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The Relationship between Financial Aid and Freshman Persistence at a Midwestern Liberal Arts College

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THE RELATIONSHIP BETWEEN FINANCIAL AID AND FRESHMAN PERSISTENCE AT A MIDWESTERN LIBERAL ARTS COLLEGE

by

Jack Phillip Powell

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Education
Department of Teaching, Learning, and Leadership

Western Michigan University
Kalamazoo, Michigan
August 2002
College student persistence has been one of the most important topics discussed in higher education over the last 25 years. The consequences of student attrition from our colleges and universities are immense for the individual student and institutions alike. One of the purposes of student financial aid is to promote student persistence. The need for empirical research to assess whether financial aid is accomplishing this vital purpose is critical. Research is particularly important given the significant shifts in policy brought on by the 1992 Reauthorization of the Higher Education Act.

This study addressed two research questions. The first deals with the relationship between financial aid and freshman persistence. Is there evidence that any of the financial aid variables in the study relate to freshman persistence? If so, what is the nature of that relationship? The second question asks if a model can be developed to predict freshman persistence at the Midwestern liberal arts college using the variables in the study.

The subjects of the study (N = 1,208) consisted of five cohorts of first-time, full-time freshmen enrolling in fall 1994 through fall 1998. The college is a private, liberal arts institution with a traditional undergraduate enrollment of 1000. The
dependent variable, persistence, signified whether a student completed two semesters of full-time course work during their freshman year and re-enrolled the following fall. Independent variables included gender, residency, ACT composite score and 10 financial aid variables.

The study revealed a relationship between several of the financial aid variables and freshman persistence. The study found that students with lower expected family income and higher unmet need were less likely to persist. This means that the receipt of financial aid alone is not adequate to overcome the effects of a low family income on persistence. The nature and strength of the relationship was difficult to determine due to high correlation between the financial aid variables and prior academic achievement as measured by the ACT composite score. The study was unable to develop a logistic regression model to predict freshman persistence using the variables of the study.
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Jack Phillip Powell
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CHAPTER I

INTRODUCTION TO THE PROBLEM

Background

Each year in early spring, millions of high school seniors across the United States receive their letters of acceptance to one or more colleges and universities. Attending college is increasingly becoming the norm in the United States and the benefits of a college education are well recognized. Over the years, higher education has played a major role in promoting the development of society as well as individuals, and college attendance has been viewed by students, parents and society as a means of widening one's intellectual and social horizons, enhancing one's earning power, and contributing to the larger social welfare. Attaining the bachelor's degree has important implications for the individual (Cuccaro-Alamin, 1996; Davis, 1997a). "Our best estimate that net of factors such as intelligence, socioeconomic background, and work experience, a bachelor's degree provides somewhere between a 20 and 40 percent advantage in earnings over a high school diploma" (Pascarella & Terenzini, 1991).

Despite these widely recognized benefits, more students leave their college or university than stay (Adelman, 1999; Astin, 1997; Tinto, 1987). Some transfer to a different institution, but many leave higher education altogether. Five-year
graduation rates have remained at approximately 45% for the past century (Cuccaro-Alamin, 1996). The percentage of entering students who don't return for a second year has actually increased slightly but steadily over the years. At private four-year colleges there was a steady climb from 22.8% to 25.9% in 1996-97, then a drop to 25.3% in 1998 (American College Testing Program, 1998).

Attrition from higher education presents problems for both the student leaving and the institutions from which they depart. As an increasing proportion of the population becomes college educated, having a degree becomes necessary for many occupations which previously had no such requirements. Persistence is a prerequisite for important outcomes. "If students do not persist, opportunities for learning and development are foreclosed, graduation is impossible, and success in later life is diminished" (Pike, Schroeder, & Berry, 1997, p. 609).

The goal of increasing student persistence is perhaps the single most important objective now facing the survival of many of the nation's colleges and universities (Voorhees, 1985a). For the institution, student attrition represents not only a loss of income from tuition, but also a cost associated with recruiting new students to fill the vacated positions. During the 1960's and 1970's, the number of students seeking entry into college grew rapidly (Hossler, 1984). The pressures on institutions of higher education were to expand rapidly enough to accommodate the increasing number of applicants. It was relatively easy to replace students who left with new students; either new freshmen or transfers from other institutions. By the beginning of the 1980's the market situation started to change. The number of
institutions had expanded in response to political and demographic pressures. At the same time, the number of students seeking admission was beginning to decline. In response to this shift in market pressures, institutions began to employ sophisticated marketing techniques in order to increase their market share and maintain enrollment. As colleges and universities developed elaborate and expensive marketing strategies, the competitive advantages of such strategies declined. It is primarily for this reason that many institutional planners began to look at the problem of student attrition (Braxton, Vesper & Hossler, 1995). "In the past, institutions focused their efforts on managing enrollment and thereby meeting revenue projections on the recruitment of new students. However, institutions have realized that revenues are affected by student persistence as much as they are by recruitment" (Porter & Barberini, 1989, p. 19).

College and universities are increasingly being blamed for students' failure to complete degrees. There is growing public use of institutional graduation rates as a measure of accountability (Adelman, 1999). Increasingly, states are using graduation and job-placement rates to judge performance. Several states have begun tying state appropriations to how well public colleges meet prescribed goals, including how fast they graduate students (Burd, 1997).

Retention and graduation rates increasingly are being used as measures of productivity and, often, of quality. College guides and magazines routinely report graduation rates and, in several cases, use them as one of several measures to develop rankings of institutions. Additionally, the federal
government has begun to monitor more closely the outcomes of higher education. Institutions are required to maintain certain minimum completion rates in order to qualify for participation in federal student financial aid programs. Also, recent legislation requires all institutions of higher education to conduct studies and maintain statistics on the rate of graduation. These statistics must be made available to all potential and current students at the institutions, as well as be submitted to the federal government. (Nehila, 1995, p. 191)

Not only are institutions facing scrutiny about their persistence rates, they are challenged by growing public concern concerning the pricing and financing of a higher education. Rates of increase in higher education have far exceeded that of the consumer price index and that of family income (College Entrance Examination Board, 1998a). Paying for a college education, even at public 4-year colleges and universities, now ranks as one of the most costly investments for United States families (U.S. General Accounting Office, 1996).

In addition to retention, institutions of higher education are particularly interested in the impact of their financial aid programs. Outlays for institutional financial aid have become an expanding portion of the budgets of both public and private institutions. Over the last two decades, tuition increased more rapidly than inflation or family income (Mulugetta, Saleh, & Mulugetta, 1997). At the same time, the growth in federal and state aid slowed, forcing colleges and universities to make up the difference with institutional dollars. "In view of the magnitude of the
investment and the manner in which it is targeted, the role of student aid on
facilitating persistence in college constitutes a major policy question” (Cabrera, Nora,

There is a call for research concerning the impact of financial aid on student
persistence (Cabrera et al., 1992; McGrath & Braunstein, 1997; Mulugetta, et al.,
1995; Paulsen & St. John, 1997). “It is clear that enrollment managers and
institutional researchers need to pay more attention to financial factors in retention
unique value of financial aid at private schools underscores the critical need for
institutional research for making optimal decisions regarding how to distribute
financial aid” (p. 45).

Research Questions

This study will address two research questions:

(1) What is the relationship between financial aid and freshman year-to-year
persistence at this Midwestern liberal arts college?

(a) Is there evidence that any of the financial aid variables in the study
relate to freshman persistence? If so, which of the variables
demonstrate a relationship to freshman persistence and what is the
nature of that relationship?

(b) Are the variables of gender, residency, and ACT composite score
intercorrelated with any of the financial aid variables? If so, what relationship do these variables have on freshman persistence?

(2) Can a model be developed to predict freshman persistence at this Midwestern liberal arts college using the variables in this study?

Significance of the Study

The purpose of student financial aid is to provide individuals access to postsecondary education, choice among institutions, and persistence to graduation (Davis, 1997b). The 1992 Reauthorization of the Higher Education Act dramatically changed the landscape of financial aid (U.S. Department of Education, 1995b). Although the relationship between financial aid and freshman persistence has been investigated, few studies have explored this relationship after the 1992 Reauthorization of the Higher Education Act. Further, few institutional studies have investigated the relationship of financial aid and persistence across multiple freshman cohorts. This study investigates the impact of financial aid on the persistence of five freshman cohorts, from Fall 1994 - Fall 1998.

This study will not attempt to make generalizations about the relationship between financial aid and persistence across institutions. The literature cautions us against making such generalizations (Gillespie & Noble, 1992; Hossler, 1984; Kang, 1993; Tinto, 1993). McGrath and Braunstein (1997) state:

A partial review of the literature indicated that the causes of attrition vary, and the strategies designed to reduce it produce different results at institutions. …
Consequently, colleges may want to conduct more of their own research because institutional data should allow administrators and faculty to develop a better understanding of the problem within the culture of their own organization. In this way, the data can be useful to design a comprehensive retention plan with appropriate interventions. (p. 396)

This study, then, is not designed to provide an answer to the question of the relationship of financial aid upon persistence at all institutions, but attempts to demonstrate how researchers might approach the issue at their own institutions. The study will provide this Midwestern liberal arts college with insight as to the relationship of financial aid and freshman persistence and thus help the administration develop policies that not only serve their students more effectively, but also assist the institution in more effectively accomplishing its mission.

Chapter 2 will provide a review of the literature and provide a context for the study.
CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This chapter will begin by providing the reader an introduction to undergraduate student financial aid and persistence. The chapter will build on this groundwork to review the literature addressing the relationship between financial aid and freshman persistence. The seasoned university administrator may find these initial sections elementary, but they will serve as an essential foundation for those unfamiliar to these topics.

The first section will provide an overview of college student financial aid. This will include the history and development of student aid, description of aid programs, and the process of awarding aid. This section will conclude with recent trends relating to governmental and institutional shifts in student aid philosophy.

The second section will provide a synopsis of undergraduate student persistence research. The third and final section will build on the overview of financial aid and student persistence to review the literature relating directly to the relationship of student aid to student persistence, and more specifically, to freshman persistence. This section will begin with general observations and organizing principles related to the financial aid and persistence literature. The review will
consider national, single institutional and meta-analysis studies. Special attention will be given to the limitations of the literature.

Overview of Undergraduate Student Financial Aid

History and Development of Student Financial Aid

The beginning of financial aid occurred in 1643 when Lady Anne Mowlson gave an endowment of 100 English pounds to Harvard for the purpose of helping a needy student. This was the first scholarship fund in America. "Merit-based" student aid continued to be provided by private and institutional sources well into the twentieth century and its purpose was primarily to attract a student of particular talent or "merit." with financial need as only a secondary consideration (Hartle, 1996). Until the close of World War II, education in America was principally elitist and available to only a small percentage of 18 to 22 year olds. For the most part, higher education was seen as appropriate for wealthy young men of relatively high academic ability who met well-defined entrance requirements, or for a few bright and talented young men who were needy. The aid provided to these students was usually in the form of book loans and work opportunities as dining hall attendants or tutors. Women were generally restricted to college programs preparing for such careers as nursing and elementary school teaching.

Throughout the 18th and 19th centuries, and well into the 20th century, there were no attempts made to develop federal policy toward higher education. Historically, federal policy in support of higher education has been reactive and
addressed specific national concerns that arose following a crisis. At the time of the Civil War, it was recognized by organizations, individuals and the federal government that there was a need to provide higher education on a wider basis for the economically disadvantaged student. The Morrill Act in 1862 was a response to the need to provide "practical" education to the common man. This Act provided funds to establish land-grant institutions for the purpose of providing publicly supported education in mechanical arts and agriculture, usually with very low or no tuition (Moore, 1983).

Early in the 20th century, the states were also becoming aware of the need for some type of state-level student aid. In 1909, Connecticut established a program to recruit trained manpower. In 1913, New York established the Regents Scholarship Program for the state's most able high school graduates. Pennsylvania followed by giving a few awards to students in each of its political districts. These programs were on a small scale with quite narrow objectives and goals. In 1935, Oregon was the fourth state to institute a state aid program. By the 1969-70 academic year, 19 states had programs to allocate financial aid in the form of student employment, grants or loans (Gladieux & Hauptman, 1995).

In 1916, Congress passed the National Defense Act creating the Reserve Officer's Training Corps. In the Great Depression other programs were implemented temporarily as part of Roosevelt's New Deal Federal Emergency Relief Administration, designed to keep students in school and off the relief rolls of the 1930's (Hartle, 1996).
Historically, social and economic disruptions followed the return of veterans from wars. In 1944, in a move to prevent similar disruptions, Congress passed the Servicemen's Readjustment Act, known as the GI Bill, to provide the opportunity for veterans returning from World War II to attend college. This bill introduced the concept of entitlement, i.e., access to monetary benefits on a categorical and not an individual basis. "The GI Bill, while outside the current definition of need based student aid, was financial assistance written large. It was also the intellectual and political wedge that provided an opening for a governmental role in financing college students, since it made the notion of governmental assistance acceptable to the public and, ultimately, essential to the institutions" (Moore, 1983, p. 27).

In 1946, The Truman Commission was created to examine higher education in the United States. The Commission made dramatic recommendations which included nondiscriminatory access for all students to colleges by increasing the number of low-or no-tuition two-year colleges close to the students' homes, and to also provide student financial aid in the form of loans, grants or employment. These actions would later lead to the development of major federal and state student financial aid programs. However, these ideas would remain dormant for years because there was no recognized crises needing an immediate response (Gladieux & Hauptman, 1995).

In 1958, the federal government again responded to a crisis—the Russian launching of Sputniks I and II—and passed the National Defense Education Act. The aid that was defined in this Act was directed toward instruction in the sciences and toward teacher training. This Act established the National Defense Student Loan...
Program offering long-term, low-interest loans to students in the fields of mathematics, science, foreign languages, and later in all academic majors. Later renamed the National Direct Student Loan Program, it is now known as the Perkins Loan Program, and stands today as the oldest federal student aid program in continuous existence (Hartle, 1996).

By the 1960s, the federal government began to take a more active role in financing higher education. The current types of student aid programs had already been in existence at one time or another and in one form or another in various state programs. These included gift aid in the form of grants and scholarships, subsidized student employment (both begun in the 17th century), loans (the National Defense Act) and entitlement (the GI Bill). Changes in the national philosophy began to emerge in the 1960's. These changes were major and pushed student financial aid into the spotlight with the assignment of financial provisions for higher education (Kurtz, 1995).

The “War on Poverty” of the mid-60’s viewed higher education as the key toward achieving social justice for all Americans (Linsley, 1997). Financial and racial barriers to higher education were to be removed. To achieve these goals, the Higher Educational Facilities Act was passed in 1963 to provide institutions with federal monies to construct classroom buildings, libraries and dormitories on their campuses. The Civil Rights Act and the Economic Opportunity Act passed the following year, creating the College Work-Study Program. This program was later renamed to the Federal Work-Study Program.
created part-time employment opportunities for needy students. Federal policy was now well established and provided financial support directly to institutions as well as directly to students (Hartle, 1996).

An historical legislative event occurred when Congress passed the Higher Education Act of 1965. The Act was the first federal legislation in support of higher education as had been outlined almost 20 years earlier by the Truman Commission. The law, with its many amendments, forms the basis of current law authorizing the federal student aid programs administered by the U.S. Department of Education. These programs are contained in Title IV of the Act. The Higher Education Act of 1965 created the first of the federal grant programs, the Educational Opportunity Grant Program, offering federal student assistance that did not have to be repaid or earned through work. It was designed for the most needy student. The Act also created the Guaranteed Student Loan Program (later renamed the Stafford Loan Program), designed to help students from middle-income families by providing long-term, low-interest loans, with repayment guaranteed by federal insurance (Linsley, 1997). These programs were designed to be delivered by campus officials and are referred to as “campus-based” programs (Kurtz, 1995). This has continued to be the conceptual and legislative framework for federal postsecondary student financial aid up to the present time.

Several important amendments and additions were made to Title IV during the next two decades. The most important of which occurred in 1972, when Congress passed Amendments to the Higher Education Act. This resulted in a shift away from
awarding aid directly to institutions in favor of awarding aid directly to students as in
the Basic Educational Opportunity Grant Program (BEOG). Student need would be
identified on the basis of family resources and the family's ability to contribute a
percentage of college costs. This "needs analysis" of low income families provided
student access to public institutions, but less so to private institutions due to their
higher tuition costs (Gladieux & Hauptman, 1995). Congress adjusted this analysis
formula to provide low-income students with college choice as well as college access.
In 1980, the BEOG program was renamed the Pell Grant Program. Two important
features of the Pell Grant included their portability, as they can be used at any
institution (access), and their function as the foundation of direct federal aid for
students (entitlement) (Moore, 1983). The Pell Grant Program is the second largest
federal financial aid program in total dollars allocated per year.

Further amendments encouraged states to expand their role through the State
Student Incentive Grant Program. This program was created to encourage states to
fund student aid by providing federal "seed" money to match state funds (Hartle,
1996). The amendments also extended eligibility for Title IV funds to students
attending proprietary schools.

In 1978, the Middle Income Student Assistant Act was passed in response to
the public's growing perception of a "middle-income squeeze" (Kang, 1993). This
Act represented a compromise between the traditional aid coalition and others who
favored tax credits and other more expensive, non-need-based approaches to the
perceived crisis (Moore, 1983). Federal student financial assistance would now
include middle and higher income families. At the same time, the eligibility
requirements for Basic Educational Opportunity Grants were loosened and the
income cap on Guaranteed Student Loan eligibility was removed. These changes,
along with the rapid rise in interest rates, pushed total grant and loan award funding to
all-time highs (Linsley, 1997).

Congress withstood the Reagan administration’s efforts in the early 1980’s to
make changes that would return federal student aid to the need-based status of the
1970’s. The result was the lack of sufficient growth in appropriations to offset large
increases in inflation. The significant loss of real dollars reduced available gift aid.
The balance of student financial aid began to shift from grants to loans; a reflection of
the administration’s conservative philosophy of returning the financial responsibility
for higher education to the student and the family (King, 1996). Educational loans
represented a significant shift from the philosophy of Kennedy and Johnson. This
conservative philosophy held that the individual student, rather than society, was the
primary beneficiary of higher education and the student would now bear this financial
responsibility (Hearn, 1998).

In 1992, President George Bush signed into law the Higher Education
Amendments to Title IV of the Higher Education Act of 1965. Congress is required
to do this periodically, and the process is called Reauthorization. This new law
established programs available to the research subjects of this dissertation. The
specific regulations and programs changed by the 1992 Reauthorization of the Higher
Education Act will be discussed later in this chapter.
The Purpose of Financial Aid

The purpose of student financial aid is undergoing scrutiny as college costs continue to rise. Increasing college tuition presents significant problems to low- and moderate-income families. The College Entrance Examination Board's (College Board) (1998a) report on trends in college pricing states that college prices have been rising at twice and sometimes three times the consumer price index since 1980. The Rand Organization (1996) in their report, Breaking the social contract: The financial crisis in higher education, offered the results of a two-year study by the Commission on National Investment. The central finding of the report concluded: "...the present course of higher education—in which costs and demand are rising much faster than funding—is unsustainable" (p. 1). The report goes on to say: "What we found was a time bomb ticking under the nation's social and economic foundations. At a time when the level of education needed for productive employment is increasing, the opportunity to go to college will be denied to millions of Americans unless sweeping changes are made to control costs, halt sharp increases in tuition and increase other sources of revenue" (p. 2). Never before has the issue of college affordability and financial aid been of greater concern to society. This has led to a review of the goals and purposes of financial aid.

