Performance-Funding Indicators for Two-Year Postsecondary Institutions: Developing an Input Model for Equitable Funding

Monograph 98-7

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(I would like to acknowledge the financial support of the American Association of Community Colleges for this research. However, all conclusions are my own.)
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Performance-Funding Indicators for Two-Year Postsecondary Institutions: Developing an Input Model for Equitable Funding

Introduction

The purpose of this study is to develop a predictive model for community college performance assessment to be used for performance-based funding and budgeting. In response to state policymakers' interest in the accountability and performance of higher education institutions, many community colleges have found that performance-assessment policies of the mid-1990s inadequately reward their contribution to higher education. Performance-based funding (PBF) and performance-based budgeting (PBB)—linking funds to institutional performance on quantitative or qualitative criteria—have created debate in two areas: the selection of valid and reliable performance indicators (PIs) and the interpretation and comparison of such measures of success across institutions and systems.

Institutional performance, as most often defined in the performance-funding arena, relies on easily measured graduation rates and transfer rates, which are often inaccurate indicators of community college performance. Although state-level PIs show much diversity, transfer and graduation rates appear as indicators in nearly all state programs.¹ "Most people regard success in graduating students as an institution's primary accountability indicator."²

For example, Welleri and Seybert point out that "[c]oncern has been raised about the success rate of students entering community colleges, as well as the ability of the colleges to move students on to the bachelor's degree."³ Some believe that this concern is fueled by a general misunderstanding of what community colleges do and the profile of
the students it serves. This misunderstanding has created what some have referred to as a 
crisis in credibility for community colleges. Among other things, performance 
assessment policies have been responses to the calls of these critics who claim 
community colleges are not producing the student outcomes expected by the general 
public.

**Outcome indicators**

Traditionally, public colleges and universities have been funded through formulas 
that rely on "current costs, student enrollments, and inflationary increases." For 
example, funding for community colleges often depends on enrollment figures—such as 
full-time equivalent student measurements (FTEs)—to dictate the amount of state funds 
allocated per institution. Burke calls these funding approaches "input" methods of 
distribution because they focus on variables that are, for the most part, out of the control 
of the institution.⁵

Although input, or resource, indicators received much attention through the 
1970's, "the 1980's saw a groundswell of interest in the other side of the ledger: 
outcomes."⁶ Serban agrees that today's performance indicators "reflect a shift of 
performance funding from the resources needed by higher education to the results 
produced."⁷

While varying forms of performance assessment techniques exist around the 
country, only outcomes assessments have been widely adopted by state and local 
educators. Partly because of the ease with which this data can be collected and 
interpreted and most likely because of the low cost of collecting this data, outcomes 
measures continue to gain popularity.
In many ways, Tennessee led the movement for reporting outcome information about postsecondary institutions. "Following the advent of performance funding in TN, which specified that institutions would gather detailed [outcome] information …three-quarters of the states adopted polices that caused public colleges and universities to collect and report some kind of outcome information." Bowen adds that this system, which holds colleges and universities accountable, requires that "institutions identify and measure the outcomes or products or effects of higher education and then compare the results with the costs."  

Although the number of performance indicators used by states ranges from thirty-seven in South Carolina to five in Minnesota, a survey of performance indicators conducted by SHEEO in 1997 indicated that the two most common indicators of performance used by states are graduation and transfer rates. Even though graduation and transfer rates reflect only one component of most assessment models—individual student’s success—these seem to be the most heavily emphasized of the possible assessment indicators; they are used in 32 and 25 states respectively. SHEEO reports that graduation rates are most commonly used for consumer information followed by degrees awarded, admission standards, and transfer rates.

**Challenges for community colleges**

The use of graduation and transfer rates as indicators of institutional effectiveness has not gone without criticism, however. While today's performance-funding indicators rely on simple graduation and transfer rates, Astin and others agree that “a simple retention ‘rate’ tells us a lot more about who an institution admits than about how effective its retention practices are.” The use of retention rates as an indicator of
educational effectiveness... makes it necessary to take into account differences in entering student characteristics (inputs) when comparing the retention rates (outputs) of colleges and universities.\textsuperscript{13}

