
# Investigating the Impact of the Nebraska ACT Pilot Project on Student College-Going Behavior

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**Abstract**
With the goal of increasing college-going among Nebraska high school students, the ACT Pilot Project was conducted by administering the ACT for all 11th graders in 13 selected public high schools in the state. This study utilizes several statistical tools like propensity score matching and logistic regression to assess the impact of being in the ACT Pilot on college-going during the time of the ACT Pilot Project in 2011-12 to 2013-14. Results indicate that participation in the ACT Pilot Project increases the odds of going on to college, although only marginally, for the high school students in the study. Other variables of interest like gender, race/ethnicity, household income status, and performance on the NeSA are greater predictors of college-going. Performance which exceed standards on the NeSA Math is found to increase the odds of going on to college by almost two times; thus suggesting that continued efforts should be directed to improving Math outcomes for Nebraska high school students. Implications of this study's findings and direction for future research are discussed.

***Keywords**: College-going; ACT; ACT Pilot Project; NeSA; College and Career Ready; Assessment; Transitions*

**Research Background and Objective**
In an effort to increase college enrollment among Nebraska high school students, the ACT Pilot Project was conducted over a five-school-year period from 2011-12 to 2015-16. All 11th graders from 13 participating public high schools were required to take the ACT on a school day in the spring of 2012, 2013, and 2014. These students were also required to take the regular NeSA (Nebraska State Accountability) assessments in 11th grade. Results of the study may help quantify the impact of administering the ACT to all 11th graders in the state on college-going and, consequently, inform related policy and decision making.

Statistical research on the ACT Pilot Project conducted by Nebraska's Coordinating Commission for Postsecondary Education (CCPE) has been underway since the fall of 2012 and is presently ongoing. The research by CCPE has two major goals:

1) To determine the relationship between ACT and NeSA assessment scores using a correlational analyses, and
2) To determine the change in college-going rates resulting from the administration of the ACT to all 11th graders in Nebraska public high schools using trend analyses.

At the time of this study, the final report supporting goal (1) and the third progress report supporting goal (2) of the ACT Pilot Project research have been completed and made publicly available. For purposes of this study, the report evaluating college-going rates is highlighted. The third progress report finds that "administering the ACT to all 11th graders had no significant, or even noticeable, effect on the overall college-going rate of the Pilot schools" (CCPE Report, 2015, p. ES 4). Moreover, little to no changes in college-going rates were observed for the ACT Pilot student groups defined by gender, race/ethnicity, and household income status. While these findings may lead to the conclusion that administering the ACT to all 11th graders would yield no effect on the overall college-going rate among all Nebraska public high school students, further statistical exploration can be done to address the experimental limitations of the ACT Pilot Project. These

limitations include the self-selection of participating public high schools in the ACT Pilot Project, and the ability for students not involved in the ACT Pilot Project to seek treatment (take the ACT) on their own.

Thus, the main objective of this study is **to investigate the impact of being in the ACT Pilot Project on college-going for Nebraska students**. This investigation, while also meeting goal (2) of the research conducted by CCPE, utilizes advanced statistical tools to account for possible differences between students in the Pilot schools and students in the non-Pilot schools due to a lack of randomization when administering the ACT throughout the Pilot Project. Moreover, statistical models are built to predict college-going of all Nebraska students with different treatment conditions. This study seeks to identify the causal effects, if any, of administering the ACT during the Pilot Project on college-going for all Nebraska public school students. While the study by CCPE focuses on college-going rates and draws conclusions at the school-level, this study assesses college-going at the student-level. Thus, more granular inferences can be made for Nebraska students.

## Research Design and Methods

*Overview*

This quasi-experimental study uses student-level data for three combined cohorts of all 11$^{th}$ graders in Nebraska public high schools from 2011-12 to 2013-14. Specifically, demographic data, ACT Pilot participation data, and college enrollment data are gathered. These data are drawn from three sources, respectively:

1) The Nebraska Student and Staff Record System (NSSRS) at the Nebraska Department of Education (NDE),
2) ACT, Inc., and
3) The National Student Clearinghouse (NSC).

Unique student identifiers are used to match students across data sets. If a student does not have a college enrollment record in the NSC data, it is assumed that the student did not go to college during the time at which the NSC data was last updated (April 2016) and obtained for this study.

*Sample*

With funding from the Nebraska Legislature, 13 selected public high schools participated in the ACT Pilot Project. These high schools, from 8 unique school districts, are as follows:

1) Alliance High School (Alliance Public Schools)
2) Columbus High School (Columbus Public Schools)
3) Gering High School (Gering Public Schools)
4) Hastings Senior High School (Hastings Public Schools)
5) Lincoln High School (Lincoln Public Schools)
6) Lincoln Northeast High School (Lincoln Public Schools)
7) Lincoln Southeast High School (Lincoln Public Schools)
8) Lincoln East High School (Lincoln Public Schools)
9) North Star High School (Lincoln Public Schools)
10) Southwest High School (Lincoln Public Schools)
11) Scottsbluff Senior High School (Scottsbluff Public Schools)

12) Sidney High School (Sidney Public Schools)
13) South Sioux Senior High School (South Sioux City Community Schools)

All 11th graders in the Pilot schools did not have to pay for the ACT but were required to take the ACT during a school day in the spring of 2012, 2013, and 2014. These students were also required to take the regular NeSA assessments for all Nebraska public high school students. Any 11th grader in the Pilot schools also had the option of paying for and taking the ACT again the following year. Similarly, students in the non-Pilot schools were also able to decide to take the ACT at their own expense.

It is important to note that some students appear in the data a number of times due to: 1) switching schools during the same school year, and/or 2) repeating 11th grade. Since the ACT was administered during the spring of the Pilot years, only the latest record of the student for the same school year is included in the analysis. It is assumed, then, that the latest record coincides with the time of the ACT Pilot administration. Multiple records of students repeating 11th grade remain in the data, since students were in the Pilot schools more than once. In this study, there are 252 records (0.38%) of students repeating 11th grade.

*Dependent Measure*

The main goal of this study is to analyze the impact of universal administration of the ACT on college-going. This has great implications as other studies have found that taking the ACT helps high school students make better decisions about colleges (shifts from two- to four-year colleges and part- to full-time) (Klasik, 2013) as well as go to college in general (Hyman, 2016). Thus, the core outcome of this study is whether the public high school student goes on to college or not.

*Treatment Condition*

This study focuses on the treatment condition of being in the ACT Pilot Project for three combined cohorts of 11th graders in Nebraska public high schools from 2011-12 to 2013-14. It is important to note that not being in the ACT Pilot Project does not necessarily mean not taking the ACT. However, due to limitations of data matching for all Nebraska public high school students who sat for the ACT (whether they were in the Pilot Project or not), the assumption is made that those in the Pilot Project took the ACT *under specific conditions*, while those not in the Pilot Project did not take the ACT *under these same conditions*. These conditions refer to:

1) The students taking the ACT during a school day,
2) The students having their ACT paid for, and
3) Any additional effort by the Pilot schools to prepare and engage students and/or parents.

This assumption has implications that are explored in the Discussion section of this paper.

**Table 1.** Treatment condition for all 11th graders at the time of the ACT Pilot Project.

| Treatment Condition | N | % |
|---|---|---|
| Pilot | 10,377 | 15.57 |
| Non-Pilot | 56,268 | 84.43 |
| Total | 66,645 | 100.00 |

*Covariates*

There are six covariates of interest in this study. The first three are characteristics of the student: gender, race/ethnicity, and household income. These variables are selected due to their availability and observed differences among sub-groups on school performance and college outcomes. Male and female students have long been found to display different academic outcomes (Clinciu, 2010; Steinmayr & Spinath, 2008). Moreover, research has also consistently shown that students from racial minority groups and from low income families perform poorer on average in school (Lacour & Tissington, 2011; Rowan, Cohen, & Raudenbush, 2004; U.S. Department of Education, 2001) and in college (Bailey & Dynarski, 2011). In this study, there are six race/ethnicity subgroups: 1=White, 2=American Indian or Alaska Native, 3=Asian or Pacific Islander, 4=Black or African American, 5=Hispanic, and 6=Two Or More Races. Students who are Native Hawaiian or Other Pacific Islander are added to the group of Asian students due to their small sample size (N=72, or 0.11%). For the student's household income, a proxy indicator is derived from the student's free-or-reduced-lunch status (1=low income and 0=non-low income).

