How well does high school grade point average predict college performance by student urbanicity and timing of college entry?

What's Happening

Michelle Hodara
Karyn Lewis
Education Northwest

This report is a companion to a study that found that high school grade point average was a stronger predictor of performance in college-level English and math than were standardized exam scores among first-time students at the University of Alaska who enrolled directly in college-level courses. This report examines how well high school grade point average and standardized exam scores predict college grades by the urbanicity of students' hometown and timing of college entry. Among recent high school graduates from both urban and rural areas of Alaska, high school grade point average was a better predictor of college course grades than were SAT, ACT, or ACCUPLACER scores. It was a more powerful predictor of college performance among students who entered college within a year of high school graduation than among students who delayed college entry. For students who delayed college entry, high school grade point average was a better predictor than were standardized exam scores in English, but that was not always the case in math.

Why this study?

Across the country large numbers of incoming college students are considered academically underprepared and are recommended for developmental education courses (also called remediation). A 2010 study of 57 community colleges in seven states found that 33 percent of students were placed in developmental English, and 59 percent were placed in developmental math (Bailey, Jeong, & Cho, 2010). Similarly, the companion study to this report found that from fall 2008 to spring 2012 about a third of

ies NATIONAL CENTER FOR EDUCATION EVALUATION AND REGIONAL ASSISTANCE
Institute of Education Sciences
U.S. Department of Education

REL NORTHWEST
Regional Educational Laboratory
At Education Northwest

first-time entrants at the University of Alaska were placed in developmental English, and half were placed in developmental math (Hodara & Cox, 2016).

Colleges typically use a single measure to place student in developmental education: standardized exam scores on the SAT, ACT, ACCUPLACER, or ACT Compass (Fields & Parsad, 2012). Recent research suggests that this reliance on standardized exam scores may result in misplacement of students in developmental coursework when they could have succeeded in college-level coursework or, less frequently, misplacement of students in college-level coursework when they could have benefited from developmental coursework (Scott-Clayton, Crosta, & Belfield, 2014). That research found that in two large community college systems nearly a quarter to a third of students may have been incorrectly placed in developmental coursework when they could have succeeded in college-level coursework.

To address misplacement of students in developmental education, community colleges are redesigning the way that they assess the college readiness of incoming students by using multiple measures to assign students to the highest level of coursework in which they are likely to succeed (Bracco et al., 2014; Dadgar, Collins, & Schaefer, 2015; Scott-Clayton et al., 2014).

Recent studies have found some evidence that high school grade point average predicts college performance more accurately than do standardized exam scores (Camara & Echternacht, 2000; Geiser & Santelices, 2007; Hiss & Franks, 2014). This report is a companion to a study that examined the predictive power of high school grade point average among students who enrolled directly in college-level courses when entering two- and four-year programs at the University of Alaska. Consistent with prior research, that study found that high school grade point average was a stronger predictor of college performance than were standardized exam scores (Hodara & Cox, 2016).

However, high school grade point average may be a less reliable predictor of college performance for particular subgroups of students. Several researchers have questioned the reliability of high school grade point average because it does not account for comparability across schools, which can differ in course rigor and grading standards, availability of highly qualified teachers, and economic inequities, among other characteristics (Camara & Michaelides, 2005; Sackett, Borneman, & Connelly, 2008). Markle and Robbins (2013) make a similar argument about the reliability of high school grade point average as a predictor of college performance for students of different ages. They reason that grade point average may less accurately represent the ability of students who delay college entry compared with the ability of students who matriculate immediately after high school graduation. If reliability is diminished under such conditions, the predictive utility of grade point average could be limited for some subgroups.

This study builds on Hodara and Cox (2016) to compare the predictive power of high school grade point average among subgroups of students—specifically, between recent high school graduates from urban areas and recent high school graduates from rural areas and between students who enrolled in college within a year of high school graduation and students who delayed college entry by at least one year. It used student-level administrative data on 17,940 first-time University of Alaska students who enrolled from fall 2008 to spring 2012 (see box 1 for a summary of the methodology used to conduct this study and Hodara & Cox, 2016, for detailed information).