"Demonstrating institutional effectiveness presents a special set of problems for community colleges."\textsuperscript{14} One reason for the difficulty community colleges face in demonstrating their effectiveness is that performance indicators are based on traditional assumptions about college students but "[f]ewer than one in six of all current undergraduates fits the traditional stereotype of the American college student."\textsuperscript{15} Nowhere is the disparity between the assumptions underlying performance indicators and the actual profile of college students more pronounced than in the community college sector.\textsuperscript{16} Community college students are "much more diverse in age, background, employment status, preparation, and educational objectives than their four-year-college counterparts."\textsuperscript{17} "[M]easures of institutional effectiveness common to four-year colleges and universities...are in most cases not applicable to community colleges."\textsuperscript{18}

In Walleri and Seybert's analysis of community college assessment strategies, they stress the effort these institutions have made to "demonstrate institutional effectiveness, including a strong outcomes assessment component."\textsuperscript{19} They believe other important components of an assessment strategy should include "systematic program reviews, follow-up surveys of former vocational students and their employers, follow-up surveys and senior institution transcript analyses of former transfer students, periodic evaluation surveys of college offices and services, and analyses of course retention and attrition rates and grading patterns."\textsuperscript{20}
Despite the complications with using traditional outcome measures to assess community college performance, however, most states continue to use the same measures for all postsecondary campuses—four-year and two-year. With the exception of California, Florida, Missouri, Colorado, and Ohio, very few states have developed performance indicators for use specifically in the community college sector.\textsuperscript{21} It should be noted, however, that while these states have developed community college specific indicators, Ohio’s performance funding only applies to two-year colleges in that state—four-year colleges are not performance funded.\textsuperscript{22}

In addition, while the five states noted above have developed community college-specific indicators, the extent of their development and use varies. For example, Burke and Serban report that while Florida has completely separate measures for its community and four-year college sectors, several states provide only one alternate item for use in conjunction with a common set for all higher education institutions in the state.\textsuperscript{23} Missouri, for example, is one of the only states to have developed a specific set of indicators for the community college sector which are used in conjunction with a set of indicators common to all higher education institutions.

A good example of the development of community college performance-based budgeting and funding indicators comes from California. A state budget signed by Governor Pete Wilson in August of 1998 earmarked $100 million for a system-wide community college accountability program—"Partnership for Excellence." This program includes about $300 million in extra funds for California's 106 community colleges and focuses on performance outcomes which include: 1) transfer, 2) degrees and certificates, 3) successful course completion, 4) workforce development, and 5) basic skills
improvement. Notice that two of the five California community college indicators—transfer and graduation rates—are among the most commonly used in all states.

Colorado, in recognizing that community college indicators of success may be different from those appropriate to four-year colleges and universities, also adopted separate performance indicators for their 2-year sector. Borrowing extensively from the American Association of Community College's 1994 *Core Indicators of Effectiveness*, Colorado became one of only a few states to adopt separate indicators.

Although many states do not have separate indicators for community colleges, many have adopted priorities that are succinct with the mission of community colleges. In 1998, "the Louisiana legislature approved a constitutional amendment that would create a 50-college system aimed at building the state's workforce." This legislation would effectively make workforce development its top priority and possibly include separate performance-based financing formulas for two-year colleges. The community college-specific formulas would emphasize measures such as job placement and salary rates of graduates and the responsiveness of colleges to industry priorities.

In 1991, Florida began requiring the state's 28 community colleges to report annual graduation rates, student progression, minority retention, placement rates, and minority enrollments. By 1994 Florida had revamped its program of institutional evaluation by using the state community college system's mission statement as a framework.

Although there is a relative void in the literature pertaining to the effectiveness of community college performance funding and budgeting, the few researchers in this area
agree on the selection of appropriate performance indicators for two-year colleges.

According to Borden and Banta, for example, "in the area of two-year college transfer effectiveness...appropriate measures of performance from the institutional perspective [are] transfer rates and the performance of former students at senior institutions."  

**Selection of performance indicators**

Performance funding has been called "one of the most controversial policies of the 1990's," perhaps because of the difficult selection of appropriate performance indicators.  In most cases, performance-based funding and budgeting are not at the heart of the controversy, but rather the performance indicators used and their interpretations have fueled the debate.

