Implementation of Career- and College-Ready Requirements for High School Graduation in Washington

Appendix A. About the study

Appendix B. Methods

Appendix C. Supporting analysis

See https://go.usa.gov/xfaRN for the full report.

Appendix A. About the study

This appendix offers additional information about the purpose of the study on implementation of the career- and college-ready (CCR) requirements for high school graduation, provides background information to contextualize the results, and summarizes the related literature.

Purpose of the study

To inform Washington state's implementation of the CCR graduation requirements, the Regional Educational Laboratory Northwest examined how increases in the requirements are associated with high school academic outcomes, high school completion, and postsecondary readiness (Reykdal, 2017; Washington State Board of Education, 2017). The CCR graduation requirements are intended to align expectations for high school graduates with the admissions standards at the state's public universities (see table A1 for the credit requirements for graduation for the classes of 1991–2019) and to enable students to pursue the career of their choice.

As the CCR graduation requirements take effect, state and local educators and policymakers have expressed concern about how the changes might affect graduation rates and postsecondary outcomes, especially for students in rural areas, English learner students, students of color, and students eligible for the national school lunch program. Many of these student groups have graduation rates that are persistently below the state average (Washington Office of Superintendent of Public Instruction, 2018).

Uncertainty among several stakeholder groups over how the new requirements might differentially affect students across the state and a desire to know what districts can do to prevent graduation rates from dropping motivated this study. Representatives from the Washington State Board of Education, which developed the new requirements, expressed interest in the study because it aligns well with the board's focus on transitions from high school to postsecondary education and careers (personal communication, July 21, 2017). The Washington Office of Superintendent of Public Instruction is also interested in the study, emphasizing the need to disaggregate findings for priority student groups, including English learner students, students of color, and students eligible for the national school lunch program (personal communication, September 26, 2017). Finally, a high school principal influenced the selection of the study topic, citing its critical importance to Washington high school educators. The principal, whose district is in a rural area in the southeast corner of the state, said that it is important for Washington policymakers to know how the new requirements could differentially affect schools like his, which

serve student populations that consist primarily of students of color, students eligible for the national school lunch program, and students whose first language is not English (personal communication, January 19, 2017).

State and local education leaders in Washington hope to use information about the differences between current district requirements and the state CCR graduation requirements, as well as the extent to which students from previous graduating classes and demographic groups are meeting the CCR requirements, to support efforts to implement the CCR requirements. Four-year cohort graduation rates trended upward between 2012/13 and 2017/18 (the most recent year with publicly available data), with graduation rates among some groups—particularly Hispanic and English learner students—improving at twice the statewide average (Washington Office of Superintendent of Public Instruction, 2018). State and local educators are wondering whether this trend is sustainable under more-rigorous graduation requirements.

This study aims to better prepare state and local education leaders in Washington for potential challenges as they implement the new requirements. It also seeks to provide useful information for other states that are considering changes to credit requirements for high school graduation. Finally, it contributes new evidence to a body of research on the relationship between increasing graduation requirements and student secondary and postsecondary outcomes, with an emphasis on students in rural schools, English learner students, students of color, and students eligible for the national school lunch program.

Background on credit requirements for graduation in Washington

The Washington State Board of Education developed career- and college-ready graduation requirements in 2010. They were the result of an effort that began in 2007 to gather input from stakeholders, conduct state and local analyses, propose legislation to codify the requirements, and fund their implementation. The state legislature approved funding for the new requirements in 2014 and directed the Washington State Board of Education to implement them for the class of 2019 and beyond (S. 6552, Wash. 2014). Districts could apply for a one- or two-year waiver, meaning that full implementation will take effect for the class of 2021.

Washington has changed its credit requirements for graduation three times since 1990/91. The first change, which took effect for the class of 2013, raised the total credits required for graduation from 19 to 20 (by increasing required math credits from 2 to 3). For the class of 2016, 1.5 credits of electives were replaced with 1 additional credit of English and 0.5 additional credit of social studies; the overall number of credits required to graduate (20) did not change. Beginning with the class of 2019, students need at least 24 credits to graduate, with increases in credit requirements for science, fine arts, and world languages (table A1).

Table A1. Washington credit requirements for high school graduation, total and by content area, classes of 1991–2019

Content area	Classes of 1991–2012	Classes of 2013–15	Classes of 2016–18	Class of 2019
Total credits	19	20 (+)	20	24 (+)
English	3	3	4 (+)	4
Math	2	3[a] (+)	3[a]	3[b]
Science[c]	2	2	2	3 (+)
Social studies	2.5	2.5	3 (+)	3
Health and physical education	2	2	2	2
Fine arts	1	1	1	2[d] (+)
World languages	0	0	0	2[e] (+)
Career and technical education	1	1	1	1
Electives	5.5	5.5	4 (−)	4

(+) indicates an increase in credit requirements; (−) indicates a decrease in credit requirements.

a. Students must complete Algebra I, Geometry, and Algebra II (or their equivalents).

b. Students must complete Algebra I and Geometry (or their equivalents) and a third credit of math. Algebra II is required to meet the minimum requirements for admission to Washington's public four-year universities.

c. For the classes of 1991–2018 the science requirement included one credit of laboratory science. Beginning with the class of 2019 the science requirement includes two credits of laboratory science.

d. Students can replace one fine arts credit with credit in another content area that aligns with their postsecondary plans.

e. Students can replace two world languages credits with credits in other content areas that align with their postsecondary plans. Two credits in the same world language are required to meet the minimum requirements for admission to Washington's public four-year universities.

Sources: Snyder & Hoffman, 2001; Washington State Board of Education, 2017.

Washington allows districts to offer students some flexibility in meeting the credit requirements for graduation. Students can replace one fine arts credit and two world languages credits with credits in other content areas that align with their postsecondary plans. The flexibility in meeting these requirements at the student level has allowed districts to interpret the state requirements in multiple ways. Some districts have made fine arts and world languages requirements for graduation, others allow students to opt in or opt out of the fine arts and world languages requirements based on their postsecondary plans, and still others designate fine arts and world languages as elective courses. In addition, the state allows for a single course to fulfill both the career and technical education requirement and another requirement.

Washington also has noncredit graduation requirements. These include preparing a "High School and Beyond Plan," taking and passing a Washington history course in middle school or high school, and passing content area assessments. Since the class of 2008, Washington has required students to pass standardized English and math assessments to graduate (Washington State Board of Education, 2017). Students can retake exams in high school if they have not achieved proficiency.

Several districts increased credit requirements for graduation between 2011/12 and 2017/18 (table A2). More districts increased credit requirements in English, math, and social studies in the years in which the state increased its requirements.

Table A2. Number of districts that increased the number of credits required to graduate from high school, by content area, 2011/12–2017/18

Content area	2011/12 to 2012/13 (*n* = 246)	2012/13 to 2013/14 (*n* = 248)	2013/14 to 2014/15 (*n* = 248)	2014/15 to 2015/16 (*n* = 248)	2015/16 to 2016/17 (*n* = 248)	2016/17 to 2017/18 (*n* = 248)
Total credits	31	24	22	24	25	24
English	6	3	4	35[a]	1	7
Math	82[a]	10	0	1	1	3
Science	4	5	9	10	9	16
Social studies	15	13	19	40[a]	7	8
Health and physical education	5	2	11	2	5	1
Fine arts	4	1	5	8	11	16
World languages	5	3	8	1	10	17
Career and technical education	8	13	17	10	11	7
Electives	99	45	44	67	39	43
Any increase	165	88	91	126	77	78

a. The state increased credit requirements in this content area in this school year.

Source: Authors' analysis of 2011/12–2017/18 data from the Washington State Board of Education.

Related literature

The 1983 *A Nation at Risk* report of the National Commission on Excellence in Education called for high school students to take four years of English language arts, three years of math, three years of science, three years of social studies, and a half year of computer science (Gardner et al., 1983). Since then, most states have increased credit requirements for graduation (Clune, 1989). Increases in credit requirements might have little effect on high-achieving students, who already take more than the minimum number of credits required to graduate (Chaney, Burgdorf, & Atash, 1997). However, a multistate longitudinal study using hierarchical modeling found that students in states with higher credit requirements tended to enroll in higher level math courses in grade 9 and take more advanced courses in high school (Schiller & Muller, 2003).

There is some evidence that higher credit requirements for graduation are associated with earning more math and science credits for low-achieving students, students of color, and students who were eligible for the national school lunch program. For instance, a multistate descriptive analysis of transcript data concluded that after states adopted more-rigorous credit requirements for graduation, average credits per student increased in all academic subjects, particularly for lower achieving students, as did course difficulty (Clune & White, 1992). In addition, a longitudinal study of education and economic data using a quasi-experimental instrumental variable approach found that increasing credit requirements led to large increases in the number of math courses completed and in postsecondary earnings, particularly for Black male students (Goodman, 2009).

However, the additional courses students take are not necessarily rigorous, nor do they necessarily prepare students for careers and college. For example, using data from the High School Transcript Study, one study found that higher credit requirements for graduation were associated with an increase in the overall number of math courses students took but not in the number of advanced courses (Finn, Gerber, & Wang, 2002). A descriptive study of the relationship between higher graduation requirements in science and science course-taking and academic achievement concluded that increasing science credit requirements was associated with an increase in science course completion but not with science learning or college outcomes (Montgomery & Allensworth, 2010). The study also noted that graduation rates declined following implementation of the new requirements and that graduation rates took five years to return to prechange levels. Another recent descriptive study reported that in states that require every student to complete at least one advanced course to graduate, almost half of students do not do so, and the share of students is higher among students of color, low-performing students, and students in small schools (Booth, Shields, & Carle, 2017).

Several studies have found that raising the number of credits required to graduate is negatively associated with high school completion rates. Using regression analysis, one study found statistically significant increases in dropout rates immediately after credit requirements were raised, and the higher dropout rate persisted (Lillard & DeCicca, 2001). Dropout rates increased most among students of color and students eligible for the national school lunch program after more-rigorous credit requirements for graduation were implemented. A study using logistic regression with American Community Survey and census data found a higher probability of dropout after increases in math and science course graduation requirements (Plunk, Tate, Bierut, & Grucza, 2014). A national quasi-experimental study also found negative effects of increasing high school graduation course requirements, especially for students of color (Daun-Barnett & St. John, 2012).

There are exceptions to the negative findings, however. A study comparing graduation outcomes for students in schools that require three math courses with outcomes for students in schools that require two math courses found no differences—although the study noted that some schools with higher credit requirements had diluted their curricula, making the courses easier to pass (Hoffer, 1997). A study on the effects of upgrading math and science credit requirements also found no negative effects on the percentage of students graduating from high school (Porter, 1998). But that study also reported concerns from teachers about "watering down" the curriculum—slowing its pace and decreasing the difficulty and number of topics covered in class and the homework assigned—to accommodate students perceived to be unprepared to take more-rigorous courses.

Research evidence on the effects of increasing credit requirements for graduation on postsecondary outcomes is inconclusive. One study found that higher credit requirements for graduation were associated with different college-level outcomes for different demographic groups (Plunk et al., 2014). Another study found that college enrollment rose faster in districts that had to increase math credit requirements in response to changes in state requirements but found no effect for districts that had to increase science credit requirements (Buddin & Croft, 2014). Both studies used regression models to control for observable factors that could influence outcomes.

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Appendix B. Methods

This appendix provides detailed information on the data sources, study sample, missing data, and analytic methods used in the report.

