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ABSTRACT

This study uses nationally representative data from the National Education Longitudinal Study of 1988 to show that information about postsecondary educational institutions (PEIs), guidance, and essential preparatory actions taken by secondary students influence whether an individual will attend a PEI within 2 years of high school graduation, and, if so, what type of PEI he or she will attend. Multinomial logistic regression is used to model PEI enrollment as a function of critical explanatory variables, controlling on an array of background and contextual characteristics including socioeconomic status, race and ethnicity, and gender. The conceptual framework is embedded in research on talent loss, which is described as the occurrence of promising students not reaching their full educational potential. Increased levels of information, guidance, and critical actions taken were positively and significantly associated with initial enrollment in a 4-year PEI, as opposed to enrollment in a 2-year PEI (full-time or part-time), or no enrollment. Further, aspects of information, guidance, and action affect the contrast between each of the 2-year enrollment categories and the never- enrolled category. These results remain significant after controlling for background and contextual characteristics. The effects on talent loss and implications for policy and practice are discussed. Three appendixes discuss the construction of variables, the estimated parameters of the logit model used, and the calculation of predicted probability profiles. (Contains 14 tables, 2 appendix tables, and 35 references.) (Author/SLD)

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CRESPAR

# REDUCING TALENT LOSS

## The Impact of Information, Guidance, and Actions on Postsecondary Enrollment

**Stephen B. Plank**
**Will J. Jordan**

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**Report No. 9 / February 1997**

CENTER FOR RESEARCH ON THE EDUCATION OF STUDENTS PLACED AT RISK

Johns Hopkins University & Howard University

UD031500

# REDUCING TALENT LOSS

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**February 1997**

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# The Center

Every child has the capacity to succeed in school and in life. Yet far too many children, especially those from poor and minority families, are placed at risk by school practices that are based on a sorting paradigm in which some students receive high-expectations instruction while the rest are relegated to lower quality education and lower quality futures. The sorting perspective must be replaced by a "talent development" model that asserts that all children are capable of succeeding in a rich and demanding curriculum with appropriate assistance and support.

The mission of the Center for Research on the Education of Students Placed at Risk (CRESPAR) is to conduct the research, development, evaluation, and dissemination needed to transform schooling for students placed at risk. The work of the Center is guided by three central themes — ensuring the success of all students at key development points, building on students' personal and cultural assets, and scaling up effective programs — and conducted through seven research and development programs and a program of institutional activities.

CRESPAR is organized as a partnership of Johns Hopkins University and Howard University, in collaboration with researchers at the University of California at Santa Barbara, University of California at Los Angeles, University of Chicago, Manpower Research Demonstration Corporation, WestEd Regional Laboratory, University of Memphis, and University of Houston-Clear Lake.

# Abstract

This study uses nationally representative data to show that information about postsecondary educational institutions (PEIs), guidance, and essential preparatory actions taken by secondary students influence whether an individual will attend a PEI within two years of high school graduation and, if so, what type of PEI he or she will attend. Multinomial logistic regression is used to model PEI enrollment as a function of critical explanatory variables, controlling on an array of background and contextual characteristics including socioeconomic status, race/ethnicity, and gender. The conceptual framework is embedded in research on talent loss, which can be described as the occurrence of promising students not reaching their full educational potential. The authors find that increased levels of information, guidance, and critical actions taken are positively and significantly associated with initial enrollment in a four-year PEI, as opposed to enrollment in a two-year PEI (full-time or part-time) or no enrollment. Further, aspects of information, guidance, and action affect the contrast between each of the two-year enrollment categories and the never-enrolled category. These results remain significant after controlling for background and contextual characteristics. The effects on talent loss and implications for policy and practice are discussed.

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# Introduction

Stratification operates largely through structures of access and constraint. Some people have ready access to information, resources, and opportunities while others encounter voids and barriers. Choices and actions are partially guided by an individual's position within structures of access and constraint. Further, the consequences of a given set of choices and actions are shaped by these structures. Social stratification in the United States has become increasingly linked to the system of education and, specifically, to postsecondary schooling (Hurn, 1993). Whether a person attends a postsecondary school, and the type of school he or she attends, has a major impact on life chances, occupational status, and wealth. This paper examines how differing access to information and guidance during the high school years, and different actions taken, affect individuals' likelihoods of following one postsecondary path or another.

Enrollment in higher education has expanded in the United States throughout this century (U.S. Department of Education, 1995). Not only is the proportion of Americans attending four-year colleges and universities greater than ever before, but the available range of other types of postsecondary educational institutions (PEIs) has grown dramatically as well. In the autumn of 1970, 6.3 million people were enrolled in American four-year colleges and universities; another 2.3 million were enrolled in two-year colleges and universities. By 1980, these numbers had risen to 7.6 million in four-year schools and 4.5 million in two-year schools. Finally, by 1993, fully 8.7 million people were enrolled in four-year schools while 5.6 million were enrolled in two-year schools. Additionally, in 1993, another one million people were enrolled in postsecondary educational institutions which were categorized as non-collegiate by the U.S. Department of Education. While enrollment in colleges and universities increased by 66% between 1970 and 1993, the total U.S. population increased by only 27%.

As access to higher education has expanded, the importance of postsecondary schooling in determining life chances, occupational status, and wealth has increased as well. Some researchers argue that the importance of postsecondary education in determining status and wealth is due to a broader social stratification system based on credentialism (Collins, 1979). Others believe that our increasingly globalized and highly technical economy genuinely requires the skills and capacities that are taught in postsecondary schools (Bell, 1973; Berryman & Bailey, 1992). Regardless of the correct balance of these and other possible explanations, one fact is irrefutable — postsecondary schooling can greatly enhance an individual's chances of achieving high status, wealth, job stability, and a host of other desired outcomes (Sewell, Hauser, & Featherman, 1976; Tinto, 1987; Bidwell, 1989).

However, although greater proportions of Americans are pursuing higher education and the importance of higher education is increasing, many young adults who are academically qualified for postsecondary schooling and who aspire to college do not make the transition from high school to a PEI (Karen, 1991; Hanson, 1994). In this paper, we explore factors that contribute to the loss of talent that occurs when high achieving-students do not continue their educations beyond high school. As we investigate the phenomenon, we focus on the impact of information, guidance, and actions during the high school years.

## Talent Loss

The term "talent loss" has been defined in several ways by educational researchers in the past decades. In the late 1960s the Department of Health, Education, and Welfare (HEW) published a report on the economy, social problems, and the condition of education which described talent loss as the percent of high school graduates who did not enter college within five years of high school graduation (U.S. Department of Health, Education, & Welfare, 1969). This report showed that, among high school graduates whose achievement placed them in the top quintile nationally, the highest SES quartile exhibited about 5% talent loss, compared to 50% talent loss within the lowest SES quartile, 33% within the second SES quartile, and 21% within the third SES quartile.

More recently, Hanson (1994) described talent loss as occurring among adolescents who demonstrated early academic potential but who (1) had educational expectations lower than their aspirations, (2) reduced their expectations over time, or (3) never realized their expectations. Like the authors of the HEW report, Hanson found that social class was among the strongest predictors of talent loss. Manski and Wise's (1983) study of college choice also demonstrated a strong inverse relationship between SES and postsecondary matriculation, holding constant high school achievement. Regardless of which operationalization one uses, talent loss has long been most severe among low-SES individuals.

We define the concept of talent loss in terms of the postsecondary paths followed by individuals in the years immediately following high school. We recognize differing degrees of talent loss. A severe definition of talent loss is the failure of high-achieving students to enter four-year colleges or universities. This definition includes high-achieving individuals who enroll at two-year PEIs among those exhibiting some level of talent loss. A less severe definition of talent loss is the failure of high-achieving students to enroll at any type of PEI in the years immediately following high school.

At times we will look beyond the highest achieving individuals and discuss talent loss throughout the continuum of academic achievement. Some readers may believe that low-achieving high school students have not displayed the potential to succeed in postsecondary education; thus, they should not be counted among the examples of talent loss when they do not pursue higher education. Other readers, however, may have the viewpoint that almost all youth can be prepared for college, given appropriate nurturing and opportunities to learn. From this viewpoint, it is valid to speak of talent loss whenever any individual fails to pursue higher education.

## Possible Explanations for Talent Loss

What factors explain talent loss and, specifically, what factors explain the high concentration of talent loss among low-SES individuals? One obvious factor is the financial cost of postsecondary education. Research has shown, not surprisingly, that greater tuition costs negatively affect the likelihood of PEI enrollment while greater family assets and offerings of financial aid positively affect this likelihood (Leslie & Brinkman, 1987; St. John & Noell, 1989; Jackson, 1990; St. John, 1990; McPherson & Shapiro, 1991; St. John, 1991; Orfield, 1992). But while the high cost of many types of postsecondary schooling is undeniable, many low-SES adolescents and their parents may make decisions based on incomplete or inaccurate information about PEI costs and available financial assistance. In the absence of ample and accurate information, many low-SES families may summarily decide that postsecondary schooling is financially unfeasible, based on their perceptions of prohibitive expenses and scarce aid. However, reliable information and guidance have the potential to change these decisions. If families gain access to information about financial aid opportunities and the realities of PEI expenses, many may confirm their fears that the financial burden is beyond what they are willing or able to bear; on the other hand, at least some may find that some available combinations of grants, loans, other financial aid, and their own resources will make PEI enrollment possible.

Access to ample and accurate information is important in facilitating PEI enrollment and reducing talent loss in another way. Many adolescents and their parents, and not only those from low-SES backgrounds, wait too long to gather information and take specific actions that are keys to successful PEI entry. They think the adolescent is situated to enter a PEI after high school, but later find that they have failed to take some important steps. Research has documented the unfortunate situation of high school students who in the spring of senior year believed they would be attending four-year colleges in the following autumn but who had not taken any of the necessary steps for application and lacked prerequisites (Rosenbaum, 1976; Rosenbaum, Miller, & Krei, 1996). In studying the ways better foresight can be developed,

Hossler and Vesper (1993) stress the importance of students and parents talking to teachers, high school counselors, college admissions counselors, and friends who can provide guidance in anticipating the necessary steps in preparing for PEI entry.

## Data Sources

The data for the present study are drawn from the National Education Longitudinal Study of 1988 (NELS:88), supported by the National Center for Educational Statistics of the U.S. Department of Education. NELS:88 provides a rich source of information on adolescents and young adults as they progress through high school and into postsecondary education and the labor force. The NELS:88 base-year design employed a two-stage, stratified, random sample of approximately 25,000 eighth graders in more than 1,000 schools, who have been resurveyed at two-year intervals (Ingels, Abraham, Spencer, & Frankel, 1989). In addition to the student component, two of each of the respondents' teachers, the school's principal, and the student's parents were administered detailed questionnaires in the base year.

In this paper, we analyze data from the student sample collected in 1990, 1992, and 1994, and from parents and school administrators in 1992.[1] Hence, our longitudinal panel captures respondents when most of them were in grade 10, then grade 12, and then two years beyond high school. Our focus in this study is on how the actions taken by high school students affect their chances of initial enrollment in a postsecondary institution. Because students are often aided by their parents and schools as they seek information and apply to college, we combine all three sources (students, parents, and schools) to better explain the determinants of postsecondary enrollment. Multinomial logistic regression is used to analyze the effects of actions taken on enrollment in a PEI. All analyses are weighted by the NCES-provided longitudinal panel weight, which allows projections to the population of American youth who were in the eighth grade in spring of 1988 or the tenth grade in spring of 1990.[2]

## Descriptive Analyses

In addition to attending colleges and universities, there are a variety of other postsecondary experiences a person can have. Moreover, the types of colleges and universities

[1] Additionally, some of our background measures, such as socioeconomic status, draw upon base year data.

