PATHOGENS in FOODS database

Discovering Pathogens-in-Foods: resources and applications of a database on occurrence data of foodborne pathogens in European-marketed foods

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Background

- Studies addressing the occurrence of pathogens in foods surveyed in the farm-to-fork chain
  - vital in the development of pathogens' risk assessment models
  - risk management tools
  - risk ranking

- Yet, the existing data is mostly dispersed, disharmonized or not easily accessible

How to solve this issue?

PIF - Pathogens In Foods

- PIF is a database of systematically formatted occurrence data
  - prevalence and enumeration
  - most important biological hazards in foods randomly surveyed
    - European farms,
    - processing facilities,
    - retail establishments
    - restauration

Accessible through the website
https://pif.esa.ipb.pt/

PIF - Pathogens In Foods

- Contains data extracted from
  - peer-reviewed articles
  - retrieved through systematic literature searches
  - using a publicly available protocol describing the search and screening process

(https://doi.org/10.5281/zenodo.7850017)

Accessible through the website
https://pif.esa.ipb.pt/

PIF partners

2018-2022

IPB and ANSES develop the PIF database

2022-present

EFSA supports the initiative

Conceptualization

Selecting the data - Review Question

“What is the occurrence (i.e., prevalence and/or concentration) of the most important biological hazards in the various foods and food products produced and/or commercialised in Europe?“

- Descriptive question with a simple PO (*population* and *outcome*) structure with the following key elements

Review Question

Population – Foods

- Beverages
- Meat and meat products
- Eggs and egg products
- Milk and dairy products
- Seafood and fishery products
- Fruits
- Vegetables
- Legumes
- Grains and cereal products
- Oils and sugars
- Ready-to-eat, composite and multi-ingredient foods

Outcome – Biological Hazards

- *Bacillus cereus*
- *Campylobacter* spp.
- *Clostridium perfringens*
- *Listeria monocytogenes*
- *Salmonella* spp.
- Shiga toxin-producing *Escherichia coli*
- *Staphylococcus aureus*
- *Yersinia enterocolitica*
- *Cryptosporidium* spp.
- *Giardia* spp.
- *Toxoplasma gondii*
- Hepatitis A virus
- Hepatitis E virus
- Norovirus

Foodchain

- Primary production (ex. farm, fishery, etc.)
- Manufacturing (processing)
- Storage
- Retail
- Restauration

Countries

- All countries in Europe

Bibliographic search

e-bibliographic databases search (with adapted database syntax):

- PubMed
- Web of Science Core Collection
- Scopus
- SciELO

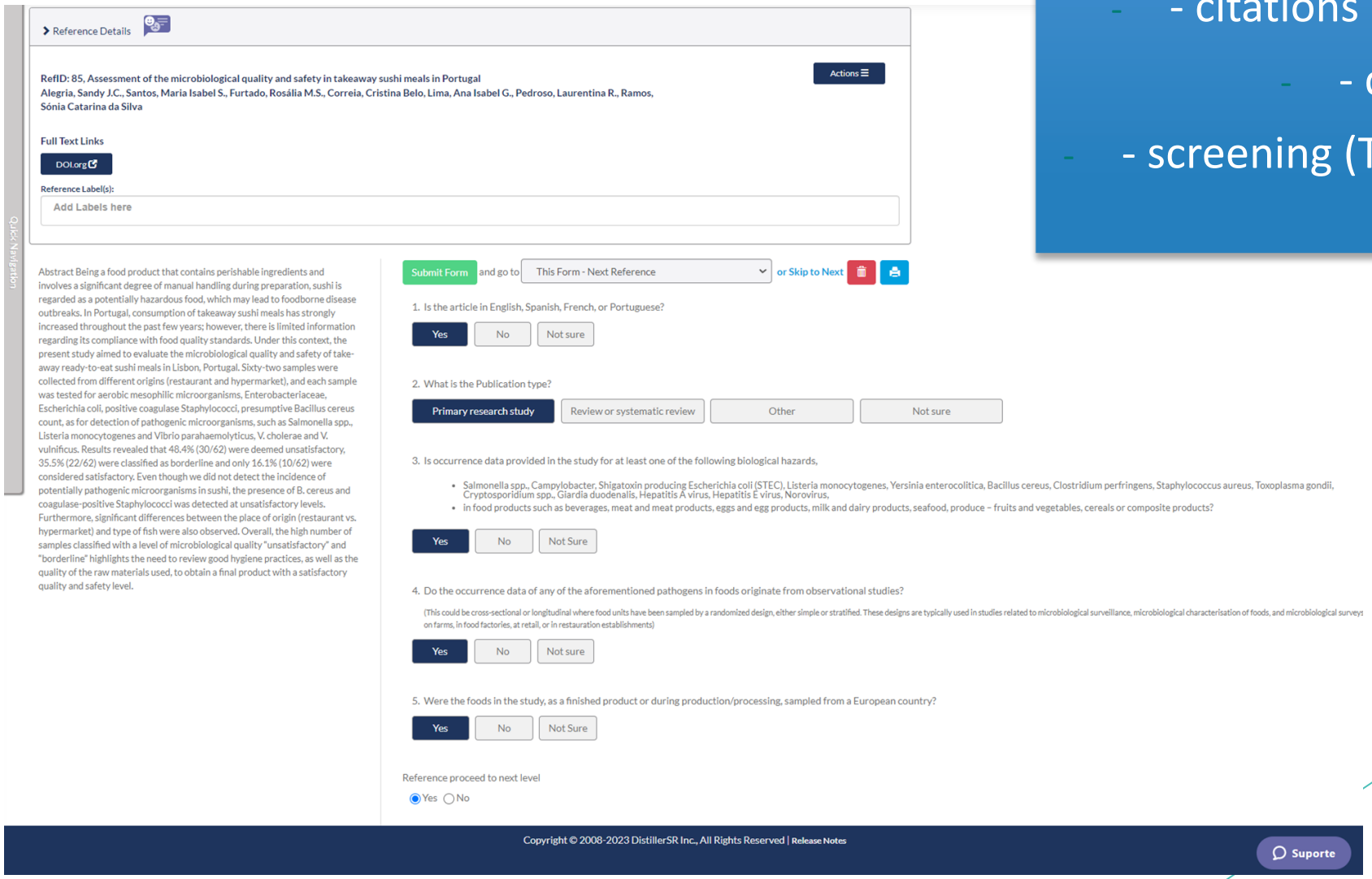
Entries filtered by:

