

Health service coverage and its evaluation

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Health service coverage is considered as a concept expressing the extent of interaction between the service and the people for whom it is intended, this interaction not being limited to a particular aspect of service provision but ranging over the whole process from resource allocation to achievement of the desired objective. For the measurement of coverage, several key stages are first identified, each of them involving the realization of an important condition for providing the service; a coverage measure is then defined for each stage, namely the ratio between the number of people for whom the condition is met and the target population, so that a set of these measures represents the interaction between the service and the target population. This definition of coverage allows for variations, which are called "specific coverage", by limiting the target population to specific subgroups differentiated by certain conditions related to service provision or by demographic or socioeconomic factors.

The evaluation of coverage on the basis of these concepts enables management to identify bottlenecks in the operation of the service, to analyse the constraining factors responsible for such bottlenecks, and to select effective measures for service development.

In many developing countries high priority has been given to the development of basic health services or primary health care. This involves two basic approaches: one is the development of new resources and technologies; the other is the effective use of available resources and technologies. In the context of the latter approach, a great deal of attention has recently been given to the management of health services.

The fundamental issues in the management of a basic health service are:

(a) How should resources be allocated and the service organized in order to serve as many people as possible?

(b) Is the service reaching the people it should serve?

(c) Has the service been effective in meeting the people's needs?

Although knowledge of the service's coverage is essential for answering these questions, the evaluation of coverage has not been common practice. There seem to be three major reasons for this. First, there has been some confusion about the concept of coverage, which has been measured and inter-

preted differently for various purposes and occasions. Secondly, the measurement of coverage invariably requires an assessment of "population", with which few service personnel have been concerned. Thirdly, the use of information on coverage has rarely been considered in the planning or management of health services.

The purpose of this paper is to:

(i) re-examine and clarify the concept of health service coverage;

(ii) propose an approach to the evaluation of coverage;

(iii) illustrate some uses of information on coverage in service management.

A RE-EXAMINATION OF HEALTH SERVICE COVERAGE

Comprehensive view of health service coverage

Health service coverage depends on the ability of a health service to interact with the people who should benefit from it (the target population), i.e., the ability to transform the intention to serve people into a successful intervention for their health. This transformation process involves a variety of factors, such as availability of resources and manpower, distribution of facilities, supply logistics, and people's atti-

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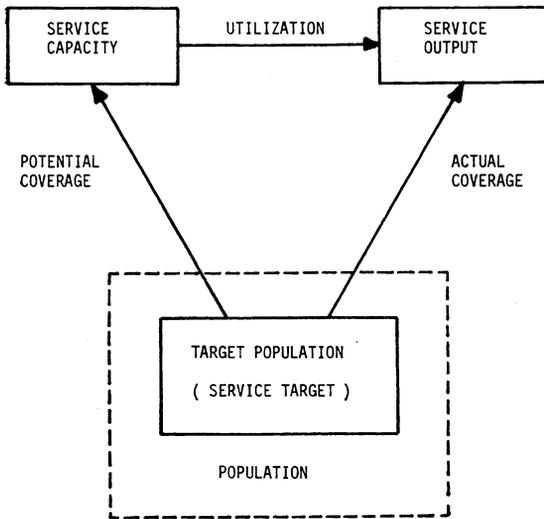


Fig. 1. Schematic model of health service coverage and utilization.

tudes to health and health care, to name just a few. It is impossible to observe the whole of such a many-sided process and evaluate it in every detail, but it is possible to observe the number of people for whom the service has satisfied certain criteria relating to its intended health intervention, and to compare that number with the target population. This has given rise to the concept of coverage and its evaluation.

Coverage is normally expressed by the proportion of the target population who can receive, or have received, the service. The number of people for whom the service can be provided expresses the service capacity and indicates the *potential* of the service. On the other hand, the number of people who have received the service expresses the service output and indicates the *actual* performance of the service. We may, therefore, define the coverage related to service capacity as *potential coverage* and that related to service output as *actual coverage*.

