



*The*  
OHIO STATE  
UNIVERSITY  
P R E S S

---

Studying Attrition and Degree Completion Behavior among First-Generation College Students in the United States

Author(s): Terry T. Ishitani

Source: *The Journal of Higher Education*, Vol. 77, No. 5 (Sep. - Oct., 2006), pp. 861-885

Published by: [Ohio State University Press](#)

Stable URL: <http://www.jstor.org/stable/3838790>

Accessed: 30-07-2015 19:25 UTC

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).



Ohio State University Press is collaborating with JSTOR to digitize, preserve and extend access to *The Journal of Higher Education*.

<http://www.jstor.org>

## Studying Attrition and Degree Completion Behavior among First-Generation College Students in the United States

The value of higher education is evidenced in a form of governmental and societal investment. The annual differential in earnings associated with educational attainment helps federal and state governments to increase their tax revenues as the number of college-educated individuals increases (U.S. Census Bureau, 2000a). Moreover, voting behavior is strongly influenced by one's educational level (U.S. Census Bureau, 2000b).

However, the value of higher education is generally linked to its narrow definition of private economic gains, such as higher earnings and better career opportunities. Administrative personnel in institutions of higher education are likely to use the language of private economic benefits to attract prospective students, while educational organizations also highlight the employment prospects upon graduating from college. Results of the survey conducted by the National Association of Colleges and Employers (NACE) in 2003 indicated that employers anticipated hiring about 13% more new college graduates in 2004 than in the

This research was supported by a grant from the American Educational Research Association, which receives funds for its "AERA Grant Program" from the National Science Foundation, and the National Center for Education Statistics and Institute of Education Sciences (U.S. Department of Education) under NSF Grant #RED-9980573. Opinions reflect those of the author and do not necessarily reflect those of the granting agencies.

I would like to thank Cliff Adelman, Steve DesJardins, and Tom Rios for helpful comments on an earlier draft of this article.

*Terry T. Ishitani is an Institutional Research Analyst in the Office of Strategic Planning at Indiana State University.*

*The Journal of Higher Education*, Vol. 77, No. 5 (September/October 2006)  
Copyright © 2006 by The Ohio State University

previous year (NACE, 2003). In addition, the public supports the economic gains associated with postsecondary education rather than the broader range of societal benefits that higher education offers. The poll conducted by the *Chronicle of Higher Education* indicated that the most important role for a college education is to prepare students for their future careers (Selingo, 2003).

Although substantial benefits associated with postsecondary education exist, certain groups of individuals are less likely to attend and graduate from American institutions of higher education and enjoy these benefits. For instance, rates of educational attainment vary across racial groups of students. The National Center for Educational Statistics (NCES, 2001) estimated that between 1999 and 2000, 71.8% of Asians who entered college completed bachelor's degree programs by the age of 24, while about 61% of Hispanics did so. Another group of students whose educational output we attempt to understand better is "first-generation" students, who are defined as students whose parents never attended college.

Studies have concluded that first-generation students were more likely to have lower college retention rates than their counterparts had (Horn, 1998; Nunez & Cuccaro-Alamin, 1998; Riehl, 1994). Furthermore, Ishitani (2003a) found that first-generation students were less likely to complete their four-year programs in a timely manner. The purpose of the present study is to investigate longitudinal persistence behavior of first-generation college students and their timely graduation rates at four-year institutions. Using the National Education Longitudinal Study: 1988–2000 (hereafter, NELS:88), a national longitudinal data set supported by NCES, the study will illustrate longitudinal college success among first-generation students in the United States, and will augment our current knowledge of first-generation students.

### *Previous Research on College Attrition and Degree Completion*

#### *College Attrition*

Student background characteristics have been broadly discussed to explain college student attrition. Examples of these student characteristics include gender (Pascarella, Duby, & Iverson, 1983; Pascarella & Terenzini, 1978, 1980, 1983; Stage, 1988; Stage & Hossler, 1989), race (Braxton, Duster, & Pascarella, 1988; Pascarella & Terenzini, 1978, 1983; Stage, 1988; Stage & Hossler, 1989), and high school academic achievement (Braxton, Duster, & Pascarella, 1988; Pascarella & Chapman, 1983; Pascarella & Terenzini, 1980). Braxton, Duster, and

Pascarella (1988) suggested that minority students were more likely than their counterparts were to depart from college.

The role of students' educational expectations has also been addressed in previous studies (Bean, 1982; Metzner & Bean, 1987; Pascarella, 1980; Pascarella & Terenzini, 1980). Metzner and Bean (1987) suggested that educational goals and student departure were negatively related. Family income was associated with student attrition behavior (Braxton, Brier, & Hossler, 1988; Hossler & Vesper, 1993; Pascarella & Chapman, 1983; Pascarella & Terenzini, 1978, 1980; Stage & Hossler, 1989). For instance, Pascarella and Chapman (1983) found that a higher level of socioeconomic status had a positive effect on academic and social integration, and ultimately influenced one's enrollment decision.

Parents' educational attainment has been shown to affect college student attrition (Pascarella & Chapman, 1983; Pascarella & Terenzini, 1978, 1980, 1983; Stage, 1988). Particularly, lower persistence rates among first-generation students were highlighted in previous studies (Horn, 1998; Ishitani, 2003b; Nunez & Cuccaro-Alamin, 1998; Riehl, 1994). Using institutional data, Ishitani (2003b) discovered a higher risk of departure among first-generation students in their first year of college. Nunez and Cuccaro-Alamin (1998) examined national data and noted that first-generation college students persisted and attained degrees at lower rates than their counterparts did.

Institutional characteristics have been associated with persistence of college students. Bradford and Farris (1991) found that private institutions typically had higher degree attainment rates (56%) than public institutions had (45%). The effects of institutional type and size have also been examined in other studies (Malette & Cabrera, 1991; Pascarella & Chapman, 1983).

Previous studies have investigated the effect of financial aid on students' departure behavior (Hochstein & Butler, 1983; Ishitani & DesJardins, 2002; Iwai & Churchill, 1982; James, 1988; Stampen & Cabrera, 1986, 1988). In some of these studies, different types of aid were found to affect students' dropout behavior in different ways. For instance, Hochstein and Butler (1983) identified that loans were negatively associated with college persistence. They also advised that grants, whether awarded alone or in conjunction with a loan, had a positive effect on student retention. Students receiving aid based on academic merit were found to have relatively low attrition rates (Stampen & Cabrera, 1988). Using an NCES data set, Ishitani and DesJardins (2002) discussed longitudinal effects of financial aid amounts on college student departure. They suggested that various aid amounts influenced student attrition behavior differently depending on the timing of departure.

*Degree Completion*

A myriad of studies on college attrition have been conducted to date, while fewer studies have addressed issues related to time to degree. Findings from previous research on time to degree have suggested that fewer credit hours were associated with longer time to graduate (Knight, 1994; Knight & Arnold, 2000; Noxel & Katunich, 1998; Volkwein & Lorang, 1996). In a similar vein, the number of remedial courses students have to take greatly affects the timing of graduation. Although inclusion of variables concerning earned credit hours and remedial courses may make obvious sense in the time to degree analysis, it is rather difficult to encompass the effect of earned credit hours using a national data set, which includes a vast number of institutions that vary uniquely in their academic curricula.

