UNDERSTANDING THE EFFECT OF AN INTERVENTION PROGRAM ON HIGH SCHOOL GRADUATION RATES: THE ACCESS AND OPPORTUNITY PROGRAM IN ST. CLOUD, MINNESOTA

MÓNICA GARCÍA-PÉREZ
St. Cloud State University
ROBERT C. JOHNSON
St. Cloud State University

ABSTRACT

Facing a continuing racial high school graduation gap, the state of Minnesota is emphasizing the importance of offering resources and opportunities to close this gap to prepare young adults to be adequately ready for success at the post-secondary level, that is, college and career. With this in mind, it is important to evaluate educational programs that offer resources such as targeted mentoring and a supportive learning environment and to estimate their impact on high school retention and graduation rates. We extend our analysis to a longitudinal study of 4-year-cohort graduation and retention rates across years using student-level administrative data from a school district in Central Minnesota on Access and Opportunity Program participants from 2008 to 2013. The combination of different cohorts allows us to disentangle cohort specific characteristics that could be correlated to rapid demographic changes that could impact students' success rates but are not related to the program itself. For instance, the entrance of new English learners in the system may bias educational outcome rates, underscoring the short-run effect of educational programs in the district. On the other hand, educational programs evolve across time and looking across the years would allow us to identify the intensity of the program and its evolution. We correct for selectivity and attrition issues based on observable characteristics and design a quasi-experimental analysis with information before and after the program started. We use as a control group most similar non-participant students. Furthermore, students who have been identified as eligible participants, but who elected not to participate, serve as another form of control. Our results show that compared to eligible non-participants, students of color participating in the program have higher odds to graduate from high school and, across cohorts, there is an increase in retention rates.

INTRODUCTION

High school graduation is of great national interest and significance. For example, President Obama has emphasized the importance of students studying hard, working to overcome challenges, and completing high school to go on to other facets of their lives. (Obama's speech on importance of education, 2009). Obama's administration has called for a redesigning of the high school experience to better prepare young people for the challenges of the 21st century (Next Generation High Schools, n.d.).

National data indicate that the high school graduation rate is increasing. However, high school completion varies by factors such as race or ethnicity, socioeconomic status, English language learner status, geography, gender among other conditions. (National Center for Education Statistics, 2016). Nationally, there have long been calls for efforts to improve educational opportunities and outcomes for underserved and at risk groups. Some examples of more recent efforts of the past three decades include the National Commission on Excellence in Education's 1983 report, "A Nation at Risk: The Imperative for Educational Reform," (A Nation At Risk, 1983); the No Child Left Behind Act (NCLB); Race to the Top (Fundamental Change, 2015); and the pending Every Student Succeeds Act (Hinrichs, 2016).

In Minnesota, similar efforts focus on improving educational outcomes for at risk students groups. The research reported in this paper comes from one such initiative. The Minnesota State Colleges and Universities system (MnSCU), now called Minnesota State, developed an initiative stressing research, demonstration and service to address these problems, funding three centers for this purpose. The St. Cloud Center for Access and Opportunity was designed to identify, implement and document the effectiveness of intervention practices, approaches and models to improve success among underrepresented and underserved students. This center focused its work primarily at the secondary level to address the issues of college readiness of underserved and underrepresented students.

LITERATURE REVIEW

A solid body of research supports the idea that precollege preparation is essential to higher education success. For example, Bowen and his colleagues (2009), in their study of almost 125,000 students in public universities, state that "Late-stage outcomes depend enormously on the qualifications that entering high school students bring with them from the eighth grade and on immutable personal attributes such as race/ethnicity, gender, and family background" (p. 111). They further note that high school grades are strong predictors of college graduation rates. Adelman (2006), in his analysis of a national longitudinal study of eighth graders also emphasized the importance of the pre-college experience. In an executive summary of his work, he argues that "The academic intensity of the student's high school curriculum still counts more than anything else in precollegiate history in providing momentum toward completing a bachelor's degree" (n.d.). Research from Chicago public schools provides additional evidence that the high school experience is crucial in attaining college success. Roderick and her colleagues (2006), in a report examining Chicago Public School graduates' college enrollment, college preparation, and graduation from four-year colleges, found that improved qualifications in high school represent an important strategy to increase college-participation rates, access to the most selective colleges, and college graduation rates of low-income, minority, and first-generation college students. This conclusion is based on their findings that Chicago public schools graduates fare poorly in higher education because of poor preparation, low grades, and low ACT test scores.

