Examining the Influence of Campus Climate on Students' Time to Degree: A Multilevel Discrete-Time Survival Analysis

Ji Zhou, Ph.D.
Institutional Research Analyst
Marshall School of Business
University of Southern California

Michelle Castellanos, Ph.D.
Institutional Research Associate
Office of Institutional Research
Loyola Marymount University

This paper was presented as a peer-reviewed research paper at the 38th annual meeting of the Association for the Study of Higher Education, St. Louis, MO, November 2013. This current copy was uploaded to ERIC in 2016, with updated references after the conference presentation. This study was conducted in the fall of 2012 when both authors were Ph.D. students and research associates at the Pullias Center for Higher Education, Rossier School of Education at the University of Southern California.

Abstract

Utilizing longitudinal data of 3477 students from 28 institutions, the authors examine the effects of structural diversity and quality of interracial relation on students' six-year persistence towards graduation. Multilevel discrete-time survival analysis was utilized to model longitudinal persistence patterns as well as the nested structure of students within institutions. Compared to White students, African American and Latino/a students had lower odds of persisting to graduation within six years. African American and Asian students had higher odds of persisting towards graduation at institutions with a critical mass of underrepresented racial and ethnic minorities and Asian students, respectively. For Latino/a students, the odds of persisting to graduation was higher when the perceived quality of interracial relation with Latino/as was more positive. White students had lower odds of persisting to graduation at institutions with higher percentage of underrepresented racial and ethnic minorities. Other important predictors of student time to degree included sex, parental education, high school GPA, number of advanced placement class passed, institutional selectivity, college GPA, effort put in studying, and financial aid. Several scholarly and practical implications based on these findings are provided.

Keywords: persistence; racial and ethnic minority students; campus racial climate; structural diversity; interracial relation

Do Structural Racial Diversity and Interracial Relations Affect Racial and Ethnic Minority Students' Persistence to Graduation? A Multilevel Discrete-Time Survival Analysis

Introduction

While more students are pursuing higher education than ever before, student persistence rates remains less promising. Recent statistics released by National Center of Education Statistics [NCES] (2011) indicate that only 59% of full-time students who enrolled at four-year institutions in 2005 completed a bachelor's degree or equivalent within six years. Such rates are even lower for Latino/a and African American students, at 48% and 38%, respectively. Substandard graduation rates are troubling for both students and the nation, as a bachelor's degree has become a necessity in a global knowledge economy. When coupled with skyrocketing tuition, relative to family income, low persistence rates may discourage students from pursuing higher education (Bound, Lovenheim, & Turner, 2007; DesJardins, Ahlburg, & McCall, 2006). President Obama and leading educational foundations have deemed improving graduation rates as a top priority for higher education institutions (e.g., Obama's 2020 College Completion Goal, Lumina Foundation's Goal 2025, and Gates Foundation's postsecondary success initiatives).

Highlighting the need address low graduation rates is not new in the academic community as numerous studies have addressed student persistence rates over the years. Scholars have identified various student background characteristics, college experiences, and institutional characteristics that influence persistence to graduation. Theories of student persistence (e.g., Tinto's integration model, Astin's student involvement theory) have been proposed and tested on various student groups and in various institutional contexts. While the existing literature is useful is useful in understanding student persistence, only slight improvement have been made over the years. For example, six-year graduation rates have only yielded a 4% increase from only from

1996 (55%) to 2005 (59%; NCES, 2011). This slight improvement varies across students from different racial and ethnic groups: 58% to 62% for white students, 39% to 40% for African American students, 46% to 51% for Latino/a students, and 63% to 69% for Asian American students. Therefore, investigating student persistence warrants continuous dedication from researchers, administrators, policy makers, and students.

In the current study, we aim to contribute to the student persistence literature in two ways. First, we explore the utility of campus racial climate theory on students' persistence to graduation, and do so with a particular emphasis on racial and ethnic minority students. Research utilizing campus racial climate theory highlights the distinct persistence patterns of racial and ethnic minorities, when compared to their majority peers (see Hurtado, Milem, Clayton-Pedersen, Allen, 1998). Second, unlike the vast majority of existing research, we combine multilevel modeling and discrete-time survival analysis to examine students' persistence patterns to a fuller extent. We utilize a national dataset of 3,477 students from 28 institutions included in the National Longitudinal Study of Freshmen (NLSF) in order to examine the influence of two aspects of campus racial climate—structural diversity and the quality of intergroup relations—on students' six-year graduation patterns. The research questions that guide our study are as follows: 1) Do structural diversity and the quality of intergroup relations influence students' persistence to graduation within six years? 2) If so, do these effects differ by racial and ethnic groups?

Literature Review

In what follows we briefly summarize the literature that informed the development of our model. We structure our summary according to Astin's (1993) Input-Environment-Output (I-E-O) conceptual model. The I-E-O model holds that student development in college occurs over a longitudinal process and is influenced by students' input (i.e., background characteristics and

pre-college experiences) and college environment (i.e., experiences in college and the college environment in which students are nested). The I-E-O model has been widely utilized in college impact research and examines the extent to which students' college experiences impact their development (Astin & Antonio, 2012; Pascarella & Terenzini, 2005). We synthesize the existing literature on students' persistence to graduation by student background characteristics and precollege learning experiences, college experiences, and institutional environment base on the I-E-O model. We then discuss mainstream theories of college student persistence, notable limitations in the existing research, and the purpose of our study.

Student Background Characteristics and Precollege Experiences

Several student background characteristics have been known to consistently predict students' persistence to graduation, including sex, race and ethnicity, age, first-generation college student status, speaking English as the second language, parental education, social economic status, academic preparedness, and academic aspirations (Allen, Robbins, Casillas, & Oh, 2008; Bound et al., 2007; Fletcher & Tienda, 2010; Ishitani, 2003; Zwick & Sklar, 2005). For example, Isthitani (2006) found that by their second year in college, first-generation students were 8.5 times more likely to drop out of college when compared to students whose parents graduated from college. In regards to pre-college academic preparedness, important indicators include SAT scores, ACT scores, high school GPA, and the number of academic placement tests passed. As may be expected, greater academic preparedness is associated with greater odds of graduating college (Fletcher & Tienda, 2010). However, students' background characteristics (e.g., socioeconomic status) and precollege academic preparation may also play a role in their influence on students' college experiences, suggesting that different achievement patterns may exist for different groups of students. The importance of student background characteristics and

precollege academic preparedness in influencing student graduation patterns, for instance, has been well established in the literature (Pascarella & Terenzini, 2005; Reason, 2009; Tinto, 1975). Zwick and Sklar (2005) found that high school GPA had a statistically significant influence on white students' college graduation patterns, while SAT had a significant effect on both Latina/o and white students. As such, researchers are now drawing their attention to the extent to which such variables interact with students' college experiences to influence their persistence patterns.

