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The High School Longitudinal Study of 2009 (HSLS:09)

A First Look at Fall 2009 Ninth-Graders

NCES 2011-327

U.S. DEPARTMENT OF EDUCATION

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Foreword

This First Look presents findings from the base-year survey of the newly launched High School Longitudinal Study of 2009 (HSLS:09), the first round of a study that will follow a ninth-grade cohort through high school and into their postsecondary years. HSLS:09 is the fifth in a series of National Center for Education Statistics (NCES) high school longitudinal studies that began in 1972 and have been continued with each new decade.

The purpose of this report is to introduce new data, marking the release of the HSLS:09 base-year dataset, through the presentation of select descriptive tables. The findings presented here represent only a small sample of the relationships between data elements in a study that gathered extensive information from school administrators, counselors, teachers, and parents, in addition to students who were both surveyed and given a mathematics assessment focused on algebraic reasoning.

The data on which the report is based are available in both public- and restricted-use versions from NCES.

We hope that the information in this report will be useful to a wide range of readers and will encourage policy analysts and researchers to explore the HSLS:09 base-year data and the future datasets that will follow.

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Chapter 1. Introduction

1.1 Focus of This Report

This report provides a first look at selected findings from the base year of the High School Longitudinal Study of 2009 (HSLS:09). The HSLS:09 project focuses on understanding students' trajectories from the beginning of high school into higher education and the workforce. The core research questions for the study explore secondary to postsecondary transition plans and the evolution of those plans; the paths into and out of science, technology, engineering, and mathematics (STEM) fields of study and careers; and the educational and social experiences that are related to these shifts in plans or paths.

While the core research questions for HSLS:09 are longitudinal in nature, the base year, by itself, supplies valuable cross-sectional data about the nation's ninth-graders. For example, the base-year study provides data about the mathematics achievement of ninth-graders and how their achievement varies by such factors as students' educational and career expectations, course enrollment, relationships with their parents and peers, and other characteristics. Contextual sources contribute to the cross-sectional profile of ninth-graders, with their school administrators and school counselors contributing data about school organization and programs, while their mathematics and science teachers report on their professional background and instructional practices. Finally, parent data situate the ninth-grader in a family context at the point of transition to high school.

The purpose of this First Look report is to introduce new National Center for Education Statistics (NCES) survey data through the presentation of selected descriptive information. Because this report is purely descriptive in nature, readers are cautioned not to draw causal inferences based on the bivariate results presented in it. It is important to note that many of the variables examined in this report may be related to one another, and complex interactions and relationships among the variables have not been explored. The variables examined here are also just a few of those that can be examined in these data; they were selected to demonstrate the range of information available from the study. These findings are examples of estimates that can be obtained from the data and are not designed to emphasize any particular issue. The release of this report is intended to encourage more in-depth analysis of the data using more sophisticated statistical methods.

With that in mind, this report highlights a few results of the mathematics assessment and student beliefs, expectations, exposure to different mathematics and science courses, educational expectations, and career planning.

Comparisons made in the text were tested for statistical significance to ensure that the differences were larger than might be expected as a result of sampling variation. All differences reported are significant at the $p < .05$ level. There were no adjustments for multiple comparisons. Estimates reported in the text that are summed across reported categories are based on the underlying unrounded estimates. Given the short format of this release report, information highlighted in the bullets does not report out all statistically significant findings from the tables.

Further information about the dataset and the methodologies employed in collecting and processing the data can be found in the technical appendix to this report (appendix A) and, with greater detail, in the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328), available from the NCES website located at http://nces.ed.gov/surveys/hsls09/. Appendix A (A.10) includes information about the variables used in each table.

1.2 Study Design

HSLS:09 is a longitudinal study of a nationally representative sample of approximately 20,000 ninth-graders in 944 schools. More specifically, the study is representative of fall term 9th-graders in schools with a 9th and an 11th grade. These students will be followed through their secondary and postsecondary or early work years. The schools were sampled from public schools, including charter schools, and private schools providing instruction to both 9th- and 11th-grade students in the 50 United States and the District of Columbia. In 2009, fall-term ninth-graders were sampled within selected schools. All ninth-grade students in the sampled schools were classified as eligible for the study, including students with disabilities and English language learners who may not have been capable of completing the survey instruments. The base-year dataset also includes 10 individual state-representative samples of public school students and schools. More information about the sample design can be found in the technical notes (appendix A).

The first follow-up of HSLS:09 will occur in the spring of 2012 when most sample members will be in the 11th grade. A postsecondary status update will occur in the summer/fall of 2013, high school transcripts will be collected and coded in the fall of 2013/spring of 2014, and a second follow-up is planned for 2015, when most sample members will be 2 years beyond high school graduation. Additional follow-ups are planned, to at least age 26.

In the base year, students completed both a questionnaire and a two-stage adaptive mathematics assessment in algebraic reasoning and problem solving.[1] The assessment is adaptive in that a student's performance on the first stage (the "router") determines the difficulty level of the form (low, moderate, or high) of the second stage. The student survey and assessments were administered by computer.

Students' tested achievement in algebraic reasoning can be reported in several ways in HSLS:09. One way is to divide students into five equal groups (called quintiles or fifths), from lowest to highest in mathematics achievement. Another test score that can be reported in HSLS:09 is the probability of a student's proficiency at any one of five hierarchical levels of performance. A proficiency probability score measures how well an examinee performs relative to set criteria representing mastery of knowledge and skills assessed. Finally, HSLS:09 assessment reporting supplies an IRT-estimated number-right score, which puts results on a scale of 0-72. This report presents assessment data in all three of these ways.

The unweighted and weighted school response rates were 50 percent and 56 percent, respectively. The unweighted and weighted students' response rates to the survey were 85 percent and 86 percent, and the unweighted and weighted student response rates to the assessment were 82 percent and 83 percent. The survey weights were adjusted for school-level and student-level unit nonresponse, and the data were then weighted to yield national estimates that represent all 9th-grade students enrolled in schools in the United States that included both 9th and 11th grades. The results of a nonresponse bias analysis conducted for the survey to inform the nonresponse weight adjustments are presented in appendix A.

Although primarily student data are reported here, the HSLS:09 dataset includes important contextual data from other sources, including school administrators, school counselors, science teachers, mathematics teachers, and parents, which are the focus of the forthcoming companion report, *High School Longitudinal Study of 2009 (HSLS:09): A First Look at Fall 2009 Ninth-Graders' Parents, Teachers, School Counselors, and School Administrators* (NCES 2011-355).

[1] Although the student sample included students with disabilities and English language learners who were deemed not capable of completing the survey instruments, such students are not reflected in the estimates reported in tables of this report because they lack student questionnaire and assessment data.

Chapter 2. Selected Findings

- Fifty-one percent of ninth-graders were non-Hispanic White, followed by Hispanic (23 percent), and non-Hispanic Black (14 percent) groups (table 1).
- Among ninth-graders, 39 percent expected to attain a graduate or professional degree and 22 percent said they did not know what educational level they expected to reach (table 1).
- Mathematics achievement varied by level of the ninth-grader's parents' highest education. For example, 24 percent of students with parents whose highest attainment was a high school diploma or GED were in the bottom quintile of the achievement distribution and 15 percent were in the highest quintile. In contrast, 5 percent of ninth-graders whose parents' highest attainment was a master's degree or higher were in the bottom quintile of mathematics achievement and 44 percent were in the top quintile. Results also varied by race/ethnicity. Some 16 percent of Asians were in the bottom two quintiles, compared to 62 percent of Blacks, 48 percent of Hispanics, and 32 percent of Whites (table 2).
- The lowest HSLS:09 proficiency level is Level 1, understanding of algebraic expressions, at which about 86 percent of ninth-graders demonstrated proficiency. At level 2, multiplicative and proportional thinking, 59 percent showed proficiency, and at one level higher, algebraic equivalents, 41 percent of ninth-graders demonstrated proficiency. For level 4, systems of equations, 18 percent were proficient. At level 5, linear functions, 9 percent were proficient (table 3).
- In addition to being nationally representative, HSLS:09 data are also representative of students who attend public schools in 10 states, including California, Florida, Georgia, Michigan, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, and Washington. As one example, in North Carolina,[2] approximately 88 percent of public school ninth-graders were proficient in algebraic expressions, 64 percent were proficient in multiplicative and proportional thinking, 46 percent had mastered algebraic equivalents, 22 percent had mastered systems of equations, and 11 percent were proficient in linear functions (table 4.b).
- Mathematics and science coursetaking varied by student, family, and school characteristics: for example, 17 percent of students in the lowest socioeconomic status (SES) [3] group reported no mathematics coursetaking, compared to 6 percent of students in the highest SES group. About 10 percent of students overall were taking no mathematics courses in fall of ninth grade, and 18 percent no science course (tables 5 and 6).
- Ninth-graders were also asked about their expectations for future educational attainment. A larger percentage of females than males indicated an expectation of obtaining a graduate or professional degree (44 percent versus 35 percent). A larger percentage of ninth-graders in the highest fifth of the socioeconomic status distribution expected to earn a graduate or professional degree compared to those in the bottom fifth (56 percent versus 27 percent). However, overall 22 percent of the cohort reported that they did not know what their highest educational attainment would be (table 7).
- Ninth-graders were asked whether they believed they could complete college. About 90 percent said they probably (44 percent) or definitely (47 percent) could. A greater percentage of private school

[2] There was no specific reason North Carolina was selected as an example. Any of the other nine states with state-representative samples equally could have been chosen to illustrate state-level findings.

[3] Socioeconomic status (SES) is a measure of a family's relative social position. For further information see appendix A (A.10.1).

ninth-graders said they definitely could finish college (61 percent) than public school ninth-graders (46 percent) (table 8).

- Ninth-graders were also asked what job or occupation they expected to have at age 30 and how much thought they had given to the chosen occupation. Approximately a quarter – 29 percent – were unable to identify an occupation[4] while nearly half – 49 percent – identified an occupation and reported thinking about it a lot. A greater percentage of females than males reported having identified and thought about an occupation a lot (54 percent versus 44 percent) (table 9). A larger percentage of Black students than White students reported having identified and thought a lot about their future job (61 percent versus 48 percent).

[4] "Don't know" occupation at age 30 was an explicit response option for this questionnaire item.

