What If We Leave It Up to Chance? Admissions Lotteries and Equitable Access at Selective Colleges

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Many prominent social scientists have advocated for random-draw lotteries as a solution to the "problem" of elite college admissions. They argue that lotteries will be fair, equitable, eliminate corruption, reduce student anxiety, restore democratic ideals, and end debates over race-conscious admissions. In response, we simulate potential lottery effects on student enrollment by race, gender, and income, using robust simulation methods and multiple minimum thresholds for grades and standardized tests. In the overwhelming majority of lottery simulations, the proportions of low-income students and students of color drop precipitously. With a GPA minimum, we find the proportion of men could drop as low as one third. Admissions lotteries with minimum bars for GPA and/or standardized tests do not appear to produce more equitable outcomes.

Keywords: college admissions; colleges; diversity; equity; gender; lottery; low-income students; race; secondary data analysis; structural diversity

There are endless concerns with admissions practices at selective colleges, and indeed most of these practices highly privilege overrepresented students. Early admissions practices are confusing to students and provide undue advantages to students who will not depend on financial aid (Avery & Levin, 2010). Legacy preferences advantage students whose families already have high levels of parental education, and who are disproportionately White and wealthy (Arcidiacono et al., 2019; Hurwitz, 2011). Test preparation services and high-priced private counselors increase standardized test scores and admissions probabilities, but only for those who can afford them (Buchmann et al., 2010; Park & Becks, 2015). Athletic preferences provided a "side door" in the admissions process that opened institutions to corruption in "Operation Varsity Blues." The holistic admissions process, rife with complexity, is a major source of anxiety for students and families (Weis et al., 2014).

Admissions practices reproduce enormous enrollment disparities in selective colleges by race, ethnicity, and social class (Bastedo & Jaquette, 2011; Posselt et al., 2012), despite strong evidence that students of color and low-income students will benefit disproportionately by their enrollment in selective colleges (Chetty et al., 2020). Admissions practices that ameliorate the advantages of White and wealthy families, such as race-conscious admissions and class-based affirmative action, have provoked endless debate, political conflict, and litigation (Baker, 2019; Garces & Poon, 2018; Horn et al., 2018).

Unsurprisingly, many observers wish for a "silver bullet" that will resolve these issues. A perennially offered solution is to create admissions lotteries. Lotteries, advocates say, will "cut the rot out of college admissions" (Schwartz, 2019), increase social mobility (Laitinen et al., 2019), help colleges "avoid accusations of racial discrimination" (Wong, 2018) and, for potential applicants, "take the sting out of not matching with their dream school" (Conley, 2018). In one stroke, they believe, a simple and efficient system of college admissions would greatly ease the process and produce more fair and equitable college access (Warikoo, 2016). In the wake of COVID-19, there have been even further calls for admissions lotteries due to the many educational inequalities exacerbated by the pandemic (Bellafante, 2020; Hess, 2020; Rojas, 2020). Most of these authors suggest creating lotteries with minimum eligibility thresholds set by grades, class rank, or standardized tests.

Given the degree of public debate, it is perhaps surprising that the potential effects of selective college lotteries are rarely studied. We conduct a rigorous simulation of the relationship

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between admissions lotteries and applicant race, class, and gender. Prior research conducted on students entering in the 1980s and 1990s found severe reductions in the number of students of color who would be admitted by lottery (Carnevale & Rose, 2003; Zwick, 2017). No work, however, has used robust simulation models, focused on students who applied to college within the past decade, examined a range of institutional selectivities, or investigated multiple thresholds for lottery eligibility. We also add an extra layer of nuance by simulating yearly random draws of admitted applicants and comparisons with the demographics of students enrolled under the current admissions system.

Literature Review

We provide an overview of admissions lotteries and their philosophical underpinnings before summarizing prior research on the feasibility and potential effects of a national admissions lottery in the United States.

Overview of Admissions Lotteries

The political philosopher Robert Paul Wolff was the earliest to suggest an admissions lottery in the journal *Dissent* in 1964, an essay that was subsequently reprinted several times. The 1960s were a time of rapid change in college admissions: Applications to the Ivy League and flagship state universities were rising quickly just as those same institutions were increasing access by permitting the admission of women and students of color, and eliminating quotas on Jewish students (Karabel, 2005). Wolff saw rising competition as exacerbating student conformity and disincentivizing learning for its own sake. While admissions offices strove to be fair, the selection process itself caused harm to students and high schools that was unavoidable. "The worst pressures," he said, "grow out of the very dedication of the elite colleges to an absolute even-handed justice in their criteria for admissions" (Wolff, 1964, p. 19). Wolff suggested that colleges should admit all students who passed a minimal national standard, and that the Ivy League should randomly assign students to institutions.

Open admissions policies, such as those implemented in the CUNY system in 1969, were inspired by campus protests led by students of color (Gumport & Bastedo, 2001). After those protests—and perhaps influenced by the Vietnam War draft lottery, which first took place in December 1969—Alexander Astin proposed making lotteries the default admissions process for all colleges. Astin (1970) saw the rising stratification of colleges by race, ethnicity, and socioeconomic status as a form of tracking, founded on an unjustified theory that high-performing students would learn more when surrounded by similar students. Like Wolff, Astin did not clearly explain how lotteries would work, offering only that colleges with "different demand-supply ratios" could coordinate lotteries among themselves. Two lotteries were briefly conducted in 1968 and 1970 at Federal City College and the University of Illinois, respectively, but both were failures and ended soon thereafter (Zwick, 2017).

