Original Article

The Surveillance System in Health Centers in Northeastern Thailand

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SUMMARY: In this study we assessed the existing communicable disease surveillance system in health centers of a province in northeastern Thailand. The first part of the study was an examination of medical records from 11 local health centers: 649 were examined for sensitivity, positive predictive value, and representativeness; and 433 were examined for timeliness and data quality. The second part of the study looked at 50 local officers from 11 local health centers, 1 district health office, 1 community hospital, and 8 sub-district administrative organizations. Quantitative data was collected through a review of medical records. Qualitative data was collected by focus groups and in-depth interviews. The reporting of suspected cases was 50.8%. Sensitivity was low for common diseases. Positive predictive value was lowest for fever of unknown origin (0%). Data quality for the date of onset and diagnosis was low. Case reporting was considered timely in only 45% of cases. Health officers perceived the surveillance system as not being up-to-date. They only collected data in a district without data analysis; the information provided by the system is not representative of the true epidemiological situation countrywide and cannot be used to help monitor disease patterns and trends. In conclusion, health officers should report diseases according to symptoms and analyze data continuously to identify urgent problem and elicit prompt responses.

INTRODUCTION

Communicable diseases remain a major public health problem throughout the world. In Thailand, a surveillance system focusing on 14 diseases was established in 1970, to meet the following objectives: monitoring trends, detecting outbreaks, and recommending effective prevention and control measures. This is a passive surveillance system, in which local health centers regularly notify District Health Offices (DHO), Provincial Health Offices (PHO), and the Bureau of Epidemiology. A standard form—Form 506—is used to record epidemiological data of reported cases. Data about notifiable diseases are collected weekly and transferred to a higher level via e-mail or diskette. The health centers analyze the data by time, place, and person to detect unusual disease patterns and prompt timely investigation. Feedback information from each district is given to each health center at meetings.

The local health center is a sub-district level health service unit on the first line, covering a population of about 1,000-5,000, with a health staff that includes a technical officer, a health worker, a midwife, and a technical nurse. Services provided at this level also include health promotion, disease prevention, and curative care. This level has increased the number of reports to the surveillance system (1).

Literature reviews suggested that the surveillance system needs improvement (2-4). Health officers still lack knowledge of practical methods of surveillance (5). The data utilized from the surveillance system for prevention and control are limited (6). There are limitations, both academic and budgetary, for the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5). The data utilized from the surveillance system for prevention and control are limited (5).

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MATERIALS AND METHODS

Study design: The study design was a descriptive epidemiological study and focus group interview.

Setting for study: Health centers were comprised of 11 local health centers, 1 DHO, 1 community hospital, and 8 sub-district administrative organizations (SAO) in a province in northeastern Thailand.

Study population: The study had two parts, as follows. (i) Quantitative study: (i) Medical records of 649 patients out of 65,661 patients in 2006 were analyzed for representativeness, sensitivity, and positive predictive value (PPV) of reporting. The medical records were randomly selected from the quarter January - March 2006. (ii) Medical records of 433 patients were analyzed for data quality and timeliness. The records were comprised of a simple random sample of all patients who were reported to the surveillance system (Form 506) during the period January - December, 2006 (705 records).

(ii) Qualitative study: The target population was 60 local officers (male = 23, female = 37) from the workplaces that had generated the data examined in the quantitative study.
The study group consisted of 50 officers (male = 22, female = 28) who were willing to participate in the study after being informed of its intent by the researchers. The gender ratios between the group of those willing to participate and the group of those unwilling to participate in the study were similar (P = 0.5472). For the study group, the mean age was 36 years, and mean experience was 7.98 years. There were 10 people unwilling to be interviewed. The mean age was 38 years, and their mean experience was 8.9 years. The characteristics of the unwilling group and the study group were similar; in particular, the mean experience levels in the two groups were similar (P = 0.7304).

Data collection: After receiving approval from the Ethics Committee of Khon Kaen University, researchers began data collection in the field. Participants who agreed to participate in the study signed a consent form. The study used both quantitative and qualitative methods to assess the existing surveillance system, according to the updated guidelines for evaluating surveillance systems (11) (see the Appendix).