Table 1. Cohort characteristics: Percentage distribution of ninth-graders, by student, family, and school characteristics: 2009

Characteristic	Number of students (in thousands)	Percent of population
Total	4,115	100.0
Sex		
Male	2,067	50.2
Female	2,048	49.8
Race/ethnicity[1]		
White, non-Hispanic	2,106	51.2
Black, non-Hispanic	569	13.8
Hispanic	926	22.5
Asian, non-Hispanic	145	3.5
All other races, non-Hispanic	370	9.0
Parents' highest education		
Less than high school	338	8.2
High school diploma or GED	1,594	38.7
Associate's degree	666	16.2
Bachelor's degree	901	21.9
Master's degree or higher	616	15.0
Socioeconomic status		
Lowest fifth	809	19.6
Middle three-fifths	2,473	60.1
Highest fifth	834	20.3
Mathematics achievement by quintile rank		
Lowest fifth	821	20.0
Middle three-fifths	2,472	60.1
Highest fifth	821	20.0
Ninth-graders' educational expectations		
High school or less	605	14.7
Some college	299	7.3
College graduation	708	17.2
Graduate/professional degree	1,612	39.2
Don't know	891	21.7
School sector		
Public	3,818	92.8
Private	297	7.2

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. Details may not sum to totals because of rounding. GED represents General Educational Development., an alternative path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Restricted-Use File (NCES 2011-333).

Table 2. Mathematics achievement: Percentage distribution in quintiles of algebra achievement among fall ninth-graders, by student, family, and school characteristics: 2009

Characteristic	Quintiles				
	Bottom	Second	Third	Fourth	Top
Total	20.0	20.0	20.0	20.0	20.0
Sex					
Male	20.5	20.1	19.2	19.9	20.3
Female	19.5	19.9	20.8	20.1	19.7
Race/ethnicity[1]					
White, non-Hispanic	14.1	18.2	20.2	22.8	24.7
Black, non-Hispanic	36.3	25.6	16.6	13.2	8.2
Hispanic	25.2	22.4	22.2	17.1	13.1
Asian, non-Hispanic	6.5	9.6	13.7	21.0	49.2
All other races, non-Hispanic	21.9	20.0	21.2	20.5	16.4
Parents' highest education					
Less than high school	28.8	25.1	25.1	15.4	5.5
High school diploma or GED	24.1	23.9	19.6	17.7	14.7
Associate's degree	16.8	23.4	22.4	20.0	17.4
Bachelor's degree	10.0	11.7	19.1	26.1	33.2
Master's degree or higher	5.2	10.8	14.0	26.1	43.9
Socioeconomic status					
Lowest fifth	35.7	25.0	19.9	13.0	6.4
Middle three-fifths	19.8	21.6	21.6	20.4	16.6
Highest fifth	5.5	10.3	15.5	25.6	43.1
Ninth-graders' educational expectations					
High school or less	38.6	26.1	20.3	10.0	4.9
Some college	25.8	23.2	24.0	17.9	9.1
College graduation	13.1	17.1	21.0	24.3	24.4
Graduate/professional degree	12.6	16.4	18.8	23.1	29.1
Don't know	24.2	23.5	19.8	18.4	14.0
School sector					
Public	21.0	20.5	20.0	19.5	19.0
Private	7.7	12.9	20.2	26.3	32.9

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. Details may not sum to totals because of rounding. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table 3. Mathematics proficiency: Percentage of ninth-graders proficient in specific algebra knowledge and skills, by student, family, and school characteristics: 2009

Characteristic	Level				
	1—Algebraic expressions	2—Multiplicative and proportional thinking	3—Algebraic equivalents	4—Systems of equations	5—Linear functions
Total	85.7	59.1	41.3	18.3	9.2
Sex					
Male	84.5	58.9	41.6	18.7	9.4
Female	86.8	59.4	41.0	17.9	8.9
Race/ethnicity[1]					
White, non-Hispanic	89.7	65.7	47.5	21.3	10.2
Black, non-Hispanic	74.4	41.3	25.5	10.4	6.3
Hispanic	82.4	52.1	33.7	13.6	7.2
Asian, non-Hispanic	94.8	81.0	67.5	39.9	19.5
All other races, non-Hispanic	83.9	56.4	38.4	16.1	8.4
Parents' highest education					
Less than high school	80.1	46.5	26.8	9.6	6.0
High school diploma or GED	82.7	52.8	34.8	14.3	7.5
Associate's degree	87.7	59.0	39.7	16.3	8.2
Bachelor's degree	93.0	74.1	56.9	27.1	12.2
Master's degree or higher	95.8	80.6	65.7	34.9	16.4
Socioeconomic status					
Lowest fifth	74.0	41.3	24.3	9.4	6.0
Middle three-fifths	86.0	57.7	38.9	16.0	8.1
Highest fifth	95.9	80.4	65.0	33.7	15.4
Ninth-graders' educational expectations					
High school or less	72.0	37.9	21.2	8.2	5.7
Some college	81.5	50.0	30.3	11.2	6.5
College graduation	90.3	66.8	48.2	20.9	9.6
Graduate/professional degree	91.3	68.9	51.5	24.4	11.5
Don't know	82.4	52.7	34.8	14.6	7.9
School sector					
Public	85.0	57.9	40.1	17.6	8.9
Private	94.6	75.1	57.2	26.6	11.8

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Proficiency Levels. Level 1—algebraic expressions: understanding of algebraic basics including evaluating simple algebraic expressions and translating between verbal and symbolic representation of expressions. Level 2, multiplicative and proportional thinking: understanding of proportions and multiplicative situations; can solve proportional situation word problems, find the percent of a number, and identify equivalent algebraic expressions for multiplicative situations. Level 3—algebraic equivalents: can link equivalent tabular and symbolic representations of linear equations, identify equivalent lines and find the sum of variable expressions. Level 4—systems of equations: demonstrates an understanding of systems of linear equations and can solve such systems algebraically and graphically and characterize the lines (parallel, intersecting, collinear) represented by a system of linear equations. Level 5—linear functions: demonstrates an understanding of linear functions and ability to find and use slopes and intercepts of lines, and use functional notation. All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. Details may not sum to totals because of rounding. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table 4. State mathematics performance: Percentage of algebra achievement (quintiles), percentage of ninth-graders proficient in specific algebra knowledge and skills, and mean algebra assessment estimated number right scores among public school ninth-graders in states with representative data: 2009

	Percentage of algebra achievement (quintiles)				
4.a. Reporting state	Bottom	Second	Third	Fourth	Top
National, public schools only[1]	21.0	20.5	20.0	19.5	19.0
California	22.4	18.2	20.2	17.4	21.8
Florida	20.3	20.7	20.1	19.7	19.3
Georgia	21.2	18.8	19.5	22.4	18.1
Michigan	19.5	18.6	24.5	16.5	20.9
North Carolina	16.7	17.8	19.5	20.3	25.6
Ohio	25.0	17.6	19.3	22.5	15.6
Pennsylvania	16.8	20.1	22.5	20.7	19.8
Tennessee	25.6	20.3	20.4	18.4	15.3
Texas	17.0	17.0	26.7	20.7	18.7
Washington	19.3	19.6	22.1	18.9	20.1
	Percentage of ninth-graders proficient in specific algebra knowledge and skills				
4.b. Reporting state	1	2	3	4	5
National, public schools only	85.0	57.9	40.1	17.6	8.9
California	84.8	58.0	41.3	19.5	9.8
Florida	85.2	58.1	40.8	18.3	9.5
Georgia	85.4	58.4	40.5	16.8	8.2
Michigan	85.9	59.8	41.1	18.5	9.1
North Carolina	87.9	63.9	46.4	22.0	10.7
Ohio	83.1	56.2	38.6	16.5	8.8
Pennsylvania	88.0	61.3	42.1	17.8	8.8
Tennessee	81.5	53.7	36.1	15.3	8.1
Texas	87.3	62.0	42.4	17.8	8.7
Washington	85.0	59.2	41.2	18.5	9.6
4.c. Reporting state	Mean algebra assessment estimated number right scores				
National, public schools only			38.4		
California			38.8		
Florida			38.7		
Georgia			38.4		
Michigan			39.0		
North Carolina			40.7		
Ohio			37.8		
Pennsylvania			39.4		
Tennessee			36.9		
Texas			39.4		
Washington			38.9		

[1] Cut points for the quintile scores are based on students in public and private schools. Each quintile contains 20 percent of the distribution of public and private school students. The estimates in this table reflect public schools only (since the reporting unit is state-representative public school samples). Therefore the distribution in table 4 is not equal with 20 percent in each quintile.

NOTE: Proficiency Levels. Level 1—algebraic expressions: understanding of algebraic basics including evaluating simple algebraic expressions and translating between verbal and symbolic representation of expressions. Level 2, multiplicative and proportional thinking: understanding of proportions and multiplicative situations; can solve proportional situation word problems, find the percent of a number, and identify equivalent algebraic expressions for multiplicative situations. Level 3—algebraic equivalents: can link equivalent tabular and symbolic representations of linear equations, identify equivalent lines and find the sum of variable expressions. Level 4—systems of equations: demonstrates an understanding of systems of linear equations and can solve such systems algebraically and graphically and characterize the lines (parallel, intersecting, collinear) represented by a system of linear equations. Level 5—linear functions: demonstrates an understanding of linear functions and ability to find and use slopes and intercepts of lines, and use functional notation. The algebra assessment estimated number right has a potential range of 0-72. Table 4 cannot be replicated from the public-use file; state indicators are available only on the restricted-use file. All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Restricted-Use File (NCES 2011-333).

