Modeling Student Academic Success: Does Usage of Campus Recreation Facilities Make a Difference?

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Abstract - The main goal of the study was to examine the relationship of student use of campus recreation facilities (CRF) on GPA, persistence, and graduation rates at a large, public, Midwestern Carnegie Doctoral-extensive university. Tinto's theory of student departure provides the conceptual framework and an extensive review of the literature on the relationship between academic performance and recreation facility use identified a set of critical explanatory variables. Although anecdotal evidence and studies of student perceptions support the contention that use of recreation facilities promotes social integration, thereby increasing the likelihood of persistence, few studies have employed actual CRF visit counts to quantify use. Since fall 2001, visit count data have been systematically collected each time a student visited a CRF. The linking of visitation data tied to unit record level student data is a unique component of this study. Maximum likelihood estimated models were used to identify which factors were related to first-term GPA, persistence, and graduation for fall 2001 entering freshmen.

1 Introduction

Over the past two and a half decades, colleges and universities have made major financial investments in recreation facilities that enrich campus life and enhance the well-being of their students (Cohen, 1996). The trend is expected to continue, with more than three billion dollars of campus recreation facility construction and renovation planned through 2011 (NIRSA Construction Report, 2006). Although the fact that colleges and universities are continuing to invest in recreation facilities in spite of ever-increasing competition for resources in higher education demonstrates their perceived value, more empirical-based evidence of a link between usage of such facilities and student success needs to be gathered.

Campus recreation facilitie(s) (CRF) typically comprise gymnasia, swimming pools, exercise equipment, handball/racquetball courts, squash courts, and climbing walls, as well as other facilities that offer a multitude of opportunities for students to engage in a wide range of physical activities. In addition, CRF often include amenities such as locker rooms, saunas, steam rooms, food concessions, lounges, and study areas. There is little doubt that campus recreation facilities are popular among college students. Anecdotal and published usage data attest to their attractiveness with consistent reports of usage rates greater than 70 percent and ranging to as high as 95 percent (Bryant, Banta, & Bradley, 1995). At least four aspects of campus recreation facility offerings likely contribute to these high rates of usage; physical fitness, skill development, competition, and social interaction.

It is reasonable to conclude that college students wish to be fit and attractive, and feel healthy. The physical and mental health benefits of engaging in the types of physical activity offered by CRF are well known and strongly supported by over a half century of research (Bouchard, Shepard, Stephens, Sutton,

& McPherson, 1990). Social interaction among users is a prominent characteristic of the typical CRF environment due to the nature of the activities offered by CRF, as well as the design elements usually incorporated into the facilities themselves. CRF offer myriad small communities in the form of teams, clubs, classes, and other affinity groups to which students can belong. They also offer a variety of spaces such as locker rooms, lounges, dining areas, and other common spaces that foster social interaction. Student use of campus recreation facilities has been described as having the potential to be among the most communal of all college experiences (Bryant, et al., 1995). The authors propose that the rich environment for student interaction characteristic of CRF makes their usage a likely contributor to student success. Braxton and Herschy (2004) propose "communal potential" to be an "important antecedent" of the integration of college students into the social fabric of their institutions. Social integration has been theorized by Tinto (1975, 1993) to be a key contributor to student persistence. This study examined the impact of student use of campus recreation facilities on persistence, as well as GPA and graduation rates at a Research I, public university.

2 Review of the Literature

As a guiding conceptual framework, this study relies on Tinto's theory of student departure. His theory of student departure focused on the academic and social integration of college students into higher education institutions. The theory posited that high levels of integration into the social and academic life of an institution lead to a greater commitment to the institution. Greater commitment and integration, in turn, leads to a greater likelihood that the student would be retained. Social integration means that students are integrated into the social system of the college through such activities as informal peer group associations, semi-formal extracurricular activities, and interaction with faculty and staff within the college. Students who are totally removed from the social fabric of the college community are more likely to leave college than persist (Swail, 2003). In terms of academic integration, grades are regarded as an extrinsic form of reward for the student's participation in college (Tinto, 1975). Many studies have shown GPA to be the single most important factor in predicting retention in college (Astin, 1997; Bennett, 2003; Braxton & Mundy, 2001-2002) Within the study institution, first-term academic indicators have been shown to be important factors in predicting future academic success (Radcliffe, Huesman & Kellogg, 2006a & 2006b).

