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ABSTRACT

Projections are presented of what will happen if current trends in enrollments in New Jersey continue and current policies are maintained. Enrollments are projected to 1990 for full-time and part-time students in three collegiate sectors. The projective methodology is a ratio technique that minimizes data requirements and eliminates the need for making subjective judgments. Projections indicate that: (1) the independent sector faces a serious enrollment problem in the future as the public sector continues to expand; (2) growth in all sectors will reach a peak between 1979-1982 and decline to 1990; and (3) some expansion is to be expected, particularly in the public two-year sector. Policy issues raised by these projections are: (1) whether present institutional capacities are sufficient to deal with the peak enrollments projected; (2) whether it is efficient to expand those segments of the postsecondary system under its control while other segments deteriorate; (3) whether the relationship between projected educational cost increases for institutional and projected enrollments will contribute to a future revenue-expenditure gap; and (4) what assumptions about change seem reasonable, and what is desirable if these projections raise areas of concern. (Author/KE)


# UNDERGRADUATE ENROLLMENT PROJECTIONS

# FOR NEW JERSEY INSTITUTIONS

# OF POSTSECONDARY EDUCATION

1976 - 1990



## COMMISSION ON FINANCING POSTSECONDARY EDUCATION

## STATE OF NEW JERSEY

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A PUBLIC COMMISSION APPOINTED BY THE NEW JERSEY BOARD OF HIGHER EDUCATION

# Introduction

States throughout the nation are becoming increasingly aware of and concerned about an almost inevitable decline in collegiate enrollments. Recent nationwide studies and special analyses in Indiana, New York and Wisconsin indicate that the long-term trend in declining enrollments will hold even if external forces such as the economy cause temporary upward adjustments. The Commission staff, based on the research described in this report, perceives a similar downward trend in New Jersey.

It should be emphasized that the projections presented in the following pages are indicative of what will happen if current trends continue and current policies are maintained. Therefore, if the enrollment trends depicted are not perceived to be in the State's best interest, it is imperative that policy-makers consider what adjustments can be made to alter the projected trends.

There are many factors that impact on enrollments, some of which can be controlled and others that are clearly beyond the control of policy-making bodies. Following are some of the primary factors in each category.

Factors that can be influenced include:

- Tuition charges at public institutions. There can be little doubt that low-tuition public institutions have dramatically expanded participation in postsecondary education over the last twenty-five years. A maintenance of this policy, in spite of rising educational costs, may help offset the declining enrollments projected for the future.

- Admission standards at public institutions. New Jersey has made a major commitment to open access in public higher education by developing a two-year college system. It is possible, however, that some potential students who go out-of-state reject two-year colleges as a satisfactory alternative because of the perceived lack of prestige of an associate degree and because they know they want a four-year program. If admission standards were keyed to access at the state colleges and Rutgers, and limits on their size were removed, enrollments might be higher in the future than these projections indicate.

- Eligibility requirements for state financial aid. Guidelines could be altered in several instances to encourage greater participation. For example, the concept of supporting full-time students in total before providing assistance to any part-time students might be rethought. Although thorough analysis of the impact of such a change is not available, it would appear that financial aid targeted to help students who only need a little support first could increase enrollments over time. Other areas of state policy on aid eligibility which should be addressed with an eye toward their impact on enrollments include portability of aid, merit and need based programs, and loan guidelines.

- Development of a student aid system that reduces the tuition differential between independent institutions and public institutions. Some would claim that the result of such an approach would simply result in independent institutions taking students from public institutions. While this point is debatable, it is clear that it is desirable to nurture the independent sector so that it remains viable while only marginally inhibiting public sector growth. In addition, the tuitions charged to students leaving the state for postsecondary education are approximately equal to the tuitions charged by New Jersey's independent institutions. If the aid package were structured so that New Jersey's independent institutions had a significant price advantage over out-of-state institutions, they might well be able to compete in that market. A negative side of this policy is the elimination of student choice through the construct of an artificial and protectionist pricing structure.

Factors which should be recognized as influencing the impact of any policy decisions and which are beyond the policy-maker's control include:

- Birth rates that affect the number of future high school graduates who will be in the pool of potential students.

- The relative attractiveness of a college education. Currently the (economic) benefits accruing to a degree-holder are offset by a relatively young, college-educated labor force that is already in place. Less tangible, but certainly important, are the feelings of potential students about the personal and social development resulting from a college experience.

- The highly competitive market in which New Jersey's institutions are located. Within two hundred miles of New Jersey an array of postsecondary education institutions exists that may be unmatched in the country in terms of diversity and overall quality.

- National and state economics which appear to have a significant impact on enrollments. This phenomenon holds true for all of higher education, including New Jersey institutions, in that two countervailing forces are at work. A bad economy reduces the amount of both family and tax-based support available to support students and institutions. However, a lack of attractive work alternatives leads individuals to seek collegiate education to either increase their skill base, to find better jobs, or to spend one or two years in a worthwhile and relatively inexpensive environment rather than take an undesirable job or accept public assistance.

The enrollment projections set forth in the following pages clearly indicate that policy-makers must assess current and extrapolated trends, evaluate their acceptability and implications, and consider how to alter the controllable variables to change those trends. During this process, it is essential that external, uncontrollable and frequently offsetting variables be kept in mind. While it is a demanding task, it is one that must be undertaken if a diversified and effective postsecondary education system is to be maintained in the future.

# ENROLLMENT PROJECTIONS

Information about the future is a critical need of policy makers and planners as they make decisions in the present. Since the magnitude of the postsecondary education system is generally determined by a desire on the part of the population for the benefits it provides, planning for the system is enhanced when future demand, as expressed by enrollments, can be determined. This demand, however, reflects the interaction between a myriad of variables affecting individual choice, and a precise picture of demand requires a knowledge of those variables and how they interact for every potential participant in the system. Clearly, this knowledge is presently unavailable.

As an alternative, then, to predicting the future, the policy maker can project the future. That is, by making certain assumptions, he can extrapolate past trends into the future. These assumptions generally reflect the specific interests of the planner, the state of any variables under his control, and the technological constraints inherent in the application of a given projective methodology to a specific set of data. Thus, for the policy maker with different sets of assumptions, alternative futures exist, providing him with the opportunity to manipulate the levels of certain variables when a particular future is found to be undesirable.