The goal of the student financial aid programs authorized under the Higher Education Act of 1965 was to ensure equal educational opportunity for all academically qualified citizens regardless of their economic status (Perna, 1998b).
Equal educational opportunity is assured when student aid is used to remove financial barriers that could prevent individuals from enrolling in college and restricting their choice of institution (Kang, 1993; Leslie & Brinkman, 1988; Murdock, 1987). In addition to access and choice, Alexander Astin (1976) emphasized the need for financial aid to assure student persistence. This represented a clear expectation that student financial aid will support a student's continuous enrollment through graduation. This goal has received much attention in recent years (Hochstein & Butler, 1993; Huff, 1989; Murdock, 1987). “Equal educational opportunity has been interpreted to include not only access to postsecondary education and choice among postsecondary educational institutions, but also persistence through graduation” (Perna, 1998b, p. 25). Porter (1991) adds: “...equal educational opportunity is defined to include persistence and degree completion, not simply the chance to go to college” (p. 75).

Many leaders in higher education do not believe that the three goals listed above fully articulate the purposes of student aid. Don Hossler, an influential voice in the study of enrollment management states: “Despite this large increase in student assistance, the purposes and goals of student aid programs remain muddled and ambiguous. The aims of financial aid programs, including federal, state, and institutional assistance, are not clearly articulated” (1984, p. 50). Student aid has been used to reward past assistance to society (veterans), to ensure the survival of educational institutions, to meet demand for skilled laborers, to remedy past racial injustice, and to provide relief to middle income students (Herndon, 1982; Parro,
1997).

With federal and state aid dollars shrinking, colleges and universities are abandoning the purposes of access and choice in order to maximize institutional net tuition/fee revenue and to attract the most talented students. The proportion of no-need or "merit aid" is increasing rapidly (Huff, 1989). Colleges, to an increasing degree, award financial aid on the basis of merit through a practice called "preferential or differential packaging." The students these colleges consider more desirable receive better financial packages. Some institutions are taking preferential packaging one step further and are "leveraging" their institutional aid. This not only rewards aid on the basis of merit, but also on the ability to pay (Parro, 1997). A student who has high need, as well as average grades, is often not given a competitive financial aid package due to the fact that the student will cost the institution too much in institutional aid. This practice is becoming more accepted as college and university budgets tighten (Rand Corporation, 1996). Hossler (1984) expressed concern with the shifts in public policy and campus-based aid programs, highlighting the fact that many institutions lack a consistent philosophical or theoretical base for their financial aid programs.

It is clear that the purposes of student financial aid are shifting and are somewhat difficult to identify. One issue that is apparent throughout the literature and across institutions, however, is that persistence through graduation remains an important goal of financial aid (Perna, 1998b; Rand Corporation, 1997).
The Process of Awarding Financial Aid

It is important for the reader to understand the context of the general principles by which financial aid is awarded to students. Responsibility for the billions of dollars in financial aid awarded each year depends primarily upon postsecondary institutions to manage the funds within congressional legislative intent. Legislators expect colleges, universities, and vocational schools to use a fair and equitable means of distributing student aid. The United States Congress and the Department of Education hold institutions accountable through layers of regulations in an effort to seek out fraud and abuse. Additionally, Congress has made institutional eligibility for federal aid contingent upon institutional enforcement of a variety of non-aid related rules, including Selective Service registration, verification of immigration and citizenship status, and confirmation of Social Security numbers. Regulations also require statistics on crime on campus, gender equity and successful academic performance in college athletic programs, and maintenance of a drug-free workplace (Davis, 1997b).

Need for financial aid is determined by comparing the student’s ability to pay to the cost of attendance at the postsecondary institution. Cost of attendance is an estimate of college expenses a student is expected to pay during a year of enrollment. Costs vary according to institutional charges and by the individual student’s circumstances. Expected Family Contribution (EFC) is the amount the student and family are expected to contribute toward those costs based on a percentage of income and assets, including all outside scholarship support and any nontaxable income.
Financial need is the cost of attendance minus the expected family contribution. Financial aid practitioners use this formula to ration scarce fiscal resources.

Colleges and universities use the need figure to award a combination (package) of available funds in the form of grants, scholarships, loans and college work-study to meet student need. The package normally begins with the awarding of all available grant aid. If grant aid is not sufficient to meet the student's need, the package may include subsidized loans and/or college work-study to cover the need. If the package still is not sufficient to meet a student's need, unsubsidized loans may be included. Unsubsidized loans are also available to student or parents who have no need, but want to borrow to reduce their current outlays for educational expenses.

Despite the seeming simplicity of the process described above, awarding of financial aid has become a complex process for postsecondary institutions.

...there is little agreement about how best to allocate shrinking funds; this creates tension among the different segments of the cost, contribution, need and packaging continuum. Institutions search for the best way to set the appropriate cost of education, determine the fairest and most equitable calculation of student contribution and financial need, and find the optimum use of the various types of aid to support the student. (Linsley, 1997, p. 13)

The 1992 Reauthorization of the Higher Education Act had a dramatic impact upon financial aid programs and increased the complexity of the awarding process described by Linsley above. The regulations and policies established by the 1992
Reauthorization provide the financial aid context of this dissertation.

1992 Reauthorization of the Higher Education Act

As outlined in the history and development of financial aid section above, the federal effort to assist low- and moderate-income students attain a postsecondary education was initiated in the Higher Education Act of 1965 (HEA) and continues to be sustained through subsequent amendments to HEA. Title IV, the heart of the Act, authorizes four types of student aid—grants, loans, work-study, and fellowships.

Considerable legislative activity concerning student aid occurred during the 102nd Congress and the first session of the 103rd. After extensive hearings and debate, the 1992 Amendments to the Higher Education Act were signed into law on July 23, 1992. Technical amendments to the 1992 amendments and to the HEA were passed prior to the end of the first session of the 103rd Congress (Schenet, 1993).

The legislation signaled a major policy shift in student financial aid (Fenske, Dillon & Porter, 1997; Hearn, 1998; Rickard & Bendall 1993). "On many counts, today's aid system looks much different from what the early legislative framers envisioned" (Gladieux & Hauptman 1995, p. 23). The first major shift was in the area of expected family contribution (EFC). EFC refers to the amount the student (and the student's family) is required to contribute toward total educational expenses as a result of a need analysis. Under the reauthorization, home and farm equity were removed from the assessment of a student's EFC. Without home and farm equity in the calculation, the EFCs of middle-income students were effectively lowered.
opening federal aid programs to some new students while permitting other students to qualify for additional financial assistance. Gladieux and Hauptman (1995) provide insight on the impact of this policy shift:

The changes in need analysis enacted in 1992 have produced another expansion in middle-income eligibility, inflating officially recognized need by several billion dollars. But with no corresponding increase in available dollars. The probable effect is that scarce dollars have shifted up the income scale, at the expense of more disadvantaged students and families. (p. 25)

In addition to this shift, the 1992 Reauthorization liberalized eligibility for independent adult students and those students using aid toward short-term vocational training at the country's burgeoning proprietary trade schools (Schenet, 1993). These changes placed additional pressure on scarce resources by increasing the number of financial aid recipients while only increasing funding at a moderate rate.

The second major policy shift was that of greater reliance on student loans. This represents a significant shift from the legislation of the 1960's and early 1970's which established a commitment to help disadvantaged students through need-based grant programs, while helping middle-class families through government guaranteed private bank loans. A 1995 report from the Education Resources Institute described it this way: “The situation currently facing student and family borrowers can be summed up in four words: an explosion in borrowing” (p. 15). Under the 1992 Reauthorization, federal student loan programs were expanded. A federal program of unsubsidized loans for dependent students was established. Under the program,
students are charged interest on the loans while they are enrolled, but they are available to students at all income levels without regard to need. Another change raised the annual limits on the amount that may be borrowed for all students who have completed the first year of study, and to increase the cumulative total amount that may be borrowed for an undergraduate education. The ceiling on the Parents Loans for Undergraduate Students (PLUS) program was removed in the reauthorization, allowing parents of dependent students to borrow up to the full cost of attendance without demonstrating financial need (Hearn, 1998).

It is clear that the 1992 Reauthorization of the Higher Education Act dramatically changed the landscape of student financial aid. This study will investigate the impact upon financial recipients who attended Cornerstone College under the regulations set forth by the 1992 Reauthorization. The next section will outline major trends in financial aid since the reauthorization.

Trends in Financial Aid

Paying for a college education is one of the most costly investments for American families. The U. S. General Accounting Office (USGAO) (1996) reports that from academic years 1980-81 through 1994-95, tuition at 4-year public colleges and universities increased 234%. In contrast, median household income, a measure of families' ability to pay for tuition, rose 82%. This increase in tuition substantially exceeded the 74% increase in the cost of consumer goods—as measured by the Consumer Price Index (CPI)—that families use their incomes to purchase. Private 4-
year institutions have increased their tuition by 35% from 1988-89 through 1998-99 according to the College Entrance Examination Board's Trends in College Pricing (1998a).

Two important sources on trends in financial aid include The National Postsecondary Aid Study of 1996 (NPSAS:96) (U.S. Department of Education. 1998b) and the College Examination Board’s Trends in Student Aid (1998b). NPSAS:96 is the fourth in a series of large-scale data collections sponsored by the National Center for Educational Statistics that provide detailed information on how students and their families pay for postsecondary education. The College Board’s (1998b) Trends in Student Aid, presents annual data on the amount of financial assistance available to help students pay for postsecondary education. The College Board began this data series 15 years ago to track the value of such aid over time from federal, state, and institutional sources.

The U.S. Department of Education’s National Center for Educational Statistics (NCES) report, Student Financing of Undergraduate Education: 1995-96, is based on NPSAS:96 (Berkner, 1998). The report established that, during the 1995-96 academic year, half of the undergraduates enrolled in postsecondary education received financial aid through programs funded by the federal government, the states, the postsecondary institutions themselves, or other organizations. The average amount of aid, for those who received aid, was approximately $4,900. Almost 40% of all undergraduates received grant aid and one-fourth took out student loans. The average amount of grant aid was $2,700 while the average student loan was $4,100.
The private, not-for-profit 4-year colleges and universities (of interest to this study) enrolled 14% of all undergraduates during 1995-96 (Berkner, 1998). The average tuition and fees for full-time undergraduates at these institutions amounted to $12,600 and the average price of attendance was $19,400. Eighty percent of full-time undergraduate students received financial aid with an average total package of $10,900. About three-fourths (72%) of the students received grants with an average value of $6,600. More than half (57%) took out a student loan, borrowing an average of $4,700. The College Examination Board's Trends in Student Aid states:

The most prominent trend in student aid that this survey has tracked since the early 1980s has been the growing reliance on borrowing for higher education. The federal government provides over 70 percent of direct aid to postsecondary students, and almost 60 percent of all aid is now in the form of loans. (1998b, p. 2)

Just 10 years ago, loans comprised 45% of all aid. Federal student aid has been changing from a grant-based system to a loan-based system (King, 1996).

The sharpest increase in borrowing occurred in the two academic years immediately after Congress broadened eligibility and raised loan limits in 1992. The erosion of average grant awards over time, combined with expanded federal loan capacity, has produced a change in how many students and families finance college. (College Examination Board, 1998b, p. 4)

Over the past decade, total aid has increased approximately 80% in constant dollars. The growing reliance on loan programs, however, was responsible for almost two-
Significant growth has been seen in the use of unsubsidized loans introduced in the 1992 Reauthorization. This option is growing at a faster rate than that of subsidized loans. The Federal Parent Loans to Undergraduate Students (PLUS) has more than doubled since the 1992 Reauthorization. The average PLUS loan amount has increased dramatically, from $3,745 in 1992-93 to $6,285 in 1997-98 – an increase of more than 65% after adjusting for inflation (College Examination Board, 1998b). Non-federal borrowing approached $2 billion in 1997-98, an 18% increase over the previous year. While such borrowing represents only a small fraction of the more than $33.5 billion generated by federal student and parent loans, “…consistently large increases over the past few years reflect a growing interest in and reliance on alternative methods of paying for college” (College Examination Board, 1998b, p. 4).

Policy analysts have struggled to interpret the massive increase in borrowing. One interpretation is that increased borrowing is symptomatic of a crisis of college affordability. According to this scenario, college costs have exceeded the means of middle-class families, and their children are forced to shoulder a greater share of the burden in the form of student loan debt. A second argument suggests that parents are transferring the cost of higher education to their children at lease in part out of an unwillingness to plan ahead and sacrifice (Baum, 1994a; Scherschel, 1998). For now, the long-term economic benefits of a college education continue to outweigh the burden of paying off student loans (King, 1996).

More students than ever are concerned about being able to finance their
college educations according to the college freshman survey results of UCLA's Cooperative Institutional Research Program. Currently, 70.7% of women and 58.5% of men are at least somewhat concerned about financing their college education (Sax, Astin, Korn, & Mahoney, 1998).

The financial aspects of attending college have changed remarkably since the 1992 reauthorization of the higher education act. The actual short- and long-term implications of the recent changes have "...been little studied empirically before now, and the severity of the problem is unclear" (Hearn, 1998, p. 47). It is hoped that this study will help to address this issue.

The purpose of this first section of the literature review was to familiarize the reader with undergraduate student financial aid: its history, purpose and current trends. The second section will provide an overview of undergraduate student persistence.

**Overview of Persistence Research**

**Introduction**

Now that the reader has an overview of postsecondary student financial aid, it is important to provide an overview of persistence research. This section will begin by giving the reader an introduction to persistence research and an appreciation for the complexity of such research. Next, important theorists and their models will be presented followed by a review of persistence rates nationally and by institutional type.
Attrition among U.S. college students is one of the most researched topics in higher education (St. John, Paulsen, & Starkey, 1996; Stampen & Cabrera, 1986; Somers, 1996b; Tinto, 1993). Few problems in higher education have received as much attention. “In general, persistence studies draw on three disciplinary areas: sociology, human capital theory from economics and comprehensive models from education” (Somers, 1996a, p. 29). The research is characterized by several levels of analysis: institutional, multi-institutional, and national (Somers 1996b). Despite the fact that persistence research has become one of the most extensive areas of the literature on higher education (St John, Paulsen, & Starkey, 1996), there is still much we do not know. This is due to the numerous complexities involved in studying the problem of student departure.

The Complexity of Persistence Research

The issue of college student attrition is complex. Despite the voluminous amounts of literature and numerous interventions on college campuses, student graduation rates have remained constant over the last decade (Gillespie & Noble, 1992). Vincent Tinto (1993) one of the most respected theorists in the area (Adelman, 1999; Gillespie & Noble, 1992; Kalsner, 1991; Thomas, 1988), states:

Successful retention efforts are difficult to mount, if only because of our continuing inability to make sense of the variable character of student departure. Despite the extensive body of literature which speaks to the question, there is still much we do not know about its longitudinal character.
and the complex interplay of forces which give rise to it. Furthermore, much of what we think we know is wrong or at least misleading. (p. 3)

Understanding retention of undergraduates is difficult due to the complex mixture of emotional, social and academic factors (Mallinckrodt & Sednek, 1987).

Don Hossler (1986) adds:

To believe there is one best way to increase retention is to fail to grasp the complexity of the issue. Institutions differ in degree level, missions and quality. The heterogeneity in student and institutional type indicates that a single model of student attrition will tend to work poorly in explaining the dropout process for individual students at particular institutions. (p. 49)

Compounding the problem is that, until recently, retention research lacked consistent operational definitions (Green, 1998), and was concentrated primarily on one type of institution (large public universities) (Adelman, 1999). Porter (1991) notes:

“Persistence is an accumulative, multivariate process, and no policymaker can influence all the variables” (p. 87).

Recent development of national databases has assisted researchers in addressing some of the complexities mentioned above. Researchers are beginning to collect the sorts of system-wide longitudinal data needed to sort through the complex interplay of individual forces which shape the extent and pattern of student departures from higher education. Despite these efforts, the goal of understanding student departure remains elusive. Tinto (1993) states it well: “The answer to the question of student retention which we offer is not simple. It identifies no single path
to enhanced student retention, nor promises that all admitted students can be retained. It argues that there is no hidden magic, no unique formula or sophisticated machinery needed to retain students” (p. 212). With this introduction to the concept of student persistence and the complexity of the research, important models of student persistence will be discussed next.

**Persistence Models**

Concern for student retention is not a new subject. The first major study on student attrition was done for the U.S. Department of Education on the entering classes of 1931 and 1932 (Hossler, 1984). Later studies emerged in 1958 and 1962 (Perna, 1998a). It was not until college enrollments began to level off in the 1970’s, however, that college and university administrators became seriously concerned about student retention.

Much of the research on student persistence has focused on the characteristics of those who dropped out of college before graduation. The pervading assumption has been that if institutions of higher learning could identify the characteristics of students who withdraw, they would be able to develop interventions to meet the needs of these students. Hossler (1984) provides a summary of retention research by grouping studies into three major categories: “...student qualities at the time of matriculation, institutional traits or characteristics, and student experiences at the institution of attendance” (p. 91).

The study of student persistence behavior in higher education has benefited
from the theoretical work of a number of individuals, most notably that of Spady (1970), Tinto (1975, 1987, 1993), and Bean (1980, 1983, 1985). The first fully developed theoretical model of student attrition was described by Spady in 1970. Spady postulated that students withdraw from college because of a lack of shared values or normative support. Tinto (1975) refined and simplified Spady's model and clearly distinguished academic and social factors. Tinto developed a longitudinal, explanatory model of the withdrawal process which is based, to a greater extent, on the degree of fit between the student and the institution. Bean’s (1980) research is compatible with Spady and Tinto’s approach, but the assumption underlying his model is that student attrition is analogous to turnover in work organizations.

Tinto's (1993) Student Integration Model provides an explanatory, predictive model of the dropout process which has at its core the concepts of academic and social integration in the institution. Tinto's model is one of the most prominent and commonly used; the research deriving from the model is vast (Adelman, 1999; Park, 1994). The model is longitudinal and regards persistence or dropout behavior primarily as a function of the quality of a student’s interactions with the academic and social systems of the college or university. The model emphasizes integration and commitment. Background characteristics interact and influence initial commitment to the goal of college completion and initial commitment to the institution. These commitments then influence students' intellectual development and academic performance, which define academic integration. Increased academic integration and social integration lead to greater goal commitment and institutional commitment.
which reduce the probability of the student dropping out (Gillespie & Nobel, 1992; Perna 1998a; Tinto, 1993).

Bean (1980, 1983, 1985) takes an industrial model of turnover in work organizations and applies it to colleges and universities. The assumption is that students and employees may leave their respective organizations for similar reasons. The model contains 12 determinants and two intervening variables. The 12 determinants include: (a) grades, (b) practical value (the belief that one's education will lead to a career), (c) development (the desire for self-development), (d) routinization (repetitive work), (e) instrumental communication (being informed about issues on the campus), (f) participation, (g) integration, (h) courses (being able to take the courses one wants to take), (i) distributive justice (being fairly treated on the campus), (j) campus organizations (the number of memberships in campus organizations), (k) opportunity (the opportunity to transfer, and (l) marriage (the likelihood that a student will marry before graduation). In addition to these determinants, the two intervening variables are (a) satisfaction and (b) intent to leave. All 12 determinants influence satisfaction positively or negatively. Satisfaction, in turn, affects intent to leave.

