Making Connections

Postsecondary education expectations and attainment of rural and nonrural students

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Key findings

This study used data from the Education Longitudinal Study of 2002 to examine the postsecondary education expectations, attainment, and realization of expectations as well as reasons for not expecting to pursue postsecondary education among rural and nonrural grade 10 students in the Regional Educational Laboratory Midwest Region. Among the findings:

- Approximately 90 percent of both rural and nonrural students expected to attend college, but the percentage who expected to attain a master's degree or higher was higher among nonrural students than among rural students.
- The reason that both rural and nonrural students reported most frequently for not expecting to pursue education beyond high school was financial concerns.
- Rural and nonrural students had similar levels of postsecondary educational attainment by 2012, eight years after expected high school graduation.
- Almost two-thirds of both rural and nonrural students had fallen short of their grade 10 education expectations by 2012.

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Summary

Prior research shows that rural students' education expectations and aspirations, as well as their postsecondary enrollment and persistence rates, tend to be lower than those of nonrural students (Byun, Meece, & Irvin, 2012; Cobb, McIntire, & Pratt, 1989; Gillie, Isenhour, & Rasmussen, 2006; Haller & Virkler, 1993; Hu, 2003; Rouse, 1995; Turley, 2009). However, much of that prior research may not apply to today's students because it uses old data or focuses on individual states or purposive samples. Meanwhile, recent policy initiatives at both the national and state levels have emphasized increasing college-going rates. Moreover, because of the rise in online learning options, high school students have more opportunities to take college preparatory courses and pursue college education without leaving home.

The Rural Research Alliance partnered with Regional Educational Laboratory (REL) Midwest to examine more recent postsecondary education expectations, attainment, and realization of expectations of rural and nonrural grade 10 students in the REL Midwest Region and the rest of the nation.[1] The study also examined the reasons that rural and nonrural students in the REL Midwest Region reported for not expecting to pursue postsecondary education. It used the most recently released data from the Education Longitudinal Study of 2002, which surveyed a nationally representative sample of grade 10 students in 2002 and then administered follow-up surveys of the same individuals in 2004, 2006, and 2012, eight years after expected high school graduation. The study used data from 2002 and 2012. It aims to support policymakers and other stakeholders in the REL Midwest states by informing policy recommendations for improving postsecondary attainment among rural students in the region.

Key findings include:
- Approximately 90 percent of both rural and nonrural grade 10 students in REL Midwest Region states in 2002 expected to attend college, but the percentage who expected to attain a master's degree or higher was higher among nonrural students than among rural students.
- The reason that both rural and nonrural students reported most frequently for not expecting to pursue postsecondary education was financial concerns.
- Rural and nonrural students had similar levels of postsecondary educational attainment by 2012.
- Almost two-thirds of both rural and nonrural students had fallen short of their grade 10 postsecondary education expectations by 2012.
- Student characteristics, and to a lesser degree family characteristics and teacher expectations, rather than school locale, accounted for much of the variation in education expectations and attainment.

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Why this study?

Adolescent expectations (what one thinks will happen) and aspirations (what one hopes will happen) are important precursors to students' successful transition into adult roles and to their fulfillment of adult responsibilities later in life (Blustein, 1997; Super, 1994). Postsecondary education expectations and aspirations serve as idealistic education and occupation dreams in younger children, which lay the groundwork for specific and realistic choices and goals during adolescence (Burnell, 2003), and they are strongly associated with subsequent educational and occupational attainment (Byun, Meece, Irvin, & Hutchins, 2012; Duncan, Featherman, & Duncan, 1972; Fan & Wolters, 2014; Howley, 2006; Kim & Schneider, 2005; Schneider, Wyse, & Keesler, 2007; Sewell, Haller, & Ohlendorf, 1970; Young, 1998).

Prior research shows that rural students' postsecondary education expectations and aspirations, as well as their postsecondary enrollment and persistence rates, tend to be lower than those of nonrural students (Cobb, McIntire, & Pratt, 1989; Haller & Virkler, 1993; Hansen & McIntire, 1989). These patterns have been linked to rural students' lower levels of education preparation (Byun, Meece, & Irvin, 2012; Hu, 2003), lower participation in an academically advanced school curriculum (Byun, Meece, & Irvin, 2012; Graham, 2009; Griffin, Hutchins, & Meece, 2011), the unique cultural and social influences of their communities (Haller & Virkler, 1993), the socioeconomic status of their families (Deosaran, 1978; Schaefer & Meece, 2009), and their distance from postsecondary institutions (Gillie, Isenhour, & Rasmussen, 2006; Rouse, 1995; Turley, 2009). For a detailed description of the research on these topics, see appendix A.

Much of the prior research on differences in postsecondary education expectations, enrollment, and persistence between rural and nonrural students may not apply to today's students because it uses old data or focuses on individual states or purposive samples

However, much of the prior research on differences in postsecondary education expectations, enrollment, and persistence between rural and nonrural students may not apply to today's students because it uses old data or focuses on individual states or purposive samples. Meanwhile, recent policy initiatives at both the national and state levels have emphasized increasing college-going rates. Moreover, the rise in online learning options has reduced logistical impediments to attaining a postsecondary degree, particularly for rural students, by expanding offerings of advanced college preparatory and dual credit courses in high schools and by giving students the opportunity to attain a postsecondary degree without leaving their homes.

The Rural Research Alliance partnered with Regional Educational Laboratory (REL) Midwest to examine more recent data on the postsecondary education expectations, attainment, and realization of expectations of rural and nonrural students in the REL Midwest Region and the rest of the nation. The alliance is made up of members from six REL Midwest Region states (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) and includes directors of national and local rural associations, administrators of cooperative educational service agencies, college faculty members, and school district directors. This study was conducted to inform policy and practice for improving postsecondary education attainment and success among rural students in the REL Midwest Region.

What the study examined

This study addresses four research questions:

1. Do grade 10 postsecondary education expectations differ between rural and nonrural students in the REL Midwest Region? Do the differences remain after student, family, teacher, and school characteristics are controlled for? How do the differences compare with those between rural and nonrural grade 10 students in the rest of the nation?

2. For students who in grade 10 did not expect to pursue postsecondary education, do the reasons reported differ between rural and nonrural students in the REL Midwest Region?

3. Does postsecondary educational attainment, measured eight years after expected high school graduation, differ between rural and nonrural students in the REL Midwest Region? Do the differences remain after student, family, teacher, and school characteristics are controlled for? How do the differences compare with those between rural and nonrural students in the rest of the nation?

4. Does the realization of grade 10 postsecondary education expectations, measured eight years after expected high school graduation, differ between rural and nonrural students in the REL Midwest Region? Do the differences remain after student, family, teacher, or school characteristics are controlled for? How do the differences compare with those between rural and nonrural students in the rest of the nation?

This study used data from the Education Longitudinal Study of 2002, a longitudinal study that followed a nationally representative cohort of grade 10 students in 2002 from high school to postsecondary education and employment

This study used the most recently released data from the Education Longitudinal Study of 2002. See box 1 for a brief description of the Education Longitudinal Study of 2002 and the samples examined for this study. Differences between rural and nonrural students in the REL Midwest Region were first examined by comparing percentage distributions of the outcomes across school locales. A series of statistical models with an increasing number of predictor variables supported further exploration of differences in the region and allowed for a comparison with differences between rural and nonrural students in the rest of the nation. See box 2 for a brief description of the measures and analytic methods used and appendix B for more detailed information.

Box 1. Data and analytic samples

Data

This study addressed four research questions using data from the Education Longitudinal Study of 2002, a longitudinal study conducted by the National Center for Education Statistics that followed a nationally representative cohort of grade 10 students in 2002 from high school to postsecondary education and employment. Follow-up data were collected in three years: 2004, when a majority of the grade 10 cohort was in grade 12; 2006, when a majority of the grade 10 cohort had completed high school and had enrolled in college or pursued employment; and 2012, when a majority of the grade 10 cohort was eight years out of high school and had attended college or pursued employment. In the base year students also were

(continued)

Box 1. Data and analytic samples *(continued)*

administered cognitive tests in math and reading, and in the base year and first follow-up year (2004), their parents, math and English teachers, and high school principals were also surveyed. The current study used restricted-use data files for the 2002 base year and the third follow-up year (2012). See http://nces.ed.gov/surveys/els2002/ for more detailed information about the Education Longitudinal Study of 2002.

Analytic samples

The study used three analytic samples. Research question 1 used the full sample of 10,740 grade 10 students in 2002 who reported their postsecondary education expectations (2,140 students in the REL Midwest region and 8,600 in the rest of the nation). Twenty-five percent of these students were in rural schools, and the rest were in nonrural schools. Research question 2 used the subsample of 160 students from the REL Midwest Region who indicated that they did not expect to pursue postsecondary education and provided a reason for their expectation. About 31 percent of these students were in rural schools, and the rest were in nonrural schools. Research questions 3 and 4 used the subsample of 8,740 students with data on educational attainment in 2012 (1,780 students in the REL Midwest Region and 6,960 students in the rest of the nation). See figure B1 in appendix B for a flowchart showing how the analytic samples were constructed; see table B1 in appendix B for details of the baseline characteristics of the analytic samples.

Box 2. Measures and methods

The study team examined relationships between four outcome measures and two predictor variables and included four categories of control variables.

Outcome measures

The four outcomes were constructed from study participants' responses to the Education Longitudinal Study of 2002 surveys:

- *Postsecondary education expectation.* Grade 10 students chose one of seven options in response to the question "As things stand now, how far in school do you think you will get?" The study team collapsed the responses into four categories: 1 = complete high school or less (less than high school graduation, high school graduation, or general equivalency diploma), 2 = attend some college but not complete a bachelor's degree (attend college or complete an associate's degree but not complete a bachelor's degree), 3 = complete a bachelor's degree, 4 = attain a master's degree or higher (attain a master's degree or other advanced degree).
- *Reason for not expecting to pursue postsecondary education.* Grade 10 students in 2002 who indicated that they did not expect to pursue postsecondary education responded to the question: "Which of the following are reasons why you have decided NOT to continue your education past high school?" The study team collapsed responses into four categories: 1 = financial concerns (I cannot afford to go on to school; I need to help support my family; I'd rather work and make money than go to school), 2 = does not need further education (I will not need more education for the career I want; I plan to be a full-time homemaker), 3 = not interested in school (I do not like school; I do not feel that going to school is important), 4 = insufficient grades (my grades are not high enough).
- *Postsecondary educational attainment.* Study participants chose one of 10 options in response to a question about the highest level of education attained as of 2012. The study team collapsed the responses into the same four categories used for postsecondary education expectations.
- *Realization of postsecondary education expectations.* The study team compared students' postsecondary educational attainment as of 2012 with their grade 10 expectation. Results were sorted into three categories: 1 = attainment fell short of expectation, 2 = attainment matched expectation, 3 = attainment exceeded expectation.

(continued)

Box 2. Measures and methods *(continued)*

Key predictor variables

The two key predictor variables used in the study were:

- *School locale.* School locale (rural or nonrural) was based on National Center for Education Statistics urban-centric locale codes. Schools with urban, suburban, or town locale codes were classified as nonrural, and schools with the rural locale code were classified as rural.
- *Region.* Region (REL Midwest Region or rest of the nation) was based on the location of the student's school. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. The rest of the nation comprises the remaining 43 states plus the District of Columbia.

Control variables

The four categories of control variables used in the study were:

- *Student characteristics.* Gender, race/ethnicity, rating of the general importance of staying close to home, average grade 10 math and reading scores, and type of high school program (general, vocational, or college preparatory).
- *Family characteristics.* Household socioeconomic status (an average of five measures: father's education and occupation, mother's education and occupation, and family income), parents' education aspirations for their child, parent involvement at home, and parent involvement at school.
- *Teacher characteristics.* Teachers' postsecondary education expectations for the student.
- *School characteristics.* School average of math and reading composite scores, percentage of racial/ethnic minority students, percentage of students eligible for the federal school lunch program, and school average of household socioeconomic status (defined above).

   See table B2 in appendix B for information on how control variables were coded.

Analytic methods

To answer the first part of research questions 1–4, the study team tabulated the weighted[1] percentages of students belonging to each category of outcome by school locale and used a chi-square test of equality of distributions to assess whether the overall percentage distributions differed between rural and nonrural students. When there were overall differences, follow-up comparisons were conducted to determine the categories of outcome in which the differences existed. Follow-up comparisons were adjusted for multiple testing across categories (see appendix B for details).

   To answer the second part of research questions 1, 3, and 4, the study team used a series of four multinomial regression models that sequentially added blocks of predictor variables (see appendix B): starting with a baseline model (model 1) that included only school locale, region indicator, and their interaction as predictor variables; then adding student characteristics that included grade 10 expectations in the case of the attainment outcome (model 2), followed by family characteristics and teacher expectations (model 3), and school contextual variables (model 4, which controlled for all the characteristics described above in the control variables section). Predictor variables —including variables that prior research has shown to be related to expectations, aspirations, or attainment (see appendix A)—were added in blocks to assess the predictive value of the models. In these models a statistically significant regression coefficient for the rural by region interaction suggested variations in rural–nonrural differences between regions, and a statistically significant sum of the coefficients for rural indicator and rural by region interaction suggested rural–nonrural differences in the REL Midwest Region. All models were two-level models (students nested within schools) that accounted for correlations among students who attended the same high schools—correlations that the methods used in the analyses of the first part of each research question did not take into account.

Note

1. All analyses employed weights that accounted for the two-stage sampling design—that is, a stratified systematic sample of students selected from sampled schools—used in the Education Longitudinal Study of 2002 (see appendix B for details).

What the study found

In 2002, 90 percent of grade 10 students in the REL Midwest Region expected to attend college, but rural students had lower postsecondary education expectations than did nonrural students, even after student, family, teacher, and school characteristics were controlled for. The reason that both rural and nonrural students reported most frequently for not expecting to pursue postsecondary education was financial concerns. Ten years after they were first interviewed, rural and nonrural students in the REL Midwest Region reported similar levels of postsecondary educational attainment, and almost two-thirds of them had fallen short of their grade 10 expectations. However, rural students in the region who fell short of or matched their expectations tended to have had higher ambitions than did their nonrural counterparts. Student and family characteristics and teacher expectations were more predictive of students' expectations and attainment than was the locale or region of the high schools they attended. However, more research is needed to understand the nature of these relationships.

In 2002 approximately 90 percent of both rural and nonrural grade 10 students in the Regional Educational Laboratory Midwest Region expected to attend college

Regardless of school locale, about 90 percent of grade 10 students in REL Midwest Region schools in 2002 expected to enroll in a postsecondary institution, and about 10 percent expected to have, at most, a high school credential (table 1). Similar patterns were observed

Regardless of school locale, about 90 percent of grade 10 students in REL Midwest Region schools in 2002 expected to enroll in a postsecondary institution, and about 10 percent expected to have, at most, a high school credential

Table 1. Postsecondary education expectations of rural and nonrural grade 10 students in spring 2002 in the Regional Educational Laboratory Midwest Region and the rest of the nation

Postsecondary education expectation	Rural	Nonrural	All	Test of equality of distributions of expectation between school locales
Regional Educational Laboratory Midwest Region				
Number of students	570	1,570	2,140	na
High school or less (percent)	10.5 (1.78)	9.4 (0.92)	9.6 na	$\chi^2 = 0.31$
At least some college (percent)	89.5 (1.78)	90.6 (0.92)	90.4 na	p-value = .579
Rest of the nation				
Number of students	2,080	6,520	8,600	na
High school or less (percent)	10.6 (0.79)	9.4 (0.52)	9.7 na	$\chi^2 = 1.76$
At least some college (percent)	89.4 (0.79)	90.6 (0.52)	90.3 na	p-value = .187

na is not applicable.

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. The rest of the nation comprises the remaining 43 states plus the District of Columbia. Percentages are weighted and unadjusted for clustering and student, family, teacher, and school characteristics. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Percentages may not sum to totals because of rounding. Neither test of equality of distributions was statistically significant at $p < .05$.

Source: Authors' calculations based on data from Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

in the rest of the nation, where 89 percent of grade 10 students who attended rural schools and 91 percent of those who attended nonrural schools anticipated enrolling in college. In both the REL Midwest Region and the rest of the nation, differences in the rates at which rural and nonrural students expected to pursue postsecondary education were not statistically significant.

In 2002 the percentage of grade 10 students in the Regional Educational Laboratory Midwest Region who expected to attend college without completing a bachelor's degree was higher in rural schools than in nonrural schools, but the percentage who expected to attain a master's degree or higher was lower in rural schools than in nonrural schools

Grade 10 students in rural and nonrural schools in the REL Midwest Region in 2002 expected to attend college at similar rates. However, rural students tended to have lower postsecondary education expectations than did nonrural students. Based on a chi-square test of equality of distributions, the overall (unadjusted) distribution of expectations across the four categories differed between rural and nonrural students (see table C1 in appendix C). And follow-up comparisons revealed statistically significant differences between rural and nonrural students in specific expectation levels (figure 1; see also table C1). The percentage of students who expected to attend some college but not complete a bachelor's

Grade 10 students in rural and nonrural schools in the REL Midwest Region in 2002 expected to attend college at similar rates. However, rural students tended to have lower postsecondary education expectations than did nonrural students

Figure 1. A higher percentage of rural students than of nonrural students in the Regional Educational Laboratory Midwest Region expected to attend some college but not complete a bachelor's degree, but a higher percentage of nonrural students than of rural students expected to attain a master's degree or higher
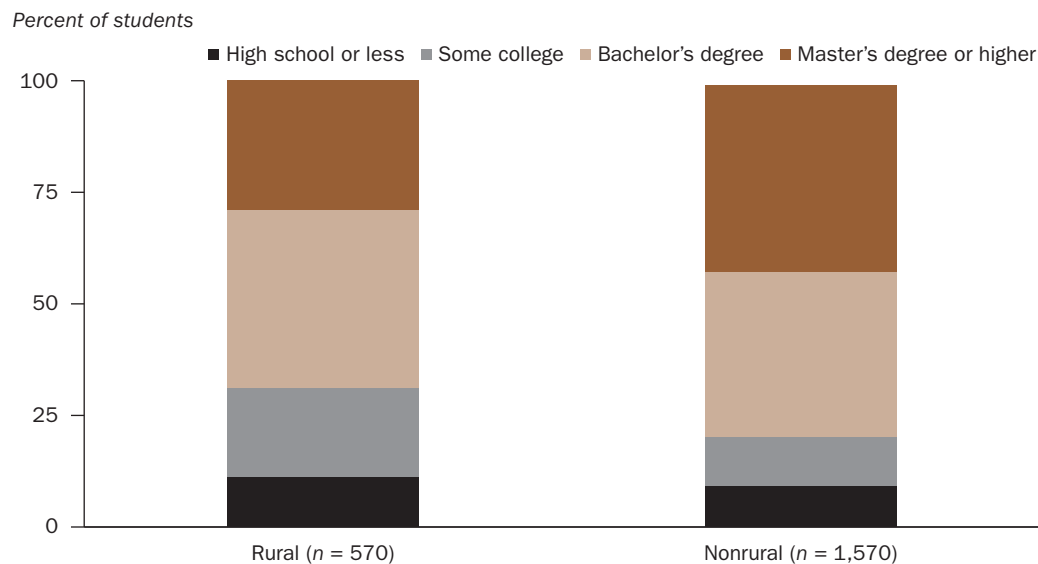
Percent of students

Note: The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Percentages are weighted and unadjusted for clustering and student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. The overall chi-square test of equality of distributions of expectations between rural and nonrural students was statistically significant at $p < .05$. The pairwise rural–nonrural difference for some college and for master's degree or higher was statistically significant at $p < .05$ after adjustments for multiple comparisons.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

degree was 9 percentage points higher among rural students (20 percent) than among nonrural students (11 percent). The percentage who expected to complete a bachelor's degree was similar (40 percent among rural students and 38 percent among nonrural students), but the percentage who expected to attain a master's degree or higher was 13 percentage points lower among rural students (29 percent) than among nonrural students (42 percent).

