PRODUCTION NOTE

University of Illinois at Urbana-Champaign Library
Considerable confusion exists even among librarians as to just what constitutes a large library and what constitutes a small library. In the public library field this problem is especially troublesome. Perhaps the most universally accepted definition of public library size is keyed to population served. The familiar and obvious difficulty with this definition is that classification by size of population served does not consider variations in public library service which exist from one city to another.

As a means of overcoming this problem some have suggested that volumes in the collection be used as the guide to size. But this approach, too, is associated with important and by now familiar difficulties. Size of collection does not bear a necessarily close relation to usefulness of collection. Libraries provide many services not directly associated with the number of volumes in a collection. And other measures of library size (number on the staff, size of budget, and the like) do not bear a necessarily close relationship to number of volumes in a given collection.

In the abstract, confusion over an appropriate definition of library size might be expected to lead to distrust, misuse, and lack of use of relevant statistics. And, in accordance with this hypothesis, it seems evident that public library statistics, although quite complete and statistically reliable, are not being properly or completely utilized.

*The authors are indebted to Carlton Allen, undergraduate assistant in the Department of Economics at Florida State University, for his assistance in making many of the necessary statistical computations, and to Professor Harry Dewey, now of the University of Maryland, for his helpful suggestions regarding the manuscript itself.
Perhaps no clearer manifestation of this point exists than the current and widely accepted doctrine among librarians that quantitative measures of library service are of relatively little importance, that what matters is the qualitative aspects of performance. However, in order to make almost any useful comparison or evaluation, it is necessary to set the stage with a quantitative reference or framework within which qualitative evaluations may be made. This is true almost regardless of the subject under consideration.

Clearly, numbers alone are not enough. It would be foolish indeed to contend that a nation’s economic growth is sufficiently measured by the dollar increase in Gross National Product. Equally foolish, to take another example, would be the contention that a child’s maturity can be measured adequately by reference to his chronological age. Measures such as these are too gross, they need qualification; but such qualification is most usefully expressed in numbers. Certainly in the field of librarianship much could be gained from increased refinement of the statistical, the quantitative aspect of librarianship. In the matter of public library size, for example, the data seem quite reliable when contrasted with comparable figures available in other fields. But existing summaries of available information are not presented in a sufficiently usable form, with the result that the full value of the statistics is not realized.

Those who work with public library statistics need to recognize the diversity of uses to which, ideally, their statistical summaries would be subjected. More specifically, and within the context of the present discussion, it is not possible to construct a unique definition of library size which is amenable to universal application. This is because the definition of library size which would be considered most appropriate in any one case would depend upon the use to which the definition would be put.

For example, the determination of optimum size of a public library might well be keyed to the size of population served, in the belief that this is the chief factor in the determination of the library budget. Naturally other factors would enter in, e.g., are there private or institutional libraries available to supplement the offerings of the local public library, and does the area have special library needs which are different from the national norm in some way? Nonetheless, population served might be a useful way to classify libraries for budget determination purposes. Under such a procedure, then, statistics would be collected which would assist public agencies and others in determining whether, on a comparative basis, a particular public library was under-supported or over-supported.

Once the size of a public library budget is established, however, further comparisons between public libraries classified on the basis of population served would seem to be meaningful only in those rare instances where the library budget in question was average for the
population served. In the remaining cases some other guide, perhaps total budget, should be used as the measure of library size. In other words, it is desirable that library statistics be summarized in a number of ways, in which they now are not, so that a variety of quantitative comparisons might be made, depending upon the ultimate purpose of the analysis.

In an effort to illustrate the point that more detailed reference to how public libraries are managed is a useful albeit under-utilized approach to public library analysis and evaluation and, further, to provide some hopefully useful statistical comparisons, a series of studies were done using the latest published U.S. Office of Education summary of public library statistics.

The studies made fall into two main parts. In the first part of the study, that dealing with the matter of definition of public library size, the usual method of classifying public libraries according to size of population served was taken as the point of departure, and then answers to several questions were sought:

(1) To what extent is population served a good index of the other aspects or measures of public library operations (size of staff, number of volumes, circulation, total budget) for which statistics are readily available?

(2) Does some measure other than the customary guide of population served appear to be a superior index to public library size?

(3) What are some typical changes a public library makes as population served increases?

