

College Preparatory Coursework in Rural High Schools

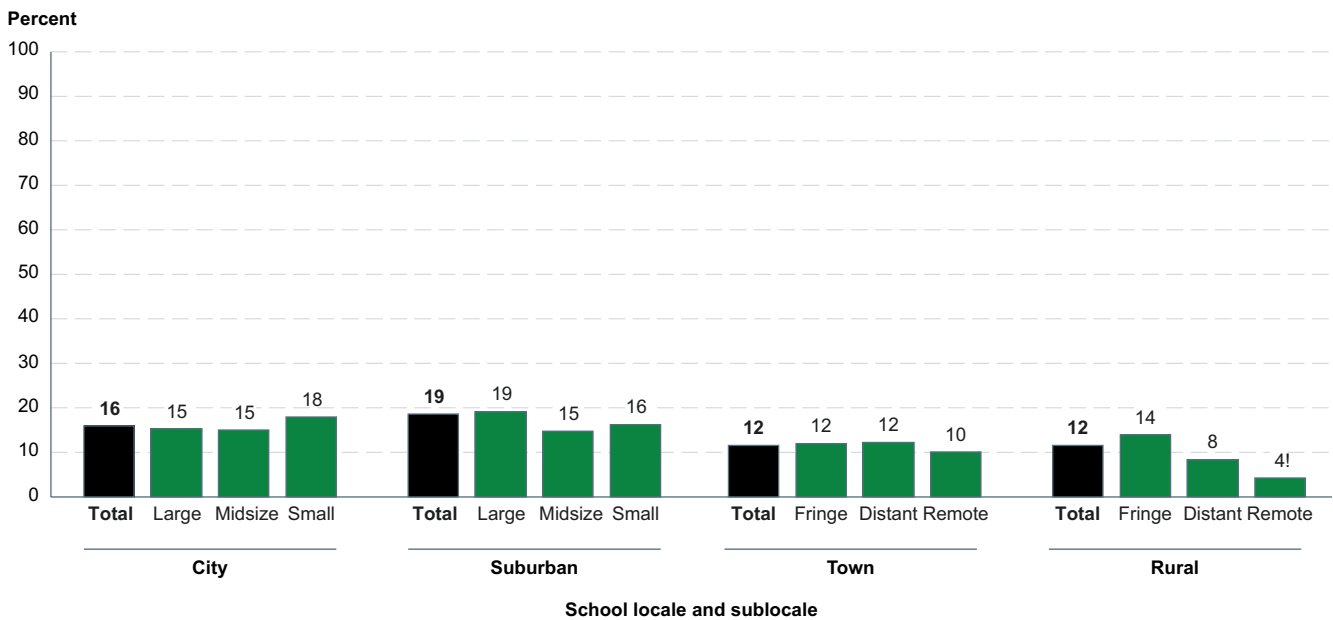
In 2019, the percentage of public and private high school graduates who had earned any advanced mathematics credits was lower in rural areas than in cities (88 vs. 91 percent), and the percentage of graduates who had earned any advanced science and engineering credits was lower in rural areas (86 percent) than in cities and suburban areas (90 percent each). In contrast, the percentage of graduates who had taken a dual enrollment course in high school was higher in rural areas (35 percent) than in cities (26 percent) and suburban areas (23 percent).

This indicator explores differences in college preparatory science, technology, engineering, and mathematics (STEM) and dual enrollment coursetaking by locale and sublocale, with a focus on rural areas, using data from the 2019 National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS).^{1,2,3} STEM courses in high school can lead to students choosing a STEM major in higher education⁴ and pursuing a technologically advanced career.^{5,6,7} In 2019, between 95 and 98 percent of high school graduates across all locales earned any STEM credits in high school. A lower percentage of public and private high school graduates in rural areas (96 percent) than in cities (97 percent) earned any STEM credits in high school.^{8,9} More specifically,

a lower percentage of graduates in remote rural areas (95 percent) than in large cities (98 percent) had earned any STEM credits in high school.