By its very nature, information about the future is unstable. Therefore, the choice of a particular technique by which to make these projections depends, in part, upon the reliability of obtainable data and the availability of techniques which maximize the use of good data. Several techniques exist which, in general, extrapolate past enrollment trends into the future, including cohort survival, ratio methods, correlational analysis and Markov processes. All of these techniques involve measuring relationships between certain variables over time,

and each assumes that some trend in the data, determined through lines of best-fit, exponential smoothing, or some other line generating procedure, will continue into the future. Each of these requires data of a different specificity and each makes certain assumptions or requires the user to make certain judgments which limit the applicability of the methodology.

Having surveyed these methods and weighed their various advantages and disadvantages, an appropriate log-linear regression technique was chosen as the projecting methodology. An explanation of this technique and why it was chosen over other methods is set forth in Appendix A.

Once the work was completed to the point of determining the regression equations, the projected enrollments were calculated for collegiate sectors and full-time/part-time students. Final results are displayed in Graphs 1 and 2 and Tables 1 and 2 (located at the end of this brief narrative and prior to Appendix A). In these tables, enrollments for the years 1969-1974 are actual numbers of students while projected enrollments for the years 1975-1990 have been rounded to the nearest one hundred students.

For full-time students, total enrollments are shown to peak in 1979, reflecting a continued growth in the public sectors until 1982 and a continuing decline in enrollments in the independent sector. Between 1974 and 1982 enrollments in the two-year public sector will grow by over 10,000 students. In the same period, enrollments in the four-year public sector will grow by over 24,000 students, a gain of roughly 33%.

For part-time students the timing of growth is similar, with a peak of close to 93,000 students reached in 1982, although the public two-year sector will grow dramatically while the four-year public sector will remain stable. The four-year independent sector is projected to decline gradually. For both full-time and part-time projections, an increasing number of births in 1969-1970 is seen as causing a short-lived increase in enrollments 18 years later with a substantial decline beyond that point to 1990.

Tables 3 and 4 indicate percentage changes in enrollments for selected time intervals. These tables demonstrate that the period of fast growth in higher education is over and that, for both full-time and part-time enrollments, growth will continue at a slower rate in the public sector for a short period of time, followed by a decline at an increasing rate. The four-year independent sector clearly is facing a difficult period as the rate of decline in enrollments increases.

Tables 5 and 6 indicate the proportion of total enrollments captured by each sector. For full-time students, the public two-year share of the total rises gently from 25% in 1975 to 30% in 1990. The public four-year institutions exhibit a more dramatic growth, increasing from 53% to 63% over the projection period. The remaining sector in this analysis, the four-year independents, is obviously hard hit by this combined growth in the public institutions, declining from 22% of the full-time total in 1975 to only 7% in 1990. The changing distribution

of part-time undergraduate enrollments is similar to, although less pronounced than, that of full-time students. The public two-year sector increases its share of students, while the public four-year sector maintains its share, and the independent sector declines.

Finally, Table 7 indicates the ratio of part-time FTE's to total FTE's (FTE's are calculated as 1 x full-time students plus 1/3 x part-time students). It is clear that changes in this ratio are expected to be moderate. The impact of these changes will be felt if funding formulas are based on FTE counts. To the extent that institutions adequately receive resources to cover their expenditures for part-time students, continued growth in part-time students would not be a liability to the public two-year sector.

In conclusion, the staff has projected enrollments to 1990 for full-time and part-time students in three collegiate sectors. The projective methodology has been a ratio technique which minimizes data requirements and eliminates the need for making subjective judgments. Data have been transformed to allow the use of log-linear regression techniques. Projections indicate that:

- the independent sector faces a serious enrollment problem in the future as the public sector continues to expand.
- growth in all sectors will reach a peak between 1979-1982 and, except for a brief period of growth later, decline to 1990.
- if past trends in part-time attendance continue, some expansion, particularly in the public two-year sector, is to be expected.

These projections obviously raise several policy issues. Four which seem of primary importance are:

- Policy-makers need to assess whether present institutional capacities are sufficient to deal with the peak enrollments projected. If not, what are the relative merits of expansion vs. continued out-of-state migration of students?
- In light of the above, the state must determine whether it is efficient to expand those segments of the postsecondary system under its control while other segments, which could bear some of the anticipated burden without additional expansion, deteriorate.
- Planners might determine whether the relationship between projected educational cost increases for institutions and projected enrollments will contribute to a future revenue-expenditure gap, given present tuition policies and the configuration of student and institutional subsidy.
- Of those factors which influence the trends extrapolated here, which are likely to change, what assumptions about change seem reasonable, and what change is desirable if these projections raise areas of concern?

Table 1

Full-Time Undergraduate Student Enrollments

By Sector

| | 2-Year Public | 4-Year Public | 4-Year Independent | Total |
|---|---|---|---|---|
| 1969 | 20,648 | 42,337 | 33,485 | 96,470 |
| 1970 | 24,477 | 50,029 | 34,709 | 109,215 |
| 1971 | 29,325 | 56,070 | 35,930 | 121,325 |
| 1972 | 30,547 | 63,750 | 35,221 | 129,518 |
| 1973 | 32,242 | 68,729 | 33,968 | 134,889 |
| 1974 | 36,017 | 74,099 | 32,918 | 143,034 |
| 1975 | 38,600 | 80,300 | 33,600 | 152,500 |
| 1976 | 40,100 | 83,600 | 32,200 | 155,900 |
| 1977 | 41,600 | 86,900 | 31,000 | 159,500 |
| 1978 | 43,400 | 90,700 | 30,000 | 164,100 |
| 1979 | 45,300 | 95,000 | 29,100 | 169,400 |
| 1980 | 45,100 | 94,600 | 26,800 | 166,500 |
| 1981 | 46,300 | 97,300 | 25,500 | 169,100 |
| 1982 | 46,800 | 98,500 | 23,900 | 169,200 |
| 1983 | 45,300 | 95,400 | 21,300 | 162,000 |
| 1984 | 44,200 | 93,100 | 19,100 | 156,400 |
| 1985 | 43,300 | 91,400 | 17,200 | 151,900 |
| 1986 | 43,200 | 91,200 | 15,600 | 150,000 |
| 1987 | 45,000 | 95,000 | 14,700 | 154,700 |
| 1988 | 46,700 | 98,600 | 13,700 | 159,000 |
| 1989 | 43,800 | 92,600 | 11,500 | 147,900 |
| 1990 | 39,400 | 83,300 | 9,100 | 131,800 |