(4) How well do public library expenditures conform to existing American Library Association quantitative standards?

In the second part of the study an effort is made to apply these results in a way which would make them operationally useful for librarians. Again, answers to more than one question were sought:

(1) Under the closer scrutiny of a detailed analysis, how well do public libraries seem to conform, in the sense that variations in the character of their operations are due solely to variations in their size?

(2) Aside from the matter of degree of conformity among public libraries of the same size, what sort of a profile of "average" behavior can be constructed?
We have not reported all of the findings that resulted from the statistical studies undertaken, which were done on a computer. One of the questionable benefits of modern technology seems to be the production of more numbers than one can profitably use. In the two sections that follow an effort is made to summarize some of the relationships which librarians might find interesting and useful.

**Definition of Public Library Size**

**Relationship Between Population Served and Public Library Size.** In the past, dollars per capita and size of population served by a public library have figured as guidelines in standards for public libraries. The *Post War Standards for Public Libraries*, published in 1943, stated the minimum annual income for a library unit, as $25,000, an amount adequate for a library serving a population of 25,000. This $1 per capita was then established for minimum service, while $1.50 per capita was set for reasonably good service, and $2 per capita for superior service.

By 1948 the Committee on Post War Planning of the American Library Association, as reported in *A National Plan for Public Library Service*, fixed $37,500 for the total income for a library unit for minimum service, a per capita income of $1.50. Leigh in *The Public Library in the United States* listed four major groups of libraries by size of population served, "because size of population served has been employed most frequently in the library literature." And certainly population served as a measure of size is in line with the method of reporting used by a majority of the statistical studies on public library service.

All this combines to suggest the desirability of relating public library size to size of population served. Nonetheless it might be expected that public libraries would not follow this rule closely, since they vary so much from one city to another.

However, there is a remarkably close statistical relationship between population served and library staff, number of volumes, circulation, and total budget. As a matter of fact, the results are statistically significant and indicate a very close relationship. Following the customary standard of equating 1.0 to perfect correlation, it was found that the coefficient of determination between population served and size of staff was .85, between population and number of volumes .54, between population served and circulation .86, and between population served and total budget .84. In other words, with the one exception, about 85 percent of the increase in population served is associated with a parallel increase in the other measures of library size which were used. In this one exception, the relationship between population served and number of volumes, the coefficient of determination is acceptably high, but the correlation between number of volumes and the other variables was generally the poorest; and librarians who have long felt that numbers of volumes are a relatively inadequate index of public library size can now see their intuitive judgment supported by statistical analysis.
Perhaps even more impressive than the close statistical relationship between population served and the other variables tested, taken severally, is the closeness of the relationship which can be observed between population served and the four other variables taken as a group, by means of multiple correlation. Analysis of this sort yielded a coefficient of determination of .89. This is exceedingly good and illustrates again the tight relationship between population served and the character of the typical public library.

Chart I shows graphically the relationship between population served on the one hand, and size of staff, number of volumes, circulation, and budget on the other hand. This chart portrays averages in a continuous line and depicts general trends rather than providing specific answers. Unfortunately it is not particularly helpful in the case of the extremely large or small libraries. Some of the very large libraries tend not to fit the statistical averages well, and the small libraries deal in figures which do not show up successfully on such a small scale chart.

The general relationships, however, are clear. Public libraries average approximately a little less than 5 staff persons, 32,000 volumes, a circulation of about 45,000, and a total budget of a little under $34,000 for each 10,000 population served.

An especial advantage of the method of presentation in this chart is that estimates of averages (staff, collections, etc.) are presented for libraries serving any population size. Heretofore, librarians interested in typical expenditure patterns often had to rely mainly on studies of public libraries believed to be "average" for the size population they served. For example, in 1964, the American Library Association published the statistics on three public libraries which it thought might be representative. As the American Library Association explained, the libraries selected had budgets higher than those of 75 percent of the libraries reporting in each population range and were intended as targets toward which all libraries realistically might aim.

Analysis shows, however, that illustrative budget I for a library serving 83,245 persons was $451,000, which is some $170,000 above the budget that the present statistical analysis suggests would have been average for the population served. Illustrative budget II for a library serving 172,500 persons was, by contrast, about $20,000 under the statistically predicted norm; while illustrative budget III, for a public library serving 407,000 persons, was approximately 30 percent below the predicted norm.