Grade 10 students in the Regional Educational Laboratory Midwest Region who attended rural schools remained less likely than those who attended nonrural schools to expect to attain a master's degree or higher after student, family, teacher, and school characteristics were controlled for

In the baseline model with no controls for background characteristics, there were several statistically significant differences in postsecondary education expectations between rural and nonrural students in the REL Midwest Region (see the results for model 1 in table C2 in appendix C). Rural students were less likely than nonrural students to expect to complete a bachelor's degree relative to attending some college but not completing a bachelor's degree (rural students' odds were 34 percent lower than nonrural students' odds). Rural students were also significantly less likely to expect to attain a master's degree or higher relative to attending some college but not completing a bachelor's degree (rural students' odds were 59 percent lower than nonrural students' odds) and significantly less likely to expect to attain a master's degree or higher relative to completing a bachelor's degree (rural students' odds were 38 percent lower than nonrural students' odds).

The statistically significant associations between school locale and postsecondary education expectations in the REL Midwest Region generally persisted, although some were weaker, after student, family, teacher, and school characteristics were controlled for (see the results for model 4 in table C2 in appendix C). Rural students remained significantly less likely than nonrural students to expect to attain a master's degree or higher rather than attend some college but not complete a bachelor's degree (rural students' odds were 36 percent lower than nonrural students' odds) and to expect to attain a master's degree or higher rather than complete a bachelor's degree (rural students' odds were 25 percent lower than nonrural students' odds). However, school locale was no longer associated with the likelihood of expecting to complete a bachelor's degree rather than attend some college but not complete a bachelor's degree.

Rural students' odds of expecting to attain a master's degree or higher rather than attend some college but not complete a bachelor's degree were 36 percent lower than those of nonrural students, after student, family, teacher, and school characteristics were controlled for

Rural students in both the REL Midwest Region and the rest of the nation were less likely than their nonrural peers to have higher postsecondary education expectations, and although the rural–nonrural gaps were greater in the REL Midwest Region than in the rest of the nation, background characteristics explained the regional differences. In the REL Midwest Region, rural students were less likely than nonrural students to expect to attain a master's degree or higher rather than attend some college but not complete a bachelor's degree. A similar pattern was observed in the rest of the nation but to a greater degree than in the REL Midwest Region (the rural–nonrural gap in expecting to attain a master's degree or higher rather than attend some college but not complete a bachelor's degree was 42 percent lower in the REL Midwest Region than in the rest of the nation; see the relative odds ratios for model 1 in table C2 in appendix C). In the REL Midwest Region, rural students were less likely than nonrural students to expect to attain a master's degree or higher rather than complete a bachelor's degree. A similar pattern was observed in the rest of the nation but to a greater degree than in the REL Midwest Region

(the rural–nonrural gap in expecting to attain a master's degree or higher rather than complete a bachelor's degree was 31 percent lower in the REL Midwest Region than in the rest of the nation; see the relative odds ratios for model 1 in table C2 in appendix C). After student, family, teacher, and school characteristics were controlled for, the regional variations in rural–nonrural differences between the REL Midwest Region and the rest of the nation were no longer statistically significant (see the relative odds ratios for model 4 in table C2 in appendix C).

Background characteristics accounted for some of the associations between school locale and postsecondary education expectations in the REL Midwest Region and explained the variations in rural–nonrural differences in student expectations between the REL Midwest Region and the rest of the nation. Student, family, teacher, and school characteristics explained 24 percent of the variation in expecting to attend some college but not complete a bachelor's degree (rather than complete high school or less), 55 percent of the variation in expecting to complete a bachelor's degree, and 68 percent of the variation in expecting to attain a master's degree or higher (see table C14 in appendix C). Statistically significant predictor variables are summarized as follows (see appendix C for more details):

- Female students tended to have higher postsecondary education expectations than did male students, with the gender gap widening as expectations rose.
- Higher academic performance was associated with higher postsecondary education expectations.
- Participation in a more rigorous, college preparatory curriculum was associated with expecting to complete a bachelor's degree or a master's degree or higher, whereas participation in vocational high school programs was associated with expecting to attend some college but not complete a bachelor's degree.
- The desire to stay close to home was negatively associated with expecting to attain a master's degree or higher.
- Parent aspirations and teacher expectations were both positively associated with students' postsecondary education expectations.

The reason that both rural and nonrural grade 10 students in the Regional Educational Laboratory Midwest Region reported most frequently for not expecting to pursue postsecondary education was financial concerns

The reason that grade 10 students in the REL Midwest Region in 2002, regardless of school locale, reported most frequently for not expecting to go to college was financial concerns. Although the overall distribution of reasons differed significantly between rural and nonrural students (see table C4 in appendix C), none of the rural–nonrural differences in each category of reason was statistically significant. In particular, the 12 percentage point difference in the percentages of rural (88 percent) and nonrural (76 percent) students who reported financial concerns was not statistically significant.[2]

The order of the remaining reasons differed between rural and nonrural students (figure 2; see also table C4 in appendix C). After financial concerns, rural students reported lack of need for further education (61 percent), lack of interest (60 percent), and perceived inadequate academic ability in high school (46 percent). Nonrural students reported perceived inadequate academic ability as the second most common reason (63 percent), followed by lack of interest (59 percent), and lack of need for further education (51 percent).

Although the overall distribution of reasons for not expecting to go to college differed significantly between rural and nonrural students, none of the rural–nonrural differences in each category of reason was statistically significant

Figure 2. Among grade 10 students in the Regional Educational Laboratory Midwest Region in 2002 who expected not to pursue postsecondary education, the most frequently reported reason was financial concerns

Percent of students
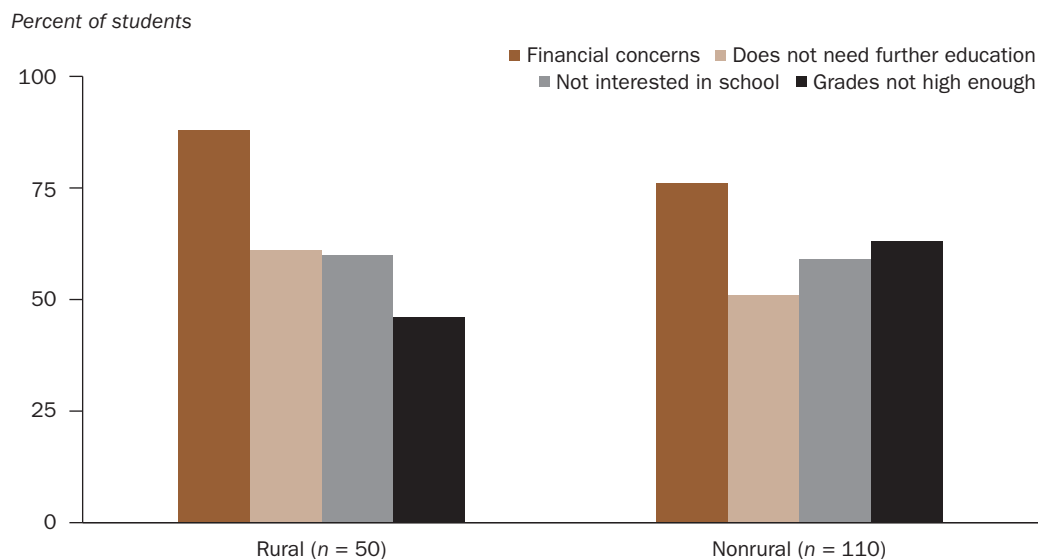
Note: Respondents could choose more than one reason. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Percentages are weighted and unadjusted for clustering and student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. The overall chi-square test of equality of distributions of reasons between rural and nonrural students was statistically significant at $p < .05$, but none of the rural–nonrural differences in each category of reason was statistically significant at $p < .05$ after adjustments for multiple comparisons.

Source: Authors' calculations based on data from Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

Rural and nonrural students in the Regional Educational Laboratory Midwest Region who were in grade 10 in 2002 had similar levels of postsecondary educational attainment in 2012, eight years after expected high school graduation

The overall (unadjusted) distribution of postsecondary educational attainment in 2012 differed significantly between rural and nonrural students in the REL Midwest Region who were in grade 10 in 2002 (see table C5 in appendix C). However, follow-up rural–nonrural comparisons in specific attainment categories revealed no statistically significant differences in the percentages of students who attained any of the four levels of education (figure 3; see also table C5). In particular, although the percentage of students who completed a bachelor's degree was higher among nonrural students (30 percent) than among rural students (24 percent) and the percentage of students who attended some college but did not complete a bachelor's degree was higher among rural students (55 percent) than among nonrural students (50 percent),[3] the differences were not statistically significant. In addition, although expectations of attaining a master's degree or higher were relatively common among rural students (29 percent) and even more common among nonrural (42 percent) students (see figure 1), only 5 percent of rural students and 7 percent of nonrural students had done so by 2012.

Although the percentage of students who completed a bachelor's degree was higher among nonrural students than among rural students and the percentage of students who attended some college but did not complete a bachelor's degree was higher among rural students than among nonrural students, the differences were not statistically significant

Figure 3. By 2012, rural and nonrural spring 2002 grade 10 students in the Regional Educational Laboratory Midwest Region had attained comparable levels of education
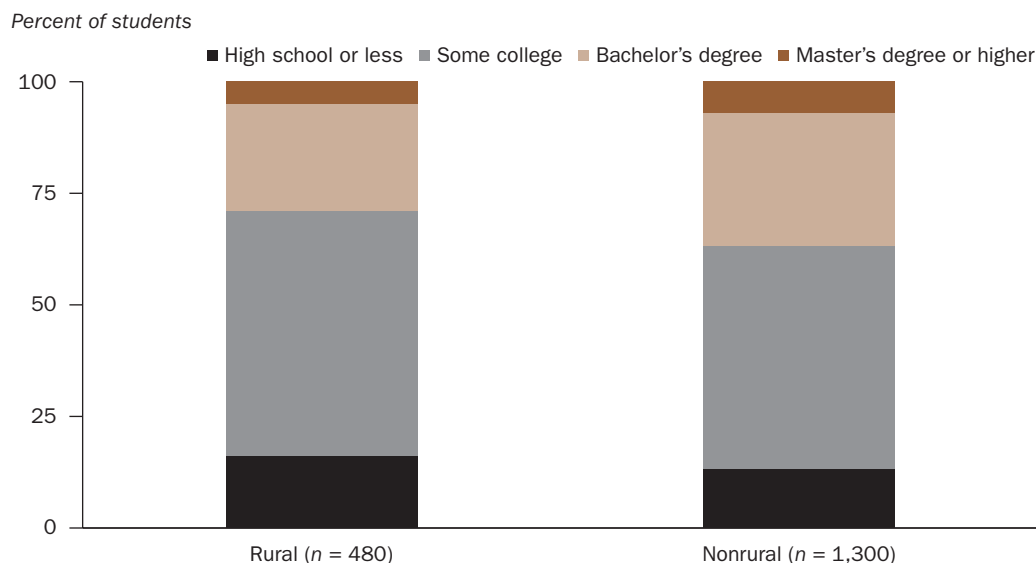
Percent of students

Legend: ■ High school or less ■ Some college ■ Bachelor's degree ■ Master's degree or higher

Horizontal axis: Rural (*n* = 480), Nonrural (*n* = 1,300)

Note: The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Percentages are weighted and unadjusted for clustering and student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. The overall chi-square test of equality of distributions of attainment between rural and nonrural students was statistically significant at $p < .05$, but none of the rural–nonrural differences in each category of attainment was statistically significant at $p < .05$ after adjustments for multiple comparisons.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Third Follow-up Restricted-Use File.

Statistical models that accounted for student, family, teacher, and school characteristics and incorporated a region indicator indicated that rural and nonrural students were equally likely to attend some college but not complete a bachelor's degree, complete a bachelor's degree, and attain a master's degree or higher relative to completing high school or less

After background characteristics were controlled for, rural and nonrural students still had similar educational attainment levels, both in the REL Midwest Region and in the rest of the nation. Statistical models that accounted for student, family, teacher, and school characteristics and incorporated a region indicator (REL Midwest Region versus the rest of the nation) indicated that rural and nonrural students were equally likely to attend some college but not complete a bachelor's degree, complete a bachelor's degree, and attain a master's degree or higher relative to completing high school or less. None of the rural to nonrural odds ratios for the REL Midwest Region was significantly different from 1, meaning that there was no difference between the odds for rural and nonrural students (see table C6 in appendix C). The regression results also suggest that differences in attainment (or the lack thereof) between rural and nonrural students in the REL Midwest Region were similar to those in the rest of the nation. None of the relative odds ratios was significantly different from 1 (see table C6 in appendix C).

Higher postsecondary education expectations predicted higher postsecondary educational attainment. Other student, family, teacher, and school characteristics may have had a greater influence on students' educational attainment than did school locale or region. One such factor was students' education expectations in grade 10. After all other background characteristics considered in the study were controlled for, students who had higher expectations tended to have higher educational attainment (see the results for model 4 in table

C7 in appendix C). Specifically, grade 10 students in 2002 who expected to attain some college but not complete a bachelor's degree (rather than complete high school or less) were, 10 years later, more likely to have attended some college but not completed a bachelor's degree (their odds of attending some college but not completing a bachelor's degree were 83 percent higher than the odds of those who expected to complete high school or less) and more likely to have completed a bachelor's degree (their odds were 190 percent higher than the odds of those who expected to complete high school or less). Students who expected to complete a bachelor's degree (rather than complete high school or less) were more likely to have attended some college but not completed a bachelor's degree (their odds were 169 percent higher than the odds of those who expected to complete high school or less) and more likely to have completed a bachelor's degree (their odds were 984 percent higher than the odds of those who expected to complete high school or less). Students who expected to attain a master's degree or higher (rather than complete high school or less) were more likely to have attended some college but not completed a bachelor's degree (their odds were 166 percent higher than the odds of those who expected to complete high school or less), more likely to have completed a bachelor's degree (their odds were 1,044 percent higher than the odds of those who expected to complete high school or less), and more likely to have attained a master's degree or higher (their odds were 793 percent higher than the odds of those who expected to complete high school or less).

Other factors also predicted educational attainment. The background characteristics examined in the study explained 37 percent of the variation in attending some college but not completing a bachelor's degree, 73 percent of the variation in completing a bachelor's degree, and 83 percent of the variation in attaining a master's degree or higher rather than completing high school or less (see table C14 in appendix C). Other factors that had statistically significant associations with postsecondary educational attainment were (see appendix C for more details about these associations):

- Being female, having higher academic achievement, participating in a college preparatory program, and having higher socioeconomic status were all associated with higher postsecondary educational attainment.
- When other background characteristics were controlled for, Black, Hispanic, and Asian students had higher educational attainment than did White students.
- While teachers' education expectations for their grade 10 students were positively associated with students' postsecondary educational attainment, parents' aspirations for their children and students' attainment were generally not related.

**Almost two-thirds of rural and nonrural students in the Regional Educational Laboratory Midwest Region who were in grade 10 in 2002 had postsecondary educational attainment by 2012 that fell short of their expectations, more than a quarter matched their expectations, and less than a tenth exceeded their expectations**

Rural and nonrural grade 10 students in the REL Midwest Region in 2002 had similar patterns in the realization of postsecondary education expectations, both in terms of the overall (unadjusted) distribution of realization and in terms of the percentage of students in specific categories of realization (fell short, matched, or exceeded; figure 4; see also table C8 in appendix C). Specifically, by 2012, 60 percent of rural students and 63 percent of nonrural students had fallen short of their postsecondary education expectations, 32 percent of rural students and 29 percent of nonrural students had matched their expectations, and 8 percent of rural students and 7 percent of nonrural students had exceeded

The background characteristics examined in the study explained 37 percent of the variation in attending some college but not completing a bachelor's degree, 72 percent of the variation in completing a bachelor's degree, and 83 percent of the variation in attaining a master's degree or higher rather than completing high school or less

Figure 4. By 2012, almost two-thirds of both rural and nonrural spring 2002 grade 10 students in the Regional Educational Laboratory Midwest Region had fallen short of their postsecondary education expectations
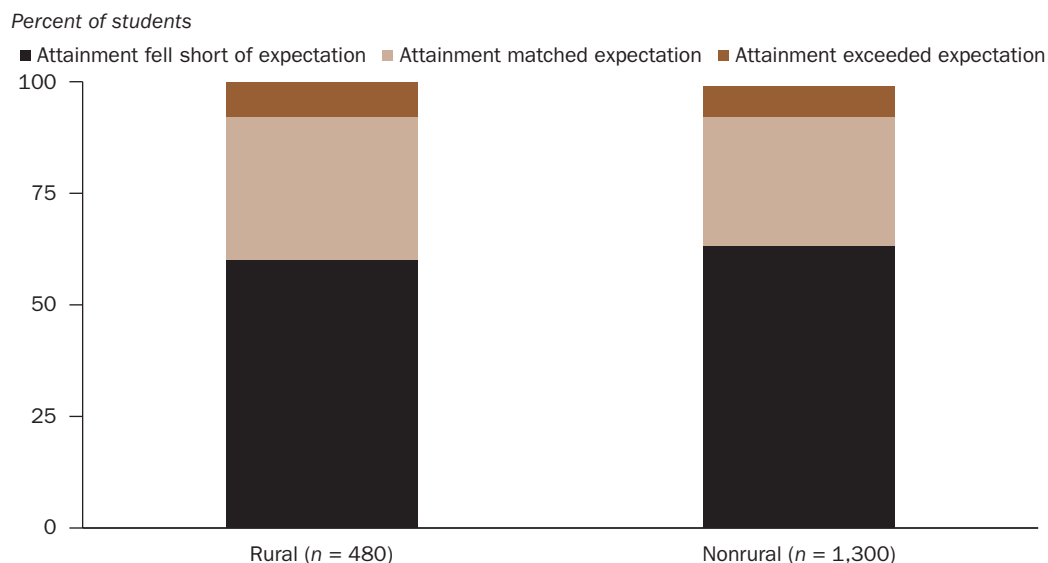
Percent of students

■ Attainment fell short of expectation   ■ Attainment matched expectation   ■ Attainment exceeded expectation

Note: The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Percentages are weighted and unadjusted for clustering and student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files, and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Neither the overall chi-square test of equality of distributions of realization between rural and nonrural students nor rural–nonrural differences in each category of realization were statistically significant at *p* < .05 after adjustments for multiple comparisons.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

their expectations. None of the above rural–nonrural differences in the realization of postsecondary education expectations was statistically significant.

There was no evidence of rural–nonrural differences in realization, regardless of whether school locale and background characteristics were controlled for. Rural and nonrural students in the REL Midwest Region were equally likely to fall short of, match, or exceed their grade 10 postsecondary education expectations; (the odds ratios from both model 1 and model 4 were not statistically different from 1; see table C9 in appendix C). Likewise, rural–nonrural differences in the extent to which expectations were realized did not vary between the REL Midwest Region and the rest of the nation (the relative odds ratios from both model 1 and model 4 were not statistically different from 1; see table C9 in appendix C).

Rural and nonrural students in the Regional Educational Laboratory Midwest Region who were in grade 10 in 2002 had, by 2012, realized their education expectations at similar rates, but nonrural students who fell short of or matched their expectations tended to have had higher expectations than did their rural peers

While no rural–nonrural differences were found when realization of education expectations was classified into three categories (fell short, matched, or exceeded), differences

By 2012, 60 percent of rural students and 63 percent of nonrural students had fallen short of their postsecondary education expectations, 32 percent of rural students and 29 percent of nonrural students had matched their expectations, and 8 percent of rural students and 7 percent of nonrural students had exceeded their expectations

became evident when expectations and attainment were examined further within each category of realization.

