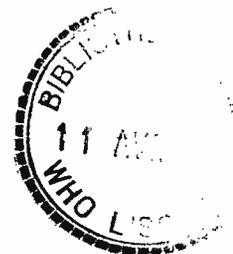


TWENTY-FIRST WORLD HEALTH ASSEMBLY

A21/Technical Discussions/1
5 April 1968

Technical Discussions

ORIGINAL: ENGLISH



BACKGROUND DOCUMENT¹

for reference use at the

TECHNICAL DISCUSSIONS

ON

NATIONAL AND GLOBAL SURVEILLANCE OF COMMUNICABLE DISEASES

¹ Prepared in the Epidemiological Surveillance unit, Communicable Diseases Division, with assistance from Dr A. D. Langmuir, Consultant.

CONTENTS

	<u>Page</u>
INTRODUCTION	3
I. THE CONCEPT OF EPIDEMIOLOGICAL SURVEILLANCE	4
1. Evolution	4
2. Definitions	5
3. Purpose	6
4. Wider Application	6
II. THE PRACTICE OF SURVEILLANCE IN THE WORLD TODAY	7
1. The Elements of Surveillance	7
2. Organization and Function	12
3. The Dissemination of Information	13
III. THE ROLE OF SURVEILLANCE IN RESEARCH	15
IV. INTERNATIONAL SURVEILLANCE	16
V. THE ROLE OF WHO IN SURVEILLANCE	17
VI. BIBLIOGRAPHY	19

INTRODUCTION

The purpose of the Technical Discussions is to provide an opportunity for informal exchange of views and experiences among those who attend the World Health Assembly, with participation of non-governmental organizations in official relationship with WHO. To this end, appropriate documentation was prepared by the Secretariat and distributed to Member States about one year in advance to allow discussions by specialized professional groups at the national level.

In compliance with this procedure, set down in resolution WHA10.33, the Director-General forwarded an outline document under a covering letter dated 21 August 1967, to all Member States, Associate Members and non-governmental organizations, suggesting that preparatory discussions be based on the topics listed in the last chapter of the outline document together with any other points which the relevant authorities might wish to consider. Comments on the outline document were at the same time invited in order that they might be used for the preparation of the present background document for the Technical Discussions.

The outline document gave special attention to the following facets of epidemiological surveillance:

1. The evolution of modern concepts of surveillance
2. The elements of surveillance
3. Surveillance and research
4. Surveillance and control operations
5. Utilization of field personnel
6. National and international surveillance
7. Dissemination of surveillance information
8. Topics for discussion.

Under the last heading "Topics for discussion", 10 questions were formulated, requesting governments to answer or comment on these, in order to obtain a first indication of what members would like to discuss at the Twenty-first World Health Assembly.

At the date of completion of the present document replies have been received from 77 Member States and Associate Members and 16 non-governmental organizations.

These replies, many of them extensive and detailed, have provided the World Health Organization with a valuable body of information, reflecting on the experience and views of the contributors, which had not previously been available.

The present background document combines, in so far as space permits, the specific comments received with the broad concepts that were presented in the outline document.

A short bibliography was given in the outline document. This has been included in the background document in an enlarged form. Due to the general character of the subject under discussion however, the bibliography is selective and by no means complete.

I. THE CONCEPT OF EPIDEMIOLOGICAL SURVEILLANCE

1. Evolution

Until about 20 years ago the traditional use in public health of the term "surveillance" was limited to certain restrictive actions directed to individuals. International quarantine procedures often called for placing contacts of plague under surveillance for the duration of the incubation period, in order to detect first symptoms of disease in time to institute treatment and isolation when indicated. Contacts of infectious syphilis are kept under surveillance for the same reasons. Surveillance thus involved systematic observation, rational interpretation of findings and responsibility to see that appropriate action was instituted.

The traditional concept also embraced recognized limitations on official actions, respect for personal freedom and the avoidance of rash and excessive actions, such as strict quarantine of whole areas or mass vaccination of whole populations, which sometimes arise from fear rather than epidemiological indication.

Beginning about 1950, the term "surveillance" was applied to certain disease problems as distinct from individual patients or contacts. It became appreciated that additional efforts and more sophisticated methods than were then in use, were necessary to chart the decline and to ensure the eradication of malaria, yaws, smallpox, urban yellow fever and other diseases which were by then rapidly disappearing in certain geographical areas. Prompt and competent field investigations of all suspected as well as definite cases became essential. Accurate and readily available facilities for laboratory confirmation of presumptive diagnosis were needed. Knowledge of vector distribution and insecticide susceptibility was vital. Awareness of the levels of vaccination in the population, and of the quality of control measures, also entered into the decisions public health authorities had to make. The term "surveillance" was employed to summarize all of these epidemiological functions related to guiding communicable disease control programmes.

Prior to this time most of this information was known or available, but it often was compartmentalized into separate elements among different administrative and professional groups. Surveillance programmes served the useful purpose of collecting and consolidating these separate elements in one central location where they could be evaluated and where the results could then be made available to those with authority for making decisions.