Many problems with this form of funding are cited in the literature. Burke and Serban, among others, report that the "selection of performance indicators and success standards, and protection of mission diversity are seen as the major difficulties associated with performance funding." Hawkins believes that "less effective indicators are those which are not easily translated into measurable terms, those which are based upon inaccurate data, and those which are taken out of proper context." Still others see the uncritical use of performance indicators as a major barrier to their utility. Ball and Wilkenson, for example, warn that performance indicators should not be a replacement for good judgement. Sizer agrees that "... reliance on performance indicators in the absence of good judgement is extremely dangerous."

The following is a list of commonly sited problems with developing and using performance indicators to judge institutional effectiveness.
Clarity of purpose. "It should be clear with PIs which direction one would like to see the values go, either up, down, or remaining level so as to indicate the desired level of performance." Dr. Robert E. Alexander, chairman of the South Carolina Council of Public College and University Presidents believes that "institutions [are] at the mercy of legislative leaders who know little about higher education and do not appreciate how difficult it is to define, much less measure, what a 'good' public college does."

Subjective development. "Whoever determines the performance indicators determines the activities and direction of the system, institution, or program..." Dr. Robert E. Alexander, chairman of the South Carolina Council of Public College and University Presidents believes that "institutions [are] at the mercy of legislative leaders who know little about higher education and do not appreciate how difficult it is to define, much less measure, what a 'good' public college does."

Unethical use. Performance indicators may also become incentives for unethical and counterproductive actions. For example, "the Student-Right-to-Know Act and National Collegiate Athletic Association (NCAA) reporting requirements have focused the attention of four-year institutions on six-year graduation rates among cohorts of entering freshmen." If colleges and universities take this indicator seriously, they may consider changing their admissions requirements and programs simply to improve their level of performance on this particular indicator, despite what it might do to other areas of non-measured performance. In short, institutions may "lower the bar," according to SHEEO, to ensure achievement of goals.

Oversimplification. There is also a danger of oversimplification or taking a reductionist approach— reducing one's goals to what one can measure. Ruppert believes that indicators should "reflect goals and purposes" and not just be collected "because the
data are available."\textsuperscript{44} Despite this danger of oversimplification, however, much of the literature agrees that the PI approach is appropriate because the "higher education process is one of transforming inputs into outputs having a higher value."\textsuperscript{45}

**Maintenance of mission.** "Many institutions are afraid that they will immediately begin losing millions of dollars to a system that is biased against them or fails to take into account their unique character and needs."\textsuperscript{46} This could present a problem for institutions whose missions are more oriented toward serving part-time, older, or working students that have been characterized as the higher education's "new majority."\textsuperscript{47} NCRP agrees that finding measures that adequately reflect differences in institutional mission is difficult.\textsuperscript{48}

**Hard to measure.** H. Bowen notes that "outcomes are extremely hard to isolate and measure"\textsuperscript{49} and NCRP believes that "addressing the complexities of measuring quality, particularly student learning"\textsuperscript{50} poses a particular problem for postsecondary use of PBF&B. Astin concurs: "...many academics believe that the most important outcomes of education are simply not measurable."\textsuperscript{51}

**Selection of measures.** There is little agreement about what outcomes are important or how they should be measured. "The time and effort involved in designing the measures, collecting the relevant data, and analyzing the results are so great as to discourage most investigators from tackling the problem."\textsuperscript{52} For example, Ruppert points out that many performance indicators do not take into account what the student wants or expects from higher education.\textsuperscript{53} Despite Ruppert's emphasis on the importance of knowing what students think and want,\textsuperscript{54} student involvement in the development of performance indicators at the state level has been scarce.
**Instability.** NCRP reports that the maintenance of institutional autonomy with state-level control and the adjustment to annual changes in legislative priorities both present unique challenges. Serban echoes these concerns in "The Performance Funding Wave: Views of State Policymakers and Campus Leaders."^{55}

**A norm-referenced approach**

A feasible approach to solving some of the problems with the interpretation of absolute performance indicators is the value-added (or input) approach. The input approach, as used by Alexander Astin, Thomas G. Mortenson, and Jill Johnes & Jim Taylor, establishes an appropriate reference norm by acknowledging the diverse backgrounds and intents of first-time college freshmen at four-year and community colleges. Using a regression equation with student characteristics as the independent variables, a model can be constructed which will facilitate the prediction of graduation and transfer rates at community colleges. In this way, the use of statistical regression analysis can enable a college with relatively low graduation and transfer rates that admits students who are not well-prepared for college-level studies to be viewed as performing better than a college with a significantly higher graduation and transfer rate that has more selective admissions standards.

