The Conference for Food Protection Workshop,
"Trends & Innovation in Food Protection at Retail & Foodservice"
Boise, Idaho
April 16, 2016

"The increasing problem of outbreaks associated with produce" ?

Produce Outbreaks, United States, 1998–2013

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Acknowledgments

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- State Lab-based surveillance & outbreak investigation & reporting
- US Food & Drug Administration & state counterparts
- US Department of Agriculture & state counterparts
- L. Hannah Gould, PhD, MBA, MS
  - New York City Department of Health & Mental Hygiene
- Coauthors:
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Outbreaks from Unique Sources:
15 New Food VehiclesIdentified in US Multistate Outbreaks, 2006-2012

- *bagged spinach*
- *carrot juice*
- *peanut butter*
- *broccoli powder on a snack food*
- *dog food*
- *pot pies/frozen meals*
- *canned chili sauce*
- *hot peppers*
- *pepper*
- *raw cookie dough*
- *hazelnuts*
- *whole fresh papayas*
- *pine nuts*
- *kosher broiled chicken livers*
- *scraped tuna product*

Data Sources: Foodborne Disease Outbreak Surveillance System, CDC Web postings

26 New Food Vehicles Identified in US Multistate Outbreaks, 2006-2015

- *Bagged spinach*
- *Carrot juice*
- *Peanut butter*
- *Broccoli powder on a snack food*
- *Dog food*
- *Pot pies/frozen meals*
- *Canned hot dog chili sauce*
- *Fresh hot chili peppers*
- *Black pepper*
- *Tahini sesame paste*
- *Raw cookie dough*
- *Fresh papaya*
- *Frozen mamay fruit pulp*
- *Bologna*
- *In-shell hazelnuts*
- *Pine nuts*
- *Par-cooked, broiled chicken livers*
- *Scraped tuna*
- *Cashew cheese*
- *Sugar cane juice*
- *Sprouted chia seeds*
- *Almond butter*
- *Caramel apples*
- *Sprouted nut butters*
- *Dried mushrooms (in truffle oil puree)*
- *Wheat flour*

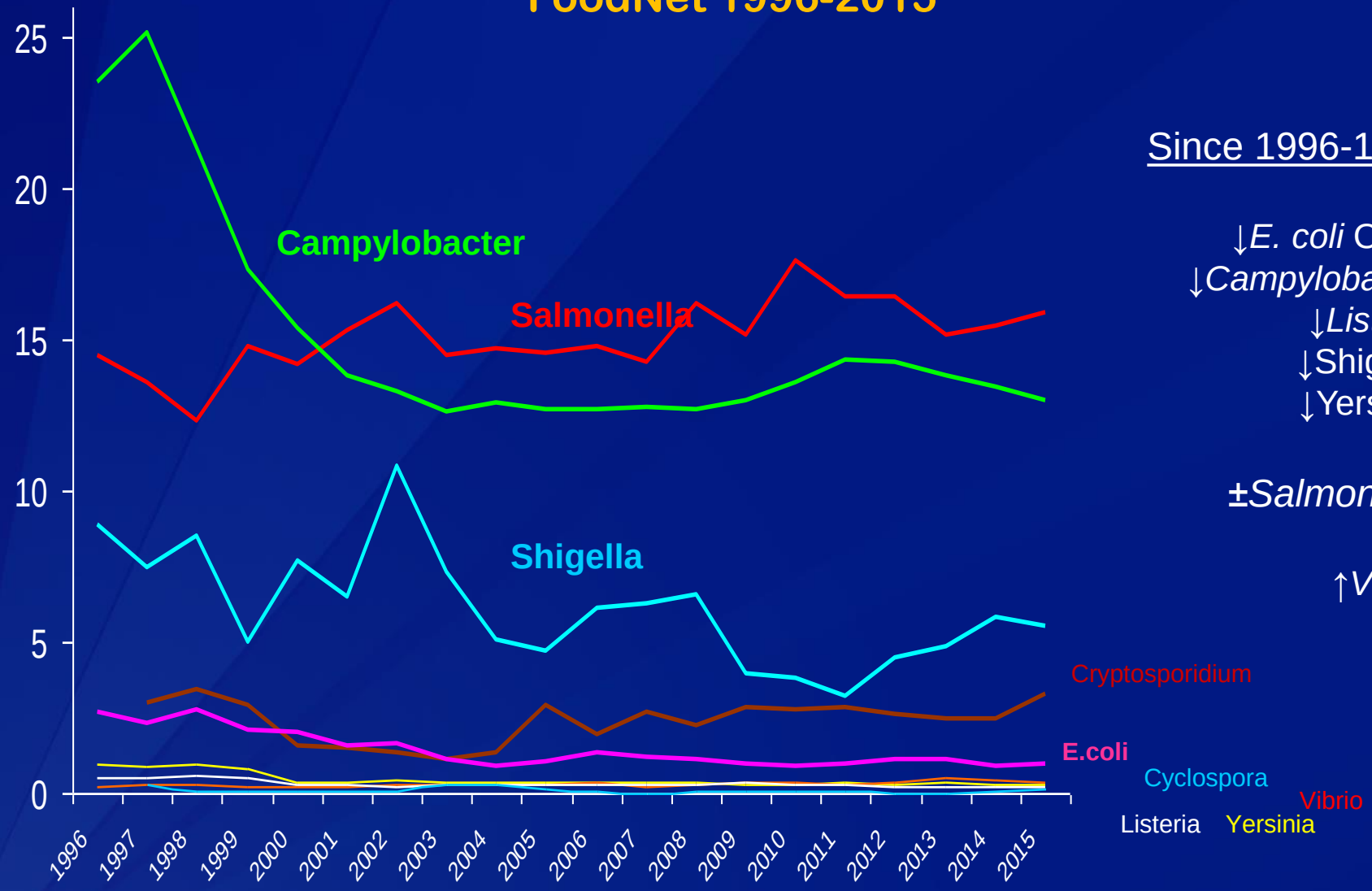
Trends of Pathogens Transmitted Commonly Through Food

Foodborne Diseases Active Surveillance Network, 2012-2015

MMWR print publication date: April 15, 2016

(EMBARGOED until April 14, 2016 at 12:00pm)

Crude Pathogen rates per 100,000
FoodNet 1996-2015



Since 1996-1998

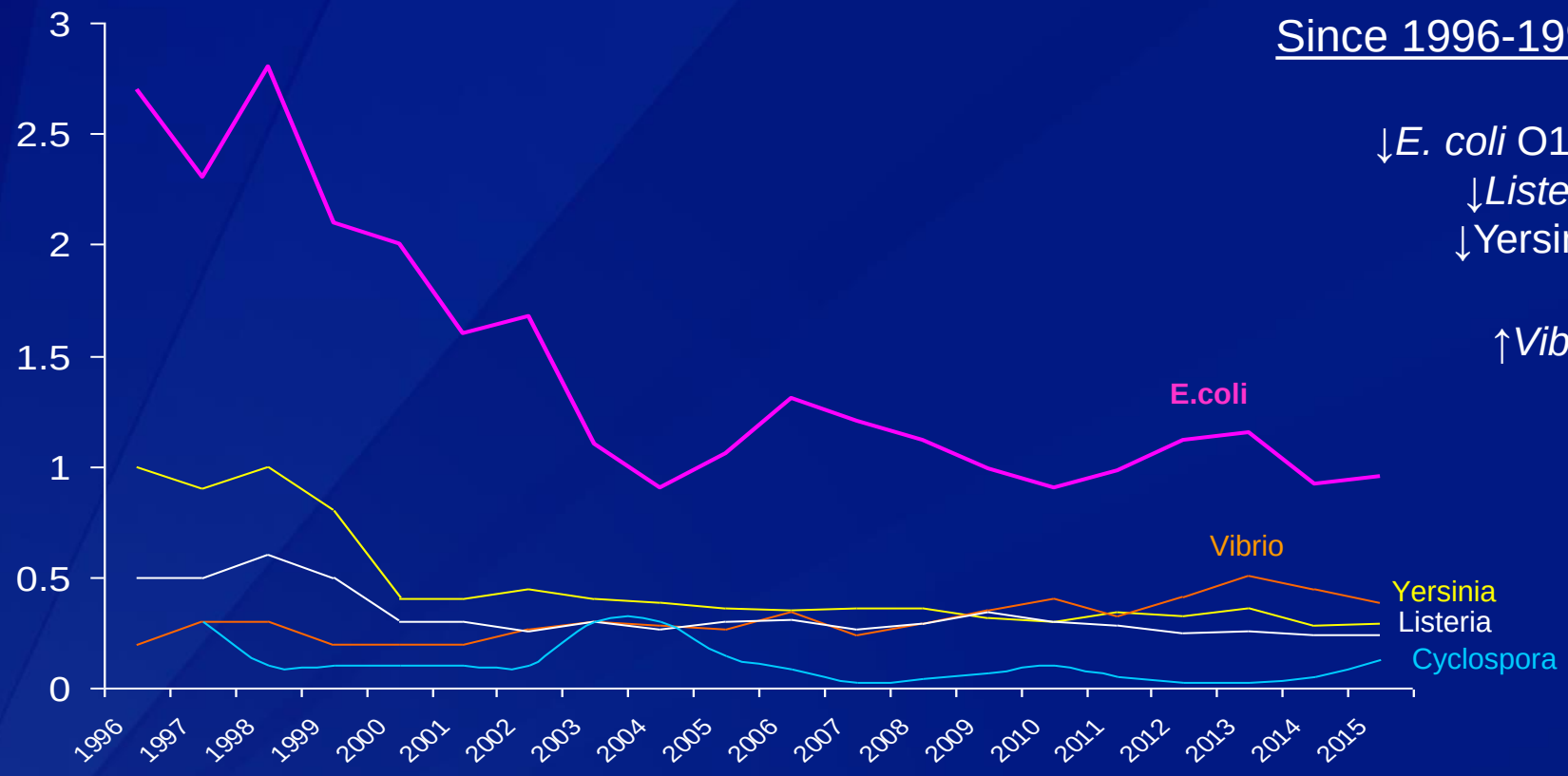
↓*E. coli* O157
↓*Campylobacter*
↓*Listeria*
↓Shigella
↓Yersinia

