Foodborne Outbreaks Attributed to Fish — United States, 1998–2012

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Conference for Food Protection Workshop
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Outline

- Introduction to foodborne disease outbreaks and national surveillance
- Fish-attributed outbreaks

Foodborne Illness

- Roughly 1 in 6 Americans, or 48 million people, become ill from foodborne diseases each year
  - 128, 000 hospitalized
  - 3,000 die

Foodborne Disease Outbreak Surveillance System

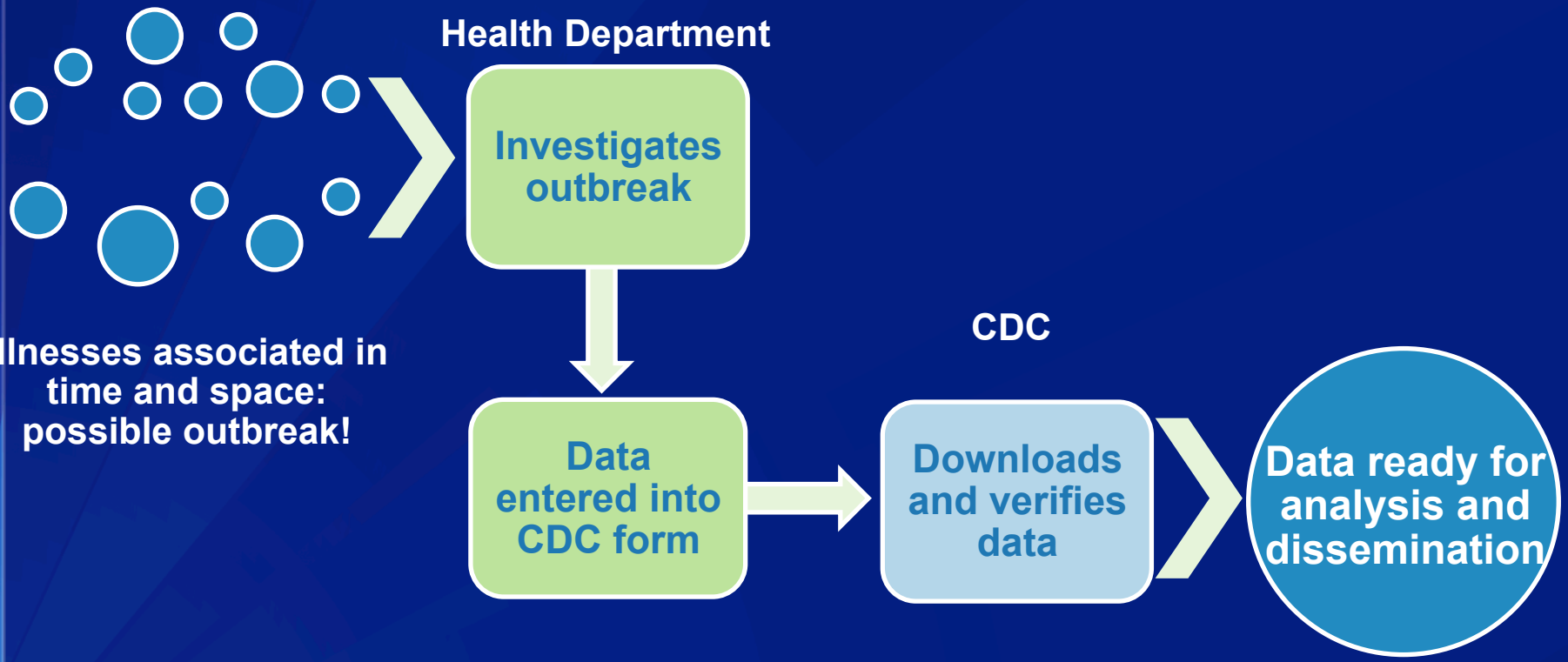
FDOSS

Captures data from investigated foodborne disease outbreaks in the United States

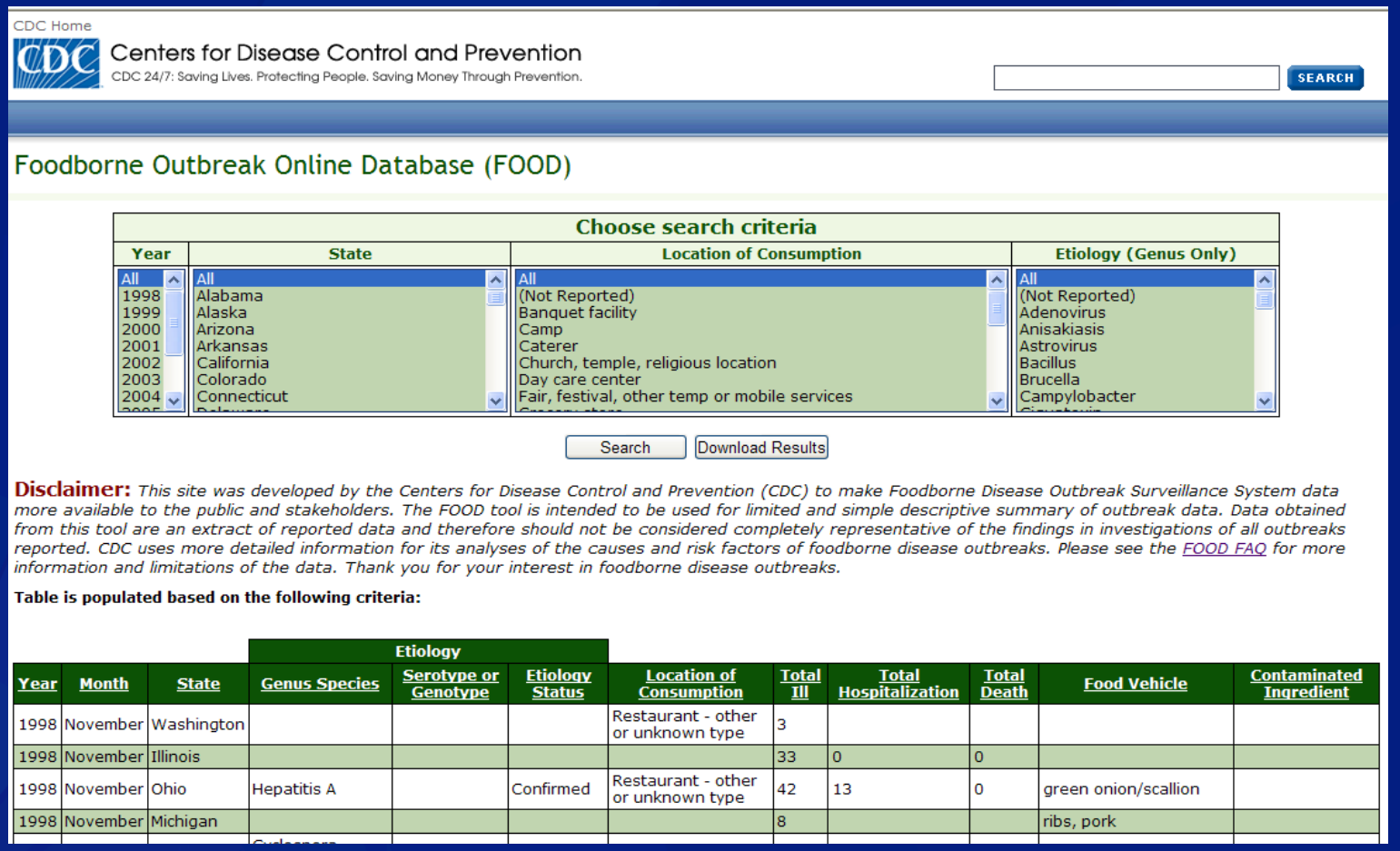
- **Provides valuable insights**
  - Numbers of illnesses, hospitalizations, deaths
  - Etiologic agents
  - Implicated foods and ingredients
  - Settings of food preparation and consumption

Foodborne Disease Outbreak Surveillance System

FDOSS



Foodborne Outbreak Online Database (FOOD)



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Centers for Disease Control and Prevention

CDC 24/7: Saving Lives. Protecting People. Saving Money Through Prevention.

