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How Well Do Contextualized Admissions Measures Predict Success for Low-Income Students, Women, and Underrepresented Students of Color?

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While a growing number of studies have examined how incorporating contextualized measures of high school performance may benefit traditionally underrepresented students at the college admissions stage, not as much is known about how such contextualized measures of high school performance relate to these students' college performance upon admission. Based on a Midwestern state's Department of Education database, this study finds that contextualized measures of high school performance are strongly associated with college success for women, low-income students, and minoritized students of color. Compared to other measures of high school performance (i.e., ACT scores), both raw and contextualized high school grade point average (GPA) also have a stronger, more consistent relationship with first-year college GPA, first-year college retention, and graduation within 4 years. These findings present implications for how holistic review is understood and implemented for traditionally underrepresented students, especially in light of the current move toward test-optional and test-free policies.

Keywords: holistic admissions, student success, low-income students, underrepresented students of color, women

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While overall college-going rates in the United States have increased significantly over the past few decades, low-income students, women, and Black, Latinx, and Indigenous students remain underrepresented at the very institutions with the capacity to generate intergenerational mobility (Baker et al., 2018; Bastedo & Jaquette, 2011; Posselt et al., 2012). Neither academic achievement nor comparatively higher tuition rates can wholly explain this trend. For example, low-income students with high SAT scores do not attend highly selective colleges in comparable numbers as their peers with similar levels of achievement from more privileged backgrounds (Chetty et al., 2017). Similarly, the introduction of no-loan programs and other institutional grants has produced mixed results: While some have seen a significant increase in enrollment (Dynarski et al., 2021), others failed to significantly improve low-income representation (Hillman, 2013; Rosinger et al., 2019). Even further, large-scale, low-cost inventions designed to test the role of financial aid information appear to have either minimal or no effect on enrollment patterns (Avery et al., 2021; Bird et al., 2021; Oreopoulos, 2021). Against this backdrop, researchers have also examined what higher education institutions can do to address issues regarding the underrepresentation of students from certain socioeconomic backgrounds, including holistic review in college admissions.

Holistic review in its purest form entails evaluating applicants' performance in light of the opportunities that had been available in their own high school, family, and neighborhood context, as opposed to simply evaluating an applicant's raw achievement in and of itself (Bastedo et al., 2016, 2018). Increasing evidence shows that admissions officers who practice this form of contextualized holistic review are more likely to admit low-socioeconomic status (SES) students (Bastedo & Bowman, 2017; Bastedo et al., 2018; Gaertner & Hart, 2013). These findings emphasize that incorporating contextualized measures of student achievement in college admissions may help institutions welcome more diverse incoming classes.

Along these lines, contextualizing high school grades and standardized test scores is one of the key indicators that real-world admissions officers rely on in an effort to level the playing field among students applying from high schools with varying levels of resources (Selingo, 2020; Stevens, 2007). At this time, over 200 colleges utilize neighborhood and high school data through landscape to contextualize individual-level data provided by students and high schools (Mabel et al., 2022), and recent results show that utilizing

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robust contextualized data yields increased admission of students from underrepresented high schools (Bastedo et al., 2022; Mabel et al., 2022). We aim to facilitate admissions officers' current efforts to contextualize high school grades and standardized test scores in a systematic way by presenting a method to measure contextualized high school achievement across applicants from all high schools. To do this, we build upon previous work that found—based on a statewide longitudinal data set consisting of students from various socioeconomic and demographic backgrounds—that contextualized high school grade point average (GPAs) and ACT scores are strongly associated with college success indicators including first-year GPA, retention, and graduation within 4 years, based on large-scale, state-level longitudinal data set (Bastedo et al., 2022).

We further expand upon these findings by examining whether the relationship between contextualized high school performance and college success also holds for underrepresented populations in higher education. To be more specific, we examine whether contextualized measures of high school performance (i.e., high school GPA, standardized test scores, high school curriculum rigor in English, math, and science) used in holistic review are associated with successful college outcomes for (a) low-income students, (b) women, and (c) underrepresented students of color. Our ultimate goal is not to examine whether these contextualized measures of high school achievement have more or less predictive validity than raw measures of high school achievement, but rather to highlight that these contextualized measures are associated with college success for traditionally underrepresented students. By doing so, we aim to throw light upon whether contextualized measures of high school performance may help identify traditionally underrepresented students who are likely to succeed in college—thereby further adding legitimacy to the use of contextualized measures of student performance in holistic admissions.

Literature Review

Residential Segregation and Differences in Educational Opportunity

Educational opportunity is inextricably linked with racially and socioeconomically discriminatory housing policies in the United States. Property tax revenues are largely determined by home values (Chiodo et al., 2010), and subsequent apportionments finance schools in the associated district (Ryan, 2010), ensuring that low-SES students are concentrated in schools that are underresourced. As a result, schools that serve low-SES students are often unable to offer the same educational support systems and opportunities found among schools in wealthier, Whiter neighborhoods (Carnevale et al., 2019).

Compounding this, housing options are constrained by discriminatory housing practices such as historic *de jure* redlining policies, ongoing discrimination from mortgage banks and property assessors, steering by realtors, and rental discrimination (Desmond, 2016). As a result, minoritized families of color and their White counterparts—even when both have comparable financial means—ultimately have access to very different housing options, adding a further layer of complexity in terms of school segregation for their children (Conley, 2010; Frankenberg et al., 2019; Shapiro, 2004). Additionally, because home ownership is a significant source of generational wealth in the United States, wealth disparities among families of different racial and ethnic groups are persistent and substantial: As of 2019, the typical White family (operationalized as the group median for each respective racial category) possessed five times the wealth of a typical Hispanic family and eight times the wealth of a typical Black family (Bhutta et al., 2020). National-level data show that school segregation by race/ethnicity has worsened over the years, with the percentage of highly segregated schools (defined as schools wherein less than 10% of the student body is White) tripling from 6% to 18% over the past 3 decades (Frankenberg et al., 2019). In fact, school segregation in the United States is currently at the highest level since the late 1960s (Frankenberg et al., 2019). Furthermore, studies show that communities across the country are likely to become even more segregated in the future (Siegel-Hawley & Frankenberg, 2012), especially in regions with high populations of immigrants (Hall, 2013). The presence of systematic links between segregated schools and unequal educational opportunities is therefore concerning, as the "resources that are consistently linked to predominantly white and/or wealthy schools help foster real and serious educational advantages over minority segregated settings" (Orfield et al., 2012, p. 8).

The implications of school segregation by race, income, and wealth on underrepresented students' academic achievement are dramatic. Underrepresented students learn and develop in schooling environments that starkly differ in terms of quantity and quality of educational resources that are available. This, in turn, is reflected in all aspects of college admissions: Underrepresented students have fewer opportunities to access advanced-level coursework such as Advanced Placement and International Baccalaureate (Iatarola et al., 2011; Perna et al., 2015; Venezia & Kirst, 2005), extracurricular programs (Stearns & Glennie, 2010; Weis et al., 2014), individualized support, pedagogical guidance from teachers (Klugman, 2012), and tailored college counseling (Attewell & Domina, 2008; McDonough, 2005; Perna et al., 2008). Current trends of increasing school segregation will therefore likely translate into an increasing gap in educational resources among public schools, which in turn will impact student learning as well as college admissions outcomes.

