



The Interagency Food Safety Analytics Collaboration (IFSAC) Public Meeting 2015

Overview of IFSAC Projects

Progress, Accomplishments, and Next Steps

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Presentation Outline

- **Strategic Plan for Projects**
 - Progress and Accomplishments
 - Next Steps
- **Strategic Plan for Communications**
 - Highlight of Accomplishments

IFSAC Strategic Plan

- **Outlines objectives, attribution analyses, and vision for communication efforts**
- **Guided by a set of objectives that include:**
 - Short Term Efforts (1-2 years)
 - Long Term Efforts (3-5 years)

Strategic Plan for Projects – Short Term Efforts

- 1) **Improved methods to identify and commoditize foods implicated in outbreaks**
 - **Project Title:** “Improve the food categories used to estimate attribution”
- 2) **Examine uncertainties associated with current foodborne illness source attribution estimates**
 - **Project Title:** “Determine representativeness of outbreak data”
 - **Project Title:** “Determine sources of uncertainty and variability in estimated attribution fractions”

Strategic Plan for Projects – Short Term Efforts (continued)

3) Determine gaps and identify solutions to improve foodborne illness source attribution estimates

- **Project Title:** “Identify opportunities to leverage methods across analytic disciplines” – IFSAC collaboration with Interagency Risk Assessment Consortium (IRAC)
- **Project Title:** “Evaluating a pathogen subtype model to better estimate the number of *Salmonella* illnesses associated with different food sources” (Hald Model)

4) Use estimates from outbreak-based foodborne illness source attribution

- **Project Title:** “Estimating foodborne illness source attribution for illnesses caused by *Salmonella*, *E. coli* O157, *Listeria monocytogenes*, and *Campylobacter*”

Improve the food categories used to estimate attribution

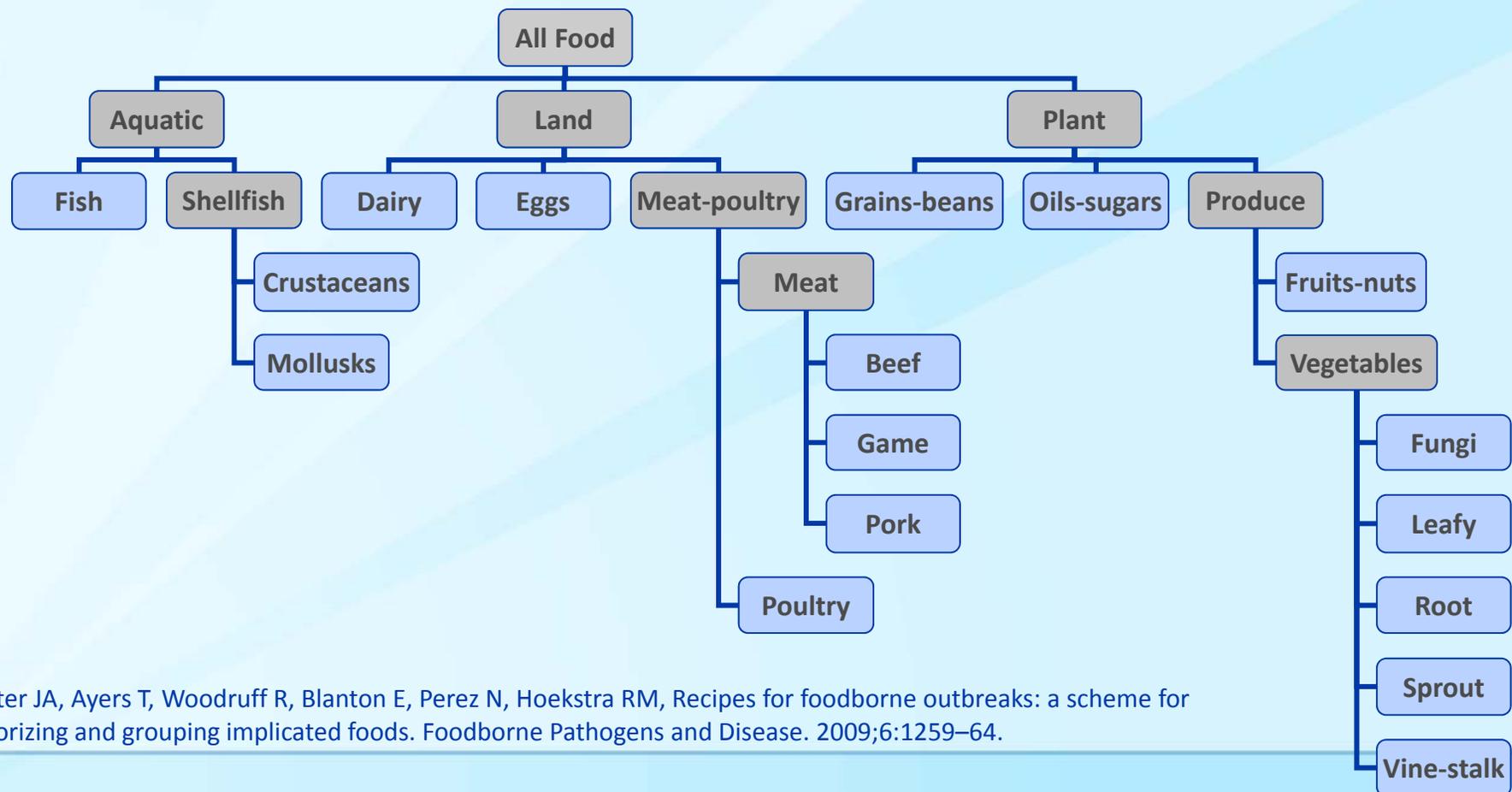
Project Objective:

Increase the accuracy and utility of food categories used to describe foods implicated in outbreaks and to generate foodborne illness source attribution estimates

Improve the food categories used to estimate attribution

Background:

- Prior to the formation of IFSAC, CDC developed a food categorization scheme with input from FSIS and FDA
- 17 food categories (in blue) used to classify 2,000 + foods that were implicated in outbreaks (1998 – 2008)*



*Painter JA, Ayers T, Woodruff R, Blanton E, Perez N, Hoekstra RM, Recipes for foodborne outbreaks: a scheme for categorizing and grouping implicated foods. Foodborne Pathogens and Disease. 2009;6:1259–64.

Improve the food categories used to estimate attribution

Methods:

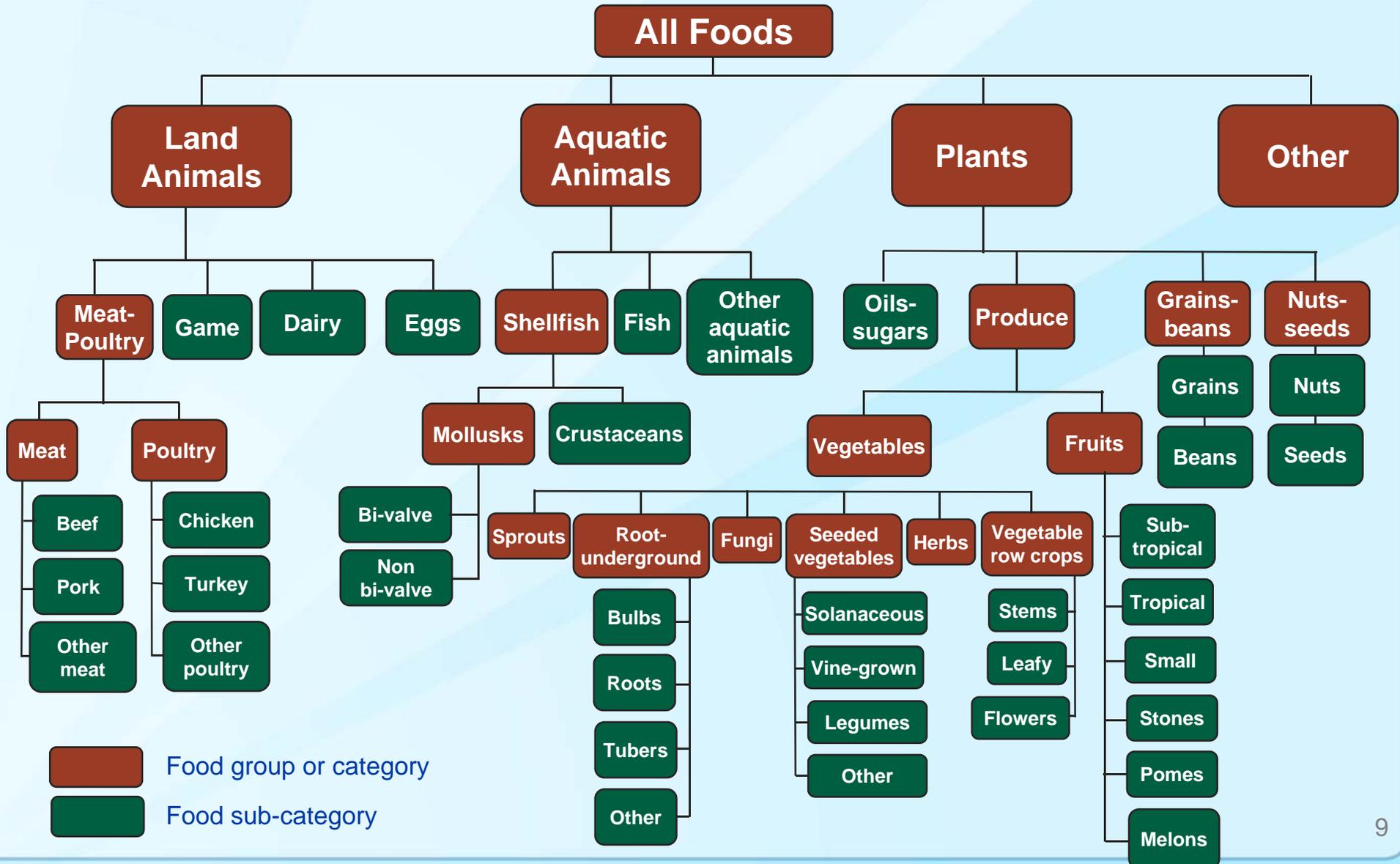
Create a new scheme to:

- Reflect FDA and FSIS regulatory classifications of foods
- Reflect production practices and postharvest handling systems
- Use accurate botanical categories