The relationship between service capacity and output is another important aspect of health service, which is called *utilization* or *service utilization*. It is normally expressed as the ratio between output and capacity, or as the rate of output, assuming the capacity of the service to be known. There is occasionally some confusion between the terms "coverage" and "utilization", and a clear distinction should be made. Utilization refers only to the service, and its measurement is only indirectly related

to the size of the target population; on the other hand, coverage expresses a relationship between the service and the target population. For example, a high utilization of service facilities does not necessarily imply satisfactory coverage and could in fact imply the contrary.

The above definitions of coverage and utilization are illustrated in Fig. 1, where each arrow represents the ratio of the component at its end to the component at its root. As the relationships between the three arrows indicate, actual coverage can be derived from the combination of potential coverage and utilization. The section with a broken outline represents the total population, the target population being normally a subgroup within the total population.

Classification of measurements of coverage

There are a number of ways of describing the capacity and output of a service; hence there are a number of ways of measuring coverage. It is unlikely that a single measurement of coverage could satisfactorily reflect the complex interaction between the health service and the target population.

In order to identify the measurements of coverage that reflect essential requirements for service provision, let us imagine the process whereby a person in need of a certain kind of health care obtains the appropriate service. First, he looks for a service in his area that is relevant to his problem; when he has found there is one, he can use it only if he has the means of reaching it; whether he can afford it and decides to use it is another matter; if he does, then he receives the service; but the service may or may not solve his problem, depending on the quality of the service as well as the nature of his condition.

Looking at this process from the point of view of service provision, it is possible to identify five important stages that successively lead to a desired health intervention and to define measurements of coverage appropriate to these stages.

1. First of all, some resources—manpower, facilities, drugs, etc.—are always required in order to provide a service; the availability of such resources limits the maximum capacity of the service, which in turn decides the amount of the service that can be made available to the target population. The ratio between this capacity and the size of the target population gives the measurement of coverage for this stage, and it may be called *availability coverage*.

2. Even if all the necessary resources are available, the service must be located within reasonable reach

of the people who should benefit from it. Meeting this condition can be considered as the next stage in the process of service provision; here, the capacity of the service is limited by the number of people who can reach and use it. The measurement of coverage based on this capacity may be called *accessibility coverage*.

3. Once the service is accessible, it still needs to be acceptable to the population, otherwise people may not come for it and may even seek alternative care. This "acceptability" may be influenced by such factors as the cost of the service to the user, the form of religion he follows, etc. If the service is accepted by the potential user, this is another step forward in the process of service provision. Here, service capacity is limited by the number of people who are willing to use the accessible service, and the measurement of coverage based on this capacity is defined as *acceptability coverage*.

4. The next stage in the process of service provision is the actual contact between the service provider and the user. The number of people who have contacted the service is a measurement of service output; the ratio between this and the size of the target population gives a measurement of coverage that may be called *contact coverage*.

5. The contact between the service provider and the user does not always guarantee a successful intervention related to the user's health problem or an effective service. We can, therefore, consider another stage in the process of service provision where a service performance that is appraised as satisfactory by specific criteria is achieved. The number of people who have received satisfactory service is thus another measurement of service output, and the measurement of coverage based on this output is called *effectiveness coverage*.

The above concept of coverage related to the process of service provision and the five measurements of coverage are illustrated in Fig. 2, while the classification of the measurements of coverage is summarized in Fig. 3 (A). It is worth noting from Fig. 2 that progress in the provision of a service means that the service must meet more requirements, hence the service satisfies the requirements of fewer people. The measurements of coverage corresponding to the five intermediate stages of the process follow the same trend (Fig. 3 B). The relationships between the different measurements of coverage are the key factors in the evaluation of coverage, which will be discussed later.

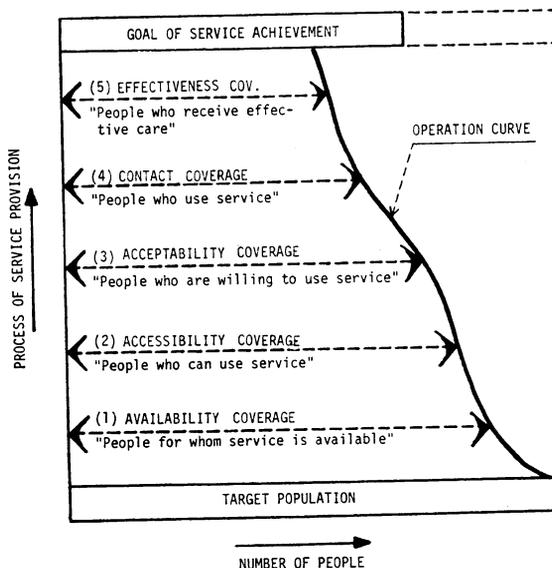


Fig. 2. Coverage diagram—illustrating relationships between the process of service provision and coverage measurements.