This report is designed to assist state and institutional higher education leaders interested in using high school grade point average to assess student readiness for college. K–12 policymakers and leaders considering which measures to include in a college-readiness indicator system also may be interested in its findings. This report is intended to prompt conversation and state- or district-specific research and cannot be used to draw conclusions about the predictive power of high school grade point average across every student population.

What the study examined

This study addressed two questions about students who enrolled directly in college-level English and math courses:

1. How well does high school grade point average predict performance in college-level English and math courses among recent high school graduates from urban and rural areas of Alaska, after standardized exam scores and other student characteristics are controlled for?

2. How well does high school grade point average predict performance in college-level English and math courses among students who entered the University of Alaska within a year of high school graduation and students who had delayed college entry by at least one year, after standardized exam scores and other student characteristics are controlled for?

Box 1. Methodology

Regression analysis was used to assess the extent to which high school grade point average and standardized exam scores predict performance in college-level courses. Regression models were estimated separately for English and math and within each subject area for students who took the SAT, students who took the ACT, and students who took the ACCUPLACER. The sample for the English analysis was restricted to students who enrolled directly in credit-bearing English courses and did not enroll in developmental reading or writing courses. The sample for the math analysis was restricted to students who enrolled directly in credit-bearing math courses and did not enroll in developmental math courses. This restriction was imposed in order to estimate the most direct relationship between prior achievement—as measured by high school grade point average and standardized exam scores—and grades earned in college courses (Scott-Clayton et al., 2014).

This study analyzed the percentage of variance (R^2) from the regression, which is a statistical measure of how well a given variable or set of variables accounts for differences in a specific outcome across a population. The percentage of variance can range from 0 to 100 percent, with higher numbers indicating that the variable is more useful in explaining the outcome.

More specifically, the regression analyses examined:

- The relationship between student characteristics and college course grades (regression 1).
- The relationship among student characteristics, standardized exam (SAT, ACT, or ACCUPLACER) scores, and college course grades (regression 2).
- The relationship among student characteristics, standardized exam scores, high school grade point averages, and college course grades (regression 3).

The student characteristics included in the regression models used to answer the first research question were gender (male or female), race/ethnicity (Alaska Native, Asian, Black, Latino, Other/Unknown, Pacific Islander, or White), degree intent at college entry (bachelor's, associate's, or certificate), and Pell Grant eligibility (a proxy for socioeconomic status). The student characteristics included in the regression models used to answer the second research question were the same characteristics used to answer the first research question plus high school graduation status (graduated from high school, received general educational development certificate, or unknown) and urbanicity of hometown at time of college enrollment (rural Alaska, urban Alaska, out-of-state, or another country).

The R^2 from regression 1 is the variance attributable to student characteristics, the R^2 from regression 2 minus the R^2 from regression 1 is the variance attributable to standardized exam scores, and the R^2 from regression 3 minus the R^2 from regression 2 is the variance attributable to high school grade point average. See the appendix for more information on the regression models. See appendix B in Hodara and Cox (2016) for information on the dataset and data cleaning.