College Experiences

College experiences that have been known to influence students' persistence to graduation include financial aid, employment on campus, academic involvement or integration[1], social integration, sense of belonging, college GPA, college major, number of credits taken per term, and place of residence (Astin, 2005; Bound et al., 2007; Desjardins et al., 2006; Dowd, 2004; Pascarella & Terenzini, 2005; Titus, 2006b). For example, students in science, technology, engineering, and math (STEM) majors are more likely to persist to graduation than are students in education or social sciences (Pascarella & Terenzini, 2005). Academic involvement is arguably the most important predictor of persistence to graduation; that is, the greater amount of time and effort that students put into academically purposeful activities is associated with greater likelihood that they will persist and graduate (Astin, 2005; Pascarella & Terenzini, 2005). More positive interactions with faculty and peers in and outside of classrooms, especially those related to academic matters, increase the likelihood of student persistence and graduation. Further, as underrepresented racial and ethnic minority students have had lower graduation rates, on average, compared with white or Asian students, many studies have attempted to identify the

[1] Integration has been frequently used interchangeably with terms such as involvement and engagement. We are aware of the differences and overlaps of these terms. We do not distinguish these terms in our paper, considering our research purpose. For a synthesis and discussion of the definition and usage of the terms, see Wolf-Wendel, Ward, and Kinzie (2009).

types of college experiences that influence their persistence. Several studies have examined racial and ethnic minorities' sense of belonging on campus. We discuss this subset of research in a later section on campus racial climate and persistence.

Institutional Environment

Studies using single- or multilevel modeling have identified institutional level characteristics that influence persistence, including institutional type, selectivity, demographics, financial resources, internal expenditure patterns, and student-faculty ratios (Bound et al., 2007; Garcia, 2013; Ishitani, 2003, 2006; Jones, 2011; Titus, 2006a, 2006b). Research and reports generally show that more selective institutions have higher graduation rates for both white students and students of color (Garcia, 2013; Jones, 2011). Similarly, institutions with greater instructional and academic resources tend to graduate more of their students on time, while institution with a greater percentage of Pell-grant students often struggle to graduate more of their students (Garcia, 2013; Jones, 2011). Among institutional-level variables, the institutional environment most relevant to our study is the demographic characteristics, or the percentage of racial and ethnic minority students. A handful of studies have found that underrepresented racial and ethnic minorities are more likely to persist and graduate at minority serving institutions than at predominantly white institutions (Garcia, 2013; Jones, 2011). We discuss this subset of research in a later section on campus racial climate and persistence.

Mainstream Theories of College Student Persistence

Two theories have dominated much of the research on persistence: Tinto's (1975, 1993) interactionalist theory of academic departure and integration, and Astin's (1984, 1993) theory of academic involvement. Tinto views persistence as the result of interaction between a student and the institution, where those with stronger ties and better fit with the academic and social

communities of the institution are more likely to persist. Central to Tinto's (1993) theory is the concept of integration defined as the "extent to which an individual shares the normative attitudes and values of peers and faculty in the institution and abides by the formal and informal structural requirements for membership in that community or in subgroups of it" (p. 116). The onus of dropout is thus largely placed upon students because they fail to fit in the predominant norms and values on a campus. While Tinto's theory has made an invaluable contribution to the research of persistence, scholars have criticized its applicability to non-traditional students, particularly racial and ethnic minorities (Museus et al., 2008; Tierney, 1992, 1999). As the ethnic diversity among college students continues to increase, scholars have suggested the use of alternative theories that are more applicable to racial and ethnic minorities as well as theories that focus on placing more responsibility on institutions (Reason, 2009; Tierney, 1992, 1999).

Astin (1984, 1993) describes student involvement as the amount of physical and mental energy that students devote to the academic experience (Astin, 1993). A highly involved student devotes considerable energy to studying, participates actively in student organizations, and interacts frequently with faculty and peers. Greater involvement in academically meaningful activities leads to greater academic outcome such as persistence to graduation. Astin conceives involvement as occurring along a continuum, where the act of dropping out can be viewed as the ultimate form of noninvolvement (Astin, 1984). As a broad experiential concept, involvement has been used for various student populations on a wide range of college outcomes, including persistence (Astin & Antonio, 2012; Pascarella & Terenzini, 2005). For racial and ethnic minority students, the broad conceptualization of involvement, while useful, may not capture experiences unique to them. As we will show in this study, an alternative and arguably more

useful approach is the combination of involvement with other theoretical constructs particularly relevant for racial and ethnic minority students.

Two Limitations of the Existing Literature

Our motivation in conducting the current study is rooted in two primary limitations in the existing literature. One limitation has to do with the mainstream theories of studying persistence. As discussed previously, mainstream theories have limited applicability to non-traditional college students, including underrepresented racial and ethnic minority students. As the six-year graduation rates for African American and Latino/a students are lower than that of White and Asian students (NCES, 2011), theories that are more applicable to these students should be explored. The increase of racial and ethnic minority in American higher education has led to the proposition and discussion of several ethnic-diversity related theories such as critical race theory (Delgado & Stefancic, 2006), cultural resistance theory (Fordham, 1996; Ogbu, 1991), and campus racial climate theory (Hurtado et al., 1998). Although these theories usually focus on educational experiences and identities, and were not proposed directly to address persistence, persistence is undoubtedly an accumulative outcome affected by educational experiences. We explore one of these theories—campus racial climate theory proposed specifically for college students and environments.

The other limitation has to do analytical techniques. The majority of the existing studies using sing- or multi-level modeling rely on logistic regression, a method unable to capture students still enrolled after the study's focal period ends (e.g., four or six years) or students who stopped out for a few semesters but returned afterwards. Further, the majority of the existing studies assume that student variables (e.g., hours spent studying, aspiration to graduate, GPA, etc.) are time-invariant as they progress through college. A handful of studies use the less-

widely-used discrete-time survival analysis to deal with the two analytical weaknesses (e.g., DesJardins, Ahlburg, & McCall, 1999; Ishitani, 2003; Murtaugh, Burns, & Schuster, 1999; Singer & Willett, 1991). For instance, DesJardins, McCall, Ahlburg, and Moye (2002) found that students' commitment to graduation positively influenced their likelihood to graduate, but this effect became less pronounced over the course of their college career. A notable limitation of the few studies that utilize survival analysis, however, is their focus on student-level experiences that take place at a single institution.

Purpose of the Study

Utilizing multilevel discrete-time survival analysis, we examine the influence of two aspects of campus racial climate—structural diversity and the quality of intergroup relations—on the six-year graduation patterns of 3,477 students from 28 institutions. This study is the first, to our knowledge, to combine multilevel and discrete-time survival analysis to model structural diversity and perceptions of interracial relation on students' persistence to graduation while accounting for both student- and institutional-level covariates. Survival analysis is an appropriate technique to examine persistence to graduation, given its ability to (a) account for longitudinal persistence patterns at different time points, (b) maximize the available information for students who dropout during the study period and those who continue to enroll when the study period ends (i.e., right-censoring), and (c) analyze both time-invariant and time varying variables. In addition, multilevel modeling addresses the hierarchical structure of multi-institutional data and provides better parameter estimates compared to conventional regression models.