The other three covariates of interest in this study are the student's NeSA performance levels on Reading, Math, and Science, attendance rate during Grade 11, and the number of years the student has been in school since completing Grade 8. Students following the regular timeline in high school have 3 years in school since completing Grade 8; that is, one year for each Grades 9, 10, and 11. In terms of NeSA performance, 4 levels are analyzed for each NeSA subject: 0=Did not Take, 1=Below Standards, 2=Meets Standards, and 3=Exceeds Standards. These variables are selected due to their good candidacy of being proxies for student motivation and aptitude, which positively correlates with school and college achievement (Hossler & Stage, 1992; MacCann, Minsky, & Roberts, 2008) and interacts with the aforementioned demographic variables like gender, race/ethnicity, and household income (Chenoweth & Galliher, 2004; Stage & Hossler, 1989).

**Table 2.** Sample sizes of each covariate by group and treatment condition.

| | N (%) | | |
|---|---|---|---|
| | **Pilot** | **Non-Pilot** | **Total** |
| *Gender* | | | |
| Male | 5,174 (49.86) | 29,007 (51.55) | 34,181 (51.29) |
| Female | 5,203 (50.14) | 27,261 (48.45) | 32,464 (48.71) |
| *Race/Ethnicity* | | | |
| American Indian or Alaska Native | 102 (0.98) | 754 (1.34) | 856 (1.28) |
| Asian or Pacific Islander | 424 (4.09) | 1,116 (1.98) | 1,540 (2.31) |
| Black or African American | 447 (4.31) | 3,865 (6.87) | 4,312 (6.47) |
| Hispanic | 1,772 (17.08) | 8,137 (14.46) | 9,909 (14.87) |
| Two or More Races | 414 (3.99) | 1,532 (2.72) | 1,946 (2.92) |
| White | 7,218 (69.56) | 40,864 (72.62) | 48,082 (72.15) |
| *Household Income Status* | | | |
| Low Income | 4,025 (38.79) | 21,414 (38.06) | 25,439 (38.17) |
| Non-Low Income | 6,352 (61.21) | 34,854 (61.94) | 41,206 (61.83) |
| *Years at School After Grade 8* | | | |
| Less than 3 Years | 633 (6.10) | 3,600 (6.40) | 4,233 (6.35) |
| 3 Years | 9,699 (93.47) | 51,308 (91.19) | 61,007 (91.54) |

| | N (%) | | |
|---|---|---|---|
| | **Pilot** | **Non-Pilot** | **Total** |
| More than 3 Years | 45 (0.43) | 1,360 (2.42) | 1,405 (2.11) |
| *NeSA Reading Performance* | | | |
| Did Not Take | 77 (0.74) | 3,864 (6.87) | 3,941 (5.91) |
| Below Standards | 3,401 (32.77) | 16,592 (29.49) | 19,993 (30.00) |
| Meets Standards | 4,036 (38.89) | 21,372 (37.98 | 25,408 (38.12) |
| Exceeds Standards | 2,863 (27.59) | 14,440 (25.66) | 17,303 (25.96) |
| *NeSA Math Performance* | | | |
| Did Not Take | 76 (0.73) | 3,837 (6.82) | 3,913 (5.87) |
| Below Standards | 4,182 (40.30) | 21,410 (38.05) | 25,592 (38.40) |
| Meets Standards | 3,526 (33.98) | 18,284 (32.49) | 21,810 (32.73) |
| Exceeds Standards | 2,593 (24.99) | 12,737 (22.64) | 15,330 (23.00) |
| *NeSA Science Performance* | | | |
| Did Not Take | 80 (0.77) | 3,854 (6.85) | 3,934 (5.90) |
| Below Standards | 3,026 (29.16) | 14,457 (25.69) | 17,483 (26.23) |
| Meets Standards | 5,754 (55.45) | 30,638 (54.45) | 36,392 (54.61) |
| Exceeds Standards | 1,517 (14.62) | 7,319 (13.01) | 8,836 (13.26) |

*Analytic Approach*

Since the 13 Pilot schools were not randomly selected to be a part of the ACT Pilot Project, differences between the students in these schools and the students in the non-Pilot schools can potentially play a causal role in affecting college-going behavior. Thus, factors apart from taking the ACT may influence college-going behavior positively or negatively. In order to draw causal conclusions from the study which was not a true experiment, a propensity score matching analysis (PSM) is used. PSM (Rosenbaum & Rubin, 1983) is a two-step statistical technique used to remove systematic differences and ensure equivalencies between those receiving treatment and those not receiving treatment.

The first step in PSM involves estimating the probability of being in the treatment group (i.e., the probability of being in the ACT Pilot Project) based on selected variables related to the treatment or the outcome. Then, observations in the control group (i.e., students in the non-Pilot schools) are matched to their counterpart in the treatment group based on similar propensity scores.

The current study employs PSM in the following manner: First, prior to any PSM analysis, tests of differences and a simple logistic regression analysis are conducted to determine the relationship between being in the ACT Pilot Project and college-going for the full sample of 11$^{th}$ graders in the data set. A multiple logistic regression model is also created using the covariates. Second, PSM is conducted by estimating the propensity scores of all 11$^{th}$ graders based on the six covariates. These scores, generated from a logistic regression model, range from 0 to 1 and represent the predicted probability of being in the ACT Pilot Project. A simple one-to-one nearest neighbor matching without replacement is performed. Third, the tests of differences and logistic regression analysis are repeated on the matched sample to assess the average effect of being in the ACT Pilot Project on college-going.

**Results**

The propensity score matching method removes prior differences among student subgroups that could potentially explain the college-going outcome. For example, in the full sample, a significantly greater percentage of Black or African American students go to college in the Pilot condition (61.74%) as compared to those in the non-Pilot condition (49.73%) ($\chi^2(1) = 23.15, p = 0.00$). After matching, the proportion of Black or African American students in the Pilot condition who go to college is no longer significantly different from those in the non-Pilot condition ($\chi^2(1) = 3.26, p = 0.07$).

Using this process, a majority of the differences among student subgroups are eliminated, thereby ensuring student subgroups are equivalent in proportion for both the Pilot and non-Pilot conditions. The differences in proportion before and after matching can be found in Table 7 of the Appendix. The quality of the matching procedure is also visually depicted in Figure 3, found in the Appendix.

Table 3 shows the sample sizes of students in the Pilot and non-Pilot conditions before and after matching on propensity scores. The new matched sample yields an equal number of students in both conditions. Those in the non-Pilot condition of this new matched sample represent the counterfactual of those in the Pilot; specifically, what the college outcome would have been if those in the Pilot were not in the Pilot (i.e., did not receive the treatment).

**Table 3.** Sample sizes before and after matching on propensity scores.

| **Sample** | **N (%)** | | |
|---|---|---|---|
| | **Pilot** | **Non-Pilot** | **Total** |
| Full Sample (before matching) | 10,377 (15.57) | 56,268 (84.43) | 66,645 (100.00) |
| Matched Sample (after matching) | 10,377 (50.00) | 10,377 (50.00) | 20,754 (100.00) |

The differences in college-going are also eliminated in the matched sample. Table 4 reveals that approximately 69% of students eventually go to college, regardless of whether they are in the Pilot or non-Pilot condition ($\chi^2(1) = 1.23, p = 0.27$). This change in the college-going outcome from the full sample to the matched sample can be visually seen in Figure 1.

