Practitioners Approach Towards Information System of Infectious Disease Surveillance Issues: A Case Study of Community Medical Unit in Thailand

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Abstract—**Thailand has had a long and successful history of health development, but there is currently little available data on the infectious diseases. Without such data, predicting how the disease might spread in the future is difficult. For a community medical unit namely Baan Bang Oor sub district medical promoting hospital which located in nearly Bangkok, the capital of Thailand, the problems are that the place of this health district is very wide spread for a few persons in charge and such the prolong period of flood and a lot of plashes cause many infectious diseases. So this study provides the application necessitate geographic information system (GIS) to the web application for effectively utilizing geospatial data in the context of a specific public health. This approach draws on concepts and is developed under the broad umbrella of GIS society. Researchers tried to make the system assists those with responsibilities for the control of infection in the timely investigation and management of health incidents, particularly when they are of regional important. This GIS usages and applications in medical and in healthcare system based on real-world experiences successfully meet the persons in charge and for community health control.**

Index Terms—**community medical unit, infectious disease surveillance, geographic information system**

I. INTRODUCTION

Public health and healthcare are important social issues with deep implications for government administrations and with large effect on individual standard of living. In many countries healthcare institutions are being pushed to their limit by an aging population and urbanization (which may lead to additional health issues such as pollution). Many of these challenges have strong geospatial components. For example geographic information system (GIS) techniques may be used to determine statistical careless of health. In addition, the ability of GIS is to detect and record the location history of individuals and groups using. Internet and smart devices coupled with the ability to analyze and visually present large amounts of geospatial data can be harnessed to advance health-related application. Thai Government authorities used the spatial distribution of resources and its usage pattern as acquired by the participatory GIS process for planning the country central policy and deciding the place for setting widespread, but lack of spatial information in rural and regional level is one of the main problems for development practitioners and government officials and local level planners.

By being told and heard the same thing about GIS, and from researchers' interviewing [1] with the head of a local health community hospital (namely Baan Bang Oor sub district medical promoting hospital) that his regional hospital has only 4 officers take services responsibility for 14 villages which more than 1,200 households and 4,800 population which is 1:1,200. By surveying, the researchers found that the public relations of the hospital using the hospital's board and poster, the health information detailed and the diseases surveillance issues were shown by using the peg or a drawing pin to stick on the map on the paper board. So, this study derived from combining participation of list of notifiable diseases and GIS results using Google Maps and its powerful communication medium which bridge the gap between indigenous technical knowledge and scientific knowledge. Thereby the study increases the capacity of local stakeholders (who are the doctor and his assistants of the Baan Oor hospital) and policy maker to interact locally with external agencies who are the village header and villagers and with central government of Thailand. This information system provides the website of the database application of Baan Bang Oor hospital's patients and the GIS for monitoring the spread of a specific number of infection diseases, and collecting data for statistical analysis of the health-related GIS applications. Moreover, it provides the application of immunization treatment and follow up babies were born at this hospital and also the part for migrant and mobile mothers of this district.

II. CONTENT CONCERNS

A. Health Situation in Thailand

Health care system in Thailand is an entrepreneurial health system with public and private providers. Public health facilities were rapidly expanded nationwide.

Private hospitals also play role in health services. However, they are mostly in Bangkok and urban area. Since 1994, the numbers of hospitals and beds have been remarkably increasing bed to population ratio came up to 1:469 in 2004. While the doctor to bed ratio has dropped from 1:15.3 in 1991 to 1:7 in 2004. Number of health care personal i.e., doctors, dentists, pharmacists, and nurses has trended to gradually mount every year due to the strategy to increase emphasis on training of qualified health care personnel in the national plans. Nevertheless the distribution of health personnel still is one of major problems in Thailand. There was significant different between Bangkok and other provinces. There are more doctors in Bangkok [2]. The majority of health care services in Thailand are delivered by the public sector, which includes 1,002 hospitals and 9,765 health stations. Most hospitals in Thailand are operated by the Ministry of Public Health (MOPH). Provincial hospitals operated by the MOPH's Office of the Permanent Secretary are classified as follows [3], [4]:

- Regional and general hospitals are located in province centers, have a capacity of 200 to 500 beds and have a comprehensive set of specialists on staff.
- Community hospitals are located in the district level and further classified by size which large community hospitals have a capacity of 90 to 150 beds, medium 60 beds and small 10 to 30 beds

While all three types of community hospitals serve the local population, community hospitals are usually limited to providing primary care, while referring patients in need of more advanced or specialized care to general or regional hospitals. Although infectious diseases, most notably HIV/AIDS and tuberculosis, remain serious public health issues, non-communicable diseases and injuries have also become important causes of morbidity and mortality [1]. Major infectious diseases in Thailand also include bacterial diarrhea, hepatitis, dengue fever, malaria, Japanese encephalitis, rabies, and leptospirosis [5].