±*Salmonella*

↑*Vibrio*

http://www.cdc.gov/foodnet/index.html

Crude Pathogen rates per 100,000
FoodNet 1996-2015



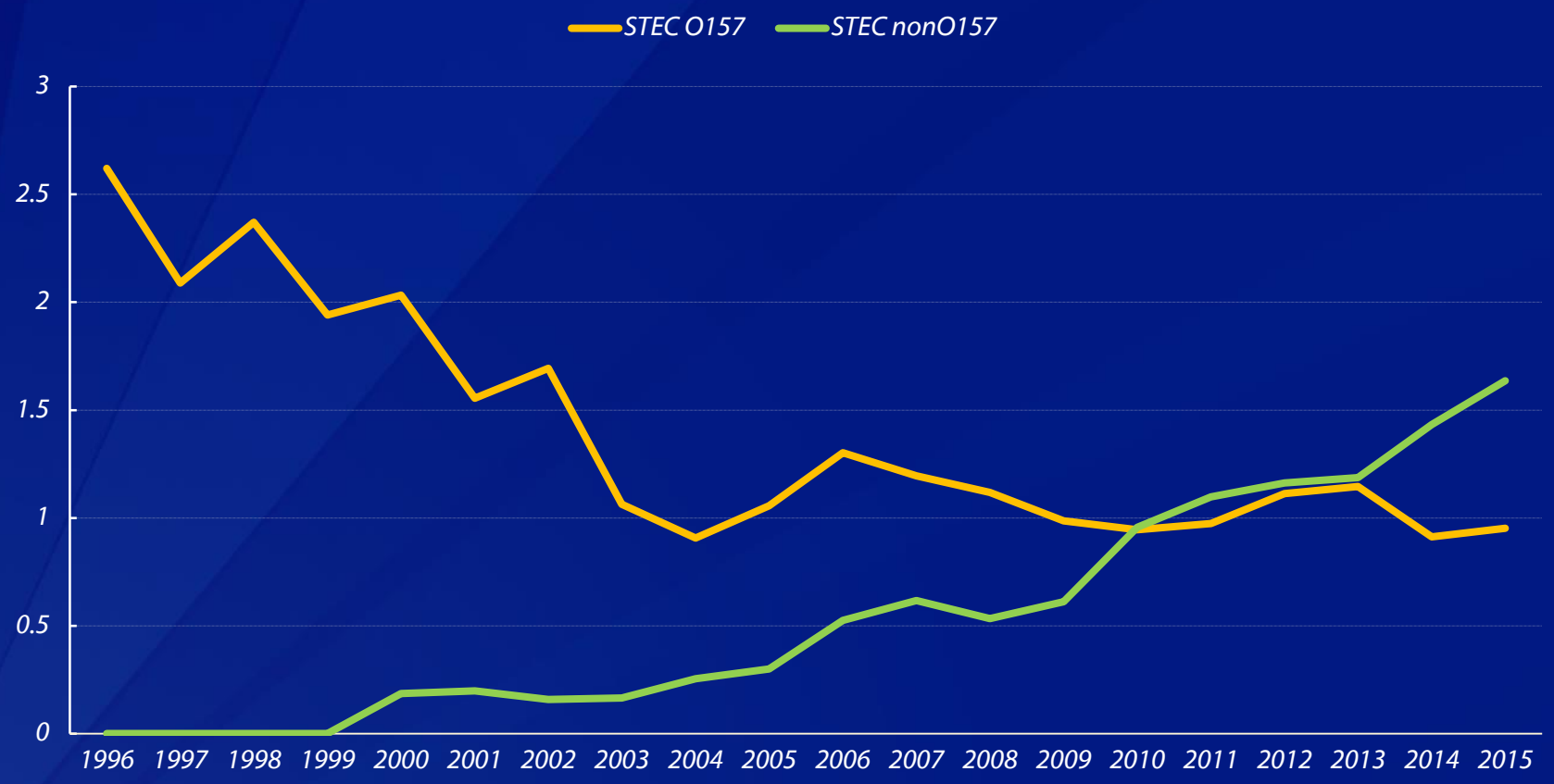
Since 1996-1998

↓*E. coli* O157
↓*Listeria*
↓Yersinia

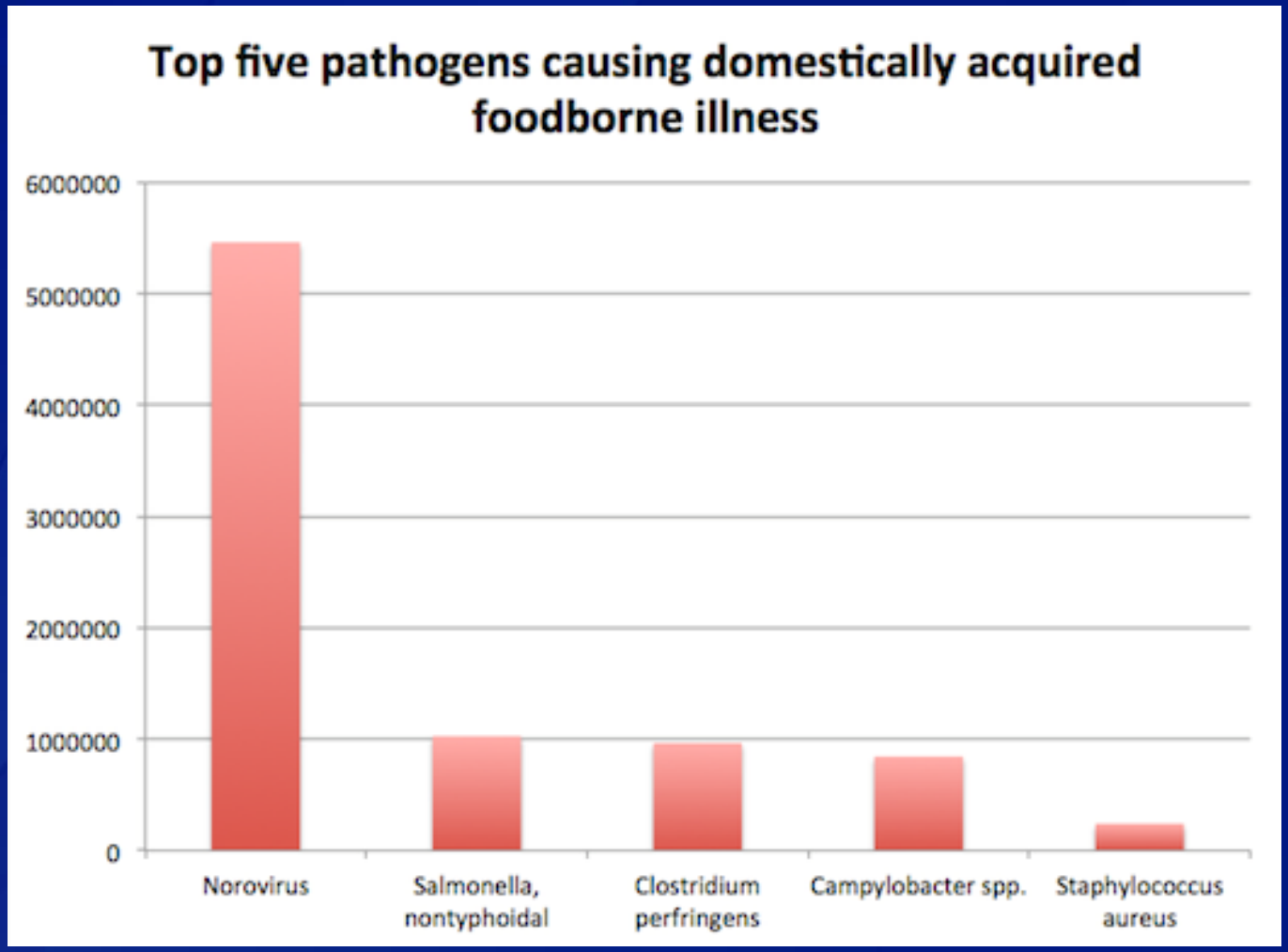
↑*Vibrio*

http://www.cdc.gov/foodnet/index.html

Incidence of STEC O157 & STEC nonO157—FoodNet, 1996-2015



Estimates of Foodborne Illness in the United States, 2011



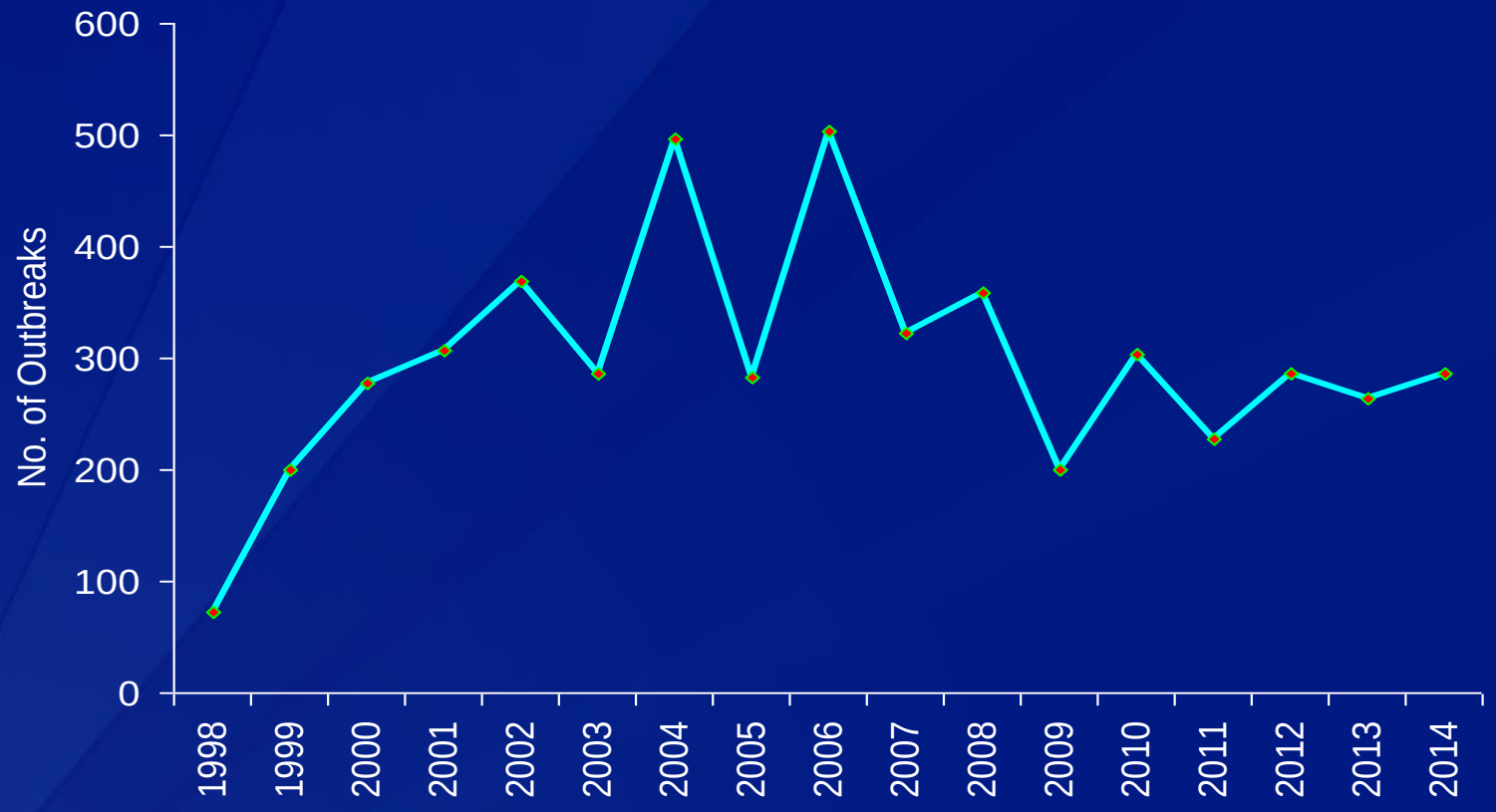