Quantitative data: Data were collected through a review of medical records. To study sensitivity and PPV of reporting, the medical records were reviewed by two experts. These two people were trained to evaluate and diagnose clearly. The most common diseases under surveillance—i.e., diarrhea, food poisoning, viral conjunctivitis, chickenpox, and fever of unknown origin (FUO)—were selected for this study. When the presence of one of these five diseases was detected, each record evaluation was confirmed by both experts. The Form 506 of the reported cases obtained from health officers was compared with medical records reviewed by researchers, which served as the gold standard for this study. The researchers used the standard case definition of the Thailand Disease Surveillance System to evaluate the reported cases.

Case definitions for diseases under surveillance: FUO means patients who have a fever >38.3°C for more than 7 days, and no other identified causes of fever after a physical examination. Chickenpox means patients who have fever and vesicular blisters, healing clear. Hemorrhagic conjunctivitis means patients who have sore eyes, discharge, and painful swollen lids. Acute diarrhea means patients passing three or more loose or watery stools within 24 h (12).

Representativeness was studied by comparing the number of reported cases from Form 506 with suspected cases during the same period. A suspected case means a patient who presents clinical signs and symptoms compatible with a particular disease, without any laboratory evidence of infection, later found by a review of medical records. Data quality was studied by comparing the medical records and Form 506 as reviewed by the researcher. Timeliness was based on the number of days between the date of disease diagnosis and the date of reporting to the community hospital. Cases reported more than 5 days after diagnosis were considered to be delayed reporting.

Qualitative data: Information was collected through four focus groups and 18 in-depth interviews. Data from health officers who work in local health centers was gathered during four focus groups, to explore their feelings, experiences, and ability to provide data for the system. Researchers encouraged the health officers to express their opinions and identify strategies for solving problems. The participants consisted of 10 persons with similar experience in the topic. All interviews were tape-recorded, and were performed in the participants’ offices (for between 60 and 80 min), and then information was transcribed verbatim.

The criteria used to evaluate transcriptions from group interviews in this study were composed of 10 attributes to find out the reasons why the objectives of the surveillance system were not met.

Quantitative data analysis: Sensitivity, PPV, timeliness, and representativeness were analyzed using number, percentage, and 95% confidence interval (CI). An unweighted Cohen’s kappa coefficient was used to analyze agreement between the report and the reviewer’s opinion.

Qualitative data analysis: Researchers undertook qualitative content analysis (13). The researchers transcribed information from focus groups and in-depth interviews, and reviewed all of the data together. The data were coded into a number of categories, and the categories were linked. Then, the researchers combined sub-categories with similar content into generic categories, and the generic categories were combined into main categories to describe the existing surveillance system. For qualitative results, content analysis was summarized (Fig. 1) in the form of a tree of categories.

Trustworthiness: The study was examined using Guba and Lincoln’s guideline (14). To ensure accuracy of data, researchers used different methods to collect data. Moreover,
When I examine diarrhea patients, I provide only health care. I disagree with reporting common diseases such as diarrhea because they are not important. The Ministry of Public Health (MOPH) still wants reports on it. It is out of date. The MOPH does not diagnose dysentery, but the Ministry of Public Health (MOPH) still wants reports on it. It is out of date. The MOPH should improve the surveillance system. As one health officer stated: “Nowadays, knowledge of care and treatment is very advanced. There are two types of diarrhea treatment: acute and chronic. So, health officers do not diagnose dysentery, but the Ministry of Public Health (MOPH) still wants reports on it. It is out of date. The MOPH should improve the surveillance system.” Another noted: “I disagree with reporting common diseases such as diarrhea or viral conjunctivitis, etc., because they are not dangerous. When I examine diarrhea patients, I provide only health education to patients.”