Financial aid is another factor often included in the study of time to degree (DesJardins, Ahlburg, & McCall, 2002; Knight, 1994; Knight & Arnold, 2000; Lam, 1999; Volkwein & Lorang, 1996). The research findings concerning financial aid from previous studies, however, are not conclusive. For example, DesJardins et al. (2002) found that campus-based employment such as work-study promoted graduation. Alternatively, other studies (Lam, 1999; Knight & Arnold, 2000) argued that campus-based employment exhibited an inverse effect on degree completion behavior. As for the effect of student loans, Lam's study (1999) indicated that students with loans were likely to graduate in a timely fashion, while Knight and Arnold's study (2000) suggested that students who financed their education with loans took a longer time to graduate. Discrepancies in these research findings may be due to how financial aid variables were constructed for a chosen methodology in each study. For instance, DesJardins et al. (2002) incorporated the nature of inconsistent aid amounts over time into their model and examined the period-specific effects of aid variables.

Student background characteristics have been particularly recognized as one of the major components in existing theoretical persistence and attrition models (Pascarella, 1980; Spady, 1971; Tinto, 1975). These theoretical models also emphasize the importance of interactions between students and institutional environments, which ultimately affect one's departure decision. However, conducting research studies that address the effects of student characteristics and environmental interactions becomes difficult for various reasons. This is apparent in the case of using national data sets. For instance, unlike data collected at a single institution, the national data set includes students who enrolled in institutions that are different in numerous ways. In addition, some questionnaire

items in the national data sets were asked only once when frequent inquiries were needed. For example, researchers are interested in the effect of academic and social integration, defined by Tinto (1975), on *longitudinal* attrition behavior. The survey may ask students about items related to academic and social integration during the first year, but it does not question these students with the same items again for the rest of their enrollment. While these items are of great value for examining first-year attrition, they are less relevant for assessing attrition behavior for subsequent years, since one's level of academic and social integration may vary over time.

The greatest benefits for explaining college success of first-generation students result from thorough examination of both precollege attributes of students and the quality of their interactions with institutions of higher education. However, this study will only investigate the effects of precollege attributes of students on their attrition and degree completion behavior, mainly due to a lack of available time-varying items in the study data, such as academic and social integration. A lack of student-institution interaction items does not nullify the value of this study. In fact, given that precollege attributes of students are considered as an important component in explaining student attrition in many attrition theories (e.g., Tinto, 1975), the outcome of this study is still believed to remain influential for policy makers to discuss retention strategies based on student precollege characteristics.

### *Methodological Concerns*

The focal point of this study is to investigate the timing of certain events, such as dropout and graduation, and the probabilities of these events occurring given diverse student characteristics and attributes. Structural equation modeling has been one typical statistical technique used in previous studies of student departure (Bean, 1983; Braxton, Duster, & Pascarella, 1988; Cabrera, Nora, & Castaneda, 1993; Nora, Attinasi, & Matonak, 1990; Pascarella & Chapman, 1983; Pascarella & Terenzini, 1983). Since students may depart at any given time while they are enrolled, selecting an arbitrary point in time to specify enrollment status of students in structural equation modeling fails to examine differences in departure behavior that may exist at various times. In addition, values of explanatory variables may be constant, while effects of these variables may change over time. Assessment of these varying effects of explanatory variables becomes difficult when one uses traditional structural equation techniques.

The present study applies event history modeling to analyze the attrition behavior of first-generation students. Event history techniques enable researchers to remedy the problems listed above. Furthermore, Metzner and Bean (1987) recognized the distinction among different types of departure behavior, and event history modeling allows researchers to control for these different types of departure. Depending on censoring methods, researchers are able to compare between transfer and dropout behavior in a longitudinal framework using event history modeling. While a handful of studies have addressed educational issues using the event history modeling (DesJardins, Ahlburg, & McCall, 1999, 2002; Murtaugh, Burns, & Schuster, 1999; Ishitani & DesJardins, 2002; Singer & Willett, 1991), examination of attrition behavior of first-generation college students using this particular statistical technique is nonexistent (except for Ishitani, 2003b).

Some previous studies focused on the length of time to graduation using linear regression modeling techniques (Knight, 1994; Knight & Arnold, 2000; Lam, 1999), while others applied logistic regression modeling to examine if students graduated within a given time frame (Adelman, 1999; Belcheir, 2000). Studies using the linear regression estimated the actual elapsed time to degree completion. However, this may be less relevant to policy makers, since they tend to view graduation as an event at a discrete time (e.g., four-year graduation rate). Moreover, given the fact that the study sample includes institutions that had different academic calendar systems, estimation of the length to graduation may lead to spurious interpretations of the result. Thus, this study defines degree completion behavior as dichotomous values (i.e., whether or not students graduated) at discrete points of time (i.e., four-, five-, and six-year graduation). As for statistical modeling, multiple logistic regression modeling is identified as an appropriate approach to analyze the dichotomous nature of degree completion behavior.

### *Data and Sample*

NELS:88 and NELS:1988–2000 Postsecondary Education Transcript Study (hereafter, PETS:2000) are national data sets sponsored by the NCES, and were used to develop a sample for this study. NELS:88 is a longitudinal data set that followed diverse educational characteristics of eighth-graders over 12 years beginning in 1988, while PETS:2000 includes transcript information of participants in NELS:88. From the sample of original participants in 1988,<sup>1</sup> 4,427 students who initially enrolled in public and private four-year institutions between 1991 and 1994 were selected for attrition and degree completion behavior

analyses. Table 1 summarizes educational outcomes of these 4,427 students at the end of 2000. In this study, college attrition behavior is defined as the first departure spell from the four-year institution in which students initially matriculated. For instance, 2,256 students who continuously enrolled in their initial institutions graduated from the same institutions by year 2000. Eight hundred forty-five students (19.1%) left their initial institutions and never attended either their initial institutions or other institutions by year 2000. Approximately 25% of the sample transferred to other institutions. Across different types of the first departure spell, more first-generation students were found in the group of students who departed from their first institutions and never attended any other institutions (24.5%).

Although the term “first-generation students” is generally defined as students whose parents never graduated from college, this study further divided the broadly defined group of first-generation students into two

TABLE 1  
Postsecondary Educational Output of the Sample

First Attrition Behavior				
Status	Count	Percent	Portion of First-Gen. Within Group	Portion of FG of Some College Parent. Within Group
Graduated from Initially Enrolled Inst.	2,256	51.0%	12.2%	30.5%
Departed from Initially Enrolled Inst.	845	19.1%	24.5%	47.7%
Transferred from Initially Enrolled Inst.	1,109	25.1%	11.0%	32.5%
Stopped out at Initially Enrolled Inst.	172	3.9%	20.9%	37.8%
Still Enrolled at Initially Enrolled Inst.	45	1.0%	22.2%	48.9%
Total	4,427			
Degree Completion Behavior				
Status	Count	Percent	Portion of First-Gen. Within Group	Portion of FG of Some College Parent. Within Group
Overall Graduation within Six Yrs.	2,933	66.3%	11.5%	29.8%
Fourth-Yr. Graduation—Yes	1,600	36.1%	8.8%	24.6%
Fourth-Yr. Graduation—No	2,827	63.9%	18.1%	40.5%
Sub-Total of Sample	4,427	100.0%		
Fifth-Yr. Graduation—Yes	996	35.2%	14.2%	35.9%
Fifth-Yr. Graduation—No	1,831	64.8%	20.2%	43.0%
Sub-Total of Sample	2,827	100.0%		
Sixth-Yr. Graduation—Yes	337	18.4%	16.6%	36.2%
Sixth-Yr. Graduation—No	1,494	81.6%	21.0%	44.5%
Sub-Total of Sample	1,831	100.0%		

subgroups. The first group of first-generation students included students with parents whose highest educational attainment was either a high school diploma or less. The second group included students with at least one of their parents having attended college but never attaining a bachelor's degree. Thus, in this study, the first-generation students defined in the first group will be referred to as first-generation students. This division of first-generation students was made to examine if significant differences existed in the analyses between students whose parents had only high school education and those whose parents had some college education. Among these 4,427 students shown in Table 2, 14.7% were first-generation students and 34.8% were first-generation students of parents with some college education.

