
# An Evaluation of the Impact of Dual Credit and Dual Enrollment on College-Going in Nebraska

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**Abstract**
The focus of this study is to investigate the effects of enrolling for and earning dual credit on college-going behavior of Nebraska public high school students. Dual enrollment or being enrolled for dual credit is defined as the state when a student is enrolled in a course eligible for earning both high school and post-secondary credit, but may or may not necessarily earn it. Dual credit i.e. earning dual credit, on the other hand, is when a student is enrolled in a course eligible for earning both high school and post-secondary credit and earns it. This study utilizes statistical techniques such as propensity score matching and logistic regression to investigate the impact of dual enrollment and earning dual credit on college-going. Results indicate that enrolling for and earning dual credit significantly increase the odds of going on to college. Among other variables that are strong predictors of college-going, gender, enrollment in Advanced Placement (AP) classes, high ability learner status, and performance on the NeSA Math assessment stand out. Implications of this study's findings and suggestions for future research are discussed in the following report.

***Keywords**: College-going; Dual Credit; Dual Enrollment; NeSA; College and Career Ready; Assessment; Transitions; Earning dual credit; Enrolling for dual credit; Advanced Coursework; AP; Advanced Placement*

## Research Objectives

This study on the effects of being enrolled in a dual credit course and earning dual credit was motivated by research which found that high school students who take advanced coursework like dual credit and Advanced Placement (AP) show an increased proclivity to transition into post-secondary institutions or colleges (Barneet and Stamm, 2010). Various studies have shown the impact of dual credit coursework as an accelerated path on a number of student outcomes like graduation rate, college-going, and college graduation. For example, Hoffman, Vargas, and Santos (2009) provided evidence that college-level coursework at the high school-level better prepares students for college.

The present study examines the impact of dual enrollment and dual credit in the state of Nebraska. Nebraska schools offer dual credit and AP classes as a means of supporting high school students in taking advanced coursework. This study may help inform how taking dual credit classes influences college-going behavior. Moreover, this study may also support education policy-makers in formulating decisions related to advanced high school coursework. Finally, this study seeks to investigate the effectiveness of dual enrollment and dual credit as a catalyst for post-secondary matriculation.

This investigation includes two treatment conditions. These treatments are analyzed separately for the purposes of this study. The first condition represents a student being dually enrolled, henceforth referred to as *dual enrollment*. This condition implies that a student was enrolled in a course which was eligible for dual credit, but may or may not successfully earn any dual credit. The second condition is *dual credit*. This condition implies that a student successfully earned both high school and post-secondary credit for their efforts in a particular course. Both of these treatment conditions, along with other variables of interest, are assessed to determine their impact on college-going.

Thus, the main objective of this study is **to investigate the impact of dual enrollment and dual credit on college-going for Nebraska high school students**. This investigation utilizes statistical modeling techniques to account for possible differences between students who receive treatment (dual enrollment or dual credit) and students who do not receive treatment. These differences, arising out of a lack of randomization, need to be addressed as they may otherwise confound findings on the college-going outcome.

**Background and Justification**

There exists an extensive body of research evaluating the impact of dual credit or dual enrollment on measures of post-secondary education like college success, persistence, graduation, and retention. This section highlights some of the key research findings related to and informing this study.

Bailey, Hughes, Karp, and Mechur (2002) discovered that dual enrollment courses allowed high school students to gain exposure to college-level courses, both practically and vocationally, which, in turn, helped prepare them for college. Similarly, Eimers and Mullen (2003) explored whether dual credit and AP courses helped prepare students for success in college or not. They explored specific relationships like the performance of dual credit students versus AP students and non-dual credit students, respectively. Student performance was measured in terms of college performance and the likelihood of the students' returning for the second year of college. Results indicated no significant differences in college performance between students earning dual credit and those with no dual credit. A comparison between dual credit students and AP students was also found to show the same results. However, earning dual credit hours was positively correlated with the likelihood of returning to college for the second year of study.

McCauley (2007) conducted a study to examine the impact of dual credit and AP courses on college graduation. Specifically, the study examined whether there was a higher likelihood for students taking dual credit and AP courses to graduate from a four-year college or university within six years. Results indicated that students who were enrolled in dual credit or AP courses were highly motivated and had a greater mental aptitude than their peers.

Household income also plays a big role in students going on to college. Acemoglu and Pischke (2001) found that an increase in family income helps in increasing the likelihood of students attending a four-year college. Regarding the effect of dual enrollment on students' success in college, Allen and Dadgar (2012) found that participation in dual credit classes significantly increased the first semester college GPA of students.

As highlighted above, many studies have focused on the college performance of dual credit students. Moreover, the existing literature often does not seek to differentiate between simply *enrolling* in a course eligible for dual credit and actually *earning* dual credit. Therefore, this study assesses the impact of both conditions (dual credit and dual enrollment) on college-going behavior. It should also be noted that students who enroll for and go on to earn dual credit do so by a method of self-selection.

## Research Design and Methods

*Sample*

This quasi-experimental study uses student-level data for all 11th and 12th graders in Nebraska public high schools from the 2012-2013 school year. Specific data elements collected include dual enrollment and dual credit information, student demographics, and college enrollment records. These data are drawn from two distinct sources:

1) The Nebraska Student and Staff Record System (NSSRS) at the Nebraska Department of Education (NDE), and
2) 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.

*Dependent Measure*

The main goal of the study is to investigate the impact of 1) dual enrollment and 2) dual credit on college-going. Thus, the dependent variable or outcome of the study is whether the high school student goes on to college or not. This measure is obtained from the NSC; i.e., a student is recorded as college-going only if a record is found in the NSC data set.

*Treatment Condition*

The two treatment conditions for this study are dual enrollment and dual credit. This study first discusses the effects of *dual enrollment* on college-going, followed by the effects of *dual credit* on college-going. Table 1 presents the number of students in each treatment condition.

**Table 1.** Treatment condition for all 11th and 12th graders in the study.

| Treatment Condition | N | % |
|---|---|---|
| Dual Enrollment | | |
| Dually Enrolled | 5,886 | 30.36 |
| Not Dually Enrolled | 13,499 | 69.64 |
| Total | 19,385 | 100.00 |
| | | |
| Dual Credit | | |
| Earned Dual Credit | 3,666 | 18.91 |
| Did Not Earn Dual Credit | 15,719 | 81.09 |
| Total | 19,385 | 100.00 |

*Covariates*

A total of 17 variables are considered as covariates of interest in this study. The student's gender, race or ethnicity, and household income are chosen as key demographic characteristics due to their availability and extensive use in education research.

For gender, male students are coded 0, and female students are coded 1. There are six racial categories and they are coded as: Whites as 1, Hispanics as 2, Blacks as 3, Asians or Pacific Islanders as 4, Native Americans as 5, and students with multiple races as 6. Students' household income status is included by means of a proxy variable that is their Free and Reduced Lunch status. These

variables are included due to prior research which show differences between or among such subgroups with regards to various academic outcomes (Clinciu, 2010; Lacour & Tissington, 2011).

Other demographic characteristics considered for this study are the student's status as a single parent, immigrant status, special education status, attendance rate, homeless status, and limited English proficiency status. The student's attendance rate is calculated as a combined attendance rate based on the number of days a student was present in both grades 11 and 12. These variables are included in the study due to their relationship to college going. Previous research indicates that students who are single parents, homeless, possessing limited proficiency in English or first generation immigrants face significant barriers and impediments to college-going and sometimes may continue to face challenges even when they succeed in getting in to college (Nellum & Davis, 2014; Hsaio, 1992; Hallett, 2010; Kanno & Cromley, 2012).

Besides the covariates mentioned above, the student's status as a gifted participant, which indicates their status as a "High Ability Learner", and their status as an AP student, are also considered. Santoli (2002) pointed out that AP courses helped better prepare students for college.

The final set of covariates included in this study is the students' performance on the three Nebraska State Accountability (NeSA) assessment subjects: Math, Science, and Reading. These variables are selected based on findings about how student aptitude and motivation correlate positively with college achievement (Hossler & Stage, 1992; McCann, Minsky, & Roberts, 2008).

Table 2 shows the number of students who are and are not enrolled in dual credit courses, and those who did and did not earn dual credit, disaggregated by different demographic subgroups.