Theoretical Framework: Campus Racial Climate

Hurtado, Milem, Clayton-Pedersen, and Allen (1998) describe an institution's campus racial climate as a multidimensional construct that comprises four interrelated dimensions: (a)

structural diversity, in terms of its numerical representation of different racial/ethnic groups; (b) the psychological perceptions and attitudes between racial groups; (c) an institution's historic legacy of inclusion or exclusion; and (d) the behavioral climate, in terms of intergroup interactions on campus (Hurtado et al., 1998; Hurtado et al., 2008). These four dimensions of campus racial climate have been studied empirically, and are said to influence the college experiences of students of color (Brown, Morning, & Watkins, 2005; Hurtado, Griffin, Arellano, & Cuellar, 2008; Hurtado & Ponjuan, 2005). We were specifically interested in how the structural and psychological dimensions of campus racial climate influence students' persistence to graduation, especially that of underrepresented racial and ethnic minority students.

Structural diversity has been considered the catalyst for promoting a more hospitable campus racial climate (Hurtado et al., 2008). For students of color, the numeric representation of people of color represents a signal about their place and visibility on campus and has been known to influence their academic and social adjustment to college (Hurtado, Carter, & Spuler, 1996). Furthermore, research indicates that the greater the racial diversity on campus, the more opportunities for interracial interactions and college learning for all students (Hurtado et al., 2008). Arguably, opportunities for increased learning as a result of interracial interactions may promote the college persistence of white and students of color alike. Empirical research, however, has mixed findings regarding the positive influence of structural diversity, indicating both positive and negative effects of structural diversity on graduation (Kim, Rhoades, & Woodard, 2003). Overall, earlier research of how racial and ethnic diversity affects college students often focuses on the influence of structural diversity. The general conclusion is that structural diversity is a necessary but insufficient precondition for creating a welcoming campus environment for underrepresented racial and ethnic minority students (Hurtado et al., 1998).

The psychological climate refers to the extent to which individuals perceive racial conflict and hostility on campus. This dimension captures both the quality of interracial interaction on campus as well as students' perceptions of institutional values. A common theme from research on the psychological dimension of campus racial climate is that its influence on persistence is indirect and subtle through commitment, sense of belonging, and academic and social involvement (Museus, Nichols, & Lambert, 2008; Pascarella & Terenzini, 2005). Students of color have been known to experience more direct encounters with racism and perceive their campus as more discriminatory compared to their white peers (Ancis, Sedlacek, & Mohr, 2000; Pewewardy & Frey, 2002; Rankin & Reason, 2005). Those who experience their campus as more hostile are more likely to experience higher levels of stress and difficulties in social, academic, and personal-emotional adjustment to college, all of which influence their persistence (Brown, Morning, & Watkins, 2005; Hurtado & Ponjuan, 2005; Hurtado, Carter, & Spuler, 1996; Hurtado et al., 2008). For example, Brown, Morning, and Watkins (2005) examined African American engineering students' perceptions of campus climate and found that students with more favorable perceptions of campus climate had greater institutional commitment and higher graduation rates. Hurtado and Ponjuan (2005) found that Latino/a students who perceived institutions' campus racial climate as hostile reported lower sense of belonging and lower commitment to persistence. Those who reported positive interracial interactions, however, demonstrated greater sense of belonging and commitment to the campus community.

In sum, we concur with other scholars (Hurtado et al., 1998; Pascarella & Tereznini, 2005; Reason, 2009) that examining the influence of campus racial climate should not focus on what an institution is (i.e., structural diversity) but what an institution does that helps students

persist and succeed. We therefore explore both structural diversity and the quality of interracial relations on persistence to graduation across different ethnic groups.

Methods

Sample

The data for the present study consists of a cohort of students from the National Longitudinal Study of Freshmen (NLSF). A total of 3,477 college students who began their freshmen year in 1999 were included in the study. Students were surveyed in the Spring of 2000, 2001, 2002, 2003, and 2005. These five waves of data were collected through computer-assisted surveys regarding students' high school experiences, college plans, social and academic experiences in college, racial perceptions, and financial matters. A sixth wave of data was derived from the National Student Clearinghouse and provides student graduation information. Four hundred and thirty-seven students who transferred to an unknown institution were excluded from the study given our inability to model the nested structure of the data for these students. Ten additional students who lacked graduation information were also excluded from the study.

Students attended one of 28 institutions of higher education (for a complete list of institutions please see NLSF, 2012. Four racial and ethnic backgrounds are represented in the sample: 901 White, 875 Asian American, 902 African American, and 799 Latino/a. Female students are overrepresented relative to their male counterparts in each of the four racial groups: 51.7% Whites, 57.1% Asian Americans, 66.4% African Americans, and 58.7% Latino/a students.

Persistence to Graduation

We specified six time points based on the available information in the NLSF dataset, including May 2001 (end of second year), May 2002 (end of third year), December 2002 (mid-

third year), May 2003 (end of fourth year), May 2004 (end of fifth year), and May 2005 (end of sixth year). Table 1 presents information on persistence to graduation patterns for each time point. Students persisted (coded as 0), graduated (coded as 1), or dropped out (coded as 0) during each of the time point. Once a student dropped out or graduated, he or she was removed from the analyses for the following time points. For example, 18 students who dropped out and 115 students (out of 3,262) who graduated by December of 2002 (mid-third year) were removed from subsequent analyses. The remaining 3,129 students who were still enrolled by the end of December 2002 comprised the total sample for the following analysis. This method allowed us to maximize the available data and account for the different persistence patterns at each time point. As shown in Table 1, 22 students were right-censored at the final time point (May 2005), indicating that they were still enrolled at their original institutions at the end of the sixth year.

[insert Table 1 about here]

Multilevel Discrete-Time Survival Model Predicting Persistence to Graduation

We utilized multilevel discrete-time survival analysis to predict students' persistence to graduation based on the theoretical and empirical literature previously discussed (see Figure 1). We had three hypotheses. First, we expected that time-invariant student-level background characteristics and precollege academic preparation would influence students' persistence to graduation. Thus race, sex, parental education, precollege aspiration to finish college, high school GPA, and the number of advanced placement classes passed were included in the model. Second, given the nesting of students within institutions, we hypothesized that time-invariant institutional-level variables would influence students' persistence to graduation. Structural diversity (discussed below) was a time-invariant institutional-level variable, along with institutional type and selectivity. Third, we hypothesized that time-invariant and time-varying

student-level experiences during college would influence their persistence to graduation. Interracial relations were treated as a time-invariant student-level variable (discussed below), together with college GPA. Students' cumulative effort to complete college was included as a time-varying student-level variable. In sum, we predicted that structural diversity and interracial relations, along with the specified covariates, would influence whether students persisted, dropped out, or graduated during each time point under examination. Table 2 presents coding and descriptive statistics.