In 2019, a lower percentage of public and private high school graduates in rural areas (88 percent) than in cities (91 percent) had earned any advanced mathematics credits, with a lower percentage of those in remote rural areas (85 percent) than in large cities (93 percent) earning any advanced mathematics credits. Thus, the overall advanced mathematics coursetaking patterns for rural areas, and remote rural areas more specifically, mirrored overall STEM coursetaking patterns.

Figure 1. Percentage of public and private high school graduates who took at least one calculus course in high school, by school locale and sublocale: 2019



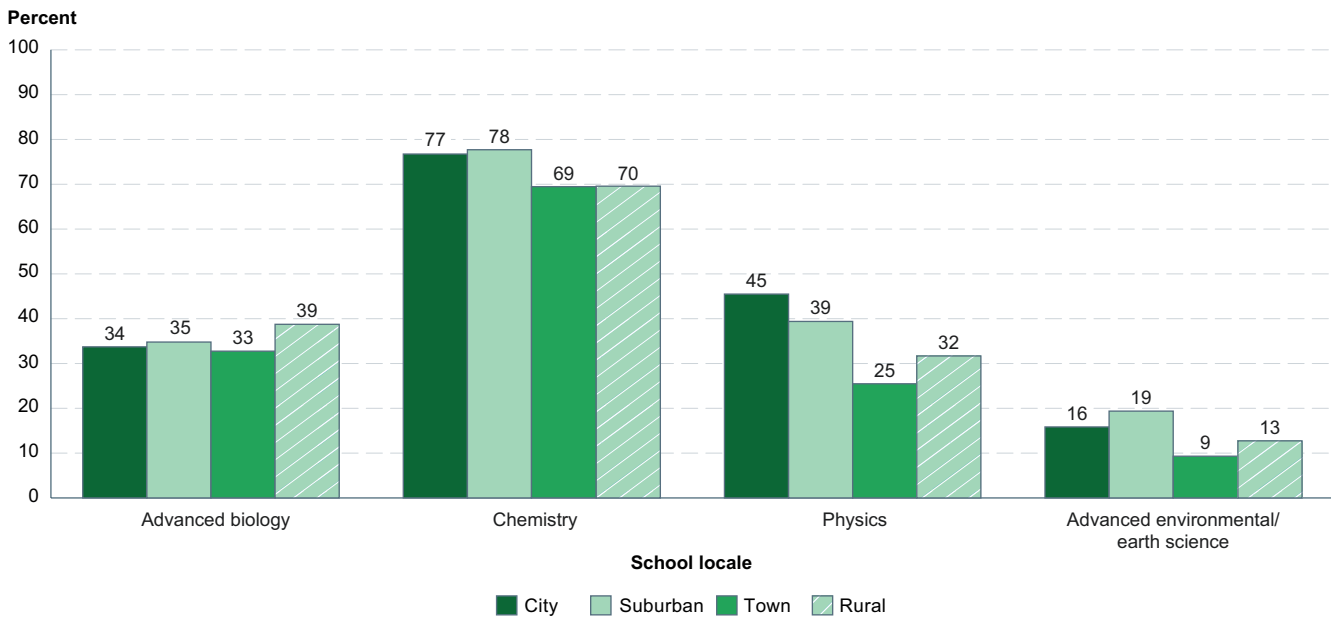
! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.
 NOTE: Percentages are for students who earned any Carnegie credits. The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course. Only calculus courses that public and private high school graduates completed and earned credits for are included in the measures. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the National Assessment of Educational Progress (NAEP) and High School Transcript Study (HSTS) assessment year, (4) the transcript contained 16 or more Carnegie credits, and (5) the transcript contained more than zero Carnegie credit in English courses. Although rounded numbers are displayed, figures are based on unrounded data.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, table 225.46.