[2] The panel weight used is F3F1PNWT, rescaled to make the weighted sample size equivalent to the unweighted sample size.

themselves vary considerably, ranging from the most selective and elite to community colleges (many having no admissions criteria beyond earning a high school diploma or GED) to proprietary schools which offer job training and confer industry-specific certificates rather than postsecondary degrees. In this study, we operationalize the respondents' first postsecondary enrollment in four distinctive categories: (1) enrollment at a four-year PEI, (2) full-time enrollment at a two-year PEI, (3) part-time enrollment at a two-year PEI, and (4) never enrolled.

The first category comprises individuals in four-year colleges and universities. This category includes both public and private school enrollees, and individuals with full-time enrollment status as well as the very small number who were part-time enrollees. The second category includes full-time enrollees at two-year schools. This set of schools is varied, including community colleges, vocational and technical schools, and proprietary schools. The third category includes part-time enrollees at two-year schools. Finally, the fourth category includes respondents who had never enrolled at any PEI as of 1994. This category of young adults is diverse. Some started families, gained employment, earned GEDs, and/or had plans to return to school.

Among the types of postsecondary educational institutions, there is much variation in the admissions standards as well as the mission and goals. For example, four-year colleges and universities often have clear minimum requirements for SAT and ACT scores, along with standards for cumulative grade point average, class rank, teacher recommendations, and the like. These standards vary from school to school. However, perhaps the most variation exists among two-year schools (Brint & Karabel, 1989; Dougherty, 1994). Community colleges cast a much broader net than four-year institutions. They attract students who aspire to four-year schools but who cannot afford them or do not qualify, along with those who desire only a couple of years of training beyond high school for a specific career. In addition, they attract adult learners wishing to change careers as well as those who simply take courses for their personal growth. Although some of these conditions also occur in four-year schools, they are especially prevalent in community colleges. Thus, community colleges are necessarily broad in their admissions policies.

By 1994, over 60% of the respondents in our longitudinal panel had enrolled in some type of PEI (i.e., 38.8% never enrolled). Table 1 illustrates the weighted frequencies of postsecondary enrollment status by individuals' background characteristics. Of all 13,350 respondents in the sample, 35.1% enrolled in four-year institutions, while 26.2% enrolled in two-year institutions, 19.3% full-time and 6.9% part-time.

**Table 1**

**Postsecondary Enrollment Status by Student Background Characteristics**

(Percentages)

| | | Postsecondary Enrollment Status by 1994 | | | |
|---|---|---|---|---|---|
| | N | Four-Year Institution | Two-Year Full-Time | Two-Year Part-Time | Never Enrolled |
| TOTAL | 13,350 | 35.1 | 19.3 | 6.9 | 38.8 |
| **Background Characteristics** | | | | | |
| SEX | 13,350 | | | | |
| Male | | 32.5 | 18.9 | 6.6 | 42.0 |
| Female | | 37.7 | 19.6 | 7.2 | 35.5 |
| RACE/ETHNITICITY | 13,343 | | | | |
| Asian, Pacific Islander | | 48.6 | 24.3 | 7.2 | 19.9 |
| Hispanic | | 20.9 | 20.3 | 9.2 | 49.6 |
| Black | | 27.5 | 17.9 | 5.0 | 49.6 |
| White | | 38.6 | 19.3 | 6.9 | 35.3 |
| Native American | | 13.9 | 13.1 | 6.8 | 66.2 |
| SOCIOECONOMIC STATUS | 13,211 | | | | |
| Lowest Quartile | | 12.9 | 17.0 | 5.0 | 65.1 |
| Middle Two Quartiles | | 31.6 | 21.4 | 8.5 | 38.5 |
| Highest Quartiles | | 65.4 | 17.3 | 5.8 | 11.5 |
| ACHIEVEMENT QUARTILE | 13,188 | | | | |
| Lowest Quartile | | 7.9 | 16.5 | 7.2 | 68.3 |
| Middle Two Quartiles | | 33.1 | 23.9 | 7.8 | 35.2 |
| Highest Quartile | | 71.8 | 13.1 | 4.8 | 10.3 |

As shown in Table 1, the enrollment of respondents differs across gender, race/ethnicity, and socioeconomic status. Regarding gender, females enrolled in four-year schools in greater proportions than did males (37.7% v. 32.5%), and females were less likely to have never enrolled than were males (35.5% v. 42%). Any gender differences seen for the two-year school enrollment categories are very small.

A breakdown of enrollment by race and ethnicity supports the findings of other studies which report that blacks, Hispanics and Native Americans lag behind whites and Asian Americans in college-going rates (Western Interstate Commission for Higher Education and The College Board, 1991; Sanderson, Dugoni, Rasinski, Taylor, & Carroll, 1996). Asian Americans attended four-year schools at a higher rate than any other group (48.6%) followed by whites (38.6%), blacks (27.5%), Hispanics (20.9%), and Native Americans (13.9%). Moreover, Asian Americans and whites were less likely to have never enrolled in a PEI than

were other groups; the percentages are 19.9% never enrolled for Asian Americans and 35.3% for whites, respectively. Just under half of the blacks and Hispanics in the sample, and fully 66.2% of the Native Americans, had never enrolled. These comparisons do not yet take into account any statistical controls.

Consistent with previous research, high SES individuals continue to attend college at a much higher rate than their low-SES counterparts. Respondents in the highest SES quartile were more than twice as likely to enroll in four-year institutions (65.4%) as were respondents in the middle two SES quartiles (31.6%). Further, respondents in the highest quartile were five times more likely to enroll in four-year schools than were respondents in the lowest quartile. Fully 65% of the lowest SES group never enrolled in a PEI, whereas only 11.5% of the highest SES group never enrolled. Of the lowest SES respondents who did enroll, most (17% of the total number) attended two-year institutions on a full-time basis. Within the middle two SES quartiles, the largest proportion never enrolled (38.5%), but most of those who did enroll attended four-year institutions (31.6% of the total number).

Because adolescents and young adults in poverty often endure complex social problems, including ineffective schools, they are placed at risk of poor academic performance and school failure. Of course, high academic performance is important for college entry, and ultimately for success in any postsecondary institution. Nearly 72% of respondents in the highest achievement quartile enrolled in four-year PEIs, compared to 33% in the middle two quartiles and 7.9% in the lowest quartile. The opposite pattern exists for those never enrolled — 10.3% of the top achievers never enrolled, compared to 68.3% of the lowest achievers. The middle achievers who enrolled in a PEI most commonly entered four-year schools, whereas the lowest achievers who enrolled in a PEI were most likely to enter two-year schools on a full-time basis.

## Achievement, SES, and Talent Loss

Table 2 depicts talent loss among individuals in the longitudinal panel and illustrates how PEI enrollment varies across achievement and SES. More specifically, it shows how at a given level of achievement, higher SES individuals are much more likely than their lower SES counterparts to enroll in a PEI. For example, in examining the top achievement group (i.e., highest 20% on standardized tests), we see that 86.6% of the highest SES respondents enrolled in four-year institutions. As SES decreases, so does the percent entering four-year schools. About 70% of the third SES quartile, 57.3% of the second SES quartile, and only half of the lowest SES quartile enrolled in four-year schools. Conversely, only 2.7% of the highest SES respondents in the top achievement quintile never enrolled in a PEI, as compared to 7.9%,

19.5%, and 22.6%, in the third, second, and lowest SES quartiles, respectively. If we use our most severe definition of talent loss (i.e., talent loss occurs when a high-achieving student does not enter a four-year PEI), then talent loss in the top achievement group is about 13% within the highest SES quartile and about 50% within the lowest. Alternatively, if we measure talent loss as never enrolling at any PEI, then talent loss in the top achievement group is 2.7% within the highest SES quartile and 22.6% within the lowest.

**Table 2**
**Postsecondary Enrollment Status by Achievement and Socioeconomic Status**
(N=13,064)

| | | | Postsecondary Institution Enrollment Categories | | | |
|---|---|---|---|---|---|---|
| **Achievement Quintile** | **Socioeconomic Status Quartile** | **Proportion of Achievement Quintile** | **4-year** | **2-year, Full-Time** | **2-year, Part-Time** | **Never Enrolled** |
| **Top Achievement Group (100-80%)** | 4. High | 52.7 | 86.6 | 7.9 | 2.8 | 2.7 |
| | 3. | 26.0 | 69.6 | 16.2 | 6.4 | 7.9 |
| | 2. | 16.2 | 57.3 | 19.8 | 3.3 | 19.5 |
| | 1. Low | 5.2 | 50.0 | 22.1 | 5.3 | 22.6 |
| **Achievement Group Four (80-60%)** | 4. High | 34.8 | 67.0 | 14.6 | 6.0 | 12.4 |
| | 3. | 30.3 | 49.1 | 21.6 | 6.8 | 22.6 |
| | 2. | 23.5 | 37.6 | 25.9 | 9.2 | 27.3 |
| | 1. Low | 11.4 | 33.2 | 18.9 | 7.7 | 40.3 |
| **Achievement Group Three (60-40%)** | 4. High | 20.8 | 53.8 | 28.9 | 6.6 | 10.8 |
| | 3. | 29.5 | 37.8 | 23.9 | 9.6 | 28.7 |
| | 2. | 28.2 | 22.6 | 24.6 | 8.5 | 44.4 |
| | 1. Low | 21.6 | 18.7 | 21.3 | 6.5 | 53.5 |
| **Achievement Group Two (40-20%)** | 4. High | 12.7 | 33.5 | 29.6 | 14.2 | 22.8 |
| | 3. | 25.5 | 23.1 | 26.4 | 9.4 | 41.2 |
| | 2. | 28.1 | 12.0 | 20.6 | 11.5 | 55.9 |
| | 1. Low | 33.7 | 9.9 | 22.9 | 4.6 | 62.6 |
| **Low Achievement Group (0-20%)** | 4. High | 8.6 | 13.0 | 37.0 | 7.5 | 42.5 |
| | 3. | 16.0 | 12.8 | 19.7 | 9.6 | 57.9 |
| | 2. | 28.8 | 5.6 | 15.9 | 9.2 | 69.3 |
| | 1. Low | 46.6 | 4.2 | 11.0 | 4.1 | 80.8 |

The relationship between SES and postsecondary enrollment is quite consistent at each level of achievement. However, the distribution of SES changes with each achievement group. Within the top achievement group, 52.7% of the respondents are also in the highest SES

quartile. In contrast, within the lowest achievement group, only 8.6% of the respondents are in the highest SES quartile. The overwhelming proportion of respondents in the lowest achievement quintile are in the lowest SES quartile (46.6%) and, within this group, 80.8% never enrolled in a PEI.

## A Closer Look at Those Who Never Enrolled

As previously shown in Table 1, nearly 40% of the respondents in the study had not enrolled in a postsecondary institution by 1994, which was two years beyond high school for those who followed a normal progression through school. To gain a better understanding of these respondents and thus the phenomenon of talent loss, we examined why they chose not to attend a PEI, why they did not pursue financial aid options, whether they had plans to continue their education, and what major life course experiences they had after leaving school.

