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Using Research to Improve College Readiness: A Research Partnership Between the Los Angeles Unified School District and the Los Angeles Education Research Institute

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Abstract

The Los Angeles Unified School District (LAUSD) serves a large majority of socioeconomically disadvantaged students who are struggling academically and are underprepared for high school graduation and college. This article describes the partnership between LAUSD and the Los Angeles Education Research Institute, and how this collaboration endeavors to produce accessible and high-quality research to inform pressing problems of practice. The article also presents findings from an ongoing partnership research project analyzing a district policy focused on improving college readiness by aligning high school graduation and college-eligibility requirements. In a cohort that went through high school before the policy became mandatory for all students, less than 1/5 of all students (and 30% of graduates) met the college eligibility criteria. Our findings indicate that academic and behavioral indicators from 8th and 9th grade can help identify for possible intervention students who are not on track to meet these new graduation requirements.

The Los Angeles Education Research Institute (LAERI) is a community organization that connects high-quality research with policy and practice to improve education throughout Los Angeles County, with the Los Angeles Unified School District (LAUSD) as its first partner. As the second largest school district in the country, LAUSD faces the challenge of extreme size (roughly 650,000 students, serving over 42% of Los Angeles County students and 10% of the state's student population), as well as the complexity of meeting the needs of a diverse student body. A large majority of students are socioeconomically disadvantaged, with 77% qualifying for free or reduced-price meals (California Department of Education, 2014d). The district serves a student population just under 75% Latino or Latina, and almost 10% African American. Many students do not come to school proficient in English, with one of four students identified as an English language learner (EL). Almost all ELs (93%) speak Spanish, but the remaining 7% collectively speak over 50 additional home languages (California Department of Education, 2014c). About 13% of students are identified for special education services (California Department of Education, 2014f).

Within this context, only about half of the district's students met or exceeded the state's math and English language arts proficiency standards in 2012–2013, and the district graduated 68% of that year's cohort, according to the state's 4-year adjusted cohort graduation rate (California Department of Education, 2014a, 2014b). This graduation rate is lower than that of several other urban districts in the state (San Diego, Long Beach, San Jose, and San Francisco), which graduate approximately 80% or just above, but comparable to Oakland's (63%).

As an indicator of the district's performance in preparing students to apply to college, a higher percentage of LAUSD students take the SAT than in Los Angeles (LA) County or across the state (53% in LAUSD, 45% in LA County, and 39% in California). However, only 23% of LAUSD students scored 1500 or higher on the test, compared with 38% of students in LA County and 47% statewide (California Department of Education, 2014e). Despite these challenges for high school graduation and college access, about two-thirds of LAUSD high school students report that they plan to graduate from a 4-year college or earn a graduate degree (LAUSD, 2013).

Addressing the needs of such a diverse population requires the collaboration of many community partners. The partnership between LAUSD and LAERI is unique among Los Angeles collaborations because it strives to inform policy and improve practice by infusing rigorous, nonpartisan research throughout the decision-making process, to close the achievement gap and improve students' future life chances. The partnership's distinctive focus is on bringing scholarship to bear on targeted problems of practice while working together with the district to ensure that findings are understood, are discussed, and generate relevant implications for action. A starting point for our partnership work has been to identify key points in a student's academic career during which practitioners can intervene to interrupt the trajectory of students who are found to be at risk of not graduating or not meeting college-eligibility requirements.

We begin by describing the LAERI–LAUSD partnership. We then present an example of an ongoing partnership research project that began with descriptive and predictive analyses to inform the implementation of a crucial new district policy designed to improve college readiness by aligning high school graduation and college-eligibility requirements. Over time, this project has evolved into a broader and more collaborative effort to learn about, improve upon, and extend LAUSD’s early warning indicator (EWI) system and its use for intervention purposes in the district. We conclude with limitations of the partnership and the research, future directions for the partnership research, and ways in which we plan to ensure that the future work is of use.

THE LAERI–LAUSD PARTNERSHIP

The LAERI–LAUSD partnership began several years ago with the goal of informing policy, transforming practice, and improving student outcomes through rigorous research. Arising from a growing tradition of place-based, applied research organizations, LAERI partners with LAUSD to design and conduct research in the service of improving practice. Although place-based research organizations around the country vary in their organizational models, each partners with a local district or districts to hold improvement at the center of the work, and to produce accessible, relevant, and high quality research that will be used to change practice.

LAERI’s organizational structures, and the strategies in place to facilitate the partnership work, derive from lessons learned from the literature on research use, the experiences of longstanding place-based research organizations like the Chicago Consortium on School Research (CCSR; Roderick, Easton, & Sebring, 2009), and our own experiences doing applied education research. The LAERI–LAUSD partnership aims to reduce the divide between researchers and decision makers because we see that divide as a critical—but surmountable—barrier to research use (Yamashiro & Phillips, 2012).

Overcoming Barriers to Research Use: At the Core of the Partnership Work

Developing a partnership between researchers and practitioners, where the end goal is for the research to be useful for improvement purposes, requires that we strive to address the barriers to use that we know exist. Challenges to research use are many. Decision makers may lack the time, the organizational will, or the capacity to support the incorporation of research into action (Caplan, 1979; Weiss, 1978). Decision makers may find practitioners’ knowledge and personal observations more attractive than research for informing action (Honig & Coburn, 2008; Lindblom & Cohen, 1979). The endorsement of research by trusted organizations or colleagues can be more influential than the rigor of the research (Nelson, Leffler, & Hansen, 2009). And research may not be relevant to decision makers’ interests or presented in an accessible language or format (Honig & Coburn, 2008; Weiss, Murphy-Graham, & Birkeland, 2005). Lack of use can also result from research that is flawed, is inconclusive, conflicts with other findings, or is insufficiently timely.

When research *is* used, it is still subject to adaptation to the local context, and interpretation through social processes, including iterative dialogue and debate among individuals; collective understandings among groups of colleagues; and endorsement or interpretation by

professional organizations, intermediaries, or interest groups (Honig & Coburn, 2008; Kennedy, 1984; Lindblom & Cohen, 1979; Nelson et al., 2009; Weiss, 1978).

To optimize the opportunities for research to be used by practitioners, this research partnership is designed to weave together the social networks of decision makers and researchers, to help build collective knowledge, while also engaging in research that has high potential to be accessible to decision-makers and relevant to their needs (Yamashiro & Phillips, 2012).

Cultivating a Productive Partnership for Increased Use

We believe that cultivating a productive partnership hinges on building trusting relationships through increased opportunities for dialogue about research, and through purposeful actions to ensure that the research is useful and relevant. In this section, we describe the strategies we employ to foster a trusting and productive relationship, to improve the chances that research will be used to inform practice.

Facilitating Social Interaction Around Research—As CCSR researchers have learned, results “... need to be heard in multiple ways over time if practitioners are to understand the findings, connect them to problems they face in their own work, and integrate that knowledge into how they do their work in schools. This takes time, and it requires that practitioners interact around findings with researchers and their colleagues,” (Roderick et al., 2009, p. 13).

Because research use depends so much on social interaction, the LAERI–LAUSD partnership employs several strategies that focus on ways to engage practitioners and integrate research into decision making.

Facilitate dialogue around key research questions and build capacity: LAERI and LAUSD generate possible research foci together through conversations between researchers and practitioners. For example, initially, LAERI conducted a series of needs-scanning interviews with key department leads to gather information about what kinds of research would help district leaders better support schools and teachers in their core work. The research questions identified through this process have been used to guide some discussions in monthly meetings of the district’s Research Priorities Committee, and were gathered with the intent of aligning future research to district needs. In addition, the initial research projects of the partnership were informed by questions that arose from these needs.

Moreover, partnerships like ours have to go beyond traditional research roles and participate in capacity building (Roderick et al., 2009). To build capacity locally, the LAERI–LAUSD partnership has begun to host research methods workshops for internal district groups to familiarize district research and program staff with different methods for evaluating programs.

