

Participatory Disease Detection through Digital Volunteerism: How the DoctorMe Application Aims to Capture Data for Faster Disease Detection in Thailand

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ABSTRACT

This paper reports the work in progress of incorporating a participatory disease detection mechanism into the existing web- and mobile device application *DoctorMe* in Thailand. As Southeast Asia has a high likelihood of hosting potential outbreaks of epidemics it is crucial to enable citizens to collectively contribute to improved public health through crowdsourced data, which is currently lacking. This paper focuses foremost on the localised approach, utilizing elements such as gamification, digital volunteerism and personalised health recommendations for participating users. *DoctorMe*'s participatory disease detection approach aims to tap into the accelerating technological landscape in Thailand and to improve personal health and provide valuable data for institutional analysis that may prevent or decrease the impact of infectious disease outbreaks.

Keywords

Participatory surveillance, digital disease detection, gamification, crowdsourcing, Thailand.

1. INTRODUCTION

Southeast Asia has long been a 'hotspot' for emerging and re-emerging diseases; it was the birthplace of both severe acute respiratory syndrome (SARS) in 2003 and highly pathogenic avian influenza (HPAI) H5N1 between 2003 and 2005 [1,2]. As viruses of zoonotic origin, these diseases typify pathogens with

the greatest pandemic potential, made all the more dangerous when found in a region of the world, such as Southeast Asia, that contains a high level of wildlife and microbial diversity [3]. The region is in the midst of rapid social, economic, and environmental change, driven by increased travel and trade to the region, urbanisation, and changing agricultural practices. While many of these trends may increase the risk for emerging diseases, technological advancements in digital communications and medical diagnostics can play a key role in protecting the population's health.

□ Over the last decade the public health community has made significant progress in global surveillance for emerging and re-emerging diseases, with a number of new disease surveillance technologies now complementing more traditional reporting systems. The Program for Monitoring Emerging Diseases (ProMED), a global listserv of infectious disease reporting [4], and the Global Public Health Intelligence Network (GPHIN), a news aggregation system that detects early signs of disease outbreaks [5], were two of the first efforts to leverage the Internet for global infectious disease surveillance. Other systems such as HealthMap [6], MedISys [7], and Biocaster [8] have also been developed, using a variety of digital media and a blend of computer algorithms and human expertise to detect the first signs of disease transmission [9]. In addition to these data-mining techniques, participatory epidemiology, with roots in wildlife health surveillance [10], has the potential to directly engage the public in disease surveillance through online reporting of symptoms to platforms such as Influenzanet [11] in Europe, Flutracking [12] in Australia, and Flu Near You [13] in North America. These participatory methods combined with digital communications hold great potential for detecting outbreaks faster.

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WWW'14 Companion, April 7–11, 2014, Seoul, Korea.
ACM 978-1-4503-2745-9/14/04.
<http://dx.doi.org/10.1145/2567948.2579273>

2. PARTICIPATORY APPROACHES EMERGING IN THAILAND

Recent improvements in international and regional disease surveillance networks will complement the ongoing improvements in disease detection and reporting. In East and Southeast Asia regional collaborations have improved through partnerships within World Health Organization (WHO) regions, the development of the Mekong Basin Disease Surveillance System (MBDS), and growing participation in the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) [1]. Thailand, geographically located in the heart of Southeast Asia and a key partner in both MBDS and the Asian Partnership for Emerging Infectious Disease Research (APEIR), hosts a population of approximately 67 million people and is working with neighbouring MBDS countries to improve community participation in disease surveillance, strengthen surveillance at the human-animal interface, and improve epidemiology capacity.

In addition to regional collaborations, Thailand's Ministry of Public Health (MOPH) works closely with the United States' Centers for Disease Control and Prevention (CDC) on a range of initiatives, including a Global Disease Detection (GDD) Regional Center that was established in 2004 and which WHO designated a Collaborating Center for Implementation of International Health Regulations National Surveillance and Response Capacity. Through the GDD the CDC works with Thailand and other partners to detect a range of diseases, including influenza, tuberculosis, anthrax, and other zoonotic and vector-borne diseases by developing sustainable, local capacity to address these threats.

Beyond traditional governmental partnerships, Thailand has demonstrated a willingness to improve public health through the use of new technologies. GeoChat, a group communication tool that uses SMS, email, and Twitter for chat, reports, and alerts, is being used in some Thai-Laos border provinces to improve disease surveillance communication [14]. This effort is supported by a collaboration between MBDS, Innovative Support to Emergencies, Diseases, and Disasters (InSTEDD), a non-profit organisation focused on using a blend of social and technical approaches to improve global health, safety and sustainable development, and Opendream, a social enterprise with expertise in Internet solution development and information design with "one single bold aim — deliver the information, change the world". GeoChat has also been used to support communication among the Thai Hospital Network, with over 900 facilities, enabling users to exchange information and receive alerts about disease outbreaks in the country.

2.1 DoctorMe: Incorporating Participatory Surveillance into a Self-Care Application

Thailand holds the advantageous position of enhancing innovative approaches, as illustrated in the GeoChat case, through its rapidly emerging technology sector. In Thailand, mobile phone penetration was reported in the second quarter of 2013 to have reached 131.8%, with the number of mobile subscriptions exceeding its population. Meanwhile, Internet access reaches

35.8% of the population, at 23.86 million users [15]. Similar to the global trend, the majority of mobile phone- and Internet users are found in urban areas. The potential for tapping into the large pool of mobile and Internet users with the aim to capture health data is promising.