- database insertion date
- type of publication (only primary research articles and reviews)
- language (English, Spanish, French and Portuguese)

Screening of studies

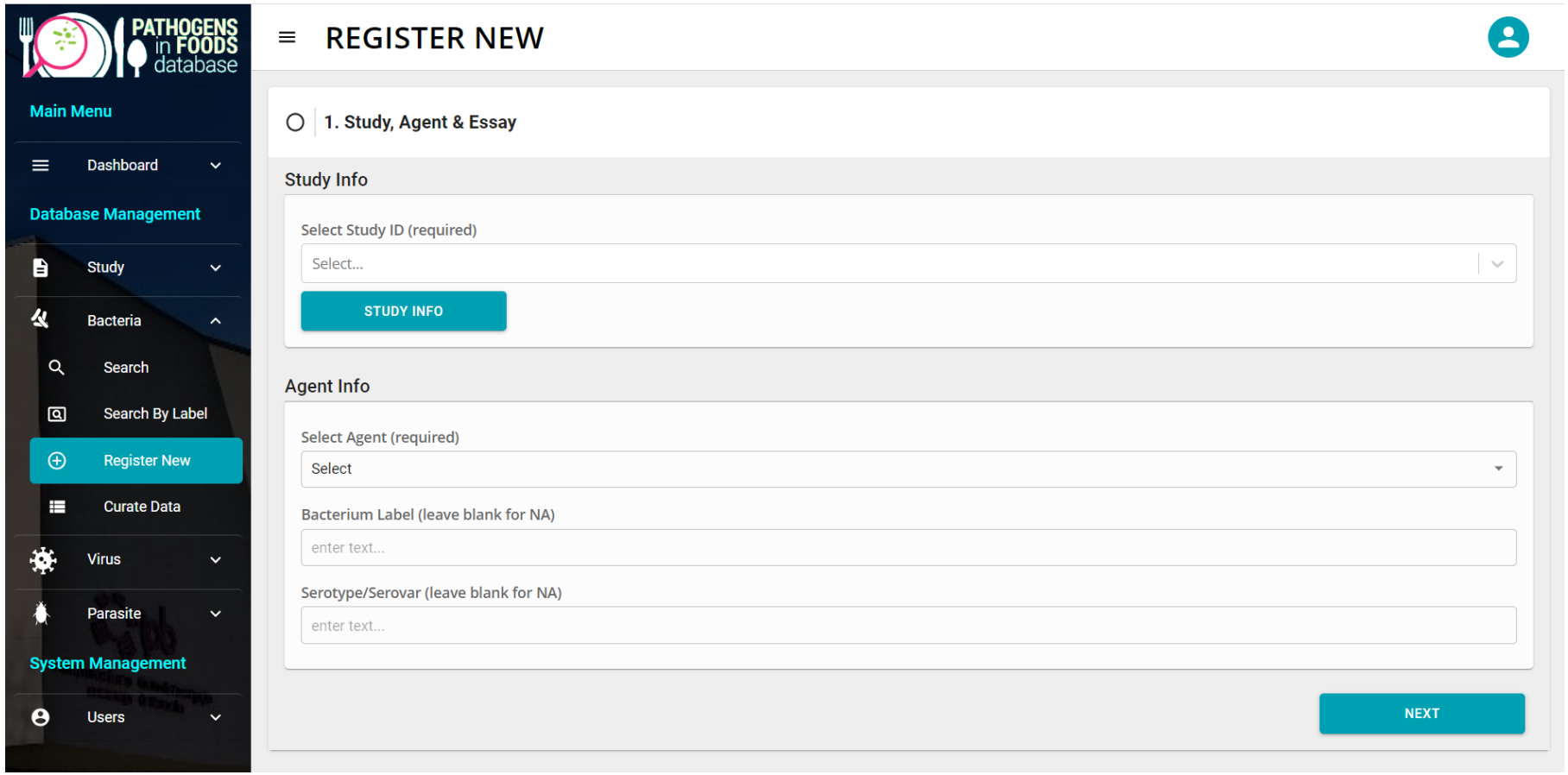
After bibliographic search

- - citations are uploaded to DistillerSR
- - duplicate cleaning
- - screening (Title/Abstract screening + Full Text screening)