Convene research discussion groups or public symposia: LAERI partners with the district to convene smaller, internal discussion groups and larger, public symposia on specific topics or research projects. Internal discussion groups typically include content or

area experts (e.g., math coordinators) or a mix of district personnel (e.g., curriculum and instruction leaders and staff from the research office).

External research symposia are designed to include a diverse set of stakeholders, including community-based organizations, policymakers, funders, district and school personnel, and researchers, to create opportunities for stakeholders to engage in a social and collective sense-making process. For example, in 2013, LAERI cohosted a research symposium to highlight the Harvard Strategic Data Project's diagnostic analyses on high school graduation and college readiness in LAUSD (Center for Education Policy Research, 2013). This symposium laid the groundwork for the body of college preparedness analyses that our LAERI-LAUSD partnership continues to pursue, and is also an example of the role that the partnership can play in coordinating external researchers so that implications from research conducted in the district become part of the local dialogue. Overall, our experiences bear out the lessons learned from recent studies of research use: that ongoing local conversations about research, involving representatives of diverse perspectives, can build local ownership of the research, thus increasing the likelihood that research will be used and will be seen as coming from a source of credible evidence (see, e.g., Honig & Coburn, 2008; Nelson et al., 2009).

Integrate practitioner viewpoints throughout the process: LAERI and LAUSD maintain open lines of communication about partnership work through monthly update meetings and through LAERI's participation in the district's monthly meetings of the Research Priorities Committee. In addition, LAERI has been building two organizational mechanisms for integrating practitioner viewpoints: a stakeholder advisory board and a panel of practitioner affiliates. LAERI's Stakeholder Advisory Board is a representative group of community, civic, district, union and association, business, and higher education stakeholders that aims to encourage public dialogue about research findings and ensure that results are relevant and accessible. The Practitioner Affiliates Panel enlists the help of school staff members to suggest research questions and review research products for relevance and accessibility.

Creating a Cumulative and Intentional Research Agenda—Bryk, Gomez, and Grunow (2011) criticize the lack of “intentional action that cumulates in coherent solutions to complex problems” (p. 10) in the research and development field. LAERI takes up this challenge as an organizational goal, because we believe that linking research to the development and improvement of solutions in the district is critical to improving student outcomes.

Through the partnership, LAERI has built a longitudinal archive of student demographic, program, course-taking, test score, grade, attendance, discipline, and survey data. Recognizing that education occurs in contexts beyond school, and that other contexts influence students' educational success, we seek to eventually link data from preschool through college and the workforce, and from other sectors (e.g., health, social welfare, criminal justice), similar to other more comprehensive data archives that link across sectors, such as the one managed by the John W. Gardner Center for Youth and Their Communities (London & Gurantz, 2010). As in Chicago, the data archive provides the foundation to promote coherence and accumulated learning across research studies, years, and contexts; to

conduct longitudinal studies evaluating shifts in policy and practice; and to build the analytic capacity of the community (Roderick et al., 2009). Building from analyses of the archive, the LAERI–LAUSD partnership intends to go beyond the administrative data to measure and study school and classroom practices, to identify, develop, evaluate, and refine strategies for improving student success.

The research we describe in this article is an example of a project that began with a question facing the district about students' preparation for college eligibility, and intentionally evolved over time to become increasingly tailored to district needs, and to address a broader question about the district's EWI system and how schools may be using the system to target interventions. We anticipate that future research will build on these initial analyses by delving more deeply into contextual supports within schools, classrooms, and after-school programs, and identifying effective intervention practices that could be scaled.

DEVELOPING A COLLABORATIVE, IMPROVEMENT RESEARCH STRAND: STUDYING INCREASED GRADUATION REQUIREMENTS AND EWI SYSTEMS

When LAERI interviewed district leaders to better understand research needs throughout the district, three main research priorities emerged for the LAERI–LAUSD partnership: (a) early elementary intervention; (b) understanding the effect of different algebra pathways (e.g., algebra in eighth grade); and (c) examining the implementation of universal college eligibility requirements for high school graduation, called LAUSD's A–G policy. A large body of research suggests that the education developmental process begins well before students start formal schooling (e.g., Duncan & Magnuson, 2011; Phillips, 2011) and that educational transitions may be particularly important moments for intervention (e.g., Alspaugh, 1998; Eccles et al., 1993). Thus, we chose these three initial areas, with an eye toward focusing on each of the major school levels and transitions, and with the hope of ultimately informing interventions in these areas.

LAUSD's Shift to College Eligibility Requirements for Graduation: The A–G Policy

In California, for students to be eligible for admission to a 4-year public college or university, students must pass (with a *C* or better) a minimum set of 15 year-long, college-approved courses. These minimum course requirements are referred to as the *A–G Requirements*, because the courses are categorized under letters—*A* includes history and social science courses; *B* includes English and language arts courses; *C* includes mathematics courses; and so on to *G* (University of California, n.d.).

In 2005, the LAUSD Board of Education approved a resolution to align the high school curriculum with the A–G course eligibility requirements. This policy shift, which fundamentally changes the meaning of a high school diploma, was intended to advance educational equity by providing universal access to a college-preparatory curriculum, thereby expanding students' access to postsecondary opportunities (LAUSD Board of Education, 2005).¹

To phase in these new requirements as part of LAUSD's high school graduation criteria, students in the class of 2016 were required to pass A–G courses with a *D* or better. The class of 2017 (i.e., students who began ninth grade in fall 2013) is the first class required to pass the A–G requirements with a *C* or better to graduate from high school. The implementation of this policy in LAUSD may have both the intended consequence of increasing access to college-preparatory curriculum and some potentially worrisome unintended consequences, such as a smaller percentage of students earning a high school diploma—because the standard is set much higher— or teachers changing their grading practices to help students pass the newly required courses.

Prior A–G and EWI Work in LAUSD and Our Partnership's Research Questions

Because this policy shift was so important to the district and held the potential for both positive and negative results, LAERI and LAUSD's interests converged around the use of research to understand the implementation of the A–G policy and how best to prepare students for high school graduation under the new requirements. LAUSD's efforts thus far had focused on dropout recovery and students earning enough credits to graduate. The district's internal performance-management unit staff members were tasked with producing analyses quickly enough to inform immediate next steps for district schools. LAUSD perceived the partnership with LAERI as an opportunity for LAERI to provide more in-depth analyses to assist the district in identifying predictors of college readiness. Because LAERI's goal is to provide rigorous and useful research on topics critical to improving students' education success, the A–G topic was well-aligned with LAERI's mission.

We started our examination of the LAUSD A–G policy by building from recent analyses of A–G completion rates in LAUSD for an earlier cohort (Center for Education Policy Research, 2013) and in another southern California school district (Betts et al., 2013). We also examined other studies that used longitudinal LAUSD data to predict high school graduation (Center for Education Policy Research, 2013; Silver et al., 2008).²

Our analyses used data from a recent class in the LAERI dataset (class of 2012) to describe the degree to which this class would have succeeded in meeting the requirements to which the class of 2017 is held.³ We also identified the school subjects that seemed to pose the largest barriers to A–G completion by describing the percentage of students who fell one, two, three, or more semesters short of the A–G requirements by subject or category. Specifically, we posed the following descriptive research questions:

1. What percentage of students completed their A–G requirements on time (i.e., 4 years after beginning ninth grade)?

¹Aligning high school curriculum with college eligibility has become increasingly popular in other districts across the state (see Betts, Zau, & Bachofer, 2013) and in other states around the country (see Achieve, Inc., 2007).

²Using data on first-time ninth graders in 2001–2002, Silver, Saunders, and Zarate (2008) found that course failures and Algebra I completion were especially important predictors of on-time high school graduation. Similarly, using data on first-time ninth graders in 2007–2008, researchers from the Strategic Data Project found that English language arts standardized test scores from eighth grade predicted high school graduation (Center for Education Policy Research, 2013).

³Although the class of 2012 graduated prior to the new requirement being implemented, schools were still expected to provide all students access to A–G courses at this time; thus, this cohort shows the A–G completion rate before consequences (i.e., students not graduating) were phased in for A–G coursework.

2. How large were the disparities in A–G completion among students from various subgroups?
3. Were particular school subjects (e.g., math or science) more likely to be barriers to A–G completion than others?