Reference: http://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article

NORS

- Reviewed outbreaks reported to
  National Outbreak Reporting System (NORS) , 1998-2013
  - Passive Surveillance
  - ≥2 illnesses resulting from the ingestion of food

http://www.cdc.gov/nors/

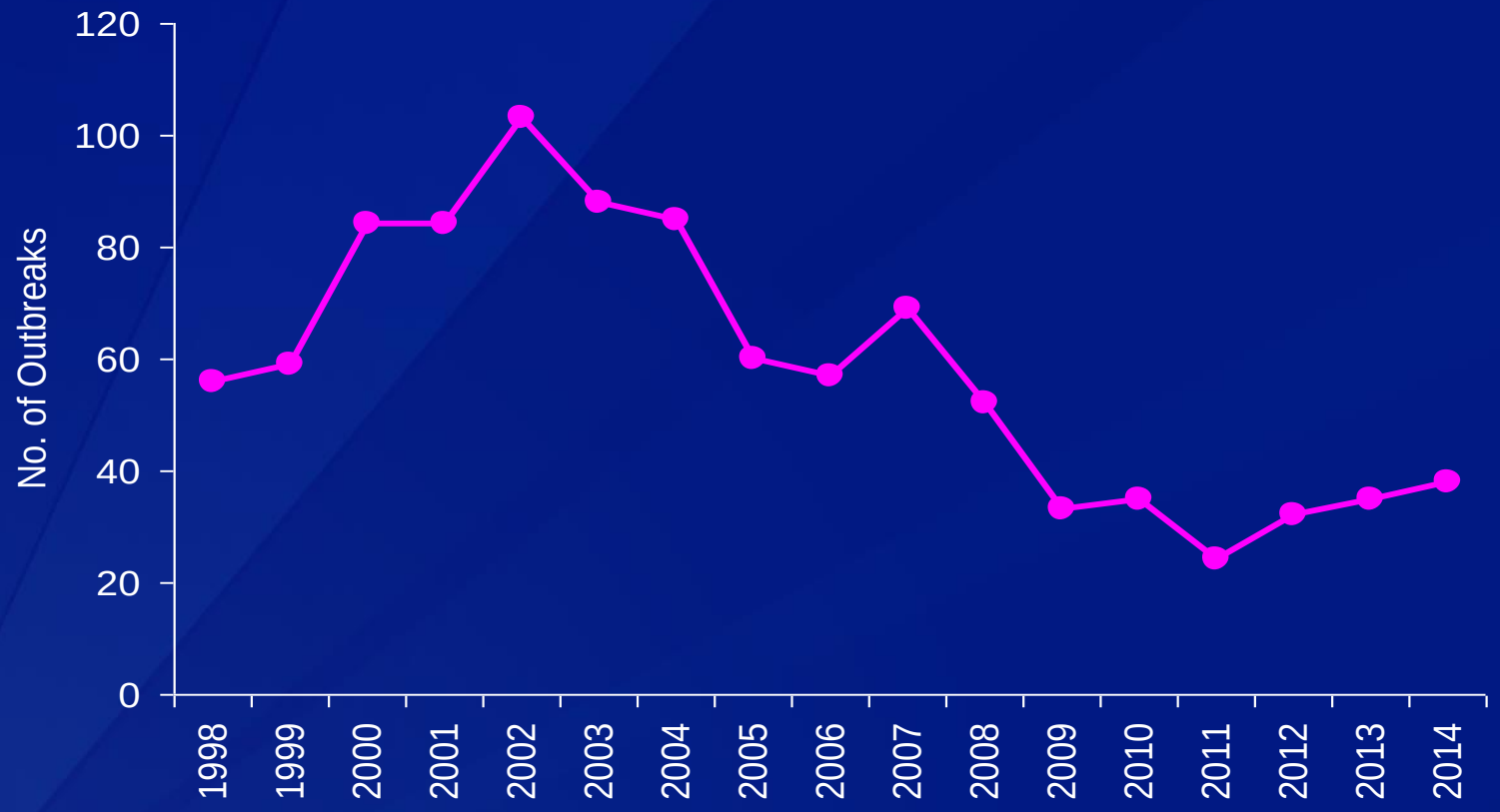
Outbreaks caused by Norovirus , 1998-2014



* Preliminary analysis

Source: http://wwwn.cdc.gov/foodborneoutbreaks/

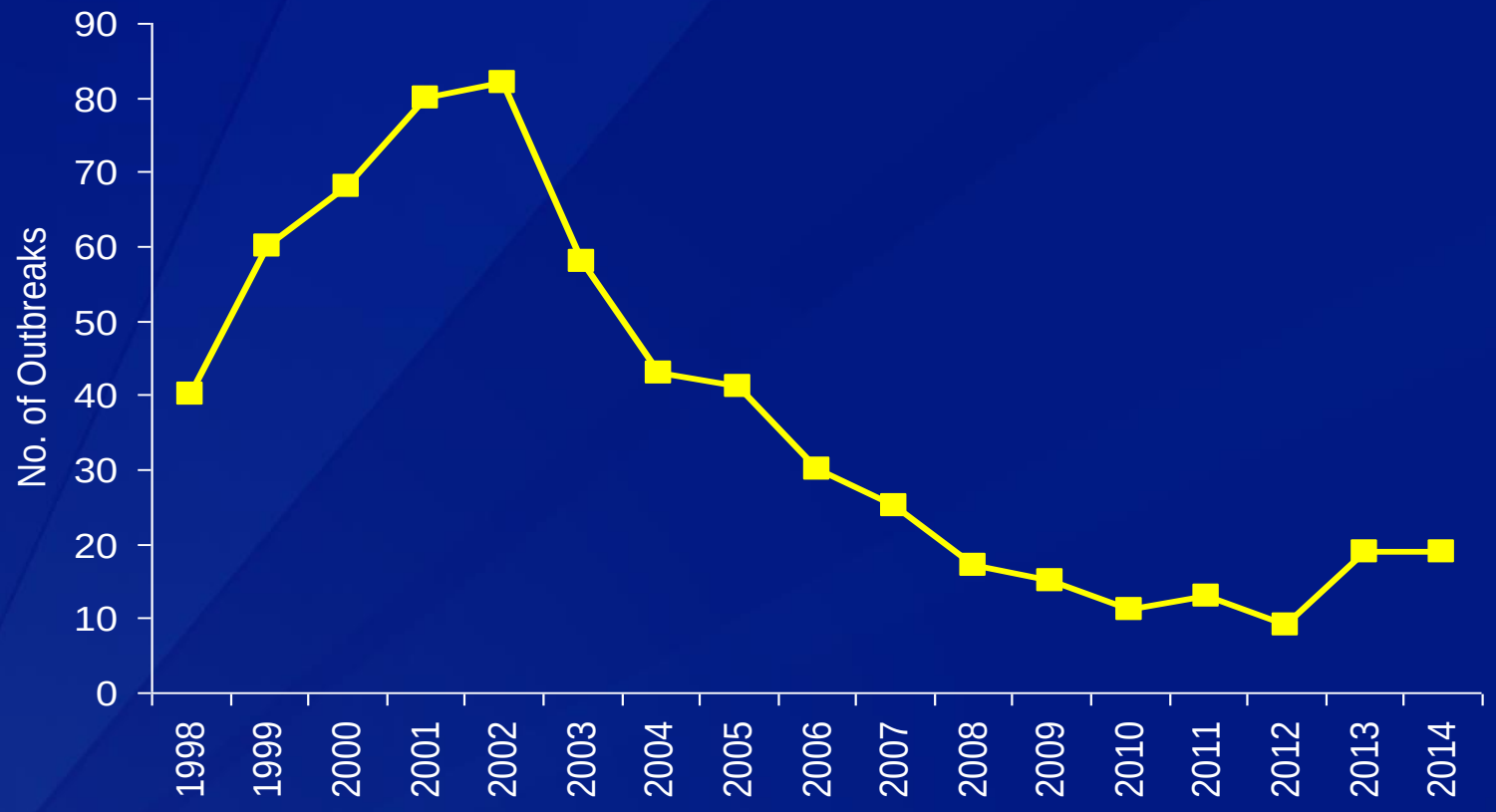
Outbreaks caused by Clostridium perfringens, 1998-2014



