Education and Career Planning in High School: A National Study of School and Student Characteristics and College-Going Behaviors

Appendix A. Sample, data source, and analysis methods

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See https://go.usa.gov/xertd for the full report.

Appendix A. Sample, data source, and analysis methods

This appendix presents expanded information about the sample, data, and methods used for the study, beginning with a discussion of the inclusion criteria used to define the original study sample. All sample sizes referenced in this appendix are rounded to the nearest 10 in accordance with Institute of Education Sciences (IES) restricted-use data disclosure standards.

Sample

The study sought to measure the self-reported education and career planning experiences of students enrolled in public schools. The study team defined a set of inclusion criteria to restrict the sample to individuals in the target population. The resulting restricted sample, or original study sample, refers to "the members of the target population from whom the study tried to collect data, regardless of whether the study actually obtained data" (Institute of Education Sciences, 2020). The study team defined the original study sample as students who began grade 9 enrolled in a public high school in the fall of 2009 and who remained enrolled in a public high school when surveyed again in spring 2012. To be included in the original study sample, a student had to have a record of enrollment in a public high school at both time points, as measured by High School Longitudinal Study of 2009 (HSLS:09) student enrollment records. Applying the study inclusion criteria resulted in an original study sample of about 18,900 observations, or 75.0 percent of the 25,206 students who were randomly selected to participate in the HSLS:09.

In addition, because the study examined student outcomes measured at a third time point, fall 2013, and because the study used weighting procedures to preserve the national representativeness of the sample, the original study sample of students was further restricted to students who remained in the HSLS:09 sample for all three time points and thus had a corresponding nonzero analytic weight for this period. Of the 25,206 students selected to participate in the original HSLS:09 sample, 15,857 (62.9 percent) met this additional criterion (Ingels et al., 2015). After this additional criterion was applied to the original study sample of about 18,900 students, the final analytic sample consisted of about 12,600 students who were present in the sample in all three survey waves, had an associated nonzero weight used to preserve the national representativeness of the sample, and met the study inclusion criteria (that is, they were enrolled in a public school at both time points at which high school experiences were measured). These roughly 12,600 students represented 50.0 percent of the original HSLS:09 sample and

79.5 percent of the 15,857 students who remained in the HSLS:09 sample through fall 2013. Collectively, they were enrolled in about 770 public high schools in the study base year (the 2009/10 school year), or 81.3 percent of the original HSLS:09 sample of 944 schools. The school sample was nationally representative of U.S. public high schools in the study base year (the 2009/10 school year). The student sample was nationally representative of first-time high school students who began grade 9 in a U.S. public high school in fall 2009 and remained enrolled in a public high school in spring 2012.

Data source

The data for this study came from the National Center for Education Statistics' (NCES) HSLS:09. The HSLS:09 employed a two-stage complex stratified sampling design with schools as the primary sampling unit and students randomly selected from sampled schools (Duprey et al., 2018). According to the NCES description of the study, "HSLS:09 focuses on how students plan and make decisions about postsecondary education," including "how students' plans vary over the course of high school and how decisions in 9th grade impact students' high school trajectories" (National Center for Education Statistics, n.d.).

The study team obtained the HSLS:09's restricted-use files, which allow students to be linked to their schools and contain a number of variables that are suppressed in the public-use files. HSLS:09 restricted-use files used in this study contained two separate data structures: a base-year school-level file corresponding to a single point in time (that is, fall 2009/10) and a longitudinal student-level file spanning the base year through two subsequent follow-up survey waves, for a total of three points in time (that is, fall 2009, spring 2012, and a 2013 update that collected data on students' experiences from their spring 2013 semester up through and including their postsecondary and workforce statuses as of November 1, 2013). Table A1 summarizes the HSLS:09 data collection waves used in this study, the time period when data collection occurred, and the corresponding period in school in which most students in the study sample would have been expected to be enrolled.

Table A1. High School Longitudinal Study of 2009 data collection waves used in the study, the period when data collection occurred, and the corresponding period in school

Data collection wave	Period when data collection occurred	Corresponding period in school[a]
Base year	Fall 2009	First semester of grade 9
First follow-up	Spring 2012	Second semester of grade 11
2013 update/high school transcripts	Summer/fall 2013	Second semester of grade 12 through the first fall following expected high school graduation

a. Refers to how far most students would have been expected to progress in school at the time data collection occurred.
Source: Duprey et al., 2018.

In addition to self-reported student survey responses, the data also contained the linked self-reported responses of the head counselors at the school of each student in the original study sample. All students in the HSLS:09 have a corresponding counselor record matched to their record; conversely, each counselor record is linked to multiple students, each of whom attended the school where that counselor was employed at the time of survey administration. Counselor responses can thus be considered school-level records. The study team gathered additional school-level contextual data from administrator responses, such as the percentage of the student body receiving free or reduced-price lunch. The final datasets compiled for the study included data from both the HSLS:09 school and student files, merged on unique identifiers linking students to their schools. The complete set of variables selected from these files is presented in table A2, along with a description of the construct that each variable measures.

Table A2. Study constructs, associated measures, High School Longitudinal Study of 2009 (HSLS:09) variables used, and corresponding survey wave

Construct	Measure	HSLS:09 variable	Survey wave
IDs and weights			
Student ID	Unique identifier	STU_ID	BY
School ID	Unique identifier	SCH_ID	BY
Primary sampling unit and stratum IDs[a]	Survey design variables used to calculate standard errors	PSU, STRAT_ID	BY, F1, U13
Analytic weights	Weights used to adjust for the composition of the sample	W1SCHOOL, W1STUDENT, W2STUDENT, W3STUDENT, W3W1W2STU	BY, F1, U13
Student characteristics in high school			
Race/ethnicity	Categorical dummy variable recoding of racial/ethnic identity	X1RACE X1HISPANIC	BY
Socioeconomic status	Continuous and quintile coding of socioeconomic status composite constructed using income, parent occupation, parent educational attainment, and school urbanicity	X1SES_U X1SESQ5_U	BY
Gender	Dichotomous indicator for female gender	X1SEX	BY
Math achievement in grade 9	Continuous and quintile coding of standardized math theta score (norm-referenced to population of 2009 grade 9 students)	X1TXMTSCOR X1TXMQUINT	BY
High school characteristics			
School control	Categorical coding of school control status, used to restrict the dataset to students enrolled in public schools	X1CONTROL X2CONTROL	BY F1
Urbanicity	Categorical coding of Common Core of Data school locale data	X1LOCALE	BY
Socioeconomic composition	Percentage of students who are economically disadvantaged, as measured by free or reduced-price lunch receipt	A1FREELUNCH	BY
Racial/ethnic composition	Percentage of students who identify as Black, as Hispanic, as White, and as non-White	X1SCHBLACK X1SCHHISP X1SCHWHITE	BY
Gender composition	Percentage of students who identify as female	X1SEX	BY
Access to rigorous coursework: math	Percentage of grade 12 students at school who have taken calculus	C2PCTCALC	F1
Counselor caseload	Average student-counselor ratio	C1CASELOAD	BY
Baseline school college-going rate	Proportion of graduating students who enroll in a postsecondary institution in the fall immediately following high school completion, as measured by the current status of prior-year graduates at the time of baseline measurement (2009)	A14YRDEGREE A12YRDEGREE	BY
Average grade 9 math achievement	Aggregated measure of the standardized math theta score	X1TXMTSCOR	BY

Construct	Measure	HSLS:09 variable	Survey wave
School-level education and career planning variables			
Grade 9 education and/or career plan (ECP) development rate	Proportion of students in grade 9 who reported developing an ECP in fall 2009	S1PLAN	BY
ECP required	School-level dichotomous indicator of whether students are required to have an ECP at this school	C1PLAN C2PSPLAN	BY F1
ECPs shared with parents	School-level dichotomous indicator of whether the school shares students' ECPs with their parents	C1PLANPARENT	BY
ECPs require parent signature	School-level dichotomous indicator of whether the school requires parents to sign off on students' ECPs	C1SIGNOFF	BY
Students' participation in education and career planning in high school			
Early planning	Student-level dichotomous indicator that student reported developing an ECP in the fall of grade 9	S1PLAN	BY
Adult support	Student-level self-reported categorical description of who helped the grade 9 student develop his or her ECP: the student's counselor, teacher, parent, other, or no one	S1PLANCNSL S1PLANTCHR S1PLANPRNT S1PLANOTH S1PLANNOONE	BY
Yearly review	Student-level categorical description of how often the respondent reported meeting with an adult in school to review or revise his or her ECP during the period spanning the fall of grade 9 through the spring of expected grade 11: more than once each school year, once each school year, less than once each school year, or never	S2REVIEWPLAN	F1
Ever developed an ECP between the fall of grade 9 and the spring of grade 11	Student-level dichotomous indicator that student reported ever developing or being asked to develop an ECP at some time from the beginning of high school up through the spring of expected grade 11	S1PLAN S2HSPLAN	F1
Students' college-going behaviors			
Submitting the Free Application for Federal Student Aid (FAFSA)	Dichotomous indicator that respondent completed the FAFSA by the fall following expected high school graduation	S3APPFAFSA	U13
Completing a college preparatory curriculum (academic concentrator status)	Dichotomous indicator that respondent earned credits in grade 9–12 in the following subjects and course levels: at least four credits in English; three credits in math, with one higher than algebra II; three credits in science, with one higher than biology; three credits in social studies, with one in U.S. or world history; and two credits in one foreign language	X3TACADTRCK	HST

Construct	Measure	HSLS:09 variable	Survey wave
Applying to a postsecondary institution	Dichotomous indicator that respondent applied to any postsecondary institution by the fall following expected high school graduation	S3CLGAPPNUM	U13
Enrolling in a postsecondary institution immediately after high school	Dichotomous indicator that respondent enrolled full- or part-time in a postsecondary degree or certificate program in the fall following expected high school graduation, by four-year, two-year, and less-than-two-year institution type	X3CLASSES X3PROGLEVEL	U13

BY is base year. F1 is first follow-up. U13 is 2013 update. HST is high school transcripts.

a. *High School Longitudinal Study of 2009 (HSLS:09) Base-Year to Second Follow-Up Data File Documentation* describes the HSLS:09 primary sampling units (PSUs) and strata as follows: "The PSU is the unit chosen at the first stage of a sample design and is typically reserved for clusters of units selected at a subsequent stage of sampling in a multistage design. The HSLS:09 PSU is the base-year school that represents a cluster of students used to select the second-stage sample" (Duprey et al., 2018, p. A-13). "Stratification is the division of a population into distinct, mutually exclusive and exhaustive subgroups (strata). Strata are generally defined to include relatively homogeneous units on characteristics that are of interest to the study. Stratification is used to reduce sampling error. In HSLS:09, the first-stage strata were formed and schools were selected independently within each stratum. Students were independently selected within strata defined by race/ethnicity" (p. A-17).

