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**A framework for global outbreak alert and response**

**World Health Organization**  
Department of Communicable Disease  
Surveillance and Response

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## 1. Background

Throughout history, human populations have experienced major outbreaks of infectious diseases, often resulting in large numbers of deaths, panic, disruption of trade and political instability. While all communicable diseases have the potential to spread, it is the rapidity of spread of epidemic-prone diseases and the high mortality rates in newly affected populations which have marked the human psyche and determined many of our social and political responses to outbreaks.

Outbreak threats were chiefly seen as coming from the outside, beyond the city or national borders. Observers noted (often incorrectly) that outbreaks followed the introduction of new people (conquering armies or immigrants). Attempts to control these outbreaks were often grounded more in prejudice and superstition than any fundamental understanding of disease causation or transmission. The public health movements of the late 19<sup>th</sup> century identified the issues of poverty, overcrowding, poor sanitation, and lack of access to clean water as factors that were associated with outbreaks, especially in urban areas. However, despite advances in the understanding of disease transmission and causation, large local, regional and global epidemics continued to occur. Plague killed 1 315 892 million people in India during 1907 alone. In 1918 the influenza pandemic is estimated to have killed over 20 million people. The introduction of cholera and yellow fever were constant threats. National legislation to control the spread of infectious diseases was introduced in many countries as a cornerstone of public health policy.

The League of Nations in 1919 recognized the threat of the international spread of infectious diseases, and attempted to build on earlier attempts to produce an internationally recognized set of regulations to address matters of international concern for the prevention and control of infectious diseases. Since 1948, WHO has been responsible for the implementation of the International Health Regulations (IHR), a legal instrument ratified by its 191 Member States. These regulations were intended to strengthen the international use of epidemiological principles to detect, reduce or eliminate the sources from which infection spread. They encourage the use of epidemiological tools at the national level to diminish the risks of spread of disease between countries, but are applicable only to cholera, plague and yellow fever.

Although the development of effective treatments and vaccines engendered rational hopes that most infectious diseases could be eradicated, the latter part of the 20<sup>th</sup> century has seen these hopes challenged. Newly recognized and familiar pathogens have re-asserted their epidemic potential as:

1. Development gaps have widened, leaving many countries unable to provide adequate basic services such as safe water, adequate nutrition, waste disposal and health care for their populations.
2. Governmental and public health care systems in many countries have collapsed due to civil strife and war.

3. Poverty, urbanization and population displacement have led to concentration of human populations in conditions that favour major outbreaks (e.g. refugee camps, urban slums).
4. Exploitation of pristine environments is exposing human populations to new infectious agents.
5. Diseases within animal populations cross into human populations.
6. Environmental change may alter the endemicity and transmission patterns of pathogens.
7. Ineffective vector control programmes have led to a proliferation of vectors, including resistant vector populations.
8. The development of antimicrobial resistance now threatens to make once curable diseases incurable.
9. The potential for accelerated spread of disease has increased markedly with globalization of travel and trade.
10. The situation is further compounded by inappropriate social, political and economic responses to epidemics with implementation of misguided measures to control disease spread.

The resurgence in awareness of infectious diseases is occurring in the context of an information revolution, which allows the public access to a huge amount of information on infectious diseases, much of which is generated by media sources. The promulgation of unverified and inaccurate information on disease outbreaks often results in an excessive reaction by both the media and politicians leading to panic and inappropriate responses. These responses can lead to unjustified disruption of travel and trade with affected countries, which may result in great economic loss.

## **2. Current Situation**

History has demonstrated the capacity of outbreak-prone diseases to spread rapidly and overwhelm national resources causing acute emergencies. At the present time, the world faces outbreak threats in three contexts:

### **2.1. The emergence of new or newly recognized pathogens**

These novel pathogens are usually poorly understood in terms of source and transmission and many have the potential to cause large outbreaks. Fortunately, some of these pathogens are not well adapted to human populations and lack the potential for sustained, epidemic spread. However, history has taught us that this can and does happen. HIV/AIDS is the most recent example of a pathogen that has emerged in the recent past and is causing a major epidemic that now threatens the economic future of many nations.