Following these descriptive analyses, and ongoing internal dialogue at the district focusing on how best to support schools in improving students' access to and success in A–G courses, the district became very concerned with earlier identification of students who are unlikely to complete the A–G requirements. The research partnership expanded the scope of inquiry to the academic and behavioral precursors in eighth or ninth grade to completing the A–G curriculum. In particular, we wanted to know the extent to which we could accurately identify eighth or ninth graders who were unlikely to complete their A–G requirements, to facilitate earlier school and district interventions for helping such students complete those requirements in time to graduate.

Specifically, our partnership developed the following research questions about predictors of A–G completion:

1. Which eighth-grade measures are predictive enough of A–G completion that they could be used to identify students for intervention during the summer prior to ninth grade?
2. Is information that is available by the end of the first semester of ninth grade as predictive as annual ninth-grade information, so that high school staff members could get an earlier start on identifying students for intervention?
3. Which annual ninth-grade indicators best predict which students will complete their A–G requirements on time?

The development of these research questions and planning for the analyses was informed by numerous conversations among partnership members about LAUSD's A–G discussions at the leadership level and the ways in which LAUSD has used EWIs and predictive analytic methods historically. For example, analysts from the district's data and performance management units have explored EWIs for 4-year on-track graduation, drop out, A–G completion, and other measures of college readiness (Chen, 2012; Delnavaz, 2014). Moreover, the district has been closely examining progress in implementing the A–G policy through careful descriptive analyses in their *performance dialogue* meetings, and that work suggested important predictive indicators to consider in future analyses. In addition, the district's existing data reporting tool, MyData, which produces *elementary alerts*, *secondary alerts*, and *early warning reports*, also informed the partnership work by providing a series of indicators to include in the analyses, to investigate their relative usefulness in predicting A–G completion (LAUSD, 2014a).

Lessons Learned From Early Warning Indicator Research Across the Country

Our partnership's decisions about what measures to include in our predictive analyses also drew on the extensive literature about EWIs and on-track indicators (see, e.g., Allensworth, 2013; Balfanz et al., 2007; Gleason & Dynarski, 2002; Hauser & Koenig, 2011). EWIs seek

to identify, early on, students who are at risk of not achieving certain milestones, so that school personnel are able to intervene earlier to support struggling students. Ideal indicators predict outcomes with a reasonable degree of accuracy and focus attention on actionable problems that are within the school's control (Allensworth, 2013). For example, researchers at CCSR developed a simple on-track indicator to predict high school graduation in the Chicago Public School System (Allensworth & Easton, 2005). This indicator defined a student as on track at the end of freshman year if that student passed enough courses to be promoted to the 10th grade and had no more than one *F* in a core subject (Allensworth & Easton, 2005). This indicator, by itself, predicted high school graduation with 80% accuracy; adding family background variables to the model increased the accuracy by only 1%.⁴

Given that ninth grade is relatively late to intervene in a student's trajectory, researchers have also explored the predictive relationships between middle school indicators and future high school outcomes. For example, Balfanz et al. (2007) found that sixth-grade measures of attendance, behavior, and course failures could identify 60% of students who failed to graduate from high school.

Although the literature on EWIs has been growing, most of this literature focuses on predicting high school graduation (or drop out) rather than college readiness. Predicting college readiness with a reasonable degree of accuracy may require different predictors than are typically used in the EWI literature or different thresholds for similar predictors.⁵ Although we draw heavily on the existing literature in the field, the development of our partnership's models for college readiness based on LAUSD data is supported by research that suggests that districts should use empirically created indicators, based on longitudinal data from the local context, because predictors and thresholds (i.e., cut points defining each predictor) can vary substantially across subpopulations and locales and because involving stakeholders in the development of EWI models can increase their relevance and utility (Bruce, Bridgeland, Fox, & Balfanz, 2011).

Methods

In this section, we describe the sample, measures, and analyses used in our descriptive and predictive examination of A–G completion in LAUSD. LAERI researchers conducted the analyses; iterative conversations and feedback between district and researcher partners shaped our sample and measurement development and the types of analyses we conducted.

Sample—To address the partnership's research questions, LAERI analyzed student-level, longitudinal data from the population of LAUSD students who were ninth graders in the fall of 2008–2009. After discussions with LAUSD staff members, we focused on two distinct analytic samples. The *all-students* sample includes all students who: (a) were first-time ninth graders in LAUSD in 2008–2009,⁶ (b) did not transfer to a nondistrict school before the end

⁴In New York, Kemple, Segeritz, and Stephenson (2013) found that a somewhat similar indicator signifying the accumulation of at least 10 credits and one or more Regents exams passed by the end of ninth grade correctly predicted high school graduation in 4 years roughly 79% of the time.

⁵Predicting college readiness well may also require measuring factors, such as college knowledge, that are less likely to exist in administrative data sets (Kless, Soland, & Santiago, 2013).

of the 2011–2012⁷ school year, and (c) would have been subject to the 2017 graduation requirements had they been first-time ninth graders in 2013–2014.⁸ Our *graduates* sample is a subset of the all-students sample. The graduates sample includes only students who had course data for all eight semesters and who graduated from an LAUSD school.⁹ This graduates sample represents students who graduated under the district's previous graduation requirements and for whom we can most accurately calculate A–G completion because students' course records are available in each semester between the fall of ninth grade and the spring of 12th grade. Results for our predictive models are based on a consistent sample that excludes students who were missing on our academic and behavioral predictors.¹⁰

Table 1 describes these two samples, showing that three quarters of the students are Latino and about half have parents who did not complete any additional education beyond high school. Students in the graduates sample have higher eighth-grade test scores, are more likely to be girls and to be classified as gifted and talented, and are less likely to be classified as limited English proficient or special education.

Measures—For this article, we focus solely on the outcome of on-time A–G completion. We defined students as on-time A–G completers if, after eight semesters of high school, they had completed the 15 year-long courses required for admission to the University of California.¹¹ After describing A–G completion rates for our two samples, we used predictive models to estimate the association between students' academic and behavioral performance in eighth and ninth grade and students' chances of on-time A–G completion. Table 2 describes how we coded these academic and behavioral measures, all of which are based on LAUSD's administrative records.

⁶We defined first-time ninth graders as students who met two criteria: (a) They had a grade level of 9 in at least one of the following fall datasets in the 2008–2009 school year: norm fall demographics, end fall demographics, or end fall marks. When there were discrepancies in grade level among the datasets, we defined the student as a ninth grader if she was in grade 9 in two out of the three files. We also defined the student as a ninth grader if she was in grade 9 in one of the files but lacked data on grade level in the other two files. If the student had missing data in only one file, and conflicting grades in the other two files, we did not define the student as a ninth grader; and (b) They had a grade level lower than 9 in the 2007–2008 school year in the norm spring demographics file, the end spring demographics file, and the end spring marks file. If grade-level information was missing in any of these datasets, we still counted the student as a pre-ninth grader as long as the student's grade level was lower than 9 in the nonmissing data set. If the student was missing grade-level information in all these data sets but took an eighth-grade or lower California Standards tests in 2007–2008, we also defined the student as a pre-ninth grader in that year.

⁷We excluded students who transferred to a public school outside the district, to a private school (including home schooling), or who left California. We also excluded students who did not appear in any course marks file during any semester between 2008–2009 and 2011–2012.

⁸We excluded two subsets of students for whom the A–G requirements of the class of 2017 do not apply. These include EL 9th graders who scored at the lowest levels of English language proficiency (ELD 1 and 2) and students with disabilities who are on an alternative curriculum (we defined such students as those who were classified as special education and were enrolled in one of the alternate-curriculum ninth-grade courses listed in district policy documents; Aquino & Howell, 2013). Taken together, these excluded EL and disabled students constituted 3% of our initial all-students sample.

⁹We defined graduates as those students with a leave code, assigned by the district, that indicated that they left because they graduated. For the subset of graduates for whom we also had specific reason codes (i.e., reasons why they left), we followed LAUSD's operational rules, excluding students who received a certificate of completion, passed the California proficiency exam, earned a GED, or were a special-education prior completer.