### *Descriptive Statistics of Explanatory Variables*

Table 2 presents descriptive statistics of the explanatory variables included in the study. After highest educational attainment of mothers and fathers was identified, higher educational attainment between the two was selected as parent's highest educational attainment. As for educational expectation, about 52% of students expected to finish graduate school, while 49% of parents expected their children to attain a graduate degree.

TABLE 2  
Descriptive Statistics of the Study Sample

Variable	Label	Count	Percent
Cohort	1991/1992	4,269	96.4%
	1993/1994	158	3.6%
Gender	Male	2,055	46.4%
	Female	2,372	53.6%
Race	Asian	419	9.5%
	Hispanic	336	7.6%
	Black	356	8.0%
	Caucasian	3,180	71.8%
	Native American	87	2.0%
	Unknown	49	1.1%
Parent's Education	First-generation	651	14.7%
	Parent with some college	1,539	34.8%
	One parent with BA	1,153	26.0%
	Both parents with BAs	1,056	23.9%
	Unknown	28	0.6%
Family Income In (1988)	0-\$19,999	565	12.8%
	\$20,000-\$34,999	999	22.6%
	\$35,000-\$49,999	929	21.0%
	\$50,000 or higher	1,548	35.0%
	Unknown	386	8.7%

TABLE 2 (Continued)  
Descriptive Statistics of the Study Sample

Variable	Label	Count	Percent
Educational Expectation	Unsure	196	4.4%
	Won't graduate from college	183	4.1%
	Graduate from college	1,761	39.8%
	Finish graduate school	2,287	51.7%
Parent's Highest Educational Expectation	Unsure	282	6.4%
	Won't graduate from college	149	3.4%
	Graduate from college	1,823	41.2%
	Finish graduate school	2,173	49.1%
High School Class Rank	Highest quintile	1,440	32.5%
	2nd quintile	971	21.9%
	3rd quintile	672	15.2%
	4th quintile	401	9.1%
	Lowest quintile	227	5.1%
	Unknown	716	16.2%
High School Academic Intensity	Highest quintile	1,692	38.2%
	2nd quintile	1,196	27.0%
	3rd quintile	588	13.3%
	4th quintile	380	8.6%
	Lowest quintile	117	2.6%
	Unknown	454	10.3%
Institutional Type	Public 4-yr.	2,871	64.9%
	Private 4-yr.	1,556	35.1%
Institutional Selectivity	Highly selective or selective	1,309	29.6%
	Non-selective	3,059	69.1%
	Unknown	59	13%
Financial Aid	1st yr. grant recipients	2,348	53.0%
	1st yr. loan recipients	1,608	36.3%
	1st yr. work study recipients	687	15.5%

Additional Variables for Time-to-Degree Analysis

Variable	Label	Count	Percent
Continuous Enrollment	Yes	3,591	81.1%
	No	836	18.9%
Total Acceleration Credits		Mean	Median
	Continuous	257	0.00
Ratio of Remedial Courses to All Courses	Continuous	0.02	0.00

NOTE: Columns may not add to 100.0 due to rounding

High school class rank and high school academic intensity quintiles<sup>2</sup> of students were included to examine the effects of precollege academic attributes. Type of institution and admission selectivity of the institution were incorporated into the study. NELS:88 only specified first-year

financial aid (loan, grant, and work-study) status of students. Thus, longitudinal effects of aid on attrition and time to degree behavior were examined solely based on their first-year aid status.<sup>3</sup>

Since continuous enrollment has a significant impact on the length of time to graduate (Belcheir, 2000), a dichotomous variable that indicated students' continuous enrollment status was added to the degree completion behavior analysis to assess the effect of discontinuous enrollment. Total acceleration credit hours were composed of postsecondary credit hours that students earned prior to their high school graduation and of credit hours students earned by examination, such as Advanced Placement tests. Credit hours that students earned by completing remedial courses are not generally counted toward earned credit hours needed for graduation. Thus, the ratio between remedial and all courses was included to examine how remedial courses affected degree completion behavior.

### *Empirical Results*

#### *Longitudinal College Attrition Behavior*

The portion of students who were still enrolled in each year (survivor function) was first estimated by the Kaplan-Meier method (the product-limit estimation). Since the Kaplan-Meier is a nonparametric method, it does not impose any assumptions about the distribution of the variables being analyzed. Thus, it is particularly useful in the early stage of the study when one needs to illustrate longitudinally the behavioral process by chosen criteria. The Kaplan-Meier estimates are graphically displayed in Figure 1. A precipitous decline was observed among first-generation students in the first year. The gaps in survival rates between first-generation students and their peers widened during the first 2 years. Moreover, this relationship, a lower survival rate for first-generation students and higher survival rates for their peers, continued until the end of the observation period.

Based on the results from equality testing of the survivor functions (Wilcoxon and Peto-Peto-Prentice tests<sup>4</sup>), the null hypothesis that the attrition rates were the same for four groups of students in Figure 1 was rejected. Although Ishitani (2003b) presented similar findings using the data from a single institution, the outcome of the Kaplan-Meier conducted in this study presented evidence that first-generation students were indeed more likely to depart from college than students with both college-educated parents were.

Two analytical models, the exponential and period-specific models, were further applied in order to capture longitudinal profiles of college attrition behavior in detail. The exponential model assumes that effects

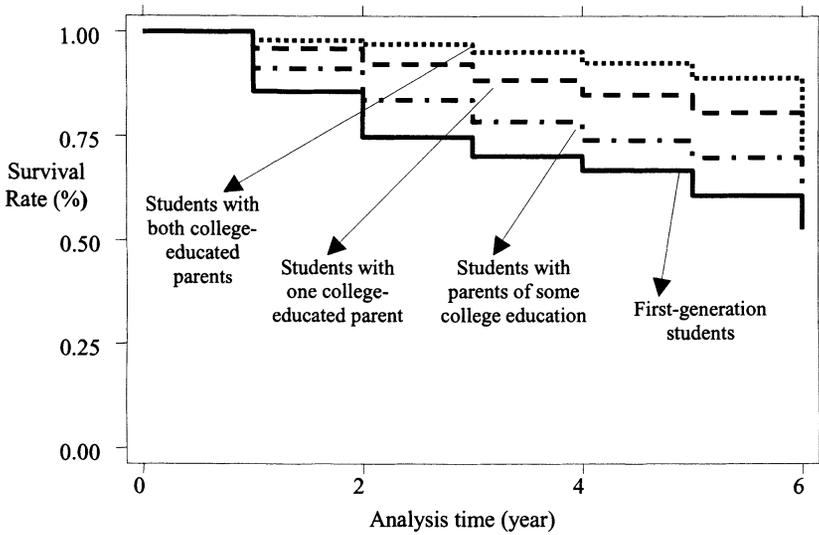


FIG. 1. Kaplan-Meier Survivor Function by Parents' Educational Attainment

of explanatory variables on student departure exponentially increase or decrease over time. To examine if the directional assumption of the exponential model explains attrition behavior, the period-specific model, which was designed to assess departure at discrete points in time, was also tested.

