Cambodia
University of Health Sciences

Vietnam
National Institute of Hygiene and Epidemiology

SURVEILLANCE OF AVIAN INFLUENZA, INFLUENZA-LIKE ILLNESS AND DENGUE FEVER/DENGUE HEMORRHAGIC FEVER ALONG THE CAMBODIA/VIETNAM BORDER

COMMUNITY-BASED SURVEILLANCE

JOINT–STUDY REPORT

THIS JOINT–STUDY WAS
SPONSORED BY

Asian Development Bank
Greater Mekong Sub-region
Communicable Diseases Control Project

PHNOM PENH, MARCH 2010

SURVEILLANCE OF AVIAN INFLUENZA, INFLUENZA-LIKE ILLNESS AND DENGUE FEVER/DENGUE HEMORRHAGIC FEVER ALONG THE CAMBODIA/VIETNAM BORDER

COMMUNITY-BASED SURVEILLANCE

JOINT–STUDY REPORT

PHNOM PENH, MARCH 2010

The study was jointly prepared by the University of Health Sciences of Cambodia (UHS-C); National Centre for Parasitology, Entomology and Malaria Control of Cambodia (CNM); National Institute of Public Health of Cambodia (NIPH); National Institute of Hygiene and Epidemiology of Vietnam (NIHE); and Tay Nguyen Institute of Hygiene and Epidemiology of Vietnam (TIHE). The study was then led by the UHS-C with funding support provided by the Asian Development Bank (ADB) Regional Pooled Fund of the Greater Mekong Sub-Region Communicable Diseases Control Project (GMS CDC Project).

Tables of contents

List of Tables, Figures and Appendices

Tables

Figures

Appendices

Abbreviation

ADB	Asian Development Bank
AHI	Avian and Human Influenza
AHW	Animal Health Worker
AI	Avian Influenza
BHW	Barangay Health Worker
CBS	Community-based surveillance
CDs	Communicable diseases
CDC	Communicable Disease Control
CFR	Case Fatality Ratio
CHW	Commune Health worker
CHC	Commune Health Centre
CNM	National Centre for Parasitology, Entomology and Malaria Control, Cambodia
DF	Dengue Fever
DHC	District Health Centre
DHF	Dengue Hemorrhagic Fever
EPI	Expanded Programme for Immunization
GMS CDC	Greater Mekong Sub-Region Communicable Diseases Control Project
HC	Health Centre
HPAI	Highly Pathogenic Avian Influenza
ILI	Influenza-Like Illness
KSCSP	Kean Svay Child Survival project
MoH	Ministry of Health
NDCP	National Dengue Control Program
NGO	Non-government Organization
NIHE	National Institute of Hygiene and Epidemiology, Vietnam

NIPH	National Institute of Public Health, Cambodia
OD	Operational District
OPD	Out Patient Department
PCR	Polymerase Chain Reaction
PDR	People's Democratic Republic
PHD	Provincial Health Department
PPV	Positive Predictive Value
RCU	Regional Coordination Unit of the ADB GMS CDC Project
RH	Referral Hospital
SMS	Short Message Service
SARS	Severe Acute Respiratory Syndrome
STD	Sexually Transmitted Disease
TIHE	Tay Nguyen Institute of Hygiene and Epidemiology, Vietnam
UHS	University of Health Sciences, Cambodia
VHSG	Village Health Support Group
VHV	Village Health Volunteer
VST	Village Surveillance Team
VVT	Village Volunteer Team
WHO	World Health Organization

Acknowledgements

This study would not have been possible without the technical and financial assistance from the Regional Coordination Unit of the Asian Development Bank, Greater Mekong Sub-Region Communicable Diseases Control Project.

Moreover, we wish to extend our appreciation to the following health authorities in Cambodia and Vietnam; Mr. Stéphane P. Rousseau and Dr. Le Duc Tho from RCU; for their support, contributions and suggestions throughout the study implementation.

We particularly wish to thank Dr. Le Van Tuan and Dr. Nicole Smith from WHO in Vietnam, Dr. David T. Dennis – Duke University, Prof. Philip C. Nasca – Dean of School of Public Health, University at Albany, and Dr. John Grundy from Cambodia for their review and comments of the draft report and Dr. Bounchan Youttiroung for his contribution in the report editing and formatting.

In addition, we would like to extent our sincerely thank and commend Village Health Volunteers and Local Health Staff of the study sites in both Cambodia and Vietnam for their willingness, commitment and ability in locally collecting and using the data for outbreak detection in their communities.

Finally, we are impressed by the enthusiasm and collaboration of the research team members from all universities and institutions in the development and pilot testing of this intervention study.

List of Researchers for the CBS joint-study in Cambodia and Vietnam, 2009

From Cambodia			From Vietnam		
No	**Name**	**Institution**	**No**	**Name**	**Institution**
1	Prof. Oum Sophal	UHS-C	1	Prof. Nguyen Tran Hien	NIHE
2	Dr. Lek Dysoley	CNM	2	Prof. Nguyen Anh Dung	NIHE
3	Dr. Tol Bunkea	CNM	3	Dr. Le Thi Phuong Mai	NIHE
4	Dr. Chheng Kanarath	NIPH	4	Dr. Nguyen Thi Phuong Lien	NIHE
5	Dr. Mao Bunsoth	NIPH	5	Dr. Nguyen Thi Thi Tho	NIHE
6	Dr. Aim Sothea	UHS-C	6	Dr. Tran Manh Tung	NIHE
7	Dr. Mey Vannareth	UHS-C	7	Dr. Ta Ngoc Ha	NIHE
8	Dr. Chau Dara Pheak	NIPH	8	Dr. Pham Van Hau	TIHE
9	Mr. Hy Sovann	Memot OD			

Executive summary

A community-based surveillance system for avian influenza, influenza-like illness and dengue/ dengue hemorrhagic fever was jointly developed by the Cambodia University of Health Sciences ; the National Centre for Parasitology, Entomology and Malaria Control ; the National Institute of Public Health; the Vietnam National Institute of Hygiene and Epidemiology; and Tay Nguyen Institute of Hygiene and Epidemiology. Under the overall leadership of the University of Health Sciences, this joint-study was implemented in the border districts of Cambodia and Vietnam. The study was implemented on the Cambodian side from September to December 2009, coordinated by Prof. OUM Sophal; and from September 2009 to January 2010 on the Vietnamese side, coordinated by Dr. Le Thi Phuong Mai of the National Institute of Hygiene and Epidemiology. This system was developed by researchers from the universities and institutes of both countries, with technical and financial support from the Regional Coordination Unit of the Asian Development Bank Great Mekong Sub-region Communicable Disease Control Project.

This system was designed to provide syndromic surveillance for rapid and comprehensive detection of avian influenza and dengue fever/dengue hemorrhagic fever outbreaks in rural communities. In this system, Village Health Volunteers and other local private care providers were trained to identify and report the suspected cases and outbreaks in their communities to local health staff for confirmation and response. In Cambodia, phone calls were used by staff from each and every Commune Health Centre to collect data from village health volunteers on a weekly basis. In Vietnam, the forms developed for this project were used to collect and collate weekly data from the local community. In both countries, phone calls were used by volunteers for immediate reporting of suspected outbreaks to the Commune Health Centres and higher level. Monthly feedback meetings between volunteers and local staff were conducted systematically in Cambodia and to a lesser extent in Vietnam.

An evaluation conducted four to five months after implementation of the community-based surveillance system found that the system was able provide an effective complement the formal disease surveillance system in place, including the provision of missing information from the communities. Moreover, in Vietnam the sensitivity and specificity of case reporting by Village Health Volunteers were found to be high. Local community and local health staff acceptance and active participation in the novel system was high, as reflected by the regular and frequent household visits of made by volunteers to insure accurate and timely data collection and reporting. The visits were also designed to insure the continuing willingness of local staff to fully participate in data management, feedback and use.

The one problem encountered was the inability to assess the ability of the community-based surveillance system to capture avian influenza outbreaks. No cases of avian influenza were detected in the study areas. In addition, the implementation project was too short (only 4-5 months) to gather sufficient baseline data for dengue hemorrhagic fever to determine if an outbreak of this disease had occurred.

Nevertheless the study provided evidence that syndromic surveillance could be successfully applied in rural settings of developing countries to rapidly detect outbreaks by local community and staff. Countries need to develop a cost-effective and sustainable community-based surveillance system for outbreak detection and response that is adapted to their specific local context.

CHAPTER 1

INTRODUCTION

Mr. Stéphane P. Rousseau-Regional Coordinator of Regional Coordination Unit-GMS CDC project (on the left) and Prof. Oum Sophal-Rector of UHS-C (on the right) at the signing meeting for the joint-study research on June 25, 2009

As of February 2010, 114 cases including 58 deaths due to avian influenza (AI) were reported in Vietnam, and 9 cases included 7 deaths in Cambodia. Moreover, all 63 provinces of Vietnam have suffered from poultry AI, with 36 provinces reporting human cases of AI. Additionally, by 21 February 2010, according to World Health Organization (WHO) data, worldwide more than 213 countries and overseas territories or communities have reported laboratory confirmed cases of the pandemic (H1N1) 2009 influenza virus, including at least 16,226 deaths.

AI, commonly knows as bird flu, is one of the most serious health threats today. Since 1997, AI outbreaks in poultry and in humans have emerged in many countries. To date, even though there has been no confirmed evidence of sustained human to human transmission, the AI outbreaks have resulted in significant losses worldwide (1-4). The 2004 epidemic that spread to several Asian countries caused remarkable losses, costing billions of dollars. It is estimated that total losses to the Asian poultry sector were more than USD 10 billion. More than 100 million birds were killed in efforts to control the outbreaks (5). The virus also, alarmingly, directly infected and killed humans. Through 17 February 2010, 51 countries have reported avian influenza A (H5N1) in poultry and 15 countries have reported avian influenza A (H5N1) in humans with a total of 478 cases, including 268 deaths (6).

Dengue fever (DF) and dengue hemorrhagic fever (DHF) are the most important vector borne viral diseases in Southeast Asia, especially in the Greater Mekong Sub-Region, in terms of morbidity and mortality. Approximately two fifths of the world's population is at risk, and more than 100 countries have experienced DF/DHF outbreaks with an annual incidence around 50 million cases per year worldwide, of which 500,000 persons are hospitalized and 20,000 die. In Vietnam in the past five years there have been approximately 50,000 to 90,000 new cases per year, and case fatal ratio of 10%. Cambodia is one of eight Asian countries with the leading cause of children hospitalization and children death (7).

A routine reporting system has been established in each of the two countries; they are facility-based systems. Experience has shown that facility-based disease surveillance systems are not able to detect all AI outbreaks in a sufficiently early stage to ensure effective application of control measures. The national disease surveillance system is a weekly reporting of priority epidemic-prone diseases. Data generated through the system is often delayed and incomplete, partly due to late, irregular and/ or incomplete reporting from the peripheral health facilities. As a result, outbreaks of infectious diseases that occurred in remote provinces were often detected late and therefore less effectively controlled. In Cambodia and Vietnam, only patients accessing public health facilities are included in the reporting system, which therefore results in missing patients who use informal health care services i.e. traditional/ home remedies, buy medicines themselves, or use private care provider's services. Another problem for disease surveillance comes from difficulties in accessing the system in remote areas due to poor transportation and lack of means of rapid communication, which are common challenges for the border areas when dealing with outbreaks. In addition, local health staffs generally do not make proper use of data gathered within the surveillance systems, other than sending information to the upper level of the health system. Poor skills together with the lack of operating resources have led peripheral health authorities to rely almost entirely on national programs, and NGOs, if any, in the control and prevention of diseases and outbreaks. This in turn leads to late and ineffective outbreak response, as well as to weak disease control and prevention.

Effective AI/DHF and other communicable disease outbreak control depends largely on the ability of surveillance systems to provide accurate and timely data for early detection and response. Routine disease surveillance systems provide neither a complete nor representative picture of health

problems in the communities because patients who could not get access to public health facilities or choose not to use them were not reported by these systems (8,9). On the other hand, community-based surveillance systems that are based upon a network of lay people involved in the systematic detection and reporting of health-related events from their community have the possibility to be more cost-effective than periodic surveys or active case findings undertaken by health staffs. It has the potential to empower the rural population vis-à-vis addressing their own health problems and improving the health status of their communities.

During 2009, the Pooled Fund of the Asian Development Bank (ADB), Greater Mekong Sub-Region Communicable Diseases Control Project (GMS CDC Project) provided financial support for a Joint research between Cambodia and Vietnam on the surveillance of AI/DHF along their border.

The joint research was implemented in the bordering districts of the two countries by researchers from five universities and institutions -including the Cambodia University of Health Sciences (UHS-C); National Centre for Parasitology, Entomology and Malaria Control (CNM); National Institute of Public Health (NIPH); the Vietnam National Institute of Hygiene and Epidemiology (NIHE); and Tay Nguyen Institute of Hygiene and Epidemiology (TIHE). This partnership addressed the questions of whether an appropriately designed and locally managed community-based surveillance system (CBS) model (i) could help fill significant gaps in the current disease surveillance system and effectively drive active community participation in disease and outbreaks control and prevention; (ii) could effectively drive active community participation in disease and outbreaks control and prevention, and (iii) would be more cost-effective and sustainable than any CBS developed and managed by NGOs or by top-down approach in the scenario of the utilization and strengthening of existing community and public health services structure is crucial to success and sustainability of the CBS.

CHAPTER 2

BACKGROUND INFORMATION AND LITERATURE REVIEW

2.1. Communicable Disease Surveillance

2.1.1. Communicable Disease Surveillance in Cambodia

Presently, there are three surveillance systems for communicable diseases in Cambodia, namely the zero reporting, hotline, and sentinel site systems.

The *zero reporting system* is a routine disease surveillance system in which all public health facilities, referral hospitals and health centers, report *weekly* on the epidemiological surveillance of 12 diseases and syndrome mix , such as acute flaccid paralysis (AFP), acute jaundice, acute respiratory infections (ARI) including severe acute respiratory syndrome (SARS) and avian influenza, severe diarrhea, dysenteries, dengue hemorrhagic fever, diphtheria, measles, meningoencephalitis, neonatal tetanus, rabies and clusters of unknown diseases (Figure 1). The system aims to provide alerts on possible outbreaks and trigger immediate investigation of cases to identify a diagnosis and appropriate control measures. Case definitions cover all identified major outbreak prone diseases.

The *sentinel surveillance* system has been established for influenza-like illness (ILI) and Japanese encephalitis. At present, ILI sentinel surveillance covers outpatients from the following 8 provinces: Battambang, Takeo, Kampong Cham, Kampot, Mondolkiri, Phnom Penh, Siem Reap, and Svay Rieng.

The *hotline system* for outbreak surveillance reporting is operated through radio communication at health center (HC) and operational districts (OD) and by fax, email and telephone or mobile phone short message system (SMS) from provinces to the Communicable Disease Control (CDC) department at the central level.

Major obstacles to the completeness of the routine disease surveillance system in Cambodia are (i) the absence of data from the private health care institutions; and (ii) the limited access to the public health centers and hospitals (in 2005 only about one fifth of patients used public health facilities and the remaining patients sought treatment from private doctors, clinics or polyclinics and private hospitals, or directly from private pharmacies or traditional healers (9).

Major obstacles to a well performing disease surveillance system in Cambodia are (i) the acute shortage of dedicated and qualified personnel due to low salaries and lack of staff motivation which severely hampers procedures for validation of data collected (completeness, timeliness and accuracy), and especially data processing ; and (ii) limited capacity of laboratories at provincial and district levels.

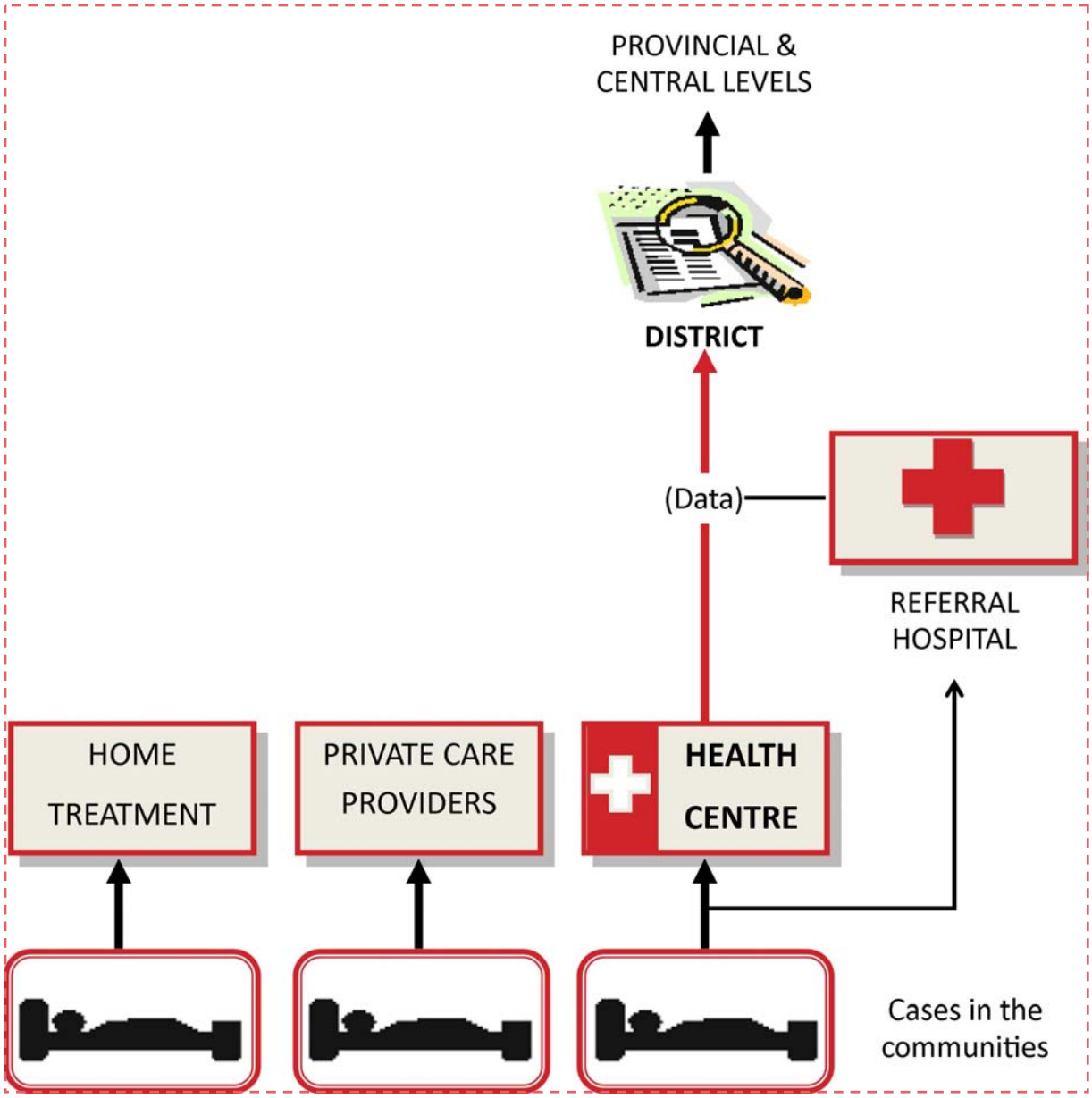


Figure 1: Flow of information of the disease surveillance system in Cambodia

There is, therefore, a need for establishing capacity for early detection and early warning of AI outbreaks as part of disease surveillance, supported by improved diagnostic capacity, awareness campaigns and emergency response. In addition, the disease surveillance and early outbreak warning at the community level is especially challenging for Cambodia because of the nature of the poultry farming practices, poor veterinary infrastructure and lack of adequately skilled technicians and professionals.

2.1.2. Communicable Diseases Surveillance in Vietnam

The communicable disease (CD) surveillance system in Vietnam follows the decentralized system of health care and public health as described in Figure 2. Surveillance data flow from over 10,000 Commune Health Stations to over 600 District Health Centers to 63 Provincial Preventive Medicine Centers to 4 Regional/National Institutes and finally to the Ministry of Health Communicable Disease Control division. Surveillance data also flow from hospitals through the respective local or central levels to be combined with aggregate surveillance data and finally to the Ministry of Health (MoH). The assigned tasks and responsibilities for surveillance are generally well understood by Preventive Medicine staff at all levels. Although village health workers (VHWs) have been assigned ten tasks, they are not directly involved in the formal surveillance system so far. When an outbreak occurs, VHWs are mainly responsible for promoting environmental hygiene, doing health education, monitoring those who have close contact with patients etc. Other community volunteers and health collaborators who usually take part in health care activities are members of community unions such as the Women's Union, Youth Union and Farmer's Union that can be considered as potential forces in community-based surveillance.

Routine surveillance: There are 26 communicable diseases and syndromes to be reported nationally from all administrative levels including ILI and Dengue fever. Any changes or additions to the list of notifiable CDs must come from the MoH. All levels from the Commune Health Centers up to the MoH are clearly aware of the 26 CDs and syndromes they are required to report as part of the national surveillance system. Most of these CDs are diagnosed clinically.

Sentinel surveillance: Some CDs, such as HIV/AIDS, sexually transmitted diseases (STDs), and influenza are monitored through sentinel surveillance systems. The sentinel groups of HIV/AIDS include STD patients, tuberculosis patients, antenatal women and military recruits. Seasonal and pandemic influenza surveillance is conducted in 15 sentinel surveillance sites among patients presenting with influenza-like illness. While it is possible that the sentinel surveillance system might identify a case of H5N1, the detection of AI cases is primarily based on national surveillance for severe viral pneumonia.

Specific surveillance: CDs that are included in the Expanded Program for Immunization (EPI), malaria, and tuberculosis have their own special program (vertical program) where treatment, laboratory testing, and surveillance are supported with funding to promulgate detailed clinical and laboratory guidelines as well as case report forms designed to collect detailed information on each case.