Sociodemographic Disparities in High School Grades and Standardized Test Scores

These differences in educational opportunities shape students' high school GPA and standardized test scores, which have historically carried heavy weight in admissions decisions (Bastedo & Jaquette, 2011)—especially at more selective universities (Alon, 2009). Persistent gaps in high school GPA and standardized test scores among different students from different socioeconomic and racial/ethnic backgrounds are therefore a legitimate source of concern. For example, Zwick (2019) notes that students from more socioeconomically privileged backgrounds on average have standardized test scores at least one standard deviation above their peers from less privileged socioeconomic backgrounds. Racial and ethnic disparities in high school GPA and standardized test scores are also present, with studies documenting a nationwide trend of Asian students in general displaying the highest high school GPAs, followed by White, then Black, and Hispanic students (Triplett & Ford, 2019; Zwick & Himelfarb, 2011). Byrd et al. (2014) also found that Black students who attended more segregated high schools tend to have lower college GPAs. Similar trends can also be found in terms of achievement on standardized tests (College Board, 2021; Venkateswaran, 2004). The gap in SAT scores among students from different racial/ethnic groups has scarcely narrowed over the past 2 decades, despite continuous efforts to address this problem: Asian and White students consistently show higher test scores than their Black and Hispanic peers, especially on the math section (College Board, 2021). Studies also show that underrepresented students of color score lower on Advanced Placement exams than their White peers (College Board, 2014; Venkateswaran, 2004).

The picture somewhat differs for women. While women—as compared to men—are not subject to differences in educational opportunity due to residential segregation as are lower SES or underrepresented students of color, women applying to college also show systematic disparities in standardized test scores when compared to their male peers (Bielby et al., 2014). This is an interesting—and also concerning—trend, as studies show female students outperform their male peers in terms of high school GPA for all subjects including math, science, social science, and English, yet they underperform in ACT tests compared to their male counterparts (Buddin, 2014). College Board data also reveal that male students have consistently outperformed female high school students in the SAT math section for many years and also have higher total SAT scores (College Board, 2021; Ellison & Swanson, 2018).

These gender disparities between standardized test scores and high school GPA highlight that although these two measures both evaluate academic achievement, they may be capturing different underlying components. Buddin (2014), for instance, posits that high school grades incorporate an element of noncognitive factors such as assiduity and day-to-day class participation (e.g., late homework, disruptive behavior, inattention). Along these lines, Jacob (2002) attributes male students' lower high school GPA to behavioral problems and lower interest in school. Standardized tests, in contrast, are a point-in-time estimate of student learning. It is therefore unsurprising that high school GPA has consistently been found to be a stronger predictor of college achievement than standardized test scores (Dixon-Román et al., 2013; Hoffman & Lowitzki, 2005). Further, studies report that students who have excelled in terms of high school GPA in the context of their own high school may show comparable, or even better, performance on various college success indicators compared to their peers who have entered college with higher raw standardized test scores and lower high school performance (Niu & Tienda, 2010b; Syverson et al., 2018). These studies, taken together, raise the question of whether there may be a better way to evaluate the academic potential of female applicants as well as underrepresented students of color and low-SES students.

Policies such as Percent Plans, which evaluate college applicants' high school grades within the context of applicants' own high schools, offer insight into how students who have outperformed their peers in high school do once admitted to college. Percent Plans—based on the logic that the top-performing high school students should be given the opportunity to receive a high-quality higher education—guarantee a certain percent of students in the respective state's high school admission into the corresponding state's public higher education system, and are being implemented in states including Texas, California, and Florida. The literature presents mixed results on whether various states' Percent Plans have led to increased diversity of student admits (Fletcher & Mayer, 2014; Klasik & Cortes, 2022; M. C. Long & Tienda, 2008). Studies observing longitudinal trends conclude that the purported benefits of Percent Plans in ensuring socioeconomic and racial/ethnic diversity appear to be exaggerated (Flores & Park, 2013; Klasik & Cortes, 2022).

In terms of college performance, however, there is evidence that shows those students with high contextualized high school achievement went on to show high performance in college—even if they had not shown the highest raw performance at the point of admission. Niu and Tienda (2010a), for example, report that top decile Black and Hispanic students admitted to University of Texas at Austin through the Texas Top Ten Percent Plan from low-SES high schools had lower average standardized test scores than their lower ranking peers from wealthier feeder high schools but showed comparable—or even better—performance than the latter in terms of college GPA once admitted. Similar trends were found in terms of other college success indicators, including first-year college retention and graduation within 4 years. Studies such as these add further weight to the importance of examining the relationship between contextualized high school performance and college success.

Heterogeneity in Relationships Between Precollege Performance and College Success

The literature on whether raw measures of high school GPA and standardized test scores are indeed objective, bias-free predictors of college success across all student subgroups adds further weight to the need to examine not only raw but also contextualized high school performance to better evaluate a student's true academic potential. Considering that grading standards, levels of rigor, and instructional resources vary widely across high schools, solely relying on raw high school performance in admissions may obfuscate the starkly different educational contexts in which each student worked toward his or her various achievements—leading, in turn, to errors in predicting college performance for certain student populations (Zwick & Himelfarb, 2011). Studies show, for example, that when comparing a student's (a) expected college GPA as predicted by a regression function and (b) real-world GPA, the former tends to overpredict (i.e., yield misleadingly high predicted college GPA) for students from high schools with fewer resources that tend to serve majority Black and/or Hispanic student populations (Mattern et al., 2008; Sackett & Kuncel, 2018; Sanchez, 2013; Young, 2001).

In the case of women, on the other hand, studies show that standardized test scores tend to underpredict women's college performance (i.e., women in reality go on to earn higher college GPAs than those predicted by standardized test scores; Leonard & Jiang, 1999). Such underprediction can in part be attributed to the limitations of the predictive power of test scores: While standardized test scores may capture female students' performance on exams and quizzes, they underpredict grade components of class discussion and research participation (Keiser et al., 2016). The same problem presents itself when estimating relationships between raw high school performance and college success for students from different racial/ethnic and socioeconomic backgrounds. For instance, Byrd et al. (2014) found that raw SAT scores were a weaker predictor of college GPA compared to high school GPA for Black students who graduated within 6 years of entering elite colleges. Similarly, studies suggest that the relationships between high school performance (i.e., high school GPA, standardized test scores) and college success differ by students' SES (Geiser & Studley, 2002; Sanchez, 2013). Using raw measures of high school performance alone in this case would therefore result in the estimation of biased relationships between high school and college performance for these student populations (Zwick & Himelfarb, 2011).

Using raw measures of high school GPA alone when evaluating student performance in high school also makes it difficult to account for grade inflation—a phenomenon that has been increasing over the past 2 decades. Studies have found steeper grade inflation among high schools with majority of White, Asian, and high-SES students (Hurwitz & Lee, 2018). Privileged students attending well-resourced high schools also benefit from test preparation courses, private tutoring, and are more likely to retake tests to boost their standardized test scores than their peers from schools from fewer resources (Buchmann et al., 2010; Park & Becks, 2015; Vigdor & Clotfelter, 2003). These differential patterns in grade inflation and test-score "boosting" further highlight the pitfalls of relying only on raw measures of high school performance to assess students' academic abilities. Admission practices that fail to take into account the high school and family context in which applicants made their various achievements limit college access for traditionally underrepresented students (Zwick, 2007). On the other hand, using contextualized forms of high school achievement when evaluating admissions files—as opposed to using only measures in their raw form—increased admits for low-income, underrepresented students of color from underserved high schools (Bastedo et al., 2018; Gaertner & Hart, 2013). A more recent study using state-level data goes a step further and demonstrates that contextualized measures of high school performance are associated with student success in college (Bastedo et al., 2022).

Our study builds upon these findings and examines whether relationships between various indicators of high school performance and college success differ for certain student subgroups—namely low-income, underrepresented students of color, and women. By doing so, we aim to explore whether contextualized measures of high school achievement may play a role in expanding college access for these traditionally underrepresented student populations, in a way that cannot be done using conventional, raw measures of high school performance alone.

Data and Method

We constructed our data set using a medium-sized Midwestern state's Department of Education (DOE) data warehouse. Specifically, we collated data from three distinct sources: (a) all public high schools within the state, (b) the state's ACT test database, and (c) the state's 15 public universities. As a result, the data set is uniquely comprehensive; to our knowledge, it is the only statewide collection of college transcript, retention, and graduation data longitudinally matched with both (a) an individual's prior academic achievements and (b) the academic achievements of their high school peers.