SEARCH

Foodborne Outbreak Online Database (FOOD)

Choose search criteria

Year	State	Location of Consumption	Etiology (Genus Only)
All	All	All	All
1998	Alabama	(Not Reported)	(Not Reported)
1999	Alaska	Banquet facility	Adenovirus
2000	Arizona	Camp	Anisakiasis
2001	Arkansas	Caterer	Astrovirus
2002	California	Church, temple, religious location	Bacillus
2003	Colorado	Day care center	Brucella
2004	Connecticut	Fair, festival, other temp or mobile services	Campylobacter

Search | Download Results

Disclaimer: *This site was developed by the Centers for Disease Control and Prevention (CDC) to make Foodborne Disease Outbreak Surveillance System data more available to the public and stakeholders. The FOOD tool is intended to be used for limited and simple descriptive summary of outbreak data. Data obtained from this tool are an extract of reported data and therefore should not be considered completely representative of the findings in investigations of all outbreaks reported. CDC uses more detailed information for its analyses of the causes and risk factors of foodborne disease outbreaks. Please see the FOOD FAQ for more information and limitations of the data. Thank you for your interest in foodborne disease outbreaks.*

Table is populated based on the following criteria:

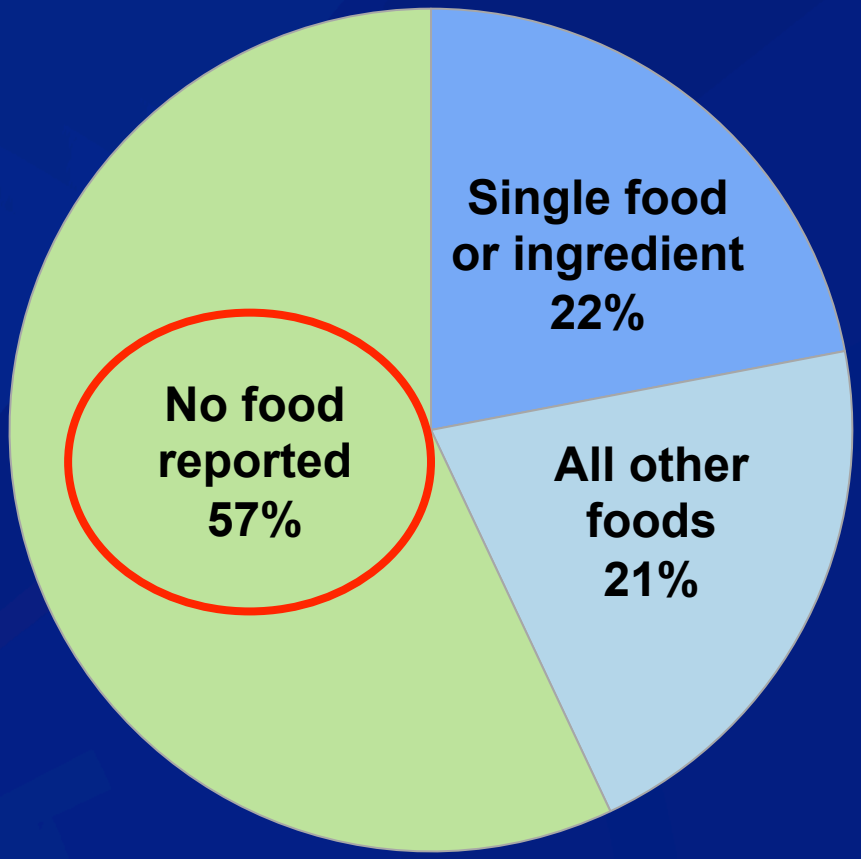
			Etiology								
Year	Month	State	Genus Species	Serotype or Genotype	Etiology Status	Location of Consumption	Total Ill	Total Hospitalization	Total Death	Food Vehicle	Contaminated Ingredient
1998	November	Washington				Restaurant - other or unknown type	3				
1998	November	Illinois					33	0	0		
1998	November	Ohio	Hepatitis A		Confirmed	Restaurant - other or unknown type	42	13	0	green onion/scallion	
1998	November	Michigan					8			ribs, pork	

http://wwwn.cdc.gov/foodborneoutbreaks

To keep in mind…

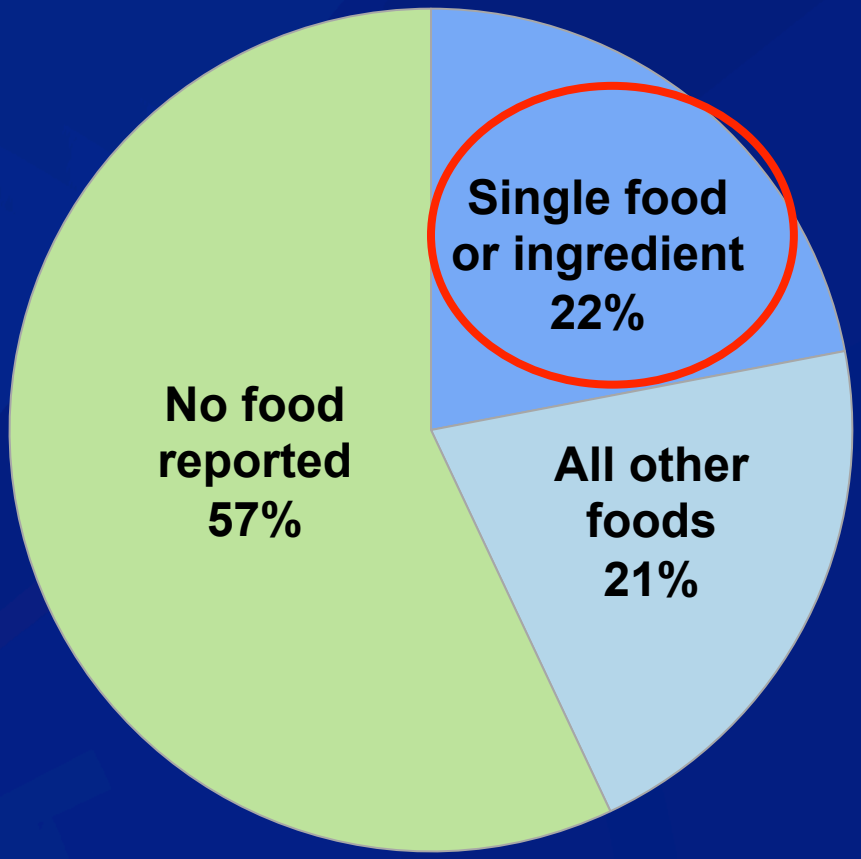
- Number of reported outbreaks likely underestimates the total number of outbreaks
- An implicated food and etiologic agent are not identified for every outbreak