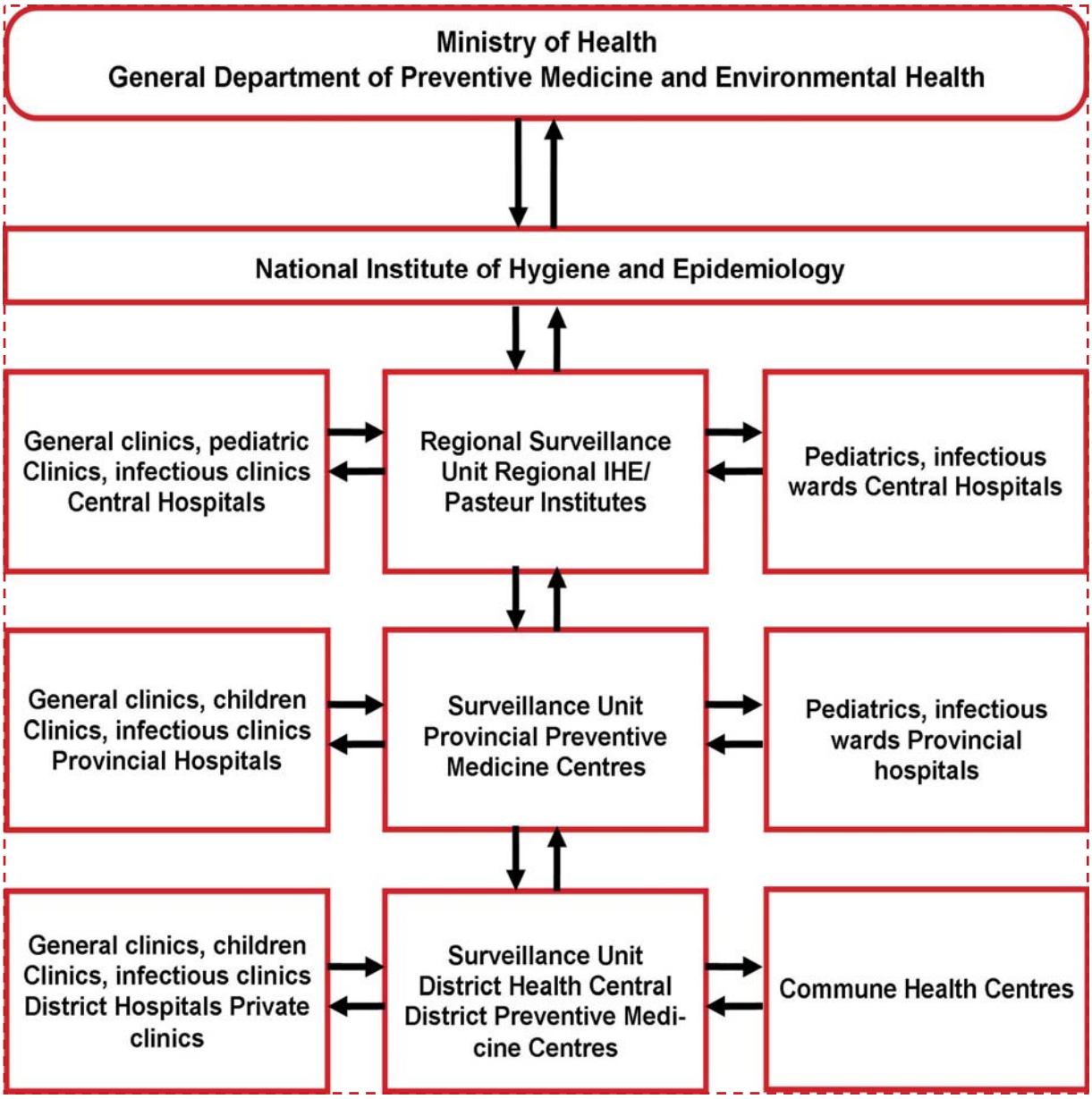


Figure 2: Communicable disease surveillance system in Vietnam

ILI Surveillance:

Basically, ILI surveillance relies on existing surveillance and reporting system as mentioned earlier and also on a national system of sentinel surveillance run by NIHE and its partners throughout Vietnam. Suspected avian influenza cases or cases of suspected A/H1N1 2009 pandemic influenza, however, have been given priority in terms of timely detection and reporting. Any animal or human AI case investigated at any level must be immediately reported to the national level for proper response. On the other hand, the district, regional and national levels must be involved in timely detection of outbreaks. Within the system, all suspected cases must be reported to health professionals for proper diagnosis. However, there are limitations in the current system. ILI has never been properly diagnosed by physicians and also documented arbitrarily in hospital log books and medical charts. Even though ILI is one of the 26 CDs to be monthly reported, the information gathered at all levels lacks detail. The only information collected is number of cases and deaths, but no information is

provided regarding gender, age, severity and other related information collected. As a result, ILI data at all levels has not been sufficient and comprehensive. Regarding laboratory tests, ILI cases are not

routinely tested as there are only four reference laboratories at three national and regional institutes in Hanoi, Ho Chi Minh City, Tay Nguyen and Nha Trang. However, a systematic sample of ILI cases enrolled in the national influenza sentinel surveillance system is tested.

AI Surveillance:

By Ministry of Health regulation, any suspected AI case must be "immediately reported" via telephone or facsimiles from all levels and health facilities (where the case is detected and investigated) to the national level (10). After the first case in December 2003, the MoH has taken a strong action to enhance the surveillance system at all levels. Recently, 63 provinces/cities of Vietnam have established a Steering Committee for Control and Prevention of SARS and Human AI. Most of the provinces/cities have developed their own "Pandemic preparedness plan", and "Rapid response teams" and have sufficient storage of supplies and equipment for outbreak control activities (including Tamiflu). Institutions in the system seem to be ready for dealing with AI outbreak such as early detection and rapid response to contain outbreaks, receiving and quarantine patients etc.

Since 2005, a national project of hospital outpatient-based surveillance that identifies individuals with acute respiratory illness meeting the WHO case definition for ILI or persons hospitalized with severe viral pneumonia (SVP) has been introduced in Vietnam by NIHE with support from the US CDC. This sentinel surveillance covers ILI in 15 hospitals, clinics, and SVP in all health facilities. The Project mainly aims to improve data quality gathering on influenza seasonality and its impact, and seeks to identify outbreak points of time and influenza virus strains circulating in Vietnam. All hospitals involved report weekly the number of outpatients with a respiratory illness who meet the case definition for ILI and the number of patients admitted to hospital with viral-suspected severe respiratory symptoms. PCR-based testing is performed on throat swabs from ILI patients and throat swabs or other respiratory secretions and serum specimens from SVP patients.

DF/DHF Surveillance:

DF/DHF is included in 26 nationally notifiable CDs. DF/DHF is reported from commune to district, provincial and national levels on a weekly and monthly basis. Blood testing for DF/DHF is only available at districts level and above. Nearly half of 63 Provincial Preventive Medicine Centre are able to confirm DF/DHF by applying ELISA/MAC-ELISA testing.

"Weekly" and "Monthly" reporting for Dengue is applied from one level to the next usually via telephones and mail on a standard form. They aggregate numbers of cases and deaths according to age groups and severity. Almost all Dengue cases are investigated and have a blood sample taken. The Dengue Prevention and Control National Project has developed software that allows provincial Preventive Medicine Centres to enter and analyse data, and give out epidemic warnings. At least two concurrent cases in one village are defined as an outbreak. In other words, Dengue reporting is a case-based surveillance system (11).

2.2. Situation of ILI and AI control and prevention

2.2.1. Cambodia

The Highly Pathogenic Avian Influenza (HPAI) outbreaks in Cambodia have severely hit smallholder farmers who are raising the majority of the country's poultry under subsistence conditions or on small-scale commercial poultry farms. The disease has seriously disrupted Cambodia's poultry sector and caused significant economic losses. After the first outbreak appeared to be under control by late 2004, Cambodia has seen new HPAI cases remerging in early 2005 with human cases and fatalities. As of December 2009 there were 9 laboratory confirmed cases of H5N1 avian influenza virus in humans in Cambodia, seven of whom died. The repeated outbreaks are indicative that the disease has become endemic, highlighting the inability of the country's disease surveillance system to control the disease.

In January 2010, there were over 24,000 ILI consultations reported by the 8 sentinel sites in Cambodia. In addition, the reported number of cases of acute respiratory tract infections fluctuated around 60,000 cases per month, with a peak in September (Figure 3). Takeo, Svay Rieng and Siem Reap had much higher rates of acute respiratory tract infections compared to other provinces (12). As of January 2010, there were 553 cases of A/H1N1, six of whom died.

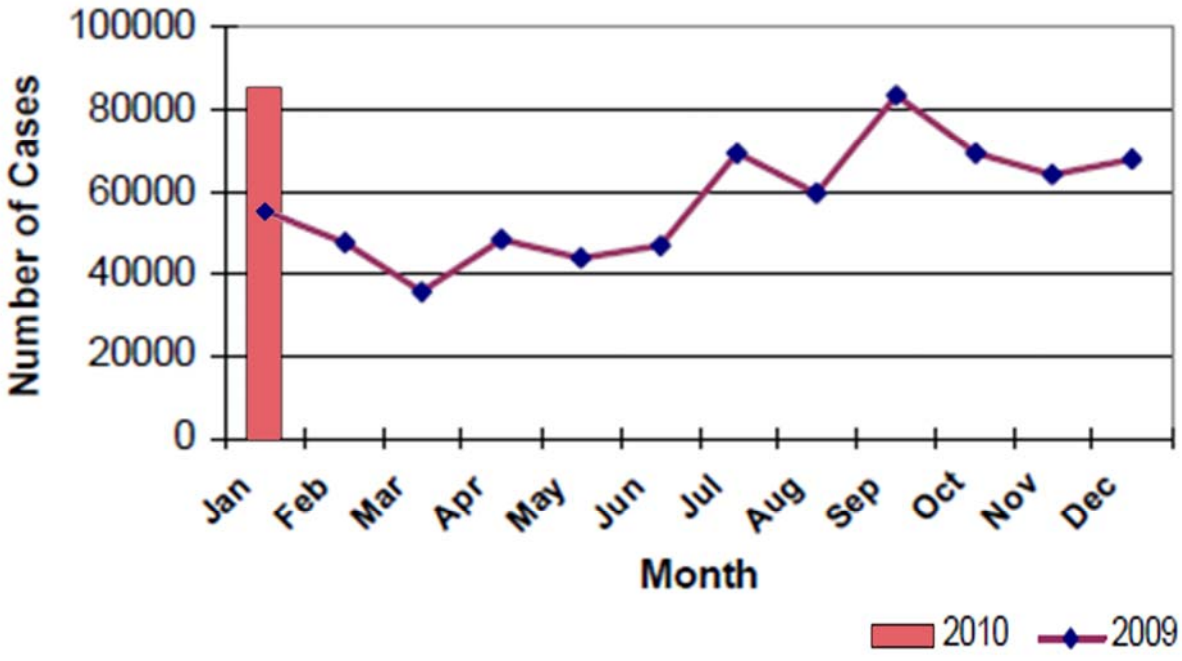


Figure 3: Acute Lower Respiratory Tract Infections All Provinces, 2009 vs 2010

2.2.2. Vietnam

ILI is one of the 26 CDs that required reporting and surveillance at all levels in Vietnam. Statistic data showed that ILI has been prevalent in Vietnam. Historically, in the North of Vietnam, during the pandemic of H3N2 in 1968-1969 the system recorded more than 170,000 cases, of which 3,770 were fatal leading to more than 1,000 cases per 100,000 population and 22 deaths/100,000. In 2006,

sentinel national influenza surveillance was implemented in Vietnam. During January 1, 2006 through December 31, 2007, of 184,521 ILI cases identified at surveillance sites, 11,082 were tested and 2112 (19%) were positive for influenza by PCR (13).

ILI routine surveillance system basically has relied on clinical symptoms of the patients. ILI morbidity was highest among infectious diseases and accounted for about 1,950 cases per 100,000 population in 2008. ILI Morbidity in the High Plateaux region was highest, following by the Northern region and Central areas. Morbidity in the South region was lowest in the country (Figure 4).

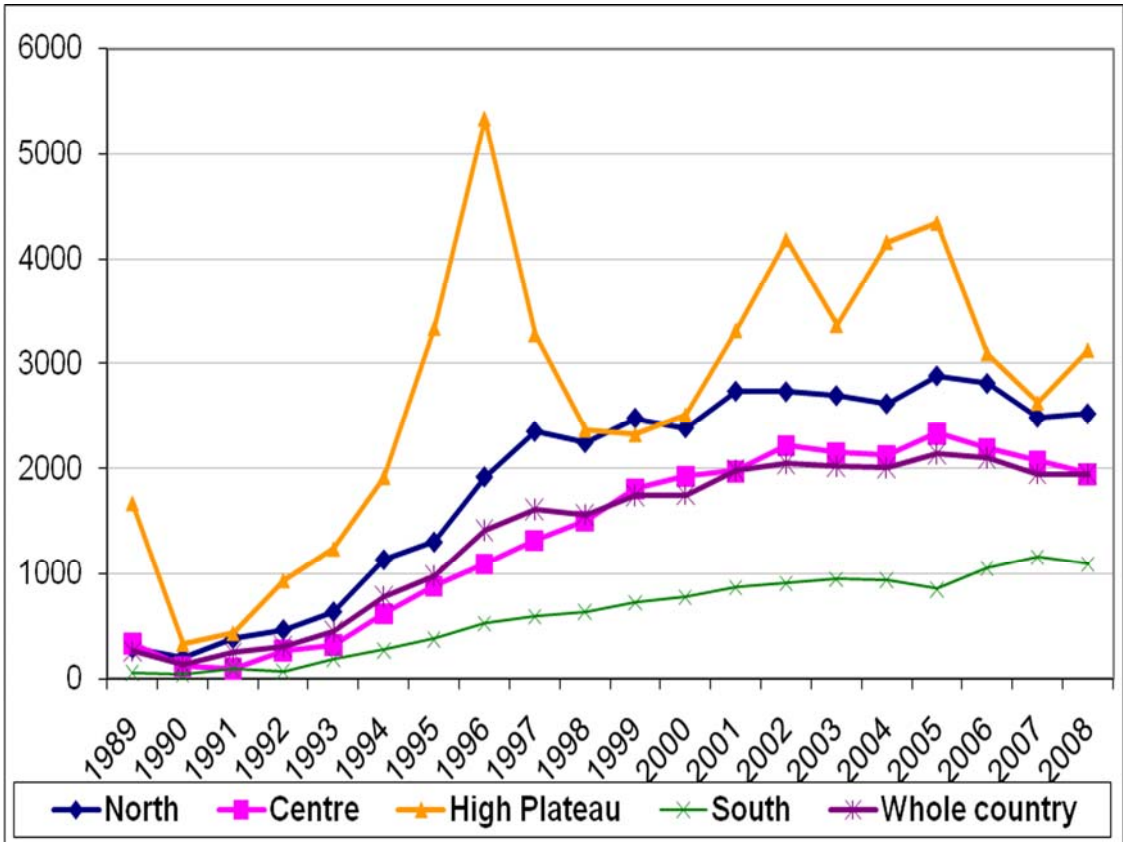


Figure 4: ILI cases per 1000,000 population in Vietnam during 1989 – 2008

Vietnam was one of 54 countries contributing cases to the H1N1 Influenza pandemic. The pandemic was identified on 30th May 2009 with Vietnam recording 11,178 positive cases including 58 deaths in the entire country by 19 February 2009. Although active control activities were taken, since July 2009 the epidemic has spread in communities resulting in an increase of morbidity nationwide especially in workplaces and schools.

In May 2009, the MoH of Vietnam issued Guideline for Control and Surveillance of pandemic (H1N1) 2009 to assist health staff at all levels in dealing with the pandemic. The guideline emphasized carrying out surveillance of suspected cases as follow: clusters with influenza like symptoms or unexplained acute lower respiratory infection; severe respiratory infection in health staff who have contact with respiratory infection patients; sudden increase of deaths or cases of severe respiratory infections in adults and healthy youths and influenza epidemics in community, schools, enterprises and offices. Furthermore, communication and health education activities have been implemented in community to alert the population regarding the pandemic.

2.3. Situation of DF/DHF prevention and control

2.3.1. In Cambodia

In Cambodia, DHF is hyper-endemic with a distinct cyclical pattern; pronounced outbreaks in 2-3 year interval and during the rainy season (Figure 5)(14). The mortality rate is high in children and among the poorest urban rural population. The DF/DHF suspected cases reported from the public health facilities in 2006 increased by more than 80% (n=16649) compared to that in 2005. Of 16,649 suspected cases, 12,281 of them or 73.7% were DF/DHF diagnosed by the hospital-based surveillance system. The incidence rates per 100,000 inhabitants increased from 70.8 in 2005 to 130.3 in 2006 (15). The age group at highest risk was young children (40% of cases are among children 5 to 9 years old in 2008) (16).

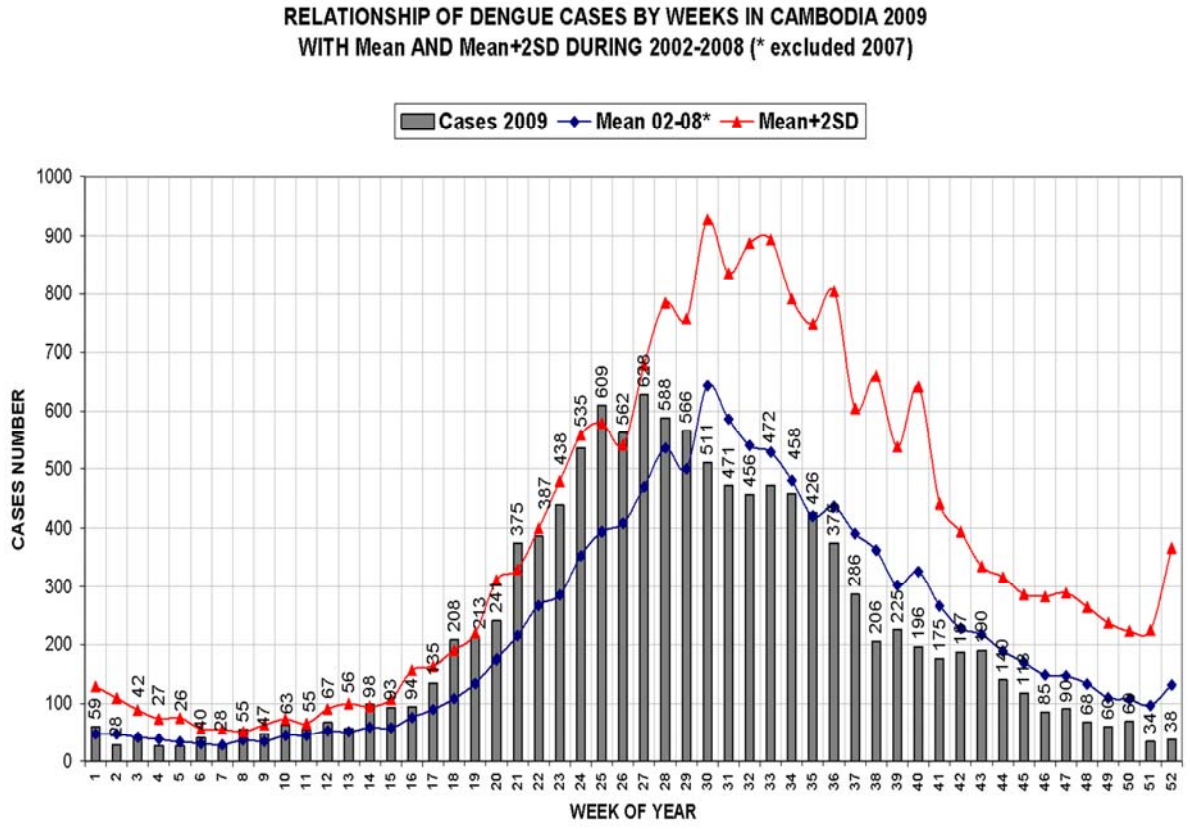


Figure 5: Epidemic curve of DHF fever in Cambodia, 2009

Outbreaks of DF/DHF have occurred in both urban and rural areas of Cambodia. The year 2007 was marked by a severe DHF outbreak affecting 22 of the country's 24 provinces and causing 407 deaths. The highest risk provinces for DHF are those most populated and located along national roads crossing Thailand, Cambodia and Vietnam (Figure 6) (16). DHF control and prevention is undertaken by the National Dengue Control Programme (NDCP) and include Temephos application, ultra low volume spray, and Information Education Communication campaigns.

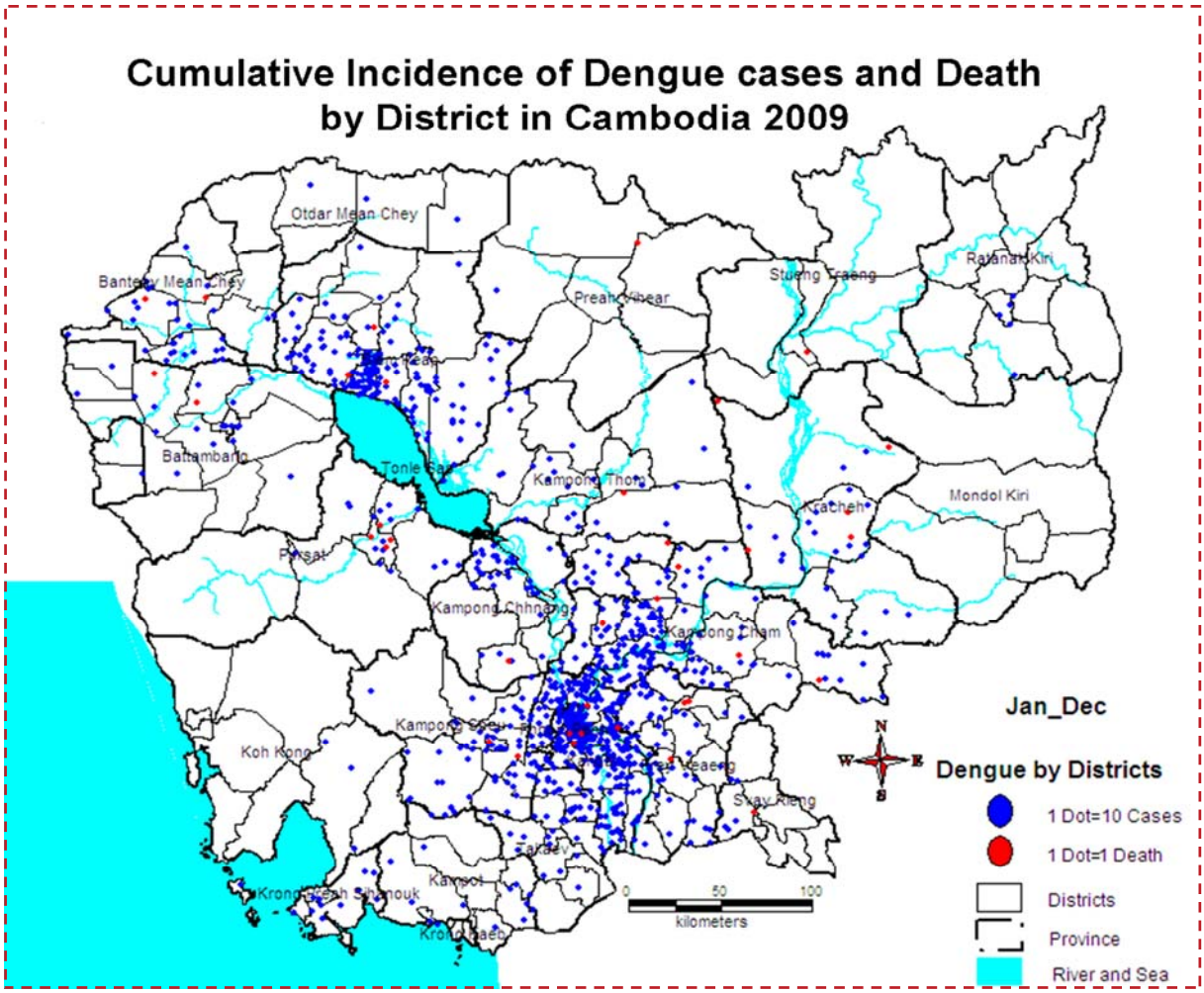


Figure 6: Distribution of Reported DHF cases by districts, Cambodia, 2008

2.3.2- In Vietnam

DF/DHF is one of the ten leading infectious diseases with high mortality and morbidity in the last ten years. Over the past 25 years (from 2006 backward) there were 1.3 million reported dengue cases and 25,000 deaths in Vietnam, and about 70 million people were at risk of dengue. Morbidity and mortality due to DF/DHF has been increasing recently. From 2000 to 2007, the number of patients increased by four-fold compared to 1980-1989. In 2004, there were 78,680 cases including 114 deaths nationwide, of which 90% were children under age 15 in the Mekong Delta provinces. There were more than 25,000 cases of DF recorded in the first half of 2009, including 26 deaths.

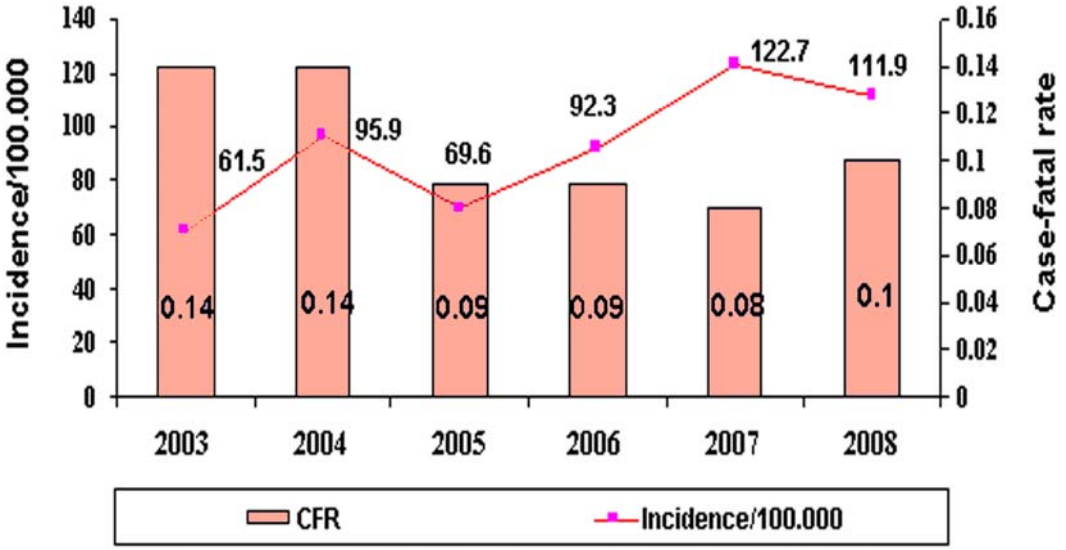


Figure 7: DF/DHF morbidity and mortality by year in Vietnam (17)

The DF/DHF incidences per 100,000 inhabitants were 122.7 and 111.9 in 2007 and 2008, respectively of which the case fatality ratio was 10%. The Southern region experienced the highest rate of the disease, accounting for 75% - 90% of total cases nationally. On average the incidence rate in the Southern provinces was 120 – 500 cases per 100,000 inhabitants, much higher than that of the rest of country while the case fatality ratio in the South provinces was 0.2534 in 2007.

