BASIC CONSIDERATIONS ON THE ORGANIZATION AND PLANNING OF EPIDEMIOLOGICAL SERVICES AT COUNTRY LEVEL

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1. INTRODUCTION

1.1 Any discussion on the epidemiological services existing, or rather required, in different countries poses very difficult problems. No clear guidelines or definite standards have been established. In addition to the differences in the existing level of development of health services, available material and human resources, and relevant social, economic and political factors in both developed and developing countries, considerable differences also exist in the concept and understanding of the role of modern epidemiology and epidemiological methodology within the national health services.

The problem will, therefore, be discussed more with regard to the general concept of work than to the organizational structure and administrative lines of command at various levels.

1.2 The public health problems of many countries in the tropical regions, as in other developing countries of the world, are mainly of an infectious nature. This fact means that a high priority should be given to the control and prevention of communicable diseases.

Due to the tremendous advances in the control of communicable diseases, based mainly on progress in microbiology, (including virology, parasitology, immunology, etc.), and the use of antibiotics, chemotherapeutics and insecticides, the risk and relative importance of some infections in developed countries are changing and continuously decreasing. However, in developing countries the spread of infections and their importance have been maintained or have even continued to increase.

Therefore, the gap between developed and developing countries in the field of communicable disease control is continuing to widen. This unfavourable situation cannot be explained or excused in the long run only because of lack of human or material resources; it is at the same time due to a lack of experience and to insufficient understanding of the concept of epidemiology and of the possibilities of controlling communicable diseases that are possible at the present time.

1.3 The solution ...
1.3 The solution of the problems of communicable diseases in tropical areas as elsewhere requires not only a specific knowledge of the natural history and ecology of individual diseases/infections, but also a multidisciplinary approach.

This aspect of the effort of organizing national health services was very often neglected in the past and epidemiological services were frequently planned and organized as a bureaucratic-administrative "green table" service only. This is very well illustrated in those countries where the step-by-step building up of community oriented microbiological laboratory and statistical services was neglected, or where the need for their integration and close co-operation with epidemiological services was not understood or was impossible because of the weakness of epidemiological services.

2. EPIDEMIOLOGICAL SERVICES

2.1 Aim of epidemiological services. Epidemiological surveillance

Epidemiological services are a specialized health service dealing with the control and prevention of communicable diseases and their sequelae. This aim can be accomplished by the determination and follow-up of the principal and contributing factors causing a disease and facilitating the spread of infection in the human and animal populations and by finding, implementing and evaluating methods to control these factors. This necessitates an effective system of epidemiological surveillance which would provide a scientific basis for early recognition of the problem, for planning, implementation and evaluation of control measures, for epidemiological forecasts (when possible), and for decision making.\(^1,2\) Surveillance also includes the periodic publication and dissemination of pertinent epidemiological information to all concerned.

In addition, epidemiological services represent an organization for the investigation and control of outbreaks of disease and for systematic and co-ordinated studies of specific diseases.

\(^/2.2\) Role of ...
2.2 Role of the environment

Since many human diseases arise from natural foci of infection or from man's environment that has been either polluted, altered or entirely created by himself, epidemiological services should closely co-operate with environmental health services (safe water supply, waste and sewage disposal), and other branches of hygienic services (food hygiene, etc.).

Many animal infections are transmissible to man. Epidemiological services are consequently linked to, or closely co-operating with, the respective veterinary services of the ministry of agriculture.

2.3 Role of therapeutic and preventive agents and its evaluation

Chemotherapeutics, antibiotics, immune sera and vaccines play a highly important role in the control and prevention of communicable diseases and their sequelae.

Epidemiological services should therefore be involved in the evaluation of their efficacy and possible side effects. In addition, these agents may influence and change the spread of infections, biological properties of etiological agents and the natural history of diseases.

Epidemiological services should accordingly be able to follow, quickly recognize and promptly react in control and preventive measures (epidemiological surveillance) to the changing situation.

2.4 Disinfection, disinsection, deratisation

Disinfection, deratisation and disinsection also play a very important role in the control and prevention of communicable diseases and all epidemiological services should be able to use these methods (trained personnel).

2.5 Planning and training

Epidemiological services should also participate in long-term planning and give technical guidance in the training (basic and post-graduate), of medical and other health personnel in a wide variety of disciplines, (public ...
disciplines, (public health officers, epidemiologists, medical microbiologists, sanitarians, sanitary engineers, laboratory technicians, statisticians, entomologists, ecologists, etc.) including health education.