Foodborne Disease Outbreaks by Food Vehicle Reported, 2008–2012



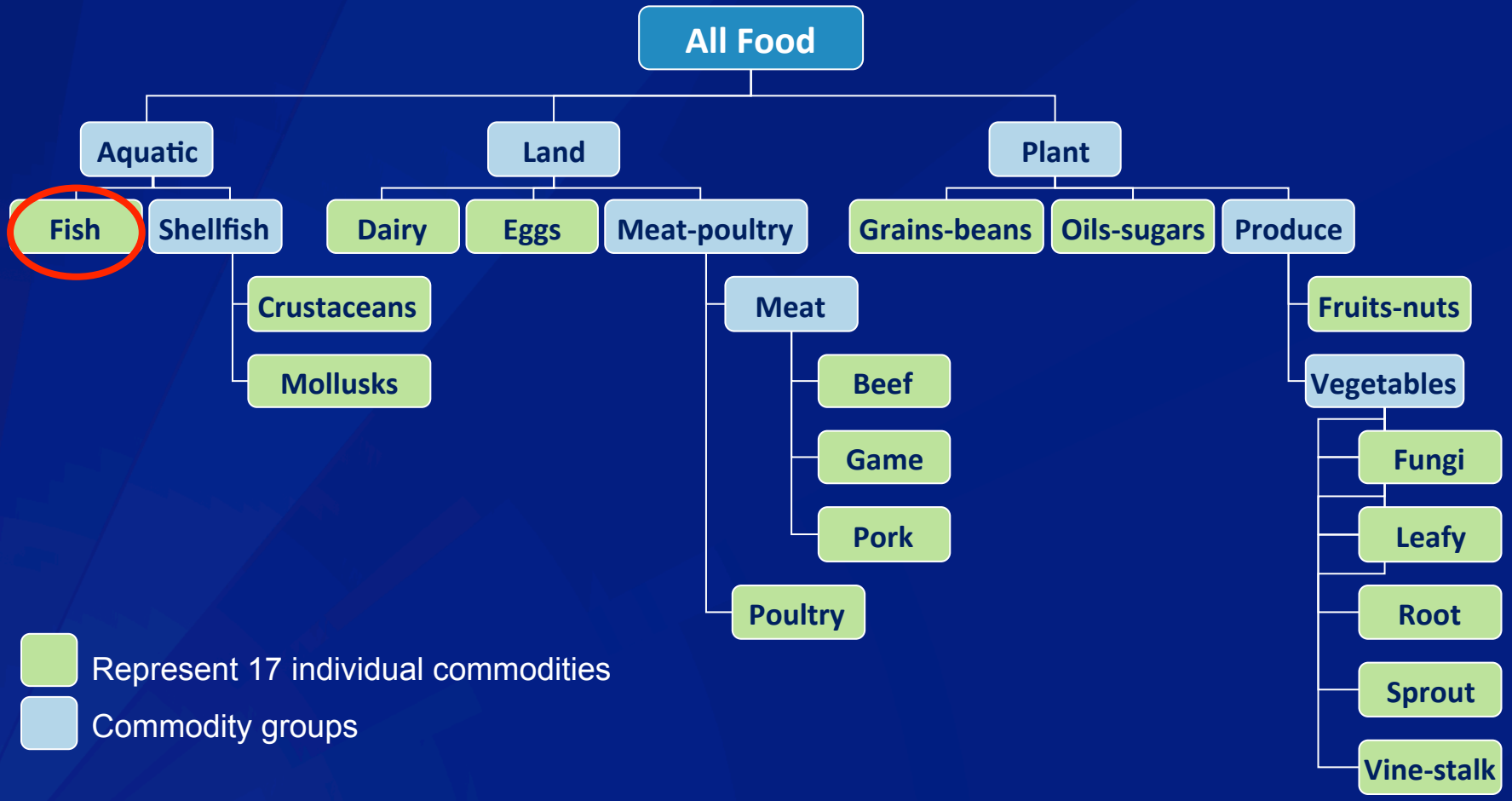
All other foods include Complex, Undetermined, and Unclassifiable foods.

Foodborne Disease Outbreaks by Food Vehicle Reported, 2008–2012

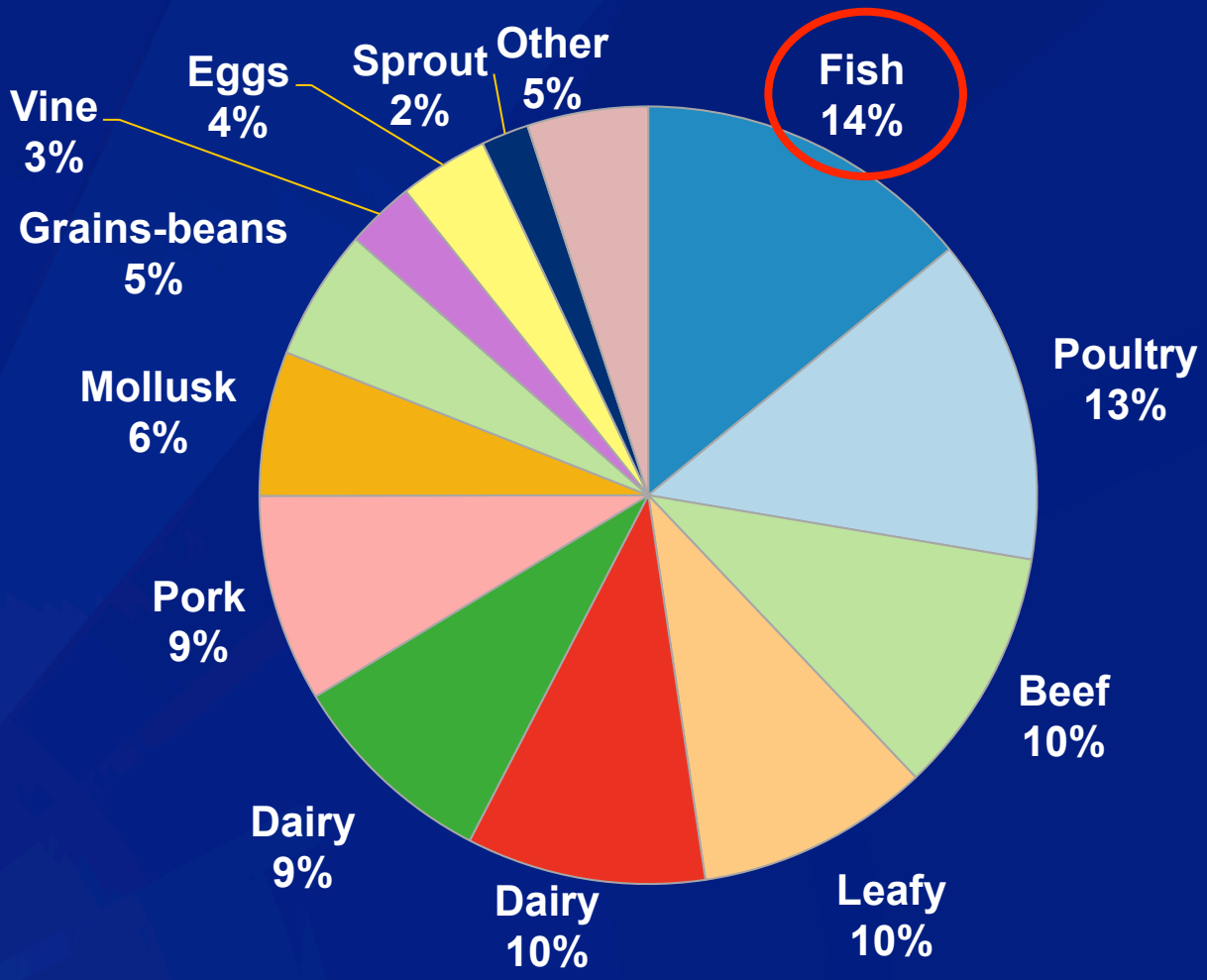


All other foods include Complex, Undetermined, and Unclassifiable foods.