Emerging risk factors for the disease such as climate changes (increasing temperatures) which influence the growth of DF vectors, and the Elnino phenomenon are making the disease more difficult to control etc. Additionally, the habit of keeping water in open tanks is also a major factor in the development of mosquitoes and thus the spread of dengue fever epidemics in the South.

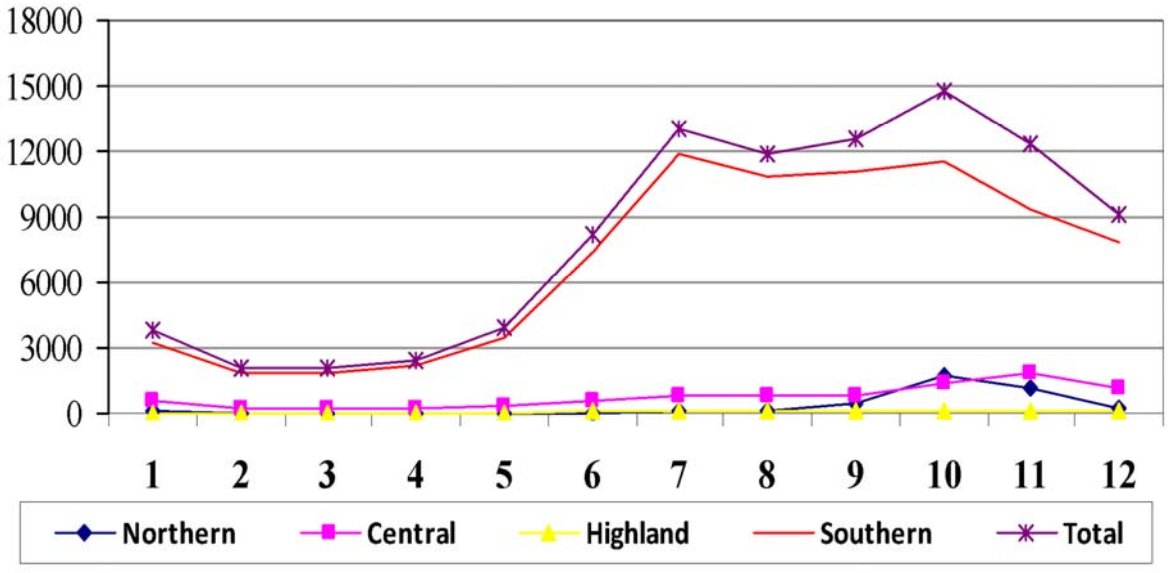


Figure 8: DF/DHF morbidity by regions and by month in Vietnam, 2007

While there is no specific treatment for dengue and a vaccine is still under development treatments to control symptoms are applied. In order to deal with dengue fever, a National Program of Dengue Control and Prevention in Vietnam is being carried out which includes a number of effective measures. Surveillance is one of the key activities which include (1) surveillance of dengue patients by through a standardized report system and sentinel reporting system, (2) serum and virus surveillance and (3) vector surveillance. Moreover, clinical guidelines of dengue treatment, and a model of community mobilization and communication activities are being widely implemented. With great effort, Vietnam has made great strides in achieving its goals of morbidity reduction, mortality reduction and the prevention of epidemics in the country in recent years. During the period 2001-2005, the morbidity rate per 100,000 population was reduced by 80.4%, while the case fatality ratio was reduced by 66.7% in comparison with the period from 1996-2000.

2.4. Lessons learnt from other CBS models

CBS has been defined as the:

> "Detection and reporting of diseases from within the community usually by local people or leaders who have received basic instruction on how to recognize certain conditions" (18); and
>
> "Surveillance where the starting point for notification is from community level, normally reported by a community worker. It can be active (looking for cases) or passive (reporting cases)"(19).

For the purpose of this study, we define CBS as *ongoing and systematic collection of disease and health-related events in the community by trained community members*. We exclude from our definition population surveys and screening activities because they are not ongoing.

A literature search for published materials on CBS during the past years was conducted through Medline and other databases using the following key words: community or village or population-based surveillance, community or village health information, community or lay reporting, village health volunteers, community health workers and community participation. In addition, available unpublished reports on the CBS systems in developing countries were also reviewed.

Not many experiences with CBS systems were found from developing countries on the use of CBS for communicable disease surveillance and lesser for AI surveillance. Case studies selected for this review were limited to models of CBS for communicable diseases including AI and malaria

Case study 1: CARE's CBS models

CARE has implemented, in the past few years, **three CBS models** for AI surveillance in several countries in the Southeast Asia and in Latin America. Active surveillance has focused solely on avian and human influenza (AHI), events-based systems designed to detect and respond to rare events of public health significance more broadly, and integrated surveillance models targeting multiple diseases to improve detection of infectious disease outbreaks (20).

In **Vietnam,** CARE's CBS model was an *active* surveillance approach focusing exclusively on AI(21). A community surveillance network involving volunteers trained and supervised by a "community

surveillance coordinator" - who is a VHW or animal health worker (AHW). The volunteers conducted regular household visits looking for suspected avian influenza cases in poultry and humans. If there was a suspected case, the volunteer immediately reported the suspected case to the surveillance coordinator or the commune avian influenza (AI) committee; if there were no suspected cases, zero reporting was submitted during a monthly meeting between the surveillance coordinator and the volunteer network.

In **Cambodia**, CARE's CBS model was an *event-based surveillance* model. In the model, a village surveillance team (VST) composed of the village chief, the AHWs, and the VHV who was trained to detect and report on events suspected to be linked to AI in poultry and/or humans. The program involved a high profile community event (a drama about the dangers of AI followed by discussion and an introduction of the VST members and their responsibilities), and follow-up village discussions to increase AI awareness and to introduce the VST's role and responsibilities. These activities were designed to increase interactions between surveillance volunteers and the community.

In Nicaragua CARE developed an event-based surveillance with the aim of establishing clear reporting mechanisms, defining triggers for reporting, and ensuring a broad understanding and awareness of those triggers. These aims were accomplished through training on triggers and reporting mechanisms to public and private health workers, pharmacists, coroners, traditional healers, religious leaders, community leaders, veterinarians, and other animal health and husbandry professionals.

In **Lao PDR**, CARE's CBS model was designed for early detection of outbreaks for multiple diseases at the community level. The system was based on 4-7 village volunteer teams (VVT) members to report single cases, clusters, and unusual numbers of significant events to the village chief, zonal level and district level for action. Reports were based on recognition of symptoms and reporting of suspected cases. Tally forms for VVTs were simple and picture-based, designed for low literacy volunteers. Different approaches were used to collect data: Volunteers' made regular visits to household in peri-urban areas; and small gatherings and community events to discuss health issues and to conduct surveillance activities in rural areas. Different reporting forms were used at different levels: a "pink" form which included basic case details represented in picture form was developed for VVT members to use when they notified authorities of any suspected outbreak; a "green" form that noted the total number of cases for the village chief; and a "white" form that was used to verify an outbreak occurrence at the zonal-level to report to the district for response.

From the recent implementation of the three CARE CBS models in the region, it was found, among all, that (i) CBS systems could be highly sensitive in increasing sensitivity but also costly and very demanding for local governments to investigate suspected cases, and (ii) sustaining volunteer effort was an important aspect in designing a locally appropriate CBS model. In addition, CBS in principle could be successfully used for disease surveillance and outbreak detection in developing countries, but there was no single CBS model for disease surveillance including AI surveillance appropriate for all countries. CBS models need to be adapted to each country's specific context.

<u>Case study 2:</u> Community-based surveillance system (CBSS) in Rural Cambodia

A community-based surveillance system was developed and implemented in seven border communes of Cambodia in the early 2000 (22). The system aimed to provide timely and representative information on major health problems and life events that would permit rapid and

effective control of outbreaks and communicable diseases in rural communities. In the system, lay people were trained as VHVs to report suspected outbreaks of important infectious diseases, and vital events occurring in their communities to local health staff who analyzed the data and gave feedback to the volunteers during their monthly meetings.

An evaluation conducted one year after implementation of the community-based surveillance system began found that the system was able to detect outbreaks early, regularly monitor communicable disease trends, and to continuously provide updated information on pregnancies, births and deaths in the rural areas. The sensitivity and specificity of case reporting by VHVs were found to be quite high. In addition, the community-based surveillance system triggered effective responses from both formal health staff and VHVs in outbreak and disease control and prevention (23).

The results suggest that a community-based surveillance system can successfully fill the gaps of the current health facility-based disease surveillance system in the rapid detection of outbreaks, in the effective monitoring of communicable diseases, and in the notification of vital events in rural Cambodia. Empowered local people and health staff can accurately report, analyze and act upon significant health problems in their community within a surveillance system they develop own and operate. The community-based surveillance system could easily be integrated with the current disease surveillance system. Its replication or adaptation for use in other rural areas in Cambodia and in other developing countries would be likely feasible and beneficial, as well as cost-effective.

Case study 3: Child Survival Project in Kean Svay District, Cambodia

A CBS team has operated since 1997 in Kean Svay District, Cambodia(24), to monitor interventions undertaken by the Kean Svay Child Survival project (KSCSP), which include immunizations, vitamin A supplementation, birth spacing, and management of childhood illnesses. The system involves two volunteers per village to collect and report data on vital events and on major infectious diseases namely measles, Dengue Hemorrhagic Fever (DHF), and severe diarrhea. Overall, there are 96 VHVs operating in the 46 villages and 12 communes of the District, covering a population of about 150,000 inhabitants. These VHVs have all been literate, mostly female and relatively young persons.

In the system, vital events and health interventions are recorded on village registers, which are aggregated into commune registers and sent monthly to the KSCSP office and health centre. Data on targeted diseases are written down on paper forms and sent to the project office within twenty-four hours of notification. Consolidated data are reported by the project team leader to the health centre and upper levels of the health system every month. Feedback is given to village volunteers during a one-day monthly training at the project office. Responses to the information are immediate and comprehensive, including disease and death investigations as well as outbreak detection and control.

Village volunteers received bicycles, per diem for their monthly training, as well as occasional presents and rewards. None of them dropped out during the first four years of the system's operation. The surveillance system substantially helped the project to achieve its objectives within a short period. However, involvement of local health staff in data compilation, analysis and use has been limited and the system may not be sustained once financial and technical support from the NGO ceases.

Case study 4: Community-based Malaria Control Programme in the Philippines

The CBS system in the Philippines was based on two types of village health volunteers: Barangay Health Workers (BHWs) enrolled by the Government and Community Health Workers supported by Non Government Organizations (NGOs) (25-27). BHWs, who formed the largest group of VHVs in the Philippines, were formally trained throughout the country between 1981-1985. They received initially three to five days training followed by periodic in-service training provided by Public Health Midwife and Malaria Control Service personnel. Numbering at least two per village, volunteers assisted malaria control in their village including symptomatic case finding, collection of blood smears, presumptive malaria therapy, registration of patients, referral of cases, and health education. In addition, they performed other tasks including nutrition programme activities, maternal and child health services, and environmental sanitation. They received weekly supervision and backup support from Primary Health Midwife.

In Quezon province, volunteers detected up to 24% of reported cases, collected up to 16% of all submitted blood smear slides, and treated up to 10% of cases. However, it appears that BHWs did not fully contribute to malaria control activities in the country due to inadequate support including logistics and community support.

.

CHAPTER 3

AIM AND OBJECTIVES

Aim of the study

To timely detect and report AI, ILI, and DF/DHF outbreaks in the rural area through active community participation.

Objectives of the study

To develop a *sustainable model* of CBS for *early detection and reporting of all* AI, ILI, and DF/DHF outbreaks along the Cambodia-Vietnam border.

CHAPTER 4

METHODOLOGY

4.1. Study Design

The study utilized an intervention design that consisted of three stages: development, pilot testing, and evaluation of a community-based surveillance system for *early detection and reporting of* AI, ILI, and DHF outbreaks along the Cambodia-Vietnam border.

4.2. Method for the development of the CBS

A stepwise approach to developing the border CBS was highly p*articipatory*, with active involvement of all major stakeholders, taking into account lessons learned from other CBS models.

Step 1: Design of CBS models

To design models of CBS for AI, ILI and DHF surveillance adapted to the Cambodia and Vietnam context, a workshop was held in Hanoi, Vietnam from 21 to 22 July 2009 where Cambodia and Vietnam researchers discussed and (i) adopted common case definitions for AI, ILI and DHF; and (ii) defined country-specific data collection and reporting methods, as well as the flow of information

Step 2: Consultation with local community

To explore the feasibility of CBS in the selected pilot districts, and to gain agreement from each local community on the following: (1) aims and objectives of the CBS; (2) procedures for data collection and reporting; and (3) methods for data analysis and information feedback.

In **Cambodia**, a meeting between researchers and local staff (Commune & District level) was held from 3 to 7 August 2009 in Memot district.

In **Vietnam**, such a meeting was conducted in Tan Hong district from 12 to 13 August 2009. During

these meetings participants were introduced to the CBS model including objectives, processes and procedures. The participants also discussed and agreed upon the need, usefulness and feasibility of the proposed CBS system in border areas. The draft CBS system for each country's project was then reviewed, refined and eventually finalized for implementation.

Step 3: Development of recording and reporting forms

Following discussions with local staff, recording and reporting forms were developed by researchers to gather necessary information required by the system.

In **Cambodia**, forms included (i) a monthly recording and reporting form, (ii) a weekly reporting form, (iii) an immediate outbreak reporting form, (iv) aggregation forms (commune register), and (v) investigation forms (See Appendix A).

In **Vietnam,** the following forms were established: (1) Form 01A: List of ILI, SVP and DF/DHF; (2) Form 02A: Weekly report; (3) Form 02B. Monthly report; (4) Form 02C: Cluster report; (5) Form 07A: Activity report of VHV; (6) Form 7B. VHV's plan; (7) Form C: Volunteer, health worker and private sector report checklist; (8) Form 7D: Volunteer, health worker and private sector activity checklist (See Appendix B).

4.3. Method for the implementation of the CBS

The system was pilot tested in Memot District, Kampong Cham province, Cambodia and in Tan Hong District, Dong Thap province, Vietnam. The implementation of the CBS was preceded by a training session with local staff and community leaders. The system was operated by local staff and community participants, with close supportive supervision of the district, provincial staff and researchers. These oversight operations were conducted almost every month.

4.4. Method for the evaluation of the system

The evaluation of the system was aimed at assessing how well the system can detect and report outbreaks of the selected disease/syndromes. Criteria for the evaluation included established surveillance system attributes including simplicity, flexibility, acceptability, representativeness, timeliness, sensitivity, specificity, and predictive value positive of the system. Evaluation methods were conducted differently between Cambodia and Vietnam.

In Cambodia:

Data reported by VHVs were compared with those recorded by commune health centres in order to determine the usefulness of the system. In addition, a structured interview with VHVs and local health staff involved in the implementation of the system was carried out at the completion of the research project in order to assess the system attributes. The interview was carried out by the researchers using a structured questionnaire (See Appendix C).

EpiInfo (version 3.5) was used for data entry, validation and analysis. Precision was measured using 95% level of confidence limits for various point estimates.

In Vietnam:

Evaluation methods employed were (1) comparing data before and after implementation of the model upon data collected by the CBSS and pulling data from the formal system, (2) interviewing health staff who were involved in the system and comparing their attitudes, knowledge, and practice before and after implementation of the model and their judgment of the model as well. Both qualitative and quantitative approaches were used i.e structured questionnaires, in-depth interview and focus-group discussion.

A data entry system was created to facilitate organization, security, quality control, maintenance, and analysis of the study database. The study database was constructed on the EpiInfo 3.2 platform and analyzed in SPSS 11.0.

CHAPTER 5

IMPLEMENTATION OF THE CBS FOR AI/ILI/DF/DHF SURVEILLANCE

This study was jointly developed by the Cambodia University of Health Sciences (UHS-C); the National Centre for Parasitology, Entomology and Malaria Control; the National Institute of Public Health; the Vietnam National Institute of Hygiene and Epidemiology (NIHE); and Tay Nguyen Institute of Hygiene and Epidemiology. The study was implemented on the Cambodian side from September to December 2009; and from September 2009 to January 2010 on the Vietnamese side. The study was carried out by researchers from Universities and Institutes of both countries, with technical and financial support from the RCU of the ADB Great Mekong Sub-region Communicable Disease Control Project.

5.1. Population under surveillance

Figure 9: Map of the location of the study area in Cambodia and Vietnam

Two nearby districts along the Cambodia-Vietnam border were selected for the pilot testing of the system (see figure 9): one in Cambodia (Memot district, in Kampong Cham province) and one in Vietnam (Tan Hong district in Dong Thap province).

The majority of the populations living in these communes are farmers, and many of them own their rice fields or fruit gardens far from the villages, at the forest rim. In addition, some of the population are fisherman. Population movements into the forest and crossing the border with neighbouring countries are

high, which puts these villagers at increased risk of communicable diseases outbreaks. The two districts are comprised of 213,300 inhabitants living in 211 villages, 134,013 of whom are from Memot district and 79,300 are from Tan Hong.

In **Cambodia,** the study was implemented from July to December 2009 in **Memot district.** Memot is one of the 10 districts in **Kampong Cham province**. The district shares its border with the Vietnamese provinces of Binh Phuoc and Tay Ninh. The district has an area of 1601.30 square kilometres and had a population of 134,013 in 2009. It is divided into 14 communes and 174 villages. The district has a referral hospital (RH) (28) and 10 commune health centres (HC) (Figure 10). The hospital and HCs are managed by an office known as Operational District (OD) (29).

Each HC covers a population around 10,000 inhabitants and is staffed with three to six nurses and midwives (Table 1). HCs provide a basic integrated package of health care services, which referred to as the Minimum Package of Activities in Cambodia. These services were comprised of basic preventive, promotional and curative care including prenatal care, immunization, birth spacing, prevention of micronutrient malnutrition, and treatment of acute respiratory infections and diarrhoea. The RH, for its part, receives cases referred from the HCs and manages complicated cases, operations, serious illnesses requiring admission, inpatients, etc. These services are referred to as the Complementary Package of Activities (22). HCs participate in the national disease surveillance system through the weekly compilation and reporting of priority epidemic-prone diseases to the Memot OD. This system latter combines data from all HCs with those from the RH and sends them to the provincial Health Department (PHD) on a weekly basis. In the case of a report of a suspected outbreak, HCs are responsible for confirming the outbreak through a site visit, whereas the OD is responsible for outbreak investigation, with support from the PHD and the Department of Communicable Disease Control of the Ministry of Health (CDC/MoH).

Figure 10: Map of Memot district with location of health facilities

Table 1: List of HCs in Memot OD with respective population coverage and staff

	Name of the HC	Population Covered (as of mid-2009)	Number of health staff		
			Total	Nurses	Midwives
1	Dar	13,392	6	5	**1**
2	Samrong	15,030	5	4	**1**
3	Kamporn	14,607	4	3	**1**
4	Memot	13,017	5	3	**2**
5	Choam Treak	16,005	5	4	**1**
6	Thmor Totueng	14,913	5	3	**2**
7	Sla	11,385	4	2	**2**
8	Chan Moul	11,935	6	4	**2**
9	Rumchek	14,356	3	2	**1**
10	Choam Kravien	9,373	5	3	**2**
Total		**134,013**	**48**	**33**	**15**

In **Vietnam,** the study was implemented in **Tan Hong district**, which is located in **Dong Thap province** and bordered with Prey Veng province of Cambodia. The district consists of 9 communes and 38 villages. The study targeted all health facilities and subjects in catchments' areas that are supposed to have first contact with sick population in the study district. Accordingly, the research included one district hospital, 9 commune health centers, and 38 villages within 9 communes, 19 pharmacies and 16 private clinics.

In Tan Hong district, each commune health center has at least one medical doctor and several doctor assistants (Table 2).

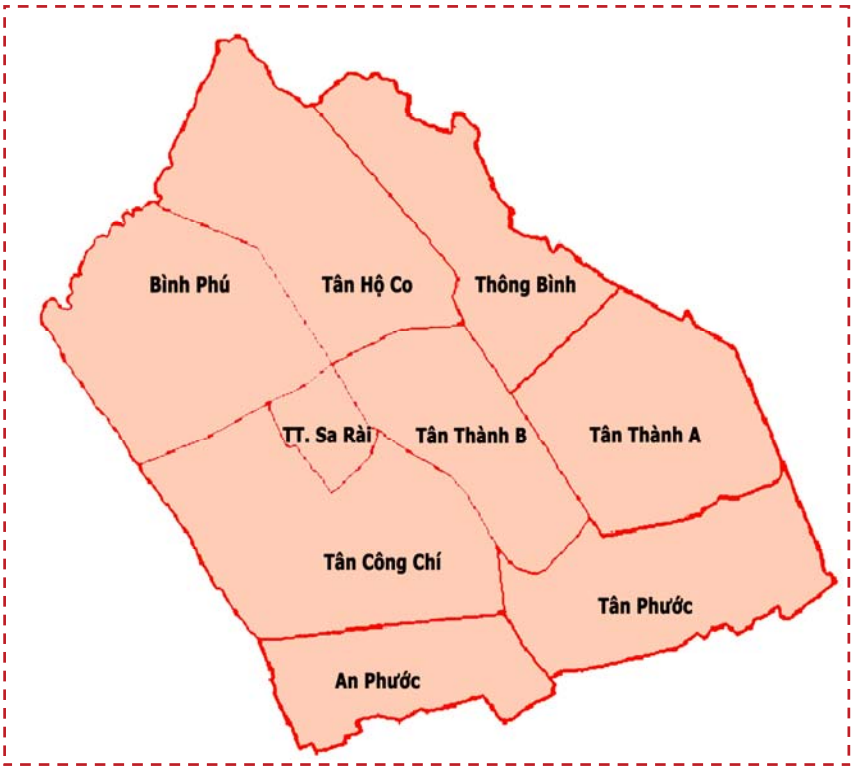


Figure 11: Map of Tan Hong district

Table 2: List of HCs in Tan Hong with respective population coverage and staff

Health Facility	Population	HWs in HF				VHVs
		Doctor	Doctor Assistant	Nurse	Other	
DHC		7	13	4	13	
Sa Rai	9584	1	2	1	1	**8**
Binh Phu	10543	1	4	2	3	**8**
Tan Ho Co	10585	1	2	3	3	**8**
Thong Binh	12484	1	5	2	3	**10**
Tan Thanh A	9989	1	2	4	2	**12**
Tan Thanh B	7771	1	2	1	2	**7**
Tan Phuoc	11933	1	4	2	3	**6**
An Phuoc	6298	1	4	0	2	**8**
Tan Cong Chi	11585	1	8	2	3	**12**
Total	**90772**	**16**	**46**	**21**	**35**	**79**

CHCs in Vietnam provide Primary Health Care, which covers family planning and population, child health care, target national programs and case investigation if an outbreak occurs. Regarding reporting involvement of CHCs in Vietnam, each CHC sends a report to the District Health Centre on a weekly and monthly basis, which then in turn, is referred to Provincial Centre of Preventive Medicine. Additionally, CHCs must follow the regulation of immediate report as described above.

5.2. Events and diseases under surveillance

The CBS system piloted in the two border districts of Cambodia and Vietnam was intended to detect and report suspected outbreaks of AI/ILI and DF/DHF in the community in a timely manner to ensure prompt investigations and effective responses by health authorities at the district and provincial levels.