Usefulness: The surveillance information was not useful for describing the basic epidemiology of diseases, and did not help monitor disease patterns and trends. The majority of health officers perceived that collected data sent to the district was an epidemiological assignment, and that they lacked the skill and knowledge to use the information in a useful way themselves. They perceived that data analysis was unnecessary because they have never used it. Researchers observing and working with them found that the health officers collected data to send to the district without using or analyzing it. One health officer said: “In the real situation, we collect only a Form 506 to send to the district. We have never analyzed data and used it in our daily work.” Moreover: “I think that information is not useful because I have never used it. Only two or three patients visit the health center weekly; this is a very small number. I think it wastes time to analyze data because the pattern of diseases is similar: such as in the rainy season we prevent dengue hemorrhagic fever, in the hot season we prevent diarrhea, and in the cold season we prevent influenza. We know this, so surveillance is not used.”

Representativeness: The percentage of suspected cases reported on Form 506 was 50.8% (330/649) (Fig. 3). The data was not representative of the true epidemiological situation because some reportable diseases were not reported. The health officers lacked the motivation to report cases. Health officers did not report diseases correctly. They did not report some diseases, because if they did it would seem that they could not control communicable diseases. Moreover, health officers selected only significant patients that would make their standard profile look good because of fear that a low profile would imply that they were irresponsible. As a health officer mentioned: “When there were 10 cases at the health center, I reported them all, but timeliness of reporting received only 30%. Whereas at another health center there were only two cases that were selected to make their profile good, and the timeliness of reporting that they received was 100%.” Other health officers agreed with him.

Some health officers perceived that it was useless to report cases due to a lack of motivation and response. They felt that, either reported or not reported, the information was not useful. When they did not submit data in a timely way, there was no penalty. In addition, disease reporting never resulted in any feedback about the reported cases. One health officer mentioned: “There are no penalties for those who do not report the surveillance data. I sometimes felt why I should report it, because report or no report, no one knows.”

Data quality: The agreement of reporting, between the information provided on the original case report and on the medical record, was greater than 90% for some variables. However, the level of agreement for signs and symptoms, date of onset, and diagnosis was low (Table 1). In terms of data quality, this was divided into completeness and agreement of the data. Completeness was high because it was controlled by computer. Agreement of data was low for some variables because health officers lacked the knowledge to diagnose diseases and feared accusations of malpractice.

The health officers who examined the patients, and the workers who entered the data into the computer, were not the same people. This could cause mistakes because the health officers may not have written the diagnosis of the disease on the medical records. When the workers entered data into the computer, they provided a diagnosis, even if they had only limited knowledge and ability to decide the correct one. The majority of workers had no formal training in epidemiology, and they simply asked for advice from the health officers when they needed to solve a problem. As a worker explained: “I enter data into the computer after health officers examine the patients. I have a lot of problems because the health officers do not write a diagnosis on the family folder. I completed high school, but I have to guess the diagnosis of the disease to
enter into the computer.” Researchers who reviewed medical records, and observed and worked with the health officers found that most of them did not write a diagnosis on the family folder because they felt insecure in diagnosing some diseases. As one noted: “When I examined the patients who visited the health center, I frequently wrote down only signs and symptoms, such as nausea and vomiting or abdominal pain, etc., because I felt insecure in diagnosing some diseases. Sometimes I was embarrassed that someone might read it.”

**Timeliness**: In 2006, 45% (197/433) of cases were reported to the district within 5 days of the date of the patient’s visit (Table 2). Timeliness was low because health officers perceived it was not important and was inconvenient. There was no budget for support, and insufficient feedback to encourage reporting. Health officers believed that common diseases were not dangerous to patients. Thus it was not necessary to report cases within 5 days. Furthermore, reporting diseases consumes time, uses money, and is inconvenient because they need to go to the district to deliver the report. One health officer said: “My health center is about 20 km from the district. I do not go to the district to deliver the report. One health officer said: “When I examine the patients who visited the health center, I frequently wrote down only signs and symptoms, such as nausea and vomiting or abdominal pain, etc., because I felt insecure in diagnosing some diseases. Sometimes I was embarrassed that someone might read it.”