Comparative statistics are not sufficiently complete to conduct a similar study on size of staff, but it would appear that illustrative library I did not have nearly so large a staff as would have been expected in view of its large budget. Illustrative libraries II and III not only have slightly lower budgets than would be expected in view of the population
1-Staff - in hundreds
2-Volumes - in millions
3-Circulation - in millions
4-Budget - in millions

CHART I
POPULATION SERVED COMPARED WITH SIZE OF STAFF, CIRCULATION, NUMBER OF VOLUMES AND BUDGET
served, but their staffs are slightly smaller also. In these cases, the staff sizes seem quite in keeping with the library budgets; but the libraries could hardly be described as ambitious targets for others to emulate as these libraries are below the statistically predicted norms.

As can be seen from Table 1 below, there seems to have been some confusion between a large library for the population served and a small library for the population served. The problem undoubtedly stems from lack of statistical information concerning the distribution of libraries within the population ranges, a difficulty which is overcome by the present analysis.

### TABLE 1

A.L.A. illustrative libraries and statistical norms compared

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b) Population Served</th>
<th>(c) Budget (Proposed)</th>
<th>(d) From Statistical Analysis</th>
<th>(e) Staff (Proposed)</th>
<th>(f) From Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>83,245</td>
<td>$451,000</td>
<td>$280,000</td>
<td>45 1/2*</td>
<td>41</td>
</tr>
<tr>
<td>II</td>
<td>172,500</td>
<td>$565,000</td>
<td>$586,000</td>
<td>76*</td>
<td>86</td>
</tr>
<tr>
<td>III</td>
<td>407,000</td>
<td>$1,086,000</td>
<td>$1,383,000</td>
<td>182</td>
<td>204</td>
</tr>
</tbody>
</table>

*Estimates of staff for these two libraries may not be completely accurate since the number of their full-time equivalent pages could not be determined.

As indicated in Chart I and in the discussion, public libraries in general tend to follow somewhat similar patterns of operation. There is not, however, the same consistency between public libraries classified by size according to population served and the existing quantitative standards for libraries so classified. That is to say, public libraries as a group are not conforming to the existing quantitative standards, either the earlier ones set forth in Post War Standards for Public Libraries, 1943, A National Plan for Public Library Service, 1948, or implied in the more recent Costs of Public Library Service, 1956, 1959, 1963.

Chart II shows the relationship between population served and actual public library budgets as compared with the 1943 and 1948 American Library Association standards (updated to account for changes in the cost of living).
Note: The 1943 minimum standard of $1.00 per capita and the 1948 minimum standard of $1.50 per capita were updated to compensate for increase in the Consumer Price Index.

CHART II
POPULATION SERVED AND ACTUAL BUDGETS COMPARED WITH UPDATED 1943 AND 1948 MINIMUM STANDARDS
This chart compares the computer analysis of public library budgets in 1962 with budgets for minimum service previously established by the profession. The budget estimates for minimum service used for this comparison are based on the standards developed in 1943 for minimum library service, ($1 per capita and adjusted to the current Consumer Price Index, which brings the per capita sum to $1.82), and the standards developed in 1948 for minimum library service, ($1.50 per capita, also adjusted to the current Consumer Price Index, which brings the per capita sum to $1.96).

Two interesting facts are revealed by this chart: the close correlation between the 1943 standards for minimum library service and the 1948 standards for minimum library service adjusted to the current Consumer Price Index; and the rather larger differences between these standards for budgets and the actual budgets. The close correlation between the adjusted 1943 and 1948 standards would indicate that basically there was no change in these standards, only an adjustment to take care of the rise in the cost of living. The somewhat larger difference between both sets of standards and actual budgets would indicate that libraries are spending more per capita than might have been predicted, an increase not accounted for by the increase in the cost of living.

The rise in per capita expenditures of public libraries might well be explained by the institution of Federal aid to public libraries and by the increase in state and local aid to public libraries which has taken place since 1948. The Library Services Act of 1956 made large sums of money available to public libraries. Following this act and perhaps stimulated by it, state and local appropriations to public libraries increased also. A report on the first six years of operation of the Library Services Act which appeared in the ALA Bulletin for May, 1963, gave some interesting figures. Between 1956 and 1962 state appropriations for rural public library service increased by $6 million (92 percent) and local appropriations by $22 million (71 percent). Over the same period state appropriations for all public library services doubled, from $12.3 million in 1956 to $25 million in 1962.