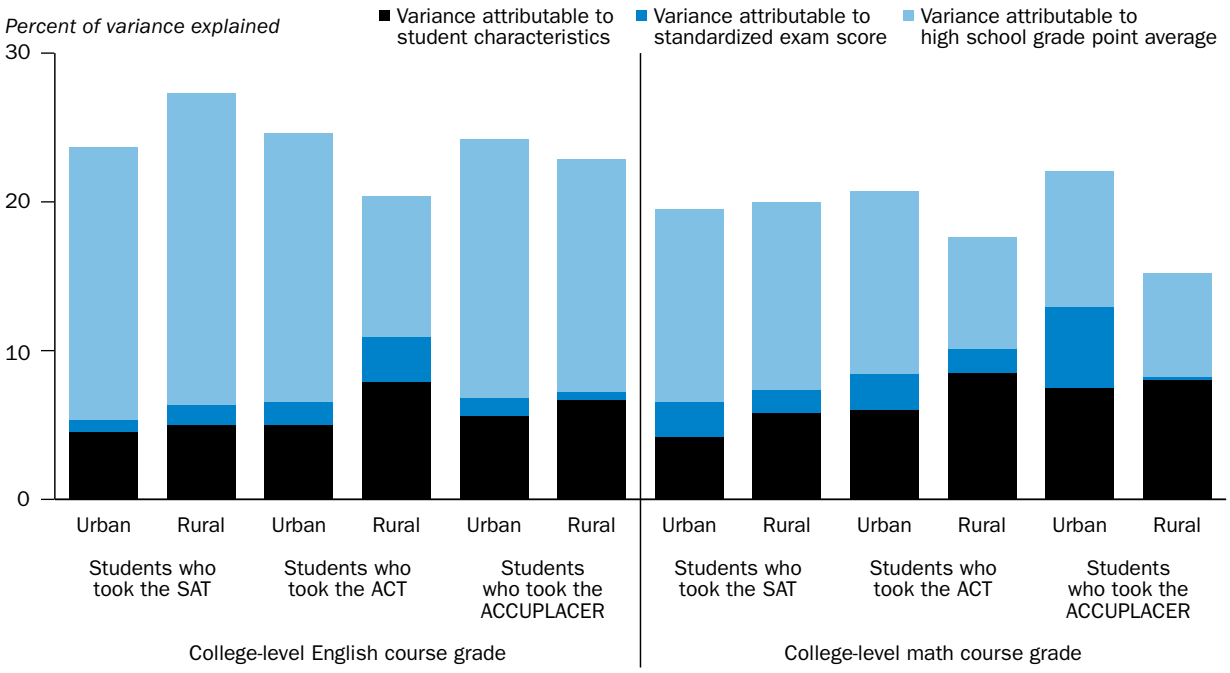
What the study found

This section reports the findings of the study.

High school grade point average was a better predictor of college performance among recent high school graduates from both urban and rural areas of Alaska than were standardized exam scores

Regardless of where in Alaska students came from, high school grade point average explained more of the variance in college performance than did standardized exam scores (figure 1). High school grade point average explained 9–18 percent of the variance in college course grades among urban students, and standardized exam scores explained 1–5 percent. Similarly, high school grade point average explained 7–21 percent of the variance in college course grades among rural students, and standardized exam scores explained approximately 0–3 percent.

Figure 1. Among first-time University of Alaska students who enrolled directly in college-level English and math courses within a year of high school graduation between 2008/09 and 2011/12, high school grade point average explained more of the variance in grades for those courses among both urban and rural students than did standardized exam scores



Note: Urban refers to the following metropolitan U.S. Census areas: Anchorage, Fairbanks, Juneau, Ketchikan, Kodiak, and Matanuska-Susitna; rural refers to all other areas in Alaska. The figure reports R^2 from ordinal regression models (see the appendix for an explanation of the study methods). For the regression models that predict grade in college-level English, the sample sizes for students who took the SAT reading were 2,423 urban students and 597 rural students, the sample sizes for students who took the ACT English were 1,318 urban students and 406 rural students, and the sample sizes for students who took the ACCUPLACER reading and writing were 1,705 urban students and 472 rural students. For the regression models that predict grade in college-level math, the sample sizes for students who took the SAT were 1,441 urban students and 361 rural students, the sample sizes for students who took the ACT math were 734 students and 223 rural students, and the sample sizes for students who took the ACCUPLACER college and intermediate algebra were 736 urban students and 200 rural students.

Source: Authors' analysis of University of Alaska administrative data on all first-time students who entered the university between fall 2008 and spring 2012.