Source: Duprey et al., 2018.

Analysis methods

This section describes the study team's approach to preparing the data files for analysis and answering the research questions. It begins by documenting the process for identifying missing data, goes on to describe the original study sample and missing data adjustments, and concludes with a discussion of the analytic models used. Appendix B presents more detail on the analysis of missing data and the approach used to adjust for patterns of missingness.

Identifying missing data in the HSLS:09. First, the study team reviewed the missing data patterns in the raw data from NCES. The HSLS:09 employs a missing data coding scheme comprising eight codes for flagging distinct kinds of missing data, five of which were present in the variables used in the study. Those five codes were:

- (–9) Item missing, nonresponse.

- (–8) Unit missing, nonresponse.

- (–7) Item legitimate skip/not applicable.

- (–6) Unit missing, component not applicable.

- (–4) Item not administered: abbreviated interview.

Following *Guidance on Addressing Missing Data in REL Descriptive Studies* (Institute of Education Sciences, 2020), missing values were coded at the unit and the item levels and summarized to calculate response rates on the key variables for each research question. See appendix B for complete tables of response rates for the school and student samples.

Preparing the raw data for analysis. Second, the study team prepared each of the two files (school and student) for analysis by recoding values of extant variables and constructing new variables needed for the analysis. Recoding values of extant variables involved recoding NCES's missing codes from their negative-coded values into either a universal missing value (.) or a valid response value. Values of –7 ("Item legitimate skip/not applicable") were recoded to zeros on items related to the sources of adult support in education and career planning and yearly review of education and/or career plans (ECPs). This recoding scheme was implemented because the survey

logic skipped over such items if students had previously responded that they did not develop an ECP. Thus, by virtue of not having an ECP, these students did not participate in these associated activities either.

Constructing new variables involved creating new measures from extant variables (for example, creating a measure of college-going that combined counselor responses from the A14YRDEGREE and A12YRDEGREE variables) and creating dummy variables from categorical measures (for example, from racial/ethnic categories), including outcome variables that were not already formatted as dichotomous measures. In addition, the study team created aggregate measures of school-level characteristics using data that were provided at the student level. For example, the HSLS:09 data did not contain a school-level measure of achievement. Thus, the study team created a variable measuring average school-level grade 9 math achievement, derived from individual students' scores. This same process was followed to create aggregate measures of the proportion of female enrollments and the average grade 9 ECP development rate by school.

Flagging the original study sample. Third, the study team merged the cleaned school-level file with the cleaned student-level file on unique student and school identifiers. The merge resulted in an unrestricted dataset of 25,206 students (that is, the full HSLS:09 sample). The study team then applied the following study inclusion criteria to restrict the dataset to the original study sample as defined above. From an unrestricted dataset of 25,206 students, a dichotomous indicator was created to flag individual observations equal to 1 for students who began the study enrolled in a public school in the base year (*N* = 20,658) and were still enrolled in a public school when surveyed again five semesters later in spring 2012 (*N* = 18,900). Thus, the original study sample was 18,900 students who met the study inclusion criteria. This sample represented the pool of students who contributed to the multiple imputation model used to adjust for missing data (see subsection below on implementing multiple imputation to adjust for missing data). A subset of these students were not present in the third survey wave conducted in fall 2013 and thus had a longitudinal weight of zero at that time point. Consequently, the study team further restricted the original study sample to the approximately 12,600 students who were present in the sample in all three survey waves, had an associated nonzero weight used to preserve the national representativeness of the sample, and met the study inclusion criteria. Collectively, they were enrolled across about 770 public schools in the base year. These 770 schools made up the school sample used to answer research question 1 on school characteristics, while the student sample of about 12,600 was used to answer research questions 2 and 3 on student characteristics and student outcomes.

Assessing the degree of missingness in the school and student samples. Fourth, the next step involved examining missing data patterns and assessing the degree of missingness in both the school and student samples. Starting with the school sample (*n* = 770), observations were flagged with a separate indicator for membership in the analytic sample if that school had complete data on all the key variables needed to answer the research questions. Individual schools were deemed nonmissing on the key variables if they had responses on every variable needed to answer research question 1. The study team determined that there were 370 schools, or 48.4 percent of the original study sample of schools, that were jointly nonmissing on all the key variables measured at the school level. For research questions 2 and 3 the study team determined that 4,220 students, or 22.3 percent of the original study sample of students, were jointly nonmissing on all the key variables measured at the student-school level. The study team used an inclusive definition of "key variables" to calculate these figures, defining primary predictors and outcome variables as key variables, as well as the covariates that would be included in the analytic models. So, 4,220 represents the total number of observations that would have been included in a complete-cases approach to estimating the analytic models (that is, an approach in which any observation that was not nonmissing on all the variables would have been removed from the models). In addition, some variables flagged as potential parameters of interest at the initial data exploration stage were ultimately not used in estimation models but were included in response rate calculations for documentation purposes. While the overall rates of missingness in the data were quite high, individual key variable response rates ranged from 74 percent to 100 percent in the school sample and from 69 percent to 99.8 percent in the student sample (see tables B1 and B2 in appendix B).

Based on the final response rates, the study team determined that missing data adjustments had to be implemented to ensure that the analytic sample represented the original study sample of 18,900 students and 770 schools.

Implementing multiple imputation to adjust for missing data. Fifth, the study team used multiple imputation modeling to adjust for the patterns of missingness observed in the data. The imputation model used data on all available students and schools in the HSLS:09 files, prior to restricting the dataset to those who were flagged as part of the original study sample, to maximize the information provided for imputation (Enders, 2010). More detail on the study team's specific imputation model and approach is provided in appendix B. The multiple imputation step yielded complete imputed cases for the subgroup of schools and students who were flagged as part of the original study sample prior to imputation, resulting in a school sample of 770 and a student sample of 12,600 students who remained in the HSLS:09 sample through fall 2013 and had a corresponding nonzero analytic weight for that period. All subsequent analyses and estimation models were based on the observed and imputed data for these final analytic samples of 770 schools and 12,600 students.

Analyzing the data. After the imputation step, the dataset was ready for analysis. Several general design parameters were applicable across all analyses. To draw valid inferences about the population of U.S. public high schools in 2009/10, the study team used HSLS:09 analytic weights and survey design variables that identified the primary sampling unit and stratum from which each school was sampled. Variance estimation was achieved using the Taylor series linearization method, a method for calculating standard errors in complex survey designs that is recommended in the HSLS:09 documentation and that supports multiple imputation estimation (Duprey et al., 2018; StataCorp, LLC, 2019). "Lonely primary sampling units" were centered at the grand mean of the analytic sample, to account for scenarios in which a single stratum contained only one sampling unit. This can happen in complex survey analysis when an estimation is performed on a subgroup containing a small enough number of observations that an unbiased variance estimator cannot be computed (StataCorp, LLC, 2020; UCLA: Statistical Consulting Group, 2020).

Because the imputation model was implemented at the student level (see appendix B for more details), research question 1 was answered by first aggregating the completed student-level data back to the school level. Using the specifications described above, the study team calculated multiple imputation estimates of means, totals, and proportions on the aggregated data following Rubin's (1987) combination rules. Estimates were weighted by W1SCHOOL to adjust for nonresponse bias and maintain the representativeness of the original study sample (Duprey et al., 2018).

Research question 2 was answered using the nonaggregated, completed student-level data. As with research question 1, the study team calculated multiple imputation estimates of means, totals, and proportions following Rubin's (1987) combination rules. Estimates were weighted by W3W1W2STU, the HSLS:09's recommended analytic weight for longitudinal analyses involving samples of students followed from the base year through the 2013 update. Subgroup analyses were estimated by race/ethnicity, top and bottom quintile of socioeconomic status, and top and bottom quintile of grade 9 math achievement.

Research question 3 called for estimating a series of statistical models to describe the potential relationships between three core education and career planning elements and students' college-going behaviors. The study team used linear probability modeling, as described in Heckman and Snyder (1996) for the modeling of binary outcomes. All seven models, corresponding to the seven outcomes examined, were estimated using the W3W1W2STU student longitudinal weight. To obtain valid predicted probabilities in the multiple imputation context, the study team followed the procedures described in Social Science Computing Cooperative (2012) to generate linear predictions from the estimated model parameters.