Data sources

Data for the study came from four sources:

- Publicly available data on district credit requirements for graduation in 2012/13–2018/19 from the Washington State Board of Education.

- Publicly available data on educators working in Washington public schools in 2017/18 from the Washington Office of Superintendent of Public Instruction's (OSPI) S-275 Personnel Database.

- Data on school urbanicity from the National Center for Education Statistics Common Core of Data (Geverdt, 2015).

- K–12 student-level data—including transcripts, demographic information, eligibility for the national school lunch program, eligibility for special education services, state assessment scores and school enrollment (including withdrawal status)—for 2009/10–2017/18 from the Comprehensive Education Data and Research System at the OSPI. Data on English learner students for 2004/05–2017/18 are from the OSPI Transitional Bilingual Instructional Program records.

Student-level data are linked across datasets and school years with a unique research identification number. Details about the specific data elements that were used to address each research question are in table B1.

Table B1. Data sources, years of data, and data elements used to address the study's research questions

Data sources	Years	Data elements
Research question 1. How did the percentage of districts that implemented the career- and college-ready (CCR) graduation requirements change between 2017/18 and 2018/19?		
• Washington State Board of Education	2017/18 and 2018/19	• Total number of credits required for graduation • Number of credits required in English language arts, math, science, laboratory science, social studies, fine arts, world languages, career and technical education, health and physical education, and electives • Class period schedules (2018/19 only)
Research question 1a. How did early implementer districts (those that implemented the CCR graduation requirements for the class of 2018) differ from districts that were not early implementers?		
• Washington State Board of Education • Washington Office of Superintendent of Public Instruction's (OSPI) public report cards • OSPI S-275 personnel database • OSPI Comprehensive Education Data and Research System	2017/18	• Indicator for whether a district implemented the CCR graduation requirements, created through the data elements listed in the cell above • Number of students enrolled, percentages of students in each racial/ethnic group, percentage of students eligible for the national school lunch program, percentage of students eligible for special education services, percentage of English learner students, and proficiency rates on state assessments • Number of schools and their grade spans, National Center for Education Statistics locale codes, and student–teacher ratios • Number of teachers and their education level, years of experience, certification, and teaching assignment • Number of courses offered in high schools by content area and type (for example, Advanced Placement and dual enrollment) • Number of students enrolled in dual-credit courses[a]
Research question 2. What percentage of students met the CCR graduation requirements between 2013/14 and 2017/18?		
• OSPI Comprehensive Education Data and Research System	2009/10–2017/18	• Student transcript data, including course enrollment and grades earned • Student enrollment data, including school and district enrollment, as well as withdrawal status (for example, graduate or dropout)
Research question 2a. How did 2018 graduates who met the CCR graduation requirements differ from those who did not?		
• OSPI Comprehensive Education Data and Research System	2009/10–2017/18	• Student transcript data, including course enrollment and grades earned • Student enrollment data, including school and district enrollment, as well as withdrawal status (for example, graduate or dropout) • Student demographic data (including eligibility for the national student lunch program, eligibility for special education services, and English learner status) and assessment data
Research question 3. How were district-level increases in total, science, fine arts, and world languages credit requirements for graduation between 2012/13 and 2017/18 associated with high school academic performance, high school completion, and postsecondary readiness?		
• Washington State Board of Education • OSPI Comprehensive Education Data and Research System	2009/10–2017/18	• Number of credits required to graduate by content area and school year • Student transcript data, including course enrollment and grades earned • State assessment scores • K–12 student enrollment data, including school and district enrollment, as well as withdrawal status (for example, graduate or dropout)

a. Dual-credit courses offer the opportunity to earn college credit in high school (for example, Advanced Placement and International Baccalaureate courses).
Source: Authors' compilation.

Study sample

This study included all students attending a Washington public high school who were held accountable to graduation requirements between 2013 and 2018. Students whose withdrawal codes indicate that they transferred to another high school and who did not appear in the following year of data were assumed to have left Washington public schools and were not included in the sample. Students who transferred to a Washington public school after the start of grade 9 were included in the sample when data elements needed for analysis were available.

Specific sampling choices for each research question are described below.

District sample to address research question 1. The sample for research question 1 on the change in the percentage of Washington districts that implemented the CCR graduation requirements and the differences between early implementer districts and districts that were not early implementers comprised 251 of 295 districts. (Forty-three districts did not offer grade 12 in 2017/18, 2018/19, or both, and the remaining district shared a high school with another district.)

Student sample to address research questions 2 and 3. The sample for research question 2 on the percentage of students who met the CCR graduation requirements and research question 3 on the association between district-level increases in total, science, fine arts, and world languages credit requirements for graduation and student academic outcomes comprised 365,485 students who began grade 9 between 2010/11 and 2014/15, were held accountable for graduation requirements between 2013/14 and 2017/18, and attended a public school in one of the 248 districts that enrolled grade 12 students and reported graduation requirements to the Washington State Board of Education between 2012/13 and 2017/18. (Three of the 251 districts that reported graduation requirements did not enroll grade 12 students during the study sample years.) The sample was limited in this way because transcripts for at least four years of high school and grade 8 state assessment scores were available for these students. The sample included:

- 71,796 students held accountable for graduation requirements in the class of 2014, 72,511 in the class of 2015, 72,626 in the class of 2016, 73,224 in the class of 2017, and 75,328 in the class of 2018.

- 5,388 American Indian/Alaska Native students, 29,406 Asian students, 17,073 Black students, 65,356 Hispanic students, 3,283 Native Hawaiian/Pacific Islander students, 223,864 White students, and 21,110 multiracial students (see the next section for information on how missing data on race/ethnicity were imputed).

- 193,077 students who were ever eligible for the national school lunch program, 20,480 current English learner students, 36,512 former English learner students (students who were reclassified as English proficient before grade 9), and 49,768 students who were ever eligible for special education services.

- 64,918 students in large metro schools, 108,876 students in metro suburb schools, 98,964 students in midsize schools, 40,804 students in urban fringe schools near metropolitan areas, and 51,923 students in distant schools farther from metropolitan areas.

- 308,273 students who graduated within four years, 15,547 students who graduated in more than four years, 23,326 students who dropped out, and 18,339 students who did not graduate or drop out.

Missing data

This section describes missing data for district- and student-level variables. It then discusses how missing data were minimized for analysis.

District-level analyses were limited to 248 school districts that enrolled grade 12 students and reported graduation requirements to the Washington State Board of Education.

Several approaches were used to address missing values in the 365,485 student records used for the analysis. For students who were missing a time-invariant variable (such as race/ethnicity or gender) in a certain school year, the study team replaced it with the modal value for that student in other school years. When no modal value existed, the most recent value was imputed across all years of data. After this procedure, no student records were missing data on gender, and 5 students were missing data on race/ethnicity. For students who were missing the year they were held accountable for graduation requirements, the study team imputed it from the variable for the students' expected graduation year.

For the 16.3 percent of students missing grade 8 assessment scores in English and the 16.4 percent missing grade 8 assessment scores in math, the study team imputed the values based on students' grade 7 assessment scores (standardized within content area, school year, grade level, and test type to have a mean of 0 and a standard deviation of 1). This reduced the percentage of students with missing values to 13.4 percent in English language arts and 13.5 percent in math. Overall, 88 percent of students missing grade 8 assessment scores in the study sample were not enrolled in Washington public schools before grade 9.

Roughly 6 percent of students were missing high school assessment scores. Washington allowed students in the sample to meet high school state assessment requirements with other options, including a collection of evidence of proficiency or a qualifying score on the ACT, the SAT, or Advanced Placement or International Baccalaureate tests. These scores were not available in the study's dataset, so students who substituted state assessment scores with one of these options were not included in the analyses where high school assessments were an outcome.

After taking the steps described above to minimize missing data, the study team used multiple imputation, a method recommended by the What Works Clearinghouse, to account for the remaining missing data on race/ethnicity, eligibility for the national school lunch program, and grade 8 state assessment scores. Five imputations were conducted using variables without missing data: gender, ever eligible for special education services, English learner status (current, former, or never English learner student), ever eligible for migrant student services, school locale (based on National Center for Education Statistics locale codes), and the year the student was held accountable for graduation requirements. The percentage of missing values before and after multiple imputation is in table B2. For outcome variables and descriptive analyses, listwise deletion was used instead of imputation. Multiple imputation was used to obtain pooled standard errors for regression models used to address research question 3.

Table B2. Number and percentage of sample values missing before and after multiple imputation, by control and outcome variables

Variable	Sample values missing before multiple imputation		Sample values missing after multiple imputation	
	Number	Percent	Number	Percent
Control variables				
Gender	0	0.0	0	0.0
Race/ethnicity	5	0.0	0	0.0
Ever eligible for the national school lunch program	213	0.0	0	0.0
Ever eligible for special education services	0	0.0	0	0.0
Ever classified as an English learner student	0	0.0	0	0.0
Ever eligible for migrant student services	0	0.0	0	0.0
Score on grade 8 state assessment in English language arts	49,036	13.4	0	0.0
Score on grade 8 state assessment in math	49,508	13.5	0	0.0
Percentage of students eligible for the national school lunch program in the last high school attended	492	0.1	0	0.0
Locale of the last high school attended	0	0.0	0	0.0
Year held accountable for career- and college-ready graduation requirements	0	0.0	0	0.0
Outcome variables				
Met career- and college-ready graduation requirements	3,164	0.9	na	na
Number of credits attempted	124	0.0	na	na
Number of credits earned	124	0.0	na	na
Final grade point average	3,051	0.8	na	na
Score on high school state assessment in English language arts	22,775	6.1	na	na
Score on high school state assessment in math	21,991	6.0	na	na
Graduated within four years	0	0.0	na	na
Dropout status	1,696	0.5	na	na
Met credit requirements for admission to a public four-year university in Washington	3,164	0.9	na	na

na is not applicable.

Source: Authors' analysis of 2009/10–2017/18 data from the Washington Office of Superintendent of Public Instruction.

Analytic methods

This section describes the analytic methods used for each research question.

Research question 1: How did the percentage of districts that implemented the CCR graduation requirements change between 2017/18 and 2018/19? Research question 1a: How did early implementer districts (those that implemented the CCR graduation requirements for the class of 2018) differ from districts that were not early implementers? To answer research question 1, the study team calculated and compared descriptive statistics. First, the study team counted the number of districts that implemented all the CCR graduation requirements for the classes of 2018 and 2019. Then, the study team counted the number of districts that implemented the CCR graduation requirements in each content area.

Next, the study team compared the characteristics of six sets of districts across three categories of implementation of the CCR graduation requirements:

- Districts that implemented all the CCR graduation requirements and districts that did not.

- Districts that implemented the CCR graduation requirements in core content areas (English, math, science, and social studies) and districts that did not.

- Districts that implemented all the CCR graduation requirements except the fine arts requirement or the world languages requirement, or both and districts that did not.

Results for the first pair of districts are reported in the main report and in appendix C. Results for the other two pairs are reported only in appendix C.

This analysis focused on the student composition of these districts, including:

- Enrollment in grades 9–12.

- Percentage of students in each racial/ethnic group.

- Percentage of students eligible for the national school lunch program.

- Percentages of current, former, and never English learner students.

- Percentage of students eligible for special education services.

- Percentage of students who were ever eligible for migrant student services.

- Percentage of students who were ever eligible for the national school lunch program.

- 2018 four-year cohort graduation rate, dropout rate, and continuing rate.

