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Questions for Self-Evaluation

1. What are decision rules?
2. What is the relationship between decision rules and conceptions of equity?
3. What are some examples of decision rules used in cities for police, libraries, and parks?
4. What are several alternative decision rules for assigning police patrolmen and investigators? Who would tend to benefit from the use of each alternative?
5. What are several alternative decision rules for the distribution of library resources to branch libraries? Who would tend to benefit from the use of each alternative?
6. What are several alternative decision rules for the distribution of park resources? Who would tend to benefit from the use of each alternative?
7. Develop alternative decision rules for some other service and analyze who would tend to benefit from their application.

CHAPTER 4. METHODOLOGY FOR ANALYZING URBAN SERVICE DISTRIBUTION

In this chapter we will discuss methods of measuring the distribution of urban public services. Categories of analysis will be suggested. Data will be classified as indicators of resources, **activities**, results, and impacts. Services to be analyzed also will be placed in categories. Specific indicators for each service, in each service category, will be presented. Consideration will be given to interpretation of combinations of these indicators for a given service, including consideration of how these indicators can be used to identify the conception of equity which seems to be **reflected** implicitly in the data. Methods for arraying these indicators geographically will be presented, and some problems of selecting appropriate geographic units of analysis will be discussed.

This chapter should help develop an ability to analyze a service systematically, from its beginning as resources to deliver it are mustered, through the activities by which it is delivered, to the results that are achieved by delivering the **service**, and the impacts on societal conditions that occur because the service has been delivered.

Skill in selecting specific indicators is an important objective. Creative imagination in generating possible **indicators** for use in analysis is needed. The most important indicators and the most feasible indicators to work with in a particular situation should be selected. Indicators relevant to measuring achievement of service objectives should be chosen. It is crucially important to use indicators of results to analyze achievement of objectives. Categories in the service delivery framework--resources, activities, results, and impacts--should be related to conceptions of equity. There are similarities among types of services. Different problems are encountered in analyzing service distribution of each **type--** routine, **protection**, developmental, and social minimum. For each type of service, different problems will arise in selecting appropriate geographic units of analysis and the most relevant indicators of **socio-economic** conditions.

Categories of Analysis

The first problem that an analyst confronts is how to measure services. Indicators must be selected. These indicators should be related to the **objectives** that the service is intended to meet.

Services have more than one objective. For example, one way of describing the objectives of fire services is: Fire services are intended to reduce the occurrence and severity of fires through inspection and public education and to suppress the fires that do occur with as little property loss and as few deaths and injuries as possible. Indicators will be needed that are relevant to measuring suppression and prevention. Both injuries and property damage need to be accounted for. A number of indicators will be needed to cover all the objectives.

Each service has one or more social conditions to which it is applied. Some of these conditions should be referred to in the **statement** of service objectives. With fire services, the social conditions to be dealt with are fires and the physical settings which have varying degrees of risk of catching fire. With police services, the social conditions to be dealt with are crimes reported. Police, of course, perform services other than detecting perpetrators of reported crimes. They direct traffic, intervene in family disputes, regulate public order, and provide a helping hand in a variety of situations. Gathering data for indicators for police services related to each social condition is not practical. Analysis should be focused on the crime fighting effort of police. Social conditions relevant to each service **should** be identified, and statements of objectives should incorporate some of these social conditions.

A service delivery framework, or model, should be used to help **identify** specific indicators for each service. The framework we propose has several uses. It directs attention to several stages of the service process. It encourages the analyst to consider the consequences of the service. It stresses performance, in addition to encompassing workload measures. Use of it leads to indicators that can be related to alternative conceptions of equity. This service delivery framework does not make the identification of suitable indicators a **simple** process, but it does help make the identification process more inclusive.

For every urban service, resources are required. In systems **model terms**, resources **commonly** are referred to as inputs. The service delivery framework and its **relationship** to systems model **terms** is diagrammed in Figures 1 and 2. Resources are money, personnel, facilities, and equipment. A useful measure of resources often **is** expenditures--expenditures for replacement of water lines, expenditures for police **patrol**, expenditures per **pupil** for education. Of all the indicators to be discussed, resource indicators usually are the easiest to construct. However, **expenditures** may be difficult to obtain, and substitutes are sometimes used for this reason. For example, instead of police patrol expenditures, analysts will find it easier to identify the number of police assigned to patrol-duty. It will be easier to identify the number of teachers per school than the expenditures that are made to employ them. Although multiple measures of resources will be helpful, expenditure measures have the advantage of encompassing most resource components.

FIGURE 1.

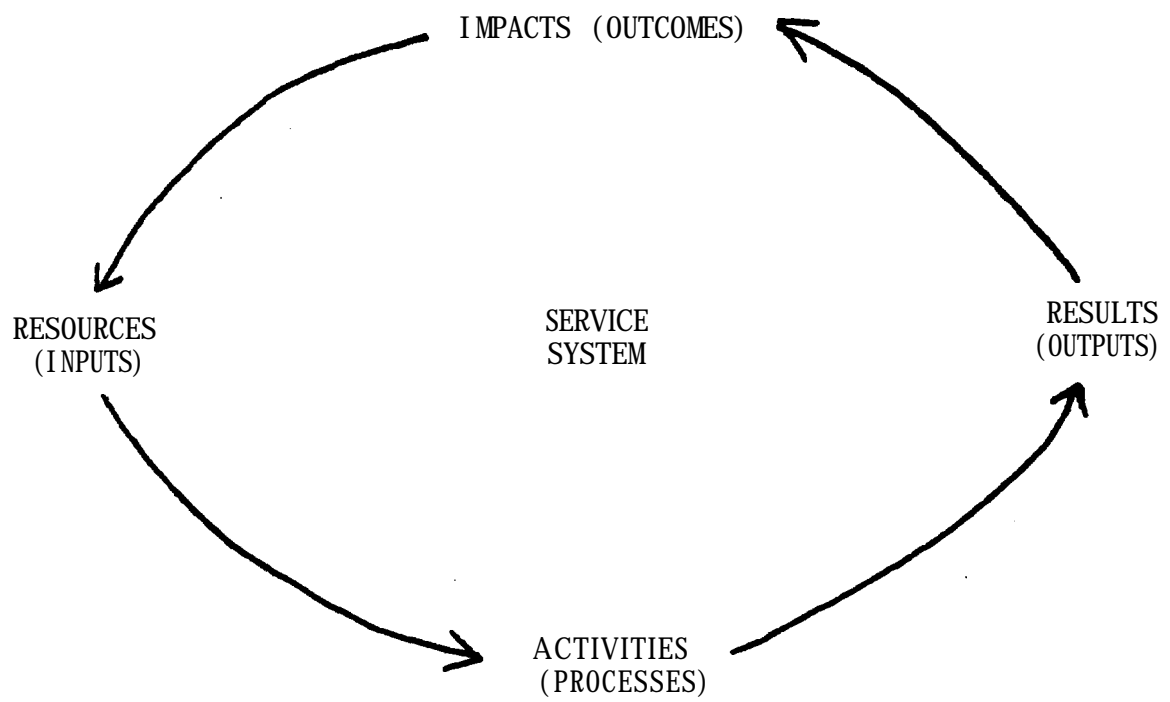


Figure 2. Service Analysts Framework

Each service has objectives
involving
Serving population and influencing social conditions

by using

Resources
(expenditures, personnel, facilities, equipment)
and engaging in
Activities
(time frequency and duration)

having

Results
(direct consequences-- intended and unintended--and
especially use of services -- amount, rate, and reasons)

and leading to

Impacts
(changes in social conditions)

The activities of the urban service system are the ways in which the resources are used. Firemen respond to fire alarms and suppress fires, policemen patrol streets and make arrests, sanitation workers collect refuse. These are sometimes referred to as processes in systems **terms**. These are more difficult to measure than are resources. They involve motion, change, action. They do not stand still. A sound camera can record how a policeman makes an arrest. But an analyst working, from police records may be able to do no better than identify the response time (the time from the time the request for service was received until the time the police arrived at the scene). Often even response time is not available. An analyst may be reduced to using time measures, e.g. how frequently was a street patrolled during an 8 p.m. to 4 a.m. police shift, how often was refuse collected, how many hours a week was a branch library open. One may have to retreat so far from identifying the activity itself, that the boundary between activity and resource indicators becomes **translucent**. How, for example, is one to use an indicator to identify the content and quality of reading instruction in the public schools. Lacking a sound camera or participant observation, the analyst is likely to have to resort to remote inference, e.g. scores of teachers on verbal tests, years of education of teachers, average class size. One can think of these as resources available in the classroom. But one can also use them as substitutes for activity indicators, inferring that the education of teachers and the size of classes influences the activities directly that occur in class.

Results are what happens as a direct consequence of the service delivery system. Results are essential in measuring the extent to which service objectives are being achieved. How much stolen property has been recovered? How much refuse has been collected? How many people have used the swimming pool? What is the water pressure at the tap? These all measure results of the service. In systems terms, they often are referred to as outputs. Frequently, in the literature, expenditures have been used as substitutes for output indicators because indicators of the type referred to here were not available. This leads to some confusion in terminology. It is another reason why we prefer to use the term results. Results are not always intended. Objectives usually are not achieved completely. Some refuse may be left on the street after collection. Some cases may be cleared by arrest, but the person arrested may sue for false arrest occasionally and win. Thus, analysts should try to include indicators of unintended, as well as of intended, consequences.

