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What Is the Status of High School Athletes 8 Years After Their Senior Year?

TEACHERS
STUDENTS NELS 88 PARENTS
SCHOOLS

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This Statistics in Brief examines the status of high school athletes 8 years after their senior year in high school. Using a representative sample of 10th-graders in 1990, who were seniors in 1992, from the National Education Longitudinal Study of 1988 (NELS:88), this Brief provides information on the 1990–1992 high school athletes' educational, labor market, and health status in the year 2000, eight years after scheduled high school graduation. Outcomes for persons who reported participation in high school athletics (persons who indicated involvement in any school sports, at any level, in 1990 or 1992) are compared to outcomes for persons who did not report any high school athletic participation. In addition, outcomes for different types of high school athletes—persons who participated as elite athletes (team captains or most valuable players [MVPs] in 1990 or 1992), varsity athletes, and junior varsity (JV)/intramural athletes[1]—are compared.

Major findings include the following:

Educational

High school athletes at the elite and varsity levels are more likely than nonathletes to have any postsecondary education by 2000 and to have earned a bachelor's degree by 2000. No differences were detected for JV/intramural athletes.

Labor Market

Elite athletes are more likely than nonathletes to be employed and employed full time in 2000. Those who participated in high school athletics at the elite and varsity levels earned a higher income in 1999, when compared to those who did not participate in high school athletics.

Health

High school athletes at all three levels of participation—elite, varsity, and JV—are more likely than nonathletes to participate in physical fitness activities and in group sports/recreation activities in 2000. Elite and varsity athletes were less likely to be daily smokers in 2000 than were nonathletes, but were more likely to binge drink in 2000 than their nonathletic counterparts.

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[1]The three categories of high school athletes discussed in this report—elite, varsity, and JV/intramural—are mutually exclusive.

Introduction

School-based organized sports play a large role on the campuses of America's educational institutions. From elementary school gym classes to high school varsity teams to National Collegiate Athletic Association (NCAA) tournaments, participation in school-based team and individual sporting competitions is a prevalent activity. Virtually every state, district, and school in the United States requires physical education for its students (Pate et al. 1995). According to figures from state high school athletic/activity associations, 55.4 percent of high school students participated in athletics in 2002–03 (National Federation of State High School Associations 2003).

Given the prevalence of school athletic programs and participation, it is important to understand and consider both the immediate and long-range impacts that such activities may have on the individual. Over the years, many studies have examined this impact and athletic participation has been shown to be associated with a number of different outcomes, ranging from educational aspirations and attainment to occupation and income to consumption of alcohol (Adelman 1990; Barber, Eccles, and Stone 2001; Long and Caudill 1991; Pascarella et al. 1999). Some of the studies have investigated athletic participation as one factor within the larger context of participation in extracurricular activities, while others have examined the influence of school athletic participation by itself (Adelman 1990; Marsh and Kleitman 2002). Regardless of the context in which school athletic participation is analyzed, the preponderance of the literature reaches similar conclusions. There is ever-increasing evidence that school athletic participation is positively associated with many educational, labor market, and health outcomes.

Barber, Eccles, and Stone (2001) found that school athletic participation was associated with academic achievement. Students who self-identified themselves as "jocks" were found to have relatively higher grade-point averages in high school and to be relatively more likely to enroll in college full time than those who did not self-identify themselves as "jocks." In addition to educational outcomes, school athletic participation has also been shown to be positively associated with income for males later in life (Long and Caudill 1991). Pascarella et al.'s (1999) review of the literature noted Adelman's (1990) finding that students who participated in college athletics have higher rates of employment than nonparticipants. In the same review, the authors also noted that Pascarella and Smart (1991) reported evidence linking athletic participation to persistence in college and completion of a bachelor's degree.

One exception to these positive patterns is alcohol consumption. A number of studies have found that students who participate in athletics have higher rates of drinking than those who do not participate in school athletics (Barber, Eccles, and Stone 2001; Eccles and Barber 1999; Long and Caudill 1991). In their research, Barber, Eccles, and Stone (2001) found that students who participated in high school athletics also had high rates of drinking relative to nonparticipants, both in high school and later in life. In a similar study, Eccles and Barber (1999) found that participation in team sports in high school was linked to higher rates of drinking alcohol, when compared to the general population. Along the same lines, Long and Caudill (1991) found that participants in college athletics had more alcohol- and drug-related problems than other students.

While some of the studies that examine the impact of athletic participation on a variety of outcomes do so using cross-sectional data, other studies, including this one, use longitudinal data in their analyses. Eccles and Barber (1999) and Barber, Eccles, and Stone (2001) used data from the Michigan Study of Adolescent Life Transitions, a longitudinal study that followed participants from their 6th-grade year in 1983 until six years after their scheduled graduation. In his piece titled *Light and Shadows on College Athletics: College Transcripts and Labor Market History*, Adelman (1990) used data from the 1986 follow-up to the National Longitudinal Study of 1972 (NLS:72), one of the predecessors to the National Education Longitudinal Study of 1988 (NELS:88), and found positive labor market outcomes for college athletes.

Marsh and Kleitman (2002) used NELS:88 data to examine the associations between participation in high school extracurricular activities, including athletics, and a number of grade 12 and postsecondary outcomes such as, school grades, coursework selection, homework, educational and occupational aspirations, self-esteem, substance abuse, number of university applications submitted, and college enrollment. Their conclusions supported many of the findings of earlier studies. Participation in high school extracurricular activities, and especially athletics, was found to be associated with relatively higher rates of achieving a number of desirable outcomes than nonparticipation. Furthermore, these authors found that participation in high school athletics had a stronger positive impact on postsecondary outcomes than participation in any other type of extracurricular activity.

As is evident from this review of the literature, a number of studies have examined the associations between school athletic participation and later-life outcomes. This study, however, goes one step farther and deconstructs athletic participation by intensity of participation. Following the methodology employed by Owings, Burton, and Daniel (1997), this report classifies participants into one of three mutually exclusive categories of athletes—elite, varsity, or junior varsity/intramural (JV). These categories were created based upon self-reported student data. Outcomes are then examined by participation status and intensity of athletic participation. Other research has found that level of participation in extracurricular activities is often associated with outcomes (Broh 2002; Fejgin 1994; Marsh 1993; Melnick, Sabo, and Vanfossen 1992; Melnick et al. 2001; Sabo, Melnick, and Vanfossen 1993).

The specific outcomes examined in this Brief are as follows:

Educational

- any postsecondary education after high school for academic credit (i.e., college, university, or vocational, technical, or trade school) by 2000 (8 years after scheduled high school graduation);
- attainment of a bachelor's degree or higher by 2000;

Labor Market

- employment in 2000;
- full-time employment in 2000;
- income in 1999;

Health

- cigarette use in 2000;
- alcohol use in 2000;
- binge drinking in 2000;
- participation in physical fitness activities in 2000; and
- participation in group or team sports and recreation in 2000.

Like Marsh and Kleitman (2002), this report uses data from NELS:88 and examines many comparable outcomes. Despite this similarity, there are a number of unique aspects of this report, which expand upon and extend the work of Marsh and Kleitman. First, while both reports use NELS:88 data—Marsh and Kleitman looked at outcomes in 1992 and 1994, respondents' scheduled senior year in high school and two years after their scheduled graduation from high school, respectively—this report examines outcomes in 2000—eight years after respondents' scheduled graduation from high school. To this extent, this Brief investigates the possible long-term associations between high school athletic participation and later-life outcomes. Using data from the 2000 follow-up allows for postsecondary outcomes to be assessed more precisely and also allows for occupational outcomes, such as employment status and income, to be examined. In addition to using data from the year 2000, this report looks only at participation in school-based athletics, as opposed to examining athletic participation as one aspect of the larger realm of extracurricular activities, as Marsh and Kleitman have done. This study also extends previous work done on the topic by deconstructing high school athletic participation by level of intensity and examining the associations between selected outcomes and the three levels of high school athletic participation.

