WEEKLY EPIDEMIOLOGICAL REPORT

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

"Our future is a race between the growing power of technology and the wisdom with which we use it."
Stephen Hawking

"Artificial intelligence" (AI) are computer programs that can do the tasks which are usually carried out by intelligent beings. AIs function using algorithms that are translated into computer codes for rapid data analysis, information and conclusions. According to the Council on Artificial Intelligence of the Organization for Economic Co-operation and Development countries (OECD): "AIs are machine-based systems, which for given human set objectives, make predictions, recommendations or decisions influencing real or virtual environments. They are designed to operate with varying levels of autonomy". AI technologies encompass pattern recognition, natural language processing, signal processing and expert systems.

"Machine Learning" is a subset AI technique where statistical and mathematical modelling techniques are used to analyze data to recognize trends to make predictions, while "Deep Learning" is a group of machine learning based on multi-layered models to gradually extract features from the data. Many machine-learning methods are driven by "big data" and big data refers to the uniquely complex voluminous, varied, veracious data collected at ever-increasing velocities. Commonly big data is found in multiple formats and is usually generated by data mining. Among open AI platforms currently in healthcare the most talked about is the Generative Pretrained Transformer (GPT) or chatGPT which is currently in its fourth version. This is a Language Learning Model (LLM) that produces text similar to human writing, that allows users to interact as if communicating with another person. Within the health care system, GPT could play a role in research by formulating questions, developing study protocols and summarizing data efficiently, while its use in medical education could be as an interactive encyclopedia, and by simulating patient interactions for medical students. Its potential use in clinical care is varied; It could provide clinical decision support to clinicians, and be incorporated into electronic medical record platforms. It can even support physicians to come up with a differential diagnosis or preliminary treatment plans. Moreover, GPT can potentially prevent clinician burnout by taking on many repetitive tasks performed daily by physicians. However, GPT could potentially

Contents	Page

jeopardize patients' privacy and safety by false or misleading information, unless its advice is filtered through the treating clinician.

A large number of AI tools have been developed specifically for use in public health as well. AI platforms have been created for disease surveillance and outbreak control, health promotion, disease screening and prevention as well as emergency preparedness. AIs commonly used in public health include platforms that can identify target groups or hot spots with "high-risk" behaviours who would benefit from health communication messages. Moreover, AI-guided technologies through the use of mobile health applications and wearable technologies including activity trackers, smart watches and smart glasses contribute to the ever-growing practice of "biosurveillance" monitoring healthy individuals to predict health risks in individuals and groups and target health-promoting activities.

Nevertheless, the benefits of AI must be balanced with ethical and legal concerns. For example, the use of non-traditional data sources such as "digital traces" which were not specifically created for health such as details from blogs, official reports, internet searches and videos from TikTok by AI platforms creates potential problems, as the use of such digital traces as health data violates the data protection principle of "purpose limitation" (i.e. individuals who generate such data would not have consented beforehand for such use of private data at the point of collection). Additionally, AI algorithms are known to regenerate biases in their training data, thereby creating the potential for harmful discrimination, exclusion and inequity in access. To understand the ethical and legal challenges and to harness the maximum benefit of AIs it is necessary to identify how such platforms affect social relationships between users, the values that define them as well as the relevant ethical and legal framework for governance.

Meanwhile, the potential for AI in healthcare is expanding and artificial intelligence is already revolutionizing the delivery of healthcare services in high-income countries. However, the utilization of AI in low and middle-income countries may be limited due to a lack of resources and inadequate infrastructure. Therefore, in addition to the ethical and legal dilemmas, the use of AI can further widen the inequities between high-income countries and their less wealthy counterparts.

Most policymakers opinion that better governance is required to set human rights standards and safeguards while new laws and jurisprudence are also necessary to address the interaction between AI and humans. Therefore, the countries belonging to OECD came out with several principles to realize the full potential of artificial intelligence platforms while ensuring their trustworthiness; respecting human rights and privacy, being transparent, explainability, robustness, security and safety, and the accountability of the human stakeholders. Consistent with this value system five recommendations were proposed to policy-makers relevant to national policies and international co-operation for veracious AI, namely: investing in AI research and development; shaping an enabling policy environment; fostering a digital ecosystem; building human capacity and preparing for labour market transformation; and international co-operation for trustworthy AI. Furthermore, provisions were included for the development of indicators to assess research, development, and deployment of AI as well as for building an evidence base to measure the progress during the implementation phase.

Using Artificial Intelligence for Disease Surveillance and Emergency Preparedness

Although artificial intelligence is yet to be fully harnessed for disease surveillance, the surveillance itself is evolving rapidly due to the use of real-time data. For example, investigators were able to detect increasingly severe pulmonary diseases associated with e-cigarettes by mining online data sources using the online "Health Map" as the mining tool. Similarly, in 2013 Microsoft researchers found very early evidence of side effects for several prescription drugs using weblogs before the information was detected by the routine warning systems at the US Food and Drug Administration Agency (US FDA) which resulted in the US-FDA calling for public proposals to develop computer algorithms to detect adverse events.

