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

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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.

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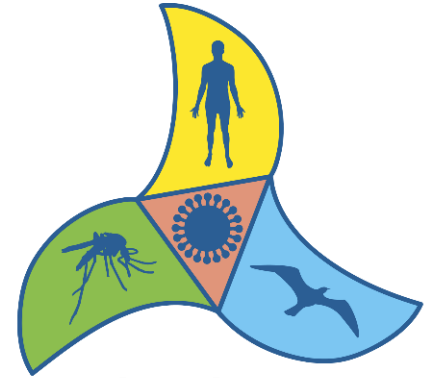


MediLabSecure

*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*

# SPECIFIC OBJECTIVES

**Advocacy for the adoption of a One Health approach**

**Networking**

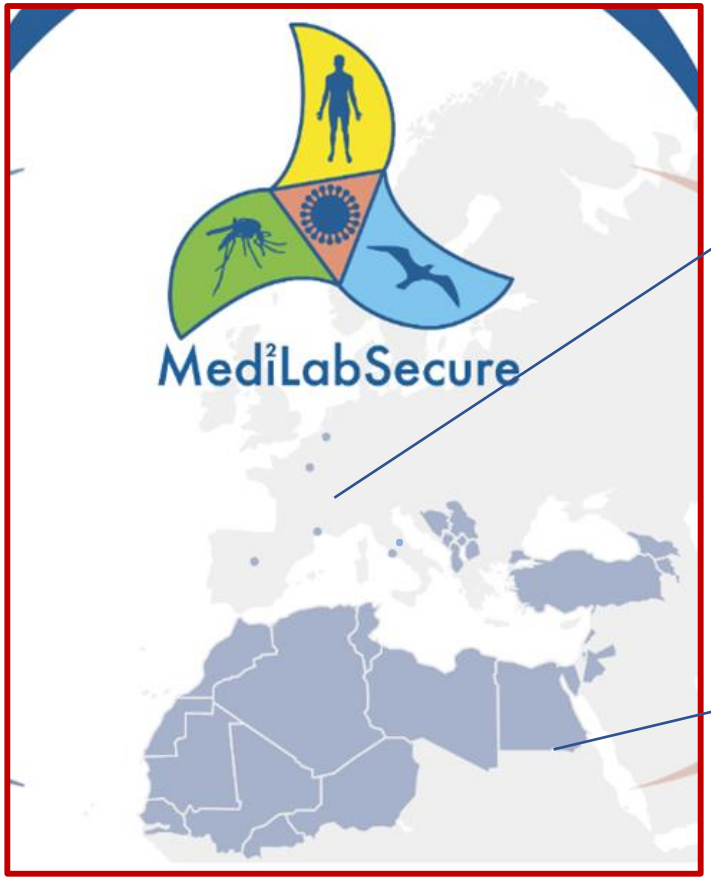
Preventing vector-borne diseases around the Mediterranean and Sahel regions by reinforcing **an international network of laboratories, public health institutions and veterinary services**

