Characteristics of Students Who Enroll in Summer Session

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ABSTRACT

Participation in summer session has benefits for students including improved retention and degree completion and increased contact with faculty (Adelman, 2006; DiGregorio, 1998). Just as some characteristics of students limit their access to participate in higher education in general, participation in summer session may also be affected by certain student characteristics. This study used a nationally representative sample to explore how undergraduate students who enroll in summer session may differ from undergraduate students who do not enroll in summer session in a variety of financial, geographic, academic, programmatic and cultural/social/physical characteristics historically associated with access to higher education.

Significant differences between summer enrolled and not enrolled students were found in a number of instances. Some characteristics that are negatively associated with enrollment, persistence and attainment in higher education were positively associated with summer enrollment. A regression analysis revealed that the combined predictive value of student characteristics accounts for only a small portion of the overall decision to enroll in the summer term.

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Chapter One

Introduction

Providing for-credit instruction to college students in the summer season has uniquely American roots. The earliest instances of this type of activity go back to the early to mid-19th century when a few individual faculty at America's oldest institutions led special courses and field studies during the summer to provide students with experiences that were not available during the fall and spring academic terms (Avent, 1925; Vincent, 1904). Later, growth in demand for trained teachers led to the widespread use of teacher institutes. Teacher institutes were usually sponsored by local or state boards of education and would convene for a period of one to four weeks, often in late summer immediately prior to the opening of the school year (Ogren, 2005; Young & McDougal, 1991). These institutes allowed teachers and administrators to improve their skills and earn credentials and were the informal forerunners of the normal school system (Avent, 1925). Teacher normal schools offered alternative schedules of study, including summer instruction, that allowed practicing educators and school administrators to obtain additional training and credentials during times that other schools were closed (Ogren, 2005; Young & McDougal, 1991).

More formally, Harvard University has offered some form of summer instruction since its early beginnings but it was the conversion from a common curriculum to an electives curriculum during the 1880s that cemented summer as a key component for students wishing to accelerate their degree completion (Schoenfeld, 1967). For-credit summer instruction became even more broadly integrated into the schedules of universities with the founding of the University of Chicago and William Rainey Harper's

"university plan." His innovative strategy established a year-round, quarter system of operation that included summer as a regular term in the overall plan for instruction. The quarter system was adopted widely by other institutions as higher education expanded across the country (Goodspeed, 1972). Summer session continued to grow in utility and enrollment through the mid-20th century, playing an important role in training teachers for the growing elementary and secondary education systems as well as training soldiers for two world wars and absorbing the enrollment of veterans returning from those wars (Young & McDougal, 1991).

By the mid-20th century, more than 1,000,000 students were participating in summer sessions at 1,100 institutions (Young & McDougal, 1991). During the 1960s, many colleges and universities used summer terms to accommodate rapidly growing enrollments that strained available classrooms and faculties and summer sessions began to commonly include a variety of course offerings that mirrored and complemented fall and spring terms (Young & McDougal, 1991). By this time, summer had become such a critical component of colleges' instructional programs that some observers predicted it would eventually be absorbed into the regular academic calendar and lose all distinction from the fall and spring terms (Schoenfeld & Zillman, 1967). However, this prediction did not come to pass. Summer session has not been incorporated into the regular academic calendar and continues to have a distinct role at most institutions.

Summer term instruction differs from fall and spring semesters in its calendar, the nature and range of its course offerings, and its administrative structure. The academic calendar for summer is often divided into two or more short terms that do not run the entire summer. This different course calendar leads to alternative course formats and

offerings. Summer courses are often delivered in a more intensive format of longer and more frequent class meetings over a shorter period of time. In addition, not every course that is taught in fall and spring is offered in the summer. Rather, institutions, and in particular academic departments and their faculties, make deliberate decisions about which courses out of their overall portfolio of courses will be offered during the summer and in what format courses will be delivered (Neidy & Griggs, 2008).

Lastly, the administrative structure of summer terms often differs from fall and spring. Summer term can be managed strategically to generate significant additional income for an institution because of its unique cost and revenue structure. Academic-year faculty, whose teaching contracts are only for fall and spring semester are generally paid at the equivalent of an adjunct rate without full fringe benefits for summer instruction (Fanjoy, 2008). However, most colleges and universities charge the same (or slightly discounted) tuition and fees for summer term as they do for fall and spring terms (Fanjoy, 2008). In an environment of growing academic capitalism, the surplus generated by a lower cost structure matched to the same revenue structure makes summer term an important source of net revenue for institutions (Doane & Pusser, 2005).

The differences between summer term and fall and spring semesters point to significant benefits for institutions, faculty, and students and it is access to the benefits for students that are of particular interest to this study. Specific benefits that have been supported in the findings of prior research include:

- Improved probability of degree completion (Adelman, 2006; Boyd, 1996; Knight, 2002)
- Acceleration of time to degree (Knight, 2002; Taylor, Lee, & Doane, 2001)

- Greater student and faculty interaction (DiGregorio, 1998; Ho & Karagiannidis, 2007).

These demonstrated benefits and additional assumed benefits are described more fully in Chapter 2.

Access and the Summer Session

If the benefits of summer sessions are understood to be of value, then access to this benefit should be of interest to citizens and policy makers. Therefore, the question of which students enroll or do not enroll in summer term is an important one for research. Questions regarding access to summer session are therefore an important subset of the larger range of questions regarding which individuals participate or do not participate in higher education overall. It follows that access to the benefits of summer session may reasonably be studied using the same conceptual frameworks that are used to understand access to higher education more generally.

Access to higher education is a construct with varied meanings and uses and defining access is essential to understanding the conceptual framework employed in this study. Adelman (2007) offers a multi-dimensional definition of higher education access. At the minimum, there is threshold access; that is, any accomplishment of an individual to enroll into an institution and to have something generated on a transcript. This initial entry access is enhanced when individuals also have the ability to move in and out of the higher education system as they need to (recurrent access), when they can attend at the times and locations of their choosing (convenient access), and when they can attend the institution of their choosing (distributional access). Thus, enrollment in higher education is an initial measure of access.

However, enrollment alone is an incomplete view of access. Staying in college or the idea of persistence also falls under the larger umbrella of access to higher education (Adelman, 2006, 2007; Pascarella & Terenzini, 2005; Tinto, 1993) and attaining the educational goal or credential to which an individual aspires is the ultimate measure of opportunity for and access to higher education (Callan, 2001; St. John & Chung, 2006b). Because summer participation has a demonstrated relationship to student persistence (Adelman, 2006), these elements of access that go beyond simple enrollment are also important to this study. Therefore, for purposes of this study, a multi-faceted definition of access includes not only getting into college (enrollment) and participating on terms that meet the student's life circumstances (persistence) but also ultimately achieving the educational credential that is of value to the student (attainment).

A definition is only one step in understanding the phenomenon of access. A definition describes what access is but does not help to predict access or explain why some individuals have access and others do not. Studies on access to higher education in general often focus on characteristics of individuals that promote or hinder access. Similarly, it is reasonable to identify characteristics that promote or hinder access to summer session enrollment. A few, small scale studies described in Chapter 2 have identified demographic characteristics of students who attend summer session at a particular institution or group of institutions. These limited studies are not sufficient for a broad understanding of summer session access and a broad range of access related characteristics that might impact that opportunity. Therefore, a conceptual framework that entails a broad understanding of personal characteristics as they relate to obtaining access is needed. Heller (2001a) provides such a framework.

Heller (2001a, p. 2) has identified five components of higher education access as follows:

> Financial accessibility: Does the student have the financial resources necessary to attend college? Geographic accessibility: How far does a potential student have to travel to attend college? Programmatic accessibility: Is the academic program that the student wants available? Academic accessibility: Has the student had the proper academic preparation in her or his precollegiate years? Cultural/social/physical accessibility: Do precollege students receive the necessary encouragement and support to attend college from their parents, families, peers, schools, and others? Do some policies (either de jure or de facto) prohibit or encourage the enrollment of students from particular groups, such as racial minorities, or older non-traditional college students? Are there physical barriers to attendance, especially for students with a disability that limits their mobility?

This expanded definition of access and the characteristics that have historically been associated with access to higher education (Financial, Geographic, Programmatic, Academic, Cultural/Social/Physical) served as the conceptual framework for my exploratory study. Access to summer session, the dependent variable was operationalized as Enrollment in the Summer Term. The independent variables were selected and tested based on their relationship to the characteristics that have historically contributed to or been barriers to a student's ability to participate in higher education.

Previous studies of summer session that used national level samples have not focused on the characteristics of students. Martin (1997) and Young and McDougal

(1988) focused on organizational and administrative structures in their national studies of summer session offices. Adelman (2006) touched on summer attendance as one of many factors that affect attainment in his summary of national level data. Schejbal (2005) focused on national economic cycles as they relate to overall increases or decreases in summer attendance. In contrast, this study used a national dataset structured to be representative of the overall student population of the United States and focused on student characteristics.

Statement of the Problem

In summary, the American system of higher education has enjoyed a long history of summer session activities that have met the special needs of various types of students (Avent, 1925; Schoenfeld, 1967; Vincent, 1904; Young & McDougal, 1991). Although summer session has become much more closely integrated into the regular instructional patterns of many institutions, it has retained its distinction from fall and spring semesters in terms of calendar, course offerings and financial structure. The differences of summer from its fall and spring counterparts are what make it a source of unique benefits for students who are able to participate (Adelman, 2006; Boyd, 1996; DiGregorio, 1998; Ho & Karagiannidis, 2007; Knight, 2002).

Because there are significant benefits to students of enrolling in summer session (Adelman, 2006; Boyd, 1996; DiGregorio, 1998; Ho & Karagiannidis, 2007; Knight, 2002; Taylor, et al., 2001), access to summer sessions is an important question. Access may be defined as enrollment into college, persisting in college on terms that meet the student's life circumstances, and attainment of the educational credential that is of value to the student (Adelman, 2006, 2007; Callan, 2001; Pascarella & Terenzini, 2005; St.

John & Chung, 2006b; Tinto, 1993). To fully appreciate and promote access to summer session for the individual, it is reasonable to use a model of factors that aid or hinder access to higher education in general. Heller (2001a) provides a multi-dimensional list of factors that have historically been thought to affect a person's ability to participate in postsecondary education. These characteristics include Financial, Geographic, Programmatic, Academic and Cultural/Social/Physical Factors.

While some researchers have explored the characteristics of students who attend summer session at individual or a small number of institutions (Gotshall, 2005; Harris & Fallows, 2002; Jenkins, et al., 2007; Patterson, Sedlacek & Tracey, 1981) there are few studies that have looked at summer participation nationally (Adelman, 2006; Schejbal, 2005). The largest national studies of summer session have focused more on administrative structures and institutional mission and not on the characteristics of students participating in summer (Martin, 1997; Young & McDougall, 1988). Where student characteristics in summer have been considered in national studies (Adelman, 2006), researchers have not examined a wide array of factors that may influence participation in summer session. No studies have looked systematically at a broad range of student characteristics that impact on summer enrollment and no studies have reviewed a large national sample of students to identify the characteristics that predict summer enrollment. My study addressed these two important gaps in the literature.

Purpose Statement

The purpose of this study was to understand the access-related characteristics of undergraduate students that make them more or less likely to enroll in the summer term. The factors explored included Financial, Geographic, Programmatic, Academic, and

Cultural/Social/Physical characteristics of students (Heller, 2001a). For purposes of this study, students who were enrolled in June of 2008 at a four-year, semester system institution, either full or part-time, were considered summer session participants.

The sample included undergraduate students enrolled in four-year institutions during academic year 2007-08 who participated in the National Postsecondary Student Aid Study (NPSAS) (National Center for Education Statistics, 2010e). Variables that operationalized the conceptual model were selected, screened and recoded as needed. Univariate analysis on each characteristic using independent samples t-test and chi-square analysis sought to find significant differences between the characteristics of students who enrolled and those who did not enroll in summer session. A series of logistic regression models using these factors were then fitted to determine the combined predictive value of the significant factors for participation or non-participation in summer session.

Research Questions

Two broad research questions were explored in this study:

1. Do the access related characteristics of undergraduate students who enroll in the summer session differ from those who do not enroll in summer?
2. To what degree do these access related characteristics predict enrollment in summer session?

Significance of the Study

This study was significant for practice, research and policy. In terms of practice, several campus constituencies may benefit from its results. These groups include enrollment managers, summer session administrators, academic advisors, and faculty. Enrollment managers are charged with accurately projecting enrollment potentials for the

institution and then taking steps to ensure those enrollment projections are met. This study helped enrollment managers better understand the characteristics of students who attend in summer and how those characteristics might differ from the fall and spring population. Understanding the characteristics of those more likely to attend in summer may help enrollment managers better predict the appeal of their institution's summer offerings to their own undergraduate population and thereby more accurately project anticipated enrollments and take steps to increase those enrollments.

Many institutions also employ summer session directors who are charged with managing and marketing summer session offerings. This study offered summer session administrators a conceptual frame they might use to compare the profiles of their summer students with a national profile. Understanding the characteristics of students who are likely to enroll in summer allows summer session administrators to target programs and market programs to likely participants. Likewise, a better understanding of the characteristics of students who are unlikely to attend in summer allows administrators to take actions to ensure that students who could benefit but are not likely to attend summer session understand the benefits and have assistance in overcoming barriers to participation.

Likewise, academic advisors who counsel students in mapping out their plans of study and completing degree requirements may use the results of this study to inform their guidance to students. Understanding the personal characteristics of individual students that might promote or prohibit their participation in summer session allows the advisor to assess more realistically the potential for a student to participate in a summer session. The advisor can make alternative plans that best fit the student or can provide

assistance in overcoming barriers to summer participation if that is what the student needs.

One study of faculty perceptions regarding summer students found that most faculty thought that summer students did not differ significantly from fall and spring students (Patterson, et al., 1981). This research may reveal differences between summer and fall/spring students that exist but may not be readily visible to faculty. Better information about the types of students in the classrooms in the summer may allow faculty to structure course content and methods in ways that better serve the population of students more likely to attend in summer.

This study also has significance for future research. This study looked exclusively at student-related factors that predicted summer enrollment. There are undoubtedly other factors that affect the likelihood of a student enrolling in summer session. A future study might look at institutional characteristics that predict summer enrollment or at teaching practices, course offerings and formats, and academic calendars that encourage or discourage summer participation.

This study was also limited to studying the choice to enroll in summer session as a measure of access to the benefits of summer session participation. A future study might look more fully at specific course enrollments of students and summer instructional practices of faculty that best lead to the expected benefits of summer session participation.

This study provided a snapshot of summer session choices including the effect of grant aid on those choices in the summer of 2008. That same year, the Pell Grant program of the Higher Education Act was amended to provide access to a "year-round"

grant that was expected to reduce the need to borrow funds to attend in summer (Wyckoff, 2008). The impact of this policy change was not reflected in this study since this study drew from 2007-2008 enrollment data. A future study could compare the impact of financial need on summer attendance before and after this change in the Pell Grant program to determine if the policy decision was effective.

This study explored summer enrollment decisions indirectly through a national dataset intended to collect information on financial aid and its effects on access to higher education. A future study could structure questions more directly suited to summer and students' decision to attend in summer, as has been proposed by Kowalik (2005). In particular and because of data limitations, I did not explore students' choice to attend in summer at an institution other than the one they normally attend in fall and spring. Accumulating credits from multiple institutions is an increasingly common practice of non-traditional college students (McCormick, 2003).

Finally, this study was significant in terms of future policy. There is interest on the part of federal policy makers in the impact of financial aid on summer session participation. Although the program has since been defunded, removing barriers to summer participation was the reason for the changes made to the Pell Grant program in 2008 (Wyckoff, 2008). The results of this study may identify other financial and non-financial factors and their impact on participation in summer session. Federal policy makers may use the findings to assess barriers for those who would benefit from summer participation.

State enrollment planners can also benefit from the information found in the results of this study. Summer session is an under-utilized portion of the academic year at

most institutions. The capacity and willingness of institutions, both public and private, to accept more summer enrollments can help states meet growing enrollment demands (Demetrulias, 2005). In addition, the benefits of summer session enrollment include support for persistence and acceleration of degree completion among students (Adelman, 2006; Boyd, 1996; Knight, 2002; Taylor, et al., 2001), a key policy outcome for state policy leaders (Hayter, 2007). State enrollment planners may use the findings of this study to better understand who does and who does not attend in summer and thereby shape policy decisions to promote attendance by those who would benefit most.

Institutional boards and policy makers can benefit from the findings of this study. Summer session is not only an important source of revenue but also helps institutions meet other institutional missions and goals (Dev, 2005; Doane & Pusser, 2005; Martin, 1997). Understanding the characteristics of students who participate or do not participate in summer session programming nationally can help university boards and policy makers better understand the specific characteristics of summer attendees and may point to untapped populations that might yield additional summer enrollment. It may also help them identify and remove barriers at their institution that prevent certain populations from participating in summer session.

Delimitations

As with all research, this study had some initial delimitations. Several of them were sample-related as this study used a national database not specifically structured to explore questions regarding summer participation. The sub-sample in this study excluded students enrolled in two-year institutions and trade schools. Since this study focused on factors that influence the decision to attend in summer, it was necessary to filter out

institutional characteristics that might distort a distinctive comparison with fall and spring enrollments. Trade schools often have a year-round operating calendar that could have clouded the results. Also, two-year institutions would have made the impact of class-level (first year, second year, third year etc.) difficult to determine. It is possible that students attending two-year schools and trade schools differ from the sub-sample used in this study and no inferences regarding their behavior were sought through this study.

The sub-sample used in this study also excluded students enrolled at institutions not using a semester system, that is a fall and spring semester with an intervening summer session. For purposes of this study, the definition of summer participation was enrollment in June of 2008. Students in schools on the quarter system might still have been enrolled in spring quarter during the month of June 2008 and were therefore excluded from the sample. Summer participation of students at quarter system schools may or may not differ from those at schools on a semester calendar. No inferences regarding students at schools using the quarter or other non-semester calendar systems were addressed in this study.

The sub-sample was also limited to students who attended a single institution during the 2007-08 academic year. Students may choose to attend a different institution during the summer than the one they attend in fall and spring. The structure of this financial aid dataset did not allow exploration of those who enrolled in a different institution in the summer. The choice of students to attend another institution during the summer is an area of suggested further research and is not addressed by this study.

This study looked at all schools that fit the four-year, semester calendar profile. Most institutions offer summer session courses, however, it is possible that some schools

that fit the profile of institutions selected for this study do not offer summer session courses. There may be students included in the sample who did not attend summer session at their regularly enrolled institution because no summer session classes were offered there.

Despite these delimitations, this study made an important contribution to the body of knowledge regarding student participation in summer sessions. A national study of student participation in summer sessions using multiple factors related to access has never been conducted. This study also established a baseline for comparison of studies of summer participation using future waves of the NPSAS data.

Organization of the Study

This study is organized around five chapters. Chapter One introduced the topic of the study, the benefits of summer session and the importance of access to summer session in preparation for presenting the research questions explored by the study and their significance. Chapter Two describes the literature that informed the study. Chapter Three details the methodology of the study including sampling techniques, data collection, data screening and transformation, and the analysis methods. Chapter Four outlines the results of the analyses and Chapter Five discusses the overall implications of the study's results.

Chapter Two

Literature Review

This study addressed a gap in the literature regarding the access-related characteristics of undergraduate students that make them more or less likely to enroll in the summer term. The access-related factors explored included Financial, Geographic, Programmatic, Academic and Cultural/Social/Physical (Heller, 2001a). This chapter describes the existing literature that informs this study both in terms of access to higher education in general and the characteristics within these five factors that could impact access to enrollment in the summer term. The chapter concludes with a synthesis of access-related characteristics that guided the selection of the specific variables explored in this study.

Financial Accessibility

Financial accessibility refers to the availability of financial resources necessary for the individual to attend college (Heller, 2001a). The relationship of financial factors to enrollment and attainment is well documented (Heller, 1999, 2001b; Leslie & Brinkman, 1988; St. John, Chung, Musoba, & Simmons, 2006). Across the United States population, the higher the cost of education for individuals and the lower their personal income the less likely they are to attend college (Heller, 1999, 2001b; Leslie & Brinkman, 1988). The availability of aid, especially in the form of grants, helps to increase enrollment and attainment (Heller, 1999, 2001b; Leslie & Brinkman, 1988; St. John, Chung, Musoba, & Simmons, 2006).

Student loans can also help families defer the cost of education into the future thus enabling access (Breneman, 1991). During the period 1996 to 2004 the percentage

of families and students borrowing funds to pay educational costs increased from 25% to 33%, with the most dramatic increase in the number of students using unsubsidized loans (from 10% to 21%) (Wei & Berkner, 2008). Combined student and parent borrowing accounts for about 47% of the total amount families pay for education (Sallie Mae, 2010).

Another method of financing higher education is to work full or part-time while enrolled. On average, students pay about 9% of their college cost from student income and savings (Sallie Mae, 2010). However, the cost of education and the ability or willingness of parents to contribute to that cost for dependent students affects the number of hours a student is likely to work while enrolled in college (Kalenkoski & Pabilonia, 2008). Low income students are more likely to need to work to help pay their cost of education and as a result are more likely to enroll part-time and less likely to persist in their enrollment (King, 2003). Students who are working to support themselves while in college are less likely to attend full-time and often do not earn enough to cover their cost of education and living expenses. Yet, they are also likely to receive less financial aid because they are working and possibly enrolled part-time (McSwain & Davis, 2007). These students are also at risk of not completing their degrees (Horn & Carroll, 1996; McSwain & Davis, 2007).

Independent student status (students who are no longer dependents of their parents) and the need to work while enrolled can combine to create substantial barriers to access. Independent students often do not have this same level of family support and must work to cover college expenses (Kalenkoski & Pabilonia, 2008). Independent students are also at risk for failure to persist and attain a credential (Horn & Carroll, 1996).

