DOCUMENT RESUME

ED 025 919 EF 002 355

By-Lins, L. J.
Methodology of Enrollment Projections for Colleges and Universities.
American Association of Collegiate Registrars and Admissions Officers.
Pub Date Mar 60
Note-78p.; Reprinted January, 1964.
Available from-Publications Office, American Council on Education, 1785 Massachusetts Avenue, Washington, D. C. ($2.00)
EDRS Price MF-$0.50 HC-$4.00
Descriptors-*Bibliographies, *Campus Planning, Data, *Demography, Educational Demand, *Enrollment Projections, Enrollment Trends, *Higher Education, Population Growth

Various methods by which the responsible officials of colleges and universities might make projections of enrollment for their respective institutions are presented in this report. The point is made that institutional enrollment projection is not a simple assignment. Many factors must be considered, analyzed, and, if possible, controlled in order to do the best job of forecasting. Before making an enrollment projection, each institution should define its aims and purposes in order to identify its long range goals. The enrollment projection techniques include a discussion of--(1) curve fitting, (2) ratio method, (3) cohort-survival method, (4) combined ratio and cohort-usrvival method, and (5) correlation analysis. Short range enrollment estimates for budget purposes and educationa, planning are discussed as are long range projections based on increasing population. A final chapter presents a brief review of guiding principles to aid the person designing tables or graphs for presentation. A substantial bibliography of books, periodicals, and reports concerned with enrollment projection is included. (NI)

METHODOLOGY OF ENROLLMENT PROJECTIONS FOR COLLEGES AND UNIVERSITIES

L. J. LINS

A.A.C.R.A.O. 1910

A SERVICE OF THE COMMITTEE ON ENROLLMENT PROJECTIONS OF
THE AMERICAN ASSOCIATION OF COLLEGIATE REGISTRARS
AND ADMISSIONS OFFICERS

AACRAO COMMITTEE ON ENROLLMENT PROJECTIONS

L. J. Lins, Coordinator ....University of Wisconsin
Robert Hewes ....Massachusetts Institute of Technology
Ted McCarrel ....State University of Iowa

METHODOLOGY OF ENROLLMENT PROJECTIONS FOR COLLEGES AND UNIVERSITIES

L. J. LINS
Coordinator of Institutional Studies
University of Wisconsin

A SERVICE OF THE COMMITTEE ON ENROLLMENT PROJECTIONS OF
THE AMERICAN ASSOCIATION OF COLLEGIATE REGISTRARS
AND ADMISSIONS OFFICERS

MARCH 1960

Reprinted January, 1964

AMERICAN ASSOCIATION OF COLLEGIATE REGISTRARS AND ADMISSIONS OFFICERS

Officers of the Association
1959-60

William F. Adams .... President, University of Alabama
Charles E. Harrell .... President-Elect, Indiana University
Hattie Jarmon ....
.... Secretary, 1958-1961, Teachers College, Columbia University
Endicott A. Batchelder .... Treasurer, 1959-1962, University of Pittsburgh
Ted McCarrel ....
..... Vice-President in Charge of Professional Activities, 1957-1960, State University of Iowa
James K. Hitt ....
Vice-President in Charge of Regional Associations and Membership Promotion, 1958-1961, University of Kansas
S. A. Nock .... Editor, 1957-1960, Cedar Crest College
Herman A. Spindt .... Past-President, University of California
True E. Pettengill ....
.... Member-at-Large of the Executive Committee, 1958-1960, University of Minnesota
Ethelyn Toner ....
.... Member-at-Large of the Executive Committee, 1959-1961 University of Washington

Committee on Research and Service

Robert E. Hewes, Chairman .... Massachusetts Institute of Technology
Irene Davis .... Johns Hopkins University
Robert F. Grose .... Amherst College
Ted McCarrel .... State University of Iowa
Nelson M. Parkhurst .... Purdue University
Henry F. Rossi .... St. John's University
Paul L. Trump .... University of Wisconsin

Foreword

HIGHER EDUCATION in the United States has undergone rapid changes in recent years. But to meet the future challenges of increasing enrollments and demands for improving quality of education, the colleges and universities of the nation must change at an ever increasing rate.

This publication is an attempt to shed some light on one basic aspect of the problem of increasing enrollments—predicting future college and university enrollments at both the state and local level. It presents the latest techniques for the development of the best possible estimates of future enrollment levels and for effective presentation of these estimates. In addition, admissions officers and registrars may find that certain of the approaches and methods suggested herein will also be applicable to other areas within their interest.

The American Association of Collegiate Registrars and Admissions Officers is grateful to Dr. L. Joseph Lins, University of Wisconsin, for bearing the entire responsibility for the preparation of this publication.

ROBERT E. HEWES
TED MCCARREL

Preface

IN SOUND educational planning, one is concerned with future instructional staff, physical facility, housing facility, and curricular needs. A college or university might find that, in defining its requirements for instruction, research, and service, many of its programs are unlike those programs found essential by other colleges or universities. However, educational institutions, whether or not recognized primarily as leaders in research and service, have the education of the future labor force as one of their prime responsibilities.

These students, growing in intellectual maturity through the combined efforts of all facets of educational endeavor, will become the scholars, the scientists, the technicians, the specialists, and the laborers of tomorrow. These persons' efforts will determine whether this nation in all of its elements will grow and prosper or will stand still and perhaps fall prey to some autocratic foreign power. The preparation of these persons is a real responsibility of our educational institutions, a responsibility which cannot be taken lightly.

Various levels and types of education will be available and acceptable to the youth of the future. Unless there is foresighted educational planning, levels of educational attainment may be determined as much by lack of facilities as by lack of intellectual ability. As a nation, we can ill afford to follow a *laissez-faire* policy and, as a result, fail to plan ahead.

This report attempts to identify means by which institutional representatives might make projections of enrollment for their respective institutions of higher education. One need only look at community, city, state, and national birth figures to note that collectively the colleges of the nation soon may expect substantial increases in enrollment. Not only has there been an increase in births, signifying a larger potential group from which the colleges might draw larger numbers of students, but also state and national reports indicate that a larger and larger proportion of the post-high school population is seeking additional formal education.

Some persons have represented the anticipated large increases in enrollment as a tidal wave, a deluge, or a flood. This implies that our colleges will be inundated in the future. It is true that, unless there is adequate long-range planning, our colleges may not be able to serve all the students who desire post-high school education. This long-range planning will require carefully prepared projections of enrollment, of economic and social change, and of administrative and research needs. On these bases and all facts which can be gathered, each institution must determine its requirements for physical facilities, for housing students and faculty, for adequate curricula, for competent instructional staff, and for health and recreational programs.

All institutions are concerned with the probable size of their respective student bodies. Enrollment is closely related to instructional, building, and curricular needs. It is hoped that through a report of this type, basic assistance in method can be given to persons who are concerned with making enrollment projections. This report will deal with how to make, not with how large will be, estimates of enrollment. A companion publication might present information on the numbers of potential students by states, by areas, and for the nation. Since this writing is so close to the time of the preparation of the 1960 U. S. Census data, it is felt that actual nation-wide projections might be deferred until those census figures are available.

The writer wishes to acknowledge with appreciation the assistance given in critical evaluation of this report by Ted McCarrel, Registrar and Director of Admissions at the State University of Iowa and Vice-President in Charge of Professional Activities of the American Association of Collegiate Registrars and Admissions Officers, and by Robert Hewes, Registrar at the Massachusetts Institute of Technology and Chairman of the Committee on Research and Service of the American Association of Collegiate Registrars and Admissions Officers. To those state representatives, listed at the end of this report, who so faithfully brought together enrollment projection reports for their respective states and forwarded these reports to the author, and to Mrs. Allan Erickson and Mrs. Richard Hough, who typed, proofed, and corrected the manuscript, the writer is deeply grateful.

L. J. L.

Table of Contents

List of Tables and Graphs

CHAPTER I

Introduction

THIS REPORT is an attempt to assist the many individuals throughout the country who have need for making institutional and/or state-wide estimates of future college enrollments. It is not intended to be a "magic potion" to cure all the ills of inadequate forecasting methods. It will not provide a system of birth or potential college age-group figures to which, as a last resort or for want of an easy way to provide a rapid forecast report, one can go and, after a little arithmetic manipulation, submit a statement or treatise aimed at "proving" that enrollments will increase.

Making enrollment projections for any institution is not a simple assignment. As much care must be exercised in their preparation as is true of any research. The problem as well as its basic assumptions or postulates should be stated and defined. A hypothesis or hypotheses, after being formulated, should be evaluated in terms of agreement or lack of agreement with observed facts, and should be tested for logical consistency. After testing, each hypothesis is restated and retested. Objectivity is the keynote of this approach. There is no substitute for experience and well thought-out subjective judgments; however, research does not start with conclusions and proceed as a method to prove those conclusions. Research, and for that matter a carefully worked out enrollment projection, does not supplant the need for sound administrative judgment. It does, however, make that judgment better informed and more intelligent.

GENERAL CONSIDERATIONS IN ENROLLMENT PROJECTIONS

The writer believes that no college can use the presently available national projections of enrollment as the best source of data for estimating its future college population. These estimates are correct in indicating that, collectively, higher educational institutions can expect substantial increases in enrollment. It is questionable, however, that these projections can be interpreted even nationally in terms of how much this increase will be. It is doubtful that state or institutional estimates will be as accurate when based upon national projections as when based upon conditions prevailing at the state or institutional level.

The writer is reminded of his early years on a farm. He discovered early that a hay rake had the potential for raking hay into a windrow; however, until it was adjusted to the conditions of a particular field, it could not be expected to do a thorough job of raking up all the hay.

This same thinking applies to enrollment projections. All factors related to the enrollment of a particular institution must be considered. These factors must be analyzed and, as far as possible, controlled in order to do the best job of forecasting. It is often assumed in national projections, for example, that the undergraduate college-age pool consists of individuals who are 18 through 21 years of age. Generally it is true that a greater proportion of college undergraduates are in this age range than in any other four-year age range. It is questionable, however, that the enrollment in any undergraduate college or collection of colleges consists of an equal proportion of the youth at each of the ages 18 through 21.

Quite frequently it is assumed that 18 year olds are representative of a freshman class. The proportion of college or university freshmen, who are of a certain age, may vary from one institution to another. At one university, enrolling over 5,000 students, it was found that 4.8 per cent of the freshmen were 17 years of age, 51.4 per cent were 18 years of age, and 19.0 per cent were 19 years of age. The ages ranged from 16 through 44 years with a mean age of 19.8 and a median age of 18.9. On another campus of the same university with an enrollment of over 17,000 students, 65.7 per cent of the freshmen were 18 years of age; the range of ages was from 16 to 55, inclusive.

On this second campus, 51.7 per cent of the total student body were within the age range of 18-21; 13.9 per cent were 18 years of age, 13.0 per cent were 19 years of age, 12.9 per cent were 20 years of age, and 11.9 per cent were 21 years of age. Within the age range of 18-24, there were 71.7 per cent of the students; 8.6 per cent were 22, 6.2 per cent were 23, and 5.2 per cent were 24 years of age. The total range of ages was from 16 through 64 with 98.3 per cent being under 40 years of age. This campus had nearly 4,000 students registered in the Graduate School.

It would seem that using an 18-21 year age group, or any other age range for that matter, without weighting according to the relative proportion of students in college of each age, would be like baking a cake after using the same amount of each ingredient of the batter. If the 18-21 year age range is not representative of the population from which the students are drawn and if the proportion of students by age is not taken into consideration, it is questionable that the forecast data will be useful except as a very general indication of future enrollment potential.

It is evident that education beyond high school encompasses a much wider range than the four-year span immediately following high school graduation. The socio-economic change following World War II has changed the pattern of college attendance. Many persons older than the traditional college-age group are entering college for the first time or are returning to college for further education in order to compete in business, science, and industry. There has been an increasing emphasis upon post-baccalaureate education to meet the demands for better prepared persons in research and technological positions.

A second major problem in national projections of enrollment has been inadequate definition of a student. Definitions of enrollment and conceptions of what is requested on an enrollment questionnaire have changed. Not all institutions are using a uniform definition in reporting. Over a period of time the same institution may have changed its method of reporting. For a number of years one university, of which the writer has knowledge, included only day students on national questionnaires while at present, unless requested otherwise, includes all students taking work creditable toward a degree. The projections made from incomplete and unreliable basic statistics are subject to the inadequacies and limitations of those statistics. All too frequently there has been no distinction made between on-campus and extension center or branch campus students, between full-time and part-time students, between day and night students, or between regular class and correspondence students.

Since the determination of the size of a student body is so important in institutional planning, it is imperative that there be a purposeful, nation-wide effort to establish more adequate definitions of students and more complete standards, procedures, and machinery for collecting and compiling college and university enrollment statistics. A committee of the American Association of Collegiate Registrars and Admissions Officers, in cooperation with representatives of national organizations, is attempting to prepare a basic data and definitions report. It is important that uniform definitions be established; it is just as important, assuming adequate definitions, to conduct a far-reaching educational program in order that implementation of the definitions will be complete. Except in a general way, it is hardly possible for national projections, based upon reported students, to represent the college population of the future unless uniform definitions are used.

A third difficulty in national projections is that the system for making the national projections is frequently applied to the states within the nation. The migration of potential or actual students is not uniform from state to state nor are the population survival rates the same for all states.

DEFINITIONS, PURPOSES, AND ASSUMPTIONS BASIC TO ENROLLMENT PROJECTIONS

The primary emphasis in this report is on projection methods for individual institutions. Before making an enrollment projection, each institution should define its aims and purposes as carefully as possible and attempt to identify its long-range goals. Will the institution limit its enrollment, or is it committed to accept all individuals who meet certain general requirements? Will sufficient housing be available for the number of students who might desire to attend the institution? Is the anticipated building program adequate to provide the necessary instructional facilities? Is it possible to secure sufficient qualified staff members? Will there be changes in the size of the area to be served? What changes may be anticipated in admissions requirements? Will there be changes in present programs or new programs added?

More general factors should be kept in mind also. Can changes in the economic structure of the patronage area be anticipated? Is there evidence that an increasing or a decreasing per cent of high school graduates will seek higher education? Can one detect tendencies for colleges within the area or in other states to restrict enrollment? Will a higher proportion of students continue for post-baccalaureate work?

These are only a few of the questions which the person making an enrollment forecast should attempt to answer prior to making the forecast. If definite answers are not possible, a framework of logical assumptions should be set up using the best data available.

One notes from the above questions that the projection of enrollments is not merely a statistical problem. In enrollment projection, the statistical study of past enrollment records must be supplemented by knowledge which may be quite non-statistical in nature. College enrollments are dependent upon a large number of complex factors which are difficult to analyze. Some of the factors affecting future enrollments might be quite different than the factors which were operative in determining the enrollments of the present and past. Some factors which affect the size of college enrollments are changes in economic and international situations, birth rates, veteran enrollments, provision of educational benefits and/or loan and scholarship programs, high school enrollments, unusual migration, changes in mortality rates, and Selective Service drafts and deferments.

Some factors operate continuously for a number of years; other factors are important for a time and later may not need to be considered at all since they no longer apply. New factors, not known or not operative at present or in the past, may appear as important factors in the future. Persons making enrollment projections cannot be aware of the future operation of all factors; consequently some error in projection might be expected. It is a continuous responsibility to make and revise enrollment projections.

Throughout this report, reference is made to projections or forecasts rather than predictions. The projection represents a normal or mean trend during the period of projection and is based upon specified assumptions. For any given year within the forecast period, it can be expected that the actual enrollment may fall above or below the projected trend line. However, if the projection is a good long-range projection, the total positive errors should be about the same as the total negative errors about the trend line. In any forecast, there is a normal range of error due to factors which cannot be completely or even partially controlled. In making projections, it is well to anticipate the variations through projecting a high, medium, and low enrollment number for each point (year) for which a forecast is made.

In general, enrollments in institutions of higher education depend upon the respective institution's power of attracting students from a pool of educationally qualified individuals and upon the desire and ability of those students to continue their study. The enrollment of each institution is affected by factors probably characteristic only to the institution in question. Each institution, for example, draws its students initially from a group of high school graduates or from some other institution in which the high school graduates began their collegiate experience. Each institution is affected, therefore, by the rate of high school graduation within the population from which it draws its students and by the rate of college attendance of the high school graduates. Each institution may have a characteristic service area, admissions policy, and rate of attrition.

It has been indicated that the forecast is based upon a well thought-out formulation of assumptions. Unless this is true, the forecast may be mere guesswork or speculation. A large amount of reliable, detailed, and relevant data upon which to base the assumptions is essential. Good forecasts will call for logically integrated, analytical techniques.

Thorough consideration should be given to the purpose of the forecast prior to collecting data and formulating assumptions. If the purpose of a long-range forecast, for example, is to attempt the determination of future instructional building needs; if the facilities used by students during the day will meet the needs of students enrolled at night; and if it can be anticipated that the number and sizes of classes held at night at a particular hour will be no greater than the maximum during any of the hours during the day, then the forecast may be based upon day enrollment only.

If the purpose of the forecast is to determine future instructional staff needs, there should be a clear definition of faculty work loads and a knowledge not only of the mean number of credits per student but also of the relative sizes of classes. Facts should be available on the number and distribution of credits carried by full-time and part-time students as well as the time of day students desire and can attend classes. It may be necessary to define students and faculty in terms of full-time equivalents.