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

| | **Enrolled in Dual Credit Course** | **Not Enrolled in Dual Credit Course** | **N (%) Earned Dual Credit** | **Did Not Earn Dual Credit** | **Total** |
|---|---|---|---|---|---|
| *Gender* | | | | | |
| Male | 2,739 (46.53) | 7,044 (52.18) | 1,608 (43.86) | 8,175 (52.01) | 9,783 (50.47) |
| Female | 3,147 (53.47) | 6,455 (47.82) | 2,058 (56.14) | 7,544 (47.99) | 9,602 (49.53) |
| *Race/Ethnicity* | | | | | |
| American Indian or Alaska Native | 51 (0.87) | 127 (0.94) | 27 (0.74) | 151 (0.96) | 178 (0.92) |
| Asian or Pacific Islander | 79 (1.34) | 318 (2.36) | 46 (1.25) | 351 (2.23) | 397 (2.05) |
| Black or African American | 274 (4.66) | 781 (5.79) | 88 (2.40) | 967 (6.15) | 1,055 (5.44) |
| Hispanic | 639 (10.86) | 1,803 (13.36) | 396 (10.80) | 2,046 (13.02) | 2,442 (12.60) |
| Two or More Races | 170 (2.89) | 342 (2.53) | 82 (2.24) | 430 (2.74) | 512 (2.64) |
| White | 4,673 (79.39) | 10,128 (75.03) | 3,027 (82.57) | 11,774 (74.90) | 14,801 (76.35) |
| *Household Income Status* | | | | | |
| Low Income | 1,698 (28.85) | 4,671 (34.60) | 936 (25.53) | 5,433 (34.56) | 6,369 (32.86) |
| Non-Low Income | 4,188 (71.15) | 8,828 (65.40) | 2,730 (74.47) | 10,286 (65.44) | 13,016 (67.14) |

| | Enrolled in Dual Credit Course | Not Enrolled in Dual Credit Course | N (%) Earned Dual Credit | Did Not Earn Dual Credit | Total |
|---|---|---|---|---|---|
| *Student Status as Parent* | | | | | |
| Single Parent | 42 (0.71) | 192 (1.42) | 25 (0.68) | 209 (1.33) | 234 (1.21) |
| Not Single Parent | 5,844 (99.29) | 13,307 (98.58) | 3,641 (99.32) | 15,510 (98.67) | 19,151 (98.79) |
| *Special Education Status* | | | | | |
| Special Education | 401 (6.81) | 1,787 (13.24) | 196 (5.35) | 1,992 (12.67) | 2,188 (11.29) |
| Not Special Education | 5,485 (93.19) | 11,712 (86.76) | 3,470 (94.65) | 13,727 (87.33) | 17,197 (88.71) |
| *Learning Ability* | | | | | |
| High Ability | 1,149 (19.52) | 2,359 (17.48) | 874 (23.84) | 2,634 (16.76) | 3,508 (18.10) |
| Not High Ability | 4,737 (80.48) | 11,140 (82.52) | 2,792 (76.16) | 13,085 (83.24) | 15,877 (81.90) |
| *Advanced Placement (AP) Enrollment Status* | | | | | |
| AP Enrolled | 1,906 (32.38) | 2,926 (21.68) | 1,152 (31.42) | 3,680 (23.41) | 4,832 (24.93) |
| Not AP Enrolled | 3,980 (67.62) | 10,573 (78.32) | 2,514 (68.58) | 12,039 (76.59) | 14,553 (75.07) |
| *NeSA Math Performance* | | | | | |
| Below Standards | 1,659 (28.19) | 6,275 (46.48) | 799 (21.79) | 7,135 (45.39) | 7,934 (40.93) |
| Meets Standards | 2,401 (40.79) | 4,659 (34.51) | 1,561 (42.58) | 5,499 (34.98) | 7,060 (36.42) |
| Exceeds Standards | 1,826 (31.02) | 2,565 (19.00) | 1,306 (35.62) | 3,085 (19.63) | 4,391 (22.65) |
| *NeSA Science Performance* | | | | | |
| Below Standards | 1,215 (20.64) | 4,569 (33.85) | 583 (15.90) | 5,201 (33.09) | 5,784 (29.84) |
| Meets Standards | 3,653 (62.06) | 7,194 (53.29) | 2,351 (64.13) | 8,496 (54.05) | 10,847 (55.96) |
| Exceeds Standards | 1,018 (17.30) | 1,736 (12.86) | 732 (19.97) | 2,022 (12.86) | 2,754 (14.21) |
| *NeSA Reading Performance* | | | | | |
| Below Standards | 1,252 (21.27) | 4,978 (36.88) | 629 (17.16) | 5,601 (35.63) | 6,230 (32.14) |
| Meets Standards | 2,587 (43.95) | 5,348 (39.62) | 1,618 (44.14) | 6,317 (40.19) | 7,935 (40.93) |
| Exceeds Standards | 2,047 (34.78) | 3,173 (23.51) | 1,419 (38.71) | 3,801 (24.18) | 5,220 (26.93) |

*Analytic Approach*

The analytic approach for this study accounts for the fact that the data used in this study is observational in nature. In other words, students are not randomly assigned to receive the treatment of dual enrollment or dual credit. The lack of random assignment into treatment conditions may mean that differences between students who receive treatment (i.e., those enrolled for dual credit or those who earn dual credit) and students who do not receive treatment (i.e., those not enrolled for dual credit or those who do not earn dual credit) can potentially play a causal role in explaining the college-going outcome.

In order to accurately assess the causal effects of dual enrollment and dual credit on college-going, a method called propensity score matching (PSM) is used. PSM (Rosenbaum & Rubin, 1983) is a two-step statistical technique which attempts to remove systematic differences between the treatment and the control groups. Thus, with PSM, the treatment group is compared to a control group that is as similar as possible on all specified covariates like gender, race, and more.

Generally, propensity score matching is conducted in two steps. In the first step, the probability or propensity of a student being in the treatment group is estimated using selected variables or covariates related to the treatment and the outcome. The second step involves matching students in the control group to their counterparts in the treatment group based on similar propensity scores.

In the current study, PSM is employed in the following manner. First, tests of differences and simple logistic regression models are run to investigate the relationship between dual enrollment or dual credit and college-going. This is done for the full sample of 11th and 12th graders from the 2012-2013 school year under investigation in this study. Second, a multiple logistic regression model using all covariates is created. Third, PSM is executed to estimate the propensity scores of all 11th and 12th graders based on the selected covariates. The matching method used here is one-to-one nearest neighbor without replacement. Once the matched sample is created, tests of differences and logistic regression analyses are repeated to determine the effect of dual enrollment or dual credit on college-going.

**Results: Dual Enrollment as Treatment Condition**

The propensity score matching method helped remove any prior differences among student subgroups that could potentially explain the college-going outcome. For example, in the full sample, a significantly greater percentage of Asian students enrolled in dual credit courses go on to college (90.80%) as compared to those not enrolled in dual credit courses (80.34%) ($\chi^2(1) = 5.2805, p = 0.022$). After matching, the proportion of dually enrolled Asian students who go on to college (96.20%) is no longer significantly different from those who are not enrolled for dual credit (90.28%) ($\chi^2(1) = 2.1382, p = 0.144$). A similar example is also found for high ability learners. Although a significant difference is seen in college-going between dually enrolled high ability learners (94.55%) ($\chi^2(1) = 7.2793, p = 0.007$) and non-dually enrolled high ability learners (92.06%), this difference ceases to exist in the matched sample ($\chi^2(1) = 0.2737, p = 0.601$). The quality of the matching procedure is also visually depicted in Figure 3, found in the Appendix.

Table 3 depicts the sample sizes of students before and after matching on propensity scores for those who are enrolled in dual credit courses and those who are not. The new matched sample created using the PSM process now has an equal number of students in both conditions. Students who are not dually enrolled in the matched sample represent the counterfactual of those who are dually enrolled; i.e., what the college outcome would have been if those who are dually enrolled are not dually enrolled.

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

| Sample | N (%) | | |
|---|---|---|---|
| | **Dually Enrolled** | **Not Dually Enrolled** | **Total** |
| Full Sample (before matching) | 5,886 (30.36) | 13,499 (69.64) | 19,385 (100.00) |
| Matched Sample (after matching) | 5,882 (50.00) | 5,882 (50.00) | 11,764 (100.00) |

**Note.** Four observations in the Dually Enrolled condition was dropped due to a lack of common region support in the propensity scores.

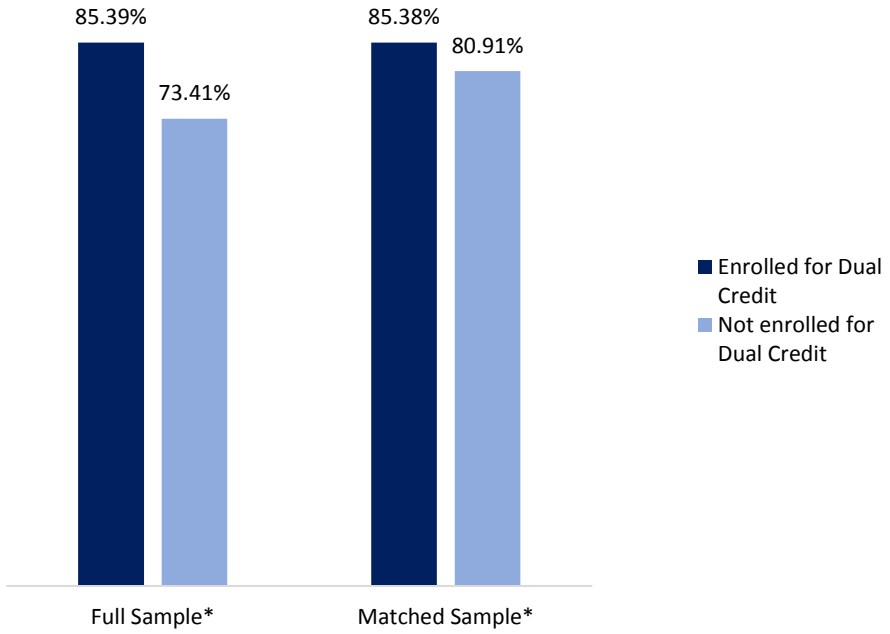
Table 4 reveals that approximately 85% of dually enrolled students eventually go on to college in both the full and matched samples. It can also be visually seen in Figure 1 that there is a significant difference in college-going between dually enrolled and non-dually enrolled students for both the full and matched samples. However, careful inspection shows that although there are significant differences in both samples (full and matched), the differences between the groups in the matched sample is smaller. A greater percentage of students not enrolled for dual credit in the matched sample (80.91%) go on to college as compared to those in the full sample (73.41%). Nonetheless, even after matching on propensity scores to ensure that dually enrolled students are being compared to non-dually enrolled students who are as similar as possible, a significant college-going difference is still observed. This lends to the notion that being dually enrolled might play an important and positive role in college-going for students.