Although different types of attrition behavior such as transfer and stopout exist, this study defined attrition behavior as students who left their initially enrolled institutions and did not return either to their initial or other institutions by the year 2000. This definition of college attrition included both voluntary withdrawal (i.e., dropout) and academic dismissal.

Table 3 includes the results of the exponential model.<sup>5</sup> The likelihood ratio to test the model fit was 827.52 ( $LR = 2 \times ((-2750.7814) - (-3173.0120))$ ). Since the likelihood ratio was larger than zero, it indicates that the current model achieved better model fit than a model only including a constant. Negative parameters indicate their positive effects on persistence, while positive parameters facilitate attrition behavior. Relative impact in Table 3 specifies the likelihood of departure influenced by individual variables as holding other variables constant. Relative impact was computed as  $\exp(\alpha) - 1$ , where  $\alpha$  represents a coefficient value. For example, first-generation students were about 1.3 times more likely to leave their institutions than were students whose parents were college-

educated. First-generation students whose parents had some college education were 99% more likely to leave their initial institutions than their counterparts were.

Other variables that were significantly associated with departure included family income, lower educational expectation, lower high school class rank quintile, lower high school academic intensity, enrollment in

TABLE 3  
Exponential Estimations of College Attrition Behavior

Variable	Label	Coeff.	p	Rel. Impact
Constant		-4.601	**	
Cohort	1993/1994	0.477		0.612
Gender	Female	-0.036		-0.036
Race	Asian	-0.195		-0.177
	Hispanic	0.147		0.159
	Black	0.158		0.171
	Native American	0.185		0.203
Parent's Education	First-generation	0.812	**	1.253
	One parent with some college	0.689	**	0.992
	One parent with BA	0.253		0.287
Family Income	0-\$19,999	0.503		0.654
	\$20,000-\$34,999	0.540	*	0.715
	\$35,000-\$49,999	0.105		0.110
Educational Expectation	Unsure	0.185		0.204
	Won't graduate from college	0.647	**	0.910
	Finish graduate school	-0.135		-0.126
Parent's Highest Educational Expectation	Unsure	0.114		0.121
	Won't graduate from college	0.290		0.336
	Finish graduate school	0.104		0.110
High School Class Rank	2nd quintile	0.424		0.528
	3rd quintile	0.804	**	1.234
	4th quintile	0.834	**	1.301
	Lowest quintile	1.059	**	1.883
High School Academic Intensity	2nd quintile	0.004		0.004
	3rd quintile	0.566	*	0.760
	4th quintile	0.636	**	0.889
	Lowest quintile	0.998	**	1.713
Institutional Type	Private four-year	-0.416	*	-0.340
Institutional Selectivity	Non-selective	0.562	*	0.754
First-Yr. Financial Aid	Grant	-0.153		-0.142
	Loan	0.039		0.039
	Workstudy	-0.379		-0.315

\*\* =  $p < 0.01$ , \*  $p < 0.05$

Log likelihood (starting values): -3276.2593

Log likelihood (final estimates): -2862.5008

a public institution, and nonselectivity of admission. Students from family incomes ranging between \$20,000 and \$34,999 were 72% more likely to depart than were students with family incomes of \$50,000 or higher. Students in the lowest quintile in high school class rank or high school academic intensity were about 1.9 or 1.7 times more likely to depart than were their counterparts in the first quintile in each category. Enrollment in a private institution yielded statistical significance, and was associated with a higher retention rate. Students attending private colleges were 34% less likely to drop out than students enrolled in public institutions were.

Table 4 displays the analysis results of departure behavior by year. As presented in the table, parameters of many variables did not change exponentially as assumed in the exponential model (e.g., see changes in constants). Furthermore, unveiling how uniquely the effects of these variables on attrition changed over time significantly contributed to improving the model fit. The likelihood ratio for the period-specific model was 1238.98, while the one for the exponential model was 827.52. The difference in likelihood ratios between the two models clearly indicates that the time-varying effects of variables must be considered in the model to attain optimal results to understand college student departure behavior.

First-generation students showed higher risks of leaving the higher education system than did students of college-educated parents in years one through four. First-generation students faced the highest risk period of departure during the second year of college. Compared to students whose parents graduated from college, they were 8.5 times more likely to drop out. The highest risk of departure for students whose parents had some college education also occurred in the second year. They were 4.4 times more likely to depart than their counterparts were. The risk of departure for first-generation students waned over time after the second year.

Delayed matriculation had a negative effect on second-year retention. Students who enrolled in college in 1993 or later were approximately 81% more likely to depart in the second year than were students who matriculated immediately after high school. Female students were more likely to depart in the second year, while they were less likely to drop out than their counterparts in the fourth year. Although the departure probability for Hispanic students was not statistically significant in Table 3, the period-specific model indicated that they were actually at risk of departure during the second year. Hispanic students were 64% more likely to depart than Caucasian students were in this particular year. After I controlled for other variables, the effect of lower income

