


# EOPS Impact Study Technical Report

**September 2012 Update**

Prepared for

California Community College Association of Extended Opportunity Programs and Services

By

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## Executive Summary

- A set of 707,113 first-time community college students was studied to determine differences in key outcomes between EOPS and non-EOPS students.
- Two statistical methods, regression and propensity score matching (PSM), were used to control for differences in background variables between EOPS and non-EOPS students.
- PSM adjusted outcomes between EOPS and non-EOPS students showed:
    - One-year retention for EOPS students was higher (89% vs. 85%)
    - Two-year retention for EOPS students was higher (75% vs. 69%)
    - Transfer English completion for EOPS students was higher (40% vs. 39%)
    - Transfer math completion for EOPS students was higher (23% vs. 20%)
    - EOPS students completed more transferable units (28.2 vs. 25.4)
    - Degree and certificate completion for EOPS student was higher (11% vs. 8%)
    - EOPS students were more likely to complete 60 or more transferable units with a grade point average of 2.0 or more (12.3% vs. 9.6%)
    - Transfer rates for EOPS were lower overall (5.8% vs. 6.3%) but EOPS students were more likely to transfer to a CSU or UC
- While all these differences were statistically significant, some of the differences were small from a programmatic perspective.

## Introduction

The purpose of the Extended Opportunity Programs and Services (EOPS) Impact Study is to show the effect of the EOPS program by comparing EOPS participants to comparable non-participants on key student outcomes. EOPS is a state-funded program designed to help students with economic or social disadvantages achieve their educational goals including obtaining job skills, occupational certificates, associate degrees, and transferring to four-year institutions. Strategies include targeted advising practices, counseling, mentoring and tutoring. EOPS also provides a secondary program, Cooperative Agencies Resources for Education (CARE), intended to support single-parent recipients of public assistance attain self-sufficiency. This study is intended to be a continuing step in the development of an ongoing system to collect and compile quantitative and qualitative evidence of EOPS program impacts.

## Related Research

EOPS programs have been a mainstay of student support at most California community colleges for several decades. While a great deal of tracking of EOPS students has transpired, relatively little rigorous research exists that seeks to evaluate the return on investment in this program. One early telephone survey of a cohort of students at San José City College in 1973 found that EOPS participants had higher rates of obtaining an associate's degree, and were more likely to still be enrolled after two years, have grade point averages over 2.0, and be accepted at a four-year institution than students who did not participate in EOPS (Preising, 1979). This study observed that the EOPS students had lower academic aspirations than comparison students. The study did not appear to implement any controls for differences in background variables.

Crawford (2000) found EOPS students had higher four-year average retention (see glossary in Appendix A) rates and higher grade point averages (GPA) than non-EOPS students. This study also did not appear to implement controls for differences in background variables when comparing outcomes. However, this study did explore in detail students' use of various services and their perception of whether their use of these services helped improve their achievement.

A more recent analysis at Crafton Hills College compared first-time college EOPS and non-EOPS student enrolled in the same course sections and found similar course completion rates, lower EOPS student course success rates, and higher EOPS student fall to spring retention (aka persistence) (Wurtz, 2011). This study indicated that differences in background characteristics between EOPS and non-EOPS students presented a limitation, which was partially mitigated by ensuring the students were enrolled in the same sections.

The study described in this report also compared EOPS to non-EOPS students and used regression analysis to attempt to control for differences in background variables.

**Sample Selection**

A set of 707,113 first-time college students beginning in either fall 2004, fall 2005, fall 2006, or fall 2007 were selected from 60 participating college districts representing 97 colleges and tracked for three years. The study used data from the California Community College Chancellor's Office Management Information System (COMIS) to identify EOPS participants and a comparison group of non-EOPS students and to derive outcome and control variables. This study included first-time students at a participating California community college who showed a credit enrollment that was not concurrent with high school enrollment and also did not have a record of an earned college-level degree or certificate were included in the study. Of all first-time students starting in Fall 2004, 2005, 2006, or 2007, there were 64,196 EOPS participants and 642,917 students who did not participate in EOPS during this same time. EOPS students in the study did not necessarily join the EOPS program in their first term, but could have been in the program at any time during the three-year tracking period.

## Methods

As EOPS students gain eligibility to enter the program by having an academically disadvantaged background, it was not appropriate to simply compare EOPS participants to all other students. In order to best isolate the effects of the EOPS program from confounding background variables, it would be best to randomly assign students to participate in EOPS (or not). In that way, differences in background variables would be ignorable as they would be more or less evenly distributed between participants and non-participants. As random assignment is not practical, the current study attempted to control for differences between participants and non-participants using two post-hoc statistical techniques.

