

Salmonellosis linked to Backyard Poultry United States, 2016

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National Poultry Improvement Plan
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National Center for Emerging and Zoonotic Infectious Diseases

Division Name in this space



CDC Enteric Zoonoses Team

- **Rapid response and management of zoonotic enteric disease outbreaks**
 - *Salmonella*
 - *E. coli*
 - Occasionally other pathogens (e.g., *Listeria*, *Campylobacter*)
- **Focused on dispersed multistate zoonotic outbreaks**
- **Coordinate efforts of local, state, and federal health officials**
 - CDC PulseNet
 - State and local health departments
 - USDA Food Safety Inspection Service (FSIS) – *meat and poultry*
 - USDA Animal Plant Health Inspection Service
 - FDA Centers for Veterinary Medicine – *animal feed and products*
 - Other countries

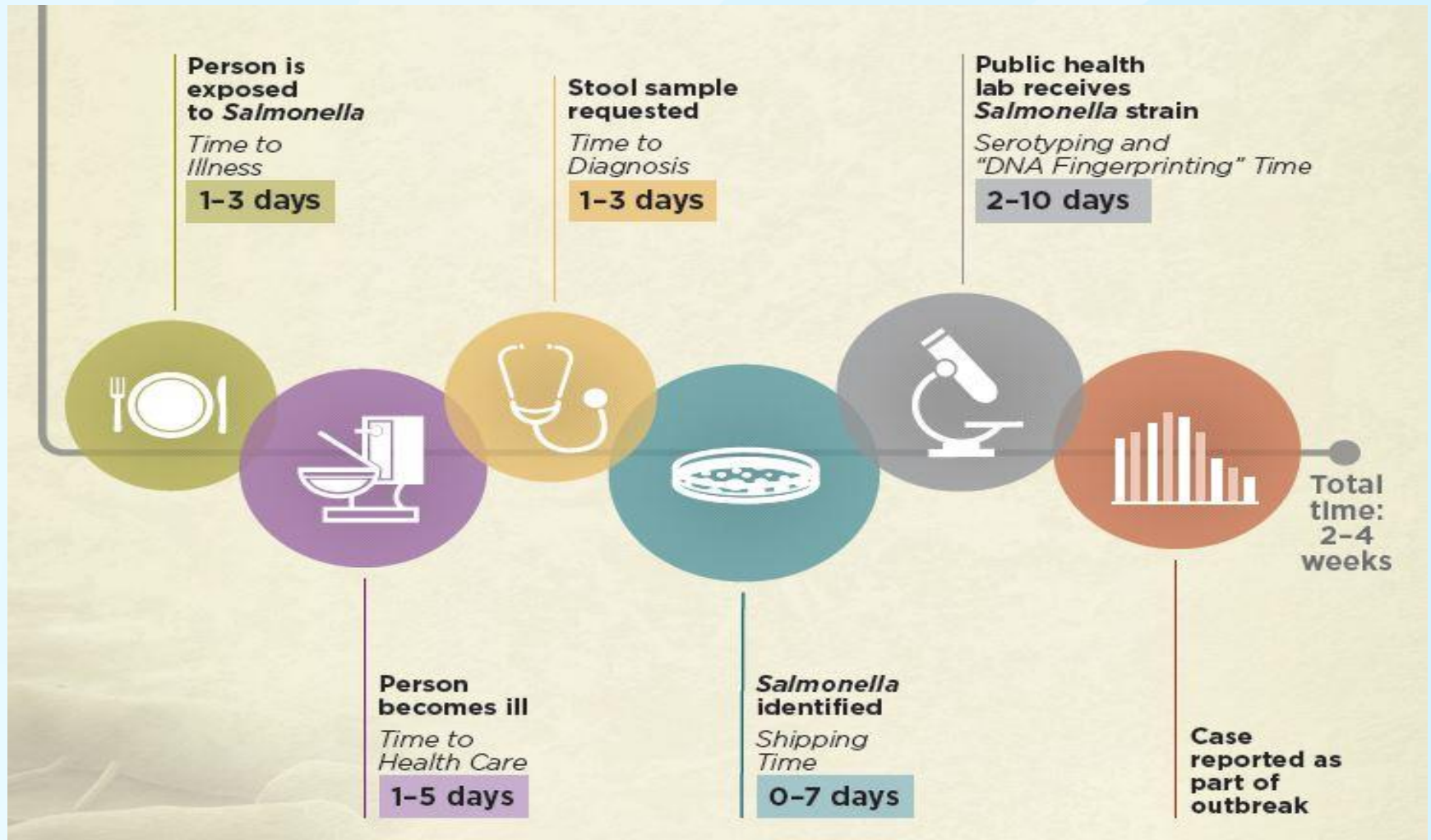
What is an outbreak?

- **An incident in which two or more unrelated people experience a similar illness after contact a common exposure, and epidemiologic analysis implicates the exposure as the source of the illness**

Outbreak investigations are a major driver for reducing disease burden

- **Prevent additional cases in current outbreak**
- **Identify a new pathogen or problem**
- **Determine what went wrong in order to prevent future similar outbreaks**
 - **Define risks associated with ownership of certain animals**
 - **Identify areas for education of owners and consumers**
 - **Stimulate further specific research**
 - **New processes or regulations**

Timeline for Reporting *Salmonella* Infections



Detecting Outbreaks with PulseNet

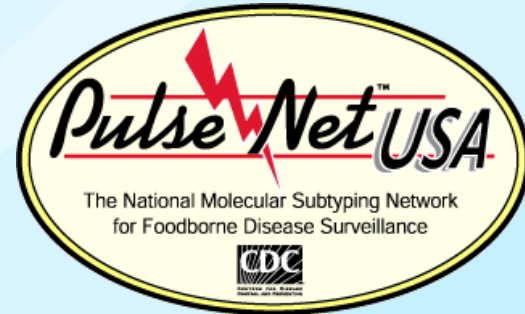
- National network of 87 state public health and regulatory laboratories, established in 1996
- When bacteria are collected from an ill person, labs create “DNA fingerprints” using pulsed-field gel electrophoresis (PFGE) and other techniques