Current Hierarchical Scheme for Grouping Foods Into Commodities



Commodities Implicated in Foodborne Disease Outbreaks, 2008–2012, n=915



"Other" includes crustacean, fungus, game, oil-sugar, and root
Data are preliminary and may change.

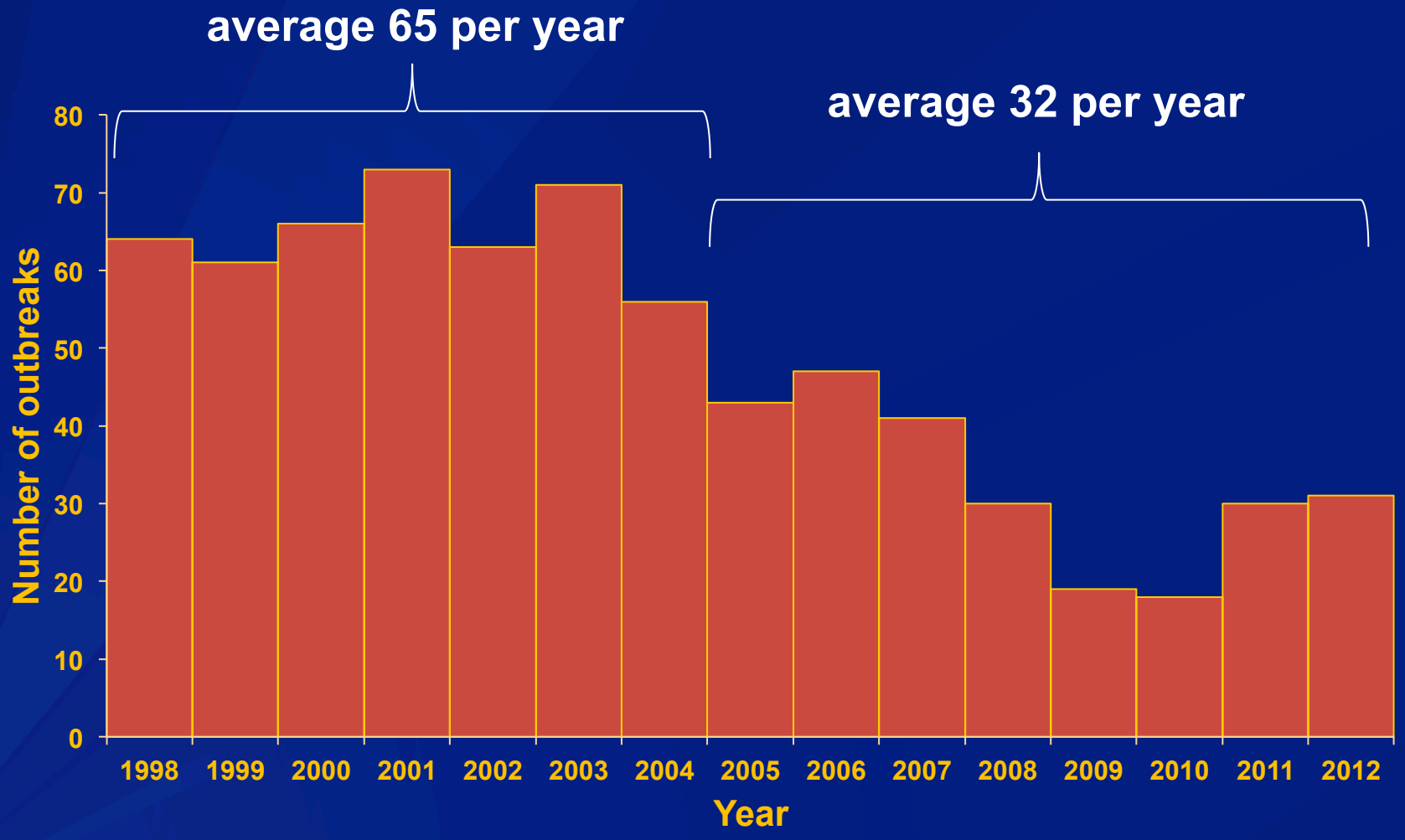
Epidemiology of Fish-Attributed Outbreaks in the United States, 1998–2012

- Reviewed data reported to FDOSS for outbreaks attributed to fish
  - Excluded shellfish
- Analyzed
  - Number of outbreaks, illnesses, hospitalizations, deaths
  - State in which outbreak occurred
  - Etiologic agent
  - Implicated fish type
  - Preparation method