It also is important to note that consequences often are not solely, perhaps not even primarily, a result of the effectiveness of the service system. Refuse left on the street may have been spilled by stray dogs. Students scoring high on verbal exams may come from homes where parents are well-educated. Fire losses that occur may result from **flammable** materials in residences that are now illegal in new dwellings, but which were legal at the time of construction. These causal relationships, of course, should be taken into account when remedial action is considered.

In some instances, opinions may be the closest analysts can come to obtaining information about results of services. For example, the noise generated by refuse collection may be identified best by whether people consider it objectionable. Data on park usage in non-supervised open areas

usually will not be gathered by park personnel. People can be asked how often they use particular parks. They also can be asked whether they know of the existence of certain facilities or programs in parks. The rate at which people use parks may be influenced by whether they feel safe when using the park. Their responses will help identify reasons for use and non-use of facilities and programs.

People also can be asked for their general opinion about services. Opinions of citizens can be an indirect result of service characteristics. We use the term "indirect result" because a number of forces may influence opinions about services. These include feelings of trust in government, confidence about being treated fairly, and attitudes toward authority. Administrators may believe a service is being delivered effectively, based on performance indicators such as those referred to earlier. Residents may have a different opinion. Opinions may not be the same in all parts of the jurisdiction. Opinions may be consistent with the performance measures, or they may be inconsistent. Sometimes administratively useful information may be obtained. Such information may be useful in making decisions about priorities among different services, where to invest resources geographically for a particular service, and how to modify public information programs. However, when opinion data differs from other data about resources, activities, and results, the objective, non-opinion data, should be emphasized in making decisions. Surveys should be conducted using random sampling methods. A reference on survey methodology should be consulted before the survey is conducted.

Table 1. Examples of Service Indicators

Data for specific indicators of resources, activities, results, and impacts are obtained by gathering field data about services and facilities and by conducting surveys of citizens.

<u>Resources</u>	Expenditures (\$ per 10,000 population, \$ per phenomenon, such as \$ per serious crimes)
	Personnel (number per 10,000 population, number per phenomenon, such as number per serious crimes)
	Equipment (playground swings per 100 children 12 and under)
	Facilities (neighborhood park acres per 1000 population)

Table 1. Examples of Service Indicators

<u>Activities</u>	Frequency (refuse pick-ups per week, hours branch library open per week) Duration (response time for police, or fire, from receipt of call for service to arrival on scene)
<u>Results</u>	Intended consequences (arrests per 100 serious crimes reported, street cleanliness rating after refuse collection, water pressure at the tap) Unintended consequences (number of missed refuse collections per week per 100 households, complaints about unnecessary use of force by police per 100 arrests for serious crimes) Use of services by amount (number of branch library books circulated per year, number of swimmers per day, number of park users per week) Use of services by rate (number of branch library books circulated per year per population in service area, number of mass transit riders per day per population in service area) Use of services by reasons (percentage of persons not using a park because of anxiety about their personal safety when using the park, percentage of persons not using mass transit for the journey to work because the relationship between transit and work schedules requires waits of 15 minutes or more)
<u>Impacts</u>	Changes in social conditions (measurable with experimentation or elaborate and usually time consuming inferences and analyses. Citizens also can be asked their opinions about the satisfactoriness of services in their neighborhood in comparison with other neighborhoods. The operational usefulness of these opinions is questionable.)

The impact of a service can be defined as the difference between results given the existence of the service and conditions that would exist in the absence of the service. This difference is very difficult to identify. What would the crime rate be if there were no police? What health hazards would exist in cities if there were no refuse collection? How would property values change if there were no public fire protection? Where would people choose to live if some places had public schools and others did not?

It is apparent when one talks about the contrast between the presence and absence of a service that the impact of the service probably is very great, although we would have difficulty estimating it accurately. But what is the impact on the crime rate of a five percent increase in the police force? How many people will change their moving decisions because of a five percent increase in education expenditures per pupil? How will voting behavior be influenced by reducing refuse left on the street by five percent? An uncommon wizardry is needed to divine accurate answers to these puzzles. In some instances, estimates can be made of certain kinds of impacts. If a residence has no public fire protection, or is greater than some specified distance from a fire hydrant, these deficiencies will be reflected in the payment of higher rates for fire insurance. They also will be reflected in property values. Calculations can be made, based on some reasonable assumptions, about how fire protection deficiencies impact the value of residences. In most instances, however, these calculations either will not be possible, will not be practical, or will not yield information that can be put to use.

The best way of identifying service impacts is by experimentation. Experimentation involves comparison between two or more situations differing, ideally, only in the procedure that is applied to them. The difference might be the presence or absence of police patrol. It might be an increase of 25 percent of police patrol in one place with no increase in another place. It might involve different activities by the same number of police in different locations. Measurements are taken of relevant indicators before the experiment, preferably several times over a substantial period, and after the introduction of the new procedure, again preferably several times. The aim of the experiment is to identify differences in the measurements and to be able to relate these differences to the change in the experimental variables. Isolating differences is difficult in the real world, because two or more situations never are identical in all respects other than the experimental variables. Nor do situations hold still. As time passes, conditions change, other than the experimental conditions. Therefore, identifying the new procedure as the cause of changes measured cannot be done with certainty. The experimental method is, however, the best method to use for identifying impacts. For the purposes described here for analyzing service distribution, the experimental method will be too complicated and expensive, except for high priority projects.² For this reason, service distribution analysis should rely on indicators of resources, activities, and results.

One important methodological issue concerns the appropriateness of the indicators selected to measure service distribution. The indicators suggested in this chapter can be used to measure service effectiveness. Many of them have been used for effectiveness analysis in field tests by the Urban Institute and the International City Management Association. One problem with effectiveness indicators is that neither one indicator nor several indicators can completely define all important aspects of any service. This problem is reduced by using several indicators. A second problem is that factors other than the service itself influence the extent to which service objectives are achieved. Non-service aspects of the **community** often affect the data found for a specific indicator. The seriousness of this problem is reduced in service distribution analysis. **Whatever** the deficiencies with an indicator, these deficiencies usually

will be similar in each part of the jurisdiction. Parts of the jurisdiction still can be compared with each other. Provided that each indicator is relevant to measuring some aspect of a service, the comparisons of each part of the jurisdiction with other parts will be useful.

A third problem is that the relationship of the distribution of one indicator to the distribution of another indicator cannot be predicted accurately, with the present state of knowledge. If you know the distribution of a service, say police, on one indicator, such as response time, you cannot predict what the distribution will be for another indicator, say percent of stolen property recovered. Since resources to gather and analyze data always are limited, analysts should be cautious about reading more into their analyses than is warranted. Fourth, there are reliability problems with some indicators. Crime rates measure the crimes that are reported, rather than all the crimes that are committed. Victimization surveys have revealed that not all crimes are reported. Use data for swimming pools can be gathered readily by counting admissions. The number of users of large parks cannot be counted readily, and probably not accurately even with considerable effort, because of the size of the park, the ability to enter from many points, and usually, the absence of an admission fee.

These methodological problems are cause for caution against reading too many conclusions into too few facts.

Operationalizing Conceptions of Equity

Each category of analysis- resources, activities, results, and ~~impacts-~~ can be used to measure the pattern of service distribution in a jurisdiction. The service distribution may not be the same for each of the different categories of analysis. For example, the resources invested in police patrol might be unequally distributed per capita, with high crime areas receiving more services, perhaps in proportion to the crime rate. The activities of patrolmen, as measured by response time, might be distributed rather equally. Would that mean results as measured by percentage of stolen property recovered would be distributed equally? Not necessarily. What of the rate at which property is stolen- in terms of robberies, burglaries, and larcenies per 1,000 people? Probably the high crime area that was assigned police patrolmen proportionate to its crime rate still would retain its designation as a high crime area thereafter. For park **services, resources**, as measured by acres of community-serving parkland, might be distributed so that every neighborhood met or surpassed an accepted standard, such as five, or eight, or ten, acres per 1,000 persons. In addition to variation in park acreage above the accepted standard, there might be additional variation in activities, such as number of hours of supervised playground recreation, number of hours of swimming, and so on, whether due to variation-in personnel expenditures or to variation in availability of these resources. Results might vary as well. Usage could be greater in areas having less park acreage and fewer hours of specialized services, perhaps due to persons there having fewer recreation options.

Equity concepts should be related to categories of indicators (resources, activities, and results) for analyzing service distribution patterns. Service distribution refers here to the geographic pattern. Equity concepts often apply to individuals. Analytical methods may describe services distributed to individuals. In practice, however, many services are delivered to areas- parks, branch libraries, public transit, and fire stations, to blocks- streets, street lights, and sidewalks, and to those who request services- police and fire services. Therefore, geographic analysis is the only practical way of analyzing many of these services. Considerations of cost reinforce the practicality of geographic analysis. Indicators of need, such as income data, can be used to supplement population, household, age, and racial data for describing geographic areas. Techniques for describing geographic areas for analytic purposes are discussed later in this chapter.