The state in our study serves as an ideal research case for several reasons. First, because the DOE required that all public high schools report complete transcript information for their students over a 5-year period (2010–2015), we have detailed course names, course types, grades, credits, and demographic information for over 2.3 million high school students. This enabled us to determine both individual and median GPAs for each high school within our sample. Second, the state also required all high school juniors to take the ACT during the collection period; from this, we constructed median ACT composite and subject scores for each school. Finally, the DOE also mandates its public universities to record detailed transcript and demographic information. As a result, our data set includes a student's courses, grades, credits, major, enrollment status, and a variety of key demographic information, including Pell recipient status, sex, and race/ethnicity.

Sample

We undertook a rigorous, labor-intensive protocol to clean over 27-million observations and construct our sample. The high school data were particularly messy; as a result, after hand-checking each individual school for consistency, we dropped approximately 32% of the schools within the raw high school data, about 20% of total students. Of those we dropped, many were either alternative schools or closed during the collection period. The remaining dropped schools had issues such as missing 1 or more years of data or significant changes in reporting that made cleaning impossible.

The final sample included only those schools and students for which we had 3 consecutive years' worth of data; from this, we constructed GPA variables normally seen by college application reviewers (i.e., the GPA of a student's first 3 years of high school). Similarly, our final sample consisted of those high school students who also attended one of their state's 15 public universities (N = 77,804). Tables 1 and 2 provide descriptive statistics of the sample, including Pell recipients (N = 21,519), women (N = 43,251), and underrepresented students of color (N = 10,390). After reviewing public enrollment records for each institution, we estimate that the sample accounts for approximately 75% of first-year, in-state students during this time period. Because the DOE data set does not include private schools (about 10% of high school graduates; National Center for Education Statistics, 2017), we remain confident that our sample is robust. We cannot ascertain that students who were not included in our analytic sample are missing at random, as we are unable to observe if these students' high school performance significantly differs from students in our analytic sample due to limitations of the data that are available to us. However, our additional analyses comparing student demographics (i.e., race, gender, Pell status) between our final analytical sample and true in-state freshman at each institution revealed that students who are missing from the DOE data set did not significantly change the demographic makeup of our sample.

Variables

Our dependent variables include three outcomes normally assumed to be indicators of college success: first-year college GPA (continuous, measured prior to their second fall semester), retention after the first year (binary, indicates if a student was enrolled in the fall semester of their second year), and graduation within 4 years (binary, indicates if a student graduated before the fall semester of their fifth year). Raw independent variables include high school GPA, ACT composite scores, and a set of measures related to students' course selection and rigor. To be specific, for each of the three subjects (math, science, and English), we created an ordinal scale that corresponds to course progression within one's high school: This scale adds one point for each additional course taken per year, and one additional point for potential Advanced Placement enrollment, with up to five total potential points for each subject. These three measures of curricular rigor were then also contextualized: These contextualized measures of math, science, and English rigor show how far (in standard deviations) a student progressed in courses offered by their school in each subject. The contextualized math score, for instance, takes a student's maximum value for math

Table 1
Descriptive Statistics of Sample—High School Demographics and Performance

Variable	All				Pell		Women		Minoritized students of color	
	N	*M*	Min	Max	*N*	*M*	*N*	*M*	*N*	*M*
School % free/reduced-price lunch	77,787	32.60%	4.50%	99.70%	21,514	40.17%	43,238	33.40%	10,379	48.40%
School % underrepresented students of color	77,787	19.50%	0.00%	100.00%	21,514	25.21%	43,238	20.30%	10,379	50.80%
School expenditures per FTE	77,787	$9,824	$7,097	$36,953	21,514	$10,010	43,238	$9,847	10,379	$11,026
High school GPA	77,804	3.42	0.65	4.00	21,519	3.40	43,251	3.47	10,390	3.15
Contextualized HS GPA	77,796	0.49	−4.36	3.47	21,517	0.56	43,246	0.57	10,390	0.43
ACT composite	77,708	23.50	11.00	36.00	21,494	22.60	43,203	23.07	10,374	20.37
Contextualized ACT composite	77,700	0.62	−2.88	5.42	21,492	0.61	43,198	0.56	10,374	0.38
Math level	77,348	4.60	2.00	8.00	21,390	4.40	43,009	4.46	10,354	3.97
Science level	77,804	4.80	2.00	9.00	21,519	4.72	43,251	4.76	10,390	4.55
English level	77,804	4.10	1.00	6.00	21,519	4.04	43,251	4.15	10,390	3.91
Contextualized math level	77,348	−0.82	−2.97	1.49	21,390	−0.88	43,009	−0.92	10,354	−1.08
Contextualized science level	77,804	−0.37	−2.97	2.98	21,519	−0.28	43,251	−0.38	10,390	−0.38
Contextualized English level	77,804	0.00	−3.47	1.49	21,519	0.01	43,251	0.08	10,390	−0.15

Note. Contextualized variables are in standard deviation units. FTE = Full-Time Equivalent; GPA = grade point average; HS GPA = high school grade point average.

course level, divides this by the maximum value of math curriculum level offered by the student's school, and then standardizes this value.

All raw and contextualized variables are continuous. Contextualized measures are created based on all students graduating from a given high school in a given year for whom we had transcript data and test scores. These contextualized variables are measured as standard deviations from the median: Each of the contextualized variables in our sample represents an individual student's distance from the median student in their high school.

Analytic Strategy

To consider the relationship between contextualized academic indicators and college success, we used both ordinary least squares (continuous dependent variables, such as first-year college GPA) and logistic regression (binary dependent variables, such as graduation within 4 years) models (J. S. Long, 1997). We used the following equation for our linear regression models:

$$\mathrm{DV} = \beta_0 + \beta_1 \mathrm{IV} + \beta_2 D + \beta_3 S + \mathrm{FE}_i + \varepsilon. \quad (1)$$

In this equation, the continuous dependent variable of interest is DV, the independent variable of interest is IV, the vector of demographic covariates is *D*, the vector of high school covariates is *S*, institution by cohort fixed effects is FE, and the error term is ε. We calculated partial η squared to interpret the effect of each model's independent variables; this also enabled comparisons across regression models. Therefore, partial η squared explains the amount of variation in which a dependent variable can be held responsible. We utilized the following equation for our logistic regression models:

$$\mathrm{DV} = \log\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_1 \mathrm{IV} + \beta_2 D + \beta_3 S + \mathrm{FE}_i + \varepsilon. \quad (2)$$

In this equation, the binary dependent variable of interest is DV, the independent variable of interest is IV, the vector of demographic covariates is *D*, the vector of high school covariates is *S*, and fixed effects are FE. Since we cannot calculate partial η squared for logistic regression models, we utilized a linear model with our binary dependent variables to estimate effect size; from this, we compared the amount of variation across models.

We ran four models for each independent and dependent variable regression. To first estimate the raw effect of our respective variables of interest, we controlled for college cohort. We then added controls for student-level demographic information: race/ethnicity, gender, and income (a binary Pell status indicator). We then further controlled for high school characteristics: district expenditures per

Table 2
Descriptive Statistics of Sample—College Success Indicators

Variable	First-year GPA				First-year retention		Four-year graduation	
	N	*M*	Min	Max	*N*	%	*N*	%
Underrepresented students of color	10,390	2.57	0	4	10,390	63.63	6,508	22.94
White and Asian students	67,413	3.03	0	4	67,414	73.04	43,361	45.21
Pell recipients	21,519	3.08	0	4	21,519	89.02	13,127	46.19
Non-Pell recipients	56,284	2.93	0	4	56,285	65.19	36,742	40.92
Women	43,250	3.07	0	4	43,251	72.99	27,746	46.17
Men	34,553	2.85	0	4	34,553	70.26	22,123	37.46

Note. GPA = grade point average.

full-time enrolled student, percentage of underrepresented students of color, school percentage of free and reduced lunch students, and the school's urbanicity. Finally, we produced submodels for populations of interest (Pell, women, underrepresented students of color [Black, Latinx, Hawaiian/Pacific Islander]). We have a range of public 4-year institutions, including selective state flagship and research-intensive institutions, but the majority of institutions in our sample are broad-access institutions. To examine the robustness of the relationships between raw and contextualized high school performance and college success across institutions, we ran an overall regression for all institutions for each model as well as regressions for each individual institution. To minimize biased estimates from unobserved variation, institution by cohort fixed effects were added to models including all institutions, and cohort fixed effects were added to each of the single-institution models.

