Predictors of the First-year Nursing Student at Risk of Early Departure

By

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Dedication

I dedicate this project and all it means to me to my husband Steve, whose unfailing support has sustained me.

Acknowledgements

I would like to thank my fellow DNP classmates, with whom I struggled to maintain a balanced perspective on life. They cheerfully encouraged my work and were there with unfailing support.

I would like to acknowledge the support, encouragement and guidance of my Capstone Project Committee, especially Rebecca Wiseman and Meg Johantgen. They were my guiding lights.

Table of Contents

List of Tables

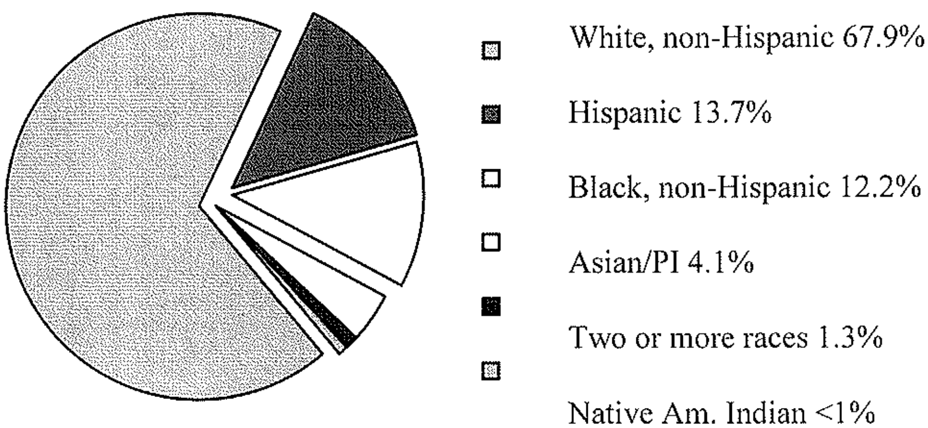
Section One

Introduction

Statement of Problem

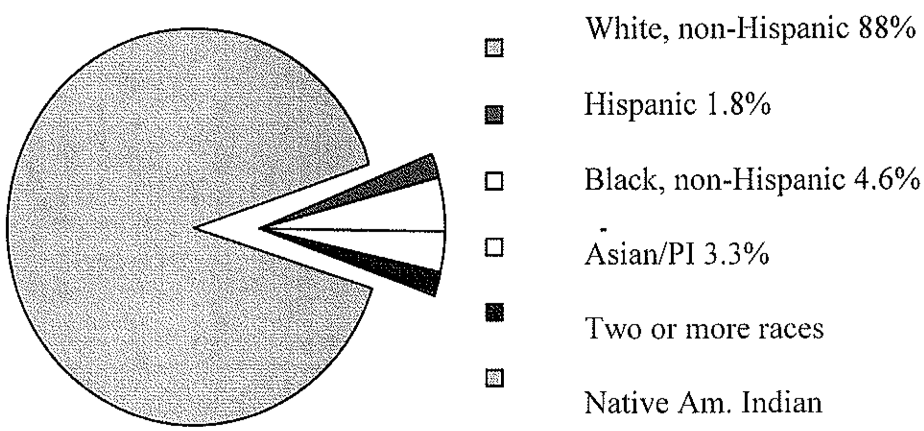
Increasing racial and ethnic diversity in the United States population has brought to the forefront the lack of diversity in the nursing workforce. The percentage of ethnic minorities in the United States has grown to 37.3% of the total population (U.S. Census Bureau, 2005). The U.S. Census Bureau (2005) defines minority groups as Black or African American, American Indian or Alaska Native, Asian or Native Hawaiian or Pacific Islander, or Hispanic.

Figure 1. U.S. Population by Race, 2005



Currently, the RN population in the U.S. is comprised of 88.4% white nurses, and 11.6% minority nurses (U.S. DHHS, 2004). There have been recent gains in increasing minority nurse representation with an increase of 35% from 1996 to 2000 (U.S. DHHS, 2004). However, the ranks of registered nurses remain the domain of white females (U.S. DHHS, 2004). Diversity in the RN workforce remains a distant goal.

Figure 2. RN Distribution by Race, 2004



Increasing minority representation in schools of nursing is a goal supported by the American Association of Colleges of Nursing (AACN, 2001). The AACN has issued a call to action to "strengthen …efforts to attract more men and minority students" (p. 3). Greater diversity in the nation's health care workforce is important for many reasons. Increasing minority representation in the nursing work force is a goal of this author. This study will explore various student characteristics and their relationship to failure in one or more first-year nursing courses.

Cohen, Gabriel, and Terrell (2002) identified four "practical" reasons for attaining greater diversity in the health care workforce: "advancing cultural competency, increasing access to high quality health care services, strengthening the medical research agenda, and ensuring optimal management of health care systems" (p. 91). By advancing cultural competency health care providers would more effectively meet the needs of a diverse population. "Health care providers must have a firm understanding of how and why different belief systems, cultural biases, ethnic origins, family structures, and ...other factors influence the manner in which people experience illness, adhere to medical advice, and respond to treatment" (p. 92). Cohen et al. (2002) state that "inadequate access to health care services remains a major problem within minority populations" (p. 93). The authors cite multiple studies demonstrating that minority providers are much more likely to practice in areas where underserved populations are found and "racial concordance between physician and patient results in greater patient satisfaction" (p. 93).

Increasing racial diversity may help to strengthen the U.S. research agenda concerning minority health disparities and may encourage increased participation of minorities in healthcare related research (Cohen, Gabriel, & Terrell, 2002). Finally, increasing diversity in the health care workforce will result in an increase of minorities in related fields. By increasing minorities trained in health related careers the pool of future minority legislators and health care executives is nurtured (Cohen, Gabriel, & Terrell, 2002). Although attaining these four goals is important, increasing minority representation in nursing is fraught with many roadblocks.

Factors which have been identified as roadblocks to increasing minority nursing representation include the socio-economic issues related to college matriculation in general: economic barriers, lack of mentors, and lack of direction from authority figures (AACN, 2001). Another type of barrier is the lack of role models in nursing faculty and administration. Currently, only 8.7% of faculty and 6.8% of deans are members of minority groups (AACN, 2001). A final barrier, and perhaps most disturbing, is the high degree of minority nursing student attrition in U.S. schools of nursing. Dowell (1996) estimated that minority attrition rates range from 15% to 85%. Although these percentages are high, there is also a wide range, which implies that some institutions have very low attrition rates.

