

Comparing Student Outcomes Between Student Support Services Participants and Nonparticipants in the *2004/09 Beginning Postsecondary Students Longitudinal Study*



U.S. Department of Education Office of Postsecondary Education

Comparing Student Outcomes Between Student Support Services Participants and Nonparticipants in the *2004/09 Beginning Postsecondary Students Longitudinal Study*

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Office of Postsecondary Education
U.S. Department of Education**

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Foreword

The mission of the U.S. Department of Education (the Department) is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access. In keeping with this mission, the Student Support Services (SSS) program of the Federal TRIO Programs assists college students from disadvantaged backgrounds who need academic support to complete their education. The goals of the SSS program are to increase rates of college persistence, graduation, and transfer from two-year to four-year institutions for eligible students and to foster an institutional climate that supports the success of low-income students, first-generation students, and individuals with disabilities.

On behalf of the Department's Office of Postsecondary Education's Student Service, we are pleased to present this report, *Comparing Student Outcomes Between Student Support Services Participants and Nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study*. This report provides information regarding the academic achievements of a subset of SSS participants that were in the *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)* as well as the achievements of a matched sample of nonparticipants in the *BPS:04/09*.

Because this study is limited to SSS participants and matched nonparticipants who were in the *BPS:04/09*, results cannot be generalized to the larger population of SSS participants in 2003–04 (when students in the study entered college as freshmen) or to current SSS participants. Additionally, the methodology does not account for unobservable factors that impact student success in college and, therefore, could be driving the results presented in this report (e.g., student perseverance or motivation). Despite these limitations, this report provides valuable information concerning the outcomes of an important federal program and adds to the public's understanding of a large and understudied population. The information in this report should prove useful to a wide array of stakeholders, including Congress, the Department of Education, and education researchers.

In making this report available, we hope that the information it provides about the performance of the SSS program will foster communication among stakeholders aimed at assessing our mission and furthering the Department's goal of increasing postsecondary persistence and degree completion.

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Executive Summary

Numerous studies have documented academic achievement gaps between students from disadvantaged populations (e.g., students from low-income families, students demonstrating academic need, first-generation college students, and students with disabilities) and students from nondisadvantaged populations. The [Student Support Services](#) (SSS) program—one of the [Federal TRIO Programs](#) (TRIO)—was created to help address and close these gaps. SSS provides funding to two-year and four-year postsecondary institutions (grantees) to assist eligible students in persisting and ultimately completing a postsecondary education program of study. However, in part due to statutory limitations in the *Higher Education Act* (which allow researchers to conduct randomized control trials *within* TRIO programs but do not permit researchers to randomly assign students to *participate* in a TRIO program), there is little rigorous research into the effectiveness of this program.

This report compares the academic achievements attained by students who first participated in the SSS program as college freshmen in the 2003–04 academic year with the achievements of students in a sample of matched nonparticipants. Both the SSS participants and nonparticipants were those who provided information as part of the National Center for Education Statistics’ *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*. The sample of matched nonparticipants in the *BPS:04/09* was selected using propensity score modeling, a statistical technique that allowed researchers to match up to five nonparticipants to each SSS participant in the *BPS:04/09* who had similar demographic and high school achievement characteristics. All of the nonparticipants included in this study were classified into one of the SSS program service eligibility status categories:

- low-income and first-generation college students
- low-income only
- first-generation only
- students with disabilities
- students with disabilities who are also low-income

In addition to meeting the student eligibility criteria, nonparticipants were selected from among the same set of institutions that the SSS participants in the *BPS:04/09* attended, though not necessarily the same institution as the participant they were being matched to. Analyses included 110 SSS participants and 280 unique matched nonparticipants at 50 two-year institutions and 150 SSS participants and 290 unique matched nonparticipants at 80 four-year institutions. In addition to comparing rates of persistence in postsecondary education and completion of an associate degree, certificate, or bachelor’s degree, this report examines students’ credit accumulation during each year of their postsecondary careers.

Highlights

Persistence in Postsecondary Education

Two-Year Institutions

- SSS participants in the *BPS:04/09* who enrolled as freshmen in two-year institutions in 2003–04 were significantly more likely than matched nonparticipants to continue enrollment, transfer to a four-year institution, or receive an associate degree or certificate by the fall of the second, third, and fourth year of college (Table 1). By the fall of the fourth year of college, 51 percent of SSS participants in the *BPS:04/09* who enrolled as freshmen in two-year institutions in 2003–04 and 32 percent of matched nonparticipants were either still enrolled in college, had transferred to a four-year institution, or had received an associate degree or certificate.

Four-Year Institutions

- SSS participants in the *BPS:04/09* who enrolled as freshmen in four-year institutions in 2003–04 were significantly more likely than matched nonparticipants to continue enrollment or obtain a bachelor’s degree by the fall of the second, third, fourth, fifth, and sixth year of college (Table 3). Ninety-three percent of SSS participants in the *BPS:04/09* and 84 percent of matched nonparticipants continued enrollment in the fall of the second year of college. By the fall of the sixth year of college, 58 percent of SSS participants in the *BPS:04/09* and 48 percent of matched nonparticipants either had received a bachelor’s degree or were still enrolled in college.

Credit Accrual

Two-Year Institutions

- By the end of the fourth year of college, SSS participants in the *BPS:04/09* who enrolled as freshmen in two-year institutions in 2003–04 had accumulated an average of 61 college credits, whereas matched nonparticipants had accumulated an average of 41 college credits (Table 2), a difference that was statistically significant.

Four-Year Institutions

- By the end of the sixth year of college, SSS participants in the *BPS:04/09* who enrolled as freshmen in four-year institutions in 2003–04 had accumulated an average of 107 college credits, whereas matched nonparticipants had accumulated an average of 95 college credits (Table 4), a difference that was statistically significant.

Completions

Two-Year Institutions

- The difference in completion rates between SSS participants and matched nonparticipants by the end of the second year of college was not statistically significant among students in the *BPS:04/09* who enrolled as freshmen in two-year institutions. However, SSS participants had significantly higher completion rates than did matched nonparticipants in later years (Figure 1). By the end of the third year of college, 40 percent of SSS participants and 28 percent of matched nonparticipants had received an associate degree or certificate and/or had transferred to a four-year institution. By the end of the fourth year of college, the corresponding rates were 46 percent and 31 percent for SSS participants and matched nonparticipants, respectively.

Four-Year Institutions

- Among students in the *BPS:04/09* who enrolled as freshmen in four-year institutions in 2003–04, differences in bachelor’s degree completion rates between SSS participants and matched nonparticipants did not achieve statistical significance (Figure 4).

Study Limitations

First, the differences in academic attainment of SSS participants and nonparticipants described above could be due to differences in the characteristics of the two groups that could not be taken into account using our analysis methods. As discussed further in Appendix B, propensity score models only account for observed student background characteristics. While the model includes information about students’ high school achievement and SAT or ACT scores, the *BPS:04/09* does not include detailed measures of student academic behaviors or mindsets prior to college entry, and these, irrespective of participation in SSS, might influence college persistence, credit accrual, and completion. In addition, only 10 percent of the nonparticipants came from the same institutions as the SSS participants they were matched to; as a result, the differences in outcomes between the two groups could be related to the differences in the quality of the institutions attended (peers, instruction, faculty) and have little to do with participation in SSS. Moreover, due to the relatively small number of SSS participants in the *BPS:04/09*, SSS participants could not be directly matched to nonparticipants within eligibility subgroups (i.e., students who were first-generation only, low-income only, first-generation and low-income, or students with disabilities). Finally, only a small proportion of SSS participants were in the *BPS:04/09*, and these participants were not chosen at random; therefore, the achievements for SSS participants in this report cannot be generalized to all SSS participants in 2003–04 or to current SSS participants.

Introduction

Background and Purpose of the Report

The [Student Support Services](#) (SSS) program—one of the [Federal TRIO Programs](#)—was originally authorized in 1968 by the *Higher Education Act of 1965* (20 U.S.C. §1101a), as amended (HEA). The goal of SSS is to increase the postsecondary persistence and graduation rates of low-income students, first-generation students,¹ and students with disabilities.

Program services are offered by postsecondary degree-granting institutions that receive grants awarded through a competitive process. In order to participate in SSS at those institutions, a student must qualify on the basis of one of the eligibility statuses (low-income and first-generation, low-income only, first-generation only, low-income student with disabilities, or student with disabilities) and must need academic support. At least two-thirds of participants served by each grantee must be either students with disabilities or first-generation, low-income students; one-third of all participants with disabilities must also be low-income. SSS projects provide a wide range of services, including academic tutoring, guidance in selecting academic courses, assistance with financial aid applications, counseling, and grant aid, among others.

Each year, the TRIO office releases information about the academic performance of SSS participants, in compliance with the *Government Performance and Results Act* (GPRA). Although these GPRA reports provide information about SSS participants' postsecondary outcomes, without information about the outcomes of similar students who are not participants in the SSS program, it is not possible to put that SSS information in context. Therefore, in this report we compare the postsecondary outcomes of a subset of SSS participants who participated in a national longitudinal study and a matched sample of nonparticipants within the same study.

Data and Sample

For this report, we identified students who participated in the SSS program and were also included in the National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study* (*BPS:04/09*). It is the most recently collected national data set of incoming college freshmen that allows for the analysis of outcomes six years after college entry (with students beginning college during the 2003–04 academic year). Postsecondary enrollment and completion of college degrees are measured using college transcripts through the 2008–09 academic year.

We identified about 110 SSS participants at two-year institutions and about 150 SSS participants at four-year institutions in the *BPS:04/09* with the transcript data needed to observe postsecondary outcomes.² Overall, the background characteristics of this subset of SSS participants were similar to the characteristics of the full sample of 49,250 first-time freshmen who participated in SSS in

¹ In this report, the term “first-generation” refers to students whose parents or legal guardians have not received a bachelor’s degree.

² The Institute of Education Sciences requires that reports using its restricted data sets round unweighted sample sizes to the nearest 10. Therefore, all unweighted *BPS:04/09* sample sizes reported in this report have been rounded to the nearest 10.

2003–04 (see Appendix B, Table B2 and Table B3 for more details). Among participants at two-year institutions, participants in the *BPS:04/09* sample were significantly younger than the population of first-time freshmen participants in 2003–04 (by approximately four years). Among participants at four-year institutions, SSS participants in the *BPS:04/09* sample were less likely to be both low-income and first-generation and were more likely to have a disability than the population of first-time freshmen participants in 2003–04. In addition, SSS participants at four-year institutions in the *BPS:04/09* sample were significantly more likely to be white, less likely to be African American, and were significantly younger (by approximately one year) than the population of first-time freshmen participants at four-year institutions in 2003–04. Due to these differences in background characteristics between the subset of SSS participants in the *BPS:04/09* and the population of SSS participants in 2003–04, findings cannot be generalized to the population of SSS participants in 2003–04 or to current SSS participants.³

To construct an appropriate comparison sample of first-time freshmen who did not participate in the SSS program (i.e., nonparticipants), we created a matched sample of students who were not identified as SSS participants but who met at least one of the eligibility criteria (i.e., were identified as low-income students, first-generation students, or students with disabilities) using propensity score modeling. While a randomized control trial is the only evaluation methodology that would allow us to make causal inferences about the effectiveness of the program, changes to the HEA during its 2008 reauthorization introduced legal barriers to pursuing such a methodology. Propensity score modeling provides a method for researchers to create matched samples of participants and nonparticipants using available student background characteristic data, though it cannot take into account student characteristics that are not available to researchers and that may themselves have an influence on the outcomes of interest (e.g., the *BPS:04/09* does not contain measures of student motivation or dispositions prior to entering college). For the analyses presented in this report, we matched each SSS participant in the *BPS:04/09* with to up to five nonparticipants with similar background characteristics.⁴ Matched samples were created separately for students attending public two-year institutions, private two-year institutions, public four-year institutions, and private four-year institutions. Please see Appendix B for more details about the selection of the sample of students from the *BPS:04/09* that is used in this report.