Lotteries have been repeatedly advocated amid debates about race-conscious admissions. Lani Guinier, in her defense of affirmative action in college admissions, suggested the creation of a weighted lottery that assured a higher probability of success to

those with stronger academic credentials, such as performance on standardized tests (Sturm & Guinier, 1996). Guinier consistently argued that overreliance on standardized testing is the fundamental problem in college admissions—and particularly the correlation between race and standardized tests—and thus a lottery eliminated the need to discriminate among high-performing applicants (Guinier, 2003). Justice O'Connor was not convinced in her decision that year in *Grutter v. Bollinger* (2003, p. 340) as she wrote,

> The Law School's current admissions program considers race as one factor among many, in an effort to assemble a student body that is diverse in ways broader than race. Because a lottery would make that kind of nuanced judgment impossible, it would effectively sacrifice all other educational values, not to mention every other kind of diversity.

O'Connor specifically rejects a lottery as an acceptable race-neutral practice in law school admissions in *Grutter*, and any attempt at racial balancing in a lottery would violate all of the assumptions underlying the rejection of quotas in *Bakke*. Perhaps in light of these cases, Guinier herself no longer advocates lotteries in her most recent work on higher education and meritocracy (Guinier, 2015).

Natasha Warikoo, in her study of student attitudes toward race-conscious admissions, echoes Guinier's critiques of meritocracy, advocating for a lottery "as a thought experiment" based on a minimal threshold for qualifications, and establishing quotas for admission by race and class (Warikoo, 2016). Dalton Conley resurrects the lottery as a solution in 2018 in response to *SFFA v. Harvard*, arguing that a lottery will end the "fretting" over college admissions and resolve the debate over whether Asian American students are discriminated against in holistic review (Conley, 2018).

Other arguments in favor of lotteries focus more on the effects on students and families. Barry Schwartz resurrects many of the arguments made by Wolff in the 1960s—he sees increasing student conformity, reduced risk taking and intrinsic motivation, unhealthy competition among students, and institutions more interested in status than educational quality (Schwartz, 2005). Schwartz suggests using a lottery for all "good enough" applicants in the top fifth of the applicant pool. Dalton Conley echoed these arguments, suggesting selecting randomly from students in the top 10% of class rank or the SAT, or "automated scoring" based on broader holistic criteria (Conley, 2018).

Political philosophers have contested views on lotteries, which are seen as an issue of procedural and distributive fairness. Advocates, such as Peter Stone, see lotteries as the fairest procedure to distribute scarce resources, particularly in cases where the fine distinction of claims is essentially impossible (such as among the most highly qualified candidates) and when those distinctions track inequalities in educational achievement and credentials (P. Stone, 2013). Others, like Deborah Stone, are far more critical of the distributive fairness of lotteries, arguing that lotteries offer more political value than absolute fairness (D. A. Stone, 2012, pp. 56–57).

> Lotteries give the appearance of being absolutely fair, and policymakers sometimes resort to them when they can't find principled reasons to justify their decisions. . . . Lotteries have

the tremendous political value of *symbolizing* absolute fairness—they don't (usually) allow bias, favoritism, or pull. Also lotteries probably dampen citizens' anger at being chosen for a burden or excluded from a benefit. Having participated in what seems like a fair game, losers are more likely to blame fate than politicians for their predicament.

Peter Stone also sees these benefits of lotteries—he calls them the *sanitizing effects of ignorance*—but argues that at least they do not allow bad reasons to influence an important outcome (P. Stone, 2009).

Feasibility and Potential Effects of Lotteries in the United States

A limited number of prior studies examine possible effects of admissions lotteries. Responding to Guinier's call to consider lotteries with a minimum threshold for acceptance, Grofman and Merrill (2004) used statistical argumentation to show that lotteries are unlikely to produce the same racial proportionality as affirmative action. Carnevale and Rose (2003) examined the demographics of 1980s students who met a potential lottery threshold. This simulation was based on the notion that, due to random assignment, over time the admitted classes of students would reflect the demographics of the population of eligible students. They found that even with an SAT minimum threshold of 900, the proportion of students of color would not rise above then-current levels, but the proportion of low–socioeconomic status students would rise significantly. They also surveyed 2,100 adults on their view of the admissions process, finding that 83% of Americans rejected the idea of using lotteries in college admissions. Zwick (2017) conducted a similar simulation of 1990s students, also examining the demographics of the students eligible for the lottery and single thresholds: A GPA of 2.8 and a SAT of 1000. Zwick found minimal differences in entering class composition, with a modest 2 percentage point increase in Black, Latinx, and Indigenous students only when using the GPA threshold.[1] Both studies predicted far lower graduation rates due to the wider range of students' academic credentials in the lottery, though, this relies on the assumption that institutions would not change their practices.

Previous simulations of lotteries all included an eligibility threshold that relied on either students' high school GPA or their college entrance examination score (SAT or ACT) to ensure that admitted students cleared some bar of academic preparation. Scholars have generally found a decrease in the share of students of color that would be in the admitted class and mixed evidence on the share of low-income students. The current study extends prior scholarship by examining multiple lottery thresholds and provides a unique methodological contribution by simulating the variation in admitted student demographics based on year-to-year lottery draws.

Method

Data

We use two nationally representative data sets from the U.S. Department of Education to compare the demographics of students currently enrolled at selective institutions and those who could enroll based on a lottery: the High School Longitudinal Study (HSLS; representative for ninth graders in 2009) and the Educational Longitudinal Study (ELS; representative for 10th graders in 2002). These data sets generally track students from high school and into college, if they choose to enroll, and include a rich set of student characteristics that supports our interest in exploring the demographics and academic qualifications of high school students entering college. For the current study, we focus on the three earliest waves of ELS:2002 (2 years past high school graduation in 2006 second follow-up) and HSLS: 2009 (1 year past high school graduation in 2013 update). We prefer the HSLS estimates due to the recency of the data; however, we include the ELS estimates to increase the generalizability of the findings. As both data sets were not sampled to be nationally representative of selective institutions, sampling weights do not produce estimates that are nationally representative for all selective institutions.