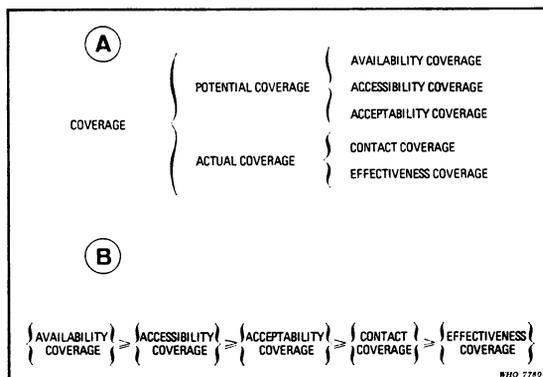


Fig. 3. Classification and interrelationship of coverage measures. (A) Classification of coverage measurements; (B) Relationships between coverage measurements.

Variations in the measurement of coverage

The various measurements of coverage have been defined above for the different numerators in the coverage ratio, while keeping the denominator or target population the same. However, a particular subgroup of the target population can be chosen for the denominator, and the resulting measurement of

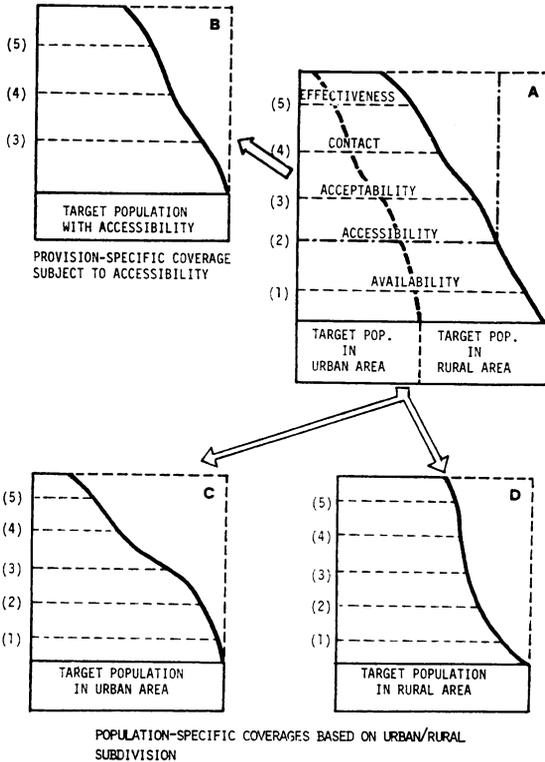


Fig. 4. Illustrations of specific coverages. (A) Overall coverage; (B) Provision-specific coverage subject to accessibility; (C) Population-specific coverage in an urban area; (D) Population-specific coverage in a rural area.

coverage will represent a different aspect of the interaction between the service and the population. In order to differentiate the coverage related to such a subgroup from that related to the whole target population, it may be called *specific coverage*.

Two types of variation are important in coverage evaluation. One type arises from taking as the denominator a part of the target population for whom certain criteria related to service provision have been met. The actual coverage among people with adequate accessibility to the service is an example. Specific coverage of this type may be called *provision-specific*. Provision-specific coverage is useful in estimating coverage or changes in coverage when the extent or methods of service provision have changed; its application will be discussed later.

An example of provision-specific coverage is illustrated in Fig. 4 (B), which concerns specific coverage

subject to accessibility. A comparison between the coverage diagram (B) and the original diagram (A) shows that the former is a partial representation of the latter; this is because the denominator for provision-specific coverage represents the part of the original target population that enjoys accessibility to the service.

Another type of variation arises from the subdivision of the target population by a factor unrelated to service provision. The differentiating factor can be chosen to suit specific purposes; subdivision by age or by urban and rural areas is a typical example. Specific coverage of this type may be called *population-specific* and it is useful in the analysis of interactions between service provision and factors affecting the target population.