It has been shown that demographic characteristics and incoming academic ability (e.g. gender, HS GPA, ACT/SAT) are important predictors of a student's ability to persist to graduation (Perkhounkova, Noble & McLaughlin, 2006; Radcliffe et al., 2006a & 2006b; Ishitani & Snider, 2006; Ishitani, 2003). But college persistence is not simply the outcome of individual characteristics or prior experiences. Tinto argued the dropout also needs to be understood as the outcome of a longitudinal process of interactions between the individual and institution in which they are registered (Beil, Reisen, Zea, & Caplan, 1999). Given that it is difficult, if not impossible to change individual characteristics (e.g. SES, gender, race, high school GPA), the research findings related to CRF usage are one of the most important parts of this study for policy makers and higher education administrators to get some insights for establishing practical policy alternatives for enhancing social integration.

Over the past 35 years, several studies have reported evidence of positive relationships between campus facilities (e.g. libraries, labs, residence halls, classrooms, etc.) and a number of variables including college choice, student satisfaction, identification with the institution, and persistence (Astin, 1973; Cain & Reynolds, 2006; Churchill and Iwai, 1981; Mallinckrodt & Sedlacek, 1987; Webster & Sedlacek, 1982). As one would expect, academic facilities were reported by students to be of key importance. Also reported to be influential were residence halls, student unions, and campus recreation facilities.

A number of recent studies have focused on usage of campus recreation facilities as it relates to student learning, development, and academic success (Artinger, Clapham, Meigs, Sampson, & Forrester, 2006; Belch, Gebel, & Mass, 2001; Bryant, et al., 1995; Haines, 2001; Hall, 2006; Lindsey & Sessoms,

2006). Several of these studies specifically examined the relationship between CRF usage and quantifiable measures of student success, including persistence and grade point average.

From surveys of 2,586 students at six colleges and universities, Bryant, et al. (1995) found 30 percent of respondents reporting CRF to be an important factor in both college selection and persistence. The authors concluded that CRF facilitate social integration by creating large numbers of opportunities for members of college communities to interact. Belch, et al. (2001) compared counts of CRF usage of three cohorts of first year students (11,076 total) against institutional records to compare GPA and persistence of CRF users versus non-users. They reported higher GPAs among CRF users and higher rates of persistence among CRF users, except for Asian American students. They attributed the results to the social nature of CRF and the sense of community shared by CRF users. In separate studies of the impact of CRF on students, Haines (2001) and Lindsey and Sessoms (2006) reported responses to the same survey question, "In deciding to continue at (your institution) how important to you was the availability of recreational facilities and programs?" Haines reported that 75 percent of males and 62 percent of females responded "somewhat important" or "very important" to the question. Lindsey and Sessoms reported a combined response, males and females, of 37 percent. Using a qualitative approach consisting of extensive interviews of eight students, Hall (2006) concluded that usage of campus recreation facilities and programs directly influenced student persistence in school. Hall noted feelings of community, social interaction, and affiliation with the institution as likely contributors to persistence.

Although the above studies offer support for the contention that use of CRF promotes social integration and increases the likelihood of persistence, in every instance except Belch, et al. (2001) their methodologies relied on convenience samples, self reports of CRF usage, or student perceptions of the value of CRF. Only Belch, et al. employed actual CRF visit counts to quantify use, but their findings are limited by the methodology employed. The use of simple bivariate descriptive statistics to examine the relationship between CRF usage and persistence is tempting, but student persistence is a complex process and bivariate relationships may well be influenced by underlying "third" factors.

3 Data

This research analyzed data collected by an electronic scan system maintained by the department of recreational sports. Students are required to scan their student identification card when they enter the CRF, which automatically creates a record for each time they access a CRF. These records were used to identify usage and frequency counts for the fall semester of 2001. The data sample consisted of 5,344 students at the study institution who entered as first-time full-time degree-seeking freshmen during the 2001 fall semester. Three academic success outcomes were modeled; first-term GPA, first-year retention and graduation by the end of the fifth-year. The models developed focused on: student background characteristics, demographics, financial need, end of first-term academic performance indicators and social integration indicators based on living on-campus and first-term CRF visits.