The first method involved propensity score matching (PSM), which uses statistical techniques to select a group of students from the non-participant group that is similar to EOPS participants on a set of available background variables. The second method used regression to statistically control for differences between EOPS and non-EOPS students using these same background variables. Logistic regression was used for all outcomes except for the number of transferable units where a linear regression was used. The purpose of using two different methods is to reduce the bias that a single method can introduce. Agreement between the two methods suggests the findings can be given more confidence.

In an effort to eliminate as many potential confounding variables as possible, an extensive list of background variables was gathered from the COMIS database. These variables are typically found to be associated at least moderately with academic achievement and attainment. The background variables included:

- Age in first term
- Gender
- African-American indicator
- Asian indicator
- Hispanic indicator
- High school graduate flag
- Received disability services
- Received Pell grant

- Level of first English course
- Level of first math course
- Year of first college attendance
- First college attended

Appendix B shows the values of these indicators in the original data set. First college of attendance was included as a control variable in order to ensure balance and representation across all colleges in the study and as a way to control for any higher order college effects. There are presumably differences between colleges in the profile of the students and the way in which their EOPS programs are implemented. By including first college of attendance, it helps adjust for those differences to allow more clarity on the impacts due to the EOPS program as opposed to other factors related to the college itself. It should be noted that some students attend more than one college, referred to as 'swirl,' although most attended just one college and there was not a significant difference between EOPS and non-EOPS students in their rate of swirling.

The outcomes selected for comparison between EOPS and non-EOPS students included:

- **One-year retention** – Students enrolling in the academic year after their first term of enrollment. For example, a first-time student in fall 2004 would be counted as retained if s/he enrolled in any term during the 2005-2006 academic year.
- **Two-year retention** – Students enrolling in the second academic year after their first term of enrollment. For example, a first-time student in fall 2004 would be counted as retained in the second year after enrollment if s/he enrolled in any term during the 2006-2007 academic year.
- **Earned degree or certificate within 3 years** – Students earning an associate's degree or certificate of completion by the end of the third year of enrollment, also referred to as earning an award. For example, a first-time student in fall 2004 who earned a degree or certificate by the end of spring 2007 would be flagged as achieving an award.

- **Transfer English success within 3 years** – Students completing a transfer-level English course as defined by taxonomy of program (TOP) codes with a grade of C- or better within three years of college entrance.
- **Transfer math success within 3 years** – Students completing a transfer-level math course as defined by taxonomy of program (TOP) codes with a grade of C- or better within three years of college entrance.
- **Number of transferable units completed within 3 years** – The sum of units coded as transferable successfully completed with a grade of C- or better within three years of college entrance.
- **60 or more transferable units completed within 3 years** – An indicator variable for students earning 60 or more units coded as transferable with a grade point average (GPA) of 2.0 or higher.
- **Transferred to a four-year institution within 3 years** – Students with a record of enrollment at a university after their community college enrollment. Note this indicator does not account for the number or type of courses taken at the university.

Note that these outcomes are system-wide and are not limited to the first college attended. In the PSM, a subset of the data was selected that included EOPS students and non-EOPS students who could be reasonably matched on all background variables. This matching process left 53,292 matched pairs of EOPS and non-EOPS students (Appendix C).

After matching, a Wilcoxon-signed rank test was used to see if the differences in the outcomes were statistically significant. For the regressions, the full original data set was used. Outcome differences were evaluated using marginal means in addition to unstandardized coefficients and odds ratios (Appendix D). Marginal means are created from inputting average values for each input variable other than the EOPS indicator and examining the difference in outputs for EOPS and non-EOPS students.

## Results

Table 1 shows the outcomes for all the first-time students (1) without statistical adjustment, (2) with adjustment using PSM, and (3) with adjustment using regression (see Appendix D for regression coefficients). In both the unadjusted and adjusted outcomes, EOPS students were higher than non-EOPS students on all outcomes except for “Transferred in 3 years.” Figure 1 shows these differences in outcomes among the three techniques. Figure 2 displays the outcomes comparing the unadjusted and PSM adjusted values. Figure 3 focuses exclusively on the PSM adjusted cohort who transferred and examines the destination university by type. EOPS students were more likely to transfer to an in-state public university (California State University or University of California) while the non-EOPS comparison students were more likely to transfer to an in-state private university or an out-of-state university, which includes private for-profit institutions. Figure 4 provides a visualization of data provided in Table 1 and shows the direction and magnitude of differences in outcomes when comparing EOPS to comparable non-EOPS first-time students. Green arrows indicate outcomes where EOPS students had higher values and red arrows indicate where EOPS students had lower values. Arrow lengths for outcomes except for average transferable units earned are proportionate to the odds ratios derived from a regression analysis shown in the full technical report. The arrow length for average transferable units earned was based on the percent difference in units between EOPS and non-EOPS students.

