

High School Longitudinal Study of 2009 (HSLs:09) First Follow-up:

A First Look at Fall 2009 Ninth-Graders in 2012



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Foreword

This First Look presents findings from the first follow-up (spring term 2012) of the High School Longitudinal Study of 2009 (HSLs:09), the second 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 with a cohort of high school seniors 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 first follow-up dataset, through the presentation of selected 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, base-year science and mathematics 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 and first follow-up data and the future datasets that will follow.

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Introduction

Focus of This Report

This report provides a first look at selected findings from the first follow-up of the High School Longitudinal Study of 2009 (HSLs:09). HSLs:09 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 fields of study and careers; and the educational and social experiences that are related to these shifts in plans or paths.

The core research questions for HSLs:09 are longitudinal in nature, and release of first follow-up data marks the stage where researchers can first employ longitudinal data. Students were first surveyed in 2009 as 9th-graders, and then again 2.5 years later, in 2012, when most cohort members were spring term 11th-graders. This report focuses both on status as of the first follow-up (for example, mathematics and science enrollment) and on change (for example, achievement gains in mathematics) between the base year and the first follow-up.

The purpose of this First Look report is to introduce new National Center for Education Statistics (NCES) HSLs:09 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 presented bivariate results. 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 small number 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 selected results of the mathematics assessment and student questionnaire, and examines them in terms of sex, race and ethnicity, socioeconomic status, and other student characteristics.

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 to First Follow-up Data File Documentation* (DFD) (Ingels et al. 2013, NCES 2014-361), available from the NCES website located at <http://nces.ed.gov/surveys/hsls09/>.

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 ninth-graders in schools with a 9th and an 11th grade in the fall of 2009. Students will be followed through their secondary and early postsecondary education and work years. The sampled schools encompass both public schools,

including charter schools, and private schools providing instruction in the 50 states and in 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 state-representative samples of public school students and schools in each of 10 states. More information about the sample design can be found in the technical notes (appendix A).

The first follow-up of HSLS:09 occurred in the spring of 2012 when most sample members were in the 11th grade. A between-round postsecondary status update survey is taking place in the summer/fall of 2013, high school transcripts will be collected and coded in the fall of 2013/spring of 2014, and a full second follow-up is planned for 2016, when most sample members will be 3 years beyond high school graduation. Additional follow-ups are planned, to at least age 30.

In both the base year and the first follow-up, students completed both a questionnaire and a two-stage adaptive mathematics assessment in algebraic reasoning and problem solving. 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. A norm-referenced approach 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 base-year or seven first follow-up hierarchical levels of performance.¹ 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 item response theory (IRT)-estimated number-correct score, which puts results on a scale of 0–118. This report presents assessment data in all three of these ways.

Although primarily student data are reported here, the HSLS:09 dataset includes important contextual data from other sources, including the school administrators, school counselors, science teachers, mathematics teachers, and parents of the students. Contextual data were gathered from each of these sources in the base year, and from school administrators, school counselors, and parents in the first follow-up.

¹ There are five hierarchical proficiency levels that have been provided both for the base year and the first follow-up (level 1 is understanding of algebraic expressions, level 2 is multiplicative and proportional thinking, level 3 is algebraic equivalents, level 4 is systems of equations, and level 5 is linear functions). Two additional proficiency levels—levels 6 and 7—have been provided only for the first follow-up. Level 6 (quadratic functions) and level 7 (log and exponential functions/geometric sequences) represent higher levels of proficiency that reflect mathematics content not normally taught to fall term 9th-graders but appropriate for some spring 11th-graders, as in the first follow-up.

Selected Findings

- The percentage of students uncertain about their educational expectations decreased as they progressed through high school—from 22 percent among ninth-graders to 11 percent two and a half years later. Over this time interval, the percentage of ninth-graders with “college graduation” expectations increased from 17 percent to 28 percent, while the percentage with “graduate/professional degree” expectations declined from 39 percent to 33 percent. (table 1)
- Ninety-three percent of ninth-graders in 2009 were in grade 11 in 2012. The percentage of ninth-graders in 2009 who were dropouts in the spring term of 2012 was 3 percent. Another 2 percent were in school but below grade 11 (indicating they had been retained) and a further 4 percent were in a grade higher than grade 11. (table 2)
- Of those enrolled in high school in spring 2012, 36 percent of students reported enrollment in algebra 2; 21 percent reported enrollment in pre-calculus or calculus. Eleven percent of students reported no math course enrollment. (table 3)
- Fifty-three percent of Asian students reported taking precalculus or calculus. This percentage was significantly higher than the next largest percentage, among White students (24 percent). Whites, in turn, had greater enrollment in precalculus or calculus (24 percent) than Blacks (12 percent) or Hispanics (16 percent). (table 3)
- Of those enrolled in high school in spring 2012, 35 percent of students were taking chemistry; 23 percent were enrolled in biology. Eighteen percent of students reported taking physics, and another 17 percent reported taking no science at all. (table 4)
- Of those students who reported they were college bound, students and their parents rated a variety of features as “very important” to their choice of a postsecondary institution: 74 percent of students and 79 percent of parents cited academic quality or reputation. Some 68 percent of students and 73 percent of parents cited cost of attendance as an important factor. A good record of placing graduates in jobs was cited by 73 percent of students and 76 percent of parents. (table 5)
- For the 2009 ninth-grade cohort in 2012, the highest educational attainment of either parent was master’s or higher for 15 percent, bachelor’s degree for 22 percent, an associate’s degree for 17 percent, high school or equivalent for 40 percent, and less than high school for 7 percent. (table 6)
- The activity students most often reported in terms of preparing for life after high school was “searched the Internet for college options or read college guides” (80 percent), followed by “talked with a high school counselor about options” (63 percent). (table 7)
- Mathematics proficiency probabilities are clusters of items representing common content and a common level of difficulty. The proficiency probability with the largest change (23 percentage points) between 2009 and 2012 was level 3, mastery of algebraic equivalents. Forty-one (41) percent of the cohort in 2009 were proficient at level 3, versus 64 percent in 2012. (table 8)
- At proficiency probability levels 4 and 5, students in the highest fifth of the socioeconomic status (SES) distribution demonstrated larger gains from 2009 to 2012 than other students. For example, at level 4, the highest fifth gained 19 percentage points, the middle three fifths 10 percentage points, and the lowest fifth 5 percentage points. At level 5, the highest fifth gained 23 percentage points, the middle three fifths 8 percentage points, and the lowest fifth 3 percentage points. (table 8)
- Black ninth-graders had their largest gains at the three lowest levels of mathematics proficiency (level 1, algebraic expressions; level 2, multiplicative and proportional thinking; and level 3,

algebraic equivalents). At level 1, between 2009 and 2012 Blacks gained 13 percentage points while Whites gained 4; at level 2, Blacks gained 21 percentage points and Whites 14. (table 8)

- Asian students had higher proficiency at levels 2 through 7 than students in other race/ethnicity groups. For example, 45 percent of Asians were at level 5 in 2012 versus 23 percent of Whites. (table 8)
- For the 10 states with state-representative public school samples in the first follow-up, level 1 proficiency (understanding of algebraic expressions) ranged from 89 to 94 percent in 2012; level 3 proficiency (algebraic equivalents) ranged from 58 percent to 68 percent; level 5 proficiency (linear functions) ranged from 13 to 21 percent; and level 7 proficiency (log and exponential functions/geometric sequences) ranged from 1 to 3 percent. (table 9b)

Table 1. Student educational attainment expectations for fall 2009 ninth-graders, by student, family, and school characteristics: 2009 and 2012

Characteristic	High school or less ¹		Some college		College graduation		Graduate/ professional degree		Don't know	
	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012
Total	14.9	16.9	7.3	11.6	17.0	27.8	39.3	33.1	21.6	10.6
Sex										
Male	17.4	21.2	7.9	11.3	18.4	28.9	34.8	27.3	21.4	11.3
Female	12.3	12.6	6.6	11.9	15.6	26.6	43.8	39.0	21.7	9.9
Race/ethnicity ²										
White, non-Hispanic	12.2	14.9	7.3	11.2	19.3	30.9	40.2	33.3	21.0	9.7
Black, non-Hispanic	17.6	17.6	6.9	10.0	13.6	22.3	43.5	39.9	18.3	10.1
Hispanic	20.7	22.3	7.2	14.0	14.9	23.4	32.6	28.3	24.7	12.1
Asian, non-Hispanic	6.3	8.2	7.3	6.3	14.0	27.4	47.4	44.4	25.0	13.6
All other races, non-Hispanic	14.8	17.4	8.4	12.3	15.1	29.0	40.9	29.5	20.7	11.7
Parents' highest education (2012)										
Less than high school	29.8	30.9	9.1	15.6	12.8	18.9	21.9	18.3	26.4	16.4
High school diploma or GED	19.2	22.9	9.3	13.7	15.0	24.8	33.8	27.5	22.7	11.0
Associate's degree	14.5	15.2	7.8	14.0	17.9	29.8	37.3	29.0	22.5	12.0
Bachelor's degree	7.5	9.6	5.2	8.6	21.8	34.2	44.9	39.7	20.7	7.9
Master's degree or higher	6.7	6.2	3.4	5.4	16.5	28.4	57.4	51.0	16.0	9.0
Socioeconomic status (2012)										
Lowest fifth	24.2	26.5	9.6	13.4	13.2	21.9	29.0	24.2	24.0	14.0
Middle three fifths	15.1	17.5	7.8	13.1	17.1	28.4	38.0	30.7	22.0	10.3
Highest fifth	5.2	5.8	3.7	5.4	20.5	31.7	52.8	48.8	17.9	8.3

See notes at end of table.