A total of n=5,211 students composed the analysis sample (i.e., had complete data) or 97.5% of the original sample. A number of first-term academic progress variables were included in the development of the persistence/graduation models, they included components of GPA, but they also assessed academic progress/difficulty (see Table 1). The ratio of credit hours successfully completed toward a degree to credit hours attempted (sans course withdrawals and remedial courses) was calculated as one measure of academic progress. The number of course withdrawals was collected separately to augment academic progress and possibly reflect academic difficulty. The number of C's and D's earned was also collected to assess academic progress, since these grades count toward the progress to a degree but indicate borderline/marginal performance. In addition, two indicator variables were developed to assess academic difficulty during the first semester; 1) did a student take a mathematics remedial course and 2) did they pass or fail this course. The remainder of the non-academic explanatory variables (with exception of remedial taken) were used in both the GPA and the persistence/graduation models.

In terms of academic background, the average ACT composite/SAT converted score was 24.6. Approximately 98% of all students who enter the study institution have an ACT and/or SAT score. The sample was composed of 49% male students, 0.7% American Indian, 4.0% Black, 1.9% Hispanic, 10.1% Asian, and 1.2% international students. The reference group consisted of white and unknown race/ethnicity students (82.1%).

Tuition-reciprocity or the lack thereof has significant financial implications as-well-as geographic implications for students. In-state students comprise the reference group for tuition residency at 68.5% of the cohort, the remaining groups were from states with tuition reciprocity agreements (26.7%), and non-reciprocity states (4.7%). About 17.1% of the students were Pell eligible this measure was used as a proxy measure of socioeconomic status.

The remaining three variables could all be considered measures of social fit, that is they all have a "communal" factor. Approximately three-fourth of students lived on-campus their first year. Only 3.7% of the students had student-athlete status during some point in their academic career. Approximately 31% of the cohort did not visit an CRF at all their first-semester, the overall average number of visits was 9.9, and of those who visited at least once, the average usage was 14.4.

Of the 5,211 students in the analysis group, the average GPA was 3.02, 85% returned in the fall of the second year, and 57.9% had graduated within 5-years of entrance to the University. For the original data sample, first-term GPA was 3.02, the proportion who persisted/graduated in the same amount of time was 84.5% and 57.9%, respectively.

Table 1. Descriptive Statistics of the Sample (N=5,211)

Variables	Values	Mean	Std. Dev.	Variable Description (type of variable)
GPA	0-4	3.02	0.75	The first fall-term GPA (response variable)
Year 1 Retention	0-1	0.85	0.35	Returned in the second year (response variable)
Year 5 Graduation	0-1	0.58	0.49	If graduated by 5th year (response variable)
Ratio	0-1	0.95	0.16	Ratio of first term credits earned to attempted
W Count	0-4	0.117	0.36	Number of W (course withdrawals) first semester
C's Received	0-5	0.70	0.89	Number of C grades earned first semester
D's Received	0-3	0.123	0.38	Number of D grades earned first semester
Remedial Taken	0-1	0.11	0.31	If math remedial course taken first semester (dummy)
Remedial Failed	0-1	0.01	0.10	If failed remedial course first semester (dummy)
ACT/SAT Score	11-35	24.6	4.14	ACT composite score/SAT converted
Male	0-1	0.49	0.50	If Male (dummy)
American Indian	0-1	0.007	0.08	If American Indian (dummy)
Black	0-1	0.04	0.20	If Black (dummy)
Hispanic	0-1	0.019	0.14	If Hispanic (dummy)
Asian	0-1	0.10	0.30	If Asian (dummy)
International	0-1	0.012	0.11	If international student (dummy)
Reciprocity	0-1	0.267	0.44	If tuition reciprocity state (dummy)
Non-reciprocity	0-1	0.047	0.21	If non-tuition reciprocity state (dummy)
Pell Grant	0-1	0.17	0.38	If Pell grant eligible (dummy)
Off-campus Housing	0-1	0.25	0.43	If living off-campus first term (dummy)
Athlete	0-1	0.04	0.19	If student athlete (dummy)
CRF Count	0-154	9.93	15.36	Total number of visits to a Campus Recreation Facilities (CRF) first semester

