

! OUTBREAK



In the last decades of the 20th century, new diseases began emerging at the unprecedented rate of one per year. This trend is expected to continue.

On average, WHO now investigates 200 outbreaks every year. Of these, around 50 will require an international response.

Some of these threats – like Ebola, plague, and epidemic meningitis – predictably recur in seasons or geographical areas. Others – like SARS – are new, unpredictable, and particularly dangerous.



All countries are vulnerable. A single case of smallpox, released in a bioterrorist act, would be a global emergency. A resurgence of SARS, returning from some unknown reservoir or laboratory accident, would also be an emergency.

All countries need protection through a shared system for detecting outbreaks early and coordinating a rapid response.

This brochure describes the mechanisms, procedures, and tools used by WHO to defend the world against the threat posed by emerging and epidemic-prone diseases.



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Defending the world against emerging and epidemic-prone diseases



Outbreaks of new, unusual, or well-known epidemic-prone diseases are occurring worldwide at an unprecedented rate, and this trend is expected to continue. Constant evolution is the survival mechanism of the microbial world. Infectious disease agents readily and rapidly multiply, mutate, adapt to new hosts and environments, and evolve to resist drugs. They are quick to exploit new opportunities to change and spread.

As dramatically illustrated by SARS, this explosive potential has been greatly augmented by the pressures of a crowded, closely interconnected, and highly mobile world. No country acting alone can protect itself against a microscopic threat that readily crosses borders concealed in humans, animals, or food. The resurgence of infectious diseases is a global threat that requires a global system for defence. That system is now in place.

Contain known risks

Respond to the unexpected

Improve preparedness

A new framework for action – put to the test



WHO has developed an operational system for keeping the infectious disease threat under close surveillance and facilitating the rapid containment of outbreaks.

Since 1997, WHO has been building up an operational system, supported by a “virtual” architecture, for strengthening global defence against the transboundary threat posed by outbreaks and epidemics. The system, which benefits from the presence of WHO offices in 141 countries, gives priority to prompt detection and rapid containment of outbreaks, with improved surveillance as the cornerstone. The system is supported by several new mechanisms and a computer-driven tool for real-time gathering of disease intelligence, and takes full advantage of new opportunities opened by the widespread use of electronic communications.

Improved defence relies on a three-pronged approach, with different strategies for combating known risks and unexpected events, and for improving both global and national preparedness. The system is continuously being strengthened as new mechanisms are developed and powerful new electronic tools become available.

In April 2000, WHO formally launched the Global Outbreak Alert and Response Network (GOARN) as a mechanism for keeping the evolving infectious disease threat under close surveillance and facilitating the rapid containment of outbreaks. This overarching network interlinks, in real time, 110 existing networks which together possess much of the data, expertise, and skills needed to keep the international community alert to outbreaks and ready to respond. By electronically linking together existing networks, WHO is able to magnify its limited resources considerably.

This operational system was put to an extreme test during the global SARS outbreak, when WHO and its GOARN partners were called upon to assist affected countries and contain the further international spread of a particularly difficult and dangerous new disease. A rapid response at levels ranging from research on the causative agent to direct assistance to countries resulted in the containment of SARS in less than four months.

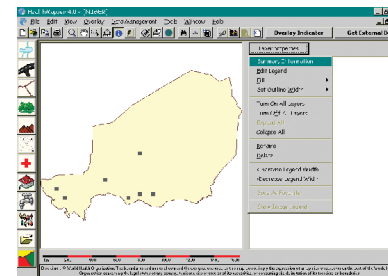
Powerful assistance from real-time tools

One of the most powerful new tools for gathering epidemic intelligence is a customized search engine that continuously scans world Internet communications for rumours and reports of suspicious disease events. This is the Global Public Health Intelligence Network (GPHIN) computer application developed by Health Canada and used by WHO since 1997. GPHIN operates as a sensitive real-time early warning system by systematically searching for key words in over 950 news feeds and electronic discussion groups around the world. Human review and computerized text mining are used to filter, organize, and classify the more than 18 000 items it picks up every day, of which around 200 merit further analysis by WHO.