There are differences between the Tinto and Bean models. While Tinto's model includes student background variables, Bean's does not (Thomas, 1988). Bean specifies intent to leave as the precursor to a student's decision to remain or drop out of school. Tinto identifies goal and institutional commitment as the forerunners of the decision. The linkages in Bean's model are clearly specified as one way, while the
directions of some of the linkages in Tinto's model are multi-dimensional (Hossler, 1984). Nevertheless, the two models share essential features. Both Bean and Tinto include variables that relate to a student's academic and social interaction with the institution. These variables are expected to influence a student's goal and institutional commitments (Tinto, 1975) or intent to leave (Bean, 1983) which in turn leads to the student's decision to remain or drop out of school.

These models have served as the conceptual framework for numerous studies and have been subjected to considerable empirical testing. Research findings have largely supported the predictive validity of the models (Cabrera, Nora, & Casteneda, 1992; Pascarella & Terenzini, 1991; Somers, 1995b). The models do have their limitations, however. St. John, Kirshstein, and Noell (1991) acknowledge that these models are frequently used for research on student persistence, but they have limitations when applied to national data. Gillespie and Noble (1992) emphasized that Tinto's model was an institutional model, not a model for general use across all institutions. Tinto (1993) agrees:

It must be noted that while this conclusion, like those regarding other roots of attrition, holds for most students, it may not apply equally well for each and every subgroup of students. Though it is important to know of the broad forces that shape persistence in the aggregate, our knowledge of attrition must eventually be informed by the particular person and the particular setting with which we are dealing. (p. 69)
National Studies of Student Persistence

While the models presented above have proved beneficial to individual institutions in their research, a comprehensive understanding of attrition was limited in scope, inadequate in design, or outdated. Much of the research lacked multi-institutional data, that is, information collected simultaneously from students at contrasting types of institutions. Also lacking was longitudinal data; information on the ways in which students change between admission and some subsequent point in time. Astin (1993) provides further critique:

Other features missing from the research include large and diverse samples of students and institutions; multiple measures of entering student characteristics; multiple follow-up measures of student development, including both cognitive and affective outcomes; multivariate designs for controlling differences among students entering differing types of institutions; and methodological provisions for separating college effects from maturational effects or the simple process of growing up. (p. 3)

National studies have proven beneficial in understanding the nature of student persistence and have overcome many of the weaknesses of the attrition literature. One of the earliest national studies was featured in the foundational work of Alexander Astin (1976) entitled Preventing Students From Dropping Out. The book is based on data from the Cooperative Institutional Research Program (CIRP). The CIRP is a national longitudinal study of the American higher education system. Established in 1966 by the American Council on Education, the CIRP is now the
nation’s largest empirical study of higher education (Sax et al., 1998) involving data on almost 1.600 institutions, over 9 million students, and more than 200,000 faculty. Astin (1976) concluded that by combining predictive factors, a composite picture of the personal and environmental factors that maximize a student’s chance of finishing college could be determined.

Astin, Tsui, and Avalos (1996) reported degree attainment rates from a sample of 365 baccalaureate-granting institutions that participated in the Cooperative Institutional Research Program’s annual survey of entering freshmen in the fall of 1985. Degree attainment data were received on 75,752 of the 95,406 freshmen for whom information was requested. The report covered degree attainment for three time intervals – 4, 6 and 9 years characterized by institutional type, student gender and student race. The data indicated that about two in five students (39.9%) were able to complete a bachelor’s degree within four years of entering college. The number rises by five percent (44.9%) over six years. Allowing nine years increases the rate by slightly less than one additional percent to 45.7%. The data also showed that degree attainment varies substantially by type of institution. The highest nine-year rate is in the private universities (72.0%), with the lowest rates in the public four-year colleges (38.4%) and universities (40.8%).

Another important national study is the 1989-90 Beginning Postsecondary Student Longitudinal Study (BPS:90/94). The BPS survey is the longitudinal component of the National Postsecondary Student Aid Study (NPSAS:90), a nationally representative sample that includes students enrolled in all types of
postsecondary institutions ranging from four year colleges and universities to less-than-two-year vocational institutions. The BPS:90/94 cohort consists of students who enrolled in postsecondary education for the first time during the 1989-90 academic year. The cohort was surveyed in 1992 and 1994, offering a wide range of information regarding student persistence and degree attainment five years after members of the cohort first enrolled in postsecondary education (Horn & Carroll, 1998). The findings of this research revealed that 30.5% of 1989-90 beginning freshmen left postsecondary education before the beginning of their second year. Freshman persistence rates were the lowest among public 2-year institutions (55.5%) and highest at private, not-for-profit, 4-year institutions (87.3 percent). The study emphasized the importance of the first year experience.

…the 1994 outcomes of the beginning students who persisted to their second year illustrate the importance of the first year with respect to eventual degree attainment and long-term persistence. Among students who began their 4-year sector and who persisted to their second year, a majority (61 percent) had completed a bachelor's degree by 1994 and an additional 15 percent were still enrolled. (Horn, 1998, p. 13)

The American College Testing Program's (ACT) National Dropout and Graduation Rates Report (ACT, 1998; ACT 1996; Gillespie & Noble, 1992) is an important source of persistence data (Geraghty, 1996). Each year since 1983, ACT has collected dropout and graduation data from most U.S. colleges and universities and reported it to admissions officials, academic counselors and more recently, the
general public. ACT is the only organization that has collected and reported consistent national graduation data since the early 1980's (ACT, 1998). The 1998 report comprises data gathered between January and May 1998. ACT received dropout information from 2,545 institutions (1,625 four-year, 920 two-year) and graduation information from 2,396 institutions. The data revealed that the percentage of entering students who did not return for a second year increased slightly over the years. Thomas Mortenson (1998), a higher-education policy analyst, provides helpful longitudinal interpretation of the ACT data. His report on persistence rates in 4-year colleges concluded:

Among the 1625 4-year colleges and universities in the ACT survey, the average persistence rate was 73.6 percent in 1998. This was up from the record low of 73.1 percent in 1996, but below the record high rate of 75.5 percent reached in 1983—the first year of the ACT report. Over the 16 years of the survey, average persistence rates in 4-year institutions have drifted downward and in 1998 they were about 2 percent below where they started in 1983. (p. 3)

The patterns of persistence vary between public and private colleges. In 1998, the average persistence rate in private institutions was 74.7%, compared to 71.3% in public institutions. During the period of the available data, the persistence rate was always higher in private colleges than in public colleges. However, over the last 16 years, the persistence rate for private colleges declined while it held somewhat constant in public institutions. Between 1983 and 1998, the average persistence rate
declined by 2.5 percent among private colleges and universities, and declined by 0.1 percent public institutions (Mortenson. 1998).

The growing use of institutional persistence and graduation rates as a measure of accountability, and the tendency in public policy and opinion to blame colleges for students’ failure to complete degrees, will enhance the importance of these national studies (Adelman. 1999) and further fuel retention research. Tinto (1993) states:

This explosion of research has served to refine, supplement, and, in some cases, challenge our understanding of the complex forces shaping student retention. It has given rise to a much needed debate in both research and policy circles about the adequacy of past theory and the effectiveness of existing programs to enhance student retention on campus. (p. ix)

The growing accountability factor driving persistence research has generated interest in the area of financial aid and its impact upon student persistence. This topic is becoming increasingly important as federal and state financial aid programs face cutbacks and new competition for funding. The next section will review the literature regarding the impact of financial aid on persistence, building on the understanding of financial aid and general persistence research featured in the previous two sections.

Overview of Financial Aid and Persistence Research

Introduction

Researchers have disagreed about the impact of student financial aid on persistence in institutions of higher education (Pascarella & Terenzini, 1991, St. John,
As was outlined in the first section, the intent of the original financial aid legislation in the 1960's was to promote both access to and persistence in higher education. For these reasons, financial aid was awarded to the student rather than the institution, in order to increase student choice. However, the research is not conclusive on whether federal financial aid actually serves these purposes. In a more recent development, institutions began to invest their own funds in aid packages in order to attract and retain students. Again, the research, while sparse, is conflicting (Somers, 1995a).

If the current aid policies were found to be ineffective in promoting access and persistence, there would be serious policy considerations for both the federal government and individual institutions. Confounding the problem of studying the impact of aid is the variation in previous research studies. Many studies of persistence used national databases, which lumped students from the most prestigious private colleges with those from large doctoral public institutions and public comprehensive universities. This aggregation limits the generalizability of the results to a specific institution. Varying research models were used, including some that excluded aid as a variable, or had only a more general financial aid variable (Somers, 1996a). Kang (1993) states: "...progress in evaluating the effect of student financial aid has been slow, because of the lack of comprehensive descriptive data and the near absence of theoretical foundations for assessing the effects of student financial aid and other economic and non-economic variables known to affect persistence in college" (p. 29).
There are additional factors making the research complex and challenging. Many of the studies tracing the impact of student financial aid on persistence are quite dated. The significant changes brought about by the 1992 Reauthorization of the Higher Education Act provide an example. The amount and types of financial aid available to students a decade ago is substantively unlike the amount and types of aid currently available (Park, 1994). Even when timing is taken into consideration, Somers (1995b) points out that: “Student response to financial aid can vary widely from school to school and even from year to year at the same college” (p. 57).

Another weakness in the literature is the reliance on research designs that presuppose no underlying structure among variables selected for investigation.

The result has been a profusion of stepwise multiple regression analyses and multidiscriminant analyses that dissect or pull apart, variables without regard to how they might work together to impact persistence rates. While these studies offer interesting speculation about the true impact of types of aid on persistence, the practice of isolating a particular variable or variables, ignores the fact that many of the variables with the potential to influence persistence are intercorrelated. (Park, 1994, p. 23)

Given that the reader has a context for the complexity and challenges of research on the impact of financial aid on student persistence, results of early research on this topic will now be addressed.
Early Research

As previously discussed, most early institutional studies of persistence focused on background, academic, and social integration variables (Davis, 1997b). Vincent Tinto (1987) in the first edition of his seminal work, *Leaving college: Rethinking the causes and cures of student attrition*, concluded that student aid had little influence on persistence based on his review of sociological research on year-to-year persistence.

Though departing students very often cite financial problems as reasons for their leaving, such statements are frequently ex post facto forms of rationalization which mask primary reasons for their withdrawal. Students who see their college experiences as rewarding and/or being directly tied to their adult futures will continue to bear great financial burdens and accept considerable short-term debt in order to complete a degree program. (p. 67)

Most early national studies of student persistence found that financial aid has a positive influence (Astin, 1976; St. John, 1989; Terkla, 1985). Astin (1975) using Cooperative Institutional Research Program data to track the college freshman class of 1968, found a negative association between the receipt of loans and persistence during the first two years of college, and a positive association between loans and four-year persistence. He concluded that loans have a negative influence on persistence and that the positive association with long-term persistence was due to the fact that students who persist were more likely to receive loans. Astin also found that most other forms of student aid demonstrated a positive effect on persistence.
Terkla (1985) found that receiving financial aid was positively associated with long-term persistence and degree completion, although she did not reach conclusions about the effects of different types of aid. Carroll (1987) examined the influence of different types of aid on within-year persistence by students in the high school class of 1980 (using HSB:80) and found a positive association between grants and persistence, but not between loans and persistence.

Two early individual institutional studies by Voorhees (1985b) and Moline (1987) reached differing conclusions on the impact of financial aid on persistence. Voorhees used linear structural relations (LISREL) in analysis of the persistence of 343 freshmen financial aid recipients at a major urban university. Results of the study indicated that financial need, student residency status, and non-campus based loans had direct effects on new freshman persistence regardless of the type or amount of campus-based aid awarded. The direct effect of each federal campus-based program on persistence was significant and positive. Moline utilized path analysis to explore the relationships among a number of variables (including financial aid variables), which had been shown in both theory and prior research to be related to student persistence. The subjects were 227 full-time freshmen enrolled in a liberal arts college at a large commuter institution. The financial aid variables in the model showed no significant effect on persistence for those students who received financial aid.

Another frequently cited reference in the literature is Leslie and Brinkman’s (1988) book *The economic value of higher education*. The authors conducted a meta-
analysis of 62 persistence studies concluding that persistence is enhanced by larger amounts of aid and that when aid forms are compared to one another, grant and scholarship aid have a more positive effect on persistence than do loans. "The overall impact of aid on persistence, as measured by the mean effect size for all 46 samples, is a statistically significant +.132" (p. 173). The authors also stated that an effect size of that magnitude ought to be considered "less than small."

This concludes a review of earlier literature addressing the issue of financial aid's impact on student persistence. A review of recent studies will follow first looking at research conducted at individual institutions, then at national studies and concluding with meta-analysis studies.

**Individual Institutional Studies**

The results of recent individual institutional research on the impact of receiving financial aid during college and bachelor's degree attainment is mixed. Several studies, (Bost, 1996; Fenske, 1993; McGrath & Braunstein, 1997; Nehila, 1995; Park, 1994; Quisenberry 1996; Sanjeev & Zytkow, 1995) suggest that receipt of general financial aid during college is positively associated with persistence and bachelor's degree completion. This influence appears to hold even when controls are made for such variables as academic ability and student financial resources. All but one of these studies collected data from freshman cohorts. Fenske (1993) collected data from a sample of full-time, dependent, aided students at Arizona State University. Of the studies that used freshmen as subjects, only two (Park, 1994;
Sanjeev & Zytkow, 1995) used multiple cohorts and these studies used just two cohorts. The number of participant sizes ranged from a low of 403 to a high of 16,653. The studies represented both public and private institutions.

Other individual institutional studies found that the receipt of general financial aid had no significant influence on student persistence and degree completion (Boivin, Beuthin, & Hauger, 1993; Cabrera, et al., 1992; Munson, 1997; Sadler Cohen, & Kockenson, 1997; Stampen & Cabrera, 1986; St. John, 1998). Five of the six studies examined freshman, while St. John (1998) studied sophomores and juniors. The research represented a mix of public and private universities. The number of participants in these studies ranged from 300 to 5,000.

Four individual institutional studies found student need to be a significant factor in persistence. Two of the studies (Huseman, Moore, Huang, & Guo, 1996; McGrath & Braunstein, 1997) found a negative correlation between unmet need and student persistence. Fenske (1993) found that unmet need was not a significant factor in student persistence, while Baker (1996) found a positive correlation between unmet need and student persistence.

Another area of investigation for many of these studies was to consider the impact of the composition of financial aid packages on student persistence. Five of the studies reported significant results in this area and like the results above, findings were mixed. St. John (1998), along with Murdock, Nix-Mayer and Tsuni (1995), found loans to have a negative impact upon persistence. Quisenberry (1996) found loans to have no impact upon persistence and receipt of grants to have a positive
relationship. Sanjeev and Zytkow (1995) found that loans had a positive impact on student persistence. Bost (1996) found that students who had a combination of grants and loans were more likely to persist than those student getting only grants or only loans.

It is obvious that one cannot make generalizations about the relationship of financial aid and student persistence based on individual institutional studies. Hossler (1994) cautions us: "...the impact of financial aid is varied and complex. The complexity highlights the need for each campus to have varied and differential aid policies targeted to meet the needs of a diverse population (p. 98). McGrath and Braunstein (1992) add: "A partial review of the literature indicates that the causes of attrition vary, and the strategies designed to reduce it produce different results at different institutions" (p. 396). It is worthy to repeat the researchers' call for institutions to conduct more of their own research in order to better understand the problem of attrition within the culture of their own institution. Far too many institutions provide retention interventions based on intuition or what has worked well at another school. A campus wide commitment to on-going research is warranted. Mulugetta, et al., (1997) make the case that this commitment is more critical for private colleges. "The unique nature of financial aid at private colleges underscores the critical need for institutional research for making optimal decisions regarding how to distribute institutional aid and how to forecast demand for that aid" (p. 45).

The review of single institutional studies leads us to the conclusion that the
differential effects of either loans or grants, or their combination, on persistence or degree completion, have not been clearly identified by research efforts to date. Findings are inconclusive, and often contradictory. The status of existing research points to the need for a longitudinal study that is single-institution based. This will isolate the research from confounding effects of inter-institutional differences in student characteristics and aid processes.

Some of the most promising research on the institutional level has come from Patricia Somers. Somers (1992) suggested that the use of different methodologies and models has resulted in discrepancies among research findings. Somers concluded that inconsistency of methodology, not the differences in tuition and financial aid awards, explained the wide variance in the results of persistence research. Somers noted that methodology has differed so much from study to study that administrators have experienced great difficulty replicating the studies or even applying the conclusions reached to situations at their institutions.

Somers and colleague Edward St. John (Somers, 1992, 1993, 1994a, 1994b, 1995a, 1995b, 1996a, 1996b; Somers & St. John, 1997; St. John, 1992, 1998) developed and tested a model that used existing institutional data to study persistence. The model examines the relationships between background, achievement, financial aid, and college experience using three logistical models: first-time attendance, within-year persistence, and year-to-year persistence (Somers, 1995a). Regression techniques are used in the model to find the “best-fit” between the explanatory variables and the outcome variable. For a model where the outcome variable is
dichotomous (persister or non-persister), a technique known as logistic regression is appropriately used (Hosmer & Lemeshow, 1989). One of the important features of logistic regression is the computation of a statistic called “delta P” or “odds-ratio,” which measures the effect on the dependent variable given a change of one unit in a selected independent variable (Somers, 1995a). For dichotomous variables the delta-P statistic provides a measure of extent to which the outcome is likely to change if the individual has the characteristic being measured. For continuous variables, the delta-P statistic means that a change in a unit of measure of that variable changes the probability that the outcome measure will happen by a specific percentage (St. John, Andrieu, Oescher, & Starkey, 1994). For example, in the case of a dichotomous variable, a delta P value of 0.054 would indicate the variable increased probability of persisting by 5.4%. In the case of a continuous variable, a delta P value of –0.0045 would indicate that a $1,000 tuition differential would decrease the probability of persistence by 4.5% (provided that tuition was coded in $1,000 increments).

Somers (1995a) used the model to study 1,473 entering fall, 1989 students at an urban public university. The study found that low-income aid applicants did not persist as well as others when the type and amount of aid were considered. It was also found that the total amount of aid offered was a significant factor in student persistence. The delta P computations showed that there were significant associations between within-year persistence and student financial aid: 6.2% per $1,000 in grants and 5.2% per $1,000 in loans (Somers, 1995a).

The model holds great promise for single institutional research. Somers
(1996a) comments on the model's potential:

Due to the ever-increasing cost of college, there has been a renewed interest in price response and its implications for financial aid, pricing policy, and overall institutional planning. Price response does show great promise in helping institutions refine their enrollment goals. However, price response seems to change in reaction to federal and institutional policy changes and varies by student population. Thus, to be useful, price response research must be done continuously, and at many types of institutions. (p. 29)

National Studies

National studies of student persistence find that financial aid has had a positive influence (Green, 1998; Kang, 1993; St. John, Andrieu, et al., 1994; St. John, Kirshstein & Noell, 1991; St. John, Oescher & Andrieu, 1992; St. John & Paulsen, et al., 1996; St. John & Starkey, 1995a; USGAO, 1995). St. John and Kirshstein, et al., (1991) using the model described above, investigated the impact of financial aid on the first to second year persistence of 3,755 students from the High School and Beyond (HSB) 1980 cohort. They discovered that financial aid (both loans and grants) had a positive impact on persistence. Students receiving a combination of grants, loans and college work study increased persistence by 5.4% over those not receiving aid. The United States Accounting Office (1995), also conducted a study of the HSB:80 cohort and came to the same conclusion. They found that for each addition of $1,000 in financial aid, low-income student attrition was reduced by 14%.
A series of studies using data from the National Postsecondary Education Study of 1987 (HPSAS-87) (St. John, 1996; St. John, Andrieu, et al., 1994; St. John, Oescher, et al., 1992; St. John, Paulsen, et al., 1996; St. John & Starkey, 1995a) found:

1. Net price and net cost were significant and negatively associated with persistence. Each additional $1,000 of tuition reduced persistence by 2.6%.