Some studies specific to summer session have touched on financial access factors. For instance, in a study of students at 10 universities who chose to use summer to shorten their time to degree, 23% of the students reported that financial pressures were an important factor in their decision (Taylor, et al., 2001). A study of summer-enrolled students at a single, large public institution found that 60% of the students enrolled in summer were working either full or part-time (Patterson, et al., 1981). In a single school of business, students were motivated to attend in summer by financial factors, specifically those surrounding obligations to pay a lease during the summer and the opportunity to use up available scholarship funds (Chandler & Weller, 1995). Students who did not receive financial aid were more likely than students who did receive financial aid to attend in summer in the University of North Carolina System (Jenkins, et al., 2007). In all instances, however, these studies were limited to a single or discrete set of institutions.

Because summer trails fall and spring in terms of financial aid planning, many students do not have remaining grant funds to support summer instruction after paying for academic year expenses. Consequently, the availability of and willingness to use loans for financial aid plays into the decision to attend in summer. Graduating students at a single university reporting their satisfaction with the level of loans they received indicated that some regretted not borrowing more so that they could have attended year-round (Manton & English, 2002). A review of the borrowing trends of Gates Millennium Scholars also found that those who borrowed funds in addition to their scholarship did so primarily to support summer attendance not covered by the Gates Millennium Scholars program (Erisman & McSwain, 2006).

Geographic Accessibility

Geographic access refers to opportunities or barriers for students to travel to attend the college of their choice (Heller, 2001a). Geographic access figures importantly into conversations about the future of higher education, particularly the predicted increase in the use of distance learning technology to deliver higher education and a predicted reduction in the number of physical campuses (Levine, 2001). In terms of overcoming geographic barriers with technology, the creation and continued success of the Western Governors University is an example of geographic barriers being transcended (if not erased) through the creation of a completely virtual university that allows students to enroll and take classes without traveling to a campus (Kinser, 2002). Nationally, the highest ranked reasons that institutions give for offering distance education courses surround issues of access including providing access to college and meeting student demands for flexible schedules and making courses more available (Parsad & Lewis, 2008).

In terms of the physical location of campuses, a case study of campus placement for the University of Texas at San Antonio and the impact of placement decisions on the educational opportunity for underrepresented students found that when a new main campus and a new branch campus were placed in suburban neighborhoods, access by Latinos and socioeconomically underrepresented students was adversely affected (Briscoe & De Oliver, 2006). Due to the cost of on-campus housing or the cost of commuting to distant campuses, the participation of students who cannot afford to or choose not to live on campus may be different than that of residential students.

Other studies show that socio-economic factors that affect attendance are also sometimes related to where a student lives before attending college and can affect educational attainment. Students who come from the extremes of the urban/rural spectrum can experience inequality of educational access due to the range of economic and social factors that are present in inner city areas and extremely rural areas (Roscigno, Tomaskovik-Devey, & Crowley, 2006; Smith, Beaulieu, & Seraphine, 1995).

Geographic factors found in studies specific to summer session include the on- or off-campus residence of students and their home's proximity to the campus. Students who live off-campus and are obligated to pay a lease during the summer see benefit in remaining at school and attending class during the summer (Chandler & Weller, 1995). Another study of summer enrolled students at a single large public university found that only 6% of students enrolled in summer reported that they lived in a campus residence hall (Patterson, et al., 1981). Harris and Fallows (2002) found that when summer courses were first offered at their British institution, the majority of students who participated lived within easy reach of the school or along convenient routes that led to the school.

Programmatic Accessibility

Programmatic access refers to whether the subject a student wants to study is available (Heller, 2001a). Dimensions of programmatic access can include: availability of a program of study, the ability to enter into and be successful in a program of study, and the varied demands of assorted programs of study. The popularity of different programs of study varies over time as individuals consider the possibilities of various careers (Pryor, Hurtado, Saenz, Santos, & Korn, 2007). One particular trend related to programmatic access is the increasing percentage of students who enter higher education

with an undeclared major. This percentage has increased from 2.2% in 1970 to 7.2% in 2006 (Pryor, et al., 2007). Selection and acceptance into a major is a measure of social and academic integration and students who enter and continue in college without selecting a major are at risk of dropping out before successfully completing a degree (Tinto, 1993).

Several small scale studies have referred to programmatic elements in relation to summer enrollment. A 1990 review of existing summer programs in Australia found that the most common program offerings in summer were in education, business, arts, law, sciences, and languages. The most common enrollments were in business programs (Richmond & Piper, 1991). The choice to attend in summer was motivated by the opportunity to prepare more fully in a specific major field of study for about a third of the students who attended summer at a single university (Keller, 1982). Chandler and Weller (1995) in a study of 300 students attending a single institution found that sophomore students who had not been admitted into a major (undeclared majors) were particularly motivated by the opportunity to gain admission to their program of choice by completing summer courses rather than meeting regular admissions requirements. Harris and Fallows (2002) also found that students at a single British institution thought of summer as a time to take courses that were outside their normal program of study.

Once in a program of study, retention and progression to the next class level in that field of study is the path to degree attainment. Some small scale studies have found that summer participation may vary by class level. For example, Patterson et al. (1981) found the distribution of class levels differed significantly for summer enrolled students. In their survey of students at a single large public university only 19% of summer

students reported themselves as freshman or sophomores while 48% described themselves as juniors or seniors. The remainder (33%) was graduate students or "other." Similarly, Gotshall (2005) and Jenkins et al. (2007) found that juniors and seniors were more likely to plan to attend summer session than were freshman or sophomores.

Academic Accessibility

Academic access refers to the academic preparation of students to pursue their desired fields of study. Academic factors may be divided into those that students bring with them into higher education and those that they experience after enrollment in higher education. In regards to those characteristics students bring with them into higher education, Adelman (2006) cited the "academic intensity" of a student's secondary preparation as an indicator of momentum toward enrollment and ultimate degree completion. Participation in advanced mathematics is a common measure of academic intensity but can have mixed predictive value (Horn & Nunez, 2000; St. John & Chung, 2006a). Looking more specifically at the academic factors that impact enrollment and degree attainment, St. John and Chung (2006b, 2006c) found that higher scores on standardized tests in high school and taking the Scholastic Aptitude Test (SAT) or American College Test (ACT) are both significant predictors of college enrollment and completion of a four-year degree.

Students who drop out of high school have a much lower probability of enrolling in higher education (St. John & Chung, 2006c). The idea of obtaining a high school diploma is not as obvious as it may seem and points toward the multiple pathways that individuals may take into higher education and through higher education. Some persons do not complete a standard high school curriculum but may later complete a General

Equivalency Diploma (GED) or other high school completion certificate to qualify for college entry. Students who complete a non-traditional high school diploma and/or who experience a delay between high school and college may have lower persistence and attainment rates than traditional students that enter college directly from high school (Horn & Carroll, 1996). Once in college, students may not follow a standard four-year curriculum at a single college to complete their degree (Longanecker & Blanco, 2003; McCormick, 2003; St. John, Chung, Musoba, & Chung, 2006).

There are also additional academic factors that can influence attainment (Heller, 2001a). Students who are marginal academic performers in high school can be accepted into college but may continue to struggle academically (Horn, Chen, & Adelman, 1998). Adelman (2006) found that students' first-year grades, the number of credit hours in which they are enrolled, and the number of credit hours they complete in summer all contribute positively to the odds of graduating from college. These findings were duplicated by Knight (2002) in a study at a single university of factors that lead to degree attainment in four years. Related to intensity of study, students who are enrolled part-time are at risk for not persisting and not attaining a degree (Horn & Carroll, 1996).

Studies specific to summer participation also reference academic factors. For example, a survey of students at 10 universities found that those with lower mean SAT scores and mean GPAs are more likely to participate in summer sessions (Taylor, et al., 2001). The opportunity to retake a course and earn a better grade is a commonly cited opportunity that summer may provide to students facing academic challenges (Kowalik, 2005). Boyd (1996) found that students who were academically dismissed in the spring at a single large public institution of higher education and who participated in a summer

academic program that allowed them to be readmitted in the fall term if successful had greater persistence after being readmitted than those who did not participate in the summer program. Chandler and Weller (1995) found that students were motivated to attend in summer by the opportunity to lighten their course load during the regular academic year. A study of students at a single British institution found that students thought of summer as a time when they could retake a failed course, make up a missed course, or get ahead by taking courses in advance of the coming fall term (Harris & Fallows, 2002).

It is not just academic struggles that may lead students to attend in summer. The intensive format of summer classes and the opportunity for additional student-faculty interaction during the summer can be a reason for students to enroll (Kowalik, 2005). Daniel (2000) found that part-time students generally favored courses delivered in a time-shortened format. Students also report higher overall ratings for courses delivered in an intensive format (Kucsera & Zimmaro, 2010). Interaction with faculty outside the classroom can improve retention for students who may be at risk in terms of degree completion (Pascarella, 1980; Pascarella & Terenzini, 1979) and studies point to the opportunity for faculty interaction as a possible reason for attending summer session (DiGregorio, 1998; Ho & Karagiannidis, 2007; White, 1999).

Other studies of summer enrolled students have emphasized the desire of students to shorten their time to degree. Respondents in a three-year study of summer session students in a single department at an Australian university indicated that the opportunity to complete their degree in a shorter timeframe was the overwhelming reason for their participation in summer session (White, 1999). Taylor, Lee and Doane (2001) also found

that interest in decreasing time to degree was a primary motivator for summer attendance. Martin (1997) reviewed the mission statements of summer session offices at a nationwide sample of colleges and universities. He found that helping students accelerate their time to degree, providing different formats for instruction and opportunities for intensive learning were common academic reasons for universities to offer a summer term program.

Cultural/Social/Physical Accessibility

Cultural/Social/Physical access refers to whether individuals receive proper encouragement to attend higher education and do not face policies, practices or physical barriers that prevent them from attending (Heller, 2001a). While Heller's description speaks of psychological, policy and physical barriers external to the student, it is the personal characteristics of the student and the impact on their ability to enter and complete higher education that make these barriers apparent. Therefore, the literature review for this type of accessibility focuses on demographic and physical characteristics that may impact a student's probability of enrollment and attainment.

The demographic variables of race, gender and age remain pertinent to issues of access to higher education. National studies point out both the demographic barriers and the progress that has been made in overcoming those barriers to higher education. During the past 40 years the entering freshman class has changed from one that was predominantly white, 18-22 years old and male to a diverse community of mostly female and older students (National Center for Education Statistics, 2009). Still certain races continue to be underrepresented in higher education. Perna (2000, 2007) highlighted the particular challenges to access and attainment that Black and Hispanic students continue

to face. Additionally, access and attainment for women has not been even across all fields, in particular the science and technology fields that advance the modern economy (Chen & Weko, 2009; Pryor, et al., 2007). Changes in the age demographics of entering students also challenge the instructional and student services of institutions that have traditionally been geared toward the 18-22 year old dependent student. Attainment for older students is challenged when institutions do not have options for flexible pathways to degree completion (King, 2003; McCormick, 2003).

One important way researchers have attempted to measure the impact of complex socioeconomic demographic factors is to look at the educational level of parents and in particular the experiences of first generation college students (Pascarella, Pierson, Wolniak, & Terenzini, 2004). Individuals who may have significant academic ability but whose parents did not attend college often do not enroll due to a lack of family support and encouragement (Horn & Nunez, 2000). Even if students do enroll in college, their background can influence their ability to attain a degree. Woodard, Mallory and De Luca (2001) summarized cultural and social characteristics from three decades of retention research and highlighted family support, self-efficacy, identity, and a sense of purpose as factors that may promote or challenge degree attainment.

Another group of individuals who face challenges to attainment are orphans and foster children. Individuals who grow up in foster care are less likely than their peers to take college preparatory classes in high school and to attend higher education (Blome, 1997). A study of 216 foster youth attending four-year colleges found that a majority of the students felt that the foster care system had not prepared them well for college (Merdinger, Hines, Osterling, & Wyatt, 2005). In addition, almost 75% of these students

reported they were working to support themselves while in college and therefore faced the financial access challenges described earlier in relation to independent working students (Horn & Carroll, 1996; Kalenkoski & Pabilonia, 2008).

When considering the increase in non-traditional age groups attending college, other demographic characteristics come into play as well. For example, students who have dependents and those who are single parents experience lower levels of persistence and attainment than students who do not have dependents or children (Horn & Carroll, 1996). In addition, an increasing number of veterans are participating in college. These students are older and more likely to be enrolled part-time than non-military dependent undergraduates (Radford, Wan, & Weko, 2009).

Some students face physical and psychological barriers to enrollment and attainment. In a study of 2007-08 college students,11% of enrolled undergraduate students reported having a specific learning disability, visual handicap, hearing or speech impairment, orthopedic handicap, or other health impairment (National Center for Education Statistics, 2009). Research on the challenges these students face has been summarized by Frieden (2003) who found that people with disabilities are less likely to start postsecondary education than are their peers. When they do pursue postsecondary education, students with disabilities are significantly more likely to be enrolled in vocational or less than four-year degree programs. Students with disabilities are less likely to complete a degree or certificate than are their peers without disabilities; and on average they will take twice as long as other students to complete their degree. (National Coucil on Disability, 2003).

There are some small scale studies that have examined student social and cultural characteristics and their impact on summer attendance. Patterson et al. (1981) studied the demographics of a random sample of summer session students at a single large public institution and found that more women than men enrolled in summer. The mean age of the summer students was 25.8 years which was significantly older than students in the regular term. Jenkins, Brown and Yang (2007) also found that more women than men enrolled in summer and that Asian and American Indian students were more likely to enroll than White or Hispanic students. In a review of several studies of time-shortened courses across several disciplines that included those taught in an accelerated format during the summer, researchers found that adult students generally favor the accelerated format (Daniel, 2000). When a pilot program of summer instruction was offered for the first time at a British university, researchers found that the participants were predominantly female (70% versus 57% during the academic year) and were older than the normal fall and spring population of students (Harris & Fallows, 2002). The research is equivocal, however. One small scale study found no difference in summer session attendance between men and women (Taylor, et al., 2001). No studies connecting orphan or foster child status, veteran status or physical disability to summer enrollment were found in the literature.

Summary of Characteristics

In conclusion, a broad range of student characteristics can impact participation in higher education. National studies have documented the impact of financial factors on access to higher education. Access is affected by the cost of education (Heller, 1999, 2001a; Leslie & Brinkman, 1988) and the availability of aid in the form of grants (Heller,

1999, 2001a; Leslie & Brinkman, 1988; St. John, Chung, Musoba, & Simmons, 2006), loans (Breneman, 1991; Sallie Mae, 2010; Wei & Berkner, 2008), and personal or family income (Heller, 1999; Leslie & Brinkman, 1988) to help pay that cost. Independent students do not have access to family income to help with the cost of education (Horn & Carroll, 1996; Kalenkoski & Pabilonia, 2008). Some students may work full or part-time while enrolled to help offset costs (Horn & Carroll, 1996; Kalenkoski & Pabilonia, 2008; King, 2003; McSwain & Davis, 2007; Sallie Mae, 2010). Small scale studies specific to summer session enrollment have found that cost of degrees and housing can be a factor in choosing to enroll in summer (Chandler & Weller, 1995; Taylor, et al., 2001), that summer enrolled students are often working full or part-time (Patterson, et al., 1981), and that the availability of financial aid and loans may play into the decision to enroll in summer (Chandler & Weller, 1995; Erisman & McSwain, 2006; Jenkins, et al., 2007; Manton & English, 2002).

Geographic factors such as where a student's permanent home is located, where students are living while enrolled, and their participation in distance education may also influence access to higher education. National studies highlight distance education as a method of overcoming geographic barriers to enrollment (Kinser, 2002; Levine, 2001; Parsad & Lewis, 2008) and that students from the extremes of urban and rural locations may be at a disadvantage when it comes to entering and completing higher education (Roscigno, et al., 2006; Smith, et al., 1995). Briscoe and De Oliver (2006) found that the location of a student's permanent home relative to the location of the institution can be a barrier to enrollment. Studies specific to summer session have also highlighted on or off-

campus living arrangements and proximity to the campus as factors that influence enrollment (Chandler & Weller, 1995; Harris & Fallows, 2002; Patterson, et al., 1981).

Programmatic factors such as availability of desired majors (Pryor, et al., 2007) and being an undeclared major (Pryor, et al., 2007; Tinto, 1993) may affect a student's decision to enroll or stay enrolled in college. Small scale studies have also identified programmatic factors including the desire to explore different majors (Chandler & Weller, 1995; Keller, 1982; Richmond & Piper, 1991) or to move from an undeclared major to a declared major (Chandler & Weller, 1995; Harris & Fallows, 2002) as reasons students may enroll in summer. Other studies found that students who enroll in summer tend to be juniors and seniors rather than freshman or sophomores (Gotshall, 2005; Jenkins, et al., 2007; Patterson, et al., 1981).

Access to higher education is also affected by academic factors including the preparation the student receives for advanced studies while in high school both in terms of general curriculum (Adelman, 2006) and advanced mathematics (Horn & Nunez, 2000; St. John & Chung, 2006a). Completing high school and college in a non-traditional manner (Horn & Carroll, 1996; Longanecker & Blanco, 2003; McCormick, 2003; St. John & Chung, 2006c; St. John, Chung, Musoba, & Chung, 2006) or experiencing a delay between high school and college enrollment (Horn & Carroll, 1996) may also impede a person's opportunity to enroll and complete higher education. Once enrolled in college, many students may struggle academically (Adelman, 2006; Horn, et al., 1998; Knight, 2002) and/or may lower their academic intensity by enrolling part-time (Horn & Carroll, 1996). Small scale studies have also linked summer session enrollment to academic factors such low SAT scores or GPAs (Taylor, et al., 2001) and opportunities

to lighten regular session course loads or retake courses (Boyd, 1996; Chandler & Weller, 1995; Harris & Fallows, 2002; Kowalik, 2005). Opportunities for more student-faculty interaction (DiGregorio, 1998; Ho & Karagiannidis, 2007; Kowalik, 2005; Pascarella, 1980; Pascarella & Terenzini, 1979; White, 1999), alternative course formats (Daniel, 2000; Kucsera & Zimmaro, 2010), and a shorter time to degree (Martin, 1997; Taylor, et al., 2001; White, 1999) have also been cited as reasons for summer enrollment.

Students' access to higher education may also be challenged by their Cultural/Social/Physical situations. Race, gender and age are commonly studied characteristics that point to underrepresentation of certain groups in higher education in general or in certain types of academic programs (Chen & Weko, 2009; King, 2003; McCormick, 2003; Perna, 2000, 2007; Pryor, et al., 2007). National studies have shown that family context including educational level of parents (Horn & Nunez, 2000; Pascarella, et al., 2004), encouragement received from parents and family (Horn & Nunez, 2000; Woodard, et al., 2001), status as an orphan or foster child (Blome, 1997; Merdinger, et al., 2005) and having children or other dependents (Horn & Carroll, 1996) can play a role in the decision to enroll or stay enrolled in college. Veteran status (Radford, et al., 2009) and having a physical and mental disability (National Coucil on Disability, 2003) may also present barriers to access. Studies specific to summer enrollment have reported demographics such as age (Daniel, 2000; Harris & Fallows, 2002; Patterson, et al., 1981), gender (Harris & Fallows, 2002; Jenkins, et al., 2007; Taylor, et al., 2001), and race (Jenkins, et al., 2007) in summer enrollees but have not studied whether these demographic factors are predictors of enrollment.

As can be seen in the review of the literature, many characteristics related to access to higher education in general have also been identified with participation or non-participation in summer session in small scale studies. However, no studies have looked systematically at a broad range of student characteristics and their impact on summer enrollment. Also, no studies have looked nationally at a large sample of students to identify the characteristics that predict summer enrollment. My study addressed these two important gaps in the literature.

Chapter Three

Methodology

The purpose of this study was to understand the access related characteristics of undergraduate students that make them more or less likely to enroll in the summer term. The factors explored included Financial, Geographic, Programmatic, Academic and Cultural/Social/Physical characteristics of students (Heller, 2001a). Specifically, I sought to address the following two research questions:

1. Do the access related characteristics of undergraduate students who enroll in the summer session differ from those who do not enroll in summer?
2. To what degree do these access related characteristics predict enrollment in summer session?

This chapter describes the methodology used to answer these research questions by providing a description of the National Postsecondary Student Aid Study, describing the sampling and data collection procedures used for the NPSAS 2008, and describing the data analysis procedure.

Description of National Postsecondary Student Aid Study

The National Postsecondary Student Aid Study (NPSAS) is an on-going research project of the National Center for Education Statistics (NCES) at the U.S. Department of Education (USDOE) (National Center for Education Statistics, 2010e). The NPSAS study was first conducted in 1986-87 and has been repeated every three to four years (Cominole, Riccobono, Siegel, & Caves, 2010; Wei et al., 2009). The main purpose of the on-going NPSAS study is to obtain data to provide "a comprehensive research dataset based on student-level records, on financial aid provided by the federal government, the

states, postsecondary institutions, employers, and private agencies, along with student demographic and enrollment data" (National Center for Education Statistics, 2010e, p. 1). The NPSAS study is a primary source of information for the USDOE to inform financial aid policy in general and in particular, policies related to the Stafford Student Loan program and Pell Grant programs.

Although the primary purpose of the study relates to financial aid, the data collected in the NPSAS includes a wide variety of information regarding institutional, individual, and family characteristics. This makes the NPSAS a rich source of data for exploring a wide range of higher education topics and in particular topics related to access. Data collected through the NPSAS are used by NCES in the Baccalaureate and Beyond (B&B) (National Center for Education Statistics, 2010a) longitudinal study and the Beginning Postsecondary Students study (BPS) (National Center for Education Statistics, 2010b).