4 Methods

Our response variables, first-term grade point average, first-year retention, and five-year graduation, require different approaches. While average grades are continuous, retention and graduation are inherently dichotomous. A student is either retained or is not, graduates or does not. If estimated with ordinary least squares regression, the errors for the model will unavoidably be heteroskedastic, violating the assumptions necessary for significance testing and potentially producing misleading results. A common solution for this problem is to begin by hypothesizing an underlying, or latent, continuous variable representing the likelihood of the outcome of interest (retention or graduation). This squares well with both our experience and the volumes of research on student success. We observe that for some students, continuing and completing their studies comes relatively easily, while for others it is a struggle with an uncertain outcome. Likewise, the literature on student success has identified factors that either assist or impede a student's continuation and completion of their college career. The explanatory variables in the model impact this latent variable through a linear equation, just as with standard regression models. It is then necessary to specify a distribution for the latent variable that constrains it to the range of zero to one. There are numerous possibilities for this "link function" but the most commonly used are the cumulative logistic and cumulative normal distributions (Maddala, 1983). Models using these distributions are known respectively as logit and probit. The differences in the shapes of the distributions are extremely small, so the selection of one over the other seldom influences the results. The logit function was selected to model second-year retention and five-year graduation outcomes. If y_j is the observed value of the latent variable y*, the probability of the non-zero response (in this case, retention or graduation, coded as "1" in the data) can be represented by the following formula, where $x_j\beta$ represents the vector of observed values and estimated coefficients for student j (StataCorp, 2005). The coefficients for the model can be estimated using maximum likelihood estimation techniques.

$$P\left(y_j \neq 0\right) = \frac{\exp(x_j\beta)}{1+\exp\left(x_j\beta\right)}$$

5 Results

The regression model for first-term grade point average accounts for 10.2% of the variation in grades (see Table 2). Academic preparation, as represented by standardized test scores (ACT or converted SAT), is the most clearly significant predictor. Moving from a score of 25 to one of 29 on the ACT increases a student's predicted GPA by 0.20. Among the demographic indicators, gender and identification as American Indian, black, or an international student are also statistically significant. Male students are predicted to have an average GPA 0.18 points lower than an otherwise identical female student. For American Indian students the gap is 0.40, while for black students it is 0.16. International students are predicted to have a first-term GPA that is 0.29 higher than a otherwise identical native students. Both measures of social integration, living on campus and utilizing the recreational sports facilities, are statistically significant contributors to predicted first-term GPA. Living off campus lowers the predicted GPA by 0.07 points, while using the recreational sports facilities one standard deviation more than average increases predicted GPA by 0.11.

Table 2. OLS Regression Model Parameter Estimates of First-Term Grade Point Average

OLS(GPA)	Coef.	Std Error	z	P>|z|	Sig.
ACT/SAT Score	0.0493	0.0028	17.3300	0.0000	***
Remedial Taken	0.0640	0.0352	1.8200	0.0690	
Athlete	0.0325	0.0538	0.6000	0.5450	
Male	-0.1790	0.0200	-8.9300	0.0000	***
American Indian	-0.4041	0.1174	-3.4400	0.0010	**
Asian	-0.0333	0.0360	-0.9300	0.3550	
Black	-0.1566	0.0539	-2.9000	0.0040	**
Hispanic	-0.0947	0.0720	-1.3100	0.1890	
International	0.2857	0.0924	3.0900	0.0020	**
Reciprocity	-0.0228	0.0239	-0.9600	0.3400	
Non-Reciprocity	-0.0194	0.0480	-0.4000	0.6860	
Pell	0.0183	0.0279	0.6600	0.5110	
Off-Campus Housing	-0.0673	0.0256	-2.6300	0.0080	**
CRF Count	0.0046	0.0007	6.9300	0.0000	***
Constant	1.8713	0.0749	24.9800	0.0000	***

* = < .05 ** = < .01 *** = < .001 R^2 = .1019

The logistic regression model for first-year retention correctly predicts the first year retention of 86.3% of the students in the cohort. The model predicts successful retentions with great accuracy, correctly identifying 98.5% of the actually retained students. However, it only identifies 15.7% of the non-retained students accurately. Particularly with highly unbalanced outcomes, correctly classifying outcomes for the rare case is challenging.

