



# **EFSA AND ECDC ONE HEALTH WGS SYSTEM**

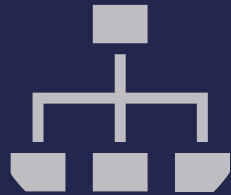
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**Science meets policy – 5<sup>th</sup>  
September 2023**

# CHALLENGES IN CROSS-SECTORIAL DATA SHARING



**Distinct Sectors:** Public health, food safety/veterinary bodies



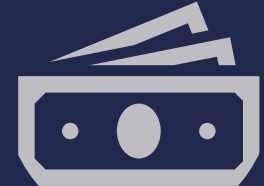
**Organizational Differences:** Varying priorities, structures, and cultures  
• *Example:* Different roles of public health agencies and food safety organizations



**Technical Obstacles:** Infrastructure, data protection, harmonization  
• *Example:* Variability in data storage standards across regions



**Legal and Ethical Concerns:** Ownership, responsible usage, data privacy  
• *Example:* Challenges related to data ownership and responsible sharing



**Economic Barriers:** Costs of technologies and capacity development  
• *Example:* Limited implementation due to financial constraints in some countries



# DATA SHARING MODELS & PROS/CONS

## ACCESSIBILITY MODELS

- **Pros:** Wide accessibility, fostering innovation
- **Cons:** Privacy concerns, potential misuse

Open Data Sharing



- **Pros:** Responsible usage, trust-building
- **Cons:** Potential access limitations, data sharing coordination

Controlled network Data Sharing



## MANAGEMENT MODELS

- **Pros:** Unified platform, streamlined analysis
- **Cons:** Single point of failure, data monopoly

Centralized Data Sharing



- **Pros:** Data autonomy, robustness
- **Cons:** Data fragmentation, interoperability challenges

