Making an Impact

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Impact of providing information to parents in Texas about the role of Algebra II in college admission

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Key findings

This randomized controlled trial examined the impact on student completion of Algebra II in grade 11 of informing parents of high school students in Texas about the role of Algebra II in college admission. Parents of students in treatment schools received an informational brochure about the role of Algebra II in college admission, and parents of students in control schools received a brochure outlining changes to high school graduation requirements.

- Students in treatment and control schools completed Algebra II in grade 11 at a similar rate, after student and school characteristics were controlled for.
- Algebra II completion rates in grade 11 did not differ between students in treatment and control schools with a high percentage of racial/ethnic minority students.
- Algebra II completion rates in grade 11 did not differ between students in treatment and control schools with a high percentage of economically disadvantaged students. However, an exploratory analysis suggests that the effects may differ between students in low-income schools and students in schools that were not low-income schools.

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Summary

Prior to June 2013, Texas students could choose between two graduation plans, the default Recommended High School Plan and the Distinguished High School Plan, both of which required students to complete four courses each in English, math (including Algebra II), science, and social studies.[1] With the enactment of House Bill 5 (HB 5) in June 2013, those plans were replaced with the Foundation High School Program, which introduced flexibility into the course requirements for high school graduation, including a new default option that does not require Algebra II.

The Foundation High School Program consists of three options: the basic 22-credit Foundation High School Program, which students need permission to select; the default 26-credit option, which comprises the Foundation High School Program plus an endorsement (Foundation High School Program Plus Endorsement); and the distinguished level of achievement, which entails fulfilling the requirements of the Foundation High School Program Plus Endorsement and completing Algebra II.[2] Only students who complete the science, technology, engineering, and math endorsement of the Foundation High School Program Plus Endorsement or a distinguished level of achievement are required to complete four courses each in English, science, and math, including Algebra II—the course requirements for admission to all public four-year colleges and universities in Texas. The students who entered grade 9 in the 2014/15 school year were the first cohort of students required to graduate under the Foundation High School Program.

Without information on the alignment between the new high school graduation requirements and college entrance requirements, parents may not be able to help their children make informed choices. This is true particularly for racial/ethnic minority and low-income parents, whose children are most likely to be affected by changes in graduation requirements because they are the most likely to complete only the minimum graduation requirements (Chaney, Burgdorf, & Atash, 1997; Domina & Saldana, 2011; Saw & Broda, 2012; Schiller & Muller, 2003).

This study used a randomized controlled trial to examine the impact of informing parents in Texas about the role of Algebra II in college admission on student completion of Algebra II in grade 11. A total of 109 schools, covering all 20 Education Service Center regions in Texas, participated in the study. Parents of students in the 54 treatment schools were mailed brochures containing information about the role of Algebra II in college admission and success, as well as information about the new high school graduation options. Parents of students in the 55 control schools received brochures containing information about changes in the high school graduation requirements.

The study, conducted in coordination with and on behalf of the Texas Education Agency, provides evidence to the agency and other states about the effect of informing parents about the role of Algebra II in college admission.

Key findings include:

- Students in treatment and control schools completed Algebra II in grade 11 at a similar rate, after student and school characteristics were controlled for.

- Algebra II completion rates in grade 11 did not differ between students in treatment and control schools with a high percentage of racial/ethnic minority students.
- Algebra II completion rates in grade 11 did not differ between students in treatment and control schools with a high percentage of economically disadvantaged students. However, an exploratory analysis suggests that the effects may differ between students in low-income schools and students in schools that were not low-income schools.

While this study provides useful information on the role of informing parents about the importance of Algebra II, there are a few limitations. First, the study team was able to follow students only through grade 11 rather than through the end of high school; however, most students who complete Algebra II in Texas are expected to do so before grade 12. Second, the control group did not carry on in a business-as-usual manner: parents of students in control schools received a brochure describing changes to the Texas graduation requirements in general and pointing to websites where additional information could be found. Third, it was not possible to determine what additional information, if any, parents of students in treatment or control schools may have received regarding the importance of Algebra II. Having that information might have enabled the study team to hypothesize as to why impacts were or were not found. Finally, although it was possible to determine with some certainty that the informational brochures were delivered, the study team could not be certain that parents opened the envelopes, read the brochure, shared the brochure with their children, or accessed material containing the information contained in the treatment brochure.

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Why this study?

Prior to June 2013, Texas students could choose between two graduation plans, the default Recommended High School Plan and the Distinguished High School Plan, with special provisions given for students to drop down to the Minimum High School Plan.[3] Beginning with the incoming grade 9 cohort of 2007/08, Texas introduced the 4x4 curriculum plan through which students following the recommended and distinguished plans were required to take four courses each in English, math (including Algebra II), science, and social studies—earning the credits they needed to be admitted to most state universities and colleges.

With the enactment of House Bill 5 (HB 5) in June 2013, these plans were replaced with the Foundation High School Program, which encompasses three graduation options (see box 1 for definitions of key terms used in the report):

- The basic Foundation High School Program, which students need permission to select and which requires students to complete 22 credits, including three courses each in science, social studies, and math.
- The default Foundation High School Plan plus an endorsement (Foundation High School Program Plus Endorsement), which requires students to complete 26 credits to graduate, including four courses each in English, math, and science. Algebra II is required only for students who earn the science, technology, engineering, and math endorsement.[4]
- A distinguished level of achievement, which adds Algebra II to the requirements of the Foundation High School Program Plus Endorsement, regardless of which endorsement a student pursues.[5]

Without information on the alignment between the new high school graduation requirements and college entrance requirements, parents—particularly racial/ethnic minority and low-income parents—may not be able to help their children make informed choices

The Foundation High School Program was crafted to give students who want to go directly into career and technical fields the flexibility to take more classes focused on their interests instead of college preparation classes.

HB 5 also changed the automatic admission policy (known as the Top 10 Percent Rule) of Texas public colleges and universities. The policy now offers admission to all Texas high school students who graduate in the top 10 percent of their class and who earn a distinguished level of achievement, starting with the 2014/15 incoming cohort of grade 9 students.[6] Most public universities in Texas still require students to have completed Algebra II in order to gain admission, despite the new graduation plans.

Research suggests that the children of racial/ethnic minority and low-income parents are most likely to be affected by changes in graduation requirements because they are the most likely to complete only the minimum graduation requirements (Chaney et al., 1997; Domina & Saldana, 2011; Saw & Broda, 2012; Schiller & Muller, 2003). As such, removing the Algebra II graduation requirement for all high school students may disproportionately affect racial/ethnic minority and economically disadvantaged students' eligibility for admission to public four-year colleges and universities in Texas. (See appendix A for a literature review on the influence of graduation requirements on student course taking, relationships between Algebra II completion and college outcomes, relationships between Algebra II completion and career outcomes, and the role of information dissemination on student choice.)

Box 1. Key terms

Algebra II completion. Refers to students who were enrolled in Algebra II for one year by the end of grade 11, regardless of whether they passed the course.

Automatic admission policy/Top 10 Percent Rule. Policy whereby students who graduate in the top 10 percent of their class and who earn a distinguished level of achievement are eligible for automatic admission to Texas public colleges and universities.

Distinguished level of achievement. An option of the Foundation High School Program that can be earned by completing Algebra II as well as the requirements of the Foundation High School Program Plus Endorsement.

Economically disadvantaged. A student who is eligible for the federal school lunch program.

Foundation High School Program. The minimum 22-credit curriculum plan for Texas high school graduation, which requires four credits in English; three credits each in math, science, and social studies; two credits in a language other than English; a credit each in fine arts and physical education; and five electives.

Foundation High School Program Plus Endorsement. The default 26-credit curriculum plan for Texas high school graduation, which requires four credits each in math, English, and science; three credits in social studies; two credits in a language other than English; a credit each in fine arts and physical education; and seven electives focused around a selected career endorsement.

Low-income school. A school in which the percentage of economically disadvantaged students is in the top third of all schools in the state.

High–racial/ethnic minority school. A school in which the percentage of racial/ethnic minority students is in the top third of all schools in the state.

Without information on the alignment between the new high school graduation requirements and college entrance requirements, parents—particularly racial/ethnic minority and low-income parents—may not be able to help their children make well informed choices.

Because Algebra II was no longer required for high school graduation but was still required for automatic college admission under the Top 10 Percent Rule, the chair of the State Board of Education was concerned that students and parents would miss critical information in planning for high school and college. The change in state graduation requirements provided an opportunity to generate rigorous evidence about the role of information dissemination in students' course completion. Information from this study provides the State Board of Education, the Texas Education Agency, and the Texas Higher Education Coordinating Board with information regarding their attempts to reduce the number of students who do not complete Algebra II.

What the study examined

Two research questions guided this study.

The first was confirmatory:

1. Does providing parents and guardians with information about the role of Algebra II in college admission have an impact on the percentage of students who complete Algebra II in grade 11?