To simulate a national lottery, we must define the pool of students who enroll based on the current selective admissions system and who would be eligible to enroll based on a lottery. To classify students who enrolled in 4-year selective institutions, we use Barron's selectivity data (2014 for HSLS and 2004 for ELS) and identify students who first enrolled in: (a) a highly selective institution (Tier 1) and (b) a moderately or highly selective institution (Tier 3 or higher).[2] Each enrollment variable equals 1 if the student enrolled in a 4-year institution with that level of selectivity and 0 if not. In ELS, first enrollment is operationalized as the first institution a student enrolled at based on the second follow-up (using the f2iorder measure to select the first).[3] In HSLS, first enrollment is operationalized as the institution a student attended in November 2013 (the first possible year of college attendance for students who completed high school in 4 years). Prior research has only considered a single category of selective or "elite" institutions (with variation in definition), so we include both operationalizations.

To classify the students eligible for the admissions lottery, we created three different lottery designations: (1) SAT, (2) GPA, (3) GPA & SAT. Although SAT and GPA are certainly not the only factors used in holistic review of applicants (Bastedo et al., 2018; Rosinger et al., 2021), they have been found to be the strongest drivers of admissions decisions (Alon, 2009; Bastedo & Jaquette, 2011). Furthermore, in addition to rigor of curriculum, grades, and standardized tests are the factors weighed most heavily in admissions decisions (Clinedinst, 2020). For SAT, we identified all students above certain college entrance exam thresholds (either ACT or SAT in SAT units): the 25th and 50th percentile among enrollees of at least moderately selective institutions. We also identified all students above the 25th and 50th percentile for overall and weighted academic high school GPA for those enrolling at moderately selective institutions (four groups total). For GPA and SAT, we identified all students above the weighted academic GPA and SAT thresholds (four groups total). We selected these threshold cutoffs to represent the lower bound of students who could potentially enroll, creating pools of students institutions might consider academic fits. See Table S1 in the online supplemental materials (available on the journal website) for an

overview of the requirements for each lottery pool along with the values at each percentile threshold.

We are especially interested in seeing how student characteristics shift depending on traditional admissions practices and a national lottery. For the demographic characteristics, we include gender, race, parental education, income, high school control, measures of financial aid, and cost of attendance. For financial aid, the exact measures depend on the data collected by the National Center for Education Statistics (NCES). For ELS, we include whether a student received a Pell grant in 2004–2005, self-report of whether a student was offered grants or scholarships, and the student's Expected Family Contribution (EFC; estimate of how much the student's family can afford to contribute to pay for college). For HSLS, we include self-reports of the offer of grants or scholarships and their total amount. All other demographic measures come from the base year of each data set (which is ninth grade for HSLS or tenth grade for ELS). We include additional data details in the online supplemental materials (available on the journal website).

Analysis

We conduct two primary analyses across the three different types of lotteries. First, we replicate and extend prior research comparing the demographics of students enrolled in selective institutions to the eligible lottery pool. We extend this research by examining lotteries based on the college entrance exam score alone, GPA alone, and a combination of the two. We also extend prior studies by examining measures of affordability and financial aid. For this first analysis, we calculate the proportion of students with the key individual demographics for students enrolled in at least moderately selective institutions and then calculate the separate proportion for highly selective institutions only. We use the appropriate panel weights for each data set.[4] These numbers are the baseline for enrollment in selective institutions. We then calculate the proportion of students with the same key individual demographics who are eligible for each lottery cutoff (e.g., cumulative GPA of at least the 25th percentile among enrollees of moderately selective institutions).

For the second analysis, we estimate simulations of random lottery pulls from the lottery-eligible pool of students. For each lottery's cutoff, we randomly sampled 1,400 students for HSLS and 1,275 students for ELS that were eligible for the lottery and calculated the proportion of the same key individual demographics from the first analysis in the sample.[5] We randomly sampled 1,000 times for each lottery (1,000 different samples of either 1,400 or 1,275 students). From this larger sampling distribution, we obtained the minimum and maximum for the share of each key individual demographic. Our initial analysis, and prior research, focus on the average demographics in lottery-eligible pools of students since the random nature of a lottery means that " . . . we need only examine the characteristics of the students who satisfy the minimum [lottery] requirement" (Zwick, 2017, p. 168). However, random lotteries only approximate the larger pool in the long run over many repeated samples.[6] That means that, in a single sample, the demographics of students could be quite far from the average in the entire lottery-eligible pool. To investigate this, it becomes necessary to examine variation in demographic characteristics that could be produced by using a lottery.

Results

We provide summary statistics on the two samples and the results of the main analyses. As mentioned earlier, since we prefer the HSLS data due to its recency, we generally refer to those estimates in this article. We include the tables for all ELS estimates in the online supplemental materials (available on the journal website).

Summary Statistics

Table 1, columns 1 and 2, includes the summary statistics for students currently enrolled in moderately and highly selective institutions from the HSLS sample. For students attending at least moderately selective institutions or highly selective institutions, the sample is predominantly White, income above $75,000, and parents most frequently hold a graduate degree. When comparing students in the sample attending highly selective institutions with the entire group of students attending at least moderately selective institutions, the highly selective enrollees are more likely to be men, Latinx, have a family income of at most $35,000, and report receiving a larger grant amount. Students attending moderately selective institutions have an average SAT of 1,154, overall GPA of 3.44, and weighted, academic GPA of 3.70 (see online supplemental material Table S2, Panel B, available on the journal website). These are all lower than the averages for students attending highly selective institutions (1,304, 3.65, and 4.09, respectively). The overall demographics are qualitatively similar in the ELS sample (online supplemental material Table S3, columns 1 and 4, available on the journal website). The EFC of students, which is only available in the ELS data, shifts from an average of approximately $18,000 for students attending at least moderately selective institutions to $23,000 for only students attending highly selective institutions.

