Working Group on Epidemic Preparedness:

Preventing the Spread of Epidemics Using ICT

September 2018

Executive Summary

BROADBAND COMMISSION
FOR SUSTAINABLE DEVELOPMENT

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History of Epidemics and Leading Causes

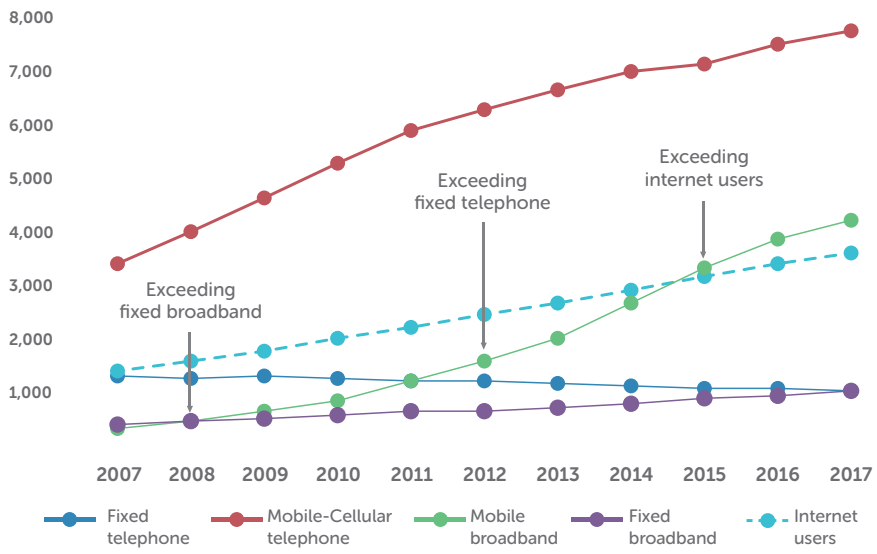
Humanity has long fought a war against infectious diseases. From the Plague of Athens, the first recorded infectious disease in history, to modern epidemics such as Ebola and MERS, infectious diseases have incurred significant social and economic losses. In particular, modern epidemics pose a great threat to humanity with its unprecedented speed and scale. The economic loss of modern epidemics are estimated to be approximately 60 billion dollars per year.

What is more concerning is that global changes have made it more difficult to address modern epidemics. Growing international exchanges since the 1970s, increase in population and urbanization, intensification of global climate and environmental changes, and inadequate systems of disease prevention and control are considered the leading causes of epidemics in modern society. Stakeholders from various fields around the world are addressing such challenges in an effort to free humanity from the threats of epidemics.

ICT as a Game Changer in Fighting Epidemics

ICT has also actively joined such efforts. Explosive growth in mobile broadband penetration in the last decade has been contributing to resolving universal challenges of mankind (poverty, famine, disease, etc.) through mobile services, and big data analysis based on data science is drawing increasing attention as a key ICT solution for fighting epidemics.

[Subscriptions of key ICT network infrastructures (Unit: Million)]

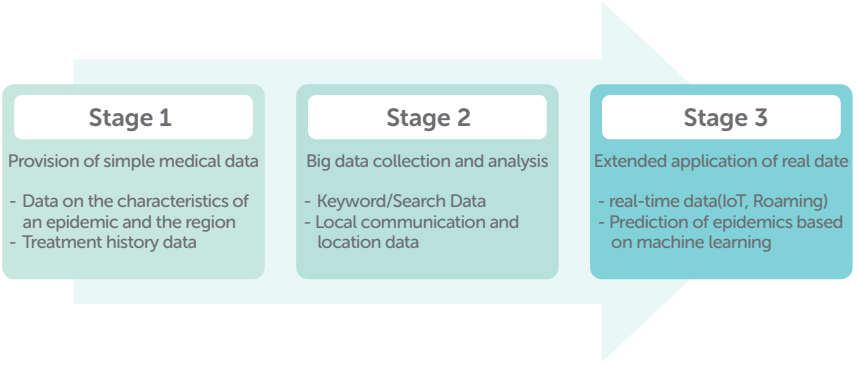


Big Data Based ICTs for Fighting Epidemics

As for data science technologies currently being utilized in the fight against epidemics, representative examples include Genetic data analysis, Cell phone mobility data analysis, Social media data analysis, Location-based information mash up, and Large-scale simulations. These technologies collect various epidemics-related big data and mash up with map and location data, thereby serving as a solution to identify the course of epidemics spread and potential infected populations.