To see whether the comparison group was as similar as possible to the sample of SSS participants, we tested for baseline equivalence on a large number of individual-level and institution-level characteristics. Within the matched sample of SSS participants and nonparticipants, observed differences in background characteristics were relatively small in magnitude and did not achieve statistical significance with one exception: within the matched sample of students at two-year institutions, the average annual tuition among SSS participants was significantly higher (by approximately \$340) than the average tuition among nonparticipants within the matched sample (see Appendix Table B5 and Table B6 for more details). At both two-year and four-year institutions, the distribution of students across racial/ethnic categories, eligibility status categories, reasons for attending the postsecondary institution, the highest level of math students completed in high school, and the institutional types and locations were similar

³ Because this sample of SSS participants is a non-representative subset of respondents to the *BPS:04/09*, and participation in the SSS program was not a factor that was considered when students were sampled for the *BPS:04/09*, survey weights were not applied to analyses, and results are therefore not generalizable to a larger population.

⁴ For analyses, nonparticipants are weighted to represent the number of times they were matched to a participant.

between SSS participants and matched nonparticipants. Average family incomes and average ACT and SAT test scores were also similar between SSS participants and matched nonparticipants. In addition, the institutions that SSS participants and matched nonparticipants attended had similar graduation and retention rates. However, to ensure that differences in outcomes between SSS participants and matched nonparticipants are not due to pre-existing differences, statistical models take into account differences in student-level and institution-level background characteristics.

Although the nonparticipant group was similar to the participant group on a number of student-level and institution-level characteristics, one important way they differed was in the specific institution attended. Only 10 percent of the participant-nonparticipant matches were from within the same institution, though they all came from institutions that offered SSS programs. This means that differences in student achievement between the two groups could be due to the differences in the quality of the institution they attended (e.g., peers, instruction, or faculty) and have little to do with participation in SSS.⁵

Methods of Analysis

To investigate the relationships between participation in the SSS program and student achievement outcomes, ordinary least squares regression models were performed.⁶ All statistical models accounted for differences in student background characteristics and institution-level characteristics between SSS participants and matched nonparticipants. A detailed description of these models can be found in Appendix B.

Two primary student achievement measures were used to define successful postsecondary outcomes for this report: postsecondary persistence and completion. These two measures were defined differently for students enrolled in two-year institutions than for those enrolled in four-year institutions:

- For students who enrolled as freshmen in two-year institutions in the 2003–04 academic year, “persistence in postsecondary education” refers to students who continued enrollment (at any two-year or four-year institution) or received an associate degree or certificate by the fall of the second, third, and/or fourth year of college. For these students, “completion” is defined as receiving an associate degree or certificate and transferring to a four-year institution, receiving an associate degree or certificate without transferring to a four-year institution, and transferring to a four-year institution without receiving an associate degree or certificate within two, three, and/or four years of entering college as freshmen. This study also examines rates of bachelor’s degree completion for these students within five and six years of college entry.

⁵ An alternative approach, emphasizing matching nonparticipants to participants within the same institution, raised the percentage of matches made in that way from 10 percent to 46 percent, but created less comparability in student characteristics between the two groups.

⁶ Logistic regression, which accounts for the non-normal distribution of the outcome measure in the calculation of standard errors, was performed as a sensitivity check in models of the binary outcomes of persistence and completion. The results of the logistic regression analyses mirrored the results presented in this report.

- For students who enrolled as freshmen in four-year institutions in the 2003–04 academic year, “persistence in postsecondary education” refers to students who continued enrollment or received a bachelor’s degree by the fall of the second, third, fourth, fifth, and/or sixth year of college. For these students, “completion” is defined as receiving a bachelor’s degree from any institution within four, five, and/or six years of entering college as freshmen.

In addition to these persistence and completion measures, this study examines whether the number of credits that students accumulated during their academic careers differed between SSS participants and matched nonparticipants.

Student Achievements

This section presents the achievements of SSS participants who were in the *BPS:04/09*, as well as the achievements of matched nonparticipants. Achievement outcomes differ between students who enrolled as freshmen in two-year and four-year institutions, and this section therefore presents their achievements in separate tables and figures.⁷

Achievements for Students Who Started in Two-Year Institutions

Persistence in Postsecondary Education

Among students who enrolled as freshmen in two-year institutions, the persistence rate equals the percentage of these students who by the fall of the following year (1) were enrolled in any two-year or four-year institution, or (2) had received an associate degree or certificate in a previous year. Table 1 shows that 74 percent of SSS participants in the *BPS:04/09* who entered as freshmen in two-year institutions persisted to the second year of college, compared with 63 percent of matched nonparticipants, a difference that was statistically significant. In addition, SSS participants were significantly more likely than matched nonparticipants to persist to the fall of the third year of college (63 percent compared with 40 percent) and the fourth year of college (51 percent compared with 32 percent).

Table 1. Percentage of first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered two-year institutions in 2003–04 and persisted in college

Outcome	Percent of SSS participants (n=110)	Percent of matched nonparticipants (n=510)	Difference
Persisted to the fall of the second year	73.7	63.0	10.7*
Persisted to the fall of the third year	63.2	40.1	23.1*
Persisted to the fall of the fourth year	50.9	32.4	18.5*

* $p < .05$

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. Percentages for nonparticipants are estimates resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Credit Accumulation

In addition to enrollment persistence, credit accumulation is an important outcome to consider because it more accurately captures students' academic progress through college. Table 2 demonstrates that by the end of the first, second, third, and fourth year of college, SSS

⁷ Detailed results, including tables with coefficients and standard errors, can be found in Appendix C.

participants who entered two-year institutions accumulated a significantly greater number of credits when compared with matched nonparticipants. For example, by the end of the first year of college, the average SSS participant had earned approximately 23 college credits, whereas the average matched nonparticipant had earned approximately 18 credits. By the end of the fourth year of college, SSS participants accumulated an average of 61 credits, which was significantly higher than the average of 41 credits accumulated by matched nonparticipants.

Table 2. Average number of credits accumulated by the end of the first, second, third, and fourth year of college among first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered two-year institutions in 2003–04

Credit accumulation	Average number of credits accumulated by SSS participants (n=110)	Average number of credits accumulated by matched nonparticipants (n=510)	Difference
By the end of the first year	23.4	18.0	5.3*
By the end of the second year	41.0	29.4	11.6*
By the end of the third year	52.5	36.2	16.3*
By the end of the fourth year	60.6	41.3	19.3*

* $p < .05$

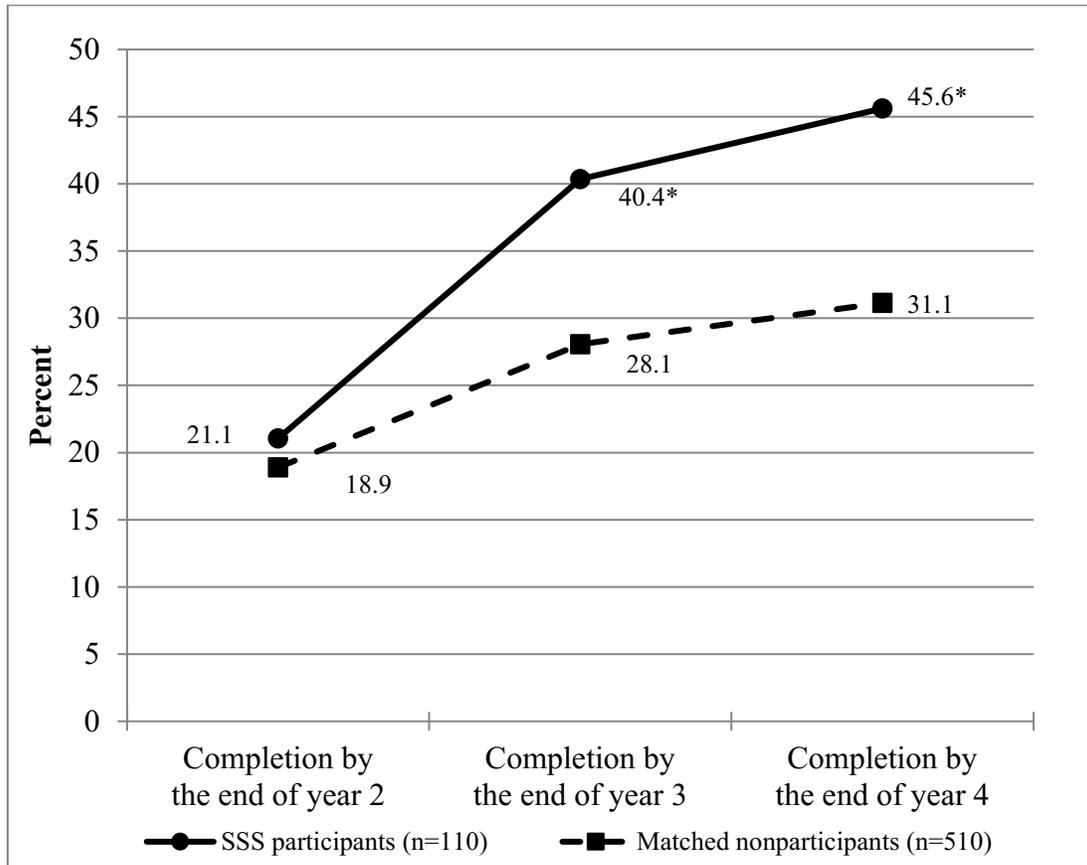
NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. A small number of matched nonparticipants at two-year institutions had missing data on credit accumulation. The average number of credits accumulated by matched nonparticipants is an estimate resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09).

Completion

For students who entered as freshmen in two-year institutions, “completion” was defined as (1) receiving an associate degree or certificate and transferring to a four-year institution, (2) receiving an associate degree or certificate without transfer to a four-year institution, or (3) transferring to a four-year institution without receiving an associate degree or certificate. The completion measure shown in Figure 1 presents the completion rate at the end of the second, third, and fourth year after entering college. At the end of the second year of college, the combined completion rate for SSS participants (21 percent) was not significantly different from the combined completion rate for matched nonparticipants (19 percent). However, by the end of the third year of college, SSS participants had significantly higher completion rates than did matched nonparticipants (40 percent compared with 28 percent). SSS participants also had significantly higher completion rates by the end of the fourth year of college (46 percent) compared with matched nonparticipants (31 percent).

