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California's Demand for Librarians: Projecting Future Requirements

MICHAEL D. COOPER

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Preface

The nation's libraries collectively serve the purpose of providing public access to the body of information preserved in recorded form. They supply the means of discovering what information exists, and of making it directly available. Providing access is a relatively small but essential part of the total task of information management, and libraries have a large, though by no means exclusive, part in that job.

Planning for the achievement and maintenance of adequate public access to recorded information requires data about the present supply of, and future need for, personnel to operate the library system. But until recently, we have not had reliable answers to these apparently simple questions: How many people are now operating the system, and how many more will be needed to keep it operating? Will there be enough people to operate it, if things go on as at present?

Only a few years ago, the American Library Association announced the existence of a critical shortage of trained librarians. Assuming the social necessity of a public access system, the centrality of the library system and the need for specially trained people to operate it, this looked like a serious social problem requiring speedy action. The association's announcement was all too soon contradicted by numerous reports of a glut of librarians on the market, leading to the recognition of a new problem calling for social action. The first problem was imaginary; one wishes the second were also.

As the result of research, we are now able to give reasonably reliable answers to the above questions. The Bureau of Labor Statistics of the U.S. Department of Labor has issued a report giving the results of a study of library manpower supply and demand nationwide. Aggregate national figures, however, need to be supplemented by local estimates. How will things be in particular parts of the country? How in New York, how in Arizona, how in California? In many ways California is unique, and not unnaturally of particular interest to us in the state. We want to know, if we are concerned with the question of who is to run the library system of the state, whether what is true in general for the country is also true for this part of it.

Michael Cooper's study thus complements the federal study by telling us about the present situation in California, and the future situation, if things go on as they have gone. It is important to stress this point, which can be taken to distinguish forecasting from prophecy. It would be comforting to know exactly what is going to happen; but we are not in that position. Essentially what a study like this tells us is: if good past predictors continue to be good, then the needs for personnel, and the supply, will be thus and so.

But what were good predictors up to now may cease to be good, for a host of reasons. For instance: already there is evidence of a structural shift in employment patterns in the library world, towards decreasing the proportion of professional staff and increasing the proportion of non-professional staff. This is especially evident in the "technical services" area of work, i.e. acquisitions, cataloging and classification. While this shift is now visible, its continuance is not certain; technological innovation might further reduce staff needs, but precisely in the area of the most routinized tasks, now being increasingly performed by non-professionals. Further, the shift is not inevitably one towards overall reduction of professional personnel, for there are signs of increasing development of direct service to library patrons, as in community outreach programs. An apparently increasing professionalization of school library services is offset by long-term demographic changes, that could conceivably be counteracted by changing the student-librarian ratio. The possible need for new categories of personnel, especially the audio-visual or instructional media specialist, might be met by new definitions of librarians' responsibilities, or might draw on entirely new sources, thus enlarging or diminishing the need for librarians.

Changes in society at large could profoundly modify the demand for library services, and therefore for librarians, but in strikingly different ways. Recollections of the Great Depression suggest that in times of economic contraction, specialized private library services contract but the demand for municipal free services expands. Library use, and the demand for library services, increases (up to a point) with increased education; so an increasingly educated public would mean an enlarging audience for library services. But one cannot now be confident that the proportion of the population seeking advanced education will continue to rise. Increasing numbers of older people, out of the work force, may well call for new orientations in library service; the young are becoming a smaller proportion of the population, and the elderly a larger proportion. But while the young have been heavy users of libraries, we cannot be sure that their elders will make comparable demands on the library system.

There are some weak signs that librarians themselves are discovering new roles that are relatively detached from libraries as institutions. As information agents or bibliographers working independently of any particular library, librarians may develop a new form of personalized information service. Of course such a new form of service might simply compensate, or might not even compensate, for a decline in demand in other sectors.

That there is likely to be an adequate, or an inadequate, supply of people to do a certain job is one matter; that the job needs doing, or will be adequately done by the people available, is another. Study of supply and demand is only one aspect of the study of the present and future adequacy of the public access system. I am glad to see Cooper's study published by the Institute of Governmental Studies, and hope that this will not be the last of its contributions to the task of aiding policy analysis in the area of information management.

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I

Introduction

Background

What are the future employment prospects for professional librarians? Although their numbers equalled only about 0.16 percent of all workers in all industries in the United States in 1970, the potential abundance or lack of jobs for professional librarians affects the plans of a variety of institutions and individuals. These include persons considering librarianship as a profession, educators who determine the scope and size of librarians' training programs, employment counselors who advise students about career prospects, employers whose library plans involve the availability of new employees, and governmental agencies that support appropriate projects and programs.

Although librarians may now be experiencing a shortage of jobs, many have argued that there is a great "need" for professional librarians, with the implication that if such needs were met, the shortage would disappear. This paper adopts Blaug's distinction between "demand" and "need."[1] Demand is defined as a willingness and ability to pay for such services; need is based on the stated objectives of an organization or community. This paper therefore focuses on *demand* for librarians, in developing projections for library employment.

Juggling Supply and Demand

Relatively complex phenomena, such as the "cobweb cycle," prevent a clear evaluation of supply and demand at any given time in many professions. A cobweb cycle is created when excess demand raises the relative earnings of those with a specialized skill. Assuming that students are made aware of and respond to the rise in prospective earnings, the increase in the supply of skilled persons takes five to ten years to materialize. Because of this lag in the adjustment of supply to demand, there is every chance that market forces will overshoot equilibrium, so that what has been a shortage turns into a glut. Subsequently, as earnings fall, the reverse effect takes place. This dynamic adjustment

process may never produce market clearance in any one period; rather it is characterized by continuous fluctuations in earnings associated with successive phases of labor shortages in one field and labor surpluses in another.[2]

Although phenomena such as cobweb cycles appear to defy control, it is important to try to provide the most accurate information possible about the future structure of the job market. This study attempts to do so for librarians, by analyzing the expected demand for professional librarians in California to 1985. California provides the focus of the study and the major data. The three models: projecting the demand for (1) public, (2) school, and (3) college and university professional librarians, are intended to be generally applicable to any of the states or to the nation as a whole.

Defining "Librarian" and Assessing Numbers

The definitions of a "librarian" are as diverse as the institutions in which librarians work. One useful and concise example is: a staff member "doing work that requires training and skills in the theoretical or scientific aspect of library work, as distinct from its mechanical and clerical aspects."[3] While this definition stresses the distinction between theoretical and clerical activities, others relate to the tasks performed by librarians, e.g., selection, cataloging, and reference.[4] Still other categories of occupational definitions have been prepared by the American Library Association[5] and the State of California.[6] In addition to duties performed, these indicate training, education and experience.

The U.S. Bureau of Labor Statistics (BLS) classifies librarians as professional and technical workers. Within that category are seven major subcategories. Librarians are classified as part of "Other Professional, Technical, and Kindred" workers, along with, e.g., accountants, airplane pilots, clergymen, lawyers, and social workers. As Table 1 indicates, in 1970 professional and technical workers accounted for 14.2 percent of the total number of individuals employed. According to a BLS projection,[7] this figure is expected to rise to 16.3 percent in 1980, making the annual rate of change between 1970 and 1980 for professionals the highest of any occupational group.

Table 2 indicates that professional librarians represent 1.13 percent of all professional, technical and kindred workers.

A detailed analysis of the occupational groups employed in libraries, based on 1970 U.S. Census data, appears in Table 3. The table shows that 17.10 percent of all workers in libraries in California were professional librarians and 56.78 percent were library assistants.

While the present analysis focuses primarily on the demand for professional librarians, nonprofessionals are also included. In general, the distinction

TABLE 1

Employment by Occupation Group, 1960, 1970, and Projected 1980 Requirements (in Thousands)

Occupation group	Actual				Projected 1980[a] requirements	
	1960		1970			
	Number	% distribution	Number	% distribution	Number	% distribution
Professional and technical workers	7,469	11.4	11,140	14.2	15,500	16.3
Managers, officials, and proprietors	7,067	10.7	8,289	10.5	9,500	10.0
Clerical workers	9,762	14.8	13,714	17.4	17,300	18.2
Sales workers	4,224	6.4	4,854	6.2	6,000	6.3
Craftsmen and foremen	8,554	13.0	10,158	12.9	12,200	12.8
Operatives	11,950	18.2	13,909	17.7	15,400	16.2
Service workers	8,023	12.2	9,712	12.4	13,100	13.8
Nonfarm laborers	3,553	5.4	3,724	4.7	3,500	3.7
Farmers and farm laborers	5,176	7.9	3,126	4.0	2,600	2.7
Total[b]	65,778	100.0	78,626	100.0	95,100	100.0

Source: Office of the President, *Manpower Report of the President, 1973,* transmitted to the Congress March 1973 (Washington, D.C.: 1973), p. 225.

[a] These projections assume 3 percent unemployment and a service economy in 1980, as described in *The U.S. Economy in 1980* (Washington, D.C.: Department of Labor, Bureau of Labor Statistics, 1970), Bulletin 1673.

[b] Represents total employment as covered by the Current Population Survey.

TABLE 2

Employment by Occupation Group for Selected Professional, Technical and Kindred Workers: 1970

Occupation	Number	% distribution	% distribution for all occupations
Professional, technical and kindred	11,140,000	100.00	14.17
Engineers, technical	1,083,922	9.73	1.38
Natural scientists	360,936	3.24	0.46
Technicians, excluding medical and dental	1,013,740	9.10	1.29
Medical and other health workers	1,775,716	15.94	2.26
Teachers	3,072,412	27.58	3.91
Social scientists	62,384	0.56	0.08
Other professional, technical and kindred (excluding librarians)	3,645,008	32.72	4.64
Librarians	125,882	1.13	0.16

Source: Adapted from U.S. Bureau of Labor Statistics, *Tomorrow's Manpower Needs: Volume IV, The National Industry–Occupational Matrix and Other Manpower Data*, Bulletin No. 1737 (Washington, D.C.: Revised 1971, 1972), p. 27; and from California, Department of Education, Bureau of Administrative Research and District Organization, *California Public Schools: Selected Statistics 1967-68* (Sacramento: 1969), p. 225. The second column and part of the first column are derived from the third column. Numbers do not add to totals shown due to rounding.

TABLE 3

Numbers of Workers in Libraries in California, by Selected Occupational Categories: 1970

Category		Number of workers		% distribution
Professional, technical and kindred workers		2,401		18.51
librarians	(2,217)		(17.10)	
others	(184)		(1.41)	
Managers		71		0.55
Sales workers		10		0.08
Clerical workers		9,738		75.12
library ass'ts.	(7,361)		(56.78)	
typists	(1,035)		(7.98)	
other	(1,342)		(10.36)	
Craftsmen		98		0.76
Operatives		231		1.78
Service workers		352		2.72
Laborers		62		0.48
TOTAL		12,963		100.00

Source: Personal communication from California State Employment Development Department, February 1974.

used here is as follows: a nonprofessional employee is "in a position, the duties of which are of a mechanical and/or routine nature, not requiring professional library education."[8]

Library Statistics

If definitions of "librarians" are varied, collections of library statistics must be called chaotic. A 1972 U.S. Office of Education survey of 2,133 governmental and nongovernmental agencies concerned with library and information center operations,[9] confirms this diagnosis. Of the group surveyed, 1,004 agencies (47 percent) stated that they collected statistics or data of some kind. Of these, 244 agencies (24 percent) collected library statistics, and 105 shared the following complaint:

> The greatest problem or difficulty encountered by respondents in their statistics or data practices is inaccurate, inconsistent or incomplete source data. This is a reflection of a general lack of uniform collecting methods and standards, and a common failure to enforce or monitor existing collection rules and procedures within the responding agencies and organizations. The latter situation is related to another common problem: lack of adequate staff time to pursue statistics–and data-collecting activities.[10]

The results of the survey indicated another critical difficulty: lack of agreement among respondents on the categories of data that should be collected, even for the most "obvious" items, and of course, on the definitions of the categories.[11] As indicated above, only a relatively small number of those responding collected any data at all. Thus, the library statistics reported in this paper should be considered only approximations of true values.

As a result of insufficient statistics on the employment of librarians, the considerable body of literature on this topic is primarily qualitative and subjective rather than quantitative, and its findings cannot support analysis of demand trends. However, the release in 1975 of the BLS report, *Library Manpower: A Study of Demand and Supply*, has improved the situation considerably.

Report of the Bureau of Labor Statistics

Commissioned by the U.S. National Center for Educational Statistics, the BLS report summarized a two-year project investigating employment patterns of librarians throughout the U.S.; it is the most thorough analysis available. The study analyzed past trends in the employment of librarians and library assistants, and projected demand for the two groups to 1985. The demand figures were compared to the number of individuals entering the labor force to give an estimate of future employment prospects in librarianship. Data for supply and demand projections were obtained by questionnaire from a stratified sample of libraries across the nation. The final report discussed economic factors that influence the labor market for librarians, library assistants, and those employed in libraries; it presented statistics and analyzed trends, 1960-1985.[13]

For libraries in schools, colleges and universities, projected enrollments provided the basis for projections of library employment. Population trends were used as primary guidelines for projecting jobs in public libraries. Finally, projections of industry employment and calculations of the proportion of special librarians to total employment in the respective industries were used to estimate employment in special libraries.[14]

The BLS prepared two alternative demand projections for the employment of professional librarians: the "basic" projection and the "alternative low." Table 4 summarizes the projected demand by type of library and shows the expected annual rate of change in employment, given the "basic" projections. Projections for 1985 indicate that the overall employment of librarians could be as high as 162,000 or as low as 148,000. The higher rate represents an approximate 2.7 percent growth for the 15-year period (1970-1985); the lower is based on 1.7 percent growth.

Table 5 summarizes demand and supply figures for the 15-year period. The total number of openings for librarians is the sum of those positions made available by growth in demand and by replacement of presently employed librarians. (Methods used to calculate replacement demand are discussed in Chapter V.) In general, approximately 72 percent of the demand for librarians to 1985 will come from replacement of those who retire or leave the profession. The table indicates (for the "basic" projection) that 11,200 students will be awarded bachelor's and master's degrees in librarianship during 1970-85, and that of these, approximately 9,000 (80 percent) will enter the labor force as librarians. On this premise, there would be 2,200 more positions available than there would be librarians to fill them, from 1970 to 1985.

Perhaps the only major flaw in an otherwise excellent report is the assumption that 80 percent of library school graduates will enter the profession. It can be assumed that not all graduates will become working librarians, but in

TABLE 4

Projected Employment Requirements for Librarians by Type of Library 1970-1985

Type of library	Estimated 1970 employment	Projected requirements for librarians				Annual percentage rate of change in employment	Projected annual percentage rate of change in employment	
		Basic		Alternative low				
		1980	1985	1980	1985	1960-70	1960-70	1980-85
School	52,000	64,500	79,500	59,000	69,500	5.3	2.2	4.3
Public	26,500	30,000	33,000	30,000	33,000	4.1	1.3	2.0
Academic	19,500	26,500	27,000	22,500	23,000	6.5	3.1	0.3
Special	17,000	20,000	22,500	20,000	22,500	5.5	1.6	2.4
TOTALS	115,000	141,000	162,000	132,000	148,000	5.2	2.0	2.8

Source: U.S., Bureau of Labor Statistics, *Library Manpower: A Study of Demand and Supply*, Bulletin No. 1852 (Washington, D.C.: 1975), Tables 14 and 15. Note that the projected annual rates of change assume the "basic" projection figures, and that the entries in the table above represent numbers of individuals who perform professional librarian duties. The numbers do not represent full time equivalent (FTE) positions.

TABLE 5

BLS Estimates of Supply and Demand for Librarians, 1960-70 and Projected 1970-80 and 1980-85

Time period	Number of openings for librarians			Bachelor's & master's degrees awarded in library science	Estimated entry of new graduates into librarianship	Excess of demand over supply
	Total	Openings due to growth	Openings due to replacement			
1960-1970	8,900	4,600	4,300	4,500	3,600	5,300
Basic						
1970-1980	10,000	2,600	7,400	10,300	8,200	1,800
1970-1985	11,200	3,100	8,100	11,200	9,000	2,200
1980-1985	13,100	4,200	8,900	13,200	10,600	2,500
Alternative low						
1970-1980	8,900	1,700	7,200	10,300	8,200	700
1970-1985	9,900	2,200	7,700	11,200	9,000	900
1980-1985	11,400	3,200	8,200	13,200	10,600	800

Source: Adapted from *Library Manpower*, Table 20. See note to Table 4, above.

the absence of reliable statistics, additional research is needed to determine the proportion that will do so.

U.S. Office of Education Study

A second attempt to predict the demand for librarians was conducted by the U.S. Office of Education.[15] This research projected the requirements for school librarians and school media specialists. As the basis for the projections, data were gathered on student enrollment and the number of full-time equivalent (FTE) librarians employed. A ratio of pupils per librarian was calculated. Historically, the pupil-librarian ratio in the United States has ranged from 1,758 students per librarian (1958-59) to 1,297 students per librarian (1967-68). In the second set, it was assumed that the average annual 3.5 percent ratio of improvement—a decline in the number of pupils per librarian—established during 1958-59 to 1967-68, would continue. The third set of projections (not shown in Table 6) was based on the ratio recommended by the National Education Association: 250 students to one librarian. This ratio would result in demand estimates for librarians roughly five times higher than either of the two projections shown in Table 6.

The number of librarians to be employed under each of these projected pupil-librarian ratios was calculated by dividing a projected value of expected enrollment (prepared by the Office of Education) by the pupil-librarian ratio.

Assuming a constant pupil-librarian ratio of 1,297 to 1, Table 6 shows that employment is expected to reach 39,320 in 1979-80. Under this constant-ratio projection, almost all openings will be due to replacement. Assuming a 3.5 percent yearly decrease in the number of students per librarian, as well as replacement jobs, total employment in 1979-80 is expected to reach 60,280. The replacement figure of 8 percent was based on replacement rates for teachers[16] and may be subject to error. (For an analysis of the problem, see the discussion in Chapter V on replacement rates.) Table 6 also indicates projected job availability in 1979-80 as being either 3,140 job openings (under the constant pupil-librarian ratio (or 6,880 job openings (under the ratio of 3.5 percent annual growth for librarian jobs).

Baumol and Marcus Study of Library Economics

Understanding the economic relationships governing library operations is helpful in projecting employment demand. Baumol and Marcus[17] analyzed the economics of academic libraries; their investigation of four-year colleges and

TABLE 6

Projected Demand for Librarians in Elementary and Secondary Schools 1968-69 to 1979-80

Year	Employment level and projected demand assuming constant pupil-librarian ratio			Employment level and projected demand, assuming 3.5% decline in ratio of pupils to librarians			
	Total employment	Total openings	Openings due to replacement	Total employment	Total openings	Openings due to growth	Openings due to replacement
1968-69	39,120	3,080	3,080	40,530	5,150	2,070	3,080
1969-70	39,560	3,130	3,130	42,480	5,190	1,950	3,240
1970-71	39,780	3,160	3,160	44,250	5,170	1,770	3,400
1971-72	39,780	3,180	3,180	45,870	5,160	1,620	3,540
1972-73	39,700	3,180	3,180	47,420	5,220	1,550	3,670
1973-74	39,550	3,180	3,180	48,950	5,320	1,530	3,790
1974-75	39,470	3,160	3,160	50,640	5,610	1,690	3,920
1975-76	39,320	3,160	3,160	52,250	5,660	1,610	4,050
1976-77	39,240	3,150	3,150	54,030	5,960	1,780	4,180
1977-78	39,160	3,140	3,140	55,890	6,180	1,860	4,320
1978-79	39,240	3,130	3,130	58,040	6,620	2,150	4,470
1979-80	39,320	3,140	3,140	60,280	6,880	2,240	4,640

Source: U.S., Office of Education, *The Education Professions 1971-72: Part IV—A Manpower Survey of the School Library Media Field,* DHEW Publication No. (OE) 73-12001 (Washington, D.C.: 1973), p. 47.

All values in the table are projections.

universities for 1967 and 1968 is of particular significance to this paper. Their work is based on U.S. Office of Education library statistics,[18,19] and uses regression analysis to explain differences in the operating costs of the 678 libraries studied.

The conclusions of the cross-sectional analysis[20] can be summarized as follows:

1. Operating cost variations among libraries relate to variations in collection size, acquisition rate and staff size.

2. Enrollment changes have little effect on the size of the staff and acquisitions.

3. Public institutions of medium and large size seem to be less adequately staffed than comparable private institutions.

4. Acquisition costs per volume are lower for small institutions, but there is little variation in costs for institutions of other sizes.

Baumol and Marcus also analyzed variations in library staff size. They found that the size of the collection, educational expenditures per student, type of institution (public or private), and size of institution (as measured by enrollment) explained most of the differences in staff size.[21]

With regard to the effect of educational expenditures per student on library staff size, Baumol and Marcus found that as expenditures increased, library staff increased. The increase in staff size was found to be three times larger in private than in public schools, however, indicating that public schools are reluctant to allocate additional resources to libraries as funds become available.[22]

Enrollment changes had little effect on library staff size. In general, staff size in private institutions tended to change more in response to enrollment changes than in public institutions.[23] No analysis was reported on the relation of faculty size to library staff. As noted below, this seems to be an important variable in understanding changes in the size of professional staff.

Baumol and Marcus were not primarily interested in staffing analysis, nor in predicting the values of staffing variables.

Additional Library Employment Studies

Two other noteworthy studies on the supply and demand for librarians are those conducted by Schick and Bolino.

The Schick Study. In 1964, Schick projected the number of professional librarians needed for each year from 1964 to 1975; he predicted that 82,500 librarians would be employed in the U.S. in 1970 and 93,000 by 1975. This nationwide study provided tabulations by type of library degree and numbers of professional librarians employed, according to library type,[24] but offered little

information on methodology. His estimates proved somewhat conservative, judging from 1970 U.S. Census data, which indicated that about 124,000 persons gave their occupation as librarians. The Schick study, nevertheless, provided a quantitative estimate, while others were offering only subjective evaluations.

Bolino's Analysis. One of the most comprehensive studies of librarian employment was that of August C. Bolino.[25] He examined employment trends, expenditures, salaries, placement of librarians, and supply of librarians for academic, school, public and special libraries.

Using cross-sectional data, he attempted to explain variations over a one-year period in professional employment levels in academic libraries. He examined a number of variables, using multiple linear regression analysis. Institutional enrollment was found to be the variable that best explained staff size variations. Briefly, Bolino's study analyzed past and present librarian employment but did not project future demand.

Forecasting Techniques

A number of alternative methods can be used to make labor force projections. Some of these methods are briefly reviewed.[26]

Techniques for forecasting can be divided into three categories: qualitative techniques, time series analysis, and causal models. Qualitative techniques are used when it is not possible to gather adequate quantitative data on which to base a forecast. The methodology generally involves soliciting the opinions of experts, obtaining as much relevant information on the problem as possible, and then making rational decisions based on the available evidence. Included in this category are the use of Delphi methods or panel consensus; visionary expertise of individuals; and historical analogy.

Users of Delphi techniques provide a series of questions addressed to a panel of experts. The answers are summarized and then presented to the experts again. The experts are asked to answer the same questions a second time, keeping in mind the group consensus in the previous round. The process continues until there is, or is not, convergence on a particular course of action or answer. The Delphi method has been used to identify public library objectives and governmental policy toward public libraries,[27] but has not been used in projections of library employment. Chambers, Mullick, and Smith[28] suggest that in general, the accuracy of the qualitative techniques for forecasting is uneven and is highly dependent on the competence of the individuals participating.

Time series analysis bases projections on data from past time periods; data are analyzed and the rate of change of the projected variable is determined. (Models developed for the present study involved some use of time series analysis.) The methodology relies heavily on the assumpton that past patterns will continue in the future. A number of methods can be used to analyze time series

data, including some that smooth data irregularities and others that seek to isolate seasonal and cyclical variations.

Baumol and Marcus used time series analysis of library data in the work cited earlier. In addition, it appears that Schick's projections of the demand for librarians[29] were based on time series analysis as well.

Causal methods use regression and econometric models. These techniques take into account all available, relevant, historical information about a process and derive a mathematical relation between the variable that is to be predicted, and the other variables known to be related. The Bureau of Labor Statistics report discussed earlier[30] used regression analysis techniques to analyze and predict librarian demand. There are no known examples of the use of econometric models (discussed below) in the analysis of the demand for librarians, but this methodology has been applied in predicting the demand for engineers.[31]

Causal models are the most sophisticated of the three groups, and they are particularly useful in predicting a turning point in an historical trend.

II

The Demand for Public Librarians in California

Public libraries in California have grown at a constant and stable rate, in terms of total expenditures for public library service throughout the state, during the 15 years from 1960 to 1975. Some of the factors contributing to this growth deserve further investigation.

General Trends

Public library systems in California (i.e., separate administrative units consisting of a central library and a number of outlets or branches) increased in number during 1960 to 1967, but have fluctuated since then.[1] (See also Fig. 1 b.) This reflects in part the general consolidation of local government administrative units since 1967. Figure 1 b, however, also shows that the total number of library outlets[2] declined to 3,009 in 1966—due to financial constraints of municipal governments—but is slowly regaining its previous level. The recent recovery is due largely to federal aid for local governments and public libraries.