Table 5. Mathematics enrollment: Percentage of all ninth-graders in various mathematics courses, by student, family, and school characteristics: 2009

Characteristic	No mathe-matics	Basic mathe-matics[1]	Pre-algebra	Algebra 1	Geometry	Algebra 2	Other[2]
Total	10.3	0.7	5.4	51.3	22.1	6.3	8.5
Sex							
Male	11.0	0.6	5.5	50.9	21.0	6.7	8.5
Female	9.5	0.7	5.3	51.7	23.1	5.9	8.5
Race/ethnicity[3]							
White, non-Hispanic	8.4	0.7	4.7	50.5	24.2	6.7	8.5
Black, non-Hispanic	14.0	1.0!	7.2	54.6	13.1	5.4	10.7
Hispanic	13.2	0.6	5.7	53.7	20.1	4.7	6.2
Asian, non-Hispanic	7.3	#!	4.1!	27.2	42.8	14.6	9.7
All other races, non-Hispanic	9.3	0.6!	6.5	55.0	20.1	6.2	9.9
Parents' highest education							
Less than high school	18.2	1.2!	7.0	46.9	18.4	3.6	8.7
High school diploma or GED	11.9	0.8	6.0	54.2	16.9	4.6	9.9
Associate's degree	8.5	0.9	5.9	58.0	17.9	4.6	8.0
Bachelor's degree	7.1	0.3!	3.1	46.9	31.5	8.5	7.2
Master's degree or higher	5.1	0.1!	1.7	38.8	38.0	12.8	8.0
Socioeconomic status							
Lowest fifth	16.9	1.3	7.2	52.6	13.7	3.7	10.0
Middle three-fifths	9.7	0.6	6.0	54.5	19.7	5.3	8.3
Highest fifth	5.7	0.2!	2.0	40.9	37.1	11.8	7.6
Ninth-graders' educational expectations							
High school or less	16.0	1.1	8.6	55.1	8.5	3.7	10.9
Some college	13.8	0.8!	7.0	57.2	13.6	4.2	8.5
College graduation	8.3	0.7!	4.5	51.8	25.9	5.8	6.7
Graduate/professional degree	7.9	0.4	3.6	47.5	29.6	8.8	7.7
Don't know	11.1	0.7!	6.7	53.3	17.5	4.8	9.7
Mathematics achievement by quintile rank							
Lowest fifth	18.9	1.4	10.2	52.5	6.0	3.9	13.5
Middle three-fifths	9.6	0.6	5.5	58.9	18.1	4.0	7.1
Highest fifth	3.8	0.1!	0.4	27.6	49.7	15.5	7.6
School sector							
Public	10.8	0.7	5.5	51.1	21.5	6.2	8.7
Private	3.6	0.2!	4.3	54.4	29.3	7.5	6.0!

Rounds to zero.

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

[1] "Basic mathematics" contains Review or Remedial mathematics including Basic, Business, Consumer, Functional, or General mathematics.

[2] "Other mathematics" contains extremely low-incidence subjects including trigonometry, integrated mathematics, statistics or probability, and advanced mathematics courses such as precalculus and calculus.

[3] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Rows sum to more than 100 percent because subjects are not mutually exclusive and some students are taking multiple mathematics courses. All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table 6. Science enrollment: Percentage of all ninth-graders in various science courses, by student, family, and school characteristics: 2009

Characteristic	No science	Biology	Earth science	Physical sciences	Chemistry	Other science[1]
Total	17.9	36.7	14.7	21.8	2.8	11.0
Sex						
Male	18.9	36.0	15.0	21.6	2.4	10.6
Female	17.0	37.3	14.4	21.9	3.2	11.4
Race/ethnicity[2]						
White, non-Hispanic	14.9	34.8	16.3	25.6	2.3	10.4
Black, non-Hispanic	25.2	34.9	9.5	23.1	3.2!	9.7
Hispanic	22.0	40.5	14.9	12.3	3.7!	11.4
Asian, non-Hispanic	12.9	49.2	8.4	18.2	4.5	13.5
All other races, non-Hispanic	16.2	35.8	15.7	22.1	2.0	13.9
Parents' highest education						
Less than high school	29.2	36.2	12.5	13.1	0.6!	11.1
High school diploma or GED	20.7	32.2	15.3	22.7	2.4	11.7
Associate's degree	15.1	33.8	15.9	23.9	2.3	14.0
Bachelor's degree	13.4	42.1	15.9	20.7	3.1	9.1
Master's degree or higher	10.8	46.9	13.5	19.7	4.9	9.0
Socioeconomic status						
Lowest fifth	26.6	31.2	14.5	20.4	2.2!	10.7
Middle three-fifths	17.6	34.9	14.9	22.9	2.4	11.9
Highest fifth	10.6	47.1	14.6	19.7	4.4	8.5
Ninth-graders' educational expectations						
High school or less	24.7	26.9	15.2	23.4	2.1!	12.1
Some college	22.4	33.2	18.3	21.1	2.0	7.9
College graduation	16.4	37.6	14.9	21.9	2.4	11.1
Graduate/professional degree	13.9	43.6	13.1	21.1	3.7	10.1
Don't know	20.3	31.2	16.1	21.9	2.1	12.6
School sector						
Public	18.7	35.5	15.2	21.5	2.7	11.1
Private	8.1	51.5	8.2	24.7	4.0!	9.0

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

[1] For example, General Science, Integrated Science, Principles of Technology.

[2] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Rows sum to more than 100 percent because subjects are not mutually exclusive and some students are taking multiple science courses. All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Restricted-Use File (NCES 2011-333).

Table 7. Educational expectations: Percentage distribution of ninth-graders' educational attainment expectations, by student, family, and school characteristics: 2009

Characteristic	High school or less	Some college	College graduation	Graduate/ professional degree	Don't know
Total	14.7	7.3	17.2	39.1	21.7
Sex					
Male	17.3	8.1	18.6	34.5	21.5
Female	12.1	6.5	15.7	43.8	21.9
Race/ethnicity[1]					
White, non-Hispanic	12.1	7.3	19.6	39.9	21.2
Black, non-Hispanic	17.6	6.6	13.8	44.0	18.0
Hispanic	20.4	7.2	14.6	32.4	25.5
Asian, non-Hispanic	5.8	6.7	15.2	47.7	24.7
All other races, non-Hispanic	15.2	8.9	15.4	40.6	19.8
Parents' highest education					
Less than high school	27.6	8.4	15.3	24.1	24.6
High school diploma or GED	17.4	9.6	16.7	34.0	22.2
Associate's degree	14.7	7.6	18.2	38.6	21.0
Bachelor's degree	5.7	5.0	23.4	46.8	19.0
Master's degree or higher	4.0	2.8	16.6	60.8	15.7
Socioeconomic status					
Lowest fifth	27.0	10.2	13.8	26.7	22.2
Middle three-fifths	14.6	7.8	17.2	37.6	22.8
Highest fifth	3.3	3.0	20.2	55.6	17.9
Mathematics achievement by quintile rank					
Lowest fifth	28.4	9.4	11.3	24.6	26.3
Middle three-fifths	13.9	7.9	17.9	38.0	22.3
Highest fifth	3.6	3.3	21.0	56.8	15.2
School sector					
Public	15.5	7.6	17.1	38.0	21.8
Private	5.4	3.8	18.0	53.1	19.6

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. Details may not sum to totals because of rounding. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table 8. Belief in ability: Percentage distribution of ninth-graders' belief in ability to complete college, by student, family, and school characteristics: 2009

Characteristic	Definitely not	Probably not	Probably	Definitely
Total	1.7	7.4	43.8	47.2
Sex				
Male	2.4	8.7	43.4	45.4
Female	0.9	6.0	44.1	48.9
Race/ethnicity[1]				
White, non-Hispanic	1.7	7.4	42.4	48.5
Black, non-Hispanic	1.4	4.0	42.8	51.7
Hispanic	1.9	9.8	48.1	40.2
Asian, non-Hispanic	0.7!	3.3	42.9	53.1
All other races, non-Hispanic	2.1	7.6	42.9	47.3
Parents' highest education				
Less than high school	3.0!	13.0	51.5	32.5
High school diploma or GED	2.2	9.1	47.0	41.7
Associate's degree	1.5	6.3	46.4	45.8
Bachelor's degree	0.4!	3.7	36.6	59.3
Master's degree or higher	0.4!	1.8	31.8	66.1
Socioeconomic status				
Lowest fifth	2.5	13.3	51.1	33.1
Middle three-fifths	1.9	7.2	45.2	45.7
Highest fifth	0.3!	2.2	32.7	64.7
Ninth-graders' educational expectations				
High school or less	6.3	23.7	57.5	12.5
Some college	1.9	14.0	67.3	16.9
College graduation	0.1![2]	0.8![2]	44.4	54.8
Graduate/professional degree	0.2![2]	0.4![2]	24.5	74.9
Don't know	2.4	11.9	61.0	24.7
Mathematics achievement by quintile rank				
Lowest fifth	4.3	13.4	50.9	31.5
Middle three-fifths	1.3	7.4	46.0	45.3
Highest fifth	0.2!	1.4	30.4	68.0
School sector				
Public	1.8	7.7	44.4	46.1
Private	0.4!	3.5	35.5	60.6

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

[2] These responses may seem contradictory. These respondents expect an educational attainment level of college completion or higher, but at the same time, report not believing in their ability to finish college. Despite the possible contradiction, these responses do reflect the data for a small proportion of the respondents. Both items were asked separately, without filtering, of all student respondents.

NOTE: All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. Details may not sum to totals because of rounding. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table 9. Occupational expectations: Percentage distribution of ninth-graders who have thought about their future occupation, by student, family, and school characteristics: 2009

Characteristic	How much thought given to identified occupation				Did not identify an occupation at age 30
	A lot	Somewhat	A little	Not at all	
Total	48.7	15.6	6.5	0.5	28.7
Sex					
Male	43.7	15.2	6.5	0.7	33.9
Female	53.8	16.0	6.5	0.3!	23.5
Race/ethnicity[1]					
White, non-Hispanic	47.7	16.4	6.5	0.4	28.9
Black, non-Hispanic	60.5	10.5	6.0	0.8!	22.2
Hispanic	44.3	15.8	6.8	0.4!	32.7
Asian, non-Hispanic	35.9	18.9	8.2	0.6!	36.4
All other races, non-Hispanic	53.5	16.4	5.4	0.4!	24.3
Parents' highest education					
Less than high school	41.9	15.1	7.6	0.3!	35.2
High school diploma or GED	52.9	13.8	6.1	0.6	26.7
Associate's degree	51.5	15.3	7.1	0.4!	25.7
Bachelor's degree	45.5	18.6	7.0	0.2!	28.6
Master's degree or higher	44.8	18.9	6.5	0.8!	29.1
Socioeconomic status					
Lowest fifth	48.2	14.0	6.0	0.6!	31.3
Middle three-fifths	50.1	15.1	6.5	0.5	27.7
Highest fifth	45.1	18.4	6.9	0.5	29.1
Ninth-graders' educational expectations					
High school or less	43.9	13.8	8.0	0.9	33.4
Some college	40.1	16.9	7.6	0.4!	35.0
College graduation	46.1	18.2	6.7	0.2!	28.8
Graduate/professional degree	60.7	15.6	4.9	0.3!	18.5
Don't know	35.5	14.2	7.8	0.9	41.6
Mathematics achievement by quintile rank					
Lowest fifth	47.9	11.5	7.3	1.1	32.1
Middle three-fifths	50.5	15.7	6.4	0.4	27.0
Highest fifth	44.4	19.1	5.8	0.2!	30.5
School sector					
Public	49.2	15.4	6.4	0.5	28.5
Private	42.3	17.7	7.5	0.5!	32.0

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: All estimates are weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. Details may not sum to totals because of rounding. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

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Appendix A
Technical Notes and Methodology

Appendix A provides information about the base-year study of HSLS:09, as well as information about statistical procedures and analysis variables used in this report. The HSLS:09 base year is discussed in seven sections: (1) Design and Purposes of HSLS:09; (2) Instrumentation; (3) Sample Design; (4) Results of Data Collection, including non-response bias analysis; (5) Weighting; (6) Imputation; and (7) Disclosure Risk Analysis and Protections. For further information on the HSLS:09 base year, see the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328) which provides guidance and in-depth documentation for users of the data file and its products. Discussion of the study is followed by information on the report's statistical procedures (A.8), generation of standard errors (A.9), and definitions of analysis variables (A.10).