Variable	Label	First Year			Second Year			Third Year			Fourth Year			Fifth Year		
		Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact
Constant		-4.729 **		0.401	-6.391 **		0.813	-5.120 **		0.449	-4.328 **		0.095	-2.562 **		0.945
Cohort	1993/1994	0.337		-0.047	0.595 *		0.502	0.371		0.449	0.091		0.095	0.665		0.945
Gender	Female	-0.048		-0.047	0.407 **		0.502	-0.087		-0.083	-0.428 *		-0.348	-0.165		-0.152
Race	Asian	-0.734		-0.240	0.240		0.271	0.033		0.033	-0.160		-0.148	-0.421		-0.343
	Hispanic	0.166		0.181	0.463 *		0.589	-0.260		-0.229	-0.071		-0.068	-0.379		-0.315
	Black	-0.141		-0.132	0.192		0.212	0.310		0.363	0.005		0.005	0.365		0.440
	Native American	-0.234		-0.209	0.406		0.501	0.198		0.219	0.179		0.196	1.290 **		2.632
Parent's Education	First-generation	0.712 *		1.038	2.253 **		8.514	0.728		1.070	0.178		0.195	-0.141		-0.131
	One parent with some college	0.739 **		1.093	1.692 **		4.430	0.782 *		1.186	0.588		0.801	-0.383		-0.318
	One parent with BA	0.253		0.287	0.991 *		1.694	0.622		0.863	0.170		0.186	-0.455		-0.366
Family Income	0-\$19,999	1.193 **		2.298	-0.023		-0.023	0.194		0.214	0.390		0.477	0.626		0.871
	\$20,000-\$34,999	0.874 **		1.396	0.371		0.450	0.441		0.555	0.393		0.481	0.525		0.691
	\$35,000-\$49,999	0.246		0.279	0.134		0.144	0.267		0.305	-0.223		-0.200	-0.001		-0.001
Educational Expectation	Unsure	-0.069		-0.067	0.818 **		1.267	-0.589		-0.445	-0.233		-0.208	-0.168		-0.154
	Won't graduate from college	0.810 **		1.247	0.576 *		0.779	0.233		0.262	0.872 *		1.392	0.362		0.436
	Finish graduate school	-0.134		-0.125	-0.294		-0.255	0.140		0.150	-0.152		-0.141	-0.047		-0.046
Parent's Highest Educational Expectation	Unsure	0.009		0.009	0.750 **		1.118	-1.009		-0.635	-1.172		-0.690	0.250		0.284
	Won't graduate from college	-0.372		-0.310	0.743 **		1.102	0.945 **		1.573	-0.057		-0.056	0.190		0.209
	Finish graduate school	-0.201		-0.182	0.238		0.269	-0.137		-0.128	0.773 **		1.167	0.047		0.048
High School Class Rank	2nd quintile	0.556 *		0.744	0.662 **		0.938	0.790 *		1.203	-0.515		-0.403	0.217		0.243
	3rd quintile	0.954 **		1.597	0.834 **		1.301	1.336 **		2.804	0.366		0.442	0.436		0.547
	4th quintile	0.889 **		1.433	0.921 **		1.511	1.386		1.386	0.409		0.902	0.902 **		1.464
	Lowest quintile	1.337 **		2.807	1.128 **		2.088	1.878 **		5.541	0.412		0.510	-0.455		-0.365
High School Academic Intensity	2nd quintile	-0.081		-0.078	0.372		0.450	-0.190		-0.173	0.119		0.126	-0.281		-0.245
	3rd quintile	0.599 **		0.821	0.861 **		1.366	0.482		0.619	0.312		0.366	0.185		0.203
	4th quintile	0.605 **		0.831	0.822 **		1.274	0.608 *		0.837	1.074 **		1.928	0.091		0.095
	Lowest quintile	0.850 **		1.340	1.310 **		2.708	1.661 **		4.263	1.433 **		3.192	0.439		0.551

TABLE 4 (Continued)  
 Period Specific Estimations of College Attrition Behavior

Variable	Label	First Year			Second Year			Third Year			Fourth Year			Fifth Year		
		Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact
Institutional Type	Private four-year	-0.220		-0.198	-0.360 *	-0.302	-0.774 **	-0.539	-0.263	-0.231	-0.643 *	-0.474				
Institutional Selectivity	Non-selective	0.693 **		0.999	0.490 *	0.632	0.638 *	0.893	0.890 **	1.436	0.105	0.111				
First-Yr. Financial Aid	Grant	-0.465 **		-0.372	0.199	0.220	-0.067	-0.064	-0.425	-0.346	0.080	0.084				
	Loan	-0.220		-0.197	0.057	0.059	-0.094	-0.089	0.287	0.332	0.108	0.113				
	Workstudy	-0.529 *		-0.411	-0.555 *	-0.425	-0.249	-0.220	-0.321	-0.275	0.140	0.150				

\*\* = p < 0.01, \* = p < 0.05  
 Log likelihood (starting values): -3276.2593  
 Log likelihood (final estimates): -2656.7679

was the most prominent in first-year retention. Students from the lowest income group were about 2.3 times more likely to depart in the first year than were students from the highest income group.

The student's educational expectation had period-specific effects on college attrition. Students who expected not to graduate from college were 1.3 times more likely to depart in the first year than were students who expected to graduate from college. The likelihood of departure among these students further increased in the fourth year. Students with unsure educational expectations were 1.3 times more likely to leave their first postsecondary institutions in the second year. Students whose parents had unsure educational expectations were also most likely to depart in the second year. Students whose parents did not expect them to graduate from college were most likely to depart in the third year, followed by the second year.

Not surprisingly, high school class rank and high school academic intensity had significant effects on college attrition behavior. Students from lower high school class rank quintiles were more likely to drop out of college. However, the highest risk periods of departure varied across different quintiles over time. For instance, students in the lowest or third class rank quintiles had the greatest likelihood of departure in the third year, while students in the fourth class rank quintile had the highest risk of dropout in the second year. Students from fourth class rank quintile were approximately 1.5 times more likely to leave in the second year than students from the highest quintile were, while students from the lowest quintile were 5.5 times more likely to do so during the third year.

The likelihood of departure among students from the lowest high school academic intensity increased until the third year, and it then decreased afterward. Students from the lowest high school academic intensity were 4.3 times more likely to drop out in the third year than students from the highest quintile were, and their odds of departure declined to 3.2 times in the fourth year. Students from the fourth quintile in academic intensity presented the highest risk of dropout in the fourth year. They were 1.9 times more likely to leave in their fourth year than were students from the highest quintile in academic intensity. Students from the third quintile had the highest risk of departure during the second year. However, their probability of departure was actually higher than that of students from the fourth quintile. They were 1.4 times more likely to leave college than students from the highest quintile.

Students attending private colleges were 30% and 54% less likely to leave their institutions in the second and third years than were those who attended public four-year institutions. Nonselectivity in admission had significant effects on attrition over time. Students who attended non-

selective institutions were the most vulnerable to departure in the fourth year, followed by the first year. Nonselective institution enrollees were 1.4 times more likely to discontinue their enrollment in the fourth year than were those students who attended selective or moderately selective institutions.

Three types of financial aid presented positive effects on first-year retention. Students who received grants or work-study jobs were 37% or 41% less likely to depart in the first year than were students who received no aid. Work-study also showed its positive effect on retention in the second year. Work-study recipients were 43% less likely to depart in the second year. Statistical significance for financial aid was mainly prominent only in the first year. This may be because the study data included financial aid status only for the first year.

One limitation in this analysis is a lack of postmatriculation variables that change their values over time, such as year-by-year college GPAs. Since event history modeling allows the analyst to include these time-varying variables and to examine their effects on attrition by year, the next logical step would be to examine how college attrition behavior among first-generation students may differ from the result of this study after controlling for factors related to continuing interactions between students and their institutions.

#### *Degree Completion Behavior*

Subjects in this analysis were censored based on graduation status, as shown in Table 1. For instance, students who had graduated in their fourth year were excluded from the analysis for fifth-year graduation, since students who graduated in the fourth year were no longer enrolled. By using this type of censoring, this study attempted to estimate parameters that were specific for the timing of graduation. Since logistic regression was identified as an appropriate statistical method for the analysis, graduation status was coded as 1 in the dichotomous dependent variables.<sup>6</sup> Hence, negative parameters indicate negative effects on graduation, while positive parameters indicate positive effects on graduation behavior.

Table 5 includes the results from the analysis of degree completion behavior. First-generation students were 51% and 32% less likely to graduate in the fourth and fifth years than were students whose parents graduated from college. First-generation students whose parents had some college education were 44% and 29% less likely to do so in the fourth and fifth years. Female students were 56% more likely to graduate within 4 years than male students were. Students' ethnicity had significant effects on degree attainment behavior. The fourth- and fifth-year

graduation rates for Hispanic students were 59% and 31% lower than those of Caucasian students. Black students were 58% less likely to graduate in their fourth year than their counterparts were.