Other pathogens, such as influenza and measles, have at some time in the past crossed over from animal species and now regularly cause major outbreaks associated with high mortality and morbidity. While novel pathogens may not always cause major outbreaks, they are often associated with high case-fatality rates, as they are poorly understood as they emerge, and initial prevention or treatment strategies prove ineffective. Examples of this include Lassa, Ebola, and, most recently, Nipah virus.

## **2.2 The recurrence of outbreaks of diseases that are recognized to cause significant human disease**

Diseases such as cholera, dengue, influenza, measles, meningitis, shigellosis, yellow fever and foodborne diseases present a constant threat to human populations. They are well adapted to transmission in the human populations either directly from person to person, through vector transmission, or via contamination of the environment or food. In general the diseases are well understood and very often effective control measures are available. In many countries these diseases have come under control by the systematic application of control measures such as vaccination or water treatment. However, if public health control measures break down or if the organism adapts (e.g. by developing resistance to antibiotics) then there is always potential for renewed outbreaks. This is best demonstrated in countries where conflict has resulted in a breakdown of governmental administrative structures, including the public health sector, and where controllable diseases may cause severe outbreaks in populations displaced due to civil strife, or may spread geographically affecting new populations. Vulnerable populations often experience severe disease (e.g., from epidemic malaria, cholera, or shigellosis) exacerbated by the delayed and ineffective responses from public authorities. Local resources may be rapidly overwhelmed if public health infrastructure is weak, with the consequence of further extension of the outbreak.

## **2.3. The accidental or deliberate release of a biological agent into human and or animal populations**

In practice, these events will exhibit similar features to [2.1] or [2.2] above, although the mode of introduction may introduce unique features (e.g., BSE/vCJD) or necessitate specialized detection systems and preparedness planning (e.g. for deliberate release of pathogens).

## **3. Action by the international community to contain outbreaks**

The threats presented by outbreaks have not gone without a series of responses at national and international levels.

Many countries have recognized the renewed threat of outbreaks and have sought to strengthen their national surveillance and response capacities. In many other countries similar developments have been very slow due to lack of funds and competing priorities. The reaction of some countries has been to devise a “brick wall” defence and concentrate on reducing the threat of disease introduction at national borders or by increasing the sensitivity of surveillance systems to pick up small numbers of imported disease cases.

There is an increasing realization that this approach often is not the most effective response. Firstly, it does not deal with the humanitarian needs of other countries that are affected by outbreak. Secondly, it is clear that assisting other countries to deal with outbreak threats actually reduces the risks of international spread.

Many national institutes offer bilateral assistance to countries affected by outbreaks. This approach is often highly effective where there is a continuing relationship and where the institute offering its services has all the skills and resources to provide comprehensive assistance. Bilateral donor agencies support many of these activities.

In countries experiencing conflict or natural disasters, non-governmental organizations (NGOs) have been in the frontline offering assistance to affected countries and helping to deal with outbreaks through measures such as vaccination, provision of safe water and effective case management.

The shared perception of infectious disease threats has fostered international initiatives and networks, such as EWGLI, ENTERNET, PACNET and the EU-US taskforce. These disease-specific and more widely focussed networks have recognized the mutual benefits of collaboration for participating countries. Organizations centred around economic and social policy, such as ASEAN, EU, and the World Bank have supported the development of network initiatives to minimize the impact of infectious diseases on economic development.

WHO has also been involved in combating outbreaks since its inception in 1950. Outbreak alert and response requires a non-partisan approach and the capacity to facilitate collaborations between diverse partners. WHO has a unique health mandate from 191 Member States and has, with existing partners, already established mechanisms for global outbreak alert and response. Current mechanisms function in the areas of outbreak alert and outbreak response.

***Outbreak alert:*** Accurate and timely information about important disease outbreaks is delivered systematically and rapidly to key professionals in international public health through:

***Specialized Surveillance Networks:*** WHO has established a number of international networks for specific disease threats (e.g. FluNet for influenza, RabNet for rabies, Global Salm-Surv for salmonellosis and DengueNet for Dengue).