The person making the enrollment projections must be aware of the purposes and plans of the institution for which the projection is made. He therefore should be informed of administrative decisions as those decisions are being made. These decisions are related to the conditions over which the institution has control. A college, for example, can control the size of its student body through an arbitrary ceiling on admissions, through increased tuition and/or fees, through higher admission and academic standards, through adjusting the proportion of in-state to out-of-state students admitted, through changes in the academic offerings, etc.

There are, however, conditions over which the college has little or no control. Among these conditions are population changes and shifts in population, military crises, economic change, and modifications of the social structure. If, for example, there is a sudden shift toward higher educational requirements in the labor force or if employers give increasing priority to job applicants with a college education, the potential demand for college education will be increased.

A sudden upward shift in a state's economy usually results in more college applicants. On the other hand, numerous institutions have found that during the first years of a recession or depression there is a tendency for more students to seek college admission; if the depression continues, it can be expected that there will be a downward shift in college attendance unless scholarship and loan programs provide the funds not otherwise available. Several recent studies have indicated that the proportion of academically qualified students who will attend college is more closely related to the education of the parents than it is to the wealth of the families. Thus if, within the area from which the students are drawn, there are industrial changes which cause a shift in the amount of education of the labor force, it can be expected that there will be a change in the proportion of high school graduates who will attend college.

The remaining sections of this report will be divided into four chapters: (1) Enrollment Projection Techniques, (2) Short-Range Estimates of Enrollment, (3) Long-Range Projections of Enrollment, and (4) Data Presentation. Projections for a particular institution, state, or the nation will not be made. It is expected that the persons most familiar with the characteristics of and circumstances surrounding a college or university are the persons associated with that college or university, and that therefore no useful purpose would be served here by attempting projections. However, in the chapter on long-range projections, the writer will briefly set up a projection analysis for a theoretical commuting-type institution. Most of the assumptions will be based upon actual data for an institution in the United States.

CHAPTER II

Enrollment Projection Techniques

At present, there are four methods in use for making enrollment projections: (1) curve-fitting, (2) ratio, (3) cohort-survival, and (4) correlation analysis. In practice, the best technique for a particular institution or state or the nation may be a combination of these methods. The writer asked a representative of each state in the United States to forward institutional and state enrollment projection reports to him. The most frequent technique used in these reports, whether for institutional or state purposes, is the ratio method.

Generally, representatives of states, in which nearly all of the major institutions are under private control, informed the writer that no state-wide projections had been made and that most institutions were not concerned with long-range projections since it was expected that the enrollments would be limited. In attempting to keep the enrollment as near as possible to the maximum number desired, representatives of these institutions need short-range estimates, however, to indicate how many new students can and should be accepted.

CURVE-FITTING METHOD

Enrollment projections by the curve-fitting method consist of determining the functional relationship which exists between past enrollments and years. This functional relationship then is projected to the year or years for which the potential enrollment number is desired. It is assumed that enrollment trends, based upon historical enrollment data, will continue and that the influences of the recent past are indicative of the factors which will operate in the future. The enrollment of the past according to time may take the form of one of many curves.

There may be a linear relationship between enrollment and time. The technique for projection would be that of least squares in calculating the constants a and b of the equation $Y = a + bX$ in which $Y =$ the estimated enrollment, X is the deviation in years from the year chosen as a base, a is the enrollment of the base or beginning year, and b is the estimated annual increase or decrease in enrollment. This technique minimizes the squares of the deviations of the actual data points from the trend line so that, in fitting the curve, the sum of the squares of the deviations from the trend line is a minimum or equals zero.

The growth of enrollment may follow an exponential trend in which year is in arithmetic progression and enrollment is in geometric progression. Thus the relationship between year and enrollment would be an exponential function of the form $Y = ab^x$, where $Y =$ enrollment. If the exponential curve is reduced to logarithmic form, $\log Y = \log a + x \log b$, the equation becomes a straight line trend of logarithmic values and the least-squares technique can be used for curve fitting.

A variation of the general exponential trend is the modified exponential trend of the form $Y = k + ab^x$. This is a form of growth curve in which the curve increases at a constantly decreasing rate; it might be used where the enrollment data shows a rather rapid increase at first and gradually tapers off to a relatively stable state. For the method of computing the modified exponential trend, the reader is referred to Croxton and Cowden.[1]

A logistic curve may fit the enrollment trend where there is a relationship between the past population growth and growth of enrollment.[2] This method can be used if the per cent rate of increase in population growth is a linear function of the growing variable, enrollment.

It may be that a second-degree parabola should be fitted to the enrollment data. This could occur if the enrollment data follows a decreasing pattern for a time and then increases or vice-versa. This trend would be expressed by the equation $Y = a + bX + cX^2$. The constants b and c give the curvature of the trend line. The line would be fitted by the method of least-squares. It is doubtful that knowledge of future conditions would warrant long-range forecasting on the basis of a second degree parabola.

If a curve-fitting technique is used, it naturally is important to be sure that the curve fitted is the curve which should be fitted. The curve should be tested for goodness-of-fit. It may be that the projection from a fitted-curve will be in error for two principal reasons: (1) an incorrect curve is used, or (2) it was not possible to control all of the factors.

[1] Frederick E. Croxton and Dudley J. Cowden, *Applied General Statistics* (New York: Prentice-Hall Inc., 1940), pp. 441-447.

[2] H. P. Kuang, "Forecasting Future Enrollment by Curve-Fitting Techniques," *The Journal of Experimental Education,* Vol. XXIII, No. 3, March 1955, p. 272.

This report will not go into detail on the methods of curve-fitting. It is assumed that if the person making enrollment projections does not understand curve-fitting techniques, he either will use simpler methods for projecting or will need greater background than can be presented in this limited publication. With the inability to control some factors which may affect future enrollments, it is questionable that a curve-fitting technique will produce more nearly correct projections than would some other method in which the variables are as carefully defined and controlled. It is entirely possible that a curve which fits enrollment data for a past group of years will fail as a projection device for the next few years.

RATIO METHOD

The ratio method determines the ratio between the persons enrolled in college and the college-age population of which those persons are a part. This method has been used widely but, as generally employed, is inferior to the cohort-survival method to be presented in the next section of this chapter. The ratio method can be, but seldom is, used to forecast freshman, sophomore, junior, senior, etc. enrollments separately. More generally the ratio used is that of the division of the total college enrollment by the total college-age pool defined as all individuals in a geographic area who are 18-21 years of age or 18-24 years of age.

As indicated in Chapter I, an age pool in which each age is given equal weight more frequently than not is a poor representation of the population from which the students come since the proportion of students at each age in any given institution is rarely the same. A better estimate can be made by weighting the population by age according to the relative weighting of ages within the college enrollment grouping.

Table I shows the distribution of ages of students in the State of Colorado.[3] One notes that in none of the two-year age ranges is the per cent of the enrollment the same or nearly the same as in any other two-year age range. In none of the collective college divisions is more than 73 per cent of the student body represented by a four-year age range. In the four-year publicly-supported institutions, 63 per cent of the students are 18 but less than 22 years of age.

[3] From: Legislative Committee Education Beyond High School, "Post High School Enrollment Projections in Colorado Four Year Institutions and Junior Colleges," August 1959 (Preliminary Report), Part II, p. 4.

TABLE I

AGE DISTRIBUTION OF TOTAL ENROLLMENT AT COLORADO COLLEGES AND UNIVERSITIES*

(Fall Enrollment, 1958)

Age	Publicly-Supported 4-Yr. Institutions		Publicly-Supported Junior Colleges		Private Colleges		Total	
	No.	%	No.	%	No.	%	No.	%
Under 18	487	2.2	235	7.3	233	3.1	955	2.8
18–19	8,401	37.0	1,847	57.2	1,964	25.7	12,212	36.4
20–21	5,902	26.0	508	15.7	1,751	22.9	8,161	24.3
22–23	2,565	11.3	253	7.8	826	10.8	3,644	10.9
24–25	1,687	7.4	163	5.1	810	10.6	2,660	7.9
26–27	1,383	6.1	71	2.2	627	8.2	2,081	6.2
28–29	723	3.2	29	.9	411	5.4	1,163	3.5
30 & Over	1,539	6.8	122	3.8	1,020	13.3	2,681	8.0
TOTAL	22,687	100.0	3,228	100.0	7,642	100.0	33,557*	100.0

* Total number on which age data were available, 33,557. Colorado Woman's College is not included in the total.

To employ the ratio method, it is necessary to have past and present data relative to the number of individuals in the college-age range, which is representative of the college enrollments, and to have historical information concerning the weighted proportion of the college-age range population which attended the college or collection of colleges for which the projection is being made. There should be separate projections for undergraduate and for post-baccalaureate—graduate and professional—students.

The enrollment grouping for which the projection is desired must be analyzed carefully over a period of years. The sex distribution by age and by class should be determined. In order to discover the population to be used as a basis for the projection, the enrollment must be distributed according to the geographic areas from which the students come. These areas may be high schools for the commuting college or counties or parishes for the college attracting students from wide areas; the area may encompass a number of states. When the area or areas from which the students come is determined, the next step is to evaluate whether or not there has been a consistent pattern in the distribution of students by area. The present college-age population of the area or areas and the anticipated college-age population should be known. The latter may be based upon births corrected for deaths and migration. The college-age population figures are weighted according to the proportion of students from each area by age.

The college enrollment is divided by the weighted college-age population for each of a number of years to determine the changes in the ratios. The ratios obtained for successive past years are examined and a decision is made whether to use the median, most recent, or mean ratio, or whether a definite trend following a consistent pattern has been established. The median, most recent, or mean ratio generally would represent a minimum projection since the projection of college attendance is based upon a constant percentage of the college-age population.

The ratio trend takes into account increases or decreases in the ratios, and it projects these increases or decreases to the future. However, in this type of enrollment projection it is customary to assume that the rate of increase or decrease will not continue indefinitely but will level off after a certain number of years; this may represent a normal projection. The continuation of an increasing ratio over the entire projection period may be considered to be a maximum projection.

An enrollment trend, in a certain sense, is an established habit. It is likely to continue unless there are changes in the factors affecting enrollment. It is entirely possible that even the experience of the past few years is not representative of the experience to be anticipated in the future. A certain element of personal judgment should be used particularly if this judgment is based upon a basic understanding of the factors affecting enrollment.

When the future ratio trend and the future college-age population is determined as accurately as possible, the future college enrollment is estimated by multiplying the future college-age population by year, by the median, mean, most recent, or increasing or decreasing ratio. It rarely is necessary to anticipate births since a projection of about 17 years into the future is sufficient for nearly all institutions or states. A 17-year projection normally can be based upon actual births since there are few college students who are under 17 years of age. It may not be necessary or desirable, for practical reasons, to use the population covering the entire age-range of the college enrollment. The experience of the particular institution or collection of institutions may indicate that omitting the upper extremes of ages will not greatly affect the projection.

There are numerous sources of information relative to population and college enrollments. Before any of these sources are used, it is essential to discover whether the available information is applicable to the college or collection of colleges for which enrollment projections are desired. Some sources of population and enrollment data are:

1. Department of Commerce, Bureau of the Census, Washington 25, D.C. In February, 1956, the U. S. Census Bureau released three series of projections of the college-age population 1958-1973.[4] The projections provide alternative assumptions about migration, adjust the basic population data for undercount of the population under five years of age, and incorporate adjustments for military personnel and college students living away from home. It should be kept in mind that the 1950 census counted students in the area in which the college was located while the earlier census enumerations counted students at their home addresses.

According to the plan available at the time of this writing, the 1960 census will distinguish between persons attending public and those attending private schools, will include more information than in 1950 on population migration, will extend the school attendance question to include persons through 34 years of age, and will determine the number of persons who have completed at least a year of graduate work. There will be statistics by state of the enrollment in school according to age with the divisions of age being 5 and 6, 7 to 13, 14 and 15, 16 and 17, 18 and 19, 20 and 21, 22 to 24, and 25 to 34 years of age. It is expected that there will be a division by sex, by single years of age from 5 years through 24 years, by public and private schools, and by state, and that there will be a table of the years of school completed by persons 25 years of age and older.

The tentative schedule of publication dates for census reports indicates that data on cross-classifications of age by education should be available before May, 1962. The population figures by state, by counties, by cities, by towns, and by villages should be available by the end of 1960. It is expected that foreign students attending United States colleges will be counted in the 1960 census and that United States students attending colleges in a foreign country will not be counted unless a special request to be counted is made to the census representative.

---

[4] *Current Population Reports*, Series P—25, No. 132.

2. National and state educational associations, regional boards, and coordinating committees for higher education. The organization of state agencies and the information available may vary from state to state.

3. Philanthropic foundations.

4. Insurance companies. Particularly useful may be the mortality or survival tables.

5. The U. S. Office of Education, Department of Health, Education, and Welfare, Washington 25, D.C. It should be kept in mind that the enrollment data presumably includes all students taking work creditable toward a degree; consequently the enrollment data may be more inclusive than is desired for a particular projection.

6. Some states have an agency which collects enrollment data from all colleges within the state; quite frequently this is done by a representative of the regional association of the American Association of Collegiate Registrars and Admissions Officers.

7. State and national departments of public health (Vital Statistics).

8. The office of the Register of Deeds of the various counties—birth records.

9. Various institutional bureaus of research or offices of institutional studies.

10. State departments of education. Many state departments of education have only public school—elementary and secondary—enrollment figures. In some states, it is very difficult to obtain the enrollment count for private elementary and secondary schools.

11. The American Council on Education, 1785 Massachusetts Ave., N.W., Washington 6, D.C.

12. The reports of Ronald Thompson, The Ohio State University.

   a. *College Age Population Trends, 1940-1970* (The American Association of Collegiate Registrars and Admissions Officers, January 1954), pp. ii + 69.
   b. *The Impending Tidal Wave of Students* (The American Association of Collegiate Registrars and Admissions Officers, October 1954), pp. 48.
   c. "The Problem of Rising College Enrollments" (P.O. Box 311, Yonkers, New York: *The College Blue Book,* 1957), pp. 18.
   d. "To Solve the Problem of Rising College Enrollments"

(P.O. Box 311, Yonkers, New York: *The College Blue Book,* 1959), pp. 919-934.

Thompson's publications are useful if one is concerned with a general measure of enrollment potential—in other words, if one is interested in whether or not increases in population can be expected, not in how much that increase might be. The reports are more useful on the national level than on the state or institutional level since weighting is not done by age even for the narrow age-range used. Adequate correction for migration and mortality also was not made. These publications have been very useful; they have emphasized the need for long-range educational planning and for immediate consideration of providing for increasing educational responsibilities.

13. Student migration reports.
    a. *The Home State and Migration of American College Students, Fall 1958* (The American Association of Collegiate Registrars and Admissions Officers, March 1959), pp. 60.
    b. *A Supplement to Home State and Migration of American College Students, Fall 1958* (The American Association of Collegiate Registrars and Admissions Officers, December 1959), pp. 41.
    c. Story, Robert C., *Residence and Migration of College Students, 1949-50* (Washington 25, D.C.: Federal Security Agency, Office of Education, 1951), pp. vi + 61.

The two former reports present data on the migration of college students for the fall of 1958, while the latter is a report of the migration of college students for the academic year 1949-50.

COHORT-SURVIVAL METHODS

Originally, a cohort was a unit of infantry in the Roman army. It consisted of one-tenth of a legion, or about 600 men. The word "cohort" in this report is used to designate a group of individuals having a similar classification trait.

The cohort-survival technique is a method based upon the extent to which a group of individuals survives by grade from first grade through college (grade-succession) or upon the extent to which a group of individuals survives by year of age from birth through the age of college graduation (age-survival). In the ratio method, for each calendar year one ratio is computed between the college-age pool and the persons enrolled in college. In the cohort-survival method a system of ratios is set up to determine the college enrollment for each calendar year; for example, in the grade-succession method, a ratio of second grade to first grade, a ratio of third grade to second grade, a ratio of fourth grade to third grade, etc. is computed. Thus the cohort of a particular year is followed through grade succession until the senior year in college and perhaps on to post-baccalaureate college years.

Grade-Succession

The number of students in a particular grade is based upon the number of students in the next lower grade the previous year minus the number of deaths and students retained in that lower grade or who drop out of school or transfer to another school. Added to this figure is the number of students retained in the grade in question and the transfers in from other schools.

The survival rate (ratio) from grade to grade is computed for a series of cohorts of successive years and a trend is established. It may be assumed that the survival rate will remain constant in which case only one cohort of first graders would be followed through all grades, elementary and secondary, to college. The latter assumes no changes in migration, mortality, or tendency to continue in school. If changes in net migration, mortality, or school attendance are anticipated during the forecast period, the data should be modified according to changes in these factors.

Long-range projections of college enrollments are possible by projecting the grade-to-grade ratios to high school graduation. The high school graduation group then becomes the cohort; persons are included who are graduates of high schools contributing to the enrollment of the college or collection of colleges for which the forecast is made. Weighting can be according to the degree of contribution by each high school.