Purpose and Objective of Project

The purpose of this project was to identify factors associated with early attrition, with particular emphasis on factors associated with minority nursing students. A logistic regression model was used to determine the predictive power of a variety of student "pre-entry attributes" (Tinto, 1993). These characteristics are a sub-set of the model proposed by Vincent Tinto (1993), and are derived directly from the theoretical framework. Tinto's (1993) theory of college student departure, "A Longitudinal Model of Institutional Departure", guided this author's identification of variables which may affect nursing student retention. The theory of college student departure utilizes a longitudinal approach to the problem of college student departure. Tinto's model (1993) describes the interaction of student "pre-entry attributes" with student goals and commitments, institutional experiences and academic and social integration (p. 114). Several pre-entry attributes were analyzed to determine which of these characteristics, if any, place nursing students at an increased risk of attrition in the first year of a two-year nursing program. This study took place at Frederick Community College, an accredited, two-year institution located in Frederick, MD.

If predictive attributes are identified they may be used by the Frederick Community College nursing administrators and faculty to improve the identification of students who are at increased risk of early departure from the nursing program. Early departure is defined as the failure or withdrawal failing from one of the three first-year nursing clinical courses. The attributes under investigation include student course-taking behaviors. Should certain course-taking patterns be predictive of early departure from the nursing program, admission policies may be examined and modified to consider these conditions. Early identification of the "at risk" student has been posited as an important first step in reducing nursing student attrition (Campbell & Dickson, 1996; Symes, Tart, & Travis, 2005).

Research Question

One gap in the research is in the area of early identification of at-risk nursing students. Studies point to the need for success-based interventions, but also lament the need to know to whom these services should be offered (Campbell & Davis, 1996; Campbell & Dickson, 1996; Perin, 2006). This study investigates which "pre-entry attributes" (Tinto, 1993) are predictive of nursing student early departure. Therefore, the research question is "Which student pre-entry attributes are predictive of nursing student early departure in a two-year nursing program?"

Theoretical Framework

Tinto's (1993) theory of college student departure, "A Longitudinal Model of Institutional Departure", guided the author's identification of variables which affect nursing student retention. The theory of college student departure utilizes a longitudinal approach to the problem of college student departure. Tinto's model (1993) describes the interaction of student "pre-entry attributes" with student goals and commitments, institutional experiences and academic and social integration (p. 114) (See Appendix A). Tinto states that positive experiences reinforce persistence and negative experiences "serve to weaken intentions and commitments" (p. 115). This model's widespread use is noted in Braxton, Hirschy, and McClendon (2004), where 775 citations to this theoretical model were identified.

The "pre-entry attributes" described in the model are: family and community background (e.g., social status, parental education, and size of community), personal attributes (e.g., sex, race, and physical handicaps), skills (e.g., intellectual and social), financial resources, dispositions (e.g., motivations, intellectual, social and political preferences), and pre-college educational experiences (e.g., high school GPA) (Tinto, 1993, p. 115). Each attribute "is posited as having a direct impact upon departure from college…by its well-documented effect upon levels of academic performance in college" (p. 115).

Braxton, Hirschy, and McClendon (2004) offer a critique of Tinto's model, stating that for the two-year college student experience many of the propositions do not have empirical evidence. Braxton et al. (2004) found that the one proposition (in Tinto's model) that does have robust empirical evidence is the relationship between student entry characteristics and the likelihood of students' departure from college. Pascarella, Duby, and Iverson (1983) tested Tinto's model in a population of commuter students and found that pre-entry characteristics explained 9.9% of their subsequent departure decisions. Background characteristics (family background, individual attributes and pre-college schooling) were associated with the largest increase in R^2. (R^2 represents the relationship between the independent variables and the dependent variable; the ability of one to predict the other.) These results imply that the characteristics that the students bring with them to the commuter college are of equal, if not greater importance in their subsequent decision to persist or depart than their actual experiences of college. Therefore, the model is used to support the choice of student pre-entry characteristics as the independent variables which may predict nursing student failure or withdrawal during the first year of a community college, two-year, nursing program. The term "early departure" is used to describe first-year attrition. (This study is graphically depicted in Appendix B).

Section Two

Review of Literature

A literature review was completed to describe the empirical background for Tinto's selection of student "pre-entry attributes". These student attributes will be the independent variables studied in this project. The literature review took place in June 2007. Two databases were utilized: the ERIC (Education Resources Information Center) database and the CINAHL (Cumulative Index of Nursing and Allied Health Literature) database. The ERIC database houses citations from over 600 journals pertaining to the field of education from 1966 to present. The CINAHL bibliographic database houses references pertaining to the field of nursing and seventeen other allied health disciplines from 1982 to present. The following search terms were entered: education, nursing; high risk and at risk students; and college students. Searching the bibliographies of selected journal articles provided a second source of relevant citations that added historical depth to the search.

Higher Education Literature

The review of the higher education literature was replete with studies describing various personal characteristics that render a college student at-risk of departure. The literature supports that the community college student is at particular risk.

Several recent reviews of the literature have been published and provide an updated analysis of the characteristics of the "at risk" student. Although background variables are associated with persistence for all minority groups, "substantially different patterns have emerged" (Carter, 2006, p.34). For white students, being a first-generation college student decreased the odds of succeeding in college, but being from a high-income family increased the odds. For Hispanics and African American students being from a high-income family increased the odds of persistence, but parent's education had no effect (Carter, 2006).

Ishitani (2006) provides an extensive review of the literature pertaining to college attrition and degree completion. Strong evidence exists that the following personal characteristics contribute to college student attrition: gender, race, and high-school academic achievement. This research validates the outside influences that effect student attrition: low family income, higher socioeconomic status, parent's educational attainment, and type of institution (Ishitani, 2006).

First-generation College Students

First-generation college students persist and attain college degrees at lower rates that their counterparts (Nunez & Cuccaro-Alamin, 1998). First-generation students were more likely to attend college part-time, to attend public 2-year institutions, to be older, married, have dependents and have lower income. Several studies have shown that first-generation college students have family and background characteristics that are associated with attrition (Chen, 2006; Choy, 2001; Ishitani, 2006; Nunez et al, 1998). First-generation students whose parents never attended college were 1.3 times more likely to leave college than were students whose parents were college-educated (Ishitani, 2006). For these reasons, it is important to consider the college student's family and personal background characteristics when describing predictor variables associated with college departure.