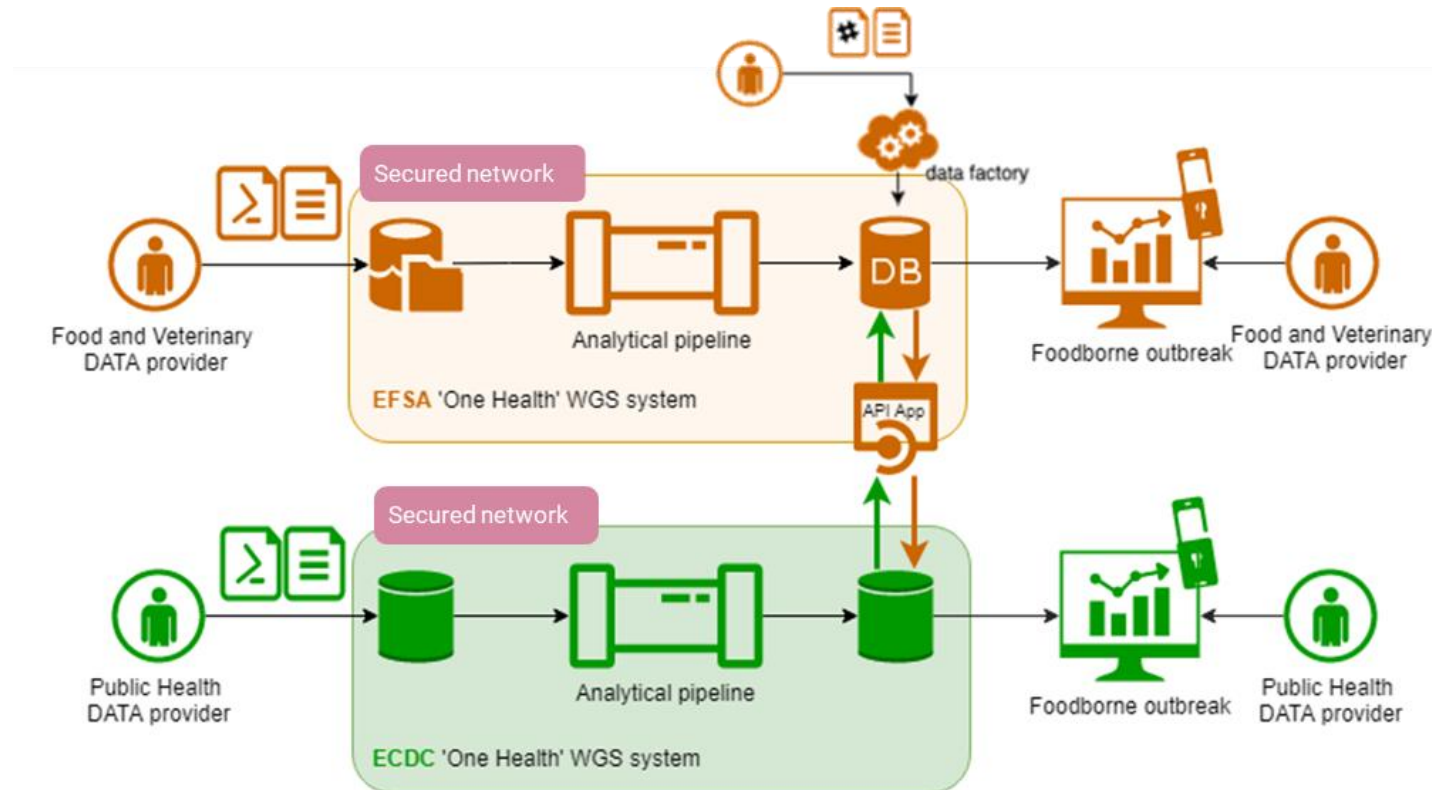
Decentralized Data Sharing



# EU ONE HEALTH WGS DATA SHARING MODEL

## COMBINATION OF APPROACHES

- **Controlled-Centralized Data Sharing at sector level:** EFSA and ECDC collect data centrally based on their remit
- **Cross-Sectoral Collaboration:** interoperability and comparability of the EFSA and ECDC platforms allow the data exchange for allowing cluster detection and outbreak investigation



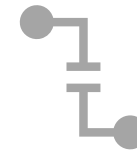
# IMPLEMENTATION MANDATE

In December 2019 EFSA and ECDC mandated for **implementing and managing a One Health system for the collection and joint analysis of WGS** data from foodborne isolates from human, food, feed, animal and environmental samples

## Requirement from the requestor



### Interoperability



### Cross-sector matches



### Machine-to-machine

1. **Two platforms** collecting data from each sector
2. Detection of **joint microbiological clusters** of human and non-human food-borne pathogens isolates
3. Data **exchange on demand** when matches have been found
4. Automatic **exchange of WGS-based typing data** and epidemiological data between the two systems

The **One Health WGS system** is in operation since July 2022