Figure 1. Percentage of first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered two-year institutions in 2003–04 and completed an associate degree or certificate or transferred to a four-year institution (with or without receiving an associate degree or certificate) within two, three, and four years



* $p < .05$

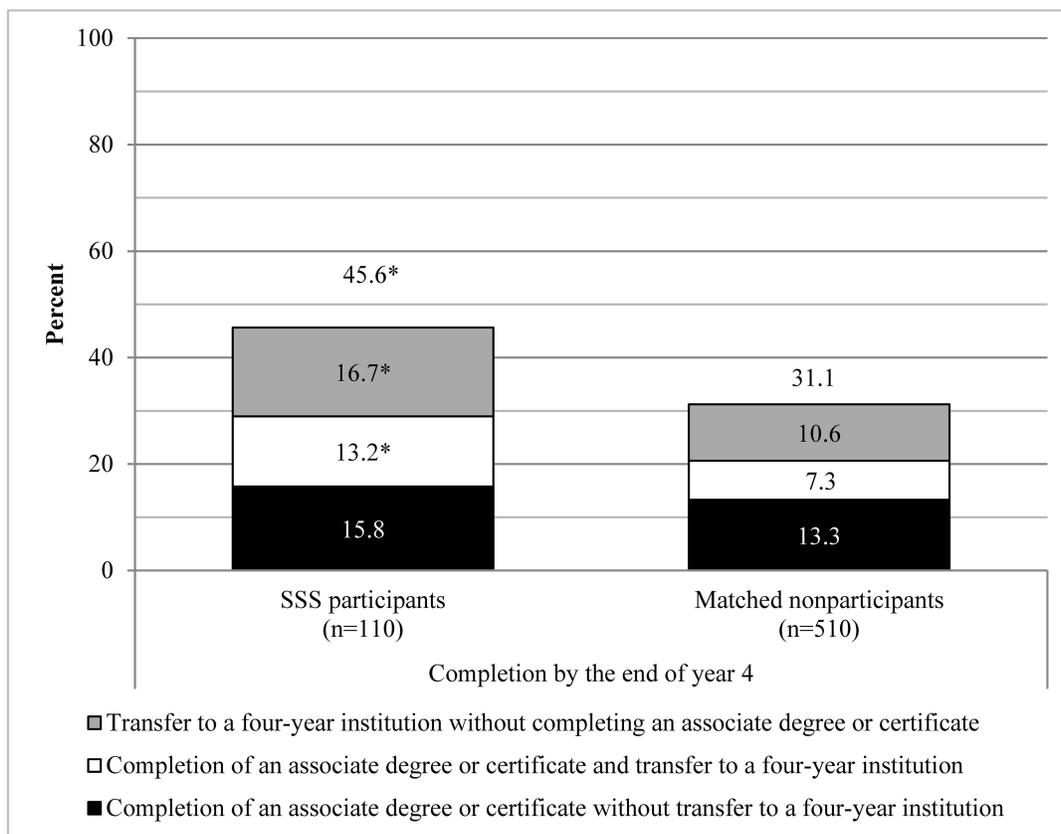
NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. Percentages for nonparticipants are estimates resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis. Completion at two-year institutions includes completion of an associate degree or certificate and transfer to a four-year institution, completion of an associate degree or certificate without transfer to a four-year institution, and transfer to a four-year institution without receiving an associate degree or certificate.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09).

Figure 2 separates the combined completion rate into three components, as defined by students' transfer and degree or certificate completion status. Transferring to a four-year institution, either with or without obtaining an associate degree or certificate, is an important completion outcome because bachelor's degree completion is a goal of the SSS program regardless of whether students begin their education at a two-year or four-year institution. Figure 2 shows that, by the end of the fourth year of college, 30 percent of SSS participants and 18 percent of matched nonparticipants transferred to a four-year institution either with or without obtaining an associate

degree or certificate. Rates of both (1) obtaining an associate degree or certificate and transferring to a four-year institution and (2) transferring to a four-year institution without obtaining an associate degree or certificate by the end of the fourth year of college were significantly higher among SSS participants when compared with matched nonparticipants. In contrast, 16 percent of SSS participants and 13 percent of matched nonparticipants at two-year institutions obtained an associate degree or certificate and did not transfer to a four-year institution by the end of the fourth year of college, a difference that was not statistically significant.

Figure 2. Percentage of first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered two-year institutions in 2003–04 and completed an associate degree or certificate and transferred to four-year institutions, completed an associate degree or certificate without transferring to four-year institutions, or transferred to four-year institutions without completing an associate degree or certificate within four years of entering college



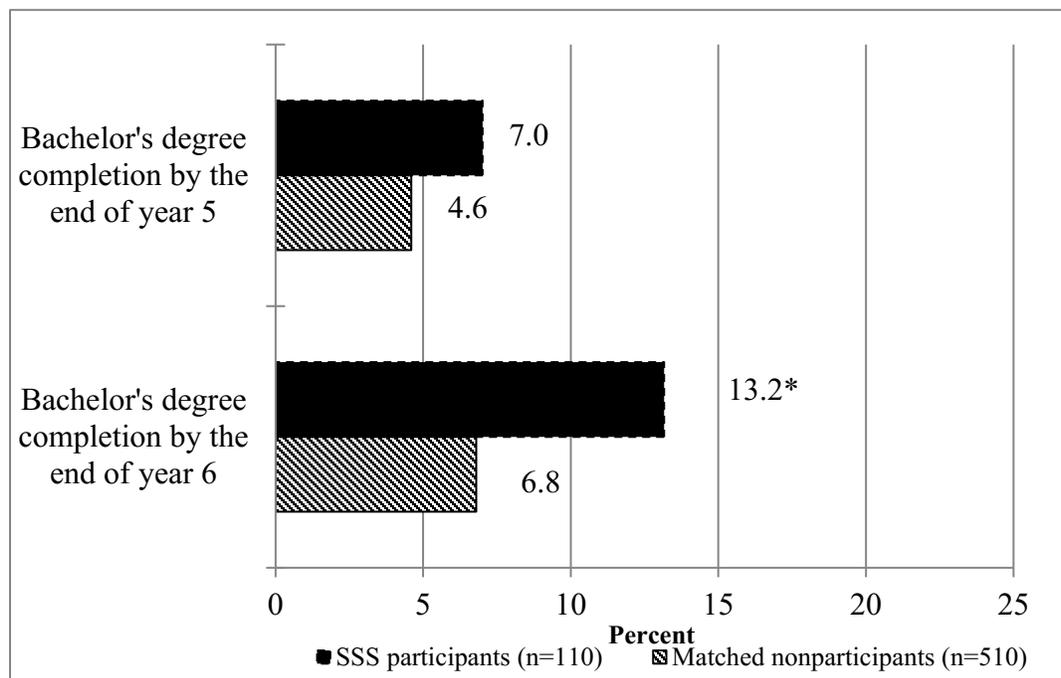
* $p < .05$

NOTE: Numbers may not sum to overall completion rates due to rounding. To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. Percentages for nonparticipants are estimates resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

The *BPS:04/09* provides information about bachelor's degree completion for students who entered as freshmen in two-year institutions, obtained by collecting transcript information from all institutions that students attended within six years of college entry. Figure 3 shows that by the end of the sixth year of college, 13 percent of SSS participants and 7 percent of matched nonparticipants had completed a bachelor's degree, a difference that was statistically significant.⁸ The difference in bachelor's degree completion rates between SSS participants and matched nonparticipants was not statistically significant by the end of the fifth year of college.

Figure 3. Percentage of first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered two-year institutions in 2003–04 and completed a bachelor's degree within five and six years



* $p < .05$

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 280 unique nonparticipants were included in the matched sample, because each nonparticipant could be matched with more than one SSS participant at two-year institutions, the weighted sample includes 510 matched nonparticipants. Percentages for nonparticipants are estimates resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

⁸ Within the sample used in this report, 37 percent of SSS participants and 39 percent of matched nonparticipants at two-year institutions were enrolled in a four-year transfer program during the first year of college. Statistical models controlled for differences in academic program as reported during students' first year of college.

Achievements for Students Who Started in Four-Year Institutions

Persistence in Postsecondary Education

For students who enrolled as freshmen in four-year institutions, the persistence rate is the percentage of these students who were enrolled in any institution in the fall of the following year. This persistence rate also includes students who obtained a bachelor's degree in any previous academic year. Table 3 shows that a significantly larger percentage of SSS participants (93 percent) than matched nonparticipants (84 percent) who entered as freshmen in four-year institutions persisted to the second year of college. SSS participants were also significantly more likely than matched nonparticipants to persist to the fall of the third, fourth, fifth, and sixth year of college.

Table 3. Percentage of first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered four-year institutions in 2003–04 and persisted in college

Outcome	Percent of SSS participants (n=150)	Percent of matched non participants (n=680)	Difference
Persisted to the fall of the second year	93.2	84.1	9.1*
Persisted to the fall of the third year	82.3	69.5	12.8*
Persisted to the fall of the fourth year	70.7	61.5	9.2*
Persisted to the fall of the fifth year	63.9	51.2	12.7*
Persisted to the fall of the sixth year	57.8	47.8	10.0*

* $p < .05$

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 290 unique nonparticipants were included in the matched sample at four-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 680 matched nonparticipants. The average number of credits accumulated by matched nonparticipants is an estimate resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09).

Credit Accumulation

Credit accumulation is an indication of students' progression through their academic careers. Through the first six years of college, SSS participants earned a significantly greater number of credits than did matched nonparticipants (see Table 4). By the end of the fourth year of college, the average SSS participant earned 93 college credits, whereas the average matched nonparticipant accumulated 83 college credits. Gaps in credit accumulation persisted through the fifth and sixth years of college.