London (1992) explored the psychological stressors first-generation college students endure. Feelings of students "shedding of one's identity and the acquisition of another" were described (London, 1992, p.8). Students may wish to try on new traits (clothing, food, music, etc), but these new interests and preferences may conflict with the preferences in the home, leaving the student to negotiate the transition. This process has been described as a "cultural adaptation due to discontinuities between the culture of their families and communities and the culture that exists on college campuses" (Engle, Bermeo, & O'Brien, 2006, p. 18). The successful negotiation of this transition has been shown to have a significant impact on the student's success in college (Engle et al., 2006).

Due to higher degrees of financial hardship, single parenthood and lack of resources, first-generation college students are more likely to attend college part-time, or at a community college. Both of these choices may lead to a lack of social integration into the college experience. This lack of engagement is one factor in the low college persistence of first-generation college students (Pike & Kuh, 2005).

High School Curriculum

The completion of a college preparatory program or honors curricula in high school had a positive influence on persistence (Braxton, Duster & Pascarella, 1988; Carter, 2006; Ishitani, 2006). This finding is consistent across racial groups. One large study of 4,427 racially diverse students found that students in the lowest quintile of high-school rank, and who had the lowest level of academic intensity were 1.9 and 1.7 times (respectively) more likely to depart from higher education (Ishitani, 2006).

Type of Higher Education Institution

The type of college institution affected student persistence; attending state universities, private colleges, and research universities was "consistently and positively associated with persistence compared to enrollment in two-year colleges" (Ishitani, 2006, p. 35). College choice decisions are limited by the student's socio-economic status (Carter, 1999, Pascarella, Smart, & Smylie, 1992). Students of low socio-economic status tend to attend colleges that are closer to home and less expensive. This finding is especially true for Hispanic students, who attend the community college at high rates (Carter, 1999).

Dougherty (1992) examined the "baccalaureate gap," the gap between community college entrants and four-year college entrants and the rates of attaining a bachelor's degree. He found that after controlling for student characteristics there were differences in degree attainment, with the community college students attaining the bachelor's degree at a lower rate (11 to 19 %) than the four-year student. These differences are attributed to institutional characteristics, transfer issues and retention at the four-year level. These findings point to the need to examine the issues that originate at the community college, that exist between the two-year and four-year institution and that exist at the four-year institution. This relationship will not be explored in this study.

Socio-economic Status

Low-income students often possess background characteristics that increase the student's at-risk status. Low-income students are less likely to have taken a highly rigorous high school curriculum, are more likely to be female, older, Black or Hispanic or be a first-generation student (Engle & O'Brien, 2007). Low-income students are also more likely to be a single parent, and employed at least part-time (Engle & O'Brien, 2007). All of these characteristics add to the student's risk burden.

Financial support of low-income students has been assessed as a strategy to increase persistence. This strategy is based on the finding that low-income students were more likely to drop out of college if the level of grant aid was insufficient (Carter, 2006). Persistence was correlated to the availability of financial aid. By age 24, only 12 percent of students from low-income families will earn a bachelor's degree compared to 73 percent from high-income families (Mortenson, 2007). Higher socioeconomic status has a positive effect on academic and social integration, and ultimately a positive effect on college retention (Ishitani, 2006; Pascarella, Duby & Iverson, 1983).

Hispanic Students

Several unique student characteristics have been described regarding Hispanic students. Greater financial responsibility for family members, delayed enrollment in college, and living with family members while in college have negative effects on persistence for Hispanic students (Fry, 2004). These factors may pull the student away from the college experience in order to provide increased support to the family. These characteristics may help to explain why Hispanic students saw a large decrease in two-year degree attainment between 1990 and 1996, from 31.9% to 25%. (ACE, 2006, p. 15). Including family members in student orientation programs and success initiatives has been suggested as a way to include the family in the college experience.

Nursing Literature

Basic Knowledge Testing

Two recent studies describe the positive predictive value of the NET (Nurse Entrance Test) reading score and success on the NCLEX-RN (National Council Licensure Examination for Registered Nurses) and nursing program completion (Sayles, Shelton, & Powell, 2003; Symes, Tart, & Travis, 2005). The NET is a product of Educational Resources, Inc. and has been developed to assess nursing students for readiness in the areas of reading comprehension, essential math skills, written expression, test taking skills, learning styles, and stress level profile (Educational Resources, n.d.). The test may be used for pre-admission testing or student counseling. Students who took developmental reading in Maryland community colleges were at increased risk of failure in community college nursing programs (Baker, 1994). Assessing students past enrollment in Developmental English and ESL English will be utilized as a proxy to a standardized reading test, such as the NET.

Academic Background

A strong background in science and math has been demonstrated to be predictive of success in today's nursing programs. This review of the literature found that all but one study concluded that science GPA (high school science GPA or nursing program science prerequisite GPA) is a positive predictor of success in the nursing program or on the NCLEX-RN exam (Byrd, Garza, & Nieswiadomy, 1999; Carpio, O'Mara, & Hezekiah, 1996; Sayles, Shelton, & Powell, 2003; Wong & Wong, 1999). These studies validate using science GPA as a predictor of success in nursing programs.

This author has discovered sufficient evidence to support the use of science prerequisite's GPA as a predictor of success in a nursing program. Current course-taking strategies (anecdotally noted) include the repeating of the science prerequisites in order to increase the student's GPA, in a selective admission environment, such as Frederick Community College. For this reason, the number of times a student has taken each science prerequisite was examined as an independent variable. This practice is thought to place a student at increased risk of early departure.

Racial/Cultural Background

The effect of a nursing student's race was examined in two studies, which found that being from a minority race had a negative effect on student success in program completion and NCLEX-RN success (Byrd, Garza, & Nieswiadomy, 1999; Sayles, Shelton, & Powell, 2003). Keeping in mind the importance of cultivating a diverse pool of registered nurses in the U.S., faculty and administrators at FCC are very interested in understanding the relationship between race and early departure from the nursing program. Therefore, student race was examined as one of the independent variables in this study.

Conclusion

Increasing the number of minority registered nurses in the U.S. is an urgent public health issue. The public health document Healthy People 2010 contains two goals. Goal two is to reduce health disparities (U.S. DHHS, 2000). One approach to reduce health disparities is to increase the number of minority registered nurses. Should no changes in nursing student enrollment and employment patterns occur, it has been calculated that by 2020 the RN workforce will fall 20% below required numbers (Buerhaus, Staiger, & Auerbach, 2000). This projection was updated in 2007 and workforce shortages are now projected to be 8.5% below required numbers in 2020 (Auerbach, Buerhaus, & Staiger, 2007). This change is due to recently increased numbers of nurses graduated from U.S. schools of nursing. This increase is thought to be due to the Johnson & Johnson recruitment campaign, increased foreign-born nurses, and the emergence of an older "twentysomething" RN workforce (Auerbach et al., 2007). Increasing the recruitment and retention of minority nursing students will result in increasing the number of nursing graduates and may result in the augmentation of an underutilized segment of the RN workforce.