In outbreak alert and response, every hour counts, as the window of opportunity for preventing deaths and further spread closes quickly. Apart from its comprehensive and systematic search capacity, GPHIN has brought tremendous gains in time over traditional systems in which an alert is sounded only after case reports at the local level progressively

filter to the national level and are then notified to WHO. GPHIN currently picks up – in real time – the first hints of close to 40% of the outbreaks subsequently verified by WHO. In addition, it frequently alerts WHO to rumours that are subsequently refuted, often before they have a chance to cause economic and social disruption.

WHO has also developed a user-friendly mapping and tracking tool, based on geographical information systems and remote sensing from satellites, that allows immediate visualization of spatial and epidemiological data for planning and preparedness. During outbreaks, this desktop application also assists in the location of cases and rapid mapping of the epidemic's dynamics. In 2001, WHO introduced an event management system to gather and communicate data throughout the course of an outbreak. The system generates a dynamic picture of operations, aids organization of logistics, and provides a systematic way to prepare better, respond faster, and manage resources more efficiently



Electronic tools have revolutionized the methods used to detect outbreaks, track their dynamics, and prevent their international spread.

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Sent: Wednesday, 11 October 2000 08:09
To: OUTBREAK@whoafr.org
Cc: OUTBREAK@who.ch
Subject: Viral haemorrhagic fever outbreak in Uganda
This is to inform you that there is a possible outbreak of viral haemorrhagic fever in Gulu district. There are several cases reported with 15 deaths including 2 health workers. A team has been sent to assist with
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Containing known epidemic threats



Electronic surveillance networks keep close watch over worrisome, but well-known diseases, such as influenza, dengue, and salmonellosis.

Many pathogens that can cause epidemics have been around for centuries. They are well adapted to spread in human populations either directly from person to person, through transmission by insects and other vectors, or by contamination of the environment or food. The major diseases they cause – influenza, yellow fever, meningitis, dengue, viral haemorrhagic fevers, and plague – pose a constant threat to human populations, often in defined geographical areas or during peak transmission seasons. They are generally well understood clinically and epidemiologically and, in most cases, effective measures are available for their control. WHO has developed standard protocols, based on years of experience, to facilitate prompt, coordinated action when countries require assistance in containing these diseases.

Under ideal conditions, rapid detection and containment of known epidemic threats reduces both the number of cases and deaths and the potential for international spread. In reality, however, most of these diseases are strongly associated with poverty. They surface

and flourish under conditions of poor hygiene, sanitation, and housing where health infrastructure is usually weak or nonexistent. Though well understood and sometimes predictable, they continue to cause considerable morbidity and mortality and great social disruption.

For outbreaks of some diseases, control depends on the rapid immunization of populations that can number in the millions and completely exhaust global vaccine reserves. For epidemic meningitis, WHO established in 1997 a coordinating mechanism, engaging major nongovernmental organizations and manufacturers, that maintains an emergency stockpile of vaccines and other supplies, oversees their distribution, and also works to forecast epidemics and reduce the price of vaccines. To date, more than 20 million doses of meningococcal vaccine have been distributed through this mechanism. In 2001, a similar mechanism for yellow fever vaccine facilitated the emergency immunization of over 2.9 million people in less than two weeks, averting an estimated 30 000 deaths.

Responding to unexpected events

Unexpected events occur when a completely new disease emerges, when a disease in animals jumps the species barrier to infect humans, or when a disease suddenly appears in a new geographical area. New threats also arise when a known pathogen mutates into a more dangerous form, capable of causing large and serious outbreaks. The possibility that disease agents might be deliberately introduced in an act of bioterrorism is presently of great concern.

Unlike the well-known epidemic threats, these unexpected events are always surrounded by considerable uncertainties which can impede their rapid identification and control. Novel pathogens are usually poorly understood in terms of their source and mechanisms of transmission, and many have the potential to cause large outbreaks. While others lack the capacity for sustained epidemic spread, they frequently achieve prominence because of their high fatality, especially when no effective treatment is available. Such problems are further complicated by the fact that many emerging diseases are caused by exotic

viruses so hazardous they require handling in specially equipped high-security laboratories, which exist in only a small number of countries.