A Minnesota non-profit think tank, Growth & Justice, convened a group of experts to review strategies for increasing college graduation in Minnesota that are based on empirical research and cost-effective. Several of these scholars identify the strong correlation between achievement and high-school graduation at the pre-college level (Perna, 2007; Levin and Belfield, 2007). Levin and Belfield, for example, provide a quantitative estimate of this relationship for Minnesota students, stating that "an increase in 8th grade achievement of one standard deviation is associated with a 48% lower probability of dropping out of high school" (p. 57). This group of scholars sought to identify promising interventions and strategies for Growth & Justice that would help the state of Minnesota increase its overall college graduation by 50 percent by the year 2020.

In addition to the national-level body of literature on intervention as a factor in educational reform and student success, the Minnesota Department of Education is advocating and implementing a system for high school dropout and prevention in order to enhance high school graduation through intervention actions. The Minnesota Early Indicator and Response System (MEIRS) is designed to be an early warning system that identifies students at risk of dropping out by monitoring known risk factors and targeting resources to the students in middle and high school. (Minnesota Department of Education, n.d.).

The Access and Opportunity Program (AOP) has as its mission and plan of operation the improvement of the secondary performance of underrepresented students in key areas deemed to be important in gaining college access and success, namely course-taking, grades, and achievement tests (as indicators of academic achievement), and ultimately high school graduation. Beyond the secondary level, the program emphasizes college readiness and workforce preparation. Success beyond the secondary level entails postsecondary enrollment, persistence and completion.

The purpose of this paper is to examine program impact on high school graduation and, secondarily, persistence. Persistence is measured by considering the likelihood that students consistently stay in the system. Students who are rotating across different schools and school systems are less successful at school and have lower graduation rates (Perna, 2007).

RESEARCH DESIGN, DATA AND METHODOLOGY

A quasi experimental design (within District 742) is employed in this project utilizing program participation (AOP participants compared to AOP non-participants) as the primary independent variable condition. District 742 students most similar to students served, in terms of pre-project indices have been assigned as control participants. With the availability of data on all students in the secondary grades, we also compare program participants with students from the general population who do not share their academic and demographic characteristics. Further, students who have been identified as eligible participants, but who elected not to participate, serve as another form of control.

The primary sources of data are student school records maintained by the school district in its student information systems, information gathered by data collection forms completed by program staff, and information on file with the Minnesota Department of Education available for public access. The information covers the academic years from 2005-2006 to 2012-2013 and all registered students in this particular district. We take advantage of the longitudinal information provided by the district to evaluate the program impact across five four-year student cohorts. We also use detailed participation information from the Access and Opportunity Program dating from its beginning in the 2008-2009 academic year.

We evaluate the impact of AOP on the students' retention and graduation rate. To do so, we incorporate evaluation techniques of non-randomized programs to incorporate the bias created by the self-selection of students into becoming participants in a program. In addition, we take into account the issue of attrition bias when evaluating the impact on retention and graduation rate.

Bias is introduced in this design because students were assigned to the program by school personnel, often counselors and administrators, based on the characteristics of the target population, namely low income, first-generation, immigrant status, and/or a member of a group traditionally underrepresented in higher education, generally members of racial or ethnic minority groups. After the program started, teachers and parents referred students. And some students sought admission to the program on their own.

Because of the lack of randomization in the assignment of students to the treatment conditions, we employ an advanced quantitative technique to evaluate treatment effects, propensity score analysis (Guo & Fraser, 2010; Murnane & Willett, 2011; Holmes, 2014). Program evaluation theory has evolved in recent years. This evolution is driven, in part, by the high costs of randomized experiments in education. Apart from the ethical issues involved in randomized public education research, the application of randomized interventions generally entails expensive operational costs that divert resources away from the program itself. With non-randomization, however, the process of evaluating programs is more complex. Yet, the need for data-driven and research-based solutions calls for methods that can improve causal inferences in observational studies. Our analysis would then use these new techniques to evaluate the impact of the program on students' retention and graduation rate.

Our methodology follows a two-step approach (Heckman correction technique, 1979). We are interested in understating the impact in both steps. The first step uses the full sample of students in the district and estimate the probability of a student being in the district during the 4-year cohort (from 9th grade to 12 grade) conditional on observable characteristics such as sex and sociodemographic background proxy by student's participation in Free Reduced Lunch Program and/or English Learner Program. This first step approximates to the analysis of students' retention rate during the period of study. We use this information to account for the effect of attrition rate on our 4-year cohort sub-sample. This rate would be used as a weighting mechanism that would account for the systematic attrition rate based on observable characteristics. For instance, if students of color are more likely to change districts and this likelihood is based on their gender and background, our 4-year cohort sample would then be composed of a biased smaller sample of students of color that would bias our estimated results. Using this likelihood rate, we move to our second step. The second step concentrates the analysis on students within the 4-year cohort group graduation rate. Now, we use the sample of students who has remained in the district during their four final years of school.