¹⁰To limit the number of students dropped from the sample, the predictive models include missing data dummies for students who are missing eighth-grade English or math standardized test scores. The models also include missing data dummies for students who are missing any of the demographic variables. In total, we lost 1,383 students from the all-students sample when we estimated our predictive models. This remaining predictive sample had an A–G completion rate that is only 0.6 percentage points higher than that of the all-students sample.

¹¹The results we present in this article are based on University of California A–G completion rules, but results based on California State University A–G completion rules hardly differ. Certain A–G designations allow for validation, in which students receive credit for an A–G course either by passing a test or by passing a more advanced course. The LAERI data archive does not account for validation through test taking or passage, but our A–G completion calculations do take into account validation through course work.

We selected measures for consideration in our predictive models if they met one of several criteria. First, we constructed measures that had been shown in prior EWI and on-track literature to predict high school graduation or dropout. For example, we constructed a version of the Consortium on Chicago School Research's "Freshman On-Track Indicator," because that indicator has been widely used and may have led to improvements in graduation rates in Chicago (see, e.g., Allensworth, 2013; Roderick, Kelley-Kemple, Johnson, & Beechum, 2014). Similarly, we considered measures of course failure, attendance, and behavior (including behavioral marks and suspension) because such measures have been prominent in EWI work conducted by Robert Balfanz and his colleagues (e.g., Balfanz et al., 2007; Mac Iver, Balfanz, & Byrnes, 2009; Neild & Balfanz, 2006).

Second, we constructed measures mirroring those that currently serve as "alerts" in the LAUSD MyData system, which are intended to identify students for "early and intensive interventions and supports" (LAUSD, 2014b. 1). These measures include whether students had received one or more failing marks in a core academic class in the most recent reporting period; had received three or more unsatisfactory marks for work effort or two or more for cooperation; had a cumulative GPA of 1.5 or below; had an attendance rate of 90% or below; or had been suspended at least once.

Third, we constructed a measure to mirror one that LAUSD has begun using in their internal performance dialogues as an assumed predictor of A–G completion. We refer to this measure as *LAUSD on track for A–G completion*, and it measures the completion of three A–G courses with a *C* or better, including English and math, during ninth grade. And, fourth, we constructed measures with higher academic performance thresholds, such as completing at least four A–G courses, completing key A–G courses with *Bs* rather than *Cs*, or earning a relatively high overall GPA, because we hypothesized that these indicators might be more successful at identifying students who are likely to complete A–G. In addition, we considered continuous measures of performance and behavior for inclusion in our multivariate predictive models.

Analysis—We began by using contingency tables, along with chi-squared statistics, to assess the association between each of our dichotomous predictors and A–G completion. Contingency tables have the advantage of being easy to understand and are thus appealing in the context of a school district. We follow the large literature in medicine and epidemiology (e.g., Loog, 2003; Swet, 1988; Vecchio, 1966) as well as the more recent education literature (e.g., Allensworth, 2013; Bowers, Sprott, & Taff, 2013; Kemple et al., 2013) and calculate the predictive accuracy of each of these dichotomous measures for identifying individuals in need of intervention.

We then estimated multivariate logistic regressions with A–G completion as the outcome and both continuous and dichotomous predictors. We developed these predictive models on a random half of the data, beginning with models that included nonlinear terms for all the continuous variables, and winnowing out insignificant nonlinear terms first, and then insignificant main effects.¹² We then examined the predictive validity of these models for the random half of the data on which we had not developed the models.¹³ We also examined

the extent to which the models' predictive validity increased when we added students' standardized test scores from eighth grade or measures of students' family background.

Finally, we constructed a multivariate index called *at risk for A–G noncompletion* by dichotomizing the most predictive variables from prior models, based on cut-offs that best distinguished A–G completers from A–G noncompleters, summing those dichotomous variables, and combining adjacent categories that had similar A–G completion rates.¹⁴

Prediction is not, of course, causation. Although we focus on the predictive accuracy of potentially malleable academic and behavioral indicators, our models should not be taken as evidence that improving these on-track indicators would improve students' A–G completion rates. Next steps toward understanding the utility of these measures would involve evaluating the extent to which interventions intended to get more students on track also succeed at improving A–G completion.

Results

Table 3 describes A–G completion rates for our two first-time ninth-grade samples (i.e., all students and graduates). About 18% of students who began ninth grade in 2008–2009 had completed their A–G requirements 4 years later. This percentage is only slightly higher than the 16% of first-time ninth graders in 2007–2008 who completed their A–G requirements (Center for Education Policy Research, 2013). Of the first-time ninth graders in our sample who graduated from high school under the former graduation requirements, only 30% had also completed A–G requirements. This is only slightly higher than the 26% of the graduates from the 2007–2008 ninth-grade cohort who had completed their A–G requirements (Center for Education Policy Research, 2013).¹⁵ For LAUSD's A–G policy not to suppress graduation rates in the district, these percentages will need to increase very rapidly.¹⁶ Fortunately, some evidence suggests that the percentages of students on track for A–G completion have been increasing in recent cohorts (Delnavaz, 2014).

A–G completion rates in LAUSD are stratified by gender, ethnicity, socioeconomic status, EL status, and school program status (see Table 3). A–G completion is lower for boys than girls, for Latinos/as and African Americans relative to Whites and Asian Americans, for students whose parents did not graduate from college, for limited English proficient students, for students who are not classified as gifted and talented, for students who are classified as having a disability, and for students with relatively low eighth-grade math and

¹²We developed the models on a separate half of the data so that any overfitting would not bias predictive results based on the other half of the data. We retained variables that were statistically significant at the .10 level, with the standard errors adjusted for the clustering of students within high schools.

¹³We estimated the predicted probability that each student in this sample would complete A–G based on the model, coded students who had at least a 50% estimated chance of completing A–G as *predicted A–G completers*, and examined the predictive accuracy of these models by comparing predicted completion rates to actual completion rates.

¹⁴This approach to developing and combining flags has proved informative in early warning research on high school dropout (see, e.g., Balfanz, Herzog, & Mac Iver, 2007) and this index enabled us to incorporate a range of indicators transparently, which reflects and supports the district's desire to use empirically based, but simple, measures in their early warning system.

¹⁵Using school-level data for the same timeframe (freshmen in 2007–2008), Saunders, Ventura, and Flores-Valmonte (2013) found that close to one in five graduates completed A–G.

¹⁶The district's performance metric for 4-year cohort graduation rates was meant to increase each year and eventually get to 100%. In 2011–2012, the district reported a 64% 4-year cohort graduation rate, and set graduation rate targets for 2012–2013 and 2013–2014 at 68% and 70%, respectively (LAUSD, 2012).

reading test scores. Notably, however, A–G completion was rarely the norm for any subgroup, in part because the vast majority of the entire cohort did not complete the A–G requirements. Even among graduates who scored at the advanced level on the eighth-grade standardized tests, over 40% in the 2008–2009 cohort did not complete their A–G requirements.

Table 4 explores whether specific school subjects were more likely than others to pose barriers to A–G completion for graduates (those in the class of 2012 who graduated under the old graduation requirements). Panel A shows the percentage of graduates short of completing each requirement with at least a C. Graduates were most likely to fall short of completing their English (49%) requirement, which is unsurprising because A–G eligibility requires 4 years (or eight semesters) of English. They were also very likely to fall short of completing their math (42%), and science (40%) course requirements. Panel B shows the extent to which students in our sample failed to even enroll in the required A–G courses. Eleven percent of graduates did not enroll in Algebra II at all (they were two semesters short of the year-long requirement), about 7% fell two or more semesters short of their science requirement, and more than 6% were over a year short (3 or 4 semesters) of enrolling in a foreign language course.