High school grade point average also explained more of the variance in college-level English grades than in college-level math grades. This finding is consistent with research conducted at California community colleges that found that high school grade point average was more predictive of college-level grades in English than in math (Willet & Karandjeff, 2014).

The combination of student characteristics, standardized exam scores, and high school grade point average explained 15–27 percent of the variance in college course grades. The remaining variance is explained by other variables. In other words, characteristics and factors that were either unavailable in the data (such as high school attendance) or not directly observable (such as student motivation) may be more powerful predictors of college course grades than are the student characteristics included in the regression models, standardized exam scores, and high school grade point average. But of the data collected for college admission and available for analysis, high school grade point average may be the strongest predictor of college performance.

High school grade point average was a more powerful predictor of college performance among students who entered college within a year of high school graduation than among students who delayed college entry

High school grade point average was a more powerful predictor of college performance among students who entered college within a year of high school graduation than among students who delayed college entry (figure 2). For example, high school grade point average accounted for 18 percent of the variance in college-level English grades among students who took the SAT and entered college within a year of high school graduation, compared with 7 percent among students who delayed entry.

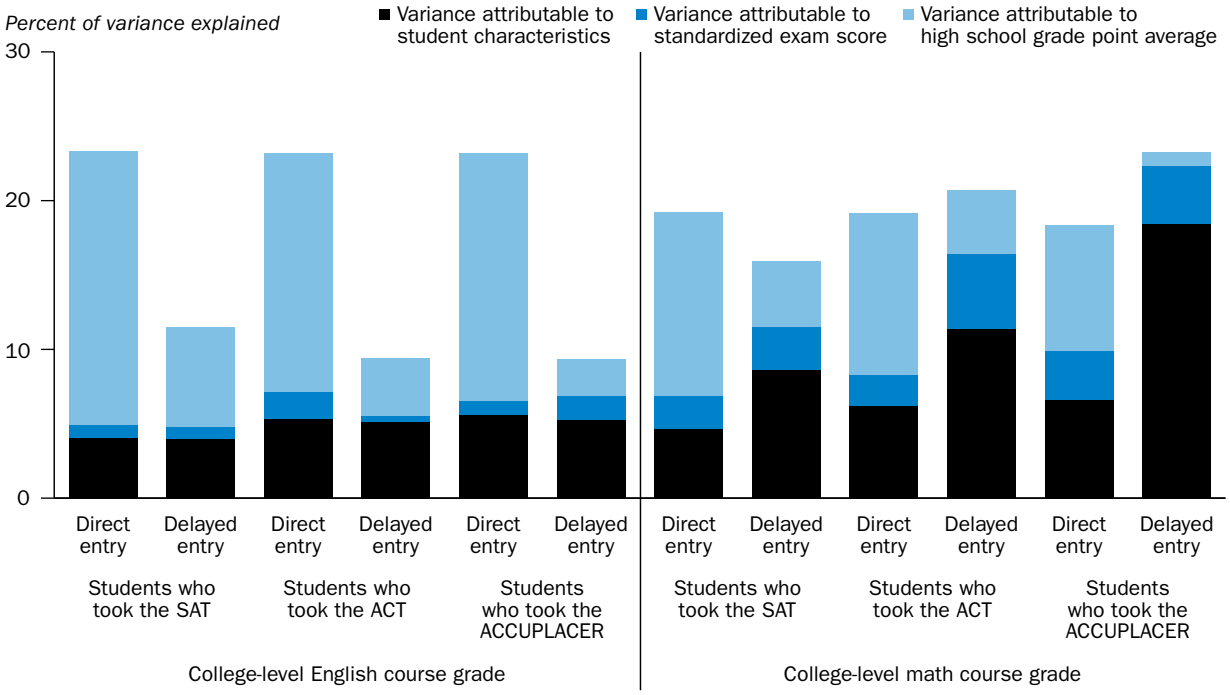
Among students who delayed college entry, high school grade point average did not consistently have more predictive power than did standardized exam scores. The predictive power of grade point average relative to that of standardized exam scores depended on the subject and the exam. High school grade point average remained a more powerful predictor of college-level English grades relative to SAT and ACT scores (among students who took those tests). But the percentage of the variance in college-level English grades explained by high school grade point average was only 1 point greater than the percentage explained by ACCUPLACER scores, and the percentage of the variance in college-level math grades was only 1 point greater than the percentage explained by SAT scores. High school grade point average was less predictive of college-level math grades than were ACT and ACCUPLACER scores.