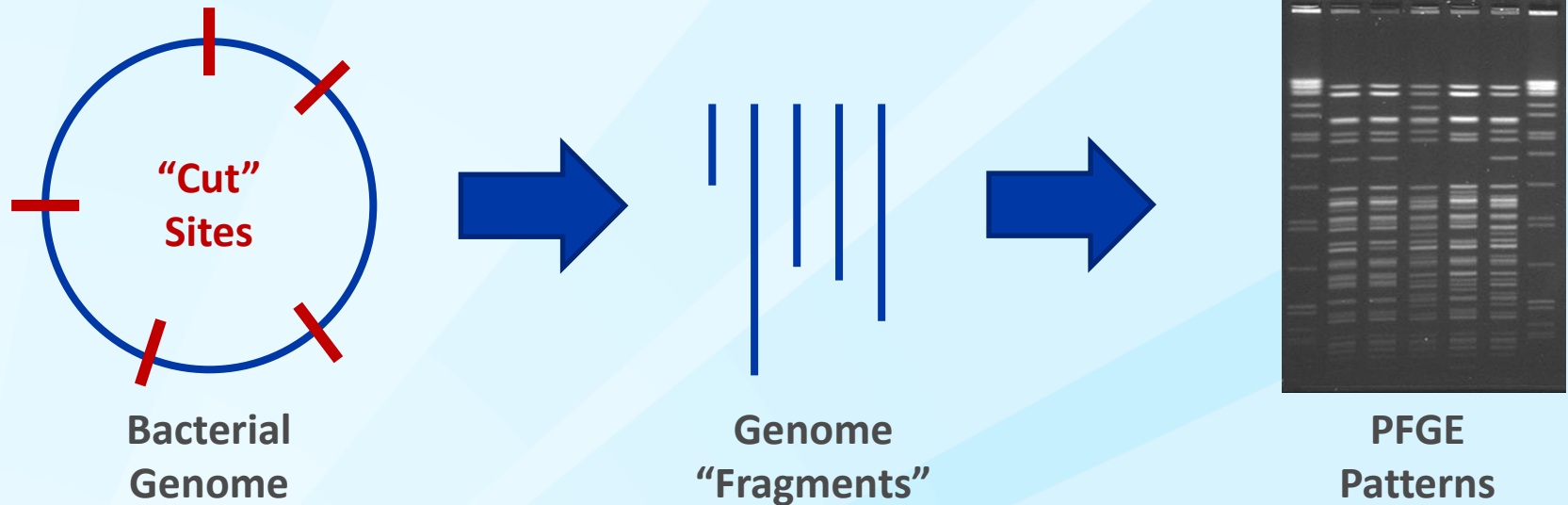
PFGE banding pattern



- Bacteria with the same DNA fingerprint are more likely to come from a common source

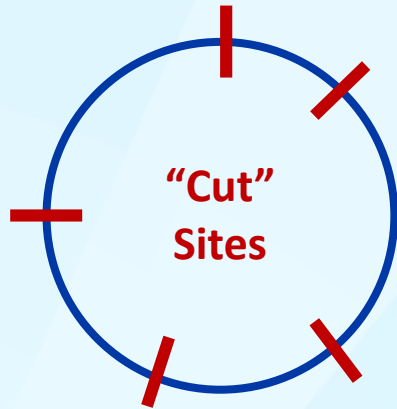


Conceptual Framework for PFGE Subtyping



- Analogous to comparing two books based on the number of words in each chapter

Whole Genome Sequencing Provides a Higher Resolution View of the Bacterial Genome



PFGE only gives information at a "cut" site via the banding pattern

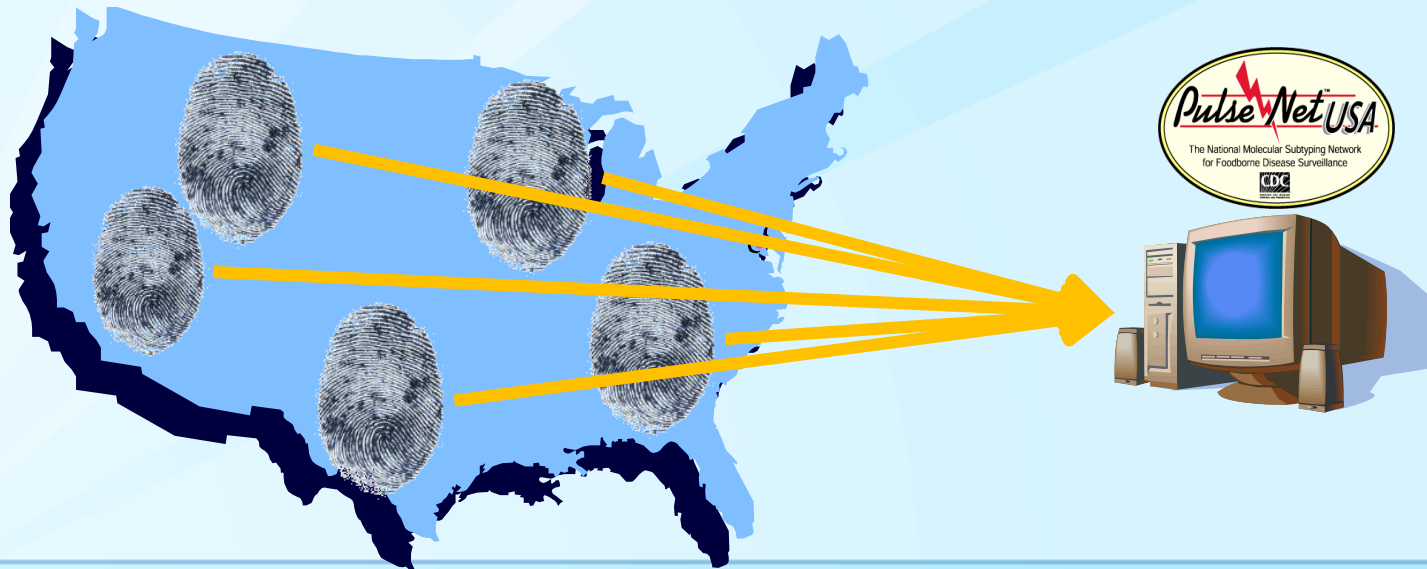


WGS has the ability to give us information at (nearly) every position in the bacterial genome

- Analogous to comparing two books based on all the words in the book
- Can identify resistance and other genes directly from sequence data when subtyping is performed

