

STATS IN BRIEF

U.S. DEPARTMENT OF EDUCATION

DECEMBER 2014

NCES 2015-990

Ninth-Graders' Mathematics Coursetaking, Motivations, and Educational Plans

AUTHORS

Lisa Hudson

Isaiah O'Rear

National Center for Education Statistics

Statistics in Brief publications present descriptive data in tabular formats to provide useful information to a broad audience, including members of the general public. They address simple and topical issues and questions. They do not investigate more complex hypotheses, account for inter-relationships among variables, or support causal inferences. We encourage readers who are interested in more complex questions and in-depth analysis to explore other NCES resources, including publications, online data tools, and public- and restricted-use datasets. See nces.ed.gov and references noted in the body of this document for more information.

Research indicates that

mathematics coursetaking is related to positive academic and economic outcomes. Studies have found that high school students who take more rather than fewer mathematics courses are more likely to attend college (Levine and Zimmerman 1995) and to have higher levels of educational attainment (Goodman 2011). Research also suggests high school students who complete higher level mathematics courses are more likely to attend college than are those who complete lower level mathematics courses (Lucas 1999) and are more likely to graduate from college (Rose and Betts 2001). Even among students with the same level of educational attainment, additional high school mathematics courses and higher levels of mathematics courses are associated with higher earnings as adults (Rose and Betts 2004).

For several decades, national longitudinal surveys have collected data on high school mathematics coursetaking and student demographics. Using these data, researchers have consistently found that students from lower socioeconomic status (SES) backgrounds take lower level courses than do those from higher SES backgrounds (Stevenson, Schiller, and Schneider 1994). This Brief uses more recent national data that include a new series of survey items to explore students' mathematics coursetaking and their motivations for this coursetaking.

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Previous research on students' course-taking motivations has been mostly qualitative and has focused on the expectations of school staff, parents, and peers (McDonough 1997). Using the new data, this Brief is able to examine a broad range of student-reported motivations for mathematics coursetaking.

Of particular interest here is how mathematics coursetaking, motivations for this coursetaking, and students' plans for after high school interact. The Brief explores this issue in several ways. First, it examines the relationship between students' coursetaking and their plans for the year after high school. Second, it examines self-reported motivations for coursetaking and their relationship to future plans. Finally, previous research has shown that students from higher SES backgrounds pursue more education than those from lower SES backgrounds (Rouse and Barrow 2006; Schnabel et al. 2002), which might

explain SES differences in mathematics coursetaking. This Brief examines whether SES differences in mathematics coursetaking remain when comparing students with the same plans for after high school.

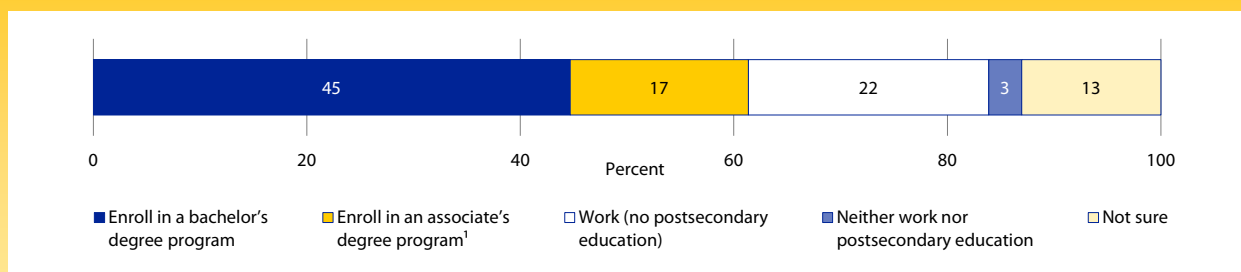
Data for this Brief were derived from the Base-Year collection of the High School Longitudinal Study of 2009 (HSLs:09). Sponsored by the National Center for Education Statistics (NCES), HSLs:09 is a nationally representative, longitudinal study of students who were in the ninth grade in fall 2009. HSLs:09 focuses on understanding students' trajectories from the start of high school into higher education and the workforce and includes items on pathways into and out of science, technology, engineering, and mathematics (STEM). All comparisons of estimates reported in this Brief were tested for statistical significance using the Student's *t*-statistic, and all differences cited are statistically significant at

the $p < .05$ level.¹ For the analysis in this Brief, students were divided into mutually exclusive groups based on their plans for the year after high school (figure 1): students who plan to enroll in a bachelor's degree program; students who plan to enroll in an associate's degree program (whether or not they plan to later transfer to a bachelor's degree program); students who plan to work without also enrolling; students who plan to neither work nor enroll; and students who are not sure what they will do. In addition to examining students overall, the rest of this Brief focuses on the three groups of students with definite college or career plans for the year after high school: those planning to enroll in a bachelor's degree program (45 percent of ninth-graders); those planning to enroll in an associate's degree program (17 percent); and those planning to work without enrolling in further education (22 percent).

FIGURE 1.

STUDENTS' PLANS FOR THE YEAR AFTER HIGH SCHOOL

Percentage distribution of ninth-graders, by their plan for the year after high school: 2009



¹ Includes students who reported that their plan for the year after high school was to enroll in both an associate's degree program and a bachelor's degree program.

NOTE: More precise estimates and standard errors are available in supplemental tables 1 and S1 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSLs:09), Base-Year Restricted-Use File.

¹ No adjustments were made for multiple comparisons. All estimates and their standard errors can be found in the supplemental tables at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

STUDY QUESTIONS

1

How does mathematics coursetaking differ among students with different post-high-school plans?

2

What motivates students' mathematics coursetaking; in particular, what roles do college and career needs play as motivators?

3

Among students with the same post-high-school plans, do students from different socioeconomic backgrounds differ in terms of their mathematics coursetaking and their motivation for mathematics coursetaking?

KEY FINDINGS

- Compared with ninth-graders planning to enter the workforce or to enter an associate's degree program, a larger percentage of those planning to enter a bachelor's degree program enrolled in mathematics above algebra I in grade 9, and a larger percentage plan to take at least 4 years of high school mathematics (figure 2). Conversely, a smaller percentage of those planning to enter the workforce (rather than enrolling in post-secondary education) took mathematics above algebra I or plan to take at least 4 years of mathematics. Ninth-graders who

plan to enroll in an associate's degree program fall in between these groups on both measures.

- Ninth-graders' plans for high school mathematics coursetaking are most often motivated by *college*² (figure 3). A minority of students reported that *career needs* motivate their coursetaking, and no more than 5 percent reported being motivated by *career needs* independently of *college* (figure 4).
- Compared with those planning to work (only), a larger percentage of ninth-graders who plan to enroll in either a bachelor's or an associate's degree program reported that both

college **and** *career needs* motivate their coursetaking plans (figure 5).

- Generally, among ninth-grade students who have the same plan for the year after high school, a larger percentage of students from higher socioeconomic backgrounds than from lower socioeconomic backgrounds took higher levels of high school mathematics (figure 9) and reported that their mathematics coursetaking is motivated by *college*, *parent encouragement*, and *school encouragement* (figures 10–12).

² The HSLS:09 included a list of six specific motivators (in addition to *other* or *no reason*). Each individual motivator is presented in this Brief in italics: (1) *college entry or success* (sometimes shortened to *college*), (2) *school requirements*, (3) *personal interest*, (4) *career needs*, (5) *parent encouragement*, and (6) *school encouragement*.