***Outbreak verification:*** Outbreak verification (OV) is a new approach to global disease surveillance. Its aim is to improve epidemic disease control by actively collecting and verifying information on reported outbreaks and informing key public health professionals about outbreaks which are of potential international public health importance. OV relies on a broad range of information sources including the Global Public Health Information Network (GPHIN) which is a web-based electronic system developed by Health Canada in collaboration with WHO which scans the web to identify suspected outbreaks. Suspected outbreaks are actively followed up with affected

countries to verify the existence of the epidemic, its cause and the response being put in place.

WHO offers assistance in all cases. The information then is disseminated via the Outbreak Verification List (OVL) to over 900 institutions and key decision-makers in international public health (e.g. WHO networks, collaborating centres, national institutes of public health, major NGOs). As of January 2000, 512 outbreak reports have been investigated and disseminated if found to be of international public health importance.

**Outbreak Response:** WHO responds to requests from Member States for assistance with outbreak management. Recent examples of outbreaks with direct WHO participation in the field are: Rift Valley fever in Kenya and Somalia, monkeypox in the Democratic Republic of the Congo, avian influenza (H5N1) in Hong Kong, Ebola haemorrhagic fever in Gabon, relapsing fever in southern Sudan, influenza in Afghanistan, epidemic dysentery in Sierra Leone and Marburg virus infection in the Democratic Republic of the Congo.

Active WHO involvement in coordinating epidemic response allows not only provision for immediate needs, but also allows initiation of measures which result in permanent benefit, such as the development of laboratory networks and active surveillance systems. An epidemic represents one of many entry points for WHO to become more deeply involved with an affected country in the areas of epidemic preparedness and the development of improved epidemic response capacity.

WHO is working with its partners to improve global, regional and national preparedness for epidemics through:

- Establishing global surveillance and response standards
- Creating networks of partners for preparedness and rapid response (e.g. sub-regional preparedness and response teams in the African Region)
- Strengthening laboratory capacity and laboratory networks
- Training in field epidemiology
- Assessment and strengthening of national surveillance systems

These activities may focus on a single country, or operate on a regional or supra-regional basis. Many broadly focussed initiatives dealing with multifocal, recurring needs are exemplified by the Cholera Task force and the ICG mechanism for meningitis, which offer immediate support for intervening in epidemics, stockpile essential materials to be available when required, and support affected countries in developing enhanced preparedness for future events. These activities require a large pool of expertise and are invariably carried out with the assistance of key partner institutions, individuals and donors. They place a heavy burden on WHO resources, requiring sustained advocacy efforts.



#### **4. Gaps, constraints, and challenges in global alert and response**

To date the responses by the international community and WHO have helped to increase awareness and develop systems to detect and contain outbreak threats. A series of networks have been established which seek to establish communication or diagnostic partnerships. These may be disease specific or regional, and focus on sharing surveillance data on outbreak-prone diseases. However, most lack a response component or are highly specialized. All these networks have a strong rationale and have been devised in response to particular needs.

The main question is how to focus global resources on an outbreak that threatens to overwhelm the national capacity for control, or to contain a disease about which little is known? The challenge will be to maximize the benefits of international partnership for access to communication, epidemiological, laboratory and intervention resources. This is especially true for areas of conflict where normal governmental structures have collapsed.

Gaps and restraints inhibiting cooperation may be financial, political, and institutional. Rivalries and boundaries may interfere with public health aims. These impediments and the global scale of the problem mean that the issues are too big to be resolved by a single organization.

- The problem begins locally
- The necessary resources are distributed globally

WHO needs to be able to access the skill of all partners to fulfil its mandate.

#### **5. Solutions**

The challenge is to strengthen global efforts to detect and contain epidemic disease threats. It is neither feasible nor desirable for any single institution to undertake to perform these functions. It is not feasible because events are far too numerous and geographically distributed for any institution's resources to respond adequately in a timely manner. Outbreaks often arise in complex political, economic and environmental circumstances, and may require sustained interventions for control and future prevention. Even if it were feasible, it would not be desirable because such an approach would do nothing to increase countries' self-reliance, and should the institution be forced to withdraw support, they would be completely unable to address their own, urgent, public health problems. Health sector development is intimately related to other development issues, and is rooted in locally accessible infrastructure.