B. Context of Baan Bang Oor Sub District Health Hospital

Thai economy has changed from agriculture to services and manufacturing. Thailand is lying on South-east Asia; over 50% of the population lives on fluvial flood plains or areas identified as being subject to the risk of flood. Flash floods are common during the rainy season from June to October [4]. Baan Bang Oor hospital is located in Nakornnayok province in the central part of Thailand, the hospital is under Baan Na District Health Center and Nakornnayok Province Health Center. The Baan Bang Oor hospital has its responsibility of 14 villages. The villages are located on the central plain of Thailand which is lying near mean level on flat terrain. Most soils in this region are derived from alluvium characteristically fertile with fine textured, poorly-drained and slow permeability resulting in flooding annually. This prolong period of flood and poorly-drained land causes the infectious diseases. Most of villagers are agriculturists and somehow as migrants to manufacture jobs but still in

treatment services of Baan Bang hospital [1]. There are a doctor and 3 staffs work as full time. Health services are concern primary care and related works such as receiving mother pregnancy and antenatal care immunization treatment and surveillance, health care in children and schools, cancer refinement for grown women, health reviving for worker aged, disabled and elderly people and undertaking surveillance of communicable disease and infection and also the epidemiological investigation. For the disease surveillance duty in their health district, the doctor and his staffs try to protect the population in charge from infection through surveillance of infectious disease and support for outbreak investigation.

C. Technology and Research Concerns

Disease surveillance is an epidemiological practice by which the spread of disease is monitored in order to establish patterns of progression. The main role of disease surveillance is to predict, observe, and minimize the harm caused by outbreak, epidemic, and pandemic situations, as well as to increase knowledge about which factors contribute to such circumstances. A key part of modern disease surveillance is the practice of disease case reporting. In modern times, reporting incidences of disease outbreaks has been transformed from manual record keeping to instant worldwide internet communication. There is considerable public pressure to make the information and activity available quickly and accurately. The HealthMap real-time automated surveillance system is a program of Children's Hospital Boston with support from Google.org, the GermTrax part for tracking the spread of sickness and disease with the help of social media. ProMED-mail, the global electronic reporting system for outbreaks of emerging infectious diseases & toxins, opens to all sources. ProMED-mail, the Program for Monitoring Emerging Diseases, is a program of the international society for infectious diseases with the support and encouragement of the Federation of American Scientists and Sate IL. [6] [7].

GIS is a technology which can be adopted as a tool for analyzing and integrating the spatial and non-spatial data in the community development projects. GIS can be integrated the local knowledge and modern technology. Google Maps [8] is a basic web mapping service application and technology provided by Google, free (for non-commercial use), that powers many map-based services, including the Google Maps website, Google Ride Finder, Google Transit and maps embedded on third-party websites via the Google Maps API. It offers street maps, a route planner for traveling by foot, car, or public transport and an urban business locator for numerous countries around the world. With the introduction of an easily pannable and searchable mapping and satellite imagery tool, Google's mapping engine prompted a surge of interest in satellite imagery. Sites were established which feature satellite images of interesting natural and man-made landmarks, including such novelties as large type writing visible in the imagery, as well as famous stadia and unique geological formations. Although Google uses the world satellite,

most of the high-resolution imagery is aerial photography taken from airplanes rather than from satellites.

There are researches about the practical development of local health protection in Thailand, the research namely "Participatory action research of learning society based on the situation and problem related to Thai Buddhists and Muslims health in Pratoochai and Patong communities, Ayutthaya Province" [9], the research aimed to study contexts and situation related to health, analyze health problems, operations of knowledge and behavior which corresponded to the health of the people in the community. The research namely "Providing complementary medicine in public hospitals to solve chronic disease problems" [10], the finding shown that complementary medical services which were initiated by hospital administrations and staffs could be solved the problems of chronic diseases, and currently the using of alternative methods in combination with modern medicine were for the middle-class patients who could afford it, not applicable to almost people.

III. METHODOLOGY

Production is an activity of converting the raw materials to the final product. The production data are the Baan Bang Oor hospital's patient's health information, the socio-economic information of the population in responsibility of the hospital, the information of diseases occurrences and the statistics reports (following to the requirements of the doctor and staffs). Since a program of MOPH (namely Health Center Information System: HCIS) has been used, so the researchers studied and tried to link with the new system. The geographic database was constructed by overlaying the spatial data to the non-spatial data. This system is considered as passive surveillance and epidemiologic surveillance, so the details of people, place and time for each individual or personal are important. The GPS receiver machine (which was the two-channel sequencing receiver NCS-NAV A150+) was used for putting in the axis schedules of the patients' households to the map.

This research is a simulation experiment of interactive software development on supporting features of GIS usages, so the microcomputer which suitable for text, image and multimedia was used. MySQL DBMS runs on AppServ while simulated server with the Windows operating system. PHP Language is for connecting data and web application, and the intelligent part of the way suggests by Google Maps API. Java Script, Dream weaver and Flash are for web decorating. For the graphics development part, the researchers considered the points which must be bright and colorful that suitable for the users and avoid copyright issues.