An illustration of population-specific coverage is shown in Fig. 4 (C) and (D). The target population represented in the original coverage diagram (A) consists of the people from the urban area and those from the rural area in roughly equal proportions, and the portions of the coverage (or service) relating to these two groups are separated by the broken line. The population-specific coverage for each group (Fig. 4 C and D) is derived by expressing its share in proportion to the target population in the area concerned. The differences between the operation curves imply significant differences in service provision between the two populations.

There are other specific coverages, but they all belong to one or other of the above two types or to a combination of them. An example of the combination type is specific coverage subject to accessibility for rural populations.

MEASUREMENT OF COVERAGE

Description of services

Fundamental to the measurement of coverage is the description, in observable or measurable terms, of the service whose coverage is to be measured. The description must at least answer the following questions:

- (a) What is the aim of providing the service?
- (b) What does the service do?
- (c) For whom or what is the service intended?
- (d) What are the essential resources required for the service?
- (e) How much of the essential resources would a unit of service require?

(f) How can the performance of the service be measured?

(g) What are the criteria for satisfactory performance of the service?

We shall see in the following sections how the measurement of coverage depends on the answers to these questions.

Unit of measurement

So far it has been assumed that coverage is expressed in terms of the service capacity or output as a proportion of the target population, and that their common unit of measurement is the person. This has been done simply to facilitate the discussion of the concept of coverage; the actual measurement demands more rigorous consideration.

Here it is necessary to go back to the target population, which was defined earlier as the people for whom the service is intended. This definition is based on two simplifications, namely that the service is provided to individuals and that their number indicates need or demand of a population for the service. A more appropriate and general definition of the denominator of the coverage ratio is the amount of need as conceived by the service provider, which may be called the *service target*. The unit used to measure this amount can also be applied to the measurement of service capacity and output and should therefore be the unit of measurement for coverage.

Most health services are intended for and provided to people, and the person is still the unit most widely used for the measurement of coverage. There are, however, services whose targets are better expressed in other units. For example, sanitation activities are often directed to households; for services of this kind, the household may be a more appropriate unit of measurement.

From the standpoint of needs, two types of health service can be identified; one is provided to meet the intrinsic need of the people, and the other type is provided in response to the incidental need or demand of the individual. An example of the former type is vaccination against a certain disease, say measles, the need for which does not depend on the incidental health condition of individuals. Most forms of medical care belong to the latter type, hospital care being a characteristic example. To differentiate between these two types of service, they may be called *prevention-oriented* and *care-oriented*, respectively.

The service target of a prevention-oriented service is determined by the demographic characteristics of a population, and the unit of measurement is also demographic, such as the person or the household. The service target of a care-oriented service is determined not only by demographic characteristics but also by epidemiological characteristics that affect the "prevalence rate" for service need. The appropriate unit of measurement for the care-oriented service is thus the episode or the case, and the service target may be several times greater than, or only a fraction of, the service target, depending on the episode frequency.

Measurement in practice

The measurement of the service target requires information on the population characteristics and the answers to the first three questions on page 298 will serve to indicate the information required. This may be available from existing sources such as census data, or obtainable from *ad hoc* surveys.

The answers to the next two questions form a basis for determining the availability of service. It is easy to recognize key manpower and facilities as essential resources, but sometimes running costs or the supply of expendable items hamper the operation of a service. These should also be taken into consideration; otherwise, one may end up installing X-ray facilities without the electricity to run them.

Records of service delivery constitute the most important source of information for assessing accessibility and acceptability, and even the records of similar services are often useful in this respect. If no relevant data are available a pilot study or research may be undertaken to obtain them.

The answers to the last two questions—(f) and (g) above—are pertinent to the measurement of service output. In measuring service output it is necessary to use the same unit of measurement as for service target: for example, if the target of a health service is expressed in terms of households, then its service output for the measurement of contact coverage must be expressed as the number of households to which the service has been rendered. The service output for the measurement of effectiveness coverage must similarly be expressed in terms of households, but in this case it is the households for which the service rendered meets the criteria of effectiveness. The criteria for effectiveness are provided from the answer to question (g). Simple criteria facilitate the measurement, and the more appropriate they are the more information can be gained on coverage.