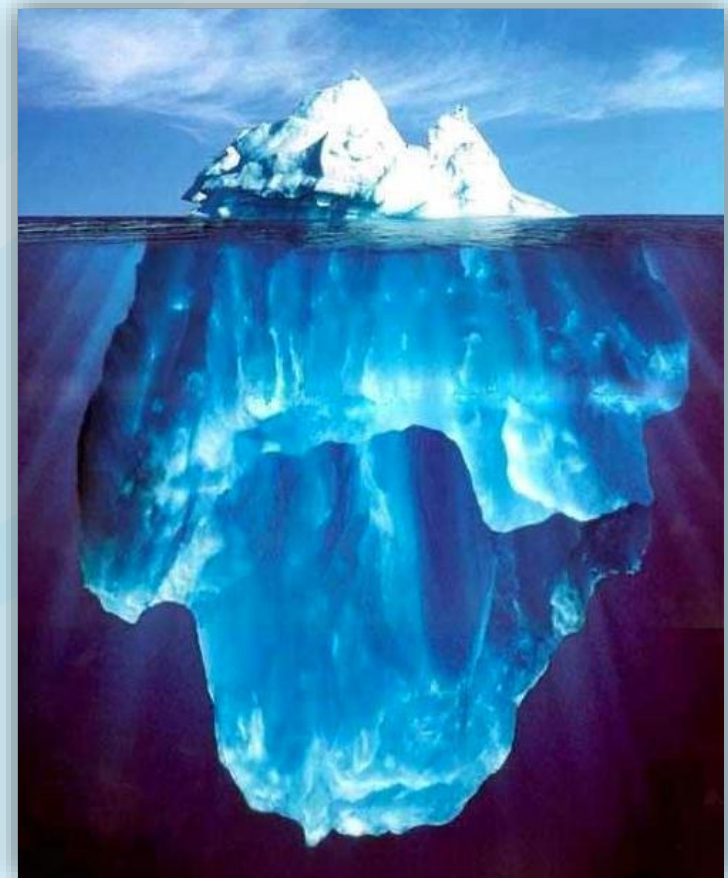
Detecting Outbreaks with PulseNet

- PFGE patterns or WGS data from illness-causing bacteria uploaded to the PulseNet USA database
- Monitored for temporal clusters with the same pattern
- When a cluster is identified, PulseNet notifies epidemiologists to investigate



PulseNet-Confirmed Cases: The Tip of the Iceberg

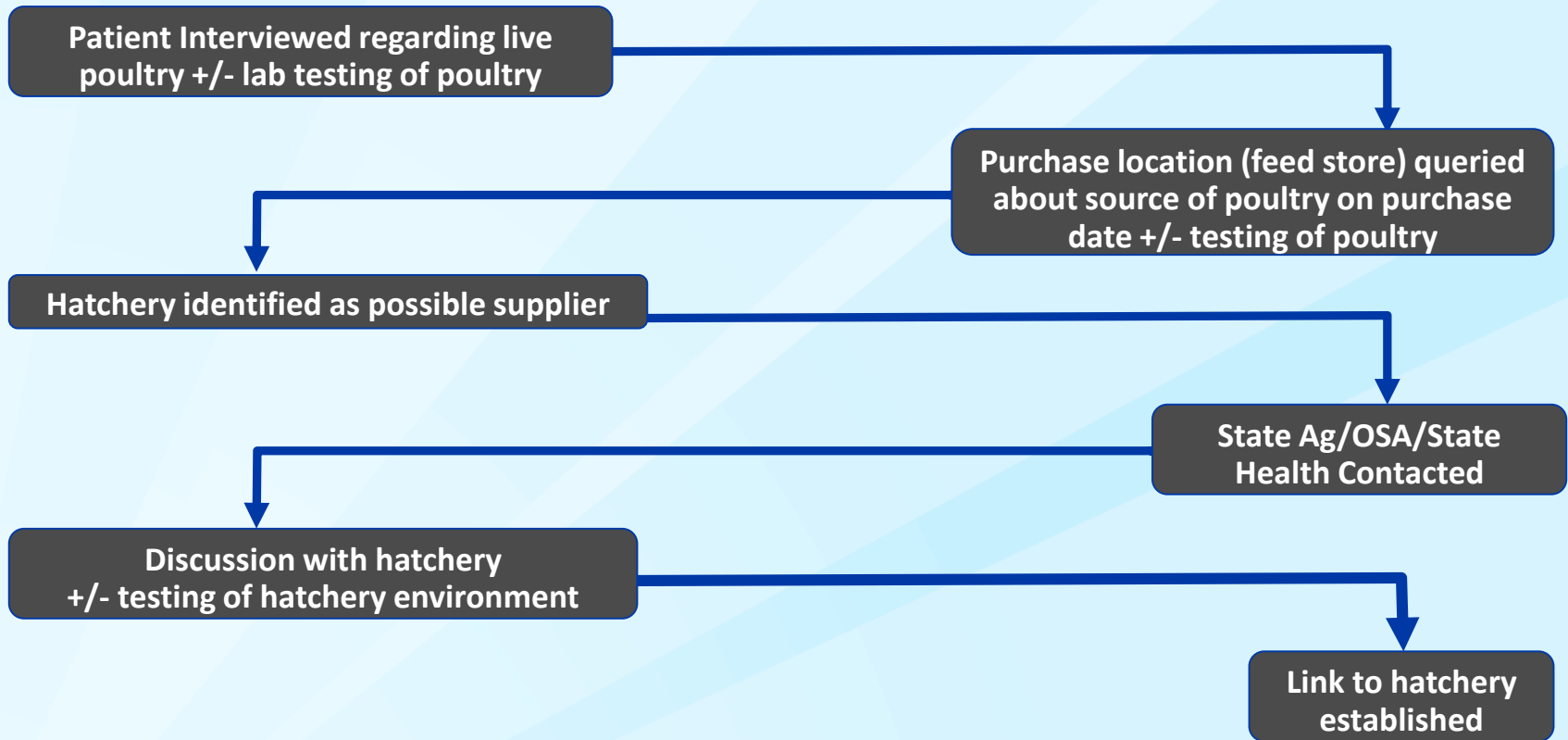
| Pathogen | Under-reporting / under-diagnosis multiplier* |
|------------------------------------|---|
| Non-typhoidal <i>Salmonella</i> | 29.3 |



Detecting Outbreaks: Poultry Industry Role

- Industry role in detecting *multistate* outbreaks
 - Are you seeing what we're seeing?
 - Routine environmental test results
 - Consumer complaints
- Understanding industry practices
- Ensuring adequate record keeping