HSLS and ELS, while nationally representative for the entry cohort, are not nationally representative of students who are admitted or enroll in selective institutions. To help understand how different the two samples are, we compare the Integrated Postsecondary Education Data System (IPEDS) demographic information of selective institution enrollees with our samples. IPEDS includes data on the gender and racial composition of the fall 2013 and fall 2004 first-time enrolling class for HSLS and ELS, respectively (online supplemental material Table S2 columns 2 and 4 and Table S3 columns 2 and 5, available on the journal website). Unfortunately, we are not able to compare other demographic or institutional information.[7] We find that the demographics generally align, although HSLS has an overrepresentation of Latinx students overall and an underrepresentation of women at highly selective institutions.

Analysis 1: Comparing Enrollees to Lottery-Eligible Pools of Students

Tables 1, 2, and 3 show the comparison between enrollees under the current admissions system and the SAT-only lottery, GPA-only

Table 1
Proportions of Student Characteristics Based on SAT Lottery Eligibility (HSLS)

Student Characteristic	Moderately Selective	Highly Selective	SAT 25th	SAT 50th
Women	0.53	0.44	0.49	0.45
White	0.67	0.58	0.68	0.71
Black	0.06	0.05	0.05	0.04
Latinx	0.13	0.17	0.11	0.09
Asian	0.09	0.14	0.07	0.08
Parental education				
HS diploma or less	0.21	0.18	0.24	0.18
Some college	0.09	0.06	0.13	0.13
Bachelor's	0.33	0.24	0.34	0.33
Graduate school	0.37	0.51	0.29	0.36
Income, US$				
At most 35,000	0.12	0.16	0.14	0.12
35,001–75,000	0.24	0.16	0.30	0.26
75,001–115,000	0.23	0.17	0.25	0.27
At least 115,001	0.40	0.51	0.31	0.35
HS private	0.19	0.31	0.12	0.14
Grants offered	0.55	0.44	0.59	0.61
Grant amount received	12341.26	21662.86	11026.01	12899.70
COA	34362.43	49088.61	28425.36	31078.77

Note. Columns contain proportions for each demographic variable. Moderately selective refers to students who first enrolled at an institution that was at least moderately selective. Highly selective refers to students who first enrolled at an institution that was highly selective (top category). The SAT categories are for students with at least the cutoff SAT score (e.g., the 25th percentile for current enrollees of institutions that are at least moderately selective). HSLS = High School Longitudinal Study; COA = cost of attendance.
Source. Data from U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09).

lottery, and mixed-eligibility criteria lottery, respectively (ELS estimates are included in the online supplemental material Tables S4, S5, and S6, available on the journal website). Columns 1 and 2 of each show the mean for students attending at least moderately selective institutions and for students attending highly selective institutions, respectively. The rest of the columns show the means for all students who are eligible for the admissions lottery based on that column's criteria. For example, in Table 1, focused on the SAT-only lottery, column 3 presents the mean for each demographic or institutional characteristic for all students with a minimum 1040 SAT (which is the 25th percentile for students who enrolled in at least moderately selective institutions in the HSLS data).

Our results show reductions in the proportion of students of color and low-income students across most lotteries. GPA-only or SAT-only lotteries do not create a pool of students with an increased share of low-income students. The most consistent finding for GPA-eligibility lotteries is that the pool of eligible students results in a substantially smaller share of men (approximately 36%–40%). When lotteries use mixed-eligibility criteria (SAT and weighted GPA), the eligible pool of Black and Latinx students is the lowest and does not reach the share of students currently enrolling at selective institutions. These findings are qualitatively similar regardless of the sample examined.[8] When focusing on EFC, the EFC of lottery-eligible students is considerably lower (especially GPA-only pools which show a US$4–US$9,000 difference). Therefore, with no other changes to the admissions process, it does not appear that the lottery-eligible pools of students would automatically create more racially or economically diverse classes at selective institutions.

Analysis 2: Simulating Yearly Random Draws From the Lottery

We present the results of the primary year-to-year simulations in Figures 1 and 2 and Figures S1 to S5 in the online supplemental materials (available on the journal website). The underlying numbers for these simulations, as well as the rest of the demographic measures, are available on request. To follow each figure, we highlight the information presented in Figure 1, which is focused on simulating the share of Black students. In Panel (a), we show the SAT-only lottery on the left and GPA-only lottery on the right. The *x*-axis represents the different cutoffs for lottery eligibility. The *y*-axis represents the percentage of Black students in a class. The minimum and maximum share of students who are Black after 1,000 random draws is represented by the vertical lines. The solid lines come from simulations based on the HSLS data. The dashed lines come from simulations based on the ELS data. The two horizontal lines represent the share of students currently enrolling in selective admissions from HSLS (the most recent data). The dashed horizontal line represents the share of students currently enrolling in highly selective institutions (approximately 5%) and the solid line represents the share currently enrolling in at least moderately selective institutions (approximately 6%). Panel (b) shows the same information for

Table 2
Proportions of Student Characteristics Based on GPA Lottery Eligibility (HSLS)