TABLE 5  
Parameter Estimation of Time-to-Degree Behavior

Variable	Label	Fourth-Year		Fifth-Year		Sixth-Year					
		Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	Coeff.	p	Rel. Impact	
Constant		-1.935	**			-0.899	**			-1.621	**
Cohort	1993	-0.360		-0.302		-0.217		-0.195		-0.763	
Gender	Female	0.444	**	0.559		0.122		0.130		0.098	
Race	Asian	-0.200		-0.181		-0.172		-0.158		0.175	
	Hispanic	-0.895	**	-0.591		-0.365	*	-0.306		0.441	
	Black	-0.869	**	-0.581		-0.334		-0.284		-0.183	
	Native American	0.072		0.075		-0.147		-0.137		0.509	
Parent's Education	First-generation	-0.706	**	-0.506		-0.378	*	-0.315		-0.166	
	One parent with some college	-0.572	**	-0.436		-0.336	*	-0.285		-0.330	
	One parent with BA	-0.301	*	-0.260		-0.246		-0.218		-0.039	
Family Income	0-\$19,999	-0.523	**	-0.407		-0.272		-0.238		-1.158	**
	\$20,000-\$34,999	-0.157		-0.145		-0.522	**	-0.407		-0.553	*
	\$35,000-\$49,999	-0.448	**	-0.361		-0.042		-0.041		-0.349	
Educational Expectation	Unsure	-0.278		-0.243		0.034		0.035		0.094	
	Won't graduate from college	-0.659		-0.483		-0.458		-0.367		-0.515	
	Finish graduate school	0.126		0.134		0.094		0.099		-0.008	
Parent's Highest Educational Expectation	Unsure	-0.401		-0.330		-0.056		-0.054		-0.028	
	Wont graduate from college	-0.530		-0.411		-0.217		-0.195		-0.578	
	Finish graduate school	-0.105		-0.100		-0.203		-0.184		-0.209	
High School Class Rank	2nd quintile	-0.280	*	-0.244		-0.054		-0.053		-0.509	*
	3rd quintile	-0.874	**	-0.583		-0.407	*	-0.334		-1.129	**
	4th quintile	-1.063	**	-0.655		-0.419		-0.342		-0.887	**
	Lowest quintile	-0.714	**	-0.510		-0.659	**	-0.483		-0.351	
High School Academic Intensity	2nd quintile	-0.300	*	-0.259		0.025		0.025		0.160	
	3rd quintile	-0.308	*	-0.265		-0.368	*	-0.308		0.048	
	4th quintile	-0.700	**	-0.503		-0.498	*	-0.392		-0.142	
	Lowest quintile	-0.886	*	-0.588		-0.274		-0.240		-0.020	
Institutional Type	Private four-year	1.091	**	1.977		0.064		0.066		-0.117	
Continuous Enrollment	Yes	2.520	**	11.429		2.015	**	6.501		2.051	**
Institutional Selectivity	Non-selective	-0.701	**	-0.504		-0.471	**	-0.376		-0.134	
Acceleration Credit Hours		0.031	*	0.031		-0.005		-0.005		0.009	
Remeidal Course Ratio		-0.356		-0.300		-0.247		-0.219		-2.613	*
First-Yr. Financial Aid	Grant	0.084		0.088		-0.026		-0.026		0.074	
	Loan	-0.218	*	-0.196		-0.090		-0.086		-0.281	
	Workstudy	0.593	**	0.809		0.184		0.202		0.343	

\*\* =  $p < 0.01$ , \* =  $p < 0.05$

As for family income, students from families with annual incomes of \$50,000 or higher were more likely to graduate in any period than were students from lower income families. Students with family incomes of less than \$19,999 were 41% and 69% less likely to graduate in the fourth and sixth years, while students whose family income ranged between \$20,000 and \$34,999 were 41% and 43% less likely to graduate in the fifth and sixth years than students in the reference group were.

Students in the highest high school class rank quintile were most likely to graduate in any period defined in the study. Interestingly, students from different class rank quintiles showed various profiles for degree completion behavior. For instance, compared to the reference group (i.e., the highest quintile group), students from the lowest or fourth quintiles were least likely to graduate in the fourth year, while students from the second or third quintiles were least likely to graduate in the sixth year. High school academic intensity presented a linear relationship with the graduation rate in the fourth year. Students with higher academic intensity were more likely to graduate in the fourth year. Students from the lowest academic intensity quintile were 59% less likely to graduate in the fourth year than students from the highest quintile were. No statistical significance was identified for sixth-year graduation behavior. Perhaps this is because of fewer students from the highest quintile who were still in the sample for the sixth-year graduation analysis.

Students enrolled in private institutions were twice as likely to graduate within 4 years as students who attended public institutions. Not surprisingly, the strongest positive impact on time to degree behavior was continuous enrollment. Students who were continuously enrolled were 11 times more likely to graduate within 4 years. However, some may be troubled with large parameter values for this variable. This is partially due to the dichotomous definition of continuous enrollment and the lack of detailed information regarding discontinuous enrollment status, such as how often or how long students discontinued their enrollment.

Students who attended nonselective institutions were about 50% less likely to graduate within 4 years after matriculation than were those who attended selective or moderately selective institutions. Interestingly, the result showed a slight positive effect of acceleration credit hours on fourth-year graduation behavior. Remedial course ratio had a strong negative effect on sixth-year graduation, while it did not yield any significant negative effects on fourth- or fifth-year degree attainment behavior. As work-study had the positive effect on retention in the attrition analysis of this study, work-study also demonstrated its positive impact on fourth-year graduation behavior. Work-study students were 81% more likely to graduate within 4 years than were those who were not

work-study students in the first year of college. In addition, the first-year loan recipients were 20% less likely to graduate in 4 years.

Overall, being a first-generation student reduced the odds of graduating in 4 and 5 years by 51% and 32%. Other variables were found to facilitate timely graduation behavior. Continuous enrollment strongly affected degree completion in all the graduation timing specified in the study. Higher high school class rank also showed positive effects on fourth-, fifth-, and sixth-year graduation behavior. Some variables yielded various period-specific positive or negative effects. For instance, female students were more likely to graduate within 4 years than male students were, while Hispanic students were less likely to graduate in the fourth or fifth year than Caucasian students were. The negative effects of lower family income were more prominent for the sixth-year graduation rate. However, this does not indicate that students with certain characteristics, such as Hispanic ethnicity or lower family income, never graduated from college. The study findings simply did not specify any particular period that they were more likely to graduate from college than their peers were.

### *Summary*

The findings attest that first-generation students were exposed to higher risks of departure through college years than their counterparts were. Moreover, they were less likely to complete their degree programs in a timely manner. Although the effect of being a first-generation student itself had a negative effect on college persistence, student persistence and timely graduation rates could alter depending on other precollege characteristics in this study, such as high school academic attributes.

The common understanding that students with higher academic skills who graduated with a higher intensity in the secondary educational program were more likely to persist was generally validated in the study. Although the varying magnitude of effects on student retention affected by high school class rank and high school academic intensity are not new to the educational research community (e.g., Horn & Kojaku, 2001), this study demonstrated that the effects of these variables on retention were not always linear when the time-varying nature of departure behavior was taken into account. Furthermore, the result of this study allows us to estimate how varying effects of high school academic attributes along with other factors, such as family income, affect the college persistence rate for first-generation students longitudinally.

