Abstract Title Page
Not included in page count.

Title: The Impact of High School Choice on Mediators of Student Success

Authors and Affiliations:

Sean P. Corcoran
Associate Professor of Educational Economics
New York University

Lori Nathanson
Research Associate
Research Alliance for New York City Schools
New York University

James J. Kemple
Executive Director
Research Alliance for New York City Schools
New York University

Abstract Body
Limit 4 pages single-spaced.

Background / Context:
Description of prior research and its intellectual context.

In 2004, the New York City Department of Education (NYCDOE) instated a universal high school choice policy in which all incoming freshmen submit a list of up to 12 schools they would like to attend ranked in order of preference. A centralized matching system then assigns students to schools using an algorithm akin to that used to match medical school graduates to residency programs (Abdulkadiroğlu, Pathak, & Roth, 2005; Bloom, Thompson, & Unterman, 2010). Roughly 80,000 students from 1,100 middle schools participate annually, choosing among 700 programs at 360 sites. No student is permitted to attend a "default" school and avoid an active choice, and few are guaranteed their first choice. Rather, each student's placement depends on admissions priorities, demand, and in some cases, schools' own rankings of applicants.

This new policy—the High School Application Processing System, or HSAPS—has many goals. One is to require that all students be engaged in the process of choosing their school. A second goal is to break the link between residential location and school assignment, by allowing students to apply to any school citywide. A third is to better facilitate matches between students' interests and needs and they school they attend. Finally, by increasing competition, the policy aims to improve overall school quality. To date, we know little about how students have fared in this large and diverse system of school choice. However, excess demand for popular and top-performing schools results in many students not receiving one of their top choices.

From a methodological standpoint, HSAPS offers an unprecedented opportunity to understand the impact of school choice on student outcomes. Many NYC high schools are oversubscribed, meaning that more students apply for admission than there are seats. In these cases, HSAPS either awards seats at random (for non-selective programs), or in order of the schools' ranked preferences (for selective programs). This assignment mechanism generates hundreds of natural experiments that can be exploited to rigorously contrast the outcomes of otherwise equivalent students who were and were not admitted to their school of choice.

This paper is part of a larger project investigating the student-level impacts and system-level effects of universal choice in NYC. As one step toward understanding the impact of choice on achievement, we examine whether admission to a preferred school impacts critical *mediators* of student success. For example, we ask whether students are more engaged with school or have better attendance when successfully matched to their first choice versus their second (or lower) choice. As we describe below, an important component of the study will address heterogeneity in effects across student populations and school types. We focus here on the population of students subject to random assignment, thus providing a plausibly causal impact estimate of attending a more preferred high school.

This study is one of the first to examine effects of school choice on mediators of student achievement. Moreover, it does so in a context of *mandatory* choice, in which all students must are required to choose a school. Existing evidence on the effects of school choice participation primarily comes from voluntary "opt out" programs, such as open enrollment, vouchers, charter,

or magnet schools (e.g., Cullen, Jacob, & Levitt, 2006; Deming, Hastings, Kane, & Staiger, 2009; Hoxby & Murarka, 2009). This work typically finds a positive or null effect of attending a chosen school on academic and other outcomes, though there is considerable heterogeneity across subgroups. For example, Deming et al. (2009) found students zoned to the lowest-performing schools saw the greatest benefits from attending a preferred school. Others found greater returns for more advantaged or motivated students (Lai, 2007; Hastings et al., 2009; Lauen, 2009).

It is less clear why students benefit from high school choice, or why these returns vary across populations. In one study of behavioral effects of school choice, Cullen et al. (2005, 2006) found that Chicago students admitted via lottery to their first choice high school were less likely to be involved in disciplinary incidents or arrests than those who lost these lotteries. Similarly, Imberman (2011) found positive effects of charter school attendance on the behavior of middle and high school students. Our study contributes to this literature by expanding the set of outcomes to student-reported measures of engagement and attendance, and by estimating effects for a large population of students and diverse set of subgroups subject to mandatory choice.

Purpose / Objective / Research Question / Focus of Study:
Description of the focus of the research.