Table 1. Student educational attainment expectations for fall 2009 ninth-graders, by student, family, and school characteristics: 2009 and 2012—Continued

Characteristic	High school or less ¹		Some college		College graduation		Graduate/ professional degree		Don't know	
	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012
Mathematics achievement by quintile rank (2012)										
Lowest fifth	27.1	35.5	9.2	14.0	12.4	17.3	25.4	19.8	26.0	13.5
Middle three fifths	14.6	15.4	8.0	12.8	17.4	30.5	38.0	30.2	22.0	11.0
Highest fifth	3.5	2.9	3.2	5.6	20.6	30.1	56.9	54.9	15.8	6.4
School sector (2009)										
Public	15.6	17.9	7.6	12.0	17.0	27.4	38.2	32.0	21.7	10.7
Private	5.4	4.5	4.0	6.9	17.7	32.1	53.4	47.4	19.5	9.1

¹This category combines "less than high school" and "high school diploma" responses. Separate categories were not reported because "less than high school" responses totaled 0.5 percent of the sample.

²Black 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: Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2W1STU. GED = General Educational Development, an alternate path to attaining a high school credential.

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 to First Follow-up Public-Use File (NCES 2014-358).

Table 2. Percentage of fall 2009 ninth-graders who were in school at various grade levels, graduated early, or were dropouts in the spring term of 2012, by student, family, and school characteristics: 2012

Characteristic	Percent in school, grade 11	Percent in school, lower than grade 11	Percent in school, higher than grade 11	Percent graduated early	Percent dropped out
Total	91.1	1.7	3.4	1.1	2.7
Sex					
Male	90.2	2.2	3.6	1.2	2.8
Female	92.0	1.2	3.2	1.0	2.7
Race/ethnicity ¹					
White, non-Hispanic	93.3	1.3	2.3	0.9	2.1
Black, non-Hispanic	86.8	1.5	6.1	1.3	4.3
Hispanic	87.8	3.1	4.2	1.3	3.6
Asian, non-Hispanic	97.7	0.7 !	1.2 !	0.1 !	0.3 !
All other races, non-Hispanic	90.2	1.2 !	4.3	1.5 !	2.8
Parents' highest education (2012)					
Less than high school	83.0	2.3	6.4	2.0 !	6.3
High school diploma or GED	88.5	2.5	3.8	1.4	3.7
Associate's degree	92.1	1.3	3.3	0.9	2.4
Bachelor's degree	94.5	1.0	2.7	0.6	1.2
Master's degree or higher	96.1	0.6	2.0	0.6	0.8
Socioeconomic status (2012)					
Lowest fifth	85.4	3.0	5.1	1.7 !	4.8
Middle three fifths	91.0	1.6	3.5	1.1	2.8
Highest fifth	97.0	0.7 !	1.3	0.4 !	0.6 !
Ninth-graders' educational expectations (2012)					
High school or less	80.1	5.2	4.7	1.4	8.7
Some college	89.2	1.1	4.4	2.6	2.6
College graduation	94.4	0.8	3.1	0.5	1.2
Graduate/professional degree	95.7	0.5	2.4	0.8	0.6
Don't know	88.1	2.5 !	4.0	1.4	4.0
Mathematics achievement by quintile rank (2012)					
Lowest fifth	79.2	4.0	6.3	2.3	8.3
Middle three fifths	92.7	1.4	3.3	1.0	1.7
Highest fifth	98.3	0.3 !	0.9	0.3 !	0.2 !
School sector (2009)					
Public	90.6	1.8	3.6	1.2	2.9
Private	97.9	0.6 !	1.1 !	0.2 !	0.2 !

! 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: Details may not sum to totals because of rounding. Students in ungraded programs are not included in the table. Early graduates include regular diploma recipients and General Educational Development (GED) completers (an alternative path to attaining a high school credential). A dropout is defined as a sample member who has stopped going to high school for a period of 4 consecutive weeks or more, other than for school breaks, illness, injury, or vacation. Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 3. Mathematics enrollment: Percentage of all fall 2009 ninth-graders in various spring term 2012 mathematics courses, by student, family, and school characteristics: 2012

Characteristic	No math	Basic math ^{1/} Pre-algebra	Algebra 1	Geometry	Algebra 2	Pre-calculus/ calculus	Other math ²
Total	11.1	5.2	6.4	16.2	35.9	21.0	19.3
Sex							
Male	11.2	5.5	6.4	17.5	34.8	20.2	18.9
Female	10.9	4.9	6.4	14.8	37.0	21.9	19.7
Race/ethnicity ³							
White, non-Hispanic	10.4	5.4	5.0	13.0	35.2	24.2	20.0
Black, non-Hispanic	15.2	5.5	7.8	18.9	39.7	11.9	23.4
Hispanic	10.8	4.6	8.8	23.1	35.3	15.5	16.4
Asian, non-Hispanic	5.7	2.6	4.0	8.7	25.1	53.0	18.6
All other races, non-Hispanic	11.6	6.0	7.8	16.6	40.3	16.0	16.3
Parents' highest education (2012)							
Less than high school	15.7	7.3	14.9	22.1	29.7	13.4	17.1
High school diploma or GED	13.7	6.2	7.4	19.8	37.2	13.4	17.3
Associate's degree	9.5	5.3	7.0	16.3	41.7	15.7	20.4
Bachelor's degree	8.5	3.7	4.0	12.3	34.7	29.3	20.8
Master's degree or higher	7.4	3.7	2.9	9.4	30.6	38.3	22.1
Socioeconomic status (2012)							
Lowest fifth	15.2	6.7	10.5	21.9	34.2	11.3	16.5
Middle three fifths	11.1	5.4	6.5	16.9	38.4	17.7	19.4
Highest fifth	7.2	3.3	2.4	8.8	30.2	39.6	21.6
Ninth-graders' educational expectations (2012)							
High school or less	16.3	8.5	14.2	27.5	30.8	5.6	15.1
Some college	13.4	8.4	9.1	20.9	41.1	7.7	16.5
College graduation	9.2	4.4	4.2	13.9	38.9	21.1	19.7
Graduate/professional degree	8.5	3.0	3.5	10.3	33.0	34.9	23.0
Don't know	13.7	5.8	7.2	18.8	39.0	14.3	15.9
Mathematics achievement by quintile rank (2012)							
Lowest fifth	17.0	10.7	14.0	25.4	32.0	5.0	16.6
Middle three fifths	11.3	4.7	6.0	17.7	41.6	13.3	18.8
Highest fifth	5.1	1.9	1.1	3.6	22.6	57.5	23.2
School sector (2009)							
Public	11.7	5.4	6.7	16.6	35.4	19.9	19.1
Private	3.4	3.1	2.8	10.7	41.7	35.1	21.5

¹ "Basic math" contains Review or Remedial math including Basic, Business, Consumer, Functional, or General math.

² "Other math" includes courses such as Algebra III, Trigonometry, Probability, Integrated Math, and International Baccalaureate Math.

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 math courses. Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT. GED = General Educational Development, an alternate path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 4. Science enrollment: Percentage of all fall 2009 ninth-graders in various spring term 2012 science courses, by student, family, and school characteristics: 2012

Characteristic	No science	Biology	Earth science	Physical sciences	Physics	Chemistry	Other science ¹
Total	18.1	23.4	10.0	3.8	17.8	34.6	11.4
Sex							
Male	18.5	21.3	11.1	4.1	18.1	32.8	14.7
Female	17.7	25.6	9.0	3.4	17.5	36.4	8.1
Race/ethnicity ²							
White, non-Hispanic	16.7	22.5	10.2	3.2	17.2	37.0	11.1
Black, non-Hispanic	21.6	22.6	10.3	5.9	15.9	33.7	11.0
Hispanic	20.0	24.9	9.3	4.0	20.8	28.4	12.2
Asian, non-Hispanic	8.1	28.3	6.1	2.1 !	28.7	44.0	10.8
All other races, non-Hispanic	20.5	24.6	12.6	4.0	12.1	32.9	11.8
Parents' highest education (2012)							
Less than high school	28.8	24.5	10.7	6.9	17.7	19.8	12.6
High school diploma or GED	20.3	25.4	10.9	4.4	13.8	33.7	12.3
Associate's degree	18.3	22.5	10.6	3.1	15.2	34.2	10.5
Bachelor's degree	14.5	21.7	8.8	3.3	21.2	38.2	10.7
Master's degree or higher	12.4	21.3	8.5	2.1	26.0	39.0	10.6
Socioeconomic status (2012)							
Lowest fifth	23.5	26.9	10.3	5.8	14.1	29.2	13.8
Middle three fifths	18.7	22.9	10.6	3.7	16.1	34.7	11.1
Highest fifth	11.4	21.7	8.2	2.1	25.8	39.1	10.1
Ninth-graders' educational expectations (2012)							
High school or less	28.5	26.1	14.3	5.0	8.1	23.3	10.3
Some college	23.8	21.6	12.8	5.1	12.6	30.7	12.9
College graduation	14.9	21.1	8.2	2.9	19.7	37.8	11.8
Graduate/professional degree	12.7	24.6	8.2	3.0	23.3	39.7	10.1
Don't know	22.0	23.7	11.2	5.3	15.2	30.9	14.4
Mathematics achievement by quintile rank (2012)							
Lowest fifth	29.7	25.1	14.2	6.8	10.7	24.1	12.4
Middle three fifths	18.3	23.7	10.0	3.7	14.7	35.6	10.8
Highest fifth	7.4	21.1	6.6	1.3	32.9	40.9	12.4
School sector (2009)							
Public	18.8	23.7	10.3	4.0	16.9	34.1	11.8
Private	8.9	20.1	7.3	1.5 !	28.2	40.3	7.0

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

¹ "Other science" includes courses such as General Science, Integrated Science, Principles of Technology, and Computer Science.

