WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiology Unit
Ministry of Health, Nutrition & Indigenous Medicine

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WEER SRI LANKA 2023

Vol. 50 No. 15 08th– 14th April 2023

Artificial Intelligence in Public Health: Disease Surveillance, Out-Break Control and Emergency Preparedness Part II

This is the last article of series of two articles.

The World Health Organization began to develop a global platform called "EPI-Brain" which would allow data scientists and public health experts to analyze big data to be prepared for an early response to oncoming emergencies. Epi-Brain is an AI that allows scientists to merge health data with other multitudes of factors that drive epidemics including human and animal population movements, animal diseases, and environmental and meteorological factors. Using machine learning Epi-Brain makes it possible to get a more comprehensive analysis to help predict the onset of outbreaks and spread. AI platforms may utilize satellite data, social networking and other data such as Google's Community mobility data to build early warning systems for the future. AIs such as "EpiBrain" have been designed to provide insight to epidemiologists, public health experts, governments, airlines and hospitals to anticipate and manage health risks.

Use of Artificial Intelligence during the COVID-19 Pandemic

The Covid-19 pandemic harnessed the power of artificial intelligence to provide tools to policy-makers, the medical community and the people to manage each stage of the emergency, by supporting early detection, prevention, response and recovery. Artificial intelligence was able to revolutionize how technology was viewed and used to understand the epidemiology of infectious disease, its related morbidity, mortality and treatment methods. Moreover, it transformed the research sphere for the discovery of drugs and treatment modalities. The pandemic also mobilized countries and organizations to use artificial intelligence to enable remote communications, widen the reach of telemedicine as well as maintain and protect food security.

At the very early stage before the onset of the pandemic, a machine learning algorithm developed by a start-up company in Canada "BlueDot" first raised the alarm regarding an outbreak of undiagnosed respiratory illness in Wuhan, China. This AI platform was developed with the capability to detect outbreaks and was equipped with advanced capabilities to predict outbreaks and to act as an early warning system for pandemics, by detecting anomalies and digital "smoke signals". BlueDot AI platform was specifi-

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cally developed to recognize outbreaks, with its capability to scan news reports in sixty-five languages, and the ability to read global airline and animal disease network data.

France, Canada, Finland, Italy and the United States of America used virtual assistants and chatbots to help screen for COVID-19 symptoms as well as to help citizens find reliable and accurate health information using AIs which were created in collaboration with the World Health Organization to facilitate contactless screening and further to provide health information using real-time data. The United States Center for Disease Control (US-CDC) and Microsoft developed the Coronavirus Self Checker service using AI to help users self-assess symptoms and guide their next course of action. Such AI platforms helped to reduce the strain on human resources in the health sector during the pandemic. Furthermore, Chatbots, virtual assistants and AI algorithms contributed immensely to the fight against COVID-19-related "infodemic" and misinformation.

Additionally, AIs were utilized to identify, locate and thereafter contact high-risk individuals to prevent COVID -19 spread among vulnerable populations. Some of these platforms were able to allocate a risk score to each individual based on respiratory complications and social isolation. An open-source AI modelled and predicted a COVID-19 vulnerability index and identified those most at risk for severe complications using a "C-19 index". Further the AI platform "EpiRisk" was able to predict an individual's probability of infection to motivate precautions and preventive measures among the general public. Such AI platforms assisted healthcare systems, social services and Insurance companies in mitigating infection risk in vulnerable individuals and neighbourhoods.

Several AI platforms used machine learning to model multiple scenarios to find the potential impact of COVID-19 and to understand the spread of infection across nations. These AI platforms were made as open-source platforms to allow nations to better understand the numbers exposed, infected and hospitalized to make better-informed decisions amidst the pandemic. As COVID-19 mutated, further improvements to the AI platforms supported epidemiologists in making accurate predictions regarding the pandemic.

AI platforms were built to accelerate research as well as to speed up the discovery of drugs to treat COVID-19. AI platforms were created to identify the body's response to COVID-19 infections and identify existing drugs that might inhibit disease progression. The BenevolentAI drug discovery platform derived contextual relationships between genes, diseases and drugs, leading to the proposal of several drug compounds. In just days the platform identified Baricitinib (a drug currently approved for rheumatoid arthritis) as a potential candidate and it underwent clinical trials as a treatment for COVID-19 within a very short period. Furthermore, another AI platform "DeepMind" was able to predict the structure of the SARS-CoV-2 viral protein structure, thereby paving the way for vaccine and drug development. Other AI platforms which facilitated researchers to rapidly identify possible treatment methods included. The "CORD-19 open research data set" and the "Kaggle Platform". These are machine-learning algorithms that can extract relevant medical information from unstructured text. These resources helped to accelerate the pace of research and discovery during the pandemic.