2. Amount and type of financial aid awarded had an influence on within-year persistence. Grants were more effective than loans in promoting persistence.

3. Unmet need was negatively associated with persistence. Each differential in unmet need reduced the probability of persistence by 0.2%.

Perna (1998b) studied a sub-sample (n = 3,188) of the Beginning Postsecondary Student Longitudinal Study of 1989-90 (BPS:89-90). This study arrived at many of the same conclusions as the HPSAS-87 studies, but used a different methodology: that of path analysis. Perna found that the total effect of financial aid on persistence was positive, but small in magnitude. This study paralleled other national studies in that the effect of financial aid on persistence depended on the type of package with grants being more effective in promoting persistence.

Green (1998) studied a sample of 563 first-time freshmen from 104 member institutions of the Coalition of Christian Colleges and Universities. He employed t-tests and discriminant analysis and came to a similar conclusion to Perna. Green found that the effect of financial aid on persistence was marginally positive, with grant aid having a significant impact on persistence. Loans had no relationship with
Institutional administrators have been unsure how to apply the national research since it is unclear how the results apply to single institutions (Somers, 1995b). These national studies have been important, however, in helping forge government policy. They provide insights into how financial aid influences persistence across higher education; which cannot be gained in single-institution studies. St. John (1991) provides a good summary of these efforts:

Research on the impact of student aid has made substantial progress during the past two decades. We have reached the point where it is possible to cast off lingering doubts about the effectiveness of student aid. It is not only evident that student aid is effective in promoting equal opportunity, but that shifts in student aid policy also influence student outcomes. The challenge remains to make better use of research in the formulation of public and student aid policies. (p. 29)

**Meta-Analysis**

Murdock's (1987, 1989, 1990) meta-analysis of empirical studies investigating the relationship between student persistence and financial aid is one of the most frequently cited works in the financial aid and persistence literature. Murdock reviewed over 500 studies for possible inclusion in the meta-analysis. 

"Therefore, the problem does not appear to be the lack of research on the relationship between persistence and financial aid; rather, the problem seems to be the lack of
systematic integration of the existing studies so that true relationships can be
discerned” (Murdock, 1989, p. 4). Included in the sample were studies that
specifically measured persistence by time. Studies were excluded which dealt with
student perceptions rather than actual persistence measures.

Studies were eliminated in which measurements of the dependent variable
(persistence) or the independent variable (financial aid) were unclear or
ambiguous, as well as studies that did not provide enough descriptive of
inferential statistics to allow a common metric. The final sample includes
studies from fifteen journal articles, twenty-one dissertations, one practicum,
seven unpublished reports, and five other dissertations later published in
journal article form. (Murdock, 1989, p. 5)

The meta-analysis Murdock (1990) found a statistically significant effect size
of +0.1316. He interpreted this to be “...in the category of less than small effect...”
(p. 216). His findings showed higher average effect sizes at private institutions.

The dollar amount of financial aid has a significant positive effect on student
persistence (Murdock, 1990). When comparing different forms of financial aid,
grants, scholarships, and the grant—loan combination have a greater positive effect
than do loans. Another finding of interest is that financial aid appears to have a
stronger effect on persistence during the latter years of college than during the
freshman year.
Summary

This review of the literature supports the need for the proposed study. An overview of undergraduate financial aid presented the history and development of financial aid, the purpose of financial aid, and the process of awarding financial aid. The importance of financial aid to the nation's students and postsecondary institutions is evident. Despite the important role of financial aid, the implications of shifting financial aid policies have received little empirical study. This is particularly important given the significant shifts in policy brought on by the 1992 Reauthorization of the higher education act. One of the stated purposes of financial aid is to promote student persistence. The need for empirical research to assess whether aid is accomplishing this important purpose is critical.

The overview of research on student persistence in college provided in this literature review also supports the need for the study. Despite the abundant amount of literature on the topic and numerous interventions on college campuses, student retention rates have remained constant over the last few decades. Gaining an understanding of the retention of undergraduates is difficult due to the complex mixture of factors involved.

One of the factors receiving attention is the relationship between financial aid and student persistence. This literature review highlighted the difficulties of inquiry into this relationship. Researchers disagree about the impact of student financial aid on persistence. Results are mixed and often contradictory. This can be attributed to the profound differences in postsecondary institutions and lack of a consistent
research design. Much of the research is dated. The amount and types of financial aid available to students changes with each reauthorization of the Higher Education Act.

Far too many institutions base financial aid policy on intuition and have little evidence of the impact of these policies. There is a need for a commitment to ongoing research regarding the relationship between financial aid and student persistence so that institutions might make optimal decisions regarding the distribution of aid.

The literature cautions us against making generalizations about the relationship of financial aid and persistence across institutions. This is not the intent of the study. The intent of the study will be to inform the administrators of this Midwestern liberal arts college so that policies may be developed which enhance freshman persistence. This does not mean that the study does not have meaning for administrators from other institutions. The study will emphasize the importance of research investigating the relationship of financial aid and freshman persistence and will provide a model for how that research might be conducted at other institutions.

The proposed study will attempt to address the above concerns. The study will address two research questions: (1) What is the relationship between financial aid and freshman year-to-year persistence? and (2) Can a model be developed to predict freshman persistence at this Midwestern liberal arts college using the variables in the study? Although the relationship between financial aid and freshman persistence has been investigated, few studies have explored this relationship for
students impacted by the significant policy changes of the 1992 Reauthorization of
the Higher Education Act. Further, few institutional studies have investigated the
relationship across multiple cohorts of new beginning freshmen. This study
accomplishes both of these important perspectives.

Chapter 3 will outline a proposed methodology for the study.
CHAPTER III

METHODOLOGY

Introduction

Chapter 1 provided an introduction to the proposed study and introduced two research questions:

(1) What is the relationship between financial aid and freshman year-to-year persistence at this Midwestern liberal arts college?

   (a) Is there evidence that any of the financial aid variables in the study relate to freshman persistence? If so, which of the variables demonstrate a relationship to freshman persistence and what is the nature of that relationship?

   (b) Are the variables of gender, residency, and ACT composite score intercorrelated with any of the financial aid variables? If so, what relationship do these variables have on freshman persistence?

(2) Can a model be developed to predict freshman persistence at this Midwestern liberal arts college using the variables in this study?

Chapter 2 provided an overview of the literature. This chapter will provide information on the proposed methodology that will be employed to address the research questions above. The chapter addresses: (a) institutional setting,
(b) description of subjects, (c) description of dependent and independent variables, (d) data collection procedures, and (e) data analysis procedures.

Institutional Setting

This Midwestern college is classified as a Liberal Arts II institution (Carnegie Foundation for the Advancement of Learning, 1987) with a traditional undergraduate enrollment of approximately 1000 students. The College experienced rapid enrollment growth starting from a fall headcount of 777 in 1992 to 1122 in 1998. During those years, the number of first-time freshmen has increased from 170 to 320 (Cornerstone, 2000). The College describes itself as a "theologically conservative institution of Christian higher education that enables individuals to apply unchanging biblical principles in a rapidly changing world" (Cornerstone, 1996, p. 3). The students at the institution generally come from white, conservative Christian homes where a high value is place on Christian higher education (Cornerstone, 2000).

Subjects

The subjects of this study consist of five cohorts of first-time freshman enrolling in fall 1994 through fall 1998. Control of population homogeneity was accomplished by selecting only freshmen who met the following criteria: (a) full-time (12 semester hours of more), (b) traditional age (less that 25 years old at the time of registration, (c) U.S. citizen, and (d) dependent students (in term of financial aid status). Dependents of college staff were excluded from the study since these
students receive full tuition remission. A homogeneous group was selected to increase the accuracy of the description of persistence for this traditionally aged, new freshman group. Although this does limit the generalizability of the results, it provides a more precise picture of the factors affecting persistence for this population (Davis, 1997b; Moline, 1987; St. John, Paulsen & Starkey, 1996; Thomas, 1988).

This is particularly true of full-time versus part-time status. A recent study of part-time student persistence behavior revealed notable differences in the persistence behavior of part-time students relative to full-time students (St. John & Paulsen, et al., 1996). In addition, full-time attendance influenced whether students received financial aid and/or the amount of aid they received.

The majority of traditionally aged college students (18-24) are classified as dependent students. Financial need is calculated differently for dependent students than independent students. The Higher Education Act of 1965 as amended, identifies students as independent if they met any of the following criteria: (a) age 24 or older, (b) veteran of the U.S. Armed Forces, (c) enrolled in a graduate or professional program beyond a bachelor’s degree, (d) married, (e) an orphan or ward of the court, or (f) has legal dependents other than spouse (Berkner, 1998).

Variables

Introduction

Variable definitions are consistent with those specified by the 1992 Reauthorization of the Higher Education Act. The next section will define the
dependent variable, persistence. Definitions of the independent variables will follow.

Dependent Variable

Persistence is the opposite of attrition and refers to those students who continue in their college studies. In this study, PERSISTER refers to those subjects who completed two semesters of full-time course work (at least 12 semester hours of credit per semester) during their freshman year and who re-enrolled for full-time coursework the following fall. A NON-PERSISTER refers to subjects who failed to enroll for full-time coursework for the fall semester of their second year. None of the subjects who were full-time students their freshman year enrolled part-time for the fall semester of the second year.

Independent Variables

Three categories of independent variables were included in the study. They include background variables, achievement variables and financial aid variables.

The background variables include GENDER and campus RESIDENCY.

The independent variable measuring academic achievement is the ACT composite score. The ACT assessment is a comprehensive evaluative, guidance, and placement program used by more than a million college-bound students each year. It consists of four academic tests with a sub-score for each and a composite score reflecting an overall score for the assessment (Gillespie & Noble, 1992). ACT composite scores range from 0 – 36. In the event that a student has submitted
multiple ACT composite scores, the highest score was used. SAT composite scores were converted to ACT composite scores using a SAT – ACT score comparison table provided by the College Board (College Entrance Examination Board, 1999).

The financial aid variables include:

1. EFC - expected family contribution.

2. COA - cost of attendance - Cost of attendance includes tuition, required fees, room, board, transportation, books and supplies. Costs of attendance figures are different for resident and commuting students and change from year to year.

3. NEED - basic demonstrated need - This is calculated by subtracting the expected family contribution (EFC) from the cost of attendance (COA).

4. OUTGRANTS - total of outside grants - This is the sum of all non-institutional grants included in student financial aid packages. These include Federal grants (Pell and Federal Supplemental Educational Opportunity), State of Michigan grants and grants from other outside sources.

5. INSTITGRANTS - total institutional grants - This includes all Cornerstone College funded grants included in student financial aid packages. These include merit-based grants (academic, athletic honor, music etc.) as well as need based institutional grants.

6. TOTGRANTS - total of all grants - This is the sum of OUTGRANTS (total outside grants) and INSTITGRANTS (total institutional grants).

7. TOTSELF - total of all self-help - This is the sum of all self-help aid (loans and college work study) included in student financial aid packages. The loans include
the Perkins Loan, the Subsidized Federal Stafford Loan, the Unsubsidized Federal Stafford Loan, the Federal Parent Loan Program, the State of Michigan Loan Program as well as any other loans used to pay the cost of attendance. The college work-study program is also included.

8. TOTAID - total aid - This variable represents the total of all aid included in student financial aid packages. It is the sum of TOTGRANTS (total grants) and TOTSELF (total self-help).

9. UNMET - unmet need - Unmet need is calculated by subtracting NEED from TOTAID (total aid).

10. OOP - out of pocket - Out of pocket costs are calculated by subtracting TOTGRANTS (total grants) from the cost of attendance (COA). This figure represents the portion of the cost of attendance that is the responsibility of the family to bear. This includes loans (which need to be paid back) and college work-study funds which need to be earned by the student.

Collection of Data

All of the data utilized in the study was gathered from existing sources. Permission to utilize this data has been secured from each of the institutional officials responsible. Data was secured by the Office of Assessment and Institutional Research from the student information systems and the financial aid database of the college. The data provided the information needed to qualify students as participants in the study. In the case of missing data, the staff of the Office of Assessment and
Institutional Research referenced hard copy files to complete the computer database file. The data provided did not carry student identifiers, thus keeping all information completely confidential. The data was downloaded from the College's administrative computer system into SPSS for Windows, Version 9.0.

Data Analysis

Introduction

The data in the study was analyzed through the use of descriptive analysis, chi-square, Pearson product-moment correlation, independent-samples t-test, and logistic regression. These techniques are described below.

Descriptive Analysis

Descriptive data regarding the five cohorts and the study variables will be summarized in Chapter 4. This provides the reader with an overview of the freshman cohorts and the student aid packaged for those students.

Bivariate Analysis

It is important to consider how the individual dependent variables relate to one another. This was accomplished through a bivariate correlation procedure to produce Pearson Product-Moment Correlation Coefficients to measure the linear association between the independent variables on a ratio/interval scale. Values of the Pearson Product-Moment Correlation coefficient range from -1 to 1.
The sign of the coefficient indicated the direction of the relationship, and its absolute value indicated the strength, with larger absolute values indicating stronger relationships (Sheskin, 1997).

The relationship of nominal independent variables was assessed using the chi-square test of independence. This type of analysis allows the construction of contingency tables with the rows representing one variable and the columns representing another variable. Within such a table, each observation will qualify for only one category within a variable classification and each category will be mutually exclusive of the other categories. The chi-square statistic is a test indicating the likelihood that two variables are statistically dependent. Its value will be small if there is little or near-zero dependence between the variables. Variables with strong statistical dependence will have large chi-square values (Sheskin, 1997).

**Independent-Samples \( t \)-test**

The independent-samples \( t \)-test procedure compares means for two groups of cases. The means of the financial aid variables were compared for the persister and non-persister groups.

**Logistic Regression Modeling**

**An Introduction to Logistic Regression**

Many statistical models can identify factors relevant to college enrollment, persistence and degree completion, but only a few can conform to the dichotomous
nature of outcome variables such as enrollment, persistence and degree completion.

Multiple linear regression is the most commonly used statistical method for predicting outcomes. However, because linear regression assumes that the criterion, or dependent variable, has multiple values that are the interval scale, it is not the most appropriate method for modeling a dichotomous criterion variable such as persistence. Because a dichotomous criterion variable is bounded, a linear regression model might result in impossible values (Hosmer & Lemeshow, 1989). Modeling phenomena with logistic regression permits exploration of the relationship between multiple categorical and continuous predictors and a dichotomous outcome (Gillespie & Noble, 1992; Murdock, Nix-Mayer, & Tsuni, 1995; St. John, 1998).

Logistic regression has been used in a number of studies on college persistence (Somers, 1996b) and financial aid relationships (Somers & St. John, 1997). Adelman (1999) makes the case for logistic regression stating:

The preferred statistical technique for telling this story involves logistic regression. To put the difference between the Ordinary Least Squares linear regression models and the logistic model too simply, the former seeks to minimize the errors in the measurement of an event, while the latter seeks to estimate the maximum likelihood of an event. (p. 79)

Hosmer and Lemeshow (1989) wrote that the goal of logistic regression, as with other statistical techniques, is "to find the best fitting and most parsimonious, yet... reasonable model to describe the relationship between an outcome variable and a set of independent variables" (p. 1). The logistic regression model is fitted to the study
data using a method for estimating coefficients call the maximum likelihood estimation. This method selects the coefficients that seem to make the observed outcome most likely to occur. The result of this estimation is called the log likelihood function, and is a measure of how nearly the model fits the study data (Somers, 1992).

**Model-Building Strategies**

The approach, in building the logistic regression model, was to use a stepwise method in which variables are selected for inclusion or exclusion from the model in a sequential fashion based solely on statistical criteria. The technique for building the logistic regression equation was forward selection with a test for backward elimination. This approach has worked well in similar studies (McGrath & Braunstein, 1997; Parro, 1997; Sadler, Cohen, & Kockesen, 1997; St. John, Andrieu, Oeschcer, & Starkey, 1994; St. John, Paulsen & Starkey, 1996).

The statistical test employed to determine inclusion or exclusion was the Wald Statistic which has a chi-square distribution (SPSS, 1999). A crucial aspect of using stepwise logistic regression is the choice of an “alpha” level to judge the importance of variables. In both cases, an alpha level for entry into the equation = 0.20 and an alpha level for removal from the equation = 0.25 will be utilized. Hosmer and Lemeshow (1989) provide guidance for the selection of alpha levels as: “...use of a more traditional level (such as 0.05) often fails to identify variables known to be important” (p. 86).

Bendel and Afifi (1997) have studied the choice of [alpha level] for stepwise
linear regression, and Costanza and Affi (1979) have studied the choice for stepwise discriminant analysis. The results of this research have shown that the choice of \([\alpha \text{ level}] = 0.05\) is too stringent, often excluding important variables from the model. Choosing an \([\alpha \text{ level}]\) in the range 0.15 to 0.20 is more highly recommended. (p. 108)

Use of this larger level has the disadvantage of including, at the model building stage, variables that are of questionable importance.

**Testing the Significance of the Variables in the Model**

In this study, an assessment of the significance of the independent variables in the logistic regression model was used to determine whether the independent variable is significantly related to the dependent variable, persistence. The Wald statistic was used to test the significance of the coefficients for the independent variables used in the study. The Wald statistic is the square of the ratio of the independent variable coefficient to its standard error and has a chi-square distribution (Hosmer & Lemeshow, 1989). This characteristic was used to test the null hypothesis that the coefficient of each independent variable is zero. In this study, an entire population was used (i.e., all enrolled new beginning freshmen were used in this analysis), rather than a sample of this population. Statistical significance of independent variables does not have its normal meaning. Therefore, in a technical sense, it is no longer necessary to project significance from a sample to a population. However, these measures do provide indicators of whether measured effects are meaningful (have
Confounding and Interaction

One of the weaknesses of the studies that examine financial aid and persistence is the over reliance on research designs that presuppose no underlying structure among variables selected for investigation. Many studies ignore the fact that many of the variables with the potential to influence persistence are intercorrelated (Fenske, 1993; Nehila, 1995; Park, 1994; Parro, 1997; Voorhees, 1985b). "The conclusions of such studies often contradict one another and thus, taken in total, fail to provide concrete direction to the financial aid practitioner" (Voorhees, 1985b, p. 23). The term "confounding variable" is used to describe a covariate that is associated with both the dependent variable of interest and a primary independent variable (Hosmer & Lemeshow, 1989). One variable that will need to be watched is the ACT composite score, the independent variable being used in this study to determine a student’s academic performance. The literature demonstrates a strong relationship of academic performance and persistence as well as academic performance and financial aid. The latter is obvious. Students receive merit scholarships based on their academic ability and often need to maintain a minimum cumulative grade point average to renew their awards. Voorhees (1985a) found that academic achievement has the largest direct effect on persistence. Campus residency has also shown a statistically positive influence on persistence (Pascarella &
To test for confounding variables, bivariate correlations using the Pearson Product-Moment Correlation Coefficient were conducted (Sheskin, 1997). A statistic that is used to look at the partial correlation between the dependent variable and each of the independent variables is the $R$ statistic. $R$ can range in value from $-1$ to $+1$. A positive value indicates that as the variable increases in value, so does the likelihood of the event occurring. If $R$ is negative, the opposite is true. Small values for $R$ indicate that the variable has a small partial contribution to the model (SPSS, 1999).