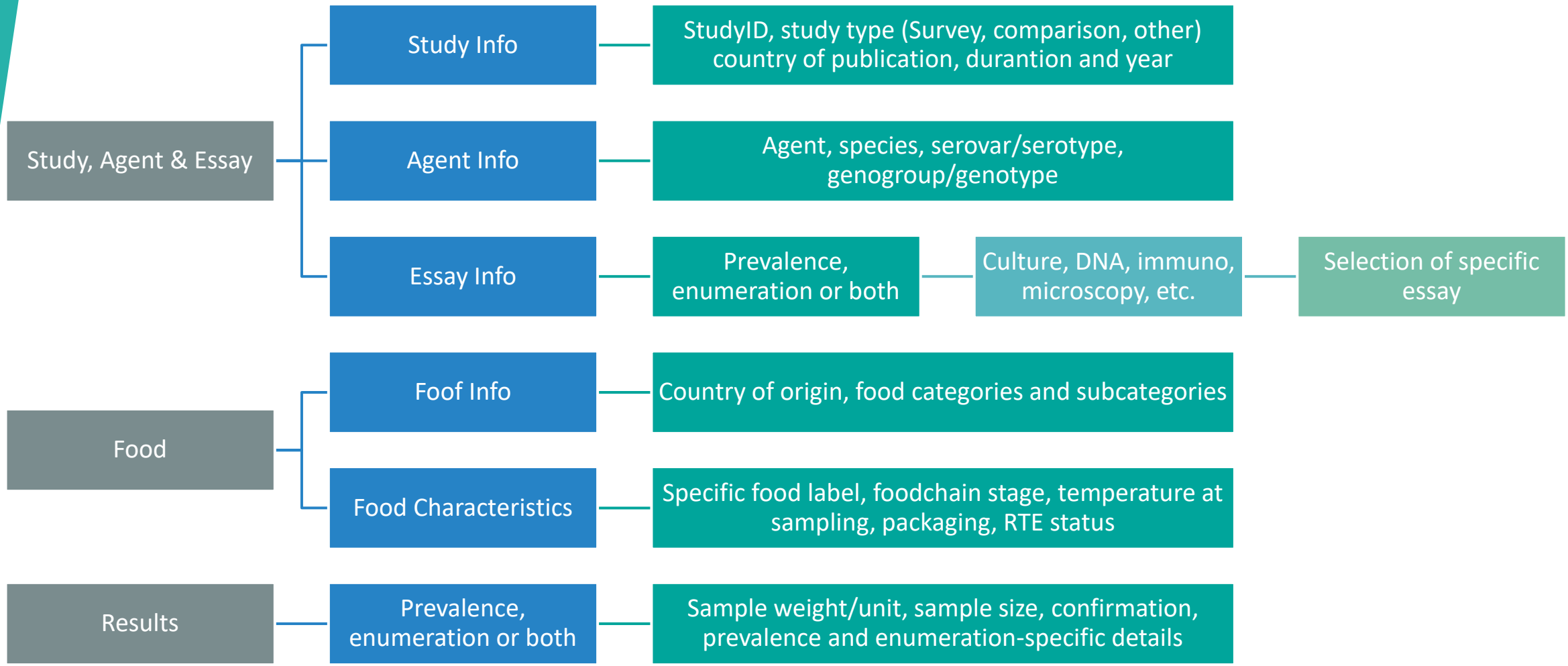


Database insertion

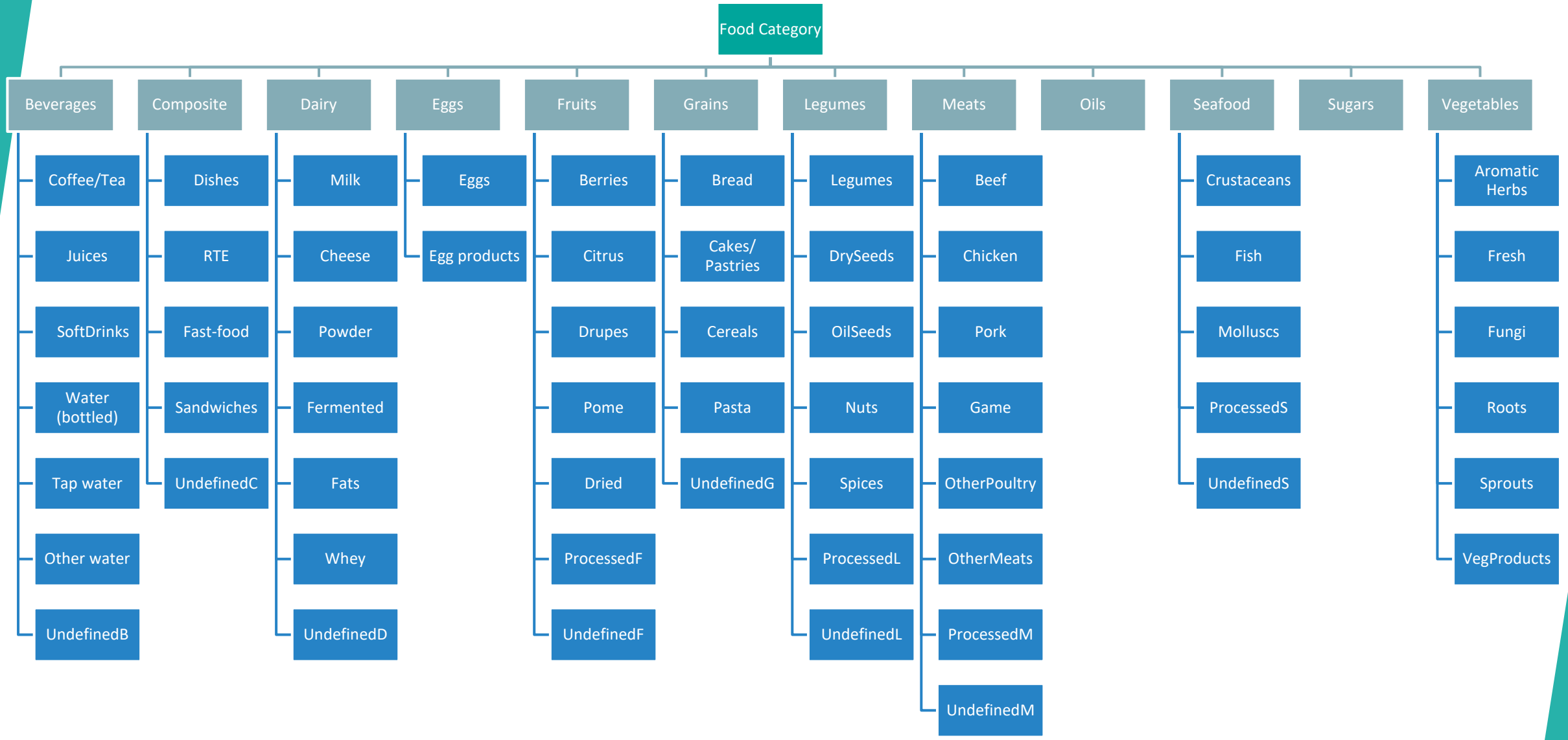
- Studies that pass both stages of screening, are selected to proceed to data extraction into the database