Analytical Problems. Now that the relationship between population served and other measures of public library size has been explored in some detail, it is necessary to enumerate some important caveats.

In the first place, it is a property of the statistics which were used that a very large library, as for example the New York Public Library, the Los Angeles Public Library, or the Chicago Public Library, by reason of being so large, can bias the final averages. An interesting study might have been to perform the same statistical analyses that were made in the course of this study, but with these large libraries left out.

As a second point, the range of tolerance (standard error) in the analyses conducted is such that the staff for two-thirds of all public libraries will fall within ±48 persons of the predicted estimates shown in Chart I. The number of volumes will fall within a range of ±445,000, circulation within a range of ±437,000, and budget within a range of ±$342,000 of the predicted
estimates shown in the first chart. These ranges of tolerance are rather large, and further refinements are needed, some of which are reported later in this work. Moreover, since failings of the statistical estimating procedures used are not the whole problem, what is also needed is a better understanding of the reasons why public libraries vary substantially from one individual situation to another. Presumably some cities are more library conscious than others, some cities meet their library needs in other ways, university or special libraries are close by, geographical sections are different, etc. The influence of these and similar factors constitutes an area for further study.

Still a third important qualification occurs perhaps because not all public libraries attempt to fill the same roles. Of the one-third of all public libraries which fall outside the ranges of tolerance given, there are some that fall way outside. Circulation predictions for the population served by the New York Public Library constitute an outstanding example of this point. Since the statistics used included the New York Public Library Reference Department, which has a research collection rather than a circulating one, circulation estimates derived from the experiences of public libraries in general are not applicable to the New York Public Library system.

As a final major point, the coverage of the statistics is excellent, with reports from 860 of the 864 designated public libraries serving cities of at least 35,000 population. The statistics themselves are probably as accurate as such figures ever are, partly because of the care taken in the statistical collection procedures and partly because of the influence of the U.S. Office of Education and the persuasive power of Federal funds. Still, numbers given should not be accepted as literal truth in every instance.

**Relationship Between Total Budget and Public Library Size.** In spite of the close statistical relationship between population served and the other measures of public library size, the estimating equations derived leave a great deal to be desired. The matter of the large standard error figures is quite troublesome. And, good as the coefficients of determination are when population served is the predictor of library size, the study showed that a closer relationship exists between total budget and the other variables. Similar studies were done using first staff as a predictor, then volumes, and finally circulation as the predictor. The results of these studies are not reported in detail as they simply confirmed the point that, of the five measures available (population served, size of staff, volumes, circulation, and total budget), budget tested out as the most reliable guide to public library size.

When budget was used as the predictor of size of library, it was found that the coefficient of determination showing the relationship between budget and population served was .84 (as before), between budget and size of staff a remarkable .99, between budget and number of volumes .81, and between budget and circulation .86. These represent a substantial improvement over the earlier case. An average of these five coefficients is .88 as opposed to an average of .77 when population served was used as the index of size.
The improved correlation when total budget is used as the measure of public library size can be illustrated also by multiple correlation analysis. If total budget is correlated with the other four variables taken all at once, the coefficient of determination is a fantastic .99 (remember that 1.0 is perfect). This is a substantial improvement over the coefficient of determination of .89 obtained when population served was used.

When budget is used as the index of size, the range of tolerance (standard error) of the estimates also is reduced substantially, along with the improvement in the various coefficients of determination. Stated in approximate terms, the ranges of tolerance are cut in half when budget is the predictor of size. Specifically, with budget as the estimator, the range of tolerance (standard error) is such that for two-thirds of the libraries, population served will fall within the range of $\pm 110,000$ of the predicted estimate; staff within the range of $\pm 15$, which is down from $\pm 48$ of the predicted estimate when population was the predictor; volumes within the range of $\pm 290,000$ (down from $\pm 445,000$) of the predicted estimate; and circulation within the range of $\pm 426,000$ (down from $\pm 437,000$) of the predicted estimate.

