

Causal Evidence for Efficacy of ACT Online Prep

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Background

College entrance exams (e.g., SAT, ACT) provide important information that influences postsecondary pathways, specifically through college admissions decisions (Clinedinst and Koranteng, 2017). In fact, 88 percent of U.S. four-year selective-admission institutions require, recommend, or consider test scores in the admissions process (U.S. Department of Education, 2016). While test preparation programs have grown in popularity (Barnes, 2017), rigorous efficacy studies are needed. Existing research shows that test preparation has a small to moderate positive effect on test scores, within the margin of measurement error for the tests.

Objective

This study examines a supplemental learning opportunity, ACT Online Prep (AOP), which happens in parallel with traditional classroom experiences and directly impacts a key lever of postsecondary admissions. I examine the effect of AOP for students testing for the first time, and separately for repeat testers. Inverse probability of treatment weighting (IPTW) based on propensity scores is used to balance treatment and comparison groups to examine the impact of AOP on ACT test scores.

Setting

Students who participate in AOP are predominantly in 11th and 12th grade. Most students enroll in AOP during ACT registration and most have access for 4-6 weeks prior to taking the ACT. Students may enroll in the program for six weeks, three months, or six months.

Population

AOP enrollment data were available from January 2016 to July 2018. For the first-time examinee analysis, the sample included 23,830 treated students and 107,211 control students. For the repeat examinee analysis, pre- and post-test records were identified for both groups, resulting in a sample of 24,731 treated students and 176,450 controls. Weighted and unweighted sample characteristics for both samples are provided in Table 1.

Intervention

AOP offers over 200 hours of material on the ACT test, including an introduction to the test and testing strategies. AOP uses practice sessions, instructional lessons, ACT practice tests, discussion boards, educational games, and flashcards to help students prepare for the ACT. The program offers both a structured linear and a personalized learning path. The system provides predicted ACT scores from both short- and long-form, practice tests. The practice items also provide feedback on each response.

Research Design

For first-time and repeat tester analyses, IPTW is used to construct a treatment and control group wherein “the distribution of measured baseline covariates is independent of treatment assignment” (Austin, 2011, p. 408). After weighting, the groups are similar on baseline characteristics (Table 1).

Data Collection and Analysis

AOP and non-AOP students were linked to official ACT test records to identify an ACTC test score. This test score was the most recent ACT test for non-AOP students. For AOP students, an ACT test record was identified after enrollment in AOP and closest to, but not more than three months after, AOP subscription expiration.

Repeat testers were also linked to a “pre” test. For AOP students this was the test closest to, and prior to, enrollment in AOP, but no more than six months before enrollment. This resulted in a potential maximum testing window of 15 months. For non-AOP students the pre-test was a randomly selected test within 15 months of the post-test.

For each analysis, logistic regression was used to model treatment membership (Table 2). The predictors for these models included demographics, coursework, and prior achievement. The IPTWs were used in two linear regression models that predicted ACT post scores while controlling for student covariates (Table 3). Post-hoc *F* tests were used to test for the significance of the difference in ACT Composite (ACTC) post-score between control and treatment groups by student subgroups (Table 4).

Results

For first-time testers, enrolling in AOP was associated with an ACTC score that was 1.22 points higher than that of non-AOP students (Figure 1). Among middle-income students, enrollment in AOP was related to an ACTC score increase of 1.57 points; the effect was smaller for high-income students, followed by low-income students. Enrollment in AOP had a greater effect for non-White students (1.21 to 1.53 points) than for White students (0.65 points).

For repeat testers, AOP enrollment was associated with an ACTC score increase of 0.37 points. Among high-income students, enrolling in AOP was related to an ACTC increase of 0.32 point; the AOP effect was slightly higher for middle- and low-income students. Across race/ethnicity groups, the AOP effect was similar (between 0.34 and 0.40 points).