**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* | | | | | | |
| Dually Enrolled | 5,026 (85.39) | 860 (14.61) | 332.81[(a)]* | 5,022 (85.38) | 860 (14.62) | 41.95[(a)]* |
| Not Dually Enrolled | 9,909 (73.41) | 3,590 (26.59) | | 4,759 (80.91) | 1,123 (19.09) | |

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

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




*$p < 0.05$

After investigating differences in college-going based on the dual enrollment treatment condition, logistic regression models are built to determine which variables strongly predict college-going for the public high school students included in the study.

First, a simple logistic regression model is built to investigate the effect of being dually enrolled on college-going. Second, the model is further developed to include all 17 predictors to assess their potential impact on college-going. This latter model is referred to as the complete model. The complete model is developed to include all student characteristics which could potentially interact with both the treatment and the outcome. The simple and complete models are built for both the full and matched samples, as 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* | | | | | |
| Dual Enrollment | 2.12* | 0.09 | [1.95, 2.30] | -10266.40 [354.26 (0.00)] | 19,385 |
| Constant | 2.76 | 0.05 | | | |
| *Complete Model* | | | | | |
| Dual Enrollment | 1.44* | 0.07 | [1.31, 1.57] | -8670.29 [3546.49 (0.00)] | 19,385 |
| Female (Male) | 1.83* | 0.09 | [1.67, 2.01] | | |
| Race/Ethnicity (White) | | | | | |

| Independent Variable | Odds Ratio | SE | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ ($p$)] | N |
|---|---|---|---|---|---|
| American Indian or Alaska Native | 0.50* | 0.15 | [0.28, 0.88] | | |
| Asian or Pacific Islander | 0.95 | 0.24 | [0.58, 1.55] | | |
| Black or African American | 1.20 | 0.20 | [0.86, 1.67] | | |
| Hispanic | 0.72* | 0.07 | [0.58, 0.88] | | |
| Two or More Races | 0.77 | 0.16 | [0.52, 1.15] | | |
| Low Income (Non-Low Income) | 0.50* | 0.02 | [0.46, 0.55] | | |
| Single Parent (Not Single Parent) | 0.76 | 0.11 | [0.57, 1.02] | | |
| Special Education (Not SPED) | 0.45* | 0.02 | [0.40, 0.50] | | |
| High Ability (Not High Ability) | 1.65* | 0.13 | [1.41, 1.93] | | |
| AP Enrolled (Not AP Enrolled) | 1.97* | 0.12 | [1.75, 2.22] | | |
| Attendance Rate | 1.06* | 0.00 | [1.05, 1.07] | | |
| NeSA Math (Meets Standards) | | | | | |
| Below Standards | 0.60* | 0.03 | [0.54, 0.66] | | |
| Exceeds Standards | 1.38* | 0.10 | [1.19, 1.60] | | |
| NeSA Science (Meets Standards) | | | | | |
| Below Standards | 0.90* | 0.05 | [0.81, 1.00] | | |
| Exceeds Standards | 0.81* | 0.07 | [0.69, 0.96] | | |
| NeSA Reading (Meets Standards) | | | | | |
| Below Standards | 0.81* | 0.04 | [0.73, 0.89] | | |
| Exceeds Standards | 1.17* | 0.08 | [1.03, 1.33] | | |
| Race/Ethnicity × Income (White × Non-Low Income)# | | | | | |
| American Indian or Alaska Native × Low Income | 3.32* | 1.14 | [1.70, 6.49] | | |
| Asian or Pacific Islander × Low Income | 3.46* | 1.05 | [1.91, 6.27] | | |
| Black or African American × Low Income | 1.67* | 0.30 | [1.17, 2.38] | | |
| Hispanic × Low Income | 1.79* | 0.21 | [1.42, 2.24] | | |
| Two or More Races × Low Income | 1.99* | 0.46 | [1.27, 3.13] | | |
| Race/Ethnicity × Gender (White × Male)# | | | | | |
| American Indian or Alaska Native × Female | 0.46* | 0.16 | [0.24, 0.90] | | |
| Asian or Pacific Islander × Female | 0.74 | 0.23 | [0.41, 1.35] | | |
| Black or African American × Female | 0.72* | 0.11 | [0.53, 0.97] | | |
| Hispanic × Female | 0.79* | 0.08 | [0.65, 0.97] | | |
| Two or More Races × Female | 0.93 | 0.21 | [0.60, 1.44] | | |
| Constant | 0.02 | 0.01 | | | |

*$p < 0.05$

**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 of the simple model indicate that the odds of going on to college is 2.12 times greater for high school students enrolled for dual credit as compared to those who are not. However, once the other covariates are controlled for in the complete model, the college-going odds for those enrolled for dual credit is 1.44 times greater than those who are not.

From the complete model, results indicate that females have greater odds, as compared to males, of going on to college (odds ratio=1.83, $p$=0.00). Hispanics and Native Americans have significantly lower odds (odds ratio=0.72, $p$=0.00 and 0.50, $p$=0.02) of going on to college as compared to Whites. Furthermore, students from lower income households have significantly lower odds of going on to college (odds ratio=0.50, $p$=0.00) as compared to those who are not from lower income households.

In consideration of other student characteristics, special education students have lower odds of going on to college as compared to those who are not special education students (odds ratio=0.45, $p$=0.00*)*. High ability learners have greater odds (odds ratio=1.65, $p$=0.00) of going on to college as compared to those who are not. Moreover, being enrolled in AP classes show greater college-going odds (odds ratio=1.97, $p$=0.00) as compared to those who are not enrolled for AP classes.

In terms of the NeSA Math and Reading subjects, students who exceed standards have significantly greater odds (NeSA Math odds ratio= 1.38, $p$-value = 0.00 and NeSA Reading odds ratio = 1.17, $p$-value = 0.01) of going on to college as compared to those who only meet standards.

To summarize, students from disadvantaged backgrounds appear to have smaller odds of going on to college than students from more advantaged backgrounds. Additionally, students who participate in advanced coursework and exceed standards on NeSA have higher odds of going on to college.

**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* | | | | | |
| Dual Enrollment | 1.38* | 0.07 | [1.25, 1.52] | -5315.17 [42.06 (0.00)] | 11,764 |
| Constant | 4.24 | 0.14 | | | |
| *Complete Model* | | | | | |
| Dual Enrollment | 1.43* | 0.08 | [1.29, 1.59] | -4479.57 [1713.25 (0.00)] | 11,764 |
| Female (Male) | 1.92* | 0.12 | [1.69, 2.18] | | |
| Race/Ethnicity (White) | | | | | |
| American Indian or Alaska Native | 0.56 | 0.26 | [0.22, 1.41] | | |
| Asian or Pacific Islander | 2.38 | 1.44 | [0.73, 7.79] | | |
| Black or African American | 1.19 | 0.28 | [0.75, 1.91] | | |
| Hispanic | 0.67* | 0.11 | [0.49, 0.93] | | |
| Two or More Races | 0.89 | 0.23 | [0.54, 1.48] | | |
| Low Income (Non-Low Income) | 0.50* | 0.03 | [0.43, 0.57] | | |
| Single Parent (Not Single Parent) | 0.53* | 0.13 | [0.33, 0.87] | | |
| Special Education (Not SPED) | 0.40* | 0.03 | [0.34, 0.48] | | |
| High Ability (Not High Ability) | 1.64* | 0.17 | [1.34, 2.02] | | |
| AP Enrolled (Not AP Enrolled) | 1.87* | 0.14 | [1.62, 2.16] | | |
| Attendance Rate | 1.07* | 0.01 | [1.06, 1.08] | | |
| NeSA Math (Meets Standards) | | | | | |
| Below Standards | 0.65* | 0.05 | [0.56, 0.75] | | |
| Exceeds Standards | 1.46* | 0.13 | [1.23, 1.74] | | |
| NeSA Science (Meets Standards) | | | | | |
| Below Standards | 0.90 | 0.07 | [0.77, 1.05] | | |
| Exceeds Standards | 0.83 | 0.09 | [0.68, 1.02] | | |
| NeSA Reading (Meets Standards) | | | | | |
| Below Standards | 0.76* | 0.06 | [0.65, 0.88] | | |
| Exceeds Standards | 1.15 | 0.09 | [0.98, 1.35] | | |
| Race/Ethnicity × Income (White × Non-Low Income)# | | | | | |
| American Indian or Alaska Native × Low Income | 3.26* | 1.60 | [1.25, 8.52] | | |
| Asian or Pacific Islander × Low Income | 3.77 | 2.64 | [0.95, 14.90] | | |
| Black or African American × Low Income | 1.40 | 0.36 | [0.85, 2.31] | | |
| Hispanic × Low Income | 2.08* | 0.36 | [1.48, 2.92] | | |
| Two or More Races × Low Income | 1.36 | 0.44 | [0.72, 2.57] | | |
| Race/Ethnicity × Gender (White × Male)# | | | | | |

| Independent Variable | Odds Ratio | SE+ | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ (*p*)] | N |
|---|---|---|---|---|---|
| American Indian or Alaska Native × Female | 0.29* | 0.13 | [0.12, 0.70] | | |
| Asian or Pacific Islander × Female | 0.37 | 0.25 | [0.09, 1.43] | | |
| Black or African American × Female | 0.62* | 0.14 | [0.40, 0.97] | | |
| Hispanic × Female | 0.76 | 0.12 | [0.56, 1.03] | | |
| Two or More Races × Female | 1.16 | 0.38 | [0.61, 2.21] | | |
| 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.