For our first step of the analysis, we use a multivariate probit model clustered at school level. Using the appropriate functional form, we estimate the individual matching probability based on observables.

$$P(match = 1|X)_{it} = \Phi(\beta_0 + \beta_1 Female_{it} + \beta_2 FRL_{it} + \beta_3 EL_{it} + \beta_3 Race_{it} + \varepsilon_{it}) \quad (1)$$

Equation (1) formally presents our first-step model where 'i' represents a student and 't' time represented here by a within 4-year cohort period. Our analysis contains five 4-years cohort groups: 2006-2009, 2007-2010, 2008-2011, 2009-2012, and 2010-2013. Figure 1 offers a visual presentation of each cohort. *P(match=1|X)* is the probability of matching that would be estimated assuming a standard normal distribution. That is, the probability a student is at the beginning of cohort 't' in 9^{th} grade and later appears at the end of the cohort 't' in 12^{th} grade assuming a standard normal distribution. *Female* represents a dummy variable that is 1 if student is female. *FRL* and *EL* are dummy variables for whether a student participates in a Free Reduced Lunch program and is an English Learner, respectively. *Race* is a dummy variable that is 1 if the student is a student of color. The reference group is White, male students who do not participate in neither a Free Reduced Lunch Program nor an English Learner Program. ε_{it} are robust and clustered standard errors. The estimated coefficients β's would give us information on the estimated impact of each variable on the likelihood a student remains in the school during the 4-year cohort group.

Our second step of the analysis considers a multivariate logistic model clustered at school level. The non-linear dependent variable is the dichotomous variable Graduate (1 if student graduate, 0 otherwise). For this section, we consider different versions of comparison groups to evaluate the impact of the program on student's graduation rate. For each type of analysis, we look at each cohort separately and the aggregate sample with all cohorts. First, we consider the groups of AOP participants and student's race separately. With this representation, we can evaluate the graduation rate between participants and non-participants by race (White versus students of color). Equations (2.A) and (2.B) show the formalization of our model when the groups are aggregated by AOP participation and Race.

$$P(Graduate = 1|X)_{it} = \mathrm{F}(\beta_0 + \beta_1 B_{it} + \beta_2 AOP_{it} + \beta_3 Race_{it} + \beta_4 Race_{it} * AOP_{it} + \beta_5 Cohort_{it} + \varepsilon_{it}) \quad (2.A)$$

$$P(Graduate = 1|X)_{i} = \mathrm{F}(\beta_0 + \beta_1 B_{i} + \beta_2 AOP_{i} + \beta_3 Race_{i} + \beta_4 Race_{i} * AOP_{i} + \varepsilon_{i}) \quad (2.B)$$

In the Equations (2.A) and (2.B), *AOP* represents a dummy variable that accounts for program participation, *B* is a vector that represents the variables Female and socioeconomic background, and *Cohort* identifies an individual's 4-year cohort group. Equation (2.B) is estimated by each cohort separately. The estimated coefficients that we would consider relevant are β_2 and β_4. β_2 would compare the impact on graduation rate of White participants verses White non-participants, meanwhile the sum of β_2 and β_4 represents the effect on students of color who are participants versus

White Non-participants. β_4 alone captures the effect on students of color who participate in the program versus those students of color who do not participate.

Given the structural issues regarding the selection on participants and the non-random distribution on program participation, we would expect that non-participant White students are not the right comparison group. The idea is that we need to compare the effect of the program using a potential outcome approach. That is, we would need to compare the group of participants to the hypothetical case of what would have been their outcome if the program would have not been implemented. If we follow this logic, assuming that the group would have reached an outcome similar to non-participant White students would be inadequate. The motivation for the creation of such program was mainly focused on the disparity on educational achievement between these groups. Therefore, we decided to create a more appropriate group to compare against and to evaluate the evolution of this impact from the period where the program was half in place to more recent years. We then defined a new variable that identifies "eligible students". These are students who meet the eligibility criteria to be a participant in the program but they do not participate. Using this new category, we can compare AOP participants to those who although eligible did not participate in the program. For this analysis, we cannot include the variables related to free reduce lunch and English learner. These two variables are used to identify 'eligibility', hence the high correlation between these variable and our new definition of "eligible" students. Equations (3.A) and (3.B) show the formal representation of our models.

$$P(Graduate = 1|X)_{it} = \mathrm{F}(\beta_0 + \beta_1 Female_{it} + \beta_2 GROUP_{it} + \beta_3 Cohort_{it} + \varepsilon_{it}) \quad (3.A)$$

$$P(Graduate = 1|X)_{it} = \mathrm{F}(\beta_0 + \beta_1 Female_{it} + \beta_2 GROUP_{it} + \varepsilon_{it}) \quad (3.B)$$

All the variables are defined as before. The new variable introduced in these representations is *GROUP*. This variable represents a vector of dummy variables listed as: White non-participants, White participants, White eligible, Non-White non-participants, Non-White eligible, and Non-White participants. The models represented in Equations (3.A) and (3.B) are estimated using the entire sample for all groups and by each group separately compared to Non-White participants. All errors are estimated in clusters and robust.