Table 5 displays the predictive results for our dichotomous predictors, organized by predictor type. We show three statistics that we deemed most helpful for assessing predictive accuracy. First, following prior on-track research (e.g., Allensworth & Easton, 2007; Kemple et al., 2013), we report the percentage of students whom the predictor correctly classified as A–G completers or A–G noncompleters. We refer to this percentage as *% correct*. Second, we identified two groups of students whom we did not want the predictive indicator to classify incorrectly—or, more colloquially, whom we did not want the indicator to miss. Of the students who did not complete A–G, Group I (*percentage missed I*) is the percent the indicator mistakenly predicted would complete. And, of students whom the indicator flagged as “predicted A–G completers,” Group II (*percentage missed II*) is the percent that did not end up completing A–G.¹⁷ Students in both missed groups would be the students who would fall through the cracks if the district were to identify students for intervention based on a given predictive indicator because both groups of students did not complete A–G, even though the indicator suggested that they would. In short, an ideal predictive indicator from the standpoint of our partnership would be one that strikes a balance between correctly classifying a high percentage of students as either completers or noncompleters and misclassifying a low percentage of students as completers.

We gleaned three main results from the classification percentages in Table 5. First, although all the predictors were statistically significantly associated with A–G completion, we found that indicators that were accurate predictors of dropout or graduation in other studies were far less accurate predictors of A–G completion. For example, Chicago’s on-track-for-

¹⁷More formally, these three percentages correspond to (a) classification accuracy; (b) 1-sensitivity, where sensitivity is defined as the proportion of A–G noncompleters identified by the indicator as noncompleters; and (c) 1-negative predictive value, where negative predictive value is defined as the proportion of students predicted to complete who actually complete. Recent literature on EWIs has stressed the importance of using various metrics of accuracy to understand the trade-offs associated with indicators and to more explicitly prioritize limited resources for intervention (Bowers et al., 2013; Knowles, 2014).

graduation indicator, which is the first indicator in the table, correctly classified 80% of students in Chicago as high school graduates (Allensworth & Easton, 2005). Yet it is a much less accurate predictor of A–G completion in Los Angeles—correctly classifying only 54% of students. More than half (56%) of A–G noncompleters are mistakenly identified as completers by this indicator. And 71% of students identified as completers by this indicator did not end up completing. These results are not unexpected, given that completing an academically rigorous set of high school or college-preparatory courses and completing high school graduation requirements have historically reflected different levels of academic performance, in LAUSD and in districts throughout the country.

Second, we found that the indicator that LAUSD has been using to refer to students who are on track for A–G at the end of ninth grade—a measure that reflects whether students have completed at least three A–G courses, including math and English, with a *C* or better by the end of ninth grade—is a better predictor than Chicago’s of eventual A–G completion in LAUSD. It classifies 79% of students correctly, mistakenly classifies only 20% of noncompleters as completers, and a little over half of those it classifies as completers (54%) turn out to be noncompleters.

Third, we learned that indicators that set a higher threshold for academic performance, course taking, and behavior tend to be more accurate predictors of A–G completion. For example, an on-track indicator that incorporates completing at least four courses (including English and math) with a *C* or better correctly classifies 83% of students and mistakenly classifies only 11% of noncompleters as completers. This indicator can be an important signal to counselors and school personnel supporting students’ scheduling decisions that students should go beyond the LAUSD on-track A–G indicator of three A–G courses in ninth grade to complete a fourth A–G class. To take another example, an on-track indicator that identifies students if they have a *B+* average in their courses correctly classifies 85% of students and mistakenly classifies only 6% of noncompleters as completers. We are not suggesting that this type of indicator is useful as an intermediate outcome to encourage teachers to work toward, because it may seem too difficult to ensure that all students’ skills are at a *B+* average or better by the end of ninth grade. However, this type of indicator could be useful for identifying students who are likely to meet A–G requirements without additional intervention.

Finally, we found that although annual measures from ninth grade tend to be more accurate predictors of A–G completion than measures from the fall of ninth grade or from the end of eighth grade, these earlier measures can be reasonably accurate in predicting A–G completion and, for some indicators, nearly as accurate as the annual ninth-grade measures. For example, identifying students as on track by the end of eighth grade if they received a *B* in both eighth-grade English and math classifies nearly as many students correctly (81%) as the analogous measure of A–G English and math completion with a *B* by the end of ninth grade (84%). These results, which resemble those from prior research (e.g., Balfanz et al., 2007), suggest that high school administrators need not wait until students have entered ninth grade to identify, and support, students who are likely to be off track for A–G completion.

However, because none of these dichotomous predictors simultaneously incorporated all the academic and behavioral information available for LAUSD students at the end of eighth grade or later, we hypothesized that models that did not restrict predictors to be dichotomous and that incorporated more measures would lead to more accurate classification (see, e.g., Carl, Richardson, Cheng, Kim, & Meyer, 2013). Such models also allowed us to investigate the extent to which incorporating standardized test scores or students' family background improved prediction. Models that do not incorporate test scores are currently of interest to the school district because the district is between tests as of this writing, no longer administering the California Standards Tests and having recently adopted the Smarter Balanced Assessment Consortium tests, results from which are not yet available. In addition, models that are sufficiently predictive, independent of students' family background, emphasize potentially malleable academic and behavioral predictors rather than factors that are less easily influenced by schools, such as parents' education.

Table 6 shows the results from these multivariate models. Even more than in the models in Table 5, the multivariate models that incorporated information from only eighth grade, or from eighth grade and the fall of ninth grade, were nearly as predictive as the models that incorporated annual ninth-grade measures, with the percentages of students classified correctly differing by two percentage points at most. This table also shows that models that incorporated test scores or family background were only slightly more predictive than models that did not. And, perhaps most important, these multivariate models correctly classified 85% or more of the students; they mistakenly classified as on track only 6 to 7% of noncompleters, and a little over a third of those classified by these models as completers ended up as noncompleters, which reaches a healthier balance between correct classification and misclassification of completers than the dichotomous predictors in Table 5.

Despite the greater predictive accuracy of the logistic regression models, which stems from their incorporation of continuous, and multiple, predictors, predicted probabilities from these models would be more challenging to communicate to school and district staff. Predicted probabilities also mask the particular academic or behavioral challenges that are producing, say, low probabilities of A–G completion. Given the district's desire to use indicators that are easily explained, the partnership combined the advantages of the multivariate models with the advantages of the dichotomous predictors by creating an *at risk for A–G noncompletion* index based on students' eighth grade attendance, behavior, and course performance.

We created this index by first adding together eight of the most predictive dichotomous indicators from Table 5, drawn from three categories—attendance, behavior, and course performance—that have proven useful as early warning indicators for high school outcomes (Mac Iver & Messel, 2013). These eight predictors included having at least a 97% attendance rate; no *Us* (i.e., marks of “Unsatisfactory”) in work effort; no *Us* in cooperation; grades of *C* or better in at least four core academic courses; at least a *B* in English; at least a *B* in math; an *A* in English; and an *A* in math. We then assigned students to risk categories based on their number of on-track indicators. We classified students as *extreme risk* if they had zero to two on-track indicators, as *high risk* if they had three to four on-track indicators, as *medium risk* if they had five to six on-track indicators, and as *low(er) risk* if they had

seven to eight on-track indicators. We labeled this last risk category *low(er)* rather than *low* because students in this category still had a relatively high chance of A–G noncompletion.

Figure 1 shows that over three quarters of first-time ninth graders in the 2008–2009 cohort were at *high risk* (19%) or *extreme risk* (57%) for A–G noncompletion. Of the students flagged as having *extreme risk* based on their eighth-grade data, 95% did not end up completing A–G 4 years later (see Figure 2). Of those flagged as *high risk* in eighth grade, nearly 80% did not end up completing. In contrast, of those flagged as *low(er) risk*, 62% completed A–G on time. When we dichotomize the eighth-grade risk index by combining those in the medium, high, and extreme categories, we find that the index has a percentage correct rate of 83.2%, a percentage missed I rate of 4.4%, and a percentage missed II rate of 38.2%. These estimates of predictive accuracy improve on all but one of the measures in Table 5 and come close to the estimates in Table 6.

Not only is this index useful for predicting which students are unlikely to complete A–G in the absence of intervention, it is also relatively simple, as a count of dichotomous predictors, and could be easily displayed in a student-level report in conjunction with the individual indicators that compose it, to show school staff members the reasons behind each student's at-risk designation and to suggest areas in need of improvement. Moreover, this approach has the important advantage of building on the logic of LAUSD's existing data displays, which already help schools track student performance in multiple areas to identify those at risk of dropping out.

