

Integrating climate and environment public dataset in surveillance for early warning for arbovirus infections

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ITALIAN CENTER FOR GLOBAL HEALTH
FIGHTING HEALTH INEQUALITIES

The One Health concept is gathering greater attention due to the (re)emergence of human pathogens from animal reservoirs and the outcomes of studies on the impact of environmental and climate changes on the transmission of several infectious diseases

Surveillance of VBD is one of the best examples of diseases benefiting from the establishment of integrated systems in accordance with the OH concept.

With limitations, **integrated surveillance systems for arbovirus infections** have been implemented in a number of countries

However, in the majority of the countries, even when the sectors involved (i.e., human, animal, entomological, and environmental) collect surveillance data, **rarely is this information shared in a timely manner between sectors to prevent outbreaks**. An early-warning capacity is therefore weak or lacking, and needs to be reinforced.



*Preventing biological risks
increased by environmental
and climate change in the
Mediterranean, Black Sea,
and Sahel regions by
strengthening institutional
capacities in the context of
One Health*



Advocacy for the adoption of a One Health approach

Networking

Preventing vector-borne diseases around the Mediterranean and Sahel regions by reinforcing an **international network of laboratories, public health institutions and veterinary services**

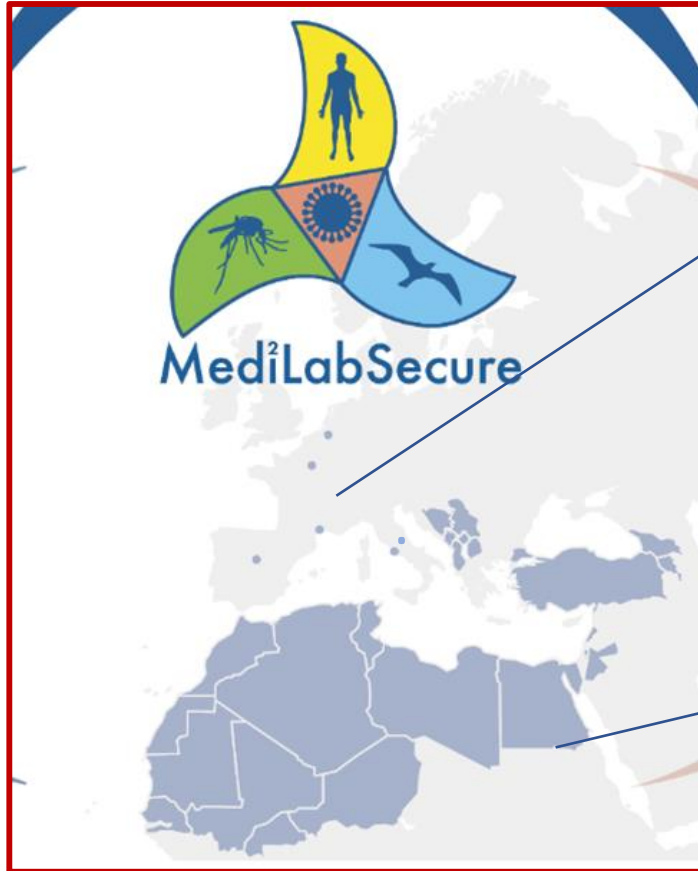
Capacity building

Enhancing **laboratory preparedness** and response capacities to arboviruses and their vectors

Enhancing **integrated surveillance, risk assessment and early warning** to prevent and control epidemics and epizootics

