WER SRI LANKA 2022

WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiology Unit
Ministry of Health, Nutrition & Indigenous Medicine
231, de Saram Place, Colombo 01000, Sri Lanka
Tele: + 94 11 2695112, Fax: +94 11 2696583, E mail: epidunit@sltnet.lk
Epidemiologist: +94 11 2681548, E mail: chepid@sltnet.lk
Web: http://www.epid.gov.lk

Vol. 49 No. 15 — 09th– 15th Apr 2022

Application of digital technologies for infectious disease surveillance, prevention and control Part I

Digital technologies have been widely used by medical professionals in both curative and preventive health sectors globally to overcome a wide range of obstacles and bottlenecks in health care provision. A key health area where the use of digital technologies has demonstrated greater success is the surveillance, prevention and control of infectious disease, which includes timely reporting, epidemic surveillance, and monitoring of programmed immunization. Specifically, web-based surveillance tools and epidemic intelligence methods, used by public health institutions, have facilitated risk assessment and timely outbreak detection. However, the usability of digital technologies depends on the digital literacy of its users. This is a major limiting factor in its implementation in developing countries in addition to resource limitations. Resource limitation includes the development of digital solutions, necessary infrastructure, and training.

Despite the above-mentioned limitations, digital technologies offer several opportunities for infectious disease surveillance, prevention and control. Developments in the area of information and communication technologies (ICT) for public health surveillance can help make analysis timelier as well as increase accuracy, while new data mining techniques and Artificial Intelligence can help to detect early warning signs of disease outbreaks as people research or discuss their symptoms online.

The following examples highlight the importance of the use of digital health solutions in disease surveillance, prevention, and control.

Use of Digital Health Solutions for Disease Surveillance during Mass Gathering

Reduction in cost coupled with improved connectivity and speed of global travel have increased the number of attendees at major international gatherings, be it a sports event like the football world cup or a religious event like the Haj pilgrimage. Further, globalization has expanded the geographic radius from which the attendees travel, leading to the potential for a more extensive spread of emerging outbreaks. Fortunately, these changes have dovetailed with improvements in mobile and digital technology, offering greater opportunities for and augmentation of traditional surveillance systems during major mass gatherings. These technologies include Internet-based systems, mobile phone applications, wireless sensor networks and syndromic surveillance systems. Because health and technological infrastructures are not consistent globally across regions, the utility of these diverse technologies is partially dependent on the geographic location of the gathering.

In the year 2009, swine flu became an infectious disease of concern which progressed to become a global pandemic. The Saudi Ministry of Health (MOH) identified the treatment of Swine Flu during the Haj pilgrimage where the holy sites in Saudi Arabia welcome pilgrims around the world.

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The ministry with the collaboration of the US CDC launched the Hajj Mobile Disease Surveillance System (Hajj-MDSS). During the initiative, the Hajj-MDSS was used for the rapid detection of various infectious diseases among pilgrims (influenza and others), enabling informed decision-making for disease control and prevention.

Digital Technologies to Map Infectious Disease Outbreaks

A geographic information system (GIS) is a technique that creates, manages, analyses and maps all types of data. GIS connects data to a map, integrating location data with all types of descriptive information. This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication and efficiency as well as better management and decision making which makes the GIS applications an ideal solution to improve the accuracy and timeliness of detection and managing an infectious disease outbreak. The earlier barriers to the application of GIS techniques which includes the non-availability of base maps and GIS devices are less of a concern at present in most developing countries including Sri Lanka. In Sri Lanka, Grama Niladari-wise GIS base maps have been already developed by the survey department. The health sector, at present, is moving forward with the development of Public Health Midwife and Public Health Inspector-wise base maps. This will remove a significant bottleneck in implanting GIS techniques in disease and outbreak surveillance. Further, wider public use of smartphones with improved connectivity has lessened the burden of the capital cost of purchasing GIS devices. GIS techniques could be applied to local geography, environmental and climatic conditions those favour especially vector-borne disease, zoonoses and emerging outbreaks which can be effectively analysed using mapping and modelling techniques. The prime goal of environmental and health management is to reduce existing risks and prevent the introduction of new uncontrolled risks. Since alterations to human health are often associated with or caused by sudden or gradual changes in the environment, it is important to identify environmental hazards and their effects early. The use of GIS maps with the available advance statistical methods to forecast could help to predict the geographical locations with inducive environmental factors which could lead to an outbreak of infectious disease. For example, these GIS tools have aided enormously in understanding the epidemiological processes of malaria. GIS is now widely used for research and development as well as decision-making policy in infectious diseases control and prevention. GIS has facilitated the analysis of access to health facilities and disease risk in different populations combined with the management and analysis of health and healthcare data. For example, GIS applications were used to study the prevalence and spread of human immunodeficiency virus (HIV) in Tanzania and Mozambique to improve the access to services and to use limited health resources to a greater effect to mitigate the transmission of the disease.