**Prior research**

The researchers having contributed the most to the literature on the prediction of four-year college student success are Alexander Astin and Vincent Tinto. For decades, Astin and Tinto studied the student characteristics most predictive of college persistence and success in the four-year college sector. Unfortunately, most of the predictors discovered by Astin and Tinto are not applicable to the community college sector because
they focus on aspects of student life not common among community colleges and their students.  

More recently, research had been conducted which utilizes predictive models of student persistence and graduation as a means of assessing the performance of four-year colleges. Commenting on the interpretation of absolute indicators of institutional performance such as graduation and transfer rates, Astin believes that “such quality judgements are meaningless without ‘input’ data on the students when they first enroll.” He argues that “‘outcome’ scores [such as graduation and transfer rates] are probably telling us much more about the population recruited by the school than they are about the effectiveness of the school’s academic program.”

Based on the findings of Astin and Tinto, Thomas G. Mortenson, Jill Johnes & Jim Taylor have developed a means of institutional comparison by creating models that hold constant those variables largely out of individual institutional control. These researchers found that, by holding constant those student variables which most strongly predict persistence and graduation rates at four-year colleges, we can more accurately assess and compare institutional performance.

**Sample and variables**

Utilizing the restricted-use Beginning Postsecondary Students longitudinal dataset (BPS: 1990-1994), this researcher had access to individual student data on the 704 two-year college students in the BPS sample. Participants in the entire BPS: 90/94 study were 10,624 first-time beginning students during the academic year 1989-90 and were followed from the 1990 National Postsecondary Student Aid Study (NPSAS:90) sample. The target population for the BPS sample was all students who entered postsecondary
education for the first time in academic year 1989-90. The NPSAS: 90 design, the first step of the BPS study, is a stratified multistage sampling design.

What makes this sample different from those used in past national longitudinal studies is that the target population includes all first time postsecondary students, regardless of when they completed high school. Because of this difference, the BPS sample is more representative of beginning postsecondary students in general and is thus more likely to include a significant number of “nontraditional” students.

Because of the stratified sampling techniques employed, the two-year college sub-sample (n=704) is a representative sample. The two-year college portion of the sample can thus be analyzed separately from the complete sample of 10,624 students in the BPS: 90/92 working sample.

Computer-Aided Telephone Interview (CATI) methods were utilized for the BPS: 90/94 data collection and resulted in an unweighted response rate of 91.4 percent among those students known to be eligible for the study. For the two-year college segment of this sample the unweighted response rates are as follows: public 90 percent; private, not-for-profit 89.4 percent; private, for-profit 88.6 percent.

The following is a list of the variables used in this researcher’s logistic regression analysis. 59

**Number of risk factors (RISK).** This is the number of persistence risk factors an individual student possessed. Risk factors included delayed enrollment, no high school diploma, part-time attendance, financial independence, having children, being a single parent, and working full time while enrolled.
Index of academic integration in 1989-90 (ACINT). This average academic integration at the NPSAS institution examines whether the student attended career-related lectures, participated in study groups with other students, talked about academic matters with faculty or met an advisor concerning academic plans. The mean of the students’ responses across these questions was calculated. Each question used in the calculation included 4 possible responses: 1= never, 2= once, 3= sometimes, 4= often. These were then recoded so that low= student’s average academic integration was less than or equal to 1.75; moderate= student’s average academic integration was greater than 1.75 but less than or equal to 2.75; high= student’s average academic integration was greater than 2.75.

Index of social integration (SOCINT). The average social integration at the NPSAS institution examines whether the student had contact with faculty outside of class, went places with friends from school, participated in student assistance centers/programs, or participated in school clubs. The mean of the students’ responses across these questions was calculated. Each question used in the calculation included 4 possible responses: 1= never, 2= once, 3= sometimes, 4= often. Low= student’s average social integration was less than or equal to 1.75; moderate= student’s average social integration was greater than 1.75 but less than or equal to 2.75; high= student’s average social integration was greater than 2.75.

Worked full time while enrolled (FTWORK). The responses to this question were: did not work full time while enrolled or worked full time while enrolled. Students who considered their primary role in postsecondary education as employees were automatically considered to work full time. The remaining students were categorized as
working full time while enrolled if the average number of hours per week they worked while enrolled was 34 or more.