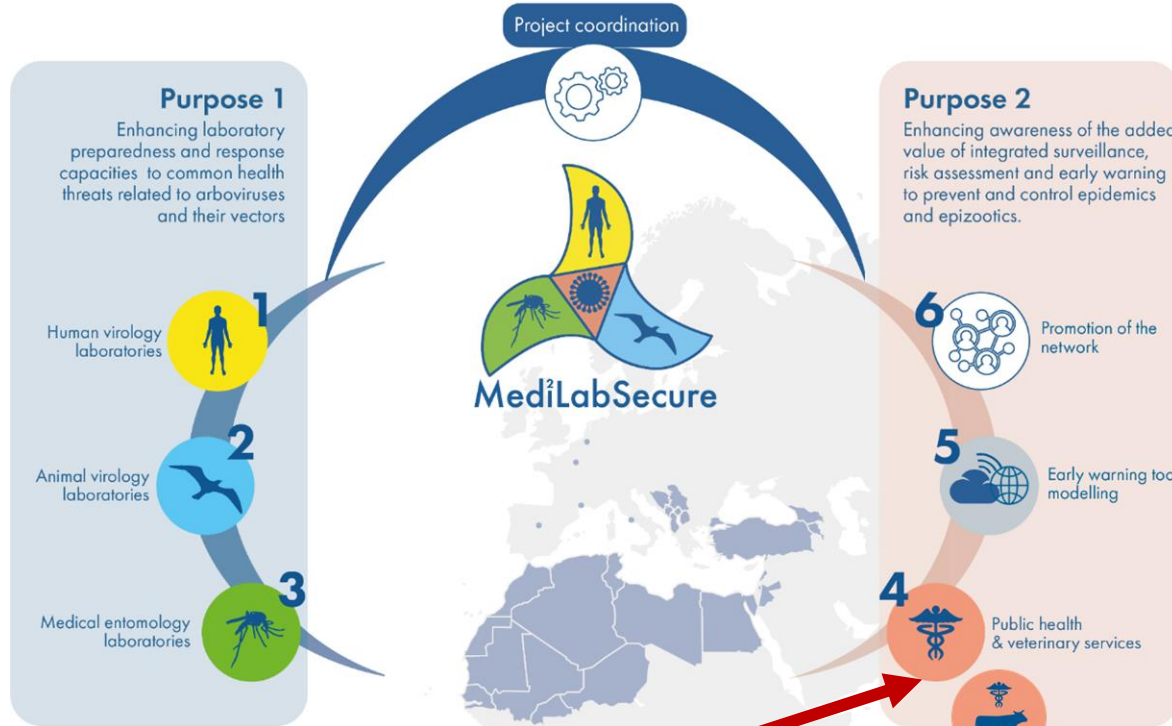


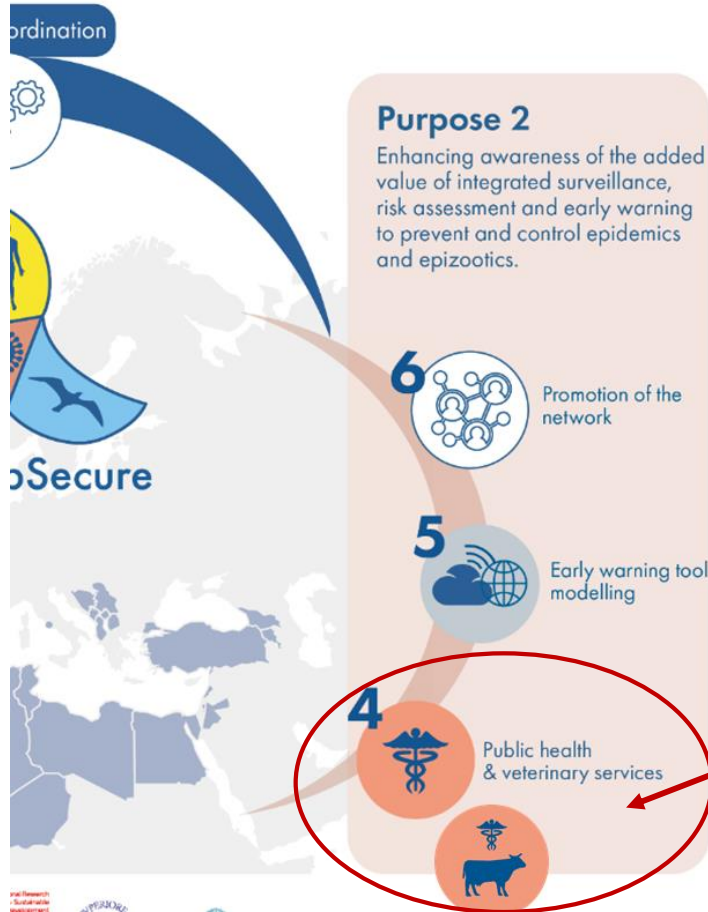
Networking



Pasteur Institute, France
INIA, Spain
IRD, France
ISS, Italy
Avia-GIS, Belgium
IZSAM, Italy

**More than 80 Lab and Institutions in
22 Countries in MLS Network:**
Albania, Algeria, Armenia, Bosnia and
Herzegovina, Burkina Faso, Egypt,
Georgia, Jordan, Kosovo, Lebanon,
Libya, Mali, Mauritania, Montenegro,
Morocco, Niger, Palestine, Rep. of
North Macedonia, Senegal, Serbia,
Tunisia, Turkey





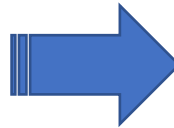
WP4- Public Health and Veterinary Services:

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Advocacy for One Health approach in the implementation of integrated surveillance & multisectoral risk assessment of arbovirus infections

Improvement of the standard methods of surveillance towards integrated surveillance, risk assessment and early case detection.