As part of our sensitivity analysis, we also ran models with major fixed effects for institutions with larger numbers of observations, showing no appreciable difference in coefficients/effect sizes compared to the same models without major fixed effects. We therefore decided not to include major fixed effects in our final analytical models. All our estimates presented in the results section (including tables and figures) are thus based on models without major fixed effects.

Limitations

All findings in our study should be interpreted as associations, not causal effects. Regardless, our study is the first of its kind to consider heterogeneity alongside contextualized academic performance in high school. Without a policy change that may lend itself toward a natural experiment, we believe that this is a suitable alternative to understand the implicit theory of holistic admissions—that performing well in high school compared to one's peers can indicate eventual college success.

Furthermore, we recognize that the way we identify and categorize our student subgroups for analysis (e.g., Pell/non-Pell, underrepresented students of color, women/men) is limited by the categorizations available in our state data set. The Pell grant indicator is an imperfect measure of SES; not only does it mask gradations (Chetty et al., 2017), but since completing the Free Application for Federal Student Aid is a time-consuming, arduous process, many students who may qualify for Pell grants never apply (Bettinger et al., 2012). Unfortunately, our data set does not include household income. Under these circumstances, we believe Pell status is the best possible indicator of lower income status, as 95% of Pell recipients come from families with an annual household income lower than $60,000 (Dortch, 2021). In terms of gender identity, students in our sample were limited to male and female categories, which does not allow us to account for students who identify as trans or nonbinary. Likewise, our underrepresented students of color category are limited to those students that identified solely as Black, Hispanic, Native Hawaiian, or Other Pacific Islander; the reference category was operationalized as White and (nondisaggregated) Asian students. We resorted to this operationalization because our data set only contains broad categorizations of race/ethnicities, preventing us from deconstructing the multiracial or Asian category to more accurately represent additional racial/ethnic populations that are underrepresented on U.S. college campuses. The literature provides evidence on why broad categorizations of race/ethnicities in higher education—for example, regarding Asian students—are problematic (Pang et al., 2011; Poon et al., 2017; Teranishi et al., 2014; Viano & Baker, 2020). Large proportions of students of East Asian or South Asian descent on average show higher academic achievement than students of Southeast Asian descent (Pang et al., 2011; Teranishi et al., 2014), and that a higher proportion of East and South Asian students are represented at selective higher education institutions (Teranishi et al., 2014). We recognize that this is an imperfect categorization and strongly encourage both scholars and policymakers to approach future data collection with a more nuanced, appropriate categorization of race/ethnicity.

Another limitation pertains to how we operationalize graduation as a college success indicator. We operationalized graduation as "graduation from college within four years," as this allowed us to include more college cohorts in our sample to examine students' graduation outcomes based on data availability. On the other hand, we also acknowledge that many students may need more than 4 years to graduate; whether a student graduates within 4 years may therefore not be the best indicator of college completion and may bias our estimates of the relationship between students' high school performance and college success. To address this concern, we also ran supplemental analyses for the 2014–2015 cohort, which allowed us to observe whether students had graduated within 5 years. Aggregated estimates for all 15 institutions and subanalyses for institutions with sufficient cell sizes show no appreciable difference in coefficients/effect sizes compared to the estimates from corresponding 4-year graduation rates models. As a result, we believe the 4-year graduation indicator, although not ideal, still provides reliable evidence to help us examine the relationship between contextualized measures and graduation.

Results

Descriptive Findings

Table 1 shows descriptive statistics for the full sample of students in our data set as well as for different subgroups—namely Pell recipients, underrepresented students of color, and women. Compared to students in the full sample, Pell recipients, women, and underrepresented students of color are disproportionately concentrated in schools with higher proportions of students of color, as well as schools with higher proportions of students receiving free and reduced-price lunch. Pell recipients and underrepresented students of color also, on average, have lower raw high school GPAs and lower ACT composite scores. Underrepresented students of color on average also tend to have taken fewer advanced high school courses.

Descriptive statistics on college GPA and persistence across all subgroups in our study are presented in Table 2. In general, underrepresented students of color have lower first-year college GPAs compared to their peers, whereas women and Pell recipients have slightly higher college GPAs compared to their peers. In addition, Pell recipients graduate college in 4 years at a higher proportion than their non-Pell-receiving peers; first-year retention rates for Pell recipients are also over 20 percentage points higher than those for non-Pell recipients. Underrepresented students of color show lower retention rates and a much lower average 4-year graduation rate than their White and Asian counterparts. Compared to their male peers, women have higher rates of retention and 4-year college graduation, although differences in retention rates between women and men are minimal.

Analytic Findings by Subsample

When interpreting findings for our study, the coefficients obtained for our models below (in Tables 3–8) should be interpreted slightly differently, depending on the dependent variable of interest. In models examining raw high school GPA or raw ACT scores, each coefficient represents the association between a 0.1-point change in high school GPA/ACT composite score and our outcome of interest. In models examining raw measures of high school course rigor, each coefficient represents the association between a 1-point increase in the ordinal scale that corresponds to course progression in high school and our outcome of interest. In models examining contextualized high school GPA or contextualized ACT scores, each coefficient represents the association between a 1 *SD* unit increase in the independent variables and our outcome of interest.

Results by Pell Recipient Status (Tables 3 and 4)

College GPA

For Pell recipients, both raw and contextualized high school GPA and ACT scores are significantly associated with first-year college GPA (Table 3). Also, across all institutions in our sample, raw high school GPA has a stronger association with first-year college GPA than raw ACT composite scores, as illustrated by Figure 1. Similarly, with the exception of only one institution, contextualized high school scores are more strongly associated with first-year GPA than are contextualized ACT composite scores in terms of both coefficients and effect sizes. As shown in Table 3, on average, each 0.1-point increase in raw high school GPA is associated with a 0.064 increase in first-year GPA, accounting for 23.4% of variation within the full sample of Pell recipients ($N = 20{,}582$). In contrast, a 1 *SD* increase in contextualized high school GPA is associated with a 0.403 increase in first-year GPA, accounting for 18.3% of variation within the sample.

The relationship between first-year college GPA and ACT scores is noticeably weaker: On average, each 1-point increase in a student's ACT composite score is associated with a 0.05 increase in first-year GPA, accounting for 9.4% of variation. A 1 *SD* increase above the median high school ACT score (i.e., contextualized ACT score), on the other hand, is associated with a 0.179 increase in first-year GPA and accounts for only 6.9% of the sample's variation.

In addition to high school GPA and ACT measures, taking a more rigorous high school curriculum is positively associated with one's first-year college GPA, although the effect sizes of these variables of interest are smaller than those associated with high school GPA and ACT composite scores. Although estimates associated with curriculum rigor are not significant for some institutions, of all the three subjects, both raw and contextualized math levels are associated with the largest effect sizes for Pell recipients, as illustrated in Figure 2.

College Persistence

As was the case for college GPA, we find that whether a student graduates college in 4 years also has a stronger relationship with high school GPA-related variables than ACT-related variables. Table 4 shows that, on average, each 0.1-point increase in raw high school GPA is associated with 14.7% higher odds of graduating within 4 years, accounting for an estimated 5.3% of the variation in graduation rate. Students with high school GPAs that are 1 *SD* above their high school's median GPA have 1.4 times higher odds of graduating within 4 years (which is 2.4 times as high as students with high school GPAs falling at their school's median), which accounts for an estimated 4.2% of variation. In contrast, each unit increase in raw and contextualized ACT composite scores is associated with 0.9% and 42.5% higher odds of graduating, accounting for 2.0% and 1.6% of variation, respectively.