2.6 Operational and management techniques

The control and prevention of communicable diseases often involve large-scale and expensive health campaigns. Their successful implementation necessitates the use of proper operational and managerial techniques. This type of non-medical staff has recently been recognized as extremely valuable in the epidemiological and other branches of health services.

3. PROBLEMS

3.1 Multi-disciplinary approach. Epidemiological surveillance

From the short description given of the general functions of national epidemiological services, the need is evident for the participation of several disciplines (multi-disciplinary approach). Practically all epidemiological services at national level need the services of well-trained personnel (graduate and non-graduate) from at least the following disciplines:

- epidemiology,
- medical microbiology (bacteriology, virology, parasitology, mycology, immunology),
- entomology,
- health statistics,
- sanitary engineering,
- veterinary health,
- laboratory and field personnel (sanitarians, inspectors, etc.).

They should have the necessary equipment for laboratory and field activities (transport, collection and storage of biological material, mobile laboratory, equipment for ecological studies, etc.).

/Ideally epidemiological.../
Ideally epidemiological services at national level should be supported by a central institute (e.g., the National Communicable Disease Center (NCDC), Atlanta, the Institute of Epidemiology and Microbiology, National Institutes of Health, or a central public health laboratory where highly qualified staff in all these disciplines work together. These central institutions, apart from their research activities (which could take from 20% to 50% of their time) support epidemiological services in the following ways:

(a) the investigation and control of outbreaks of diseases of national importance;
(b) they guide and co-ordinate studies of specific diseases;
(c) direct epidemiological surveillance of the most important infections in the country;
(d) they undertake national reference laboratory work in microbiology and technical guidance (standardization) of work in public health laboratory services at regional and district level;
(e) they train personnel in epidemiology, statistics, medical microbiology, etc.;
(f) they disseminate epidemiological information periodically.

If such a level in the development of epidemiological services in a country has not yet been attained, the administrative (decision making) part of epidemiological services should co-operate with and utilize the services of existing laboratories (in microbiology, statistics, environmental health, entomology, etc.).

It is sometimes very surprising to note that in some developing countries with one very poorly equipped and staffed public health laboratory service, there also exists a university department of microbiology that has no interest in the current and often very serious problems of communicable diseases and public health. In the past, in several European countries, university departments (ministry of education) have played a very important role in the study and control of communicable diseases in co-operation with the public health services. This has also a very favourable effect on the teaching activities and orientation of...
work of these medical schools.

These minimum requirements form the most difficult problems in organizing efficient and productive epidemiological services in many countries of the world because of:

3.2 Weakness of health services

The concept of epidemiological services and epidemiological surveillance and their role in the successful control and prevention of communicable diseases is not yet widely understood.

Health services in many developing countries are still weak and suffer from a lack of personnel and material resources. Young medical doctors and other key personnel at the national level are not sufficiently interested in working in the fields of public health, epidemiology or microbiology. These activities are usually less advantageous and provide fewer career prospects than clinical medicine or private practice.

It is more a political than a technical question to recognize in time that without the availability of such well trained national personnel a country cannot be really independent of outside help and successful in the control of communicable diseases.

It is again primarily a political question that these public health disciplines (epidemiology, microbiology, etc.) that are extremely important, should provide attractive career opportunities for very talented medical and other graduate personnel.

In the last twenty years WHO and other international organizations have made every effort to help developing countries in education and training, and have provided training facilities in different fields of medical sciences, especially microbiology, epidemiology, etc. However, the results until now have not been too successful, because of very complex reasons. One very important reason is that training in developing countries was not always well guided and supervised with regard to the health problems, priorities and needs of the country (e.g., communicable disease problems, community-oriented work in microbiology and ...)
microbiology and not PhD diplomas in microbiology with subsequent interest in the narrow field of research only).

3.3 Weakness or practical non-existence of a suitable statistical basis for epidemiological services

Health statistics are a basic component of epidemiological services, not only in the collection, recording and processing of data (morbidity and mortality reports), but also in the manifold planning and implementation of different field surveys and epidemiological studies.

In many countries the collection, recording and processing of statistical data are still centralized in a statistical bureau and morbidity and mortality data are then given to the ministry of health with some delay.

It should be recognized (and there are many examples illustrating this) that the collection and processing of morbidity and mortality data in the field of communicable diseases cannot be successful and useful unless it is processed and interpreted (with due relation to the data from other sources (field, laboratory), under the direct supervision of a trained epidemiologist.

This could be effected either by establishing a statistical laboratory for communicable diseases within the epidemiological services, or by ensuring that this part of the general statistical section should co-operate and be technically guided by the epidemiological section; alternatively, and this is a very good solution, it could be allocated to the department of epidemiology of the Central Institute (e.g., NCDC, Atlanta, etc.).