# EFSA – ECDC COLLABORATION AGREEMENT



The EFSA – ECDC interaction is described in the [Collaboration Agreement](#) and its Annex



**Harmonized procedure and agreed thresholds**

Comparable analytical pipelines  
CRC32 integer for allele designation



**Automatic exchange of cgMLST profiles and metadata upon a match is found**

Metadata includes date, country, sample category and clusterID

Visibility of "Country" info is restricted





# THE EFSA ONE HEALTH WGS SYSTEM



# SHARING OF FOOD DATA: OBJECTIVES AND GOALS

## Objectives

To collect genomic profile of foodborne pathogens and associated epidemiological data of isolates from food, feed, animals and related environment

To allow ECDC to query the EFSA database for finding possible matches between human and non-human isolates

To offer a set of services through a user-friendly interface for the analysis and managing of the submitted data

## Goals

Build a database of genome profiles that can be queried in case of foodborne outbreaks

Support the real-time investigation of multi-country foodborne outbreaks

Support cross-sectorial collaboration and partnership among MS in the Food Sector

Preparedness

Response

Engagement







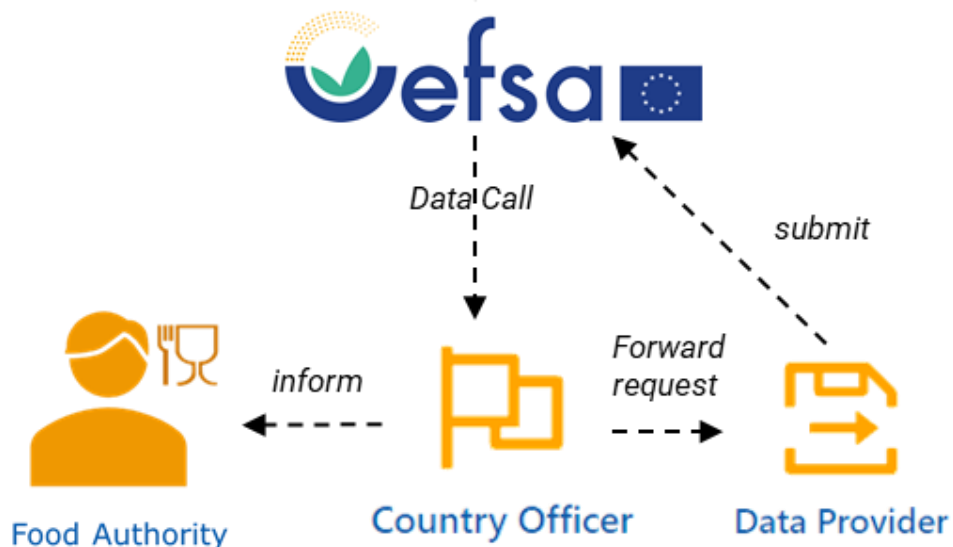
# WHEN DATA ARE SHARED IN THE EFSA PLATFORM