Student Characteristic	Moderately Selective	Highly Selective	Overall GPA 25th	Overall GPA 50th	Weighted Academic GPA 25th	Weighted Academic GPA 50th
Women	0.53	0.44	0.60	0.64	0.60	0.62
White	0.67	0.58	0.69	0.73	0.67	0.71
Black	0.06	0.05	0.05	0.04	0.06	0.04
Latinx	0.13	0.17	0.12	0.10	0.13	0.11
Asian	0.09	0.14	0.06	0.06	0.07	0.08
Parental education						
HS diploma or less	0.21	0.18	0.30	0.27	0.29	0.23
Some college	0.09	0.06	0.13	0.12	0.13	0.11
Bachelor's	0.33	0.24	0.30	0.32	0.31	0.34
Graduate school	0.37	0.51	0.27	0.29	0.28	0.33
Income, US$						
At most 35,000	0.12	0.16	0.16	0.14	0.15	0.13
35,001–75,000	0.24	0.16	0.31	0.29	0.31	0.28
75,001–115,000	0.23	0.17	0.25	0.26	0.25	0.26
At least 115,001	0.40	0.51	0.28	0.30	0.29	0.33
HS private	0.19	0.31	0.12	0.13	0.12	0.14
Grants offered	0.55	0.44	0.57	0.60	0.59	0.62
Grant amount received	12341.26	21662.86	10306.92	10909.97	10972.89	12104.69
COA	34362.43	49088.61	26944.99	28128.93	27939.12	30434.56

Note. Columns contain proportions for each demographic variable. Moderately selective refers to students who first enrolled at an institution that was at least moderately selective. Highly selective refers to students who first enrolled at an institution that was highly selective (top category). The GPA categories are for students with at least the cutoff GPA score (e.g., the 25th percentile for current enrollees of institutions that are at least moderately selective). HSLS = High School Longitudinal Study; COA = cost of attendance.
Source. Data from U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09).

the GPA-and-SAT-combined lottery.[9] All figures follow this same format.[10]

Figures 1 and 2 and Figures S2 to S3 in the online supplemental materials (available on the journal website) show racial breakdowns of enrollment share. Regardless of the lottery, White and Asian students' potential share of enrollment drastically increase. This coincides with a dramatic decrease in the share of Black and Latinx students in eligibility, with only one lottery, 25th percentile threshold for college entrance exam, potentially creating a class similar to the share of Black students who are currently enrolling. In particular, lotteries that include college entrance exam scores would likely create year-to-year classes that dip into the 1% to 4% range for Black and Latinx students, far below current enrollment levels.

Supplemental Figure S1 (available on the journal website) shows the year-to-year variation in men's enrollment. It appears that GPA-only lotteries, regardless of the criteria, have the potential to create a significant reduction in the share of men enrolled at selective institutions. Of note, the minimum share of men when the GPA criterion is at least the 50th percentile approaches or goes below 35%. When examining the GPA and SAT combined lottery, none of the different thresholds reach a maximum that is near the current share of men enrolling at highly selective institutions.

Turning to a focus on financial resources, Supplemental Figure S4 (available on the journal website) shows that only two of the close to 20 lottery configurations are able to create an eligibility pool of low-income students similar to current enrollment at selective institutions (and this is only in the HSLS data). Any lottery including college entrance exam scores is generally unable to create a pool that reaches the moderately selective share, unless focusing on the maximum numbers that result from the simulation for the 25th percentile threshold for SAT. Figure S5 shows the simulations for EFC based solely on ELS data. It shows that there is a clear relationship between inclusion of a college entrance exam score as lottery eligibility criteria and a higher average EFC among the pool of lottery-eligible students.

Therefore, year-to-year simulations of an admission lottery suggest that, in some years, lotteries would create severe reductions in the racial and economic diversity of an incoming class. In particular, if increasing the number of low-income students attending selective institutions is a goal, including a college entrance exam as part of lottery eligibility makes attaining this goal exceptionally difficult.

Sensitivity Analysis

While it is useful to compare the lottery-eligible pool of students with those who actually *enrolled* in selective institutions, we also investigate how the lottery-eligible students compare with the individuals who were *admitted* to the institution.[11] While HSLS only asked participants about a subsample of institutions to which they were admitted, ELS participants were asked to list all institutions to which they were admitted. We therefore use the ELS data.

Table 3
Proportions of Student Characteristics Based on GPA and SAT Lottery Eligibility (HSLS)

Student Characteristic	Moderately Selective	Highly Selective	Weighted Academic GPA 25th		Weighted Academic GPA 50th	
			SAT 25th	SAT 50th	SAT 25th	SAT 50th
Women	0.53	0.44	0.54	0.47	0.58	0.52
White	0.67	0.58	0.72	0.75	0.73	0.75
Black	0.06	0.05	0.03	0.01	0.03	0.01
Latinx	0.13	0.17	0.10	0.09	0.09	0.09
Asian	0.09	0.14	0.07	0.08	0.08	0.09
Parental education						
HS diploma or less	0.21	0.18	0.22	0.17	0.20	0.17
Some college	0.09	0.06	0.11	0.10	0.09	0.09
Bachelor's	0.33	0.24	0.34	0.35	0.36	0.35
Graduate school	0.37	0.51	0.33	0.38	0.35	0.40
Income, US$						
At most 35,000	0.12	0.16	0.10	0.09	0.11	0.09
35,001–75,000	0.24	0.16	0.30	0.26	0.27	0.25
75,001–115,000	0.23	0.17	0.27	0.29	0.28	0.30
At least 115,001	0.40	0.51	0.33	0.36	0.34	0.36
HS private	0.19	0.31	0.13	0.14	0.13	0.14
Grants offered	0.55	0.44	0.61	0.63	0.63	0.64
Grant amount received	12341.26	21662.86	12447.70	14326.80	14081.72	15599.20
COA	34362.43	49088.61	30602.42	32962.70	32635.78	34358.76

Note. Columns contain proportions for each demographic variable. Moderately selective refers to students who first enrolled at an institution that was at least moderately selective. Highly selective refers to students who first enrolled at an institution that was highly selective (top category). The GPA and SAT categories are for students with at least the cutoff GPA and SAT score (e.g., an academic weighted GPA of at least the 25th percentile and an SAT of at least the 50th percentile for current enrollees of institutions that are at least moderately selective). HSLS = High School Longitudinal Study; COA = cost of attendance.
Source. Data from U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09).