3.4 Weakness of existing public health laboratory services and a frequent lack of concept with regard to the community needs and the importance of support of epidemiological services

Medical microbiology is an independent branch of medical sciences and its application in public health is a vitally important instrument for epidemiological services. Traditionally, the sciences of epidemiology (of communicable diseases) and microbiology have been closely associated.
Furthermore, the demand for the establishment of public health laborato-
ries arose not from bacteriologists, but from epidemiologists.\(^3\)

However, in the majority of countries the microbiological laborato-
ries or institutions were built up before a clear concept evolved and
development of modern epidemiological services were started. They were
mainly organized in close relation to individual patient diagnosis
(hospital laboratories) to the detriment of the interests of epidemi-
ological services (community or population-oriented laboratory work).
There are various reasons for this; often because health services in
general were or still are oriented mainly to curative medicine.

In some countries the idea of integrated laboratory services\(^4\) was
not properly understood or implemented, especially with regard to
clinical pathology. It is erroneous to believe that three or at the
most four years of superficial training in eight or more different
laboratory disciplines is a sufficient technical curriculum for the
personnel of national laboratory services in view of the need for
community-oriented microbiology at central level.

When considering integrated public health laboratory services it
must be a priori clear that a minimum of two branches should exist:

(a) medical microbiology (including laboratory investigation of
drinking water, food) serving both the community and hospitals;

(b) biochemistry, haematology, histopathology, etc. utilized for
hospitals and individual patient care mainly.

These two branches use different laboratory methods and equipment
and service, co-operate with or are technically influenced by different
departments of the health services. For example, the first branch
(a) - microbiology - is influenced by epidemiological services, the
second branch (b) - biochemistry, etc. - by different medical care
and hospital departments.

It is again not only a technical but also a political responsi-
ability to ensure that existing progress in the field of medical micro-
biology facilitates the successful control and prevention of many

/communicable diseases ...
communicable diseases. This is true to such an extent that any delay in the application of existing knowledge causes serious harm to the health and economy of a country.

Even with a full understanding of the question, the recruitment and adequate training of talented and keenly interested nationals for different fields of laboratory services require several years.

It would be unwise not to forecast in time these actual and urgent needs of national health services in view of the importance of communicable diseases and their preventability.

Some of the more developed countries present other difficulties. Health services are usually reasonably well organized and epidemiological services particularly at central and regional levels exist. Such countries also have microbiological laboratories and research or university microbiological institutes with a good number of well and sometimes highly qualified staff in different fields of medical microbiology. However, even in these countries the role of the microbiological laboratory in the planned control and prevention of communicable diseases, (e.g., in the planning, implementation and evaluation of vaccination and other control programmes, in epidemiological surveillance, etc.), is not yet fully appreciated. The work of these relatively well-staffed and equipped microbiological institutions is sometimes mainly oriented to individual patient diagnosis and often to the narrow field of individual research interest.

This situation can partly be explained by the fact that microbiologists do not realize how fascinating and important (practically and scientifically) community-oriented microbiological work is. On the other hand, epidemiologists in these countries have also not taken steps to define the role of modern microbiology in the control and prevention of communicable diseases.

Another important reason is that very often microbiologists with high seniority and scientific status do not wish to be subordinated to /recently developed...
recently developed epidemiological services.

Such a situation could be resolved in a spirit of good teamwork and co-operation.

It should be recognized that modern epidemiology and epidemiological services can only be successful when they are based on highly qualified laboratory work in microbiology. It is not crucial (and depends on the conditions in individual countries) whether the microbiological institution or branch of the public health laboratory services is subordinate to the public health laboratory or epidemiological or other departments of the health administration. Both should closely co-operate and their activities be integrated and mutually influenced.

3.5 Public health administrators (decision makers) in many countries do not yet realize the high priority that should be given to the strengthening of epidemiological services in order to ensure that they are sufficiently staffed and equipped. They are also not sufficiently aware that the use of existing epidemiological methodology and laboratory means has a far-reaching effect on the improvement of planning, implementation and evaluation of control and preventive measures, and that this provides the best scientific basis for taking decisions.

In several countries where during the last twenty years campaigns have been organized (more or less successfully) against different diseases, (tuberculosis, yaws, leprosy, smallpox, etc.), isolated units dealing with particular diseases are still found in the ministry of health. Sometimes in these cases the vitally important communicable diseases control (e.g., epidemiological) section that would be responsible for planning and executing well-balanced and synthetized communicable disease programmes in the country does not exist.

