
Interagency for Food Safety Analytics Collaboration (IFSAC)



History of IFSAC

- IFSAC established in 2011 by:
 - Centers for Disease Control and Prevention (CDC)
 - U.S. Food and Drug Administration (FDA)
 - United States Department of Agriculture's Food Safety and Inspection Service (FSIS)
- Charter established in 2016
- Guided by Strategic Plans and Priority Setting Plans



Introduction

- Shared vision amongst CDC, FDA, and FSIS to improve foodborne illness source attribution
- Brought leaders, scientists, and analysts from the 3 agencies together to create, implement, and complete projects
- Projects designed to complement one another to ensure maximum utility and efficiency
- IFSAC identified four priority pathogens as the initial focus of projects:
 1. [Salmonella](#)
 2. [E. coli O157:H7](#)
 3. [Listeria monocytogenes \(Lm\)](#)
 4. [Campylobacter](#)



IFSAAC's Purpose and Goals

- Three federal agencies working together to:
 - Analyze and interpret human surveillance and food contamination data;
 - Share data and methods; and
 - Monitor progress toward the goal of preventing foodborne illness
- Major goals:
 - Identify, plan, and conduct food safety and foodborne illness analytic projects recognized as high priority by all three agencies
 - Improve coordination of federal food safety analytic efforts; and
 - Address cross-cutting priorities for food safety data collection, analysis, and use



Importance of IFSAC

- Accomplishments build on each other and allow pursuit of new, ever-more challenging objectives and projects
- Project outputs are supported by all three agencies and can be used to implement and promote harmonized approach to attribution estimation



IFSAC Structure

Steering

Committee (SC)

- Provides oversight of analytic projects and ensure projects are coordinated and managed effectively
- Composed of 2 representatives from each agency

Technical Workgroup (TWG)

- Provides the analytic expertise to develop and execute IFSAC projects
- Workgroup composed of 2 points of contact from each agency

Communication Workgroup (CWG)

- Advise SC and TWG on development and implementation of communication materials
- Composed of 1-2 representatives from each agency



Process

- Steering Committee (SC) identifies top priorities
- Technical Workgroup (TWG) develops analytic project plans to address priorities
 - Plans include deliverables, timeline, and milestones
 - Projects typically conclude with an internal final report and/or other public-facing deliverable (published manuscript, presentation at conferences/meetings, etc.)
- SC tracks all projects and provides input on analyses
- All public documents and web pages undergo formal clearance by all 3 agencies