Five conceptions of equity were analyzed in Chapter 2. These are equity based on equality, need, demand, preference, and willingness-to-pay. The categories of analysis (resources, activities, and results) described here can be used to give concrete meaning to these equity concepts. The importance of making equity concepts concrete can be illustrated with equity as equality. Equity as equality could mean that equal resources per capita should be provided. For parks, this could mean that each neighborhood should receive the same number of acres of community- serving parkland per 1,000 persons. For police, it could mean that patrolmen should be distributed so that each neighborhood receives the same number of patrolmen per 1,000 residents. Equity as equality also could mean that equal activities per capita should be provided. For parks, this could mean that each neighborhood should receive the same number of hours of supervised summer playground recreation per 1,000 residents. For police, it could mean that response time should be approximately equal in each neighborhood. Equity as equality also could mean that equal results per capita should be provided. For parks, this could mean that persons in each neighborhood should be equally satisfied with the safety, maintenance, and facilities in their neighborhood parks. For police, it could mean that clearance rates for burglaries and robberies are equal, or within a small range of variation, in each police precinct. There are a number of indicators of resources, activities, and results that can be used to analyze each service. Each equity concept (equality, need, demand, preference, and willingness-to-pay) needs to be operationalized in terms of these analytical categories.

These categories of indicators provide a means for administrators to compare their concepts of equity with the service distribution pattern as it exists. Analysis and interpretation of these indicators can be included in the decision-making process as changes in departmental procedures, programs, operating budgets, and capital expenditures are considered.

Categories of Services and Indicators of Distribution

Each service should be analyzed separately. Indicators need to be selected which are appropriate to each service. There are similarities among some services which make it useful to categorize them to simplify discussion. The use of categories should not be interpreted to mean that each member of that category is identical to each other member. There is no simple formula that enables analysts to select the same indicators for each service in the category. There are enough similarities among members of the categories, however, to obtain guidance in thinking about indicators to use. In this section, urban services are placed in four categories: routine, protection, developmental, and social minimum. Each category will be discussed below. Lists of indicators will be presented for each service. Some of these indicators will be discussed to illustrate why they were chosen, and why other possible indicators were left off the list. The social minimum category of services will not be discussed at as great length as the other service categories because of the special difficulties of analyzing these services.

Routine Services

Routine services are those services used on most days by most people. These services include solid waste collection and disposal, water supply, sewage collection and disposal, and transportation (including streets, bridges, sidewalks, street lights, and some mass transit). Each of these services has been, and still is, provided by private enterprise. The role of the public sector has grown each decade, so that now the public sector dominates in providing these services. The distinguishing feature of these services is the routine and almost inevitable nature of their use. Nearly everyone, regardless of age, sex, and social status, uses these services, directly or indirectly, frequently, and usually daily.

Most of these services also are characterized by an important, usually dominant role for physical facilities and equipment rather than for personnel. This influences the selection of indicators. Residents and government officials have a strong interest in the presence, or absence, of the physical facilities or item of equipment. Is there public water supply or not? Sewers or not? Paved streets or not? Sidewalks or not? Street lights or not? A bus within walking distance or not? When the presence or absence of facilities can be identified clearly, distributional analysis is relatively easy.

As these examples suggest, the analysis of some of these services relies considerably on indicators of resources. Some indicators to use in analyzing distribution of routine services are listed in Tables 2, 3, and 4. Percentage indicators aid geographic comparison.

Table 2. Water Supply Indicators

Objectives: Provide a reliable supply of water that **is** adequate for household, commercial, and industrial use, aesthetically acceptable, and free of health hazards.

Indicators by measurement category	Data collection source and procedure
<u>Resources</u>	Water Department records
Percent dwelling units with public water supply per service district	
Expenditures for new water lines per 1000 dwelling units	
Expenditures for replacement, repair, and maintenance of water lines per 1000 dwelling units	
Average annual expenditures last five years for new water lines (and separately for replacement, repair, and maintenance of water lines)	
<u>Results</u>	Water Department records and citizen survey
Average water pressure at the tap per service district	Measure for a random sample of dwelling units
Water quality at the tap (taste, odor, color, purity) per service district	Citizen survey of random sample of dwelling units
Time without water service per service district	Department records

Table 3. Solid Waste Collection Indicators

Objectives: Promote cleanliness, health, and safety of the **community** by removing garbage and trash **while** minimizing inconvenience to citizens.

Indicators by measurement category	Data collection source and procedure
<u>Resources</u>	Sanitation department records
Expenditures per ton collected per route	Expend./tons

Indicators by measurement category	Data collection source and procedure
Expenditures per route mile Expenditures per capita per route	Expend./Miles Expend./persons
<u>Activities</u>	Sanitation department records
Frequency of regular collection	Statement if uniform, map if variable
Location of regular collection (curb, side of dwelling)	Statement if uniform, map if variable
Frequency of bulk refuse collection	Statement if uniform, map if variable
Frequency of street cleaning	Statement if uniform, map if variable
<u>Results</u>	Sanitation department records
Street cleanliness (refuse left after collection)	Sanitation department records Visual inspection or photo rating data by block gathered by sanitation department.
Pounds of garbage collected per route	Sanitation department records
Resident satisfaction with service (This can include specific aspects, such as street appearance, noise, odors, missed collections, damage to containers, health and fire hazards)	Responses to question on garbage and trash collec- tion included, in a general survey of resident opinions on local govern- ment services.
Missed collections	Sanitation department records. Supervisor survey and resident complaints.
Complaints about service.	Sanitation department and/ or complaint department records.

Table 4. Street Indicators

Objectives: Provide access for motorists, bicyclists, and pedestrians to and from their destinations that is convenient, smooth, and safe.

<u>Indicators by measurement category</u>	<u>Data collection source and procedure</u>
-------------------------------------------	---------------------------------------------

Resources

Department Records

Percent of streets paved per service district

Expenditures for paving new streets per 1000 dwelling **units**¹

Expenditures for resurfacing and repair of **streets** per 1000 dwelling units

Average annual expenditures last five years for paving new streets (and separately for resurfacing and repair of *streets*) per 1000 dwelling units

Percent of streets resurfaced last five years per service district

Expenditures for grading of unpaved streets per 1000 dwelling units

Percent of streets with sidewalks on at least one side per service district

Percent of major street miles with bicycle lanes per service district

Average distance between street lights per service district

Results

Department Records

Smoothness of streets per block and per service district

Roughometer, blindfolded **inspection**, or visual inspection

Motor vehicle (bicycle and pedestrian) traffic per block and service district

Traffic counts

Illumination after dark at street level per block and service district

Field observations

All expenditure items also should be related to traffic volume.

What percentage of the street mileage in a **neighborhood** is paved? What percentage of the dwelling units have sewer connections? These data usually will be available from engineering maps. It will be relatively simple to compare these data using a variety of **boundaries--** census tracts, neighborhoods, wards, service districts. Because of the capital intensive nature of most of these services, service districts (for maintenance and installation) are likely to be larger than for other services. In small and medium size jurisdictions, service districts may not be used at all. On the other hand, refuse collection, as a less capital intensive service, may have smaller service districts. Information also can be obtained easily for individual **blocks**, so that it can be observed whether deficiencies are isolated or cumulative.

Expenditure data provide the second main method of analyzing these services. These indicators concern how much is spent (in the most recent fiscal year, or the annual average for the most recent five years) for new water lines, for replacement and **repair** of existing water lines, and the like. These data may be difficult to obtain. Furthermore, in some situations, they may not be helpful. If an area has not been the **location** of expenditures for water lines during the previous year or five years, this may be of little consequence if the area has water lines that are functioning **adequately**. On the other hand, if the area lacks adequate water service, and expenditures have been made in other areas where water service is adequate, then this is a matter of concern. In practice, therefore, it may be appropriate to discover problem areas first, by determining the presence or absence of adequate facilities and equipment and by studying indicators of results, to be discussed below. Thereafter, expenditure analysis could be attempted for those areas **that** lack adequate facilities and equipment in comparison with **jurisdiction-**wide norms. The important thing to do will be to schedule expenditures for areas lacking adequate facilities and equipment.

Activity indicators are not important for most of these services. We are not concerned with the water flowing through the distribution line. We are interested in the water **pressure** at-the tap, at which point we consider the pressure an indicator of the result of water **supply**. We are not concerned with operation and maintenance practices; we are concerned with the time residents are without water service because of faulty water supply. Again we treat this as a result indicator, an unintended result.

Activities are difficult to measure. An activity implies that people are doing something. It involves a process, an interaction. It needs to be recorded, observed, **commented** on in narrative. Therefore, activities are difficult to reduce to simple indicators. Activity indicators that are simple enough for use by administrators usually are pale reflections of the phenomena administrators would like to measure. Instead of the activity itself, administrators are likely to need to measure the time (and place) in which it occurs. In the case of routine services, this will be

relevant for services with a substantial personnel component, such as refuse collection, street cleaning, and bus service. The indicators, as shown in Table 1, will be of the frequency (and location and time of day) of refuse collection, the frequency of street cleaning, and the frequency of bus service. Frequency indicators do not apply to streets, water, sewers, and sidewalks, because these facilities are intended to be available at all times.