The second was exploratory:

2. Do the impacts vary by the percentage of students in a school who are racial/ethnic minorities or economically disadvantaged?

The data and methods used to answer the research questions are summarized in box 2 and detailed in appendix B.

Box 2. Data, sampling, and methods

Data

The study used longitudinal student- and school-level datasets provided by the Texas Education Agency (TEA). Specifically, the study used data from the TEA Public Education Information Management System, statewide assessment files, and Texas Academic Performance Report files. The Public Education Information Management System contains student-level data on student enrollment and demographic characteristics, special program participation, and course completion. The Texas Academic Performance Report files contain organizational data for schools and districts, such as percentage of students in each racial/ethnic group, percentage of economically disadvantaged students, percentage of students in special education, percentage of English learner students, and percentage of students who passed state achievement tests. The statewide assessment files contain student-level data on the State of Texas Assessments of Academic Readiness™, the Texas state achievement test.

The study also used information from a website review performed as part of a Regional Educational Laboratory Southwest technical assistance project conducted on behalf of TEA in fall 2014. In that project researchers reviewed the websites of all 1,026 public school districts in Texas to assess whether districts required or encouraged students to complete Algebra II. (See appendix B for additional information.)

Sampling

School districts with at least one high school were recruited from across Texas to participate in the study. The recruiting strategy for the study followed two objectives: to recruit at least two high schools in each of the 20 Education Service Center regions across the state (see http://tea.texas.gov/regional_services/esc/ for a map of regions)[1] and to recruit high schools that did not require or strongly encourage students to complete Algebra II—high schools in which it was believed that the study informational materials could make the largest impact. Schools were informed that the study was being conducted as a randomized controlled trial in which half of participating schools would be randomly assigned to a treatment group and the other half

(continued)

would be assigned to the control group. After random assignment, schools in the treatment group were provided informational brochures about the role of Algebra II in college admission to send to parents and guardians. Schools in the control group were provided with informational brochures describing the changes to the high school graduation requirements, including the elimination of Algebra II as a graduation requirement, to send to parents and guardians.

Recruitment was conducted though research applications to the district, email and telephone contact, and public information requests.[2] Recruitment was conducted at the high school or district level depending on the requirements of the district. A total of 116 high schools in 63 districts were recruited to participate and were randomly assigned to the treatment and control groups within each Education Service Center region. (When more than one school from a district was recruited, blocking for randomization was done by district and Education Service Center region.) Of those 116 schools, 109—54 treatment schools and 55 control schools—participated in the study. Compared with all other high schools across Texas, the participating schools had higher percentages of racial/ethnic minority students, economically disadvantaged students, English learner students, and lower achieving students. Study schools were also substantially larger, on average.

To track whether schools mailed the brochures to parents and guardians, each participating school was provided with an envelope addressed to the study team. This envelope was included in the box of envelopes to be disseminated to parents and guardians. The study team asked participating schools to mail these envelopes at the same time they mailed the other envelopes, which had the study team address as the return address so that if the parent/guardian address was not correct, they would be returned to the study team. Any envelopes received by the study team were used to determine whether schools mailed the materials to the parents and guardians and when the materials had been mailed. The study team placed telephone calls to schools for which no envelope was received by the end of March. School staff responding to the telephone calls verified whether the envelopes to parents and guardians had been mailed and the mailing date.

Students were included in the analyses if they were enrolled in grade 10 in a study high school during the 2015/16 school year, were enrolled in a Texas public high school during the 2016/17 school year, and had not completed Algebra II before the 2016/17 school year.[3] A total of 29,483 students were included in the analyses—14,415 in treatment schools and 15,068 in control schools.

Methods

To answer the confirmatory research question, a multilevel regression model was used to compare Algebra II completion rates by the end of grade 11 for students in treatment schools and students in control schools. To answer the exploratory research question, interaction terms were included in the model to identify differential impacts for high–racial/ethnic minority and low-income schools. The models employ random effects to control for clustering by school. Results are reported in figures 1–3 in the main text as the probability of completing Algebra II in grade 11; log odds ratios, odds ratios, and standard errors are shown in appendix E.

Notes

1. Despite this strategy, only one high school was recruited in region 1 (Edinburg).

2. Texas districts are required to respond to information requests from the public. The study team obtained high school directory information for grade 10 students after submitting public information requests to high school districts in Texas.

3. The percentage of students who completed Algebra II prior to the 2015/16 school was very similar in treatment schools (26 percent) and control schools (25 percent).

The interventions for the study consisted of informational brochures for parents and guardians of grade 10 students. The brochures were designed with the assistance of a marketing professor at the University of Pittsburgh to have a professional appearance and minimal text. They contained links to websites where parents could find more information about changes to the high school graduation requirements.

The brochure sent to parents and guardians of students in treatment schools was a two-page (one double-sided sheet of paper), trifold full-color brochure displaying information about the role of Algebra II in four-year college admission (see appendix C). It outlined the course requirements for each of the new high school graduation plans and how they related to the admission requirements of public four-year colleges and universities in Texas. It also highlighted the mismatch between graduation requirements and college and university admission requirements and stated that, beginning with the 2014/15 cohort of grade 9 students, only students who complete the distinguished level of achievement are eligible for the state's automatic admission policy. English and Spanish versions of the brochure were produced, and all parents of students in treatment schools received both versions.

The adjusted predicted probability of completing Algebra II in grade 11 was .80 for students in treatment schools and .78 for students in control schools

The brochure that was sent to parents and guardians of students in control schools was a one-page, full-color brochure briefly outlining the primary changes to the high school graduation requirements, including that only the science, technology, engineering, and math endorsement and the distinguished level of achievement require completion of Algebra II (see appendix D). The information in the brochure was also available on the Texas Education Agency website. English and Spanish versions of the brochure were produced (with one language printed on each side), and all parents of students in control schools received both versions.

The brochures were sent through the U.S. mail, and all envelopes containing the brochures were sealed, stamped, and printed with the Texas Education Agency logo to encourage parents to open them. Dissemination of the brochures coincided with the time period when grade 10 students were selecting courses for their junior year: January–March 2016. (See appendix B for additional details about dissemination of the brochures.)

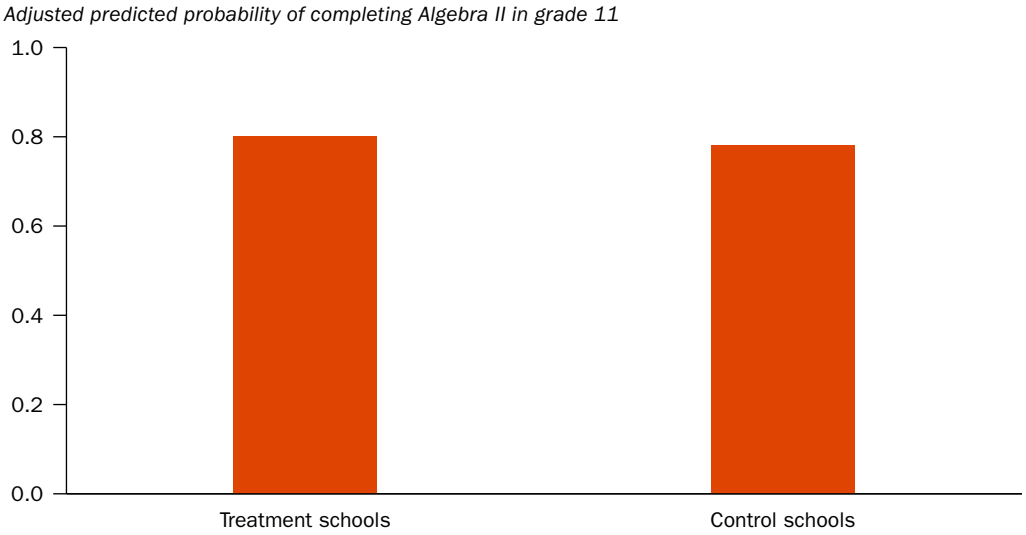
What the study found

This section presents the main findings of the study.

Informing parents about the role of Algebra II in college admission had no clear impact on Algebra II completion rates for grade 11 students

After student background characteristics and school characteristics were controlled for, students in treatment and control schools completed Algebra II in grade 11 at a similar rate. The adjusted predicted probability of completing Algebra II in grade 11 was .80 for students in treatment schools and .78 for students in control schools (figure 1). Although the Algebra II completion rate for treatment group students was higher than that of students in control schools, the difference was not statistically significant. (See table E1 in appendix E for log odds ratios, odds ratios, and standard errors for all variables in the model.)

Figure 1. The adjusted predicted probability of completing Algebra II in grade 11 in Texas was not statistically significantly different for students in treatment and control schools, 2016/17



Note: See appendix E for log odds ratios, odds ratios, and standard errors for all variables in the model.

Source: Authors' calculations based on data from the Texas Education Agency Public Education Information Management System, statewide assessment files, and Texas Academic Performance Report files.