- Percentage of students whose home language is English, percentage whose home language is Spanish, and percentage whose home language is another language.

- Average English language arts and math assessment scores in grade 8.

- Average cumulative grade point average.

- Percentage of students suspended or expelled.

- Average number of full-day excused absences.

- Average number of full-day unexcused absences.

In addition, the study team examined the characteristics of districts' educator workforce, course offerings, and physical characteristics to determine whether there were meaningful differences between districts that implemented the CCR graduation requirements and districts that did not.

Educator workforce

- Teacher race/ethnicity and gender.

- Average base and additional salary for beginning teachers.

- Percentage of teachers with at least a master's degree.

- Percentage of teachers with 0–1 year of experience.

- Teachers' average number of years of experience.

- Average number of students per teacher by content area.

Course offerings

- Average number of students per unique course by content area.

Physical characteristics

- Number of high schools.

- Percentage of high schools that are large metro, metro suburb, midsize, urban fringe, and distant (based on National Center for Education Statistics locale codes).

- Location (represented on a map of Washington State school districts).

- Average percentage of students in the school who are eligible for the national school lunch program.

To simplify reporting of correlations and test for significant differences, a regression framework was used to compare the six sets of districts. The model was:

$$Y_j = \beta_0 + \beta_1 Implemented2019_j + e_j$$

where *Y* is a characteristic of district *j* expressed as a continuous random variable, *Implemented2019* is an indicator for whether a district implemented the CCR graduation requirements (equal to 1 if true and 0 otherwise), and e_j is an error term clustered by school district (expected to be normally distributed with mean 0 and standard deviation 1). Models were run separately for each of the three pairs of district types.

Research question 2: What percentage of students met the CCR graduation requirements between 2013/14 and 2017/18? Research question 2a: How did 2018 graduates who met the CCR graduation requirements differ from those who did not? To answer research question 2, the study team calculated the percentage of students who met all the CCR graduation requirements and the percentage of students who met all the CCR graduation requirements except the fine arts requirement or the world languages requirement, or both among students in the class of 2018. The study team then calculated the percentage of students in the class of 2018 who met the CCR graduation requirements by content area. The results are disaggregated for students who graduated within four years and for students who did not graduate (see tables C1 and C2 in appendix C).

Research question 3: How were district-level increases in total, science, fine arts, and world languages credit requirements for graduation between 2012/13 and 2017/18 associated with high school academic performance, high school completion, and postsecondary readiness? To answer research question 3, the study used a regression framework to describe the relationship between increases in credit requirements for graduation and outcomes for different student groups. Binary indicators were created to signal whether a district changed a requirement (total or in science, fine arts, or world languages) in a given year. The basic model was:

$$Y_{ij} = \beta_0 + \beta_1 CreditReqChange_j + \boldsymbol{\delta}_{ij} + \boldsymbol{\gamma}_j + \boldsymbol{a}_j + e_{ij}$$

where Y_{ij} represents an outcome in table B3 for student *i* in cohort *j*, *CreditReqChange* is the increase in credit requirements (total or in a specific content area) in cohort *j*, $\boldsymbol{\delta}$ is a vector of student characteristics (including gender; race/ethnicity; grade 8 English language arts and math assessment scores; whether the student was ever eligible for the national school lunch program, special education services, or migrant student services between 2009/10 and 2017/18; whether the student was a former English learner student who was reclassified as proficient before high school;[1] and whether the student was an English learner at any point in high school), $\boldsymbol{\gamma}$ is a set of fixed effects for school district, $\boldsymbol{a}$ is a set of fixed effects for the year in which students were held accountable for graduation requirements, and e_{ij} is an error term clustered by school and assumed to be normally distributed with mean 0 and standard deviation 1.

The student characteristics in $\boldsymbol{\delta}$ are included in the model because they are typically associated with academic outcomes. For instance, prior performance on state assessments is associated with subsequent performance on state assessments. Academic outcomes may also vary based on gender, race/ethnicity, socioeconomic status,

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[1] English learner status is observable for students who were eligible for services between 2004/05 and 2017/18.

eligibility for special education services, English proficiency, and periods of interrupted education or high mobility (migrant status).

The models were run for all students and separately for the following student groups:

- Students from different racial/ethnic groups.

- Current, former, and never English learner students.

- Students eligible for the national school lunch program and students not eligible for the national school lunch program.

- Students in large metro, metro suburb, midsize, urban fringe, and distant schools (based on National Center for Education Statistics locale codes).

Table B3. High school academic performance, high school completion, and postsecondary readiness outcomes

Topic	Measures
High school academic performance	Number of credits attempted
	Number of credits earned
	English language arts and math state assessment scores
High school completion	Cumulative grade point average
	Graduation from high school within four years
	Dropping out of high school
Postsecondary readiness	Meeting credit requirements for admission to a four-year public university in Washington[a]

a. See Washington Student Achievement Council (2017) for the requirements.
Source: Authors' compilation.

References

Geverdt, D. (2015). *Education Demographic and Geographic Estimates program (EDGE): Locale boundaries user's manual*. (NCES 2016-012). U.S. Department of Education. Washington, DC: National Center for Education Statistics. https://eric.ed.gov/?id=ED577162.

Washington Student Achievement Council. (2017). *Admissions standards policy* (Updated ed.). Olympia, WA: Author. Retrieved May 16, 2019, from https://www.wsac.wa.gov/sites/default/files/2015.Minimum.College.Admission.Standards.Policy.pdf.

Appendix C. Supporting analysis

This appendix provides data to supplement the information presented in the main report. This includes additional results on the characteristics of districts that implemented all or some of the career- and college-ready (CCR) requirements for high school graduation for the class of 2018, the percentages of 2018 graduates by student group who met the CCR graduation requirements and of 2018 graduates who did not meet the requirements, and the relationships between increases in graduation requirements and student academic outcomes.

Table C1. Average student, workforce, and school characteristics of districts that implemented all the Washington career- and college-ready requirements for high school graduation for the class of 2018, districts that implemented the requirements in core content areas, and districts that implemented all the requirements except the fine arts requirement or the world languages requirement, or both

Characteristic	Implemented all the career- and college-ready graduation requirements			Implemented the career-and college-ready graduation requirements in core content areas[a]			Implemented all the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both		
	Yes (n = 22)	No (n = 226)	Difference	Yes (n = 38)	No (n = 210)	Difference	Yes (n = 32)	No (n = 216)	Difference
Student characteristics									
Number of students	335.9	688.5	−352.6***	533.1	679.7	−146.6	479.9	683.5	−203.6*
Race/ethnicity (percent)									
American Indian/Alaska Native	4.5	3.6	0.9	3.8	3.6	0.2	4.4	3.6	0.9
Asian	2.3	3.2	−0.9	2.7	3.2	−0.5	2.3	3.2	−0.9
Black	0.7	2.0	−1.3**	1.2	2.0	−0.8	0.8	2.0	−1.3***
Hispanic	14.8	19.9	−5.1	20.9	19.2	1.6	18.9	19.6	−0.7
Native Hawaiian/Pacific Islander	0.2	0.5	−0.3**	0.3	0.5	−0.3*	0.2	0.6	−0.4***
White	72.4	65.9	6.5	66.6	66.4	0.1	68.8	66.1	2.7
Multiracial	5.0	4.9	0.2	4.6	5.0	−0.4	4.6	4.9	−0.4
Primary or home language (percent)									
English	89.5	86.3	3.2	84.8	86.9	−2.2	86.4	86.6	−0.2
Spanish	10.4	13.2	−2.7	14.8	12.6	2.2	13.3	12.9	0.4
Other	2.5	3.8	−1.3	3.6	3.7	−0.1	3.1	3.7	−0.7
Average grade 8 assessment scores (standard deviation)									
English language arts	−0.113	−0.111	−0.002	−0.140	−0.106	−0.034	−0.12	−0.11	−0.02
Math	−0.183	−0.146	−0.037	−0.185	−0.143	−0.042	−0.18	−0.15	−0.03
Other student characteristics									
Average cumulative grade point average	2.80	2.78	0.01	2.78	2.78	0.0	2.80	2.78	0.01
Percentage of students who were ever eligible for migrant student services	2.9	4.6	−1.7	5.0	4.3	0.7	3.9	4.5	−0.6
Percentage of current English learner students	6.0	6.7	−0.6	7.8	6.4	1.4	6.2	5.9	0.4
Percentage of former English learner students	7.1	10.3	−3.1	10.2	9.9	0.3	10.1	10.8	−0.6
Percentage of never English learner students	86.8	83.1	3.8	82.0	83.7	−1.7	83.7	83.4	0.3
Percentage of students who were ever eligible for the national school lunch program	69.8	65.5	4.3	68.0	65.5	2.5	67.8	65.6	2.2
Percentage of students who were ever eligible for special education services	22.4	21.2	1.2	21.8	21.2	0.5	21.7	21.2	0.5
Percentage of students suspended or expelled	4.3	5.1	−0.8	4.8	5.1	−0.2	4.6	5.1	−0.5

Characteristic	Implemented all the career- and college-ready graduation requirements			Implemented the career-and college-ready graduation requirements in core content areas[a]			Implemented all the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both		
	Yes (n = 22)	No (n = 226)	Difference	Yes (n = 38)	No (n = 210)	Difference	Yes (n = 32)	No (n = 216)	Difference
Average number of full-day excused absences	11.2	9.6	1.6*	10.3	9.6	0.7	10.7	9.6	1.1
Average number of full-day unexcused absences	3.8	4.0	−0.3	4.4	3.9	0.4	4.4	3.9	0.5
2018 four-year cohort graduation rate	88.9	87.3	0.7	87.1	87.4	−0.4	87.6	87.4	0.3
2018 four-year cohort dropout rate	4.4	4.4	−0.1.	5.1	4.3	0.8	7.8	8.2	−0.5
2018 four-year cohort continuing rate	7.6	8.2	−0.6	7.7	8.2	−0.5	4.6	4.4	0.2
Workforce characteristics									
Teacher race/ethnicity (percent)									
American Indian/Alaska Native	1.2	1.1	0.1	1.2	1.1	0.1	1.3	1.1	0.2
Asian	0.9	1.3	−0.4	1.1	1.3	−0.2	0.8	1.3	−0.5*
Black	0.6	0.6	−0.1	0.5	0.7	−0.2	0.4	0.6	−0.2
Hispanic	2.1	3.7	−1.7*	3.6	3.6	0.1	2.3	3.8	−1.5*
White	94.2	91.9	2.3	92.2	92.1	0.1	93.7	91.9	1.8
Multiracial	0.7	1.0	−0.3	0.8	1.0	−0.2	0.9	1.0	−0.1
Other workforce characteristics									
Percentage of female employees	67.5	70.0	−2.5	68.1	70.0	−1.9	67.9	70.1	−2.1
Average beginning teacher base salary ($)	56,793	56,775	18	56,841	56,766	74	56,913	56,750	163
Average beginning teacher additional salary ($)	4,881	6,508	−1,627	5,817	6,467	−649	5,643	6,480	−838
Percentage with master's degree or higher	66.0	66.7	−0.7	65.8	66.9	−1.1	66.3	66.6	−0.4
Percentage with 0–1 year of experience	9.1	8.6	0.5	9.1	8.6	0.5	9.0	8.6	0.3
Average years of experience	14.1	14.0	0.1	14.2	14.0	0.2	14.3	13.9	0.4
Average number of students per teacher by content area									
English	42.5	61.2	−18.7*	47.2	61.8	−14.6	46.7	61.4	−14.7
Math	45.8	59.6	−13.8*	50.5	59.8	−9.3	49.1	59.7	−10.6
Science	75.3	96.6	−21.3	84.4	96.6	−12.2	81.7	96.6	−15.0
Social studies	69.2	84.1	−14.9	78.4	83.5	−5.1	77.6	83.5	−5.9
Fine arts	94.4	119.8	−25.4	105.1	119.8	−14.7	103.1	119.7	−16.6
World languages	135.9	196.9	−61.0**	173.2	194.8	−21.6	165.8	195.3	−29.4
Health and physical education	88.5	122.5	−34.1	103.7	122.4	−18.7	100.4	122.4	−22.0
Religion	460.5	893.8	−433.3***	945.6	859.2	86.4	968.0	859.8	108.2
Military science	526.6	975.0	−448.4***	775.6	973.4	−197.8	526.6	975.0	−448.4***
Computer science	225.8	367.9	−142.1**	327.8	362.3	−34.4	317.4	362.7	−45.4

