

# NCAA Research Report

93-08

*Major Findings from the NCAA Division II  
Academic Performance Study*



# FOREWORD

This report is the ninth in a series that we shall be publishing to inform our member institutions and others about our study of student-athletes' academic performance under NCAA Bylaw 14.3.

The results presented are preliminary. This study was begun in 1985 and still has several years before completion.

We welcome your comments and suggestions on this report.

CEDRIC W. DEMPSEY  
NCAA Executive Director  
May 1995



THE NATIONAL COLLEGIATE ATHLETIC ASSOCIATION

6201 College Boulevard  
Overland Park, Kansas 66211-2422  
913/339-1906  
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**Edited By:** Martin T. Benson, *Publications Editor*.

Distributed to CEOs, athletics directors, senior woman administrators and faculty athletics representatives at all Division II institutions.

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# INTRODUCTION

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This is a summary of statistical research on the academic performance of student-athletes in collegiate sports programs. The report describes statistical models used in the prediction of academic success defined by college graduation. Longitudinal data from the academic performances of more than 900 student-athletes in NCAA Division II collegiate sports programs are used. Several statistical models that are similar to those detailed in NCAA Research Report

Nos. 90-01 to 91-05 are applied. The 14 main findings of this research are listed in terms of: (1) Predictions of college graduation from high-school academic variables; (2) demographic and athletics groups; (3) using different variables for initial-eligibility rules; and (4) differences in optimal cut-points based on different utility structures. We highlight several limitations and benefits and we describe further research.

## PURPOSE OF THIS REPORT

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During the early 1980s, controversy arose about the lack of adequate academic and social preparation and success of student-athletes. In response, the NCAA debated these issues for several years. At the same time, controversy was generated from the possible inclusion of a minimum test score as an eligibility requirement, especially because of the possibility of test bias, differential validity, and selection bias with minority groups. (See references in NCAA Report Nos. 91-02 and 91-03.)

In 1988-89, Division II implemented legislation (commonly known as Proposition 48) that required a prospective student-athlete who had graduated from high school to present a 2.00 grade-point average (GPA) in 11 academic core courses and a minimum SAT score of 700 or ACT score of 17 (current scale). If these criteria were met, the student-athlete was eligible for competition, practice and athletics aid immediately upon enrollment. Division II student-athletes who did not meet these minimum

requirements could not practice or compete during their first academic year in residence. These initial-eligibility restrictions were imposed on "all students at all schools" in order to form a "level academic playing field" for recruitment and competition in Division II.

The NCAA Academic Performance Study (APS) was started in 1985 by the NCAA Research Committee as a broad study of the academic-performance patterns of student-athletes. (See Research Report No. 90-01). In 1991 this research was used to examine some of the controversial issues surrounding initial-eligibility rules.

The current Division II NCAA-APS database covers aspects of the college careers of five cohorts of student-athletes who attended college on athletics grants-in-aid. Included in the database are freshman classes from 1986 to 1990 in Division II schools who responded to the NCAA-APS questionnaire. The 185 Division II institutions that were

members of the NCAA in 1986 were randomly stratified into five subgroups and initially surveyed in one of the five years, 1986-90. The APS data form was sent to a representative at each school, who was asked to complete a confidential questionnaire on each student-athlete in the current freshman class. More details on this survey data collection are provided in Research Report Nos. 90-01 and 91-01.

The results of the initial NCAA research on the graduation rates of more than 900 stu-

dent-athletes who entered Division II colleges in 1986 and 1987 are summarized herein. These records are pertinent because: (1) They were obtained before the initial-eligibility rules were put into effect, and (2) the complete five-year college record is available. In contrast to the other reports in this series, this one emphasizes only the research findings; details of the statistical methods used are not included, but can be found in the reports that use the 1991 APS database.

## ACADEMIC CHARACTERISTICS OF THE 1986-87 FRESHMAN COHORT

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In this report, we review data only from the first two cohorts of this study, 1986 and 1987 freshman student-athletes. The database contains a total of 935 student-athlete records from participating colleges. Longitudinal data were requested on the same student-athletes for each of the subsequent five years using a similar survey form (see Research Report No. 90-01). For the purposes of the analyses to follow, problematic records were eliminated, and records where the race/ethnicity question was answered as either "white, non-hispanic" or "black" were the only ones used.

Five-year college graduation was a key outcome variable—college graduation was achieved only if the students received degrees from the colleges in which they initially enrolled as freshmen. Student-athletes who dropped out in bad standing (dropouts) or good standing (stopouts), transferred to another school (transfers) or continued into the sixth year (continuers), were considered nongraduates.

Other outcome variables have been considered. For example, an "adjusted" graduation rate was calculated to eliminate students who were in good academic standing when they either continued at another school (i.e., transfers) or when they left school (stopouts). Furthermore, a "good standing" or "eligibility" variable was examined on a year-by-year basis and used in other kinds of analyses.

Table 1 gives a description of the sample as a breakdown of graduation rates for various groups of student-athletes. The overall number of student-athletes in this sample is 935, the number of college graduates in this student-athlete sample is 375; an overall graduation rate of 40.1 percent.

Further breakdown of these variables by six different group classifications is detailed in the remaining columns of Table 1. The groups include sex, race and revenue sports (i.e., men's football and basketball)



groups. One noticeable feature is the relatively high graduation rates for female student-athletes, and the relatively low graduation rates for black student-athletes. Further data on graduates and nongraduates are displayed on the graphs in Figure 1. In the figure on the left, each dot indicates a student-athlete who received a college degree from his or her initial college within five years of entry. On the right, each dot indicates a student-athlete who failed to receive a degree from his or her initial college within five years of entry. Each X-axis shows the student-athletes' scores on a nationally standardized test of scholastic achievement (ACTSAT). Each Y-axis shows the student-athletes' high-school GPAs based on 11 core courses (GPACORE).

This plot shows overall higher scores on

both grades and test scores for the college graduates but the dispersion of these scores in the two groups appears to be similar. This total sample of student-athletes is approximately equivalent to a group with a high-school core GPA=2.64 (a B-minus average), which is below the national average. This sample also has average test scores of 819 on the SAT or 17.5 on the ACT, both below the national averages. These two student academic variables are strongly positively correlated ( $r=.65$ ) in these data, and also positively correlated with the student graduation outcome ( $r=.38$ ).

Fourteen different findings are listed in the next four sections, along with a few relevant tables and figures to demonstrate these results.

## FINDINGS ABOUT HIGH-SCHOOL ACADEMIC PREDICTORS

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**Finding 1:** Both high-school core grade-point average (GPACORE) and national test scores (ACTSAT) were found to be significant but moderate predictors of college graduation.

**Finding 2:** High-school core grade-point average was a slightly stronger predictor of college graduation, but GPACORE and ACTSAT variables together were better predictors than either one alone.

**Finding 3:** An equally weighted combination of both variables, termed an AVERAGE or INDEX score, was the single best predictor of college graduation. Institutional variables that have been important in previous work were not available in these analyses.

There are several ways to demonstrate these findings. Table 2 simply shows the distribution of student-athletes for both high-school GPA and test-score categories. Table 3 shows student-athletes with increasing high-school GPA scores also have a tendency toward increasing graduation rates five years later. Table 4 shows that student-athletes with increasing national test scores (ACT or SAT) also have a tendency toward increasing graduation rates five years later.

Table 5 shows the graduation rates of student-athletes with specific combinations of high-school grades and test scores. The added prediction of a combination variable becomes clearer when we compare gradu-

ation rates along equivalent diagonals in this table.

The percentages in the tables also include a margin of error (+ or -) based on the specific sample sizes of each cell. These errors were considered in the statistical prediction results of Figure 2 (revised from Figures 2 and 3 of Research Report 91-02). These plots display the prediction equations for separate GPACORE and ACTSAT equations. The most obvious feature of these plots is the increasing probability of graduation for increasing high-school GPA and test scores. Figure 2a shows high-school GPA on the X-axis and the probability of college graduation on the Y-axis. Figure 2b plots test

scores on the X-axis and the probability of college graduation on the Y-axis. Figure 2c illustrates the prediction model that is generated by combining test score with GPA.

These increasing probability functions show a small but reliable gain in the probability of graduation with small differences in the GPA and SAT or ACT test scores. These figures can be used to make a graphic prediction about the probability of graduation for any student-athlete, including the confidence boundary around these predictions (see Research Report 92-02 for details; e.g., this increase is linear in the log odds, so it is S-shaped in terms of the probability).

## FINDINGS ABOUT DEMOGRAPHIC AND ATHLETICS GROUP DIFFERENCES

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**Finding 4:** There are significantly higher graduation rates for females, and this result obtains even when other variables are held constant.

**Finding 5:** There are large race differences in graduation rates, with black student-athletes graduating at a significantly lower rate. These group differences can be accounted for by taking into account the other high-school academic variables.

**Finding 6:** While black student-athletes, in general, entered school less well prepared, a much larger “within group” proportion of black graduates was found at these lower levels of academic preparation. This becomes important when initial-eligibility rules are considered (see later findings).

The first positive result listed above is small but significant. The sex differences simply

mean that females achieved graduation at a slightly better rate than their entering grades and tests predicted. This is not a new finding, and it is likely the effect of other factors not measured.

The lack of a clear positive result for racial groups is complex and needs to be examined in several ways. Clearly there are large initial group differences in the high-school academic variables and these parallel the subsequent group differences in college graduation. Table 6 shows the graduation rates for white and black student-athletes who have different levels of high-school core GPA. For example, 22.4 percent of white graduates have GPAs of less than 2.25; however, 63.6 percent of black graduates are at the same level of GPA.

The large group differences in overall graduation rates can be seen to mimic the dif-

ferent entering GPA characteristics of the groups. In Table 6 the cumulative number of persons in each level is listed in the third column labeled “Cumulative % Persons.” This column shows an unequal number of white and black students at each of these GPA levels. The interval from GPA=2.77 to GPA=4.00 includes 39.3 percent (100 percent-60.7 percent) of the white students while the same interval includes only 8.1 percent (100 percent-91.9 percent) of the black students. Figures 3a, 3b, and 3c show these differences in graphic form.

Table 7 shows similar information for students with entering SAT or ACT scores. Figures 4a, 4b and 4c show the distribu-

tions of test scores in graphic format. Table 7 shows that 30.2 percent (100 percent-69.8 percent) of the white students in the sample score above the national averages, while only 2.0 percent (100 percent-98.0 percent) of black students in this sample score above the national average. Figures 4a, 4b and 4c illustrate the group differences in the test-score variable.

Finally, of course, we recognize that these results are not necessarily effects of sex, sport or race alone; the initial differences in high-school academic achievements are likely to be the outcome of a much more complex set of sociocultural group and individual differences that were not measured in this study.

## FINDINGS ABOUT INITIAL-ELIGIBILITY VARIABLES

**Finding 7:** The current rule of “minimum GPA  $\geq 2.0$  AND SAT  $\geq 700$  OR ACT  $\geq 17$ ,” is termed a “conjunctive” or “double-cut” rule. There is no past literature on this sort of rule except to say it has no known empirical basis and implicitly places an increased weight on the test-score variable.

**Finding 8:** More accurate standards cannot easily come about by the use of a conjunctive rule because of adverse effects. This includes more errors, such as more false negatives in general, and more adverse impact on all students. Past research shows the use of a conjunctive rule will probably lead to a negative and disproportionate impact on minority students.

**Finding 9:** More accurate standards can more easily come about by the use of an equally weighted combination of high-

school grades and test scores—termed an “average,” “index” or “compensatory” variable. This variable has no minimum cutting scores on any specific component (see next section), so high scores on one variable can be used to compensate for low scores on the other.

Some of these findings seem to be fairly well-known in the educational literature (see the references in Research Report Nos. 91-03 through 91-05). The current test-score minimum (of SAT=700) is about one standard deviation below the mean (or  $Z=-1$ ) so, theoretically, it should cut out about 16 percent of students. In practice, this effect is much larger (32.7 percent; see below). In contrast, the GPA requirement (of GPA=2.00) is approximately two standard deviation units below the mean (so  $Z=-2$ ) and it should cut out less than 2 per-

cent of the students. In practice, this is much larger.