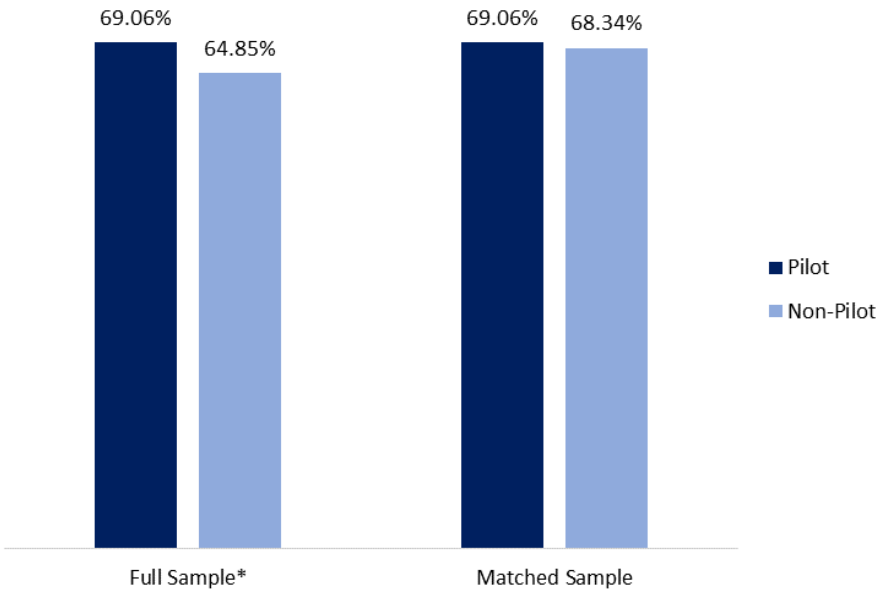
**Table 4.** Test of differences in college-going on full and matched samples.

| | **Full Sample** | | | **Matched Sample** | | |
|---|---|---|---|---|---|---|
| **N (%)** | College-Going | Not College-Going | Test Statistic | College-Going | Not College-Going | Test Statistic |
| *Treatment Condition* | | | | | | |
| Pilot | 7,166 (69.06) | 3,211 (30.94) | 68.49[(a)]* | 7,166 (69.06) | 3,211 (30.94) | 1.23[(a)] |
| Non-Pilot | 36,492 (64.85) | 19,776 (35.15) | | 7,092 (68.34) | 3,285 (31.66) | |

*$p < 0.05$

**Note.** a = Chi-square value

**Figure 1.** Differences in college-going on full and matched samples.




*$p < 0.05$

Moving beyond evaluating differences in college-going based on treatment condition, a series of logistic regression models is built to determine strong predictors of college-going for the students included in this study. First, a simple logistic regression model is created to assess the impact of being in the ACT Pilot Project on college-going. Then, the model is further specified to include the 6 covariates, referred to as the complete model. This latter complete model is developed to ensure that all other student characteristics which interact with both the treatment and the outcome are controlled for in order to accurately determine the increase in the odds of going to college, based on these student characteristics. Moreover, the complete model controls for interactions among student characteristics that may affect the college-going outcome. These interactions exist in two forms in the complete model: 1) the interaction between race/ethnicity and household income, and 2) the interaction between race/ethnicity and gender. It is important to control for these interactions since the effect of race/ethnicity on college outcomes has been found to be differential across socioeconomic status (Black & Sufi, 2002), and across gender (Barajas & Pierce, 2001; Strayhorn, 2010). The two models described are built for both the full sample and the matched sample, and results are shown in Table 5 and Table 6, respectively.

**Table 5.** Regression analyses on the full sample, with college-going as the outcome.

| Independent Variable | Odds Ratio | SE | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ (*p*)] | N |
|---|---|---|---|---|---|
| *Simple Model* | | | | | |
| ACT Pilot Participation | 1.21* | 0.03 | [1.16, 1.27] | -42900.85 [69.47 (0.00)] | 66,645 |
| Constant | 1.85 | 0.02 | | | |

| Independent Variable | Odds Ratio | SE | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ (*p*)] | N |
|---|---|---|---|---|---|
| *Complete Model* | | | | | |
| ACT Pilot Participation | 1.05 | 0.03 | [1.00, 1.10] | -32895.17 [20080.84 (0.00)] | 66,645 |
| Female (Male) | 2.08* | 0.05 | [1.98, 2.18] | | |
| Race/Ethnicity (White) | | | | | |
| American Indian or Alaska Native | 0.56* | 0.09 | [0.40, 0.78] | | |
| Asian or Pacific Islander | 1.20 | 0.15 | [0.95, 1.52] | | |
| Black or African American | 1.02 | 0.08 | [0.87, 1.19] | | |
| Hispanic | 0.73* | 0.04 | [0.66, 0.81] | | |
| Two or More Races | 0.92 | 0.09 | [0.75, 1.12] | | |
| Low Income (Non-Low Income) | 0.45* | 0.01 | [0.42, 0.47] | | |
| Years at School after Grade 8 (3 Years) | | | | | |
| Less than 3 Years | 0.41* | 0.02 | [0.38, 0.45] | | |
| More than 3 Years | 0.66* | 0.06 | [0.55, 0.80] | | |
| Attendance Rate | 1.07* | 0.00 | [1.06, 1.07] | | |
| NeSA Reading (Meets Standards) | | | | | |
| Did Not Take | 0.54* | 0.11 | [0.37, 0.81] | | |
| Below Standards | 0.66* | 0.02 | [0.63, 0.70] | | |
| Exceeds Standards | 1.17* | 0.04 | [1.10, 1.24] | | |
| NeSA Math (Meets Standards) | | | | | |
| Did Not Take | 0.22* | 0.06 | [0.13, 0.38] | | |
| Below Standards | 0.51* | 0.01 | [0.48, 0.53] | | |
| Exceeds Standards | 1.64* | 0.06 | [1.53, 1.75] | | |
| NeSA Science (Meets Standards) | | | | | |
| Did Not Take | 0.55* | 0.15 | [0.33, 0.93] | | |
| Below Standards | 0.76* | 0.02 | [0.72, 0.80] | | |
| Exceeds Standards | 0.93 | 0.04 | [0.86, 1.01] | | |
| Race/Ethnicity × Income (White × Non-Low Income)# | | | | | |
| American Indian or Alaska Native × Low Income | 2.06* | 0.38 | [1.44, 2.94] | | |
| Asian or Pacific Islander × Low Income | 2.17* | 0.29 | [1.66, 2.82] | | |
| Black or African American × Low Income | 1.89* | 0.16 | [1.60, 2.24] | | |
| Hispanic × Low Income | 1.96* | 0.12 | [1.75, 2.20] | | |
| Two or More Races × Low Income | 1.29* | 0.15 | [1.03, 1.61] | | |
| Race/Ethnicity × Gender (White × Male)# | | | | | |
| American Indian or Alaska Native × Female | 0.65* | 0.11 | [0.47, 0.91] | | |
| Asian or Pacific Islander × Female | 0.69* | 0.09 | [0.54, 0.90] | | |

| Independent Variable | Odds Ratio | SE | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ ($p$)] | N |
|---|---|---|---|---|---|
| Black or African American × Female | 0.95 | 0.07 | [0.82, 1.10] | | |
| Hispanic × Female | 0.86* | 0.04 | [0.78, 0.95] | | |
| Two or More Races × Female | 0.93 | 0.10 | [0.75, 1.15] | | |
| Constant | 0.01 | 0.00 | | | |

*$p < 0.05$

**Note.** # The values displayed for the interaction terms are the differences in the odds ratios between two groups (Low Income and Non-Low Income, or Female and Male), for each race/ethnicity subgroup. Please refer to the Appendix for figures on the interaction terms.