Table 3. Logit Model Parameter Estimates of Probability of First-Year Retention

Logit (Retention)	Coef.	Std Error	z	P>|z|	Sig.
Ratio	3.2455	0.2308	14.0600	0.0000	***
C's Received	-0.2587	0.0457	-5.6600	0.0000	***
D's Received	-0.4960	0.0911	-5.4400	0.0000	***
W Count	-0.5445	0.0993	-5.4800	0.0000	***
ACT/SAT Score	0.0141	0.0126	1.1200	0.2620	
Remedial Taken	-0.3652	0.1456	-2.5100	0.0120	*
Remedial Failed	-0.5903	0.3907	-1.5100	0.1310	
Athlete	0.7786	0.2820	2.7600	0.0060	**
Male	0.2792	0.0876	3.1900	0.0010	**
American Indian	-1.1544	0.3699	-3.1200	0.0020	**
Asian	0.2722	0.1534	1.7700	0.0760	
Black	0.3448	0.2188	1.5800	0.1150	
Hispanic	-0.4090	0.2621	-1.5600	0.1190	
International	-0.1668	0.3853	-0.4300	0.6650	
Reciprocity	-0.4105	0.1037	-3.9600	0.0000	***
Non-Reciprocity	-0.8237	0.1837	-4.4800	0.0000	***
Pell	-0.0298	0.1152	-0.2600	0.7960	
Off-Campus Housing	-0.3273	0.1059	-3.0900	0.0020	**
CRF Count	0.0085	0.0034	2.5300	0.0120	**
Constant	-1.1513	0.4065	-2.8300	0.0050	***

*=<.05 **= < .01 *** = < .001 Pseudo R^2 = .1273

Log-likelihood = -1903.14, p(chi-square) < .0001

Since logit coefficients do not have the same direct, substantive interpretation as those from OLS regression, another approach is necessary to evaluate the practical impact of changes to the explanatory variables. One approach is to define a "baseline" case, and compute the predicted value for that case. The baseline represents a "typical" student, setting all dichotomous variables at their base (zero) level, and all continuous variables to the nearest observable value to their mean. The impact of the explanatory variables can then by assessed by changing their values, one at a time, and comparing the probability predicted for that "alternative" case to the baseline. The difference between the two predicted probabilities represents the practical impact of substantively meaningful changes in the explanatory variables.

Table 4. Predicted First-Year Retention Rates for Alterative Values of Each Variable Holding All Other Variables at Baseline Values

Logit(Retention)	Baseline	Alterative	Retention	Change
Ratio	1	0.8	87%	-6%
C's Received	0	1	91%	-2%
D's Received	0	1	88%	-4%
W Count	0	1	88%	-5%
ACT/SAT Score	25	29	93%	0%
Remedial Taken	0	1	90%	-3%
Remedial Failed[1]	0	1	83%	-10%
Athlete	0	1	96%	4%
Male	0	1	94%	2%
American Indian	0	1	80%	-13%
Asian	0	1	94%	2%
Black	0	1	95%	2%
Hispanic	0	1	89%	-3%
International	0	1	91%	-1%
Reciprocity	0	1	89%	-3%
Non-Reciprocity	0	1	85%	-8%
Pell	0	1	92%	0%
Off-Campus Housing	0	1	90%	-3%
CRF Count	10	25	93%	1%
		Baseline:	**93%**	**0%**
		Averages:	**88%**	**0%**
		Actual:	**85%**	**0%**

[1] Alternative for Remedial Failed also includes Remedial Taken set to 1.

Once first-term academic performance is taken into account, standardized test scores are not a statistically significant predictor of first-year retention. Failing to successfully complete a course, receiving a grade of C or D, or withdrawing from a course after the second week of class reduce the estimated likelihood of being retained into a student's second year. Compared to the baseline case, a student who fails to successfully complete one course their first term is 6% less likely to be retained. Each C grade earned lowers the likelihood of retention by 2%, each D lowers it by 4%, and each withdrawal lowers it by 5%. At a less exacting level of significance (.05), taking a remedial course also lowers the probability of retention by 3%. Failing that course would be estimated to lower that probability considerably further, but the relevant coefficient is not statistically significant and therefore should not be viewed as a reliable estimate. The number of cases involved is relatively small, and therefore the estimate is not likely to be as precise.