5.2.1. Case detection

People from the local community (village) were required to report on a regular basis (weekly in Cambodia; weekly and monthly in Vietnam) the following syndromes/ suspected diseases that occurred in their community:

Influenza-like Illness

-Sudden onset of fever (>38.5^{0}C Cambodia and >38^{0}C in Vietnam) and

-Cough or sore throat, or running nose and

-No other cause identified for the disease

Suspected Avian Influenza/ Severe Viral Pneumonia

-Sudden onset of fever (> 38.5^{0}C Cambodia and >38^{0}C in Vietnam), and

-Cough or sore throat or running nose, and

-Breathing difficulties, and

-Recent contact with sick or dead poultry

Suspected Dengue Hemorrhagic Fever

-Sudden onset of fever (> 38.5^{0}C Cambodia and >38^{0}C in Vietnam) that lasts about 2 to 7 days, and

-Hemorrhagic tendency including: spontaneous bruising and/or macular rash and/or bleeding from mucosa, gingival, injection sites, and/or vomiting blood and/or bloody stool, and

- Headache, pain in muscle/joint (Vietnam only).

In Vietnam, not only VHVs but also all health workers e.g. commune health workers (CHWs), clinicians in district hospital, pharmacists and private clinics who have first contact with sick population were required to report all identified cases. In addition to using standard case definitions, these health care workers were instructed to follow the ILI/AI and DF/DHF screening and detecting procedure as described in Figure 12.

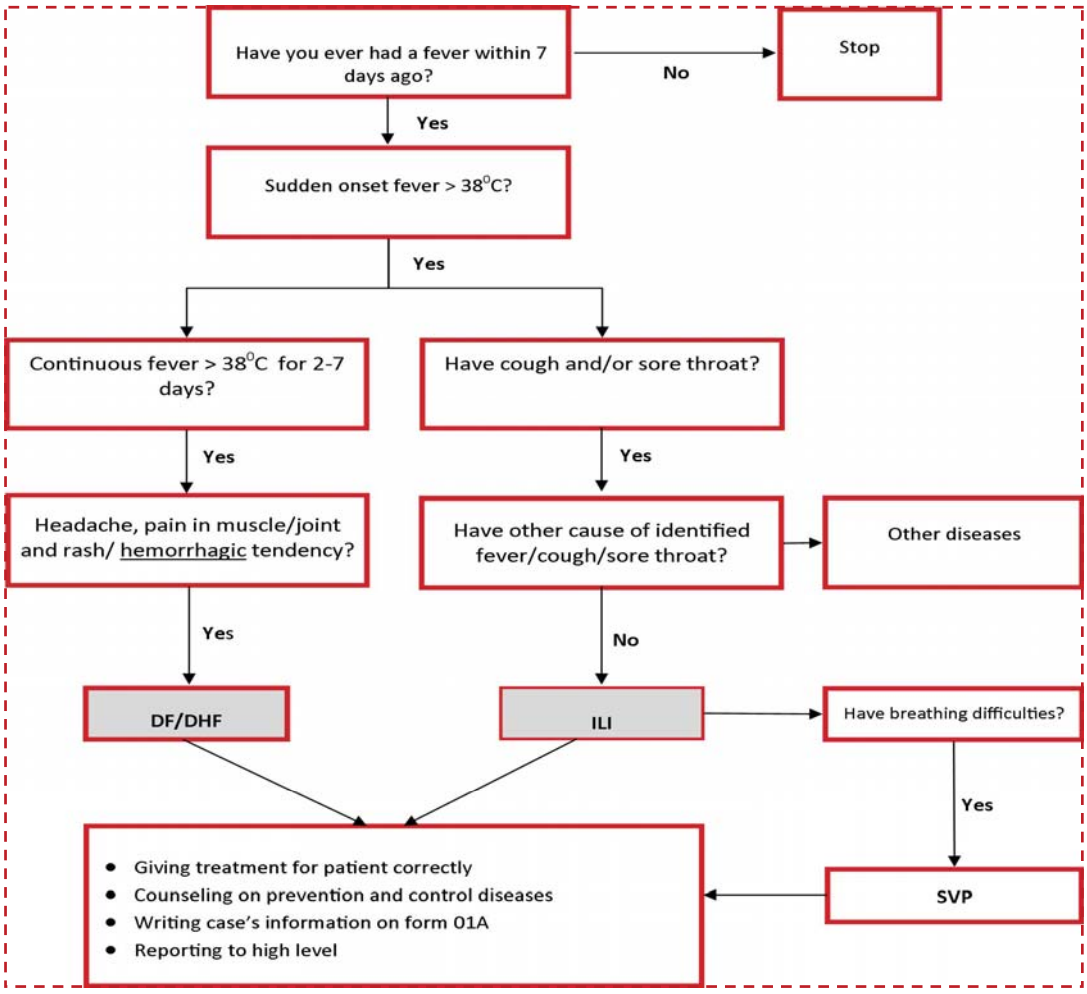


Figure 12: Procedure of screening and detecting the ILI/ AI and DF/DHF in Vietnam

5.2.2. Event detection

In addition to the regular case reporting, people from the local community (village) were required to report within 24 hours the following events they noticed in their community:

In Cambodia:

Immediate report (by phone call) to relevant health center for any clustering in a given village within a week of five or more cases of ILI or five or more suspected cases of AI or DHF.

In Vietnam:

Immediate report by phone call or in-person to relevant commune health centre (CHC) (with VHVs) or to District Health Centre (with CHC) when identifying any grouping of cases fitting the following cluster definitions:

- Suspected ILI cluster: Two or more cases of ILI in a given village within a week and having contact among two cases within 14 days.
- Suspected Avian Influenza/ Severe Viral Pneumonia cluster: Two or more suspected cases or deaths of unclear cause respiratory diseases
- Suspected Dengue Hemorrhagic Fever cluster: Two or more cases of DF/DHF in a given village within a week

Cases detected by VHVs were required to either report or refer to CHC within a day for verification.

5.3. Reporting mean and information flow

Reporting means and information flow in the CBS for AI/ILI, DF/DHF surveillance was different between Cambodia and Vietnam.

5.3.1. Cambodia

The **telephone**, available in all villages of the district, was selected as the principal means for data communication. VHVs and HC staff agreed to use their own mobile phones for data reporting and collection, with calling costs covered by the project.

A **flow of information** within the system had been adopted based upon lessons learned through experiences from other countries. It was intended to (1) allow participation of local health staff and VHVs at different stages of the system; (2) enable local use of data; (3) detect outbreaks quickly; (4) facilitate monitoring of follow-up action; and (5) provide instant feedback to participants. Figure 13 depict the flow of information of the CBS implemented in Memot, in which:

1. VHVs (two to three per village) were expected to undertake household visits and record ILI and suspected AI and DHF cases within their village by using a form specially designed for this purpose (See Appendix A). They were also requested to attend a monthly feedback meeting at the HC at the end of each calendar month.

2. HC staff (two per HC) were assigned to make a weekly call to VHVs in each village under

the HC's catchments' area in order to collect ILI cases and suspected cases of AI and DHF. They were also required to compile data collected from all VHVs within a month and to provide a graphical presentation of the information to all VHVs at their monthly feedback meeting with the VHVs .

3. VHVs who noticed any clustering (5 or more cases within a week) of cases of ILI or any clustering of suspected cases of AI or DHF in their village, and any death related to these syndromes/diseases had to call the HC immediately (i.e. within 24 hours).

Outbreak confirmation by HC and outbreak investigation and response by OD and upper level of health authorities were part of routine duties included in the formal disease surveillance system process.

Forms were provided to VHVs and HC staff to collect and record data during the implementation of the CBS system in Memot and included (i) Monthly Recording and Reporting Form, (ii) Weekly Reporting Form, (iii) Immediate Reporting Form, (iv) Aggregation Forms (HC register), and (v) HC Investigation Forms (See Appendix A).

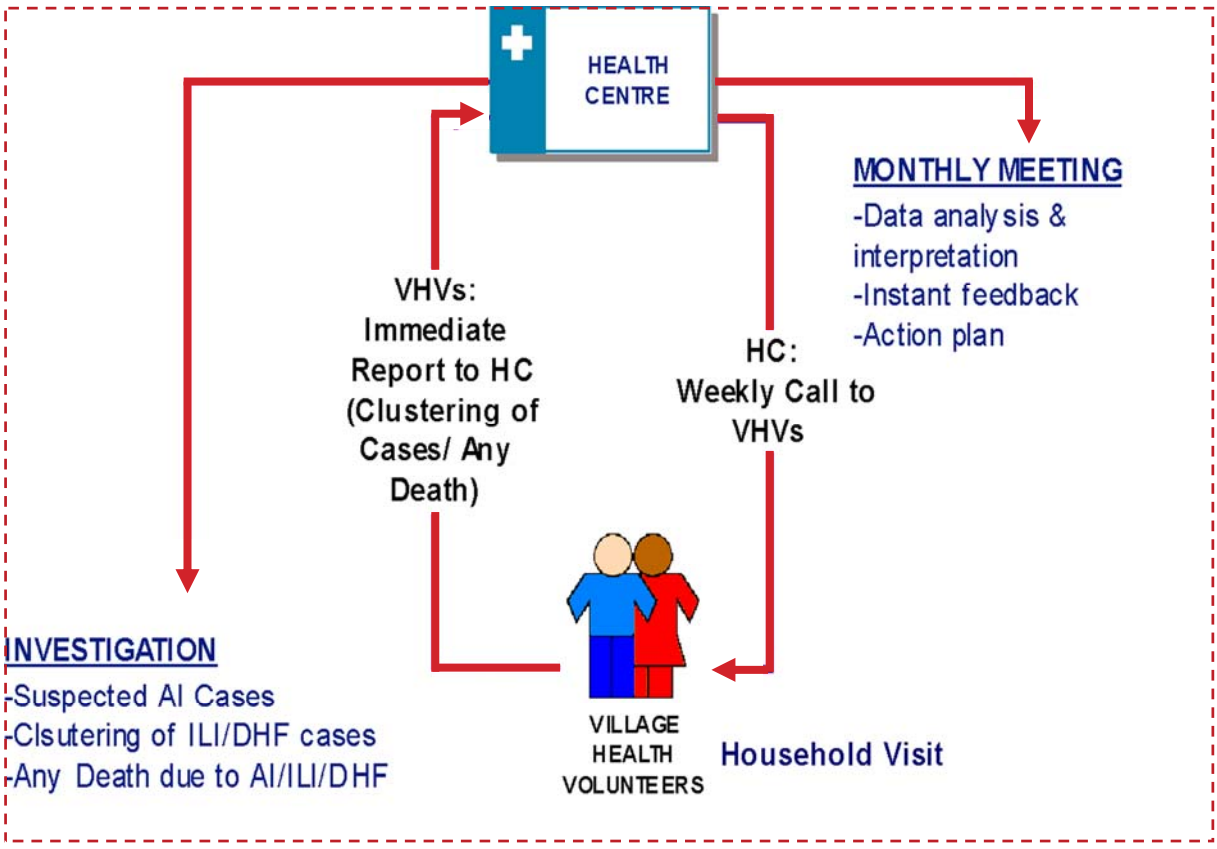


Figure 13: Flow of information of the CBS in Memot district

5.3.2. Vietnam

Case detection was assigned to (i) VHVs who conducted household visits, (ii) CHWs who examined patients who came to CHCs, (iii) private doctors who examined patients in private clinics, (iv) pharmacists who asked patients who came to buy medicines and (v) clinicians in out patients departments (OPD) of district hospitals who also examined patients. Information was obtained from patients and households using structured forms.

Any case detected by VHVs and pharmacists was reported to the CHC within a day for **verification and confirmation**. Additionally, once a week, the VHVs aggregated all cases in a form which was sent to the CHCs even if no cases were detected in a given week. This "zero report" was to be sent to the CHC every Monday morning.

All cases reported by VHVs and pharmacists, which were verified by CHCs, private doctors and cases detected by the CHCs were aggregated and reported to the District Health Centre.

Cases detected by the OPD of a district hospital were required to be reported to the District Health Centre in order to facilitate the aggregation of these cases with cases reported from CHCs. The aggregated reports were in turn sent to the Provincial Centre of Preventive Medicine as part of the regular reporting flow (Figure 14).

Reporting was carried out on immediate, weekly and monthly schedules as described earlier.

Each VHV was assigned to visit at least 100 to 160 households a month. In addition to identifying cases during the visit, they also provided communication on disease prevention and conducted follow-up of cases and other health events reported by CHCs. On average, one CHC oversees about 8-12 VHVs, 2 private clinics and 2 pharmacies. In short, each CHC had responsibilities for (i) verifying cases reported by VHVs and pharmacies, (ii) detecting cases, (iii) aggregating cases and reporting to the district health Centre. Furthermore, each CHC was required to hold monthly meeting with all VHVs, pharmacies and private clinics in the given commune to analyze the situation, to give feedback to VHVs pharmacies and private clinics and to encourage them to maintain active involvement in the surveillance system.

The District Health Centers collected data weekly and monthly from 9 CHCs and from the district hospital. The District Health Center is responsible for confirming cases, analyzing data, giving feedback to the local areas, and responding to outbreaks occurring at the local level and reporting the results of these investigations to the higher levels of authority. DHC was also responsible for monitoring the system at the lower levels.

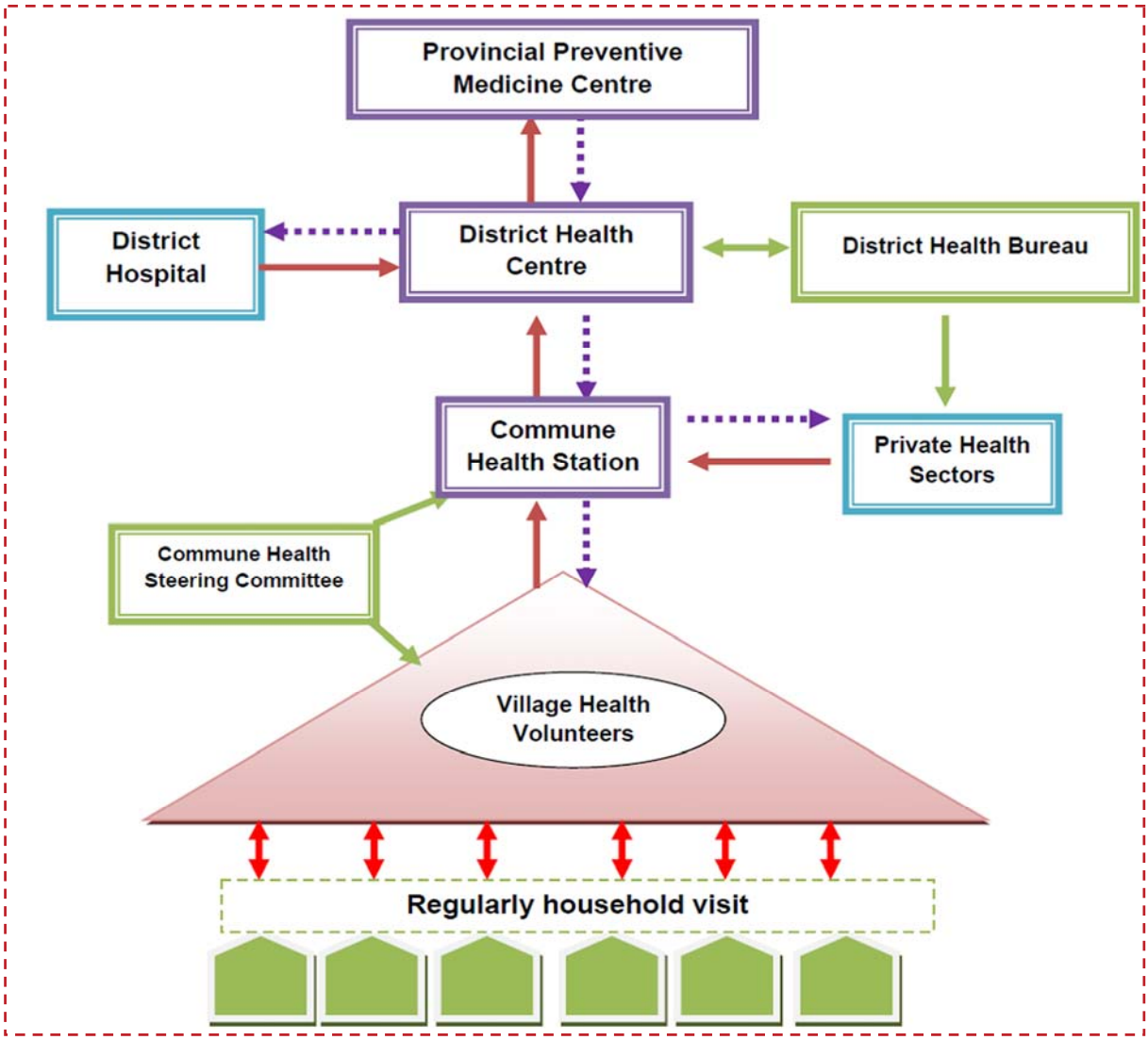


Figure 14: Reporting flow in Tan Hong district, Dong Thap province

5.4. Selection and training of VHVs and health staff

In **Memot district**, the CBS enrolled *existing VHVs* elected by the community which ranged from two to three VHVs per village, depending on the population size of the village and available VHVs. District and HC staffs involved in the CBS were selected by the Director of the OD. Overall there were 4 OD staff, 20 HC staffs and 357 VHVs enrolled in the CBS in Memot district (Table 3). Health staff received a 2-day training prior to the implementation of the CBS. The training was held at the Memot OD and given by the research team. It included case definition, information mean and flow, data collection, recording and aggregation, and techniques for data analysis, oral presentation, and interpretation.

Table 3: List of HC with number of staff and VHVs trained in Memot district, Sep-Dec 2009

No.	Health Centre (name)	Number of HC staff	Number of VHVs
1	Dar	2	**29**
2	Samrong	2	**37**
3	Kamporn	2	**28**
4	Memot	2	**26**
5	Choam Treak	2	**54**
6	Thmor Totueng	2	**45**
7	Sla	2	**31**
8	Chan Moul	2	**42**
9	Rumchek	2	**29**
10	Choam Kravien	2	**37**
Total		**20**	**357**

Trained HC staff subsequently conducted a one-day VHVs training at their respective HC, under the supervision of the research team members and OD staff. VHVs' training focused on the identification and reporting of suspected cases and outbreak of suspected AI and DHF (Figure 15).

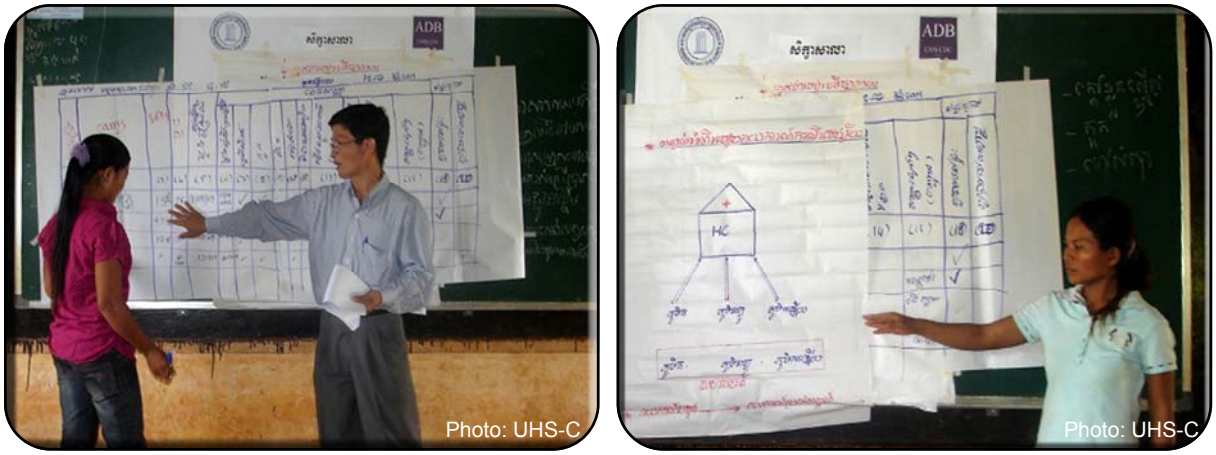


Figure 15: Training of VHVs, Memot district, 2009

In **Tan Hong district**, the research project involved 2 doctors at out-patient Department of district hospital, 18 Commune health workers at 9 commune health Centres, 79 VHVs in 38 villages within 9 communes, 19 pharmacies and 16 private clinics (Table 4).

Table 4: Training and supervision provided to staff

Output indicators	Number	Percentage
CHCs have HWs trained	9/9	**100**
Private clinic have HWs trained	16/16	**100**
Villages have VHVs trained	79/79	**100**
Pharmacies have staff trained	19/62	**30.6**
CHCs equipped with surveillance tools (logbooks, forms…)	9/9	**100**
VHVs equipped with equipment and materials	79/79	**100**
HWs received supervision	49/52	**94.2**
VHVs received supervision	68/71	**95.8**

Figure 16: Training of VHVs and other Volunteers, Tan Hong District, 2009

CHAPTER 6

RESULTS

This chapter presents the main findings of the study that was implemented from September to December 2009 in Memot district, Cambodia, and from September 2009 to January 2010 in Tan Hong district, Vietnam.

6.1. Data collection and reporting

Cambodia

In Memot district, during the period of the project implementation, phone calls were used to collect and report data by VHVs and HC staff, with regular monthly meetings used to feedback the information to all participants.

There were a total of 704 phone calls made by staff of the 10 HC to VHVs in their catchment area to collect data on a weekly basis. In addition, VHVs had made 17 phone calls to HC staff to report suspected outbreaks.

In addition, there were 40 feedback meetings conducted at the end of each month by each and every HC in the district during the 4-month of the project implementation in Memot district. The proportion of VHVs who attended the meeting ranged from 94 to 100 percent (Table 5).

Table 5: Monthly data collection, report and feedback of the CBS System, Sep-Dec 2009

Activities		Description	Month				Total
			Sep	Oct	Nov	Dec	
1	Data collection and reporting	Weekly call by staff	176	176	176	176	**704**
		Immediate report by VHVs	0	8	5	4	**17**
2	Monthly feed-back meetings	# Meetings (HC)	10	10	10	10	**40**
		# Participants (VHVs) n= 252	352 (100.0%)	351 (99.7%)	347 (98.6%)	330 (93.8%)	**(93.8-100.0%)**

During the meeting, HC staff presented aggregated data from all villages covered by the HC, checked with the participants for data completeness and accuracy, and then discussed the information drawn from the data. The Meeting was usually followed by decision on action to be taken by all stakeholders, and by a health education session for VHVs on communicable disease recognition and prevention (Figure 17).

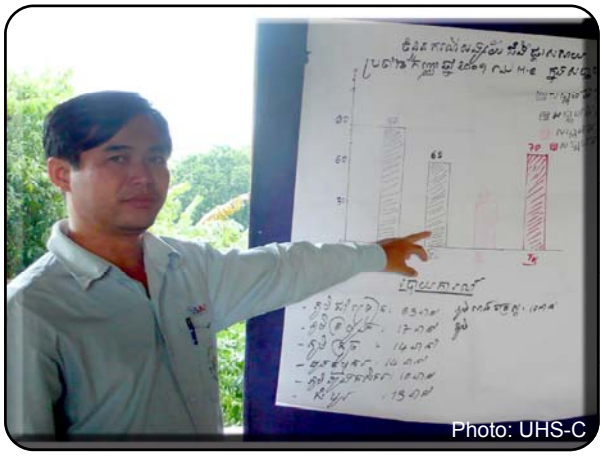


Figure 17: Data presentation by HC staff during a feedback meeting, Memot district, 2009

An interview with VHVs at the end of the project revealed that 95% of them reported conducting household visits to collect data for the weekly report to HC. The survey also found that 99% of VHVs reported collecting data for the CBS system at least once a week (Table 6).

Table 6: Reported method and frequency of data collection, Survey of VHVs

Data collection	Description	Number	Percents
Method (n=325)	House-to-house visits	310	**95.4**
	Reports from villagers	83	**25.5**
Frequency of house-to-house visits (n=310)	Daily	54	**17.4**
	Twice a week	26	**12.4**
	Weekly	234	**75.5**
	Monthly	4	**1.3**

Vietnam

In Vietnam, monthly visits by researchers were conducted to monitor and document any progress made in the implementation of the CBS model in Tan Hong district. In the third visit, 100% of CHCs had actually conducted meetings with VHVs, and more than half of them (55.6%) were able to analyze data themselves by using an electronic MS Excel file provided by the researchers, while there were only 66.7% of CHCs conducted monthly meeting with volunteers and 22.2% of CHCs analyzed data using MS Excel in the first visit and those figures were 55.6%, 33.3%, respectively in the second monitoring visits. Additionally, the CHCs provided feedback to the VHVs more frequently. In the first months, not all private clinics were involved in the CBS model, but 100% of them were involved in the project during the last two months (Table 7).