A.1 Design and Purposes of HSLS:09

HSLS:09 is the fifth in a series of National Center for Education Statistics secondary longitudinal studies. All of the studies monitor the transition of national samples of young people from the high school years to postsecondary statuses, including further education, participation in the work force, and the assumption of other adult roles.

The core research questions for HSLS:09 explore secondary to postsecondary transition plans and the evolution of those plans; the paths into and out of science, technology, engineering, and mathematics; and the educational and social experiences that affect these shifts.

The HSLS:09 base year took place in the 2009–10 school year, with a randomly selected sample of fall-term 9th-graders in more than 900 public and private high schools with both a 9th and an 11th grade. Students took a mathematics assessment and survey online. Students' parents, school administrators, and mathematics and science teachers as well as the school's lead counselor completed surveys on the phone or on the Web.

The first follow-up of HSLS:09 will take place in the spring of 2012 when most sample members will be in the spring of the 11th grade. Dropouts and transfer students will be followed, as well as those who remain in the base-year school. A postsecondary update will take place in the summer/fall of 2013, to learn about the cohort's postsecondary plans and decisions. High school transcripts will be collected in the fall of 2013/early 2014, and a second follow-up will take place in 2015, when most sample members will be 2 years beyond high school graduation. Further information on study design and purposes can be found in chapter 1 of the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328).

A.2 Instrumentation

Base-year instrument design for HSLS:09 was guided by a conceptual framework that takes the student as the fundamental unit of analysis and attempts to identify the precursor factors, such as motivation, beliefs, and interests that may lead to academic goal-setting and decision-making. It traces the many variables—including perceived opportunities, barriers, and costs—that are associated with students' values and expectations and that factor into their most basic education-related choices. The study design also acknowledges the importance of social context and the interaction between students and their families, teachers, peers, and the wider community.

Base-year instrument design was also guided by the desire to develop computer-assisted research instruments. The student questionnaire was, for the first time in the history of the study series, electronically administered, as was the student assessment in algebraic reasoning. The contextual questionnaires—parent, teacher, school administrator and counselor—were designed for Web self-administration or computer-assisted telephone administration (CATI) by an interviewer. Computerization of the instruments was desired for several reasons, including its contribution to higher quality data and to the accurate assignment of second-stage forms in the mathematics assessment (a two-stage adaptive test was employed).

Student Questionnaire. The content of the student questionnaire included both future locating information and substantive questions. The questionnaire elicited demographic information (for example, sex, race/ethnicity); language background; school experiences in the current and previous school year (including mathematics and science experiences and course enrollment). It also inquired into constructs such as mathematics self-efficacy and identification and high school, postsecondary, and career plans, among other topics.

Parent Questionnaire. The parent questionnaire also included locating and substantive items. Substantive items covered household members and their roles and characteristics; demographic data; information on immigration status and language use; socioeconomic status (education, occupation, income); the student's educational history (including grade retention and change of schools); family interactions; parental involvement in the ninth-grader's learning; and plans and preparations for postsecondary education.

Teacher (mathematics and science) Questionnaire. Teachers were selected by virtue of teaching an HSLS:09 student in science or mathematics. The teacher questionnaire collected background information about the respondent, including both demographic characteristics and educational and professional history. Mathematics and science teachers were asked to evaluate their mathematics or science department, and provide information at the classroom level. In part because of the fall timing of the survey (exposure to the student was comparatively low), teachers were not asked to supply ratings or evaluations of individual HSLS:09 students.

School Administrator Questionnaire. The school questionnaire allowed for two respondents: the factual information sections (1–4) could be delegated to a knowledgeable staff member, the final section to be completed only by the principal, because its content concerned the principal's background and beliefs. The questionnaire elicited information about school characteristics; the student population; the school's teachers; course offered; and the goals, beliefs, and background of the principal.

Counselor Questionnaire. The counselor questionnaire sought information about school programs and practices, especially as they related to activities to transition students into high school, student programs, and course assignments. The majority of questions inquired about staffing and practices (e.g., counselor certifications and caseloads, basis for assignment to students), resources (enrichment programs, services for struggling students, dropout prevention programs, and so on), and mathematics and science placement (placement criteria for both ninth-graders and upperclassmen in mathematics and science).

Mathematics Assessment in Algebraic Reasoning. The mathematics assessment was designed to provide a measure of student achievement in algebraic reasoning at two points in time (9^{th} and 11^{th} grade). The test framework was designed to assess a cross-section of understandings representative of the major domains of algebra and the key processes of algebra. The test and item specifications describe six domains of algebraic content and four algebraic processes:

- Algebraic Content Domains:
  - The language of algebra
  - Proportional relationships and change
  - Linear equations, inequalities, and functions
  - Nonlinear equations, inequalities, and functions
  - Systems of equations
  - Sequences and recursive relationships

- Algebraic Processes:
  - Demonstrating algebraic skills
  - Using representations of algebraic ideas
  - Performing algebraic reasoning
  - Solving algebraic problems

The assessment was built as a two-stage test, with a router (completed by all students) and a second-stage assignment of one of three forms of variable difficulty. For more information, see section A.10.2.

A.3 Sample Design

In the base-year survey of HSLS:09, students were sampled through a two-stage process. First, stratified random sampling and school recruitment resulted in the identification and contacting of 1,889 eligible schools. A total of 944 of these schools participated in the study, resulting in a 56 percent (weighted) or 50 percent unweighted school response rate.[1] The target population at the school level was defined as regular public schools, including public charter schools, and private schools, in the 50 United States and the District of Columbia, providing instruction in both 9th and 11th grade. The target population of students was defined to include all ninth-grade students who attended the study-eligible schools in the fall 2009 term.

In the second stage of sampling, students were randomly sampled from school enrollment rosters, with 25,206 eligible selections (or about 27 students per school). All students who met the target population definition were deemed eligible for the study. However, not all students were capable of completing a questionnaire or assessment. Students who, due to language barriers or severe disabilities, were judged by their schools to be unable to participate directly in the study were retained in the sample and contextual data were sought for them. However, they lack student survey and assessment data. Their ability to complete the study instruments will be reassessed in the first follow-up. Of the 25,206 eligible students, 24,658 students were classified as questionnaire-capable and 548 as questionnaire-incapable.

HSLS:09 school and student samples are nationally representative, and also state-representative for a subset of 10 states. For most purposes, the student is the unit of analysis. Data at the school, classroom, or home level may be attached to the student record as contextual data. Several contextual respondent populations were sampled. The school's head administrator comprises one such respondent group. The lead counselor (or most knowledgeable about the entering ninth-grade class) was identified (with the help of the school), and used as a source of school-level student contextual data. Mathematics and science teachers of HSLS:09 ninth-graders enrolled in the subject were asked to complete a teacher questionnaire. The final source of contextual data was the parent. The parent was self-selected, using the criterion that the responding parent should be the one most knowledgeable about the ninth-grader's current experiences.

A.4 Results of School Recruitment and Data Collection

Table A-1 below summarizes the results of school recruitment and instrument completion by each component.

[1] The HSLS09 base year school cooperation rates are lower than the cooperation rates obtained in the prior NCES secondary longitudinal studies. For example, the immediate predecessor study, ELS:2002, obtained in its spring 2002 base year survey, a school cooperation rate of 62 percent (unweighted) or 68 percent (weighted). Further detail on school recruitment challenges is provided in chapter 4 of the *HSLS:09 Base-Year Data File Documentation* (NCES 2011-328).

Table A-1. Summary of HSLS:09 base-year response rates: 2009

Instrument	Selected	Participated	Weighted percent	Unweighted percent
School	1,889	944	55.5	50.0
School administrator[1]	944	888	94.9	94.1
School counselor[1]	944	852	91.3	90.3
Student questionnaire[2, 3]	25,206	21,444	85.7	85.1
Student assessment[2, 3]	25,206	20,781	83.0	82.4
Parent questionnaire[2]	25,206	16,995	67.5	67.4
School administrator[2]	25,206	23,800	94.5	94.4
School counselor[2]	25,206	22,790	90.0	90.4
Teacher questionnaire				
Mathematics teacher[4]	23,621	17,882	71.9	75.7
Science teacher[5]	22,597	16,269	70.2	72.0

[1] Weighted estimates use the school base weight.
[2] Weighted estimates use the student base weight.
[3] Among questionnaire-capable students (n = 24,658), some 21,444 completed the student questionnaire, and 20,781 completed the mathematics assessment. Thus 87.0 percent (unweighted) completed the student interview or 87.4 percent weighted. Likewise, 84.3 percent (unweighted) completed a mathematics assessment or 84.7 percent weighted.
[4] Weighted estimates use the student base weight. Results reflect students who were enrolled in a mathematics course.
[5] Weighted estimates use the student base weight. Results reflect students who were enrolled in a science course.
NOTE: All percentages are based on the row under consideration.
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base Year.

Overall, about half the eligible selected schools participated, for a realized sample of 944 schools (56 percent weighted response rate). More than 21,000 students participated, or about 86 percent (weighted) of eligible selected fall ninth-graders (table A-1). While school cooperation rates were relatively low, important information about nonresponding schools was available from the sampling frame, and, in most instances, also from a special nonresponding school questionnaire. This facilitated the identification of bias, and of weighting adjustments designed to reduce or eliminate nonresponse bias for data elements known for both responding and nonresponding schools.