However, considering that the increased complexity of modern epidemics requires multi-faceted solutions, epidemics solutions that solely depend on big data might not be able to produce tangible and meaningful outcomes in the future. This challenge can be resolved by utilizing various ICT technologies in data collection and analysis, thereby lowering the dependency on a single source of data. More recently, the effort to fight epidemics is further evolving by using real data such as roaming data, social media and IoT in an effort to collect more practical data and to enhance the effectiveness of data analysis.

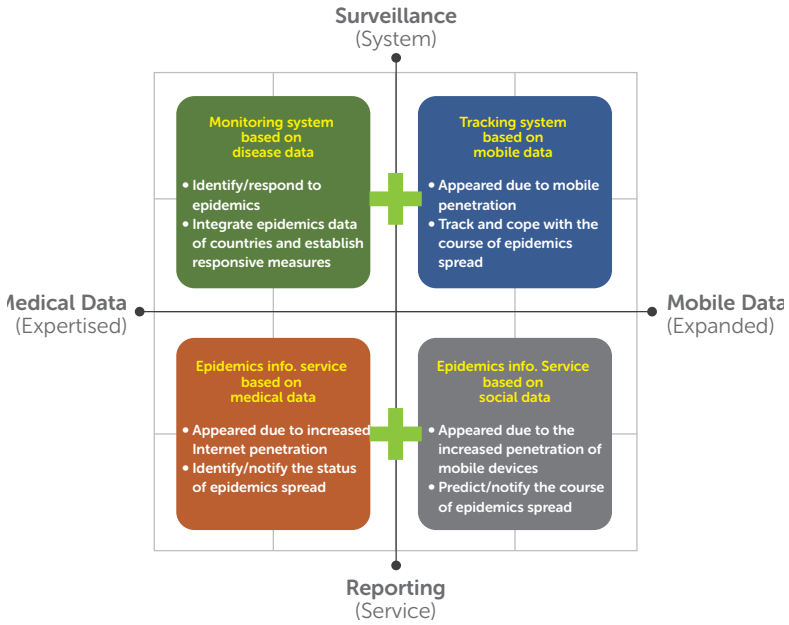
[Data Expansion for Effective Epidemic Response]



Diversification of Big Data Based Epidemic Solutions

Along with the expansion of data usage scope for effective response to epidemics, various big data based solutions began to emerge. ICT has expanded the scope of data use from previous medical data to mobile data and contributed not only to helping enhance public awareness but also to helping the public more proactively respond to prevent the spread of epidemics. Big data based epidemics solutions that currently exist can be divided as follows.

[Data Expansion for Effective Epidemic Response]



In the figure above, the horizontal axis represents the expand in data field, and the data tends to further expand and integrate with one another from expertised small data (medical) to big data (mobile). The vertical axis represents the enhancement of epidemics solutions and signifies that the purpose of using ICT solutions is changing from epidemics information provision (Reporting) to epidemics monitoring (Surveillance).

① Monitoring system based on disease data

This system identifies and responds to the spread of epidemics based on disease data of each country. The main objective of this system is to establish a hotline among each nation's government ministry in charge of epidemics management and international health authorities (or regional associations) through which epidemics data can be shared and coping method can be established. Even though this is the most initial type of solution, this is still an important system considering that the very basic step of establishing epidemics measures is to collect index-based data and to analyze them from a comprehensive standpoint.

② Epidemics information service based on medical data

While the existing solutions focused on supporting the efforts to respond to epidemics at the national level, new epidemics solutions have added a new objective of directly notifying citizens of the status of the epidemics spread. As for the data to be used, previous epidemics data were aggregated with de-identified medical data provided by

various institutions, thereby evolving in a direction that has significantly enhanced the accuracy of epidemics spread trends.

③ Tracking system based on mobile data

The penetration of mobile devices has contributed to enhancing the instantaneity of epidemics solutions that are based on epidemics and medical data. If the epidemics solutions based on medical data aimed to establish ex post coping methods through identifying the spread of epidemics outbreaks, new solutions based on mobile data were utilized in minimizing the gap between the outbreaks and the response by tracking the course of epidemics outbreaks. So, this solution can be said to be the first of its kind in terms of big data based epidemics solutions.

