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**WHO Report on Global Surveillance of Epidemic-prone  
Infectious Diseases**

**World Health Organization**

Department of Communicable Disease Surveillance and  
Response

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## **Acknowledgements**

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This report is dedicated to the late Karin Ljungars Esteves, our former colleague at WHO, who made an enormous contribution to communicable disease surveillance activities over many years.

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# CHAPTER 1

## INTRODUCTION

### Background

This report focuses on the analysis and interpretation of data collected by WHO on the surveillance of infectious epidemic diseases, the strengths and weaknesses of the data, and how the data can be used and interpreted. There are several aspects of this report that are worth noting. First, time series data for approximately half a century are reported for many of these diseases. Such data allow recent changes to be interpreted in a long-term perspective. Indeed, part of the motivation for including particular diseases in this report is to make these data available to the public, to health professionals and to scholars. One of the surveillance systems discussed in this report, the surveillance system for leishmania/HIV co-infection, is very new. Already this system is indicating that co-infection is a problem in some parts of Europe. For HIV/AIDS, there is a unique set of data from the beginning of the pandemic until the present time.

Second, this volume uses a multiple disease approach, and examines not only the surveillance of (nine) different diseases, but also contrasts and compares their global surveillance systems.

Surveillance has been defined as the continuing scrutiny of all aspects of the occurrence and spread of a disease that are pertinent to effective control.<sup>1</sup> For this, systematic collection, analysis, interpretation and dissemination of health data are essential. This includes collecting information about clinical diagnoses, laboratory diagnoses and mortality, as well as other relevant information needed to detect and track diseases in terms of person, place and time. Surveillance systems must detect new communicable diseases as well as recognize and track diseases that currently are, or have the potential to become, of major public health importance.

### Why infectious diseases are still a problem and surveillance is still required

In the 1970s many experts thought that the fight against infectious diseases was over. In fact, in 1970, the Surgeon-General of the United States of America indicated that it was “time to close the book on infectious diseases, declare the war against pestilence won, and shift national resources to such chronic problems as cancer and heart disease”.

Indeed, complacency about the threat of communicable diseases in the 1970s led to less priority for communicable disease surveillance systems. Partly as a result, these systems were not maintained in large parts of the developing world, and this retarded recognition of the magnitude of problems posed by new and re-emerging communicable diseases, and therefore effective action to control them.

During the last two decades, this opinion has been reversed, and there is now a renewed appreciation of the importance of communicable disease. The spread of new diseases such as HIV/AIDS, hepatitis C, and dengue haemorrhagic fever, and the resurgence of diseases long since considered under control such as malaria, cholera, and sleeping sickness, have drawn considerable attention. Infectious diseases cause 63% of all childhood deaths and 48% of premature deaths. Many of these deaths are caused by epidemic infectious diseases such as cholera, meningococcal disease, and measles. There are continuing threats of large epidemics with widespread mortality like the ‘Spanish flu’ epidemic in 1918-1919 which killed an estimated 40 million people worldwide, or the HIV/AIDS epidemic which has caused widespread morbidity and mortality, and reversed hard-won gains in life expectancy in Africa.

In light of this, it is clear that effective public health surveillance is critical for the early detection and prevention of epidemics. There is a clear and urgent need for surveillance of (i) known existing

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<sup>1</sup> Last, JM. *A Dictionary of Epidemiology*. Oxford University Press, 1995.

communicable diseases, especially those with high epidemic potential, (ii) early recognition of new infections (over 20 new pathogens have been discovered since the mid-1970s), and (iii) monitoring the growing resistance to antimicrobial drugs.

## **Global epidemic surveillance**

In the modern world, with increased globalization, and rapid air travel, there is a need for international coordination and collaboration. Everyone has a stake in preventing epidemics.

WHO has the mandate to lead and coordinate global surveillance. This includes setting international epidemic surveillance standards, providing technical assistance to Member States in surveillance activities, training in field epidemiology, strengthening laboratory capacity and laboratory networks. WHO also maintains international collaborating networks like the WHO Network of Collaborating Centres for Influenza Surveillance which monitors strains of influenza, the cholera task force which coordinates preparedness and response to cholera outbreaks, and the International Coordinating Group (ICG) on Vaccine Provision for Epidemic Meningitis Control.

In addition, WHO ensures international coordination of epidemic response, particularly for diseases of international public health importance or when countries lack the capacity to respond to an epidemic themselves. Responses can vary from investigating the cause of an epidemic, to verifying and disseminating information, and to providing needed equipment and laboratory supplies.

## **The scope of this report**

This report concentrates on the surveillance of nine infectious epidemic diseases that are either new or volatile or pose an important public health threat. All have high epidemic potential and most are increasing in incidence. They include:

- Yellow fever
- Plague
- Cholera
- Meningococcal disease
- Dengue fever and dengue haemorrhagic fever
- Influenza
- African trypanosomiasis
- HIV/AIDS
- Leishmaniasis and leishmania/HIV co-infection

These diseases are difficult to track because of their complicated epidemic patterns, their ability to develop new strains, and their tendency to spread quickly to new locations. Most of these diseases have high case fatality rates and severe symptoms increasing the urgency of fast identification of new occurrences to prevent further transmission.