As can be seen, these ranges of tolerance are still so large as to forestall many of the more useful applications of the statistical findings reported in this study. Further, as will be shown later, some of the high correlations are misleading. Much remains to be done in the way of statistical refinement. The difficulty which has been highlighted by this analysis is that public libraries vary tremendously in the way in which they spend their money, and in the amount of money that they have to spend. As was pointed out earlier, some towns seem highly library conscious, others do not. Some libraries report a comparatively high circulation with a relatively small collection; still others report almost the exact opposite, and so on. Subject to these limitations, the charted relationship between public library budgets and the variables (population served, number of volumes, circulation, and size of staff) is as shown below in Chart III. This chart, too, portrays averages in a continuous line showing general trends, and has the same advantages and limitations as Chart I.

Again the general relationships are clear. For every $10,000 of budget, approximately, public libraries serve another 3,500 persons, hire another one-and-a-half staff members, acquire 8,500 more books, and add 15,000 to their total circulation.

Conclusions. The summarized statistical results of this portion of the study indicate that a comparison between public libraries grouped according to their budgets, for most purposes, will be much more meaningful than comparisons between public libraries according to any of the other plausible guides tested (i.e., size of staff, number of volumes, population served, and total circulation). In the course of developing this conclusion, several other matters of quite far-reaching importance have been touched upon.
CHART III

PUBLIC LIBRARY BUDGETS COMPARED WITH POPULATION SERVED, SIZE OF STAFF, CIRCULATION, AND NUMBER OF VOLUMES
In the first place, no one has a really good quantitative measure of how much public libraries contribute to the effective functioning of our economy and our cultural way of life. Absolute measures of this aspect of public librarianship are going to be difficult to procure, but comparative measures are obtainable and desperately needed.* So long as no sensible guide exists as to how large public library budgets ought to be, there will remain substantial variation in the way public libraries are treated from one city to another.

In the second place, a review of such statistics as are available indicates a great lack of statistical information, even of the sort which would be comparatively easy to obtain and particularly useful to the profession. How do public libraries differ from one geographic region to another in terms of services offered, budgets, and the like? What characteristics seem to be typical of "library-conscious cities" and what characteristics are lacking elsewhere? And so on.

As a third point (and this is most important), statistical refinement of available data on public library operations is so inadequate that much more needs to be done before one even knows what statistical questions are the right ones to ask. For example, this study assumed that public libraries could be analyzed as a group. But one of the obvious conclusions of the present study is that perhaps a better analysis of public libraries would be possible if public libraries were grouped according to size. Before this can be done, two main issues need to be resolved. What is the best index of public library size? What is the best set of groupings of public libraries which might be used in a detailed analysis of their several characteristics? Answers to both these questions would depend in part upon the purpose of the analysis under consideration. But it seems clear that for many purposes, total budget is superior to population served as an index of public library size. If public libraries are indeed grouped according to total budget, the generally most useful breakdown of budgets would seem to be as shown in Table 2.

<table>
<thead>
<tr>
<th>Library Size</th>
<th>Budget Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very small</td>
<td>Under $100,000</td>
</tr>
<tr>
<td>Small</td>
<td>$100,000 - $250,000</td>
</tr>
<tr>
<td>Medium</td>
<td>$250,000 - $1,500,000</td>
</tr>
<tr>
<td>Large</td>
<td>$1,500,000 - $3,500,000</td>
</tr>
<tr>
<td>Very large</td>
<td>$3,500,000 - $9,000,000</td>
</tr>
</tbody>
</table>

*A questionnaire asking people whether they would prefer more libraries or more public roads, etc., would be one way to accomplish this objective.
Since only the New York Public Library has a budget of over $9 million, the library size classifications effectively eliminate that library by putting it in a size group by itself. This is necessary because the New York Public Library is so radically different from any other public library in the country. It has twice the budget, nearly twice the staff, and about five times as many volumes as its closest competitor. The New York Public Library, when the Reference Department is included, just does not fit the computed norms at all well.

If, instead of budgets, public libraries are sized according to the somewhat less useful measure of population served, the most desirable grouping would seem to be as shown in Table 3.