Research Hypotheses

There is no one specific theory that can be used to predict the associations between athletic participation and all outcomes studied in this Brief—education, labor market, and health. However, there are general tenets that can guide thinking on hypothesis formation. Long and Caudill (1991) hypothesized that participation in athletics enhances self-control, perseverance, and discipline, traits that lead to positive outcomes in education, society, and the labor market. In addition, athletes may develop better exercise and eating habits that lead to positive personal health outcomes. Given these theories and the findings of previous research, it is hypothesized that, when compared to individuals who did not report participation in high school athletics, individuals who reported athletic participation will be more likely to experience positive outcomes for every outcome examined except two. The two exceptions are alcohol use and binge drinking. Given the number of studies that have found athletic participation associated with higher levels of alcohol consumption, it is hypothesized that similar results will be observed in this study.

It is also hypothesized that, among athletic participants, those who participate at the more intense levels will experience more positive outcomes than those who participate at less intense levels. That is, it is expected that more positive outcomes will be observed for elite athletes compared to varsity athletes and JV athletes. Similarly, it is hypothesized that varsity athletes will be observed to have more positive outcomes compared to JV athletes.

The National Education Longitudinal Study of 1988 (NELS:88)

This Brief uses data from the National Education Longitudinal Study of 1988 (NELS:88). The NELS:88 is a nationally representative sample of eighth-graders who were first surveyed in the spring of 1988. A sample of these respondents was then resurveyed through four follow-ups, conducted in 1990, 1992, 1994, and 2000.

A sample of 9,840 NELS:88 students who were 10th-graders in 1990 and 12th-graders in 1992 was used to produce the estimates in this report. For each NELS:88 follow-up from which this report draws data (1990, 1992, and 2000), persons were asked to complete a questionnaire. However, not all persons completed the questionnaire as requested. In 1990, the weighted completion rate of the student questionnaire was 91.1 percent. For the second follow-up, in 1992, the weighted completion rate of the student questionnaire was 91.0 percent. The weighted completion rate for the fourth follow-up, in 2000, was 82.7 percent. Thus the unit nonresponse for the instruments used to produce the estimates in this Brief ranged from 82.7 percent to 91.1 percent. Weighted item response rates ranged from a low of 90.7 percent (for the variable measuring participation on a swim team during high school) to a high of 100 percent for a number of variables (including those measuring whether a person was named MVP of a team, gender, race, and attendance at a postsecondary institution).

Student-reported data from the first and second follow-ups, in 1990 and 1992 (sophomore and senior years in high school), were used to determine, among other variables, high school athletic participation status, level of athletic participation, participation in nonsport extracurricular activities, sex, race/ethnicity, and household socioeconomic status (SES), as well as 10th-grade test scores. On these questionnaires, students reported on a range of topics including school, work, and home experiences; educational and occupational aspirations; and other student perceptions. Additional topics included self-reports on smoking, alcohol and drug use, and extracurricular activities.

NELS:88 surveyed students two additional times after 1992, once in 1994 (two years after scheduled high school graduation) and once in 2000. In addition to drawing on data collected during the 1990 and 1992 follow-ups, this report utilizes data from the 2000 follow-up, 8 years after students' expected graduation from high school. The comparisons drawn for educational, labor market, and health outcomes were based upon data from the 2000 follow-up.

Overview of Analyses

There are two main types of analyses used in this Brief. The first type of analysis, bivariate analysis, is used to describe the characteristics of students that reported participating in high school athletics and those that did not participate in high school athletics. The purpose of this analysis is to provide a profile of high school athletes. The specific characteristics described are as follows:

- sex;
- race/ethnicity;
- socioeconomic status;
- school control;
- participation in nonsport extracurricular activities,
- 10th-grade test scores; and
- 10th-grade locus of control.

Comparisons are then made contrasting the characteristics of students reporting high school athletic participation and those reporting no high school athletic participation. Similar comparisons are then made for each level of athletic participation intensity. That is, the characteristics of elite athletes are compared to the characteristics of varsity and JV athletes and the characteristics of varsity athletes are compared to the characteristics of JV athletes. Please refer to the Technical Notes for a complete description of the statistical techniques used to make these comparisons.

The second type of analysis employed in this report is multivariate regression analysis. Multivariate regression analysis is a technique that allows for the isolation of an association between an independent variable and a dependent variable (e.g., the association between athletic participation and earning a bachelor's degree) while taking into account, or controlling for, other independent variables that may also be associated with the dependent variable (e.g., sex, academic achievement, socioeconomic status, or race/ethnicity).

The specific method of regression analysis employed in this report is called hierarchical regression. In hierarchical regression analyses, outcomes are first modeled using only control variables. Then, additional independent variables are introduced into the model, and, based on entry of these new variables into the model, observations are made regarding any increases or decreases in the predictive power of the model. In addition, the relative sizes of coefficients and odds ratios can be compared.

The hierarchical regression analysis performed in this report is typical in nature. All outcomes selected for examination are first modeled using five selected control variables—sex, race/ethnicity, household socioeconomic status, 10th-grade test scores, and 10th-grade locus of control. These demographic and student achievement variables have been shown to be associated with future outcomes in previous research (Ingels et al. 2002), and also appear to be associated with athletic participation (see table 1). This is the control model. Three additional variables are then added to the model. These variables measure athletic participation at each level of intensity—elite, varsity, and JV. The model containing these additional variables is referred to as the full model. Each outcome is then modeled using the full model, and the results of the full model are compared to the results of the control model for each outcome. More specifically, likelihood ratio tests are used to determine if the addition of the three athletic participation variables helps predict differences among individuals for each outcome.

It is important to note that these analyses do not offer a formal evaluation of the impact or effect of high school athletic participation on selected outcomes for young adults. Causal relationships are best determined with a design that randomly selects and assigns adolescents to the characteristics of athletic participation discussed in this Brief. Of course, this type of treatment is often difficult to perform. The strengths of this study, however, are the use of a nationally representative sample of students from both public and private schools, the incorporation of a time dimension to establish proper variable order, and a control for variables that may be related to high school athletic participation and the variety of outcomes in 2000 (e.g., sex, race/ethnicity, household SES, 10th-grade test scores). It is possible that other important variables may be related to athletic participation and the outcomes for young adults but are not represented in the analyses, such as physical health and stature, two variables not available on the NELS:88 dataset. Also, participation in sporting activities outside of school was not specifically examined in this Brief. Given the nonexperimental, longitudinal design of the study, there is no way to determine if the samples of athletes and nonathletes were equivalent in all important ways in high school besides this athlete characteristic. This is a research design limitation that makes it impossible to draw causal conclusions from the data. All comparisons in the text are statistically significant at the .05 level unless otherwise noted. The reader is referred to the Technical Notes for further details on the statistical methods and variables used in this report.

Findings

This Brief investigates the educational, labor market, and health status of high school athletes 8 years after their senior year in high school, beginning first with a description of the characteristics of students who reported participating in high school athletics in 1990 or 1992. Following this description is a portrayal of students participating at the three mutually exclusive categories of high school athletes—elite, varsity, and JV.

This section then turns to presenting and discussing results of the multivariate regression analyses. As stated earlier, the multivariate regression analyses were undertaken to evaluate the ability of high school athletic participation to predict a number of later-life outcomes after controlling for possible alternative predictors. Results from the control model are presented first and are followed by results from the full model.

Who Participated in High School Athletics: 1990 and 1992

This section examines a number of demographic and school-related measures of high school athletes and nonathletes[2] in 1990 and 1992. Athletes differed from nonathletes in many ways in the early 1990s (table 1). Following are highlighted findings from table 1:

Sex

A greater percentage of males than females reported athletic participation (72 percent versus 49 percent).

Race/ethnicity

No differences were detected in high school athletic participation rates between Whites and Blacks, and Whites and Hispanics.

[2]Less than one percent of students in the sample were classified as nonathletes because they attended schools that did not provide opportunities to participate in athletics.

Socioeconomic status

A greater percentage of students from high-socioeconomic status families[3] reported high school athletic participation than students from middle- or low- SES families (70 percent versus 60 and 48 percent, respectively).

School control

A greater percentage of students in private high schools reported high school athletic participation than students in public schools (72 percent versus 60 percent).

Extracurricular activity participation

A greater percentage of students who participated in other nonsport school extracurricular activities[4] reported athletic participation than students who did not participate in other activities (62 percent versus 57 percent).

10th-grade test scores

A greater percentage of students with high test scores[5] reported athletic participation than students with middle or low scores (66 percent versus 60 and 57 percent, respectively).