The general equation for all seven models was specified as follows:

Model 1: Student-level linear regression

$$Y_{ij} = \beta_0 + \beta_1 ECP9th_{ij} + \beta_2 Counselor_{ij} + \beta_3 Teacher_{ij} + \beta_4 Parent_{ij} + \beta_5 Other_{ij} + \beta_6 YearlyReview_{ij} + \beta_7 Student_{ij} + \beta_8 School_j + \varepsilon_{ij}$$

where Y_{ij} is a dichotomous indicator for whether student i in school j met the outcome of interest, with separate equations for each outcome (submitting the FAFSA, completing a college preparatory curriculum, applying to a postsecondary institution, immediately enrolling in any postsecondary institution, immediately enrolling in a four-year program, immediately enrolling in a two-year program, and immediately enrolling in a less-than-two-year/certificate program); $ECP9th_{ij}$ is a dichotomous indicator for whether student i in school j developed an ECP in the fall of grade 9; $Counselor_{ij}$ is a dichotomous indicator for whether the grade 9 student's counselor helped develop the ECP; $Teacher_{ij}$ is a dichotomous indicator for whether the grade 9 student's teacher helped develop the ECP; $Parent_{ij}$ is a dichotomous indicator for whether the grade 9 student's parent or parents helped develop the ECP; $Other_{ij}$ is a dichotomous indicator for whether the grade 9 student received help from someone else to develop the ECP; $YearlyReview_{ij}$ is a dichotomous indicator for whether the student reported meeting with an adult in school to review or revise the ECP at least once per school year; $Student_{ij}$ is a vector of student characteristics used as covariates, including race/ethnicity, socioeconomic status, gender, and grade 9 math achievement; and $School_j$ is a vector of school characteristics used as covariates hypothesized from the literature to influence the conditions in which education and career planning occur, including urbanicity, socioeconomic composition, racial/ethnic composition, gender composition, access to rigorous coursework, average counselor caseload, the baseline college-going rate, the average grade 9 mathematics achievement, and the grade 9 ECP development rate. In this equation β_0 is the model intercept, β_1 is the difference in the probability of achieving the outcome between respondents who reported developing an ECP in the fall of grade 9 and respondents who did not, β_2 is the difference in the probability of achieving the outcome between respondents who reported receiving help from a counselor to develop an ECP and respondents who did not, β_3 is the difference in the probability of achieving the outcome between respondents who reported receiving help from a teacher to develop an ECP and respondents who did not, β_4 is the difference in the probability of achieving the outcome between respondents who reported receiving help from a parent to develop an ECP and respondents who did not, β_5 is the difference in the probability of achieving the outcome between respondents who reported receiving help from someone else to develop an ECP and respondents who did not, β_6 is the difference in the probability of achieving the outcome between respondents who reported meeting with an adult in school at least once per year to review or revise an ECP and respondents who did not have plans, β_7 represents a vector of coefficients capturing the relationship between the student characteristics used as covariates and the probability that $Y_{ij} = 1$, β_8 represents a vector of coefficients capturing the relationship between the school characteristics used as covariates and the probability that $Y_{ij} = 1$, and ε_{ij} is the error term.

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Appendix B. Handling of missing data

This appendix describes the study team's approach to handling missing data in the study sample. First, it presents an analysis of the response rates and degree of missingness across the school and student subsamples. Then, it explains how the study team used multiple imputation modeling to adjust for the patterns of missingness in the data and reduce the likelihood of bias on measurable characteristics between observations with missing data and observations with complete data.

Response rate comparison

The first step in assessing the degree of missing data in the original study sample was to determine how many observations would be included in the analysis absent any adjustments for missing data. As described in appendix A, the original study sample was defined as the sample of High School Longitudinal Study of 2009 (HSLS:09) students who began grade 9 enrolled in a public high school in fall 2009 and who remained enrolled in a public high school when surveyed again in spring 2012. As a nationally representative sample, this group of students was representative of the target population from whom the study attempted to collect data. However, not all HSLS:09-sampled students had complete data on every item examined as part of the current study. To understand the extent of the missing data, a response rate comparison was conducted for research question 1, for which schools were the unit of analysis, and again for research questions 2 and 3, for which students were the unit of analysis, following the guidelines set forth in *Guidance on Addressing Missing Data in REL Descriptive Studies* (Institute of Education Sciences, 2020).

Tables B1 and B2 summarize the results of the response rate comparisons. First, table B1 presents the response rates for the key variables in the school sample needed to answer research question 1: To what extent is education and career planning required in public high schools nationwide? Do schools that require planning differ, on average, from those that do not in terms of urbanicity, student demographic composition, student-counselor ratio, college-going rate, or grade 9 math achievement?

Table B1. Unit and item response rates for key variables in the school sample

Type of data the study attempted to collect	Number of schools from which study attempted to collect data	Number of schools with data	Response rate (percent)
Key variable: School requires that students have an education and/or career plan			
Any data from the HSLS:09 (unit response rate)	770	690	89.6
Response to this survey question among schools that took the survey (item response rate)	690	690	100.0
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	690	89.6
Key variable: School shares students' plans with their parents			
Any data from the HSLS:09 (unit response rate)	770	690	89.6
Response to this survey question among schools that took the survey (item response rate)	690	690	100.0
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	690	89.6

Type of data the study attempted to collect	Number of schools from which study attempted to collect data	Number of schools with data	Response rate (percent)
Key variable: School requires parents to sign off on students' plans			
Any data from the HSLS:09 (unit response rate)	770	690	89.6
Response to this survey question among schools that took the survey (item response rate)	690	690	100.0
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	690	89.6
Key variable: Percent of student body receiving free or reduced-price lunch			
Any data from the HSLS:09 (unit response rate)	770	720	93.5
Response to this survey question among schools that took the survey (item response rate)	720	690	95.8
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	690	89.6
Key variable: Percent of student body of Hispanic/Latino/Latina origin			
Any data from the HSLS:09 (unit response rate)	770	720	93.5
Response to this survey question among schools that took the survey (item response rate)	720	700	97.2
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	700	90.9
Key variable: Percent of student body that is White			
Any data from the HSLS:09 (unit response rate)	770	720	93.5
Response to this survey question among schools that took the survey (item response rate)	720	700	97.2
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	700	90.9
Key variable: Percent of student body that is Black or African American			
Any data from the HSLS:09 (unit response rate)	770	720	93.5
Response to this survey question among schools that took the survey (item response rate)	720	700	97.2
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	700	90.9
Key variable: Percent of 08/09 seniors who went to a 4-year bachelor's-granting institution			
Any data from the HSLS:09 (unit response rate)	770	720	93.5
Response to this survey question among schools that took the survey (item response rate)	720	570	79.2
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	570	74.0
Key variable: Percent of 08/09 seniors who went to a 2-year associate's-granting/technical institution			
Any data from the HSLS:09 (unit response rate)	770	720	93.5
Response to this survey question among schools that took the survey (item response rate)	720	570	79.2
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	570	74.0

Type of data the study attempted to collect	Number of schools from which study attempted to collect data	Number of schools with data	Response rate (percent)
Key variable: Average caseload for school's counselors			
Any data from the HSLS:09 (unit response rate)	770	690	89.6
Response to this survey question among schools that took the survey (item response rate)	690	690	100.0
Response to this survey question among all schools in the original study sample (product of unit and item response rates)	770	690	89.6
Key variable: School control	770	770	100.0
Key variable: School locale	770	770	100.0
Key variable: Average grade 9 mathematics score	770	770	100.0
Key variable: Percent of student body that identifies as female	770	770	100.0
All key variables for addressing the research question	**770**	**370**	**48.1**

HSLS:09 is High School Longitudinal Study of 2009.
Note: Sample sizes are rounded to the nearest 10.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Two of the key variables had a response rate that fell below the Institute of Education Sciences' (IES) minimum threshold of 85 percent: percent of 08/09 seniors who went to a 4-year bachelor's-granting institution (73.9 percent response rate) and percent of 08/09 seniors who went to a 2-year associate's-granting/technical institution (74.1 percent response rate). However, among the 770 schools in the original study sample, only 370 schools (or 48.4 percent) were jointly nonmissing on all 14 key variables needed to address research question 1. Based on these results, the study team concluded that a substantial degree of missingness was present in the school sample.

Next, table B2 presents the response rates for the key variables in the student sample needed to answer research questions 2 and 3:

Research question 2: To what extent do public high school students report participating in education and career planning in grade 9 (early planning)? To what extent do they receive support in early planning from adults such as teachers and parents (adult support)? To what extent do students who develop an education and/or career plan (ECP) in high school review it annually with an adult in school (yearly review)? Does participation in these three core elements of education and career planning vary by student race/ethnicity, socioeconomic status, or prior achievement?

Research question 3: What is the relationship between public high school students' participation in the three core education and career planning elements (early planning, adult support, and yearly review) and their college-going behaviors (submitting the Free Application for Federal Student Aid [FAFSA], completing a college preparatory curriculum, applying to a postsecondary institution, and enrolling in postsecondary education immediately after high school?