Simulations of several rules that have been discussed recently for possible adoption in Division I are presented. Table 8 provides descriptions of these rules and Figure 5 provides graphic illustrations of their effects. Table 9 provides results of the simulations on several different important considerations (e.g., graduation rates, minority impacts, false negatives).

The minority differences in ineligibility are large in each rule, from the lowest at the Prop 174 rule (-48.6 percent), to the highest under the Prop 16 (-54.1 percent) rule. The second set of rows in Table 9 highlights the false negatives. These are the percentages of 1986-87 actual graduates who would be declared ineligible under

these new rules. (The percentages listed are percentages of the total group, not just of the actual graduates.) Here we find clear differences in false-negative rates between the Prop 174 rule (6.8 percent), Prop 48 (7.8 percent) and Prop 16 (9.8 percent) rules.

The fourth set of rows of the table shows the expected graduation rate of 1986-87 student-athletes that would have accompanied each eligibility rule. These are the rates of those who would have been declared eligible who actually graduated. As one can see, the highest graduation rate obtains from Prop 16 and the lowest from MOIC 94. Even though the graduation rates are lower, the number of graduates may be higher under rules with lower rates because they allow more freshmen to enter the system.

## FINDINGS ABOUT INITIAL-ELIGIBILITY CUT SCORES

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**Finding 10:** The distributions of graduates and nongraduates overlap on the academic variables (see Figure 1). Thus, the choice between desired outcomes, such as the false negatives vs. true positives, needs to be defined in terms of utility weights. These utilities or goals have a large impact on the general shape of the utility functions, including the optimal cutoff values.

**Finding 11:** Goals that largely emphasize graduation and tend to ignore minority impacts lead to an increasingly stringent cutoff point. Goals that emphasize the value of number of graduates and opportunity to obtain a degree lead to less stringent cutoff points when utility analyses are performed.

**Finding 12:** Goals that largely emphasize minority impacts lead to the elimination of a cutoff point.

**Finding 13:** Goals that emphasize both increased graduation and minority impacts (i.e., mixed utilities) lead to cutoff points that are much lower than the current (Prop 48) rules or the proposed (Prop 16) rules. Using the mixed utilities studied, the maximum expected utility on the average variable would be at  $Z = -1.4$ . (One combination that would achieve this level would be a core GPA of 2.3 and an SAT score of 630. Many other combinations would work.)

**Finding 14:** There is a wide range of similarly effective cutoffs, but the analyses

seem to show a sharp drop in optimality when more stringent than  $Z=-1.4$ .

A detailed discussion of these principles is presented in Research Report No. 91-05, in which the cost-benefit analyses based on a variety of different choices of outcome goals or utilities are defined. The choice of a maximum expected-utility value is an important consideration in decision analysis: (1) The variable with the highest maximum expected-utility value is considered the “best” variable, and (2) the cut-point associated with this maximum value is considered the “best” cut-point for a rule. Our research provides a method to examine these ideas once the goals are clearly stated, but it does not specify what these goals should be.

Table 10 provides a look at a standard decision table that used to identify outcomes and weight costs and benefits. These sorts of tables can be used throughout utility analysis.

Figure 6 is an example of three utility tables for a “mixed” utility function. Under mixed utility weights, graduates are weighted twice as much as nongraduates and minority graduates are weighted twice as much again. As the tables show, using these types of weights leads to an index rule at an average of  $Z=-1.4$ . Different weights lead to different cut-points.

Figure 7 provides data on where one

would find the optimum cut-points for different graduation weights. It also provides a graphical look at natural breaks in the data. For example, part A of this figure shows that if you weight graduates at exactly 2.0 times more important than non-graduates, you would set an index rule at  $Z=-0.8$ . If you moved to a weighting of 2.1 times, the optimal cutoff drops to  $Z=-1.4$ . That score stays the same for weights all the way up to 3.0.

The approximate 98 and 99 percent confidence boundaries around these rules are shown in Figure 7. These are sampling limits of these statistical choices, and here we find that given any set of utilities, many choices of a rule are not significantly different from the so-called “best” choices. Thus, some flexibility of choice in the specific cut-point may be desirable even given these data.

On the other hand, the differences described also appear small because we are focusing on only the peak values. If comparisons are made between different cut-points on different variables, these differences can become large. Also, if we assume that each point of expected utility has an impact on a specific number of persons (for example,  $N=40,000$ ) then these small differences in percentages can reflect a positive or negative impact on a large number of persons.



# LIMITATIONS AND BENEFITS OF THE 1994 RESEARCH

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**Limitation 1:** There are several potential design flaws in the 1994 studies, including the use of different colleges in different years. Wherever possible, comparability of schools has been checked and no statistical adjustments have been required. All such issues require further study.

**Limitation 2:** Missing data has been a problem, but we have tried to deal with these problems using standard statistical techniques. Further statistical studies are needed to represent the missing colleges or missing students.

**Limitation 3:** Five-year graduation was used as the only index of academic outputs, and precollege core-GPA and test scores as the only indices of academic inputs. Other academic performance outcomes should be reexamined in this way, including continuing eligibility, academic honors and other significant academic hurdles.

**Limitation 4:** The significant effects highlighted are considered to be small to moderate. These effect sizes are only as large as those found in studies of first-year grade-point averages.

**Limitation 5:** The selection effects described for different eligibility rules is based on a "simulation" of "what might have happened"; however, these 1986-87 students were not under the pressures of restrictions such as Prop 48 or Prop 16. These pressures can force some students to do better and others to do worse, and we do not know what would have actually happened to any individual under any rule.

**Limitation 6:** We have examined the selection effects from the point of view of the persons denied admission, but there is no way to know what would have happened to the individual or the college in such cases. It is likely that some students would "go on" to another college (e.g., Division II, Division III, junior college), or go directly to work. It is likely that students denied admission would be "replaced" by others with more academic achievements.

**Limitation 7:** One problem the decision maker faces is the definition of utilities. The variety of substantive reasons for different utility structures is unbounded, and this can create confusion. Further studies of explicit and implicit utilities are needed.

***Note 1:** These 1986-87 freshmen are the only data that are not censored by the imposition of such rules. All other data gathered after this point (1988-1990) will have an increased censoring of individuals so the full impact of Prop 48 will be difficult to assess.*

***Note 2:** A full five-year longitudinal record was available, and this allowed college graduation to be studied as an outcome.*

***Note 3:** The statistical methodology used tried to account for statistical artifacts, as well as sensitivity to small effects. Confidence boundaries and margin of error were added to account for the accuracy in predictions.*

***Note 4:** The decision-making methodology identified the limitations of the data in terms of decision making. If no goals are*

*stated it is unlikely that a coherent decision can be made.*

**Note 5:** *This initial research leads to other questions, such as continuing eligibility,*

*choices of major, profiles of academic achievement and so on. The new data should prove informative about other issues of concern to the NCAA.*



**TABLE 1**  
**DESCRIPTIVE STATISTICS**  
**FOR 1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES**

STUDENT ATHLETE GROUPS	Number of Students		Number of Graduates		High-School Core GPA		Entering SAT Score		Entering ACT Score	
	N	(%)	N	(%)	Mean	(SD)	Mean	(SD)	Mean	(SD)
<b>OVERALL</b>	935	(100.0%)	375	(40.1%)	2.64	(.62)	819	(190)	17.5	(5.3)
<b>DEMOGRAPHIC SUBGROUPS</b>										
1. White Female	243	(26.0%)	127	(52.3%)	2.96	(.58)	866	(162)	18.8	(4.6)
2. White Male Revenue	205	(21.9%)	88	(42.9%)	2.64	(.55)	852	(184)	18.4	(5.1)
3. White Male Non-Rev	290	(31.0%)	116	(40.0%)	2.66	(.59)	881	(161)	19.2	(4.5)
4. Black Female	37	(4.0%)	13	(35.1%)	2.43	(.43)	627	(152)	12.1	(4.2)
5. Black Male Revenue	129	(13.8%)	23	(17.8%)	2.12	(.50)	635	(156)	12.3	(4.4)
6. Black Male Non-Rev	31	(3.3%)	8	(25.8%)	2.20	(.39)	639	(137)	12.5	(3.8)
<b>SUBGROUP COMPARISONS</b>										
1. SEX										
Male	655	(70.1%)	235	(35.9%)	2.53	(.59)	812	(195)	17.3	(5.4)
Female	280	(30.0%)	140	(50.0%)	2.89	(.59)	834	(180)	17.9	(5.0)
2. RACIAL GROUP										
White	738	(78.9%)	331	(44.9%)	2.75	(.59)	868	(168)	18.9	(4.7)
Black	197	(21.1%)	44	(22.3%)	2.19	(.49)	634	(152)	12.3	(4.3)
3. MALE SPORTS										
Male-Revenue	334	(35.7%)	111	(33.2%)	2.44	(.59)	768	(203)	16.1	(5.7)
Male-Non-Rev	321	(34.3%)	124	(38.6%)	2.61	(.59)	858	(174)	18.6	(4.9)
4. FEMALE-RACE										
White Female	243	(26.0%)	127	(52.3%)	2.96	(.58)	866	(162)	18.8	(4.6)
Black Female	37	(4.0%)	13	(35.1%)	2.43	(.43)	627	(152)	12.1	(4.2)
5. REVENUE-RACE										
White-Male-Rev	205	(21.9%)	88	(42.9%)	2.64	(.55)	852	(184)	18.4	(5.1)
Black-Male-Rev	129	(13.8%)	23	(17.8%)	2.12	(.50)	635	(156)	12.3	(4.4)

**NOTES:**

A GRADUATE is defined as a student-athlete who graduated within FIVE years after enrollment.  
Core GPA, SAT, and ACT score averages estimated from standard scores (i.e.; Z-values, see text).  
Total N=935 from the 1994 NCAA-APS Databank.



TABLE 2

DISTRIBUTION OF ALL STUDENT-ATHLETES  
 BASED UPON BOTH CORE GPA AND TEST SCORES  
 (1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES)

ACTSAT		< -2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	≥ 1.75
ACT		0.0	6.6	9.5	12.4	15.3	18.2	21.1	24.0	26.9	29.8
		6.6	9.5	12.4	15.3	18.2	21.1	24.0	26.9	29.8	36.0
SAT		400	428	532	635	739	842	946	1049	1153	1256
		428	532	635	739	842	946	1049	1153	1256	1600
GPACORE	GPA										
< -2.25	0.0 1.9	0.5%	1.8%	2.0%	2.2%	1.1%	0.3%	0.1%	--	--	--
-2.00	1.9 2.1	0.3%	1.6%	3.2%	4.0%	2.2%	1.3%	0.6%	--	--	--
-1.50	2.1 2.4	0.4%	1.0%	2.1%	3.9%	5.2%	2.1%	1.5%	0.4%	--	--
-1.00	2.4 2.6	--	0.7%	1.6%	1.8%	4.7%	4.0%	0.9%	0.2%	0.3%	--
-0.50	2.6 2.9	--	1.0%	1.4%	2.7%	2.5%	5.3%	1.3%	0.4%	0.3%	--
0.00	2.9 3.2	--	--	0.4%	1.0%	2.5%	3.3%	2.0%	1.2%	0.5%	0.1%
0.50	3.2 3.4	0.1%	--	0.1%	0.4%	1.2%	1.5%	2.6%	2.5%	0.7%	--
1.00	3.4 3.7	--	--	0.1%	0.4%	0.6%	1.3%	1.1%	1.5%	0.7%	0.3%
1.50	3.7 3.9	--	--	--	--	0.5%	1.0%	0.9%	1.6%	0.6%	0.1%
≥ 1.75	3.9 4.0	--	--	--	--	0.1%	--	0.3%	0.9%	0.3%	0.2%

NOTES: Displayed values represent percentage of N=935.