The graduation group, or if preferable the twelfth-grade school-year enrollments, are "survived" to the freshman classification in the college or collection of colleges. The collegiate enrollment is then based upon the class-to-class survival from freshman to senior years in the collegiate institution or institutions.

A new cohort usually is necessary for graduate enrollment projections. This cohort generally is composed of persons who received their baccalaureate degrees from a number of colleges since many institutions, particularly those with large graduate enrollments, attract post-baccalaureate students from colleges with or without a graduate program as well as from their own graduating classes. For many students, there is a span of years between the year of being granted the baccalaureate degree and the year of beginning graduate work; thus, insofar as possible, all pertinent information relative to deferred as well as immediate graduate education after the baccalaureate degree should be gathered and used in making the projection.

Age-Survival

The age-survival method is the same in principle as the grade-succession method. The chief difference is that survival ratios are computed from age-to-age rather than from grade-to-grade statistics. In many states, complete enrollment data for elementary and secondary schools are not available since the State Department of Education, or any other central enrollment collection agency, does not have adequate data on elementary and secondary enrollments in the private schools. In these states, the age-to-age survival method generally is superior to the grade-to-grade succession method.

The number of births of individuals in the area providing students to the college or collection of colleges is obtained. The cohort of births is "survived" through the level of ages to college graduation. Weighting is necessary according to mortality, migration, and the respective contribution of each sub-area to the total college enrollment. From one sub-area, for example, a very small percentage of the college-age youth may choose to attend college; from another area a high proportion of the college-age youth may attend. If there are pronounced differences between the male and female number of births, mortality rates, and contributions to the college enrollment, it is necessary to compute the age-to-age survival by sex.

A college, which attracts students from a wide geographic area and which frequently modifies its curricular offerings, may have difficulty in identifying the initial cohort from which it will draw its students. It may be necessary to identify the cohort which provides a high percentage of the student body and to make the assumption that the increases or decreases in students from the identifiable cohort is representative of the increases or decreases to be expected for the the entire college. This would be true, for example, of an institution drawing heavily from in-state areas but having students also who come from the various states of the United States and from foreign countries. An institution of this type may choose to make the assumption that the proportion of in-state to out-of-state students will remain the same, or it may be committed to a policy of limited out-of-state enrollment.

If college enrollment projections are to be made for more than 17 years into the future, it will be necessary to forecast future births. This can be done using available population and fertility data for the area; however, it is doubtful that an enrollment projection of more than 17 years into the future either would be reliable or that it would be necessary for institutional planning. Therefore, space in this publication will not be devoted to projecting births.

COMBINED RATIO AND COHORT-SURVIVAL METHOD

The writer believes that for many institutions a grade-to-grade or an age-to-age survival technique is not sufficiently superior to a simpler and less cumbersome combined ratio and cohort-survival method to warrant the extra effort. If the problem is to project enrollments through all levels of education from first grade through college, then there seems to be no reasonable alternative to a complete grade-to-grade or age-to-age survival method. However, if the problem is only one of projecting college enrollments, it may be satisfactory to set up direct experience ratios of survival from birth to 17, 18, and 19 year olds. This assumes that the new freshman class in a college is composed primarily of 17, 18, and 19 year olds from a readily identifiable area. The ratio of freshmen to the population of 17, 18, and 19 year olds weighted according to the proportion of 17, 18, and 19 year olds among the new freshmen is determined for the past few years. It is noted that this procedure, through building up an experience trend over a period of years automatically considers the factors of mortality, migration, and desire for college attendance. The assumption is made that the effects of mortality, migration, and desire for further education in the future will be the same as in the past.

The ratio of the new freshman enrollment to the 17, 18, and 19 year olds in the population (mean, median, or increasing ratio depending upon the experience) is used to project the future new freshman enrollment. From the new freshman enrollment, a cohort-survival (grade-succession) method is used to determine the size of the sophomore, junior, and senior classes. This will be explained more fully in Chapters III and IV.

The cohort-survival technique generally is superior to the ratio method since it provides more detailed information concerning the projected enrollments. By the same token, it requires more specific enrollment and population data on which to base the projection. A serious limitation of the cohort-survival method is the amount of work involved. It is quite logical to project births to first grade attendance and to use the cohort-survival technique for grade-to-grade succession through college attendance. However, any long-range projection may be in error due to unanticipated changes such as changes in migration patterns, in economic conditions, in mobilization patterns, in the social and political structure, etc. Whether a ratio method, a cohort-survival method, or a combined ratio and cohort-survival method should be used for projecting enrollments rests in the good judgment of the person making the projection. That judgment should be as educated as possible. It should be based upon all the data it is possible to gather and upon the background assistance of all persons who in any way can contribute to the determination of relevant factors which will or may vary over a period of time.

CORRELATION ANALYSIS

The methods of enrollment projection briefly explained thus far in this chapter were based upon the change in enrollment with the passage of time. The correlation analysis method is an attempt to determine the association between enrollment (dependent variable) and one or more independent factors or variables. It may be found, for example, that university or college enrollment varies concomitantly with the number of high school seniors and per capita income. The variation in enrollment may be closely related to a single variable or to a combination of variables. In any event, zero-order coefficients of correlation would be computed between the dependent variable of enrollment and each of the several independent variables. If it is found that there is a significant concomitant association between the dependent variable of enrollment and two or more of the independent variables taken separately, a correlation matrix consisting of the intercorrelations should be set up.

The matrix can be solved by a system of determinants or by solving simultaneous equations. In setting up the matrix for determinants, the independent variables would be ordered so that X_1 is the variable associated to the greatest degree with Y (the dependent variable of enrollment), X_2 is a variable with a high degree of association with

Y but a low degree of association with X_1, X_3 is a variable with a high degree of association with Y but a low degree of association with X_1, and X_2, etc.

It may be that the correlation analysis method to be used would be rectilinear or curvilinear. This can be determined best by bivariate plotting, scatter diagram graphing. After solving the correlation matrix, the beta coefficients should be changed to regression coefficients in order that actual values, rather than standard deviation form values, of the independent variables can be substituted in the regression equation. The regression equation takes the form of $Y = a + b_1 X_1 + b_2 X_2 + \ldots + b_n X_n$.

The correlational method is useful in supplementing the forecast based on a time series analysis. For some colleges, the correlational method may be superior to any of the time series methods.

It is recognized that many persons reading this publication may not be familiar with correlational analyses. For those who are well grounded in statistical theory, an elaboration probably is not necessary. For those who would need a great deal of background, the space of this publication is insufficient to go into detail. For these latter persons, the author suggests the reading of two currently available publications:

1. Carol R. Carlson, *et al. An Educational Statistics Primer* (Madison, Wis.: Dembar Publications, Inc., 1956), pp. v + 89. This booklet is designed for the person who does not have a strong mathematical background and is developed as a self-teaching guide. It includes measures of central tendency and variability, simple correlation and regression, errors of measurement and sampling, and multiple correlation. There is information on both rectilinear and curvilinear correlation and regression and on the solution of a correlation matrix. Particularly emphasized in the solution of a correlation matrix is the Aitkin Method of Pivotal Condensation with each pivot converted to unity; this is a determinant solution.

2. Edward J. Boling; Donald A. Gardiner. *Forecasting University Enrollment* (Knoxville: The University of Tennessee Record, Vol. XXVII, No. 8, February 1952), Section F, "Correlation Analysis Applied to Enrollment Forecasting," pp. 27-33.

CHAPTER III

Short-Range Estimates of Enrollment

THE PRIMARY PURPOSE of a short-range estimate of enrollment is to provide an annual or biennial basis for budget preparation and educational planning. At the institutional level this may involve college or school, class, and departmental estimates of enrollment.

For some institutions, instructional and administrative costs are directly related to enrollment size. In other institutions, particularly those with large evening and/or part-time programs, total enrollment is a quite unsatisfactory basis on which to estimate instructional costs. In all institutions, a better index for budget preparation may be faculty-load data and number of credits taught. The number of students enrolled in a particular college or school within a university, for example, may be little related to the number of credits taught or students served by that college or school.

Departmental budgets usually are more closely related to student credit loads and adviser loads than to the number of students classified in the department. The problem of defining, measuring, and estimating faculty work loads and of measuring and estimating credits taught and building facilities needed could be the subject of an entire publication.

AT THE STATE LEVEL

Short-range (annual or biennial) state-wide estimates of enrollment generally are of greater importance to public institutions than to private institutions. This is true particularly in states where the proposed budgets for all state-supported colleges are reported to a central state agency and in turn are consolidated by that agency and presented to the Governor and Legislature for approval.

The state's program of higher education, however, cannot be planned without considering the contribution of the private colleges. There must be a cooperative effort of both public and private institutions; the best educational program for the state results from the integrated efforts of all institutions.

In a short-range forecast, one either is not faced with a problem of proliferation of state and independent colleges or it should be possible to identify the new colleges being formed and their effect upon the total enrollment distribution. The problem of short-range projections, then, is only a matter of anticipating total enrollments in the state and the distribution of those enrollments among the colleges.

If there is close coordination between all colleges, significant changes in programs or facilities should be known. This knowledge is helpful in determining changes which might affect a particular institution or which might change the ratio of public to private enrollment. If it is known that the private colleges within a state will limit their enrollments, and if there are significant enrollment increases to be expected, it becomes quite obvious that either the public institutions of the state will be expected to absorb the increases or an increasing number of the state's students either will be applying to out-of-state colleges or will be denied the opportunity for continued education.

A second consideration is the organization for and defined functions of public higher education. If public higher education is served through the combined efforts of the university, state colleges, and community colleges, there should be a constant interchange of ideas and plans, of definitions of programs, and of statements of purposes. This interchange makes a state-wide organization more meaningful in planning all facets of the higher educational program —staff, buildings, finances, curricula, and research and service.

There are two approaches to state-wide short-range estimates of enrollment. In the first, each institution makes its own estimates; these estimates then are pooled. In the second, a representative of a central agency makes the state-wide estimates of enrollment and determines as accurately as possible how these enrollments will be distributed among the colleges. The writer believes that the first method is preferable, for each institution is then responsible for its own estimates of enrollment; these estimates should be pooled and evaluated by the state agency responsible for the consolidated presentations.

It will be noted in the following sub-section of this chapter, "At the Institutional Level," that the enrollment of an institution consists of students new to that institution (transfer students and first-time students to any college), continuing students, and re-entry students. The first-time students to any college (new freshmen) is the group with which one is primarily concerned in the short-range estimate at the state level. The numbers of continuing and re-entry students can be determined quite accurately from attrition and retention data collected from all institutions; the very recent attrition and retention experience would be used in determining the student continuation expectation. It would seem that a representative of each institution could estimate the continuing, re-entry, and transfer students of that institution better than a representative of a central agency could.

In determining the number of new freshmen to any college, a central agency can be quite helpful. This agency should collect college enrollment statistics for the entire state with one category of the statistics being the numbers of new freshmen by sex. The agency also should collect statistics by sex on high school attendance by areas within the state. This might be according to high school graduation or preferably by attendance in the junior year and senior year of high school.

Using the junior and senior year high school enrollments by sex over a period of a few years, the junior survival to seniors and senior survival to college new freshmen can be computed. For the first year of the biennium, the total college new freshmen for the state can be estimated by sex by using the ratio of the new freshman enrollments to the high school seniors. If possible, the ratio should be weighted according to the contributions of the various areas of the state to the total new freshman enrollment. For the second year of the biennium, the junior to senior and senior to new freshman survival would be used.

The total new freshman enrollment by area can be divided according to the recent past experience of the relative attraction of each college in the state. In other words, for the recent past, one determines how the new freshmen have been distributed among the various colleges.

This procedure has the limitation that non-resident students are not considered in the estimate; the assumption probably would be made that the per cent of non-resident students would not change. It does not seem logical that a representative of the central agency is best qualified to make estimates from the state totals to the institutional level. If there are modifications of programs or facilities which may change the desire of students to attend a particular institution, the persons apt to know those modifications are the administrative personnel of the particular institution. It, therefore, usually is advisable that the central state agency be instrumental in determining the cohort pool but that the institutional representative be responsible for the actual estimate for the respective college. However, a total public versus a total private college division of the estimated new freshman enrollment might be the responsibility of the central state agency; this provides a check on the total estimates of enrollment resulting from the pooled estimates of the individual colleges.

AT THE INSTITUTIONAL LEVEL

A short-range estimate of enrollment at the college or university level consists in identifying and estimating the enrollments of four major groups of students:

1. New students. These are persons never before registered in a college or university (new freshmen) or persons never before registered in a graduate school (new graduate students). The source of new freshmen is high school graduates. The source of new graduate students is the institution's own undergraduate schools and colleges and, in addition, other colleges and universities from which the institution draws students after they have been granted the baccalaureate degree.

2. Transfer or advanced-standing students. These are individuals who have completed some undergraduate or graduate work at another college or university. For some colleges, the undergraduate transfers may be primarily from junior colleges within the state; for other colleges, the undergraduate transfers may be from a wide range of colleges and universities scattered over a wide geographic area. In some states, it has been found that a very high percentage of the transfer students from out-of-state colleges and universities are students whose residence is within the state but who chose to attend an out-of-state college for a year or two prior to returning to the state to complete the baccalaureate degree. Often, a person prefers to attend a small college for a year or two and to complete the degree in a major university. This may be because of geographic proximity of the smaller college to the person's home or because of a feeling that, after having been graduated from a small high school, the transition from high school to a small college is less difficult than to a large university.

3. Re-entry students. These are former students of the college or university. They may have withdrawn voluntarily or have been dropped for scholastic or disciplinary reasons. The definition of a re-entry student varies. One institution may define a re-entry student as a person who was previously in attendance at the institution but

was not in attendance during the semester or session immediately preceding the semester or session for which re-entry application is made. A second institution may define a first semester or quarter re-entry student as one who was not in attendance in the institution at any time during the previous academic year; for purposes of the second semester or quarter registration, a re-entry may be defined as a student who was not registered in the institution the previous semester or quarter. The definition is primarily according to the best method of identifying students for registration and advising purposes.

4. Continuing students. Continuing students are those who by definition have been in continuous attendance in the college or university. Students who have been registered previously in the institution as undergraduates and who are re-registering as undergraduates are either re-entry or continuing students. In an institution where a re-entry is defined as a student not in attendance the previous semester or session, a continuing student is one who was registered in the immediate prior session.

Colleges Without a Limited Enrollment Policy

Enrollment projections for a college with a limited enrollment policy and for a college without a limited enrollment policy are similar in procedure but different in purpose. The administrative officials of the college or university with a limited enrollment policy need to determine the limit of enrollment and, on the basis of this limit, estimate how many new freshmen, new graduate students, and transfer students can be admitted and yet not only stay within the limit of enrollment but also reach the maximum enrollment desired.

Officials of colleges or universities without limited enrollment policies need to estimate the size of the total enrollment of the respective college or university and to anticipate the distribution of that enrollment among the colleges and schools and/or departments within the institution. Ordinarily even the short-range estimates of enrollment are necessary prior to the time that data are available on the number of application blanks received and permits for registration issued. The estimate of enrollment must be based upon the data available at the time the estimate is made. For the institution which he represents, the writer has found that a combined ratio, cohort-survival method yields the best short-range estimates of enrollment.

The general method presented here may not be useful to all colleges and universities. Each institutional representative must analyze the situations surrounding his own institution and should apply the projection technique which has been accurate in the past. The minimum enrollment data breakdown necessary is by class, by college or school, by sex, and by current entrance status (new, continuing, advanced standing, and re-entry).

New Freshmen: One needs to be fully aware of the areas or high schools from which the new freshmen come. If the estimate is for one year only, a set of experience ratios between college new freshmen and high school seniors can be set up over a period of years. These ratios can be weighted according to the relative contribution of each high school to the new freshman enrollment. This is not difficult for a college or university which is primarily commuting in nature. For the institution drawing from a wide area of the state or from the entire state, it probably is satisfactory to discover the relative contributions by areas of the high school seniors to the new freshman enrollment. The institution accepting new freshmen from a number of states and perhaps foreign countries may have a non-resident admissions policy limited to a certain number of students; if so, the number of non-residents is a constant to be added to the estimate of resident students after that estimate has been determined.

If the non-resident admissions policy is one which limits only in terms of rank in class or ability level, the best estimate of the number of non-resident students may be based upon past experience, the changes in senior high school attendance in those states contributing the most students, and the ability of the colleges within those states to serve increasing numbers of students. Any changes in admissions or housing policies must be known by the person making the estimates; for example, if additional residence halls have been built, if the number or percentage of non-resident students allowed to live in the residence halls is increased, and if an increased effort is made to advertise the availability of rooms for non-resident students, it can be expected that during a period of general increases in enrollment there will be a substantial increase in non-resident students admitted to and actually attending the institution.

It may be that high school enrollment data are not available for the state. In this event, age data might be used with weighting made according to the percentage of individuals from each year of age in the previous new freshman groups. Thus age tables for the areas being served must be available. These tables may be the result of an age-to-age survival technique corrected for migration and mortality.

After estimating the total new freshmen for the institution, a division by school or college within the institution should be made. If the relative percentage of new freshmen in each college or school has not varied for a number of years, these percentages can be used to estimate the division by school or college. If there is reason to believe that a particular school or college will attract a higher or lower percentage of the new freshmen, this fact should be reflected in the distribution of the enrollment estimate.