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. Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT. GED = General Educational Development, an alternate path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 5. Percentage of college-bound fall 2009 ninth-graders in spring term of 2012 and percentage of their parents rating various features of postsecondary institutions as “very important” to their choice of a college: 2012

Characteristic	Student	Parent
Academic quality or reputation	74.3	79.4
Cost of attendance	67.5	72.9
Close to home	26.3	32.3
Far away from home	12.2	12.9
A good record of placing graduates in jobs	73.0	76.3
A good record of placing graduates in graduate or professional schools	58.4	61.7
Opportunity to play sports	24.4	22.5
Recommended by family or friends	24.0	22.1
Offers a particular program of study	73.5	69.1
Good social life	52.5	34.0
Good sports teams or school spirit	32.7	24.1
Parents or a family member went there	9.1	11.8

NOTE: “College-bound” refers to students who expect to attend some college or attain a bachelor’s degree or higher credential. Estimates weighted by W2STUDENT and W2PARENT.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 6. Cohort characteristics: Percentage distribution of fall 2009 ninth-graders in spring term of 2012, by student, family, and school characteristics: 2012

Characteristic	Number of students (in thousands)	Percent of population
Total	4,155	100.0
Sex		
Male	2,093	50.4
Female	2,062	49.6
Race/ethnicity ¹		
White, non-Hispanic	2,158	51.9
Black, non-Hispanic	570	13.7
Hispanic	928	22.3
Asian, non-Hispanic	148	3.6
All other races, non-Hispanic	351	8.4
Parents' highest education (2012)		
Less than high school	303	7.3
High school diploma or GED	1,660	40.0
Associate's degree	690	16.6
Bachelor's degree	902	21.7
Master's degree or higher	601	14.5
Socioeconomic status (2012)		
Lowest fifth	820	19.7
Middle three fifths	2,502	60.2
Highest fifth	833	20.1
Mathematics achievement by quintile rank (2012)		
Lowest fifth	830	20.0
Middle three fifths	2,495	60.1
Highest fifth	830	20.0
Ninth-graders' educational expectations (2012)		
High school or less	717	17.3
Some college	480	11.6
College graduation	1,150	27.7
Graduate/professional degree	1,359	32.7
Don't know	449	10.8
School sector (2009)		
Public	3,858	92.8
Private	298	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: Details may not sum to totals because of rounding. Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT. GED = General Educational Development, an alternative path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 7. Percentage of fall 2009 ninth-graders who have participated in various activities to prepare for life after high school: 2012

Activity to prepare for life after high school	Percent participating
Searched the Internet for college options or read college guides	79.7
Talked with a high school counselor about options	63.0
Attended a program or taken a tour on college campus	50.1
Attended a career day or job fair	47.9
Took a course to prepare for a college admission exam, such as SAT or ACT	40.3
Volunteered in a job related to career goals	34.2
Sat in on or took a college class on campus	25.1
Did an internship or apprenticeship in a job related to career goals	16.8
Talked about options with a family-hired counselor	12.6

NOTE: Estimates weighted by W2STUDENT.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 8. Mathematics proficiency: Percentage of fall 2009 ninth-graders proficient in specific algebraic knowledge and skills, by student, family, and school characteristics: Fall 2009 and Spring 2012

Characteristic	Level 1			Level 2			Level 3			Level 4			Level 5			Level 6	Level 7
	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Spring 2012	Spring 2012
Total	85.7	92.4	6.7	58.8	74.7	15.9	40.9	63.9	23.0	18.0	28.6	10.6	9.1	19.0	10.0	5.3	2.3
Sex																	
Male	84.3	91.7	7.4	58.4	74.3	16.0	41.0	63.5	22.5	18.4	29.1	10.7	9.3	19.9	10.6	5.9	2.6
Female	87.0	93.0	6.1	59.3	75.1	15.8	40.9	64.2	23.4	17.7	28.2	10.5	8.8	18.1	9.3	4.7	2.0
Race/ethnicity ¹																	
White, non-Hispanic	89.7	94.0	4.4	65.6	79.5	13.9	47.3	70.0	22.7	21.2	34.1	12.9	10.1	22.9	12.8	6.2	2.7
Black, non-Hispanic	73.9	87.2	13.3	40.7	61.5	20.8	24.9	47.9	23.0	10.0	14.8	4.7	6.2	8.3	2.1	2.3	0.9
Hispanic	82.8	90.9	8.2	52.2	69.8	17.6	33.2	57.1	23.9	13.2	21.4	8.1	7.2	13.4	6.2	3.4	1.4
Asian, non-Hispanic	94.4	97.8	3.4	80.0	90.4	10.4	66.1	84.6	18.5	38.1	54.8	16.7	18.6	44.6	25.9	16.6	7.6
All other races, non-Hispanic	84.3	92.4	8.1	56.1	73.6	17.6	38.1	62.0	23.9	15.9	26.5	10.6	8.3	17.5	9.2	4.8	2.1
Parents' highest education (2012)																	
Less than high school	75.0	86.8	11.8	42.7	61.1	18.4	24.4	46.6	22.3	8.9	14.0	5.1	5.8	8.6	2.7	2.6	1.0
High school diploma or GED	80.7	89.8	9.2	49.7	67.8	18.1	31.8	55.2	23.4	12.7	19.7	7.0	7.0	11.8	4.8	3.1	1.2
Associate's degree	86.3	92.4	6.1	56.2	73.7	17.5	37.0	61.8	24.8	15.1	24.4	9.3	7.9	14.9	7.0	3.8	1.5
Bachelor's degree	91.9	95.9	4.0	71.0	84.1	13.2	52.9	75.8	22.9	24.2	39.5	15.3	11.1	27.0	15.9	7.1	3.1
Master's degree or higher	94.8	96.9	2.1	77.2	87.8	10.7	61.1	81.2	20.0	31.2	49.4	18.2	14.6	37.1	22.5	11.7	5.3

See notes at end of table.

Table 8. Mathematics proficiency: Percentage of fall 2009 ninth-graders proficient in specific algebraic knowledge and skills, by student, family, and school characteristics: Fall 2009 and Spring 2012—Continued

Characteristic	Level 1			Level 2			Level 3			Level 4			Level 5			Level 6	Level 7
	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Spring 2012	Spring 2012
Socioeconomic status (2012)																	
Lowest fifth	75.3	86.3	11.0	43.1	61.2	18.1	25.8	47.5	21.7	9.9	15.0	5.1	6.1	9.0	2.9	2.6	1.0
Middle three fifths	85.8	92.6	6.8	57.4	74.3	16.9	38.6	62.9	24.2	16.2	25.8	9.6	8.2	16.1	7.8	4.2	1.7
Highest fifth	95.1	97.5	2.3	78.2	89.1	10.9	62.2	82.7	20.5	31.2	50.3	19.1	14.2	37.3	23.1	11.1	5.0
Ninth-graders' educational expectations (2012)																	
High school or less	73.2	83.3	10.1	38.3	53.7	15.4	21.1	39.7	18.6	8.0	10.2	2.3	5.6	6.1	0.4	2.1	0.7
Some college	82.8	90.9	8.1	51.1	69.1	18.1	30.9	55.6	24.8	11.4	17.9	6.5	6.5	10.4	3.8	2.6	1.0
College graduation	90.1	95.8	5.8	64.8	81.5	16.7	45.6	70.9	25.3	19.4	31.7	12.3	9.2	20.1	10.9	4.9	2.1
Graduate/professional degree	91.5	95.7	4.3	70.6	83.7	13.1	53.8	75.7	21.9	25.8	41.8	16.0	12.1	29.7	17.7	8.7	3.9
Don't know	78.9	89.1	10.1	47.7	68.7	21.0	31.0	56.3	25.3	13.2	20.5	7.3	7.5	12.8	5.4	3.7	1.5
School sector (2009)																	
Public	85.0	92.0	7.0	57.6	73.5	16.0	39.7	62.4	22.7	17.3	27.2	9.8	8.8	17.9	9.0	5.0	2.2
Private	94.3	97.7	3.4	75.0	90.0	15.0	57.2	83.5	26.3	26.5	47.5	21.0	11.8	33.5	21.8	8.7	3.7

[†] 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: Levels 6 and 7 were not available for the 2009 sample. The proficiency levels represent the following: Level 1—algebraic expressions; Level 2—multiplicative and proportional thinking; Level 3—algebraic equivalents; Level 4—systems of equations; Level 5—linear functions; Level 6—quadratic functions; Level 7—log and exponential functions (geometric sequences). Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2W1STU. GED = General Educational Development, an alternative path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table 9. Mathematics performance for selected states: Average mathematics IRT-estimated number-correct scores, percentage of fall 2009 ninth-graders proficient in specific algebra knowledge and skills, and change in proficiency from 2009 to 2012, in states with state-representative data: Fall 2009 and Spring 2012