TABLE 3

COLLEGE GRADUATION RATES  
BY HIGH-SCHOOL CORE GRADE-POINT AVERAGE  
(1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES)

STUDENT GRADES GPACORE    Core GPA Z-unit      Interval		FIVE-YEAR GRADUATION Graduation    Margin    Confidence Rate          of Error    Interval			SAMPLE Interval    Interval Size        Percent	
< -2.38	0.00—1.80	10.9%	(±7.7)	[5.4—20.9]	64	6.8%
-2.25	1.80—1.93	22.6%	(±14.2)	[11.4—39.8]	31	3.3%
-2.00	1.93—2.06	27.0%	(±9.9)	[18.2—38.1]	74	7.9%
-1.75	2.06—2.19	26.6%	(±10.6)	[17.3—38.5]	64	6.8%
-1.50	2.19—2.32	40.2%	(±10.4)	[30.3—51.0]	82	8.8%
-1.25	2.32—2.45	36.4%	(±11.3)	[25.8—48.5]	66	7.1%
-1.00	2.45—2.58	40.3%	(±10.7)	[30.1—51.5]	77	8.2%
-0.75	2.58—2.71	32.9%	(±10.8)	[23.0—44.5]	70	7.5%
-0.50	2.71—2.84	28.0%	(±10.0)	[19.1—39.0]	75	8.0%
-0.25	2.84—2.97	42.3%	(±13.0)	[29.9—55.8]	52	5.6%
0.00	2.97—3.10	54.1%	(±12.1)	[41.7—66.0]	61	6.5%
0.25	3.10—3.23	61.2%	(±13.2)	[47.2—73.5]	49	5.2%
0.50	3.23—3.36	62.5%	(±15.9)	[45.3—77.1]	32	3.4%
0.75	3.36—3.49	47.7%	(±14.2)	[33.7—62.0]	44	4.7%
1.00	3.49—3.62	75.0%	(±15.3)	[56.6—87.3]	28	3.0%
1.25	3.62—3.75	65.2%	(±18.2)	[44.9—81.2]	23	2.5%
1.50	3.75—3.88	70.6%	(±19.9)	[46.9—86.7]	17	1.8%
≥ 1.63	3.88—4.00	69.2%	(±16.7)	[50.0—83.5]	26	2.8%
AVERAGE -0.76          2.63		40.1%	(±3.1)	[ 37.0—43.3]	935	100.0%
NOTES: GPACORE = Z-unit of high-school GPA in 11 core courses; Raw GPA assumes mean = 3.03 and standard deviation = .52; Confidence Interval = 95% CI = $\frac{N}{N+z^2} [P + \frac{z^2}{2N} \pm z \sqrt{\frac{P*Q}{N} + \frac{z^2}{4N^2}}]$ , where $z=1.96$ ; Margin of Error = (Lower 95% CI + Upper 95% CI)/2.						

TABLE 4

STUDENT GRADUATION  
BY NATIONALLY STANDARDIZED ACT OR SAT SCORES  
(1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES)

STUDENT TEST SCORE			FIVE-YEAR GRADUATION			SAMPLE	
ACTSAT Z-unit	ACT score Interval	SAT score Interval	Graduation Rate	Margin of Error	Confidence Interval	Interval Size	Interval Percent
< -2.38	0.0—5.8	400—402	0.0%	(±19.5)	[0.0—39.0]	6	0.6%
-2.25	5.8—7.3	402—454	17.7%	(±17.4)	[6.2—41.1]	17	1.8%
-2.00	7.3—8.7	454—506	8.7%	(±12.2)	[2.4—26.8]	23	2.5%
-1.75	8.7—10.2	506—558	22.4%	(±10.5)	[13.6—34.6]	58	6.2%
-1.50	10.2—11.6	558—609	22.2%	(±13.2)	[11.7—38.1]	36	3.9%
-1.25	11.6—13.1	609—661	31.9%	(±10.5)	[22.3—43.3]	72	7.7%
-1.00	13.1—14.5	661—713	28.1%	(±10.8)	[18.6—40.1]	64	6.8%
-0.75	14.5—16.0	713—765	27.9%	(±10.4)	[18.6—39.5]	68	7.3%
-0.50	16.0—17.4	765—816	42.6%	(±9.2)	[33.7—52.0]	108	11.6%
-0.25	17.4—18.9	816—868	54.2%	(±10.5)	[43.5—64.5]	83	8.9%
0.00	18.9—20.3	868—920	39.3%	(±8.7)	[30.9—48.4]	117	12.5%
0.25	20.3—21.8	920—972	46.3%	(±10.7)	[35.8—57.1]	80	8.6%
0.50	21.8—23.2	972—1023	54.3%	(±11.4)	[42.7—65.4]	70	7.5%
0.75	23.2—24.7	1023—1075	52.4%	(±14.5)	[37.7—66.7]	42	4.5%
1.00	24.7—26.1	1075—1127	52.4%	(±14.5)	[37.7—66.7]	42	4.5%
1.25	26.1—27.6	1127—1179	55.6%	(±20.9)	[33.8—75.5]	18	1.9%
1.50	27.6—29.0	1179—1230	72.7%	(±17.5)	[51.8—86.8]	22	2.4%
≥ 1.63	29.0—36.0	1230—1600	77.8%	(±24.2)	[45.3—93.7]	9	1.0%
AVERAGE							
-0.36	17.5	819	40.1%	(±3.1)	[ 37.0—43.3]	935	100.0%

NOTES: ACTSAT = Student ACT or SAT test (Z-score) with mean SAT = 894, standard deviation SAT = 207, mean ACT = 19.6 and standard deviation ACT = 5.8. Margin of error and confidence interval calculation defined in Table 2.

TABLE 5

GRADUATION RATES BY BOTH CORE GPA AND TEST SCORES  
(1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES)

ACTSAT		< -2.25	-2.00	-1.50	-1.00	-0.50	0.00	0.50	1.00	1.50	≥ 1.75
ACT		0.0	6.6	9.5	12.4	15.3	18.2	21.1	24.0	26.9	29.8
		6.6	9.5	12.4	15.3	18.2	21.1	24.0	26.9	29.8	36.0
SAT		400	428	532	635	739	842	946	1049	1153	1256
		428	532	635	739	842	946	1049	1153	1256	1600
GPACORE	GPA										
< -2.25	0.0	0.0%	5.9%	21.1%	23.8%	20.0%	0.0%	0.0%	--	--	--
	1.9	(±22)	(±13)	(±17)	(±17)	(±23)	(±28)	(±40)			
-2.00	1.9	0.0%	20.0%	20.0%	27.0%	40.9%	16.7%	0.0%	--	--	--
	2.1	(±28)	(±19)	(±14)	(±14)	(±19)	(±20)	(±20)			
-1.50	2.1	25.0%	11.1%	25.0%	44.4%	40.8%	40.0%	64.3%	0.0%	--	--
	2.4	(±33)	(±21)	(±18)	(±15)	(±13)	(±20)	(±22)	(±24)		
-1.00	2.4	--	42.9%	26.7%	17.7%	34.1%	40.5%	50.0%	0.0%	33.3%	--
	2.6		(±30)	(±21)	(±17)	(±13)	(±15)	(±28)	(±33)	(±37)	
-0.50	2.6	--	11.1%	23.1%	28.0%	56.5%	32.0%	41.7%	0.0%	33.3%	--
	2.9		(±21)	(±21)	(±17)	(±19)	(±13)	(±24)	(±24)	(±37)	
0.00	2.9	--	--	25.0%	44.4%	69.6%	58.1%	36.8%	45.5%	80.0%	0.0%
	3.2			(±33)	(±27)	(±18)	(±16)	(±20)	(±25)	(±29)	(±40)
0.50	3.2	0.0%	--	0.0%	0.0%	45.5%	71.4%	70.8%	47.8%	57.1%	--
	3.4	(±40)		(±40)	(±24)	(±25)	(±21)	(±17)	(±19)	(±30)	
1.00	3.4	--	--	0.0%	25.0%	66.7%	58.3%	70.0%	85.7%	57.1%	100.0%
	3.7			(±40)	(±33)	(±30)	(±24)	(±25)	(±18)	(±30)	(±33)
1.50	3.7	--	--	--	--	60.0%	55.6%	62.5%	66.7%	100.0%	100.0%
	3.9					(±33)	(±27)	(±28)	(±22)	(±20)	(±40)
≥ 1.75	3.9	--	--	--	--	100.0%	--	33.3%	75.0%	66.7%	100.0%
	4.0					(±40)		(±37)	(±26)	(±37)	(±33)

NOTES: N=935; Student Graduation = proportion of student-athletes that graduate from an institution within five years of first admission; Margin of Error calculation defined in Table 2.

TABLE 6

GRADUATION RATE BY CORE GPA SCORES  
FOR TWO RACIAL GROUPS  
(1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES)

STUDENT GRADES		FIVE-YEAR		GRADUATION		COMPARISON	
Z-score GPACORE midpoint	Raw score Core GPA midpoint	Within Cell Graduation % White	Black	Cumulative % Persons White	Black	Cumulative % Graduates White	Black
<-2.25	<1.86	20.0	12.2	4.7	20.8	2.1	11.4
-2.00	1.99	25.0	22.6	14.5	47.7	7.6	38.6
-1.50	2.25	43.0	26.2	30.0	69.0	22.4	63.6
-1.00	2.51	35.4	25.0	45.3	79.2	34.4	75.0
-.50	2.77	36.0	20.0	60.7	91.9	46.8	86.4
.00	3.03	53.8	50.0	73.3	97.0	61.9	97.7
.50	3.29	58.0	0.0	84.3	99.0	76.1	97.7
1.00	3.55	67.3	50.0	91.7	100.0	87.3	100.0
1.50	3.81	68.2	--	97.7	100.0	96.4	100.0
≥1.75	≥3.94	70.6	--	100.0	100.0	100.0	100.0
Notes: Total N=935, White S-A N=738, Black S-A N=197, from 1994 APS data.							

TABLE 7

GRADUATION RATE BY STANDARDIZED TEST SCORES  
FOR TWO RACIAL GROUPS  
(1986-87 DIVISION II FRESHMAN STUDENT-ATHLETES)

STUDENT TEST SCORES			FIVE-YEAR GRADUATION COMPARISON					
Z-score ACTSAT midpoint	Raw score ACT midpoint	Raw score SAT midpoint	Within Cell Graduation %		Cumulative % Persons		Cumulative % Graduates	
			White	Black	White	Black	White	Black
<-2.25	<6.6	<428	0.0	8.3	0.1	6.1	0.0	2.3
-2.00	8.0	480	21.4	14.0	2.0	27.9	0.9	15.9
-1.50	10.9	584	25.0	20.0	8.5	55.8	4.5	40.9
-1.00	13.8	687	31.3	26.8	23.7	76.7	15.1	65.9
-.50	16.7	791	47.6	32.1	46.2	90.9	39.0	86.4
.00	19.6	894	44.3	28.6	69.8	98.0	62.2	95.5
.50	22.5	998	52.4	50.0	83.8	99.0	78.6	97.7
1.00	25.4	1101	55.0	0.0	94.6	99.5	91.8	97.7
1.50	28.3	1205	63.6	100.0	99.1	100.0	98.2	100.0
≥1.75	≥29.8	≥1256	85.7	--	100.0	100.0	100.0	100.0
Notes: Total N=935, White N=738, Black N=197, from 1994 APS data.								

TABLE 8

A SUMMARY OF SIX ALTERNATIVE INITIAL-ELIGIBILITY RULES  
PROPOSED BY VARIOUS NCAA COMMITTEES

Initial- Eligibility Rule	MINIMUM ACADEMIC REQUIREMENTS			
	Number of Core Courses	High-School Grades	Standardized Test Score	Combined Average
PRE 86	none	GPA = 2.00	none	none
PROP 48	11	Core-GPA = 2.00	SAT=700 or ACT=17	$Z = -1.5$ (e.g., 2.00/700)
PROP 16	13	Core-GPA = 2.00	SAT=700 or ACT=17	$Z = -1.0$ (e.g., 2.50/700)
ARC 91-94	13	none	none	$Z = -1.0$ (e.g., 2.50/700)
MOIC 94	13	none	none	$Z = -1.2$ (e.g., 2.40/650)
PROP 174	13	Core-GPA = 2.00	none	$Z = -1.2$ (e.g., 2.40/650)

Notes: (1) PRE 86 = Rules existing before the 1986 academic year; (2) Prop 48 = as voted in 1983; (3) Prop 16 = as voted in 1992; (4) ARC 91-94 = Academic Requirements Committee 1991 and 1994 recommendation; (5) MOIC 94 = Minority Opportunities and Interests Committee 1994 recommendation; (6) Prop 174 = 1994 recommendation of Proposition 174 Committee.