Model results for the matched sample indicate that the odds of college going is 1.38 times greater for high school students enrolled in dual credit courses as compared to those who are not (*p*-value=0.00). However, once the covariates are considered in the complete model, the odds of college-going for students enrolled for dual credit is 1.43 times greater than those who are not enrolled for dual credit (*p*-value=0.00). The increase in college-going odds after controlling for the impact of the covariates reveals that dual enrollment has a strong and positive effect on college-going.

Looking across demographic characteristics, for gender (odds ratio=1.92, *p*-value=0.00), race (Hispanics, odds ratio=0.67, *p*-value=0.01) and household income status (odds ratio=0.50, *p*-value=0.00), the effects on college-going odds closely follow those found for the full sample. Similarly, special education students have lower odds of going on to college as compared to those who are not special education students (odds ratio=0.40, *p*-value=0.00). Besides that, single parent students have lower odds of going on to college (odds ratio=0.53, *p*-value=0.01) as compared to those who are not.

Across program participation and academic ability, high ability learners have greater odds (odds ratio= 1.64, *p*-value=0.00) of going on to college as compared to those who are not. Similarly, being enrolled in AP classes reflects greater college-going odds (odds ratio= 1.87, *p*-value=0.00) as compared to those who are not enrolled for AP classes. In terms of NeSA Math, students who exceed standards, as compared to those who meet standards, exhibit significantly greater odds of going on to college (odds ratio= 1.46, *p*-value= 0.00). These results for the matched sample are also visually depicted in Figure 2.

**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.

**Results: Dual Credit as Treatment Condition**

This section presents the college-going results observed with dual credit as the treatment condition. Similar to that found in the previous section, the propensity score matching method helped remove any prior differences among student subgroups that could potentially explain the college-going outcome. For example, in the full sample, a significantly larger percentage of Asian students (97.83%) earning dual credit go on to college as compared to those who did not earn dual credit (82.91%) ($\chi^2(1) = 6.9619, p = 0.008$). After matching, the proportion of college-going Asian students who earned dual credit (97.83%) is no longer significantly different from those who did not earn dual credit (93.62%) ($\chi^2(1) = 1.0006, p = 0.317$). The quality of the matching procedure is visually depicted in Figure 3a, found in the Appendix.

Table 3a shows the sample sizes of students before and after matching on propensity scores for those who earned dual credit and those who did not. The new matched sample created using the PSM process now has an equal number of students in both conditions. Students who did not earn dual credit in the matched sample represent the counterfactual of those who earned dual credit.

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

| Sample | N (%) | | |
|---|---|---|---|
| | Earned Dual Credit | Did Not Earn Dual Credit | Total |
| Full Sample (before matching) | 3,666 (18.91) | 15,719 (81.09) | 19,385 (100.00) |
| Matched Sample (after matching) | 3,666 (50.00) | 3,666 (50.00) | 7,332 (100.00) |

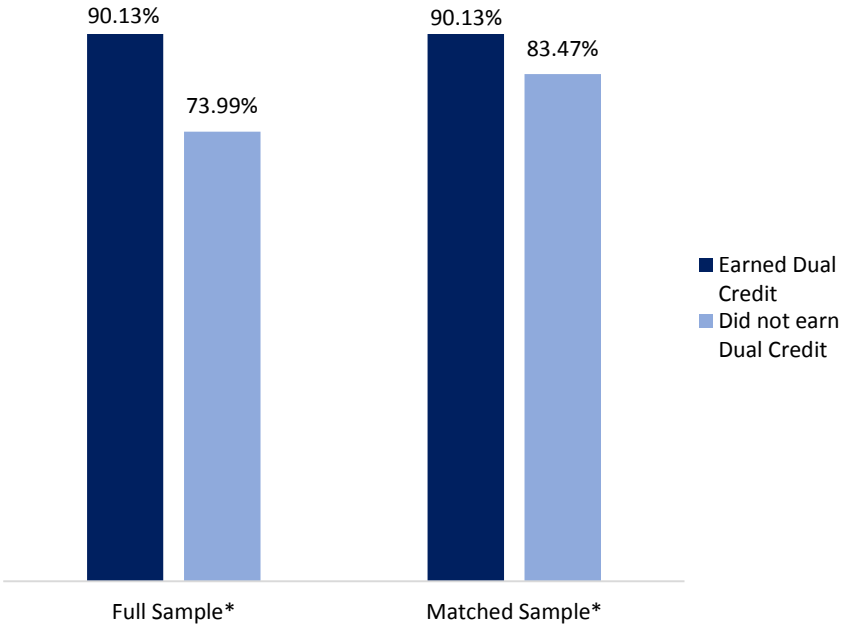
Table 4a reveals that 90.13% of students who earned dual credit go on to college. This is true for both the full and matched samples. It is also seen in Figure 1a that in both the full and matched samples, there is a statistically significant difference in college-going between students who earned dual credit and those who did not. However, this difference is reduced in the matched sample. Nonetheless, even after propensity score matching, significant college-going differences remain. This implies that earning dual credit should be an important consideration with respect to improved college-going for students.

**Table 4a.** 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* | | | | | | |
| Dual Credit | | | | | | |
| Earned Dual Credit | 3,304 (90.13) | 362 (9.87) | 437.43[(a)]* | 3,304 (90.13) | 362 (9.87) | 70.86[(a)]* |
| Did Not Earn Dual Credit | 11,631 (73.99) | 4,088 (26.01) | | 3,060 (83.47) | 606 (16.53) | |

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

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




*$p < 0.05$

The simple and complete models built for both the full and matched samples are presented in Table 5a and Table 6a, respectively.

**Table 5a.** 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* | | | | | |
| Dual Credit | 3.21* | 0.19 | [2.86, 3.60] | -10190.61 [505.85 (0.00)] | 19,385 |
| Constant | 2.85 | 0.05 | | | |
| *Complete Model* | | | | | |
| Dual Credit | 1.96* | 0.12 | [1.74, 2.22] | -8630.17 [3626.71 (0.00)] | 19,385 |
| Female (Male) | 1.81* | 0.09 | [1.65, 1.99] | | |
| Race/Ethnicity (White) | | | | | |
| American Indian or Alaska Native | 0.48* | 0.14 | [0.27, 0.85] | | |
| Asian or Pacific Islander | 0.98 | 0.25 | [0.60, 1.60] | | |
| Black or African American | 1.25 | 0.21 | [0.90, 1.73] | | |
| Hispanic | 0.72* | 0.07 | [0.59, 0.88] | | |
| Two or More Races | 0.80 | 0.16 | [0.54, 1.19] | | |
| Low Income (Non-Low Income) | 0.51* | 0.02 | [0.46, 0.56] | | |
| Single Parent (Not Single Parent) | 0.75 | 0.11 | [0.56, 1.01] | | |
| Special Education (Not SPED) | 0.44* | 0.02 | [0.40, 0.49] | | |
| High Ability (Not High Ability) | 1.62* | 0.13 | [1.38, 1.89] | | |
| AP Enrolled (Not AP Enrolled) | 2.00* | 0.12 | [1.78, 2.25] | | |
| Attendance Rate | 1.06* | 0.00 | [1.05, 1.07] | | |
| LEP (Not LEP) | 0.56* | 0.09 | [0.41, 0.77] | | |
| NeSA Math (Meets Standards) | | | | | |
| Below Standards | 0.61* | 0.03 | [0.55, 0.67] | | |
| Exceeds Standards | 1.37* | 0.10 | [1.18, 1.59] | | |
| NeSA Science (Meets Standards) | | | | | |
| Below Standards | 0.91 | 0.05 | [0.82, 1.01] | | |
| Exceeds Standards | 0.81* | 0.07 | [0.68, 0.95] | | |
| NeSA Reading (Meets Standards) | | | | | |
| Below Standards | 0.81* | 0.04 | [0.74, 0.90] | | |
| Exceeds Standards | 1.17* | 0.08 | [1.03, 1.34] | | |
| Race/Ethnicity × Income (White × Non-Low Income)# | | | | | |
| American Indian or Alaska Native × Low Income | 3.32* | 1.14 | [1.70, 6.50] | | |
| Asian or Pacific Islander × Low Income | 4.17* | 1.30 | [2.27, 7.67] | | |
| Black or African American × Low Income | 1.67* | 0.30 | [1.17, 2.38] | | |

| Independent Variable | Odds Ratio | SE | 95% CI | Log Likelihood [Likelihood Ratio $\chi^2$ ($p$)] | N |
|---|---|---|---|---|---|
| Hispanic × Low Income | 1.82* | 0.21 | [1.45, 2.28] | | |
| Two or More Races × Low Income | 1.98* | 0.46 | [1.26, 3.11] | | |
| Race/Ethnicity × Gender (White × Male)# | | | | | |
| American Indian or Alaska Native × Female | 0.48* | 0.16 | [0.25, 0.94] | | |
| Asian or Pacific Islander × Female | 0.76 | 0.23 | [0.42, 1.39] | | |
| Black or African American × Female | 0.71* | 0.11 | [0.52, 0.96] | | |
| Hispanic × Female | 0.79* | 0.08 | [0.64, 0.96] | | |
| Two or More Races × Female | 0.91 | 0.20 | [0.58, 1.41] | | |
| Constant | 0.02 | 0.01 | | | |

*$p < 0.05$

**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.

For the simple model, it is seen that the odds of college-going is 3.21 times greater for high school students who earned dual credit as compared to those who did not. However, once the other covariates are controlled for in the complete model, the odds of college-going for high school students who earned dual credit is 1.96 times greater than those who did not. While there is a decrease in the magnitude of the college-going odds, students who earned dual credit are still twice as likely to go on to college than their peers who did not earn dual credit.