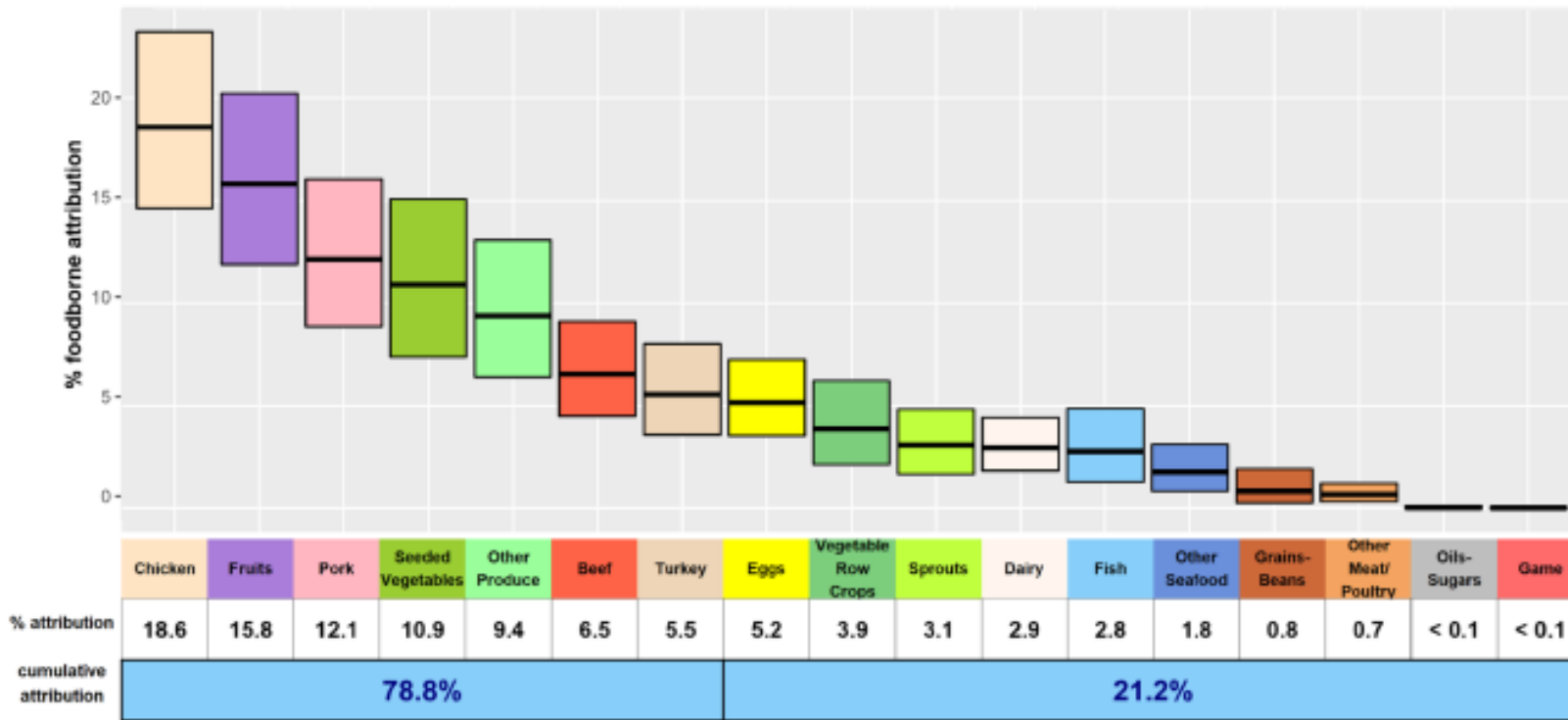
Strategic Priorities for 2024 – 2028

- Explore additional data sources and alternative methods to better estimate the sources of foodborne illnesses caused by *Campylobacter* and harmonize estimates across different approaches and data sources
- Expand our list of priority pathogens to include non-O157 Shiga toxin-producing *Escherichia coli* (STEC) and provide source attribution estimates in IFSAC's annual Foodborne Illness Source Attribution reports
- Consider incorporating data on non-foodborne sources of priority pathogens, such as animal and environmental sources, into IFSAC's annual Foodborne Illness Source Attribution estimates to better refine and contextualize foodborne illness source attribution estimates
- Finalize existing analyses and disseminate findings to multiple audiences



Foodborne Illness Source Attribution Estimates for *Salmonella*, *E. coli* O157, and *Listeria monocytogenes* – United States, 2021

Salmonella



Selected IFSAC Completed Projects

- **Shared Needs:** Developed a shared understanding and statement of needs for foodborne illness source attribution.
- **New Food Categorization Scheme:** Improved food categorization scheme for attributing outbreaks and related illness to food.
- **Sporadic and Outbreak Comparison:** Compared characteristics of sporadic and outbreak-associated foodborne illness.
- **Improved Outbreak Analyses:** Improved analyses of outbreak data used to assign implicated foods to food categories.
- **Harmonized Estimates:** Developed a method for food source attribution for four bacteria (*Salmonella*, *E. coli* O157:H7, *Listeria monocytogenes* [*Lm*], and *Campylobacter*) using outbreak data.



Selected Current Projects

- **Change Over Time:** Determining possible statistical modeling approaches to evaluate temporal changes in attribution estimates.
- ***Campylobacter* Comparative Review:** Scoping review of available literature to characterize the current understanding of the attribution of *Campylobacter* infections to foods
- **Whole Genome Sequencing (WGS) for *Salmonella* Enteritidis (SE) Attribution:** Develop a model to estimate the percentage of SE human illnesses from each food category.
- ***Campylobacter* attribution:** Evaluating the use of case-control data, WGS data, and a combination of the two for improving *Campylobacter* attribution methods.



Campylobacter Comparative Review

Project Overview

Purposes

- Contextualize IFSAC estimates
- Identify alternative estimates
- Inform future studies

Two scales of attribution estimates of interest

- Proportion foodborne
- Proportion to specific commodities (particularly dairy and chicken)