Results in Table 5 display the odds of going on to college, for the full sample. With the simple model, the odds of going to college are 1.2 times greater for those in the Pilot compared to those not in the Pilot ($p = 0.00$). However, after controlling for the other covariates in the complete model, the odds of going on to college are nearly equal for those in the Pilot compared to those not in the Pilot (odds ratio = 1.0, $p = 0.07$). When holding all other covariates constant in the complete model, these key results are found:

1) Females have a larger odds of going on to college than males (odds ratio = 2.1, $p = 0.00$),
2) American Indians or Alaska Natives and Hispanics have smaller odds of going on to college than Whites (odds ratio = 0.6 for American Indian or Alaska Native, $p = 0.00$; odds ratio = 0.7 for Hispanics, $p = 0.00$),
3) Students from low income households have less than half the odds of going on to college compared to those from non-low income households (odds ratio = 0.4, $p = 0.00$),
4) For those who have less than or more than 3 years of school after Grade 8, the odds of going on to college are smaller than the odds for those with the regular 3 years of school after Grade 8 going on to college (odds ratio = 0.4 for less than 3 years, $p = 0.00$; odds ratio = 0.7 for more than 3 years, $p = 0.00$),
5) The odds of going on to college increases with attendance rate, though not substantially (odds ratio = 1.1, $p = 0.00$),
6) The performance on all 3 NeSA subjects are significant predictors of college-going, with NeSA Math Performance being the strongest predictor of the odds of going on to college. Those who exceed standards in the NeSA Math have a larger odds of going on to college than those who meet standards (odds ratio=1.6, $p = 0.00$). Moreover, for all 3 NeSA subjects, students who do not take the NeSA or who are below standards have significantly smaller odds of going on to college compared to those who meet NeSA standards.

**Table 6.** Regression analyses on the matched sample, with college-going as the outcome.

| Independent Variable | Odds Ratio | SE+ | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ ($p$)] | N |
|---|---|---|---|---|---|
| *Simple Model* | | | | | |
| ACT Pilot Participation | 1.03 | 0.03 | [0.97, 1.10] | -12897.58 [1.23 (0.27)] | 20,754 |

| Independent Variable | Odds Ratio | SE+ | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ (*p*)] | N |
|---|---|---|---|---|---|
| Constant | 2.16 | 0.05 | | | |
| *Complete Model* | | | | | |
| ACT Pilot Participation | 1.08* | 0.04 | [1.01, 1.16] | -10423.08 [4950.23 (0.00)] | 20,754 |
| Female (Male) | 2.06* | 0.09 | [1.89, 2.24] | | |
| Race/Ethnicity (White) | | | | | |
| American Indian or Alaska Native | 0.54 | 0.19 | [0.27, 1.07] | | |
| Asian or Pacific Islander | 1.16 | 0.20 | [0.83, 1.61] | | |
| Black or African American | 0.92 | 0.16 | [0.65, 1.29] | | |
| Hispanic | 0.72* | 0.07 | [0.61, 0.86] | | |
| Two or More Races | 1.20 | 0.19 | [0.88, 1.63] | | |
| Low Income (Non-Low Income) | 0.45* | 0.02 | [0.41, 0.49] | | |
| Years at School after Grade 8 (3 Years) | | | | | |
| Less than 3 Years | 0.41* | 0.00 | [0.36, 0.47] | | |
| More than 3 Years | 0.50* | 0.02 | [0.28, 0.89] | | |
| Attendance Rate | 1.08* | 0.00 | [1.07, 1.08] | | |
| NeSA Reading (Meets Standards) | | | | | |
| Did Not Take | 1.11 | 0.73 | [0.31, 4.02] | | |
| Below Standards | 0.66* | 0.03 | [0.60, 0.73] | | |
| Exceeds the Standards | 1.15* | 0.06 | [1.03, 1.28] | | |
| NeSA Math (Meets Standards) | | | | | |
| Did Not Take | 0.30 | 0.20 | [0.08, 1.09] | | |
| Below Standards | 0.52* | 0.02 | [0.48, 0.57] | | |
| Exceeds Standards | 1.59* | 0.10 | [1.41, 1.80] | | |
| NeSA Science (Meets Standards) | | | | | |
| Did Not Take | 0.51 | 0.34 | [0.14, 1.87] | | |
| Below Standards | 0.80* | 0.04 | [0.73, 0.88] | | |
| Exceeds Standards | 1.00 | 0.07 | [0.87, 1.15] | | |
| Race/Ethnicity × Income (White × Non-Low Income)# | | | | | |
| American Indian or Alaska Native × Low Income | 3.06* | 1.13 | [1.49, 6.31] | | |
| Asian or Pacific Islander × Low Income | 2.26* | 0.42 | [1.57, 3.24] | | |
| Black or African American × Low Income | 2.22* | 0.42 | [1.54, 3.21] | | |
| Hispanic × Low Income | 1.90* | 0.19 | [1.57, 2.31] | | |
| Two or More Races × Low Income | 1.04 | 0.18 | [0.74, 1.48] | | |

| Independent Variable | Odds Ratio | SE+ | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ (*p*)] | N |
|---|---|---|---|---|---|
| Race/Ethnicity × Gender (White × Male)# | | | | | |
| American Indian or Alaska Native × Female | 0.46* | 0.15 | [0.24, 0.88] | | |
| Asian or Pacific Islander × Female | 0.73 | 0.13 | [0.51, 1.04] | | |
| Black or African American × Female | 0.90 | 0.14 | [0.66, 1.22] | | |
| Hispanic × Female | 0.86 | 0.07 | [0.72, 1.02] | | |
| Two or More Races × Female | 0.77 | 0.13 | [0.55, 1.07] | | |
| Constant | 0.00 | 0.00 | | | |

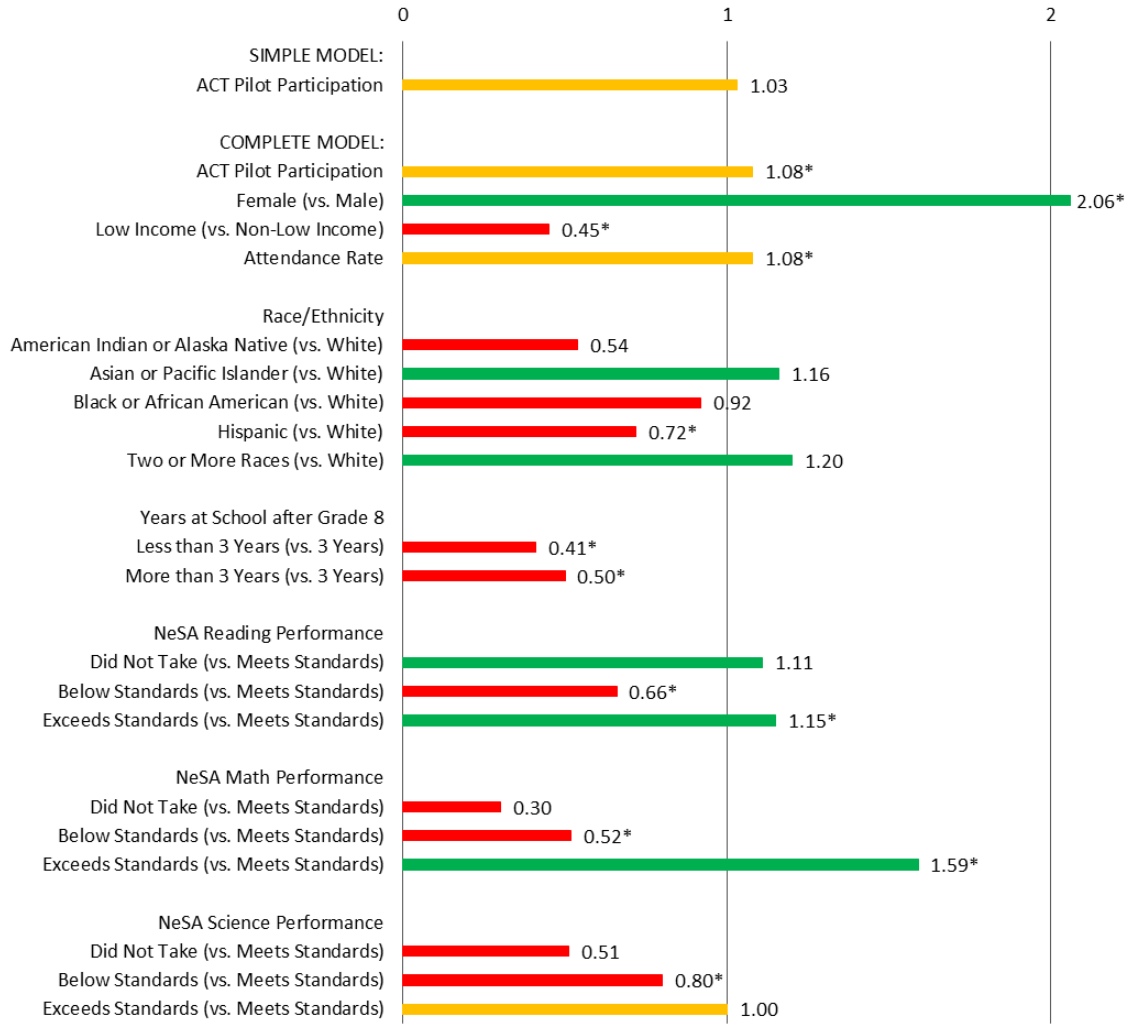
*$p < 0.05$

**Note.** # The values displayed for the interaction terms are the differences in the odds ratios between two groups (Low Income and Non-Low Income, or Female and Male), for each race/ethnicity subgroup. Please refer to the Appendix for figures on the interaction terms. + Standard errors not accounting for propensity score estimation.