Table B2. Unit and item response rates for key variables in the student sample

Type of data the study attempted to collect	Number of students from whom study attempted to collect data	Number of students with data	Response rate (percent)
Key variable: F07 9th grader has put together an education plan and/or career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	15,670	96.9
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,670	82.9
Key variable: F08A 9th grader's counselor helped put together education/career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	15,610	96.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,610	82.6
Key variable: F08B 9th grader's teacher helped put together education/career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	15,610	96.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,610	82.6
Key variable: F08C 9th grader's parent(s) helped put together education/career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	15,610	96.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,610	82.6
Key variable: F08D Someone else helped 9th grader put together education/career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	15,610	96.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,610	82.6
Key variable: F08E No one helped 9th grader put together education/career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	15,610	96.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,610	82.6

Type of data the study attempted to collect	Number of students from whom study attempted to collect data	Number of students with data	Response rate (percent)
Key variable: D29 School asked teen to develop graduation/career/education plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,380	86.7
Response to this survey question among students who took the survey (item response rate)	16,380	15,970	97.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,970	84.5
Key variable: D31 How often met with adult in school to review plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,380	86.7
Response to this survey question among students who took the survey (item response rate)	16,380	15,900	97.1
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,900	84.1
Key variable: B01 Students are required to have graduation/career/education plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,910	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,910	89.5
Key variable: B02A Plan includes graduation plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,890	99.9
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,890	89.4
Key variable: B02B Plan includes career plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,890	99.9
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,890	89.4
Key variable: B02C Plan includes education plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,890	99.9
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,890	89.4
Key variable: B04 Students' plans are shared with parents			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,830	99.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,830	89.0

Type of data the study attempted to collect	Number of students from whom study attempted to collect data	Number of students with data	Response rate (percent)
Key variable: B03 Level of customization of high school plans			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,910	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,910	89.5
Key variable: B05 How often students meet with adult in school to review/revise plan			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	16,880	99.8
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,880	89.3
Key variable: C06A % 12th graders who have taken calculus			
Any data from the HSLS:09 (unit response rate)	18,900	16,910	89.5
Response to this survey question among students who took the survey (item response rate)	16,910	15,710	92.9
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	15,710	83.1
Key variable: D01 Completed a FAFSA for teenager's education			
Any data from the HSLS:09 (unit response rate)	18,900	14,270	75.5
Response to this survey question among students who took the survey (item response rate)	14,270	14,140	99.1
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	14,140	74.8
Key variable: Academic track/concentrator			
Any data from the HSLS:09 (unit response rate)	18,900	16,900	89.4
Response to this survey question among students who took the survey (item response rate)	16,900	16,900	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,900	89.4
Key variable: C07 How many postsecondary institutions applied to/registered at			
Any data from the HSLS:09 (unit response rate)	18,900	14,270	75.5
Response to this survey question among students who took the survey (item response rate)	14,270	13,050	91.5
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	13,050	69.0
Key variable: U13 Taking postsecondary classes as of November 2013 (imputed version)			
Any data from the HSLS:09 (unit response rate)	18,900	14,270	75.5
Response to this survey question among students who took the survey (item response rate)	14,270	14,270	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	14,270	75.5

Type of data the study attempted to collect	Number of students from whom study attempted to collect data	Number of students with data	Response rate (percent)
Key variable: Degree program level			
Any data from the HSLS:09 (unit response rate)	18,900	14,270	75.5
Response to this survey question among students who took the survey (item response rate)	14,270	14,150	99.2
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	14,150	74.9
Key variable: Student's sex			
Any data from the HSLS:09 (unit response rate)	18,900	18,900	100.0
Response to this survey question among students who took the survey (item response rate)	18,900	18,870	99.8
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	18,870	99.8
Key variable: Student's race/ethnicity-composite			
Any data from the HSLS:09 (unit response rate)	18,900	18,900	100.0
Response to this survey question among students who took the survey (item response rate)	18,900	17,510	92.6
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	17,510	92.6
Key variable: Student is Hispanic/Latino/Latina-composite			
Any data from the HSLS:09 (unit response rate)	18,900	18,900	100.0
Response to this survey question among students who took the survey (item response rate)	18,900	17,510	92.6
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	17,510	92.6
Key variable: Socioeconomic status composite derived with locale (urbanicity)			
Any data from the HSLS:09 (unit response rate)	18,900	16,610	87.9
Response to this survey question among students who took the survey (item response rate)	16,610	16,610	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,610	87.9
Key variable: Quintile coding of X1SES_U composite derived with locale (urbanicity)			
Any data from the HSLS:09 (unit response rate)	18,900	16,610	87.9
Response to this survey question among students who took the survey (item response rate)	16,610	16,610	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,610	87.9
Key variable: Mathematics standardized theta score			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	16,170	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,170	85.6

Type of data the study attempted to collect	Number of students from whom study attempted to collect data	Number of students with data	Response rate (percent)
Key variable: Mathematics quintile score			
Any data from the HSLS:09 (unit response rate)	18,900	16,170	85.6
Response to this survey question among students who took the survey (item response rate)	16,170	16,170	100.0
Response to this survey question among all students in the original study sample (product of unit and item response rates)	18,900	16,170	85.6
All key variables for addressing the research questions	**18,900**	**4,220**	**22.3**

HSLS:09 is High School Longitudinal Study of 2009. FAFSA is Free Application for Federal Student Aid.
Note: Sample sizes are rounded to the nearest 10.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Of the 28 key variables, 13 had a response rate that fell below the minimum threshold of 85 percent (see table B2). These included all the predictor variables measuring participation in core education and career planning activities (early planning, adult support, and yearly review), as well as the outcome variables of submitting the FAFSA, applying to a postsecondary institution, enrolling in a postsecondary institution, and program level of postsecondary enrollment. Across all 18,900 student records in the original study sample, only 4,220 students (or 22.3 percent) were jointly nonmissing on all key variables needed to address research questions 2 and 3, including the school-level measures that would be used as covariates in the analytic models. Based on these results, the study team concluded that a substantial degree of missingness was present in the student sample.

Assessing the potential for nonresponse bias

Given the large percentage of schools and students without complete data on the key variables needed to address the research questions, it was likely that the nonmissing respondent samples of 370 schools and 4,220 students would not resemble their respective original study samples. To assess the extent to which this could be the case, the study team explored the possibility of conducting a formal nonresponse bias analysis. IES statistical standards require that such an analysis identify covariates with at least a 95 percent response rate with which to compare respondents to the original study sample. Furthermore, selected covariates should relate strongly to the key variables, as measured by a correlation of .25 or higher.

The study team reviewed the analytic variables for potential candidates that would meet these conditions. Among student-level variables, only students' self-reported sex had an acceptable response rate of 99.8 percent (or 18,870 of 18,900 total records). Ideally, the study team would have been able to assess the differences between respondents and the original study sample using a more robust set of covariates that correlated strongly with all the key predictor and outcome variables. While conducting a thorough nonresponse bias was not feasible with the available data, however, the study team nonetheless had concerns about the potential for bias in a complete-cases approach. Acknowledging the substantial loss in sample size under such an approach and the possibility that inferences based on the nonmissing sample of respondents were unlikely to generalize to the original study sample, the study team determined that missing data adjustments should be implemented prior to answering the research questions.

Adjusting for missing data using multiple imputation

Multiple imputation provides a flexible, rigorous method for handling missing data that is appropriate for situations like these (Graham, 2009). Several benefits of multiple imputation suggest its relative strength compared with alternative approaches. Most significant of these is its reliance on a range of possible imputed

values rather than any one specific value. In essence, this allows for some variation in potential imputed values that is lost in regression-based single imputation models (Graham, 2009).

In general, multiple imputation proceeds in two stages: an imputation stage and an analysis stage. In the imputation stage a model is specified to impute missing values for variables that have missing data, based on the observed relationships among those variables and a set of identified auxiliary variables (Graham, 2009). One of the most important decisions to make at the imputation stage is which of these variables to include in the imputation model. In the interest of completeness, the study team included all key variables with missing data described in the analyses above, even if they had response rates that exceeded the 85 percent threshold, such that no analytic variables would be left with missing values at the analysis stage. For auxiliary variables the study team used the nonmissing variables of school control, urbanicity, grade 9 ECP development rate, average grade 9 math achievement, the percentage of the student body that identified as female, the survey design variables (primary sampling unit and stratum ID), the HSLS:09 analytic weights used in the analytic models, and a unique school identifier.

Following Enders (2010), both original and derived (that is, researcher-constructed) variables were included in the imputation model. That is, all variables that would be used in the analytic models at the analysis stage were included in the imputation model, to preserve relationships among the variables. As summarized in UCLA: Statistical Consulting Group (2020), if variables that are not included in the imputation model are later used in the analysis models, the imputed values on the included variables are assumed to have a correlation of zero with the variables that were left out of the imputation model. This would result in an underestimation of potential associations among model parameters in the analysis stage.

The study team chose the multivariate normal model, which uses an iterative Markov chain Monte Carlo (MCMC) method to impute missing values (StataCorp, 2019; van Buuren, 2018). The multivariate normal/MCMC approach has been validated as an appropriate model for handling a range of variable structures and is robust to violations of normality, especially in large sample sizes such as that of the HSLS:09 (van Buuren, 2018). One consequence of the MCMC approach is that it can produce imputed values outside the plausible range—for example, imputing values for a dichotomous variable that are less than 0 or greater than 1—but such results do not bias the resulting parameter estimates (for example, means, standard errors, coefficients) and can be rounded to their nearest plausible value if reporting proportions or categorical tabulations is the goal (UCLA: Statistical Consulting Group, 2020).

