openFMD
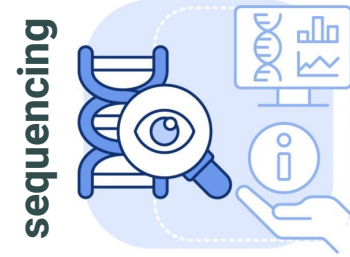## a digital platform to support Foot-and-Mouth Disease global surveillance

Antonello Di Nardo

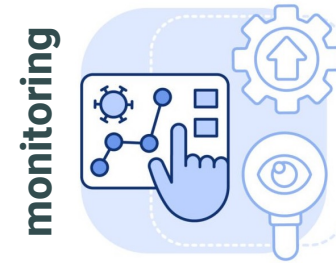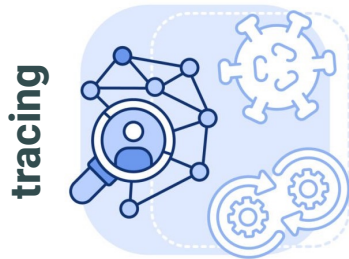senior molecular epidemiologist

epidemiological intelligence

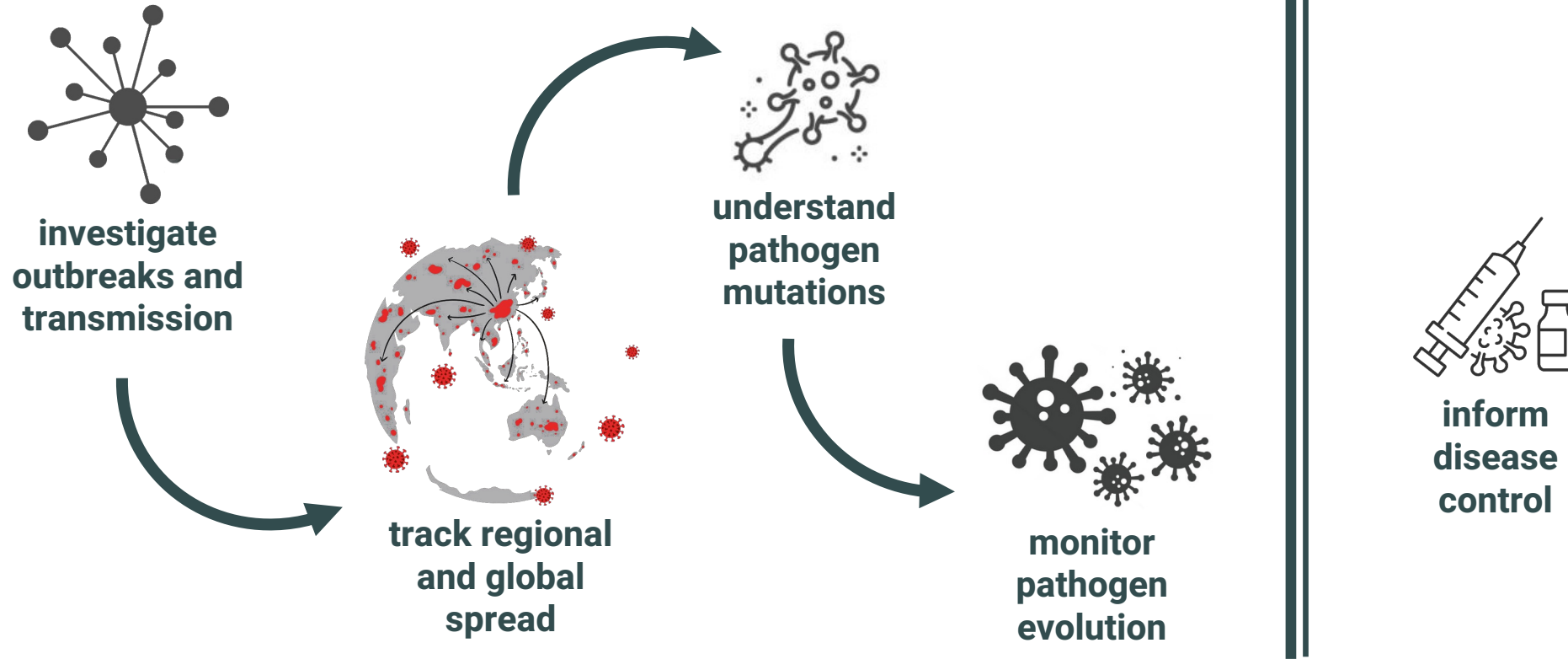detecting

sequencing