Result indicators measure some consequence, intended or unintended, of the service. With water supply, water pressure and quality (taste, odor, color, purity) indicate the result of the service. The location of a test batch of water on a scale of acceptable and unacceptable pressure and quality indicates whether intended or unintended results have been achieved. The time without water service is another indicator of an unintended result. With streets, two indicators of results are the smoothness of the ride and the volume of traffic. These indicators, together, are useful indicators of need for the service, as well as of results of previous service provision. If a particular street with the greatest use also is the street with the bumpiest ride, its potential claim on resurfacing and repair funds is apparent. This is one of the general uses of result indicators. They measure the consequences of previous service. At the same time, they indicate need for future services. This indication of need, of course, requires interpretation. Interpretation includes justification in comparison with competing needs. These measures are not as straightforward as they may seem. Impressions of street smoothness vary with the observer. Smoothness can be measured by visual observation, by blindfolded evaluators recording **their impressions** of bumps, and by machines called roughometers. Some tests have indicated that man and machine observations are not highly correlated. Nor are there high correlations between the impressions of different human observers. At a minimum this suggests that reliance on a single observer may produce decisions on expenditure priorities of questionable validity. Traffic volume also has ramifications. High usage may reflect the absence of acceptable options. High usage also may be generated from outside the jurisdiction rather than from within it. Thus, administrators will need to interpret the importance of traffic volume in the context of travel alternatives and the source (and destination) of the traffic.

Some opinion indicators for routine services, as with other services, may be of practical use. In some instances, opinion indicators may be of special importance. Water taste and odor, for example, is in the eyes (or mouth and nose) of the beholder. Smoothness of streets, as we have seen, is impressionistic. Noise occurring during garbage collection can be measured by sound equipment, but whether noise is objectionable or not depends upon whether it is heard and whether the listeners object to it.

Opinion indicators also need interpretation. **Suppose**, for example, that resident satisfaction with water, sewers, streets, and refuse **collection** is much lower in one neighborhood than in other neighborhoods. **How** should this be interpreted, if the indicators of resources and results seem to describe a service pattern contrary to the resident's opinions? **One** interpretation would be that their expectations are higher than those of people in other neighborhoods; therefore, they are less satisfied even

though they receive better services. Another interpretation would be that they are disaffected from government, in general, expect to receive inferior services, and conclude that whatever level of service they receive must be inferior to services received elsewhere. **What** action should be taken? The problem may be more one of public relations than of service delivery. It could be approached in that way. This possible pattern of findings also suggests that opinion measures used in isolation from performance measures have the potential of leading to questionable conclusions.

Examples

Hypothetical examples of possible findings may help clarify uses of information about routine services by service district. Consider the following pattern for water supply in four service districts within one jurisdiction.

Table 5. Hypothetical Water Indicators

	Districts			
	1	2	3	4
Average expenditures for replacement and repair of water lines last five years/100 dwelling units (resource)	\$5, 000	\$20, 000	\$20, 000	\$20, 000
Percent dwellings with public water supply (resource)	50	100	100	100
Percent dwellings with water pressure greater than x lbs./sq.in. of those having public water (result)	25	100	100	100
Time without water service of those having public water (in days) (result)	20	2	2	2
Modal response on survey to question about taste of public water at the tap (result)	Poor	Good	Good	Good

In this example, district 1 fares less well than districts 2, 3 and 4 on each measure, which includes representatives of indicators of resources and results. The difference is striking for each indicator. In addition, the data for districts 2, 3, and 4 are identical. District 1 clearly is a prime candidate for receiving additional investment in water supply in coming years. The amount of this investment and its urgency is given greater meaning by having data to analyze and interpret.

Consider a much different pattern for these same indicators.

Table 6. Hypothetical Water Indicators

	Districts			
	1	2	3	4
Average expenditure for replacement and repair of water lines last five years/100 dwelling units (resource)	\$5, 000	\$10, 000	\$15, 000	\$15, 000
Percent dwellings with public water supply (resource)	100	100	100	100
Percent dwellings with water pressure greater than x lbs./sq.in. of those having public water (result)	75	50	25	100
Time without water service of those having public water (in days) (result)	5	10	20	2
Modal response on survey to question about taste of public water at the tap (result)	Poor	Fair	Fair	Good

These data describe a non-cumulative pattern of water service inadequacy. District 4 shows well on each indicator. District 1 does fairly well on water pressure but worse on taste. Districts 2 and 3 received more expenditures for replacement and repair of water lines than district 1, perhaps because it has more old lines, as reflected in their greater number of days without service, 10 and 20 compared with 5 in district 1. The water source could be different for different districts. This might explain taste variations. Greater filtration may be called for in district 1. Low water pressure in district 3 may call for greater pumping station capacity. It would seem that replacement and repair expenditures in district 4 are high and that other districts should get relatively more in the future. One characteristic of these data is that they are not self-explanatory. They require interpretation by, and additional information from, the administrators of the water system. But they also provide the data to make such explorations meaningful and perhaps to lead to modified decisions. Low water pressure and a substantial number of days without service probably deserve priority.

The remedy might be expensive. Taste problems may be less serious, and perhaps the remedy is less costly. Pending cost analysis, district 3 probably should be first in line for alteration.

Protection Services

Protection services help to maintain public order and to protect persons and property. *Among* these services are police, fire, courts, corrections, code enforcement, and emergency services. The discussion here will be confined to police and fire. Police and fire services have two functions. One is to prevent the occurrence of undesirable events (violent crimes, property crimes, damage to persons and property from fires)--the preventive function. The second is to suppress the undesirable activity, and, in the case of property crimes, to recover what has been taken--the suppressive function. This involves putting out fires, arresting violators of the law--in the act if possible, and investigating to determine the perpetrator of the crime or the fire. To the extent that the preventive function is successful, the role of the suppressive function is lessened. The preventive function reduces the risk that undesirable **events will occur**. The suppressive function reduces the damage from these events once they have occurred.

The important characteristic of these services is that people benefit from these services to the extent that risk and damage are reduced. In the case of routine services, people want them available regularly and use them routinely. In the case of developmental services, people want them available to use at their discretion. **But** with protection services, people hope that they will have no **need** of these services. This affects the measurement process. **More water** pressure is considered beneficial. More expenditures for education are considered beneficial. In both instances; it is assumed that better results will follow from greater expenditures'. 'With protection services, especially with police, our confidence in this relationship is not so great. While people in high crime areas certainly want police protection, there is no evidence to suggest that most police activities have any influence on the crime rate. This complicates the interpretation of findings for particular indicators of police services. Because causal relationships are obscure for police services, the task of **determining** what distribution of police services is equitable becomes more difficult.

Useful indicators of police and fire services are listed in Tables 7 and 8. The list, of course, could be expanded, but those indicators included may be more than most local governments will have the resources to gather data for. Indicators pertinent to both the preventive and suppressive functions are included. The emphasis is on suppression. This probably **is** appropriate, since suppression usually is emphasized by administrators. A useful modification of this list would be for administrators to add indicators of prevention that are particularly applicable to activities engaged in by their departments.

Table 7. Fire Protection Indicators

Objectives: Reduce the occurrence and severity of fires through inspection and public education and suppress the fires that do occur with as little property loss and as few deaths and injuries as possible.

Indicators by measurement category	Data collection source and procedure
<u>Resources</u>	Department records
Expenditures for fire crews per 1000 dwelling units	
Average expenditures for fire equipment last five years per 1000 dwelling units	
Average fire flow capacity at random points per service district	
Average distance of dwelling units from a fire hydrant per service district	
Expenditures for preventive fire inspections per 1000 dwelling units	
Total expenditures per fire per service district	
<u>Activities</u>	Department records
Average fire response time per service district	Time from receipt of call to arrival at the scene
Percent fire response time greater than x minutes by type of fire per service district	
<u>Results</u>	Department records
Occurrence of serious fires as a percentage of dwelling units inspected in last six months per service district	

Indicators by measurement category	Data collection source and procedure
Occurrence of serious fires as a percentage of dwelling units not receiving fire prevention inspection during preceding six months per service district	Department records
Dollar loss from fires per service district	
Dollar loss as a percentage of damaged structures' value per service district	
Civilian casualties from fires per 10,000 residents per service district	

Table 8. Police Protection Indicators

Objectives: Promote **community** safety through the apprehension of offenders and the prevention of crime; provide service in a fair, prompt, courteous, and thorough manner.

Indicators by measurement category	Data collection source and procedure
<u>Resources</u>	Department records
Number of patrolmen per 1000 residents per district	
Number of investigators per 1000 residents per district	
Number of patrolmen per 100 total reported crimes per 1000 residents per district	
Number of investigators per 100 total reported crimes per 1000 residents per district	
<u>Activities</u>	Department records
Mean police response time to all calls for service per district	Time from receipt of call for service to arrival at scene

Indicators by measurement category	Data collection source and procedure
------------------------------------	--------------------------------------

Percent of patrol **officers'** time spent on active patrol per district

Hours spent **investigating** criminal incidents for each category of crime per district

Results

Department records

Number of arrests per 100 total crimes reported

Number of arrests per 100 serious personal crimes reported per district

Number of cases cleared per 100 total crimes reported per district²

Number of cases cleared per 100 serious personal crimes reported per district

Percentage of stolen property recovered per district

Department records

Number of arrests per 100 total actual **crimes** per **district**

Victimization survey

Percentage of **citizens** rating police performance as **satisfactory** per **district**

Ci **tizen** survey

Impacts

Total reported and actual **crime** rate per 1000 residents per district

Department records and **victimization** survey

¹ For a more extensive list and discussion of police indicators see Kenneth R. Mladenka and William H. Lucy, Handbook for Analyzing the Distribution of Police Services, (Washington, D.C.: National Training and Development Service, 1978).