**Educational aspirations in 1989-90 (ASPIRE).** This variable measured the highest level of education that the student expected to complete and was recoded from the student’s reported educational aspirations in the NPSAS survey. The categories for the student responses were: trade school, 2-year degree, bachelor’s degree, and advanced degree. It is assumed by this researcher that a student not interested in the attainment of a degree or certificate would respond “none of the above.”

**Age in 1994 (AGE).** This is the student’s age as of spring 1994 derived by adding 5 years to the age of the students when they began postsecondary education. The categories were: 24 years or younger, 25-29 years old, 30-34 years old, and 35 years or older.

**Parental education (PARED).** Parental level of education is the highest level of education completed by either parent. Categories were: less than high school; high school graduate; some postsecondary education; and bachelor’s degree or higher.

**Race (RACE).** This variable was recoded to indicate whether the student was white or nonwhite.

**Religion (RELIGION).** Because past research indicated that both Catholic and Jewish religions are positively correlated with success, this variable was recoded to indicate whether the student was Catholic or Jewish— or not.

**Number of dependants (NUMDEP).** This variable is the number of dependents the student claimed on his/her tax returns in 1989-90.
Ability index high (ABILITYH). This variable is an indicator of a student’s perception of his past academic performance relative to other students.

Ability index low (ABILITYL). This variable is an indicator of a student’s perception of his past academic performance relative to other students.

Moderator variables

Level and control of institution (LEVELCON). Level and control of the referent institution is an aggregate of two variables—level of institution and control of institution. Of interest to this researcher is the group coded ‘4’—public and private two-year institutions. A public institution is defined as “a postsecondary educational institution operated by publicly elected or appointed school officials in which the program and activities are under the control of these officials and that is supported primarily by public funds.” A private, not-for-profit institution is “a postsecondary educational institution that is controlled by an independent governing board and incorporated under Section 501 (c)(3) of the Internal Revenue Code.” A two year institution is “an institution whose program of study results in an award or degree below the baccalaureate level, and is at least 2 years but less than 4 years in duration. These institutions include many community and junior colleges.”

Institution I.D. (INSTID). Each institution was assigned a unique identifier. This variable reflects those assignments.

Dependant variable

Outcome (OUTCOME). The student outcome of interest is his or her graduation and/or transfer from a two-year institution within the five years from 1990 to 1994 in which the BPS: 90/94 study was conducted. Because this variable is a record of whether
the student graduated and/or transferred from *any* postsecondary institution, not necessarily his/her beginning institution, this outcome variable measures student graduation and transfer in its broadest sense.

**Reencoding the data**

After selecting the variables to be included in the regression analysis, recoding of some variables was necessary. For instance, the student outcome variable was recoded as a dichotomous dummy variable to reflect two categories: “attain/transfer” (yes=1 or no=0).

The variables which required recoding to account for missing data were: the two ability index variables, the social and academic integration variables, age, number of dependents, parents’ education level, and the risk variable. All “system missing” data were replaced with that variable’s mean to avoid the exclusion of cases. In this way, the 2-year college sample size remained relatively large (n=704).

**Logistic regression analysis**

For this data, which includes a dichotomous dependent variable, logistic regression analysis was used to predict whether a student would graduate and/or transfer from a two-year college within the five years from 1990 to 1994. This analysis also helped to identify the variables most predictive of these events. Instead of using multiple linear regression analysis for data, logistic regression was more appropriate because “the assumptions necessary for hypothesis testing in regression analysis are necessarily violated.” Predicted values derived from a multiple regression analysis cannot be interpreted as probabilities because they are not “constrained to fall in the interval between 0 and 1.” In turn, since logistic regression analysis requires “far fewer
assumptions than discriminant and multiple linear regression analysis,\textsuperscript{65} logistic regression will perform better than the aforementioned analysis techniques.

After the application of a filter for the two-year college students in the sample (LEVELCON= 4), three types of logistic regression were run. Using SPSS, a forward step-wise WALD logistic regression analysis was run at the .05 level of significance.