- Enhance capacities for integrated actions to prevent & control epidemics & epizootics;
- Contribute to the development of methodological approaches to promote One Health initiatives;
- Strengthen the public health and veterinary services networks;
- Identify indicators & integrated surveillance systems for early warning & risk assessment;
- Promote & facilitate harmonization of integrated surveillance & early warning;
- Promote intersectoral interactions involved in arboviral zoonosis detection & response;



The identification of **early warning indicators** in association with rapid implementation of prevention and control measures could reduce the severity of arbovirus epidemics.

Ad hoc indicators can also highlight the **vulnerability of countries or specific zones to the introduction and spread of arbovirus infections**, thus providing precious information to prevent the occurrence of outbreaks and epidemics.



To this aim, we identified **a set of surveillance indicators** that could assist in increasing regional early-warning capacity and verified, through a survey, their collection at the national level in the 22 MLS countries of the Mediterranean, Black Sea and Sahel regions.



The study focused on emerging and re-emerging arboviruses:

- Crimean-Congo haemorrhagic fever virus—CCHFV
- Chikungunya virus—CHIKV
- Dengue virus—DENV
- Rift Valley fever virus—RVFV
- West Nile virus—WNV
- Yellow fever virus—YFV, and
- Zika virus—ZIKV)

representing possible priorities for the various geographical areas included in MLS network.