The relationship between our independent variables of interest and college retention is much weaker compared to other dependent variables (Supplemental Tables A1 and A2). The odds ratios of our

Table 3

Pell Recipients: Coefficients and Effect Sizes for High School GPA/ACT Variables and First-Year College GPA

		HS GPA		Contextualized HS GPA			ACT composite		Contextualized ACT composite	
Institution	*N*	Coefficient	Effect size	Coefficient	Effect size	*N*	Coefficient	Effect size	Coefficient	Effect size
Total	20,582	0.064***	0.234	0.403***	0.183	20,559	0.005***	0.094	0.179***	0.069
A	1,747	0.059***	0.239	0.404***	0.207	1,742	0.005***	0.111	0.213***	0.104
B	1,645	0.059***	0.212	0.360***	0.164	1,643	0.003***	0.035	0.097***	0.020
C	1,131	0.053***	0.263	0.387***	0.231	1,129	0.005***	0.156	0.227***	0.137
D	2,378	0.078***	0.266	0.508***	0.224	2,378	0.005***	0.114	0.222***	0.102
E	210	0.076***	0.382	0.544***	0.315	210	0.007***	0.196	0.306***	0.200
F	3,625	0.070***	0.176	0.370***	0.120	3,622	0.004***	0.059	0.127***	0.037
G	626	0.094***	0.305	0.570***	0.201	626	0.004***	0.061	0.148***	0.037
H	768	0.059***	0.272	0.438***	0.256	768	0.006***	0.136	0.276***	0.114
I	1,331	0.061***	0.267	0.388***	0.211	1,331	0.005***	0.122	0.204***	0.100
J	840	0.072***	0.373	0.546***	0.339	840	0.007***	0.182	0.285***	0.152
K	1,600	0.089***	0.095	0.235***	0.031	1,598	0.004***	0.058	0.115***	0.034
L	738	0.061***	0.165	0.362***	0.145	736	0.004***	0.058	0.139***	0.046
M	426	0.048***	0.176	0.350***	0.155	426	0.004***	0.087	0.185***	0.088
N	1,863	0.070***	0.284	0.409***	0.209	1,859	0.005***	0.101	0.190***	0.067
O	1,654	0.059***	0.225	0.390***	0.183	1,651	0.005***	0.106	0.189***	0.075

Note. Each coefficient/effect size represents an individual linear regression model with all covariates and fixed effects. GPA = grade point average; HS GPA = high school grade point average.
*** $p < .001$.

Table 4
Pell Recipients: Odds Ratios and Effect Sizes for High School GPA/ACT Variables and 4-Year College Graduation

		HS GPA		Contextualized HS GPA			ACT composite		Contextualized ACT composite	
Institution	*N*	Odds ratio	Effect size	Odds ratio	Effect size	*N*	Odds ratio	Effect size	Odds ratio	Effect size
Total	13,122	1.147***	0.053	2.408***	0.042	13,103	1.009***	0.020	1.425***	0.016
A	1,052	1.136***	0.057	2.199***	0.042	1,047	1.007***	0.013	1.384***	0.013
B	1,036	1.201***	0.085	3.089***	0.068	1,034	1.014***	0.038	1.672***	0.030
C	683	1.098***	0.041	1.916***	0.033	681	1.008***	0.017	1.351**	0.012
D	1,567	1.144***	0.041	2.555***	0.041	1,567	1.008***	0.014	1.408***	0.013
E	132	1.165***	0.073	4.154***	0.087	132	1.011	0.024	1.752*	0.032
F	2,493	1.130***	0.025	1.950***	0.018	2,491	1.005***	0.005	1.141*	0.002
G	412	1.205***	0.068	3.755***	0.067	412	1.009**	0.022	1.406*	0.015
H	503	1.173***	0.124	3.384***	0.123	503	1.016***	0.066	2.059***	0.064
I	828	1.133***	0.054	2.296***	0.044	828	1.010***	0.027	1.576***	0.025
J	495	1.179***	0.072	3.575***	0.061	495	1.017***	0.049	1.984***	0.043
K	1,019	1.395***	0.046	2.465***	0.018	1,017	1.010***	0.015	1.411***	0.012
L	425	1.192***	0.055	2.604***	0.037	424	1.012***	0.026	1.465*	0.017
M	271	1.138***	0.044	2.284**	0.030	271	1.013***	0.035	1.618**	0.028
N	1,131	1.190***	0.097	2.667***	0.063	1,129	1.012***	0.031	1.504***	0.021
O	1,036	1.106***	0.035	2.264***	0.040	1,033	1.008***	0.016	1.477***	0.018

Note. Each odds ratio/effect size represents an individual logistic regression model with all covariates and fixed effects. GPA = grade point average; HS GPA = high school grade point average.
* $p < .05$. ** $p < .01$. *** $p < .001$.

independent variables are not statistically significant across all institutions; even those that are statistically significant have smaller effect sizes, although high school GPA measures still show a stronger relationship with first-year retention than ACT measures for some institutions.

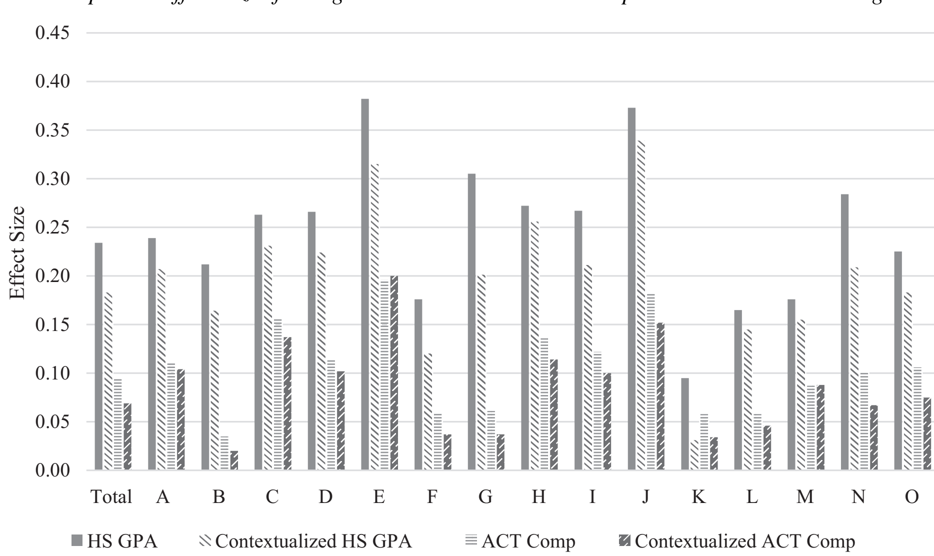
Results by Race/Ethnicity (Tables 5 and 6)

College GPA

As shown in Table 5, both raw and contextualized high school GPA consistently show a significant association with first-year college GPA for underrepresented students of color across the majority of institutions in our sample. ACT scores, whether raw or contextualized, show more mixed results: For some institutions in our sample, measures of student performance on the ACT do not show a significant relationship with college GPA; even at those institutions in which ACT are significantly associated with college GPA, effect sizes are smaller than those for high school GPA, which is more intuitively demonstrated by Figure 3.