Opportunities, Challenges, and Limitations

This joint effort between LAUSD and LAERI led to a stronger understanding of student progress in secondary school. LAUSD learned that their current EWI system might have been good at predicting dropout or graduation status under old policies, but was not as accurate in predicting successful completion of A–G. The district also found LAERI's deeper examination of the EWI context helpful for shifting the focus away from dropout-related indicators used by the district to those more relevant to graduation and college readiness. Seeing the value of indicators that are empirically based, and noting the influence that indicators can have in discussions about intervention, also led the district to consider using measures at the end of eighth grade to identify students for intervention upon entry to high school. From LAERI's perspective, the district offered critical insight regarding the relevance of the research to practice. This perspective pushed LAERI researchers to spend more time thinking about how best to conduct and communicate this type of research so that it can be helpful to both district and school staffs. LAERI also benefited from communication with the school district about its rules for coding particular variables, and how to understand the district's data more generally.

Working in this partnership was not without its challenges, however. The timeframe for conducting these more comprehensive analyses was often longer than ideal for the district's decision-making processes. And LAERI continues to seek and develop ways to communicate the results that balance rigor and accessibility. LAERI also needed to adapt its planned analyses to reflect ongoing changes in district practice and priorities. Although this was a challenge to efficiency, the evolution and refinement of the work to match the

district's needs helped ensure that it would be useful. Finding ways to balance competing priorities, pressures, and timelines with the necessities of rigor was a constant challenge to which both parties had to commit. From both partnership organizations' perspectives, keeping track of emerging learnings and evolving events in each other's organizations could be difficult. Staying committed to regular meetings was a seemingly time-consuming, but necessary, mechanism for keeping communication lines open.

A crucial limitation of the analyses presented here is that they are based on only one cohort, and on a cohort that was not subject to the new A–G policy. Predictive analyses like these should always be validated on additional cohorts—and that validation process should be ongoing, even after particular indicators have been selected for inclusion in a district's early warning system, to ensure that the selected indicators maintain their predictive power. In this particular context, in which the A–G policy has affected only recent cohorts as the policy has been phased in, validating these predictive models on recent cohorts is especially critical because the associations between the academic and behavioral predictors of A–G completion may change as policy implementation continues.

Perhaps the most critical limitation of this work is that EWI or on-track indicator development is simply a first step along a much more complicated and important path that ideally will lead to the use of these indicators to change district and school practices in ways that improve students' academic outcomes. The development of predictive indicators may be a helpful or even necessary step toward increasing the efficiency and effectiveness with which the district and schools support children, but such indicators are insufficient for generating educational improvement.

FUTURE DIRECTIONS

Analyses conducted by the district, by other researchers, and now through this partnership have begun to shape a new body of work. And people at both the district and LAERI feel strongly that the partnership has contributed to deeper learning in both organizations. Currently, the district is planning to establish a working group to discuss EWIs of critical milestones throughout a student's career, to proactively guide educators in LAUSD to use EWI data in increasingly focused ways to support interventions.

This working group will examine some of the partnership's research findings about the existing EWIs used by the district.¹⁸ It will also discuss the inclusion of EWIs in various alert reports for schools or classrooms, and how indicators can be used for instructional improvement. Longer term, our partnership hopes to refine and develop tools for use by personnel at different levels of the system (e.g., interdisciplinary support teams at the school site). And, most importantly, we hope to study the use of these tools, the supports and interventions provided to students identified by the tools, and evaluate the effects on school practices and student outcomes.

¹⁸The district's current early-warning reporting system tracks changes in student performance over different time periods and across subject areas. The reports trigger a warning whenever a student's performance declines from one time period to the next. The *at-risk* report triggers an alert whenever student performance falls into a risk zone in one or more areas (LAUSD, 2014a).

To provide research that will support the EWI system and intervention needs, the team of LAUSD–LAERI researchers and practitioners identified this list of possible next steps:

- Examining more recent cohorts, to see whether predictive qualities of indicators change as the policy is phased in and as schools and the district act to support students' A–G success.
- Examining the extent to which the results hold across demographic and language proficiency groups, and for other college readiness outcomes, such as SAT and AP participation and scores.
- Extending the analysis to earlier grades (e.g., middle and elementary) to better understand how to target early intervention efforts.
- Studying high schools that consistently (i.e., across several cohorts) have higher or lower A–G completion rates than we would otherwise anticipate based on the academic and behavioral characteristics of students entering those schools, to better understand those schools' instructional and intervention supports.
- Expanding the current work by:
 - a. Investigating additional classification models, such as *classification and regression tree analysis*, that may be equally useful and easier to understand (see, e.g., Koon, Petscher, & Foorman, 2014).
 - b. Looking beyond typical administrative data indicators (e.g., grades, course-taking, attendance) to college-knowledge measures (e.g., how to apply to, enroll in, and finance college) or academic tenacity and motivation measures; and
 - c. Looking beyond student-level indicators to program- or system-level indicators at the school or district—e.g., course availability, college-going culture, staffing capacity, or academic resources.
- Extending the analyses beyond college readiness to college enrollment, persistence, and completion, to better understand the K–12 indicators that best predict college success.
- Understanding indicator use by developing and refining ways of displaying or communicating EWI information and evaluating the effect of indicator use on changing school practices and student outcomes.

The partnership work allowed both institutions to learn collectively about how to take steps to solve key problems facing at-risk students in Los Angeles. These problems are, in many ways, universal; graduating more students who are college ready is a challenge in all districts across the state and nation. However, students who demonstrate patterns associated with risk in earlier years in districts like LAUSD, where graduation and college eligibility are closely aligned, face greater risks of falling through the cracks, not meeting the new curricular requirements, and thereby not getting a high school diploma. These students will need information, support, and intervention as early as possible to ensure that they achieve their true potential. And the systems that are in place to support them need concrete

evidence about which students are not on track to graduate under the new requirements and what programs and interventions are most likely to work to keep those students on track. This research partnership focused on college readiness aims eventually to put all of these pieces in place to allow for focused intervention at the earliest sign of risk.

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FIGURE 1.

Percent of 9th graders at-risk for A-G non-completion. *Note.* $N = 35,935$. Data are based on students who began 9th grade for the first time in 2008–2009. Students are considered at *low(er) risk* if they have 7 to 8 on-track indicators, at *medium risk* if they have 5 to 6 on-track indicators, at *high risk* if they have 3 to 4 on-track indicators, and at *extreme risk* if they have 0 to 2 on-track indicators. The on-track indicators include the following annual 8th grade measures: At least 97% attendance; No *Us* in work effort; No *Us* in cooperation; *C* or better in at least four core academic courses; At least a *B* in English; At least a *B* in math; *A* in English; *A* in math. Source: Los Angeles Education Research Institute calculations based on its archive of Los Angeles Unified School District individual student administrative records.

FIGURE 2.

Percent of students who completed or did not complete A-G, by 8th grade risk category.

Note. $N = 35,935$. Data are based on students who began 9th grade for the first time in 2008–2009. Students are considered at *low(er) risk* if they have 7 to 8 on-track indicators, at *medium risk* if they have 5 to 6 on-track indicators, at *high risk* if they have 3 to 4 on-track indicators, and at *extreme risk* if they have 0 to 2 on-track indicators. The on-track indicators include the following annual 8th grade measures: At least 97% attendance; No *Us* in work effort; No *Us* in cooperation; *C* or better in at least four core academic courses; At least a *B* in English; At least a *B* in math; *A* in English; *A* in math. Source: Los Angeles Education Research Institute calculations based on its archive of Los Angeles Unified School District individual student administrative records.