This paper estimates the impact of attending a preferred high school on mediating factors of student success, including engagement, behavior, and attendance. For example, we ask whether students are more engaged with their school or have higher attendance when successfully matched to their first choice versus their second (or lower) choice. By focusing on the subset of incoming freshman who are assigned at random to their preferred school by the HSAPS mechanism (cases of oversubscription), we provide a plausibly causal estimate of the impact of attending a preferred school on these factors. In addition to estimating the average impact across all students, we explore heterogeneity in treatment effects across student populations of interest (e.g. economically disadvantaged, ELL, and low, middle, and high-achieving students).

Setting:
Description of the research location.

This study takes place in New York City, a setting with a large and diverse population of public school students, enabling us to examine the effects of choice for many interesting subgroups, many of whom may not have otherwise participated in voluntary school choice. The number of available school choices is also large and diverse, with close to 700 programs at 360 school sites. NYC's public transportation system provides students accessibility to a great many of these, offering a large menu of options for its students.

Population / Participants / Subjects:
Description of the participants in the study: who, how many, key features, or characteristics.

Our study relies on two cohorts of rising 8th grade students in New York City in 2007-08 and 2008-09, approximately 150,000 students. As seen in Table 1, which focuses on the 2007-08 cohort, our study population reflects the size and diversity of the public schools in NYC. Roughly 32% of these students are black, 40% Hispanic, and 27% white or Asian. Close to 60%

are eligible for free or reduced price lunch (a proxy for low income). Many students are English language learners (11%), and more than 6% are recent immigrants. On a baseline of 79,000 students in this one cohort, all of these subgroups are sizable.

Intervention / Program / Practice:
Description of the intervention, program, or practice, including details of administration and duration.

HSAPS was implemented in 2004 as part of a larger set of education reforms under Mayor Michael Bloomberg and Chancellor Joel Klein. The new policy required all 8th grade students to submit an application listing up to 12 high school programs, ranked in order of preference. Selective schools rank applicants without knowledge of the students' rankings. HSAPS' matching mechanism then assigns students to programs based on admissions method (i.e., school type), eligibility, admissions priorities, seat availability, and the ranked preferences of students and schools (Abdulkadiroğlu et al., 2005; Bloom et al., 2010, Corcoran & Levin, 2011).

NYC high schools can be divided into one of six school types, or admissions methods, which determine how HSAPS assigns students to the school. For example, limited unscreened schools are non-selective, but give priority to students who live in a defined geographic area. On the other hand, screened schools rank students and HSAPS uses these rankings when assigning students to schools. The number of applicants and school type determines for whom the school is oversubscribed; a school can be oversubscribed for some priority groups but not others.

When a non-selective school is oversubscribed, students are assigned randomly within priority group. For example, in the case of "limited unscreened" schools, students who live in the same borough as the school and attended an information session are given first priority. In the case of selective schools, seats are allocated in order of the school's rankings. In all cases, HSAPS attempts to assign students to their highest ranked choice with seats available. In Table 2 we use HSAPS data to estimate the percentage of first choices made by students that were considered oversubscribed. For non-selective schools such as limited unscreened and educational option, we estimate that 53-63% of first choices were oversubscribed in 2007-08.

Research Design:
Description of the research design.

As an impact analysis, our most substantial challenge lies in identifying appropriate comparison groups for students receiving their school of choice. In most settings, selection complicates identification: choices are systematically related to factors related to outcomes of interest. Fortunately, many NYC high schools are oversubscribed, in which case HSAPS awards seats randomly or by schools' rankings, depending on the school type. Assuming randomization works as intended, students subject to random assignment should be equivalent along observable and unobservable dimensions, thus providing appropriate comparison groups.

For the subset of students admitted at random to their nth school choice (e.g. 1st) by the HSAPS mechanism, we estimate the impact of attending this school relative to a less preferred choice, comparing outcomes for those who identically ranked the same nth choice. For example, for outcome Y for student i (engagement, suspension, or attendance), we estimate the regression:

$$(1) \ Y_i = \alpha_{1s} + \gamma Z_{1i} + \beta X_i + u_i$$

where Z_{1i}=1 if student i is assigned to her first choice school (which is random, conditional on priority group), α_{1s} is a first choice school fixed effect (effectively comparing students within "lotteries"), and X_i is a set of student-level covariates. The parameter γ is the average impact of attending a first choice school on the outcome Y. This model is estimated for the pooled sample, for each (non-selective) school type, and for subgroups of interest. We also extend this model to incorporate all students assigned to a non-selective school through random assignment, allowing γ to vary depending on whether assignment was to a first, second, third, or lower choice.