The original short-range estimates should be corrected from time to time as information becomes available on applications received and permits issued. If new freshmen advance-register, that is register some weeks or months before the beginning of classes, and if a partial fee payment is required, the actual final new freshman enrollment can be estimated quite accurately. Advance registration has the advantage also of providing information on enrollments in course sequences and of enrollments by subjects. This information is particularly useful for institutions where early decisions must be made in the hiring of new teaching assistants, instructors, and professorial staff.

Re-entry Students: If a student plans to re-enter the institution, he should be required to communicate with the institution prior to regular registration. This is helpful in anticipating the numbers of re-entry students by school or college and class for the institution. However, even if a re-entry application is required, these applications generally are not received in time to be useful in the early short-range estimate; the estimate can be corrected from time to time on the basis of re-entry application data.

For the early short-range estimate, one should have data available on the past student withdrawals by sex, class, and college or school and the percentage of these persons who have returned in the past. The re-entry estimate may need to be based upon the withdrawals for a number of semesters or years and should be divided by sex, class, and college or school within the institution.

Advanced Standing Students: The number of advanced standing (transfer) students will be based probably upon the experience of the past several years coupled with a knowledge of the changing enrollments in the colleges from which these students normally come. The estimated advanced standing enrollment also should be divided by sex, class, and college or school.

Continuing Students: Let it be assumed that the estimate for continuing students is for the first semester of an academic year. The procedure is to determine the grade-survival from the freshman class to the senior class in the institution. The second semester enrollment is divided by sex, by class, and by college or school for several past second semesters. The ratios by class from one first semester to the previous second semester are determined as follows for each sex by college or school:

1. continuing freshmen first semester to total freshmen second semester,
2. continuing sophomores first semester to total freshmen second semester,
3. continuing juniors first semester to total sophomores second semester, and
4. continuing seniors first semester to total juniors second semester.

These ratios (mean, median, or increasing) then are applied to the respective divisions of enrollment by sex, class, and college or school for the last second semester to arrive at the estimate for the next first semester. This should give a good estimate of the total continuing students by sex. There will be errors by class; some of the error can be eliminated if two ratios are computed for each class by sex and by college or school. The first semester sophomore continuing students, for example, are not all students who were freshmen the previous second semester; some of the second semester freshmen will be continuing as freshmen the next first semester. Some of the second semester sophomores will continue as sophomores the following first semester; not all juniors will become seniors nor will all seniors have been graduated at the end of the second semester. The two ratios are (1) the ratio of the promoted continuing students in the first semester class in question to the total enrollment of the next lower second semester class, and (2) the ratio of the non-promoted continuing students in the first semester class in question to the total second semester enrollment of the class of which these students were a part.

Some schools and colleges within an institution accept students only after a year or two of preparation in some other college. A School of Pharmacy, for example, may accept only students who have completed a year of work in a College of Arts and Sciences and who have a certain minimum grade-point average. As freshmen, these students would be classified as pre-pharmacy students in the College of Arts and Sciences. The ratio of continuing sophomores the first semester in Pharmacy would have as its base the second semester pre-pharmacy freshmen rather than the total second semester College of Arts and Sciences freshmen.

The same general pattern for estimating the enrollments of a graduate school or professional schools such as law and medicine would be used. The graduate school enrollment would be divided according to those seeking the masters degree and those seeking the doctorate. These groups are "survived" from the second semester to the succeeding first semester.

As is true of the other general divisions of which the total enrollment is composed, if there is an advance registration period and/or a pre-advising period, the early estimates of enrollment can be corrected according to the statistics available as the result of the students indicating their intent to continue. If the pre-advising or advance registration period is prior to the end of the semester preceding the semester for which estimates are made, it is necessary to correct the estimates on the basis of scholastic drop actions as well as on the basis of the past experience of the per cent of students who indicated an intent to continue but did not continue.

Colleges With a Limited Enrollment Policy

The general pattern of estimates of the college without a limited enrollment policy applies to the college with a limited enrollment policy. The latter college, instead of estimating the number of new students which can be expected, will estimate the number of continuing and re-entry students, subtract this number from the total enrollment desired, and estimate the number of new freshmen and advanced standing students which can be accepted.

For the situation above, the admissions personnel must have experience tables which show the trend of actual enrollments as compared with permits issued. A second problem is that of keeping the enrollments by classes balanced so that a large class graduating will be succeeded by a large freshman class and so that the junior and senior classes will not be so large that few freshmen can be admitted. The latter could easily result in a rapid decrease in total enrollment over a period of two years since there would be a small number of freshmen to be "survived" to the upper classes.

CHAPTER IV

Long-Range Projections of Enrollment

Unless there are drastic changes downward in economic and social conditions, changes in mobilization patterns, and changes in the desire of the college-age youth to attend college, it can be expected that there will be a continuing increase in collegiate enrollments. The present increase in enrollments is due at least in part to an increasing population, particularly in that part of the population which is of college age, and to an increasing proportion of the population which actually attends college.

During the years since World War II, the birth rate has risen. Enrollment in elementary and secondary schools is increasing rapidly. It can be expected that soon there will be great increases in college and university enrollments. The larger number of births is only one of the factors contributing to larger enrollments. At the present time, economic conditions are favorable, there is an increasing demand for college graduates, and there is a marked tendency in the direction of increased family size among college-educated parents. It is known that a larger proportion of children whose parents have a college education attend college than of children whose parents do not have a college education.

It is not too early to plan carefully for increased college enrollments. Each state and institution within the state must analyze its enrollment potential and, on that basis, must plan as thoroughly as possible the means for serving its students. For some institutions, this will involve the construction of many new buildings; however, brick and mortar alone will not suffice to guarantee high quality education. The need for instructional staff also must be recognized. It not only is necessary to prepare the persons who desire to become teachers but it also will be necessary to make the teaching profession sufficiently attractive to hold the present teachers and to attract a larger proportion of college graduates to teaching.

That increases in enrollment can be expected is important in alerting the people of this nation to the needs of higher education. Even more important are educated projections of how great the enrollment increases might be at any particular time. Enrollment projections must be based upon the best possible data supplemented by a set of well-integrated and well-founded basic assumptions. The data as well as the assumptions will vary from state to state and from institution to institution. It is recognized that no single method of long-range enrollment projections will meet the needs of all states or all institutions. The method to be used must be determined by persons who have a good background in projection theory, who understand demographic data, and who are aware of the educational needs of the particular state or institution. The projections should be reviewed and, if necessary, revised periodically in order to take into account changing conditions.

The validity and reliability of enrollment projections is somewhat related to the size of the population area and to the length of the projection period. As the size of the population area is decreased and as the length of the projection period is increased, the reliability of the projection generally decreases. Thus long-range projections for a state are usually more reliable than for a city or county. Also projections 10 to 15 years into the future are less reliable than are projections for a shorter period of time. In a small population segment, very rapid changes in migration, mortality, and economic conditions may occur; these changes usually occur more slowly in an entire state, for the loss through migration in one area may result in an increase in population in another area.

Enrollment projections can be made as far as 17 years into the future without estimating births. Nearly all individuals who will be enrolled in colleges and universities 17 years from now are born and can be counted.

Any of a number of factors might affect future enrollments. The projections are based upon certain assumptions; if any of the assumptions are violated, the projection may lose its validity and new projections will need to be made. Some of the many possible assumptions are listed here; some or all of them may apply to a particular projection. Other assumptions might also be applicable; the following are for illustrative purposes only:

1. Counties (or parishes) in which a high proportion of youth attend high school will continue to graduate a higher proportion of high school age youth than will the remainder of the state.

2. There will be no major changes in academic or admissions requirements during the period covered.

3. Facilities and staff will be provided to meet the needs of the projected student body.

4. Tuition and fees will not change markedly in relation to the value of the consumer dollar.

5. The various forms of financial benefits available to students will be expanded at a rate roughly commensurate to the increase in enrollment. Financial benefits will continue to include scholarships, fellowships, assistantships, loan funds, and job opportunities while attending college.

6. There will be no major war or other major catastrophe and no major change in the requirements and practices relative to compulsory military training.

7. The federal or the state government will not provide new forms of subsidies for men discharged from the armed forces.

8. There will be no great change in mortality and migration patterns.

9. Economic conditions will remain substantially the same as at the present time.

10. The retention rate and transfer rate from class to class will remain about the same as it has been during the past few years.

11. No new major curricular programs will be added or dropped.

AT THE STATE LEVEL

One of the most serious problems in analyzing college enrollment trends and in projecting enrollments is the incompleteness or inadequacy of the basic data. In some states, it is almost impossible to secure complete elementary and secondary enrollment data particularly from the private schools since there is no central enrollment collection agency. Furthermore, not all schools, whether elementary or secondary or collegiate, define a student in exactly the same way.

Reliable projections cannot be made without precise definitions of the purpose of the projections, the meaning of the projection results, and the types of students and programs included. One must determine, for example, whether the projection is for total student enrollment and, if so, what this total includes; whether the projection is for full-time equivalent students, or whether it includes full and part-time on a head-count basis; whether the projection includes all post-high school institutions, or whether some institutions such as vocational schools and business colleges are excluded; and whether students carrying credit as well as students carrying non-credit courses are included.

The writer believes that a cohort-survival projection method is superior to the ratio method. Since the next section of this chapter, "At the Institutional Level," will have a description of an age-to-age survival method, a short explanation of the grade-succession method of projection is presented here.

In the grade-succession method, an analysis is made of the extent to which children enrolled in the first grade in the elementary schools of the state survive through the various grades to become college or university students. In the grade-succession method, four sets of historical enrollment statistics are necessary.

1. Grade-to-grade survival. It is necessary to know the enrollment in each elementary and high school grade for the entire state and to know the survival from one grade to the next. All schools of the state must cooperate in providing data, not just the public or public white schools.

2. Twelfth grade survival to new college and university freshmen by sex. This requires data from all secondary schools and from all colleges. It is helpful to know the attendance of the in-state high school graduates at out-of-state colleges and the attendance of out-of-state high school graduates at in-state colleges. The twelfth grade survival to college attendance by sex should be on a differential basis, that is, by significant areas of the state since, from some areas of the state, a much higher percentage of the high school graduates choose to attend college than is true from other areas of the state.

3. Class-to-class survival in the colleges and universities. This is the survival from one class in a particular year to the next higher class in the succeeding year. If there are variations in class-to-class survival from one institution to another, these variations should be known and weighting should be done according to the variations.

4. Migration patterns of college students. In 2 above, it was indicated that one should have information on the twelfth grade to new freshman in-migration and out-migration. The migration patterns above the freshman level should be known also. For example, is there a trend which indicates that in-state students are choosing to go to out-of-state colleges for a year or two and then transfer to in-state colleges; is this a trend also for out-of-state students; if so, is it a net in-migration or out-migration?

Do the survival trends over a period of years show a consistent pattern or are there fluctuations? If there are fluctuations, it will be necessary to decide on the basis of the best data available whether the projection should be based on a mean, median, or increasing trend. It is well to have low, medium, and high projections with the logic of each carefully explained.

The next step is to outline the basic assumptions accepted relative to economic conditions, migration, selective service requirements, catastrophic and war conditions, increased desire for education, etc. On the basis of the historical enrollment data and these assumptions, the survival rates and ratios are extended through the forecast period.

It is well to note that some of the factors affecting undergraduate enrollments also may affect professional and graduate enrollments. Other factors not of concern at all in an undergraduate forecast may be very important in a professional or graduate student forecast. Ordinarily, a survival ratio from baccalaureate degrees within the state in one year to graduate school enrollment in the next year is not a very good measure of new graduate or total graduate enrollment. Graduate enrollments generally are affected more by migration, for example, than are undergraduate enrollments. For many students, there is a lag of some years between the granting of the baccalaureate degree and the commencement of graduate work.

It is quite possible that, for a particular state, an age-survival technique is superior to a grade-to-grade survival method. This could be true particularly at the graduate level where an age distribution might describe the students better than a baccalaureate degree date distribution.

The reader is referred to Chapter II of this publication for the differences in the various projection methods. Each person making an enrollment forecast will have to decide which method best fits the data and meets the needs of the particular situation for which the forecast is made.

AT THE INSTITUTIONAL LEVEL

General Comments

An institutional projection may involve a very simple or a very complex technique. If the projection for the state is well conceived, if it is done by areas of the state, and if the enrollment for a particular institution is drawn almost entirely from a small area of the state, then the person concerned with the institutional projection may merely have to use the state report in computing the percentage of students from the area who can be expected to enter the particular institution as new freshmen, and to survive this cohort through four years of college. Unfortunately, the procedure is this simple for only a few institutions since rarely do the survival and transfer rates for the state apply also to a particular institution.

For the institution for which a decision is made to serve only a certain number of students, long-range projections may be meaningless. The major problem for this type of institution is to set up procedures designed to attract a certain number of students and to keep the enrollment at capacity. However, it is necessary to know general trends of enrollment increases or decreases and to be aware of changes in economic conditions. It is possible, for example, that increased fees and/or increased admissions standards would result in decreased enrollment even during a time when the general collegiate enrollment in the state is increasing.

A Projection for an Institution

To add meaning to what has been written, the author feels it desirable to present data relative to a particular institution and to present a method of making a projection for that institution. Only part of the enrollment and projection data will be included in order that the presentation may be as brief as possible.

The analysis is for a university which will be called the University of Anystate-Pinetree. This university is located in the city of Pinetree, in Forest County, and the state of Anystate. The data are real; the names of the institution, cities, county, and state are fictitious.

The University of Anystate-Pinetree is a state university and was conceived primarily as a commuting institution serving the city of Pinetree, Forest County, and the neighboring counties. It resulted from the merger of two separate colleges in July, 1956. The history of enrollments for the purpose of establishing trends, therefore, is not only short but also subject to variation due to such factors as prospective students questioning whether or not the new institution would fulfill the mission of either of the two prior institutions, whether or not the potential students would feel that the new institution compares in status to other universities, whether or not the new institution would attract students from outside of the commuting area, how rapidly new and diversified programs might be developed, and how the new institution might affect or be affected by the drawing and holding power of the other institutions in the area. Two public technical colleges one of which is a junior college, numerous small private colleges, and a large private university are located in Forest County; all except one small private college are located in the city of Pinetree.

The University of Anystate-Pinetree currently offers work on two campuses within the city. One campus is downtown and the other is in a residential area. It has been decided that expansion of facilities will take place on the latter campus and that eventually the downtown campus may serve only evening students. A graduate school is not anticipated, but graduate work will be offered in the evening and the credit certified to a university with a large graduate school.

The projection attempts to determine the potential size of the student body if facilities are provided. Therefore, the projection is concerned with day undergraduate students only and has as its immediate purpose the providing of information helpful in making decisions on building and campus site needs. The projection is for the years 1959 through 1975.

It is assumed that:

1. The drawing power of the institution will be limited primarily to students within commuting distance.

2. The primary service area will continue to be Forest County. Of the new freshmen, first semester 1958-59, 82.5 per cent lived in Forest County at the time of registration; 83.7 per cent were graduated from Forest County high schools including 61.0 per cent who were graduated from high schools in the city of Pinetree.

3. The new freshman group will be made up of 17, 18, and 19 year olds in the same proportion as was true of the September, 1958 entering class. Of the new freshmen in September, 1958, 89.1 per cent were 17, 18, or 19 years of age; of the 17, 18, and 19 year olds, 7.5 per cent were 17 years of age, 77.5 per cent were 18 years of age, and 15.0 per cent were 19 years of age.

4. The Forest County school census figures are reliable and valid.

5. The change in the number of individuals at each successive age will follow the average change from age to age, represented by the Forest County school census, for the years 1956 to 1957 and 1957 to 1958.

6. There will be no substantial change in the proportion of Forest County residents attending colleges outside of Forest County and in the proportion of students who are not Forest County residents attending Forest County colleges.

7. There will be no new colleges established which will affect the enrollment at the University of Anystate-Pinetree.

8. The retention rate and transfer rate from class to class will remain about the same as the average retention rate for the years 1956-57, 1957-58, and 1958-59; that is, other freshmen to new freshmen previous year (40.34 per cent), sophomores to total freshmen previous year (67.43 per cent), juniors to total sophomores previous year (59.00 per cent), seniors to total juniors previous year

(99.41 per cent), and specials to total classified enrollment for year in question (2.22 per cent).

9. The present programs will continue in about the same ratio as at present; a Graduate School or professional schools will not be developed.

10. The population and migration of eligible students will follow the pattern of the past two years.

11. Economic conditions in the area will remain substantially the same as at the present time. Slight variations should not invalidate the projections but a severe recession or a great economic "boom" would require a complete revision of them.

12. There will be no major war or other major catastrophe.

13. Facilities and staff will be provided to meet the needs of the enlarged student body.

14. Academic and admissions requirements will not be changed to any great extent.

15. Selective Service requirements and educational aid programs will continue on the same basis as at the present time.

In order to determine the method to be used and the factors applicable in projecting the enrollment of day students for the University of Anystate-Pinetree, it was necessary to study some of the basic characteristics of the student body. This was done in terms of the relationship of the total student body to the total enrollment in the Forest County public and private colleges and in the state as a whole, the relationship of the undergraduate enrollment to the undergraduate enrollment in the other Forest County colleges and in the state as a whole, and the relationship of the new freshmen to the new freshmen in the other Forest County colleges and the state as a whole.