Variation across regions

- Want to be able to compare U.S. findings to international findings

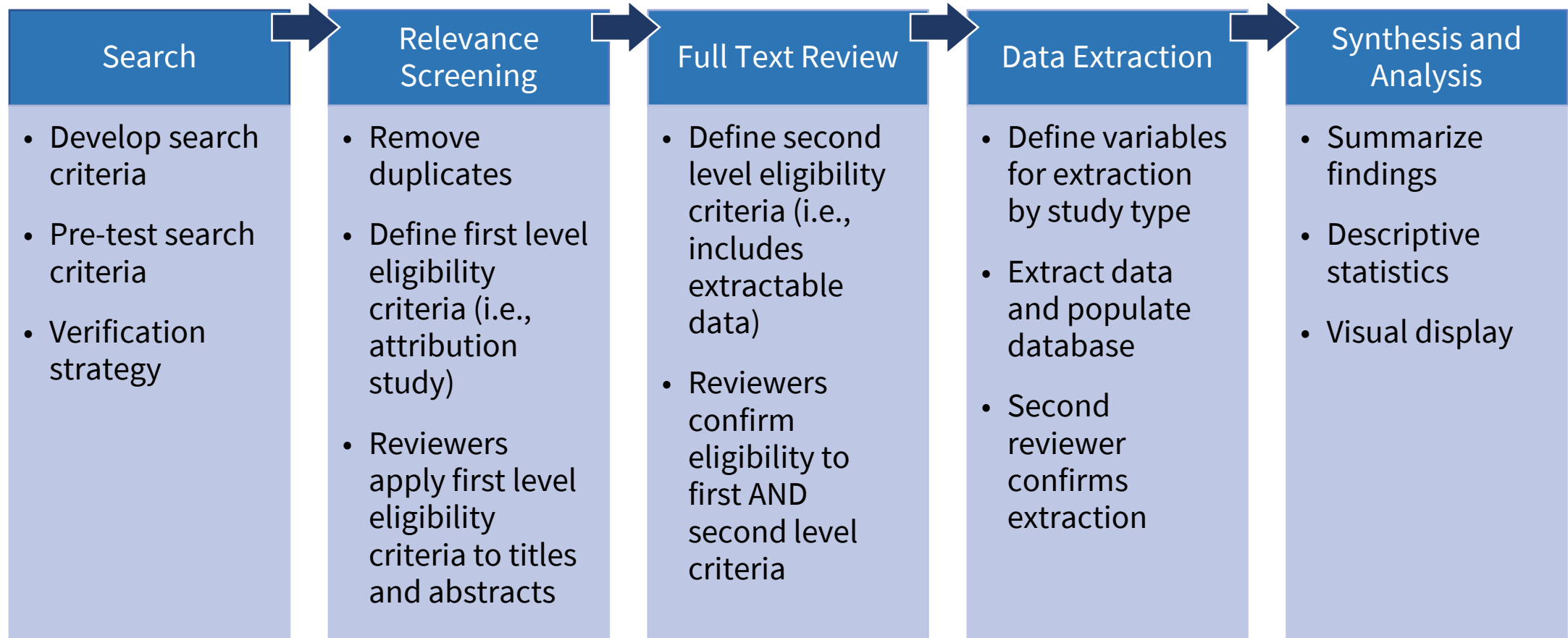
Variation across study type

- Want to examine differences in estimates by methods/data



Campylobacter Comparative Review

Steps in Scoping Review

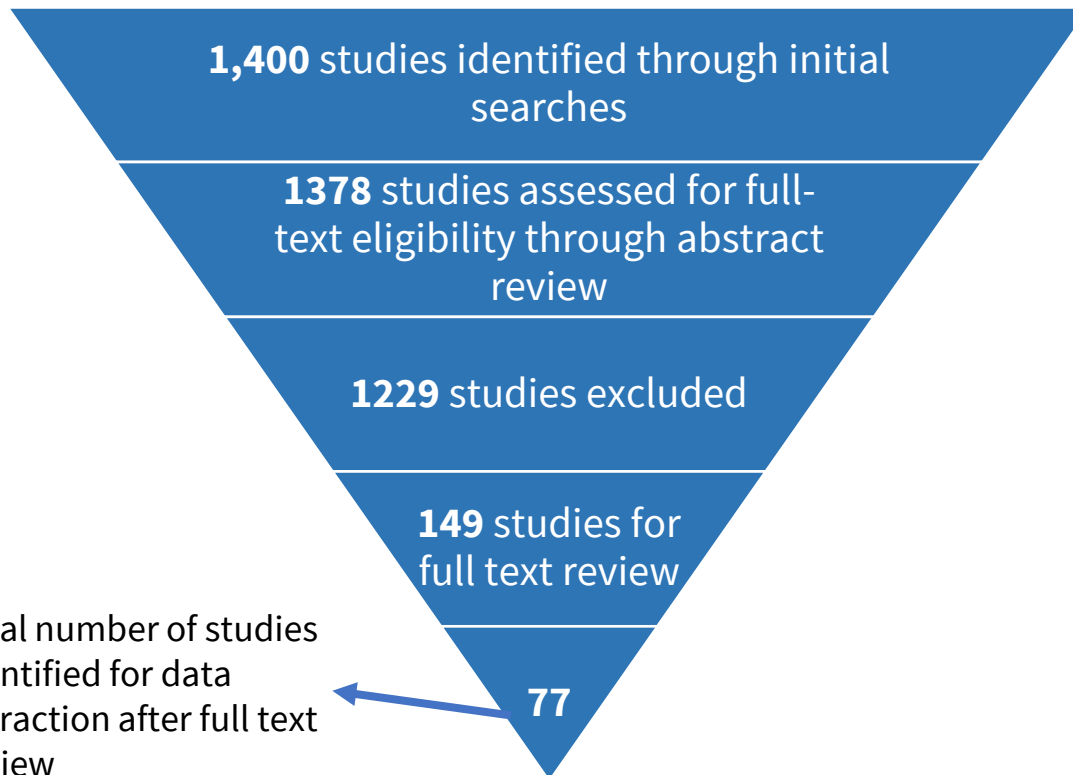


Campylobacter Comparative Review

