Tropical Medicine and Health Vol. 40 No. 4, 2012, pp. 141-147
doi:10.2149/tmh.2012-10

Field action report

A Surveillance Model for Human Avian Influenza with a Comprehensive Surveillance System for Local-Priority Communicable Diseases in South Sulawesi, Indonesia

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Received 2 April, 2012 Accepted 4 October, 2012 Published online 29 December, 2012

Abstract: The government of Indonesia and the Japan International Cooperation Agency launched a three-year project (2008–2011) to strengthen the surveillance of human avian influenza cases through a comprehensive surveillance system of local-priority communicable diseases in South Sulawesi Province. Based on findings from preliminary and baseline surveys, the project developed a technical protocol for surveillance and response activities in local settings, consistent with national guidelines. District surveillance officers (DSOs) and rapid-response-team members underwent training to improve surveillance and response skills. A network-based early warning and response system for weekly reports and a short message service (SMS) gateway for outbreak reports, both encompassing more than 20 probable outbreak diseases, were introduced to support existing paper-based systems. Two further strategies were implemented to optimize project outputs: a simulation exercise and a DSO-centered model. As a result, the timeliness of weekly reports improved from 33% in 2009 to 82% in 2011. In 2011, 65 outbreaks were reported using the SMS, with 64 subsequent paper-based reports. All suspected human avian influenza outbreaks up to September 2011 were reported in the stipulated format. A crosscutting approach using human avian influenza as the core disease for coordinating surveillance activities improved the overall surveillance system for communicable diseases.
Key words: human avian influenza, communicable diseases, surveillance and response, outbreak

INTRODUCTION

The first human case of human H5N1 avian influenza (AI) was detected in Indonesia in July 2005. Since then, cases have been reported continually, resulting in 110 fatal human cases by June 19, 2008, the world's highest cumulative number [1, 2]. In response, the Indonesian Ministry of Health stressed the importance of AI control in its National Long-term Health Development Plan for 2005–2025. The national strategic plan for integrated surveillance of avian influenza (2006) [3] also emphasized the strengthening of AI surveillance. The government of Indonesia and the Japan International Cooperation Agency (JICA) launched a three-year technical cooperation project—The Project to Enhance the Surveillance System for Avian Influenza—in October 2008. The aim of the project was to strengthen the surveillance of human AI cases through a comprehensive surveillance system of local-priority communicable diseases in South Sulawesi Province.

MATERIALS AND METHODS

Project site and period

South Sulawesi Province is one of 33 Indonesian provinces and is located on the southwestern peninsula of Sulawesi Island. South Sulawesi Province is a key junction

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and gateway to eastern Indonesia (Fig. 1). The province, with an area of 46,717 km^2, consists of 24 districts/cities with 8.3 million inhabitants [4]. With one confirmed case of human AI reported in June 2006, this province is also considered endemic for AI among poultry [5, 6]. The three-year project implemented from October 20, 2008 to October 19, 2011 targeted this province.

Preliminary and baseline surveys [7, 8]

To determine the field situation, a cross-sectional investigation was planned. The preliminary survey was conducted during the period from May to August 2008. The baseline survey, targeting all district officials, was conducted from July to September 2009. The survey teams included both Japanese and Indonesian experts who conducted a document and data review as well as interviews with officials on all levels from the federal government to local health centers. These surveys and field observations revealed that the province and its 24 districts/cities faced three major challenges in attempting to strengthen the AI surveillance system:

(1) Despite the existence of national surveillance and outbreak response guidelines [3, 9–11], the preliminary surveys indicated that local health officials were ineffective when they encountered suspected human AI cases. In addition, the shifting of responsible officials made it difficult to maintain the knowledge and skills necessary to handle an outbreak of human AI cases. At the time of the baseline survey, officials in seven of the 24 districts did not know the management techniques for handling an outbreak of human AI cases, and only four of them used AI-related data to implement prevention and control measures. Practical and accessible materials, applicable to local settings, should be developed.

(2) The responsible officials were not equipped with the knowledge and skills necessary to conduct effective surveillance and to make a timely response. The results of the baseline survey showed that seven of the 24 districts did not have staff trained for human AI case surveillance and response. In addition, three of them did not collaborate with the animal sector for AI surveillance. Coordination, collaboration, and information-sharing needed strengthening.