Looking across demographic characteristics, results of the complete model indicate that females have greater odds as compared to males of going on to college (odds ratio=1.81, $p$=0.00). Hispanics and Native Americans have significantly lower college-going odds (odds ratio=0.72, $p$=0.00 and 0.48, $p$=0.01) as compared to Whites. Moreover, students who belong to lower income households have significantly lower odds of going on to college (odds ratio=0.51, $p$=0.00) as compared to those who are not from lower income households.

Across program participation and academic ability, special education students have lower odds of going on to college as compared to those who are not special education students (odds ratio=0.44, $p$=0.00). High ability learners (odds ratio=1.62, $p$=0.00) and those enrolled in AP classes (odds ratio=2.00, $p$=0.00) are also found to have larger college-going odds than their respective counterparts.

In terms of the NeSA Math and Reading subjects, students who exceed standards, as compared to those who only meet standards, have significantly greater odds (NeSA Math odds ratio=1.37, $p$-value=0.00 and NeSA Reading odds ratio=1.17, $p$-value=0.01) of going on to college.

**Table 6a.** 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* | | | | | |
| Dual Credit | 1.81* | 0.13 | [1.57, 2.08] | -2825.30 [71.53 (0.00)] | 7,332 |
| Constant | 5.05 | 0.22 | | | |
| *Complete Model* | | | | | |
| Dual Credit | 1.95* | 0.15 | [1.67, 2.27] | -2378.81 [964.51 (0.00)] | 7,332 |
| Female (Male) | 1.96* | 0.17 | [1.64, 2.33] | | |
| Race/Ethnicity (White) | | | | | |
| American Indian or Alaska Native | 0.62 | 0.42 | [0.16, 2.37] | | |
| Asian or Pacific Islander | 5.23 | 5.63 | [0.64, 43.02] | | |
| Black or African American | 2.21 | 1.14 | [0.80, 6.06] | | |
| Hispanic | 1.01 | 0.24 | [0.63, 1.62] | | |
| Two or More Races | 1.03 | 0.41 | [0.47, 2.25] | | |
| Low Income (Non-Low Income) | 0.56* | 0.06 | [0.46, 0.69] | | |
| Single Parent (Not Single Parent) | 0.48* | 0.15 | [0.26, 0.90] | | |
| Special Education (Not SPED) | 0.39* | 0.05 | [0.31, 0.50] | | |
| High Ability (Not High Ability) | 1.62* | 0.22 | [1.24, 2.11] | | |
| AP Enrolled (Not AP Enrolled) | 2.19* | 0.23 | [1.78, 2.70] | | |
| Attendance Rate | 1.08* | 0.01 | [1.06, 1.10] | | |
| LEP (Not LEP) | 1.09 | 0.80 | [0.26, 4.57] | | |
| NeSA Math (Meets Standards) | | | | | |
| Below Standards | 0.67* | 0.07 | [0.55, 0.82] | | |
| Exceeds Standards | 1.47* | 0.17 | [1.17, 1.85] | | |
| NeSA Science (Meets Standards) | | | | | |
| Below Standards | 1.05 | 0.12 | [0.84, 1.32] | | |
| Exceeds Standards | 0.75* | 0.10 | [0.58, 0.98] | | |
| NeSA Reading (Meets Standards) | | | | | |
| Below Standards | 0.62* | 0.07 | [0.51, 0.77] | | |
| Exceeds Standards | 1.20 | 0.13 | [0.96, 1.49] | | |
| Race/Ethnicity × Income (White × Non-Low Income)# | | | | | |
| American Indian or Alaska Native × Low Income | 1.92 | 1.35 | [0.48, 7.63] | | |
| Asian or Pacific Islander × Low Income | 0.57 | 0.70 | [0.05, 6.30] | | |
| Black or African American × Low Income | 1.13 | 0.57 | [0.42, 3.03] | | |
| Hispanic × Low Income | 1.26 | 0.32 | [0.77, 2.06] | | |
| Two or More Races × Low Income | 0.73 | 0.40 | [0.25, 2.12] | | |

| 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 | 0.16* | 0.10 | [0.05, 0.52] | | |
| Asian or Pacific Islander × Female | 1.06 | 1.30 | [0.10, 11.76] | | |
| Black or African American × Female | 0.41 | 0.20 | [0.16, 1.06] | | |
| Hispanic × Female | 0.56* | 0.12 | [0.37, 0.84] | | |
| Two or More Races × Female | 1.53 | 0.84 | [0.53, 4.48] | | |
| 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.

Next, results of the simple and complete models for the matched sample are presented in Table 6a. For the simple model, it is seen that the odds of college-going is 1.81 times higher for high school students who earned dual credit as compared to those who did not (*p*-value=0.00). However, once the covariates are controlled for in the complete model, the odds of college-going for high school students who earned dual credit is increased to 1.95 times greater than those who did not (*p*-value=0.00).

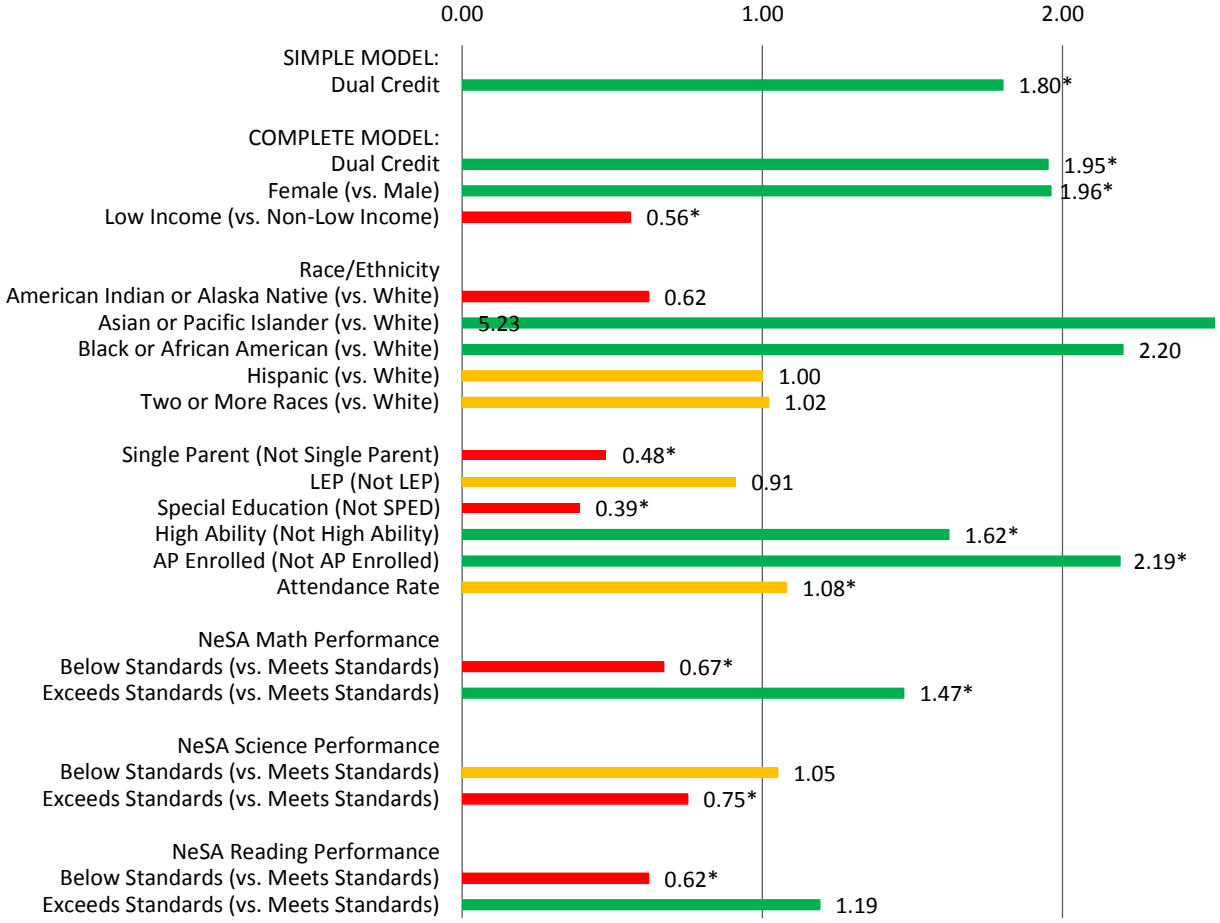
Looking across demographic characteristics including gender (odds ratio=1.96, *p*-value=0.00) and household income status (odds ratio=0.56, *p*-value=0.00), their effect on the college-going odds closely follow that found for the full sample. However, race is no longer observed to be a significant predictor of college-going odds.