Locus of control

A greater percentage of students with high or middle levels of locus of control than a low level participated in high school athletics[6] (64 and 64 percent, respectively, versus 53 percent).

[3]Household socioeconomic status (SES) is divided into three categories—high, middle, and low. A greater percentage of students from high socioeconomic (SES) families reported high school athletic participation compared to students from middle- or low-SES families, and a greater percentage of students from middle-SES families reported participation than students from low-SES families. Definitions for socioeconomic status (SES) and other variables are included in the Technical Notes.

[4]Participation in extracurricular activities included participation in any of the following activities in either 1990 or 1992: cheerleading, pom-pom, drill team, school music group (band, orchestra), school play or musical, student government, academic honor society, school yearbook or newspaper, school service clubs, school academic clubs, school hobby clubs, school FTA, FHA, FFA.

[5]Test scores are a composite score of reading and math tests taken by NELS 10th-graders.

[6]Locus of control measures individuals' beliefs about whether personal outcomes are the result of personal actions (internal locus of control orientation) or events outside of personal control (external locus of control orientation). Locus of control is a composite of six questionnaire items from the first follow-up survey. Locus of control was divided into three categories—high, middle, and low. Higher levels indicate a more internal locus of control; lower levels indicate a more external locus of control. Details on this and other composites are included in the Technical Notes.

Who Participated at Different Levels of High School Athletic Intensity: 1990 and 1992

Of interest is not only the kind of student who participates in high school athletics, and the consequences of doing so, but also how participation in athletics at different levels of intensity— elite, varsity, JV/intramural—is associated with student characteristics and later outcomes. Following are highlighted findings from table 1:

Sex

Of all high school athletes, a greater percentage of males than females participated at the elite level (42 percent versus 33 percent), while a greater percentage of females than males participated at the JV/intramural level (33 percent versus 24 percent).

Race/ethnicity

Of all high school athletes, a greater percentage of Blacks than Whites and Hispanics were elite athletes (51 percent versus 36 and 37 percent, respectively), while a greater percentage of Whites than Blacks were varsity athletes (36 percent versus 27 percent).

Extracurricular activity participation

Of all high school athletes, a greater percentage of students who participated in other extracurricular activities were elite athletes than those who did not participate in other extracurricular activities (40 percent versus 32 percent).

School control

Of all high school athletes, a greater percentage of students in public schools than students in private schools were varsity athletes (35 percent versus 29 percent).

10th-grade test scores

Of all high school athletes, a greater percentage of athletes with low test scores than with high scores participated at the elite level (42 percent versus 34 percent).

Of all high school athletes, a greater percentage of students with high scores than with middle scores were varsity athletes (39 percent versus 33 percent); and a greater percentage of students with middle scores than with low scores were JV/intramural athletes (30 percent versus 25 percent).

Locus of control

Of all high school athletes, a greater percentage of athletes with middle levels of locus of control than with high levels participated at the varsity level (36 percent versus 30 percent).

The bivariate analyses demonstrate that significant gender and other demographic differences exist between athletes and nonathletes. These differences suggest that comparisons need to control for these differences. The multivariate analysis provides these controls.

Multivariate Analysis

In an effort to determine whether participation in high school athletics predicts later-life outcomes independent of other factors—specifically sex, race/ethnicity, socioeconomic status, 10th-grade test scores, and students' locus of control—multivariate logistic regression analyses were performed on each of the outcomes that were selected for examination in this Brief.

Table 1. Percentage of student participation in high school athletics, by sex, race/ethnicity, socioeconomic status, school type, extracurricular activities, test scores, and self-concepts: 1990 and 1992

		High school athletic participation[1]					
					Percent of high school athletes in each level of participation		
Characteristic	Population total	Total	Did not report participation in high school athletics[2]	Reported participation in high school athletics	Elite[3]	Varsity[4]	JV/intramural[5]
Total	100	100	39.1 (0.97)	60.9 (0.97)	38.1 (1.14)	34.2 (1.00)	27.7 (1.04)
Sex							
Male	50.2 (0.91)	100	27.6 (1.16)	72.4 (1.16)	41.6 (1.54)	34.1 (1.49)	24.3 (1.40)
Female	49.8 (0.91)	100	50.7 (1.28)	49.3 (1.28)	33.0 (1.88)	34.3 (1.59)	32.6 (1.57)
Race/Ethnicity[6]							
White	76.9 (1.40)	100	38.6 (1.00)	61.4 (1.00)	35.8 (1.08)	35.7 (1.07)	28.5 (1.13)
Black	12.8 (1.09)	100	38.9 (3.44)	61.1 (3.44)	51.1 (5.40)	26.7 (4.08)	22.1 (3.68)
Hispanic	10.3 (0.99)	100	45.9 (3.61)	54.1 (3.61)	36.8 (3.91)	37.4 (4.61)	25.8 (3.58)
Household socioeconomic status[7]							
Low	18.9 (0.89)	100	52.4 (2.23)	47.6 (2.23)	37.6 (3.09)	34.0 (2.81)	28.4 (2.58)
Middle	51.5 (1.06)	100	39.7 (1.30)	60.3 (1.30)	38.5 (1.62)	33.7 (1.40)	27.8 (1.51)
High	29.6 (1.13)	100	30.1 (1.55)	69.9 (1.55)	38.3 (1.74)	34.9 (1.72)	26.8 (1.63)
12th-grade school type							
Public	90.5 (0.65)	100	40.2 (1.02)	59.8 (1.02)	38.3 (1.25)	34.9 (1.09)	26.9 (1.11)
Private	9.5 (0.65)	100	28.4 (3.04)	71.6 (3.04)	37.3 (2.95)	29.4 (2.31)	33.2 (3.18)
Extracurricular activities (nonsport)							
Yes	80.8 (0.79)	100	38.1 (1.02)	61.9 (1.02)	39.5 (1.21)	33.3 (1.01)	27.2 (1.10)
No	19.2 (0.79)	100	43.4 (2.21)	56.6 (2.21)	31.8 (2.96)	38.5 (3.35)	29.7 (2.96)
10th-grade test scores[8]							
Low	17.9 (0.84)	100	43.0 (2.30)	57.0 (2.30)	42.3 (3.38)	33.2 (3.45)	24.5 (2.47)
Middle	51.6 (0.89)	100	40.0 (1.33)	60.0 (1.33)	37.4 (1.55)	32.5 (1.28)	30.2 (1.50)
High	30.6 (0.92)	100	34.2 (1.40)	65.8 (1.40)	33.7 (1.54)	39.4 (1.79)	27.0 (1.66)
10th-grade locus of control							
Low	22.4 (0.83)	100	46.9 (2.17)	53.1 (2.17)	35.1 (2.82)	33.9 (2.60)	31.0 (2.60)
Middle	50.1 (0.91)	100	35.8 (1.12)	64.2 (1.12)	38.2 (1.78)	36.3 (1.60)	25.6 (1.39)
High	27.5 (0.82)	100	36.1 (1.90)	63.9 (1.90)	39.8 (1.98)	30.2 (1.71)	30.0 (1.97)

[1]Includes respondents who reported athletic participation as elite, varsity, or JV/intramural athletes.

[2]Includes respondents who reported not participating in high school athletics, or were in schools that did not have sports teams in 1990 and 1992.

[3]Includes respondents who reported being a team captain or named a most valuable player (MVP) in 1990 or 1992.

[4]Includes respondents who reported they were on a varsity sports team in 1990 or 1992, but were not considered "elite" athletes.

[5]Includes respondents who reported they were on a junior varsity or intramural sports team in 1990 or 1992, but were not elite athletes or on varsity sports teams.

[6]Asians/Pacific Islanders and American Indians/Alaska Natives were not reported due to small sample sizes.

[7]Socioeconomic status (SES) was obtained from F2SES1Q, which is a quartile coding of the composite variable, F2SES1. F2SES1 provides an SES scale for each individual that is derived from the following parent-questionnaire data obtained in the base year (1988): father's education level, mother's education level, father's occupation, mother's occupation, and family income. Respondents were considered to be from a household of "high" SES if their households' SES fell in the highest quartile of all respondents' households. Households in the lowest quartile were considered "low" SES, and households in one of the two middle quartiles were considered "middle" SES. F2SES1Q was used in the regression analysis.