In high–racial/ethnic minority schools the adjusted predicted probability of completing Algebra II in grade 11 was .83 for students in control schools and .82 for students in treatment schools; in schools that were not high–racial/ethnic minority schools the adjusted predicted probability was .78 for students in control schools and .82 for students in treatment schools

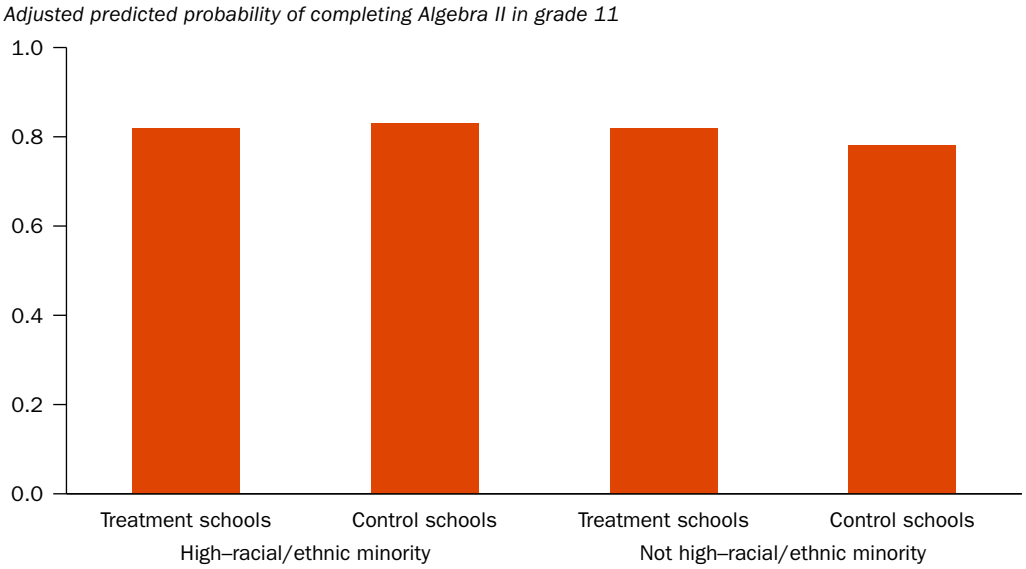
In schools with a high percentage of racial/ethnic minority students, informing parents about the role of Algebra II in college admission had no clear impact on Algebra II completion rates for grade 11 students

After school and student characteristics were controlled for, informing parents about the role of Algebra II in college admission did not have a statistically significant impact on students in high–racial/ethnic minority schools or students in schools that were not high–racial/ethnic minority schools. The analyses also did not find differences in impacts based on the percentage of racial/ethnic minority students in the school. In high–racial/ethnic minority schools the adjusted predicted probability of completing Algebra II in grade 11 was .83 for students in control schools and .82 for students in treatment schools, after student and school characteristics were controlled for. In schools that were not high–racial/ethnic minority schools the adjusted predicted probability was .78 for students in control schools and .82 for students in treatment schools, after student and school characteristics were controlled for (figure 2). The differences between treatment and control groups in each type of school were not statistically significant. (See table E2 in appendix E for log odds ratios, odds ratios, and standard errors for all variables in the model.)

Algebra II completion rates in grade 11 did not differ between students in low-income treatment and control schools, but an exploratory analysis suggests that the effects differ between students in low-income schools and students in schools that were not low-income schools

The impacts of the intervention were not statistically significant for students in either low-income schools or schools that were not low-income schools. However, the statistically significant interaction between treatment status and school low-income status suggests that the intervention's effect on students in low-income schools differed from its effect on

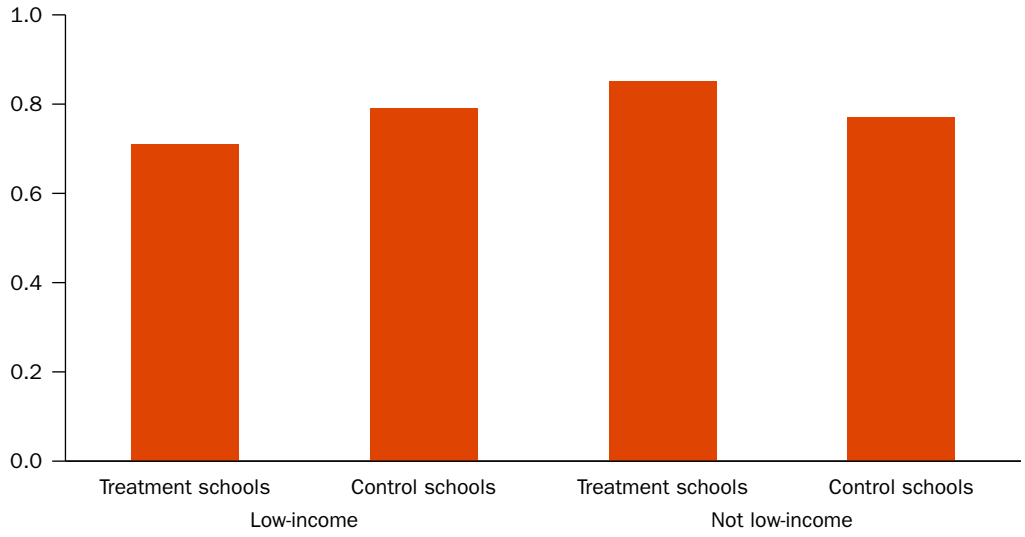
Figure 2. For both high–racial/ethnic minority schools and schools that were not high–racial/ethnic minority schools in Texas, the adjusted predicted probability of completing Algebra II in grade 11 was not statistically significantly different for students in treatment and control schools, 2016/17



Note: High–racial/ethnic minority schools are schools in which the percentage of racial/ethnic minority students is in the top third of the state. See appendix E for log odds ratios, odds ratios, and standard errors for all variables in the model.

Source: Authors' calculations based data from the Texas Education Agency Public Education Information Management System, statewide assessment files, and Texas Academic Performance Report files.

Figure 3. For both low-income schools and schools that were not low-income schools in Texas, the adjusted predicted probability of completing Algebra II in grade 11 was not statistically significantly different for students in treatment and control schools, but the intervention's effect may have differed for students in low-income schools and students in schools that were not low-income schools, 2016/17



Note: Low-income schools are schools in which the percentage of economically disadvantaged students is in the top third of all schools in the state. The interaction between treatment status and school low-income status was significant at $p < .05$. See table E3 in appendix E for log odds ratios, odds ratios, and standard errors for all variables in the model.

Source: Authors' calculations based on data from the Texas Education Agency Public Education Information Management System, statewide assessment files, and Texas Academic Performance Report files.

students in schools that were not low-income schools. Specifically, in low-income schools the Algebra II completion rate in grade 11 was lower for students in treatment schools than for students in control schools, but in schools that were not low-income schools, rates were higher for students in treatment schools than for students in control schools. The probability of completing Algebra II in grade 11 was .71 for students in low-income treatment schools and .79 for students in low-income control schools; the probability was .85 for students in treatment schools that were not low-income schools and .77 for students in control schools that were not low-income schools (figure 3). (See table E3 in appendix E for log odds ratios, odds ratios, and standard errors for all variables in the model.)

Implications of the study findings

Overall, the study found no statistically significant differences in Algebra II completion rates in grade 11 between students in treatment and control schools, nor did it find treatment effects when high–racial/ethnic minority schools and schools that were not high–racial/ethnic minority schools were analyzed separately or when low-income schools and schools that were not low-income schools were analyzed separately.

The statistically significant interaction between school-level treatment and low-income school status seems to suggest that the informational materials functioned differently depending on the type of school they were distributed to—low-income or not low-income

The results are not surprising in light of the findings of a recent Regional Educational Laboratory Southwest descriptive study on statewide trends in Algebra II completion by grade 11 before and after changes to Texas state graduation requirements (Stoker, Mellor, & Sullivan, 2018). That study found that the statewide rate of Algebra II completion by grade 11 did not change following the introduction of the Foundation High School Program and concluded: "While HB 5 made room for flexibility in the high school course math curriculum, many districts continued to place students in Algebra II, a math course that is a prerequisite for admission to most colleges and universities in Texas" (p. 10).

However, an analysis conducted to answer the current study's exploratory research question found a statistically significant interaction between school-level treatment and low-income school status. In particular, while the estimated impacts of the treatment were not statistically significant for students in low-income schools or for students in schools that were not low-income schools, the interaction suggested a less positive impact for students in low-income schools. Interpreting the statistically significant interaction is difficult. However, the results seem to suggest that the informational materials functioned differently depending on the type of school that distributed them—low-income or not low-income. Additional research could help parse this out. Knowing that parents and guardians of students in schools with and in schools without a high percentage of economically disadvantaged students respond differently to the two types of brochures could help the Texas Education Agency better design and target informational materials for parents and guardians.