**Sensitivity**: Reporting had low sensitivity for common diseases—e.g., FUO, diarrhea, and food poisoning—while for chickenpox it was high (Table 3). Sensitivity was low because health officers lack knowledge, do not want additional work, and lack awareness of the importance of reporting common diseases.

Health officers felt insecure about diagnosing some diseases that had non-specific symptoms. They had only 50% reliability when they diagnosed some diseases, because they did not have any biological tests for verification. As a result, they frequently diagnosed incorrectly and reported only symptoms. One health officer said: “When I diagnose some diseases, I feel only 50% confident. It is difficult to distinguish between diarrhea, food poisoning, or dysentery. Sometimes I wrote only ‘abdominal pain’ on the family folder.” Other health officers agreed with him.

Health officers can diagnose diseases, but they are concerned about fatigue, since they dislike field work, or give priority to other work. They did not investigate some diseases, they preferred to avoid a notifiable diagnosis, and instead reported a different disease. In addition, they preferred not to have to collect specimens for the laboratory. So they did not report diarrhea cases, even when they were diagnosed. During the discussion about this, health officers explained: “Once, the district asked health officers to collect specimens from all cases of diarrhea patients for *Vibrio cholerae* surveillance. We preferred to diagnose food poisoning instead of diarrhea because we preferred to not collect specimens.” Further: “When there are 10-15 cases of chickenpox, we will report only two or three of them—that makes us feel satisfied. If we report too many cases from the area, our superior will come to check, and this doubles our work. Other places are doing the same thing.”

**PPV**: The lowest values for the PPV of disease reporting were for FUO (0%) and food poisoning (44%). Case reporting, therefore, would not give an accurate picture of disease in the community (Table 3). Most health officers work on the basis of their own experience, without any reference to the formal disease definitions of the surveillance system. As one health officer explained: “We have never used case definitions for disease reporting because no one told us. When we examined patients and reported diseases, we had different perceptions that let us work based on our own knowledge. We have never talked about or discussed our work.” In addition, health officers in the district are often reassigned, which causes a lack of continuity and coordination in the area. One officer stated: “I have been here almost 2 years, and I never heard anyone discuss case definitions to report diseases. There are few health officers in the district, they have a lot of work to do, and they have been changed too often. There is a lack of continuity of working.”

**DISCUSSION**

The surveillance system at health centers is a tool for early detection, monitoring trends of diseases, and recommending effective prevention and control measures. The findings in this study were that health officers had no thresholds for action in response to surveillance data for epidemic-prone diseases. The majority of health officers at health centers go into the field to investigate for prevention and control disease only when the health officers at the district office notify them to do so. They only collected data to report to the district without performing data analysis. Very little feedback information from the district was given to each health center. The epidemiology unit at the district office emphasized only timeliness of reporting without looking at other important

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### Table 1. Level of agreement between data on reporting form and record review

<table>
<thead>
<tr>
<th>Data element</th>
<th>No. of reports validated</th>
<th>Percent agreement</th>
<th>Kappa (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>433</td>
<td>98.9%</td>
<td>0.95 0.91 0.99</td>
</tr>
<tr>
<td>Gender</td>
<td>433</td>
<td>99.5%</td>
<td>0.98 0.96 1.00</td>
</tr>
<tr>
<td>Occupation</td>
<td>433</td>
<td>97.5%</td>
<td>0.90 0.86 0.97</td>
</tr>
<tr>
<td>Address</td>
<td>433</td>
<td>97.5%</td>
<td>0.90 0.85 0.96</td>
</tr>
<tr>
<td>Date of visit</td>
<td>433</td>
<td>97.7%</td>
<td>0.91 0.86 0.97</td>
</tr>
<tr>
<td>Signs &amp; symptoms</td>
<td>433</td>
<td>83.1%</td>
<td>0.49 0.39 0.59</td>
</tr>
<tr>
<td>Date of onset</td>
<td>433</td>
<td>25.2%</td>
<td>-0.40 -0.47 -0.33</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>433</td>
<td>31.4%</td>
<td>-0.15 -0.21 -0.09</td>
</tr>
</tbody>
</table>