[8]Test scores are a composite of reading and math scores in 10th grade.

NOTE: Detail may not sum to totals because of rounding. Standard errors appear in parentheses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), First Follow-Up Student Questionnaire (1990), and Second Follow-Up Questionnaire (1992).

The specific outcomes examined were

Educational

- any postsecondary education for academic credit (college, university, or vocational, technical, or trade school) by 2000 (8 years after scheduled high school graduation);
- attainment of a bachelor's degree or higher by 2000;

Labor Market

- employment in 2000;
- full-time employment in 2000;
- income in 1999;

Health

- cigarette use in 2000;
- alcohol use in 2000;
- binge drinking in 2000;
- participation in physical fitness activities in 2000; and
- participation in group or team sports and recreation in 2000.

As described earlier, each of the outcomes above were regressed on two sets of independent variables—a control model and a full model. The control model contains five student demographic and background characteristics—sex, race/ethnicity, household SES, 10th-grade test scores, and locus of control. Table 2 shows the results of the control model analyses. The full model contains the five control variables plus the three athletic participation intensity variables—elite, varsity, and JV. Table 3 presents the results of the full model analyses.

In both tables 2 and 3, logistic regression is used for all models, except when annual income is the dependent variable. Unstandardized OLS coefficients are presented for the annual income model (since it is a continuous outcome), and odds ratios are presented for the others (since they are binary outcomes). An odds ratio greater than one indicates a greater likelihood of achieving the outcome variable; a ratio equal to one indicates an equal likelihood of achieving the outcome; and a ratio of less than one indicates a lower likelihood of achieving the outcome. For example, in table 3, students who were elite athletes are 1.49 times (about one and one-half times) more likely to be employed than non-athletes. Another way to state this is that elite athletes are 49 percent (computed: [odds ratio – 1]*100) more likely than nonathletes to be employed in 2000. See the Technical Notes section of this Brief for more information on the use of logistic regression and the interpretation of odds ratios and regression coefficients.

Control Model Results

The results of the control model analyses show that sex is the most consistent predictor of all ten outcomes examined in this report, although in different ways depending on the outcome (table 2).

There are two outcomes in the year 2000 that males are less likely to achieve than females. These are having any postsecondary education and earning a bachelor's degree (odds ratios of 0.59 and 0.66, respectively). Specifically, males are 41 percent less likely to have any postsecondary education by 2000 and 34 percent less likely to have earned a bachelor's degree by 2000 compared to females. The results also show that males are about two times more likely than females to be employed and to be employed full time in the year 2000. Males are more likely than females to smoke daily, use alcohol, binge drink, participate in physical fitness activities, and participate in group sports/recreation activities (refer to table 2 for specific odds ratios and coefficients).

The control models also show that race/ethnicity is a less consistent predictor of the variety of outcomes explored in this report than sex. Sex was a statistically significant predictor of all ten outcomes that are examined in this report, whereas race/ethnicity was found to be associated with seven outcomes. Race/ethnicity was found to be associated with having any postsecondary education by 2000, but not with having earned at least a bachelor's degree by 2000. Blacks were found to be almost two times more likely than Whites—the comparison group—to have any postsecondary education by 2000 (odds ratio of 1.97), while Hispanics and Other races/ethnicities were found to be 2.39 and 1.95 times more likely than Whites, respectively, to have any postsecondary education by 2000.[7] Blacks, Hispanics, and Other races/ethnicities are also

[7]The finding that Blacks and Hispanics are more likely than Whites to have any postsecondary education may appear inconsistent with the literature. For example, using NELS:88 data, Ingels et al. (2002) found that 69.7 percent of Hispanics and 76.5 percent each of Blacks and Whites had any postsecondary experience. The seemingly inconsistent percentages reported in this Brief of Blacks and Hispanics having any postsecondary experience compared to Whites are attributable primarily to the fact that other factors, such as SES, 10th-grade test scores, and locus of control, have been controlled in the analysis reported in this Brief.

shown to be less likely than Whites to smoke on a daily basis (odds ratios of 0.33, 0.39, and 0.50, respectively).

The other three control variables comprising the control model—SES, 10th-grade test scores, and locus of control—are shown to be statistically significant predictors in various cases. Each of these variables was entered into the control model as "quarter" variables, for example measuring the top 25 percent, middle two 25 percents, and bottom 25 percent of students in terms of SES, achievement on the NELS 10th-grade test, and locus of control.[8] None of these factors influence being employed in 2000 or being employed full time in 2000; however, all three were positively associated with having any postsecondary education by the year 2000, having earned at least a bachelor's degree by the year 2000, annual income in 1999, and participation in physical fitness activities in 2000. That is, individuals from relatively higher SES families were more likely to have any postsecondary education, to have earned a bachelor's degree by the year 2000, to have a higher annual income in 1999, and to have participated in physical fitness activities in 2000 compared to students from relatively lower SES families. The same relationships—more likely to have any postsecondary education, to have earned a bachelor's degree, to have a higher annual income in 1999, and to have participated in physical fitness activities in 2000—hold for students who had relatively higher 10th-grade test scores and a relatively more internal control perspective compared to students who had relatively lower test scores and a relatively external control perspective. Table 2 presents coefficients and odds ratios for each variable in the control model.

[8]Please refer to the Technical Notes for the exact names of the variables used in the control model.

Full Model Results

The full model results address the primary question of this Brief: Does participation in high school athletics predict later-life outcomes independent of other predictors, specifically sex, race/ethnicity, SES, and tested achievement? As shown in table 3, the answer is yes. After controlling for the possible influences of sex, race/ethnicity, SES, and tested achievement, participation in high school athletics—particularly at the highest level of intensity, elite participation—independently accounted for differences in later life outcomes. The secondary purpose of this Brief is to investigate the association between intensity of athletic participation and later life outcomes. The findings show that participation in high school athletics at the elite level is associated with all the outcomes examined here, whereas participation at lower levels is associated with some, but not all, postsecondary outcomes.

Table 2. Coefficients, standard errors, and odds ratios from multivariate analysis of selected characteristics on post high school outcomes: 2000

Characteristic	Any PSE, 2000[1]	Bachelor's degree or higher, 2000[2]	Employed, 2000	Employed full time, 2000	Annual income, 1999[3]
Male	-0.52*	-0.42*	0.79*	0.73*	0.34*
	(0.12)	(0.09)	(0.11)	(0.09)	(0.03)
	[0.59]	[0.66]	[2.20]	[2.08}	
Black	0.68*	0.13	0.17	-0.15	-0.06
	(0.31)	(0.17)	(0.18)	(0.19)	(0.06)
	[1.97]	[1.14]	[1.19]	[0.86]	
Hispanic	0.87*	-0.14	-0.03	-0.29*	-0.03
	(0.28)	(0.16)	(0.18)	(0.14)	(0.04)
	[2.39]	[0.87]	[0.97]	[0.75]	
Other[9]	0.67*	0.31	-0.42*	-0.43*	-0.10
	(0.25)	(0.16)	(0.17)	(0.18)	(0.07)
	[1.95]	[1.36]	[0.66]	[0.65]	
SES	0.81*	0.71*	0.04	0.01	0.04*
	(0.07)	(0.04)	(0.04)	(0.04)	(0.01)
	[2.25]	[2.03]	[1.04]	[1.01]	
10th-grade tests[10]	0.51*	0.80*	0.03	-0.08	0.05*
	(0.07)	(0.05)	(0.05)	(0.04)	(0.01)
	[1.67]	[2.23]	[1.03]	[0.92]	
Locus of control	0.25*	0.19*	-0.02	-0.02	0.05*
	(0.06)	(0.04)	(0.05)	(0.05)	(0.01)
	[1.28]	[1.21]	[0.98]	[0.98]	
Log likelihood or R^2 [11]	-786,507	-1,143,190	-770,038	-1,159,390	0.068

See notes at end of table.