[insert Figure 1 about here]

[insert Table 2 about here]

Structural Diversity

As previously discussed, structural diversity refers to the numeric representation of people of color at an institution (Hurtado et al., 1998). While people of color includes all non-white students, we differentiate between Asians and underrepresented minorities (URMs) (i.e., African Americans and Latino/as) given previous research indicating the distinct precollege academic preparation, college academic experiences, and college outcomes of such students (Cole & Zhou, 2013, 2014; Massey et al., 2006; Zhou, 2012). We created dummy variables utilizing the group mean percentages of Asian and URMs across the 28 institutions to determine an institutions' structural diversity. The mean percentages across institutions were 13% and 12% for Asian and URMs students, respectively. Institutions that met or surpassed these thresholds were considered to have a critical mass of students from that respective racial group.

Interracial Relation

The quality of interracial relation was a time-invariant student-level factor that captured a student's overall perceived quality of interactions between his or her own race and individuals

from the other three race categories. For example, the interracial relation construct for Latina/o students was a composite of three items regarding the quality of interracial relation between Latino/a and White, Latino/a and African American, and Latino/a and Asian American students. These items were measured on a scale of 0 to 10, where 0 indicated very poor interracial relation on campus and 10 indicated excellent interracial relations. Factor analyses and Cronbach's reliability statistics indicated that the constructs were statistically satisfactory (see Table 3).

[insert Table 3 about here]

Analysis

The following function describes our multilevel discrete-time survival analysis model.

$$logit\{Pr(y_{sij} = 1|d_{sij},x_{sij})\}$$
$$= \alpha_1 + \alpha_2 d_{2sij} + \cdots + \alpha_6 d_{6sij} + \beta_1 x_{1ij} + \cdots + \beta_{17} x_{17ij} + \beta_{18} x_{18sij}$$

y_{sij} is an indicator for the event (i.e. graduation) occurring at time *s* for person *i* at institution *j*. $d_{2sij} \cdots d_{6sij}$ were dummy variables for time points 2 through 6 (time point 1 is the reference or starting point). $x_{1ij} \cdots x_{17ij}$ represent the 17 time-invariant variables. x_{18sij} was the one time-varying variable (cumulative efforts to complete college). Before testing the model, we transformed the NLSF dataset from a person-oriented format to a person-period format. Longitudinal student data are often stored in a person-oriented format, which include a single record per student. A person-period dataset, however, includes multiple lines of data for a single individual. One line of data presents each period that the individual is observed. This transformation was necessary because survival analysis requires that each student have a record for each period of observation.

We utilized Stata statistical software and followed four analytical steps. We began by running a fully unconditional model (Model 1) to gauge whether a multilevel analysis was necessary. We obtained a significant intraclass correlation (ICC) of .093 (χ^2=256.56, p<.001),

suggesting that 9.3% of the variance in students' persistence to graduation was between institutions. A multilevel random effects model was therefore appropriate. Second, we included all the time-invariant and time-varying student- and institutional-level covariates (Model 2). We then added our variables of interest into the model: structural representation of Asians dummy variable, structural representation of URMs dummy variable, racial relation between Asians and other three races, racial relation between African Americans and other three races, and racial relation between Latino/a and other three races (Model 3). Further, structural representation dummies were interacted with race for the respective racial group, and racial relation was interacted with race for the respective racial group. For example, being Latino/a was interacted with the structural representation of URMs at the institution, and being Latino/a was also interacted with the perceived interracial relation between Latino/a and other racial groups. Each model (From Model 1 to Model 3) was incrementally more complicated. We used the likelihood ratio test to examine whether the more complicated model improved the model fit compared to the previous model. Each likelihood ratio test obtained significant result, indicating an improvement of model fit in each step.

Limitations

Several limitations are worthy of discussion. First, given the limitations of the NLSF dataset, were unable to include 437 students who transferred to other institutions. Second, while there is various advantages of utilizing previously collected national data, researchers are limited to the variables included in the dataset. In the present study, we were unable to examine the role of important covariates such financial aid and sense of belonging, as well as the time-varying effect of college GPA. Since NLSF does not provide GPA information for each wave of data, we included college gpa as a time-invariant variable.

Third, students who dropped out between the beginning of their first year and the middle of their second year were grouped with those who dropped out during the end of their second year (spring 2001). Including dropout information at earlier time points would incur model misspecification since spring 2001 is the first time point for which student graduation information is provided in the NLSF dataset. Fourth, while longitudinal, the data utilized in the current study remains correlational (i.e., non-experimental) in nature. Causal relationships resulting from the study should be interpreted with caution.

A final limitation worth noting is that, with the exception of graduation and institutional-level data, all data were collected from students' self-reports. Due to the high cost of experimental studies, student self-reported survey has become one of the most frequently used data sources in higher education (Herzog & Bowman, 2011). A common critique against self-reports is that students may be using different baselines when they are asked to report their own growth during college. However, the self-reported variables included in our model did not concern self-evaluated growth during college. Our large study sample size also helps to offset threats to validity resulting from self-report measures.

Results

We provide a summary of the study findings in Table 4. The extremely large odds of graduating at each time point are worth explanation. The odds of an event occurring in discrete-time survival analysis reflect the conditional odds that the event will occur, given that it has not yet occurred. In our study, the baseline was Spring 2001 (the end of sophomore year). Compared to this baseline, the odds of graduating at each of the following time points were significant. For example, if a student had not graduated by the end of his or her sophomore year and had not dropped out, the odds of graduating at the end of his or her junior year increased by 216%. The

odds of graduating between 3.5 (mid junior year) and 6 years were extremely large and became less meaningful, due to the disproportionate number of students (only one) who graduated at Spring 2001 (end of sophomore year, the baseline) compared to the later time points.

We obtained a good model fit representing students' persistence to graduation. The variables identified by the existing literature also significantly affected persistence to graduation within six years of college in our study. For example, being a female student increased the odds of six-year graduation by 31% compared to being a male student ($p < .01$). Enrollment at a public research institution decreased the odds of six-year graduation by 62% compared to enrollment at a liberal arts college ($p < .05$). Students' cumulative effort to finish college also increased the odds of graduation at each time points within the six years (OR = 1.04, $p < .001$).

Structural diversity and interracial relations affected persistence to graduation for different racial groups. For white students, the reference group in our study, the quality of interracial relations did not appear to affect their persistence to graduation within six years. However, white students had a 38% lower odds of persistence to graduation from institutions with more than 12% URM ($p < .05$).