### Table 2. Timeliness of reporting by the surveillance system of 11 local health centers

<table>
<thead>
<tr>
<th>Disease</th>
<th>No.</th>
<th>Timeliness (%)</th>
<th>Median (day)</th>
<th>Max (day)</th>
<th>Min (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>187</td>
<td>54.0</td>
<td>5</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>85</td>
<td>35.3</td>
<td>6</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Viral conjunctivitis</td>
<td>71</td>
<td>54.9</td>
<td>4</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Chickenpox</td>
<td>19</td>
<td>10.5</td>
<td>20</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Fever of unknown origin</td>
<td>71</td>
<td>35.2</td>
<td>8</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>433</td>
<td>45.5</td>
<td>6</td>
<td>26</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 3. Sensitivity and positive predictive value of reporting of 11 local health centers

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. (n = 649)</th>
<th>Sensitivity (95% CI)</th>
<th>Positive predictive value (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>401</td>
<td>43.7 (37.5, 50.0)</td>
<td>75.5 (67.7, 82.2)</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>98</td>
<td>53.7 (37.4, 69.3)</td>
<td>44.0 (29.9, 58.8)</td>
</tr>
<tr>
<td>Viral conjunctivitis</td>
<td>69</td>
<td>69.8 (55.7, 81.7)</td>
<td>90.2 (76.9, 97.3)</td>
</tr>
<tr>
<td>Chickenpox</td>
<td>21</td>
<td>100.0 (83.2, 100)</td>
<td>95.2 (76.2, 99.9)</td>
</tr>
<tr>
<td>Fever of unknown origin</td>
<td>60</td>
<td>0</td>
<td>0 (0-4.1)</td>
</tr>
</tbody>
</table>

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points such as sensitivity. In addition, the policy at the local level did not encourage health officers to be attentive. This caused the local health officers to pay less attention to their duty. This is similar to the findings of other studies (8).

The sensitivity of reporting varies from 0-70%. This means that the information does not indicate the magnitude of the problem. These findings differ from those reported in developed countries. In Sweden, Jansson et al. (15) assessed the sensitivity of reporting of four diseases, and reporting was high. Health facilities in developed countries that are responsible for disease notification will more often have access to physicians and laboratories to aid in diagnosis, while health centers in Thailand have only health officers available to diagnose diseases, according to standard definitions and reports submitted on Form 506. This study found that sensitivity of FUO reporting was 0%. This is different from the other diseases considered (diarrhea, food poisoning, etc.), since, by definition, FUO needs both laboratory and clinically based evaluation (12). Therefore, health centers should use health officers to collect data by syndromic report to alert the district offices of the emergence of a health problem. In addition, the data needs to be analyzed continuously at the health centers to ensure a prompt response.

The usefulness of data to address disease prevention and control in local areas is at a low level. Health officers only collected data to report to community hospitals without performing data analysis, since they are not aware of its usefulness. Administrators also use data for low-level decision-making. Making use of data to solve problems in local areas is minimal. This finding is similar to the studies of the Centers for Disease, Control and Prevention (CDC) (8) and Djibuti et al. (3). Compliance in reporting data to the surveillance system is low, unlike in developed countries where the system is compulsory (16). The minimal use of data to solve disease problems in local areas might be due to a lack of skill and knowledge among health officers. The surveillance system needs improvement to improve data quality, and it must then be used to solve problems correctly and effectively.

The percentage of suspected cases reported was low (50.8%). The reporting of cases could not explain the true epidemiological situation. It could be that this reflects case ascertainment bias and information bias. Some health officers believe that if there are many reports they might be blamed for not controlling the communicable diseases. In addition, health officers in some health centers are often reassigned, which causes a lack of continuity and coordination in the area. This change in personnel can result in missed reporting in some areas. Information bias also occurs due to human error. Most health officers may not write the diagnosis of disease on the medical records. In addition, there may be errors in data entry. This is similar to other studies in Japan (16), which found that half of the cases were reported late and were not included in the weekly data. In contrast, a study in the United States (17) found that the population under surveillance for reporting adverse drug events more closely represented some variables. However, representativeness is good in some health center areas (Fig. 3); in particular, the reporting rates of the diseases were close in health center Nos. 2 and 9 because the head of health centers was interested in epidemiological work, which encouraged the local health officers to be interested in their work as well. Internet access might also improve the surveillance system.