Table 2. Coefficients, standard errors, and odds ratios from multivariate analysis of selected characteristics on post high school outcomes: 2000—Continued

Characteristic	Daily smoker, 2000[4]	Alcohol use, 2000[5]	Binge drinker, 2000[6]	Physical fitness, 2000[7]	Group sports/ recreation, 2000[8]
Male	0.21*	0.67*	1.23*	0.26*	0.92*
	(0.09)	(0.09)	(0.09)	(0.10)	(0.07)
	[1.23]	[1.95]	[3.42]	[1.30}	[2.51]
Black	-1.10*	-0.35*	-0.71*	-0.01	0.38*
	(0.22)	(0.17)	(0.23)	(0.17)	(0.15)
	[0.33]	[0.70]	[0.49]	[0.99]	[1.46]
Hispanic	-0.95*	-0.10	-0.10	-0.03	-0.13
	(0.15)	(0.15)	(0.16)	(0.17)	(0.19)
	[0.39]	[0.90]	[0.90]	[0.97]	[0.88]
Other[9]	-0.70*	-0.22	-0.60*	-0.29	#
	(0.22)	(0.15)	(0.20)	(0.25)	(0.17)
	[0.50]	[0.80]	[0.55]	[0.75]	[1.00]
SES	-0.08	0.26*	0.13*	0.16*	-0.01
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
	[0.92]	[1.14]	[1.14]	[1.17]	[0.99]
10th-grade tests[10]	-0.17*	0.21*	-0.06	0.16*	-0.09*
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
	[0.84]	[1.17]	[0.94]	[1.17]	[0.91]
Locus of control	-0.20*	-0.04	-0.07	0.22*	0.13*
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
	[0.82]	[0.96]	[0.93]	[1.25]	[1.14]
Log likelihood or R^2 [11]	-1,067,020	-1,312,580	-1,203,530	-951,265	-1,472,940

*p<.05

Rounds to zero.

[1]Any postsecondary education by 2000.

[2]Earned a bachelor's degree or higher by 2000.

[3]Includes those who worked full time or part time. Logged in OLS regression.

[4]Reported smoking one or more cigarettes per day in 2000.

[5]Reported drinking alcohol on one or more occasions in the 30 days before the survey in 2000.

[6]Binge drinking is defined as five or more drinks on a single occasion in the 2 weeks before the survey in 2000.

[7]Reported participating in physical fitness activities to get in or stay in shape at least once a week during the 12 months before the survey in 2000.

[8]Reported participating in group or team sports and recreation at least once a month during the 12 months before the survey in 2000.

[9]Includes Asian/Pacific Islanders and American Indian/Alaska Native.

[10]Test scores are a composite of reading and math scores in 10th grade.

[11]The R^2 statistic only applies to the outcome for annual income in 1999.

NOTE: Female is the omitted category for sex. White is the omitted category for race/ethnicity. SES, 10th-grade test scores, and locus of control are all quartile variables, and the coefficients and odds ratios are associated with moving up one quartile. All models are logistic regression, except where the dependent variable is annual income (1999), where OLS regression analysis is performed. Standard errors are in parentheses. Odds ratios are in brackets.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), First Follow-Up Student Questionnaire (1990), Second Follow-Up Questionnaire (1992), and Fourth Follow-Up Questionnaire (2000).

Elite athletes were more than three times as likely as those who did not participate in high school athletics to participate in physical fitness activities and in group sports/recreation activities in 2000 (odds ratios of 3.19 and 3.71, respectively) (table 3). Also, elite athletes were more than twice as likely as nonathletes to have any postsecondary education by 2000 and to have earned a bachelor's degree by 2000. Furthermore, as was hypothesized, elite athletes were approximately one and a half times more likely than nonathletes to use alcohol and to binge drink in 2000. This contrasts with the positive influence of elite participation (as well as at the varsity level) on smoking behavior: elite athletes are about half as likely as nonathletes to smoke daily in 2000. Elite athletes were also shown to be more likely than nonathletes to have been employed in 2000, employed full time in 2000, and to have earned a higher income in 1999.

Participation in high school athletics at the second highest level of intensity—varsity participation— also independently predicted many outcomes, though not as many as were predicted by participation at the elite level. In all, participation in high school athletics at the varsity level was associated with increased likelihood of the following:

- any postsecondary education by 2000;
- earned a bachelor's degree by 2000;
- higher annual income in 1999;
- binge drinking in 2000;
- participating in physical fitness activities in 2000; and
- participating in group sports/recreation activities in 2000.

In addition, participation at the varsity level was associated with a decreased likelihood of daily smoking in 2000.

However, for each outcome, the odds ratios for participation in high school athletics at the varsity level are closer to 1 than the odds ratios for participation at the elite level. This indicates that, for each outcome, participation in high school athletics at the varsity level is not as strongly related as is participation at the elite level. For example, for the outcomes any postsecondary education by 2000 and having earned a bachelor's degree or higher by 2000, the odds ratios for participation at the varsity level are 1.70 and 1.86, respectively. These are lower than the odds ratios associated with participation at the elite level, which are 2.05 and 2.27, respectively. To further illustrate, elite athletes are 2.05 times more likely than nonathletes to have any postsecondary education by 2000 while varsity athletes are 1.70 times more likely than nonathletes to achieve the same outcome. For all outcomes, the coefficients associated with participation at the varsity level can be found in table 3.

The full model results indicate a different story for participation at the JV/intramural level. Participation at this level was shown to be related, and positively, to only two outcomes, participation in physical fitness activities and

Table 3. Coefficients, standard errors, and odds ratios from multivariate analysis of high school athletic status and selected characteristics on post high school outcomes: 2000

Characteristic	Any PSE, 2000[1]	Bachelor's degree or higher, 2000[2]	Employed, 2000	Employed full time, 2000	Annual income, 1999[3]
Male	-0.67*	-0.59*	0.73*	0.68*	0.32*
	(0.12)	(0.09)	(0.12)	(0.09)	(0.03)
	[0.51]	[0.55]	[2.08]	[1.97}	
Black	0.64*	0.09	0.15	-0.16	-0.06
	(0.30)	(0.19)	(0.18)	(0.19)	(0.06)
	[1.90]	[1.09]	[1.16]	[0.85]	
Hispanic	0.88*	-0.13	-0.03	-0.29*	-0.03
	(0.28)	(0.16)	(0.18)	(0.14)	(0.04)
	[2.41]	[0.88]	[0.97]	[0.75]	
Other[9]	0.62*	0.29	-0.44*	-0.44*	-0.10
	(0.23)	(0.16)	(0.16)	(0.18)	(0.07)
	[1.86]	[1.34]	[0.64]	[0.64]	
SES	0.78*	0.68*	0.03	(#)	0.03*
	(0.07)	(0.04)	(0.04)	(0.04)	(0.01)
	[2.18]	[1.97]	[1.03]	[1.00]	
10th-grade tests[10]	0.52*	0.82*	0.03	-0.08	0.05*
	(0.08)	(0.05)	(0.05)	(0.05)	(0.01)
	[2.18]	[2.27]	[1.03]	[0.92]	
Locus of control	0.24*	0.17*	-0.03	-0.03	0.05*
	(0.06)	(0.05)	(0.05)	(0.05)	(0.01)
	[1.27]	[1.19]	[0.97]	[0.97]	
Participated at elite level[11]	0.72*	0.82*	0.40*	0.30*	0.13*
	(0.21)	(0.11)	(0.14)	(0.13)	(0.04)
	[2.05]	[1.19]	[1.49]	[1.35]	
Participated at varsity level[12]	0.53*	0.62*	0.17	0.18	0.07*
	(0.15)	(0.12)	(0.14)	(0.11)	(0.04)
	[1.70]	[1.86]	[1.19]	[1.20]	
Participated at JV/ intramural level[13]	0.20	0.19	-0.17	-0.05	#
	(0.18)	(0.12)	(0.14)	(0.11)	(#)
	[1.22]	[1.21]	[0.84]	[0.95]	
Log likelihood or R^2 [14]	-777,312*	-1,122,710*	-766,373*	-1,156,400*	0.073*

See notes at end of table.

