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EPIDEMIA	Epidemic Prognosis Incorporating Disease and Environmental Monitoring for Integrated Assessment
ESA	Eastern and Southern Africa
EWARS	Early Warning and Response System
EWS	Early Warning System
FAO	Food and Agriculture Organization
FEWS NET	Famine Early Warning Systems Network
IDEWS	Infectious Disease Early Warning System
MSF	Médecins Sans Frontières
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
RVF	Rift Valley Fever
UK	United Kingdom
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
US	United States
WHO	World Health Organization
WMO	World Meteorological Organization

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#	Query	Results from 9 Jun 2023
1	exp Climate Change/ or exp Greenhouse Effect/	70,775
2	(climat* or environment* or el nino or la nina or ENSO or meteorolog* or biolog* or weather or precipitation or heat or temperature or rain* or atmospher*).ti,ab.	4,122,576
3	1 or 2	4,136,567
4	exp Population Surveillance/ or exp Disease Outbreaks/ or (transmi* or infect* or epidemic or outbreak or prevent* or control*).ti,ab.	10,192,086
5	3 and 4	1,211,310
6	(Early warning* or EWS or alert or alarm or MEWS or HEWS or DEWS or EWARS).ti,ab.	79,492
7	(vector-borne or water-	

	burden countr* or high burden nation* or countdown countr* or countdown nation* or poor countr* or poor nation* or poor population* or poor world or poorer countr* or poorer nation* or poorer population* or poorer world or developing econom* or less developed econom* or underdeveloped econom* or under developed econom* or middle income econom* or low income econom* or lower income econom* or low gdp or low gnp or low gross domestic or low gross national or lower gdp or lower gnp or lower gross domestic or lower gross national or lmic or lmics or third world or lami countr* or transitional countr* or emerging econom* or emerging nation*).ti,ab.	
10	5 and 6 and 7 and 8 and 9	396
11	limit 10 to yr="2005 -Current"	378
12	limit 11 to english language	369
13	12 not (covid-19 or coronavirus).ti,ab.	362

Inclusion criteria	Exclusion criteria
Features a climate sensitive IDEWS for public health use.	Does not feature IDEWS that incorporates an environmental/meteorological/climate variable in the prediction. IDEWS for use in clinical settings were not eligible.
Target a WHO CSD (Table 1).	Non-communicable, emerging/zoonotic, and mental health diseases alongside EWS for natural disasters were not included.
Discuss IDEWS pilot, implementation, or scale-up	

Country	Climate-sensitive infectious disease	Name of IDEWS, project dates, level of implementation	Prediction data types and sources	How is an alert generated and communicated, to whom	Description of response and/or outcome	Implementation partners and donor	Reference number
WHO African Region							
Botswana	Malaria	NA	Climate and weather predictions from the Southern African Regional Climate Outlook forum.	Made available through National Meteorological and Hydrological Services websites.	In 2006, malaria incidence levels were maintained at levels far below those in previous years, partially attributable to this new strategy.	WHO Global Malaria Programme in partnership with Zimbabwe.	

		The system was launched by the Kenya Meteorological Department in 2011 to cover three counties- Kericho, Kisii and Kakamega- in the Western Kenyan highlands.	Malara surveillance data from national health information system. Meteorological data from Kericho, Kisii and Kakamega stations and transmitted to Kenya Meterological data center in Nairobi. Entomological data From the Ecology of African Highland Malaria project database.	Alerts generated based on surpassing a threshold outbreak probability. Different thresholds necessary for different states: Kakamega model (30%), Kisii and Kericho/Nandi (20%). Meteorologists communicate the results at the end of every month for assessment by malaria control division of the Ministry of Health.	Used to mobilize extra drugs, diagnostic supplies are restocked. Extra supply of ITNs.	Lead by the Kenya Meteorological Department and the MoH, in collaboration with the WHO Country Office, Kenya Medical Research Institute, National Institute for Medical Research (Tanzania), MoH (Uganda), and the International Centre for Insect Physiology and Ecology. Funded by NIH, IDRC, FCDO.	94
		The Highland Malaria Project (HIMAL) tested predictive early warning systems in the East African highlands	Rainfall data.	NA	District health management teams need to provide evidence for exceptional seasonal epidemics to mobilise resources.	Division of Malaria Control with UNICEF	72
	Malaria and diarrhoeal diseases.	Implementation in Nyando Province.	Data from national meteorological services was used to provide seasonal and short-term climate predictions ±³ F O L -PaBeW H G L V H D V H D Q W L F L		Educational materials that also utilised indigenous early warning signs were used for community mobilisation. Establishment of health contingency plans for outbreak occurrence. Pre-peak season activities included strengthening flood gates, cleaning water channels, de-silting rivers, stockpiling water purifiers, treating drinking water, cleaning mosquito breeding grounds, improving drainage fortifying latrines and homes,		

			interventions from the 3 U H V L G H Q W ¶ V 0 D and National Malaria Control Programme.				
	Malaria, Rift Valley Fever, Plague	NA	Climate and weather predictions from the Southern African Regional Climate Outlook forum. Data also comes from meteorological satellites installed in the country and the International Research Institute for Climate and Society.	An epidemiological risk map is generated for the highlands of Madagascar- areas are classified as very weak, weak, medium, high or very high risk. Made available through National Meteorological and Hydrological Services websites. An online tool for febrile syndromes is also available.	The Directorate of Public Health and Epidemiological Surveillance receives the alerts. A monthly bulletin is generated by for the health sector ahead of the rainy season. The Pasteur Institute uses the projected risk maps to prioritise areas in the highlands for IRS.	WHO Global Malaria Programme in partnership with WMO, National Ministries of Health, National Meteorological and Hydrological Services, Pasteur Institute, UNCIEF and USAID.	1