In addition, a study was made of the University of Anystate-Pinetree new freshmen according to their high school and geographic origin and of the advanced standing students according to their college and geographic origin. Lastly, a study was made of the age distribution of the University of Anystate-Pinetree student body by class.

The analyses, for purposes of projection indicated that:

1. The enrollment at the University of Anystate-Pinetree is increasing more rapidly than is true of the undergraduate enrollment of the state as a whole, suggesting that the University of Anystate-Pinetree enrollment probably should not be related to the total college age pool of the state.

2. There has been an increase in the per cent of the Forest County

college new freshmen attending the University of Anystate-Pinetree in each year for the past four years. This may mean that the private colleges do not desire, may not be able, or will not have the opportunity to enroll as high a percentage of the Forest County college students in the future as is true at present.

3. There has been a general decline in the percentage of the state's new freshmen enrolled in Forest County colleges but an increase in each of the past four years, with the exception of 1957, for the University of Anystate-Pinetree. Thus in any projection, the relative University of Anystate-Pinetree increases should be taken into account.

4. Of the advanced standing students who entered the University of Anystate-Pinetree, first semester 1958-59, 63.9 per cent were individuals whose home residence was in Forest County. Though subject to error, it would appear that a best estimate of advanced standing students as a source of student body increment is the Forest County residents; the previous data presented does not indicate that the total college enrollments in the state would be a good index of the number of advanced standing students to expect at the University of Anystate-Pinetree.

From the observations and basic assumptions listed above, the general method of making the undergraduate day enrollment projection for the University of Anystate-Pinetree is to:

1. determine the pool of 17, 18, and 19 year olds in Forest County using the school census reports;

2. determine the age-to-age cohort survival for Forest County from one year to the next, i.e., the one year olds to two year olds the following year, the two year olds to three year olds the following year, etc.;

3. project the age population by age for Forest County;

4. develop a weighted 17-19 year old Forest County age pool;

5. relate the new freshmen, at the University of Anystate-Pinetree, to the 17-19 year old age pool;

6. project the new freshman enrollment for the University of Anystate-Pinetree:

   a. by projection A, assuming that the various colleges located in Forest County will have the same percentage of the total Forest County college-going youth as they had in the past, and

   b. by projection B, correcting for the average increase in the percentage of new freshman students enrolled at the University of Anystate-Pinetree during the past five years as compared with the total enrollment in all Forest County colleges;

7. determine the cohort-survival (class-succession) for the University of Anystate-Pinetree; and

8. project the enrollments from class to class.

Projection of New Freshmen: Since the new freshmen at the University of Anystate-Pinetree come primarily from Forest County and since they are primarily 17, 18, and 19 years of age, the attempt was to determine the pool of 17, 18, and 19 year olds in Forest County.

The Forest County school census figures for each age 0 through 19, as of June 30, for the years 1956, 1957, and 1958 were obtained. The census figures for the city of Pinetree were taken from the statistical reports of the Pinetree City Board of School Directors. The school census figures for the cities of Oaktree, Elmtree, Appletree, Mapletree, and Willowtree, and the school census figures for Forest County outside of the cities listed were obtained from the reports of the Forest County Superintendent of Schools. Forest County is primarily a metropolitan area with all of the cities listed being suburbs of the city of Pinetree. The composite of all school census figures indicated above, for each year, gave the total number of individuals at each age for the year within Forest County.

It is assumed that, if there are errors in the method of taking the school census, the errors are consistent. If there is under-reporting for any age group, this will not invalidate the projection providing the under-reporting is consistent from year to year.

To project the 17, 18, and 19 year olds in Forest County, an average change from one age to the next for the years 1956 to 1957 and 1957 to 1958 was computed. This gave the age-survival for the under one year olds to one year olds, one year olds to two year olds, two year olds to three year olds, etc. A computed change of this type incorporates the factors of mortality and migration. It is assumed, for the purposes of this report, that mortality and migration for the forecast period is represented by mortality and migration during the 1956 to 1958 period.

Using the factor of average change from one age to the next and the 0 through 19 year old population by age as of June 30, 1958, the population was projected to the 17, 18, and 19 year olds for the years, ending June 30, of 1959 through 1975. For illustrative purposes, the age-survival for the years 1959 through 1967 is presented in Table II. The same procedure was continued through 1977 when the under one year olds of 1958 are "survived" to 19 year olds of 1977.

TABLE II

PROJECTION OF INDIVIDUALS AT EACH AGE, JUNE 30 OF EACH YEAR, FOREST COUNTY

Age	Actual 1958	Survival Ratio	Projected Number								
			1959	1960	1961	1962	1963	1964	1965	1966	1967
0	19,741										
1	21,805	109.73	21,622								
2	22,392	111.56	24,326	24,166							
3	22,355	100.24	22,446	24,384	24,224						
4	21,457	99.45	22,232	22,323	24,250	24,091					
5	20,975	102.13	21,914	22,706	22,798	24,767	24,604				
6	20,622	99.84	20,941	21,879	22,670	22,762	24,727	24,565			
7	19,529	101.36	20,902	21,226	22,177	22,978	23,072	25,063	24,899		
8	19,203	101.86	19,892	21,291	21,621	22,589	23,405	23,501	25,529	25,362	
9	17,765	98.26	18,869	19,546	20,921	21,245	22,196	22,998	23,092	25,085	24,921
10	17,794	102.33	18,179	19,309	20,001	21,408	21,740	22,713	23,534	23,630	25,669
11	17,955	98.10	17,456	17,833	18,942	19,621	21,001	21,327	22,281	23,087	23,181
12	13,833	103.58	18,598	18,081	18,471	19,620	20,323	21,753	22,091	23,079	23,914
13	12,970	99.00	13,695	18,412	17,900	18,286	19,424	20,120	21,535	21,870	22,848
14	12,589	100.18	12,993	13,720	18,445	17,932	18,319	19,459	20,156	21,574	21,909
15	13,856	99.06	12,471	12,871	13,591	18,272	17,763	18,147	19,276	19,967	21,371
16	12,399	102.60	14,216	12,795	13,206	13,944	18,747	18,225	18,619	19,777	20,486
17	10,224	94.22	11,682	13,394	12,055	12,443	13,138	17,663	17,172	17,543	18,634
18	9,459	100.70	10,296	11,764	13,488	12,139	12,530	13,230	17,787	17,292	17,666
19	8,510	88.82	8,401	9,145	10,449	11,980	10,782	11,129	11,751	15,798	15,359

The ages of new freshmen at the University of Anystate-Pinetree used for developing an experiential relationship between age and attendance was the age during the calendar year; therefore, it was necessary to convert the population age figures as of June 30 to figures as of December 31. The results are reported in the second, third, and fourth columns of Table III. It is assumed that half of the individuals, at any age as of June 30, were born on or after July 1 of the previous year and half were born prior to July 1 of the year reported. According to the staff of the office of the Forest County Register of Deeds, about half of the births in any calendar year take place prior to July 1 of that year.

The Forest County college freshman age pool (Table III) was developed using the freshman age distribution at the University of Anystate-Pinetree, first semester 1958-59. This is a weighted age pool, for each year, consisting of 7.5 per cent 17 year olds, 77.5 per cent 18 year olds, and 15.0 per cent 19 year olds.

The relationship between the Forest County weighted 17-19 year old age pool and the new freshmen at the University of Anystate-Pinetree was computed for the fall semester of the years 1956-57, 1957-58, and 1958-59, and two projections of new freshmen at that university were made (Table III). Both projections assume no increase in the relationship between the total new freshman enrollment in all Forest County colleges and the weighted 17, 18, and 19 year olds in Forest County. This seems reasonable since there has been no general increase in this relationship during the past three years; this relationship was: 1956, 52.88 per cent; 1957, 48.10 per cent; and 1958, 51.21 per cent. The average of these three years is 50.73 per cent. One cannot assume that the fluctuation represents a real increase; the facts imply, however, that there will be variations in the relationship from year to year.

PROJECTION A assumes that each of the various Forest County colleges will continue to attract the same percentage of new freshmen among the total Forest County college new freshmen as is true at present.

PROJECTION B assumes that the University of Anystate-Pinetree will attract a higher percentage of the total Forest County college new freshmen than is true at present. This seems reasonable since, during the past five years, the University of Anystate-Pinetree, or the two colleges prior to the merger, has had an increasing percentage of the total new freshmen enrolled in the Forest County colleges; the average increase has been .89 per cent per year.

TABLE III

TRANSFORMATION OF AGE TABLES FROM JULY 1–JUNE 30 TO JANUARY 1–DECEMBER 31, FOREST COUNTY 17, 18, AND 19 YEAR OLDS; DETERMINATION OF WEIGHTED AGE POOL 17–19; AND PROJECTION OF UNIVERSITY OF ANYSTATE-PINETREE NEW FRESHMEN

Year	Age in Years			Weighted 17–19 Age Pool†	New Fresh. Univ. of Anystate-Pinetree		% New Fresh. Is of Age Pool	
	17	18	19					
1956	9,930	9,386	8,470	9,289	1,454		15.65	
1957	10,081	9,636	9,040	9,580	1,385		14.46	
1958	11,312	9,842	8,984	9,824	1,602		16.31	
					PROJECTION			
					A	*B*	*A*	*B*+
1959	12,949	10,989	9,348	10,890	1,776	1,826	16.31	16.77
1960	13,094	12,579	10,454	12,299	2,006	2,119	16.31	17.23
1961	12,630	12,772	11,968	12,641	2,062	2,236	16.31	17.69
1962	13,194	12,291	12,060	12,324	2,010	2,237	16.31	18.15
1963	15,942	12,834	11,656	12,890	2,102	2,399	16.31	18.61
1964	17,944	15,446	12,180	15,143	2,470	2,888	16.31	19.07
1965	17,896	17,480	14,769	17,105	2,790	3,341	16.31	19.53
1966	18,660	17,418	16,545	17,380	2,835	3,474	16.31	19.99
1967	19,560	18,150	16,512	18,010	2,937	3,683	16.31	20.45
1968	20,614	19,033	17,228	18,881	3,079	3,948	6.31	20.91
1969	21,464	20,048	18,052	19,855	3,238	4,243	16.31	21.37
1970	22,122	20,892	19,034	20,706	3,377	4,520	16.31	21.83
1971	23,012	21,523	19,803	21,377	3,487	4,765	16.31	22.29
1972	23,458	22,392	20,418	22,176	3,617	5,045	16.31	22.75
1973	24,547	22,838	21,238	22,726	3,707	5,275	16.31	23.21
1974	25,445	23,867	21,640	23,651	3,857	5,598	16.31	23.67
1975	24,910#	24,776	22,670	24,470	3,991	5,905	16.31	24.13

† Based upon composition of Sept. 1958 University of Anystate-Pine[illegible]e new freshman class, i.e., 89.1% of the new freshmen were 17, 18, or 19 years of age; of these 7.50% were 17, 77.50% were 18, and 15.00% were 19 years of age.

\+ Corrected for average increase in percentage of total Forest County college new freshman students enrolled at the University of Anystate-Pinetree or the two prior colleges during the past five years. This average increase is .89; transformed to the age pool percentage this becomes .46.

\# Estimated from difference in births 1959 and 1958.

The average increase is transformed to an average "age pool-new freshman" percentage increase factor through the proportion $\frac{.89}{31.84} = \frac{x}{16.31}$ where:

31.84 = the per cent of the total Forest County college new freshmen enrolled at the University of Anystate-Pinetree during the first semester 1958-59;

16.31 = the relationship between the Forest County 17-19 age pool and the new freshman enrollment, first semester 1958-59; and

.89 = the average increase, over the last five years, in the per cent of the Forest County college new freshmen who were enrolled at the University of Anystate-Pinetree or the two colleges prior to the merger.

From this proportion, $x = .46$ is derived as a constant to be added consecutively by year to the per cent the University of Anystate-Pinetree new freshman enrollment is of the weighted 17-19 age pool. The factor then becomes $k + nx$ where $k = 16.31$ and $n =$ the number of years since 1958.

It is interesting to note the effects of migration and/or mortality and/or under-reporting in the school census and/or over-reporting of births for Forest County. As shown in Table III, the weighted 17-19 year olds for the years 1956, 1957, and 1958, based upon the Forest County School census, was 9,289, 9,580, and 9,824 respectively. For the same years, the comparably weighted 17-19 year olds based upon births in Forest County 17, 18, and 19 years previously was 13,092, 13,045, and 13,646 respectively. These latter figures are higher and do not take into account the factors of migration, mortality, and home address of the mother at the time the child was born. The birth figures are occurrence figures, that is, births within Forest County whether or not the mother was a resident of Forest County.

Projection of Total Undergraduates: The total undergraduate enrollment projection is based upon the projection of new freshmen and the survival rate from class to class at the University of Anystate-Pinetree. The retention rate from 1950-51 through 1958-59 is shown in Table IV. The freshman class enrollment consists of the new freshmen plus the other freshmen (continuing, advanced standing, and reentry).

The best estimate of retention from class to class appears to be the average retention rate for the past three years; this is the period since the merger. Prior to that time, one of the colleges was a freshman-

TABLE IV

UNDERGRADUATE RETENTION RATE‡ FROM CLASS TO CLASS, ONE FIRST SEMESTER TO NEXT, THE UNIVERSITY OF ANYSTATE-PINETREE*

Fall	Freshman				Sophomore		Junior		Senior		Total Class.	Specials		Total Enroll.
	New	Other†	Total	Other % of New	Enroll.	% of Fresh.	En-roll.	% of Soph.	En-roll.	% of Junior		En-roll.	% of Class	
1950	1,005	354	1,359		875		432		405		3,071	148	4.82	3,219
1951	954	300	1,254	29.85	784	57.69	357	40.80	419	96.99	2,814	116	4.12	2,930
1952	996	270	1,266	28.30	709	56.54	352	44.90	349	97.76	2,676	127	4.75	2,803
1953	1,039	291	1,330	29.22	765	60.43	331	46.69	336	95.45	2,762	92	3.33	2,854
1954	1,132	375	1,507	36.09	838	63.01	398	52.03	383	115.71	3,126	85	2.72	3,211
1955	1,427	462	1,889	40.81	1,009	66.95	490	58.47	433	108.79	3,821	84	2.20	3,905
1956	1,454	541	1,995	37.91	1,278	67.65	623	61.74	479	97.76	4,375	88	2.01	4,463
1957	1,385	525	1,910	36.12	1,375	68.92	748	58.53	601	96.47	4,634	101	2.18	4,735
1958	1,602	651	2,253	47.00	1,255	65.71	780	56.73	778	104.01	5,066	125	2.47	5,191

‡ For other freshman, based upon new freshman one year earlier; for sophomore, on freshman one year earlier; for junior, on sophomore one year earlier; for senior, on junior one year earlier; and for specials, on total classified enrollment for year in question.

* Two separate and independent public colleges prior to 1956–57.

† Continuing, advanced standing, and re-entry.

NOTE: Valid only for freshmen, sophomores, and seniors prior to 1956–57 since one of the separate colleges was only a junior college prior to this date and sophomores were expected to transfer to another institution for junior year work.

sophomore center and students were expected to transfer to other institutions in order to complete their degrees. The average retention rate for the past three years was: other freshmen to new freshmen the previous year, 40.34 per cent; sophomores to total freshmen previous year, 67.43 per cent, juniors to total sophomores previous year, 59.00 per cent; seniors to total juniors previous year, 99.41 per cent; and specials to total classified enrollment for the year in question, 2.22 per cent.

Projection A (Table III) is the basis for the minimum projection of new freshmen. Projection B (Table III) is the basis for the maximum projection of new freshmen. For the purposes of planning, the projection based upon projection B should be used; the results of this projection are shown in Table V. The projected total enrollment using projection A has a range of 5,580 in 1959 to 13,490 in 1975. Using projection B, the range of total enrollment is from 5,625 in 1959 to 19,460 in 1975.

TABLE V

PROJECTED FIRST SEMESTER ENROLLMENT, THE UNIVERSITY OF ANYSTATE-PINETREE BASED UPON PROJECTION B* AND AVERAGE RETENTION RATE#

Fall	Fresh.	Soph.	Junior	Senior	Specials	Total
1959	2,471	1,519	740	775	120	5,625
1960	2,855	1,666	896	736	137	6,290
1961	3,091	1,925	983	891	150	7,040
1962	3,139	2,084	1,136	977	164	7,500
1963	3,301	2,117	1,230	1,129	173	7,950
1964	3,855	2,226	1,249	1,223	187	8,740
1965	4,506	2,599	1,313	1,242	215	9,875
1966	4,822	3,038	1,533	1,305	237	10,935
1967	5,084	3,251	1,792	1,524	259	11,910
1968	5,434	3,428	1,918	1,781	279	12,840
1969	5,836	3,664	2,023	1,907	295	13,725
1970	6,232	3,935	2,162	2,011	315	14,655
1971	6,588	4,202	2,322	2,149	339	15,600
1972	6,967	4,442	2,479	2,308	359	16,555
1973	7,310	4,698	2,621	2,464	377	17,470
1974	7,726	4,929	2,772	2,606	397	18,430
1975	8,163	5,210	2,908	2,756	423	19,460

* See Table III.