Table 3. Coefficients, standard errors, and odds ratios from multivariate analysis of high school athletic status and selected characteristics on post high school outcomes: 2000—Continued

Characteristic	Daily smoker, 2000[4]	Alcohol use, 2000[5]	Binge drinker, 2000[6]	Physical fitness, 2000[7]	Group sports/ recreation, 2000[8]
Male	0.31*	0.59*	1.14*	0.05*	0.73*
	(0.09)	(0.09)	(0.09)	(0.11)	(0.08)
	[1.36]	[1.80]	[3.13]	[1.05}	[2.08]
Black	-1.05*	-0.38*	-0.77*	-0.09	0.32*
	(0.22)	(0.18)	(0.23)	(0.16)	(0.14)
	[0.35]	[0.68]	[0.46]	[0.91]	[1.38]
Hispanic	-0.96*	-0.09	-0.10	-0.02	-0.12
	(0.15)	(0.15)	(0.16)	(0.16)	(0.19)
	[0.38]	[0.91]	[0.90]	[0.98]	[0.89]
Other[9]	-0.67*	-0.25	-0.63*	-0.37	-0.08
	(0.22)	(0.15)	(0.20)	(0.25)	(0.19)
	[0.51]	[0.78]	[0.53]	[0.69]	[0.92]
SES	-0.05	0.24*	0.10*	0.11*	-0.05
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
	[0.95]	[1.27]	[0.94]	[1.12]	[0.95]
10th-grade tests[10]	-0.18*	0.21*	-0.06	0.17*	0.09*
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
	[0.84]	[1.23]	[0.94]	[1.19]	[1.09]
Locus of control	-0.19*	-0.05	-0.09*	0.19*	0.10*
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)
	[0.83]	[0.95]	[0.91]	[1.21]	[1.11]
Participated at elite level[11]	-0.58*	0.42*	0.52*	1.16*	1.31*
	(0.12)	(0.12)	(0.11)	(0.16)	(0.10)
	[0.56]	[1.52]	[1.68]	[3.19]	[3.71]
Participated at varsity level[12]	-0.30*	0.17	0.23*	0.63*	0.62*
	(0.13)	(0.12)	(0.12)	(0.14)	(0.11)
	[0.74]	[1.19]	[1.26]	[1.88]	[1.86]
Participated at JV/ intramural level[13]	-0.17	0.10	0.16	0.42	0.53*
	(0.12)	(0.12)	(0.12)	(0.15)	(0.10)
	[0.84]	[1.11]	[1.17]	[1.52]	[1.70]
Log likelihood or R^2 [14]	-1,059,760*	-1,307,360*	-1,195,900*	-927,855*	-1,414,660*

*$p < .05$

Rounds to zero.

[1]Any postsecondary education by 2000.

[2]Earned a bachelor's degree or higher by 2000.

[3]Includes those who worked full time or part time. Logged in OLS regression.

[4]Reported smoking one or more cigarettes per day in 2000.

[5]Reported drinking alcohol on one or more occasions in the 30 days before the survey in 2000.

[6]Binge drinking is defined as drinking five or more drinks on a single occasion in the 2 weeks before the survey in 2000.

[7]Reported participating in physical fitness activities to get in or stay in shape at least once a week during the 12 months before the survey in 2000.

[8]Reported participating in group or team sports and recreation at least once a month during the 12 months before the survey in 2000.

[9]Includes Asian/Pacific Islanders and American Indian/Alaska Natives.

[10]Test scores are a composite of reading and math scores in 10th grade.

[11]Includes respondents who reported being a team captain or named a most valuable player (MVP) in 1990 or 1992.

[12]Includes respondents who reported they were on a varsity sports team in 1990 or 1992, but were not considered "elite" athletes.

[13]Includes respondents who reported they were on a junior varsity or intramural sports team in 1990 or 1992, but were not elite athletes or on varsity sports teams.

[14]The R^2 statistic only applies to the outcome for annual income in 1999.

NOTE: Female is the omitted category for sex. White is the omitted category for race/ethnicity. SES, 10th-grade test scores, and locus of control are all quartile variables, and the coefficients and odds ratios are associated with moving up one quartile. Nonathlete is the omitted category for high school athletic status. All models are logistic regression, except where the dependent variable is annual income (1999), where OLS regression analysis is performed. Standard errors are in parentheses. Odds ratios are in brackets.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), First Follow-Up Student Questionnaire (1990), Second Follow-Up Questionnaire (1992), Third Follow-Up Student Questionnaire (1994) and Fourth Follow-Up Student Questionnaire (2000).

participation in group sports/recreation activities in 2000. As was the case between participation at the elite level and the varsity level, participation at the JV level is not as powerful a predictor as is participation at the varsity level, evidenced by the fact that the odds ratios associated with participation at the JV level indicate smaller likelihoods than the odds ratios associated with participation at the varsity level. For example, for the outcome participation in physical fitness activities in 2000, the odds ratio associated with participation at the JV level is 1.52, smaller than the 3.19 and 1.88 odds ratios that are associated with participation at the elite and varsity levels, respectively.

Control model versus full model comparison

By performing a statistical test (called a likelihood ratio test) that compares the log likelihoods of the two models in this analysis (the control model and the full model), it can be determined whether athletic participation accounts for a statistically significant additional amount of variation in each of the outcomes examined.

The log likelihoods for each model are presented in the bottom row of tables 2 and 3. The results of the log likelihood tests indicate that the association between athletic participation and each outcome explains additional variance in that outcome. That is, for each outcome, a statistically significant difference was found between the log likelihood of the control model and the log likelihood of the full model. In each case the log likelihood of the full model was larger than the log likelihood of the control model, meaning that the full model had more predictive power than the control model. For the annual income model, there was a statistically significant increase in the R^2 statistic between the control model and the full model. Hence, the athletic participation variables are shown to be predictive of all outcomes examined in this Brief, independent of the control variables. More information can be found in the Technical Notes.

Conclusion

This Brief examines the relationship between participation in high school athletics and later-life outcomes. Consistent with previous research, this report generally found positive relationships between high school athletic participation and educational, labor market, and health outcomes in 2000, eight years after scheduled high school graduation (Barron, Ewing, and Waddell 2000; Curtis, McTeer, and White 2003; Eide and Ronan 2001; Howell, Miracle, and Rees 1984; Marsh 1993; Marsh and Kleitman 2002; Picou, McCarter, and Howell 1985; Sabo, Melnick, and Vanfossen 1993; Spreitzer 1994). High school athletes at the elite and varsity levels of participation experienced greater educational and labor market success than nonathletes. The health outcomes for high school athletes included lesser rates of smoking at the elite and varsity levels of participation and greater rates of participation in fitness activities and in group sports/recreation activities at all three levels of participation, compared to nonathletes. High school athletes at the elite and varsity level, however, were more likely to be binge drinkers.

This Brief extended the work of previous researchers by examining the positive and negative associations of high school athletic participation by intensity of participation, as measured by participation at the elite, varsity, or JV level. It finds that the relationships described above are more apparent when comparing elite athletes—students who were team captains or MVPs in 1990 or 1992—with nonathletes than when comparing varsity or JV athletes with nonathletes. The high level of athletic involvement among elite athletes is, for the most part, associated with positive outcomes. Other researchers have also found that level of involvement matters (Broh 2002; Fejgin 1994; Marsh 1993; Melnick, Sabo and Vanfossen 1992; Melnick et al. 2001; Sabo, Melnick and Vanfossen 1993).

Future work in this area should include more extensive controls for possible selection effects of high school athletic participation. For example, certain students who are highly motivated may be more likely to participate in athletics compared to students who have low motivation. A highly motivated person is also more likely to succeed in the labor market (e.g., to get a job and to advance within the job market). Therefore, it is important to account for these underlying differences between athletes and nonathletes. For some research (i.e., Fejgin 1994), associations with athletic participation are diminished once selection controls are included, indicating that the associations may stem from underlying differences between athletes and nonathletes. In addition, as the findings in this Brief on differences by sex, race/ethnicity, and SES demonstrate, the role of athletic participation may vary for different groups of individuals; thus the relationship between different variables should also be further investigated. While this report provides greater detail by examining different levels of athletes, another avenue of investigation would be to examine differences among sports and their relationships with later outcomes, as certain sports may teach or instill particular skills that are beneficial to participants in postsecondary or professional environments.