Characteristic	Implemented all the career- and college-ready graduation requirements			Implemented the career-and college-ready graduation requirements in core content areas[a]			Implemented all the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both		
	Yes (n = 22)	No (n = 226)	Difference	Yes (n = 38)	No (n = 210)	Difference	Yes (n = 32)	No (n = 216)	Difference
Audiovisual communications	175.8	364.3	−188.6***	264.0	362.5	−98.5*	234.3	365.0	−130.6**
Business and marketing	270.5	319.2	−48.7	298.0	318.1	−20.1	290.2	318.7	−28.5
Manufacturing	420.7	712.7	−291.9***	624.6	706.8	−82.2	554.2	711.9	−157.7
Health sciences	278.2	450.6	−172.4**	312.3	458.6	−146.3**	299.7	455.1	−155.4**
Public protective services	337.3	834.6	−497.3**	1068.4	775.6	292.7	711.5	821.8	−110.4
Hospitality and tourism	286.3	521.3	−235.0***	448.7	511.9	−63.2	380.0	519.2	−139.1
Architecture and construction	371.6	662.7	−291.1***	564.4	653.4	−88.9	477.5	664.6	−187.1
Agriculture	241.4	471.9	−230.5***	330.0	475.6	−145.6*	313.5	473.0	−159.5**
Human services	134.8	244.2	−109.5***	160.9	247.7	−86.8***	147.2	247.5	−100.3***
Transportation and logistics	486.0	866.7	−380.8	595.9	882.2	−286.3	555.9	880.6	−324.7*
Engineering and technology	299.9	521.9	−222.0*	394.2	523.9	−129.6	390.6	520.6	−130.0
Miscellaneous/other	13.8	21.7	−7.8***	16.1	21.8	−5.7**	15.0	21.8	−6.8**
School characteristics									
Locale									
Large metro	0.0	17.8	−17.8***	11.1	17.7	−6.6**	0.0	18.4	−18.4***
Metro suburb	7.8	25.6	−17.9***	14.4	26.1	−11.7***	4.6	26.5	−21.9***
Midsize	19.4	24.1	−4.6	16.9	24.7	−7.8**	23.6	23.9	−0.3
Urban fringe	21.4	11.3	10.1*	23.9	10.4	13.5***	26.4	10.6	15.9***
Distant	51.5	21.1	30.3***	33.7	21.1	12.6***	45.4	20.6	24.8***
Other school characteristics									
Number of high schools	1.5	3.2	−1.7***	2.1	3.2	−1.2**	1.9	3.2	−1.3***
Percentage of students eligible for the national school lunch program	46.3	48.0	−1.7	47.0	48.3	−1.3	46.2	48.1	−2.0

* Significant at p = .05; ** significant at p = .01; *** significant at p = .001.

a. Core content areas are English, math, science, and social studies.

Note: Differences may not be exact because of rounding.

Source: Authors' analysis of 2017/18 data from the Washington Office of Superintendent of Public Instruction and Washington State Board of Education.

Table C2. Percentage of students in the class of 2018 who graduated within four years and met the Washington career- and college-ready requirements for high school graduation, by student and school characteristic and content area

Characteristic	All the career- and college ready graduation requirements	All the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both	Total credits (24)	English (4)	Math (3)	Science (3)	Laboratory science (2)	Social studies (3)	Health and physical education (2)	Fine arts (2)	World languages (2)	Career and technical education (1)
All students (N = 59,386)	26.8	44.9	93.8	92.6	95.3	90.4	63.4	92.8	83.9	70.5	76.6	88.6
Student characteristics												
Race/ethnicity												
American Indian/ Alaska Native (n = 706)	19.9	36.8	90.8	89.9	93.8	85.5	50.3	92.0	85.8	66.3	65.1	91.1
Asian (n = 5,781)	27.1	43.6	93.0	91.2	95.4	93.7	65.1	94.1	77.8	72.1	84.8	84.6
Black (n = 2,886)	21.4	39.8	88.7	88.7	92.2	86.7	58.2	90.2	80.4	63.4	70.0	87.3
Hispanic (n = 11,584)	21.9	38.7	97.5	96.4	97.6	90.6	53.7	95.2	90.4	68.2	74.7	93.6
Native Hawaiian/ Pacific Islander (n = 661)	22.8	43.9	87.3	89.1	91.3	87.3	61.3	90.3	80.9	62.8	66.0	86.8
Multiracial (n = 4,203)	26.8	45.6	92.5	91.4	94.2	89.7	67.5	91.7	79.6	69.1	78.4	86.2
White (n = 39,498)	28.8	47.4	93.6	92.2	95.1	90.4	66.2	92.3	83.6	71.9	76.7	88.1
Socioeconomic status												
Ever eligible for the national school lunch program (n = 33,835)	23.2	41.7	94.2	93.6	95.4	88.9	57.4	92.6	87.2	69.1	69.6	91.0
Never eligible for the national school lunch program (n = 31,484)	30.6	48.5	93.5	91.5	95.2	92.1	69.9	93.0	80.2	72.2	84.3	86.0
Special education status												
Ever eligible for special education services (n = 8,949)	20.0	44.2	95.6	94.5	95.7	85.7	60.9	92.7	87.6	70.6	52.8	91.9
Never eligible for special education services (n = 56,370)	27.9	45.0	93.6	92.3	95.3	91.2	63.8	92.8	83.3	70.5	80.4	88.1

Characteristic	All the career- and college ready graduation requirements	All the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both	Total credits (24)	English (4)	Math (3)	Science (3)	Laboratory science (2)	Social studies (3)	Health and physical education (2)	Fine arts (2)	World languages (2)	Career and technical education (1)
English learner status												
Current English learner student (*n* = 3,794)	15.7	34.7	87.1	90.0	89.9	78.6	50.2	87.6	84.6	61.6	53.4	87.5
Former English learner student (*n* = 7,884)	24.3	41.5	97.8	96.6	98.4	94.2	56.5	95.7	89.9	69.5	80.8	92.5
Never English learner student (*n* = 53,641)	28.0	46.1	93.7	92.2	95.2	90.7	65.4	92.8	82.9	71.3	77.7	88.1
High school academic achievement												
Grade point average of 3.0 or higher (*n* = 33,868)	29.8	46.4	94.6	92.8	96.5	93.6	66.1	93.5	81.9	72.9	85.7	86.3
Grade point average below 3.0 (*n* = 31,347)	23.5	43.4	93.0	92.3	94.1	87.0	60.4	92.1	86.0	68.1	66.9	91.1
Bottom 25 percent of grade 8 English language arts assessment scores (*n* = 11,705)	21.2	42.9	96.8	95.8	96.8	88.0	57.3	94.7	91.0	68.2	60.7	94.1
Middle 50 percent of grade 8 English language arts assessment scores (*n* = 30,107)	30.0	48.6	97.6	96.0	98.1	94.2	65.7	95.2	87.6	73.0	81.4	91.0
Top 25 percent of grade 8 English language arts assessment scores (*n* = 16,023)	30.0	47.4	97.6	95.5	98.7	96.3	68.6	95.3	82.1	75.2	88.4	86.5
Bottom 25 percent of grade 8 math assessment scores (*n* = 12,707)	20.6	41.9	96.7	95.7	96.6	88.3	56.3	94.5	90.5	69.0	60.5	93.7

Characteristic	All the career- and college ready graduation requirements	All the career- and college- ready graduation requirements except the fine arts requirement or the world languages requirement, or both	Total credits (24)	English (4)	Math (3)	Science (3)	Laboratory science (2)	Social studies (3)	Health and physical education (2)	Fine arts (2)	World languages (2)	Career and technical education (1)
Middle 50 percent of grade 8 math assessment scores (n = 29,697)	30.4	48.7	97.4	96.2	98.0	93.8	65.1	95.2	88.6	73.1	81.0	91.3
Top 25 percent of grade 8 math assessment scores (n = 15,520)	30.1	48.5	98.0	95.2	99.0	97.3	71.3	95.5	80.3	74.8	90.6	85.9
Gender												
Female (n = 33,337)	27.8	43.8	93.5	92.2	95.3	90.6	63.6	92.3	81.0	74.6	80.0	86.3
Male (n = 31,982)	25.8	46.0	94.2	93.0	95.4	90.2	63.2	93.3	86.9	66.4	73.1	91.0
School characteristics												
High school locale												
Large metro (n = 12,573)	23.3	37.0	92.4	92.3	94.6	91.6	53.9	91.8	79.1	75.1	79.3	86.4
Metro suburb (n = 20,035)	30.4	49.9	94.1	91.2	95.8	91.8	73.2	93.2	80.1	71.5	80.7	85.8
Midsize (n = 16,877)	25.7	42.8	93.6	93.1	94.9	89.2	58.8	92.0	87.3	67.3	74.8	90.2
Urban fringe (n = 7,314)	25.8	46.4	94.9	94.1	96.0	89.5	67.4	93.4	83.9	70.7	75.4	89.1
Distant (n = 8,516)	26.5	47.9	94.9	94.0	95.5	88.7	59.9	94.7	93.0	67.9	67.9	94.9
Percentage of students eligible for the national school lunch program in high school												
More than 75 percent (n = 1,851)	10.4	16.6	95.3	94.2	96.0	88.0	21.2	92.4	91.9	71.6	66.4	92.1
25–75 percent (n = 44,085)	23.8	41.5	93.8	93.1	95.1	90.0	58.7	92.4	84.4	68.8	74.2	89.9
Less than 25 percent (n = 18,769)	35.5	56.1	94.1	91.3	95.9	92.1	78.5	94.0	81.8	74.8	84.2	84.8

Source: Authors' analysis of 2013/14–2017/18 data from the Washington Office of Superintendent of Public Instruction and National Center for Education Statistics locale codes (Geverdt, 2015).