Behind this shift from reporting of mortality and morbidity as a crude expression of the extent of a disease problem, towards a concerted attempt to keep under continuous observation all factors that significantly contributed to the occurrence of disease in human populations, lay also a changing attitude towards the pathogenesis of disease. Until very recently communicable diseases have been looked upon as caused by a single factor, the infectious agent, in contrast to chronic, non-infectious diseases. It is now widely accepted that although the presence of a single agent is necessary in order to produce infection, the presence of the agent does not necessarily result in the development of disease and further spread of the infection. Other factors, such as dosage of the infection, type and duration of exposure, physiological and nutritional status of the host, host behaviour and a number of environmental characteristics, are at play, and consequently infections clearly have a multi-factorial causation. Plans for successful control action in communicable diseases have to be based not only on knowledge of these factors, but also on an understanding of their interrelationships. Full account therefore, has to be taken of all observable factors, in the host and the environment, that together create suitable conditions for the dissemination of the infectious agent and the development of disease.

2. Definitions

In the original outline document, epidemiological surveillance of communicable diseases was defined as "- the exercise of continuous scrutiny of and watchfulness over the distribution and spread of infections and factors related thereto, of sufficient accuracy and completeness to be pertinent to effective control". The reaction to this definition as reflected by comments made by Member governments has generally been favourable, although one government suggested that the definition was very broad and that the usefulness of the discussions might be diluted, if allowed to range so widely. Another government specifically underlines that it agrees to this definition because it excludes control.

In malaria eradication, influenced by the specific aim of the programme, the term "surveillance" has been given a very extended meaning, the individual functions of which are - "case detection, parasitological examination, antimalarial drug treatment, epidemiological investigation, entomological investigation, elimination of foci by either residual spraying or mass drug administration, case follow-up and community follow-up".¹ Thus, some aspects of control are embraced in this definition of malaria surveillance.

In the early phases of the mass penicillin campaigns against endemic treponematoses (endemic syphilis and tropical yaws) the term "surveillance" was also used in the frame of action taken concurrently in the programme, while subsequently, in the sero-epidemiological evaluation phase of the programme, the action-aspects of control was not included in surveillance.

Elsewhere,² epidemiological surveillance has been defined as follows: "Surveillance thus means the epidemiological study of a disease as a dynamic process involving the ecology of the infectious agent, the host, the reservoirs, and the vectors, as well as the complex mechanisms concerned in the spread of infection and the extent to which this spread occurs.

As well as being valuable for research, national surveillance activities are fundamental to the planning and assessment of communicable disease control measures. They provide a scientific basis for ascertaining the advisability and extent of mass vaccination (for example, against poliomyelitis, measles, pertussis or diphtheria) and assessing its effectiveness. In some diseases they can give valuable information on treatment and on changes in the distribution and properties of the infective agents (streptococci, shigellae, influenza virus, etc.). Surveillance also permits the early recognition of changes in disease patterns and a prompt adjustment of control measures. Sometimes it is possible to make an epidemiological forecast (in pertussis, influenza, poliomyelitis, etc.). Thus surveillance has a clearly defined aim in the study or control of a disease".

It would therefore appear that in the rapid evolution of the concept of surveillance emphasis on certain activities varies, depending on the specific diseases involved. In spite of seeming differences there is agreement on the basic concept of surveillance as a continued activity, comprising the systematic collection, evaluation and dissemination of pertinent information to public health authorities for decision making. To ensure appropriate and prompt action it is most important in the surveillance activities to detect at the earliest possible moment a change in the incidence of a disease, or to recognize a change in the ecological situation which may influence the appearance or further spread of infection.

¹ Terminology of Malaria and of Malaria Eradication, Report of a Drafting Committee, WHO, 1963.

² K. Raška (1966) WHO Chronicle, vol. 20, No. 9.

3. Purpose

While rigidity in the matter of definition would hardly seem fruitful it is important that there is agreement on the purpose of surveillance, which is to utilize all appropriate epidemiological and other methods to guide the control of disease. Ideally surveillance should provide the basis for establishing priorities (see II, 2) and should permit the prediction of future trends. While the purpose of surveillance is applicable to some extent to all diseases, primary attention should be directed towards those diseases amenable to effective control action.

4. Wider Application

Human society is increasingly centred in urban, densely built-up areas, where a healthy existence depends on a number of well-organized public services. This is especially true with regard to environmental health. Good water supplies and efficient sewage disposal are almost taken for granted in many big cities of the world, but it is as well to remember that these systems may facilitate the spread of infections such as typhoid fever, viral hepatitis and amoebic dysentery. An effective working relationship between the environmental health authorities and those responsible for epidemiological surveillance is therefore essential.

In the man-made urban environments of today, two particular situations exist that require attention of those who are charged with epidemiological surveillance. One is the potential health hazards caused by sanitary installations that were constructed in some old cities a century or more ago, and now are in a condition of decay due to inadequate maintenance. The other is borne by the rapid and uncontrolled build-up of urban dwellings in developing countries, resulting in unhygienic environments, that present a threat to health. This threat is caused not only by lack of elementary sanitary facilities such as water supplies and sewage disposal; it is also to a large extent due to a build-up of vector populations, such as Aedes aegypti, caused by improper water storage, as well as inadequate control of milk and other food-stuffs.