1

How does mathematics coursetaking differ among students with different post-high-school plans?

Ninth-graders' current mathematics coursetaking can be categorized into three levels, based on the highest course taken:³

- No mathematics or mathematics below algebra I (e.g., general mathematics);
- Algebra I (including integrated mathematics I); and
- Mathematics above algebra I (e.g., algebra II, geometry).

In fall 2009, more than half of ninth-graders (52 percent) were taking algebra I, and an additional 29 percent were taking mathematics above algebra I (table 1). The remaining 19 percent is composed of 10 percent who were not taking a mathematics course and 9 percent who were taking a mathematics course below algebra I. In terms of their future mathematics

TABLE 1.

MATHEMATICS COURSETAKING Percentage distributions of ninth-grade students, by current mathematics coursetaking and planned years of future mathematics coursetaking: 2009

Student characteristic	Percent of ninth-graders
Highest level of mathematics course taken in grade 9	
No mathematics	10.3
Mathematics below algebra I	9.0
Algebra I	52.1
Mathematics above algebra I	28.7
Planned years of high school mathematics coursetaking	
1 or 2 years	11.5
3 years	27.2
4 or more years	61.3

NOTE: Detail may not sum to 100 because of rounding. Standard errors are available in supplemental table S1 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

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 Restricted-Use File.

coursetaking, 89 percent of ninth-graders reported that they plan to take 3 or more years of mathematics during

high school, and most (61 percent) reported that they plan to take 4 or more years.⁴

³ The full set of courses within each of these categories is listed in the "Technical Notes" section.

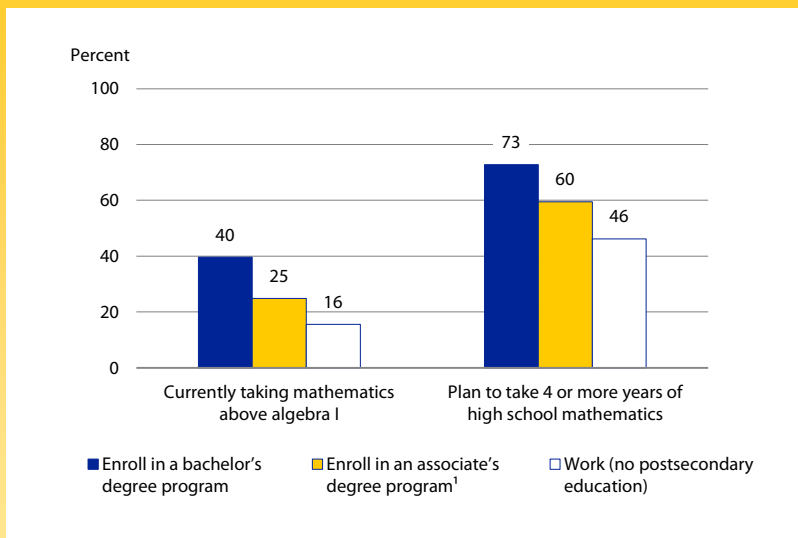
⁴ Students can take more than 4 years of mathematics by taking more than one mathematics course in a year.

Coursetaking by post-high-school plans.

As figure 2 shows, ninth-graders' current mathematics coursetaking and plans for future mathematics coursetaking vary according to students' post-high-school plans. Students who plan to enroll in a bachelor's degree program were the group with the largest percentage taking mathematics above algebra I in grade 9 and the group with the largest percentage planning to take at least 4 years of high school mathematics, while students planning to enter the workforce (with no postsecondary enrollment) were the group with the smallest percentage taking mathematics above algebra I in grade 9 and with the smallest percentage planning to take at least 4 years of high school mathematics. Students who plan to enroll in an associate's degree program fall in between "bachelor's degree" and "work" students on these measures.

FIGURE 2.

MATHEMATICS COURSETAKING, BY POST-HIGH-SCHOOL PLANS
Percentage of ninth-graders taking mathematics above algebra I and percentage who plan to take 4 or more years of high school mathematics, by plan for the year after high school: 2009



¹Includes students who reported that their plan for the year after high school was to enroll in both an associate's degree program and a bachelor's degree program.

NOTE: This figure excludes the 16 percent of students whose future plan was "Neither work nor postsecondary education" or "Not sure." More precise estimates and standard errors are available in supplemental tables 3 and S3 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

2 What motivates students' mathematics coursetaking; in particular, what roles do college and career needs play as motivators?

Overall, about two-thirds of ninth-graders (68 percent) reported that they were taking their current mathematics course (or courses) because their high school required it in some way: Either they had no choice (there were no other offerings or the course was assigned to them), or they needed to take the course to meet high school graduation requirements.⁵ Of more interest for this analysis is what motivates students' **future** mathematics coursetaking, for which students typically have more choice.

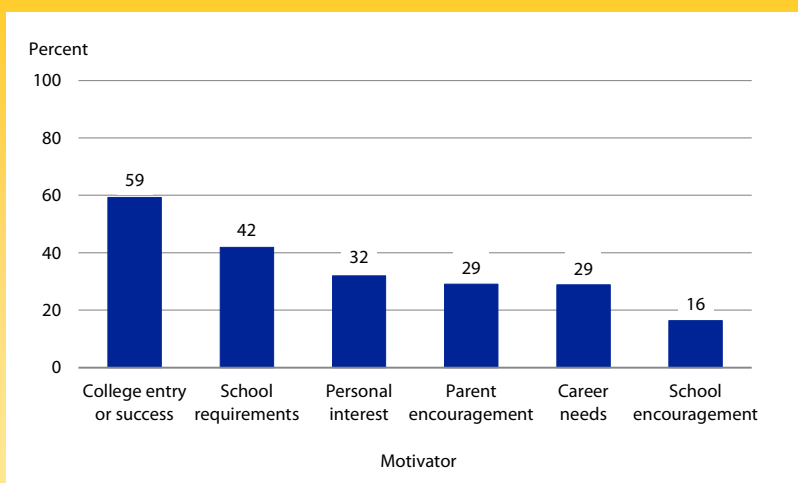
As seen in figure 3, *college (entry or success)* was the predominant motivator for students' future mathematics coursetaking, reported by 59 percent of ninth-graders. *School requirements* was the second most common motivator (42 percent). *Personal interest*, *career needs*, and *parent encouragement* were each reported by 29–32 percent of students, and *school encouragement* was the least commonly mentioned motivator (16 percent). Thus, compared with *college*, *career needs* was reported as a course-taking motivator by about half as many students (29 versus 59 percent).

College versus career as motivators.

Because students could select more than one motivator for their coursetaking, it is possible to examine the extent to which students are motivated by

FIGURE 3.

MOTIVATORS FOR MATHEMATICS COURSETAKING
Percentage of ninth-graders who selected each motivator for their future high school mathematics coursetaking: 2009

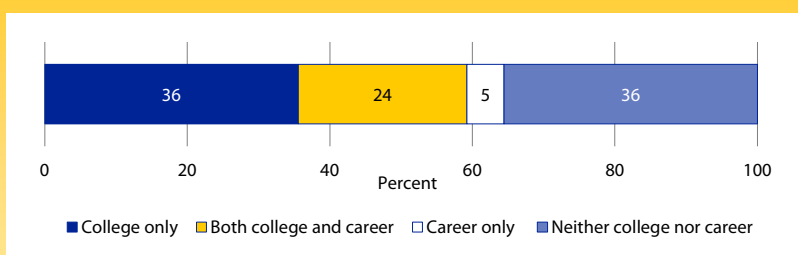


NOTE: This figure excludes the "Other or no reason" motivator category. More precise estimates and standard errors are available in supplemental tables 2 and S2 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HLS:09), Base-Year Restricted-Use File.