**TABLE 3**

Population as a guide to public library size

<table>
<thead>
<tr>
<th>Library Size</th>
<th>Population Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very small</td>
<td>Under 35,000</td>
</tr>
<tr>
<td>Small</td>
<td>35,000 - 100,000</td>
</tr>
<tr>
<td>Medium</td>
<td>100,000 - 400,000</td>
</tr>
<tr>
<td>Large</td>
<td>400,000 - 1,200,000</td>
</tr>
<tr>
<td>Very large*</td>
<td>1,200,000 and above</td>
</tr>
</tbody>
</table>

*Since the Chicago Public Library actually serves a somewhat larger population than the New York Public Library, which serves only three of New York's five boroughs, this system of categorization does not effectively eliminate the latter. Nonetheless, for reasons cited above, elimination of the New York Public Library from computations seems the wiser course of action.

It should be noted here, however, that the population breakdowns suggested do not conform to the budget breakdowns proposed in Table 2. The population breakdowns are based upon distribution of the data, not upon what is appropriate if budget is the guide. It must be stressed further that in the lower population ranges the data show such wide dispersion as to obscure any sharply definable trends. Again this strengthens the case for budget as the measure of public library size whenever possible.
The range of tolerance to the statistical estimates given thus far is too large for much practical application. The intent of this section is to test the idea that the grouping of public libraries by the developed definitions of size can be used to improve the usefulness of the statistical estimates. In other words, a librarian in charge of a medium-sized public library, for example (i.e., a library with a budget of between $250,000 and $1,500,000), hopefully would find helpful a study of the statistical data on that particular size group.

Unfortunately, it develops that statistical predictions obtained in this way are still not very good, in the sense that a great deal of variation among libraries is still revealed. As pointed out earlier, many factors affect the character of library services provided in a given community. Since a good public library meets the needs and interests of the community it serves, it will be affected by sociological and other environmental factors as well as by the total budget provided for it. Nonetheless, detailed study of the characteristics of public libraries classified according to budget size is a logical first step towards developing a fuller understanding of how and why public libraries vary from one community situation to another.

General Characteristics Summarized. The average or typical behavior patterns of public libraries sized according to the five budget groupings are summarized below in textual form and by means of illustrative charts. When budget is used as a guide to public library size, very large public libraries are identified as libraries with total budgets ranging from $3,500,000 to $9,000,000. Currently eleven public libraries fall into this category, with the New York Public Library excluded for reasons cited earlier. In general it may be said that a very large public library with an average budget of $6,250,000 would have a staff of approximately 930, a collection of approximately 2,500,000, a circulation of approximately 9,800,000, and serve a population of around 2,480,000. Then, for every $10,000 variation from the $5,750,000 average budget it would be expected that the typical very large public library would adjust the size of staff by 1.4 employees, number of volumes by 2,000, circulation by 19,000 and population served by 6,000. These relationships are shown in Chart IV.

Large public libraries, those with budgets ranging from $1,500,000 to $3,500,000, number eighteen. Characteristically, a large public library with a budget of $2,500,000 would have a staff of 385, a collection of 1,400,000, a circulation of 3,840,000 and serve a population of approximately 716,000. Then for every $10,000 of plus or minus variation in budget, it would be expected that the large public library would change its staff by 1.4 persons, its collection by 6,000 volumes, its circulation by 10,000 and population served by 2,000. This information is illustrated in Chart V.
CHART IV
PUBLIC LIBRARY BUDGETS COMPARED WITH POPULATION SERVED,
SIZE OF STAFF, CIRCULATION, AND NUMBER OF VOLUMES
(Very Large Libraries)
CHART V
PUBLIC LIBRARY BUDGETS COMPARED WITH POPULATION SERVED,
SIZE OF STAFF, CIRCULATION, AND NUMBER OF VOLUMES
(Large Libraries)
Medium-sized public libraries are identified (when budget is used as a guide) as libraries with total budgets ranging from $250,000 to $1,500,000. There are 164 libraries in this category. Typically, a medium-sized public library with a budget of $875,000 would have a staff of 138, a collection of 490,000 volumes, a circulation of 1,750,000, and serve a population of approximately 360,000. Then for every $10,000 of plus or minus variation in budget it would be expected that the medium-sized public library would adjust its staff by 1.5 persons, its number of volumes in the collection by 4,900, its circulation by 18,000 and its population served by 3,600. This information is shown in Chart VI.