For Asian American students, the main effects of being Asian and the percentage of Asian students on campus were not significant predictors of six-year graduation; the interaction term, however, was significant. For Asian students, enrolling at an institution with an Asian student enrollment greater than 13% increased the odds of graduating within six years by 71%, compared to enrolling at an institution with less than 13% Asian students ($p < .01$). The perceived quality of interracial relation was not associated with Asian students' likelihood of graduation.

For African American students, both the main effects of being African American and the percentage of URM on campus were significant predictors. The interaction term for being African American and the percentage of URM was also significant. For African American students, the odds of graduating at an institution with less than 12% URM was 56% less than that of White students at such institution ($p < .05$). However, enrolling at an institution with more than 12% URM increased African American students' odds of graduating by 67% ($p < .05$). The perceived quality of interracial relation was not associated with African American students' likelihood of graduation.

For Latino/a students, the odds of graduating at an institution with less than 12% URM was 66% less than that of White students at such institution. However, the interaction term for being Latino/a and the percentage of URM was not significant. Unlike for Asian and African American students, more positive perceived interracial relations with other racial groups increased Latino/a students' odds of graduation within six years (OR = 1.05, $p < .05$).

Discussion

Overall, our findings indicate the importance of creating ethnically diverse student bodies (structural diversity) and enhancing students' interracial relations, especially for students of color. In the current study, a more ethnically diverse student body significantly increased the likelihood that Asian and African American students graduated within six-year. Similarly, more positive interracial relations increased Latino/a students six-year graduation rates.

Our statistically significant findings regarding the effect of structural diversity for students of color both contribute and confound the existing literature. In our study, the raw percentages of Asian or URMs did not affect students' persistence to graduation within six years. Instead, it was the percentage of students of color that influenced their graduation rates. It was

once Asian and URMs reached a critical mass (for this sample, 13% for Asians and 12% for URM), that an increase in persistence to graduation became evident for Asian and African American students. While previous research indicates that structural diversity does not typically exhibit a directly effect on students' six-year graduation rates (Garcia, 2013; Jones, 2011; Pascarella & Terenzini, 2005; Reason, 2009), structural diversity has been established an important and positive indicator of institutional resources for students of color (e.g., faculty of color, academic support services for students of color, instructional expenditure for students of color, etc). Such institutional resources, in turn, promote the college persistence and adjustment of students of color (Hurtado, Carter, & Spuler, 1996). Greater institutional resources not only provide additional help for students of color but also signal their place and visibility on campus.

The contradictory effects regarding the percentage of URM students on white and African American students' persistence to graduation are troubling. Such findings do not imply that the percentage of URM should be enhanced at the expense of white students, or vice versa. Rather, racial and ethnic diversity emphasizes the inclusivity and equitable opportunities of all students (American Council on Education & American Association of University Professors, 2000; Gurin, Dey, Hurtado, & Gurin, 2002). The contradictory effects revealed in our study suggest that institutions may be failing to prepare students from all racial and ethnic groups equally; however, more research is needed in this area.

The significance of positive interracial relation on persistence to graduation for Latino/a students echoes the existing literature. Scholars have suggested that structural diversity is a necessary but insufficient precondition for creating a more welcoming campus environment (Hurtado et al., 1998). In this study, although the 28 institutions enrolled fewer Latino/a students than African American or Asian students, Latino/a students had a more positive perceived

interracial relation than the other two groups. More positive perception of racial relations is usually associated with lower levels of stress and difficulties in adjusting to college and persisting to graduation (Hurtado & Ponjuan, 2005; Hurtado et al., 2008).

Implications for Practice

In an era of increasing accountability, institutions have begun to conduct their own assessment of student outcomes. Persistence to graduation has been an important institutional and student outcome. Self-assessment studies can utilize the technique we used in this study by combining multilevel and discrete-time survival analysis. Our combined model obtained a good model fit, as shown through the maximum likelihood estimation and the significant coefficients. For comparison purposes, we conducted a multilevel logistic regression using the same variables in the multilevel discrete-time survival analysis. The time-varying variable of accumulative college effort was recoded into the average effort a student made during college. Dropouts at any of the six time points were coded into missing data excluded from analysis. Results showed that the multilevel logistic model obtained a poor model fit and failed to capture the effects of race on students' persistence to graduation, indicating the need for more rigorous approaches such as the one used in this study.

In fact, the advantage of combining multilevel and discrete-time survival analysis is not fully captured in our study, because the majority of the sample persisted and graduated within six years and most of them even within four years. In other words, survival was not a considerable threat to most of the students in our sample, making the time variables less illuminating. However, this combined method would be useful for institutions with high percentage of dropouts and/or students taking longer time to degree, among which racial and ethnic minority students are overly represented. Collecting multiple data points of persistence to graduation

might be costly for large-scale national or statewide studies. However, institutions can conduct self-assessment studies and build the predictive model on their own students, since student persistence data are nowadays regularly collected at least by semesters. Departments or broad disciplines of study are reasonable multilevel nesting structures, given that persistence to graduation has been found to vary by majors (Chen, 2013).

Implications for Further Research

Findings from the current study highlight two directions of further research. First, researchers are encouraged to explore whether and how structural diversity interacts with interracial relation in affecting students' persistence to graduation. The two dimensions of interest in the current study— the numeric representation of students of color (structural diversity) and perceived quality of interracial relations (psychological dimension)—are interrelated and affect students' various college outcomes, including persistence towards graduation. Empirical research suggests a less definitive, albeit moderately positive, correlation between the two dimensions. For example, the bulk of the research shows that a racially diverse student body is linked to a greater likelihood that students will interact with individuals from distinct racial and ethnic back grounds than their own. More frequent interracial contacts enhance interracial relations (Denson & Chang, 2009; Fischer, 2011; Zhou, 2012). In the current study, we interacted race with both structural diversity and interracial relations in order to examine their effects on students from distinct racial and ethnic backgrounds. In doing so, however, we limited our ability examine whether structural diversity and perceived interracial relations also had an interaction effect. Doing so would have led to the creation of a three-way interaction, which is difficult to interpret.

Second, an advantage of using survival analysis is its ability to account for the changing values of variables as individuals go through the study time period. We utilized this advantage by including students' cumulative effort to finish college as they persisted to the next time point. Future researchers may also consider modeling students' perceived quality of interracial relation as a time varying effect. In the current study, we measured the quality of interracial relation as time-invariant since NLSF does not provide this information for each wave of data. However, it is reasonable to expect that a student's overall perception of interracial relation would affect his or her persistence to graduation at each time point.