The review of the literature validated this author's choice of independent variables to predict early departure from a two-year nursing program. Based on the literature review the effect of the following independent variables were measured: age, gender, race, socio-economic status, work status and role during the nursing program, past enrollment in developmental or ESL reading, and the number of times a student has taken the nursing program science prerequisites. These variables correspond to the "pre-entry attributes" of Tinto's model. Further discussion of these variables can be found in the Sample section of this paper.

An improved understanding of which characteristics places a student at risk of failure or withdrawal in the first year of the FCC nursing program (early departure) will be useful to nursing program faculty and administrators. Student retention programs and services may be designed to meet the needs of the "at risk" student, and those students can be urged to participate. These efforts are undertaken to increase nursing student retention and to increase minority representation in nursing.

Section Three

Methodology

Design

This descriptive, correlational study utilized administrative data maintained at Frederick Community College (FCC).

Sample

Data about students admitted to the FCC Nursing Program during the fall 2005 semester and fall 2006 semester was evaluated. The study is limited to these two years due to the need for access to the Nursing Student Information Sheet, which is not maintained after the student graduates from the two year program.

The nursing program admits 64 students each fall, yielding a maximum of 128 records for review. Based on past demographic trends it is expected that approximately 25% of the students will be of a minority cultural/ethic group and 90% or more will be female. Of the 128 student records it is estimated that 24 will be PN (Practical Nursing) majors, and the remaining 104 will be RN (Registered Nursing) majors. Based on past experiences, almost all of the PN majors will continue onto the second year of the nursing program. There is no curricular difference in the PN and RN majors nursing coursework during the first year of the program. The PN majors have completed all three science pre-requisites: Anatomy and Physiology I and II, and Microbiology. The only difference in the PN and RN major is in the number of General Education credits completed upon application to the nursing program. PN majors must complete 12 fewer credits of General Education coursework prior to enrolling in the program. Since most of the PN majors continue to the second year of the nursing program, many have completed all the requirements for the RN program. Due to this potential curricular difference, the student's major was analyzed as an independent variable.

Data Sources

This study utilized the following data sources: PeopleSoft database which is administered and stored by FCC; student transfer transcripts (paper); student financial aid electronic records; and the Nursing Student Information Sheet

PeopleSoft is a commercial database product designed for the management of all data relevant to the function of a college or university. It contains data relevant to academic advisement, financial aid, student grades, administration and student records. The strength of the PeopleSoft database lies in the fact that the majority of the data is entered electronically; fields are required, disallowing missing data. Few student applications are entered manually, but the existence of this practice does introduce some error into the process.

A second source of data was the student's financial aid record. This data is entered electronically by the agencies providing the funding, and will therefore contain little error. The director of financial aid assisted with the data collection, and helped to verify or refute any data discrepancies.

The third source of data was the student's transfer transcript record. This data is housed in the registrar's office. This data was created by the transferring institution, and is stored electronically and is considered to be of high quality. The transcript coordinator assisted with this data collection and review.

The final source of data was the Nursing Student Information Sheet. This record is completed by the student, and the presence of data is verified by the Academic Office Manager of the nursing program. The quality of the data that is present is believed to be high.

Variables and Definitions

The types of data examined as independent variables were derived from Tinto's (1993) description of student "pre-entry attributes" and include student individual characteristics and institutional experiences. This model was used to support the choice of student pre-entry characteristics as the independent variables which may predict nursing student early departure (See Table 1).

The completion of either a Developmental English course or an ESL English course is being examined as a substitute for a commercial reading test, such as the NET. The Frederick Community College nursing program does not employ the use of any standardized testing at the outset of the nursing program. This study examined if students who take a Developmental English course or ESL course, due to low pre-admission placement testing upon initial enrollment at the college, are at increased risk of failure in the first year of the nursing program. This proposition is supported by Baker's (1994) finding that there was a relationship between students taking a developmental reading course in Maryland community colleges, and failing in a community college nursing program.

The students' need to work during the program and being a recipient of need-based financial aid were used as proxies for the student's socioeconomic status. Data on student income is not recorded or maintained at FCC. Being from the lowest income groups has been shown to correlate with increased student attrition (Ishitani, 2006). The student's intent to work during the nursing program is recorded on the Nursing Student Information Sheet, and may be an indication of lower income status.

The number of times a student has chosen to enroll in the science prerequisites was measured by utilizing the PeopleSoft database as well as transfer transcripts. This variable was assessed due to the current practice of weaker students repeating required science coursework until an acceptable grade is achieved. The term "science prerequisite" is defined as the three prerequisite science courses for the FCC Nursing Program: Anatomy & Physiology I, Anatomy & Physiology II and Microbiology. It is thought that this practice may increase a student's risk of failure in the first year of the nursing program, early departure.

Conversely, it was posited that students who enter the program as a certified nursing assistant (CNA) may have certain skills, knowledge and abilities that will positively correlate to a student's successful completion of the first year of a two-year nursing program. For this reason, the effect of being a CNA on admission to the nursing program was analyzed.

The effect of each predictor on the likelihood of unsuccessful completion of a first-year nursing course (outcome variable) was analyzed. The first year of the FCC nursing program consists of a 6 credit course titled Introduction to Clinical Nursing (NU 101), a 7 credit course titled Medical Surgical Nursing I (NU 211), and a 3 credit course titled Reproductive Health Nursing (NU 210). First-year student attrition ranges from 15 – 25% annually. Very low attrition is noted after the first year (<10%).

The dependent variable is early departure from the nursing program. Early departure was defined as withdrawal failing or failure from any of the three first-year nursing courses. Withdrawal is defined as a student initiated decision to discontinue course enrollment. Withdrawal data was recorded as WF – withdrew failing, and WP – withdrew passing. This allowed the researcher to differentiate between those leaving for academic and non-academic reasons. Courses from which students withdraw failing were recorded as course failures. Courses from which students withdraw passing were not recorded as course failures. Course failure is defined as a final course grade of D (70-74.5%) or F ($\leq$ 69.5%). All nursing courses at FCC must be passed with a grade of 75% or more of all available course points.

Finally, all nursing clinical courses have a theory and a clinical component, each of which must be passed. The theory component is graded as the result of several multiple-choice examinations with points assigned. The clinical component of each course is graded on a pass/fail basis. Should a student fail the clinical component, the grade assigned to the course is an F, regardless of the number of points earned in the theory component.