Small public libraries are defined as those with a budget range of $100,000 to $250,000. Two hundred and twenty-one libraries were identified as falling into this category. According to the statistical analysis of this size category, a typical small public library with a total budget of $175,000 would have a staff of approximately 28, a collection of 125,000 volumes, a circulation of 440,000 and serve a population of approximately 91,000. Then for every $10,000 plus or minus variation in budget it would be expected that the small public library would adjust its staff by 1.4 persons, its collection by 5,200 volumes, its circulation by 20,000 and its population served by 4,000. This information is given in Chart VII.

The very small public library was defined as a library with a budget of less than $100,000. There are some 445 libraries in this category (out of 860 studied). According to statistical predictions, a very small public library with a budget of $50,000, if an average library for its budget size, would have a staff of approximately 10, a collection of 51,000 volumes, a circulation of 200,000 and serve a population of approximately 62,000. Then for every $10,000 plus or minus variation in the budget it would be expected that the very small public library would adjust its staff by 1.6 persons, its collection by 7,600 volumes, its circulation by 27,000 and its population served by 3,400. This information is illustrated in Chart VIII.

The material just presented, which groups libraries according to their budget size, is useful as a measure of what public libraries are doing on the average. Aside from the matter of averages, however, it is necessary both to get some idea (a) of the closeness of the general relationship between fluctuations in budgets and in the other four variables, and (b) of the range of variation among libraries.

**Special Analyses of the Data.** A first factor of interest concerns closeness of the relationship between variations in budgets and variations in the other four variables. The results of this aspect of the study are summarized in Table 4 and lead to several important conclusions.
1-Population - in hundreds of thousands
2-Staff - in tens
3-Volumes - in hundreds of thousands
4-Circulation - in hundreds of thousands

CHART VI
PUBLIC LIBRARY BUDGETS COMPARED WITH POPULATION SERVED,
SIZE OF STAFF, CIRCULATION, AND NUMBER OF VOLUMES
(Medium Libraries)
CHART VII
PUBLIC LIBRARY BUDGETS COMPARED WITH POPULATION SERVED,
SIZE OF STAFF, CIRCULATION, AND NUMBER OF VOLUMES
(Small Libraries)
### Table 4

Percentage of variation in population served, staff, volumes and circulation associated with the variation in public library budgets (i.e., Coefficients of Determination)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Population</td>
<td>---</td>
<td>.84</td>
<td>.65</td>
<td>.44</td>
<td>.34</td>
<td>.12</td>
</tr>
<tr>
<td>Staff</td>
<td>.85</td>
<td>.99</td>
<td>.82</td>
<td>.67</td>
<td>.86</td>
<td>.53</td>
</tr>
<tr>
<td>Volumes</td>
<td>.54</td>
<td>.81</td>
<td>.29</td>
<td>.57</td>
<td>.66</td>
<td>.21</td>
</tr>
<tr>
<td>Circulation</td>
<td>.86</td>
<td>.86</td>
<td>.66</td>
<td>.27</td>
<td>.61</td>
<td>.19</td>
</tr>
</tbody>
</table>

### Table 5

Range of tolerance to the predicted estimates within which two-thirds of all public libraries will fall (i.e., Standard Error of the Estimates)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>---</td>
<td>±110,000</td>
<td>±540,000</td>
<td>±125,000</td>
<td>±140,000</td>
<td>±31,000</td>
</tr>
<tr>
<td>Staff</td>
<td>±48</td>
<td>±15</td>
<td>±80</td>
<td>±50</td>
<td>±17</td>
<td>±6</td>
</tr>
<tr>
<td>Volumes</td>
<td>±445,000</td>
<td>±290,000</td>
<td>±438,000</td>
<td>±277,000</td>
<td>±100,000</td>
<td>±41,000</td>
</tr>
<tr>
<td>Circulation</td>
<td>±437,000</td>
<td>±426,000</td>
<td>±1,640,000</td>
<td>±874,000</td>
<td>±403,000</td>
<td>±125,000</td>
</tr>
</tbody>
</table>
If population is used as the predictor and all libraries are grouped together, the statistical relationship is quite close. In 85 percent of cases an increase in population served will be associated with an increase in size of staff, in 54 percent of cases with an increase in number of volumes, and in 86 percent of cases with an increase in circulation. In other words, in the great majority of cases, a library serving a larger population group will be larger in all other three aspects.