Among students who were in grade 10 in the REL Midwest Region in 2002 who fell short of their postsecondary education expectations in 2012, nonrural students had had higher expectations than rural students. In the REL Midwest Region the majority of both rural and nonrural students who fell short of their education expectations in 2012 belonged to one of three groups: those who had expected to complete a bachelor's degree but attended some college and did not complete a bachelor's degree, those who had expected to attain a master's degree or higher but attended some college and did not complete a bachelor's degree, and those who had expected to attain a master's degree or higher but completed a bachelor's degree (see table C11 in appendix C). Within these groups, nonrural students tended to have had higher expectations than rural students. For example, among those who fell short of their expectations and attended some college but did not complete a bachelor's degree, 32 percent of nonrural students had expected to attain a master's degree or higher, compared with 21 percent of rural students; whereas 40 percent of rural students who attended some college but did not complete a bachelor's degree had expected to complete a bachelor's degree, compared with 30 percent of nonrural students. In the rest of the nation, rural and nonrural students whose attainment fell short of their expectations generally had similar expectations.

Among students who were in grade 10 in the REL Midwest Region in 2002 who matched their postsecondary education expectations by 2012, nonrural students had had higher expectations and attainment than rural students. In the REL Midwest Region the two largest groups of both rural and nonrural students whose postsecondary educational attainment matched their expectations were students who had expected to and did attend some college but not complete a bachelor's degree and students who had expected to and did complete a bachelor's degree (see table C12 in appendix C). However, the percentage of students who had expected to attend some college but not complete a bachelor's degree was almost twice as high among rural students (41 percent) as among nonrural students (23 percent). In contrast, the percentage of students who expected to and did complete a bachelor's degree was about 1.4 times higher among nonrural students (42 percent) as among rural students (30 percent), and the percentage of students who expected to attain a master's degree or higher was almost twice as high among nonrural students (19 percent) as among rural students (11 percent). In other words, among students in the REL Midwest Region who met their expectations, nonrural students expected and attained higher levels of postsecondary education than did rural students. No such differences emerged in the rest of the nation.

Among students who were in grade 10 in the REL Midwest Region in 2002 who exceeded their postsecondary education expectations in 2012, almost two-thirds had not expected to pursue postsecondary education but attended college without completing a bachelor's degree. Just over 60 percent of rural and nonrural students in the REL Midwest Region who exceeded their postsecondary education expectations had not had expectations beyond high school but attended some college and did not complete a bachelor's degree. About 16 percent of students who exceeded their expectations had expected to attend some college and not complete a bachelor's degree but completed a bachelor's degree, and about 15 percent had expected to complete a bachelor's degree but attained a master's degree or higher (see table C13 in appendix C).

In the REL Midwest Region the two largest groups of both rural and nonrural students whose postsecondary educational attainment matched their expectations were students who had expected to and did attend some college but not complete a bachelor's degree and students who had expected to and did complete a bachelor's degree

Students' gender, race/ethnicity, and socioeconomic status, as well as their teachers' education expectations for them, explained some of the variation in students' realization of postsecondary education expectations. Student, family, teacher, and school characteristics explained 8 percent of the variation in matching expectations and 20 percent of the variation in exceeding expectations (rather than falling short of expectations; see table C14 in appendix C). Factors that were statistically significant predictors of realization include (see appendix C for more details):

- Male students were more likely than female students to match rather than to fall short of their postsecondary education expectations.
- White students were more likely than students in the "other" race/ethnicity category (which includes American Indian/Alaska Native students and multiracial students) to exceed rather than to fall short of their postsecondary education expectations.
- Students who had higher socioeconomic status were more likely than students who had lower socioeconomic status to match rather than to fall short of their postsecondary education expectations.
- Students whose teachers had higher education expectations for them were more likely than students whose teachers had lower education expectations for them to match rather than to fall short of their postsecondary education expectations.

Student and family characteristics and teacher expectations accounted for more of the variation in students' postsecondary education expectations and attainment than did school locale or region, but much of the variation remained unexplained

School locale and region explained up to 4 percent of the variation in expectations, up to 3 percent of the variation in attainment, and up to 5 percent of the variation in realization of expectations (see the results for model 1 in table C14 in appendix C). Adding student characteristics increased the explained variation by 18–58 percentage points for expectations, by 32–74 percentage points for attainment, and by 3–9 percentage points for realization of expectations (see the results for model 2 in table C14 in appendix C). Adding family characteristics and teacher expectations increased the explained variation by at most 7 percentage points (see the results for model 3 in table C14 in appendix C). And adding school characteristics generally increased the explained variation by no more than 5 percentage points (see the results for model 4 in table C14 in appendix C). These findings indicate that student characteristics explained a larger portion of the variation in students' expectations, attainment, and realization of expectations than did school locale, school region, family characteristics, teacher expectations, or the other school characteristics examined in this study.

While the background characteristics examined together explained a large portion (55–83 percent) of the variation in expectation and attainment of a bachelor's degree or a master's degree or higher (rather than completing high school or less), it explained less of the variation in expectation (24 percent) and attainment (37 percent) of attending some college but not completing a bachelor's degree. Similarly, these characteristics explained 8 percent of the variation in matching and 20 percent of the variation in exceeding postsecondary education expectations rather than falling short of them. Much of the variation in expectation and attainment of attending some college but not completing a bachelor's degree and in realization of expectations thus remains unexplained. The unexplained variation could be due to variables that predict these outcomes but were not included in the

While background characteristics examined together explained 55–83 percent of the variation in expectation and attainment of a bachelor's degree or a master's degree or higher (rather than completing high school or less), it explained less of the variation in expectation (24 percent) and attainment (37 percent) of attending some college but not completing a bachelor's degree

models (for example, personal motivation, academic self-efficacy, and school support), to measurement error in some of the variables included in the models, or to a wrongly specified relationship between some of the predictor variables and the outcomes.

Implications of the study findings

This study focused on rural and nonrural students who were in grade 10 in the REL Midwest Region in 2002 and examined differences in their postsecondary education expectations, attainment, and realization of expectations. The study also explored the reasons that students reported for not expecting to pursue postsecondary education. Several implications emerged from the study's findings.

Policymakers and practitioners may consider focusing on helping rural and nonrural students meet their postsecondary education expectations

- Approximately 90 percent of rural and nonrural students in the REL Midwest Region expected to attend at least some college, and approximately 70 percent of rural students and 80 percent of nonrural students in the REL Midwest Region in 2002 expected to attain a bachelor's degree or higher. However, 10 years later, approximately 60 percent of rural and nonrural students in the REL Midwest Region fell short of their postsecondary education expectations. The group that was most likely to fall short of meeting postsecondary education expectations was students who had expected to complete a bachelor's degree or higher but instead attended some college (see table C11 in appendix C). Thus, the data suggest that most of the students who expected to complete a bachelor's degree or higher who did not realize this expectation had enrolled in postsecondary education but did not complete a bachelor's degree or higher.
- Given the constraints of the dataset analyzed for this study, it is not possible to probe more deeply into why rural and nonrural students fell short of their postsecondary education expectations. Students may lack knowledge of the postsecondary pathways that would lead to a career that matches their interest and abilities. As a result, their postsecondary expectations may be misaligned to their career goals (for example, they may expect to attain a bachelor's degree when their career goals require only an associate's degree or certificate). Educators at the secondary level may consider working with students to set career goals, providing students with information about postsecondary pathways that will enable them to meet those goals, and providing students with information about the requirements of those pathways (for example, the courses students should expect to take, how much it costs to complete the pathway, and what financial aid options are available).
- Alternatively, students may not have the academic skills, financial resources, or motivation to complete the postsecondary pathway in which they enroll. Educators at the postsecondary level may consider working with students to address barriers to realizing their postsecondary education expectations. For example, some colleges use first-year experience courses to help students develop academic skills (such as time management and study skills) and foster a sense of belonging on campus. A recent What Works Clearinghouse (2016) review of first-year experience courses suggests that such courses can help students attain the credits they need to complete their degree.

Students may not have the academic skills, financial resources, or motivation to complete the postsecondary pathway in which they enroll. Educators at the postsecondary level may consider working with students to address barriers to realizing their postsecondary education expectations

Additional research is needed to examine why rural and nonrural students often fail to realize their postsecondary expectations

The student, family, teacher, and school characteristics examined in this study explained only 8 percent of the variation in matching expectations and 20 percent of the variation in exceeding expectations (rather than falling short of expectations). The unexplained variation could be due to variables that predict realization of postsecondary education expectations but were not included in the models (for example, personal motivation, academic self-efficacy, and school support). Further research that examines such variables may provide additional insights into why rural and nonrural students may fail to realize their postsecondary education expectations.

In addition, future research could help guide policymakers' and educators' efforts by focusing on why rural and nonrural students fail to realize their postsecondary education expectations. Potential reasons include enrolling in a four-year college but not persisting, changing career aspirations after grade 10 and instead enrolling in a two-year college, realizing that postsecondary education expectations were misaligned with career goals, or not being prepared to meet the academic demands of the chosen pathway. The Education Longitudinal Study of 2002 was not designed to address these questions. Future research could consider developing surveys that uncover nuanced information about the barriers students face in realizing their postsecondary education expectations.

Future research could help guide policymakers' and educators' efforts by focusing on why rural and nonrural students fail to realize their postsecondary education expectations

Limitations of the study

This study has six main limitations.

First, the findings presented in this study are correlational. Therefore, the statistics indicate relationships between variables but say nothing about whether the relationships are causal.

Second, urban–rural distinctions are not always clearly defined. Although the National Center for Education Statistics urban-centric system of locale codes categorizes schools based on their proximity to an urban area, the system may not have adequately separated all schools in truly rural communities from all schools in truly nonrural communities. Moreover, rural communities are not equal with respect to composition or resources, and rural communities in the REL Midwest Region may present unique characteristics compared with rural communities in the rest of the nation. Likewise, there is also variation within the nonrural category, with some schools perhaps resembling rural schools even though they may be closer to urban areas. This study did not control for such variations in rural or nonrural communities.

Third, the aggregation of all regions outside the REL Midwest Region into the rest of the nation results in a heterogeneous region that may mask rural–nonrural differences across the areas that make up the region. Similarly (although perhaps to a lesser degree), rural–nonrural patterns observed in the REL Midwest Region may also mask variations across the states that make up the region. Although supplementary analysis (see appendix A) indicated that the Education Longitudinal Study of 2002 data samples from the REL Midwest Region and from the rest of the nation are representative of the grade 10 students

in each region in spring 2002, the findings presented in this report are simply averages and may not reflect rural–nonrural patterns in smaller areas within each region.

Fourth, small cross-tabular cell sizes that result from dividing a sample into subgroups can yield unstable and unreliable estimates. To avoid small cell sizes, the study team combined related categories of the variables (for example, collapsing three similar reasons for not expecting to attend college into the single category of financial concerns). However, small (unweighted) cell sizes (under 30) still occurred. For these cells, the study team checked the reliability of estimates by calculating the coefficient of variation, which is the ratio of the standard error to the point estimate (for example, the estimate of the percentage of rural students who cited financial concerns) expressed as a percentage. Ratios greater than 30 percent indicated that the estimates for these cells were relatively stable (Seastrom, 2012); these cells are noted in the tables in this report.

Fifth, collapsing categories to avoid small cell sizes and facilitate interpretation of findings resulted in loss of information. For example, the measure used for the realization of expectations (see box 2) treated all students belonging to each realization category equally. This means that grade 10 students who expected to complete high school or less and who attended college but did not complete a bachelor's degree were given the same "exceeded expectations" classification as students who expected to attend college but not complete a bachelor's and who attained a master's degree or higher. The study team suspects that these cases are qualitatively different (based on background, motivation, opportunities to learn), but such differences were not fully captured in the analysis.

Finally, although many factors commonly thought to affect education expectations and attainment were considered in the study, these variables represent only a small subset of the variables available in the four waves of Education Longitudinal Study of 2002 data. It is therefore possible that the associations (or lack thereof) found in this study are artifacts of the effects of factors not considered.

The variables used in this study represent only a small subset of the variables available in the four waves of Education Longitudinal Study of 2002 data. It is possible that the associations (or lack thereof) found in this study are artifacts of the effects of factors not considered

Appendix A. Literature review

This appendix includes a summary of previous research on rural–nonrural differences in postsecondary education expectations and aspirations and postsecondary enrollment, persistence, and success among rural students.

Postsecondary education expectations and aspirations

Much of the prior research on education ambitions does not distinguish between expectations and aspirations. Studies that do generally define aspirations as a "realm of possible options" and expectations as "the most likely outcome that an individual pursues" (Beal & Crockett, 2010, p. 259). Regardless of the distinctions or lack thereof, researchers have found that students' expectations and aspirations are consequential. For example, high school students' education and occupation expectations and aspirations are associated with their learning and help guide them in making life choices (Bajema, Miller, & Williams, 2002; Walberg, 1989). Numerous studies have also shown that higher education expectations and aspirations are associated with greater scholastic outcomes and occupational attainment (Byun, Meece, Irvin, & Hutchins, 2012; Campbell, 1983; Duncan, Featherman, & Duncan, 1972; Fan & Wolters, 2014; Hill et al., 2004; Howley, 2006; Kim & Schneider, 2005; Schneider et al., 2007; Sewell, Haller, & Ohlendorf, 1970; Sewell, Haller, & Portes, 1969; Young, 1998).

Researchers have linked many factors to academic expectations and aspirations. For example, evidence indicates that academic aspirations tend to be higher for students whose parents have higher levels of education and whose families have higher socioeconomic status. Studies have shown that low-achieving students with high expectations tend to have parents with higher levels of education and that female students with low education goals tend to have mothers with lower levels of education (Anderson, 1980; Voelkl, 1993). In addition, students from families with lower socioeconomic status have lower academic achievement and lower education expectations and aspirations than do students from families with higher socioeconomic status and with parents who achieved higher levels of education (Adelman, 2006; Byun, Meece, & Irvin, 2012; Plank & Jordan, 2001; Signer & Saldana, 2001; Young, 1998).

Evidence indicates that gender, race/ethnicity, and parent involvement are also associated with education aspirations. Early research found that girls' education expectations tend to be higher than boys' (Marini & Greenberger, 1978), but more recent literature has shown that family functioning variables, such as parent involvement, communication, and expectations, influence students' expectations and aspirations more than do gender or social class (Meece, Askew, Agger, Hutchins, & Byun, 2014; Signer & Saldana, 2001; Smith-Maddox, 2000). Research has also shown that gender differences are mediated by student race/ethnicity and the grade level at which expectations are assessed (Kao & Tienda, 1998). For instance, one study reported that Black and Hispanic students often have lower levels of postsecondary education than do their White and Asian counterparts but that unique cultural beliefs and structural barriers to social resources mediate the differences (Kao & Tienda, 1998). Prior studies conclude that students whose parents are more involved in their children's education do better academically (Cotton & Wikelund, 2001) and have higher education expectations and aspirations (Engle, 2007; Henderson & Berla, 1994; Smith-Maddox, 1999) than do students whose parents are less involved. In addition, research indicates that the positive relationship between parent involvement and

students' postsecondary education plans holds even after student ability and family education background are accounted for (Henderson & Berla, 1994).

Timing also matters for education expectations. Previous research has shown that postsecondary expectations can depend on when they are measured (Beal & Crockett, 2010; Trusty, 2000; Trusty & Harris, 1999) and that education expectations are less stable for Black and Hispanic students than for students in other racial/ethnic groups (Kao & Tienda, 1998; Trusty & Harris, 1999; Voelkl, 1993). However, these studies also report that students from families with lower socioeconomic status show more unstable expectations over time, and differences in the stability of Black and Hispanic students' aspirations could simply reflect the effects of lower socioeconomic status among families in these groups.

Prior research suggests that rural students tend to have lower postsecondary education expectations and aspirations and to aspire less to professions and more to lower level positions (such as laborers and service positions) than do nonrural students (Cobb et al., 1989; Haller & Virkler, 1993; Hansen & McIntire, 1989).

Research also has shown that rural students' low education aspirations are associated with lower levels of education preparation. In one study researchers found that rural high school students took less rigorous courses and had lower standardized test scores than did urban and suburban students (Byun, Meece, & Irvin, 2012). Further, some evidence indicates that students in rural settings have more limited access to college preparatory programs and a narrower school curriculum than do nonrural students (Griffin, Hutchins, & Meece, 2011; Graham, 2009).

Cultural and social factors may also affect rural students' aspirations. Previous research has suggested that the aspirations of rural youth are particularly vulnerable to social influences because rural communities tend to have small populations, are geographically isolated, and have cultures with unique expectations and standards (Haller & Virkler, 1993; Howell, Tung, & Wade-Harper, 1996; Quaglia & Cobb, 1996). Career choices develop through exposure to occupations available in the community (Haller & Virkler, 1993). For instance, rural students might be more inclined than nonrural students to pursue vocational postsecondary paths (such as auto worker and cosmetologist) or agricultural occupations because demand for these vocations is higher in rural communities (Burnell, 2003; Haller & Virkler, 1993). Recent research also suggests that rural youth who have strong family and community ties lower their education and occupation aspirations to match opportunities available in their communities (Howley, 2006).

Although prior research suggests lower aspirations among rural students, other research suggests that aspirations may have more to do with a student's socioeconomic status than whether the student is from a rural community. Using High School and Beyond data, Haller and Virkler (1993) found only a small difference in the education aspirations between rural and nonrural students, which they attributed largely to the rural families' lower socioeconomic status. More recently, using the Education Longitudinal Study of 2002 base year and 2004 survey data, Schaefer and Meece (2009) found that socioeconomic status explained the largest share of the variance in the education expectations and math achievement of grade 12 students. Evidence also indicates that socioeconomic status affects self-efficacy and that students with low socioeconomic status tend to develop lower education expectations because of low academic self-efficacy (Deosaran, 1978).

Prior research indicates that education aspirations relate to attainment and that rural students may have lower postsecondary enrollment and persistence rates than do nonrural students. Using Education Longitudinal Study of 2002 data, Liu (2009) found that, independent of community type, students who had high, stable aspirations from grade 10 to two years after high school were more likely to enroll in college than were students with less consistent or lower aspirations overall. Using data from the National Education Longitudinal Study of 1988, Hu (2003) found that rural students, specifically, aspired to four-year colleges, enrolled in any college, and enrolled in four-year colleges at lower rates than did their urban counterparts. Similarly, when using the same data, Byun, Meece, and Irvin (2012) found that, compared with rural students, urban students were 74 percent more likely to enroll in college and 106 percent more likely to attain a college degree.

As with factors that affect rural students' education aspirations, researchers have identified several individual and family factors that are associated with rural students' postsecondary choices and achievement, including socioeconomic status, parent education, parent involvement, proximity to postsecondary institutions, and various student demographics (Byun, Meece, & Irvin, 2012; Gibbs, 1998; Howley, 2006). For example, Byun, Meece, and Irvin (2012) found that rural students attained a bachelor's degree at a lower rate than did nonrural students largely because of lower socioeconomic status among rural students. Several other studies have shown that family income predicts college enrollment or completion (Adelman, 2006; Adelman, Daniel, Berkovits, & Owings, 2003; Bozick, 2007; Goldrick-Rab & Pfeffer, 2009), and at all levels of academic achievement, lower socioeconomic status students enroll in college at a lower rate (Plank & Jordan, 2001). However, the attitudes and behaviors of parents of low-income youth may mediate the impact of economic disadvantage on students' college enrollment because economically disadvantaged parents tend to be less optimistic about their children's education chances and subsequently engage less in parenting strategies that promote college enrollment (Crosnoe, Mistry, & Elder, 2002). In addition, Byun, Meece, and Irvin (2012) showed that parents' expectations and involvement in their children's education (specifically, the extent to which they discussed academic work with their children) were positively related to college enrollment and degree attainment, even after academic preparation was controlled for, and that rural parents had lower levels of involvement than did nonrural parents.