Limitations of the study

This study has four main limitations.

First, the study team was able to follow students only through grade 11. While most students in Texas—over 75 percent—complete Algebra II by the end of grade 11 (Stoker et al., 2018), some complete it in grade 12. Prior to HB 5, about 5 percent of students completed Algebra II in grade 12. Given the timeline of this study, it is not possible to determine whether the brochures have an impact on students who may complete Algebra II in grade 12.

Second, the control group did not carry on in a business-as-usual manner. Rather, parents of students in control schools received a brochure describing changes to the Texas high school graduation requirements, including changes to the math requirements (that Algebra II is required only for students completing the science, technology, engineering, and math endorsement or the distinguished level of achievement). It is possible that receipt of the brochure prompted parents to look into changes in the graduation requirements, including the repercussions of not completing Algebra II, more than they would have if they had not received the brochure. It is also possible that receipt of the brochure led parents of students in control schools to believe that taking Algebra II is not necessary for their student.

Third, although it was possible to determine with some certainty that the informational brochures were delivered, it was not possible to determine whether parents opened the envelopes, read the content of the brochure, or shared the brochure with their children. It was beyond the scope of the study to contact parents to determine whether they accessed the information in the envelopes. It was also beyond the scope of the study to determine whether parents accessed other information about the importance of Algebra II. This is the case with most interventions of this type.

The control group did not carry on in a business-as-usual manner; rather, parents of students in control schools received a brochure describing changes to the Texas high school graduation requirements, including changes to the math requirements

Fourth, although the study team identified schools to recruit for the study based on information provided on district websites—whether the district was promoting or requiring completion of Algebra II—the website review was conducted several months prior to recruitment. It is possible that the information on the websites did not reflect the district policy and practices in place at the time that the students in the study cohort were choosing courses for grade 11. It is also possible that districts had been promoting Algebra II through means other than the district website. This may have reduced the impact that the brochure had on students in treatment schools, especially if more control schools were pushing students toward Algebra II.

Appendix A. Literature review

This appendix describes prior research on the influence of graduation requirements on student course taking, relationships between Algebra II completion and college outcomes, relationships between Algebra II completion and career outcomes, and the role of information dissemination on school choice.

Influence of graduation requirements on student course taking

Graduation requirements have a strong influence on the courses that students take and the courses that schools offer. The publication of *A Nation at Risk* (National Commission on Excellence in Education, 1983) had a profound effect on perceptions of the types of knowledge and skills that students need to be prepared for college or career. As a result, states began to change the number of core content courses that students needed to complete to graduate from high school. Within 10 years of publication of *A Nation at Risk*, 45 states raised high school graduation requirements, with the most dramatic increases in math and science (Stevenson & Schiller, 1999). Considerable research in the late 1990s and early 2000s investigated the influence of these higher graduation requirements on students' math course taking and achievement. Overall, these studies found that high school graduation requirements influenced the level or number of math courses that students completed (Clune & White, 1992; Finn, Gerber, & Wang, 2002; Schiller & Muller, 2003; Teitelbaum, 2003); however, studies were mixed as to whether graduation requirements influenced student achievement, as measured by grades and test scores. Results of most studies suggested that although increases in math level were associated with gains in math achievement, increases in the number of math courses students take were not (Chaney et al., 1997; Teitelbaum, 2003).

Several studies have found that graduation requirements have a disproportionate influence on marginal students (those who completed only the minimum graduation requirements; Chaney et al., 1997) and racial/ethnic minority and economically disadvantaged students (Domina & Saldana, 2011; Saw & Broda, 2012; Schiller & Muller, 2003). Domina and Saldana (2011) found that the national trend toward academic intensification disproportionately influenced the math course completion patterns of Black, Hispanic, and low-socioeconomic status students. Specifically, they found that due to increasing standards, between 1982 and 2004 the enrollment rate in advanced math courses grew faster for Black and Hispanic students than for White students. With regard to Algebra II completion, even after differences in family background and grade 10 test scores were controlled for, the odds of completing Algebra II grew faster for Black and Hispanic students than for White students. The authors found similar evidence to suggest that curricular intensification also boosted economically disadvantaged and low-achieving students' Algebra II completion rates. Between 1982 and 2004 the gap in Algebra II completion rates between economically disadvantaged students and non–economically disadvantaged students narrowed from 16 percentage points to 11, and the Algebra II completion rate for low-achieving students surged nearly 30 percentage points.

These increases in math course taking coincided with rising college enrollment rates for Black and Hispanic students. Between 1983 and 2011 the percentage of recent high school graduates who enrolled in a two- or four-year college increased from 38 percent to 67 percent for Black students and from 54 percent to 67 percent for Hispanic students.

These patterns suggest that increases in high school graduation requirements have had an influence on college preparation and enrollment for these students (Snyder & Dillow, 2012).

Relationships between Algebra II completion and college outcomes

Research on the relationships between high school math completion and college success has found positive, statistically significant relationships between completion of higher level math courses and college enrollment, persistence, and completion. For example, Horn and Nunez (2000) found that students who completed Algebra II or higher were significantly more likely to enroll in a four-year college within two years of high school graduation than were students who did not complete Algebra II or higher. These effects were particularly strong for students whose parents completed no more than a high school education. Similarly, Adelman (1999) found that of all precollege curricula, the highest level of math that students study in high school had the strongest influence on bachelor's degree completion —finishing a course beyond the level of Algebra II (for example trigonometry or precalculus) more than doubled the odds that a student who entered postsecondary education would complete a bachelor's degree. Adelman's (2006) follow-up work found that every step up the math course ladder multiplied the odds of earning a bachelor's degree by roughly 2.5. He again found that although students who completed Algebra II or higher were more likely to earn a bachelor's degree than were students who completed geometry or lower math courses, students who moved one step above Algebra II to trigonometry were considerably more likely to earn a bachelor's degree. Horn, Kojaku, and Carroll (2001) also found a consistent advantage for students who completed a rigorous high school curriculum, including higher level math courses. These students were more likely to remain in their initial higher education institution and stay on track for a bachelor's degree. Moreover, students who completed a rigorous curriculum in high school were statistically significantly less likely to report taking remedial coursework in college.

Relationships between Algebra II completion and career outcomes

Gaertner, Kim, DesJardins, and McClarty (2013) used data from the National Education Longitudinal Study (NELS) of 1988 and the Education Longitudinal Study (ELS) of 2002 to investigate relationships between high school math course taking and college and career outcomes two years after high school graduation. The authors found that Algebra II completion was not associated with any of the career outcomes using either NELS or ELS data, with one exception. With the NELS data, Algebra II completion was a statistically significant and positive predictor of annual earnings change. However, the analyses did find statistically significant relationships between Algebra II completion and several college outcomes. Using the NELS dataset, the authors found statistically significant, positive relationships between Algebra II completion and admission to college, cumulative grade point average, second-year retention, and college graduation. With the ELS data, Algebra II was statistically significant and positively related to admission to a highly selective college.[7] Although the authors concluded that Algebra II completion appears to be more important for college outcomes than for career outcomes, it is difficult to tell given the short time period in the study to examine career outcomes. Most students will not settle into a career immediately out of high school.

The role of information dissemination on student choice

Tailoring or targeting information to individuals has been shown to be successful at influencing choice in a wide variety of fields (Dougherty et al., 2010; Kreuter, Stretcher, & Glassman, 1999; Resnicow et al., 2009). Studies from fields outside of education, such as health sciences and political science, suggest that simplified information presentation, including pictorial representations, basic wording, and larger and clearer print, can improve information accessibility and use (Davidhizar & Brownson, 2000; Hastings, Van Weelden, & Weinstein, 2007; Hastings & Weinstein, 2008; Koning & Van der Wiel, 2010). Moreover, studies on information readability in health care have shown that the way information is presented and disseminated can significantly influence the choices people make (Hibbard & Peters, 2003; Holmes-Rovner, Llewellyn-Thomas, Coulter, O'Connor, & Rovener, 2001; Wegner & Girasek, 2003).

Three large-scale experimental studies have looked at the impact of providing parents with school information on subsequent outcomes. Two of the experimental studies looked at links between school information and parent choice. Both studies found that providing simplified information directly to a select group of parents increases the probability of those parents choosing higher achieving schools for their children (Hastings et al., 2007; Hastings & Weinstein, 2008). One experimental study examined the role of providing parents with information about the importance of math and science in daily life and for various careers, as well as information about how parents could communicate with their children and personalize the relevance of math and science for them (Harackiewicz, Rozek, Hulleman, & Hyde, 2012). The authors found that students in the experimental group whose parents had received the information took statistically significantly more math and science courses during their last two years of high school. They also found that students who received the brochures were statistically significantly more likely to take additional elective, advanced math and science courses (that is Algebra II, precalculus, calculus, chemistry, and physics).

Appendix B. Data and methodology

This appendix describes the data sources, sample, dissemination of materials, and analysis.