(3) The results of the baseline survey showed that the existing paper-based surveillance systems did not function in a timely manner, that more than 30% of outbreak reports were not sent within 24 hours, and that only 33% of weekly reports were submitted promptly to the provincial health office.

Main activities

Based on findings from these surveys, the project launched three major activities: 1) development of a technical protocol, 2) human resource development, and 3) surveillance system support.

(1) Development of a technical protocol

The project helped local health personnel to develop a technical protocol for human AI surveillance and response, consistent with national guidelines. The protocol emphasized concrete surveillance and response procedures, which were not described in detail in the national guidelines. The protocol showed clearly how local officials at all levels should fulfill their responsibilities and duties in actual set-

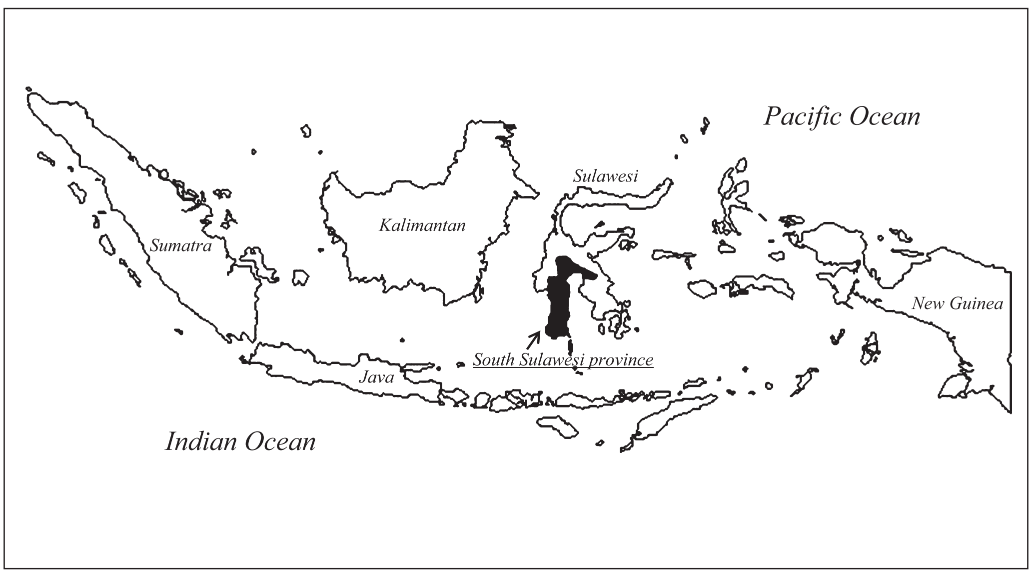

Fig. 1. Map of Indonesia (highlighted area is the project site)

tings. The protocol contained the working definition of suspected human AI and concrete methods of surveillance implementation, outbreak investigation, retrieval and shipping of the specimens (nasopharyngeal and oropharynx swabs and blood), and monitoring evaluation. The reporting formats were also attached. Basically, the protocol integrated AI surveillance into the existing disease surveillance system. This protocol became a concrete manual for local surveillance officials. The protocol enabled better coordination of activities and human resources that were separately introduced by public sectors and/or donor agencies and that did not work efficiently in this area previously. The technical protocol was developed in 2009 through several meetings and workshops. Not only central and local governmental human health sectors but also other sectors, such as academic, hospital, laboratory, and animal sectors, were involved in this development process. The technical protocol was subsequently endorsed by the government; the provincial governor issued a decree in 2010, whereupon it became a legal framework for provincial surveillance and response activities. The protocol was revised in February 2011 through the experience of daily activities and simulation exercises [12].

(2) Human resource development

District surveillance officers (DSOs) (typically two per district) play a central role in AI surveillance and response at the district level. The present project attempted to strengthen the effectiveness of DSOs. The rapid response team (RRT) is a cross-sectional team organized to manage outbreaks under the leadership of the district health office. The team consists of six members: 1) a DSO, 2) a medical doctor, 3) an animal health officer, 4) a laboratory technician, 5) a health promotion official, and 6) a zoonosis program officer. Training programs targeted all 24 districts/cities. The DSO training programs, to which all 48 DSOs were invited, have been conducted three times, the first from November to December 2009, the second in August 2010, and the third in March 2011. The RRT training programs, to which all six members from each district were invited, have been conducted twice, the first from October to November 2009 and the second in July 2011. All training programs were consistent with the technical protocol.