Improve the categories used to estimate attribution

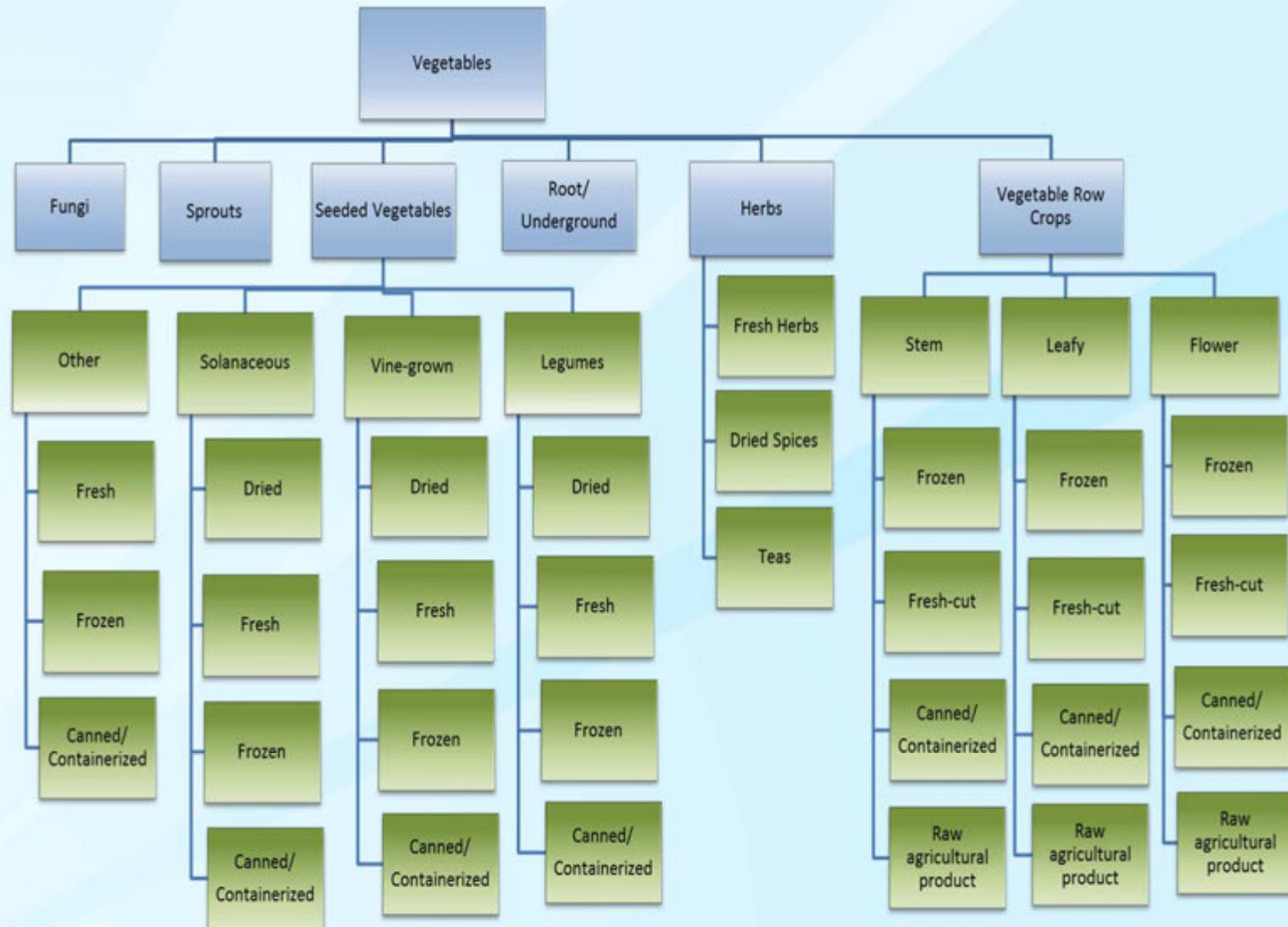
Results:

- New scheme was developed and has been used for attribution studies and outbreak summaries since 2011



Improve the food categories used to estimate attribution

Sub-categories reflect processing in new food commoditization scheme



Improve the food categories used to estimate attribution

Communication:

- IFSAC Webinar on June 18, 2013: “Improving the Categories Used to Classify Foods Implicated in Outbreaks”
<http://www.cdc.gov/foodsafety/ifsac/events.html>

Next Steps:

- Integrating new categories and food assignment rules into routine Foodborne Disease Outbreak Surveillance System data collection and reporting activities



Short Term Effort #2: Examine uncertainties associated with current foodborne illness source attribution estimates

Determine representativeness of outbreak data

Project Objective:

Compare the characteristics of ill people and foods linked to outbreaks of *Salmonella*, *E. coli* O157, *Listeria monocytogenes*, and *Campylobacter* illnesses with those associated with sporadic illnesses and foods consumed by the general population to determine whether outbreak illness are representative of sporadic illnesses

Determine representativeness of outbreak data

Project addresses objective by using two analyses:

- 1. FoodNet Sub-Project:** Compare the epidemiologic features of outbreak and non-outbreak (sporadic) illnesses ascertained in FoodNet
- 2. National Health and Nutrition Examination Survey (NHANES) Sub-Project:** Compare the distributions of foods associated with foodborne outbreaks to the distributions of foods eaten by NHANES dietary recall participants