# TABLE 9

A SUMMARY OF SIX ALTERNATIVE INITIAL-ELIGIBILITY RULES  
 PROPOSED BY VARIOUS NCAA COMMITTEES FOR ALL  
 STUDENT-ATHLETES IN THE DIVISION II 1986-87 COHORTS  
 (STUDENT N=935, INSTITUTION N=43)

Projected Outcomes	Pre 86	Prop 48	Prop 16	ARC 91-94	MOIC 94	Prop 174
<b>1. DECLARED INELIGIBLE</b>						
Overall	0.0	32.7	38.5	34.1	27.3	28.7
White	0.0	21.1	27.1	23.3	16.9	18.4
Black	0.0	76.1	81.2	74.6	66.0	67.0
White-Black Diff	0.0	-55.0	-54.1	-51.3	-49.1	-48.6
<b>2. FALSE NEGATIVES</b>						
Overall	0.0	7.8	9.8	8.8	6.6	6.8
White	0.0	6.2	8.4	7.3	5.0	5.3
Black	0.0	13.7	15.2	14.2	12.7	12.7
White-Black Diff	0.0	-7.5	-6.8	-6.9	-7.7	-7.4
<b>3. FALSE POSITIVES</b>						
Overall	59.9	35.0	31.2	34.5	39.3	38.1
White	55.1	40.2	36.4	39.2	43.2	42.0
Black	77.7	15.2	11.7	17.3	24.4	23.4
White-Black Diff	-22.5	25.0	24.8	21.9	18.9	18.7
<b>4. GRADUATION RATE</b>						
Overall	40.1	48.0	49.2	47.6	46.0	46.6
White	44.9	49.0	50.0	48.9	48.0	48.5
Black	22.3	36.2	37.8	32.0	28.4	29.2
White-Black Diff	22.5	12.8	12.2	16.9	19.6	19.3
<b>5. ACCURATE PREDICTIONS</b>						
Overall	40.1	57.2	58.9	56.7	54.1	55.1
White	44.9	53.5	55.1	53.5	51.8	52.7
Black	22.3	71.1	73.1	68.5	62.9	64.0
White-Black Diff	22.5	-17.5	-17.9	-15.0	-11.2	-11.2



TABLE 10

# STANDARD DECISION TABLES FOR CLASSIFICATION AND PREDICTION-ACCURACY MODELS

[a]: Standard Decision Table

Expected by Eligibility Rule	Observed Outcome (from Actual Data)			
	Nongraduate	Graduate	Total	
	Not Eligible	True Negative (TN): not eligible and did not graduate	False Negative (FN): not eligible but did graduate	TN + FN: Number Declared not eligible
	Eligible	False Positive (FP): eligible but did not graduate	True Positive (TP): eligible and did graduate	FP + TP: Number Declared eligible
Total	TN + FP: Number of Nongraduates	FN + TP: Number of Graduates	TN+FN+FP+TP: Total Number of Students	

[b]: Decision Table including Group Differences

Expected by Eligibility Rule		Observed Graduation Outcome				Total
		White		Black		
		Nongrad.	Graduate	Nongrad.	Graduate	
	Not Eligible	Benefit(1)	Cost(2)	Benefit(3)	Cost(4)	Frequency(NE)
	Eligible	Cost(1)	Benefit(2)	Cost(3)	Benefit(4)	Frequency(E)
	Total	Freq(WNG)	Freq(WG)	Freq(BNG)	Freq(BG)	Frequency(N)

# FIGURE 1

## COMPARATIVE ACTSAT AND GPACORE SCORES OF DIVISION II GRADUATES AND NONGRADUATES IN 1986-87 COHORTS

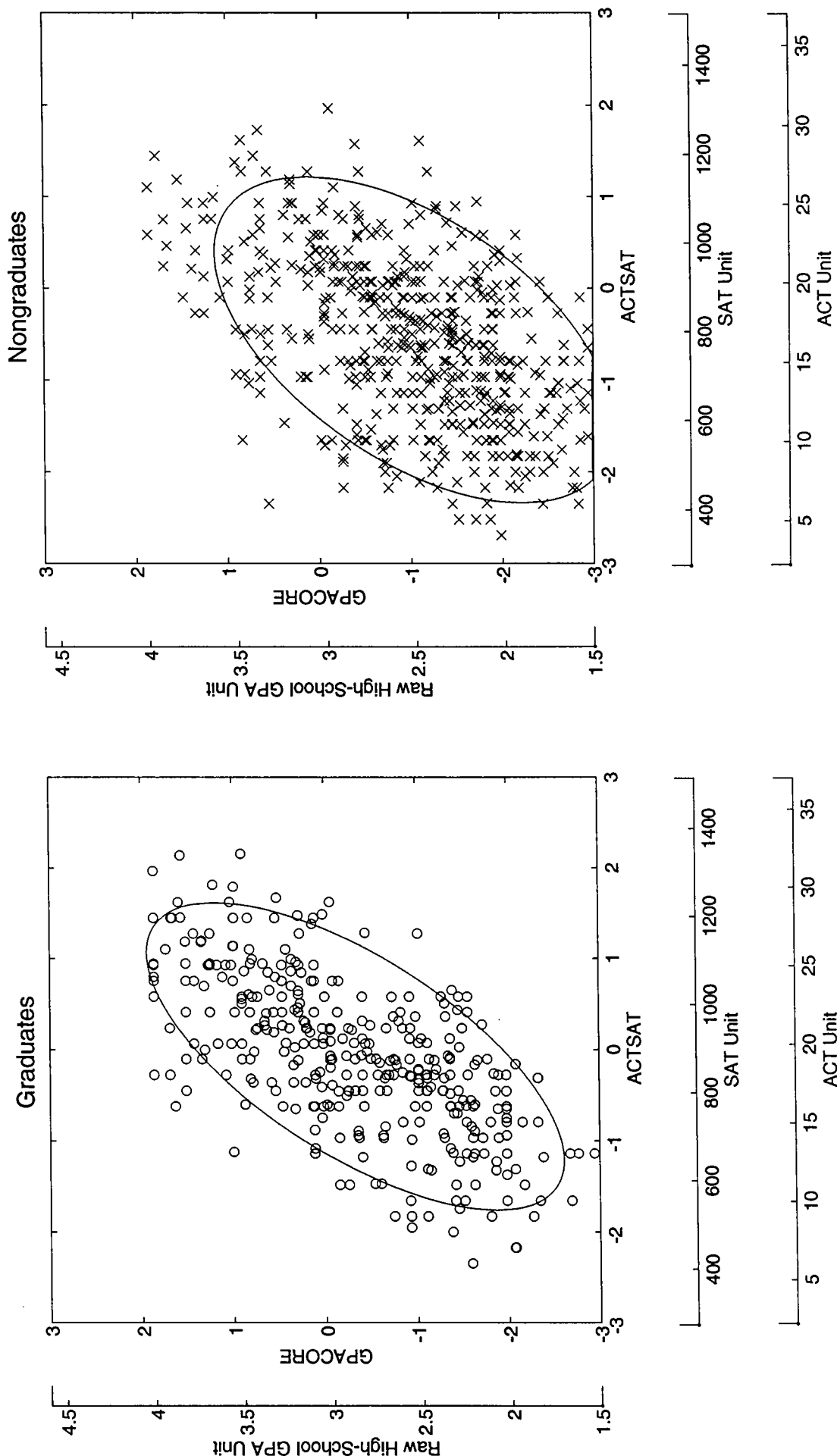


FIGURE 2A

LOGIT PREDICTION OF GRADUATION RATE FROM  
CORE-GPA ONLY FOR ALL DIVISION II STUDENT-ATHLETES  
IN 1986-87 COHORTS (N=935)  
(with 99% Confidence Boundaries)

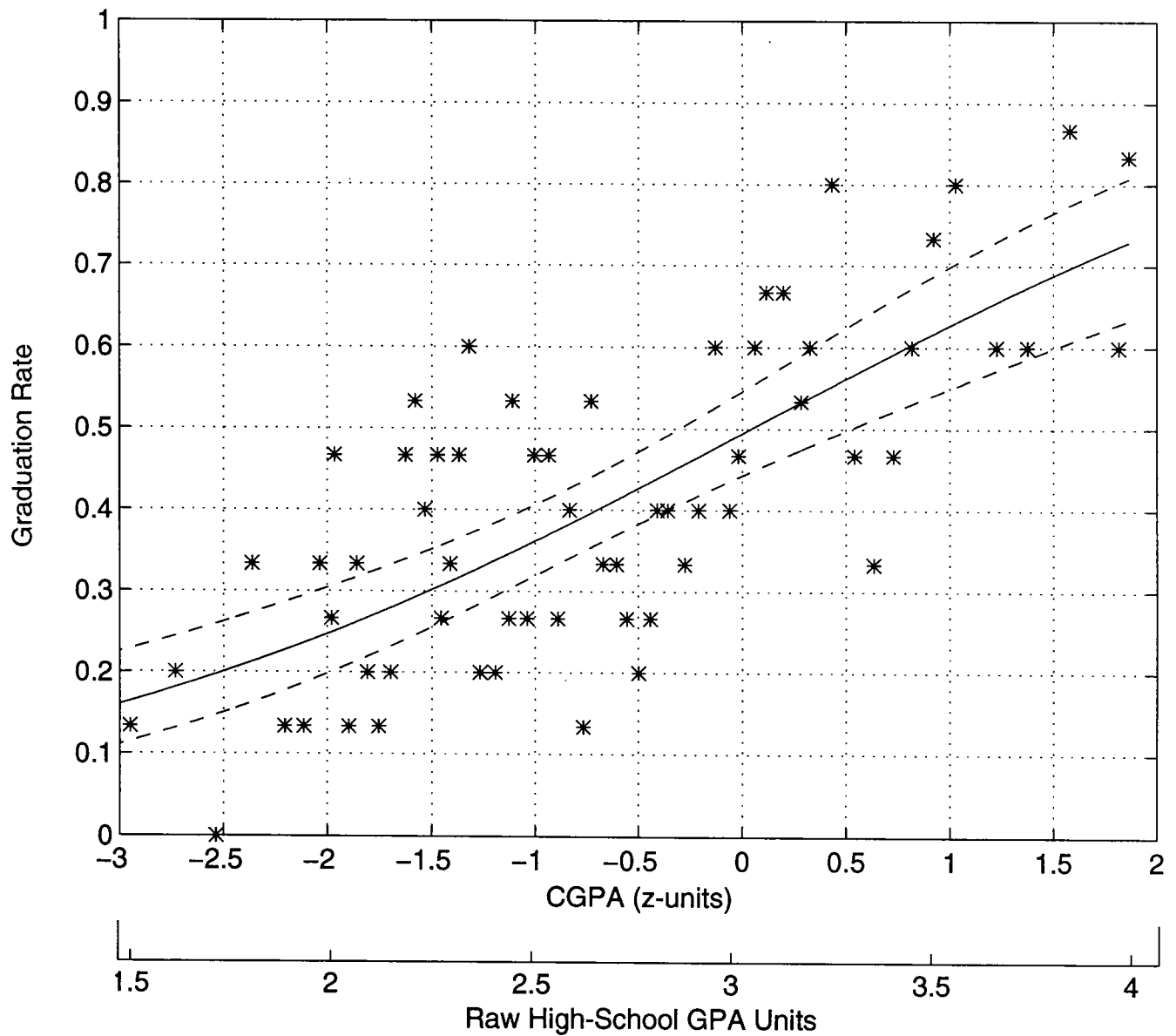
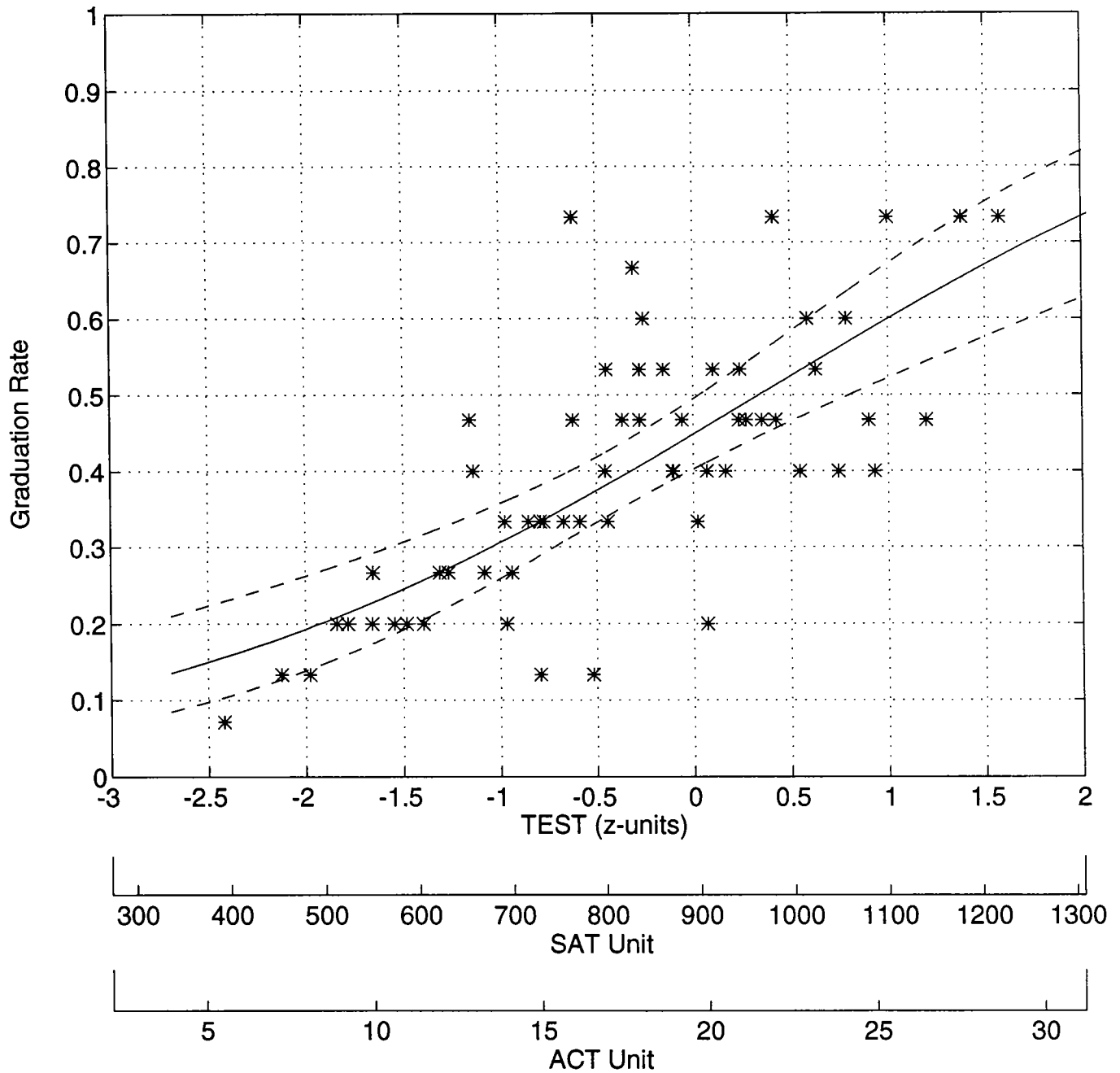