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Technical Notes

High school athletes were divided into three mutually exclusive categories (elite, varsity, JV/intramural) based on responses to questions about athletic participation in 1990 and 1992.[9] The 1990 student questionnaire items asked about participation in the following interscholastic and intramural sports: baseball/softball, basketball, football, soccer, swim team, other team sport (hockey, volleyball, etc.), and individual sport (cross-country, gymnastics, golf, tennis, track, wrestling, etc.). The questions also asked at what level the student participated (responses were: school does not have, did not participate, intramural, junior varsity, varsity, captain/co-captain). The 1992 student questionnaire asked about interscholastic and intramural athletic participation (in separate questions) in team sports (baseball, basketball, football, soccer, hockey, etc.) and individual sports (cross-country, gymnastics, golf, tennis, track, wrestling, etc.), and at what level (responses for interscholastic sports were: school does not have, did not participate, junior varsity, varsity, captain/co-captain; responses for intramural sports were: school does not have, didn't participate, participated, officer/leader[10]). Questions in 1990 and 1992 also asked if a student had been named an MVP of a sports team.

Athlete categories were created based on responses to these variables in 1990 and 1992. Elite athletes were those students who were team captains in 1990 or 1992, or reported being named most valuable player (MVP) of their team in 1990 or 1992. Varsity athletes were students who were not elite athletes, but reported participating in a varsity sport in 1990 or 1992. Junior varsity or intramural participation included respondents who were not elite athletes or varsity athletes, but participated in a junior varsity or intramural sport in 1990 or 1992. These three categories together comprised students who reported participation in high school athletics. Nonathletes were students who did not participate in any of the above (team captains, most valuable players (MVPs), varsity, junior varsity, or intramural sports), including students whose schools did not have any sports teams. These categories were constructed with the following variables from the NELS:88/2000 public-use ECB/CD: F1S41AA-AG, F2S30AA-AB, F2S30BJ-BK, F1S8H, and F2S29G.

Information on demographic characteristics was obtained from the following variables:

- Respondent's sex was obtained from F4SEX.
- Respondent's race/ethnicity was obtained from F4RACE, whose categories include: Asian/Pacific Islander; Hispanic; Black, not Hispanic; White, not Hispanic; and Native American/Alaska Native.
- Socioeconomic status (SES) was obtained from F2SES1Q, which is a quartile coding of the composite variable, F2SES1. F2SES1 provides an SES scale for each individual that is derived from the following parent-questionnaire data obtained in the base year (1988): father's education level, mother's education level, father's occupation, mother's occupation, and family income. Respondents were considered to be from a household of "high" SES if their households' SES fell in the highest quarter of all respondents' households. Households in the lowest quarter were considered "low" SES and households in one of the two middle quarters were considered "middle" SES. F2SES1Q was used in the regression analysis.

Other individual and school background information (table 1) were gathered from the following variables:

- Public versus private high school (G12CTRL1). Private schools included Catholic, private/other religion, private/non-religious, and private/not ascertained schools.
- Extra-curricular activities (nonsport) (F1S41AA-AI, F1S41BA-BI, F2S30AC, F2S30BA-BK)—participation in any nonsport extracurricular activities in either 1990 or 1992. These questions asked about

[9]A similar categorization was employed by Owings, Burton, and Daniel (1997).

[10]Officer/leader was not considered the equivalent of captain/co-captain because it is for an intramural sport.

participation in the following activities in 1990 and 1992: cheerleading, pom-pom, drill team, school music group (band, orchestra), school play or musical, school government, academic honor society, school yearbook, newspaper, school service clubs, school academic clubs, school hobby clubs, school FTA, FHA, and FFA.

- 10th-grade test scores (F12XQURT)—quartile coding of the composite of reading and math scores, F12XCOMP. Respondents had "high" test scores if their score fell in the highest quarter. Respondents in the lowest quarter had "low" scores, and respondents in one of the two middle quarters had "middle" scores. F12XQURT was used in the regression analysis.
- A locus of control orientation is a belief about whether personal outcomes are contingent on personal actions (internal locus of control) or on events outside of personal control (external control orientation). Tenth-grade locus of control (F1LOCU2Q)—quartile coding of composite locus of control variable, F1LOCUS2. Respondents had "high" locus of control (more internal orientation) if their score fell in the highest quarter. Respondents in the lowest quarter had "low" locus of control (more external orientation), and respondents in one of the two middle quarters had "middle" locus of control. The composite locus of control consisted of six variables (F1S62B,C,F,G,K,M). F1LOCU2Q was used in the regression analysis.

The outcome variables were all taken from the 4th follow-up in 2000, except for college athletic participation, which was only asked in the third follow-up (1994). The outcomes measures were obtained from the following variables:

Postsecondary Education

- Any postsecondary education after high school for academic credit (college, university, or vocational, technical, or trade school) by 2000 (F4ATTPSE).
- Bachelor's degree or higher by 2000 (F4HHDG).
- Participation in college athletics by 1994 (VARATH, OTHERATH)—intercollegiate athletics at longest postsecondary institution, not including intramural sports.

Labor Market Status

- Employed and employed full time in 2000 (F4AACTF, F4AACTP).
- 1999 Income (F4HI99) for full-time and part-time workers. This variable was logged in the regression analysis.

Health/Well-Being

- Cigarette use in 2000 (F4ISMOKE)—at least one cigarette per day ("daily smoker").
- Alcohol use in 2000 (F4IDRINK, F4IBINGE)—alcoholic drink at least once in past 30 days; five or more drinks on a single occasion in past 2 weeks.
- Physical fitness in 2000 (F4IFITNS)—participated in physical fitness activities to get in or stay in shape; at least once per week.
- Team sports/recreation in 2000 (F4ISPORT)—participated in group or team sports and recreation; at least once per month.

Survey Methodology

The National Center for Education Statistics (NCES) of the U.S. Department of Education has collected longitudinal data for almost 30 years. Starting in 1972 with the National Longitudinal Study of 1972 (NLS:72), and continuing to the most recent study, the Education Longitudinal Study of 2002 (ELS:2002), NCES provides longitudinal data to education policymakers and researchers that link secondary school educational experiences with important downstream outcomes like labor market experiences and postsecondary education enrollment and attainment.

Initiated in 1988 as the third in an NCES series of decade-length secondary school longitudinal studies, NELS:88 was the most ambitious longitudinal study undertaken by NCES. It extended the age and grade span of earlier NCES longitudinal studies by initiating data collection with a middle school/junior high school cohort, the eighth-grade class of 1988. Along with student surveys, NELS:88 included surveys of parents, teachers, and school administrators. The study also administered cognitive tests in reading, mathematics, science, and social studies to the sample members. High school transcripts were collected in 1992, and postsecondary education transcripts were collected in the fall of 2000. The sample was "freshened" at each of the first two follow-up studies, generating a 10th- and 12th-grade cohort in the first follow-up survey (1990) and second follow-up (1992) survey, respectively. Thus, NELS:88 follows an 8th-, 10th- and 12th-grade cohort over time. The analysis population for this report was 10th-graders in 1990 who continued as high school seniors in 1992.

The fourth follow-up (NELS:88/2000) took place in 2000, the year in which most sample members turned 26 years of age and typically were eight years removed from high school enrollment. This follow-up study focused on the educational, labor market, and social processes and transitions experienced by young adults. Interviewing began in January 2000. Interview topics included experiences with postsecondary education, labor market participation, job-related training, community integration, and marriage and family formation. The study also included student transcript data collection from the postsecondary institutions that NELS:88/2000 respondents reported attending after high school. Transcript data collection began in September 2000.

Sampling/Weighting

The NELS:88 base-year sample design began with a nationally representative, two-stage stratified probability sample of 1,052 participating eighth-grade schools and 24,599 participating students (of 26,432 eighth-graders selected in those schools). Each subsequent round of NELS:88 has involved complex and difficult sampling and data collection decisions, culminating in the NELS:88/2000 sample, which was the result of two further subsampling activities. The general purpose of weighting survey data is to compensate for these unequal probabilities of selection and to adjust for the effects of nonresponse. Weights for the fourth follow-up study were developed in several steps. In the first step, unadjusted weights were calculated as the inverse of the probabilities of selection, taking into account all stages of the sample selection process. In the second step, these initial weights were adjusted for nonresponse. In order to maintain consistency in weights across the multiple data collection waves of NELS:88 (i.e., to ensure that weighting totals reflected the population totals of the original group of interest), multidimensional raking was also applied to these nonresponse adjusted weights. The raking was performed with respect to base-year through fourth-follow-up-study response status, dropout status, race/ethnicity, sex, and school status.