	Mean algebra assessment estimated number-correct scores						
9.a. Reporting state	Fall 2009		Spring 2012		Change		
National, public schools only	38.4		63.8		25.4		
California	39.3		65.9		26.6		
Florida	38.1		62.7		24.6		
Georgia	38.2		61.1		22.9		
Michigan	38.7		63.9		25.2		
North Carolina	40.4		64.0		23.6		
Ohio	38.2		63.0		24.8		
Pennsylvania	39.6		66.1		26.5		
Tennessee	37.4		60.9		23.5		
Texas	39.4		64.2		24.8		
Washington	38.9		65.5		26.6		
Percent proficient in spring 2012							
9.b. Reporting state	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
National, public schools only	92.0	73.7	62.7	27.5	18.2	5.1	2.2
California	94.1	78.5	68.0	31.0	21.3	6.2	2.8
Florida	90.1	71.6	60.7	27.5	18.4	5.1	2.2
Georgia	92.0	71.2	58.5	21.1	12.5	3.5	1.4
Michigan	91.4	74.6	63.9	27.6	17.7	4.6	1.9
North Carolina	92.2	73.4	62.7	28.5	19.3	5.6	2.4
Ohio	90.7	71.8	60.9	26.8	17.3	5.4	2.3
Pennsylvania	95.0	78.7	67.5	29.2	18.8	4.8	2.0
Tennessee	89.3	69.3	57.8	22.0	13.6	3.7	1.6
Texas	91.4	73.6	62.7	27.6	18.3	4.5	1.9
Washington	92.5	75.9	64.9	29.1	20.4	6.6	3.0
Gain in proficiency 2009–2012							
9.c. Reporting state	Level 1	Level 2	Level 3	Level 4	Level 5		
National, public schools only	6.9	16.0	22.9	10.0	9.3		
California	7.6	18.0	24.6	10.2	10.4		
Florida	6.4	14.8	20.8	9.4	8.7		
Georgia	6.5	13.9	19.7	5.2	4.3		
Michigan	5.6	15.6	24.0	9.6	8.5		
North Carolina	4.9	10.3	16.8	6.8	8.8		
Ohio	6.3	14.2	21.0	10.2	8.6		
Pennsylvania	6.3	17.2	25.5	11.5	10.1		
Tennessee	5.8	15.1	22.1	6.9	5.6		
Texas	4.4	12.5	21.5	10.8	10.3		
Washington	7.7	17.5	24.7	10.6	10.5		

! Interpret data with caution. Estimate is unstable because the standard error represents more than 30 percent of the estimate.
NOTE: The number-correct score has a potential range of 0–118. Levels 6 and 7 were not available for the 2009 sample and not included in panel 9c. The proficiency levels represent the following: Level 1—algebraic expressions; Level 2—multiplicative and proportional thinking; Level 3—algebraic equivalents; Level 4—systems of equations; Level 5—linear functions; Level 6—quadratic functions; Level 7—log and exponential functions (geometric sequences). Table 9 cannot be replicated from the public-use file; state indicators are available only on the restricted-use file. States included in this table were selected to participate in a National Science Foundation-funded effort to draw state-representative samples of their students. Estimates weighted by W2W1STU for panels 9a and 9c and W2STUDENT for panel 9b. IRT= item response theory.

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 to First Follow-up Restricted-Use File (NCES 2014-359).

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Appendix A: Technical Notes and Methodology

Appendix A: Technical Notes and Methodology

Appendix A provides information about the High School Longitudinal Study of 2009 (HSLs:09), as well as information about statistical procedures and analysis variables used in this report. The HSLs:09 first follow-up is discussed in eight sections: (A.1) Design and Purposes of HSLs:09; (A.2) Instrumentation; (A.3) Sample Design; (A.4) Results of Data Collection; (A.5) Weighting; (A.6) Nonresponse Bias Analysis; (A.7) Imputation; and (A.8) Disclosure Risk Analysis and Protections. In this appendix, discussion of the study is followed by information on the report's statistical procedures (A.9), generation of standard errors (A.10), and definitions of analysis variables (A.11). For further information on the HSLs:09 base year, see the *HSLs:09 Base-Year Data File Documentation* (DFD) (NCES 2011-328) and for the first follow-up the *HSLs:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361).

A.1 Design and Purposes of HSLs:09

HSLs:09 is the fifth in a series of National Center for Education Statistics (NCES) 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 workforce, 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 administration took place in the 2009–10 school year, with a randomly selected sample of fall-term ninth-graders in 944 public and private high schools with both a 9th and an 11th grade. Students took a mathematics assessment and survey online. In addition, 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 took place in 2012 when most sample members were in the spring term of the 11th grade. Dropouts, newly homeschooled, and transfer students were followed, as well as those who remained in the base-year school. All sample members were eligible to complete both a questionnaire and a mathematics assessment. In addition to a student questionnaire and mathematics assessment, parents, administrators and counselors were also surveyed. A brief status update (to be completed either by the student cohort member or the parent) is underway (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 full second follow-up interview will take place in 2016, when most sample members will be 3 years beyond high school graduation.

A.2 Instrumentation

Instrument design for the HSLs:09 base year and first follow-up 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

¹ The base-year student (Ingels et al. 2011) and contextual data (LoGerfo, Christopher, and Flanagan 2011) First Look reports provide an introduction to the base year data, while the base-year Data File Documentation (Ingels, Pratt et al. 2011) describes the base-year study in detail.

study design also acknowledges the importance of social context and the interaction between students and their families, teachers, peers, and the wider community.

Instrument design was also guided by the desire to develop computer-assisted research instruments that could be completed either in the school setting or outside of school. 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 (base year only), school administrator, and counselor—were designed for Web self-administration or computer-assisted telephone administration 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 math assessment (a two-stage adaptive test was employed).

Student Questionnaire. The questionnaires elicited demographic information (for example, sex, race/ethnicity); language background; school experiences in the current and previous school year (including math and science experiences and course enrollment). It also inquired into constructs such as math self-efficacy and math identity, and high school, postsecondary, and career plans, among other topics. In the first follow-up, questions were tailored to students' pathways—for example, there were specific questions for those who had dropped out of school, and for those who had transferred.

Parent Questionnaire. There was both a base-year and a first follow-up parent survey, the latter conducted with a subsample of parents. The parent questionnaire identified household members and their roles and characteristics; and obtained 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 cohort member's learning, and plans and preparations for postsecondary education.

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 (ninth and when the majority of students were in 11th 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

Both in the base year and first follow-up, 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 on the modeling of the direct assessment data, please see chapter 2 of the *HSLs:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361).

Other HSLs:09 Instruments. Although not utilized in the analyses in this brief report, HSLs:09 also contains questionnaire data from several other sources including a school administrator survey (base year and first follow-up), a counselor survey (base year and first follow-up) and surveys of mathematics and science teachers (in the base year only). Further information about all HSLs:09 questionnaires may be found in chapter 2 of the *HSLs:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361).

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. The target population at the school level was defined as regular public schools, including public charter schools, and private schools, in the 50 states and in the District of Columbia, providing instruction in both ninth 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, because of language barriers or severe disabilities (there were 548 such students in the base year) 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 base-year student survey and assessment data. Their ability to complete the study instruments was reassessed in the first follow-up. Of the 25,184 first follow-up eligible student cohort sample, 24,993 students were classified as first follow-up questionnaire-capable and 251 as questionnaire-incapable. In part, this first follow-up increase in questionnaire-capable sample members reflects the acquisition, by 2012, of English language skills for 2009 ninth-graders who had a language barrier to questionnaire completion. Of the 320 cases reclassified as questionnaire-capable in 2012, 184 (57.5 percent) had been defined in the base year as questionnaire-incapable owing to limited English proficiency (LEP).

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 these subjects were asked to complete a teacher questionnaire. The final source of contextual data was the parent or guardian. Parents were recruited in the base year, using contact information obtained from school-provided lists. 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.

In the first follow-up, all base-year sample members—including nonparticipants—were followed, and asked to complete the questionnaire and the mathematics assessment (both instruments were available to both in-school and out-of-school sample members). (Two exceptions to this are sample members who

died, or were removed as base-year sampling errors discovered only in the first follow-up, e.g., not a ninth-grader in 2009.) First follow-up contextual data include information from administrators of schools that were included in the base year as well as schools to which students had transferred; from counselors of schools that were included in the base year (but not counselors in schools to which students had transferred); and from a random subsample of parents. Therefore, the first follow-up administrator and counselor data are solely a contextual source for students, because the first follow-up school sample is not nationally representative (although the base-year sample was).

A.4 Participation and Bias: Data Collection Results

Tables A-1 and A-2 below summarize the results of instrument completion by each component, base year and first follow-up, for those components drawn upon for this report.

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

Questionnaire/assessment	Eligible	Participated	Weighted percent	Unweighted percent
School ¹	1,889	944	55.5	50.0
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

¹ Uses the school base weight.

² Uses 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, 87.4 percent weighted (87.0 percent unweighted) completed the student interview. . Likewise, 84.7 percent weighted (84.3 percent unweighted) completed a math assessment.

NOTE: All percentages are based on the row under consideration.

SOURCE: U.S. Department of Education, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSLS:09) Base Year.

Table A-2. Summary of HSLS:09 first follow-up response rates: 2012

Questionnaire	Eligible	Participated	Weighted percent	Unweighted percent
Base-year schools ¹	939	904	†	96.3
Transfer school ²	1,822	1,346	†	71.5
Student questionnaire ^{3, 4}	25,184	20,594	82.0	81.8
Student assessment ^{3, 4}	25,184	18,507	73.0	73.5
Parent questionnaire ^{5, 6}	11,952	8,651	72.5	72.4

† Not applicable. School sample is not representative of population of high schools in 2012.