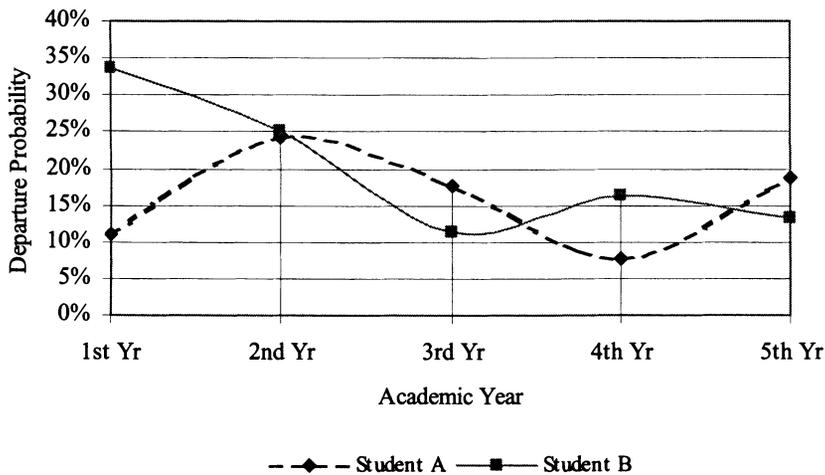
As for degree completion behavior among first-generation students, first-generation students with parents who had some college education

were slightly more likely to graduate in a timely manner than were first-generation students whose parents never attended college. As observed in the findings of the attrition analysis in this study, the impact of high school academic attributes was also pivotal in projecting the odds of timely college graduation among first-generation students. Thus, it becomes important for us to be aware of diverse precollege characteristics that exist within the group of first-generation students and of the prolonging effects these precollege characteristics have on students' time to degree behavior.

*Simulation of Longitudinal Student Attrition Behavior*

Let us assume two first-generation students with different characteristics. Student A is a male Hispanic from a family with an annual income of \$34,000. He expects to graduate from college. He graduated from a high school in the lowest quintile in academic intensity, and he was in the second quintile in high school class rank. He attends a nonselective public institution with assistance from a grant, loan, and work-study. Student B is a female Hispanic from a family with annual income of \$19,000. She expects to graduate from college. She graduated from a high school in the fourth quintile in academic intensity, and she was in the third quintile in high school class rank. She attends a nonselective public institution with a loan only. Longitudinal departure risks between these two students are illustrated in Figure 2. Although both Students A and B are first-generation students, Student A would have a far lower rate of departure in the first year. However, his risk of departure would be almost equal to that of Student B in the second year. After he successfully completed his second year, his risk of departure would gradually wane over time. As for Student B, after enduring the highest risk of departure in her first year, her risk of departure would continue decreasing until her third year. Then, in her fourth year, it would become higher than that of Student A.

Concrete recommendations on types of effective interventions that would reduce departure risks among first-generation students are beyond the scope of this study. However, illustrated longitudinal student attrition behavior clearly provides higher education personnel and policy makers with the effective timing for these interventions. For instance, many higher educational personnel and policy makers believe that a large proportion of students tend to leave their institutions within the first year of college (Berkner, Cuccaro-Alamin, & McCormick, 1996), and they may be more concerned with improving the retention rate of first-generation students during the first 2 years of college. Using the simulated students illustrated above, these higher educational



	Gender	Race	First-Generation	Family Income	Edu Expectation	HS Class Rank	HS Academic Intensity	Attending Public Inst.	Non-Selective Inst.	Grant	Loan	Work Study
Student A	Male	Hispanic	Yes	\$34,000	BA	2nd Quint.	Lowest Quint.	Yes	Yes	Yes	Yes	Yes
Student B	Female	Hispanic	Yes	\$19,000	BA	3rd Quint.	4th Quint.	Yes	Yes	No	Yes	No

personnel and policy makers are able to further identify which first-generation student is more likely to depart and in what year. Student B should be contacted with more intensive interventions immediately after her matriculation in order to improve her odds of returning for the second year. Student A should be closely monitored during the first year, and feedback based on his first-year experience in college should be triggered to plan retention strategies for him to return successfully in the third year. Thus, application of time-specific departure risks of students would affect the designing of educational policies to strengthen the college success of first-generation students with greater efficiency.

### Endnotes

<sup>1</sup>The study originally included the sample of 11,316 eighth-grade students, and their secondary school attrition and college-choice behavior analyses. The results of these omitted analyses are available upon request.

<sup>2</sup>High school academic intensity was estimated by the highest observed level of curriculum across each major component, such as math, reading, and science.

<sup>3</sup>Although information on year-by-year financial aid students was not available in the study data, the first-year financial aid variables were included in the model, largely based on the assumption that the type of aid students had was rather constant, while the amount of aid might change over time.

<sup>4</sup>These are statistic tests to compare survivor functions across groups. They are similar to nonparametric rank tests, which compare the observed and expected number of

students who left in each of the groups. The expected number of departed students is obtained under the null hypothesis of no differences in survivor functions across the groups.

<sup>5</sup>Since this study originally included the sample of 11,316 eighth-grade students, and their secondary school attrition and college-choice behavior analyses, F4PNLWT was used in the study as a sample panel weight. Furthermore, as suggested by Perna (2000), the estimates in event history modeling were adjusted by the panel weight divided by the average weight in the sample.

<sup>6</sup>Parameters in this analysis were estimated by the AM statistical software that was provided by the American Institute for Research. This program was developed particularly to handle complicated sampling design and estimation issues typically involved in using the NCES national data.

## References

- Adelman, C. (1999). *Answers in the toolbox: Academic intensity, attendance patterns, and bachelor's degree attainment*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Bean, J. (1982). Student attrition, intentions, and confidence: Interaction effects in a path model. *Research in Higher Education, 17*(4), 291–320.
- Bean, J. (1983). The application of model of turnover in work organization to the student attrition process. *Review of Higher Education, 6*(2), 129–148.
- Belcheir, M. J. (2000). *Predicting the probability of graduating after four, six, and ten years: Research report*. Boise, ID: Boise State University. (ERIC Document Reproduction Services No. ED 443 339)
- Berkner, L. K., Cuccaro-Alamin, S., & McCormick, A. C. (1996). *Descriptive summary of 1989–90 beginning postsecondary students: Five years later with an essay on post-secondary persistence and attainment* (NCES 96–155). Washington, DC: U.S. Government Printing Office.
- Bradford, C., & Farris, E. (1995). *Survey on retention at higher education institutions: Higher education survey report*. Rockville, MD: Westat.
- Braxton, J. M., Brier, E. M., & Hossler, D. (1988). The influence of student problems on student withdrawal decisions: An autopsy on autopsy studies. *Research in Higher Education, 28*(3), 241–253.
- Braxton, J. M., Duster, M., & Pascarella, E. T. (1988). Causal modeling and path analysis: An introduction and an illustration in student attrition research. *Journal of College Student Development, 29*(3), 263–272.
- Cabrera, A. F., Nora, A., & Castaneda, M. B. (1993). College persistence: Structural equations modeling test of an integrated model of student retention. *Journal of Higher Education, 64*(2), 123–139.
- DesJardins, S. L., Ahlburg, A. A., & McCall, B. P. (1999). An event history model of student departure. *Economics of Education Review, 18*(3), 375–390.
- DesJardins, S. L., Ahlburg, A. A., & McCall, B. P. (2002). A temporal investigation of factors related to timely degree completion. *Journal of Higher Education, 73*(5), 555–581.
- Hochstein, S. K., & Butler, R. R. (1983). The effects of the composition of a financial aids package on student retention. *Journal of Student Financial Aid, 13*(1), 21–27.
- Horn, L. (1998). *Stopouts or stayouts? Undergraduates who leave college in their first year* (NCES 1999–087). Washington, DC: U.S. Government Printing Office.