FIGURE 2B

LOGIT PREDICTION OF GRADUATION RATE FROM  
TEST SCORE ONLY FOR ALL DIVISION II STUDENT-ATHLETES  
IN 1986-87 COHORTS (N=935)  
(with 99% Confidence Boundaries)



## FIGURE 2C

LOGIT PREDICTION OF GRADUATION RATE FROM TEST-GPA  
AVERAGE ONLY FOR ALL DIVISION II STUDENT-ATHLETES  
IN 1986-87 COHORTS (N=935)  
(with 99% Confidence Boundaries)

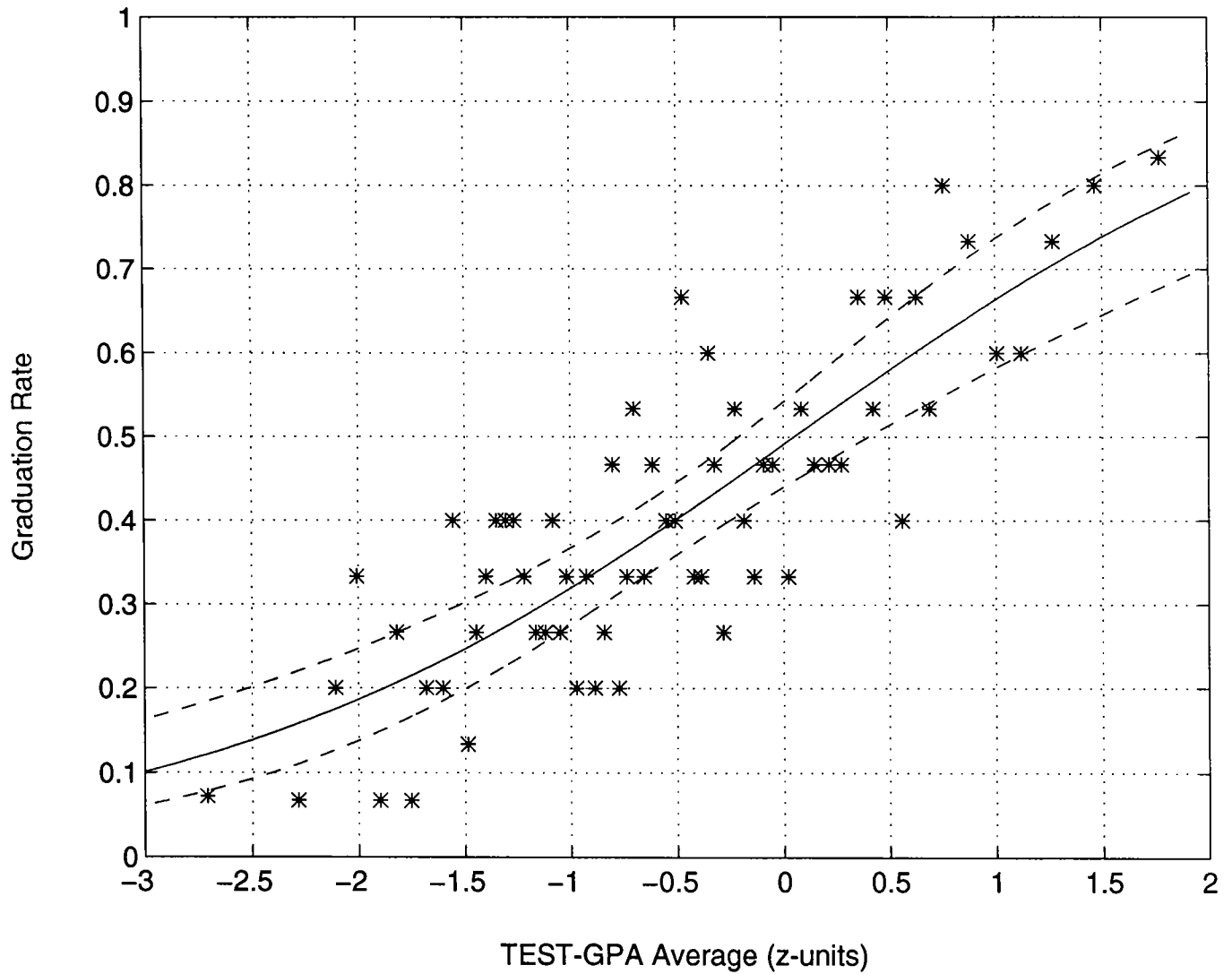
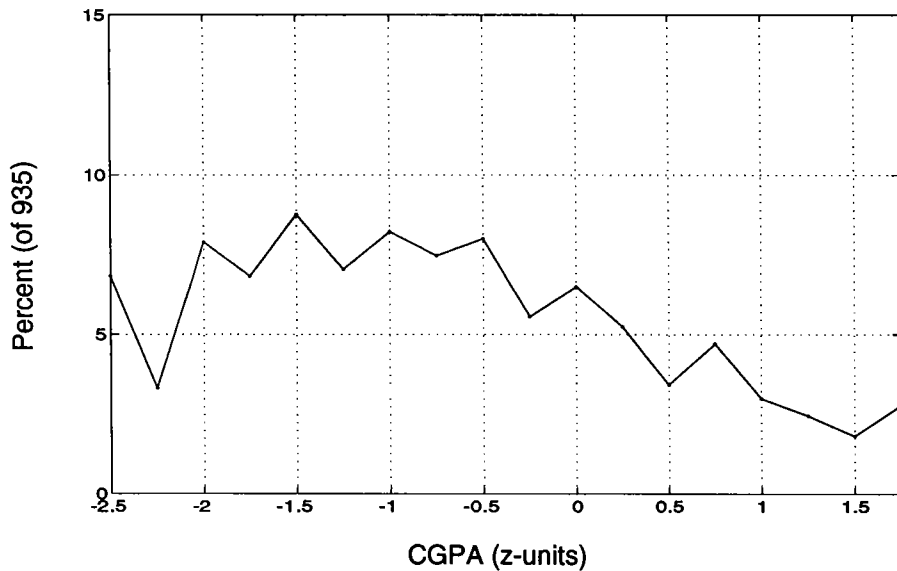
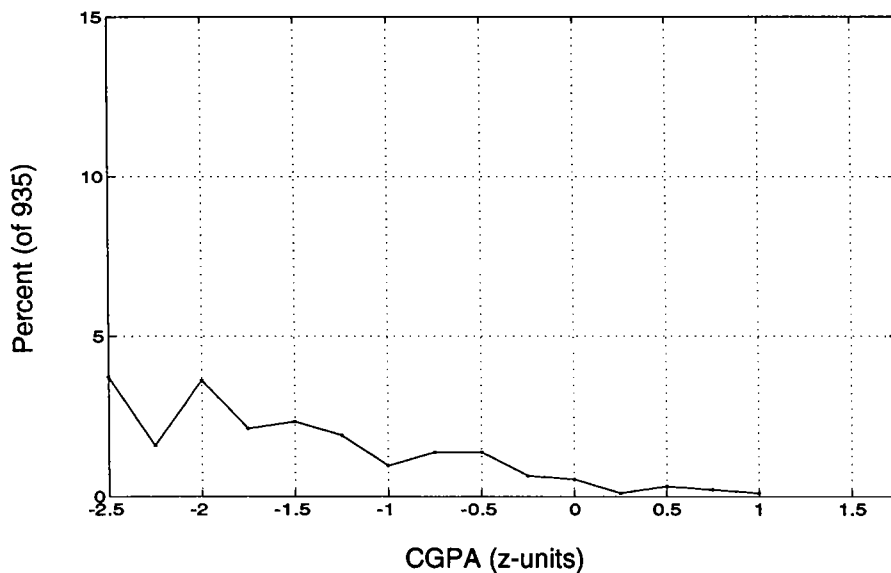


FIGURE 3A

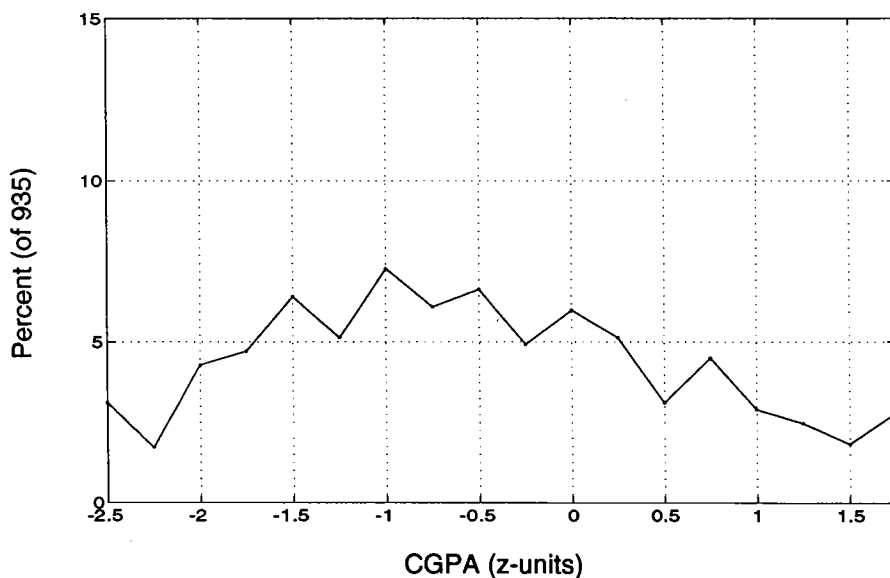
FREQUENCY DISTRIBUTIONS ON CGPA  
OF ALL DIVISION II STUDENT-ATHLETES IN 1986-87 COHORTS  
(Percent = % of 935)