Traceback



- Process repeated for every single ill person reported
- Traceback to a hatchery takes 60–90 days
- Only a fraction of ill people know the location and date of purchase, breed of poultry
- Only a fraction of stores have records regarding suppliers of poultry
- Drop-shipping and trans-shipping complicate this process



Outbreak of *Salmonella* Infections Linked to Backyard Poultry

Salmonellosis

- **Most common bacterial enteric illness in United States**
 - 1.2 million illnesses per year
 - Multiple sources
 - Food
 - Water
 - Animal contact
- **11% results from animal contact, or zoonotic**
 - Direct or indirect
 - Highest morbidity and mortality among enteric zoonoses
 - Children disproportionately affected

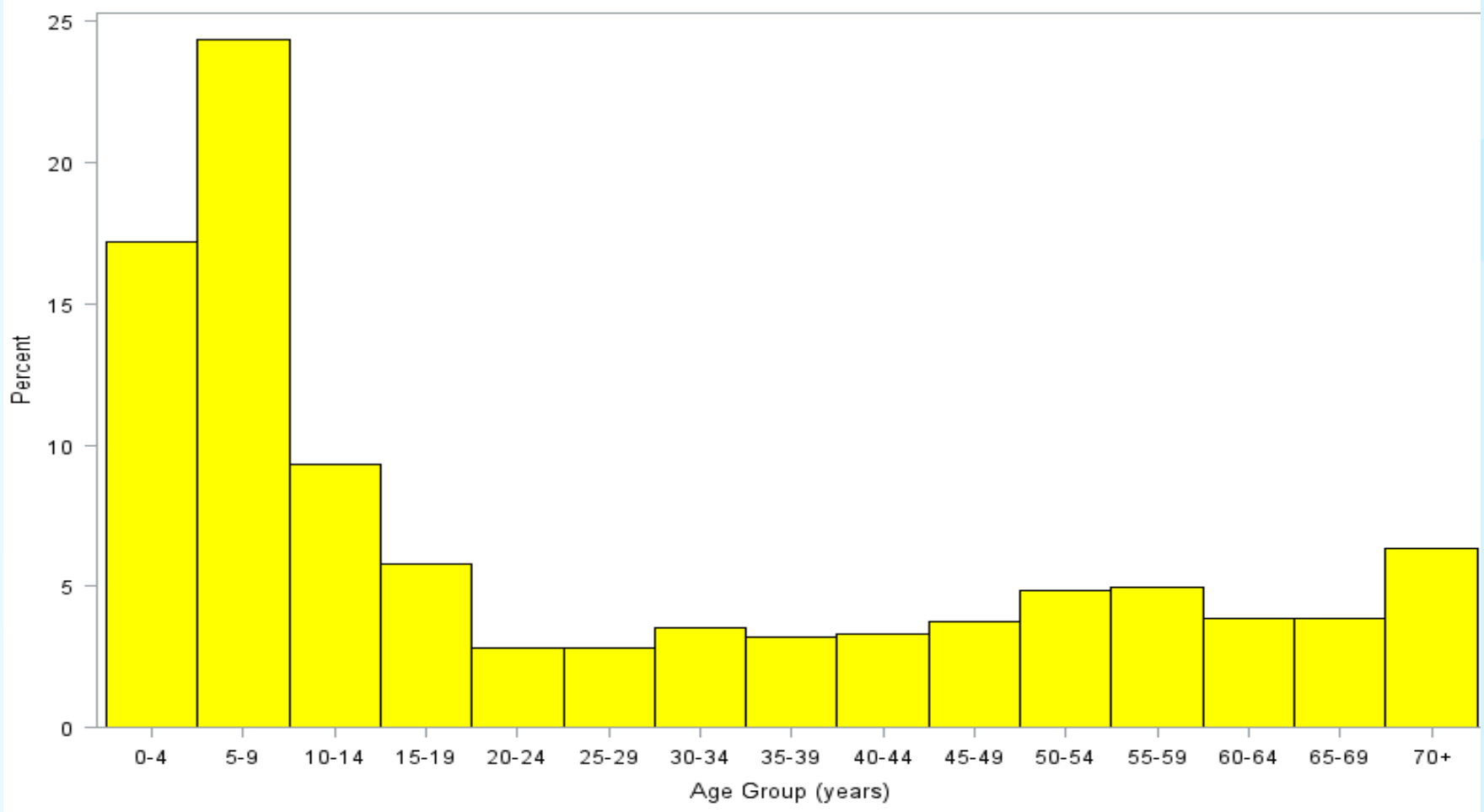
Poultry Hosts

- Poultry carrying certain strains of *Salmonella* might not exhibit signs of illness
 - Appear healthy and clean
- Poultry shed *Salmonella* bacteria intermittently
 - Stress increases shedding
- Commingling of birds spreads *Salmonella*
- Young birds often have higher prevalence
- Environmental contamination