Results also show that special education students have lower odds of going on to college as compared to those who are not special education students (odds ratio=0.39, *p*-value=0.00). Similarly, students who are single parents have lower odds of going on to college (odds ratio=0.48, *p*-value=0.02) as compared to those who are not.

Additionally, high ability learners (odds ratio= 1.62, *p*-value=0.00) and students enrolled in AP classes (odds ratio= 2.19, *p*-value=0.00) have greater odds of going on to college as compared to their respective counterparts.

For the NeSA Math, students who exceed standards, as compared to those who meet standards, exhibit significantly greater odds of going on to college (odds ratio= 1.47, *p*-value= 0.00). These results for the matched sample are also shown in Figure 2a.

**Figure 2a.** 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**

The present study utilizes propensity score matching and logistic regression to understand the impact of enrolling for and earning dual credit on college going for 11th and 12th graders in the 2012-2013 school year. Prior to matching, it is found that a significantly greater amount of students who are dually enrolled go on to college as compared to those who are not (refer to Figure 1). However, this effect may be due to the students enrolled for dual credit being different from those not enrolled for dual credit on key variables like gender, race or ethnicity, income, and NeSA performance levels. After matching students who are enrolled for dual credit with those who are not enrolled for dual credit based on similarity in the covariates included in the models, the difference in college-going, though smaller, is still observed. The predictive analyses using logistic regression reveals that being dually enrolled significantly increases college-going odds, *ceteris paribus*.

In terms of student demographics, interesting college-going differences are also found, especially for attributes like gender and race. It is seen that female students outperform their male counterparts where college-going is concerned. Evidence of this is seen in both the full and matched samples. In terms of racial groups, only Hispanic students are found to have smaller odds of going on to college as compared to White students, holding all other covariates constant.

In terms of other student characteristics showing an increased odds of going on to college, attributes like being a high ability learner, being AP-enrolled, and exceeding the standards on the NeSA Math stand out. If a student is a high ability learner, then he or she has significantly better odds of going on to college. Similarly, taking AP classes is also seen to significantly and positively impact college-going odds. Finally, exceeding standards on the NeSA assessments is found to be a significant predictor for college-going odds. As such, it is seen that the NeSA Math has the strongest effect on college-going odds across all three NeSA subjects.

As a result of this exploratory study, it is found that dually enrolled students, female students, students who are enrolled in Advanced Placement classes, students who are high ability learners, and students who exceed NeSA Math standards are associated with increased college-going odds. However, only about 30% of students in this study are dually enrolled (see Table 1).

As is the case with dual enrollment being the treatment condition, it is seen that earning dual credit increases the odds of college-going. Even after controlling for variations among other demographic attributes, the odds of college-going for high school students who earned dual credit is significantly larger than for those who did not earn dual credit.

In light of the aforementioned findings, it is proposed that efforts should be focused on encouraging schools to introduce advanced coursework and encouraging students to enroll for them. Moreover, among the students already enrolled for coursework that is eligible for earning dual credit, they should be encouraged to do so. In this study, only about 19% of students earn dual credit (see Table 1).

The study shows that overall males have a lower likelihood to enter college as compared with their female counterparts. Hence, more attention should be given to investigate whether there are any

underlying mediating factors that could be leading to such a scenario. Moreover, there should be continuous efforts to help students perform better in school assessments (like the NeSA exams) to improve their college-going odds.

**Broader Impacts**

This study is not without limitations. While important demographic variables are considered, other unmeasured variables like parental support and students' peer influence are not accounted for when building the predictive models.

Furthermore, the present study uses data which has been supplied by respective schools across the state. Hence, inferences drawn from this study would be subject to the quality of the data. Many of the students whose records are not available from the respective schools or in the NSC database would need further investigation as to what may have actually happened with their college-going outcome.

In conclusion, this study finds that students enrolled for dual credit classes have higher odds of going on to college as compared to those who are not enrolled for dual credit classes. Similarly, students who earn dual credit have better odds of going on to college compared to those who do not earn dual credit. In light of this, educators should encourage students to enroll for dual credit coursework and eventually earn them in the effort to improve their college-going outcome. Further research can also be conducted to study the impact of dual enrollment and dual credit on other college outcomes for Nebraska students, like college persistence and college graduation.

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## Appendix

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

*Tables and Figures*

**Table 7.** Difference in college-going between those who were dually enrolled vs. those not dually enrolled.

| Sample | N | Difference in College-Going (%) |
|---|---|---|
| Full Sample | 19,385 | 11.98 |
| Matched Sample | 11,764 | 4.47 |

**Table 7a.** Difference in college-going between those who earned dual credit vs. those who did not earn dual credit.

| Sample | N | Difference in College-Going (%) |
|---|---|---|
| Full Sample | 19,385 | 16.14 |
| Matched Sample | 7,332 | 6.66 |

**Table 8.** Fit statistics for the logistic regression models predicting college-going. (Dual Enrollment as treatment condition)

| | Full Sample | | Matched Sample | |
|---|---|---|---|---|
| **Fit Statistic** | Simple Model | Complete Model | Simple Model | Complete Model |
| Likelihood Ratio | 3192.23* | | 1671.20* | |
| Area under ROC curve# | 0.572 | 0.784 | 0.540 | 0.782 |
| McFadden's $R^2$ # | 0.017 | 0.170 | 0.004 | 0.161 |
| AIC+ | 1.059 | 0.898 | 0.904 | 0.767 |
| BIC+ | -170821.112 | -173736.922 | -99612.534 | -101021.292 |

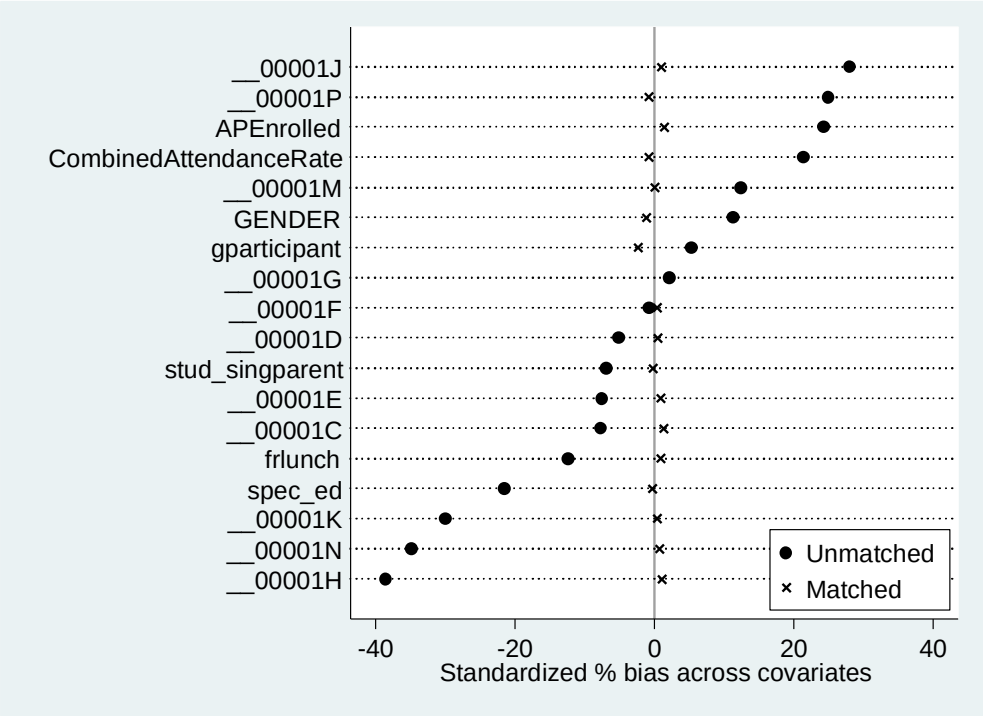
**Note.** * = The complete model fits better, # = Larger values indicate better fit, + = Smaller values indicate better fit

**Table 8a.** Fit statistics for the logistic regression models predicting college-going. (Dual Credit as treatment condition)

| | Full Sample | | Matched Sample | |
|---|---|---|---|---|
| **Fit Statistic** | Simple Model | Complete Model | Simple Model | Complete Model |
| Dual Credit | | | | |
| Likelihood Ratio | 3120.86* | | 892.98* | |
| Area under ROC curve# | 0.570 | 0.787 | 0.573 | 0.787 |
| McFadden's $R^2$ # | 0.024 | 0.174 | 0.013 | 0.169 |
| AIC+ | 1.052 | 0.896 | 0.771 | 0.663 |
| BIC+ | -170972.706 | -173609.828 | -59586.426 | -60043.308 |