Nonresponse bias analyses were conducted to determine whether unit nonresponse from any of the six interview data sources (school administrator and school counselor, student, parent/guardian, mathematics teacher, and science teacher) significantly increased the estimated bias for a set of population estimates. Weighted response rates for mathematics and science teachers as well as parents of the sampled students fell below 85 percent and thus, per NCES standards, were subjected to the bias analysis procedures. The remaining sources were also included for a complete evaluation of HSLS:09. Characteristics associated with the school (e.g., school sector, percent minority) and with the sampled student (e.g., race/ethnicity, sex) were used in the bias tests.

Table A-2 contains a summary of the findings for the data components included in this report before and after the base weights were adjusted for nonresponse. For example, among the 60 tests conducted for student data, 18 percent were identified as having a significant level of bias before the weights were adjusted. This amount falls to almost zero once the weights were adjusted. The proportion of significant bias tests was largest for the school analytic weights (20 percent); however, the median absolute relative bias was reduced by more than 6 percentage points.

Overall the unit nonresponse bias analysis detected bias in a limited number of estimates generated with the nonresponse adjusted student weights, home-life weights, and mathematics enrollee weights (0

percent, 2 percent, and 2 percent, respectively) (see table A-2). Non-negligible biases were linked to the school and science enrollee weights and were primarily due to domains with relatively small sample sizes.

Specific variables used in the unit nonresponse bias analyses were school sector; ninth-grade enrollment (Asian, Black, Hispanic, Other); whether a charter school; total and ninth-grade enrollment; number of full-time teachers; student-to-teacher ratio; Census region; school locale (urbanicity); grade span; whether school has a religious affiliation; whether school is a regular secondary; and for the student-based tables, student sex and race. Bias was more an after-adjustment problem for school and science weights than for student, home-life or mathematics course enrollee weights. Using the relative bias estimate (in which bias is expressed on a uniform scale across items) as the criterion, the school weight variables and the science enrollee weight variables with the highest remaining (post-adjustment) bias and were "no religious affiliation"; "school is regular secondary: no"; and "student-teacher ratio > 25".

The analysis procedure for evaluating nonresponse bias can be found in chapter 6, section 6.7, of the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328). Tabular results for the unit nonresponse bias analysis are presented in appendix H, section H.1, of the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328). These tables show unit nonresponse bias both before and after weighting adjustments. See table H-1 for school base weights, table H-2 for student base weights, table H-3 for the home-life (parent) base weights, table H-4 for the science course enrollee base weights, and table H-5 for the mathematics course enrollee weights.

Table A-2. Summary statistics for unit nonresponse bias analyses by HSLS:09 analytic weight

		Significant bias tests [1]		Median absolute relative bias [2]		
Analytic weight	Number of t tests	Before adjustment (%)	After adjustment (%)	Before adjustment	After adjustment	Change
School	55	45.5	20.0	12.0	5.8	-6.2
Student	60	18.3	0.0	1.2	0.1	-1.1
Student contextual						
Home-life	60	23.3	1.7	1.5	0.6	-0.9
Science enrollee	60	33.3	11.7	6.6	3.9	-2.7
Mathematics enrollee	60	23.3	1.7	5.9	1.3	-4.6

[1] Bias significantly different from zero at the 0.05 level of significance. Before and after are in reference to the nonresponse weight adjustment.
[2] The relative bias is calculated as the estimated bias divided by the estimated value. The absolute relative bias is the absolute value of the relative bias
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base Year.

Of the students participating, approximately 98 percent were surveyed in in-school sessions, and 2 percent outside school. In-school sessions were 90 minutes in length, with 15 minutes for instructions and setup, 35 minutes for the student questionnaire, and 40 minutes for the two-part 40-question adaptive algebraic reasoning assessment. Out-of-school survey administrations did not include the assessment. Interview time for the out-of-school administration averaged 42 minutes.

Parent and school staff surveys (administrator, counselor, mathematics teacher, science teacher) were designed for computerized administration in either of two modes—web-based self-administration, or CATI (computerized self-administration).

A.5 Weighting

Analytic weights are used in combination with software that accounts for HSLS:09 complex survey design to produce estimates for the target population, with appropriate standard errors. Five sets of

analytic weights were computed for HSLS:09: a school-level weight, a student-level weight, two student-level weights associated with contextual data from science and mathematics courses, and a student-level weight for use with parent-supplied family and home contextual data.

The school-level weight can be used for school-level analyses involving the school administrator and counselor questionnaires. The student-level weight is used with student-level analyses. Because of the comparatively low unit response rates for parents and teachers, three special student weights—adjusted for parent, mathematics teacher, and science teacher nonresponse, respectively—were also produced. These weights presuppose that parents and teachers provide contextual data for participating students, and that the student is the unit of analysis.

Variance estimation is provided through two means: BRR (Balanced Repeated Replication) provided on both public- and restricted-use files and a Taylor series linearization (available on the restricted use file). The BRR approach to calculating HSLS:09 standard errors is recommended, although both methods give similar results.

A.6 Imputation

Imputation of values for missing items is also an important feature of the HSLS:09 data set. Despite the best efforts of data collectors, some questionnaire items remain unanswered. Completeness of some key student variables in HSLS:09 was also adversely affected by unit nonresponse at the parent level (for example, family income, parental educational attainment, and occupation, all critical components of the socioeconomic status [SES] index), or, more rarely, the failure of questionnaire completers to complete an assessment.

Imputation addresses the problem of missing items. Advantages of using imputed values include the ability to use all study respondent records in an analysis (complete-case analysis) which affords more power for statistical tests. Additionally, if the imputation procedure is effective (i.e., the imputed value is equal to [or close to] the true value) then the analysis results are likely less biased than those produced with the incomplete data file.

HSLS:09 variables in general did not suffer from high levels of item nonresponse. Nevertheless, a set of key analytic variables was identified for item imputation to facilitate complete-case analysis on data obtained from the participating ninth-grade students. Values were assigned in place of missing responses for 18 variables identified from the student and parent questionnaires through single-value imputation. Missing student ability estimates in mathematics (*theta*), the associated standard error of measurement (*sem*) for the theta, and socioeconomic status (SES) values derived from parent responses were replaced with five values using a multiple imputation procedure. Regardless of the method, indicator variables (flags) were created to allow users to easily identify the imputed values.

For further information on the HSLS:09 base year imputations, see the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328) available on the HSLS:09 page of the NCES website: nces.ed.gov/surveys/hsls09.

A.7 Disclosure Risk Analysis and Protections

The disclosure treatment methods used to produce the HSLS:09 base-year data files include variable recoding, suppressing, and swapping. Some variables that had values with extremely low frequencies were recoded to ensure that the recoded values occurred with a reasonable frequency. Other variables were recoded from continuous to categorical values. Thus, rare events or characteristics have been masked for certain variables.

Other variables were classified as high risk and were suppressed from the public-use file. The suppressing techniques included removing the response from the file (i.e., reset to a "suppressed" reserve code) or removing records entirely from the public-use file (e.g., student nonrespondents).

A.8 Statistical Procedures in This Report

Estimates in this report were generated using BRR weights**.** Estimates in this report were computed with the student weight (W1STUDENT) for all variables except parent highest education, which was computed using the parent weight (W1PARENT).

Comparisons that appear in the selected findings have been tested for statistical significance (set at a probability of .05) to ensure that the differences are larger than those that might be expected because of sampling variation. The conclusions stated in this report are supported by a two-tailed test of statistical significance, specifically, a *t* test. Whether the statistical test is considered significant 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. The alpha level is an *a priori* statement of the probability that a difference exists in fact rather than by chance.

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

$$t = \frac{x_1 - x_2}{\sqrt{\left(SE_1^2 + SE_2^2\right)}}$$

where x_1 and x_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. This formula is valid only for independent estimates.

A.9 Survey Standard Errors in This Report

Because the HSLS:09 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 if they had been based on data from a simple random sample of the same size.

Calculating exact standard errors for survey estimates can be difficult. Several procedures are available for calculating precise estimates of sampling errors for complex samples. Procedures such as Taylor Series approximations, BRR, and Jackknife Repeated Replication, which can be found in advanced statistical programs such as SUDAAN, AM, or WESVAR, produce similar results. The HSLS:09 analyses included in this report used the BRR procedure to calculate standard errors.

A.10 Definitions of Analysis Variables

This section describes the variables used in each of the tables of this report. These variables were used in conjunction with the student weight, except for highest parent education, which utilized the parent weight. The first sub-section (A10.1) contains most of the student, family, and school variables (row variables) used throughout the tables (and summarized in table 1). The second sub-section describes the mathematics achievement measures (used as column variables for tables), and the third section describes coursetaking variables and variables concerning postsecondary options. To see the survey instruments (questionnaires) and obtain specific item and response option wording, researchers can consult http://www.nces.ed.gov/surveys/hsls09/index.asp. Versions of the questionnaires with routing logic and flow charts representing how respondents were assigned questions can be found in appendix A of the *HSLS:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328). For more information on the mathematics assessment development and scoring, see chapter 2 of the DFD. For more information about the construction of the socioeconomic status index, see chapter 7 and appendix J of the DFD.

A.10.1 Student Background Characteristics

Sex (X1SEX)

Sex of the sample member is taken from the base-year student questionnaire; if missing, it is supplemented by the parent questionnaire or school-provided sampling roster. If the sex indicated by any of these three sources was inconsistent, X1SEX was coded based on review of student name records.

Race/Ethnicity (X1RACE)

A composite rendering of the racial and ethnic group to which a student belongs, based on separate questions about race and Hispanic ethnicity. The categories of X1RACE were collapsed into non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic Asian, and all other non-Hispanic races (including non-Hispanic American Indian or Alaska Native, non-Hispanic Native Hawaiian or other Pacific Islander, and those who selected two or more races). Race/ethnicity is based on data from the student questionnaire, if available; if not available from the student questionnaire, it is based on, in order of preference, data from the school-provided sampling roster or data from the parent questionnaire.

Parents' Highest Education (X1PAREDU)

Indicates the highest level of education achieved by either parent living in the sample member's home, based on the base-year parent questionnaire. The top three categories ("Master's degree," "Educational Specialist diploma," and "Ph.D./M.D./Law/other high-level professional degree") of the composite variable X1PAREDU were recoded into a single category ("Master's degree or higher") for this report. The variable X1PAREDU is constructed from two composite variables (X1PAR1EDU and X1PAR2EDU).