"the cycle of organised and systematic **collection**, **analysis** and **interpretation** of information from <u>all sources</u> to **detect**, **verify** and **investigate** potential health risks"
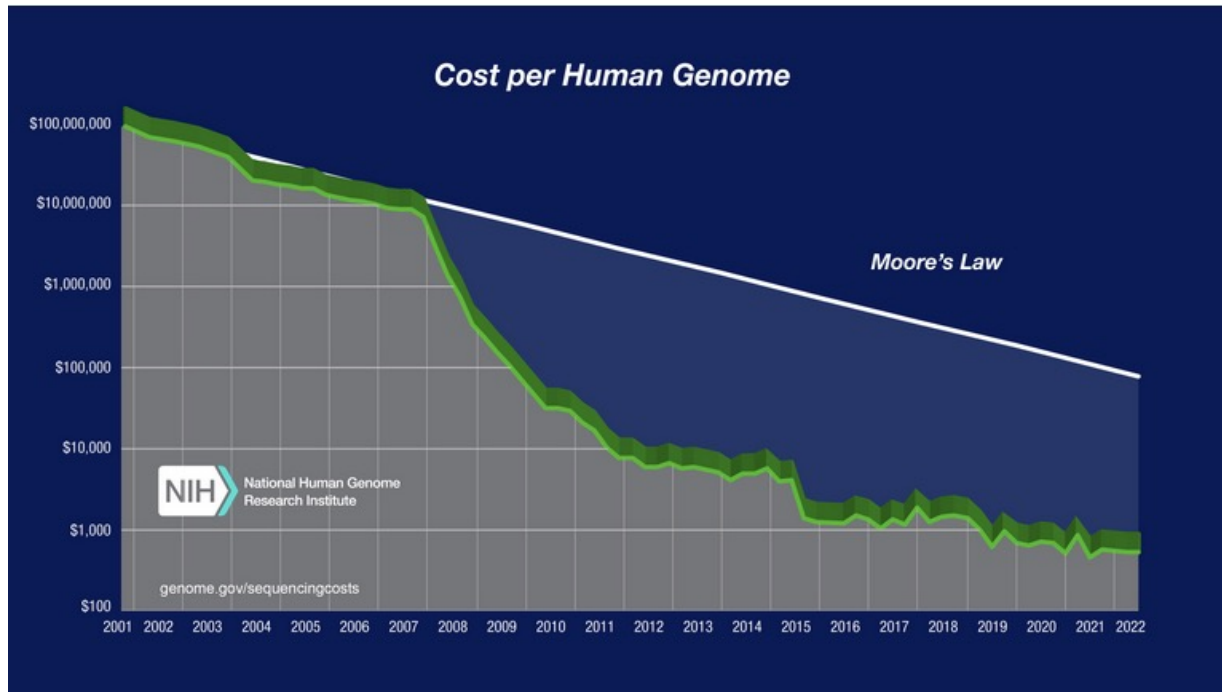
Source: @WHO

tracing

monitoring

epidemiological surveillance

surveillance data is **crucial** to get us to **know** about disease threats and trends
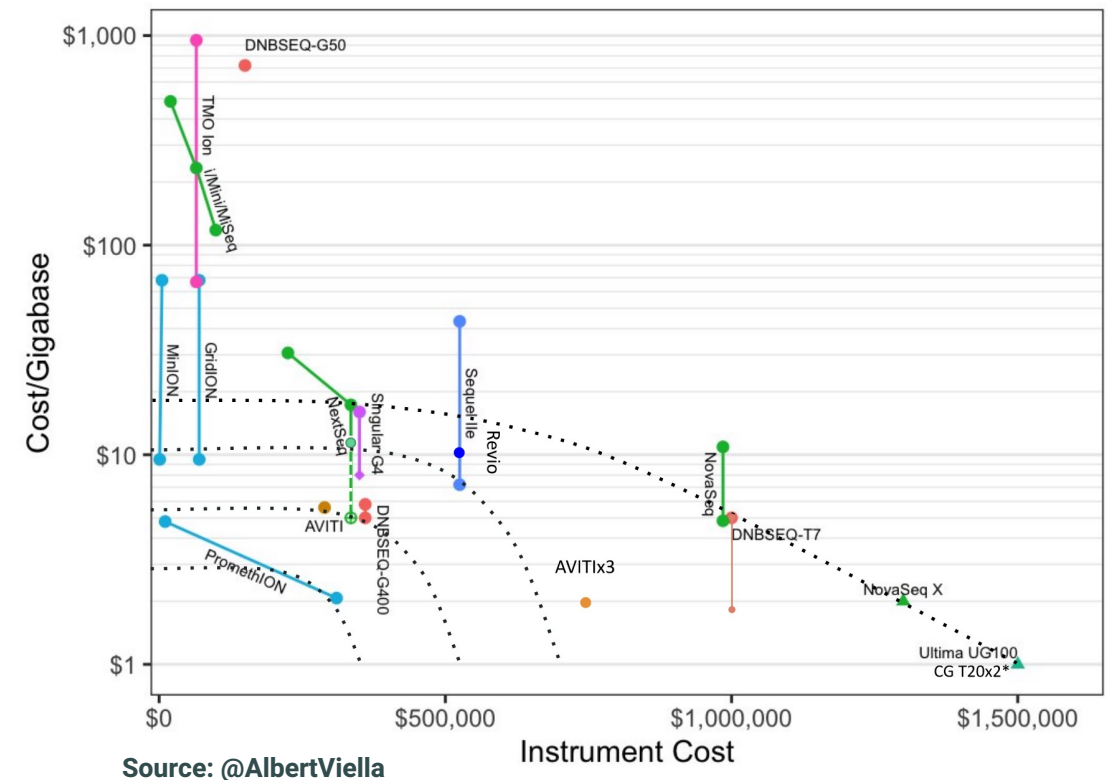
genomic data