Malawi

			app with local data on tsetse fly and trypanosomiasis distribution.			
Malaria and diarrhoeal disease	Pilot sites were in the coastal Tanga province.	Data from national meteorological services was used to provide seasonal and short-term climate predictions as part of climate-based disease DQWLFLSDWLRQ´		Educational materials and health contingency plans were designed for outbreak response. Cleaning of the local environment, distributing treated bed nets and water purifiers alongside sanitation campaigns were key activities before the beginning of the rainy season.		

				control measures such as house-to-house visits to destroy potential mosquito breeding sites. campaigns to inform and educate local communities in higher risk areas to reduce breeding sites and protect themselves. International warnings facilitated by publication in international press and through foreign health authorities.		
		has national coverage of 553 microregions.				
		EWARS-R was tested from December 2016-February 2017 in ten districts.	Meteorological data (outdoor mean air temperature, outdoor mean humidity, total rainfall); epidemiological data (mean age of hospitalized cases, serotypes, probable and lab confirmed and hospitalized dengue cases); entomological data.	Threshold based system		

		Puerto Libertador, San Jose del Guaviare, Buenaventura).	experiments; climate data (temperature, precipitation and ENSO) from the Colombian Institute of Hydrology, Meteorology and Environmental studies. The system will integrate with national surveillance systems.		groups in high malaria season, effective case management.		
	Dengue, Chikungunya, Zika	EWARS (WHO-TDR) tool for dengue is piloted for dengue in Colombia in the city of Cucuta, this paper tests its applicability to Zika and Chikungunya.	Epidemiological, meteorological, and entomological data from national epidemiological surveillance systems and meteorological institutes.	Alarms are triggered when the outbreak probability surpasses a user defined threshold.	A response plan is recommended using the online system depending on the lag time. Response plan is staged.		68
Mexico	Dengue	WHO-TDR EWARS was implemented in 2015-2017 in 20 health districts					

Bhutan	Climate sensitive diseases with initial focus on diarrhoeal diseases	Bhutan has adopted a 6-point plan to implementing an early warning system; validation of the pilot model for diarrhoeal diseases is ongoing in six basic health units in a high-risk riverine area.	Disease surveillance data; meteorological data (daily and monthly rainfall, temperature, humidity); monthly entomological data from vector surveillance. The EWS is suggested to be integrated with the national surveillance system.	Alerts are generated based on the calculation of a health risk index-predicted number of cases over the average number of cases. Once the threshold value has been surpassed an alert is issued.	Health professionals will be encouraged to prepare response plans.	The Department of Public Health of the MoH led the project, with the Environmental Health Programme coordinating implementation. Part of a joint initiative of WHO and UNDP, funded by the Global Environment Facility Special Climate Change Fund.	82;110

India

Cambodia	Dengue, Chikungunya	IDEWS implementation is part of the *Building resilience of health systems in Asian LDCs to climate change* project which began in 2019.	NA	NA	Responses are determined by a rapid response plan	Implemented by the Ministry of Health with WHO and UNDP, funded by the Global Environmental Facility	89
Fiji	Climate-sensitive diseases (initial focus on diarrhoeal disease)	Pilot communities					

			Meteorological Services Singapore, Department of Statistics,				
The Solomon Islands	Malaria	Piloted the MalaClim model in September 2014 in the region of Northern Guadalcanal. Officially launched in 2015 after successful pilot, with expansion to cover Guadalcanal and Central Provinces.	OND rainfall provided by the Solomon Islands Meteorological Service. Rainfall gauges are being installed at EWS locations.	The warning system is based on three categories of alert levels based on level of rainfall ±below normal, normal, and above normal- which aligns with the methodology used by local meteorological services. Monthly outlooks are communicated throughout the malaria season.	Currently communicated as		

				For the 2006-2007 epidemic over East Africa, forecasts were published online in December 2006.	animal and human cases). After confirmation, Kenyan MoH initiated a social mobilization campaign, vector control measures, a ban on animal slaughtering, animal movement controlled and quarantining, as well as a mass cattle vaccination campaign.	
West Africa	Meningitis		The system uses expert reanalysis of atmospheric conditions - temperature, relative humidity- provided by the National Center for Environmental Predictions and dust projections are from the Barcelona Supercomputer Centre. Sub-seasonal forecasts are from the European Centre for Medium-Range Weather Forecasts (ECMWF).	ACMAD produces the forecast with a two-week lead time. WHO defined two thresholds to monitor meningitis outbreaks: alert threshold when three suspected meningitis cases are reported in a week for every 100,000 inhabitants in an area. An epidemic threshold when then suspected cases of meningitis are reported in a week for every 100,000 inhabitants in a given areas. WHO defines four vigilance levels for countries (red, orange, yellow and white) - red means that meningitis outbreaks are expected.	WHO Afro coordinates prevention, preparedness, and response in countries of the meningitis belt. EWS is checked every Monday during the meningitis season and WHO staff share a bulletin with technical partners and national health authorities. WHO Afro organizes fortnightly coordination meetings to follow up on epidemiological situations in countries. When a red vigilance level is associated with reported meningitis cases, local health services submit a request to MenAfriNet to provide high quality case-based surveillance. Local health services transportation of samples and vaccine doses, manage available supports to improve performance and reinforce the surveillance system for upcoming weeks. A request is submitt	

moisture data from NASA's Global Land Data Assimilation System, Human Population density data from NASA's socioeconomic data and applications center. Chikungunya vector distributions from the Walter Reed Biosystematics Unit VectorMap. Ground-based surveillance from ProMED