Using the MCMC approach, the model was estimated on the complete sample of HSLS:09 schools and students, which was merged at the student level prior to subsetting any data to preserve as much auxiliary data as possible to inform the imputations (Enders, 2010). The study team used the average missingness rate across all key variables to determine the number of imputations to estimate, an approach suggested by van Buuren (2018) as a reasonable guideline when dealing with large datasets that contain large shares of incomplete cases. Specifically, in the merged student sample of 18,900 cases, the average percentage missing was 21.97981, which the study team rounded to 22 for the number of imputations. Since the student sample included the merged school-level variables, the average missingness figure was based on all the key variables needed to answer the research questions, thus reflecting missingness at the school and student levels.

The imputation stage resulted in complete, imputed cases for the 18,900 student-level observations composing the original study sample and their 770 linked schools, generating 22 new imputed values for each original missing value. In the analysis stage of the imputation, survey-weighted parameters were estimated on the restricted dataset of these 18,900 cases using the imputed values generated from the imputation model. Specifically, parameter estimates were computed separately for each imputation, then pooled according to Rubin's (1987) combination rules to produce a single set of model parameters. For research question 3 on student outcomes, model results were then converted to predicted probabilities using the linear prediction method, which meets the

assumptions of Rubin's rules (Social Science Computing Cooperative, 2012). The results for each research question are presented in appendix C, which provides detailed data tables corresponding to each model.

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Appendix C. Supporting analyses

This appendix provides expanded data tables from the analyses for each research question. All sample sizes and information about the strata, primary sampling units, and populations used to compute each estimate are rounded to the nearest 10 in accordance with Institute of Education Sciences restricted-use data disclosure standards.

Model results for research question 1: To what extent is education and career planning required in public high schools nationwide? Do schools that require planning differ, on average, from those that do not in terms of urbanicity, student demographic composition, student-counselor ratio, college-going rate, or grade 9 math achievement?

Table C1. Multiple imputation estimates of the proportion of public high schools that required education and/or career plans, by type of plan, 2009/10

Type of plan	Proportion	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Combined education and career plan	0.5923907	0.038003	0.5176723	0.6671092
Career plan only	0.0553120	0.012848	0.0300111	0.0806129
Education plan only	0.2108642	0.030099	0.1516905	0.2700378
No planning requirement	0.1414331	0.020665	0.1008067	0.1820595

Note: *n* = 770. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 17,520. Out-of-bounds imputed values were rounded to the nearest integer to obtain proportion estimates of plan types.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C2. Multiple imputation estimates of the proportion of public high school students who were enrolled in a high school requiring education and/or career plans, 2009/10

Characteristic	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Proportion of students enrolled	0.8123427	0.017159	0.778608	0.846078

Note: *n* = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,782,900.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C3. Multiple imputation estimates of average characteristics and mean differences between schools that required education and/or career plans and schools that did not, 2009/10

Characteristic	Mean among schools that required ECPs (n = 660)	Mean among schools that did not require ECPs (n = 110)	Mean difference (percentage points)	p-value
City	0.176948	0.18789	−0.010942	0.833
	(0.0257051)	(0.0409038)		
Suburb	0.1742652	0.2625059	−0.0882407	0.122
	(0.017483)	(0.0500075)		
Town	0.1589517	0.2808405	−0.1218888	0.092
	(0.020938)	(0.0627563)		
Rural	0.4898352	0.2687637	0.2210715*	0.011
	(0.0404144)	(0.0674431)		
Percent of student body receiving free or reduced-price lunch	47.98159	31.66962	16.31197***	0.000
	(1.267048)	(2.240131)		
Percent of student body that identifies as Hispanic	13.21735	10.55309	2.664259	0.411
	(1.267242)	(2.882554)		
Percent of student body that identifies as White	68.92891	77.6743	−8.745385	0.064
	(2.64477)	(3.672052)		
Percent of student body that identifies as Black	14.66309	7.787874	6.875217**	0.005
	(1.736111)	(1.59553)		
Percent of student body that identifies as non-White	31.38494	22.43553	8.94941	0.059
	(2.655309)	(3.69591)		
Percent of student body that identifies as female	46.94358	49.2035	−2.259926	0.380
	(2.168703)	(1.453696)		
Average caseload for school's counselors	313.1173	331.559	−18.44176	0.470
	(20.27878)	(14.64608)		
2008/09 school college-going rate	71.48596	74.4962	−3.010235	0.321
	(1.704757)	(2.470843)		
Average grade 9 math achievement	48.38791	50.57873	−2.190815**	0.001
	(0.3390566)	(0.5706567)		

* Significant at p < .05; ** significant at p < .01; *** significant at p < .001.
Note: n = 770. Numbers in parentheses are standard errors.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Model results for research question 2: To what extent do public high school students report participating in education and career planning in grade 9 (early planning)? To what extent do they receive support in early planning from adults such as teachers and parents (adult support)? To what extent do students who develop an education and/or career plan in high school review it annually with an adult in school (yearly review)? Does participation in these three core elements of education and career planning vary by student race/ethnicity, socioeconomic status, or prior achievement?

Table C4. Multiple imputation estimates of the proportion of public high school students who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.618849	0.006819	0.605442	0.632257
Ever developed an ECP	0.746636	0.005972	0.734895	0.758377
Adult support: any	0.444335	0.006979	0.430612	0.458059
Adult support: counselor	0.107110	0.005134	0.097016	0.117204
Adult support: teacher	0.099040	0.004260	0.090662	0.107418
Adult support: parent	0.340092	0.007043	0.326245	0.353939
Adult support: other adult	0.089976	0.004295	0.081531	0.098422
Adult support: none	0.177946	0.005591	0.166951	0.188941
Ever reviewed ECP	0.312248	0.007477	0.297545	0.326950
Reviewed ECP once a year	0.129532	0.005220	0.119269	0.139796
Reviewed ECP more than once a year	0.093702	0.004704	0.084454	0.102951
Reviewed ECP less than once a year	0.088455	0.003908	0.080771	0.096140
Reviewed ECP never	0.123875	0.004469	0.115088	0.132662
Reviewed ECP at least once a year	0.222107	0.007009	0.208325	0.235888

ECP is education and/or career plan.

Note: *n* = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,782,900.

Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C5. Multiple imputation estimates of the proportion of Black public high school students who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.768201	0.0184705	0.7317133	0.8046881
Ever developed an ECP	0.862852	0.0149474	0.8333305	0.8923742
Adult support: any	0.526823	0.0235288	0.4803400	0.5733069
Adult support: counselor	0.129385	0.0156308	0.0985103	0.1602595
Adult support: teacher	0.132448	0.0150155	0.1027705	0.1621249
Adult support: parent	0.407573	0.0278472	0.3525638	0.4625814
Adult support: other adult	0.100213	0.0139485	0.0726471	0.1277784
Adult support: none	0.243780	0.0166416	0.2108950	0.2766644
Ever reviewed ECP	0.377881	0.0210315	0.3363092	0.4194518
Reviewed ECP once a year	0.143215	0.0148212	0.1138943	0.1725359
Reviewed ECP more than once a year	0.134975	0.0133256	0.1086265	0.1613243
Reviewed ECP less than once a year	0.098719	0.0126766	0.0736527	0.1237843
Reviewed ECP never	0.129300	0.0140248	0.1015650	0.1570359
Reviewed ECP at least once a year	0.270427	0.0211365	0.2286464	0.3122080

ECP is education and/or career plan.
Note: Subpopulation *n* = 1,302. Imputations = 22. Number of strata = 310. Number of primary sampling units = 470. Subpopulation size = 533,670.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C6. Multiple imputation estimates of the proportion of Hispanic public high school students who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.591961	0.0175439	0.5573994	0.6265235
Ever developed an ECP	0.714312	0.0157070	0.6833712	0.7452519
Adult support: any	0.412838	0.0192890	0.3748334	0.4508421
Adult support: counselor	0.089988	0.0105980	0.0691059	0.1108692
Adult support: teacher	0.093287	0.0097894	0.0739928	0.1125817
Adult support: parent	0.306305	0.0173535	0.2721142	0.3404952
Adult support: other adult	0.100176	0.0131348	0.0742983	0.1260538
Adult support: none	0.185133	0.0153470	0.1548914	0.2153747
Ever reviewed ECP	0.284840	0.0176676	0.2500359	0.3196436
Reviewed ECP once a year	0.100990	0.0107960	0.0797229	0.1222571
Reviewed ECP more than once a year	0.096121	0.0125081	0.0714800	0.1207613
Reviewed ECP less than once a year	0.086630	0.0123159	0.0623684	0.1108906
Reviewed ECP never	0.124168	0.0124845	0.0995740	0.1487617
Reviewed ECP at least once a year	0.197346	0.0156514	0.1665131	0.2281780

ECP is education and/or career plan.
Note: Subpopulation *n* = 1,990. Imputations = 22. Number of strata = 350. Number of primary sampling units = 600. Subpopulation size = 855,180.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C7. Multiple imputation estimates of the proportion of White public high school students who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.578802	0.0085546	0.5619785	0.5956251
Ever developed an ECP	0.721933	0.0078890	0.7064186	0.7374472
Adult support: any	0.424488	0.0080532	0.4086495	0.4403254
Adult support: counselor	0.106571	0.0058037	0.0951569	0.1179845
Adult support: teacher	0.086509	0.0048293	0.0770113	0.0960072
Adult support: parent	0.327403	0.0070764	0.3134850	0.3413199
Adult support: other adult	0.076939	0.0040067	0.0690574	0.0848210
Adult support: none	0.156844	0.0053545	0.1463130	0.1673750
Ever reviewed ECP	0.299719	0.0080864	0.2838157	0.3156225
Reviewed ECP once/year	0.141007	0.0059342	0.1293361	0.1526774
Reviewed ECP more than once a year	0.076620	0.0042258	0.0683087	0.0849316
Reviewed ECP less than once a year	0.081582	0.0043382	0.0730495	0.0901137
Reviewed ECP never	0.120177	0.0046426	0.1110459	0.1293073
Reviewed ECP at least once a year	0.217339	0.0073580	0.2028683	0.2318092

ECP is education and/or career plan.