Table 6 shows the results of the logistic regression models for the matched sample. The simple model reveals that being in the ACT Pilot does not significantly increase college-going odds, a result that closely follows that seen in Table 4 and Figure 1. However, the complete model using the matched sample shows that being in the ACT Pilot significantly increases the odds of going on to college, although only marginally; that is, an 8% increase (odds ratio = 1.08, $p = 0.02$). Other results for the complete model using the matched sample are similar to those found in the complete model for the full sample. One noteworthy difference in the results of the complete model using the matched sample is that, across races/ethnicities, only Hispanic students have smaller odds of going on to college relative to Whites (odds ratio = 0.7, $p = 0.00$). The odds of going on to college is no longer significant for American Indian or Alaska Native students after matching (odds ratio = 0.5, $p = 0.08$).

A comparison of the magnitude of the odds ratios predicting college-going is shown in Figure 2 for the matched sample. As a guide, the longer the bar, the greater the odds of going on to college. Figure 2 reveals that gender and NeSA Math performance are strongly and significantly associated with increased college-going; specifically, for females and for those who exceed standards, compared to males and those who meet standards.

**Figure 2.** Odds ratios of college-going for the matched sample.




*$p < 0.05$

**Note.** The value of 1 signifies equal odds of going on to college, i.e. the closer the odds ratio is to 1, the lesser the difference in the college-going odds between the 2 comparison groups. Green bars represent larger odds, orange bars represent equal odds, and red bars represent smaller odds.

## Discussion

This study utilizes propensity score matching to capture the impact of being in the ACT Pilot on college-going for three combined cohorts of 11th graders in Nebraska public high schools from 2011-12 to 2013-14. The matching is necessary in order to accurately obtain the treatment effect from observational data whereby the treatment is not randomly assigned to individual students. Prior to matching, it is found that a significantly greater amount of students in the Pilot go to college as compared to those in the non-Pilot (refer to Figure 1). However, this effect may be due to students in the Pilot condition being different from students in the non-Pilot condition on key variables like gender, race or ethnicity, and NeSA performance levels. After matching each student in the Pilot condition to a student in the non-Pilot condition that is as similar as possible on the 6 covariates included in the models, the difference in college-going is no longer observed.

However, further analyses reveal that being in the ACT Pilot significantly increases the odds of college-going by about 8% (odds ratio = 1.08, $p = 0.02$). Furthermore, controlling for other variables, students who are females or from non-low income families have greater odds of going on to college as compared to males and those from low income families. These gender and income differences in college outcomes have been growing (Bailey & Dynarski, 2011), which poses a social and economic challenge for researchers and educators alike to bridge this gap.

One racial minority group is found to have smaller odds of going on to college than White students, *ceteris paribus*. This minority group is Hispanic students (odds ratio = 0.7, $p = 0.00$). Thus, a racial difference is still seen when controlling for the main effects and the interaction of race/ethnicity with the economic conditions (i.e., household income) and the gender of the students in the study. The interaction between race/ethnicity and economic conditions indicates that, relative to Whites, the odds of going on to college for all other minority groups differ across income status, except for students with two or more races. Similarly, the interaction between race/ethnicity and gender indicates that, relative to Whites, the odds of going on to college differ across gender, but only for American Indian or Alaska Native students.

Additionally, students' performance on the NeSA is significantly related to college-going. For all 3 NeSA subjects, those who test below standards have a significantly smaller odds of going on to college compared to those who meet standards (odds ratio = 0.7 for Reading, $p = 0.00$; odds ratio = 0.5 for Math, $p = 0.00$; odds ratio = 0.8 for Science, $p = 0.00$). NeSA Math performance, in particular, has the strongest effect on college-going across the three NeSA subjects. Compared to students who meet NeSA Math standards, those who exceed standards have a greater odds of going on to college (odds ratio = 1.6, $p = 0.00$). Table 2 details that the largest group of students are "Below Standards" in their NeSA Math performance. Thus, consideration should be given to further improving Math outcomes for students.

Since the report by CCPE found a strong positive correlation between NeSA scores and ACT scores during the ACT Pilot Project (CCPE Report, 2015), when the ACT replaces the NeSA in the spring of 2017 (Nebraska Department of Education News Release, September 2, 2016), further study may be warranted to investigate ACT performance and college-going for Nebraska public high school students.

**Broader Impacts**

This study is not without limitations. While important demographic variables are taken into account when investigating the impact of being in the ACT Pilot Project on college-going, other unmeasured variables like the student's parental support or the student's peer influence to go to college are not accounted for in building the predictive models. Moreover, participation in the ACT Pilot Project is not a pure treatment of taking the ACT as students who did not participate in the ACT Pilot Project could also seek treatment on their own and take the ACT at their own expense. However, in specifying the specific conditions under which the Pilot students took the ACT, the effect of the treatment informs us whether taking the ACT *under these conditions* plays a role in improving college-

going or not. This study finds that the proportion of students who go on to college is similar across both the Pilot and non-Pilot conditions ($\chi^2(1) = 1.23$, $p = 0.27$). However, participation in the ACT Pilot Project is associated with increased odds of going on to college, although substantively this effect is very small (odds ratio = 1.08, $p = 0.00$) (Chen, Cohen, & Cohen, 2010).

Other demographic variables like gender, race/ethnicity, and household income status greatly affect the odds of going on to college. Obviously, student demographics are outside of the control of educators and policy makers. Thus, continued efforts should be directed towards improving academic achievement in Nebraska schools. This is due to the finding that greater performance on all NeSA subjects is associated with a greater odds of college-going for the students in the study.

In the upcoming 2016-2017 school year, the ACT will replace the 11$^{th}$ grade NeSA assessment (Nebraska LB930, 2016; Nebraska Department of Education News Release, September 2, 2016). While this study's findings may suggest that little change should be expected in college-going for Nebraska public high school students as a result of the assessment change, additional research is still required to provide a clearer picture of the impact of taking the ACT on postsecondary matriculation. As aforementioned, the results of this study is limited to assessing the college-going effect of being in the ACT Pilot, and not of taking the ACT per se. With the statewide implementation of a college entrance assessment for all Nebraska public high school students, more robust analyses should be performed with newly collected data to determine if universal administration will positively impact students, and in turn, families, communities, and future generations.

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## Appendix

This section contains the tables and figures alluded to in the text of this report. Information on the data files requested from various sources is also provided here.