FIGURE 4.

OVERLAP OF COLLEGE AND CAREER AS COURSETAKING MOTIVATORS
Percentage distribution of ninth-graders, by college versus career motivation for future high school mathematics coursetaking: 2009



NOTE: Detail may not sum to 100 because of rounding. More precise estimates and standard errors are available in supplemental tables 2 and S2 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HLS:09), Base-Year Restricted-Use File.

both *college* and *career needs* rather than just one. As figure 4 shows, 24 percent of ninth-graders reported that their future

mathematics coursetaking was motivated by both *college* and *career needs*. Overall, 36 percent selected *college* as a

⁵ Data not in figures; see supplemental table 2 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

motivator independently of *career needs*, while 5 percent selected *career needs* as a motivator independently of *college*. In other words, most (82 percent) of the students whose future mathematics coursetaking is motivated by *career needs* are also motivated by *college*.⁶

One potential reason *career needs* is mentioned less frequently than

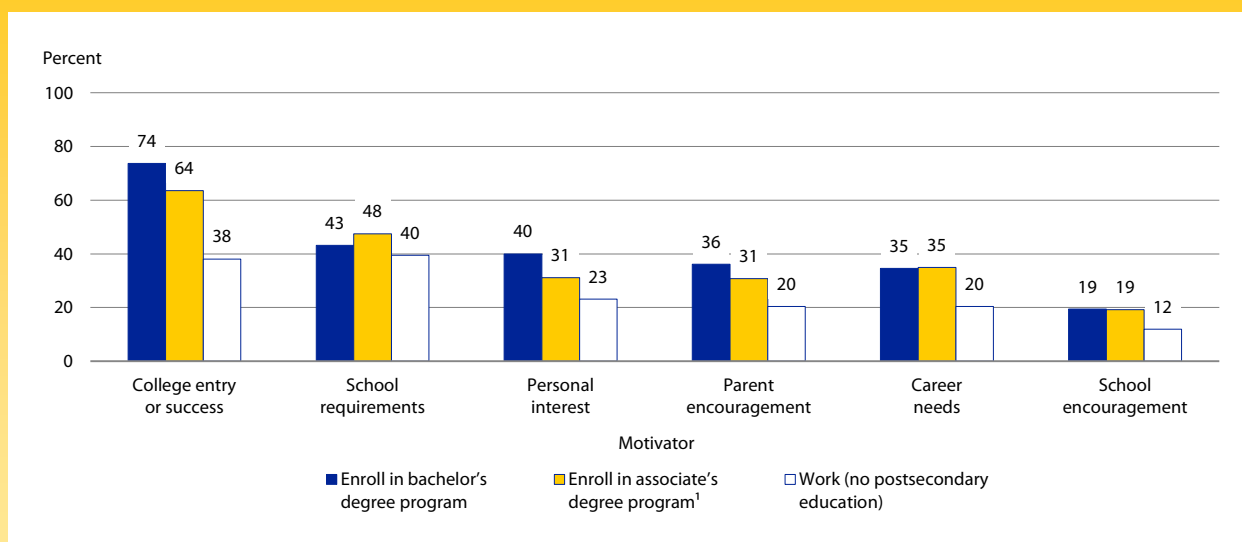
college as a motivator for mathematics coursetaking is that more students plan to go directly from high school into postsecondary education than into the labor force. However, figure 5 shows that college plans do not fully explain the comparatively low motivational role of careers. Specifically, a larger percentage of students who plan to enroll in either a bachelor's or an associate's

degree program after high school, compared with those planning to work, reported that their future mathematics coursetaking is motivated by each specific listed factor—including *career needs*. In short, work-bound students were less likely than college-bound students to report *career needs* as a motivator.

FIGURE 5.

COURSETAKING MOTIVATORS, BY POST-HIGH-SCHOOL PLANS

Percentage of ninth-graders who reported each motivator for their future high school mathematics coursetaking, by plan for the year after high school: 2009



¹ Includes students who reported that their plan for the year after high school was to enroll in both an associate's degree program and a bachelor's degree program.

NOTE: This figure excludes the "Other or no reason" motivator category and the 16 percent of students whose future plan was "Neither work nor postsecondary education" or "Not sure." More precise estimates and standard errors are available in supplemental tables 3 and S3 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

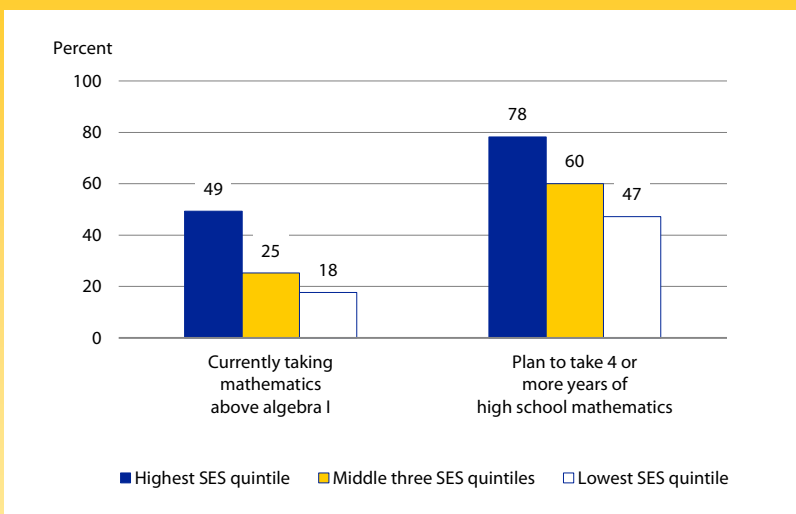
⁶ These findings do not mean that students see mathematics as irrelevant to work. When asked if their current mathematics course is useful for a future career, 84 percent of ninth-graders agreed that it is (see supplemental table 1 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>).

3 Among students with the same post-high-school plans, do students from different socioeconomic backgrounds differ in terms of their mathematics coursetaking and their motivation for mathematics coursetaking?

Consistent with previous research, a larger percentage of ninth-graders from higher SES backgrounds than from lower SES backgrounds took mathematics above algebra I or plan to take at least 4 years of high school mathematics (figure 6).⁷ Similarly, a larger percentage of ninth-graders from higher rather than lower SES backgrounds plan to enter a bachelor's degree program in the year after high school, and a smaller percentage plan to enter an associate's degree program or the workforce (figure 7). Finally, motivations for taking more mathematics in high school also varied by SES (figure 8), with a larger percentage of students from higher rather than lower SES backgrounds being motivated by *college, parent encouragement, and personal interest*; those from the highest SES quintile also were more often motivated by *career needs* and *school encouragement* than were those from lower SES levels.

FIGURE 6.