Because the RRT members were all from the human health sector, except for one person from the animal sector, one of the major challenges was to create better collaboration between the human health sector and the animal sector, especially in the early phase of the project. The RRT training and the simulation exercise provided opportunities to enhance this relationship. Even in the process of developing and revising the technical protocol and the DSO training program, individuals from the animal sector were invited as resource persons. These activities helped to strengthen the connection between the two sectors.

(3) Surveillance system support

The "early warning alert and response system" (EWARS) and the "short message service" (SMS) gateway were introduced in 2010 to improve the timeliness of reporting and to complement paper-based official forms. These systems had already been introduced in some other provinces through the Ministry of Health in collaboration with the World Health Organization (WHO) and the United States Centers for Disease Control and Prevention (US CDC) [13]. The EWARS is a computer network-based weekly reporting system that can issue alerts by threshold to trigger the immediate investigation of each event. The EWARS reports are transmitted from health centers to the district health office by SMS every Saturday. The DSO enters and analyzes the data using Microsoft Access-based computer software introduced by the WHO, then e-mails a district report to the provincial health office on Tuesday mornings; the central government receives the provincial EWARS report the same day. The SMS gateway allows for mobile phone-based outbreak reporting. When the DSO verifies an outbreak, the finding is relayed immediately and simultaneously to provincial and national health authorities. Outbreak reports have to be submitted within 24 hours. The SMS gateway was introduced to supplement the official paper-based method and to promote the timeliness of outbreak reporting. These two systems, which encompass more than 20 kinds of probable outbreak diseases with local priority, were introduced into the South Sulawesi Province through the present project in March 2010.

In this project, the comprehensive surveillance system was defined as the sector-wide surveillance and response system not only for human AI cases but also for local-priority communicable diseases [7].

Additional efforts to optimize project outputs

In addition to the main project activities, two other strategies were implemented to enhance the effectiveness of disease surveillance: 1) a simulation exercise and 2) a project activities package.

(1) Simulation exercise

A simulation exercise for a human AI outbreak was developed and conducted in late November 2010; the protocol was revised in early 2011, based on the experience gained from the exercise and daily activities.

(2) Project activities package

Some activities, such as EWARS and SMS, had already been introduced in other provinces of Indonesia. The DSO and RRT were assigned at all levels in the country. However, weaknesses in surveillance activities remained.

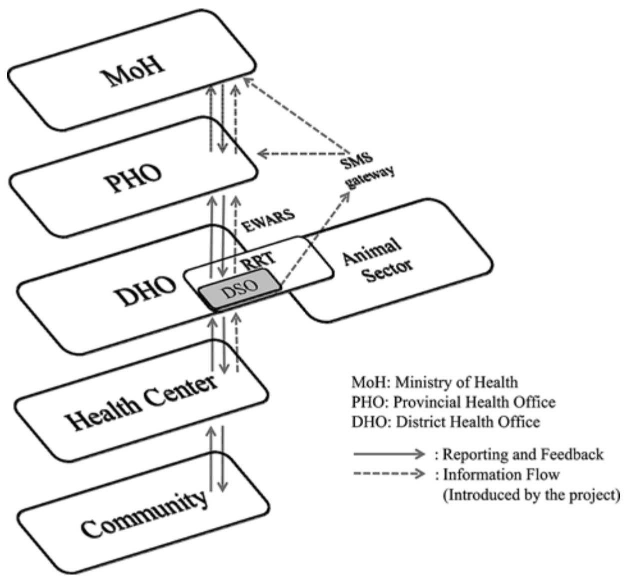

Fig. 2. The project system

The project packaged these activities and focused on the DSOs. The training mainly targeted DSOs for two reasons: 1) the DSO plays an important role in every operation and 2) the DSO holds a mid-level position in the public health system, intermediate between the local and central levels. The project developed a surveillance model package to precede the project activities. To assure comprehension of the activities articulated in the model, the technical protocol and the simulation exercise were used. The packaged model was also used to educate stakeholders about the project activities (Fig. 2).

Evaluation of the surveillance and response system

The surveillance system and outbreak response were evaluated in terms of A) timeliness of reports, B) regular feedback, and C) outbreak verification and investigation.