ANALYSIS OF RESULTS

We follow the methodology detailed in the previous section to analyze the impact of the program. This paper focuses on two major components of the goal of the educational program: graduation rate and retention rate. We explain in detail the results for each particular comparison group.

Table 1 shows the distribution of the matched data by cohort and aggregate. On average, the distribution of type of students is similar across cohorts, except for participation rate. The low participation rate in the first cohort is reasonable given that Access and Opportunity Program started late in the year 2008 and students in the 2006-2009 cohort were already in the later years of schooling. White and non-White participants were only 4% and 7% of their cohort. For those students who we find at the beginning and at the end of their particular cohort, the graduation rate was between 77% and 88%. There is a clear trend of downward graduation rate overall across cohorts, with the most recent cohort being more than 10 percentage points below the earliest cohort in our dataset. Two other elements are important to highlight from this table. First, the proportion of Free Reduced Lunch participants increases across the cohorts. The significant increase is larger than 10 percentage points. Second, the proportion of English learners also increases, although not as dramatic as the other group. However, the combination of these two trends could be affecting overall graduation rate. Our goal is to consider these elements in our analysis and disentangle the potential impact of the intervention program that maintain as one of its goal student success through graduation rate.

Targeted goal: Graduation Rate

One of the primary goals of this program was offering the support needed to increase students' likelihood to graduate from high school. As mentioned before, the evaluation of this goal is complex given the non-random assignation into the program. In this section, we would evaluate the likelihood to graduate from high school and compare it through the different groups. During the period of analysis, there are also other economic components that may have affected these rates. The years during the starting of the program the country faced the Great Recession, during that period we can also see an increase in the number of students participating in Free Reduced Lunch (Figure 2).

Tables 2 and 3 show the odds ratios of model represented in equation (2) with a change in the reference group. In the first table, we compared Student of Color AOP participants (SOC AOP) and Non-AOP participants (SOC Non-AOP) against Non- AOP participant White students (WHITE Non-AOP). Overall, being a student of color lowers the odds of graduation compared to white students, but having been a program participant overcomes part of this reduction by almost half, after we take into consideration the likelihood of staying during the 4 years of school. When we combine all cohorts, we can increase the variation of the sample and be more effective in estimating the impact of participants versus non-participants. Nevertheless, non-participant white students have the highest likelihood of high school graduation compared to all the other groups. We consider that this is expected given the differences in background between participants and non-participants and white and student of color. As we previously mentioned, non-participant white students are then not the right comparison group to evaluate the impact of the program.

Table 3 shows a separate way to evaluate the impact of AOP participation. We consider now as the reference group SOC AOP. This presentation allows us to show the actual impact of program participation. The comparable groups that we turn our focus to are white and student of color who would be considered eligible to participate in the program but do not participate. These groups share more similar background to all participants in the program than those who are not eligible such as non-participant white students. Compared to SOC AOP, SOC and white eligible students have lower odds to graduate from high school. For 10 SOC AOP students, only 1 or 2 SOC and white eligible students graduate from high school. Because of the demographics and socioeconomic background in the area, most students of color are eligible. This is the reason behind not seeing a significant effect on SOC non-AOP. Nevertheless, among white students, those who would be eligible, we see a significant reduction in their graduation rates odds ratio almost similar to the one we see for eligible students of color. Table 4 confirms our findings (column 2 and 4) while separately evaluating each group against students of color who participate in the program. AOP participant students of color (SOC AOP) have significantly higher odds to graduate from high school than eligible white students and eligible students of color.

Unintended consequence: Retention Rate

Primarily, the program was designed to assist students in need along their high school education. However, in this process the program was also able to reduce the attrition rate of students of color. Although, SOC participant are less likely than White Non-Participants to stay within a 4-year cohort, this difference is smaller across cohorts.

Table 5 shows the estimated probability of staying in school from the first year to the fourth year for each cohort. Because we are comparing the rates against the group with the highest retention rate, the estimated value is negative across all groups and cohorts. We focus on the absolute value of the number to evaluate the increase in retention rates. Compared to eligible students of color, eligible white students, and student of color who are not participants, AOP participants, white and non-white, see a reduction in their attrition rates, which can be read as an increase in retention rates. AOP participant students of color show the largest change from 40% to 28% less likely to white non-AOP to remain in school. It is almost half of a reduction on the rate. White students who are eligible but do not participate do not see any meaningful change in this rate across cohorts. Eligible students of color show a small reduction but still maintain a large likelihood of attrition compared to white non-AOP students. In fact, the rate changes from 40% to more than 33%. Overall, the group with the largest change across cohort is the students of color participating in the program.