Distance to college also correlates with whether and where students apply to or enroll in college. Specifically, students are less likely to attend a college the farther it is located from their home (Howley, 2006; Rouse, 1995) and are more likely to apply to college as the number of colleges located nearby increases (Turley, 2009). A study of college choice found that students from various socioeconomic backgrounds discussed proximity to home as a factor in their college choice (McDonough, 1997). Students may find it more financially or logistically convenient to enroll in colleges that are closer to home (Gillie et al., 2006; Turley, 2009). Because rural communities tend to have lower socioeconomic status levels and higher rates of poverty (Lichter & Johnson, 2006; O'Hare & Savage, 2006) and because substantial financial savings are associated with students' living at home while attending college (Turley, 2009), the location of postsecondary institutions may be especially important for rural families.

Appendix B. Data and methodology

This appendix describes the construction of the analytic samples, provides baseline characteristics of the analytic samples, and details the study methodology.

Construction of the analytic samples

The Education Longitudinal Study of 2002 (ELS:2002) followed a nationally representative sample of grade 10 students selected from a nationally representative sample of public and private schools that served grade 10 students in spring 2002. This appendix describes how the study team identified regional samples for analysis.

Construction of the regional samples. The primary unit of analysis for the ELS:2002 was the student. To select students for the ELS:2002, a two-stage, stratified random-sampling design was used: in the first stage, schools with a grade 10 were selected independently (primary sampling units) within each predetermined stratum; then, in the second stage, grade 10 students were systematically sampled within selected schools. The ELS:2002 base year student sample was representative of the roughly 3 million grade 10 students in the nation in 2001/02, and the school sample was representative of the nation's 25,000 regular[4] public and private high schools with a grade 10 in spring 2002. The sample for the study was restricted to grade 10 students attending regular public high schools in spring 2002.

Because sample selection for public schools in ELS:2002 was stratified by the nine U.S. Census Divisions[5] and by locale (urban, suburban, or rural),[6] the ELS:2002 data support analysis at the national and census division levels (Ingels et al., 2007). Two of the nine census divisions cover the seven states in the Regional Educational Laboratory (REL) Midwest Region: the East North Central census division includes Illinois, Indiana, Michigan, Ohio, Wisconsin, and the West North Central division covers Iowa and Minnesota. To generate the study sample for the REL Midwest Region, the study team added the Iowa and Minnesota samples from the West North Central division to the samples from the East North Central division. The resulting sample contained approximately 2,400 students and 100 schools, representing more than 618,000 students and about 3,800 schools.

Representativeness of the regional samples. To verify the representativeness of the constructed study sample, three sets of comparisons were conducted: ELS:2002 weighted counts of public school students and schools[7] in the newly configured study sample were compared with the corresponding counts of grade 10 students and schools with a grade 10 in the 2001/02 Common Core of Data (CCD) school universe file, ELS:2002 distributions of rural and nonrural students in the study sample were compared with the corresponding CCD student distributions, and ELS:2002 distributions of rural and nonrural schools in the study sample were compared with the corresponding CCD school distributions. To assess the representativeness of the sample for the rest of the nation, the ELS:2002 and CCD comparisons were repeated using public schools and students in the rest of the nation.

The comparisons revealed that the discrepancies between ELS:2002 and CCD student and school counts in the study sample were comparable to the corresponding differences in the East North Central division and in the nation and that the distributions of study sample schools and students by rural status did not differ statistically between ELS:2002 and CCD. The findings from these comparisons indicated that, with appropriate weights,

the constructed study sample is representative of the population of spring 2002 grade 10 students in the REL Midwest Region. Similar findings for the sample for the rest of the nation indicate that the ELS:2002 sample from the rest of the nation is also representative of the population of grade 10 students in the region during spring 2002.

Construction of the analytic samples. The ELS:2002 base-year survey sample consisted of about 15,360 spring 2002 grade 10 students attending regular public and private high schools (figure B1). There were 10,740 grade 10 students for the expectations analytic samples, after the removal of 120 students with missing base-year weights (BYSTUWT), students who attended private schools (3,270), and students who reported not knowing their expectations (1,230). Next, ELS:2002 participants with missing postsecondary educational attainments were excluded (2,000 students), leaving 8,740 students in the attainment and realization analytic sample. To construct the reasons analytic sample, the study

Figure B1. Construction of the analytic samples
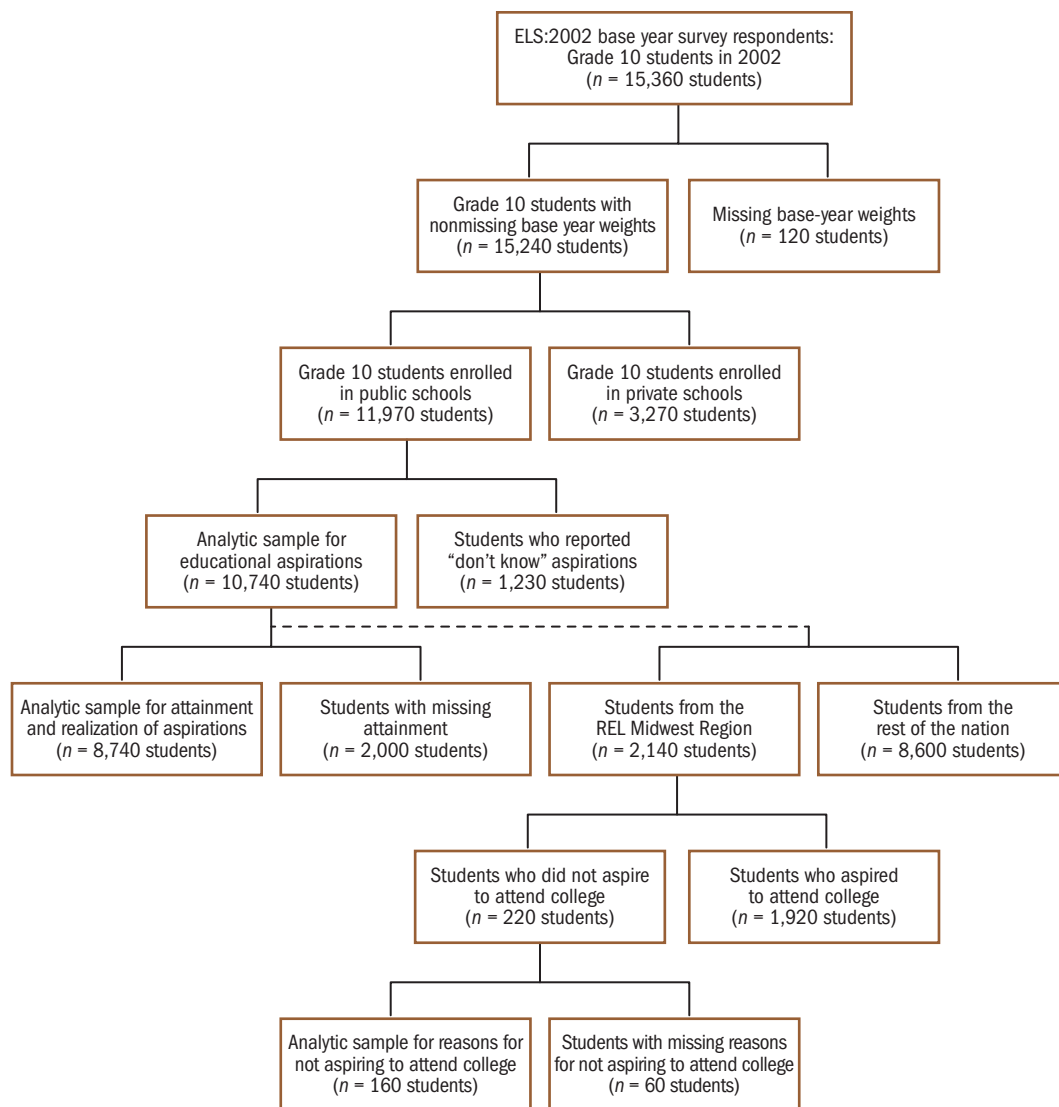
ELS:2002 is Education Longitudinal Study of 2002. REL is Regional Educational Laboratory.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

team started with the 10,740 students in the expectations sample, retained those who are from the REL Midwest Region and indicated that they did not expect to go beyond high school (220 students), and then removed those who offered no reason for their low expectations (60 students). The remaining 160 students made up the reasons sample.

Sample characteristics. The demographic, academic, family, and school characteristics of rural and nonrural grade 10 students in the three analytic samples are shown in table B1. The three samples are the expectations sample, the reasons sample, and attainment and realization sample. The characteristics are presented for each region and by school locale. To provide context for the types of students in the analytic samples, characteristics of rural and nonrural students in the nation as a whole (that is, the combined sample from the REL Midwest Region and the rest of the nation) are also presented. All percentages and averages are weighted to reflect the sampling design of ELS:2002.

Within each of the three analytic samples, students who attended rural schools were generally more likely to be White than were students in nonrural schools, and the schools they attended had smaller percentages of Black students and Hispanic students. In the REL Midwest Region, nonrural students (49 percent) were more likely than rural students (37 percent) to participate in college preparatory programs, whereas rural students (54 percent) were more likely than nonrural students (41 percent) to participate in a general high school curriculum.

Table B1. Baseline characteristics of spring 2002 rural and nonrural grade 10 public school students in the analytic samples (percent, unless otherwise noted)

| | Analytic sample for expectations | | | | | | Analytic sample for reasons | | Analytic sample for attainment and realization | | | | | |
| | REL Midwest Region | | Rest of the nation | | United States | | REL Midwest Region | | REL Midwest Region | | Rest of the nation | | United States | |
Characteristic	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural
Sample size (unweighted)	570	1,570	2,080	6,520	2,650	8,090	50	110	490	1,300	1,670	5,290	2,160	6,580
Demographic characteristics														
Gender														
Male	47.8	48.4	49.7	50.5	49.3	50.1	64.3	65.6	47.8	46.9	48.3	48.9	48.2	48.5
Female	52.2	51.6	50.3	49.5	50.7	49.9	35.7	34.4	52.2	53.1	51.7	51.1	51.8	51.5
Race/ethnicity														
White	88.1	66.1	74.5	51.4	77.0	54.3	73.3	70.1	89.2	66.7	74.6	53.3	77.4	56.0
Black	0.9[a]	14.6	12.6	17.3	10.5	16.8	[b]	13.5[a]	0.9[a]	13.9	12.8	16.7	10.5	16.2
Hispanic	2.3[a]	10.1	6.2	21.0	5.5	18.9	[b]	10.3	1.9[a]	9.6	5.8	20.3	5.0	18.2
Asian or Pacific Islander	0.8[a]	3.6	1.3	5.2	1.2	4.9	[b]	3.4[a]	0.9[a]	3.8	1.2	4.8	1.1	4.6
Other[c]	7.8[a]	5.5	5.4	5.1	5.8	5.2	20.1[a]	2.7[a]	7.1[a]	5.9	5.7	4.9	6.0	5.1
Prior achievement														
Grade 10 math and reading composite score[d]	51.0	50.1	50.6	49.6	50.7	49.7	43.6	41.4	51.8	50.7	51.1	50.1	51.2	50.2
Geographical preference (desire to stay close to home)														
Low	49.4	45.5	46.9	47.3	47.3	46.9	44.4	37.0	48.7	45.7	46.5	47.1	46.9	46.8
Medium	29.7	32.7	30.1	32.6	30.0	32.7	36.9	33.2	29.3	32.3	30.9	32.5	30.6	32.4
High	20.9	21.8	23.0	20.1	22.6	20.4	18.7[a]	29.9	22.0	22.0	22.6	20.4	22.5	20.7
High school program type														
General	53.9	40.8	37.6	36.9	40.6	37.7	79.8	73.9	53.1	40.5	35.5	37.2	38.9	37.8

(continued)

Table B1. Baseline characteristics of spring 2002 rural and nonrural grade 10 public school students in the analytic samples (percent, unless otherwise noted) *(continued)*

Characteristic	Analytic sample for expectations						Analytic sample for reasons		Analytic sample for attainment and realization					
	REL Midwest Region		Rest of the nation		United States		REL Midwest Region		REL Midwest Region		Rest of the nation		United States	
	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural	Rural	Nonrural
College preparatory or academic	36.9	49.4	50.3	51.7	47.9	51.2	9.2[a]	14.8	38.3	50.6	51.6	51.3	49.0	51.2
Vocational	9.2	9.7	12.1	11.5	11.6	11.1	11.1[a]	11.4	8.5	8.9	12.9	11.6	12.0	11.0
Family characteristics and teacher's expectation														
Parent aspiration for student														
High school or less	4.6	3.6	4.1	3.6	4.2	3.6	21.4[a]	12.6	4.6[a]	2.8	4.2	3.4	4.3	3.3
Some college	21.1	10.9	11.7	8.2	13.4	8.7	49.6	39.0	22.1	11.4	11.7	8.0	13.7	8.7
Bachelor's degree	51.6	47.8	45.4	43.8	46.6	44.6	21.6[a]	38.8	50.6	47.6	44.7	43.8	45.9	44.6
Master's degree or higher	22.7	37.7	38.8	44.5	35.8	43.1	7.4[a]	9.6[a]	22.7	38.1	39.4	44.8	36.2	43.5
Teacher's expectation for student														
High school or less	14.1	15.0	18.7	15.9	17.9	15.7	54.6	46.9	12.2	13.6	17.5	14.8	16.4	14.5
Some college	38.5	27.6	29.5	23.9	31.2	24.7	38.5	37.8	38.9	26.1	27.9	23.2	30.1	23.8
Bachelor's degree	34.0	40.1	36.6	42.0	36.1	41.6	6.9[a]	14.7[a]	34.5	41.7	38.0	42.8	37.3	42.5
Master's degree or higher	13.4	17.2	15.1	18.1	14.8	17.9	[b]	[b]	14.5	18.7	16.6	19.3	16.2	19.1
Parent involvement at home														
Rarely	20.0	19.6	17.8	17.1	18.2	17.6	27.3[a]	43.3	20.5	19.8	18.3	16.7	18.7	17.4
Sometimes	52.5	49.6	50.5	49.7	50.9	49.7	56.8	47.9	52.7	49.1	50.3	49.9	50.8	49.8
Often	27.5	30.8	31.7	33.2	30.9	32.7	16.0[a]	8.8[a]	26.8	31.1	31.4	33.4	30.5	32.9
Parent involvement at school														
At most once	79.6	73.4	73.1	73.9	74.2	73.8	90.7	80.1	80.6	73.7	72.7	73.7	74.2	73.7
More than once	20.4	26.6	26.9	26.1	25.8	26.2	9.3[a]	19.9	19.4	26.3	27.3	26.3	25.8	26.3
Socioeconomic status														
Socioeconomic status[e]	−0.2	0.0	−0.1	0.0	−0.1	0.0	−0.5	−0.4	−0.2	0.0	−0.1	0.0	−0.1	0.0
School characteristics														
Average achievement[d]	50.4	49.7	50.2	49.5	50.2	49.5	49.4	48.5	50.5	49.9	50.2	49.6	50.3	49.7
Percentage of racial/ethnic minority students	6.2[a]	29.6	22.4	42.7	19.4	40.1	7.2[a]	30.8	6.1[a]	28.5	22.3	41.7	19.1	39.0
Percentage of students eligible for the federal school lunch program	19.3	19.4	22.5	24.7	22.0	23.6	20.0	23.6	19.4	18.7	22.9	24.1	22.3	23.0
Average socioeconomic status[e]	−0.2	0.0	−0.1	0.0	−0.1	0.0	−0.2	−0.1	−0.2	0.0	−0.1	0.0	−0.1	0.0

REL is Regional Educational Laboratory.

Note: The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Percentages are weighted and may not sum to 100 percent because of rounding. When categorical variables had missing data, the percentages shown exclude the missing values.

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

b. Does not meet National Center for Education Statistics reporting standards. The numerator is less than 3 or the denominator is less than 30.

c. Includes American Indian/Alaska Native students and multiracial students.

d. Standardized scores with a mean of 50 and standard deviation of 10.

e. An equally weighted average of five standardized components: father's/guardian's education, mother's/guardian's education, family income, father's/guardian's occupation, and mother's/guardian's occupation.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Analysis variables. The names and descriptions of the variables used to construct the measures for this study, the sources and coding of the variables in the ELS:2002 restricted-use files, and the coding of the analysis variables are given in table B2.

Table B2. Analysis variables

Measure	Variable name and description in the Education Longitudinal Study of 2002 data files	Source of variable	Source variable coding	Analysis variable coding
Outcomes				
Education expectation[a,b]	BYSTEXP: how far in school grade 10 student thinks he or she will get	Base-Year Student Survey	1 = Less than high school graduation 2 = High school graduation or general equivalency diploma (GED) only 3 = Attend or complete two-year college/school 4 = Attend college, four-year degree incomplete 5 = Graduate from college 6 = Attain master's degree or equivalent 7 = Attain Ph.D., M.D., or other advanced degree	1 = High school or less (BYSTEXP = 1, 2) 2 = Some college (BYSTEXP = 3, 4) 3 = Bachelor's degree (BYSTEXP = 5) 4 = Master's degree or higher (BYSTEXP = 6, 7)
Reasons for not expecting to continue education past high school	BYS62 is a check-all-that-apply question with eight response options, captured by indicator variables, BYS62A to BYS62H, where each indicator is equal to 1 if checked, and 0 otherwise	Base-Year Student Survey	Each variable was coded as a binary variable: 1 = Yes; 0 = No BYS62A: I do not like school BYS62B: My grades are not high enough BYS63C: I will not need more education for the career I want BYS62D: I cannot afford to go on to school BYS62E: I'd rather work and make money than go to school BYS62F: I plan to be a full-time homemaker BYS62G: I do not feel that going to school is important BYS62H: I need to help support my family	1 = Financial concerns (I cannot afford to go on to school, I need to help support my family, or I'd rather work and make money than go to school) 2 = Does not need further education (I will not need more education for the career I want, or I plan to be a full-time homemaker) 3 = Not interested in school (I do not like school, or I do not feel that going to school is important) 4 = Grades not high enough (My grades are not high enough)
Educational attainment	F3ATTAINMENT: highest educational attainment as of 2012 follow-up survey	Third Follow-up Student Survey	1 = No high school credential, no postsecondary attendance 2 = High school credential, no postsecondary attendance 3 = Some postsecondary attendance, no postsecondary credential 4 = Undergraduate certificate 5 = Associate's degree 6 = Bachelor's degree 7 = Postbaccalaureate certificate 8 = Master's degree 9 = Post–master's certificate 10 = Doctoral degree	1 = High school or less (F3ATTAINMENT = 1, 2) 2 = Some college (F3ATTAINMENT = 3, 4, 5) 3 = Bachelor's degree (F3ATTAINMENT = 6, 7) 4 = Master's degree or higher (F3ATTAINMENT = 8, 9, 10)

(continued)

Table B2. Analysis variables *(continued)*

Measure	Variable name and description in the Education Longitudinal Study of 2002 data files	Source of variable	Source variable coding	Analysis variable coding
Realization of postsecondary education expectation	F3ATTAINMENT and BYSTEXP	Third Follow-up and Base-Year Student Survey	The analysis variable was constructed by the study team based on the collapsed four-category coding (high school or less, some college, bachelor's degree, and master's degree or higher) for education expectations and attainment. Educational attainment was compared with expectation to obtain the coding given in the next column.	1 = Attainment is below expectation 2 = Attainment matches expectation 3 = Attainment exceeds expectation
Control variables				
Gender	BYSEX: sex of student	Base-Year Student Survey	1 = Male 2 = Female	0 = Male 1 = Female
Race/ethnicity	BYRACE: student's race/ethnicity	Base-Year Student Survey	1 = American Indian/Alaska Native, non-Hispanic 2 = Asian, Hawaii/Pacific Islander, non-Hispanic 3 = Black or African American, non-Hispanic 4 = Hispanic, no race specified 5 = Hispanic, race specified 6 = More than one race, non-Hispanic 7 = White, non-Hispanic	1 = White (BYRACE = 7) 2 = Black (BYRACE = 3) 3 = Hispanic (BYRACE = 4, 5) 4 = Asian or Pacific Islander (BYRACE = 2) 5 = Other (BYRACE = 1, 6)
Standardized grade 10 math and reading composite score	BYTXCSTD: continuous variable with mean of 50 and standard deviation of 10	Base-Year Student Survey	Continuous variable	Continuous variable
Student's preferred geographical residence	BYS54H (importance of living close to parents/relatives) and BYS54I (importance of getting away from this area)	Base-Year Student Survey	BYS54H and BYS54I coded as: 1 = Not important 2 = Somewhat important 3 = Very important	Reversed code BYS54I first so that higher values reflected greater importance of living closer to home, then took the mean of the responses to BYS54H and BYS54I, and recoded the mean into 1 = not important to stay close to home (mean < 2).; 2 = somewhat important (mean = 2); 3 = very important (mean > 2).
Type of high school program (student self-report)	BYSCHPRG: high school program (student self-report)	Base-Year Student Survey	1 = General 2 = College preparatory-academic 3 = Vocational, including technical/business	Same as original coding
Parent's aspiration	BYP79: How far in school do you want your 10th grader to go?	Base-Year Parent Survey	BYP79 has seven response options : 1 = Less than high school graduation 2 = High school graduation or GED only 3 = Attend or complete two-year college/school 4 = Attend college, four-year degree incomplete 5 = Graduate from college 6 = Attain master's degree or equivalent 7 = Attain Ph.D., M.D., or other advanced degree	1 = Complete high school or less (BYP79 = 1, 2) 2 = Attend college but not complete a bachelor's degree (BYP79 = 3, 4) 3 = Complete a bachelor's degree (BYP79 = 5) 4 = Attain a master's degree or higher (BYP79 = 6, 7).