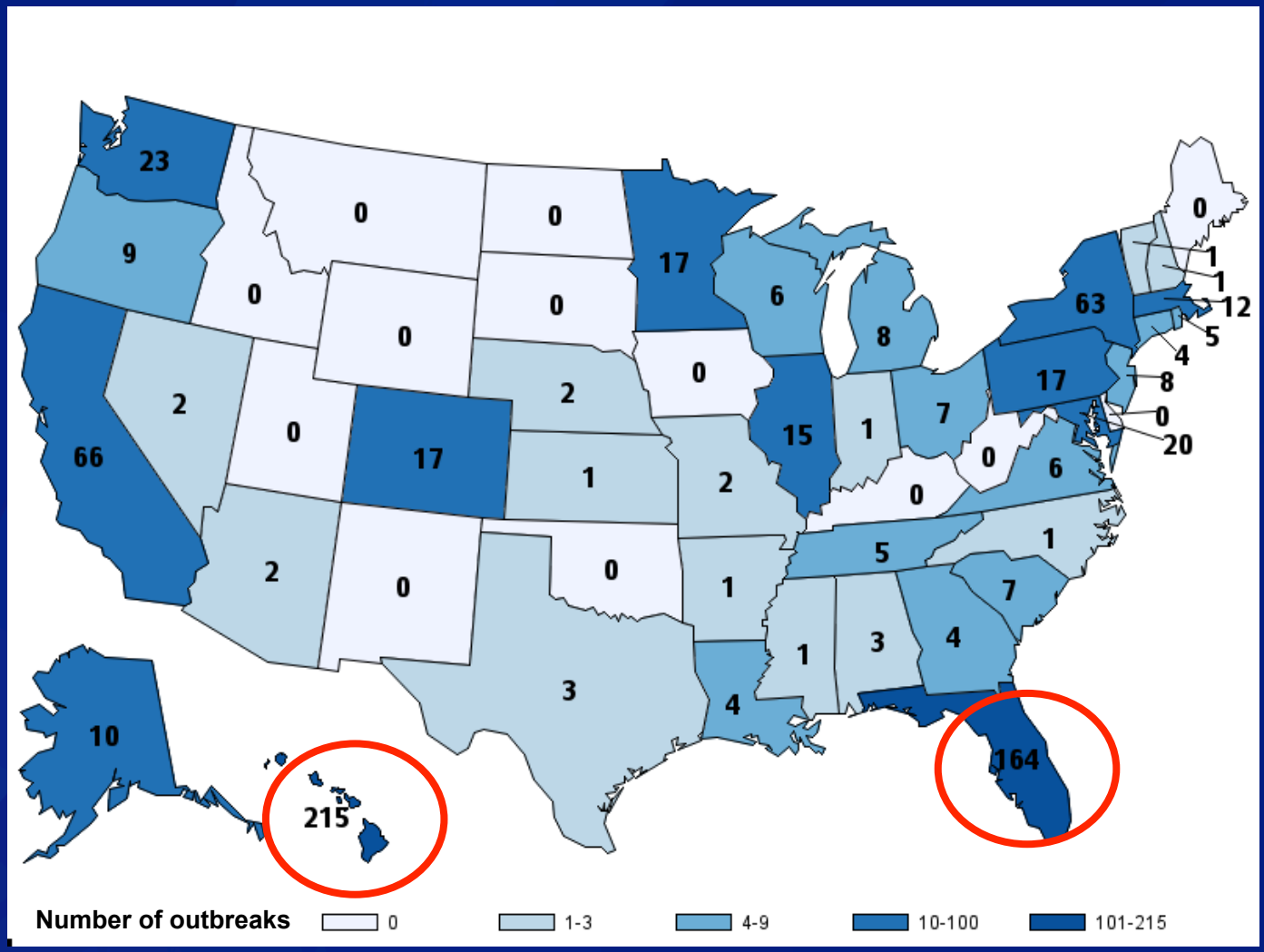
Results

- 713 outbreaks
- 4182 illnesses
  - Median 3 illnesses per outbreak (range: 2–425)
- 295 hospitalizations
- 3 deaths

Number of Fish-Associated Outbreaks by Year, United States, 1998–2012



Number of Outbreaks by State



Map doesn't show outbreaks that occurred in Guam (4), Puerto Rico (12), and the District of Columbia (3).
Includes 4 multistate outbreaks that are assigned as one outbreak to each state involved.

Number of Outbreaks by Etiology*

Etiology	Percent of Outbreaks
Scombroid toxin	**55%**
Ciguatoxin	**33%**
Salmonella	2%
Clostridium botulinum	2%
Other etiologies (<10 outbreaks each)	8%
Total	**643**

*Among outbreaks with a reported single etiology.
1 outbreak was reported with multiple etiologies, 70 outbreaks with no reported etiology.

Scombroid fish poisoning

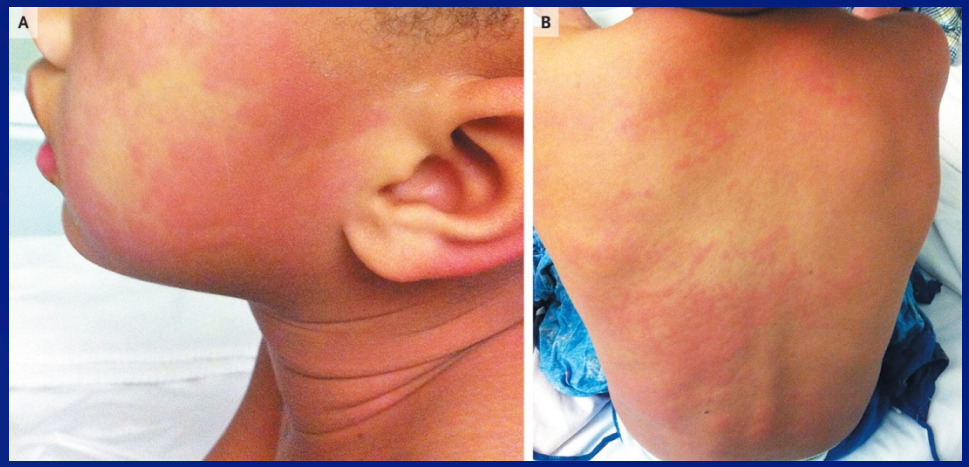
- **Caused by:**

Elevated histamine levels in fish resulting from improper storage

  - Once histamine is produced, it cannot be eliminated by cooking or freezing

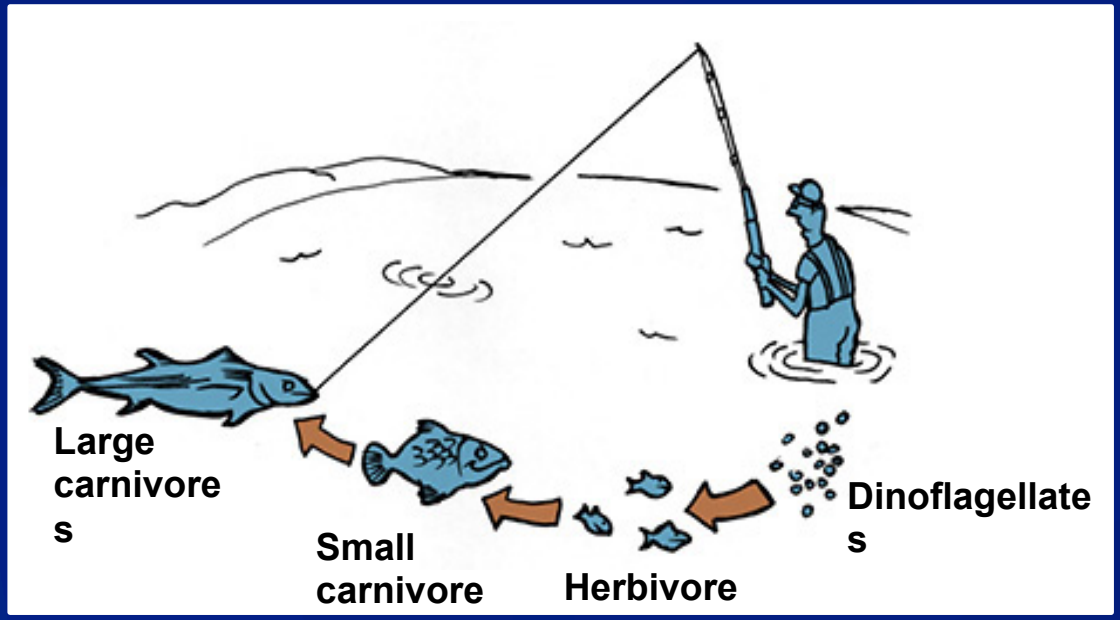
Scombroid fish poisoning

- **Time to symptom onset:** minutes to hours
- **Symptoms/signs:** facial flushing, tingling and swelling, rapid heart beat, wheezing, nausea, vomiting, diarrhea, itchy rash
- **Treatment:** antihistamines and supportive care