**Table 3A**
**Reasons for Not Planning to Continue Education Immediately After High School** †
(N=2014)

| Reasons | % |
|---|---|
| Plan to take some time off before going on to PEI | 64 |
| Rather work and make money | 48 |
| Cannot afford to go on to PEI | 48 |
| Do not like school | 35 |
| Grades are not high enough | 31 |
| Will not need more education for chosen career | 22 |
| Need to help support family | 22 |
| Have not taken the right courses | 18 |
| No other family member has ever gone to PEI | 16 |
| Do not feel that going on to school is important | 15 |
| Plan to join the Armed Forces | 14 |
| College admissions test scores were not high enough | 11 |
| Plan to be a full time homemaker | 8 |
| Counselors and/or teachers recommended work | 6 |
| Did not get admitted to any of the schools applied to | 5 |

† These percentages depict non-dropouts who reported in 1992 that they did not plan to continue their education immediately after high school *and* who had "Never Enrolled" as of 1994.

A battery of questions to this effect was asked of students in the NELS:88 sample. Table 3A lists some of the common reasons why young adults had not planned to continue

their education immediately after high school. Note that respondents could offer more than one reason. Among respondents who reported in 1992 that they did not plan to continue their education immediately after high school, and who had never enrolled at a PEI as of 1994, the most frequent response was that they planned to take time off before continuing their education (64%). About half (48%) indicated they would rather work and make money than attend college, and about half (48%) said they could not afford postsecondary schooling. More than a third said flatly that they did not like school, and 31% reported that their grades were too low. A relatively small number of respondents (16%) did not plan to enroll in a PEI because no one else in their family had gone to college.

**Table 3B**
**Reasons for Not Applying for Financial Assistance for Postsecondary Enrollment** [†]
(N=3303)

| Reasons | % |
|---|---|
| Grades/test scores are not high enough to qualify | 35 |
| Did not know how to apply | 26 |
| Could not get much information on how and where to apply | 21 |
| Family and teen can pay for education | 17 |
| Not eligible because teen will only attend school part-time | 15 |
| Did not wish to report financial situation | 14 |
| No money is available for aid | 11 |
| Missed the deadline for application | 10 |
| Too much paper work is required in order to apply | 8 |
| Other relatives will help to pay college expenses | 5 |

[†] Reported by parents of students who planned to continue their education after high school but who had not applied for financial aid as of 1992 *and* who had not enrolled by 1994.

Often, applying to college goes hand-in-hand with applying for financial aid. (Again, about half of the never-enrolled respondents said they did not pursue college because the financial costs were too high.) Among respondents who reported in 1992 that they planned to continue their education after high school but who had not applied for financial aid as of 1992 and who had never enrolled at a PEI as of 1994, 35% had not applied for financial aid because they felt their grades and test scores were not high enough to qualify (Table 3B). In addition, 26% did not know how to apply. Ten percent attempted to apply for aid but missed the deadline, and 8% thought too much paperwork was required.

Lastly, respondents who had not enrolled in a PEI by 1994 may have had life course experiences that either increased or inhibited their chances of attending college in the future.

Educational expectations are not static; experiences beyond high school can alter one's thinking about the need and possibilities for higher education and training. Table 3C presents postsecondary expectations among respondents who never enrolled, along with some life course experiences. In 1992, fully 66% of the individuals who ended up not enrolling in a PEI by 1994 had plans to continue their education; in 1994, 68% reported plans to continue their education. Eighty-eight percent of these young adults had been employed at some point during these two years. In addition, 57% received their high school diplomas, while another 12% earned a GED. These data are consistent with the dropout literature which reports that many adolescents and young adults who drop out of school have plans to return (Jordan, Lara, & McPartland, 1996) and eventually earn the high school credential (Roderick, 1993). However, 18% of these respondents had neither earned the high school credential nor were pursuing it as of 1994. Some were beginning to form families; that is, 32% had a child and 20% had married.

**Table 3C**
**Postsecondary Expectations and Life Course Experiences**
**Among Students who Never Enrolled in a PEI, 1992-1994**
(N=4743)

| **Expectations** | **%** |
|---|---|
| Plan To Continue Education Beyond High School (1992) | 66 |
| Plan To Continue Education Beyond High School (1994) | 68 |
| **Life Course Experiences** | |
| Employed (at some point) | 88 |
| Served in Military (at some point) | 3 |
| Married at Least Once | 20 |
| Had at Least One Child | 32 |
| Received High School Diploma | 57 |
| Received GED | 12 |
| Pursuing GED or High School Diploma | 13 |
| Did not Graduate and not Pursuing GED or HS Diploma | 18 |

# Multivariate Analyses

We use multinomial logistic regression models to examine postsecondary enrollment as a function of a set of explanatory variables. These models are useful when one has a polytomous, nominal dependent variable such as PEI enrollment, and a combination of continuous and dichotomous explanatory variables. In this section, we describe these models and the variables included in them. We present descriptive univariate statistics for these variables for the sample of our final model and for the larger longitudinal panel. We outline the substantive ways in which the sample of our final model differs from the longitudinal panel.

A multinomial logistic regression model is a type of generalized logit model (Agresti, 1990). A logit, or log odds, is defined as $\ln (p_i/p_j)$, where i and j are two levels at which the dependent variable can be observed; $p_i$ and $p_j$ are the probabilities of these levels i and j being observed, respectively. For a dependent variable such as our measure of PEI enrollment, which can be observed at any of four nominal levels (four-year, two-year full-time, two-year part-time, and never enrolled), there are six pairs of responses for which we can construct logits. However, if we know a certain choice of three of these logits, the others can be calculated directly using those three. Therefore, in the following analyses, parameters estimates predict each of three logits: $\ln (p_{4\text{-yr}}/p_{2\text{-yr FT}})$, $\ln (p_{4\text{-yr}}/p_{2\text{-yr PT}})$, and $\ln (p_{4\text{-yr}}/p_{\text{Never Enrolled}})$. The first of these logits represents the log odds of enrolling in a four-year PEI rather than enrolling full-time in a two-year PEI; the second represents the log odds of enrolling in a four-year PEI rather than enrolling part-time in a two-year PEI; the third represents the log odds of enrolling in a four-year PEI rather than never having been enrolled.

In the models below, the estimated coefficients express the additive relationship between each explanatory variable and the log odds of an individual being in one enrollment status rather than another.[3] It is somewhat difficult to convey the substantive significance of these estimates when they are presented in terms of effects on log odds. Therefore, we also guide the reader through the exercise of expressing the multiplicative relationship between the explanatory variables and the odds $(p_i/p_j)$ of an individual being in one enrollment status rather than another and, further, expressing the probability $(p_i)$ of an individual with a given profile across the explanatory variables ending up in each of the four enrollment statuses.

[3] We estimate our models using the CATMOD procedure in SAS, specifying the maximum-likelihood method of estimation with generalized logits as the response functions (SAS Institute 1989).

Although multinomial logit models are appropriate and informative given the nominal, polytomous nature of the dependent variable and the combination of continuous and dichotomous explanatory variables, two methodological constraints exist — our ability to assess overall goodness-of-fit and the necessity of using listwise deletion of cases in instances of missing data. Regarding goodness-of-fit, generalized logit models typically rely on chi-squared statistics to measure a model's overall fit. However, because so many of our independent variables are continuous with a large number of unique values, most of our observations represent separate populations of size one. That is, when we cross-classify cases by all of the variables in our final model, most cells contain a single case. At this extreme of sparseness, chi-squared goodness-of-fit statistics are inappropriate for testing overall fit of models (Agresti, 1990; Haberman, 1974). The chi-squared statistics can still be used to compare the improvement in fit one model offers relative to another, and the maximum likelihood estimates for each model's parameters represent the values under which the observed data would have had the highest probability of occurrence. However, we are limited in how well we can assess the overall explanatory power of the models.

Our second constraint involves the deletion of cases in instances of missing data. Pairwise deletion, which is sometimes used in estimating regression models in order to preserve a larger number of cases, is not an option in the estimation of multinomial logit models. Listwise deletion must be used, meaning that our models are estimated based only on those cases for which data is non-missing for all independent variables as well as the dependent variable. As a result, many cases are lost due to deletion of missing data in our analyses. Whereas the full longitudinal panel, which is representative of those who were in the eighth grade in 1988 or in the tenth grade in 1990, includes 13,958 respondents, our estimated models are based on 8,125 of these cases.

## Variables and Measures

Descriptions of all variables used in the logistic regression models are given here. Additionally, details of the construction of all variables are provided in Appendix A. As mentioned above, the dependent variable identifies enrollment status at the first PEI attended, if any was attended. The four levels of enrollment status are (a) enrollment at a four-year PEI, (b) full-time enrollment at a two-year PEI, (c) part-time enrollment at a two-year PEI, or (d) never enrolled. The information for the dependent variable was taken from the third follow-up student questionnaire collected in spring of 1994, which was two years after high school graduation for most respondents.

**Table 4**
**Overview of Independent Variables in Multinomial Logistic Regression Models**

*Model I* (Baseline)
- Intercept
- Asian/Pacific Islander
- Hispanic
- Native American
- Female
- Urban
- Rural
- Public
- Prior Test Scores

*Model II* (Introduction of SES)
- Variables of Model I
- SES

*Model III* (Introduction of Student, Parent, & School Discussion)
- Variables of Model II
- Parent-Student Discussion (LH)
- Parent-Student Discussion (LL)
- Parent-Student Discussion (HL)
- Parent-School Communication
- Parent Discussion w/Other Parents

*Model IV* (Introduction of SAT/ACT Preparation and Taking)
- Variables of Model III
- Parent Encouraged SAT/ACT Prep
- Prep Course for SAT/ACT
- Prep Manuals for SAT/ACT
- Exam Planning/Taking (NY)
- Exam Planning/Taking (NN)
- Exam Planning/Taking (YN)

*Model V* (Full Model)
- Variables of Model IV
- Guidance & Help from School
- Visited a PEI w/ Parent
- Financial Aid Information Sources
- Applied for Financial Aid
- Applied to a PEI

Table 4 shows the independent variables in our models. Model I (the baseline model) includes a set of four dummy variables representing race and ethnicity as well as measures of gender, urbanicity, school sector, and prior achievement. The indicators of race and ethnicity are *Asian/Pacific Islander*, *Hispanic*, *Black*, and *Native American*. *White* is the excluded reference category. Gender is indicated by a dummy variable for female, with male as the reference category. Dummy variables for urban and rural indicate the classification of the respondent's high school in 1992, with suburban as the reference category. A dummy variable for public school status describes the sector of the high school in 1992, with the reference category comprising all private school types. Finally, the baseline model includes a measure of prior test score. This measure is based on tenth-grade standardized math and reading tests. However, when these tests were unavailable, scores from eighth or twelfth grade were used.

Model II introduces a single measure, an indicator of socioeconomic status. With the introduction of this variable, we are able to see how strong the effect of SES is on each of the

logits, net of test scores and other baseline measures. Model II is somewhat analogous to Table 2 in that it focuses on the degree to which SES is associated with postsecondary enrollment status for respondents at a given achievement level.

