, among those who take PE in each grade					
Total	3.9	4.2	4.2	4.1	
8th	3.8	3.8	4.1	4.0	
10th	4.2	4.4	4.4	4.2	
12th	3.9	4.2	4.1	4.0	
Mean number of days/week that students in each grade have PE in all schools					
Total	2.6	2.6	2.6	2.9	
8th	3.5	3.4	3.3	3.6	
10th	2.7	2.6	3.0	2.9	
12th	1.4	1.5	1.1	1.4	
Mean length of PE classes (in minutes) in each grade ^a					
Total	56.3	60.5	55.8	55.5	
8th	49.9	55.1	52.2	51.5	
10th	60.2	61.7	58.3	58.9	
12th	59.1	64.5	57.8	58.3	
Mean time students in all schools spend in PE classes (in minutes) per week ^a					
Total	142.4	147.2	147.0	156.8	
8th	171.5	181.2	162.5	177.0	
10th	166.2	148.6	161.5	171.6	
12th	85.4	108.0	91.8	91.3	
Varsity and intramural sports participation					
Mean % of boys who participate in interscholastic or varsity sports					
Total	39.9	31.4	30.3	34.5	WB, WH
8th	40.4	27.6	26.8	33.9	WB, WH
10th	40.5	33.8	35.2	37.1	WB
12th	38.7	32.4	27.4	32.4	WB, WH
Mean % of girls who participate in interscholastic or varsity sports					
Total	36.0	25.3	26.3	31.5	WB, WH
8th	37.3	22.7	23.6	31.1	WB, WH
10th	36.2	25.6	30.4	34.2	WB, WH
12th	34.4	28.3	23.8	28.5	WB, WH
Mean % of boys who participate in intramural sports or physical activity clubs					
Total	19.2	19.9	18.2	19.0	
8th	24.3	20.8	26.0	23.5	
10th	16.9	19.9	14.5	15.8	
12th	15.9	18.8	12.5	14.2	
Mean % of girls who participate in intramural sports or physical activity clubs					
Total	16.8	15.7	15.1	16.3	
8th	21.3	16.3	21.2	20.2	
10th	15.2	16.2	12.3	13.5	
12th	13.5	14.1	10.9	12.2	

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Table 3. (continued)

	Student race/ethnicity				Significant racial/ethnic comparison
	White	Black	Hispanic	Other	
Walking or biking to school					
Mean % of students who walk or bike from home to school on an average school day					
Total	10.5	17.1	24.7	20.6	WB, WH
8th	16.4	24.7	31.4	26.5	WH
10th	8.3	15.6	29.3	19.4	WB, WH, BH
12th	6.3	9.1	9.8	11.3	
Physical fitness tests					
Percent of students who attend schools that provide physical fitness tests to at least some students ^a					
Total	47.0	44.5	42.0	49.0	
8th	63.7	74.5	58.9	60.4	
10th	51.3	32.6	39.1	49.1	WB
12th	24.2	31.3	16.8	25.0	
Percent of students in schools in which at least some parents are provided with the results of physical fitness tests ^a					
Total	25.6	25.2	19.0	29.9	
8th	39.8	47.8	27.8	40.9	BH
10th	24.2	11.0	17.3	26.7	
12th	11.5	23.7	6.2	12.1	BH

Note: Between-race/ethnicity differences are indicated in the column "Significant racial/ethnic comparison" with a minimum significance level of $p < 0.05$.
BH, black-Hispanic; WB, white-black; WH, white-Hispanic.

schools that provide physical fitness tests to at least some students, or between SES and the percentage of students in schools where at least some parents were provided with the results of these physical fitness tests.

Multivariate Analysis

Multivariate analyses were used to examine the three most important outcome variables—average time spent in PE per week, average rate of participation in varsity sports, and average rate of participation in intramural sports or physical activity clubs. For each of these outcomes, three analyses are presented in Tables 5 through 7: the simple bivariate relationships between

each of these outcome variables and gender, race/ethnicity, SES, grade level, region, and urbanicity. Model 1 then presents the first four of those variables regressed against each outcome, while the full model adds region and urbanicity to the set. The obvious objective was to estimate the effect of each predictor variable while controlling simultaneously for the others.