Table 4. Average number of credits accumulated by the end of the first, second, third, fourth, fifth, and sixth year of college among first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered four-year institutions in 2003–04

Credit accumulation	Average number of credits accumulated by SSS participants (n=140)	Average number of credits accumulated by matched nonparticipants (n=670)	Difference
By the end of the first year	27.4	24.3	3.1*
By the end of the second year	51.5	45.3	6.3*
By the end of the third year	73.1	64.0	9.0*
By the end of the fourth year	93.0	83.0	10.0*
By the end of the fifth year	102.8	91.8	11.0*
By the end of the sixth year	106.9	94.6	12.3*

* $p < .05$

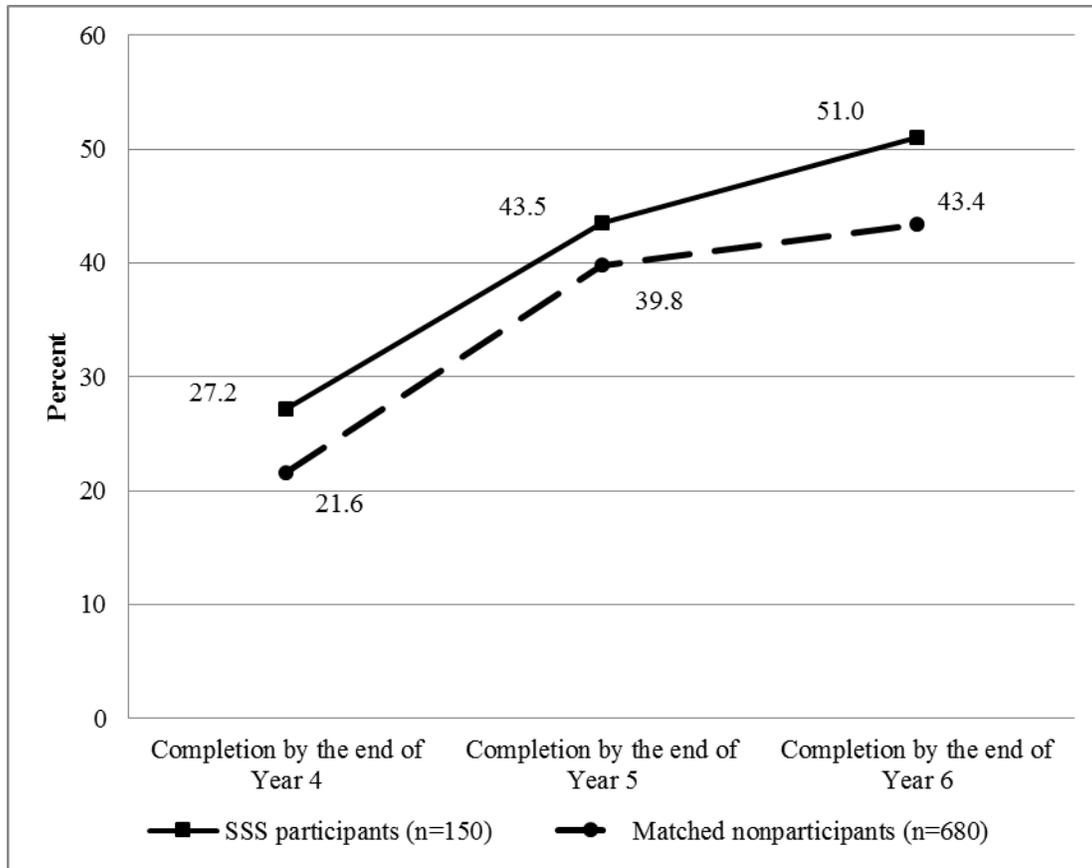
NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 290 unique nonparticipants were included in the matched sample at four-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 680 matched nonparticipants. A small number of SSS participants and matched nonparticipants at four-year institutions had missing data on credit accumulation. The average number of credits accumulated by matched nonparticipants is an estimate resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09).

Bachelor's Degree Completion

For students who enrolled as freshmen in four-year institutions, degree completion was measured as the percentage of incoming freshmen who received a bachelor's degree within four, five, and six years of entering college. Fifty-one percent of SSS participants and 43 percent of matched nonparticipants completed a bachelor's degree by the end of their sixth year of college, a difference that fell short of achieving statistical significance (see Figure 4).

Figure 4. Percentage of first-time freshman Student Support Services (SSS) participants and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered four-year institutions in 2003–04 and completed a bachelor’s degree within four, five, and six years



* $p < .05$

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 290 unique nonparticipants were included in the matched sample at four-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 680 matched nonparticipants. Percentages for nonparticipants are estimates resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education’s National Center for Education Statistics’ 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09).

Study Limitations

The differences in academic attainment of SSS participants and nonparticipants described above could be due to differences in the characteristics of the two groups that could not be taken into account using our analysis methods. As discussed further in Appendix B, propensity score models only account for observed student background characteristics. While the model includes information about students’ high school achievement and SAT or ACT scores, the BPS:04/09 does not include detailed measures of student academic behaviors or mindsets prior to college entry and these, irrespective of participation in SSS, might influence college persistence, credit accrual, and completion. In addition, only 10 percent of the nonparticipants came from the same

higher education institutions as the SSS participants they were matched to; as a result, the differences in outcomes between the two groups may be due to the differences in the quality of the institutions attended (peers, instruction, faculty) and have little to do with participation in SSS. Moreover, due to the relatively small number of SSS participants in the *BPS:04/09*, SSS participants could not be directly matched to nonparticipants within eligibility subgroups (i.e., students who were first-generation only, low-income only, first-generation and low-income, or students with disabilities). Finally, only a small proportion of SSS participants were in the *BPS:04/09*, and these participants were not chosen at random; therefore, the achievements for SSS participants in this report cannot be generalized to all SSS participants in 2003–04 or to current SSS participants.

Conclusion

This report compared the academic achievements of SSS participants who were in the *BPS:04/09* to the achievements of matched nonparticipants, separately for students who began at two-year and four-year institutions. Overall, findings show the SSS participants demonstrated higher rates of persistence, credit accrual, and completion than matched nonparticipants, although differences in completion rates for students who attended four-year institutions did not achieve statistical significance.

Two-Year Institutions

SSS participants in the *BPS:04/09* who entered as freshmen in two-year institutions were more likely to persist in college and accumulate a greater number of college credits for the first four years of postsecondary education (accumulating approximately 19 more college credits, or 47 percent more college credits, by the end of the fourth year of college) relative to matched nonparticipants. SSS participants were also more likely to experience a completion outcome (i.e., transfer to a four-year institution with or without obtaining an associate degree or certificate first or earning an associate degree or certificate without transferring) than were matched nonparticipants by the end of the third and fourth year of college. Finally, SSS participants who began their education at two-year institutions were significantly more likely than matched nonparticipants to complete a bachelor's degree within six years of college entry.

Four-Year Institutions

Among students who entered college at four-year institutions, SSS participants were more likely to persist in college and accumulate more credits during the first six years of college (accumulating approximately 12 more college credits, or 13 percent more college credits, by the end of the sixth year of college) when compared with matched nonparticipants. Although rates of bachelor's degree completion appeared to be higher for SSS participants than for matched nonparticipants, differences in completion rates are not statistically significant.

APPENDIX A. GLOSSARY

Appendix A: Glossary

Academic need refers to (1) students who had a high school grade point average below 2.0 or (2) students who obtained a GED, received a high school completion certificate, or did not receive a high school degree or certificate.

Associate degree refers to a degree granted for the successful completion of a sub-baccalaureate program of study, which usually requires at least two years (or the equivalent) of full-time college-level study. This includes degrees granted in a cooperative or work-study program.

Bachelor's degree refers to a degree granted for the successful completion of a baccalaureate program of study, which usually requires at least four years (or the equivalent) of full-time college-level study. This includes degrees granted in a cooperative or work-study program.

Beginning Postsecondary Students Longitudinal Study (BPS:04/09) is the data source from which samples of Student Support Services participants and matched nonparticipants examined in this report were drawn. Sponsored by the National Center for Education Statistics (NCES) of the U.S. Department of Education, the *BPS:04/09* surveyed a sample of first-time students who were beginning their undergraduate education in academic year 2003–04. Students were surveyed at three points in time: at the end of their first year and then three and six years after first starting postsecondary education. The *BPS:04/09* collects data on a variety of topics, including student demographic characteristics, school and work experiences, persistence, transfer, and degree attainment. Student background characteristics presented in this report are derived from the first-year survey and other administrative data collections, and postsecondary achievements are derived from students' college transcript data, which were part of the collection effort for the *BPS:04/09*.

Completion (for students who enrolled in two-year institutions) refers to any of the following three outcomes: (1) transferring to a four-year institution (with or without receiving an associate degree or certificate), (2) obtaining an associate degree, or (3) receiving a certificate. The time frame for completion at two-year institutions is within two, three, and four years of entering college as a freshman.

Completion (for students who enrolled in four-year institutions) refers to obtaining a bachelor's degree within four, five, and six years of entering college as a freshman.

Disability status is one of the eligibility criteria for receiving SSS program services. Students with disabilities may have been diagnosed with either a physical or mental impairment that would limit their ability to participate in college activities.

Eligibility statuses are the criteria used by the SSS program to determine whether students qualify to receive program services. The five eligibility statuses are

1. low-income and first-generation;
2. low-income only;
3. first-generation only;

4. disabled; and
5. disabled and low-income.

Due to small sample sizes, for this report, all students who reported having a disability status (including those who were low-income) were classified as disabled.

First-generation refers to a student whose parents or legal guardians did not receive a bachelor's degree.

Four-year institution refers to an institution that primarily awards bachelor's degrees.

Freshmen students refers to students who are entering college for the first time and have never attended a postsecondary institution in the past. All students in the *BPS:04/09* are first-time freshmen students.

Low-income refers to taxable family income that does not exceed 150 percent of the national poverty level in the calendar year prior to a student's entering college for the first time. This poverty level is established by the U.S. Census Bureau every year and varies based on family size and state of residence.

p stands for “*p* value,” which is a statistical calculation of the probability that an observed finding could occur by chance in a population. The notation $p < .05$ (which is the standard researchers typically use) means that the finding must have a calculated *p* value of less than 5 percent to conclude that a finding is “statistically significant.” For more information, see Appendix B, Testing for Significant Differences on Student Outcomes.

Persistence (for students who enrolled in two-year institutions) is defined as continued enrollment in postsecondary education into the fall term of a student's second, third, and fourth year of college at either a two-year or a four-year institution. This measure also includes students who obtained an associate degree or a certificate in a previous academic year.

Persistence (for students who enrolled in four-year institutions) is defined as continued enrollment in postsecondary education into the fall term of a student's second, third, fourth, fifth, and sixth year of college. This measure also includes students who obtained a bachelor's degree in a previous academic year.

Race and ethnicity are used to describe groups that individuals belong to, identify with, or belong to in the eyes of the community. The groups follow. (Due to the small number of students included in this study, several smaller racial/ethnic groups were collapsed into a category labeled “other.”)

- **Black or African American**—a person having origins in any of the black racial groups of Africa
- **Hispanic or Latino**—a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race

- **White**—a person having origins in any of the original peoples of Europe, North Africa, or the Middle East
- **American Indian or Alaska Native**—a person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.
- **Asian**—a person having origins in any of the original peoples of the Far East, Southeast Asia, and the Indian subcontinent. This area includes, for example, China, India, Japan, Korea, and the Philippine Islands.
- **Native Hawaiian or Other Pacific Islander**—a person having origins in any of the original peoples of Hawaii or other Pacific islands such as Samoa and Guam.

Statistical significance is a mathematical tool that is used to determine whether the outcome of a statistical test is the result of a relationship between specific factors or merely the result of chance. Tests of statistical significance are used to indicate that the observed differences are not likely to be associated with sampling and measurement error, but are statistically dependable population differences. For more information, see Appendix B, Testing for Significant Differences on Student Outcomes.

Two-year institution refers to an institution that primarily awards associate degrees.

APPENDIX B. DATA SOURCES AND METHODOLOGY

Appendix B: Data Sources and Methodology

This appendix provides additional information about (1) the data sources used in this report; (2) the methodology used to create subsets of Student Support Services (SSS) participants and matched nonparticipants from the *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*; (3) a comparison of student characteristics between SSS participants identified in the *BPS:04/09* and all first-time freshman participants in the SSS program in 2003–04; (4) a comparison of student characteristics between SSS participants and matched nonparticipants at two-year and four-year institutions in the *BPS:04/09*; (5) testing for statistically significant differences in student achievements between SSS participants and nonparticipants; and (6) the limitations of the data and analyses.

