WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiology Unit
Ministry of Health & Mass Media

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WEER SRI LANKA 2025

Vol. 52 No. 15 **05th – 11th Apr 2025**

Strengthening Early Warning Systems for Leptospirosis in the Context of Climate Change: A Public Health Priority for Sri Lanka

Leptospirosis continues to pose a substantial public health burden in Sri Lanka, with more than 10,000 cases and nearly 200 deaths reported annually. As an endemic zoonotic disease, its transmission is closely linked to environmental exposures, particularly following periods of heavy rainfall and flooding. The bacterium *Leptospira* thrives in warm, moist environments and is commonly transmitted to humans through water contaminated with the urine of infected animals, particularly rodents. In recent years, changing climatic conditions have been increasingly associated with leptospirosis outbreaks globally, due to more frequent flooding, altered rainfall patterns, and expanding rodent habitats. These trends highlight the urgency of adopting proactive, data-driven approaches to disease prevention and control in Sri Lanka.

The World Health Organisation (WHO) emphasises the importance of the One Health approach, improved surveillance systems, and climate-resilient health infrastructure. Within this context, Early Warning Systems (EWS)—as promoted by the WHO and implemented in several countries—offer a promising solution to enhance Sri Lanka's response to leptospirosis. Recognising leptospirosis as a climate-sensitive disease highlights the importance of predictive systems that can anticipate outbreaks and trigger early interventions.

An Early Warning System is a framework designed to detect early signs of disease emergence or increase and to issue timely alerts that enable preventive or mitigatory public health actions. For leptospirosis, EWS typically integrate environmental, meteorological, and epidemiological data to predict periods and locations of high transmission risk. These systems function not as passive reporting mechanisms but as dynamic tools that support real-time risk assessment and enable targeted response planning. An effective EWS does more than detect emerging threats—it provides actionable intelligence that allows for timely public health decisions and resource mobilisation.

The WHO recognises EWS as an essential climate-sensitive intervention within the One Health framework. Given the environmental determinants of leptospirosis—including rodent ecology, human occupational exposure, land use patterns, and flood events—integrated systems that incorporate data from multiple sectors can enhance the timeliness and effectiveness of control measures. Globally, countries such as Thailand, Brazil, and India have implemented EWS to guide public health interventions during peak leptospirosis seasons and in response to emerging threats.

Thailand, for example, uses rainfall data and historical disease patterns to develop risk maps and start prophylaxis campaigns in high-risk provinces. These campaigns are often accompanied by targeted awareness programs aimed at agricultural workers and other vulnerable groups. Brazil's geo-referenced alert system enables rapid deployment of vector control teams and public awareness activities in flood-prone urban areas, where inadequate sanitation and dense populations increase the risk. In parts of India, leptospirosis alerts are issued through the Integrated Disease Surveillance Programme (IDSP) based on weather patterns and real-time surveillance data. These alerts facilitate the advanced positioning of medical supplies, deployment of rapid response teams, and strategic public health messaging in vulnerable districts.

Sri Lanka already has a well-established disease surveillance system and strong multisectoral coordination mechanisms—including a National Steering Committee, district-level technical committees, and divisional coordinating committees. The national communicable disease surveillance system is supported by a network of Medical Officers of Health (MOHs), Public Health Inspectors (PHIs), and Epidemiologists, who provide regular reporting and are instrumental in outbreak investigations. However, a formal EWS tailored specifically to

leptospirosis has yet to be developed. Current surveillance remains predominantly reactive, with interventions typically triggered only after the detection of cases. This delay in response can lead to missed opportunities for containment and a higher burden on the health system. The ability to forecast outbreaks and initiate timely responses could significantly improve outcomes and optimise resource utilisation.

Many leptospirosis outbreaks in Sri Lanka are linked to seasonal flooding, particularly in low-lying areas of the Western, Sabaragamuwa, and Southern Provinces. This presents a clear opportunity to develop a national EWS by integrating meteorological data, geographic information, historical incidence patterns, and environmental indicators. The feasibility of such a system is supported by existing infrastructure. The Department of Meteorology and the Disaster Management Centre will be able to provide reliable rainfall and flood data, while disease surveillance data is routinely collected at national and subnational levels. Geospatial technologies such as Geographic Information Systems (GIS) can be employed to map high-risk areas and track environmental changes that influence disease patterns. What remains is the technical integration of these datasets, the development of predictive models using statistical or machine learning approaches, and the establishment of risk thresholds that can trigger public health responses.