Conclusions

This study highlighted the positive impact of enrolling in ACT Online Prep. Among first-time tested students, low-income students did not benefit as much from AOP as middle- and high-income students. This seems to conflict with a recent finding by Sanchez and Harnisher (2018) that showed that a similar product, ACT Online Prep Live (OPL), demonstrated a greater impact for low-income students than for high-income students. These contradictory findings may be explained by the make-up of the students using these programs. Low-income students may be eligible to take the ACT with a fee waiver and therefore receive OPL for free for twelve months. As a result, potential low-income AOP students may have received OPL for free and therefore not enrolled in AOP. This might also explain why there are relatively few low-income AOP students in our study. Low-income AOP students may have not used or may not have been aware of fee waiver opportunities.

The positive impact of AOP appears to be higher for first-time testers. The model for repeat-testers included ACTC score as a prior achievement indicator in addition to HSGPA, which may be an important variable related to AOP self-selection. It is also possible that AOP provides much needed familiarity with the ACT test in addition to content review. For repeat testers, it is possible that this increase in test familiarity has already taken place and the AOP effect reflects the impact of supplemental learning and content reinforcement.

Future research on AOP can look at enrollment in the program and usage of the components of the program. As described earlier, there are many elements of the AOP program. Usage patterns, and their distinct effects, should be investigated further.

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Table 1: Student Characteristics

Student Characteristic	First-time Testers			Repeat Testers		
	Unweighted Control	Weighted Control	Un/weighted Treatment	Unweighted Control	Weighted Control	Un/weighted Treatment
Family Income						
< \$36,000	48.6%	7.9%	8.0%	55.8%	7.9%	10.2%
\$36,000 - \$100,00	46.2%	34.0%	35.0%	38.9%	30.8%	38.1%
> \$100,000	5.2%	58.1%	57.0%	5.3%	61.3%	51.7%
Gender						
Female	59.0%	50.4%	51.0%	63.4%	53.4%	53.5%
Male	41.0%	49.6%	49.0%	36.6%	46.6%	46.6%
Race/Ethnicity						
White	31.8%	70.9%	69.4%	25.0%	72.8%	69.3%
African-American	18.8%	5.0%	5.0%	28.4%	6.4%	7.8%
Hispanic	30.5%	9.9%	10.5%	31.3%	8.7%	9.6%
Other	18.9%	14.2%	15.2%	15.3%	12.0%	13.3%
Taken Advanced Coursework						
Yes	58.3%	64.9%	66.3%	63.9%	69.8%	69.3%
No	41.7%	35.1%	33.7%	36.1%	30.2%	30.7%
Student Grade Level						
11	51.8%	65.4%	66.0%	35.6%	52.5%	41.2%
12	48.2%	34.6%	34.1%	64.4%	47.5%	58.8%
Need Help in Educational or Career Navigation						
Yes	84.3%	70.7%	71.0%	88.2%	72.8%	73.9%
No	15.7%	29.3%	29.0%	11.8%	27.3%	26.1%
Parent Completed a B.A.						
Yes	32.4%	77.8%	76.7%	30.4%	79.9%	75.0%
No	67.6%	22.2%	23.3%	69.6%	20.1%	25.0%
Taken Mathematics Beyond Algebra II						
Yes	77.9%	84.6%	85.2%	82.0%	88.5%	88.0%
No	22.1%	15.4%	14.8%	18.1%	11.5%	12.1%
Taken Science Beyond Chemistry						
Yes	59.4%	66.2%	66.9%	60.8%	68.4%	66.9%
No	40.6%	33.8%	33.1%	39.2%	31.6%	33.2%
Average ACT Composite Score	19.1	21.4	22.5	19.7	22.8	23.1
Average HSGPA	3.3	3.5	3.5	3.3	3.5	3.5
Average Number of Times Tested	1.0	1.0	1.0	3.5	4.2	4.6

Note: ATT weights are equal to 1 for the treatment group; as such, the weighted and unweighted values are the same.