The effect of the adjustments was to reduce the differences between EOPS and non-EOPS students, particularly on the retention measures. Note that all differences were statistically significant; however, given the large sample size, the statistical significance is not as important as the actual practical magnitude of the differences. In other words, it is more important to consider the magnitude of the observed differences, after adjustment, and determine if the effect is of practical significance in light of the investment made in the EOPS intervention. For example, one could ask, “What is the value of an 11% completion rate for associate’s degrees within three years, versus an 8% completion rate?”

Both the PSM and regression showed differences in the same direction, but with different magnitudes (Figure 1). The one measure where non-EOPS students had higher rates of achievement than EOPS students was on transferring within three years. However, both the PSM and regression adjusted the differences in three-year transfer rates to a magnitude that is perhaps of little practical importance (~0.5%).

Of the two techniques, the propensity score matching creates perhaps the most readily interpretable results given that it identifies a matched group of non-EOPS participants that very closely resembles the EOPS participants, with the exception that they did not participate in the program. This technique is designed to mimic or replicate the random assignment situation of true experiments that is the "gold standard" for determining causality. In contrast, regression techniques often use marginal means to compare treatment and comparison groups. While useful for conveying effect sizes, they are derived from a student profile based on averages that might not reflect the actual composition of students in the data set. For this reason, it is most straightforward to use the PSM-adjusted value to convey outcomes to a general audience (Figure 2).

Future research should include analyses that extend the time to transfer beyond three years. Findings from the Transfer Velocity Project show certain predictors of transfer, such as obtaining an Associate's degree, are time-dependent such that they are more predictive of transfer when they happen earlier in a student's career (Hayward, 2011). Moreover, data from the Transfer Velocity Cohort Report on the California Community College's Chancellor's Office Data Mart (http://datamart.cccco.edu/Outcomes/Transfer_Velocity.aspx) show that African American and Hispanic students begin to close the gap in transfer rates with White and Asian students when the time to transfer is extended beyond three years.

**Table 1. Unadjusted and adjusted outcomes for EOPS and non-EOPS students.**

| | Original File Unadjusted Means | | | PSM Adjusted Means | | | Regression Marginal Means | | |
|---|---|---|---|---|---|---|---|---|---|
| **Outcome** | EOPS | non-EOPS | Diff | EOPS | non-EOPS | Diff | EOPS | non-EOPS | Diff |
| One-year retention | 81.7% | 58.3% | 23.4% | 89.1% | 84.9% | 4.2% | 72.2% | 63.2% | 9.0% |
| Two-year retention | 66.1% | 42.3% | 23.8% | 74.5% | 68.9% | 5.6% | 49.8% | 41.6% | 8.2% |
| Transfer English success in 3 years | 33.2% | 26.3% | 6.9% | 39.9% | 38.7% | 1.2% | 18.6% | 17.0% | 1.6% |
| Transfer math success in 3 years | 18.9% | 14.9% | 4.0% | 22.7% | 19.9% | 2.8% | 8.6% | 6.0% | 2.5% |
| Mean transferable units completed in 3 years | 28.2 | 25.1 | 3.1 | 28.2 | 25.4 | 2.8* | 27.4 | 25.3 | 2.2* |
| Earned Degree or Certificate in 3 years | 9.5% | 5.6% | 4% | 11% | 8% | 4%* | 6.1% | 4.0% | 2%* |
| 60 or More Transferable Units Completed in 3 Years | 10.2% | 8.0% | 2.2% | 12.3% | 9.6% | 2.7%* | 2.9% | 2.2% | 0.7%* |
| Transferred in 3 years | 5.1% | 8.1% | -2.9% | 5.8% | 6.3% | -0.5%* | 4.1% | 4.5% | -0.4%* |
| Count | 64,196 | 642,917 | | 53,292 | 53,292 | | 64,196 | 642,917 | |