The solution to this challenge does not lie with a single institution, but with an effective technical partnership of national and international institutions and networks. To this end, an operational global network of partners would be in a position to bring the resources of

many organizations to bear on the problem. The aim, therefore, is to increase global public health security by establishing a technical partnership within an operational global outbreak alert and response network.

## **6. Objectives of a global outbreak alert and response network**

The network will bring together key institutional and human resources so that outbreaks of potential international importance are detected, verified and responded to efficiently and effectively by the international community, and the level of preparedness of individual states is increased. The criteria for activation of the network to respond to emergent and well-characterized disease threats should be based on the following criteria:

- Humanitarian need
- International spread is possible
- Travel and trade may be interrupted

## **7. Underlying principles of the network**

Effective global alert and response will be served by:

- A strong partnership of existing technical institutions and networks
- Effective coordination of partners for international alert and response
- Rapid communication of information
- Rapid and efficient mobilization of technical support to contain outbreaks and assist the affected state(s)
- Follow-up activities in affected state(s) to improve preparedness

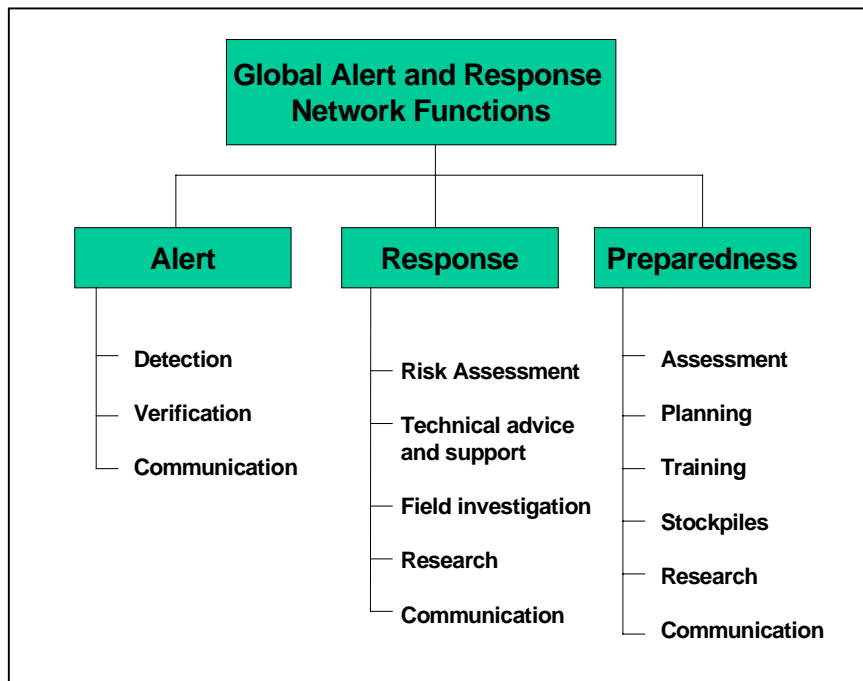
## **8. Functions of the network**

The network will focus on three major functional areas:

- Outbreak alert
- Coordination of outbreak response
- Outbreak preparedness (national and international)

These will be achieved through the processes of:

- Offering assistance to outbreak affected states
- Combating the international spread of outbreaks
- Ensuring follow-up activities to prevent recurrence or further spread of the disease
- Identifying and encouraging essential research to strengthen future prevention and control capabilities
- Evaluation of international efforts to contain outbreaks



## 8.1 Outbreak alert

Outbreak alert is the process by which intelligence on outbreaks of potential international importance is gathered, verified and shared with partners so that an effective response may be put in place to support the affected state(s). The network will function as a source of information on outbreak of potential international importance.