COVERAGE EVALUATION AND MANAGEMENT

Identification of service bottlenecks

Suppose that the five measurements of coverage are obtained. The stages in service provision have been defined in such a way that certain inequalities exist between them (Fig. 3 B). A large difference between an adjacent pair of the coverage measurement implies that, for a significant proportion of the target population, the service is failing to meet the requirements for progress in service provision. In other words, a large difference implies the existence of a problem or a bottleneck in the service provision. In the coverage diagram, the bottleneck appears as a sharp shift of the operation curve to the left.

Fig. 5 illustrates three examples of service bottlenecks, indicated by the shading on the operation curve. Example (A) shows bottlenecks in the availability and accessibility of the service, which imply poor allocation and deployment of resources and facilities. Example (B) shows bottlenecks in acceptability and contact. Low acceptability implies poor appreciation of service by the public; while the reason for inadequate coverage by contact can be a lack of public demand for the service, or failure to provide the service to some people because of faulty operation. Example (C) shows a bottleneck in effectiveness, which implies poor quality service.

Analysis of constraints

A bottleneck shows where the difficulty in service provision lies, but it does not pinpoint the factor responsible for the poor coverage. For example, poor quality service may be due to the use of ineffective drugs or incorrect administration of effective drugs. A good knowledge of the health service

and of the situation of the target population is thus required in order to analyse the constraining factors.

Gathering the relevant information for the analysis is an integral part of coverage evaluation. Health personnel as well as clients and potential users are important sources of information, and consultation with them may very well be sufficient to permit the causes of bottlenecks to be identified.

Supposing that existing knowledge or available information about the service is insufficient to identify any particular cause for the bottleneck, other approaches are available. One approach is to compare the coverages of different areas. The chosen areas would differ in situation and processes of service provision with respect to the factor suspected to be responsible for the bottleneck. If a high correlation is found between the degree of coverage and circumstances involving the factor, the suspicion is likely to be justified.

Another approach is to compare population-specific coverages by subdividing the target population. In the subdivision, the factor that appears most likely to be responsible for the bottleneck is selected as the differentiating factor. If the right factor is chosen, there will be significant variation in the target-specific coverages.

Yet another approach is to change conditions associated with the suspected factor experimentally, and compare coverage before and after the change. If a significant difference is observed, the suspicion may very well be justified.

This does not exhaust the possible approaches to the analysis of constraints. Nor can any one approach be suggested as being better than others. The selection of the best approach has to be made when and where such analysis is required, i.e., in the actual situation.

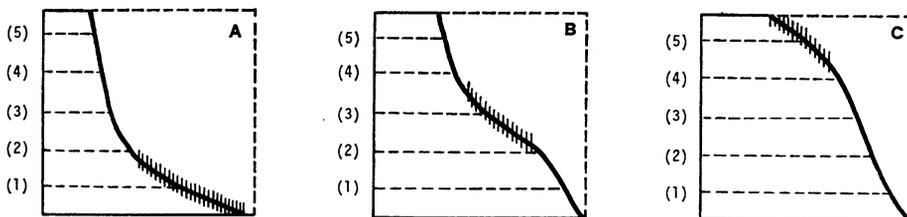


Fig. 5. Examples of service operation and bottlenecks. (A) Bottlenecks in availability and accessibility of service because of poor allocation and deployment of resources and facilities; (B) Bottlenecks in acceptability of service because of poor appreciation of the service by the people; (C) Bottlenecks in effectiveness of service because of poor quality of the service.

Cost/effectiveness analysis for service development

Once the factors constraining service development become known, proper remedial action needs to be taken. An important concern at this stage is the selection of an effective form of action, and cost/effectiveness analysis provides a basic approach for this purpose. For such analysis it is essential to know the service output or actual coverage, particularly the effectiveness coverage, that is expected from the implementation of the remedial action. As shown in Fig. 2, the effective service is the consequence of successful service provision and the effectiveness coverage can only be assessed in conjunction with the other measurements of coverage. Therefore the cost/effectiveness analysis of an action for service development requires the assessment of its probable impact on the entire process of service provision or on coverage in general, which may not be an easy task. However, a remedial action normally changes only certain aspects of service provision, and it is possible to take advantage of this in assessing the prospective coverage. This is another application of the concept of specific coverage.