Table 2

Part-Time Undergraduate Student Enrollments

By Sector

| | 2-Year Public | 4-Year Public | 4-Year Independent | Total |
|---|---|---|---|---|
| 1969 | 17,326 | 26,853 | 18,430 | 62,609 |
| 1970 | 21,941 | 31,303 | 16,735 | 69,979 |
| 1971 | 25,253 | 32,946 | 14,445 | 72,644 |
| 1972 | 29,163 | 24,535 | 12,740 | 66,438 |
| 1973 | 33,938 | 27,913 | 12,122 | 73,973 |
| 1974 | 40,823 | 31,598 | 12,481 | 85,748 |
| 1975 | 39,600 | 31,300 | 12,600 | 83,500 |
| 1976 | 41,000 | 31,600 | 12,100 | 84,800 |
| 1977 | 43,300 | 32,000 | 11,600 | 86,900 |
| 1978 | 45,400 | 32,700 | 11,400 | 89,500 |
| 1979 | 47,700 | 33,500 | 11,100 | 92,300 |
| 1980 | 47,700 | 32,800 | 10,400 | 90,900 |
| 1981 | 49,200 | 33,200 | 10,100 | 92,500 |
| 1982 | 50,000 | 33,100 | 9,700 | 92,800 |
| 1983 | 48,500 | 31,600 | 8,900 | 89,000 |
| 1984 | 47,500 | 30,400 | 8,200 | 86,100 |
| 1985 | 46,700 | 29,500 | 7,700 | 83,900 |
| 1986 | 46,700 | 29,100 | 7,300 | 83,100 |
| 1987 | 48,700 | 30,000 | 7,200 | 85,900 |
| 1988 | 50,700 | 30,800 | 7,200 | 88,700 |
| 1989 | 47,600 | 28,700 | 6,400 | 82,700 |
| 1990 | 42,900 | 25,600 | 5,500 | 74,000 |

Table 3

Percentage Change of Full-Time Student Enrollments, By Sector

| | 2-Year Public | 4-Year Public | 4-Year Independent | Total |
|---|---|---|---|---|
| 1969 | 20,648 | 42,337 | 33,485 | 96,470 |
| | +74.4% | +75.0% | -1.7% | +48.3% |
| 1974 | 36,017 | 74,099 | 32,918 | 143,034 |
| | +25.2% | +27.7% | -18.6% | +16.4% |
| 1980 | 45,100 | 94,600 | 26,800 | 166,500 |
| | -4.0% | -3.4% | -35.8% | -8.7% |
| 1985 | 43,300 | 91,400 | 17,200 | 152,000 |
| | -9.0% | -8.9% | -47.1% | -13.3% |
| 1990 | 39,400 | 83,300 | 9,100 | 131,800 |

Table 4

Percentage Change of Part-Time

Student Enrollments, By Sector

| | 2-Year Public | 4-Year Public | 4-Year Independent | Total |
|---|---|---|---|---|
| 1969 | 17,326 | 26,853 | 18,430 | 62,609 |
| | +135.6% | +17.7% | +32.3% | +37.0% |
| 1974 | 40,823 | 31,596 | 12,481 | 85,748 |
| | +16.7% | +3.8% | -16.7% | +5.7% |
| 1980 | 47,700 | 32,800 | 10,400 | 90,900 |
| | -2.1% | -11.2% | -26.0% | -8.3% |
| 1985 | 46,700 | 29,500 | 7,700 | 83,900 |
| | -8.1% | -13.2% | -28.6% | -13.4% |
| 1990 | 42,900 | 25,600 | 5,500 | 74,000 |

Table 5

Percent of Full-Time Undergraduates in Each Sector

for the Years 1969-1990

| | 2-Year Public | 4-Year Public | 4-Year Independent |
|---|---|---|---|
| 1969 | 21.4 | 43.9 | 34.7 |
| 1970 | 22.4 | 45.8 | 31.8 |
| 1971 | 24.2 | 46.2 | 29.6 |
| 1972 | 23.6 | 49.2 | 27.2 |
| 1973 | 23.9 | 51.0 | 24.4 |
| 1974 | 25.2 | 51.8 | 23.0 |
| 1975 | 25.3 | 52.7 | 22.0 |
| 1976 | 25.7 | 53.6 | 20.7 |
| 1977 | 26.1 | 54.5 | 19.4 |
| 1978 | 26.4 | 55.3 | 18.3 |
| 1979 | 26.8 | 56.1 | 17.2 |
| 1980 | 27.1 | 56.8 | 16.1 |
| 1981 | 27.4 | 57.5 | 15.1 |
| 1982 | 27.7 | 58.2 | 14.1 |
| 1983 | 28.0 | 58.9 | 13.1 |
| 1984 | 28.3 | 59.5 | 12.2 |
| 1985 | 28.5 | 60.2 | 11.3 |
| 1986 | 28.8 | 60.8 | 10.4 |
| 1987 | 29.1 | 61.4 | 9.5 |
| 1988 | 29.3 | 62.0 | 8.6 |
| 1989 | 29.6 | 62.6 | 7.8 |
| 1990 | 29.9 | 63.2 | 6.9 |

Table 6

Percent of Part-Time Undergraduates in Each Sector

for the Years 1969-1990

| | 2-Year Public | 4-Year Public | 4-Year Independent |
|---|---|---|---|
| 1969 | 27.7 | 42.9 | 29.4 |
| 1970 | 31.4 | 44.7 | 23.9 |
| 1971 | 34.8 | 45.4 | 19.9 |
| 1972 | 43.9 | 36.9 | 19.2 |
| 1973 | 45.9 | 37.7 | 16.4 |
| 1974 | 47.6 | 36.8 | 14.6 |
| 1975 | 47.4 | 37.5 | 15.1 |
| 1976 | 48.5 | 37.3 | 14.3 |
| 1977 | 49.8 | 36.8 | 13.3 |
| 1978 | 50.7 | 36.5 | 12.7 |
| 1979 | 51.7 | 36.3 | 12.0 |
| 1980 | 52.5 | 36.1 | 11.4 |
| 1981 | 53.2 | 35.9 | 10.9 |
| 1982 | 53.9 | 35.7 | 10.5 |
| 1983 | 54.5 | 35.5 | 10.0 |
| 1984 | 55.2 | 35.2 | 9.5 |
| 1985 | 55.7 | 35.2 | 9.2 |
| 1986 | 56.2 | 35.0 | 8.8 |
| 1987 | 56.7 | 34.9 | 8.4 |
| 1988 | 57.2 | 34.7 | 8.1 |
| 1989 | 57.6 | 34.7 | 7.7 |
| 1990 | 58.0 | 34.6 | 7.4 |