Homer and Lemeshow (1989) recommend that the confounder status of a covariate can be ascertained by comparing the estimated coefficient for the independent variable from models containing and not containing the covariate. Frequently, in social science and educational research, the nature of the effect of one independent variable on an outcome varies by differences in another independent variable (Parro, 1997). This is referred to as “interaction.” Sheskin (1997) describes interaction: “An interaction is present in a set of data when the performance of subjects on one independent variable is not consistent across all the levels of another independent variable” (p. 489). Interaction becomes apparent when an isolated suspect variable from the logistic regression model results in a significant change in the impact of another variable. Fortunately, SPSS 9.0 (SPSS, 1997) provides the inclusion of interaction terms in the logistic regression model. When interaction was found between variables, appropriate interaction terms were inserted into the logistic regression model to assure the best predictive model possible.
Assessing the Goodness of Fit of the Model

Hosmer and Lemeshow (1989) remind us of the power of logistic regression: “The logistic regression model is a remarkably flexible model. Unless we are dealing with a set of data where most of the probabilities are very small or very large, or where the fit is extremely poor in an identifiable systematic manner, it is unlikely that any alternative model will provide a better fit” (p. 168). Several methods were employed to assess the goodness of fit of the model in this study. One way to assess how well the model fits is to compare its predictions to the observed outcomes. This is done by use of a classification table. This was done by using the equation generated by the model to predict the probability of freshman returning for their sophomore year on a student-by-student basis. If the predicted probability of retention turns out to be greater than 50%, students were assigned to the PERSISTER group; otherwise students were assigned to the NON-PERSISTER group. The percent of correct classifications was used to evaluate the goodness of fit.

Another useful tool is known as the likelihood. Since the likelihood is a small number less than 1, it is customary to use $-2$ times the log of the likelihood ($-2LL$) as a measure of how well the estimated model fits the data (SPSS, 1999). Smaller $-2$ log L values are indicative of better fitting models (St. John, Andrieu, et al., 1994). Two other statistics were valuable in assessing the fit of the logistic regression model. They are the Cox and Snell R2 and the Nagelkerke R2. These are statistics that attempt to quantify the proportion of explained “variance” in the regression model.
The last test for the goodness of fit that was employed was the Hosmer and Lemeshow Test (Hosmer & Lemeshow, 1989). It is a commonly used test for the goodness of fit of the observed and predicted number of events. The test divides the cases into 10 approximately equal groups based on the estimated probability of the event occurring and assesses how the observed and expected numbers of events and non-events compare. The chi-square test is used to assess the difference between the observed and expected number of events (SPSS, 1999).

Summary

This concludes the chapter on methodology which included a description of the institutional setting and subjects, definitions of dependent and independent variables, and a description of data analysis procedures. Chapter 4 will present the findings of the study.
CHAPTER IV

FINDINGS

Introduction

Chapter 1 of this study outlined the importance of the study of the relationship of financial aid and student persistence. Additionally, the chapter proposed two research questions to be investigated. (1) What is the relationship between financial aid and freshman year-to-sophomore persistence at this Midwestern Liberal Arts college? (2) Can a model be developed to predict freshman persistence at this Midwestern Liberal Arts college using the variables in the study? The significance of these study questions was explained.

Chapter 2 provided a review of the literature, including an overview of undergraduate financial aid and persistence research, and concluded with a review of financial aid and persistence research. The complexity and challenges regarding financial aid and persistence research were presented.

Chapter 3 detailed the methodology of the study including a description of the institutional setting for the study, subjects, variables, collection of data, along with strategies for analysis of the data.

Chapter 4 will present the findings of the study. The chapter will begin with descriptive data providing analysis of the subjects of the study as well as the
dependent and independent variables. The second section will provide an analysis of
the relationship between variables. The last section will attempt to answer the second
research question using logistic regression modeling to predict freshman persistence
based on the variables included in the study.

Descriptive Analysis

Subjects

This Midwestern Liberal Arts college experienced rapid enrollment growth
from 1994 to 1998. Fall 1994 undergraduate headcount totaled 735 and grew to 1122
by Fall 1998 (Cornerstone, 2000). This pattern of growth is mirrored in Table 1,
which shows the number of subjects in each of five freshman cohorts. The
enrollment of

<table>
<thead>
<tr>
<th>Cohort</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>151</td>
<td>239</td>
<td>261</td>
<td>276</td>
<td>281</td>
<td>1208</td>
</tr>
</tbody>
</table>

first-time, full-time freshmen grew steadily from 1994 to 1998, increasing by 86%.
The total number of subjects equals 1208. The selection of a homogeneous sample
was accomplished by selecting only freshmen meeting the following criteria: (a) full-
dependent. A homogeneous group was selected to increase the accuracy of the
description of persistence for these freshman cohorts.

Variables

Dependent Variable

Persistence is the opposite of attrition and refers to those students who
continue in their college studies. In this study, PERSISTER refers to those subjects
who complete two semesters of full-time course work during their freshman year and
who re-enrolled for full-time coursework the following fall. A NON-PERSISTER
will refer to subjects who failed to enroll for full-time course work for the fall
semester of their second year. Table 2 shows persistence by cohort. The

Table 2
Persistence by Cohort

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
<td>n %</td>
</tr>
<tr>
<td>P</td>
<td>102</td>
<td>67.5</td>
<td>163</td>
<td>68.2</td>
<td>172</td>
<td>65.9</td>
</tr>
<tr>
<td></td>
<td>171</td>
<td>62.0</td>
<td>195</td>
<td>69.4</td>
<td>803</td>
<td>66.5</td>
</tr>
<tr>
<td>N</td>
<td>49</td>
<td>32.5</td>
<td>76</td>
<td>31.8</td>
<td>89</td>
<td>34.1</td>
</tr>
<tr>
<td></td>
<td>105</td>
<td>38.0</td>
<td>86</td>
<td>30.6</td>
<td>405</td>
<td>33.5</td>
</tr>
</tbody>
</table>

Note. aPERSISTER. bNON-PERSISTER.

average persistence rate for all cohorts equaled 66.5%. Persistence rates varied from
a low of 62% for the 1997 cohort to a high of 69.4% for the 1998 cohort. This
roughly translates to the fact that the College loses nearly one-third of its freshman each year. This Midwestern Liberal Arts college’s freshman persistence rate is substantially lower than national figures. The 1989-90 Beginning Postsecondary Student Longitudinal Study (Horn & Carroll, 1998) found that 1989 beginning freshman persistence to be 69.5% overall, but 87.3% for private, not-for-profit institutions like this institution.

Table 3 shows a comparison of national average freshman persistence rates for private, bachelor degree granting institutions (with traditional level of selectivity) with corresponding Midwestern Liberal Arts college rates.

Table 3

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>National Average</td>
<td>72.0</td>
<td>71.5</td>
<td>71.1</td>
<td>70.9</td>
<td>71.1</td>
</tr>
<tr>
<td>College Average</td>
<td>67.5</td>
<td>68.2</td>
<td>65.9</td>
<td>62.0</td>
<td>69.4</td>
</tr>
</tbody>
</table>

The College’s rates fall below those of like institutions. This college is not following the trend of consistently dropping persistence rates reported by ACT (1998) except in 1998 when the rate jumped by 7.4%. The College’s rates fluctuated over the five cohorts without a discernable pattern.
Independent Variables

**GENDER.** Table 4 shows the breakdown of gender across the five cohorts and an average across all cohorts. The College's percentage of female students is higher than the statistics at similar institutions. Kojaku and Nunez (1998)

<table>
<thead>
<tr>
<th>Cohort</th>
<th>1994</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>F*</td>
<td>98</td>
<td>54.9</td>
<td>152</td>
<td>63.6</td>
<td>157</td>
<td>60.2</td>
<td>177</td>
<td>64.1</td>
<td>205</td>
<td>73.0</td>
<td>789</td>
</tr>
<tr>
<td>M*</td>
<td>53</td>
<td>35.1</td>
<td>87</td>
<td>36.4</td>
<td>104</td>
<td>39.8</td>
<td>99</td>
<td>35.9</td>
<td>76</td>
<td>27.0</td>
<td>419</td>
</tr>
</tbody>
</table>

Note. *Female. **Male.

report the percentage of 1995-96 beginning postsecondary students who are female at 56.1% for private, non-for-profit, 4-year institutions. This is 4.1% lower than Cornerstone's percentage.

**RESIDENCY.** Table 5 shows residency across cohorts. The rates for the Midwestern Liberal Arts college freshmen are much higher as compared to the campus as a whole. From 1994 - 1998, the percentage of resident students equaled a low of 57.1% in 1994 rising to high of 62.1% in 1996 and then back to 51.7% in 1998 (Cornerstone, 2000).
ACT. Table 6 shows mean ACT composite scores by cohort as well as for all subjects along with standard deviation. Table 7 shows the ACT means for

Table 5
Residency by Cohort

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R*</td>
<td>131</td>
<td>86.8</td>
<td>203</td>
<td>84.9</td>
<td>232</td>
<td>88.9</td>
</tr>
<tr>
<td>C^b</td>
<td>20</td>
<td>13.2</td>
<td>36</td>
<td>15.1</td>
<td>29</td>
<td>11.1</td>
</tr>
</tbody>
</table>


Table 6
Mean ACT Composite Scores by Cohort

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>21.56</td>
<td>22.05</td>
<td>22.18</td>
<td>22.67</td>
<td>22.53</td>
<td>22.27</td>
</tr>
<tr>
<td>SD</td>
<td>3.88</td>
<td>3.71</td>
<td>3.55</td>
<td>3.62</td>
<td>3.95</td>
<td>3.75</td>
</tr>
</tbody>
</table>

the College's cohorts in comparison with national ACT means for corresponding years. The means for the Midwestern Liberal Arts college students are higher than the national means. The College's means show a pattern of moderate increase with the 1997 cohort setting a record for the institution.
Table 7

Comparison of National ACT Means with College Means

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>National Means</td>
<td>20.8</td>
<td>20.8</td>
<td>20.9</td>
<td>21.0</td>
<td>21.0</td>
</tr>
<tr>
<td>College Means</td>
<td>21.6</td>
<td>22.1</td>
<td>22.2</td>
<td>22.7</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Expected Family Contribution (EFC). EFC is the amount of dollars a student and family are expected to contribute toward college costs, including a percentage of income and assets, all outside scholarship support, and any non-taxable income (Linsley. 1997). This figure is important because it (along with cost of attendance) determines a student's eligibility for financial aid. Table 8 shows mean EFC by cohort and total group. Mean EFC shows growth over the five cohorts, indicating

Table 8

Mean Expected Family Contribution (EFC) by Cohort

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$3,848</td>
<td>$4,677</td>
<td>$5,046</td>
<td>$5,753</td>
<td>$6,364</td>
<td>$5,291</td>
</tr>
<tr>
<td>SD</td>
<td>$3,600</td>
<td>$4,266</td>
<td>$4,965</td>
<td>$4,917</td>
<td>$5,290</td>
<td>$4,814</td>
</tr>
</tbody>
</table>
that, on the average, families are more affluent. The 1998 figure of $6,364 represents an increase of $2,516 or 65% over 1994. The College Entrance Examination Board (1998b) reports that median family income increased from $38,572 in 1994 to $46,958 in 1998. This represents an increase of 22%. This is well below the 65% increase in EFC of Midwestern Liberal Arts college students over the same period.

Cost of Attendance (COA). Cost of attendance includes tuition, required fees, room, board, transportation, books and supplies. Table 9 shows the College's COA for 1994 - 1998. Table 10 shows the College's tuition and fees costs during the same period (Cornerstone, 2000) contrasted with average tuition and fees costs for private four-year institutions across the nation (College Board, 1998a). It is evident from Table 10 that the College was priced well below the average of private, four-year institutions. However, the average price of tuition and fees increased by 26% over the five year period while the College's tuition and fees costs rose by 44% over that same period. Kojaku and Nunez (1998) found that average tuition and fees for private, four-year institutions in 1995 was $11,586 while

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>COA</td>
<td>$13,300</td>
<td>$14,500</td>
<td>$16,000</td>
<td>$17,000</td>
<td>$17,500</td>
</tr>
</tbody>
</table>
Table 10

Comparison of College Tuition and Fees with Average Tuition and Fees of Private, Four-Year Institutions 1994 - 1998

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>College</td>
<td>$7,120</td>
<td>$7,750</td>
<td>$8,892</td>
<td>$9,532</td>
<td>$10,236</td>
</tr>
<tr>
<td>National</td>
<td>$11,709</td>
<td>$12,432</td>
<td>$12,823</td>
<td>$13,664</td>
<td>$14,709</td>
</tr>
</tbody>
</table>

the average cost of attendance (COA) equaled $17,823.

**Basic Demonstrated Need (NEED).** Basic demonstrated need is calculated by subtracting expected family contribution (EFC) from the cost of attendance (COA). Basic demonstrated need is used by postsecondary institutions to build financial aid packages. Table 11 shows mean need for each of the cohorts and the mean for all subjects. Standard deviation entries demonstrate an increasing variance in the data with Fall 1997 being an exception.

Table 11

Basic Demonstrated Need by Cohort

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>M</td>
<td>$9,351</td>
<td>$9,460</td>
<td>$9,832</td>
<td>$10,484</td>
<td>$9,514</td>
<td>$9,773</td>
</tr>
<tr>
<td>SD</td>
<td>$3,920</td>
<td>$5,299</td>
<td>$9,605</td>
<td>$7,486</td>
<td>$13,539</td>
<td>$9,099</td>
</tr>
</tbody>
</table>
Outside Grants (OUTGRANTS). Outside grants represent the sum of all non-institutional grants included in student financial aid packages. These include Federal grants (Pell and Federal Supplemental Educational Opportunity). State of Michigan grants and grants from other outside sources. Table 12 shows the mean for each cohort as well as the mean for all subjects included in the study. Eighty percent of students in the study received an outside grant(s).

Table 12

Outside Grants by Cohort

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$2,208</td>
<td>$2,350</td>
<td>$2,568</td>
<td>$2,620</td>
<td>$2,545</td>
<td>$2,487</td>
</tr>
<tr>
<td>SD</td>
<td>$1,752</td>
<td>$1,796</td>
<td>$1,804</td>
<td>$1,858</td>
<td>$1,999</td>
<td>$1,858</td>
</tr>
</tbody>
</table>

Institutional Grants (INSTITGRANTS). Institutional grants are the sum of all College funded grants included in student financial aid packages. These include merit-based grants (academic, athletic, honor, music, etc.) as well as need-based institutional grants. Table 13 shows the mean for each cohort as well as the mean for all subjects included in the study. Eighty-eight percent of the subjects received an institutional grant from the College.
Table 13

Institutional Grants by Cohort

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$1.924</td>
<td>$1.752</td>
<td>$1.896</td>
<td>$1.991</td>
<td>$2.314</td>
<td>$1.990</td>
</tr>
<tr>
<td>SD</td>
<td>$1.221</td>
<td>$1.324</td>
<td>$1.560</td>
<td>$1.620</td>
<td>$1.487</td>
<td>$1.485</td>
</tr>
</tbody>
</table>

Total Grants (TOTGRANTS). Total grants are the sum of all grants awarded in the financial aid package including outside grants (OUTGRANTS) and institutional grants (INSTITGRANTS). Table 14 shows the mean for each cohort as well as the mean for all subjects included in the study. Ninety-six percent of students in the study received some type of grant in their financial aid package. Kojaku and Nunez (1998) report that 80.5% of full-time beginning students in 1996 received grants at private, non-for-profit, 4-year institutions with an average grant amount of

Table 14

Total Grants by Cohort

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>$1.994</td>
<td>$2.142</td>
<td>$2.296</td>
<td>$2.431</td>
<td>$2.554</td>
<td>$2.340</td>
</tr>
</tbody>
</table>
$6,384. For the 1996 cohort, 93.5% of students received a grant with the average amount totaling $4,464.

**Total Self Help (TOTSELF).** Total self help is the sum of all self help aid (loans and college work study) included in student financial aid packages. The loans include the Perkins Loan, the Subsidized Federal Stafford Loan, the Unsubsidized Federal Stafford Loan, the Federal Parent Loan Program, the State of Michigan Loan Program as well as any other loans used to pay the cost of attendance. Table 15 shows the mean for each cohort as well as the mean for all subjects included in the study. Self help was awarded to 84.4% of the students in the study. This is higher than the 59.2% reported for 1996 beginning students by Kajaku and Nunez (1998). Midwestern Liberal Arts college students are more likely to take advantage of self-help than are those students from the national sample of students in similar institutions.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$3,145</td>
<td>$3,301</td>
<td>$4,088</td>
<td>$3,903</td>
<td>$3,702</td>
<td>$3,683</td>
</tr>
<tr>
<td>SD</td>
<td>$1,905</td>
<td>$2,672</td>
<td>$2,873</td>
<td>$2,797</td>
<td>$3,174</td>
<td>$2,805</td>
</tr>
</tbody>
</table>

**Total Aid (TOTAID).** Total aid is the sum of all aid included in student financial aid packages. It is the sum of total grants (TOTGRANTS) and total self-
help (TOTSELF). This amount provides the total amount of aid available to each student in the study. Table 16 shows the mean for each cohort as well as the mean for all subjects included in the study.

Table 16
Total Aid by Cohort

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$7,278</td>
<td>$7,404</td>
<td>$8,552</td>
<td>$8,515</td>
<td>$8,562</td>
<td>$8,159</td>
</tr>
<tr>
<td>SD</td>
<td>$3,051</td>
<td>$3,803</td>
<td>$4,031</td>
<td>$3,955</td>
<td>$4,143</td>
<td>$3,920</td>
</tr>
</tbody>
</table>

Unmet Need (UNMET). Unmet need is calculated by subtracting need from total aid. Table 17 shows the mean for each cohort as well as the mean for all subjects included in the study. It is interesting that unmet need decreases over the five years. The standard deviation increases indicating greater variance.

Table 17
Unmet Need by Cohort

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<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$2,073</td>
<td>$2,057</td>
<td>$1,279</td>
<td>$1,969</td>
<td>$951</td>
<td>$1,614</td>
</tr>
<tr>
<td>SD</td>
<td>$2,981</td>
<td>$4,576</td>
<td>$8,253</td>
<td>$6,014</td>
<td>$12,396</td>
<td>$8,001</td>
</tr>
</tbody>
</table>
Out of Pocket (OOP). Out of pocket costs are calculated by subtracting total grants (TOTGRANTS) from the cost of attendance (COA). This figure represents the portion of the cost of attendance that is the responsibility of the family to bear. This not only includes cash payments, but also includes loans, which need to be paid back, and college work-study funds which need to be earned by the student. Table 18 shows the mean for each cohort as well as the mean for all subjects included in the study. An increase in standard deviation demonstrates increased variance or spread of the out of pocket amounts for the subjects.

### Table 18

Out of Pocket by Cohort

<table>
<thead>
<tr>
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<td>$5,367</td>
<td>$5,872</td>
<td>$4,654</td>
<td>$5,296</td>
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<td>$8,634</td>
<td>$6,467</td>
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Statistical Analysis

**Bivariate Correlations**

It is important to consider how the individual dependent variables relate to one another. This was accomplished through a bivariate correlation procedure to produce Pearson Product-Moment Correlation Coefficients to measure the linear association between the independent variables. Values of the Pearson Product-Moment
Correlation coefficient range from -1 to 1. The sign of the coefficient indicates the direction of the relationship, and its absolute value indicates the strength, with larger absolute values indicating stronger relationships (Sheskin, 1997). Tables 19 and 20 show the results of the bivariate correlation procedure for those variables on an interval/ratio scale. Interesting relationships between the variables are revealed. Strong correlations are evidenced in Tables 19 and 20. Several of these relationships are obvious. One would expect a strong negative correlation between expected family contribution (EFC) and total aid (TOTAID), for example. This also holds for the strong positive correlations between basic demonstrated need (NEED) and various types of aid along with a strong correlation between NEED and TOTAL AID.