Physical education. Table 5 presents regression results for mean time per student spent in PE classes. The only significant association was with grade level. As shown in Table 2, 12th graders averaged significantly lower in mean time spent in PE classes than 8th graders. The strength of that association was not affected by the

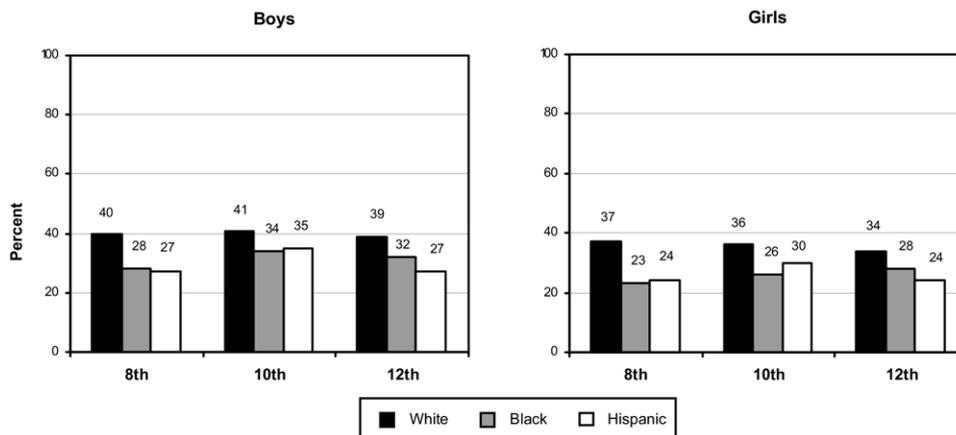


Figure 1. Varsity sports: average percentage of students reported to be participating, by grade, gender, and race/ethnicity of the student.

Table 4. Physical education (PE) and other physical activities by student SES: 2003–2005

	Student SES					b	Significant linear association
	1 (Low)	2	3	4	5 (High)		
Approx N total	4,151	12,369	14,507	14,944	8,214		
Approx N 8th	1,459	4,331	4,725	5,543	3,168		
Approx N 10th	1,541	4,180	5,105	5,260	2,848		
Approx N 12th	1,152	3,859	4,678	4,141	2,198		
PE participation							
Percentage of students in each grade in schools that require PE in that grade							
Total	49.6	51.8	50.2	55.2	59.2	2.33	**
8th	84.4	86.2	85.5	86.8	89.7	1.06	
10th	39.4	45.1	46.9	49.4	52.3	2.76	
12th	19.1	20.5	18.1	20.2	24.1	0.89	
Mean % of students in each grade that take PE							
Total	62.4	63.3	62.2	66.2	68.3	1.59	*
8th	89.8	91.0	90.6	91.7	93.0	0.66	
10th	59.0	60.9	62.8	64.4	65.6	1.64	
12th	32.0	34.9	32.8	34.4	36.1	0.53	
Mean number of days/week students have PE, among those who take PE in each grade							
Total	4.2	4.0	4.0	4.0	3.9	-0.06	
8th	3.9	3.8	3.8	3.9	3.8	-0.01	
10th	4.4	4.3	4.3	4.2	4.1	-0.08	
12th	4.3	4.0	4.0	3.9	3.8	-0.11	*
Mean number of days/week that students in each grade have PE in all schools							
Total	2.6	2.6	2.5	2.6	2.7	0.02	
8th	3.5	3.4	3.5	3.5	3.5	-0.002	
10th	2.7	2.7	2.8	2.8	2.7	0.02	
12th	1.4	1.5	1.4	1.4	1.4	-0.03	
Mean length of PE classes (in minutes) in each grade ^a							
Total	57.0	57.2	57.4	56.6	54.3	-0.68	
8th	52.1	52.0	51.3	49.8	49.5	-0.83	*
10th	59.5	59.5	60.1	61.7	58.1	0.04	
12th	60.3	60.8	60.9	58.8	55.8	-1.28	
Mean time students in all schools spend in PE classes (in minutes) per week ^a							
Total	144.6	144.7	145.7	146.9	141.1	-0.41	
8th	178.0	173.4	174.9	170.6	167.1	-2.32	
10th	143.9	161.1	168.5	170.3	158.3	2.68	
12th	99.9	93.5	88.1	85.6	81.4	-4.20	
Varsity and intramural sports participation							
Mean % of boys who participate in interscholastic or varsity sports							
Total	31.7	35.9	37.1	39.1	39.7	1.73	***
8th	29.7	35.5	36.6	38.7	38.8	1.83	*
10th	34.9	36.5	37.8	40.3	42.3	1.89	**
12th	30.1	35.8	37.0	38.2	37.7	1.41	
Mean % of girls who participate in interscholastic or varsity sports							
Total	27.4	31.9	33.0	35.0	35.6	1.75	***
8th	26.1	32.0	33.1	35.6	35.9	2.01	**
10th	29.2	31.6	33.0	35.7	38.0	2.17	***
12th	26.7	32.1	33.1	33.5	32.1	0.85	
Mean % of boys who participate in intramural sports or physical activity clubs							
Total	16.8	16.8	18.5	20.4	22.8	1.70	***
8th	20.7	20.3	22.6	25.8	29.2	2.53	**
10th	15.7	15.4	17.1	17.9	17.9	0.79	
12th	13.2	14.4	15.8	16.2	19.1	1.33	