CONCLUDING REMARKS

Programs targeting students in need are important, especially in Minnesota where the on-time high-school graduation rate for students of color are some of the lowest in the country (Minnesota Public Radio, 2016). For many years, in states like Minnesota, this gap has been overlooked because of the growing increase in the total high school graduation rates. Our goal in this paper has been to show the evaluation of a long-standing program that provides extra academic resources to students in need and to compare the performance of this group versus other groups who have not participated in the program. Educational programs like this one are difficult to evaluate given the non-randomization of the selection of participants. Therefore, we used more sophisticated methodologies to be able to analyze the performance of the relevant groups.

At this point, programs like the Access and Opportunity Program allow us to evaluate the feasibility of using them to reduce the gap that currently exists among diverse groups. Considering the effect that we find in our research, it is worthwhile to promote such programs.

REFERENCES

A Nation at Risk. (1983). Retrieved from https://www2.ed.gov/pubs/NatAtRisk/risk.html

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Washington, D.C: U.S. Department of Education.

Adelman, C. (n.d.). *The Toolbox revisited: Paths to degree completion from high school through college, executive summary*. Retrieved October 2010, from Ed.Gov U.S. Department of Education : http://www2.ed.gov/rschstat/research/pubs/toolboxrevisit/index.html

Bowen, W. G., Chingos, M. M., & McPherson, M. S. (2009). *Crossing the finish line: Completing college at America's public universities.* Princeton, New Jersey: Princeton University Press.

Fundamental Change: Innovation in America's schools under race to the top (2015). Retrieved from http://www2.ed.gov/programs/racetothetop/rttfinalrptfull.pdf

Guo, S., & Fraser, M. (2010). *Propensity score analysis: Statistical methods and applications*. Thousand Oaks, CA: Sage Publications, Inc.

Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica*, *47*(1): 153–61. doi:10.2307/1912352.

Hinrichs, E. (2016). *Cautious optimism, and a lot of questions, about what the new federal education law will mean for Minnesota*. Retrieved from https://www.minnpost.com/education/2016/07/cautious-optimism-and-lot-questions-about-what-new-federal-education-law-will-mean

Holmes, W. (2014). *Using propensity scores in quasi-experimental designs*. Thousand Oaks, CA: Sage Publications, Inc.

Levin, H. M., & Belfield, C. R. (2007). Investments in K-12 for Minnesota: What works? *Smart Investments in Minnesota Students* (pp. 29-38). St. Paul, Minnesota: Growth & Justice.

Minnesota Department of Education. (n.d.). *Minnesota early indicator and response system.* Retrieved from http://education.state.mn.us/MDE/dse/drop/MEIRS/050418

Minnesota Public Radio. (2016, March 7). *Minnesota's graduation gap: By the numbers*. Retrieved from https://www.mprnews.org/story/2016/03/07/graduation-gap-by-the-numbers

Murnane, R. J. & Willett, J. B. (2011). *Methods matter: Improving causal inference in educational and social science research*. New York, NY: Oxford University Press.

National Center for Education Statistics. (2016). Retrieved from http://nces.ed.gov/programs/coe/indicator_caa.asp

Next Generation High Schools: Redesigning the American high school experience. (n.d.) Retrieved from http://www.ed.gov/highschool

Obama's speech on importance of education. (2009). Retrieved from http://www.upi.com/Obamas-speech-on-importance-of-education/21501252429738/

Perna, L. W. (2007). Improving the transition from high school to college in Minnesota: Recommendations based on a review of effective programs. *Smart Investments in Minnesota's students* (pp. 57-72). St. Paul, Minnesota: Growth & Justice.

Roderick, M., Nagaoka, J., Allensworth, E., Coca, V., Correa, M., & Stoker, G. (2006, April). *From high school to the future: A first look at Chicago Public School graduates' college enrollment, college preparation, and graduation from four-year colleges*. Chicago, Illinois: Consortium on Chicago School Research, University of Chicago.