Standard measures of library performance and status reveal a relatively stable pattern. For example, except for a decline in 1968-69 to 1969-70, the number of volumes held by California public libraries has increased steadily since 1960 (Fig. 1 c), total expenditure for library materials (Fig. 1 e) has risen steadily and total circulation of non-book materials (Fig. 1 f) increased each year.

The statistics indicate a change in the relation between patterns of book circulation (Fig. 1 d) and non-book circulation (Fig. 1 f); the former has declined in the last few years while the latter has increased. These trends suggest that

Figure 1

Trends in Public Library Statistics

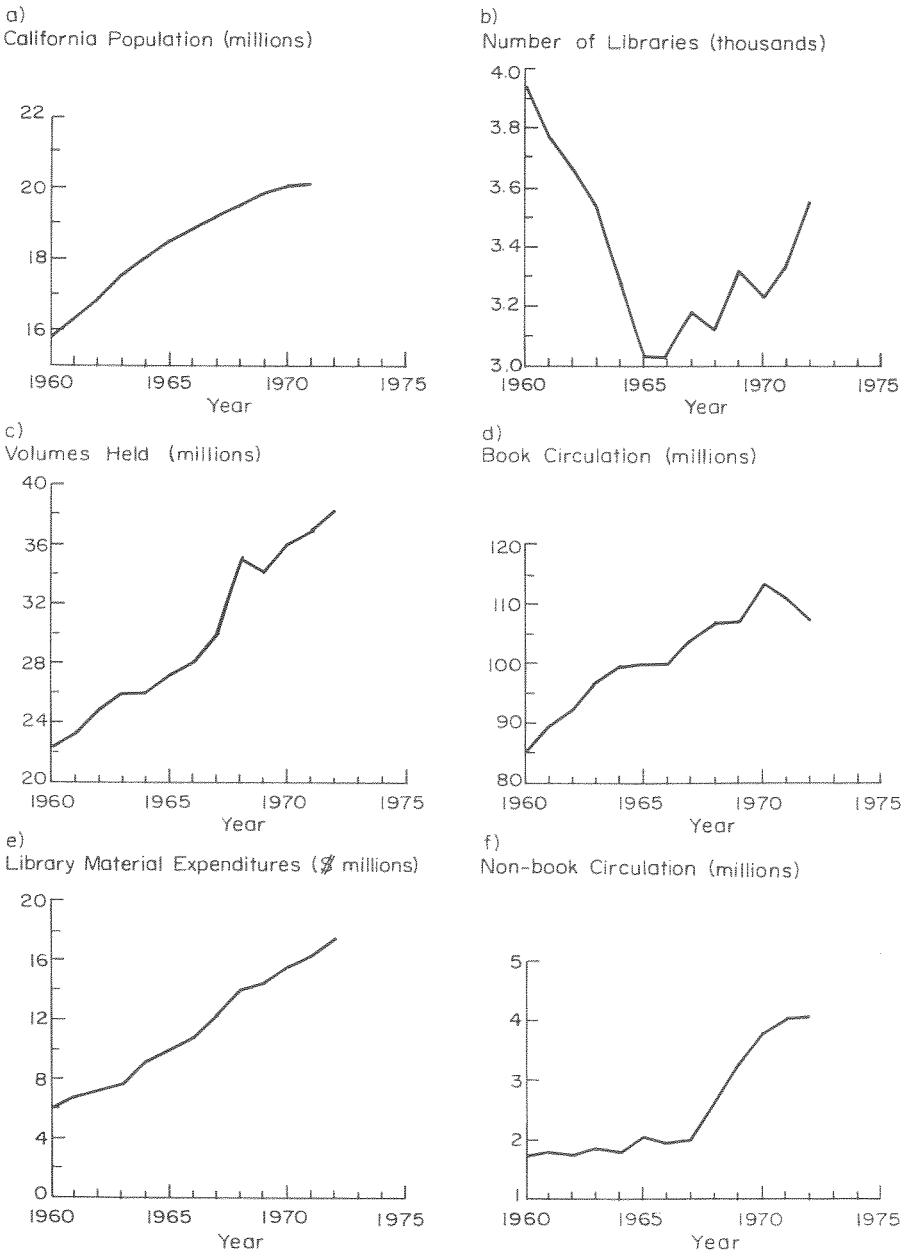
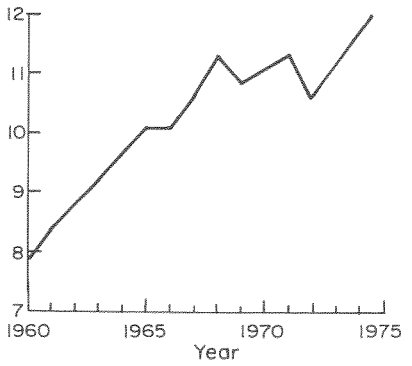
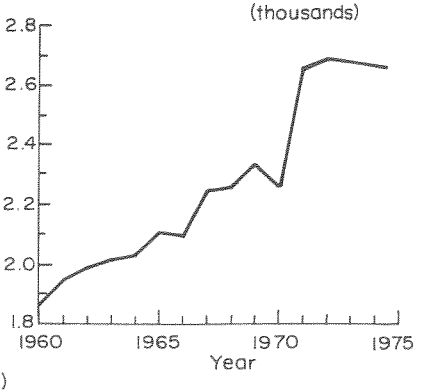


Figure 1 cont'd

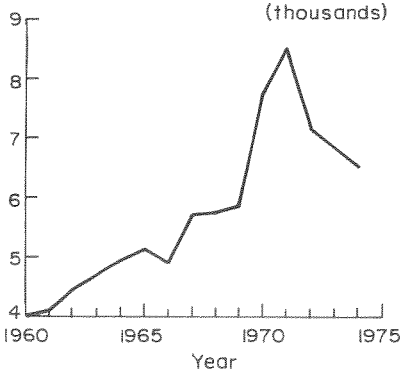
g)
Total Number Employees (thousands)



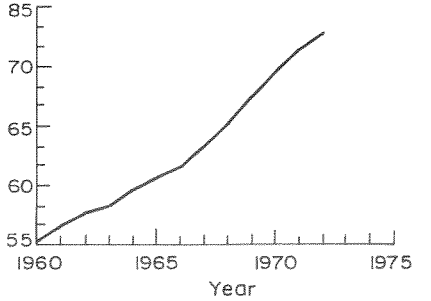
h)
FTE Number Professional Librarians (thousands)



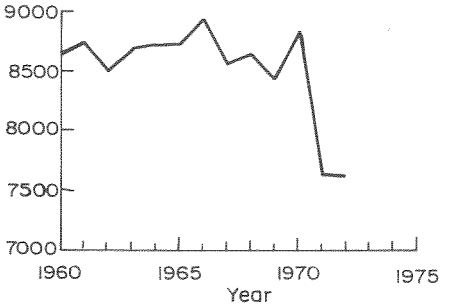
i)
FTE Number Non-professional Librarians (thousands)



j)
Salary and Wage Expenditures ($ millions)



k)
Librarian / Population Ratio



public library patrons are taking greater advantage of the library media collections than of the book stock, although book circulation remains far larger in actual numbers.

Employment Trends and Salary Allocations

The proportion of professional librarians to total staff members in California public libraries is small, and the latter group is increasing at a faster rate than the former, as seen in Figs. 1 h and 1 i. (Note, however that the two graphs are plotted on different scales so that the slopes of the curves do not pictorially indicate relative growth rate.)

Since 1970, the number of library assistants increased for one year, then declined over the next three. The number of professional librarians climbed from 1970 to 1971, but remained relatively constant thereafter. The rate of growth of salary and wage expenditures (Fig. 1 j) has been relatively constant at a rate of about $4.46 million a year from roughly 1960 to 1974. It appears that the total funds available for library salaries is growing steadily.[3]

One explanation for this growth is that local government expenditures have risen steadily. Library expenditures have remained almost constant at about 1 percent of such expenditures for the last 20 years or more.[4] Salary allocations for libraries continue at about the same percent of total expenditure each year, but increased salary and wage rates as well as increased costs of library materials result in lowered purchasing power for the library dollar.

Financial Outlook

Financial support for public libraries in California comes mainly from local government sources in the form of property tax revenues which supply more than 97 percent of public library income (1972-73 average). Some additional funds are supplied through bonds (mainly for construction of facilities) and through general revenues of the local government unit.

State and federal financial support for public libraries is small. California contributes mainly through the Public Library Services Act, which in 1972-73 supplied $800,000 to public libraries throughout the state. Federal funds for public libraries are provided through the Library Services and Construction Act (LSCA);[5] about $2 million were supplied to California libraries in 1972-73 under the terms of this act. Federal funds are also channeled into public library systems through the State and Local Federal Assistance Act of 1972 (General Revenue Sharing).

At present, the only stable, ongoing source of income available to public libraries appears to be property tax revenues. The state Public Library Services

Act funds are limited and distributed annually to an increasing number of libraries. In the past few years, a large part of the federal LSCA funds have been authorized but not allocated.

Property tax revenue also has its uncertainties. Recent court decisions requiring more equitable property tax rates between certain governmental jurisdictions in California may result in changes in the availability of funds.[6] Libraries can expect that increasing property tax levies to provide more income for their operations will meet with stiff taxpayer resistance.

Changes in the future amount or availability of such funds will significantly affect library staffing patterns. Aside from the fact that the number of professionals will vary, the proportion of librarians to library assistants will diminish in response to economic factors.[7] The proportion will also be affected by changes in the internal structure of libraries, e.g., the use of automation, particularly in the technical services functions.

Assumptions and Projection Methods

Demand projections for public librarians involve analyses of the past and expected future trends with respect to the variables displayed in Fig. 1 and App. Table 1. Except for California population, these variables relate to the internal operation of the library: e.g., circulation, volumes added, materials expenditures, are all measures of performance of the public libraries in California. In order to project the demand for professional public librarians, it is necessary to consider how the public libraries justify their need for additional staffing and what external economic variables are used to quantify their demands.

In the planning process, librarians have historically relied upon "library standards" for libraries of various sizes, such as those formulated by the American Library Association and similar groups. For example, standards would indicate that a library serving a certain population area should have a specified number of books and staff of a certain size, and provide certain services and physical facilities. Standards also apply to material selection and library organizational structure.[8]

Justification for additional staff would involve additional work loads as reflected in reference service provided, circulation handled, special programs developed, and existing programs expanded. In addition, a number of variables external to the public library influence variations in the size of the staff of professional librarians. One of the most important of these variables is the trend in California's population (Fig. 1 a). In general, the state's population has risen fairly rapidly until 1970, and then leveled off. Other variables include total local property tax revenue, total state and local government expenditures, and the personal income level of the state's inhabitants. As suggested earlier, property

tax revenue as a variable appears to be highly related to hiring, because much of the financial support for public libraries comes from this source. In addition, personal income of individuals could explain variations in support because of the strong positive relationship many researchers have found between income level and use of the public library.[9]

See Appendix 1 for the statistical analysis of the relationship between these variables and employment of professional librarians. Appendix 1 also shows that the ability of the statistical relationship to explain variations in the numbers of librarians employed can be increased slightly by using combinations of the variables.

The question then remains: Which of the external variables that in the past has explained most of the changes in professional employment should be used to project future employment levels? The evidence supports the theory that California population has been the most useful one. It most closely characterizes in a quantitative way the decisionmaking processes of library administrators in requesting staffing changes. As the population increases, libraries experience increasing demands for services which they attempt to meet with additional staff.

Projections of the Demand for Public Librarians

For this study, projections of the future employment level of professional public librarians used California population as the dependent variable in a linear regression equation. Details on the form of the equation appear in Appendix 1.

To make projections it was necessary to obtain estimates of California population from the base year, 1975, to the end of the projection period, 1985. Such projections are regularly prepared by the California State Department of Finance's Population Research Unit.[10]

Population projections require a number of assumptions, the most important being the fertility rate of women. The Population Research Unit currently makes population projections using three fertility rates. Series C estimates assume 2.8 births per woman during her childbearing years, series D assumes 2.5 births, and series E assumes 2.1 births.[11]

The number of individuals entering or leaving California must also be taken into account in estimating population for the state. The Population Research Unit calculates that the net migration to California was about 100,000 people in 1972. They suggest that this is a reasonable average and that other possible values are a lower limit of no migration and an upper limit of 150,000.[12] (See Table 7.)

For each of the population projections given in Table 7, a projected employment level for public libraries was calculated, as shown in Table 8 (using

TABLE 7

Projections of California Population 1975-1985

Year	Series E-O)	Series D-100	Series D-150	Series C-150
1975	21,075,000	21,205,800	21,205,800	21,242,000
1976	21,255,000	21,470,000	21,470,800	21,531,300
1977	21,431,900	21,749,700	21,759,700	21,848,400
1978	21,604,300	22,040,900	22,070,900	22,191,300
1979	21,771,100	22,343,800	22,404,200	22,560,100
1980	21,932,900	22,658,700	22,759,800	22,955,100
1981	22,090,000	22,987,400	23,139,800	23,377,700
1982	22,252,900	23,323,600	23,528,100	23,811,300
1983	22,419,200	23,665,600	23,922,800	24,253,300
1984	22,586,900	24,012,100	24,322,500	24,702,600
1985	22,757,100	24,362,800	24,726,800	25,158,800
Annual growth rates	0.73%	1.4%	1.5%	1.7%

Source: California State Department of Finance Population Research Unit. Series E-O assumes 2.1 births per woman and no immigration; Series D-100 assumes 2.5 births and 100,000 immigration; Series D-150 assumes 2.5 births and 150,000 immigration; and Series C-150 assumes 2.8 births and 150,000 immigration.

TABLE 8

Projected Number of Public Librarians in California, 1975-1985

Year	Projected numbers using population series number:			
	E-O	D-100	D-150	C-150
1975	2,540	2,559	2,559	2,565
1976	2,567	2,599	2,599	2,608
1977	2,593	2,640	2,641	2,655
1978	2,618	2,683	2,688	2,706
1979	2,643	2,728	2,737	2,760
1980	2,667	2,775	2,790	2,819
1981	2,691	2,824	2,846	2,882
1982	2,715	2,874	2,904	2,946
1983	2,739	2,925	2,963	3,012
1984	2,764	2,976	3,022	3,079
1985	2,790	3,028	3,082	3,146
Annual growth	0.9%	1.7%	1.9%	2.1%

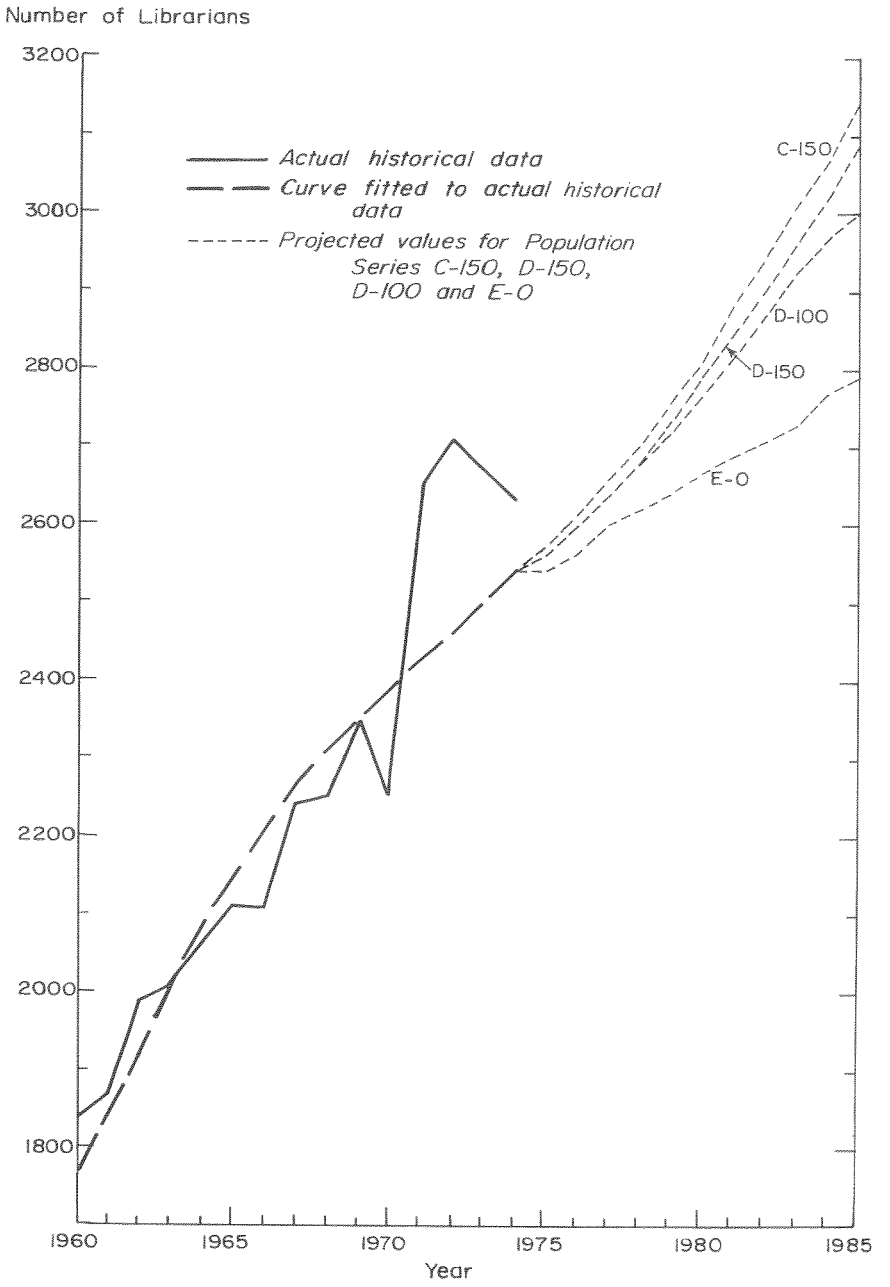
Note: See Table 7 for discussion of methodology used to derive projections and for description of each population series. The equation used to make the projections is given in Appendix Table 3 (equation 1).

Note for Figure 2

See note, Table 7, for series definitions. See Table 8 for projected numbers of librarians.

Figure 2

Actual and Projected Numbers of Public Librarians in California 1960-1985



the equation described in Appendix Table 3). Figure 2 graphs the same information. Actual observations of the employment levels of librarians are shown along with the predicted values of the variables from the regression equation noted above. After 1974, the four alternative projections are shown. The line resulting from the regression analysis does not pass through all observed values of the time series. The predicted values of employment do, however, coincide with the observed values rather closely before 1971. The departure of the observed values from the trend line in 1972-1974 indicates that either a major change in the relationship of population to librarians took place or that there was a temporary aberration in this relationship. In either case, the projections assume that the proportional relationship between population and number of librarians that existed from 1960 to 1974 will continue to exist from 1975 to 1985. It is possible that past trends will not continue, and that the proportion of librarians to population will change in the future. Figure 2 gives a considerable range of projected employment levels corresponding to each population series.

III

The Demand for School Librarians in California

Public elementary and secondary school systems in California are currently experiencing a major change in their financial health and in the size of their student enrollments. This change was brought about by a decline in the birth rate and a leveling off in the federal and state funds available to support education. This chapter examines the effect of these trends on the employment of school librarians and projects employment levels.

Institutional Trends

Figure 3 displays a number of the trends in public school statistics in California from approximately 1960 to 1975.[1] The growth in the number of schools leveled off around 1970 (Fig. 3 a), and since then the number has been relatively constant. This trend is related to enrollment. As shown in Fig. 3 e, elementary school enrollment has been declining since 1968. Secondary enrollment (Fig. 3 f) was still increasing as of 1974, but more slowly since 1971.[2]

Related to the enrollment changes are the trends in the number of teachers employed. Figures 3 b and 3 c plot the number of elementary and secondary teachers employed from 1960 to 1974. The number of elementary teachers increased rapidly until 1968, but since then it has remained relatively constant at around 112,000–115,000. The number of secondary teachers climbed steadily until 1971, and then declined until 1973, when it increased slightly.

The effect of these trends on public school librarians is shown in Fig. 3 d. The rate of growth in the number of librarians changed after 1967 to a much more gradual average increase, with some fluctuation. As of 1974, employment

Figure 3

Trends in School and School Library Statistics

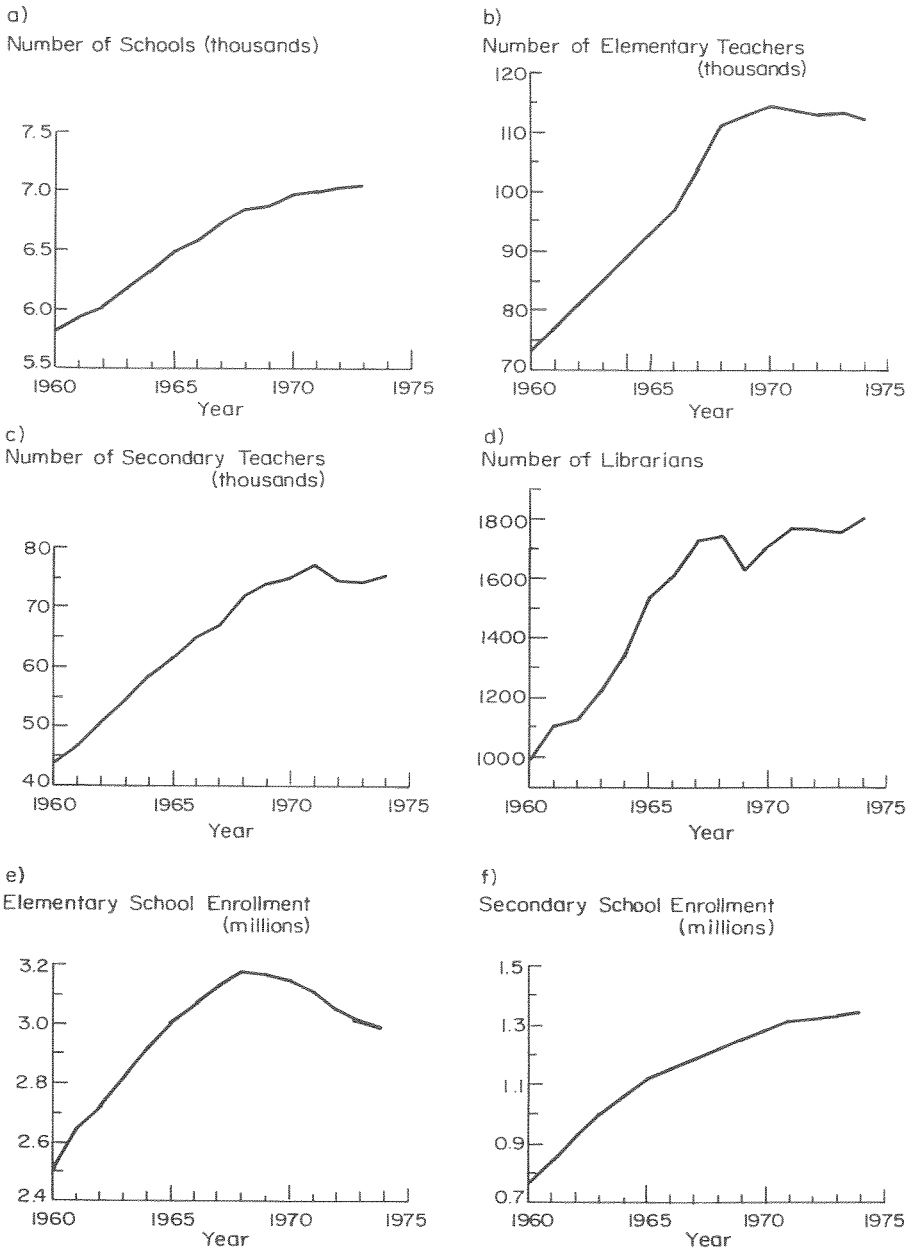
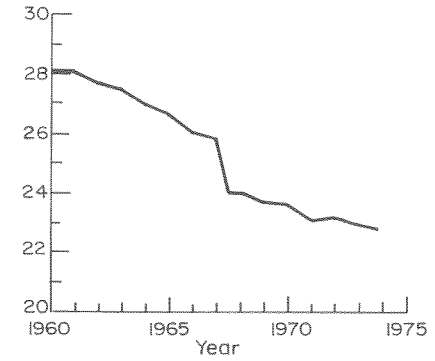


Figure 3 cont'd

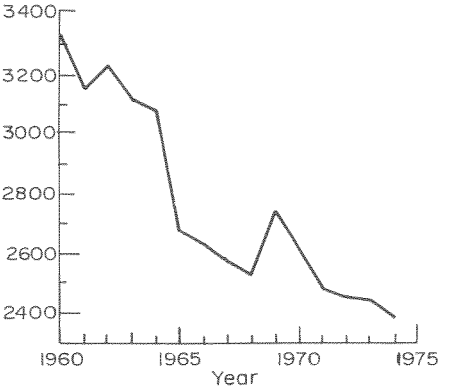
g)

Student/Teacher Ratio



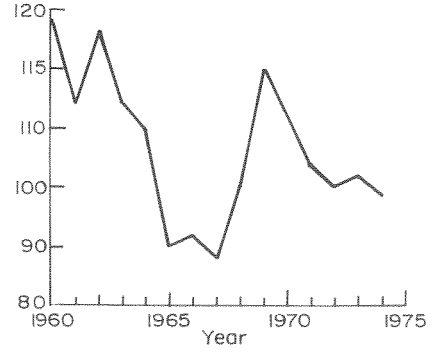
h)

Student/Librarian Ratio



i)

Teacher/Librarian Ratio



levels for librarians did not seem to be affected by enrollment declines or levelings. There are a number of possible explanations: First, most librarians were employed in secondary rather than in elementary schools, and enrollment drops had not yet been felt in secondary schools in 1974. Second, there may be economies of scale that affect library staff size. For example, a school may employ only one librarian, and a reduction of library staff would therefore mean a choice between closing the library, operating it with library assistants, or consolidatng it with other services. In the short run, library staffing may not be as flexible as classroom staffing.