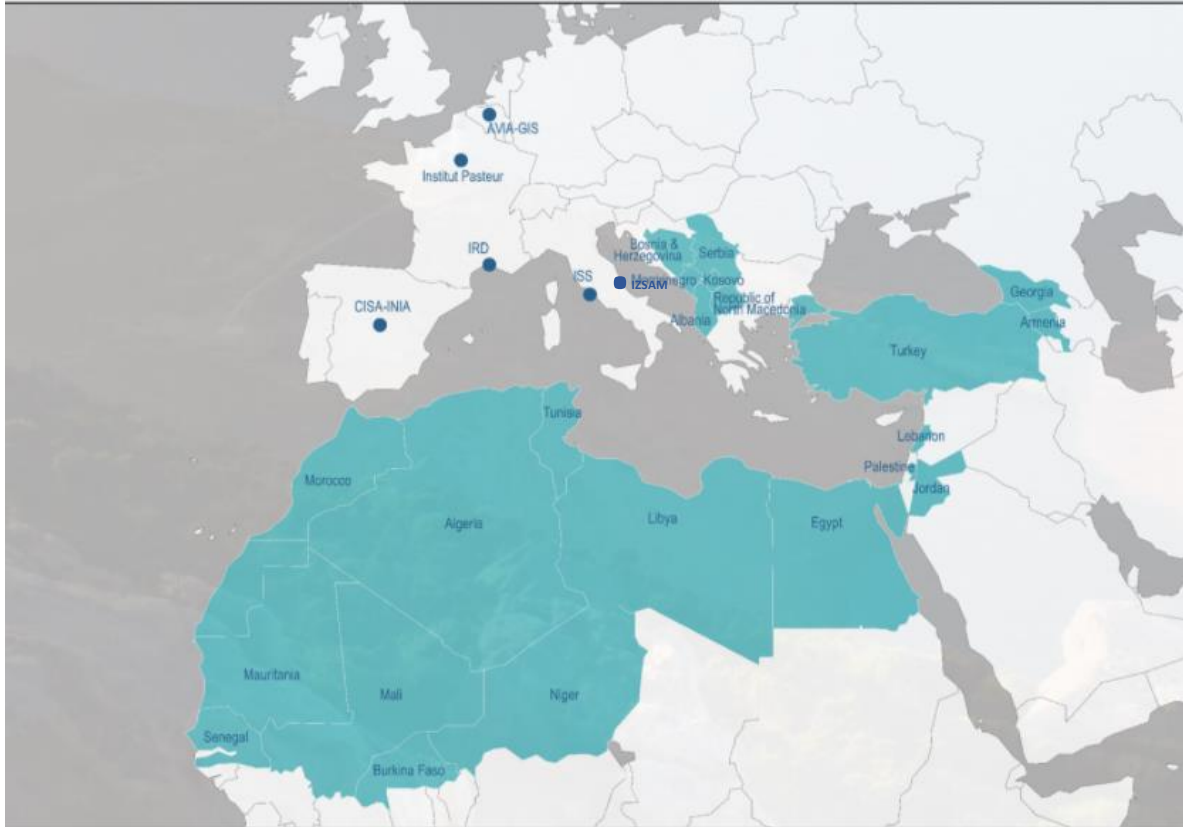


3.1. Selected Indicators

The indicators selected among those identified from the literature are reported in Table 1.

Table 1. Selected potential indicators for early warning.

Sector	Type of Indicator	Specific Indicators
Vector	Pathogen-specific	Vector presence Vector abundance/density Vector seasonality Vector infection rate
Human	General	Population density Population age distribution
	Pathogen-specific	Disease frequency or occurrence—new notified cases/outbreaks (according to National case definition) per year Disease frequency or occurrence—number confirmed laboratory cases (according to National case definition) per year Disease frequency or occurrence—persons with detected antibodies (sero-prevalence)
Animal	General	Animal population density ¹ Animal movements and trade—pastoralism and transhumance Animal movements and trade—import and export Animal movements and trade—wildlife migrations
	Pathogen-specific ²	Animal disease occurrence Animal disease seroprevalence



110

officially appointed national contact points, belonging to three sectors (**vector, human, and animal**) of the study area, were invited to answer to an online questionnaire.



Table 2. Zoonotic pathogens perceived relevance in the study area and by sectors.

Pathogens	Overall Relevance in the Study Area	Sector Relevance (Vector)	Sector Relevance (Human)	Sector Relevance (Animal)
West Nile virus	59/81 (73%)	18/20 (90%)	22/30 (73%)	18/31 (61%)
Crimean-Congo Haemorrhagic Fever virus	51/81 (63%)	14/20 (70%)	20/30 (67%)	17/31 (55%)
Rift Valley fever virus	40/81 (49%)	11/20 (55%)	13/30 (43%)	16/31 (52%)

Table 3. Non-zoonotic pathogens perceived relevance in the study area and by sectors.

Pathogens	Overall Relevance in the Study Area	Sector Relevance (Vector)	Sector Relevance (Human)
Dengue virus	31/50 (62%)	13/20 (65%)	18/30 (60%)
Chikungunya virus	23/50 (46%)	11/20 (55%)	12/30 (40%)
Zika virus	20/53 (40%)	9/20 (45%)	11/30 (37%)
Yellow fever virus	19/53 (38%)	8/20 (40%)	11/30 (37%)



- The most frequently collected indicator in the **entomology sector** is “vector presence,” regardless of the involved pathogen, while data on “vector infection rate” are rarely gathered .
- The results from the **human sector** questionnaires show that **population density** and **population age distribution** data are collected in almost all cases. To evaluate disease frequency or occurrence, the most frequently collected data are **new cases** (new notified cases or outbreaks, according to the national case definition, per year) and **laboratory cases** (number of confirmed laboratory cases, according to national case definition, per year).
- For the **animal sector**, data on **animal population density** are collected in 100% of the cases for cattle, goats, and sheep, and to a lesser extent for equids and camels; rarely collected for wild species. **Data on animal movements and trade** are frequently collected in terms of import and export, and quite often for pastoralism and transhumance practices. Wild animal information (**wildlife migrations**) is again gathered very rarely. Data regarding **disease occurrence and disease seroprevalence** in animals are collected to a different extent depending on the pathogen considered.



Amongst other questions, one was:

- **Do you/your office have access to any global public dataset related to Climate & Environment?**

In case of “yes”,

To which one/s? And with which purpose/s?

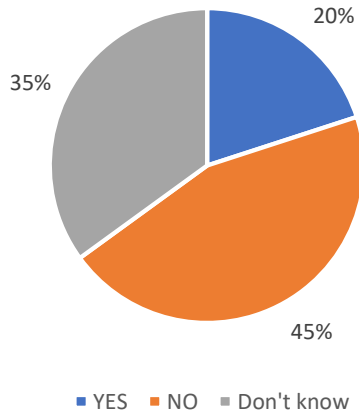
From May until December 2019, responses were collected and then analysed.