Data Collection and Analysis:
Description of the methods for collecting and analyzing data.

The study draws on a collection of administrative databases provided by the NYCDOE. The HSAPS database is the primary data source for student choices. In addition to all students' ranked high school choices, this data includes individual and contextual variables, including age, feeder school, academic history (including middle school course transcripts), attendance record, achievement test scores, special education and limited English proficiency status, school rankings, and ultimate school placement.

This data is supplemented with other student characteristics, attendance and suspension records in high school, as well as aggregate characteristics of middle and high schools from databases compiled by the Research Alliance for NYC Schools. Using unique identifiers, all student records are matched to student-level responses on the annual NYC School Survey. Because survey data is only available from 2008 forward, we rely exclusively on data from the 2007-08 and 2008-09 cohorts. From the School Survey we focus on the NYCDOE's Engagement scale ($\alpha \approx 0.83$), which includes items such as "I feel welcome in my school," and "My school offers a wide enough variety of classes and activities to keep me interested in school," and has a standard deviation of .17 on a 4-point scale. In these years, the student response rate to these surveys was 72-74%.

Findings / Results:
Description of the main findings with specific details.

This study is in progress. We have compiled all of the necessary data for the two cohorts under investigation, and analysis is currently underway. A descriptive analysis of student choices and placements (which did not include School Survey results, nor exploited the randomization mechanism) was published in Spring 2011 by Corcoran & Levin (2011).

Conclusions:
Description of conclusions, recommendations, and limitations based on findings.

Universal choice policies like the one adopted in NYC have the potential to dramatically alter the playing field of educational opportunity for urban youth. Our study will provide new evidence on the impact of universal choice on a large population of students and subgroups, and shed light on mechanism through which school choice affects students' academic success.

Appendix A. References
References are to be in APA version 6 format.

Abdulkadiroglu, A., Pathak, P. A., & Roth, A. E. (2005). The New York City high school match. *American Economic Review, 95*(2), 364-367. doi:10.1257/000282805774670167

Bloom, H. S., Thompson, S. L., & Unterman, R. (2010). *Transforming the high school experience: How New York City's new small schools are boosting student achievement and graduation rates*. New York: MDRC. Retrieved from http://www.mdrc.org/publications/560/full.pdf

Corcoran, S. P., & Levin, H. M. (2011). School choice and competition in the New York City schools. In J. A. O'Day, C. S. Bitter & L. M. Gomez (Eds.), *Education reform in New York City: Ambitious change in the nation's most complex school system* (pp. 199-224). Cambridge, MA: Harvard Education Press.

Cullen, J. B., Jacob, B. A., & Levitt, S. (2005). The impact of school choice on student outcomes: An analysis of the Chicago Public Schools. *Journal of Public Economics, 89*(5-6), 729-760. doi:10.1016/j.jpubeco.2004.05.001

Cullen, J. B., Jacob, B. A., & Levitt, S. (2006). The effect of school choice on participants: Evidence from randomized lotteries. *Econometrica, 74*(5), 1191-1230. doi:10.1111/j.1468-0262.2006.00702.x

Deming, D., Hastings, J., Kane, T., & Staiger, D. (2009). *School choice and college attendance: Evidence from randomized lotteries.* Unpublished manuscript. Retrieved from http://aida.econ.yale.edu/~jh529/papers/DHKS_CollegeGoing_DraftSept09.pdf

Hastings, J. S., Kane, T. J., & Staiger, D. O. (2009). *Heterogeneous preferences and the efficacy of public school choice.* Unpublished manuscript. Retrieved from http://www.econ.yale.edu/~jh529/papers/HKS_Combined_200806.pdf

Hoxby, C. M., & Murarka, S. (2009). *Charter schools in New York City: Who enrolls and how they affect their students' achievement* (NBER Working Paper No. 14852). Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w14852

Imberman, S. A. (2011). "The effect of charter schools on achievement and behavior of public school students." *Journal of Public Economics* 95(7-8):850-863.