MATHEMATICS COURSETAKING, BY SOCIOECONOMIC STATUS (SES)
Percentage of ninth-graders taking mathematics above algebra I and percentage who plan to take 4 or more years of high school mathematics, by SES: 2009



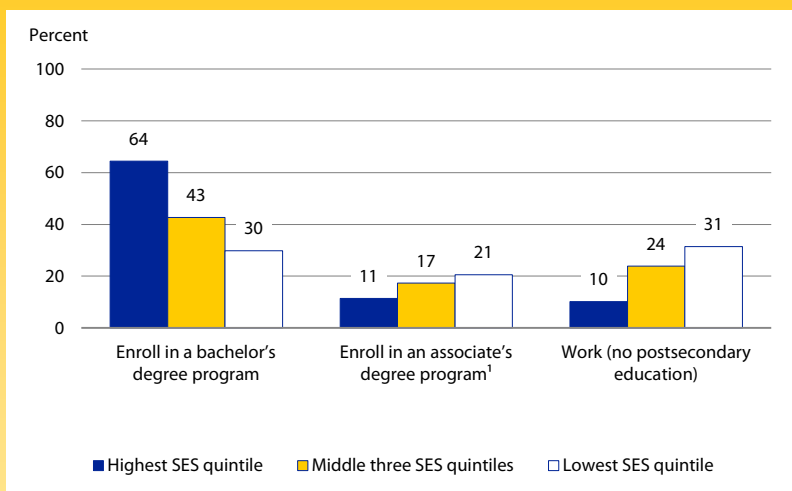
NOTE: SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. More precise estimates and standard errors are available in supplemental tables 4 and S4 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

⁷ For this analysis, students were divided into three groups based on their family SES level compared with that of other HSL:09 students: those in the lowest SES quintile (i.e., lowest one-fifth of SES levels); those in the middle three SES quintiles (referred to here as the "mid-SES quintiles"); and those in the highest SES quintile.

These findings lead to the third key question addressed in this Brief, as they raise the possibility that SES differences in coursetaking and motivations for coursetaking may be associated with the different educational plans of students from different SES backgrounds. The remainder of this section examines this issue, looking at the coursetaking and coursetaking motivations of students who have the same post-high-school plans, but different SES backgrounds.

FIGURE 7.

PLANS FOR THE YEAR AFTER HIGH SCHOOL, BY SOCIOECONOMIC STATUS (SES)
Percentage of ninth-graders who have each plan for the year after high school, by SES: 2009



¹ Includes students who reported that their plan for the year after high school was to enroll in both an associate's degree program and a bachelor's degree program.

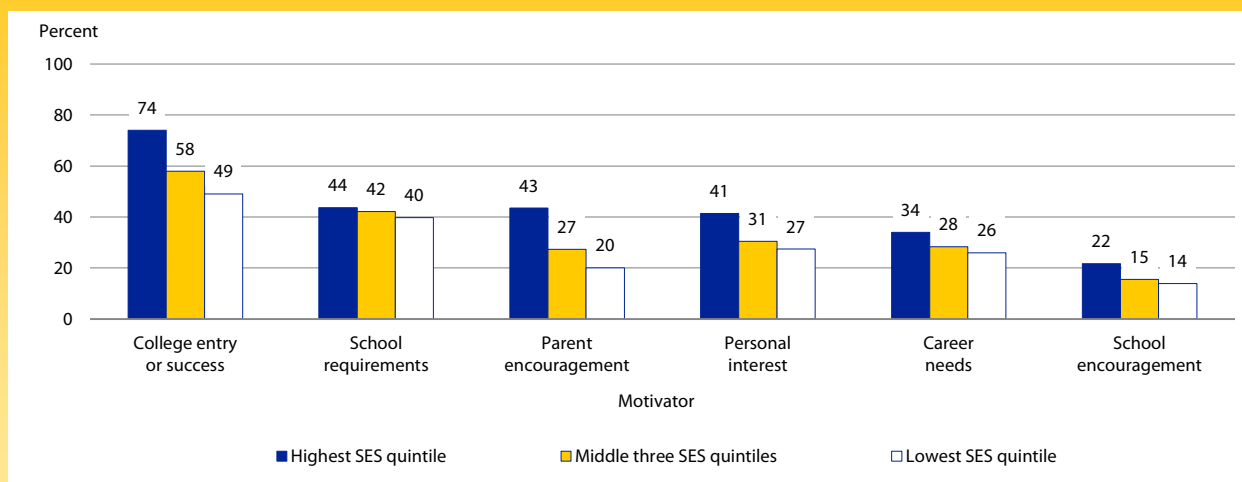
NOTE: SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. This figure excludes the 16 percent of students (overall) whose future plan was "Neither work nor postsecondary education" or "Not sure." More precise estimates and standard errors are available in supplemental tables 4 and S4 at

<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

FIGURE 8.

COURSETAKING MOTIVATORS, BY SOCIOECONOMIC STATUS (SES)
Percentage of ninth-graders who reported each motivator for their future high school mathematics coursetaking, by SES: 2009



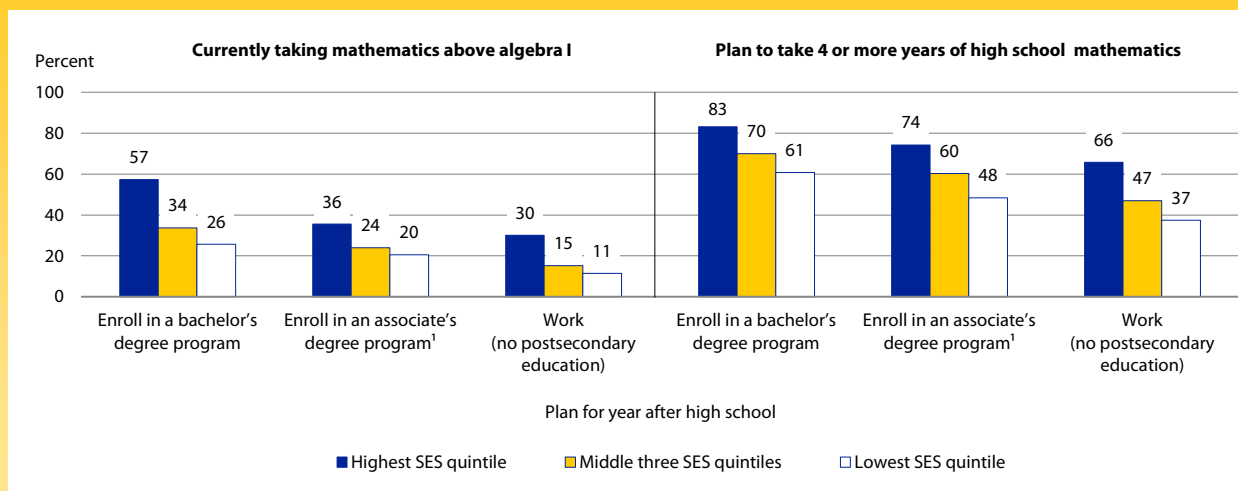
NOTE: SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. This figure excludes the "Other or no reason" motivator category. More precise estimates and standard errors are available in supplemental tables 4 and S4 at

<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

FIGURE 9.

MATHEMATICS COURSETAKING, BY POST-HIGH-SCHOOL PLANS AND SOCIOECONOMIC STATUS (SES)
Percentage of ninth-graders who are currently taking mathematics above algebra I and percentage who plan to take 4 or more years of high school mathematics, by their plan for the year after high school and SES: 2009



¹ Includes students who reported that their plan for the year after high school was to enroll in both an associate's degree program and a bachelor's degree program.