*Tables and Figures*

**Table 7.** Test of differences in college-going on full and matched samples.

| | | Full Sample | | | Matched Sample | | |
|---|---|---|---|---|---|---|---|
| **N (%)** | | College-Going | Not College-Going | Test Statistic | College-Going | Not College-Going | Test Statistic |
| *Treatment Condition* | | | | | | | |
| Pilot | | 7,166 (69.06) | 3,211 (30.94) | 68.49[a]* | 7,166 (69.06) | 3,211 (30.94) | 1.23[a] |
| Non-Pilot | | 36,492 (64.85) | 19,776 (35.15) | | 7,092 (68.34) | 3,285 (31.66) | |
| *Gender* | | | | | | | |
| Male | Pilot | 3,351 (64.77) | 1,823 (35.23) | 58.45[a]* | 3,351 (64.77) | 1,823 (35.23) | 2.60[a] |
| | Non-Pilot | 17,147 (59.11) | 11,860 (40.89) | | 3,355 (63.25) | 1,949 (36.75) | |
| Female | Pilot | 3,815 (73.32) | 1,388 (26.68) | 11.91[a]* | 3,815 (73.32) | 1,388 (26.68) | 0.15[a] |
| | Non-Pilot | 19,345 (70.96) | 7,916 (29.04) | | 3,737 (73.66) | 1,336 (26.34) | |
| *Race/Ethnicity* | | | | | | | |
| American Indian or Alaska Native | Pilot | 49 (48.04) | 53 (51.96) | 9.45[a]* | 49 (48.04) | 53 (51.96) | 1.56[a] |
| | Non-Pilot | 246 (32.63) | 508 (67.37) | | 36 (39.13) | 56 (60.87) | |
| Asian or Pacific Islander | Pilot | 319 (75.24) | 105 (24.76) | 6.76[a]* | 319 (75.24) | 105 (24.76) | 0.77[a] |
| | Non-Pilot | 764 (68.46) | 352 (31.54) | | 310 (72.60) | 117 (27.40) | |
| Black or African American | Pilot | 276 (61.74) | 171 (38.26) | 23.15[a]* | 276 (61.74) | 171 (38.26) | 3.26[a] |
| | Non-Pilot | 1,922 (49.73) | 1,943 (50.27) | | 246 (55.78) | 195 (44.22) | |
| Hispanic | Pilot | 998 (56.32) | 774 (43.68) | 31.31[a]* | 998 (56.32) | 774 (43.68) | 4.46[a]* |
| | Non-Pilot | 3,986 (48.99) | 4,151 (51.01) | | 915 (52.77) | 819 (47.23) | |
| Two or More Races | Pilot | 269 (64.98) | 145 (35.02) | 13.18[a]* | 269 (64.98) | 145 (35.02) | 1.04[a] |
| | Non-Pilot | 843 (55.03) | 689 (44.97) | | 253 (61.56) | 158 (38.44) | |
| White | Pilot | 5,255 (72.80) | 1,963 (27.20) | 18.43[a]* | 5,255 (72.80) | 1,963 (27.20) | 0.49[a] |
| | Non-Pilot | 28,731 (70.31) | 12,133 (29.69) | | 5,332 (73.32) | 1,940 (26.68) | |
| *Household Income Status* | | | | | | | |
| Low Income | Pilot | 2,191 (54.43) | 1,834 (45.57) | 48.48[a]* | 2,191 (54.43) | 1,834 (45.57) | 3.72[a] |
| | Non-Pilot | 10,376 (48.45) | 11,038 (51.55) | | 2,008 (52.26) | 1,834 (47.74) | |

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| N (%) | | Full Sample College-Going | Full Sample Not College-Going | Full Sample Test Statistic | Matched Sample College-Going | Matched Sample Not College-Going | Matched Sample Test Statistic |
|---|---|---|---|---|---|---|---|
| Non-Low Income | Pilot | 4,975 (78.32) | 1,377 (21.68) | 33.38[a]* | 4,975 (78.32) | 1,377 (21.68) | 0.52[a] |
| | Non-Pilot | 26,116 (74.93) | 8,738 (25.07) | | 5,084 (77.80) | 1,451 (22.20) | |
| *Years at School after Grade 8* | | | | | | | |
| Less than 3 Years | Pilot | 298 (47.08) | 335 (52.92) | 16.75[a]* | 298 (47.08) | 335 (52.92) | 0.29[a] |
| | Non-Pilot | 1,384 (38.44) | 2,216 (61.56) | | 296 (48.60) | 313 (51.40) | |
| 3 Years | Pilot | 6,857 (70.70) | 2,842 (29.30) | 26.50[a]* | 6,857 (70.70) | 2,842 (29.30) | 1.87[a] |
| | Non-Pilot | 34,915 (68.05) | 16,393 (31.95) | | 6,786 (69.80) | 2,936 (30.20) | |
| More than 3 Years | Pilot | 11 (24.44) | 34 (75.56) | 3.69[a] | 11 (24.44) | 34 (75.56) | 0.09[a] |
| | Non-Pilot | 193 (14.19) | 1,167 (85.81) | | 10 (21.74) | 36 (78.26) | |
| *NeSA Reading Performance* | | | | | | | |
| Did Not Take | Pilot | 24 (31.17) | 53 (68.83) | 25.43[a]* | 24 (31.17) | 53 (68.83) | 6.96[a]* |
| | Non-Pilot | 465 (12.03) | 3,399 (87.97) | | 10 (13.33) | 65 (86.67) | |
| Below Standards | Pilot | 1,687 (49.60) | 1,714 (50.40) | 8.89[a]* | 1,687 (49.60) | 1,714 (50.40) | 5.42[a]* |
| | Non-Pilot | 7,765 (46.80) | 8,827 (53.20) | | 1,592 (46.78) | 1,811 (53.22) | |
| Meets Standards | Pilot | 3,003 (74.41) | 1,033 (25.59) | 0.00[a] | 3,003 (74.41) | 1,033 (25.59) | 0.15[a] |
| | Non-Pilot | 15,891 (74.35) | 5,481 (25.65) | | 2,977 (74.78) | 1,004 (25.22) | |
| Exceeds Standards | Pilot | 2,452 (85.64) | 411 (14.36) | 0.00[a] | 2,452 (85.64) | 411 (14.36) | 0.27[a] |
| | Non-Pilot | 12,371 (85.67) | 2,069 (14.33) | | 2,513 (86.12) | 405 (13.88) | |
| *NeSA Math Performance* | | | | | | | |
| Did Not Take | Pilot | 22 (28.95) | 54 (71.05) | 20.73[a]* | 22 (28.95) | 54 (71.05) | 5.51[a]* |
| | Non-Pilot | 451 (11.75) | 3,386 (88.25) | | 10 (13.33) | 65 (86.67) | |
| Below Standards | Pilot | 2,143 (51.24) | 2,039 (48.76) | 6.87[a]* | 2,143 (51.24) | 2,039 (48.76) | 7.82[a]* |
| | Non-Pilot | 10,497 (49.03) | 10,913 (50.97) | | 1,997 (48.18) | 2,148 (51.82) | |
| Meets Standards | Pilot | 2,688 (76.23) | 838 (23.77) | 7.49[a]* | 2,688 (76.23) | 838 (23.77) | 5.25[a]* |
| | Non-Pilot | 14,320 (78.32) | 3,964 (21.68) | | 2,721 (78.53) | 744 (21.47) | |
| Exceeds Standards | Pilot | 2,313 (89.20) | 280 (10.80) | 2.44[a] | 2,313 (89.20) | 280 (10.80) | 2.49[a] |
| | Non-Pilot | 11,224 (88.12) | 1,513 (11.88) | | 2,364 (87.82) | 328 (12.18) | |

| | | Full Sample | | | Matched Sample | | |
|---|---|---|---|---|---|---|---|
| **N (%)** | | College-Going | Not College-Going | Test Statistic | College-Going | Not College-Going | Test Statistic |
| *NeSA Science Performance* | | | | | | | |
| Did Not Take | Pilot | 25 (31.25) | 55 (68.75) | 27.17[a]* | 25 (31.25) | 55 (68.75) | 8.00[a]* |
| | Non-Pilot | 459 (11.91) | 3,395 (88.09) | | 10 (12.66) | 69 (87.34) | |
| Below Standards | Pilot | 1,517 (50.13) | 1,509 (49.87) | 17.41[a]* | 1,517 (50.13) | 1,509 (49.87) | 11.06[a]* |
| | Non-Pilot | 6,646 (45.97) | 7,811 (54.03) | | 1,384 (45.86) | 1,634 (54.14) | |
| Meets Standards | Pilot | 4,299 (74.71) | 1,455 (25.29) | 1.58[a] | 4,299 (74.71) | 1,455 (25.29) | 3.76[a]* |
| | Non-Pilot | 23,129 (75.49) | 7,509 (24.51) | | 4,390 (76.27) | 1,366 (23.73) | |
| Exceeds Standards | Pilot | 1,325 (87.34) | 192 (12.66) | 3.50[a] | 1,325 (87.34) | 192 (12.66) | 1.51[a] |
| | Non-Pilot | 6,258 (85.50) | 1,061 (14.50) | | 1,308 (85.83) | 216 (14.17) | |
| Average Attendance Rate | Pilot | 94.99 | 90.71 | 26.38[b]* | 94.99 | 90.71 | 26.38[b]* |
| | Non-Pilot | 94.90 | 88.82 | 66.20[b]* | 95.33 | 90.74 | 27.90[b]* |