Figures and Tables

Figure 1
4-year Student Cohort

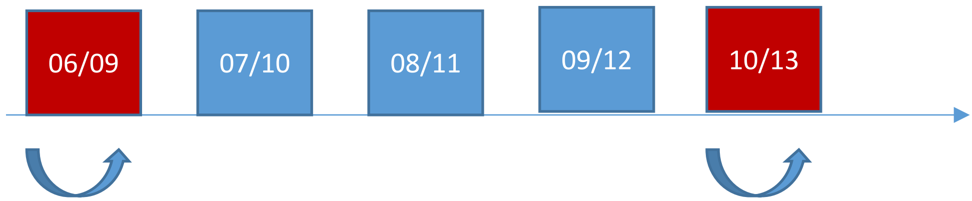

Figure 2
Free and Reduced Lunch and English Learner Status of Samples

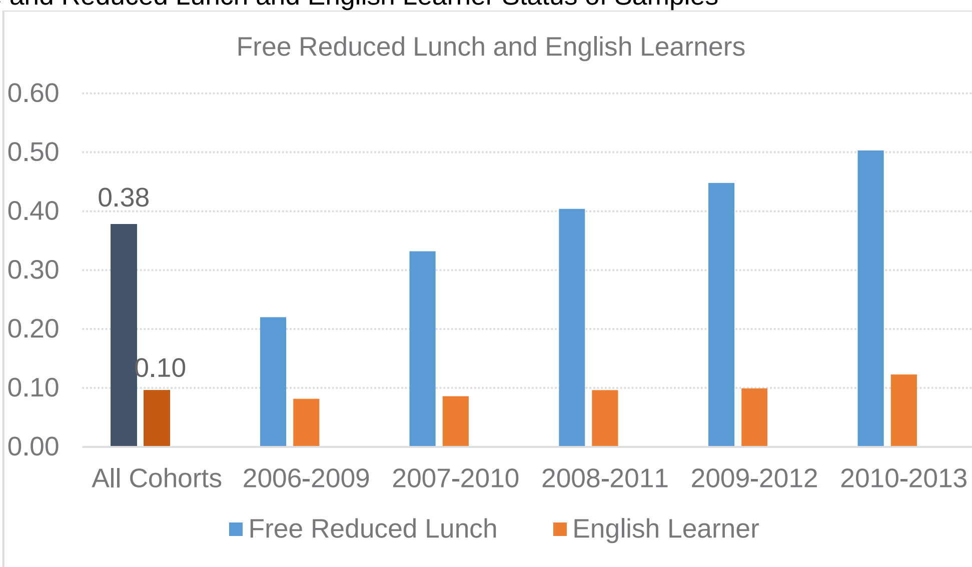

Table 1
Summary Statistics

VARIABLES	All Cohorts mean	sd
White Non-Participant	**0.55**	*0.50*
White Eligible	**0.18**	*0.39*
White Participant	**0.07**	*0.26*
SOC Participant	**0.13**	*0.33*
SOC Eligible	**0.04**	*0.20*
SOC Non Participant	**0.02**	*0.15*
Graduated	**0.83**	*0.37*
Non-White	**0.19**	*0.40*
White	**0.81**	*0.40*
Non- Participant	**0.80**	*0.40*
Participant	**0.20**	*0.40*
Female	**0.48**	*0.50*
Male	**0.52**	*0.50*
Free Reduced Lunch	**0.38**	*0.49*
English Learner	**0.10**	*0.30*
4-year Cohort (% of full cohort)	**0.73**	*0.44*
N. Observations	**3184**	

Table 1 (continued)

Cohorts	06-09		07-10		08-11		09-12		10-13	
VARIABLES	**mean**	sd	**mean**	sd	**mean**	sd	**mean**	sd	**mean**	sd
White Non-Participant	**0.68**	*0.47*	**0.59**	*0.49*	**0.55**	*0.50*	**0.49**	*0.50*	**0.43**	*0.50*
White Eligible	**0.13**	*0.34*	**0.17**	*0.38*	**0.19**	*0.39*	**0.23**	*0.42*	**0.21**	*0.41*
White Participant	**0.04**	*0.21*	**0.07**	*0.25*	**0.06**	*0.24*	**0.08**	*0.28*	**0.12**	*0.32*
SOC Participant	**0.07**	*0.26*	**0.11**	*0.31*	**0.15**	*0.35*	**0.13**	*0.34*	**0.19**	*0.39*
SOC Eligible	**0.04**	*0.20*	**0.04**	*0.21*	**0.04**	*0.19*	**0.05**	*0.22*	**0.04**	*0.20*
SOC Non Participant	**0.03**	*0.18*	**0.02**	*0.15*	**0.02**	*0.13*	**0.02**	*0.16*	**0.01**	*0.10*
Graduated	**0.88**	*0.33*	**0.85**	*0.36*	**0.86**	*0.34*	**0.79**	*0.41*	**0.77**	*0.42*
Non-White	**0.15**	*0.36*	**0.18**	*0.38*	**0.20**	*0.40*	**0.21**	*0.41*	**0.24**	*0.43*
White	**0.85**	*0.36*	**0.82**	*0.38*	**0.80**	*0.40*	**0.79**	*0.41*	**0.76**	*0.43*
Non- Participant	**0.88**	*0.32*	**0.82**	*0.38*	**0.79**	*0.41*	**0.79**	*0.41*	**0.70**	*0.46*
Participant	**0.12**	*0.32*	**0.18**	*0.38*	**0.21**	*0.41*	**0.21**	*0.41*	**0.30**	*0.46*
Female	**0.48**	*0.50*	**0.46**	*0.50*	**0.49**	*0.50*	**0.46**	*0.50*	**0.51**	*0.50*
Male	**0.52**	*0.50*	**0.54**	*0.50*	**0.51**	*0.50*	**0.54**	*0.50*	**0.49**	*0.50*
Free Reduced Lunch	**0.22**	*0.41*	**0.33**	*0.47*	**0.40**	*0.49*	**0.45**	*0.50*	**0.50**	*0.50*
English Learner	**0.08**	*0.27*	**0.09**	*0.28*	**0.10**	*0.30*	**0.10**	*0.30*	**0.12**	*0.33*
4-year Cohort (% of full cohort)	**0.70**	*0.46*	**0.78**	*0.42*	**0.76**	*0.43*	**0.74**	*0.44*	**0.70**	*0.46*
N. Observations	**674**		**629**		**644**		**645**		**592**	