Table 7

Ratio of Part-Time FTE's to Total FTE's

| | 2-Year Public | | | 4-Year Public | | | 4-Year Independent | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1/3 PT | FTE | 1/3 PT / FTE | 1/3 PT | FTE | 1/3 PT / FTE | 1/3 PT | FTE | 1/3 PT / FTE |
| 1969 | 5,775 | 26,423 | 21.9 | 8,951 | 51,268 | 17.5 | 6,143 | 39,628 | 15.5 |
| 1970 | 7,314 | 31,791 | 23.0 | 10,434 | 60,463 | 17.3 | 5,578 | 40,287 | 13.8 |
| 1971 | 8,418 | 37,743 | 22.3 | 10,982 | 67,052 | 16.4 | 4,815 | 40,745 | 11.8 |
| 1972 | 9,721 | 40,268 | 24.1 | 8,178 | 71,928 | 11.4 | 4,247 | 39,468 | 10.8 |
| 1973 | 11,313 | 43,555 | 26.0 | 9,304 | 78,033 | 11.9 | 4,041 | 38,009 | 10.6 |
| 1974 | 13,608 | 49,625 | 27.4 | 10,533 | 84,632 | 12.4 | 4,160 | 37,078 | 11.2 |
| 1975 | 13,200 | 51,800 | 25.5 | 10,400 | 90,700 | 11.5 | 4,200 | 37,800 | 11.1 |
| 1976 | 13,700 | 53,800 | 25.5 | 10,500 | 94,100 | 11.2 | 4,000 | 36,200 | 11.1 |
| 1977 | 14,400 | 56,000 | 25.7 | 10,700 | 97,600 | 11.0 | 3,900 | 34,900 | 11.2 |
| 1978 | 15,100 | 58,500 | 25.8 | 10,900 | 101,600 | 10.7 | 3,800 | 33,800 | 11.2 |
| 1979 | 15,900 | 61,200 | 26.0 | 11,200 | 106,200 | 10.5 | 3,700 | 32,800 | 11.3 |
| 1980 | 15,900 | 61,000 | 26.1 | 10,900 | 105,500 | 10.3 | 3,500 | 30,300 | 11.6 |
| 1981 | 16,400 | 62,700 | 26.2 | 11,100 | 108,400 | 10.2 | 3,400 | 28,900 | 11.8 |
| 1982 | 16,700 | 63,500 | 26.3 | 11,000 | 109,500 | 10.0 | 3,200 | 27,100 | 11.8 |
| 1983 | 16,200 | 61,500 | 26.3 | 10,500 | 105,900 | 9.9 | 3,000 | 24,300 | 12.4 |
| 1984 | 15,800 | 60,000 | 26.3 | 10,100 | 103,200 | 9.8 | 2,700 | 21,800 | 12.4 |
| 1985 | 15,600 | 58,900 | 26.5 | 9,800 | 100,200 | 9.8 | 2,600 | 19,800 | 13.1 |
| 1986 | 15,600 | 58,800 | 26.5 | 9,700 | 100,900 | 9.6 | 2,400 | 18,000 | 13.3 |
| 1987 | 16,200 | 61,200 | 26.5 | 10,000 | 105,000 | 9.5 | 2,400 | 17,100 | 14.0 |
| 1988 | 16,900 | 63,600 | 26.6 | 10,300 | 108,900 | 9.5 | 2,400 | 16,100 | 14.9 |
| 1989 | 15,900 | 59,800 | 26.6 | 9,600 | 102,200 | 9.4 | 2,100 | 13,600 | 15.4 |
| 1990 | 14,300 | 53,700 | 26.6 | 8,500 | 91,800 | 9.3 | 1,800 | 10,900 | 16.5 |

Appendix A

Cohort survival, the most common method used to project enrollments, is essentially a technique by which individual populations are tracked from birth through college. Birth, mortality, migration, high school graduate rate, college-going rate, and survival rate in college can be incorporated into this model to reflect a logical flow of persons into and out of a pool of individuals attending college. The scope of data elements required to project using this technique is substantial, and in the use of certain variables--for instance the college-going rate in 1985--one is forced to make subjective judgments. In addition, the step-by-step approach becomes increasingly unstable as the estimates made in one step impact on estimates made in later steps, magnifying the total variance of the projection at each succeeding decision point. One way in which this problem has been confronted has been to estimate high and low levels for each decision point, carry these through the projection, and produce several possible outcomes, normally with a large spread between lowest and highest estimates. Interpreting these results is often difficult and, unless the projector can assess the impact of each variable at every decision point, he is unable to determine which decision contributed most significantly to the outcome.

Both Markov analysis and correlation analysis require even more detailed but equally reliable information in order to yield useful results. While these methods can potentially provide a large amount of specific information, the fact that the required input data was either unavailable in sufficient detail or unreliable, in conjunction

with a belief that the minimization of subjective judgments was highly desirable, led the Commission staff to reject these approaches as well. However, Appendix B does contain some findings based on a cohort survival technique.

The ratio method is appealing in that the data requirements are not overwhelming and its use is common. One driving force involved in determining potential demand for a service such as education is births some number of years prior to the time when that service is to be offered. Birth data has the real advantage of being accurate and, in the case of a service not offered until more than 18 years after birth, such data allows the planner to project demand 18 years into the future on the basis of firm information which is presently available. Therefore, it was determined that the ratio of enrollments to births should be the variable projected into the future. A flow chart of the projection model appears as Chart A1.

Actual number of births for the years 1947-1972 were provided by the New Jersey Department of Health and they were utilized in two ways. For the years 1947-1956, births served as input data, while for the years 1957-1972 the product of births and the projected ratio of enrollments to births yielded projected enrollments.

Lacking accurate data on enrollment classifications, that is by level or program, the single factor for projective purposes becomes the ratio of total enrollments to births 18 years prior to freshman class year, disaggregated by collegiate sector (public two-year, public four-year and independent four-year) as well as by full-time or part-time

status. This data was available for the years 1965-1974 and is based on all students attending New Jersey institutions. New Jersey students attending institutions outside of the state are not included, while out-of-state residents enrolled in New Jersey institutions are included. This does not represent a large problem as long as the proportion of New Jersey students is constant in each sector. The ratio of out-of-state to total students for the four-year independent sector varies from 27.3 to 33.6% over the years we used and is shown in Table A1. For the other sectors, the proportion of out-of-state students is small, below 8%, and is not a concern.