*$p < 0.05$
**Note.** a = Chi-square value, b = t-value

**Table 8.** Difference in college-going between those in the Pilot and those not in the Pilot.

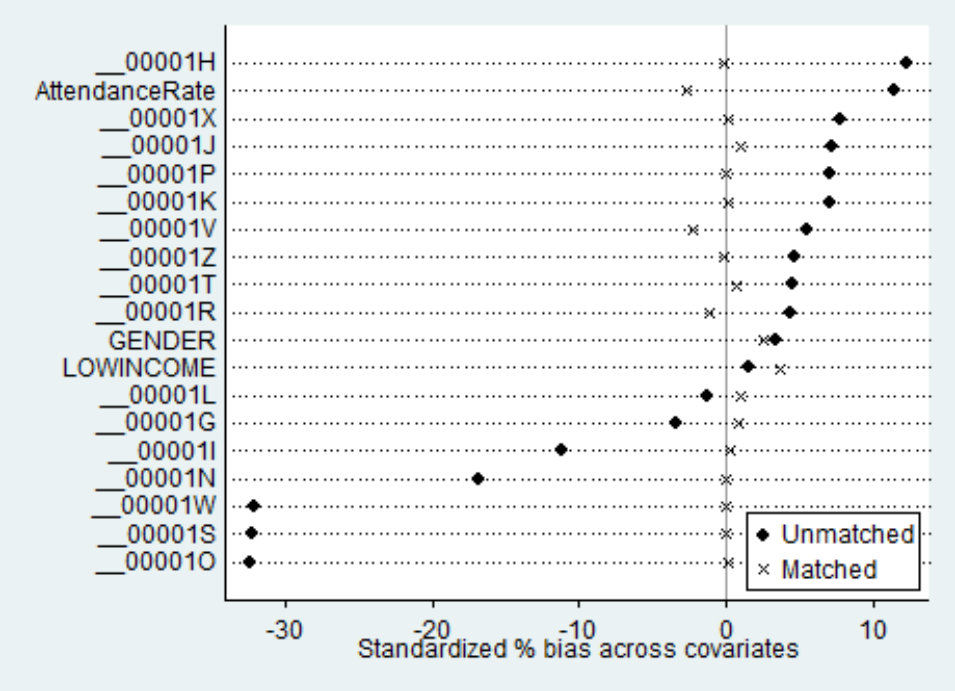
| Sample | N | Difference in College-Going (%) |
|---|---|---|
| Full Sample | 66,645 | 4.20 |
| Matched Sample | 20,754 | 0.71 |

**Table 9.** Fit statistics for the logistic regression models predicting college-going.

| | Full Sample | | Matched Sample | |
|---|---|---|---|---|
| **Fit Statistic** | Simple Model | Complete Model | Simple Model | Complete Model |
| Likelihood Ratio | 20011.36* | | 4949.01* | |
| Area under ROC curve# | 0.512 | 0.813 | 0.504 | 0.789 |
| McFadden's $R^2$ # | 0.001 | 0.234 | 0.000 | 0.192 |
| AIC+ | 1.288 | 0.989 | 1.243 | 1.009 |
| BIC+ | -654411.114 | -673867.120 | -180489.975 | -184941.955 |

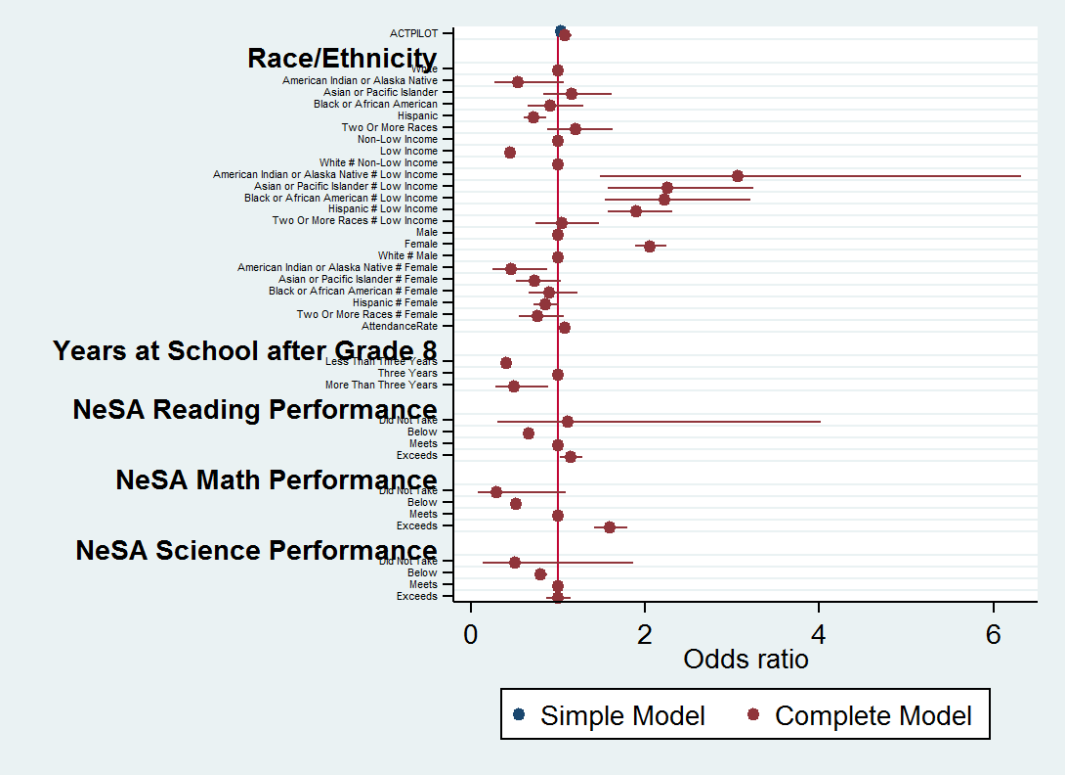
**Note.** * = The complete model fits better, # = Larger values indicate better fit, + = Smaller values indicate better fit

**Figure 3.** Quality of matching among the covariates.




**Note.** The unmatched sample refers to the full sample, prior to matching. The closer the marker is to 0%, the smaller the bias for each covariate group.

**Figure 4.** Odds ratios of college-going for the matched sample, with 95% confidence intervals.




**Note.** The value of 1 signifies equal odds of going on to college, i.e. the closer the odds ratio is to 1, the lesser the difference in the college-going odds between the 2 comparison groups.