* Preliminary analysis

Source: http://wwwn.cdc.gov/foodborneoutbreaks/

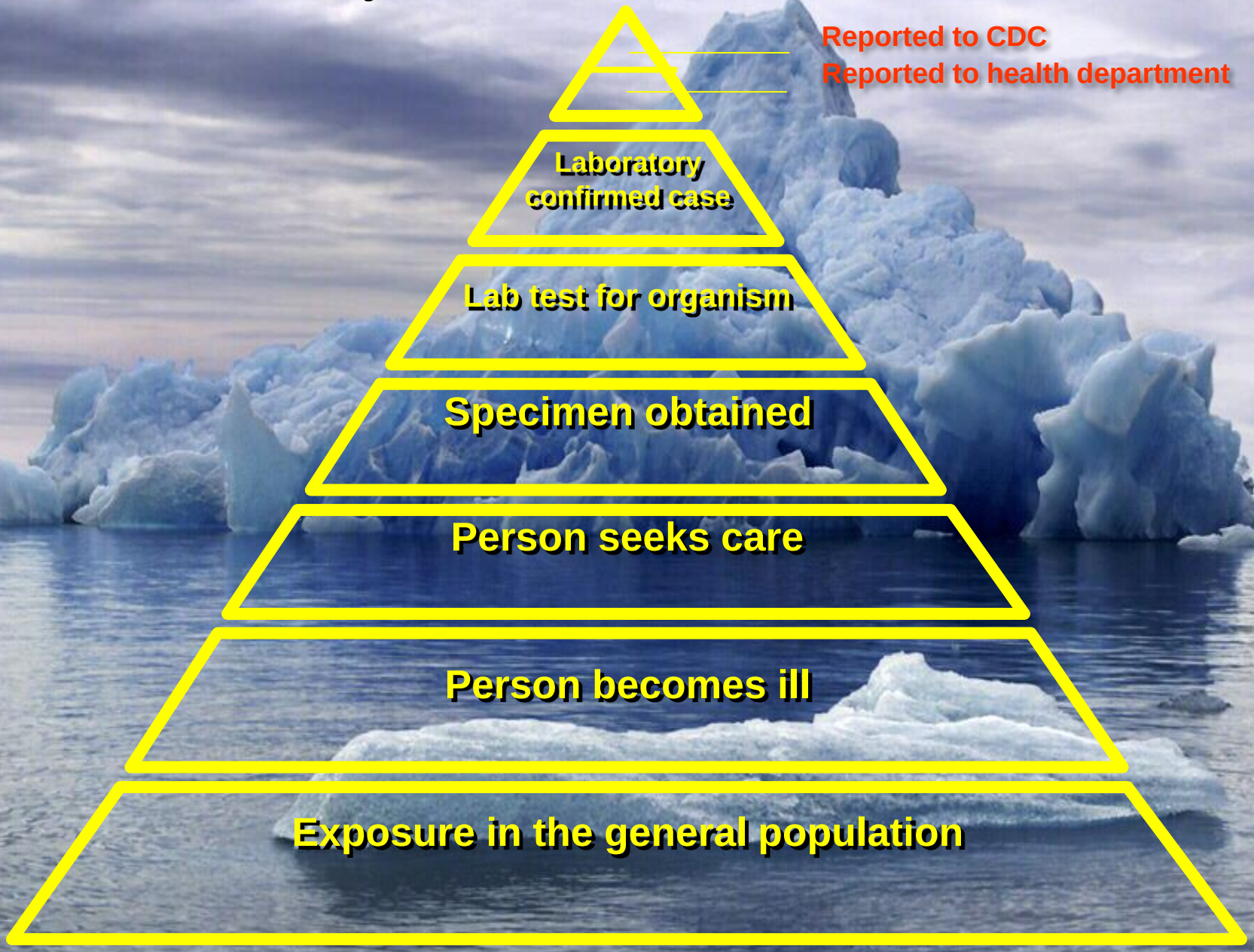
Outbreaks caused by Staphylococcus aureus, 1998-2014