An increasingly important problem is posed by the extensive trade in food and animal feeds and their international distribution through commercial channels, with insufficient control for contamination. Because of the important economic interests behind this trade it will take stringent legislature to rectify the situation. The chance of such action at the present time in any large number of countries is very small, and the problem therefore will deserve the attention of epidemiological surveillance for a long time to come.

The concept of surveillance is gaining increasing validity outside the field of acute communicable diseases. The term is applied frequently to activities dealing with non-communicable disease factors, such as air pollution, atmospheric radioactivity and automobile accidents.

II. THE PRACTICE OF SURVEILLANCE IN THE WORLD TODAY

In spite of the considerable variations in the present concepts of surveillance as applied to certain diseases and programmes, in actual practice there are three intrinsic features common to all definitions. These are:

1. The systematic collection of pertinent data.
2. The orderly consolidation and evaluation of these data.
3. The prompt dissemination of the results to those who need to know.

There are many and varied sources of surveillance data. They differ from country to country and from disease to disease. For the purposes of the Technical Discussions these sources have been termed "the Elements of Surveillance". The replies from the Member countries discussed these elements in considerable detail. Some of the main points are summarized as follows:

1. The Elements of Surveillance

1.1 Mortality registration

Most but not all countries that responded to the outline document recognized the potential value of mortality statistics, but their limitations were frequently mentioned:

- (a) incomplete registration;
- (b) inadequate or inaccurate medical certification;
- (c) delayed tabulation of statistics.

In some countries death registration has been compulsory for over 100 years and is essentially complete. In other countries deaths are registered only in major cities. The accuracy of medical certification is admittedly inadequate in all countries. The proportion of deaths certified by physicians varies. In some countries only deaths occurring in government controlled hospitals are registered. The lag in collection and analysis of mortality statistics is a common complaint. It was pointed out by several countries that the main purpose of death registration was for inheritance, and other judiciary, rather than medical reasons. Reporting of deaths could be made more useful to the health authority if all deaths certified as due to a communicable disease were immediately reported.

The extent to which deaths are subjected to post-mortem examination has a profound effect on the usefulness of mortality data. Not only do post-mortem examinations provide much more reliable information on the primary causes of death, but also they serve as an index of the prevalence of other non-lethal but important infections and their sequelae.

One notable use of mortality data for current surveillance purposes is the regular tabulation of weekly or monthly deaths from pneumonia, influenza, bronchitis and other acute respiratory conditions. With epidemic influenza there is usually a sharp increase in mortality from these causes and often a measurable increase in total mortality. The excess mortality from pneumonia and influenza is probably the most useful measure of the extent and severity of epidemic influenza.

1.2 Morbidity Reporting

The responses to the outline document discussed at length various aspects of the reporting of notifiable diseases. Essentially every country utilizes this element of surveillance. In some countries reporting is required only for major infections such as malaria, cholera, smallpox, plague and haemorrhagic fever. In other countries 40 or more diseases are notifiable.

The sources of reports are primarily practising physicians but other sources are important such as hospitals, dispensaries, school authorities and industrial establishments.

The incompleteness of the morbidity reporting systems was almost universally recognized. In some countries, reliance was placed on the governmentally supported dispensaries and hospitals. In others, private physicians were legally required to report, but enforcement was admittedly difficult. Those countries having well organized, officially controlled medical care services are able to achieve better reporting than equally well developed countries having largely private systems for medical care.

Even under situations where morbidity reporting is quite complete, the biological characteristics of many diseases prevent, under the best circumstances, a measurement of the true extent of infection. In sub-clinical infections, as in the case of poliomyelitis, which cannot be reportable, the employment of other elements of surveillance such as the conduct of serological surveys or the search for virus carriers, are necessary to measure the prevalence of infection.

One interesting development, used in several countries, is to select a sample of co-operating physicians who agree to report regularly and completely. This system is most applicable to those diseases, such as influenza, acute diarrhoeal diseases, and the contagious diseases of childhood, which occur in high incidence, at least during epidemic periods, and do not usually require hospitalization.

Some countries pay a fee to physicians for reporting cases of communicable disease. This practice partially compensates the busy practitioner for the burden of reporting and should help to ensure accuracy and completeness of data, but the system is of limited value.

The necessity for prompt reporting was generally recognized. For the usually rare but serious diseases immediate reporting by telephone or telegraph, even on suspicion, is essential. For the more common diseases, daily or weekly reporting by mail usually suffices.

The simplicity of the data to be submitted facilitates morbidity reporting. For the uncommon diseases of major importance the information should consist of the name, age, sex and residence of the patient, the diagnosis and the date of onset. This permits individual case investigation. (See also 1.5.) For the more common diseases, reporting can be limited to the numbers of new cases seen during the preceding week. This much simpler method of reporting is applicable to such diseases as influenza, dengue, and the common contagious diseases of childhood. This system is used not only by busy practising physicians but also lends itself to routine reporting at a dispensary or hospital.

Where medical facilities are adequate, a workable system of morbidity reporting is a most important element of surveillance. None other is as comprehensive, as universally practised and as potentially all inclusive. While reporting is notoriously incomplete in most countries, and surely can be improved in all, this element is the foundation of any effective communicable disease programme. Before embarking on other more elaborate and specialized elements of surveillance, health authorities would be wise to devote first

attention to improving and modernizing their morbidity reporting system. The most important single step to achieve this objective is the prompt and regular dissemination of well evaluated information to all those who have contributed the reports.