**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

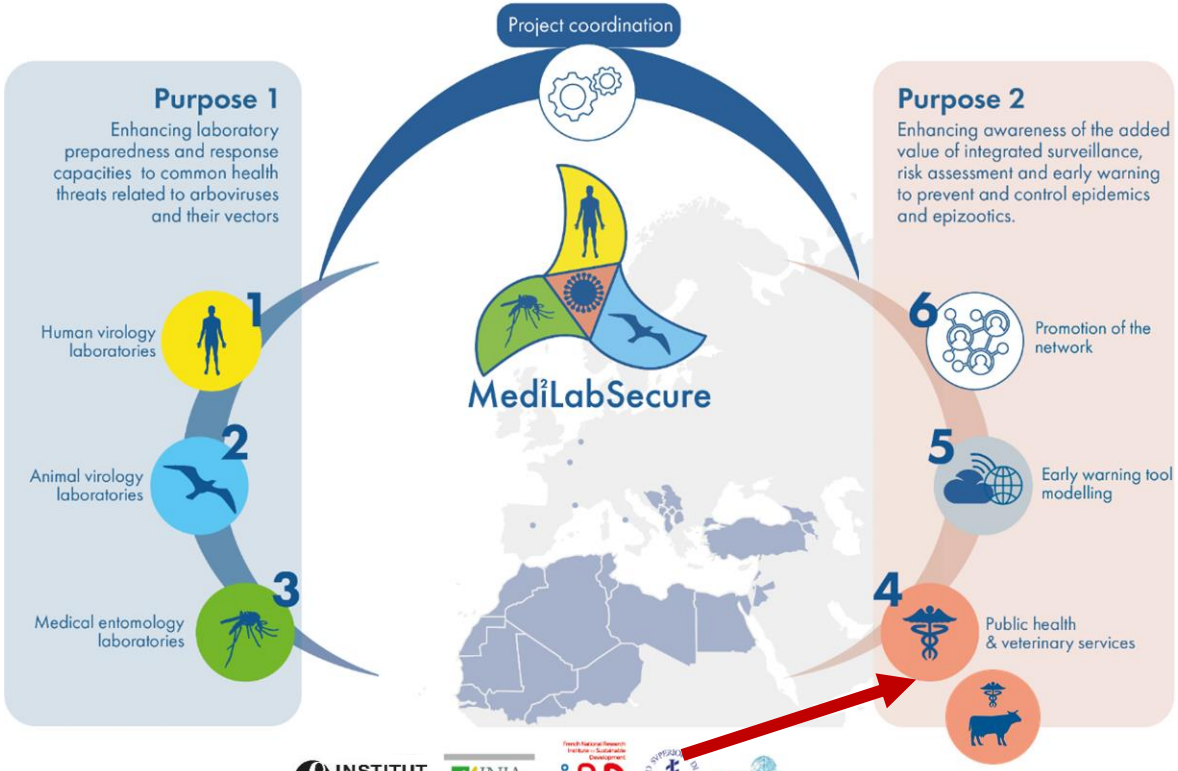
# Networking

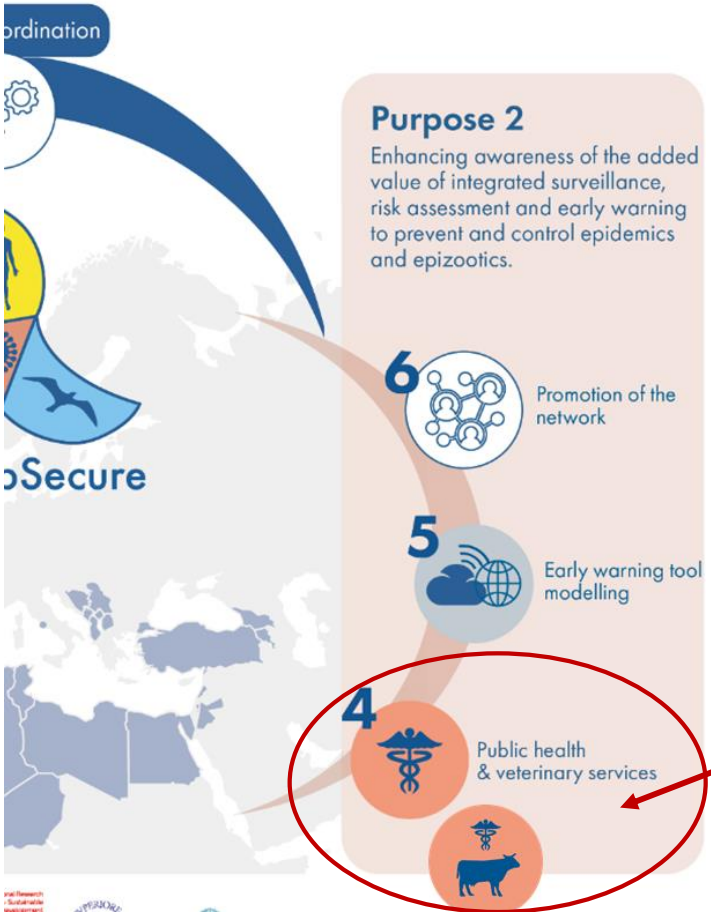



Pasteur Institute, France
INIA, Spain
IRD, France
ISS, Italy
Avia-GIS, Belgium
IZSAM, Italy

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

# IMPLEMENTATION






WP4- Public Health and Veterinary Services:

Italian National Health Institute (ISS)

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Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise G. Caporale (IZSAM)