In 2019, lower percentages of public and private high school graduates in rural areas than in cities and suburban areas had earned any credits in the most rigorous advanced mathematics subjects, precalculus/analysis and calculus. For example, 12 percent of graduates in rural areas had earned any credits in calculus, compared with 16 percent in cities and 19 percent in suburban areas. The percentage of graduates who had earned any credits in calculus was lower in remote rural areas (4 percent) than in all other sublocales (ranging from 8 to 19 percent). The percentage of graduates who had earned any credits in precalculus/analysis was lower in remote rural areas (24 percent) than in large suburban areas (42 percent), small cities

(42 percent), midsize cities (41 percent), and large cities (40 percent).

In 2019, the percentage of public and private high school graduates who had earned any advanced science and engineering credits—which include advanced biology, chemistry, advanced environmental/earth science, physics, and engineering—was lower in rural areas (86 percent) than in cities and suburban areas (90 percent each). More specifically, the percentage was lower for graduates in remote rural areas (83 percent) than for graduates in large cities (90 percent), small cities (90 percent), and large suburban areas (91 percent).

Figure 2. Percentage of public and private high school graduates who took selected advanced science courses in high school, by school locale: 2019



NOTE: Percentages are for students who earned any Carnegie credits. The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the National Assessment of Educational Progress (NAEP) and High School Transcript Study (HSTS) assessment year, (4) the transcript contained 16 or more Carnegie credits, and (5) the transcript contained more than zero Carnegie credit in English courses. Although rounded numbers are displayed, figures are based on unrounded data.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, table 225.46.

In 2019, coursetaking patterns by locale differed by specific science subjects. Similar to the overall advanced science and engineering coursetaking pattern, lower percentages of public and private high school graduates in rural areas than in cities and suburban areas had earned any credits in chemistry, advanced environmental/earth science, or physics. For example, the percentage of graduates who had earned any credits in physics was lower in rural areas (32 percent) than in suburban areas (39 percent) and in cities (45 percent). More specifically, the percentage was lower in remote rural areas (25 percent) than in cities of all sizes and large suburban areas (ranging from 41 to 47 percent). In contrast, the percentage of graduates who had earned any credits in advanced biology was higher in rural areas (39 percent) than in towns (33 percent), suburban areas (35 percent), and cities (34 percent).

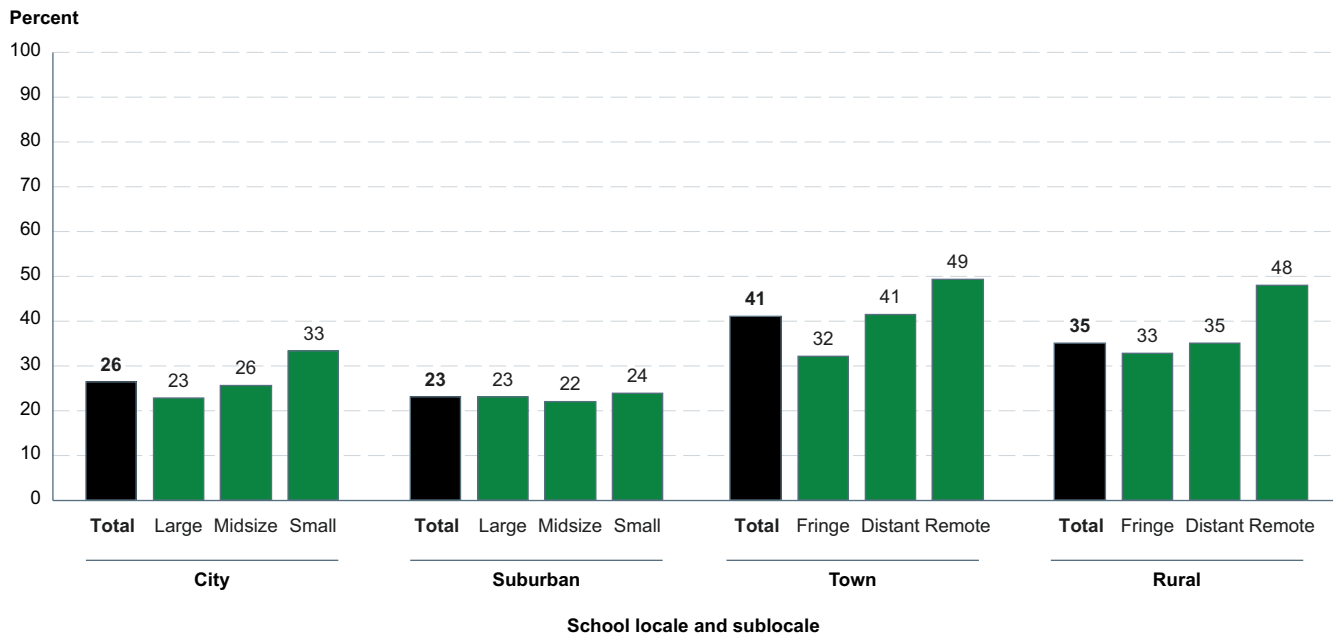
The percentage of graduates in rural areas who had earned any credits in engineering (12 percent) was not measurably different from the percentages in other locales.