Implications of the study findings

The findings provide evidence of the predictive power of high school grade point average in gauging readiness for college-level English and math coursework across student subgroups. The findings pertain only to students who enrolled directly in college-level English or math; the extent to which the findings would hold for University of Alaska students who first took developmental education courses is unclear.

High school grade point average was consistently predictive of college performance among recent high school graduates regardless of whether they were from rural or urban parts of Alaska. Although the students attended different high schools, their high school grade point average was similarly predictive. High school grades may be more predictive than standardized exam scores and consistently predictive regardless of high school urbanicity because they are a measure of cumulative performance over time and thus quantify other skills or competencies—beyond reading and math proficiency—that are necessary to succeed in college. Farrington et al. (2012) suggest that high school grade point average measures not only the knowledge and cognitive skills captured by standardized exam scores, but also other competencies that fall under the rubric of "noncognitive factors" (figure 3). What to call the skills in this broadly defined category is a subject of debate; commonly used terms include nonacademic skills, social and emotional learning, soft

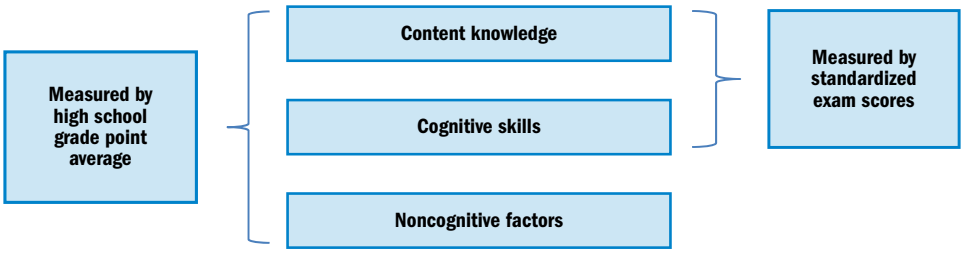
Figure 2. Among first-time University of Alaska students who enrolled directly in college-level English and math courses within a year of high school graduation between 2008/09 and 2011/12, high school grade point average explained more of the variance in grades for those courses than it did among students who delayed college entry



Note: Direct entry refers to students who entered the University of Alaska in the fall or spring following high school graduation. Depending on the sample, 93–98 percent of those students had a high school diploma, and the remaining 2–7 percent had a general educational development (GED) certificate or unknown high school graduation status. Delayed entry refers to students who had at least a one-year gap between high school graduation and college entry. Depending on the sample, 78–96 percent of those students had a high school diploma, and the remaining 4–22 percent had a general educational development certificate or unknown high school graduation status. The figure reports R^2 from ordinal regression models (see the appendix for an explanation of the study methods). For the regression models that predict grade in college-level English, the sample sizes for students who took the SAT reading were 3,273 direct entry students and 556 delayed entry students, the sample sizes for students who took the ACT English were 1,945 direct entry students and 314 delayed entry students, and the sample sizes for students who took the ACCUPLACER reading and writing were 2,285 direct entry students and 1,262 delayed entry students. For the regression models that predict grade in college-level math, the sample sizes for students who took the SAT math were 1,943 direct entry students and 206 delayed entry students, the sample sizes for students who took the ACT math were 1,064 direct entry students and 95 delayed entry students, and the sample sizes for students who took the ACCUPLACER college and intermediate algebra were 1,008 direct entry students and 171 delayed entry students.