Only a few demographic indicators reach statistical significance. Student-athletes are 4% more likely to be retained than otherwise similar non-athletes. Male students are also more likely to be retained, at a rate 2% higher than otherwise similar students. The only racial/ethnic category that appears as a statistically significant predictor is identification as American Indian, and here the difference is substantial. Compared to an otherwise similar student, American Indian students are predicted to be retained at a rate that is 13% lower.

Measures of geography and social integration were also significant. Compared to otherwise similar in-state students, students from neighboring states with tuition reciprocity arrangements were 3% less likely to be retained, while those from further away were 8% less likely to be retained. Living off-campus reduced a student's predicted probability of retention by 3%. By contrast, visiting the campus recreation facilities one standard deviation more than average increased a student's predicted probability of retention by 1%.

The logit model of five-year student success (graduation after five years) correctly predicts the outcomes of 70% of the cohort. As with the retention model, it is more accurate for the more common, successful case, correctly identifying 85% of those who actually graduated after five years. The five-year model does considerably better than the first-year retention model, however, at identifying students who were not successful, correctly identifying 50% of those who were no longer enrolled after five years.

Table 5. Logit Model Parameter Estimates of Probability of Five-Year Student Success

Logit(Success)	Coef.	Std Error	z	P>|z|	Sig.
Ratio	3.5631	0.3193	11.1600	0.0000	***
C's Received	-0.3814	0.0355	-10.7300	0.0000	***
D's Received	-0.6874	0.0954	-7.2100	0.0000	***
W Count	-0.7156	0.0946	-7.5700	0.0000	***
ACT/SAT Score	0.0468	0.0094	4.9800	0.0000	***
Remedial Taken	-0.9965	0.1138	-8.7500	0.0000	***
Remedial Failed	-0.8449	1.0396	-0.8100	0.4160	
Athlete	0.1179	0.1727	0.6800	0.4950	
Male	-0.0682	0.0640	-1.0700	0.2860	
American Indian	-0.8626	0.4184	-2.0600	0.0390	*
Asian	-0.0131	0.1152	-0.1100	0.9090	
Black	-0.2014	0.1818	-1.1100	0.2680	
Hispanic	0.1729	0.2312	0.7500	0.4550	
International	0.0123	0.2875	0.0400	0.9660	
Reciprocity	-0.2254	0.0752	-3.0000	0.0030	**
Non-Reciprocity	-0.4144	0.1514	-2.7400	0.0060	**
Pell	-0.2921	0.0885	-3.3000	0.0010	**
Off-Campus Housing	-0.3393	0.0807	-4.2100	0.0000	***
CRF Count	0.0073	0.0022	3.3700	0.0010	**
Constant	-3.5027	0.4084	-8.5800	0.0000	***

* = < .05 ** = < .01 *** = < .001 Pseudo R^2 = .1482

Log-likelihood = -3020.67, p(chi-square) < .0001

Six of the seven academic preparation and performance measures are statistically significant predictors of five-year student success. Failing to complete a course in the first term reduces the predicted likelihood of success after five years by 14%, compared to the baseline. Each grade of C earned reduces the probability of success by 7%, while each grade of D or withdrawal reduces it by 14%. A one standard deviation increase in ACT composite score (or converted SAT) increases the predicted probability of success by 3%. Taking a remedial mathematics course reduces the likelihood of success after five years

by 21%. As with the retention model, the estimated coefficient for failing a remedial course is substantial, but because the standard error of the estimate is also large, the impact is not statistically significant and therefore no conclusions can be safely drawn about its true impact.

Table 6. Predicted Five-Year Student Success Rates for Alternative Values of Each Variable Holding All Other Variables at Baseline Values

Logit(Success)	Baseline	Alterative	Graduation	Change
Ratio	1	0.8	64%	-14%
C's Received	0	1	72%	-7%
D's Received	0	1	65%	-14%
W Count	0	1	64%	-14%
ACT/SAT Score	25	29	82%	3%
Remedial Taken	0	1	58%	-21%
Remedial Failed[1]	0	1	37%	-42%
Athlete	0	1	81%	2%
Male	0	1	77%	-1%
American Indian	0	1	61%	-18%
Asian	0	1	78%	0%
Black	0	1	75%	-4%
Hispanic	0	1	81%	3%
International	0	1	79%	0%
Reciprocity	0	1	75%	-4%
Non-Reciprocity	0	1	71%	-8%
Pell	0	1	73%	-5%
Off-Campus Housing	0	1	72%	-6%
CRF Count	10	25	80%	2%
		Baseline:	**79%**	**0%**
		Averages:	**57%**	**0%**
		Actual:	**58%**	**0%**

[1] Alternative for Remedial Failed also includes Remedial Taken set to 1.