Trends in non-public schools in California are much more difficult to ascertain.[3] Enrollment in private elementary schools has declined since 1968-69 to 315,000–316,000 for 1971-72 to 1974-75. Secondary private school enrollment reached a low in 1971-72 and as of 1974-75 had climbed back almost to its 1968-69 level. Nationwide, elementary and secondary enrollment has declined from about 6.3 million in 1964 to 4.7 million in 1974.[4]

Some small increases have been recorded for the number of private school teachers in California, from 1972-73 to 1974-75. For the United States as a whole, the number of private teachers has remained relatively constant.[5] Statistics are generally not available on the number of librarians in private schools in California.[6]

School Librarian Demand Model

The level of employment for professional school librarians can be determined in several ways. While the financial situation of a school district and of the State of California must be taken into account, the simplest and most reasonable explanation is that the demand is derived from enrollment levels. As the number of students increases, library staff increases–according to historical ratios, local or state legislative intent or regulations, professional standards, or political pressure.

Using observations of enrollment and number of librarians employed 1960-75, it was found that a regression equation using only elementary and secondary enrollment would explain 95 percent of the variation in the number of public school librarians employed. In addition, the multiple correlation coefficient between number of librarians and enrollments was found to be 0.98.[7]

Given this conclusive statistical result, projections using this model of professional employment and enrollment were developed using estimates of future elementary and secondary school enrollment levels derived from the California population projections discussed in Chapter II above.

The California State Department of Finance's Population Research Unit provides population projections for the four population series (E-O, D-100,

D-150, and C-150) in a number of different formats. Population projections that provided the age distribution of the population for each year were used to compute enrollments.

School Librarian Projections

Projections of employment levels for school librarians used the statistical relation between professionals and both elementary and secondary school enrollments. (See Appendix 2, equation 1). The results of the computation, which used the projected enrollment figures summarized in Table 9, are given in Table 10.

The figures for public school librarians are derived by using equation 1 of Appendix 2 with the public enrollment figures. The assumption underlying these projections is that the proportion of school librarians to students enrolled will remain the same in the next 10 years as it has averaged in the 15 year period ending in 1975.

Projections for private school librarians presented certain methodological difficulties. Because no historical information is available on which to develop a statistical relation between the number of private school librarians and the other variables, such as enrollment, current private school enrollment was projected from U.S. Census data on the proportion of each age group attending private schools. These proportions were then applied to the age-specific population projections, to arrive at enrollment projections for private schools. The ratio for public school librarians and student enrollment was used with the private enrollment projections to produce the private school librarian projections. These projections may not be as accurate as one would like, but if anything, they would tend to overstate the employment levels of private librarians because the student-librarian ratio is likely to be higher in private than in public schools. Further, since the projected value is only 180-200 individuals, the size of the error relative to the 9,000 to 10,000 librarians in California is small.[8]

The proportion of individuals of a particular age and sex who attend school in California was used to modify the age-specific population estimates to arrive at enrollment projections.[9] Individuals aged 5-13 years in the population were considered as potential elementary school students, and those 14-17 years old as potential secondary school students.

Table 9 presents the projected enrollment figures for each of the four population series discussed earlier. Not shown, but calculated, were the projected public and private enrollments used to develop the totals shown in Table 9. For no series is the enrollment expected to increase over the 1975

TABLE 9

Projected Total Elementary and Secondary School Enrollment for California Public and Private Schools, 1975-1985 (in thousands)

Year	Population series E-O		Population series D-100		Population series D-150		Population series C-150	
	Elementary	Secondary	Elementary	Secondary	Elementary	Secondary	Elementary	Secondary
1975	3,011	1,499	3,016	1,502	3,015	1,484	3,015	1,501
1976	2,977	1,500	2,986	1,504	2,985	1,504	2,985	1,504
1977	2,924	1,494	2,938	1,501	2,960	1,502	2,940	1,511
1978	2,852	1,469	2,874	1,480	2,862	1,482	2,878	1,482
1979	2,783	1,431	2,842	1,447	2,849	1,451	2,861	1,451
1980	2,723	1,374	2,831	1,395	2,861	1,402	2,894	1,402
1981	2,695	1,307	2,739	1,334	2,904	1,343	2,957	1,343
1982	2,684	1,246	2,632	1,277	2,968	1,289	3,048	1,289
1983	2,673	1,216	2,682	1,251	3,036	1,265	3,146	1,265
1984	2,660	1,222	2,769	1,262	3,104	1,278	3,249	1,277
1985	2,643	1,255	3,027	1,301	3,171	1,320	3,355	1,320
Expected yearly average rate of change	-1.22%	-1.63%	0	-1.3%	+0.5%	-1%	+1%	+1.2%

See note, Table 7, for assumptions for each population series.

TABLE 10

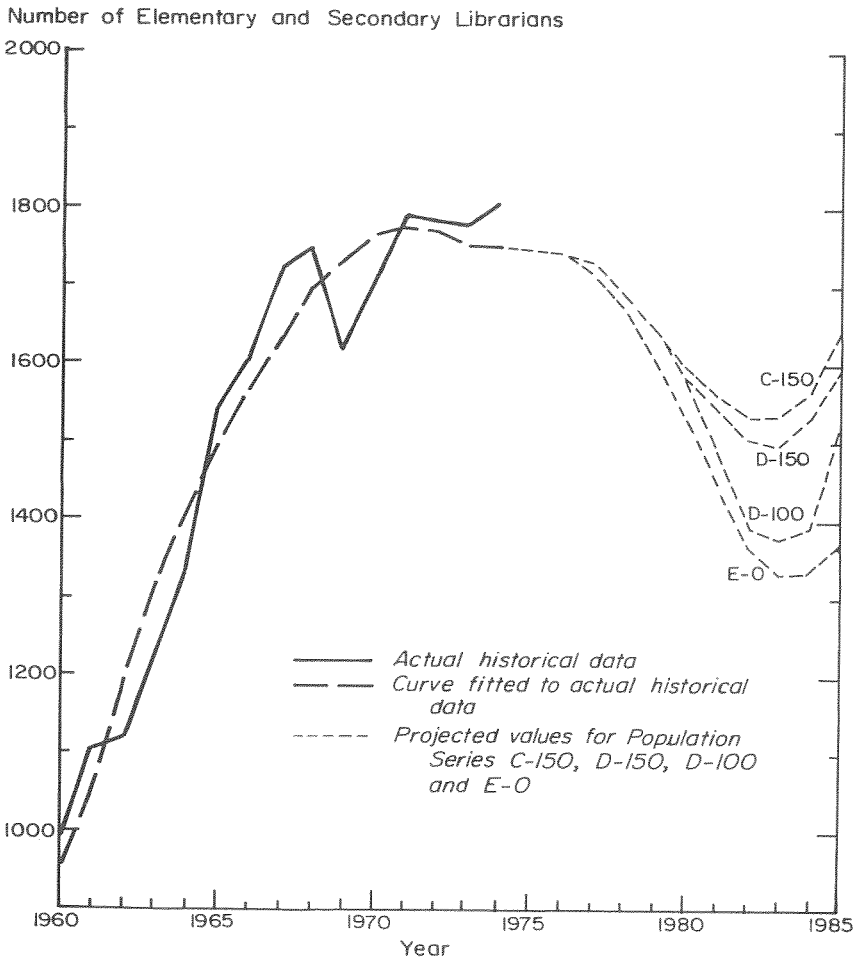
Projected Total Elementary and Secondary School Librarians for California, 1975-1985

Year	Population series E-O			Population series D-100			Population series D-150			Population series C-150		
	Total librarians	Public school librarians	Private school librarians	Total librarians	Public school librarians	Private school librarians	Total librarians	Public school librarians	Private school librarians	Total librarians	Public school librarians	Private school librarians
1975	1,967	1,752	215	1,971	1,756	215	1,950	1,756	213	1,971	1,756	215
1976	1,957	1,743	214	1,964	1,750	214	1,964	1,750	214	1,964	1,750	214
1977	1,932	1,720	211	1,945	1,733	213	1,955	1,742	213	1,957	1,744	213
1978	1,877	1,670	207	1,898	1,690	209	1,897	1,688	209	1,902	1,693	209
1979	1,809	1,607	202	1,848	1,642	205	1,855	1,649	206	1,859	1,653	206
1980	1,721	1,526	195	1,782	1,581	200	1,800	1,598	202	1,810	1,607	203
1981	1,631	1,442	189	1,678	1,485	193	1,743	1,545	198	1,760	1,560	200
1982	1,554	1,370	184	1,574	1,389	185	1,699	1,503	196	1,725	1,526	198
1983	1,514	1,333	181	1,559	1,375	185	1,692	1,496	196	1,728	1,529	199
1984	1,516	1,335	181	1,601	1,412	188	1,730	1,531	199	1,776	1,573	204
1985	1,552	1,368	184	1,733	1,533	199	1,803	1,598	205	1,862	1,652	210
Expected yearly average rate of change		-2.1%			-1.2%			-0.8%			-0.6%	

See note, Table 7, for assumptions for each population series.

Figure 4

Actual and Projected Numbers of Elementary and Secondary School Librarians



level. In general, the figures bottom out at about 1983, and start increasing again after that date. The figures in Table 9 are directly related to expected population growth, and the trends here are simply an extraction from the more general population trends discussed earlier.

The projected level of school librarians employed is expected to drop for both categories of librarians over the period 1975-1985. (See Table 10.) This reflects the fact that population is not expected to grow at previous rates.

Figure 4 plots the historical time series on public elementary and secondary school librarians from 1960 to 1974 along with the calculated regression equation values for the same data points. In general, the regression equation's estimated values are close to those of the actual data points except for 1969, where there was a reported drop in employment. The figure also plots projected employment levels, using the data from Table 10. Depending on the population growth (and thus enrollment), employment in 1985 could be as low as 1,368 for a birth rate of 2.1 children (E-O) or as high as 1,652, assuming a rate of 2.8 (C-150) births.

There are a number of factors besides birthrate that could influence the employment level. One of these is a change in the ratio of students to librarians. There is presumably a better level of library service if there are more librarians providing service. If librarians and administrators can make this case and secure additional funds for staff, then employment would rise even though enrollment continued to decline.

Another factor is the growth of media centers in place of or in addition to traditional libraries. If librarians are equipped to take on the new duties of media center operations, there could be an expanded market for their skills that is not reflected in the demand projections.

Note to Figure 4.

See note, Table 7, for series definitions. See Table 10 for projected numbers of librarians.

IV

The Demand for College and University Librarians in California

Four Types of Systems

College and university librarians are employed in four types of institutions in California: community or junior colleges; state universities and colleges; independent colleges and universities; and components of the University of California system. This chapter analyzes the growth and present status of each of these four groups and develops models to predict the demand for librarians within each group.

As of 1974-75, the community colleges in California enrolled about 4.1 million students as compared to 221,500 in the California State University and College (CSUC) system and about 105,500 for the University of California system. If total institutional expenditures are used as the basis for ranking by size, the University of California is first with $1.1 billion, followed by the independent colleges, the community colleges, and the CSUC system. The University of California also ranks first on the basis of library expenditures ($40.6 million) for 1974-75, followed by the community colleges ($27.1 million), CSUC ($26.2 million), and the independent colleges ($17.2 million).

Employment of professional librarians is relatively evenly distributed across the four sectors. The University of California employs 28 percent (520) of the 1,873 FTE librarians in the four groups, followed by the community colleges, with 26 percent (479), and the CSUC and independent colleges with about 23 percent each (440 and 434 respectively). In addition, 39 percent of all library assistants are employed by the University of California.

California Community Colleges: General Trends

Community colleges emphasize, for the most part, technical rather than academic training. From 1960-61 to 1971-72, community college enrollment in California rose at an average annual rate of 9.5 percent. From 1971-72 to 1974-75 the annual rate more than doubled, at 21.2 percent (see Fig. 5 a). Currently, job counseling and public information announcements are emphasizing the advantages of a two-year technical program. In addition, some individuals enroll in community colleges for their first two years and then transfer to the State University and Colleges system or to the University of California.

Weekly student contact hours (WSCH), a measure of instructional loads, have grown steadily at about 20 percent annually (Fig. 5 b).[1] With respect to expenditures for library operations, they have increased rapidly, and generally in proportion to total institutional expenditures (Fig. 5 h). For example, in 1974-75, library expenditures were about 3.7 percent of such totals; in 1960-61, about 3.9 percent; in 1965-66 about 4 percent; and in 1970-71, about 3 percent.

Community College Librarian Demand Model

As indicated earlier, California's community colleges are concerned with providing both vocational training and the first two years of academic study in preparation for student transfer to four-year colleges or universities. Their focus is on teaching and on meeting a wide spectrum of student educational needs. It is reasonable to assume, therefore, that construction of new facilities, remodeling of existing facilities, and staffing are a function of anticipated enrollments.

This hypothesis is confirmed by examining statistical relations, analyzing staffing formulas, and investigating the methods used to justify additional funds.[2] In fact, community college staff members do justify capital outlay programs based on expected future instructional loads and enrollment levels.[3]

Further, the statistical analysis described in Appendix 3, confirms the strong relationship between librarian staffing levels and both enrollment and weekly student contact hours. The model for librarian demand projections therefore relates level of employment of librarians to level of enrollment in California community colleges.[4]

Community College Librarian Projections

Projected employment levels of community college librarians in California were determined by assuming that the proportion of librarians to students

Figure 5

Trends in Community College and Community College Library Statistics

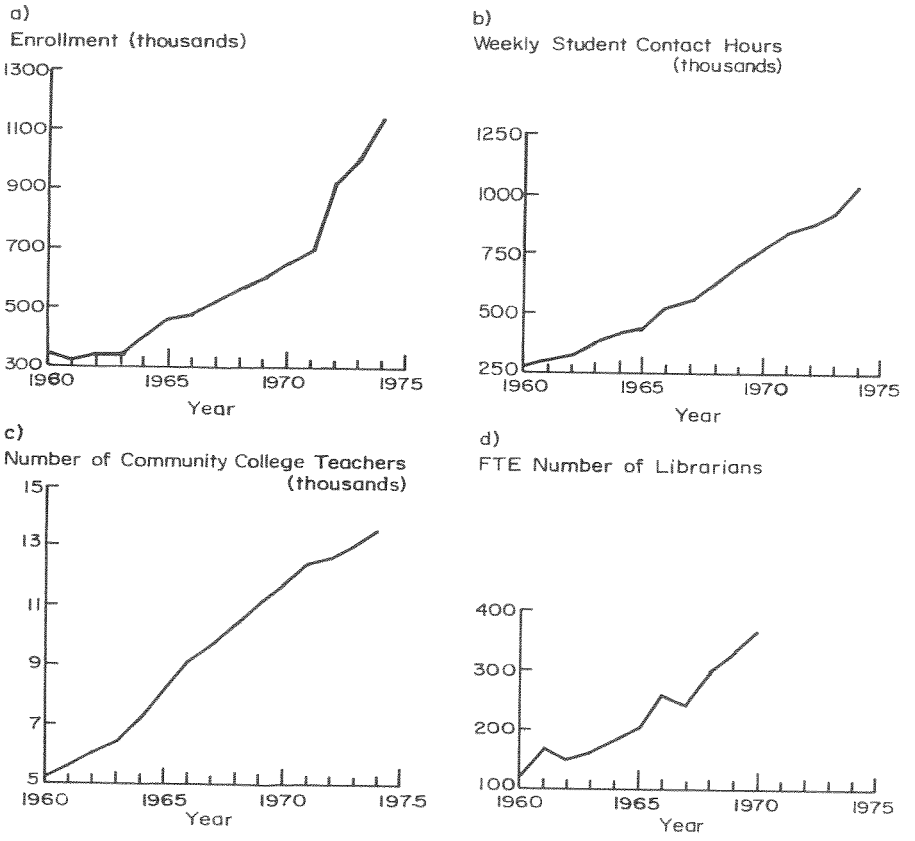
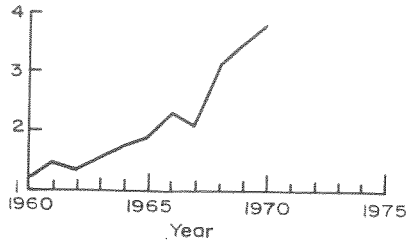


Figure 5 cont'd

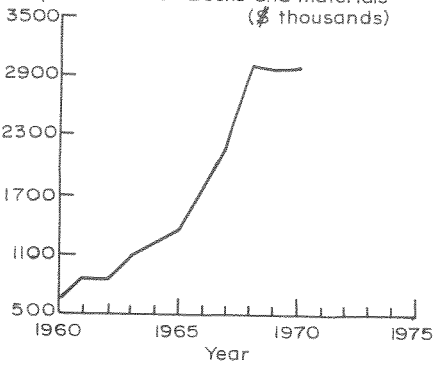
e)

Volumes Held (millions)



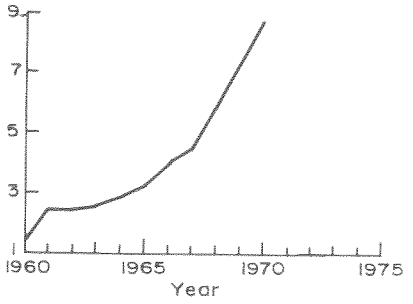
f)

Expenditures on Books and Materials ($ thousands)



g)

Library Salary Expenditures ($ millions)



h)

Total Institutional Expenditures ($ millions)

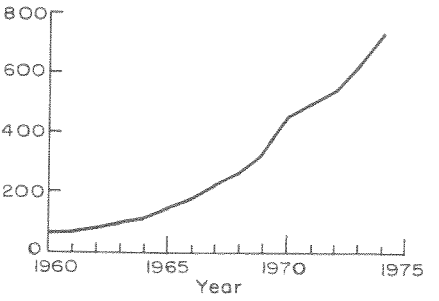


TABLE 11

Projected Total Community College Enrollment for California, 1975-1985 (in thousands)

Year	Enrollment projections (in thousands)		
	Low	Mid-range	High
1975-76	1,157.3	1,204.1	1,238.9
1976-77	1,181.9	1,268.1	1,355.0
1977-78	1,203.4	1,316.9	1,471.1
1978-79	1,226.2	1,362.2	1,592.3
1979-80	1,246.1	1,403.9	1,714.1
1980-81	1,261.5	1,439.1	1,835.5
1981-82	1,276.5	1,476.7	1,959.5
1982-83	1,286.8	1,510.7	2,081.5
1983-84	1,291.1	1,534.7	2,199.4
1984-85	1,288.4	1,548.1	2,311.6
1985-86	1,282.5	1,554.1	2,421.7

Source: California Community Colleges, Office of the Chancellor, see text note 3 above. See Table 7 for assumptions underlying each enrollment projection series.

that has existed for the 12 years under observation would continue in the next 11. As mentioned earlier, this statistical relation is given in Appendix 3. The enrollment projections obtained from the Office of the Chancellor of the California Community Colleges,[5] support the effort to explore thoroughly the expected growth of the community college system under a number of possible assumptions. Table 11 presents three alternative projections of enrollment from 1975-76 to 1985-86.[6]

The "low" enrollment projection was based on the early assumption that the enrollment participation rates of males and females would remain constant at their Fall 1974 levels, and similarly, that the participation rates by age would remain at their Fall 1974 levels. This was a conservative estimate, and it is likely that participation rates will increase somewhat over the base year. According to this projection, enrollment would rise at an average annual rate of about 1 percent during the 11 years from 1975-76 to 1985-86.

The "mid-range" projections were developed by analyzing the age-sex enrollment participation rates and modifying them to conform to judgments as to future conditions. Factors included adjustments to reflect the end of an influx of veterans, and the assumption that the enrollment rates of women would stabilize in the future rather than continue to increase.[7] Briefly, the mid-range estimates projected an average annual rate of growth in employment of about 2.9 percent from 1975-76 to 1985-86.

The "high" set of projections in Table 11 assumed an average annual enrollment growth of 9.5 percent. These projections were developed by making (least-squares) estimates of historical age and sex participation rates. The projected rates for enrollment were set by extrapolating historical trends without consideration of possible changes in growth rates. This set of projections is considered unlikely, but was used to set an upper limit on enrollment.

The enrollment projections of Table 11 were combined with the statistical relationship between librarians and enrollment (Appendix 3) to derive the projected number of community college librarians (Table 12). The low enrollment projections indicated that librarians will increase slightly from 532 to 588 during the 11 years from 1975-76 to 1985-86, an average rise of about five librarians per year. The mid-range estimates showed the librarians numbering 709 in 1985-86, with their numbers increasing by an average of about 14 per year. The highest estimates of enrollment suggested that the number of librarians will almost double, from 569 in 1975-76 to 1,094 in 1985-86. The mid-range enrollment figures, with an average annual growth of 2.8 percent in librarian employment, are considered the most likely.

Figure 6 plots the actual historical data and the projected values for the three sets of assumptions. For the period 1960 to 1968, the regression equation values approximated the actual data values relatively closely. During 1969-1971, the estimated values diverged from the observed values, then converged again. It is apparent from the graph that the high estimate of enrollment is an

TABLE 12

Projected Total of Community College Librarians for California, 1975-1985

Year	Librarians employed, assuming:		
	Low enrollment projection	Mid-range enrollment projection	High enrollment projection
1975-76	532	553	569
1976-77	543	582	620
1977-78	553	603	672
1978-79	563	623	726
1979-80	572	642	780
1980-81	579	658	834
1981-82	585	674	889
1982-83	590	689	943
1983-84	592	700	995
1984-85	591	706	1,045
1985-86	588	709	1,094

Note: See p. 39 for derivation of projections.