In 2019, the percentage of public and private high school graduates who had earned any credits in a technology course was 41 percent in rural areas, which was not measurably different from the percentages in other

locales. However, coursetaking patterns for specific types of technology courses differed from the overall technology coursetaking pattern. The percentage of graduates who had earned any credits in engineering/science technologies was higher in rural areas (8 percent) than in cities (5 percent), and the percentage who had earned any credits in computer science was higher in rural areas (21 percent) than in towns (15 percent).

Students may also prepare for postsecondary education while in high school by earning postsecondary education credits through dual enrollment courses. These courses include college-level academic courses either taught at high schools or at local colleges, advanced career/technical education courses that count for credit at vocational colleges or trade schools, and high school-level academic courses that count for credit at liberal arts or community colleges. Dual enrollment courses may contribute to increased achievement in postsecondary education.^{10,11} Additionally, dual enrollment courses can help students in rural areas overcome barriers to postsecondary education, such as financial barriers or barriers related to students' distance from a postsecondary institution.¹² In 2019, some 28 percent of all high school graduates had taken at least one dual enrollment course.

Figure 3. Percentage of public and private high school graduates who took any dual enrollment course in high school, by school locale and sublocale: 2019



NOTE: Percentages are for students who took any dual enrollment course. The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course. Dual enrollment courses may include college-level academic courses taught either at the high school or at a local college, advanced career/technical education courses that count for credit at vocational colleges and/or trade schools, and high school-level academic courses that count for credit at liberal arts or community colleges. For a high school graduate to be included in the analyses, their transcript had to meet five requirements: (1) the graduate received either a standard or honors diploma, (2) the transcript had three or more years of delineated courses, (3) at least one course on the transcript was taken during the National Assessment of Educational Progress (NAEP) and High School Transcript Study (HSTS) assessment year, (4) the transcript contained 16 or more Carnegie credits, and (5) the transcript contained more than zero Carnegie credit in English courses. Although rounded numbers are displayed, the figures are based on unrounded data.
 SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2019 High School Transcript Study (HSTS). See *Digest of Education Statistics 2021*, table 225.65.

In 2019, the percentage of public and private high school graduates who had taken a dual enrollment course in high school was higher in rural areas (35 percent) than in cities (26 percent) and suburban areas (23 percent) but it was not measurably different from the percentage in towns (41 percent). In particular, this pattern was consistent across six of the seven types of dual enrollment courses: English language and literature; mathematics; life and physical sciences; social science and history; visual and performing arts; and career/technical education.¹³ For example, the percentage of graduates who had taken a dual enrollment course in English language and literature was higher in rural areas (15 percent) than in cities (9 percent) and suburban areas

(8 percent). For mathematics dual enrollment courses, the percentage in rural areas was 10 percent, compared with 7 percent each in cities and suburban areas.