TABLE 1

Background Characteristics of Students in First-Time Ninth Grade Cohort, 2008–2009

	Sample	
	All Students	Graduates
Age in fall of 9th grade (mean)	14.4	14.4
Gender		
Girl	49.3%	53.3%
Boy	50.7%	46.7%
Race/Ethnicity		
American Indian/Alaskan Native	0.3%	0.3%
Asian/Pacific Islander	6.5%	8.4%
African American	9.0%	7.6%
Latino/a	76.9%	75.0%
White	7.2%	8.7%
Subsidized lunch eligibility	56.9%	56.0%
Parents' educational attainment		
Less than high school	30.0%	28.1%
High school graduate	20.7%	20.9%
Some college	11.4%	12.4%
College graduate or more	11.2%	13.4%
Missing parent education	26.6%	25.2%
Language classification		
English only	24.9%	23.8%
Initially fluent English proficient	8.9%	10.0%
Limited English proficient	23.5%	15.6%
Reclassified English proficient	42.8%	50.6%
Gifted and talented	14.5%	19.8%
Special education	9.9%	7.0%
Highest of reading/math California Standards Test (CST) scores		
Far below basic	6.8%	2.9%
Below basic	21.5%	14.1%
Basic	33.0%	33.3%
Proficient	26.8%	33.2%
Advanced	12.0%	16.5%

Note. The all-students sample size is 37,318; the graduates sample size is 22,669. Because of missing data on language classification, there are 20 fewer students in the all-students sample and 11 fewer in the graduates sample. Because of missing data on 8th grade CST scores, there are 634 fewer students in the all-students sample and 153 fewer students in the graduates sample. See text for description of sample definitions. Source: Los Angeles Education Research Institute calculations based on its archive of Los Angeles Unified School District individual student administrative records.

TABLE 2

Academic and Behavioral Predictors of A–G Completion

Dichotomous Measures	Description
Chicago “On Track” for graduation (9th grade annual)	Coded as on-track if students passed enough classes in the 9th grade to be promoted to 10th grade the following school year (in LAUSD, this is 10 semester-long classes) and did not earn more than 1 semester <i>F</i> in an English, math, science, or social studies class.
No <i>F</i> s in English or math; in a core course (i.e., English, math, social studies, science); or in any course	Coded as receiving no <i>F</i> s if students received no <i>F</i> s in the semester-long courses considered or if they did not take the courses considered (and thus could not have received <i>F</i> s in them).
<i>D</i> +/ <i>C</i> – average or better, <i>C</i> average or better, <i>B</i> average or better, <i>B</i> + average or better in all courses	Coded as meeting these grade point thresholds if students earned a 1.5, 2.0, 3.0, or 3.5 or better grade point average, respectively, in all courses to which grades were assigned.
<i>C</i> or better in Algebra I	Coded as having completed Algebra 1 with a <i>C</i> or better if students passed the second semester of Algebra with a <i>C</i> or better, or passed a higher level math course (excluding geometry) with a <i>C</i> or better, or had completed Algebra 1 with a <i>C</i> or better in a prior school year. (These coding rules reflect UC validation rules for math A–G completion.) For the fall of 9th grade measure, students are coded as having completed Algebra 1 if they completed the course as 8th graders or if they completed Algebra 1A with a <i>C</i> or better in the fall of 9th grade.
LAUSD “On Track” for A–G completion; <i>C</i> or better in A–G/academic English and Math; <i>C</i> or better in at least 4 A–G/academic courses, including English and math	Coded as on track if students earned a <i>C</i> or better in an A–G eligible math course, an A–G eligible English course, and at least one other type of A–G eligible course. When students took more than one A–G eligible English or math course, we counted the second of those courses toward the other A–G requirement. For students in 8th grade, this variable reflects academic courses in English, math, science, and social studies rather than A–G courses because few middle school courses are A–G approved. When students passed a relevant course in one semester of a school year but had missing marks for that course during the other semester, we coded them as though they had passed the year-long course.
<i>B</i> or better, or <i>A</i> , in A–G/academic English and math	Earned a <i>B</i> or better, or earned an <i>A</i> , in an A–G eligible math course and an A–G eligible English course (or, for 8th graders, math and English).
Attendance rate at least 80%, 90%, 95%, 97% (annual); Absent 20 or 5 days or fewer (annual)	Coded as meeting these attendance thresholds if students’ attendance rate (or days attended) met or exceeded the given threshold.
Never suspended (annual)	Coded as never suspended if students never received a suspension of any length.
No <i>U</i> s, or no more than 2 or 3 <i>U</i> s, in work effort/cooperation in any course	Coded as receiving no <i>U</i> s, or no more than 2 or 3 <i>U</i> s, based on the number of <i>unsatisfactory</i> marks students received for work effort or cooperation in their semester-long courses.
At least two <i>E</i> s in work effort/cooperation in all courses	Coded as meeting the thresholds if students received at least 2 <i>excellent</i> marks in work effort/cooperation in their semester-long courses.
<i>Continuous Measures</i>	
Academic grade point average	Mean academic grades across all courses.
Work effort grade point average	Mean work effort grades across all courses.
Cooperation grade point average	Mean cooperation grades across all courses.
Number of days absent (annual)	
Number of days suspended (annual)	
Number of A–G courses completed	Number of A–G eligible courses in which students earned a <i>C</i> or better.
CST English and math scores (8th grade annual)	CST scale scores for English-language arts and math.

Note. LAUSD = Los Angeles Unified School District. CST = California Standards Test. UC = University of California. U = Unsatisfactory. E = Excellent.

TABLE 3

A–G Completion Rates by Background Characteristics of Students in First-Time Ninth Grade Cohort, 2008–2009

	Sample	
	All Students	Graduates
Overall	18.4%	29.5%
Gender		
Girl	22.3%	33.1%
Boy	14.7%	25.3%
Race/Ethnicity		
American Indian/Alaskan Native	19.7%	34.8%
Asian/Pacific Islander	42.4%	51.6%
African American	11.5%	22.2%
Latino/a	15.9%	26.1%
White	32.2%	42.7%
Subsidized lunch eligibility		
No	19.3%	30.1%
Yes	17.8%	28.9%
Parents' educational attainment		
Less than high school	14.5%	25.1%
High school graduate	17.8%	28.0%
Some college	20.5%	30.2%
College graduate or more	32.7%	43.4%
Missing parent education	16.4%	27.7%
Language classification		
English only	18.4%	30.4%
Initially fluent English proficient	24.7%	35.0%
Limited English proficient	4.8%	11.2%
Reclassified English proficient	24.7%	33.6%
Gifted and talented		
No	14.4%	24.3%
Yes	42.5%	50.1%
Special education		
No	20.1%	31.1%
Yes	3.6%	7.3%
Highest of reading/math CST scores		
Far below basic	0.9%	3.4%
Below basic	3.8%	9.0%
Basic	12.7%	20.0%
Proficient	28.7%	36.5%
Advanced	49.7%	57.2%

Note. CST = California Standards Test. Numbers show the percentage of students who completed the A–G requirements within 4 years of beginning 9th grade. The all-students sample size is 37,318; the graduates sample size is 22,669. Because of missing data on language classification, there are 20 fewer students in the all-students sample and 11 fewer in the graduates sample. Because of missing data on 8th grade CST scores, there are 634 fewer students in the all-students sample and 153 fewer students in the graduates sample. See text for description of sample definitions. Source: Los Angeles Education Research Institute calculations based on its archive of Los Angeles Unified School District individual student administrative records.

