# Panel 2.2: Surveillance, Early Warning Alert, and Response: Communicable and Vector-Borne Diseases

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**Abbreviations:**
EWARN = early warning alert and response system
FETP = Field Epidemiology Training Program
GOARN = Global Outbreak Alert and Response Network
MOH = Ministry of Health
MOPH = Ministry of Public Health
NGO = non-governmental organization
SARS = severe acute respiratory syndrome
SRRT = surveillance and rapid response team
WHO = World Health Organization
WHO/HQ = World Health Organization Headquarters

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## Abstract

This is a summary of the presentations and discussion of Surveillance, Early Warning Alert and Response at the Conference, *Health Aspects of the Tsunami Disaster in Asia*, convened by the World Health Organization (WHO) in Phuket, Thailand, 04–06 May 2005. The topics discussed included issues related to the surveillance, early warning alert, and response to communicable and vector-borne diseases as pertaining to the responses to the damage created by the Tsunami. It is presented in the following major sections: (1) key questions; (2) needs assessment; (3) coordination; (4) gap filling; and (5) capacity building. The key questions section is presented in six sub-sections: (1) communicable diseases; (2) early warning; (3) laboratory capacity and referral networking; (4) coordination of disease surveillance, early warning, and response; (5) health infrastructure rebuilding; and (6) using existing national surveillance plans to enhance disease surveillance and early warning systems.

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## Background

More than two million persons were displaced and health services were disrupted in India, Indonesia, the Maldives, Thailand, and Sri Lanka in the aftermath of the Tsunami of 26 December 2004. The immediate health concern in such emergency situations with massive population displacements is the identification and control of potentially widespread outbreaks of communicable diseases. Members of the World Health Organization (WHO) staff, including the Global Outbreak Alert and Response Network (GOARN) partners were deployed to Aceh Province in Indonesia, Sri Lanka, and the Maldives to assist the Ministries of Health (MOHs) with the establishment of supplemental surveillance, early warning alert and response systems (EWARN). India and Thailand, which were not as extensively affected as was Aceh, had more robust epidemic-response capacities, and as needed, were supported by the WHO country offices. The principal objectives of these surveillance systems were to: (1) detect diseases that were likely to produce epidemics and were occurring in the population based on symptomatic diagnosis followed by laboratory confirmation; and (2) institute necessary interventions to contain further spread of the disease and to limit morbidity and mortality in the affected populations.

## Key Questions

The panelists focused their discussion on the following 13 questions:

*Communicable Diseases*

1. How effective were the surveillance, early warning alert, and response systems for communicable diseases for:
   a. establishing a sensitive and responsive surveillance system;
   b. ensuring good coordination of reporting by clinical care providing agencies (government, non-governmental organizations (NGOs), military);

   c. detecting and responding to alerts in a thorough and timely manner;
   d. investigating outbreaks including:
      (1) confirmation of potential pathogens by laboratory diagnosis;
      (2) determination of the mode of transmission;
      (3) identification of persons-at-risk;
      (4) institution of necessary control measures and interventions; and
      (5) utilization of available resources to prepare for outbreak management and control; and
   e. building local and national capacities?;
2. What was done well, in terms of appropriateness, adequacy, effectiveness, efficiency, and connectedness?
3. What could have been done better?
4. How can the lessons learned be translated into future health responses in surveillance, early warning alert, and response systems for communicable diseases?
5. What specific tools were useful and, if so, what would these contain, and how could they be put into practice?

*Establishing and Sustaining Early Warning Systems*

6. Should the establishment of early warning systems be focused on the affected localities or expanded to cover other areas in the country?
7. Should the approach include all of diseases under national surveillance or be limited to give priority to epidemic-prone and vaccine-preventable diseases?
   a. Should a syndromic approach be used?;
   b. What was the importance of communication and feedback to partners?

*Laboratory Capacity and Referral Networking*

8. What was the role of each level of the public health laboratories?
9. How did the current laboratory network function in the affected areas?
10. What is required for laboratory strengthening (technical experts, guidelines, and procurement of reagents, supplies, referral networks)?