These features can contribute to delayed or confused diagnosis, even in the most advanced countries, and fuel public panic. The potential for social and economic disruption is great, as illustrated by the culling of millions of poultry, pigs, and cattle in efforts to contain emerging zoonotic diseases, and by the high economic costs of SARS.

WHO support is particularly important when unexpected events occur. New tools such as GPHIN greatly enhance vigilance, while the Global Outbreak Alert and Response Network maintains capacity for rapid response, containment, and specialized investigations. The WHO network of 270 collaborating laboratories and institutes provides a broad geographical base of technical support, including high-security facilities for the diagnosis and study of hazardous pathogens. This capacity for rapid alert and specialized investigations would strengthen the international response to a bioterrorist attack.



Capacity for rapid response is particularly important for new diseases, which are poorly understood as they emerge and difficult to contain.

Improving preparedness



Strengthened capacity at the national level – where the diseases occur – increases the likelihood that an event will be detected early enough to prevent international spread.

Global and regional surveillance and reporting systems will eventually detect most large outbreaks. The delays, however, can be considerable, especially for the many outbreaks, strongly associated with poverty, that occur most readily in populations with little access to health services. Moreover, good local data on normal patterns of disease facilitate recognition of an unusual event, which could signal the emergence of a new disease, a laboratory accident, or the deliberate use of an agent in a bioterrorist attack. Local data also assist in predicting conditions conducive for outbreaks and epidemics. Strengthening of capacity at national level – where the diseases occur – increases the likelihood that an event will be detected early enough to prevent international spread.

While almost all countries rely on some system for disease surveillance, such systems often lack an early warning component and may have no mechanism for triggering a rapid and appropriate response. Such weaknesses contribute to late detection and reporting of outbreaks and have historically resulted in requests for assistance at a stage when the outbreak is more difficult and

costly to contain, and more dangerous for the international community. The dangers of delayed detection and international spread – vividly illustrated by SARS – are magnified by the tendency of new diseases, especially zoonoses, to emerge under conditions of crowding and poor hygiene.

Apart from providing the strongest defence, capacity building for national epidemic detection and response is far more cost-effective than mounting an international response. In 2001, WHO opened a new facility in Lyon, France, to provide 2-year specialized training for epidemiologists and laboratory personnel from developing countries. The training includes a 6-week course in Lyon followed by specially tailored field work in the home country. WHO also helps countries improve surveillance through the introduction of multi-disease surveillance systems and simple community-based Early Warning and Response Networks that link sentinel reporting sites by radio. WHO also establishes international norms and standards for improving laboratory biosafety and thus preventing outbreaks associated with laboratory accidents.

Strengthening the legal mandate

The *International Health Regulations*, which are administered by WHO, are the only legally binding international instrument covering measures for preventing the transboundary spread of infectious diseases. They provide a single code of procedures and practices, including routine measures at airports and seaports, for preventing the importation of pathogens and vectors. They also set out roles and responsibilities for WHO as well as for individual countries, for responding to emergencies. They therefore contribute greatly to the use of uniform and adequate protective measures both on a routine basis and in crisis situations, and for both well-known risks and unexpected events.

The current regulations, in force since 1969, are now undergoing substantial revision to make them responsive to changes ushered in by the resurgence of the infectious disease threat, the increased volume and complexity of international travel and trade, and the widespread use of electronic communications. Whereas the current regulations prescribe measures for only three diseases (cholera, plague, and yellow fever),

the revised regulations will provide a universal framework for protecting populations against all public health emergencies of international concern caused by infectious diseases.

Many specific revisions address problems identified as WHO has worked to strengthen its outbreak alert and response activities, and are thus firmly grounded in practical experience. The revised regulations will strengthen procedures for rapidly gathering information, for determining when a disease event constitutes an international threat, and for seeking WHO assistance.

Revisions also take into account the speed and widespread use of electronic communications, which mean that official government notifications of a disease event are frequently pre-empted by reports in the media or on the Internet. In May 2003, in response to SARS, WHO was formally authorized to use information sources, such as those searched by GPHIN, other than government reports, and to issue global alerts when neighbouring countries or international public health are threatened by a disease event.