(continued on next page)

Table 4. (continued)

	Student SES					b	Significant linear association
	1 (Low)	2	3	4	5 (High)		
Mean % of girls who participate in intramural sports or physical activity clubs							
Total	13.8	14.3	15.9	17.9	19.4	1.57	***
8th	16.8	17.5	19.5	22.4	24.6	2.19	**
10th	13.3	13.4	14.9	16.0	15.8	0.85	
12th	10.7	11.8	13.2	13.9	16.1	1.29	*
Walking or biking to school							
Mean % of students who walk or bike from home to school on an average school day							
Total	21.4	13.7	13.0	12.9	12.8	-1.23	**
8th	26.9	19.8	19.5	19.9	18.6	-1.06	
10th	24.5	12.9	12.0	10.6	11.1	-2.17	*
12th	10.5	7.7	7.5	6.3	6.6	-0.78	
Physical fitness tests							
Percentage of students who attend schools that provide physical fitness tests to at least some students ^a							
Total	43.9	48.9	46.8	45.3	46.2	-0.43	
8th	64.0	65.0	67.1	60.9	61.9	-1.23	
10th	36.7	49.5	48.8	47.6	46.4	0.69	
12th	26.3	29.2	22.8	21.9	23.8	-1.71	
Percentage of students in schools in which at least some parents are provided with the results of physical fitness tests ^a							
Total	21.2	26.2	24.7	25.1	28.4	0.94	
8th	33.2	39.5	40.5	37.7	44.2	1.40	
10th	14.0	22.1	21.3	23.5	24.0	1.65	
12th	14.5	14.9	11.7	10.7	12.0	-1.11	

Note: The column labeled “b” refers to the unstandardized regression coefficient obtained from the OLS regression analyses that were utilized to determine if a linear association exists between SES and each of the physical education and other physical activity variables. Significance of regression coefficients is indicated with asterisks in the column “Significant linear association”.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

introduction of any of the other variables included in the full model.

Varsity sports participation. In Table 6, it is noted that black and Hispanic students attend schools where a significantly lower percentage of students participated in varsity sports compared to schools attended by white students. These racial/ethnic differences remained significant and were diminished only modestly after adjusting for SES and grade level. When urbanicity and region were entered into the model, the coefficients for each minority group dropped some, but still remained highly significant. SES was also significantly and positively associated with the level of student participation in interscholastic or varsity sports. In the full model, students who lived in large- and medium-sized cities attended schools with lower varsity sports participation rates than schools in rural areas. Also, students who lived in the Northeast and North Central regions attended schools that had significantly higher varsity sports participation rates than schools in the South, while those in the West had rates not much different from the South (Table 6).