Sampling Procedures

The target population for the NPSAS survey was all eligible students enrolled at Title IV participating postsecondary institutions in the United States or Puerto Rico between July 1, 2007 and June 30, 2008. NPSAS employed a two-stage sampling design that selected institutions for participation and then students within those institutions. A stratified sampling methodology was used for selection of institutions and students (Cominole, et al., 2010; Wei, et al., 2009). A stratified sample divides the total population into subdivisions and makes random selections within each of the subdivisions for purposes of allowing estimates to be made for the separate stratum of the overall sample (Pedhazur, 1991). In the first stage, the survey team selected 1,940

institutions with strata based on institutional control (public/private), institutional level (less than two-year, two-year, two to three-year and four-year), highest degree offering, number of degrees in education (to ensure sufficient numbers of education majors), and state. Some types of institutions and students were intentionally oversampled in the selection process to ensure that an adequate number of students were included in the various strata of the sample (Cominole, et al., 2010; Wei, et al., 2009).

Study administrators asked the selected institutions to provide enrollment lists of students who were currently enrolled in either an academic or vocational program or in at least one course for credit that could be applied toward an academic degree. A total of 1,730 (89%) of the selected institutions provided the requested enrollment lists (Cominole, et al., 2010). From those lists, the study administrators selected students with sample strata based on student level, including students who were receiving a degree in 2008 (to provide a sufficient sample for the B&B study that is drawn from the NPSAS data), other undergraduate students, master's students, doctoral students, other graduate students, and first professional students. The selection process oversampled students from certain states to provide a representative sample of these states' populations that would support state specific studies. Business students were undersampled and education majors were oversampled.

The stratified selection procedures resulted in an initial sample of 137,800 students. Eligibility conditions for students included enrollment in (a) an academic program; (b) at least one course for credit that could be applied toward an academic degree; or (c) an occupational/vocational program that required a minimum number of hours and awarded a degree, certificate or other formal award. Selected students could

not be concurrently enrolled in high school or enrolled solely in a GED or other high school completion program (Cominole, et al., 2010). Of the initial sample,132,800 students were found eligible to participate as study respondents and at the completion of data collection 127,700 students had sufficient data. The resulting weighted response rate was 96% of eligible students (Cominole, et al., 2010).

Instrumentation and Data Collection

Once a student was identified as a study participant, data for that student were gathered from multiple sources including: (a) student records from institutions of higher education, (b) federal information systems including the Central Processing System, (c) the National Student Loan Data System, (d) the National Student Clearing House, (e) the Integrated Postsecondary Education Data System (IPEDS), standardized college admissions tests including the SAT and ACT databases and, (f) interviews/surveys with individual students (Cominole, et al., 2010; Wei, et al., 2009). Institutions provided data on registration, admissions, enrollment, tuition, and financial aid through a computer assisted data entry (CADE) format. The registration and admissions information provided by the institution included local and permanent addresses, other contact information, personal demographic characteristics, and scores on admissions tests. Enrollment and tuition information included enrollment by month during the 2007-08 academic year, field of study, class level, and the amount of tuition and fees paid or offset by a state prepaid tuition program. The specific institutional elements under financial aid included need analysis for the student and institutional aid awards to the student. The financial aid section also collected other identifying student information including social security number and last name. This information allowed the survey team to obtain data

from other federal financial aid databases on Pell Grants and federal student loans (Cominole, et al., 2010; Wei, et al., 2009).

A survey instrument was administered to the student participants. The survey was created to be used as both a self-administered on-line survey or to be used in CADE format for phone interviewing. The instrument included nine topical areas: eligibility and enrollment history, expenses and financial aid, student employment, educational experiences, and background and demographic information. There were also two sections administered only to graduating undergraduates regarding future employment plans and teaching experience (Cominole, et al., 2010).

Reliability and Validity

The NPSAS study used data drawn from multiple sources. Due to the complexity and importance of the national study, the researchers took several steps to ensure the reliability and validity of the data. These steps were carried out in a one-year field test of the methodology that included interviewer training, efforts to increase response rates, and examination of surveys and specific survey items. This field test resulted in changes to the actual study methodology (Cominole et al., 2008).

Reliability. A reliable survey results in consistent responses. To determine the reliability of a survey instrument, researchers look at the internal consistency of the instrument as well as the consistency over time. Internal consistency refers to whether responses to similar questions within the questionnaire are similar. Consistency over time or test-retest reliability refers to whether responses to the questionnaire are the same over time. Unless the survey is intended to measure changes in attitudes over time, the same questions should elicit similar responses when asked at a later date (Suskie, 1996).

For the NPSAS study a test-retest method in which a random sample of respondents completed the survey a second time and their responses were compared for consistency was used to measure and improve the reliability of the student survey. Reliability of certain items in the instrument was evaluated on an item by item basis and by survey delivery method (i.e., self-administered or interviewer administered) with percent agreement between tests ranging from a low of 54% to 100%. Reliability statistics for each item were calculated using Cramer's V, Kendell's tau B, and Pearson's product-moment correlation coefficient r. Cramer's V relational statistic scores ranged from .31 to 1.00. Kendell's tau B scores ranges from .55 to .82 and Pearson's product moment correlation coefficient r scores ranged from .29 to.97. Overall the questionnaire was found to be reliable and individual items that exhibited low reliability scores were evaluated and revised if possible before the administration of the actual survey (Cominole, et al., 2008). No variables that exhibited low relational statistics in the field test were used in this study.

In addition, an analysis of nonresponse to survey items was conducted as part of the field test. Some non-responses were attributed to the sensitive nature of the data such as family income or grade point average. Other nonresponses were due to question wording or sequences. Changes were made to the final wording of the survey to reduce the occurrence of non-responses (Cominole, et al., 2008).

Validity. Validity refers to whether "one can draw meaningful and useful inferences from scores on the instruments" (Cresswell, 2003, p. 157). The three dimensions of validity that a study design must consider are content validity, predictive validity, and construct validity. Content validity is concerned with whether an instrument

measures the content it was intended to measure. Predictive validity looks at whether the instrument can predict scores against another objective criteria. Construct validity is concerned with whether the instrument actually measures the idea or concept that it is intended to measure (Cresswell, 2003).

Of these three criteria, content validity and predictive validity were most relevant to the overall construction of the NPSAS survey while construct validity has particular relevance to the behavior this specific research project explored, that is, enrollment in the summer term. The NCES research team took several steps to ensure the content and predictive validity of their data collection methods. In addition to the test-retest evaluation of the specific survey questions and non-response analysis previously described, the field test team also tested the accuracy of enrollment information submitted by the institutions by comparing the information with other sources of data such as the IPEDS. Where counts were inconsistent with other reporting or data were found to be missing or incorrectly classified by the institution, follow-up calls were made to reconcile and correct the data submission (Cominole, et al., 2008). Range and consistency checks were also conducted to ensure that data elements collected were in valid or reasonable ranges. Cross item comparisons were made to ensure consistency among surveyed facts such as birth date and high school graduation. A bias analysis was conducted on survey items where the response rate was less than 85%. There was a low institutional response rate for private not-for-profit less than four year institutions and for private for-profit less than two year institutions. The bias analysis for institutional information sought to determine if the responses received varied significantly from the characteristics of the total population where that information could be determined.

Institution responses and characteristics were compared with data collected in IPEDS and missing variables were imputed using IPEDS information. Six survey items had response rates of less than 85%. For the survey items that had low response rates resulting in missing data, values were imputed using the characteristics of other student respondents and the bias analysis determined whether the imputation process reduced the bias as compared to the data available before imputation (Cominole, et al., 2010; Wei, et al., 2009).

Construct validity is concerned with whether the instrument actually measures the more abstract idea or concept that it is intended to measure (Creswell, 2003). This study sought to measure students enrolled during summer term. For purposes of this study the definition of a student enrolled in summer term was one who was enrolled in June 2008 at a semester-based school. This definition assumed that semester-based schools had ended their spring semester sometime prior to June and had begun summer session by the end of June. This assumption was supported by definitions used in a nationwide survey. Ashford (2001) found that 66.4% of institutions used an early semester calendar that began at the end of August and ended in early to mid-May. Another 3.6% used a traditional semester calendar that began in early September and ended in early to mid-May. The IPEDS definition of a semester calendar system is consistent with this study definition and states that a semester system "consists of two sessions called semesters during the academic year with about 15 weeks for each semester of instruction. There may be an additional summer session" (National Center for Education Statistics, 2010d, "Semester").

Information regarding the calendar system and month-by-month enrollment pattern of the student participants came from institutional records and not from the student survey. In NPSAS the calendar system information was populated from the 2004 iteration of the NPSAS study where available and was confirmed or entered by institutional administrators in their initial contact with the research group during the institution selection process (Cominole, et al., 2010). Student enrollment by month also came from institutional records provided in the student selection process (Cominole, et al., 2010). National definitions of semester terms, each institution's self-identification of its calendar system and the student's enrollment during the summer month of June supported the construct validity of the summer term enrollment variable.

Methodology of Present Study

The purpose of this study was to understand the access related characteristics of undergraduate students that make them more or less likely to enroll in the summer term. A five-step analysis process was undertaken to answer the two research questions posed in the study. First, a subsample of student cases was selected from the larger NPSAS sample and then weighted for analysis. Second, variables from NPSAS that represented the student characteristics identified in the conceptual framework that guided the study were selected. The selected variables were screened and recoded as necessary to best address the research questions and the chosen statistical techniques used to analyze the data. Third, univariate analyses were conducted on each of the selected variables. Significant differences between summer enrolled students and non-enrolled students were identified using independent samples t-test and chi-square analysis. Fourth, the characteristics that were significantly different in the univariate analyses were tested and

screened for strong correlations. Lastly, the variables that were significantly different in the univariate analyses were entered into a series of logistic regression models to determine the degree to which they predicted a student's choice to enroll (or not enroll) in summer term. These steps are described more fully in the following three sections on (a) sample selection and weighting, (b) variable selection, screening and recoding, and (c) data analysis methods. Statistical analysis was conducted using SPSS version 17 and Excel spreadsheets.

Sample Selection and Weighting. The NPSAS sample included 127,700 eligible students both undergraduate and graduate from a variety of institution types. The research questions in this study are concerned with a specific type of student, therefore a subsample of the overall sample was chosen. Subsample selection was determined by the research questions. This study focused on undergraduate student choices so only undergraduate participants were selected for analysis. To filter the effects of alternative calendar institutions and proprietary or two-year institutions on student attendance patterns, only students who attended a four-year institution on the semester system were selected for analysis. Lastly, this research focused on students' choice to attend the same institution in summer as they attended during the regular academic year. Therefore, only students who attended a single institution during the study year were selected for analysis. Specific variables used to select the subsample and their impact on filtering the sample are shown in Table 1.

The NPSAS study involved a complex sampling strategy that oversampled some populations to ensure enough cases for analysis of those populations. Weights were applied to each case for the sample so that analysis results would represent the overall

Table 1

Selection of Subsample

Selection Criteria	Variable Name & Criteria	n	%
All NPSAS Participants		127,700	100.0%
Undergraduate Students	STUDTYPE = 1 Undergraduate	109,600	85.8%
Four Year Institution	SECTOR = 1 Public 4 Year or 2 Private not for profit 4 year.	67,250	52.7%
Calendar System	CALSYS = 1 Semester	98,780	79.2%
Attended One Institution	STUDMULT = 1 Single Institution	118,270	92.6%
Total Subsample		39,020	30.5%

Note: n rounded to nearest 10.

population. The restricted dataset included a raw weight variable intended for use in adjusting each case by the individual's probability of selection. Using the raw weight alone in the SPSS statistical packages will overstate the sample size (Thomas, Heck, & Bauer, 2005). To eliminate overstatement of the sample size by the statistical package a relative weight was calculated. The relative weight was the raw weight for each case divided by the mean raw weight of the total sample:

$$\frac{w_i}{\overline{w}}$$

where $\overline{w} = \frac{\sum w_i}{n}$. This relative weight adjusted for oversampling in the design and was used in all analyses. Design effects may also result from using nested data and were addressed through the application of a more rigorous threshold of statistical significance ($p \leq .01$) in both the univariate and logistic regression analyses (Thomas, et al., 2005). The resulting weighted subsample of students was 39,020 or 31% of the total weighted survey sample and 36% of the total weighted undergraduate survey sample.

The distribution of the subsample by institutional size and type is shown in Table 2. Key demographic characteristics, including the gender, age, race/ethnicity and income level distribution of the resulting subsample are described in Table 3. While this study did not consider institutional characteristics as a predictor of summer enrollment, it is important to note that institutional factors may affect summer session attendance. For example, some institutions do not offer summer session and there may be students in the sample who did not attend summer session at their regularly enrolled institution because no summer session classes were offered. This is a delimitation of this study as described in Chapter 1.

Table 2

Institution Characteristics of Subsample

Institution Characteristic	n	%
Enrollment Size		
Very Small (<1,000)	670	1.7
Small (1,000 - 2,999)	4,560	11.7
Medium (3,000 – 9,999)	10,000	25.6
Large (10,000 or greater)	23,800	61.0
Institutional Control		
Public	28,540	73.1
Private	10,490	26.9

Note: n rounded to nearest 10.

Carnegie Size Classifications (Carnegie Foundation for the Advancement of Teaching, 2011).

Table 3

Demographic Characteristics of Subsample

Demographic	n	%
Gender		
Male	17,800	45.6
Female	21,220	54.4
Age Group		
Age 15-23	28,560	73.2
Age 24-29	5,340	13.7
Age 30 and Above	5,120	13.1
Race/Ethnicity		
American Indian or Alaska Native	860	2.2
Asian	2,580	6.6
Black or African American	5,390	13.8
Hispanic or Latino Origin	4,530	11.6
Native Hawaiian/Other Pacific Islander	480	1.2
Other	1,030	2.6
White	29,930	76.7
Family/Independent Student Annual Income		
$0 to $25,000	9,560	24.5
$25,001 to $50,000	7,750	19.9
$50,001 to $75,000	6,380	16.4
$75,001 to $125,000	9,500	24.3
Greater Than $125,000	5,840	15.0

Note: n rounded to nearest 10. Categories for race ethnicity are not mutually exclusive so number of cases adds to more than subsample and percentages add to more than 100%.

Variable Selection, Screening, and Recoding. The factors explored in this study included Financial, Geographic, Programmatic, Academic, and Cultural/Social/Physical characteristics of students. While this conceptual framework (Heller, 2001a) provided an overall guide to the study, it was necessary to further define the conceptual framework by identifying specific NPSAS variables that would broadly but accurately support exploration of the five factors. The selected variables then needed to be screened and in some cases transformed or recoded for analysis.

Variable selection. The selection of the variables was guided by the literature review and started with the broad list of access related characteristics identified in that review. In selecting NPSAS variables a principle of selecting the most simple or direct definition of the factor without introducing unnecessary complexity and interrelatedness was followed. The following is description of the variables chosen under each grouping of the five access elements that are the framework for this study (Heller, 2001a).

The first element is Financial access or the availability of resources necessary for an individual to attend college (Heller, 2001a). Consistent with the the primary purpose of the survey, the NPSAS data set includes a wide variety of cost and financial aid variables. For purposes of this study the following NPSAS variables were chosen as representative variables for the characteristics identified through the literature review. Cost of education is represented by Student Budget (BUDGETAJ). Personal and/or Family Income is represented by Total Income of Parents or Independent Student (CINCOME). Availability of grants and loans is represented by the two variables Ratio of Grant Aid to Student Budget (GRTCST) and the Ratio of Loan Aid to Student Budget (LOANCST2) respectively. Working while enrolled is described by the variable Work

Intensity While Enrolled (JOBENR) and independent student status is found in the variable Dependency Status (DEPEND). These six NPSAS variables were used to explore the Financial access element.

The second element of the framework is Geographic access or the opportunities and barriers for students to travel to attend the college of their choice (Heller, 2001a). The literature review identified four characteristics with corresponding variables that were selected for analysis. Participation in distance learning is represented by the variable Took Distance Education Courses in 2007-08 (DISTEDUC). In the survey, respondents were prompted to consider distance learning courses as those primarily delivered using live, interactive audio or videoconferencing, pre-recorded instructional videos, webcasts, CD-ROM, or DVD, or computer-based systems delivered over the Internet. Distance education did not include correspondence courses. There are also variables that describe the Distance of the NPSAS Institution from the Student's Home (DISTHOME) and the degree of urbanization of the student permanent home (LOCALEST). Lastly, the status of the student in living on or off campus is represented by the variable Residence While Enrolled (LOCALRES).

Programmatic access refers to whether the desired study major is available to the student (Heller, 2001a). The literature review in this area revealed three major factors related to access and summer session that were readily apparent in three NPSAS variables. The factors are student major represented by the NPSAS variable Field of Study (MAJORS12), interest in changing majors as represented by the variable Major Ever Formally Changed (MAJCHG), and class level which is reported in the variable Undergraduate Class Level During the 2007-08 Academic Year (UGLVL1).

Academic access refers to the academic preparation of students to pursue their desired fields of study (Heller, 2001a). The NPSAS survey collected information on both the high school and postsecondary academic achievement of students. Completing advanced mathematics in high school was cited as a factor related to degree completion and is represented by the variable Highest Level of Math Completed (HCMATHHI). SAT scores are also an access indicator and are reported in the NPSAS variable SAT Derived Combined Score (TESATDER). Type of high school diploma and a delay between entering high school and college are represented by the variables High School Degree Type (HSDEG) and Delayed Enrollment into Postsecondary Education In Years (DELAYENR). GPA in college is an indicator of students who may be struggling academically and is reported in the NPSAS variable Grade Point Average (GPA). Being enrolled in college only part-time is another identified risk factor for degree completion and is reported in the variable Attendance Pattern (ATTNSTAT).

One Academic access factor is represented by a variable derived from several other NPSAS variables. The study variable representing completion of a rigorous high school curriculum (RIGOROUS) was derived from five separate NPSAS variables that describe how many years of English, mathematics, science, social science and foreign language study each student completed while in high school (HCYSENGL, HCYSMATH, HCYSSCIE, HCYSSOCI, HCYSLANG). All cases where the student completed four years of English, at least three years of math, at least three years science, at least three years of social science and at least one year of foreign language were computed as having completed a rigorous curriculum. This selection of courses is based

on curriculum requirements for the federal Academic Competitiveness Grants program (U.S. Department of Education, 2010).

There were four Academic characteristics identified in the literature review for which no related NPSAS variable could be found. Specifically, the academic access characteristics of needing to make up a failed course, seeking alternative course formats, seeking contact with faculty and seeking to accelerate degree completion were not captured by any of the NPSAS variables therefore those potential characteristics are not available for analysis in this study.

The fifth access element in the Heller (2001a) framework is Cultural/Social/Physical access and refers to whether individuals receive proper encouragement to attend higher education and do not face policies, practices or physical barriers that prevent them from attending. This element includes race which is represented by seven individual race/ethnicity variables in NPSAS (RAINDIAN, RAASIAN, RABLACK, HISPANIC, RAISLAND, RAOTHER, RAWHITE). The demographic variables of gender and age are also represented by the NPSAS variable Gender (GENDER) and Age Group as of 12/31/2007 (AGEGROUP). Parental education levels were identified as a possible cultural and social characteristic and selection of the variable Either Parents Highest Education Level (PAREDUC) allows exploration of that factor. Status as an orphan or foster child is represented by the variable Orphan or Ward of the Court (ORPHAN). Having dependents and being a single parent are challenges to access and are represented by the NPSAS variables Has Any Dependents (DEPANY) and Single Parent Independent Student (SINGLPAR) respectively. Veteran students are identified in the variable Veteran Status (VETERAN). Lastly, physical and mental

barriers to access are reflected in the inclusion of the variable Has Some Type of Disability (DISABLE).

In all, 40 access related variables were selected for screening, transformation, recoding and analysis. Table 4 shows the characteristics described in the literature associated with each of the five elements of the Heller (2001a) framework and the corresponding NPSAS variable(s) chosen to represent those characteristics. In addition to the characteristics under the five factors, the variable of enrollment status in June of 2008 (ENR12) was also selected as the dependent variable for this study.

Variable screening, transformations, and recoding. All variables were reviewed prior to analysis. As a result of this review, modifications were made to several of the variables to facilitate the usefulness of the variable for the chosen analysis techniques or to facilitate answering the research questions at hand. The following is a description of the screening carried out for continuous and categorical variable types and a description of any transformation or recoding made to the variables with justifications for modifications.

Continuous variable screening, transformation and recoding. There were eight continuous variables selected for analysis. All were screened for normality of distribution and outlier cases. All eight variables displayed positive or negative skewness in their raw form as demonstrated by a skewness to standard error of skewness ratio greater than 1.96 (Warner, 2008). Visual inspection of the distributions also confirmed non-normal patterns of distribution. Data transformation was considered for all variables and applied in two cases where it effectively reduced skewness and kurtosis in the distribution. Even with transformation these two distributions violated assumptions of

Table 4

Access Factors from Literature Review and Related NPSAS Variables

Access Factor	NPSAS Variable Description	Variable Name
Financial		
Cost of education	Student budget (attendance adjusted)	BUDGETAJ
Personal/Family income	Total income of parents or independent student	CINCOME
Availability of grants	Ratio of grant aid to student budget	GRTCST
Availability of loans	Ratio of loans to student budget (includes Parent PLUS)	LOANCST2
Working while enrolled	Work intensity while enrolled (excluding work study/assistantships)	JOBENR
Independent student status	Dependency status	DEPEND
Geographic		
Participation of the student in distance learning	Took distance education courses in 2007-08	DISTEDUC
Distance from the student's permanent home to the institution attended	Distance from NPSAS school to home	DISTHOME
Degree of urbanization of the student's permanent home	Degree of urbanization of student's address	LOCALEST
Status of the student in living on or off campus while enrolled	Residence while enrolled	LOCALRES
Programmatic		
Selected major of study	Field of study: undergraduate (12 categories)	MAJORS12

Table 4 (continued)

Access Factors from Literature Review and Related NPSAS Variable

Access Factor	NPSAS Variable Description	Variable Name
Interest in changing major of study	Majors: Ever formally changed	MAJCHG
Year of undergraduate study	Undergraduate class level during the 2007-08 academic year	UGLVL1
Academic		
Academic intensity of secondary school program (derived)	Years of study planned or completed in high school English, Math, Science, Social Science, Foreign Language[a]	HCYENGL HCYMATH HCYSSCIE HCYSSOCI HCYLANG
Advanced math in high school	Highest level of math completed/planned	HCMATHHI
Scores on college entrance exams	SAT derived combined score	TESATDER
Type of high school diploma	High school degree type	HSDEG
Delay between high school and college	Delayed enrollment into postsecondary education – Number of Years	DELAYENR
GPA in college	Grade point average	GPA
Struggling academically		
Needing to make up a failed course	No related NPSAS variable	
Enrolled part-time versus full-time	Attendance Pattern	ATTNSTAT
Seeking an alternative course format	No related NPSAS variable	
Seeking contact with faculty	No related NPSAS variable	
Seeking to accelerate degree completion	No related NPSAS variable	

Table 4 (continued)

Access Factors from Literature Review and Related NPSAS Variable

Access Factor	NPSAS Variable Description	Variable Name
Cultural/Social/Physical		
Race/Ethnicity	Race: Asian	RAASIAN
	Race: Black or African American	RABLACK
	Race: Indian or Alaskan Native	RAINDIAN
	Race: Latino origin	HISPANIC
	Race: Native Hawaiian/Other Pacific Islander	RAISLAND
	Race: Other	RAOTHER
	Race: White	RAWHITE
Gender	Gender	GENDER
Age	Age group as of 12/31/2007	AGEGROUP
Parental education level/First generation status	Either parents highest education level	PAREDUC
Orphan or foster child	Orphan or ward of court	ORPHAN
Have dependents	Has any dependents	DEPANY
Single parent	Single-parent independent students	SINGLPAR
Veteran/military status	Veteran status	VETERAN
Mental or physical Disability	Disability: has some type of disability	DISABLE

Note. [a] Study variable derived from these five NPSAS variables.

normality and these violations are noted in the reporting of results. Two other continuous variables with significantly skewed distributions were converted from continuous to categorical data. All results of transformed continuous variables are reported in the original measurement units. A description of individual continuous variable transformations and recoding follows.