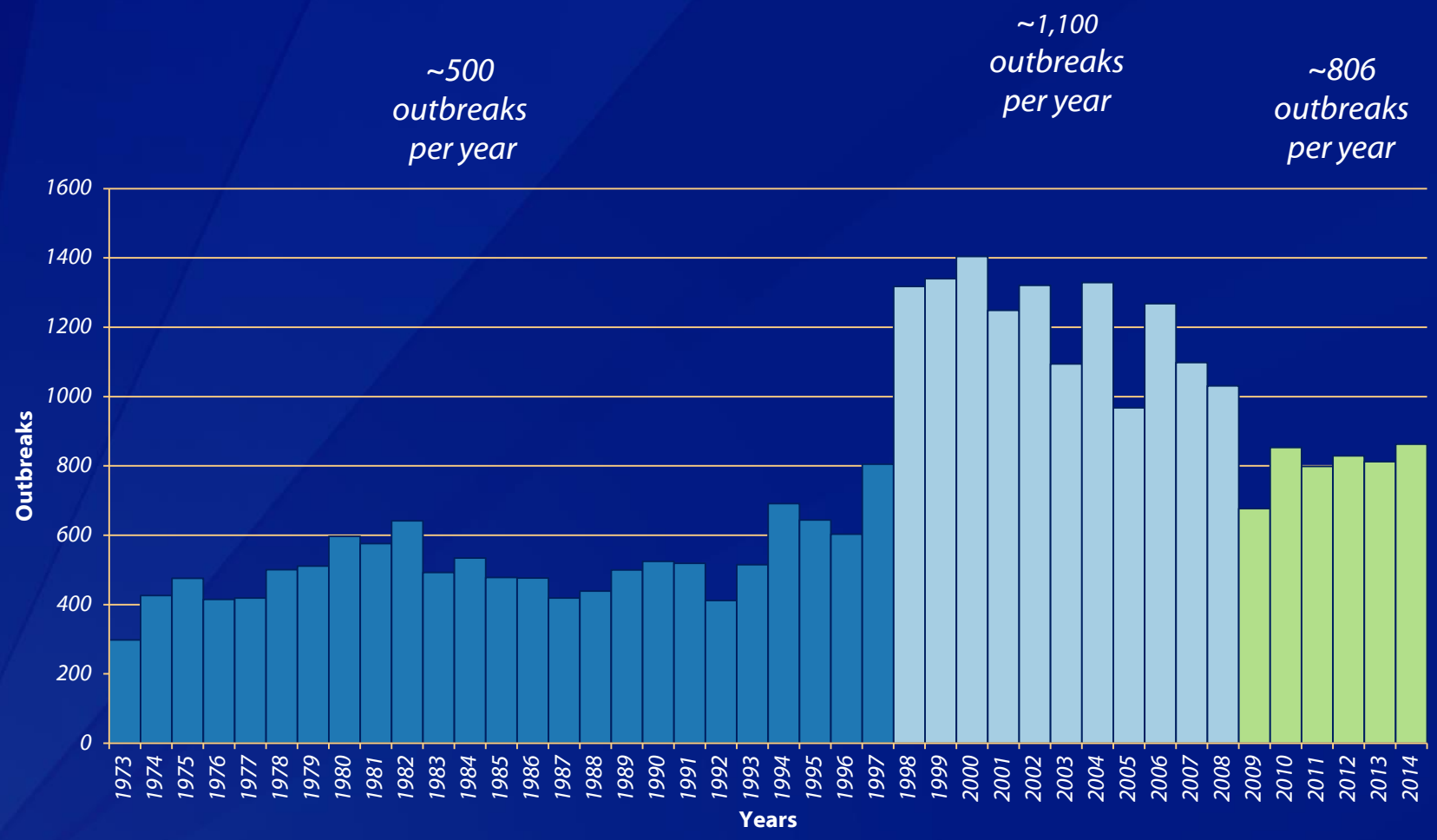
* Preliminary analysis

Source: http://wwwn.cdc.gov/foodborneoutbreaks/

The Surveillance Pyramid

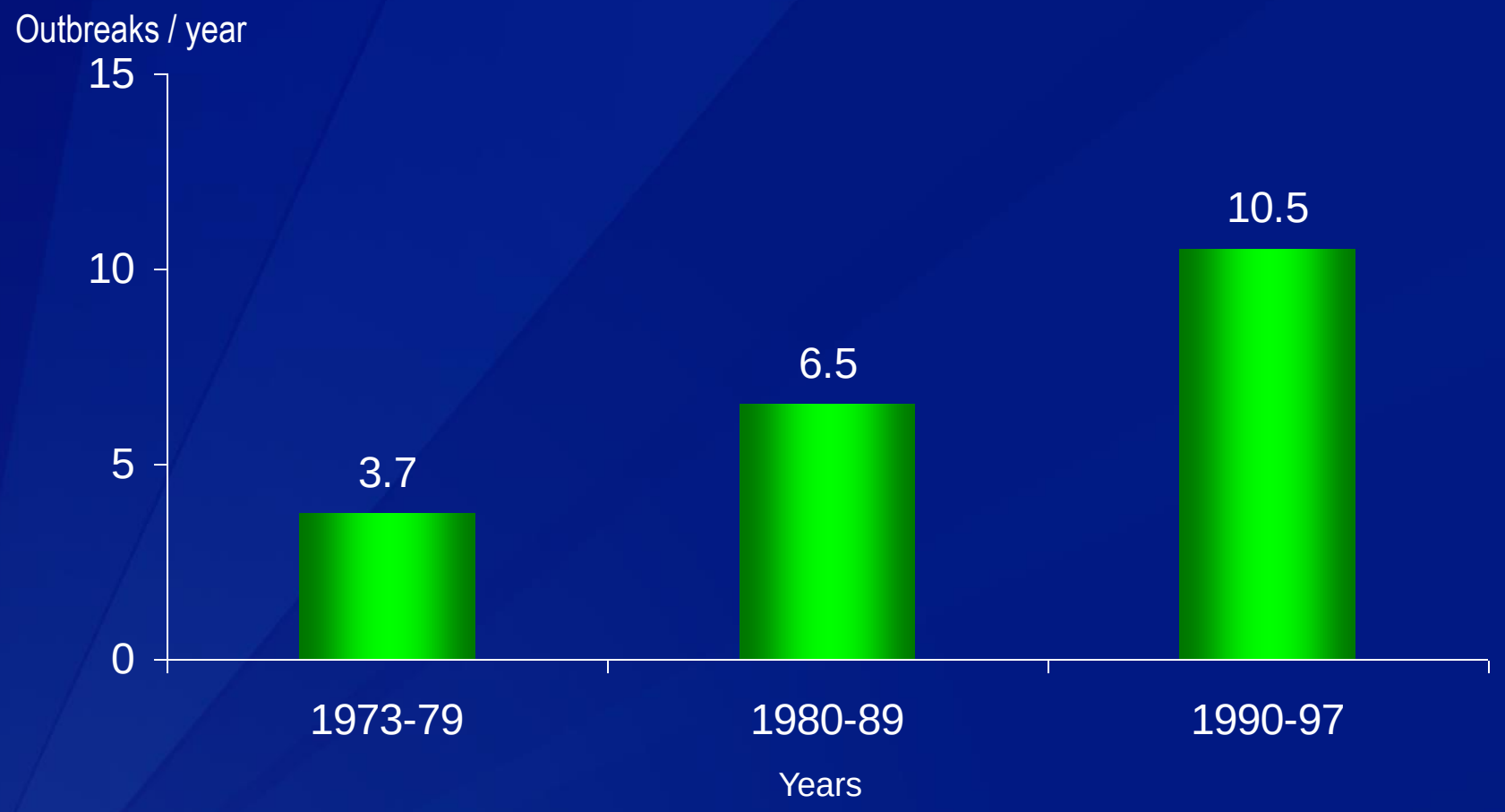


Foodborne Disease Outbreaks, 1973–2014



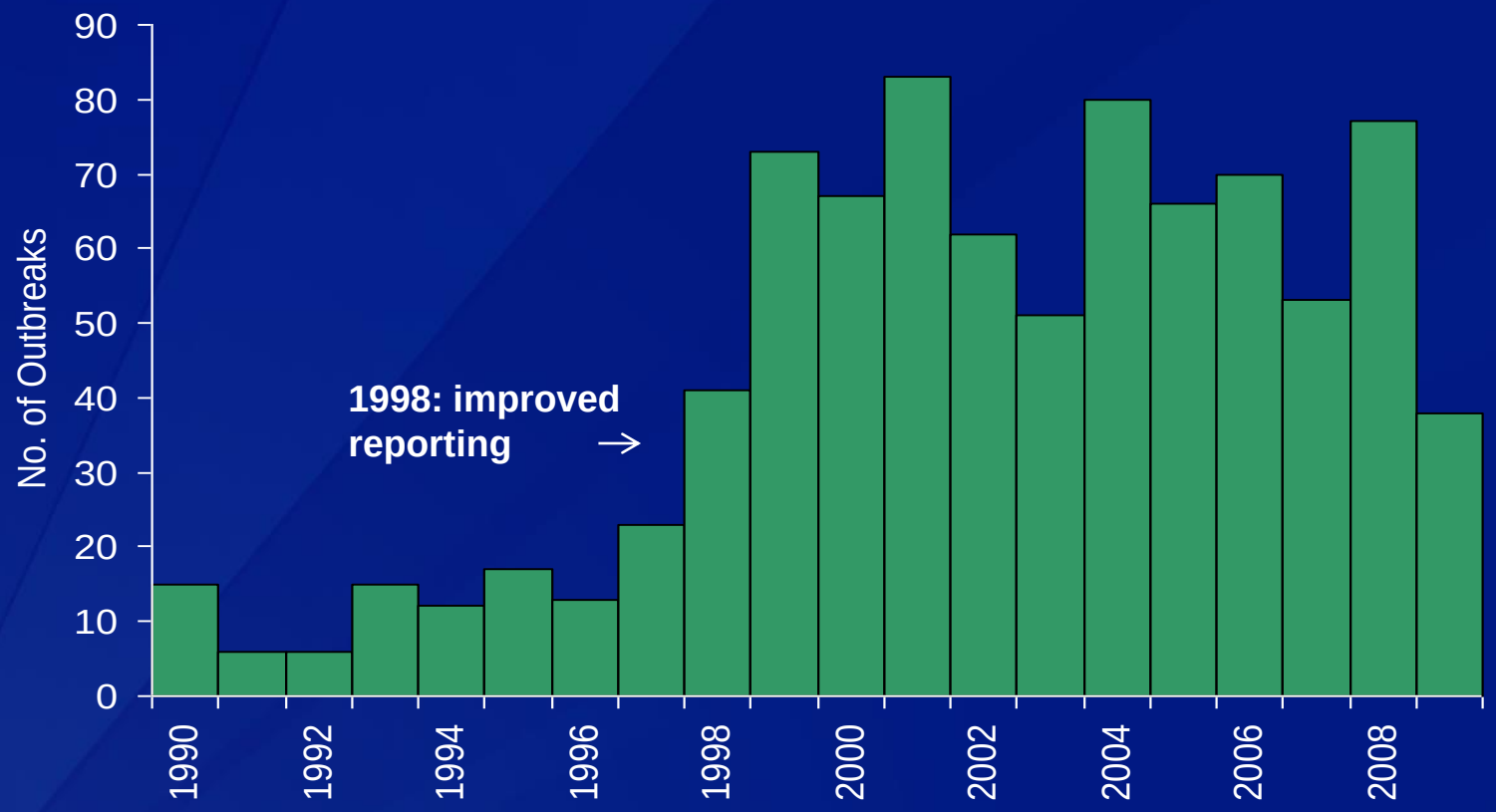
Data are preliminary & may change.

Average # of produce-associated outbreaks by decade, USA,1973-97*



* Source: CDC, Friedman CR, 40th Interscience Conference on Antimicrobial Agents & Chemotherapy, Sept 2000. NACMCF, Microbiological safety evaluations and recommendations on fresh produce, Food Control, Volume 10, Issue 2, April 1999, Pages 117–143,

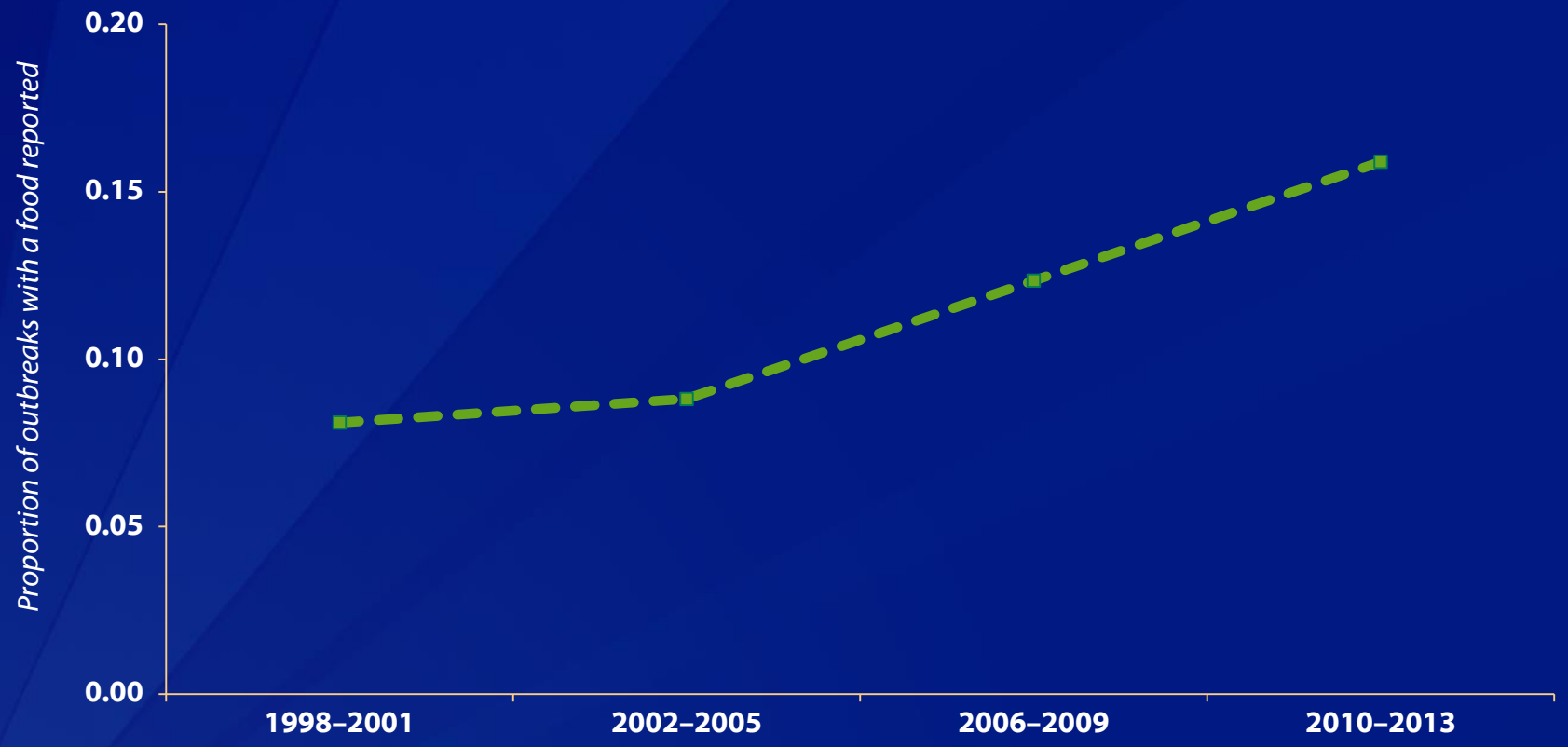
Outbreaks caused by Fresh Produce, 1990-2009