**A. All Student-Athletes  
(n=935)**



**B. Black Student-Athletes  
(n=197)**

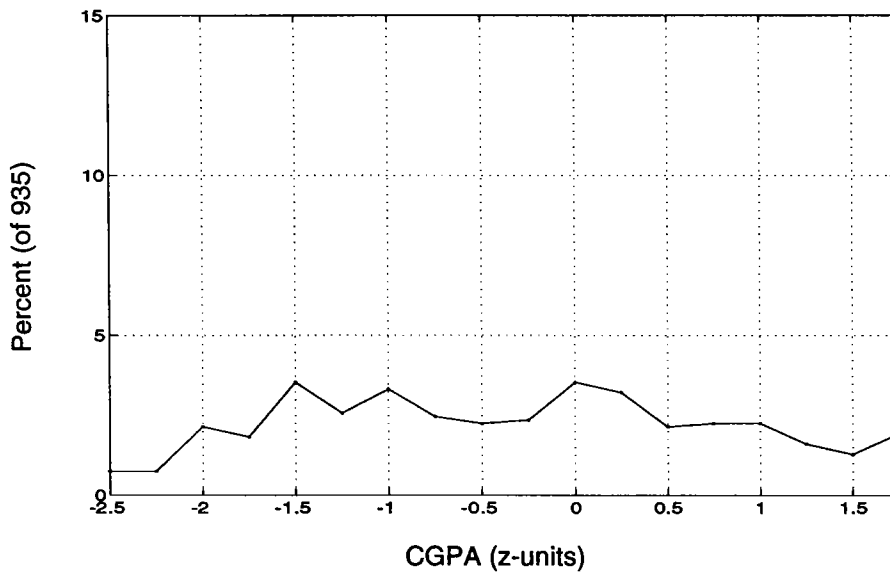


**C. White Student-Athletes  
(n=738)**

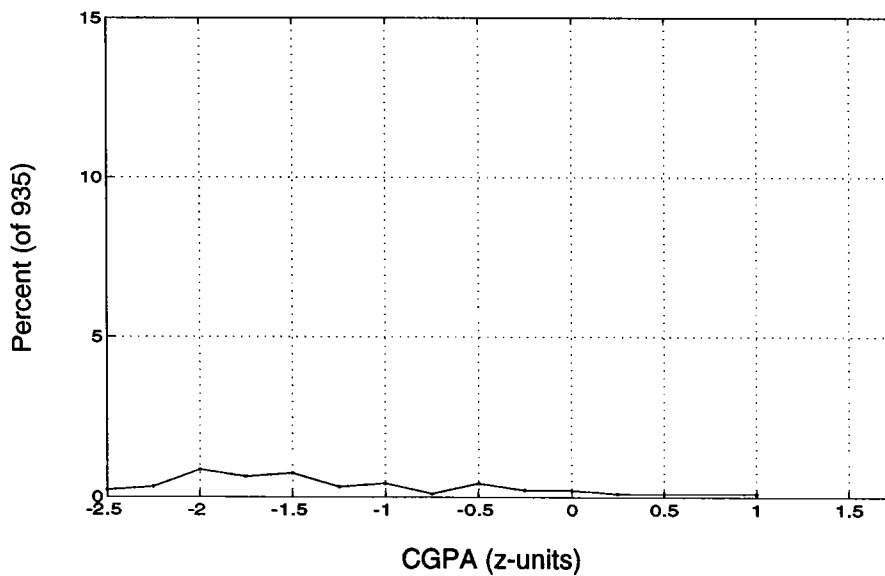


FIGURE 3B

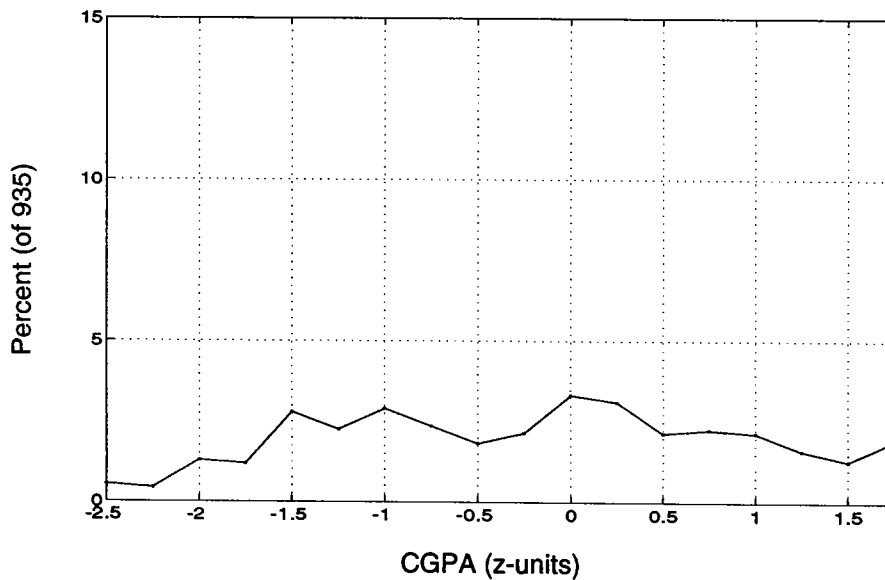
FREQUENCY DISTRIBUTIONS ON CGPA OF GRADUATING  
DIVISION II STUDENT-ATHLETES IN 1986-87 COHORTS  
(Percent = % of 935)



**A. All S-A Graduates  
(n=375)**



**B. Black S-A Graduates  
(n=44)**

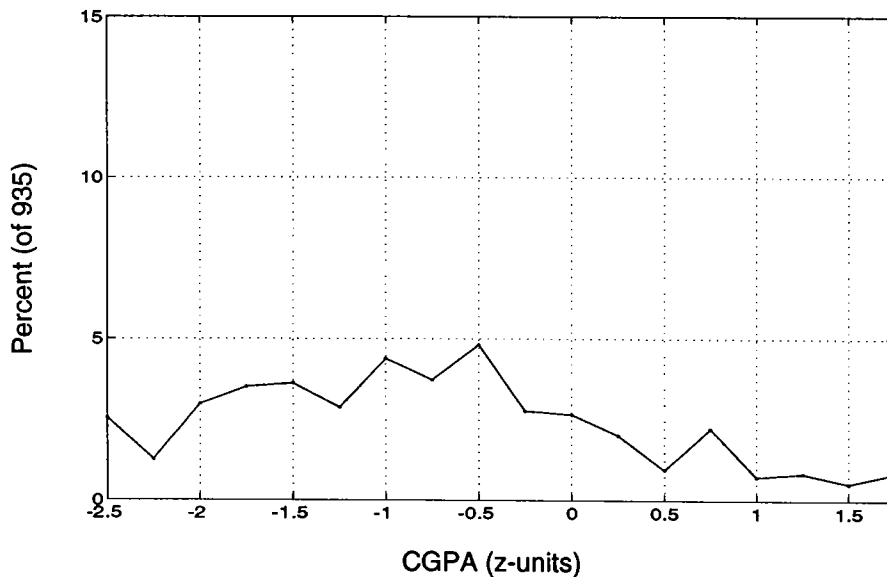
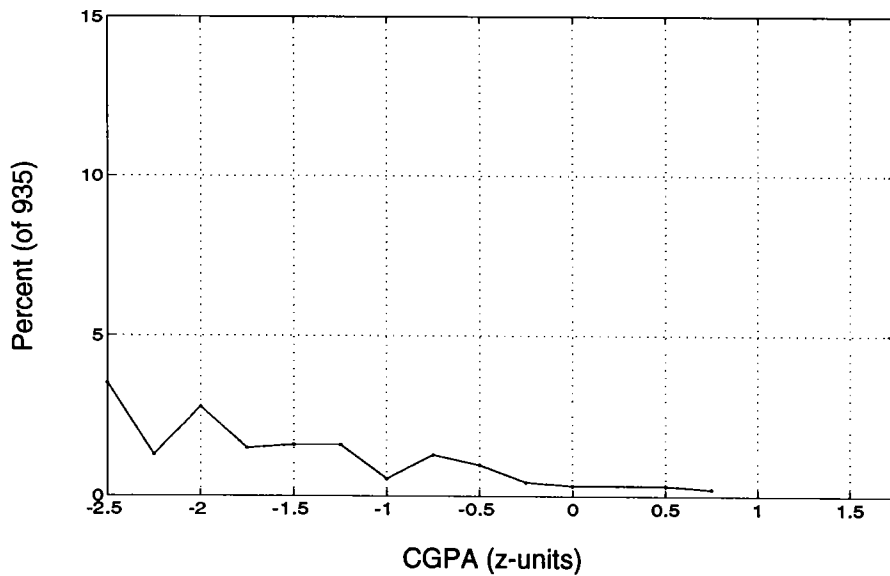
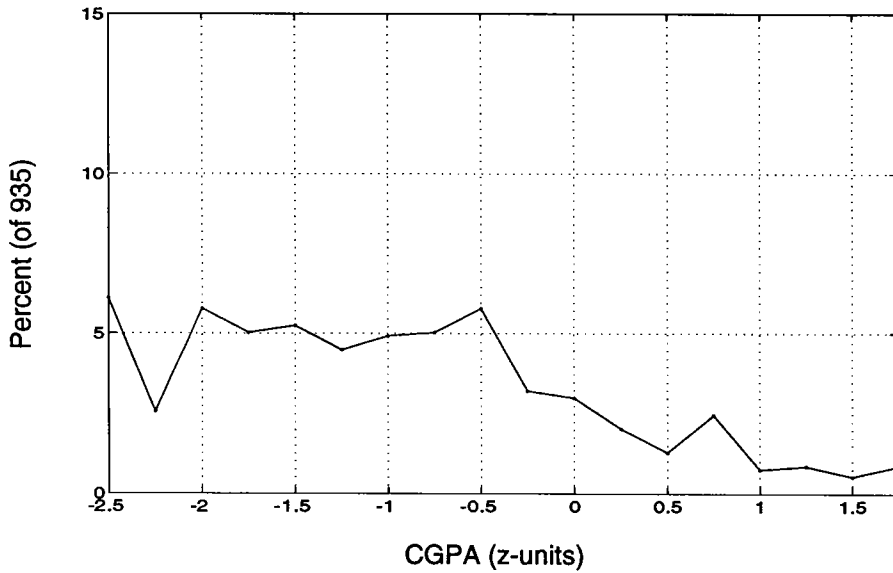


**C. White S-A Graduates  
(n=331)**

# FIGURE 3C

## FREQUENCY DISTRIBUTIONS ON CGPA OF NONGRADUATING DIVISION II STUDENT-ATHLETES IN 1986-87 COHORTS

(Percent = % of 935)