Figure 6

Actual and Projected Numbers of Community College Librarians in California

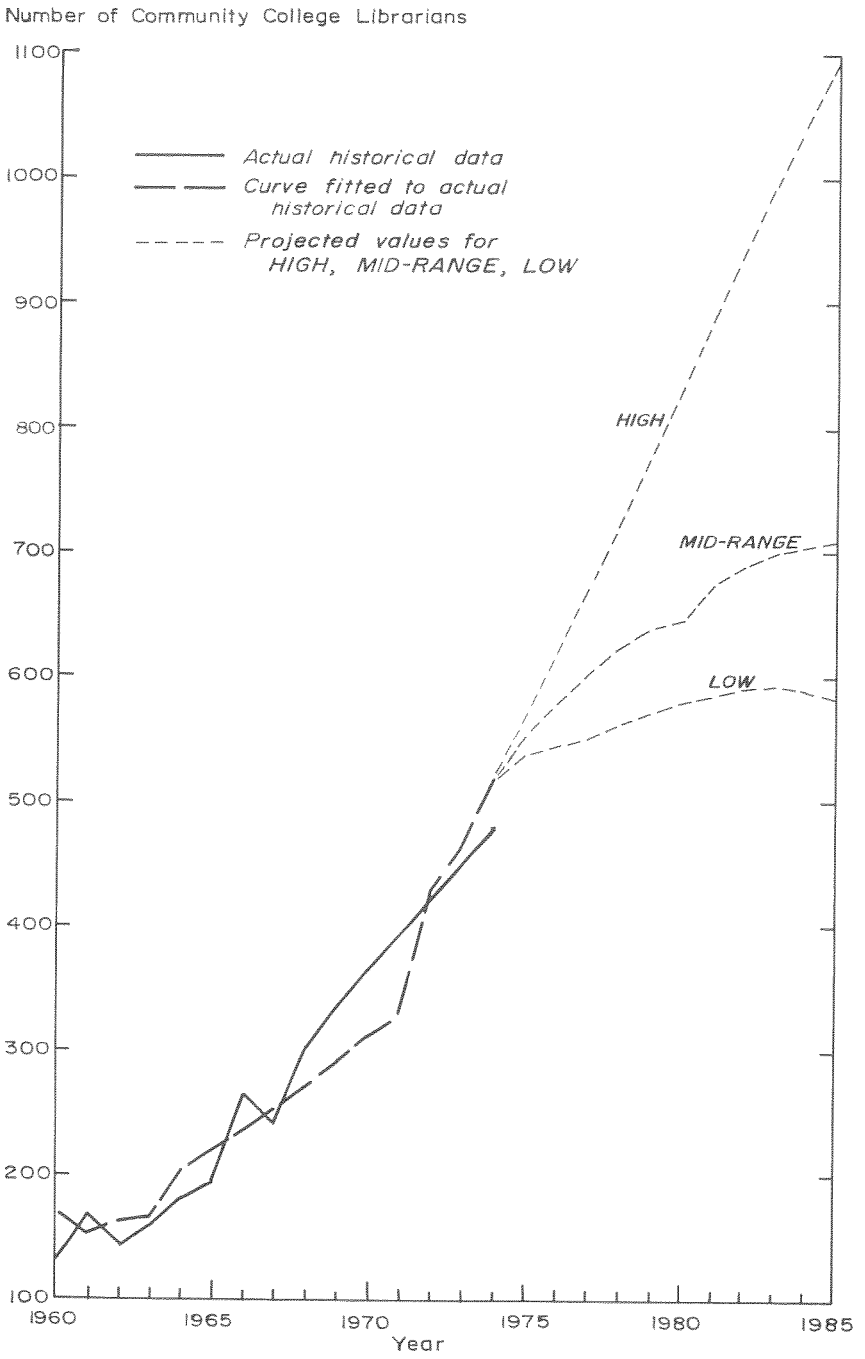


Figure 7

Statistical Trends in California State University and Colleges System

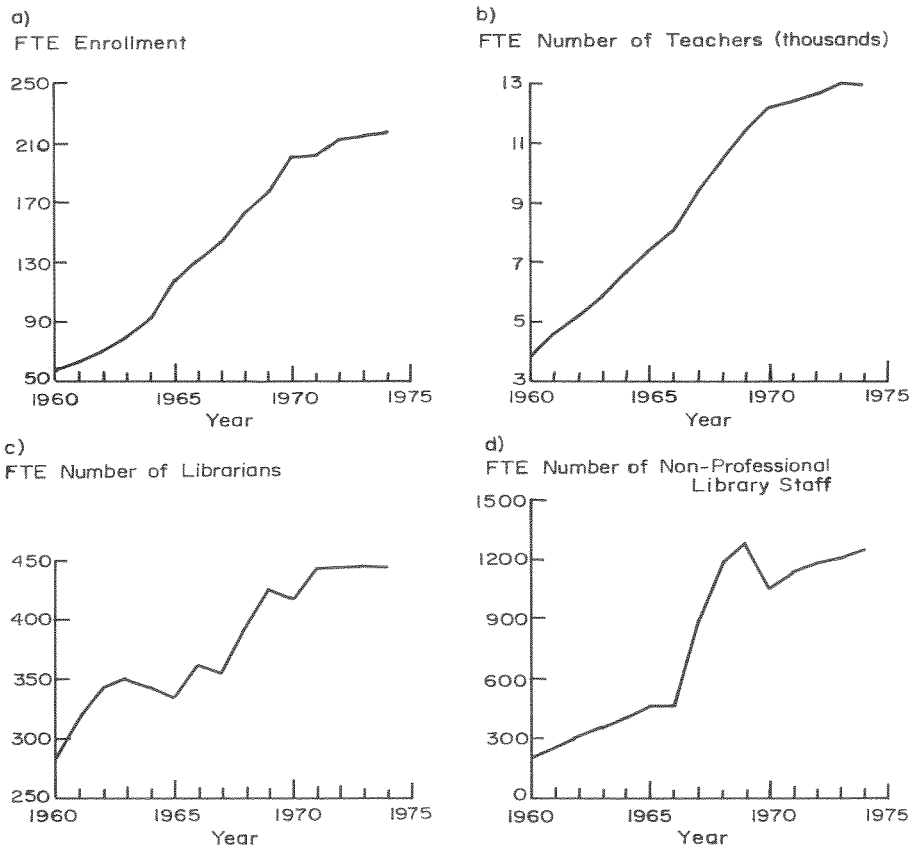
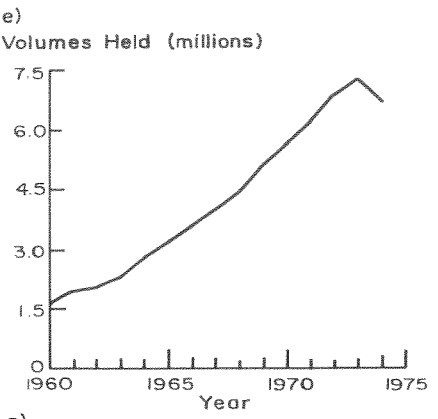
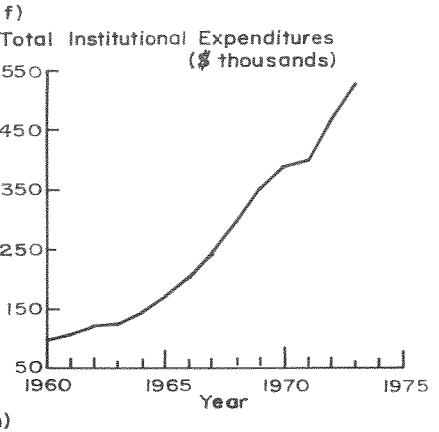
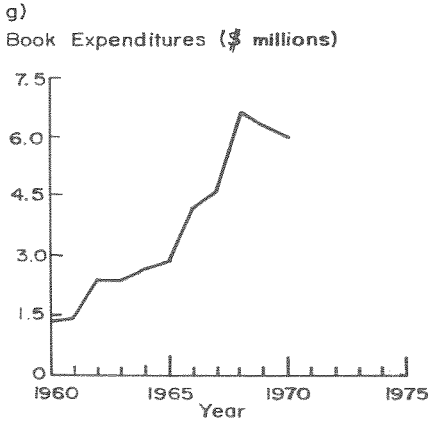
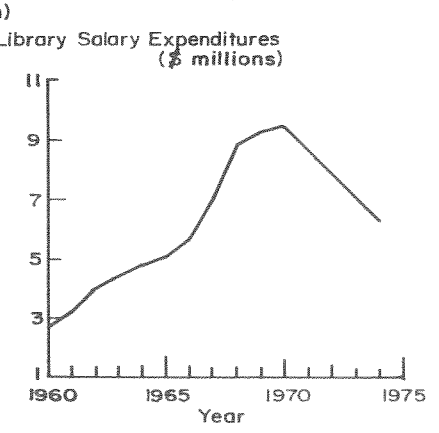


Figure 7 cont'd









extrapolation of a straight line trend. On the other hand, the low estimate implies no growth.

California State University and Colleges: General Trends

The California State University and Colleges system (CSUC) consists of 19 campuses throughout the state. Offerings include bachelor's, master's, and doctoral degrees.[8] The system construes its mission as including provision of ". . . instruction for undergraduate and graduate students, through the master's degree, in the liberal arts and sciences, in applied fields and in the professions, including the teaching profession."[9]

Like other sectors of higher education in California, the CSUC grew rapidly in enrollment during the 1960's (Fig. 7 a). This rise in enrollment, and the availability of resources (Fig. 7 f), gave the system considerable flexibility in developing new programs of instruction, in hiring faculty and staff to support the rise in enrollment, and in introduction of new programs.

In response to a general reduction in full-time equivalent (FTE) enrollment beginning in the early 1970's, the number of teachers employed by CSUC began to level off (Fig. 7 b). From 1960-61 to 1970-71, faculty size increased by more than 8,600 positions for an average annual increase of 22.7 percent. During the same period, the number of professional librarians increased by an annual average of only 4.5 percent. From 1970-71 to 1974-75, however, the situation for both teachers and librarians changed considerably. What had formerly been a 22.7 percent annual increase in teacher employment became a 1 percent annual increase; in fact, an absolute decline in FTE teacher employment took place between 1973 and 1975. The average rate of growth in librarian employment 1970 to 1975 was only 1.4 percent per year, not as dramatic a drop as in teacher employment, but still a substantial decline.

Indications of a decline in the service given by the CSUC library system include the following: The number of volumes held (Fig. 7 e) by the system libraries began to decline from 1973-74 to 1974-75, and the rate of increase of salary expenditures dropped off dramatically after 1970 (Fig. 7 h). CSUC library directors noted, in January 1976, that the lack of adequate staffing as well as the number of volumes had forced elimination of some services.[10]

Unless additional funds are supplied to the library system, it appears that quality of service will continue to suffer, with employment possibilities unlikely to increase.

Librarian Demand Model for California State University and Colleges

Staffing levels in the CSUC system both for faculty and for professional and nonprofessional librarians are determined primarily on the basis of enroll-

ment levels.[11] As noted below, additional variables enter into the determination of the size of library staff, as well.[12] Formulas determine the numbers of employees for technical processing and public service.

Until recently, the number employed for technical processing was a function of the number of volumes processed by the library. This figure, in turn, was a function of enrollment size. Public service staff size was directly related to the number of users, which included undergraduates, graduates, faculty and staff. In addition, staff was also provided for administrative functions based on enrollment and/or staff size.[13]

The current library staffing formula[14] relates staff size to the volume holdings, the number of volumes added per year, and the full-time equivalent number of faculty and students on each campus. Each of these factors is weighted by a value that reflects a standard amount of time taken to perform the technical or reader service function. The result is a total quantity of staff time to be used for technical processing and reader services for the budgeted year.

In all of the CSUC formulas, professional and nonprofessional staff are not shown separately.

The preceding discussion indicates that budgetary determination of staff size has evolved as formulas have changed; for this reason, a number of equations were investigated in this monograph.[15] The first projects employment on the basis of future student enrollment; the second, on faculty size, and the last, on both numbers of students and faculty. All three have strong justification based on the staffing formulas noted earlier, and strong statistical justification. All three equations (by their independent variables) explain at least 91 percent of the variation in employment of librarians.[16] Because of the lack of data, only the first equation was used, because projections of teacher employment are not made independently of enrollment.[17]

Librarian Projections for California State University and Colleges

Employment levels for librarians were projected, using a model based on future enrollment levels in the CSUC system. The equation used for the projections is given in Appendix 4. Enrollment projections used in the librarian model are given in Table 13.

Three alternative sets of projections in Table 13 represent a low, midrange, and high estimate of future enrollment. The projections in Column 1 indicate no growth, wherein enrollment remains at its 1974-75 level through 1985-86. The second set, in Column 2, were developed by the Chancellor's Office of the CSUC system, using population projections from the California State Department of Finance. The figures in the final column are enrollment projections based on the assumption that the rate of growth from 1960-61 to 1974-75 will continue to 1985-86. The present birthrate makes this outcome

TABLE 13

Projected California State University and College FTE Enrollment, 1975-1985

Year	Projected enrollment assuming no change in enrollment from 1974-75	CSUC Chancellor's Office enrollment projections	Projected enrollment assuming historical growth rate from 1960-61 to 1974-75 will continue to 1985-86
1975-76	221,510	223,900	251,114
1976-77	221,510	226,700	264,560
1977-78	221,510	229,600	278,008
1978-79	221,510	232,800	291,456
1979-80	221,510	236,000	304,903
1980-81	221,510	238,800	318,350
1981-82	221,510	240,800	331,797
1982-83	221,510	241,800	345,244
1983-84	221,510	241,000	358,691
1984-85	221,510	240,000	372,138
1985-86	221,510	239,500	385,586

Source: See text, p. 45, for an analysis of each alternative.

very unlikely; and the projections serve as an upper limit on expected system growth.

Table 14 presents the projected employment level of CSUC librarians for the same three sets of enrollment projections as in Table 13. The no growth set predicted 443 librarians employed throughout the projection period. The CSUC Chancellor's Office's projections implied that librarian employment will rise from 445 in 1975-76 to a maximum of 460 in 1982-83, and then will decline to 458 in 1985-86. The librarian employment projections based on historic growth patterns in enrollment show employment rising at an average annual rate of 2.4 percent.

Figure 8 plots the three predicted levels (using the regression equation in Appendix 4) along with the historical data on employment and the predicted employment levels during the 1960-61 to 1974-75 period. There was little difference between the observed and expected values during this period, especially during the latter years. The maximum difference between the low and high employment projections for 1985-86, was only 50 FTE librarians. Even in the most favorable circumstances, employment evidently will not increase greatly.

The University of California: General Trends

For the last several years, the State of California has operated under a fiscally conservative administration whose policies have affected all sectors of education, including the University of California.

Enrollment on the campuses of the University of California (UC) system has risen from about 42,000 in 1960-61 to over 100,000 in 1974-75 (Fig. 9 a). During the first 10 years of the period, the average annual growth was about 13 percent, but in the next six years it slowed to only 3 percent. Similarly, the number of University faculty members has remained essentially constant since 1970 (Fig. 9 b). While some increases are expected in future numbers of faculty, the increases of 11 percent per year that occurred from 1960-61 to 1969-70 are not expected to be reached again.[18]

The number of librarians employed by the University (Fig. 9 c) grew steadly until 1968-69; since then it has declined, although employment rose again in 1974-75. This five-year decline in professional employment seems unfortunate in the light of student and faculty requirements for library services. One factor should be kept in mind, however. The size of the professional staff may be decreasing because non-professional staff are taking over activities—e.g., technical processing—formerly performed by professional librarians. We need to know more about the cuts in employment of professionals and their effects before we can determine whether or not service has actually declined.

TABLE 14

Projected FTE Employment of Librarians in California State College and Universities, 1975-1985

Year	Projected number of librarians, assuming no growth in enrollment	Projected number of librarians, assuming CSUC enrollment projections	Projected number of librarians, assuming historical growth rate in enrollment will continue
1975-76	443	445	468
1976-77	443	448	479
1977-78	443	450	490
1978-79	443	453	501
1979-80	443	455	512
1980-81	443	458	523
1981-82	443	459	534
1982-83	443	460	545
1983-84	443	459	556
1984-85	443	459	567
1985-86	443	458	578

Source: See note, Table 13.

Figure 8

Actual and Projected Numbers of California State University and College Librarians 1960-1985

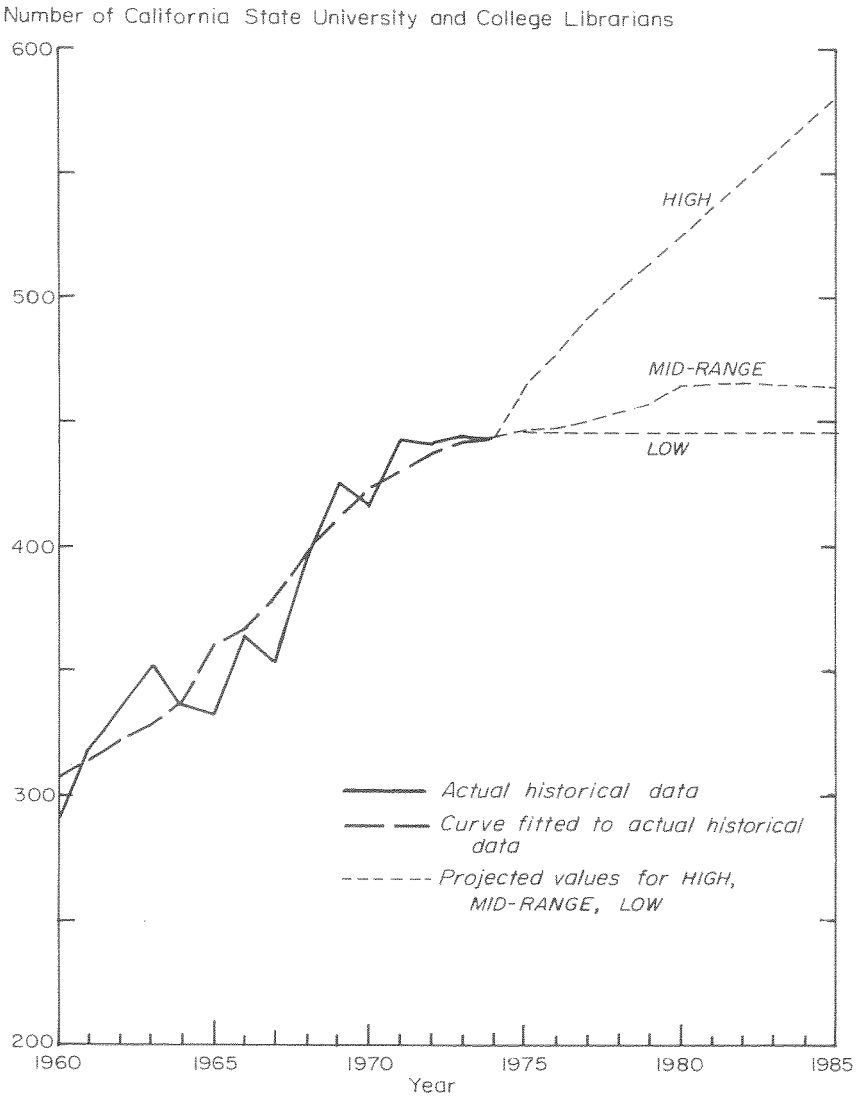


Figure 9

Trends in University of California Institutional and Library Statistics

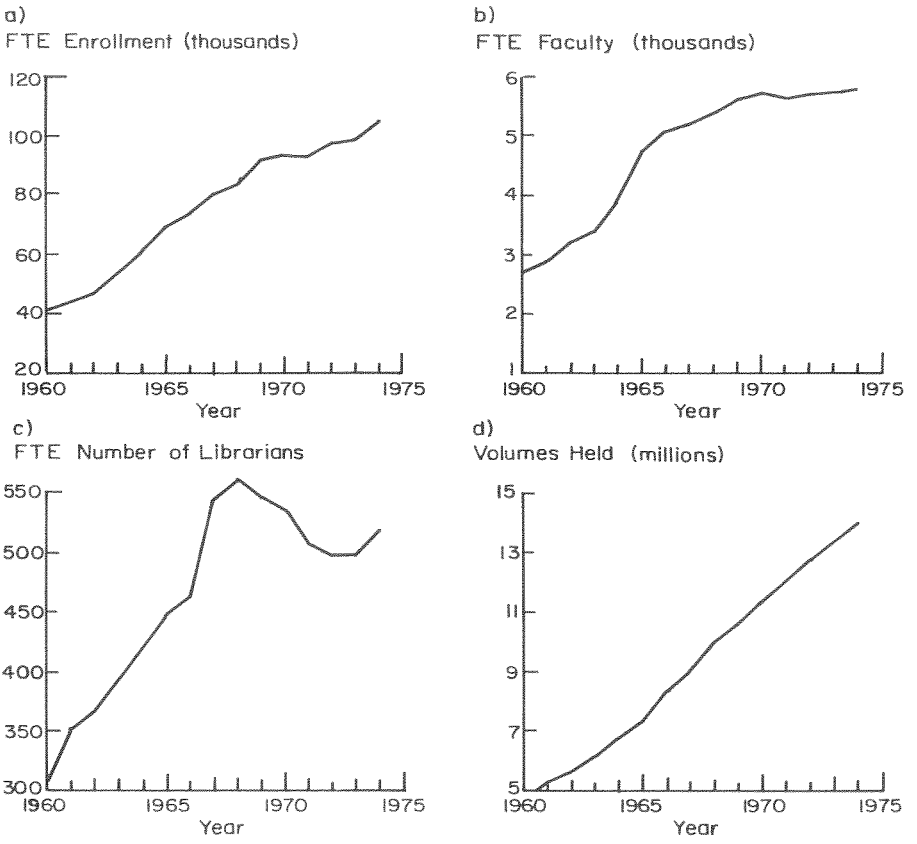
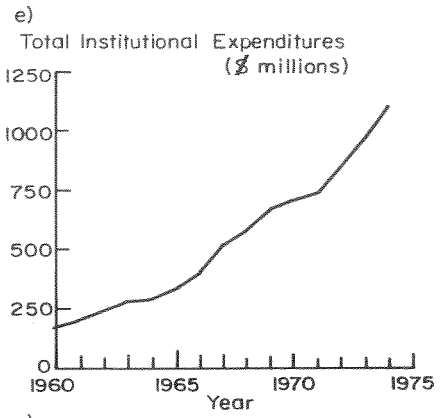
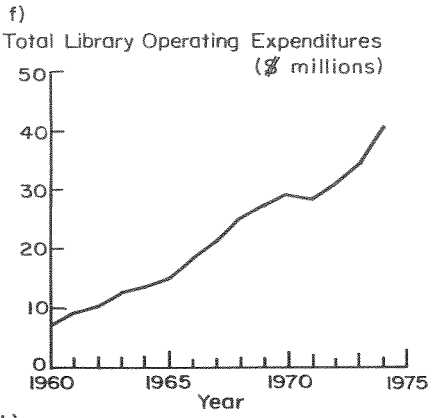
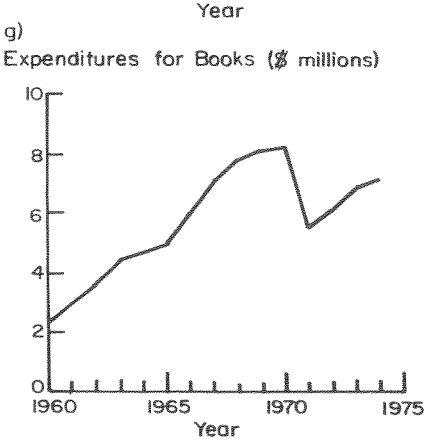
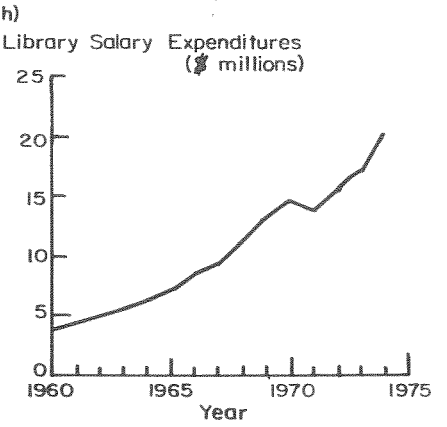


Figure 9 cont'd









Figures 9 e and 9 f show the past trends in expenditures made by the University as a whole, and by the libraries in particular. From 1960-61 to 1974-75, total institutional expenditures rose at an average annual rate of 35 percent, while library expenditures rose at about 31 percent. Library expenditures were 4 percent of total University expenditures in 1960-61, and declined slightly to about 3.5 percent in 1974-75.

In order to maintain adequate collections of library material, however, expenditures must be increased to keep pace with inflation reflected in rising prices as well as the expanding production of the world's publishers. Under these conditions, relying on constant percentage increases (e.g., 5 percent annually every year) in library budgets leads to deterioration of collections unless library systems institute cooperative resource-sharing projects.

University of California Librarian Demand Model

The University of California is committed to the two major responsibilities of research and teaching both undergraduate and graduate students; a major commitment to research is reflected in the activities of faculty and graduate students. Library collections and services are oriented both toward meeting the needs of researchers and providing materials for student course work.

Library resources have in the past been allocated on the basis of teaching needs and faculty research interests; graduate student research interests normally follow those of the faculty. It was reasonable, therefore, to develop a model for predicting employment levels for University librarians in terms of expected future enrollment as well as faculty size. In contrast, enrollment alone was considered sufficient for predicting librarian employment levels for the other sectors of higher education in California.

A model that considers librarian employment as related to both faculty size and enrollment has considerable statistical validity.[19] When historical data on the UC system are analyzed, one finds that a regression equation with librarian employment as a function of enrollment explains only 63 percent of the variation in the number of librarians employed, and an equation with librarians as a function of faculty size explains only 77 percent of the variation in number of librarians employed. When both faculty and enrollment are added to the equation, however, the explained variation increases to 86 percent.

Because both students and faculty are major users of the library, and because of the improved statistical characteristics of an equation including both variables, this was the model chosen as a basis for projecting librarian employment.

University of California Librarian Projections

Projections of both enrollment and faculty levels were used to arrive at three alternative projections of librarian employment at the University of California for 1975-1985. Table 15 gives the three sets of enrollment and faculty projections.

The first set is based on the assumption that the enrollment level and faculty size as of 1974-75 will continue through 1985-86. The second set was developed by the University's Office of Budgetary Planning. Enrollment projections are developed from a model that considers population projections and historical trends in enrollment. Faculty projections are developed by negotiation on a campus and departmental level and aggregated for a systemwide figure. These projections indicate enrollment increasing at an average of about .77 percent per year, and faculty increasing at 1.4 percent per year. The third set of projections, by far the highest and the least likely to occur, is based on the assumption that the historical growth rate in faculty and enrollment from 1960-61 to 1974-75 will continue from 1975-76 to 1985-86. This means an average annual increase of 4,687 students and 244 faculty—equivalent to a 4.1 percent and 3.6 percent average annual increase, respectively.

Table 16 presents projected employment levels of librarians, assuming each of the projected sets of values of Table 15. Equation 4 in Appendix Table 14, Appendix 5, was used to develop the projections. The first column in Table 16 shows the projected employment remaining at 526 librarians under a no growth assumption. Column 2 gives the projections based on the University's projections of student and faculty size. This set shows the employment level of librarians rising from 520 in 1975-76 to 630 in 1985-86, for an annual increase of 2.1 percent per year.

The final column in Table 16 gives the projected employment level, assuming that historical growth rates will continue to 1985-86. This yields 769 librarians employed in 1985-86 and a 2.6 percent growth rate per year. These alternatives are plotted in Fig. 10 along with the values predicted by the regression equations during 1960-61 to 1974-75 and the actual employment levels during that period

Independent Colleges and Universities in California: General Trends

Major private institutions such as Stanford University, the University of Southern California, and the Claremont Colleges as well as specialized engineering colleges, art academies, law schools and schools of religion are included in the category of independent colleges and universities that employ librarians.