Intramural sports participation. Finally, multivariate prediction of intramural sports participation is provided in Table 7, where it can be seen that high-SES students attend schools where a greater percentage of students participate in intramural sports or physical activity clubs, with the rate of participation increasing about 1.2 percentage points with each step up on the 5-point SES scale, after adjusting for all other variables in the regression. Twelfth graders attended schools where on average there was less participation in these activities than in schools that 8th graders attend—a relationship that was little changed by the inclusion of the other variables in the model. Students who live in the North Central and Western regions attended schools where they were more likely to participate in intramural sports or physical activity clubs than students who live in the South. (The Northeast also shows a higher rate than the South, but the difference does not quite reach the traditional level of significance: $p < 0.09$ bivariate and $p < 0.10$ multivariate.) Once controls for region and urbanicity were introduced, the lower rate of intramural sports participation by Hispanic students, which was nonsignificant in the bivariate

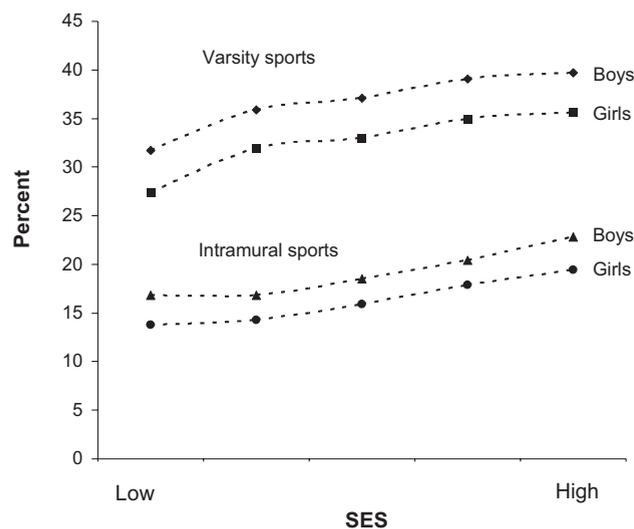


Figure 2. Varsity and intramural sports: average percentage of students in the school reported as participating, by gender and socioeconomic status (SES) of the student.

ate model, became even lower and attained significance in the full model. Apparently, Hispanic students attend schools where sports participation occurs at a lower rate than would be expected, taking into account where they were located geographically.

Table 5. Results of multiple regression analyses predicting mean time per student spent in PE classes (in minutes) per week: 2004–2005

Demographic characteristic	Bivariate	Model 1	Full model
Gender			
Male	Ref	Ref	Ref
Female	2.42	3.28	3.44
Race/ethnicity			
White	Ref	Ref	Ref
Black	4.81	0.58	2.79
Hispanic	4.59	-4.95	-6.50
SES ^a	-0.41	-1.26	-2.03
Grade			
8th	Ref	Ref	Ref
10th	-8.35	-8.68	-10.60
12th	-83.73***	-84.00***	-83.85***
Urbanicity			
Large MSA	10.73		6.55
Other MSA	15.43		17.0
Non-MSA	Ref		Ref
Region			
Northeast	4.22		2.13
North Central	23.63		22.06
South	Ref		Ref
West	23.23		16.10

Note: Data are for 2004 and 2005 only because the question on time spent on PE was not asked in 2003.

^aSES ranges from 1–5, with higher scores representing higher SES.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

MSA, metropolitan statistical area; PE, physical education; SES, socioeconomic status.