Using this method, the enrollment-births ratio is estimated for years beyond 1975 by extrapolation along a line that "best-fits" the data from 1965-1974. In fitting a line to the 1965-1974 data, several methods have been proposed. Software limitations, the high $R^2$'s obtained,[1] and considerations of simplicity and reproducibility encouraged the staff's use of log-linear techniques over the non-linear logistic growth and straight-line methods used by other researchers. In particular, log-linear regressions in which time (t=year-1965) was logarithmically transformed were used for projecting ratios for all sectors save the independent four-year institutions. The TSP (Time Series Processor) package on an IBM 360/91 installation was employed.

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[1] $R^2$ is a statistic which indicates the amount of variance in the data accounted for by the regression line. If the regression line "fits" the actual data perfectly, the $R^2$ of the regression equation would equal unity, the highest value attainable.

The equations for the best fitting line and the associated $R^2$, the amount of variance accounted for, are shown in Tables A2 and A3. Tables A4 and A5 show the relationship between actual enrollments, rounded to the nearest one hundred, and enrollments projected by a regression line calculated to best fit the ratio of enrollments to births for the years 1969-1974.

In the case of the four-year public institutions, it came to the staff's attention that some problems had existed in collecting data for the years 1969-1971. In fact, some full-time students may have been counted as part-time students if they attended evening classes. Since it was determined that this situation could not be rectified, that is, students could not be transferred from one status to another at this time, a statistical procedure was chosen to test whether the line of best fit, as calculated above, should be changed in either the full-time or part-time projection for the public four-year sector.

A dummy variable was created for the years in question, entered into the computer, and new regression lines were calculated. To determine whether the projections including the dummy explained the data significantly better than did the original projections, the Chow test was employed.[1] It was determined that a significant improvement resulted only for the part-time four-year public enrollment projections.

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[1] The test, based on the reduction in the sum of squared residuals caused by the inclusion of the dummy variable, is an F ratio of that reduction divided by the sum of residuals of the dummy equation, adjusted for the appropriate degrees of freedom, as follows:

$$F = \frac{\frac{SSR_{original} - SSR_{dummy}}{r}}{\frac{SSR_{dummy}}{n-k-1}}$$

Where SSR = the sum of squared residuals
r = degrees of freedom lost = 1
n-k-1 = degrees of freedom in the original equation = 7

# FLOW CHART OF PROJECTION METHODOLOGY

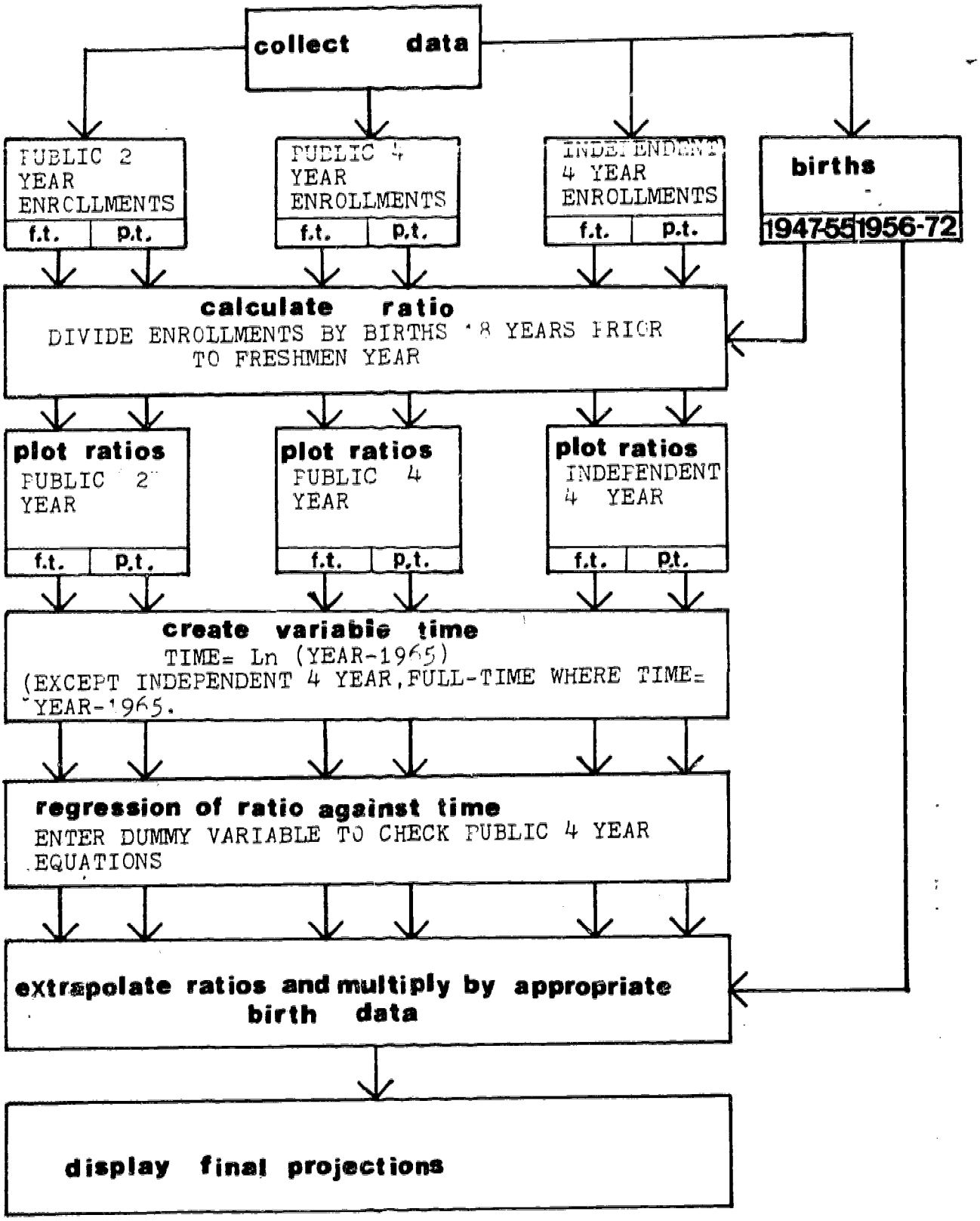


Table A1

Relationship Between Out-of-State
and Total Enrollment in the
4-Year Independent Sector

| Year | Out-of-State Students | In-State Students | Total Students | Out-of-State as Percent of Total Enrollment |
|---|---|---|---|---|
| 1969 | 9,151 | 24,334 | 33,485 | .273 |
| 1970 | 9,718 | 24,991 | 34,709 | .280 |
| 1971 | 10,234 | 25,696 | 35,930 | .285 |
| 1972 | 9,899 | 25,322 | 35,221 | .281 |
| 1973 | 9,415 | 24,553 | 33,968 | .277 |
| 1974 | 9,238 | 23,680 | 32,918 | .281 |