## REACTIVE

- Data calls for all countries when a outbreak assessment has been requested
- Data calls for specific countries on *ad hoc* basis
- Country officer is dispatcher of EFSA requests
- Country officer ensures coordination at MS level

## PROACTIVE

- Data provider can share data at any time
- Each country has own strategy on sharing
  - All own checks data
  - Data collected for annual monitoring
  - Only in response to EFSA calls
  - ...
- EFSA network suggested to prioritize for sharing data prospectively data related to:
  - IRASFF notifications
  - outbreak national investigation
  - cross-sectorial national cluster
- MS are always invited to share data as response during outbreak investigation and monitoring



# WHAT DATA ARE SHARED THROUGH THE EFSA PLATFORM

For each entry we collect experimental data and typing data and (optional) epidemiological data



**Experimental data:** information related to the experiment (*raw sequencing reads*)



**Typing data:** genomic profile and other typing data extracted from the raw sequencing reads

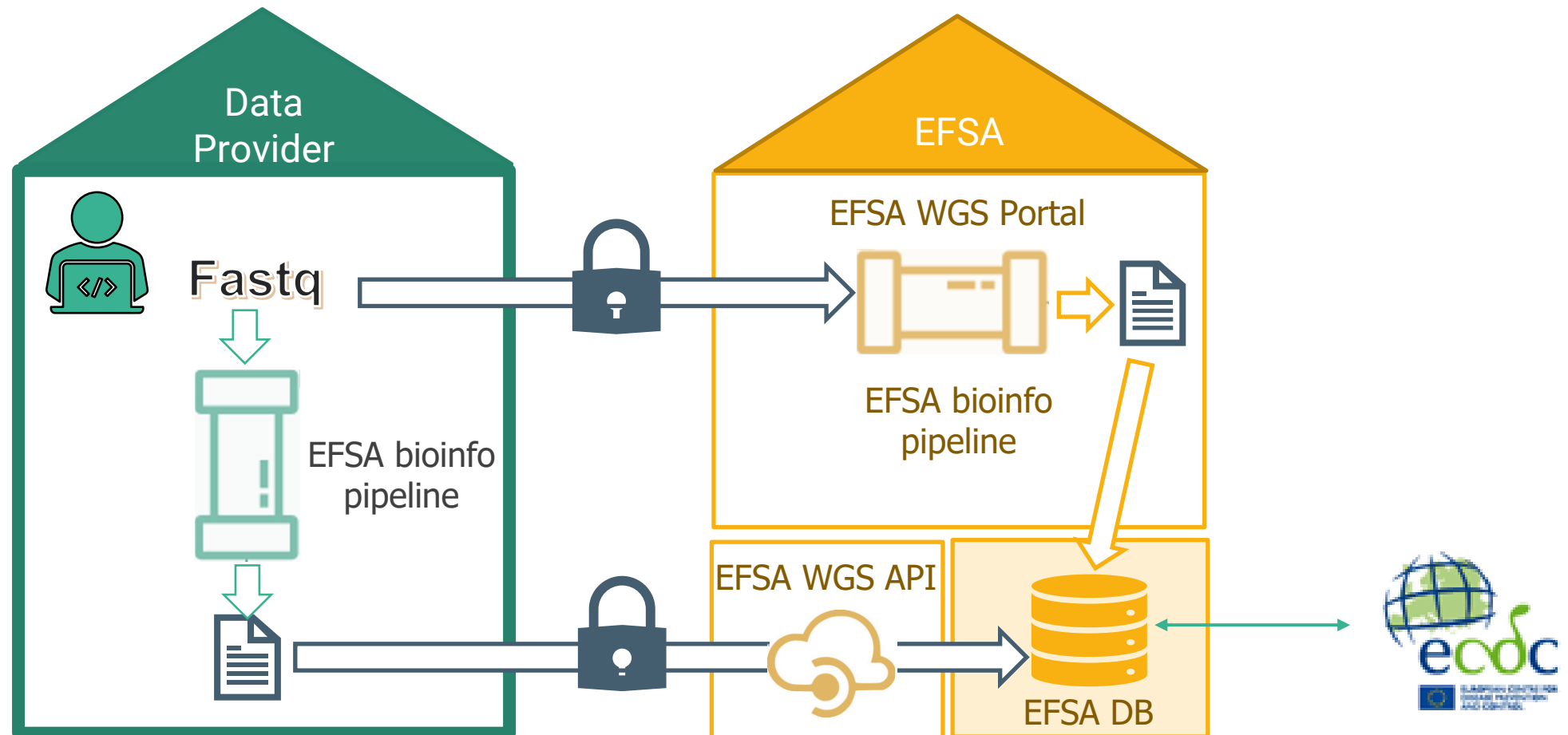


**Epidemiological data:** information related to the food, feed and animal samples from which the pathogen isolates linked to genomic profiles originated



# HOW DATA ARE SHARED THROUGH THE EFSA PLATFORM

1. Share data using the WGS portal uploading *fastq* → take advantage of EFSA computing resources
2. Share data programmatically releasing directly profiles and typing data → control the entire process



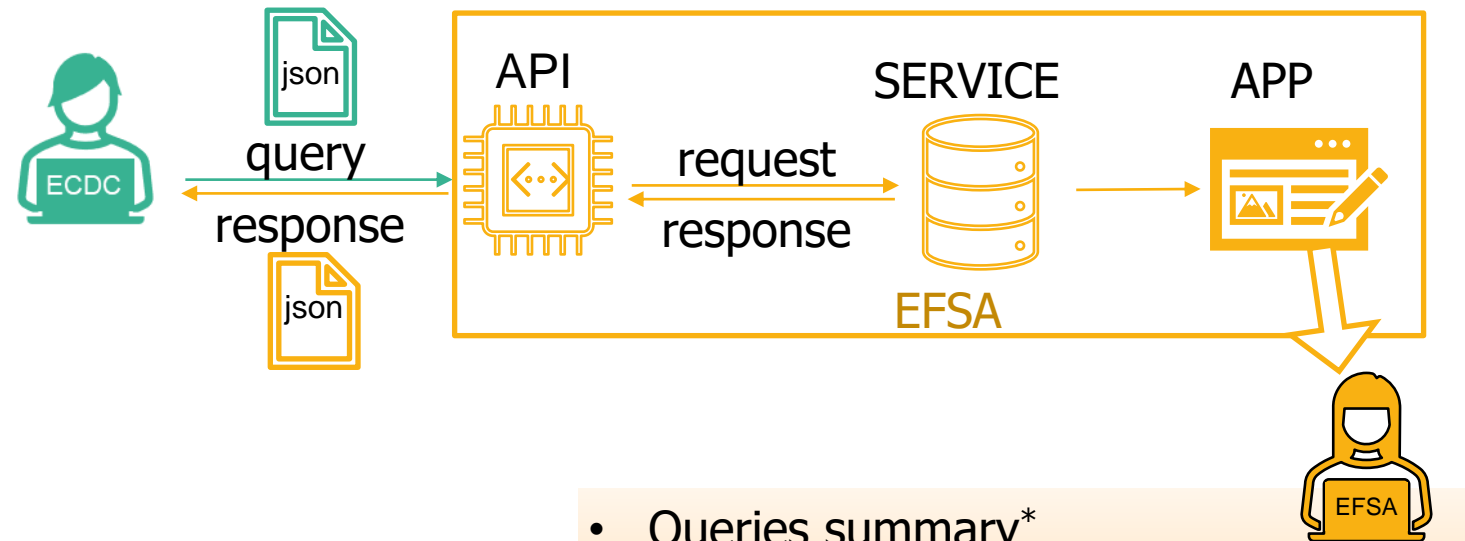
# HOW ECDC/EFSA INTERACT: THE QUERY WORKFLOWS

## Recurring weekly querying

- **Indicator-based surveillance**
- Automatic weekly querying
- Cluster definition at ECDC
- Fixed threshold

## Ad hoc querying

- **Event-based surveillance**
- Querying on demand
- Linked to events in EpiPulse
- Multiple thresholds