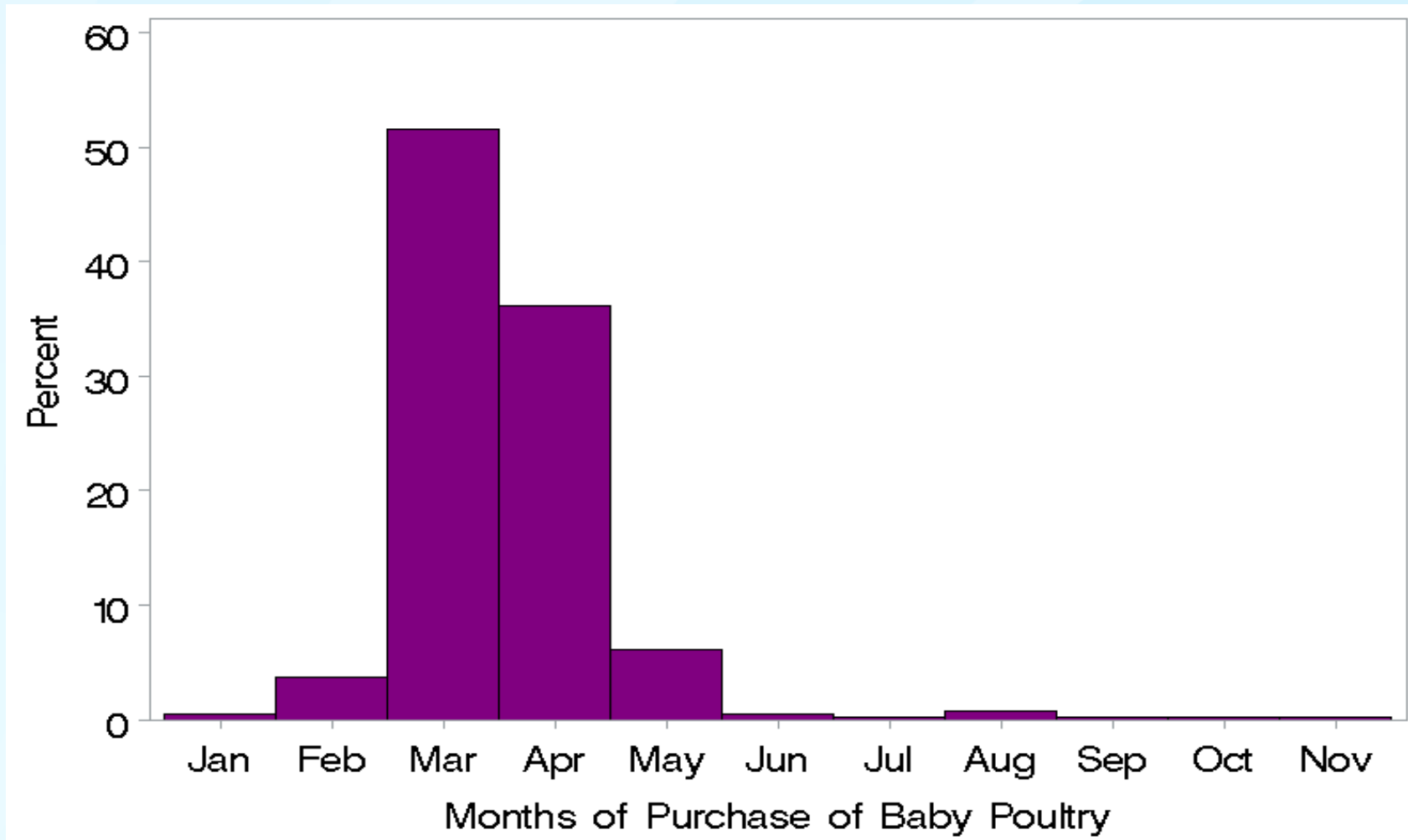
Outbreaks of Salmonellosis Linked to Backyard Poultry

- **61 outbreaks 1990–2015**
 - Involve young children
 - Start in spring, continue through fall
 - Pets, backyard flocks
 - Contact at agricultural feed stores
- **Multiple *Salmonella* serotypes associated**
- **Multiple outbreak strains linked to single hatchery**
- **Multiple hatcheries with distinct strains**

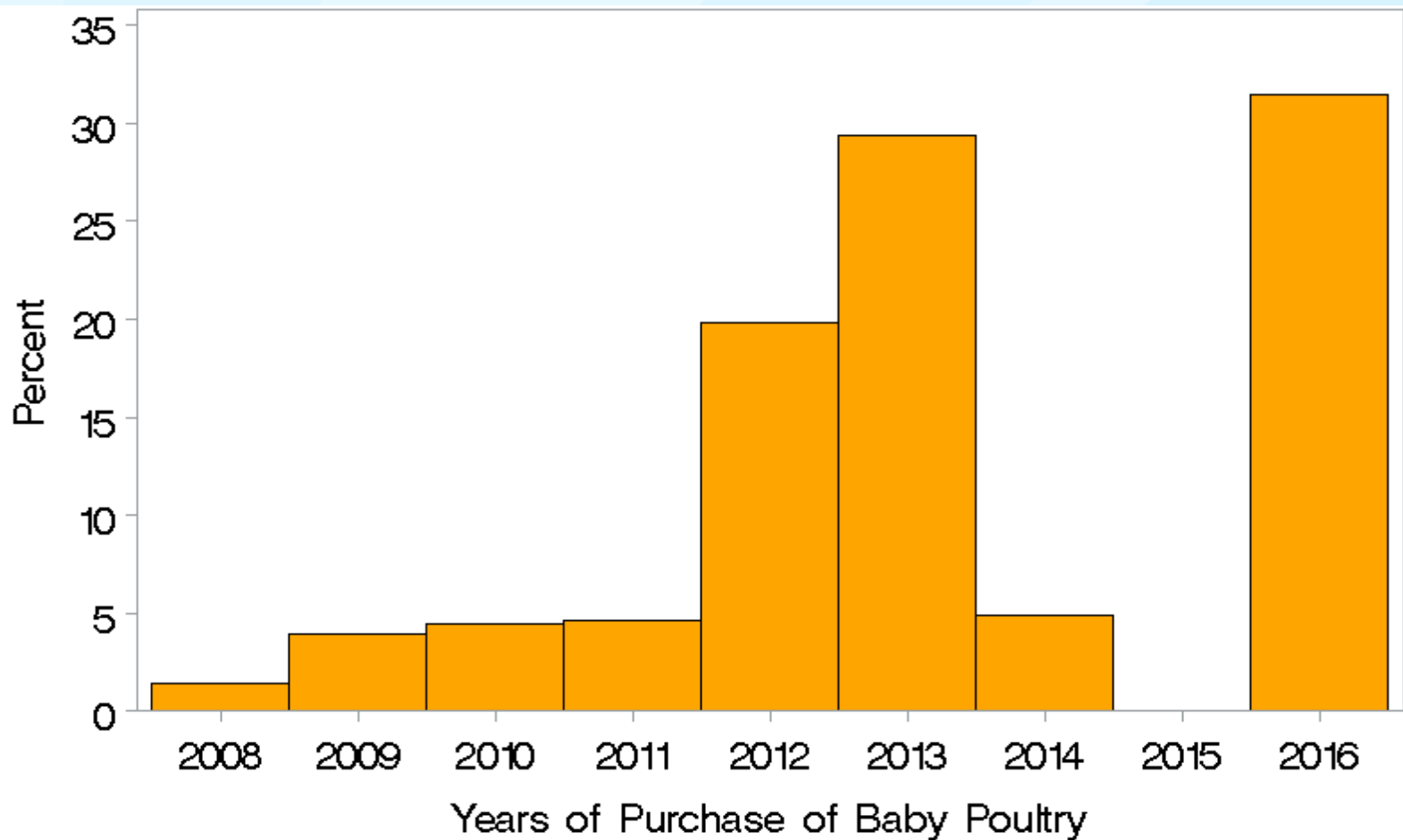
Age Distribution of *Salmonella* Illnesses Linked to Backyard Poultry—United States, 2008–2016 (n=849)