advances in the field of genomics over the past 20 years have led to substantial reductions in the cost of genome sequencing

Source: @NHGRI Genome Sequencing Program

Source: @AlbertViella

surveillance data

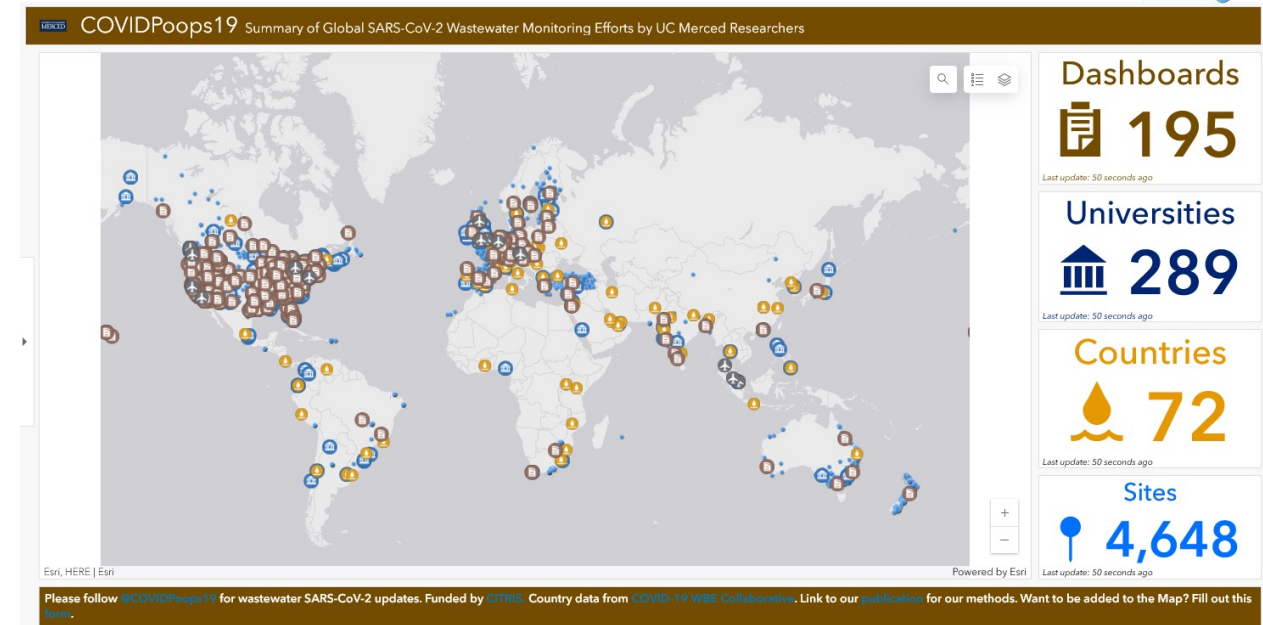surveillance data is the **raw** material, and because of that it is **critical**

the SARS-CoV-2 pandemic has led to a revolution not only in how we **collect** the data but also in how we **use** it

scientific publication

- important but not informing real-time response

revolution in analysis and information

- enabling analysis is key
- building new tools and resources is critical
- sharing and collaboration is essential

COVIDPoops19 Summary of Global SARS-CoV-2 Wastewater Monitoring Efforts by UC Merced Researchers

Dashboards 195
Last update: 50 seconds ago

Universities 289
Last update: 50 seconds ago

Countries 72
Last update: 50 seconds ago

Sites 4,648
Last update: 50 seconds ago

Please follow @COVIDPoops19 for wastewater SARS-CoV-2 updates. Funded by CITRIS. Country data from COVID-19 WBE Collaborative. Link to our publication for our methods. Want to be added to the Map? Fill out this form.

Source: @COVIDPoops19

digital epidemiology and surveillance

How do we empower appropriate surveillance?