TABLE 15

Projected University of California FTE Enrollment and FTE Faculty, 1975-1985

	Projections, assuming no change in enrollment of faculty size from 1974-75 level		Projections prepared by University of California Office of Budgetary Planning		Projections, assuming historical growth rate of enrollment and faculty from 1960-61 to 1974-75 will continue to 1985-86	
Year	Enrollment	Faculty	Enrollment	Faculty	Enrollment[c]	Faculty[d]
1975-76	105,535	5,970	109,938	6,103	113,604	6,696
1976-77	105,535	5,970	109,107	6,316	118,291	6,940
1977-78	105,535	5,970	111,436	6,441	122,978	7,183
1978-79	105,535	5,970	112,431	6,529	127,665	7,427
1979-80	105,535	5,970	113,236	6,581	132,352	7,670
1980-81	105,535	5,970	114,061	6,626	137,039	7,914
1981-82	105,535	5,970	118,830	6,670	141,727	8,158
1982-83	105,535	5,970	115,580	6,712	146,414	8,401
1983-84	105,535	5,970	116,436	6,791[b]	151,101	8,645
1984-85	105,535	5,970	117,027	6,870[b]	155,778	8,888
1985-86	105,535	5,970	117,899[a]	6,949[b]	160,475	9,132

Source: Enrollment and faculty projections in columns 3 and 5 from University of California Office of Budgetary Planning, January 20, 1976.

[a]Estimated by assuming that the projected average annual rate of growth in enrollment from 1975-76 to 1984-85 of 872 FTE students would continue one more year at that rate.

[b]Estimated by assuming that the projected average annual rate of growth in faculty from 1975-76 to 1982-83 of 79 FTE faculty would continue for three more years at that rate.

[c]Projected, using time series data on FTE enrollment from Appendix Table 14 for the period 1960-61 to 1974-75.

[d]Projected, using time series data on FTE faculty from Appendix Table 14 for the period 1960-61 to 1974-75.

TABLE 16

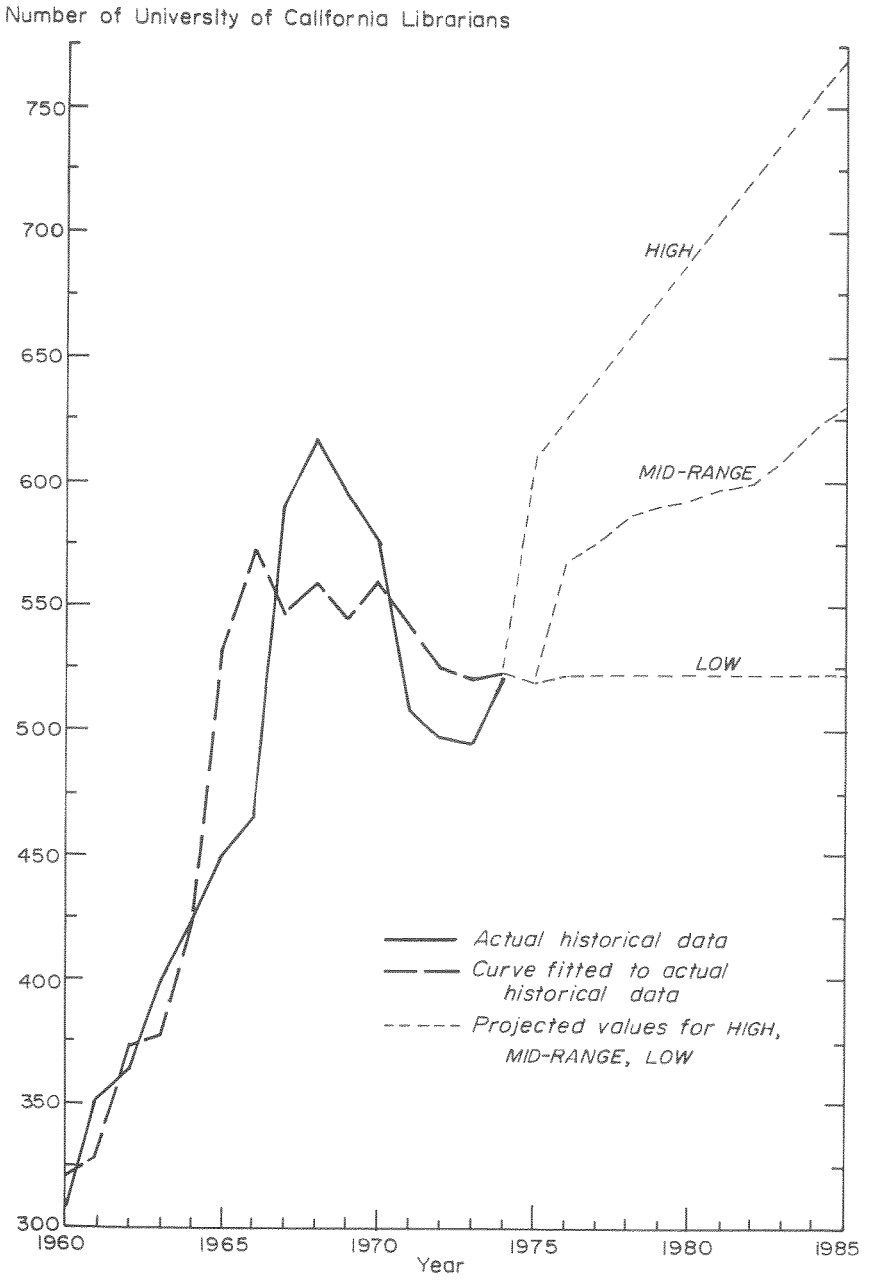
Projected FTE Employment of Librarians in the University of California, 1975-1985

Year	Projected number of librarians, assuming no growth in enrollment or faculty	Projected number of librarians, assuming University of California Office of Budgetary Planning figures for enrollment and faculty	Projected number of librarians, assuming historical growth rate in enrollment and faculty will continue to 1985
1975-76	526	520	610
1976-77	526	566	626
1977-78	526	575	641
1978-79	526	585	657
1979-80	526	590	673
1980-81	526	593	689
1981-82	526	597	705
1982-83	526	600	721
1983-84	526	609	737
1984-85	526	621	753
1985-86	526	630	769

Note: The projected sets of values are based on the same materials as Table 15. See discussion on p. 53.

Figure 10

Actual and Projected Numbers of University of California Librarians 1960-1985



Since local or state public funds do not provide them with basic support, the independent institutions rely heavily on tuition, gifts and endowments, and where appropriate, on research funds to help cover their operating and capital expenditures. Such unreliable income sources create considerable budgetary uncertainty for the majority of the smaller institutions in this group; the few largest end up in possession of most of the resources. For all but the best established, library service is often provided through volunteer and part-time help and relies on donations.

In contrast to the national situation, where FTE enrollment has averaged a 4.2 percent annual increase in private higher education,[20] independent institutions in California during 1960-61 to 1972-73 increased enrollment by a somewhat higher average of 5.4 percent annually (Fig. 11 a). From 1972-73 to 1973-74 enrollment declined, but is is not yet clear whether or how long the decline might continue. The number of FTE librarians (Fig. 11 b) increased until 1968 and since then has declined steadily. Library operating expenditures (Fig. 11 e) have continued to increase throughout the 15 years shown.

Librarian Demand Model and Projections for Independent Colleges and Universities

A major obstacle to a thorough and reliable analysis of the future demand for librarians in the independent colleges is the lack of a centralized organization to provide planning and historical information about the group, and the absence of adequate data on the ways staffing decisions are made. It was assumed in this analysis that enrollment plays a key part in determining staff size since a large proportion of the independent group's operating funds comes from tuition. The statistical analysis shows that the correlation between librarians and enrollment is about .90. An equation with number of librarians employed as a function of the number of FTE student enrollment explains 81 percent of the variation in the dependent variable.[21]

Table 17 gives three alternative estimates of independent college and university enrollment. As before, the first of these assumes that FTE enrollment will remain at its 1973-74 level. The second is derived from projections of FTE enrollment for all private institutions of higher education in the United States. These projections are prepared annually by the National Center for Educational Statistics.[22] Briefly, 7.21 percent of all U.S. private college and university enrollment is in California. The 1974-75 ratio of California's private enrollment to that of the U.S. was multiplied by the projected U.S. private enrollment for 1975-76 to 1985-86 to arrive at the projected California independent college and university enrollment as shown in Column 2 of Table 17.

The final column shows the projections of FTE enrollment based on the assumption that the rate of growth would continue through 1985-86 at an

Figure 11

Trends in Independent Colleges and Universities
Institutional and Library Statistics

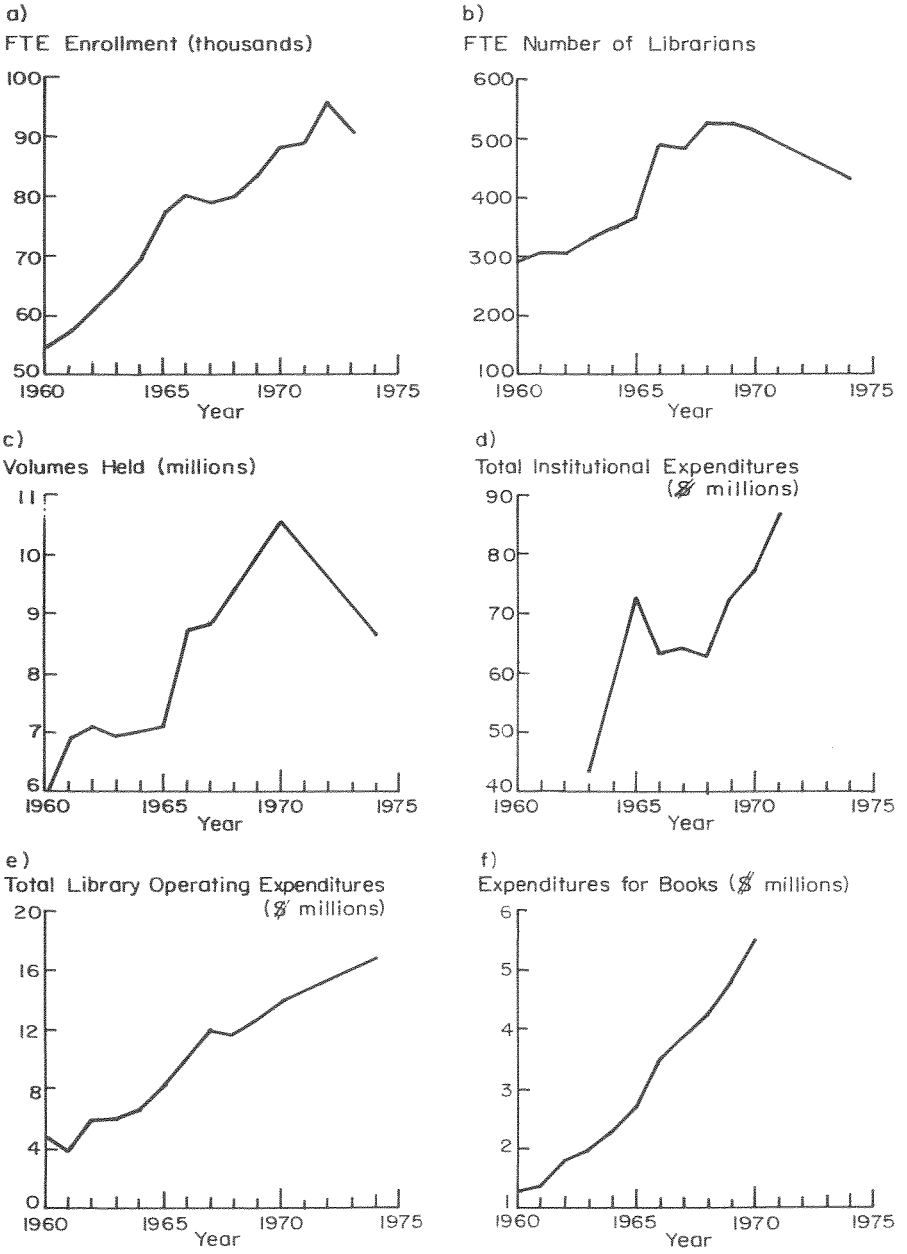


TABLE 17

Projected FTE Enrollment in Independent Colleges and Universities in California, 1975-1985

Year	Projected enrollment, assuming no change from 1973-74 level	Projected enrollment, based on U.S. private college and university enrollment figures	Projected enrollment assuming historical growth in enrollment will continue to 1985-86
1975-76	91,196	100,637	102,939
1976-77	91,196	101,503	106,020
1977-78	91,196	102,079	109,100
1978-79	91,196	102,152	112,181
1979-80	91,196	101,431	115,262
1980-81	91,196	100,349	118,343
1981-82	91,196	98,691	121,424
1982-83	91,196	96,816	124,505
1983-84	91,196	93,139	127,586
1984-85	91,196	89,318	130,667
1985-86	91,196	87,011	133,748

Source: See p. 57 for derivation of the projection in column 2.

Note to Figure 11.

In all but a few instances, data are incomplete for the later years in Figure 11. (See App. Table 15.) In some cases, there are data for 1974 but not for 1971, 1972 and 1973. In these instances the graph is extended across the missing data points to indicate the trend.

TABLE 18

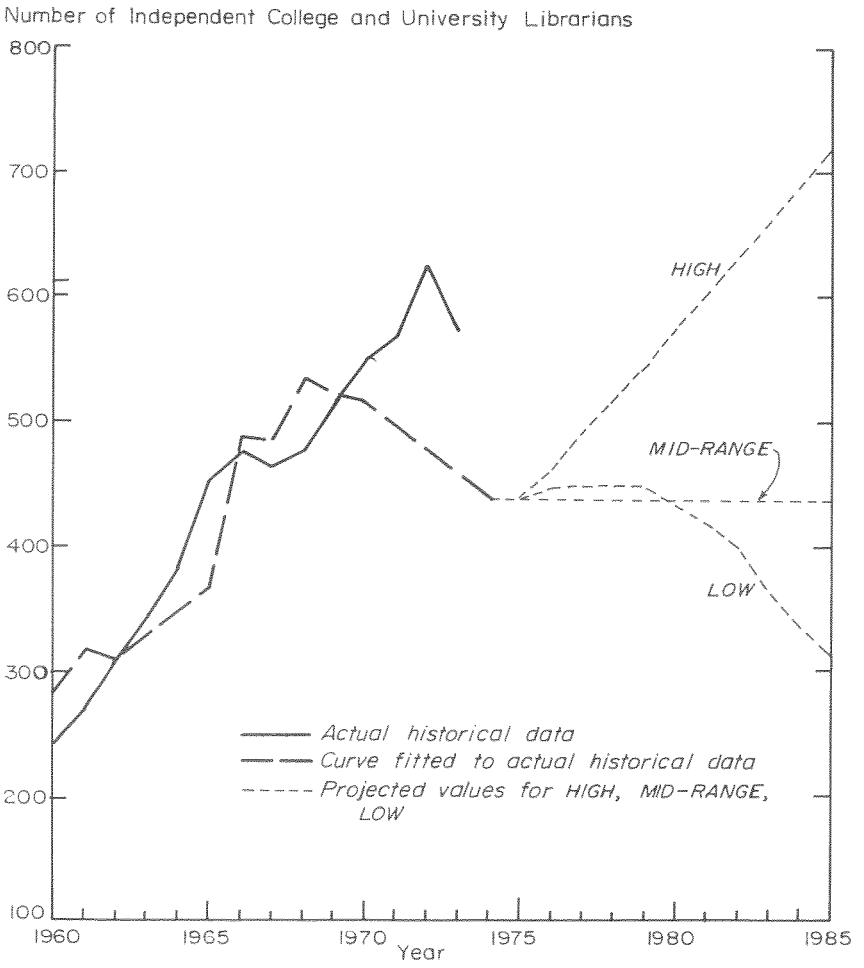
Projected FTE Employment of Librarians in Independent Colleges and Universities in California, 1975-1985

Year	Projected number of librarians, assuming no growth in enrollment	Projected number of librarians, based on U.S. private college and university enrollment projections	Projected number of librarians, assuming historical growth rate in enrollment will continue to 1985-86
1975-76	434	434	434
1976-77	434	442	462
1977-78	434	447	490
1978-79	434	448	518
1979-80	434	442	546
1980-81	434	432	574
1981-82	434	417	602
1982-83	434	400	630
1983-84	434	366	658
1984-85	434	332	686
1985-86	434	311	715

Note: See note, Table 17.

Figure 12

Actual and Projected Numbers of Librarians in Independent Colleges and Universities in California 1960-1985



average of 3 percent per year, as it has in the previous 14 years from 1960-61 to 1974-75.

Table 18 gives the projected number of librarians for each of the three enrollment projections, and Fig. 12 plots the alternatives. A steady state of enrollment results in 434 librarians being employed during each of the 11 years. The projections based on U.S. enrollment figures show that the number of librarians is expected to rise until 1978-79 and decline thereafter, to 311 in 1985-86. Projections based on the historical growth rate (Column 3) show an increase of 6.5 percent per year, for a total of 715 librarians in 1985-86.

Until 1979-80, the projected number of librarians (based on U.S. projections of private school enrollment) remains above the level of the no-growth enrollment projection. Thereafter, the lines cross. The nationwide projections are based on population, not on historical growth. It is in the 1980's that the effect of the present declining birthrate will be felt in higher education enrollments.[23]

V

Replacement Demand

In the previous chapters, projections were made of the expected employment levels for public, school, and college and university librarians. Table 19 shows that the total employment of librarians is expected to rise from 6,482 (in 1975-76) to 6,992 (in 1985-86) for an average annual increase of only 0.8 percent. As of 1985-86, according to these projections, 43 percent of all librarians in California (excluding special librarians) will be working in public libraries, 25 percent in school libraries, and the remaining 32 percent in college and university libraries. Within the colleges and universities, the largest employer is expected to be the community college system, followed by the University of California. These figures show how many librarians will be employed each year, but they do not indicate how many new jobs will open for librarians annually. The number of openings is the sum of the new positions (demand expansion) and the old positions (replacement demand) that open up when librarians leave their jobs due to retirement, death, change of occupation, or other causes.

Rates for Males and for Females

The number of replacement jobs can be computed in two ways. The first is to use the age distribution of librarians, together with age-specific female and male replacement rates, to compute by sex the number of individuals in each age group leaving the labor force. (Additional details concerning this approach are given in the 1969 BLS study.[1] For data needed to calculate rates for librarians, see Cooper, and Read.)[2]

A second approach derives one retirement rate for female librarians and one for males and applies these rates to the total number of female and male librarians without directly considering age distribution. These single replacement rate figures, one for men and one for women, are initially derived from the age distribution of librarians, and represent an average replacement rate for librarians of all ages. Once the replacement rates are established, the age distributions are not again consulted. The latter approach is used in the present study.

TABLE 19

Projected FTE Employment of Librarians in California, 1975-1985

Year	Projected number of public librarians	Projected number of school librarians	Projected number of college and university librarians					Projected total employment
			Community colleges	California State University and Colleges	University of California	Independent colleges and universities	Total	
1975-76	2,559	1,971	553	445	520	434	1,952	6,482
1976-77	2,599	1,964	582	448	566	434	2,030	6,593
1977-78	2,640	1,945	603	450	575	434	2,062	6,647
1978-79	2,683	1,898	623	453	585	434	2,095	6,676
1979-80	2,728	1,848	642	455	590	434	2,121	6,697
1980-81	2,775	1,782	658	458	593	434	2,143	6,700
1981-82	2,824	1,678	674	459	597	434	2,164	6,666
1982-83	2,874	1,574	689	460	600	434	2,183	6,631
1983-84	2,925	1,559	700	459	609	434	2,202	6,686
1984-85	2,976	1,601	706	459	621	434	2,220	6,797
1985-86	3,028	1,733	709	458	630	434	2,231	6,992

Source: Each of the projections in Table 19 is taken from tables presented earlier: Public librarians, Table 8 Series D-100; school librarians, Table 10 Series D-100; community colleges, Table 12 mid-range; CSUC, Table 14, CSUC estimates; University of California, Table 16 budgetary planning estimates; independent colleges and universities, Table 18, no-growth enrollment estimates.

The annual replacement rate for female librarians in California was 0.0598 in 1970 and is expected to reach 0.0615 by 1985. This means that in 1970 approximately 6 percent of the female librarians then currently employed left their jobs. The annual replacement rate for male librarians was 0.0183 in 1970 and is projected to be 0.0166 in 1985.[3] The average replacement rate for both men and women was 0.0504 in 1970, and is expected to be 0.0513 in California in 1985. By way of comparison, for the U.S. as a whole, comparable labor force replacement rates for both men and women were 0.0567 in 1970 and are projected to 0.0577 for 1985.[4]

There are several explanations for the variations in the rates between males and females. First, the rate for females is greater because the net out-migration from the labor force is greater for women than for men. It is possible that this trend may change as more women stay in the labor force longer. Second, replacement rate is a function of the age distribution of the occupation group. Since female librarians in California have the highest median age of any professional workers,[5] their replacement rate will be high compared to other female professionals.

The number of jobs created by replacing librarians leaving the labor force is highly dependent on the proportion of women to men in the profession. The more women, the greater the replacement demand since the replacement rate for women is more than three times that for men. In 1970, according to the *1970 U.S. Census of Population*,[6] women constituted 77 percent of the librarians in California and 84 percent for the U.S. as a whole.[7]

Although there is virtually no information about the number of women librarians working in each of the types of California libraries, the Bureau of Labor Statistics (BLS) in 1970 estimated the percentage in the U.S. as follows: in school libraries, 93 percent women; public libraries, 86 percent; academic libraries, 66 percent.[8] To estimate the proportion of women in various types of California libraries, the total proportion of women librarians in the U.S. (84 percent) was adjusted to the California total (77 percent) and the proportion of women in each category was recalculated: school libraries, 90 percent; public libraries, 80 percent (rounded from 79.3); and academic libraries, 50 percent.

Viewing the data from 1970, it is a complex matter to estimate the percentages for 1985. Two related questions are: How many additional women will be joining the labor force? and, How many of them will be librarians? The rate of women participating in the labor force has shown a steady increase over the last decade and a half, and there is no reason to believe that this trend will be reversed. Proportions of women of working age in the labor force appear as follows:[9]

1960	1970	(proj.) 1980	(proj.) 1990
37.8%	43.4%	45.6%	46.5%

TABLE 20

Total Projected Demand for Public Librarians in California, 1975-1985

Year	Population series E-O				Population series D-100			
	Total employment	Positions created by replacement	New positions	Total jobs	Total employ-ment	Positions created by replacement	New positions	Total jobs
1975	2,540				2,559			
1976	2,567	132	27	159	2,599	134	40	174
1977	2,593	134	26	160	2,640	136	41	177
1978	2,618	135	25	160	2,683	139	43	182
1979	2,643	137	25	162	2,728	141	45	186
1980	2,667	138	24	162	2,775	144	47	191
1981	2,691	140	24	164	2,824	146	49	195
1982	2,715	141	24	165	2,874	149	50	199
1983	2,739	142	24	166	2,925	152	51	203
1984	2,764	144	25	169	2,976	155	51	206
1985	2,790	145	26	171	3,028	158	52	210

Note: Calculations are based on the assumption that 80 percent of public librarians are women.

TABLE 20 cont'd

Year	Population series D-150				Population series C-150			
	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs
1975	2,559				2,565			
1976	2,599	134	40	174	2,608	134	43	177
1977	2,641	136	42	178	2,655	137	47	184
1978	2,688	139	47	186	2,706	140	51	191
1979	2,737	142	49	191	2,760	143	54	197
1980	2,790	145	53	198	2,819	146	59	205
1981	2,846	148	56	204	2,882	149	63	212
1982	2,904	151	58	209	2,946	153	64	217
1983	2,963	154	59	213	3,012	157	66	223
1984	3,022	157	59	216	3,079	160	67	227
1985	3,082	161	60	221	3,146	164	67	231

Note: Calculations are based on the assumption that 80 percent of public librarians are women.

Participation rates are related to age, marital status, age of children, potential earnings, general economic conditions, and level of education. The last appears to be a critical factor for librarians, since the higher the educational attainment of a group, the greater is its labor force participation rate. Thus increased numbers of highly educated women are expected to enter the labor force, with an unknown proportion interested in becoming librarians. Because of such indications and uncertainties, the 1970 proportions were used to compute replacement demand through 1985.

Replacement Calculations

The data on the 1970 and projected 1985 replacement rates for men and women were used to compute a yearly change in the replacement rates.[10]

Tables 20 through 25 present the calculation of the total number of jobs that are expected to be open for librarians in each year from 1975 to 1985 for each of the six types of libraries covered in this study (public, school, community college, State University and College, University of California, and independent college and university). For the calculations in Table 20 (public librarians), it was assumed that 80 percent of the librarians were women; for Table 21 (school librarians), the value used was 90 percent; and Tables 22, 23, and 24 (academic), 50 percent women was assumed. Each of the tables shows the calculations of the jobs available for each of the alternative projection series of librarians.