Overall, 81 completed questionnaires were received

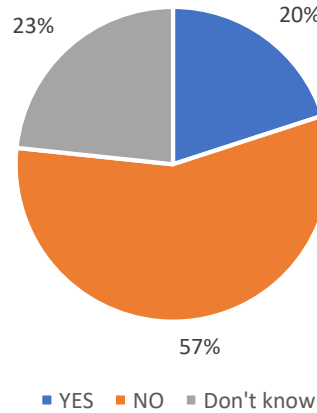


Within each of the three sectors, the users of datasets corresponded to about 20% of the respondents

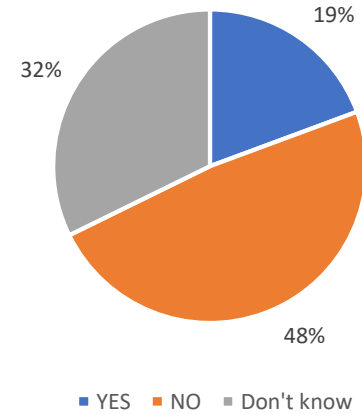
Vector



Human



Animal





Overall, **ten respondents gave further details.**



3



2



5

Seven people reported the parameters investigated and/or the purpose, and three reported examples of websites/platforms for global public datasets consultation, National or International.

IMPLEMENTATION: THE SURVEY



Mentioned websites

MODIS	https://modis.gsfc.nasa.gov/data/
WORLDCLIM	https://www.worldclim.org/
SOILGRIDS	https://soilgrids.org/#/!/?layer=ORCDRC_M_sl2_250m&vector=1
UNSD	https://unstats.un.org/home/



Data

Home >> Data

Data Products

Algorithms

Direct Broadcast

Data

The MODIS instrument is operating on both the Terra and Aqua spacecraft. It has a viewing swath width of 2,330 km and views the entire surface of the Earth every one to two days. Its detectors measure 36 spectral bands between 0.405 and 14.285 μm , and it acquires data at three spatial resolutions -- 250m, 500m, and 1,000m.

Along with all the data from other instruments on board the Terra spacecraft and Aqua spacecraft, MODIS data are transferred to ground stations in White Sands, New Mexico, via the Tracking and Data Relay Satellite System (TDRSS). The data are then sent to the EOS Data and Operations System (EDOS) at the Goddard Space Flight Center. The Level 1A, Level 1B, geolocation and cloud mask products and the Higher-level MODIS land and atmosphere products are produced by the MODIS Adaptive Processing System (MAPS), and then are parceled out among three DAACs for distribution. Ocean color products are produced by the Ocean Color Data Processing System (OC2PS) and distributed to the science and applications community.

The many data products derived from MODIS observations describe features of the land, oceans and the atmosphere that can be used for studies of processes and trends on local to global scales. As just noted, MODIS products are available from several sources. MODIS Level 1 and atmosphere products are available through the LAAC2 web. Land Products are available through the Land Processes DAAC at the U. S. Geological Survey EROS Data Center (EDC). Cryosphere data products (snow and sea ice cover) are available from the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado. Ocean color products and sea surface temperature products along with information about these products are obtainable at the OC2PS at GOC. Users with an appropriate x-band receiving system may capture regional data directly from the spacecraft using the MODIS Direct Broadcast signal.

More information about obtaining MODIS data can be found from the information sites listed below. The



Welcome to UNSD

Statistical Commission

COVID-19 Response Resources for Official Statisticians

United Nations WORLD DATA FORUM

2020 World Population and Housing Census Programme

News

How Covid-19 is changing the world: a statistical perspective - Volume II

1 September 2020
Volume II of the report published by the Committee of Coordination of Statistical Activities (CCSA) provides an updated snapshot of some of the latest information available on how COVID-19 is affecting different aspects of public and private life. The report is available [here](#).