Project Status and Next Steps

Phase 1

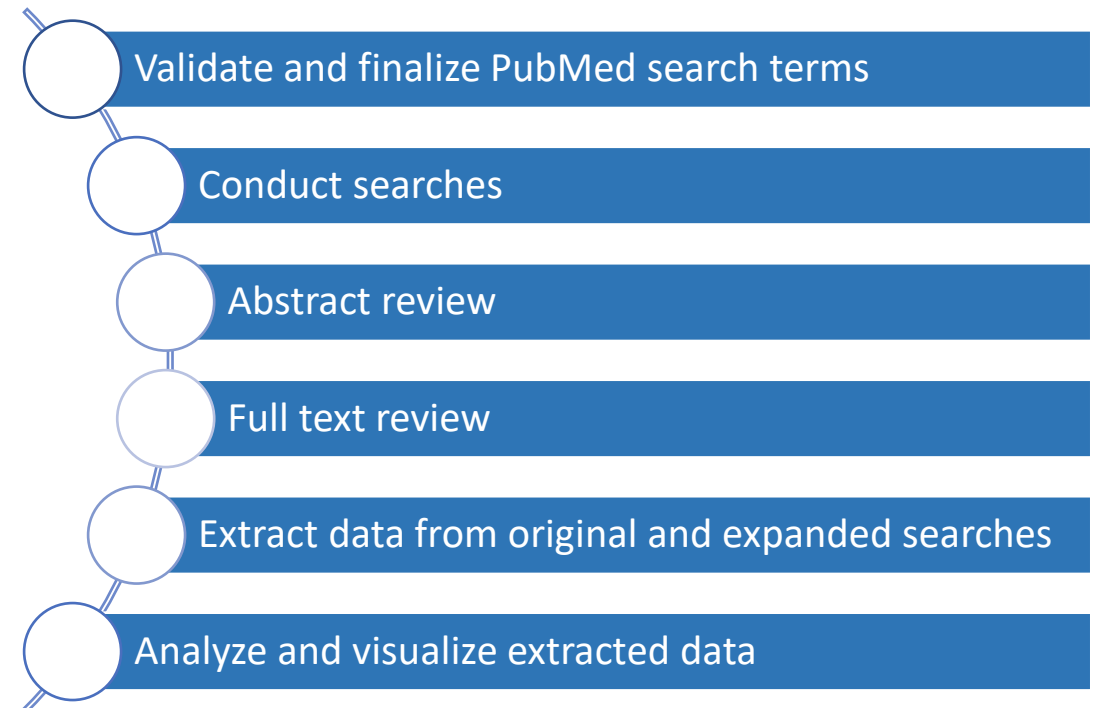
Search Time Period: 2010-2018



Final number of studies identified for data extraction after full text review

Phase 2

Search Time Period: 2018-2024

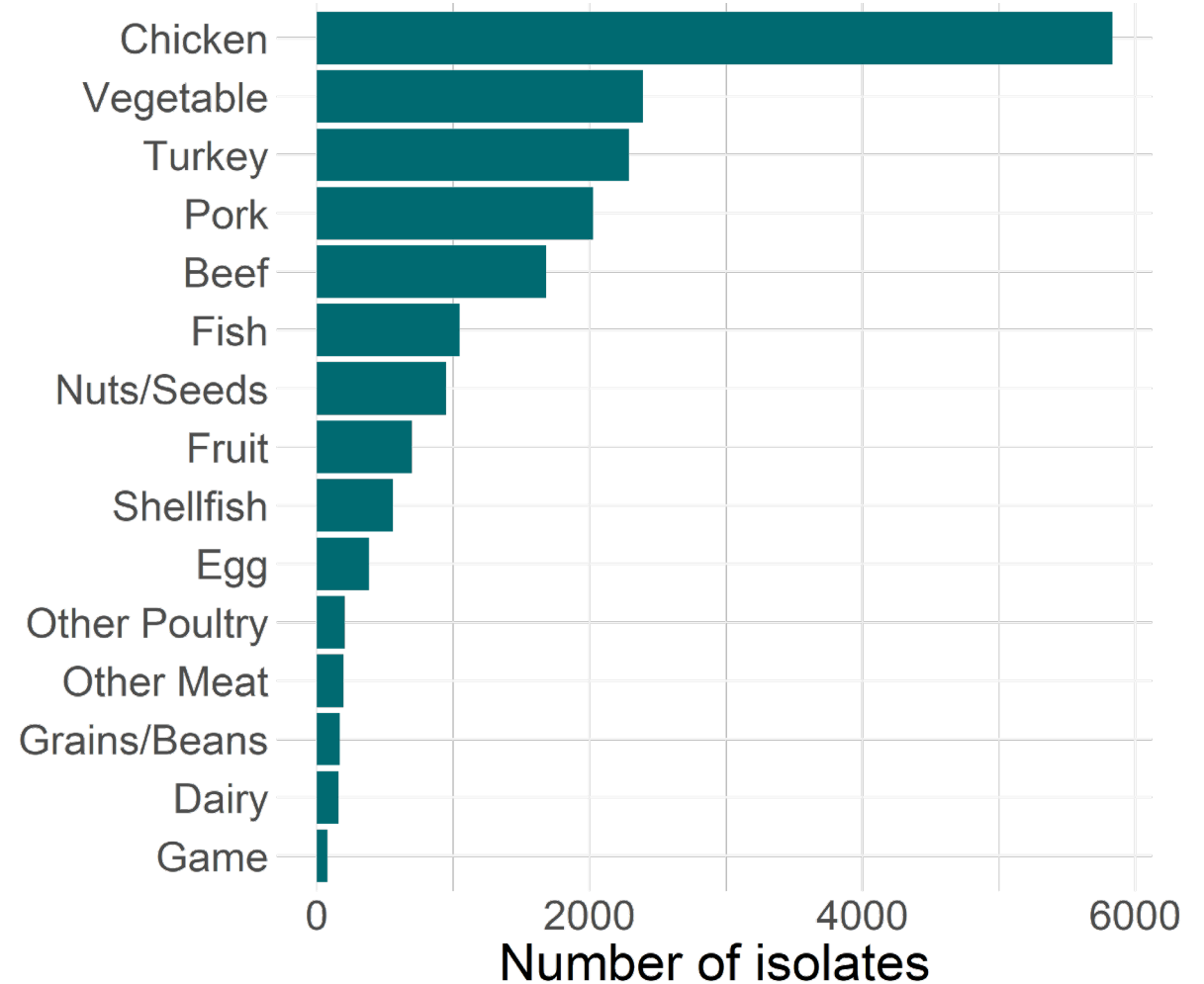


Estimate the Percentage of Human *Salmonella* Illnesses From Unknown Source