Model III introduces a set of measures of the level of communication and discussion among students, parents, and school personnel. The intent is to see not only whether these variables are related to postsecondary enrollment status, but also whether they reduce the effects of SES and are thus mechanisms through which the advantages of higher SES are manifested. Three dummy variables in Model III indicate the levels of discussion between student and parents about: (a) selecting courses or programs at school, (b) school activities or events of particular interest to the student, (c) things the student had studied in class, (d) the student's grades, (e) plans and preparation for the ACT or SAT, and (f) applying to college or other schools after high school. Students were asked in 1990 and in 1992 how often they had discussed each of these things with their parents in the first half of that school year. The first of the dummy variables, *Parent-Student Discussion (LH)*, equals "1" when there was a low level of discussion about these academic issues in 1990 but a high level in 1992.[4] *Parent-Student Discussion (LL)* equals "1" when there were low levels of discussion in both 1990 and 1992. Finally, *Parent-Student Discussion (HL)* equals "1" when discussion was at a high level in 1990 but a low level in 1992. The excluded reference category against which these three dummy variables are compared is the case of high levels of parent-student discussion in both 1990 and 1992. With these three dummy variables, we can assess not only the importance of a high level of discussion about these educational topics, but also the importance of early and sustained discussion about them.

Continuing the set of measures of communication and discussion, Model III also includes a measure of *Parent-School Communication*. Parents were asked in 1992 how often they had either contacted their teen's school or been contacted by the school about: (a) the teen's plans after leaving high school, and (b) the teen's course selection for entry into college, vocational, or technical school after leaving high school. Our measure of *Parent-School Communication* is a composite based on the parent's four responses (regarding school-initiated contact about the teen's plans, parent-initiated contact about the teen's plans, school-initiated contact about course selection, and parent-initiated contact about course selection).

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[4] *(LH)* indicates "low, high" in order to describe the 1990 and 1992 levels of discussion. Similarly *(LL)* represents "low, low" and *(HL)* represents "high, low."

Finally, *Parent Discussion with Other Parents* is a composite measure of the parent's 1992 responses to questions about how often he or she talked to the parents of their teen's friends about: (a) things that were going on at the teen's school, (b) the teen's educational plans for after high school, and (c) the teen's career plans.

Model IV introduces a set of measures of preparation for the SAT or ACT. This block of variables exemplifies our focus on actions taken. Both in preparing for these tests and in actually taking them, there are actions that the student, parent, or school can take that should affect an individual's postsecondary prospects. *Parent Encourage SAT/ACT Prep* is a dummy variable that takes the value "1" if the parent reported in 1992 that he or she had encouraged the teen to get a book, a manual, a computer program, or to take a course that would help the teen prepare for either the SAT or the ACT. This variable takes the value "0" if the parent reported that he or she had not offered encouragement for preparation for either test. *Prep Course for SAT/ACT* is a dummy variable that takes the value "1" if the student reported in 1992 that he or she had done (or planned to do) any of the following to prepare for the SAT or ACT: (a) taken a special course at his or her high school, (b) taken a course offered by a commercial test preparation service, or (c) received private one-to-one tutoring. The dummy variable takes the value "0" if the student reported having done none of these things. Similarly, *Prep Manuals for SAT/ACT* is a dummy variable that takes the value "1" if the student reported in 1992 having done (or planning to do) any of the following to prepare for SAT or ACT: (a) studying from test preparation books, (b) using a test preparation video tape, or (c) using a test preparation computer program.

Finally, Model IV includes a set of three dummy variables which indicate whether the respondent had taken or planned to take either the SAT or ACT as of 1990 and whether he or she had actually taken one of the exams by 1994. Specifically, *Exam Planning/Taking (NY)* takes the value "1" if the respondent had neither taken nor had plans to take either test as of 1990 but had in fact taken one of them by 1994.[5] *Exam Planning/Taking (NN)* takes the value "1" if the respondent had neither taken nor had plans to take either exam as of 1990 and still had not taken either exam as of 1994; the variable takes the value "0" otherwise. *Exam Planning/Taking (YN)* takes the value "1" if the respondent reported plans to take one of the exams as of 1990 but had not taken either of them by 1994. The excluded reference category against which these three "planning and taking" dummy variables are compared is the case in which the respondent had plans to take, or had actually taken, one of the exams as of 1990 and

[5] *(NY)* indicates "no, yes" in order to describe the 1990 and 1992 planning and actions. Similarly *(NN)* represents "no, no" and *(YN)* represents "yes, no."

had taken one of them as of 1994. These variables, like the set of dummy variables introduced in Model III regarding levels of parent-student discussion, allow us to assess not only the importance of taking the SAT or ACT, but also the importance of early and sustained planning.

Model V (our final model) introduces a set of measures of "actions taken" involving visiting PEIs, applying to PEIs, and exploring and applying for financial aid. The measure of *Guidance and Help from School* is a composite based on the respondent's 1992 reports of whether he or she had received each of the following four things at high school: (a) help with filling out vocational/technical school or college applications, (b) help with filling out financial aid forms, (c) assistance in writing essays for vocational/technical school or college applications, or (d) days off from school to visit vocational/technical schools or colleges. The measure of whether the teen *Visited a PEI with a Parent* takes the value "1" if the parent reported that he or she had visited one or more schools with the teen during the high school years; the measure takes the value "0" if no schools were visited.

*Financial Aid Information Sources* is a function of the number of information sources parents had utilized as of 1992 to learn about applying for financial aid for the teen's future education. The possible information sources included: (a) talking with a high school guidance counselor, (b) talking with a representative from a vocational/technical school or college, (c) talking with a loan officer at a bank, (d) talking to another knowledgeable person, (e) reading U.S. Department of Education information, (f) reading information from a vocational/technical school or college, or (g) reading about aid available through military service. The logarithmic transformation we use in constructing this variable (see Appendix A) is consistent with the idea that every information source utilized has benefits in helping a teen reach a PEI, but the benefits come with diminishing returns as the number of sources increases beyond one.

*Applied for Financial Aid* is a dummy variable that takes the value "1" if the respondent reported in either 1992 or 1994 that he or she had applied for financial aid at one or more PEIs; the variable takes the value "0" otherwise. Finally, *Applied to a PEI* is a dummy variable that takes the value "1" if the respondent reported in either 1992 or 1994 that he or she had applied for admission to at least one PEI; it takes the value "0" otherwise. It is important to note that in our sample, some students who enrolled in each of the PEI types never reported the completion of a formal application, so failure to complete these applications is not an absolute barrier. However, we expect that knowledge of the financial aid and admissions application processes, and successful completion of these processes, will markedly increase an individual's chances of ending up in a PEI, especially a four-year school.

**Table 5**
**Percentages, Means, and Standard Deviations of Variables Used in Model: Sample of Final Model and Longitudinal Panel**

| Variables in the Equation | | Final Model Sample (N=8,125) | | Longitudinal Panel[a] (N=13,958) | |
|---|---|---|---|---|---|
| **Dependent** | | % | | % | |
| Enrollment Status | 4-Year PEI | 47.6 | | 35.1 | |
| | 2-Year FT | 21.2 | | 19.3 | |
| | 2-Year PT | 6.9 | | 6.9 | |
| | Never Enrolled | 24.3 | | 38.7 | |
| **Independent** | | | | | |
| Asian/Pacific Islander | | 3.9 | | 3.8 | |
| Hispanic | | 7.5 | | 11.2 | |
| Black | | 11.3 | | 13.6 | |
| Native American | | 1.0 | | 1.5 | |
| Female | | 50.7 | | 49.5 | |
| Urban | | 25.9 | | 29.0 | |
| Rural | | 31.8 | | 30.6 | |
| Public | | 89.4 | | 91.2 | |
| Parent-Student Discussion (LH) | | 16.5 | | 15.5 | |
| Parent-Student Discussion (LL) | | 31.5 | | 31.4 | |
| Parent-Student Discussion (HL) | | 17.7 | | 18.2 | |
| Parent Encouraged SAT/ACT Prep | | 80.6 | | 75.5 | |
| Prep Course for SAT/ACT | | 26.6 | | 26.4 | |
| Prep Manuals for SAT/ACT | | 56.0 | | 53.9 | |
| Exam Planning/Taking (NY) | | 12.5 | | 14.7 | |
| Exam Planning/Taking (NN) | | 15.9 | | 17.9 | |
| Exam Planning/Taking (YN) | | 12.6 | | 14.0 | |
| Visited a PEI | | 55.7 | | 45.1 | |
| Applied for Financial Aid | | 46.2 | | 36.5 | |
| Applied to a PEI | | 66.6 | | 54.3 | |
| | | μ | σ | μ | σ |
| Prior Test Scores | | 0.248 | 0.979 | 0.054 | 1.020 |
| SES | | 0.102 | 0.760 | 0.072 | 0.797 |
| Parent-School Communication | | 0.053 | 0.804 | 0.001 | 0.802 |
| Guidance & Help from School | | 0.045 | 0.720 | 0.002 | 0.712 |
| Parent Discussion w/Other Parents | | 0.125 | 0.893 | -0.010 | 0.888 |
| Financial Aid Information Sources | | 1.040 | 0.756 | 0.883 | 0.776 |

[a] Average non-missing valid number of cases for any individual variable in full longitudinal panel is 12,834.

Having described the variables in the models, we need to examine how the sample used in estimating these models differs from the longitudinal panel. Table 5 shows that the sample used in the regression models (n=8,125) has a greater representation of respondents who

attended a four-year PEI for their first post-high school enrollment than does the longitudinal panel. The longitudinal panel includes a greater percentage of respondents who never enrolled in a PEI. These differences are primarily due to the fact that we include in our models some questions that were asked only of students and school personnel if the student was enrolled in school at the time of the 1990 and 1992 surveys. Thus, we lose respondents from the sample who had dropped out permanently or temporarily at these times.

Other noteworthy differences between the final model sample and the longitudinal panel are found in the percentages of respondents who had applied to a PEI by 1994 (66.6% versus 54.3%, respectively), and prior test scores (0.248 and 0.054 on the standardized scale, respectively). Again, these differences are primarily related to the fact that some of the individuals who were marginally engaged in high school, and who dropped out either permanently or temporarily, are lost from the final model sample.

## Results of Multivariate Analyses

This section presents the results of the analyses in two ways. First, we discuss the estimated effects of the independent measures on the log odds of entry into a four-year PEI relative to two-year full-time status, two-year part-time status, and never-enrolled status. Second, we present four substantively interesting hypothetical cases. For each case, we present the predicted probability that an individual who fits the case's profile of independent measures will end up in each of the four postsecondary destinations.

### Effects on Log Odds

Table 6A shows the parameter estimates for the baseline model. The first column of parameters provides estimated effects of the background measures on the log odds of attending a four-year PEI rather than a two-year PEI as a full-time student. The second column depicts effects on the log odds of attending a four-year PEI rather than a two-year PEI as a part-time student. Finally, the third column depicts effects on the log odds of attending a four-year PEI rather than never enrolling in a PEI.

Asian/Pacific Islander respondents are significantly more likely than white respondents to attend four-year PEIs rather than never enrolling ($\beta_{\text{4-yr/Never Enrolled}} = 0.84$). Black respondents are significantly more likely than white respondents to attend four-year PEIs rather than any of the other three options ($\beta_{\text{4-yr/2-yr FT}} = 0.70$; $\beta_{\text{4-yr/2-yr PT}} = 0.91$; $\beta_{\text{4-yr/Never Enrolled}} = 0.52$). It is

important to note that these advantages associated with minority status are found in a model in which prior test scores, as well as gender, urbanicity, and school type have been controlled. Appendix B shows an estimated model that includes only an intercept and indicators of race/ethnicity. In that reduced model, Hispanics, blacks, and Native Americans all lag behind whites in the likelihood of attending four-year PEIs. What Table 6A shows, however, is that among respondents sharing a given level of prior achievement, blacks are more likely than whites to attend four-year PEIs. Furthermore, as we move to the models that incorporate measures of SES, guidance, information, and actions taken, we will see that the magnitude of this advantage increases for black respondents and an advantage also emerges for Hispanic respondents.