Table 6. Results of multiple regression analyses predicting mean percent of students who participate in interscholastic or varsity sports: MTF 2003–2005

Demographic characteristic	Bivariate	Model 1	Full model
	β	β	β
Gender			
Male	Ref	Ref	Ref
Female	-0.87	-0.64	-0.50
Race/ethnicity			
White	Ref	Ref	Ref
Black	-9.76***	-9.46***	-6.34***
Hispanic	-10.01***	-9.09***	-5.21***
SES ^a	1.81***	1.30**	1.62***
Grade			
8th	Ref	Ref	Ref
10th	1.40	1.50	1.41
12th	-0.40	-0.61	-0.69
Urbanicity			
Large MSA	-8.65		-7.64*
Other MSA	-7.07		-6.60*
Non-MSA	Ref		Ref
Region			
Northeast	9.31**		10.20**
North Central	11.58**		10.89***
South	Ref		Ref
West	1.98		3.49

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

^aSES ranges from 1–5, with higher scores representing higher SES. MSA, metropolitan statistical area; MTF, Monitoring the Future; SES, socioeconomic status.

Discussion

Physical education in schools. The sharp decline in PE participation between 8th grade and 12th grade—from 91% to 34% participation—should be of serious concern in light of the obesity epidemic affecting the country. More than one third of all students in 10th grade and two thirds of those in 12th, who might be getting regular exercise within the context of the school physical education curriculum, were not. Further, there was no compensatory increase across grades in sports participation that might offset the effects on physical fitness or general well-being.

Summing across all grades, no significant differences exist by race/ethnicity in the proportion who attend schools that require physical education, but among 8th graders specifically, Hispanic youth attended schools in which smaller proportions of students were required to take PE than schools attended by white youth. Lower-SES students were also less likely to have PE required in their schools. It seems likely that their schools have been more affected by budget limitations or a greater need to abandon activities like PE in their pursuit of improved student academic performance. Schools attended by Hispanic students have a significantly smaller percentage actually taking PE in 8th and 12th grades than do those attended by white students, no doubt due

Table 7. Results of multiple regression analyses predicting mean percent of students who participate in intramural or physical activity clubs: MTF 2003–2005

Demographic characteristic	Bivariate	Model 1	Full model
	β	β	β
Gender			
Male	Ref	Ref	Ref
Female	-0.56	-0.37	-0.29
Race/ethnicity			
White	Ref	Ref	Ref
Black	-0.26	0.25	1.56
Hispanic	-1.44	-0.13	-3.88***
SES ^a	1.63***	1.61***	1.21***
Grade			
8th	Ref	Ref	Ref
10th	-6.36	-6.20	-6.38
12th	-7.37*	-7.15*	-6.87*
Urbanicity			
Large MSA	5.67		4.50
Other MSA	4.62		4.10
Non-MSA	Ref		Ref
Region			
Northeast	6.40		5.73
North Central	5.28		5.29*
South	Ref		Ref
West	10.78*		12.31*

^aSES ranges from 1–5, with higher scores representing higher SES. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

MSA, metropolitan statistical area; MTF, Monitoring the Future; SES, socioeconomic status.

at least in part to the lower requirements that they do so. Lower SES was also found to be associated with fewer students actually participating in PE, very likely for much the same reason.

Not surprisingly, the average time in minutes per week spent in physical education classes also declines sharply by grade, particularly by 12th grade. Multivariate analyses predicting this outcome variable did not show significant differences associated with any of the other variables in the model, including gender, race/ethnicity, SES, urbanicity, and region (Table 5).

Varsity sports participation. Unlike physical education, participation in interscholastic or varsity sports does not show a decline at higher grade levels for either gender, but it does not show any increase either. Some 37% of male American secondary school students participate in varsity sports in all three grades combined, based on the estimates provided by school administrators. Females average slightly lower overall by about four percentage points, although this difference does not show as statistically significant in the multivariate analyses. What was most impressive was how close the genders were in their rates of varsity sports participation, likely as a result of the effects of Title IX of the Education Amendments of 1972 to the Civil Rights Act of 1964.