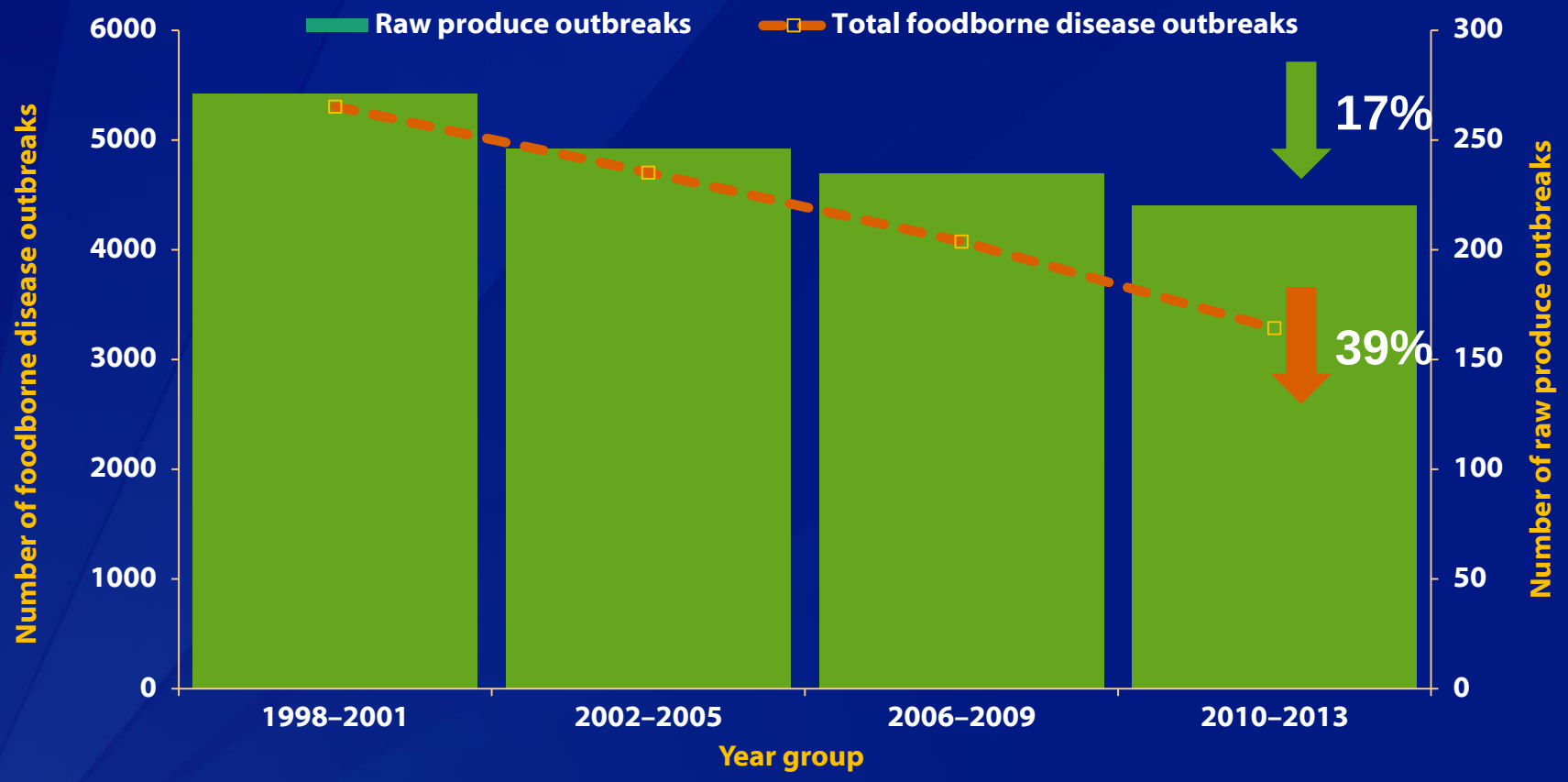
* Preliminary analysis

Source: CSPI Outbreak Alert Database http://www.cspinet.org/foodsafety/outbreak/pathogen.php

Increasing proportion of outbreaks with a food reported were caused by raw produce



Number of foodborne disease outbreaks & outbreaks attributed to raw produce

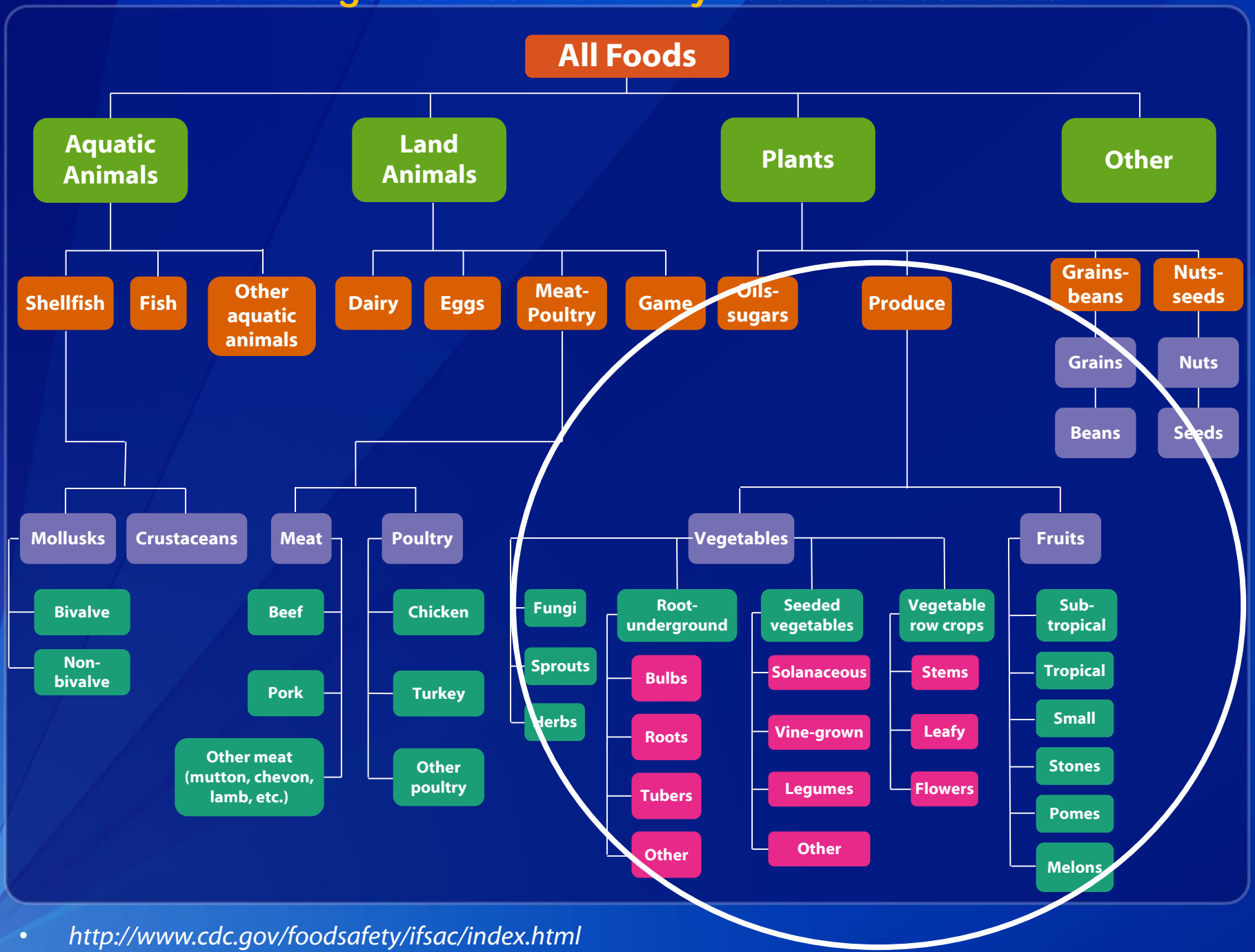


Methods

- Reviewed outbreaks reported to National Outbreak Reporting System (NORS) , 1998-2013
  - Passive Surveillance
  - ≥2 illnesses resulting from the ingestion of raw produce
    - Only included outbreaks associated with raw produce
  - Analysis
    - Number of outbreaks, illnesses, outcomes
    - Etiologic agents
    - Types of produce