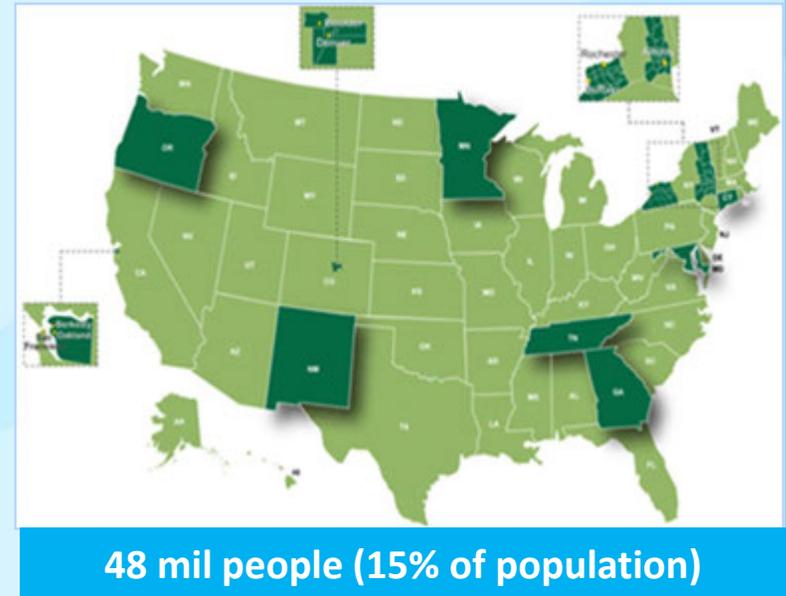


Determine representativeness of outbreak data

FoodNet Sub-Project

Methods:

- Compare geographic, demographic, temporal, and clinical characteristics of outbreak and non-outbreak (sporadic) illnesses ascertained in FoodNet with IFSAC's 4 priority pathogens
- If outbreak and sporadic cases are similar epidemiologically, we *cannot reject* the hypothesis that exposure pathways are similar



Determine representativeness of outbreak data

FoodNet Sub-Project

Results:

- ***E. coli* O157, *Listeria monocytogenes*, and *Campylobacter*** – Outbreak illnesses are similar to sporadic illnesses with respect to patient illness severity, gender, and age
- ***Campylobacter*** – Fewer illnesses associated with outbreaks compared with the other three pathogens in the study
- ***Salmonella*** – Outbreak illnesses are similar to sporadic illnesses with respect to illness severity and gender
 - For age, the percentages of outbreak and sporadic illnesses that occur among older children and adults are also similar. However, the percentage of outbreak illnesses in the youngest age category (≤ 3 years of age) was substantially lower compared with the other age groups

Determine representativeness of outbreak data

FoodNet Sub-Project

Conclusion:

These findings are important because they indicate that, with the exception of *Salmonella* illnesses among children ≤ 3 years of age, it may be appropriate to use outbreak data to estimate which foods may be associated with sporadic illnesses in the population.

Communication:

IFSAC Webinar on January 10, 2014: “Are Outbreak Illnesses Representative of Sporadic Illnesses?”

<http://www.cdc.gov/foodsafety/ifsac/events.html>

Next Steps: Manuscript in development

Determine representativeness of outbreak data

National Health and Nutrition Examination Survey (NHANES) Sub-Project

Methods:

- Compare the distributions of foods associated with foodborne outbreaks to the distributions of foods eaten by NHANES dietary recall participants
- Link all foods implicated in outbreaks to foods consumed by NHANES dietary recall study participants

Progress:

- Analyses continuing



The National Health and Nutrition Examination Survey (NHANES) assesses the health and nutritional status of adults and children.