Data

The study used longitudinal student- and school-level datasets provided by the Texas Education Agency (TEA). Specifically, the study used data from the TEA Public Education Information Management System, statewide assessment files, and Texas Academic Performance Report files for the 2014/15–2016/17 school years.

The study also used information from a website review performed as part of a Regional Educational Laboratory (REL) Southwest technical assistance project conducted on behalf of TEA in fall 2014. In that project, researchers reviewed the websites of all 1,026 public school districts in Texas to assess whether districts required or encouraged students to complete Algebra II (box B1).

Box B1. Website review

From July to October 2014 Regional Educational Laboratory Southwest researchers conducted Internet searches for each of the 1,026 public school districts in Texas. Researchers reviewed each district website for information regarding Texas House Bill 5 (HB 5), particularly as it pertained to Algebra II and high school graduation requirements. On each website, researchers:

- Conducted keyword searches using the terms "high school graduation requirements," "high school graduation plans," "HB 5 graduation plans," "HB 5 endorsements," "foundation high school plan," "FHSP," and "endorsement" within the district search engine.
- Reviewed the district's board meeting notes from Spring 2014.[1]
- Reviewed the student and parent sections of the website.

Depending on the information found, researchers recorded:

- The default diploma option (that is, Foundation High School Program, Foundation High School Program Plus Endorsement, or distinguished level of achievement), if any, assigned to grade 9 students entering district high schools in the 2014/15 school year.
- The endorsement options being offered in the district (that is, arts and humanities; business and industry; public services; science, technology, engineering, and math; or multidisciplinary).
- How information about the new graduation requirements was being disseminated, if at all (for example, by website, email, fliers, or parent meetings).

Approximately 11 percent of districts encouraged students to complete a distinguished level of achievement, for which students must complete Algebra II, or made that the default option.

These data were used to identify schools for recruitment in the current study, though some of the information may have changed between 2014, when it was collected, and spring 2016, when the students in the current study chose their grade 11 courses.

Notes

1. Several school districts provided information in board minutes about how the districts are responding to HB 5 with regard to diploma plan placement and endorsements offered.

Sample

The sampling strategy for the study followed two objectives: to recruit at least two high schools from each of the 20 Education Service Center regions across Texas and to recruit high schools that, based on the website review discussed in box B1, did not require or strongly encourage students to complete Algebra II—high schools in which it was believed that the study materials could make the largest impact. Schools that strongly encouraged students to complete Algebra II and schools listed as an Early College High School or a magnet school were omitted. In addition, high schools that did not cover grades 9–12 were omitted; however, high schools with any grade configuration that included all of these grades were recruited.

Recruitment for the study was conducted at the high school and district levels. The study team used three techniques to recruit districts and high schools.

- *Research requests.* As required by district policy, the study team submitted research requests to five very large districts in winter 2015 and received district approval from three of them. One district provided Excel spreadsheets containing student names and addresses for all high schools in the district, and the other two districts required the study team to contact individual schools to recruit them to participate in the study. A total of 20 schools from three districts were recruited using research requests.
- *Email messages and telephone calls.* For districts not requiring a research request, the study team used email and telephone calls to recruit high schools. Starting in fall 2015, the study team began working with the Texas Association of School Administrators (TASA) to recruit high schools to participate in the study. TASA's membership includes all district superintendents in Texas. One of TASA's goals is to ensure that districts are getting as much information as possible when legislative changes affect students. During the first week of October, TASA introduced the study to district superintendents throughout the state in its online newsletter. The newsletter contained a short description of the study and invited superintendents to share this information with principals in their districts. A week later, the study team sent a follow-up email to all superintendents in the state providing information about the study and inviting them to participate. Superintendents were asked to contact the study team if they were interested in having their high schools participate in the study or to forward the email to high school principals in their districts. About one week later, similar emails were distributed to high school principals throughout the state to introduce the study and invite them to participate.

  Both sets of emails outlined the goals of the study, the content of the informational materials, and schools' roles in information dissemination. Principals were made aware that the study was being conducted as a randomized controlled trial and that half of participating schools would receive the informational materials focused on the role of Algebra II in college admission, while the other half would receive informational materials describing general changes to the graduation requirements. Principals were informed that all participating schools would have access to all study materials at the conclusion of the study—the 2017/18 school year. Interested principals and superintendents were directed to contact the study team for additional information.

  Three weeks after the initial emails were distributed to superintendents and principals, the study team conducted telephone calls to recruit additional high

schools in Education Service Center regions from which two schools had not already been successfully recruited. A total of 51 high schools were recruited using the email and telephone campaign.

- *Public information requests*. While conducting school recruitment, the study team learned that several districts could not consent to participate in the study because the study did not meet the district definition of research—because it did not include a district-level data collection component. As such, the study team was directed to submit public information requests to obtain spreadsheets containing publicly available student names and addresses for students in district high schools.[8] The directories are regularly used by businesses, colleges, and other entities to contact students and parents in area schools. Using this process, the study team obtained data for 45 public high schools and mailed the materials to students directly. Before the informational materials were mailed, emails were sent to all the schools asking them to contact the study team if they did not want the materials mailed to their students. Only one school contacted the study team for additional information about the study. Upon hearing the details of the study, the school agreed to allow the materials to be mailed to students.

A total of 116 schools in 63 districts were recruited to participate in the study. Two schools were recruited in each Education Service Center region except region 1, in which only one school was recruited.[9]

After the recruitment period closed, high schools were randomized into treatment and control groups. Simple randomization within a region was conducted using participating high schools in each Education Service Center region (table B1). The one school in region 1 was assigned to the treatment condition to even out the number of treatment and control schools.[10] Thus, both the treatment and control groups contained 58 high schools.

Of the 116 schools that were recruited, 109 participated in the study. Seven schools verbally agreed to participate but failed to sign the written consent form and either informed the study team that they did not plan to mail the materials or did not respond to telephone inquiries. These schools were dropped from the study—four treatment schools and three control schools. The final analytic sample contained 54 treatment schools (14,415 students) and 55 control schools (15,068 students). Overall attrition for schools was 6.0 percent, with differential attrition of 1.7 percent (table B2). Overall attrition for students was 6.5 percent, with differential attrition of 3.0 percent.

All students who began grade 9 during the 2014/15 school year (the first cohort of students to be required to graduate under the Foundation High School Program), were in grade 10 and present in Texas public high schools during the 2015/16 school year, and remained enrolled in a Texas public high school during the 2016/17 school year, including students in special education and English learner students, were eligible to be included in the study if their school opted to participate.[11] Students in grade 10 who were not part of the incoming grade 9 cohort of 2014/15 in participating schools were excluded from the study, although they may have received study materials. Students who completed Algebra II before the 2016/17 school year were also excluded because the informational brochures could not have an impact on students who had already completed Algebra II. Table B3 shows the number of students meeting these qualifications.

Table B1. Number of study schools in each Texas Education Service Center region recruited to participate and in the analytic sample, 2015/16

Education Service Center region	Schools recruited	Schools in the analytic sample		
		All schools	Treatment schools	Control schools
1	1	1	1	0
2	2	2	1	1
3	3	3	1	2
4	14	14	6	8
5	2	2	1	1
6	5	4	2	2
7	3	3	2	1
8	4	4	2	2
9	2	2	1	1
10	17	17	8	9
11	16	14	7	7
12	8	7	3	4
13	14	13	7	6
14	3	3	2	1
15	2	2	1	1
16	3	3	1	2
17	3	3	1	2
18	6	6	3	3
19	2	1	1	0
20	6	5	3	2
Total	**116**	**109**	**54**	**50**

Source: Authors' compilation.

Table B2. Sample attrition from treatment and control schools in Texas, 2016/17

Level	Number recruited		Number in analytic sample		Overall attrition (percent)	Differential attrition[a] (percent)
	Treatment group	Control group	Treatment group	Control group		
Schools	58	58	54	55	6.0	1.7
Students	15,163	16,363	14,415	15,068	6.5	3.0

a. Absolute values.

Source: Authors' compilation.

Since school recruitment efforts focused on schools that did not require Algebra II or include materials on their district websites specifically endorsing Algebra II, the sample was not expected to be representative of all high schools in Texas with grades 9–12. The study sample contains higher percentages of racial/ethnic minority students, economically disadvantaged students, English learner students, and lower achieving students than did all other Texas public high schools (table B4). Participating schools were also substantially larger, on average, than all other Texas public high schools.

Following What Works Clearinghouse (WWC) guidelines, baseline equivalence on key demographic and achievement variables was assessed for the analytic sample. Table B5 presents descriptive data on these variables for students in treatment and control schools,

Table B3. Number of students and schools in Texas participating in the study, 2016/17

Statistic	Total	Treatment group	Control group
Recruitment			
Number of schools	116	58	58
Number of students who were enrolled in grade 10 in 2015/16	45,586	22,045	23,541
Number of students who were also enrolled in grade 11 in 2016/17	42,378	20,535	21,843
Number of students from who did not take Algebra II before 2016/17	31,526	15,163	16,363
Analytic sample			
Number of schools	109	54	55
Number of students enrolled in schools that participated in the study	29,483	14,415	15,068

Source: Authors' compilation based on data from the Texas Education Agency Public Education Information Management System.