The NPSAS variable Student Budget (BUDGETAJ) is a continuous variable that describes the total cost of attendance for the student. The distribution of this variable was negatively skewed due to the larger number of students enrolled in public universities that would typically have a lower cost of attendance than the smaller population of students enrolled in private institutions with a higher cost of attendance. This variable was transformed to the study variable Square Root of Student Budget (SQRTBUDGETAJ). The square root transformation reduced skewness and kurtosis but did not achieve the assumptions of a normal distribution (skewness/SE of skewness = 28.75).

Similarly, the NPSAS variable Total Family Income (CINCOME) was strongly negatively skewed. The family income variable is drawn from financial aid information systems and reports total family income for 2006 for both dependent and independent students. The income variable ranges from $0 to $500,000. However the median income is only $57,688 and many respondents are shown with zero income for 2006. This is not surprising considering that the population included independent students who may be attending school full-time and supporting themselves with student loans and part-time employment. This variable was also transformed to the study variable Square Root of Total Family Income (SQRTCINCOME) for analyses. Using the square root of income

reduced skewness and kurtosis but did not meet the assumptions of a normal distribution completely (skewness/SE of skewness = 26.92).

Distance from NPSAS school (DISTHOME) was strongly negatively skewed. There was a wide range of values for this variable with some student's permanent homes more than 12,400 miles from the institution. However, most students in the sample lived very close with the median distance of only 35 miles. The mean distance was 230 miles. Given the irregular distribution, this variable was converted to the dichotomous study variable Distance to Home Above Median (DISTHOMEHIGH). Students living further than 35 miles from the NPSAS institution were coded as 1 and students living 35 miles or closer were coded as 0. The new categorical variable was reviewed for cell counts sufficient for 2x2 table analysis and logistic regression.

The NPSAS variable Delayed Enrollment into Postsecondary Education In Years (DELAYENR) was also negatively skewed. Eighty-one percent of students in the sample had no delay enrolling in college after completing high school. The literature review related to this characteristic and risk of not completing one's degree cited any delay as a risk factor and each additional year of delay increasing the risk (Horn & Carroll, 1996). Since the presence of risk can be accounted for as a dichotomous variable and the continuous variable displayed significant non-normality in distribution, this variable was recoded to the dichotomous yes/no study variable Enrollment into College Delayed (DELAYENRYN). This variable allowed comparison of summer participation by students who experienced a delayed entry into college with those that experienced no delay in entry to college. The new categorical variable was reviewed for cell counts sufficient for 2x2 table analysis and logistic regression.

Categorical variable screening, and recoding. Thirty-one categorical variables were selected for analysis. All categorical variables were screened prior to analysis and as a result of screening, several were recoded to dichotomous dummy variables to promote the ability to compare summer participation among different groups of students based on characteristics. Other variables were collapsed from several categories to fewer categories to highlight the characteristics of interest to this study in terms of access in general and access to the summer session as informed by the literature review. A detailed description of recodings with justification follows.

The NPSAS variable Work Intensity While Enrolled (JOBENR) had three categories: Not working, working part-time, and working full-time. This single variable was recoded to three dichotomous Yes/No variables which were Not Working (NOWORK), Working Part-Time (PTWORK) and Working Full-Time (FTWORK). The expansion of the variable allowed comparisons of the three types of employment categories at the univariate analysis level.

The NPSAS variable Urbanization of Student's Home (LOCALEST) was collapsed from 12 categories into two dichotomous variables to allow exploration of summer attendance by students from the extremes of the urban-rural spectrum as identified in the literature review (Roscigno, et al., 2006; Smith, et al., 1995). The resulting study variables allow comparison of students whose permanent homes are in large cities (URBANEXTREME) with all other students and students whose homes are in remote rural areas (RURALEXTREME) with all other students. Large city is defined as "territory inside an urbanized area and inside a principal city with population of 250,000 or more" and remote rural locations as "Census-defined rural territory that is more than

25 miles from an urbanized area and is also more than 10 miles from an urban cluster" (National Center for Education Statistics, 2010c, Metro- and Urban-Centric Locale Code Categories: Definitions and Comparison).

The NPSAS variable Local Residency While Enrolled (LOCALRES) had three categories: On-Campus, Off-Campus, Living with Parents. The literature review related to this characteristic highlighted housing costs for off-campus leases as a motivator for attending in summer. Therefore, this variable was collapsed from three categories into a dichotomous yes/no variable of Living Off Campus (LOCALRESOFF).

The NPSAS variable for Student Major (MAJORS12) contained 12 different majors categories plus an undeclared major and no major categories in a single variable. To allow comparison of summer participation by each major group with all other major groups, this single variable was expanded into dichotomous dummy variables for each category. The resulting variables used in this study are Undeclared Major (MAJORUND), Humanities Major (MAJORHUM), Social/Behavioral Sciences Major (MAJORSOC), Life Sciences Major (MAJORLS), Physical Sciences Major (MAJORPS), Math Major (MAJORMATH), Computer/Information Sciences Major (MAJORCOMP), Engineering Major (MAJORENG), Education Major (MAJORED), Business Management Major (MAJORBUS), Health Major (MAJORHLTH), Vocational/Technical Major (MAJORVOC), Other Technical Major (MAJORTECH) and Not in a Degree Program (MAJORNONE).

Likewise, the NPSAS variable Class Level (UGLVL1) had six different categories for year of study. In order to allow comparison of summer participation by each class level against all other class levels, this variable was expanded into six

dichotomous variables. These are First Year Student (FIRSTYR), Second Year Student (SECONDYR), Third Year Student (THIRDYR), Fourth Year Student (FOURTHYR), Fifth Year Student (FIFTHYR) and Unclassified Undergraduate (UNCLASSYR).

The NPSAS variable Highest Level of Math Completed (HCMATHHI) was collapsed from five categories into two categories. The literature identifying mathematics as a factor in college attendance and bachelor's degree completion referenced participation in intensive math courses as a predictor (Horn & Nunez, 2000; St. John & Chung, 2006a). Trusty and Niles (2003) categorized Algebra 2, Trigonometry, Pre-Calculus or Calculus as intensive math courses. Therefore, the recoded study variable, Advanced Math in High School (MATHINT), classified students as having taken one of these courses or not.

The NPSAS variable High School Degree Type (HSDEG) contained six possible categories of high school diploma type, including no high school degree or certificate. The literature discussing this characteristic as it relates to participation and completion of higher education cited students who dropped out of school as those at risk (St. John & Chung, 2006c) Therefore, this variable was recoded into a study variable that allowed a more straightforward comparison of summer participation by students who completed a GED degree or equivalency with all other students. The resulting study variable is Received GED or Equivalency (DIPLOMAGED). Students who had not completed a high school degree were also considered for analysis as a separate group. However, only about 60 individuals in the sample had not completed a high school degree and a 2x2 analysis of summer enrolled individuals in this group would result in an expected cell size of less than five cases; therefore, no separate analysis was conducted on this group.

The NPSAS variable Attendance Pattern (ATTNSTAT) distinguished between students who enrolled full-time for the full year and full-time for part of the year as well as part-time for part of the year and part-time for the full year. The student characteristic of interest to this study was full or part-time enrollment regardless of the full year or partial year distinction. Therefore, the original variable was collapsed to the dichotomous study variable Enrolled Part-Time (ENRPARTTIME) to allow the comparison of the summer enrollment of students who were enrolled part-time for the full academic year with those who were enrolled full-time during all or a portion of the academic year.

The NPSAS variable Age Group as of 12/31/2007 contained three categories that were coded into three dichotomous variables to allow comparison of summer participation of students in each of the age groups with all other students. Specifically, the three study variables Student Age 15 to 23 (AGE1523), Student Age 24 to 29 (AGE2429) and Student Age 30 or Over (AGE30PLUS) were derived from this variable.

The NPSAS variable Either Parent's Highest Education Level provided detailed categories on various possible levels of education. The literature that informed this study focused on the experiences of first generation students in attending and completing college (Horn & Nunez, 2000; Pascarella, et al., 2004; Woodard, et al., 2001). First generation students are those whose parents did not attend any college; therefore this variable was recoded into the study variable Parent Has No College Experience (PARENOCOLL) to allow for comparison of the summer participation of students whose parents had no college attendance with those whose parents attended college and/or obtained degrees at any level.

Lastly, the NPSAS variable Enrolled June 2008 (ENR12) served as the indicator for summer enrollment. The original NPSAS variable included categories for enrolled full-time, enrolled part-time and not enrolled. For purposes of this study, full or part-time enrollment in summer was not pertinent to the research question so the two separate categories were collapsed into the study variable Summer Enrolled (SUMMERENROLLED) with two categories enrolled or not enrolled.

Table 5 displays the final variables and the coding used in this study. After recoding, the categorical study variables were cross-tabulated with the intended dependent variable of summer enrollment to confirm that no variables had a cell frequency of less than five and that the number of cases in each cell were sufficient for 2x2 tables and logistic analysis (Hosmer & Lemeshow, 2000; Warner, 2008). Only the variable related to students who did not have a high school degree was excluded from analysis as a result of this screening. All other variables contained sufficient cell sizes for further analysis.

All selected and recoded variables were screened for missing cases. The sample size for this study was 39,020 but eight variables had missing cases that resulted in a smaller sample for those variables. The study variables Permanent Home in Large City and Permanent Home in Remote Rural Area had 970 missing cases. The location of the student's permanent legal residence as reported on financial aid applications, institutional records or in interviews was the basis for this variable. Investigation of the missing cases revealed that a little less than half of them were international students and no inferences regarding international students are made in this analysis.

The study variable Major Change had 2,900 missing cases which represented students who had not yet declared a major or who were in non-degree programs. Variables related to SAT score, completing an intensive high school math curriculum and completing a rigorous high school curriculum all had 5,120 missing cases which represented students who were 30 or more years of age and were not asked about their test scores or high school curriculum.

The variable for Any Delay Between High School and College contained 60 missing cases which were individuals who reported that they had no high school diploma and had not completed high school. The variable used for parent's college experience had 720 missing cases which were individuals who reported that they did not know their parents' educational levels. Lastly, the question that asked if individuals were orphans or wards of the court system was not asked to students 23 years of age or older resulting in 10,470 missing cases for that variable.

Missing cases were excluded in the univariate analysis resulting in a differing total sample (N) for some variables. The differing sample size is reported and no inferences are made regarding the missing population where the cause of the missing cases is known. The impact of missing cases was also considered in the selection of variables for the logistic regression model. Where variables with missing cases were included in the logistic regression model, SPSS employed a listwise deletion process that effectively removes the case with missing values from the analysis sample.

Data Analysis Procedures. The purpose of this study was to understand the access-related characteristics of undergraduate students that make them more or less likely to enroll in the summer term. The data analysis procedures used were appropriate

Table 5

NPSAS Variable and Related Study Variable Coding

NPSAS Variable	Study Variable	Coding
Financial		
BUDGETAJ	SQRTBUDGETAJ[a]	Continuous
CINCOME	SQRTCINCOME[a]	Continuous
GRTCST	GRTCST	Continuous
LOANCST2	LOANCST2	Continuous
JOBENR	NOWORK[b]	0=No/1=Yes
	PTWORK[b]	0=No/1=Yes
	FTWORK[b]	0=No/1=Yes
DEPEND	DEPEND	1=Dependent 2=Independent
Geographic		
DISTEDUC	DISTEDUC	0=No/1=Yes
DISTHOME	DISTHOMEHIGH[c]	0=No/1=Yes
LOCALEST	URBANEXTREME[c]	0=No/1=Yes
	RURALEXTREME[c]	0=No/1=Yes
LOCALRES	LOCALERESOFF[c]	0=No/1=Yes
Programmatic		
MAJORS12	MAJORUND[b]	0=No/1=Yes
	MAJORHUM[b]	0=No/1=Yes
	MAJORSOC[b]	0=No/1=Yes
	MAJORLS[b]	0=No/1=Yes
	MAJORPS[b]	0=No/1=Yes
	MAJORMATH[b]	0=No/1=Yes
	MAJORCOMP[b]	0=No/1=Yes
	MAJORENG[b]	0=No/1=Yes
	MAJORED[b]	0=No/1=Yes
	MAJORBUS[b]	0=No/1=Yes
	MAJORHLTH[b]	0=No/1=Yes
	MAJORVOC[b]	0=No/1=Yes
	MAJORTECH[b]	0=No/1=Yes
	MAJORNONE[b]	0=No/1=Yes

Table 5 (continued)

NPSAS Variable and Related Study Variable Coding

NPSAS Variable	Study Variable	Coding
MAJCHG	MAJCHG	0=No/1=Yes
UGLVL1	FIRSTYR[b]	0=No/1=Yes
	SECONDYR[b]	0=No/1=Yes
	THIRDYR[b]	0=No/1=Yes
	FOURTHYR[b]	0=No/1=Yes
	FIFTHYR[b]	0=No/1=Yes
	UNCLASSYR[b]	0=No/1=Yes
Academic		
HCYENGL	RIGOROUS[d]	0=No/1=Yes
HCYMATH		
HCYSSCIE		
HCYSSOCI		
HCYLANG		
HCMATHHI	MATHINT[c]	0=No/1=Yes
TESATDER	TESATDER	Continuous
HSDEG	DIPLOMAGED[c]	0=No/1=Yes
	DIPLOMANONE[c]	0=No/1=Yes
DELAYENR	DELAYENRYN[c]	0=No/1=Yes
GPA	GPA	Continuous
ATTNSTAT	ENRPARTTIME[c]	0=No/1=Yes
Cultural/Social/Physical		
RAASIAN	RAASIAN	0=No/1=Yes
RABLACK	RABLACK	0=No/1=Yes
RAINDIAN	RAINDIAN	0=No/1=Yes
HISPANIC	HISPANIC	0=No/1=Yes
RAISLAND	RAISLAND	0=No/1=Yes
RAOTHER	RAOTHER	0=No/1=Yes
RAWHITE	RAWHITE	0=No/1=Yes
GENDER	GENDER	1=Male/2=Female

Table 5 (continued)

NPSAS Variable and Related Study Variable Coding

NPSAS Variable	Study Variable	Coding
AGEGROUP	AGE1523[b]	0=No/1=Yes
	AGE2429[b]	0=No/1=Yes
	AGE30PLUS[b]	0=No/1=Yes
PAREDUC	PARENOCOLL[c]	0=No/1=Yes
ORPHAN	ORPHAN	0=No/1=Yes
DEPANY	DEPANY	0=No/1=Yes
SINGLPAR	SINGLPAR	0=No/1=Yes
VETERAN	VETERAN	0=No/1=Yes
DISABLE	DISABLE	0=No/1=Yes
Dependent		
ENR12	SUMMERENROLLED[c]	0=No/1=Yes

Note: [a]transformed. [b]dummy coded. [c]recoded. [d]derived.

to answering the two research questions:

1. Do the access related characteristics of undergraduate students who enroll in the summer session differ from those who do not enroll in summer?

2. To what degree do these access related characteristics predict enrollment in summer session?

The following is an explanation of the procedures used to answer each research question.

Comparison of summer enrolled and not enrolled students. The first research question to be answered was whether the access-related characteristics of students who attend in summer differ from students who do not attend in summer. To answer this question the Pearson's chi-square for each categorical independent variable as it related to the dependent variable Summer Enrolled, was computed along with the odds ratio. The odds ratio value described the probability of students from each category of the dependent variable attending in summer as more or less than the probability of a student from the comparison group (Howell, 2007). Results of the individual chi-square analyses are reported in Chapter 4. All variables with a significant chi-square result ($p \leq .01$) were considered for the logistic model.

For continuous independent variables, an independent samples t-test was calculated for each variable, along with effect size using Cohen's *d* for the mean difference for summer enrolled versus not enrolled students. The assumption of homogeneity of variance was assessed by the Levene Test for Equality of Variances. Results of the individual t-tests are reported in Chapter 4. All variables that displayed a significant relationship ($p \leq .01$) in the t-test analysis were considered for the logistic model.

Test for strong correlations between significant variables and logistic regression models. The second research question posed in the study asked whether the characteristics in which summer enrolled students differ significantly from non-enrolled students have predictive value for enrollment in summer session. This question treated the dichotomous variable of enrollment in June of 2008 as the dependent variable. The independent variables are those in which enrolled and non-enrolled students were found to differ significantly in the univariate chi-square and t-test analyses. When the outcome variable is dichotomous, the impact of the independent variables on that outcome may be expressed in terms of the effect of the independent variables on the probability that the dependent variable will be one or the other of two possible outcomes (Garson, 2010; Hosmer & Lemeshow, 2000). This calculation is referred to as logistic regression analysis.

One of the key assumptions of logistic regression is an absence of high multicolinearity among the independent variables (Garson, 2010). When one independent variable is a near linear function of another independent variable in a logistic regression model the standard error of the logit coefficient, the measure of effect of the variable, is larger and the results are less reliable (Garson, 2010). Prior to fitting logistic regression models, Pearson correlation coefficients of each of the independent variables in each model were calculated to identify strong correlations. The treatment of variables exhibiting strong intercollinearity is described in Chapter 4. In fitting each logistic regression model, the standard errors of the estimated coefficients were observed for additional effects of multicollinearity and other numerical problems (Hosmer & Lemeshow, 2000, p. 141).

Logistic regression models were built to determine the predictive value of the selected variables on the overall probability of a student enrolling in summer. The building of the logistic regression models followed the process outlined by Hosmer and Lemeshow (2000) by conducting a complete univariate analysis of all potential variables using independent samples t-test, chi-square and effects testing as described in the analytical techniques associated with the first research question. Variables were selected for inclusion in the logistic regression analysis for each factor on the basis of: (a) having a significant relationship *(*$p \leq .01$) with summer enrollment as determined by the t-test or chi-square scores from the univariate analysis; (b) not having a large number of missing cases that would result in the exclusion of other groups of research interest; (c) the need to select the groups of key research interests where multiple groups within a chosen variable had a significant relationship to summer enrollment; and (d) the need to avoid the effects of strong intercorrelation among the selected variables.

Hosmer and Lemeshow (2000, p. 95) suggested that any variable with a significance of $p < .25$ should be included in the initial model to ensure that no essential variables are excluded. Due to the large NPSAS sample size available for this research, many variables had significance levels of $p \leq .01$ at the univariate stage and that was also the significance level set to address the unknown effects of the nested survey methods employed for NPSAS. Therefore, variables that met the study method standard of $p \leq .01$ were considered for additional analysis and entered into the initial logistic regression model.

The models developed for each factor were evaluated for significance compared to a null model or model containing no variables. The overall fit of each model was

evaluated using the Hosmer and Lemeshow Goodness of Fit Test with models that had a non-significant Hosmer and Lemeshow Goodness of Fit score being deemed to adequately fit the data. Relevance of each model was determined by Nagelkerke's pseudo R^2 value. The complete results of the logistic regression analyses are displayed and discussed in Chapter 4.

Chapter 4

Findings

This chapter presents the results of the study and is organized around the two research questions posed in the study. The first research question was addressed through a series of univariate analyses using each of the chosen characteristics identified through the literature review and selected from the NPSAS dataset. A large number of access related characteristics grouped under a broad five factor framework (Heller, 2001a) were selected for analysis. The spectrum of characteristics explored is supported by prior research on access and summer attendance as outlined in Chapter 2. An exploratory study is justified by the lack of nationally representative research on characteristics of students who attend in summer.

The univariate analysis of characteristics used a series of t-test and chi-square analyses with each of the individual student characteristics treated as the dependent variable and summer enrollment as the independent variable. Each analysis sought to determine if students who enrolled in summer differed significantly from students who did not enroll in summer with respect to the selected characteristic. Each analysis was run independently and the results are reported individually. This univariate analysis was the first step in building the logistic regression models intended to answer the second research question.

The overall sample size was 39,020 students. Eight variables had missing cases that were not replaced. Where the sample size differed for a specific characteristic, the number of missing cases and resulting sample size is reported in the results. Where the

specific group that the missing cases represented could be determined, that information is included in the reporting of results and no inference regarding missing group(s) is made.

The distribution of key demographic characteristics of the selected sample including gender, race, income and enrollment by institutional type are reported in Chapter 3.