¹ The HSLS:09 school sample included all schools that participated in the base-year data collection. However, five schools are not included in the number of eligible schools; four had closed and one did not have any base-year students still enrolled. Participating base-year schools include schools that conducted in-school student data collection sessions. All 939 schools were contacted to complete school administrator and school counselor questionnaires regardless of whether they conducted in-school student sessions.

² Transfer schools were identified from enrollment status updates provided by the school and responses provided in the student and parent questionnaire. Transfer schools were only contacted if at least one student from the transfer school participated in the first follow-up study.

³ A total of 22 students from the base year were ineligible for the first follow-up.

⁴ Weighted percentage uses the student base weight.

⁵ Weighted percentage uses the parent base weight.

⁶ A subsample of 11,952 eligible parents was asked to participate in the HSLS:09 first follow-up data collection.

NOTE: All percentages are based on the number of sample members in 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) First Follow-up.

A.5 Weighting

Analytic weights are used in combination with software that accounts for the HSLs:09 complex survey design to produce estimates for the target population, with appropriate standard errors. Four analytic weights were computed for the HSLs:09 first follow-up using a similar methodology as implemented in the base year. They include two student weights, one for analyses specific to the first follow-up, allowing for inclusion of base-year nonrespondents as well as base-year respondents in analyses (W2STUDENT) and one for longitudinal analyses associated with change between the base year and first follow-up (W2W1STU). Both first follow-up student weights are used in this report. In addition, two weights adjusting for patterns of parent nonresponse were developed, one weight for first follow-up–specific analyses (W2PARENT) and one for longitudinal analyses (W2W1PARENT).

A.6 Nonresponse Bias Analysis

Nonresponse bias analyses were conducted to determine whether unit nonresponse from any of the data sources significantly increased the estimated bias for population estimates. Table A-3 summarizes findings for the data components included in this report before and after the base weights were adjusted for nonresponse. Further information on the procedures for evaluating nonresponse bias and for their results can be found in chapter 6 of the *HSLs:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361).

Table A-3. Summary statistics for unit nonresponse bias analyses before and after a weight adjustment for nonresponse by HSLs:09 analytic weight: 2012

Analytic weight	Significant bias tests at 0.05 level ¹		Median absolute relative bias ²		
	Percent before weight adjustment	Percent after weight adjustment	Percent before weight adjustment	Percent after weight adjustment	Percent relative change ³
Student					
W2STUDENT	31.8	0	1.2	0.3	-72.3
W2W1STUDENT	33.3	0	1.6	0.3	-79.0
W2PARENT	25.8	0	2.3	0.2	-89.7

¹ Before and after are in reference to the nonresponse weight adjustment. A total of 66 statistical tests were performed; the number 66 was used as the basis for the reported percentages.

² The percent relative bias is calculated as 100 multiplied by the estimated bias divided by the estimated value. The absolute relative bias is the absolute value of the (percent) relative bias.

³ The percent relative change is calculated as 100 multiplied by the median value after adjustment minus the median value before adjustment divided by the median value before adjustment.

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 and First Follow-up.

A.7 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. Unit nonresponse at the parent level (and to a lesser degree missing assessment data as well) also affected the completeness of some key student variables such as (for example) family income, parental educational attainment, and occupation—all critical components of the socioeconomic status index.

Imputation addresses the potential concern related to missing values. 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. (On both the benefits and techniques of imputation see, for example, Little and Rubin 2002.)

Although there was some item nonresponse on all HSLS:09 base year and first follow-up surveys, 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 student sample members. Both logical and stochastic imputation was used, and for the latter, both single and multiple imputation was implemented. Values were assigned in place of missing responses for 18 variables identified from the student and parent questionnaires through single-value imputation. Multiple imputation was used to address missing student ability estimates in mathematics (*theta*), the associated standard error of measurement (*sem*) for the theta, and socioeconomic status (SES) values. Regardless of the method, indicator variables (flags) were created to allow users to easily identify the imputed values. Missingness in other survey instruments was not addressed through imputation. Further information can be found in the *HSLS:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361).

A.8 Disclosure Risk Analysis and Protections

The disclosure treatment methods used to produce the HSLS:09 base-year to first follow-up 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 technique entailed removing the response from the public-use file (i.e., reset to a “suppressed” reserve code).

A.9 Statistical Procedures in This Report

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. There were no adjustments for multiple comparisons. 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:

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

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.10 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, balanced repeated replicate (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.11 Definitions of Analysis Variables

This section describes the variables used in each of the tables of this report. The first subsection (A11.1) contains most of the student, family, and school variables (row variables) used throughout the tables. The second subsection describes the mathematics achievement measures (used most often as column variables for tables); the third section describes coursetaking variables and variables concerning postsecondary options. To see the base-year and first follow-up 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) and appendix A of the *HSLS:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361). For more information on the mathematics assessment development and scoring, see chapter 2 of the *Base-Year to First Follow-up DFD*.

A.11.1 Student Background Characteristics

Sex (X2SEX)

X2SEX updates the base-year variable 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. Sex information was gathered also from new respondents in the first follow-up.

Race/Ethnicity (X2RACE)

First follow-up race is an update of base-year race (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. Race information was gathered also from new respondents in the first follow-up.

Parents' Highest Education (X2PAR1EDU)

Indicates the highest level of education achieved by parent 1. X2PAR1EDU is pulled from the first follow-up parent questionnaire, and if missing it is imputed from the base-year parent questionnaire and the first follow-up student questionnaire. X2PAR1EDU is statistically imputed for first follow-up student sample members when all sources of parent data are missing (imputed values in X2PAR1EDU can be identified using X2PAR1EDU_IM=2). (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.

Socioeconomic Status Quintile (X2SESQ5)

Socioeconomic status (SES) is a measure of the family’s relative position in American 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 (X2PAR1EDU, X2PAR2EDU); 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 X2PAR1OCC6 and X2PAR2OCC6); and family income (X2FAMINCOME). 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.

Base-Year 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 NCES Common Core of Data 2007–08 and the Private School Universe Survey 2007–08.

First Follow-up State Geocode for School Attended (X2STATE)

X2STATE is the FIPS code for the first follow-up school state. For purposes of computing achievement gain in the mathematics assessment at the level of the state representative samples, base-year students who had moved out of the base-year state were excluded.

A.11.2 Mathematics Achievement

Mathematics Assessment Score

The HSLs:09 base-year and first follow-up mathematics assessments provide a measure of student achievement in algebra for a cohort of ninth-graders, over two points in time—upon entry to high school in fall 2009 and 2.5 years later.

In both the base year and the first follow-up, the assessment was administered by computer using a two-stage design. In the first stage, each student took a common 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.

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 (for the base year) and seven discrete levels of proficiency (for the first follow-up).

Mathematics IRT-Estimated Number Correct on Base-Year to First Follow-up Scale (X2X1TXMSCR)

The math IRT-estimated number correct is a criterion-referenced measure of achievement at the time of the base-year assessment. The criterion is the set of skills defined by both the HSLS:09 base-year and first follow-up framework and represented by the 118 items used to score the HSLS:09 first follow-up mathematics assessment. The estimated number correct for math is an estimate of the number of items students would have answered correctly had they responded to all 118 items in the item pool. The ability estimates (thetas) from the base year and item parameters derived from the IRT calibration were used to calculate each student’s probability of a correct answer for each of the items in the pool. These probabilities are summed to produce the IRT-estimated number-correct scale score. See chapter 2 of the *HSLS:09 First Follow-up Data File Documentation* (NCES 2014-361) for more information on the derivation of the math estimated number correct.

First Follow-up Mathematics Quintile Score (X2TXMQUINT)

The math quintile score is a norm-referenced measure of achievement. The quintile score divides the weighted (population estimate) achievement distributions into five equal groups, based on math score (X2TXMTSCOR). 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. See chapter 2 of the *HSLS:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361) for more information on the derivation of the math quintile score.

Probability of Proficiency Scores

The mathematics proficiency probability scores are criterion-referenced and are based on clusters of items that mark seven levels on the mathematics scale developed in the HSLS:09 first follow-up. The levels are hierarchical in the sense that mastery of a higher level typically implies proficiency at the lower levels. The HSLS:09 first follow-up proficiency probabilities were computed using IRT-estimated item parameters. Each proficiency probability represents the probability that a student would pass a given proficiency level. Clusters of four items were identified that marked mathematics level 1: algebraic expressions. Students able to answer questions such as these have an understanding of algebraic basics including evaluating simple algebraic expressions and translating between verbal and symbolic representations of expressions. See chapter 2 of the *HSLS:09 Base-Year to First Follow-up Data File Documentation* (DFD) (NCES 2014-361) for more information on the derivation of the math proficiency probability score.

Probability of Proficiency, Level 1: X2TXMPROF1; X1TXMPROF1 in base year

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.

Probability of Proficiency, Level 2: X2TXMPROF2; X1TXMPROF2 in base year

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.

Probability of Proficiency, Level 3: X2TXMPROF3; X1TXMPROF3 in base year

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.

Probability of Proficiency, Level 4: X2TXMPROF4; X1TXMPROF4 in base year

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.

Probability of Proficiency, Level 5: X2TXMPROF5; X1TXMPROF5 in base year

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.