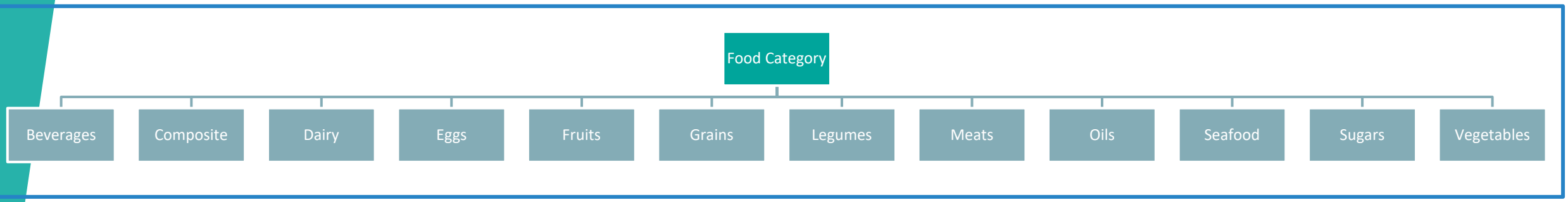
Extracted Information



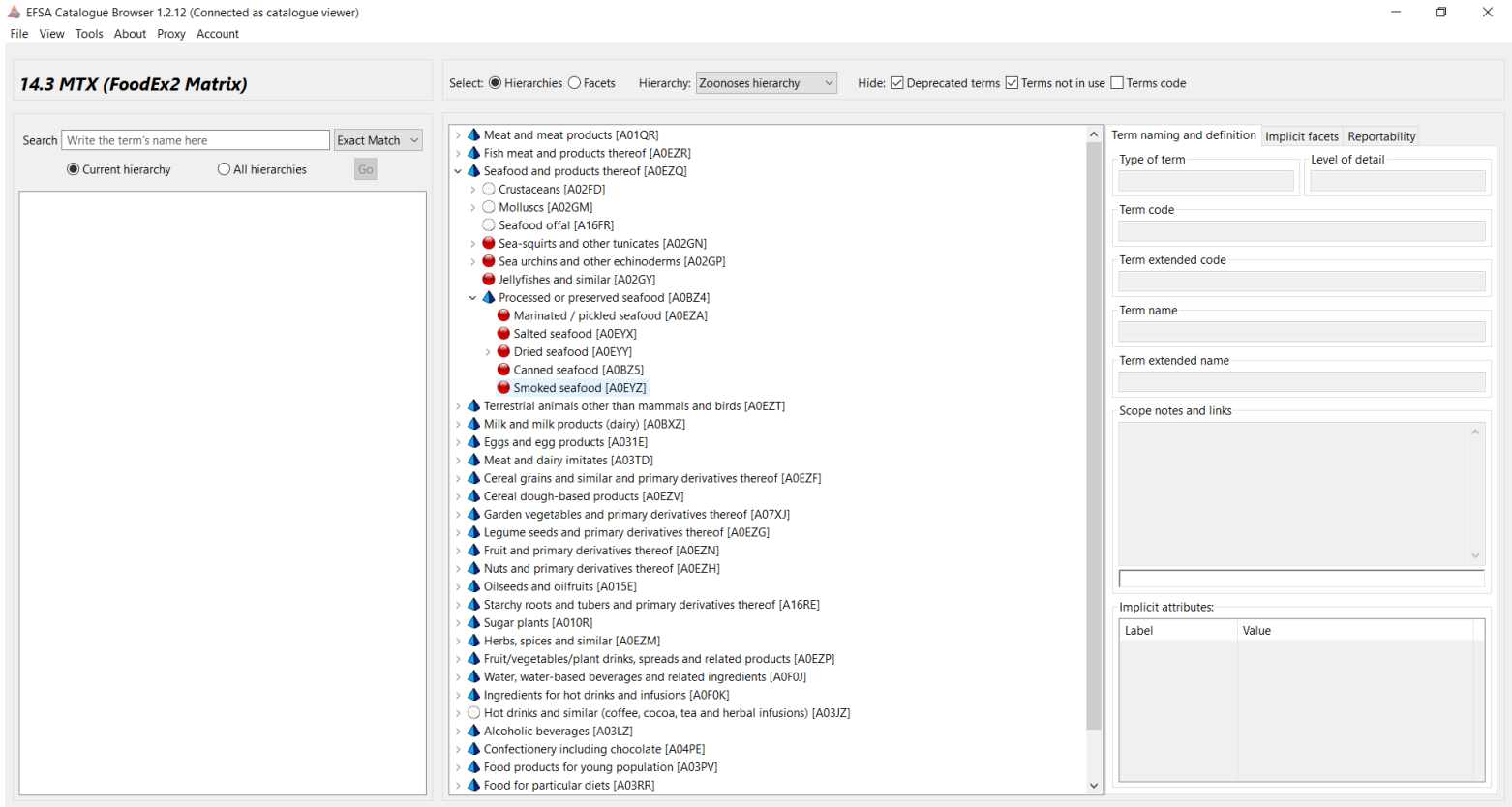
PIF Food Info - **Before**