Results of Univariate Analysis

Results of Univariate Analysis on Variables in the Financial Factor

Financial characteristics considered for their impact on summer enrollment included Student Budget (SQRTBUDGETAJ), Total Family Income (SQRTCINCOME), Ratio of Grant Aid to Student Budget (GRTCST), Ratio of Loans to Student Budget (LOANCST), Not Working While Enrolled (NOWORK), Working Part-Time While Enrolled (PTWORK), Working Full-Time While Enrolled (FTWORK), and Dependency Status (DEPEND). Specific findings related to each characteristic are outlined in Tables 6 and 7.

Student Budget. In data screening, this variable displayed a non-normal distribution even after a square root transformation. An independent samples t-test was performed on the study variable SQRTBUDGETAJ with SUMMERENROLLED as the grouping variable. Students who enrolled in summer had a slightly higher total cost of attendance than students who did not enroll in summer (mean difference $20.17 per year). The difference between the means was statistically significant ($p \leq .01$) t = -6.64. Calculation of Cohen's d showed that the groups differed by 13% of a standard deviation, which is a small effect size.

Table 6

T-Tests of Financial Characteristics

Variable	N	M	SD	t	*d*
SQRTBUDGETAJ				-6.64*	0.13
Enrolled	2,960	134.8	39.2		
Not Enrolled	36,070	130.3	35.0		
SQRTCINCOME				8.38*	0.16
Enrolled	2,960	223.7	115.3		
Not Enrolled	36,070	242.2	115.0		
GRTCST				-1.55	0.03
Enrolled	2,960	19.9	23.6		
Not Enrolled	36,070	19.2	22.7		
LOANCST2				-4.52*	0.09
Enrolled	2,960	24.8	29.0		
Not Enrolled	36,070	22.3	28.4		

Note. N rounded to nearest 10.

M = mean.

SD = standard deviation.

t = computed value of t-test.

d = Cohen's estimate of effect size.

*$p \leq .01$.

Table 7

Chi-Square Tests of Financial Characteristics

		Percent Enrolled			
Variable	N	Yes	No	χ^2 (1)	OR
NOWORK					
Yes	12,080	6.6	93.4	24.54*	0.81.
No	26,950	8.0	92.0		
PTWORK					
Yes	20,320	7.4	92.6	2.00	ns
No	18,700	7.8	92.2		
FTWORK					
Yes	6,630	9.9	90.1	64.27*	1.45
No	32,400	7.1	92.9		
DEPEND					
Independent	12,270	10.1	89.9	163.90*	1.64
Dependent	26,750	6.4	93.6		

Note. N rounded to nearest 10.

χ^2 = computed value of chi-square test.

OR = odds ratio.

ns = not significant.

*$p \leq .01$.

Total Family Income. This variable also displayed a non-normal distribution even after transformation. An independent samples t-test was performed on the study variable SQRTCINCOME with SUMMERENROLLED as the grouping variable. Students who enrolled in summer had a lower family income than students who did not enroll in summer (mean difference $341). The difference between the means produced a statistically significant result *(p* ≤ .01) *t* = -8.38. Calculation of Cohen's d showed that the groups differed by just 16% of a standard deviation which is a small effect size.

Ratio of Grant Aid to Student Budget. In data screening, this variable displayed a non-normal distribution. An independent samples t-test was performed on the study variable GRTCST with SUMMERENROLLED as the grouping variable. Students who enrolled in summer had a slightly higher ratio of grants to total cost than students who did not enroll in summer (mean difference 0.67%). The difference between the means failed to produce a statistically significant result *(p* ≤ .01) t = -1.55.

Ratio of Loans to Student Budget. In data screening, this variable displayed a non-normal distribution. An independent samples t-test was performed on the study variable LOANCST2 with SUMMERENROLLED as the grouping variable. Students who enrolled in summer had a higher ratio of loans to total cost than students who did not enroll in summer (mean difference 2.5%) and the difference between the means was statistically significant at *p* ≤ .01(*t* = -4.52. Calculation of Cohen's *d* showed that the groups differed by 9% of a standard deviation, which is a small effect size.

Not Working While Enrolled. Students who were not working while enrolled were found to be enrolled in summer session about 6.6% of the time versus 8.0% for students who reported working full-time or part-time. A chi-square test of the

relationship between not working (NOWORK) and summer enrollment (SUMMERENROLLED) resulted in $\chi^2(1) = 24.536$, which was statistically significant at $p \leq .01$. This is associated with an odds ratio of .81 indicating that the odds of a student who does not work enrolling in summer session were 81% of those who report working full or part-time.

Working Part-Time While Enrolled. Students who were working part-time while enrolled were found to be enrolled in summer session about 7.4% of the time versus 7.8% for students who were not working or were working full-time. A chi-square test of the relationship between working part-time (PTWORK) and enrollment in the summer (SUMMERENROLLED) produced a result of $\chi^2(1) = 2.003$, which is not statistically significant at $p \leq .01$.

Working Full-Time While Enrolled. Students who were working full-time while enrolled in college were found to be enrolled in summer session about 9.9% of the time versus 7.1% for students who reported not working or only working part-time. A chi-square test of the relationship between working full-time (FTWORK) and enrollment in the summer (SUMMERENROLLED) produced a statistically significant result at $p \leq .01$ with $\chi^2(1) = 64.271$. This is associated with an odds ratio of 1.45 indicating that the odds of a student who reports working full-time enrolling in summer session was about 1.4 times greater than those who report not working or working only part-time.

Dependency Status. Students who were independent of their families for financial support were found be enrolled in summer 10.1% of the time. Students who were financial dependents were enrolled in summer about 6.4% of the time. A chi-square test of the relationship between dependency status (DEPEND) and summer enrollment

(SUMMERENROLLED) resulted in $\chi^2(1) = 163.897$, which was statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.64 indicating that the odds of an independent student enrolling in summer were about 1.6 times higher than a dependent student.

Results of Univariate Analysis on Variables in the Geographic Factor

Geographic characteristics explored for their relationship to summer enrollment included the student's participation in distance education, the distance from the student's permanent home to their institution, whether the student's permanent home was in an urban or rural extreme, and whether the student was living off-campus while enrolled. Findings for each of these characteristics are displayed in Table 8 and described more fully in the following section.

Participation in Distance Education. Students who reported that they had participated in distance education at some point during the academic year, were enrolled in summer 9.5% of the time. Only 7.2% of students who reported no participation in distance education were enrolled in summer. A chi-square test of the relationship between participation in distance education (DISTEDUC) and summer enrollment (SUMMERENROLLED) produced $\chi^2(1) = 41.525$, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.36 indicating that the odds of enrolling in summer session are about 1.4 times higher when the student reports having participated in distance education.

Distance from NPSAS School to Home. Students whose permanent address was closer than the sample median of 35 miles from their enrolled institution attended

Table 8

Chi-Square Tests of Geographic Characteristics

Variable	N	Percent Enrolled		$\chi^2(1)$	OR
		Yes	No		
DISTEDUC					
Yes	6,340	9.5	90.5	41.53*	1.36
No	32,690	7.2	92.8		
DISTHOMEHIGH					
Yes	18,950	6.8	93.2	28.56*	0.81
No	20,070	8.3	91.7		
URBANEXTREME					
Yes	5,660	5.8	94.2	30.75*	0.72
No	32,390	7.9	92.1		
RURALEXTREME					
Yes	750	7.3	92.7	0.09	ns
No	37,300	7.6	92.4		
LOCALRESOFF					
Yes	19,830	9.2	90.8	145.00*	1.60
No	19,200	5.9	94.1		

Note. N rounded to nearest 10.

χ^2 = computed value of chi-square test.

OR = odds ratio.

ns = not significant.

*$p \leq .01$.

summer term 8.3% of the time. This compares to 6.8% of those who lived further away than the sample median. A chi-square analysis of the relationship between living 35 miles or farther from school (DISTHOMEHIGH) and summer enrollment (SUMMERENROLLED) produced $\chi^2(1) = 28.56$, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .81 indicating that students whose permanent home is 35 miles or closer to their institution are only about 81% as likely as students who live further away to attend in summer.

Student from a Large City Locale. This variable had 970 missing cases and the results are based on a reduced sample size of 38,050. Many of the missing cases in this variable were from international locations and no inferences regarding students from international urban locations should be made from these findings. Students whose permanent homes were in large cities attended summer session 5.8% of the time. This is lower than students whose homes are not in a large city who attended summer session at a rate of 7.9%. A chi-square analysis of the relationship between having a permanent home in a large city location (URBANEXTREME) and summer enrollment produced $\chi^2(1) = 30.75$, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .716 indicating that students whose permanent home is in a large city location are only about 72% as likely as all other students to attend in summer.

Student from a Remote Rural Locale. This variable also had 970 missing cases, many of which were international students. The reduced sample size for this analysis is 38,050 and no inferences regarding students from international rural locations should be made from these findings. Students whose homes were in remote rural locations attended summer session in slightly lower proportions than all other students.

The percentage enrolled was 7.3% for students from remote rural locations versus 7.6% for students from all other types of locations. A chi-square test of the relationship between the having a permanent home in a remote rural area (RURALEXTREME) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .09, which is not statistically significant at $p \leq .01$.

Student Residence Off-Campus. Students who lived off-campus enrolled in summer at a rate of 9.2% versus 5.9% for students who lived on-campus or with their parents. A chi-square test of the relationship between living off-campus (LOCALRESOFF) and summer enrollment (SUMMERENROLLED) produced $\chi^2(1) = 144.996$, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.60 indicating that the odds of students living off-campus enrolling in summer session are about 1.6 times greater than students who live on-campus or with their parents.

Results of Univariate Analysis on Variables in the Programmatic Factor

Programmatic characteristics explored for their effect on the choice to enroll in summer included the student's major, whether the student had changed majors, and the student's year of study. The results of chi-square analysis on each of these characteristics are displayed in Table 9.

Undeclared Major. Only 5.7% of students who were undeclared majors enrolled in summer versus 7.7% for all other majors. A chi-square test of the relationship between being an undeclared major (MAJORUND) and summer enrollment (SUMMERENROLLED) produced $\chi^2(1) = 11.14$, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .73 indicating that the odds of students with

an undeclared major enrolling in summer session are only about 73% of that of all other students in the sample.

Humanities Major. Students who were humanities majors were enrolled in summer 6.5% of the time versus 7.7% for all other majors. A chi-square test of the relationship between being a humanities major (MAJORHUM) and summer enrollment (SUMMERENROLLED) produced $\chi^2(1) = 10.36$, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .83, indicating that the odds of a student with a humanities major enrolling in summer session are only about 83% of that of any other student.

Social/Behavioral Sciences Major. Students who were social/behavioral science majors enrolled in summer 7.4% of the time. Students who were not social/behavioral majors were enrolled in summer 7.6% of the time. A chi-square test of the relationship between being a social behavioral major (MAJORSOC) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .13, which is not statistically significant at $p \leq .01$.

Life Sciences Major. About 6.8% of students who were life sciences majors enrolled in summer versus 7.7% of students in other majors. A chi-square test of the relationship between being a life sciences major (MAJORLS) and enrollment in summer (SUMMERENROLLED) produced χ^2 (1) = 3.71, which is not statistically significant at $p \leq .01$.

Physical Sciences Major. Students who were physical sciences majors enrolled in summer 6.7% of the time. Students who were not physical sciences majors were enrolled in summer 7.6% of the time. A chi-square test of the relationship between being

Table 9

Chi-Square Tests of Programmatic Characteristics

		Percent Enrolled			
Variable	N	Yes	No	$\chi^2(1)$	OR
MAJORUND					
Yes	2,070	5.7	94.3	11.14*	0.73
No	36,950	7.7	92.3		
MAJORHUM					
Yes	5,430	6.5	93.5	10.36*	0.83
No	33,590	7.7	92.3		
MAJORSOC					
Yes	4,520	7.4	92.6	0.13	ns
No	34,500	7.6	92.4		
MAJORLS					
Yes	3,510	6.8	93.2	3.71	ns
No	35,510	7.7	92.3		
MAJORPS					
Yes	600	6.7	93.3	0.72	ns
No	38,420	7.6	92.4		
MAJORMATH					
Yes	300	7.3	92.7	0.04	ns
No	38,720	7.6	92.4		
MAJORCOMP					
Yes	1,000	9.1	90.8	3.50	ns
No	38,020	7.5	92.5		

Table 9 (continued)

Chi-Square Tests of Programmatic Characteristics

		Percent Enrolled			
Variable	N	Yes	No	$\chi^2(1)$	OR
MAJORENG					
Yes	2,380	6.5	93.5	4.54	ns
No	36,640	7.6	92.4		
MAJORED				.	
Yes	3,280	7.5	92.5	0.01	ns
No	35,750	7.6	92.4		
MAJORBUS					
Yes	7,150	8.0	92.0	2.63	ns
No	31,880	7.5	92.5		
MAJORHLTH					
Yes	3,320	9.6	90.4	20.44*	1.33
No	35,710	7.4	92.6		
MAJORVOC					
Yes	370	9.4	90.6	1.81	ns
No	38,650	7.6	92.4		
MAJORTECH					
Yes	4,270	8.5	91.5	6.23	ns
No	34,750	7.5	92.5		
MAJORNONE					
Yes	830	8.1	91.9	0.33	ns
No	38,190	7.6	92.4		

Table 9 (continued)

Chi-Square Tests of Programmatic Characteristics

Variable	N	Percent Enrolled		$\chi^2(1)$	OR
		Yes	No		
MAJCHG					
Yes	10,800	7.9	92.1	1.06	ns
No	25,320	7.6	92.4		
FIRSTYR					
Yes	9,360	5.6	94.4	69.12*	0.66
No	29,670	8.2	91.8		
SECONDYR					
Yes	7,820	7.0	93.0	5.09	ns
No	31,200	7.7	92.3		
THIRDYR					
Yes	8,950	9.9	90.1	90.75*	1.49
No	30,070	6.9	93.1		
FOURTHYR					
Yes	10,960	7.6	92.4	0.00	ns
No	28,060	7.6	92.4		
FIFTHYR					
Yes	1,440	8.2	91.8	0.79	ns
No	37,580	7.6	92.4		

Table 9 (continued)

Chi-Square Tests of Programmatic Characteristics

		Percent Enrolled			
Variable	N	Yes	No	$\chi^2(1)$	OR
UNCLASSYR					
Yes	500	10.7	89.3	6.96*	1.5
No	38,530	7.5	92.5		

Note. N rounded to nearest 10.

χ^2 = computed value of chi-square test.

OR = odds ratio.

ns = not significant.

*$p \leq .01$.

a physical sciences major (MAJORPHYS) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .72, which is not statistically significant at $p \leq .01$.

Math Major. Students who were math majors were enrolled in summer 7.3% of the time. Students who were not math majors were enrolled in summer 7.6% of the time. A chi-square test of the relationship between being a math major (MAJORMATH) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .04, which is not statistically significant at $p \leq .01$.

Computer Science Major. Students who were computer science majors were enrolled in summer 9.1% of the time. Students who were not computer sciences majors were enrolled in summer 7.5% of the time. A chi-square test of the relationship between being a computer science major (MAJORCOMP) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 3.50, which is not statistically significant at $p \leq .01$.

Engineering Major. Students who were engineering majors were enrolled in summer 6.5% of the time. Students who were not engineering majors were enrolled in summer 7.6% of the time. A chi-square test of the relationship between being an engineering major (MAJORENG) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 4.54, which is not statistically significant at $p \leq .01$.

Education Major. Students who were education majors enrolled during the summer at a rate of 7.5% versus 7.6% for all other students. A chi-square test of the relationship between being an education major (MAJORED) and summer enrollment

(SUMMERENROLLED) produced χ^2 (1) = .01, which is not statistically significant at $p \leq .01$.

Business Management Major. Business management majors were enrolled in summer at a rate of 8.0% versus 7.5% for students who were not business management majors. A chi-square test of the relationship between being a business management major (MAJORBUS) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 2.63, which is not statistically significant at $p \leq .01$.

Health Major. Students who were health majors were enrolled in summer 9.6% of the time. Students who were not health majors were enrolled in summer 7.4% of the time. A chi-square test of the relationship between being a health major (MAJORHLTH) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 20.44, which is statistically significant at p.≤.01. This is associated with an odds ratio of 1.33, indicating that the odds of a health major enrolling in summer session are 1.3 times the odds of other majors.

Vocational Major. Students who were vocational majors were enrolled in summer 9.4% of the time versus 7.6% of all other majors. A chi-square test of the relationship between being a vocational major (MAJORVOC) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 1.81, which is not statistically significant at $p \leq .01$.

Technical Major. Students who were technical majors enrolled in summer at a rate of 8.5% versus 7.5% of all other majors. A chi-square test of the relationship between being a technical major (MAJORTECH) and summer enrollment

(SUMMERENROLLED) produced χ^2 (1) = 6.23, which is not statistically significant at $p \leq .01$.

Change of Major. There were 2,900 missing cases for the variable Change of Major. The missing cases were students who had not declared a major or were in non-degree programs. Students who reported that they had formally changed their major at least once were enrolled in summer 7.9% of the time. Students who reported they had not changed their major enrolled in summer 7.6% of the time. The overall enrolled percentage for the reduced sample was 7.7%. A chi-square test of the relationship between having changed majors (MAJORCHG) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 1.06, which is not statistically significant at $p \leq .01$.

First Year Undergraduate. First year undergraduates enrolled in summer about 5.6% of the time while students who were not first year undergraduates enrolled in summer 8.2% of the time. A chi-square test of the relationship between first year class level (FIRSTYR) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 69.12 which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .66, indicating that the odds of first year student enrolling in summer are only 66% of the odds of all other students.

Second Year Undergraduate. Second year undergraduates enrolled in summer about 7.0% of the time. Students who were not second year undergraduates were enrolled in summer 7.7% of the time. A chi-square test of the relationship between second year class level (SECONDYR) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 5.09, which is not statistically significant at $p \leq .01$.

Third Year Undergraduate. About 9.9% of students who were third year undergraduates enrolled in summer. Students who were not third year undergraduates were enrolled in summer 6.9% of the time. A chi-square test of the relationship between third year class level (THIRDYR) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 90.75, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.49, indicating that the odds of a third year student enrolling in summer are about 1.5 times the odds of all other students.

Fourth Year Undergraduate. Fourth year undergraduates enrolled in summer 7.6% of the time. Students who were not fourth year students enrolled 7.6% of the time. A chi-square test of the relationship between being a fourth year undergraduate major (FOURTHYR) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .00, which is not statistically significant at $p \leq .01$.

Fifth Year Undergraduate. Fifth year undergraduates enrolled in summer at a greater percentage (8.2%) than other students (7.6%). However, a chi-square test of the relationship between being a fifth year undergraduate (FIFTHYR) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .79, which is not statistically significant at $p \leq .01$.

Unclassified Undergraduate. A small portion of the sample (1.4%) was unclassified in terms of their year of enrollment. These students enrolled in summer 10.7% of the time compared to 7.5% for students who were classified by year. A chi-square test of the relationship between being an unclassified undergraduate major (MAJORNONE) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 6.95 which is statistically significant at $p \leq .01$. This is associated with an odds ratio of

1.47, indicating that unclassified undergraduates are about 1.5 times more likely to be enrolled in summer than classified students. The 95% confidence interval on this odds ratio ranged from 1.102 to 1.958 suggesting that the strength of the relationship is not clearly defined.

Results of Univariate Analysis on Variables in the Academic Factor

Students who enrolled in summer were compared with those who did not enroll in summer on a variety of academic characteristics. The academic variables included both continuous and categorical type variables so both t-tests and chi-square analysis were conducted as appropriate to the variable. The continuous academic variables analyzed included: mean college GPA and mean entering SAT scores. The categorical academic variables analyzed included: having completed a rigorous high school curriculum, the level of mathematics the student accomplished while in high school, whether the student had a GED diploma, whether there was any delay between completing high school and entering college and whether the student enrolled part-time during the regular academic year. The results of the univariate analysis of the variables representing these characteristics are displayed in Tables 10 and 11.

SAT Score. There were 6,680 individuals in the sample for whom an SAT score was not reported. This number includes 5,120 students over the age of 30 for whom SAT information was not collected and no inferences regarding older students and the relationship of their SAT scores to summer enrollment should be made. Among the students in the sample, those who enrolled in summer had a lower mean SAT score (TESATDER) than students who did not enroll in summer. The mean difference was 12.5 points. A t-test of the difference between the means produced a statistically

Table 10

T-Tests of Academic Characteristics

Variable	N	M	SD	t	*d*
TESATDER					
Enrolled	2,250	1,028.3	188.6	3.04*	-0.07
Not Enrolled	30,090	1,040.8	191.6		
GPA					
Enrolled	2,960	306.2	70.1	-8.49*	0.16
Not Enrolled	36,070	295.6	64.9		

Note. N rounded to nearest 10.

M = mean.

SD = standard deviation.

t = computed value of t-test.

d = Cohen's estimate of effect size.

*$p \leq .01$.

Table 11

Chi-Square Tests of Academic Characteristics

		Percent Enrolled			
Study Variable	N	Yes	No	χ^2	OR
RIGOROUS					
Yes	23,160	6.7	93.3	9.15*	0.87
No	10,750	7.6	92.4		
MATHINT					
Yes	32,400	7.0	93.0	0.01	ns
No	1,500	6.9	93.1		
DIPLOMAGED					
Yes	960	7.9	92.1	0.18	ns
No	38,060	7.6	92.4		
DELAYENR					
Yes	7,100	10.3	89.7	91.13*	1.5
No	31,870	7.0	93.0		
ENRPARTTIME					
Yes	11,240	8.1	91.9	6.14	ns
No	27,280	7.4	92.6		

Note. N rounded to nearest 10.

χ^2 = computed value of chi-square test.

OR = odds ratio.

ns = not significant.

*$p \leq .01$.

significant result ($p \leq .01$) t = -3.04. However, calculation of Cohen's d showed that the groups differed by 7% of a standard deviation.