Data Sources

2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)

The National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*⁹ is the most recent nationally representative data set of students that provides data on persistence and completion outcomes in the six years following postsecondary entry. The BPS:04 cohort includes students entering postsecondary education for the first time, beginning their freshman year in 2003–04.¹⁰ The *BPS:04/09* contains sufficient student background information to identify students' eligibility status and measure students' high school achievement, allowing the team to match SSS participants within the data set with nonparticipants with similar eligibility criteria and high school achievement.

Student background characteristics were measured through student surveys and other administrative data collections that took place during the spring and summer of 2004 (i.e., during or immediately after students' first year of college). All measures of student achievement, and all of the variables used in the propensity score model described below, were collected during the first year of college but measure students' achievement and traits prior to college entry and therefore prior to students' potential admission to an SSS program. The *BPS:04/09* data used to measure student outcomes come entirely from transcripts collected through the NCES *2009 Postsecondary Education Transcript Study (PETS:09)*. Student survey data were not used to measure achievement outcomes.

Some students in the *BPS:04/09* had incomplete outcome data due to missing transcript data. Although 92 percent of the base-year *BPS:04/09* sample had transcript data from at least one postsecondary institution, the *BPS:04/09* had complete transcript data for 87 percent of the base-year sample.¹¹ Within the sample that was used for this study, 87 percent of SSS participants and

⁹ <https://nces.ed.gov/surveys/bps/>

¹⁰ Data have been collected for a more recent cohort of BPS respondents who entered their freshman year in 2011–12. However, at the time this report was produced, outcome data six years after initial college entry were not yet available.

¹¹ <http://nces.ed.gov/pubs2012/2012246.pdf>

87 percent of matched nonparticipants had transcript data from every institution students attended.¹²

Annual Performance Reports

SSS grantees are required to report annually the student-level background and academic information about the participants served. These annual performance reports (APRs) include student identifying information (i.e., first and last names, date of birth, social security number) and information about individual students' race/ethnicity, eligibility status, and academic need. For this report, we used the identifying information in the APR data to identify SSS participants within the *BPS:04/09* data. In addition, APR data were used to measure the characteristics of all first-year freshman SSS participants in 2003–04 and compare how these characteristics resembled the characteristics of the subset of SSS participants who participated in the *BPS:04/09*.

Identifying SSS Participants in the BPS:04/09

The process of identifying SSS participants in the *BPS:04/09* began with the creation of input files containing personally identifiable information (PII). Two separate PII input files (one containing PII for all *BPS:04/09* sample members and another containing PII for SSS participants who first enrolled in a postsecondary institution during the 2003–04 academic year¹³) were independently created for the purpose of identifying matches in the two files. When compiling these files, programmers also created corresponding sets of matching “keys” composed of different combinations of first name, last name, date of birth (DOB), and social security number. Table B1 displays the matching keys that were used to identify cases that were in both the *BPS:04/09* and the SSS files.

¹² At four-year institutions, 89 percent of nonparticipants and 90 percent of participants had complete transcript data. At two-year institutions, 85 percent of nonparticipants and 83 percent of participants had complete transcript data.

¹³ To account for the possibility that cases could have legitimate associations with multiple names (e.g., as a result of marrying) and/or school codes (e.g., as a result of school transfer), multiple records per individual were included in both the SSS and BPS matching input files, where applicable.

Table B1. Composition of *Beginning Postsecondary Students Longitudinal Study (BPS:04/09)* and Student Support Services Annual Performance Report Matching Keys

Key number	Key composition
Key 1	Last Name + First Name + Date of Birth + Social Security Number
Key 1t	Last Name + First Name + Date of Birth t ¹ + Social Security Number
Key 2	Last Name + First Name + Date of Birth
Key 2t	Last Name + First Name + Date of Birth t ¹
Key 3	Last Name + First Name + Social Security Number
Key 4	Last Name + Date of Birth + Social Security Number
Key 4t	Last Name + Date of Birth t ¹ + Social Security Number
Key 5	First Name + Date of Birth + Social Security Number
Key 5t	First Name + Date of Birth t ¹ + Social Security Number
Key 6	Social Security Number
Key 7	First three letters of First Name + First three letters of Last Name + Date of Birth
Key 7t	First three letters of First Name + First three letters of Last Name + Date of Birth t ¹

¹ Date of Birth t refers to month and day for Date of Birth are transposed relative to the corresponding key.

SOURCE: The subset of Student Support Services (SSS) participants was drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 *Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*. Information for all SSS participants in 2003–04 come from the 2003–04 Annual Performance Report Data (APR).

Programmatic matching was then performed by sequentially merging the PII input files on each of the matching keys described in Table B1. For each *BPS:04/09* record, a match was first attempted on Key 1. For any *BPS:04/09* record that did not yield a match on Key 1, a match on Key 1t was then attempted. For any records where a match on Key 1t was not obtained, a match on Key 2 was then attempted. This matching process continued until either a match was obtained or all matching keys were exhausted.

After programmatic matching was completed, quality control steps were implemented, including a manual review of matched cases to eliminate false positive matches on the less restrictive keys.¹⁴ A total of 330 SSS participants were identified in the *BPS:04/09*.

Approximately 70 SSS participants were removed from the sample prior to conducting propensity score modeling. First, approximately 30 SSS participants were removed from the sample because institutions participants attended did not match between the *BPS:04/09* data and the APR data. Second, approximately 20 SSS participants were removed from the sample because they did not have transcript data. Finally, approximately 20 participants were removed from the sample for having missing data on one of the covariates in the propensity score model or because zero eligible nonparticipants in the *BPS:04/09* attended the same postsecondary institution (described in more detail below). Our final analytic sample included 110 SSS participants who enrolled in two-year institutions and 150 SSS participants who enrolled in four-year institutions.

¹⁴ A very small number of SSS participants were matched using Key 6, Key 7, and Key 7t (rounding to 0).

We compared the background characteristics of SSS participants identified in the *BPS:04/09* in the final analytic sample to the background characteristics of all first-year SSS participants in 2003–04 to determine whether the subset of participants used in this report were representative of all SSS participants during the reporting year (see Table B2 and Table B3). This analysis was limited to student characteristics that were available in both the APR (for all SSS participants in 2003–04) and the *BPS:04/09* (for the subset of SSS participants included in our analysis). Because SSS participants were not randomly selected to participate in the *BPS:04/09*, the characteristics of SSS participants in the *BPS:04/09* are not likely to be identical to the characteristics of all SSS participants in 2003–04. Table B2 and Table B3 present the distribution of characteristics for SSS participants in the *BPS:04/09* and for all SSS participants in 2003–04 separately for students who began in two-year and four-year institutions.

Among participants who enrolled as freshmen at two-year institutions, the distribution of students by eligibility status, gender, and race/ethnicity was relatively similar between the subset of SSS participants in the *BPS:04/09* and all SSS participants in 2003–04 (see Table B2). The average age of SSS participants in the *BPS:04/09* was significantly lower (by approximately four years) than the average age of all SSS freshman participants in 2003–04 at two-year institutions.

Table B2. Characteristics of first-time freshman Student Support Services (SSS) participants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and all SSS participants who entered two-year institutions in 2003–04

Characteristics	SSS participants in the BPS:04/09 (n=110)	All SSS participants in 2003–04 (n=21,445)	Difference
	Percent	Percent	Percentage points
Eligibility status			
First-generation and low-income	65.8	63.8	2.0
Low-income only	4.5	6.0	-1.5
First-generation only	15.3	17.5	-2.2
Disabled (includes low-income)	14.4	12.5	1.9
Sex			
Male	31.6	32.6	-1.0
Female	68.4	67.4	1.0
Race/Ethnicity			
White	48.3	47.4	0.9
Black	24.6	28.3	-3.7
Hispanic	15.8	12.1	3.7
Other	11.4	12.2	-0.8
	Average/ Median	Average/ Median	Average/ Median
Average age (in years)	22.1	25.7	-3.6*
Median age (in years)	19.0	20.8	-1.8

* $p < .05$

NOTE: Due to small sample sizes, persons identifying as Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, Asian, and persons with more than one reported race are collapsed into the category "other" race/ethnicity.

SOURCE: The subset of Student Support Services (SSS) participants was drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09). Information for all SSS participants in 2003–04 come from the 2003–04 Annual Performance Report Data.

Among participants who enrolled as freshmen at four-year institutions, the percentage of participants who were both first-generation and low-income was significantly smaller and the percentage of participants who were disabled was significantly higher among SSS participants in the BPS:04/09 than the percentage observed among all SSS freshmen participants at four-year institutions in 2003–04. SSS participants in the BPS:04/09 were also significantly more likely to be white and significantly less likely to be black than the population of SSS freshmen participants at four-year institutions in 2003–04. The average age of SSS participants in the BPS:04/09 was also significantly lower (by approximately one year) than the average age of all SSS freshman participants in 2003–04 at four-year institutions.

Table B3. Characteristics of first-time freshman Student Support Services (SSS) participants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and all SSS participants who entered four-year institutions in 2003–04

Characteristics	SSS participants in the BPS:04/09 (n=150)	All SSS participants in 2003–04 (n=27,804)	Difference
	Percent	Percent	Percentage points
Eligibility status			
First-generation and low-income	54.6	64.8	-10.2*
Low-income only	12.1	8.6	3.5
First-generation only	17.7	18.3	-0.6
Disabled (includes low-income)	15.6	8.3	7.3*
Sex			
Male	38.8	36.6	2.2
Female	61.2	63.3	-2.1
Race/Ethnicity			
White	45.6	31.9	13.7*
Black	19.7	30.8	-11.1*
Hispanic	27.9	25.8	2.1
Other	6.8	11.4	-4.6
	Average/ Median	Average/ Median	Average/ Median
Average age (in years)	19.1	20.3	-1.2*
Median age (in years)	18.0	18.8	-0.8

* $p < .05$

NOTE: Due to small sample sizes, persons identifying as Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, Asian, and persons with more than one reported race are collapsed into the category "other" race/ethnicity.

SOURCE: The subset of Student Support Services (SSS) participants was drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09). Information for all SSS participants in 2003–04 comes from the 2003–04 Annual Performance Report Data.

Overall, the comparison of the characteristics of the subset of SSS participants in the BPS:04/09 and the characteristics of all SSS participants in 2003–04 revealed a few differences among students at two-year institutions and a larger number of differences among students at four-year institutions. Due to these differences, the results in this report cannot be interpreted as generalizable to the population of SSS participants in 2003–04 or to current SSS participants because SSS participants were not randomly selected to participate in the BPS:04/09. Because participation in the SSS program was not a factor that was considered by the research team that selected the sample for the BPS:04/09, survey weights would not provide accurate population-level estimates for the select sample of SSS participants in the BPS:04/09. It is for this reason that survey weights are not applied to analyses presented in this report.