* $p < 0.0005$, Wilcoxon test used for PSM

**Figure 1. Differences in unadjusted and adjusted outcomes for EOPS and non-EOPS students.**

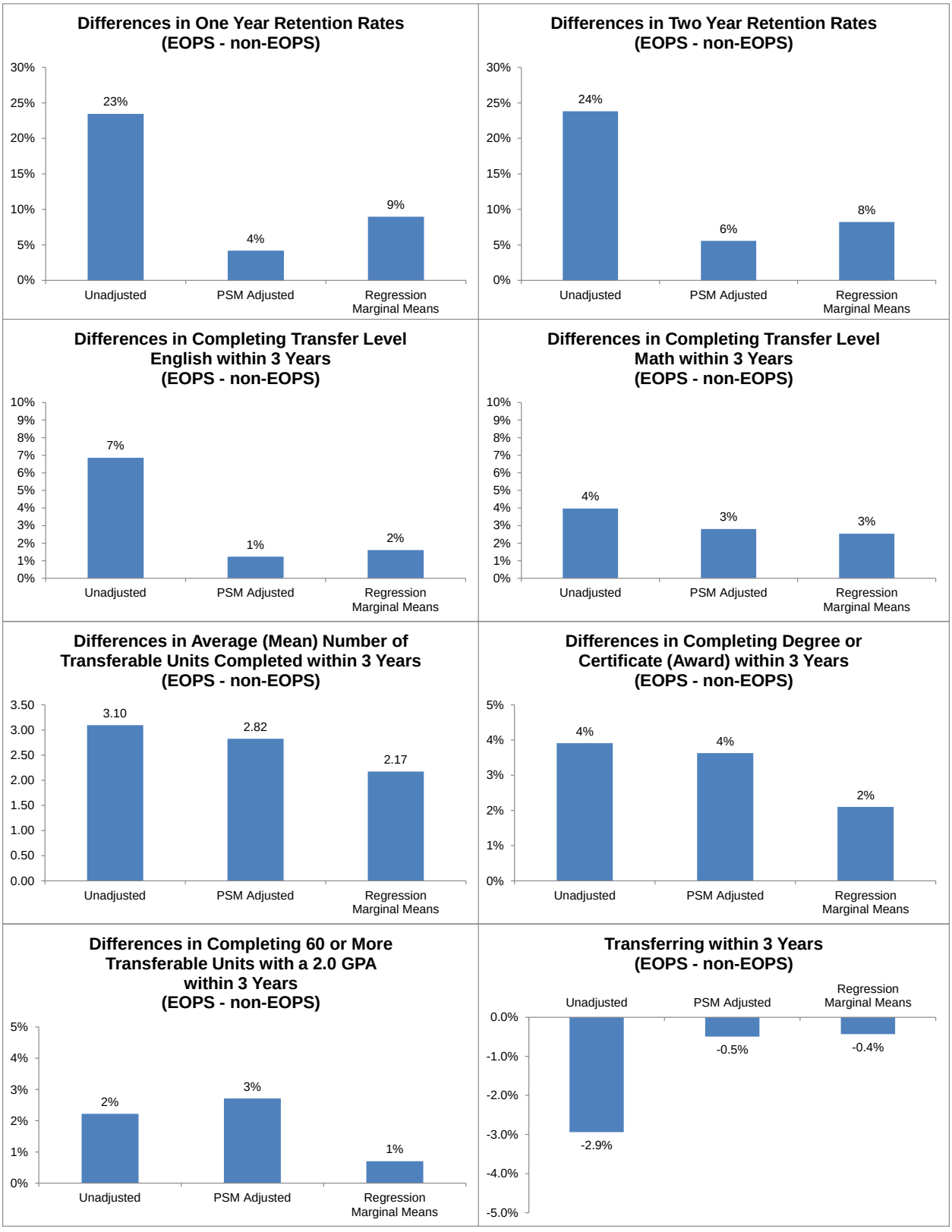


**Figure 2. Comparison of unadjusted and propensity score matched (PSM) adjusted outcomes for EOPS and non-EOPS students.**