GPA in College. In the sample, students who enrolled in summer had a higher mean college grade point average (GPA) than students who did not enroll in summer. The mean difference was 10.61 points. A t-test of the difference between the means produced a statistically significant result ($p \leq .01$) t = -8.49. Cohen's d showed that the groups differed by 16% of a standard deviation.

Academic Intensity of Secondary School Program. Students who were 30 years of age or older were not asked about their high school experiences. Therefore the sample size for this variable was 5,120 less than the total sample size. In the reduced sample, 7.0% of students overall attended summer session. Students who completed a rigorous high school curriculum (i.e. one that would meet the requirements for a federal academic competiveness grant (U.S. Department of Education, 2010) attended at a rate of 6.7% versus 7.6% for students who had not completed a rigorous high school curriculum. A chi-square test of the relationship between completing a rigorous high school curriculum (RIGOROUS) and attending in summer (SUMMERENROLLED) produced χ^2 (1) = 9.15, which is statistically significant at $p \leq .01$. This is associated with an oddsratio of .87, indicating that students who completed a rigorous high school curriculum are only 83% as likely to enroll in summer as students who did not complete a rigorous high school curriculum. Or, stated as the inverse, students who did not complete a rigorous high school curriculum are 1.15 times more likely to attend in summer.

Advanced Math in High School. Students who were 30 years of age or older were not asked about their high school experiences. Therefore the sample size for this

variable was 5,120 less than the total sample size. In the reduced sample, 7.0% of students overall attended summer session. Students who completed advanced math in high school attended summer in about the same proportion as those who did not take advanced math (7.0% versus 6.9% respectively). A chi-square test of the relationship between taking advanced math in high school (MATHINT) and the choice to enroll in summer (SUMMERENROLLED) produced χ^2 (1) = 0.01, which is not statistically significant at $p \leq .01$.

Received GED or Equivalency. About 7.9% of students who received a GED diploma enrolled in the summer. All other students enrolled in summer at a rate of 7.6%. A chi-square test of the relationship between having a GED diploma (DIPLOMAGED) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .18, which is not statistically significant at $p \leq .01$.

Delay in Enrollment into PSE. This variable had 60 missing cases representing students who reported they had no high school diploma and had not completed high school. About 10.3% of students who had delayed enrolling into college by one year or more enrolled in summer. This is compared to only 7.0% of students who experienced no delay between high school and college. A chi-square test of the relationship between a delay in enrollment (DELAYENR) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 91.13 which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.53, indicating that students who experienced a delay are about 1.5 times more likely to be enrolled in summer than students that did not.

Enrolled Part-Time During the Regular Academic Year. About 8.1% of students who enrolled part-time during the 2007-08 academic year were also enrolled in

the summer. Students who enrolled full-time at any point during the academic year enrolled in summer at a rate of 7.4%. A chi-square test of the relationship between an attendance pattern that included part-time enrollment (ENRPARTTIME) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 6.14, which is not statistically significant at $p \leq .01$.

Results of Univariate Analysis on Variables in the Cultural/Social/Physical Factor

Students who enrolled in summer were compared with students who did not enroll in summer in a variety of Cultural/Social/Physical characteristics. These characteristics included race, gender, age group, parental college level, orphan status, whether the student had dependents, whether the student was a single parent, the student's veteran status, and whether the student had a disability. The results of the univariate analysis of the variables representing these characteristics are displayed in Table 12.

Race American Indian or Alaskan Native. Students who described themselves as American Indian or Alaskan Natives enrolled in summer at a rate of 7.7%. Students of other races/ethnicities enrolled 7.6% of the time. A chi-square test of the relationship between being an American Indian/Alaska Native (RAINDIAN) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .024, which is not statistically significant at $p \leq .01$.

Race Asian. Students who described themselves as Asian enrolled in summer at a rate only slightly lower than other students (7.5% versus 7.6%). A chi-square test of the relationship between being Asian (RAASIAN) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = .00, which is not statistically significant at $p \leq .01$.

Table 12

Chi-Square Tests of Cultural/Social/Physical Characteristics

		Percent Enrolled			
Study Variable	N	Yes	No	χ^2	OR
RAINDIAN					
Yes	860	7.7	92.3	0.02	ns
No	38,170	7.6	92.4		
RAASIAN					
Yes	2,580	7.5	92.5	0.00	ns
No	36,440	7.6	92.4		
RABLACK					
Yes	5,400	9.9	90.1	49.98*	1.42
No	33,630	7.2	92.8		
HISPANIC					
Yes	4,530	5.7	94.3	25.00*	0.72
No	34,500	7.8	92.2		
RAISLAND					
Yes	480	8.8	91.2	1.10	ns
No	38,550	7.6	92.4		
RAOTHER					
Yes	1,030	5.4	94.6	6.86*	0.70
No	37,990	7.6	92.4		

Table 12 (Continued)

Chi-Square Tests of Cultural/Social/Physical Characteristics

		Percent Enrolled			
Study Variable	N	Yes	No	χ^2	OR
RAWHITE					
Yes	29,930	7.2	92.8	21.52*	0.82
No	9,090	8.7	91.3		
GENDER					
Male	17,800	7.2	92.8	5.36	ns
Female	21,220	7.9	92.1		
AGE1523					
Yes	28,560	6.6	93.4	137.22*	0.63
No	10,470	10.2	89.8		
AGE2429					
Yes	5,340	9.0	91.0	17.94*	1.25
No	33,680	7.3	92.7		
AGE30PLUS					
Yes	5,120	11.4	88.6	122.37*	1.71
No	33,900	7.0	93.0		
PARENCOLL					
Yes	27,000	8.2	91.8	10.43*	1.14
No	11,300	7.3	92.7		

Table 12 (Continued)

Chi-Square Tests of Cultural/Social/Physical Characteristics

Study Variable	N	Percent Enrolled		χ^2	OR
		Yes	No		
ORPHAN					
Yes	170	12.7	87.3	9.81*	2.05
No	28,390	6.6	93.4		
DEPANY					
Yes	5,510	11.3	88.7	126.22*	1.70
No	33,510	7.0	93.0		
SINGLPAR					
Yes	2,640	10.1	89.9	25.49*	1.41
No	36,390	7.4	92.6		
VETERAN					
Yes	880	12.9	87.1	36.78*	1.84
No	38,140	7.4	92.6		
DISABLE					
Yes	3,580	7.7	92.3	0.04	ns
No	35,440	7.6	92.4		

Note. N rounded to nearest 10.

χ^2 = computed value of chi-square test.

OR = odds ratio.

ns = not significant.

*$p \leq .01$.

Race Black or African American. Students who described their race as Black or African American enrolled in summer at a rate of 9.9%. Students of other races/ethnicities enrolled 7.2% of the time. A chi-square test of the relationship between being Black or African American (RABLACK) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 49.98, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.42, indicating that the odds of a Black or African American student enrolling in summer are about 40% greater than the odds of other students.

Ethnicity Hispanic or Latino. Students who described themselves as having Hispanic or Latino origin enrolled in summer at a rate of 5.7% while non-Hispanic students enrolled 7.8% of the time. A chi-square test of the relationship between being Hispanic or Latino (HISPANIC) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 25.00, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .72, indicating that the odds of a Hispanic or Latino student enrolling in summer are about 72% of the odds of other students.

Race Native Hawaiian. Students who described themselves as Native Hawaiian or Other Pacific Islander enrolled in summer at a rate higher than students of other races (8.8% versus 7.6%). However, a chi-square test of the relationship between being a native Hawaiian or other Pacific Islander (RAISLAND) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 1.10, which is not statistically significant at $p \leq .01$.

Race Other. Students who described their race as Other enrolled in summer at a rate of 5.4%. Students who did not report their race or ethnicity as Other enrolled 7.6%

of the time. A chi-square test of the relationship between the reported race being Other (RAOTHER) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 6.86, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .70, indicating that the odds of a student who reported their race as Other enrolling in summer are about 70% of the odds of other students.

Race White. Students who described themselves as White enrolled in summer at a rate of 7.2%. Students of other races/ethnicities enrolled 8.7% of the time. A chi-square test of the relationship between being White (RAWHITE) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 21.52, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .82, indicating that the odds of a White student enrolling in summer are only about 82% of the odds of other students.

Gender. In the sample, female students enrolled in summer in greater proportions than male students with enrollment 7.9% for females versus 7.2% for males. A chi-square test of the relationship between gender (GENDER) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 5.36, which is not statistically significant at $p \leq .01$.

Age 15 to 23. Students who reported their age as 15 to 23 years of age enrolled in summer in smaller proportions than students who were 24 years or older. Younger students enrolled at a rate of 6.6% versus 10.2% for students over 24. A chi-square test of the relationship between being traditional college age or younger (AGE1523) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 137.22, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of .63 indicating

that the odds of a student age 15 to 23 enrolling in summer are about 63% of those of older students.

Age 24 to 29. Students who reported their age as 24 to 29 years of age enrolled in summer in greater proportions than students of other ages. These students enrolled at a rate of 9.0% versus 7.3% for students who were younger or older. A chi-square test of the relationship between being age 24-29 (AGE2429) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 17.94, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.25 indicating that the odds of a student age 24 to 29 enrolling in summer are about 25% higher than those of older students.

Age 30 or Over. Students who reported their age as 30 or older enrolled in summer in greater proportions than students who were younger than 30. These students 30 years of age or older enrolled at a rate of 11.4% versus 7.0% for students 29 years of age and younger. A chi-square test of the relationship between being older than 30 (AGE30PLUS) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 122.37, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.71 indicating that the odds of a student over 30 enrolling in summer are 71% greater than those of younger students.

Parents Have No College Experience. This variable had 720 missing cases representing students who stated that they did not know their parents highest level of education. Students who reported that their parents' had no college experience enrolled in summer at a rate of 8.2%. Students whose parents had attended some college enrolled at a rate of 7.3%. A chi-square test of the relationship between parental education level (PARENOCOLL) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) =

10.43, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.14, indicating that the odds of a student whose parent has no college experience enrolling in summer are about 14% higher than of the odds of students whose parent attended some college.

Orphan or Ward of the Court. This characteristic was only reported for students who were 23 years of age or younger resulting in 10,470 missing cases. The number of students who reported being orphans or wards of the court was a very small portion of the total sample population (about .6%). Students who were orphans or wards of the court enrolled in summer at a rate of 12.7% versus 6.6% for other students. A chi-square test of the relationship between being an orphan or ward of the court (ORPHAN) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 9.81, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 2.05 indicating that students who are orphans or wards of the court are more than twice as likely as other students to enroll in summer session. This is the largest effect size of any variable, however, due to the small number of students who reported they were orphans, the confidence interval for the odds ratio was large (95%CI [1.3,3.3]).

Dependents. Students who had dependents enrolled in summer at a rate of 11.3%. Students who did not have dependents enrolled at a rate of 7.0%. A chi-square test of the relationship between having dependents (DEPENDANY) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 126.22, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.70, indicating that the odds of a student who has dependents enrolling in summer are 70% higher than the odds of a student who does not have dependents.

Single Parent. Students who reported being a single parent enrolled in summer at a rate of 10.1%. Students who were not single parents enrolled at a rate of 7.4%. A chi-square test of the relationship between being a single parent (SINGLPAR) and summer enrollment produced χ^2 (1) = 25.49, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.41, indicating that the odds of a student who is a single parent enrolling in summer are 40% higher than the odds of a student who is not a single parent.

Veteran Status. Students who are veterans enrolled in summer at a rate of 12.9%. Students who were not veterans enrolled at a rate of 7.4%. A chi-square test of the relationship between being a veteran (VETERAN) and summer enrollment (SUMMERENROLLED) produced χ^2 (1) = 36.78, which is statistically significant at $p \leq .01$. This is associated with an odds ratio of 1.84, indicating that the odds of a student who is a veteran enrolling in summer are 84% greater than the odds of a student who is not a veteran.

Disability. Students who reported having a disability enrolled in summer at a rate of rate of 7.7%. Students who did not have a disability enrolled at a rate of 7.6%. A chi-square test of the relationship between having a disability (DISABLE) and summer enrollment produced χ^2 (1) = .04, which is not statistically significant at $p \leq .01$.

Summary of Univariate Analysis

These analyses were conducted to answer the first research question: Do the access related characteristics of undergraduate students who enroll in summer session differ from students who do not enroll in summer. Through t-test and chi-square analyses, several variables in the five factors were found to be associated with enrollment

in summer session. Financially, students who attend in summer tend to have slightly higher costs of attendance and loans, and slightly lower incomes. Students who are working full-time and/or are independent students tend to enroll in summer more often and students who are not working at all do not enroll in summer session as often as their working counterparts. Geographically, students who have participated in distance education, who have a permanent home outside of an urban area or within 35 miles of their enrolled institution, and who do not live on-campus or with their parents tend to enroll in summer session more often. Programmatically, students whose major is undeclared or in the humanities tend not to enroll in summer session. Those who major in health related programs tend to enroll in summer. First year students do not enroll in summer session whereas third year students and students whose year of study is unclassified do tend to enroll in summer session. Academically, students who attend in summer have slightly lower SAT scores but higher grade point averages. Students who experienced a delay in enrollment into postsecondary education of one year or more are likely to enroll in summer session. In terms of Cultural/Social/Physical characteristics of students, Black students are likely to enroll in summer whereas Hispanic, White and students who report their race as Other tend not to enroll in summer. Younger students, those age 15-23, tend not to enroll in summer whereas older students are more likely enroll in summer. Students who have dependents, who are single parents, veterans, and those whose parents have no college experience tend to enroll in summer as well.

Looking at the continuous variables as a group, it is important to note that all effect sizes as calculated by Cohen's d were less than .20. This is considered a small effect size, however in new areas of research inquiry and in studies of "phenomena which

cannot be brought into the laboratory", both conditions that apply in the present study, the effect size is likely to be small or difficult to distinguish from other extraneous variables (Cohen, 1988, p. 25). Fortunately, the large sample size (39,020) and high standard of significance *(p* < .01) used in this study imply that even the small effect sizes detected can be duplicated.

Among the categorical variables, it is important to note that some characteristics are more strongly related to summer enrollment than others. Table 13 lists the categorical variables with a significant relationship to summer enrollment sorted by their odds ratio within each factor. The factors most strongly associated with summer enrollment are listed at the top within each grouping. Those characteristics most strongly associated with not enrolling in summer are at the bottom within each group. In this grouping, the variables orphan/ward of the court status (ORPHAN) veteran status (VETERAN), and being age 30 or older (AGE30PLUS) appear to have the strongest association with summer attendance while being traditional college age (AGE1523) and freshman status (FIRSTYR) seem to have the strongest association with not enrolling in summer.

Results of Logistic Regression Analysis

The second research question to be answered was: Do the access related characteristics in which students differ have predictive value for enrollment in summer session? This question was answered through a series of logistic regression analyses using selected variables from the univariate analysis. A separate regression model was built for each of the five factors to determine the predictive value of characteristics within

TABLE 13

Categorical Variables Sorted by Odds Ratio within Factors

Variable	N	χ^2	OR
Financial			
DEPEND	39,020	163.90*	1.64
FTWORK	39,020	64.27*	1.45
NOWORK	39,020	24.54*	0.81
Geographic			
LOCALRESOFF	39,020	145.00*	1.60
DISTEDUC	39,020	41.53*	1.36
DISTHOMEHIGH	39,020	28.56*	0.81
URBANEXTREME	38,050	30.75*	0.72
Programmatic			
THIRDYEAR	39,020	90.75*	1.49
UNCLASSYR	39,020	6.96*	1.47
MAJORHLTH	39,020	20.44*	1.33
MAJORHUM	39,020	10.36*	0.83
MAJORUND	39,020	11.14*	0.73
FIRSTYR	39,020	69.12*	0.66
Academic			
DELAYENR	38,970	91.13*	1.53
RIGOROUS	33,900	9.15*	.87
Cultural/Social/Physical			
ORPHAN	28,560	9.81*	2.05
VETERAN	39,020	36.78*	1.84
AGE30PLUS	39,020	122.37*	1.71
DEPANY	39,020	126.22*	1.70
RABLACK	39,020	49.98*	1.42
SINGLPAR	39,020	25.49*	1.41

TABLE 13 (Continued)

Categorical Variables Sorted by Odds Ratio within Factors

AGE2429	39,020	17.94*	1.25
PARENOCOLL	38,300	10.43*	1.14
RAWHITE	39,020	21.52*	0.82
HISPANIC	39,020	25.00*	0.72
RAOTHER	39,020	6.86*	0.70
AGE1523	39,020	137.22*	0.63

Note. N rounded to nearest 10.

χ^2 = computed value of chi-square test.

OR = odds ratio.

*$p \leq .01$.

each of the factors. Lastly, an overall regression model that combined the five factors was built to estimate the predictive value of the combined variables.

Variables were selected for inclusion in the initial logistic regression analysis on the basis of: (a) having a significant relationship *(p* ≤ .01) with summer enrollment as determined by the t-test or chi-square scores from the univariate analysis; (b) not having a large number of missing cases that would result in the exclusion of other groups of research interest; (c) the need to select the groups of key research interests where multiple groups within a chosen variable had a significant relationship to summer enrollment; (d) the need to avoid the effects of strong intercorrelation among the selected variables. The selection of variables for each factor model is described in the development of that model.

Suitability of each logistic regression model was assessed using three test statistics. First, the change in the -2 log likelihood (-2LL) score of each model compared to a model without any predictors (the null model) was evaluated to determine overall significance of the model. The significance of the change in the -2LL score between the proposed model and the null model can be evaluated using the chi-square distribution to assess the "goodness" or "badness" of fit of a model (Warner, 2008). For purposes of this study, a significant chi-square *(p* ≤ .01) distribution of the change in the -2LL score indicated that the model was statistically significant.

Second, the adequacy of the fit of each model to the data was determined by calculation of the Hosmer and Lemeshow (H-L) Goodness of Fit Test. The H-L Goodness of Fit Test evaluates how the observed frequency of membership in the dependent variable groups compares to the frequency of membership that is predicted by

the model (Hosmer & Lemeshow, 2000; Warner, 2008). For this test a non-significant score indicates that the model adequately fits the data and the significance level was set at the more conservative level of $p \geq .05$ for this test.

Third, the overall predictive value of the model was assessed using the Nagelkerke's R^2 statistic. The Nagelkerke's R^2 score may be used to assess the effect size of the variables in the model in explaining the overall variance (Garson, 2010; Warner, 2008). For logistic regression analysis, R^2 like measures must be interpreted in conjunction with overall goodness of fit measures (Garson, 2010).

Results of Logistic Regression on Variables in the Financial Factor

The univariate analysis found that the following Financial Factor variables had a significant relationship with summer enrollment. Student Budget (SQRTBUDGETAJ), Family Income (SQRTCINCOME), Ratio of Loans to Student Budget (LOANCST), Not Working While Enrolled (NOWORK), Working Full-Time While Enrolled (FTWORK) and Dependent Student Status (DEPEND).

None of these variables had missing cases however two of the employment while enrolled variables, NOWORK and FTWORK were found to be significantly related to summer enrollment. For purposes of this study, the variable Working Full-Time While Enrolled (FTWORK) was chosen as the analysis variable with the comparison group consisting of those students who worked part-time or not at all. Correlations among the remaining Financial Factor variables are displayed in Table 14.

The variables were analyzed for intercollinearity. The Pearson r^2 values indicated that the financial characteristics selected for logistic analysis exhibited some possible linear relationships. Dependency status exhibited several logical connections to other

financial variables. Independent student status is inversely connected to family income and cost of education indicating these students who are not able to rely on parent's income are likely to report lower incomes and also to have a lower cost of attendance. Independent student status is also related to working full-time indicating that students who are dependents might not need to work and especially not need to work full-time. A cross-tab investigation of the relationship between dependency status and working full-time found that 33% of independent students work full-time versus 9% of dependent students. No variables were excluded from the model due to intercollinearity, however, standard errors of the logistic coefficients were monitored in the logistic results for effects of intercollinearity among other variables.

An initial logistic regression model was fitted using the selected Financial factor variables. All variables in the initial model were found to contribute significantly to the overall fit of the model based on the significance of the Wald statistic. The Financial factor logistic model is displayed in Table 15.

The logistic regression model of Financial characteristics was significantly different from the null model. The -2LL score for the null model with no variables was 20,933. The -2LL score for the model including Financial variables decreased to 20,592 and the distribution of this change was significant (χ^2 (5) = 341.58, p = .000). The H-L Goodness of Fit score was χ^2 = 45.547 with a significance of p =.000. A significant chi-square score on the H-L Goodness of Fit test indicates that the model did not adequately fit the data (Garson, 2010). For the financial characteristics model the Nagelkerke's R^2 value was .021 indicating that these Financial characteristics predict about 2.1% of the overall choice to enroll in summer. Because the H-L Goodness of Fit score indicated that

TABLE 14

Intercorrelations for Selected Financial Factor Variables (N=39,020)

Variable	1	2	3	4	5
1. SQRTBUDGETAJ	--				
2. SQRTCINCOMES	.228*	--			
3. LOANCST	.093*	-.087*	--		
4. FTWORK	-.232	-.079	.004	--	
5. DEPEND	-.358*	-.481*	.021*	.296*	--

Note. N rounded to nearest 10. *p ≤ .01.

Dependency Status coded as 1=Dependent Student, 2 = Independent Student.

All other variables coded 1=Yes, 0=No.

TABLE 15

Summary of Logistic Model of Financial Variables That Predict Summer Enrollment (N=39,020)

Variable	B	SE	Wald (1df)	OR
SQRBUDGETAJT	0.01	0.00	145.42*	1.01
SQRTCINCOME	-0.00	0.00	12.66*	1.00
LOANCST	0.00	0.00	7.28*	1.00
FTWORK	0.32	0.05	39.61*	1.37
DEPEND	0.52	0.05	111.00*	1.69
Constant	-4.00	0.13	2,872.17*	0.02

Note. N rounded to nearest 10.

B = Regression coefficient.

Wald = Wald statistic with 1 degree of freedom.

OR = Odds ratio.