Things were less equivalent, however, when differences in sports participation were examined relative to

race/ethnicity. Black and Hispanic students, who were at higher risk of being overweight on average, attended schools that have lower rates of varsity sports participation than those that white students attend, a finding that holds for both genders and at all three grades. The differences were quite substantial and remained highly significant, although somewhat diminished, in the multivariate analysis in which other variables were controlled. Those analyses also revealed significant differences in sports participation related to region of the country, urbanicity, and SES, all of which were correlated with race/ethnicity. Contrary to what some may have thought, given the climate difference among them, the Northeast and the North Central turned out to have higher reported rates of varsity sports participation than the South and the West.

Lower-SES students, who are at higher risk for obesity on average, attend schools with the lowest rates of participation in varsity sports (Table 4). Such participation was significantly positively related to SES, even after controlling for other variables, including race/ethnicity. These findings are consistent with the fact that most of these sports require the appropriate facilities (e.g., a swimming pool, football field), personnel, equipment, parental involvement, and travel, all of which may be more affordable to families of higher SES and schools with a higher tax base. Also, it is possible that students of higher SES have the resources to attend schools, especially private schools, or to live in school districts that provide more opportunities for their involvement in interscholastic sports. Prior research has found that a significantly higher percentage of boys and girls were physically active when schools provided students with adequate space, facilities, equipment, and adult supervision²⁸ and when parents were available to provide youth with encouragement and transportation to attend these activities.²⁹ It is also possible that less-privileged students lack the means to pay out-of-pocket costs or parental subsidies that may be required to participate on sports teams. School districts and states could as a matter of policy choose to cover such charges for students unable to pay them.

Intramural sports participation. Intramural sports were reported to have considerably lower rates of student participation overall than varsity sports, and unlike the latter, they showed a substantial drop in the participation rate between middle school and high school. In 8th grade, the rates of participation in intramural sports or physical activity clubs during the year were estimated at 24% and 21%, respectively, for boys and girls, indicating that this form of sport may play an important role in providing exercise in middle school; but by 12th grade the rates had fallen to 16% and 13%. The large racial/ethnic differences seen in varsity sports were not observed in intramural sports in the bivariate analyses, but Hispanic students did have a

somewhat lower-than-expected rate of participation than white students in the multivariate model ($p < 0.001$), after controlling for things such as grade, region, urbanicity, and SES. As was true for varsity sports, there was a significant positive linear association between SES and the percentage of youth in the school who participated in intramural sports. In the multivariate analyses, the magnitude of the association was attenuated, but remained significant. It is not clear whether this finding means that youth of higher SES have more opportunities for intramural sports presented by their schools, or whether they are more able or willing to take advantage of opportunities than low-SES youth. Possibly both are true, but either way, the outcome was that low-SES students are getting less exercise not only from their lower participation in varsity sports but from their lower participation in PE and in intramural sports as well.

Overall, relatively few students were involved in these extracurricular activities. Averaging across the three grades, less than 38% were estimated to participate in varsity sports at any time during the school year and less than 19% in intramural sports or physical activity clubs. This suggests that roughly half of all secondary students in the country could benefit from the improved cardiovascular fitness and increased calorie expenditure that would result from increased sports participation,^{30,31} protective factors against the risk of developing metabolic syndrome and cardiovascular diseases in later years. Increasing participation in physical activities is important for all students, particularly given the upward trends in overweight among American youth generally. Particular attention should be paid to factors that can help increase participation by black and Hispanic students, and students of lower SES, because they represent populations with higher-than-average risk for overweight and the associated medical complications.

Further contributing to the lack of physical activity is the fact that the percentage of students who walk or bike to school on an average day decreases significantly with grade level, from a rather low level of 20% in 8th grade to only 7% by 12th. The decline with age was not unexpected, as high school students on average probably live farther from the school than middle school students, given the larger geographic area that high schools serve, and thus may be more likely to take a school bus or be driven to school. Also, more of them own their own motor vehicles and can drive themselves to school, which may account for the further decline between 10th and 12th grade. Clearly, getting to and from school is no longer an important source of exercise for students. There has, however, been a movement toward encouraging walking and biking to school, which deals with various aspects of the problem from community design to safety.³² From a health perspective, it is encouraging to see that a greater percentage of black and Hispanic students and students

of lower-SES backgrounds walk or bike from home to school, but the overall percentages are still sufficiently modest, so that the benefits reach a quarter or less of these groups. Further, how much exercise these commutes actually entail is not known; some may be very short, such as those in dense urban environments.