² The number of cases cleared refers to reported crimes for which a suspect is formally charged and other crimes for which the police believe the suspect is responsible but for which he may not be formally charged.

Resources

Indicators are needed for the prevention and suppression functions. For police, indicators often concentrate, sometimes exclusively, on patrol. These should be related to population (e.g. patrol manpower/1,000 people) and to need (e.g. patrol manpower/10 FBI index reported crimes). Some police departments have adopted complicated formulas for assigning patrolmen. In such cases, manpower should be expressed as well in a form appropriate to the formula. Frequently there are no separate data describing investigation of crimes. This is unfortunate, since it clearly makes a difference to the suppression function how much investigative time is allocated to one district versus others.

Fire protection depends upon personnel, equipment, and availability of water. **Water** pressure was identified as a result of the water system, when routine services were analyzed. But in the context of fire protection, water pressure is an indicator of a resource for use in suppression. Expenditures for personnel should be distinguished from expenditures for equipment. Since fire equipment has a relatively long life, average expenditures for five years is an appropriate indicator. Expenditures for preventive inspections also should be identified. If the fire department is organized so that inspectors are ready for suppression duty even during inspections, then the same expenditures can be counted twice--once for fire inspection and once for fire crews.

Activities

Measures of time are the principal indicators of activities. Response time-- the time elapsed from receipt of a call for service to the arrival of the police or fire crews at **the scene--is** an important indicator for both services. Fire departments usually record this data. Police departments frequently do not. Police records may reveal nothing closer to response time than the time **a** call for service was received and **the time the patrolmen reported themselves ready for duty again after handling the service request. This is** a data gap that police administrators should fill. The frequency of preventive police patrol also is useful, as is the time elapsed from a request for assistance, usually from patrolmen, and the beginning of work by an investigator, in cases in which investigation is warranted. The amount of investigative time for each category of FBI index crimes also is an important indicator.

Results

Indicators of results primarily concern percentages of reported crimes handled in a variety of ways by the police. Perhaps the arrest rate (arrests divided by crimes reported) and the clearance rate (the percentage of crimes cleared by

arrest, including crimes police believe were committed by those arrested even if charges against them are not filed due to insufficient evidence) are most basic, in the sense that punishment-and probably some prevention--begins there. Victims of thefts want their goods returned, of course, so that percent stolen property recovered is another useful indicator. Some other indicators involve dilemmas. Good arrests (arrests for which there is solid evidence) are more likely to be prosecuted in the courts and to lead to convictions. Thus, indicators of these can be considered measures of the **quality** of arrests. At the same time, prosecutors, defense attorneys, judges and, sometimes, probation officers, **influence** these indicators. Still, they probably are useful, because they help identify differences in arrest quality among precincts, especially where the prosecutor and judge are the same for each precinct.

For fire service, indicators of fire loss are the most fundamental measures of the consequences of the phenomenon they try to prevent. Fire indicators, like police indicators, tend to be negative. They measure unintended consequences, or consequences beyond the control of the service. One way to improve on fire result **indicators** is to include indicators that relate results to attempts at prevention. Thus, fires can be related to the occurrence of fire prevention inspections within some time span, six months for example, prior to the outbreak of the fire.

Opinions about police service probably are more important than opinions about fire service. Subjective assessment of police conduct has become an important indicator of police success. People are concerned about police courtesy, force used by police, **sensitivity** by police in asking questions, and thoroughness by police **in** investigations. Opinions about police behavior, and effectiveness, in one neighborhood in comparison with other neighborhoods also may be a matter of considerable administrative, and political, importance.

Examples

Two conceivable patterns of police distribution are given below. Their **symmetry**, of course, makes them improbable.

Table 9. tiypothetical Police Indicators

	Districts			
	<u>1</u>	2	3	4
Expenditures police patrol/ 1,000 people (resource)	20	20	20	20
Expenditures for police patrol/ 10 FBI index crimes (resource)	10	80	80	80

	Districts			
	1	2	3	4
Expenditures police Investigation/ 1,000 people (resource)	1	5	5	5
Percent crimes reported cleared by arrest (result)	5	30	30	30
Percent stolen property recovered (result)	4	10	10	10

In the pattern above, patrol funds are **distributed** equally per capita. This has the effect of an unequal distribution per reported crime, indicated by expenditures for police patrol per 10 FBI index crimes. This inequality is repeated, though not at the same ratios, for investigation, clearance rate, and stolen property recovered.

Table 10. Hypothetical Police Indicators

	Districts			
	1	2	3	4
Expenditures police patrol/ 1,000 people (resource)	80	20	20	20
Expenditures for police patrol / 10 FBI index crimes (resource)	40	40	40	40
Expenditures police investiga- tion/1,000 people (resource)	5	5	5	5
Percent crimes reported cleared by arrest (result)	20	20	20	20
Percent stolen property recovered (result)	10	10	10	10

In the second pattern, equal expenditures are made for each 10 FBI **index** crimes. This equality persists through the indicators for investigation, clearance rate, and stolen property recovered. It has the effect of unequal expenditures per capita for police patrol.

The difference **between** a population-based distribution pattern and a pattern based on crimes reported is apparent. **Differences** in clearance rates and property recovery rates, of course, can vary considerably though expenditures per crime reported may be similar. The complex patterns that may exist in the administrator's world may be difficult to interpret. The accumulation of experience will help **interpretation**. In the short run, administrators at least will have meaningful data to which to apply their best professional judgment.

Developmental Services

Developmental services are intended to develop the physical, intellectual, and emotional potential of individuals. The services treated here--education, libraries, parks and recreation--are available to nearly everyone, at least during certain periods of their lives. Other services also serve developmental **functions**. These other services, however, tend to be restricted in their clientele. They will be discussed in the next section on social minimum services.

Education, libraries, and parks and recreation each are developmental in nature, but they differ substantially from each other in their social functions. Education is the most important of these services, because it influences one's life chances the most. The relatively occasional and peripheral use made of library, parks, and **recreation** services makes the equity issues in regard to them less momentous, though still important, than those applying to education.

There are serious measurement problems with each of these services. With education, it is not clear how the investment of resources is related to results or to impacts. Education activities are difficult to measure. Time indicators are not helpful. The measurement problems with libraries and parks are dominated by the discretionary and occasional use that is made of them by their clientele. Indicators of access and availability and reasons for non-use as well as for use help to deal with the discretionary and occasional nature of these services. Irregular use is an effect of varying preferences and resources. Preferences for the services offered by libraries, parks, and recreation vary among individuals. Even among those individuals with similar preferences, the availability of space, time, and money vary. Some people buy books that others must go to the library and borrow. Some **people** use spacious yards, take vacations, have country homes, and use private clubs, while others depend on public facilities. Thus, when distribution of libraries is described, this does not describe the distribution of access to the kind of services libraries provide because some people have alternatives others lack. When **distribution** of **public** parks and recreation is described, variations in alternatives available to different people should be taken into account in interpreting the equity of a particular distribution.

Geographic Units of Analysis: The Service Area

Parks and libraries involve similar problems in determining service districts. The procedure described here for parks can be applied also to libraries. For each type of park, or facility, for which a distribution analysis is to be conducted, a circle should be drawn representing the park's service radius. The distance of the service radius will depend upon a) the type of park, and b)

the distance standard accepted in the community for that type of park. For neighborhood parks, for example, the standard suggested by the National Recreation and Parks Association is a service radius of no more than one-half mile.

One objective is to determine the number of residents who do not live within a service radius. To accomplish that, a circle of appropriate radius, say one-half mile, should be drawn around each park classified as a neighborhood park. A circle also should be drawn around larger parks which perform functions similar to those of neighborhood parks. Those functions will need to be specified in order to decide whether also to draw service lines around school grounds and private recreation areas in developments. For private recreation areas, the service line would not go outside the area of eligible users, but it would not necessarily include all of the private development, since some eligible residents might live outside the service area radius accepted in the community. After service area boundaries are drawn, the area that falls within them should be inspected to determine whether they are accessible to all residences within them. Where there are impassable barriers, such as expressways, or barriers passable with considerable difficulty, the service boundaries should be modified to reflect realistic walking paths.

This process can be repeated for each type of park. For each park type, a service radius appropriate to it should be selected. For small and medium size parks, those with a service radius no more than two or three miles, the service area can be calculated in mileage rather than in time. For service areas of greater size, such as for regional parks, driving time is a more suitable criterion for calculating a service area. Ease of access may vary considerably, depending on the location from which one is traveling to the regional park.

A second objective is to determine whether enough park acreage and other facilities--ball fields, tennis courts, swimming pools, and so on, are available to serve the residents within each service radius. For this purpose, population estimates must be obtained for each service area. The procedure for making population estimates will be described below. At this stage, accurate data are needed on park acreage and on facilities in parks and elsewhere. Data on park acreage and facilities provide the basis for determining whether there are 10 acres of community-serving parkland, or whatever the standard may be, per 1,000 persons within the service area, or whether there is one basketball court for 500 people, if that is the standard.