Ciguatera fish poisoning

- **Caused by:** Toxins that accumulate in the flesh of fish, typically large reef-dwelling carnivorous fish found in tropical oceans
  - Natural toxins, cannot be reliably eliminated by cooking

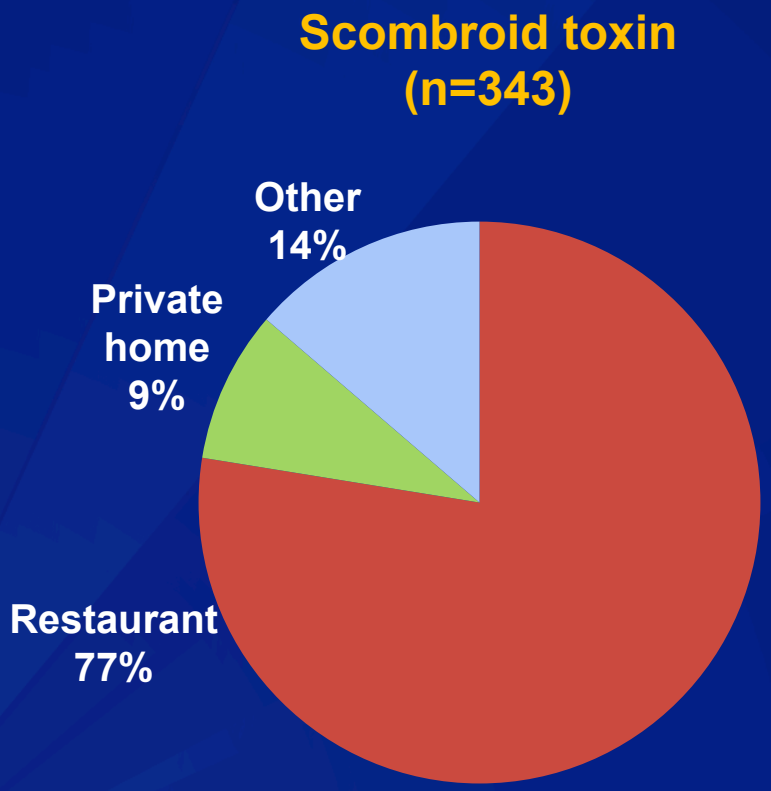


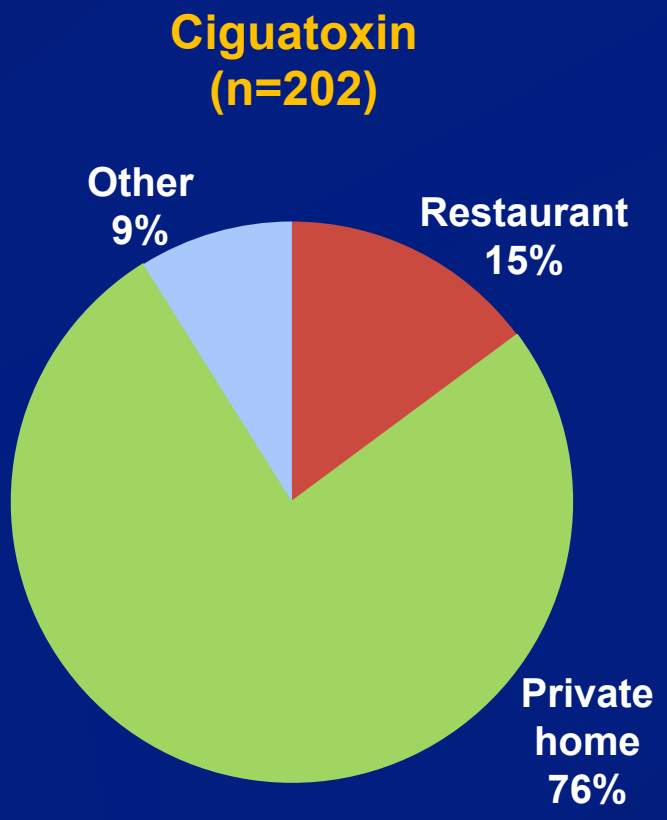
Ciguatera fish poisoning

- **Time to symptom onset:** 3 to 30 hours
- **Symptoms/signs:**
  - Gastrointestinal: nausea, vomiting, diarrhea, abdominal pain
  - Neurological: aberrant temperature perception (classically, cold feels hot), numbness and tingling, itching, muscle and joint pains
  - Cardiac: low blood pressure, slow heart rate
- **Treatment:** Supportive care

Preparation Setting***

- Restaurant: 54%
- Private home: 33%





*** Of the 685 outbreaks with a reported preparation setting

Ten Largest Outbreaks

Year	Reporting state	Fish family	Etiologic agent	Number of illnesses
2012	Multistate	Tuna	*Salmonella* Nchanga and Bareilly	425
2004	Wisconsin	Not specified	Norovirus	380
2000	New York	Not specified	*Salmonella* Enteritidis	68
2004	Virginia	Tuna	*Salmonella* Weltevreden	63
1998	Massachusetts	Cod	Not reported	60
2010	Multistate	Tuna	*Salmonella* Paratyphi B	51
1998	Washington	Not specified	*Salmonella* Typhimurium	50
1998	Louisiana	Not specified	*Shigella sonnei*	47
2008	Virginia	Bass	*Salmonella* multiple	45
			Salmonella	

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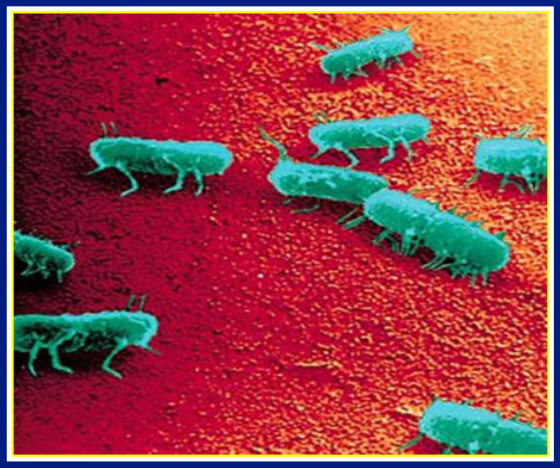
			Salmonella	