NOTE: SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. This figure excludes the 16 percent of students (overall) whose future plan was "Neither work nor postsecondary education" or "Not sure." More precise estimates and standard errors are available in supplemental tables 5 and 55 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

Coursetaking. Generally, differences in coursetaking by SES remain when one compares students who have the same plan for the year after high school. First, figure 9 shows that among ninth-graders who plan to enter a bachelor's degree program after high school, 57 percent from the highest SES quintile were enrolled in mathematics above algebra I, compared with 34 percent of those from the mid-SES quintiles and 26 percent of those from the lowest SES quintile. A similar pattern exists for students planning to enter an associate's degree program⁸ and for students

planning to work. Second, figure 9 shows that among students with the same plan for after high school larger percentages of students from higher than lower SES backgrounds reported that they plan to take at least 4 years of mathematics during high school. For example, among students who plan to enroll in a bachelor's degree program in the year after high school, 83 percent of students from the highest SES quintile plan to take at least 4 years of mathematics, compared with 70 percent of those from the mid-SES quintiles and 61 percent of those from the lowest SES quintile.

Motivation for coursetaking.

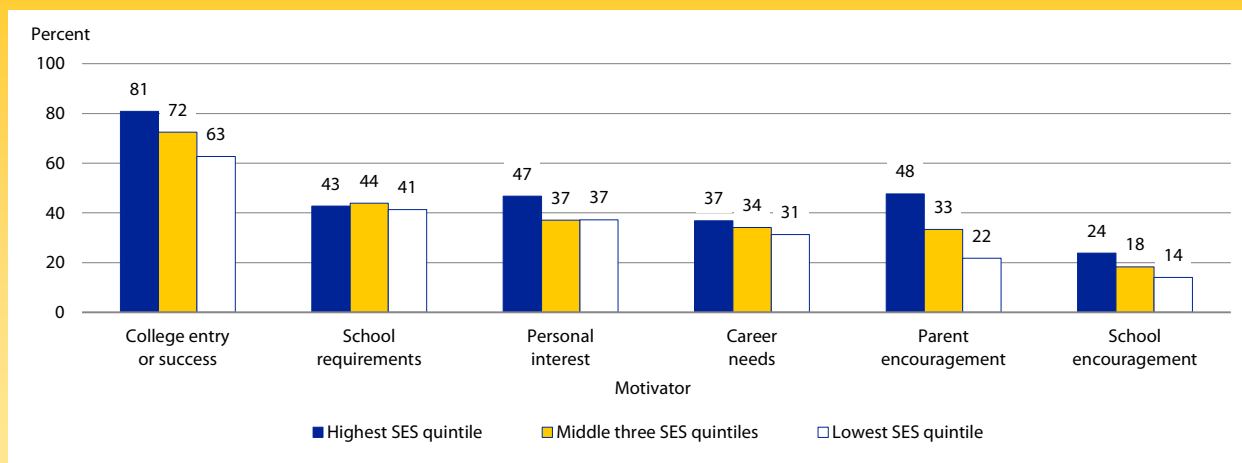
Figures 10–12 show that students' motivations for future mathematics coursetaking often differ among students who have the same educational plans but different SES backgrounds. First, a larger percentage of students from the highest SES background, compared with those from lower SES backgrounds, reported that their future mathematics coursetaking is motivated by *college*, by *parent encouragement*, and by *school encouragement*; this was true for all three groups of students—those seeking a bachelor's degree, those seeking an associate's degree, and

⁸ For students planning to enroll in an associate's degree program, a higher percentage of students from the highest SES quintile than from the two lower SES quintile groups took mathematics above algebra I in grade 9, but there was no detectable difference between students in the mid-SES quintiles and the lowest quintile.

FIGURE 10.

COURSETAKING MOTIVATORS FOR STUDENTS PLANNING TO ENTER A BACHELOR'S DEGREE PROGRAM, BY SOCIOECONOMIC STATUS (SES)

Among ninth-graders who plan to enter a bachelor's degree program in the year after high school, the percentage who reported each motivator for their future high school mathematics coursetaking, by SES: 2009



NOTE: SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. This figure excludes the "Other or no reason" motivator category. More precise estimates and standard errors are available in supplemental tables 6 and S6 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

those planning to enter the workforce.⁹ Among students planning to enter a bachelor's degree program, this pattern extends across the three SES levels. Thus, for example, 81 percent of bachelor's-bound students from the highest SES quintile reported that *college* motivated their future mathematics coursetaking, compared with 72 percent from the mid-SES quintiles and 63 percent from the lowest SES quintile.

Second, *personal interest* was more often reported as a motivator for coursetaking by students from the highest SES background than from lower SES backgrounds, among both

students seeking an associate's degree and students planning to enter the workforce.¹⁰ Among students seeking a bachelor's degree, no detectable differences were found in the percentage of students from different SES backgrounds who reported that *personal interest* motivated their coursetaking.

Finally, *school requirements* was more often reported as a motivator for coursetaking by students from the highest SES background than from lower SES backgrounds, among both students who plan to enroll in an associate's degree program and students planning to enter the workforce.¹¹

Among students seeking a bachelor's degree, no detectable differences were found in the percentage of students from different SES backgrounds who reported that *school requirements* motivated their coursetaking.

In summary, differences in students' mathematics coursetaking and their motivations for taking mathematics depend not just on students' plans for the year after high school, but also on their SES background independently of those plans. Students from higher SES backgrounds took more mathematics courses than their lower SES peers with the same post-high-school plan. Generally, students from high-SES backgrounds also reported being more motivated than their lower SES peers by *college*, *parent encouragement*, and *school encouragement*, regardless of their plan for the year after high school.

⁹ Among students planning to enroll in an associate's degree program, a larger percentage of students from the highest SES quintile reported *parent encouragement* as a motivator, compared with (only) students in the mid-SES quintiles. Similarly, among students who plan to enter the workforce, a larger percentage of students from the highest SES quintile reported *school encouragement* as a motivator, compared with (only) students in the mid-SES quintiles.

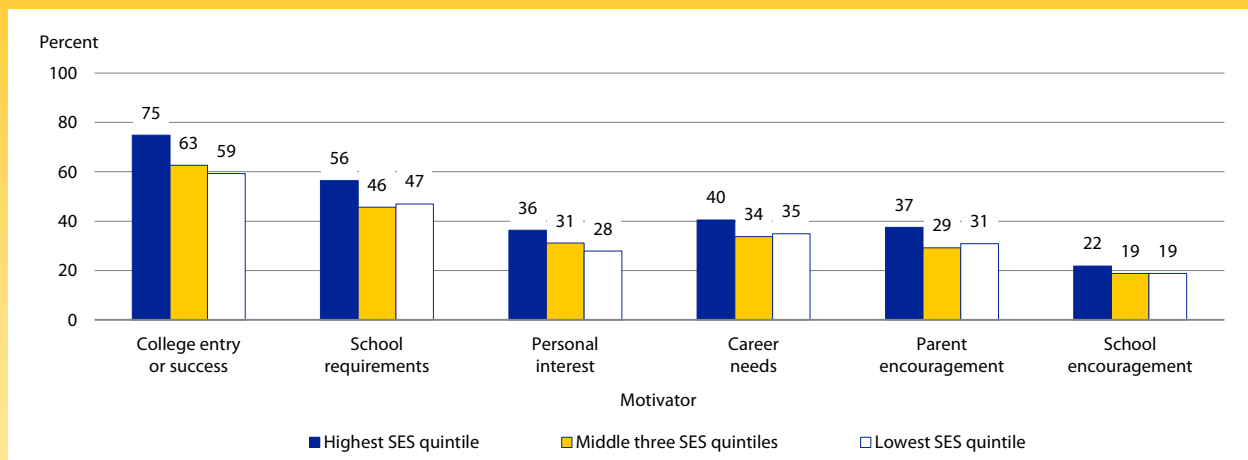
¹⁰ Among students planning to enroll in an associate's degree program, a larger percentage of those from the highest SES quintile than from the lowest SES quintile reported *personal interest* as a motivator.