Conclusion

Gurin et al. (2002) assert, "research on whether and how diversity might affect education is of crucial legal and practical importance" (p. 332). While institutions have attempted to embrace racial diversity, diversity initiatives often compete with long-held institutional beliefs, assumptions, and practices that contradict such policies. During a time of budget crisis, diversity initiatives are often pushed back (Smith, 2009). Our study indicates that greater structural diversity and more positive interracial relations significantly increase the six-year graduation rates of students of color—an outcome that is of high stakes not only for students, but also for higher education institutions and the economic wellbeing of the nation.

References

Allen, J., Robbins, S. B., Casillas, A., & Oh, I. S. (2008). Third-year college retention and transfer: Effects of academic performance, motivation, and social connectedness. *Research in Higher Education, 49*, 647–664.

American Council on Education and American Association of University Professors. (2000). Does diversity make a difference? Three research studies on diversity in college classrooms. Washington, DC: American Council on Education and American Association of University Professors.

Ancis, J. R., Sedlacek, W. E., & Mohr, J. J. (2000). Student perceptions of campus cultural climate by race. *Journal of Counseling & Development, 78*(2), 180-185.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25*, 297–308.

Astin, A. W. (1993). *What matters in college? Four critical years revisited*. San Francisco, CA: Jossey-Bass.

Astin, A. W., & Antonio, A. L. (2012). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education* (2nd ed). Lanham, MD: Rowman & Littlefield.

Astin, A. W. (2005). Making sense out of degree completion rates. *Journal of College Student Retention, 7*, 5–17.

Bound, J., Lovenheim, M., & Turner, S. (2007). Understanding the decrease in college completion rates and the increased time to the baccalaureate degree. University of Michigan Population Studies Center Research Report No. 07-626. Retrieved from http://www.psc.isr.umich.edu/pubs/pdf/rr07-626.pdf

Brown, A. R., Morning, C., & Watkins, C. (2005). Influence of African American engineering student perceptions of campus climate on graduation rates. *Journal of Engineering Education, 94,* 263–271.

Chang, M. J. (2000). Improving racial diversity: A balancing act among competing interests. *Review of Higher Education, 23*, 153–175.

Chen, X. (2013). *STEM Attrition: College Students' Paths Into and Out of STEM Fields (NCES 2014-001)*. National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

Chimka, J. R., Reed-Rhoads, T., & Barker, K. (2008). Proportional hazards models of graduation. *Journal of College Student Retention, 9,* 221–232.

Cole, D., & Zhou, J. (2013). Do diversity experiences help college students become more civically minded? Applying Banks' multicultural education framework. *Innovative Higher Education, 39,* 109–121.

Cole, D., & Zhou, J. (2014). Diversity and collegiate experiences affecting self-perceived gains in critical thinking: Which works and who benefits? *Journal of General Education, 63,* 15–34.

Delgado, R. & Stefancic, J. (2006). *Critical race theory: An introduction.* New York, NY: The New York University Press.

Denson, N., & Chang, M. J. (2009). Racial diversity matters: The impact of diversity-related student engagement and institutional context. *American Educational Research Journal, 46*, 322–353.

DesJardins, S. L., Ahlburg, D. A., & McCall, B. P. (1999). An event history model of student departure. *Economics of Education Review*, *18*(3), 375-390.

DesJardins, S. L., Ahlburg, D. A., & McCall, B. P. (2006). The effect of interrupted enrollment on graduation from college: Racial, income, and ability differences. *Economics of Education Review, 25*, 575–590.

DesJardins, S. L., & McCall, B. P. (2010). Simulating the effects of financial aid packages on college student stopout, reenrollment spells, and graduation chances. *The Review of Higher Education, 33*, 513–541.

DesJardins, S. L., McCall, B. P., Ahlburg, D. A., & Moye, M. J. (2002). Adding a timing light to the "tool box". *Research in Higher Education*, *43*(1), 83-114.

Dowd, A. C. (2004). Income and financial aid effects on persistence and degree attainment in public colleges. *Education Policy Analysis Archives, 12*, 1–35.

Fischer, M. J. (2011). Interracial contact and changes in the racial attitudes of White college students. *Social Psychology of Education, 14*, 547–574.

Fletcher, J., & Tienda, M. (2010). Race and ethnic differences in college attainment: Does high school attended matter? *The ANNALS of the American Academy,* 144–166. DOI: 10.1177/0002716209348749.

Fordham, S. (1996). *Blacked out: Dilemmas of race, identity, and success at capital high*. Chicago, IL: University of Chicago Press.

Garcia, G. A. (2013). Does the percentage of Latinas/os affect graduation rates at 4-year Hispanic serving institutions (HSIs), emerging HSIs, and Non-HSIs? *Journal of Hispanic Higher Education, 12*, 256–268.

Gurin, P., Dey, E. L., Hurtado, S., & Gurin, G. (2002). Diversity and higher education: Theory and impact on educational outcomes. *Harvard Educational Review, 72*, 330–366.

Herzog, S., & Bowman, N. A. (Eds.). (2011). *Validity and limitations of college student self-report data*. SanFrancisco, CA: Jossey-Bass.

Hurtado, S., & Ponjuan, L. (2005). Latino educational outcomes and the campus climate. *Journal of Hispanic Higher Education, 4,* 235–251.

Hurtado, S., Carter, D. F., & Spuler, A. (1996). Latino student transition to college: Assessing difficulties and factors in successful college adjustment. *Research in Higher Education, 37,* 135–157.

Hurtado, S., Griffin, K. A., Arellano, L., & Cuellar, M. (2008). Assessing the value of climate assessments: Progress and future directions. *Journal of Diversity in Higher Education, 1*, 204–221.

Hurtado, S., Milem, J. F., Clayton-Pedersen, A., & Allen, W. R. (1998). Enhancing campus climates for racial/ethnic diversity: Educational policy and practice. *Review of Higher Education, 21,* 279–302.

Ishitani, T. T. (2003). A longitudinal approach to assessing attrition behavior among first-generation students: Time-varying effects of pre-college characteristics. *Research in Higher Education, 44,* 433–449.

Ishitani, T. T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. *Journal of Higher Education, 77*, 861–885.

Jones, W. A. (2011). Examining the relationship between student body racial diversity and college/university retention and graduation. Dissertation submitted to the faculty of the Graduate School of Vanderbilt University.

Kim, M. M., Rhoades, G., & Woodard Jr, D. B. (2003). Sponsored research versus graduating students? Intervening variables and unanticipated findings in public research universities. *Research in Higher Education, 44*(1), 51-81.

Massey, D. S., Charles, C. Z., Lundy, G. F., & Fischer, M. J. (2006). *The source of the river: The social origins of freshmen at America's selective colleges and universities*. Princeton, NJ: Princeton University Press.

Murtaugh, P. A., Burns, L. D., & Schuster, J. (1999). Predicting the retention of university students. *Research in Higher Education, 40,* 355–371.

Museus, S. D., Nichols, A. H., & Lamber, A. D. (2008). Racial differences in the effects of campus racial climate on degree completion: A structural equation model. *Review of Higher Education, 32,* 107–134.