**Results**

With 30 rejected cases due to missing data, the number of cases included in the analysis was 674. The resulting logistic regression equation is:

\begin{align*}
\text{Prob (graduation/transfer)} &= 1 / (1 + e^{-Z}) \\
\text{Where } Z &= -.6916 + .4173(\text{acint}) - .2901(\text{risk}) \\
\text{Where } e &= 2.718 \text{ (the base of the natural logarithm)}
\end{align*}

The maximum-likelihood method, which is analogous to the least-squares method in multiple linear regression analysis, results in the inclusion of coefficients that make the observed results most “likely” in the model. In general, if the estimated probability is less than .5 the event is predicted not to occur.

The exclusion of some variables was necessary since, as is the case with multiple linear regression, the contribution of individual variables in logistic regression is difficult to determine. It was clear that the component variables of the RISK variable needed to be excluded from the analysis because they were highly correlated with the RISK variable.

The two variables shown to be most predictive of student graduation and/or transfer were the risk (RISK) and academic integration (ACINT) variables.
**Wald statistic.** The Wald statistic— the square of the ratio of the coefficient to its standard error— resulted in 15.8686 and 34.8712 for ACINT and RISK respectively. The significance levels for the two Wald statistics were .0001 and .0000 for ACINT and RISK respectively. Using a significance level of 0.05, both ACINT and RISK were significantly different from zero.

**R-values.** The R values for ACINT and RISK were .1224 and -.1884 respectively, reflecting a relatively small partial contribution to the model.

The log of the odds, or logit, was:

\[
\text{Logit} = \log \left( \frac{\text{Prob (event)}}{\text{Prob (no event)}} \right) = \beta + \beta x + \ldots + \beta x
\]

Since the coefficient of RISK was -.2901, when RISK changes from 0 to 1 and the values of the other independent variables remain the same, the log odds of the outcome decrease by .2901 (because it has a negative coefficient).

**Odds ratios.** The odds ratio, which is the change in odds for a case when the value of that variable increases by one, were 1.5178 for ACINT and .7482 for RISK. In other words, when ACINT increases from 0 to 1, the odds of a student graduating and/or transferring are increased by a factor of 1.5178. For RISK, the odds will decrease by .7482 as RISK changes from 0 to 1. This means, for example, that as a two-year college student's number of risk factors increases from 0 to 1, the odds of him graduating and/or transferring decreases by a factor of .7482.
**Goodness of fit**

The classification table. This is a comparison of the predictions to the observed outcomes. This table compares the observed and predicted group memberships when cases with the predicted probability of .5 or greater are classified as graduating or transferring within 5 years.

According to the classification table, 258 students who did not graduate or transfer were correctly predicted by the model not to graduate or transfer. Also, 116 students who did graduate were incorrectly predicted not to graduate or transfer. In reference to the input model for performance funding, these are the students for whom the community college should be rewarded. The off-diagonal tells you how many cases were incorrectly classified.

**Percent correct.** 68.98% of those students who did not graduate and/or transfer from a two-year college in the BPS study were correctly predicted not to graduate and/or transfer. Of those who did graduate, only 52.67% were correctly classified. Overall, 61.72% of the students were correctly classified.

**Log likelihood.** Another way to assess the model’s goodness of fit is to examine how “likely” the sample results actually are, given the parameter estimates. The $-2 \log$ likelihood in the model with only the constant was 926.22137. Since small log likelihood values indicate a good model with high likelihood of the observed results, these results indicate a poor fit. Once RISK and ACINT were added to the model, however, the log likelihood improved to 862.964, indicating the increased predictive power of a model using the RISK and ACINT variables. According to the Model Chi-
Square, the improvement of the log likelihood with the addition of these two variables resulted in a 63.257 increase in \(-2\text{LL}\).

**Nagelkerke's R\(^2\)**. An estimation of the R\(^2\) used for multiple linear regression, this model's Nagelkerke's R\(^2\) indicated that only about 12% of the variation in the outcome variable is explained by the logistic regression model.

**Conclusions**

This model, which utilized variables found in prior research to be predictive of four-year college student academic behavior, is clearly not a good model for the prediction of two-year college student graduation and transfer rates. A better model must be developed which is able to explain a larger proportion of the variation in graduation and transfer rates. Although the classification table indicated that 61.72% of the sample's outcomes were correctly predicted, the Nagelkerke's R\(^2\) was less encouraging. Since (according the Nagelkerke's R\(^2\)) only 12% of the variation in the outcome could be explained using the current model, the next step should be to include variables that can do a better job of predicting two-year college student graduation and transfer likelihood.