*Coordination of Disease Surveillance, Early Warning, and Response*

11. What was the role of WHO, NGOs, militaries, national authorities, and other partners such as private health care providers?

*Health Infrastructure Rebuilding*

12. Based on the level of destruction, what are the needs that can and should be addressed?

*The Link to Existing National Surveillance Plans*

13. Improving preparedness for epidemics (development of plans, procurement of essential drugs and supplies including emergency health kits), outbreak verification, investigation, and responses.

## Discussion

The key questions addressed by the panel focused on the effectiveness of the surveillance early warning alert and response systems used for the detection of communicable diseases for:

1. Establishing a sensitive and responsive surveillance system;
2. Ensuring good coordination of reporting by the clinical care agencies (government, non-governmental organizations, military) involved;
3. Detecting and responding to alerts in a thorough and timely manner;
4. Investigating outbreaks, including: confirmation of potential pathogens by laboratory diagnosis, determination of the mode of transmission, and identification of persons-at-risk;
5. Instituting necessary control measures and interventions;
6. Utilizing available resources to prepare for outbreak management and control; and
7. Building local and national capacities.

The panelists represented two countries (Indonesia and Sri Lanka) in which the WHO and external agencies played a more substantial role in developing and maintaining the surveillance system, and two countries (India and Thailand) that were able to cope with limited external assistance. The perspectives presented by these speakers brought to the forefront the different elements and inputs required for establishing systems for surveillance and early warning for epidemic-prone communicable diseases. Individual factors depended on the capacity of the existing disease surveillance system and state of preparedness to respond to health emergencies. The discussion focused on the broader issues of ensuring continued success and sustainability, and how the lessons learned could be applied to responding to future emergencies.

*Needs assessments*

In all of the areas affected by the Tsunami, there was a substantial medical risk for the spread of communicable diseases. The increase in risk was due to large population displacements and poor environmental conditions, including the disruption of the water and sanitation infrastructures and over-crowding in camps or host communities. Therefore, it was recognized that in order to intervene at the earliest possible sign of an outbreak, a highly sensitive surveillance system was required to monitor trends of the incidence and prevalence of diseases that have a high risk for producing an epidemic. As much as was possible, in order to conduct more intensive, active surveillance for syndromes that potentially could become epidemic, the existing MOH surveillance systems had to be enhanced and supplemented.

There were two factors that determined the type of inputs needed to institute the necessary surveillance in the affected countries: (1) the status of the existing surveillance system pre-Tsunami, both technically and functionally; and (2) the scale of the destruction caused by the Tsunami, in terms of both the infrastructural and human toll. In Aceh Province in Indonesia, not only was the damage to the health infrastructure and personnel extensive, but the

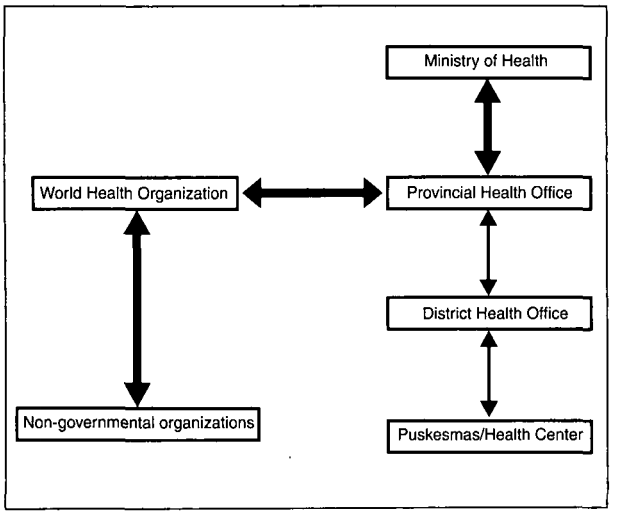




**Figure 1**—Flow of surveillance information in Banda Aceh

| Syndromes | Diseases (19 --> 23) |
|---|---|
| Diarrheal | Acute diarrhea, cholora, dysentery, food poisoning |
| Respiratory | Influenza, pneumonia (include aspirated), measles |
| Febrile | Malaria, dengue, typhoid, pyrexia of unknown origin |
| Neurological | Meningococcal, encephalitis |
| Jaundice | Hepatitis |
| Injuries | Wound, electrical |
| Others | Conjunctivitis, fever with rash, unknown dead, etc. |