Lai, F. (2007). *The effect of winning a first-choice school entry lottery on student performance: Using a natural experiment from the middle school reforms in Beijing.* New York: National Center for the Study of Privatization in Education at Teachers College, Columbia University. Retrieved from: http://www.ncspe.org/publications_files/OP139.pdf

Lauen, D. L. (2009). To choose or not to choose: High school choice and graduation in Chicago. *Educational Evaluation and Policy Analysis, 31*(3), 179-199. doi:10.3102/0162373709339058

Appendix B. Tables and Figures
Not included in page count.

Table 1: Characteristics of 8th grade students participating in HSAPS, 2007-08 cohort

Student characteristic	(%)
Black	32.2
Hispanic	39.8
Asian	13.9
White	13.6
Female	49.0
Free lunch eligible	59.8
Recent immigrant	6.3
ELL	11.1
Overage (15+)	9.7
High reading level	16.8
Low reading level	12.2
Middle reading level	70.9
Borough:	
Manhattan	12.0
Brooklyn	31.5
Queens	27.5
Bronx	22.8
Staten Island	6.2
N	78,991

Table 2: Estimating the number of students allocated to their *first choice* school through random or rank-based assignment: 2007-2008

Program type	(A) Number ranking program first	Col. %	(B) Of (A), received first choice	% of (A)	(C) Of (A), estimated choices that were oversubscribed	% of (A)	(D) Of (C), % getting first choice
Zoned	5,925	8.9	4,141	69.9	2,333	39.4	27.5
Unscreened	1,272	1.9	863	67.8	516	40.6	25.2
Limited unscreened	10,928	16.5	8,069	73.8	5,818	53.2	56.7
Screened	23,132	34.8	8,484	36.7	5,071	** 21.9	69.5
Audition	4,858	7.3	1,719	35.4	350	*** 7.2	58.9
Educational option	20,261	30.5	12,754	62.9	12,872	63.5	47.6
Total (or % of all)	66,376	-	36,030	54.3	26,960	40.6	-

Notes: column (A) includes applicants from public and private schools who did *not* accept a specialized high school offer if given one, and were not ineligible for their first choice, and were ultimately finalized to some program (a missing final program may indicate that the student left the district or withdrew from the process). Whether or not a first choice is determined *oversubscribed* depends on the school type (i.e., admissions method) and the priority group that the student is a member of (see details below).

Zoned: a first choice is oversubscribed: (1) only for students who reside *outside* of the residential zone, and (2) when there are more out-of-zone first choice applicants than first choices awarded (we require a minimum of 5 more applicants than seats awarded).

Unscreened and limited unscreened: a first choice is oversubscribed if there are more first choice applicants *within one's priority group* (e.g. geographic preference category) than there are first choices awarded to this priority group (we require a minimum of 5 more applicants than seats awarded, and a minimum of 1 seat awarded; groups where no student received their first choice were not oversubscribed).

Screened: a first choice is oversubscribed *if the student has been ranked by the school* and there are more *school ranked* first choice applicants than there are *school ranked* first choices awarded (we require a minimum of 5 more applicants than seats awarded). **21.9% represents the percent of all screened program first choices that were oversubscribed. This appears low because in order to be

considered oversubscribed, the school had to have ranked the student (only 43.3% are ranked). *Of those ranked by the school,* 50.5% would be considered oversubscribed choices.

Audition: same rules as screened. Note that only 1,896 (39.0%) of the 4,858 audition program applicants were ranked at all by the school. The remaining 61.0% are never in the running for their first choice. (Although a small share, 0.9%, of the first choice applicants who were *not* ranked by the school ended up getting their first choice). ***7.2% represents the percent of all audition program first choices that were oversubscribed. This appears low because in order to be considered oversubscribed, the school had to have ranked the student (and as note, only 39.0% are ranked). *Of those ranked by the school,* 18.5% would be considered oversubscribed choices.

Educational option: a first choice is oversubscribed if there are more first choice applicants within one's priority group *and reading ability level* (low, middle, high) than there are first choices awarded to this priority group and reading ability level (we require a minimum of 5 more applicants than seats awarded to this group).