### 8.1.1 Detection

- Partners may inform the network Operational Support Team of suspected outbreaks

### 8.1.2 Verification

- The Operational Support Team will seek to verify the existence of an outbreak with national authorities
- Information on suspected outbreaks will be posted on the Outbreak Verification List that will be circulated to all network member institutions
- Members of the network may be asked to verify the existence of outbreaks or to share confirmatory results with the network.

The International Health Regulations (IHR) are currently being extensively revised and will be implemented in 2005. The proactive approach to international disease control envisaged for the new formulation of the IHR will cover a wide range of diseases and will encourage early reporting of outbreaks to allow rational assessment of impact on economic activities. Countries will be protected from unjustified economic reprisals through a system of advice and mediation. Under these proposals, accurate information

on outbreaks will be required so that affected states may receive appropriate assistance to minimize adverse health and economic outcomes.

### **8.1.3 Communication**

- Verified information may be published on the WHO Website or in the *Weekly Epidemiological Record*. In addition a protected web area will be available to network members with more detailed information on each event.

*These processes may be subject to the existing government procedures and approvals.*

## **8.2 Coordination of outbreak response**

The response activities will be those carried out by the international community to support a state or states affected by an outbreak. The network will seek to ensure that outbreaks are effectively contained and that affected states receive rapid assistance. These response activities can include:

### **8.2.1 Risk assessment**

- Determination of the level of threat posed by the incident

### **8.2.2 Technical advice and support**

- Advice/guidance on best practice
- Assistance with information and media management
- Planning and financing outbreak response

### **8.2.3 Field investigation**

- Provision of essential materials for protection, investigation and containment
- Placing rapid response teams in the field to assist states with containment activities

### **8.2.4 Research**

- Coordinating investigations and research required to understand disease causation, transmission and prevention

### **8.2.5 Communication**

- Informing participants and partners about investigation and research findings

## **8.3 Support for activities within response function**

The network will seek to ensure that all partners have up-to-date information on the evolution of outbreaks of international importance.

The network will seek to advise states affected by an outbreak on the standards regarding disease confirmation, investigation, response and prevention of recurrence and further spread. This guidance will utilize existing WHO standards as well as the experts within the network who may have specialist knowledge to share regarding specific events. The network will devise codes of practice and standard procedures for network operations, for field investigations and for conflict resolution. These procedures will be drawn up by a 'task force' coordinated by WHO, and will be submitted to the partners for approval. An outbreak event management system will be developed which will include databases on events, experts, supplies and evaluation and will be able to generate a dynamic picture of the patterns of disease events and the international response to them.

The network will mobilize resources for outbreak response and provide both logistic and financial assistance to affected states if necessary to contain outbreak threats and prevent recurrence.

Coordinating investigations and research required to understand disease causation, transmission and prevention: The network will coordinate activities in investigations in which it actively participates to avoid interference with or duplication of efforts, and to ensure that essential components of investigations are performed. The network will encourage essential research arising from investigations, and seek to facilitate the equitable distribution of research opportunities.

Placing rapid response teams in the field to assist states with containment activities: The network will provide manpower and logistic support as appropriate to constitute and facilitate the timely arrival of teams in the field.

#### **8.4 Preparedness (national and international)**

The network will encourage the following activities to improve international and national epidemic preparedness:

##### **8.4.1 Assessment**

- Evaluation of network responses for rapidity, quality and appropriateness of measures performed
- Assistance with, and evaluation, of follow-up activities to address gaps in response capacity
- Assistance to countries in evaluation of preparedness level and needs

##### **8.4.2 Training**

- Provision of assistance in developing/strengthening preparedness plans and surveillance systems
- Training in epidemic preparedness at national/local level

- Exchange schemes for skill acquisition in both the laboratory and epidemiological sectors
- Creating network links among laboratories
- External Quality Assurance schemes for laboratories