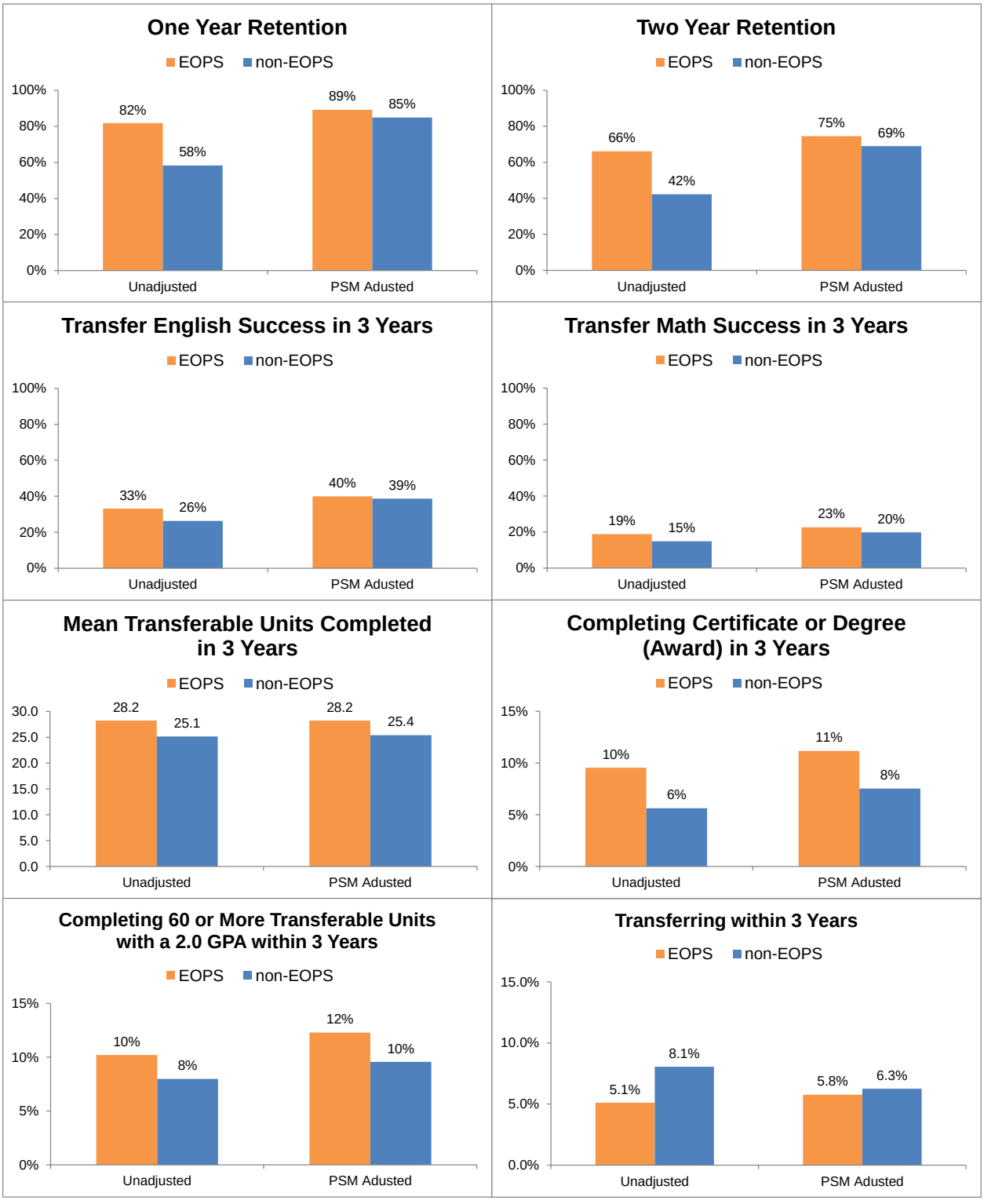
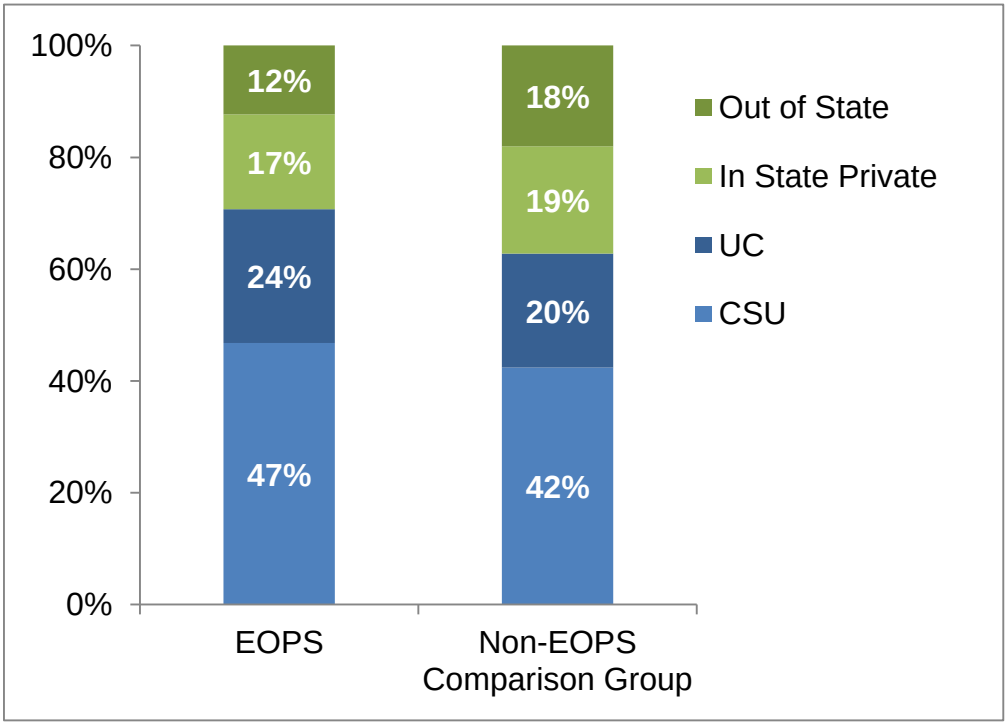