- Horn, L., & Kojaku, L. K. (2001). High school academic curriculum and the persistence path through college: Persistence and transfer behavior of undergraduates 3 years after entering 4-year institutions. *Education Statistics Quarterly*, 3(3), 65–72.
- Hossler, D., & Vesper, N. (1993). An exploratory study of the factors associated with parental saving for postsecondary education. *Journal of Higher Education*, 64(2), 140–164.
- Ishitani, T. T. (2003a, May). *Exploring time to graduation: Effects of pre-college characteristics and enrollment behavior on timely degree completion*. Paper presented at the 43rd Annual Forum of the Association for Institutional Research, Tampa, FL.
- Ishitani, T. T. (2003b). A longitudinal approach to assessing attrition behavior among first-generation students: Time-varying effects of pre-college characteristics. *Research in Higher Education*, 44(4), 433–449.
- Ishitani, T. T., & DesJardins, S. L. (2002). A longitudinal investigation of dropout from colleges in the United States. *Journal of College Student Retention*, 4(2), 173–201.
- Iwai, S. I., & Churchill, W. D. (1982). College attrition and the financial support systems of students. *Research in Higher Education*, 17(2), 105–113.
- James, E. (1988). Student aid and college attendance: Where are we now and where do we go from here? *Economics of Education Review*, 7(1), 1–13.
- Knight, W. E. (1994, May). *Why the five-year (or longer) bachelors degree?: An explanatory study of time to degree attainment*. Paper presented at the annual forum of the Association for Institutional Research, New Orleans, LA.
- Knight, W. E., & Arnold, W. (2000, May). *Towards a comprehensive predictive model of time to bachelor's degree attainment*. Paper presented at the annual forum of the Association for Institutional Research, Cincinnati, OH.
- Lam, L. T. (1999, May). *Assessing financial aid impact on time-to-degree for nontransfer undergraduate students at a large urban public university*. Paper presented at the annual forum of the Association for Institutional Research, Seattle, WA.
- Mallete, B., & Cabrera, A. F. (1991). Determinants of withdrawal behavior: An explanatory study. *Research in Higher Education*, 32(2), 179–194.
- Metzner, B. S., & Bean, J. (1987). The estimation of a conceptual model of nontraditional undergraduate student attrition. *Research in Higher Education*, 27(1), 15–38.
- Murtaugh, P. A., Burns, L. D., & Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education*, 40(3), 355–371.
- National Association of Colleges and Employers. (2003, September 10). *Employers project college hires to climb 12.7 percent in 2003–04*. Retrieved December 8, 2003, from <http://www.nacweb.org/press/display.asp?year=2003&prid=179>
- National Center for Educational Statistics. (2001). *Percentage distribution of 1999–2000 bachelor's degree recipients according to age at bachelor's degree completion, by gender, race/ethnicity, and parents' educational attainment*. Retrieved June 22, 2004, from <http://www.nces.ed.gov/quicktables/>
- Nora, A., Attinasi, L. C., & Matonak, A. (1990). Testing qualitative indicators of precollege factors in Tinto's attrition model: A community college student population. *Review of Higher Education*, 13(3), 337–355.
- Noxel, S., & Katunich, L. (1998, May). *Navigating for four years to the baccalaureate degree*. Paper presented at the annual forum of the Association for Institutional Research, Minneapolis, MN.
- Nunez, A. M., & Cuccaro-Alamin, S. (1998). *First-generation students: Undergraduates whose parent never enrolled in postsecondary education* (NCES 1999–082). Washington, DC: U.S. Government Printing Office.

- Pascarella, E. T. (1980). Student-faculty informal contact and college outcomes. *Review of Educational Research*, 50(4), 545–595.
- Pascarella, E. T., & Chapman, D. (1983). A multi-institutional path analytical validation of Tinto's model of college withdrawal. *American Educational Research Journal*, 20(1), 87–102.
- Pascarella, E. T., Duby, P., & Iverson, B. (1983). A test and reconceptualization of a theoretical model of college withdrawal in a commuter institution setting. *Sociology of Education*, 56(2), 88–100.
- Pascarella, E. T., & Terenzini, P. (1978). The relation of students' precollege characteristics and freshman year experience to voluntary attrition. *Research in Higher Education*, 9(4), 347–366.
- Pascarella, E. T., & Terenzini, P. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *Journal of Higher Education*, 51(1), 60–75.
- Pascarella, E. T., & Terenzini, P. (1983). Path analytic validation of Tinto's model. *Journal of Educational Psychology*, 75(2), 215–226.
- Perna, L. W. (2000). Differences in the decision to attend college among African Americans, Hispanic, and Whites. *Journal of Higher Education*, 71(2), 117–141.
- Riehl, R. J. (1994). The academic preparation, aspirations, and first-year performance of first-generation students. *College and University*, 70(1), 14–19.
- Selingo, J. (2003, May 2). What Americans think about higher education. *The Chronicle of Higher Education*, p. A10.
- Singer, J. D., & Willet, J. B. (1991). Modeling the days of our lives: Using survival analysis when designing and analyzing longitudinal studies of duration and the timing of events. *Psychological Bulletin*, 110(2), 268–290.
- Spady, W. G. (1971). Dropout from higher education: Toward an empirical model. *Interchange*, 2(3), 38–63.
- Stage, F. K. (1988). University attrition: LISREL with logistic regression for the persistence criterion. *Research in Higher Education*, 29(4), 343–357.
- Stage, F., & Hossler, D. (1989). Differences in family influences on college attendance plans for male and female ninth graders. *Research in Higher Education*, 30(3), 301–315.
- Stampen, J. O., & Cabrera, A. F. (1986). Exploring the effects of student aid on attrition. *Journal of Student Financial Aid*, 16(2), 28–37.
- Stampen, J. O., & Cabrera, A. F. (1988). The targeting and packaging of student aid and its effect on attrition. *Economics of Education Review*, 7(1), 29–46.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45(1), 89–125.
- U.S. Census Bureau. (2000a, August). *Educational attainment in the United States. Current Population Reports*. Retrieved December 5, 2003, from <http://www.census.gov/prod/2000pubs/p20-528.pdf>
- U.S. Census Bureau. (2000b, August). *Voting and registration in the election of November 1998. Current Population Reports*. Retrieved December 5, 2003, from <http://www.census.gov/prod/2000pubs/p20-523.pdf>
- Volkwein, J. M., & Lorang, W. G. (1996). Characteristics of extenders: Full-time students who take light credit loads and graduate in more than four years. *Research in Higher Education*, 37(1), 43–68.