Table 2: Logistic Propensity Score Models

Effect	First-Time	Repeat Testers
Intercept	-4.05	-5.43
Female	-0.08	-0.11
Family Income		
Low-Income	0.76	0.66
High-Income	-1.00	-0.81
Race/Ethnicity		
African-American	1.06	0.93
Hispanic	0.72	0.75
Other	0.38	0.42
Taking any Advanced Coursework	0.08	0.15
Taking the ACT as a Junior	-	-0.11
Need Help in Educational or Career Navigation	0.07	0.12
Has a Parent with a Bachelor's Degree	-0.64	-0.49
Taken Mathematics beyond Algebra II	0.07	-
Taken Science beyond Chemistry	-0.10	-0.05
HSGPA	0.47*	0.69
Square of HSGPA	-0.06	-0.13
Number of times taken the ACT	0.05	0.71
Square of number of times taken the ACT	0.00	-0.04
Number of Months between tests	-	-0.14
Prior ACT Composite Score	-	0.02

Note: All retained predictors were significant. Unless noted, significance was <0.0001. "*" indicates significance of <0.02. "-" indicated the predictor was either not retained as significant or not included in the model.

Table 3: Models predicting Official ACT Test Scores

Effect	First-time	Repeat
Intercept	6.63	0.04
Treatment Group	0.66	0.65
Female	-0.64	-0.20
Family Income		
Low-Income	-0.15*	0.00
High-Income	0.37	0.18
Treatment by Family Income Interaction		
Treatment * Low-Income	-0.36	-0.02
Treatment * High-Income	0.35	-0.09
Race/Ethnicity		
African-American	-2.35	-0.33
Hispanic	-1.26	-0.23
Other	0.03	0.02
Treatment by Race/Ethnicity Interaction		
Treatment * African-American	0.56	0.06
Treatment * Hispanic	0.83	0.05
Treatment * Other	0.88	0.04
Taking any Advanced Coursework	2.39	0.22
Taking the ACT as a Junior	0.45	-0.10
Need Help in Educational or Career Navigation	-1.17	-0.19
Has a Parent with a Bachelor's Degree	1.05	0.20
Taken Mathematics beyond Algebra II	0.97	0.08
Taken Science beyond Chemistry	0.67	0.14
HSGPA	3.35	0.53
Taken the ACT more than Once	-	-
Number of Months to Graduation	0.18	0.00
Square of Number of Months to Graduation	-0.01	0.00
Prior ACT Composite Score	-	0.91
Treatment * Prior ACT Composite Score	-	-0.01
Months Between ACT Administrations	-	0.06
Square of Months Between ACT Administrations	-	0.00

Note: Coefficients are significant at the <0.0001 level unless otherwise specified. "*" indicates significance at the <0.001 level. Nonsignificant values noted in bold. "-" indicated the variable was not included in that model.

Table 4: Least Squares Mean Estimate of Official ACT Composite Score

Model	Treatment	Control	Difference
First-Time Tester Model			
Family Income			
Low-income	19.86	19.00	0.86
Middle-income	21.09	19.52	1.57
High-income	20.37	19.15	1.22
Race/Ethnicity			
African-American	18.97	17.76	1.21
Hispanic	20.34	18.85	1.48
Other	21.67	20.14	1.53
White	20.77	20.12	0.65
Treatment indicator	20.44	19.22	1.22
Repeat Tester Model			
Family Income			
Low-income	20.51	20.13	0.39
Middle-income	20.54	20.13	0.41
High-income	20.63	20.31	0.32
Race/Ethnicity			
African-American	20.39	19.99	0.40
Hispanic	20.48	20.09	0.39
Other	20.71	20.34	0.37
White	20.66	20.32	0.34
Treatment indicator	20.56	20.19	0.37

Note: All differences were significant (<0.0001)