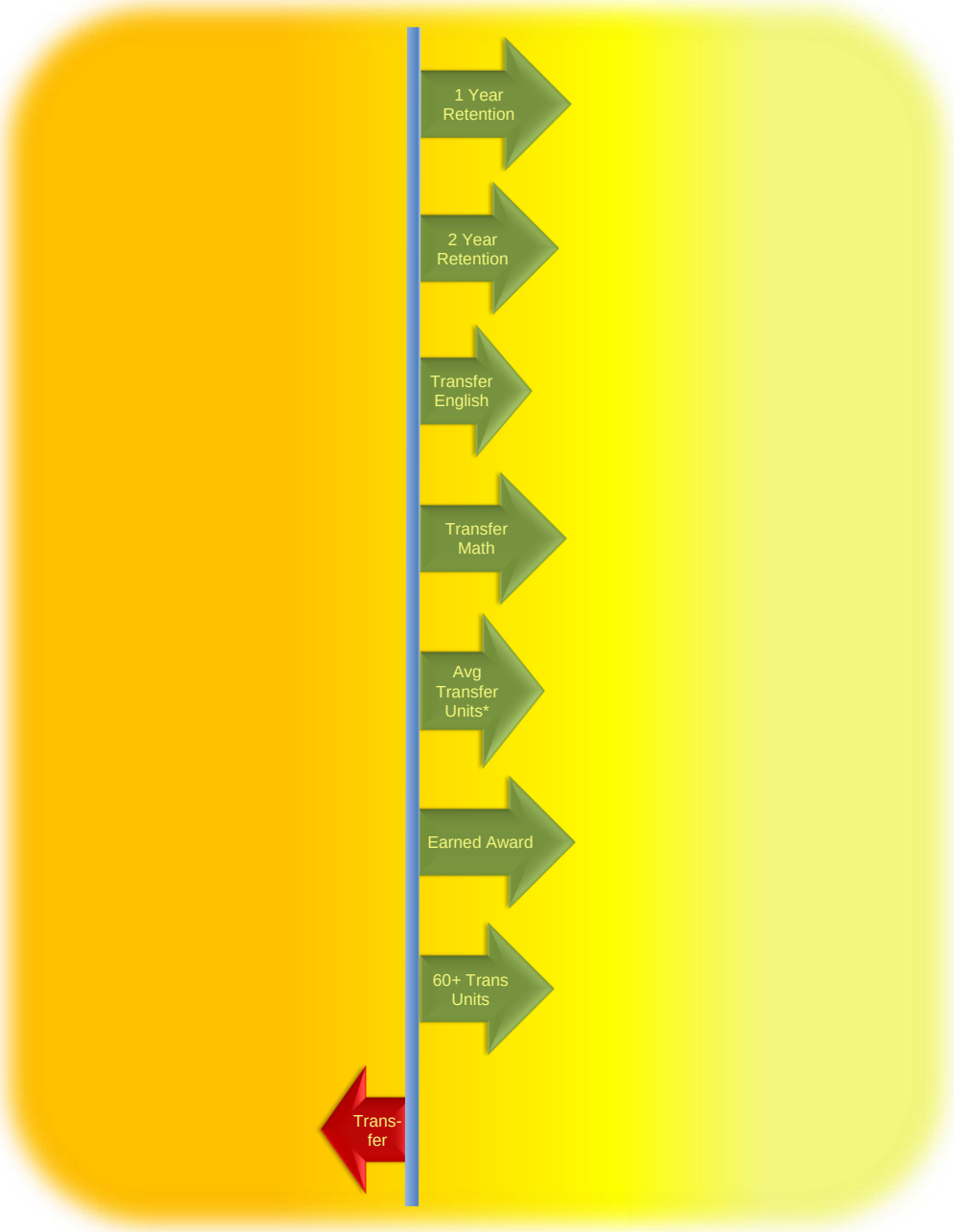
**Figure 3. Segment transferred to by EOPS and non-EOPS comparison group students who transferred within 3 Years using propensity score matched (PSM) cohorts.**




Note: Differences in proportions were statistically significant ($\chi^2(3) = 55.2$, $p < 0.005$).

**Figure 4. Approximate differences in key outcomes between EOPS and comparable non-EOPS students**

Green arrows indicate EOPS outcomes were higher than non-EOPS outcomes
Red arrows indicate EOPS outcomes were lower than non-EOPS outcomes



## Discussion

In this study, PSM and regression analyses did produce similar findings. However, it should be kept in mind that other key differences between EOPS and non-EOPS students may not have been fully accounted for due to lack of data availability. These other variables may include factors such as parent education level, personal support networks, individual motivation, employment load, responsibility for dependents, and health conditions.

In finding generally higher outcomes for EOPS students, it is reasonable to review the mechanisms by which the EOPS program may be directly influencing student achievement. The classic works by Astin (1984) and Tinto (1993) and subsequent research (e.g., Crawford, 2000) illustrate the importance and efficacy of student engagement in student retention and success. The EOPS program has many strategies specifically designed to enhance student engagement and success such as counseling, advising, tutoring, peer networking, and social activities with college personnel and peers.