Online supplemental material Table S3 (available on the journal website) includes the demographic characteristics of students accepted to at least one moderately selective institution and to at least one highly selective institution (columns 3 and 6, respectively). There are generally more Black and Latinx accepted students than enrolled, though the difference is slim. This means that comparing the demographics of the admitted students with the lottery-eligible students or the simulations of year-to-year admissions lotteries would show even more dramatic drops in Black and Latinx students. Therefore, we still do not find evidence that an admissions lottery would create more equitable incoming classes at selective institutions. Though, we note that this relies on institutions continuing their prior yield practices. If institutions shift how they attempt to convince admitted students to enroll, there could be increased equity in entering classes (though that is beyond the scope of a lottery).

Another possibility is that admissions offices could implement a lottery stratified by race, gender, and/or income to mitigate the negative effects of an unstratified lottery. We explore the viability of stratified sampling by gender and income for the GPA-only lottery.[12] We find that stratified sampling by gender provides qualitatively similar variation. However, stratifying by income increases the ability of the lottery to diversify the incoming class in their income and EFC. The share of Black and Latinx students do not increase with either stratified sample. This exploration provides additional support that increasing racial

equity in admissions classes generally requires a focus on race (Reardon et al., 2018).

Due to data limitations, we cannot simulate lotteries by race or any that include college entrance exams. There are inadequate observations for every demographic group and lottery-eligibility criteria in the data. We do examine the percentile thresholds required for SAT-only and weighted-GPA-only lotteries to have enough students of each racial/ethnic group to conduct the random sampling.[13] We find that, regardless of the data set, the SAT-only lottery would need a threshold below the 5th percentile of students currently enrolled in at least moderately selective institutions. The weighted-GPA-only lottery would need a threshold between the 10th and 13th percentile. Institutions may find these thresholds to be quite extreme, especially since they are solely to have sufficient numbers of students in the data to randomly sample (which does not guarantee that the random sample would be reflective of current enrollees). Overall, we do not see strong evidence that stratifying the applicant pool by race, gender, or income is likely to produce the desired results.

Discussion

We find dramatic and negative potential effects of admissions lotteries on the participation of students of color, low-income students, and men. Using minimum thresholds for both GPA and standardized tests, both together and separately, the participation
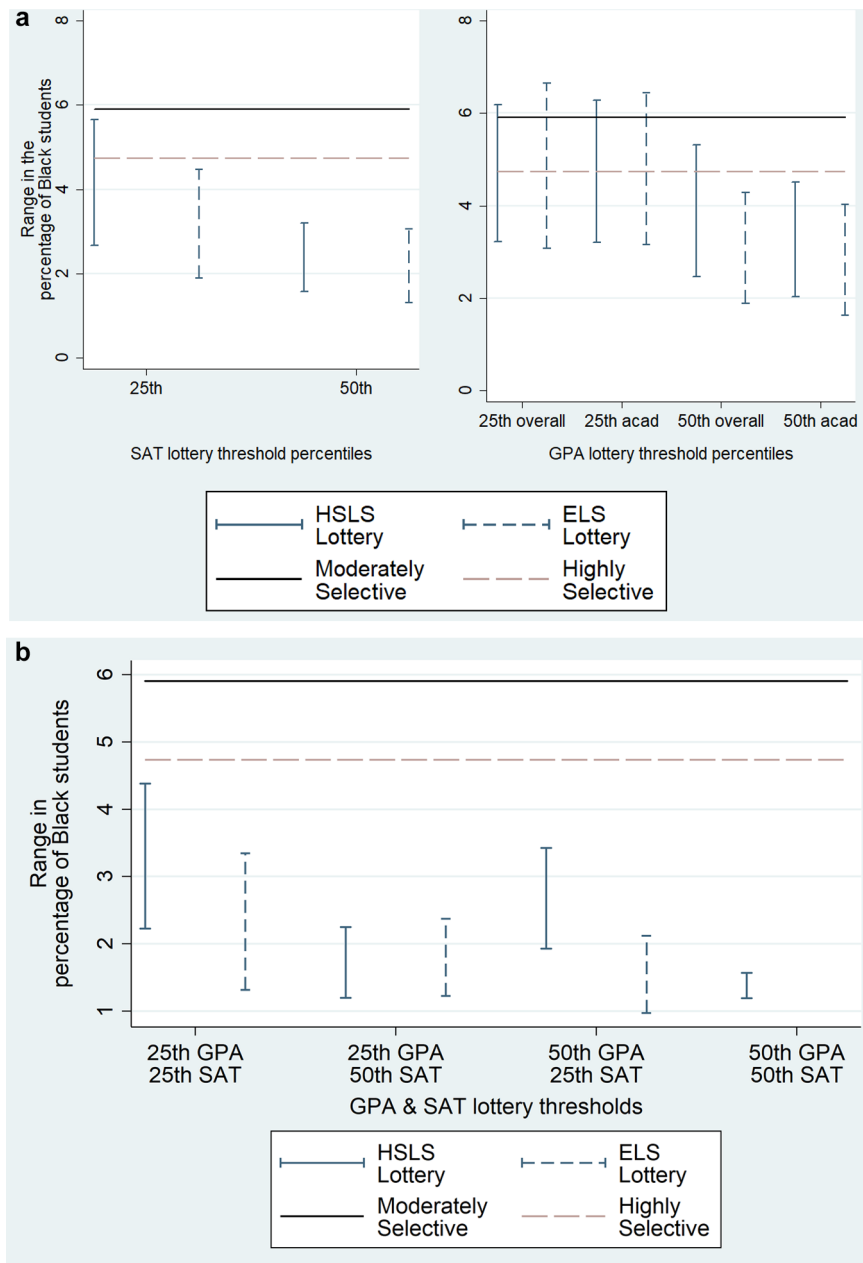
FIGURE 1. *Year-to-year simulation for Black students. (a) SAT-only and GPA-only lotteries. (b) GPA and SAT combined lottery.*
Note. HSLS = High School Longitudinal Study; ELS = Educational Longitudinal Study.
Source. Data from U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09). U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002)."