Source: Authors' analysis of University of Alaska administrative data on all new students who entered the university between fall 2008 and spring 2012.

Figure 3. Competencies measured by high school grade point average and standardized exam scores



Source: Adapted from Farrington et al. (2012).

skills, and 21st-century competencies. Such competencies include self-control, tenacity, academic motivation, metacognitive strategies, study skills, time management, and problem-solving skills.

This report and many others (see Farrington et al., 2012, for a comprehensive review) suggest that high school grade point average may be a useful additional tool for making more holistic course placement decisions because it contains unique and valid information, not captured by standardized exam scores, about students' likelihood of succeeding in college courses. Open-admissions colleges across the country have used similar evidence to develop course placement approaches based on multiple measures, with the ultimate goal of improving student persistence and degree completion (Bracco et al., 2014; Dadgar et al., 2015; Hassel & Giordano, 2011). While placement policies that use high school grade point average generally pertain to recent high school graduates (Bracco et al., 2014), this report provides evidence that high school grade point average is more predictive of college performance in English than are standardized exam scores for students who delay entry to college and thus may provide additional information about the college readiness of older students. The results are less consistent in math: the ACCUPLACER and ACT test were slightly better predictors than was high school grade point average.

Multiple-measure approaches from across the country demonstrate that high school grade point average can be used by community colleges across an entire state (used in North Carolina, as described in Bracco et al., 2014), a single community college working with local school districts (used by Long Beach City College, described by Dadgar et al., 2015), or a department at a small college within a large university system (used by the English department at University of Wisconsin, described in Hassel & Giordano, 2011). The findings in this report may thus be used by higher-education stakeholders at the department, campus, or college level to prompt conversations about the value and feasibility of using high school grade point average in course placement decisions.

Finally, the findings have implications for K–12 education stakeholders interested in developing a college readiness indicator system for their state or district. This report offers initial evidence that high school grade point average provides information about readiness for college coursework that is not captured by standardized exam scores. Educators and administrators in other states and districts may want to examine the relationship between high school grade point average and college readiness within their own student populations. Further research may be able to identify the extent to which high school grade point average is related to college readiness and success and to specify grade cutpoints that can be used in a college readiness indicator system. For example, research on specific indicators of college readiness has found that a grade point average of 3.0 or higher is related to college persistence and completion (Hein, Smerdon, & Samboldt, 2013). If a district or state were to monitor students' high school grade point averages to determine whether they met the 3.0 threshold, it could provide additional support for students performing below that level.

Appendix. Methods

This report used a dataset that was cleaned for a study by Hodara and Cox (2016). The appendixes in that report provide information on data cleaning and the entire dataset. This appendix gives details of the regression models used for analysis in this report.

To answer the first research question, regression analysis was conducted for two groups of students who enrolled as first-time college students at the University of Alaska between fall 2008 and spring 2012: recent high school graduates from urban areas of Alaska and recent high school graduates from rural areas of Alaska. Students' hometowns were classified as urban on the basis of U.S. Census designation as a metropolitan area. The following Alaskan communities meet this definition: Anchorage, Fairbanks, Juneau, Ketchikan, Kodiak, and Matanuska-Susitna. All other Alaskan hometowns are considered rural.

For these two groups, nine ordinal logistic regression models were run for English, and nine ordinal logistic regression models were run for math. Ordinal logistic regression was used because the dependent variable has ordered categories. The dependent variable in the models was grade in first college-level English or math course: the highest grade (A) was equal to 5, and the lowest grade (F or withdrawal) was equal to 1. This report presents the R^2 from the regression models, which indicates the percentage of variance explained by the variables.

To answer the second research question, the same regressions were run for two other groups of students who enrolled as first-time college students at the University of Alaska between fall 2008 and spring 2012: students who entered college within a year of high school graduation and students who delayed college entry by at least year.