Learning from past experience it is hoped that the smallpox eradication programme, which is progressing well, could be used in some parts of the world in the near future as a spearhead for the step-by-step strengthening of national epidemiological and basic health services. Thus ...
services. Thus, in the final stages of the smallpox eradication programme its personnel and resources could be simultaneously utilized for the control and prevention of one or even more important communicable diseases (meningococcal meningitis, tuberculosis, etc.).

4. ORGANIZATIONAL STRUCTURE AND ADMINISTRATIVE LINES OF COMMAND

Epidemiological services at central level are based on two parts: (a) administrative (decision making) in the ministry of health; (b) technical laboratories, (research institutions or the central public health laboratory), with transport and other means for laboratory studies and field investigations, (mobile laboratories, equipment for collection, transport and storage of biological material, etc.), which provide the health authorities with the necessary surveillance data for making decisions.

As has been previously mentioned, there is no single prescription that could be recommended for all countries because of their very different levels of development of health services and political and socio-economic situations. Using experience gained from different countries of varying size, population and political structure, but where the epidemiological services are well organized, productive and successful in control and prevention, the following possible organizational scheme has been worked out showing the administrative lines of command for services at national, regional and district (provincial) levels (Table 1).

The most important factors involved are understanding and acceptance of a basic concept of epidemiology and epidemiological surveillance, the need for teamwork (co-operation) and above all the complete interest of everybody concerned in solving the most important health problems of the country.

The establishment of epidemiological services is a long-term and complex process involving many factors, (epidemiological situation, size of the country, available human and material resources and existing organizational structure of health services, etc.).

/5. Role of ...
Table 1
ORGANIZATIONAL SCHEME OF EPIDEMIOLOGICAL SERVICES IN A COUNTRY

- Institute of Epidemiology and Microbiology and Institute of Hygiene could be integrated in the Central Public Health Laboratory or could be a part of a National Institute of Health, etc.

Lines of command (full supervision)

- Lines of co-operation

- Depending on the stage of development and size of the country
5. ROLE OF WHO

WHO has made every effort to strengthen epidemiological services as an integral part of general health services and to stress that microbiological laboratories constitute the most important tool of epidemiological services. WHO has also repeatedly stressed the need for a multi-disciplinary approach and for an improved use of methodology (operational, management, etc.).

All these aspects were clearly illustrated during the Technical Discussions at the Twenty-first World Health Assembly in 1969 on the National and Global Surveillance of Communicable Diseases.\(^5\)

The participation of public health laboratory services in surveillance at national and international levels was further elaborated by Raška.\(^6\) WHO has been playing a very important role in this field during the last twenty years in many aspects, such as:

(a) providing technical advice in building-up and strengthening epidemiological, public health laboratory and statistical services;

(b) providing training grants;

(c) providing methodological advice and reference material (sera, strains, antigens, etc.) from the network of WHO Reference Centres;

(d) participating in the surveillance activities of health services of individual Member States by providing methodological advice and/or means for collection, transport and storage of biological material (blood, etc.) for investigation (WHO Serum Reference Banks);

(e) providing in the WHO Serum Reference Banks and WHO Reference Centres or in other co-operating research institutes, laboratory investigation services which could not be carried out in many countries where such services were needed.

6. SUMMARY

The tremendous developments in science and technology have provided means for the efficient control and prevention of most of the communicable diseases ...
communicable diseases in the world.

However, in developing countries the spread of infection still continues to be a most important cause of illness, invalidity and death, as well as an economic burden.

The solution to this problem lies not only in a specific knowledge of the natural history and ecology of individual diseases and infections, but also in having sufficiently strong, well-organized and equipped epidemiological services as an integral part of the health services of a country.

Depending on the available human and material resources, the political and socio-economic situation and different concepts, the development and organizational structure of epidemiological services in individual countries also vary to a very great extent.

The step-by-step building-up and strengthening of epidemiological services is a long-term and complex process which could be influenced by many factors.

The aims, the organizational structure of epidemiological services and the concept of work based mainly on epidemiological surveillance activities, have been stressed. A multi-disciplinary approach and the full participation of several scientific disciplines and health laboratory services, (microbiology, statistics, environmental health, etc.), are indispensable.

An analysis was made of several causes of the present unfavourable situation in the field of communicable disease control and prevention in developing countries, and possible solutions were considered.
References


5. National and Global Surveillance of Communicable Diseases (1968) (Background document for the Twenty-first World Health Assembly, A21/Technical Discussions/5)