Figure 18: Meeting between health staff and VHVs, Tan Hong District, 2009

Table 7: Results of 3 monitoring visits

Process indicators	Monitoring visit		
	1st (%)	2nd (%)	3rd (%)
CHCs collected data from all sources	77.8	77.8	88.9
CHCs analyzed data	22.2	33.3	55.6
CHCs conducted monthly meeting with volunteers	66.7	55.6	100
CHCs gave feedback regularly to volunteers	55.6	55.6	88.9
CHCs implemented CBSS	100	100	100
Private clinic implemented CBSS	88.2	94.3	100

6.2. Detection of outbreaks

Cambodia

During the four-month period of the CBS implementation, VHVs in Memot district reported 10,617 ILI cases, 63 suspected DHF cases, and 6 suspected AI cases. Only 1,621 (15.3%) out of the 10,617 ILI cases sought treatment at health facilities. None of suspected AI case but 30 (47.5%) of suspected DHF cases reported by VHVs sought treatment at health facilities. Health facilities, on the other hand, recorded during the same period 12,550 consultations for ILI (HC: 12,243; RH: 307), 48 cases of DHF (admitted at the district Referral Hospital, in which 46 came from Memot district) and no case of AI (Table 8)

Therefore the proportion of additional cases reported by VHVs to the formal disease surveillance system (i.e. cases not treated at public health facilities) was 41.8% for ILI (8,996/ 12, 550), and 71.7% for suspected DHF (33/46)

Table 8: Case reported by VHVs and by health facilities, Memot district, Sep-Dec 2009

Syndrome/ Disease	CBS report			Health facility record
	Total	Home	Health facility	
ILI	10,617 (100%)	8,996 (84.7%)	1,621 (15.3%)	**12,550**
Suspected AI cases	6 (100%)	6 (100%)	0 (0.0%)	**0**
DHF	63 (100%)	33 (52.4%)	30 (47.6%)	**46** (excluded 2 cases from other districts)

Data reported by VHVs also included the date of onset of all cases, which thus allowing HC staff to plot epidemic curves for ILI (Figure 19) and for suspected AI and DHF cases (Figure 20). These charts were used in presentations to VHVs during their monthly feedback meetings, and to detect a peak of ILI occurrence and a clustering of suspected DHF cases.

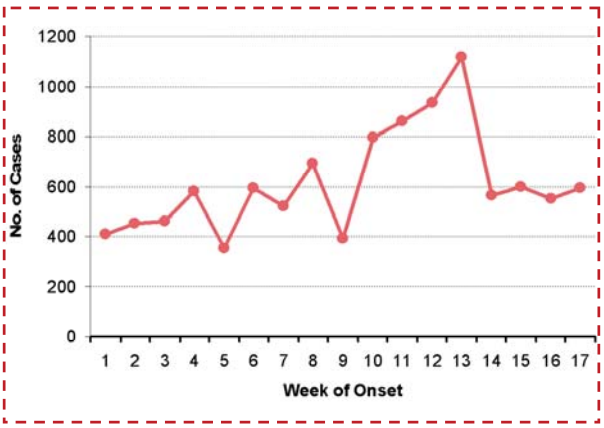


Figure 19: Incidence of ILI and Number of Cases by Week of Onset, Memot District, Cambodia

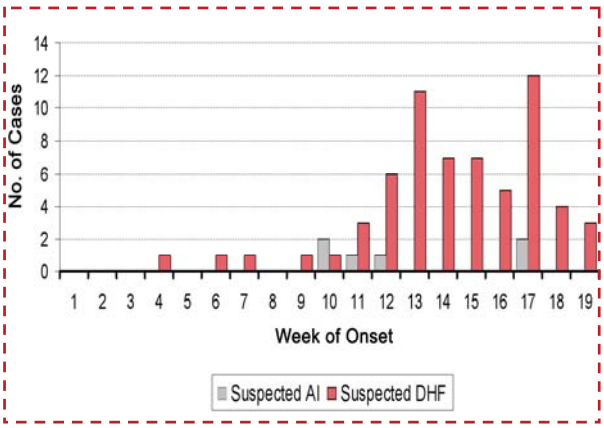


Figure 20: Report of Suspected Cases of AI and DHF by Week of Onset, Memot District, Cambodia

In terms of event reporting, 17 clusters of ILI/ suspected AI cases were reported, of which 13 (76.5%) were investigated by HC staff, which resulted in the confirmation of no cases of AI. No clusters of suspected DHF cases and no death related to ILI/AI/DHF were reported by VHVs (Table 9).

Table 9: Events Reported and Investigated by the CBS in Memot district, Sep-Dec 2009

Event	# Events reported by VHVs	# Investigations by health staff	# Confirmed events
Clustering of ILI cases/ Suspected AI	17	13 (76.5%)	Not AI
Clustering of suspected DHF cases	0	0	0
Any death related to ILI/ AI/ DHF	0	0	0

Vietnam

In Tan Hong, from week 36th of 2009 to week 5th of 2010, there were 79 VHVs, 9 CHCs, 19 pharmacies and 16 private clinics in 9 communes participated in the CBS model in Tan Hong district, covering a population of 90,772. A total of 2,198 ILI cases, 22 DF cases, 3 DF outbreaks (cluster of DF) were detected (Figure 21). In the first period (36th – 41st of September), fewer ILI cases were detected as it took time to become familiar with the model and associated process.

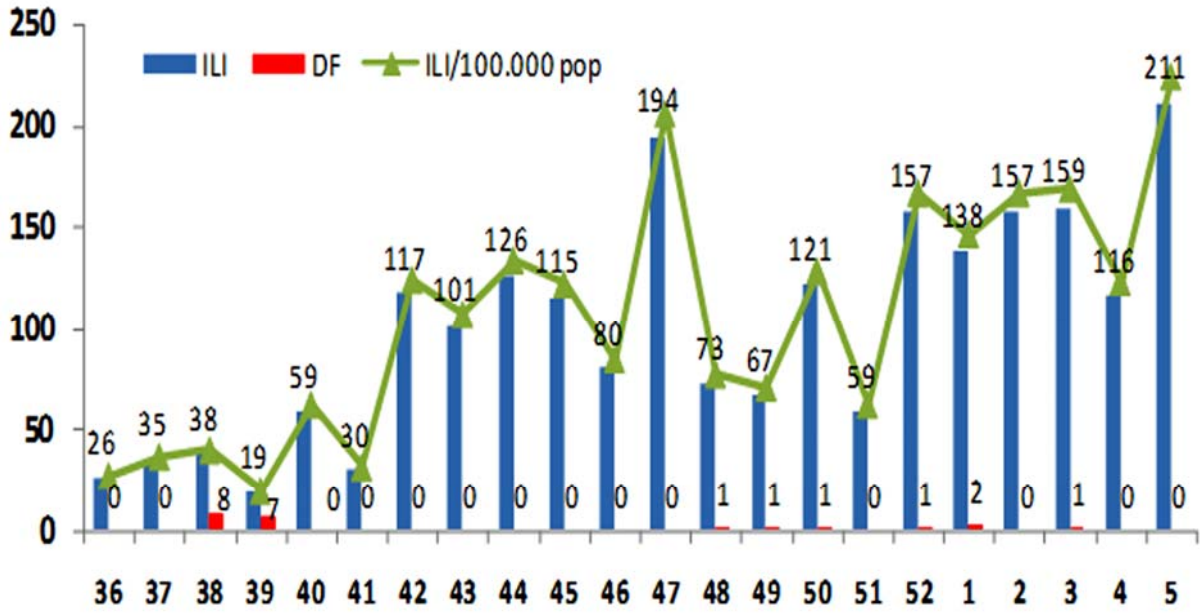


Figure 21 : ILI and DF/DHF by Week, Tan Hong District, Sep 2009-Jan 2010

Among 2198 ILI cases, 31.4% of them was under 5 years of age, 30.2% aged 5- <15 years and 38.4% aged ≥ 15 years (Figure 22). It was noted that females were slightly more likely than males accounting for totally 53.4% and 46.6%, respectively (data not shown).

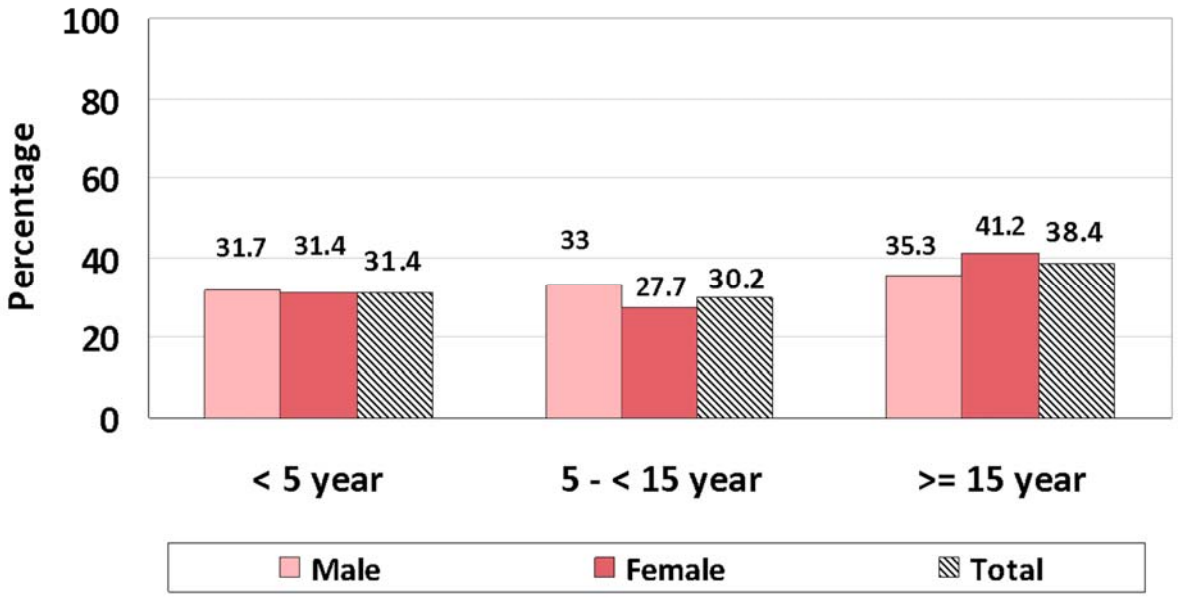


Figure 22: ILI by Age Group and Gender, Tan Hong District, Sep 2009-Jan 2010

ILI Incidence per 100,000 population ranged from 587.5/100,000 in An Phuoc commune to 5,206/100,000 population in Sa Rai. On average, it was about 2,081/100,000 population (Figure 23).

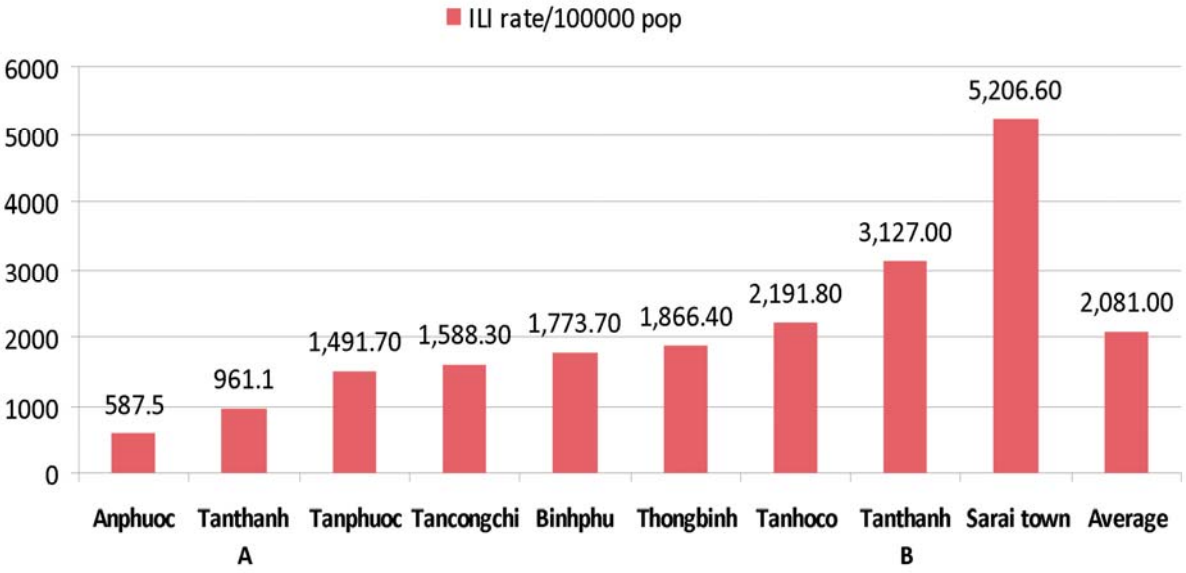


Figure 23: ILI rate/100,000 Population by Commune, Tan Hong District, Sep 2009-Jan, 2010

6.3. Attributes of the CBS System

Simplicity

The simplicity or complexity of a surveillance system is reflected by the structure and the operation of the system (30).

The CBS system for AI, ILI, and DHF surveillance in Cambodia and Vietnam relied on using syndromic surveillance to detect outbreaks of AI and DHF, and was therefore easy for local community workers to collect the required data.

Cambodia

In Cambodia the telephone was used by HC staff to contact VHVs to collect data from the village on a weekly basis. This process was intended to make it easy for VHVs to report data. Data preparation for presentation and feedback took place on only one day per month. Health staff from health centre and district levels as well VHVs were all involved in this process. In addition, during their monthly feedback meeting, the health centre staff used easy-to-understand charts to present diseases and other health-related event trends and distributions by place and person to all CBS team members.

Interviews with VHVs and HC staff at the end of the project revealed that over two-thirds of VHVs did not in general experience any difficulty in calling HC staff, whereas many of the latter (85%) complained that it was difficult for them to collect data by phone from VHVs (Table 10). The main reason cited by staff was the difficulties encountered when attempting to reach VHVs who went to the field for farming at the time of the call and left their phone at home.

Table 10: Experiences in using the telephone, VHVs and Staff survey, Dec 2009

	Experience in Calling HC Staff (in general)	Number	Percentage
VHVs	Easy	224	**68.9**
	Difficult	75	**23.1**
	Very difficult	15	**4.6**
	Unknown/ Never call	11	**3.4**
	Total	**325**	**100.0**
	Experience in Collecting CBS Data from VHVs by Phone	**Number**	**Percentage**
HC Staff	Easy	3	**15.0**
	Difficult	17	**85.0**
	Total	**20**	**100.0**

The interviews also revealed that most respondents (95% of VHVs vs. 85% of HC staff) felt comfortable in using the paper-based forms to record data (Table 11).

Table 11: Experiences in filling forms, VHVs and Staff survey, Dec 2009

	Experience in Filling Village Reporting Form	Number	Percentage
VHVs	Easy	309	**95.1**
	Difficult	14	**4.3**
	Unknown/ Never call	2	**0.6**
	Total	**325**	**100.0**
	Experience in Filling HC Aggregation Form	**Number**	**Percentage**
HC Staff	Easy	17	**85.0**
	Difficult	3	**15.0**
	Total	**20**	**100.0**

Vietnam

In Vietnam, simplicity was measured by interviewing staff concerning the case definitions used and extent to which the forms used were understandable and if the reporting flow was appropriate for local conditions. The VHVs expressed support for the decision to allow flexibility in reporting method either through telephone or in-person reporting. The staff interviews also revealed that almost all VHVs confirmed the appropriateness of the case definitions, the surveillance forms and reporting processes. However, only half of CHWs agreed that the simplicity level of the forms was appropriate. The requirement that data on the forms be entered and then analyzed electronically seemed to be a burden for some VHVs. These electronic approaches and procedures were completely new to many VHVs and required more time for them to become familiar with the software (Table 12).

Table 12: Attitude of staff towards the CBS model in Tan Hong

Indicators	% HWs agree (n=52)	% VHVs agree (n=71)
Case definition is appropriate	86.5	93
Surveillance forms are easy to apply	50.0	98.6
Reporting flow is appropriate	90.4	94.4
Time implementing CBS model		
Short	15.4	19.7
Average	65.4	76.1
Long	19.2	4.2

In Tan Hong, two thirds of respondents felt strongly that the time they spent participating in this model was suitable. Moreover, the survey results showed that the staff had a good understanding of the case definitions used in the model (Table 13).

Table 13: Assessment of case definition used in the CBS in Tan Hong district

Indicators	HWs			VHVs		
	Pre (N= 48)	Post (N=52)	P*	Pre (N=49)	Post (N=71)	P*
Understanding the case definition of ILI	8.3 %	59.6 %	**< 0.001**	81.6%	94.4 %	**0.027**
Understanding the case definition of AI	72.9%	84.6%	**0.15**	24.5%	70.4%	**<0.000**
Understanding the case definition of DF/ DHF	41.7%	82.7%	**<0.000**	53.1%	80.3%	**0.0015**
Understanding the definition of avian H5N1 cluster	50%	61.5%	**0.25**	4 %	36.6 %	**<0.000**

*Chi-square test

Flexibility

Flexibility refers to the ability of a surveillance system to "adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds" (30).

The CBS in Memot and Tan Hong districts enrolled practically all of the same VHVs and health staff who had been previously involved in community-based surveillance for some other communicable diseases. This demonstrates the ability of the CBS to add other diseases or conditions with ease.

Acceptability

Acceptability refers to the "willingness of individuals and organizations to participate in the surveillance system"(30). The CBS depends on the VHVs and local health staff for the provision of accurate, consistent, and timely data.

Cambodia

Village Health Volunteers

Interview with the VHVs found that the vast majority (80.3%) of those interviewed reported a high level satisfaction with the CBS experience . In addition, almost all VHVs responded that they found the feedback meetings very useful and provided them with opportunities to learn more about communicable diseases prevention and control (Table 14).

Table 14: Attitudes of VHVs vis-à-vis of the CBS, VHVs' survey, Dec 2009

Attitude of VHVs		Number	Percents
Satisfaction to be VHVs in the CBS	Very satisfied	261	**80.3**
	Fairly satisfied	64	**19.7**
	Total	**325**	**100.0**
Usefulness of Feedback Meeting	Very useful	283	**87.1**
	Useful	41	**12.6**
	Not useful	1	**0.3**
	Total	**325**	**100.0**

Health staff

Health centre and OD staff were keen to learn basic field epidemiology for collating, analysing and interpreting data as well as for doing field investigations. Many staff were found to be quite interested in using the surveillance data locally, which they had previously only forwarded to the upper levels of the health system.

Interviews with OD and HC staff found that their level of satisfaction with the CBS ranged from fair (41.7%) to total satisfaction (58.3%). In addition, most health staff (91.7%) responded that the feedback meetings were very useful for them and their VHVs (Table 15).

Table 15: Attitudes of health staff vis-à-vis of the CBS, staff's survey, Dec 2009

Attitude of OD and HC health staff		Number	Percent
Satisfaction to be enrolled in the CBS	Very satisfied	14	**58.3**
	Fairly satisfied	10	**41.7**
	Total	**24**	**100.0**
Usefulness of Feedback Meeting	Very useful	22	**91.7**
	Useful	2	**8.3**
	Total	**24**	**100.0**

Vietnam

In Tan Hong, acceptability was ascertained by asking staff their opinions about the model. Almost all agreed that the tasks required by the model were well matched with their skill levels and their regular set of responsibilities and assignments (Table 16).

Table 16: Staff attitude towards the CBS model in Tan Hong

Indicators	% HWs agree (n=52)	% VHVs agree (n=71)
CBS is appropriate for their tasks and responsibilities	92.3	91.5
CBS is appropriate for their capacity	94.2	94.4

Prior to the introduction of CBS model, influenza was one of 26 notifiable infectious diseases. Influenza was underreported with many data elements fund to be inaccurate and incomplete. A fair amount of inconsistency was reported hen comparing data form between different records in the CHCs. These problems arose in large part due to the lack of consistent and clear case definitions for ILI recorded in the reporting system. On the other hand, improper supervision and feedback from higher to lower levels of the surveillance system often led to carelessness and a lack of quality control at CHCs. Furthermore, the logbooks often contained insufficient information on key variables such as address, onset date, and symptoms. As a result, these problems led to low quality and accuracy of surveillance data. This issue has been observed in Vietnamese health reporting system at all levels. The CBS model provided training with concrete and complete case definitions and flowchart of ILI which were rated by the staff to be effective documents for those who are working within the surveillance system.

Given the non-availability of laboratory testing to all cases of AI and DF/DHF at the commune level where diagnoses rely primarily on clinical symptoms, the standard case definitions of ILI, AI and DF can help improve not only staff capacity but also the quality of the reporting system.

> *"Before CBS introduction, ILI diagnosis subjectively depends on each HW, but no criteria. If a patient has fever >38 degree and, cough or sore throat, it may be classified ILI, while the others can record as angina or acute respiratory infection…"* **(CHW)**
>
> *"…but now all of HWs use the same case definition so I think the data will be more accurate … "* **(CHW)**

Sensitivity and specificity of case reporting

Sensitivity (S) refers to the "proportion of cases of a disease (or other health-related event) detected by the surveillance system", as well as to the "ability (of the system) to detect outbreaks, including the ability to monitor changes in the number of cases over time" (30). Positive predictive value (PPV), on the other hand, refers to the proportion of persons, reported as having a disease or other health-related event, who have actually experienced that disease or event (30).

Cambodia

For the CBS in Memot, sensitivity and specificity of the system could not be calculated because no population survey was conducted that could be used as a gold standard for comparison with surveillance data. However, as a proxy indicator of the CBS sensitivity, a survey of VHVs at the end of the project found that up to 94% of them reportedly detected almost all cases of ILI, AI and DHF in their village (Table 17).

Table 17: VHVs' report on the completeness of the case detection in their village, Memot District, 2009

Report on levels of completeness of cases detection	VHVs	
	Number	Percents
All cases	138	**42.5**
Almost all	169	**52.0**
Not many	10	**3.1**
Unknown	8	**2.5**
Total	**325**	**100.0**

The same survey found that around 85% of VHVs could correctly recite the case definition of ILI (i.e. Fever and cough/sore throat/ runny nose) and suspected DHF (i.e. Fever and rash/bleeding). However, only about one out of four VHVs provided correct answers to the case definition of suspected AI (i.e. Fever and cough/sore throat/ runny nose and difficult breathing and contact with sick/dead poultry). In addition, VHVs who failed to provide correct case definitions of suspected AI also failed to mention "contact with sick/dead poultry" in their answer (Table 18).

Table 18: Knowledge on Case Definition of Reported Disease/Syndrome, VHVs' survey, Memot District, Dec 2009

Syndrome	Correct answers, compared with case definition (n=325)	
	Number	Percent
ILI	278	**85.5**
Suspected AI	91	**28.0**
Suspected DHF	271	**83.4**
Unknown	8	**2.5**

When comparing cases reported by VHVs from Sep to Dec 2009 (from VHVs' backup reporting form in which VHVs both reported a case for a specific disease/ syndrome and its symptoms) with relevant case definition used in the CBS, we found that there was a 99.5% concordance between ILI cases reported by VHVs and its case definition, a 83.3% concordance between reported cases of suspected AI and its case definition, and 69.8% concordance for the reported cases of suspected DHF and its case definition (Table 19).

Table 19: Cases reported by VHVs vs. case definition, CBS in Memot, Sep- Dec 2009

VHVs' report	Case definition used in the CBS in Memot district		
	Concordance: Freq (%)	Non concordance: Freq (%)	Total: Freq (%)
ILI	10,568 (99.5)	49 (0.5)	**10,617 (100.0)**
Suspected AI	5 (83.3)	1 (16.7)	**6 (100.0)**
Suspected DHF	44 (69.8)	19 (30.2)	**63 (100.0)**

Data concerning VHVs' levels of knowledge of the disease/syndrome to be reported and levels of concordance between reported symptoms of syndrome/disease and their case definition could be used as proxy indicators for the specificity of the CBS in Memot district.