Improvement of the model may include the addition of other BPS variables in the logistic regression analysis. Specifically, by testing the components of the constructed RISK variable but excluding the actual RISK variable, may result in a model that better fits the data. Also, since the variables used in this analysis were selected based on prior research conducted about four-year colleges and students, it is necessary to explore variables not yet used in this type of analysis.
Another tactic for improving the prediction of graduation and transfer rates may be to use institutional data obtained from American College Testing (ACT). The data collected by ACT has been utilized for this purpose by others in the field and may result in a better fit between the data and the model. The anticipated result will be a more accurate prediction of the outcome of concern.

**Future research**

Once a model is developed that can adequately predict the graduation and transfer behavior of 2-year college students, the next step will be to apply institutional data to the new model. This application will result in the prediction of student graduation and transfer behavior at various institutions that can then be compared to actual graduation and transfer rates at those same institutions. Because the necessary institutional data for community colleges has been found in Florida, this state is a good candidate for the analyses.

Finally, conducting case studies of several institutions with residuals that are particularly positive may help ferret out some of the reasons these programs are successful with the student material they receive. Defining and measuring what happens from the time a student enters postsecondary education to the time he or she graduates or transfers is an elusive task, at best. However, through the derivation of a model from logistic regression analysis, the student input variables which carry the most weight in predicting who will graduate and/or transfer from community colleges can illuminate how well colleges are performing in relation to specific student population characteristics. This value-added model can provide a cost effective way to
accommodate and reward a substantially expanded range of learners and student goals while still making funding dependent on demonstrated outcomes.66

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1 Joseph C. Burke & Andrea M. Serban, "Performance Funding: Fad or Emerging Trend?," Community College Journal (Dec/Jan 1997-98) 27.

2 Paper presented by the Joint Commission on Accountability Reporting (JCAR) convention.

3 ibid.


5 Burke, "Performance Budgeting and Funding."

6 Borden and Banta, 99.


8 H. Bowen, p.xi.

9 H. Bowen, p. xi.


11 State Higher Education Executive Officers, Preliminary Results from the SHEEO State Survey on Performance Measures (July 1998), page unnumbered.

Borden, 16.


Arthur Levine & Jeanette S. Cureton, "What We Know About Today's College Students," About Campus (March/April 1998) 4-9. This information is based on national surveys conducted between 1993 and 1997.

For example, Levine and Cureton report nearly one-third of all undergraduate students at all higher education institutions require remediation in at least one area, a growing trend that is strongly correlated with the time in which a program can be completed.

R. Dan Walleri and Jeffrey A. Seybert, "Demonstrating and Enhancing Community College Effectiveness," Making a Difference.

ibid.

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p.88.

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Patton, 1.

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Banta and Borden, 29.

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37 Borden and Banta, 11.

38 in Peter Schmidt, (April 4, 1997), A26, Dr. Robert E. Alexander, chairman of the South Carolina council of Public college and University Presidents and chancellor of the University of South Carolina at Aiken.

39 Banta and Borden, 12.

40 Schmidt, A26.


42 ibid.

43 Hawkins, Preliminary Results from the SHEEO State Survey on Performance Measures, page unnumbered.


45 Banta and Borden, 14.

46 Schmidt, A26.

47 Banta and Borden, 12.

48 NCRParemeters, 3.

49 p.xi.

50 NCRParemeters, 3.

51 Astin in H. Bowen, 24.

52 ibid.

53 Ruppert, 8.

54 Ruppert, 14.

55 NCRParemeters, 2.

56 SAT score and on-campus housing, for example, are often inappropriate indicators for the community college sector because many of these students do not take the SAT and most community colleges do not offer on-campus housing.


58 ibid.

59 These descriptions follow those given in the Descriptive Summary of 1989-90 Beginning Postsecondary Students: 5 Years Later technical report. Contained within the parentheses are the names assigned by this researcher.
60 ibid. p.B-16.

61 ibid.

62 ibid.


64 ibid.

65 ibid.

66 The Knight Higher Education Collaborative supported by the John S. and James L. Knight Foundation, "A Very Public Agenda," *Policy Perspectives* v8, n2 (Sept. 1998), 1-10.