*$p \leq .01$.

the model was inadequate in fit, the R^2 value of this model must be interpreted conservatively.

Results of Logistic Regression on Variables in the Geographic Factor

In the univariate analysis the following geographic variables were found to be significantly related to summer enrollment: Residence Off-Campus (LOCALRESOFF), Participated in Distance Education (DISTEDUC), Distance to Permanent Home Higher than Median (DISTHOMEHIGH) and From a Large City (URBANEXTREME). The variable URBANEXTREME had 971 missing cases consisting mostly of international students. SPSS logistic regression analysis removes missing cases from the analysis using listwise deletion and the total number of cases for this analysis is reduced to N = 38,050. No inferences regarding international students are made from this analysis. The correlation coefficients of these variables are displayed in Table 16.

The review of these variables for correlations revealed logical connections between some of the variables. Specifically, students who report that their permanent home is close to campus might also be expected to live off-campus and students who report participating in distance education are also somewhat more likely to live off-campus. Investigation of these relationships revealed that 58% of students whose permanent home is close to campus (within 35 miles) report living off-campus versus 43% of students whose permanent home is further from campus. Likewise, 21% of students who lived off-campus also participated in distance education while only 11% of students who lived on-campus participated in distance education. Although significant, neither of these relationships was strong enough to warrant exclusion of the variable from

TABLE 16

Intercorrelations for Selected Variables in the Geographic Factor (N=38,050)

Variable	1	2	3	4
1. LOCALRESOFF	--			
2. DISTEDUC	.151*	--		
3. DISTHOMEHIGH	-.145*	-.060*	--	
4. URBANEXTREME	.004	-.030	-.087	--

Note. N rounded to nearest 10

All variables coded 1=Yes, 0=No.

*$p \leq .01$.

the logistic model. Standard errors in the logistic model were monitored for the effects of intercollinearity.

An initial logistic regression model was fitted using the selected variables in the Geographic factor. All variables in the initial model were found to contribute significantly to the overall fit of the model based on the significance of the Wald statistic. The logistic model of variables in the Geographic factor on the decision to enroll in summer is displayed in Table 17.

The logistic regression model of Geographic characteristics was significantly different from the null model. The -2LL score for the null model with no variables was 20,485 whereas the -2LL score for the model including Geographic variables decreased to 20,265. The distribution of this change was significant ($\chi^2 = 220.88$, $p = .000$). The H-L Goodness of Fit score was $\chi^2 = 10.05$ with a significance level of $p = .19$ indicating that the model adequately fit the data. The overall predictive value of the Geographic factor variables on the decision to enroll, as determined by the Nagelkerke's R^2 value, was .014, indicating that the geographic characteristics in this model predicted about 1.4% of the overall choice to enroll in summer.

Results of Logistic Regression on Variables in the Programmatic Factor

The following Programmatic variables were found to be significantly related to summer enrollment in the univariate analysis: Class Level is Third Year (THIRDYR), Class Level is First Year (FIRSTYR), Class Level is Unclassified (UNCLASSYR), Major is Health (MAJORHLTH), Major is Humanities (MAJORHUM), and Major isUndeclared (MAJORUND). There were no missing cases among these Programmatic variables. Three out of six possible categories of year of enrollment were found to be

TABLE 17

Summary of Logistic Model of Variables in the Geographic Factor that Predict Summer Enrollment (N=38,050)

Variable	B	SE	Wald (1df)	OR
LOCALRESOFF	0.44	0.04	118.64*	1.55
DISTEDUC	0.19	0.05	15.66*	1.21
DISTHOMEHIGH	-0.17	0.04	17.42*	0.85
URBANEXTREME	-0.35	0.06	33.14*	0.70
Constant	-2.66	0.04	4,655.65*	0.07

Note. N rounded to nearest 10.

B = Regression coefficient.

Wald = Wald statistic with 1 degree of freedom.

OR = Odds ratio

*$p \leq .01$.

significant with first year students unlikely to enroll in summer and third year and unclassified year students likely to enroll in summer. Both class level and undeclared major as reported in the literature review (Pryor, et al., 2007; Tinto, 1993) are research characteristics of interest. Unclassified year students were a very small portion of the overall sample (1.4%) and the univariate analysis resulted in an odds ratio with a large 95% confidence interval. The experiences of first year students versus juniors has also been highlighted in other studies related to summer session enrollment (Gotshall, 2005; Jenkins, et al., 2007; Patterson, et al., 1981). Therefore, for purposes of this analysis, the experiences of first year students and third year students were selected for analysis, with all other students being included in the comparison group. Three out of the 14 possible major categories were found to be significantly related to summer enrollment in the univariate analysis. All three major categories were included in the analysis with other majors serving in the comparison group.

The correlation coefficients of the remaining programmatic variables are displayed in Table 18. A review of correlation among these variables revealed logical relationships among mutually exclusive variables (i.e. students who are first year students cannot also be third year students) as well as a moderate correlation between undeclared majors (MAJORUND) and first year students (FIRSTYR). Investigation of this relationship revealed that about 14% of first year students are also undeclared majors versus only about 3% of all other students. Therefore, neither variable was excluded from analysisdue to correlation but standard errors in the logistic regression were monitored for any effects of intercollinearity.

TABLE 18

Intercorrelations for Selected Programmatic Factor Variables (N=39,020)

Variable	1	2	3	4	5
1. THIRDYEAR	--				
2. MAJORHLTH	-.013	--			
3. MAJORHUM	-.001	-.123*	--		
4. MAJORUND	-.086*	-.072*	-.095*	--	
5. FIRSTYR	-.306*	.018*	.015*	.216*	--

Note. N rounded to nearest 10.

All variables coded 1=Yes, 0=No.

*$p \leq .01$.

A logistic regression model was fitted using the selected variables of MAJORUND, MAJORHUM, MAJORHLTH, FIRSTYR, and THIRDYR. Calculations of the initial model revealed that the variable MAJORUND did not contribute significantly to the predictive value of the model (Wald = 2.16(1df), p =.141) and this variable was dropped before fitting the final model for this factor. A final model of the Programmatic variables predicting the choice to enroll or not enroll in summer is described in Table 19.

The final logistic regression model of Programmatic characteristics was significantly different from the null model. The -2LL score for the null model with no variables was 20,933 whereas the -2LL score for the model including Programmatic variables decreased to 20,783. The distribution of this change was significant (χ^2 = 149.92, p = .000). The H-L Goodness of Fit score was χ^2 = 2.951 with a significance level of p=.566 indicating that the model adequately fit the data. The overall predictive value (Nagelkerke's R^2) of these variables on the decision to enroll was .009 indicating that Programmatic factor characteristics predict a little less than 1% of the overall choice to enroll in summer.

Results of Logistic Regression on Variables in the Academic Factor

The univariate analysis found that the following characteristics were significantly associated with summer enrollment: Academic Intensity of Secondary School Program (RIGOROUS),Experienced a Delay of One Year or More into Postsecondary Education (DELAYENR), SAT Score (TESATDER), and Grade Point Average in College (GPA). The variables RIGOROUS and TESATDER had 5,120 and 6,680 missing cases respectively representing mostly students who were over the age of 30 and were not

TABLE 19

Summary of Logistic Model of Programmatic Variables that Predict Summer Enrollment (N=39,020)

Variable	B	SE	Wald (1df)	OR
MAJORHUM	-0.15	0.06	6.79*	0.86
MAJORHLTH	0.28	0.06	19.05*	1.32
FIRSTYR	-0.30	0.05	34.99*	0.73
THIRDYEAR	0.31	0.04	50.37*	1.37
Constant	-2.53	0.03	7,928.46*	0.08

Note. N rounded to nearest 10.

B = Regression coefficient.

Wald = Wald statistic with 1 degree of freedom.

OR = Odds ratio.

*$p \leq .01$.

asked about their high school experiences or test scores. In order to not exclude students who were 30 years of age or older which is an important research group of interest, these two academic variables were excluded from the logistic regression. DELAYENR also had a small number of missing cases and the sample for this analysis was reduced to N = 38,970. The correlation coefficient between the two remaining variables DELAYENR and GPA was r^2 = -.005 and was not significant and is not displayed in a separate table. The logistic regression calculation of Academic variables is displayed in Table 20. The null model for this slightly reduced sample had a -2LL score of 20,904. The logistic model with the two Academic variables was significantly better than the null model (-2LL = 20,755, χ^2 = 149.46 (2 df), p = .000). The fit of the Academic variable model was not adequate according to the H-L Goodness of Fit Test (χ^2 = 27.24 (8 df) p = .001) and the Nagelkerke's R^2 value was small at .001 indicating that this model predicted less than .1% of the choice to enroll. The R^2 score must be interpreted conservatively in light of the lack of adequate fit score of this model.

Results of Logistic Regression on Cultural/Social/Physical Variables

The univariate analysis found that the following Cultural/Social/Physical factor variables were significantly related to summer enrollment: Race Black or African-American (RABLACK); Race Hispanic (HISPANIC); Race Other (RAOTHER); Race White (RAWHITE); Age Group 15-23 (AGE15-23); Age Group 24-29 (AGE2429); Age Group 30 or More Years of Age (AGE30PLUS), Parents Have No College Experience (PARENOCOLL), Orphan or Ward of the Court (ORPHAN); Has Dependents (DEPANY); Single Parent Status (SINGLPAR), and Veteran Status (VETERAN).

TABLE 20

Summary of Logistic Model of Academic Variables that Predict Summer Enrollment (N=38,970)

Variable	B	SE	Wald (1df)	OR
DELAYENR	.43	.05	90.01*	1.53
GPA	.00	.00	62.62*	1.00
Constant	-3.28	.09	1,299.86*	.04

Note. N rounded to nearest 10.

B = Regression coefficient.

Wald = Wald statistic with 1 degree of freedom.

OR = Odds ratio.

*$p \leq .01$.

The variable ORPHAN had 10,466 missing cases representing all students 24 years of age and older who were not asked this question. In order to avoid exclusion of a large population of research interest to this study, the variable ORPHAN was not included in the logistic regression. The variable PARENOCOLL has 725 missing cases and reduced number of total cases for this logistic regression analysis was 38,300.

The variables for race and age had many significant categories and selections were made to focus the logistic regression on fewer categories of specific research interest. In terms of race, four out of the seven possible race classifications were significantly associated with summer enrollment. The categories of Black/African-American and Hispanic have been highlighted in the literature as most associated with access and completion challenges (Perna, 2000, 2007) and were chosen as the analysis group with all other race/ethnicities treated as the comparison group. It should be noted that under the NCES data procedures for racial categories (National Center for Education Statistics, 2002), individuals may be classified into more than one category. In this sample about 1.1% of individuals identified themselves as Hispanic/Latino in ethnicity and Black/African American in race.

In terms of age, membership in all three age groups was significantly related to summer enrollment with traditional college age students (15-23 years of age) less likely to enroll in summer and older students more likely to enroll in summer. The challenges for older students to attain a degree and their need for flexible pathways to degree completion was highlighted in the literature (King, 2003; McCormick, 2003). Therefore, older students age 30 and above were chosen as the analysis group with students 29 years of age and younger serving as the comparison group.

Correlations among the remaining variables were calculated and are displayed in Table 21. SINGLEPAR was strongly correlated to DEPANY ($r^2 = .664$). Further investigation revealed that the variable SINGLEPAR is derived in the NPSAS dataset from the variable DEPANY included in this study and a marital status variable not included in this study. Because SINGLEPAR describes a subset of the subjects who reported having dependents, the variable SINGLEPAR was dropped from the logistic analysis in favor of the more broadly indicative variable DEPANY.

DEPANY was also strongly correlated to AGE30PLUS ($r^2 = .540$). Review of the relationship between DEPANY and AGE30PLUS revealed that 62% of students age 30 or older had dependents versus only 7% of students younger than 30 years of age. Because of the strong relationship between AGE30PLUS and DEPANY, the variable DEPANY was also excluded from the logistic analysis in favor of the broader age group variable. AGE30PLUS was also moderately correlated with RABLACK, VETERAN and PARENOCOLL. About 23% of Black students were age 30 or older versus 12% of all other students. Similarly, about 9% of students 30 and older were veterans versus 1.2% of students in other age groups. About 54% of students 30 and over had parents with no college experience versus about 26% of students under the age of 30. The variables AGE30PLUS, RABLACK, and VETERAN were not eliminated from the logistic regression analysis but standard errors in the model were monitored for effects of intercollinearity.

A logistic regression model including the remaining Cultural/Social/ Physical variables was fitted and the contribution of each variable to the model was evaluated using the Wald statistic. In the initial model the variable PARENOCOLL did not have a

TABLE 21

Intercorrelations for Selected Cultural/Social/Physical Variables (N=38,300)

Variable	1	2	3	4	5	6	7
1. RABLACK	--						
2. HISPANIC	-.049*	--					
3. AGE30PLUS	.117*	.011	--				
4. PARENOCOLL	.116*	.109*	.206*	--			
5. DEPANY	.118*	.049*	.540*	.188*	--		
6. SINGLPAR	.155*	.044*	.271*	.127*	.664*	--	
7. VETERAN	.026*	.003	.178*	.062*	.122*	.024*	--

Note. N rounded to nearest 10.

*$p \leq .01$.

All variables coded 1=Yes, 0=No.

significant coefficient that contributed to the overall model (Wald = .948 (1df) $p = .330$) and it was dropped from the analysis. Exclusion of this variable and its missing cases returned the sample size to the full 39,020 cases. A final model was fitted and is described in Table 22.

The logistic regression model of selected Cultural/Social/Physical variables was significantly better than the null model (-2LL = 20,755, $\chi^2 = 178.70$, $p = .000$). The H-L Goodness of Fit test indicated that the model adequately fit the data returning $\chi^2 = .159$ which was not significant *(*$p = .923$). These Cultural/Social/Physical variables explained about 1.1% of student's choice to enroll in summer session (Nagelkerke's $R^2 = .011$).

Results of a Combined Logistic Regression with All Five Factors

As a final stage of analysis, the variables included in the five factor logistic regressions above were combined into a single logistic model to determine the overall predictive value of student characteristics on the choice to enroll in summer. Variables were entered in five blocks in the order of importance to the overall decision to enroll as determined by the Nagelkerke's R^2 value from the individual factor logistic regressions. In the individual factors logistic regressions, the Financial factor had the largest predictive value ($R^2 = .021$), followed in order by Geographic ($R^2 = .014$), then Cultural/Social/Physical ($R^2=.011$), Programmatic ($R^2=.009$) and Academic ($R^2=.001$).

The variables Student from a Large City Locale (URBANEXTREME) and Delay in Enrollment into PSE (DELAYENR) had missing cases in the combined analysis resulting in a slightly reduced sample size of 38,000. The missing cases for URBANEXTREME were identified as mostly international students. No inferences regarding international students are made in this analysis.

TABLE 22

Summary of Logistic Model of Cultural/Social/Physical Variables that Predict Summer Enrollment (N=39,020)

Variable	B	SE	Wald (1df)	OR
RABLACK	0.27	0.05	28.98*	1.32
HISPANIC	-0.32	0.07	23.09*	0.72
AGE30PLUS	0.47	0.05	85.64*	1.60
VETERAN	0.39	0.11	13.88*	1.48
Constant	2.60	0.02	12,137.53	0.07

Note. N rounded to nearest 10.

B = Regression coefficient.

Wald = Wald statistic with 1 degree of freedom.

OR = Odds ratio.

*$p \leq .01$.

Combining variables from among the five factors revealed additional intercollinearities to be considered in fitting the logistic model. Dependent Student Status (DEPEND) was significantly correlated to other variables that would logically be associated with being an independent adult. It is logical to conclude that students older than 30 (AGE30PLUS, $r^2 = .574$) would tend to report themselves as independent students and that independent students might also be more likely to live off-campus (LOCALRESOFF, $r^2 = .446$), to work full-time (FTWORK, $r^2 = .296$) and to have experienced a delay in enrollment (DELAYENR, $r^2 = .438$). To reduce the effects of intercollinearity in the combined logistic model, the variable DEPEND was excluded from the model. The variable AGE30PLUS was also moderately correlated to DELAYENR ($r^2 = .391$), FTWORK ($r^2 = .276$) and LOCALRESOFF ($r^2 = .333$). These variables were retained in the analysis and standard errors were monitored for any effects of intercollinearity.

A hierarchical logistic regression model was fitted using the 18 selected variables across the five factors and is displayed in Table 23. The combined variables under each factor were entered as steps. The combined model including all five factors resulted in a significantly lower -2LL score at each step of the model. The -2LL score for the full combined model was 19,776 ($\chi^2 = 679.9$, $p = .000$). The predictive value of the model was evaluated at each step and found to improve as each additional factor and its related variables were fed into the model. The Nagelkerke's R^2 value of the total combined model was .043 indicating that combined the selected variables in the five factors accounted for about 4.3% of the choice to enroll in summer.

TABLE 23

Summary of Logistic Model of Combined Variables (N=38,000)

Variable	B	SE	OR	R^2	ΔR^2
Step 1 – Financial				.015	
SQRTBUDGETAJ	0.01*	0.00	1.00		
SQRTCINCOME	-0.00*	0.00	1.00		
LOANCST	0.00	0.00	1.00		
FTWORK	0.27*	0.05	1.31		
Step 2 – Geographic				.029	.014
DISTEDUC	0.17*	0.05	1.19		
DISTHOMEHIGH	-0.17*	0.04	0.84		
URBANEXTREME	-0.42*	0.06	0.66		
LOCALRESOFF	0.33*	0.05	1.39		
Step 3 – Cultural/Social/Physical				.035	.006
RABLACK	0.31*	0.06	1.36		
HISPANIC	-0.28*	0.07	0.76		
AGE30PLUS	0.15	0.06	1.17		
VETERAN	0.22	0.11	1.25		
Step 4 - Programmatic				.039	.004
MAJORHUM	-0.13	0.06	0.88		
MAJORHLTH	0.19*	0.06	1.20		
FIRSTYR	-0.12	0.06	0.89		
THIRDYR	0.29*	0.05	1.33		
Step 5 - Academic				.043	.004
DELAYENR	0.21*	0.05	1.24		
GPA	0.00*	0.00	1.00		
Constant	-3.98	0.13	0.02		

Note. N rounded to nearest 10. B = Regression coefficient. SE = Standard error OR = Odds ratio. R^2 = Nagelkerke's R^2 value at step. ΔR^2 = Change in R^2 between steps. *Significant Wald statistic at 1 degree of freedom and $p \leq .01$.

In summary, the univariate analysis of each selected variable was sufficient to answer the first research question demonstrating that students who enroll in summer and those that do not enroll in summer do differ significantly across several access related characteristics. The logistic regression analyses answer the second research question demonstrating that some of the characteristics in which students differ also have value in predicting the student's choice to enroll in summer session.

Chapter 5

Discussion

The purpose of this study was to understand the access-related characteristics of undergraduate students that make them more or less likely to enroll in the summer term. The factors explored included Financial, Geographic, Programmatic, Academic, and Cultural/Social/Physical characteristics of students (Heller, 2001a). This chapter summarizes the major findings of the study, discusses the findings as they relate to prior research, and describes their implications for future practice, research and policy. Limitations of the study are also discussed.

The first research question asked whether the access related characteristics of undergraduate students who enroll in summer session differed from students who do not enroll in summer session. A series of univariate chi-square and t-test analyses of the relationship of characteristics were conducted within each of the five access factors and summer enrollment. This analysis found that there are characteristics in each of the five factors where students differ significantly. These characteristics are outlined in Table 24 and are described below by factor and in terms of students who enroll versus students who do not enroll.

In terms of those significant characteristics that are related with summer enrollment, students who enroll in summer session tend to have to have slightly higher costs of attendance, use more student loans to cover those costs, and have slightly lower total family incomes. Students who are working full-time or are independent in their financial status also tend to enroll in summer more often than students who are not. Students who have participated in distance education during the school year are likely to

Table 24

Summary of Factors and Individual Characteristics with Significant Relationship to Summer Enrollment

Factor	Characteristic	Relationship to Summer Enrollment
Financial	Cost of Attendance	Mean Higher if Enrolled
	Family Income	Mean Lower if Enrolled
	Percent of Financial Aid from Loans	Mean Higher if Enrolled
	Not Working While Enrolled	Not Enrolled
	Working Full-Time While Enrolled	Enrolled
	Independent Student Status	Enrolled
Geographic	Participated in Distance Education	Enrolled
	Permanent Home more than 35 Miles from Campus	Not Enrolled
	Local Residence in an Urban Area in a Large City	Not Enrolled
	Local Residence Off-Campus	Enrolled
Programmatic	Undeclared Major	Not Enrolled
	Humanities Major	Not Enrolled
	Health Major	Enrolled
	First Year Student	Not Enrolled
	Third Year Student	Enrolled
	Year of Study is Unclassified	Enrolled
Academic	Completed a Rigorous High School Curriculum	Not Enrolled
	Enrollment into Higher Education Delayed by One Year or More	Enrolled
	SAT Score	Mean Lower if Enrolled
	College GPA	Mean Higher if Enrolled

Table 24 (continued)

Summary of Factors and Individual Characteristics with Significant Relationship to Summer Enrollment

Cultural/Social/Physical	Race Black or African American	Enrolled
	Ethnicity Hispanic	Not Enrolled
	Race Other	Not Enrolled
	Race White	Not Enrolled
	Age 15 to 23 Years Old	Not Enrolled
	Age 24 to 29 Years Old	Enrolled
	Age 30 Year Old or Older	Enrolled
	Neither Parent Has College Experience	Enrolled
	Orphan or Ward of the Court	Enrolled
	Has Dependents	Enrolled
	Is Unmarried and Has Dependents	Enrolled
	Military Veteran	Enrolled

participate in summer session, as are students who live off-campus or have a permanent home that is within 35 miles of campus. Third year students and students who are not classified by year tend to enroll in summer session as do students who major in health related programs. Students who attend in summer have slightly lower SAT scores but higher GPAs. Students who delay one year or more after high school before enrolling in higher education are more likely to enroll in summer session than those who experience no delay between high school and college. Black students as well as students who have dependents and those who are single parents tend to enroll in summer. Students who are orphans or wards of the court enroll in summer at significantly higher rates higher than other students and students who reported that they are veterans or whose parents had no college experience also tend to enroll in summer.