Meetings and events

Economic

- Online event - 23 June - 20 October 2020
Virtual Expert Forum on SEA Experimental Ecosystem Accounting 2020
- Online event - 21 September - 30 October 2020
E-learning Course on Statistics of International Trade in Services Organized jointly by UNSD, UNCTAD, in cooperation with WTO
- Online event - 21 September - 30 October 2020
Cours d'apprentissage en ligne Trade et Trade sur les statistiques du commerce international des services Organisé conjointement par le DSNU et

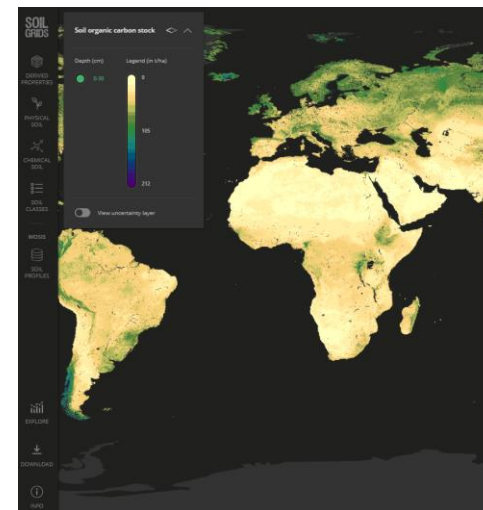
Commitments

- Fundamental Principles of Official Statistics
- Principles Governing International Statistical Activities

Partners

- National Statistical Offices
- CCSA
- CCSLM
- International Agencies

Featured Databases



WorldClim

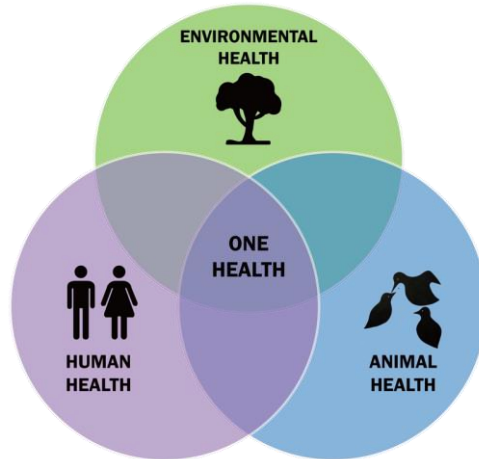
Maps, graphs, tables, and data of the global climate

Download

Conclusions (1)

01

A certain grade of collection of surveillance data (indicators) is already in place in the MLS region



Source: Wikipedia

02

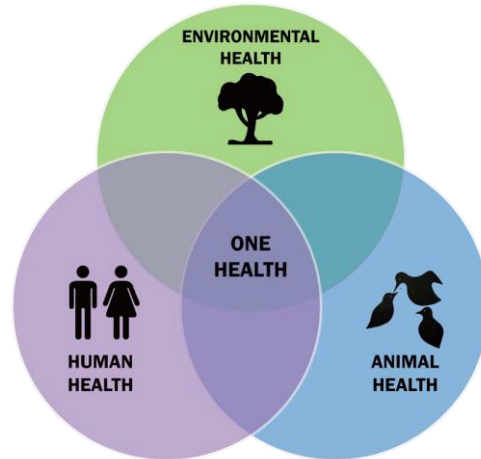
Their collection should be strengthened and the gaps on critical indicators addressed (i.e. vector infection rate and wildlife information)

Conclusions (2)

01

A **low level of use of global public datasets** on climate and environment in the investigated study area was highlighted.

Moreover, only few respondents were able to produce examples of datasets in use.

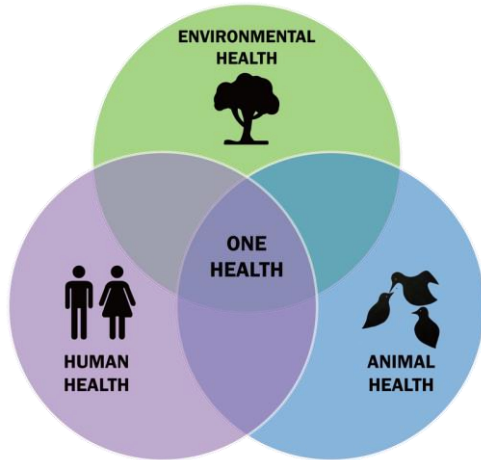


Source: Wikipedia

02

It appears important to implement **awareness on the availability of environment and climate datasets**, in order to strengthen integrated early warning strategies in the three involved sectors with a One Health approach.

Conclusions (3)



Source: Wikipedia

It appears worthwhile proceeding with further assessments which can help clarify the reliability of the indicators collected and the feasibility of the implementation of an integrated early warning system for arboviral infections.

Since some relevant indicators are already being collected, this would not demand for extra resources but, on the contrary, its operationalization could lead to savings.

[www.
medilabsecure.com](http://www.medilabsecure.com)

Thank you
for your attention



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