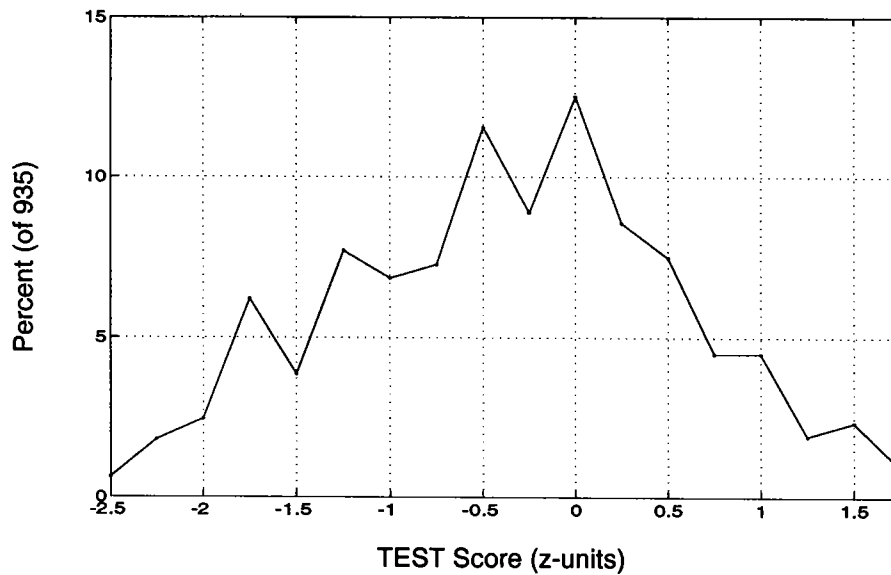




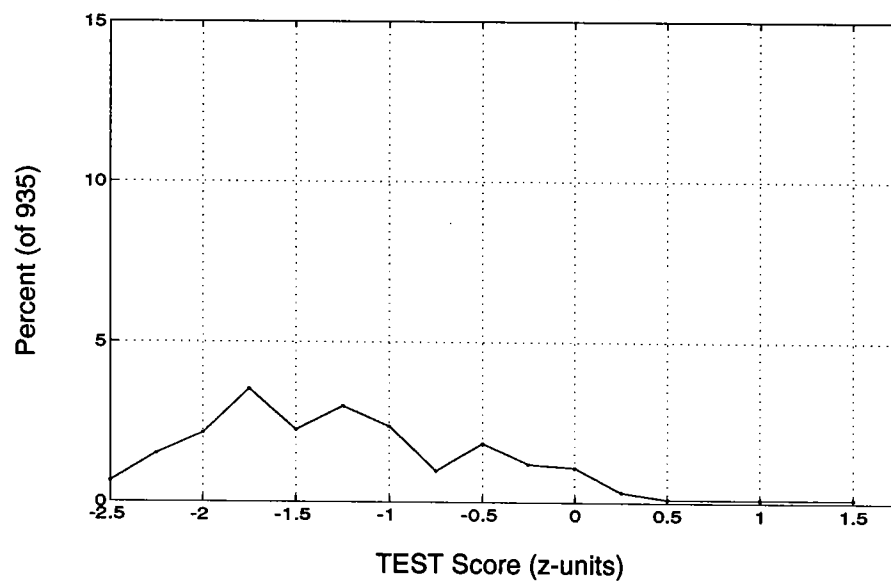
# FIGURE 4A

## FREQUENCY DISTRIBUTIONS ON TEST SCORE OF ALL DIVISION II STUDENT-ATHLETES IN 1986-87 COHORTS

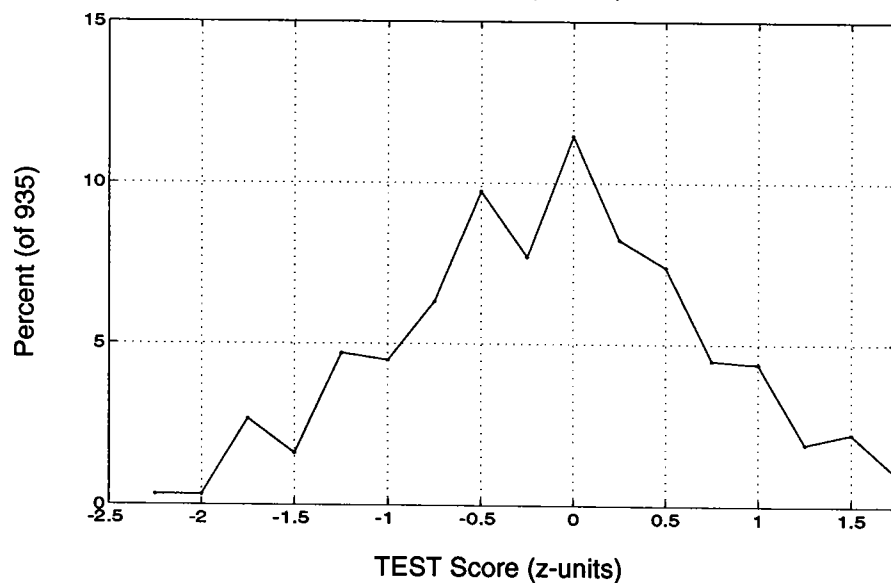
(Percent = % of 935)



**A. All Student-Athletes  
(n=935)**



**B. Black Student-Athletes  
(n=197)**



**C. White Student-Athletes  
(n=738)**



FIGURE 4B

FREQUENCY DISTRIBUTIONS ON TEST SCORE OF GRADUATING  
DIVISION II STUDENT-ATHLETES IN 1986-87 COHORTS

(Percent = % of 935)

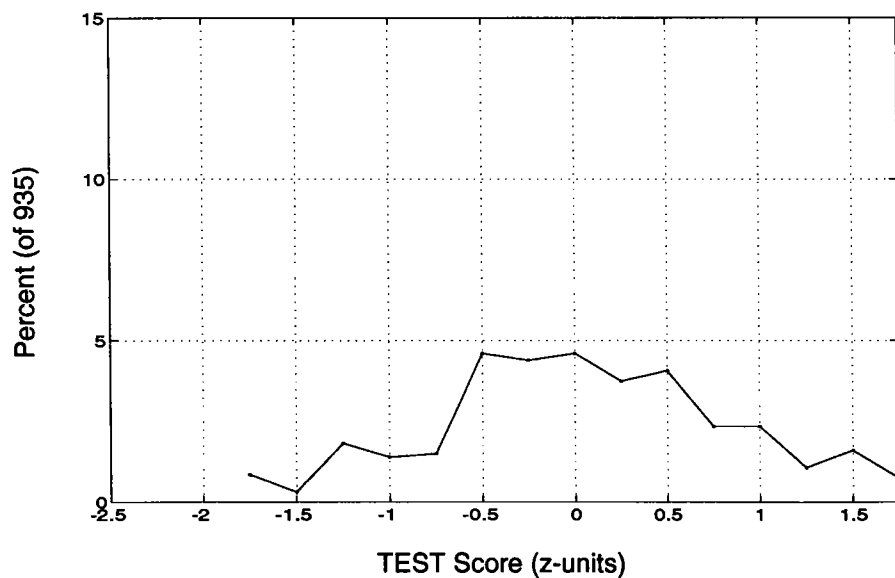
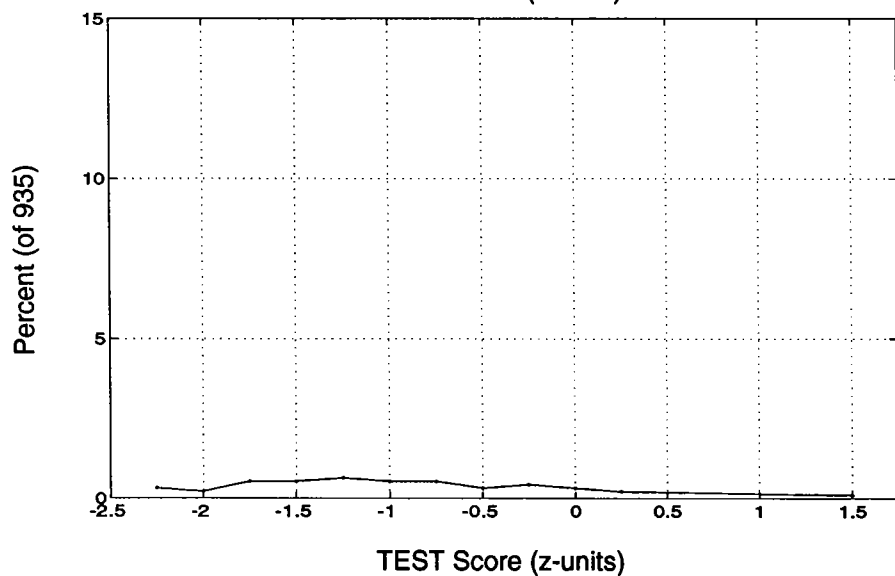
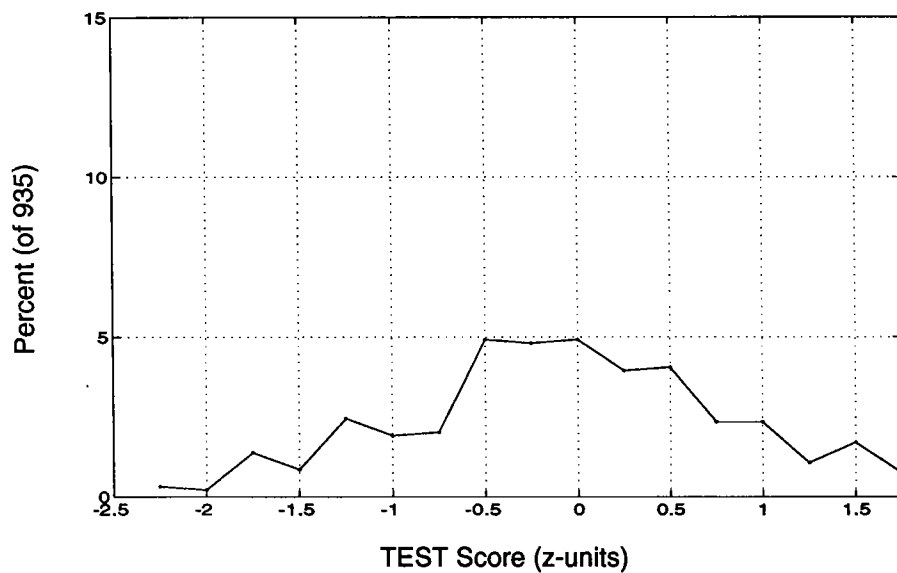
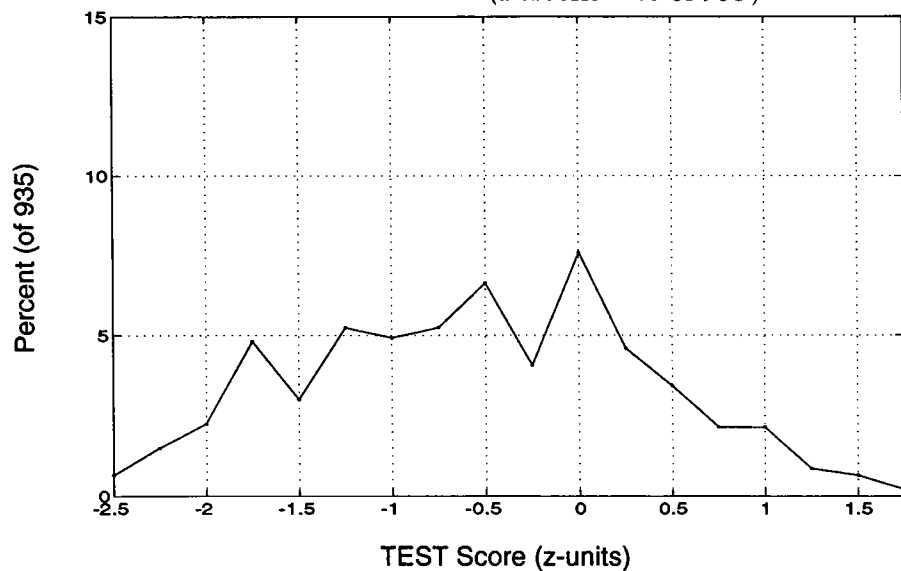