Contrary to discussions around the principles of holistic review and the benefits of selecting students who push themselves to take the most academically challenging courses available in their high

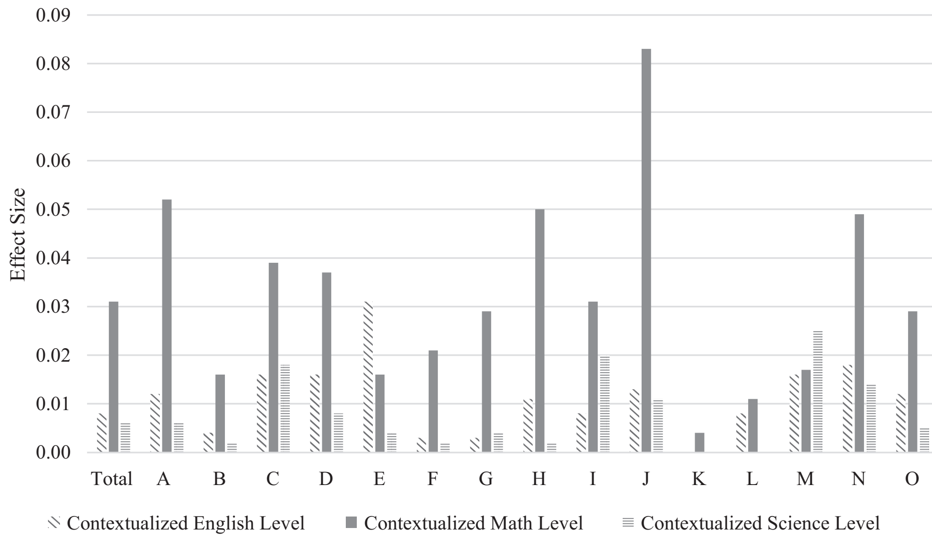
Figure 1
Pell Recipients: Effect Sizes for High School GPA and ACT Composite on First-Year College GPA



Note. GPA = grade point average; HS GPA = high school grade point average.

Figure 2

Pell Recipients: Effect Sizes for Contextualized High School Curriculum Rigor Levels on First-Year College GPA



Note. GPA = grade point average.

school context, for underrepresented students of color, the three curriculum rigor variables do not appear to have as a strong association with first-year GPA as other variables of interest. Supplemental Tables A3–A5 show that these curriculum rigor variables are not significantly related to college GPA in approximately half the institutions in our sample of underrepresented students of color (especially for science and English level), and effect sizes associated with each increase in course level attainment are very small compared to other variables of interest. Across most of the institutions in our underrepresented students of color sample, the relationship between contextualized math level and college GPA has the largest effect sizes out of all three subjects. While the underrepresented sample shows less consistent results compared to the Pell sample in terms of the relationship between curriculum rigor

Table 5

Underrepresented Students of Color: Coefficients and Effect Sizes for High School GPA/ACT Variables and First-Year College GPA

		HS GPA		Contextualized HS GPA			ACT composite		Contextualized ACT composite	
Institution	*N*	Coefficient	Effect size	Coefficient	Effect size	*N*	Coefficient	Effect size	Coefficient	Effect size
Total	9,961	0.076***	0.152	0.439***	0.113	9,945	0.005***	0.037	0.129***	0.016
A	900	0.082***	0.193	0.558***	0.169	899	0.006***	0.063	0.248***	0.051
B	1,228	0.071***	0.123	0.398***	0.086	1,225	0.001	0.002	−0.035	0.001
C	508	0.061***	0.143	0.410***	0.120	507	0.005***	0.044	0.171***	0.029
D	816	0.091***	0.173	0.558***	0.146	816	0.006***	0.053	0.193***	0.033
E	22	—	—	—	—	22	—	—	—	—
F	1,741	0.074***	0.144	0.367***	0.092	1,740	0.005***	0.061	0.130***	0.024
G	72	0.062*	0.064	0.514*	0.091	72	−0.001	0.004	−0.107	0.011
H	124	0.082***	0.155	0.479***	0.110	124	0.007*	0.046	0.204	0.022
I	618	0.077***	0.158	0.489***	0.135	618	0.005***	0.034	0.165***	0.021
J	369	0.068***	0.152	0.391***	0.094	368	0.004*	0.015	0.012	0.000
K	642	0.089***	0.125	0.319***	0.058	642	0.003***	0.027	0.080***	0.015
L	298	0.089***	0.140	0.489***	0.105	296	0.004	0.017	0.051	0.002
M	315	0.059***	0.129	0.402***	0.121	313	0.005***	0.037	0.221***	0.050
N	1,094	0.079***	0.175	0.450***	0.132	1,090	0.006***	0.045	0.145***	0.018
O	1,214	0.069***	0.117	0.414***	0.094	1,213	0.004***	0.026	0.120***	0.012

Note. Each coefficient/effect size represents an individual linear regression model with all covariates and fixed effects. While we do have estimates for institution E, these estimates may be biased because only 22 students from this institution qualified as an underrepresented student of color. We therefore eliminated these students from our subsample analyses. Observations from this institution were still included to obtain estimates across all institutions (estimates for "total"). GPA = grade point average; HS GPA = high school grade point average.
* $p < .05$. *** $p < .001$.

Table 6
Underrepresented Students of Color: Odds Ratios and Effect Sizes for High School GPA/ACT Variables and 4-Year College Graduation

		HS GPA		Contextualized HS GPA			ACT composite		Contextualized ACT composite	
Institution	*N*	Odds ratio	Effect size	Odds ratio	Effect size	*N*	Odds ratio	Effect size	Odds ratio	Effect size
Total	6,497	1.173***	0.044	2.479***	0.030	6,485	1.012***	0.020	1.423***	0.010
A	556	1.204***	0.089	3.442***	0.075	555	1.012***	0.023	1.674***	0.023
B	746	1.220***	0.058	2.986***	0.039	743	1.018***	0.029	1.478**	0.009
C	332	1.169***	0.043	2.396*	0.023	331	1.018**	0.038	2.208***	0.039
D	531	1.190***	0.049	2.824***	0.047	531	1.013***	0.023	1.704***	0.022
E		—	—	—	—		—	—	—	—
F	1,171	1.105***	0.019	1.634***	0.011	1,170	1.006*	0.005	1.119	0.002
G	44	—	—	—	—	44	—	—	—	—
H	78	—	—	—	—	78	—	—	—	—
I	400	1.210***	0.057	2.821***	0.028	400	1.002	0.000	1.015	0.000
J	251	1.264***	0.084	3.607**	0.049	250	1.021*	0.035	1.640	0.012
K	380	1.340***	0.062	3.093***	0.037	380	1.016***	0.038	1.418*	0.016
L	208	1.166**	0.027	2.445	0.018	207	1.012	0.005	1.305	0.002
M	226	1.055	0.005	1.406	0.005	225	1.009	0.003	1.310	0.001
N	756	1.219***	0.079	2.793***	0.052	754	1.018***	0.045	1.594***	0.018
O	764	1.166***	0.043	2.591***	0.034	764	1.014***	0.022	1.701***	0.019

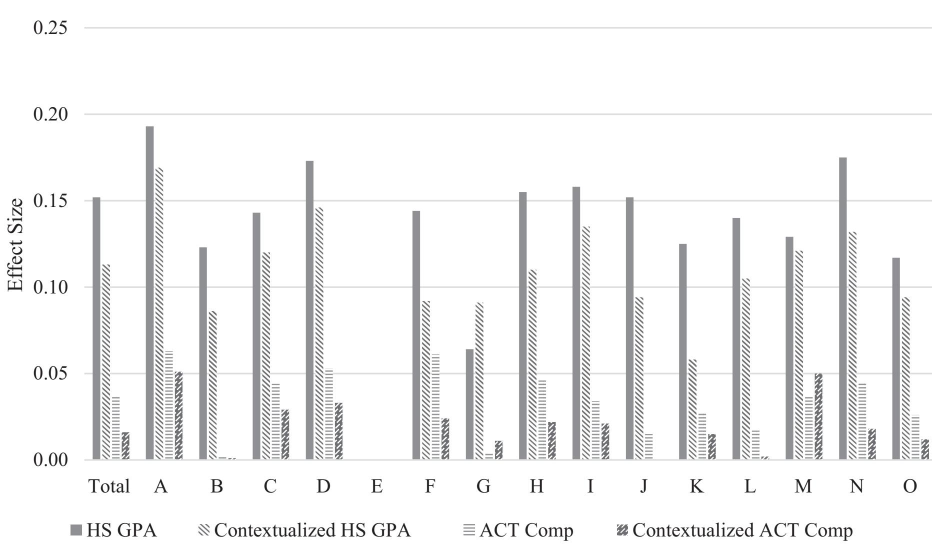
Note. Each odds ratio/effect size represents an individual logistic regression model with all covariates and fixed effects. The sample of underrepresented students of color at institution E was very small, and there was not enough variation in graduation rates to complete/support a logistic regression. In addition, while we do have estimates for institutions G and H, these estimates may be biased because only a small number of students from these institutions (44 from institution G and 78 from institution H) qualify as underrepresented student of color. We therefore eliminated these students from our subsample analyses. Observations from institutions E, G, and H were still included in the logit model across all institutions (estimates for "total"). GPA = grade point average; HS GPA = high school grade point average.
* $p < .05$. ** $p < .01$. *** $p < .001$.

and college GPA, many institutions have statistically nonsignificant estimates.