Short Term Effort #3: Determine gaps and identify solutions to improve foodborne illness source attribution estimates

IFSAC Collaboration with Interagency Risk Assessment Consortium (IRAC)

Objective: Establish external collaboration with IRAC to identify opportunities to leverage methods across different analytic disciplines

Approach: Conduct joint IFSAC and IRAC seminar series and capstone workshop to:

- Discuss ways to improve the quality of information that regulatory agencies use for risk-based decision-making
- Discuss ways that epidemiological and risk assessment methods could be used for improving food-safety decision-making

IFSAC Collaboration with Interagency Risk Assessment Consortium (IRAC)

Outcome:

Seminars provided data on:

- Epidemiological methods for identifying risk factors and other influences on the population's health
- Risk-assessment methods for estimating the likelihood that illness results from a specific hazard.
- Based on this collaborative exchange, IFSAC and IRAC participants identified ways to benefit from both methods in the future

Short Term Effort #3: Determine gaps and identify solutions to improve foodborne illness source attribution estimates

Evaluating a pathogen subtype model to better estimate the number of *Salmonella* illnesses associated with different food sources using the Hald Model



Source: CDC

Attribution of *Salmonella* illnesses to food commodities using the Hald model

Background:

- Hald model, developed by Tine Hald from Technical University of Denmark, links the number of reported foodborne illnesses caused by *Salmonella* to
 - Levels of contamination in food reservoirs
 - Amount of each food consumed
- Model includes two other factors assumed to influence the number of illnesses
 - **Food source factors:** relative differences among food reservoirs that influence their ability to transmit *Salmonella* (e.g., differences in food processing, preparation practices)
 - **Pathogen factors:** relative differences between *Salmonella* subtypes that influence their ability to cause a disease (e.g., pathogenicity, survival in food)

Attribution of *Salmonella* illnesses to food commodities using the Hald model

Objective:

Expand a U.S. model previously used* to attribute illnesses to FSIS-regulated food products by incorporating data about FDA-regulated food sources of *Salmonella*, exploring whether model can provide reasonable estimates of foodborne illness source attribution to

- Evaluate the relationships between food contamination, consumption, and human illness
- Estimate the percentage of illnesses attributable to food contaminated before the point of food preparation and service

* Guo, C., Hoekstra, R. M., Schroeder, C. M., Pires, S. M., Ong, K. L., Hartnett, E., ... & Cole, D. (2011). Application of Bayesian techniques to model the burden of human salmonellosis attributable to US food commodities at the point of processing: adaptation of a Danish model. *Foodborne Pathogens and Disease*, 8(4), 509-516.

Attribution of *Salmonella* illnesses to food commodities using the Hald model

Methods:

- Include data from additional food products, such as seafood, herbs, and produce
- Include shell eggs in the model, using 3 different contamination scenarios and assess model results under each scenario
- Update the model to improve model performance

Attribution of *Salmonella* illnesses to food commodities using the Hald model

Progress:

- Report outlining model and results in development

Next Steps:

- Determine how to use the model to assess changes over time
- Improve data collection
- Incorporate more specific pathogen subtyping data in future models



Strategic Plan for Projects – Long Term Efforts

1) Develop foodborne illness source attribution models using a variety of data sources

- **Project Title:** “Attribution of *Salmonella* illnesses to food commodities using the Hald model”

[Discussed in previous slides on Short Term Effort section]

- **Project Title:** “Baseline estimate of the proportion of foodborne *Salmonella enterica* serotype Enteritidis (SE) illnesses that can be attributed to shell eggs and other common sources”

Strategic Plan for Projects – Long Term Efforts (continued)

2) Determine most appropriate methods for generating both “blended” and harmonized food source attribution estimates

- **Project Title:** “Baseline estimate of the proportion of foodborne *Salmonella enterica* serotype Enteritidis (SE) illnesses that can be attributed to major food categories”
- **Project Title:** “Estimating foodborne illness source attribution for illnesses caused by *Salmonella*, *E. coli* O157, *Listeria monocytogenes*, and *Campylobacter*”

Long Term Effort #1: Develop foodborne illness source attribution models using a variety of data sources

Long Term Effort #2: Determine most appropriate methods for generating both “blended” and harmonized food source attribution estimates