http://www.cdc.gov/nors/

Food categories used for analysis of outbreak data



- *http://www.cdc.gov/foodsafety/ifsac/index.html*

Outbreaks associated with raw produce, 1998-2013

17,374 foodborne outbreaks

9,422 (54%) with food reported

972 (10%) consumption of raw produce

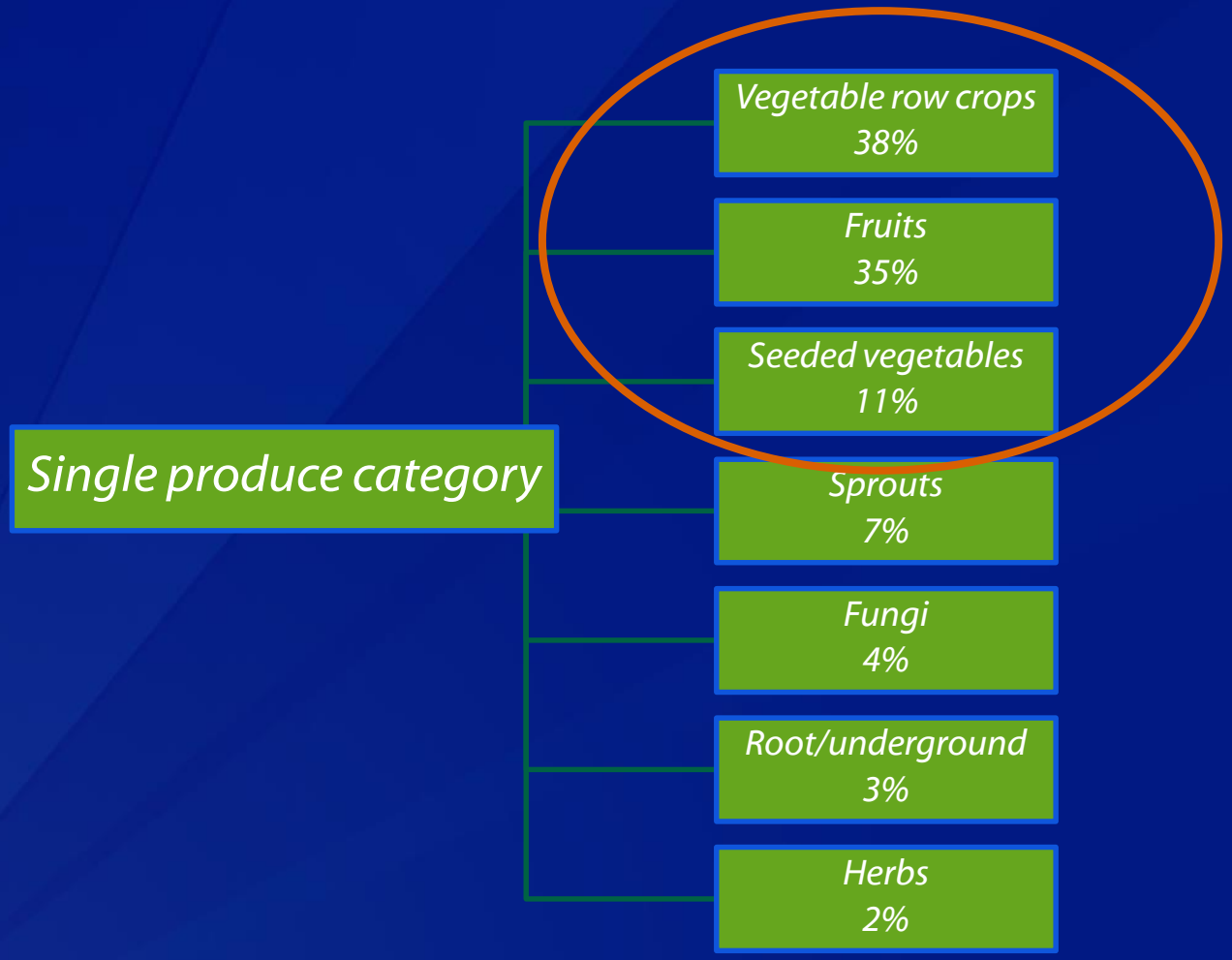
- *34,674 illnesses*
- *2,315 hospitalizations*
- *72 deaths*

Outbreaks not categorized further (n=345)

Not categorized

- *Salad*
  226 outbreaks
- *Mexican-style dips/salsas*
  62 outbreaks
- *Mixed vegetables*
  57 outbreaks

Types of produce implicated in outbreaks (n=612 with single produce category)



Outbreaks associated with vegetable row crops (n=235)

Leafy

98%

Stem

1%

Flowering

1%

Types of leafy vegetables implicated in outbreaks (n=78)

Lettuce

- *Romaine* 26%
- *Leaf* 19%
- *Iceberg* 18%
- *Mesculun* 5%

Other leafy vegetables

- *Cabbage* 12%
- *Spinach* 6%
- *Scallions* 5%
- *Kale* 3%
- *Arugula* 1%

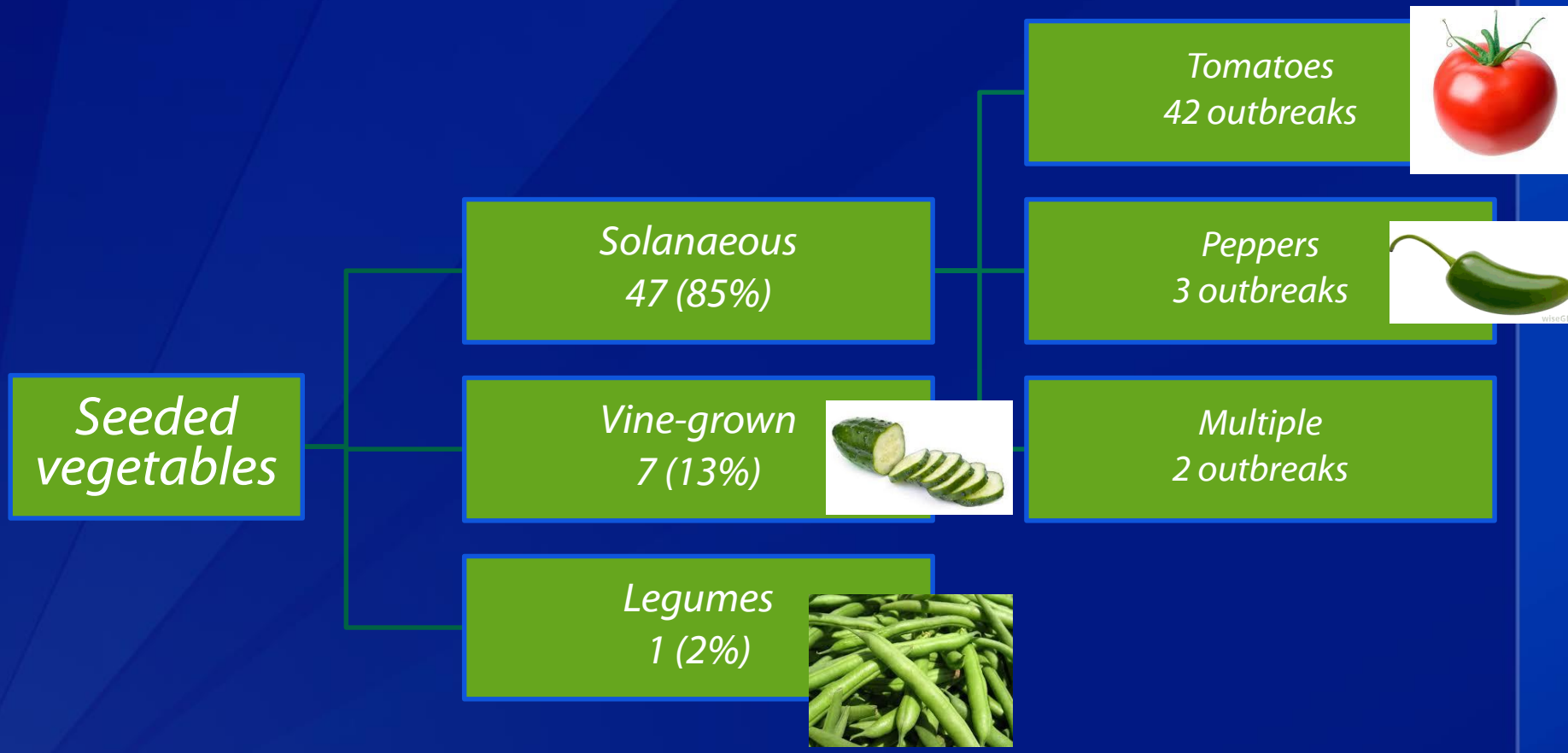
Outbreaks associated with fruits (n=216)

Further categorized (110)

- *Melons 38%*
- *Small 27%*
- *Pome 14%*
- *Sub-tropical 12%*
- *Tropical 7%*
- *Stone 2%*

'Mixed fruit', 'Fruit salad', 'Fruit' (106)

Outbreaks associated with seeded vegetables (n=66)



3 pathogens caused 85% of outbreaks associated with produce

Etiology	Number outbreaks
Norovirus	418 (54%)
Salmonella	167 (21%)
Newport	31 (19%)
Enteritidis	22 (14%)
Typhimurium	18 (11%)
Shiga toxin-producing *E. coli*	74 (10%)

Most common pathogen-food pairs causing outbreaks

Pathogen	Vegetable Row Crops	Fruits	Seeded Vegetables
Norovirus	119	93	15
Salmonella	9	51	36
Shiga toxin-producing *E. oli*	41	13	2