¹¹ A larger percentage of work-bound students from the highest SES quintile and the mid-quintiles, compared with those from (only) the lowest SES quintile, reported *school requirements* as a motivator.

FIGURE 11.

COURSEWORK MOTIVATORS FOR STUDENTS PLANNING TO ENTER AN ASSOCIATE'S DEGREE PROGRAM, BY SOCIOECONOMIC STATUS (SES)

Among ninth-graders who plan to enter an associate's degree program in the year after high school, the percentage who reported each motivator for their future high school mathematics coursetaking, by SES: 2009



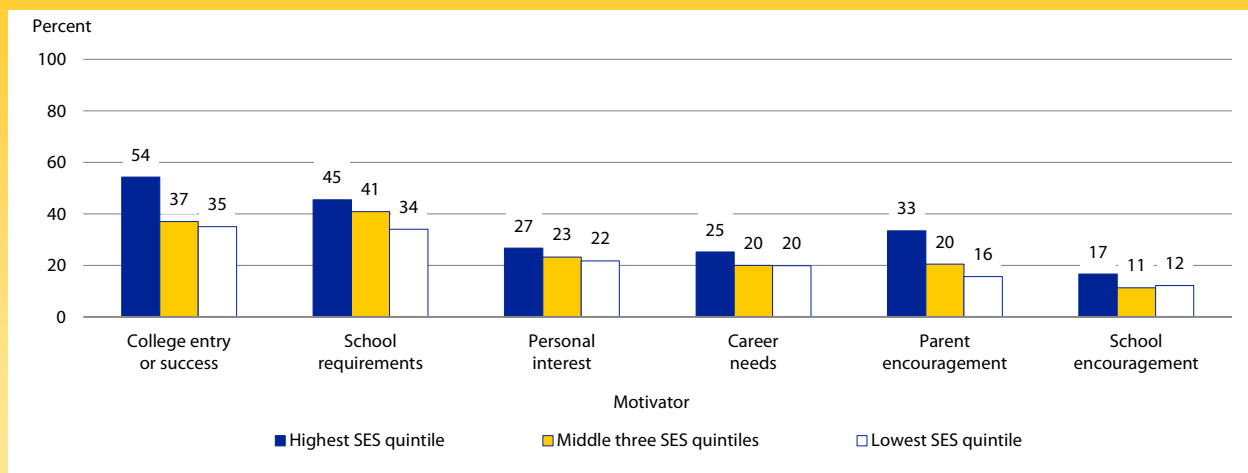
NOTE: Figure includes students who reported that their plan for the year after high school was to enroll in both an associate's degree program and a bachelor's degree program. SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. This figure excludes the "Other or no reason" motivator category. More precise estimates and standard errors are available in supplemental tables 6 and S6 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

FIGURE 12.

COURSEWORK MOTIVATORS FOR STUDENTS PLANNING TO ENTER THE WORKFORCE, BY SOCIOECONOMIC STATUS (SES)

Among ninth-graders who plan to enter the workforce in the year after high school, the percentage who reported each motivator for their future high school mathematics coursetaking, by SES: 2009



NOTE: SES is a composite measure derived from parents' education level, occupation, and income; this variable was fully imputed for 24 percent of students and partially imputed for 8 percent of students. This figure excludes the "Other or no reason" motivator category. More precise estimates and standard errors are available in supplemental tables 6 and S6 at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2009 High School Longitudinal Study of 2009 (HSL:09), Base-Year Restricted-Use File.

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<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015990>

More information from the 2009 High School Longitudinal Study can be found in the following publications produced by the National Center for Education Statistics (NCES):

High School Longitudinal Study of 2009 (HSLS:09). A First Look at Fall 2009 Ninth-Graders' Parents, Teachers, School Counselors, and School Administrators (NCES 2011-355).
<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2011355>

High School Longitudinal Study of 2009 (HSLS:09). A First Look at Fall 2009 Ninth-Graders (NCES 2011-327).
<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2011327>

Another NCES report, based on the 2009 National Assessment of Educational Progress (NAEP) High School Transcript Study, provides additional information on student coursetaking for the high school graduating class of 2009:

The Nation's Report Card: America's High School Graduates (NCES 2011-462).
<http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2011462>

TECHNICAL NOTES

This section describes the survey methodology for the HSLs:09, the survey's response rates, the procedures used to test for statistical significance, and the variables used for the analysis in this Statistics in Brief. More detailed information on the survey methodology and response rates is available in the HSLs:09 data documentation report (Ingels et al. 2011).

Survey Methodology

The estimates provided in this Statistics in Brief are from data collected through the NCES base-year HSLs:09. Starting with a cohort of students who were in the ninth grade in fall 2009, the HSLs:09 follows students throughout their high school and early adult years, to understand students' trajectories from the beginning of high school into postsecondary education, the workforce, and beyond. The HSLs:09 Base-Year survey included a mathematics assessment and a student questionnaire, as well as questionnaires administered to students' parents, mathematics or science teachers, counselors, and school administrators. The student background questionnaire collected information on students' demographic characteristics, socioeconomic status (SES), mathematics and science coursetaking, attitudes toward mathematics and science, and sources of information for course choices, as well as information on issues related to educational and career plans, and school and social experiences related to these plans. The analysis in this

Brief used the HSLs:09 student questionnaire data file, which includes a measure of family socioeconomic status (SES) derived from information originally obtained in the HSLs:09 parent questionnaire.

The HSLs:09 included a school target population and a student target population. The school target population is regular public schools (including public charter schools) and private schools in the 50 United States and the District of Columbia providing instruction to students in both the 9th and 11th grades. The corresponding target population for students is all ninth-grade students who attended the target population schools in fall 2009.

To select students for the HSLs:09, students were sampled using a two-stage process. First, a stratified random sample of schools (stratified based on school type or sector, region, and locale) resulted in the identification and contacting of 1,889 eligible schools. In the second stage of sampling, students were randomly selected from school enrollment rosters, with 25,206 eligible student selections (about 27 students per school). Of the 25,206 eligible students, 24,658 were classified as capable of completing a questionnaire or an assessment.

Estimates were weighted to adjust for the unequal probability of selection into the sample and for nonresponse. For HSLs:09, five sets of analytic weights were computed: a school-level weight, an unlinked student-level weight, two student-level weights

associated with contextual data from mathematics and science courses, and a student-level weight for use with parent-supplied family and home contextual data. For this Statistics in Brief, the unlinked student-level weight W1STUDENT was used.