Ensuring researchers are given the tools and knowledge they need to understand data

Enabling research and policy through diverse tools

deployment of agile integrated genomic, clinical, and epidemiologic surveillance systems with seamless interoperability and global interconnectivity
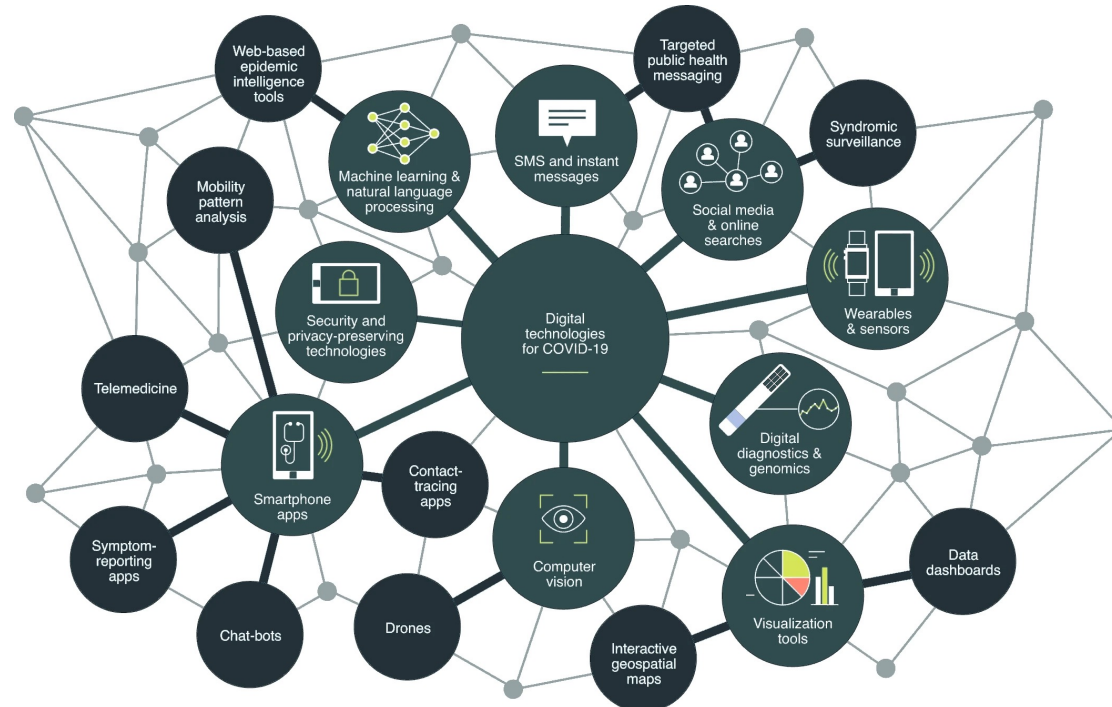

Source: @Budd et al. 2020 *Nat Med*

Make research and knowledge sharing more efficient

wider cross-sectorial collaboration and data sharing between laboratories, health agencies, surveillance databases, and the broader scientific community