The estimates in this report were produced using F4F1PNWT, the panel weight for 10th-grade members of the NELS:88 sample who were res,pondents during the first (1990), second (1992), third (1994), and fourth follow-ups (2000). In addition, students were selected who were part of the 12th-grade cohort in 1992. This unweighted sample size included 9,840 NELS:88/2000 10th-grade students in 1990 who were seniors in 1992. Weighting procedures were then applied such that the 9,840 respondents represent a population of 2,494,866 individuals who were in 10th grade in 1988. This is somewhat smaller than the original weighted sample of 1990 10th-graders who were seniors in 1992. This reduction in the target population between 1990 and 2000 is due to a variety of factors. Respondents who dropped out of high school between 1990 and 1992 were excluded from this report. Additional sample loss is a result of death, emigration out of the country, moving abroad, nonresponse, etc. In some cases the unweighted sample sizes are lower than 9,840 because of item nonresponse.

Survey Standard Errors

Because the NELS:88 sample design involved stratification, the disproportionate sampling of certain strata, and clustered (i.e., multistage) probability sampling, the resulting statistics are more variable than they would have been had they been based on data from a simple random sample of the same size. The NELS:88/2000 analyses included in this report used the Taylor Series procedure to calculate standard errors as generated by AM statistical software (http://am.air.org). This procedure is also found in advanced statistical programs like SUDAAN or STATA.

Statistical Tests

Differences Between Means

Comparisons that have been drawn in the text of this report have been tested for statistical significance to ensure that the differences are larger than those that might be expected due to sampling variation. The statistical comparisons in this report were based on the *t* statistic. Whether the statistical test is considered significant or not is determined by calculating a *t* value for the difference between a pair of means or proportions and comparing this value to published tables of values, called critical values (cv). The alpha level is an *a priori* statement of the probability that a difference exists in fact rather than by chance. All comparisons in the text are statistically significant at the .05 level unless otherwise noted.

The *t* statistic between estimates from various subgroups presented in the tables can by computed by using the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{(se_1^2 + se_2^2)}},$$

where E_1 and E_2 are the estimates to be compared (e.g., the means of sample members in two groups) and se_1 and se_2 are their corresponding standard errors.

Given the large number of comparisons made in this report, it is likely that some relationships identified as significant may have occurred by chance. One solution is to employ a test for multiple comparisons, such as the Bonferroni adjustment. The Bonferroni adjustment is appropriate to test for statistical significance when the analyses are mainly exploratory because it results in a more conservative critical value for judging statistical significance. However, another solution—the one used in this report—is to first describe the bivariate relationships and then test to see if these relationships persist in a multivariate analysis. The multivariate analyses employed here, and described below, examine bivariate relationships while accounting for other important variables. Presumably any marginal bivariate relationships would not persist once other factors are considered in concert.

Multivariate Analysis

To carry out the multivariate analysis presented in tables 2 and 3, either a binary logistic regression or an ordinary least squares (OLS) regression was conducted based on the properties of the dependent variable. Where the dependent variable was continuous (annual income in 1999), an OLS was run. In the case of income, past research supports taking the log of the actual reported income to better approximate the assumed distribution when using OLS. Where the dependent variable had only two meaningful categories, the assumptions related to OLS are violated. Therefore, a binary logistic regression is used instead. The logistic regression model addresses these violations by conducting a logit transformation of the dependent variable. All dependent variables except income in this report were binary and logistic regression was performed.

As noted in the body of the report, the specific method of regression analysis employed in this report is known as hierarchical regression analysis. In hierarchical regression analyses, outcomes are first modeled using only control variables. Then, additional independent variables are introduced into the model and observations are made regarding increases or decreases in the explanatory power of the model. The purpose of a hierarchical regression model is to determine whether the independent variables of interest (athletic participation in this report) add any predictive power. In OLS regressions, this can be determined by comparing R^2 statistics, but unlike an OLS regression, logistic regressions do not produce an R^2 statistic. Instead, logistic regressions produce what is known as a log likelihood. Like an R^2 statistic, the log likelihood assesses the explanatory power of the regression model, but it cannot be interpreted in the same manner as an R^2 statistic. However, the predictive powers of two logistic regression models can still be compared with a likelihood ratio test (LRT).

A LRT is calculated by subtracting the value of the log likelihood of the full model from the log likelihood of the control model. That number is then multiplied by two.

$$LRT = 2 * (LL_c - LL_f)$$

Since the LRT statistic approximately follows the Chi-square distribution, standard statistical tables can be used to determine the critical value that the LRT statistic must exceed to achieve statistical significance. To do this the level of significance used in the testing must be selected first (.05 was the level used in this analysis). The number of degrees of freedom must then be considered. This number is determined by observing how many additional degrees of freedom are present in the full model, compared to the control model. In the case of this report, three additional degrees of freedom are present in the full model, compared to the control model. The critical value is then determined by consulting a standard Chi-square distribution table and finding the appropriate value, considering the level of significance and the number of degrees of freedom.

In addition to understanding the relationship between the primary independent variable (e.g., high school athletic participation) and the dependent variables (e.g., education and labor market success in 2000), a number of control variables were examined. Because secondary analysis of survey data prevents the option of using random assignment for the characteristic of interest (e.g., athletic participation in high school), a number of variables are introduced into the regression model in an effort to control for a potentially spurious correlation between the independent and dependent variables (Allison 1999). For example, certain characteristics of the respondent might be related to their postsecondary educational attainment such as gender and the family's socioeconomic status (SES). Without controlling for these other potentially confounding factors, we might find a statistically significant relationship between high school athletic participation and postsecondary educational attainment when one does not actually exist.

In these analyses, we control for the respondent's sex, race/ethnicity, the respondent's family's socioeconomic status, and 10th-grade test scores.

The regression coefficients generated by the OLS procedure are interpreted as a slope. The b value, or slope, indicates how many units of change in the dependent variable occur for each unit change in the independent variable. For example, in this analysis in table 3, being an elite athlete, compared to a nonathlete, is associated with an increase of 0.14 in the respondent's salary (natural log) in 1999. A significant negative coefficient means that for every unit change in the independent variable there is a b units decrease in the dependent variable. Since it is difficult to interpret effects on logged earnings, the coefficients can also be interpreted as, for example, being an elite athlete versus a nonathlete is associated with a 15 percent ($100*[e^{0.14} – 1]$) increase in the logged dependent variable (income).

In the binary logistic regression models, the independent variables of interest (high school athletic participation) are categorical and the coefficient is expressed in relation to an omitted value of those variables (nonathlete), controlling for all other variables in the model. For example, in this analysis in table 3, being an elite athlete, compared to a nonathlete, is associated with an increase of 0.41 in the probability that the respondent is employed in 2000.

Often the odds ratio (computed e^{β}) can be used to estimate the change in probability of a particular variable in the logistic regression model making the coefficients easier to interpret. An odds ratio greater than one indicates a greater likelihood of having the characteristic than the omitted group, a ratio equal to one indicates no greater or lesser likelihood of having the characteristic, and a ratio less than one indicates a lower likelihood of having the characteristic compared to the omitted value. Most statistical packages will generate both the coefficients and the odds ratios. For example, in table 3, students who were elite athletes are 1.49 times (about one and one-half times) more likely to be employed than nonathletes. Another way to state this is that elite athletes are 9 percent (computed: [odds ratio – 1]*100) more likely than non-athletes to be employed in 2000.

Some NELS:88 variables are analyzed in such a way that makes it impossible to have an omitted group. The variables in this analysis for which there is no omitted group are the variables measuring household socioeconomic status, 10th-grade test scores, and locus of control. All of these are quartile variables, and the odds ratio presented is the increase (or decrease) in likelihood in achieving an outcome that a person would experience by moving up one quartile. For example, the independent variable household socioeconomic status has an odds ratio of 2.18 for the outcome any postsecondary education by 2000. This means that a person in the second quarter of the scale is 2.18 times more likely than a person in the lowest quarter of the scale to have any postsecondary education by 2000. Similarly, a person in the third quarter of the scale is 2.18 times more likely than a person in the second quarter of the scale to have any postsecondary education by 2000.

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For More Information

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