**Table 1**—Epidemic prone diseases under active surveillance in Tsunami-affected areas.

pre-existing surveillance system conducted by multi-purpose staff at the health centers, was only minimally functional (Figure 1). In contrast, Thailand's Ministry of Public Health (MOPH) had built a surveillance system using the lessons learned from its recent experiences with the severe acute respiratory syndrome (SARS) and avian influenza. It used those experiences to reinforce its relatively robust, routine system with surge capacity in the form of Surveillance and Rapid Response Teams (SRRT). These teams could be mobilized immediately and transported to an affected area to perform the required situation analysis and to fashion responses from these needs assessments.

The surveillance system in India was less effective than was the one in Thailand. Although a primary health infrastructure exists throughout India, it was inadequate, and the national disease surveillance program did not function effectively. In Indonesia, international field epidemiology teams with necessary equipment and supplies were deployed immediately through the use of the WHO's GOARN system. In Thailand and India, trained personnel that were available from unaffected regions of the country were re-assigned to respond into the affected areas. Sri Lanka had a reasonably functional surveillance system, but it required external support due to the extent of the devastation to the provinces affected. With subsequent assistance from the WHO and international NGOs, it was able to put into place field epidemiology teams.

The following essential elements were part of EWARN: (1) syndrome-based report formats with standardized case definitions were established in each area affected; (2) early warning alert mechanisms; (3) involvement of all partner health agencies (NGOs with clinical facilities, hospitals, and laboratories); and (4) rapid response teams for investigations of its outbreaks (Table 1). Many of the countries had limited laboratory capacity even though the importance of adequate public health laboratory support for verification was recognized. The reporting and interpretation of the data collected from surveillance activities were more complete in Aceh and Thailand than in the other countries affected by the Tsunami. In addition, many of these systems provided essential feedback to the affected populations. India had an added problem in that only 20% of health services are provided by the government, and the private sector was not involved in surveillance efforts. The most challenging aspect, thus, was to systematically identify the communities and quantify the populations that were most vulnerable to disease outbreaks in order to target appropriate interventions during the immediate emergency phase.

## Coordination

In every country, the MOH must be the lead agency for undertaking all of the health actions required for disaster response, including surveillance. When requested, the WHO provides support to this system mainly in the form of technical assistance (human resources and tools such as guidelines, formats, software, and training). Even in Aceh, where during the first few weeks after the Tsunami, the WHO staff led the surveillance efforts, they did so under the auspices of the MOH. All of the surveillance activities were conducted jointly by the MOH and WHO staff. The MOH has taken the lead for the transition from the emergency phase into the recovery phase [rehabilitation and reconstruction]. The NGOs and other international agencies that provide clinical care to populations in the affected areas are responsible for reporting syndromes with epidemic potential to the MOH. However, coordination of these responses requires that all parties involved remain aware of the need to maintain this hierarchy and to respect,the fact that the MOH ultimately is responsible for all such actions. In Aceh, where there was an open-door policy for NGO assistance, this form of coordination became one of the most important elements for the success of the surveillance system and it required concerted effort by all partners (Figure 2). Active surveillance was required to ensure that the system was complete. In addition, training for using standard case definitions was required to ensure that the reporting was accurate and to ensure the reporting was accurate. The fewer the number of outside agencies that