FMD global surveillance

"The genomic surveillance of FMDV contributes to international disease surveillance activities undertaken by the **WOAH/FAO Reference Laboratory Network for FMD**, which are facilitated via links to the FAO and WOAH"
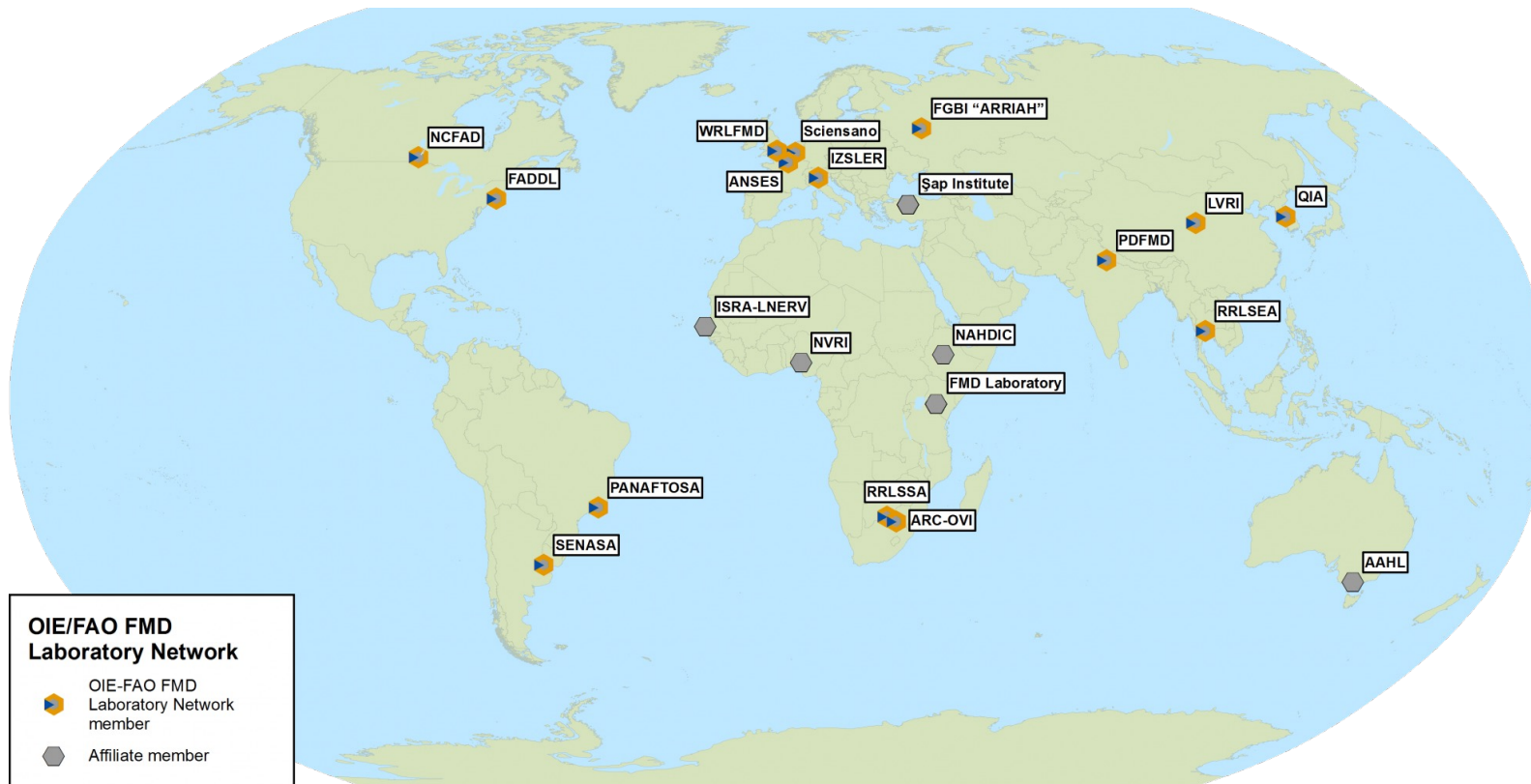
FMD digital surveillance

"to **help** researchers, national and regional laboratories, governments and international organisations in **planning** and **prioritising** FMD surveillance activities, and to contribute in **reducing** the risk of FMD spread and introduction in disease-free areas"

Provide comprehensive information from FMD global surveillance

Improve analysis and risk assessment of FMDV lineages circulating in different parts of the world

Identify and monitor gaps in FMD surveillance and track progress in the implementation of the global strategy for FMD control

Ensure risk managers have the info required to assess and control FMD risk, including through selection of the most appropriate vaccine strains matched to the circulating viruses