Source: Department of Higher Education, Data Brief No. 5, December, 1974

Table A2

Regression Equations

Full-Time Undergraduate Projections

Public 2-Year

$$y(t) = (.107336 \ln (t) + .051853) \times \text{births}_{(t-18)}$$

$$R^2 = .93$$

Public 4-Year

$$y(t) = (.239642 \ln (t) + .069688) \times \text{births}_{(t-18)}$$

$$R^2 = .99$$

Independent 4-Year

$$y(t) = (-.011176\ t + .371410) \times \text{births}_{(t-18)}$$

$$R^2 = .88$$

Table A3

Regression Equations

Part-Time Undergraduate Projections

Public 2-Year

$$y(t) = (.138910 \ln (t) - .013876) \times \text{births}_{(t-18)}$$

$$R^2 = .94$$

Public 4-Year

$$y(t) = (.017517 \ln (t) + .201584 + .047804 \text{ dummy}^*) \times \text{births}_{(t-18)}$$

$$R^2 = .75$$

Independent 4-Year

$$y(t) = (-.045166 \ln (t) + .201331) \times \text{births}_{(t-18)}$$

$$R^2 = .82$$

* dummy = 1 for years 1969-71 and 0 for all others

Table A4

Full-Time Undergraduate Projections

| | Actual | Fitted |
|---|---|---|
| 2-Year Public | | |
| 1969 | 20,600 | 21,100 |
| 1970 | 24,500 | 24,800 |
| 1971 | 29,300 | 27,500 |
| 1972 | 30,500 | 30,800 |
| 1973 | 32,200 | 33,300 |
| 1974 | 36,000 | 35,800 |
| 4-Year Public | | |
| 1969 | 42,300 | 42,300 |
| 1970 | 50,000 | 50,200 |
| 1971 | 56,100 | 56,200 |
| 1972 | 63,800 | 63,400 |
| 1973 | 68,700 | 68,700 |
| 1974 | 74,100 | 74,300 |
| 4-Year Independent | | |
| 1969 | 33,500 | 34,400 |
| 1970 | 34,700 | 34,800 |
| 1971 | 35,900 | 34,300 |
| 1972 | 35,200 | 34,700 |
| 1973 | 34,000 | 34,100 |
| 1974 | 32,900 | 33,700 |

Table A5

Part-Time Undergraduate Projections

| | Actual | Fitted |
|---|---|---|
| 2-Year Public | | |
| 1969 | 17,300 | 18,800 |
| 1970 | 21,900 | 23,100 |
| 1971 | 25,200 | 26,400 |
| 1972 | 29,700 | 30,300 |
| 1973 | 34,900 | 33,300 |
| 1974 | 40,800 | 36,300 |
| 4-Year Public | | |
| 1969 | 26,900 | 28,800 |
| 1970 | 31,300 | 30,600 |
| 1971 | 32,900 | 31,600 |
| 1972 | 24,500 | 27,900 |
| 1973 | 27,900 | 28,800 |
| 1974 | 32,500 | 29,900 |
| 4-Year Independent | | |
| 1969 | 18,400 | 17,000 |
| 1970 | 16,700 | 16,700 |
| 1971 | 14,400 | 16,100 |
| 1972 | 12,700 | 13,400 |
| 1973 | 12,100 | 13,000 |
| 1974 | 12,500 | 12,700 |

Appendix B

As part of the staff's investigation into various projective techniques, some data were acquired which allowed us to utilize a cohort survival methodology. Because the data were incomplete and because survival rates appeared to be unstable, the methodology was not employed in actually computing projections. However, the data have been displayed in Table B1 since they reveal results which raise questions about how the present higher education system operates and point out difficulties in utilizing the cohort survival technique.

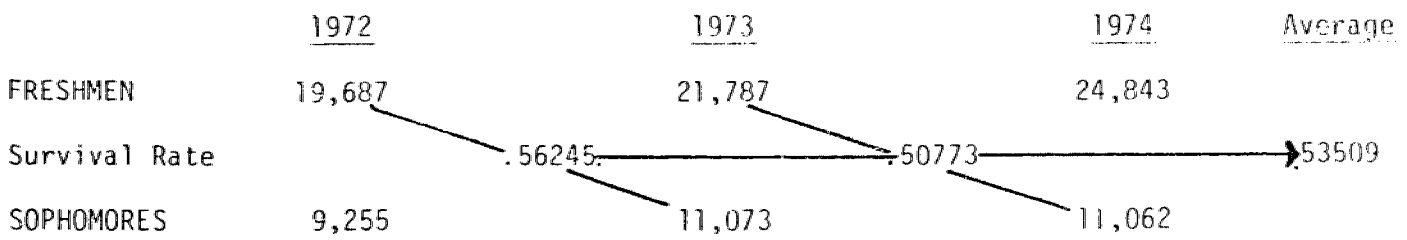
One inference drawn from this display is that survival rates between freshman and sophomore years are lower than between any other contiguous years. In particular, the survival rates of sophomores in county colleges is very low, although this may reflect the fact that large numbers of students are enrolled in one-year terminal programs. The high survival rates between sophomore and junior years, with values greater than 1 in the public sector, imply a net transfer of new students into the junior class. The fact that the figures do not indicate which students dropped out after sophomore year and how many new transfer students were added to the junior class make a determination of a real persistence rate, that is an average number of years spent in college by students, all but impossible. If such data were available, a Markov process could probably be used to better advantage in any case.

Finally, the survival rate between junior and senior years is very high and always higher than the freshman to sophomore survival rate, implying that if a student can survive until junior year, his chances are high of becoming a senior and, one assumes, of graduating. It would appear, too, that transfer students survive well. Again, without better data it is impossible to determine whether transfer students or students who entered as freshmen survive better.