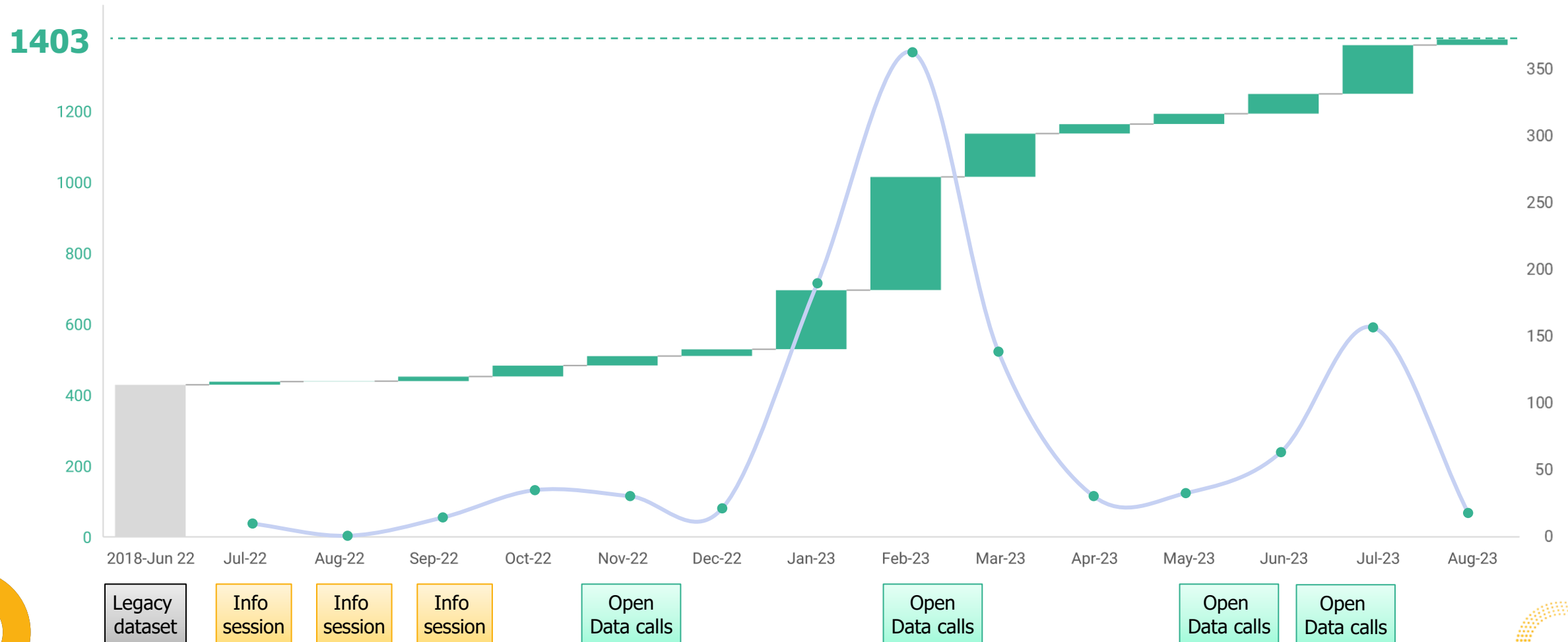


- Queries summary\*
- MSTs including human and food data

\* >30k queries since 1st of July 2022  
Average 2500 queries each month



# MEMBER STATES CONTRIBUTION TO EFSA DATABASE

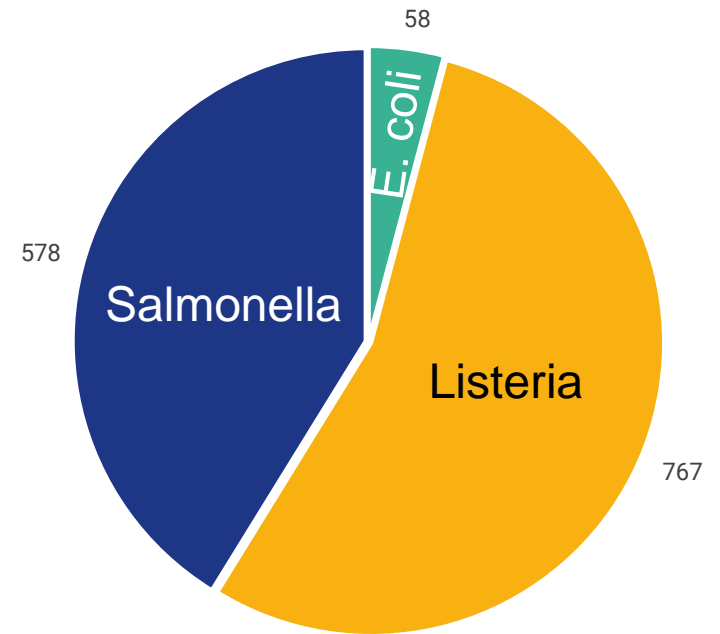
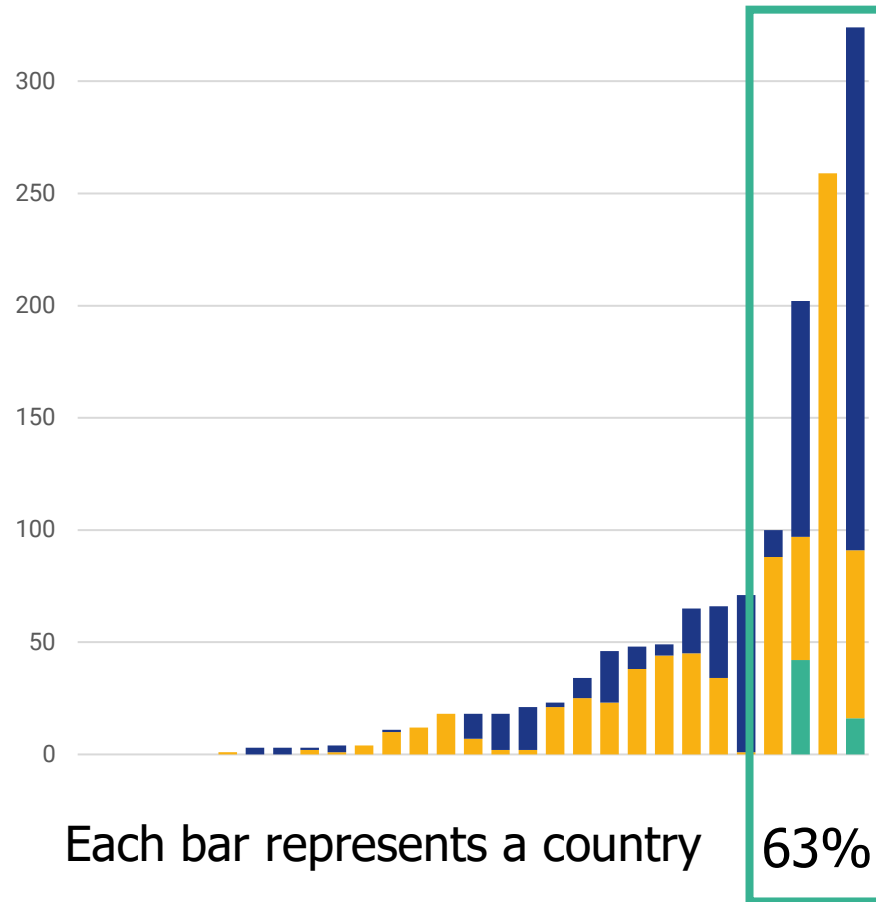