Finally, the findings regarding physical fitness tests show that while nearly half (47%) of all students at 8th grade were in schools that conduct at least some physical fitness tests, the prevalence declined sharply thereafter, reaching only 24% by 12th grade. These declines in testing were expected given the decline in PE rates across grades, as testing is likely to take place within the context of PE classes. Even fewer students were in schools where the PE test results were shared with parents. Whether the implementation of physical fitness tests and the communication of these results to parents will result in increased physical activity and a subsequent reduction in body mass index (BMI) among students is an empirical question that remains to be answered. What can be said at present is that the application of this approach is quite limited.

Limitations. As is true for most studies, this study has limitations that should be kept in mind when interpreting the findings. The data were based on the responses from school administrators (mostly principals) or other school staff members who completed a self-administered questionnaire, so there is the possibility of errors in reporting due to lack of knowledge, misunderstanding, and social desirability bias. Some of the information requested may have been derived from records, but much of it is likely based on their best estimates. To minimize some of these errors, research staff recontacted those participants who provided incomplete or inconsistent answers by phone or letter in order to clarify or complete the information requested. Because the questions were generally straightforward, because the answers generally should be known to the respondents, and because the subjects tended to be responsible and educated people who take their task seriously, these data are believed to be largely valid. Confidence in the validity of the data is further enhanced by preliminary analyses that suggest that a reasonable level of agreement exists between what the school respondent reports about the rates of sports participation by students and what students in the same schools report about their own level of participation in school athletics. To be specific, the estimated percentage of boys participating in varsity sports during the school year correlated between 0.44 and 0.64, depending on grade level, with aggregate students' self-reports of the extent to which they participated in school athletic teams during the school year. (The student question did not differentiate varsity from intramural teams, which would reduce the expected level of correlation.) The comparable numbers with the school

respondent's estimate of the percentage of girls participating in varsity sports were between 0.40 and 0.64. (All correlations were significant at $p < 0.001$.)

Although the student sample sizes were large, it was not possible to analyze data for the various Hispanic subgroups separately nor to disaggregate the residual racial/ethnic category of "other." The extent to which the findings of the study apply to racial/ethnic groups not distinguished in the present study is unknown. Finally, some of the differences examined were not statistically significant despite what at times appeared to be large and important differences.

Notwithstanding these limitations, this study includes a large nationally representative sample of schools and of students in them. This permitted the simultaneous examination of both school-level variables and several important student-level characteristics in recent years.

Conclusion

This study documents the large differences that exist across grades and across particular population subgroups in participation in school-based physical activities by American students, whether in terms of their PE participation or their participation in interscholastic or intramural sports. Participation rates in PE and intramural (but not varsity) sports fall sharply with increasing grade level. Black and Hispanic youth, as well as students of lower SES—all of whom were overrepresented among the overweight and obese^{5,7,9}—were less likely to participate in varsity and intramural sports than were white students and those of higher SES, respectively. Changing the physical activity levels of students should be a goal that is integrated into larger efforts to develop, test, and implement comprehensive, theoretically based interventions supported by evidence, as some have suggested.^{33–35} Insofar as some of the differences observed in school-related exercise levels were the result of disparities in the resources available to the schools that serve higher-risk children, it follows that bringing resources into a more equitable distribution may be a necessary part of the solution to the obesity epidemic among children. The authors intend to extend the present work in at least two directions—by continuing to track these conditions in American schools into future years, in order to assess important changes in school environments that increasingly seem likely to occur, and by extending the analyses of the individual- and school-level measures of exercise and sports participation to determine their relationships with self-reported exercise levels more generally, as well as with BMI and overweight among American adolescents.

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