Month of Poultry Purchase among Illnesses linked to Backyard Poultry—United States, 2008–2016*



Year of Poultry Purchase among Illnesses Linked to Backyard Poultry—United States, 2008–2016*



*Missing 2015 data

Type of Poultry Exposure among Illnesses linked to Backyard Poultry—United States, 2008–2016 (n=921)

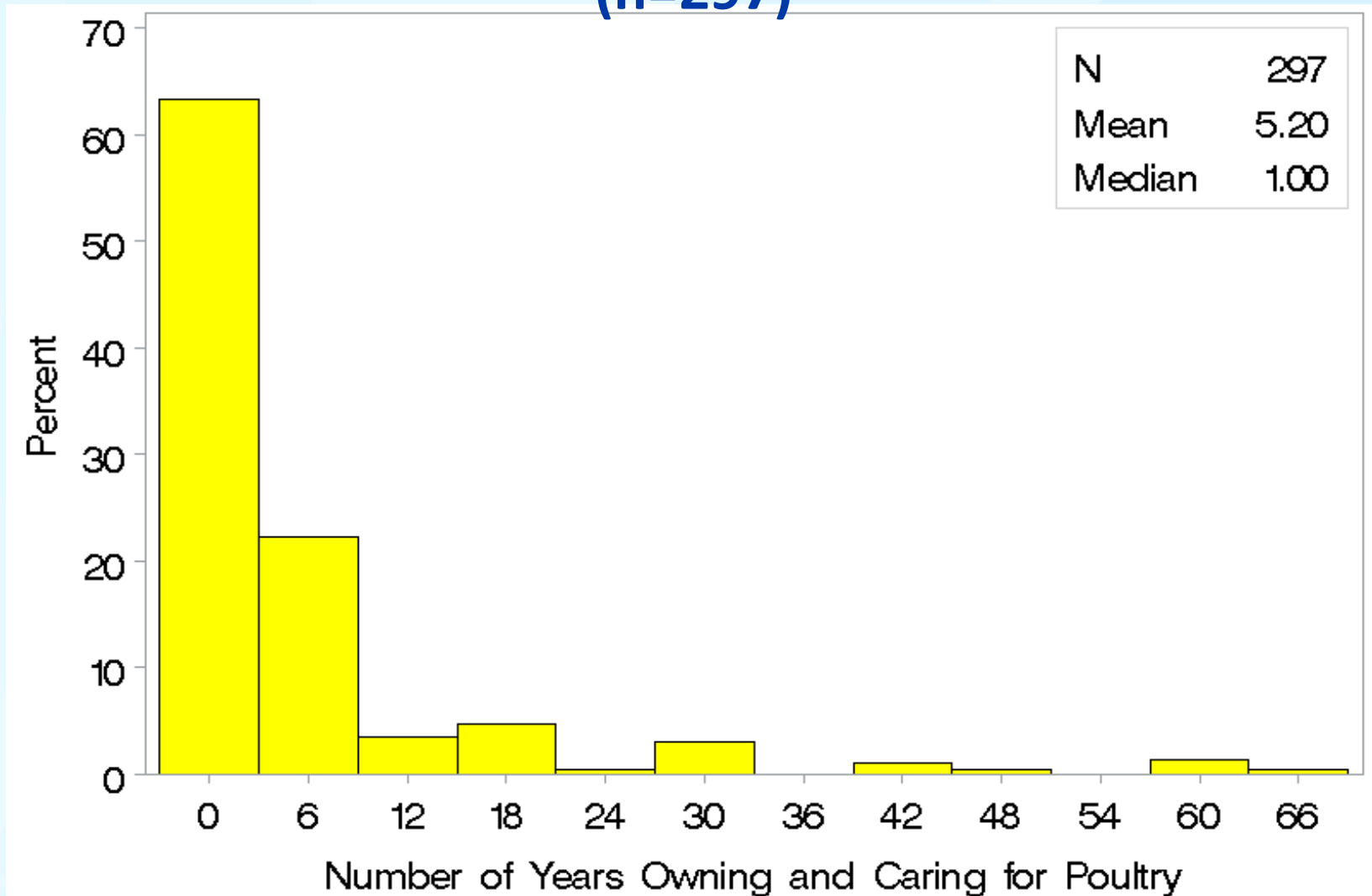
| Types of Poultry | No. | Percent** |
|------------------|-----|-----------|
| Chicks/Chickens | 686 | 75 |
| Ducklings/Ducks | 274 | 30 |
| Gosling/Geese | 28 | 3 |
| Poults/Turkeys | 45 | 5 |
| Other | 27 | 3 |