**Table 6A**
**Estimated Parameters in Logit Model for Postsecondary Enrollment:**
**Baseline Equation** (N=8125)

| | Parameter Estimates | | |
|---|---|---|---|
| **Independent** | **4-yr v. 2-yr FT** | **4-yr v. 2-yr PT** | **4-yr v. Never Enrolled** |
| **Intercept** | 0.95*** | 1.89*** | 1.66*** |
| **Asian/Pacific Islander** | 0.01 | 0.37 | 0.84*** |
| **Hispanic** | -0.03 | -0.23 | -0.06 |
| **Black** | 0.70*** | 0.91*** | 0.52*** |
| **Native American** | 0.24 | -0.66 | 0.11 |
| **Female** | 0.11 | 0.08 | 0.47*** |
| **Urban** | 0.11 | 0.18 | -0.04 |
| **Rural** | 0.02 | 0.56*** | -0.19** |
| **Public** | -0.78*** | -0.73*** | -1.63*** |
| **Prior Test Scores** | 1.02*** | 1.13*** | 1.48*** |

*p<.05 **p<.01 ***p<.001

Table 6A also shows positive and significant effects for prior test scores ($\beta_{\text{4-yr/2-yr FT}} = 1.02$; $\beta_{\text{4-yr/2-yr PT}} = 1.13$; $\beta_{\text{4-yr/Never Enrolled}} = 1.48$). It makes intuitive sense that prior test scores would be positively associated with attending a four-year PEI. Furthermore, we see that they are increasingly salient as one considers the likelihood of attending a four-year PEI relative to, first, a two-year school as a full-time enrollee, second, a two-year school as a part-time enrollee, and, third, never enrolling at a PEI.

Having analyzed the baseline effects of race and ethnicity, prior achievement, and other background controls, we turn now to the effect of SES on postsecondary destinations. As shown in Table 6B, the effect of SES is positive and significant for each of the three logits ($\beta_{4\text{-yr/2-yr FT}} = 0.59$; $\beta_{4\text{-yr/2-yr PT}} = 0.46$; $\beta_{4\text{-yr/Never Enrolled}} = 1.26$). These results suggest that higher SES increases one's likelihood of attending a four-year PEI rather than any of the other three options. The effect is especially strong on the log odds of attending a four-year PEI rather than never enrolling.

**Table 6B**
**Estimated Parameters in Logit Model for Postsecondary Enrollment:**
**Baseline Equation** (N=8125)

| | Parameter Estimates | | |
|---|---|---|---|
| **Independent** | **4-yr v. 2-yr FT** | **4-yr v. 2-yr PT** | **4-yr v. Never Enrolled** |
| **Intercept** | 0.65*** | 1.65*** | 1.12*** |
| **Asian/Pacific Islander** | 0.03 | 0.38 | 1.00*** |
| **Hispanic** | 0.21 | -0.05 | 0.52*** |
| **Black** | 0.88*** | 1.05*** | 0.91*** |
| **Native American** | 0.32 | -0.59 | 0.26 |
| **Female** | 0.15* | 0.11 | 0.60*** |
| **Urban** | 0.12 | 0.18 | -0.01 |
| **Rural** | 0.17* | 0.68*** | 0.12 |
| **Public** | -0.64*** | -0.64*** | -1.30*** |
| **Prior Test Scores** | 0.90*** | 1.04*** | 1.26*** |
| **SES** | 0.59*** | 0.46*** | 1.26*** |

*p<.05 **p<.01 ***p<.001

Table 6C introduces measures of the level of communication and discussion among students, parents, and school personnel about academic matters and postsecondary preparation. With the introduction of these five measures, the effect of SES on the each of the three logits remains significant, but is reduced from the levels seen in the previous model ($\beta_{4\text{-yr/2-yr FT}} = 0.52$; $\beta_{4\text{-yr/2-yr PT}} = 0.37$; $\beta_{4\text{-yr/Never Enrolled}} = 1.10$). The direct effect of SES on the log odds of attending a four-year PEI rather than a two-year PEI as a full-time enrollee is reduced to 88% of what it was in Table 6B with the introduction of measures of communication among students, parents, and schools. (Compare the coefficients in Tables 6B and 6C to see that: 0.52/0.59 = 0.88.) Similarly, the direct effect of SES on the log odds of attending a four-year PEI rather than a two-year PEI as a part-time enrollee is reduced to 80% of what it was as we introduce these measures of communication (0.37/0.46 = 0.80). Further, the direct effect of SES on the log

odds of attending a four-year PEI rather than never enrolling is reduced to 87% of what it was within this model (1.10/1.26 = 0.87). This provides some evidence that part of the advantage that high SES respondents experience relative to low-SES respondents of otherwise-similar background characteristics (including achievement) in the likelihood of reaching a four-year PEI comes via the patterns of communication and discussion among themselves, their parents, and the people at their high schools.

**Table 6C**
**Estimated Parameters in Logit Model for Postsecondary Enrollment: Baseline Equation** (N=8125)

| | Parameter Estimates | | |
|---|---|---|---|
| **Independent** | **4-yr v. 2-yr FT** | **4-yr v. 2-yr PT** | **4-yr v. Never Enrolled** |
| **Intercept** | 0.77*** | 1.85*** | 1.71*** |
| **Asian/Pacific Islander** | 0.18 | 0.57* | 1.23*** |
| **Hispanic** | 0.22 | -0.04 | 0.46*** |
| **Black** | 0.83*** | 0.98*** | 0.72*** |
| **Native American** | 0.26 | -0.72 | 0.03 |
| **Female** | 0.12 | 0.08 | 0.55*** |
| **Urban** | 0.15 | 0.22 | 0.02 |
| **Rural** | 0.13 | 0.61*** | 0.03 |
| **Public** | -0.59*** | -0.57** | -1.26*** |
| **Prior Test Scores** | 0.92*** | 1.06*** | 1.30*** |
| **SES** | 0.52*** | 0.37*** | 1.10*** |
| **Parent-Student Discussion (LH)** | -0.19* | -0.29* | -0.29** |
| **Parent-Student Discussion (LL)** | -0.36*** | -0.45*** | -1.04*** |
| **Parent-Student Discussion (HL)** | -0.35*** | -0.56*** | -0.84*** |
| **Parent-School Communication** | 0.21*** | 0.32*** | 0.53*** |
| **Parent Discussion w/Other Parents** | 0.16*** | 0.26*** | 0.38*** |

*p<.05 **p<.01 ***p<.001

The coefficients seen in Table 6C show that early and sustained parent-student discussion about academic matters and postsecondary preparation increases the likelihood of reaching a four-year PEI. The coefficients for *Parent-Student Discussion (LH)*, *Parent-Student Discussion (LL)*, and *Parent-Student Discussion (HL)* are all negative and significant. This reveals that the excluded reference category, where parent-student discussion was at a high level in both 1990 and 1992, is markedly more advantageous in terms of boosting the likelihood of reaching a four-year PEI. In noting these results, it is especially important to consider the implications of the negative coefficients for *Parent-Student Discussion (LH)*

($\beta_{4\text{-yr/2-yr FT}} = -0.19$; $\beta_{4\text{-yr/2-yr PT}} = -0.29$; $\beta_{4\text{-yr/Never Enrolled}} = -0.29$). These negative coefficients suggest that discussion that begins sometime after the sophomore year of high school is to some extent "too little, too late." There is a distinct advantage in terms of the likelihood of reaching a four-year PEI to having a high level of discussion not only in the final years of high school but also in the early years.

The coefficients for *Parent-School Communication* and *Parent Discussion with Other Parents* are also positive and significant for all three logits. The likelihood of an individual reaching a four-year PEI increases with greater levels of communication (a) between parents and schools regarding a teen's postsecondary planning and course selection and (b) within networks of parents regarding things going on at high school and teens' educational and career plans. Similar to other variables in the analyses, *Parent-School Communication* and *Parent Discussion with Other Parents* exhibit increasingly strong effects as we move from the first logit to the third logit in Table 6C. That is, these factors increase the likelihood of reaching a four-year PEI relative to all three of the other options, but are especially strong for the contrast between four-year and never-enrolled status.

Table 6D introduces measures of preparation for, and taking of, the SAT or ACT. With the introduction of the six measures of SAT/ACT preparation and taking, the direct effect of SES on the log odds of attending a four-year PEI rather than a two-year PEI as a full-time enrollee is reduced to 64% of what it was upon entering the equation. (Compare the coefficients in Tables 6B and 6D to see that: 0.38/0.59 = 0.64.) The direct effect of SES on the log odds of attending a four-year PEI rather than a two-year PEI as a part-time enrollee is reduced to 46% of what it was (0.21/0.46 = 0.46). The direct effect of SES on the log odds of attending a four-year PEI rather than never enrolling is reduced to 67% of what it was (0.84/1.26 = 0.67). This provides evidence that part of the advantage high SES respondents experience relative to low-SES respondents, at given levels of achievement and other background characteristics, comes via patterns of planning, preparing, and taking the SAT or ACT.

Parents encouraging preparation for the exams has a positive effect on the likelihood of reaching a four-year PEI relative to each of the other options ($\beta_{4\text{-yr/2-yr FT}} = 0.33$; $\beta_{4\text{-yr/2-yr PT}} = 0.36$; $\beta_{4\text{-yr/Never Enrolled}} = 0.64$). Taking a course in preparation for the exams also has a positive effect on the likelihood of reaching a four-year PEI relative to each of the other options ($\beta_{4\text{-yr/2-yr FT}} = 0.29$; $\beta_{4\text{-yr/2-yr PT}} = 0.36$; $\beta_{4\text{-yr/Never Enrolled}} = 0.39$). Using a manual (or video tape or computer program) is significant for the logit of four-year PEI relative to "never enrolled" status, but the effects of *Prep Manuals for SAT/ACT* are weaker than those seen for *Prep Course for SAT/ACT* ($\beta_{4\text{-yr/2-yr FT}} = 0.09$; $\beta_{4\text{-yr/2-yr PT}} = 0.12$; $\beta_{4\text{-yr/Never Enrolled}} = 0.23$).