Table C3. Percentage of students in the class of 2018 who did not graduate and met the Washington career- and college-ready requirements for high school graduation, by student and school characteristic and content area

Characteristic	All the career- and college ready graduation requirements	All the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both	Total credits (24)	English (4)	Math (3)	Science (3)	Laboratory science (2)	Social studies (3)	Health and physical education (2)	Fine arts (2)	World languages (2)	Career and technical education (1)
All students (N = 5,380)	3.6	9.2	45.1	47	52.8	42.6	28.8	38.3	55.5	35.3	22.3	63.9
Student characteristics												
Race/ethnicity												
American Indian/ Alaska Native (n = 197)	a	9.2	35.1	36.8	44.9	41.6	19.5	31.9	49.7	31.4	13.5	61.1
Asian (n = 173)	9.6	13.4	51.5	53.3	61.7	47.9	41.3	38.3	58.1	46.1	31.7	65.3
Black (n = 378)	a	6.4	37.0	43.7	48.2	30.4	24.8	32.6	49.0	27.3	15.9	57.1
Hispanic (n = 1,558)	2.3	6.6	44.5	49.5	50.8	39.4	22.1	38.0	57.8	30.9	24.8	64.6
Native Hawaiian/ Pacific Islander (n = 84)	a	a	40.2	40.2	45.1	31.7	28.0	37.8	54.9	22.0	13.4	61.0
Multiracial (n = 390)	5.3	11.1	40.1	42.7	51.2	42.7	32.9	35.3	51.5	32.1	25.7	59.7
White (n = 2,916)	4.0	10.5	47.5	47.2	54.9	45.9	32.2	40.0	55.9	39.0	21.6	65.2
Socioeconomic status												
Ever eligible for the national school lunch program (n = 4,799)	3.1	8.5	44.1	46.5	51.9	41.1	26.6	37.0	56.2	34.2	20.6	64.1
Never eligible for the national school lunch program (n = 897)	6.3	13.7	50.8	49.9	57.9	51.4	41.7	45.9	51.6	41.2	32.3	63.0
Special education status												
Ever eligible for special education services (n = 1,522)	2.3	10.2	50.8	52.2	58.8	40.2	29.7	38.8	58.2	34.9	12.2	67.3
Never eligible for special education services (n = 4,174)	4.1	8.8	42.9	45.1	50.6	43.5	28.4	38.1	54.5	35.4	26.1	62.7

Characteristic	All the career- and college ready graduation requirements	All the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both	Total credits (24)	English (4)	Math (3)	Science (3)	Laboratory science (2)	Social studies (3)	Health and physical education (2)	Fine arts (2)	World languages (2)	Career and technical education (1)
English learner status												
Current English learner student (*n* = 764)	1.9	5.8	40.3	55.0	47.1	30.7	18.4	31.8	56.6	27.5	17.3	57.7
Former English learner student (*n* = 587)	3.8	8.7	52.3	50.7	56.8	47.4	28.5	45.1	64.2	35.8	32.5	72.4
Never English learner student (*n* = 4,345)	3.9	9.9	45.0	45.1	53.3	44.1	30.7	38.5	54.1	36.6	21.8	63.9
High school academic achievement												
Grade point average of 3.0 or higher (*n* = 453)	4.4	9.3	49.8	47.5	50.5	36.2	24.8	34.6	51.4	38.3	20.6	66.1
Grade point average below 3.0 (*n* = 5,072)	3.6	9.3	45.0	47.3	53.3	43.4	29.3	38.9	56.1	35.2	22.6	64.0
Bottom 25 percent of grade 8 English language arts assessment scores (*n* = 2,335)	2.3	7.6	43.6	45.8	51.6	40.0	24.7	36.7	57.2	31.4	16.5	65.1
Middle 50 percent of grade 8 English language arts assessment scores (*n* = 1,958)	5.0	11.5	52.7	51.1	61.1	52.0	34.6	44.3	60.4	41.4	28.8	69.8
Top 25 percent of grade 8 English language arts assessment scores (*n* = 439)	8.0	15.8	57.2	56.5	65.2	57.0	42.1	48.3	59.3	48.3	39.8	68.4
Bottom 25 percent of grade 8 math assessment scores (*n* = 2,602)	2.3	7.6	42.5	45.1	49.8	39.2	24.0	37.1	55.9	31.6	17.1	63.5

Characteristic	All the career- and college ready graduation requirements	All the career- and college-ready graduation requirements except the fine arts requirement or the world languages requirement, or both	Total credits (24)	English (4)	Math (3)	Science (3)	Laboratory science (2)	Social studies (3)	Health and physical education (2)	Fine arts (2)	World languages (2)	Career and technical education (1)
Middle 50 percent of grade 8 math assessment scores (n = 1,856)	5.4	12.3	54.8	52.8	64.0	54.0	35.8	44.7	62.2	43.1	30.3	72.1
Top 25 percent of grade 8 math assessment scores (n = 282)	8.6	17.6	65.5	61.5	73.7	65.8	54.7	52.2	64.0	50.0	42.4	72.3
Gender												
Female (n = 2,275)	4.3	10.1	45.7	47.7	54.2	43.8	30.5	38.5	50.2	40.8	26.7	61.7
Male (n = 3,421)	3.1	8.6	44.7	46.6	51.9	41.8	27.6	38.1	59.0	31.6	19.4	65.4
School characteristics												
High school locale												
Large metro (n = 1,083)	3.4	8.0	42.2	45.3	50.4	37.7	27.7	32.5	49.8	34.1	22.7	60.1
Metro suburb (n = 1148)	4.9	11.7	47.5	48.2	55.2	46.1	38.6	43.6	51.9	38.2	26.0	61.7
Midsize (n = 1,931)	2.6	7.3	44.5	46.4	52.0	43.1	24.0	37.7	58.4	32.6	22.4	63.8
Urban fringe (n = 535)	4.6	12.3	46.9	48.7	54.4	43.1	30.9	40.6	58.0	41.2	19.3	65.8
Distant (n = 999)	3.6	9.8	45.6	47.7	53.4	42.7	26.6	38.0	59.0	34.9	19.0	69.9
Percentage of students eligible for the national school lunch program in high school												
More than 75 percent (n = 413)	a	2.6	38.4	42.3	48.5	37.6	10.8	29.6	52.1	29.4	14.2	60.8
25–75 percent (n = 4,457)	3.5	9.5	45.9	47.6	53.5	43.0	28.8	38.6	56.5	35.3	22.3	65.0
Less than 25 percent (n = 686)	6.2	12.9	48.8	49.8	55.3	47.2	43.2	44.9	52.8	41.5	29.5	59.0

a. Suppressed to protect student privacy because of small sample size.

Source: Authors' analysis of 2013/14–2017/18 data from the Washington Office of Superintendent of Public Instruction and National Center for Education Statistics locale codes (Geverdt, 2015).

Table C4. Association between increases in requirements for high school graduation and student academic outcomes, by student characteristic and content area