\# The best estimate is the average retention rate for the past three years; this is: other freshmen to new freshmen previous year (40.34%), sophomores to total freshmen previous year (67.43%), juniors to sophomores previous year (59.00%), seniors to juniors previous year (99.41%), and specials to total classified enrollment for year in question (2.22%).

NOTE: Figures have been adjusted so the total will round to a terminal digit of 0 or 5.

CHAPTER V

Data Presentation

BOTH THE BACKGROUND DATA on which enrollment projections are based and the projections themselves generally will appear in some type of duplicated or printed report. This chapter is a brief review of guiding principles which may be helpful to the person designing tables and/or graphs. The reader is referred to the books by Schmid,[5] by Modley and Lowenstein,[6] by Jenkinson,[7] by Wittich and Schuller,[8] and by the Committee on Standards for Graphic Presentation,[9] for elaborate details on the preparation of visual materials.

One of the prime principles in data reporting is that the materials should be presented candidly and honestly. The presentation should be understandable to the persons who are expected to use the report; therefore, the report with its accompanying tables and graphs should be "crystal clear." No matter how carefully enrollment projections are made, if the technique and the results are not presented in a succinct and comprehensible manner, there is the possibility that the persons who have the responsibility for final institutional decisions will distrust and perhaps disregard the generalizations and conclusions reached.

Various techniques of presentation should be used. Some persons are able to read tables with ease. Other individuals see the data best when presented in diagrammatic form. The advantages of a written page accompanied by a well designed, clear graph is somewhat synonymous to the advantages of a presentation using audio-visual materials rather than mere verbalization.

It should be kept in mind that college administrators and members of boards of regents or boards of trustees are persons confronted with

[5] Calvin F. Schmid, *Handbook of Graphic Presentation* (New York: The Ronald Press Co., 1954), pp. vii + 316.

[6] Rudolf Modley and Dyno Lowenstein, *Pictographs and Graphs* (New York: Harper & Bros., 1952), pp. 186.

[7] Bruce L. Jenkinson, *Bureau of the Census Manual of Tabular Presentation* (Washington, D.C.: U. S. Government Printing Office, 1950), pp. xiv + 266.

[8] Walter Arno Wittich and Charles Francis Schuller, *Audio-Visual Materials* (New York: Harper & Bros., 1957), pp. xxvii + 570.

[9] Committee on Standards for Graphic Presentation, *Time Series Charts: A Manual of Design and Construction* (New York: The American Society of Mechanical Engineers, 1938), pp. 68.

many elaborate reports each day. It is impossible for them to read all the materials which come to their desks; therefore, if the report can be brief, it is more subject to notice. Also, an attractive and well presented chart or graph may convey a thought which might not be understood even after many minutes of verbalization or many pages of written material.

TABLES

The basic objective in a table is to arrange and present data so the reader can grasp the materials rapidly. A tabular form is especially useful when large amounts of data of various classifications are presented. A table perhaps is not the clearest method of presenting material, but it is an efficient method from the standpoint of number of pages in a volume and of having various data located together for comparative purposes. Since many persons do not understand columns and rows of figures and therefore have difficulty in analyzing a table, a clear written or verbal presentation should accompany the table. It must be remembered that in a table the emphasis is upon understandability and gaining the reader's attention. Therefore, the table should be as simple as possible and constructed in such a way that the reader is drawn to what is in the table, not to the art work which might surround the table.

In a particular report, it is well to use a rather consistent form for all tables. The reader then knows what to expect in going from one table to another and does not have to study form before studying content. However, one should not force material into a particular form where some other style might be more appropriate.

Tabulation is preferable to long paragraphs of numbers in the body of a report for the reader generally is more concerned with conclusions than with minute detail. Not all statistical data, however, need be presented in tabular form, particularly if, when presented in the written part of the report, the data contribute to the analysis and do not detract from the ease of reading.

A table should appear as near as possible in the text to the discussion that relates to it since the prime purpose of the table is to give a clear understanding or interpretation of what has been written. The table will follow the reference made to it in the text; it may be on the following page if the page containing the reference will not accommodate the entire table. Reference should be by table number and should include the page on which the table appears if that page is different from the page on which reference is made. It is clearer and more accurate to state, "Table V on page 10 indicates . . ." than "The following table indicates. . . ."

Tables most generally are numbered consecutively with Roman numerals throughout the report; the word "table" is capitalized, and both the word and the number are centered above the table. This is followed, two vertical spaces below, by the table title (centered above the table) and with all words in capital letters. If the title is more than one line in length, it is preferable to use an inverted pyramid form, that is, each successive line should be shorter than the previous line. Complete segments of the title appear on a line; phrases, for example, should not be broken between lines. The title should designate what is to be found in the table and should proceed from the general (or population) to the particular and time. Thus the title generally will be in the order of: what, classified how, the location, and the time (See Table VI). A headnote, enclosed in parentheses and appearing between the title and the top rule of the table, may be appropriate in qualifying, or explaining, the title or the table as a whole. In contrast, a table footnote generally qualifies or explains a specific cell, line, column, or segment.

Ordinarily tables of only two columns would not be ruled either vertically or horizontally but the column heads would be underlined. Tables of more than two columns should be ruled with a horizontal double rule at the top, a single horizontal rule between the head or heads and the body, and a single horizontal rule at the end of the table. The minimum vertical rules are those which separate the stub from the field of the table and the segments of the field from one another. Where segments consist of several columns and these are separated by rules, there should be a double vertical rule between the segments. This plan and variations of a complex nature are illustrated in Table VII, "The Major Parts of a Table," page 49.

It is well to keep ease of reading in mind. Unless there is a good reason to the contrary, the table should have neither a vertical rule for each column nor a horizontal rule for each row; these tend to attract attention away from the numbers in the table. If there are long columns of numbers, they should be broken periodically with an extra type space in order to provide a guide in following a line across the table and to break up the blackness of the page.

Each column heading should be centered within the space al-

TABLE VI

ENROLLMENT OF STUDENTS BY SEX, ENTRANCE STATUS, AND COLLEGE AND CLASS
THE UNIVERSITY OF WISCONSIN, MADISON CAMPUS, SECOND SEMESTER 1958–59
(End of First Week of Instruction)

Classification	Summary Total					Men					Women				
	Total	Cont.	Re-Ent.	Adv. Stg.	New	Total	Cont.	Re-Ent.	Adv. Stg.	New	Total	Cont.	Re-Ent.	Adv. Stg.	New
COURSE															
Letters & Science	7,712	7,030	325	137	220	4,834	4,355	249	84	146	2,878	2,675	76	53	74
Agriculture	1,299	1,188	34	26	51	1,229	1,126	30	25	48	70	62	4	1	3
Home Economics	502	478	9	8	7	—	—	—	—	—	502	478	9	8	7
Commerce	795	745	20	9	21	745	698	20	8	19	50	47	—	1	2
Education	1,749	1,474	112	29	134	761	591	61	9	100	988	883	51	20	34
Engineering	2,863	2,578	134	64	87	2,849	2,564	134	64	87	14	14	—	—	—
Nursing	281	259	12	8	2	—	—	—	—	—	281	259	12	8	2
Pharmacy	264	254	5	2	3	231	223	4	2	2	33	31	1	—	1
Law	491	450	27	14	—	485	445	26	14	—	6	5	1	—	—
Medicine	332	332	—	—	—	308	308	—	—	—	24	24	—	—	—
Auditors	5	2	1	2	—	2	1	—	1	—	3	1	1	1	—
TOTAL	16,293	14,790	679	299	525	11,444	10,311	524	207	402	4,849	4,479	155	92	123
CLASS															
Graduates	4,046	3,491	179	—	376	3,329	2,882	138	—	309	717	609	41	—	67
Professionals	823	782	27	14	—	793	753	26	14	—	30	29	1	—	—
Seniors	2,877	2,734	118	25	—	1,989	1,878	90	21	—	888	856	28	4	—
Juniors	2,760	2,564	101	95	—	1,879	1,729	79	71	—	881	835	22	24	—
Sophomores	2,656	2,434	141	91	—	1,664	1,499	107	58	—	1,002	935	34	33	—
Freshmen	3,057	2,750	97	61	149	1,768	1,557	80	38	93	1,289	1,193	17	23	56
Specials*	64	35	16	13	—	22	13	4	5	—	42	22	12	8	—
TOTAL	16,293	14,790	679	299	525	11,444	10,311	524	207	402	4,849	4,479	155	92	123

* Special students not classified by year.

TABLE VII
THE MAJOR PARTS OF A TABLE

Table No.
Table Title
(Headnote)

Stub — Segment

Stubhead	Spanner Head			Spanner Head		
	Total	Col. Head	Col. Head	Total	Col. Head	Col. Head
DIVISION HEAD	BLOCK	COLUMN				
Line Caption						
Line Caption						
Line Caption						
TOTAL LINE CAPTION				Cell		
DIVISION HEAD						
Line Caption	←			ROW	→	
Line Caption						
Line Caption						
TOTAL LINE CAPTION				*		
TOTAL				Cell		

* Footnote. — Field

lotted to the respective column. Abbreviations can be used throughout the table if these are standard abbreviations which are understood or if the abbreviations are explained in a footnote to the table. It is often convenient to number the columns in addition to having a column head, since this may facilitate reference in the text to the particular items. In the headings of a segment, each lower head should refer solely and strictly to the next higher level, for example:

Correct Heading

Residence			
Resident		Non-Resident	
Male	Female	Male	Female

Incorrect Heading

Residence			
Male		Female	
Res.	Non-Res.	Res.	Non-Res.

Footnotes to a table should appear immediately below the table while footnotes for a written page are located at the bottom of the page. It is acceptable, if there are not more than two footnotes for a table, to use an asterisk (*) and/or a dagger (†). If there are numerous footnotes for a table, superscript numbers might be more appropriate. In the text of the report, footnote references are numbered consecutively and appear as superscript numbers.

CHARTS OR GRAPHS

The terms "chart" and "graph" frequently are used interchangeably. In this report, reference will be to graphic presentation or graph. The word "chart" is considered as a more general term than the word "graph" and includes graphs, maps, posters, pictures, diagrams, and cartoons. Graphs are visual representations of numerical data which reveal important relationships in the data. A graph may show trends, or it may show variations from a norm.

The major reason for a graph is to present comparative, quantitative information quickly and simply. Graphs should be easy to read and therefore should not be very complex. When a complex system of numerical data is portrayed, it is better generally to have a series of simpler graphs rather than one intricate composite graph. If a composite graph is necessary, it should be preceded by a series of supporting graphs.

Campbell[10] lists the following rules or standards for graphic presentation; these are from the "Report of the Joint Committee of the American Society of Mechanical Engineers on Standards for Graphic Presentation":

1. The general arrangement of a diagram should proceed from left to right.
2. Where possible, represent quantities by linear magnitude, as areas or volumes are more likely to be misinterpreted.
3. For a curve, the vertical scale, whenever practicable, should be so selected that the zero line will appear in the diagram.
4. If the zero line of the vertical scale will not normally appear in the curve diagram, the zero line should be shown by the use of a horizontal break in the diagram.
5. The zero lines of the scales for a curve should be sharply distinguished from the other co-ordinate lines.
6. For curves having a scale representing percentages, it is usually desirable to emphasize in some distinctive way the 100 per cent line used as a basis of comparison.

---

[10] William Giles Campbell, *Form and Style in Thesis Writing* (New York: Houghton Mifflin Co., 1954), p. 53.

7. When the scale of the diagram refers to dates, and the period represented is not a complete unit, it is better not to emphasize the first and last ordinates, since such a diagram does not represent the beginning and the end of time.

8. When curves are drawn on logarithmic co-ordinates, the limiting lines of the diagram should be of some power of 1- on the logarithmic scale.

9. It is advisable not to show any more co-ordinate lines than are necessary to guide the eye in reading the diagram.

10. The curve lines of a diagram should be sharply distinguished from the ruling.

11. In curves representing a series of observations, it is advisable, whenever possible, to indicate clearly on the diagram all the points representing the separate observations.

12. The horizontal scale for curves should usually read from left to right and the vertical scale from bottom to top.

13. Figures for the scale of a diagram should be placed at the left and at the bottom or along the respective axes.

14. It is often desirable to include in the diagram the numerical data or formulae represented.

15. If numerical data are not included in the diagram, it is desirable to give the data in tabular form accompanying the diagram.

16. All lettering and all figures in a diagram should be placed so as to be easily read from the base as the bottom or from the right-hand edge of the diagram as the bottom.

17. The title of a diagram should be made as clear and complete as possible. Sub-titles or descriptions should be added if necessary to insure clearness.

It is noted in the foregoing list that the word "diagram" is used rather than graph and that the rules or standards are directed primarily to line graphs. Some of the rules apply also to bar graphs and other visual materials.

Bar Graphs

Horizontal bar graphs and column bar graphs are one-dimensional although the bar is shown to have width. The width of the bar has no relationship to the data; the value or magnitude is determined by the length of the bar. A column graph is identical in purpose to a horizontal graph; the difference is that the bars of a column graph are vertical.

Bar graphs are of two general types: (1) a graph with all bars of equal length, each bar representing 100 per cent, or some other unit, and (2) a graph with bars of varied lengths and with each bar representing an amount of a category. Each bar may be divided and shaded to show the relative amount of the elements of which the total of the bar is composed.

It is recommended that a carefully planned scale and a key (to the shading) be included with the graph. There is no rule as to the width of the bars themselves or the width of the space between bars. A "rule-of-thumb" is that the width of the bars is determined by the size and characteristics of the graph and that the width of the space between bars should be about one-half the width of a bar.

Plane and Volume Graphs

A plane graph is two-dimensional while a volume graph is three-dimensional. Unless one understands the construction of and computation for proportional representation in these graphs, it is advisable to rely on a one-dimensional form since the representation is more easily drawn proportional to the amount. If a plane graph or volume graph is used, it is important to keep in mind that the area or volume represents the amount. An amount twice the size of a square, for example, would be represented by a square with each side multiplied by the square root of two. Doubling each side would multiply the amount by four; tripling each side would multiply the amount by nine.

A multi-dimensional bar graph pictured on a flat surface to give the illusion of depth is not a volume graph. It does give a certain "life" to the presentation to have bars with "perspective", an illusion of depth. If this conceals rather than points out the facts, it would be much better to rely on a simple bar graph. Eye appeal is used in some advertisements to attract attention; however, in so doing, attention often is drawn from, rather than to, the facts. It is important in educational work to present the data in such a way that the data will be understood. If color, multi-dimensional graphs, and superfluous art work hide the actual data, the educationalist has defeated his purpose.

Linear Graphs

In enrollment projections, one is concerned with time series, a sequence of values related to periods of time. The most common type of graph for presenting time series is the linear graph in which the plotted points are joined consecutively by straight lines to form a continuous line movement or curve.

Two types of linear graphs are considered here: (1) those presented in rectilinear coordinate form and (2) those presented in semilogarithmic or ratio form. At the end of this chapter, a brief comparison will be made of the same data plotted in actual numbers on rectilinear coordinate paper, as index values on rectilinear coordinate paper, and in actual numbers on semilogarithmic paper.

In determining the type of graph to be used, one is concerned with the meaning of the data, the purpose of the chart, and the audience to whom the chart is directed. The Committee on Standards for Graphic Presentation[11] points out situations for which the linear graph is and is not particularly useful:

A. THE LINE CHART SHOULD GENERALLY BE USED:

1. For series where there are many successive values to be pictured.
2. Where several series are shown for comparison on the same chart.
3. For close reading or interpolation.
4. When the emphasis should be on the movement rather than on the actual amounts.
5. When the chart is to be used for the projection of trends.

B. THE LINE CHART MAY NOT BE THE BEST TYPE:

1. Where there are relatively few plotted values in the series.
2. When the emphasis should be on the change in amounts rather than on the movement of the series.
3. To emphasize the differences between values or amounts on different dates.
4. When the movement of the data is extremely violent or irregular.
5. When the presentation is designed for popular appeal.

Rectilinear Coordinate Graph: A rectilinear coordinate graph sometimes is referred to as a Cartesian coordinate or rectangular graph. A rectilinear coordinate system consists of four quadrants. The X (abscissa) axis is horizontal; the Y (ordinate) axis is perpendicular to the X axis. The four quadrants formed by the intersection (origin of coordinates) and extension of the two axes are:

Quadrant I—X values positive and Y values positive.
Quadrant II—X values negative and Y values positive.
Quadrant III—X values negative and Y values negative.
Quadrant IV—X values positive and Y values negative.

[11] Committee on Standards for Graphic Presentation, *op. cit.*, p. 14.

Quadrant I is used almost exclusively in graphing. Occasionally, quadrant IV and quadrant I may be used together in order to display values of a directional nature, that is, both positive and negative values of the dependent or Y variable. The X scale generally represents the independent variable; in graphing this is frequently the variable of time.

The base line on all rectilinear coordinate graphs should be zero except where for good reason some other reference value is more appropriate. This occurs, for example, when an index is used and the first year is represented by an index of 100 and all other index values exceed 100; in this case the base line would be 100. In order not to misrepresent the visual picture, the zero base line is important; without it the data appear distorted.