Baseline estimate of the proportion of foodborne *Salmonella enterica* serotype Enteritidis (SE) illnesses that can be attributed to shell eggs and other common sources



Baseline estimate of the proportion of foodborne SE illnesses that can be attributed to shell eggs

Background:

- **CDC and FDA have been partners since 2010 on a Department of Health and Human Services (HHS) Agency Priority Goal to reduce SE infections**
 - Goal is focused on reducing infections associated with shell eggs (FDA Final Egg Rule, 2010)
 - <http://www.performance.gov/>
- **Attribution estimates varied by data source and method**
 - 2002 FoodNet case-control study
 - Small proportion of illnesses attributed to shell eggs
 - Outbreak data
 - High proportion of illnesses attributed to shell eggs

Baseline estimate of the proportion of foodborne SE illnesses that can be attributed to shell eggs

Objective:

- Develop estimates of the percentage of illnesses attributable to shell eggs before the Egg Rule
 - FDA chose 2007-2009 as baseline period

Method:

- Produce baseline estimates of the proportion of SE illnesses attributable to shell eggs by using mathematical models that incorporate data from foodborne disease outbreak investigations and from a 2002 case-control study of sporadic (non-outbreak) illnesses.

Baseline estimate of the proportion of foodborne SE illnesses that can be attributed to shell eggs

Results:

Baseline attribution of SE foodborne illnesses, 2007-2009

- **Attribution Fraction (95% CI)**
 - Shell eggs 40% (30-51%)

Next Steps

- **Propose a method to estimate attribution for recent sources of SE using new data (after 2009)**



Estimating foodborne illness source attribution for illnesses caused by *Salmonella*, *E. coli* O157, *Listeria monocytogenes*, and *Campylobacter*

Supports:

- **Strategic Short Term Effort #2:** Examine uncertainties associated with current foodborne illness source attribution estimates
- **Strategic Short Term Effort #4:** Use estimates from outbreak-based foodborne illness source attribution
- **Strategic Long Term Effort #2:** Determine most appropriate methods for generating both “blended” and harmonized food source attribution estimates



Estimating foodborne illness source attribution for illnesses caused by *Salmonella*, *E. coli* O157, *Listeria monocytogenes*, and *Campylobacter*

Objectives:

- Identify appropriate methods to estimate percentages of illnesses caused by priority pathogens attributable to food categories in new categorization scheme using outbreak data
- Develop tri-agency, outbreak-derived attribution fractions using a refined simple food methodology with quantified uncertainty
- To provide harmonized source attribution estimates by developing a single, robust method to produce estimates that all 3 agencies may use in their food safety activities

Estimating foodborne illness source attribution for illnesses caused by *Salmonella*, *E. coli* O157, *Listeria monocytogenes*, and *Campylobacter*

More details on methods, results, and conclusions will be discussed in next presentation...

Strategic Plan for Communications:

Highlight of Accomplishments & Future Directions

2011

- IFSAC Charter was signed
- FDA Risk Communication Advisory Committee Meeting

2012

- Development/Implementation of IFSAC Strategic Plan
- First Public Meeting
 - Introduction to IFSAC
 - Development of the IFSAC Strategic Plan
 - Solicited public input on opportunities and challenges to improve foodborne attribution efforts in US

2013

- **First Webinar:** “Improving the Categories Used to Classify Foods Implicated in Outbreaks”

Strategic Plan for Communications:

Highlight of Accomplishments & Future Directions

2014

- **Second Webinar:** “Are Outbreak Illnesses Representative of Sporadic Illnesses?”
- **Webpage:** Designed and launched IFSAC web page:
<http://www.cdc.gov/foodsafety/ifsac/index.html>

2015

- **Second public meeting:** An opportunity for IFSAC, the public, and our food safety partners to:
 - Discuss IFSAC’s work and overall federal efforts to improve estimates of foodborne illness source attribution
 - Engage stakeholders and solicit feedback for plans for future IFSAC projects
- **Continue communication efforts through various avenues as analytical projects progress and results are available**

Thank you!