1.3 Epidemic Reporting

Most countries require epidemic reporting not only of the known epidemic diseases but also of unknown or undiagnosed conditions. All possible sources of information are used, including reports from physicians, dispensaries, hospitals, schools and industries. Often epidemics are first detected when an increased number of specimens is sent to a laboratory, or when an excess mortality is noted, or when an account in the newspapers is reported.

Certain diseases cannot be readily distinguished as individual, sporadic cases, nor do they in such form constitute a significant health hazard. In epidemic form, however, they may be serious. Examples include influenza, rubella, dengue, salmonellosis, shigellosis and other types of acute diarrhoea and food poisoning. An organized system for the reporting of these types of epidemics is an important aspect of surveillance.

The effectiveness of the reporting of all types of epidemics depends not only on the alertness of the local health authority, but also on the promptness and manner with which the central health authority responds. With adequate consultative services immediately available, including the staff, equipment and necessary supplies, reporting of epidemics can lead to effective control. If on the other hand the reporting of epidemics results in severe restrictive measures, such as economic embargoes, quarantines or charges of negligence, then suppression of reports will occur. (See also 1.6.)

1.4 Laboratory investigations

The basic importance of adequate public health laboratory services for effective surveillance was recognized by all the countries responding to the outline document. Increasingly, such services are essential to the verification of diagnosis, to the tracing of sources of infections and modes of spread, and to the selection of specific control measures. A few examples include treponematoses, poliomyelitis with its three sero-types of virus, influenza with its two virus types A and B, and several sub-types of each, and the arboviruses which include yellow fever, the encephalidites, dengue and the haemorrhagic fevers. There are also many bacterial, parasitic and rickettsial diseases which require competent laboratory services for effective surveillance.

The wide range of essential services provided by the laboratory often include, in addition to the identification of the etiological agent, a description of important biological properties. Examples are the specific typing of salmonella or testing for resistance to antibiotics, or the demonstration of the carrier state, or long-term latent persistence of the etiological agent in the body. The epidemiologist depends not only on microbiological support, but also on histopathology and biochemistry, as well as on ecological knowledge of the vector-borne diseases. For many problems the veterinary laboratory makes a vital contribution (multidisciplinary approach).

A variety of organizations for providing laboratory services was described in the responses. Many countries support central and regional laboratories as part of the official health agencies. In other countries laboratory services are provided, at least for certain specified infections, through institutes, public as well as private. Laboratories affiliated with hospitals render substantial services. In the public interest, all diagnostic laboratory services connected with the diagnosis and control of the acute communicable diseases should be freely available without charge.

1.5 Individual case investigation

Many countries showed great appreciation for the importance of follow-up field investigations of selected communicable diseases. In all countries both suspected and confirmed cases of the quarantinable diseases receive first attention. In some countries additional diseases are followed up, depending upon the availability of epidemiologically trained personnel. The particular diseases chosen for field investigations vary widely from country to country. Cholera in the Eastern Mediterranean, South East Asia and the Western Pacific and meningococcal meningitis in Africa and the Eastern Mediterranean are but two examples.

For some diseases field investigations of cases are performed by local personnel, such as public health nurses or sanitary inspectors, particularly when a standard form is to be completed, or prescribed specimens need to be collected in an established programme. Other times more sophisticated field investigations by medical officers, epidemiologists or special consultants are necessary when a problem of diagnosis exists or an epidemic is feared.

When a disease is endemic at a moderate to high level of incidence, individual case investigation may not be indicated, except in selected instances. As various diseases come under effective public health control, the importance of this element of surveillance increases. As these diseases approach the level of eradication, intensive investigations of all reported cases, including suspects, become imperative.

1.6 Epidemic Field Investigation

This element in some way is a logical extension of individual case investigations, and this relationship was noted in some of the responses. Epidemic investigation has been listed separately, however, because there are essential differences in procedure, urgency and type of information collected. The investigation of a single case rarely permits a determination of source of infection and mode of spread. The data collected on single sporadic cases must be submitted to the central surveillance unit for analysis and evaluation along with other reports.

The occurrence of an epidemic, however, calls for a more thorough investigation, often by a multi-professional team. The primary function of such a team is to support the local health authority with the skilled clinical, epidemiological and laboratory services that may not be available locally. Working with the full authority of the central health authorities such field teams can conduct investigations on a broad base, extending some times to neighbouring health jurisdictions, thus permitting a prompt and full determination of the extent of the problem. (See also 1.3.)

1.7 Surveys

Most of the countries responding to the outline document listed a wide variety of epidemiological surveys that had been conducted. This approach to surveillance is applicable to all countries, regardless of the state of their economic development. In developing areas with limited health facilities, carefully planned surveys for malaria, yaws, tuberculin sensitivity, or various antibody levels are essential preliminaries to sound health planning. In more advanced areas surveys help to measure progress and assess the effects of control programmes. In areas where eradication may have been attained or be impending, surveys are needed to assure that important gaps in the control programmes have not arisen.