These service radii also provide the geographic boundary within which to apply the other service indicators discussed in Chapter 4. For example, capital expenditures per resident and operating expenditures per resident should be based on the number of residents in the service area. These additional calculations

are needed in this respect. 1) Some residents will live in more than one service area. Therefore, they will be the recipients of expenditures for each service area. If expenditures for one park are \$20 per capita and those for a second park are \$15 per capita, then residents living within both service radii would be the recipients of \$35 per capita. 2) Some residents will not live in any service area. Therefore, they could be interpreted not to receive any expenditures on their behalf. In this interpretation, a neighborhood would be described in **two** parts. One percentage of its residents would receive X dollars of operating expenditures per resident, and a second percentage would not receive any. 3) Those living outside the service area, according to community standards, could be assigned to the service area of the park nearest them. This method would affect each indicator that relates a service variable, such as park acreage, facilities, or expenditures, to a population variable, such as each resident or to 1,000 residents. Assume that operating expenditures were \$20 per capita, \$40,000 for 2,000 residents within the service area and there are 2,000 more residents in the neighborhood outside the service area. If these 2,000 outsiders are included, for a total of 4,000 residents to be served, then per capita expenditures would be \$10.

Resources

Indicators of resources, and the other categories of indicators for developmental services, are listed in Tables 11 and 12. For parks and recreation, acreage, expenditure, and distance indicators are most useful. Differences in access can be accounted for, partially, by distance indicators--distance to neighborhood parks, distance to supervised recreation, distance to playgrounds. In using these indicators, differing availability of transportation and alternative recreation opportunities should be kept in mind.

For libraries, expenditure and distance indicators also are helpful. Expenditures for books (and other materials) and personnel should be distinguished, because one of the important characteristics of library budgeting is the relative shares assigned to books (and other materials) and personnel. Indicators about the amount and type of books also are useful, though inevitably subjective.

Education is a specialized subject about which many studies have been conducted. Urban administrators who are not part of education bureaucracies have little, usually no, influence on education policies. Those who have a special interest in education should consult other sources.

Table 11. Indicators for Analyzing Park Service Distribution

Objectives: Provide a variety of leisure activities for all citizens which are enjoyable, **accessible**, **aesthetically** appealing, and safe.

Indicators by measurement category	Data collection source and procedure
<u>Resources</u>	
Acres of neighborhood parks/1,000 residents	Dept. records and updated census (same for other population indicators)
Acres of community-serving parks/1,000 residents	
Numbers of facilities (e.g. ball fields, tennis courts, swings, slides, and so on)/1,000 residents	
Number of residents more than x miles from parks (by type) and from facilities/1,000 residents	Dept. records, draw service radius, use block data
Capital expenditures/residents	
Operating expenditures/residents	Dept. records (requi res time allocation for mobile employees and equipment)
Capital expenditures/user	Dept. records and field observations
Operating expenditures/user	Dept. records and field observations
Number of facilities (by type)/1,000 users	Dept. records and field observations
<u>Activities</u>	
Minutes of operation (facilities)/resident	Dept. records
Minutes of supervised recreation/resident	
Minutes of programs (by type)/resident	
Minutes of operation (facilities)/user	

<u>Indicators by measurement category</u>	<u>Data collection source and procedure</u>
Attendance per 100 hours of operation by type of facility/ 1,000 residents	Dept. records or field observations
Number of users of community-serving parks/1,000 residents	Field observations
Citizen rating of park services overall	Citizen survey
Citizen rating of safety, cleanliness, and maintenance by park and facility	Citizen survey

Table 12. Indicators of Library Services

Objectives: Provide a comprehensive, timely, and accessible body of informational and educational materials that is satisfactory to all types of residents.

<u>Indicators by measurement category¹</u>	<u>Data collection source and procedure</u>
<u>Resources</u>	Department records
Total number of books in each library branch per 1,000 persons per service district ²	
Annual expenditures for books and other materials per 1,000 persons per service district for each branch	
Number of residents more than x miles from the nearest branch library by neighborhood	
Number of square feet of space for reading per branch for each 1,000 persons per service district	
<u>Activities</u>	Department records
Total hours branch libraries are open each week per 1,000 persons per service district	

Indicators by
measurement category

Data collection source
and procedure

Total hours of special programs in
each branch library each week
per 1,000 persons per service
district

Results

Department records and
citizen survey

Percentage of persons in each
branch library service area
registered with the library
system

Number of books circulated annually
by each branch library per 1,000
persons per **service** district

Percentage of residents in each
service district dissatisfied
with their branch library
services

Citizen survey

¹ For a **more** extensive explanation of **library** indicators, see
Kenneth R. Mladenka and William H. Lucy, Handbook for Analyzing
the Distribution of Library Services, (Washington, D.C.:
National Training and Development Service, 1978).

² Service districts for the purposes of indicators in this table
should be drawn so that the entire **jurisdiction** is blanketed
with service districts. Except where barriers interfere,
residents should be assigned to the nearest branch.

Activities

Activity indicators for recreation are very difficult to identify and use. One of the better such measures is hours of supervised recreation programs. This has some difficulty when used to distinguish neighborhoods. Especially in smaller communities, supervised recreation may be concentrated in a few places so that some neighborhoods might appear to be totally deprived. This appearance, of course, could also be a reality; availability of transportation will determine the extent to which appearance and reality merge. Time indicators are probably the closest one can come to an activity measure for libraries. Total hours that branches are open and total hours of programs are **two** such indicators.

Results

Indicators of results also are difficult to obtain for these services. Parks and recreation are particularly difficult services for which to construct result indicators that provide meaningful distinctions among neighborhoods. One indicator that should be included is usage, especially usage of those facilities that are neighborhood-oriented. **Playgrounds** are the best example. Swimming pools are another example. These indicators should be used with caution. **High** usage may indicate high need and low availability of alternative public, and private, recreation alternatives. Therefore, it may be a better estimator of need for investment of additional resources than a measure of the success of existing facilities.

There are problems also with result indicators for library services. Circulation and frequency of use of branch libraries for all purposes are **two** indicators of results. Library usage is related to education and income. On the one hand, high circulation may say more about the clientele than about the services of the library. On the other hand, if high circulation is taken as an indicator of need, it may lead to higher income and higher education areas getting a substantially higher share per capita of expenditures for libraries.

Some citizen survey findings about developmental services should be useful to administrators. Opinions about parks and recreation are useful, for example, because a) use of parks is related to beliefs about one's potential safety when there, b) use **is** related to information about opportunities parks and recreation programs offer, and c) use is related to opinions about the adequacy of facilities and programs made available by parks and recreation services.

Opinions of residents can give insight to reasons for use and non-use of libraries--adequacy of book collections, hours of service, accessibility of location, helpfulness of staff. **When**

variation in individual preferences are substantial, opinions of users and non-users become particularly important. This characteristic applies to library and to parks and recreation services.

Examples

Hypothetical examples of possible findings for indicators for recreation and libraries are given below.

Table 13. Hypothetical Recreation Indicators

	1	2	3	4
Expenditures for playground personnel and supplies per week (resource)	\$300	\$300	\$300	\$300
Average distance from residents to nearest playground (miles) (resource)	1	3/4	1/2	1/2
Total hours of supervised recreation at playgrounds per week during summer (activity)	40	40	40	40
Visits per week to playground (result)	600	400	300	200
Opinions about feelings of safety at playgrounds (result)	Fairly safe	Fairly safe	Safe	Very safe
Population	8000	5000	3000	2000

• Here is a situation in which expenditures and hours of supervised recreation are the same for each playground. However, usage varies greatly, by a three-to-one ratio. The greater usage in neighborhood one would seem to be related to the greater area it serves and the larger population in that area. Perhaps usage would be even greater if people felt safer there. And perhaps people would feel safer if usage was not so heavy and if the number of supervisors was greater in relation to the number of users. This information clearly calls for further investigation. At a glance, one gets the impression that shifts in operating and capital expenditures are warranted.

Below are a set of possible findings for four indicators of library services for four neighborhoods.

Table 74. Hypothetical Library Indicators

	Neighborhoods			
	1	2	3	4
Expenditures per capita for library books for branches (resource)	\$0.50	\$0.67	\$0.80	\$1.00
Average distance from residents to nearest branch library (resource)	1/2 mile	2/3 mile	3/4 mile	1 mile
Circulation per year of books from branch libraries per 7,000 people in service area (result)	5	6.7	a	10
Resident opinion: How well are books in your branch library related to interests of neighborhood residents (result)	Poorly	Fairly well	Well	Very well

These data reflect proportionality among expenditures, area served, and **circulation**. There is a reasonableness to that pattern. But one of the consequences, in this hypothetical example, is that opinions of residents indicate great variety in how they perceive the branch library collections being related to their interests. It is possible that in neighborhood 7 the residents' **dissatisfaction** with the collection is caused by expenditures for books being low-half as much per capita as in neighborhood 4. Perhaps these expenditures are based on **circulation**. If so, this is important for two reasons. First, it may be that circulation is low partly **because** of dissatisfaction with the **collection**. Second, the variation in book expenditures may get out-of-hand, resulting in space shortages in popular branches. Both tendencies are **self-reinforcing**. More **circulation** leads to **higher expenditures which** may lead to more circulation.

Social Minimum Services

The services under this heading are **commonly** discussed as those performing much of the **redistributive function** of the **economy**. These programs, generally, are explicitly redistributive. **They are** intended to redistribute benefits that have accrued to

individuals from the combined operation of the private and public economies. One of our themes, however, is that all services have distributive implications. They can perpetuate or modify the pattern of benefits that result from private sector activity of the economy. If they modify the pattern of benefits, their effect is redistributive.