Two broad categories of error occur in estimates generated from surveys: sampling and nonsampling errors. Sampling errors occur when observations are based on samples rather than on entire populations. The standard error of a sample statistic is a measure of the variation due to sampling and indicates the precision of the statistic. The complex sampling designs used in the HSLs:09 must be taken into account when calculating variance estimates such as standard errors. The analysis for this Statistics in Brief used variance estimation provided through Taylor series linearization. Although HSLs:09 used balanced repeated replication for variance estimation/standard error calculation, the methods produce similar results.

Nonsampling errors can be attributed to several sources: incomplete information about all respondents (e.g., some students or schools refused to participate or students participated but answered only certain items); differences among respondents in question interpretation; inability or unwillingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, sampling, and imputing missing data. Standard quality control procedures

were followed in the HSLs:09 data collection process in order to minimize nonsampling errors.

Response Rates and Nonresponse Bias

NCES requires that for any stage of data collection yielding a response rate below 85 percent, the data must be evaluated for nonresponse bias (U.S. Department of Education 2002). For this Brief, this requirement pertains to *unit* response rates—representing the percentage of schools completing the school questionnaire, the percentage of parents completing the parent questionnaire, and the percentage of students completing the student questionnaire—and *item* response rates for each of the items within these surveys that was used in this analysis.

The (weighted) unit response rates were 56 percent for the school questionnaire, 68 percent for the parent questionnaire, and 86 percent for the student questionnaire. Although these rates require a nonresponse bias analysis only for the school and parent questionnaires, a nonresponse bias analysis was also performed on the student questionnaire

because response rates within certain domains were below the 85 percent level. These analyses determine whether statistically detectable differences exist between estimates calculated for questionnaire respondents and nonrespondents and result in adjustments to the analytic weights to minimize identified differences. Table A-1 provides a summary of the results of these analyses and weighting adjustments.

Adjusting for nonresponse requires comparable information on respondents and nonrespondents. For the school nonresponse bias analysis, some information about nonresponding schools was available from the sampling frame. In addition, nonresponding schools were also asked to complete an abbreviated school characteristics questionnaire, which gathered information about basic characteristics of the refusing schools. The nonresponse analysis thus involved two adjustments: one for nonresponding schools that had completed the nonresponding school questionnaire, and one for schools that had not completed that questionnaire.

For the student nonresponse bias analysis, some information on nonresponding students was available from schools' enrollment lists, and school characteristics were also used as analysis variables. For the parent nonresponse bias analysis, information on nonresponding parents was not available. Therefore, student and school characteristics used in the student-level nonresponse bias analysis were used to create a home-life contextual analytic weight.

The item response rates for the items used in this Brief were all above 85 percent (see "Variables Used" section below). However, one variable—a composite measure of SES—was originally collected on the parent survey and was thus missing for the 23.9 percent of students whose parents did not complete a parent survey. (See table A-1 for additional details about potential bias due to parents' nonresponse.) For these students, the SES measure was fully imputed, as described in the "Variables Used" section (and in more detail in Ingels et al., 2011). At least one of the components was missing for

TABLE A-1. Summary statistics for response rates and nonresponse bias analyses, by HSLs:09 questionnaire

Questionnaire	Weighted response rate	Number of <i>t</i> tests	Percent of tests with bias ¹		Median absolute relative bias (percent) ²		
			Before adjustment	After adjustment	Before adjustment	After adjustment	Change
School	55.5	55	45.5	20.0	12.0	5.8	-6.2
Student	85.7	60	18.3	#	1.2	0.1	-1.1
Parent	67.5	60	23.3	1.7	1.5	0.6	-0.9

Rounds to zero.

¹ Percent of tests with bias significantly different from zero at the 0.05 significance level.

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.

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.

7.8 percent of the students. For these students, the SES measure was partially imputed as described below.

Statistical Procedures

Comparisons of estimated proportions were tested using Student's t statistic. Differences between the estimates were tested against the probability of a Type I error¹² or significance level. The statistical significance of each comparison was determined by calculating the Student's t value for the difference between each pair of proportions and comparing the t value with published tables of significance levels for two-tailed hypothesis testing. Student's t values were computed to test differences between independent estimates using the following formula:

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

where E_1 and E_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors.

There are hazards in reporting statistical tests for each comparison. First, comparisons that produce large t statistics may appear to merit special attention. This can be misleading because the magnitude of the t statistic is related not only to the observed differences in percentages, but also to the number of respondents in the specific categories used for comparison. Hence,

a small difference compared across a large number of respondents would produce a large (and possibly statistically significant) t statistic.

A second hazard in reporting statistical tests is the possibility of a "false positive" or Type I error. Statistical tests are designed to limit the risk of this type of error using a value denoted by alpha. The standard alpha level of .05 was selected for findings in this Brief. This alpha level ensures that, in situations where there is no actual difference between the compared quantities in the population, a tested difference of a certain magnitude or larger would be produced no more than 1 time out of 20 (no adjustments were made for multiple comparisons). When t -tests have alpha values at the .05 level or smaller, the analyst rejects the null hypothesis that there is no difference between the compared quantities. Failing to reject a null hypothesis (i.e., failing to detect a difference), however, does not imply the compared quantities are the same or equivalent.

Variables Used

The following variables used in this Brief were obtained from the HSLs:09 base-year student file or derived from the variables in that file. With one exception, these variables were created from data collected in the base-year student survey. The exception is the "socioeconomic status quintile" variable, which was

created, as described below, from data collected in the base-year parent survey. In the descriptions below, variables that were taken from the HSLs:09 file are listed in capital letters, followed by the weighted item response rate.

Highest mathematics course taken in ninth grade

This variable is based on the question "Are you currently taking a math course this fall?" and the follow-up question "What math course(s) are you currently taking this fall?" Responses to these questions were used to create a variable that indicates the highest level of mathematics course the student is taking.

1. Mathematics above algebra I:

The student responded "yes" to taking "Geometry" (S1GEOM09, 98.8 percent), "Algebra II" (S1ALG2M09, 98.8 percent), "Trigonometry" (S1TRIGM09, 98.8 percent), "Statistics or Probability" (S1STATSM09, 98.8 percent), "Integrated Math II or above" (S1INTGM209, 98.8 percent), "Analytic Geometry" (S1ANGEOM09, 98.8 percent), or "Other advanced math course such as pre-calculus or calculus" (S1ADVM09, 98.8 percent).

2. Algebra I: The student is not in category (1), and the student responded "yes" to taking "Algebra I including IA and IB" (S1ALG1M09, 98.8 percent) or "Integrated Math I" (S1INTGM109, 98.8 percent).

¹² A Type I error occurs when one concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn when no such difference is present.

3. No mathematics or mathematics

below algebra I: The student is not in categories (1) or (2), and the student responded “yes” to taking “Review or remedial math including basic, business, consumer, functional or general math” (S1REVM09, 98.8 percent), “Pre-algebra” (S1PREALGM09, 98.8 percent), or “Other math course” (S1OTHM09, 98.8 percent), or the student responded “no” to “Are you currently taking a math course this fall?” (S1MFALL09, 99.1).

Number of years of mathematics student expects to take

This variable is based on the question “Including this year, how many years of math do you expect to take during high school?” (S1MYRS, 98.2 percent). Response options were “One year,” “Two years,” “Three years,” or “Four or more years.” For this analysis the “One year” and “Two years” responses were combined to create a “One or two years” category.