If it is absolutely necessary to omit part of the axis scale, the breaking of the grid must be clearly indicated on the graph and explained in the text. A grid is the area composed of coordinate rulings.

Some producers of graphs attempt to present a very dramatic picture of change and thereby distort the data. If one wants to show a great vertical change, it is only necessary to enlarge the vertical scale and/or shorten the horizontal scale. If one desires to demonstrate a small amount of change in the dependent variable, he can lengthen the X scale and/or shorten the Y scale.

"Tricks" of graphing are frowned upon. The reader is referred particularly to Modley and Lowenstein,[12] "Cheating with Charts." The producer of graphs should use a lot of good common sense in the scaling. Each graph should be planned individually according to the special characteristics of the data and the particular use to which the graph is to be put. It should always be kept in mind that the person looking at the graph may be swayed by a first impression and may not take the time for an educated analysis.

Schmid[13] points out that the "arithmetic line chart" (rectilinear coordinate) "is particularly effective in portraying time series such as movements or trends over a period of years or variations covering shorter periods—days, weeks, or months."

Index Graph: An index graph is not a true type of graph. The index can be presented on rectilinear coordinate axes or by means of a bar graph. Whereas an arithmetic graph represents an absolute

[12] Modley and Lowenstein, *op. cit.*, pp. 68-79.
[13] Schmid, *op. cit.*, p. 45.

amount, an index compares relative growth or decline with reference to the same starting point or base period. The base is 100; the amount for each subsequent (or preceding) period is divided by the amount for the base period and multiplied by 100. The two time series of enrollments for the university campuses of Table VIII would be represented by two lines quite a distance apart on an arithmetic scale but would begin from the same base, 1954-55 on an index scale.

TABLE VIII
ENROLLMENT, CAMPUS A AND CAMPUS B OF UNIVERSITY X, FALL SEMESTERS 1954–1959

Year	Campus A		Campus B	
	Enroll.	Index*	Enroll.	Index*
1959–60	18,150	131.7	5,355	166.3
1958–59	16,960	123.1	4,890	151.9
1957–58	15,710	114.0	4,185	129.9
1956–57	15,185	110.2	3,885	120.7
1955–56	14,500	105.2	3,460	107.5
1954–55	13,780	100.0	3,220	100.0

* Index 1954–55 = 100.

Care should be taken in the interpretation of index data. It is true that the fall 1959 enrollment of Campus B is 66.3 per cent higher than the fall 1954 enrollment (166.3 − 100.0). It is not correct that the enrollment of Campus B in 1959, for example, is 14.4 per cent higher than that of 1958 (166.3 − 151.9); the actual increase of 1959 over 1958 is 9.5 per cent. The comparison is only in terms of the base or index year.

Semilogarithmic or Ratio Graph: The semilogarithmic graph is a graph in which the horizontal axis is divided into equal or arithmetic rulings while the vertical axis is divided into logarithmic rulings. It is superior for most purposes to either an arithmetic or index presentation. An arithmetic line graph represents only change in absolute amounts; an index graph compares only relative growth or decline with reference to a base period; a semilogarithmic graph represents both absolute amount and relative change at the same time.

One need only understand a few basic principles of common logarithms, that is logarithms to the base 10, to be able to construct a semilogarithmic graph. In the equation $10^x = N$ (written in exponential form), the exponent x is the logarithm of N. In logarithmic form, $\log N = x$. Therefore the logarithm of $1 = 0$; of $10 = 1$; of

$100 = 2$; of $1000 = 3$; etc. ($10^0 = 1$; $10^1 = 10$; $10^2 = 100$; $10^3 = 1000$; etc.). A logarithm consists of two parts: (1) the *characteristic,* or integral part, and (2) the *mantissa,* or fractional part, of the logarithm. Since concern here is only with positive values of logarithms, only the case of N being greater than 1 will be considered; in this case the characteristic of log N is one less than the number of digits in the integral part of N. For example, the characteristic of 5.24 is 0; of 52.4 is 1; of 524 is 2; etc.

The mantissa of the logarithm of a number is independent of the decimal point in the number and depends only upon the significant digits in the number. Therefore, if the characteristic and mantissa are combined, it is found from a table of logarithms that log 5.24 = 0.71933; log 52.4 = 1.71933; log 524 = 2.71933; etc.

In the construction of a semilogarithmic grid, only the logarithmic values from 1 to 10 are required. It is noted that a rectilinear coordinate grid begins with zero; a logarithmic grid begins with multiples of 10, i.e., 0.1, 1, 10, 100, 1000, etc., since the logarithm of 0 is minus infinity.

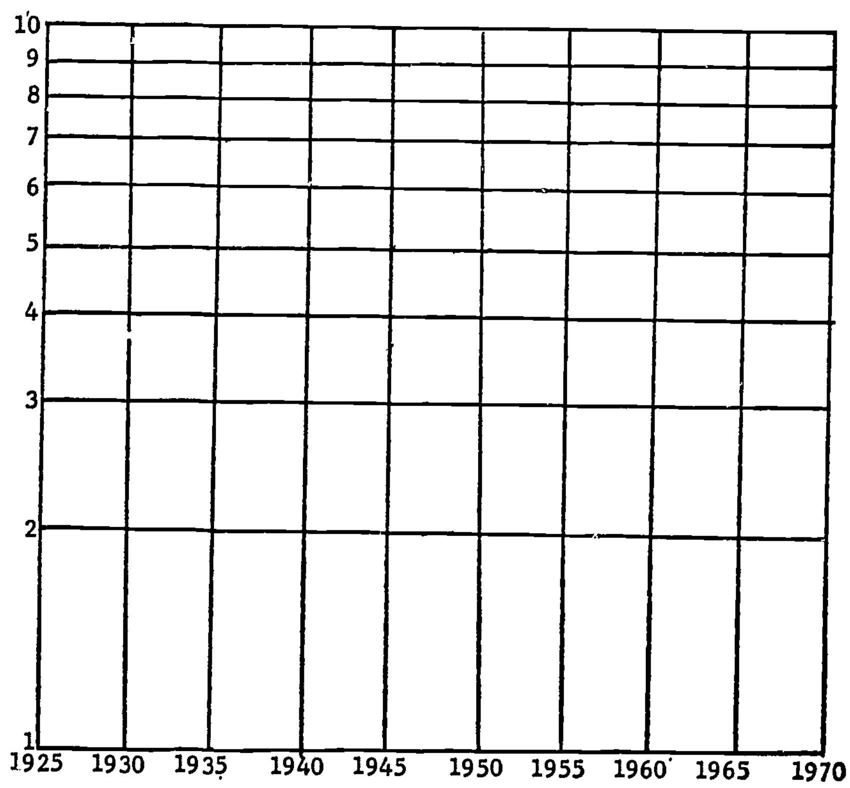
Each successive logarithmic grid (cycle or tier) is identical to the previous one except that the corresponding division in each successive grid is 10 times that of the respective division in the previous grid. One final concept is necessary: the common logarithm (logarithm to the base 10) of a number is the antilogarithm of the number's exponent (log 1 = 0, antilog 0 = 1; log 10 = 1, antilog 1 = 10; etc.). The logarithmic value thus can be plotted on a linear scale as follows, with the width between each division being determined by the value of the logarithm and the designation being that of the antilogarithm.

Logarithm	*Antilogarithm*
2.00000	100
1.95424	90
1.90309	80
1.84510	70
1.77815	60
1.69897	50
1.60206	40
1.47712	30
1.30103	20
1.00000	10
.95424	9
.90309	8
.84510	7

Logarithm	*Antilogarithm*
.77815	6
.69897	5
.60206	4
.47712	3
.30103	2
.00000	1

The range of the antilogarithm for one cycle is 1 to 10; for the second cycle is 10 to 100; for the third cycle is 100 to 1000; etc. In graphing, one can have the base line as the beginning of any cycle. The respective distances between each division of a cycle are shown in the semilogarithmic grid of Graph I.

GRAPH I
SEMILOGARITHMIC GRID OF ONE CYCLE



Note that the horizontal scale is divided into equal divisions of time. The vertical scale is divided according to the logarithmic value of the antilogarithm. This is a method of setting up one's own semilogarithmic grid. Semilogarithmic paper can be purchased commercially, but it has the disadvantage of all grid lines being printed. It is useful in setting up the graph, but the complete printed grid detracts from the line formed from the values of the two variables. It also is somewhat inflexible; however, semilogarithmic paper in various cycle sizes can be purchased.

Comparison of Arithmetic, Index, and Semilogarithmic Graphs: To add meaning to the differences in arithmetic, index, and semilogarithmic presentations, the data of Table IX is plotted in Graph II. Projected enrollments for two campuses of the same institution are shown on an arithmetic, on an index, and on a logarithmic scale. The two former are parts of rectilinear coordinate graphs and the latter is a part of a semilogarithmic graph with the X-axis in all cases being divided arithmetically according to the variable of time.

TABLE IX

PROJECTED ENROLLMENTS OF CAMPUS I AND CAMPUS II OF STATE UNIVERSITY X, 1959–1968

Fall Term	Campus I		Campus II	
	Enroll.	Index*	Enroll.	Index*
1968–69	11,300	211.2	29,400	162.0
1967–68	11,000	205.6	28,500	157.0
1966–67	10,300	192.5	26,900	148.2
1965–66	9,600	179.4	25,500	140.5
1964–55	8,900	166.3	23,900	131.7
1963–64	8,125	151.9	22,350	123.1
1962–63	6,950	129.9	20,700	114.0
1961–62	6,450	120.6	20,000	110.2
1960–61	5,750	107.5	19,100	105.2
1959–60	5,350	100.0	18,150	100.0

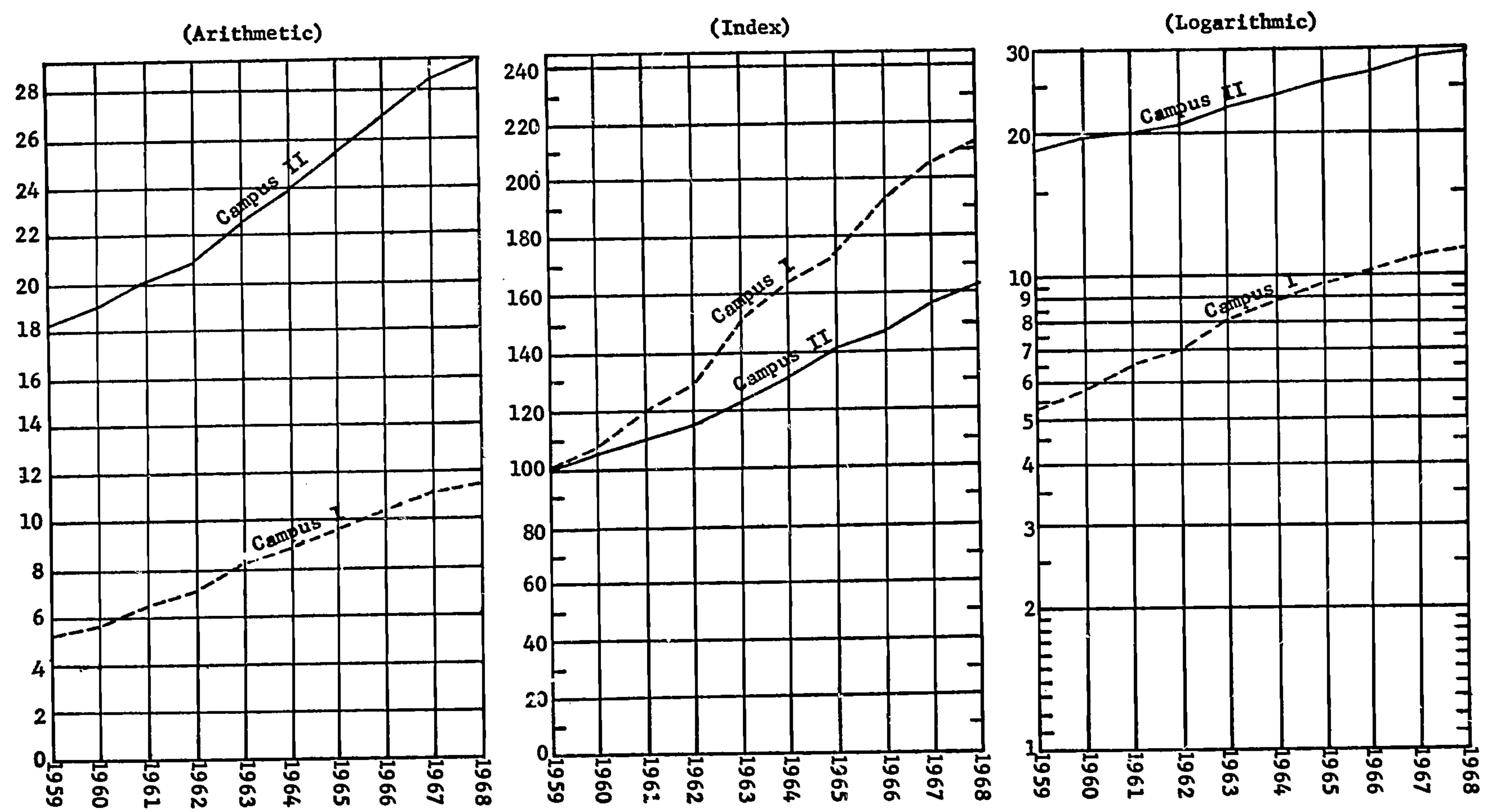
* Index 1959–60 = 100.

The arithmetic scale (rectilinear coordinate graph) indicates that the numerical change for Campus II can be expected to be greater than for Campus I. It cannot be determined easily whether the rate of change is greater or less. In other words, if instructional cost is directly related to enrollment, this graph would not indicate the relative increases in instructional cost needs.

The index scale (rectilinear coordinate graph) shows that Campus II can be expected to grow relatively more rapidly than Campus I on the basis of the enrollment of 1959-60. It does not show the amount of expected growth. In fact, unless a person observes carefully, he may interpret this graph to mean that both campuses had equal enrollments in 1959-60 but that the expected amount of increase for Campus I is greater than for Campus II.

GRAPH II

Comparison of Projected Enrollments of Two Campuses of the Same Institution When Plotted on Arithmetic, Index, and Logarithmic Scales



The logarithmic scale (semilogarithmic graph) shows both relative change and amount of change. On this graph, one notes that both campuses can expect growth, that Campus I is expected to grow relatively faster than Campus II, but that a greater numerical growth can be expected on Campus II than on Campus I.

It is assumed by some that, since a semilogarithmic graph shows both rate of change and amount of change, it is the best graph to use and should be used for all purposes. This is not true for if it is desirable to show only the amount of change, an arithmetic graph presents a truer picture of the change—a picture which also is easier to interpret. One notes immediately that on a semilogarithmic graph a small vertical change at the top of the graph represents a much larger amount than a small vertical change at the bottom of the graph. The grid of Graph I demonstrates these relative amounts for equal vertical distances. The vertical distance from 1 to 2 is equal to the vertical distance from 2 to 4 and is equal to the vertical distance from 4 to 8, yet the actual amount in each of these vertical divisions is double the amount of the previous division.

In case both the amount and the rate of change are important, it is recommended that an arithmetic graph and a semilogarithmic graph be constructed for the data and presented side by side for the reader. In interpreting semilogarithmic and arithmetic graphs, it is pointed out that:

1. If a variable is increased by a constant amount over time, it is increasing at a decreasing rate. This would appear as a line convex upward on a semilogarithmic graph but as a straight line with an upward slope on a rectilinear coordinate graph (See Graph III, line A).

2. If a variable is increased at a constant rate over time, it is increasing by an increasing amount. This would appear as a straight line with an upward slope on a semilogarithmic graph but as a line concave upward on a rectilinear coordinate graph (See Graph III, line B).

3. If a variable is decreased by a constant amount over time, it is decreasing at an increasing rate. This would appear as a line convex downward on a semilogarithmic graph but as a straight line with a downward slope on a rectilinear coordinate graph (See Graph III, line C).

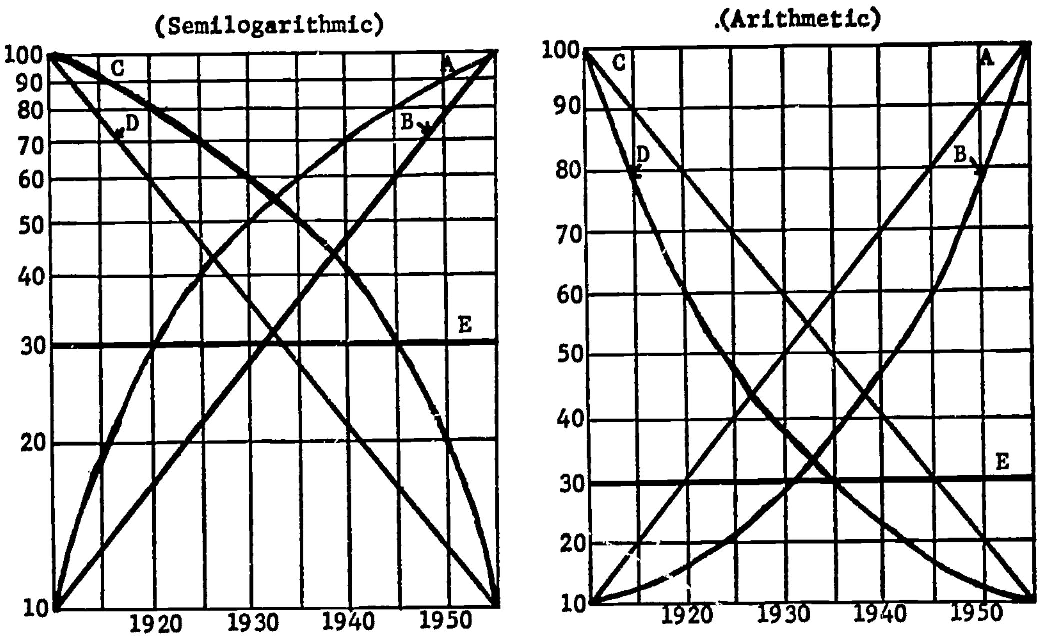
4. If a variable is decreased at a constant rate over time, it is decreasing by a decreasing amount. This would appear as a straight

line with a downward slope on a semilogarithmic graph but as a line concave downward on a rectilinear coordinate graph (See Graph III, line D).