Selection of Matched Nonparticipants

After identifying SSS participants in the BPS:04/09, we created a matched sample of nonparticipants who had background characteristics similar to those of the SSS participants. In order to find the appropriate comparison sample, we first limited the pool of nonparticipants to

students who met at least one of the eligibility criteria (first-generation college students, students from low-income families, or students with disabilities). We removed from the sample international or foreign students (because only U.S. citizens and legal permanent residents are eligible to receive program services) and a small number of students who had missing data about parental education. We also limited the pool of nonparticipants to students who attended postsecondary institutions in which at least one student was identified as an SSS participant to ensure that differences in student achievements were not attributable to differences in institutional characteristics between SSS participants and matched nonparticipants. Therefore, our subset of nonparticipants includes only students who attended postsecondary institutions with SSS grants. Finally, nonparticipants must have had transcript data so that student outcomes could be measured. After applying these data filters, we identified 1,620 eligible nonparticipants who attended the same institutions that the SSS participants in the *BPS:04/09* attended.

After limiting our pool of nonparticipants, we performed propensity score modeling to match each SSS participant with up to five nonparticipants with similar background characteristics. Propensity score modeling is a statistical technique that allows researchers to estimate students' probability of receiving a "treatment" (e.g., participation in the SSS program) using observed characteristics of the students prior to receiving the treatment. With the *BPS:04/09* student survey data, we performed two logistic regression models (separate models were performed for students who enrolled in two-year institutions and students who enrolled in four-year institutions as freshmen in 2003–04) that estimated students' probability of participating in the SSS program using the student characteristics listed in Table B4. Calculated propensity scores rely on a rich set of observable student characteristics, and the variables listed in Table B4 demonstrate the variety of demographic, academic, and attitudinal measures that were identified in the *BPS:04/09* as likely to be related to students' probabilities of participating in the SSS program. In addition to measures of students' demographic and family background characteristics, as well as measures of high school achievement, propensity score models included the survey weight associated with the transcript data. This survey weight accounts for any additional unmeasured factors that were associated with students' probability of having longitudinal transcript data. The propensity score models also included institutional fixed effects (dummy variables indicating the first postsecondary institution that students attended) to control for institutional factors.

After estimating propensity scores, each SSS participant was matched with up to five nonparticipants with the most similar propensity score.¹⁵ Matching was performed separately for students attending public two-year institutions, private two-year institutions, public four-year institutions, and private four-year institutions, and matching was conducted "with replacement," meaning that each nonparticipant could be matched to more than one participant. In addition, a "caliper" was applied to matches, which forced the matched nonparticipant to have a propensity score value that was no more than 0.25 standard deviations different from the matched SSS participant. If, for a particular SSS participant, only three nonparticipants had propensity score values within this caliper, then only three nonparticipants were matched with that SSS participant. For these reasons, the number of nonparticipants in the matched sample does not equal five times the number of SSS participants. Analytic models apply frequency weights for which each SSS

¹⁵ Alternative analyses were performed that matched each participant with between one and four nonparticipants. However, in addition to increasing statistical power, the sample in which we matched each participant with up to five nonparticipants provided the sample in which we achieved the best baseline equivalence (i.e., the fewest observed differences between participants and matched nonparticipants in background characteristics).

participant has a weight of 1 and each matched nonparticipant has a weight that is equal to the number of times the nonparticipant was matched to a participant. In this study, approximately 53 percent of the nonparticipants were matched to one SSS participant, 20 percent of the nonparticipants were matched to two participants, 11 percent of nonparticipants were matched to three participants, and 16 percent were matched with between four and nine participants. Our final matched sample included 110 SSS participants and 280 unique nonparticipants at 50 two-year institutions and 150 SSS participants and 290 unique nonparticipants at 80 four-year institutions.

Because propensity scores were calculated based on a large number of student background characteristics, and the primary focus was on student-level matches rather than matching SSS participants with nonparticipants within the same institution, only 10 percent of the participant-nonparticipant matches were from within the same institution. While this study examined differences in institutional characteristics between SSS participants and matched nonparticipants (e.g., degree of urbanization, graduation and retention rates, and the percentage of incoming freshmen students who were full-time degree-seeking students), observed differences in student achievement between the two groups could be due to unmeasured characteristics of the institution they attended (e.g., peers, instruction, faculty) that have little to do with participation in SSS.¹⁶

¹⁶ An alternative approach, emphasizing matching nonparticipants to participants within the same institution, raised the percentage of matches made in that way from 10 percent to 46 percent, but created less comparability in student characteristics between the two groups.

Table B4. Observable student characteristics that were included in propensity score models predicting the students' probability of participating in the Student Support Services program

Variable	Description
AGE	Students' age as of December 31, 2003
GENDER	Binary indicator for students' sex
CAGI	Students' household adjusted gross income in 2002–03
RACE	Students' race/ethnicity; binary indicators for black, Hispanic, and other (white as the reference category)
DEPANY	Indicator for whether students have dependents; value of 0 if student is a single parent (separate indicator)
SINGLPAR	Binary indicator for whether students are single parents
DISABLE	Binary indicator for whether students reported having a physical, emotional, or mental disability
HCMATH	Highest level of math that students completed during high school; binary indicators for less than Algebra II, Algebra II and/or trigonometry, precalculus or calculus, and missing data
HOMEDIST	The reported distance between students' permanent residence and the college they attend
HSDEG; HSGPAREP	An indicator of academic need has a value of 1 if students reported not receiving a high school diploma (including students who received a GED or completion certificate) OR if students reported having below a 2.0 GPA at high school completion
PARED	Binary indicator for parents' education level; variable has a value of 1 if neither of students' parents received a four-year college degree
PRIMLANG	Binary indicator for whether English is students' primary language
DELAYENR	Binary indicator for whether students delayed enrollment between high school completion and college enrollment; has a value of 1 if students enrolled in a four-year institution more than a year after high school completion; has a value of 1 if students enrolled in a two-year institution more than five years after high school completion
RAD04A	Binary indicator for whether students decided to attend institution because of academic program or coursework
RAD04B	Binary indicator for whether students decided to attend institution because of reputation
RAD04C	Binary indicator for whether students decided to attend institution because of affordability
RAD04E	Binary indicator for whether students decided to attend institution because of personal reasons
PELL04	Total dollar amount of the Pell Grant that students received during the 2003–04 academic year
TEACTDER	Students' ACT test score (inserted mean value for missing data and added binary indicator for missing data in model)
TESATDER	Students' SAT test score (inserted mean value for missing data and added binary indicator for missing data in model)
WTC000	Transcript weight
INSTID	Binary indicators for the postsecondary institutions in which students enrolled in the 2003–04 academic year

SOURCE: The U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Comparing Background Characteristics Between Participants and Nonparticipants in the Matched Sample

Using propensity score modeling, once the matched sample of participants and nonparticipants is selected, differences between participants and nonparticipants with regard to the specified background characteristics should be minimal. The characteristics of participants and nonparticipants in the matched sample used in this report are shown in Table B5 (for students enrolled in two-year institutions) and Table B6 (for students enrolled in four-year institutions). These tables also include the characteristics of all nonparticipants in two-year and four-year institutions who were included in the propensity score model (i.e., nonparticipants who met eligibility criteria and attended the same institutions that SSS participants attended) to demonstrate how the characteristics of the sample of matched nonparticipants were more similar to the characteristics of SSS participants than the characteristics of the sample of all eligible nonparticipants. While it is true that similarity was not improved for each of the individual characteristics (e.g., in Table B5, the percentage of all eligible nonparticipants who are financially independent is more similar to the percentage observed for SSS participants than the percentage observed for matched nonparticipants), similarity is improved for a majority of the observed characteristics.

We examined the magnitude of the difference in background characteristics between SSS participants and matched nonparticipants by calculating effect sizes.¹⁷ According to the What Works Clearinghouse (WWC), observed differences with an effect size of less than 0.05 satisfy the requirement of “baseline equivalence,” meaning that differences between participants and matched nonparticipants are so small that they do not require statistical adjustment in outcome models. Differences in background characteristics that have an effect size between 0.05 and 0.25 are considered acceptable to the WWC (allowing studies to “meet WWC standards with reservations”) as long as these characteristics are included in statistical models that estimate differences in student outcomes between groups. Differences in background characteristics that exceed an effect size of 0.25 do not meet WWC standards for baseline equivalence. In addition to the detailed comparisons in Table B5 and Table B6, Table B7 summarizes the number of variables that fall within these three categories of baseline equivalence within the matched sample separately for students at two-year institutions and students at four-year institutions.

Though statistical significance is not considered when determining baseline equivalence, we also performed statistical tests to determine whether observed differences between SSS participants and matched nonparticipants could have occurred by chance. In addition to estimating the effect of each individual characteristic on the probability of participating in the SSS program (see Table B5 and Table B6 for results), we performed maximum likelihood tests among students who attended two-year institutions and among students who attended four-year institutions to determine whether the entire set of student background and institutional characteristics significantly improved the estimation of the probability of participation in the SSS program. Results showed that, within the weighted, matched samples of students, the inclusion of covariates did not significantly improve the prediction of the probability of SSS program participation.

¹⁷ Following WWC guidelines, effect sizes were calculated using *Hedges' g* for continuous background characteristics and the *Cox Index* for binary background characteristics.

Although none of the differences in Table B5 had an effect size that was greater than 0.25, observed differences between SSS participants and matched nonparticipants at two-year institutions in terms of whether students had dependents, whether students were financially independent, and the average price of tuition at students' postsecondary institutions had effect sizes with absolute values exceeding 0.2. Within the sample used in this report, 9 percent of SSS participants and 12 percent of matched nonparticipants at two-year institutions had dependents (but were not single parents), while 33 percent of SSS participants and 41 percent of matched nonparticipants were financially independent. Both of these differences indicate that the SSS participants in the sample were less likely to have familial responsibilities than matched nonparticipants. In addition, the average price of annual tuition among SSS participants (\$2,513) was higher than the average price of annual tuition among matched nonparticipants (\$2,175). This difference in average price of tuition is the only difference that achieved statistical significance within the sample of SSS participants and matched nonparticipants. All other differences between SSS participants and matched nonparticipants at two-year institutions had effect sizes that were smaller in magnitude. In particular, the distribution of students across racial/ethnic categories, eligibility status categories, reasons for attending the postsecondary institution, and academic program were relatively similar between SSS participants and matched nonparticipants at two-year institutions. The percentage of students who attended private institutions and average SAT and ACT test scores were also similar between these groups of students.