### 8.4.3 Stockpiles

- Maintaining stockpiles of essential materials for preparedness needs

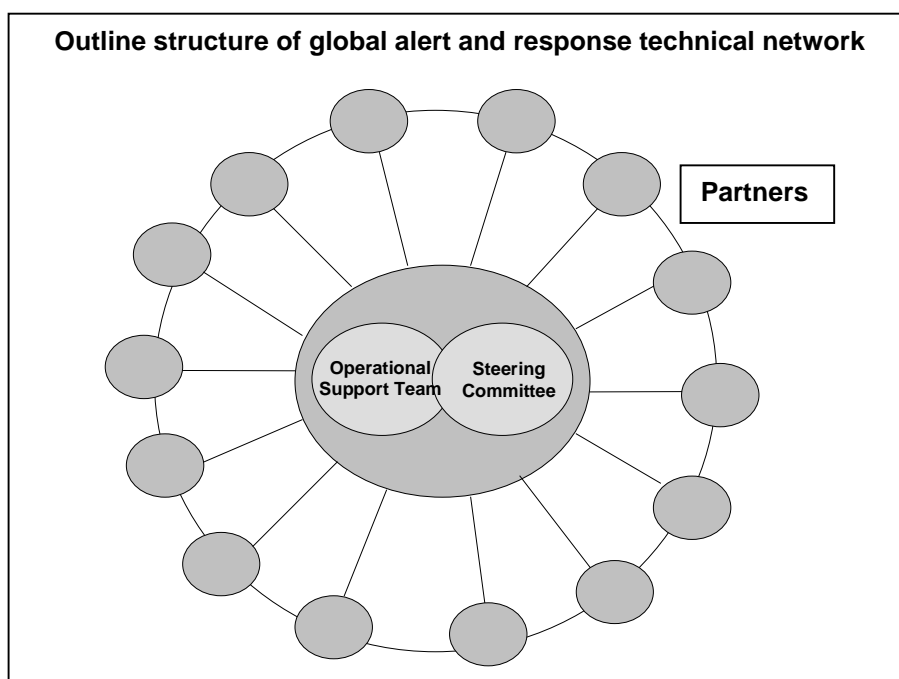
### 8.4.4 Communication

- Information sharing will be an essential feature of the network, with timely distribution of important information to partners
- Information technology development and sharing

## 9. Structure of the network

The network will build on existing partnerships in outbreak alert and response. The concept is to bring together existing institutions and networks in a global alert and response network that will seek to coordinate activities so that:

**THE APPROPRIATE ASSISTANCE GETS TO AFFECTED STATES RAPIDLY AND LEADS TO REDUCED MORTALITY, PREVENTION OF SPREAD AND RECURRENCE**



## 9.1. Network Operational Support Team

The Operational Support Team for the network will be based at WHO in Geneva and at each of the WHO Regional Offices. This team will:

- Carry out outbreak verification, sharing privileged information with members of the network and key public health professionals on a global basis
- Maintain a database of partner institutions and professionals available for outbreak preparedness and response missions
- Maintain essential stocks of protective, outbreak investigation and communications equipment and make these materials available on a 24 hour basis to teams leaving for the field
- Offer assistance to countries experiencing outbreaks
- Assemble field teams to respond to country needs
- Provide logistic and administrative support to teams in the field
- Provide WHO team leader where required
- Maintain an outbreak response minimum database in order that audit of outbreak response may be carried out
- Provide constantly updated information on outbreak responses to the network
- Provide quarterly and yearly reports to the network and committees of that network tasked with oversight

## 9.2 Network partners

Partners in the network will formally commit to participation in the network and where appropriate:

- Establish a formal communication link with the network via a focal point for international alert and response
- Assist in the process of outbreak verification
- Identify their capacities and resources in international response and indicate to the network the availability of these resources
- Provide the network with expert opinion on specific outbreak events including risk assessment
- Make personnel available to join international outbreak response teams
- Provide laboratory facilities for disease confirmation
- Participate in follow-up projects aimed at improving outbreak preparedness (e.g. epidemiology and laboratory training, early warning system development)
- Second staff to work in the operational support team

## 10. Network development, oversight and evaluation

Oversight for the network will be provided by a Steering Committee. The Committee will be composed of a sub-group of network partners (selected by all the partners) and key WHO staff from HQ and the Regional Offices. Procedures for such a selection need to be

defined by a task force and submitted for approval by the network partners. This Committee will oversee the implementation of network activities and regularly evaluate the performance and progress of the network. The Committee will provide advice to WHO on strategic approaches to outbreak alert and response and will also report to all network partners. The Steering Committee should meet formally twice per year to review activities, evaluate performance, and make recommendations. The Committee will then report to the full network.