5. If a variable is neither increasing nor decreasing in amount or in rate of change over time, it would appear as a straight horizontal line on both the semilogarithmic and rectilinear graphs (See Graph III, line E).

GRAPH III

COMPARISON OF SEMILOGARITHMIC AND ARITHMETIC GRAPHS



6. If a variable is increased at an increasing rate over time, it is increasing by an increasing amount. The line on both the semilogarithmic graph and the rectilinear coordinate graph would be concave upward; however, the line would be more concave on the rectilinear coordinate graph than on the semilogarithmic graph.

7. If a variable is decreased at a decreasing rate over time, it is decreasing by a decreasing amount. The line on both the semilogarithmic graph and the rectilinear coordinate graph would be concave downward.

Bibliography

BOOKS

Campbell, William Giles. *Form and Style in Thesis Writing* (New York: Houghton Mifflin Co., 1954), pp. vi + 114.

Carlson, Carol R.; et al.; *An Educational Statistics Primer* (Madison, Wis.: Dembar Publications Inc., 1956), pp. v + 89.

Committee on Standards for Graphic Presentation. *Time Series Charts: A Manual of Design and Construction* (New York: The American Society of Mechanical Engineers, 1938), pp. 68.

Jenkinson, Bruce L. *Bureau of the Census Manual of Tabular Presentation* (Washngton, D.C.: U. S. Government Printing Office, 1950), pp. xiv + 266.

Modley, Rudolf; Lowenstein, Dyno. *Pictographs and Graphs* (New York: Harper & Bros., 1952), pp. 186.

Schmid, Calvin F. *Handbook of Graphic Presentation* (New York: The Ronald Press Co., 1954), pp. viii + 316.

Weld, Walter E. *How to Chart Facts from Figures with Graphs* (Norwood, Mass.: Codex Book Co., Inc., 1950), pp. xiv + 218.

Wittich, Walter Arno; Schuller, Charles Francis. *Audio-Visual Materials* (New York: Harper & Bros., 1957), pp. xxvii + 570.

PERIODICALS AND REPORTS

(Note: Many of the institutional and state reports are not available for distribution since the supply was limited.)

A Call for Action (Washington, D.C.: American Council on Education, 1954), pp. i + 29.

A Supplement to Home State and Migration of American College Students, Fall 1958 (The American Association of Collegiate Registrars and Admissions Officers, December 1959), pp. 41.

A 15-Year Forecast of Students, Staff, and Facilities for the University of Delaware (Newark: The University of Delaware, February 1958), pp. xii + 113.

A Forecast of Enrollments in the State Institutions of Higher Education in New Mexico up to 1970 (P.O. Box 1616, Santa Fe: Board of Educational Finance, State of New Mexico, File No. 92-0, December 1954), pp. 13.

An Analysis of Future Enrollment in Utah's Colleges 1956-1967 (Salt Lake City: University of Utah, Bureau of Economic and Business Research, February 1956), pp. 40.

An Open Door for New Hampshire Youth? A Survey of Enrollment Pros-

pects at the University of New Hampshire, 1956-73 (Durham: University of New Hampshire, February 1957), pp. 12.

Boling, Edward J.; Gardiner, Donald A. *Forecasting University Enrollment* (Knoxville, Tennessee: University of Tennessee, The Division of University Extension, Vol. XXVII, No. 8, February 1952), pp. 99.

Bowles, Frank H. "Some basic Considerations in Predicting College Enrollment," *Educational Record,* XXVI, July 1955, pp. 211-213.

Brewster, Sam F.; et al. *Study of the Physical Plant Requirements of the Alabama Polytechnic Institute from 1955 to 1970* (Auburn: Building Program Committee, Alabama Polytechnic Institute, 1955), pp. iii + 71.

Burns, N. "Coming Crisis in Higher Education," *The School Review,* Vol. LXIII, May 1955, pp. 251-258.

Committee on Higher Education. "Enrollments, Programs, and Degrees" (Montgomery: Alabama Education Commission, 1958), pp. 41-51, typed.

Current Population Reports, Population Estimates, Series P-25, No. 132 (Washington, D.C.: U. S. Bureau of the Census, February 20, 1956), pp. 8.

Curtis, H. A.; et al. *Restudy of College Population 1960-1975* (Tallahassee: The Board of Control, The State University System of Florida, March 1958), Part I, pp. 26; Part II, pp. xiii + 35.

Freedman, Ronald; Meyer, Albert; Thaden, John F. *Future School and College Enrollments in Michigan: 1955 to 1970* (Ann Arbor: J. W. Edwards, Inc., 1954), pp. 65.

Frisen, Carl M. *Projected Enrollment in California's Schools 1956-1970* (Sacramento: Department of Finance, Budget Division, Financial Research Section, State of California, July 1956), pp. ii + 37.

Hallenbeck, Edwin F. *Higher Education 1959-1980 Rhode Island* (Providence: State of Rhode Island & Providence Plantations Commission to Study Higher Education, February 1959), pp. 19.

———. *Population Projections of Rhode Island Youth* (Providence: The State of Rhode Island Commission to Study Higher Education, Research Study No. 1, September 1958), pp. 18.

———. *Projections of Rhode Island School Enrollment* (Providence: The State of Rhode Island Commission to Study Higher Education, Research Study No. 2, September 1958), pp. 13.

———. *Projections of Rhode Island College Enrollment 1950-1980* (Providence: The State of Rhode Island Commission to Study Higher Education, Research Study No. 6, November 1958), pp. 19.

Higher Education in Wyoming (Laramie: University of Wyoming, n. d.), pp. iii + 45.

Iowa Colleges 1955-1970 Enrollment Trends (Iowa State Board of Education Coordinating Committee of Registrars, January 1955), pp. 21.

Joint Staff, Coordinating Committee on Higher Education. "Higher Education Enrollments in Wisconsin" (Madison: Wisconsin Center Building, 1957), pp. 10.

Klassen, Peter P. *College-Age Population Projections and Enrollment Estimates in Illinois to 1977* (Chicago: University of Illinois, March 1959), pp. ii + 55.

Kuang, H. P. "Forecasting Future Enrollment by Curve-Fitting Techniques," *The Journal of Experimental Education,* Vol. XXIII, No. 3, March 1955, pp. 271-274.

Legislative Committee Education Beyond High School. *Post High School Enrollments in Colorado Four-Year Institutions and Junior Colleges* (Denver 2, Colorado: Colorado General Assembly, August 1959—Preliminary Report), pp. 29.

Lins, L. J. *Enrollment and Enrollment Projections University of Wisconsin-Milwaukee* (Madison: University of Wisconsin, Office of Institutional Studies, August 1959), pp. iv + 48.

———. *Wisconsin College Enrollment Trends and Projection* (Madison: University of Wisconsin, Office of Institutional Studies, September 1955), pp. iv + 40.

"Looking at Our Educational Future," *Eastern Mennonite College Bulletin,* Vol. XXXVI, No. 6, June 1957, pp. 16.

Marshall, Douglas G. *Population Characteristics, Resources, and Prospects in the North Central Region* (Madison: University of Wisconsin, Agricultural Experiment Station, Research Bulletin 209, April 1959), pp. 81.

———. *Wisconsin's Population—Changes and Prospects* (Madison: University of Wisconsin, Agricultural Experiment Station, Research Bulletin 194, March 1959), pp. 49.

Martin, Robert R.; Miller, James L., Jr. *Future Kentucky College Enrollments* (Frankfort: Kentucky Council on Public Higher Education, State Office Building, 1958), pp. v + 30.

Mason, Paul L. *Indiana Student Migration for Fall 1958* (Lafayette, Indiana: Purdue University, 1959), pp. iii + 37.

Opening (Fall) Enrollment in Higher Education (Year), Analytic Report (Washington 25, D.C.: Office of Education, U. S. Department of Health, Education, and Welfare).

Opening (Fall) Enrollment in Higher Education (Year): Institutional Data (Washington 25, D.C.: Office of Education, U. S. Department of Health, Education, and Welfare).

Parkhurst, N. M.; Suddarth, Betty. *Potential Enrollment for Indiana Colleges and Universities 1955 to 1972* (The Enrollment Study Committee of the Indiana Conference of Higher Education, 1955), pp. ix + 103.

Population Bulletin (1507 M Street, N.W., Washington, D.C.: Population Reference Bureau, Inc.).

Potthoff, Edward F. *Enrollments in the Secondary Schools and Higher Institutions of Illinois, 1909-10 to 1975-76* (Urbana: University of Illinois, Bureau of Institutional Research, March 1951), pp. iv + 145.

Projections of the College Age Population for Southern States (Atlanta: Southern Regional Education Board, n. d.), pp. 54.

Schmid, Calvin F.; Miller, Vincent A. *Enrollment Forecasts State of Washington: 1957-1965* (Seattle: Washington State Census Board, 1957), pp. vii + 78.

Statistical Abstracts of the United States (Washington, D.C.: U. S. Bureau of the Census, U. S. Government Printing Office).

Statistical Bulletin, Metropolitan Life Insurance Company (1 Madison Ave., New York 10, N.Y.: Metropolitan Life Insurance Co.).

Stecklein, John E. "Enrollment Prediction for the College" (New York: College Entrance Examination Board, *Planning College Policy for the Critical Decade Ahead,* 1958), pp. 36-50.

Story, Robert C. *Residence and Migration of College Students, 1949-50* (Washington 25, D.C.: Federal Security Agency, Office of Education, 1951), pp. vi + 61.

Suddarth, Betty M.; Parkhurst, Nelson M. *Potential Enrollment for Purdue University, 1955 to 1972* (Lafayette, Indiana: Purdue University, 1956), pp. iv + 42.

The Home State and Migration of American College Students Fall 1958 (The American Association of Collegiate Registrars and Admissions Officers, March 1959), pp. 60.

Thompson, Ronald B. *College Age Population Trends 1940-1970* (The American Association of Collegiate Registrars and Admissions Officers, January 1954), pp. ii + 69.

———. *The Impending Tidal Wave of Students* (The American Association of Collegiate Registrars and Admissions Officers, October 1954), pp. 48.

———. "The Problem of Rising College Enrollments" (P.O. Box 311, Yonkers, New York: *The College Blue Book,* 1957), pp. 18.

———. "To Solve the Problem of Rising College Enrollments" (P.O. Box 311, Yonkers, New York: *The College Blue Book,* 1959), pp. 919-934.

Turner, Howard. "The Prediction of College Enrollment, with Particular Reference to Southwestern Louisiana Institute," *The Southwestern Louisiana Journal,* Vol. III, No. 2, April 1959, pp. 56-66.

State Representatives

Alabama	Charles W. Edwards	Alabama Polytechnic Institute
Arizona	David L. Windsor	University of Arizona
Arkansas	Carter A. Short	University of Arkansas
California	Florence N. Brady	Occidental College
Colorado	Stella Morris	Colorado State University
Connecticut	Franklin Fingles	University of Connecticut
Delaware	Robert Gebhardtsbauer	University of Delaware
District of Columbia	J. G. Conner	Georgetown University
Florida	Charles H. Walker	Florida State University
Georgia	W. L. Carmichael	Georgia Institute of Technology
Idaho	Anna C. Nunn	Idaho State College, Pocatello
Illinois	Harold E. Temmer	University of Illinois, Chicago
Indiana	N. M. Parkhurst	Purdue University
Iowa	Arthur M. Gowan	Iowa State College
Kansas	Worth A. Fletcher	University of Wichita
Kentucky	Charles F. Elton	University of Kentucky
Louisiana	Albert L. Clary	Louisiana State University
Maine	George H. Crosby	University of Maine
Maryland	Rebecca C. Tansil	State Teachers College at Towson
Massachusetts	Rudolph M. Morris	Northeastern University
Michigan	Kermit H. Smith	Michigan State University
Minnesota	R. E. Summers	University of Minnesota
Mississippi	Robert B. Ellis	University of Mississippi
Missouri	R. P. Foster	Northwest Missouri State College
Montana	Leo Smith	Montana State University
Nebraska	Floyd W. Hoover	University of Nebraska
Nevada	Clarence E. Byrd	University of Nevada
New Hampshire	Elizabeth M. Sladen	Colby Junior College
New Jersey	Robert P. Biunno	The Newark Colleges
New Mexico	J. C. MacGregor	University of New Mexico
New York	Henry F. Rossi	St. John's University
North Carolina	Charles Bernard	University of North Carolina
North Dakota	Ruby M. McKenzie	University of North Dakota
Ohio	Kenneth R. Varner	The Ohio State University
Oklahoma	J. E. Fellows	University of Oklahoma
Oregon	Clifford L. Constance	University of Oregon

Pennsylvania	Ernest Whitworth	University of Pennsylvania
Rhode Island	Edwin F. Hallenbeck	University of Rhode Island
South Carolina	K. N. Vickery	Clemson Agricultural College
South Dakota	H. W. Frankenfeld	University of South Dakota
Tennessee	R. F. Thomason	University of Tennessee
Texas	W. B. Shipp	University of Texas
Utah	L. H. Campbell	University of Utah
Vermont	Marion E. Holmes	Middlebury College
Virginia	E. W. Lautenschlager	University of Virginia
Washington	Ethelyn Toner	University of Washington
West Virginia	Luther E. Bledsoe	Marshall College
Wisconsin	L. J. Lins	University of Wisconsin
Wyoming	Archie V. Johnson	University of Wyoming

PUBLICATIONS OF AACRAO

COLLEGE AND UNIVERSITY, the Journal of AACRAO. The current volume is Volume 35. Address requests for back numbers to Endicott A. Batchelder, Treasurer of AACRAO, University of Pittsburgh, Pittsburgh 13, Pennsylvania. $1.00 each (50¢ to members of the Association).

NEWSLETTER. A Semiannual Report of Association Activities (Spring and Winter since 1958). Address requests for back numbers to Robert E. Mahn, Chairman, Committee on Special Publications, Office of the Registrar, Ohio University, Athens, Ohio.

Address requests for copies of the following publications to Publications Office, American Council on Education, 1785 Massachusetts Avenue, Washington 6, D.C. Submit check to order of the Council with order for cost publications.

Report of Credit Given. T. E. Kellogg, Editor. A summary report of credit acceptance policies, by states. Published annually in January. $1.00.

World Education Series. William H. Strain, Chairman; Clara H. Koenig, Editor. *Do-It-Yourself Evaluation of Foreign Student Credentials* (1957), free; *Scandinavian Study-Tour* (1959), $1.00; *Guides to the Academic Placement of Students from Foreign Countries in United States Educational Institutions* (each $1.00): Germany (1957); Canada (1957); Korea (1958); Thailand (1959).

Methodology of Enrollment Projections for Colleges and Universities, by L. J. Lins (1960). $2.00.

Retention of Records (1960). $1.50.

An Adequate Permanent Record and Transcript Guide (1959). Free.

The Office Manual (Abstract of Thesis), by Leslie W. Ross (1959). Apply. Thesis may be borrowed from Committee on Special Publications. See NEWSLETTER entry above for address.

The Home State and Migration of American College Students, Fall 1958. Nelson M. Parkhurst, Coordinator of the Study. (1959). $2.00.

A Supplement to Home State and Migration of American College Students, Fall 1958. (1959). $1.00.

Office Machine Equipment (1959). $1.00.

Analysis and Design of Office Forms (1958). $1.00.

Catalogues Are For Students Too (1958). $1.00.

Manual for Studies of Space Utilization in Colleges and Universities, by John Dale Russell and James Doi (1957). $2.00.

AACRAO Policies and Procedures (A Handbook) (1953). Apply.

Publications currently out of print but available for reference in most registrar-admissions offices and many libraries.

Secondary School-College Co-operation: An Obligation to Youth (1955).

A Glossary of Terms Used by Registrars and Admissions Officers, by Robert E. Mahn (1956).

Professional Training Recommended for the Registrar and Admissions Officer (1954).

The Impending Tidal Wave of Students, by Ronald B. Thompson (1954).

College Age Population Trends, 1940-70, by Ronald B. Thompson (1953).

Topical Index of COLLEGE AND UNIVERSITY through Volume 25, by Robert E. Mahn (1951). Volumes 26ff are indexed in the Summer issue of each year.)