Table B4. Comparison of study schools to all other public high schools in Texas, 2016/17

Characteristic	Study schools (*N* = 109)	All other Texas public high schools (*N* = 1,292)	Difference
Average total enrollment	1,468	952	516
Percentage of students by race/ethnicity			
American Indian	0.30	0.44	–0.14
Asian	2.17	2.08	0.09
Black	17.72	8.96	8.76
Hispanic	49.93	43.45	6.48
Pacific Islander	0.16	0.10	0.06
White	28.03	43.23	–15.20
Two or more races/ethnicities	11.70	11.20	0.50
Percentage of students by student characteristics			
Economically disadvantaged	59.31	52.97	6.34
In special education	9.60	9.27	0.33
English learner	10.52	5.59	4.93
Percentage of students by achievement			
Passed Algebra I end-of-course assessment	69.41	73.72	–4.31

Source: Authors' calculations based on data from Texas Academic Performance Reports.

as well as effect size differences between these groups. To assess baseline equivalence between students in treatment and control schools, treatment and control group frequencies and means were entered into a WWC study review guide spreadsheet and effect size differences were obtained. Most of the effect size differences were in the acceptable range —the absolute value of the effect size was smaller than 0.05. The percentages of Hispanic, White, economically disadvantaged, and English learner students had effect size differences large enough to warrant inclusion in the analytic models based on WWC criteria.

Table B5. Baseline equivalence for the analytic sample of students in Texas, 2016/17

Characteristic	Students in treatment schools (*N* = 14,415)	Students in control schools (*N* = 15,068)	Effect size[a]
Gender			
Female	0.49	0.48	0.02
Male	0.51	0.52	0.03
Race/ethnicity			
Asian	0.02	0.02	0.00
Black	0.21	0.19	0.08
Hispanic	0.54	0.62	0.20
Other race/ethnicity	0.02	0.02	0.00
White	0.20	0.15	0.21
Student characteristics			
Economically disadvantaged	0.61	0.70	0.24
In special education	0.11	0.11	0.00
English learner	0.14	0.16	0.10
Achievement			
Average Algebra I end-of-course scale score	3,720.39 (601.11)	3,704.03 (556.08)	0.03

a. Based on absolute differences between the group means. Following What Works Clearinghouse procedures, a Cox index was used to calculate the effect sizes for dichotomous outcomes. The Cox index assumes that the dichotomous outcome is based on an underlying latent variable and calculates the effect size using a scaled difference between log odds of the intervention and control groups. See What Works Clearinghouse (2017) for more information.

Note: Values in parentheses are standard deviations.

Source: Authors' compilation using data from the Texas Education Agency Public Education Information Management System and State of Texas Assessments of Academic Readiness Algebra I end-of-course data.

Dissemination of informational materials

Dissemination of the informational brochures coincided with the time period when grade 10 students were selecting courses for their junior year: January–March 2016. The envelopes containing the brochures were sealed, stamped, and printed with the TEA logo to encourage parents to open them. A copy of the informational brochure that was mailed to parents of students in the treatment group is in appendix C, and a copy of the informational brochure that was mailed to parents of students in control schools is in appendix D.

Once schools were recruited into the study, the study team provided them with two options for distribution of materials.

The first was for schools to disseminate the materials themselves. Under this option, school staff were asked to provide the study team with the number of grade 10 students for the 2015/16 school year. The study team then counted out that number of postage-paid envelopes, plus a few extra, and sent them express mail to the high school using the contact name provided by the school. Schools were then asked to print mailing labels for grade 10 students, attach them to the envelopes, and have the U.S. Postal Service pick them up during its daily run. The envelopes were addressed to the "Parents or Guardians of [student name]". Schools were provided with $150 to cover the cost of address labels, printer ink, and staff time after the study team verified that the envelopes had been mailed.

The boxes of materials also contained an envelope addressed to the study team. Schools were asked to mail that envelope along with the student envelopes. Receipt of the letters and the postmarks for these letters served as indicators to the study team on whether and when schools had mailed the materials. The study team placed telephone calls to 11 schools that did not mail back the envelopes by the end of March. School staff were asked to verify whether the envelopes had been mailed to parents and guardians and the mailing date. Additionally, the return address on all envelopes mailed to parents and guardians was the REL Southwest office. The study team used the zip codes on the envelopes that were returned to REL Southwest as undeliverable to identify which school the envelope was associated with. This information was used to verify which schools had mailed the envelopes to parents and guardians. At least one undeliverable mail envelope was received from each participating school. The study team was thus confident that all participating schools had mailed the envelopes to parents and guardians.

The second option was for the study team to disseminate the materials. Under this option, schools were asked to provide spreadsheets containing the names and addresses of grade 10 students. The spreadsheets were then used to print mailing labels, which were affixed to the envelopes by the study team. This was done for the schools recruited through public information requests, as well as the schools in the district that opted to send the study team an Excel file containing students' names and addresses.

Schools were never informed of their treatment status. Additionally, it is unlikely that a school could have determined its treatment status based on the materials it received had someone from the school opened one of the sealed envelopes. The treatment and control brochures were not shared with schools before dissemination of the informational materials.

Analysis

Confirmatory and exploratory analyses were used to assess the impact of the intervention on student outcomes. The confirmatory analyses were designed to investigate differences in Algebra II completion rates between students in treatment and control schools. The exploratory analyses were designed to investigate whether there are differential impacts of the treatment for the specified subgroups—high–racial/ethnic minority schools and low-income schools.

Confirmatory analysis. To assess the effect of providing parents with information about the role of Algebra II in college admission, a two-level model, with students nested within schools, was estimated:

Student level:

$$E(Y_{ij}|\mu_{ij}) = \mu_{ij},\ n_{ij} = \mu_{ij}$$

$$\text{Log}\left(\frac{\varphi_{ij}}{1-\varphi_{ij}}\right) = n_{ij},$$

$$n_{ij} = \beta_{0j} + \beta_1(Asian_{ij}) + \beta_2(Black_{ij}) + \beta_3(Hispanic_{ij}) + \beta_4(Other\ Race_{ij}) + \beta_5(Special\ Education_{ij}) + \beta_6(LEP_{ij}) + \beta_7(Economic\ Disadvantage_{ij}) + \beta_8(Algebra\ I\ EOC_{ij})$$

where *LEP* indicates that the student is an English learner student, and *Algebra I EOC* is the Algebra I end-of-course assessment.

School level:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(Treat_j) + \sum_{q=2}^{Q}\gamma_{0q}(ESC\ Region_j) + \gamma_{0Q+1}(Cov_j) + u_j$$

where φ_{ij} is the probability that student i in school j completed Algebra II by the end of grade 11, $Treat_j$ is a binary indicator that takes on the value of 0 for control schools and 1 for treatment schools, $ESC\ Region_j$ is a set of binary indicator variables that have the value of 0 for schools not in the Education Service Center (ESC) region and 1 for schools in the ESC region, Cov_j are school-level covariates (that is, percentage of racial/ethnic minority students, percentage of economically disadvantaged students, percentage of students in special education, percentage of English learner students, school enrollment, and average percentage of students who passed the State of Texas Assessments of Academic Readiness Algebra I end-of-course exam), and u_j are random errors associated with schools. The use of random school effects controls for clustering by school. In this model the covariate of interest is γ_{01}, which is the treatment effect. A binary indicator for region 1 was not included in the model, since only one high school was recruited from that district. In the analyses the single high school from region 1 was combined with the single remaining school in region 19—one of the region 19 schools dropped out of the study. Region 11 is the omitted region, as it had the largest number of schools. All covariates in the model, with the exception of the treatment indicator, were grand mean centered. The treatment indicator retained the 0/1 coding.