## **11. Funding the network**

The network will be funded in a number of ways:

- WHO will provide staff for the Operational Support Team from core staff
- Partners will be expected to provide staff time to the network. This may happen through a number of mechanisms:
  - provision of professionals to outbreak response teams
  - secondment of professionals to the Operational Support Team
  - logistic and communication support
- WHO and its partners in the network will develop a budget proposal and approach key donors for funds to support outbreak alert and response, as well as key preparedness projects (especially in complex emergency countries)

## **12. Activities leading to a functional network**

In order that a functional network be put in place, a series of activities will be required. These activities are listed in draft form in Annex 1.



## Annex 1: Activity Matrix

Activities leading to a functional global outbreak alert and response network			
Activity	Description	Timeframe	Action
1. Develop an event management information system	An integrated information system which will hold key information on all outbreaks of international importance and allow for effective sharing of information and coordination of activities.	Phase II available September 2000	Operational Support Team
2. Develop an internet environment for data and information sharing	An extra-net solution to allow network members to access information on current and past events as well as communicate with the network on all aspects of alert and response. This environment could hold minimum data sets from epidemiological investigations, discussion groups for specific events and background material on priority diseases.	Phase I by December 2000	Operational Support Team
3. Inventory of capacities of network members for global alert and response	A detailed description of the resources in each institution, organization or network available for international response (e.g. epidemiologists, specialist laboratory facilities). This will eventually be available on the intranet and will be updated by network members as necessary.	December 2000	Operational Support Team Network Partners
4. Global database of experts available for international response	This searchable database will be integrated with the event management system and will hold data on the skills, experience and contact details of experts that will be available to join international response teams at short notice.	December 2000	Operational Support Team
5. Establish Network Steering Committee and its working procedures	A representative "interim" committee will be formed and will meet twice in 2000. This group will establish the operational mechanisms of the network and will foreshadow the establishment of a formal committee in 2001	First meeting by September 2000	Operational Support Team Network Partners
6. Development of standard operating procedures for all aspects of placing an international response team in the field to assist affected states	These procedures will cover: <ul style="list-style-type: none"> <li>- Administrative arrangements for team formation</li> <li>- Team leadership</li> <li>- Briefing and debriefing procedures</li> <li>- Ownership and distribution of clinical samples</li> <li>- Data ownership, sharing and publication</li> <li>- Minimum standards of behaviour in the field</li> </ul>	December 2000	Operational Support Team Network Partners

7. Establish and maintain stockpiles of essential outbreak investigation and response equipment and supplies	<p>Current global and regional stocks of specialized investigation and response equipment will be inventoried and new stocks ordered. These stocks will be managed within the event management information system. WHO will ensure that teams going to the field have adequate protective and investigation equipment. In addition strategic stocks will be placed at regional level.</p> <p>A detailed analysis of the adequacy of current stockpiles of outbreak response supplies such as vaccines, antibiotics and fluids will be made for priority diseases</p>	October 2000	Operational Support Team
8. Develop rapid field assessment, risk assessment and investigation protocols for specific priority diseases	Standardized procedures for field assessment and investigation will be agreed. These will be adaptable at field level according to the situation.	June 2001	Operational Support Team  Task Force  Network Partners
9. Develop and implement network advocacy strategy	The network will seek to raise awareness of the threat presented by outbreaks and the need for investment in both global, regional and national preparedness activities. An advocacy campaign will be financed by WHO and will target political leaders, the media and the general public. As part of this advocacy initiative the network will seek to raise funds to support preparedness activities and field responses.	November 2000	Operational Support Team  Network Partners
10. Establish criteria for evaluation of network activity	A series of performance indicators for network activity will be devised and agreed (e.g. days to response)	March 2001	Operational Support Team Task Force Network Partners