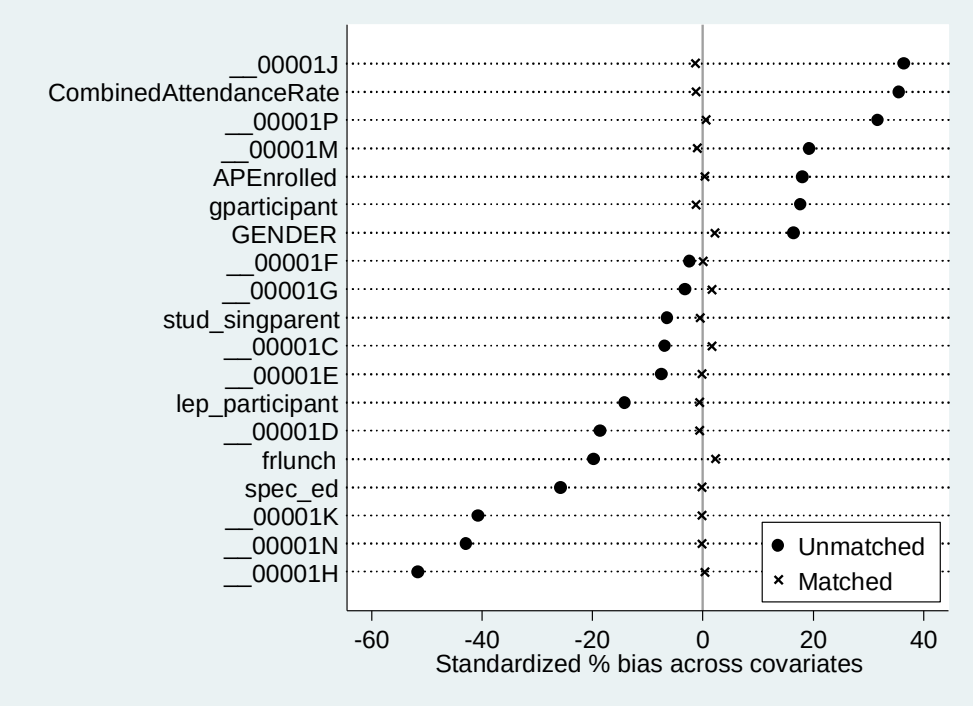
**Note.** * = The complete model fits better, # = Larger values indicate better fit, + = Smaller values indicate better fit

**Figure 3.** Quality of matching among the covariates (Dual Enrollment as treatment condition)



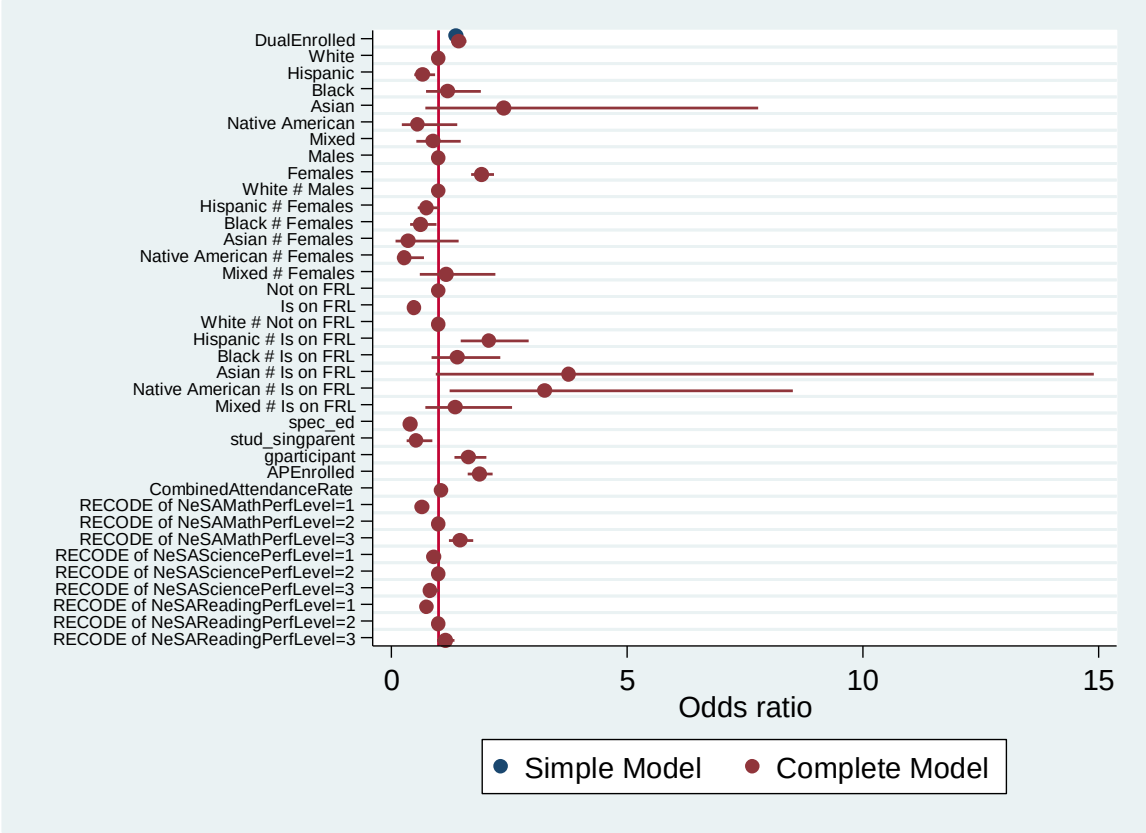

**Note.** The unmatched sample refers to the full sample, prior to matching. The closer the marker is to 0%, the smaller the bias for each covariate group.

**Figure 3a.** Quality of matching among the covariates (Dual Credit as treatment condition)



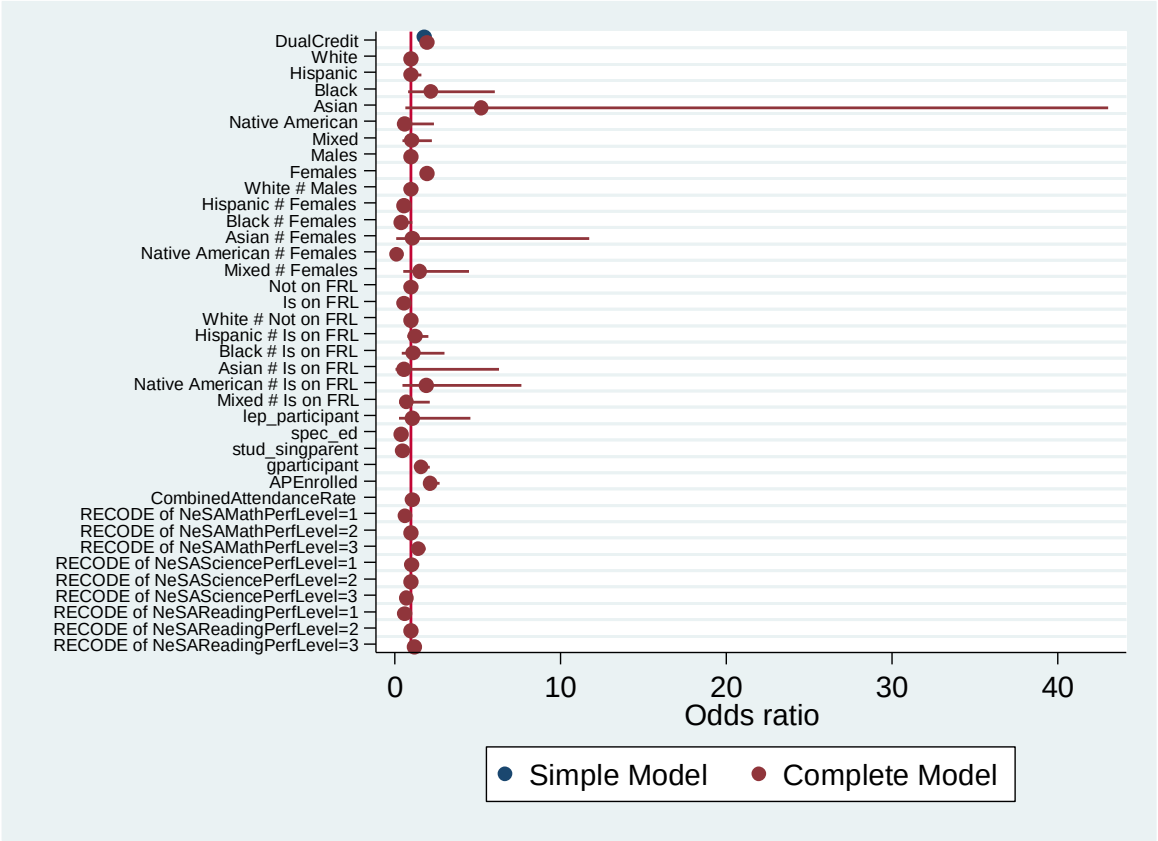
**Note.** The unmatched sample refers to the full sample, prior to matching. The closer the marker is to 0%, the smaller the bias for each covariate group.