A specific example from San Joaquin Delta College discusses the implementation of a guidance course for EOPS students that was related to improved student outcomes (Nguyen, 2008). A more recent study used a survey instrument to examine the impact of EOPS services on the attitudes and social and academic integration of African-American EOPS students (Rams, 2009). For this group of students, the study suggests EOPS was a causal factor in increasing student self-efficacy scores and enhancing retention. Currently, the California Community College EOPS Association is engaged in a survey of their programs statewide to document specific practices at each college to better understand the relationship between specific services and student outcomes.

## Appendix A. Glossary

**Completion** - Completing a course without dropping or withdrawing. Note this was formerly called retention.

**Linear Regression** - A mathematical model that predicts the value of an outcome based upon one more predictor variables. Variables are typically continuous as opposed to categorical.

**Logistic Regression** - A form of regression where the dependent variable is binary such as completion or non-completion and a logistic function is used instead of the more familiar linear function. This method predicts the probability of the outcome occurring based upon values of independent variables, some of which can act as a control for differences in background variables between a treated and untreated group.

**Propensity Score Matching** - A statistical technique where two groups are matched on key variables using likelihood techniques to create a test set of matched pairs for comparison. This method is used when random assignment to conditions has not occurred and it is desirable to control for differences between groups to examine the effects of a treatment.

**Retention** - A student enrolling again in a subsequent term or academic year. (Note: this measure was formerly called “persistence.”)

**Transfer Ready** - Earning 60 or more transferable units with a GPA of 2.0 or higher.

**Success** - Earning a grade of C- or better in a course.

**Appendix B. Values for control variables in raw data set used for propensity score matching and regression.**

| Category | Variable | Value |
|---|---|---|
| EOPS Status | EOPS | 9% |
| | non-EOPS | 91% |
| Other Services | Received Disability Services | 5% |
| | Received Pell Grant | 23% |
| Age | Mean Age in First Term | 23.1 |
| Education | High School Graduate | 75% |
| Gender | Female | 51% |
| | Male | 49% |
| Ethnicity | African American | 8% |
| | Asian | 10% |
| | Filipino | 3% |
| | Hispanic | 36% |
| | Native American | 1% |
| | Pacific Islander | 1% |
| | White | 33% |
| | Other/Unknown | 8% |
| Level of First English | More Than 2 Levels Below Transfer | 6% |
| | 2 Levels Below Transfer | 12% |
| | 1 Level Below Transfer | 18% |
| | Transfer Level | 19% |
| | Other English | 2% |
| | No English Enrollment | 43% |
| Level of First Math | More Than 2 Levels Below Transfer | 15% |
| | 2 Levels Below Transfer | 13% |
| | 1 Level Below Transfer | 12% |
| | Transfer Level | 11% |
| | Other Math | 4% |
| | No Math Enrollment | 45% |
| Year of First Enrollment | 2004-2005 | 24% |
| | 2005-2006 | 24% |
| | 2006-2007 | 25% |
| | 2007-2008 | 27% |
| Percent of students from each college | College with fewest students in study | 0.2% |
| | College with average (mean) number of students in study | 1.0% |
| | College with most students in study | 3.0% |