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
All students									
Credits attempted (*n* = 364,869)	0.435	−1.113**	−5.746***	−0.077	0.076	0.124	−0.023	−0.436*	0.399
	(0.278)	(0.545)	(1.288)	(0.403)	(0.145)	(0.437)	(0.266)	(0.237)	(0.311)
Credits earned (*n* = 364,869)	0.328	−0.941*	−5.624***	−0.060	0.080	−0.0006	−0.014	−0.415*	0.489
	(0.273)	(0.534)	(1.224)	(0.385)	(0.155)	(0.431)	(0.257)	(0.242)	(0.299)
Grade point average (*n* = 364,993)	−0.004	−0.041*	−0.100**	0.039***	0.013	0.005	−0.0007	−0.012	0.019
	(0.010)	(0.024)	(0.040)	(0.015)	(0.011)	(0.031)	(0.017)	(0.012)	(0.023)
Scores on high school state assessment in English language arts (*n* = 342,295)	0.034**	0.047**	−0.016	0.041*	0.013	0.023	0.043*	0.032	0.014
	(0.015)	(0.019)	(0.024)	(0.024)	(0.016)	(0.048)	(0.025)	(0.023)	(0.025)
Scores on high school state assessment in math (*n* = 343,051)	0.003	0.022	−0.026	0.015	0.017	0.010	−0.005	−0.031	0.008
	(0.014)	(0.015)	(0.024)	(0.022)	(0.013)	(0.034)	(0.030)	(0.027)	(0.025)
Probability of graduating (*n* = 364,993)	−0.006	0.0001	0.006	0.010	0.002	−0.039**	0.002	0.004	−0.001
	(0.006)	(0.004)	(0.013)	(0.007)	(0.006)	(0.019)	(0.007)	(0.006)	(0.009)
Probability of dropping out (*n* = 363,837)	−0.002	−0.002	−0.008	−0.002	0.0008	0.009	0.003	0.005	−0.002
	(0.004)	(0.003)	(0.009)	(0.005)	(0.004)	(0.011)	(0.006)	(0.005)	(0.006)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 361,853)	−0.018	0.011	0.0007	−0.011	0.016**	−0.019	−0.045	−0.037	0.005
	(0.014)	(0.010)	(0.024)	(0.026)	(0.008)	(0.021)	(0.034)	(0.025)	(0.011)
Race/ethnicity									
American Indian/Alaska Native									
Credits attempted (*n* = 5,018)	1.120**	−0.200	−3.295**	0.496	0.445	−1.327	1.203	0.678	−0.781
	(0.551)	(0.764)	(1.325)	(0.944)	(0.558)	(1.296)	(1.083)	(0.962)	(1.535)
Credits earned (*n* = 5,018)	1.113*	−0.493	−2.815**	0.575	0.578	0.634	1.470	1.059	−1.308
	(0.619)	(0.784)	(1.291)	(1.083)	(0.529)	(1.172)	(1.134)	(1.123)	(1.703)
Grade point average (*n* = 5,021)	0.042	−0.054	0.034	0.100	0.101**	0.150	0.025	0.159	−0.147
	(0.053)	(0.070)	(0.109)	(0.087)	(0.050)	(0.115)	(0.104)	(0.102)	(0.181)
Scores on high school state assessment in English language arts (*n* = 4,492)	0.070	0.018	0.015	0.012	−0.042	0.100	0.123*	0.145*	−0.058
	(0.068)	(0.068)	(0.105)	(0.070)	(0.066)	(0.147)	(0.070)	(0.075)	(0.157)
Scores on high school state assessment in math (*n* = 4,538)	0.039	−0.056	−0.151	−0.041	0.021	0.047	0.060	0.200	0.071
	(0.074)	(0.068)	(0.115)	(0.094)	(0.067)	(0.146)	(0.116)	(0.137)	(0.212)
Probability of graduating on time (*n* = 5,021)	0.010	−0.026	0.035	0.085	0.041	0.010	0.053	0.057	−0.048
	(0.034)	(0.034)	(0.049)	(0.052)	(0.030)	(0.052)	(0.064)	(0.056)	(0.067)
Probability of dropping out (*n* = 4,994)	−0.029	0.0003	0.003	−0.023	−0.005	−0.029	0.016	−0.048	−0.033
	(0.029)	(0.025)	(0.050)	(0.043)	(0.023)	(0.046)	(0.030)	(0.042)	(0.071)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 4,946)	0.013	0.016	−0.033	0.019	0.0004	0.154**	0.093	0.001	−0.031
	(0.026)	(0.033)	(0.042)	(0.033)	(0.023)	(0.060)	(0.064)	(0.047)	(0.045)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
Asian									
Credits attempted (N = 29,398)	0.997**	−2.129**	−10.39***	−0.106	−0.386	2.572***	−0.534	−0.518*	2.197
	(0.425)	(0.921)	(1.619)	(0.400)	(0.417)	(0.983)	(0.405)	(0.279)	(1.362)
Credits earned (n = 29,398)	1.013**	−1.387	−10.29***	−0.009	−0.135	1.775*	−0.329	−0.353	2.440**
	(0.433)	(0.986)	(1.556)	(0.420)	(0.448)	(0.969)	(0.461)	(0.328)	(1.234)
Grade point average (n = 29,404)	0.003	−0.089*	−0.228**	0.060**	0.039	0.072	0.034	0.011	0.135
	(0.021)	(0.054)	(0.089)	(0.027)	(0.033)	(0.094)	(0.033)	(0.024)	(0.110)
Scores on high school state assessment in English language arts (n = 28,111)	0.037	−0.007	0.071**	0.019	0.008	0.014	0.038	0.040	0.237**
	(0.032)	(0.039)	(0.030)	(0.046)	(0.031)	(0.059)	(0.034)	(0.034)	(0.116)
Scores on high school state assessment in math (n = 27,905)	−0.0006	0.065*	−0.047	0.055	0.042	0.057	0.034	0.010	0.030
	(0.030)	(0.033)	(0.039)	(0.041)	(0.030)	(0.053)	(0.040)	(0.032)	(0.113)
Probability of graduating on time (n = 29,404)	−0.015	−0.010	0.009	−0.004	0.022*	−0.064	−0.001	−0.005	−0.002
	(0.011)	(0.008)	(0.017)	(0.009)	(0.012)	(0.044)	(0.010)	(0.007)	(0.051)
Probability of dropping out (n = 29,304)	−0.001	−0.002	−0.003	0.0009	−0.009	0.036	−0.00007	0.0005	0.021
	(0.005)	(0.005)	(0.011)	(0.007)	(0.007)	(0.031)	(0.005)	(0.005)	(0.021)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 29,282)	−0.070**	−0.0004	−0.038	−0.094	0.023	−0.038	−0.109	−0.088*	−0.018
	(0.031)	(0.024)	(0.045)	(0.067)	(0.025)	(0.043)	(0.067)	(0.051)	(0.061)
Black									
Credits attempted (n = 17,051)	1.644***	−0.295	−8.310***	−0.537	−1.061**	2.108**	−1.163**	−1.135**	−0.883
	(0.388)	(0.431)	(1.523)	(0.611)	(0.463)	(0.830)	(0.552)	(0.534)	(1.306)
Credits earned (n = 17,051)	1.409***	−0.190	−7.583***	−0.295	−0.674	2.048**	−1.186**	−0.761	−0.597
	(0.414)	(0.421)	(1.394)	(0.614)	(0.458)	(0.805)	(0.513)	(0.541)	(1.118)
Grade point average (n = 17,065)	−0.028	−0.053	−0.078	0.051	0.021	0.123*	−0.013	0.052	−0.052
	(0.032)	(0.037)	(0.048)	(0.052)	(0.039)	(0.070)	(0.061)	(0.052)	(0.180)
Scores on high school state assessment in English language arts (n = 15,579)	0.094**	−0.035	0.082	0.042	−0.096**	−0.024	0.049	0.017	−0.228**
	(0.043)	(0.050)	(0.050)	(0.090)	(0.037)	(0.101)	(0.100)	(0.091)	(0.113)
Scores on high school state assessment in math (n = 15,663)	0.023	0.047	0.030	0.069	−0.077	0.087	0.024	−0.009	0.021
	(0.030)	(0.032)	(0.046)	(0.059)	(0.050)	(0.057)	(0.075)	(0.070)	(0.151)
Probability of graduating on time (n = 17,065)	−0.023	0.004	−0.015	0.022	0.028	−0.006	−0.007	0.046	0.131**
	(0.017)	(0.016)	(0.026)	(0.037)	(0.022)	(0.023)	(0.030)	(0.038)	(0.052)
Probability of dropping out (n = 16,980)	0.0005	0.005	−0.006	−0.010	−0.006	−0.002	0.024	−0.0001	0.0004
	(0.011)	(0.010)	(0.018)	(0.023)	(0.015)	(0.017)	(0.019)	(0.025)	(0.055)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 16,904)	−0.022	−0.007	0.044	0.046	0.032	−0.005	−0.042	0.045	0.023
	(0.015)	(0.016)	(0.028)	(0.034)	(0.020)	(0.031)	(0.039)	(0.036)	(0.047)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
Hispanic									
Credits attempted (n = 65,298)	0.007	−0.949**	−3.400***	−1.145	−0.240	0.477	−0.412	−0.496*	0.555
	(0.649)	(0.442)	(1.146)	(1.300)	(0.253)	(0.530)	(0.330)	(0.269)	(0.356)
Credits earned (n = 65,298)	−0.057	−0.611	−3.378***	−1.067	−0.263	0.139	−0.297	−0.482	0.918**
	(0.641)	(0.423)	(1.061)	(1.276)	(0.307)	(0.611)	(0.357)	(−.306)	(0.373)
Grade point average (n = 65,324)	0.008	−0.010	−0.035	0.037	−0.016	−0.010	0.024	−0.014	0.068**
	(0.018)	(0.024)	(0.035)	(0.025)	(0.020)	(0.063)	(0.022)	(0.023)	(0.028)
Scores on high school state assessment in English language arts (n = 61,062)	0.031	−0.003	0.002	0.081*	0.038*	0.106*	0.071*	0.073***	0.008
	(0.028)	(0.027)	(0.033)	(0.042)	(0.020)	(0.062)	(0.039)	(0.025)	(0.027)
Scores on high school state assessment in math (n = 61,364)	−0.006	−0.015	−0.027	0.027	0.014	0.048	−0.002	0.0009	0.006
	(0.019)	(0.020)	(0.043)	(0.021)	(0.016)	(0.046)	(0.054)	(0.045)	(0.033)
Probability of graduating on time (n = 65,324)	−0.002	0.009	0.009	0.005	−0.004	−0.050	−0.002	−0.005	0.035*
	(0.010)	(0.010)	(0.018)	(0.013)	(0.012)	(0.042)	(0.015)	(0.016)	(0.018)
Probability of dropping out (n = 65,097)	0.0009	−0.007	0.002	−0.004	−0.002	−0.002	0.003	0.020	−0.016
	(0.006)	(0.007)	(0.012)	(0.008)	(0.007)	(0.022)	(0.014)	(0.016)	(0.012)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 64,879)	0.003	0.004	0.003	0.029**	0.024*	−0.026	−0.006	0.0006	0.020
	(0.012)	(0.009)	(0.026)	(0.014)	(0.013)	(0.024)	(0.024)	(0.019)	(0.013)
Multiracial									
Credits attempted (n = 21,087)	0.692*	−1.330**	−4.566***	0.852**	−0.149	1.173	0.200	0.096	0.593
	(0.375)	(0.668)	(1.401)	(0.383)	(0.204)	(0.903)	(0.314)	(0.288)	(0.675)
Credits earned (n = 21,087)	0.537	−1.185*	−4.562***	0.920**	−0.127	1.138	0.264	0.105	0.666
	(0.344)	(0.662)	(1.376)	(0.373)	(0.211)	(0.872)	(0.328)	(0.284)	(0.639)
Grade point average (n = 21,094)	−0.040	−0.030	−0.141**	0.058**	0.028	0.084	0.039	0.00006	−0.002
	(0.025)	(0.032)	(0.068)	(0.027)	(0.023)	(0.077)	(0.033)	(0.029)	(0.069)
Scores on high school state assessment in English language arts (n = 19,722)	−0.011	0.048	0.004	0.021	0.005	0.036	0.007	0.014	0.074
	(0.031)	(0.032)	(0.058)	(0.042)	(0.031)	(0.102)	(0.044)	(0.037)	(0.063)
Scores on high school state assessment in math (n = 19,839)	−0.030	0.038	−0.019	−0.006	0.034	−0.037	0.010	−0.061	0.179**
	(0.033)	(0.029)	(0.062)	(0.055)	(0.025)	(0.090)	(0.068)	(0.056)	(0.076)
Probability of graduating on time (n = 21,094)	−0.004	0.002	0.029	0.021	−0.0005	−0.023	0.021	0.021	−0.039
	(0.014)	(0.011)	(0.024)	(0.015)	(0.013)	(0.034)	(0.019)	(0.015)	(0.028)
Probability of dropping out (n = 21,052)	−0.010	−0.011	−0.008	−0.002	0.010	−0.027	−0.005	−0.001	−0.021
	(0.010)	(0.008)	(0.021)	(0.017)	(0.008)	(0.032)	(0.012)	(0.011)	(0.019)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 20,964)	−0.006	0.043***	−0.006	0.010	0.018	−0.0005	−0.021	−0.046	−0.014
	(0.018)	(0.016)	(0.045)	(0.026)	(0.016)	(0.047)	(0.047)	(0.029)	(0.022)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
White									
Credits attempted (*n* = 223,730)	0.358	−1.127**	−4.861***	0.125	0.192	−0.385	0.180	−0.423	0.240
	(0.281)	(0.570)	(1.407)	(0.286)	(0.159)	(0.420)	(0.307)	(0.278)	(0.315)
Credits earned (*n* = 223,730)	0.240	−1.015*	−4.892***	0.096	0.149	−0.411	0.138	−0.423	0.261
	(0.271)	(0.555)	(1.360)	(0.272)	(0.160)	(0.412)	(0.293)	(0.275)	(0.297)
Grade point average (*n* = 223,797)	−0.004	−0.043*	−0.103**	0.030*	0.014	−0.013	−0.014	−0.018	0.002
	(0.011)	(0.025)	(0.045)	(0.016)	(0.011)	(0.034)	(0.019)	(0.014)	(0.023)
Scores on high school state assessment in English language arts (*n* = 210,344)	0.028*	0.066***	−0.051*	0.033	0.020	0.0002	0.034	0.022	0.014
	(0.015)	(0.018)	(0.027)	(0.024)	(0.017)	(0.047)	(0.026)	(0.024)	(0.030)
Scores on high school state assessment in math (*n* = 210,700)	0.009	0.025	−0.036	0.009	0.024	−0.013	−0.020	−0.043	0.003
	(0.017)	(0.017)	(0.027)	(0.024)	(0.015)	(0.042)	(0.033)	(0.027)	(0.029)
Probability of graduating on time (*n* = 223,797)	−0.005	−0.002	0.006	0.009	−0.001	−0.037**	0.003	0.004	−0.013
	(0.005)	(0.005)	(0.012)	(0.007)	(0.005)	(0.015)	(0.008)	(0.006)	(0.010)
Probability of dropping out (*n* = 223,133)	−0.003	−0.0006	−0.013	−0.002	0.003	0.011	0.001	0.004	0.004
	(0.004)	(0.003)	(0.008)	(0.005)	(0.004)	(0.009)	(0.007)	(0.005)	(0.006)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 221,619)	−0.021	0.011	−0.001	−0.017	0.011	−0.017	−0.050	−0.038	0.006
	(0.016)	(0.012)	(0.030)	(0.027)	(0.008)	(0.025)	(0.034)	(0.025)	(0.011)
English learner status									
Current English learner students									
Credits attempted (*n* = 20,473)	0.923	0.010	−8.617***	−0.591	−0.467	0.612	0.649	0.188	0.778
	(0.610)	(0.529)	(1.603)	(1.355)	(0.409)	(0.879)	(0.531)	(0.456)	(0.485)
Credits earned (*n* = 20,473)	0.824	0.193	−7.899***	−0.418	−0.272	−0.276	0.674	0.252	1.053**
	(0.04)	(0.479)	(1.438)	(1.340)	(0.486)	(0.887)	(0.430)	(0.435)	(0.533)
Grade point average (*n* = 20,476)	0.060**	0.030	−0.043	0.099**	0.014	−0.092	0.082*	0.022	0.051
	(0.026)	(0.027)	(0.060)	(0.045)	(0.036)	(0.087)	(0.046)	(0.044)	(0.041)
Scores on high school state assessment in English language arts (*n* = 18,744)	−0.017	−0.023	−0.052	−0.013	0.028	0.109	0.073	−0.031	−0.022
	(0.034)	(0.044)	(0.050)	(0.049)	(0.038)	(0.097)	(0.055)	(0.053)	(0.068)
Scores on high school state assessment in math (*n* = 18,639)	−0.057**	−0.039	0.032	−0.018	−0.017	0.010	0.161**	0.078	0.011
	(0.027)	(0.037)	(0.053)	(0.040)	(0.032)	(0.113)	(0.064)	(0.080)	(0.053)
Probability of graduating on time (*n* = 20,476)	−0.014	0.0009	0.018	0.025	−0.007	−0.080	0.020	0.017	0.049
	(0.016)	(0.016)	(0.033)	(0.022)	(0.022)	(0.064)	(0.024)	(0.022)	(0.032)
Probability of dropping out (*n* = 20,309)	−0.008	−0.008	−0.014	−0.016	−0.003	0.010	−0.034**	0.013	−0.011
	(0.011)	(0.011)	(0.025)	(0.017)	(0.016)	(0.038)	(0.016)	(0.019)	(0.023)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 20,381)	−0.008	−0.0006	0.027	0.003	0.012	−0.044*	0.009	0.038	0.015
	(0.009)	(0.011)	(0.018)	(0.016)	(0.011)	(0.026)	(0.029)	(0.028)	(0.014)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