Table 1. Independent and Dependent Variables and Data Sources

Independent Variables	*Data Source*
Age	PeopleSoft (PS)
Sex	PS
Race	PS
SES	Financial Aid
Anatomy & Physiology I (# times taken)	PS or student transcripts
Anatomy & Physiology II (# times taken)	PS or student transcripts
Microbiology (# times taken)	PS or student transcripts
Major (RN or PN)	PS
Developmental English	PS or student transcripts
ESL English	PS or student transcripts
CNA on admission	Nursing Student Information Sheet
Plans to work	Nursing Student Information Sheet
Dependent Variables	*Data Source*
NU 101 – pass/fail	PS
NU 210 – pass/fail	
NU 211 – pass/fail	

Human Subject Issues

IRB approval from the University of MD, School of Medicine was obtained on October 29, 2007. An Application for Approval of Use of Human Participants was approved on the same day by the director of the FCC Outcome Assessment, Planning and Research Department (OAPR). The document is maintained in the OAPR office. Access to this data was assured by the

FCC VP of Information Technology and the FCC PeopleSoft Project Director. The security of the data was maintained by utilizing a password protected computer accessible only to the named investigator. Confidentiality of the subjects was maintained by the use of a pseudo-identifier. Each record (once data collection was completed) was stripped of the student identification number, and replaced with a randomly chosen record number. The original record which included student identification was destroyed.

Study Procedures

Data collection took place in November 2007, after IRB and FCC Human Subjects approval was confirmed. Data collection from the PeopleSoft database was facilitated by the PeopleSoft Project Director. The following data was collected from the PeopleSoft database: student demographic information (sex, race, gender), enrollment history in Developmental English, ESL English, science prerequisites and nursing courses, and nursing major (RN/PN). This data was placed on an Excel spreadsheet to facilitate analysis by the SPSS (Statistical Package for the Social Sciences) program.

Additional data was collected and placed on the Excel spreadsheet: student information from the Nursing Student Information Sheet (age on admission to program, intention to work during program and status as a CNA upon admission to program), student transfer course information (science prerequisites, Developmental English and ESL English), and if the student received need-based financial aid. The acquisition of the student transfer transcript information was facilitated by the nursing program's Academic Office Manager. This staff member made copies of all transfer transcripts stored in PeopleSoft for all of the study subjects. A student's status as a recipient of need-based financial aid was assessed by this researcher by hand searching all of the subject's financial aid records. These records are stored electronically in the financial aid office. All sources of need-based aid were considered a positive finding.

After data collection was complete, the data set was evaluated and analyzed. The data set was evaluated for missing data (there were none). Two students received a grade of W (withdraw) from one or more nursing courses. One student withdrew from the first nursing course, NU 101, within 5 weeks of the course's start. This student withdrew passing for personal reasons, and was therefore excluded from the data set. The second student who withdrew, withdrew from both second semester nursing courses (on the last date to withdraw). She withdrew failing, and therefore the decision was made to modify her record to reflect a failure for both second semester nursing courses. These were the only modifications to the data set prior to analysis.

Analysis was completed using the SPSS statistical software at the University of Maryland, School of Nursing.

Section Four

Results

Description of Sample

As summarized in Table 2, the sample of 124 first-year nursing students whose pre-entry characteristics were analyzed had the following distinctive characteristics: the mean age was 32.2 years; they were predominately female (92.7%); the group is racially diverse with 21% non-white; the majority of the students planned to work during the nursing program (66.1%); and almost half received need-based financial aid (43%). These characteristics are consistent with the profile of the community college student, and may be different than the 4-year college nursing student. Due to these differences in student characteristics, application of these study results may be limited to community college nursing students.

Between the two sub-sets of students, those admitted in the fall semesters of 2005 and 2006, there were four significantly different characteristics: age in years ($t=2.589$, $p=.011$); course taking for Anatomy & Physiology I (once or more than once) ($\chi2 = 4.689$, $p=.030$); Anatomy & Physiology II (once or twice) ($\chi2 = 5.140$, $p=.023$); and the collapsed category of "Repeated any science prerequisite" revealed group differences ($\chi2 = 8.549$, $p=.003$). The sub-set of students who entered the nursing program in the fall semester of 2006 was significantly younger than the students who entered in the fall semester of 2005, and they repeated the science prerequisites with greater frequency. However, these group difference did not result in any significant differences in failing a first-year nursing course ($\chi2 = .322$, $p=.571$), the dependent variable.

Table 2. Characteristics of Sample (N=124)

	Fall 05 N=63		Fall 06 N=61		Combined Years N=124		Test Statistic of Difference in Years
	X (SD)	N(%)	X (SD)	N(%)	X (SD)	N(%)	
Age	34.4(9.37)		30.1(9.12)		32.23(9.46)		**t=2.589 p=.011**
Age							
0-29		24(38.1)		32(52.5)		56(45.2)	$\chi2$=2.585
30-99		39(61.9)		29(47.5)		68(54.8)	p=.108
Sex							
Female		60(95.2)		55(90.2)		115(92.7)	$\chi2$=1.19
Male		3(4.8)		6(9.8)		9(7.3)	p=.276
Race							
White		49(77.8)		49(80.3)		98(79.0)	$\chi2$=1.59
African American		8(12.7)		4(6.6)		12(9.7)	p=.452
Other (Asian, Hispanic and Native American)		6(9.5)		8(13.1)		14(11.3)	
A & P I – times taken							
1		56(88.9)		45(73.8)		101(81.5)	$\chi2$=5.076
2		7(11.1)		15(24.6)		22(17.7)	p=.079
3		0		1(1.6)		1(.08)	
A & P I – times taken							
Once		56(88.9)		45(73.8)		101(81.5)	**$\chi2$=4.689**
More than once		7(11.1)		16(26.2)		23(18.5)	**p=.030**
A & P II – times taken							
1		61(96.8)		52(85.2)		113(91.1)	**$\chi2$=5.140**
2		2(3.2)		9(14.8)		11(8.9)	**p=.023**
Microbiology – times taken							
1		62(98.4)		58(95.1)		120(96.8)	$\chi2$=1.101
2		1(1.6)		3(4.9)		4(3.2)	p=.294
Repeated any science pre-requisite							
Yes		7(11.1)		20(32.8)		27(21.8)	**$\chi2$= 8.549**
No		56(88.9)		41(67.2)		97(78.2)	**p=.003**
Developmental English							
Yes		6(9.5)		9(14.8)		15(12.1)	$\chi2$=.797
No		57(90.5)		52(85.2)		109(87.9)	p=.372
ESL Course							
Yes		4(6.3)		6(9.8)		10(8.1)	$\chi2$=.508
No		59(93.7)		55(90.2)		114(91.9)	p=.476
RN/PN Major							
RN		51(81)		52(85.2)		103(83.1)	$\chi2$ =.406
PN		12(19)		9(14.8)		21(16.9)	p=.524
Need-based financial aid recipient							
Yes		23(36.5)		20(32.8)		43(34.7)	$\chi2$=.189
No		40(63.5)		41(67.2)		81(65.3)	p=.663