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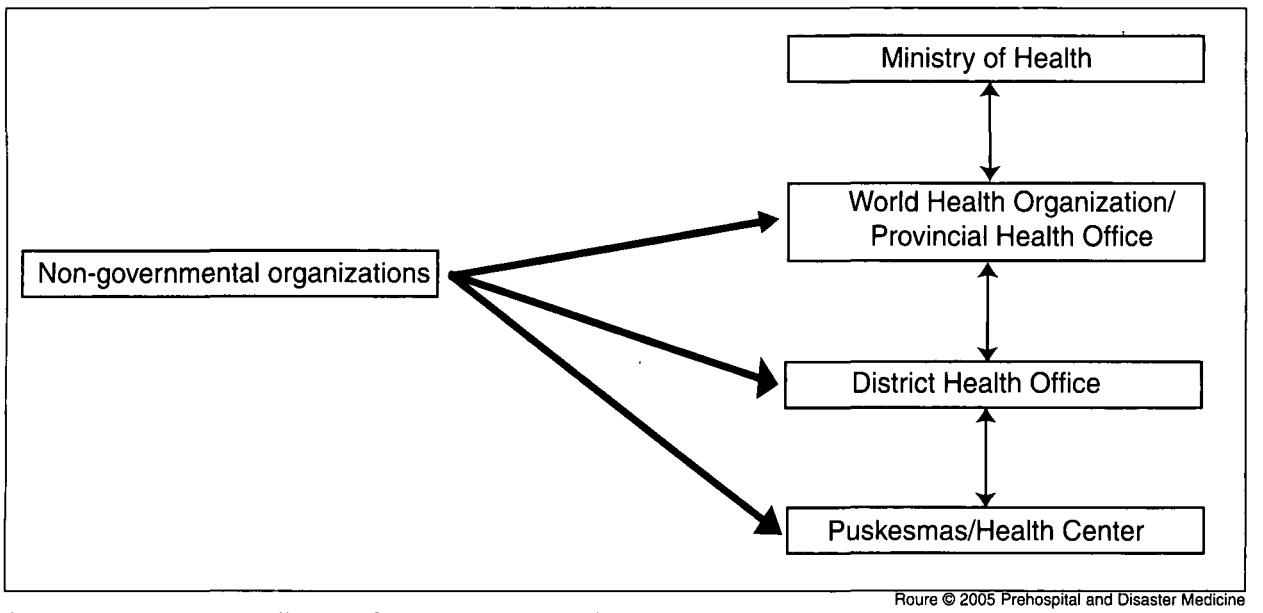


**Figure 2**—Flow of surveillance information in Banda Aceh: Rehabilitation Phase.

were involved, the less was the burden to coordinate the efforts of the non-MOH entities that were providing care to the affected populations.

## Discussion

Coordination for responses to unexpected communicable disease events between the different levels of the MOH, whether related to disasters caused by natural hazards or disease outbreaks, required that a structure be planned and established in anticipation of an event. The ability to keep a routine surveillance system flexible, (i.e., expand to incorporate EWARN as needed and/or to mobilize rapid response teams from other regions), must be addressed in planning as part of the capacity-building efforts. All of the countries involved indicated that the Field Epidemiology Training Program is an integral part of such a response. In addition, international networks such as the Global Outbreak Alert and Response Network, also are valuable resources during emergencies. However, it is important to import human resources based on relevance and capacity, and for the long term to engender trust and build effective relationships with local actors. More important is the need to develop local capacity, at least at the country level, since any external assistance is only temporary. Local communities also can be used to assist surveillance efforts, especially as EWARN must be sensitive rather than specific. In Indonesia, the posyandus are community-based volunteers (often midwives), who are used for various health outreach efforts. However, the Tsunami destroyed this resource. It is worth repeating that coordination with the public health laboratory services is crucial to a responsive early warning and surveillance system, but this requires that a quality-assured laboratory service exists in the first place. In India, although laboratory services do exist, the quality is problematic.

An important element of the coordination between the various arms of the EWARN system during the emergency was to maintain regular feedback mechanisms. Once data are analyzed, the results must be disseminated to all of the stakeholders, particularly those collecting the data. These reports are used to identify problems and to undertake interventions to meet the defined needs. In Aceh, this occurred during weekly health coordination meetings and via a published epidemiologic bulletin in both the English and Indonesian languages. In India, information flowed regularly between the primary health centers and the district and state headquarters. Although data processing and interpretation were conducted in Sri Lanka, this occurred without the use of standard indicators, and there was no feedback, so the utility of the information was limited. Responsiveness to an outbreak is dependent on the threshold levels that must be identified *a priori* based on an understanding of the epidemiologic situation in the affected areas, i.e., establishing a baseline, so that area-specific and locally appropriate thresholds can be defined.