***Percent is out of total 921 cases (18 missing), adds up to >100% as some own >1 type of poultry*

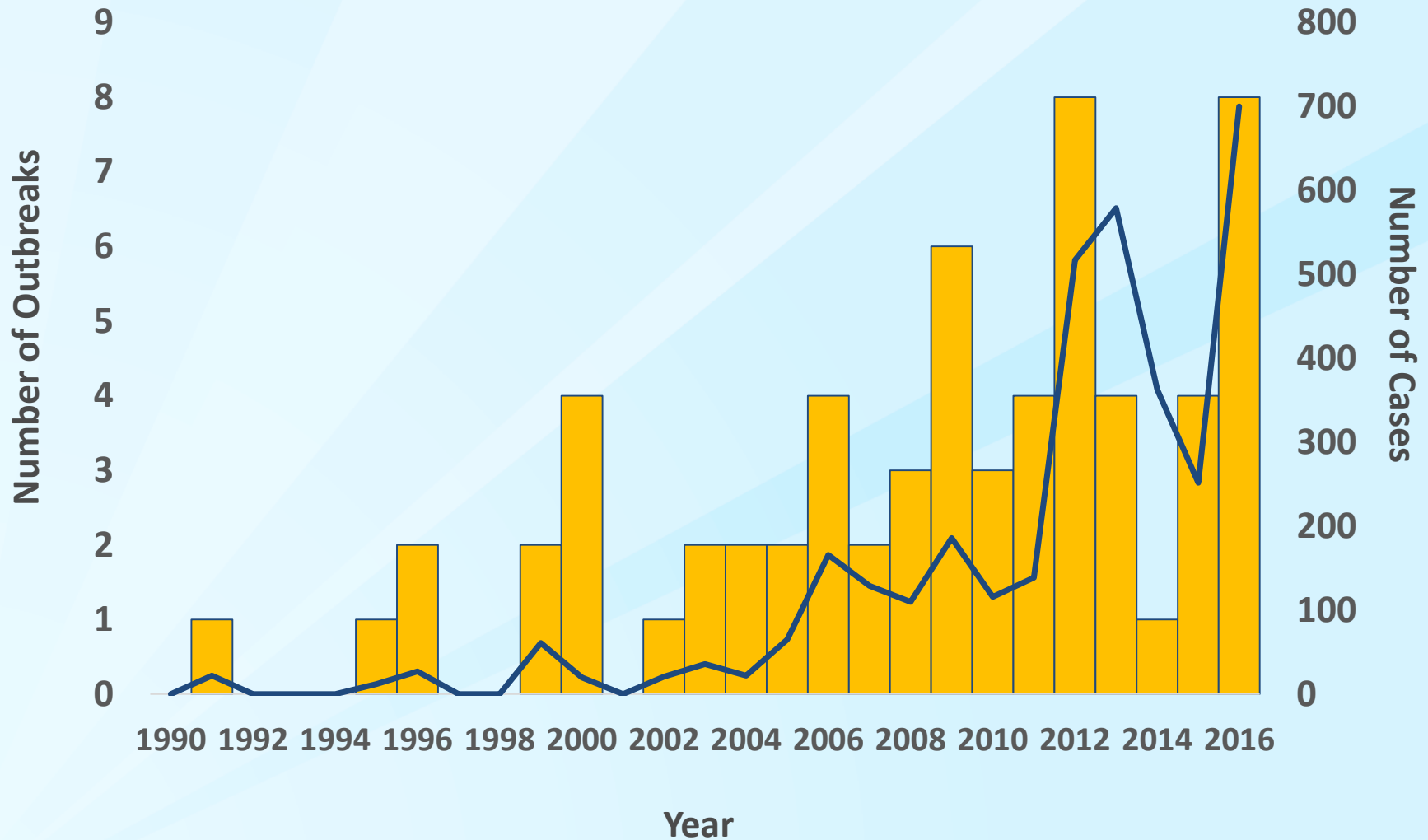
Reasons for Poultry Purchase among Illnesses Linked to Backyard Poultry—United States, 2008–2016 (n=681)

| Reasons for Purchase of Baby Poultry | n | Percent* |
|--------------------------------------|-----|----------|
| Eggs | 421 | 62 |
| Keep as pets | 204 | 30 |
| Meat | 79 | 12 |
| Fun or Hobby | 69 | 10 |
| Fair or Exhibitions | 21 | 3 |
| Easter | 13 | 2 |

Distribution of Length of Ownership among Illnesses Linked to Backyard Poultry—United States, 2008–2016 (n=297)



Number of Illnesses and Outbreaks Linked to Backyard Poultry—United States, 1990–2016



2016 Outbreaks Linked to Backyard Poultry

- **Highest number illnesses observed in a single year**
- **8 outbreaks**
 - *Salmonella* serotypes Hadar, Indiana, Muenster, Mbandaka, Infantis, Braenderup, Enteritidis
 - Serotype mostly linked to foodborne illness now linked to live poultry
 - >800 people affected
 - More children aged 0–9 years impacted than any other age groups
 - Multiple poultry breeds
 - 4 hatcheries linked to illnesses

Factors in 2016 Outbreaks

- **Commercial production**
- **Hatcheries**
- **Feed stores**
- **Consumers**



Factors in 2016 Outbreaks—Commercial Production

- Egg suppliers do not participate in *Salmonella* monitoring or control programs
- Egg suppliers with *Salmonella* do not inform hatcheries



Factors in 2016 Outbreaks—Hatcheries

- Not all hatcheries participating in NPIP Voluntary *Salmonella* monitoring and control program
- NPIP participant hatcheries are receiving products (e.g. day old chicks) and drop-shipping from non-participatory hatcheries
- Hatcheries are unregulated
- Hatcheries involved in outbreaks might not inform other hatcheries, stores or consumers



Factors in 2016 Outbreaks—Stores

- **From 2008–2014, 10% of ill people reported contact with baby poultry at a feed store**
- **Past outbreaks have included ill feed store employees who only had contact with live poultry at work**
- **Agricultural feed stores, which display and sell live poultry, should play a key role in prevention of illness**
 - **Sourcing from non-NPIP hatcheries**
 - **Lack of awareness regarding where poultry are truly sourced**
 - **Challenges with record keeping**