Salmonellosis

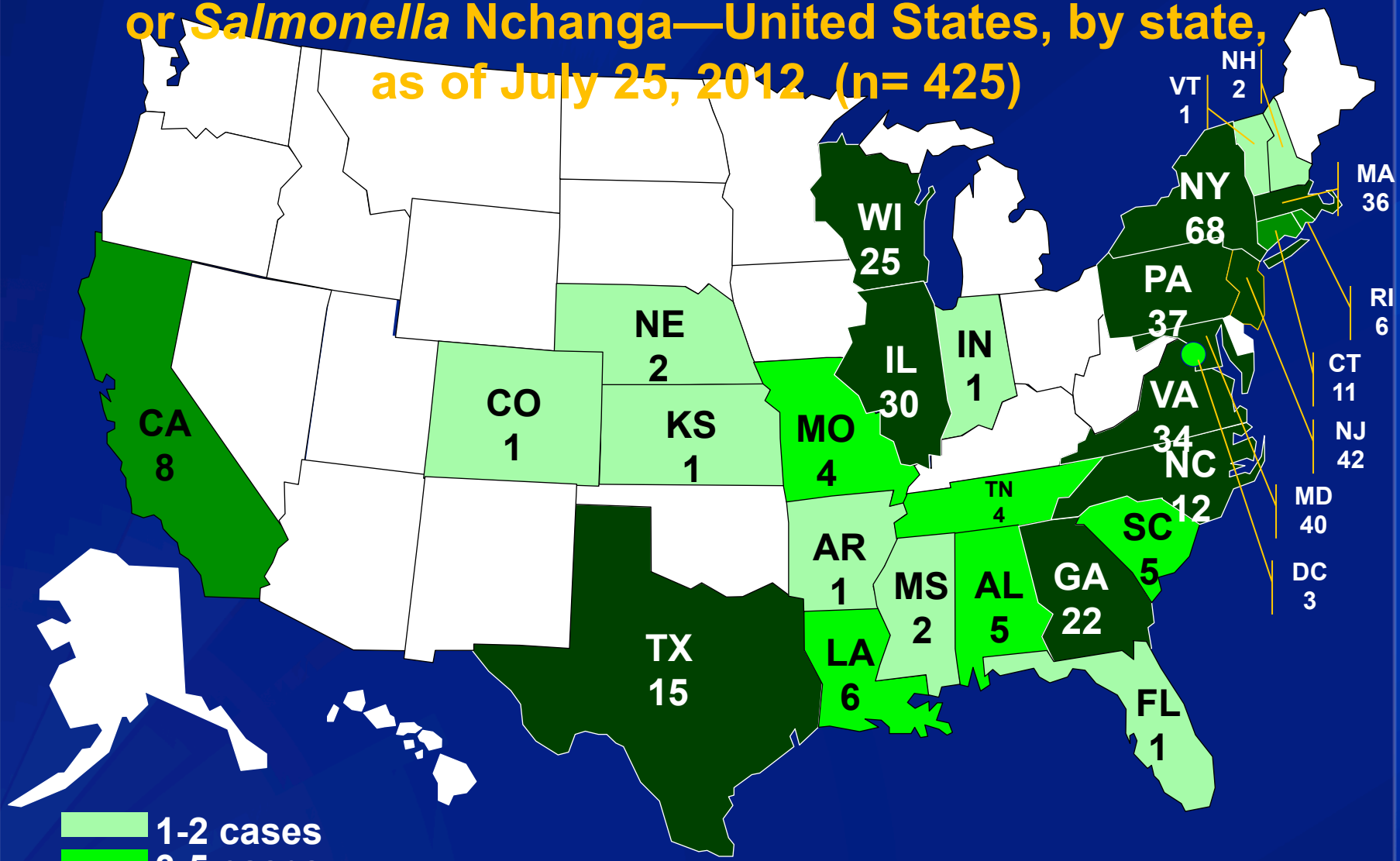
- **Caused by:** gram-negative bacteria
  - Sources include contaminated water and food
- **Time to symptom onset:** 6 to 72 hours
- **Symptoms/signs:**
  - Fever, abdominal pain, nausea, vomiting, diarrhea,
  - Bloodstream infections
- **Treatment:**
  - Rehydration
  - Antibiotics in certain cases



Largest Fish-Associated Outbreak

- January–July 2012
- *Salmonella* Bareilly and *Salmonella* Nchanga infections

Cases infected with the outbreak strains of *Salmonella* Bareilly or *Salmonella* Nchanga—United States, by state, as of July 25, 2012 (n= 425)



Largest Fish-Associated Outbreak

Nakaochi Scrape

Public Health Impact

- FDA Office in New Delhi, India
- Hazard Analysis and Critical Control Point (HACCP) Inspection

- Seafood HACCP Deficiencies
  - Controls for histamine
  - Controls for *Clostridium botulinum*
  - Significant sanitation concerns

Public Health Impact

- **Import Alert**
  - April 13, 2012: All fresh and frozen tuna from Company A detained and screened
- **Recalls**
  - April 13, 2012: Company A voluntarily recalled 58,828 lbs of frozen raw tuna scrape
  - May 10, 2012: Company A recalls an undetermined amount of tuna strips yet to enter commerce

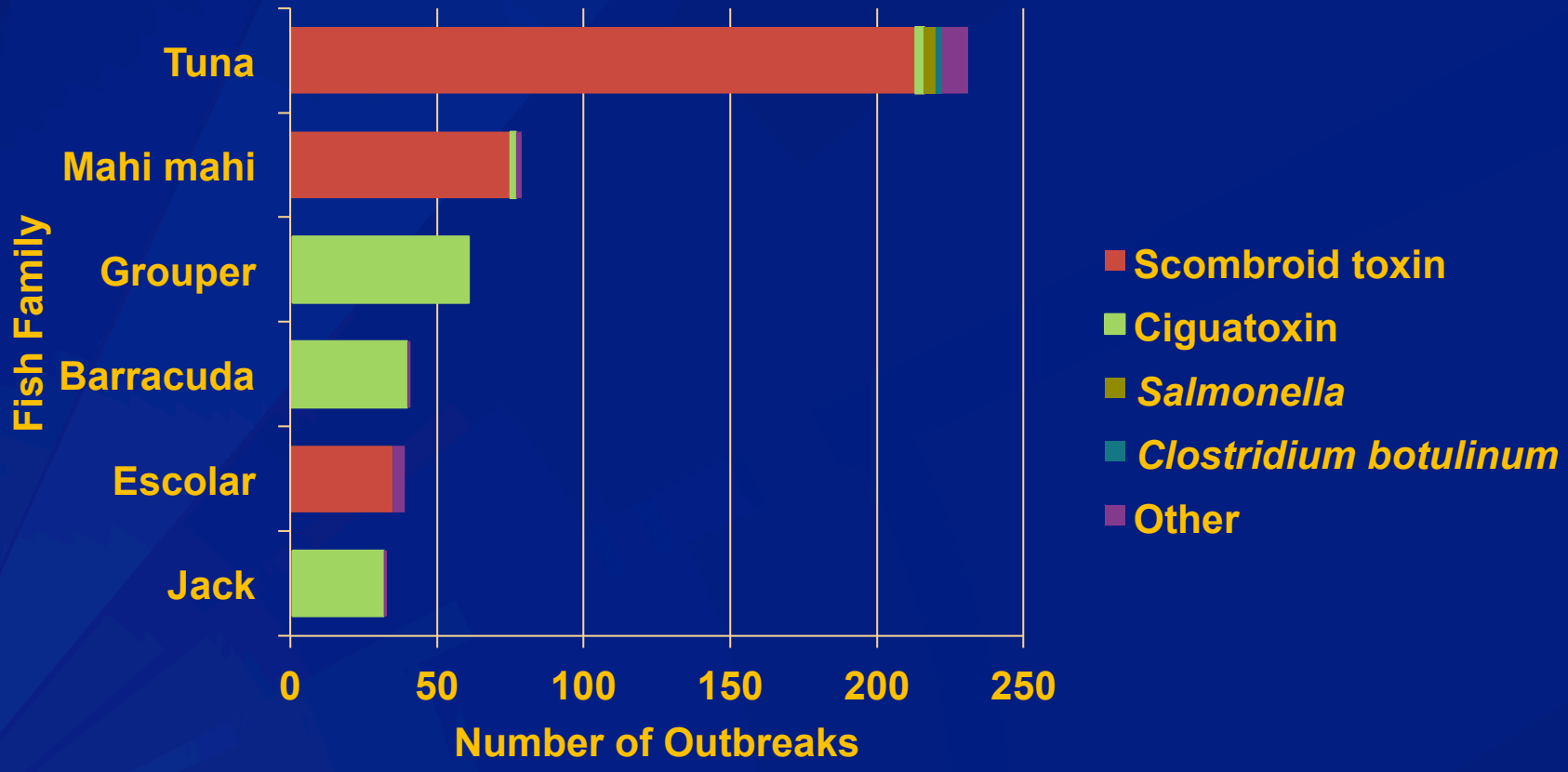
Number of Outbreaks by Fish Family**

Fish Family	Percent of Outbreaks
Tuna	**39%**
Mahi mahi	**13%**
Grouper	**10%**
Barracuda	6%
Escolar	6%
Jack	6%
Salmon	4%
Snapper	3%
Kole	3%
Marlin	3%
Other	8%
Total	**651**