The most common dual enrollment course types taken by public and private high school graduates in rural areas were career/technical education (15 percent), English language and literature (15 percent), social science and history (13 percent), and mathematics (10 percent). (For more information about career/technical education in rural areas, see [Career and Technical Education Programs in Rural High Schools](#).) These four types of courses were also the most common types of dual enrollment courses in the United States overall.

Endnotes:

¹ Please visit the National Center for Education Statistics (NCES) [Education Across America](#) website for the definitions of locale and sublocale.

² Unless otherwise noted, total estimates include the 50 states and the District of Columbia.

³ The NAEP HSTS classifies STEM courses into one of three course types: (1) STEM advanced mathematics—algebra II, precalculus, analysis, calculus, and other advanced mathematics courses; (2) STEM advanced science and engineering—advanced environmental science, advanced biology, chemistry, physics, and engineering; and (3) STEM-related technical—engineering and science technology, health science and technology, and computer science.

⁴ Wang, X. (2013). Why Students Choose STEM Majors: Motivation, High School Learning, and Postsecondary Context of Support. *American Educational Research Journal*, 50(5): 1081-1121. <https://doi.org/10.3102/0002831213488622>.

⁵ Black, S.E., Muller, C., Spitz-Oener, A., He, Z., Hung, K., and Warren, J.R. (2021). The Importance of STEM: High School Knowledge, Skills and Occupations in an Era of Growing Inequality. *Research Policy*, 50(7), Article 104249. <https://doi.org/10.1016/j.respol.2021.104249>.

⁶ Carnevale, A.P., Smith, N., and Melton, M. (2011). *STEM: Science, Technology, Engineering, Mathematics*. Washington, DC: Georgetown University Center on Education and the Workforce. <https://cew.georgetown.edu/cew-reports/stem/>.

⁷ Commission on STEM Education. (2018). Charting a Course for Success: America's Strategy for STEM Education. *National Science and Technology Council*. <https://files.eric.ed.gov/fulltext/ED590474.pdf>.

⁸ For a high school graduate to be included in the analyses of this indicator, their transcript had to meet five requirements:

(1) the graduate received either a standard or honors diploma, (2) the transcript had 3 or more years of delineated courses, (3) at least one course on the transcript was taken during the National Assessment of Educational Progress (NAEP) and High School Transcript Study (HSTS) assessment year, (4) the transcript contained 16 or more Carnegie credits, and (5) the transcript contained more than zero Carnegie credit in English courses. The Carnegie unit is a standard of measurement that represents one credit for the completion of a 1-year course.

⁹ Courses that public and private high school graduates completed and earned credits for are included in the measures.

¹⁰ Allen, D., and Dadgar, M. (2012). Does Dual Enrollment Increase Students' Success in College? Evidence From a Quasi-Experimental Analysis of Dual Enrollment in New York City. *New Directions for Higher Education*, 2012(158): 11-19. <https://doi.org/10.1002/he.20010>.

¹¹ Kremer, K.P. (2020). Predictors of College Success Outcomes in Emerging Adults: The Role of High School Dual Enrollment Courses. *Emerging Adulthood*, 10(1): 188-196. <https://doi.org/10.1177/2167696820916639>.

¹² Gagnon, D., Liu, J., and Cherasaro, T. (2021). *Understanding Access to and Participation in Dual Enrollment by Locale and Income Level* (REL 2021-089). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Central. <https://ies.ed.gov/pubsearch/pubsinfo.asp?pubid=REL2021089>.

¹³ In 2019, the percentage of high school graduates who had taken a dual enrollment course in world language and literature was not measurably different between rural areas and other locales for which data were available.

Reference tables: *Digest of Education Statistics 2021*, tables 225.46 and 225.65

Related indicators and resources: [High School Mathematics and Science Course Completion](#) [*Condition of Education*]

Glossary: [Locale codes](#); [STEM fields](#)