Note: Total number of observations identifies the number of students in each and all cohorts. Each column cohort column only considers the sample of students who are identified as part of that particular cohort. The means in the table can be interpreted as percentages when multiplied by 100.

Table 2
Odd Ratios/ Logistic Regression Graduation Rate – Compared to White Non-AOP

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All COHORTS	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5
Female	1.408***	1.582*	1.329	1.773**	1.073	1.416*
	(0.143)	(0.407)	(0.309)	(0.440)	(0.220)	(0.291)
Ever AOP	2.171*	7.094	38.55**	8.972	3.367	1.570
	(0.879)	(10.81)	(66.98)	(16.93)	(3.498)	(1.235)
Student of Color	0.301***	0.202***	0.478*	0.350**	0.269***	0.336***
	(0.0496)	(0.0669)	(0.193)	(0.158)	(0.0872)	(0.139)
SOC*Ever AOP	2.113***	2.915	1.674	1.625	1.899	2.348
	(0.538)	(2.206)	(1.069)	(1.069)	(0.963)	(1.238)
Cohort						
2007-2010	0.882					
	(0.147)					
2008-2011	1.010					
	(0.169)					
2009-2012	0.672**					
	(0.108)					
2010-2013	0.693**					
	(0.121)					
Constant	7.316***	7.786***	6.025***	8.281***	5.558***	4.198***
	(0.962)	(1.473)	(1.047)	(1.613)	(0.910)	(0.698)
Observations	3,184	674	629	644	645	592

Note: The results show the estimated coefficient from each regression. First column aggregates all cohorts; consecutive columns are results from regressing each cohort separately. The sample considers only those students who are matches at the beginning and at the end of the 4-year cohort group. Propensity scores are estimated in a first regression and used as weights to compute the likelihood of matching. The variables used on this first regression include sociodemographic background variables such as gender and Free/Reduced Lunch, and program participation. The reference group is white, male, non-participant student. Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 3
Odd Ratios/ Logistic Regression Graduation Rate – Compared to Students of Color AOP

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All Cohort	C-1	C- 2	C- 3	C- 4	C- 5
Female	1.441***	1.628*	1.331	1.863**	1.071	1.417
	(0.149)	(0.418)	(0.321)	(0.477)	(0.226)	(0.304)
White AOP	1.574**	1.704	1.249	1.761	1.954*	1.269
	(0.305)	(1.159)	(0.621)	(0.846)	(0.763)	(0.413)
White AOP eligible	0.236***	0.118	0.0121***	0.0638	0.285	0.282*
	(0.0902)	(0.167)	(0.0202)	(0.110)	(0.288)	(0.212)
SOC non-AOP	0.482	0.0597*			0.725	0.850
	(0.241)	(0.0865)			(0.904)	(1.108)
SOC AOP eligible	0.133***	0.0426**	0.0094***	0.0432*	0.0957**	0.221*
	(0.0544)	(0.0614)	(0.0161)	(0.0765)	(0.101)	(0.187)
White non-AOP	1.181	0.304	0.0560*	0.576	1.033	2.815
	(0.450)	(0.423)	(0.0937)	(1.004)	(1.048)	(2.190)
2007-2010	0.989					
	(0.172)					
2008-2011	1.216					
	(0.211)					
2009-2012	0.837					
	(0.142)					
2010-2013	0.903					
	(0.163)					
Constant	10.17***	31.74**	185.7***	41.60**	9.581**	5.192**
	(3.736)	(44.03)	(310.3)	(71.44)	(9.526)	(3.818)
Observations	3,184	674	615	633	645	592