To illustrate this, let us consider an expansion of service. The expansion increases the availability and accessibility of the service, but it may not change its acceptability or effectiveness. We can estimate the increases from the details of the resources and facilities involved in the expansion. If we assume that the people who gain access to the service by this expansion have similar health conditions and attitudes towards the service, we can expect the same coverage for them as for the people who already have access to the service (i.e., the same provision-specific coverage subject to accessibility). Combining these two results we can calculate the expected coverage under the expansion.

Fig. 6 (B) shows the new coverage diagram derived in this way. The unshaded part shows the estimated availability coverage and accessibility coverage ($1'$ and $2'$), and the shaded part the provision-specific coverage which includes the other measures (3), (4), and (5). As we assume the provision-specific coverage to remain the same after the expansion, the corresponding part (shaded area) of the operational curve in the new diagram is homologous in shape to the original diagram.

To illustrate another application of provision-specific coverage, let us consider the adaptation of a new service technology—another common action for service development. Unlike service expansion, this

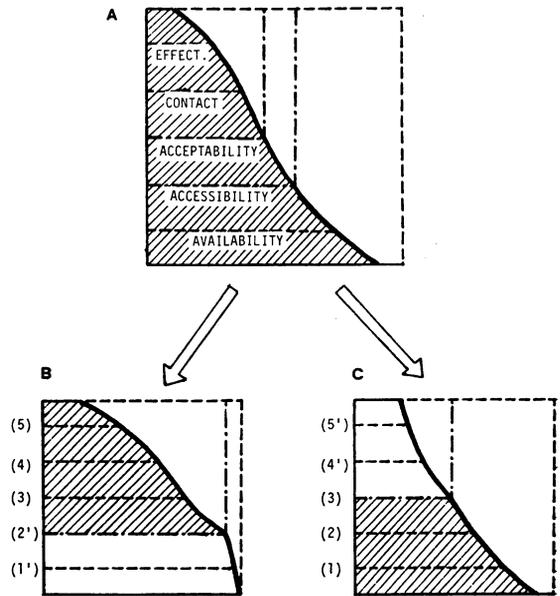


Fig. 6. Application of the concept of provision-specific coverage in assessing aspects of service development. (A) Coverage of existing service; (B) Expansion of the service—availability coverage and accessibility coverage change but provision-specific coverage subject to accessibility remains the same; (C) Adaptation of new technology—potential coverage remains the same but actual coverage changes.

action is likely to affect service personnel as well as the target population, bringing changes in the actual coverage and probably even in the acceptability of the service. These changes are difficult to assess without a trial estimate.

To facilitate discussion, let us assume that the service with the new technology is provided through the same delivery channel as the existing service, and that between the two services there is no significant difference in resource requirements and availability or even in acceptability because of their apparent similarity in the eyes of the user. In brief, these conditions lead to the same service provision but only up to the stage of acceptability, and the same coverage may be expected with respect to the corresponding measures. Contact coverage and effectiveness coverage still need to be known for the assessment of coverage for the new service to be completed. Hence, the experimental method of obtaining the two measurements of actual coverage is based on

the people who have been users of the existing service. The method is efficient because the sample population is easier to identify and smaller in size than the target population as a whole. This trial estimate gives the provision-specific coverage subject to acceptability. By substituting this estimated coverage for the corresponding part of the existing coverage, we can calculate the expected coverage for the new service.

Fig. 6 (C) is a diagram of the coverage in this case. As in Fig. 6 (B), the unshaded part shows the estimated coverage—in this case the coverage measurements (4') and (5')—and the shaded part shows the coverage by the existing service delivery system. From the diagram the number of people who reap the benefit of the new service can be estimated, and this permits a comparison of the benefits and costs and an evaluation of the merits of the action taken.

These are examples of two typical applications of provision-specific coverage in the assessment of two typical forms of action for service development. For the assessment of other forms, other applications of specific coverage can be made. For example, if some actions involve changes in the target population, the application of population-specific coverage will prove useful. One such example may be service expansion specifically aimed at rural populations. As discussed above, the changes in coverage due to the expansion can be estimated by applying the concept of provision-specific coverage. We can improve the accuracy of such estimates by applying it only to the population-specific coverage for the rural population concerned.