Table B1

Cohort Survival Rates in Various Collegiate Sectors

COUNTY COLLEGES




RUTGERS AND NJIT

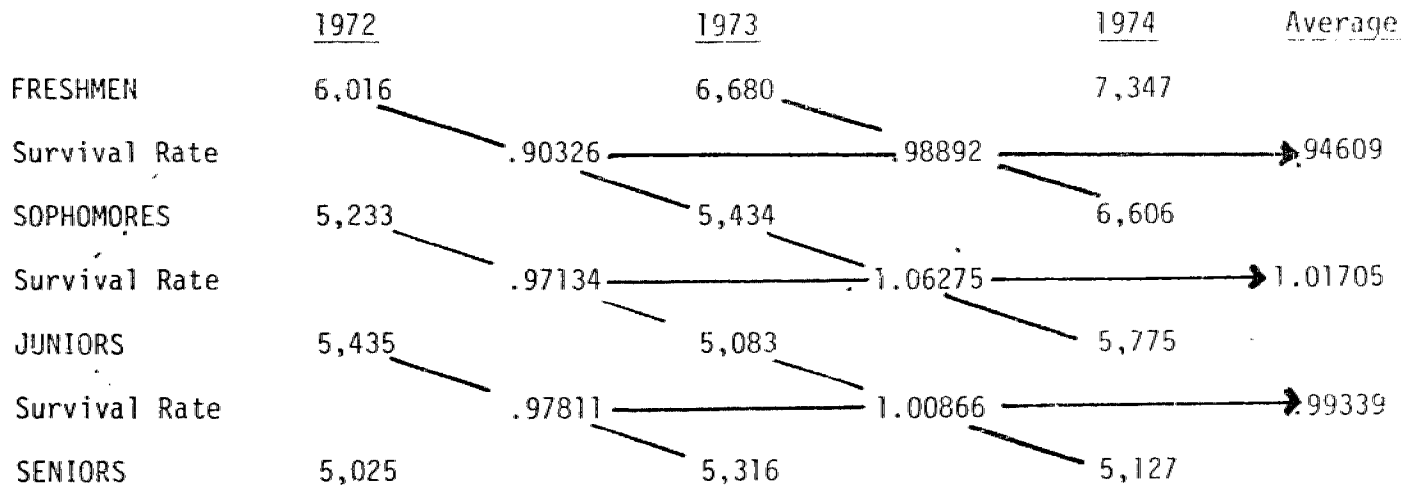
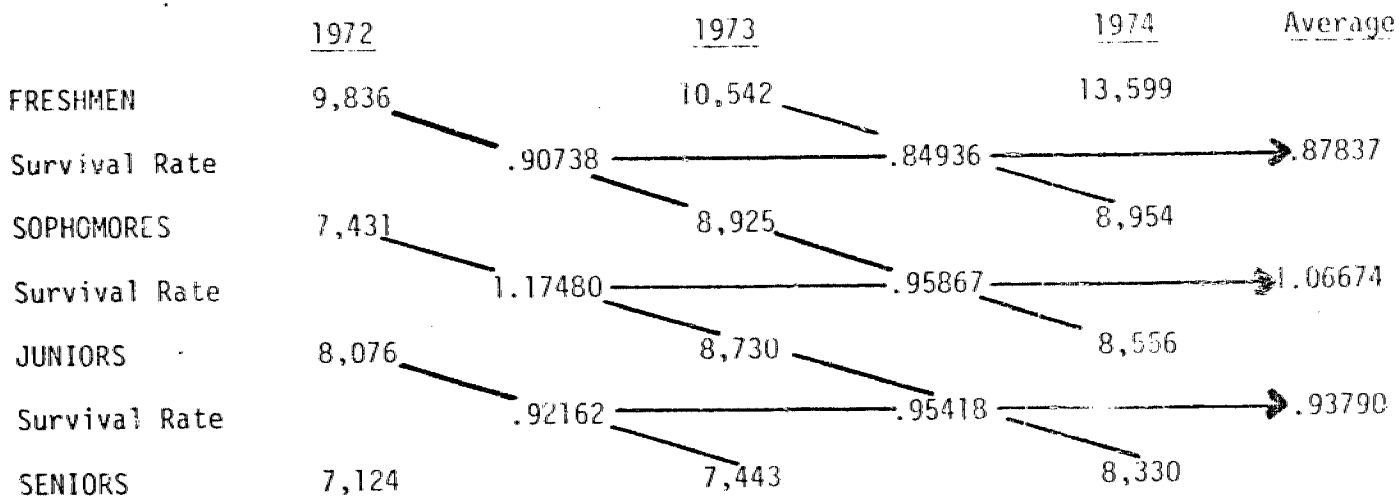
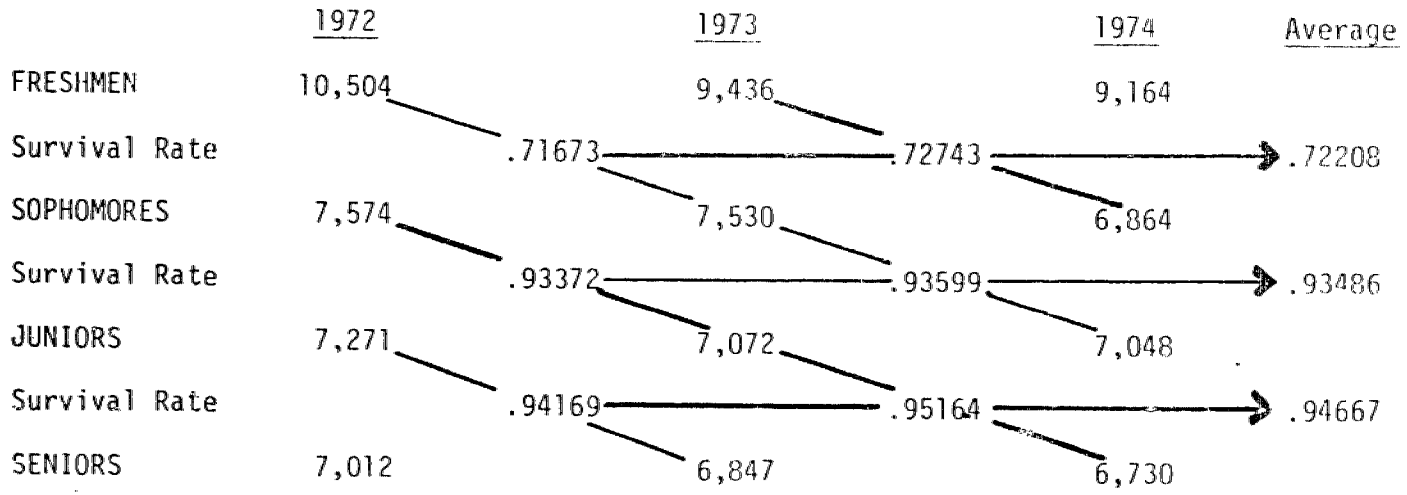