Probability of Proficiency, Level 6: X2TXMPROF6

Level 6: quadratic functions. This score was added for the first follow-up and is not represented in the base-year scores. Students able to answer questions such as these have an understanding of quadratic functions and can solve quadratic equations and inequalities and understand the relationship between roots and the discriminant.

Probability of Proficiency, Level 7: X2TXMPROF7

Level 7: log and exponential functions (geometric sequences). This score was added for the first follow-up and is not represented in the base-year scores. Students able to answer questions such as these have an understanding of exponential and log functions, including geometric sequences and can identify inverses of log and exponential functions and when geometric sequences converge.

A.11.3 Cohort Members' Enrollment Status, Coursetaking**High School Enrollment (X2ENROLSTAT, S2GRD1112)**

First follow-up respondents were asked whether they were attending high school, not attending high school, or being homeschooled (X2ENROLSTAT). In a separate question, first follow-up respondents were asked what grade they were in, based on the following choices: 9th grade, 10th grade, 11th grade, 12th grade, You were in an ungraded program, You were not attending school (S2GRD1112).

Grade Student Took Algebra 1 (S2ALG1WHEN)

All ninth-grade cohort respondents were asked in the first follow-up "What grade were you in when you took Algebra I?" [(If you have taken it more than once, answer for your most recent course. If you are currently taking Algebra I, choose your current grade.) / (If you have taken it more than once, answer for your most recent course.)] Response categories were as follows: 8th grade or earlier, 9th grade, 10th grade; 11th grade, 12th grade, or You have not taken Algebra I yet.

Mathematics Course Enrollment

This variable is based on a follow-up question to the student question, “Are you currently taking a math course this spring term?” For students who indicated yes, a follow-up question asked, “What math course(s) are you currently taking this spring term?” Each course response is represented as a separate variable in the data file. Note that students could respond affirmatively to more than one course. This report coded a student under “no math” if he or she answered “no” to the first question. The 19 math courses listed were reduced to seven for purposes of this report: no math, basic math/pre-algebra, algebra 1, geometry, algebra 2, pre-calculus/calculus, and other.

Science Course Enrollment

This variable is based on a question in the student questionnaire, “Are you currently taking a science course this spring term?” For students who indicated yes, a follow-up question asked, “What science course(s) are you currently taking this spring term?” Each course response is represented as a separate variable in the data file. 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. The 25 listed courses were combined to realize the six categories in this report: biology, earth science, physical science, physics, chemistry, and other science.

A.11.4 Postsecondary Choice Criteria, Anticipations, and Expectations

Cohort Members’/Parents’ Postsecondary Choice Criteria

Cohort members were asked: How important to you [will/would] each of the following characteristics be when choosing a school or college to attend after high school? This question was asked of all respondents who reported wanting to attend postsecondary education if there were no barriers, and to their parents. Response options were Very important, Somewhat important, and Not at all important. The following were the subparts of this item (each represented as separate variables in the data file): Academic quality or reputation, Cost of attendance, A good record of placing graduates in jobs, A good record of placing graduates in graduate or professional schools, Opportunity to play sports, Recommended by family or friends, Close to home, Far away from home, Good social life, Good sports teams or school spirit, A family member went there.

Plans and Preparation Activities in Anticipation of Leaving High School

All first follow-up ninth-grade cohort members were asked about plans and preparations for the future. Response options were yes or no, for the following item subcategories: Attended a career day or job fair; Attended a program at, or taken a tour of a college campus; Sat in on or taken a college class; Participated in an internship or apprenticeship related to your career goals; Worked or volunteered in a job related to your career goals; Searched the Internet for college options or read college guides; Talked with a high school counselor about your options for life after high school; Talked about your options with a counselor hired by your family to help you prepare for college; Took a course to prepare for a college admission exam such as SAT or ACT.

2009 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.

2012 Cohort Members’ Educational Expectations (X2STUEDEXPCT)

Indicates the highest level of education the sample member expected to achieve as of spring 2012. X2STUEDEXPCT is drawn from the first follow-up student questionnaire, and if missing it is statistically imputed. Categories were asked and recast for reporting purposes to reflect the conventions of the base-year variable, X1STUEDEXPCT.

Appendix B: Standard Error Tables

Table B-1. Standard errors for student educational attainment expectations for fall 2009 ninth-graders, by student, family, and school characteristics: 2009 and 2012

Characteristic	High school or less ¹		Some college		College graduation		Graduate/ professional degree		Don't know	
	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012
Total	0.57	0.62	0.33	0.43	0.53	0.57	0.64	0.75	0.50	0.44
Sex										
Male	0.76	0.83	0.48	0.52	0.72	0.76	0.92	0.88	0.76	0.67
Female	0.82	0.72	0.43	0.73	0.75	0.86	0.93	0.94	0.72	0.54
Race/ethnicity ²										
White, non-Hispanic	0.53	0.67	0.38	0.52	0.57	0.73	0.79	0.71	0.65	0.50
Black, non-Hispanic	1.31	1.60	1.09	1.10	1.47	1.62	1.93	2.32	1.78	1.21
Hispanic	1.52	1.38	0.86	1.28	1.09	1.21	1.49	1.65	1.47	1.13
Asian, non-Hispanic	1.61	1.70	1.99	1.48	1.56	2.43	3.27	3.17	1.96	2.12
All other races, non-Hispanic	1.74	1.97	1.18	1.16	1.55	2.00	1.76	1.68	1.47	1.72
Parents' highest education (2012)										
Less than high school	2.53	2.86	1.41	2.22	2.17	1.90	2.40	1.92	2.59	2.07
High school diploma or GED	0.76	0.91	0.60	0.89	0.93	0.84	0.94	1.20	0.89	0.70
Associate's degree	1.22	1.12	0.64	0.99	1.02	1.19	1.39	1.40	1.37	0.88
Bachelor's degree	0.67	0.73	0.70	0.73	1.12	1.25	1.27	1.26	1.01	0.68
Master's degree or higher	0.88	0.87	0.42	0.60	1.08	1.38	1.42	1.50	1.08	0.79
Socioeconomic status (2012)										
Lowest fifth	1.36	1.74	0.98	1.24	1.25	1.35	1.68	1.45	1.45	1.20
Middle three fifths	0.68	0.63	0.42	0.58	0.58	0.69	0.82	0.86	0.69	0.51
Highest fifth	0.61	0.71	0.42	0.48	0.98	1.27	1.22	1.24	0.96	0.65

See notes at end of table.

Table B-1. Standard errors for student educational attainment expectations for fall 2009 ninth-graders, by student, family, and school characteristics: 2009 and 2012—Continued

Characteristic	High school or less ¹		Some college		College graduation		Graduate/ professional degree		Don't know	
	2009	2012	2009	2012	2009	2012	2009	2012	2009	2012
Mathematics achievement by quintile rank (2012)										
Lowest fifth	1.40	1.44	0.88	0.92	0.98	0.97	1.23	1.36	1.24	1.03
Middle three fifths	0.59	0.75	0.42	0.54	0.66	0.72	0.68	0.84	0.63	0.63
Highest fifth	0.69	0.44	0.46	0.67	1.01	1.15	1.29	1.32	0.84	0.62
School sector (2009)										
Public	0.60	0.67	0.36	0.46	0.58	0.60	0.67	0.81	0.52	0.47
Private	0.85	0.78	0.79	0.77	1.55	1.63	1.88	2.09	1.51	0.71

¹This category combines "less than high school" and "high school diploma" responses. Separate categories were not reported because "less than high school" responses totaled 0.5 percent of the sample.

²Black 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: Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2W1STU. GED = General Educational Development, an alternate path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table B-2. Standard errors for percentage of fall 2009 ninth-graders who were in school at various grade levels, graduated early, or were dropouts in the spring term of 2012, by student, family, and school characteristics: 2012

Characteristic	Percent in school, grade 11	Percent in school, lower than grade 11	Percent in school, higher than grade 11	Percent graduated early	Percent dropped out
Total	0.47	0.21	0.25	0.15	0.20
Sex					
Male	0.64	0.32	0.35	0.21	0.28
Female	0.54	0.19	0.32	0.16	0.31
Race/ethnicity ¹					
White, non-Hispanic	0.39	0.19	0.21	0.17	0.20
Black, non-Hispanic	1.79	0.45	1.06	0.34	0.81
Hispanic	1.39	0.67	0.60	0.39	0.75
Asian, non-Hispanic	0.48	0.26	0.36	0.09	0.16
All other races, non-Hispanic	1.08	0.42	0.85	0.53	0.57
Parents' highest education (2012)					
Less than high school	2.17	0.65	1.26	0.66	1.15
High school diploma or GED	0.70	0.40	0.41	0.22	0.41
Associate's degree	0.67	0.33	0.47	0.22	0.42
Bachelor's degree	0.62	0.22	0.42	0.19	0.28
Master's degree or higher	0.58	0.16	0.41	0.24	0.23
Socioeconomic status (2012)					
Lowest fifth	1.23	0.73	0.66	0.36	0.57
Middle three fifths	0.52	0.21	0.31	0.19	0.29
Highest fifth	0.44	0.23	0.26	0.18	0.20
Ninth-graders' educational expectations (2012)					
High school or less	1.33	0.94	0.67	0.32	0.98
Some college	1.03	0.34	0.75	0.59	0.45
College graduation	0.53	0.20	0.37	0.15	0.25
Graduate/professional degree	0.46	0.11	0.33	0.19	0.14
Don't know	1.39	0.93	0.91	0.29	0.62
Mathematics achievement by quintile rank (2012)					
Lowest fifth	1.24	0.53	0.72	0.46	0.94
Middle three fifths	0.50	0.25	0.29	0.18	0.20
Highest fifth	0.27	0.12	0.20	0.14	0.09
School sector (2009)					
Public	0.50	0.22	0.27	0.16	0.22
Private	0.58	0.21	0.42	0.15	0.10

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: Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Students in ungraded programs are not included in the table. Early graduates include regular diploma recipients and General Educational Development (GED) completers (an alternative path to attaining a high school credential). A dropout is defined as a sample member who has stopped going to high school for a period of 4 consecutive weeks or more, other than for school breaks, illness, injury, or vacation. Estimates weighted by W2STUDENT.

