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Areas of Interest: Public Health Surveillance, Communicable Disease Epidemiology, Field Epidemiology, Information Technology for Strengthening of Health Systems, Public Health Administration & Program Management

Dr. Singh is Assistant Professor at the Indian Institute of Public Health (IIPH) – Hyderabad. He is a graduate of Government Medical College in Nagpur, MH, India and Emory University in Atlanta, GA, USA. He is currently pursuing a fellowship from

the Wellcome Trust on Disease Surveillance. He began his public health career as a medical officer in-charge of a Primary Health Center in a tribal region in Maharashtra. He then worked with the National Polio Surveillance Program of World Health Organization (WHO), providing leadership and technical support to the healthcare system at multi-district level in the states of Bihar and Maharashtra.

At IIPH, he coordinated the first two batches of Post Graduate Diploma in Biostatistics and Data Management (PGDBDM) program. He conducts and coordinates courses on applied epidemiology, public health surveillance, public health emergency preparedness and public health program management. He is involved in developing content and coordinating state and national level trainings of epidemiologists, surveillance officers and district and state public health managers under various national health programs. He also provides technical support to the Andhra Pradesh state government on disease control, surveillance and response programs. He is a member of the Immunization Technical Support Unit (ITSU) for the Ministry of Health, Government of India. ITSU has been constituted by the ministry of health in the year 2012 to guide the strengthening of routine immunization program in the country. He has been a member of the national Common Review Mission of the National Rural Health Mission (NRHM).

He has experience in providing leadership and technical support to the disease surveillance and vaccine preventable diseases elimination programs at the Ministry of Health in Kenya; he worked as a consultant with Center for Disease Control and Prevention (CDC), Atlanta's 'STOP' program and WHO country office in Kenya.

He has provided consultancy as public health systems domain expert to some high impact Information, Communication and Technology (ICT) projects in the domain of health information systems, public health surveillance and maternal & child health.

He is an active member of the International Society for Disease Surveillance (ISDS) and he represents the Global Outreach Committee and Global Health Informatics Group of the ISDS as a member. Dr. Singh is an associate edit of following journals, Springer Journal – Earth Perspectives, Internet Journal of Epidemiology and Indian Emergency Journal.

SHORT MESSAGING SERVICE BASED DISEASES SURVEILLANCE SYSTEM

Part of Integrated Disease Surveillance Project
in Andhra Pradesh, India

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There is mounting interest in the field of mHealth - the provision of health-related services via mobile communications. This can be attributed to certain interrelated trends. In many parts of the world epidemics and a shortage in the health care workforce continue to present grave challenges for health care systems. Yet in these same places, the explosive growth of mobile communications over the past decade offers new hope for the promotion of quality healthcare. In many nations paper based surveillance reports must be submitted in person and manually entered into a central health database. Recent evidence from small scale pilots in developing countries have shown that the data collection process can be more efficient and reliable if conducted via mobile phones rather than in the previous paper based formats.

The overall objective of the Integrated Disease Surveillance Project (IDSP) launched in 2004 was to improve the timeliness and quality of the response to infectious disease outbreaks at district level, and to improve the quality of monitoring and surveillance of infectious disease at state and national level. Periodic reviews of the IDSP undertaken internally and by the Joint

Implementation Support Review Mission (JISM), comprising of state officials and members from the development partners, have reported many challenges to improving the effectiveness of the IDSP. These include the lack of human resources, poor communications with the distant and remote reporting site locations, resource limitations and lack of analytical skills and capacity.

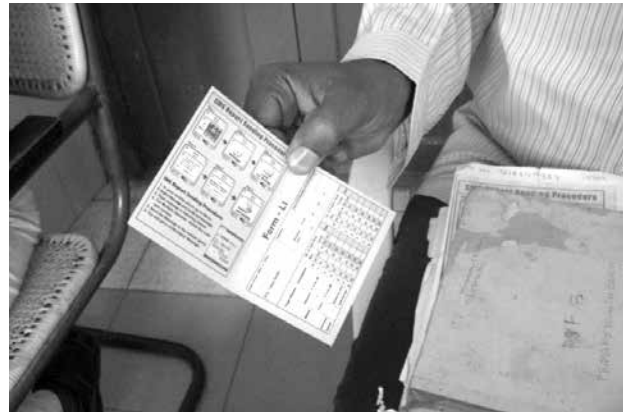
In the state of Andhra Pradesh (AP) the situation with the IDSP was not dissimilar. To address the challenges, a Short Message Service (SMS) based surveillance system was designed and piloted in six of AP's 23 districts, starting in August 2008. The SMS based surveillance system was an attempt to tackle the barriers to improving the IDSP by capitalizing on the exponential growth in numbers as well as reach of mobile phones in the state.. The system was jointly designed in the state by the Directorate of Health Services (DH) and the National Informatics Centre (NIC). The system used simple alpha-numeric codes to collect information compatible with the prescribed IDSP formats. Health workers across the state were trained to report the information via SMS to a central server in Hyderabad. To ensure data security the system was designed to identify every health facility