- Develop a random forest model using whole genome multi-locus sequence typing (wgMLST) calls to predict the source of isolates
- Apply model to human isolate with unknown source to estimate likely source

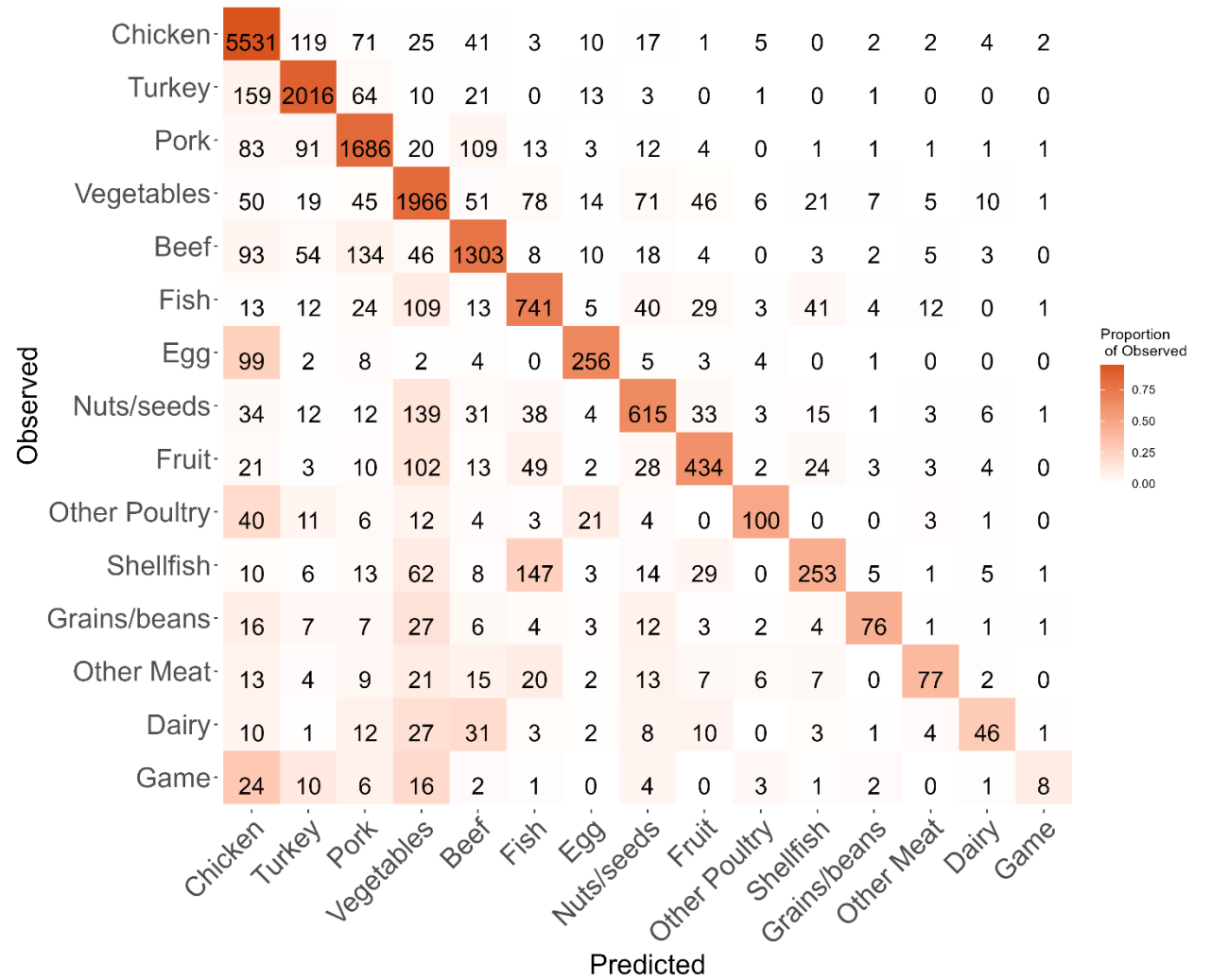
Salmonella Isolates From Known Single Source Foods

- 18,661 isolates, all assigned to single source foods
- Trained model accuracy >80%