Vietnam

In Vietnam the influenza sentinel surveillance system has been in operation in 15 units in the whole country since 2005. Reference was made to ILI sentinel surveillance data in 2009(31). In Cai Be district, Tien Giang province, a neighbouring province, we measured a ratio of ILIs per OPD consultations in the last six months of 2009 at 0.04. Based on this ratio, we estimated the minimum number of ILI cases in the community in the last six months of 2009 in Tan Hong at approximately 3,982 cases. As mentioned earlier, cases captured by the model in 5 months in Tan Hong were 2,198 cases. Thus, we calculated the proxy sensitivity of CBS model of 66.2%. We cannot make any exact conclusions about sensitivity since we could not get the actual number of cases, but only an estimated number in Tanhong community. Even, the proxy sensitivity of CBS model was not as high as expected, but fairly good. Sensitivity estimates need to take into account the fact during the study period, VHVs could only visit about 50% of their geographically assigned households. Full coverage of all households might result in a higher level of sensitivity for the model.

In Vietnam the PPV of case detection and the PPV of reported outbreaks by the VHVs was estimated by comparing reported cases with those verified by both the CHC and DHC. The definition was also used to check accuracy of reported cases. Among a random sample of 221 cases verified by CHWs and checked against the case definition, 180 cases were confirmed as actual cases. The PPV of case detection by VHVs was fairly high (81.4%). The PPV of outbreaks reported by the VHVs was 100% as three DF outbreaks reported by them were confirmed by DHC. Although the above proxy sensitivity was not high, the PPV of case detection and outbreak detection by VHVs was fairly high. The high PPV was a reflection of good model effectiveness.

We also calculated PPV of case detection by CHWs before and after the period of conducting the CBS model by comparing data from CHC records before and after the model implementation to measure if the PPV increased after the model was implemented. After the initial five months of operation, the PPVs for case detection of CHWs increased from 45.1% to 69% (Table 20). These data suggest that implementing the CBS model contributed to better performance of the CHCs in terms of accurate data recording.

Table 20: PPV of case detection by CHWs in Tan Hong District before and after intervention

7/2009 (pre-intervention)			12/2009 (post-intervention)		
No of cases reported	No of cases met case definition	**PPV**	No of cases reported	No of cases met case definition	**PPV**
465	1031	**45.1%**	684	991	**69.0%**

Representativeness

Representativeness refers to the capability of a surveillance system to correctly portray a disease or other health-related event by time, place and person (30).

The CBS in Cambodia and Vietnam was designed to collect all data in the community whether they stayed at home or treated at any public or private health facilities. By doing so, the system was able to provide more representative data than the health facility-based data.

Timeliness

Timeliness refers to "the speed between different steps in a public health surveillance system" (30).

Cambodia

The CBSS was designed to reduce as much as possible delays between its different steps, with the main objective of facilitating rapid detection of outbreaks in remote communities by local people (VHVs) and to timely responses to the outbreaks by local staff. Although the CBS in Memot district reported data on a weekly basis, suspected outbreaks were to be immediately reported. From VHVs' report, up to 90% of all ILI and suspected cases of AI and DHF were detected within three days after onset (Figure 24), and the time lags between the onset and detection of cases were on average 1.3 days, 1.6 days and 2.3 days for ILI, suspected AI, and suspected DHF respectively (Table 21).

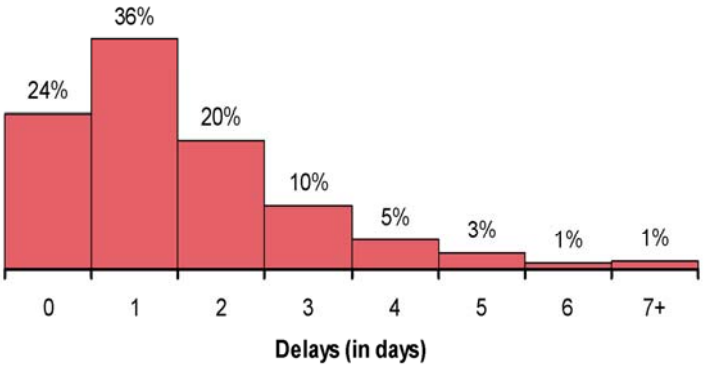


Figure 24: Time lag in detection of all reported cases, VHVs' report, Sep-Dec 2009

Table 21: Time lag between case onset and detection, VHVs' report, Sep- Dec 2009

Disease/ Syndrome	Number of Observations	Delay from onset to detection (in days)		
		Range	Means (SD)	Median
ILI syndrome	10,617	0- 27	1.6 (3.12)	1
Suspected AI	6	0- 3	1.3 (1.87)	1
Suspected DHF	63	0- 15	2.3 (8.96)	1
AI	10,686	0- 27	1.6 (1.78)	1

Vietnam

In Tan Hong district, timeliness and completeness were evaluated by reviewing reports sent and received between levels within the system. The results showed that 97.7% reports were received on a timely basis on a stipulated day and 94.6% of them were completed. A hundred percent reports were provided with required information such as name, age, gender, address, time of onset, time of detection, time of sending report, symptoms etc. (Table 22).

Table 22: Timeliness and completeness of reports

Indicator	Number	Percentage (%)
Reports received on times	1908/1952	**97.7**
Reports received have completed data	1847/1952	**94.6**
Case have enough information	2198/2198	**100**

Timeliness and completeness were also measured by interviewing staff i.e. VHVs, CHWs, districts health staff. Almost all agreed with timeliness and completeness criteria of the reports, 96.7% and 98.4% respectively. However, only 65.9% of staff agreed of report accuracy (Table 23).

Table 23: Timeliness and completeness of report by interviewing

Indicators	% HWs agree (n=52)	% VHVs agree (n=71)	% Total
Reports were sent timely	92.3	100	**96.7**
Reports were accurate	59.6	70.4	**65.9**
Reports were complete	96.2	100	**98.4**

Additionally, when reviewing detecting time since onset, 91% of reported cases were detected within two days of onset in Tan Hong, of which 38.6% detected within the first day (Figure 25).

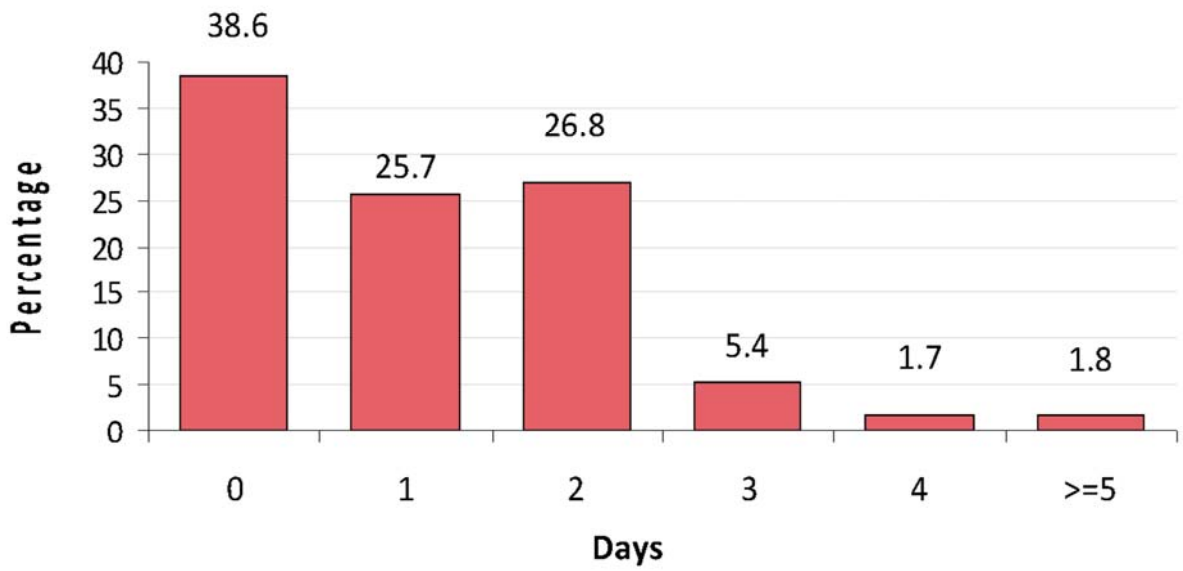


Figure 25: Time lag in ILI case reporting by VHVs and CHWs, Tan Hong

Stability and sustainability

The stability of a public health surveillance system refers to its "reliability (i.e. the ability to collect, manage, and provide data properly without failure) and availability (the ability to be operational when it is needed)" (30).

In the field of public health, *sustainability* has been defined as the capacity to maintain program services at a level which will provide ongoing prevention and treatment for a health problem after termination of major financial, managerial, and technical assistance from an external donor (32).

Cambodia

During the implementation of the CBS in Memot district, most VHVs undertook household visits on a regular basis whereas HC staff made a weekly call to collect data as expected and conducted monthly feedback meetings with their VHVs as planned. The stability and sustainability of the CBS system in Memot district resided in its enrolment of existing VHVs and local health staff to use data they themselves collected and analyzed. In fact, VHVs in Memot and other districts of Cambodia are part of a countrywide network of VHVs called "Village Health Support Group" (VHSG) established in the early 2000s by the MoH to improve the services of the commune HC. Each VHSG is composed of two representatives from each village in the commune and three staff from a health centre. Village representatives or VHVs are elected by the population, and they need to have their own means of transportation, must attend a monthly meeting at the commune health centre and are expected to perform several functions including (1) giving information on the perception by the community of the health centre services; (2) providing information on health issues in their village; (3) providing information on newborns and deaths including maternal deaths; (4) promoting the health centre services with villagers; (5) arranging the dates of outreach services with the village chiefs; (6) arranging with village chiefs for health education material to be distributed in the village; and (7) identifying the poor in their village for fees exemption.

Vietnam

The implementation of the CBS model in Tan Hong district relied on existing system and routine work of health staff and VHVs. Household visit had been already assigned to VHVs by local authorities and the CBS had neither changed nor added more work to VHVs. On the other hand, the CBS model is in line with Ministry of Health policy, of which criteria for village health worker's (VHW) selection are standardized and the regulation of their tasks and responsibilities is going to be revised. Therefore, during the 5-month implementation of the CBS in Tan Hong, VHVs conducted household visits regularly. Additionally, monitoring and instructing VHVs in health activities in the community had also been officially assigned to CHCs which play a very important role in data reporting for the formal disease surveillance system.

In Tan Hong, household visit is one of the VHVs' responsibilities which were assigned by local health authority. On the other hand, VHVs run several primary health care programs in community which also required household visits. Thus, it was not a surprise when 82.7% of HWs and 98.6% of VHVs affirmed to continue sustaining and conducting household visits after the end of the CBS project. Furthermore, the SWOT analysis had shown great abilities of the model in sustaining in the future.

Furthermore, using a strengths, weakness, opportunities, and threats (SWOT) analysis model, we found abilities in sustaining the model in the future. Even the model may have to deal with current constraints in health system, but it also had strengths and opportunities. The system design with two-way flow of information, instant feedback, local use of data, and simplicity, acceptability and the usefulness features as well as its decentralized management contributed to the success of the CBS. The CBS has many attributes that could make it viable – that is sustainable. First, VHVs and health staff have the capability to run and manage the system by themselves, with little technical or supervisory support from the higher level. Second, the system is built on the existing health system and resources, following the Ministry of Health policy and strategy to strengthen the Operational District structure. It gives the Operational District and health centre a mechanism to fulfill their role in disease prevention and control in the communities (Table 24).

Table 24: SWOT analysis of CBS model

Strengths • Applying the case definition. • Good attitude of staff • Improving the capacity of HWs/VHVs • Linkage between public health sector, private health sector and community • Having good cooperation among local stakeholders • High proportion of sick people use health services	**Weaknesses** • Capacity of the first level in Tan Hong district is low • Short time of testing the model may not good enough to apply this model • Numerous HH vs. VHVs
Opportunities • Avian and H1N1 pandemic makes people have good attitude with the disease and prevention disease. • Having new guidelines on ILI case definition of MoH • Strategy of MoH on improving the surveillance system	**Threats** • More emerging and new diseases • Having conflict information on pandemic • H1N1 pandemic make people alarmed • Poverty • Seasonality, weather effects

Cost and benefits

Cambodia

It is difficult to evaluate the cost and effectiveness of any project without comparing areas with and without the interventions involved. Nevertheless, in the absence of valid data from communes similar to the project communes, an attempt was made to cost the system operation at the community level, if it had to be run by VHVs and local staff in the following years (i.e. excluded costs of the design, training and supervision by central level researchers). Therefore the cost of the system operation at the local level in Cambodia (phone cost included) was on average USD 0.49 per capita (of the beneficiary or population of the project district) (See Appendix D).

In regards to the benefit of the CBS, surveys, VHVs and staff in Memot district in December 2009 found that almost VHVs and all HC and OD staff felt that the system was useful (Table 25). For VHVs who responded that the CBS was useful, most of them (81.4%) stated that the system would allow timely outbreak control and prevention. OD and HC staff, on the other hand, specified that the CBS benefits were in its ability to rapidly detect disease outbreak (83.3%) and to enable them to prevent and control outbreaks in a timely manner (81.4%) (Figure 26).

Table 25: Attitude of key players towards the CBS, VHVs and Staff Survey, Memot district, Dec 2009

Usefulness of CBS	VHVs		HC & OD Staff	
	Frequency	%	Frequency	%
Very useful	286	**88.0**	22	**91.7**
Fairly useful	37	**11.4**	2	**8.3**
Unknown	2	**0.6**	0	**0.0**
Total	**325**	**100.0**	**24**	**100.0**

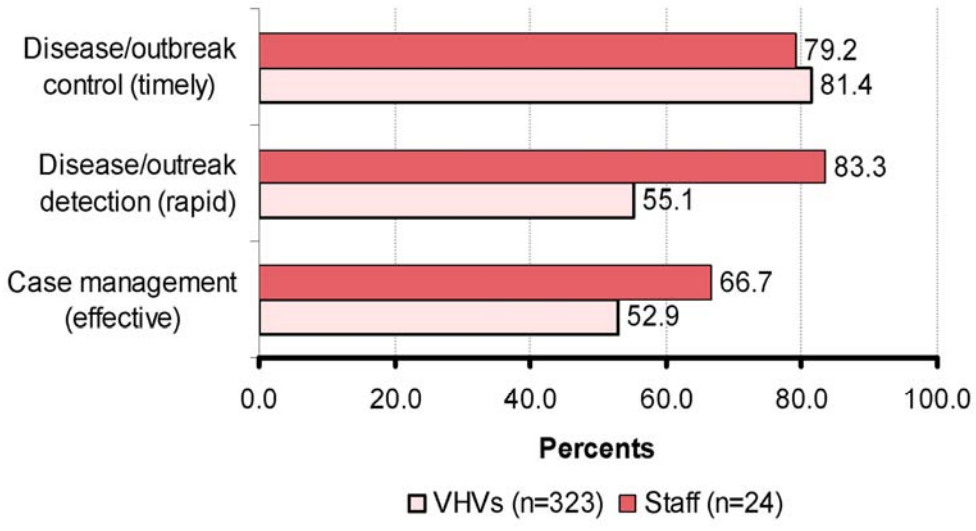


Figure 26: Attitude of key players towards CBS benefits, VHVs and Staff Survey, Memot district, Dec 2009

Finally, most key players (87.1% of VHVs vs. 91.7% of staff) affirmed that their monthly feedback meetings were very useful (Table 26).

Table 26: Attitude of key players towards feedback meetings, VHVs and staff survey, Memot district, Dec 2009

Feedback meeting	VHVs		Staff	
	Frequency	%	Frequency	%
Very useful	283	**87.1**	22	**91.7**
Fairly Useful	41	**12.6**	2	**8.3**
Not useful	1	**0.3**	0	**0.0**
Total	**325**	**100.0**	**24**	**100.0**

Vietnam

Regarding cost estimation, in the existing health system currently, nearly all the cost of Dengue and ILI surveillance in Vietnam is assumed by the existing health services which is not included payment for VHV. Accordingly, in order for continuous active CBS model by VHVs is beyond their normal duties, incentives must be required. In July 2009, the government promulgated the decision to stipulate VHV's monthly stipend. Even this decision has not performed in the whole country yet because of limited local budget it is expected to apply nationwide in the short future. In this research we paid monthly stipend about 15$ per month per VHV which was similar to the norm of the government.

The usefulness and benefits of the CBS model to existing health reporting system, i.e. CHCs and DHC by comparing reporting performance and relevant works of health staff before and after implementing the model were also evaluated in Tan Hong by interviewing staff who participated in the model. In terms of system improvement, almost all VHVs and CHWs agreed that the CBS model helped to improve surveillance capacity of the system. 69.2% of CHWs and 100% VHVs thought that CBS model contributed to ILI/AI surveillance improvement. And about such number of staff, 69.2% and 100%, respectively agreed that the model raised awareness about disease in community (Table 27).

Table 27: Attitude of staff about system improvement, Tan Hong District, Vietnam

Indicators	% HW agree (N= 52)	% VHV agree (N=71)
CBS model improved system capacity on surveillance as a whole	96.2	94.4
CBS model improved the ILI/AI surveillance system	69.2	100
CBS raised people awareness on disease and their health	69.2	100

It was found that there was a significant increase in proportion of respondents with correct practices in detecting, reporting, investigating and supervision and managing the environment of outbreak areas between pre- and post intervention (Table 28).

Table 28: HWs practice on detecting the SVP outbreak, Tan Hong District, Vietnam

Indicators	Pre (N= 48)	Post (N=52)	P*
Performing case screening correctly	8.3	69.2	**<0.000**
Reporting to upper level timely	35.4	71.2	**<0.000**
Managing patient as guidelines correctly	77.1	80.8	**0.65**
Investigating and supervising correctly	50	76.9	**0.005**
Managing environment outbreak areas correctly	10.4	36.5	**0.002**
Communicating correctly	33.3	51.9	**0.06**
Confirming a suspected H5N1 outbreak	85.4	80.8	**0.5**
Monitoring the outbreak correctly	12.5	26.9	**0.07**

*Chi-square test

The CBS model benefited VHVs as their practices in detecting and surveillance also improved. By comparing pre-and post-intervention, the results showed big changes in VHV's practices (Table 29).

Table 29: VHVs practice on detecting the ILI, Tan Hong District, Vietnam

Indicators	Pre (N=49)	Post (N=71)	P*
Performing in case screening correctly	53.1	84.5	**<0.000**
Recording patient's information correctly	65.3	93	**<0.000**
Reporting to upper level in timely manner	85.7	98.6	**0.01**
Managing the patient as guidelines correctly	14.3	15.5	**0.85**
Counselling patient correctly	69.4	74.6	**0.53**
Confirming the ILI cluster	69.4	88.7	**0.008**
Monitoring the outbreak correctly	67.3	74.6	**0.38**

*Chi-square test

We measured usefulness and benefits of the model by comparing pre- and post-intervention indicators. After 5-month implementation, an improvement trend in data collection and analysis in CHCs was demonstrated (Table 30).

Table 30: Data resources for collection and analysis in CHC, Tan Hong District, Vietnam

Indicators	Pre (N= 48)	Post (N=52)	P*
Data derived from			
CHC	87.5	100	**0.27**
VHVs	58.3	100	**<0.000**
PHSs	52.1	100	**<0.000**
The upper level	83.3	100	**0.006**
Data analysis in CHCs			
By time	92	95.5	**0.6**
By place	68	81.8	**0.1**
By person	64	59.1	**0.6**

*Chi-square test

Although there was no change reported in the number of feedback and supervision visits provided to lower levels, the quality was significantly improved. In each visit, in addition to supervising collecting data and sending report of the CHCs, refreshed training and attending monthly meeting with VHVs and sharing information was also provided to CHWs and VHVs. This activity encouraged active community participation in disease control and prevention (Table 31).

Table 31: Feedback and supervision between district and commune level

Indicators	HWs			VHVs		
	Pre (N= 48)	Post (N=52)	P*	Pre (N=49)	Post (N=71)	P*
Received feedback from upper level	87.5	88.4	**0.8**	73.5	100	**<0.000**
Received supervision from upper level	83.3	94.2	**0.08**	95.9	95.8	**0.67**

*Chi-square test

On the other hand, the hands-on practice training method prior to implementation and during supervision visits was a practical way to equip HWs and VHVs with enough knowledge and skills to accomplish their tasks. In the in-depth interviews, all respondents stated that participating in the model greatly improved their work performance.

More importantly, monthly supportive supervisions fostered an interest, good attitude and impression of these stakeholders involved in this model. Most local staff acknowledged the value and importance of regular supervisory visits

Each CHC was provided an electronic file and trained how to use it. With this file, CHCs can enter data submitted from peripheral points every week. They can then easily undertake simple data analysis. With this method, CHCs can recognize the trends of disease in their areas and be able to plan accordingly.

*"before that we just counted the cases and then reported, but now we can see disease tendency right after entering data" (**CHW and DHW**)*

Although not all CHCs used the file for data entry and analysis as they were not familiar with computer, they nonetheless admitted that it was a useful tool for tracking disease pattern for a proper action in community.

Box 1: Perception of CBS model

"To improve the health of the people" (VHVs)

"*It is the first time I have trained in ILI definition correctly, so I think that we will have better data*" (CHWs)

"*It helps us to improve the capacity of local staff, and strengthen a linkage between DHC and district hospital, health department of District People Committee and between the different HWs in CHC in surveillance activity*" (DHWs)

"Monitoring visit is the way to re-train…" (VHV)

"*We have never had hand-on practice training on surveillance activity as screening, recording and special the supervision method, it helps us to know what we did right and what we did wrong…*" (CHW)

CHAPTER 7

DISCUSSION

This section will review the performance of the system, give possible explanations about the underlying factors that affect system performance, examine the cost and sustainability of the system, identify its implications, and propose some recommendations for future research and practical application.

7.1. System description

System purpose

The CBS for AI/ILI/DHF surveillance designed and implemented in the two border districts of Cambodia and Vietnam was intended to complement the formal disease surveillance system in order to comprehensively detect AI and DHF outbreaks on a timely basis through active community participation.

Stakeholders

The CBS for AI/ILI/DHF surveillance was designed by Cambodia and Vietnam researchers but was adapted for implementation by both research teams according to the context of their respective country.

In Cambodia the CBS was implemented in Memot district from September to December 2009, covering a total population of 134,013 inhabitants. The system enrolled 2 to 3 VHVs per village and 2 staff per commune HC. The system was operated with supervision and support from 4 district staff, backed up by researchers from Phnom Penh. VHVs enrolled in the CBS were those who had been elected by the community and were part of a HC community network known as Village Health support Groups.

In Vietnam, the CBS was implemented in Tan Hong district from September 2009 to January 2010, and covered a total population of 90,772 inhabitants. Unlike Cambodia, the CBS in Vietnam enrolled not only VHVs (2 per village) but also private clinics and pharmacies in the study district. With regard to the operation of the model, the role of CHCs was very important as they were directly responsible

for initiating and getting the system operational. Furthermore, they supervised and supported the VHVs. The enthusiastic support the CHC staff showed for the model coupled with the infusion of their areas of expertise were critical factors in convincing the local VHVs to be come engaged with the new system. In Tan Hong, CHCs were provided with training, working instruments, and refresher training during supervision visits which helped to improve their working capacity. Involvement of all community stakeholders was also important when raising community concerns about health and prevention. In this model, participation of the private sector in Tan Hong was essential given that more than half of the people with a reported illness (57.66%) in Mekong River Delta in Vietnam went to private clinics for examination (33).

Volunteers

Volunteers from the local community and local health staff played the central role in the operation and management of the CBS in Cambodia and Vietnam. The interaction between these key players led to an effective CBS system in these settings.

VHVs played a tremendous role in the CBS by their enhanced ability to rapidly identify and report cases and events. The success of the rapid detection program is illustrated by the high PPV associated with the data efforts of the CBS project in Vietnam.