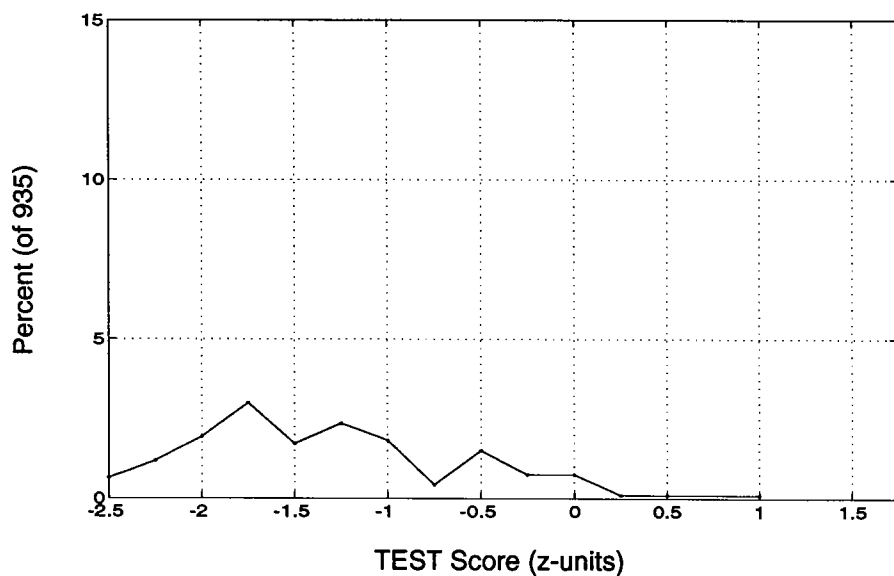
FIGURE 4C

FREQUENCY DISTRIBUTIONS ON TEST SCORE  
OF ALL NONGRADUATING DIVISION II  
STUDENT-ATHLETES IN 1986-87 COHORTS

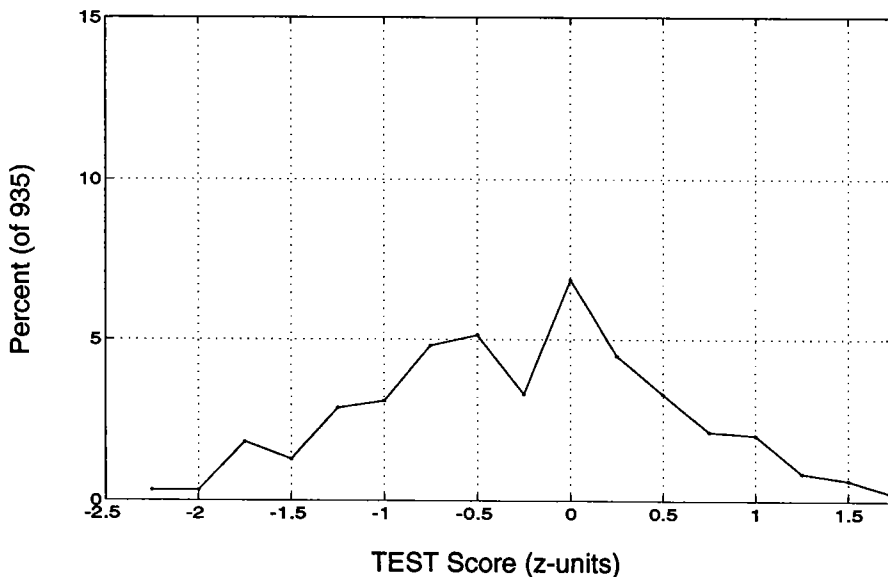
(Percent = % of 935)



**A. All S-A Nongraduates  
(n=560)**



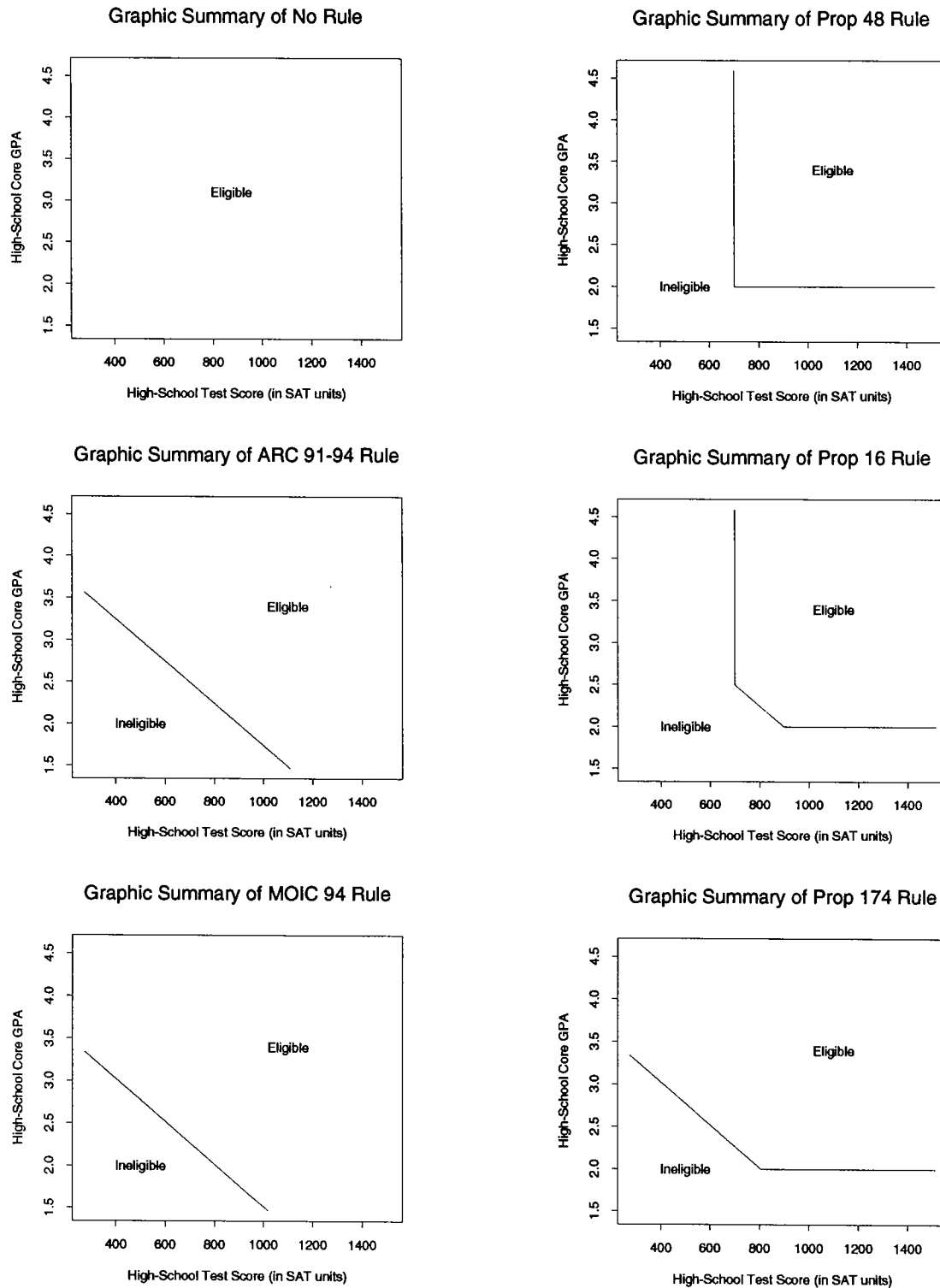
**B. Black S-A Nongraduates  
(n=153)**



**C. White S-A Nongraduates  
(n=407)**

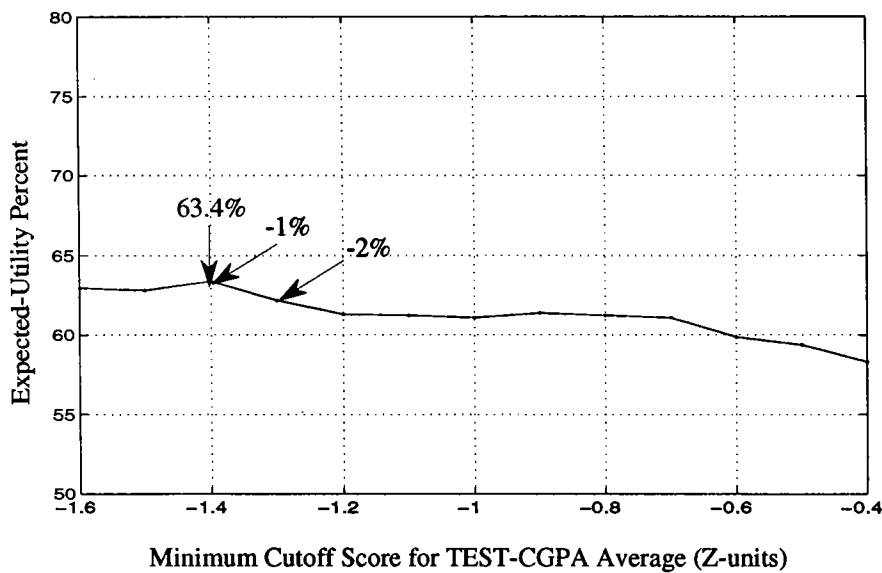
# FIGURE 5

## SELECTION REGIONS GENERATED BY PROPOSED NCAA ELIGIBILITY RULES

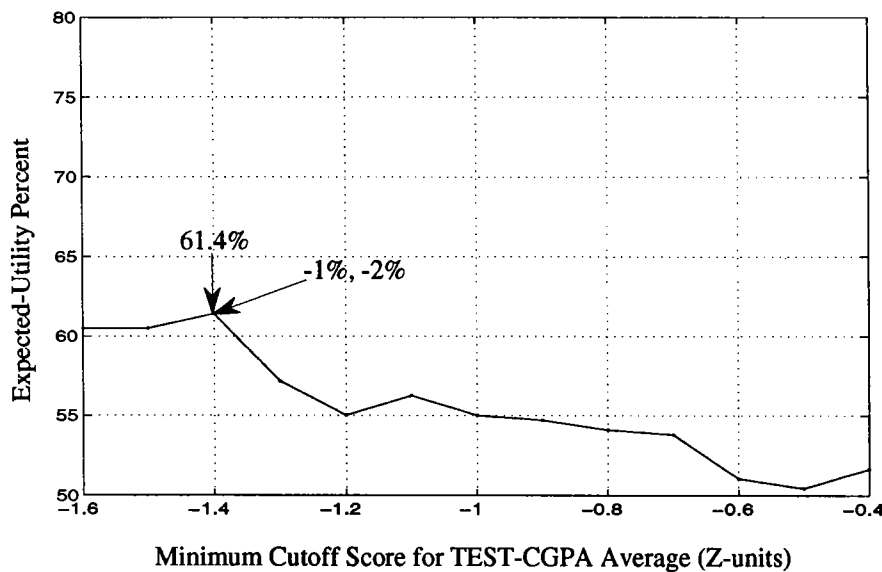


# FIGURE 6

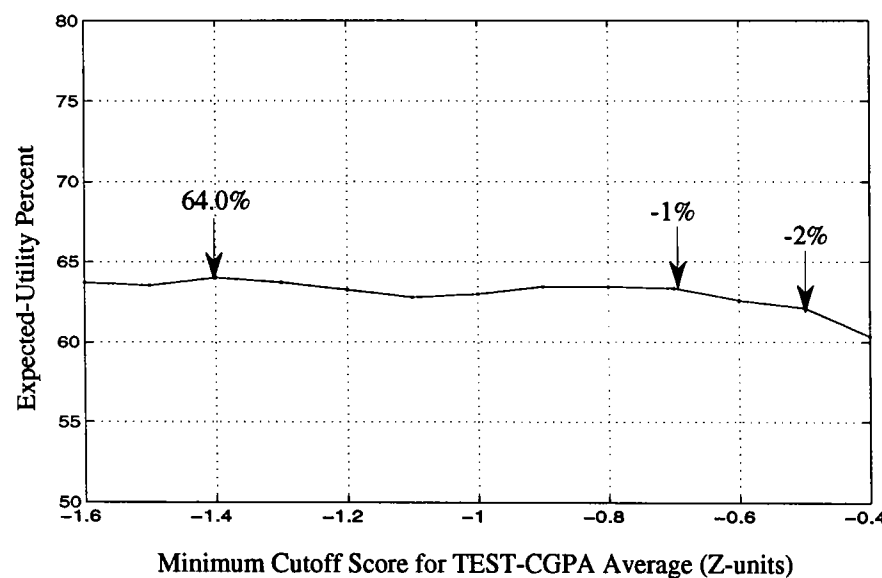
EXPECTED UTILITY AS A FUNCTION OF TEST-CGPA AVERAGE  
MINIMUM CUTOFF FOR 1986-87 DIVISION II COHORTS  
(MIXED UTILITY WEIGHTS)



**A. All Student-Athletes**  
**Black Grad Weight=4**  
**White Grad Weight=2**  
**(n=935)**



**B. Black Student-Athletes**  
**Grad Weight=4**  
**(n=197)**



**C. White Student-Athletes**  
**Grad Weight=2**  
**(n=738)**

# FIGURE 7

OPTIMAL TEST-CGPA AVERAGE MINIMUM CUT-OFF  
FOR 1986-87 DIVISION II COHORTS AS A FUNCTION OF  
GRADUATION WEIGHT  $[(UTP-UFN)/(UTN-UFP)]$