Other relationships are less obvious. A correlation of 0.66 exists between ACT and EFC, significant at the p<0.05 level. ACT is also correlated with OUTGRANTS with a correlation of .307, significant at the p<.01 level. It is interesting that as the College's cost of attendance (COA) increased, so did the average EFC of the prospective students (0.165, p<.05).

The multiple correlations evidenced by Tables 19 and 20 will need to be carefully considered in the attempt to assess relationships based on logistic regression later in this chapter.
## Table 19

### Bivariate Correlations — A

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<th>COA</th>
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<th>OUT-GRANTS</th>
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<td>-.679**</td>
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<td>.165**</td>
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<td>.023</td>
<td>.069*</td>
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<tr>
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<td>-.732**</td>
<td>.023</td>
<td>1.000</td>
<td>.494*</td>
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<tr>
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<td>-.679**</td>
<td>.069*</td>
<td>.494*</td>
<td>1.000</td>
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<td>-.186**</td>
<td>.096**</td>
<td>.158**</td>
<td>-.033</td>
</tr>
<tr>
<td>TOT-GRANTS</td>
<td>.164**</td>
<td>-.657**</td>
<td>.115**</td>
<td>.493**</td>
<td>.773**</td>
</tr>
<tr>
<td>TOT-SELF</td>
<td>-.107**</td>
<td>-.282**</td>
<td>.087**</td>
<td>.285**</td>
<td>.186**</td>
</tr>
<tr>
<td>TOT-AID</td>
<td>.021</td>
<td>-.594**</td>
<td>.131**</td>
<td>.479**</td>
<td>.595**</td>
</tr>
<tr>
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<td>-.541**</td>
<td>-.038</td>
<td>.903**</td>
<td>.270**</td>
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<tr>
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<td>-.079**</td>
<td>-.624**</td>
<td>-.007</td>
<td>.969**</td>
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*Significant at the .05 level, two-tailed.

**Significant at the .01 level, two-tailed.
Table 20

Bivariate Correlations – B

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<th>TOT-SELF</th>
<th>TOT-AID</th>
<th>UNMET</th>
<th>OOP</th>
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<td>.164**</td>
<td>-.107**</td>
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<td>-.079**</td>
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<td>-.657**</td>
<td>-.282**</td>
<td>-.594**</td>
<td>-.541**</td>
<td>-.624**</td>
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<tr>
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<td>.115**</td>
<td>.087**</td>
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<tr>
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<td>.493**</td>
<td>.285**</td>
<td>.479**</td>
<td>.903**</td>
<td>.969**</td>
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<td>.595**</td>
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<td>.327**</td>
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<td>.707**</td>
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<td>.261**</td>
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<td>.242**</td>
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<tr>
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<td>1.000</td>
<td>.054</td>
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<td>.242**</td>
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<td>.940**</td>
<td>1.000</td>
</tr>
</tbody>
</table>

*Significant at the .05 level, two-tailed.
**Significant at the .01 level, two-tailed.
**Independent - Samples t-test**

The independent-samples t-test procedure compares means for two groups of cases. The first step explores the relationship of RESIDENCY, a dichotomous variable, with the financial aid and academic achievement variables. Table 21 shows the result of the analysis. There is a significant difference between commuter and resident students in the amount of total institutional aid (INSTITGRANTS), total grants (TOTGRANTS), total aid (TOTAID), total unmet need (UNMET) and total outside grants (TOTGRANT). It is apparent that residence students enjoy larger financial aid packages and have less unmet need (UNMET) than do commuter students.

The second procedure explores the relationship of GENDER with the financial aid variables and the academic achievement variable. Table 22 follows with the results of this t-test. The results show that there is no significant difference between males and females in terms of composite ACT scores or in the amount of aid they received.

In the third procedure, the means of the financial aid variables and academic achievement variable is compared for the PERSISTER and NON-PERSISTER groups.
### Table 21

t-Test Values for Grouping Variable Residency

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Prob.</th>
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</thead>
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<td>C</td>
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<tr>
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<td>$5.985</td>
<td>.593</td>
<td>1206</td>
<td>.554</td>
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<td>.000**</td>
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<td>$1.495</td>
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<tr>
<td>TOT-GRANT</td>
<td>C</td>
<td>142</td>
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<td>$1.903</td>
<td>-4.83</td>
<td>1206</td>
<td>.000**</td>
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<tr>
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<td>R</td>
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<td>$1.270</td>
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</tr>
</tbody>
</table>

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Table 21 — Continued

$t$-Test Values for Grouping Variable Residency

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OOP</td>
<td>C</td>
<td>142</td>
<td>$6,604$</td>
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<td>$8,502$</td>
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</tr>
</tbody>
</table>

Note: C indicates COMMUTER. R indicates RESIDENT.

* Significant at the .05 level.
** Significant at the .001 level

institutional aid (INSTITGRANTS), unmet need (UNMET) and in the amount of outside grants (OUTSIDE). The PERSISTERS showed less financial need than that of the NON-PERSISTERS. The PERSISTERS had more favorable financial packages than the NON-PERSISTERS in the area of institutional (INSTITGRANTS) and outside grants (OUTGRANTS). NON-PERSISTERS had a higher amount of unmet need than did the PERSISTERS.

Table 22

$t$-Test Values for Grouping Variable Gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Prob.</th>
</tr>
</thead>
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Table 22 — Continued

$t$-Test Values for Grouping Variable Gender

<table>
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<th>Variable</th>
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<td>M</td>
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</table>

Note: F indicates FEMALE. M indicates MALE.

*Significant at the .05 level.
** Significant at the .001 level

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Table 23

$t$-Test Values for Grouping Variable PERSISTENCE

<table>
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<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>$t$-value</th>
<th>df</th>
<th>2-tail Prob.</th>
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<td></td>
<td>P</td>
<td>803</td>
<td>22.5</td>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFC</td>
<td>N</td>
<td>405</td>
<td>$4,688$</td>
<td>$4,410$</td>
<td>-.310</td>
<td>1206</td>
<td>.005*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$5,595$</td>
<td>$4,979$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEED</td>
<td>N</td>
<td>405</td>
<td>$10,789$</td>
<td>$6,202$</td>
<td>2.76</td>
<td>1206</td>
<td>.007*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$9,261$</td>
<td>$10,219$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT-GRANT</td>
<td>N</td>
<td>405</td>
<td>$2,503$</td>
<td>$1,871$</td>
<td>.215</td>
<td>1206</td>
<td>.547</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$2,478$</td>
<td>$1,852$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSTIT-GRANT</td>
<td>N</td>
<td>405</td>
<td>$1,771$</td>
<td>$1,274$</td>
<td>-3.66</td>
<td>1206</td>
<td>.001**</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$2,101$</td>
<td>$1,569$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT-GRANT</td>
<td>N</td>
<td>405</td>
<td>$4,274$</td>
<td>$2,170$</td>
<td>-2.14</td>
<td>1206</td>
<td>.073</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$4,579$</td>
<td>$2,416$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT-SELF</td>
<td>N</td>
<td>405</td>
<td>$3,619$</td>
<td>$2,652$</td>
<td>-.557</td>
<td>1206</td>
<td>.464</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$3,714$</td>
<td>$2,880$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT-AID</td>
<td>N</td>
<td>405</td>
<td>$7,893$</td>
<td>$3,753$</td>
<td>-1.68</td>
<td>1206</td>
<td>.208</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$8,293$</td>
<td>$3,997$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNMET</td>
<td>N</td>
<td>405</td>
<td>$2,896$</td>
<td>$5,178$</td>
<td>3.98</td>
<td>1206</td>
<td>.041*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>$967$</td>
<td>$9,332$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Table 23— Continued

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OOP</td>
<td>N</td>
<td>405</td>
<td>$6,515</td>
<td>$5.089</td>
<td>3.67</td>
<td>1206</td>
<td>.004**</td>
</tr>
<tr>
<td>P</td>
<td>803</td>
<td>$4,682</td>
<td>$9.339</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N indicates NON-PERSISTER. P indicates PERSISTER.

*Significant at the .05 level.
** Significant at the .001 level

Chi-Square Test

The Chi-square test was employed to explore the relationship of the dichotomous independent variables GENDER and RESIDENCY with the dichotomous, dependent variable PERSISTENCE. Tables 24 and 25 show the crosstabulations of these variables. The Chi-Square analysis showed no relationship between gender and persistence with a Pearson Chi-Square value of 0.55 and 2-sided significance of $p = .814$. The Chi-Square analysis did show a relationship between residency and persistence with a Pearson Chi-Square value of 5.45 and significance of $p = .023$. Resident students are more likely to persist than commuting students.

Logistic Regression

An introduction to logistic regression was provided in chapter 3. Logistic regression permits exploration of the relationship between multiple categorical and
Table 24
Results of Persistence and Gender Crosstabulation

<table>
<thead>
<tr>
<th>Persistence</th>
<th>Non-Persister</th>
<th>Persister</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td></td>
</tr>
<tr>
<td>Persister</td>
<td>273</td>
<td>132</td>
<td>405</td>
</tr>
<tr>
<td>Non-Persister</td>
<td>516</td>
<td>287</td>
<td>803</td>
</tr>
<tr>
<td>Total</td>
<td>789</td>
<td>419</td>
<td>1208</td>
</tr>
</tbody>
</table>

χ² = 0.55  p = .814

Table 25
Results of Persistence and Residency Crosstabulation

<table>
<thead>
<tr>
<th>Persistence</th>
<th>Non-Persister</th>
<th>Persister</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residency</td>
<td>Commuter</td>
<td>Resident</td>
<td></td>
</tr>
<tr>
<td>Persister</td>
<td>60</td>
<td>245</td>
<td>405</td>
</tr>
<tr>
<td>Non-Persister</td>
<td>82</td>
<td>721</td>
<td>803</td>
</tr>
<tr>
<td>Total</td>
<td>142</td>
<td>1066</td>
<td>1208</td>
</tr>
</tbody>
</table>

χ² = 5.45  p = .023*

*Significant at the .05 level.

continuous predictors and a dichotomous outcome (Gillespie & Noble, 1992; Murdock, Nix-Mayer, & Tsuni, 1995; St. John, 1998). Logistic regression has been used in a number of studies on college persistence (Somers, 1996b) and the impact of financial aid (Somers & St. John, 1997). The goal of the procedure is “to find the best fitting and most parsimonious, yet... reasonable model to describe the

The approach in building the logistic regression model was to use a stepwise method in which variables are selected for inclusion or exclusion from the model in a sequential fashion based solely on statistical criteria. The technique for building the logistic regression equation was forward selection with a test for backward elimination. The statistical test employed to determine inclusion or exclusion was the Wald Statistic which has a chi-square distribution (SPSS, 1999). A crucial aspect of using stepwise logistic regression is the choice of an “alpha” level to judge the importance of variables. An alpha level for entry into the equation = 0.20 and an alpha level for removal from the equation = 0.25 will be utilized. Hosmer and Lemeshow (1989) provide guidance for the selection of alpha levels as: “...use of a more traditional level (such as 0.05) often fails to identify variables known to be important” (p. 86).

Univariate Analysis

Chapter 3 stressed the importance of assessing the intercorrelation of dependent variables. One of the weaknesses in the literature that examines financial aid and persistence is the over reliance on research designs that presuppose no underlying structure among variables selected for investigation. Many studies ignore the fact that many of the variables with the potential to influence persistence are intercorrelated (Fenske, 1993; Nehila, 1996; Park, 1994; Parro, 1997; Voorhees,
Table 19 demonstrates that several of the dependent variables in this study are intercorrelated. Hosmer and Lemeshow (1989) recommend a careful univariate analysis of each of the variables when dependent variables are intercorrelated, as they are in this study. "...the most desirable univariate analysis involves fitting a univariate logistic regression model to obtain the estimated coefficient, the estimated standard error, the likelihood ratio test for the significance of the coefficient, and the univariate Wald statistic" (p. 84). Upon completion of the univariate analyses, variables for inclusion in the multivariate analysis should be selected. Hosmer and Lemeshow (1989) state: "Any variable whose univariate test has a p-value < 0.25 should be considered as a candidate for the multivariate model..." (p. 86).

The results of the univariate analyses are shown in Table 26. Given the criterion listed above, the variables of GENDER, Cost of Attendance (COA), Total self help (TOTSELF) should be excluded from the multivariate analysis.

**Multivariate Analysis**

The results of the multivariate Analysis are shown in Table 27. Table 27 lists variables included in the equation. These include: ACT composite score (ACT), expected family contribution (EFC), total grants (TOTGRANTS), and unmet need (UNMET). The variables excluded from the model include: GENDER, RESIDENCY, financial need (NEED), outside grants (OUTGRANT), total...
Table 26

Univariate Logistic Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>.1400</td>
<td>.1291</td>
<td>1.1772</td>
<td>.2779</td>
</tr>
<tr>
<td>RESIDENCY</td>
<td>.4247</td>
<td>.1821</td>
<td>5.4420</td>
<td>.0197</td>
</tr>
<tr>
<td>ACT</td>
<td>.0586</td>
<td>.0167</td>
<td>12.2854</td>
<td>.0005</td>
</tr>
<tr>
<td>EFC</td>
<td>4.08E-05</td>
<td>1.32E-05</td>
<td>9.4689</td>
<td>.0021</td>
</tr>
<tr>
<td>COA</td>
<td>-1.9E-05</td>
<td>4.21E-05</td>
<td>.2032</td>
<td>.6521</td>
</tr>
<tr>
<td>NEED</td>
<td>-2.6E-05</td>
<td>9.59E-06</td>
<td>7.5826</td>
<td>.0059</td>
</tr>
<tr>
<td>OUTGRANTS</td>
<td>.0004</td>
<td>.0001</td>
<td>8.1333</td>
<td>.0043</td>
</tr>
<tr>
<td>INSTITGRANTS</td>
<td>.0002</td>
<td>4.372E-05</td>
<td>13.0893</td>
<td>.0003</td>
</tr>
<tr>
<td>TOTGRANTS</td>
<td>5.62E-05</td>
<td>2.632E-05</td>
<td>4.5574</td>
<td>.0328</td>
</tr>
<tr>
<td>TOTSELF</td>
<td>1.22E-05</td>
<td>2.189E-05</td>
<td>.3101</td>
<td>.5776</td>
</tr>
<tr>
<td>TOTAID</td>
<td>2.61E-05</td>
<td>1.560E-05</td>
<td>2.8066</td>
<td>.0939</td>
</tr>
<tr>
<td>OOP</td>
<td>-5.4E-05</td>
<td>1.374E-05</td>
<td>15.3440</td>
<td>.0001</td>
</tr>
<tr>
<td>UNMET</td>
<td>-5.9E-05</td>
<td>1.362E-05</td>
<td>18.7859</td>
<td>.0000</td>
</tr>
</tbody>
</table>

institutional aid (INSTITGRANTS), total self-help (TOTSELF), total aid (TOTAID) and total out-of-pocket costs (OOP).

Hosmer and Lemeshow (1989) stress the importance of consideration of interaction between the variables. "Once we have obtained a model that we feel
interaction between the variables. " Once we have obtained a model that we feel

Table 27
Results of Logistic Regression for Variables Included in the Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>p</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>.0375</td>
<td>.0176</td>
<td>4.549</td>
<td>.0329</td>
<td>.0407</td>
</tr>
<tr>
<td>EFC</td>
<td>7.02E-05</td>
<td>2.56E-05</td>
<td>7.541</td>
<td>.0060</td>
<td>.0600</td>
</tr>
<tr>
<td>TOTGRANTS</td>
<td>.0002</td>
<td>4.199E-05</td>
<td>15.248</td>
<td>.0001</td>
<td>.0927</td>
</tr>
<tr>
<td>UNMET</td>
<td>-3.2E-05</td>
<td>1.710E-05</td>
<td>3.957</td>
<td>.0579</td>
<td>-.0322</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.1619</td>
<td>.4405</td>
<td>6.957</td>
<td>.0083</td>
<td></td>
</tr>
</tbody>
</table>

contains the essential variables, we should look more closely at the variables in the model and consider the need for including interaction terms among the variables" (p. 88).

Included in the next logistic regression analysis was the inclusion of the six possible interaction terms which included: ACT by EFC, ACT by TOTGRANTS, ACT by UNMET, EFC by TOTGRANTS, EFC by UNMET, and TOTAL GRANTS by UNMET. Table 28 demonstrates that inclusion of the interaction terms improved the model (as measured by a reduction in the -2 Log Likelihood from 1498.731 in the first model to 1480.957 in the second). Variables excluded from the model include: ACT, EFC, INSTITGRANTS, TOTGRANTS, ACT by UNMET, EFC by
ACT by EFC, ACT by TOTGRANTS and EFC by UNMET.

Table 28
Results of Logistic Regression with Interaction Terms Included

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>p</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNMET</td>
<td>-.0001</td>
<td>2.846E-05</td>
<td>12.4038</td>
<td>.0004</td>
<td>-.0822</td>
</tr>
<tr>
<td>ACT by EFC</td>
<td>2.19E-06</td>
<td>8.809E-07</td>
<td>6.206</td>
<td>.0127</td>
<td>.0522</td>
</tr>
<tr>
<td>ACT by TOTGRANTS</td>
<td>6.47E-06</td>
<td>1.358E-06</td>
<td>22.7190</td>
<td>.0000</td>
<td>.1160</td>
</tr>
<tr>
<td>EFC by UNMET</td>
<td>5.35E-09</td>
<td>1.840E-09</td>
<td>8.4641</td>
<td>.0036</td>
<td>.0648</td>
</tr>
<tr>
<td>Constant</td>
<td>.0373</td>
<td>.2409</td>
<td>.0239</td>
<td>.8770</td>
<td></td>
</tr>
</tbody>
</table>

Goodness of Fit of the Model

This section will discuss methods for assessing the fit of the logistic regression model with the assumption that the model contains those variables (main effects as well as interactions) that should be in the model and that variables have been entered in the correct functional form. This step is designed to assess how effective the model is in describing the outcome variable PERSISTENCE. One way to determine how well the model fits is to compare the model's predictions to the observed outcomes. Table 29 contains the classification table. The table indicates
that 33 non-persisting students were correctly predicted to not return for their second year at the College. It incorrectly predicted 372 would persist.

Table 29
Classification Table

<table>
<thead>
<tr>
<th>Predicted</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-persister</td>
</tr>
<tr>
<td>Observed</td>
<td>Non-persister</td>
</tr>
<tr>
<td></td>
<td>Persister</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
</tr>
</tbody>
</table>

Twenty-one students were incorrectly predicted to not return. The model correctly predicted that 782 would be retained. Overall, 67.47% of the students were correctly predicted.

Another useful tool to assess goodness of fit is known as the likelihood. Since the likelihood is a small number less than 1, it is customary to use -2 times the log of the likelihood (-2 Log Likelihood) as a measure of how well the estimated model fits the data (SPSS, 1999). Smaller -2 Log Likelihood values are indicative of better fitting models (St. John, Andrieu, et al., 1994). The -2 Log Likelihood for the equation totals 1480.957, which is considered a large value (Hosmer & Lemeshow, 1989).