Like many CBS systems, VHVs in the CBS project in Cambodia and Vietnam were residents in the village where they served and many were also well known by their neighbors. These VHVs tend to be more active in data collection and more effective in creating local awareness of communicable disease issues among villagers. Most VHVs were reportedly able to undertake their weekly visits to most of the households in their village to collect and send data to the HC level as required. In Vietnam, all VHVs confirmed that household visits and other community activities were suitable within their responsibility and that they would continue these activities in the future (Table 32).

Table 32: Profile and roles of VHVs in the CBS in Cambodia and Vietnam

	Volunteers	Cambodia	Vietnam
1	Profile	Existing VHVs	• Existing VHVs and • Private clinics • Pharmacies
		Resident of the village	Residents
		Per diem and travel cost for monthly meeting	Monthly incentive
2	Number and Population coverage	2-3 VHVs/village 70 households/ VHV	2 VHVs/village 100-160 households/VHV
3	Data collection	Households visits (weekly- most households)	Households visits (weekly- many households)
4	Data reporting Freq (means)	• Weekly (Phone call from HC+ Forms) • Immediate (Call to HC)	• Weekly (Phone call & forms) • Immediate (Phone calls)

Most importantly, the manner in which the VHVs were involved in the CBS system had a great influence on their motivation and performance. In situations where the VHVs were only asked to collect and report data to health staff, they tended to be more poorly motivated, especially when they were not able to fully understand the overall objectives of the data collection process. This problem was reported in some CBS systems where many VHVs failed to submit reports on a regular and/or timely basis. In the CBS implemented in Cambodia, VHVs took part in the interpretation and use of the information drawn from their data that were presented at the monthly feedback meetings held by HC staff. In Vietnam, even though VHVs had not been involved in analysis and interpretation of data, they nevertheless seemed to be performing well in the CBS, for instance well collecting data and timely reporting data.

Health staff

Local health staff played a very important role in data management, analysis and feedback as well as in outbreak investigation and control. In the Philippines CBDDS system, health centre staffs were expected to investigate outbreaks of EPI target diseases as well as give feedback to the community (34). Local health staff positively influenced VHVs' work in the CBS systems in Cambodia and elsewhere through their supportive supervision and commitment (35) (Table 33).

Table 33: Profile and roles of local health staff in the CBS in Cambodia and Vietnam

	HC staff	Cambodia	Vietnam
1	Profile	• HC staff (2/HC) • OD staff (4)	• HC staff (2/ HC) • District staff (2)
2	Data collection	Weekly call to collect data from VHVs	Receive data reported (using Forms) by VHVs, pharmacies and private clinics.
		Recorded data in a form	Recorded data in a form
		Aggregate data from all villages	Aggregate data from all villages
3	Data analysis	Manual at HC level (tables & charts)	Computerized at HC (program for analysis provided by researchers)
4	Feedback	Monthly meeting at HC: systematic (100%)	Monthly meeting at HC
		Graphical presentation	Presentation and discussion

In the Cambodia CBS, HC staff demonstrated a great ability in conducting disease surveillance activities. They were well-motivated and able to learn and apply basic epidemiology data analysis approaches, and contribute to the interpretation and presentation of data at their monthly feedback meetings with VHVs. In Vietnam, although data aggregation and reporting were the responsibilities of the CHC's, participation in the CBS model helped local health staff better understanding the meaning and usefulness of surveillance data.

Operation

The CBS for AI/ILI and DF/DHF surveillance on the Cambodia and Vietnam borders was a syndromic surveillance for early outbreak detection. The system used data on syndromes namely "ILI", "suspected AI", and "suspected DF/DHF" that might indicate the early stages of an outbreak of AI and DHF.

In **Cambodia**, VHVs collected and recorded data during their regular house-to-house visits using a form specially designed for this purpose. They were required to make phone calls to alert HC staff when they observed any clustering (defined as 5 or more cases within a week) of ILI, suspected AI, or suspected DHF in their village. HC staff, on the other hand, had to collect data from their VHVs through weekly phone calls by using another form, and to aggregate data for presentation and discussion at their monthly feedback meeting with VHVs in all villages in their catchment area. HC staff had to make a field investigation to confirm any suspected outbreak reported by VHVs or others, an activity that was already part of their routine duty within the formal disease surveillance system. On the Cambodian border, phone calls from the VHVs to the CBS provided a rapid means of transmitting data on documentation and verification of outbreaks and served to permit trends analysis in real time. This rapid communication was designed to effect more timely outbreak detection than that provided by the use of reporting forms

In **Vietnam**, forms were used to collect and report cases and events by VHVs and other volunteers enrolled in the CBS (pharmacists, private clinicians) to commune HCs. Data were aggregated and reported to the district level for analysis and feedback on a weekly basis. At the commune HC level, data were also analyzed using a computer software program specially designed for this purpose. This was not the case for Cambodia where data analysis at the HC level was by hand, using calculators.

Finally, the CBS implemented in both Cambodia and Vietnam was more action-oriented than information oriented, as it was designed to report syndromic cases and events to enable authorities to rapidly detect AI and DHF outbreaks in the community.

Selection of disease for surveillance:

Very common but not severe illnesses like ILI appeared to place a reporting burden on VHVs. It may be more cost-effective to only report clusters of suspected AI cases. In other words, event reporting would be more appropriate than case reporting for common but not life threatening illnesses.

Although only reporting, rare, severe or life threatening illnesses like AI might seem better for the CBS, especially in Cambodia, doing so might lead to making the VHVs less motivated in the long run. Also, a single disease/ event CBS would not be cost-effective and sustainable on the Cambodian border

Method for data collection

Using Phone calls for weekly data collection and reporting had several benefits:

1. to remind VHVs to have weekly data ready to report to the HC at the agreed day of the call (at the

end of the week for the CBS in Cambodia), therefore requiring VHVs to conduct at a minimum, weekly households visit; and

2. to allow HC staff to monitor disease trends in every and all villages weekly, and prepare, in advance, data for presentation at the feedback meeting with VHVs at the end of each month.

Inconveniences associated with the use of the weekly data collection calls were:

1. cost of the telephone call;

2. additional workload for HC staff that were poorly paid,

3. the limited number VHVs in each area who already had many duties to perform including on-site vaccination of children and mothers, monthly outreach activities to all villages for health promotional and preventative activities, and

4. lack of telephone access for VHVs who had to go into the field early in the morning and arrived home late in the evening.

A total of 85% of the Cambodian HC staff interviewed complained about the requirement that they make weekly phone calls for data collection and reporting. .

Most VHVs in both the Cambodian and Vietnamese sites, however, affirmed they had no difficulty in occasionally calling HC staff, especially when reporting suspected outbreaks. Nevertheless, requesting VHVs to make weekly phone calls to HC staff appears to be a potential problem for a CBS in certain rural areas.

The recording form based on symptoms and syndromes had the advantage of being easy for the VHVs to complete. The use of a syndromic approach also made the form flexible by allowing for easy adaptation of the basic format to any new communicable disease (by adding few more symptoms). It was also possible to compare the listed symptoms with the syndrome reported and to make adjustments to the case definition for a particular disease when necessary. Approximately 90% of VHVs and health staff in Cambodia and Vietnam affirmed that they felt comfortable in using the CBS forms for data recording and reporting.

7.2. Outbreak Detection

Timeliness

In Cambodia, the interval between the onset of a syndrome and its detection was recorded and reported by VHVs. Up to 90% of cases were identified within 3 days after onset. In addition, data from all villages were reported to the HC on a weekly basis and suspected outbreaks were reported within a day of notice. This finding underscores the potential for the CBS in Cambodia to recognize and report syndromic cases and events in a timely manner. Despite the fact that no outbreak was detected during the 4-month implementation of the CBS in the study district, reporting of individuals cases appeared to be enhanced by the CBS model. In Vietnam, data reporting were in weekly and monthly basis and it was affirmed to be timely.

In the other CBS systems, the frequency of data reporting ranged from one week to two-three months, and information feedback took one-two months or longer. VHVs in the KSCSP in Cambodia, however, reported measles outbreaks to the project on average five days after rash onset, slightly shorter than the figures reported by the Cambodia Rural CBSS (24).

Validity in outbreak detection

"Measuring the validity of a system for outbreak detection requires an operational definition of an outbreak." Although a statistical deviation from a baseline rate can be useful for triggering further investigation, it is not sufficient for defining an outbreak. In practice, the confirmation of an outbreak is a judgment that depends on past experience with the condition as follow: the severity of the condition, the communicability of the condition, confidence in the diagnosis of the condition, public health concern about outbreaks at the time, having options for effective prevention or control, and the resources required and available to respond. Operationally, an outbreak is defined by the affected public health jurisdiction when the occurrence of a condition has changed sufficiently to warrant public health attention" (28).

In **Cambodia**, 17 clusters of ILI/suspected AI were reported to HC, of which 13 were investigated but none of them was confirmed as AI. In regards to DHF, almost half of the suspected cases of DHF were admitted to the district hospital and confirmed as such, but the remaining cases that were treated at home were not investigated. Trend analysis of reported ILI cases found an excessive increase during weeks 10-13 of the project implementation compared to the previous one-week period. However, in absence of information on disease occurrence from previous years, this increase could be a seasonal variation of ILI,. ILI is a very common illness and its case reporting might not be appropriate for an outbreak detection system. Also, reporting a cluster ILI cases would not useful for the detection of any AI outbreak. However, the system could retain only reports of any cluster of cases or any death related to suspected AI cases.

In **Vietnam** no cluster of ILI and AI was detected but 3 suspected clusters of DHF were reported by VHVs and confirmed by DHC. These results demonstrate the capacity of VHVs to detect events that experience has shown often go undetected at the community level and only become recognized at the district level when DF patients decide to go to the district hospital at an early stage of disease. Data from this project clearly show that the VHVs working within the model can successfully identify early stage DF cases that had been previously missed. No ILI cluster was reported while numerous ILI cases were detected in comparison with DF cases. It might be suspected that VHVs had a longer train of experience dealing with DF prevention and might not be as familiar with ILI symptoms.

Data quality

Data quality in the CBS models in Cambodia and Vietnam was fairly good. In Vietnam the PPV of case detection by VHVs was fairly high (81.4%) and the PPV of outbreak detection by VHVs was 100% (all three DF outbreaks reported by them were confirmed by DHC). In Cambodia, no population survey was conducted that could assess PPV of cases and outbreak detection, but the comparison between symptoms and cases reported by VHVs produced a fairly high concordance with their case definition (99.5% for ILI, 83.3% for suspected AI, and 69.8% for suspected DHF).

In addition, a very important feature of a system aimed at the detection of communicable disease outbreaks is its "Geographic representativeness"(28). In the CBS models, the fact that VHVs were assigned in each and every village to detect and report cases and events in the CBS provides satisfies the criterion of geographic representativeness, although this criterion may not be totally met in remote areas and in areas with poor transportation and communication infrastructure.

7.3. System Experience

System usefulness

Most VHVs and local health staff in both Cambodia and Vietnam felt that the CBS model was very useful for rapid outbreak detection and reporting, and for initiating timely outbreak control and prevention measures. It appears that initial and monthly training contributed to improving their capacity for effective disease detection and prevention.

In Vietnam, the CBS was reported to have enhanced the surveillance capacity of the existing formal disease surveillance system. The enhanced system raised disease awareness in the community, as reflected by a significant increase between pre- and post intervention periods in the proportion of respondents with improved knowledge concerning selected communicable diseases. The CBS also served to improve disease detection and reporting practices, and foster the development and execution of timely investigation of outbreaks. Hands-on practice, training and regular supervision visits were believed to play an important role in improving the HWs and VHVs capacity for conducting effective disease surveillance. The introduction at the Commune HC of a computer program and the training of staff in use of this program for the analysis of data reported by local communities were viewed as a useful tool for tracking disease patterns and for developing proper actions in the affected community.

In Cambodia, the system had also enabled health staff and VHVs to regularly monitor the occurrence and distribution of these infectious diseases in the communities during their feedback meetings. In contrast, in many CBS systems corrective actions are delayed because they have to be initiated by national program staff, and result in waiting for a decision to be made at a higher level of the health system.

Costs

The estimated annual cost for running the CBS in Memot (excluding system design and development) was on average US$ 0.49 per capita (of the study population). It was higher than the cost of the Cambodia Rural CBSS (22) which was estimated at US$0.47 per capita during the first year of its implementation (including initial training and development). In addition, the Cambodia Rural CBSS was designed to capture more diseases and events that those of the Vietnam study project.

Nevertheless, the cost of the study project appears to be lower than that of many similar systems

running in developing countries to date, including the KSCSP in Cambodia (22) (estimated at US$1.20 per capita), because of its use of existing health infrastructure and staff. Therefore, this system costs much less than projects run by NGOs where additional staff and facilities have to be funded.

However, it is difficult to compare the costs of different CBS systems because of the differences in the types and number of events monitored by different systems, the variety of interventions undertaken by each project in which the CBS system is an integral part, as well as the inconsistency of the available cost data. In any case, the cost for an extra case detected by the Cambodia Rural CBSS, like other CBS systems reviewed, was by far lower than that of survey or active case searching by health staff.

Sustainability

Even though the CBS model implemented in both countries may have to deal with current constraints in the health system, it also had strengths and opportunities. The system design with its two-way flow of information, instant feedback, local use of data, simplicity, acceptability and usefulness features as well as its decentralized management contributed to the success of the CBS. The CBS has many attributes that could make it viable and sustainable. First, VHVs and health staff have the capability to run and manage the system by themselves, with little technical or supervisory support from the higher level. Second, the system is built on the existing health system and resources, following the Ministry of Health policy and strategy to strengthen the Operational District structure. It gives the Operational District and health centre a mechanism to fulfil their role in disease prevention and control in the communities

Constraints

There were some constraints for the CBS system that prevented achieving greater results. First, VHVs were not able to collect data from all the people in their areas especially those families living too far away from the VHV's house, those who could not be reached due to rainy season conditions or those who had temporarily relocated to the farm land during rice planting and harvesting seasons. The completeness and frequency of household visits are crucial for comprehensive and early detection of outbreaks in an area. VHVs in **Memot district**, on the one hand, were responsible for around 70 households each, and most of them were reportedly able to visit most of the households in their area. In **Tan Hong district**, each VHV was responsible for around 300 households but was able to visit at best 160 households a month. Therefore VHVs could not finish visiting all households within their responsible areas resulting in missing cases. On the other hand, pushing VHVs to do household visit more frequently could lead to poor worker morale. In order to resolve the issue, all VHVs were requested to develop a monthly visiting plan by themselves that could help them to be more active and participatory in planning and implementing the program. VHVs in both the Cambodia and Vietnam sites also used these household visits to perform other preventive and health promotion activities as required by health authorities (in Vietnam, for instance, these activities included participation in community programs such as Red Cross, Family Planning and Population, Dengue Fever prevention, Nutrition etc.) Integration of different work responsibilities in one household visit appears to be an effective approach to increase the frequency of VHVs' household visits.

Second, the relationship between length of training and the competency of VHVs in accurately detecting and reporting cases is . VHVs in Tan Hong reached a case ascertainment accuracy of 81.4% despite the fact that they had less professional training than workers in many other provinces in Vietnam. In many provinces in Vietnam, VHVs participated in 3-month to 9-month official training programs. An assumption was that if VHVs had higher capacity and are well trained, the system may work better. However the correlation between length of training and job performance was always in the predicted direction. The accuracy of case detection and reporting was less an issue for Cambodia where VHVs enrolled in this study were requested to record symptoms for each syndrome reported, and it was left to the HC staff to make a final verification for the classification of the syndrome.

Third, health staff response to the information generated by the CBS was not yet optimal, as reflected by inadequate outbreak investigations and corrective measures in these areas. Low salaries and inadequate funding for health services in general hamper staff motivation and limits the quality and coverage of the services they perform, especially in public health.

Fourth, in Vietnam, during the time of project implementation, health authorities had given the community strong warnings of an impending H1N1 pandemic. The population was worried about the imposition of a one-week quarantine people suspected to be infected with the H1N1 virus. As a result, individuals who were ill were more likely to conceal and less likely to report their symptoms to VHVs during their household visit. Hence, case detection and reporting by VHVs were not as high as they should have been, but were clearly affected by outside influences beyond their control. .

Limitations of the study

There were some limitations of the study.

First, the duration of implementation of the project was too short (four months for Cambodia and five months for Vietnam) to adequately assess the full potential of the CBS system to detect outbreaks in the implanting districts. Furthermore, in any community project several years may be required following the end of the project to accurately assess its sustainability. In Vietnam, it might take at least two or three months for staff to become familiar with a new surveillance system. Short duration of implementation precluded a robust evaluation of the model's effectiveness. The study findings suggest that it takes at least two months to adequately train staff and to work out the problems inherent in most field operations early on, VHVs had difficulty in using the syndromic approach to identifying cases, while the CHWs capacity to actively supervise and support VHVs was initially limited. Even in the last month of the project not all CHWs, could use and recognize the advantages of data entry using MS Excel files. Adequate start-up time is needed when implementing a "new system". This time is needed to have staff buy into the new system by beginning to recognize the immediate and long-term benefits of the system. It is also critical to allow time for training all staff in the system's operational features. In **Cambodia,** there were no outbreaks of AI or DHF in the study district that were confirmed by health authorities during the 4-month period of the project, and it is difficult to judge whether the implemented CBS system would be able to detect outbreaks of these diseases in the future.

Second, the performance of the project was assessed using survey findings as a gold standard and was therefore subject to many of the biases usually associated with this form of dada collection. For instance, the validity of the data could have been affected by recall biases in the surveys of VHVs' in

both Cambodia and Vietnam, and a lack of available comparisons over various times and places in the case of Cambodia. Also information bias might arise in surveys where health staff were involved in the interview of the local population (36).

Third, in terms of system sustainability, even when health staff and VHVs were judged to be sufficiently skilful to run the system after initial training and subsequent monthly trainings during their feedback meetings, the continuation of the system's operation depends on some continuing external source of financial support, from either a donor or the government. However, it seems to be more optimistic in Vietnam as monthly payment for VHVs has been officially stipulated by the government, but awaits execution nationwide.

CHAPTER 8

CONCLUSION

The CBS study project in Cambodia and Vietnam sheds additional light on how a CBS model for AI/DHF outbreak detection in rural setting worked in border districts of Cambodia and Vietnam. The study projects were different from those previously piloted in Cambodia and Vietnam. Cambodia, on the one hand, only had experience with an event-based AI CBS model implemented by CARE, involving vital events and multiple diseases but not AI CBS models. Vietnam, on the other hand, had only experienced an intensive single AI disease CBS model implemented by CARE.

Findings from the two projects supports revealed the feasibility of a syndromic surveillance for AI/ DHF outbreak detection in the study areas in both countries. Local community and local staff acceptance and active participation of this novel system was high, as reflected by regular and frequent households visits of VHVs for data collection, which resulted in increased timeliness and accuracy of data reporting, and an increased willingness of HC staff to actively participate in data management, feedback and use. Similar to previous experiences, frequent VHV's household visits were the key in ensuring the rapid and comprehensive detection of major health events in each community.

However, drawing final conclusions based on the study data is complicated by the absence or low frequency of confirmed AI outbreaks in both areas during the short study period. The findings indicate that the CBS system has high sensitivity in detecting ILI cases. These results demonstrate the high potential of the CBS system to detect AI outbreaks should they occur.

The use of the telephone for the weekly collection of cases from a local community was feasible and effective but had some associated difficulties to overcome including added burden for local staff, and added cost. The use of telephone appears to be rather more appropriate for immediate reporting of suspected outbreaks by the VHVs but not for regular collection and reporting of community data by local health staff;

Initial and periodic training of VHVs and local staff regarding accurate identification and confirmation of cases and outbreaks combined with the use of syndromic case definition and user-friendly reporting forms appeared to be very crucial in assuring data quality.

The existing formal disease surveillance system in place at the start of the study period is designed

to capture cases that come for diagnosis and treatment of their symptoms or die at public health facilities. The facility-based disease surveillance system could never capture all cases and events in the community. The CBS was not designed to replace but complement the facility-based system by identifying cases that would never com to the attention of health facility staff. Additionally, the CBS can serve to strengthen the formal surveillance system in terms of reporting completeness and quality, capacity building and fostering important interactions among all stakeholders.

CHAPTER 9

RECOMMENDATIONS

The key lesson learned from this project was that various principles of the CBS approach can be successfully applied in rural settings of developing countries to detect disease outbreaks by local community residents and staff. Countries need to adapt to their specific local context (e.g. small or large geographic areas, frequency and severity of diseases or events to be reported, available resources including capacity available at the local level of the health system etc.) in the development of a cost-effective and sustainable CBS for outbreak detection and response. An appropriate CBS model for rural settings in developing countries would be a system that:

1. Focuses *on early detection of outbreaks for multiple diseases* such as the model tested in the Lao PDR. Multiple disease and events are more likely to sustain interest of local community based staff in the surveillance system. Requesting VHVs to do households visits for diseases that are infrequent and not year-round would not be motivating or cost-effective

2. Uses a *syndromic approach for case and event reporting* is effective when using VHVs' who relatively low levels literacy.

3. *Select syndromes or events for* surveillance that are of importance to the community. Syndromes commonly seen in the community but not severe like ILI should only be reported not on a case basis but as a clustering of cases in time and space (event reporting) and when linked with similar events involving poultry/animal exposures. Doing so would make VHVs and HC staff workload less in terms of data reporting and field investigation;

4. Empower local communities to run the system by themselves including case detection and reporting (by VHVs and other local volunteers) to data analysis and interpretation (by commune HC staff) to data use in decision making and action plans that involve all

stakeholders (for instance monthly feedback meeting of HC staff and VHVs like in the case of CBS in this project in Cambodia and CBSS for Rural Cambodia;

5. Sustain the motivation of VHVs and local health staff as key players who have a pivotal role in system operation, effectiveness and sustainability. There should be mechanism and means to motivate the local community and staff to actively participate in the system.

6. *Yields appropriate responses* (including feedback, investigation, control and prevention measures) from the formal disease surveillance network to the information generated by the CBS as this is of paramount importance to sustain local community motivation. In this context, the district level of the health care system has a key role in the CBS by providing necessary technical and managerial support to the HC level especially in capacity building and outbreak investigation. Importantly, there are the needs to educate community and health workers at all levels on importance of the diseases under surveillance, the benefits to community for early detection, reporting and response, and heightened awareness of disease and disease risks in the community.

References

1. Buxton Bridges C, Katz JM, Seto WH, Chan PK, Tsang D, Ho W, et al. Risk of influenza A (H5N1) infection among health care workers exposed to patients with influenza A (H5N1), Hong Kong. J Infect Dis. 2000 Jan;181(1):344-8.

2. Beigel JH, Farrar J, Han AM, Hayden FG, Hyer R, de Jong MD, et al. Avian influenza A (H5N1) infection in humans. The Writing Committee of the World Health Organization (WHO) Consultation on Human Influenza A/H5N1. . N Engl J Med. 2006;354(8):884.

3. Ungchusak K, Auewarakul P, Dowell SF, Kitphati R, Auwanit W, Puthavathana P, et al. Probable person-to-person transmission of avian influenza A (H5N1). N Engl J Med. 2005 Jan 27;352(4):333-40.

4. Liem NT, Lim W. Lack of H5N1 avian influenza transmission to hospital employees, Hanoi, 2004. Emerg Infect Dis. 2005 Feb;11(2):210-5.

5. WHO.OIE.FAO. Stop the Spread. Measures to Stop the Spread of High Pathogenic Bird Flu at Its Source. WHO/OIE/FAO Consultation on Avian influenza and Human Health: Risk Reduction Measures in Producing, Marketing, and Living with Animals in Asia. 4 to 6 July. 2005.

6. WHO. Cumulative number of confirmed human cases of Avian influenza A/(H5N1) reported to WHO, 30 March. 2009 [cited 2009 May]; Available from: http://www.who.int/csr/disease/avian_influenza/country/cases_table_2009_03_30/en/index.html

7. Ngan C. 2006 DF-DHF National Report. National Dengue Control in Cambodia. A National Centre for Parasitology, Entomology and Malaria Control of the Cambodian. Ministry of Health. Cambodia. 2006.

8. Wollschlaeger K. Health care clinics in Cambodia. Can Fam Physician. 1995 Apr;41:569-71.

9. National Institute of Public Health and National Institute of Statistics. Cambodia Demographique Health Survey. Phnom Penh: National Institute of Public Health and National Institute of Statistics; 2005.; 2005.