as of 15 Aug 2023



# MEMBER STATES CONTRIBUTION TO EFSA DATABASE

## Uneven contribution from MS



Data shared by MS

In addition **imported from public repositories**

1000 *Salmonella*

4000 *Listeria*



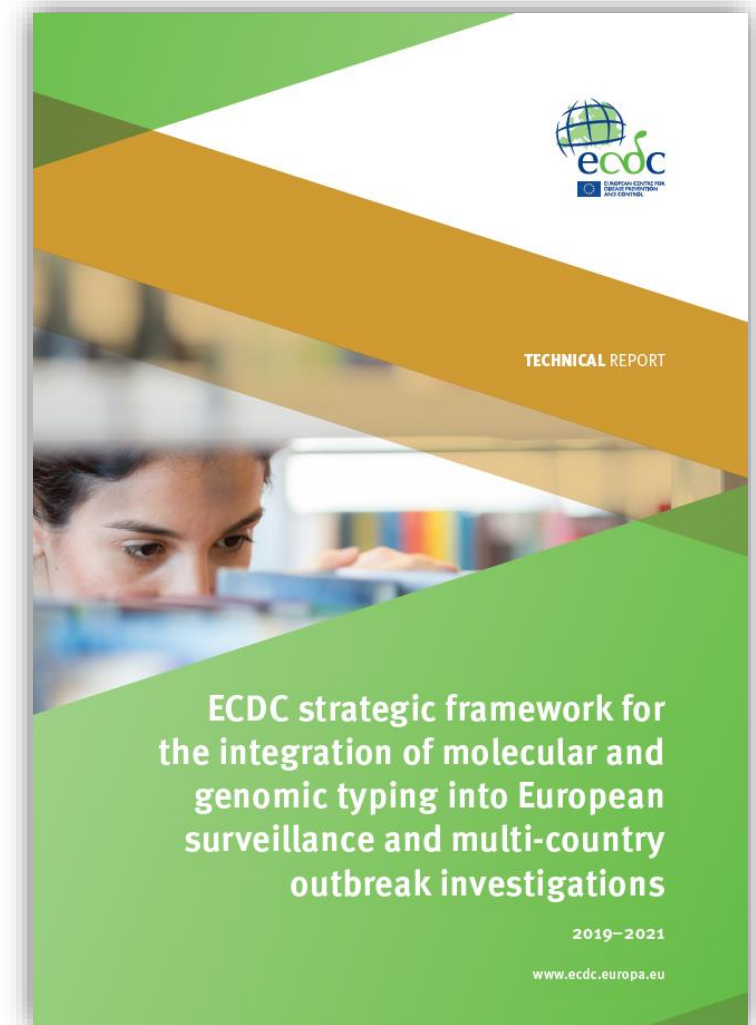


# ECDC ONE HEALTH SYSTEM

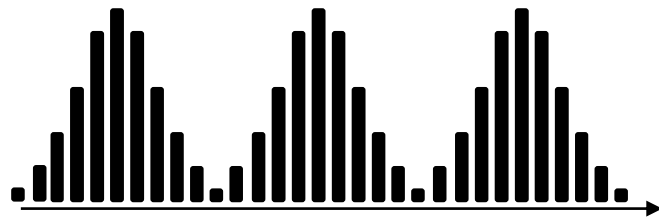


# Public health applications of integrated epidemiological and WGS data collection and analysis

- 1. Outbreak investigations:** real-time information sharing and analysis for *rapid risk assessment*, targeted public health response and transmission control
- 2. Control-oriented surveillance:** real-time, continuous surveillance with maximal disease sampling frame for *early outbreak detection*
- 3. Strategy-oriented surveillance:** either by *sentinel continuous surveillance* or *periodic surveys*, with representative sampling frame for programme evaluation and trend monitoring



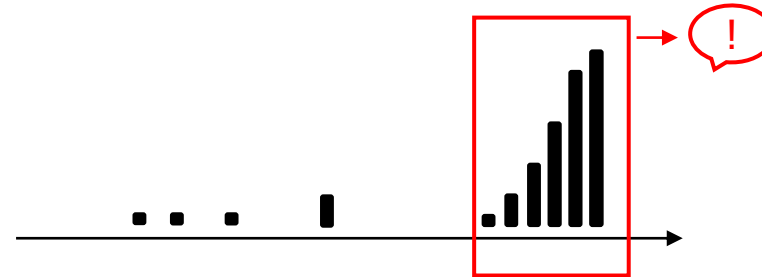
# Different types of surveillance



Indicator-based  
surveillance

## TESSy - The European Surveillance System

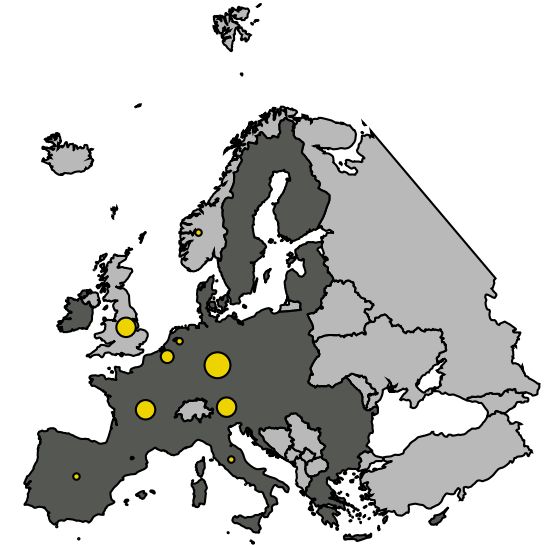
Collecting, analysing and  
disseminating surveillance data.



Event-based surveillance  
(e.g. outbreaks)