A phased implementation—beginning with pilot districts in high-burden districts—could help build local capacity, refine prediction models, and strengthen institutional coordination. This process may be supported by training programs for public health staff on the use of EWS platforms, improved data sharing protocols between sectors such as health, agriculture, meteorology, and local governance, and investments in digital infrastructure and analytics. Leveraging mobile technology and cloud-based data systems could improve real-time data capture and dissemination of alerts to health officials and community stakeholders.

Additionally, community engagement is critical to the success of an early warning system. Public understanding of risk alerts and appropriate preventive behaviour must be integrated into system design. For example, alert levels could be tied to specific community actions, such as avoiding contact with floodwaters, the use of protective clothing during agricultural work, or participation in targeted prophylaxis campaigns. School programs, local media, and community health workers can all play vital roles in disseminating timely information and reinforcing risk-reducing behaviours.

Nonetheless, several challenges will need to be addressed. These include limited intersectoral data integration, insufficient modelling expertise in the public sector, underinvestment in environmental surveillance, and data gaps related to rodent population dynamics—key reservoirs of leptospirosis. Furthermore, inconsistencies in rainfall patterns due to climate variability may affect the predictability of outbreaks. To overcome these barriers, Sri Lanka may benefit from partnerships with academic institutions and international agencies with technical expertise in disease modelling, environmental monitoring, and health systems strengthening. Collaborative research initiatives can help build the evidence base needed to develop robust forecasting algorithms and validate risk prediction tools.

Despite these constraints, the potential public health benefits of an operational EWS are considerable. A functional system could facilitate timely awareness campaigns, more efficient allocation of resources, and targeted distribution of chemoprophylaxis, ultimately contributing to a measurable reduction in leptospirosis cases and deaths. Moreover, the same system could support early detection and response to other climate-sensitive diseases, including dengue, influenza, and waterborne illnesses such as cholera and hepatitis A. Thus, investing in EWS not only strengthens disease-specific control efforts but also enhances overall health system resilience to the impacts of climate change.

Developing an early warning system for leptospirosis presents an important opportunity for Sri Lanka to shift from reactive to predictive disease control. By aligning with global best practices and leveraging existing institutional strengths and technological resources, such a system can enhance preparedness, safeguard high-risk populations, and bolster the country's resilience to climate-related infectious diseases. Realising this vision will require collaborative leadership, cross-sectoral partnerships, technical innovation, and sustained commitment at national and subnational levels. In doing so, Sri Lanka can position itself as a regional leader in climate-informed public health preparedness, ready not only to manage the threat of leptospirosis but to confront the growing spectrum of health risks posed by a changing environment.

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Table 1: Selected notifiable diseases reported by Medical Officers of Health 29th – 04th Apr 2025 (14th Week)