Socioeconomic Status Quintile (X1SESQ5)

Socioeconomic status (SES) is a measure of the family's relative position in society. The continuous SES index score is based on five components: education of each parent or guardian or education of the single parent/guardian, where applicable (X1PAR1EDU, X1PAR2EDU); the occupational prestige score of each parent or guardian or the prestige score of the single parent/guardian, where applicable (as determined from occupation codes X1PAR1OCC6 and X1PAR2OCC6); and family income (X1FAMINCOME). In this report, SES is reported in quintiles (fifths) of an SES index score (the index is a continuous measure, that is also available for analytic use). The quintile measure divides the weighted (population estimated) SES distribution into five equal groups. Quintile 1 corresponds to the lowest one-fifth of the population, quintile 5 the highest. To determine the quintile cut-points, the weighted distribution of the SES index score was divided at the 20th, 40th, 60th, and 80th percentiles. For this report, the middle three quintiles were combined to form one category.

All SES components derive from the base-year parent questionnaire. The derived variables X1PAR1EDU and X1PAR2EDU indicate the highest level of education achieved by each parent. The categorical variable X1FAMINCOME indicates the sample member's family income from all sources in 2009. Parent occupational prestige scores were coded from the parents' current or most recent occupation (X1PAR1OCC6, X1PAR2OCC6).

Estimates for each of the five SES components are calculated using the parent responses, the parent analysis weights (W1PARENT), and software that accounts for the complex sample design of the HSLS:09. With these estimates, a standardized survey-based z-score is calculated. The SES composite variable is then calculated for each student as the simple average of these weighted and design-adjusted z-scores.

Ninth-Graders' Educational Expectations (X1STUEDEXPCT)

Indicates the highest level of education the sample member expects to achieve, based on student reports from the base-year student questionnaire. The composite variable X1STUEDEXPCT was recoded for this report in the following manner: "High school or less" combines "Less than high school" and "High school diploma or GED"; "Some college" combines "Start an Associate's degree," "Complete an Associate's degree," and "Start a Bachelor's degree"; "College graduation" combines "Complete a Bachelor's degree" and "Start a Master's degree"; and "Graduate/professional degree" combines "Complete a Master's degree," "Start Ph.D./M.D./Law/other professional degree," and "Complete Ph.D./M.D./Law/other professional degree." "Don't know" responses remain in their own category.

School Sector (X1CONTROL)

The X1CONTROL categorical variable identifies the student's base-year school as being public or private, as indicated in the source data for sampling: the Common Core of Data (CCD) 2007–2008 and the Private School Survey (PSS) 2007–2008.

A.10.2 Mathematics Achievement

Mathematics Assessment Score

The HSLS:09 base-year mathematics assessment provides a measure of student achievement in algebra for a cohort of ninth-graders. The six domains of algebraic content and four algebraic processes covered by the assessment are described in section A.2 of this appendix.

The assessment was administered by computer using a two-stage design. In the first stage, each student took a common 15-item Stage 1 router test. On the basis of Stage 1 performance, each student was routed to a low, moderate, or high level of difficulty Stage 2 test, each consisting of 25 items. Even though the item pool consisted of 72 items, students were only aware that they were taking a 40-item test. For linking purposes, 12 items were common to both the high and moderate Stage 2 tests and 5 items were common to both the low and moderate Stage 2 tests. The computer program included an online scientific calculator and allowed students to skip and return to items within each stage and to identify items for review within each stage before submitting their answers as finished.

The scores used to describe students' performance on the mathematics assessment are based on Item Response Theory (IRT). The IRT model uses patterns of correct, incorrect, and omitted responses to obtain ability estimates that are comparable across the low-, moderate-, and high-difficulty test forms. Specifically, the IRT three-parameter logistic (3PL) model was used to calibrate the test items and estimate a student's ability. The 3PL model is a mathematical model for estimating the probability that a person will respond correctly to an item. This probability is given as a function of one parameter characterizing the proficiency of a given student and three parameters characterizing the properties of a given item—the item's difficulty, discriminating ability, and a guessing factor. The IRT model accounts for the three characteristics of each test question in estimating a student's ability.

Scores on the HSLS:09 mathematics assessment are represented in three ways in this report: as membership in one of five quintiles based on the weighted distribution of all scores; as an estimated-number correct score; and as a probability of proficiency in five discrete levels of algebraic content.

Quintiles

The mathematics quintile membership is a norm-referenced measure of achievement. The quintile measure divides the weighted (population estimate) achievement distributions into five equal groups based on the mathematics standardized scores (see next paragraph). Quintile 1 corresponds to the lowest achieving one-fifth of the population, quintile 5 the highest. To determine the quintile cut-points, the weighted distribution of the standardized scores was divided at the 20th, 40th, 60th, and 80th percentiles.

Cut-points were matched to unrounded standardized scores. For this report, the middle three quintiles were combined to form one category.

Proficiency Levels

The mathematics proficiency probability scores are criterion-referenced and are based on clusters of items that mark five levels on the mathematics scale developed in HSLS: 09. The levels are hierarchical in the sense that mastery of a higher level typically implies proficiency at the lower levels. The HSLS:09 proficiency probabilities were computed using IRT-estimated item parameters, with clusters of four items marking mathematics proficiency at each level. The five levels are the following:

- Level 1: algebraic expressions. Students able to answer questions like these have an understanding of algebraic basics including evaluating simple algebraic expressions and translating between verbal and symbolic representations of expressions.
- Level 2: multiplicative and proportional thinking. Students able to answer questions like these have an understanding of proportions and multiplicative situations and can solve proportional situation word problems, find the percent of a number, and identify equivalent algebraic expressions for multiplicative situations.
- Level 3: algebraic equivalents. Students able to answer questions like these have an understanding of algebraic equivalents and can link equivalent tabular and symbolic representations of linear equations, identify equivalent lines, and find the sum of variable expressions.
- Level 4: systems of equations. Students able to answer questions like these have an understanding of systems of linear equations and can solve such systems algebraically and graphically and characterize the lines (parallel, intersecting, collinear) represented by a system of linear equations.
- Level 5: linear functions. Students able to answer questions like these have an understanding of linear functions and can find and use slopes and intercepts of lines, and use functional notation.

Although clusters of four items anchor each mastery level, the probability of proficiency is a continuous score that does not depend on a student answering the actual items in each of the clusters but rather on the probability of a correct answer on these items given the overall pattern of response on the items completed.

Estimated-Number Correct

The mathematics IRT-estimated number-correct score is a criterion-referenced measure of achievement. The criterion is the set of skills defined by the HSLS: 2009 framework and represented by the 72 items in the HSLS: 2009 mathematics item pool. The estimated number-correct score for mathematics indicates the number of items students would have answered correctly had they responded to all 72 items in the item pool. The ability estimates and item parameters derived from the IRT model can be used to calculate each student's probability of a correct answer for each of the items in the pool.

A.10.3 Ninth-Grade Coursetaking and Opinions

Mathematics Course Enrollment

This variable is based on a follow-up question to the student question, "Are you currently taking a math course this fall? [Were you taking a math course in the fall of 2009?]" (S1MFALL09). For students that indicated yes, a follow-up question asked, "What math course(s) are you currently taking this fall? [What math course(s) were you taking in the fall (2009)?]" (the bracketed versions were asked if the student

interview was conducted after late December 2009).The responses to this question are coded as a series of separate variables. Note that students could respond affirmatively to more than one course. This report coded a student under "no mathematics" if he or she answered "no" to the first question. Students responding to either geometry or analytical geometry were coded as "geometry." In addition, the following courses were all coded as "other" because of small numbers of students responding to each one: Trigonometry, Integrated Mathematics I, Integrated Mathematics II, Statistics or Probability, other advanced mathematics course such as Precalculus or Calculus, and other mathematics course. "Basic mathematics" contains Review or Remedial Mathematics including Basic, Business, Consumer, Functional or General Mathematics.

Science Course Enrollment

This variable is based on a follow-up question to the student question, "Are you currently taking a science course this fall? [Were you taking a science course in the fall of 2009?]" (S1SFALL09). For students who indicated yes, a follow-up question asked, "What science course(s) are you currently taking this fall? [What science course(s) were you taking in the fall (2009)?]" (the bracketed versions were asked if the student interview was conducted after late December 2009). The responses to this question are coded as a series of separate variables. Note that students could respond affirmatively to more than one course. This report coded a student under "no science" if he or she answered "no" to the first question. Other responses were combined as follows: Biology I, Advanced Biology (biology II, AP, or IB), Life Science, Anatomy or Physiology, and other biological sciences were combined as "Biology"; Earth Science, Environmental Science, and other earth or environmental science were combined as "Earth Science"; Physical Science, Physics I, Advanced Physics (physics II, AP, or IB), and other physical science were combined as "Physical Science"; Chemistry I and Advanced Chemistry (chemistry II, AP, or IB) were combined as "Chemistry"; and all other science course selections were combined as "other."

Ninth-Graders' Educational Expectations (X1STUEDEXPCT)

Indicates the highest level of education the sample member expects to achieve, based on student reports from the base-year student questionnaire. The composite variable X1STUEDEXPCT was recoded for this report in the following manner: "High school or less" combines "Less than high school" and "High school diploma or GED"; "Some college" combines "Start an Associate's degree," "Complete an Associate's degree," and "Start a Bachelor's degree"; "College graduation" combines "Complete a Bachelor's degree" and "Start a Master's degree"; and "Graduate/professional degree" combines "Complete a Master's degree," "Start Ph.D./M.D./Law/other professional degree," and "Complete Ph.D./M.D./Law/other professional degree." "Don't know" responses remain in their own category.

Belief in Ability to Complete College (S1ABILITYBA)

This variable is based on the student question, "Whatever your plans, do you think you have the ability to complete a Bachelor's degree?" Response options were definitely not, probably not, probably, and definitely.

Have Thought About Future Occupation (S1OCC30THINK)

This variable is based on a follow-up question to the student question, "As things stand now, what is the job or occupation that you expect or plan to have at age 30?" The follow-up asks "How much have you thought about this choice? Have you thought about it…," with response options being not at all, a little, somewhat, or a lot. The legitimate skips for the follow-up question (28.7 percent of the sample) are coded "Did not identify an occupation at age 30" in the prior question. Thus the "Did not identify an occupation at age 30" group and the four "How much thought given to occupation" groups sum to 100 percent of the sample.