These nine diseases have several different transmission patterns. Yellow fever, plague, dengue/dengue haemorrhagic fever, African trypanosomiasis, and leishmaniasis are all vector-borne diseases transmitted by the bite of infected insects; influenza and meningococcal disease have airborne transmission routes; while cholera is transmitted by contaminated food and water, and HIV is transmitted primarily through sexual contact. HIV and HIV-leishmania co-infection, and African trypanosomiasis can also be transmitted through contact with infected blood either from blood transfusions, contaminated needles or use of contaminated blood products. Vertical transmission from mother to child occurs in both HIV and African trypanosomiasis.

The remainder of this chapter presents a description of the types of data used in the surveillance of the nine diseases presented. This provides insight into the different types of activities that make up disease surveillance systems, and includes a discussion of the uses and limitations of surveillance data. Next, there are observations about how the modern world is impacting on infectious diseases, using examples from the nine diseases covered in the report. Finally some conclusions are drawn.

## **Types of surveillance**

Table 1.1 presents the types of surveillance data available for the nine diseases covered in this report. This includes the information collected, years covered, type of surveillance, frequency of reporting, and the strengths and weaknesses of the surveillance system.

## ***Reporting cases and deaths***

One of the mainstays of communicable disease surveillance is the reporting and confirmation of cases seen in health facilities. This is known as passive reporting (in contrast to active case-finding methods where cases are actively looked for). For passive reporting to be successful, primary health care providers must be able to recognize the clinical manifestations of reportable diseases. This involves having clear, uniform case definitions available at the peripheral level. In addition, laboratories need adequate resources to make the required laboratory diagnoses.

Passive surveillance has many weaknesses. First, in many parts of the world there is very little access to health care facilities, and many people fall ill or die at home without ever visiting a health facility. Thus many cases are not reported. Second, there are problems of under-recognition of diseases, particularly those that are new to an area or those with non-specific symptoms. Third, in many parts of the world the level of laboratory support is inadequate. Fourth, there are common logistical problems in reporting in many parts of the world, over-worked and underpaid staff, lack of motivation for reporting when no feedback is provided, and a need for further training. Overall, there is considerable variation in the quality of reporting systems from country to country, reflecting economic, social, cultural and epidemiological differences.

There are several typical reporting practices used, depending on the control measures needed, and the specific regulations in the country.

Three diseases are currently subject to the International Health Regulations:<sup>2</sup> yellow fever, plague, and cholera. The regulations, which were first adopted by the World Health Assembly in 1951 and then revised slightly in 1969, are a mechanism to provide security against the international spread of epidemic diseases with a minimum interference with world traffic. These are the only binding international legislation for public health and they require that:

Each national health administration should inform WHO within the first 24 hours of being informed of the first suspected case on its territory of a disease subject to the Regulations. This includes both indigenous and imported cases. All subsequent cases and deaths should be reported to WHO.

For these diseases the report from the health professional to the next higher administrative level is done by a rapid method such as phone, e-mail, fax or telex.

Although all cases and deaths from yellow fever, plague and cholera should theoretically be reported to WHO, this does not always happen in practice. In many instances, countries are unwilling to notify WHO because of the fear of economic and political consequences, such as the loss of tourism and trade, and the imposition of travel restrictions. This causes underreporting and reporting delays.

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<sup>2</sup> The International Health Regulations are currently undergoing substantive revision.

Therefore reported data for the diseases covered by the International Health Regulations need to be interpreted with caution.

For diseases not subject to the International Health Regulations, national reporting practices and laws vary across countries. For infectious diseases with potentially high case fatality rates which can spread rapidly (such as meningococcal disease), most countries require rapid reports of the first occurrences of suspect cases. For other diseases, such as pneumonia or AIDS, weekly, monthly, or quarterly case reports are done. Not all infectious diseases are routinely reported, as reporting every infectious disease would place an undue burden on health services.

Some countries have sentinel sites that report more frequently and sometimes on more diseases than the routine reporting system. If these sites are well chosen, they can provide a wealth of information in a timely way – something that would be impossible to expect of all primary health care centres. The disadvantage of relying on sentinel sites alone is that they may not necessarily be representative of the country as a whole.

With the exception of the International Health Regulations which are determined internationally, reporting requirements for infectious diseases are nationally or sub-nationally determined. For example, a disease like leishmaniasis is notifiable in some high risk countries but not in all. Even within countries there may be important differences. For example, reporting of HIV is required in some states in the United States of America but not in others.

As a result there are differences from country to country, and even within countries in how the reporting of each disease is carried out. This makes sense because each country faces a different set of disease related circumstances. However, it does introduce an element of non-comparability into global disease surveillance systems, since information on the same disease is collected in a somewhat different way depending on the country. This must be kept in mind in the analysis of global surveillance data.

Six of the nine diseases in this report depend heavily on reported numbers of cases and/or reported numbers of deaths to track the disease in terms of person, place and time. These include cholera, plague, yellow fever, meningococcal disease, dengue, and leishmaniasis (including leishmaniasis/HIV co-infection).

WHO headquarters maintains disease specific global data bases including the reported numbers of cases and deaths for each country by year. During analysis and interpretation, these data are often supplemented by additional information, and scientific studies. For example, in many instances scientific studies indicate that disease transmission has taken place in a particular country, even though there have been no reported cases. In general, WHO data are adequate to present a broad reflection of disease and mortality trends as is done in this report. More disaggregated data are usually needed for more in-depth analyses.

### ***Surveillance of disease strains***

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