Table B5. Characteristics of first-time freshman Student Support Services (SSS) participants, all eligible nonparticipants, and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered two-year institutions in 2003–04

Characteristics	All eligible nonparticipants in the BPS:04/09 (n=820)	Matched nonparticipants in the BPS:04/09 (n=510)	SSS participants in the BPS:04/09 (n=110)	Difference between SSS participants and matched nonparticipants
	Percent	Percent	Percent	Effect size
Eligibility status				
First generation college-going	81.5	90.3	89.5	-0.052
Disability status	12.5	10.9	14.0	0.174
Female	58.4	67.8	68.4	0.016
Race/Ethnicity				
White	60.1	53.6	48.2	-0.130
Black	15.3	23.6	24.6	0.032
Hispanic	13.6	13.3	15.8	0.124
Other	10.9	9.6	11.4	0.120
Primary language is English	89.3	91.6	91.2	-0.030
Student has dependents (does not include single parents)	8.6	12.1	8.8	-0.217
Student is a single parent	11.2	13.5	14.9	0.073
Student is financially independent	30.5	41.3	33.3	-0.208
Highest level of high school mathematics				
Below Algebra II	18.7	20.3	22.8	0.091
Algebra II and/or trigonometry	46.5	40.0	40.4	0.010
Pre-calculus or calculus	14.0	11.9	14.0	0.115
Missing Information	20.8	27.9	22.8	-0.163
Academic need (did not receive regular high school diploma or had high school GPA below 2.0)	15.6	18.5	18.4	-0.004
Delayed entry into college by at least five years	15.2	20.7	16.7	-0.160
Reasons students decided to attend institution				
Academic program or coursework	42.7	54.4	50.9	-0.085
Reputation	35.6	47.6	43.9	-0.090
Affordability	67.6	68.4	64.9	-0.096
Personal reasons	37.0	49.1	47.4	-0.043
Missing ACT test score information	45.3	48.5	42.1	-0.158
Missing SAT test score information	45.3	48.5	42.1	-0.158
Missing high school GPA	27.7	33.9	28.9	-0.140
Institutional control				
Public	94.8	78.6	73.7	-0.163
Private	5.2	21.4	26.3	0.163
Carnegie classification				
Associate college	95.6	92.6	91.2	-0.111
Other	4.4	7.4	8.8	0.111
Degree of urbanization				
City	39.8	29.2	28.1	-0.035
Urban fringe	24.1	11.1	13.2	0.117
Rural	35.4	57.3	56.1	-0.029
Missing information	0.7	2.3	2.6	0.073
Academic program				
Associate or certificate program	37.3	32.2	28.1	-0.118
Four-year transfer program	46.1	39.0	36.8	-0.055
Missing information	16.5	28.8	35.1	0.174

Characteristics	All eligible nonparticipants in the BPS:04/09 (n=820)	Matched nonparticipants in the BPS:04/09 (n=510)	SSS participants in the BPS:04/09 (n=110)	Difference between SSS participants and matched nonparticipants
	Average	Average	Average	Effect size
Household adjusted gross income in 2002–03	\$35,387	\$24,770	\$22,591	-0.098
Total amount of Pell grant in 2003–04	\$1,207	\$1,826	\$2,029	0.126
Age	22	23	22	-0.121
Distance between permanent residence and college	54	59	47	-0.064
High school achievement				
ACT test score	19	18	18	-0.024
Verbal SAT score	441	420	421	0.008
Mathematics SAT score	440	419	416	-0.038
Combined SAT test score	881	840	837	-0.015
Enrollment size	7,670	3,979	3,697	-0.047
Price of tuition	\$1,714	\$2,175	\$2,513	0.207*
Percentage of incoming freshmen who are full-time, degree-seeking students	46	47	48	0.086
Percentage of incoming, degree-seeking students who return to college in the fall of Year 2	58	57	57	-0.061
Percentage of incoming, degree-seeking students who obtain an associate's degree within 3 years	27	31	30	-0.043
Transcript weight	250	192	190	-0.012

* $p < .05$

NOTE: Due to small sample sizes, persons identifying as Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, Asian, and persons with more than one reported race are collapsed into the category "other" race/ethnicity. Carnegie classification reflects the highest award that institutions award. Information on degree of urbanization is reported in four major groupings (city, urban fringe, town, and rural) based on institutions' locations relative to urbanized areas. The three town and rural codes (fringe, distant, and remote) constitute the "rural" grouping. The price of tuition represents the tuition that the institution requires, not the cost that students pay. All eligible nonparticipants include students in the BPS:04/09 that did not receive SSS program services; were low-income, first generation, or a student with disabilities; had transcript data; and attended the same postsecondary institutions that identified SSS participants attended. To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. To avoid multicollinearity, propensity score models and outcome models include combined SAT scores and do not include verbal and mathematics SAT scores. SOURCE: Subsets of Student Support Services (SSS) participants and nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 *Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Table B6 displays the background characteristics of SSS participants and matched nonparticipants who enrolled in four-year institutions, as well as the characteristics of all eligible nonparticipants at four-year institutions. Overall, these analyses revealed that one difference in observed background characteristics between SSS participants and matched nonparticipants exceeded an effect size of 0.25: 7 percent of SSS participants and 4 percent of matched nonparticipants who enrolled in four-year institutions were classified as "other" race (i.e., were not white, black, or Hispanic). All other differences between SSS participants and matched nonparticipants at four-year institutions had effect sizes below 0.25, and no differences between SSS participants and matched nonparticipants achieved statistical significance. SSS participants were somewhat less likely than matched nonparticipants to have missing information about the degree of urbanization for the postsecondary institution (11 percent compared with 15 percent) or missing information about high school grade point average (6 percent compared with 8 percent). All other differences between SSS participants and matched nonparticipants had effect sizes below 0.2. The distribution of students across racial/ethnic categories, eligibility status categories, reasons for attending the institution, and institution type and location were similar

between SSS participants and matched nonparticipants, as were average ACT and SAT test scores.

Table B6. Characteristics of first-time freshman Student Support Services (SSS) participants, all eligible nonparticipants, and matched nonparticipants in the 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09) who entered four-year institutions in 2003–04

Characteristics	All eligible nonparticipants in the BPS:04/09 (n=800)	Matched nonparticipants in the BPS:04/09 (n=680)	SSS participants in the BPS:04/09 (n=150)	Difference between SSS participants and matched nonparticipants
	Percent	Percent	Percent	Effect size
Eligibility status				
First generation college-going	71.5	77.2	78.2	0.035
Disability status	13.6	14.8	15.0	0.008
Female	58.9	59.0	61.2	0.056
Race/Ethnicity				
White	61.8	47.9	45.6	-0.057
Black	11.6	20.6	19.7	-0.031
Hispanic	18.7	27.1	27.9	0.025
Other	7.9	4.4	6.8	0.274
Primary language is English	84.1	81.4	80.3	-0.043
Student has dependents (does not include single parents)	2.0	2.7	2.7	0.014
Student is a single parent	3.4	3.0	2.7	-0.052
Student is financially independent	8.5	7.5	8.2	0.052
Highest level of high school mathematics				
Below Algebra II	7.5	6.4	7.5	0.106
Algebra II and/or trigonometry	38.7	56.1	54.4	-0.040
Pre-calculus or calculus	47.7	31.7	33.3	0.046
Missing Information	6.1	5.9	4.8	-0.139
Academic need (did not receive regular high school diploma or had high school GPA below 2.0)	3.6	4.3	4.1	-0.031
Delayed entry into college by at least one year	12.0	6.5	6.8	0.029
Reasons students decided to attend institution				
Academic program or coursework	57.1	58.1	59.9	0.043
Reputation	57.7	59.5	59.9	0.010
Affordability	57.8	52.1	52.4	0.008
Personal reasons	42.1	44.5	44.2	-0.008
Missing ACT test score information	15.7	17.6	13.6	-0.185
Missing SAT test score information	15.7	17.6	13.6	-0.185
Missing high school GPA	9.5	8.3	6.1	-0.197
Institutional control				
Public	74.8	57.4	54.4	-0.073
Private	25.2	42.6	45.6	0.073
Carnegie classification				
Baccalaureate college	20.6	33.0	32.7	-0.009
Master's or doctoral college	73.3	61.2	62.6	0.035
Other	6.1	5.8	4.8	-0.123
Degree of urbanization				
City	48.9	41.3	40.8	-0.011
Urban fringe	18.9	13.6	17.7	0.188
Rural	22.5	30.0	30.6	0.017
Missing information	9.7	15.1	10.9	-0.227

Characteristics	All eligible nonparticipants in the BPS:04/09 (n=800)	Matched nonparticipants in the BPS:04/09 (n=680)	SSS participants in the BPS:04/09 (n=150)	Difference between SSS participants and matched nonparticipants
	Average	Average	Average	Effect size
Household adjusted gross income in 2002–03	\$45,063	\$36,823	\$36,346	-0.013
Total amount of Pell grant in 2003–04	\$1,450	\$2,195	\$2,137	-0.033
Age	19	19	19	-0.019
Distance between permanent residence and college	163	157	162	0.008
High school achievement				
ACT test score	22	20	19	-0.076
Verbal SAT score	506	476	459	-0.166
Mathematics SAT score	504	457	460	0.028
Combined SAT test score	1,011	933	918	-0.085
Enrollment size	14,214	9,301	9,323	0.002
Price of tuition	\$7,242	\$8,255	\$9,149	0.141
Percentage of incoming freshmen who are full-time, degree-seeking students	74	74	73	-0.017
Percentage of incoming, degree-seeking students who return to college in the fall of Year 2	74	74	74	0.034
Percentage of incoming, degree-seeking students who obtain a bachelor's degree within 6 years	46	47	48	0.076
Transcript weight	187	185	182	-0.024

NOTE: Due to small sample sizes, persons identifying as Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, Asian, and persons with more than one reported race are collapsed into the category “other” race/ethnicity. Carnegie classification reflects the highest award that institutions award. Information on degree of urbanization is reported in four major groupings (city, urban fringe, town, and rural) based on institutions’ locations relative to urbanized areas. The three town and rural codes (fringe, distant, and remote) constitute the “rural” grouping. The price of tuition represents the tuition that the institution requires, not the cost that students pay. All eligible nonparticipants include students in the BPS:04/09 that did not receive SSS program services; were low-income, first generation, or a student with disabilities; had transcript data; and attended the same postsecondary institutions that identified SSS participants attended. To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the BPS:04/09 who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the BPS:04/09. While 290 unique nonparticipants were included in the matched sample at four-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 680 matched nonparticipants. To avoid multicollinearity, propensity score models and outcome models only include combined SAT scores.

SOURCE: Subsets of Student Support Services (SSS) participants and nonparticipants were drawn from the U.S. Department of Education’s National Center for Education Statistics’ 2004/09 *Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Overall, the results in Table B5 and Table B6 show that there were few large or statistically significant differences in background characteristics between SSS participants and matched nonparticipants at two-year and four-year institutions. These results also demonstrate how an effect size between 0.05 and 0.25 (and an effect size greater than 0.25) can be associated with differences between SSS participants and matched nonparticipants that are relatively small. For example, among students who entered four-year institutions, 7 percent of SSS participants and 4 percent of matched nonparticipants were classified as “other” race, a difference with an effect size of 0.274.