The values in Tables 20-25 are calculated by applying the proportion of women of the total employment for a year to the employment level for that year.[11]

The total number of jobs in public libraries, using series D-100, is expected to grow from 174 FTE in 1976 to 210 in 1985, for an increase in demand of only 36 during the 11-year period (Table 20). The demand for school librarians (Table 21) is expected to be much less than for public librarians. Using the population series D-100, the total demand for jobs is expected to be negative during 1981-1982. This is because the overall employment level of school librarians is expected to decline below the point that would be compensated for by the replacement demand.

Overall demand for librarians in colleges and universities in California is expected to be small, but is not expected to be negative. Based on mid-range enrollment assumptions, the total demand for community college librarians (Table 22), would begin at 52 librarians in 1975 and decline to 31 by 1985. A decline in CSUC librarians (Table 23), assuming "CSUC projections," is also expected, beginning with a demand for 20 FTE in 1976 and declining to 17 FTE in 1985.

TABLE 21

Total Projected Demand for Elementary and Secondary School Librarians in California, 1975-1985

Year	Population series E-O				Population series D-100				Population series D-150			
	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs
1975	1,967				1,971				1,950			
1976	1,957	110	-10	100	1,964	110	-7	103	1,964	110	14	124
1977	1,932	109	-25	84	1,945	109	-19	90	1,955	110	-9	101
1978	1,877	106	-55	51	1,898	107	-47	60	1,897	107	-58	49
1979	1,809	102	-68	34	1,848	104	-50	54	1,855	105	-42	63
1980	1,721	97	-88	9	1,782	101	-66	35	1,800	102	-55	47
1981	1,631	92	-90	2	1,678	95	-104	-9	1,743	99	-57	42
1982	1,554	88	-77	11	1,574	89	-104	-15	1,699	96	-44	52
1983	1,514	86	-40	46	1,559	88	-15	73	1,692	96	-7	89
1984	1,516	86	2	88	1,601	91	42	133	1,730	98	38	136
1985	1,552	88	36	124	1,733	99	132	231	1,803	103	73	176

Note: Calculations are based on the assumption that 90 percent of school librarians are women. The minus signs indicate an absolute decline in the number of positions.

TABLE 22

Total Projected Demand for Community College Librarians in California, 1975-1985

	Low enrollment projections				Mid-range enrollment projections				High enrollment projections			
Year	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs
1975	532				553				569			
1976	543	21	11	32	582	23	29	52	620	24	51	75
1977	553	22	10	32	603	24	21	45	672	26	52	78
1978	563	22	10	32	623	24	20	44	726	28	54	82
1979	572	22	9	31	642	25	19	44	780	30	54	84
1980	579	23	7	30	658	26	16	42	834	33	54	87
1981	585	23	6	29	674	26	16	42	889	35	55	90
1982	590	23	5	28	689	27	15	42	943	37	54	91
1983	592	23	2	25	700	27	11	38	995	39	52	91
1984	591	23	-1	22	706	28	6	34	1,045	41	50	91
1985	588	23	-3	20	709	28	3	31	1,094	43	49	92

Note: Calculations are based on the assumption that 50 percent of community college librarians are women.

TABLE 23

Total Projected Demand for California State University and Colleges Librarians, 1975-1985

	No enrollment growth		CSUC enrollment projections				Historical growth projections			
Year	Total employment	Positions created by replacement	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs
1975	443		445				468			
1976	443	17	448	17	3	20	479	19	11	30
1977	443	17	450	18	2	20	490	19	11	30
1978	443	17	453	18	3	21	501	20	11	31
1979	443	17	455	18	2	20	512	20	11	31
1980	443	17	458	18	3	21	523	20	11	31
1981	443	17	459	18	1	19	534	21	11	32
1982	443	17	460	18	1	19	545	21	11	32
1983	443	17	459	18	-1	17	556	22	11	33
1984	443	17	459	18	0	18	567	22	11	33
1985	443	17	458	18	-1	17	578	23	11	34

Note: Calculations based on the assumption that 50 percent of CSUC librarians are women.

TABLE 24

Total Projected Demand for University of California Librarians, 1975-1985

	No enrollment or faculty growth		UC Budgetary Planning enrollment & faculty projections				Historical growth projections			
Year	Total employment	Positions created by replacement	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs
1975	526	21	520				610			
1976	526	21	566	22	46	68	626	24	16	40
1977	526	21	575	22	9	31	641	25	15	40
1978	526	21	585	23	10	33	657	26	16	42
1979	526	21	590	23	5	28	673	26	16	42
1980	526	21	593	23	3	26	689	17	16	43
1981	526	21	597	23	4	27	705	28	16	44
1982	526	21	600	23	3	26	721	28	16	44
1983	526	21	609	24	9	33	737	29	16	45
1984	526	21	621	24	12	36	753	29	16	45
1985	526	21	630	25	9	34	769	30	16	46

Note: Calculations based on the assumption that 50 percent of University of California librarians are women.

TABLE 25

Total Projected Demand for Librarians at Independent Colleges and Universities in California, 1975-1985

	No enrollment growth		Enrollment projections for U.S.				Historical growth projections			
Year	Total employment	Positions created by replacement	Total employment	Positions created by replacement	New positions	Total jobs	Total employment	Positions created by replacement	New positions	Total jobs
1975	434		434				434			
1976	434	17	442	17	8	25	462	18	28	46
1977	434	17	447	17	5	22	490	19	28	47
1978	434	17	448	17	1	18	518	20	28	48
1979	434	17	442	17	-6	11	546	21	28	49
1980	434	17	434	17	-10	7	574	22	28	50
1981	434	17	417	16	-15	1	602	24	28	52
1982	434	17	400	16	-17	-1	630	25	28	53
1983	434	17	366	14	-34	-20	658	26	28	54
1984	434	17	332	13	-34	-21	686	27	28	55
1985	434	17	311	12	-21	-9	715	28	29	57

Note: Calculations based on the assumption that 50 percent of independent college and university librarians are women. The minus signs indicate an absolute decline in the number of positions.

Total Projected Number of Jobs for 1975 to 1985 for Librarians Who are Women

Proportion of librarians who are women	Total number of jobs						
	Public libraries	Elementary and secondary school libraries	Community college libraries	CSUC libraries	UC libraries	Independent colleges and universities libraries	Total colleges and universities
.45			398	183	330	160	1,071
.50			414	192	342	170	1,118
.55			427	202	356	180	1,165
.60			442	212	369	190	1,213
.65			454	221	382	200	1,257
.70	1,811		472	231	395	210	1,308
.75	1,871	641	485	241	409	220	1,355
.80	1,923	680					
.85	1,994	717					
.90		755					

Note: These calculations are based on the same projection alternatives as those in Table 19.

The University of California system (Table 24) presents a similar picture, with an absolute decline in available jobs under the UC budgetary planning enrollment and faculty projections. The independent colleges and universities (Table 25) will move from a positive demand for the period up to 1981 to a negative demand for the years 1982-1985.

The calculations in Tables 20-25 were based on the previously stated assumptions about the proportion of each group that are women: public librarians, 80 percent; school librarians, 90 percent; and college and university librarians, 50 percent. Table 26 summarizes the results of these computations in terms of the total number of FTE jobs expected to be available during the 11-year period. For the proportions above, 1,923 public library, 755 school library, and 1,118 college and university library jobs will be available during 1975-1985. Table 26 provides information on how the number of jobs will vary if there are changes in the proportion of librarians who are women. For example, if instead of 90 percent of all school librarians being women, the proportion comes closer in the future to the state average of 77 percent (say 75 percent), then the total number of jobs available from 1975 to 1985 could be expected to be 641 instead of 755. On the contrary, if the number of college librarians who are women rises to 70 percent from the present 50 percent, the number of jobs available would be 1,308 instead of 1,118.

VI

Conclusions

This monograph has described a set of models for projecting the demand for librarians in California for the period up to 1985. The analysis included searches of the available literature for data on staffing decisions and derivation of statistical relations that explain the variations in employment levels of librarians. For the public library sector, librarian employment was projected in relation to the expected population of the State of California. Employment of librarians in the libraries of schools, community colleges, the State University and Colleges system, and independent colleges and universities were based on projected enrollment in each of these sectors. Future demand in the University of California, because of that system's emphasis on research, was derived from both enrollment and faculty projections. Lack of information dictated the exclusion of special librarians from this study, but to the extent that law or health science librarians are employed in public libraries or college and university libraries, they are included in the projections.

The mid-range projections indicate that in terms of expansion demand, employment in California will grow at an average rate of 1.8 percent per year for public libraries and decline at 1.2 percent for school libraries. It will increase at a rate of 2.8 percent per year for community college libraries, 0.3 percent for the California State University and Colleges system, and 2.1 percent for the University of California libraries. In the independent colleges and universities, employment will remain constant. Overall, the employment level for librarians in California's colleges and universities will increase at an average annual rate of 1.4 percent. (Total employment in all sectors will increase at an average of 0.8 percent annually.) For previous rates of growth per year from 1960 to 1974, see Table 27 (a) and (b).

Replacement demand is expected to be of critical importance in creating jobs. The projections indicate that out of 3,796 jobs expected to be available between 1975 and 1985, the need for replacements will open 3,286 of them (86.6 percent). Only 510 (or 13.4 percent) will result from expansion demand.

TABLE 27

Annual Growth Rates in Library Employment

(a)

Category of library	California historical rate 1960-1974 (in percents)	California projected rate 1975-1985 (in percents)	U.S. projected rate 1970-1985 (in percents)
Public	3.1	1.8	1.6
School	5.9	-1.2	3.6
College and university	6.2*	1.4	2.8

*This represents overall growth in all sectors of this category.

(b)

Category of library	California historical rate 1960-1974 (in percents)
Community college	20.9
UC system	5.0
CSUC system	3.8
Independent colleges and universities	3.5

Some Comparisons

It is useful to compare the results of the statistical models for California presented in this monograph with the demand for librarians throughout the United States as projected from 1970 to 1985 by the Bureau of Labor Statistics.[1] The BLS study indicates an overall growth rate in employment of 2.7 percent per year using their basic projections, and 1.9 percent for their low projections, whereas the projections used in this study show employment for librarians increasing at only 0.8 percent per year.

In its basic projections series, BLS ranks school libraries as having the potentially highest employment growth rate (3.6 percent), followed by college libraries (2.8) percent, and finally public libraries (1.6 percent). The projections used in this study rank public libraries highest (1.8 percent),then colleges (1.4 percent), and last, schools (-1.2 percent). (See Table 27). Most of the differences between the two sets of projections can be explained in terms of the time period in which the projections were made. Work on the BLS study was completed in early 1974 when the major changes in population trends were still not discernible. Projections of population and enrollment based on population trends since the BLS study show a continuing downward trend. Some analysts believe that the birthrate in the United States has reached a low point and that the next few years will see a move upward. If this is the case, the population will grow, causing an increase in future demand for librarians.

This paper used population as the key variable in predictions of librarian employment. Public librarians meet the needs of a community group whose size is determined largely by geographic, political and economic factors. However, the ultimate determinant of the size of communities is the birthrate. The same logic holds true for school, college, and university librarians, only in this case the surrogate for size of the population is enrollment. While factors such as age, socio-economic status, and sex help to determine enrollment, enrollment lags behind population.

Projections cannot be considered in isolation from political and economic factors. The assumptions about the U.S. economy in 1985 were based mainly on BLS projections[2] that there will be no major changes in the institutional framework of the U.S. economy, and that present technological, social and scientific trends will continue. The only anticipated major departure from past trends is the likelihood of a slowdown in economic growth during 1980-85, and a potential oversupply of college graduates. This latter trend is expected to begin in the late 1970's.[3]

The political environment is one of fiscal conservatism. Currently, there is no reason to believe that an era of affluence for educational institutions, similar to the post-Sputnik years, will recur. The present financial difficulties

of many cities and states and attendant claims on the tax dollar make it highly unlikely that any major new funds will be available for educational and cultural projects. Even if funds were made available, it is doubtful that libraries could obtain financial priority over other civic facilities and services such as hospitals, recreation and parks, and fire and police.

The Issue of Supply

Althouth this paper has concentrated on the *demand* for librarians in California, *supply* of librarians is also a complex issue. To place the demand figures in perspective, it is useful to estimate the number of librarians being graduated each year. In 1974-75 roughly 600 qualified librarians graduated from library schools in California, while the average number of jobs per year (projected for 1975 to 1985) is about 380. The latter figure excludes special librarians. If it is assumed that special libraries employ about 15 percent of the total number of librarians, then the average, including special libraries, would be 437 job openings each year.[4]

Not all the graduates of library schools will actually enter the labor force as librarians. The BLS estimates that only 80 percent of those receiving library degrees will take jobs as professionals.[5] As mentioned in Chapter I, there is no statistical evidence presented to support this estimate. On the basis of the projections in this study, there will be jobs sufficient to employ only 73 percent of library school graduates each year. The migration of professionals from other states into California and the departure of California graduates to other states also influences the state's supply of qualified librarians. These factors, however important, were omitted from the projections until future studies can reveal the size of the movements.

Impacts of Automation

The impact of automation on staffing patterns in libraries and the changing ratio of librarians to library assistants may change future employment possibilities for librarians in ways not anticipated here. In general, the level of automation is increasing in libraries, and routine clerical activities are now being performed by machines. There is, however, a paucity of data on the effect of this trend on the demand for professional librarians. For example, the demand for librarians with computer skills may increase, as well as the demand for computer scientists with library expertise, thus creating more professional openings.

It is uncertain whether the future demand for professionals will decline as activities of a routine, clerical nature are increasingly handled by nonprofessionals, that is, library assistants, In many library systems librarians are still

performing clerical tasks that could be performed by library assistants, particularly in technical processing departments. However, upon the retirement of librarians primarily involved with clerical duties, budgetary exigencies may lead to their replacement by library assistants, with a consequent lessening of demand for professionals. Even the highest projections of employment presented here reveal an oversupply of librarians. A solution to this problem may be in a swing away from an exclusively traditional concept of the librarian's role—as a supplier of material and information through the organizational structure of a library—to a wider concept that includes dissemination of information in a variety of ways. Librarians should be involved in meeting the information needs of the state and the nation and designing new systems. Such developments would not only benefit the community but also contribute to the increased employability of librarians themselves.

At present, of course, many librarians work in nontraditional information and automation areas, such as systems analysis, programming of technical processing, bibliographic searching, catalog production, or automatic indexing and abstracting systems. Management systems with a computerized data base may soon be adopted in the administrative headquarters of libraries, and librarians with computer and library experience, together with analytic skills, will be needed to implement these systems. Also, librarians with training in systems analysis and automation may develop careers with consulting firms that specialize in library problems, or with government or institution-sponsored research firms.

Policy Implications

The policy implications of this study are many. It is important to allow individuals who want to become librarians the freedom of occupational choice. But as this study makes clear, not all current graduates will be able to find traditional library jobs.

Library schools must realize that they cannot continue to increase the size of each class in the face of a very uncertain job outlook. Unless library schools can assure themselves that they are training individuals with marketable skills that will gain them jobs, they should reassess their mission.

Library schools might help to correct the present imbalance by diverting resources from the first professional degree program in library science to retraining programs aimed at upgrading the skills of individuals already in the profession. Continuing education for librarians could well be given priority by library schools because it would both increase professional competence and reduce the number of new librarians entering the profession.

NOTES

NOTES TO CHAPTER I

[1] Mark Blaug, *An Introduction to the Economics of Education* (Baltimore: Penguin Books, 1972), p. 145.

[2] Blaug, note 1 above, p. 139.

[3] U.S., Office of Education, National Center for Educational Statistics, *Library Statistics of Colleges and Universities, Institutional Data, Part A, Fall 1971*, by Stanley V. Smith and Joel Williams, DHEW Publication No. (OE) 72-103 (Washington, D.C.: 1972), p. 3.

[4] See, for example, in the U.S., Department of Labor, Manpower Administration, *Dictionary of Occupational Titles* (Washington, D.C.: 1965), classification number 100–Librarians; numbers 100-168–Librarian and Librarian Reference; numbers 100-118–Library Director; and other headings such as Bookmobile Librarian, Children's Librarian, Patients' Librarian, Motion Picture Librarian, and Young-Adult Librarian.

[5] American Library Association, Office for Library Education, *Library Education and Manpower: A Statement of Policy Adopted by the Council of the American Library Association* (Chicago: American Library Association, 1970).

[6] *News Notes of California Libraries*, 68(1): 17 (Winter 1973).

[7] U.S., Bureau of Labor Statistics, *The U.S. Economy in 1980. A Summary of BLS Projections*. Bulletin No. 1973 (Washington, D.C.: 1970).

[8] *News Notes*. . . . See note 6 above.

[9] U.S., Office of Education, National Center for Educational Statistics, *National Inventory of Library Statistics Practices: Final Report, Vol. 1, Data Collection on the National, State, and Local Levels* (Washington, D.C.: 1972).

[10] Ibid., p. 12.

[11] Loc. cit.

[12] Bulletin No. 1852 (Washington, D.C.: 1975). A summary of this report, prepared by one of its principal authors, appeared in Anne Kahl, "What's Happening to Jobs in the Library Field?" *Occupational Outlook Quarterly*, 18(4): 20-25 (Winter 1974). For a somewhat similar analysis of the labor market facing professional librarians see Michael D. Cooper, "An Analysis of the Demand for Librarians," *Library Quarterly*, 45(4): 373-404 (October 1975).

Notes to Chapter I cont'd

[13] The major difference between the BLS report and this study is that in the present work we develop a model for analysis of the labor market in California, while the BLS model is concerned with the United States as a whole. In addition, the present work develops functional relationships that can be used by library planners to analyze the labor market in other geographic areas or to develop alternative projections of demand for California.

[14] U.S., Bureau of Labor Statistics, *Tomorrow's Manpower Needs: Vol. I, Developing Area Manpower Projections*, Bulletin No. 1606 (Washington, D.C.: February 1969); and *Tomorrow's Manpower Needs: Vol. IV, The National Industry–Occupational Matrix and Other Manpower Data*, Bulletin No. 1737, Revised 1971 (Washington, D.C.: 1972).

[15] U.S., Office of Education, *The Education Professions 1971-72: Part IV–A Manpower Survey of the School Library Media Field*, DHEW Publication No. (OE) 73-12001 (Washington, D.C.: 1973).

[16] Ibid., p. 47, footnote 1 on Table 11.

[17] William J. Baumol and Matityahu Marcus, *Economics of Academic Libraries*, Prepared for Council on Library Resources by Mathematica, Inc. (Washington, D.C.: American Council on Education, 1973).

[18] U.S., Office of Education, National Center for Educational Statistics, *Library Statistics Colleges and Universities, Data for Individual Institutions, Fall 1967*, by Bronson Price, Report OE-15023-67 (Washington, D.C.: June 1969).

[19] *Library Statistics* . . . note 18 above, *Fall 1968*, by Joel Williams, Report OE-15023-68 (Washington, D.C.: February 1969).

[20] Baumol and Marcus, note 17 above, pp. 17-18.

[21] Ibid., p. 28.

[22] Ibid., p. 29.

[23] Ibid., p. 30.

[24] Frank L. Schick, "Professional Library Manpower," *ALA Bulletin*, 58(4): 315-317 (April 1964).

[25] August C. Bolino, *Supply and Demand Analysis of Manpower Trends in the Library and Information Field, Final Report* (University Park, Md.: Univ. of Maryland School of Library and Information Services, 1969) (ED 038 986).

For an abridged version of this report see August C. Bolino, "Trends in Library Manpower," *Wilson Library Bulletin*, 43(3): 269-278 (November 1968).

Notes to Chapter I cont'd

[26] This section draws heavily for its structure on John C. Chambers, Satinder K. Mullick, and Donald D. Smith, "How to Choose the Right Forecasting Technique," *Harvard Business Review*, 49(4): 45-74 (July-August 1971).

[27] See Jean B. Wellisch, Ruth J. Patrick, Donald V. Black, and Carlos A. Cuadra, *The Public Library and Federal Policy* (Westport, Conn.: Greenwood Press, 1974).

[28] See note 26 above.

[29] See note 24 above.

[30] U.S., Bureau of Labor Statistics, *Library Manpower: A Study of Demand and Supply*, Bulletin No. 1852 (Washington, D.C., 1975).

[31] Roger H. Bezdek, *Long-Range Forecasting of Manpower Requirements: Theory and Applications* (New York: Institute of Electrical and Electronics Engineers, Inc., 1974).

NOTES TO CHAPTER II

[1] Analysis of public library trends in this section is based on the statistics in Table 1 of Appendix I. A number of the time series from that table appear in graphic form in Figure 1 in the text. Definitions of the variables are drawn from *News Notes of California Libraries*, 57 (1) (Winter 1962) and succeeding Winter issues through Winter 1973—the source of statistics on California public libraries used in this monograph.

[2] Henceforth the word "library" will be used in place of "library outlet" to indicate a single public service point of a library system.

[3] Note that on Figure 1 and subsequent figures, graphs plot statistics available at the time of writing.

[4] Thomas Childers and Beth I. Krevitt, "Municipal Funding of Library Services," *American Libraries*, 3 (1): 53-57 (January 1972).

[5] A useful summary of the current financial situation facing public libraries in the United States is given in Jean B. Wellisch, Ruth J. Patrick, Donald V. Black, and Carlos A. Cuadra, *The Public Library and Federal Policy* (Westport, Conn.: Greenwood Press, 1974).

Notes to Chapter II cont'd

[6] See, e.g., *Serrano* v. *Priest* 5 c.3d 584.

[7] Hiring library assistants rather than librarians to fill vacant positions is a major issue, but is not included in this discussion.

[8] *Minimum Standards for Public Library Systems, 1966*, proposed by the Standards Committee and Subcommittees of the Public Library Association and American Library Association (Chicago: American Library Association, 1967).

[9] Douglas Lough Zweizig, "Predicting Amount of Library Use" (Ph.D. dissertation, Syracuse University, 1973).

[10] California, Department of Finance, Population Research Unit, *Population Projections for California Counties, 1975-2020*, Report 74 p-2, Alternative Series D-100, E-O, D-150, C-150 (Sacramento: June 1974).

[11] U.S., Bureau of the Census, *Current Population Reports: Population Estimates and Projections, Projections of the Population of the United States by Age and Sex: 1972 to 2020*, Series P-25, No. 493 (Washington, D.C.: 1972) and U.S., Bureau of the Census, *Current Population Reports: Population Estimates and Projections, Projections of the Population of the United States by Age and Sex: 1970 to 2929.* Series P-25, no. 470 (Washington, D.C.: 1971). Later projections by the Bureau of the Census use different designations. For details see U.S., Bureau of the Census, *Projections of the Population of the United States by Age and Sex, 1975 to 2000, with the Extensions of Total Population to 2025*, Series P-25, no. 541, Advanced Report (Washington, D.C.: February 1975).

[12] See California, Department of Finance, Population Research Unit, *Population Projections for California Counties, 1975-2020*, Report 74 p-2, Alternative Series D-100, E-O, D-150, C-150 (Sacramento: June 1974) for details of other assumptions underlying these projections.

NOTES TO CHAPTER III

[1] The raw data for these graphs appear in Table 5, Appendix 2. Comparable statistics for private schools have just begun to be collected, and are summarized in Appendix Table 6.

[2] In this and subsequent discussions elementary enrollment is defined as including grades kindergarten (k) through 8, and secondary as grades 9 through 12.

Notes to Chapter III cont'd

[3] See Appendix Table 6 for details.

[4] U.S., Office of Education, National Center for Educational Statistics, *Projections of Educational Statistics to 1984-85*, by Kenneth A. Simon and Martin M. Frankel, NCES 76-210 (Washington, D.C.: 1976).

[5] Ibid.

[6] Extensive investigation revealed only that there were 160 private school librarians in 1966-67 and 189 in 1968-69; California, Department of Education, Bureau of Audio-Visual and School Library Education, *Application for School Library Resources Phase One, Title II ESEA (P.L. 89-10), 1969-70* (Sacramento); California, Department of Education, Bureau of Audio-Visual and School Library Education, *Total Data for School Library Resources Phase One, Title II ESEA (P.L. 89-10), 1967-68* (Sacramento).

[7] A detailed regression analysis of public school and school library statistics is presented in Appendix 2, along with details of the equation discussed above.

[8] See Michael D. Cooper, "An Analysis of the Demand for Librarians," *Library Quarterly*, 45(4): 373-404 (October 1975); and U.S., Bureau of Labor Statistics, *Library Manpower: A Study of Demand and Supply*, Bulletin Number 1852 (Washington, D.C.: 1975) for details.

[9] The proportions used in the computation were from the 1970 U.S. Census of Population for California and were tabulated for both public and private schools for males and females; U.S., Bureau of the Census, *Census of Population: 1970; Detailed Characteristics*, Final Report PC (1)-D6, California, Section I (Washington, D.C.: 1972).

NOTES TO CHAPTER IV

[1] Weekly student contact hours are defined as the product of student enrollment and instructional loads.

[2] See Appendix 3 for a statistical analysis of these interrelations as they apply to librarian staffing.