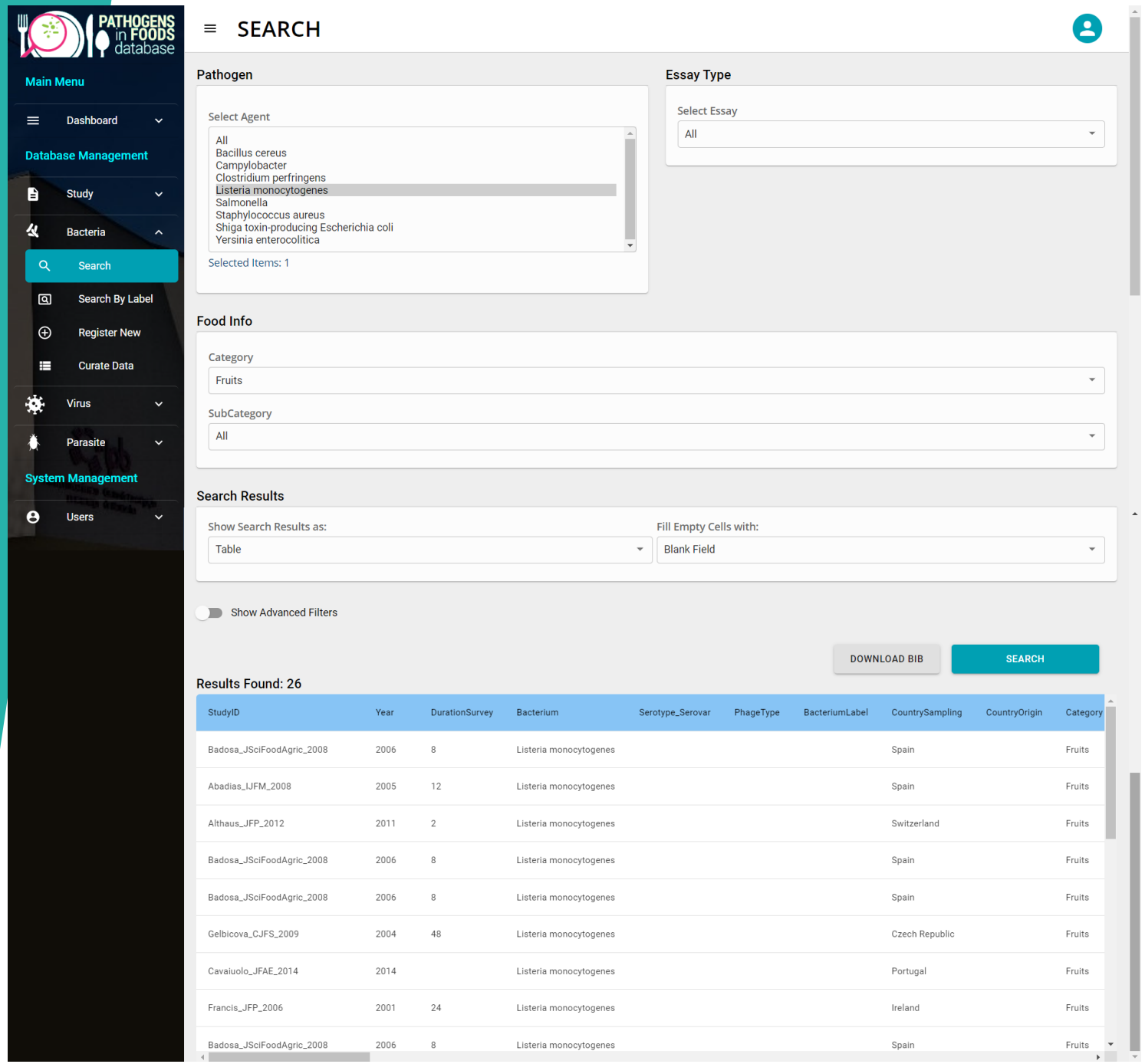


PIF Food Info - **Now**



Food categories and subcategories are currently being harmonized according to EFSA's FoodEx2 Matrix