A) Two aspects of timeliness for weekly reports, one from the district to provincial level and the other from the health center to district level, were measured. After the network-based EWARS was introduced, its reporting timeliness was used to replace the timeliness of paper-based weekly reporting. Timely reports for the previous week were received by the provincial health office before being sent to the central government on Tuesday. The proportion of timely reports among the 24 districts was used for the district to provincial level and the proportion of timely reports among all health centers was used for the health center to district level. These proportions were derived from the official data of the South Sulawesi provincial health office.

B) Regular feedback was measured by reports every three months using the technical protocol and weekly EWARS feedback, which was created by software semi-automatically, from the provincial to district level.

C) For outbreak verification and investigation activities, the frequency of reports via SMS from the district to provincial level was observed. The provincial health office verified the outbreak reports from the district level that were either paper-based or SMS-based by contacting the district health office or visiting sites.

Due to the nature of the project implemented among Indonesian official sectors, we could only utilize the data that were reported in the project documents, shared and published mainly through the provincial health office. Thus, the results were limited to only some project periods. The timeliness of the weekly reports was compared between the baseline period and the time after the EWARS introduction, which was treated as two periods. Outbreak verification and investigation activities were described from January to September 2011, just before the end of the project. These were officially published during the project period.

RESULTS

A) Timeliness of reporting

Before the introduction of EWARS, the timeliness of the paper-based weekly reports from the district to provincial level was 33% for 12 weeks in the 2009 baseline period. After the introduction of EWARS, the average timeliness tended to increase, from 69% (EWARS-based reports from Week 14 to Week 52) in 2010 to 82% (EWARS-based reports from Week 1 to Week 37) in 2011 (Fig. 3). The average reporting timeliness from the health center level to the district level was 52% (EWARS-based reports from Week 14 to Week 52) in 2010 and 69% (EWARS-based reports from Week 1 to Week 37) in 2011.

B) Regular feedback

A feedback bulletin was created every three months for the provincial to district level, but weekly feedback from the provincial level was not complete or regular.

From the district to health center level, it was difficult to measure reporting regularity. Feedback was mainly created when an alert was raised by a EWARS report.

C) Outbreak verification and investigation

From January to September 2011, 65 outbreaks were reported via the SMS gateway, including more than ten suspected outbreak diseases such as acute diarrhea, malaria, dengue hemorrhagic fever, and measles. Of these 65 SMS gateway reports, 64 paper-based outbreak-report forms

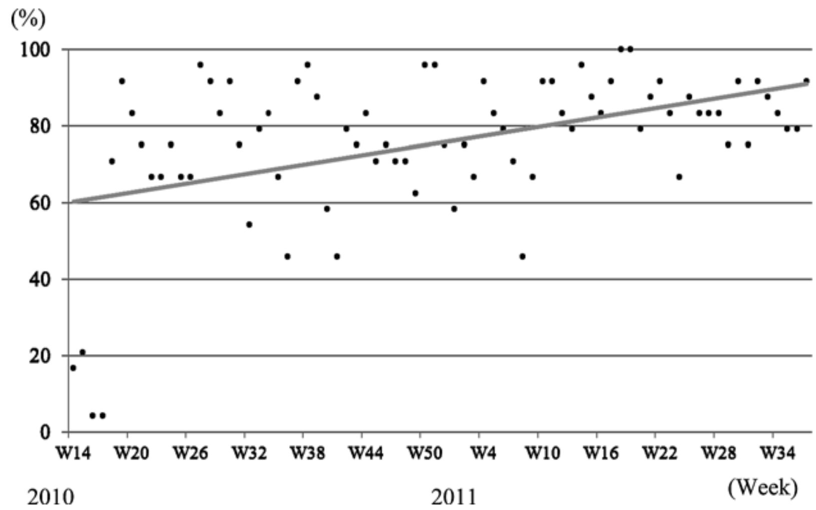

Fig. 3. Trend of weekly report timeliness from the district to provincial level after the introduction of the Early Warning Alert and Response System

were submitted after the SMS reports. In this period, all eight suspected human AI outbreaks were reported in a manner consistent with the technical protocol. The samples taken were sent to regional and national laboratories to confirm the results. No positive case was reported in this period from South Sulawesi Province.