	Fall 05 N=63		Fall 06 N=61		Combined Years N=124		Test Statistic of Difference in Years
	X (SD)	N(%)	X (SD)	N(%)	X (SD)	N(%)	
Plan to work during							
program		40(63.5)		42(68.9)		82(66.1)	$\chi 2$=.398
Yes		23(36.5)		19(31.1)		42(33.9)	p=.528
No							
CNA							
Yes		13(20.6)		19(31.1)		32(25.8)	$\chi 2$=1.79
No		50(79.4)		42(68.9)		92(74.2)	p=.181
Pass/Fail							
NU 101							
Pass		62(98.4)		59(96.7)		121(97.6)	$\chi 2$=.376
Failed		1(1.6)		2(3.3)		3(2.4)	p=.540
Pass/Fail							
NU 210							
Pass		59(93.7)		56(91.8)		115(92.7)	$\chi 2$=.157
Failed		4(6.3)		5(8.2)		9(7.3)	p=.692
Pass/Fail							
NU 211							
Pass		55(87.3)		54(88.5)		109(87.9)	$\chi 2$=.044
Failed		8(12.7)		7(11.5)		15(12.1)	p=.835
Failed first-year nursing course							
Yes		9(14.4)		11(18.0)		20(16.1)	$\chi 2$=.322
No		54(85.7)		50(82.0)		104(83.9)	p=.571

Note: Bolded statistics represent significant findings.

Factors Associated with Failing a First-year Nursing Course

Three significant relationships between student characteristics and the risk of failing a first-year nursing course were revealed (See Table 3). Students who took either Anatomy & Physiology course more than once were at significant risk for failing a first-year nursing course (A&P I, $\chi 2$ =15.613, $p<.001$; A&P II, $\chi 2$ =13.169, $p<.001$). Students who repeated any science prerequisite (Anatomy & Physiology I, II or Microbiology) were also at increased risk ($\chi 2$ =15.455, $p<.001$). Two other student characteristics approached significance, but did not meet the rigid criteria of $p<.05$; students who completed a Developmental English ($\chi 2$=3.734, p=.053) and male students ($\chi 2$=2.123, p=.145).

Table 3.
Relationship between Student Characteristics and Failing a First-year Nursing Course

	Total Sample (N=124)	Failed First Year Nursing Course (N=20)		
	N (%)	N (%)	χ^2	p-value
Age				
0-29	56(45.2)	11(19.6)	0.932	.334
30-99	68(54.8)	9(13.2)		
Sex				
Male	9(7.3)	3(33.3)	2.123	.145
Female	115(92.7)	17(14.8)		
Race				
White	98(79.0)	16(16.3)	.041	.980
African American	12(9.7)	2(16.7)		
Other(Asian, Hispanic, and Native American)	14(11.3)	2(14.3)		
Race				
White	98(79.0)	16(16.3)	.013	.908
Else	26(21.0)	4(15.4)		
Need based financial aid				
Yes	43(34.7)	5(11.6)	.986	.321
No	81(65.3)	15(18.5)		
A & P I – times taken				
Once	101(81.5)	10(9.9)	**15.613**	**.000**
More than once	23(18.5)	10(43.5)		
A & P II – times taken				
Once	113(91.9)	14(12.4)	**13.169**	**.000**
More than once	11(8.9)	6(54.5)		
Microbiology – times taken				
Once	120(96.8)	19 (15.8)	.240	.624
More than once	4(3.2)	1 (25.0)		
Repeated Science Pre-requisite				
Yes	97(78.2)	11(40.7)	**15.455**	**.000**
No	27(21.8)	9(9.3)		
Major				
RN	103(83.1)	16(15.5)	.159	.690
PN	21(16.9)	4(19.0)		
Developmental English				
Yes	15(12.1)	5(33.3)	3.734	.053
No	109(87.9)	15(13.8)		
ESL Course				
Yes	10(8.1)	2(20.0)	.120	.729
No	114(91.9)	18(15.8)		
Plan to Work				
Yes	82(66.1)	14(17.1)	.160	.690
No	42(33.9)	6(14.3)		
CNA				
Yes	32(25.8)	4(12.5)	.420	.517
No	92(74.2)	16(17.4)		

Note: Bolded values indicate significant results.

Logistic regression was used to model the influence of student pre-entry characteristics on failing a first-year nursing course. The first analysis entered the two significant bivariate characteristics of taking either of the Anatomy & Physiology courses more than once. The decision to enter only two characteristics was an effort to follow the "rule of 10" (Hosmer & Lemeshow, 2000, p. 347). This rules states that for every 10 events, one should enter 1 parameter; of the 124 subjects, 20 failed a first-year nursing course (20 events). This analysis revealed that these two variables correctly predicted 85.5% of the cases. Students who took Anatomy & Physiology I more than once were 5.24 times more likely to fail a first-year nursing course (CI 1.725,15.975, p=.004). Students who took Anatomy & Physiology II more than once were 5.23 times more likely to fail a first-year nursing course (CI 1.252, 21.849, p=.023).

The second logistic regression analysis entered all student characteristics of interest at once. Variables were chosen based on a p value less than .25 at the bivariate level as well as those that had significant support in the literature (See Table 4). This model correctly predicted 83.9% of cases. While controlling for all other variables, three student characteristics significantly influenced failure in a first-year nursing course: being a male increased a student's risk of failure 6.56 times (OR=6.56; CI 1.044, 41.18); repeating Anatomy & Physiology I or II increased a students risk of failure by about 7 times. At the bivariate level male sex approached significance (χ^2=2.12, p=.145), and after controlling for all other variables male sex became a significant predictive characteristic.