# WP4 Public Health & Veterinary services

**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.

# IMPLEMENTATION: THE SURVEY

### 3.1. *Selected Indicators*

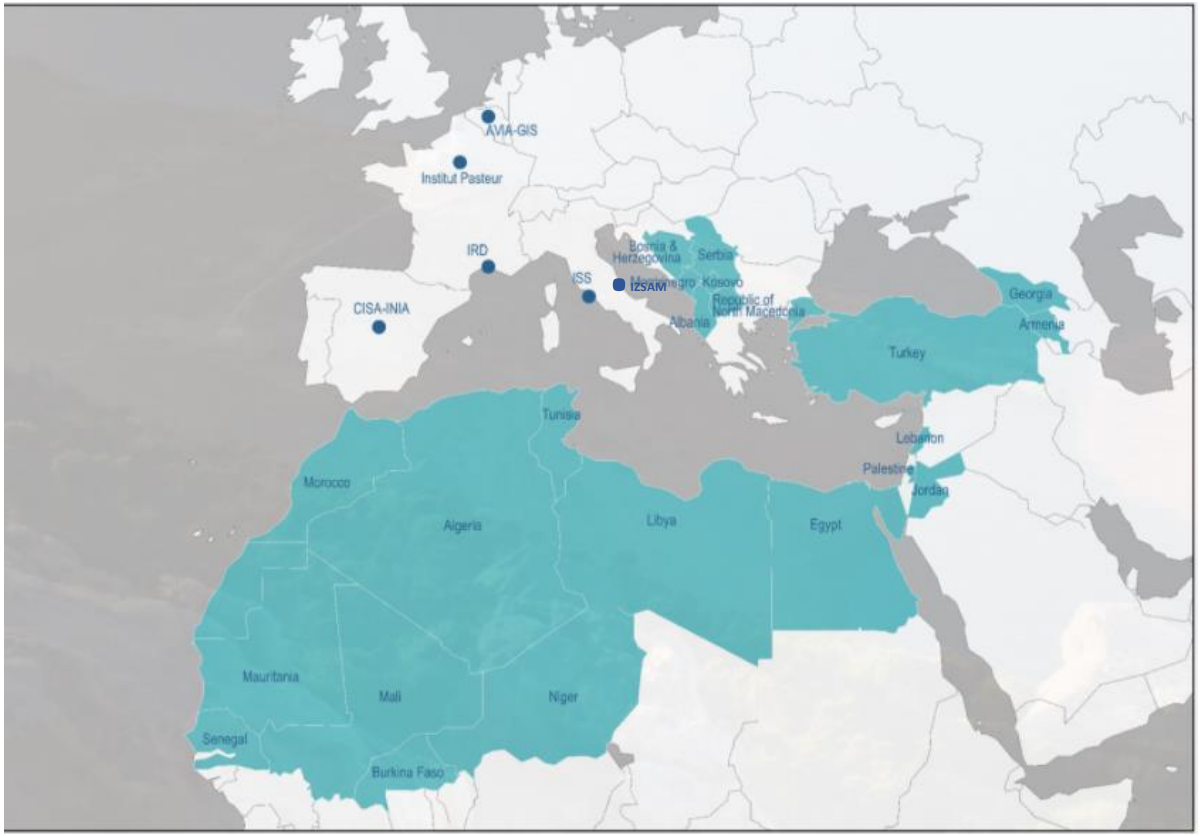
The indicators selected among those identified from the literature are reported in Table 1.

**Table 1.** Selected potential indicators for early warning.

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

Laura Amato, Maria Grazia Dente, Paolo Calistri, Silvia Declich on behalf of the MediLabSecure Working Group.
Integrated Early Warning Surveillance: Achilles Heel of One Health? Microorganisms 2020, 8, 84; doi:10.3390

# IMPLEMENTATION: THE SURVEY




**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%) |

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# IMPLEMENTATION: THE SURVEY

- 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.

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# IMPLEMENTATION: THE SURVEY

Amongst other questions, one was:

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

In case of "yes",

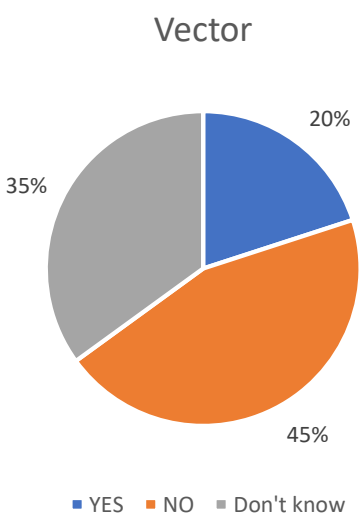
**To which one/s? And with which purpose/s?**

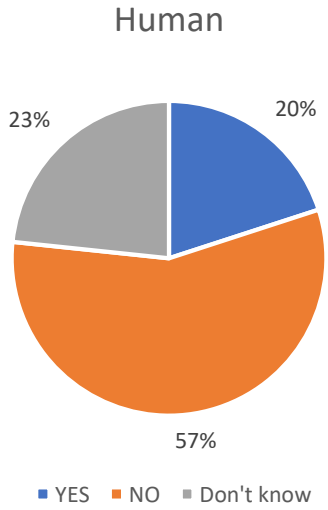
From May until December 2019, responses were collected and then analysed.