National Center for Education Statistics. (2011). Percentage of first-time full-time bachelor's degree-seeking students at 4-year institutions who completed a bachelor's degree, by race/ethnicity, time to completion, sex, and control of institution: Selected cohort entry years, 1996 through 2005. Retrieved from https://nces.ed.gov/programs/digest/d12/tables/dt12_376.asp

National Longitudinal Study of Freshmen (NLSF). (2012). NLSF brochure. Retrieved from http://nlsf.princeton.edu/data.htm

Ogbu, J. U. (1991). Cultural diversity and school experience. In C. E. Walsh (Ed.), *Literacy as praxis: Culture, language, and pedagogy* (pp. 25–50). Norwood, NJ: Ablex.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research*. San Francisco, CA: Jossey-Bass.

Pewewardy, C., & Frey, B. (2002). Surveying the landscape: Perceptions of multicultural support services and racial climate at a predominantly White university. *The Journal of Negro Education, 71*, 77–95.

Rabe-Hesketh, S., & Skrondal, A. (2012). *Multilevel and longitudinal modeling using Stata*. (3rd ed.). College Station, TX: Stata Press.

Rankin, S. R., & Reason, R. D. (2005). Differing perceptions: How students of color and White students perceive campus climate for underrepresented groups. *Journal of College Student Development, 46*, 43–61.

Reason, R. D. (2009). An examination of persistence research through the lens of a comprehensive conceptual framework. *Journal of College Student Development, 50,* 659–682.

Singer, J. D., & Willett, 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*, 268–290.

Smith, D. G. (2009). *Diversity's promise for higher education*. Baltimore, MD: John Hopkins University Press.

Tierney, W. G. (1992). An anthropological analysis of student participation in college. *Journal of Higher Education, 63*, 603–618.

Tierney, W. G. (1999). Models of minority college going and retention: Cultural integrity versus cultural suicide. *Journal of Negro Education, 68*, 80–91.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*, 89–125.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago, IL: University of Chicago Press.

Titus, M. A. (2006a). Understanding the influence of the financial context of institutions on student persistence at four-year colleges and universities. *Journal of Higher Education, 77*, 353–375.

Titus, M. A. (2006b). Understanding college degree completion of students with low socioeconomic status: The influence of the institutional financial context. *Research in Higher Education, 47*, 371–398.

Wolf-Wendel, L., Ward, K., & Kinzie, J. (2009). A tangled web of terms: The overlap and unique contribution of involvement, engagement, and integration to understanding college student success. *Journal of College Student Development, 50*, 407–428.

Zhou, J. (2012). Pride and prejudice: Racial contacts affecting students' perceptions of their own race and of other races. Paper presented at the annual meeting of the Association for the Study of Higher Education, Las Vegas, NV.

Zwick, R., & Sklar, J. (2005). Predicting college grades and degree completion using high school grades and SAT scores: The role of student ethnicity and first language. *American Educational Research Journal, 42*, 439–464.

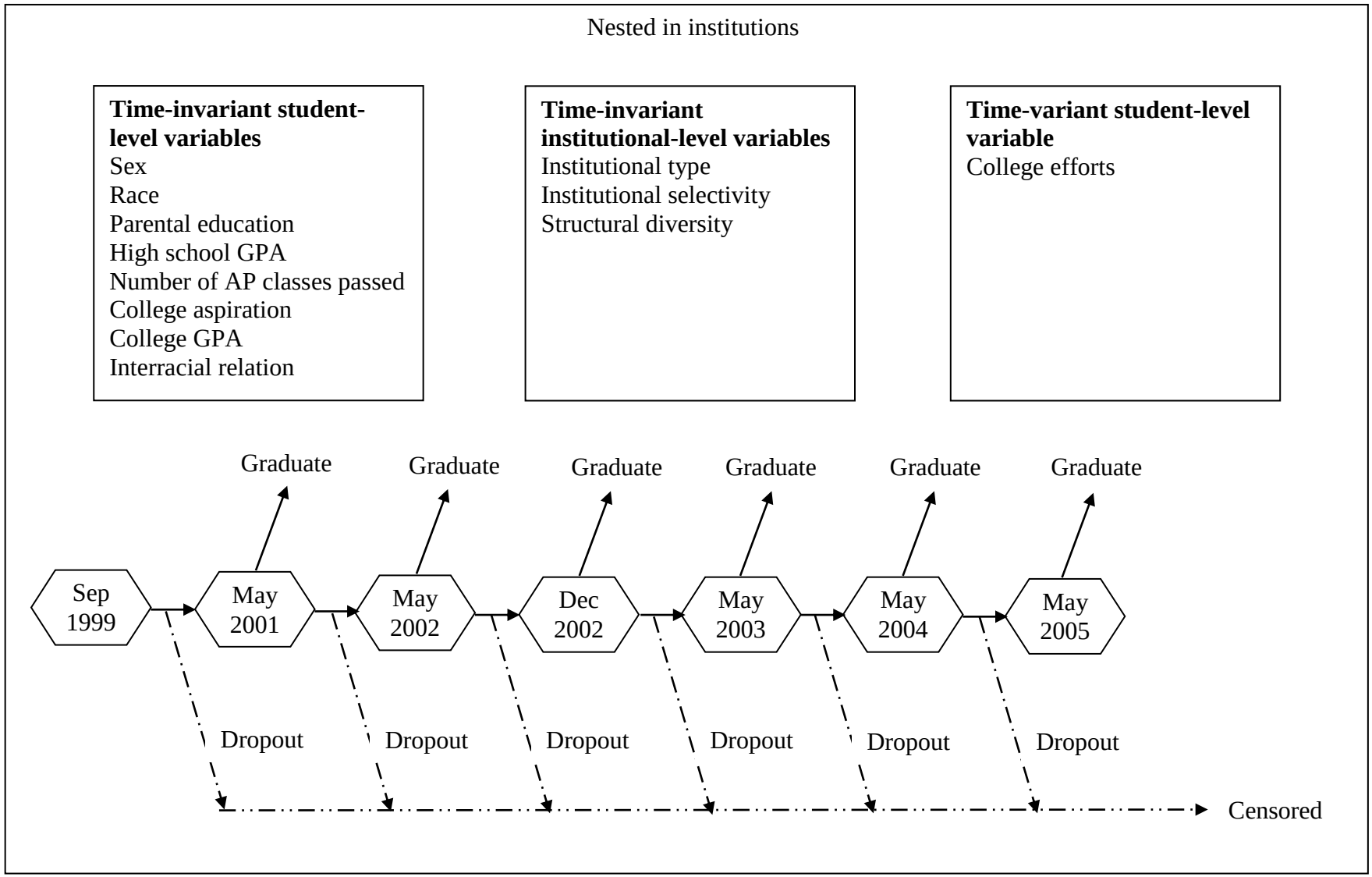

Figure 1. Multilevel discrete time survival model predicting students' persistence to graduation.