Appendix B
Standard Error Tables

Table B-1. Standard errors for percentage distribution of ninth-graders, by student, family, and school characteristics: 2009

Characteristic	Standard error
Total	†
Sex	
Male	0.69
Female	0.69
Race/ethnicity[1]	
White, non-Hispanic	1.24
Black, non-Hispanic	0.92
Hispanic	0.96
Asian, non-Hispanic	0.34
All other races, non-Hispanic	0.40
Parents' highest education	
Less than high school	0.56
High school diploma or GED	0.92
Associate's degree	0.52
Bachelor's degree	0.71
Master's degree or higher	0.53
Socioeconomic status	
Lowest fifth	0.81
Middle three-fifths	0.58
Highest fifth	0.74
Mathematics achievement by quintile rank	
Lowest fifth	0.74
Middle three-fifths	0.64
Highest fifth	0.77
Ninth-graders' educational expectations	
High school or less	0.51
Some college	0.31
College graduation	0.49
Graduate/professional degree	0.58
Don't know	0.41
School sector	
Public	0.02
Private	0.02

† Not applicable.

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

† Not applicable.

NOTE: Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Restricted-Use File (NCES 2011-333).

Table B-2. Mathematics test distribution: Standard errors for percentage distribution (quintiles) of algebra achievement among fall ninth-graders, by student, family, and school characteristics: 2009

	Quintiles				
Characteristic	Bottom	Second	Third	Fourth	Top
Total	0.74	0.77	0.47	0.52	0.77
Sex					
Male	0.88	0.77	0.63	0.67	0.86
Female	0.89	1.20	0.69	0.77	0.95
Race/ethnicity[1]					
White, non-Hispanic	0.57	0.66	0.51	0.54	0.77
Black, non-Hispanic	1.99	2.17	1.37	1.42	1.10
Hispanic	1.57	1.16	1.29	1.10	1.01
Asian, non-Hispanic	0.96	2.27	1.68	1.99	3.69
All other races, non-Hispanic	2.19	1.83	1.38	1.47	1.39
Parents' highest education					
Less than high school	2.66	2.35	2.45	1.90	1.19
High school diploma or GED	1.16	1.25	0.82	0.86	0.89
Associate's degree	1.46	1.99	1.33	1.19	1.16
Bachelor's degree	0.85	0.84	0.88	1.20	1.11
Master's degree or higher	0.64	1.10	0.84	1.24	1.48
Socioeconomic status					
Lowest fifth	1.64	1.56	1.24	0.98	0.74
Middle three-fifths	0.77	0.79	0.58	0.66	0.72
Highest fifth	0.46	0.77	0.65	1.00	1.14
Ninth-graders' educational expectations					
High school or less	1.82	1.60	1.43	0.84	0.85
Some college	1.97	1.55	2.14	1.43	1.06
College graduation	0.94	1.12	0.99	1.25	1.25
Graduate/professional degree	0.80	1.15	0.61	0.77	1.24
Don't know	1.20	1.00	0.97	0.93	0.98
School sector					
Public	0.79	0.81	0.51	0.54	0.82
Private	1.00	1.11	1.20	1.26	1.92

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table B-3. Mathematics proficiency: Standard errors for percentage of ninth-graders proficient in specific algebra knowledge and skills, by student, family, and school characteristics: 2009

	Level				
Characteristic	1—Algebraic expressions	2—Multiplicative and proportional thinking	3—Algebraic equivalents	4—Systems of equations	5—Linear functions
Total	0.57	0.85	0.83	0.50	0.21
Sex					
Male	0.68	0.90	0.89	0.54	0.24
Female	0.60	1.14	1.13	0.61	0.24
Race/ethnicity[1]					
White, non-Hispanic	0.43	0.70	0.76	0.51	0.23
Black, non-Hispanic	1.58	1.86	1.59	0.65	0.21
Hispanic	1.17	1.35	1.15	0.59	0.21
Asian, non-Hispanic	0.83	1.73	2.62	2.62	1.39
All other races, non-Hispanic	1.48	1.83	1.68	0.91	0.38
Parents' highest education					
Less than high school	1.71	1.91	1.56	0.66	0.18
High school diploma or GED	0.86	1.05	0.95	0.50	0.23
Associate's degree	0.78	1.19	1.11	0.64	0.25
Bachelor's degree	0.53	0.88	0.94	0.70	0.35
Master's degree or higher	0.48	0.84	1.02	0.98	0.56
Socioeconomic status					
Lowest fifth	1.29	1.18	0.90	0.39	0.10
Middle three-fifths	0.54	0.82	0.78	0.42	0.17
Highest fifth	0.30	0.59	0.75	0.79	0.45
Ninth-graders' educational expectations					
High school or less	1.40	1.13	0.82	0.38	0.09
Some college	1.47	1.62	1.25	0.52	0.17
College graduation	0.72	1.02	1.07	0.68	0.25
Graduate/professional degree	0.54	1.04	1.19	0.80	0.37
Don't know	0.83	1.11	0.99	0.61	0.28
School sector					
Public	0.61	0.90	0.88	0.53	0.22
Private	0.78	1.50	1.75	1.32	0.54

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Proficiency Levels. Level 1—algebraic expressions: understanding of algebraic basics including evaluating simple algebraic expressions and translating between verbal and symbolic representation of expressions. Level 2, multiplicative and proportional thinking: understanding of proportions and multiplicative situations; can solve proportional situation word problems, find the percent of a number, and identify equivalent algebraic expressions for multiplicative situations. Level 3—algebraic equivalents: can link equivalent tabular and symbolic representations of linear equations, identify equivalent lines and find the sum of variable expressions. Level 4—systems of equations: demonstrates an understanding of systems of linear equations and can solve such systems algebraically and graphically and characterize the lines (parallel, intersecting, collinear) represented by a system of linear equations. Level 5—linear functions: demonstrates an understanding of linear functions and ability to find and use slopes and intercepts of lines, and use functional notation. Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table B-4. State mathematics performance: Standard errors for percentage of algebra achievement (quintiles), percentage of ninth-graders proficient in specific algebra knowledge and skills, and mean algebra assessment estimated number right scores among public school ninth-graders in states with representative data: 2009

	Percentage of algebra achievement (quintiles)				
4.a. Reporting state	Bottom	Second	Third	Fourth	Top
National (public schools only)	0.79	0.81	0.51	0.54	0.82
California	2.66	2.06	1.49	1.67	3.20
Florida	3.10	2.65	1.94	2.26	3.26
Georgia	2.30	1.50	1.96	2.52	2.62
Michigan	2.14	1.72	1.71	1.87	2.64
North Carolina	2.17	1.82	1.19	1.69	3.37
Ohio	5.02	2.19	2.15	2.47	2.89
Pennsylvania	2.79	2.77	1.34	2.87	2.48
Tennessee	2.52	2.17	1.55	1.80	1.61
Texas	2.83	1.18	1.95	1.97	1.82
Washington	2.31	1.98	1.68	1.80	3.02
	Percentage of ninth-graders proficient in specific algebra knowledge and skills				
4.b. Reporting state	1	2	3	4	5
National (public schools only)	0.61	0.90	0.88	0.53	0.22
California	1.79	2.85	3.07	2.04	0.87
Florida	2.39	3.61	3.65	2.34	1.24
Georgia	1.82	2.55	2.54	1.52	0.52
Michigan	1.48	2.54	2.70	1.66	0.64
North Carolina	1.58	2.75	2.96	2.19	1.00
Ohio	3.34	4.71	4.22	2.06	0.82
Pennsylvania	1.91	3.52	3.38	1.75	0.71
Tennessee	1.91	2.36	2.00	1.04	0.46
Texas	2.19	2.73	2.42	1.37	0.58
Washington	1.64	2.66	2.91	2.26	1.12
4.c. Reporting state	Mean algebra assessment estimated number right scores				
National (public schools only)			0.31		
California			1.03		
Florida			1.29		
Georgia			0.86		
Michigan			0.89		
North Carolina			1.04		
Ohio			1.56		
Pennsylvania			1.11		
Tennessee			0.76		
Texas			0.92		
Washington			1.04		

NOTE: Proficiency Levels. Level 1—algebraic expressions: understanding of algebraic basics including evaluating simple algebraic expressions and translating between verbal and symbolic representation of expressions. Level 2, multiplicative and proportional thinking: understanding of proportions and multiplicative situations; can solve proportional situation word problems, find the percent of a number, and identify equivalent algebraic expressions for multiplicative situations. Level 3—algebraic equivalents: can link equivalent tabular and symbolic representations of linear equations, identify equivalent lines and find the sum of variable expressions. Level 4—systems of equations: demonstrates an understanding of systems of linear equations and can solve such systems algebraically and graphically and characterize the lines (parallel, intersecting, collinear) represented by a system of linear equations. Level 5—linear functions: demonstrates an understanding of linear functions and ability to find and use slopes and intercepts of lines, and use functional notation. Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Restricted-Use File (NCES 2011-333).