However, if budget is used as the predictor and again if all libraries are grouped together there is a definite improvement in the closeness of the statistical relationship. If one library has a budget which is larger than another, in 84 percent of the cases population served will be larger, in 99 percent of the cases staff will be larger, and so on.

But when libraries are grouped according to budget size and reexamined, the closeness of these statistical relationships deteriorates. Sometimes the deterioration is extreme, as with small libraries for example, where in only 7 percent of cases is an increase in budget a full explanation of any change in population served (see Table 4). Often, too, an increase in budget is associated with an increase in the other variables (population served, size of staff, number of volumes, circulation) less than one-half the time, which means that the chance factor is large. Specifically this problem comes up in examination of the size of collections for very large libraries; in the examination of population and circulation in the case of the large libraries; in the case of population for medium-sized libraries; and nearly all the time in the case of the small and very small libraries (see Table 4).

In the case of the very smallest category of libraries, an explanation for the reduced correlation seems clear. Available statistics upon which analysis was based are only for those communities with populations of more than 35,000 persons. Hence the data for this category are not complete, as most small libraries are in towns of fewer than 35,000 persons. In regard to the other size groups and without going into detail, statisticians know that sometimes a study involving a high number of statistical observations (e.g., several hundred libraries) leads to a certain amount of spurious correlation. It depends upon the amount of lift to the trend line, upon the degree of homogeneity of variation about the trend and perhaps upon other factors.

A second factor of interest is the range of tolerance (plus or minus) within which two-thirds of all libraries will fall. These ranges are shown in Table 5. Examination of this table indicates that grouping libraries in this way yields ranges of tolerance which are more realistically related to the general size of the library.

In other words, in the case of the predictions of staff size, for example, two-thirds of all very large libraries, which typically have a staff of as many as 1000, will have a staff within a range of ±80 of the
predicted estimates. For large libraries, where staff sizes are much more likely to be under 400, staff size for two-thirds of all these libraries will fall within the range of ±50. For medium-sized libraries the range is ±17, for small libraries ±6 and for the very small libraries the range is ±2.

A final piece of information, which stems from the study of libraries grouped according to size of budget, is budget breakdown analysis, presented at this point as additional evidence in support of the general proposition that statistical analysis of public libraries has practical value. For the purposes of this part of the study, salary budgets of public libraries and book budgets were examined in relation to the total amount of money expended. Computed norms showing the typical ratio of budget expenditures among the usual categories (salaries, books, and other expenditures) are presented in Table 6.

**TABLE 6**

Approximate budget ratios*

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>77%</td>
<td>73%</td>
<td>66%</td>
<td>66%</td>
<td>60%</td>
</tr>
<tr>
<td>Books</td>
<td>15%</td>
<td>15%</td>
<td>14%</td>
<td>15%</td>
<td>19%</td>
</tr>
<tr>
<td>Other</td>
<td>8%</td>
<td>12%</td>
<td>19%</td>
<td>18%</td>
<td>21%</td>
</tr>
</tbody>
</table>

*In no case was the slope of the resulting line very different from zero, so charting seemed unnecessary.
REFERENCES


5. American Library Association. Costs of Public Library Service, 1963. Chicago, ALA, 1964, pp. 8-13. A fourth library was included in this study. It is not mentioned in the text because representative library IV was a systems library. Characteristics of the system's member libraries were not given and statistical evaluation of their operation thus was impossible.

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He is a fellow of the Royal Economic Society, and a member of the American Economic Association, Southern Economic Association, and American Association of University Professors of which he is campus chapter president for 1967-68. He is listed in several directories, including American Men of Science, and is the author of a number of articles dealing primarily with monetary and wage theory.

Dr. Ruth Rockwood holds the degrees of A.B. from Wellesley College, M.S. from the University of Illinois Library School, and Ed.D. in Higher Education from Indiana University. She has had library experience in public, school, academic and special libraries and has taught in the library schools at Chulalongkorn University, Thailand (under a Fulbright Award) and Indiana University as well as in the Florida State University Library School. Her special fields are public library service and adult services.

She is a member of the American Library Association, American Association of University Professors, Association of American Library Schools, Florida Library Association (of which she is past president) and the Southeastern Library Association, as well as the honorary fraternity, Beta Phi Mu. She is a contributor to professional periodicals.
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