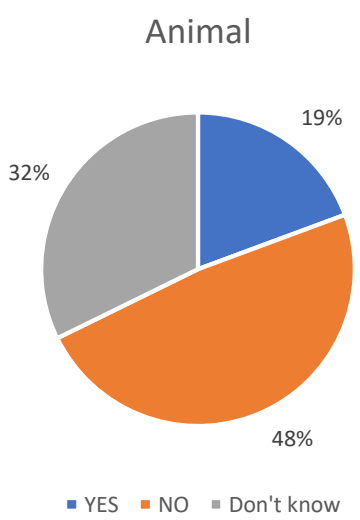
Overall, 81 completed questionnaires were received

## IMPLEMENTATION: THE SURVEY

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



## IMPLEMENTATION: THE SURVEY

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

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**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

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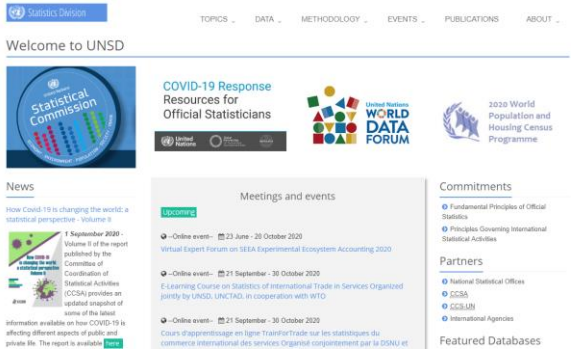
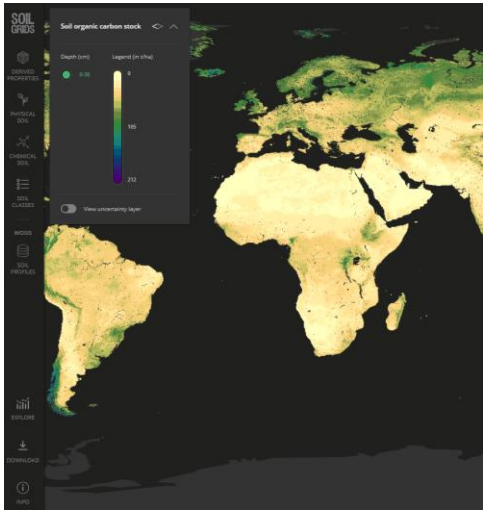
| Mentioned websites | |
|---|---|
| MODIS | https://modis.gsfc.nasa.gov/data/ |
| WORLDCLIM | https://www.worldclim.org/ |
| SOILGRIDS | https://soilgrids.org/#!/?layer=ORCDRC_M_sl2_250m&vector=1 |
| UNSD | https://unstats.un.org/home/ |

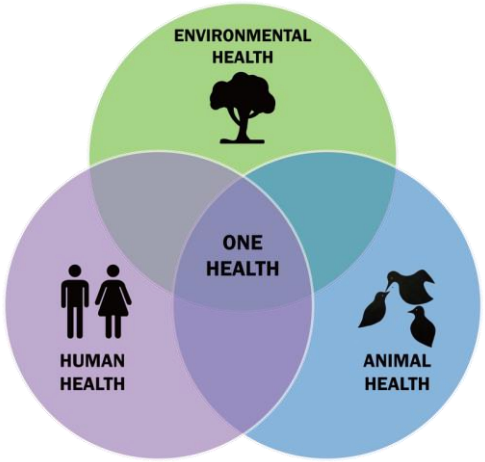




# Conclusions (1)

01

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




Source: Wikipedia

02

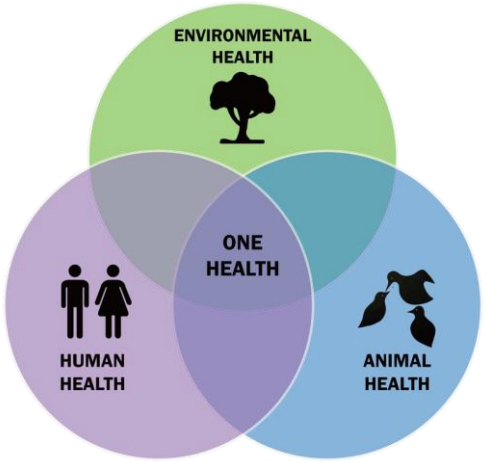
Their collection should be strengthened and the gaps on critical indicators addressed (i.e. vector infection rate and wildlife information)

# 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.

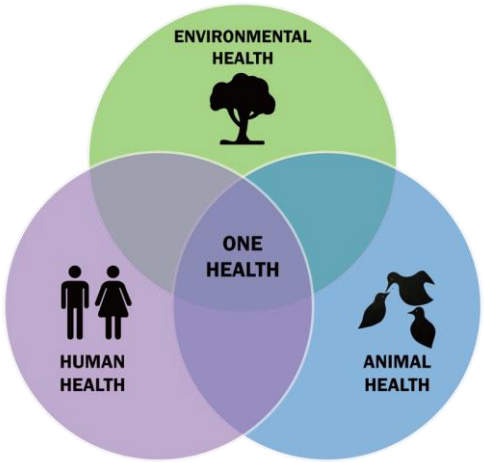


Source: Wikipedia

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.

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# Thank you
# for your attention


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