The programs we place in the category of social minimum services include public assistance (welfare), public hospitals, public health and mental health, food stamps, hot lunches, day care, manpower training, and public housing. The guiding principle of these services is that there should be at least a minimum level of social services to provide necessities for people unable to get them in other ways. Each is designed for a limited portion of the population to provide a minimum income or essentials that income buys, such as food, housing, medical care, and job training. The standards for these services usually are set by the U. S. Congress or by state legislatures. These standards explicitly treat people unequally. Some people are eligible, while others are not.

The exclusive nature of these programs makes an analysis of distribution of them to the general population superfluous. Geographic analysis loses much of its relevance, because many, and probably most, of the people in any neighborhood will not be eligible for the service. Therefore, analysts should concentrate on those eligible. One question will be: Are those eligible treated equally? Or are they treated unequally according to explicit criteria that recognize need for service? Geographic analysis may be relevant to this. Accessibility to services often is a source of considerable inequality. Hospitals may be difficult to reach. This also is true of day care programs, hot lunch locations, public health services, and the like.

It also is relevant, of course, to compare services received by eligible participants with those received by ineligible persons. One complaint about some social programs, for example, is that rigid cut-off eligibility standards have the effect of making some of those eligible for services better-off than those slightly **above** the **cut-off** line. More generally, the question to ask is what level of service, and access to service, is available to those using the program compared with those not eligible for the program? In answering this question a data base is obtained for making policy judgments about the appropriateness of the standards, services, and funding levels in effect when the study was made.

A variety of indicators should be used in analyzing these services. The resource, activity, and result categories will be helpful in designing indicators. There are special problems, however, such as those referred to above and others related to the difficulty of identifying results, which are beyond the scope of our work here.

Geographic Analysis

The analysis of service distribution involves geographic comparisons. Geographic units must be selected for which data are to be gathered. Each geographic unit should have three characteristics. First, it should be feasible to gather service data for them. Second, population data and physical characteristics (such as housing) data should be available in order to match them with service data. Third, the unit should be relevant to decisions that may be made about the service.

These three characteristics often are difficult to obtain. There are differences between services that are likely to require use of more than one, and perhaps several, geographic units. Many services will have service districts. Each fire house is intended to serve a particular area. This also usually is true of public schools. These areas almost always will be different from each other and also will be different from police patrol districts. They are likely also to differ from refuse collection routes. And for some services, such as branch libraries and parks and playgrounds, service district boundaries are permeable since usage of these facilities is a matter of individual choice rather than of administrative discretion.

It will be most **common** to match service data with population data to obtain an indicator of x amount of service per capita, or per 1,000 people. For example, an analyst may want to determine expenditures for police patrol per 1,000 residents, or park acreage per 1,000 residents, or solid waste collected per 1,000 residents. Occasionally there will be a need for data for the number of households. For example, an analyst may want to determine solid waste collected per household or weekly public transit rides per household. For some purposes, such as parks and recreation analysis, age data will be useful, such as acres of playgrounds in relation to numbers of people under 18. Each of these data items is available in **Block Statistics** published by the **U. S. Bureau** of the Census. Block Statistics are published for every square block in the urbanized area of all 243 Standard Metropolitan Statistical Areas (**SMSA'S**) that existed in 1970. **These** data can be **summed** for all blocks that make up any unit for which aggregate **indicators** are sought--service districts, neighborhoods, or parts of neighborhoods.

To assist **in** evaluating the equity of a particular **service** distribution pattern, analysts will need other data. For example, they should identify the income and race of residents. Service distribution then can be related to income, and to race, to see if either characteristic seems to be associated with a service district or neighborhood receiving better or worse service than it seems it should receive based on some conception of equity. Data on the number of Negroes are reported for blocks.

The reliability of the data is questionable, but it probably is preferable to use block data to construct data for larger units than it is to take census tract data for race and to guess the racial characteristics of the portion, or portions, of a census tract for which one needs data. Income data are not available for blocks. A substitute for income can be used. Average value of owner-occupied housing is reported, as are the number of units, in block statistics. From these data, an analyst can construct averages for housing value for service districts or neighborhoods.

A much wider variety of population and housing data are available for census tracts. Census tracts rarely coincide with service districts. Nor are they likely to coincide with boundaries of neighborhoods, as neighborhoods are perceived by residents. If one proposes to make use of data available only in census tract documents, then it becomes necessary to adjust census tract data to fit service district boundaries. This requires assumptions, with an undetermined, but potentially considerable, margin for error, about the population and housing characteristics in the portion of a single tract, or portion of two or more tracts, which coincide with the service district boundaries. The simplest assumption is that the portion of a tract has the same characteristics as the entire tract. This probably is more often false than accurate. And how inaccurate it may be cannot be determined. For example, the median family income in a census tract might be \$11,500. One might have to assume that the median family income in a portion of the tract was identical, even though visual inspection suggested that income variation in different parts of the census tract might be substantial. Similarly, if a service district overlapped part of two census tracts, having median family income of \$10,100 and \$11,900 respectively, one would need to use an arbitrary rule-of-thumb procedure to arrive at a service district estimate for median family income. If one estimated, as in Figure 3, that the tract with a \$10,100 median constituted 60 percent of the service district ($\$10,100 \times 60\% = \$6,060$) and the tract with an \$11,900 median constituted 40 percent of the service district ($\$11,900 \times 40\% = \$4,760$), then the sum of the two portions would be \$10,820 ($\$6,060 + \$4,760 = \$10,820$). This procedure has obvious flaws. It is not valid to add, or average, medians. There is no way to be confident that a portion of a census tract coheres to a census **tract-**wide statistic. Still, this procedure probably is the best available. While it may cause considerable distortion in comparing service districts that seem, by this method, to be similar in median family income, it will cause fewer problems in dealing with service districts that are more distinct from each other.

One requirement of the procedure is that an estimate be made of the proportion of the census tract population that is included within the service district. This can be done using block data. By comparing a map of blocks with a service district map, the sum of the population living within the service area can be computed. These data, of course, become outmoded, in some areas, between the censuses, which are conducted at 10 year intervals. The planning department serving the jurisdiction may have **up-to-date** population estimates based on building permits, demolition permits, electricity connections, and the like.

The third need for data to conduct geographic service analysis is to use units of analysis that are relevant for decision-making. The service district is a unit of analysis that often can produce information useful for decision-making by urban administrators. Per capita garbage collection costs may be much lower than the norm in one service district, and refuse left on the street after collection may be greater in that district. If so, administrators could use this information to shift the expenditure pattern, modify decision rules used in collecting garbage, and/or add supplementary programs. Expenditures per crime reported may be considerably lower in one police patrol district than the norm in other districts. Perhaps the crime rate has been rising faster in that district as well. This information might be used to modify police patrol intensity, and perhaps the allocation of investigative personnel. The average distance from residences to playgrounds might be considerably less in one neighborhood, or service district, than in other neighborhoods. Perhaps the equipment and/or programs are fewer in that particular neighborhood as well. Perhaps density is greater and incomes are lower there also, resulting in fewer recreational alternatives for young people living there. In such a case, the arguments for redirecting recreation resources would be strong. In each of these, and many other, instances, the service district is useful as a unit for which to gather distributional data.

Information about units of analysis other than service districts also is useful to administrators. Garbage collection may be less satisfactory on a block that is particularly densely **settled**, or on several such blocks, in a service district which at the aggregate level seems to compare adequately with other service districts. This might be caused by lack of storage areas, by landlords that do not supply sufficient garbage cans, or by other conditions which may be associated with residents having low incomes. For the results of garbage collection to reach a satisfactory level in such an area, or areas, it may be necessary to modify a number of practices which work well in most areas. This possibility would not be identified by using service district data. Fire department administrators need to know how many (and the percentage of) residences, and other buildings, are more than the recommended number of feet from fire hydrants,

and whether there are some fire hydrants that are not operating properly. This same need for specific information applies to a number of physical facilities, such as street lights, sidewalks, sewers, paved streets, and water lines. The block--that is, both sides of a street, rather than a square block as used in census documents--is an appropriate unit of analysis for these services, supplementing the neighborhood, census tract, or service district level of analysis. The absence of adequate services may be cumulative, applying to a number of services. If certain blocks suffer cumulative deprivation, this condition can be identified only by using the block as a unit of analysis.

In selecting units of analysis, priority should be given to choosing units that are most relevant to making decisions for each service. This basis for decisions usually will lead to selecting service districts as the unit of analysis. Because service district boundaries for various services often will differ, one from another, systematic comparison of parts of the jurisdiction that are well- or poorly-served cumulatively will be difficult to make. However, by mapping the findings for each service, and by developing transparent overlays for them, visual identification of relatively deprived and relatively well-off areas, in terms of the quality and quantity of services, can be identified. This information also can be computerized, using a code for each street and block. In this way, comparisons among services for each block in the jurisdiction would be possible.

The Technology of Methodology

Having presented a framework for analyzing services, categorized services by types, suggested indicators for several services, and discussed geographic analysis, more remains to be done. Two steps are needed. One is to relate service indicators to concepts of equity. Is the service distribution pattern consistent with the concept of equality, or is it responsive to need or to demand? Ways of doing this are presented in Chapter 6. There the relationship between equity concepts, decision rules, service indicators, and management decisions is summarized.