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Table 1: Selected notifiable diseases reported by Medical Officers of Health 01st- 07th Apri 2023 (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	154	3974	0	3	0	7	0	1	0	6	5	75	0	0	0	2	0	0	3	76	0	9	1	5	**26**	**90**
Gampaha	124	4256	0	5	0	6	0	1	0	1	6	129	0	1	0	6	0	0	1	79	0	28	0	10	**2**	**92**
Kalutara	48	1269	0	8	0	1	0	0	0	3	14	189	0	1	0	1	0	1	8	126	1	27	0	1	**4**	**98**
Kandy	98	1030	2	13	0	0	0	2	1	11	8	60	1	24	0	1	0	1	4	96	0	6	0	11	**77**	**100**
Matale	34	389	0	1	0	0	0	1	2	4	3	38	0	3	0	2	0	0	1	19	0	2	8	97	**22**	**100**
NuwaraEliya	3	53	7	28	0	0	0	0	2	9	2	30	5	24	1	1	0	0	1	34	0	4	0	0	**52**	**100**
Galle	31	575	0	12	0	7	0	0	0	9	25	247	0	22	0	0	0	0	3	114	0	4	0	1	**34**	**100**
Hambantota	29	334	0	1	1	1	0	0	3	7	5	75	1	35	0	9	0	0	7	48	1	8	16	166	**36**	**99**
Matara	30	513	0	7	0	2	0	0	1	4	15	178	2	13	0	2	0	0	6	82	0	7	9	49	**53**	**100**
Jaffna	64	1046	3	30	0	1	0	5	0	8	1	5	10	406	0	1	0	1	7	87	1	1	0	2	**62**	**93**
Kilinochchi	1	49	0	2	0	0	0	0	13	13	0	6	0	4	0	0	0	0	0	4	0	0	0	0	**19**	**95**
Mannar	2	36	0	5	0	0	0	1	0	0	1	19	0	4	0	0	0	0	0	1	0	2	0	0	**16**	**100**
Vavuniya	3	60	0	5	0	1	0	0	0	0	0	16	0	6	0	1	0	0	0	8	0	1	0	2	**0**	**95**
Mullaitivu	3	28	0	8	0	0	0	2	0	6	0	16	0	3	0	0	0	0	0	5	0	0	0	1	**20**	**94**
Batticaloa	93	790	1	60	0	6	0	4	0	6	0	22	0	1	0	1	0	0	0	22	0	11	0	0	**44**	**99**
Ampara	0	39	0	1	0	1	0	0	0	0	0	11	0	0	0	1	0	0	0	17	0	6	0	2	**16**	**63**
Trincomalee	118	790	0	3	0	1	0	0	0	4	0	18	0	9	0	0	0	0	2	16	0	4	0	1	**24**	**98**
Kurunegala	30	890	0	12	0	6	0	0	0	0	3	71	0	7	1	6	0	0	12	189	3	53	3	118	**23**	**98**
Puttalam	24	1970	0	4	0	1	0	0	0	0	0	11	0	6	0	1	0	0	0	32	0	14	0	5	**16**	**95**
Anuradhapur	10	172	0	1	0	0	0	1	0	1	2	113	0	23	0	1	0	0	1	79	0	8	0	142	**22**	**94**
Polonnaruwa	4	213	0	5	0	3	0	0	0	6	3	51	0	5	0	7	0	0	1	28	0	9	9	134	**29**	**99**
Badulla	9	416	0	11	0	3	0	0	0	6	4	98	0	16	2	39	0	0	3	57	2	11	0	7	**66**	**100**
Monaragala	8	130	1	9	0	2	0	0	0	0	49	189	2	20	1	9	0	0	0	21	0	29	5	60	**26**	**100**
Ratnapura	22	616	0	10	0	8	0	1	0	7	26	317	0	14	0	6	0	0	4	46	3	67	3	54	**38**	**100**
Kegalle	48	778	0	5	0	0	1	1	0	4	8	123	1	13	0	2	0	0	4	119	3	19	0	11	**32**	**99**
Kalmune	47	1125	1	19	2	4	0	0	0	0	2	13	0	0	0	0	0	0	3	18	0	10	0	0	**38**	**100**
SRILANKA	**103**	**21541**	**15**	**268**	**3**	**61**	**1**	**20**	**22**	**115**	**18**	**2120**	**22**	**660**	**5**	**99**	**0**	**3**	**71**	**1423**	**14**	**340**	**54**	**879**	**34**	**97**

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). **T=**Timeliness refers to returns received on or before 07th April, 2023 Total number of reporting units 358 Number of reporting units data provided for the current week: 305 **C****-Completeness

Table 2: Vaccine-Preventable Diseases & AFP

01st– 07th Apri 2023(14th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2023	Number of cases during same week in 2022	Total number of cases to date in 2023	Total number of cases to date in 2022	Difference between the number of cases to date in 2023 & 2022
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	00	00	00	00	00	00	00	00	00	00	02	23	24	- 4.16 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	01	00	00	00	00	00	00	00	02	01	63	13	384.6 %
Measles	00	00	00	00	00	00	00	00	00	00	00	11	10	10 %
Rubella	00	00	00	00	00	00	00	00	00	00	00	01	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 Enceph-alitis	00	00	00	00	00	00	00	00	00	00	00	02	01	100 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	03	00	0 %
Tuberculosis	85	22	04	03	04	00	04	04	00	126	94	2281	2265	0.7 %

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

Take prophylaxis medications for leptospirosis during the paddy cultivation and harvesting seasons.

It is provided free by the MOH office / Public Health Inspectors.

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