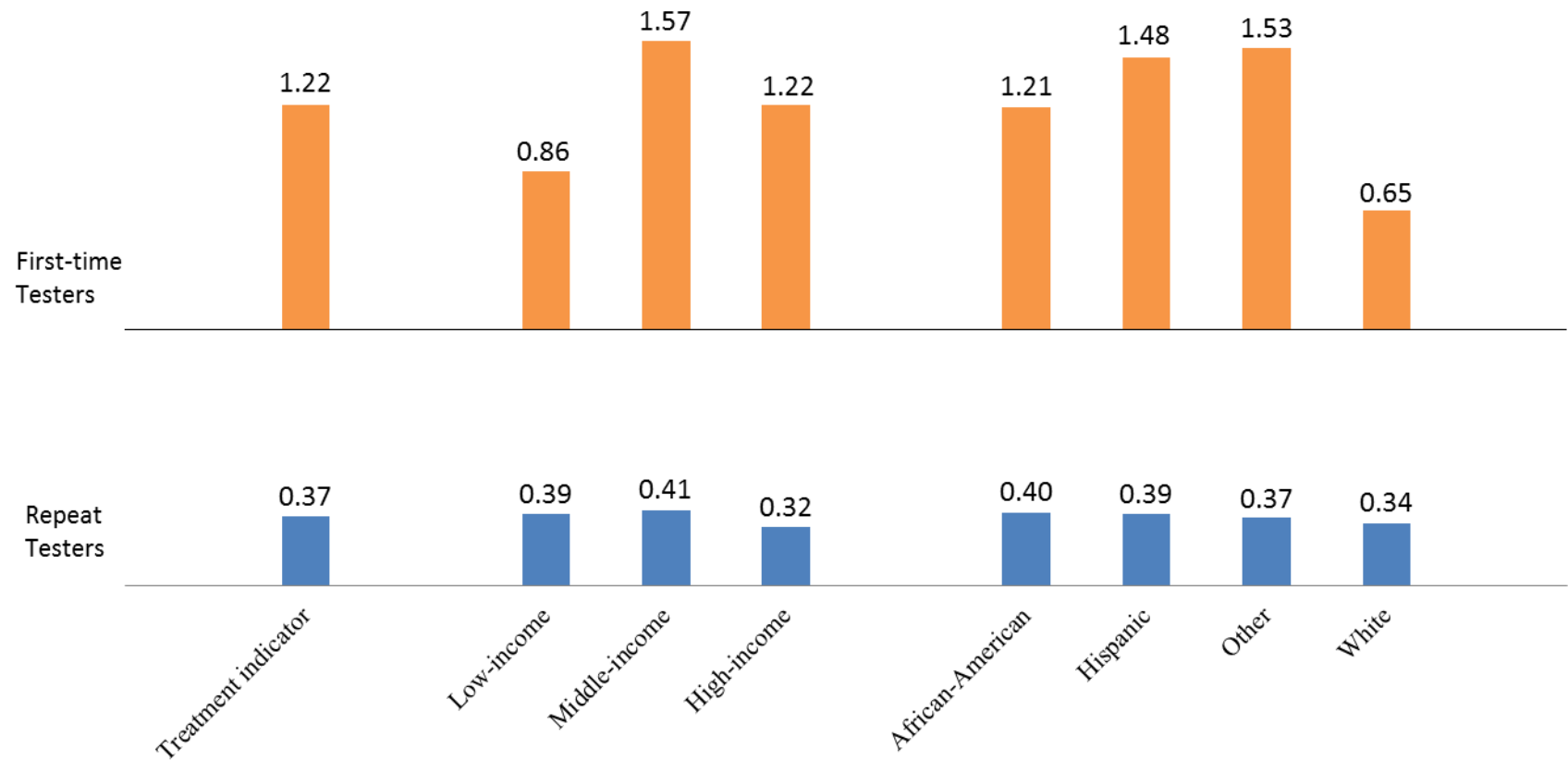


Figure 1: Adjusted mean differences between treatment and control groups