[3] California Community Colleges, Office of the Chancellor, Enrollment Projections: *Analysis in Relation to Community College Capital Outlay Bond Proposal* (Mimeographed, Sacramento: 1974).

Notes to Chapter IV cont'd

[4] Strong statistical interrelationships were found among almost all the variables internal to community college library operations. For example, number of librarians is highly correlated (above 0.95) with volumes held, volumes added, periodicals received, and operating expenditures. While it is useful to know that these relations exist, these variables cannot be used as a basis for projections since they are assumed to be derived from enrollment requirements.

[5] See note 3 above.

[6] The projection of enrollment termed "low" in Table 11 is "Set 1" in the California Community Colleges report; similarly, the "mid-range" projection is "Set 4," and the "high" projection is "Set 6."

[7] Further details on the mid-range projections are given in Office of the Chancellor, note 3 above. In this projection series ". . . the participation rate of males 25-29 years of age is reduced over a six-year period to a level approximating the lowest known rate (fall 1972). To compensate for the effect of male veterans currently in the 30-34 age group the rate of participation is kept at the fall 1974 level over time, even though this rate increased 18% from fall 1972. Rates for other male categories have been held constant at the 1974 level also, with the exception of the 35+ category which is allowed to increase at . . .[one-half the average historical participation rate of growth for this age group]," p. 52.

[8] Doctoral degrees are offered jointly by a CSUC campus and a University of California campus.

[9] California State University and Colleges, Office of the Chancellor, Division of Educational Programs and Resources, *Academic Program and Resource Planning in the California State University and Colleges, 1975-76 through 1979-80* (Los Angeles: April 1975), p. iv.

[10] California, California State University and Colleges, Office of the Chancellor, *Library Development, 1977-78–1981-82: A Plan to Establish and Maintain Adequate Support for Academic Programs of the California State University and Colleges* (Los Angeles: May 1976), Appendix B.

[11] *Academic . . . Planning . . .* note 9 above, see p. 7.

[12] California, California State University and Colleges, Office of the Chancellor, *History of CSUC Library Formulas* (Mimeographed, Los Angeles, 1975); and California, California State University and Colleges, Office of the Chancellor, *Library Development, 1977-78–1981-82: A Plan to Establish and Maintain Adequate Support for Academic Programs of the California State University and Colleges* (Los Angeles: May 1976), Appendix A.

Notes to Chapter IV cont'd

[13]The preceding discussion generalizes from four specific staffing functions used by CSUC. For details of each formula, see "History . . ." note 12 above.

[14] See *Library Development. . .* note 12 above.

[15] For details of the equations, see Appendix 4.

[16] See Table 12 in Appendix 4 for details.

[17] Teacher projections are usually calculated by dividing projected enrollment by a constant student-teacher ratio.

[18] A considerable body of literature on the issue of supply and demand for Ph.D.'s has been developed. This literature is relevant since it analyzes institutional requirements for Ph.D.'s, especially those of universities which are the major employers. An early study of the problem of over-supply was presented by Allan M. Cartter, "Scientific Manpower for 1970-1985," *Science* 172(3979): 132-140 (April 9, 1971), followed by Dael Wolfle and Charles V. Kidd, "The Future Market for Ph.D.'s," *Science* 173(3999): 784-790 (August 27, 1971). More recently, both the National Science Foundation and the U.S. Bureau of Labor Statistics have come to the same conclusion (an oversupply of Ph.D.'s), their views differing principally about the magnitude of the problem; see U.S. National Science Foundation, *Projections of Science and Engineering Doctorate Supply and Utilization, 1980 and 1985*, NSF 76-301 (Washington, D.C.: 1975) and U.S. Bureau of Labor Statistics, *Ph.D. Manpower: Employment Demand, and Supply, 1972-85*, Bulletin 1860 (Washington, D.C.: 1975); also, Gina Bari Kolata, "Projecting the Ph.D. Labor Market: NSF and BLS Disagree," *Science* 191(4225): 363-365 (January 30, 1976).

[19] See Appendix 5 for details.

[20] U.S., Office of Education, National Center for Educational Statistics, *Projections of Educational Statistics to 1984-85*, by Kenneth A. Simon and Martin M. Frankel, NCES 76-210 (Washington, D.C.: 1976).

[21] See Appendix 6 for details.

[22]U.S., Office of Education, National Center for Educational Statistics, note 20 above.

[23] For a discussion of methodological difficulties in projecting independent college and university librarian employment levels, see Appendix 6.

NOTES TO CHAPTER V

[1]U.S., Bureau of Labor Statistics, *Tomorrow's Manpower Needs: Volume I Developing Area Manpower Projections*, Bulletin Number 1606 (Washington, D.C.: February 1969).

[2] Michael D. Cooper, "An Analysis of the Demand for Librarians," *Library Quarterly*, 45(4): 373-404 (October 1975); Sarah Reed, "Library Manpower Planning in the USA," *Libri*, 25(4): 332-347 (1975).

[3] See Cooper, note 2 above.

[4] U.S., Bureau of Labor Statistics, *Tomorrow's Manpower Needs, Supplement No. 4: Estimating Occupational Separations from the Labor Force for States* (Washington, D.C.: U.S. Department of Labor, Bureau of Labor Statistics, 1974).

[5] U.S., Bureau of the Census, *Census of Population: 1970; Detailed Characteristics*, Final Report PC(1)-D6, California, Section 1 (Washington, D.C.: 1972).

[6]Ibid.

[7] U.S., Bureau of Labor Statistics, *Library Manpower: A Study of Demand and Supply*, Bulletin Number 1852 (Washington, D.C.: 1975).

[8]Ibid.

[9]Source: U.S., Department of Labor, *Manpower Report of the President*, Transmitted to the Congress April 1975 (Washington, D.C.: 1975), pp. 56-57.

[10] This yearly change was 0.0001133 for women and -0.0001133 for men. These rates were arrived at by linear interpolation, using the difference between the two years' (1970 and 1985) data points. This methodology is in accord with that suggested in U.S., Bureau of Labor Statistics, *Tomorrow's Manpower Needs: Volume I Developing Area Manpower Projections*, Bulletin Number 1606 (Washington, D.C.: February 1969) and *Tomorrow's Manpower Needs*, note 4 above. Based on the change per year, the 1975 replacement rate for men was computed to be at 0.01773, and for women, 0.06037. The replacement rates were then separately multiplied by the number of females and number of males for each type of library to arrive at the replacement demand for a given year.

Notes to Chapter V cont'd

[11] For example, for the projections based on population series D-100 (Table 20), the number of librarians projected to be employed in 1979 is 2,728. It was assumed that 80 percent of this, or 2,163, are women. Consequently, the remainder, 565, are men. For 1979, the replacement rate for women is expected to be .0607066, and for men, .0173934. Each figure is multiplied by the number of male and female librarians expected to be employed in 1979, indicating that 131 jobs will be created by women leaving the labor force (.0607066 times 2,728) and 10 (.0173934 times 565) by men leaving the labor force. The replacement demand is 141 (131 + 10), and the expansion demand is 45 (the difference between the 1978 employment level (2,683) and the 1979 level (2,728). The total number of jobs for the year is the sum of the two demands, or 186 jobs.

NOTES TO CHAPTER VI

[1] U.S., Bureau of Labor Statistics, *Library Manpower: A Study of Demand and Supply*, Bulletin Number 1852 (Washington, D.C.: 1975).

[2] U.S., Bureau of Labor Statistics, *The U.S. Economy in 1985: A Summary of BLS Projections*, Bulletin 1809 (Washington, D.C.: 1974).

[3] Ibid., p. 3.

[4] Nationwide, the BLS estimates that special librarians are about 15 percent of the total number of librarians; see note 1 above, p. 14. Also note that this number of special librarians represents those not employed in public or college and university libraries, since those in the latter group are already counted in other categories in the demand projections.

[5] U.S., Bureau of Labor Statistics, note 1 above.

Appendices

Appendix 1

REGRESSION ANALYSIS OF CALIFORNIA PUBLIC LIBRARY STATISTICS

This appendix describes the results of an analysis of public library statistics. The data used for the analysis come from App. Table 1, which summarizes public library statistics for the period 1960-1974. In addition, the variables that were considered to be potential external indicators of librarian staffing levels are presented in App. Table 2.

A series of multiple linear regression analyses were performed to determine which of the external variables would furnish the best explanation of the variation in the number of professional librarians employed in public libraries in California each year. The functional relation examined was of the form

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$$

where

Y = number of professional librarians employed

X_1 = California population

X_2 = California total state and local general fund expenditures

X_3 = California local property tax revenue, and

X_4 = California per capita personal income adjusted for inflation.

The a and b_1 are constants.

App. TABLE 1

California Public Library Statistics

	Fiscal year								
	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
California population (in thousands)	15,863	16,366	16,905	17,518	18,021	18,491	18,851	19,234	19,513
Libraries									
Number of systems	164	168	168	167	169	177	175	178	175
Number of libraries	3,952	3,787	3,668	3,555	3,296	3,049	3,009	3,118	3,104
Volumes (in thousands)									
Total held–end of year	22,666	23,740	24,839	25,947	25,948[b]	27,297	28,144	30,514	35,278
Added this year	1,964	2,163	2,287	2,263	2,334	2,454	2,579	2,906	3,118
Circulation (in thousands)									
Books	84,963	89,139	92,110	97,135	99,130	99,728	99,787	104,113	107,147
Other than books	1,423	1,551	1,479	1,690	1,545	2,108	1,890	1,963	2,604
Expenditures (in thousands of $)									
Total salaries	26,256	30,083	33,566	35,878	39,055	42,082	45,409	49,853	56,085
Library materials	6,355	6,740	7,332	7,847	9,389	10,014	10,994	12,304	14,207[c]
Employees									
Total number	7,937	8,494	8,846	9,224	9,711	10,080	10,064	10,679	11,366
FTE professional librarians	1,835	1,867	1,989	2,013	2,067	2,115	2,103	2,240	2,255
FTE nonprofessional librarians	3,972	4,179	4,513	4,723	4,960	5,167	4,881	5,706	5,791

App. TABLE 1 cont'd

	Fiscal year					
	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
California population (in thousands)	19,819	20,025	20,285	20,518[a]	20,730[a]	20,933[a]
Libraries						
Number of systems	174	172	171	169		
Number of libraries	3,306	3,234	3,331	3,565		
Volumes (in thousands)						
Total held—end of year	34,246	36,080	36,936	38,721		
Added this year	3,014	3,166	2,850	1,758		
Circulation (in thousands)						
Books	107,789	113,594	111,156	107,148		
Other than books	3,382	3,811	4,011	4,029		
Expenditures (in thousands of $)						
Total salaries	63,267	69,575	74,993	79,384		
Library materials	14,531	15,875	16,485	17,889		
Employees						
Total number	10,895	11,123	11,344	10,601		9,116
FTE professional librarians	2,351[d]	2,255	2,658	2,692		2,631
FTE nonprofessional librarians	5,872[d]	7,757	8,565	7,165		6,485

Source: Summarized from California, State Library, *News Notes of California Libraries*, 57:1 (Winter 1962) and succeeding winter issues through 1973. Population figures from California, Department of Finance, Population Research Unit, *California Population 1971* (Sacramento: 1971), p. 4. Note that revised population figures for 1970 to 1972, which are used in these tables, were issued separately in an errata sheet.

[a] Population figures for the years 1972-73, 1973-74, 1974-75 from California, Department of Finance, Interdepartmental Research Coordinating Committee, *California Statistical Abstract 1968* and issues through 1972 (Sacramento).

[b] School service collections are not included in the total for 1964-65.

[c] Books, periodicals, and audiovisual materials are included in the total for 1968-69.

[d] From 1969-70 onward, figures for FTE personnel are recorded in the following form: (1) librarians (2) others, rather than as (1) professional or (2) nonprofessional librarians.

App. TABLE 2

California State and Local Direct General Fund Expenditures, Local Property Tax Revenue, and Per Capita Personal Income

Year	Direct general fund expenditures for all functions (in millions of dollars)	Local property tax revenue (in millions of dollars)	Per capita personal income (in dollars)
1960-61	6,920.6	2,302.1	2,710
1961-62	7,311.2	2,467.8	2,795
1962-63	8,155.2	2,681.9	2,902
1963-64	9,089.0	2,995.5	3,003
1964-65	9,688.6	3,146.6	3,146
1965-66	11,036.3	3,563.5	3,268
1966-67	12,470.2	3,935.6	3,472
1967-68	13,139.1	4,145.3	3,663
1968-69	15,099.2	4,628.5	3,969
1969-70	16,782.2	4,997.5	4,236
1970-71	18,530.7	5,747.5	4,505
1971-72	20,051.8	6,427.1	4,693
1972-73	21,082.2	6,872.7	5,017
1973-74	23,392.2	6,825.4	5,491
1974-75			6,032

Source: U.S., Bureau of the Census, *Government Finances in 1960-61*, GF Series, Bureau of the Census, Washington, D.C., 1961, and succeeding yearly issues through 1973-74.
See also, California, Department of Finance, "Per Capita Personal Income, 1950-1974." mimeographed (Sacramento: 1975).

The regression results are summarized in App. Table 3, and the correlation matrix for the variables is presented in App. Table 4.

The single variable regression equations (1, 2, 3, and 4 in App. Table 3) of librarians, with population, total state and local expenditures, property tax revenue, and per capita income had coefficents of determination of .75, .71, .47 and .23, respectively. Property tax revenue and personal income do not appear to be particularly good explanatory variables, whereas population and expenditures do.

When a second variable was added to some of the equations, very little improvement in the coefficient of determination (R^2) was observed. For example, adding the variable X_3 (property tax revenue) to equation (1) kept R^2 at the same level and also kept the multiple correlation coefficient at .87. Adding personal income into equation (1) resulted in an increase in the amount of explained variation by 4 percent (R^2=.79), which is a rather small change.

The regression results indicated that an equation with all four independent variables in it explained 93 percent of the variation in the number of professional librarians (R^2), that the F ratio for the entire equation was significant at the .000 level, and that the multiple correlation coefficient was .96. The problem, however, was that some of the B values were negative and their individual F ratio significance in the equation was low. This multicollinearity is verified by examining the correlation matrix for the variables (App. Table 3). A situation similar to the one above arises when the equation includes X_1, X_2, and X_4 and also X_1, X_3, and X_4. In general, the single variable–population–explained a large part of the variation in professional staff size. The statistical analysis thus confirmed the historical data–that population plays an important role in the determination of staff size.

App. TABLE 3

Regression Summary of California Public Library Statistics

Equation number	Dependent variable: professional librarians	Constant	Independent variable X_1 California population	X_2 Total state and local expenditures	X_3 Local property tax revenue	X_4 Per capita personal income	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom Regression	Residential	F Ratio	Significance
1	Y	-879.144 (-1.545)	$.163 \times 10^{-4}$ (5.455)				.748	.865	1	10	29.76	.000
2	Y	1771.519 (17.827)		$.387 \times 10^{-8}$ (4.932)			.709	.842	1	10	24.32	.001
3	Y	1771.731 (11.011)			$.105 \times 10^{-7}$ (2.953)		.466	.682	1	10	8.72	.014
4	Y	1777.714 (6.705)				.134 (1.714)	.227	.476	1	10	2.94	.117
5	Y	-790.521 (-.974)	$.157 \times 10^{-4}$ (3.189)		$.650 \times 10^{-9}$ (.162)		.749	.866	2	9	13.44	.002
6	Y	-831.235 (-1.528)	$.150 \times 10^{-4}$ (4.974)			$.629 \times 10^{-2}$ (1.406)	.794	.891	2	9	17.32	.001

Note: The t statistic is given in parentheses below each coefficient.

App. TABLE 4

Correlation Matrix for California Public Library Variables

	Professional librarians	California population	Total expenditures	Local property tax revenue
California population	.8651			
Total expenditures	.8418	.7115		
Local property tax revenue	.6825	.7689	.2848	
Per capita personal income	.4764	.3174	.8510	-.2580

Appendix 2

REGRESSION ANALYSIS OF CALIFORNIA SCHOOL AND SCHOOL LIBRARY STATISTICS

The public school and school library statistics used as a basis for the re-regression analysis are given in App. Table 5, and the available information on California private schools is reported in App. Table 6.

The correlation matrix for selected values (App. Table 7) shows that the number of professional librarians employed is highly correlated with all the variables. However, as discussed in Chapter III, many of the variables are obviously interrelated. The basic causal chain is believed to start with increased enrollment and to lead to additional teachers, librarians and schools.

Several single variable regression equations were analyzed for their ability to explain variations in the number of librarians employed. As is shown in App. Table 8, all the equations provided a good fit to the data. In the equations the following definitions hold:

Y = number of public school librarians employed

X_1 = number of schools

X_2 = elementary school enrollment

X_3 = secondary school enrollment

Equation 1, with only number of schools, indicates that historically California has added about six librarians for every ten schools built (b_1=.6341). With number of schools alone as the predictor, only 4 percent of the variation in librarian employment remains unexplained.

Confirming the evidence that there are more librarians in secondary than in elementary schools, equation 4 shows that the staffing in the past has resulted in approximately one librarian being added for every 1,000 secondary

school students (b_2=.0012). Only about three librarians per 10,000 elementary school students has been the pattern (b_1=.00033).

While both equations 2 and 3 explain a large proportion of total variation in number of librarians, it was felt that neither of them was complete by itself in explaining the process. Equation 4 was selected for use in predicting future employment levels for this and the other reasons explained above and in Chapter III.

App. TABLE 5

California Public School and School Library Statistics

	Fiscal year								
	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Schools									
No. of districts[b]	1,656	1,609[l]	1,572[l]	1,535	1,489	1,357	1,189	1,109	1,094
No. of schools[j]	5,722	5,921	6,072	6,199	6,337	6,507	6,580	6,735[b]	6,859[b]
Staff									
No. of elementary teachers (FTE)[j]	73,412	76,879	80,890	84,702	88,982	92,914	96,738	104,279[b]	111,701[b]
No. of secondary teachers (FTE)[j]	44,088	46,643	50,539	54,426	58,512	61,282	65,682	66,823[b]	71,914[b]
No. of librarians (FTE)[f]	985	1,102	1,118	1,237	1,345	1,544	1,612	1,725	1,747
Students (in thousands)									
Total elementary enrollment (Fall)[k]	2,519	2,621	2,720	2,824	2,928	3,011	3,087	3,146	3,186
Total secondary enrollment (Fall)[k]	785	851	932	1,014	1,063	1,111	1,148	1,185	1,226
Average daily attendance[f]	3,196	3,380	3,559	3,755	3,947	4,116	4,255	4,391	4,561
Median salaries (in dollars)									
Elementary teacher[j]		6,308	6,538	6,781	7,100	7,439	7,813	8,309[b]	8,880[b]
Secondary teacher[j]		7,168	7,421	7,697	8,087	8,504	8,922	9,569[b]	10,093[b]
Librarian[j]	7,581	7,858	8,112	8,535	9,114	9,523	9,954	10,483	10,964
Expenditures (in thousands)									
General fund for books	8,417[e]	8,805[e]	9,666[e]	10,914[e]	12,870[e]		13,095[g]	13,424[b]	13,169[b]
Total for library resources						18,944[h]	20,963[h]	21,195[c]	22,938[d]

	Fiscal year					
	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
Schools						
No. of districts[b]	1,082	1,070	1,069	1,067	1,054	
No. of schools[j]	6,884[b]	6,968[a]	6,981[b]	7,019	7,037	
Staff						
No. of elementary teachers (FTE)[j]	113,080	114,554[b]	114,069	113,277	113,733	112,234
No. of secondary teachers (FTE)[j]	74,033	75,080[b]	76,986	74,275	74,108	75,218
No. of librarians (FTE)[f]	1,621	1,705	1,789	1,781	1,772	1,802
Students (in thousands)						
Total elementary enrollment (Fall)[k]	3,178	3,168	3,108	3,056	3,001	2,960
Total secondary enrollment (Fall)[k]	1,263	1,289	1,316	1,321	1,328	1,335
Average daily attendance[f]	4,596	4,645	4,713			
Median salaries (in dollars)						
Elementary teacher[j]	9,598	10,303[b]	10,784	11,668	12,493	13,746
Secondary teacher[j]	10,775	11,611[b]	12,078	12,688	13,400	14,595
Librarian[j]	11,680	12,495[l]	13,309	13,876	14,789	16,221
Expenditures (in thousands)						
General fund for books	11,609[b]	13,044[b]	12,340[b]			
Total for library resources	22,252[i]					

(See notes, p. 102.)

Notes to App. TABLE 5

[a]U.S., Office of Education, National Center for Educational Statistics, *Digest of Educational Statistics.*

[b]California, Department of Education, *California Public Schools: Selected Statistics.*

[c]U.S., Office of Education, *Second Annual Report, Fiscal Year 1967: Title II Elementary and Secondary Education Act of 1965.*

[d]U.S., Office of Education, *Third Annual Report, Fiscal Year 1968: Title II Elementary and Secondary Education Act of 1965.*

[e]California, Department of Education, *School Libraries in California.*

[f]Figures for numbers of librarians and average daily attendance for all years are from California, Department of Finance, *California Statistical Abstract* 1960-61–1974-75.

[g]U.S., Office of Education, National Center for Educational Statistics. *Statistics of State School Systems, 1967-68.*

[h]California, Department of Education, Bureau of Audio-Visual and School Library Education, *Total Data for School Library Resources Phase One, Title II ESEA.*

[i]California, Department of Education, Bureau of Audio-Visual and School Library Education, *Application for School Library Resources Phase One, Title II ESEA.*

[j]Figures for all years, with the exception of those noted separately, are from California, Department of Education, *Salaries of Certificated Employees in California Public Schools.*

[k]Figures provided by the Population Research Unit of the California Department of Finance, Budget Division.

[l]In the absence of published date, these figures were estimated by linear interpolation.

App. TABLE 6

California Private School Statistics

	Fiscal year						
	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
Schools							
No. of schools			1,839	2,008	2,303	2,407	2,495
Staff							
No. of teachers				21,815			
Full time					19,169	19,482	20,451
Part time					4,971	5,914	5,795
Students							
Elementary enrollment	324,931	322,167	321,395	315,377	315,302	316,670	315,191
Secondary enrollment	98,943	97,941	94,674	94,044	94,900	95,165	97,153

App. TABLE 7

Correlation Matrix for California Public School and School Library Variables

	No. of professional librarians	No. of schools	No. of school districts	Elementary school enrollment	Secondary school enrollment	No. of elementary teachers
No. of schools	.9781					
No. of school districts	-.9774	-.9768				
Elementary school enrollment	.8942	.8725	-.8798			
Secondary school enrollment	.9690	.9960	-.9620	.8581		
No. of elementary teachers	.9587	.9880	-.9803	.8733	.9768	
No. of secondary teachers	.9689	.9925	-.9775	.8876	.9895	.9918

App. TABLE 8

Regression Analysis of California Public School and School Library Statistics

Equation no.	Dependent variable: professional librarians	Constant	Independent variable X_1 Number of schools	X_2 Elementary school enrollment	X_3 Secondary school enrollment	R^2 Coefficient of determination	Multiple correlation coefficient	Degrees of freedom: Regression	Degrees of freedom: Residential	F Ratio	Significance
1	Y	-2653.583 (-10.743)	.634 (16.955)			.956	.978	1	13	287.49	.000
2	Y	-2127.901 (-4.184)		$.123 \times 10^{-3}$ (7.201)		.799	.894	1	13	51.86	.000
3	Y	226.544 (-1.806)			$.153 \times 10^{-3}$ (14.135)	.939	.969	1	13	199.79	.000
4	Y	-829.397 (-2.540)		$.328 \times 10^{-4}$ (1.969)	$.121 \times 10^{-3}$ (6.332)	.954	.977	2	12	123.95	.000

Note: The t statistic is given below each coefficient in parenthesis.

Appendix 3

REGRESSION ANALYSIS OF CALIFORNIA COMMUNITY COLLEGES AND LIBRARY STATISTICS

The data presented in App. Table 9 were used as a basis for the statistical analysis of community colleges and library trends. Chapter IV discussed the rationale for basing projections of librarian employment levels on future enrollment levels. The statistical evidence supporting this decision is given in App. Table 10.

In App. Table 10 the results of several simple and multiple linear regression analyses are presented. Equation 1 in the table was used to project future librarian employment levels. The equation uses projections of future enrollment in community colleges (X_1) to make staffing projections. Ninety percent (R^2) of the variation in number of community college librarians employed can be explained by this equation. In addition, the correlation between the two variables is high (.949) and the F statistic is significant at the .000 level.

Equations 2, 3, and 4 of App. Table 10 display the results of the regression of professional librarians with weekly student contact hours, FTE number of faculty, and total institutional expenditures. All three of the equations have an R^2 value greater than equation 1. Nevertheless, the important relationship is that of providing library service to students, and thus equation 1 is correct even though the others have a higher coefficient of determination.

Equations 5 through 8 in App. Table 10 give the results of multiple linear regression of the independent variables with number of librarians employed. In equation 5, the coefficients of the independent variables show that approximately one librarian is added for every 5,400 students (b_1=.000184) and every 41 faculty (b_2=.0242).