Exploratory analyses. The subgroup analyses looked at whether the impact of providing parents and guardians with information about the role of Algebra II in college admission differs by whether the school has a high percentage of racial/ethnic minority students or by whether it has a high percentage of low-income students. These analyses build on the two-level hierarchical linear model used in the confirmatory analysis:

Student level:

$$E(Y|X) = \text{Log}\left(\frac{\varphi_{ij}}{1-\varphi_{ij}}\right) = n_{ij},$$

$$n_{ij} = \beta_{0j} + \beta_1(Asian_{ij}) + \beta_2(Black_{ij}) + \beta_3(Hispanic_{ij}) + \beta_4(Other\ Race_{ij}) + \beta_5(Special\ Education_{ij}) + \beta_6(LEP_{ij}) + \beta_7(Economic\ Disadvantage_{ij}) + \beta_8(Algebra\ I\ EOC_{ij})$$

School level:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(Treat_j) + \gamma_{02}(High\ Minority\ or\ Low\ Income_j) + \sum_{q=3}^{Q}\gamma_{0q}(ESC\ Region_j) + \sum_{r=Q+1}^{R}\gamma_{0r}(Cov_j) + \gamma_{0r+1}(Treat_j * High\ Minority\ or\ Low\ Income_j) + u_j$$

This model includes a term, *High Minority,* that indicates whether the percentage of racial/ethnic minority students in a school is in the top third of the state or a term, *Low Income,* that indicates whether the percentage of economically disadvantaged students is in the top third of the state, depending on the analysis. The model also includes $Treat_j$ * *High Minority or Low Income,* in which the treatment indicator is interacted with a school-level covariate—either high racial/ethnic minority or low-income, depending on the analysis. For example, to investigate differences in the treatment effect by school racial/ethnic composition, a high–racial/ethnic minority school indicator was included, which takes on a value of 1 for schools in which the percentage of students in the school who are

American Indian, Black, Hispanic, or a race/ethnicity other than Asian or White is in the top third of schools in the state, and a value of 0 otherwise. Similar analyses were conducted to look at differential impacts for low-income schools. All covariates in these models, except the treatment indicators, indicators for high–racial/ethnic minority or low-income schools, and interactions between the treatment indicators and indicators for high–racial/ethnic minority or low-income schools, were grand mean centered. The treatment indicators, indicators for high–racial/ethnic minority or low-income schools, and interactions between the treatment indicators and indicators for high–racial/ethnic minority or low-income schools retained the 0/1 coding. The coefficient of interest for these analyses is the interaction term, γ_{0R+1}.

For the exploratory analyses, separate models were analyzed in which the omitted category was reversed in order to estimate the treatment impact for high–racial/ethnic minority versus not high–racial/ethnic minority schools and low-income versus not low-income schools. That is, in one set of analyses the omitted categories were high–racial/ethnic minority schools or low-income schools, while in another set of analyses the omitted categories were schools that were not high–racial/ethnic minority schools or not low-income schools. The interaction term included matched the analysis. Only the results of the analyses in which the omitted categories were schools that were not high–racial/ethnic minority schools and schools that were not low-income schools are shown in tables E2 and E3 in appendix E.

The adjusted predicted probabilities shown in figures 2 and 3 in the main text were calculated using the coefficients obtained from the analyses of the multilevel models. The adjusted predicted probabilities for the treatment schools that were not high–racial/ethnic minority schools or not low-income schools were calculated by adding the coefficients for the intercept and treatment indicator and transforming the log odds ratio to a probability. The adjusted predicted probabilities for treatment schools that were high–racial/ethnic minority schools or low-income schools were calculated by adding the coefficients for the intercept, treatment indicator, high–racial/ethnic minority or low-income indicator, and the interaction between treatment and high–racial/ethnic minority or low-income and transforming the log odds ratio to a probability. The high–racial/ethnic minority or low-income control school adjusted predicted probabilities were calculated by adding the coefficients for the intercept and the high–racial/ethnic minority or low-income indicator and transforming the log odds ratio to a probability. The adjusted predicted probabilities for control schools that were not high–racial/ethnic minority schools or not low-income schools were calculated by transforming the log odds ratio for the intercept to a probability. Since all the other variables in the models were grand mean centered, the predicted probabilities are based on the mean values of these variables for the overall sample.

Appendix C. Treatment group brochure

This appendix includes the informational brochure that was sent to the treatment group. The brochure is a trifold. When folded, the panel on the right is the cover of the brochure, the panel on the left is folded in, and the panel in the middle is the back of the brochure.

the high school graduation requirements are changing?

Beginning with the graduating class of 2018, Texas high school students will have the option to complete one of three new graduation plans: the Foundation Plan, the Foundation plus Endorsement Plan, or the Distinguished Plan.

With the move to these new graduation plans comes new course requirements, particularly with regard to mathematics. Only students who choose to complete the Distinguished Plan or the STEM endorsement within the Foundation plus Endorsement Plan will be required to complete Algebra II.

Yet, Algebra II is still an admissions requirement for most public colleges and universities in Texas.

For more information:

Texas Education Agency:
http://www.tea.state.tx.us/brochures/

Institute for Public School Initiatives
http://ipsi.utexas.edu/hb5-resources-2/

Education Service Center Region 13
http://www4.esc13.net/cc/house-bill-5

Class of 2018!

Did you know...

Will you have the math to get you to college?

Not all new graduation plans require Algebra II, but most Texas public universities do!

Your Choice of High School Graduation Plans:

Foundation Plan (22 credits)

English (4 credits)
Science (3 credits)
Mathematics (3 credits)
Social Studies (3 credits)
Physical Education (1 credit)
World Language (2 credits)
Fine Arts (1 credit)
Electives (5 credits)

Does NOT require Algebra II

Foundation plus Endorsement (26 credits)

English (4 credits)
Science (4 credits)
Mathematics (4 credits)
Social Studies (3 credits)
Physical Education (1 credit)
World Language or Computer Science (2 credits)
Fine Arts (1 credit)
Electives (2 credits)
Endorsement Requirements

Only STEM endorsement requires Algebra II

Distinguished (26 credits)

English (4 credits)
Science (4 credits)
Mathematics (4 credits)
MUST INCLUDE ALGEBRA II
Social Studies (3 credits)
Physical Education (1 credit)
World Language or Computer Science (2 credits)
Fine Arts (1 credit)
Electives (2 credits)
Endorsement Requirements for 1 Endorsement

Requires Algebra II

Affects Your College Options:

Will NOT qualify for admission to Texas public universities

Will qualify for admission to Texas public universities, **if you complete Algebra II**

Will qualify for automatic admission to Texas public universities

If you intend to select either the **Foundation** or the **Foundation plus Endorsement** Plan,

talk to your guidance counselor TODAY about adding Algebra II!

Appendix D. Control group brochure

This appendix includes the informational brochure that was sent to the control group.

Class of 2018!

Did you know the high school graduation requirements are changing?

Beginning with the graduating class of 2018, Texas high school students will have the option to complete one of three new graduation plans: the Foundation Plan, the Foundation plus Endorsement Plan, or the Distinguished Level of Achievement Plan.

With the move to these new graduation plans comes new course requirements, particularly with regard to mathematics. Only students who choose to complete the Distinguished Level of Achievement Plan or the STEM endorsement within the Foundation plus Endorsement Plan will be required to complete Algebra II.

For more information about the changes to the Texas high school graduation requirements, as well as additional information about each of the plans and endorsement areas, please review the materials provided on these resource pages:

Texas Education Agency:
http://www.tea.state.tx.us/brochures/

Institute for Public School Initiatives
http://ipsi.utexas.edu/hb5-resources-2/

Education Service Center Region 13
http://www4.esc13.net/cc/house-bill-5

Appendix E. Outcomes analysis results

This appendix presents the results of the outcomes analyses.

Table E1. Results for the multilevel model comparing Algebra II completion for students in treatment and control schools, 2016/17

Variable	Log odds ratio	Odds ratio	Standard error	*t* ratio
School-level variables				
Intercept	1.24	3.47	0.14	8.74**
Treatment	0.11	1.12	0.21	0.54
Enrollment	0.00	1.00	0.00	–1.10
% racial/ethnic minority	0.00	1.00	0.01	0.08
% economically disadvantaged	0.01	1.01	0.01	1.29
% special education	0.03	1.03	0.05	0.69
% English learner	0.01	1.01	0.01	0.50
Algebra I end-of-course exam	0.01	1.01	0.01	1.54
Region 2	–0.42	0.66	0.90	–0.47
Region 3	–1.02	0.36	0.71	–1.44
Region 4	0.11	1.12	0.43	0.26
Region 5	–0.97	0.38	0.83	–1.17
Region 6	–0.78	0.46	0.63	–1.23
Region 7	–0.57	0.57	0.69	–0.82
Region 8	–1.05	0.35	0.61	–1.72
Region 9	–1.35	0.26	0.85	–1.58
Region 10	–0.20	0.82	0.44	–0.46
Region 12	–0.23	0.79	0.54	–0.43
Region 13	–0.55	0.58	0.47	–1.18
Region 14	–1.07	0.34	0.72	–1.47
Region 15	–0.42	0.66	0.97	–0.43
Region 16	–0.82	0.44	0.72	–1.15
Region 17	–0.10	0.91	0.74	–0.13
Region 18	–0.74	0.48	0.64	–1.16
Region 19[a]	–0.49	0.61	0.86	–0.57
Region 20	0.34	1.41	0.67	0.51
Student-level variables				
Male	–0.37	0.69	0.03	–11.42**
Asian	0.52	1.68	0.16	3.25**
Black	0.03	1.03	0.06	0.49
Hispanic	0.04	1.04	0.05	0.74
Other race/ethnicity	–0.11	0.90	0.11	–0.94
Economically disadvantaged	–0.17	0.84	0.04	–4.40**
Special education	–1.19	0.31	0.05	–22.85**
English learner	–0.35	0.70	0.05	–6.90**
Algebra I end-of-course exam	0.00	1.00	0.00	40.23**

** Significant at $p < .01$.

a. Because there was just one school in region 1 and one in region 19, region 1 was combined with region 19 for the analyses.