Of the demographic variables, only identification as an American Indian is a statistically significant predictor, and that is only at a more generous 0.05 alpha level. The practical significance of this indicator, however, is substantial, as students who identify as American Indians are 18% less likely to be successful after five years than otherwise similar students. This is clearly an issue that warrants further attention at the study institution. While they were statistically significant predictors of first-year retention, neither gender nor athletic-status, were statistically significant in the five-year student success model.

The results for geographic and social integration measures were similar to those in the first-year retention model. Students from neighboring states with tuition reciprocity agreements were 4% less likely to be successful after five years than otherwise similar in-state students, while those from more distant places were 8% less likely to be successful. Financial need also appears as a statistically significant predictor in the five-year success model, with students who were eligible for Pell grants in their first term predicted to be 6% less likely to succeed than comparable students with more financial resources. Finally, living off campus reduced the expected likelihood of success by 6%, while using the campus recreational facilities one standard deviation more than average increased the likelihood of success by 2%.

6 Limitations

A limitation of the current study and any observational-type study is self-selection bias. That is, there may be unobserved characteristics of those individuals who use CRF vs. those who do not that may affect the outcome of interest. One factor that may have influenced the outcome of interest is the distance to a CRF from a student's residence. Survey data collect over the past 15 years at the study institution has consistently shown the further students live from the institution's CRFs the less likely they are to use the CRFs. In the current study, the decision to focus on new freshmen, the vast majority of who reside on-campus during their first semester, may have limited this problem. This may become more of a factor, however, when the study is expanded to examine CRF usage over the academic career path of students (e.g. as they move off-campus). In the future, residence address and usage patterns should be analyzed to alleviate these concerns. A second limitation may be the lack of generalizability of results across various postsecondary institutions. The research was by necessity focused on a single cohort from a single large public institution, though the findings were in-line with previous research found at other institutions and the study institution which may validate the application of the findings.

7 Discussion

The findings of this study confirm what has been found in previous retention/graduation studies conducted at the institution of study 1) first-term academic performance plays a critical role in the future academic success of all new freshmen students at the University 2) living in residence halls first semester is positively related to future academic success 3) non-resident students are less likely to be successful than their in-state counterparts and 4) Race/ethnicity tends not to play a major role after controlling for these other factors. The uniqueness of this study is that for an entire cohort of new entering freshmen the authors have been able to demonstrate that actual CRF usage, while simultaneously controlling for other important academic, financial and social fit factors, does have a positive association with academic success. It appears that the answer to the research question posed by this study is yes, usage of CRF does make a difference in the academic performance of college students.

The authors hypothesized that there is a social factor associated with using CRF that promotes social integration of the individual with the campus community. The finding of a positive association with usage of CRF and future academic success is strong evidence for continuing to pursue this effort. To this end, continuing to increase the presence and promoting the usage of on-campus recreational facilities should be a continuing goal. In addition, the relationship of other academic/student group activities to academic success, such as Greek life, freshmen seminars, first year orientation programs, and living learning communities, would be worth exploring as well.

Colleges and universities may be wise to implement strategies to raise awareness among students and faculty alike of the link between social integration and student academic success. Academic advisors, residence hall advisors, counselors, faculty, and any other staff who support student success should vigorously encourage usage of CRF, as well as involvement in other campus activities that have a significant communal factor.

Furthermore, the impact of CRF usage on student success and evidence linking proximity of student housing with rates of CRF usage should inform institutional master planning of facilities. At every opportunity, colleges and universities should build student housing and CRF in close proximity. For institutions with very large campuses, multiple smaller CRFs strategically sited around campus may yield higher rates of CRF usage than a solitary large campus recreation facility.

8 Errata

In the version of this paper presented at the CSRDE National Symposium in September, 2007, the r-square value for the OLS regression model for first-term GPA was incorrectly reported as .7087. The correct value, as reported above, is .1019.

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