### *Gap filling*

The necessity of having some sort of surveillance systems in place for communicable and vector-borne diseases that have epidemic-prone was recognized and prioritized by all of the national health authorities in each of the affected countries. The quality and extent of the elements in the surveillance system varied based on the availability of the local capacity and resources [buffering capacity], and on the nature of external assistance requested.

Thailand attempted to undertake a rapid assessment and situation analysis of the state of the surveillance system in the affected region in a formal manner. However, the reality was that, due to limited communication and the focus of local staff efforts on saving lives in the immediate aftermath of the Tsunami, this assessment only was based on subjective observations. India was on the verge of launching a national integrated disease surveillance program for 14 diseases, using a syndromic approach, and thus, a national-level assessment of the likely needs was possible for the affected areas. The

identification of the population requiring coverage by EWARN, (i.e., internally displaced persons (IDPs), host populations, and volunteers), was difficult in all instances, but particularly in Aceh and Thailand. Trends of diseases covered in terms of rates also was difficult to ascertain because of highly mobile base populations. Population coverage by active surveillance teams is very labor-intensive; thus, more innovative solutions are required on the ground.

Instituting interventions to prevent the spread of disease is important during disasters, regardless of whether an outbreak is identified. Bottled water distribution, monitoring of "cooking centers", and environmental control of vectors were prioritized in Thailand. Measles vaccination campaigns were initiated in Thailand and Aceh, especially since EPI coverage levels were unknown because data were lost during the Tsunami. Although sporadic cases of epidemic-prone diseases have been identified, the fact that no major outbreaks have been detected in any of the countries post-Tsunami is a reflection not only of the success of such measures being instituted, but also in the overall health system response to the crisis including effective surveillance.

*Capacity building*

Building human resource capacity for communicable disease surveillance cannot be stressed enough to ensure sustainability long after the emergency is over, and until the next one comes along. A good routine surveillance system that is well-planned, well-coordinated and connected, and is functional at all levels of the MOH, will be able to respond to any unexpected events. India's planned national integrated disease surveillance system will incorporate the lessons learned during the Tsunami disaster. It universally was agreed that this crisis has created a unique opportunity to build on the current momentum and develop a surveillance system that is more effective and responsive than the one that existed before the Tsunami. This system must include all of the improvements required for not only disaster response, but also for routine activities. Better-trained personnel in routine systems are better able to handle emergencies with fewer further inputs, particularly from external sources.

## Conclusions and Recommendations

A Field Epidemiology Training Program (FETP) is a vital element in capacity building in all of the affected countries, and must be promoted and encouraged. Thailand plans to incorporate surveillance as an integral component in the curriculum for mobile medical teams, and India plans to involve the private sector in its integrated disease surveillance program. Besides rapidly mobilizing such human resources within countries, cooperation between countries in the region that share language and a common culture for sharing personnel also could be considered. Training the human workforce in surveillance is not a one-time event, and it must remain a priority for re-training in order to keep it appropriately responsive to future, unexpected events.

All of the countries requested technical support from international agencies such as the WHO. The technical support though varied, included training personnel and equipping surveillance systems, particularly with computers. This disaster has indicated that public health laboratory capacity building and improved linkages to the routine surveillance activities require prioritization in all of the countries, especially with respect to quality assurance. In planning for improved surveillance systems at the country level, the EWARN methodology should be reviewed for relevance and appropriateness. For instance, consideration should be given to whether mental health conditions and nutrition should be included. There are important issues associated with the management of stockpiles of donated medical supplies such as manpower and infrastructure inputs.

## Summary

Surveillance systems worked well where they were well-established prior to the Tsunami, but better systems will be required in the future. This will require substantial capacity building of personnel and laboratory capacities. The implementation of Field Epidemiology Training Programs seem to be an appropriate mechanism for improving this capacity.