Note: Subpopulation *n* = 6,940. Imputations = 22. Number of strata = 370. Number of primary sampling units = 730. Subpopulation size = 1,908,640.

Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C8. Multiple imputation estimates of the proportion of public high school students of other races/ethnicities who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.659487	0.0164998	0.6270149	0.6919598
Ever developed an ECP	0.772950	0.0168548	0.7397797	0.8061194
Adult support: any	0.487180	0.0172835	0.4531610	0.5211993
Adult support: counselor	0.114908	0.0122284	0.0908382	0.1389767
Adult support: teacher	0.121717	0.0117908	0.0985117	0.1449226
Adult support: parent	0.375320	0.0174197	0.3410333	0.4096068
Adult support: other adult	0.112013	0.0090082	0.0942744	0.1297515
Adult support: none	0.175878	0.0150932	0.1461731	0.2055831
Ever reviewed ECP	0.337639	0.0184220	0.3013807	0.3738965
Reviewed ECP once a year	0.119656	0.0124065	0.0952368	0.1440742
Reviewed ECP more than once a year	0.111233	0.0110813	0.0894241	0.1330421
Reviewed ECP less than once a year	0.107417	0.0105859	0.0865821	0.1282520
Reviewed ECP never	0.131937	0.0110387	0.1102103	0.1536632
Reviewed ECP at least once a year	0.231352	0.0159650	0.1999314	0.2627727

ECP is education and/or career plan.

Note: Students of other races/ethnicities are those who do not identify as Black, Hispanic, or White. Subpopulation *n* = 2,370. Imputations = 22. Number of strata = 360. Number of primary sampling units = 670. Subpopulation size = 485,410.

Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C9. Multiple imputation estimates of the proportion of public high school students in the top quintile of socioeconomic status who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.596035	0.0139745	0.5685300	0.6235399
Ever developed an ECP	0.728415	0.0127968	0.7032298	0.7536008
Adult support: any	0.461865	0.0141689	0.4339760	0.4897532
Adult support: counselor	0.130571	0.0091643	0.1125332	0.1486092
Adult support: teacher	0.100378	0.0084738	0.0836992	0.1170566
Adult support: parent	0.389110	0.0137232	0.3620956	0.4161237
Adult support: other adult	0.063887	0.0062564	0.0515695	0.0762039
Adult support: none	0.136491	0.0087352	0.1192962	0.1536854
Ever reviewed ECP	0.294641	0.0128601	0.2693284	0.3199530
Reviewed ECP once a year	0.135649	0.0089537	0.1180255	0.1532725
Reviewed ECP more than once a year	0.084338	0.0070320	0.0704955	0.0981810
Reviewed ECP less than once a year	0.074778	0.0068250	0.0613441	0.0882117
Reviewed ECP never	0.127972	0.0097930	0.1086970	0.1472479
Reviewed ECP at least once a year	0.218938	0.0110090	0.1972688	0.2406061

ECP is education and/or career plan.
Note: Subpopulation *n* = 2,890. Imputations = 22. Number of strata = 360. Number of primary sampling units = 650. Subpopulation size = 679,480.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C10. Multiple imputation estimates of the proportion of public high school students in the bottom quintile of socioeconomic status who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.639375	0.0159167	0.6080477	0.6707024
Ever developed an ECP	0.758551	0.0140135	0.7309721	0.7861290
Adult support: any	0.432758	0.0159546	0.4013389	0.4641763
Adult support: counselor	0.096752	0.0094742	0.0781020	0.1154018
Adult support: teacher	0.111134	0.0102796	0.0908989	0.1313682
Adult support: parent	0.310496	0.0159810	0.2790334	0.3419587
Adult support: other adult	0.106722	0.0130857	0.0809654	0.1324791
Adult support: none	0.210568	0.0143154	0.1823848	0.2387509
Ever reviewed ECP	0.311424	0.0172852	0.2774055	0.3454422
Reviewed ECP once a year	0.110575	0.0101912	0.0905175	0.1306331
Reviewed ECP more than once a year	0.097883	0.0108077	0.0766124	0.1191526
Reviewed ECP less than once a year	0.101655	0.0117014	0.0786262	0.1246841
Reviewed ECP never	0.115670	0.0103883	0.0952226	0.1361169
Reviewed ECP at least once a year	0.209354	0.0147997	0.1802263	0.2384816

ECP is education and/or career plan.
Note: Subpopulation *n* = 2,270. Imputations = 22. Number of strata = 360. Number of primary sampling units = 660. Subpopulation size = 795,600.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C11. Multiple imputation estimates of the proportion of public high school students in the top quintile of grade 9 math achievement who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.5961754	0.0120708	0.5724201	0.6199307
Ever developed an ECP	0.7402876	0.0115409	0.7175754	0.7629998
Adult support: any	0.4414736	0.0141576	0.4136110	0.4693363
Adult support: counselor	0.1287331	0.0099530	0.1091454	0.1483208
Adult support: teacher	0.1048628	0.0085181	0.0880987	0.1216269
Adult support: parent	0.3449598	0.0129710	0.3194322	0.3704873
Adult support: other adult	0.0806676	0.0071123	0.0666696	0.0946657
Adult support: none	0.1562719	0.0116568	0.1333308	0.1792131
Ever reviewed ECP	0.3202474	0.0149829	0.2907586	0.3497363
Reviewed ECP once a year	0.1518927	0.0107107	0.1308134	0.1729721
Reviewed ECP more than once a year	0.0863026	0.0072789	0.0719750	0.1006302
Reviewed ECP less than once a year	0.0813604	0.0083541	0.0649191	0.0978017
Reviewed ECP never	0.1326795	0.0104198	0.1121721	0.1531869
Reviewed ECP at least once a year	0.2386600	0.0127055	0.2136532	0.2636667

ECP is education and/or career plan.
Note: Subpopulation *n* = 3,020. Imputations = 22. Number of strata = 360. Number of primary sampling units = 660. Subpopulation size = 769,200.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C12. Multiple imputation estimates of the proportion of public high school students in the bottom quintile of grade 9 math achievement who reported participating in education and career planning in 2009/10 and 2011/12, by planning element

Planning element	Mean	Standard error	95 percent confidence interval	
			Lower bound	Upper bound
Developed an ECP in fall of grade 9	0.6679276	0.0154906	0.6374306	0.6984246
Ever developed an ECP	0.7754878	0.0146538	0.7466402	0.8043354
Adult support: any	0.4586491	0.0159843	0.4271755	0.4901227
Adult support: counselor	0.1022214	0.0132600	0.0761163	0.1283264
Adult support: teacher	0.1077593	0.0122902	0.0835585	0.1319601
Adult support: parent	0.3385573	0.0147358	0.3095448	0.3675698
Adult support: other adult	0.0844383	0.0088995	0.0669112	0.1019653
Adult support: none	0.2114002	0.0182096	0.1755492	0.2472511
Ever reviewed ECP	0.3232049	0.0183197	0.2871108	0.3592989
Reviewed ECP once a year	0.1331617	0.0126428	0.1082340	0.1580894
Reviewed ECP more than once a year	0.0971830	0.0108115	0.0758664	0.1184996
Reviewed ECP less than once a year	0.0905949	0.0099163	0.0710586	0.1101311
Reviewed ECP never	0.1062438	0.0092260	0.0880414	0.1244462
Reviewed ECP at least once a year	0.2262627	0.0159859	0.1947544	0.2577709

ECP is education and/or career plan.
Note: Subpopulation *n* = 1,950. Imputations = 22. Number of strata = 360. Number of primary sampling units = 640. Subpopulation size = 694,530.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Model results for research question 3: What is the relationship between public high school students' participation in the three core education and career planning elements (early planning, adult support, and yearly review) and their college-going behaviors (submitting the Free Application for Federal Student Aid, completing a college preparatory curriculum, applying to a postsecondary institution, and enrolling in postsecondary education immediately after high school)?