Factors in 2016 Outbreaks—Consumers

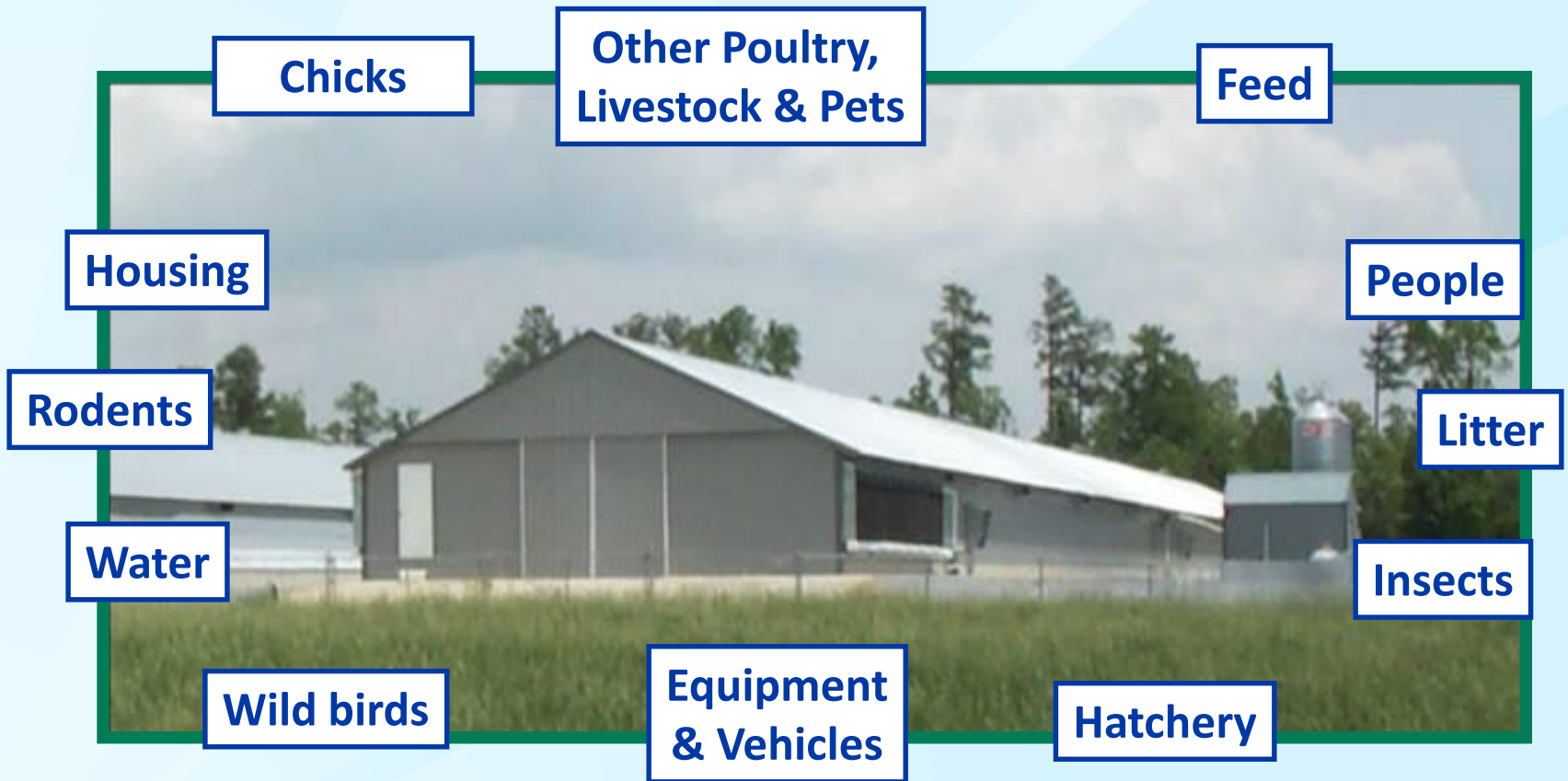
- High risk practices
- Keeping poultry indoors
- Close contact such as holding and kissing poultry



Prevention and Control

- Industry involvement is critical
- Dialog with egg suppliers regarding impact of vertically transmitted *Salmonella* serotypes on hatcheries
 - What percentage of eggs at hatcheries come from large, commercial suppliers?
 - Certain breeds?
 - “Discard birds” or overhatch?

Potential *Salmonella* Sources at Hatcheries

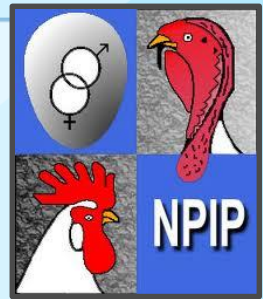


Reducing Burden of *Salmonella* in Hatcheries

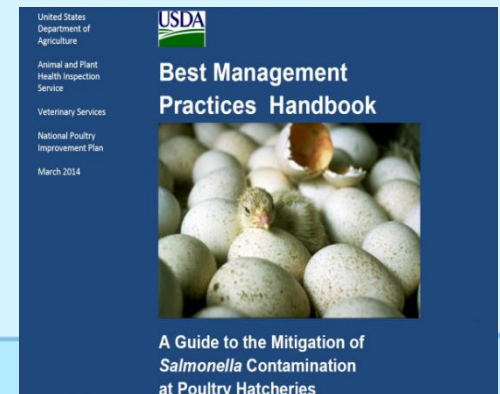
- **Participate in the NPIP Voluntary *Salmonella* Monitored Program**
 - Ensure compliance with the program if already participating
- **Conduct routine environmental sampling**
 - Consider increasing frequency of testing when hatchery is implicated in an outbreak
- **Autogenous vaccine to address outbreak strains of *Salmonella***
- **Testing eggs brought in from outside the hatchery**
- **Maintain accurate records**
- **Ensure feed is free of pathogens**
- **Insect and rodent control programs.**
- **Educate consumers**



National Poultry Improvement Plan



- **Voluntary *Salmonella* Monitoring Program to prevent and control *Salmonella* in mail-order hatcheries**
 - Addresses *Salmonella* strains of human health concern
 - Retailers can choose to buy from participating source hatcheries
- **Best Management Practices Handbook: A Guide to the Mitigation of *Salmonella* Contamination at Poultry Hatcheries**
- **However—many are not aware of program or how to implement**



Agricultural Stores—Before



Agricultural Feed Stores—After



TSC

USE CAUTION WHEN HANDLING BABY CHICKS

To avoid the possibility of infection and help stop the spread of *Salmonella*, clean your hands immediately after touching chicks and ducklings. Use the hand sanitizer provided near the Chick Days display or wash your hands with soap and water.

- Chicks & ducklings are not appropriate pets for children under 5 years old.
- Don't nuzzle or kiss chicks & ducklings.
- Call your health care provider if you think you have a *Salmonella* infection.

Children under 5 years old, people with weakened immune systems and women who are pregnant or may be pregnant, should not handle poultry.

If you have any questions, please see a Team Member.

PLEASE DO NOT CL

CORNISH ROCKS

ASSORTED BANTAMS

DUCKS

DUCKS

SUPPLIES

CHICK CARE

Consumer Recommendations

- **Wash your hands**
 - Touching live poultry
 - Contacting anything in the area where they live and roam
- **Poultry ownership might not be right for all people**
 - Children younger aged <5 years
 - Older adults
 - People with weak immune systems
- **Do not let live poultry inside the house**



Partners to Address *Salmonella* Illness Outbreaks

- **Public health agencies**
 - CDC
 - State and local health departments
 - Public Health Agency of Canada
- **Agriculture agencies**
 - United States Department of Agriculture (USDA)
 - State departments of agriculture
- **Industry**
 - Egg suppliers
 - Mail-order hatcheries
 - Agricultural feed stores
- **Consumers**

Additional Resources

<http://www.cdc.gov/zoonotic/gi/education.html>





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