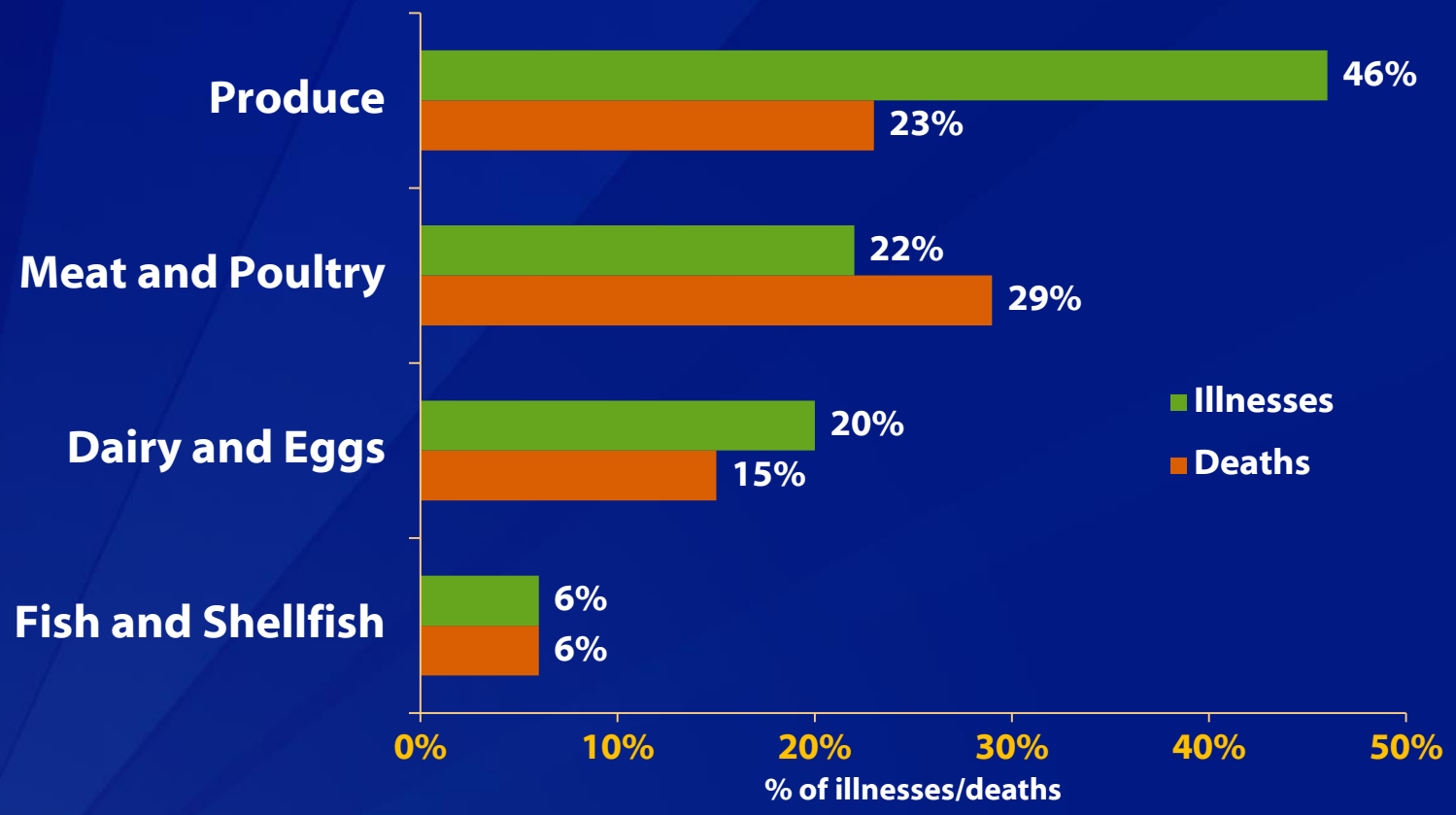
Role of ill food handlers

- ~ ¼ of outbreak reports implicated an ill food handler
- By produce category:
  - 30% of outbreaks associated with vegetable crops
  - 23% of outbreaks associated with fruits
  - 3% of outbreaks associated with seeded vegetables
- 78% of norovirus outbreak reports

Limitations

- Not all foodborne disease outbreaks are detected, investigated, & reported
- Data did not always clearly indicate if produce was consumed raw
- Processing & packaging data was limited
- Sources of food implicated & points of contamination was incomplete

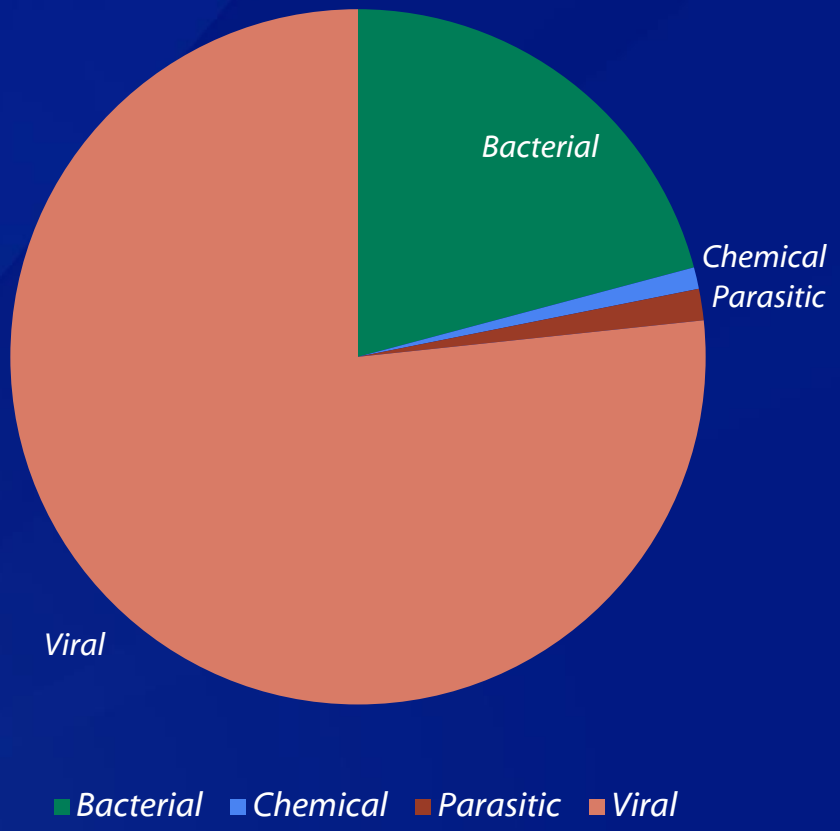
Conclusions:
Role of produce in foodborne illness, 1998–2008



- Painter JA, Hoekstra RM, Ayers T et al. Attribution of foodborne illnesses, hospitalizations, & deaths to food commodities by using outbreak data, United States, 1998–2008. Emerg Infect Dis. 2013 Mar

Estimated annual foodborne illnesses attributed to produce, by pathogen type, USA, 1998–2008*

N = 4,924,877



http://wwwnc.cdc.gov/eid/article/19/3/pdfs/11-1866.pdf

Conclusions

- 1973-2000, there was a continuous increase in the # of fresh produce associated outbreaks.
- 1998–2013, total produce outbreaks decreased. Proportion of outbreaks attributed to raw produce increased.
- Many types of raw produce cause outbreaks, although leafy vegetables & fruits most common

Many studies of "sporadic" illness do NOT associate fruit & vegetable items with illness

Food	Agent	Study*
↓ Risk: Berries, Carrots strawberries, apples, pears, raw vegetables	Campylobacter	Adak, Cowden et al. 1995 Kapperud, Espeland et al. 2003 Neimann, Engberg et al. 2003 Friedman, Hoekstra et al. 2004 Schonberg-Norio, Takkinen et al. 2004 Wingstrand, Neimann et al. 2006
↓ Risk: Fruit & vegetables	Salmonella	Gillespie, O'Brien et al. 2005 Doorduyn, Van Den Brandhof et al. 2006
↓ Risk: Fruit & vegetables	E coli O157:H7	Kassenborg, Hedberg et al. 2004 Voetsch, Kennedy et al. 2007 Rivas, Sosa-Estani et al. 2008
↓ Risk: Fruit & vegetables	Cryptosporidia	Robertson, Sinclair et al. 2002 Khalakdina, Vugia et al. 2003 Roy, DeLong et al. 2004
↑Risk: melons at commercial establishment	Listeria	Varma , Samuel et al. 2007

The Last Word

- The vast majority of meals are safe
  - these estimates do not provide information on the risk of illness per serving
- Fruits & vegetables are an essential part of a healthy diet
  - they are linked to a reduced risk of heart attack, stroke, & cancer

These attribution estimates are important because they can help regulatory agencies & industry to target prevention efforts that will improve the safety of the foods that we need & that we love to eat

Source: Christopher R. Braden, M.D., National Center for Emerging & Zoonotic Infectious Diseases
January 30, 2013

Foodborne Outbreak Online Database Tool

Search Options: Clear All

- Year
- State
- Location of Preparation
- Food/Ingredient Clear
- Etiology

This data was last updated on 10/16/2015.

Disclaimer: FOOD Tool 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. CDC uses more detailed information for its analyses of the causes and risk factors of foodborne disease outbreaks. Please read the full disclaimer before using this data.

Current Search: 1998 to 2014 | cucumber Clear

Clear All

Outbreaks per State Display: U.S. Map

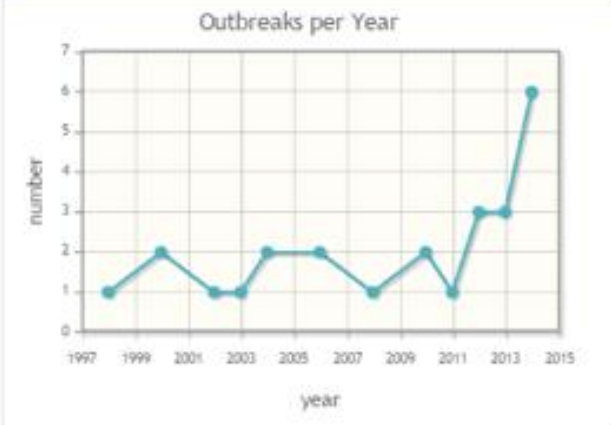
Quick Stats - Current Search

25	Outbreaks
1,200	Illnesses
104	Hospitalizations (8.7%)
1	Deaths (0.1%)

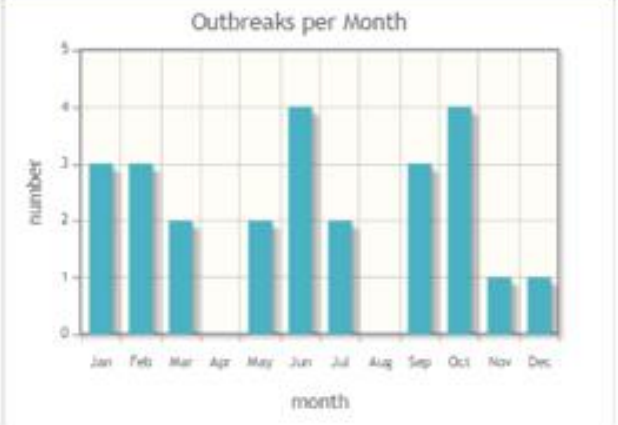
Quick Stats - Overall

18,211	Outbreaks
358,391	Illnesses
13,715	Hospitalizations (3.8%)
318	Deaths (0.1%)

Year Display: Outbreaks



Month Display: Outbreaks



http://wwwn.cdc.gov/foodborneoutbreaks/

Thank you

For more information please contact Centers for Disease Control & Prevention
1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info