④ Epidemics information service based on social data

Social data has invited smartphone users around the world as the main player of data production, thereby further minimizing the gap between epidemics outbreak and the response. In addition, accumulated information has been provided as a form of mobile application, which enabled access to the latest epidemics information anytime, anywhere. In the meantime, social data has been contributing to improving the accuracy of epidemics spread forecast. What we should note is that various solutions exchange their own data in an effort to effectively prevent the spread of epidemics. Not only epidemics information services used by citizens but also other solutions used for public purposes in the field of epidemics monitoring system are more increasingly doing so.

Global efforts on improving epidemic preparedness capabilities

Internet and mobile data not only supplement traditional public health infrastructure, but are also used as the hub of epidemic data and offer greater diversity in the methodology for early warning and data collection. With new types of data accumulating, such as internet search queries and social media, new efforts are being made to enhance surveillance efficiency by making direct use of this data or combining it with traditional data for analysis. Governments, companies, and international organizations around the world are seeking meaningful use cases for ICT based disease response.

[Cambodia] Mekong Basin Disease Surveillance

The MBDS (Mekong Basin Disease Surveillance) cooperation is a self-organized sub-regional network commenced in 2001 among six Mekong Basin countries and provinces of China, including Cambodia, Yunnan (and, since 2006, Guangxi) provinces of China, Laos, Myanmar, Thailand, Vietnam. It aims to strengthen national and sub-regional capabilities in epidemiology surveillance and outbreak response, especially on 18 currently designated priority

diseases, to rapidly and effectively control them. The cooperation focuses on collaborative cross-border disease surveillance and response activities, through programming at approximately 25 designated cross-border sites.

[ProMED] Disease Notification Mailing Service

ProMED (Program for Monitoring Emerging Diseases) is the biggest private, open system of unofficial disease surveillance and reporting in international health. This web and email based service aims to continuously and rapidly monitor and report potential outbreaks of infectious diseases and exposures to toxins that could affect human or animal health. Through ProMED system, thousands of scientists, health professionals, journalists, and non-professionals interested in infectious diseases can receive news of epidemics in near real-time. ProMED played an important role in identifying the outbreak of SARS in 2003.

[ITU] CDR Based Ebola Outbreak Data Repository

IIn 2015, when 3 West African countries were hit by the Ebola virus, ITU initiated its first big data project. In collaboration with the beneficiary member states of Guinea, Liberia and Sierra Leone, the project was able to showcase the potential of big data to facilitate the timely exchange of information to respond to epidemic outbreaks. In close cooperation with the national telecommunication regulatory agencies in Guinea, Liberia and Sierra Leone, and with all mobile network operators (MNOs) operating in these countries, ITU conducted a preliminary study on sample Call Detail Records (CDR) data. After collecting the anonymized CDR data, ITU consolidated it into a single platform and opened it to third-party, then used data de-identification, location information calibration, and data standardization to predict the possible paths of Ebola outbreak.

[KT] Roaming Data Based Smart Quarantine Solution

During the MERS outbreak, Korean authorities had a difficult time verifying infections for those travelers that visited unaffected countries after visiting contaminated regions. KT, a mobile communication company in Korea, suggested a quarantine solution that uses communication data collected in accordance with the 'Infections Disease Control and Prevent Act', which had been useful during the avian influenza outbreak. KT linked the roaming data of its subscribers with KCDC's data on epidemics to select at-risk travelers, and successfully built an SMS solution to send texts with disease information and guidelines. This data was also used to secure statistics about Korean citizens residing in contaminated areas and those that arrived in Korea during the incubation period, which was developed into a statistical dashboard for quarantine policies and measures.

[HealthMap] Map Based Real-Time Disease Information App

HealthMap is an open service that aggregates and analyzes social data on infectious diseases and public health reports, and provides them

free of charge to a diverse audience from public health workers to ordinary citizens. Disease information is available whenever, wherever through the very accessible mobile app. The primary objective of HealthMap is to provide disease information in real-time. To this end, HealthMap monitors global online news (i.e. Google News, Baidu) and reports by international health organizations (i.e. WHO) around the clock, and allows users to customize the map and time series as they want to see them.