**Figure 5.** The college-going log odds of each race/ethnicity subgroup, for each level of household income status.

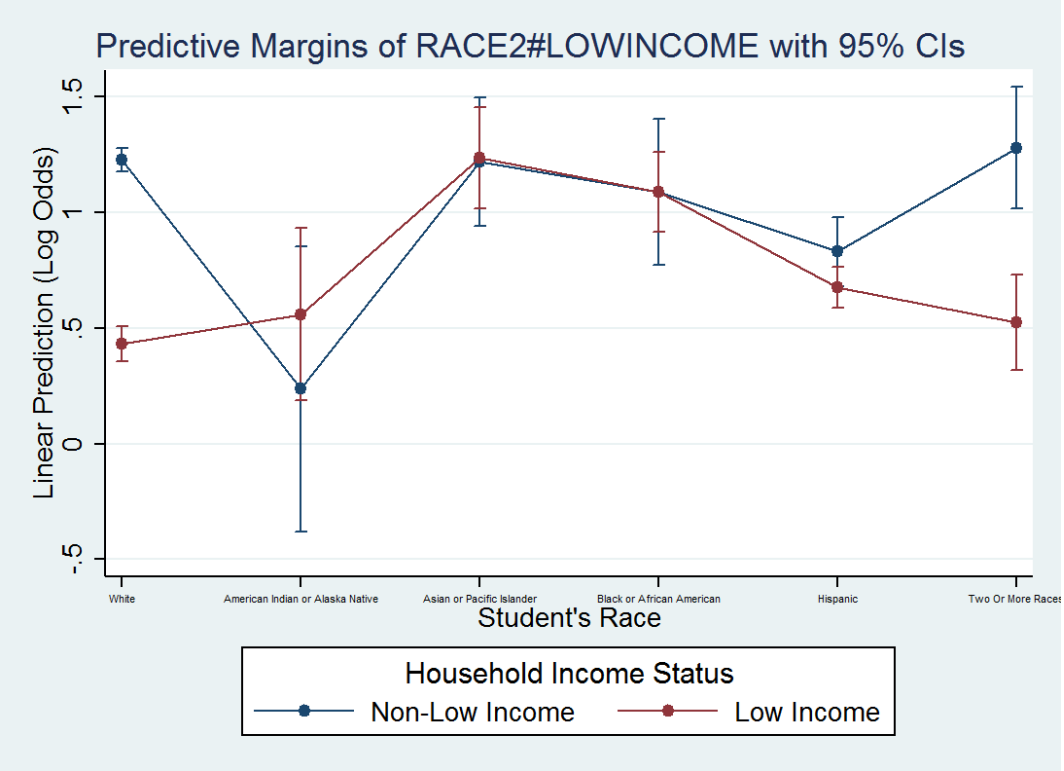
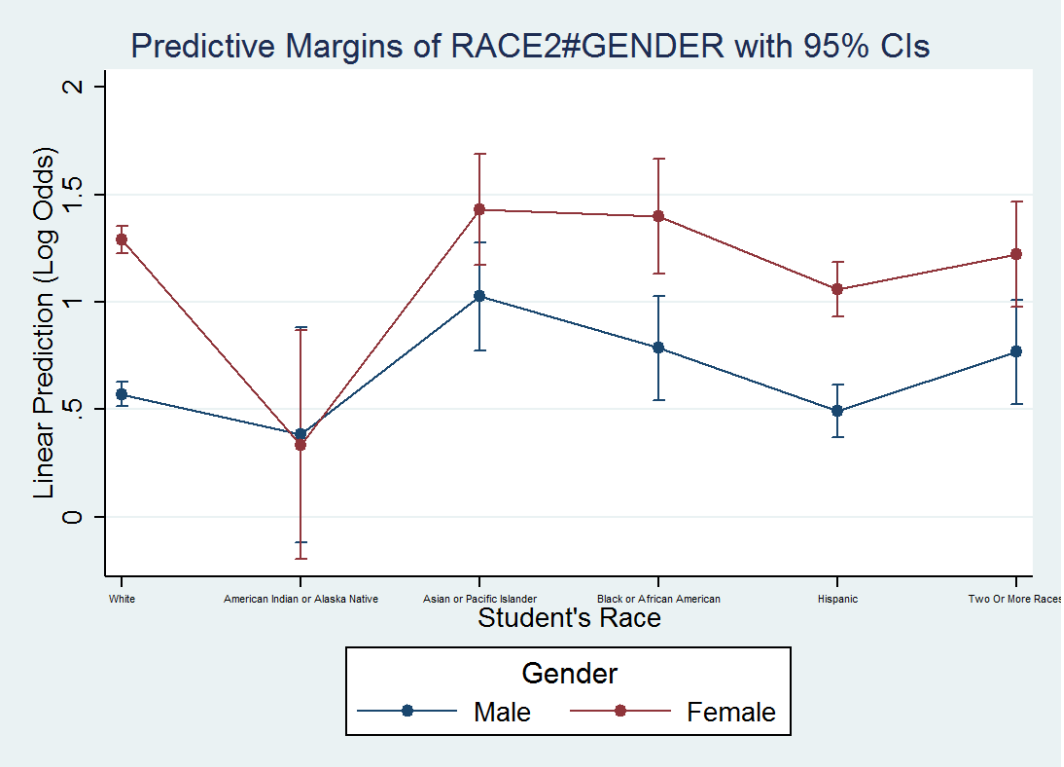



**Figure 6.** The college-going log odds of each race/ethnicity subgroup, for each gender.



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*Data for ACT Pilot Project*

NDE and NSC data requested from Max Reiner on 6/30/2016, received on 7/5/2016, final update received on 8/4/2016:

i) ALL 11th graders in 2011-12
ii) ALL 11th graders in 2012-13
iii) ALL 11th graders in 2013-14

| **Data from NSSRS** | **Data from NSC** |
|---|---|
| School Year | NDE Student ID |
| Grade Level (should be "11" for all) | First Name |
| NDE Student ID | Middle Initial |
| First Name | Last Name |
| Middle Initial | High School |
| Last Name | Record Found |
| District Name | College Name |
| District ID | College Code |
| School Name | College State |
| School ID | 2 or 4 Year (Type of College) |
| Birthdate | Public/Private |
| Year of Graduation | Enrollment Begin |
| Gender | Enrollment End |
| Race | Enrollment Status |
| Ethnicity | Graduated |
| Free and Reduced Lunch Status | Graduation Date |
| LEP Participation | Degree Title |
| LEP Duration | Degree Major 1 |
| Honors or Advanced Placement | College Sequence |
| High Ability Learner Participant | |
| Foreign Exchange Student | |
| Immigrant Indicator | |
| Special Ed | |
| Homeless | |
| Attendance Rate | |
| Residence Status | |
| Number of Years at Listed School since 9th Grade | |
| Number of Years at Any School Since 9th Grade | |
| Number of Years at Any School Since 1st Grade | |
| Transferred Out Before Graduation | |
| NeSA 11th Grade [Reading/Math/Science] Scale Score | |
| NeSA 11th Grade [Reading/Math/Science] Performance | |
| NeSA 8th Grade [Reading/Math/Science] Scale Score | |
| NeSA 8th Grade [Reading/Math/Science] Performance | |

ACT Pilot Project data requested from Duncan Hsu on 6/30/2016, received on 7/1/2016:

i) Pilot 11th graders in 2011-12
ii) Pilot 11th graders in 2012-13
iii) Pilot 11th graders in 2013-14

| **Data from ACT and NDE** |
|---|
| REPORTING_YEAR |
| NE_DEPT_ED_STUDENT_ID |
| NDE_NESA_DISTRICT_CODE |
| NDE_NESA_DISTRICT_NAME |
| NDE_NESA_SCHOOL_CODE |
| NDE_NESA_SCHOOL_NAME |
| ACT_SCHOOL_ID |
| ACT_DISTRICT_ID |
| ACT_NDE_MATCH_DISTRICT_CODE |
| ACT_NDE_MATCH_DISTRICT_NAME |
| ACT_NDE_MATCH_SCHOOL_CODE |
| ACT_NDE_MATCH_SCHOOL_NAME |
| NDE_STUDENT_LAST_NAME |
| NDE_STUDENT_FIRST_NAME |
| NDE_STUDENT_MID_INIT |
| GENDER |
| GRADE |
| ACT_STUDENT_LAST_NAME |
| ACT_STUDENT_FIRST_NAME |
| ACT_STUDENT_MID_INIT |
| BIRTH_DATE |
| ACT_YEAR_OF_GRADUATION |
| ACT_TEST_DATE_MM_YY |
| ACT_SCALE_SCORE_ENGLISH |
| ACT_SCALE_SCORE_READING |
| ACT_SCALE_SCORE_MATH |
| ACT_SCALE_SCORE_SCIENCE |
| ACT_SCALE_SCORE_COMPOSITE |
| ACT_SUM_SCALE_SCORES |
| NESA_SCALE_SCORE_READING |
| NESA_SCALE_SCORE_MATH |
| NESA_SCALE_SCORE_SCIENCE |
| RACE_ETHNIC_CODE |
| RACE_ETHNIC_CODE_LONG_DESC |
| FREE_AND_REDUCED_LUNCH |

| |
|---|
| STUDENT_REASON_NOT_TESTED |
| COMMENT |