Table 4.
Likelihood of Failing a First-Year Nursing Course by Student Characteristics

Characteristics	N	Unadjusted Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio[a]	95% Confidence Interval
Sex					
Female[b]	115				
Male	9	2.882	0.657,12.643	**6.558**	**1.044,41.18**
Age at Admission					
0-29[b]	56				
30-99	68	0.624	0.238,1.634	0.987	0.923,1.056
Race					
White[b]	98				
Other	26	0.932	0.283,3.070	0.584	0.108,3.174
Need-based Financial Aid					
No[b]	104				
Yes	20	0.579	0.195,1.718	0.533	0.150.1.894
Developmental English					
No[b]	109				
Yes	15	3.133	0.940,10.44	3.549	0.783,16.079
ESL Course					
No[b]	114				
Yes	10	1.333	0.261,6.800	2.698	0.209,34.783
A&P I times taken					
Once[b]	101				
More than once	23	7.000	2.445,20.037	**7.053**	**1.952,25.487**
A&P II times taken					
Once[b]	113				
More than once	11	8.486	2.285,31.517	**6.690**	**1.304,34.324**

[a] adjusted for all other variables in model
[b] referent category

Note: bolded value indicates significant results

Discussion

The initial intent of this study, to examine characteristics which may predict nursing student early departure in order to increase minority nursing student success, did not reveal a statistically significant relationship between race and failure of a first-year nursing course. Minority nursing students did not have an increased risk of early departure (OR=0.58; CI 0.108, 3.174). This finding is reassuring to the administrators and faculty at FCC. Minority student representation in this sample is 21%, higher than the Frederick County community (16%), and the concern that minority students were at greater risk of failing was dispelled in this sample (U.S. Census Bureau, 2006).

The anecdotal observation that students repeat the nursing program science prerequisites in order to improve their standing for admission has been found to be a significant risk factor for failure of a first-year nursing course. This finding is not surprising, in that students who are weak in science and math have been shown to graduate from nursing programs at lower rates, and pass the NCLEX-RN exam less often (Byrd, Garza, & Nieswiadomy, 1999; Carpio, O'Mara, & Hezekiah, 1996; Sayles, Shelton, & Powell, 2003; Wong & Wong, 1999). Students, advisors and program managers must be aware that this finding supports advising students strongly to consider their ability to be successful in a nursing program if they are weak in science, evidenced by the need to repeat a science prerequisite in order to be competitive for admission.

Strengthening the Pool of Applicants

Administrators.

Program managers must consider structuring admission plans or criteria to discourage the practice of repeating the science prerequisites in order to subsequently strengthen the pool of applicants to the FCC Nursing Program. Currently at Frederick Community College, the student's most recent grade on a science prerequisite is the one that is considered for admission. This grade translates into a point value. This system of allotting points to certain characteristics (county of residence, prerequisite general education grades, and prerequisite completion) is the procedure for choosing those admitted to the program from the pool of applicants. This study recommends one of the following: limiting the number of times a student can take a science prerequisite, using the first attempt's grade, or calculating an average grade rather than the most recent grade in those courses. Any of these methods would result in an indirect discouragement of the practice of repeating the required science courses.

Another strategy to strengthen the pool of nursing program applicants would be to work with the local high school counselors, college advisors, and high-school and college science professors to inform them of the need to direct students who are strong in sciences toward a career in nursing. Recent publicity regarding the nursing shortage has resulted in increased interest in the field, but the characteristics of the successful nursing student need to be publicized. Working with the local high schools is possible in Frederick County, MD. Currently, collaboration exists between the community college and the Frederick County Public School System (FCPS). Utilizing this collaborative framework, and the grant money that is available from the FCC/FCPS Collaboration Grant, an informational and interactive program should be developed by nursing program administrators. This collaboration could involve the development of a pre-nursing club at the middle-school or high-school level. This club may allow students access to the nursing lab and to enjoy shadowing experiences with local nurses. Brief topical presentations would stress the importance of critical thinking utilizing a strong science background.

Faculty.

A strategy that may be implemented by nursing faculty would involve nursing program faculty making guest appearances in the college science courses. The nursing faculty could describe how the topics studied in the science course directly relate to nursing issues. Finally, science professors could be invited to attend Medical-Surgical nursing lectures, to witness how the information taught in the Anatomy & Physiology courses are expanded upon in the nursing lectures. This would invite collaboration between these closely related subjects of study.

Students.

A recommendation to first-year nursing students would be to have students consider that they may be trying to balance too many outside responsibilities while attending college. At the community college, many students are considered "at risk". This is due in part to the overall low rate of degree attainment for all community college students, regardless of race or ethnicity. For all students who identified themselves as degree-seeking, only 28% had earned an associates degree or certificate between 1996 and 2000 (American Council on Education, 2006). This low rate of degree attainment is due in part to student outside commitments. The typical community college student works at least part-time (60%) and may work full-time (40%); they are also often single parents (17%) (American Association of Community Colleges, 2007). These outside commitments may limit the student's participation in extracurricular activities, i.e. college-wide clubs, study groups, mentoring programs, etc.

Recognizing the student's desire to balance work, home and college responsibilities, families, employers and daycare providers' play an important role in supporting the nursing student. This author recommends the creation of a "Family Orientation" where students and significant family members attend a program overview increasing the support and understanding nursing students receive from these important stakeholders. The value in including the family cannot be underestimated due to the fact that all of FCC's nursing students are commuter students, living in a home environment while attending college.

Classroom Strategies.

Tinto (1998) encourages the use of learning communities to improve student retention. The learning community is comprised of sets of students who enroll in the same sequence of courses.

Tinto (1998) describes the benefits of learning communities: the formation of supportive peer groups, the increased enjoyment of learning, an increase in measurable learning, and the student's feelings of validation. This study supports the creation of learning communities within the nursing program. I would recommend that students who are in the same lecture section in the first semester, be kept together for the ensuing semesters, mimicking the cohort scheduling seen in the creation of learning communities. This practice would encourage study partners to remain intact as well as supporting the formation of relationships that will build over the two-year program.

Male Students.

This study found that male students are significantly more likely to fail a first-year nursing course. This finding requires further analytic inquiry. It is important to consider first that of the 124 students in this study, only 9 (7.3%) were male. Repeating this study with a larger sample size would increase the validity of these findings. The first year of the nursing program in this study includes three courses: NU 101 Fundamentals of Nursing, NU 210 Reproductive Health Nursing, and NU 211 Medical Surgical Nursing I. Analyzing which of these courses the males are more likely to fail would increase the understanding from a curricular point-of-view. This author wonders if the men are failing the Reproductive Heath Nursing course more frequently. Should this be true, it may require a clearer understanding on the part of the professors who teach this course of the needs of the male students.