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(reporting unit) involved in the project with a unique identification number and the SMS was accepted only from registered mobile numbers. The system was also able to send automatic alerts to registered mobile numbers when the frequency of reports crossed pre-set threshold levels. Health workers in 3,832 reporting units (hospitals and health centres) across six pilot districts began using this system to send IDSP reports in August 2008. Anecdotal reports suggested some promising results such as improved reporting from the hard to reach areas, possibility of generation of more timely alerts regarding outbreaks, reduced burden of paper work and savings on resources such as stationery and postage. As a result of this promising feedback from the pilot sites, the SMS based system was rolled out to about 16,000 reporting units across the state.



Health worker displaying Pocket flip card of SMS reporting procedures



Medical officer at a PHC training health staff on SMS reporting procedures

In the conventional paper based surveillance system the reporting was done manually or semi-automatically, i.e. entirely by post or in person to

the district level surveillance unit. From the district centre the data used to be consolidated and sent to the state level surveillance unit by email or by fax. Usually the information about the health events used to take a few weeks of time to travel from the field level to the state level. In the mHealth surveillance system, the field level health workers were given a messaging template, or a 'midlet' was stored in their mobile phones to capture the data with menu driven interfaces, which were converted into an SMS. The SMS thus created is sent to a central gateway, which gets processed at state level, and subsequently the national level disease surveillance servers get updated. SMS based alerts and early warnings get generated automatically to the registered stakeholders responsible for taking timely remedial measures. The State Surveillance Unit (SSU) printed and distributed pocket sized flip cards with SMS reporting procedures to aid the sending of SMS reports by the health workers. Flex posters of SMS reporting procedures were also printed



Flex board of SMS reporting procedures in the laboratory

and distributed to all reporting units, including the laboratories. The SSU has also hosted a website where web based customized reports generated from the SMS reports can be accessed by different stakeholders.

Results from an evaluation of the system have shown an increase in regular reporting from the hard to reach reporting sites. The health workers surveyed reported that they were receiving reminders through the SMS based surveillance system, and that these reminders have led to an improvement in the reporting frequency. The system acknowledged receipt of SMS reports in the proper format, and many health workers stated that the immediate acknowledgement of a report



Mobile phone of a health worker showing a reminder from the SMS surveillance System

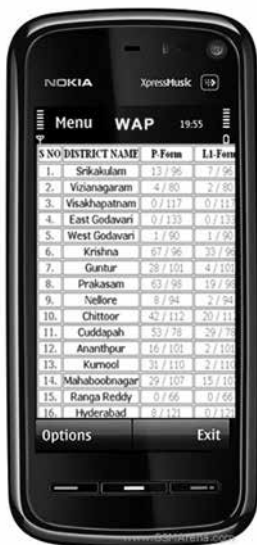
encouraged them to send regular reports. The system also generates automatic alerts based on thresholds set for the number of cases reported for various diseases. The threshold levels are set based on the definitions of outbreaks given in the IDSP manuals and are unique to a disease. These alerts can lead to a significant decrease in the response time to disease outbreaks in the state. Alerts to multiple stakeholders may also lead to better inter-sectoral coordination in responding to disease outbreaks in the state.



Interactive state map with complete disease surveillance reports

An evaluation of the system has shown that there is significant decrease in the time taken to report every week in a SMS based surveillance system as compared to the paper based reporting system. This system has also led to a significant reduction in the money spent on travel and stationery versus the conventional paper based reporting system.

Mobile phones in this system have also made availability of real time data from the field easily accessible on the hand sets in a user-friendly mode. District and state level managers are accessing real time reports from the field through their mobile handsets and making timely decisions. This has led to a significant increase in the number of situations in which



District wise disease surveillance reports on mobile phone

the managers have taken some preemptive measures to prevent outbreaks or control the spread of outbreaks.

Overall, the Short Message Service technology has been successfully utilized in Andhra Pradesh to create a disease surveillance system which is adept for timely and adequate response to disease outbreaks in a cost effective way. The evaluation of this system has shown that high mobile phone penetration in the population provides the opportunity for making public health programmes more community-centric.

Mobile phone based surveillance also offers an opportunity for linking human and animal

health surveillance from the grass roots right up to the national level. Efforts need to be made to explore further possibilities for knowledge sharing and for forging appropriate collaborations to find solutions to health problems across the public health and veterinary sectors.

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