Table B1 - Continued

STATE COLLEGES




INDEPENDENT 4-YEAR COLLEGES



# SURVIVAL RATES IN TERMS OF FRESHMEN

## RUTGERS AND NJIT

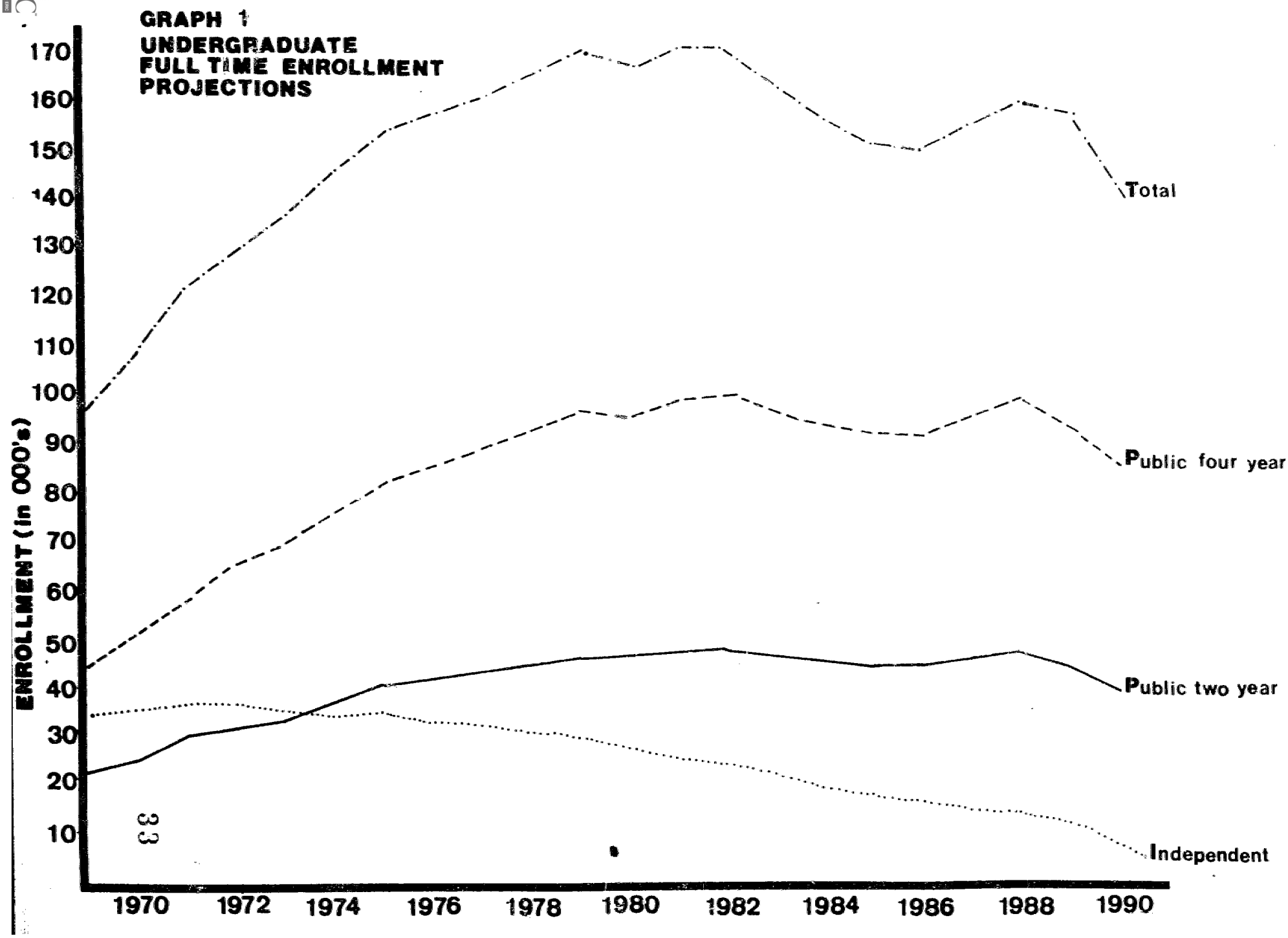
| | | | | | |
|---|---|---|---|---|---|
| Freshmen | = 1.00000 x | freshmen | = 1.00000 x | freshmen |
| Sophomores | = .94609 x | freshmen | = .94609 x | freshmen |
| Juniors | = 1.01705 x | sophomores | = .96222 x | freshmen |
| Seniors | = .99339 x | juniors | = .95586 x | freshmen |
| "Persistence" | | | = 3.86417 | |

## STATE COLLEGES

| | | | | | |
|---|---|---|---|---|---|
| Freshmen | = 1.00000 x | freshmen | = 1.00000 x | freshmen |
| Sophomores | = .87837 x | freshmen | = .87837 x | freshmen |
| Juniors | = 1.06674 x | sophomores | = .93699 x | freshmen |
| Seniors | = .93790 x | juniors | = .87881 x | freshmen |
| "Persistence" | | | = 3.69417 | |

## INDEPENDENT 4-YEAR COLLEGES

| | | | | | |
|---|---|---|---|---|---|
| Freshmen | = 1.00000 x | freshmen | = 1.00000 x | freshmen |
| Sophomores | = .72208 x | freshmen | = .72208 x | freshmen |
| Juniors | = .93486 x | sophomores | = .67504 x | freshmen |
| Seniors | = .94667 x | juniors | = .63904 x | freshmen |
| "Persistence" | | | = 3.03616 | |


GRAPH 1
UNDERGRADUATE
FULL TIME ENROLLMENT
PROJECTIONS
ENROLLMENT (in 000's)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
Total
Public four year
Public two year
Independent

# GRAPH 2
## UNDERGRADUATE
## PART-TIME ENROLLMENT PROJECTIONS