Two other statistics are valuable in assessing the fit of the logistic model.
They are the Cox and Snell $R^2$ and the Nagelkerke $R^2$. These are tools which attempt to quantify the proportion of explained "variance" in the regression model (SPSS, 1999). The Cox and Snell $R^2$ value equaled .049 meaning that about 5% of the "variance" in the outcome variable is explained by the logistic regression model. The Nagelkerke $R^2$ value of .067 indicated that 6.7% of the variance in the outcome variable is explained by the logistic regression model.

The last test for the goodness of fit that was used is the Hosmer and Lemeshow test (Hosmer & Lemeshow, 1989). It is a commonly used test for the goodness of fit of the observed and predicted number of events. The test divides the cases into 10 approximately equal groups based on the estimated probability of the event occurring and assesses how the observed and expected numbers of events and non-events compare. The chi-square test is used to assess the difference between the observed and expected number of events (SPSS, 1999). The value of the Hosmer-Lemeshow goodness-of-fit statistic computed equaled 13.66, and the corresponding p value computed from the chi-square distribution with 8 degrees of freedom is .0911. This indicates that model fit is poor (Hosmer & Lemeshow, 1989).

Financial Aid Variable Ratios

As stated earlier, the goal of logistic regression is "to find the best fitting and most parsimonious, yet... reasonable model to describe the relationship between an outcome variable and a set of independent variables" (Hosmer & Lemeshow, 1989, p. 1). The work above resulted in a model of poor fit explaining less than 7% of the
variance in the outcome variable. An exploration of financial aid variables ratios will be employed to determine if these variables increase the fit of the logistic regression model. Table 30 below describes the financial aid variables to be tested.

Table 30
Financial Aid Variable Ratios

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEED TO COA</td>
<td>Financial Need to Cost of Attendance</td>
</tr>
<tr>
<td>TOTGRANTS TO COA</td>
<td>Total Grants to Cost of Attendance</td>
</tr>
<tr>
<td>TOTSELF TO COA</td>
<td>Total Self-Help to Cost of Attendance</td>
</tr>
<tr>
<td>TOTAID TO COA</td>
<td>Total Aid to Cost of Attendance</td>
</tr>
<tr>
<td>UNMET TO COA</td>
<td>Unmet Need to Cost of Attendance</td>
</tr>
<tr>
<td>OOP TO COA</td>
<td>Out of Pocket to Cost of Attendance</td>
</tr>
<tr>
<td>NEED TO TOTAID</td>
<td>Need to Total Aid</td>
</tr>
<tr>
<td>TOTSELF TO TOTAID</td>
<td>Total Self-Help to Total Aid</td>
</tr>
<tr>
<td>OOP TO TOTAL AID</td>
<td>Out of Pocket to Total Aid</td>
</tr>
</tbody>
</table>
Table 30 - Continued

<table>
<thead>
<tr>
<th>Financial Aid Variable Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>TOTSELF</td>
</tr>
<tr>
<td>TO NEED</td>
</tr>
<tr>
<td>TOTAID</td>
</tr>
<tr>
<td>TO NEED</td>
</tr>
<tr>
<td>UNMET</td>
</tr>
<tr>
<td>TO NEED</td>
</tr>
<tr>
<td>OPP TO</td>
</tr>
<tr>
<td>NEED</td>
</tr>
</tbody>
</table>

**Independent - Samples t-test of Financial Aid Variable Ratios**

The independent-samples t-test procedure compares means for two groups of cases. The first step explores the relationship of PERSISTENCE, a dichotomous variable, with the financial aid variable ratios. Table 31 shows the result of the analysis. Significant differences between the NON-PERSISTER and PERSISTERS were found. NON-PERSISTERs had a higher mean need to cost of attendance ratio (NEED TO COA) than the PERSISTERS. The NON-PERSISTERs showed a lower ratio of total grants to cost of attendance (TOTGRANTS TO COA), a lower ratio of total aid to cost of attendance (TOTAID TO COA). The mean of the PERSISTERs group differed from the mean of the NON-PERSISTER group demonstrating lower
Table 31

*t-Test Values for Grouping Variable PERSISTENCE*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEED TO COA</td>
<td>N</td>
<td>405</td>
<td>.6776</td>
<td>.3817</td>
<td>2.731</td>
<td>1206</td>
<td>.006*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.5866</td>
<td>.6129</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT-GRANTS TO COA</td>
<td>N</td>
<td>405</td>
<td>.2688</td>
<td>.1364</td>
<td>-2.188</td>
<td>1206</td>
<td>.029*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.2882</td>
<td>.1500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT-SELF TO COA</td>
<td>N</td>
<td>405</td>
<td>.2267</td>
<td>.1634</td>
<td>-.680</td>
<td>1206</td>
<td>.497</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.2339</td>
<td>.1789</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT-AID TO COA</td>
<td>N</td>
<td>405</td>
<td>.4439</td>
<td>.2183</td>
<td>-2.336</td>
<td>1206</td>
<td>.020*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.4764</td>
<td>.2336</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNMET TO COA</td>
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<td>.1821</td>
<td>.3183</td>
<td>4.053</td>
<td>1206</td>
<td>.000**</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.0645</td>
<td>.5382</td>
<td></td>
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<tr>
<td>OOP TO COA</td>
<td>N</td>
<td>405</td>
<td>.4088</td>
<td>.3122</td>
<td>3.708</td>
<td>1206</td>
<td>.000**</td>
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<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.2984</td>
<td>.5564</td>
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<td></td>
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</tr>
<tr>
<td>NEET TO TOTAID</td>
<td>N</td>
<td>405</td>
<td>1.6934</td>
<td>4.1631</td>
<td>2.237</td>
<td>1206</td>
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<td>10.0826</td>
<td></td>
<td></td>
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<tr>
<td>TOT-GRANTS TO TOTAID</td>
<td>N</td>
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<td>.5835</td>
<td>.2356</td>
<td>-.208</td>
<td>1206</td>
<td>.835</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.5865</td>
<td>.2332</td>
<td></td>
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</table>
Table 31 - Continued

$t$-Test Values for Grouping Variable  PERSISTENCE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping Variable</th>
<th>No. of Cases</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>df</th>
<th>2-tail Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTSELF TO TOTAIL</td>
<td>N</td>
<td>405</td>
<td>.4165</td>
<td>.2356</td>
<td>.2084</td>
<td>1206</td>
<td>.835</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.4135</td>
<td>.2332</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OOP TO TOTAIL</td>
<td>N</td>
<td>405</td>
<td>1.1099</td>
<td>4.1355</td>
<td>2.238</td>
<td>1206</td>
<td>.025*</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>-.0076</td>
<td>10.1102</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTSELF TO NEED</td>
<td>N</td>
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<td>.2797</td>
<td>.6686</td>
<td>-1.531</td>
<td>1206</td>
<td>.126</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.3834</td>
<td>1.2770</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAIL TO NEED</td>
<td>N</td>
<td>405</td>
<td>.6685</td>
<td>1.2338</td>
<td>-1.048</td>
<td>1206</td>
<td>.295</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.7976</td>
<td>2.3185</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNMET TO NEED</td>
<td>N</td>
<td>405</td>
<td>.3315</td>
<td>1.2338</td>
<td>1.048</td>
<td>1206</td>
<td>.295</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.2024</td>
<td>2.3185</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OOP TO NEED</td>
<td>N</td>
<td>405</td>
<td>.6112</td>
<td>.9603</td>
<td>.320</td>
<td>1206</td>
<td>.749</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>803</td>
<td>.5858</td>
<td>1.4437</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: N indicates NON-PERSISTER. P indicates PERSISTER.

*Significant at the .05 level.
** Significant at the .001 level

ratios of unmet need to cost of attendance (UNMET TO COA), out of pocket to cost of attendance (OOP TO COA) and need to total aid (NEED TO TOTALAID).
**Logistic Regression - Univariate Analysis**

An univariate analysis was conducted to identify variables for inclusion in the multivariate analysis as recommended by Hosmer and Lemeshow (1989) and demonstrated earlier. Financial Aid variable ratios whose univariate test has a $p$-value $< 0.25$ were considered as a candidate for the multivariate model along with the variables selected earlier for inclusion in the first multivariate model. The results of the univariate analysis are shown in Table 32. Those financial aid variable ratios that will be included in the multivariate analysis include: need to cost of attendance (NEED TO COA), total grants to cost of attendance (TOTGRANTS TO COA), total aid to cost of attendance (TOTAID TO COA), unmet need to cost of attendance (UNMET TO COA), out of pocket to cost of attendance (OOP TO COA), need to total aid (NEED TO TOTAID), out of pocket to total aid (OOP TO TOTALAID), and total self help to need (TOTSELF TO NEED).

**Multivariate Analysis**

Table 28 showed the variables included in the previous regression model which resulted in a $-2 \text{ Log Likelihood}$ of 1498.731. The variables included in this model were unmet need (UNMET) and the interaction terms ACT by EFC, ACT by TOTALGRANTS, and EFC by UNMET. This combination of variables resulted in the best fitting model. It is now time to investigate whether the addition of the financial aid variable ratios, that were chosen as a result of the univariate analysis, improve the fit of the model.
Table 32

Univariate Logistic Regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEED TO COA</td>
<td>-.4189</td>
<td>.1547</td>
<td>7.3268</td>
<td>.0068*</td>
</tr>
<tr>
<td>TOT-GRANTS TO COA</td>
<td>.9200</td>
<td>.4218</td>
<td>4.7577</td>
<td>.0292*</td>
</tr>
<tr>
<td>TOT-SELF TO COA</td>
<td>.2404</td>
<td>.3534</td>
<td>.4627</td>
<td>.4963</td>
</tr>
<tr>
<td>TOTAID TO COA</td>
<td>.6425</td>
<td>.2683</td>
<td>5.4194</td>
<td>.199*</td>
</tr>
<tr>
<td>UNMET TO COA</td>
<td>-.9535</td>
<td>.2190</td>
<td>18.9475</td>
<td>.0000*</td>
</tr>
<tr>
<td>OOP TO COA</td>
<td>-.8606</td>
<td>.2217</td>
<td>15.0714</td>
<td>.0001*</td>
</tr>
<tr>
<td>NEET TO TOTAID</td>
<td>-.0972</td>
<td>.0332</td>
<td>8.5969</td>
<td>.0034*</td>
</tr>
<tr>
<td>TOTGRANTS TO TOTAID</td>
<td>.0050</td>
<td>.2638</td>
<td>.0435</td>
<td>.8347</td>
</tr>
<tr>
<td>TOTSELF TO TOTAID</td>
<td>-.0530</td>
<td>.2638</td>
<td>.0435</td>
<td>.8347</td>
</tr>
<tr>
<td>OOP TO TOTAID</td>
<td>-.0987</td>
<td>.0337</td>
<td>8.5558</td>
<td>.0034*</td>
</tr>
<tr>
<td>TOTSELF TO NEED</td>
<td>.0996</td>
<td>.0690</td>
<td>2.0865</td>
<td>.1486*</td>
</tr>
<tr>
<td>TOTAL AID TO NEED</td>
<td>.0349</td>
<td>.0339</td>
<td>1.0581</td>
<td>.3037</td>
</tr>
<tr>
<td>UNMET TO NEED</td>
<td>-.0349</td>
<td>.0039</td>
<td>1.0581</td>
<td>.3037</td>
</tr>
<tr>
<td>OPP TO NEED</td>
<td>-.0155</td>
<td>.0487</td>
<td>.1018</td>
<td>.7497</td>
</tr>
</tbody>
</table>

*Variables to be included in multivariate analysis.
A multivariate logistic regression analysis was conducted using only those financial aid variable ratios chosen above. The resulting $-2 \text{ Log Likelihood}$ of 1459.224 showed an improvement over the model above. Smaller $-2 \text{ Log Likelihood}$ values are indicative of better fitting models (St. John, Andrieu, et al., 1994). The financial aid variable ratios were then combined with the variable UNMET as well as the three interaction terms. The resulting $-2 \text{ Log Likelihood}$ of 1439.962 resulted in further improvement over the initial model. Table 33 lists the variables in this logistic regression equation.

**Goodness of Fit of the Model**

This section discusses methods for assessing the fit of the final regression model with the assumption that the model contains those variables (main effects as well as interactions) that should be in the model and that variables have been entered in the correct functional form. This step is designed to assess how effective the model is in describing the outcome variable PERSISTENCE. One way to determine how well the model fits is to compare the model's predictions to the observed outcomes. Table 34 contains the classification table. The table indicates that 37 non-persisting students were correctly predicted to not return for their second year at the Midwestern Liberal Arts college. It incorrectly predicted 358 would persist. Twenty-eight students were incorrectly predicted to not return. The model correctly predicted that 758 would be retained. Overall, 67.32% of the students were correctly predicted.
Table 33

Multivariate Logistic Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEED TO COA</td>
<td>-2.9813</td>
<td>1.6669</td>
<td>3.1989</td>
<td>.0737</td>
</tr>
<tr>
<td>TOTGRANTS TO COA</td>
<td>1.7797</td>
<td>1.7567</td>
<td>1.0263</td>
<td>.3110</td>
</tr>
<tr>
<td>TOTAID TO COA</td>
<td>2.0770</td>
<td>1.4690</td>
<td>1.9991</td>
<td>.1574</td>
</tr>
<tr>
<td>UNMET TO COA</td>
<td>5.9462</td>
<td>2.8850</td>
<td>4.2481</td>
<td>.0393</td>
</tr>
<tr>
<td>NEET TO TOTAID</td>
<td>-.6667</td>
<td>.5172</td>
<td>1.6616</td>
<td>.1974</td>
</tr>
<tr>
<td>OOP TO TOTAID</td>
<td>.6353</td>
<td>.5157</td>
<td>1.5175</td>
<td>.2180</td>
</tr>
<tr>
<td>TOTSELF TO NEED</td>
<td>.0716</td>
<td>.0714</td>
<td>1.0060</td>
<td>.3159</td>
</tr>
<tr>
<td>UNMET NEED</td>
<td>-.0003</td>
<td>.0002</td>
<td>3.6840</td>
<td>.0549</td>
</tr>
<tr>
<td>ACT BY EFC</td>
<td>1.84E-06</td>
<td>1.88E-06</td>
<td>.9472</td>
<td>.3304</td>
</tr>
<tr>
<td>ACT BY TOTGRANTS</td>
<td>5.64E-06</td>
<td>3.22E-06</td>
<td>3.0561</td>
<td>.0804</td>
</tr>
<tr>
<td>EFC BY UNMET</td>
<td>6.86E-09</td>
<td>3.07E-09</td>
<td>4.9986</td>
<td>.0254</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>.6287</td>
<td>.6846</td>
<td>.8433</td>
<td>.3585</td>
</tr>
</tbody>
</table>
Although this model seemed a better fit as determined by a reduction in the -2 Log Likelihood, the earlier model resulted in a higher percentage of correct predictions at 67.47%.

As was discussed above, two other statistics are valuable in assessing the fit of the logistic model. They are the Cox and Snell R$^2$ and the Nagelkerke R$^2$. These are tools which quantify the proportion of explained "variance" in the regression model (SPSS, 1999). The Cox and Snell R$^2$ value equaled .054 meaning that about 5% of the "variance" in the outcome variable is explained by the logistic regression model. This value showed this model to be a better fit than the former which had a Cox and Snell R$^2$ value of 0.49. The Nagelkerke R$^2$ value of .075 indicates that 7.5% of the variance in the outcome variable is explained by the logistic regression model. This again is evidence of the better fit of the second model since the first model has a Nagelkerke R$^2$ value of .067.

The last test for the goodness of fit that was used is the Hosmer and Lemeshow test (Hosmer & Lemeshow, 1989). As discussed earlier, it is a commonly
used test for the goodness of fit of the observed and predicted number of events. The test divides the cases into 10 approximately equal groups based on the estimated probability of the event occurring and assesses how the observed and expected numbers of events and non-events compare. The chi-square test is used to assess the difference between the observed and expected number of events (SPSS, 1999). The value of the Hosmer-Lemeshow goodness-of-fit statistic equaled 9.1251, and the corresponding p value computed from the chi-square distribution with 8 degrees of freedom is .3319. These values indicate a poor model fit (Hosmer & Lemeshow, 1989).

Chapter 5 will provide a discussion of these results.
CHAPTER V

SUMMARY, CONCLUSIONS, AND DISCUSSION

Introduction

This chapter begins by providing an overview of the problem researched in this study, the source of data, and research methods used. Salient findings will be reviewed, and conclusions will be drawn based on the findings. Finally, implications for practical application of the findings and conclusions are identified, and recommendations for further research will be suggested.

A Summary of the Study

College student persistence has been one of the most important topics discussed in higher education over the last 25 years. The consequences of student attrition from our colleges and universities are immense for the individual student and institutions alike. Pike, Schroeder and Berry (1997) summarize the cost to the individual student: "If students do not persist, opportunities for learning and development are foreclosed, graduation is impossible, and success in later life is diminished" (p. 609). Colleges and universities have become acutely aware of the economic impact of attrition on their campuses. Although the enrollment of non-traditional students has softened the blow of a decreasing pool of high school seniors.
during the 1980's and 1990's, many institutions experienced enrollment reductions and made student retention a priority.

In addition to retention, institutions of higher education are particularly interested in the impact of their financial aid programs. Outlays for institutional financial aid have become an expanding portion of the budgets of both public and private institutions. Over the last two decades, tuition increased more rapidly than inflation or family income (Mulugetta, Saleh, & Mulugetta, 1997). At the same time, growth in federal and state aid slowed, causing colleges and universities to make up the difference with institutional dollars. It is critical for colleges and universities to understand the relationship between persistence and financial aid.

As stated in Chapter 1, this study is intended to study the relationship of financial aid and freshman persistence at the Midwestern Liberal Arts college. The study addresses two key research questions:

1. What is the relationship between financial aid and freshman year-to-year persistence at the Midwestern Liberal Arts college?

   a. Is there evidence that any of the financial aid variables in the study relate to freshman persistence? If so, which of the variables demonstrate a relationship to freshman persistence and what is the nature of that relationship?

   b. Are the variables of gender, residency, and ACT composite score intercorrelated with any of the financial aid variables? If so, what relationship do these variables have on freshman persistence?
Can a model be developed to predict freshman persistence at the Midwestern Liberal Arts college using the variables in this study?

An extensive review of the research literature was conducted in preparation for this study in Chapter 2. The review of the literature supported the need for the proposed study. An overview of undergraduate financial aid presented the history and development of financial aid, the purpose of financial aid, and the process of awarding financial aid. The importance of financial aid to the nation's students and postsecondary institutions was established. Despite the important role of financial aid, the implications of shifting financial aid policies have received little empirical study. This is particularly important given the significant shifts in policy brought on by the 1992 Reauthorization of the Higher Education Act. One of the stated purposes of financial aid is to promote student persistence. The need for empirical research to assess whether aid is accomplishing this important purpose is critical.

The overview of persistence research provided in the literature review also supported the need for the proposed study. Despite the abundant amount of literature on the topic and numerous interventions on college campuses, student retention rates have remained constant over the last few decades. Gaining an understanding of the retention of undergraduates is difficult due to the complex mixture of factors involved.

One of the factors receiving attention is the relationship of financial aid and student persistence. The literature review highlighted the difficulties of inquiry into this relationship. Researchers disagree about the impact of student financial aid on
persistence. Results are mixed and often contradictory. This can be attributed to the profound differences in postsecondary institutions and lack of a consistent research design. Much of the research is dated. The amount and types of financial aid available to students changes with each reauthorization of the Higher Education Act which makes the need for updated research significant.

Far too many institutions base financial aid policy on intuition and have little evidence of the impact of these policies. There is a need for a commitment to ongoing research regarding the relationship between financial aid and student persistence so that institutions might make optimal decisions regarding the distribution of aid.