Current coursetaking motivated by personal interest

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “You really enjoy math” (S1MENJOYS, 98.2 percent) or “You like to be challenged” (S1MCHALLENGE, 98.2 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both

motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Current coursetaking motivated by school requirements

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “You had no choice, it is a school requirement” (S1MHSREQ, 98.2 percent) or “It was assigned to you” (S1MASSIGNED, 98.2 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Current coursetaking motivated by encouragement from school staff

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “The school counselor suggested you take it” (S1MCOUNSEL, 98.2 percent) or “A teacher encouraged you to take it” (S1MTEACHER, 98.2 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Current coursetaking motivated by encouragement from parents

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “Your parent(s) encouraged you to take it” (S1MPARENT, 98.2 percent). The variable takes the value “no” if the student responded “no” to this motivation. The variable takes a “missing” value if the response to this motivation is missing.

Current coursetaking motivated by college entry or success

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “You will need it to get into college” (S1MCLGADM, 98.2 percent) or “You will need it to succeed in college” (S1MCLGSUCC, 98.2 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Current coursetaking motivated by career needs

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “You will need it for your career” (S1MCAREER, 98.2 percent). The variable takes the value “no” if the student

responded “no” to this motivation. The variable takes a “missing” value if the response to this motivation is missing.

Current coursetaking motivated by other reason or no reason

This variable is based on the question “Why are you taking [fall 2009 math course]?” The variable takes the value “yes” if the student responded “yes” to “Some other reason” (S1MOTHREASN, 98.2 percent) or “You don’t know why you are taking this course” (S1MNOREASON, 98.2 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Future coursetaking motivated by personal interest

This variable is based on the question “What are the reasons you plan to take more math courses during high school?” The variable takes the value “yes” if the student responded “yes” to “You are good at math” (S1MREASGOOD, 97.1 percent) or “You enjoy studying math” (S1MREASENJOY, 97.1 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Future coursetaking motivated by school requirements

This variable is based on the question “What are the reasons you plan to take more math courses during high school?” The variable takes the value “yes” if the student responded “yes” to “Taking more math courses is required to graduate” (S1MREASREQ, 97.1 percent). The variable takes the value “no” if the student responded “no” to this motivation. The variable takes a “missing” value if the response to this motivation is missing.

Future coursetaking motivated by encouragement from school staff

This variable is based on the question “What are the reasons you plan to take more math courses during high school?” The variable takes the value “yes” if the student responded “yes” to “Your teachers will want you to” (S1MREASTCHR, 97.1 percent) or “Your school counselor will want you to” (S1MREASCNSL, 97.1 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Future coursetaking motivated by encouragement from parents

This variable is based on the question “What are the reasons you plan to take more math courses during high school?” The variable takes the value “yes” if the student responded “yes” to “Your parents will want you to”

(S1MREASPAR, 97.1 percent). The variable takes the value “no” if the student responded “no” to this motivation. The variable takes a “missing” value if the response to this motivation is missing.

Future coursetaking motivated by college entry or success

This variable is based on the question “What are the reasons you plan to take more math courses during high school?” The variable takes the value “yes” if the student responded “yes” to “Taking more math courses will be useful for getting into college” (S1MREASCLG, 97.1 percent) or “Taking more math courses will be useful in college” (S1MREASUSE, 97.1 percent). The variable takes the value “no” if the student responded “no” to both motivations. The variable takes a “missing” value if responses to both motivations are missing or if the response to one motivation is “no” and the response to the other motivation is missing.

Future coursetaking motivated by career needs

This variable is based on the question “What are the reasons you plan to take more math courses during high school?” The variable takes the value “yes” if the student responded “yes” to “You will need more math courses for the type of career you want” (S1MREASJOB, 97.1 percent). The variable takes the value “no” if the student responded “no” to this motivation. The variable takes a “missing” value if the response to this motivation is missing.

Future coursetaking motivated by other or no reason

This variable is based on the question “What are the reasons you plan to take more math courses during high school?”

The variable takes the value “yes” if the student responded “yes” to “Most students who are like you take a lot of math courses” (S1MREASLIKE, 97.1 percent); “Your friends are going to take more math courses” (S1MREASFRND, 97.1 percent); “Some other reason” (S1MREASOTH, 97.1 percent); or “You don’t know why, you just probably will” (S1MREASNOT, 97.1 percent). The variable takes the value “no” if the student responded “no” to all four motivations. The variable takes a “missing” value if responses to all four motivations are missing or if the response to one or more of these motivations is missing and the other responses are “no.”

Students’ plans for the year after high school

These variables are based on the question “What do you plan to do during your first year after high school?” The responses to this question are coded as a series of separate variables. Although students could respond affirmatively to more than one activity in the HSLS:09 questionnaire, the created variables are mutually exclusive.

1. Enroll in an associate’s degree program: The student responded “yes” to “Enroll in an Associate’s degree program in a two-year

community college or technical institute” (S1FYAA, 98.0 percent).

2. Enroll in a bachelor’s degree program: The student is not in category (1), and the student responded “yes” to “Enroll in a Bachelor’s degree program in a college or university” (S1FYBA, 98.0 percent).
3. Work, with no postsecondary education: The student is not in categories (1) or (2), and the student responded “yes” to “Attend a registered apprenticeship program” (S1FYAPPR, 98.0 percent), “Join the armed services” (S1FYMILITARY, 98.0 percent), or “Get a job” (S1FYJOB, 98.0 percent).
4. Neither work nor postsecondary education: The student is not in categories (1), (2), or (3), and the student responded “yes” to “Start a family” (S1FYFAMILY, 98.0 percent), “Travel” (S1FYTRAVEL, 98.0 percent), or “Do volunteer or missionary work” (S1FYVOLUN, 98.0 percent).
5. Not sure: The student responded “yes” to “Not sure what you want to do” (S1FYNOTSURE, 98.0 percent).

Socioeconomic status quintile

Socioeconomic status (SES) is a measure of the family’s relative position in society. Based on items in the HSLS:09 base-year parent questionnaire, a continuous SES index score was developed based on five variables: highest level

of education of each parent or guardian (X1PAR1EDU and X1PAR2EDU); the occupational prestige score of each parent or guardian (coded from occupation variables X1PAR1OCC6 and X1PAR2OCC6); and family income (X1FAMINCOME). For the 23.9 percent of weighted cases with nonresponding parents/guardians, five imputed values were generated (X1SES1-X1SES5), and X1SES was computed as the average of the five imputed values. For 7.8 percent of weighted cases, education, occupation, or family income were imputed using other information provided by the responding parent/guardian, and X1SES was constructed from the combination of actual and imputed parent/guardian values. For these cases, the values of X1SES1-X1SES5 are equivalent to X1SES. Finally, the SES index score was divided into quintiles (five equal groups) using the 20th, 40th, 60th and 80th percentiles, with quintile 1 corresponding to the lowest one-fifth of the population and quintile 5 to the highest one-fifth (X1SESQ5). For this Brief, the middle three quintiles of X1SESQ5 were combined to form one category. This approach provides SES categories of sufficient size for cross-sectional analysis, while also restricting the low and high ends of the distribution (the lowest and highest quintiles) to groups that can be reasonably interpreted as “low SES” and “high SES,” respectively.

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The 2009 High School Longitudinal Study data will be added to DataLab in the summer of 2015. At that point, you can replicate or expand upon the figures and tables in this report, or even create your own. DataLab has several different tools that allow you to customize and generate output from a variety of different survey datasets. Visit DataLab at:

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