The nine regressions conducted for both research questions are as follows:

Sample includes students who took the SAT and enrolled directly in college-level English or math:

$$Grade = \alpha + \beta DEMO_i + \varepsilon_i$$
$$Grade = \alpha + \beta DEMO_i + \beta SAT_i + \varepsilon_i$$
$$Grade = \alpha + \beta DEMO_i + \beta SAT_i + \beta HSGPA_i + \varepsilon_i$$

Sample includes students who took the ACT and enrolled directly in college-level English or math:

$$Grade = \alpha + \beta DEMO_i + \varepsilon_i$$
$$Grade = \alpha + \beta DEMO_i + \beta ACT_i + \varepsilon_i$$
$$Grade = \alpha + \beta DEMO_i + \beta ACT_i + \beta HSGPA_i + \varepsilon_i$$

Sample includes students who took the ACCUPLACER and enrolled directly in college-level English or math:

$$Grade = \alpha + \beta DEMO_i + \varepsilon_i$$
$$Grade = \alpha + \beta DEMO_i + \beta ACCUPLACER_i + \varepsilon_i$$
$$Grade = \alpha + \beta DEMO_i + \beta ACCUPLACER_i + \beta HSGPA_i + \varepsilon_i$$

The exact variables included in the regressions were:

- *Grade:* college course grade.
  - For English regressions: grade in first college-level English course (English 111 for most students in the sample).
  - For math regressions: grade in first college-level math course (Math 107 for most students in the sample).
- *Demo:* demographic characteristics (same for English and math regressions).
  - Gender (male or female).
  - Race/ethnicity (Alaska Native, Asian, Black, Latino, Other/Unknown, Pacific Islander, or White).
  - Degree intent at college entry (bachelor's, associate's, or certificate).
  - Pell Grant eligibility on the basis of responses on the Free Application for Federal Student Aid (a proxy for socioeconomic status).
  - High school graduation status (graduated from high school, received general educational development certificate, unknown) [research question 2 only].
  - Urbanicity of hometown at time of college enrollment (rural Alaska, urban Alaska, out-of-state, or another country) [research question 2 only].
- *SAT:* SAT scores.
  - For English: SAT reading score.
  - For math: SAT math score.
- *ACT:* ACT scores.
  - For English: ACT English score.
  - For math: ACT math score.
- *ACCUPLACER:* ACCUPLACER scores.
  - For English: ACCUPLACER reading and writing section scores.
  - For math: ACCUPLACER intermediate and college algebra section scores.
- *HSGPA:* Cumulative high school grade point average (same for English and math regressions).

References

Bailey, T., Jeong, D. W., & Cho, S.-W. (2010). Referral, enrollment, and completion in developmental education sequences in community colleges. *Economics of Education Review, 29*(2), 255–270. http://eric.ed.gov/?id=EJ876583

Bracco, K. R., Dadgar, M., Austin, K., Klarin, B., Broek, M., Finkelstein, N., et al. (2014). *Core to college evaluation: Exploring the use of multiple measures for placement into college-level courses—Seeking alternatives or improvements to the use of a single standardized test.* San Francisco, CA: WestEd. http://eric.ed.gov/?id=ED559630

Camara, W. J., & Echternacht, G. (2000). *The SAT® I and high school grades: Utility in predicting success in college* (Research Note No. 10). New York, NY: College Board, Office of Research and Development. Retrieved December 7, 2015, from http://research.collegeboard.org/publications/content/2012/05/sat-i-and-high-school-grades-utility-predicting-success-college.

Camara, W., & Michaelides, M. (2005). *AP® use in admissions: A response to Geiser and Santelices*. New York, NY: College Board. Retrieved December 7, 2015, from https://research.collegeboard.org/sites/default/files/publications/2012/7/misc2005–1-ap-use-admissions-geiser-santelices.pdf.