(continued)

Table B2. Analysis variables *(continued)*

Measure	Variable name and description in the Education Longitudinal Study of 2002 data files	Source of variable	Source variable coding	Analysis variable coding
Teacher's expectation[c]	BYTE20: How far English teacher expects student to get in school BYTM20: How far math teacher expects student to get in school	Base-Year Teacher Survey	BYTE20 and BYTM 20 each had seven response options: 1 = Less than high school graduation 2 = High school graduation or GED only 3 = Attend or complete two-year college/school 4 = Attend college, four-year degree incomplete 5 = Graduate from college 6 = Attain master's degree or equivalent 7 = Attain Ph.D., M.D., or other advanced degree	The higher of BYTE20 and BYTM20 was selected and recoded as: 1 = Complete high school or less (BYTE20 = 1, 2) 2 = Attend college but not complete a bachelor's degree (BYTE20 = 3, 4) 3 = Complete a bachelor's degree (BYTE20 = 5) 4 = Attain a master's degree or higher (BYTE20D = 6, 7)
Parent involvement at home	BYS85A: how often parents check homework BYS85B: how often parents help with homework BYS86A: how often student discusses school courses with parents BYS86B: how often student discusses school activities with parents BYS86C: how often student discusses things studied in class with parents BYS86D: how often student discusses grades with parents	Base-Year Student Survey	BYS85A and BYS85B: 1 = Never 2 = Rarely 3 = Sometimes 4 = Often BYS86A, BYS86B, BYS86C, and BYS86D: 1 = Never 2 = Sometimes 3 = Often	For uniformity of scale, BYS85A and BYS85B were first converted into a three-point scale (never, sometimes, often) by collapsing the categories "rarely" and "sometimes" into "sometimes"). All items were then coded as: 0 = Never 1 = Sometimes 2 = Often The mean of the (recoded) item responses was used as a composite measure and recoded as: 0 = Rarely (mean < 0.5) 1 = Sometimes (0.5 ≤ mean < 1.5) 2 = Often (mean ≥ 1.5)
Parent involvement at school	BYP53H: Parents contact school about fundraising/volunteer work BYP54B: Attend parent–teacher organization meetings BYP54C: Take part in parent–teacher organization activities	Base-Year Parent Survey	BYP53H: 1 = None 2 = Once or twice 3 = Three or four 4 = More than four times BYP54B and BYP54C: 0 = No 1 = Yes	BYP53H was converted into a binary indicator: 0 = None 1 = At least once The mean of the above recoded variable, BYP54B and BYP54C was used as a composite measure and recoded as: 0 = At most once (mean < 0.5) 1 = More than once (mean ≥ 0.5)
School average achievement	School average of standardized grade 10 math and reading composite score, BYTXCSTD	Education Longitudinal Study of 2002 data	Continuous variable	Continuous variable

(continued)

Table B2. Analysis variables *(continued)*

Measure	Variable name and description in the Education Longitudinal Study of 2002 data files	Source of variable	Source variable coding	Analysis variable coding
Percentage of racial/ethnic minority students	CP02PMIN: percentage of minority students in the school in 2001/02	Education Longitudinal Study of 2002 data	Continuous variable	Continuous variable
Percentage of students eligible for federal school lunch program	CP02FLUN: Percentage of the school's students who qualify for free or reduced-price lunch in 2001/02	Education Longitudinal Study of 2002 data	Continuous variable	Continuous variable
School socioeconomic status	School average of the SES composite score, BYSES1 (calculated by the project team)	Base-Year Parent Survey	Continuous variable	Continuous variable

a. When asked about their education expectations, about 9 percent of grade 10 students in the expectations analytic sample chose the "don't know" response option. As prior researchers have done (for example, Schaefer & Meece, 2009), the study team excluded from the analysis students who chose this option. In the nation's public schools, about 10.1 percent of rural students and 10.1 percent of nonrural students reported "don't know." In the Regional Educational Laboratory Midwest Region, 9.5 percent of rural students and 10.2 percent of nonrural students reported "don't know." In the rest of the nation, 10.2 percent of rural students and 10.1 percent of nonrural students reported "don't know." Rural and nonrural students did not differ significantly in the rates at which they chose this option.

b. Education expectation was also used as a control variable in the analysis of educational attainment.

c. Teacher's expectation was reported by both the math and English teacher for about 60 percent of the students in the analytic samples, by the math teacher only for about 15 percent, by the English teacher only for about 15 percent, and by neither teacher for about 10 percent (see appendix C for an explanation of how missing data were treated in this study).

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Analysis methods

The study team addressed the research questions by calculating descriptive statistics, conducting chi-square tests of equality of distributions, and estimating two-level (students within schools) multinomial logistic regression models (see box B1 for definitions of terms used in this appendix).

Addressing the first part of research questions 1, 3, and 4. The first part of research questions 1, 3, and 4 asked whether grade 10 students' postsecondary education expectations, postsecondary educational attainment 10 years later, and realization of grade 10 postsecondary education expectations differed between rural and nonrural students in the REL Midwest Region. The analysis for these research questions is described in terms of postsecondary education expectations, and analogous methods were used for postsecondary educational attainment and realization of expectations.

Rural–nonrural differences in the postsecondary education expectations of grade 10 students in the REL Midwest Region were examined by cross-tabulating percentages of these students who fit into each of the four categories of postsecondary education expectations: completing high school or less, attending some college but not completing a bachelor's

Box B1. Definitions of analytic terms

Odds. A ratio, *pm/pr*, of the probability, $pm = P(R = m)$, that an outcome variable *R* falls into category *m*, called the target category, and the probability, $pr = P(R = r)$, that *R* falls into another category *r*, called the reference category. For example, in the context of postsecondary education expectations, the odds of expecting to complete a bachelor's degree relative to expecting to complete high school or less (the reference category) was calculated as the probability of expecting to complete a bachelor's degree divided by the probability of expecting to complete high school or less.

Odds ratio. A statistic that compares the odds of one group (say, group 1) to the odds of another group (say, group 2). It is calculated as OR = (odds for group 1)/(odds for group 2). For example, the rural to nonrural odds ratio was OR = (odds for rural students)/(odds for nonrural students). An odds ratio equal to 1 indicates that the two groups are equally likely to choose a particular outcome category (relative to the reference category). An odds ratio greater than 1 indicates that group 1 is more likely than group 2 to choose a particular outcome category (relative to the reference category). An odds ratio less than 1 indicates that group 1 is less likely than group 2 to choose a particular category (relative to the reference category). The farther the odds ratio is from 1, the stronger the relationship between rural status and the outcome.

Relative odds ratio. The odds ratio for one group divided by the odds ratio for another group. For example, if the odds ratio is the rural to nonrural odds ratio, the relative odds ratio, $ROR = OR_{Midwest}/OR_{Rest of the nation}$, compares the rural to nonrural odds in the Regional Educational Laboratory (REL) Midwest Region with the rural–nonrural odds in the rest of the nation. A relative odds ratio equal to (or close to) 1 indicates that rural–nonrural differences in the REL Midwest Region are about the same as rural–nonrural differences in the rest of the nation. A relative odds ratio greater than 1 indicates that rural–nonrural differences in the REL Midwest Region are greater than rural–nonrural differences in the rest of the nation, and a relative odds ratio less than 1 indicates that rural–nonrural differences in the REL Midwest Region are less than the rural–nonrural differences in the rest of the nation.

Chi-square test of equality of distributions. A test of the hypothesis that a categorical variable (for example, postsecondary education expectation) has the same distribution across distinct populations (for example, rural and nonrural students). A statistically significant test indicates that the distributions are different, and a statistically nonsignificant test indicates that the distributions are the same.

Post hoc (or multiple) comparison. A set of hypothesis tests that are usually conducted after a statistically significant overall finding. In a chi-square test of equality of distributions of a variable with three or more categories (for example, postsecondary education expectations) across distinct populations (for example, rural and nonrural students), a significant overall test indicates that the two distributions are different, but it does not specify which categories are contributing to the overall difference. Post hoc comparisons can reveal the specific categories in which the differences lie.

Multinomial logistic regression. A regression often used when an outcome variable (for example, postsecondary education expectation) has more than two categories (for example, four categories: high school or less, some college, bachelor's degree, and master's degree or higher), to model the association between a set of predictors and the odds that the outcome takes on one of the possible categories (for example, bachelor's degree) relative to another category, called the reference category (for example, high school or less). The association between the odds and a predictor is represented by the regression coefficient, *b*, associated with the predictor. The exponentiated coefficient (e^b, where $e = 2.1718$) reflects the multiplicative change in the odds, or the odds ratio, associated with a one-unit increase in the predictor. For example, an exponentiated coefficient, or odds ratio, of 1.54, means that increasing the value of the predictor by one results in a $(1.54 − 1)*100 = 54$ percent increase in the odds. An exponentiated coefficient, or odds ratio, of 0.27 means that increasing the value of the predictor by one is associated with a $(0.27 − 1)*100 = 73$ percent decrease in the odds.

Percentage of variance explained. The extent to which the model predictor variables, taken in combination, account for observed differences in the outcome. The higher the percentage, the more accurate the model is in predicting the outcome.

degree, completing a bachelor's degree, and attaining a master's degree or higher. The study team then conducted an omnibus (or global) chi-square test of equality of distributions to ascertain whether the distribution of expectations differed across school locales (rural and nonrural). If the test was not statistically significant, the study team concluded that no rural–nonrural differences existed in the overall pattern of grade 10 students' expectations in 2002. If the test was statistically significant, the study team conducted post hoc pairwise comparisons to investigate the nature of the rural–nonrural differences. These post hoc comparisons involved comparing rural and nonrural percentages in each category of expectations (for example, some college). Because the post hoc comparisons tested multiple contrasts, there were increased chances of spurious significant findings (that is, results showing a statistically significant difference when in fact there was none). The study team attempted to prevent such errors by using a Sidak-adjusted significance level for each contrast, in place of the customary 0.05 level.[8]

Addressing the second part of research questions 1, 3, and 4. The second part of research questions 1, 3, and 4 asked whether rural–nonrural differences in the REL Midwest Region remained after background characteristics were accounted for and, if so, whether they differed from rural–nonrural differences in the rest of the nation, in terms of three outcomes: postsecondary education expectations, postsecondary educational attainment, and realization of postsecondary education expectations.[9] To address these topics, the study team fitted a series of two-level (level 1: students; level 2: schools) multinomial logistic regression models (four for each outcome) that sequentially added blocks of predictors, starting first with model 1, which included only school locale (rural or nonrural), region indicator (REL Midwest Region or the rest of the nation), and their interaction as predictors; followed by a model that added student characteristics and, in the case of the attainment outcome, grade 10 expectations (model 2); then a model that incorporated family characteristics and teacher expectations (model 3); and finally the full model that added school contextual variables and thus included all the control variables shown in table B2 (model 4).[10] In these models, a statistically significant rural by region interaction coefficient indicated that the association between rural status and outcome differed between the REL Midwest Region and those in the rest of the nation, and a statistically significant sum of the rural indicator and interaction coefficients indicated rural–nonrural differences in the REL Midwest Region. Because the outcomes of interest had more than two categories, they lent themselves naturally to multinomial models.

The multinomial logistic regression model is described for a general outcome variable R, which has M categories, and takes the value of m with probability $p_m = P(R = m)$, for $m = 1, \ldots, M$. Here, R represents any of the above three outcomes. For example, R could be the postsecondary education expectations measure, which has $M = 4$ categories: $m = 1$ (completing high school or less); $m = 2$ (attending some college but not completing a bachelor's degree); $m = 3$ (completing a bachelor's degree); and $m = 4$ (attaining a master's degree or higher). The multinomial model compares each category of response (for example, $m = M$) to a reference category (for example, $m = 1$). For this analysis, the reference category was the category with the lowest value. In the case of postsecondary education expectations, this meant that the reference category was $m = 1$ (high school or less).

To model the response, R, the study team transformed the ratio of the two probabilities:

$$p_m/p_1 = P(R = m)/P(R = 1)$$

This represents the odds of being in category m relative to those of being in category 1, using the logit link to obtain the log of the odds (or logit):

$$\eta_m = \log\left(\frac{p_m}{p_1}\right) = \log\left(\frac{p(R = m)}{p(R = 1)}\right)$$

The mth logit, η_m, for student i from high school j was then used as outcome in a two-level multinomial logit model. A two-level model (students nested within high schools) adjusted for the correlations that existed among grade 10 students who attended the same high school. The two-level baseline multinomial logit model (model 1) has the following form:

Level 1 (student-level) model: $\eta_{mij} = \beta_{0j(m)}$, $m = 2, \ldots, M$,

where $i = 1, \ldots, n_j$ students from high school j, $j = 1, \ldots, J$ high schools.

Level 2 (high school-level) model:

$$\beta_{0j(m)} = \gamma_{00(m)} + \alpha_{01(m)}(Rural_j) + \alpha_{02(m)}(Region_j) + \alpha_{03(m)}(Rural_j * Region_j) + u_{0j(m)},\ m = 2, \ldots, M,$$

where $Rural_j$ = school locale indicator that is equal to 1 if rural and 0 if nonrural; $Region_j$ = region indicator that is equal to 1 if REL Midwest Region and 0 if the rest of the nation; $u_{0j(m)}$ = random error associated with school j and category m, assumed to be identically distributed (across schools) with a mean of zero and a variance of $\tau_{00(m)}$. The above model specification means that there are M – 1 sets of regression coefficients for each outcome.

One of the main tasks for this model was to determine whether the rural by region interactions $\{\alpha_{03(m)}, m = 2, \ldots, M\}$ were statistically significantly different from zero. If $\alpha_{03(m)}$ was statistically significant, there was evidence that the rural effect on being in category m (relative to category 1) differed between the REL Midwest Region and the rest of the nation. If it was not, the evidence was not statistically compelling to claim a differential rural effect between the two regions. In the above formulation, the association between rural status and the log of the odds of being in category m relative to category 1 is represented by $\alpha_{01(m)}$ in the rest of the nation and by $\alpha_{01(m)} + \alpha_{03(m)}$ in the REL Midwest Region. So another task was to determine whether $\alpha_{01(m)} + \alpha_{03(m)}$ was statistically significantly different from zero (that is, if school locale had an effect in the REL Midwest Region). It was possible, of course, for school locale to have a differential effect on being in category m relative to category 1 (for example, "bachelor's degree" relative to "high school or less") but not on being in another category k relative to category 1 (for example, "some college" relative to "high school or less").

To also assess differential effects of school locale on the odds of being in category m relative to a category other than the reference category specified in the multinomial model (category 1), the odds ratios for all pairs of categories (for example, "bachelor's degree" relative to "high school or less"; "bachelor's degree" relative to "some college") were estimated. This calculation produced estimated odds ratios for the REL Midwest Region and the estimated odds ratios for the rest of the nation. The study team also divided the former by the latter to obtain the relative odds ratio. A relative odds ratio that is statistically significantly different from 1 signals that the rural effect, unadjusted for background characteristics,

varied across the two regions. Moreover, the (unadjusted) odds ratios within each region shed further light on the differences in rural and nonrural students' odds of being in one category of the outcome relative to another category when background characteristics were not controlled for. These estimated odds ratios and relative odds ratios for each category of the outcome (relative to another category) are presented in the results for model 1 in tables C2, C6, and C9 in appendix C.

To test whether the associations between school locale (rural or nonrural) and each of the three student outcomes (grade 10 students' postsecondary education expectations in 2002, postsecondary educational attainment as of 2012, and realization of postsecondary education expectations as of 2012) were robust to the influence of background characteristics, the study team augmented the baseline multinomial model (model 1) by incorporating student characteristics (model 2), then adding family and teacher factors (model 3), and finally adding school variables (model 4). The study employed predictor variables that prior research suggested might be related to the outcomes. As before, a statistically significant rural by region interaction indicated a differential effect of school locale between the REL Midwest Region and the rest of the nation, except that the associations were net of the effects of background characteristics collected during the base year survey.

The study team included the following student and family characteristics collected during the base year survey at level 1: student's gender, race/ethnicity, average grade 10 math and reading scores, socioeconomic status composite (parent education, parent occupation, and family income), student's preference to stay close to home and type of high school program (general education, college preparatory, or vocational education), parent involvement, parent aspirations, and teacher expectations. For the regression analysis of postsecondary educational attainment as of 2012 (question 3), students' postsecondary education expectations in 2002 were also controlled for.

The study team included the following high school characteristics measured in 2002 at level 2: school mean of average grade 10 math and reading scores, percentage of racial/ethnic minority students, percentage of students eligible for the federal school lunch program, and the average composite SES.

The full results (estimated odds ratios and standard error corresponding to each coefficient) from fitting model 1 and model 4 are presented in tables C3, C7, and C10 in appendix C.

Addressing research question 2. To examine students' reasons for not expecting to pursue postsecondary education, the study team focused on the subsample of 160 grade 10 students in the REL Midwest Region in 2002 who indicated that they did not expect to pursue postsecondary education and provided a reason for their expectation. This sample made up about 7 percent of the grade 10 students in the REL Midwest Region in 2002. The study team examined rural–nonrural differences in reasons, but unlike the analyses for research questions 1, 3 and 4, the analyses for reasons are purely descriptive. The study team thought it prudent not to model this outcome as a function of multiple predictors because of the small sample size. Moreover, because this outcome is derived from a check-all-that-apply question, modeling would have required using a separate logistic regression model for each of the four (dichotomous) categories of the outcome measure.

To assess rural–nonrural differences in the reasons provided by the students in the REL Midwest Region, the study team first calculated the percentages of students who reported each category of reasons; the team then cross-tabulated these percentages with school locale. Because these response categories were generated by a check-all-that-apply question, the sum of the percentages within each school locale may exceed 100 percent. The study team accounted for the fact that each respondent could choose multiple response options by using modified omnibus and post hoc chi-square test statistics developed by Katz and McSweeney (1984) specifically for check-all-that-apply questions. The study team then conducted an omnibus chi-square test to determine whether the reasons reported differed by school locale within the region; if the test was significant, the study team conducted post hoc comparisons to understand the nature of the rural–nonrural differences within the region.