10. Decision number 158/2004/QD-BYT, 19 January, 2004 of Minister of Health for Provincial PM Center on "immediate reporting" AI suspected cases.

11. Decision number 1266/QD-BYT on 14th April, 2006 of Minister of Health on Dengue fever/ Haemorrhagic fever surveillance and control guidelines.

12. Ministry of Health, Cambodia Respiratory Disease and Influenza Bulletin. January 2010 (Weeks 1-5).

13. Nguyen HT, Dharan NJ, Le MT, Nguyen NB, Nguyen CT, Hoang DV, et al. National influenza surveillance in Vietnam, 2006-2007. Vaccine. 2009 Dec 11;28(2):398-402.

14. Ngan C. 2009 DF-DHF Report. National Dengue Control in Cambodia. A National Centre for Parasitology, Entomology and Malaria Control of the Cambodian. Ministry of Health. Cambodia. 2009.

15. Ngan C. 2006 DF-DHF National Report. National Dengue Control in Cambodia. A National Centre for Parasitology, Entomology and Malaria Control of the Cambodian. Ministry of Health. Cambodia. 2009.

16. Ngan C. Ministry of Health, Dengue Situation in 2008 and its control strategies. Cambodia Communicable Disease Bulletin. . 2008;6 (6):1-8.

17. Dengue Fever Morbidity and Mortality. National Report. Vietnam: Vietnam Administration of Preventive Medicine and Environment; 2008.

18. WHO. WHO Recommended Surveillance Standards Manual. Second edition. World Health Organization, Geneva. 1999 [cited 2009 May]; Available from: http://www.int/emcdocuments/surveillance/docs/whodscrisr992.pdf

19. WHO. Protocol for the Assessment of National Communicable Disease Suveillance and response Systems. Guidelines for Assessment Teams. World Health Organization. 2001 [cited 2009 May 23]; Available from: http:/www.who.int/emc-documents/ surveillance/docs/ whocdssrisr20012.pdf

20. Promising Practices for Community-based Surveillance: Experiences from CARE's Work with Community-based Models of Avian and Human Influenza Surveillance in Five Countries. CARE 2009 [cited 2009 March]; Available from: http://www.comminit.com/redirect.cgi?m=02bd64edcafacb7d938e5bb58a3c3577

21. CARE. CARE Vietnam's Community-based Surveillance Model: Bringing the Fight to the Flu- A case Study of Outbreak Detection and Rapid Response to Avian Influenza in Vietnam's Haiphong Province. 2008 [cited 2009 May]; Available from: http://icarenews.care.org/avianflu/Docs/CARE%20Vietnam%20Community-based% 20Surveillance%20Case%20Study.pdf

22. Oum S, Chandramohan D, Cairncross S. Community-based surveillance: a pilot study from rural Cambodia. Trop Med Int Health. 2005 Jul;10(7):689-97.

23. Chau DP, Ogata H, Hyoi, N. Evaluation of Disease Surveillance System to Detect Disease Outbreak in Cambodia. J Natl Inst Public Health. 2007;54(4):412-13.

24. Oum S. Kean Svay Child Survival Project: Report on the Review of Community-based Health Information System. Consultancy report, World Vision, Phnom Penh, Cambodia, unpublished. 2000.

25. Lariosa TR. "The role of village of community health workers in malaria control in the Philippines. "SE Asian J Trop Med Public Health 23 Suppl 1: 30-35. 1993.

26. Manderson L. "Community participation and malaria control in Southeat asia: Defining the principles of involvement. SE Asian J Trop Med Public Health. 1992a;23:suppl 1: 9-16.

27. Manderson L. "Summary of Seameo-Tromed technical meeting on social and behaviour aspects of malaria control: I. Community participation and the control of malaria. SE Asian J Trop Med Public Health. 1992b;23:suppl 1: 3-5.

28. Buehler JW, Hopkins RS, Overhage JM, Sosin DM, Tong V. Framework for evaluating public health surveillance systems for early detection of outbreaks: recommendations from the CDC Working Group. MMWR Recomm Rep. 2004 May 7;53(RR-5):1-11.

29. Rushton J, Viscarra R, Guerne Bleich E, McLeod A. Impact of avian influenza outbreaks in the poultry sectors of five South East Asian countries (Cambodia, Indonesia, Lao PDR, Thailand, Viet Nam) outbreak costs, responses and potential long term control. World's Poultry Science Journal. 2005;61(03):491-514.

30. CDC. Updated Guidelines for Evaluating Public Health Suveillane Systems. 2001:MMWR. 50 (RR13).

31. NIHE. Vietnam. National Influenza Sentinel Surveillance. 2009.

32. USAID. Sustainability of Development Programs: A Compendium of Donor Experience. Washington, DC: US Agency for International Development. 1998.

33. Ministry of Health, 2003. Vietnam. National Health Survey 2001-2002.

34. Kalter H. Activation and Implementation Workshops for Community-based Disease and Death Surveillance. Consultancy Report, World Vision, Sorsogon Province, Philippines, unpublished. 1999.

35. Okanurak K, Ruebush, T.K. "Village-based diagnosis and treatment of malaria " Acta Trop. 1996;61(2):157-67.

36. Kroeger A. "Response Errors and Other Problems of Health Interview Surveys in Developing Countries". World Health Statistics Quarterly 38. 1985.

Appendices

Appendix A : Recording Forms & Register for Cambodia

Form1: Cases reporting form for VHV

Health Centre_______________ Week……….Month……..Year
Village_______________ Khum_______________

No	Name	Age	Sex (M/F)	Time of Onset (dd-mm-yy)	Time of identification (dd/mm/yy)	Symptoms									Place of Treatment	
						Fever (> 38oC)	Cough	Sore throat	Runny nose	Breathing difficulty	rash/ petechia	Hematemesis, gingivorrhage/	Contacted with poultry	Other	Home	Health Facility
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)

Form2: Cases reporting form for Health Centre

Health Centre_____ Week……Month……..Year

Village_____ Commune_____

No	Name	Age	Sex (M/F)	Time of Onset (dd-mm-yy)	Time of identification (dd/mm/yy)	Symptoms									Suspected cases			Place of Treatment	
						Fever (> 38oC)	Cough	Sore throat	Runny nose	Breathing difficulty	rash/ petechia	Hematemesis, gingivorrhage/ bloody stool	Contacted with poultry	Other	ILI : (7)+[(8)/(9)/(10)/(11)]	AI : (7)+[(8)/(9)/(10)/(11)]+(14)]	DF : (7)+[(12)/(13)]	Home	Health Facility
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)

Surveillance of AI, ILI and DHF along the Cambodia and Vietnam border [Community-Based Surveillance]

Form3: Monthly Aggregated Reporting Form by Age Group

Health Centre__________________ Month........Year
Village________________________ Khum________________________________

Age Group	Sex	Week1 (1-7)			Week2 (8-15)			Week3 (16-23)			Week3 (24-31)			Total		
		ILI	AI	DF	ILI	AI	DF	ILI	AI	DF	ILI	AI	DF	**ILI**	**AI**	**DF**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
0-4	M															
	F															
5-14	M															
	F															
15-49	M															
	F															
>50	M															
	F															
Total	M															
	F															

Form4-1: Calling Monitoring Form

Health Centre_____
Week……Month……..Year……..

No	Village	VHV Name	HC Staff Name	Called Phone Number	Calling Date	Calling Duration	
						Immediate	Weekly
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

Checked by

Health Centre Chief

Reported by

Health Staff

Form4-2: Aggregated Calling Monitoring Form

Health Centre_____ Month……..Year……..

No	Village	Calling Duration (in minute)	
		Immediate	Weekly
(1)	(2)	(3)	(4)

Checked by Reported by

Operational District Chief Health Centre Chief

Form5: Monthly Aggregated Reporting Form by Village

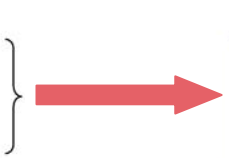
Health Centre_____ Month……..Year……

No	Village	ILI		AI		DF	
		Reported Cases	Cases Investigated/ Confirmed	Reported Cases	Cases Investigated/ Confirmed	Reported Cases	Cases Investigated/ Confirmed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total						

Appendix B : Recording Forms & Register for Vietnam

INSTRUCTION

Case definition of ILI:
Sudden onset fever above 38°C, AND
Cough and/or sore throat, AND
No other causes of other suspected diseases



If ILI patient have difficult or fast breathing, he/she may have severe viral pneumonia (SVP)

Case definition of DF/DHF
Sudden onset fever > 38°C and last about 2 – 7 days, AND
Head, muscle and joint pain, AND
Rash or hemorrhagic tendency (positive tourniquet test, spontaneous bruising, macula rash and/or bleeding from mucosa, gingival, injection sites, vomiting with blood, or bloody/bleeding stool).

WHEN DETECTING A NEW CASE, HW NEEDS TO DO:

1. ***ASK*** the patient that where he/she lives for last one week; if he/she has close contact with respiratory infected patient; if there is any patient in their home or neighbours?
2. ***RECORD*** the information on logbook and form 01A.
3. ***COUNSEL ILI patients how to quarantine, prevent, treat and care at home***.
4. ***REPORT*** SVP patients and ***REFFER*** them to high level.
5. ***RECONFIRM*** ILI, SVP or DF/DHF that detected by VHVs and drug sellers

COLLECTING AND REPORTING

Weekly collecting and reporting data from commune health Centres, pharmacies, private clinics and VHVs.

1. ***IMMEDIATELY REPORT using form 02C when detected a cluster*** .
2. ***WEEKLY REPORT to DHC*** using form 02A ***on every Monday afternoon*** .
3. ***MONTHLY REPORT*** to DHC on 30^{th}
4. ***MONITORING the implementation of VHV and private sector***
5. ***FEEDBACK to VHVs and private health sector on the meeting day at commune***.

FORM 01A. LIST OF ILI, SVP AND DF/DHF

Week.... (From Monday dd / m / y to Sunday dd / mm / yy)

resource	Name	Age		Address	Occupation	Time of onset	Time of identification	Time of report	Symptoms						No other cause	In case cluster	Suspected case
		M	F						Fever > 38 (t)	Fever last about 2-7 days	Cough/sore throat	Difficult breathing	Headache and joint pain	Rash/ petechia			
PC	**Nguyễn Văn A**	**41**		**4, ấp 2**	**NN**	**31/08**	**01/09**	**02/09**	**38,4**	**2**	√				√	√	**ILI**
CHC	Nguyễn Thị Bé		6th	4, ấp 2	Nhỏ	01/09	01/09		39	1	√	√			√	√	SVP
VHVs	**Nguyễn Văn A**	**41**		**4, ấp 2**	**NN**	**31/08**	**31/08**	**02/09**	**38,5**	**1**	√				√		**ILI**
CHC	Lê Thị Tám		30	4, ấp 2	NN	01/09	03/09		39	2	√				√	√	ILI

COMMUNE:.............................

FORM 02A. WEEKLY REPORT

Week.... (From Monday dd / m / y to Sunday dd / mm / yy)

Name of case	Status	Age group								Address						Confirmed cases
		0 - < 5y		5- <15y		≥15y		Total		1	2	3	4	5	6	
		M	F	M	F	M	F	M	F							
ILI	Case															
	Death															
SVP	Case															
	Death															
DF/DHF	Case															
	Death															

Day month year 20
Chief of CHC

COMMUNE:……

FORM 02B. MONTHLY REPORT

Month…. (From to)

Name of case	Status	Age group								Address						Reconfirmed cases
		0 - < 5y		5- <15y		≥15y		Total		1	2	3	4	5	6	
		M	F	M	F	M	F	M	F							
ILI	Case															
	Death															
SVP	Case															
	Death															
DF/DHF	Case															
	Death															

Day month year 20
Chief of CHC

COMMUNE: ………………………………

FORM 02 C. CASE CLUSTER REPORT

1. Type of cluster:
2. Address of cluster:
3. Identified time of case cluster
4. Number of cases in the cluster:
5. Symptoms of cases:
6. Time of report:
7. Activities implemented:

 - .
 -

List of cases in the cluster

Resource	**Name**	**Age**		**Address**	**In relation**	**Time of onset**	**Time of identification**	**Condition** (Mild, severe, dead)
		M	F					
1								
2								
3								

Commune: **Village:** **Name of VHV:**

Form 07 A. ACTIVITY REPORT OF VHV

Month [.....] (From: / /200_ to: / /200_)

1. Population in village: ..... No of household in village: [.....]

Items	Week 1	Week 2	Week 3	Week 4	Week 5	Month
No of HH had visited	[.....]	[.....]	[.....]	[.....]	[.....]	[.....]
No of HH had had health problem	[.....]	[.....]	[.....]	[.....]	[.....]	[.....]
No of HH had visited 1 time/week	[.....]	[.....]	[.....]	[.....]	[.....]	[.....]
No of HH had visited ≥ 2 times/week	[.....]	[.....]	[.....]	[.....]	[.....]	[.....]
No of HH had not visited	[.....]	[.....]	[.....]	[.....]	[.....]	[.....]

2. Comment

VHV (Signed)

FORM 7B. VHV's PLAN

Stt	Name of HH	Address	Tel	Check ✓ in the boxes if the HH has plan to be visited					
				Month....	Month....	Month....	Month....	Month....	Month....
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									
17.									

FORM 7C. VOLUNTEER, HEALTH WORKER AND PRIVATE SECTOR REPORT CHECKLIST

Month Year

No	Name of VHV/private clinic	Week …		Week …		Week …		Week …		Week …	
		Reports sent on time	Reports with required information	Reports sent on time	Reports with required information	Reports sent on time	Reports with required information	Reports sent on time	Reports with required information	Reports sent on time	Reports with required information
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

FORM 7D. VOLUNTEER, HEALTH WORKER AND PRIVATE SECTOR ACTIVITY CHECKLIST

Commune Month Year

Content	Name of VHVs								
	VHV 1	**VHV 2**	**VHV 3**	**VHV 4**	**VHV 5**	**VHV 6**	**VHV 7**	**VHV 8**	**VHV 9**
No of HHs have been visited									
No of HHs have been visited 1 time/week									
No of HHs have been visited ≥ 2 times/week									
No of HHs have had health problem									
No of HHs have been checked randomly by CHC									
No of ILI cases have been reported									
No of reported ILI cases haven been confirmed by CHC									
No of suspected ILI cases haven't been confirmed by CHC among reported ILI cases									
No of DF cases have been reported									
No of reported DF cases haven't been confirmed by CHC									
No of suspected DF cases haven't been confirmed by CHC in out of reported DF cases									

Appendix C: Evaluation

C1- Questionnaires for VHVs

Identification:

Name of interviewer:.....

Health Centre:.....

Village:.....

A. Purposes and Objectives of the CBSS:

No	Question	Optional Categories	Skip
1	Do you know what the purpose of CBS system is?	…… …… ……	
2	Do you know, what the data you collected is used for?	…… …… ……	
3	Who use the date you collected? (circle all appropriate answers)	1. Ministry of Health (MoH) 2. Provincial Health Department (PHD) 3. Operational Health District 4. Health Centre 5. Researchers 8. Other (specify)…… 9. Don't know	

B. Components of CBSS

No	Question	Optional Categories	Skip
4	What were the syndromes/ diseases that you collected?	1. Avian Influenza (AI) 2. Influenza like illness (ILI) 3. Dengue Hemorrhagic Fever (DHF) 8. Other (specify)…….. 9. Don't know	
No	**Question**	**Optional Categories**	**Skip**
5	What type(s) of the population is (are) under this CBSS?	1. Human beings 2. Animal/Birds 8. Other (specify)…….. 9. Don't know	

6	How did you define the following syndrome/disease?	1. Avian Influenza (AI) …… …… …… 2. Influenza like illness (ILI) …… …… 3. Dengue Hemorrhagic Fever (DHF) …… ……	
7	How did you collect data?	1. House to house visit 2. Report from villagers 8. Other (specify)…… 9. Don't know	
8	How often did you collect data?	1. Daily 2. Weekly 3. Monthly 4. Twice a week 8. Other (specify)…… 9. Don't know	
9	Was it difficult to find out the cases?	1. Easy 2. Difficult 3. Very difficult 9. Don't know	
10	If it was difficult, please specify.	----------	
11	How did you report the cases to the HC staff?	1. By phone 2. By reporting form 8. Other (specify)…… 9. Don't know	
No	**Question**	**Optional Categories**	**Skip**
12	In each month, how often did the HC staff phone you to get any suspected cases?	1. Daily 2. Weekly 3. Monthly 8. Other (specify)…… 9. Don't know	
13	On average, how long did it each phone call last?	……minute(s)	

14	Have you ever made an immediate report by phone to the HC staff?	1. Yes 2. No 8. Other (specify)…… 9. Don't know	
15	In which case, do you have to report immediately to the HC staff?	1. There are 5 or more of the same cases in a week 8. Other (specify)…… 9. Don't know	
16	Last month, how many times did you make an immediate report to the HC staff?	……time(s)	
17	Do you have any difficulty to report the cases by phone to the HC staff?	1. Very difficult 2. Difficult 3. Easy 8. Other (specify)…… 9. Don't know	
18	If it was difficult, please specify.	……	
19	Do you think the CBS is useful to you and your community?	0. Not useful 1. Very useful 2. Fairly useful 8. Other (specify)…… 9. Don't know	
No	**Question**	**Optional Categories**	**Skip**
20	If it is useful, please specify.	1. Timely detect the case 2. Timely control and prevent the disease 3. Timely treatment 8. Other (specify 9. Don't know	
21	What do you think of the filling-in of the reporting form?	1. Easy 2. Difficult 3. Very difficult 8. Other (specify)…… 9. Don't know	

22	If it was difficult, please specify.	……	
23	In the future, if there are some more syndromes/ diseases added to this surveillance system, do you think you're still able to do it?	1. Yes 2. No 8. Other (specify) …… 9. Don't know	
24	Do you think that you have reported all the cases?	1. All cases 2. Almost all 3. Few cases 4. Not sure 8. Other (specify)…… 9. Don't know	
25	Are you satisfied to be a village health volunteer for the CBSS?	1. Very satisfied 2. Satisfied 8. Other (specify)…… 9. Don't know / No idea	
26	Was the Monthly Feedback Meeting useful to you?	0. Not useful 1. Very useful 2. Useful 8. Other (specify)…… 9. Don't know	
27	If it was useful, please specify.	……	
28	In which part of the Monthly Feedback Meeting were you satisfied?	…… ……	
29	In which part of the Monthly Feedback Meeting you are **not** satisfied?	…… ……	
30	Do you have any suggestion(s)/ comment(s) to improve the CBSS?	…… …… …… ……	

C2- Questionnaires for HC/OD Staff

Identification:

Name of interviewer:.....

Respondent: 1. Operational District Staff 2. Health Centre Staff

C. Purposes and Objectives of the CBSS:

No	Question	Optional Categories	Skip
1	Do you know what the purpose of CBS system is?	…… ……	
2	Do you know what the data you collected is used for?	…… ……	
3	Who use the date you collected? (Circle all appropriate answers)	6. Ministry of Health (MoH) 7. Provincial Health Department (PHD) 8. Operational Health District 9. Health Centre 10. Researchers 88. Other (specify)…… 99. Don't know	

B. Components of CBSS

No	Question	Optional Categories	Skip
4	What syndromes/diseases do VHVs have to report?	4. Avian Influenza (AI) 5. Influenza like illness (ILI) 6. Dengue Hemorrhagic Fever (DHF) 8. Other (specify)…… 9. Don't know	
5	What type(s) of the population is (are) under this CBSS?	3. Human being 4. Animal/Bird 8. Other (specify)…… 9. Don't know	
6	What do you define the following syndrome/disease?	1. Avian Influenza (AI) …… …… 2. Influenza like illness (ILI) …… …… 3. Dengue Hemorrhagic Fever (DHF) …… ……	

7	How did VHVs report the cases to the HC staff?	3. By phone 4. By reporting form 8. Other (specify)…….. 9. Don't know	
8	In each month, how often did the HC staff phone VHVs to get any suspected cases?	4. Daily 5. Weekly 6. Monthly 10. Other (specify) …….. 9. Don't know	
9	On average, how long did each phone call from HC staff to VHVs last?	……minute(s)	
10	Have VHVs ever made an immediate report to the HC staff?	3. Yes 4. No 8. Other (specify)…….. 9. Don't know	
11	In which case, did VHVs have to make an immediate report to the HC staff?	2. There are 5 or more of the same cases in a week 8. Other (specify)…….. 9. Don't know	
12	Last month, how many times did VHVs make an immediate report about the case to the HC staff?	……time(s)	
13	Do you have any difficulty to get reported cases by phone from VHVs?	1. Very difficult 2. Difficult 3. Easy 8. Other (specify)…….. 9. Don't know	
14	If it was difficult, please specify.		
15	Do you think about the CBSS is useful to your HC/OD?	3. Not useful 4. Very useful 5. Fairly useful 8.. Other (specify) …… 9. Don't know	

16	If it is useful, please specify	4. Timely detect the case 5. Timely control and prevent the disease 6. Timely treatment 10. Other (specify …… 11. Don't know	
17	What do you think of the filling-in of the reporting form?	1. Easy 2. Difficult 3. Very difficult 8..Other (specify)…… 9. Don't know	
18	If it was difficult, please specify		
19	In the future, if there are some more syndromes/ diseases added to this surveillance system, do you think you're still able to do it?	3. Yes 4. No 8. Other (specify) …… 9. Don't know	
20	Do you think that you have reported all the cases?	5. All cases 6. Almost all 7. Few cases 8. Not sure 8. Other (specify)…… 9. Don't know	
21	Do you think VHVs have accurately reported the cases to the health centre according to the instruction?	1. Totally correct 2. Almost correct 3. Very few correct 8. Other (specify)…… 9. Don't know	
22	Are you satisfied to participate with the CBSS?	3. Very satisfied 4. Satisfied 8. Other (specify)…… 9. Don't know / No idea	

23	Was the Monthly Feedback Meeting between you and HC useful?	3. Not useful 4. Very useful 5. Useful 9. Other (specify)…… 10. Don't know	
23	If it was useful, please specify	…… ……	
24	In which part of the Monthly Feedback Meeting with HC were you satisfied?	…… …… ……	
25	In which part of the Monthly Feedback Meeting with HC were you **not** satisfied?	…… …… ……	
26	Do you have any suggestion(s)/ comment(s) to improve the CBSS?	…… …… …… ……	

Appendix D : Cost (in US$) for the CBSS operation in Memot district, Sep-Dec 2009

	Category	Items	Unit	Quantity	Unit Cost	Total cost
1	**Training**	Per diem OD	5	4	15	**300.0**
	(Two training courses plus one	Per diem HC	5	20	10	**1,000.0**
	Consultation workshop)	Per diem VHV	1	357	5	**1,785.0**
		Travel HC	4	16	5	**320.0**
		Travel VHV	1	283	2	**566.0**
		equipment hire				**450.0**
		Venue hire	1	10	25	**250.0**
		Training material				**156.9**
		Stationary				**537.5**
		Refreshment				**516.0**
	Sub total (1)					**5,881.4**
2	**Data collection & Reporting**	Telephone		11521	0.09	**1,036.9**
		Reporting forms				**477.0**
		Register	1	10	10	**100.0**
		Instructions	1	390	0.1	**39.0**
	Sub total (2)					**1,652.9**
3	**Monthly Feedback Meeting**	VHV Per diem	4	357	5	**7,140.0**
		VHV travel	4	283	2	**2,264.0**
		HC staff per diem	4	20	10	**800.0**
		Equipment	4	10	25	**1,000.0**
		Venue hire	4	10	25	**1,000.0**
		Stationary				**330.0**
		Refreshment	4	390	1	**1,558.0**
	Sub total (3)					**14,092.0**
4	**Supervision**	OD Per diem	4	4	15	**240.0**
		OD Travel cost	4	4	10	**160.0**
		Stationary	0	0	0	**0.0**
	Sub Total (4)					**400.0**
	Grand Total (Sub-Total 1+2=3+4)	**Grand Total** (Sub-Total 1+2=3+4)				**22,026.3**
	Estimated annual operation cost = (Grand Total Cost/4months) x 12 Months =					**66,079.0**
	Estimated annual cost per capita of beneficiary = Annual Cost/ population number= 66,079 / 134,013 =					**0.49**