openFMD portal

unique access point for all information, data and analytics for FMD
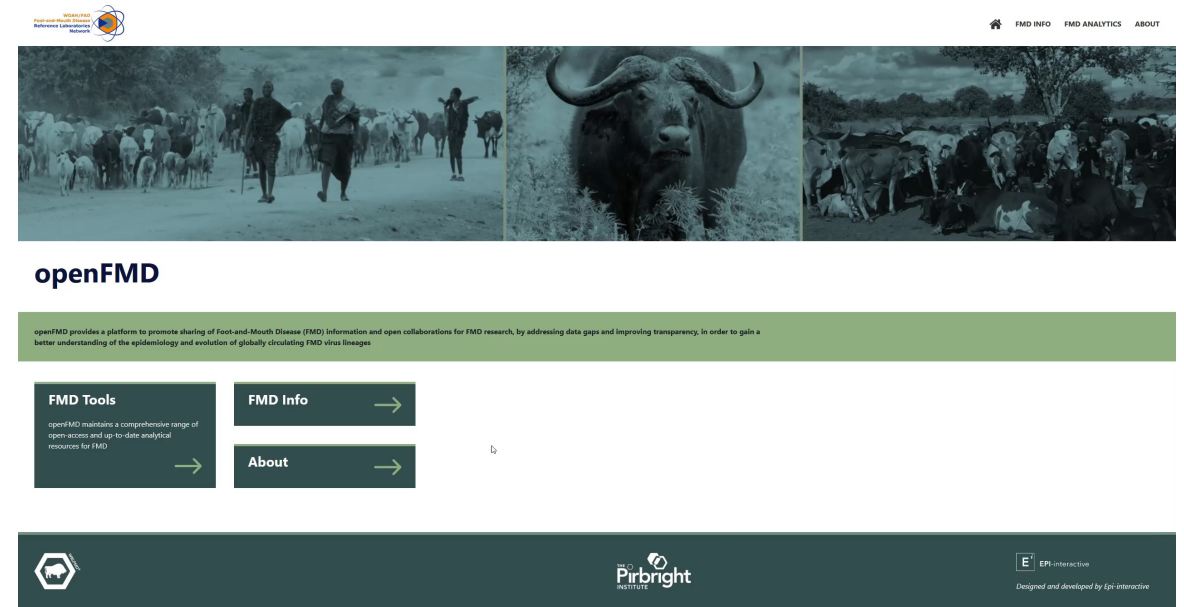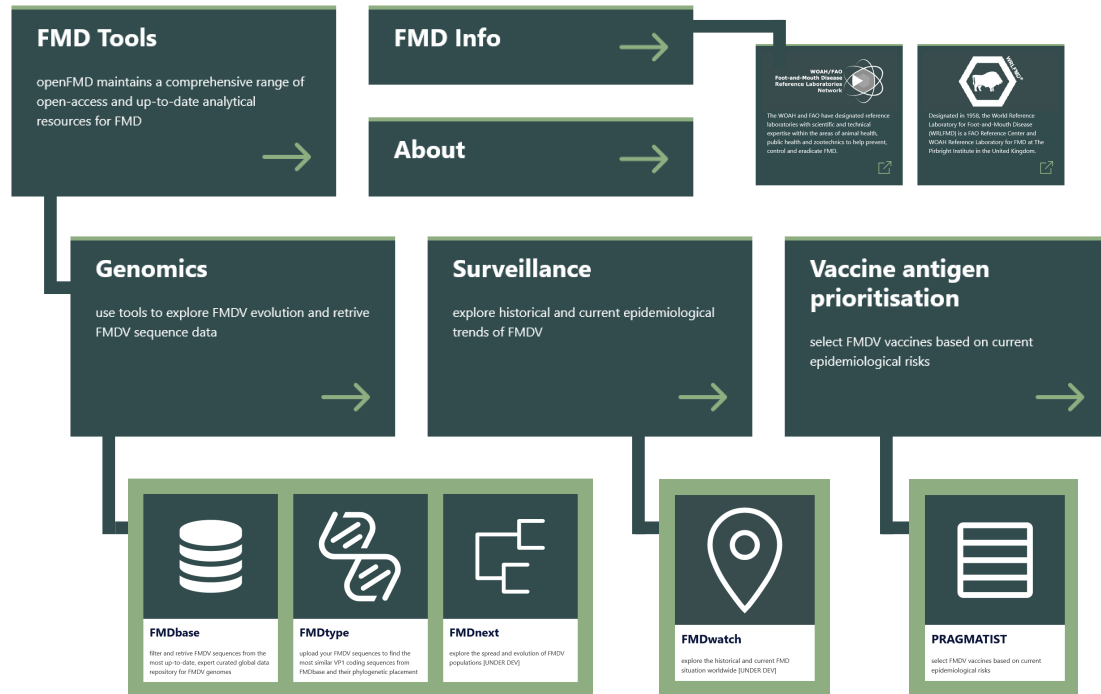
openFMD analytics

"a portfolio of **interactive analytical tools** developed by the FAO World Reference Laboratory for FMD and the WOAH/FAO Reference Laboratory Network for FMD and implemented towards the overarching effort of enhancing the **global epidemiological intelligence** of FMD"

openFMD

FMDbase

FMDtype

FMDwatch

FMDnext

PRAGMATIST

| https://www.openfmd.org/dashboard/... |

FMDbase
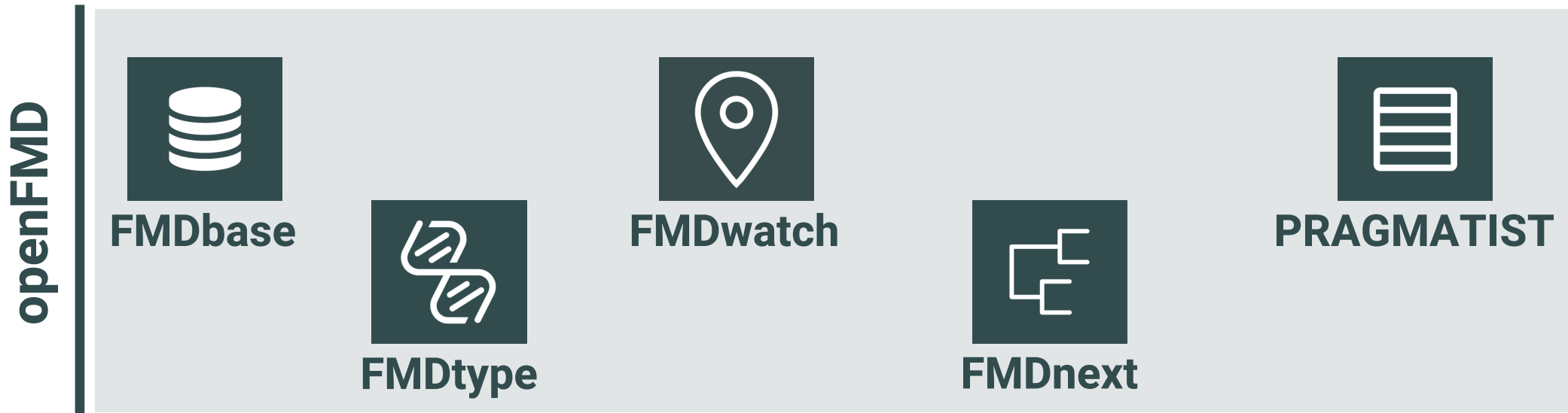
an expert-curated database of FMDV sequences