Former English learner students									
Credits attempted (*n* = 36,481)	−0.255	−1.253**	−6.744***	−1.101	−0.102	1.192**	0.108	−0.263	0.461
	(0.629)	(0.525)	(1.923)	(1.495)	(0.281)	(0.535)	(0.312)	(0.242)	(0.508)
Credits earned (*n* = 36,481)	−0.312	−0.900*	−6.631***	−0.952	−0.094	0.778	0.366	−0.072	0.839*
	(0.616)	(0.513)	(1.780)	(1.461)	(0.324)	(0.568)	(0.347)	(0.283)	(0.445)
Grade point average (*n* = 36,486)	0.005	−0.006	−0.054	0.076**	−0.015	0.020	0.057*	0.059*	0.062**
	(0.020)	(0.025)	(0.050)	(0.036)	(0.028)	(0.066)	(0.032)	(0.032)	(0.031)
Scores on high school state assessment in English language arts (*n* = 35,284)	0.035	−0.005	0.010	0.122***	0.052**	0.144**	0.037	0.111**	0.047
	(0.029)	(0.033)	(0.034)	(0.043)	(0.023)	(0.064)	(0.038)	(0.044)	(0.035)
Scores on high school state assessment in math (*n* = 35,538)	−0.009	−0.022	−0.038	0.043*	0.034*	0.079	−0.048	0.011	−0.017
	(0.027)	(0.027)	(0.057)	(0.023)	(0.020)	(0.063)	(0.063)	(0.039)	(0.053)
Probability of graduating on time (*n* = 36,486)	−0.006	0.010	0.015	0.002	−0.001	−0.095*	0.012	0.011	0.032*
	(0.011)	(0.010)	(0.022)	(0.013)	(0.012)	(0.054)	(0.018)	(0.019)	(0.019)
Probability of dropping out (*n* = 36,478)	0.003	−0.003	−0.006	−0.013	0.001	0.020	0.001	0.002	−0.008
	(0.007)	(0.007)	(0.017)	(0.008)	(0.008)	(0.031)	(0.010)	(0.012)	(0.017)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 36,350)	−0.007	0.006	−0.024	0.040	0.032*	−0.020	−0.016	0.004	0.013
	(0.015)	(0.013)	(0.033)	(0.027)	(0.017)	(0.029)	(0.028)	(0.033)	(0.018)
Never English learner students									
Credits attempted (*n* = 307,915)	0.467*	−1.156**	−5.458***	0.063	0.098	−0.002	−0.040	−0.465*	0.331
	(0.265)	(0.571)	(1.289)	(0.292)	(0.148)	(0.439)	(0.285)	(0.257)	(0.326)
Credits earned (*n* = 307,915)	0.358	−1.001*	−5.373***	0.056	0.091	−0.059	−0.053	−0.458*	0.375
	(0.259)	(0.558)	(1.236)	(0.277)	(0.151)	(0.437)	(0.273)	(0.258)	(0.314)
Grade point average (*n* = 308,031)	−0.009	−0.047*	−0.107**	0.033**	0.016	0.008	−0.012	−0.019	0.011
	(0.011)	(0.026)	(0.044)	(0.016)	(0.010)	(0.031)	(0.018)	(0.013)	(0.025)
Scores on high school state assessment in English language arts (*n* = 288,267)	0.037**	0.057***	−0.024	0.035	0.008	0.003	0.039	0.027	0.015
	(0.015)	(0.019)	(0.026)	(0.025)	(0.017)	(0.047)	(0.027)	(0.024)	(0.027)
Scores on high school state assessment in math (*n* = 288,874)	0.009	0.030*	−0.035	0.013	0.018	−0.002	−0.014	−0.040	0.011
	(0.015)	(0.016)	(0.025)	(0.024)	(0.014)	(0.037)	(0.032)	(0.027)	(0.026)
Probability of graduating on time (*n* = 308,031)	−0.006	−0.0009	0.005	0.009	0.003	−0.031**	0.0006	0.003	−0.009
	(0.005)	(0.004)	(0.012)	(0.007)	(0.006)	(0.016)	(0.007)	(0.006)	(0.009)
Probability of dropping out (*n* = 307,050)	−0.003	−0.002	−0.009	−0.0003	0.001	0.007	0.004	0.005	−0.0009
	(0.004)	(0.003)	(0.008)	(0.005)	(0.004)	(0.010)	(0.006)	(0.005)	(0.005)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 305,122)	−0.020	0.013	0.0004	−0.017	0.015*	−0.017	−0.051	−0.043*	0.005
	(0.016)	(0.011)	(0.027)	(0.028)	(0.008)	(0.023)	(0.036)	(0.026)	(0.011)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
Eligibility for the national school lunch program									
Ever eligible for the national school lunch program									
Credits attempted (n = 192,674)	0.383	−0.577**	−5.083***	−0.280	−0.026	0.219	0.042	−0.350	0.381
	(0.334)	(0.284)	(1.243)	(0.635)	(0.164)	(0.447)	(0.279)	(0.253)	(0.286)
Credits earned (n = 192,674)	0.263	−0.420	−4.780***	−0.220	−0.006	0.008	0.062	−0.357	0.501*
	(0.332)	(0.274)	(1.139)	(0.611)	(0.186)	(0.454)	(0.271)	(0.253)	(0.283)
Grade point average (n = 192,717)	−0.005	−0.012	−0.037	0.041**	0.004	−0.005	0.005	−0.020	0.006
	(0.013)	(0.015)	(0.029)	(0.019)	(0.013)	(0.035)	(0.017)	(0.016)	(0.023)
Scores on high school state assessment in English language arts (n = 179,767)	0.018	0.030	0.013	0.046*	0.021	0.016	0.030	0.025	0.010
	(0.018)	(0.021)	(0.025)	(0.024)	(0.017)	(0.048)	(0.025)	(0.020)	(0.027)
Scores on high school state assessment in math (n = 180,878)	0.004	−0.0004	0.010	0.011	0.014	0.008	−0.027	−0.029	0.008
	(0.015)	(0.016)	(0.031)	(0.022)	(0.014)	(0.035)	(0.034)	(0.030)	(0.023)
Probability of graduating on time (n = 192,717)	−0.008	0.003	0.006	0.014	0.007	−0.050**	0.006	0.012	0.002
	(0.008)	(0.006)	(0.017)	(0.012)	(0.009)	(0.025)	(0.010)	(0.011)	(0.012)
Probability of dropping out (n = 192,350)	−0.003	−0.002	−0.009	−0.005	0.002	0.012	−0.003	0.008	−0.004
	(0.005)	(0.004)	(0.013)	(0.008)	(0.006)	(0.015)	(0.008)	(0.009)	(0.008)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 191,587)	−0.004	0.002	0.016	0.026**	0.019**	−0.024	−0.003	−0.005	0.007
	(0.008)	(0.007)	(0.020)	(0.011)	(0.009)	(0.020)	(0.012)	(0.012)	(0.011)
Never eligible for the national school lunch program									
Credits attempted (n = 171,993)	0.467	−1.627**	−6.523***	0.041	0.200	−0.164	−0.226	−0.526*	0.312
	(0.312)	(0.809)	(1.572)	(0.284)	(0.175)	(0.552)	(0.326)	(0.271)	(0.406)
Credits earned (n = 171,993)	0.372	−1.429*	−6.612***	0.011	0.194	−0.133	−0.220	−0.484*	0.315
	(0.303)	(0.792)	(1.527)	(0.281)	(0.173)	(0.528)	(0.325)	(0.285)	(0.394)
Grade point average (n = 172,063)	0.001	−0.069*	−0.168***	0.034*	0.025*	0.021	−0.005	−0.005	0.031
	(0.011)	(0.036)	(0.062)	(0.018)	(0.013)	(0.043)	(0.022)	(0.014)	(0.028)
Scores on high school state assessment in English language arts (n = 162,448)	0.046***	0.062***	−0.055**	0.023	0.005	0.006	0.038	0.029	0.020
	(0.017)	(0.021)	(0.026)	(0.031)	(0.018)	(0.053)	(0.031)	(0.027)	(0.030)
Scores on high school state assessment in math (n = 162,025)	0.0008	0.047***	−0.067**	0.017	0.023	0.008	0.002	−0.035	0.011
	(0.018)	(0.017)	(0.027)	(0.025)	(0.018)	(0.041)	(0.032)	(0.028)	(0.037)
Probability of graduating on time (n = 172,063)	−0.002	−0.005	0.008	0.005	−0.005	−0.018	0.002	−0.001	−0.009
	(0.004)	(0.004)	(0.010)	(0.005)	(0.004)	(0.012)	(0.005)	(0.004)	(0.009)
Probability of dropping out (n = 171,396)	−0.001	−0.002	−0.007	0.001	−0.0004	0.003	0.006	0.004	0.001
	(0.003)	(0.002)	(0.006)	(0.003)	(0.002)	(0.009)	(0.004)	(0.003)	(0.004)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 170,084)	−0.036	0.018	−0.018	−0.049	0.013	−0.008	−0.077	−0.056	0.006
	(0.025)	(0.016)	(0.033)	(0.042)	(0.011)	(0.025)	(0.050)	(0.036)	(0.015)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
High school locale									
Large metro school									
Credits attempted (n = 64,849)	1.533***	0.517	−10.02***	1.563**	−0.871	0.348	−0.421	[a]	[a]
	(0.534)	(0.380)	(1.668)	(0.724)	(0.740)	(0.832)	(1.183)		
Credits earned (n = 64,849)	1.688***	1.621***	−10.06***	1.471**	−0.336	0.061	0.060	[a]	[a]
	(0.588)	(0.601)	(1.590)	(0.743)	(0.785)	(0.843)	(1.294)		
Grade point average (n = 64,918)	0.002	−0.014	−0.043	0.080**	0.019	−0.042	−0.195***	[a]	[a]
	(0.024)	(0.021)	(0.032)	(0.033)	(0.029)	(0.036)	(0.025)		
Scores on high school state assessment in English language arts (n = 60,300)	0.070**	0.075	−0.028	0.122***	−0.076*	0.0228	−0.006	[a]	[a]
	(0.034)	(0.047)	(0.040)	(0.038)	(0.042)	(0.071)	(0.040)		
Scores on high school state assessment in math (n = 60,551)	0.024	0.057	−0.049	0.080*	−0.020	0.037	−0.045	[a]	[a]
	(0.031)	(0.041)	(0.038)	(0.044)	(0.054)	(0.040)	(0.068)		
Probability of graduating on time (n = 64,918)	−0.032*	−0.022	−0.0002	0.036*	0.041	−0.036	−0.019	[a]	[a]
	(0.017)	(0.013)	(0.022)	(0.012)	(0.029)	(0.032)	(0.029)		
Probability of dropping out (n = 64,662)	0.0049	0.001	0.005	−0.010	−0.007	0.001	0.012	[a]	[a]
	(0.011)	(0.0076)	(0.015)	(0.016)	(0.015)	(0.019)	(0.019)		
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 64,370)	−0.051**	0.005	−0.128**	0.079***	0.093***	−0.029	0.0045	[a]	[a]
	(0.025)	(0.014)	(0.049)	(0.030)	(0.035)	(0.028)	(0.0095)		
Metro suburb									
Credits attempted (n = 108,582)	1.209	−3.878***	−0.493	0.431	0.367	[a]	0.316	0.016	2.513**
	(0.910)	(1.456)	(0.434)	(0.527)	(0.368)		(0.456)	(0.414)	(1.045)
Credits earned (n = 108,582)	1.145	−3.686**	−0.039	0.433	0.421	[a]	0.298	0.055	2.299**
	(0.892)	(1.436)	(0.429)	(0.514)	(0.369)		(0.431)	(0.431)	(1.033)
Grade point average (n = 108,620)	0.094**	−0.159**	−0.096	0.034	0.052*	[a]	0.020	0.043	0.129
	(0.042)	(0.071)	(0.110)	(0.039)	(0.031)		(0.040)	(0.035)	(0.086)
Scores on high school state assessment in English language arts (n = 103,316)	0.041	0.052	0.078***	0.020	0.040	[a]	0.051	0.041	−0.092***
	(0.036)	(0.040)	(0.016)	(0.063)	(0.027)		(0.048)	(0.042)	(0.025)
Scores on high school state assessment in math (n = 103,363)	−0.004	0.061**	−0.070***	0.005	−0.015	[a]	0.002	−0.054	−0.143***
	(0.030)	(0.028)	(0.016)	(0.038)	(0.023)		(0.034)	(0.038)	(0.027)
Probability of graduating on time (n = 108,620)	−0.009	0.004	0.026***	0.009	0.001	[a]	−0.005	0.0164*	−0.029
	(0.011)	(0.008)	(0.007)	(0.011)	(0.009)		(0.005)	(0.009)	(0.034)
Probability of dropping out (n = 108,402)	0.003	−0.005	−0.030***	−0.005	0.002	[a]	0.004	−0.006	0.027
	(0.005)	(0.006)	(0.006)	(0.011)	(0.008)		(0.004)	(0.007)	(0.025)
Probability of meeting credit requirements for admission to a public four-year university in Washington (n = 107,849)	−0.086*	0.023	0.170***	−0.129*	−0.001	[a]	−0.129**	−0.090*	−0.030**
	(0.047)	(0.025)	(0.019)	(0.070)	(0.015)		(0.064)	(0.052)	(0.014)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
Midsize									
Credits attempted (*n* = 98,947)	0.790***	0.209	−0.0001	1.085**	0.071	−0.101	1.033*	0.013	−0.304
	(0.270)	(0.226)	(0.308)	(0.421)	(0.270)	(0.391)	(0.570)	(0.449)	(0.359)
Credits earned (*n* = 98,947)	0.621**	0.281	−0.245	0.883**	−0.258	−0.659	0.804*	−0.115	−0.139
	(0.299)	(0.180)	(0.289)	(0.360)	(0.217)	(0.742)	(0.454)	(0.399)	(0.273)
Grade point average (*n* = 98,964)	0.0312*	0.040**	−0.057**	0.044**	−0.014	−0.026	0.044**	−0.005	0.019
	(0.019)	(0.018)	(0.027)	(0.018)	(0.018)	(0.070)	(0.019)	(0.019)	(0.026)
Scores on high school state assessment in English language arts (*n* = 92,173)	0.031	0.034	−0.025	0.033	0.030	−0.088	0.051*	0.021	0.024
	(0.026)	(0.031)	(0.030)	(0.025)	(0.032)	(0.101)	(0.027)	(0.034)	(0.078)
Scores on high school state assessment in math (*n* = 92,506)	0.010	0.028	−0.016	0.080	0.077**	−0.282***	0.117	0.0426	0.086**
	(0.037)	(0.023)	(0.024)	(0.086)	(0.019)	(0.093)	(0.111)	(0.064)	(0.037)
Probability of graduating on time (*n* = 98,964)	0.013	0.016**	−0.005	0.0236	−0.013	−0.066	0.029*	0.004	0.001
	(0.011)	(0.007)	(0.010)	(0.017)	(0.011)	(0.048)	(0.017)	(0.011)	(0.015)
Probability of dropping out (*n* = 98,645)	−0.013	−0.007	−0.013	0.0007	0.003	0.013	−0.008	0.013	−0.015
	(0.009)	(0.005)	(0.015)	(0.015)	(0.009)	(0.010)	(0.021)	(0.014)	(0.009)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 98,181)	0.020	−0.011	0.081	0.039*	0.004	0.167***	0.034	0.006	−0.020*
	(0.018)	(0.016)	(0.076)	(0.021)	(0.010)	(0.053)	(0.029)	(0.032)	(0.010)
Urban fringe									
Credits attempted (*n* = 40,717)	0.569*	1.604	0.698	−0.076	−0.001	−1.562***	−0.001	−0.190	1.343
	(0.302)	(1.116)	(0.461)	(1.182)	(0.336)	(0.217)	(0.734)	(0.606)	(1.484)
Credits earned (*n* = 40,717)	0.535*	1.613	0.592	0.007	0.033	−2.142***	−0.190	−0.409	1.444
	(0.283)	(1.031)	(0.473)	(1.063)	(0.318)	(0.217)	(0.736)	(0.611)	(1.370)
Grade point average (*n* = 40,717)	−0.002	0.034	−0.006	0.053**	0.020	−0.207***	−0.053	−0.062	−0.014
	(0.027)	(0.028)	(0.026)	(0.021)	(0.014)	(0.017)	(0.044)	(0.038)	(0.039)
Scores on high school state assessment in English language arts (*n* = 38,569)	−0.022	0.060*	−0.048	−0.088**	0.011	−0.086*	−0.071*	−0.024	0.075
	(0.046)	(0.035)	(0.118)	(0.035)	(0.047)	(0.046)	(0.040)	(0.056)	(0.068)
Scores on high school state assessment in math (*n* = 38,562)	0.049	0.042	0.047	−0.052	−0.013	−0.039	−0.052	−0.013	0.023
	(0.037)	(0.055)	(0.043)	(0.035)	(0.050)	(0.036)	(0.080)	(0.073)	(0.043)
Probability of graduating on time (*n* = 40,717)	−0.009	0.014	0.010	0.024	−0.011	−0.121***	−0.042*	−0.054**	−0.013
	(0.015)	(0.017)	(0.009)	(0.015)	(0.011)	(0.009)	(0.024)	(0.021)	(0.022)
Probability of dropping out (*n* = 40,592)	0.010	−0.009	−0.004	−0.013	0.006	0.033***	0.039*	0.048***	0.010
	(0.011)	(0.006)	(0.006)	(0.015)	(0.006)	(0.008)	(0.020)	(0.017)	(0.013)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 40,299)	0.003	0.077**	0.0155	−0.002	0.001	−0.006	−0.027*	−0.022*	0.008
	(0.012)	(0.037)	(0.067)	(0.027)	(0.025)	(0.015)	(0.015)	(0.012)	(0.026)