**Table 6D**
**Estimated Parameters in Logit Model for Postsecondary Enrollment: Baseline Equation** (N=8125)

| Independent | Parameter Estimates: 4-yr v. 2-yr FT | 4-yr v. 2-yr PT | 4-yr v. Never Enrolled |
|---|---|---|---|
| **Intercept** | 0.60*** | 1.65*** | 1.36*** |
| **Asian/Pacific Islander** | 0.10 | 0.48 | 1.00*** |
| **Hispanic** | 0.29* | 0.05 | 0.52*** |
| **Black** | 0.71*** | 0.85*** | 0.43*** |
| **Native American** | 0.09 | -0.91* | -0.30 |
| **Female** | 0.01 | -0.05 | 0.34*** |
| **Urban** | 0.15 | 0.22 | 0.01 |
| **Rural** | 0.11 | 0.59*** | 0.01 |
| **Public** | -0.45*** | -0.37* | -0.81*** |
| **Prior Test Scores** | 0.79*** | 0.91*** | 1.03*** |
| **SES** | 0.38*** | 0.21** | 0.84*** |
| **Parent-Student Discussion (LH)** | -0.04 | -0.12 | 0.03 |
| **Parent-Student Discussion (LL)** | -0.10 | -0.15 | -0.51*** |
| **Parent-Student Discussion (HL)** | -0.23* | -0.40** | -0.56*** |
| **Parent-School Communication** | 0.16*** | 0.26*** | 0.41*** |
| **Parent Discussion w/Other Parents** | 0.13*** | 0.21*** | 0.30*** |
| **Parent Encouraged SAT/ACT Prep** | 0.33*** | 0.36** | 0.64*** |
| **Prep Course for SAT/ACT** | 0.29*** | 0.36** | 0.39*** |
| **Prep Manuals for SAT/ACT** | 0.09 | 0.12 | 0.23** |
| **Exam Planning/Taking (NY)** | -0.39*** | -0.35* | -0.77*** |
| **Exam Planning/Taking (NN)** | -2.08*** | -2.25*** | -3.18*** |
| **Exam Planning/Taking (YN)** | -1.75*** | -2.11*** | -2.67*** |

*p<.05 **p<.01 ***p<.001

The coefficients for planning to take, and taking, SAT or ACT exams are all negative and significant. This reveals that the excluded reference category, where the respondent had plans to take, or had actually taken the SAT or ACT as of 1990 and had taken one of them as of 1994, is markedly more advantageous in terms of boosting the likelihood of reaching a four-year PEI. As with the measures of parent-student discussion, the implications of the negative coefficients for *Exam Planning/Taking (NY)* ($\beta_{\text{4-yr/2-yr FT}} = -0.39$; $\beta_{\text{4-yr/2-yr PT}} = -0.35$; $\beta_{\text{4-yr/Never Enrolled}} = -0.77$) need to be examined. Why is a student more likely to make the transition to a four-year PEI if he or she not only took the SAT or ACT eventually but had begun planning for it early? We speculate that early planning reflects a general awareness and

preparation that is advantageous. The findings for these measures of SAT and ACT planning and taking probably reflect more than just the narrow issue of these two exams. The findings may reflect more broadly the importance of receiving information and beginning one's planning and preparation early.

**Table 6E**
**Estimated Parameters in Logit Model for Postsecondary Enrollment:**
**Baseline Equation** (N=8125)

| | Parameter Estimates | | |
|---|---|---|---|
| **Independent** | **4-yr v. 2-yr FT** | **4-yr v. 2-yr PT** | **4-yr v. Never Enrolled** |
| **Intercept** | -0.40* | 0.46 | -0.57* |
| **Asian/Pacific Islander** | 0.18 | 0.64* | 1.10*** |
| **Hispanic** | 0.33* | 0.13 | 0.66*** |
| **Black** | 0.70*** | 0.86*** | 0.40** |
| **Native American** | 0.16 | -0.79* | -0.34 |
| **Female** | -0.05 | -0.12 | 0.15 |
| **Urban** | 0.15 | 0.19 | 0.01 |
| **Rural** | 0.08 | 0.57*** | -0.02 |
| **Public** | -0.48*** | -0.51** | -0.86*** |
| **Prior Test Scores** | 0.74*** | 0.83*** | 0.97*** |
| **SES** | 0.42*** | 0.23** | 0.81*** |
| **Parent-Student Discussion (LH)** | 0.03 | -0.08 | 0.11 |
| **Parent-Student Discussion (LL)** | -0.02 | -0.09 | -0.36*** |
| **Parent-Student Discussion (HL)** | -0.16 | -0.37* | -0.42*** |
| **Parent-School Communication** | 0.06 | 0.12 | 0.12* |
| **Parent Discussion w/Other Parents** | 0.09* | 0.16** | 0.18*** |
| **Parent Encouraged SAT/ACT Prep** | 0.28** | 0.25 | 0.46*** |
| **Prep Course for SAT/ACT** | 0.23** | 0.33** | 0.24* |
| **Prep Manuals for SAT/ACT** | 0.04 | 0.08 | 0.15 |
| **Exam Planning/Taking (NY)** | -0.33*** | -0.30* | -0.57*** |
| **Exam Planning/Taking (NN)** | -1.45*** | -1.58*** | -2.03*** |
| **Exam Planning/Taking (YN)** | -1.31*** | -1.62*** | -1.82*** |
| **Guidance & Help from School** | 0.17** | -0.09 | 0.23*** |
| **Visited a PEI w/Parent** | 0.30*** | 0.33** | 1.25*** |
| **Financial Aid Information Sources** | 0.07 | 0.28*** | 0.31*** |
| **Applied for Financial Aid** | 0.49*** | 0.59*** | 0.60*** |
| **Applied to a PEI** | 0.62*** | 0.75*** | 1.14*** |

*p<.05 **p<.01 ***p<.001

Table 6E presents the final model, introducing measures of visiting PEIs during the high school years, applying to PEIs, and exploring and applying for financial aid. Although the effects of these measures are highly significant, they do not reduce the direct effects of SES from the levels seen in Table 6D.[6,7] But while we see no further reduction in the direct effects of SES, the significant effects in Table 6E are informative.

Specifically, one sees that increased guidance and help received at the high school boosts one's likelihood of reaching a four-year PEI when contrasted with (a) enrolling full-time in a two-year PEI or (b) never enrolling ($\beta_{\text{4-yr/2-yr FT}} = 0.17$; $\beta_{\text{4-yr/Never Enrolled}} = 0.23$). Visiting one or more PEIs with parents is positively associated with reaching a four-year PEI relative to each of the other three options, most strongly in the case of the "never enrolled" category ($\beta_{\text{4-yr/2-yr FT}} = 0.30$; $\beta_{\text{4-yr/2-yr PT}} = 0.33$; $\beta_{\text{4-yr/Never Enrolled}} = 1.25$). The measure of utilizing financial aid information sources has significant effects for (a) the log odds of enrolling in a four-year PEI rather than enrolling part-time at a two-year PEI and (b) the log odds of enrolling in a four-year PEI rather than never enrolling ($\beta_{\text{4-yr/2-yr PT}} = 0.28$; $\beta_{\text{4-yr/Never Enrolled}} = 0.31$). These results are consistent with the speculation that failure to investigate and secure sufficient financial aid can have the effect of forcing an individual to pursue the less expensive routes of part-time postsecondary education or no enrollment rather than the more expensive routes of full-time enrollment at either a four-year or two-year school. Finally, both the action of applying for financial aid and the action of applying for admission to a PEI are positively and significantly associated with each of the three logits.

## Interpreting the Results via Illustrative Cases

To further clarify the substantive significance of the effects of our variables on PEI enrollment, we present four illustrative cases, each of which represents a substantively interesting profile across the independent variables. For each illustrative case, we calculate the predicted probability of an individual who fits the case's profile ending up in each of the four categories of postsecondary enrollment status.

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[6] In fact, two of the coefficients for SES in Table 6E are slightly larger than the coefficients in Table 6D. These differences between Tables 6E and 6D are neither statistically nor substantively significant, however.

[7] One of the reasons why the items introduced in the final model do not further reduce the effects of SES is because they are the last block entered. Their relationship to SES overlaps with the relationship between SES and the variables entered in the two previous models which limits the degree to which the variables of the final model can have an independent effect.

## Table 7A
## Profiles of Four Illustrative Cases

| Actions Taken By Student, Parent and/or School | Profiles † Case A: Strong School Strong Family | Case B: Weak School Weak Family | Case C: Strong School Weak Family | Case D: Weak School Strong Family |
|---|---|---|---|---|
| **High Level of Parent-Student Discussion** | 10th & 12th Grades | 12th Grade Only | 12th Grade Only | 10th & 12th Grades |
| **Parent-School Communication** | 75th Percentile | 25th Percentile | 50th Percentile | 50th Percentile |
| **Parent Discussion with Other Parents About College** | 75th Percentile | 25th Percentile | 25th Percentile | 75th Percentile |
| **Parent Encouraged Preparation for SAT/ACT** | Yes | No | No | Yes |
| **Student Use Courses & Manuals SAT/ACT Preparation** | Both | Neither | Both | Both |
| **Has Taken SAT/ACT by 1994** | By 1994 with Plans in 1990 | By 1994 w/o Plans in 1990 | By 1994 with Plans in 1990 | By 1994 with Plans in 1990 |
| **Guidance & Help from School** | 75th Percentile | 25th Percentile | 75th Percentile | 25th Percentile |
| **Visited at Least One College or Voc/Tech School with Parent** | Yes | No | No | Yes |
| **Parent's Use of Financial Aid Information Sources** | 75th Percentile | 25th Percentile | 25th Percentile | 75th Percentile |

† In addition to characteristics given above, all case profiles depict a black male who attended an urban, public high school, with achievement in 75th percentile, with SES in 50th percentile, who had applied for financial aid, and who had applied to at least one college or other PEI.

The profiles for the four illustrative cases are presented in Table 7A. All four cases depict black males from urban public schools. All four depict individuals in the 75th percentile for prior test scores and the 50th percentile for SES. Further, the cases represent individuals who applied for financial aid and applied to at least one PEI. We make these traits common to all four cases in order to focus on the other independent variables, which are closely tied to our focus on the ways in which actions taken influence postsecondary destinations.

The cases differ from one another on these other action-oriented, policy-relevant variables. Case A represents an individual with many resources and advantages, and who has taken many of the actions which boost one's likelihood of enrolling in a PEI and, specifically, in a four-year college. Case B represents an individual with few resources and advantages, and who has taken few of the actions which aid one in reaching a PEI. Case C represents an individual who benefits from a strong high school setting, but who comes from a family setting

that does not offer high levels of information or guidance. Case D represents an individual who benefits from a strong family setting but who encounters a relatively weak school setting.

**Table 7B**
**Predicted Probabilities of Postsecondary Enrollment Status for Four Illustrative Cases**

| Postsecondary Enrollment Status in 1994 | Predicted Probabilities † | | | |
|---|---|---|---|---|
| | Case A: Strong School Strong Family | Case B: Weak School Weak Family | Case C: Strong School Weak Family | Case D: Weak School Strong Family |
| **4-Year PEI** | 92.1% | 50.7 | 75.4 | 89.8 |
| **2-Year FT** | 5.6 | 17.1 | 10.5 | 7.4 |
| **2-Year PT** | 1.1 | 4.3 | 3.5 | 1.0 |
| **Never Enrolled** | 1.2 | 28.0 | 10.7 | 1.8 |

† Columns may not sum to 100 percent due to rounding.

What are the predicted probabilities for each of these illustrative cases reaching each of the four postsecondary enrollment statuses, given the profiles of Table 7A and the parameter estimates of Table 6E? Details of the computations which produce the predicted probabilities are presented in Appendix C. Based on those computations, Table 7B displays the predicted probabilities.

The four hypothetical individuals are characterized by greatly different transition probabilities. Case A, with many resources and advantages and who has taken many beneficial actions, has a 92.1% chance of enrolling in a four-year PEI. His expected probability of enrolling full-time in a two-year PEI is just 5.6%. His probabilities of enrolling part-time in a two-year school and never enrolling are 1.1% and 1.2%, respectively. In contrast, Case B, who matches Case A in terms of prior achievement, SES, and other background traits, is greatly affected by his lack of resources, advantages, and actions taken. Case B has only a 50.7% chance of enrolling in a four-year PEI. He has a 17.1% chance of enrolling full-time in a two-year PEI, a 4.3% chance for part-time enrollment in a two-year PEI, and a 28.0% chance of never enrolling.