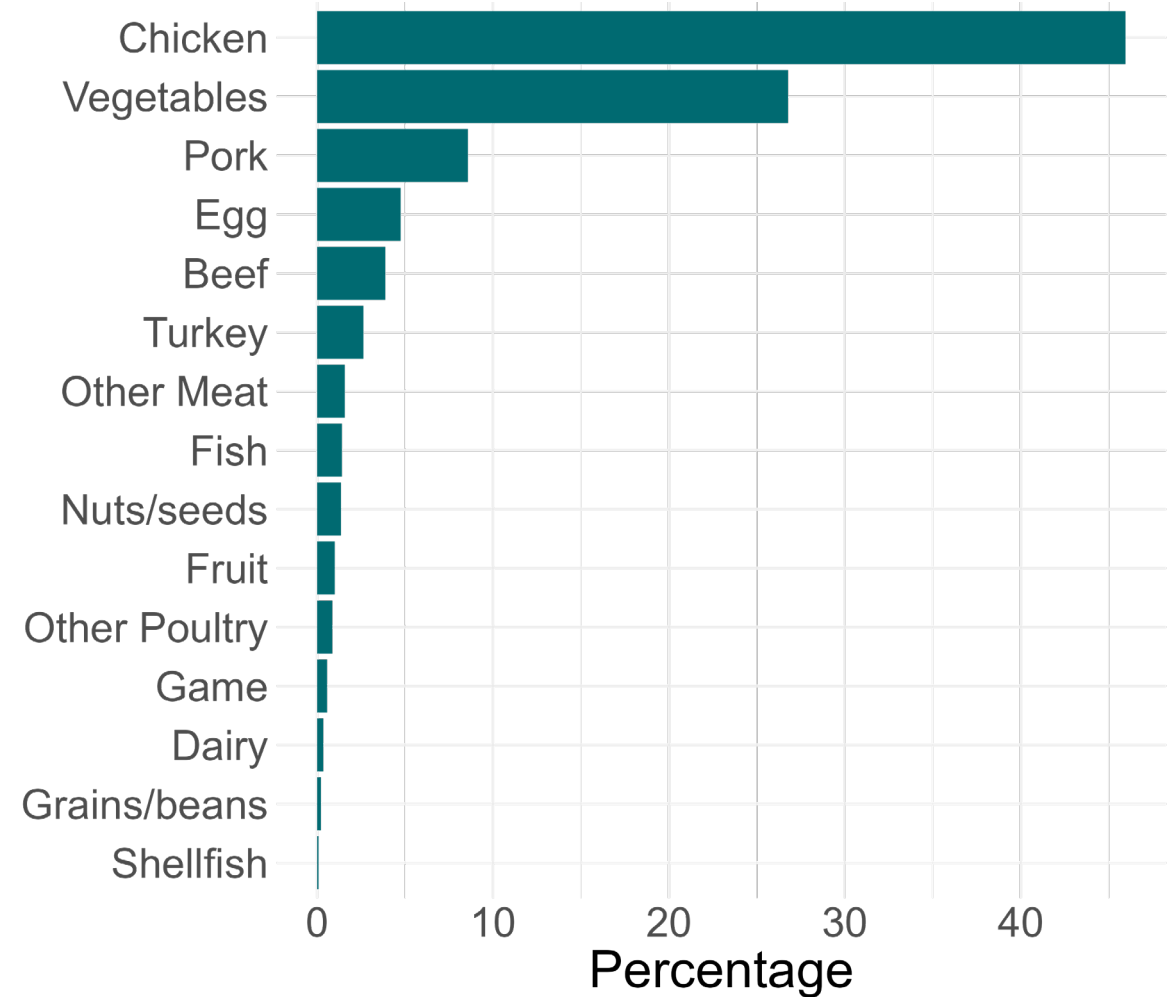
Isolates Were From Many Categories

- >18,600 isolates, all assigned to single categories
 - About 1/3 from chicken reservoir
- Trained model accuracy >80%



Source Attribution for Domestic Infections

- 44% of domestic infections assigned as unknown reservoir
- Among those with known reservoirs, this model predicts that among domestic infections
 - 46% from chicken reservoir
 - 27% from vegetable reservoir