Serological surveys may have particular application in developing areas as a method of detecting the first evidence of the existence of a specific infection. Surveys are applicable in all areas to determine immunity status and they are essential for the assessment of the results of immunization programmes.

Other forms of survey also should be noted as valuable for surveillance purposes. These include cultures of the throat and of stool specimens for virus and bacterial agents, surveys of the prevalence of specific vectors and their possible resistance to insecticides. Post-mortem surveys have been useful for determining past prevalence of certain infections such as trichinosis, or sequelae from infections, for instance rheumatic heart disease.

As most surveys are both expensive and technically demanding it is particularly important that they are mainly undertaken if the results can be immediately and directly translated into action.

1.8 Animal reservoir and vector distribution studies

The surveillance of the many zoonoses and the arthropod-borne diseases requires the collection and evaluation of extensive data on animal reservoirs of infection and vectors. There was wide variation in the responses of Member countries to this element of surveillance. Some countries reported on the conduct of several types of host-vector density studies; other countries indicated little interest or activity. The studies reported varied widely and depended on the specific problems and environmental situations existing in the countries concerned. This element of surveillance emphasizes the necessity for maintaining the closest collaboration among epidemiologists, public health veterinarians, medical entomologists, and other public health biologists.

In addition to maintaining surveillance over the occurrence of zoonoses and the arthropod-borne diseases, the same techniques have broad application in the expanding economy of many developing countries. For example, when a dam is being constructed to expand irrigation and to develop agriculture, or industry in once virgin areas, it is only prudent for advanced planning to include careful studies of the potential disease problems that may be encountered. Also, at a later stage in the development of such areas, intensive surveillance of all acute diseases is of prime importance because when the ecology of an area is disrupted by large projects, new problems, some of serious degree, should be anticipated.

1.9 Biologics and drug utilization

Only a small number of countries reported that they kept records on the distribution and utilization of vaccines, immuno-globulins, and chemotherapeutic and prophylactic drugs. Many countries, however, indicated that the records were available. This element of surveillance would seem to have created the least amount of interest, in spite of the widespread misuse of drugs, especially broad-spectrum antibiotics, leading to emergence of drug-resistant strains of infectious agents. A problem that is being recognized as increasingly important is the occurrence of delayed adverse effects in the use of drugs. Knowledge of the extent to which these drugs are being employed is necessary to determine the magnitude of the problem.

1.10 Knowledge of the population and environment

All responding countries recognized the basic importance of this element. The surveillance epidemiologist must have access to the latest and most complete census and demographic information, in order to determine rates and trends of disease. These data should ideally include economic and sociological factors, such as the conditions of housing and crowding, the general status of sanitation, the levels of nutrition, the accessibility and methods of use of water and storage of food, to mention only some. The importance of another whole body of knowledge, namely, meteorological and climatic data, has been emphasized by one of the non-governmental organizations responding to the outline document.

2. Organization and Function

The surveillance system can be broken down into a basic chain of events as follows: identification of sources of data - field observations¹ - data recording - data reporting - data analysis and evaluation - formulation of recommendations for the decision making authority - dissemination of information to all those who are responsible for control action and to those who play an active role at the various levels of the surveillance system.

To make this chain of events function as a continued process requires a structure. The surveillance structure in turn can take many forms and degrees of complexity, depending on the socio-economic conditions, including medical facilities and personnel, and it also depends on the number of specified diseases that are being brought under surveillance at any given time. In its simplest form the structure will be designed for the surveillance of a single type of infection, under conditions where the sources of information will be lay people or semi-skilled technicians, reporting on a regular basis directly to a single, co-ordinating and evaluating authority. In its most complex form the structure will support a highly sophisticated network of medical monitoring units, dealing concurrently with problems related to a large number of communicable diseases that are amenable to control.

Most countries have surveillance activities based on a structure that is somewhat in between these two extremes. Shortage of skilled personnel and laboratory services are frequently mentioned as hampering factors in developing an effective surveillance structure. It would appear though, that not infrequently a more closely co-ordinated structure could be accomplished through a more rational use of already existing facilities. Better use of available data would also strengthen the efficiency of the surveillance operation. This includes the bringing together of information to a central evaluating unit from a wide variety of services such as hospitals, clinics, mobile health teams, physicians, pathologists, veterinarians (including slaughter-house reports), vector control units, rodent and pest controllers, sanitary engineers, etc. Detailed arrangements for the functioning of a surveillance system is to a great extent determined by the nature of the disease or infection against which it is directed.

Whatever the complexity of the surveillance structure, an assessment and evaluation mechanism for regular control of the reliability of the system must be undertaken. This would ordinarily be the function of the central directing unit.

Another, and fundamental process in the application or adjustment of the basic chain of events to a structure that is suitable for a given socio-economic situation, is that of formulating a rational approach to priorities. Essentially, there are two kinds of priorities involved, namely, (1) to give priority to selected diseases, when warranted by limitations of funds, personnel and facilities, and (2) giving priorities in the recommendations for control action. The first kind of priority will have to take into account not only the degree of severity of various endemic diseases and their incidence or prevalence, but also the probability of successful control action, taking into account locally available facilities. The second kind of priority has to do with a rational assessment, in terms of epidemiological cost-benefit analysis, where there is a choice of more than one course of action for the control of a given disease. In many instances it would here be appropriate and relevant to make use of mathematical programming techniques to predict the outcome in relation to costs of more than one course of action under a given set of epidemiological premises. This analytical approach to formulating recommendations is particularly important in many of the developing countries today where meagre resources make it imperative to be cost conscious and above all, avoid mistakes at the decision making level.