West Nile Virus Spreading Faster

By LAURAN NEERGAARD
WASHINGTON - West Nile virus is sickening people far earlier this summer than usual, and is spreading so quickly - it's hit 33 states, as far west as South Dakota believe it will reach or next.

Nobody knows how the disease is spreading rapidly in Louisiana

New flu virus

A new strain of influenza appeared last winter, public health experts said yesterday. It was not sufficiently different from circulating strains

SARS virus costing Asia \$11 billion

Hong Kong - The outbreak of the deadly SARS virus has cost Asia nearly US\$11bn and the figure could rise, it was reported

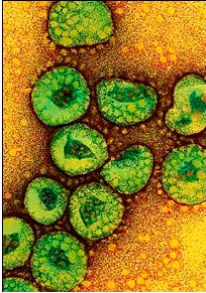
Liberia reports major cholera outbreak

Officials said 400 cholera cases had been admitted to the J.F. Kennedy Hospital and that measures had been taken to chlorinate water in the affected

worst affected. The epidemiologist at the Ministr of Health, Charles Nagbe, said the areas were hit were located around

The *International Health Regulations* have an established role as the principal regulatory mechanism for the sharing of epidemiological information on transboundary spread of infectious diseases. Their revision will be another important step in strengthening the world's collective defences against the infectious disease threat.

Defence against a shared threat



The need now is for global unity in the face of a threat that is both predictably recurring and unpredictably emerging.

The world faces the prospect of outbreaks – whether predictable or unexpected – arising from the volatile microbial world on a daily basis. The great social and economic disruption caused by SARS demonstrates the impact a new disease can have in a closely interconnected and highly mobile world. SARS was the first severe and readily transmissible new disease to emerge in the 21st century. It is unlikely to be the last.

Moreover, SARS is only one of around 50 outbreaks of major international concern that occur each year. Some recent examples:

- **In January**, an outbreak of a new strain of epidemic meningitis began in Burkina Faso and later appeared in Nigeria, completely outstripping global capacity to manufacture sufficient protective vaccine.
- **In February**, Ebola haemorrhagic fever surfaced in a remote part of the Congo, with poor capacity for local response, and was fatal in more than 70% of cases.

- **Subsequent months** saw cases of avian influenza in Hong Kong and the Netherlands, plague in Algeria, legionellosis in France, and cholera in Iraq, Liberia, and 5 other countries.

A global system of surveillance and response helps ensure that the world is not taken by surprise and knows how to collaborate in managing a shared threat. Aided by new tools and operational protocols, WHO and its partners in the Global Outbreak Alert and Response Network are permanently alert to the constantly changing infectious disease threat and permanently prepared to respond.

The revised International Health Regulation will give this operational work, which has already proved vital in defending global health security, the added power of a formal legal foundation. The need now is for global unity in the face of a shared threat that can be managed only through strong partnerships and only when given adequate priority by the governments of all nations.

The WHO response to SARS

16 November 2002. First known case of atypical pneumonia occurs in Guangdong Province, China.

27 November 2002. GPHIN picks up rumour of “flu outbreak” in mainland China.

10 February 2003. WHO Beijing office alerts GOARN following reports of panic over a “strange” outbreak in Guangdong.

11 February. China formally reports Guangdong outbreak of acute respiratory syndrome with 305 cases and 5 deaths. The outbreak is said to be under control.

21 February. The disease moves out of mainland China when a Guangdong doctor, who had treated patients, checks into a Hong Kong hotel. He infects at least 16 other guests and visitors, who spread the disease internationally.

4 March. Hong Kong reports cases.

5 March. Hanoi reports cases.

7 March. First urgent alert to GOARN partners.

8–10 March. WHO teams arrive in Hanoi and Hong Kong.