- The official repository of FMDV genomic data from the WOAH/FAO Reference Laboratory Network for FMD

- Fully curated FMDV sequences + associated metadata (n=18177)

  - Public data (n=12622)
    Published material (GenBank submitted)

  - Private data (n=5555)
    Unpublished material (FMD Ref Lab Net data)

- User queries + metadata info

- Download data in either .csv or .fasta format

| https://www.fmdbase.org |

FMDtype

annotating FMDV sequences and generating FMDV genotyping report

- User friendly tool to interrogate user data against the FMDV db in a simple guided fashion

- 'Annotate' user genomic sequences

- Test an 'evolutionary scenario' by including FMDV sequences from the database

- Reconstruct (+download) phylogenetic trees (.nexus file) [limited to 100 tips]

- Generate (+download) ad-hoc genotyping reports in (PDF file)

| https://www.openfmd.org/dashboard/fmdtype |

FMDwatch

exploring and visualising FMD surveillance data

- Integrate all sources of FMD surveillance data in a single repository (WRLFMD + FMD Ref Labs + WOAH WAHIS)

- Allow to better identify FMD surveillance gaps and option to improve activities related to FMD risk monitoring

- Improve timely analysis and communication of FMDV activities at country/regional levels

- Support evidence-based decision-making processes for FMD control

- [future devs] Help to monitor FMDV antigenic evolution by reporting vaccine-matching data

| https://www.openfmd.org/dashboard/fmdwatch |

PRAGMATIST
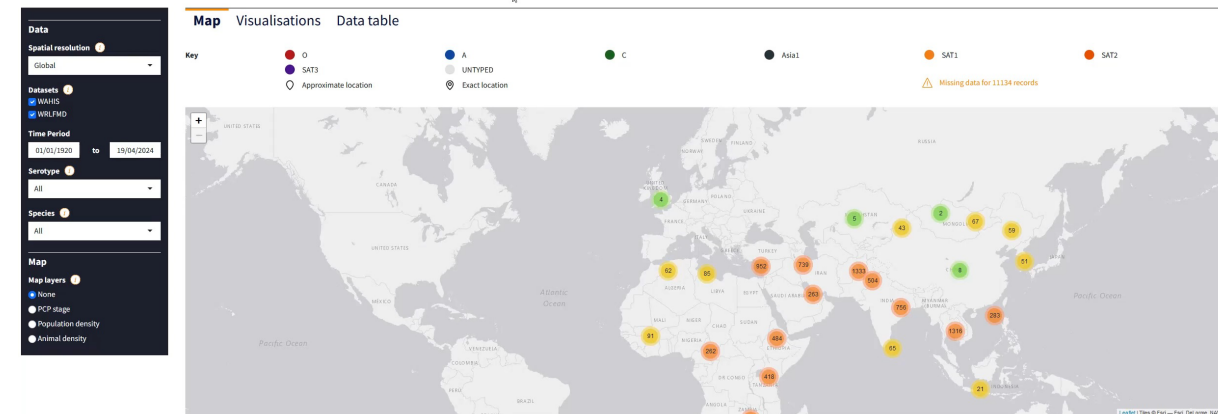
evaluation and prioritisation of candidate FMDV strains for inclusion in antigen banks

- Create and test FMD regional/country risk scenarios

- Identify FMD profile risks for different FMDV lineages circulating globally

- Evaluate FMDV vaccine strains coverage and protection

- Identify high-priority vaccine to be included in FMDV antigen banks

- [future devs] Generate (+download) PRAGMATIST reports in (PDF file)

| https://www.openfmd.org/dashboard/pragmatist |

FMDnext

exploring the spread and evolution of FMD viral populations

- Provide a global snapshot of FMDV evolution at serotype level with the analysis of the full repository of FMDV sequences [starting from 1924]

- Assess geographical spread of FMDV lineages at regional level through phylogeographic links

- Monitor FMDV evolution and identify increasing diversity and geographic expansion of new potential threats