DISCUSSION

For optimally coordinated implementation of the International Health Regulations (2005), each WHO member state must be capable of detecting, confirming, reporting, and containing an emerging threat to public health by 2012 [14]. To attain this milestone, core capacities, including surveillance and leading outbreak investigations, are required of member states. To facilitate compliance with the International Health Regulations core capacities, the Asia-Pacific Strategy for Emerging Diseases was developed in 2005, aiming to provide a common framework for national and regional capacities [15]. In Indonesia, a road map was developed to fulfill core capacities in collaboration with the WHO and US CDC in 2009 [16]. As a global public health emergency, human AI could potentially cause the greatest number of fatalities ever recorded [17]. Early detection and response are vital not only for Indonesia, but for the entire world. The Indonesian national strategic plan for integrated surveillance of avian influenza was promulgated in 2006. The project began in 2008, in line with domestic and international strategies. During the project period, human AI case surveillance was stressed throughout the period of the Health Sector Strategic Plan 2010–2014, which aimed to detect 100% of suspected human AI cases [18].

To mount an effective public health response, a framework developed by the WHO highlights five core components: surveillance, healthcare response, public health intervention, communication, and command [19]. These core components were integrated into the project activities, and the protocol became a decree issued by the provincial governor. Cross-sectional RRTs, authorized by the district regents/mayors, made a strong commitment. Cross-sectional training and multi-level meetings created effective communication mechanisms and pathways among the stakeholders.

Several programs aim to improve public health surveillance and response in developing countries by addressing the control of specific diseases, in line with donor perspectives. Crosscutting initiatives also aim to improve the general public health surveillance and response system in a multi-disease manner [20–22]. Human AI case surveillance and response activities, in line with donor perspectives, were a core component of the project, while some project activities covered other communicable diseases as well. The project results suggested that both AI and local-priority communicable disease surveillance and response improved through these project activities.

In some countries, the WHO's Integrated Disease Surveillance and Response Strategy has been successful because of a threshold-based surveillance strategy that focuses on public health responses at the district level. In addition, empowerment of frontline health workers is a key element of an efficient surveillance system [22, 23]. The same strategy was adopted for this project, focusing on the DSO as the frontline health officer and introducing a surveillance system with action thresholds. The project also developed a

DSO-centered model for efficiency and better comprehension of surveillance and response activities.

Some countries have shown that a complementary surveillance system that provides information enabling the early detection of outbreaks, in addition to the conventional routine surveillance system, can help to detect public health threats promptly [24–26]. The project results suggested that the EWARS, which had alert thresholds for probable disease outbreaks, contributed to improving the timeliness of weekly reports, especially from the district level. The SMS outbreak reporting system seemed to motivate the DSOs to submit their paper-based reports, resulting in improved reporting and response for both suspected human AI cases and other probable outbreak diseases. This project approach efficiently supported comprehensive bottom-up public health surveillance and response.

As a hospital-based network for the early detection of infectious disease outbreaks in Indonesia, the Early Warning Outbreak Recognition System has been introduced in some provincial hospitals, including South Sulawesi [27]. The role and function of the EWARS system in the public health network is to complement existing integrated disease-surveillance systems. An integrated approach to communicable disease surveillance envisages all surveillance activities in a country as a common public service, conducting many functions using similar structures, processes and personnel. Therefore, well-developed surveillance activities in one area may act as a driving force for strengthening other surveillance activities, with potential synergies and shared resources [20]. Training programs for field epidemiology assistants from all eastern provinces of Indonesia were conducted in South Sulawesi. This training had previously been conducted mainly at the central government level. In 2011, the South Sulawesi provincial health office initiated this training—from curriculum development to delivery of the training program—instead of the central government. This training also provided a forum for sharing project experiences with other provinces. The Ministry of Health plans to expand this model to Central Sulawesi Province, on the northern border, and to utilize the human resources and experiences from South Sulawesi in the national plan.

ACKNOWLEDGEMENT

The Japan International Cooperation Agency and the Indonesian Ministry of Health, Indonesia collaborated on the "Project to Enhance the Surveillance System for Avian Influenza" in 2008–2011. Sincere thanks are due to the provincial and district health officers in South Sulawesi. This work was partly supported by a grant from the National Center for Global Health and Medicine (22-7).

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