12 March. WHO issues first global alert.

13 March. Singapore reports cases. Second GOARN alert.

14 March. Toronto reports cases.

15 March. WHO issues second, more urgent alert and sets out guidelines for recognizing the new disease, now named SARS.

17 March. WHO sets up virtual research networks of scientists, clinicians, and epidemiologists.

26 March. Twelve countries report 1300 cases

27 March. WHO issues more stringent advice to travellers and airlines, including recommendations on passenger screening.

28 March. Policy for hospital discharge and follow-up issued.

2 April. First recommendations to postpone travel to designated areas.

3 April. GOARN investigative team arrives in Guangdong.

4 April. Guidelines for global surveillance issued.

11 April. Clinical guidelines issued.

14 April. Over 3 000 cases reported globally.

16 April. WHO laboratory network identifies causative agent.

24 April. Guidelines for infection control issued.

25 April. Outbreaks in Hanoi, Hong Kong, Singapore, and Toronto show signs of peaking.

28 April. Viet Nam becomes first country to contain its outbreak.

29 April. Recommendations for laboratory testing issued.

22 May. Number of cases surpasses 8000, with 5000 in China.

27 May. World Health Assembly adopts a SARS resolution. A second resolution strengthens WHO's capacity to respond to outbreaks.

3 June. Cases in China show sharp decline.

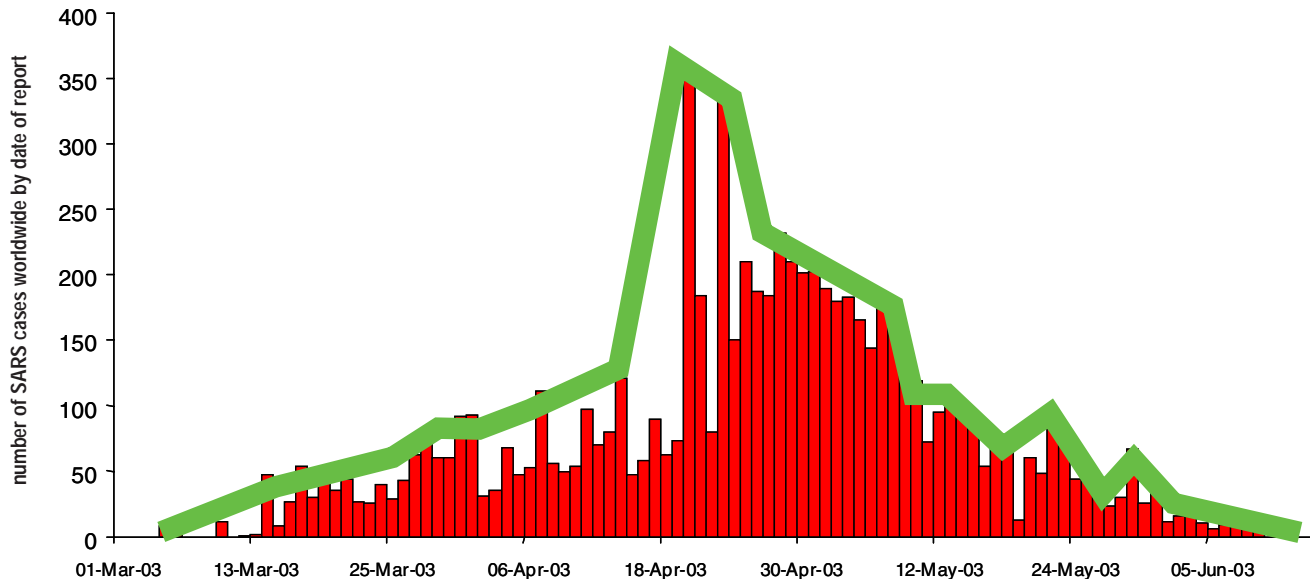
12 June. Senior WHO officials arrive in Beijing to assess the SARS situation in China.

24 June. The last remaining travel recommendations (for Beijing) are removed.

5 July. WHO announces that the last known chains of transmission have been broken. The global SARS outbreak is contained. Altogether, 8422 cases and 916 deaths occurred.

10 September. A laboratory-related case in Singapore is confirmed. Rapid detection and proper management prevent further cases.

A global threat contained



World Health Organization
Department of Communicable Disease Surveillance and Response
CH-1211 Geneva 27, Switzerland
Tel. +(41) 22 791 29 09 – Fax +(41) 22 791 41 98
Email: csr@who.int or outbreak@who.int – Web: <http://www.who.int/csr>