- Support evidence-based decision-making processes for FMD control

- [future devs] Predict FMDV antigenic evolution

| https://www.openfmd.org/dashboard/fmdnext |

Powered by
Nextstrain
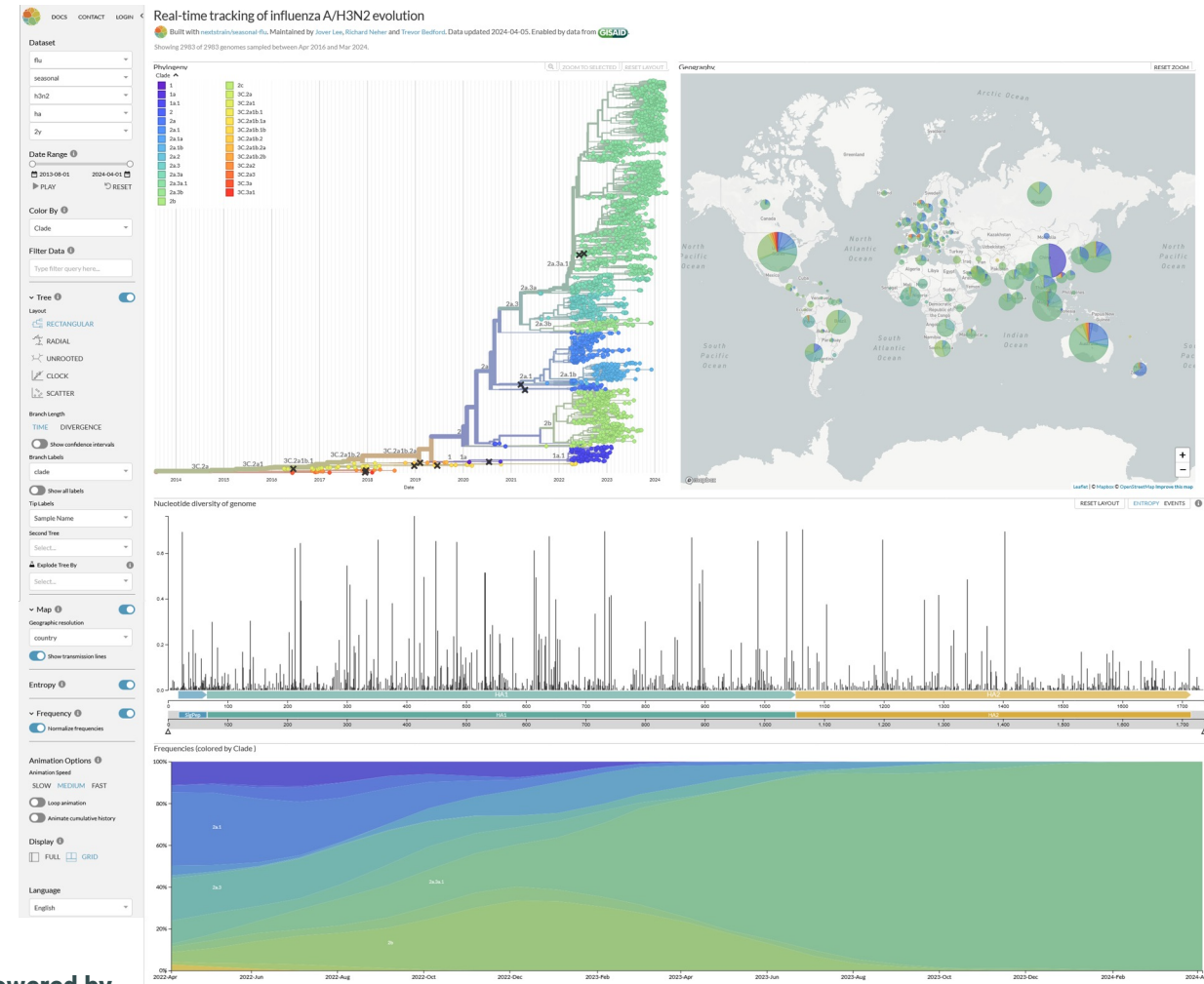
openFMD vision

connect

Provide an ecosystem that connect FMD data of different type and from a wide range of sources

+

Offering the infrastructure and implement policies and practices to equitable sharing and access of FMD data
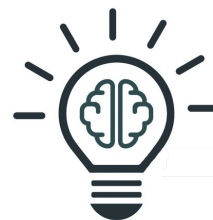
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strengthen

Create a collaborative epidemiological intelligence environment for FMD

+

Pulling on multiple strengths and works from groups of FMD scientists around the world

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innovate

Facilitate the wide availability of analytical tools for FMD

+

Enabling FMD research communities and animal health institutions to strengthen decision making processes through innovative tools and applications

acknowledgements

collaborators

funding