The accuracy regarding the date of onset, date of visit, and diagnosis was low. These variables are important, because this information can help prevent and control disease. This is similar to the finding of Suttisa et al. (7). In contrast, a study in the United States (18) found that data quality was high. It could be that diagnosis and data entry into the system is a one-stop service in developed countries. The situation is different in health centers, where health officers only record diagnoses on the medical records, and then workers undertake entry of data into a computer.

The timeliness of reporting was only 45%, so the surveillance system does not report the situation in real time. A typical case of disease was brought to the attention of health officers >6 days after onset. During this time secondary and tertiary transmission may occur, so that the level of timeliness is not satisfactory for effective disease control. This finding is different from another study that reported timeliness at health centers was 85.2% (10). In the United States, acute diseases were reported within one incubation period in more than 60% of cases (9). In developed countries, the majority of health facilities have access to the Internet. It is anticipated that the timeliness will increase as more health officers gain access to the Internet.

The supporting activities of systems are limited. Only 15.6% of health officers were found to have received training in surveillance, a result similar to other studies (5). Internet access is available in only 2 of 11 health centers in northeastern Thailand. Health officers are in need of more transportation and telephone support for reporting cases; at present they receive very little support from the government. This is similar to the results of a study by Wilkins et al. (6). Continuing supervision of the system is insufficient, as was also seen in other studies (8).

There are several reasons for the poor performance of health officers. First, their knowledge of diagnostic criteria is poor, so most of them lack confidence. Second, health officers frequently make mistakes in case reporting, case diagnosis, etc. Third, most of them think that case reporting is not important. Fourth, health officers diagnose and report diseases based on their own experience without standardized data collection. Fifth, there is limited financial support for field work. Sixth, there is no penalty for not reporting. And last, health officers have a case ascertainment and information bias, which makes the surveillance information not representative of the real situation.

This study has two main limitations. One was the “gold standard” used to evaluate sensitivity and PPV. Two experts judged the diagnosis of diseases; and they might have had some differences of opinion about some of the conclusions regarding diagnosis. However, these had been standardized before the study began. Another problem is that the sample size of some selected diseases was rather small.

In conclusion, the surveillance system in health centers is potentially useful in ensuring detection of outbreaks of infectious diseases, monitoring responses, and providing information for policy decisions. The surveillance system needs to be improved, especially in terms of sensitivity, PPV, timeliness, usefulness, data quality, and acceptability, in order to support public health action. The findings indicated that the health officers at health centers should report diseases according to symptoms and analyze data continuously to highlight urgent problems and elicit prompt responses. They should enter data immediately after disease diagnosis and submit reports via the Internet. In addition, they should use standard case definitions for reporting cases. In addition, an academic evaluation of the health center surveillance system
should be done at least once a year.

APPENDIX

Sensitivity is assessed by the proportion of cases of a disease detected by the surveillance system.

Positive Predictive Value is the proportion of persons identified as having a disease who actually do have the condition under surveillance.

Representativeness is assessed by the accurate description of the occurrence of a health-related event over time and its distribution in the population by place and person.

Timeliness is determined by the speed between steps in a surveillance system.

Simplicity is assessed by looking at the structure and ease of operation of a system.

Stability is the reliability and availability of the surveillance system.

Flexibility is judged retrospectively by observing how a system can adapt to changes in information needs, for example, the appearance of new diseases.

Acceptability is assessed by the willingness of persons and organizations to participate in the surveillance system.

Usefulness is assessed by describing the actions that were taken as a result of the data from the surveillance system.

Data quality is assessed by examining the completeness and agreement of the data recorded in the surveillance system.

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REFERENCES