The second necessary step is to decide which indicators to select and how to interpret the findings from the indicators selected. There is more art than science in this process. The more indicators one can gather data for, the more fully the distribution pattern of the service can be described. But a complete description of service distribution is not possible. Cost constraints will impose themselves in any event. The selection of indicators, then, will be a function of what data are routinely available, how many purposes will be served by gathering additional data, what possibility is there that knowledge of the distribution of a particular service indicator might lead to action that otherwise would not occur, and what is the budget for the data gathering and analysis process.

Having selected indicators, how is one to interpret the findings? For a given indicator, say fire response time, a jurisdiction-wide mean response time can be ~~computed~~—four minutes perhaps. The meaningfulness of departures from that mean could be approached in three ways. The deviation of every service district from that mean could be computed and the extreme high response time districts could be selected for ~~action~~—regardless of how much they deviated from the mean. The second interpretation would call for action only if deviations from the mean exceeded a specified standard, say six minutes. This second method seems much preferable to the first. The third method would be to carry the analysis a step farther and to consider what part of the high response time districts had the highest response times, and, in addition, to see if they bordered parts of other districts with high response times. By this method, policy makers could decide whether fire stations should be added or relocated. Thus, the way to use the data for a given indicator should be related to possible action that government might take.

Some analysts will be tempted to convert the findings for each data item (e.g. fire response time, value of property lost to fire, percentage of residences inspected for fire hazards annually, and the like) to a common base and then to add them together. For example, for fire district no. 1, the fire response time might be 75 percent higher than the mean, the value of property lost 35 percent higher than the mean, and the percentage of residences inspected annually 10 percent lower than the mean. Each of these would be in the direction of less desirability. An analyst could decide to add them (75, 35, and 10) and then to divide by three, yielding a mean score for district 1 of 40. A score of this sort could be computed for each district.

Summary scores of this type are interesting, but one should not make too much of them. Any summary score implies a weighting system. If no weighting system is made explicit, then each item is weighted equally. One must decide whether this is appropriate. More importantly, summary scores can hide what individual scores reveal. For example, property loss 35 percent higher than the mean may result from a single serious fire, and not call for a policy response. But a 75 percent higher response time, if it also exceeds the standard that fire officials consider excessive in adding to the risk of loss of life and property, may call for a policy response to provide additional or relocated fire stations, or more men and equipment. The importance of this policy response will not be illuminated by a **summary** score of 40 for district 1 for three indicators. The **summary** score is useful, however, in that it can show whether there is a pattern of inferior, or superior, service, in addition to whatever individual indicator findings seem to call for a policy response. 4

Another methodological issue concerns how, and whether, to develop summary service quality scores for service districts, neighborhoods, or census tracts for several services. The biggest obstacle to such summaries is that data probably will be gathered for service districts and the service districts for different services are not likely to have the same boundaries. Without common boundaries, summary scores are meaningless. Administrators are not likely to have much incentive to reverse the process, trying to gather data for many services for identical territories, such as census tracts. Such data are more difficult to gather and of

less decision-making usefulness than are service district data. For academics, interested in patterns of service distribution, in correlations with socioeconomic and population indicators (e.g. income and race), the effort is more likely to be valuable.

Some Ways for Urban Administrators to Use Distributional Analysis

In Chapter 3, we discussed the significance of decision rules, noting that decision rules have distributional consequences. Sometimes the direction of these distributional consequences can be inferred. The extent of distributional consequences, however, only can be guessed at without data to describe the service pattern. Administrators may want to change decision rules but be uncertain about the importance of doing so. Distributional analysis will help them decide which rules to retain and which rules to change. Since decision rules govern all the important, routine aspects of urban service delivery, the combination of decision rule identification and distributional analysis brings the routine aspects of service delivery within the decision-making scope of administrative generalists, dependent on bureaus to deliver services and with substantial authority delegated to bureau personnel. City and county managers, budget directors, and planning directors are locked out of a great many service delivery decisions in which they have a legitimate role. This minor role also describes the fate of elected officials-mayors and local legislators. Their role in service distribution is much more minor, it appears, than the role of administrative generalists.

Attenuation of supervision and control of operating departments by administrative generalists and elected officials diminishes the accountability of local government to local citizens. Decision rule analysis and distributional analysis, therefore, have fundamental importance in establishing more meaningful linkages between citizens and their government.

Changes will also occur in the annual operating budget, reflecting departmental changes. Capital improvement programs, which usually schedule capital projects five or six years in advance, require decisions about locations as well as about types of projects. Distributional analysis will provide much greater systematic information for officials to use in preparing capital improvement programs. Officials will have accurate answers to questions like: Which neighborhoods are most in need of park and recreation improvements? Which neighborhoods need street improvements, better mass transit service, a branch library, and upgraded water supply? Just as capital programing will be strengthened, so also will the preparation of community facilities plans and decisions about how to allocate federal funds made available in block grants under the Housing and Community Development Act of 1974.

Efforts to make local services more effective will be given a new dimension. Objectives can be set for service districts and neighborhoods, as well as for the entire jurisdiction. Jurisdiction objectives may be either reflections of past performance or arbitrary guesses about what a new program or service should achieve. The goal of distributional equity becomes **operational**- something that administrators can work **with-**

once systematic distributional analysis is executed. **Management** by objectives, therefore, also achieves a new dimension. Aiming at a two percent increase in the jurisdiction's arrest rate is one type of goal. Aiming at a variation among service districts or neighborhoods of no more than 10 percent is a second type of goal. Program evaluation of new services, new decision rules, or new facilities also is given added meaning. For program evaluation to be meaningful, base-line and trend data are needed. Without information about past performance, there is no way to assess the effect of changes in rules, facilities, and services. Service status monitoring can provide this baseline data. The richest form of baseline data is data that includes distributional analysis.

Previous mention was made of the strength that distributional analysis can add to the linkage between citizens and government. Since the mid-1960's, citizen participation has been advocated as a means of improving that linkage. Satisfaction with citizen participation methods varies widely. The consequences of the various participation methods are not well understood. But one aspect of citizen participation is clear. Citizens lack sufficient information to participate meaningfully in regard to most local service delivery issues. Furthermore, government officials often lack sufficient information to respond appropriately to requests and demands from citizens. Systematic distributional analysis can help correct both these deficiencies in the linkage between citizens and government.

Conclusion

In analyzing urban services, it is important to use a number of different kinds of indicators. Research findings have shown that distribution patterns discovered for one indicator are often not the same as those found for other indicators. In addition, different kinds of measures provide information that is needed by administrators; and by elected officials and citizens, in making decisions. It is important to know how resources are distributed. It also is important to know the pattern of activities and the pattern of service results. In selecting indicators, an attempt should be made to cover each objective of a service, remembering that services usually have more than one objective. Unintended consequences should be taken into account when indicators are selected.

Complex measurement and analysis are expensive. Short-cuts are needed. Sampling is one necessary short-cut. Selectivity in indicators is another. Limiting services analyzed is a third. Selectivity will be particularly appropriate during the first attempt at data gathering and analysis of service distribution. Experience will aid judgment about what is worth doing. Funding will need to be obtained. There are a number of options. Funds could come from the budgets of the manager, budget office, or **planning**. Some communities may be able to use general revenue sharing funds. **Others** can use funds available under the Housing and Community Development Act of 1974 to study some services. The federal and state governments could provide a new source of funds, and, in time, perhaps they should require that such studies be conducted as a condition of eligibility for certain federal and state funds.5

FOOTNOTES

1. A few indicators to be obtained from citizen surveys are included in the sample list of indicators with each category of services in sections that follow. Sample citizen surveys are included in handbooks for individual services (police, parks and recreation, solid waste collection, and libraries) that accompany this volume. Other sample citizen surveys can be found in Webb, Kenneth, and Hatry, Harry P., Obtaining Citizen Feedback, (Washington, D.C.: The Urban Institute, 1973); and The Urban Institute and International City Managers Association, Measuring the Effectiveness of Basic Municipal Services, (Washington, D.C.: The Urban Institute, 1974). For survey methodology see Charles H. Backstrom and Gerald D. Hursh, Survey (Evanston, Ill.: Northwestern University Press, 1963) and H y m a n , Survey Design and Analysis, (Glencoe: Free Press, 1955).

2. Campbell, Donald T., and Stanley, Julian C., (Experimental and Quasi-Experimental Designs for Research, (Chicago: Rand McNally & Co., 1963); Hatry, Harry P., Winnie, Richard E., and Fisk, Donald M., Practical Program Evaluation for State and Local Government Officials, (Washington, D.C.: The Urban Institute, 1973); Weiss, Carol H., Evaluation Research. (Englewood Cliffs, N. J.: Prentice-Hall, -Inc., 1972).

3. Boots, Andrew J. III, Dawson, Grace, Silverman, William, and Hatry, Harry P., Inequality in Local Government Services: A Case Study in Neighborhood Roads, (Washington, D.C.: The Urban Institute, 1972).

4. For attempts to develop summary indices, see the Neighborhood Standards Project of Portland, Oregon, 1978, and Dajani, Jarir S., Vesilind, P. Aarne, and Hartman, Gerald, "Measuring the Effectiveness of Solid Waste Collection," Urban Analysis, 1977, 181-219.

5. Some of the material in this chapter draws on an article by William H. Lucy, Dennis Gilbert, and Guthrie S. Birkhead, "Analysis of Equity in Local Service Distribution," Public Administration Review, 1977.