¹ "Field observations" here denote any data and information reported to a central unit for epidemiological evaluation, whether of clinical, laboratory or any other pertinent nature.

Epidemiological surveillance lends itself to modern methods of operational research for its refinement to achieve optimum performance under a given set of conditions. Work in this area is essential to the further development of efficient surveillance at varying levels of socio-economic development.

3. The Dissemination of Information

An excellent response was received to the question in the outline document dealing with "surveillance reports" and "epidemiological bulletins". Many illustrative examples were appended. Essentially all countries recognized the responsibility to issue regular reports but many admitted the limited value of present practices for surveillance purposes.

The character of the reports that are being issued vary in the extreme. Some appear weekly, others bi-weekly, monthly, quarterly or annually. Various combinations of these intervals are often employed. For example, some countries issue a weekly statistical bulletin with no commentary, a monthly or quarterly summary with some comment and an annual report with extensive textual material. Publication of such reports may be delayed for many months and therefore have more value as archives than for surveillance purposes.

Often the statistical summaries will be issued by a central statistical service which may be administratively separate from the Ministry of Health or at least independent from the communicable diseases epidemiologist. As a result, a serious delay may occur before the epidemiologist has full access to current data. Furthermore, it may be difficult, if not impossible, for him to insert appropriate commentary regarding important current epidemiological events in such statistical reports.

Ideally a system of surveillance reports can be visualized:

(i) City, Province or State Reports

To varying degrees, depending on the extent of health department organization, health jurisdictions below the national level should issue regular reports containing pertinent information on surveillance. These reports should go to local health officers, practising physicians, hospitals, and all persons having local responsibility for the control of communicable diseases. The reports should summarize current data regarding the incidence of important diseases and include epidemiological evaluations. Also, such reports might well give newsworthy and pertinent items regarding control measures, for instance the availability of vaccines and other biological products and new recommendations regarding control programmes. This information would be obtained from national surveillance reports and other appropriate sources.

(ii) National Reports

Every nation should issue regular surveillance reports according to a schedule adapted to its needs and facilities. The context should be similar to that of the city, province and state reports; in fact it should be based primarily upon a consolidation and evaluation of these reports. In addition, the national report should also focus on the problems of greatest national interest and concern. Summaries of interesting developments on the international scene may also be pertinent and useful. The report should be designed primarily for local, provincial and state officials and others concerned. Copies should be submitted to neighbouring countries, WHO and other international agencies and persons interested.

(iii) International Reports

A more detailed discussion of the reporting of surveillance information between two nations, or among a group of nations in certain geographic areas, is discussed in Chapter IV - and the role of WHO in surveillance is discussed in Chapter V.

Whatever the level of the surveillance activity, certain general principles apply. Once adequate information is collected and evaluated, the health authority should disseminate all pertinent facts and conclusions to those who submitted the basic data, and to all others who have a need to know (the decision makers).

In large measures surveillance information in an appropriately interpreted form should be issued on a regular basis to the public. Knowledge of the current status and trends of communicable diseases is of wide interest. Regular news releases constitute not only a major responsibility of the health authority, but a valuable opportunity for health education.

During the early stages of an epidemic or outbreak, before its extent or seriousness has been determined, it may be difficult for the health authority to make a competent and informed statement to the public. Such circumstances demand an immediate epidemiological field investigation. As soon as the problem has been defined a factual report should be made, first to all competent health authorities to guide their actions and, later at an appropriate time, to the public.

The purpose of all dissemination of surveillance data at local, national and international levels is to generate immediate control action. It is desirable that sufficient technical resources be provided locally for all emergencies. At times, however, assistance may be necessary from outside. Prompt and regular reporting to WHO of current data on potentially important problems permits the Organization to prepare for appropriate action.

III. THE ROLE OF SURVEILLANCE IN RESEARCH

One chapter in the outline document discussed the distinction between surveillance and research. Although it is often difficult to draw a sharp dividing line between the two functions it is desirable to do so. Surveillance involves the direct practice of epidemiology. It centres on the application of existing knowledge to guide the health authority in the use of known control measures. Research, on the other hand, is the pursuit of new knowledge from which better control measures will result.

There is and should be a close interrelation between surveillance and research. During the course of collecting and analysing surveillance data an epidemiologist is certain to encounter many interesting new problems. Often, as a result of the partial application of control measures, the ecology of the infection is changed in unanticipated ways. For example, following the introduction of poliomyelitis vaccine the epidemiological pattern of poliomyelitis changed abruptly. Problems of potency of the early vaccines were uncovered. The existence of ECHO and Coxsackie virus infections became clarified. These problems and new leads were taken directly to the research laboratory for intensive investigation and resolution. The epidemiologist who first discovers such leads should be encouraged, in so far as time permits, to pursue research investigations and to collaborate with interested laboratories.