Table B-5. Mathematics enrollment: Standard errors for percentage of all ninth-graders in various mathematics courses, by student, family, and school characteristics: 2009

Characteristic	No mathe-matics	Basic mathe-matics[1]	Pre-algebra	Algebra 1	Geometry	Algebra 2	Other[2]
Total	0.60	0.11	0.41	1.12	0.91	0.46	0.48
Sex							
Male	0.66	0.12	0.52	1.14	0.94	0.50	0.56
Female	0.70	0.15	0.43	1.36	1.13	0.56	0.54
Race/ethnicity[3]							
White, non-Hispanic	0.66	0.16	0.38	1.00	1.03	0.59	0.64
Black, non-Hispanic	1.54	0.42	1.01	2.45	1.52	1.04	1.11
Hispanic	1.29	0.16	0.93	2.25	1.55	0.67	0.71
Asian, non-Hispanic	1.33	†	1.52	2.49	2.54	1.63	1.99
All other races, non-Hispanic	1.17	0.22	0.98	2.03	1.46	0.68	1.21
Parents' highest education							
Less than high school	1.95	0.53	1.13	2.88	3.56	0.89	1.62
High school diploma or GED	0.99	0.23	0.62	1.38	0.99	0.45	0.73
Associate's degree	1.01	0.27	1.09	1.87	1.37	0.59	0.91
Bachelor's degree	0.82	0.14	0.46	1.32	1.16	0.81	0.80
Master's degree or higher	0.83	0.06	0.30	1.76	1.79	1.05	0.99
Socioeconomic status							
Lowest fifth	1.34	0.32	0.79	2.34	1.57	0.59	0.88
Middle three-fifths	0.65	0.13	0.52	1.13	0.87	0.43	0.54
Highest fifth	0.68	0.07	0.32	1.48	1.50	1.01	0.93
Ninth-graders' educational expectations							
High school or less	1.25	0.24	1.03	2.25	1.02	0.59	1.11
Some college	1.63	0.29	1.27	2.65	1.88	0.75	1.07
College graduation	0.94	0.27	0.55	1.64	1.33	0.70	0.76
Graduate/professional degree	0.73	0.11	0.41	1.36	1.23	0.69	0.64
Don't know	0.79	0.23	0.59	1.36	1.24	0.54	0.73
Mathematics achievement by quintile rank							
Lowest fifth	1.36	0.33	0.86	1.68	0.84	0.57	1.06
Middle three-fifths	0.63	0.13	0.48	1.36	0.95	0.44	0.51
Highest fifth	0.57	0.06	0.11	1.31	1.53	1.17	0.83
School sector							
Public	0.65	0.12	0.45	1.16	0.94	0.47	0.49
Private	0.61	0.13	1.00	2.71	2.57	1.51	2.03

[1] "Basic mathematics" contains Review or Remedial mathematics including Basic, Business, Consumer, Functional, or General mathematics.

[2] "Other mathematics" contains extremely low-incidence subjects including trigonometry, integrated mathematics, statistics or probability, and advanced mathematics courses such as precalculus and calculus.

[3] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

† Estimate connected with standard error rounds to zero.

NOTE: Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table B-6. Science enrollment: Standard errors for percentage of all ninth-graders in various science courses, by student, family, and school characteristics: 2009

Characteristic	None	Biology	Earth science	Physical sciences	Chemistry	Other science[1]
Total	1.14	1.63	1.15	1.54	0.56	0.94
Sex						
Male	1.18	1.55	1.14	1.51	0.48	0.95
Female	1.29	1.93	1.26	1.69	0.68	1.09
Race/ethnicity[2]						
White, non-Hispanic	1.14	1.63	1.47	1.89	0.42	0.90
Black, non-Hispanic	2.41	2.80	1.35	2.82	1.02	1.39
Hispanic	2.27	2.62	1.62	1.77	1.15	1.54
Asian, non-Hispanic	2.18	4.90	1.73	4.40	1.25	2.85
All other races, non-Hispanic	1.78	3.02	1.93	1.94	0.42	1.94
Parents' highest education						
Less than high school	2.78	3.38	1.63	1.96	0.32	1.79
High school diploma or GED	1.61	2.14	1.32	2.02	0.57	1.18
Associate's degree	1.38	2.25	1.68	2.06	0.67	2.27
Bachelor's degree	1.24	1.95	1.52	1.90	0.92	1.12
Master's degree or higher	1.36	2.39	1.67	1.90	1.41	1.32
Socioeconomic status						
Lowest fifth	2.10	2.37	1.36	2.43	0.67	1.23
Middle three-fifths	1.18	1.71	1.23	1.56	0.43	1.15
Highest fifth	1.16	2.11	1.53	1.87	1.18	1.06
Ninth-graders' educational expectations						
High school or less	1.75	1.89	1.72	1.70	0.76	1.88
Some college	2.41	2.55	2.24	2.08	0.43	0.99
College graduation	1.74	2.00	1.33	1.68	0.56	1.22
Graduate/professional degree	1.22	1.88	1.16	1.80	0.92	0.99
Don't know	1.44	1.89	1.43	1.95	0.61	1.20
School sector						
Public	1.22	1.71	1.25	1.60	0.58	0.97
Private	1.57	4.62	1.94	3.60	2.01	2.60

[1] For example, General Science, Integrated Science, Principles of Technology.

[2] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Restricted-Use File (NCES 2011-333).

Table B-7. Educational expectations: Standard errors for percentage distribution of ninth-graders' educational attainment expectations, by student, family, and school characteristics: 2009

Characteristic	High school or less	Some college	College graduation	Graduate/ professional degree	Don't know
Total	0.51	0.31	0.49	0.59	0.41
Sex					
Male	0.66	0.47	0.65	0.80	0.63
Female	0.67	0.40	0.67	0.79	0.62
Race/ethnicity[1]					
White, non-Hispanic	0.45	0.36	0.51	0.71	0.57
Black, non-Hispanic	1.24	0.96	1.40	2.07	1.61
Hispanic	1.30	0.75	1.13	1.37	1.10
Asian, non-Hispanic	1.12	1.73	1.67	2.97	1.75
All other races, non-Hispanic	1.76	1.43	1.21	1.67	1.37
Parents' highest education					
Less than high school	2.33	1.41	2.28	2.32	2.12
High school diploma or GED	0.69	0.67	0.91	1.03	0.81
Associate's Degree	1.84	0.79	1.09	1.78	1.27
Bachelor's degree	0.66	0.55	1.13	1.38	1.03
Master's degree or higher	0.52	0.41	1.06	1.63	1.14
Socioeconomic status					
Lowest fifth	1.25	0.79	1.10	1.28	0.95
Middle three-fifths	0.52	0.40	0.57	0.66	0.60
Highest fifth	0.40	0.37	0.82	1.06	0.81
Mathematics achievement by quintile rank					
Lowest fifth	1.20	0.78	0.90	1.12	1.12
Middle three-fifths	0.58	0.39	0.61	0.72	0.58
Highest fifth	0.66	0.40	1.04	1.24	0.88
School sector					
Public	0.54	0.33	0.53	0.62	0.44
Private	0.71	0.54	1.20	1.56	0.95

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table B-8. Belief in ability: Standard errors for percentage distribution of ninth-graders' belief in ability to complete college, by student, family, and school characteristics: 2009

Characteristic	Definitely not	Probably not	Probably	Definitely
Total	0.13	0.33	0.60	0.69
Sex				
Male	0.24	0.48	0.73	0.89
Female	0.14	0.45	0.87	0.77
Race/ethnicity[1]				
White, non-Hispanic	0.16	0.38	0.59	0.73
Black, non-Hispanic	0.40	0.67	1.63	1.79
Hispanic	0.40	0.88	1.71	1.78
Asian, non-Hispanic	0.46	0.78	2.33	2.55
All other races, non-Hispanic	0.56	1.43	2.01	1.77
Parents' highest education				
Less than high school	1.00	1.77	3.07	2.73
High school diploma or GED	0.25	0.65	0.95	0.95
Associate's degree	0.39	1.06	1.79	1.89
Bachelor's degree	0.15	0.57	1.42	1.39
Master's degree or higher	0.18	0.32	1.39	1.43
Socioeconomic status				
Lowest fifth	0.46	1.05	1.54	1.61
Middle three-fifths	0.18	0.38	0.76	0.75
Highest fifth	0.11	0.26	0.99	1.02
Ninth-graders' educational expectations				
High school or less	0.63	1.11	1.36	1.06
Some college	0.46	1.38	1.86	1.62
College graduation	0.06	0.32	1.27	1.34
Graduate/professional degree	0.08	0.16	0.77	0.81
Don't know	0.38	0.95	1.29	1.30
Mathematics achievement by quintile rank				
Lowest fifth	0.54	0.90	1.36	1.39
Middle three-fifths	0.15	0.38	0.75	0.79
Highest fifth	0.12	0.29	1.14	1.23
School sector				
Public	0.14	0.34	0.65	0.74
Private	0.29	0.53	1.18	1.43

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

NOTE: Standard errors are for estimates weighted by W1STUDENT, except for Parents' highest education, which is weighted by W1PARENT. Estimates reflect those students who were eligible and capable for the student survey and assessment. GED represents General Educational Development, an alternate path to attaining a high school credential. Socioeconomic status (SES) is a measure of a family's relative social position. Further details are provided in appendix section A.10.1.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public-Use File (NCES 2011-334).

Table B-9. Occupational expectations: Standard errors for percentage distribution of ninth-graders who have thought about their future occupation, by student, family, and school characteristics: 2009

Characteristic	How much thought give to identified occupation				Did not identify an occupation at age 30
	A lot	Somewhat	A little	Not at all	
Total	0.62	0.43	0.31	0.07	0.77
Sex					
Male	0.76	0.71	0.40	0.11	0.86
Female	0.88	0.63	0.42	0.08	0.89
Race/ethnicity[1]					
White, non-Hispanic	0.76	0.44	0.29	0.08	0.72
Black, non-Hispanic	2.07	1.20	0.89	0.32	2.03
Hispanic	1.79	1.34	0.88	0.14	1.89
Asian, non-Hispanic	2.50	1.80	1.48	0.40	2.92
All other races, non-Hispanic	1.86	1.79	0.87	0.17	1.72
Parents' highest education					
Less than high school	2.50	1.94	1.51	0.12	2.63
High school diploma or GED	1.08	0.88	0.49	0.16	1.20
Associate's degree	2.27	1.28	1.20	0.17	1.51
Bachelor's degree	1.30	0.87	0.65	0.09	1.32
Master's degree or higher	1.49	0.98	1.07	0.25	1.46
Socioeconomic status					
Lowest fifth	1.35	1.32	0.71	0.22	1.74
Middle three-fifths	0.80	0.50	0.36	0.09	0.79
Highest fifth	1.06	0.78	0.71	0.13	1.02
Ninth-graders' educational expectations					
High school or less	1.57	1.47	1.05	0.23	1.91
Some college	1.90	1.40	1.14	0.16	2.33
College graduation	1.50	0.88	0.53	0.08	1.32
Graduate/professional degree	0.98	0.68	0.34	0.10	0.78
Don't know	1.33	0.85	0.69	0.20	1.49
Mathematics achievement by quintile rank					
Lowest fifth	1.64	0.91	0.78	0.27	1.55
Middle three-fifths	0.84	0.56	0.50	0.07	0.94
Highest fifth	1.18	0.92	0.53	0.06	1.21
School sector					
Public	0.65	0.45	0.33	0.07	0.81
Private	1.34	1.03	0.58	0.18	1.23

[1] Black includes African American, Hispanic includes Latino, and All other races includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Two or more races.

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SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base-Year Public -Use File (NCES 2011-334).