Percentage of variance explained. Building on the method proposed by Snijders and Bosker (1999) for two-level logistic regression models, the percentage of variance explained in a two-level multinomial logistic regression model with M response categories (and reference category $m = 1$) can be calculated as

$$R_m^2 = \frac{\sigma_{Fm}^2}{\sigma_{Fm}^2 + \tau_0^2 + \sigma_R^2} \, , \, m = 2, \ldots, M,$$

where σ_{Fm}^2 is the variance of the linear predictor $(\hat{\eta}_m)$, τ_0^2 is the variance between high schools, and σ_R^2 is the student-level residual variance, which has a fixed value of $\pi^2/3$ for the logistic distribution. This calculation yields the percentage of variance explained in the outcome of falling in the mth category rather than the reference category (see box B1).

Weighting. Analyses employed weights that reflected the two-stage sampling design used in ELS:2002. The current study used the base weight (BYSTUWT) for questions that involved data from the ELS:2002 base year survey only (questions 1 and 2) and used the third follow-up survey panel weight (F3BYPNLWT) for questions that involved data from the ELS:2002 third follow-up data and earlier waves (questions 3 and 4). The third follow-up survey panel weight was constructed to support estimates that generalized to the target population of grade 10 students enrolled in spring 2002 and was used in conjunction with the grade 10 cohort flag to ensure that the 2004 freshmen students were filtered out of the sample. In addition to the student weights, the two-level multinomial models incorporated the base year school weight (BYSCHWT) for level 2 (school-level) weighting.

Estimation of standard errors. All analyses associated with research question 2 and the first part of research questions 1, 3, and 4 used student-level balanced repeated replicate weights to obtain standard error estimates. The multilevel multinomial logistic regression analyses associated with the second part of research questions 1, 3, and 4 used a sandwich estimator to obtain standard errors that accounted for sampling stratification and the clustering of students within schools, a pseudo-likelihood approach that accounted for inverse probability weights in a two-level model using adaptive quadrature (Rabe-Hesketh & Skrondal, 2006). The approach incorporated both student-level and school-level weights. Level 1 (student-level) weights were scaled according to the scaling method 1 formula detailed in Rabe-Hesketh and Skrondal (2006, p. 813). This method was implemented using a Stata program for maximum likelihood estimation of generalized linear latent and mixed models (Rabe-Hesketh, Skrondal, & Pickles, 2004).

Missing data. Only students who had nonmissing values of the outcome variables were included in the analysis. Missing values in the predictor variables were imputed using the dummy indicator approach. This method replaced missing values with a constant (the mean of the observed values) and added indicators for missing values in the analytic model. The dummy indicator approach has been demonstrated through simulations to produce minimal bias in impact estimates and associated standard errors (Puma, Olsen, Bell & Price, 2009). The rates of missing data in the analysis variables used in the current study are given in table B3. The National Center for Education Statistics has previously imputed missing values for a number of variables included in the ELS:2002 base year data and third follow-up restricted-use data files. These imputed variables included one of the key analytic variables used in the current study: the highest level of educational attainment as of the third follow-up interview, as well as some of the background characteristics used in the analysis: gender, race/ethnicity, school program type, student postsecondary education expectations, parent aspirations for student postsecondary achievement, and student ability estimates for math and reading from the base year data.

Table B3. Percentage of missing data in the respective analytic samples for postsecondary education expectations and attainment and realization of expectations

Variable	Expectations	Attainment and realization of expectations
Sample size (unweighted)	10,740	8,740
Student characteristics		
Gender	0.0	0.0
Race/ethnicity	0.0	0.0
Geographical preference (desire to stay close to home)	4.1	3.6
Grade 10 math and reading composite score	0.0	0.0
High school program type	0.0	0.0
Family and teacher characteristics		
Parent aspirations for student	0.0	0.0
Teacher expectations for student	11.3	10.9
Parent involvement at home	14.0	12.9
Parent involvement at school	19.4	17.4
Socioeconomic status	0.0	0.0
School characteristics		
Average achievement	0.6	0.5
Percentage of racial/ethnic minority students	1.9	1.9
Percentage eligible for federal school lunch program	9.5	9.6
Average socioeconomic status	1.1	1.1

Note: To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Missing rates are based on unweighted sample sizes. Missing rates for the analytic sample for reasons are not presented because the analysis for reasons did not involve use of the variables in this table.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Appendix C. Additional findings

The tables and figures in this appendix provide more detailed results than do the findings in the main text. These details include the percentage of variance explained by each of the multinomial regression models used in the analysis, as well as details about the associations between statistically significant predictors and the outcomes. However, for brevity, full results on regression coefficients are presented only for the baseline model (model 1) and the full model that included all background characteristics examined (model 4). Findings from additional analyses (not discussed in the main text) are provided as well. Results are presented for each research question.

Findings from multinomial regression analysis (the second part of research questions 1, 3, and 4) are presented as odds ratios that compare the odds of an event occurring in one group with the odds of that event occurring in another group, after the effects of all other predictor variables in the model are controlled for (see appendix B for more details about multinomial regression). For categorical predictors (such as school locale), odds ratios represent the likelihood of students in a target group (such as rural students) exhibiting an outcome (such as expecting to complete a bachelor's degree) relative to a reference group (such as nonrural students). An odds ratio equal to 1 indicates that the outcome is equally likely to occur for both groups. An odds ratio greater than 1 indicates that students in the target group are more likely to exhibit the outcome than are students in the reference group. An odds ratio of less than 1 indicates that students in the target group are less likely to exhibit the outcome than are students in the reference group. For example, the rural-to-nonrural odds ratio of 0.66 for expecting to complete a bachelor's degree relative to attending some college but not completing a bachelor's degree indicates that the odds of expecting to complete a bachelor's degree are 44 percent lower for rural students in the Regional Educational Laboratory Midwest Region than for nonrural students. For continuous predictors (such as test scores), odds ratios represent the change in the odds of an event occurring based on a one-unit increase in the predictor value after the effects of all other predictor variables in the model are controlled for. For example, the odds ratio of 1.12 for average math and reading test scores indicates that a one-point increase in a student's average score (for example, from 1.0 to 2.0) is associated with a 12 percent increase in the odds of a student expecting to attain a master's degree or higher.

Research question 1

Research question 1 asked whether rural–nonrural differences existed in the postsecondary education expectations of students who were in grade 10 in the Regional Educational Laboratory (REL) Midwest Region in 2002. The overall chi-square test of equality of distributions of expectations showed a statistically significant difference between rural and nonrural grade 10 students in the REL Midwest Region (table C1; see also figure 1 in the main text). A similar comparison of rural and nonrural students in the rest of the country showed no statistically significant difference in postsecondary education expectations between school locales (see table C1).

The estimated rural-to-nonrural odds ratios for postsecondary education expectations among spring 2002 grade 10 students suggest no rural–nonrural differences among students in the rest of the country who expect to attain a master's degree or higher but do indicate that rural students in the REL Midwest Region are less likely than their nonrural peers to expect to attain a master's degree or higher, even after student, family, teacher, and school characteristics are controlled for (table C2).

**Table C1. Percentage distribution of spring 2002 grade 10 students'
postsecondary education expectations, by region and school locale**

Postsecondary education expectation	Regional Educational Laboratory Midwest Region			Rest of the nation		
	Rural (n = 570)	Nonrural (n = 1,570)	All (n = 2,140)	Rural (n = 2,080)	Nonrural (n = 6,520)	All (n = 8,600)
High school or less	10.5	9.4	9.6	10.6	10.6	9.7
	(1.79)	(0.92)	(0.84)	(0.79)	(0.52)	(0.44)
Some college	20.0*	11.1*	12.9	14.0	14.0	11.9
	(1.64)	(0.95)	(0.90)	(0.89)	(0.63)	(0.50)
Bachelor's degree	40.1	37.5	38.0	38.9	38.9	40.2
	(2.27)	(1.28)	(1.14)	(1.40)	(0.75)	(0.64)
Master's degree or higher	29.4*	42.0*	39.4	36.5	36.5	38.2
	(2.18)	(1.53)	(1.37)	(1.45)	(0.93)	(0.77)
Overall test of equality of distributions of expectation across school locales	χ^2 = 7.68 p-value = 0.000*			χ^2 = 2.47 p-value = 0.063		

* Rural–nonrural difference at the given level of expectation was statistically significant at $p < .05$ after multiple comparisons were adjusted for.

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are weighted and unadjusted for clustering and student, family, teacher, and school characteristics. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Column percentages may not sum to 100 because of rounding. The overall chi-square test was statistically significant at $p < .05$.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

Additional findings from multinomial logistic regression models used to address research question 1

Student, family, teacher, and school characteristics that may explain rural–nonrural differences in postsecondary education expectations were included in the multinomial regression model for research question 1 (see results for model 4 in table C3). The full model produced coefficients that indicated statistically significant associations between student expectations and several student and family characteristics and teacher expectations. No statistically significant associations were found between expectations and school characteristics. Causal connections cannot be inferred from these associations, and the associations are not examined separately for rural and nonrural students.

Female students had higher postsecondary education expectations than did male students, and the gender gap widened as expectations rose. As other empirical studies have shown (see the literature review in appendix A), female grade 10 students expressed higher academic expectations than did their male peers, even after other factors, including academic performance and family socioeconomic status, were controlled for (see the results for model 4 in table C3). The current study found that the odds of female students expecting to attend some college without completing a bachelor's degree rather than complete high school or less was 59 percent higher than the corresponding odds for male students. The odds of expecting to complete a bachelor's degree rather than complete high school or less were 94 percent higher for female grade 10 students than for male grade 10 students, and the odds of expecting to attain a master's degree or higher rather than complete high school or less were 187 percent higher for female grade 10 students than for male grade 10 students.

Table C2. Odds ratios for rural–nonrural differences in spring 2002 grade 10 students' postsecondary education expectations and relative odds ratios for variations in rural–nonrural differences between the Regional Educational Laboratory Midwest Region and the rest of the nation

| Contrast | Model 1 (rural, region, rural by region interaction) | | | Model 4 (rural, region, rural by region interaction plus control variables) | | |
| | Odds ratio: rural to nonrural | | Relative odds ratio: REL Midwest Region to rest of nation | Odds ratio: rural to nonrural | | Relative odds ratio: REL Midwest Region to rest of nation |
	REL Midwest Region	Rest of the nation		REL Midwest Region	Rest of the nation	
Some college versus high school or less	1.44 (0.38)	1.48* (0.26)	0.97 (0.31)	1.37 (0.32)	1.25 (0.22)	1.10 (0.32)
Bachelor's degree versus high school or less	0.94 (0.25)	1.16 (0.21)	0.81 (0.26)	1.18 (0.27)	1.17 (0.21)	1.00 (0.29)
Master's degree or higher versus high school or less	0.59 (0.18)	1.04 (0.20)	0.56 (0.20)	0.88 (0.24)	1.17 (0.20)	0.75 (0.24)
Bachelor's degree versus some college	0.66* (0.11)	0.79 (0.11)	0.84 (0.18)	0.86 (0.15)	0.94 (0.13)	0.92 (0.19)
Master's degree or higher versus some college	0.41* (0.07)	0.70* (0.12)	0.58* (0.14)	0.64* (0.14)	0.94 (0.15)	0.68 (0.17)
Master's degree or higher versus bachelor's degree	0.62* (0.09)	0.89 (0.08)	0.69* (0.12)	0.75* (0.11)	1.00 (0.10)	0.75 (0.13)

* Statistically significant at $p < .05$.

REL is Regional Educational Laboratory.

Note: Numbers in parentheses are standard errors. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Odds ratios and relative odds ratios come from multinomial logistic regression models that adjusted for clustering. Sample sizes: $n = 2,140$ for the REL Midwest Region (rural: 570; nonrural: 1,570) and $n = 8,600$ for the rest of the nation (rural: 2,080; nonrural: 6,520). To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

Higher academic performance was associated with higher education expectations but to a limited degree. Among grade 10 students with otherwise similar characteristics, a one standard deviation increase in average math and reading scores was associated with 4 percent higher odds of expecting to attend some college rather than complete high school or less, 9 percent higher odds of expecting to complete a bachelor's degree rather than complete high school or less, and 12 percent higher odds of expecting to attain a master's degree or higher rather than complete high school or less (see the results for model 4 in table C3). These findings, combined with the above findings on gender gaps, suggest that gender played a stronger role in expectations than did academic abilities.

Participation in a rigorous, college-oriented curriculum was related to expecting to complete a bachelor's degree or to attain a master's degree or higher, while participation in vocational high school programs was related to expecting to attend some college but not complete a bachelor's degree. Grade 10 students in 2002 were asked which of three options best described their high school program of study: general, college preparatory (academic), or vocational (including technical or business). After all other background characteristics

Table C3. Odds ratios from a multinomial logistic regression of spring 2002 grade 10 students' postsecondary education expectations

Characteristic	Model 1 (rural, region, rural by region interaction)			Model 4 (rural, region, rural by region interaction plus all control variables)		
	Some college versus high school or less	Bachelor s degree versus high school or less	Master's degree or higher versus high school or less	Some college versus high school or less	Bachelor's degree versus high school or less	Master's degree or higher versus high school or less
Rural and region indicators						
Intercept	1.32* (0.12)	4.35* (0.47)	3.97* (0.50)	3.76* (0.63)	21.68* (4.00)	15.92* (3.00)
Rural	1.48* (0.26)	1.16 (0.21)	1.04 (0.20)	1.25 (0.22)	1.17 (0.21)	1.17 (0.20)
REL Midwest Region	1.01 (0.17)	0.90 (0.17)	1.10 (0.22)	1.01 (0.17)	1.09 (0.21)	1.51* (0.29)
Rural by REL Midwest Region	0.97 (0.31)	0.81 (0.26)	0.56 (0.20)	1.10 (0.32)	1.00 (0.29)	0.75 (0.24)
Student characteristics						
Gender						
Female	na	na	na	1.59* (0.35)	1.94* (0.34)	2.87* (0.54)
Race/ethnicity						
Black versus White	na	na	na	0.94 (0.24)	1.21 (0.29)	1.01 (0.27)
Hispanic versus White	na	na	na	1.08 (0.35)	1.57 (0.44)	1.43 (0.37)
Asian or Pacific Islander versus White	na	na	na	1.04 (0.49)	1.13 (0.40)	1.28 (0.49)
Other race/ethnicity[a] versus White	na	na	na	1.18 (0.38)	1.45 (0.43)	1.59 (0.49)
Prior achievement						
Grade 10 average math and reading scores	na	na	na	1.04* (0.01)	1.09* (0.01)	1.12* (0.01)
Geographical preference						
Medium desire to stay close to home versus low desire to stay close	na	na	na	0.74 (0.16)	0.88 (0.17)	0.66* (0.14)
High desire to stay close to home versus low desire to stay close	na	na	na	0.98 (0.21)	0.92 (0.18)	0.74 (0.16)
High school program type						
College preparatory/academic versus general	na	na	na	1.59* (0.26)	3.08* (0.40)	3.92* (0.58)
Vocational versus general	na	na	na	3.29* (0.59)	1.77* (0.37)	1.90* (0.42)
Family characteristics and teacher's expectation						
Parent aspirations for student						
Some college versus high school or less	na	na	na	1.50 (0.36)	1.96* (0.57)	1.29 (0.55)
Bachelor's degree versus high school or less	na	na	na	2.05* (0.64)	7.81* (2.22)	8.17* (3.27)
Master's degree or higher versus high school or less	na	na	na	2.22* (0.71)	8.78* (2.77)	17.42* (7.53)

(continued)

Table C3. Odds ratios from a multinomial logistic regression of spring 2002 grade 10 students' postsecondary education expectations *(continued)*

Characteristic	Model 1 (rural, region, rural by region interaction)			Model 4 (rural, region, rural by region interaction plus all control variables)		
	Some college versus high school or less	Bachelor s degree versus high school or less	Master's degree or higher versus high school or less	Some college versus high school or less	Bachelor s degree versus high school or less	Master's degree or higher versus high school or less
Teacher expectations for student						
Some college versus high school or less	na	na	na	1.85* (0.35)	2.30* (0.40)	2.54* (0.50)
Bachelor's degree versus high school or less	na	na	na	2.23* (0.60)	4.74* (1.17)	5.90* (1.60)
Master's degree or higher versus high school or less	na	na	na	2.17 (1.19)	4.39* (1.44)	8.51* (3.04)
Parent involvement at home						
Sometimes versus rarely	na	na	na	1.51* (0.24)	2.13* (0.38)	2.49* (0.48)
Often versus rarely	na	na	na	1.94* (0.63)	3.74* (1.21)	5.74* (1.92)
Parent involvement at school						
More than once	na	na	na	1.15 (0.29)	0.87 (0.20)	0.71 (0.19)
Socioeconomic status						
Socioeconomic status	na	na	na	1.29* (0.17)	1.35 (0.21)	1.32 (0.21)
School-level variables						
School average math and reading achievement	na	na	na	1.03 (0.03)	1.00 (0.03)	0.99 (0.03)
Percentage of racial/ethnic minority students	na	na	na	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
Percentage of students eligible for the federal school lunch program	na	na	na	1.00 (0.01)	1.00 (0.01)	1.00 (0.01)
School average socioeconomic status	na	na	na	0.61 (0.21)	1.09 (0.40)	1.45 (0.56)

* Statistically significant at $p < .05$.

na is not applicable. REL is Regional Educational Laboratory.

Note: Numbers in parentheses are standard errors. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Odds ratios come from multinomial logistic regression models that adjusted for clustering. Sample sizes (unweighted): $n = 2,140$ for the REL Midwest Region (rural: 570; nonrural: 1,570) and $n = 8,600$ for the rest of the nation (rural: 2,080; nonrural: 6,520). To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten.

a. Includes American Indian/Alaska Native students and multiracial students.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

were controlled for, the students who reported participating in a college preparatory program rather than a general program had 292 percent higher odds of expecting to attain a master's degree or higher rather than complete high school or less, 208 percent higher odds of expecting to complete a bachelor's degree rather than complete high school or less, and 59 percent higher odds of expecting to attend some college but not complete a bachelor's degree rather than complete high school or less (see the results for model 4 in table C3).

Grade 10 students who reported participating in a vocational high school track rather than a general program had 229 percent higher odds of expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 77 percent higher odds of expecting to complete a bachelor's degree rather than complete high school or less, and 90 percent higher odds of expecting to attain a master's degree or higher rather than complete high school or less.

The desire to stay close to home was negatively associated with expecting to attain a master's degree or higher. Compared with students who had a low desire to stay close to home, spring 2002 grade 10 students who had a moderate desire to stay close to home had 44 percent lower odds of expecting to attain a master's degree or higher relative to completing high school or less (see the results for model 4 in table C3). However, there were no statistically significant differences in expectations between students with a strong desire to stay close to home and students with a low desire to stay close to home.

Parents' education aspirations for their children and teachers' expectations for students were both associated with students' education expectations, but parents' aspirations had a stronger association. Students' postsecondary education expectations mirrored their parents' aspirations and teachers' expectations. Parents' aspiring for their children to attend some college but not complete a bachelor's degree (rather than complete high school or less) was associated with 96 percent higher odds of students' expecting to complete a bachelor's degree relative to completing high school or less. Parents' aspiring for their children to earn a bachelor's degree (rather than complete high school or less) was associated with 105 percent higher odds of students' expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 681 percent higher odds of expecting to complete a bachelor's degree, and 717 percent higher odds of expecting to attain a master's degree or higher. Parents' aspiring for their children to earn a master's degree or higher (rather than complete high school or less) was associated with 122 percent higher odds of students' expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 778 higher odds of expecting to complete a bachelor's degree, and 1,642 percent higher odds of expecting to attain a master's degree or higher (see the results for model 4 in table C3).

Like parents' aspirations, teachers' expectations showed a positive, albeit weaker, relationship with their students' postsecondary education expectations, and the associations were also more pronounced as the levels of expectation rose. Teachers' expecting their students to attend some college but not completing a bachelor's degree (rather than complete high school or less) was associated with 85 percent higher odds of students' expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 130 percent higher odds of expecting to complete a bachelor's degree, and 154 percent higher odds of expecting to attain a master's degree or higher. Teachers' expecting their students to complete a bachelor's degree relative to completing high school or less was associated with 123 percent higher odds of students' expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 374 percent higher odds of expecting to complete a bachelor's degree, and 490 percent higher odds of expecting to attain a master's degree or higher. Teachers' expecting their students to attain a master's degree or higher (rather than complete high school or less) was associated with 339 percent higher odds of students' expecting to complete a bachelor's degree relative to completing high school or less and 751 percent higher odds of expecting to attain a master's degree or higher (see the results for model 4 in table C3).