Table B7 summarizes the number of covariates that (1) achieved baseline equivalence, (2) had effect sizes between 0.05 and 0.25 and therefore require statistical adjustment in outcome models, and (3) did not achieve baseline equivalence at two-year and four-year institutions. Overall, about one-quarter of the covariates at two-year institutions and half of the covariates at four-year institutions achieved baseline equivalence with an effect size less than 0.05. However, with the exception of students categorized as “other” race at four-year institutions, all differences between SSS participants and matched nonparticipants had effect sizes that were below 0.25. To account for observed differences between SSS participants and nonparticipants, all of the background variables for which the difference had an effect size that was greater than or equal to

0.05 in Table B5 and Table B6 were included in statistical models predicting the relationship between participation in the SSS program and student achievements. All dummy variables associated with students' race/ethnicity, the highest level of math that students completed in high school, institutions' Carnegie classification, institutions' degree of urbanization, and the academic program of students attending two-year institutions (excluding reference categories) were included in outcome models because at least one of the dummy variables for each measure did not meet baseline equivalence.

Table B7. Number and percentage of covariates that met different levels of baseline equivalence at four-year and two-year institutions

	Two-year institutions	Four-year institutions
Total number of covariates	47	45
Number of covariates with effect size below 0.05	13	26
Percentage of covariates with effect size below 0.05	27.7	57.8
Number of covariates with effect size between 0.05 and 0.25	34	18
Percentage of covariates with effect size between 0.05 and 0.25	72.3	40.0
Number of covariates with effect size above 0.25	0	1
Percentage of covariates with effect size above 0.25	0.0	2.2

NOTE: Percentages include combined SAT scores, verbal SAT scores, and mathematics SAT scores as separate covariates. To avoid multicollinearity, propensity score models and outcome models only include combined SAT scores.

SOURCE: Subsets of Student Support Services (SSS) participants and nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' 2004/09 *Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Testing for Significant Differences on Student Outcomes

To determine whether the persistence and completion rates of SSS participants in the *BPS:04/09* were statistically different enough from the rates among matched nonparticipants in the *BPS:04/09* to be considered true population differences (and not just differences due to sampling error), linear probability models were conducted using the matched sample of participants and nonparticipants.¹⁸ In addition, ordinary least squares regression models were performed to estimate differences in credit accumulation between SSS participants and matched nonparticipants.¹⁹ Separate models were performed for students who entered postsecondary education at two-year institutions and four-year institutions. Student-level and institution-level characteristics that demonstrated a difference between participants and nonparticipants in the matched sample and exceeded an effect size of 0.05 (as shown in Table B5 and Table B6) were

¹⁸ For binary outcomes, including persistence and completion, logistic regression models were also performed. Results of logistic regression models largely mirrored the results of the linear probability models presented here. However, according to the logistic regression results, SSS participants were significantly more likely to complete a bachelor's degree within four years of college entry than matched nonparticipants.

¹⁹ The *BPS:04/09* transcript data include variables that indicate the cumulative number of credits students achieved each academic year. The cumulative number of credits that students achieved each academic year was approximately normally distributed, but taking the square root of the number of credits earned made the distribution more normal. Results of models predicting the square root of the number of credits earned mirror the results presented in this report, though differences between SSS participants in the *BPS:04/09* and matched nonparticipants were larger in magnitude.

included as control variables in regression models.²⁰ In this report, differences with a p value of .05 or lower (i.e., the conventional p value used in social science research) are identified as statistically significant.

Limitations of Data and Analyses

One limitation to these analyses is that the propensity score model that created the comparison group only accounts for observed differences (e.g., student demographics and high school achievement) and does not account for unobserved student characteristics (such as motivation prior to entering college) that might influence student outcomes. In addition, only a small proportion of SSS participants were in the *BPS:04/09*, and we observe a few statistically significant differences between the SSS participants in the *BPS:04/09* and the population of first-time freshman SSS participants in 2003–04, particularly at four-year institutions. Therefore, the results cannot be generalized to all SSS participants or all SSS grantee institutions.

Because the propensity score matching process focused on matching SSS participants with nonparticipants who were most similar to them based on observed student-level background characteristics (regardless of which institution they attended), only 10 percent of the nonparticipants came from the same higher education institutions as the SSS participants they were matched to. As a result, the differences in outcomes between the two groups may be due to the differences in the quality of the institutions attended (peers, instruction, faculty).

As a result of the relatively small number of SSS participants at two-year and four-year institutions in the *BPS:04/09*, this study had low statistical power, which is defined as the ability to detect statistically significant differences between groups of students. Therefore, differences in student achievements for subgroups of students within two-year and four-year institutions—such as comparisons of student achievements between SSS participants and matched nonparticipants by eligibility status—could not be estimated due to the small number of students in these subgroups. The propensity score model created similar samples of SSS participants and matched nonparticipants separately within two-year and four-year institutions, but to produce this same level of similarity between SSS participants and matched nonparticipants by eligibility status, alternative propensity score models would need to be performed within each subgroup of students. These analyses were not feasible due to the relatively small number of students within the subgroups.

In addition, the *BPS:04/09* data do not contain information about services—such as tutoring or academic counseling—that students may have received throughout their academic careers, and it is therefore possible that nonparticipants received services similar to SSS program services. As a result, the differences in achievements should not be interpreted as the differences between SSS

²⁰ Sensitivity analyses were performed that included a smaller set of student-level and institution-level background characteristics. Results from these parsimonious models largely resemble the results presented in this report. When models only have control variables for age, race/ethnicity, gender, eligibility status indicators, prior achievement, and an indicator for private institutions, SSS participants who attended four-year institutions were significantly more likely than matched nonparticipants to obtain a bachelor's degree within six years of college entry. Including institution-level characteristics (e.g., tuition, Carnegie classification, degree of urbanization) to statistical models explained significant differences in six-year bachelor's degree completion rates between SSS participants and matched nonparticipants.

participants and students who did not receive any services of any kind during their academic careers; rather, the nonparticipants in this study represent a matched sample of nonparticipants that experienced a “business as usual” condition.

Finally, this study identifies students in the *BPS:04/09* who participated in the SSS program, but it does not consider the length of time that participants participated in the SSS program. Therefore, some of the participants in this report may have participated in the SSS program for less than a year while others may have participated throughout their college careers. Future studies should look more closely at the relationship between length of participation in the SSS program and participant outcomes.

APPENDIX C. DETAILED OUTCOME RESULTS

Appendix C: Detailed Outcome Results

In this appendix, we provide tables that include detailed results of analyses of student outcomes. These tables include the coefficients, standard errors, and *p* values associated with the indicator for participation in the SSS program in statistical models predicting student achievements.

Table C1. Results of statistical models estimating the effect of participating in the Student Support Services (SSS) program on student achievements at two-year institutions

Student Achievement	Coefficient	Standard error	<i>p</i> value	Percent of SSS participants (n=110)	Percent of matched non participants (n=510)
Persistence					
to the fall of the second year	0.107	0.045	0.018	73.7	63.0
to the fall of the third year	0.231	0.047	0.000	63.2	40.1
to the fall of the fourth year	0.185	0.046	0.000	50.9	32.4
Completion					
by the end of the second year	0.022	0.039	0.577	21.1	18.9
by the end of the third year	0.123	0.044	0.006	40.4	28.1
by the end of the fourth year	0.145	0.046	0.002	45.6	31.1
Obtained an associate degree or certificate and transferred to a four-year institution					
by the end of the fourth year	0.058	0.027	0.031	13.2	7.3
Obtained an associate degree or certificate and did not transfer to a four-year institution					
by the end of the fourth year	0.025	0.035	0.473	15.8	13.3
Transferred to a four-year institution and did not obtain an associate degree or certificate					
by the end of the fourth year	0.061	0.030	0.043	16.7	10.6
Obtained a bachelor's degree					
by the end of the fifth year	0.024	0.021	0.251	7.0	4.6
by the end of the sixth year	0.064	0.025	0.011	13.2	6.8

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. Percentages for nonparticipants are estimates resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis. Completion at two-year institutions includes completion of an associate degree or certificate and transfer to a four-year institution, completion of an associate degree or certificate without transfer to a four-year institution, and transfer to a four-year institution without receiving an associate degree or certificate.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Table C2. Results of statistical models estimating the effect of participating in the Student Support Services (SSS) program on credit accumulation at two-year institutions

Credit accumulation	Coefficient	Standard error	p value	Average number of credits accumulated by SSS participants (n=110)	Average number of credits accumulated by matched nonparticipants (n=510)
By the end of the first year	5.344	1.038	0.000	23.4	18.0
By the end of the second year	11.572	2.033	0.000	41.0	29.4
By the end of the third year	16.320	2.739	0.000	52.5	36.2
By the end of the fourth year	19.286	3.295	0.000	60.6	41.3

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 280 unique nonparticipants were included in the matched sample at two-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 510 matched nonparticipants. A small number of matched nonparticipants at two-year institutions had missing data on credit accumulation. The average number of credits accumulated by matched nonparticipants is an estimate resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Table C3. Results of statistical models estimating the effect of participating in the Student Support Services (SSS) program on student achievements at four-year institutions

Student Achievement	Coefficient	Standard error	p value	Percent of SSS participants (n=150)	Percent of matched nonparticipants (n=680)
Persistence					
to the fall of the second year	0.091	0.031	0.003	93.2	84.1
to the fall of the third year	0.128	0.039	0.001	82.3	69.5
to the fall of the fourth year	0.092	0.041	0.023	70.7	61.5
to the fall of the fifth year	0.127	0.042	0.003	63.9	51.2
to the fall of the sixth year	0.100	0.043	0.019	57.8	47.8
Obtained a bachelor's degree					
by the end of the fourth year	0.056	0.035	0.103	27.2	21.6
by the end of the fifth year	0.037	0.040	0.351	43.5	39.8
by the end of the sixth year	0.076	0.041	0.063	51.0	43.4

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 290 unique nonparticipants were included in the matched sample at four-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 680 matched nonparticipants. The average number of credits accumulated by matched nonparticipants is an estimate resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.

Table C4. Results of statistical models estimating the effect of participating in the Student Support Services (SSS) program on credit accumulation at four-year institutions

Credit accumulation	Coefficient	Standard error	<i>p</i> value	Average number of credits accumulated by SSS participants (n=140)	Average number of credits accumulated by matched nonparticipants (n=670)
By the end of the first year	3.078	0.846	0.000	27.4	24.3
By the end of the second year	6.252	1.765	0.000	51.5	45.3
By the end of the third year	9.035	2.782	0.001	73.1	64.0
By the end of the fourth year	9.965	3.659	0.007	93.0	83.0
By the end of the fifth year	10.966	4.178	0.009	102.8	91.8
By the end of the sixth year	12.284	4.271	0.004	106.9	94.6

NOTE: To create the subset of matched nonparticipants, propensity score modeling was performed to identify respondents in the *BPS:04/09* who did not participate in the SSS program but had observed background characteristics that were similar to those of the SSS participants identified in the *BPS:04/09*. While 290 unique nonparticipants were included in the matched sample at four-year institutions, because each nonparticipant could be matched with more than one SSS participant, the weighted sample includes 680 matched nonparticipants. A small number of SSS participants and matched nonparticipants at four-year institutions had missing data on credit accumulation. The average number of credits accumulated by matched nonparticipants is an estimate resulting from statistical models that control for student background characteristics. Please see Appendix B for more details about sample selection and data analysis.

SOURCE: Subsets of Student Support Services (SSS) participants and matched nonparticipants were drawn from the U.S. Department of Education's National Center for Education Statistics' *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*.



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