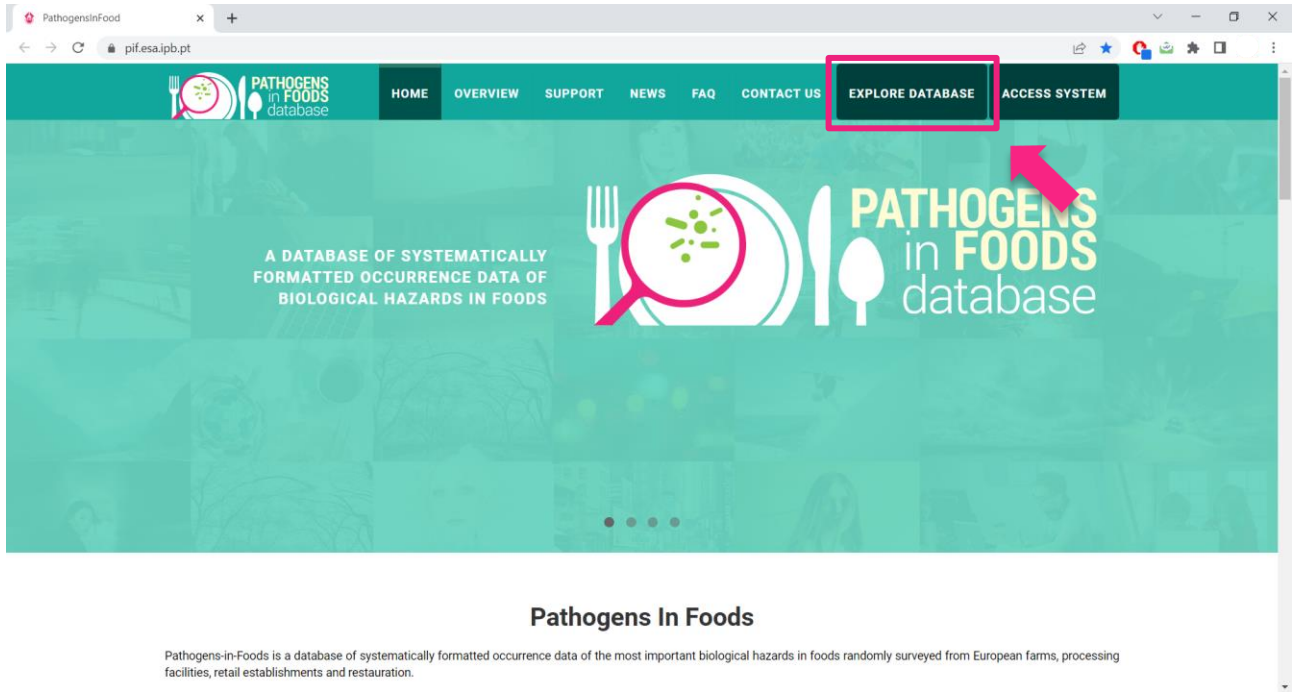
Database Interface

- PIF allows data extraction according:
  - pathogen,
  - food type or country,
  - Other metadata
- Presently contains:
  - > 1,100 primary studies
  - ~ 6,000 entries of samples

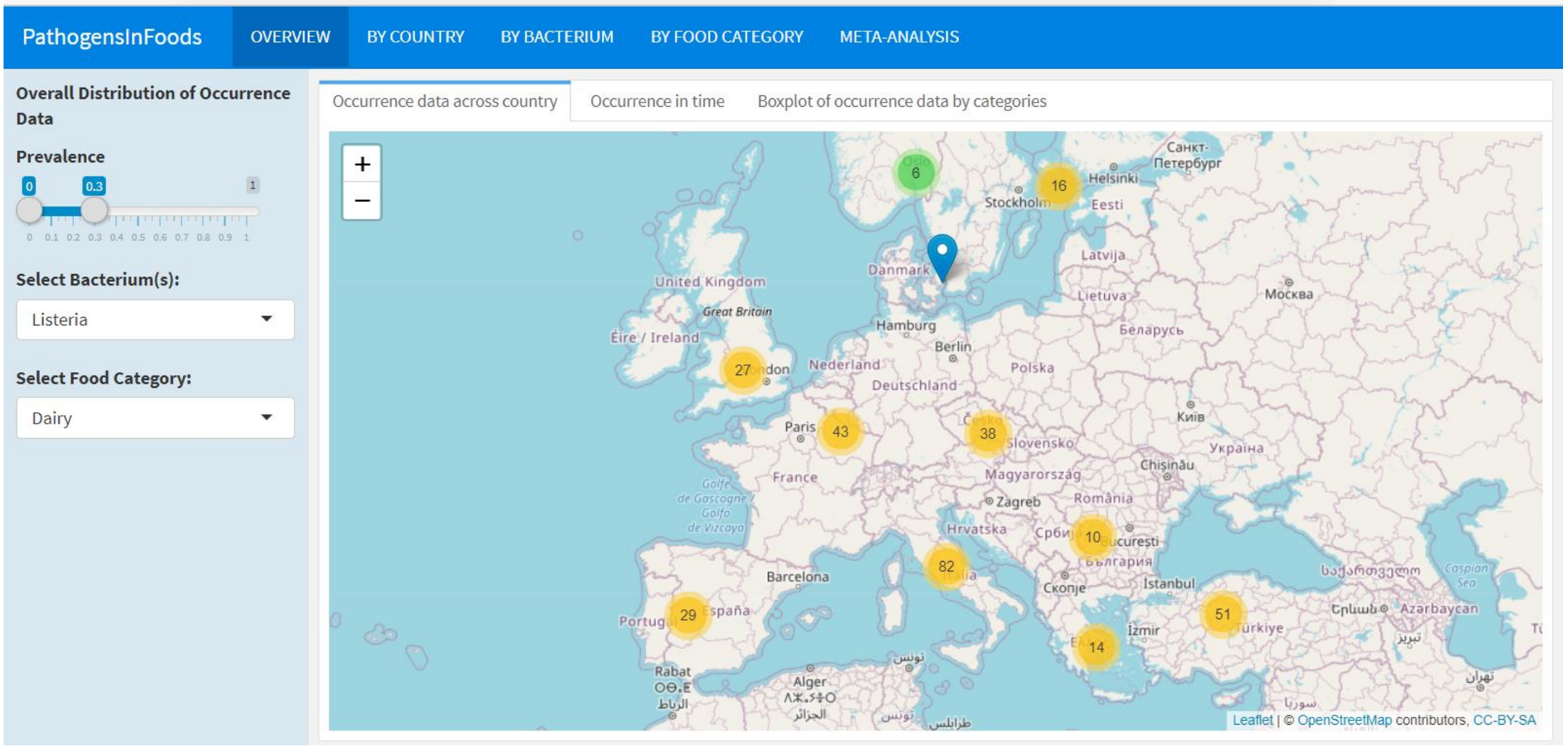
Interactive Dashboards

- PIF also generates interactive charts, summary statistics and meta-analysis, easily accessible through interactive dashboards