Table C13. Multiple imputation linear probability model results for submitting the Free Application for Federal Student Aid

Variable	Coefficient	Standard error	t	P > t	95 percent confidence interval	
					Lower bound	Upper bound
Early planning	0.0199206	0.0149768	1.33	0.185	−0.0095677	0.0494089
Adult support: counselor	0.0093274	0.0198411	0.47	0.639	−0.0297218	0.0483766
Adult support: teacher	0.0115341	0.0237373	0.49	0.627	−0.0352360	0.0583042
Adult support: parent	0.0244673	0.0175621	1.39	0.164	−0.0100730	0.0590075
Adult support: other adult	−0.0183194	0.0237881	−0.77	0.442	−0.0651624	0.0285235
Yearly review	0.0459131	0.0138348	3.32**	0.001	0.0186039	0.0732224
Grade 9 math score	0.0087806	0.0009034	9.72***	0.000	0.0070018	0.0105594
Socioeconomic status	0.0323557	0.0092538	3.50**	0.001	0.0141451	0.0505663
Black	0.1313752	0.0223067	5.89***	0.000	0.0874348	0.1753155
Hispanic	0.0235229	0.0241308	0.97	0.330	−0.0239347	0.0709806
Other race/ethnicity	0.0329761	0.0186305	1.77	0.078	−0.0036802	0.0696325
Female	0.1167743	0.0119333	9.79***	0.000	0.0932549	0.1402937
Suburb	0.0180793	0.0199464	0.91	0.366	−0.0212190	0.0573776
Town	−0.0022607	0.0248074	−0.09	0.927	−0.0511646	0.0466433
Rural	0.0158956	0.0203001	0.78	0.435	−0.0241278	0.0559190
Average grade 9 ECP development rate	−0.0003965	0.0005113	−0.78	0.439	−0.0014031	0.0006102
Average grade 9 math score	−0.0017781	0.0019490	−0.91	0.362	−0.0056166	0.0020603
Percent of student body receiving free or reduced-price lunch	0.0007491	0.0004889	1.53	0.127	−0.0002134	0.0017116
Percent Black	−0.0004849	0.0008130	−0.60	0.552	−0.0020899	0.0011202
Percent Hispanic	0.0003639	0.0008250	0.44	0.660	−0.0012624	0.0019902
Percent non-White	−0.0002135	0.0007356	−0.29	0.772	−0.0016673	0.0012404
Percent female	−0.0006887	0.0005546	−1.24	0.215	−0.0017803	0.0004030
Average counselor caseload	−0.0001049	0.0000662	−1.59	0.114	−0.0002352	0.0000253
2008/09 school college-going rate	0.0012636	0.0005009	2.52*	0.013	0.0002700	0.0022571
Percentage of grade 12 students who have taken calculus	0.0000709	0.0005858	0.12	0.904	−0.0010944	0.0012362
Constant	0.2103554	0.1333220	1.58	0.116	−0.0522594	0.4729701

* Significant at *p* < .05; ** significant at *p* < .01; *** significant at *p* < .001.
ECP is education and/or career plan.
Note: *n* = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C14. Multiple imputation linear probability model results for completing a college preparatory curriculum

Variable	Coefficient	Standard error	t	P > t	95 percent confidence interval Lower bound	Upper bound
Early planning	−0.023831	0.016478	−1.45	0.150	−0.056303	0.008642
Adult support: counselor	0.004486	0.021476	0.21	0.835	−0.037772	0.046744
Adult support: teacher	0.012601	0.022801	0.55	0.581	−0.032243	0.057444
Adult support: parent	0.063883	0.016829	3.80***	0.000	0.030783	0.096984
Adult support: other adult	0.016974	0.023764	0.71	0.476	−0.029770	0.063717
Yearly review	0.009212	0.015549	0.59	0.554	−0.021369	0.039792
Grade 9 math score	0.015630	0.000771	20.27***	0.000	0.014114	0.017146
Socioeconomic status	0.084825	0.008940	9.49***	0.000	0.067248	0.102402
Black	0.015088	0.020929	0.72	0.471	−0.026074	0.056250
Hispanic	0.003134	0.018500	0.17	0.866	−0.033300	0.039569
Other race/ethnicity	0.000754	0.016308	0.05	0.963	−0.031312	0.032821
Female	0.066477	0.010731	6.19***	0.000	0.045367	0.087587
Suburb	−0.030143	0.023977	−1.26	0.209	−0.077285	0.016999
Town	−0.087537	0.027768	−3.15**	0.002	−0.142136	−0.032939
Rural	−0.022501	0.026413	−0.85	0.395	−0.074432	0.029429
Average grade 9 ECP development rate	0.001067	0.000681	1.57	0.118	−0.000273	0.002406
Average grade 9 math score	−0.000904	0.002751	−0.33	0.743	−0.006315	0.004507
Percent of student body receiving free or reduced-price lunch	−0.000093	0.000604	−0.15	0.877	−0.001282	0.001095
Percent Black	0.004442	0.001053	4.22***	0.000	0.002371	0.006513
Percent Hispanic	0.003271	0.001076	3.04**	0.003	0.001155	0.005388
Percent non-White	−0.002715	0.000917	−2.96**	0.003	−0.004519	−0.000912
Percent female	−0.000394	0.000751	−0.52	0.600	−0.001869	0.001082
Average counselor caseload	−0.000179	0.000076	−2.36*	0.019	−0.000328	−0.000030
2008/09 school college-going rate	0.000945	0.000578	1.64	0.103	−0.000193	0.002084
Percentage of grade 12 students who have taken calculus	0.002153	0.000798	2.70**	0.007	0.000582	0.003725
Constant	−0.518334	0.159492	−3.25	0.001	−0.831932	−0.204736

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.
ECP is education and/or career plan.
Note: n = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C15. Multiple imputation linear probability model results for applying to a postsecondary institution

Variable	Coefficient	Standard error	t	P > t	95 percent confidence interval Lower bound	Upper bound
Early planning	0.0159365	0.0138897	1.15	0.253	−0.0114508	0.0433239
Adult support: counselor	0.0008226	0.0171910	0.05	0.962	−0.0330211	0.0346663
Adult support: teacher	0.0439922	0.0165925	2.65**	0.009	0.0112823	0.0767021
Adult support: parent	0.0243184	0.0126821	1.92	0.056	−0.0006768	0.0493137
Adult support: other adult	−0.0126850	0.0173994	−0.73	0.467	−0.0469789	0.0216089
Yearly review	0.0272503	0.0101311	2.69**	0.008	0.0072965	0.0472040
Grade 9 math score	0.0061376	0.0005900	10.40***	0.000	0.0049756	0.0072996
Socioeconomic status	0.0602393	0.0067027	8.99***	0.000	0.0470293	0.0734493
Black	0.0725094	0.0160721	4.51***	0.000	0.0408408	0.1041780
Hispanic	0.0248901	0.0196473	1.27	0.206	−0.0137809	0.0635612
Other race/ethnicity	0.0275019	0.0151361	1.82	0.070	−0.0022788	0.0572827
Female	0.0977121	0.0102176	9.56***	0.000	0.0776071	0.1178172
Suburb	0.0045787	0.0140769	0.33	0.745	−0.0231333	0.0322907
Town	−0.0381600	0.0219643	−1.74	0.083	−0.0813774	0.0050573
Rural	−0.0074676	0.0151954	−0.49	0.624	−0.0373999	0.0224646
Average grade 9 ECP development rate	−0.0003748	0.0003870	−0.97	0.334	−0.0011365	0.0003868
Average grade 9 math score	0.0007182	0.0017868	0.40	0.688	−0.0027986	0.0042351
Percent of student body receiving free or reduced-price lunch	−0.0000509	0.0004309	−0.12	0.906	−0.0008999	0.0007981
Percent Black	0.0001103	0.0009338	0.12	0.906	−0.0017273	0.0019479
Percent Hispanic	0.0005235	0.0009752	0.54	0.592	−0.0013950	0.0024420
Percent non-White	0.0002051	0.0008583	0.24	0.811	−0.0014829	0.0018931
Percent female	−0.0009151	0.0004402	−2.08*	0.038	−0.0017813	−0.0000489
Average counselor caseload	−0.0000872	0.0000529	−1.65	0.101	−0.0001914	0.0000170
2008/09 school college-going rate	0.0011321	0.0004763	2.38*	0.019	0.0001913	0.0020729
Percentage of grade 12 students who have taken calculus	0.0004975	0.0004812	1.03	0.304	−0.0004600	0.0014551
Constant	0.3945839	0.1049843	3.76	0.000	0.1879061	0.6012616

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.
ECP is education and/or career plan.
Note: n = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C16. Multiple imputation linear probability model results for enrolling in a postsecondary institution immediately after high school

Variable	Coefficient	Standard error	t	P > t	95 percent confidence interval Lower bound	Upper bound
Early planning	0.010810	0.016191	0.67	0.505	−0.021027	0.042646
Adult support: counselor	0.023560	0.019821	1.19	0.235	−0.015424	0.062543
Adult support: teacher	0.016317	0.025777	0.63	0.527	−0.034368	0.067002
Adult support: parent	0.060484	0.018205	3.32**	0.001	0.024685	0.096283
Adult support: other adult	−0.058513	0.023789	−2.46*	0.014	−0.105293	−0.011732
Yearly review	0.029707	0.012245	2.43*	0.016	0.005622	0.053793
Grade 9 math score	0.009604	0.000671	14.30***	0.000	0.008284	0.010924
Socioeconomic status	0.122007	0.007802	15.64***	0.000	0.106668	0.137345
Black	0.029669	0.021426	1.38	0.167	−0.012458	0.071796
Hispanic	0.006932	0.019403	0.36	0.721	−0.031214	0.045079
Other race/ethnicity	0.004571	0.018651	0.25	0.807	−0.032098	0.041240
Female	0.099427	0.011928	8.34***	0.000	0.075977	0.122878
Suburb	0.021292	0.016371	1.30	0.194	−0.010893	0.053478
Town	−0.019846	0.024538	−0.81	0.419	−0.068089	0.028397
Rural	0.005918	0.018892	0.31	0.754	−0.031226	0.043061
Average grade 9 ECP development rate	−0.000441	0.000449	−0.98	0.326	−0.001324	0.000441
Average grade 9 math score	0.000768	0.002071	0.37	0.711	−0.003304	0.004840
Percent of student body receiving free or reduced-price lunch	−0.000550	0.000513	−1.07	0.284	−0.001559	0.000458
Percent Black	−0.000919	0.000976	−0.94	0.347	−0.002839	0.001000
Percent Hispanic	−0.000055	0.001050	−0.05	0.958	−0.002118	0.002009
Percent non-White	0.001183	0.000902	1.31	0.190	−0.000590	0.002956
Percent female	−0.000296	0.000471	−0.63	0.530	−0.001222	0.000629
Average counselor caseload	−0.000102	0.000063	−1.61	0.109	−0.000227	0.000023
2008/09 school college–going rate	0.001341	0.000560	2.39*	0.017	0.000237	0.002445
Percentage of students in grade 12 who have taken calculus	0.000595	0.000507	1.17	0.242	−0.000406	0.001595
Constant	0.045787	0.148078	0.31	0.757	−0.245352	0.336927