Health Status Code used during COVID-19 Pandemic in China

Source: https://www.gensler.com/blog/a-day-in-the-life-going-back-to-work-in-china

Table 1: Selected notifiable diseases reported by Medical Officers of Health 02nd – 08th Apr 2022 (14th Week)

RDHS	Dengue Fever		Dysentery		Encephaliti		Enteric Fever		Food Poi-		Leptospirosis		Typhus		Viral Hep-		Human		Chickenpox		Meningitis		Leishmania-		WRCD	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	T*	C**
Colombo	10	2355	0	2	0	1	0	0	0	3	3	29	0	0	0	1	0	0	0	9	0	3	0	1	7	100
Gampaha	63	1930	0	4	0	0	0	0	0	6	1	28	0	0	0	2	0	1	1	8	1	4	3	6	5	72
Kalutara	53	785	0	4	0	0	0	1	0	5	4	90	1	2	0	1	0	1	3	21	1	10	0	0	4	100
Kandy	37	558	0	3	0	0	0	0	0	3	0	23	3	11	0	4	0	0	6	16	1	2	1	2	5	96
Matale	8	133	0	0	0	0	0	0	0	0	3	17	0	2	0	1	0	0	1	6	0	1	10	135	15	100
NuwaraEliya	0	52	0	7	0	0	0	0	0	0	1	17	1	7	0	0	0	0	0	8	0	0	0	0	8	100
Galle	39	719	0	1	0	0	0	0	0	0	8	120	0	6	0	1	0	0	4	25	0	9	0	0	5	100
Hambantota	16	227	1	23	0	0	0	0	0	0	4	51	2	15	0	1	0	0	0	12	0	3	14	153	13	100
Matara	18	261	0	4	0	0	0	0	0	0	7	50	1	5	0	1	0	0	2	7	0	3	5	86	16	100
Jaffna	94	1048	1	9	0	2	3	38	2	12	0	15	19	325	0	2	0	1	1	43	1	4	0	0	50	88
Kilinochchi	2	48	0	4	0	0	0	0	2	11	0	1	0	6	0	0	0	0	0	2	0	0	0	1	32	100
Mannar	1	142	0	1	0	0	0	0	0	0	1	10	0	2	0	1	0	0	0	0	0	13	0	0	23	81
Vavuniya	0	41	0	0	0	1	1	1	0	0	0	5	0	1	0	0	0	0	0	5	0	0	0	0	2	82
Mullaitivu	3	25	2	2	0	0	0	2	1	1	0	9	0	3	0	0	0	0	0	3	0	0	0	1	24	100
Batticaloa	43	369	0	31	0	5	0	0	0	5	2	15	0	0	0	1	0	0	0	5	1	16	0	1	29	100
Ampara	2	46	0	6	0	1	0	0	0	0	1	29	0	1	0	1	0	0	2	22	0	6	0	7	7	100
Trincomalee	50	405	0	20	0	0	0	1	0	0	1	6	0	1	0	4	0	0	1	3	0	2	0	0	20	92
Kurunegala	36	1025	0	5	0	1	0	0	0	1	1	28	1	11	0	0	0	0	3	25	0	9	9	153	5	100
Puttalam	26	820	0	0	0	0	0	0	0	0	0	7	1	3	0	0	0	0	0	3	0	10	0	2	12	92
Anuradhapur	6	136	0	7	0	0	0	1	0	2	2	67	0	14	0	2	0	1	3	16	0	11	6	165	5	88
Polonnaruwa	1	41	0	3	0	0	0	0	0	1	1	38	0	0	0	0	0	0	0	2	0	2	5	121	7	88
Badulla	8	365	0	4	0	0	0	0	2	5	2	65	0	10	4	32	0	0	1	18	1	6	0	7	5	100
Monaragala	11	99	1	3	0	0	0	3	0	2	3	100	1	9	1	18	0	0	1	18	0	11	0	41	6	100
Ratnapura	44	632	1	13	0	5	0	1	0	15	13	209	0	7	1	9	0	0	2	23	5	11	1	74	6	95
Kegalle	27	394	0	3	0	1	0	1	0	4	6	123	1	7	0	2	0	0	2	27	0	15	2	9	5	100
Kalmune	28	227	2	18	0	0	0	0	1	4	0	3	0	1	0	0	0	0	0	10	2	10	0	0	24	100
SRILANKA	72	12883	8	177	0	17	4	49	8	80	64	1155	31	449	6	84	0	4	33	337	13	161	56	965	12	95

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 08th Apr , 2022 Total number of reporting units 361 Number of reporting units data provided for the current week: 342 C**-Completeness

Table 2: Vaccine-Preventable Diseases & AFP

02nd – 08th Apr 2022 (14th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2022	Number of cases during same week in 2021	Total number of cases to date in 2022	Total number of cases to date in 2021	Difference between the number of cases to date in 2022 & 2021
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	01	01	00	00	00	00	00	00	00	02	01	24	16	50 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	00	00	00	00	00	00	00	00	01	04	13	32	- 59.3 %
Measles	00	00	00	00	00	00	00	00	00	00	00	10	05	100 %
Rubella	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	01	01	0 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese Encephalitis	00	00	00	00	00	00	00	00	00	00	00	01	00	0 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tuberculosis	26	00	00	02	04	02	00	00	00	94	87	2265	1840	23.0 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

RDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:
Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,
Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis
CRS =**Congenital Rubella Syndrome
NA = Not Available

Covid-19 Prevention & Control

For everyone's health & safety, maintain physical distance, often wash hands, wear a face mask and stay home.

Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to **chepid@sltnet.lk. Prior approval should be obtained from the Epidemiology Unit before publishing data in this publication**

ON STATE SERVICE

Dr. Samitha Ginige
Actg. CHIEF EPIDEMIOLOGIST
EPIDEMIOLOGY UNIT
231, DE SARAM PLACE
COLOMBO 10