College Persistence

A student's high school GPA has the strongest association with student graduation within 4 years. Table 6 shows that, with the exception of a few small institutions in our sample, raw and contextualized high school GPA are both positively associated with graduating within 4 years for underrepresented students of color; contextualized high school GPA had slightly lower, but still comparable, effect sizes with raw high school GPA. In contrast, ACT scores, both raw and contextualized, do not show a consistent, significant association with college graduation and retention across

Figure 3
Underrepresented Students of Color: Effect Sizes for High School GPA and ACT Composite on First-Year College GPA



Note. GPA = grade point average; HS GPA = high school grade point average.

Table 7
Women: Coefficients and Effect Sizes for High School GPA/ACT Variables and First-Year College GPA

		HS GPA		Contextualized HS GPA			ACT composite		Contextualized ACT composite	
Institution	*N*	Coefficient	Effect size	Coefficient	Effect size	*N*	Coefficient	Effect size	Coefficient	Effect size
Total	41,807	0.093***	0.246	0.605***	0.200	41,763	0.006***	0.084	0.250***	0.067
A	4,778	0.097***	0.286	0.686***	0.258	4,772	0.008***	0.125	0.339***	0.117
B	2,955	0.086***	0.181	0.547***	0.145	2,954	0.003***	0.016	0.108***	0.009
C	2,116	0.085***	0.270	0.611***	0.238	2,113	0.007***	0.101	0.307***	0.091
D	5,343	0.102***	0.255	0.667***	0.222	5,342	0.006***	0.092	0.255***	0.083
E	476	0.097***	0.335	0.755***	0.305	474	0.008***	0.108	0.320***	0.100
F	7,444	0.095***	0.208	0.504***	0.145	7,437	0.005***	0.063	0.171***	0.046
G	615	0.143***	0.351	0.760***	0.197	615	0.007***	0.124	0.277***	0.089
H	1,547	0.094***	0.324	0.670***	0.273	1,547	0.010***	0.151	0.391***	0.119
I	3,001	0.088***	0.257	0.620***	0.236	2,998	0.007***	0.102	0.289***	0.092
J	1,885	0.099***	0.289	0.733***	0.261	1,883	0.008***	0.109	0.338***	0.093
K	3,956	0.114***	0.127	0.306***	0.044	3,951	0.004***	0.061	0.131***	0.040
L	937	0.097***	0.194	0.601***	0.160	936	0.006***	0.061	0.184***	0.035
M	919	0.083***	0.222	0.573***	0.194	917	0.007***	0.088	0.281***	0.086
N	2,866	0.094***	0.248	0.578***	0.193	2,858	0.007***	0.090	0.265***	0.062
O	2,969	0.087***	0.221	0.589***	0.183	2,966	0.006***	0.078	0.260***	0.060

Note. Each coefficient/effect size represents an individual linear regression model with all covariates and fixed effects. GPA = grade point average; HS GPA = high school grade point average.
$^{*} p < .05$. $^{**} p < .01$. $^{***} p < .001$.

institutions in our sample, and the effect sizes of estimates are small (Table 6).

Results by Gender (Tables 7 and 8)

College GPA

Our findings for women are in large part in line with those for Pell recipients and underrepresented students of color, with measures related to high school GPA displaying the strongest relationship with college performance (Figure 4). As shown in Table 7, on average, each 0.1-point increase in high school GPA is associated with a 0.093 increase in first-year college GPA, accounting for 24.6% of variation within the full sample of women ($N = 41{,}807$). While findings from models using raw measures of high school GPA do show larger effect sizes, results from models examining the relationship between contextualized high school GPA and college GPA show similar levels of significance and comparable effect sizes. On average, a 1 *SD* increase in contextualized high school GPA is associated with a 0.605 increase in first-year college GPA, accounting for 20.0% of variation

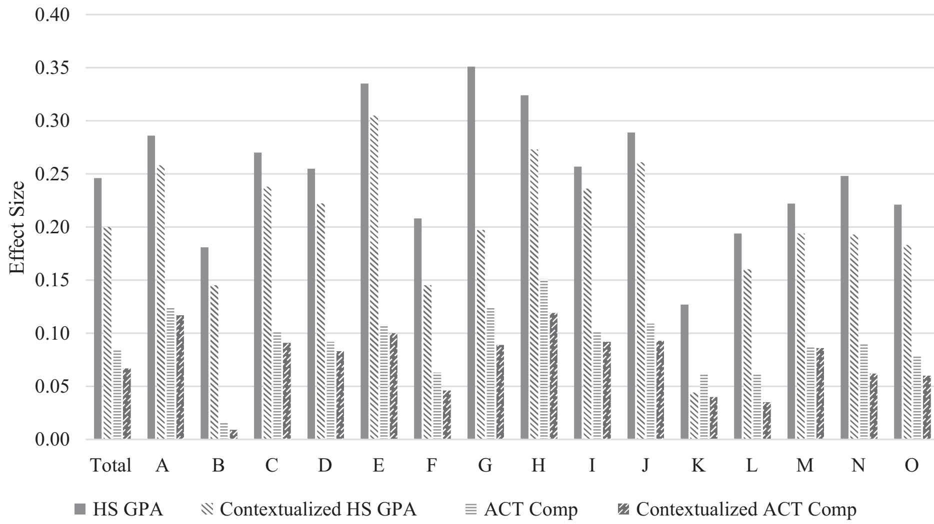
Table 8
Women: Odds Ratios and Effect Sizes for High School GPA/ACT Variables and 4-Year College Graduation

		HS GPA		Contextualized HS GPA			ACT composite		Contextualized ACT composite	
Institution	*N*	Odds ratio	Effect size	Odds ratio	Effect size	*N*	Odds ratio	Effect size	Odds ratio	Effect size
Total	27,731	1.194***	0.074	3.177***	0.063	27,699	1.011***	0.029	1.600***	0.025
A	3,181	1.194***	0.109	3.522***	0.098	3,176	1.012***	0.039	1.732***	0.041
B	1,921	1.228***	0.086	3.622***	0.07	1,920	1.015***	0.041	1.797***	0.032
C	1,390	1.198***	0.125	3.626***	0.107	1,387	1.015***	0.056	1.876***	0.052
D	3,556	1.204***	0.074	3.615***	0.072	3,555	1.010***	0.024	1.568***	0.024
E	326	1.216***	0.096	4.840***	0.106	325	1.016***	0.054	1.988***	0.052
F	4,996	1.170***	0.037	2.517***	0.032	4,991	1.003**	0.002	1.139**	0.002
G	399	1.279***	0.079	4.768***	0.069	399	1.014***	0.044	1.921***	0.046
H	1.066	1.238***	0.153	4.183***	0.131	1,066	1.018***	0.081	2.219***	0.074
I	1,952	1.173***	0.082	3.077***	0.073	1,949	1.012***	0.043	1.756***	0.041
J	1,258	1.251***	0.11	4.702***	0.094	1,256	1.021***	0.087	2.361***	0.071
K	2,591	1.390***	0.04	2.790***	0.015	2,589	1.011***	0.014	1.483***	0.010
L	592	1.239***	0.067	3.487***	0.052	592	1.015***	0.046	1.733***	0.031
M	693	1.096***	0.013	1.770**	0.01	692	1.007*	0.006	1.287	0.004
N	1,844	1.210***	0.097	2.812***	0.061	1,838	1.017***	0.059	1.795***	0.037
O	1,931	1.134***	0.054	2.713***	0.059	1,929	1.008***	0.016	1.477***	0.018

Note. Each odds ratio/effect size represents an individual logistic regression model with all covariates and fixed effects. GPA = grade point average; HS GPA = high school grade point average.
$^{*} p < .05$. $^{**} p < .01$. $^{***} p < .001$.