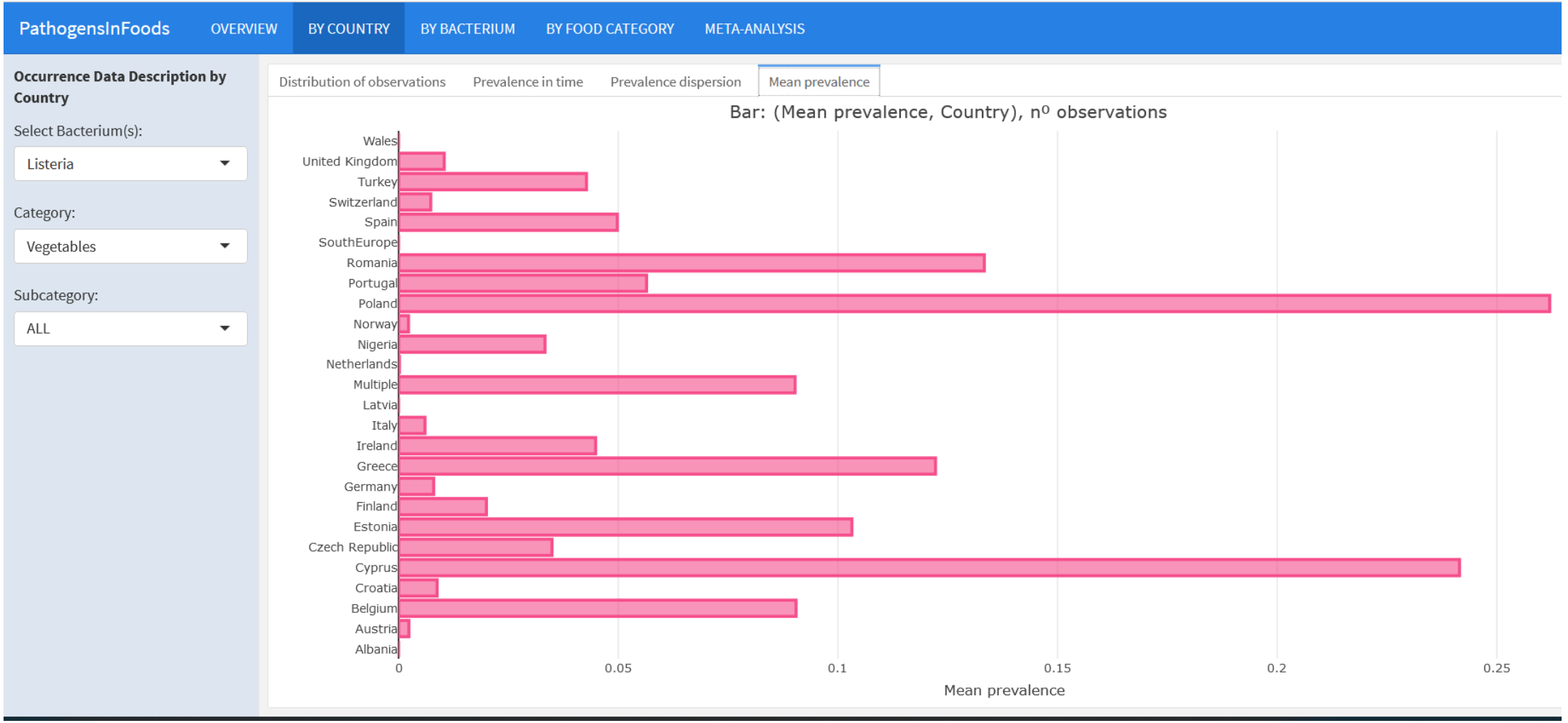
- Select:
- “Explore Database” on the website and navigating through the dashboards like:
  - “Overview”
  - “By Country”
  - summary of occurrence data across countries and in time
  - boxplots of occurrence data by food categories or country



Interactive Dashboards



Interactive Dashboards



Interactive Dashboards

- The “Meta-Analysis” dashboard provides synthesised statistical analysis for all the available entries on the selected pathogen and food categories

- For example, meta-analysis of *L. monocytogenes* incidence in fruits:
- Overall: 1.34% (95% CI 0.83-2.15)
- Berries: 1.40% (95% CI 0.56-3.49)
- Dried fruits: 2.25% (95% CI 0.44-10.58)
- Drupes: 0.86% (95% CI 0.05-12.33)
- Processed fruits: 1.14% (95% CI 0.28-4.44)

Final Considerations

- Pathogens-in-Foods has been constructed to facilitate the access, visualisation and assessment of microbiological occurrence data from different sources

- The database contains microbiological survey results extracted from over 1,100 peer-reviewed articles published since 1998 until the present day, and the systematic review protocol is periodically employed to retrieve current published studies and data

- PIF is a free tool for food safety researchers and policymakers, that gathers reliable and quality assessed data that can be used in microbiological risk assessment and help establish future food safety guidelines

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Thank you!

Follow us at:

Website:
https://pif.esa.ipb.pt/

Zenodo: Resources of PIF
https://doi.org/10.5281/zenodo.7850017

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