As Southeast Asia is a hotspot for disease outbreaks and Thailand's technological capacity continues to increase, the web- and mobile application DoctorMe aims to incorporate a participatory disease surveillance mechanism to capture health data from citizens.



In 2009 Folk Doctor Foundation digitalised their bi-weekly healthcare magazine in collaboration with Change Fusion, a non-profit project of Opendream, and with financial support from the Thai Health Promotion Foundation. In late 2011, this initiative developed into the free iOS and Android mobile device application known as DoctorMe, and was incorporated into the Folk Doctor Foundation website in 2012. DoctorMe's digitalisation of existing general health care information published in a handbook created by the Folk Doctor Foundation has enabled a more cost-effective and wider scale of outreach.

The DoctorMe mobile application has, since its launch in 2011, steadily been ranked amongst the most popular applications in the health and fitness category of mobile applications in Thailand,

both in the iOS and Android markets. By the end of 2013, the application had been downloaded by over 400,000 users and has 35,000 active users monthly. DoctorMe also provides a Global Positioning System (GPS) with a database of over 1000 registered hospitals and clinics, free emergency call system and information regarding medicines and Thai herbal remedies.

DoctorMe's current version does not collect user data, but identifies trending symptoms searched by users. By early 2014, the DoctorMe web- and mobile application will integrate a participatory disease surveillance mechanism that is incorporated into the existing application.

Together with the financial support of the Skoll Global Threats Fund and in collaboration with the Folk Doctor Foundation, Opendream has developed the software and incentive-basis for DoctorMe to incorporate a function for citizens to contribute to public health through community reported data, potentially enhancing the process of detecting diseases faster.

2.2 Incentives for Participatory Surveillance

DoctorMe's participatory surveillance mechanism has from an early stage utilised a community approach. Opendream's participation and co-organisation of the hack-a-thon¹ "epihack" in Phnom Penh, Cambodia in August 2013, marked the first step in DoctorMe's conceptual development, through collectively developing the functions, desired impact and incentives that could be applied in the application.

DoctorMe holds the advantage of being an existing application with a broad, and continuously growing, user base. However, designing the incentives for engaging users in the participatory surveillance mechanisms are crucial.

To leverage the pre-existing function of healthcare advice, DoctorMe aims to generate relevant data for users reporting symptoms of disease. One incentive for participating citizens will be customised health advice, based on the health status reported, as well as a personal health tracker, allowing the user to identify one's own health trends. In addition, DoctorMe uses an appealing design, which has been referred to as "Asian cuteness", and integrates a gamification element, meaning that as a user actively reports their health status they will be virtually rewarded through badges and personalised avatars. DoctorMe also desires to advocate for so-called digital volunteerism, where users are aware of the value of individual reporting as a public health good. As volunteerism is a distinguishing characteristic found in the Thai society, such as local rescue work or temple work, the concept of digital volunteerism may be engaging.

3. DOCTORME AS A PARTICIPATORY DISEASE DETECTOR – THE GROWING NEED IN SOUTHEAST ASIA

DoctorMe is the first application of its kind in the Southeast Asian region, a geographically important region, as it holds a high likelihood of fostering emerging diseases. DoctorMe has carefully given attention to a vast spectrum of factors that may ensure the successful implementation and function of its participatory disease surveillance mechanism, both among web- and mobile device users. It is crucial to localise DoctorMe through allowing users to report their interaction with animals (which no other digital participatory disease mechanism allows), as this may be a factor for disease spread. Through the weekly push notifications and email blasts DoctorMe aims to collect health reports with a gamification approach and advocacy of digital volunteerism, while delivering personalised health recommendations to users. DoctorMe illustrates the potential for combining creative tools while enhancing public health through crowdsourced data.



Thus, the two main objectives of DoctorMe's participatory surveillance approach are; (a) to provide users personalised health care recommendations through a feedback loop based on the reported symptoms, which consequently contributes to improved personal health and potentially decreases the costs of medical care, and (b) to utilise the captured data on an institutional level to track public health trends and identify potential disease outbreaks,

¹ The "epihack" hack-a-thon is an event gathering designers, software developers and public health experts from across the globe to jointly improve and develop health-based technology.

which may be analysed by the Thai Bureau of Epidemiology, local hospitals or veterinarians. All data captured by DoctorMe will be stored by Opendream on behalf of the Thai Health Promotion Foundation and the application will be built using open source code. Data will be provided to the Thai Bureau of Epidemiology for analysis by that institution.

DoctorMe is an application that has grown from the initial function of providing useful health recommendations to incorporating a participatory disease surveillance mechanism. DoctorMe addresses the pressing need of including the general public in the disease reporting process. This technology represents an effective, scalable and cost-effective tool to reach the aim of detecting diseases more rapidly for safer societies.

4. ACKNOWLEDGMENTS

Our thanks to the **Thai Health Promotion Foundation**, **Folk Doctor Foundation** and **Change Fusion**, who jointly enabled DoctorMe to bridge technology and public health. We are also grateful for the support and encouragement of the **Skoll Global Threats Fund** in taking DoctorMe to the next level, by incorporating a participatory disease surveillance element into the system. Last, but not least, our thanks to the whole Opendream team - that joyfully and creatively constructed the online application; whose impact reached offline.

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