[Ericsson, GSMA] Mobile Information Notification Infrastructure for Ebola Management

Ericsson and GSMA aimed to overcome the Ebola Outbreak in West Africa by building mobile infrastructure. This effort was significant in that it laid the foundation on which disease solutions can operate by investing physical resources in a region with insufficient ICT infrastructure. GSMA focused its efforts on providing accurate disease information to ordinary citizens in Ebola affected regions. It built a mobile information notification system where WHO approved Ebola information could be viewed through feature phone channels like SMS and interactive voice response (IVR). Ericsson concentrated its efforts on providing mobile communication support for healthcare personnel working in the affected countries. It built an emergency communication network for the volunteers in the affected regions, while also distributing smart devices to the 40,000 healthcare personnel for better information sharing.

Recommendations

Regulation for Safe Personal Data Utilization

Currently, many countries around the globe have privacy protection laws in place. However, this should not lead to the loss of opportunities to prevent the spread of epidemics in an early manner. Considering the fact that epidemics can harm not only individuals but also the public health as a whole, we could consider that relevant privacy laws enable the processing of public health data without consent in contexts where the processing is necessary to protect the public interest in the area of public health during epidemiological emergencies. In addition, we need to continue our efforts to create an environment where the use of personal information takes place in a safe and reliable manner.

Establishment the of epidemics data sharing/ monitoring system

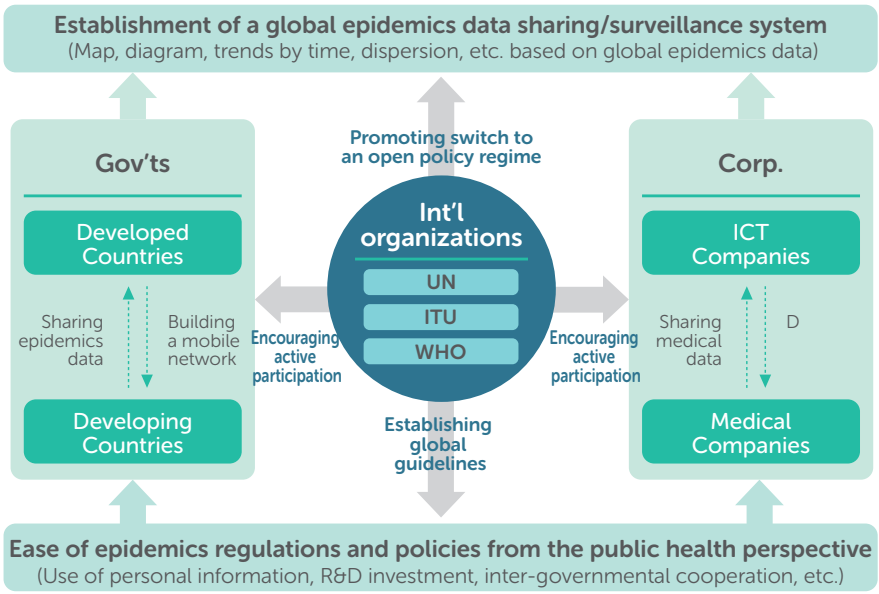
Data sharing and utilization among nations around the world is essential to more effectively fight epidemics. Under the shared goal of epidemics eradication, governments around the world need to have a renewed perspective toward epidemics data sharing and make more concerted efforts in establishing a common system. In particular, active participation from Asia and Africa, which are often prone to epidemics, is required. However, some of the countries in those regions do not have enough resources and budget and lack technological

infrastructures, thereby failing to operate the epidemics response system. Hence, it is the responsibility of the international community to think about how to best provide economic and technical support so that these regions in need can build an epidemics monitoring system.

Expansion of global governance

There is a pressing need for the international community to actively collaborate in fighting epidemics. Private enterprises need to develop epidemics solutions based on their various ICT technologies and data, and nations around the world should pursue more open and integrated approach so that the data and solutions of private companies can be effectively shared on a single global system.

[Epidemics governance structure led by international organizations]



At the same time, there is an increasing need for global governance to be jointly led by international organizations of various fields, such as UN, ITU, and WHO. Remaining tasks for international organizations now include the establishment of epidemics-related regulations and policy guidelines that governments around the world can refer to and the promotion of the private-public-international community participation to build an integrated system.

#Broadband
#ICT4SDG
#OtherHashtags

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