Source: Authors' calculations based on data from the Texas Education Agency Public Education Information Management System and State of Texas Assessments of Academic Readiness Algebra I end-of-course data.

Table E2. Results for the multilevel model comparing Algebra II completion for students in treatment and control schools with a high percentage of racial/ethnic minority students, 2016/17

Variable	Log odds ratio	Odds ratio	Standard error	*t* ratio
School-level variables				
Intercept	1.26	3.51	0.15	8.62*
Treatment	0.25	1.29	0.29	0.87
Treatment × high racial/ethnic minority	–0.34	0.71	0.44	–0.78
Enrollment	0.00	1.00	0.00	–1.25
% racial/ethnic minority	0.00	1.00	0.01	–0.18
% economically disadvantaged	0.01	1.01	0.01	1.10
% special education	0.03	1.03	0.05	0.67
% English learner	0.01	1.01	0.02	0.54
Algebra I end-of-course exam	0.01	1.01	0.01	1.44
High–racial/ethnic minority	0.35	1.41	0.54	0.64
Region 2	–0.44	0.65	0.91	–0.48
Region 3	–1.14	0.32	0.77	–1.49
Region 4	0.14	1.15	0.44	0.32
Region 5	–1.03	0.36	0.85	–1.22
Region 6	–0.79	0.45	0.64	–1.23
Region 7	–0.56	0.57	0.72	–0.78
Region 8	–1.12	0.33	0.62	–1.80
Region 9	–1.33	0.26	0.86	–1.55
Region 10	–0.19	0.83	0.44	–0.43
Region 12	–0.22	0.80	0.55	–0.40
Region 13	–0.58	0.56	0.47	–1.23
Region 14	–1.11	0.33	0.74	–1.49
Region 15	–0.47	0.62	0.98	–0.48
Region 16	–0.80	0.45	0.73	–1.11
Region 17	–0.06	0.94	0.75	–0.08
Region 18	–0.77	0.46	0.66	–1.18
Region 19[a]	–0.35	0.70	0.89	–0.40
Region 20	0.35	1.42	0.68	0.51
Student-level variables				
Male	–0.37	0.69	0.03	–11.42**
Asian	0.52	1.69	0.16	3.26**
Black	0.03	1.03	0.06	0.49
Hispanic	0.04	1.04	0.05	0.75
Other race/ethnicity	–0.14	0.90	0.11	–0.94
Economically disadvantaged	–0.17	0.84	0.04	–4.40**
Special education	–1.19	0.31	0.05	–22.85**
English learner	–0.35	0.70	0.05	–6.89**
Algebra I end-of-course exam	0.00	1.00	0.00	40.24**

* Significant at $p < .05$; ** significant at $p < .01$.

a. Because there was just one school in region 1 and one in region 19, region 1 was combined with region 19 for the analyses.

Source: Authors' calculations based on data from the Texas Education Agency Public Education Information Management System and State of Texas Assessments of Academic Readiness Algebra I end-of-course data.

Table E3. Results for the multilevel model comparing Algebra II completion for students in treatment and control schools with a high percentage of economically disadvantaged students, 2016/17

Variable	Log odds ratio	Odds ratio	Standard error	*t* ratio
School-level variables				
Intercept	1.22	3.39	0.14	8.60**
Treatment	0.50	1.65	0.28	1.78
Treatment × low income	–0.91	0.40	0.43	–2.09*
Enrollment	0.00	1.00	0.00	–1.66
% racial/ethnic minority	0.00	1.00	0.01	0.11
% economically disadvantaged	0.02	1.02	0.01	1.54
% special education	0.03	1.03	0.05	0.54
% English learner	0.01	1.01	0.01	0.86
Algebra I end-of-course exam end-of-course exam	0.02	1.02	0.01	1.66
Low-income	0.10	1.10	0.49	0.20
Region 2	–0.46	0.63	0.94	–0.49
Region 3	–1.10	0.33	0.72	–1.53
Region 4	0.30	1.35	0.43	0.69
Region 5	–0.85	0.43	0.82	–1.04
Region 6	–0.84	0.43	0.65	–1.29
Region 7	–0.52	0.60	0.69	–0.75
Region 8	–1.14	0.32	0.61	–1.87
Region 9	–1.49	0.23	0.85	–1.76
Region 10	–0.13	0.88	0.45	–0.28
Region 12	–0.10	0.90	0.56	–0.19
Region 13	–0.51	0.60	0.47	–1.09
Region 14	–1.17	0.31	0.73	–1.61
Region 15	–0.50	0.61	0.96	–0.52
Region 16	–0.69	0.50	0.72	–0.96
Region 17	0.02	1.02	0.75	0.03
Region 18	–0.78	0.46	0.66	–1.19
Region 19[a]	–0.42	0.66	0.87	–0.48
Region 20	0.45	1.57	0.67	0.67
Student-level variables				
Male	–0.37	0.69	0.03	–11.42**
Asian	0.52	1.69	0.16	3.26**
Black	0.03	1.03	0.06	0.50
Hispanic	0.04	1.04	0.05	0.76
Other race/ethnicity	–0.11	0.90	0.11	–0.93
Economically disadvantaged	–0.17	0.84	0.04	–4.41**
Special education	–1.19	0.31	0.05	–22.85**
English learner	–0.35	0.70	0.05	–6.90**
Algebra I end-of-course exam	0.00	1.00	0.00	40.23**

* Significant at $p < .05$; ** significant at $p < .01$.

a. Because there was just one school in region 1 and one in region 19, region 1 was combined with region 19 for the analyses.

Source: Authors' calculations based on data from the Texas Education Agency Public Education Information Management System and State of Texas Assessments of Academic Readiness Algebra I end-of-course data.

Notes

1. Students could drop down to the Minimum High School Program, which did not require Algebra II, if their school district provided written notice to the student's parent or guardian explaining the benefits of the Recommended High School Program; the student, the student's parent or guardian, and a school counselor or school administrator agreed that the student should be permitted to take courses under the Minimum High School Program; and the student met one of the following conditions: was at least 16 years old, had completed two credits required for graduation in each subject area, or had failed to be promoted to grade 10 one or more times as determined by the school district.
2. A student may graduate under the Foundation High School Program without earning an endorsement if, after grade 10, the student and the student's parent or guardian are notified of the benefits of graduating with an endorsement and the student's parent or guardian gives written permission for the student to complete the basic 22-credit Foundation High School Program.
3. Students could drop down to the Minimum High School Program, which did not require Algebra II, if their school district provided written notice to the student's parent or guardian explaining the benefits of the Recommended High School Program; the student, the student's parent or guardian, and a school counselor or school administrator agreed that the student should be permitted to take courses under the Minimum High School Program; and the student met one of the following conditions: was at least 16 years old, had completed two credits required for graduation in each subject area, or had failed to be promoted to grade 10 one or more times as determined by the school district.
4. The endorsements include science, technology, engineering, and math; business and industry; public services; arts and humanities; and multidisciplinary studies. A student can earn a science, technology, engineering, and math endorsement by completing foundation and general endorsement requirements, including Algebra II; chemistry; physics; a coherent sequence of four or more credits in career and technical education that consist of at least two courses in the same career cluster, including at least one advanced career and technical education course, which includes any course that is the third or highest course in a sequence; and a coherent sequence of four credits in computer science selected from the approved list.
5. A student may graduate under the Foundation High School Program without earning an endorsement if, after grade 10, the student and the student's parent or guardian are notified of the benefits of graduating with an endorsement and the student's parent or guardian gives written permission for the student to complete the basic 22-credit Foundation High School Program.
6. Previously, students in the top 10 percent of their graduating class were automatically eligible for admission. Students who earn the science, technology, engineering, and math endorsement also qualify for automatic admission because they are required to complete Algebra II, which qualifies them for a distinguished level of achievement.
7. Only admission to college and college selectivity were available in ELS. Data were not available in ELS for cumulative grade point average, retention, or graduation.
8. Students and parents who did not wish to have their contact information publicly available could opt out of the directories.

9. The study team attempted to recruit more than one school in this region but did not receive the public information request data from districts in this region in time to include them.
10. After the schools in the other districts were randomized, there were 57 treatment schools and 58 control schools.
11. Students must take Algebra I in grade 9 if they did not complete it in middle school and then complete geometry (in that order). Although the informational materials were not distributed until students were in grade 10, the timing of the intervention is such that all students meeting the eligibility requirements in participating schools should have had the opportunity to complete Algebra II in grade 11, unless they were already off track by having failed an earlier math course.

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