of students of color and low-income students drops precipitously, in some models to levels below 2% of the class. Using a minimum threshold for GPA alone, we find that the proportion of men could drop as low as one-third. These results are consistent across a range of minimum GPA thresholds, weighted GPAs, and standardized tests.

There are limitations to the current study's implications. To use the two NCES data sets, we had to assume on-time high school graduation and immediate entry to college for the two samples. It is likely that a true admissions lottery pool would include students who faced interruptions in their schooling; students who are more likely to be American Indian/Alaskan Native, Latinx, Pacific

Islander, or Black (U.S. Department of Education, 2020). This shift could potentially create a more equitable pool of students to be randomized. However, random assignment would only approximate the larger pool over repeated random samples, and therefore the year-to-year entering classes would vary widely. Furthermore, it is not clear what would happen to the distribution of GPA or test scores if the government or a national association implemented a lottery. For example, if lottery eligibility was based in some part on test scores, most likely the probability of certain students retaking the tests would increase. We cannot say with certainty how the implementation of a national lottery would fundamentally shift GPAs or test scores as this would create incentives for students to
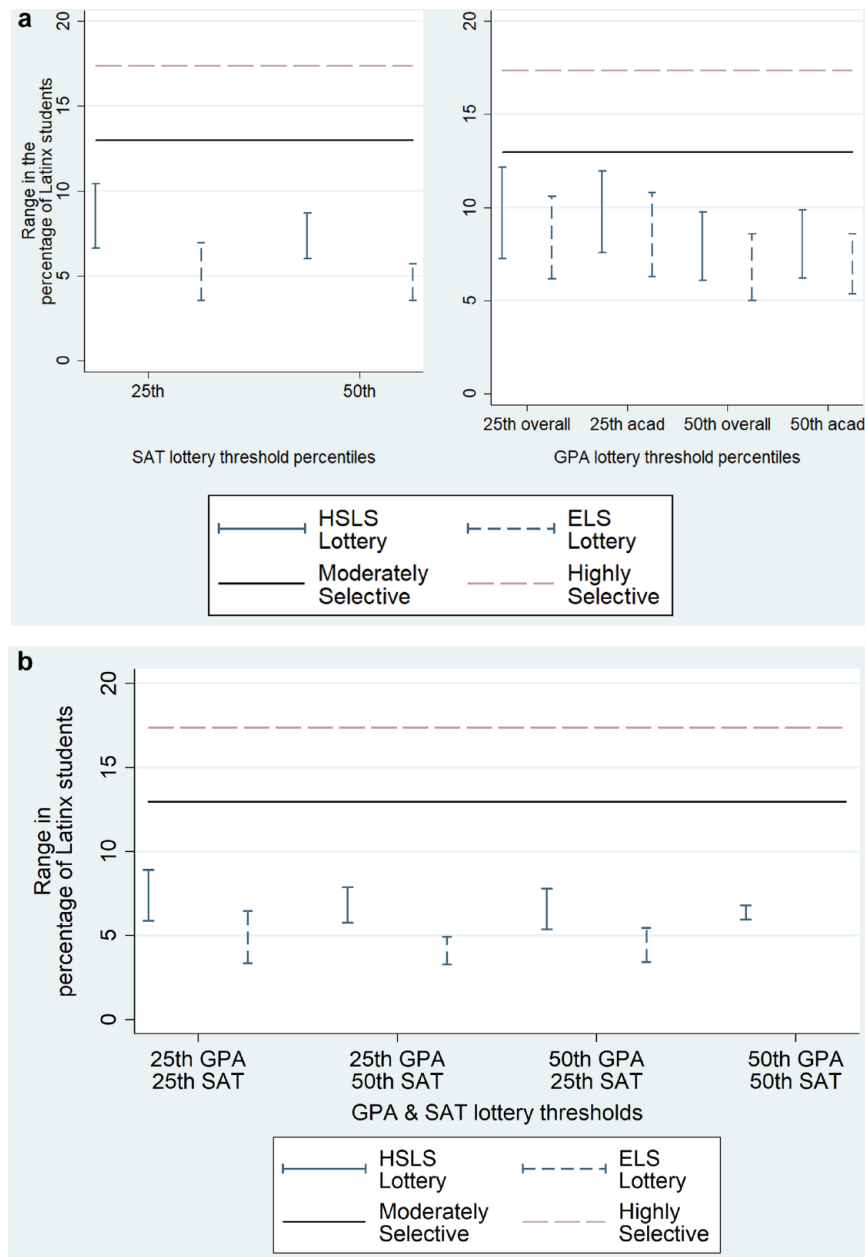
FIGURE 2. *Year-to-year simulation for Latinx students. (a) SAT-only and GPA-only lotteries. (b) GPA and SAT combined lottery.*
Note. HSLS = High School Longitudinal Study; ELS = Educational Longitudinal Study.
Source. U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS:09). U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002).

retake tests or for teachers to make sure students' grades reach the threshold. While many lottery advocates seem to assume that lotteries will attract more low-income applicants, existing evidence suggests that test preparation and retaking predominantly benefit White, Asian, and higher-income students (Park & Becks, 2015), even though retaking would benefit minoritized students in admissions as well (Goodman et al., 2020).