Similarly, every research worker during the course of his studies, particularly those being conducted in the field, is likely to observe cases, isolate causative agents, and determine epidemiological associations that may be important to current surveillance. It is his obligation to report such findings to the appropriate health authority in order that the necessary control actions be taken promptly. It is noteworthy that most of the laboratories collaborating in the World Influenza Programme are actively conducting research. They in turn have continuing communications with many other laboratories and clinics within their respective areas. A prime concern of this whole programme is the detection of new variants of the influenza virus as soon as they occur anywhere in the world. If the first such isolation were made as part of a research study in a medical centre or research institute, it would be of utmost importance that the findings be reported for surveillance purposes. Research into the epidemiology of disappearing disease combined with evaluation of the outcome of mass penicillin campaigns in post campaign surveys is an example from the international programme against endemic treponematosi. During the last decade surveillance of influenza among animals, (swine, horses, ducks and other birds), has resulted in important research leads, now under intensive investigations.

On an even broader scale it should be emphasized that new information of importance in the control of diseases is continually being discovered in research centres. Unless this new knowledge is made available promptly to the health authority it cannot be applied. This further emphasizes the close interrelation between research and surveillance.

Several countries commented that field studies, such as multi-purpose serological surveys, are often planned in advance and conducted with the dual purpose of producing new research data and simultaneously providing information of practical importance for surveillance.

Thus surveillance and research can reinforce each other in many ways. The closest intercommunications between workers in both fields should be encouraged at the same time as a distinction between the primary functions of the two activities should be recognized.

IV. INTERNATIONAL SURVEILLANCE

So far in this background document surveillance has been discussed primarily from the point of view of separate nations and their component health jurisdictions. The international aspects, however, are of great importance. The whole history of the quarantinable diseases and the development of the International Sanitary Regulations illustrate the use of some basic principles of what is now termed surveillance but, of course, these principles were in world-wide application long before this term was being used. Another predecessor of international surveillance is the World Influenza Programme.

Most countries commented on this aspect of surveillance and the information received clearly indicates extensive activities. International surveillance at the present time takes many forms varying from simple, informal arrangements between two neighbouring states, to more formal bilateral or multilateral conventions, to continental, hemispheric and global co-operative efforts. A great variety of activities are undertaken, such as annual conferences on malaria eradication with participants from two or more countries, assistance from one country to another in phage typing of v. cholerae, assistance in poliomyelitis serological surveys, joint field investigations in border areas of selected diseases, etc. But the most common form of international surveillance consists of regular exchange of reports and information between two or more countries. Usually, such arrangements are limited to a few diseases of particular concern to the participating countries. These diseases frequently are the concern of geographical regions but further development of regional surveillance is needed. In South-East Asia, cholera, haemorrhagic fever and malaria are of common interest. In Central Africa, cerebro-spinal meningitis, yellow fever, and trypanosomiasis are of most concern. In Europe, salmonellosis, poliomyelitis and rabies have received most attention. In the western hemisphere a variety of disease problems, such as viral encephalitis, vampire bat rabies and Chagas' disease, have led to international surveillance activities. In the world at large there is wide-spread interest in, and concern about smallpox, influenza, poliomyelitis, venereal diseases and tuberculosis. There is growing recognition of the importance of measles, infectious hepatitis, and the arthropod-borne viral infections. (The role of WHO in surveillance is discussed in chapter V.)

V. THE ROLE OF WHO IN SURVEILLANCE

The role of WHO in epidemiological surveillance has recently been reviewed in some detail¹ and only the main features will therefore be given here. Global surveillance was initially limited to the six quarantinable diseases (plague, cholera, yellow fever, smallpox, typhus, and relapsing fever), an activity now governed by the International Sanitary Regulations under WHO's direction. In recent years surveillance has been extended to several other diseases of international importance. Influenza is a good example. The influenza virus is being continuously surveyed by a network of WHO Influenza Centres in all parts of the world to ensure that if a new virus type emerges it is detected as early as humanly possible. Following extensive mass treatment campaigns against the endemic treponematoses, the effect of these control programmes is being assessed through clinical and sero-epidemiological surveillance. Malaria is under continuous surveillance as part of the malaria eradication programme. Tuberculosis surveillance is done extensively through a series of WHO assisted tuberculosis control programmes, through the organization of case reporting and tuberculin testing among children. In Europe, surveillance of tuberculosis as a vanishing disease is conducted by WHO in co-operation with the International Union against Tuberculosis and a number of national health authorities. WHO assisted surveillance is at present being expanded to include internationally important diseases such as dengue haemorrhagic fever in South-East Asia and the Western Pacific, and salmonellosis in Europe. Development of a new approach to surveillance of wild-life rabies is being actively undertaken, at the same time as means are sought to stop the present spread of these diseases in central Europe.

WHO assisted surveillance programmes are not limited to infections and diseases. Considerable emphasis is being given to surveillance of vector populations both with regard to their distribution (mapping), density, resistance to insecticides and ecological factors of importance to their ability to transmit infectious agents.