Figure 4

Women: Effect Sizes for High School GPA and ACT Composite on First-Year College GPA



Note. GPA = grade point average; HS GPA = high school grade point average.

within the women sample. As is the case in our analyses with other aforementioned subsamples, the relationship between college GPA and ACT-related measures seems weaker compared to high school GPA-related measures—with contextualized ACT scores showing slightly smaller but still comparable effect sizes when compared to raw ACT scores. Similar to findings for Pell recipients, effect sizes associated with curriculum rigor variables are smaller than those associated with high school GPA and ACT composite scores for women. Of all the three subjects, both raw and contextualized math levels have the most consistently significant association across all institutions (Supplemental Tables A7–A9).

College Persistence

Findings for models predicting college graduation in 4 years are similar to those obtained for aforementioned subsamples. As shown in Table 8, compared to ACT measures, high school GPA-related variables—whether raw or contextualized—have a stronger association with a woman's odds of graduation. On average, a 0.1-point increase in raw high school GPA is associated with 19.4% higher odds of graduating within 4 years, accounting for 7.4% of the variation in graduation rate. If a student's high school GPA is one standard deviation above their own high school's median GPA, the student's odds of 4-year graduation are 2.2 times higher, accounting for an estimated 6.3% of variation. ACT scores both raw and contextualized, while generally showing a statistically significant, positive relationship with 4-year graduation across institutions in our sample, again showed much smaller effect sizes compared to high school GPA-related measures.

In contrast to our results for college GPA and 4-year graduation, results for first-year college retention showed much more mixed results (Supplemental Tables A10 and A11). While high school GPA and ACT-related variables do generally show positive relationships with first-year retention across our sample of institutions, effect sizes are minimal, or do not consistently associated with retention across all institutions (especially for ACT-related variables).

General Trends Across Subsamples

Our analyses support that contextualized measures of high school performance are positively associated with college success, and that these findings are true across our Pell recipient, underrepresented students of color, and women subsamples. Moreover, our variables of interest exhibit a clear hierarchy in the strength and consistency of association with various college success outcomes: across all three subsamples, measures related to high school GPA display the strongest relationship.

Another interesting trend across the three subsamples is that all variables of students' high school performance are more strongly associated with college persistence as students progressed into their college careers: the strength of the relationship between high school performance and college success is comparatively stronger for graduation within 4 years, while it is weaker for first-year retention. Trends also show that in general, contextualized measures of high school performance may be useful at a broader range of institutions, as opposed to only highly selective institutions, across all three student subsamples.

Discussion and Implications

Our findings show that both raw and contextualized high school GPA appear to have the strongest association with first-year college GPA, retention after the first year, and graduation within 4 years, across all three of our subsamples. Although both raw and contextualized ACT scores are associated with first-year GPA for Pell recipients and women, findings are more mixed for underrepresented students of color: Contextualized scores do not show a consistently significant, positive relationship with 4-year graduation across institutions in this sample.

While a growing number of studies have thrown light on how incorporating contextualized measures of high school performance may benefit traditionally underrepresented students at the college admissions stage (Bastedo et al., 2019, 2022; Gaertner & Hart, 2013), not much empirical evidence has been available on how such contextualized measures of high school performance relate to traditionally underrepresented students' performance in college after they are admitted. While the coefficients and effect sizes obtained for contextualized measures of high school performance tend to be smaller than those obtained for their raw counterparts across all our subgroup analyses, caution should be exercised before jumping to the conclusion that raw measures are more useful than contextualized measures. As Sawyer (2013) explains, the usefulness of a selection variable for college admissions indeed is decided by its relationship with desirable college outcomes—but also ultimately depends on what admissions offices are aiming to achieve. While admissions officers certainly aim to enroll high-achieving students, their goal is not always to identify and admit those students who show the strongest correlations with maximum academic success—whether defined as the highest college GPAs or the fastest time-to-degree; rather, depending on their institutional mission, admissions officers make active efforts to—if not even prioritize—identifying and admitting applicants who they believe will benefit by attending their institution, not to mention benefit others by helping build a more diverse campus environment (Cheslock & Kroc, 2012; DesJardins & Bell, 2006; Sawyer, 2013). Although these two goals may seem similar, they are not completely identical (Sawyer, 2013). The former goal—maximizing academic success among enrolled students—would lend weight to selecting students based on raw measures of high school performance, as these display higher correlations with various indicators of college success; the latter goal—identifying applicants who can benefit from attending an institution—would lend weight to admitting students using not only raw but also contextualized measures, as they reflect important information on the high school and family background in which students obtained their various achievements that are absent in raw measures. This perspective is particularly important to keep in mind when analyzing our findings on low-income, underrepresented students of color, and women. These student subgroups are unfairly placed at a disadvantage if evaluated out of context, despite having faced years of systematic, differential access to high-quality educational opportunities (Iatarola et al., 2011; McDonough, 2005; Perna et al., 2015). And alternatives to contextualized holistic review, such as lotteries, yield enormous disparities in admission for students of color (D. J. Baker & Bastedo, 2022). Our findings suggest that using contextualized measures of high school performance in admissions decisions alongside raw measures has added value for institutions seeking to admit a diverse pool of students who have the potential to, and ultimately will, benefit from college education.

These are timely results, as evolving changes in college admissions policies necessitate a more nuanced understanding of contextualized holistic review. As an outgrowth of the COVID-19 pandemic, many selective institutions no longer require applicants to submit standardized test scores—instead allowing those students who wished to submit their scores to do so, a practice known as "test-optional." Harvard College has extended this practice through at least 2026 (Anderson, 2021), while the Massachusetts Institute of Technology will require test scores from Fall 2022 (Anderson, 2022), and the University of California system has abolished the use of standardized tests completely (Watanabe, 2021). Still, researchers considering test-optional policies introduced before the pandemic found that while adoption does increase applications from low-income students and underrepresented students of color, they do not significantly alter the SES makeup of incoming classes (Belasco et al., 2015; Bennett, 2022; Rosinger et al., 2019; Rubin & González-Canché, 2019), leading Bennett (2022) to conclude that colleges cannot solely rely upon test-optional policies to diversify their campuses, and admissions officer diversity may be crucial as well (Bowman & Bastedo, 2018). This study demonstrates that using holistic, contextualized measures of high school performance may serve as an alternative measure.

Our findings also present important implications in light of the looming possibility that the Supreme Court may strike down the use of affirmative action in college admissions. In January 2022, the Supreme Court agreed to take up two cases—one against Harvard University and the other against the University of North Carolina—that could potentially result in the Court reversing its consistent support for race-conscious admissions over the past few decades (Liptak & Hartocollis, 2022). If this scenario unfolds, higher education institutions across the country would be prohibited from taking into account race/ethnicity in their admissions processes. This prospect has understandably elicited alarm among higher education leaders, who are trying to determine ways to maintain diversity on college campuses without incorporating race/ethnicity as a factor in admissions (Krantz, 2022). Our study findings suggest that using contextualized measures of high school performance—as opposed to merely raw measures—will help admissions officers identify traditionally underrepresented students, particularly students of color, who have the academic potential to succeed in college upon being admitted. In the case, that the Supreme Court bans the use of race-conscious admissions, using contextualized measures of high school performance may become more pervasive as colleges seek out fair and equitable means of evaluation within the legal limitations placed upon them by the Court.

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