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 to First Follow-up Public-Use File (NCES 2014-358).

Table B-3. Standard errors for mathematics enrollment: Percentage of all fall 2009 ninth-graders in various spring term 2012 mathematics courses, by student, family, and school characteristics

Characteristic	No math	Basic math ¹ / Pre-algebra	Algebra 1	Geometry	Algebra 2	Pre-calculus/ calculus	Other math ²
Total	0.63	0.31	0.44	0.58	0.96	0.69	0.76
Sex							
Male	0.70	0.38	0.63	0.83	1.03	0.73	0.93
Female	0.75	0.39	0.52	0.78	1.20	0.93	0.90
Race/ethnicity ³							
White, non-Hispanic	0.67	0.45	0.43	0.70	1.10	0.82	0.95
Black, non-Hispanic	1.71	0.93	1.20	1.70	1.88	1.31	1.85
Hispanic	1.09	0.56	1.02	1.40	1.98	1.38	1.46
Asian, non-Hispanic	1.35	0.78	1.03	1.47	2.46	3.74	2.64
All other races, non-Hispanic	1.65	0.86	1.18	1.49	2.30	1.50	1.43
Parents' highest education (2012)							
Less than high school	1.86	1.43	2.87	2.24	2.42	2.32	2.15
High school diploma or GED	0.95	0.48	0.62	0.91	1.23	0.78	0.91
Associate's degree	0.76	0.76	0.91	1.25	1.61	1.12	1.35
Bachelor's degree	0.78	0.41	0.45	0.89	1.28	1.08	1.22
Master's degree or higher	0.88	0.61	0.55	1.01	1.32	1.52	1.31
Socioeconomic status (2012)							
Lowest fifth	1.39	0.85	1.14	1.25	2.03	1.25	1.43
Middle three fifths	0.69	0.39	0.52	0.69	1.06	0.69	0.84
Highest fifth	0.75	0.47	0.37	0.82	1.30	1.36	1.16
Ninth-graders' educational expectations (2012)							
High school or less	1.59	0.80	1.29	1.60	1.76	0.78	1.20
Some college	1.14	1.09	1.10	1.88	1.98	0.80	1.41
College graduation	0.79	0.56	0.57	1.00	1.37	0.94	1.06
Graduate/professional degree	0.80	0.31	0.41	0.75	1.32	1.26	1.06
Don't know	1.39	0.91	1.10	1.77	2.44	1.39	1.49
Mathematics achievement by quintile rank (2012)							
Lowest fifth	1.35	0.91	1.40	1.44	1.72	0.71	1.26
Middle three fifths	0.76	0.36	0.45	0.80	1.15	0.66	0.83
Highest fifth	0.57	0.41	0.24	0.47	1.30	1.32	1.49
School sector (2009)							
Public	0.69	0.34	0.48	0.61	0.98	0.75	0.79
Private	0.92	0.72	0.63	2.19	3.12	3.23	1.82

¹ "Basic math" contains Review or Remedial math including Basic, Business, Consumer, Functional, or General math.

² "Other math" includes courses such as Algebra III, Trigonometry, Probability, Integrated Math, and International Baccalaureate Math.

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: Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT. GED = General Educational Development, an alternate path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-365).

Table B-4. Standard errors for science enrollment: Percentage of all fall 2009 ninth-graders in various spring term 2012 science courses, by student, family, and school characteristics

Characteristic	No science	Biology	Earth science	Physical sciences	Physics	Chemistry	Other science ¹
Total	0.77	0.87	0.59	0.31	0.81	1.15	0.46
Sex							
Male	0.83	0.92	0.71	0.40	0.85	1.15	0.68
Female	0.99	1.19	0.67	0.39	1.01	1.44	0.54
Race/ethnicity ²							
White, non-Hispanic	0.92	0.92	0.66	0.35	1.06	1.34	0.45
Black, non-Hispanic	1.66	2.18	1.39	0.82	1.78	2.10	1.70
Hispanic	1.45	1.47	1.23	0.88	1.52	1.88	1.13
Asian, non-Hispanic	1.47	2.97	1.32	0.66	3.70	4.70	1.62
All other races, non-Hispanic	1.58	1.49	1.56	0.71	1.32	2.62	1.20
Parents' highest education (2012)							
Less than high school	2.79	2.38	1.90	1.43	2.13	2.02	1.96
High school diploma or GED	1.00	1.20	0.75	0.43	0.83	1.55	0.82
Associate's degree	1.40	1.49	1.07	0.48	1.23	1.71	0.89
Bachelor's degree	1.00	1.03	0.77	0.45	1.37	1.73	0.69
Master's degree or higher	1.10	1.33	1.04	0.34	1.68	1.83	0.97
Socioeconomic status (2012)							
Lowest fifth	1.30	1.75	1.05	0.77	1.32	1.84	1.31
Middle three fifths	0.93	0.83	0.70	0.38	0.86	1.29	0.50
Highest fifth	0.97	1.19	0.87	0.32	1.62	1.82	0.79
Ninth-graders' educational expectations (2012)							
High school or less	1.63	1.79	1.40	0.62	0.84	1.35	0.93
Some college	1.74	1.66	1.23	0.84	1.20	2.08	1.48
College graduation	0.99	1.10	0.69	0.39	1.32	1.72	0.65
Graduate/professional degree	0.81	1.24	0.63	0.39	1.22	1.54	0.68
Don't know	1.95	2.22	1.18	0.97	1.47	2.25	2.01
Mathematics achievement by quintile rank (2012)							
Lowest fifth	1.83	1.65	1.06	0.76	1.07	1.96	1.04
Middle three fifths	0.84	1.03	0.67	0.37	0.77	1.24	0.53
Highest fifth	0.84	1.22	0.76	0.26	1.86	2.05	1.01
School sector (2009)							
Public	0.83	0.89	0.62	0.34	0.82	1.17	0.49
Private	1.65	2.12	1.30	0.51	3.42	3.50	0.87

¹ "Other science" includes courses such as General Science, Integrated Science, Principles of Technology, and Computer Science.

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: Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT. GED = General Educational Development, an alternate path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table B-5. Standard errors for percentage of college-bound fall 2009 ninth-graders in spring term of 2012 and percentage of their parents rating various features of postsecondary institutions as “very important” to their choice of a college: 2012

Characteristic	9th-grade cohort member	Parent
Academic quality or reputation	0.64	0.78
Cost of attendance	0.57	0.70
Close to home	0.54	0.91
Far away from home	0.39	0.66
A good record of placing graduates in jobs	0.54	0.78
A good record of placing graduates in graduate or professional schools	0.65	0.99
Opportunity to play sports	0.61	0.87
Recommended by family or friends	0.52	0.91
Offers a particular program of study	0.65	0.85
Good social life	0.57	1.00
Good sports teams or school spirit	0.66	0.97
Parents or a family member went there	0.34	0.76

NOTE: “College-bound” refers to students who expect to attend some college or attain a bachelor’s degree or higher credential. Estimates weighted by W2STUDENT and W2PARENT.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table B-6. Standard errors for cohort characteristics: Percentage distribution of fall 2009 ninth-graders in spring term of 2012, by student, family, and school characteristics: 2012

Characteristic	Standard Error
Total	0.00
Sex	
Male	0.66
Female	0.66
Race/ethnicity ¹	
White, non-Hispanic	1.13
Black, non-Hispanic	0.89
Hispanic	0.98
Asian, non-Hispanic	0.36
All other races, non-Hispanic	0.38
Parents' highest education (2012)	
Less than high school	0.45
High school diploma or GED	0.84
Associate's degree	0.39
Bachelor's degree	0.63
Master's degree or higher	0.49
Socioeconomic status (2012)	
Lowest fifth	0.77
Middle three fifths	0.65
Highest fifth	0.66
Mathematics achievement by quintile rank (2012)	
Lowest fifth	0.72
Middle three fifths	0.63
Highest fifth	0.68
Ninth-graders' educational expectations (2012)	
High school or less	0.55
Some college	0.40
College graduation	0.54
Graduate/professional degree	0.73
Don't know	0.41
School sector (2009)	
Public	0.01
Private	0.01

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: Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2STUDENT. GED = General Educational Development, an alternative path to attaining a high school credential.

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 to First Follow-up Public-Use File (NCES 2014-358).