Outcome	Total credits	English	Math	Science	Social studies	Health and physical education	Fine arts	World languages	Career and technical education
Distant									
Credits attempted (*n* = 51,774)	−1.052	−0.479	0.400	−1.887	0.927**	0.365	−0.494	−1.153*	0.367
	(0.792)	(0.378)	(0.666)	(1.189)	(0.454)	(0.484)	(0.845)	(0.623)	(0.331)
Credits earned (*n* = 51,774)	−1.022	−0.590	0.255	−1.698	0.757*	0.553	−0.267	−0.973	0.446
	(0.751)	(0.370)	(0.534)	(1.130)	(0.448)	(0.486)	(0.814)	(0.603)	(0.336)
Grade point average (*n* = 51,774)	−0.018	−0.041*	0.090***	0.0023	0.0017	0.032	0.003	−0.021	0.009
	(0.019)	(0.021)	(0.034)	(0.022)	(0.023)	(0.035)	(0.027)	(0.024)	(0.020)
Scores on high school state assessment in English language arts (*n* = 47,937)	0.025	0.042	0.043*	0.057	0.006	0.119*	0.053	0.036	−0.007
	(0.033)	(0.036)	(0.026)	(0.039)	(0.044)	(0.072)	(0.033)	(0.023)	(0.023)
Scores on high school state assessment in math (*n* = 48,069)	0.014	−0.109**	0.124	−0.007	0.008	0.083	−0.066	−0.054*	−0.015
	(0.022)	(0.042)	(0.141)	(0.036)	(0.034)	(0.056)	(0.040)	(0.032)	(0.027)
Probability of graduating on time (*n* = 51,774)	0.004	−0.008	0.003	0.005	0.012	0.0007	0.007	0.006	0.011
	(0.012)	(0.013)	(0.040)	(0.016)	(0.014)	(0.012)	(0.018)	(0.014)	(0.012)
Probability of dropping out (*n* = 51,536)	−0.004	0.009	−0.025	−0.005	−0.004	−0.009	−0.003	−0.004	−0.007
	(0.005)	(0.009)	(0.015)	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)
Probability of meeting credit requirements for admission to a public four-year university in Washington (*n* = 51,154)	0.021	−0.010	0.048**	0.017	0.028	−0.037***	0.001	−0.009	0.012
	(0.015)	(0.014)	(0.023)	(0.014)	(0.019)	(0.014)	(0.020)	(0.015)	(0.013)

* Significant at *p* = .05; ** significant at *p* = .01; *** significant at *p* = .001.

a. No graduation credit increases occurred between 2012/13 and 2017/18 among districts in sample.

Note: Numbers in parentheses are standard errors. Each cell represents a separate regression model that controlled for the school year in which students were held accountable for graduation requirements, gender, race/ethnicity, grade 8 English language arts and math state assessment scores, whether students were ever eligible for the national school lunch program, whether students received special education services, whether students were a current or former English learner student (compared with a never English learner student), whether students were ever eligible for migrant student services, the percentage of students eligible for the national school lunch program in the last high school students attended, and the locale of the last high school students attended (based on National Center for Education Statistics locale codes). Fixed effects are included for each school district.

Source: Authors' analysis of 2009/10–2017/18 data from the Washington Office of Superintendent of Public Instruction.

Reference

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