* Significant at *p* < .05; ** significant at *p* < .01; *** significant at *p* < .001.
ECP is education and/or career plan.
Note: *n* = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C17. Multiple imputation linear probability model results for enrolling in a bachelor's program at a postsecondary institution immediately after high school

Variable	Coefficient	Standard error	t	P > t	Lower bound	Upper bound
					95 percent confidence interval	
Early planning	−0.011930	0.019551	−0.61	0.542	−0.050500	0.026639
Adult support: counselor	0.025712	0.020074	1.28	0.202	−0.013838	0.065262
Adult support: teacher	−0.000706	0.024228	−0.03	0.977	−0.048559	0.047147
Adult support: parent	0.037328	0.016734	2.23*	0.027	0.004309	0.070347
Adult support: other adult	−0.019178	0.025659	−0.75	0.456	−0.070031	0.031675
Yearly review	0.012759	0.016731	0.76	0.447	−0.020326	0.045845
Grade 9 math score	0.014006	0.000853	16.43***	0.000	0.012310	0.015702
Socioeconomic status	0.145174	0.011002	13.20***	0.000	0.123460	0.166887
Black	0.029800	0.025574	1.17	0.246	−0.020838	0.080438
Hispanic	−0.055964	0.024116	−2.32*	0.022	−0.103597	−0.008331
Other race/ethnicity	−0.015099	0.017964	−0.84	0.402	−0.050588	0.020391
Female	0.045524	0.012506	3.64***	0.000	0.020836	0.070211
Suburb	−0.003693	0.017948	−0.21	0.837	−0.039115	0.031730
Town	−0.034572	0.027305	−1.27	0.209	−0.088783	0.019640
Rural	−0.015677	0.022063	−0.71	0.479	−0.059347	0.027993
Average grade 9 ECP development rate	−0.001129	0.000555	−2.03*	0.043	−0.002224	−0.000035
Average grade 9 math score	−0.001254	0.002200	−0.57	0.570	−0.005601	0.003094
Percent of student body receiving free or reduced-price lunch	−0.000104	0.000598	−0.17	0.863	−0.001300	0.001092
Percent Black	0.001458	0.000826	1.76	0.081	−0.000182	0.003098
Percent Hispanic	0.000976	0.000852	1.15	0.255	−0.000715	0.002667
Percent non-White	−0.001344	0.000765	−1.76	0.082	−0.002863	0.000176
Percent female	−0.000080	0.000709	−0.11	0.910	−0.001481	0.001321
Average counselor caseload	−0.000156	0.000065	−2.40*	0.017	−0.000283	−0.000028
2008/09 school college-going rate	0.002041	0.000686	2.98**	0.004	0.000682	0.003400
Percentage of grade 12 students who have taken calculus	0.001930	0.000572	3.38**	0.001	0.000799	0.003060
Constant	−0.365512	0.142628	−2.56	0.011	−0.647297	−0.083727

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.
ECP is education and/or career plan.
Note: n = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C18. Multiple imputation linear probability model results for enrolling in an associate program at a postsecondary institution immediately after high school

Variable	Coefficient	Standard error	t	P > t	95 percent confidence interval	
					Lower bound	Upper bound
Early planning	0.0279767	0.0198879	1.41	0.162	−0.0113385	0.0672920
Adult support: counselor	−0.0397492	0.0231355	−1.72	0.088	−0.0854231	0.0059247
Adult support: teacher	0.0399138	0.0260389	1.53	0.128	−0.0115783	0.0914059
Adult support: parent	0.0021613	0.0192824	0.11	0.911	−0.0358955	0.0402182
Adult support: other adult	0.0070764	0.0282329	0.25	0.802	−0.0485215	0.0626743
Yearly review	0.0350149	0.0203253	1.72	0.087	−0.0052128	0.0752425
Grade 9 math score	−0.0031974	0.0008720	−3.67***	0.000	−0.0049258	−0.0014690
Socioeconomic status	−0.0292670	0.0107038	−2.73**	0.007	−0.0504100	−0.0081240
Black	0.0082338	0.0275888	0.30	0.766	−0.0462479	0.0627154
Hispanic	0.0333582	0.0251382	1.33	0.186	−0.0162891	0.0830055
Other race/ethnicity	−0.0072222	0.0196714	−0.37	0.714	−0.0460761	0.0316316
Female	0.0236946	0.0144850	1.64	0.104	−0.0049645	0.0523538
Suburb	0.0384456	0.0203957	1.88	0.062	−0.0019479	0.0788391
Town	0.0293731	0.0307722	0.95	0.341	−0.0313294	0.0900756
Rural	0.0304490	0.0208023	1.46	0.145	−0.0106281	0.0715261
Average grade 9 ECP development rate	0.0009643	0.0005377	1.79	0.074	−0.0000958	0.0020245
Average grade 9 math score	0.0007919	0.0024743	0.32	0.749	−0.0040997	0.0056835
Percent of student body receiving free or reduced-price lunch	−0.0001281	0.0005941	−0.22	0.830	−0.0013064	0.0010503
Percent Black	−0.0018687	0.0010144	−1.84	0.068	−0.0038796	0.0001422
Percent Hispanic	−0.0007127	0.0010140	−0.70	0.483	−0.0027148	0.0012894
Percent non-White	0.0015788	0.0009071	1.74	0.084	−0.0002145	0.0033721
Percent female	−0.0003000	0.0007555	−0.40	0.692	−0.0017912	0.0011912
Average counselor caseload	0.0000556	0.0000671	0.83	0.408	−0.0000768	0.0001880
2008/09 school college-going rate	0.0001750	0.0006744	0.26	0.796	−0.0011580	0.0015080
Percentage of grade 12 students who have taken calculus	−0.0010593	0.0005545	−1.91	0.059	−0.0021579	0.0000393
Constant	0.2880426	0.1449029	1.99	0.049	0.0009780	0.5751071

** Significant at $p < .01$; *** significant at $p < .001$.

ECP is education and/or career plan.

Note: n = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.

Source: Authors' analysis of data from the High School Longitudinal Study of 2009.

Table C19. Multiple imputation linear probability model results for enrolling in a certificate program at a postsecondary institution immediately after high school

Variable	Coefficient	Standard error	t	P > t	95 percent confidence interval	
					Lower bound	Upper bound
Early planning	−0.003268	0.009175	−0.36	0.722	−0.021414	0.014878
Adult support: counselor	0.003868	0.010288	0.38	0.708	−0.016513	0.024249
Adult support: teacher	−0.010200	0.010501	−0.97	0.333	−0.030969	0.010568
Adult support: parent	−0.005194	0.009015	−0.58	0.566	−0.023037	0.012649
Adult support: other adult	0.013938	0.012532	1.11	0.269	−0.010900	0.038776
Yearly review	−0.006574	0.007313	−0.90	0.370	−0.021020	0.007872
Grade 9 math score	−0.003515	0.000405	−8.68***	0.000	−0.004320	−0.002710
Socioeconomic status	−0.021943	0.004742	−4.63***	0.000	−0.031306	−0.012580
Black	−0.024523	0.012087	−2.03*	0.045	−0.048505	−0.000541
Hispanic	−0.001283	0.010604	−0.12	0.904	−0.022248	0.019682
Other race/ethnicity	−0.007804	0.008758	−0.89	0.374	−0.025103	0.009494
Female	−0.020592	0.006931	−2.97**	0.004	−0.034398	−0.006786
Suburb	0.016864	0.008022	2.10*	0.037	0.001015	0.032714
Town	0.015852	0.010570	1.50	0.136	−0.005032	0.036737
Rural	0.029484	0.009183	3.21**	0.002	0.011345	0.047623
Average grade 9 ECP development rate	−0.000202	0.000241	−0.84	0.405	−0.000681	0.000278
Average grade 9 math score	0.001128	0.000955	1.18	0.240	−0.000764	0.003021
Percent of student body receiving free or reduced-price lunch	0.000485	0.000235	2.07*	0.041	0.000020	0.000951
Percent Black	−0.000658	0.000382	−1.72	0.088	−0.001417	0.000100
Percent Hispanic	−0.000869	0.000377	−2.31*	0.023	−0.001615	−0.000124
Percent non-White	0.000574	0.000325	1.77	0.079	−0.000069	0.001217
Percent female	0.000462	0.000261	1.77	0.079	−0.000054	0.000977
Average counselor caseload	−0.000024	0.000024	−0.98	0.331	−0.000071	0.000024
2008/09 school college-going rate	−0.000929	0.000291	−3.19**	0.003	−0.001515	−0.000343
Percentage of grade 12 students who have taken calculus	0.000090	0.000248	0.36	0.719	−0.000404	0.000583
Constant	0.248886	0.054584	4.56	0.000	0.140653	0.357119

* Significant at *p* < .05; ** significant at *p* < .01; *** significant at *p* < .001.
ECP is education and/or career plan.
Note: *n* = 12,600. Imputations = 22. Number of strata = 370. Number of primary sampling units = 770. Population size = 3,893,710.
Source: Authors' analysis of data from the High School Longitudinal Study of 2009.