The evidence we provide is a useful first step in imagining the barriers to admissions lotteries creating more equitable incoming classes. In addition, there are several practical realities that admissions professionals would need to engage with before an admissions lottery was implemented. A lottery would create a need for changes in the ways that financial aid is distributed, how housing prepares for who will live on campus, and more. The current work provides evidence that admissions lotteries would likely need additional parameters to create more equitable classes, for example, stratified sampling by race or income. Though, these types of lottery restrictions would be politically difficult to implement, in line with the critiques of race-conscious admissions practices, and legally impossible if quotas are created. We also note that we were unable to explore racial stratification due to data limitations. It is difficult to draw concrete conclusions about racially stratified lotteries as the share of students within each racial group in this data depends heavily on the NCES sampling

procedure and who chose to respond. Conservatively, we can say that—due to systemic structures in the United States dictating college entrance exam scores, access to rigorous courses, and discrimination in academic assessment—to create a racially stratified admissions lottery the minimum thresholds would likely have to be below the 20th percentile of students who currently enroll. Without an external force mandating this, such as the federal government, it is difficult to imagine institutions opting into a lottery with thresholds set at this level. Even if there was a mandate, that does not change the legal implications of what are essentially racial quotas, or the implications of wide variations in the demographics of admitted students (e.g., proportions of low-income and racially minoritized students in the class) from year to year when using a lottery.

We used college entrance exam scores and GPA (unweighted and weighted to incorporate course rigor) as thresholds for the lottery due to their ubiquity across the United States as admissions criteria for a majority of selective institutions. We do not believe that these are objective measures of students' innate intelligence; more that, if a lottery were to occur, it is likely that one of these measures would be used to define who is eligible (and all prior simulations use some combination of these measures). Still, it is likely that part of the reason lotteries based on some combination of GPA and test scores do not automatically create a more equitable class is that the measures themselves are inequitable (e.g., Reeves & Halikias, 2017). In addition, although test scores have historically been one of the strongest predictors of admission to selective colleges, a rapidly rising number of institutions have adopted both temporary and permanent test-optional and test-blind policies in response to the COVID-19 pandemic. Although the GPA-only lottery is not a perfect representation of a test-blind, holistic-review admissions process, it does indicate that we should not anticipate that test-blind policies, on their own, will lead to reduced racial or socioeconomic stratification.

We do not find evidence that admissions lotteries would create a more equitable entering class at selective institutions with regard to race or income. We do not seek to dismiss lotteries out of hand, only to provide evidence on the types of parameters and considerations that must be taken into consideration when seriously considering their implementation. Future research and policy proposals should consider the issues we explore in this work, particularly the thresholds needed for eligibility and the significant year-to-year variation in student demographics that will result from any lottery conducted over time. There are real inequities in the way that selective admissions is currently conducted in the United States. It is just not clear, based on the evidence, that lotteries are the solution.

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NOTES

[1]HSLS and ELS use the term *Hispanic* during data collection. We choose to use the term *Latinx* in our article in order to use a nongendered term not created by the U.S. government, though we acknowledge how the federal government constructed racial categories in the surveys (see Viano & Baker [2020], for an overview of data collection using the term Hispanic).

[2]We select these years for Barron's based on their proximity to the year that students would be most likely to enroll. We provide additional context for the moderately and highly selective institutions in the online supplemental materials (available on the journal website).

[3]NCES collects data for the ELS second follow-up in 2006 which is 2 years after high school graduation for students with on-time progression. This means that some students enrolled directly after graduating from high school and other students could have waited a year. We investigated when students first enrolled in higher education (using f2istart) and close to 80% of the students in the sample first enrolled in the 2004–2005 academic year. So, while students could have waited a year to enroll, the vast majority of students enrolled directly after high school graduation.

[4]We use panel weight f2bywt for ELS and w3w1w2stu for HSLS.

[5]We chose the samples based on the average number of first-time freshmen attending moderately or highly selective institutions in fall 2013 for HSLS and fall 2004 for ELS.

[6]See Wooldridge's (2009) Appendix C for a discussion of random sampling and unbiased estimates of population parameters.

[7]The College Scorecard includes additional information on students (e.g., parental education, income). However, this information is only available for all undergraduates at an institution. It is not measured for only first-time students (which is the focus of the current study). For this reason, we do not compare the two analytical samples with Scorecard data.

[8]The ELS GPA-only lottery does show an increase in low-income students (at most US$20,000 in income); however, this is not replicated in the more recent HSLS data.

[9]The ELS 50th percentile in weighted academic GPA and 50th percentile in SAT creates such a small sample size that simulations cannot be estimated. We present only the HSLS estimates for this lottery.

[10]This statement is true except for Figure S5. Since EFC was only collected in ELS, there is only one set of vertical lines and the two horizontal lines representing the EFCs of current students come from ELS data.

[11]Zwick (2017) includes a sensitivity analysis comparing applicants to highly selective institutions; however, we wanted to focus on admitted students since a lottery will randomize who is admitted, not who applies or who enrolls.

[12]We include details of this analysis in the online supplemental materials (available on the journal website).

[13]We include details about this analysis in the online supplemental materials (available on the journal website).

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