Cases C and D illustrate that the aspects of family resources we have been able to measure are somewhat more beneficial than the aspects of school resources we have been able to measure. Case D, who receives strong family but weak school support, has an 89.8% chance of enrolling in a four-year PEI while Case C, which receives a strong school but weak family support, has a 75.4% chance of enrolling in a four-year PEI. However, many of the resources and actions are aspects of PEI preparation that could potentially be supported and encouraged by either the school or the family. We do not offer our models and these profiles as rigorous

tests of whether a strong school can serve as a functional equivalent to a strong family. Rather, we view the models and profiles as being useful in highlighting some of the resources and actions that can lead to postsecondary educational careers when present, and that can lead to talent loss when absent.

## Discussion and Conclusions

This paper began with a discussion of the expansion of postsecondary schooling, and the importance of higher education in improving one's life chances. We then introduced the concept of talent loss and showed, using nationally representative data, what previous research has shown as well — talent loss is most severe among students from the lowest socioeconomic origins. Even among high achieving students, extreme talent loss occurs among low-SES individuals at the point of transition from high school. Thus, although both the prevalence and importance of postsecondary schooling are increasing, some young adults who are academically qualified for higher education and who would greatly benefit from it are not making the transition to PEIs.

In investigating sources of talent loss, we identified specific aspects of information, guidance, and action that are often absent for low-SES individuals. Their absence explains much of the negative association between SES and talent loss. Conversely, when these aspects of information, guidance, and action are present, an individual's likelihood of postsecondary enrollment is increased. Specifically, communication and discussion among students, parents, and school personnel about academic matters and postsecondary preparation increase an individual's chances of enrolling at a four-year college or other PEI. Also, receiving encouragement to take the SAT or ACT, preparing for these tests, and taking them increases the chances of postsecondary enrollment. In both the areas of parent-student discussion and SAT/ACT planning, the analyses demonstrate the importance of early and sustained efforts. In other words, beginning serious discussions and serious planning after the sophomore year of high school may be too late. Finally, receiving guidance and help at one's high school, visiting PEIs during the high school years, exploring financial aid opportunities, and completing formal applications for admission and financial aid were found to be important steps in the transition to a PEI.

A practical implication of these findings is that families and schools should be able to use this information to focus on some key steps in helping students make the transition to postsecondary schooling. However, there is more to be learned and our findings should be

interpreted with some caution. One must always be careful in making predictions or projections from correlational findings. We have shown estimated transition probabilities for some interesting hypothetical cases which fall within the range of our observed data. However, there is not enough evidence to claim that, in practice, simply increasing a student's levels of information, guidance, and action in the areas explicitly modeled above would be sufficient to realize the full estimated change in postsecondary prospects. That is, specific actions such as early planning and preparation for the SAT are surely associated with a larger constellation of aspirations, actions, and opportunities for the members of our sample. If policy efforts were focused on augmenting the degree to which high-achieving, low-SES students begin early planning and preparation for the SAT but the other parts of this constellation were not developed, we might observe part but not all of the effect on PEI enrollment suggested by our estimated models.

The major findings of this study suggest that information, guidance, and actions taken significantly influence PEI enrollment. However, the results do not tell us the extent to which policy and programmatic interventions aimed at reducing talent loss are effective. To more fully examine practical approaches to bridging the gap between high school and postsecondary educational institutions, promising interventions need to be developed, implemented, and evaluated. This work does not require beginning at square one — there is ongoing, field-based research focused on increasing the rate of school success among all students as well as building postsecondary educational connections among students placed at risk (LaPoint, Jordan, McPartland, & Towns 1996; Madhere & Mac Iver 1996). Ultimately, a research agenda that combines both national statistics and rigorous evaluations of well-implemented programs will take us the furthest in informing and changing policy and practice.

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# APPENDIX A

# CONSTRUCTION OF VARIABLES

# Construction of Variables

## Dependent Variable

***Enrollment Status at the First PEI Attended, if Any***

This variable is constructed from PSEFIRTY and PSEFIRST. It identifies the respondent's enrollment status at the first PEI he or she attended, if any was attended by the time of the third follow-up survey. The four levels which can be taken for this variable are: (a) enrollment at a four-year PEI, (b) full-time enrollment at a two-year PEI, (c) part-time enrollment at a two-year PEI, and (d) never enrolled.

## Independent Variables

***Asian/Pacific Islander, Hispanic, Black, Native American***

These four dummy variables are constructed from F3RACE. They are entered in our models with *White* as the excluded reference category.

***Female***

This dummy variable is constructed from F3SEX. It is entered in our models with *Male* as the excluded reference category.

***Urban, Rural***

These two dummy variables are constructed from G12URBN3. They describe the classification of the respondent's high school in 1992 and are entered in our models with *Suburban* as the excluded reference category.

***Public***

This dummy variable is constructed from G12CTRL1. It describes the classification of the respondent's high school in 1992 and is entered in our models with the reference category comprising all private school types.

***Prior Test Scores***

This dummy variable is constructed from F12XCOMP, BY2XCOMP, and F22XCOMP. In constructing it, we transformed the composite measure of 1990 math and reading standardized test scores into a Z-score (standardized on the basis of all non-missing

1990 scores in the longitudinal panel). If the 1990 standardized scores were not available, we transformed the composite of 1988 math and reading standardized test scores into a Z-score (standardized on the basis of all non-missing 1988 scores in the longitudinal panel). If neither the 1990 or 1988 standardized tests were available, we transformed the 1992 math and reading composite into a Z-score (standardized on the basis of all non-missing 1992 scores in the longitudinal panel).

Clearly, it would be inappropriate to substitute 1988 or 1992 measures for missing 1990 measures in models of growth. In our analyses, however, we simply wanted a reliable covariate that reflects the individual's achievement at a relatively early time point, relative to his or her peers' achievement. After extensive investigation of the test score distributions at each time point, and of the stability of students' ranks over time, we became satisfied with our measure as an indicator of early academic achievement.

***SES***

This measure of socioeconomic status is constructed from F2SES1. It is used exactly as constructed by the National Center for Education Statistics. It is a composite measure based on parents' education (of both parents, if applicable and available), parents' occupational prestige (of both parents' jobs, if applicable and available), and family income. Where parent reports are unavailable or inadequate, student reports are used. See the *NELS:88 Base Year through Third Follow-Up Electronic Codebook/CD-ROM* for more detail (U.S. Department of Education 1996).

***Parent-Student Discussion (LH), Parent-Student Discussion (LL), Parent-Student Discussion (HL)***

These three dummy variables are constructed from (F1S105A, B, C, D, F, and G) and (F2S99A, B, C, D, E, and F). They indicate the 1990 and 1992 levels of discussion between student and parents about (a) selecting courses or programs at school, (b) school activities or events of particular interest to the student, (c) things the student had studied in class, (d) the student's grades, (e) plans and preparation for the ACT or SAT, and (f) applying to college or other schools after high school. Students were asked in 1990 and 1992 how often they had discussed each of these six things with their parents in the first half of that school year.

*Parent-Student Discussion (LH)* equals "1" if the respondent's 1990 mean of Z-scores for these six items (a through f, above) was below the longitudinal panel's 1990 median level while the 1992 mean of Z-scores for the six items was above the longitudinal panel's 1992

median level; the variable equals "0" otherwise.[8] *Parent-Student Discussion (LL)* equals "1" if both the 1990 mean of Z-scores and the 1992 mean of Z-scores were below the panel's mean for the corresponding years; the variable equals "0" otherwise. *Parent-Student Discussion (HL)* equals "1" if the 1990 mean of Z-scores was above the panel's 1990 median while the 1992 mean of Z-scores was below the panel's 1992 median; it equals "0" otherwise. These three dummy variables are entered in our models with *Parent-Student Discussion (HH)* as the excluded reference category, which represents the case of high levels of discussion in both 1990 and 1992.

### *Parent-School Communication*

This measure is constructed from (F2P43C and F2P43D) and (F2P44C and F2P44D). Parents were asked in 1992 how often they had either contacted their teen's school or been contacted by the school about (a) the teen's plans after leaving high school and (b) the teen's course selection for entry into college, vocational, or technical school after leaving high school. Our composite measure of Parent-School Communication is the mean of Z-scores of the parent's four responses (about parent-initiated contact about teen's plans, school-initiated contact about teen's plans, parent-initiated contact about course selection, and school-initiated contact about course selection). The composite's internal consistency (Cronbach's alpha) equals 0.80.

### *Parent Discussion with Other Parents*

This composite variable is constructed from F2P56A, B, and C. It is the mean of Z-scores of the parent's 1992 responses to questions about how often he or she talked to the parents of the teen's friends about (a) things that were going on at the teen's school, (b) the teen's educational plans for after high school, and (c) the teen's career plans. The composite's internal consistency (Cronbach's alpha) equals 0.86.

### *Parent Encouraged SAT/ACT Preparation*

This variable is constructed from F2P62A and B. It equals "1" if the parent reported in 1992 that he or she had encouraged the teen to get a book, a manual, or a computer program, or to take a course that would help him or her prepare for either the SAT or the ACT. The variable equals "0" if the parent reported that he or she had not offered encouragement for these forms of test preparation.

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[8] In our description of this dummy variable and all others described in this appendix, we use the word "otherwise" to indicate cases for which there were valid (non-missing) data which did not meet the conditions under which the variable equals "1."

### *Prep Course for SAT/ACT*

This variable is constructed from F2S45A, B, and C. It equals "1" if the student reported in 1992 that he or she had done (or planned to do) any of the following to prepare for the SAT or ACT: (a) taken a special course at his or her high school, (b) taken a course offered by a commercial test preparation service, or (c) received private one-to-one tutoring. The variable equals "0" if the student reported having done none of these things.

### *Prep Manuals for SAT/ACT*

This variable is constructed from F2S45D, E, and F. It equals "1" if the student reported in 1992 that he or she had done (or planned to do) any of the following to prepare for the SAT or ACT: (a) studying from test preparation books, (b) using a test preparation video tape, or (c) using a test preparation computer program.

### *Exam Planning/Taking (NY), Exam Planning/Taking (NN), Exam Planning/Taking (YN)*

These three dummy variables are constructed from (F1S50B and C), (F2S44B and C), and (PPOSTEX1 and 2). They indicate whether the respondent had taken or planned to take either the SAT or ACT as of 1990 and whether he or she had actually taken one of the exams by 1994. Specifically, *Exam Planning/Taking (NY)* equals "1" if the respondent had neither taken nor had plans to take either test as of 1990 but had in fact taken one of them by 1994; the variable equals "0" otherwise. *Exam Planning/Taking (NN)* equals "1" if the respondent had neither taken nor had plans to take either exam as of 1990 and still had not taken either exam as of 1994; it equals "0" otherwise. *Exam Planning/Taking (YN)* takes the value "1" if the respondent reported plans to take one of the exams as of 1990 but had not taken either of them by 1994.

These three dummy variables are entered in our models with *Exam Planning/Taking (YY)* as the excluded reference category, which represents the case in which the respondent had plans to take, or had actually taken, one of the exams as of 1990 and had taken one of them as of 1994.

### *Guidance and Help from School*

This composite variable is constructed from F2S57A, B, C, and D. It is the mean of Z-scores of the respondent's 1992 reports of whether he or she had received each of the following things at school: (a) help with filling out vocational/technical school or college applications, (b) help with filling out financial aid forms, (c) assistance in writing essays for vocational/technical

school or college applications, and (d) days off from school to visit vocational/technical schools or colleges. The composite's internal consistency (Cronbach's alpha) equals 0.65.