Parent involvement at home (but not parent involvement at school) was positively related to higher education expectations. Parents were asked how often (rarely, sometimes, or often) they were involved with their grade 10 students' education at home. Compared with students whose parents were rarely involved at home, students whose parents were often involved at home had 94 percent higher odds of expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 274 percent higher odds of expecting to complete a bachelor's degree, and 474 percent higher odds of expecting to attain a master's degree or higher. Compared with students whose parents were rarely involved at home, students whose parents were sometimes involved at home had 51 percent higher odds of expecting to attend some college but not complete a bachelor's degree relative to completing high school or less, 113 percent higher odds of expecting to complete a bachelor's degree, and 149 percent higher odds of expecting to attain a master's degree or higher (see the results for model 4 in table C3).

Research question 2

Most grade 10 students (73 percent) in the REL Midwest Region who in 2002 did not expect to pursue postsecondary education provided reasons for doing so. For both rural and nonrural students in the REL Midwest Region, financial concerns were the most frequently reported reason (table C4; see also figure 2 in the main text). However, results of the omnibus chi-square tests of equality of distributions of reasons suggest that in the REL Midwest Region there were rural–nonrural differences in the reasons. Although the overall test was statistically significant, none of the rural–nonrural differences for each category of reason was statistically significant (none of the p-values fell below the Sidak-adjusted significance level of 0.017).

Table C4. Percentage distribution of reasons given by spring 2002 grade 10 students in the Regional Educational Laboratory Midwest who did not expect to pursue postsecondary education, by school locale

Reason	Rural (n = 50)	Nonrural (n = 110)	All (n = 160)
Financial concerns	88.2 (4.45)	75.9 (4.71)	78.7 (3.73)
Does not need further education	61.4 (7.81)	51.0 (4.95)	53.3 (4.06)
Not interested in school	59.9 (8.26)	58.8 (5.79)	59.1 (4.74)
Grades not high enough	46.1 (6.55)	62.7 (5.63)	59.0 (4.68)
Overall test of equality of distributions of reasons across school locales		χ^2 = 13.13 p-value = 0.004	

Note: Numbers in parentheses are standard errors. Respondents could choose more than one reason. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Percentages are unadjusted and do not account for student, family, teacher, and school characteristics. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. The overall test for equality of distributions was statistically significant at p < .05, but none of the rural–nonrural differences in any given category of reason was statistically significant at p < .05 after multiple comparisons were adjusted for.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year Restricted-Use File.

Examination of postsecondary education attainment as of 2012 among spring 2002 grade 10 students indicated an overall relationship between school locale and attainment in the REL Midwest Region but not in the rest of the country (table C5). But when follow-up comparisons were conducted within each attainment level in the REL Midwest Region, no statistically significant rural–nonrural differences emerged. Similarly, when other factors were controlled for, no rural–nonrural differences were evident, either in the REL Midwest Region or in the rest of the country (see the results for model 4 in table C6).

Additional findings from multinomial logistic regression models used to address research question 3

Analyses for research question 3 revealed other factors that influenced postsecondary education attainment (table C7). Spring 2002 grade 10 students' postsecondary education expectations predicted their educational attainment 10 years later, and similar factors shaped both their expectations and attainment.

Being female, having higher academic achievement, participating in a college preparatory program, and having higher socioeconomic status were associated with higher postsecondary educational attainment. Among grade 10 students in spring 2002, female students had 35 percent higher odds of attending some college but not completing a bachelor's degree rather than complete high school or less than did male students and 82 percent higher odds of attaining a master's degree or higher rather than complete high school or less.

Table C5. Percentage distribution of spring 2002 grade 10 students' postsecondary educational attainment as of 2012, by region and school locale

Educational attainment	Regional Educational Laboratory Midwest Region			Rest of the nation		
	Rural (*n* = 480)	Nonrural (*n* = 1,300)	All (*n* = 1,780)	Rural (*n* = 1,670)	Nonrural (*n* = 5,290)	All (*n* = 6,960)
High school or less	16.2 (2.66)	13.2 (1.20)	13.8 (1.12)	18.6 (1.33)	15.1 (0.70)	15.9 (0.63)
Some college	55.0 (2.58)	50.0 (2.11)	51.1 (1.80)	51.5 (1.55)	52.4 (0.88)	52.2 (0.78)
Bachelor's degree	24.3 (2.28)	29.6 (2.09)	28.4 (1.76)	24.1 (1.38)	26.0 (0.89)	25.6 (0.76)
Master's degree or higher	4.6 (0.83)	7.2 (0.79)	6.6 (0.66)	5.8 (0.68)	6.5 (0.42)	6.3 (0.35)
Overall test of equality of distributions of attainment across school locales	$\chi^2 = 2.65$ p-value = 0.050			$\chi^2 = 1.98$ p-value = 0.118		

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory (REL) Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are unadjusted and do not account for student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Percentages may not sum to 100 because of rounding. The overall test for the REL Midwest Region was statistically significant at $p < .05$, but neither the overall test for the rest of the nation nor any of the rural–nonrural differences in any given category of attainment for the REL Midwest Region and the rest of the nation were statistically significant at $p < .05$ after multiple comparisons were adjusted for.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Third Follow-up Restricted-Use File.

Table C6. Odds ratios for rural–nonrural differences in spring 2002 grade 10 students' postsecondary educational attainment and relative odds ratios for variations in rural–nonrural differences between the Regional Educational Laboratory Midwest Region and the rest of the nation

Contrast	Model 1 (rural, region, rural by region interaction)			Model 4 (rural, region, rural by region interaction plus control variables)		
	Odds ratio: rural to nonrural		Relative odds ratio: REL Midwest Region to rest of nation	Odds ratio: rural to nonrural		Relative odds ratio: REL Midwest Region to rest of nation
	REL Midwest Region	Rest of the nation		REL Midwest Region	Rest of the nation	
Some college versus high school or less	0.98 (0.25)	0.90 (0.17)	1.09 (0.34)	1.35 (0.39)	1.06 (0.16)	1.27 (0.39)
Bachelor's degree versus high school or less	0.82 (0.23)	0.87 (0.22)	0.93 (0.35)	1.46 (0.49)	1.11 (0.19)	1.31 (0.46)
Master's degree or higher versus high school or less	0.51 (0.21)	0.82 (0.25)	0.62 (0.31)	0.89 (0.37)	0.95 (0.24)	0.94 (0.45)
Bachelor's degree versus some college	0.82 (0.16)	0.99 (0.15)	0.83 (0.20)	1.08 (0.20)	1.04 (0.15)	1.03 (0.21)
Master's degree or higher versus some college	0.51 (0.18)	0.93 (0.20)	0.55 (0.23)	0.66 (0.24)	0.89 (0.20)	0.74 (0.32)
Master's degree or higher versus bachelor's degree	0.62 (0.19)	0.89 (0.16)	0.7 (0.25)	0.61 (0.21)	0.85 (0.17)	0.71 (0.27)

REL is Regional Educational Laboratory.

Note: Numbers in parentheses are standard errors. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Odds ratios and relative odds ratios come from multinomial logistic regression models that adjusted for clustering. Sample sizes (unweighted): $n = 1,780$ for the REL Midwest Region (rural: 480; nonrural: 1,300) and $n = 6,960$ for the rest of the nation (rural: 1,670; nonrural: 5,290). To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. None of the odds ratios or relative odds ratios was statistically significant at $p < .05$.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Third Follow-up Restricted-Use File.

A one standard deviation increase in average math and reading scores was associated with 4 percent higher odds of attending some college but not completing a bachelor's degree relative to completing high school or less, 8 percent higher odds of completing a bachelor's degree, and 13 percent higher odds of attaining a master's degree or higher.

Grade 10 students who participated in a college preparatory program rather than a general program had 41 percent higher odds of completing a bachelor's degree rather than completing high school or less. But students who participated in a vocational program rather than a general program had 65 percent lower odds of attaining a master's degree or higher relative to completing high school or less.

Grade 10 students whose households had a one standard deviation higher socioeconomic status had 66 percent higher odds of attaining some college relative to high school or less, 161 percent higher odds of attaining a bachelor's degree relative to completing high school or less, and 159 percent higher odds of attaining a master's degree or higher relative to completing high school or less. Similarly, students who went to schools with a

Table C7. Odds ratios from a multinomial logistic regression of spring 2002 grade 10 students' postsecondary educational attainments as of 2012

Variable	Model 1 (rural, region, rural by region interaction)			Model 4 (rural, region, rural by region interaction plus all control variables)		
	Some college versus high school or less	Bachelor's degree versus high school or less	Master's degree or higher versus high school or less	Some college versus high school or less	Bachelor s degree versus high school or less	Master's degree or higher versus high school or less
Rural and region indicators						
Intercept	3.80* (0.43)	1.72* (0.26)	0.41* (0.07)	9.23* (1.38)	2.76* (0.47)	0.21* (0.05)
Rural	0.90 (0.17)	0.87 (0.22)	0.82 (0.25)	1.06 (0.16)	1.11 (0.19)	0.95 (0.24)
REL Midwest Region	0.98 (0.15)	1.16 (0.25)	1.08 (0.30)	1.32 (0.22)	1.63* (0.28)	1.43 (0.36)
Rural by REL Midwest Region	1.09 (0.34)	0.93 (0.35)	0.62 (0.31)	1.27 (0.39)	1.31 (0.46)	0.94 (0.45)
Student characteristics						
Gender						
Female	na	na	na	1.35* (0.18)	1.36 (0.22)	1.82* (0.42)
Race/ethnicity						
Black versus White	na	na	na	2.38* (0.48)	2.14* (0.58)	5.00* (2.05)
Hispanic versus White	na	na	na	1.81* (0.31)	1.57 (0.40)	1.30 (0.47)
Asian or Pacific Islander versus White	na	na	na	2.07* (0.54)	4.11* (1.35)	4.42* (1.56)
Other race/ethnicity[a] versus White	na	na	na	0.53* (0.11)	0.47* (0.15)	0.72 (0.36)
Prior achievement						
Grade 10 math and reading composite score	na	na	na	1.04* (0.01)	1.08* (0.01)	1.13* (0.02)
Geographical preference						
Medium desire to stay close to home versus low desire to stay close	na	na	na	1.33 (0.21)	1.37 (0.30)	1.39 (0.40)
High desire to stay close to home versus low desire to stay close	na	na	na	1.26 (0.19)	1.63* (0.35)	1.28 (0.32)
High school program type						
College preparatory/ academic versus general	na	na	na	1.18 (0.15)	1.41* (0.24)	1.06 (0.25)
Vocational versus general	na	na	na	1.31 (0.21)	0.85 (0.19)	0.35* (0.14)
Education expectations						
Some college versus high school or less	na	na	na	1.83* (0.29)	2.90* (1.21)	0.98 (1.05)
Bachelor's degree versus high school or less	na	na	na	2.69* (0.52)	10.84* (4.35)	5.51 (5.43)
Master's degree or higher versus high school or less	na	na	na	2.66* (0.50)	11.44* (4.52)	8.93* (9.03)

(continued)

Table C7. Odds ratios from a multinomial logistic regression of spring 2002 grade 10 students' postsecondary educational attainments as of 2012 *(continued)*

Variable	Model 1 (rural, region, rural by region interaction)			Model 4 (rural, region, rural by region interaction plus all control variables)		
	Some college versus high school or less	Bachelor's degree versus high school or less	Master's degree or higher versus high school or less	Some college versus high school or less	Bachelor s degree versus high school or less	Master's degree or higher versus high school or less
Family characteristics and teacher's expectation						
Parent aspirations for student						
Some college versus high school or less	na	na	na	0.71 (0.19)	1.12 (0.52)	0.13* (0.13)
Bachelor's degree versus high school or less	na	na	na	1.08 (0.24)	2.08 (0.84)	1.03 (0.82)
Master's degree or higher versus high school or less	na	na	na	1.01 (0.28)	2.18 (0.94)	1.32 (1.06)
Teacher's expectation for student						
Some college versus high school or less	na	na	na	2.08* (0.29)	3.37* (1.13)	0.99 (0.74)
Bachelor's degree versus high school or less	na	na	na	3.97* (0.78)	16.09* (5.44)	32.63* (23.60)
Master's degree or higher versus high school or less	na	na	na	6.34* (3.63)	42.23* (26.11)	138.55* (121.93)
Parent involvement at home						
Sometimes versus rarely	na	na	na	1.32 (0.24)	1.41 (0.32)	1.17 (0.46)
Often versus rarely	na	na	na	1.14 (0.21)	1.24 (0.32)	1.00 (0.37)
Parent involvement at school (more than once)	na	na	na	1.02 (0.19)	1.03 (0.23)	0.75 (0.19)
Student-level socioeconomic status	na	na	na	1.66* (0.22)	2.61* (0.44)	2.59* (0.63)
School-level variables						
School average math and reading achievement	na	na	na	1.01 (0.02)	1.04 (0.03)	1.05 (0.04)
Percentage of racial/ethnic minority students	na	na	na	1.00 (0.00)	1.00 (0.00)	0.99 (0.00)
Percentage of students eligible for the federal school lunch program	na	na	na	1.01 (0.01)	1.01 (0.01)	1.01 (0.01)
School average socioeconomic status	na	na	na	1.80* (0.52)	2.05* (0.74)	1.14 (0.51)

* Statistically significant at *p* < .05.

na is not applicable. REL is Regional Educational Laboratory.

Note: Numbers in parentheses are standard errors. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Odds ratios come from multinomial logistic regression models that adjusted for clustering. Sample sizes (unweighted): *n* = 1,780 for the REL Midwest Region (rural: 480; nonrural: 1,300) and *n* = 6,960 for the rest of the nation (rural: 1,670; nonrural: 5,290). To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten.

a. Includes American Indian/Alaska Native students and multiracial students.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

one standard deviation higher average socioeconomic status had 80 percent higher odds of attaining some college relative to high school or less, and 105 percent higher odds of attaining a master's degree or higher relative to high school or less.

When student, family, teacher, and school characteristics were controlled for, spring 2002 grade 10 Black, Hispanic, and Asian students had higher educational attainment than did White students. Compared with White students, Black students had 138 percent higher odds of attending some college but not completing a bachelor's degree, 114 percent higher odds of completing a bachelor's degree, and 400 percent higher odds of attaining a master's degree or higher, relative to completing high school or less. Compared with White students, Hispanic students had 81 percent higher odds of attending some college but not completing a bachelor's degree relative to completing high school or less. Compared with White students, Asian students had 107 percent higher odds of attending some college but not completing a bachelor's degree, 311 percent higher odds of completing a bachelor's degree, and 342 percent higher odds of attaining a master's degree or higher, relative to completing high school or less. On the other hand, students in the "other" race/ethnicity category (which includes American Indian/Alaska Native and multiracial students), had 47 percent lower odds than did their White counterparts of attending some college but not completing a bachelor's degree and 53 percent lower odds of completing a bachelor's degree, relative to completing high school or less.

Teacher expectations had a positive association with students' postsecondary attainment, but parent aspirations generally had no association and in one instance had a negative association. Teachers' expectations for their grade 10 students in 2002 showed a positive association with students' educational attainment 10 years later, and the associations were more pronounced as the levels of expectation rose. Grade 10 students whose teachers expected them to attend some college but not complete a bachelor's degree (rather than complete high school or less) had 108 percent higher odds of attending some college but not complete a bachelor's degree and 227 percent higher odds of completing a bachelor's degree, relative to completing high school or less. Grade 10 students whose teachers expected them to complete a bachelor's degree (rather than complete high school or less) had 297 percent higher odds of attending some college but not completing a bachelor's degree, 1,509 percent higher odds of completing a bachelor's degree, and 3,163 percent higher odds of attaining a master's degree or higher, relative to completing high school or less. Grade 10 students whose teachers expected them to attain a master's degree or higher (rather than complete high school or less) had 534 percent higher odds of attending some college but not complete a bachelor's degree, 4,123 percent higher odds of completing a bachelor's degree, and 13,755 percent higher odds of attaining a master's degree or higher, relative to completing high school or less.

Parents' aspirations were not associated with their children's postsecondary attainment except in one case: students whose parents aspired for them to attend college but not complete a bachelor's degree had 87 percent lower odds of attaining a master's degree or higher (rather than completing high school or less) compared with students whose parents aspired for them to complete high school or less. The study team suspects that the general lack of association between parent aspirations and their children's educational attainment once students' own expectations were controlled for may reflect the strong association between parents' aspirations and students' expectations (see additional findings from multinomial logistic regression models used to address research question 1). More research is needed to understand this general lack of association.

Responses to the Education Longitudinal Study of 2002 base year and 2012 follow-up surveys showed that the degree to which students' postsecondary educational attainment fell short of their expectations, matched their expectations, or exceeded their expectations was the same for rural and nonrural students in both the REL Midwest Region and other parts of the country (tables C8 and C9). However, rural students in the REL Midwest region who fell short of or matched their expectations tended to have had higher expectations than their nonrural counterparts (tables C11 and C12). About 60 percent of rural and nonrural students in the region who exceeded their expectations had not expected to pursue postsecondary education but attended college without completing a bachelor's degree (table C13).

Additional findings from multinomial logistic regression models used to address research question 4

The findings from the multinomial logistic regression models revealed that some student, family, teacher, and school characteristics were positively or negatively related to students' realization of education expectations. Statistically significant findings are summarized here.

Higher socioeconomic status and higher teacher expectations were associated with higher odds of matching postsecondary education expectations relative to falling short of them. When students who were similar in terms of other background characteristics were examined, those with one standard deviation higher socioeconomic status had 20 percent higher odds of matching postsecondary education expectations rather than falling short of them, and those whose teachers expected them to attain a master's degree or higher had

Table C8. Percentage distribution of spring 2002 grade 10 students' realization of postsecondary education expectations in 2012, by region and school locale

Realization of postsecondary education expectations	Regional Educational Laboratory Midwest Region			Rest of the nation		
	Rural (*n* = 480)	Nonrural (*n* = 1,300)	All (*n* = 1,780)	Rural (*n* = 1,670)	Nonrural (*n* = 5,290)	All (*n* = 6,960)
Attainment fell short of expectation	59.8 (2.90)	63.5 (1.86)	62.7 (1.61)	65.5 (1.51)	65.8 (0.75)	65.7 (0.69)
Attainment matched expectation	32.4 (2.84)	29.4 (1.79)	30.0 (1.54)	27.2 (1.32)	26.5 (0.71)	26.7 (0.65)
Attainment exceeded expectation	7.8 (1.51)	7.2 (0.79)	7.3 (0.71)	7.3 (0.84)	7.7 (0.45)	7.6 (0.40)
Overall test of equality of distributions of realization of expectation across school locales	$\chi^2 = 0.63$ *p*-value = 0.535			$\chi^2 = 0.21$ *p*-value = 0.810		

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are unadjusted and do not account for student, family, teacher and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. The overall chi-square test was not statistically significant at *p* < .05. Rural–nonrural differences for each category of realization also were not statistically significant at *p* < .05 after multiple comparisons were adjusted for. Percentages may not sum to 100 because of rounding.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Table C9. Odds ratios for rural–nonrural differences in realization in 2012 of postsecondary education expectations and relative odds ratios for variations in rural–nonrural differences between spring 2002 grade 10 students' expectations in the Regional Educational Laboratory Midwest Region and in the rest of the nation

Contrast	Model 1 (rural, region, rural by region interaction)			Model 4 (rural, region, rural by region interaction plus control variables)		
	Odds ratio: rural to nonrural		Relative odds ratio: REL Midwest Region to rest of nation	Odds ratio: rural to nonrural		Relative odds ratio: REL Midwest Region to rest of nation
	REL Midwest Region	Rest of the nation		REL Midwest Region	Rest of the nation	
Matching versus falling short	1.22 (0.18)	1.01 (0.12)	1.21 (0.23)	1.03 (0.15)	0.98 (0.14)	1.05 (0.19)
Exceeding versus falling short	1.34 (0.34)	0.71 (0.15)	1.90 (0.63)	1.16 (0.30)	0.85 (0.20)	1.37 (0.45)
Exceeding versus matching	1.10 (0.29)	0.70 (0.15)	1.57 (0.53)	1.13 (0.31)	0.86 (0.19)	1.31 (0.41)

REL is Regional Educational Laboratory.