**Figure 4.** Odds ratios of college-going for the matched sample, with 95% confidence intervals (Dual Enrollment as treatment condition)




**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 4a.** Odds ratios of college-going for the matched sample, with 95% confidence intervals (Dual Credit as treatment condition)




**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. (Dual Enrollment as treatment condition)

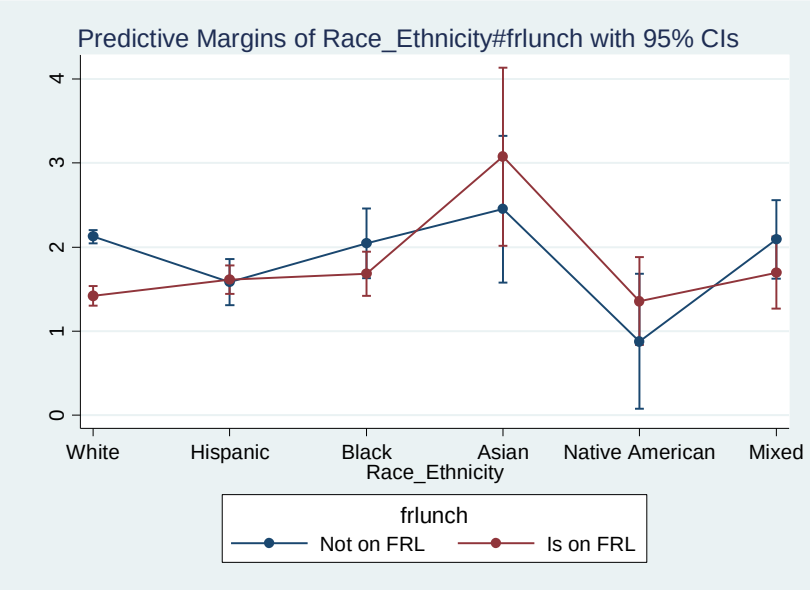
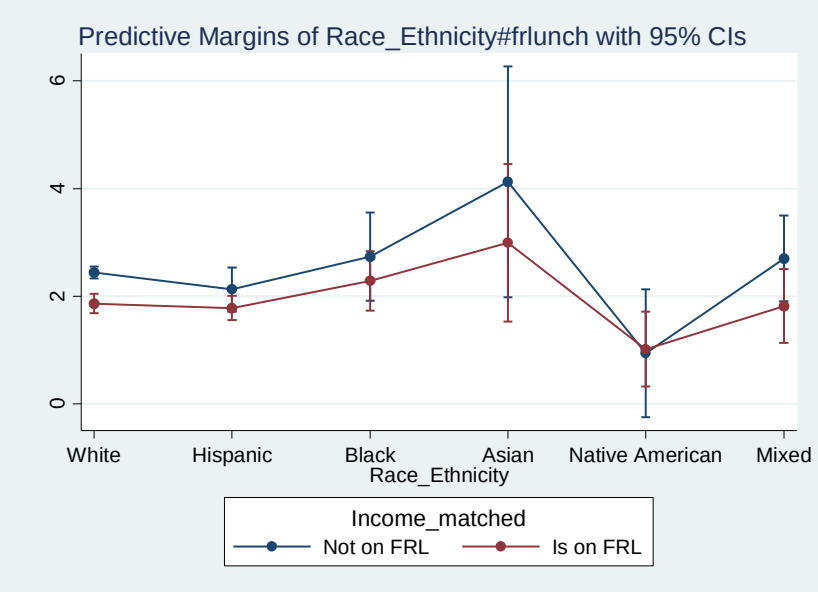



**Figure 5a.** The college-going log odds of each race/ethnicity subgroup, for each level of household income status. (Dual Credit as treatment condition)




**Note: Although reported, the contrast is not significant for race and income**

**Figure 6.** The college-going log odds of each race/ethnicity subgroup, for each gender. (Dual Enrollment as treatment condition)

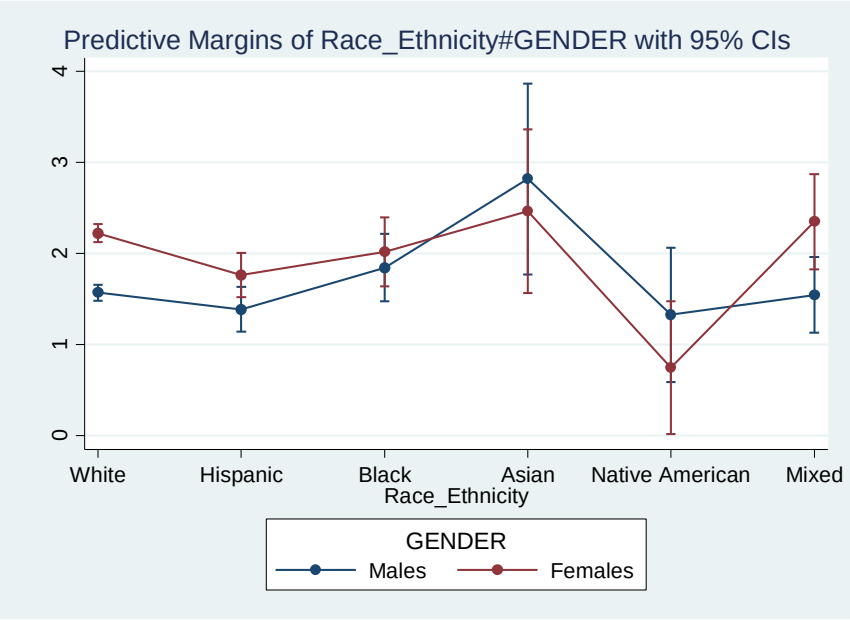
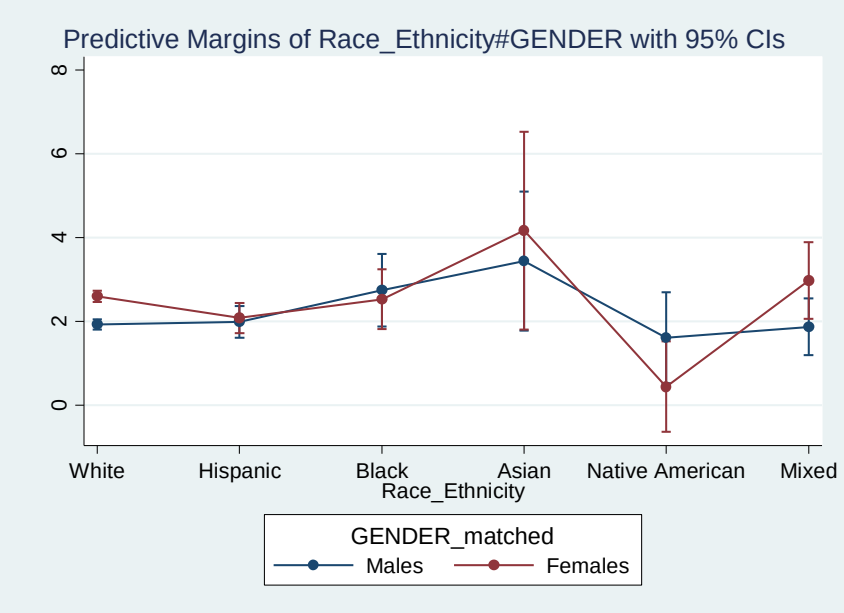



**Figure 6a.** The college-going log odds of each race/ethnicity subgroup, for each gender. (Dual Credit as treatment condition)



NEBRASKA
DEPARTMENT OF EDUCATION

*Data for Dual Enrollment and Dual Credit Study*

NDE and NSC data asked from Max Reiner on 6/30/2016, received on 7/5/2016, final update received on 8/4/2016: ALL 11th and 12th graders in 2012-13

| **Data from NSSRS** | **Data from NSC** |
|---|---|
| School Year | NDE Student ID |
| Grade Level (should be 11 and 12) | 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 or Gifted Participant | |
| Foreign Exchange Student | |
| Immigrant Indicator | |
| Special Ed | |
| Homeless | |
| Combined 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 12th Grade [Reading/Math/Science] Scale Score | |
| NeSA 12th Grade [Reading/Math/Science] Performance | |
| AP Enrollment Status | |
| Dual Enrollment status | |
| Dual Credit status | |

The coding of the two treatment conditions and all 17 covariates is done in the following manner:
**Note:** Students who did not take any of the three NeSA test subjects are not considered for this study.

| Covariates | Categories |
|---|---|
| Dual Enrollment (treatment condition or main covariate of interest) | Dually Enrolled (baseline or compared to group) |
| | Not Dually Enrolled |
| Dual Credit (treatment condition or main covariate of interest) | Dual Credit (baseline or compared to group) |
| | Did not earn Dual Credit |
| Gender | Male |
| | Female (baseline or compared to group) |
| Race/Ethnicity | White (baseline or compared to group) |
| | Hispanic |
| | Black or African American |
| | Asian or Pacific Islander (combined into one group since the latter were not too many and for purposes of analyses) |
| | American Native |
| | Multiple Races |
| House Income Status | Non-FRL |
| | FRL (baseline or compared to group) |
| Immigrant Status | Non-Immigrant |
| | Immigrant (baseline or compared to group) |
| Gifted Participation Status or High Ability Learner | Non-High Ability Learner |
| | High Ability Learner (baseline or compared to group) |
| Single Parent Status | Student is not a single parent |
| | Student is a single parent (baseline or compared to group) |
| House Income Status | Non-FRL |
| | FRL (baseline or compared to group) |
| Immigrant Status | Non-Immigrant |
| | Immigrant (baseline or compared to group) |
| Gifted Participation Status or High Ability Learner | Non-High Ability Learner |
| | High Ability Learner (baseline or compared to group) |
| Single Parent Status | Student is not a single parent |
| | Student is a single parent (baseline or compared to group) |
| LEP Participation Status | Not a participant in LEP program |
| | Participant in LEP program (baseline or compared to group) |
| Special Education Status | Not a Special Education student |
| | Is a Special Education student (baseline or compared to group) |
| Homeless Status | Not Homeless |
| | Homeless (baseline or compared to group) |
| NeSA Math Performance Level | Below standards |
| | Meets standards (baseline or compared to group) |
| | Exceeds standards |
| NeSA Science Performance Level | Below standards |
| | Meets standards (baseline or compared to group) |
| | Exceeds standards |
| NeSA Reading Performance Level | Below standards |
| | Meets standards (baseline or compared to group) |
| | Exceeds standards |
| AP Status | Is an AP enrolled student |
| | Is not AP enrolled student |