### *Visited a PEI with Parent*

This variable is constructed from F2P67. It equals "1" if the parent reported in 1992 that he or she had visited one or more schools with the teen during the high school years; it equals "0" if no schools were visited.[9]

### *Financial Aid Information Sources*

This variable is constructed from F2P84A, B, C, D, E, F, and G. Parents were asked in 1992 whether they had done each of the following to learn about applying for financial aid for the teen's further education: (a) talked with a high school guidance counselor, (b) talked with a representative from a vocational/technical school or college, (c) talked with a loan officer at a bank, (d) talked to another knowledgeable person, (e) read U.S. Department of Education information, (f) read information from a vocational/technical school or college, or (g) read about aid available through military service. After investigating several coding schemes, we constructed our variable as: ln [ 1 + (# of information sources utilized) ].

### *Applied for Financial Aid*

This variable is constructed from F2S60B1B, F2S60B2B, APPLAID1, and APPLAID2. It equals "1" if the respondent reported in either 1992 or 1994 that he or she had applied for financial aid at one or more PEIs; the variable equals "0" otherwise.

### *Applied to a PEI*

This variable is constructed from F2S60A and NUMAPL. It equals "1" if the respondent reported in either 1992 or 1994 that he or she had applied for admission to at least one PEI; the variable equals "0" otherwise.

---

[9] For our measure of PEI visits, as with many of our independent variables, we explored several coding schemes before retaining the one used in our final model because it offered the greatest improvement in the model's fit. Other schemes we investigated included (a) 0=zero visits, 1=one visit, 2=two or more visits; (b) 0=zero visits, 1=one visit, 2=two visits, 3=three or more visits; and (c) ln [ 1 + (# of PEIs visited) ].

# APPENDIX B

# ESTIMATED PARAMETERS IN LOGIT MODEL FOR POSTSECONDARY ENROLLMENT: INTERCEPT AND RACE/ETHNICITY

## Estimated Parameters in Logit Model for Postsecondary Enrollment: Intercept and Race/Ethnicity

(N=8125)

| | Parameter Estimates | | |
|---|---|---|---|
| **Independent** | **4-yr v. 2-yr FT** | **4-yr v. 2-yr PT** | **4-yr v. Never Enrolled** |
| **Intercept** | 0.85*** | 2.00*** | 0.78*** |
| **Asian/Pacific Islander** | -0.04 | 0.20 | 0.74*** |
| **Hispanic** | -0.46*** | -0.74*** | -0.66*** |
| **Black** | -0.05 | 0.05 | -0.59*** |
| **Native American** | -0.60 | -1.43*** | -1.04*** |

*p <.05 **p <.01 ***p<.001

# APPENDIX C

# CALCULATION OF PREDICTED PROBABILITY PROFILES

# Calculation of Predicted Probability Profiles

In this appendix, we provide details on the calculation of the predicted probability profiles for the illustrative cases shown in Tables 7A and 7B. Additionally, we provide the values of all continuous independent variables at their 5th, 25th, 50th, 75th, and 95th percentiles, as observed among the members of the longitudinal panel. With these observed values, interested readers can calculate profiles for other cases of their choosing.

To explicate the calculation of the predicted probability profiles, we describe the computation of the values for Case A of Tables 7A and 7B. The goal is to calculate $p_1$, $p_2$, $p_3$, and $p_4$, the predicted probabilities that an individual who is characterized by Case A will be (a) enrolled in a four-year PEI, (b) enrolled full-time in a two-year PEI, (c) enrolled part-time in a two-year PEI, or (d) never enrolled, respectively. The first step in accomplishing this goal is to plug values for all independent variables into the estimated model of log odds (steps 1 through 5, below). The second step is to translate the predicted log odds into predicted odds (steps 6 through 10, below). The final step is to solve a set of simultaneous equations for the predicted probabilities (steps 11 through 21, below). In solving for the predicted probabilities, we use the fact that the four probabilities sum to one.

In plugging values for all independent variables into the estimated model of log odds shown in Table 6E, we set each dummy variable to either zero or one, in accordance with the profile for Case A described in Table 7A. Specifically, the following dummy variables were set to zero: *Asian/Pacific Islander*, *Hispanic*, *Native American*, *Female*, *Rural*, *Parent-Student Discussion (LH)*, *Parent-Student Discussion (LL)*, *Parent-Student Discussion (HL)*, *Exam Planning/Taking (NY)*, *Exam Planning/Taking (NN)*, and *Exam Planning/Taking (YN)*. The following variables were set to one: *Black*, *Urban*, *Public*, *Parent Encouraged SAT/ACT Prep*, *Prep Course for SAT/ACT*, *Prep Manual for SAT/ACT*, *Visited a PEI*, *Applied for Financial Aid*, and *Applied to a PEI*. For each continuous variable, we examined the observed distribution for the members of the longitudinal panel. Values for these continuous variables at various percentiles are shown in Table C.1. In accordance with the profile for Case A, we selected the value for the 50th percentile of SES and the values for the 75th percentiles for all other continuous independent variables.

**Table C.1**
**Observed Values of Continuous Independent Variables at Various Percentiles**

| | Percentile | | | | |
|---|---|---|---|---|---|
| **Variable** | **5th** | **25th** | **50th** | **75th** | **95th** |
| **Prior Test Scores** | -1.588 | -0.935 | -0.093 | 0.804 | 1.624 |
| **SES** | -1.404 | -0.644 | -0.058 | 0.496 | 1.228 |
| **Par-Schl Communication** | -0.650 | -0.650 | -0.331 | 0.333 | 1.605 |
| **Parent Disc w/Other Parents** | -0.877 | -0.877 | -0.040 | 0.394 | 1.665 |
| **Guidance & Help from Schl** | -0.776 | -0.776 | -0.247 | 0.789 | 1.351 |
| **Financial Aid Inf Sources** | 0.000 | 0.000 | 1.099 | 1.609 | 1.946 |

Using the first column of estimated parameters in Table 6E and the appropriate values for Case A, we calculate the log odds, $\ln(p_1/p_2)$, as follows:[10]

$$\begin{aligned}(1)\quad \ln(p_1/p_2) &= -0.4037 + 0.7047\,(1) + 0.1483\,(1) - 0.4848\,(1) + 0.7386\,(0.804) \\ &\quad + 0.4221\,(-0.058) + 0.0606\,(0.333) + 0.0881\,(0.394) + 0.2798\,(1) \\ &\quad + 0.2305\,(1) + 0.0445\,(1) + 0.1676\,(0.789) + 0.3000\,(1) \\ &\quad + 0.0714\,(1.609) + 0.4899\,(1) + 0.6170\,(1) \\ &= 2.7975\end{aligned}$$

Using the second column of parameters in Table 6E and the values for Case A, we calculate the log odds, $\ln(p_1/p_3)$, as follows:

$$\begin{aligned}(2)\quad \ln(p_1/p_3) &= 0.4630 + 0.8614\,(1) + 0.1935\,(1) - 0.5128\,(1) + 0.8321\,(0.804) \\ &\quad + 0.2274\,(-0.058) + 0.1232\,(0.333) + 0.1577\,(0.394) + 0.2522\,(1) \\ &\quad + 0.3265\,(1) + 0.0831\,(1) - 0.0934\,(0.789) + 0.3287\,(1) \\ &\quad + 0.2773\,(1.609) + 0.5936\,(1) + 0.7451\,(1) \\ &= 4.4657\end{aligned}$$

[10] The parameters have been rounded to two decimal places in Table 6E. In the present calculations, we go to the fourth decimal place, as provided in the SAS output.

Using the third column of parameters in Table 6E and the values for Case A, we calculate the log odds, $\ln(p_1/p_4)$, as follows:

$$\begin{aligned}(3)\quad \ln(p_1/p_4) &= -0.5660 + 0.3950\,(1) + 0.00999\,(1) - 0.8555\,(1) + 0.9734\,(0.804) \\ &\quad + 0.8149\,(-0.058) + 0.1156\,(0.333) + 0.1752\,(0.394) + 0.4615\,(1) \\ &\quad + 0.2401\,(1) + 0.1548\,(1) + 0.2273\,(0.789) + 1.2502\,(1) \\ &\quad + 0.3088\,(1.609) + 0.6001\,(1) + 1.1430\,(1) \\ &= 4.35219\end{aligned}$$

For the forthcoming calculations, we will also need to know $\ln(p_2/p_3)$ and $\ln(p_2/p_4)$. Rather than plugging values into estimated equations, we can solve for these two values as follows:

$$\begin{aligned}(4)\quad \ln(p_2/p_3) &= -\ln(p_1/p_2) + \ln(p_1/p_3) && \{\text{property of natural logs}\} \\ &= -2.7975 + 4.4657 \\ &= 1.6682\end{aligned}$$

$$\begin{aligned}(5)\quad \ln(p_2/p_4) &= -\ln(p_1/p_2) + \ln(p_1/p_4) && \{\text{property of natural logs}\} \\ &= -2.7975 + 4.35219 \\ &= 1.55469\end{aligned}$$

Exponentiating each of the above values, we calculate the odds, $(p_1/p_2)$, $(p_1/p_3)$, $(p_1/p_4)$, $(p_2/p_3)$, and $(p_2/p_4)$, as follows:

$$\begin{aligned}(6)\quad p_1/p_2 &= \exp[\ln(p_1/p_2)] && \{\text{substituting from (1)}\} \\ &= \exp(2.7975) \\ &= 16.4035\end{aligned}$$

$$\begin{aligned}(7)\quad p_1/p_3 &= \exp[\ln(p_1/p_3)] && \{\text{substituting from (2)}\} \\ &= \exp(4.4657) \\ &= 86.9819\end{aligned}$$

$$\begin{aligned}(8)\quad p_1/p_4 &= \exp[\ln(p_1/p_4)] && \{\text{substituting from (3)}\} \\ &= \exp(4.35219) \\ &= 77.6483\end{aligned}$$

$$\begin{aligned}(9)\quad p_2/p_3 &= \exp[\ln(p_2/p_3)] && \{\text{substituting from (4)}\} \\ &= \exp(1.6682) \\ &= 5.3026\end{aligned}$$

$$\begin{aligned}(10)\quad p_2/p_4 &= \exp[\ln(p_2/p_4)] && \{\text{substituting from (5)}\} \\ &= \exp(1.55469) \\ &= 4.7336\end{aligned}$$

Because $p_1+p_2+p_3+p_4=1$, we use the odds to solve for probabilities $p_1$, $p_2$, $p_3$, and $p_4$ as follows:

(11) $p_1 + p_2 + p_3 + p_4 = 1$

(12) $p_1 = 16.4035p_2$ {from (6)}

(13) $17.4035p_2 + p_3 + p_4 = 1$ {substitute (12) into (11)}

(14) $p_3 = 0.1886p_2$ {from (9)}

(15) $17.5921p_2 + p_4 = 1$ {substitute (14) into (13)}

(16) $p_4 = 0.2113\ p_2$ {from (10)}

(17) $17.8034p_2 = 1$ {substitute (16) into (15)}

(18) $p_2 = 0.056$ {dividing by 17.8034}

(19) $p_1 = 0.921$ {substitute (18) into (12)}

(20) $p_3 = 0.011$ {substitute (18) into (14)}

(21) $p_4 = 0.012$ {substitute (18) into (16)}

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