**Among outbreaks with a reported fish family. 62 outbreaks with no reported fish family.

Number of Outbreaks by Fish Family and Etiology,

for Six Fish Families Associated with the Largest Number of Outbreaks



Preparation Method

- Raw or lightly cooked fish was implicated in 48 (10%) of 481 outbreaks with a reported preparation method
  - Tuna (30 of 173 outbreaks) and salmon (6 of 17 outbreaks) were the most common fish types reported consumed raw

Raw tuna

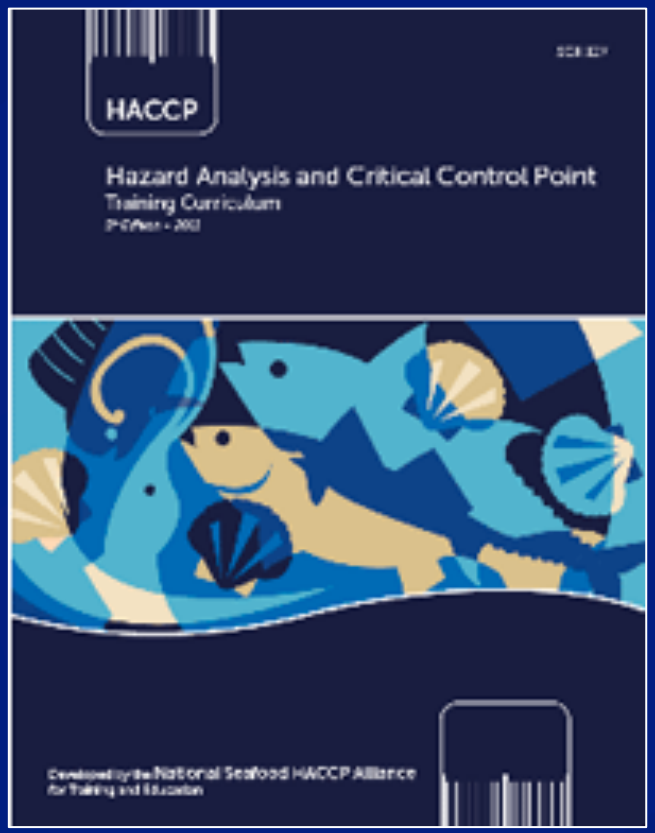
Raw salmon

Discussion

- Reported outbreaks attributed to fish declined from 1998–2012
  - Declines were driven by decreases in outbreaks associated with the most common etiologies and fish families reported by a few states
- Fish was consumed raw or undercooked in only a small proportion of outbreaks
- Most outbreaks were caused by scombroid toxin and ciguatoxin, which are not destroyed by cooking

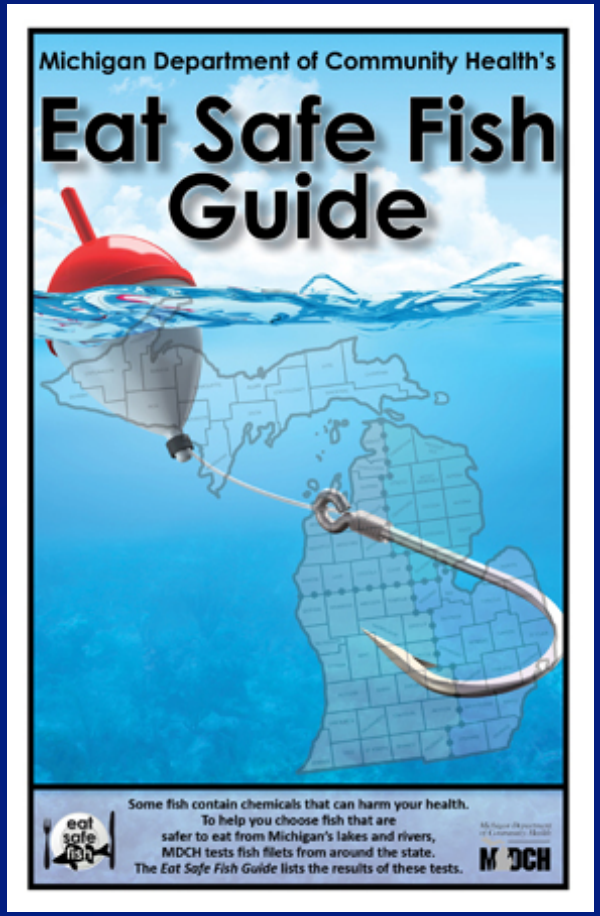
Possible reasons for the decline in the number of outbreaks attributed to fish…

- Hazard Analysis and Critical Control Point (HAACP)
  - HAACP principles mandated for seafood processing by the US Food and Drug Administration (FDA) in 1997 ensure safe and sanitary processing of fish and fishery products
  - FDA provides guidance to industry: “Fish and Fishery Products Hazards and Controls Guidance”



Possible reasons for the decline in the number of outbreaks attributed to fish…

- Guidelines on selection of appropriate harvest locations
  - States issue advisories to commercial and recreational fishermen to avoid reefs known to be toxic



Possible reasons for the decline in the number of outbreaks attributed to fish…

- **Reporting**
  - The decline may reflect changes in reporting and surveillance by some states

Possible reasons for the decline in the number of outbreaks attributed to fish…

- **Public awareness**
  - **Public health campaigns on safe procurement, storage, and preparation of fish may have prevented illnesses**

Possible reasons for the decline in the number of outbreaks attributed to fish…

Other ideas!

Recommendations

- Though reported outbreaks attributed to fish declined, fish continues to be one of the most common foods implicated in outbreaks

Recommendations

- Control measures targeting the most common etiologies implicated in outbreaks could further reduce outbreaks caused by fish
  - Proper fish storage
  - Selection of appropriate harvest locations
  - Appropriate preparation

Acknowledgments

- State, local, and territorial health departments
- CDC's National Outbreak Reporting System Team
- CDC's National Center for Environmental Health
- US Food and Drug Administration
- Florida Fish and Wildlife Conservation Commission
- Steve Otwell, Thomas Swenarton, Wayne Bennett, Gerald L. Hasty, Christie Wilcox

More prevention is possible.

For more information please contact Centers for Disease Control and Prevention

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Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: http://www.cdc.gov