Table B-7. Standard errors for percentage of fall 2009 ninth-graders who have participated in various activities to prepare for life after high school: 2012

	Percent participating
Searched the Internet for college options or read college guides	0.65
Talked with a high school counselor about options	0.83
Attended a program or taken a tour on college campus	0.77
Attended a career day or job fair	0.88
Took a course to prepare for a college admission exam, such as SAT or ACT	0.74
Volunteered in a job related to career goals	0.63
Sat in on or took a college class on campus 2012	0.64
Did an internship or apprenticeship in a job related to career goals	0.56
Talked about options with a family-hired counselor	0.43

NOTE: Estimates weighted by W2STUDENT.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table B-8. Standard errors for mathematics proficiency: Percentage of fall 2009 ninth-graders proficient in specific algebraic knowledge and skills, by student, family, and school characteristics: Fall 2009 and Spring 2012

Characteristic	Level 1			Level 2			Level 3			Level 4			Level 5			Level 6	Level 7
	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Spring 2012	Spring 2012
Total	0.57	0.36	0.37	0.81	0.69	0.50	0.77	0.79	0.53	0.45	0.66	0.56	0.19	0.55	0.49	0.17	0.08
Sex																	
Male	0.69	0.47	0.58	0.91	0.83	0.78	0.88	0.89	0.79	0.52	0.76	0.35	0.22	0.66	0.38	0.24	0.12
Female	0.61	0.43	0.31	1.01	0.83	0.73	1.00	0.97	0.81	0.55	0.82	0.96	0.21	0.69	0.96	0.20	0.09
Race/ethnicity ¹																	
White, non-Hispanic	0.46	0.29	0.31	0.68	0.57	0.35	0.72	0.64	0.31	0.48	0.62	0.52	0.21	0.56	0.44	0.20	0.10
Black, non-Hispanic	1.76	1.25	0.67	1.91	1.78	1.27	1.59	1.80	1.22	0.61	0.99	0.56	0.16	0.68	0.56	0.10	0.05
Hispanic	1.16	0.82	1.59	1.36	1.51	2.00	1.17	1.63	1.55	0.60	1.14	1.16	0.21	0.97	1.34	0.24	0.12
Asian, non-Hispanic	1.11	0.47	1.48	1.97	1.39	3.11	2.90	1.84	3.33	2.60	2.83	1.19	1.40	3.15	2.83	1.76	0.83
All other races, non-Hispanic	1.60	0.94	1.53	1.83	1.59	1.33	1.61	1.74	1.28	0.87	1.35	0.87	0.37	1.11	0.63	0.43	0.24
Parents' highest education (2012)																	
Less than high school	2.14	1.43	3.54	2.13	2.19	3.31	1.66	2.31	2.13	0.61	1.60	1.86	0.17	1.27	1.85	0.38	0.25
High school diploma or GED	0.86	0.62	0.49	1.01	0.99	0.56	0.90	1.08	0.74	0.41	0.65	0.31	0.15	0.49	0.17	0.11	0.05
Associate's degree	0.94	0.57	0.83	1.27	1.16	0.80	1.05	1.29	0.92	0.54	0.88	1.40	0.22	0.79	1.08	0.23	0.10
Bachelor's degree	0.53	0.35	0.59	0.93	0.72	0.86	0.97	0.88	0.85	0.66	0.89	0.90	0.30	0.78	0.89	0.29	0.14
Master's degree or higher	0.48	0.45	0.61	1.05	0.82	1.64	1.22	1.02	1.35	0.96	1.26	0.79	0.49	1.24	1.01	0.58	0.30

See notes at end of table.

Table B-8. Standard errors for mathematics proficiency: Percentage of fall 2009 ninth-graders proficient in specific algebraic knowledge and skills, by student, family, and school characteristics: Fall 2009 and Spring 2012—Continued

Characteristic	Level 1			Level 2			Level 3			Level 4			Level 5			Level 6	Level 7
	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Fall 2009	Spring 2012	Change	Spring 2012	Spring 2012
Socioeconomic status (2012)																	
Lowest fifth	1.52	0.92	1.60	1.47	1.55	1.57	1.12	1.57	1.06	0.44	0.89	0.85	0.11	0.72	0.93	0.18	0.11
Middle three fifths	0.54	0.37	0.28	0.83	0.71	0.26	0.77	0.79	0.41	0.42	0.63	0.45	0.17	0.52	0.46	0.14	0.06
Highest fifth	0.36	0.35	0.53	0.78	0.68	1.34	0.95	0.81	1.39	0.84	1.04	1.31	0.43	1.06	1.22	0.45	0.23
Ninth-graders' educational expectations (2012)																	
High school or less	1.05	0.88	1.22	1.03	1.23	1.82	0.72	1.21	1.48	0.24	0.55	0.39	0.07	0.39	0.38	0.07	0.03
Some college	1.32	0.88	0.61	1.28	1.25	1.49	1.04	1.28	1.80	0.48	0.89	0.77	0.13	0.80	0.50	0.12	0.05
College graduation	0.62	0.32	0.60	0.92	0.66	0.32	0.92	0.84	0.43	0.56	0.80	0.69	0.22	0.66	0.64	0.18	0.09
Graduate/professional degree	0.60	0.43	0.69	1.02	0.89	0.65	1.06	1.06	0.59	0.72	1.00	1.16	0.35	0.94	1.28	0.36	0.18
Don't know	1.35	1.11	0.85	1.71	1.61	1.46	1.49	1.62	1.47	0.78	1.23	1.60	0.32	1.02	1.26	0.27	0.13
School sector (2009)																	
Public	0.62	0.39	0.41	0.87	0.75	0.58	0.83	0.86	0.61	0.49	0.71	0.55	0.20	0.59	0.43	0.18	0.09
Private	0.75	0.48	0.69	1.61	1.04	1.07	2.06	1.42	1.29	1.58	2.23	1.34	0.63	2.26	1.97	0.77	0.33

[†] 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: Levels 6 and 7 were not available for the 2009 sample. The proficiency levels represent the following: Level 1—algebraic expressions; Level 2—multiplicative and proportional thinking; Level 3—algebraic equivalents; Level 4—systems of equations; Level 5—linear functions; Level 6—quadratic functions; Level 7—log and exponential functions (geometric sequences). Socioeconomic status is a measure of a family's relative social position. Further details are provided in appendix section A.11. Estimates weighted by W2W1STU. GED = General Educational Development, an alternative path to attaining a high school credential.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Public-Use File (NCES 2014-358).

Table B-9. Standard errors for mathematics performance for selected states: Average mathematics IRT-estimated number-correct scores, percentage of fall 2009 ninth-graders proficient in specific algebra knowledge and skills, and change in proficiency from 2009 to 2012, in states with state-representative data: Fall 2009 and Spring 2012

9.a. Reporting state	Mean algebra assessment estimated number-correct scores			Change
	Fall 2009	Spring 2012		
National, public schools only	0.30	0.45		0.22
California	1.00	1.51		0.77
Florida	1.28	1.89		0.74
Georgia	0.92	1.17		0.52
Michigan	0.93	1.26		0.50
North Carolina	1.05	1.67		0.91
Ohio	1.36	2.33		1.18
Pennsylvania	1.32	1.84		0.88
Tennessee	0.64	1.03		0.66
Texas	0.94	1.68		0.90
Washington	1.25	1.64		0.65

9.b. Reporting state	Percent proficient Spring 2012						
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
National, public schools only	0.38	0.72	0.83	0.70	0.58	0.19	0.09
California	0.99	2.23	2.77	2.52	2.19	0.82	0.38
Florida	1.22	2.75	3.41	3.24	2.64	0.80	0.36
Georgia	1.01	2.15	2.53	1.93	1.35	0.38	0.17
Michigan	1.37	1.98	2.17	2.19	1.84	0.56	0.26
North Carolina	1.35	2.46	2.66	2.76	2.45	0.92	0.45
Ohio	1.59	3.73	4.16	3.38	2.57	0.95	0.48
Pennsylvania	1.30	2.75	3.41	3.21	2.43	0.64	0.29
Tennessee	1.15	1.88	1.92	1.42	1.19	0.47	0.28
Texas	1.33	2.56	2.85	2.60	2.17	0.65	0.30
Washington	0.99	1.99	2.27	3.03	3.05	1.87	0.97

9.c. Reporting state	Gain in proficiency 2009–2012				
	Level 1	Level 2	Level 3	Level 4	Level 5
National, public schools only	0.38	0.41	0.44	0.41	0.47
California	1.30	1.46	1.67	1.45	1.71
Florida	1.86	1.68	1.49	1.43	1.72
Georgia	2.01	1.40	1.09	0.93	0.99
Michigan	1.22	1.63	1.42	0.84	1.24
North Carolina	1.28	2.06	1.87	1.26	1.66
Ohio	2.13	1.71	1.66	1.87	1.98
Pennsylvania	1.99	2.50	2.29	1.94	2.05
Tennessee	1.38	1.81	1.31	1.10	0.99
Texas	1.44	1.31	1.38	1.58	1.72
Washington	1.70	2.03	2.30	1.38	1.94

NOTE: The number-correct score has a potential range of 0–118. Levels 6 and 7 were not available for the 2009 sample and not included in panel 9c. The proficiency levels represent the following: Level 1—algebraic expressions; Level 2—multiplicative and proportional thinking; Level 3—algebraic equivalents; Level 4—systems of equations; Level 5—linear functions; Level 6—quadratic functions; Level 7—log and exponential functions (geometric sequences). Table 9 cannot be replicated from the public-use file; state indicators are available only on the restricted-use file. Estimates weighted by W2W1STU for panels 9a and 9c and W2STUDENT for panel 9b. IRT = item response theory.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. High School Longitudinal Study of 2009 (HSL:09) Base-Year to First Follow-up Restricted-Use File (NCES 2014-359).