Dadgar, M., Collins, L., & Schaefer, K. (2015). *Placed for success: How California community colleges can improve the accuracy of placement in English and math courses, reduce remediation rates, and improve student success.* Oakland, CA: Career Ladders Project. Retrieved December 7, 2015, from http://www.careerladdersproject.org/wp-content/uploads/2015/03/CLP_IP_Brief_37_508.pdf.

Farrington, C. A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T. S., Johnson, D. W., et al. (2012). *Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance—A critical literature review.* Chicago, IL: University of Chicago, Consortium on Chicago School Research. http://eric.ed.gov/?id=ED542543

Fields, R., & Parsad, B. (2012). *Tests and cut scores used for student placement in postsecondary education: Fall 2011.* Washington, DC: National Assessment Governing Board. http://eric.ed.gov/?id=ED539918

Geiser, S., & Santelices, S. V. (2007). *Validity of high-school grades in predicting student success beyond the freshman year: High-school record vs. standardized tests as indicators of four-year college outcomes* (Research & Occasional Paper Series No. CSHE.6.07). Berkeley: University of California, Berkeley, Center for Studies in Higher Education. http://eric.ed.gov/?id=ED502858

Hassel, H., & Giordano, J. B. (2011). First year composition placement at open-admission, two-year campuses: Changing campus culture, institutional practice, and student success. *Open Words, 5*(2), 29–59.

Hein, V., Smerdon, B., & Sambolt, M. (2013). *Predictors of postsecondary success*. Washington, DC: American Institutes for Research, College & Career Readiness & Success Center. http://eric.ed.gov/?id=ED555671

Hiss, W. C., & Franks, V. W. (2014). *Defining promise: Optional standardized testing policies in American college and university admissions*. Arlington, VA: National Association for College Admission Counseling. Retrieved December 7, 2015, from http://www.nacacnet.org/research/research-data/nacac-Research/Documents/DefiningPromise.pdf.

Hodara, M., & Cox, M. (2016). *Developmental education and college readiness at the University of Alaska* (REL 2016–123). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northwest. http://eric.ed.gov/?id=ED565798

Markle, R., & Robbins, S. (2013). *A holistic view of course placement decisions: Avoiding the HS GPA trap.* Princeton, NJ: Educational Testing Service.

Sackett, P. R., Borneman, M. J., & Connelly, B. S. (2008). High stakes testing in higher education and employment: Appraising the evidence for validity and fairness. *American Psychologist, 63*(4), 215–227. http://eric.ed.gov/?id=EJ795259

Scott-Clayton, J., Crosta, P. M., & Belfield, C. R. (2014). Improving the targeting of treatment: Evidence from college remediation. *Educational Evaluation & Policy Analysis, 36*(3), 371–393. http://eric.ed.gov/?id=EJ1042032

Willett, T., & Karandjeff, K. (2014). *Stepping up: Progression in English and math from high school to college*. Sacramento, CA: Research and Planning Group for California Community Colleges. Retrieved December 7, 2015, from http://rpgroup.org/sites/default/files/RPSteppingFinal.pdf.

REL 2017–250

The National Center for Education Evaluation and Regional Assistance (NCEE) conducts unbiased large-scale evaluations of education programs and practices supported by federal funds; provides research-based technical assistance to educators and policymakers; and supports the synthesis and the widespread dissemination of the results of research and evaluation throughout the United States.

February 2017

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0003 by Regional Educational Laboratory Northwest, administered by Education Northwest. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education; nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Hodara, M., & Lewis, K. (2017). *How well does high school grade point average predict college performance by student urbanicity and timing of college entry?* (REL 2017–250). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northwest. Retrieved from http://ies.ed.gov/ncee/edlabs.

This report is available on the Regional Educational Laboratory website http://ies.ed.gov/ncee/edlabs.

The Regional Educational Laboratory Program produces 7 types of reports