Table 1.

Life Table of Students' Persistence to Graduation

Time Interval	Begin Total	Graduate	Drop Out	Discrete Time Hazard	Standard Error	95% Confidence Interval	
Sep 1999–May 2001	3477	1	14	.0003	.0003	.0000	.0011
May 2001–May 2002	3462	28	172	.0081	.0015	.0054	.0113
May 2002–Dec 2002	3262	115	18	.0353	.0033	.0291	.0420
Dec 2002–May 2003	3129	2436	0	.7785	.0158	.7479	.8097
May 2003–May 2004	693	31	0	.0447	.0080	.0304	.0618
May 2004–May 2005	662	640	0	.9668	.0382	.8933	1.0431

Table 2.

Coding and Descriptive Statistics of Covariates

Variables and Coding	Mean	*SD*
Time-Invariant Student Level Variables		
Sex	.58	.01
female=1, male=0		
Race	2.46	.02
White=1, Asian=2, African American=3, Latino=4		
Parental Education	10.50	.05
Sum of father's and mother's education, grade school=1, some high school=2, high school=3, some college=4, college=5, some graduate=6, graduate or professional degree=7		
High School GPA	3.72	.31
overall GPA on a 4.0 scale		
Number of Advanced Placement Classes Passed	2.39	2.17
total number of all advanced placement classes passed		
College Aspiration (4-item composite, α=.701)	35.65	4.49
Likelihood of finishing two years of college, graduating from college, having post-graduation education, finishing graduate or professional degree, very unlikely=0, very likely=10		
College GPA	3.11	.42
overall GPA on a 4.0 scale		
Interracial Relation (3-item composite for each race)		
the perceived quality of interracial relation on campus between students' own racial group and each of the other three racial groups, very poor=0, excellent=10		
White students' interracial relation (α=.820)	17.13	5.08
Asian students' interracial relation (α=.859)	16.54	5.13
African American students' interracial relation (α=.712)	16.90	4.50
Latino students interracial relation (α=.727)	16.95	4.91

cont.

Table 2 (cont.)

Coding and Descriptive Statistics of Covariates

Variables and Coding	Mean	*SD*
Time-Invariant Institutional Level Variables		
Institutional Type	2.22	.60
Liberal arts=1, private research=2, public research=3		
Institutional Selectivity	19.49	13.21
Rankings based on U.S. News & World Report 2001-2002, ranked No. 1=1		
Percentage of Asian	.46	.50
Percentage of Asians in the undergraduate student body 2001-2002, more than 13%=1, equal or less than 13%=0		
Percentage of Underrepresented Minority	.39	.48
Percentage of URM in the undergraduate student body 2001-2002, more than 12%=1, equal or less than 12%=0		
Time-Variant Student Level Variables		
Accumulative College Efforts		
No effort=0, maximum effort=10		
Time point 1 (by Spring 2001, i.e., for the first two years)	13.89	3.02
Time point 2 (by Spring 2002)	21.39	3.85
Time point 3 (by Fall 2002)	25.15	4.45
Time point 4 (by Spring 2003)	29.20	4.48
Time point 5 (by Spring 2005)	35.69	6.85
Time point 6 (by Spring 2006)	42.96	7.29

Table 3

Factor Analyses of Perceived Quality of Interracial Relation Constructs

	No. of Factors Retained	Likelihood Ratio Test	Cronbach's α (std.)
White			
White and Asian White and African American between White and Latino	1	$\chi 2=844.68$ $p<.001$	.820
Asian			
White and Asian Asian and African American Asian and Latino	1	$\chi 2=1180.48$ $p<.001$	.859
African American			
African American and Asian White and African American African American and Latino	1	$\chi 2=446.48$ $p<.001$	.712
Latino			
Latino and Asian Latino and African American White and Latino	1	$\chi 2=536.50$ $p<.001$	.767

Table 4

Multilevel Discrete Time Survival Model on Persistence to Graduation (N=28, n=14673)

Event		Odds Ratio	Std. Err.	*p*	95% Conf. Int.	
Time to graduation (baseline=1)						
	11	22.65	23.11	**	3.06	167.38
	13	91.20	92.13	***	12.59	660.53
	15	15005.22	15177.49	***	2066.66	108947.3
	19	178.59	185.43	***	23.34	1366.70
	23	223172.4	236724.1	***	27909.47	1784553
Sex (reference=male)		1.31	.11	***	1.11	1.54
Parental education		1.03	.02	*	1.01	1.07
High school GPA		1.56	.22	**	1.18	2.06
Number of AP classes passed		1.07	.02	**	1.02	1.12
College aspiration		1.03	.01	***	1.01	1.05
Institutional type (reference=liberal arts)						
	Private research	1.04	.24		.66	1.63
	Public research	.38	.11	**	.22	.66
Institutional selectivity		.98	.01	*	.97	.99
College GPA		1.88	.18	***	1.55	2.28
College effort		1.04	.01	***	1.02	1.06
Race (reference=White)						
	Asian	.78	.30		.36	1.67
	African American	.44	.17	*	.20	.93
	Latino	.34	.14	**	.15	.76
Structural diversity						
	% Asian students	.73	.14		.50	1.08
	Asian*%Asian	1.71	.33	**	1.16	2.51
	% URM	.62	.13	*	.41	.95

cont.

Table 4 (cont.)

Multilevel Discrete Time Survival Model on Persistence to Graduation

Event	Odds Ratio	Std. Err.	*p*	95% Conf. Int.	
African American*%URM	1.67	.35	*	1.12	2.51
Latino*%URM	1.24	.14		.15	1.76
Interracial relation (IR)					
Asian IR	.99	.02		.97	1.03
Asian IR*Asian	1.01	.02		.97	1.05
African American IR	.98	.02		.94	1.01
African American IR*African American	1.01	.02		.97	1.06
Latino's IR	1.01	.02		.97	1.05
Latino IR*Latino	1.05	.02	*	1.01	1.10
Wald $\chi 2$	2894.19****				
Likelihood ratio test $\chi 2$	53.61****				

Note. *$p < .05$, **$p < .01$, ***$p < .001$, ****$p < .0001$. The odds of an event occurring in discrete-time survival analysis reflect the conditional odds that the event will occur, given that it has not yet occurred. In our study, the baseline was Spring 2001 (the end of sophomore year). Compared to this baseline, the odds of graduating at each of the following time points were significant. For example, if a student had not graduated by the end of his or her sophomore year and had not dropped out, the odds of graduating at the end of his or her junior year increased by 216%. The odds of graduating between 3.5 (mid junior year) and 6 years were extremely large and became less meaningful, due to the disproportionate number of students (only one) who graduated at Spring 2001 (end of sophomore year, the baseline) compared to the later time points.