Finally, the national decrease in male student degree attainment may be another influence on male student performance in the nursing program. In the 2002-2003 cohort of students participating in higher education, women earned 58% of all college degrees, and 60% of associate's degrees (National Center for Education Statistics, 2005). How this influence is felt in schools of nursing requires a larger sampling of nursing students. This study included 9 males, only 7.3% of the students in the study. At Frederick Community College, male students comprise a larger percentage of students admitted to the Evening/Weekend Option. The cohort of students that entered the program in January of 2007 was 25% male (8 of 32). Analyzing these student's attrition patterns may allow an increased understanding of male nursing student success in the two-year nursing program.

Summary of Recommendations

The following recommendations are proposed based on this study:

- Consider revision of student selection process to discourage multiple enrollments in Anatomy & Physiology I and II
- Form a collaboration with FCPS to create a Pre-Nursing Club at the middle-school and/or high-school level
- Form a collaboration with FCPS to inform high-school counselors and science teachers of the rigors of the two-year nursing program, especially as it relates to science
- Form a collaboration with FCC Anatomy & Physiology I and II faculty to encourage classroom visits, and brief presentations by nursing faculty to "make real" the utilization of this content in an Allied Health field
- Encourage science faculty at FCC to visit the Medical-Surgical Nursing lectures to see the content they teach "in use"
- Create a system of cohort scheduling, keeping lecture sections together throughout the two-year program
- Analyze which courses males fail in this nursing program's first year

- Replicate this study with a larger sample to increase the validity of the findings relating to male student course failure

Project's Role in the Attainment of Personal Leadership Goals

The original intent of this study was to better understand the influence of a student's race on success in FCC's nursing program. Fortunately, race did not play a role in student academic success in the first year of this two-year nursing program. The findings about students who repeat the nursing science prerequisites solidified this author's belief that those students were at increased risk of failing a first-year course in the nursing program. Utilizing this study I have been able to make concrete recommendations to address this issue. Being able to statistically support my hypothesis and to develop a clearer understanding of the student's experience in the nursing program has brought innumerable positive influences to my every-day role as a nurse educator. It will also provide the program manager, FCC advisors and other nursing faculty with information that was previously unavailable and with recommendations that are based on today's education literature.

Personally, this project has provided me with the opportunity to take course-work that has increased my understanding of the college student experience, minority student issues, enrollment and degree attainment patterns, the current literature pertaining to student retention theory, the importance and process of including evidence-based practice information at all levels of nursing education. I have grown as a result of my exposure to the many various types of nurses in the Doctor of Nursing Practice program, and have benefited from the positive influence of many nursing faculty at the University of Maryland.

I plan to disseminate this information in a variety of ways over the next year. I plan to submit a manuscript proposal this summer to a nursing education journal, and will submit abstracts to present my findings at a national nurse educator's conference. I respectfully submit this project as one requirement of the Doctor of Nursing Program.

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Appendix A

Tinto's Longitudinal Model of Institutional Departure
(1993)

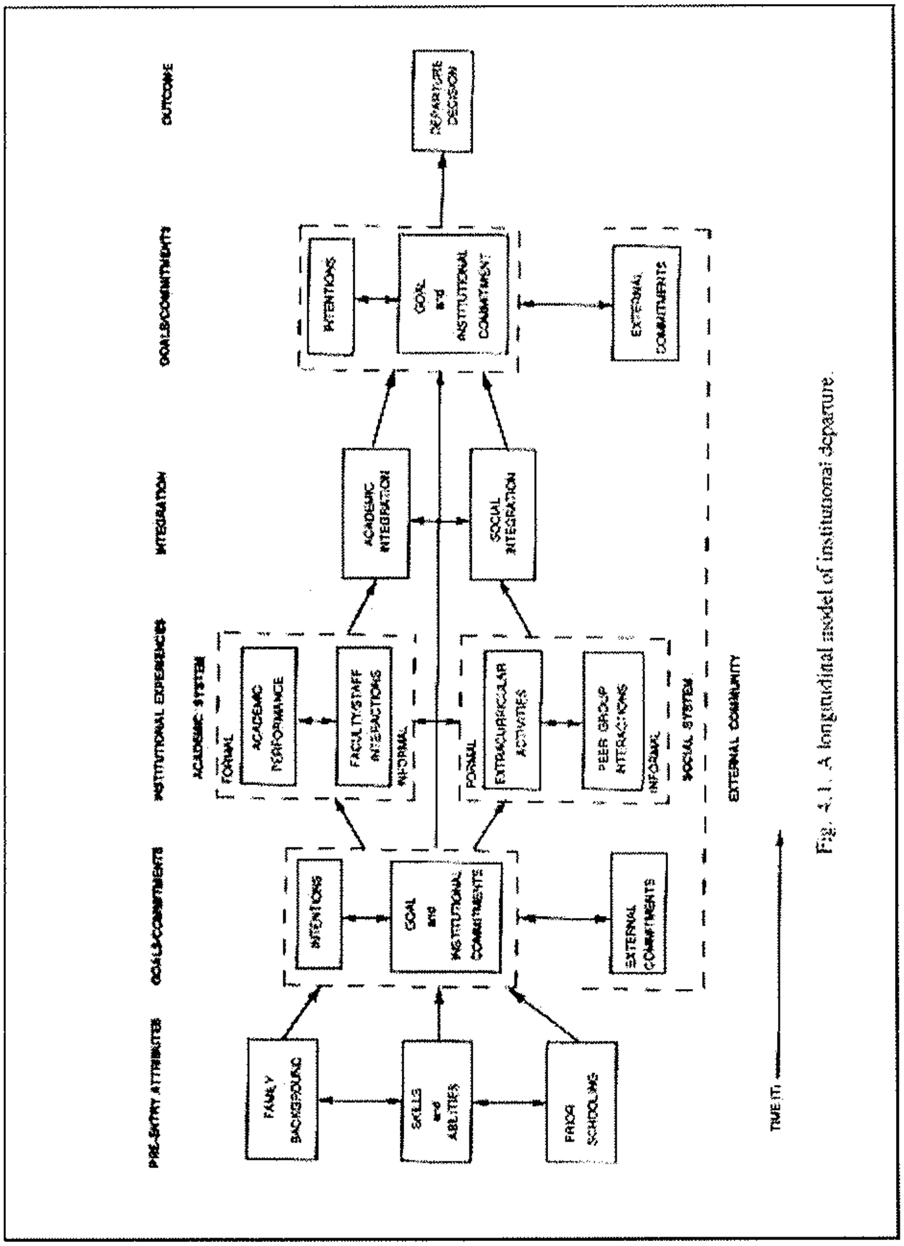

Fig. 4.1. A longitudinal model of institutional departure.

Appendix B

Subset of Tinto's Model under Study