TOWARDS THE DEVELOPMENT OF A COVERAGE EVALUATION SCHEME

So far only a conceptual framework of coverage evaluation has been discussed; some thoughts on the development of a coverage evaluation

scheme may be in order. In brief, this requires three things:

(a) information—demographic, epidemiological, and socioeconomic—on the population with which the service is concerned;

(b) knowledge of the health problem that the service is intended to deal with and of the activities of the service;

(c) ability to gather information on the operation of the service.

Obviously, not every country or service system can meet these requirements: there may not be adequate census data for the information; there may not be enough experts with the knowledge, or there may not be an adequate service infrastructure with the ability. Under such—probably common—circumstances, the evaluation scheme may first be developed for a limited pilot area and later expanded as practical methods become established.

This approach has many advantages. For coverage evaluation, demographic and epidemiological information on the population is essential, but it is rarely readily available. The approach facilitates the gathering of such information by focusing attention on a population of manageable size. Sometimes, knowledge of the health problem and also of the ways in which the service intervenes in it needs to be gained from experience; a pilot operation gives an opportunity for this, thus facilitating selection of the appropriate target and coverage measures. If the coverage evaluation is meant for the service management, continuous gathering of information on the operation of the service is necessary; hence it is important to make this activity as simple and practical as possible. For this, simple and appropriate indicators of the service operation must be identified and practical methods developed for gathering them. Again, a pilot operation will give an opportunity for doing so before the full implementation of the evaluation scheme.

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RÉSUMÉ

LA COUVERTURE DE LA POPULATION PAR LES SERVICES DE SANTÉ ET SON ÉVALUATION

La couverture de la population se définit, pour un service de santé, par l'étendue de l'interaction constatée entre ce service et la population qu'il entend servir; cette interaction n'est pas seulement un aspect particulier de la prestation de services: elle englobe tout le processus allant de l'allocation de ressources à la réalisation de l'objectif visé. Pour mesurer la couverture, il faut au préalable identifier les principales étapes aboutissant à cet objectif, étapes dont chacune correspond à la réalisation d'une condition importante de fourniture du service; en mesurant la couverture pour chaque étape — c'est-à-dire la proportion entre le nombre de personnes pour lesquelles la condition en cause est remplie et la population cible — on obtient un ensemble de données qui déterminent l'interaction entre le service et la population cible. La couverture peut être définie d'une manière plus spécifique lorsque ce critère est, par exemple, appliqué à un groupe particulier de population requérant des prestations d'une certaine nature ou présentant des caractéristiques spéciales sur le plan démographique ou socio-économique.

La fourniture des prestations commence avec l'allocation de ressources, laquelle conditionne la quantité de prestations qui pourront être offertes à la population cible. Selon la manière dont le service sera ensuite

déployé, c'est-à-dire selon son accessibilité, les candidats aux prestations pourront ou non en faire usage. Mais les gens ne recourront au service offert que s'ils le jugent acceptable, condition qui est liée à de nombreux facteurs parmi lesquels figurent le prix des prestations et les coutumes locales. Ces trois premières conditions étant réunies, le contact entre le service et les usagers potentiels ne pourra s'établir que si les besoins de ceux-ci sont connus ou perçus. Finalement on pourra mesurer l'efficacité du service en fonction de sa capacité de couvrir ces besoins en fournissant les prestations appropriées.

La couverture étant mesurée à ces cinq niveaux successifs de distribution des services, on identifiera aisément tout goulot d'étranglement dans le fonctionnement, puisqu'on constatera en ce cas un écart significatif entre les taux de couverture qui s'établiront pour deux niveaux successifs. Si l'on soupçonne certaines contraintes d'être responsables de ce goulot d'étranglement, l'analyse de ces facteurs sera elle-même facilitée par la comparaison du taux de couverture dans des situations qui se différencient par l'existence ou l'absence desdits facteurs. Enfin, cette fragmentation de la mesure de la couverture est également utile pour l'analyse de la relation coût/efficacité et le choix de stratégies appropriées pour le développement d'un service.