The researchers designed to plug Google Maps into the webpage of the systems. Google created the Google Maps API to allow researchers to integrate Google Maps into websites with own data points. It is a free service, and currently does not contain ads. By using the Google Maps API, it is possible to embed the full Google Maps site into an external website. Researchers required to request and API key, which was bound to the website and

directory entered when creating, the key. The Google Maps API version 3, when creating a customized map interface requires adding the Google JavaScript code to a page, and then using Javascript functions to add points to the map. The researchers designed the database system of the patient's personal data and their household detailed using context diagram, data flow diagram, entity-relationship diagram and the reports of the system.

One of the imperative of total quality management is nourishing the human resource by establishing highly human compatible system [11]. This aspect has been directly and indirectly emphasized by the quality gurus. The system achieved this requirement and identified as a quality strategy under the name "quality through counseling". The experts by names of the Baan Bang Oor hospital, the doctor the staffs and the head of Baan Bang Oor village were in the process of content testing.

IV. RESULTS

The system was produced for online presentation providing the features which allow users to access services via Internet and in their health district. The programming was written into 2 parts the administration part and the user part. The medical secret detailed content is only for admin. The homepage of the system has shown in Fig. 1. The admin page is accessed via registration as in Fig. 2- Fig. 3. There are some examples of GIS application which geospatial data in the context of diseases epidemic shown in Fig. 4- Fig. 6. There is some information for the ordinary users such as statistics of patients in the timely investigation of infectious diseases as in Fig. 7. There is the information or the website according to the requirement of the hospital such as the news of the Really Simple Syndication (RSS). The immunological injection histories of the specific patients and the follow management also provided.
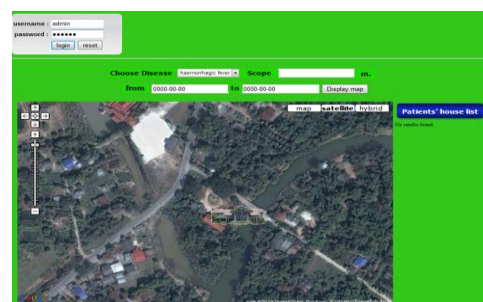

Figure 1. Homepage of the system.

Figure 2. Login to access the system of admin.

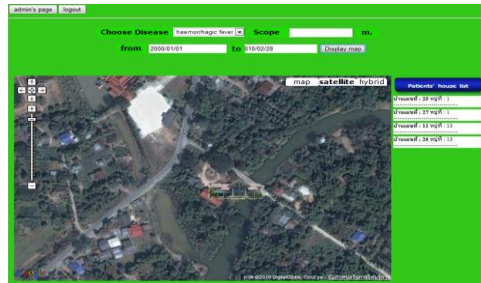Figure 3.   The accessible pages of admin.

Figure 4.   Undertake Google Maps of the Hemorrhagic fever dissemination.

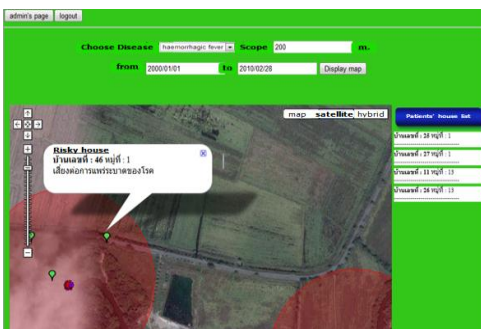Figure 5.   Undertake results of the Haemorrhagic fever dissemination.

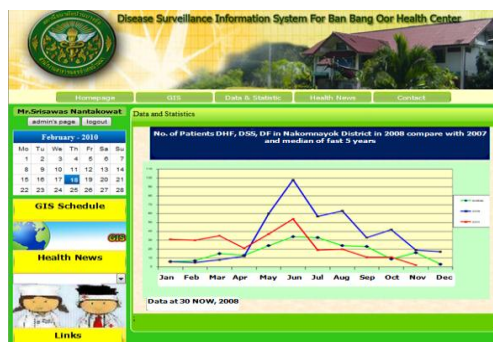Figure 6.   The risky house of the Haemorrhagic fever dissemination.

Figure 7.   Timely statistics of infectious diseases surveillance.

V.   CONCLUSION

Of the reasons that under the decentralization act the Ministry of Public Health of Thailand has transferred most of their health facilities to the local governments and local health centers, and the problem of misdistribution of health care providers among rural and urban area still exist, the doctor and his staffs of Baan Bang Oor sub district medical hospital have tried to play the role in health services for the population in their health district. So the database system was constructed and has provided via Internet using geographic information system and Google Maps. The system protects the population from infection through surveillance of infectious diseases. This study has focused and developed longstanding development plan for everyone in the regional or local health planning environment.

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