The literature cautions us against making generalizations about the relationship of financial aid and persistence across institutions. This is not the intent of the study. The intent of the study is to inform College administrators so that policies may be developed which enhance freshman persistence. This does not mean that the study does not have meaning for administrators from other institutions. The study emphasizes the importance of research investigating the relationship of financial aid and freshman persistence and will provides a model for how that research might be conducted at other institutions.

Chapter 3 outlined proposed methodology, including a description of the institutional setting and subjects, definitions of dependent and independent variables, and concluded with a description of data analysis procedures.

Chapter 4 presented the findings of the study beginning with descriptive data...
providing analysis of the subjects of the study as well as the dependent and
independent variables. The next section of the chapter provided an analysis of the
relationship between variables. The last section explored logistic regression
modeling to predict freshman persistence based on the variables included in the study.

Findings

Descriptive Analysis

As stated in Chapter 1, this study did not attempt to make generalizations
about the relationship of financial aid and persistence across institutions. The
literature cautions us against making such generalizations (Gillespie & Noble, 1992;
Hossler, 1984; Kang, 1993; Tinto, 1993). McGrath and Braunstein (1997) state:

A partial review of the literature indicated that the causes of attrition vary, and
the strategies designed to reduce it produce different results at institutions....
Consequently, colleges may want to conduct more of their own research
because institutional data should allow administrators and faculty to develop a
better understanding of the problem within the culture of their own
organization. In this way, the data can be useful to design a comprehensive
retention plan with appropriate interventions. (p. 396)

This study, therefore, is not designed to provide an answer to the question of the
relationship of financial aid upon persistence at all institutions, but attempts to
demonstrate how researchers might approach the issue at their own institutions. The
caution against making such generalizations is particularly appropriate in this study. Descriptive analysis demonstrates that the Midwestern Liberal Arts College is a unique institution and experienced significant change during the time frame of the study.

This Midwestern Liberal Arts college experienced rapid enrollment growth from 1994 to 1998 at a rate exceeding that of like institutions and higher education as a whole (Chronicle of Higher Education, 2000). Despite this enrollment growth, the institution falls behind other private, not-for-profit institutions in its freshman persistence rate (69.5% vs 87.3%) (Horn & Carroll, 1998). It also falls behind in national rates for all institutions (69.4% vs 71.1 for the 1998 cohort) (American College Testing Program, 1998). The College has a higher percentage of females (Kojaku & Nunez, 1998) and a higher percentage of freshmen who live on campus (88.2% in 1998) (Kojaku & Nunez, 1998). The College's freshmen have higher mean ACT composite scores than the national average (22.5 vs. 21.0 in 1998) (ACT, 1998).

In terms of pricing, the College's cost of attendance is well below the average of private, four-year institutions (College Entrance Examination Board, 1998a), although it has increased its cost of attendance at a higher rate than the national average over the period of the study. The average price of tuition and fees at private four-year institutions from 1994 to 1998 increased by 26% (College Entrance Examination Board, 1998a) while the College's increased by 46% (Cornerstone, 2000).
Despite the College's aggressive price increases, the average freshman's out of pocket costs (the portion of the cost of attendance that is the responsibility of the family to bear) have remained almost constant from 1994 to 1998. The mean out of pocket costs for the 1994 cohort totaled $5,218 while that figure totaled $5,296 for the 1998 cohort (see Table 18). Average basic demonstrated need also remained constant. The mean basic demonstrated need (NEED) for the 1994 cohort totaled $9,351 while the figure for the 1998 cohort totaled $9,773 (see Table 11). Average unmet need actually fell from a high of $2,073 for the 1994 cohort, to $1,614 for the 1998 cohort (See Table 17).

An increase in average expected family contribution (EFC) provides an explanation as to why out of pocket costs and basic demonstrated need have remained relatively constant despite aggressive tuition increases by the College. Expected family contribution is the amount of dollars a student and family are expected to contribute toward college costs, including a percentage of income and assets, all outside scholarship support, and any non-taxable income (Linseiy, 1997). At Cornerstone, this figure rose dramatically for the average family from 1994 to 1998. The 1994 cohort's mean expected family income totaled $3,848 while the 1998 cohort's figure totaled $6,364 representing a 65% increase over the five year period. Cornerstone College was attracting students better prepared to meet the rising tuition costs. The 65% increase in expected family contribution compares to an overall 22% increase in median family income nationwide during the same period (College Entrance Examination Board, 1998b).
As the College's cost of attendance increased, the average family's ability to pay (a combination of total aid and expected family contribution) kept pace with the rate of increase ranging 15% to 17% below the cost of attendance over the five year period.

![Graph showing the relationship between cost of attendance and ability to pay over five years.]

Figure 1. Relationship of Cost of Attendance and Ability to Pay

Research Question 1

The first research question to be addressed investigates the relationship of financial aid to freshman year-to-year persistence at this College.
Is there evidence that any of the financial aid variables in the study relate to freshman persistence? If so, which of the variables demonstrate a relationship to freshman persistence and what is the nature of that relationship?

The independent-samples t-test procedure was employed to compare means of the financial aid variables for the grouping variable PERSISTENCE. Means for each of the financial aid variables were computed for both PERSISTERS and NON-PERSISTERS (see Table 23). A significant difference (p<.005) between the means was found between these groups for EFC (expected family contribution). The mean for PERSISTERS totaled $5,595 while the mean for NON-PERSISTERS totaled $4,688. Freshman students with greater resources to pay for college, including income, assets, and outside scholarship support, were more likely to return for their second year at the College.

A significant difference between the PERSISTERS and NON-PERSISTERS was also found in the mean amount of basic demonstrated need (NEED). Basic demonstrated need is calculated by subtracting expected family contribution (EFC) from the cost of attendance (COA). The mean for PERSISTERS totaled $9,261 while the mean for NON-PERSISTERS totaled $10,789. This significant difference (p<.007) between the means demonstrates that the lower the NEED, the more likely a student is to persist.

There was also a significant difference (p<.001) between the means in the amount of institutional grant (INSTITGRANT). PERSISTERS had mean
institutional grants of $2,101 while the NON-PERSISTERS had mean institutional grants of $1,771.

Unmet Need (UNMET) is calculated by subtracting need from total aid. There is a significant difference between the means (p<.041) here also. NON-PERSISTERS had an average unmet need of $2,869 while the PERSISTERS had an average unmet need of $967. This represents a difference of $1,902, nearly 11% of the total cost of attendance for the 1998 cohort.

Out of Pocket (OOP) costs are calculated by subtracting total grants (TOTGRANT) from the cost of attendance (COA). This is the total of all financial resources the student and/or family put toward a college education. It not only includes cash payments, but educational loans and earned college work-study funds. There was a significant difference (p<.004) between the means of the PERSISTERS and NON-PERSISTERS. The mean out of pocket expense for the NON-PERSISTERS was $6,515 while the mean for the PERSISTERS totaled $4,682.

This leads us to conclusions relating to the second part of the first research question: Are the variables of gender, residency, and ACT composite score intercorrelated with any of the financial aid variables? If so, what relationship do these variables have on freshman persistence?

The independent-samples t-test procedure was employed to determine if there were significant differences between females and males across the financial aid variables. The results (see Table 22) demonstrated no significant differences in means for any of the variables. The results of a Chi-Square test were employed to
explore the relationship of the dichotomous independent variables GENDER and PERSISTENCE. The analysis showed no significant relationship between the variables.

The impact of institutional grants on freshman persistence is difficult to determine since there is a high correlation (.307, significant at the .01 level) between ACT composite scores and the amount of institutional grant. The higher the ACT composite score, the higher the institutional grant. There is a significant difference in the ACT composite score means between the PERSISTERS and NON-PERSISTERS (p<.003). The PERSISTERS had a mean composite ACT score of 22.5 while the NON-PERSISTERS had a mean composite ACT score of 21.7. It is difficult to determine the individual impact of these highly correlated variables.

It is interesting to note the role of campus residency in the study. A Pearson Chi-Square test was employed to explore the relationship between PERSISTENCE and RESIDENCY. It was found that resident students were more likely to persist than commuter students (see Table 25). When an independent-samples t-test procedure was employed with residency as a grouping variable, there were significant differences between means for commuters and residents across several financial aid variables (see Table 21). Resident students demonstrated higher mean institutional grants (INSTITGRANT), total grants (TOTGRANT), total aid (TOTAID) and self-help (TOTSELF). Resident students also enjoyed lower mean unmet need (UNMET) and out of pocket expenses (OOP). Obviously, resident students were given stronger financial aid packages than those of commuters. There
was no significant difference between the means in basic demonstrated need for these
groups.

In summary, there does appear to be a relationship between several of the
financial aid variables and freshman persistence. The nature and strength of the
relationship is difficult to determine due to high correlation between the financial aid
variables. In addition, prior academic achievement, as measured by the composite
ACT score, has a strong relationship to institutional grants and both have a strong
relationship to persistence. It is difficult to determine impact each of these variables
have on persistence. The literature indicates that both can have a positive impact
upon persistence.

Residency has an interesting role to play in this study. The literature provides
evidence that campus residency has a positive impact on persistence (Tinto, 1993).
This Midwestern Liberal Arts college provides stronger financial aid to residence
students and there is evidence that residence students persist at a higher rate than do
commuting students. It is unclear whether it is the residency, the enhanced aid or
both which contribute to enhanced persistence.

Research Question 2

Question 2 involves the use of logistic regression. As described in Chapter 3,
logistic regression permits exploration of the relationship between multiple
categorical and continuous predictors and a dichotomous outcome. Logistic
regression has been used in a number of studies on college persistence (Somers,
1996b) and the impact of financial aid (Somers & St. John, 1997). The goal of the procedure is "to find the best fitting and most parsimonious, yet... reasonable model to describe the relationship between an outcome variable and a set of independent variables" (Hosmer & Lemeshow, 1989, p. 1). The second research question to be addressed is: Can a model be developed to predict freshman persistence at the Midwestern Liberal Arts college using the variables in this study?

The process began with a univariate analysis as recommended by Hosmer and Lemeshow (1989). This is an important process when independent variables with the potential to influence persistence are intercorrelated as in this study. The result of the univariate analysis resulted in the exclusion of GENDER, cost of attendance (COA), and total self-help (TOTSELF) from the multivariate analysis. The variables included in the equation included ACT composite score, expected family contribution (EFC), total grants (TOTGRANT), and unmet need (UNMET). Consideration was then given to potential interaction among the variables. Six interaction terms were included in the analysis along with those that survived the first multivariate analysis. The inclusion of the interaction terms improved the model as measured by a reduction in the -2 Log Likelihood. The variables included in the equation (see Table 28) were unmet need (UNMET), and three interaction terms: ACT composite score by expected family contribution (EFC), ACT composite score by total grants (TOTGRANT) and expected family contribution (EFC) by unmet need (UNMET).

The goodness of fit of the model was then assessed. This step was designed to assess how effective the model is in describing the dependent variable.
PERSISTENCE. The model did not prove to be a well fitting model. Overall, the model correctly predicted the persistence status of just 67.47% of the cases. Further, the resulting $-2 \log \text{Likelihood}$ of 1480.957, considered a large value did not indicate a good fit.

Two other statistics were employed to assess the fit. These are the Cox and Snell $R^2$ and the Nagelkerke $R^2$. The Cox and Snell $R^2$ value equaled .049 meaning that about 5% of the "variance" in the outcome variable is explained by the logistic regression model. The Nagelkerke $R^2$ value of .067 indicated that 6.7% of the variance in the outcome variable is explained by the logistic regression model.

The last test for the goodness of fit that was used was the Hosmer and Lemeshow test (Hosmer & Lemeshow, 1989). It is a commonly used test for the goodness of fit of the observed and predicted number of events. The test divides the cases into 10 approximately equal groups based on the estimated probability of the event occurring and assesses how the observed and expected numbers of events and non-events compare. The chi-square test is used to assess the difference between the observed and expected number of events (SPSS, 1999). The value of the Hosmer-Lemeshow goodness-of-fit statistic computed equaled 13.66, and the corresponding $p$ value computed from the chi-square distribution with 8 degrees of freedom equaled .0911. This indicates that model fit is poor (Hosmer & Lemeshow, 1989).

The resulting model proved a poor predictor of freshman persistence. An exploration of financial aid variables ratios was then employed to determine if these variables increase the fit of the logistic regression model. Fifteen financial aid
variables were developed and tested in the process described above. Seven of the financial aid variable ratios were combined with the variables from the initial logistic regression equation.

The resulting model did not prove to be a significant improvement. Although this model seemed a better fit as determined by a reduction in the \(-2\) Log Likelihood, the earlier model resulted in a higher percentage of correct predictions at 67.47%. The Cox and Snell R\(^2\) value equaled \(.054\) meaning that about 5\% of the "variance" in the outcome variable is explained by the logistic regression model. This value showed this model to be a better fit than the former which had a Cox and Snell R\(^2\) value of 0.49. The Nagelkerke R\(^2\) value of \(.075\) indicates that 7.5\% of the variance in the outcome variable is explained by the logistic regression model. This again is evidence of the better fit of the second model since the first model has a Nagelkerke R\(^2\) value of \(.067\). The value of the Hosmer-Lemeshow goodness-of-fit statistic equaled 9.1251, and the corresponding \(p\) value computed from the chi-square distribution with 8 degrees of freedom is \(.3319\). These values indicate a poor model fit (Hosmer & Lemeshow, 1989).

This work provided an answer to research question 2. A model could not be developed to predict freshman persistence at the Midwestern Liberal Arts college using the variables in this study.

**Discussion**

This study provided evidence that financial aid does have an effect on
persistence. The negative influence of low expected family contribution resulting in higher need, unmet need and out of pocket expenses is troubling. This means that the receipt of financial aid alone is not adequate to overcome the effects of a low family income on persistence. Every effort should be made by the College to insure that financial barriers to persistence are removed.

One of the consequences of The 1992 Reauthorization of the Higher Education Act was to greatly expand aggregate student need. Colleges and universities could not meet the increased demand for aid particularly with the Federal Government's shift from an emphasis on grants to loans. Gladieux and Hauptman (1995) provide insight on the impact of this policy shift:

The changes in need analysis enacted in 1992 have produced another expansion in middle-income eligibility, inflating officially recognized need by several billion dollars. But with no corresponding increase in available dollars. The probable effect is that scarce dollars have shifted up the income scale, at the expense of more disadvantaged students and families. (p. 25)

As a result, institutions began to "leverage" financial aid. Institutional financial aid was no longer primarily aimed at meeting student need, but aimed at other institutional priorities.

...there is little agreement about how best to allocate shrinking funds; this creates tension among the different segments of the cost, contribution, need and packaging continuum. Institutions search for the best way to set the appropriate cost of education, determine the fairest and most equitable
calculation of student contribution and financial need, and find the optimum
use of the various types of aid to support the student. (Linsley, 1997, p. 13)

One of the consequences of these shifts was to target aid toward academically
stronger students. When available institutional aid is directed to academically
stronger students, it is misused if the goal is to improve the likelihood that all students
will graduate. If aid is used in this way, it directs scarce resources to students who
already have a higher likelihood of graduation (Tinto, 1993), and away from students
who have their already lower likelihood of graduation because of weak academic
background compounded by the lower likelihood resulting from higher unmet need.
The College may actually be losing potential revenue by shifting institutional aid to
high achieving students. The study showed a significant, positive correlation between
ACT composite score and expected family contribution. Providing excess aid (aid
greater than need) to high achieving students may bring higher prestige to the
institution, but it does impact revenue based on higher attrition rates.

The College may not only be neglecting lower achieving students in its aid
policies, but may also be neglecting the commuting student. Although no significant
difference was found between commuters and residents in expected family
contribution (EFC) or basic demonstrated need (NEED), resident students enjoyed
larger aid financial aid packages than did commuting students. The College
obviously provides preference to resident students. Perhaps this is an effort to
enhance room and board revenue. The College may be losing revenue from
commuting students due to this policy. Although there is evidence that resident
students tend to have higher rates of persistence than do commuters (Tinto, 1993). There is a need to investigate this issue further.

This research failed to demonstrate that a predictive model of freshman persistence could be developed using the variables in this study. It is assumed that factors other than financial aid are at work in the student's decision to leave the college or retain. The study lacked comprehensive data to critically assess the major theoretical model of attrition. These data, however, could easily be included in a comprehensive review of institutional retention that includes social, environmental, and academic variables. This study has made the case for the inclusion of financial aid variables.

In light of the findings presented in this study, the success of institutional strategies to increase the persistence of students depends in no small way on the involvement of the financial aid professional. Financial aid administrators are becoming much more involved in institutional planning, budget-making, and decision making processes. The need to better understand the financial and personal characteristics of student aid recipients and the effects of their enrollments on the financial health of their institutions is putting aid issues more frequently on planning agendas (Davis, 1997b). Many financial aid administrators have been reluctant to provide research-based information to institutional decision makers (Kurtz, 1995). Financial aid administrators can play an important role in stimulating new institutional studies. Their expertise is important to the design and interpretation of institutional studies. While it may be true that many financial aid administrators are
not trained in research methodologies, there are usually faculty members, institutional researchers, or graduate students with whom they can collaborate to conduct such studies.

Recommendations for Further Research

This study demonstrates the need for institutions to study how students respond to financial aid awards. Institutions can refine their enrollment and budget-planning processes so that the impact of institutional financial aid can be addressed. Private colleges that invest substantial institutional funds in aid should carefully examine the impact of these funds and how they can be better used to promote persistence. Hopefully this study will provide a starting point for this Midwestern Liberal Arts college to do such research and perhaps provide a model for other institutions.

This study was limited in that it investigated freshman first-to-second year persistence only. A longitudinal study tracking freshman cohorts for eight or more semesters would be interesting and important. It is possible that the impact changes over time particularly since upperclassmen are eligible for higher educational loans than are freshmen. It would also be helpful to track freshman first-to-second semester persistence also.

This study should be replicated at other institutions. In order for this type of research to be useful and accurate, each institution must perform its own research about how students respond to their financial aid packages. Financial aid policies are
complex and institution specific. Research done at the institutional level has a great advantage over national research because data cannot be collected quickly enough at the national level to promote planning processes. Institutional research can provide a crucial missing link for many colleges in the planning process assisting them in becoming more competitive and serving their students better. Data collected from many schools would allow for comparison and permit analysis of variations between both comparable schools and all institutions.

Although this study did not produce a model to assist the College in predicting persistence, it is still a worthy goal. The study lacked comprehensive data to critically assess a major theoretical model of attrition such as the one proposed by Tinto (1993). These data, however, could easily be included in a comprehensive review of institutional retention that includes social, environmental, and academic variables. The study demonstrated that financial aid variables would be an important component of such a model.

Summary

This study provided evidence that financial aid appears to have an effect on persistence at this Midwestern Liberal Arts college. This evidence, along with other research done on financial aid and persistence featured in the literature review, demonstrates the need for institutions to study how students respond to financial aid awards. The challenge remains to make better use of research in the formulation of public and institutional student aid policies.
Appendix A

Human Subjects Institutional Review Board Approval
Date: February 20, 2001

To: Jaiming Shen, Principal Investigator
Jack Powell, Student Investigator for dissertation

From: Michael S. Pritchard, Interim Chair

Re: HSIRB Project Number: 01-01-1S

This letter will serve as confirmation that your research project entitled "The Relationship of Financial Aid and Freshman Persistence at Cornerstone College" has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: February 20, 2002
BIBLIOGRAPHY