In terms of characteristics that are related to not enrolling in summer, students who are not working either full or part-time are less likely to enroll in summer session. A student whose permanent home is more than 35 miles away from campus or is located in an urban area tends not to enroll in summer session. First year students and those who major in humanities or have an undeclared major tend not to enroll in summer session. Students who completed a rigorous high school curriculum that met the requirements of the Federal Academic Competiveness Grant program (U.S. Department of Education, 2010) are less likely to enroll in summer than students who have not completed such a program. Students who are age 15-23 are not as likely as older students to enroll in summer. Hispanic, White and students who reported their race as other are also not as likely to enroll.

The second research question asked to what degree the access related characteristics of students predicted enrollment in summer session. A logistic regression was performed on the significant variables in each of the five factors to determine the predictive value of each factor. In addition, the five factors were entered into a hierarchical logistic regression model to determine their combined predictive value. Within the five factors, all logistic models were found to be significant in their predictive ability when compared with the null model. However, only three out of the five factors resulted in models with an adequate fit as evaluated by the Hosmer-Lemeshow Goodness of Fit Test. The Geographic, Programmatic and Cultural/Social/Physical models adequately fit the data while the Financial and Academic variable models did not fit the data. Predictive values of the five individual factors ranged from 0.1% to 2.1% with the Financial and Geographic factors having the largest predictive value and the Programmatic and Academic factors having the least predictive value. When all five factors were entered as steps in a combined model, each contributed positively to the significance of the combined model and also to its predictive value. The final combined five-factor model was significant, fit the data adequately but predicted only about 4.2% of the decision to enroll.

Interpretation of the Findings

Within each factor, logical connections between summer enrollment and student characteristics may be found that help explain the findings of this research. Some findings will require additional research to fully understand. The following is an attempt to interpret the relationship of the student characteristics in each factor with the choice to enroll or not enroll in summer.

Within the Financial factor the higher cost of attendance and associated use of loans may be explained by the data that were collected in the study. In the dataset total tuition charged to the student (as reported by the institution) and other costs of attendance (as reported by the student) were combined to calculate the total cost of attendance (Cominole, et al., 2010). The total tuition and fees charged by the institution for the academic year could be inclusive of summer charges resulting in the higher cost for summer enrolled students. The lower family income for summer-enrolled students may be reflective of the fact that summer-enrolled students are also more likely to be independent students. Independent students typically report lower family incomes in their financial aid documents as they are not relying on parental or other family income for support. The relationship of full-time work status to summer enrollment points to students who must stretch out their studies over more semesters each year to accommodate the time needed to balance work and school responsibilities. Students who do not work at all may have fewer challenges balancing responsibilities and therefore less need to attend in the summer.

Geographic characteristics associated with summer session point to the local and permanent residences of students as determining factors. Commuter students, those who have a permanent home within 35 miles of campus, or who live off-campus rather than in the residence halls are likely to enroll. Students whose permanent homes are in urban regions do not appear to attend during the summer. One possible explanation for this finding is that summer employment opportunities in urban areas draw students away from their institution to seek work back home over the summer. Another possible explanation is that students from urban areas return home in the summer and attend classes at another

institution. One of the delimitations of this study is it that it looks at summer attendance only at the same institution. More research is needed to fully understand this finding. Students who attend in summer are also more likely to have participated in distance education. This relationship is consistent with a picture of time-challenged students using summer and other tools such as distance learning courses to manage schedules and sustain or accelerate their time to degree.

The most compelling relationships in the Programmatic factor are those between year of study and summer enrollment. First year students are less likely to enroll in summer because they are still new in their academic careers and may not need to make up courses or may not even know what kinds of courses are offered in the summer. On the other hand, third year students are well along in their studies and have had time to evaluate the value of summer enrollment. They may need to repeat or catch up on a dropped course. They may also have had the opportunity to explore different majors or minors that require them to complete additional course work. Summer is a time to do that work and still graduate on time. The summer enrollment of students who are not classified into a year of study may point to the use of summer session by non-traditional students completing a degree on a part-time basis over more than the normal four or five year period. Certain majors are also related to summer enrollment. Health majors who enroll in summer may be required to complete practica and summer is an opportune time to complete these requirements. The tendency of undeclared majors to not enroll in summer may reflect the enrollment patterns of first year students since many students enter college without a declared major. The relationship of academic major to summer enrollment is an area that requires more research to fully understand.

In terms of Academic factors, the picture of students who face challenges in entering, persisting and attaining college degrees is reinforced by the findings that those with lower average SAT scores and those who experience a delay in enrollment are significantly more likely to attend in summer. Likewise, students who have completed a rigorous curriculum in high school do not enroll in summer therefore the inverse is also true; those who have not completed a rigorous curriculum are likely to enroll in summer. Once in college, those who enroll in summer tend to have a slightly higher GPA. The relationship between GPA and summer may be that the choice to enroll in summer reflects students' dedication to their studies that, in turn, may result in a higher GPA.

Many Cultural/Social/Physical variables were significantly related to summer session enrollment. The most interesting were those related to age where it was found that students who are traditional college age do not choose to attend in summer. Younger students seem to prefer a traditional fall/spring college experience, whereas those who are older and completing their degrees later in life are more likely to be interested in year-round attendance. Students who have dependents or are single parents choose to enroll in summer. This may point to time management and using summer as a tool to catch-up, keep up, or accelerate degree completion when there are competing demands on a student's time. The enrollment of military veterans in summer is consistent with the Academic variable of students who have experienced a delay in enrollment. Veterans are often students who enlisted in the military right out of high school. This finding may also suggest veterans' interest in accelerating degree completion through summer enrollment. The relationships of race/ethnicity and orphan/ward of the court status to summer

enrollment requires more research to fully understand and are discussed under directions for future research.

The overall predictive values of the individual logistic regression models confirm the small effect sizes and odds ratios reported in the univariate analysis. The individual factor models and the combined model predict only a small portion of the decision to enroll and make it clear that the decision is a complex one. Even a broadly defined set of factors accounts for only a small portion (4.2%) of the overall decision to enroll. More research about additional factors that might relate to enrollment in summer is needed to more fully understand the phenomenon.

Relationship of Findings to Prior Summer Research

The summer enrollment related studies reported in Chapter 2 were largely carried out on small samples from one or two institutions. This national level study confirmed some findings of these earlier studies and contradicted others. In the characteristics reported under the Financial Factor, this study's results partially confirmed earlier findings that summer school students commonly work full or part-time (Patterson, et al., 1981). Full-time work status was confirmed in this study. Part-time work status, however, was not significantly related to summer enrollment. Earlier findings that students rely on loans to fund summer attendance (Erisman & McSwain, 2006; Manton & English, 2002) are tangentially supported by my finding that summer-enrolled students have a larger ratio of loans to total costs than non-enrolled students.

Geographic variables that relate to the location of the student's permanent or campus residence were confirmed by this study. Off-campus residence has been connected with summer enrollment in prior studies (Chandler & Weller, 1995; Patterson,

et al., 1981), as has the proximity of the student's permanent home to the campus (Harris & Fallows, 2002). Both of these findings are confirmed by this study that found that students who live off-campus and those whose permanent homes are within 35 miles of the campus are likely to enroll in summer.

In relation to the variables in the Programmatic factor, this study did not confirm one earlier study's (Richmond & Piper, 1991) finding that business majors are likely to enroll and also contradicted earlier findings that undeclared majors are more likely to enroll (Chandler & Weller, 1995). This study found no relationship between being a business major and summer enrollment and found that students with undeclared majors were less likely to enroll than other students. Earlier studies (Gotshall, 2005; Jenkins, et al., 2007; Patterson, et al., 1981) found that third year and fourth year students are more likely to enroll in summer than first year and second year students. This study confirmed that third year students enrolled more often than first year students but found no significant relationship between fourth year status and summer enrollment.

Academically, Taylor, Lee and Doane (2001) found that students who enrolled in summer had lower mean SAT scores and lower GPA scores than other students. The present study confirmed the SAT finding; summer-enrolled students in this sample had a slightly lower average SAT score than other students. However, my results contradicted the GPA findings. In my study, summer-enrolled students in this nationally representative sample had a higher mean GPA than non-enrolled students.

In terms of Cultural/Social/Physical characteristics, the findings of three earlier studies (Harris & Fallows, 2002; Jenkins, et al., 2007; Patterson, et al., 1981) that reported more females than males enrolled in summer were not confirmed by this study.

The findings of this study are more consistent with Taylor et al. (2001) who found no significant relationship between gender and summer enrollment. Another study on racial characteristics of summer enrolled students found that Asian American and American Indian students were more likely to enroll in summer than White or Hispanic students (Daniel, 2000) . The present study found no relationship between Asian American or American Indian race and summer enrollment but confirmed Daniel's (2000) finding that White and Hispanic students are less likely to enroll in summer than students of other races/ethnicities. Two studies (Daniel, 2000; Harris & Fallows, 2002) reported a relationship between older students and summer enrollment, a finding confirmed in this study's results.

Implications of the Study

Interpreting the results of this study is important, as is comparing the results to those of previous studies. However, the study has a number of practical applications along with implications for future practice, research, and policy.

Implications for Practice

This study has implications for university faculty, administrators and other planners interested in increasing participation in summer session or maximizing the benefits of summer enrollment for students. One key finding of this study is that students who attend in summer do differ from other students in several access-related characteristics. An earlier study of faculty perceptions at a single institution found that most faculty thought summer enrolled students did not differ significantly from students enrolled in fall and spring (Tracey, Sedlacek, & Patterson, 1980). Evidence that can be used to change mistaken perceptions is important and several findings of this study may

be used to help faculty and others to understand the differences and target financial aid, marketing, support services, and courses to best meet the needs of students and the institution.

Financially, students who attend in summer have higher costs, lower family incomes and tend to rely on loan aid to meet those costs. This combination of factors points to the need for additional grant support for summer enrolled students. Some students who would benefit from attending in the summer may choose not to enroll in order to avoid taking on additional debt. In practice, summer trails fall and spring in financial aid disbursement and many students apply all available grant aid to their fall and spring enrollment, leaving no available aid for summer. Grants targeted specifically for summer costs or assistance for students in planning their financial aid across three terms instead of two may increase summer enrollment.

Targeted marketing should involve key variables that seem to influence the decision to enroll. One of those is the location of the student's residence. Students who have non-permanent homes off-campus or permanent homes within 35 miles of campus are likely to enroll in summer. Promotions targeted to students fitting this profile may be more productive than more general promotional efforts. Likewise, being older and other characteristics typically associated with older undergraduate students (i.e. delay in enrollment, working full-time, having dependents) are also associated with summer enrollment. Targeting promotional efforts and shaping information to appeal to a slightly older age demographic may prove more effective in boosting summer enrollments than efforts that ignore differences in age among students. Likewise, universities that serve older students through their summer sessions should be aware of the specific services,

like childcare options or flexible class schedules, that allow attendance outside of normal work hours.

In the Programmatic arena, the dichotomy between first year students' non-attendance and third year students' tendency to enroll in summer has implications for faculty and academic program planners. Understanding the typical course needs of the institution's third year students in a variety of majors and ensuring that these courses are available during summer term will ensure that third year students who are considering summer enrollment can find the courses they need. On the other hand, summer attendance is not typically in first year students' plans and special efforts will be needed to help them gain an understanding early in their first year about the benefits of continuing their studies over the summer. Courses (e.g., general education requirements) and other activities that would appeal to students early in their academic career should be included in the summer schedule and directly marketed to these students.

Lastly, the logistic regression analysis completed in this study, while significant in its predictive value, highlights that student characteristics account for only a small portion of the overall enrollment decision. This finding could be viewed as good news for practitioners since generally student characteristics are not within the institution's control to change or manipulate. Rather, institutional characteristics including policies and practices of the institution may play a more important role in predicting summer enrollment than the characteristics of the student. More research is needed to confirm whether this is, in fact, the case.

Implications for Research

The findings of this exploratory study into student characteristics and summer session participation point to additional areas for future investigation. The most compelling questions requiring further investigation come out of the findings related to the many Cultural/Social/Physical factor variables and patterns of attendance related to race/ethnicity and age related variables.

In terms of race and ethnicity, this study found that Black students are more likely to attend in summer than students of other races. It was also found that Hispanic students are less likely to attend than non-Hispanic students. Given the importance of summer session attendance to attainment (Adelman, 2006) and the particular challenges these two groups have related to attainment (Perna, 2000, 2007), understanding the underlying causes of these differences is an important direction for future research. A future study could explore the attitudes of students from these two race/ethnicity groups toward summer enrollment and their perceptions of its value. A qualitative study could explore the experiences and perceptions of students from underrepresented groups who choose to enroll in summer courses with those who do not choose to enroll in summer courses. These studies might point to particular benefits of summer enrollment that could be promoted and barriers to summer enrollment that need to be overcome for these specific groups of students.

Similarly, attainment for older students is challenged when institutions do not have options for flexible pathways to degree completion (King, 2003; McCormick, 2003). This study found that older students are more likely to use summer as one of those flexible pathways to attainment. A future study should explore more fully the

experiences of older students who enroll in summer. The purpose of this type of study would be to highlight the particular value that summer enrollment provides to non-traditional aged students and to identify barriers to participating in summer that this group may face.

In terms of traditional aged college students and those who are financially dependent upon their parents, there is clearly much less interest and participation in year-round enrollment. Given the desire of institutions for more year-round operation as a way to increase the efficiency, revenues and the throughput of enrollments, better understanding of the perceptions and attitudes toward summer enrollment among this age group, which is the majority age group at four year institutions, is an important area for future research. This research should strive to identify cultural barriers and perceptions that would need to be overcome to encourage more voluntary participation in summer terms by traditional aged college students.

Orphan/Ward of the Court status was the characteristic that had the strongest relationship to summer enrollment. Students who reported that they were orphans or wards of the court were more than twice as likely as other students to enroll in summer session. Given the value of summer session to attainment (Adelman, 2006) and the challenges these students have related to enrollment and persistence (Blome, 1997; Merdinger, et al., 2005) this phenomenon is worthy of additional research. The purpose of such research would be to understand the perceptions of this group of students toward summer enrollment and the particular benefits that summer enrollment might provide for this group. The findings might lead to greater access for orphans and wards of the court and maximize the benefits they receive from summer enrollment.

Lastly, the logistic regression analysis of this study demonstrates that many of the factors that influence the decision to enroll were not identified in this study. Clearly there are other factors that affect the enrollment decision and future research should look at institutional characteristics, policies and practices as well as state level policies and practices that might also influence the rate of participation in summer. The purpose of such studies would be to create a more complete understanding of the overall summer enrollment process by considering non-personal characteristics and the possible interrelations between personal characteristics and institutional characteristics that affect the choice to enroll.

Implications for Policy

The findings of this research have significance for future policy, particularly in the Financial factor and Cultural/Social/Physical factor as it relates to different age groups. Financially, students who attend in summer experience higher costs over the course of the year, tend to have a lower mean family income, and rely more on loans to fund their education. These findings point to the need for additional grant aid specifically targeted to summer enrollment to reduce the financial barriers that may exist for some students who could benefit from summer enrollment. Some states and individual institutions are adopting mandatory year-round attendance requirements (Ashburn, 2011; Masterson, 2010). These requirements should be matched with appropriate grant aid mechanisms. Federal adoption of a year-round approach to Pell grant funding was reflective of this need but was discontinued by the Congress due to budget constraints. In the absence of federal assistance for students with financial need, states and institutions

seeking to promote or even require summer enrollment should also make available grants that support year-round attendance.

This study found that traditional college age students and characteristics related to traditional college age students such as dependency status and location of residence point to a probability of non-participation in summer session. Policy makers interested in compelling students to attend year-round or requiring institutions to expand their year-round utilization of facilities should be aware that the expectations of the majority of college age students at four year institutions do not appear to include summer attendance. Institutions and states will likely need to use a combination of "carrots and sticks" to encourage more year-round enrollment from this age group and demographic. Incentives might take the form of discounted summer tuitions and other forms of financial aid designated for summer. If traditional aged college students are using summer as a time to gain work experience and build their resumes, then the provision of meaningful undergraduate research and internship experiences might be a more important summer offering for this group than traditional courses. In terms of "sticks," compulsory attendance can be forced through scheduling certain required courses only during the summer term.

Lastly, this study found that being older than traditional college age and characteristics that might logically be associated with being older such as being an independent student, working full-time, having dependents of your own, having experienced a delay in enrollment, and living off-campus indicate a higher probability of enrolling in summer term. Policy makers interested in increasing the number of individuals with college degrees should note that these non-traditional students are using

summer as a tool for incorporating college attendance and degree attainment into their overall life that might include work, family, and other commitments that seem to expand with age. Financial aid for summer enrolled students, subsidies that allow institutions to offer low-cost summer courses, and the funding of student services directed to non-traditional aged students and their life circumstances are all policy tools that can enable this age group to take even greater advantage of the benefits of summer enrollment.

Limitations

Several delimitations of this study were described in Chapter 1 including a focus on four-year institutions with a semester system calendar and an assumption that all institutions included in the survey offered some type of for-credit summer course offerings. As with all research projects, this study had limitations that came to light as the data were prepared and analyzed. The dependent variable for this study was enrollment in June of 2008. Enrollment in June at a semester-based school was equated with summer enrollment and the construct validity of this assumption is described in Chapter 3. Students may also be enrolled in July as a summer enrollment but the July enrollment information in the dataset referred to July of 2007 and could not be used to get a more complete picture of enrollment in summer 2008. As a result, it is possible that some students who were not enrolled in June of 2008, did enroll in July of 2008 but are not reflected as summer enrollments for this study.

Another limitation related to the dependent variable is the single year of data. One researcher has demonstrated a possible relationship between summer enrollment and the national economy, demonstrating that enrollment can be higher in periods of economic crisis and lower when the economy is thriving (Schejbal, 2005). The summer

of 2008 preceded the economic crises of the 2009-2010 academic year. It is possible that enrollment activity and patterns for summer of 2008 may not be reflective of enrollment levels or patterns in more recent years.

Also, there were several variables included in the analyses that had missing cases that were not replaced. Where possible, the source of the missing cases was identified and cautions offered about making inferences about the missing groups for that characteristic. One group in particular that was excluded from the Geographic factor was international undergraduate students. Some variables that had a large number of missing cases were excluded from the logistic regression analyses as well. The significant Academic factor variables for GPA and SAT score were not collected from students aged 30 and older. Information regarding the significant Cultural/Social/Physical factor variable Orphan/Ward of the Court was not collected on students older than 23 years of age. All three of these variables were excluded from the combined logistic regression analysis in order to retain the more important and inclusive variable of AGE30PLUS and these characteristics are not included in the overall predictive value of the combined model.

Lastly, the survey data only reported students' attendance at a single institution and not multiple institutions. This becomes more important as findings from this study point toward the participation of older, non-traditional student groups in summer sessions. These groups are more apt to attend multiple institutions simultaneously as they accumulate credits from multiple sources in pursuit of their desired credential (McCormick, 2003). As a result, activities of older, non-traditional students reported in

this study may not reflect the full extent of their participation in summer studies if those activities occurred at other institutions.

In conclusion, increased summer participation is of benefit to students, institutions and policy makers. Students choose to attend summer session for a variety of reasons and individual circumstances. This study has provided nationally representative confirmation that certain characteristics can predict the choice to enroll in summer. Knowing more about the students who are likely to attend in summer makes it possible to more effectively target information about, and opportunities related to summer school to students who most need and may most benefit most from that information. Likewise, understanding the characteristics of students that are less likely to enroll in summer is a first step in overcoming attitudes, lack of knowledge, or other barriers that contribute to the choice to not enroll.

This study also found that having characteristics associated with non-traditional undergraduate student populations such being older, being employed full-time or having dependents can make students more likely to enroll in summer. These students benefit from summer as it is a tool they may use to maintain their progress toward degree completion and to manage time for school among other competing demands. Black students who have been historically underrepresented in higher education and continue to face challenges in terms of degree completion are also more likely to be enrolled in summer than students of other races. Understanding that summer is not only of benefit to students with access challenges but also that these students have a predisposition to use the summer session to help them toward their goals is an important outcome of this study.

In the past century, the university summer term has served important national policy objectives such preparing primary and secondary teachers for a rapidly growing public education system and accommodating an enrollment surge of veterans returning from World War II. In the current era, summer is once again being called upon to increase the capacity of the university to educate more students in less time under the mantra of year-round operation (Masterson, 2010). Research such as the present study provides important insights into the current relevance of the summer term and the students who do and do not see it as an important element of their academic path. This study and the diversity of factors and characteristics that it shows impact the summer enrollment decision are evidence that a one-size-fits-all approach to summer planning and enrollment is ill-advised. Rather, each institution must understand and adapt to the unique characteristics and life circumstances of the students it enrolls and should match summer offerings and services to best meet the needs and expectations of those students. An informed and focused approach to managing summer session should enable universities to once again demonstrate that they are flexible, resilient and committed to using summer term to successfully address the needs of the nation.

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Appendix A
IRB Protocol Approval Letter

VirginiaTech

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: May 25, 2010

TO: Joan B. Hirt, Kenneth S. Smith

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires June 13, 2011)

PROTOCOL TITLE: Student Characteristics that Predict Summer Enrollment

IRB NUMBER: 10-477

Effective May 24, 2010, the Virginia Tech IRB PAM, Andrea Nash, approved the new protocol for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

PROTOCOL INFORMATION:
Approved as: **Exempt, under 45 CFR 46.101(b) category(ies) 2, 4**
Protocol Approval Date: **5/24/2010**
Protocol Expiration Date: **NA**
Continuing Review Due Date*: **NA**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:
Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?
5/24/2010		North Amer. Assoc. of Summer Sessions	Not Required (not federally funded)

*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

cc: File