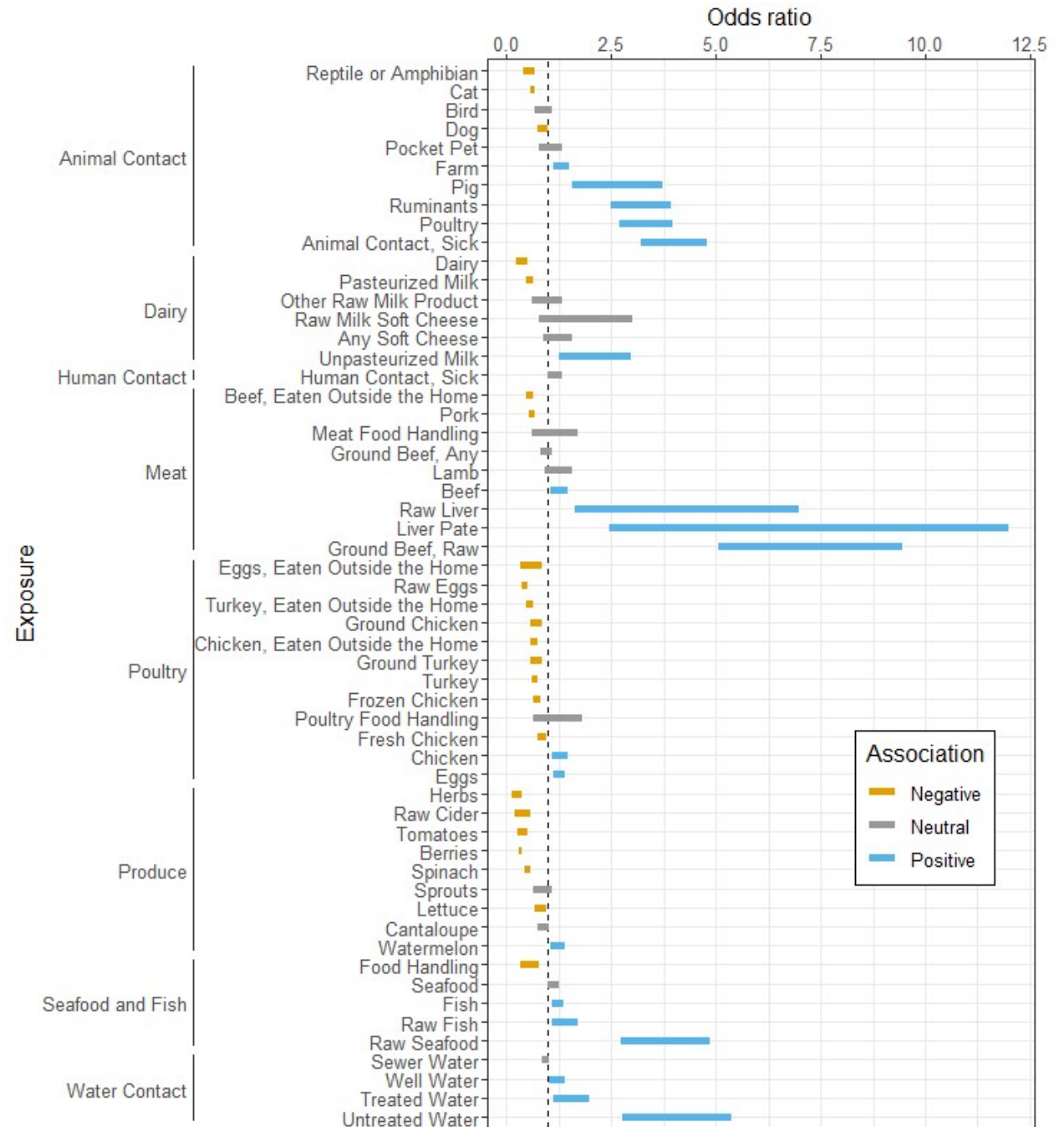


Campylobacter Attribution Using Sporadic Case Data Obtained From State and Local Investigations

- Improve methods for *Campylobacter* attribution
 - We are exploring the use of case-control data, WGS data, and a combination of the two
 - New methods will require new data streams
- We will identify the best approach based on science **and** whether the data can be sustainably collected over time

WGS *Campylobacter* Attribution Ratio Preliminary Results

Several exposures linked to previous outbreaks or illness were associated with an increased odds of being a case

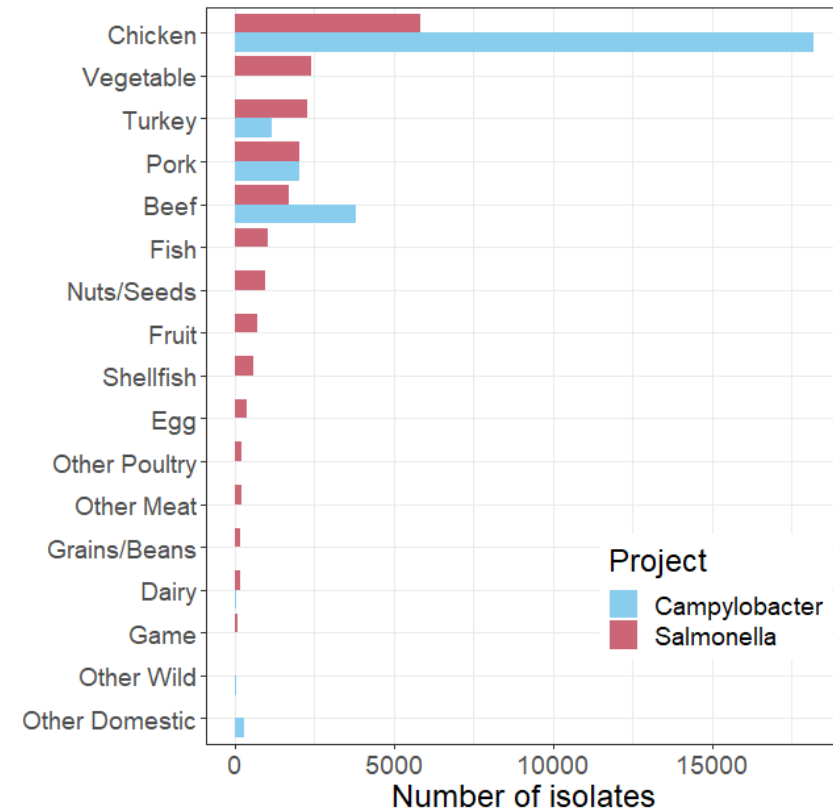


Differences Between *Salmonella* and *Campylobacter* (Inputs)