For equation 6, multicollinearity exists between weekly student contact hours and total institutional expenditures, and a similar situation exists in equation 8.

App. TABLE 9

California Community Colleges: Library and Institutional Statistics

	Fiscal year						
	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
Students (in thousands)							
Total enrollment[f]	340	305	337	336	411	459[c]	487
FTE enrollment[c]	100	113	121	128	152	192	202
Weekly student contact hours[e]	2,751	3,041	3,245	3,711	4,191	4,855	5,159
Staff							
Total teachers[d]	5,150	5,542	6,074	6,464	7,294	8,286	9,112
FTE no. of librarians	122	167	148	159	179[b]	199	260
FTE no. of nonprofessional library staff	122	176	175	207	238[b]	268	413
Books and periodicals							
Total volumes held—end of year (in thousands)	1,286	1,476	1,393	1,532	1,702[b]	1,871	2,361
Volumes added this year (in thousands)	101	154	142	178	230[b]	283	267
No. of periodicals received	11,260	16,326	15,850	17,948	19,256[b]	20,565	31,798
Expenditures (in thousands of dollars)							
Total institutional[g]	56,299	62,256	76,292	89,545	105,719	140,147	171,963
Total library operating	2,214	3,253	3,231	4,055	4,811[b]	5,568	7,046
For books and library materials	565	846	833	1,076	1,271[b]	1,465	1,986
Salaries (professional librarian)	1,395	2,046	1,986	2,421	2,885[b]	3,350	4,154
Wages (nonprofessional library staff)	144	211	219	250	280[b]	310	460

App. TABLE 9 cont'd

	Fiscal year							
	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
Students (in thousands)								
Total enrollment[f]	522	568	603[c]	652[c]	695[c]	922[c]	1,009[c]	1,135
FTE enrollment[c]	217	234	259	283	296	284	306	
Weekly student contact hours[e]	5,691	6,318	7,009	7,805	8,331	8,653	9,194	10,491
Staff								
Total teachers[d]	9,650	10,438	11,322	11,775	12,396	12,651	12,993	13,591
FTE no. of librarians	242	302	332[b]	362				479[a]
FTE no. of nonprofessional library staff	342	454	503[b]	552				806[a]
Books and periodicals								
Total volumes held–end of year (in thousands)	2,129	3,106	3,447[b]	3,788				4,844[a]
Volumes added this year (in thousands)	279	333	379[b]	426				347[a]
No. of periodicals received	37,864	44,635	49,683	54,732				
Expenditures (in thousands of dollars)								
Total institutional[g]	237,533	282,716	334,079	451,027	509,913	551,943	625,407	743,472
Total library operating	7,450	10,345	12,093[b]	13,840				27,146[a]
For books and library materials	2,244	3,059	3,033[b]	3,008				
Salaries (professional librarian)	4,214	6,274	7,450[b]	8,625				9,204[a]
Wages (nonprofessional library staff)	612	623	766	909				7,195[a]

Notes to App. TABLE 9

Source: U.S. Office of Education, National Center for Educational Statistics, *Library Statistics of Colleges and Universities. Part 1: Institutional Data.* 1960-61, 61-62, 62-63, 66-67, 67-68, 70-71.

[a]Figures supplied by California Postsecondary Education Commission from the U.S., Department of Health, Education, and Welfare, Education Division, *Higher Education General Information Survey* and *Library General Information Survey.*

[b]These figures, in the absence of published data, have been estimated by linear interpolation.

[c]California, Department of Finance, *California Statistical Abstract.* 1960 and yearly thereafter.

[d]Figures for 1960-69 from State of California, Department of Education, Division of School Apportionments and Reports; those for 1971-72 and 1974-75 from California Teachers Association, *Teacher Supply and Demand Study.*

[e]Figures supplied by the Office of California Community Colleges, Sacramento.

[f]California, Department of Finance, *Report of Total and Full-time Enrollments in California Institutions of Higher Education.*

[g]California, Department of Education, *California Public Schools: Selected Statistics.* 1967-68 and yearly thereafter.

App. TABLE 10

Regression Summary of Some Institutional Characteristics of California Community Colleges and Community College Library Statistics

Equation number	Dependent variable: professional librarians	Constant	Independent variable X_1 Total community college enrollment	X_2 Weekly student contact hours	X_3 FTE no. of faculty	X_4 Total institutional expenditures	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom Regression	Residential	F Ratio	Significance
1	Y	17.979 (.688)	$.444x10^{-4}$ (9.477)				.900	.949	1	10	89.81	.000
2	Y	-1.197 (.094)		$.461x10^{-5}$ (20.846)			.978	.989	1	10	434.57	.000
3	Y	-86.176 (-3.212)			.038 (12.915)		.943	.971	1	10	166.81	.000
4	Y	129.330 (11.230)				$.508x10^{-7}$ (13.285)	.946	.973	1	10	176.50	.000
5	Y	-59.794 (-2.799)	$.184x10^{-4}$ (3.116)		$.242x10^{-2}$ (4.914)		.973	.986	2	9	160.92	.000

App. TABLE 10 cont'd

Equation number	Dependent variable: professional librarians	Constant	Independent variable X_1 Total community college enrollment	X_2 Weekly student contact hours	X_3 FTE no. of faculty	X_4 Total institutional expenditures	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom Regression	Residential	F Ratio	Significance
6	Y	7.155 (.203)		$.431 \times 10^{-5}$ (3.551)		$.348 \times 10^{-8}$ (.256)	.978	.989	2	9	197.01	.000
7	Y	15.053 (.527)			$.194 \times 10^{-2}$ (4.135)	$.269 \times 10^{-7}$ (4.305)	.982	.991	2	9	238.88	.000
8	Y	22.046 (.482)	$-.240 \times 10^{-5}$ (-.203)		$.193 \times 10^{-3}$ (3.856)	$.297 \times 10^{-7}$ (1.957)	.982	.991	3	8	142.30	.000

Legend:

Y = number of community college librarians employed
X_1 = total community college enrollment
X_2 = weekly student contact hours
X_3 = FTE number of community college faculty
X_4 = total institutional expenditures
( ) = t statistic

Appendix 4

REGRESSION ANALYSIS OF CSUC INSTITUTIONAL AND LIBRARY STATISTICS

Time series data, upon which the regression analysis of the CSUC system were based, are presented in App. Table 11. The regression results are given in App. Table 12.

The equation used to predict future employment levels of librarians was number 1 in App. Table 12. This equation shows that historically one librarian was added to the staff for every 1,200 students (b_1=.821 X 10^{-4}). The projections assume that this relationship will continue in the future. The equation has a coefficient of determination of .914, and the correlation between the independent variable–enrollment– and the dependent variable–number of librarians–is 0.956.

Two other external variables were analyzed as potential predictors of employment. They are number of teachers and expenditures by the system. Equation 2, with number of teachers as the independent variable explained about one percent more of the variation in employment level than did the equation with number of students as the independent variable. Nevertheless, since staffing in libraries is related to enrollment, there is a stronger theoretical justification for using students in the predictor equation.

Equation 4 in App. Table 12 gives the regression results when both enrollment and number of teachers are included. Multicollinearity exists here between the variables, students and teachers, and the coefficient of the enrollment variable is negative. Moreover, the F ratio for the variable is only significant at the .714 level. Other combinations of variables in the equation (5, 6, and 7) all suffer from multicollinearity problems.

App. TABLE 11

California State University and Colleges: Library and Institutional Statistics

	Fiscal year							
	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
Students								
FTE enrollment[e]	56,480	64,090	71,502	80,188	92,471	116,362	129,441	143,627
Staff								
FTE no. of teachers[f]	3,822[a]	4,644[a]	5,154	5,877	6,653	7,346	8,060	9,305
FTE no. of librarians[c]	287	319	342	351	342	333	362	353
FTE no. of nonprofessional library staff[c]	214	250	308	354	404	453	439	893[c]
Books and periodicals								
Total volumes held--end of year (in thousands)	1,583	1,883	2,000	2,343	2,787[a]	3,231	3,663	4,060
Volumes added this year (in thousands)	191	252	280	299	307[a]	315	502	476
No. of periodicals received	17,351	20,365	24,204	26,902	27,391[a]	27,881	34,718	41,279
Expenditures (in thousands of dollars)								
Total institutional	70,014[g]	79,975[g]	92,262[g]	105,347[g]	141,323[h]	170,316[h]	204,951[h]	243,426[h]
Total library operating	4,399	5,391	6,955	7,649	8,890[a]	10,131	13,764	14,396
For books and library materials	1,111	1,414	2,071	1,987	2,435[a]	2,882	4,149	4,685
Salaries (professional librarians)	2,646	3,152	3,877	4,248	4,625[a]	5,002	5,669	6,970
Wages (nonprofessional library staff)	421	479	595	661	715[a]	769	1,184	1,290

App. TABLE 11 cont'd

	Fiscal year						
	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
Students							
FTE enrollment[e]	162,438	181,245	197,454	204,224	213,947	218,075	221,510
Staff							
FTE no. of teachers[f]	10,366[a]	11,427	12,488	12,575	12,781	13,068	12,973
FTE no. of librarians[c]	392[c]	425[c]	417[d]	443[c]	441[c]	444[c]	440[c]
FTE no. of nonprofessional library staff[c]	1,188[c]	1,289[c]	1,038[d]	1,146[c]	1,181[c]	1,207[c]	1,240[c]
Books and periodicals							
Total volumes held—end of year (in thousands)	4,475	5,188	5,644	6,221	6,933	7,374	6,719[b]
Volumes added this year (in thousands)	493	796	572	657	654	562	440[b]
No. of periodicals received	50,882	53,426	57,919	65,224	68,759	70,776	
Expenditures (in thousands of dollars)							
Total institutional	298,360[h]	356,947[h]	390,927[h]	405,306[h]	472,567[h]	529,246[h]	
Total library operating	19,719	23,814	21,161	20,275	24,148	26,856	26,151[b]
For books and library materials	6,713	6,329[a]	5,946				
Salaries (professional librarians)	8,839	9,250[a]	9,661				6,224[b]
Wages (nonprofessional library staff)	1,857	1,748[a]	1,638				5,961[b]

Notes to App. TABLE 11

Source: U.S., Office of Education, National Center for Educational Statistics, *Library Statistics of Colleges and Universities, Part 1: Institutional Data*. 1960-61, 61-62, 62-63, 66-67, 67-68, 70-71.

[a]These figures, in the absence of published data, were estimated by linear interpolation.

[b]Figures supplied by the California Postsecondary Education Commission from U.S., Department of Health, Education, and Welfare, Education Division, *Higher Education General Information Survey*, and *Library General Information Survey*.

[c]Figures for 1967-68 to 1974-75 are taken from: California, Department of Finance, *Budget*.

[d]Vacant positions not included in the total.

[e]California, Department of Finance, *California Statistical Abstract*, 1960 and subsequent years.

[f]For the years 1960-62 and 1968-69, figures for full-time faculty were provided by the California State Universities and Colleges, Office of the Chancellor. Figures for part-time faculty were estimated in order to arrive at totals. For the years 1963-1967, full-time faculty figures are from the Office of the Chancellor, part-time figures are from: California, Coordinating Council for Higher Education, *Annual Report on Faculty Salaries*, 1962 and subsequent years. Figures for full-time and part-time faculty for the years 1970-74 are from the Office of the Chancellor.

[g]California, Department of Finance, *Budget*.

[h]California State Colleges and Universities, *Statistical Abstract*.

App. TABLE 12

Regression Summary of California State University and Colleges: Institutional and Library Statistics

Equation number	Dependent variable: professional librarians	Constant	Independent variable X_1 FTE number of students	Independent variable X_2 FTE number of teachers	Independent variable X_3 General fund expenditures	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom Regression	Degree of freedom Residual	F Ratio	Significance
1	Y	261.429	$.821 \times 10^{-4}$			.914	.956	1	13	137.96	.000
		(24.116)	(11.746)								
2	Y	243.541		$.149 \times 10^{-2}$		.926	.962	1	13	161.50	.000
		(21.470)		(12.708)							
3	Y	301.224			$.350 \times 10^{-7}$	.838	.916	1	13	67.32	.000
		(27.255)			(8.205)						
4	Y	237.595	$-.295 \times 10^{-4}$	$.202 \times 10^{-2}$		.926	.962	2	12	75.49	.000
		(12.060)	(-.376)	(1.426)							

App. TABLE 12 cont'd

Equation number	Dependent variable: professional librarians	Constant	Independent variable X_1 FTE number of students	X_2 FTE number of teachers	X_3 General fund expenditures	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom: Regression	Residual	F Ratio	Significance
5	Y	264.447	$.743 \times 10^{-4}$		$.365 \times 10^{-8}$	.915	.956	2	12	64.44	.000
		(18.945)	(3.287)		(.363)						
6	Y	250.804		$.126 \times 10^{-2}$	$.605 \times 10^{-8}$	.929	.964	2	12	78.43	.000
		(16.760)		(3.915)	(.762)						
7	Y	235.424	$-.132 \times 10^{-3}$	$.328 \times 10^{-2}$	$.154 \times 10^{-7}$	.938	.969	3	11	55.56	.000
		(12.438)	(-1.275)	(2.033)	(1.443)						

Legend:

Y = number of California State University and Colleges' librarians employed
X_1 = FTE enrollment in CSUC system
X_2 = FTE number of teachers in CSUC system
X_3 = general fund expenditures (in dollars) by system
( ) = t statistic

Appendix 5

REGRESSION ANALYSIS OF UC INSTITUTIONAL AND LIBRARY STATISTICS

Multiple linear regression analysis of the data presented in App. Table 13 was performed for selected combinations of independent variables, and the results of the analysis are given in App. Table 14.

Equations 1, 2, and 3 in App. Table 14 involve only a single variable: number of students, number of faculty, and institutional expenditure, respectively. Equations 4, 5, and 6 involve two variables each, and equation 7 includes all three.

The only equation that is relatively low in explanatory power is number 3, with libraries as a function of total institutional expenditure. Equation 1, with enrollment only, has an R^2 of .63; equation 2 has an R^2 of .77. When both variables are combined in one equation (number 4), the R^2 increases to .87 and the multiple correlation increases to .93. Equation 4 was used as the basis for predicting future librarian demand.

App. TABLE 13

University of California: Library and Institutional Statistics

	Fiscal year							
	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
Students								
FTE enrollment[c]	41,764	45,861	49,423	54,871	61,318	68,576	73,900	81,183
Staff								
FTE no. of faculty[c]	2,716	2,909	3,255	3,461	3,922	4,741	5,129	5,256
FTE no. of librarians	306	351	367	392	421[a]	450	465	589[a]
FTE no. of nonprofessional library staff	409	487	523	568	622[a]	676	818	923[a]
Books and periodicals								
Total volumes held–end of year (in thousands)	4,912	5,279	5,770	6,233	6,782[a]	7,331	8,361	9,000
Volumes added this year (in thousands)	287	379	505	528	553[a]	578	701	783
No. of periodicals received (in thousands)	68	75	87	100	113[a]	125	80	158
Expenditures (in thousands of dollars)								
Total institutional[d]	192,839	217,220	253,382	291,329	295,018	351,839	419,896	521,661
Total library operating	7,658	9,321	10,883	12,502	13,862[a]	15,222	18,235	21,693
For books and library materials	2,142	2,911	3,644	4,474	4,764[a]	5,054	5,989	7,145
Salaries (professional librarians)	3,926	4,474	4,980	5,573	6,389[a]	7,024	8,173	9,486
Wages (nonprofessional library staff)	797	1,035	1,157	1,250	1,302[a]	1,354	2,168	2,578

App. TABLE 13 cont'd

	Fiscal year						
	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
Students							
FTE enrollment[c]	84,281	91,650	93,701	93,142	96,917	99,487	105,535
Staff							
FTE no. of faculty[c]	5,418	5,610	5,746	5,651	5,680	5,749	5,970
FTE no. of librarians	614[b]	594[a]	575	507[c]	497[c]	495[c]	520[c]
FTE no. of nonprofessional library staff	1,028	1,074[a]	1,120	1,055[c]	1,555[c]	1,585[c]	1,639[c]
Books and periodicals							
Total volumes held—end of year (in thousands)	9,881	10,648	11,415	12,080[c]	12,768[c]	13,311[c]	13,978[c]
Volumes added this year (in thousands)	813	793	773	734[c]	604[c]	627[c]	667[c]
No. of periodicals received (in thousands)	199	201[a]	203	248	255[c]	262[c]	268[c]
Expenditures (in thousands of dollars)							
Total institutional[d]	591,659	678,864	712,146	743,217	852,231	976,119	1,147,999
Total library operating	25,305	27,140[a]	28,975	28,047[c]	30,998[c]	34,431[c]	40,598[c]
For books and library materials	7,880	8,083[a]	8,287	5,755[c]	6,070[c]	6,471[c]	7,115[c]
Salaries (professional librarians)	11,648	13,264[a]	14,880	13,682[c]	15,162[c]	16,946[c]	20,054[c]
Wages (nonprofessional library staff)	2,827	2,616[a]	2,406	2,835[c]	3,189[c]	3,680[c]	4,196[c]

Notes to App. TABLE 13

Source: U.S., Office of Education, National Center for Educational Statistics, *Library Statistics of Colleges and Universities, Part 1: Institutional Data*, 1960-61, 61-62, 62-63, 66-67, 67-68, 70-71.

[a]These figures, in the absence of published data, were estimated by linear interpolation.

[b]Includes 47.5 FTE listed as other professional library staff.

[c]Figures for all categories supplied by Office of Budgetary Planning, University of California. Figures for FTE faculty are those budgeted, rather than actual.

[d]Regents of the University of California, *Financial Report*, 1960-61 to 1974-75.

App. TABLE 14

Regression Summary of University of California Institutional and Library Statistics

Equation number	Dependent variable: professional librarians	Constant	Independent variable X_1 FTE number of students	Independent variable X_2 FTE number of faculty	Independent variable X_3 Total institutional expenditures	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom: Regression	Degree of freedom: Residual	F Ratio	Significance
1	Y	204.447 (3.351)	$.366 \times 10^{-3}$ (4.724)			.632	.795	1	13	22.31	.000
2	Y	131.011 (2.419)		$.741 \times 10^{-2}$ (6.672)		.774	.880	1	13	44.52	.000
3	Y	373.322 (8.254)			$.199 \times 10^{-7}$ (2.727)	.364	.603	1	13	7.436	.017
4	Y	73.154 (1.531)	$-.657 \times 10^{-3}$ (-2.879)	.192 (4.587)		.866	.931	2	12	38.88	.000
5	Y	-18.761 (-.286)	$.101 \times 10^{-2}$ (6.370)		-489×10^{-7} (-4.293)	.855	.925	2	12	35.33	.000
6	Y	23.161 (.435)		.122 (7.127)	$-.215 \times 10^{-7}$ (-3.211)	.878	.937	2	12	43.36	.000
7	Y	21.580 (.315)	$.274 \times 10^{-4}$ ($.397 \times 10^{-2}$)	.119 (1.463)	$-.223 \times 10^{-7}$ (-1.049)	.878	.937	3	11	26.50	.000

Appendix 6

REGRESSION ANALYSIS OF CALIFORNIA INDEPENDENT COLLEGES AND UNIVERSITIES INSTITUTIONAL AND LIBRARY STATISTICS

The projections of the number of independent college and university librarians in California were considerably hampered by lack of adequate data. App. Table 15 presents the available figures. The lack of information for 1971-74 is particularly unfortunate, since in almost every other sector major reversals of longstanding trends occurred during this period. As a result of missing data in the later years, the regression equations (App. Table 16) are more heavily weighted by earlier rather than later observations, and the trend lines are biased. This bias can be observed in Figure 11, where the expected values of equation 1 (App. Table 16) are quite far from the observed values from 1970 onward.

The methodology previously used to make projections was changed to handle this divergence. In the previous analysis, the predicted and observed levels were closely correlated, and projected values of all employment series were continued from the points where the predicted (rather than the observed) time series stopped. This method was not followed for the independent librarian projections because of the bias in the trend line caused by lack of historical data. Instead, the three projection series were adjusted to begin at the 1974-1975 observed employment level. For example, when the steady state enrollment figures in text Table 17 for 1975-76 (91,196) are substituted into equation 1 of App. Table 16, the projected number of librarians for 1975-76 and succeeding years to 1985-86 should be 578. This figure was reduced to 434 (the 1974-75 observed level) as seen in text Table 18, to compensate for the trend divergence.

The projections based on U.S. enrollment were similarly adjusted. The 1975-76 enrollment projection of 100,637 (text Table 17) results in an employment of 663 librarians, using equation 1 of App. Table 16. This was reduced to 434, and each succeeding employment level was reduced by 229 (from 663 to 434). An adjustment of 250 (from 684 to 434) was also made for the third set of projections.

Lack of time series data on the number of teachers constituted a further problem. App. Table 16 presents regression results from the use of two independent variables only: enrollment and institutional expenditures. Equation 1 in App. Table 16 shows the results of a regression of enrollment with librarians,

and equation 2 the results of expenditures with librarians. The final equation has both variables in it. Enrollment explains 80 percent of the variation in the number of librarians (R^2=.805) and expenditures explain 51 percent (R^2=.511). When both variables are combined into one equation there is essentially no improvement in the explanatory power of the equation or in the correlation coefficient.

Equation 1 was used to project employment levels to 1985-86. While this equation has a reasonable coefficient of determination, the estimates derived from it must be treated with greater caution than other projections in this monograph, because of the lack of adequate data upon which to base this historical analysis.

App. TABLE 15

Independent Colleges and Universities in California: Library and Institutional Statistics

	Fiscal year							
	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
Students								
Total enrollment	75,967	81,196[c]	85,199	90,986	97,161	104,855	107,140	105,700
FTE enrollment[c]	54,237	57,220	61,234	65,797	69,979	77,453	80,210	78,845
Staff								
FTE no. of librarians	290	307	304	329	348[a]	366	491	488
FTE no. of nonprofessional library staff	294	329	343	351	451[a]	550	686	429
Books and periodicals								
Total volumes held—end of year (in thousands)	5,944	6,857	7,156	6,956	7,035[a]	7,115	8,760	8,891
Volumes added this year (in thousands)	327	325	428	396	443[a]	490	624	654
No. of periodicals received (in thousands)	55	58	37	63	96[a]	128	272	130
Expenditures (in thousands of dollars)								
Total institutional				438,930	586,569[a]	734,207	631,499	640,031
Total library operating	4,632	3,762	6,070	6,260	7,223[a]	8,189	10,513	11,959
For books and library materials	1,317	1,474	1,765	1,968	2,379[a]	2,790	3,541	3939
Salaries (professional librarians)	2,328	2,780	3,134	3,444	4,094[a]	4,744	5,404	6,065
Wages (nonprofessional library staff)	466	535	540	556	638[a]	719	818	917

App. TABLE 15 cont'd

	Fiscal year						
	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75
Students							
Total enrollment	106,000	114,583	117,891	117,787	125,575		
FTE enrollment[c]	80,000	83,874	88,140	89,938	96,389	91,196	
Staff							
FTE no. of librarians	531	524[a]	517				434[b]
FTE no. of nonprofessional library staff	193	207[a]	221				526[b]
Books and periodicals							
Total volumes held–end of year (in thousands)	9,484	10,055[a]	10,627				8,687[b]
Volumes added this year (in thousands)	839	759[a]	679				409[b]
No. of periodicals received (in thousands)	311	211[a]	110				
Expenditures (in thousands of dollars)							
Total institutional	633,480	728,213	774,900	865,658			
Total library operating	11,581	12,997[a]	14,414				17,187[b]
For books and library materials	4,241	4,917[a]	5,593				
Salaries (professional librarians)	6,923	8,204[a]	9,485				5,282[b]
Wages (nonprofessional library staff)	1,014	1,197[a]	1,381				3,347[b]

Notes to App. TABLE 15

Source: U.S., Office of Education, National Center for Educational Statistics, *Library Statistics of Colleges and Universities, Part 1: Institutional Data*, 1960-61 and certain subsequent years.

[a]These figures, in the absence of published data, were estimated by linear interpolation.

[b]Figures supplied by the California Postsecondary Education Commission from U.S., Department of Health, Education, and Welfare, Education Division, *Higher Education General Information Survey* and *Library General Information Survey*.

[c]California, Department of Finance, *California Statistical Abstract*, 1960, and each succeeding year.

App. TABLE 16

Regression Summary of California Independent Colleges and Universities: Institutional and Library Statistics

Equation number	Dependent variable: professional librarians	Constant	Independent variable: FTE number of students	Independent variable: Total institutional expenditures	R^2 Coefficient of determination	Multiple correlation coefficient	Degree of freedom: Regression	Degree of freedom: Residual	F Ratio	Significance
1	Y	-251.568	$.909 \times 10^{-3}$		.805	.897	1	7	28.94	.001
		(-2.031)	(5.379)							
2	Y	34.854		$.559 \times 10^{-7}$	.511	.715	1	7	7.30	.031
		(.248)		(2.702)						
3	Y	-248.827	$.849 \times 10^{-3}$	$.614 \times 10^{-8}$	.808	.899	2	6	12.61	.007
		(-1.867)	(3.046)	(.285)						

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