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TABLE 4

Percentage of Graduates From First-Time Ninth Grade Cohort, 2008–2009, Not Completing or Not Enrolling in Each A–G Requirement

Panel A	Number of Semesters Short of Completing the A–G Requirement With a Cor Better								
A–G requirement	1	2	3	4	5	6	7	8	Overall % Failing Short
Social Studies (a)	16.9	9.6	2.6	1.0					30.1
English (b)	16.8	12.4	8.4	5.2	3.2	1.6	0.6	0.4	48.5
Math (c)	8.2	14.3	6.2	7.4	2.9	2.9			42.0
Algebra 1	4.8	6.0							10.8
Geometry	9.6	15.9							25.4
Algebra 2	7.4	25.7							33.1
Science (d)	14.5	14.4	7.1	3.9					39.9
Foreign language (e)	4.3	4.1	2.1	10.7					21.1
Visual/Performing arts (f)	9.3	3.6							12.9
Elective (g)	1.0	0.4							1.3
Panel B	Number of Semesters Short of Enrolling in the Required A–G Courses								
Social Studies (a)	0.8	0.8	0.0	0.3					1.9
English (b)	2.1	0.5	0.1	0.0	0.0	0.0	0.0	0.3	2.9
Math (c)	5.4	11.6	1.0	0.8	0.1	0.3			19.2
Algebra 1	1.1	0.4							1.5
Geometry	2.5	3.2							5.6
Algebra 2	4.2	11.0							15.2
Science (d)	1.8	6.8	0.1	0.3					8.9
Foreign language (e)	2.0	4.0	1.0	5.3					12.3
Visual/Performing arts (f)	4.0	2.4							6.4
Elective (g)	0.0	0.2							0.2

Note. Panel A, modeled after table 6 in Betts, Zau, and Bachofer (2013), shows the percentage of graduates who fell 1 to 8 semesters short of passing each of the University of California (UC) requirements for A–G (with a grade of C or better). Panel B shows the percentage of graduates who fell 1 to 8 semesters short of enrolling in a course that met UC-defined requirements for A–G. The far right column shows the percentage of graduates who failed to meet each requirement. Students can appear in multiple categories. Source: Los Angeles Education Research Institute calculations based on its archive of Los Angeles Unified School District individual student administrative records.

TABLE 5
Dichotomous Predictors of On-Time A–G Completion for First-Time Ninth Graders in 2008–2009 Cohort

Indicators	8th Grade Indicators			Fall 9th Grade Indicators			9th Grade Indicators		
	% Correct	% Missed I	% Missed II	% Correct	% Missed I	% Missed II	% Correct	% Missed I	% Missed II
Courses and grades									
Chicago “On Track” for graduation									
No <i>F</i> s in English or math	46.0	65.6	74.5	52.2	57.2	72.5	54.4	56.0	70.7
No <i>F</i> s in a core course	53.9	55.4	71.6	54.6	55.4	70.9	60.8	47.4	67.8
No <i>F</i> s in any course	56.5	52.0	70.5	60.7	47.3	68.0	64.8	42.2	65.5
<i>D</i> +/ <i>C</i> – average or better	34.2	81.2	77.6	41.6	72.1	75.5	70.6	34.3	61.5
<i>C</i> average or better	47.3	64.7	73.8	54.7	55.6	70.6	42.2	71.4	75.2
<i>B</i> average or better	77.7	22.0	55.1	80.2	19.5	51.3	56.8	53.2	69.6
<i>B</i> + average or better	84.0	7.4	39.9	84.4	6.7	38.0	82.6	16.4	47.2
<i>C</i> or better in Algebra I	71.6	29.6	62.1	52.5	57.5	72.0	56.7	52.3	70.1
<i>C</i> or better in A–G/academic English and math	66.2	37.3	66.2	67.8	36.6	64.3	76.4	24.0	56.7
LAUSD “On Track” for A–G completion (<i>C</i> or better in at least 3 A–G/academic courses, including English and math)	68.1	34.9	64.8	71.5	31.2	61.6	78.8	19.9	53.6
<i>C</i> or better in at least 4 A–G/ academic courses, including English and math	74.1	26.0	59.7	77.8	20.3	55.3	82.8	11.4	45.5
<i>B</i> or better in A–G/academic English and math	80.8	12.1	50.4	80.9	14.5	50.1	83.6	8.0	41.5
<i>A</i> in A–G/academic English and math	82.4	2.3	36.2	82.8	3.5	38.0	82.5	1.8	32.6
Attendance									
Attendance rate at least 80%	21.5	96.9	80.5				24.1	93.7	80.0
Attendance rate at least 90%	28.9	87.4	79.1				33.8	81.0	78.1
Attendance rate at least 95%	43.0	67.7	76.5				49.4	59.3	74.6
Attendance rate at least 97%	56.1	48.1	73.4				61.0	41.4	71.3
Missed 20 days or fewer	25.8	91.3	79.8				27.5	89.3	79.3
Missed 5 days or fewer	54.4	50.6	74.0				54.8	50.5	73.5
Behavior									
Never suspended	27.6	89.0	79.4				25.3	91.9	79.8
No <i>U</i> s in work effort	73.5	26.4	60.5	73.7	28.6	59.4	80.5	18.3	50.9
No <i>U</i> s in cooperation	59.3	46.7	70.1	58.4	49.3	69.7	68.1	36.0	64.2

Indicators	8th Grade Indicators			Fall 9th Grade Indicators			9th Grade Indicators		
	% Correct	% Missed I	% Missed II	% Correct	% Missed I	% Missed II	% Correct	% Missed I	% Missed II
No more than 3 <i>Us</i> in work effort	47.6	64.0	73.8	38.1	76.4	76.5	58.5	50.8	68.8
No more than 2 <i>Us</i> in cooperation	37.6	76.6	76.9	31.8	84.2	78.2	46.0	66.2	74.2
At least two <i>Es</i> in work effort	35.8	79.0	77.3	51.7	58.8	72.2	38.3	76.2	76.5
At least two <i>Es</i> in cooperation	30.7	85.4	78.6	42.3	70.9	75.4	31.2	84.9	78.3

Note. $N = 35,935$. See Table 2 for description of measures. Numbers are percentages reflecting the following: % Correct = of all students, % correctly classified as A–G completers or A–G noncompleters. % Missed I = of those who did not complete A–G. % predicted by the indicator to complete. % Missed II = of those predicted by the indicator to complete A–G. % who did not actually complete A–G. See text for additional details. LAUSD = Los Angeles Unified School District. Source: Los Angeles Education Research Institute calculations based on its archive of LAUSD individual student administrative records.

TABLE 6

Multivariate Prediction of On-Time A–G Completion for First-Time Ninth Graders in 2008–2009 Cohort

Models	% Correct	% Missed I	% Missed II
(1a) Academic and behavioral predictors from 8th grade	85.0	6.3	36.9
(1b) With 8th grade test scores	85.3	6.3	36.2
(1c) With demographics/background	85.3	6.2	35.9
(2a) Academic and behavioral predictors from 8th grade & fall of 9th grade	86.2	6.9	35.0
(2b) With 8th grade test scores	86.4	7.0	34.7
(2c) With demographics/background	86.3	6.9	34.8
(3a) Academic and behavioral predictors from 8th grade & 9th grade	86.5	7.2	34.7
(3b) With 8th grade test scores	86.6	7.3	34.7
(3c) With demographics/background	86.6	7.3	34.7

Note. Results are from the random half of the sample that was not used to develop the model. $N = 17,967$. Models include predictors that were statistically significant at the .10 level, with standard errors adjusted for the non-independence of observations within schools. Academic grade point average (GPA), work effort grade point average (WPA), and cooperation grade point average (CPA) are averages for all courses taken. Model 1 predictors include GPA, CPA, WPA and WPA-squared, days absent, days suspended, and Algebra 1 completion with a C or better by the end of 8th grade. Model 2 predictors include 8th-grade GPA, 8th-grade CPA, days absent in 8th grade, days suspended in 8th grade, Algebra 1 completion with a C or better by the end of 8th grade, 9th-grade GPA and GPA-squared, 9th-grade WPA, Algebra 1A completion with a C or better in the fall of 9th grade, and dummy variables for number of A–G courses completed in fall of 9th grade. Model 3 predictors include 8th-grade GPA, days absent in 8th grade, days suspended in 8th grade, Algebra 1 completion with a C or better by the end of 8th grade, 9th-grade GPA and GPA-squared, 9th-grade WPA, and dummy variables for number of A–G courses completed in 9th grade. Models that include 8th-grade test scores include English California Standards Test (CST) scale scores (along with nonlinear terms), math CST scale scores, and dummy variables indicating missing CST scores. Models that include demographics/background include age and dummy variables for gender, ethnicity, free/reduced lunch, parents' education, language classification, gifted status, and special education status. Source: Los Angeles Education Research Institute calculations based on its archive of Los Angeles Unified School District individual student administrative records.