Concerning the question in the outline document of WHO's role in surveillance, many governments expressed the view that WHO should exert a leading role in promoting and co-ordinating epidemiological surveillance, both at the national and international level. Many suggestions were made regarding the nature of such WHO contributions, i.e. convening conferences and seminars, making experts available for consultation and advice, and providing supplies and equipment for field work. WHO, it was also suggested, might play a useful role in helping countries to plan and execute sero-epidemiological surveys. Perhaps the most important single function emphasized in the comments was for the Organization to receive, consolidate and disseminate epidemiological information. One country underlined the importance of quick dissemination of information by WHO and suggested that this might be achieved by the use of a computer.

Many of these suggestions are in line with current thinking within the Organization, and in order to develop a programme capable of meeting today's requirements in the development of efficient epidemiological surveillance, both at the national and international level, an Epidemiological Surveillance Unit was established in the Communicable Diseases Division. This unit is structuring surveillance programmes for selected and internationally important diseases and developing multi-purpose serological surveys. These are being conducted in some countries of the world where morbidity reporting is weak, and where consequently little is known about the disease problems in both urban and rural areas. In addition to giving information about the kind of infections that occur, and the relative risk of the different kinds of infection, these sero-epidemiological surveys give important data on the proportion of susceptible people in the population as a basis for formulating economic vaccination programmes.

¹K. Raška, WHO Chronicle, Vol. 20, No. 9, 1966.

Surveillance activities concerning specific communicable diseases and their sequelae are carried out by all units in the Communicable Diseases Division, the Vector Biology and Control Unit, as well as other relevant units in closest co-operation and co-ordination with the Regional Offices.

To assist in the sero-epidemiological aspects of the WHO surveillance programme, two Serum Reference Banks have been created, one in the Institute of Epidemiology and Microbiology in Prague, Czechoslovakia, and the other at Yale University School of Medicine in New Haven, Connecticut, United States of America. The purpose of these Banks is to receive and store sera and undertake to arrange for examination of serum specimens at suitable laboratories, both in the field of microbiology as well as immunology, human genetics, haematology and nutrition. The Directors of these Serum Reference Banks are working in close co-operation with the Epidemiological Surveillance Unit of WHO.

Perhaps the most important aspect of the future role of WHO in surveillance is to help Governments in formulating a rational approach to a better utilization of existing facilities and resources. This would require the prior development of a suitable methodology to be tested in a variety of socio-economic and cultural situations. Essentially what is needed here is a systems-analysis geared to surveillance, which would ensure that scarce facilities and resources are being put to optimum use. As mentioned earlier, another important aspect in the planning of efficient surveillance is an analytical approach to both the allocation of priorities, and the formulation of recommendations.

Epidemiological emergencies are the concern of any surveillance system; indeed the very existence of an emergency must be discovered and defined by the system, and appropriate recommendations prepared for the decision making authority. WHO's role here is twofold:

- (1) to help deficient national surveillance systems to become reorientated and strengthened to a degree that permits it to deal adequately with an emergency situation;
- (2) to maintain sufficient flexibility and resources, to permit the Organization to move into an epidemiological emergency with assistance appropriate to the situation, on the request of a Government whose services are not yet adequate to cope with a sudden disease outbreak.

Quick and efficient dissemination of information plays a prominent part in WHO's surveillance programme and is accomplished primarily through the Weekly Epidemiological Record. A special aspect of dissemination of information, namely that of storing essential information in an easily retrievable form, is of considerable importance to international surveillance. A computerized epidemiological data bank which will greatly facilitate this service is under development. This data bank will serve a variety of purposes such as providing a pertinent epidemiological framework for assessment of disease outbreaks, for evaluation of data collected in sero-epidemiological studies, and for giving meaningful background information for day-to-day news of interest to epidemiological surveillance.

VI. REFERENCES

I. WHO AND ASSOCIATED PUBLICATIONS

1. International Sanitary Regulations, Third annotated edition, WHO, 1966
2. Pan American Sanitary Bureau, Guide for the reporting of communicable diseases in the Americas, Washington (Miscellaneous Publications No. 6) 1955
3. Raška, K. (1966) National and international surveillance of communicable diseases, WHO Chronicle, 20, 315-321
4. Study Group on Immunological and Haematological Surveys, Report (1959) Wld Hlth Org. techn. Rep. Ser., No. 181
5. Taylor, I. (1965) The notification of infectious diseases in various countries. WHO, Public Health Papers, No. 27, 17-68
6. Terminology of malaria and of malaria eradication: Report of a Drafting Committee. WHO, 1963
7. Yekutieli, P. (1960) Problems of epidemiology in malaria eradication, Bull. Wld Hlth Org., 22, 669-683

II. OTHER PUBLICATIONS

8. Langmuir, A. D. (1963) Surveillance of communicable diseases of national importance, New Engl. J. Med., 268, 182-192
9. Langmuir, A. D. (1964) Airborne infection: how important for public health?
1. A historical review, Amer. J. publ. Hlth, 54, 1666-1668
10. Newer surveillance methods in the control of communicable disease (1965) Milbank mem. Fd Quart., 43, No. 2, Pt 2, 369-412
11. Raška, K. (1964) The epidemiological surveillance programme, J. Hyg. Epidem. (Praha), 8, 137-168