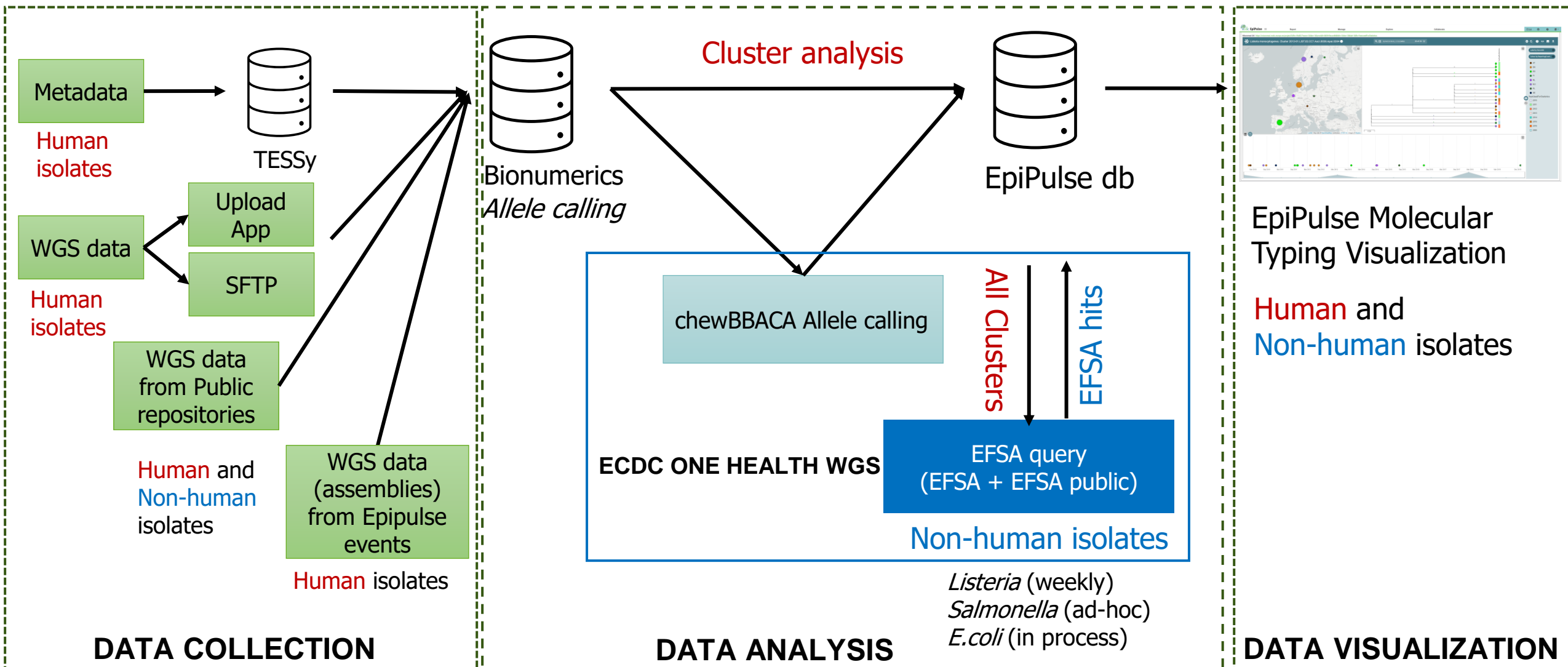
## *EpiPulse - the European surveillance portal for infectious diseases!*

Collecting, analysing, sharing, and  
discussing infectious disease data for threat  
detection, monitoring, risk assessment and  
outbreak response. Data are shared on a  
voluntary basis.



Strategy-oriented  
surveillance  
(e.g. structured surveys)

# ECDC CLUSTER PROCESS FLOWCHART





# Overview of TESSy multi-country clusters, Listeria

	Total
Total number of clusters	661
Number of single-country clusters detected	500
Number of multi-country clusters detected	161
Number of single-country clusters with non-human isolates	63
Number of multi-country clusters with non-human isolates	65



	Core cluster (within 4 cg-AD)
Median number of countries involved in clusters (range)	2 (2-10)
Median number of isolates (range)	4 (2-226)
Median duration in years (range)	2.8 (0-14.8)*

\*calculated for clusters that have full start and end dates available

As of 30 August 2023

# Salmonella - Cluster 2023-02.SALM.03.SENFTENBERG



# Conclusions



- **Controlled-Centralized Data Sharing:** Ensures data integrity, security, and responsible chain of custody for sector-specific information.
- **Cross-Sectoral Collaboration:** Fosters multidisciplinary insights and collaborative outbreak response.
- **Secure Collaboration:** Sharing data while retaining ownership
- **Responsible Data Use:** Prioritizing accuracy, ethics, and regulations
- **EU Complexity:** Addressing diverse organizational structures and national prioritizations
- **Operational Efficiency:** Swift outbreak response and public health protection
- **Constantly evolving:** Room for further development, input from data providers/users considered

# Acknowledgements



**EU/EEA Member  
States Experts**



Erik Alm  
Áine Collins  
Cecilia Jernberg  
Saara Kotila  
Taina Niskanen  
Daniel Palm  
Johanna Takkinen  
Therese Westrell



Giancarlo Costa	Jaro Greniers
Chiara Bianchi	Free Bruneel
Giovanni Iacono	Remi Mestdagh
Di Piazza Giulio	Bram Lust
Luca Pasinato	Hugo Lamberechts
Eleonora Sarno	Sebastian Leysen
Valentina Rizzi	Tom Peeters