RDHS	Dengue Fever		Dysentery		Encephalitis		En. Fever		F. Poisoning		Leptospirosis		Typhus F.		Viral Hep.		H. Rabiies		Chickenpox		Meningitis		Leishmania-		Tuberculosis		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	A	B	T*	C**
Colombo	204	3292	2	14	0	3	0	3	0	5	15	142	0	4	0	5	0	0	8	168	3	22	0	1	40	574	100	100
Gampaha	135	2090	1	19	1	17	0	1	0	45	13	213	1	7	0	5	0	0	28	269	5	42	0	14	0	331	100	100
Kalutara	39	526	0	11	2	3	1	4	0	13	10	196	0	0	1	3	0	0	23	229	3	13	0	1	0	168	100	75
Kandy	65	896	2	22	0	2	0	4	0	8	11	96	1	20	0	5	0	0	9	133	1	11	2	24	17	237	100	100
Matale	21	480	0	8	0	1	0	0	5	23	9	66	0	3	1	5	0	0	0	41	0	2	4	77	6	49	92	100
Nuwara Eliya	3	63	3	27	0	3	0	4	0	44	2	43	0	23	0	0	0	0	5	84	0	6	0	0	3	82	85	100
Galle	34	594	0	19	0	2	0	0	0	27	7	259	0	28	0	4	0	0	17	253	5	54	0	1	10	143	100	100
Hambantota	13	273	0	7	0	2	0	0	0	3	15	130	0	14	0	2	0	0	7	139	1	6	5	84	4	50	100	100
Matara	38	514	0	5	0	2	0	1	0	3	13	157	0	8	0	2	0	0	4	125	2	17	1	34	0	52	94	100
Jaffna	15	481	3	31	0	1	0	3	6	17	1	110	15	264	0	1	0	1	15	136	0	10	0	0	7	56	93	93
Kilinochchi	0	41	0	5	0	0	0	4	0	2	2	48	0	11	0	1	0	0	0	1	0	0	0	0	1	17	100	100
Mannar	2	83	0	0	0	0	0	0	0	1	1	14	0	5	0	0	0	0	1	13	0	9	0	0	0	13	100	100
Vavuniya	3	28	0	5	0	0	0	1	0	20	4	38	0	3	0	0	0	0	0	13	0	6	0	7	1	15	100	100
Mullaitivu	2	26	0	1	0	0	0	1	0	2	0	38	1	5	0	0	0	0	4	11	0	4	0	0	4	10	83	100
Batticaloa	46	766	2	65	0	8	0	0	0	70	1	29	0	1	0	9	0	0	2	76	1	19	0	2	3	43	86	100
Ampara	5	55	0	6	0	2	0	0	0	3	2	60	0	1	1	2	0	0	8	53	2	9	0	9	0	19	86	100
Trincomalee	36	386	1	24	0	2	0	0	0	16	2	60	1	7	1	3	0	0	0	39	0	7	0	3	8	34	100	100
Kurunegala	19	343	1	8	1	8	0	1	0	19	12	249	1	18	0	1	0	1	12	259	1	45	7	168	11	110	100	100
Puttalam	11	284	0	9	0	0	0	0	0	4	3	117	1	23	0	1	0	0	2	53	1	33	0	11	0	48	100	100
Anuradhapura	6	264	0	19	0	5	0	2	1	8	7	164	0	12	0	6	0	0	16	108	2	33	20	239	6	81	87	100
Polonnaruwa	5	77	0	7	1	3	0	1	0	2	7	73	0	0	1	12	0	0	4	62	2	7	20	131	1	22	100	91
Badulla	9	239	2	12	0	3	0	3	0	0	12	116	1	9	1	13	0	0	6	143	0	25	3	12	4	67	94	100
Monaragala	15	273	1	7	0	3	0	0	0	3	25	221	1	20	0	5	0	0	3	50	2	19	5	46	1	29	82	100
Ratnapura	54	723	3	36	0	4	0	3	1	15	46	514	0	13	1	3	0	1	10	161	3	48	5	44	6	132	95	100
Kegalle	20	392	4	28	0	3	0	1	0	16	15	198	1	7	0	6	0	0	29	281	3	32	0	12	8	81	82	100
Kalmunai	10	164	1	9	0	0	0	0	0	7	2	44	0	1	0	1	0	0	1	57	0	8	0	0	3	39	100	100
SRILANKA	**810**	**13353**	**26**	**404**	**5**	**77**	**1**	**37**	**13**	**376**	**237**	**3395**	**24**	**507**	**7**	**95**	**0**	**3**	**214**	**2957**	**37**	**487**	**72**	**920**	**144**	**2502**	**95**	**99**

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 04th Apr, 2025 Total number of reporting units 361 Number of reporting units data provided for the current week: 358 C**-Completeness

A = Cases reported during the current week. B = Cumulative cases for the year.

Table 2: Vaccine-Preventable Diseases & AFP 29th Mar - 04th Apr 2025 (14th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2025	Number of cases during same week in 2024	Total number of cases to date in 2025	Total number of cases to date in 2024	Difference between the number of cases to date in 2025 & 2024
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	00	01	00	00	01	02	00	00	00	04	01	19	19	0%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	01	00	00	00	00	01	00	04	07	03	63	72	-12.5 %
Measles	00	00	00	00	00	00	00	00	00	00	09	01	177	-99.4%
Rubella	00	00	00	00	00	00	00	00	00	00	00	00	01	-100%
CRS**	00	00	00	00	00	00	00	00	00	00	00	01	00	0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	01	02	01	100 %
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	04	01	300 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	08	01	700 %

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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ON STATE SERVICE

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