Note: The results show the estimated coefficient from each regression. First column aggregates all cohorts; consecutive columns are results from regressing each cohort separately. SOC stands for student of color and AOP stands for Access and Opportunity Program. The sample considers only those students who are matches at the beginning and at the end of the 4-year cohort group. Propensity scores are estimated in a first regression and used as weights to compute the likelihood of matching. The variables used on this first regression include sociodemographic background variables such as gender and Free/Reduced Lunch, and program participation. The reference group is student of color, male, participant student. Robust standard errors in parenthesis. For cohorts 2 and 3, the sample size of SOC non-AOP is perfectly identified by gender and socioeconomic background. This forces the observations to be excluded from the estimation. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 4
Odd ratios/ Logistic Regression for Graduation Rate – by AOP and NON-AOP groups

VARIABLES	(1) vs. White Non-AOP (ALL COHORTS)	(2) vs. White elig. (ALL COHORTS)	(3) vs. SOC elig. (ALL COHORTS)	(4) vs. SOC NON-AOP (ALL COHORTS)	(5) vs. WHITE AOP (ALL COHORTS)
Female	1.506***	1.349**	1.135	1.427*	1.206
	(0.225)	(0.195)	(0.210)	(0.301)	(0.218)
SOC AOP	1.347	3.869**	1.401	3.442**	0.656
	(0.669)	(1.784)	(0.296)	(2.278)	(0.126)
2007-2010	1.098	0.721	0.970	1.847	1.046
	(0.257)	(0.203)	(0.334)	(0.734)	(0.403)
2008-2011	1.410	0.722	0.624	1.423	0.888
	(0.325)	(0.196)	(0.201)	(0.558)	(0.352)
2009-2012	0.919	0.631*	0.429***	1.339	0.896
	(0.219)	(0.172)	(0.136)	(0.581)	(0.378)
2010-2013	1.539	0.589*	0.521**	2.086	1.188
	(0.431)	(0.166)	(0.163)	(1.042)	(0.551)
Constant	10.29***	3.431***	2.173***	3.665***	20.77***
	(1.874)	(0.821)	(0.645)	(1.619)	(9.677)
Observations	2,157	994	545	478	642

Note: The results show the estimated coefficient from each regression. Each column separately analyses each group. The sample considers only those students who are matches at the beginning and at the end of the 4-year cohort group. SOC stands for student of color and AOP stands for Access and Opportunity Program. Propensity scores are estimated in a first regression and used as weights to compute the likelihood of matching. The variables used on this first regression include sociodemographic background variables such as gender and Free/Reduced Lunch, and program participation. The reference group in each model is student of color, male, participant student. Robust standard errors in parenthesis. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5
Probability of Matching/ Retention Rate – by cohort all groups (AOP and NON-AOP)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	06-09	07-10	08-11	09-12	10-13
SOC AOP	-0.401***	-0.274***	-0.270***	-0.238***	-0.283***
	(0.00419)	(0.00283)	(0.00402)	(0.00502)	(0.00427)
White eligible	-0.126***	-0.0981***	-0.139***	-0.102***	-0.136***
	(0.00340)	(0.00243)	(0.00365)	(0.00418)	(0.00400)
White AOP	-0.0393***	-0.0529***	-0.106***	-0.0688***	-0.102***
	(0.00643)	(0.00395)	(0.00619)	(0.00640)	(0.00545)
SOC eligible	-0.400***	-0.280***	-0.333***	-0.310***	-0.333***
	(0.00358)	(0.00357)	(0.00508)	(0.00607)	(0.00523)
SOC NON-AOP	-0.283***	-0.163***	-0.170***	-0.228***	-0.198***
	(0.00540)	(0.00529)	(0.0109)	(0.00876)	(0.0112)
Constant	0.806***	0.857***	0.867***	0.833***	0.829***
	(0.00146)	(0.00124)	(0.00199)	(0.00250)	(0.00248)
Observations	969	811	848	878	850
R-squared	0.955	0.945	0.900	0.831	0.888

Note: The results show the estimated coefficient from each regression. Each column corresponds to a particular cohort. The sample considers only those students who are matches at the beginning and at the end of the 4-year cohort group. Estimated probability is estimated using equation (1). SOC stands for student of color and AOP stands for Access and Opportunity Program. The variables used on this first regression include sociodemographic background variables such as gender and Free/Reduced Lunch, and program participation. The reference group in each model is white, male, non-participant student. Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.