Note: Numbers in parentheses are standard errors. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Odds ratios and relative odds ratios come from multinomial logistic regression models that adjusted for clustering. Sample sizes (unweighted): $n = 1,780$ for the REL Midwest Region (rural: 480; nonrural: 1,300) and $n = 6,960$ for the rest of the nation (rural: 1,670; nonrural: 5,290). To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. None of the odds ratios or relative odds ratios was statistically significant at $p < .05$.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

68 percent higher odds of matching their expectations rather than falling short of them (see the results for model 4 in table C10).

Some factors were negatively associated with students' realization of postsecondary education expectations. When all other background characteristics were controlled for, female students had 22 percent lower odds than did male students of matching their postsecondary education expectations rather than falling short of them (see the results for model 4 in table C10). Students in the "other" race/ethnicity category had 58 percent lower odds than did White students of exceeding their postsecondary education expectations rather than falling short of them. And students with a one standard deviation higher average achievement had 2 percent lower odds of exceeding their postsecondary education expectations rather than falling short of them.

Similarly, students who participated in a rigorous, college-focused program of study had 28 percent lower odds of matching their postsecondary education expectations and 44 percent lower odds of exceeding their postsecondary education expectations rather than falling short of them. Moreover, higher parent expectations and greater parent involvement at home were generally correlated with lower odds of matching or exceeding expectations as compared with falling short of them. These counterintuitive negative relationships may be related to the way in which realization of expectations was coded. Because higher expectations tend to be more difficult to meet or exceed than lower expectations, students with higher expectations tend to be less likely to realize their expectations. This might be the

case here. For example, students who participated in college preparatory programs generally had higher postsecondary education expectations (see findings from research question 1) and may have been more likely to fall short of their expectations. Similarly, students whose parents had higher aspirations for them also tended to have higher expectations for themselves (see findings from research question 1) and may also have been less likely to match or exceed their expectations. More research is needed to better understand these associations.

Table C10. Odds ratios from a multinomial logistic regression of spring 2002 grade 10 students' realization in 2012 of postsecondary education expectations

Characteristic	Model 1 (rural, region, rural by region interaction)		Model 4 (rural, region, rural by region interaction plus all control variables)	
	Matching versus falling short	Exceeding versus falling short	Matching versus falling short	Exceeding versus falling short
Rural and region indicators				
Intercept	0.43* (0.02)	0.12* (0.01)	0.40* (0.03)	0.08* (0.01)
Rural	1.01 (0.12)	0.71 (0.15)	0.98 (0.14)	0.85 (0.20)
REL Midwest Region	1.03 (0.11)	0.89 (0.15)	1.01 (0.11)	0.96 (0.16)
Rural by REL Midwest Region	1.21 (0.23)	1.90 (0.63)	1.05 (0.19)	1.37 (0.45)
Student characteristics				
Gender				
Female	na	na	0.78* (0.07)	0.81 (0.14)
Race/ethnicity				
Black versus White	na	na	0.78 (0.12)	1.35 (0.29)
Hispanic versus White	na	na	0.86 (0.13)	1.02 (0.22)
Asian or Pacific Islander versus White	na	na	1.09 (0.22)	0.93 (0.29)
Other race/ethnicity[a] versus White	na	na	0.87 (0.26)	0.42* (0.14)
Prior achievement				
Grade 10 average math and reading scores	na	na	0.99 (0.01)	0.98* (0.01)
Geographical preference				
Medium desire to stay close to home versus low desire to stay close	na	na	1.10 (0.17)	1.03 (0.21)
High desire to stay close to home versus low desire to stay close	na	na	1.24 (0.16)	1.01 (0.22)
High school program type				
College preparatory/academic versus general	na	na	0.72* (0.08)	0.56* (0.09)
Vocational versus general	na	na	1.03 (0.12)	0.76 (0.19)

(continued)

Table C10. Odds ratios from a multinomial logistic regression of spring 2002 grade 10 students' realization in 2012 of postsecondary education expectations *(continued)*

Characteristic	Model 1 (rural, region, rural by region interaction)		Model 4 (rural, region, rural by region interaction plus all control variables)	
	Matching versus falling short	Exceeding versus falling short	Matching versus falling short	Exceeding versus falling short
Family characteristics and teacher's expectation				
Parents' aspirations for student				
Some college versus high school or less	na	na	0.40* (0.10)	0.78 (0.26)
Bachelor's degree versus high school or less	na	na	0.26* (0.07)	0.24* (0.08)
Master's degree or higher versus high school or less	na	na	0.22* (0.05)	0.16* (0.06)
Teacher's expectation for student				
Some college versus high school or less	na	na	0.92 (0.12)	0.75 (0.15)
Bachelor's degree versus high school or less	na	na	1.13 (0.18)	0.97 (0.26)
Master's degree or degree versus high school or less	na	na	1.68* (0.31)	1.71 (0.51)
Parent involvement at home				
Sometimes versus never	na	na	0.78* (0.09)	0.73 (0.17)
Often versus never	na	na	0.63* (0.08)	0.40* (0.10)
Parent involvement at school				
More than once	na	na	1.06 (0.12)	0.94 (0.19)
Socioeconomic status				
Socioeconomic status	na	na	1.20* (0.10)	1.13 (0.17)
School-level variables				
School average math and reading achievement	na	na	1.03 (0.02)	1.00 (0.03)
Percentage of racial/ethnic minority students	na	na	1.00 (0.00)	1.00 (0.00)
Percentage of students eligible for the federal school lunch program	na	na	1.00 (0.00)	1.00 (0.01)
School average socioeconomic status	na	na	0.90 (0.16)	1.57 (0.52)

* Statistically significant at $p < .05$.

na is not applicable. REL is Regional Educational Laboratory.

Note: Numbers in parentheses are standard errors. The REL Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Odds ratios come from multinomial logistic regression models that adjusted for clustering. Sample sizes (unweighted): $n = 1,780$ for the REL Midwest Region (rural: 480; nonrural: 1,300) and $n = 6,960$ for the rest of the nation (rural: 1,670; nonrural: 5,290). To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten.

a. Includes American Indian/Alaska Native students and multiracial students.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Table C11. Percentage distribution of participants in the Education Longitudinal Study of 2002 whose postsecondary educational attainment by 2012 fell short of their grade 10 expectations, by region and school locale

Expectation	Attainment	Regional Educational Laboratory Midwest Region (n = 1,120)		Rest of the nation (n = 4,570)		
		Rural (n = 300)	Nonrural (n = 820)	Rural (n = 1,100)	Nonrural (n = 3,470)	All (n = 5,690)
Some college	High school diploma or less	7.2 (1.73)	3.5 (0.78)	8.0 (0.94)	5.0 (0.48)	5.4 (0.37)
Bachelor's degree	High school diploma or less	7.2 (1.93)	6.9 (0.94)	7.6 (0.91)	8.2 (0.58)	7.9 (0.46)
Bachelor's degree	Some college	40.4* (4.21)	29.6* (1.85)	33.5 (1.82)	33.2 (1.04)	33.0 (0.79)
Master's degree or higher	High school diploma or less	2.9[a] (1.27)	2.8 (0.64)	4.2 (0.84)	3.4 (0.39)	3.5 (0.31)
Master's degree or higher	Some college	21.0* (3.11)	31.6* (1.76)	26.5 (1.96)	28.8 (0.88)	28.5 (0.68)
Master's degree or higher	Bachelor's degree	21.3 (2.47)	25.6 (2.17)	20.1 (1.65)	21.3 (0.99)	21.8 (0.75)
Overall test of equality of distributions of realization of expectation across school locales		$\chi^2 = 3.75$ p-value = 0.003*		$\chi^2 = 1.63$ p-value = 0.154		

*Rural–nonrural difference at the given level of expectation and attainment was statistically significant at $p < .05$ after multiple comparisons were adjusted for. Overall test was statistically significant at $p < .05$.

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are unadjusted and do not account for student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Percentages may not sum to 100 because of rounding.

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

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Table C12. Percentage distribution of participants in the Education Longitudinal Study of 2002 whose postsecondary educational attainment by 2012 matched their grade 10 expectations, by region and school locale

| Expectation | Attainment | Regional Educational Laboratory Midwest Region (n = 540) | | Rest of the nation (n = 1,860) | | |
		Rural (n = 160)	Nonrural (n = 380)	Rural (n = 450)	Nonrural (n = 1,410)	All (n = 2,400)
High school diploma or less	High school diploma or less	18.2 (4.79)	16.3 (2.39)	20.6 (2.61)	15.8 (1.30)	16.9 (1.00)
Attend some college	Attend some college	41.4* (3.46)	22.9* (2.45)	28.7 (2.33)	26.7 (1.58)	27.2 (1.14)
Attain bachelor's degree	Attain bachelor's degree	29.9* (3.59)	41.5* (2.96)	36.1 (2.52)	41.1 (1.61)	39.7 (1.22)
Master's degree or higher	Master's degree or higher	10.6* (2.17)	19.3* (2.14)	14.6 (1.73)	16.4 (1.22)	16.2 (0.88)
Overall test of equality of distributions of realization of expectation across school locales		$\chi^2 = 5.69$ $p\text{-value} = 0.001*$		$\chi^2 = 1.32$ $p\text{-value} = 0.268$		

* Rural–nonrural difference at the given level of expectation and attainment was statistically significant at $p < .05$ after multiple comparisons were adjusted for. Overall test was statistically significant at $p < .05$.

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are unadjusted and do not account for student, family, teacher, and school characteristics. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Percentages may not sum to 100 because of rounding.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Table C13. Percentage distribution of participants in the Education Longitudinal Study of 2002 whose postsecondary educational attainment by 2012 exceeded their grade 10 expectations, by region and school locale

Expectation	Attainment	Regional Educational Laboratory Midwest Region (n = 130)		Rest of the nation (n = 520)		All (n = 650)
		Rural (n = 40)	Nonrural (n = 90)	Rural (n = 120)	Nonrural (n = 400)	
High school diploma or less	Some college	61.4 (8.11)	62.3 (6.81)	60.2 (5.40)	58.0 (2.78)	59.2 (2.32)
High school diploma or less	Bachelor's degree or higher[a]	b —	b —	b —	4.9 (1.29)	4.1 (0.92)
Some college	Bachelor's degree or higher[a]	16.5[c] (5.70)	16.0[c] (5.14)	15.3 (3.41)	11.0 (1.80)	12.8 (1.48)
Bachelor's degree	Master's degree or higher	14.6[c] (6.32)	19.7 (5.14)	22.6 (4.52)	26.0 (2.44)	24.0 (1.91)
Overall test of equality of distributions of realization of expectation across school locales		$\chi^2 = 0.38$ p-value = 0.766		$\chi^2 = 1.19$ p-value = 0.313		

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are unadjusted and do not account for student, family, teacher, and school characteristics. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Percentages may not sum to 100 because of rounding. Neither the overall test nor any of the rural–nonrural differences at each level of expectation was statistically significant at $p < .05$.

a. Because of some cells with zero counts, bachelor's degree and master's degree or higher were collapsed into bachelor's degree or higher.

b. Reporting standards not met.

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

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Variance explained

The percentage of variance explained by the multinomial regression models and the changes in percentage of variance explained as blocks of predictors were added to the previous model are summarized in table C14.

In both the Regional Educational Laboratory Midwest Region and the rest of the nation, rural and nonrural students attained an associate's degree or an undergraduate certificate at similar rates

Prior research has shown that rural students attend two-year colleges at significantly higher rates than their nonrural (Burke, Davis, & Stephan, 2015) or urban (Hu, 2003) counterparts. To investigate rural and nonrural differences in the attainment of students who expected to attend college but not complete a four-year degree, the study team examined the extent to which these students attained an undergraduate certificate or associate's degree. Specifically, the study team conducted a supplementary analysis that answered the following question: Among spring 2002 grade 10 students who expected to either attend or

Table C14. Percentage of outcome variance explained in four multinomial logistic regression models

Outcome	Percentage of variance explained (change in percentage variance explained relative to prior model)			
	Model 1 (rural, region, rural by region Interaction)	Model 2 (model 1 predictors plus student characteristics)	Model 3 (model 2 predictors plus family characteristics plus teacher expectations)	Model 4 (model 3 predictors plus school level variables)
Expectation in 2002				
Some college versus high school or less	1	19 (+18)	20 (+1)	24 (+4)
Bachelor's degree versus high school or less	1	48 (+47)	55 (+7)	55 (+0)
Master's degree or higher versus high school or less	4	62 (+58)	68 (+6)	68 (+0)
Attainment in 2012				
Some college versus high school or less	~0	32 (+32)	35 (+3)	37 (+2)
Bachelor's degree versus high school or less	~0	68 (+68)	73 (+5)	73 (+5)
Master's degree or higher versus high school or less	3	77 (+74)	83 (+6)	83 (+0)
Realization in 2012 of expectation in 2002				
Matching versus falling short	1	4 (+3)	7 (+3)	8 (+1)
Exceeding versus falling short	5	14 (+9)	20 (+6)	20 (+0)

~ is approximately.

Note: Numbers in parentheses are the percentage point increase in variance explained as predictors were added to the model in the previous column. For the analysis of educational attainment, student characteristic predictors also included students' education expectations.

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

complete a two-year postsecondary program, or to attend college but not complete a bachelor's degree, did the proportions of students who attained either an associate's degree or an undergraduate certificate differ between rural and nonrural public high school students in the REL Midwest Region and in the rest of the nation?

Results indicate that in the REL Midwest Region, 38 percent of rural students who expected to complete some college had, by 2012, attained an associate's degree or an undergraduate certificate compared with 25 percent of nonrural students, but the difference was not statistically significant (p-value = 0.135). In the rest of the nation, the difference between rural (22 percent) and nonrural (24 percent) students who expected to complete some college and by 2012 had attained an associate's degree or an undergraduate certificate also was not statistically significant (p-value = 0.485; table C15).

Table C15. Percentage distributions of spring 2002 grade 10 students expecting to attend college but not complete a four-year degree who by 2012 had attained an undergraduate certificate or associate's degree, by region and school locale

| Educational attainment | Regional Educational Laboratory Midwest Region | | | Rest of the nation | | |
	Rural (*n* = 60)	Nonrural (*n* = 100)	All (*n* = 160)	Rural (*n* = 180)	Nonrural (*n* = 420)	All (*n* = 600)
Undergraduate certificate or associate's degree	37.5 (7.17)	24.9 (3.88)	29.3 (3.53)	21.9 (2.74)	24.4 (2.29)	23.7 (1.79)
Other educational attainment[a]	62.5 (7.17)	75.1 (3.88)	70.7 (3.53)	78.1 (2.74)	75.6 (2.29)	76.3 (1.79)
Overall test of equality of distributions of attainment across school locales	χ^2 = 2.37 p-value = 0.125			χ^2 = 0.49 p-value = 0.485		

Note: Numbers in parentheses are standard errors. The Regional Educational Laboratory Midwest Region comprises seven states: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin; the rest of the nation comprises the remaining 43 states and the District of Columbia. Percentages are unadjusted and do not account for background factors. Sample sizes are unweighted. To comply with National Center for Education Statistics reporting requirements on restricted-use data files and to ensure that reported subgroup counts sum to the total count, student counts are rounded to the nearest ten. Neither the overall test nor any of the rural–nonrural differences at each level of attainment were statistically significant at $p < .05$.

a. Includes "no high school credential, no postsecondary attendance," "high school credential, no postsecondary attendance," "some postsecondary attendance, no postsecondary credential," "bachelor's degree," "postbaccalaureate certificate," "master's degree," "post-master's certificate," and "doctoral degree."

Source: Authors' calculations based on data from the Education Longitudinal Study of 2002 Base-Year and Third Follow-up Restricted-Use Files.

Notes

1. The Rural Research Alliance is made up of six members from six REL Midwest Region states (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) and includes directors of national and local rural associations and collaboratives, administrators of cooperative educational service agencies, college faculty members, and school district directors. The REL Midwest Region also includes Iowa.

2. It is not uncommon to have a statistically significant overall test of equality of distributions of a variable across groups but have no statistically significant differences between groups at each category of the variable. One reason is that the latter comparisons adjust for the number of comparisons being made by requiring more stringent thresholds for declaring statistical significance.

3. Prior research has shown that rural students attend two-year colleges at significantly higher rates than do nonrural and urban students (Burke, Davis, & Stephan, 2015; Hu, 2003). Results of supplementary analysis on postsecondary attainment in this study show that among students who aspired to attend college but not complete a bachelor's degree, there were no statistically significant differences in the percentages of rural and nonrural students who attained an associate's degree or an undergraduate certificate, both in the REL Midwest Region and in the rest of the nation (see appendix C).

4. The National Center for Education Statistics (NCES) classifies elementary and secondary schools into four types: regular, special education, vocational education, and other/alternative.

5. The nine census divisions are: New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont); Middle Atlantic (New Jersey, New York, Pennsylvania); East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin); West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota); South Atlantic (Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia); East South Central (Alabama, Kentucky, Mississippi, Tennessee); West South Central (Arkansas, Louisiana, Oklahoma, Texas); Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming); and Pacific (Alaska, California, Hawaii, Oregon, Washington). The New England and Middle Atlantic census divisions were combined to be consistent with the National Education Longitudinal Study of 1988 stratification.

6. The locale strata used for the ELS:2002 sample were based on the former census and National Center for Educational Statistics (NCES) tripartite locale codes: urban, suburban, and rural. The current study used the newer four-part locale codes—city, suburban, town, and rural—that were introduced in the census and adopted by NCES in 2006, collapsed into a binary indicator: rural or nonrural (where the latter designation comprises the city, suburban, and town locales). Implementation of the new locale codes resulted in 3.5 percent of 16,763 schools changing designations from nonrural to rural and 2.9 percent changing from rural to nonrural.

7. Weighted student counts and school counts were obtained by summing the ELS:2002's base-year student weight (BYSTUWT) and the base-year school weight (BYSCHWT) across the region of interest.

8. The Sidak method uses a significance level of $1 - (1 - 0.05)^{(1/K)}$, where K is the number of orthogonal contrasts. This method controls the familywise error rate and has slightly more power to detect a difference, should one exist, than does the Bonferroni method, which uses a significance level of $0.05/K$.

9. Educational attainment and the realization of grade 10 expectations were measured eight years after expected high school graduation. Statistics from Kena et al. (2015) show that in 2013 roughly 40 percent of first-time full-time students entering four-year institutions do did not graduate within six years. The current study did not examine factors (such as the timing of initial college enrollment, full-time or part-time college attendance, or participation in college remediation courses) that directly influence the length of time it takes to complete a postsecondary degree or attain education expectations.

10. Because the list of relevant control variables is long, some of these variables might be highly correlated. Collinearity of control variables can yield unstable estimates, inflate associated standard errors, and reduce power to detect effects. In the study team's analysis for expectations, attainment, and realization of expectations, multicollinearity was tested using the variance inflation factor. None of the variance inflation factor values (which were mostly less than 4) reached 10, which is a commonly used threshold for severe multicollinearity.

   When examining the associations between control variables and the outcomes, the study did not consider their interactions with other control variables. In particular, the relationship between each background characteristic and an outcome was assumed to be the same for rural and nonrural students and the same for the REL Midwest Region and the rest of the nation. It is conceivable that these factors may have different relationships to the outcome across school locales and regions.

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