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 to be continued ...

Table 1: Selected notifiable diseases reported by Medical Officers of Health 25th– 31st Mar 2023 (13th 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	180	3820	0	3	0	7	0	1	0	6	11	70	0	0	0	2	0	0	5	73	1	9	1	4	**25**	**91**
Gampaha	227	4132	1	5	0	6	0	1	0	1	19	123	0	1	0	6	0	0	7	78	2	28	0	10	**1**	**94**
Kalutara	54	1221	0	8	0	1	0	0	0	3	14	175	0	1	0	1	0	1	10	118	0	26	0	1	**4**	**98**
Kandy	112	932	2	11	0	0	1	2	9	10	5	52	2	23	0	1	0	1	10	92	0	6	0	11	**75**	**100**
Matale	49	355	0	1	0	0	0	1	0	2	6	35	1	3	0	2	0	0	1	18	0	2	0	89	**23**	**100**
NuwaraEliya	4	50	0	21	0	0	0	0	0	7	1	28	1	19	0	0	0	0	3	33	0	4	0	0	**49**	**100**
Galle	42	540	2	12	4	7	0	0	0	9	49	216	2	22	0	0	0	0	10	109	0	4	0	1	**32**	**100**
Hambantota	33	305	0	1	0	0	0	0	0	4	9	70	1	34	0	9	0	0	3	41	0	7	34	150	**35**	**100**
Matara	30	483	0	7	0	2	0	0	0	3	28	163	1	11	0	2	0	0	9	76	1	7	3	40	**52**	**100**
Jaffna	58	982	6	27	0	1	0	5	1	8	0	4	23	396	0	1	0	1	8	80	0	0	0	2	**60**	**93**
Kilinochchi	3	48	0	2	0	0	0	0	0	0	0	6	0	4	0	0	0	0	0	4	0	0	0	0	**18**	**96**
Mannar	4	34	0	4	0	0	0	0	0	0	0	17	0	4	0	0	0	0	0	1	0	2	0	0	**19**	**82**
Vavuniya	8	57	0	5	0	1	0	0	0	0	2	16	0	6	0	1	0	0	0	8	0	1	1	2	**0**	**100**
Mullaitivu	0	25	0	8	0	0	0	2	0	6	0	15	0	3	0	0	0	0	0	5	0	0	0	1	**18**	**95**
Batticaloa	62	674	1	59	0	6	0	4	0	6	3	22	1	1	0	1	0	0	2	22	0	11	0	0	**43**	**100**
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**	**67**
Trincomalee	108	672	0	3	1	1	0	0	1	4	1	18	2	9	0	0	0	0	0	14	0	4	0	1	**24**	**100**
Kurunegala	39	851	1	12	1	6	0	0	0	0	1	67	0	7	0	5	0	0	17	173	1	47	4	114	**22**	**98**
Puttalam	20	1936	1	4	1	1	0	0	0	0	0	11	0	6	0	1	0	0	1	32	0	13	0	5	**17**	**93**
Anuradhapur	3	160	0	1	0	0	0	1	0	1	9	111	0	23	0	1	0	0	4	76	0	8	3	142	**20**	**96**
Polonnaruwa	4	209	1	5	1	3	0	0	0	6	3	48	0	5	1	7	0	0	1	27	0	9	8	125	**26**	**99**
Badulla	26	407	0	11	0	3	0	0	0	6	8	94	3	16	4	37	0	0	6	54	2	9	0	7	**63**	**100**
Monaragala	13	122	0	8	2	2	0	0	0	0	30	140	3	18	1	8	0	0	0	21	1	29	9	55	**24**	**100**
Ratnapura	42	594	0	10	0	8	0	1	1	7	21	291	2	14	0	6	0	0	3	42	6	64	1	51	**37**	**100**
Kegalle	49	730	2	5	0	0	0	0	0	4	8	115	1	12	0	2	0	0	3	115	2	16	1	11	**31**	**100**
Kalmune	41	1073	0	18	0	2	0	0	0	0	0	11	0	0	0	0	0	0	3	13	1	9	0	0	**36**	**100**
SRILANKA	**121**	**20451**	**17**	**252**	**10**	**58**	**1**	**18**	**12**	**93**	**22**	**1929**	**43**	**638**	**6**	**94**	**0**	**3**	**10**	**1342**	**17**	**321**	**65**	**824**	**33**	**97**

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 31st Mar, 2023 Total number of reporting units 358 Number of reporting units data provided for the current week: 318 **C****-Completeness

Table 2: Vaccine-Preventable Diseases & AFP

25th– 31st Mar 2023(13th 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	01	00	00	00	00	00	00	01	02	21	22	- 4.5 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	04	01	01	00	01	01	01	00	10	02	61	12	408.3 %
Measles	01	00	01	00	00	00	00	00	01	03	00	11	10	10 %
Rubella	00	01	00	00	00	00	00	00	00	01	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 Encephalitis	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	97	15	21	12	18	23	11	16	24	237	202	2155	2171	- 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.

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

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