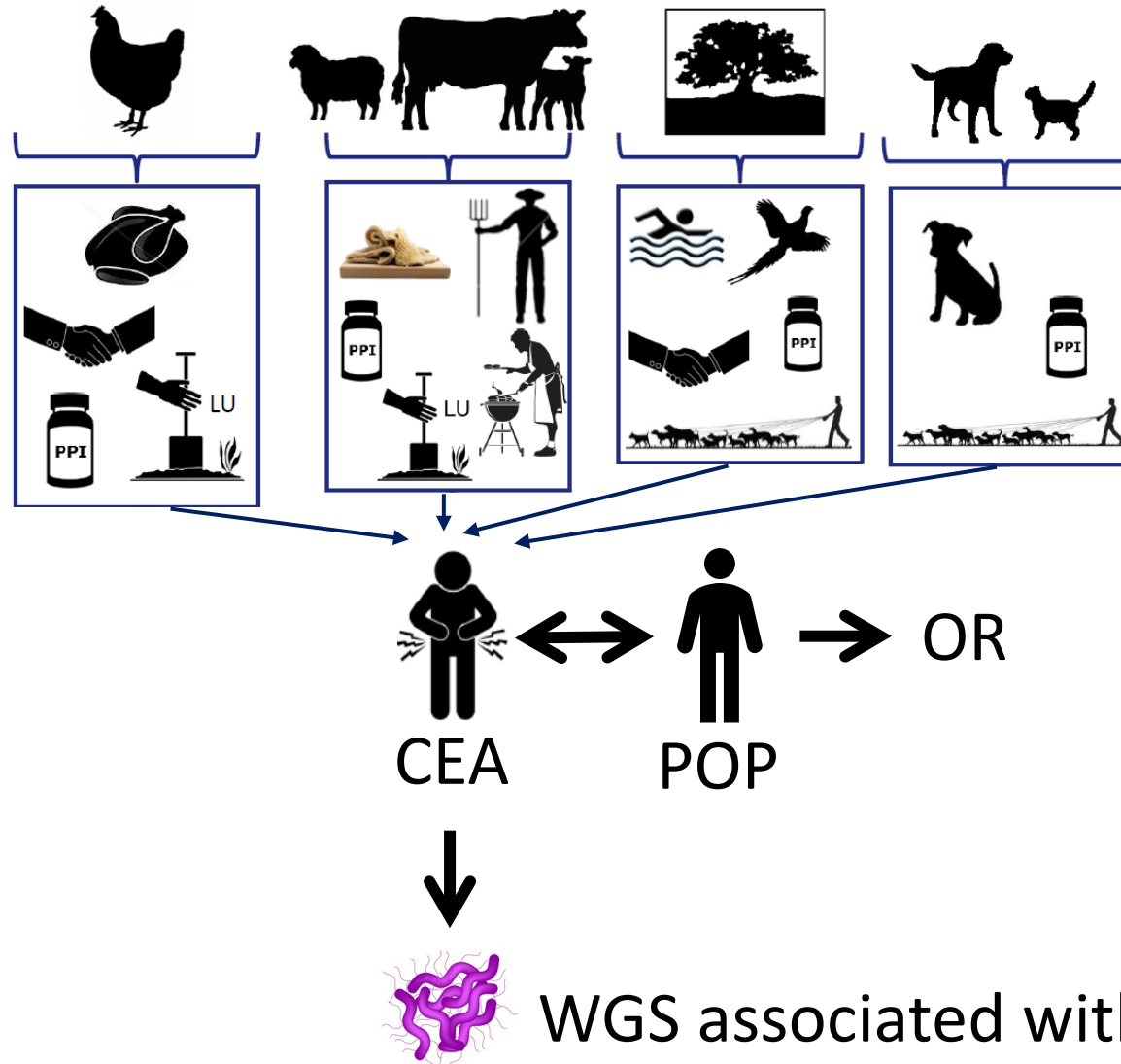
Counts and distribution of available NCBI isolates

	<i>Salmonella</i> (Project 25)	<i>Campylobacter</i> (Project 30)
Number of isolates	18,661	25,579
Genes (loci) present in >1%	8,143	2,902
Food categories	15	7
Chicken proportion	31%	71%

Food category distribution of available NCBI isolates



Using WGS and Case Control



IFSAC Collaborations

- Centers of Excellence (COE) outbreak bias and uncertainty
- Develop a shared understanding and statements of need for foodborne illness source attribution with the Interagency Risk Assessment Consortium (IRAC)



IFSSAC's Work Supports Agency Efforts

- Support FDA's effort to implement the Food Safety Modernization Act (FSMA)
- Support FDA's pathogen prioritization efforts through preliminary analyses of foodborne outbreaks for food source attribution (Risk Prioritization)
- Support USDA FSIS' *Salmonella* Framework



IFSAC Publications



- Annual Reports on Foodborne Illness Source Attribution Estimates
- Recency-Weighted Statistical Modeling Approach to Attribute Illnesses Caused by 4 Pathogens to Food Sources Using Outbreak Data, United States
- An Updated Scheme for Categorizing Foods Implicated in Foodborne Disease Outbreaks: A Tri-Agency Collaboration



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