## Appendix C. Propensity score matching bias reduction.

| Variable | Sample | Mean | | | | t-test | |
|---|---|---|---|---|---|---|---|
| | | Treated | Control | % Bias | % Reduc-tion in Bias | t | p |
| Age At Term | Unmatched | 21.95 | 21.38 | 6.6 | | 14.49 | < 0.00005 |
| | Matched | 21.95 | 20.96 | 11.6 | -74.5 | 19.79 | < 0.00005 |
| No High School Diploma | Unmatched | 0.070 | 0.045 | 10.7 | | 25.48 | < 0.00005 |
| | Matched | 0.070 | 0.064 | 2.5 | 76.2 | 3.86 | < 0.00005 |
| Male | Unmatched | 0.360 | 0.487 | -25.4 | | -54.4 | < 0.00005 |
| | Matched | 0.360 | 0.369 | -1.8 | 92.9 | -3.01 | 0.003 |
| Hispanic | Unmatched | 0.433 | 0.325 | 22.4 | | 49.98 | < 0.00005 |
| | Matched | 0.433 | 0.477 | -9.2 | 58.8 | -14.6 | < 0.00005 |
| African-American | Unmatched | 0.140 | 0.061 | 26.4 | | 67.92 | < 0.00005 |
| | Matched | 0.140 | 0.145 | -1.6 | 94 | -2.21 | 0.027 |
| Asian | Unmatched | 0.164 | 0.110 | 15.9 | | 37.31 | < 0.00005 |
| | Matched | 0.164 | 0.155 | 2.6 | 83.8 | 3.94 | < 0.00005 |
| Any Disability | Unmatched | 0.097 | 0.044 | 20.7 | | 53.11 | < 0.00005 |
| | Matched | 0.097 | 0.084 | 5.2 | 75 | 7.51 | < 0.00005 |
| Pell Grant | Unmatched | 0.852 | 0.209 | 168.5 | | 349.41 | < 0.00005 |
| | Matched | 0.852 | 0.855 | -0.7 | 99.6 | -1.21 | 0.225 |
| More Than 2 Levels Below Transferable English | Unmatched | 0.141 | 0.056 | 29.1 | | 76.59 | < 0.00005 |
| | Matched | 0.141 | 0.142 | -0.1 | 99.8 | -0.07 | 0.944 |
| 2 Levels Below Transferable English | Unmatched | 0.230 | 0.126 | 27.6 | | 66.62 | < 0.00005 |
| | Matched | 0.230 | 0.235 | -1.3 | 95.1 | -1.97 | 0.049 |
| 1 Level Below Transferable English | Unmatched | 0.264 | 0.216 | 11.1 | | 24.87 | < 0.00005 |
| | Matched | 0.264 | 0.271 | -1.8 | 83.9 | -2.82 | 0.005 |
| Transferable English | Unmatched | 0.186 | 0.267 | -19.5 | | -40.62 | < 0.00005 |
| | Matched | 0.186 | 0.186 | 0 | 99.8 | 0.06 | 0.956 |
| Other English | Unmatched | 0.025 | 0.023 | 1.4 | | 3.17 | 0.002 |
| | Matched | 0.025 | 0.021 | 2.7 | -88.5 | 4.48 | < 0.00005 |
| More Than 2 Levels Below Transferable Math | Unmatched | 0.315 | 0.143 | 41.9 | | 103.21 | < 0.00005 |
| | Matched | 0.315 | 0.310 | 1.3 | 96.8 | 1.93 | 0.054 |
| 2 Levels Below Transferable Math | Unmatched | 0.213 | 0.155 | 14.8 | | 33.98 | < 0.00005 |
| | Matched | 0.213 | 0.223 | -2.6 | 82.4 | -3.99 | < 0.00005 |
| 1 Level Below Transferable Math | Unmatched | 0.147 | 0.159 | -3.6 | | -7.65 | < 0.00005 |
| | Matched | 0.147 | 0.155 | -2.3 | 35 | -3.79 | < 0.00005 |
| Transferable Math | Unmatched | 0.116 | 0.150 | -10 | | -21.01 | < 0.00005 |
| | Matched | 0.116 | 0.115 | 0.3 | 96.8 | 0.56 | 0.579 |
| Other Math | Unmatched | 0.059 | 0.049 | 4.5 | | 10.06 | < 0.00005 |
| | Matched | 0.059 | 0.056 | 1.5 | 67.4 | 2.3 | 0.021 |
| 2004-2005 | Unmatched | 0.248 | 0.238 | 2.2 | | 4.89 | < 0.00005 |
| | Matched | 0.248 | 0.244 | 0.9 | 61.7 | 1.39 | 0.165 |
| 2005-2006 | Unmatched | 0.249 | 0.241 | 1.9 | | 4.1 | < 0.00005 |
| | Matched | 0.249 | 0.250 | -0.2 | 90.4 | -0.29 | 0.772 |
| 2006-2007 | Unmatched | 0.245 | 0.248 | -0.5 | | -1.12 | 0.265 |
| | Matched | 0.245 | 0.248 | -0.5 | 1.3 | -0.82 | 0.41 |

Individual colleges omitted to protect confidentiality

## Appendix D. Regression coefficients for EOPS participation indicator.

| Outcome | Un-standardized Coefficient | Odds Ratio | Estimated Relative Risk (Zhang & Yu 1998) | $R^2$ | McFadden's $R^2$ |
|---|---|---|---|---|---|
| One-year retention | | 1.51 | 1.51 | | 0.23 |
| Two-year retention | | 1.39 | 1.39 | | 0.19 |
| Transfer English success in 3 years [a] | | 1.12 | 1.12 | | 0.29 |
| Transfer math success in 3 years [b] | | 1.46 | 1.46 | | 0.29 |
| Mean transferable units completed in 3 years | 2.17 | | | 0.37 | |
| Earned degree or certificate in 3 years | | 1.56 | 1.56 | | 0.11 |
| 60 or more transferable units completed in 3 years | | 1.33 | 1.33 | | 0.31 |
| Transferred in 3 years | | 0.90 | 0.90 | | 0.17 |

[a] excluded transfer level and 'other' English from regression to allow for convergence

[b] excluded transfer level and 'other' math from regression to allow for convergence

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