

***COMPARISON OF THE COMPLETENESS
AND TIMELINESS OF FOODBORNE
ILLNESS OUTBREAK INVESTIGATION
INTERVIEWS CONDUCTED BY STATE
VERSUS COUNTY LEVEL AGENCIES***

Sarah Boline

Master of Public Health Field Experience

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Outline

- KDHE Field Experience
- Background
 - *Salmonella*
 - STEC
 - Completeness and Timeliness
- Project
 - Objectives
 - Methods
 - Results
 - Conclusions
 - Limitations
 - Recommendations
 - Future Research





Kansas Department of Health and Environment Field Experience

Mission Statement

- “To protect and improve the health and environment of all Kansans”



Kansas Department of Health and Environment (KDHE)

- Bureau of Epidemiology and Public Health Informatics (BEPHI)
 1. Environmental Public Health Tracking Program
 2. Health and Vital Statistics and Analysis
 - 3. Infectious Disease Epidemiology and Response**
 4. Infectious Disease Surveillance
 5. Office of Vital Statistics
- Responsible for collecting, analyzing, and interpreting data for public health

Internship Activities

- Required training and courses
 - EpiTrax
 - EasyQuery
 - Pentaho
- Kansas Immunization Program Presentations
- *Salmonella* investigation phone call
- Daily 4 pm meeting
- Kansas Health and Environment Laboratory (KHEL) Tour

Learning Objectives

- Process surrounding descriptive analysis and disease investigation on a state level
- Carry out an outbreak investigation
- Observe data analysis performed by epidemiologists



Reflection of Field Experience

- Epidemiologist area of expertise
- Department involvement
- Protect and improve public health



Background

Salmonella

- Infect over one million people in the US annually
 - 19,000 hospitalizations and 378 deaths (Waechter et al. 2013)
- Salmonellosis – gastroenteric
 - Resolve itself unless young, old, immunocompromised
- Serotyping
 - 2,500-less than 100 responsible for human infections

Salmonella

- Symptoms
 - Diarrhea
 - Abdominal pain
 - Cramps
 - Fever
 - Chills
 - Nausea/vomiting
 - Joint pain
 - Headache
 - Myalgia
 - Malaise



Shiga toxin-producing *E. coli* (STEC)

- Causes more than 265,000 illnesses in the US annually
 - 3,600 hospitalizations and 30 deaths (CDC 2015)
- Similar symptoms to *Salmonella*
- Lives in digestive tracts of ruminant animals
- Infected by direct contact with animal, contaminated water or food

STEC

- Common STECs in North America

1. O157:H7

2. O26

3. O45

4. O103

5. O111

6. O121

O145

Completeness and Timeliness

- Pilot project
- Altman et al. 2011 study
- Nicolay et al. 2010 study

Completeness and Timeliness

- **Completeness** - Number of questions answered or left blank
- **Timeliness** – How many days it took the outbreak investigation interviewer to make contact with the case, start the interview, and complete the interview.



Comparison of the Completeness and Timeliness of Foodborne Illness Outbreak Investigation Interviews Conducted at the State Versus County Level

Objectives

- Compare the completeness and timeliness of foodborne illness outbreak investigation interviews
 - State versus county level
- *Salmonella* and STEC lab-confirmed cases
 - January to June 2016
- To see if a centralized interview system would product more complete and timely outbreak interview investigations

Methods

- Collect EpiTrax data from January to June 2016
- Export to Excel and SAS
- Compare completeness and timeliness across jurisdictions of outbreak investigation interviews
- Military excluded
- Johnson, Jackson, Atchison, and Edwards Counties
 - Decentralized from KDHE

KDHE Goals

- Contact a case within 24 hours of being classified as a case
- Set-up an interview within three days
- Complete the interview within five days
- 100 percent completion

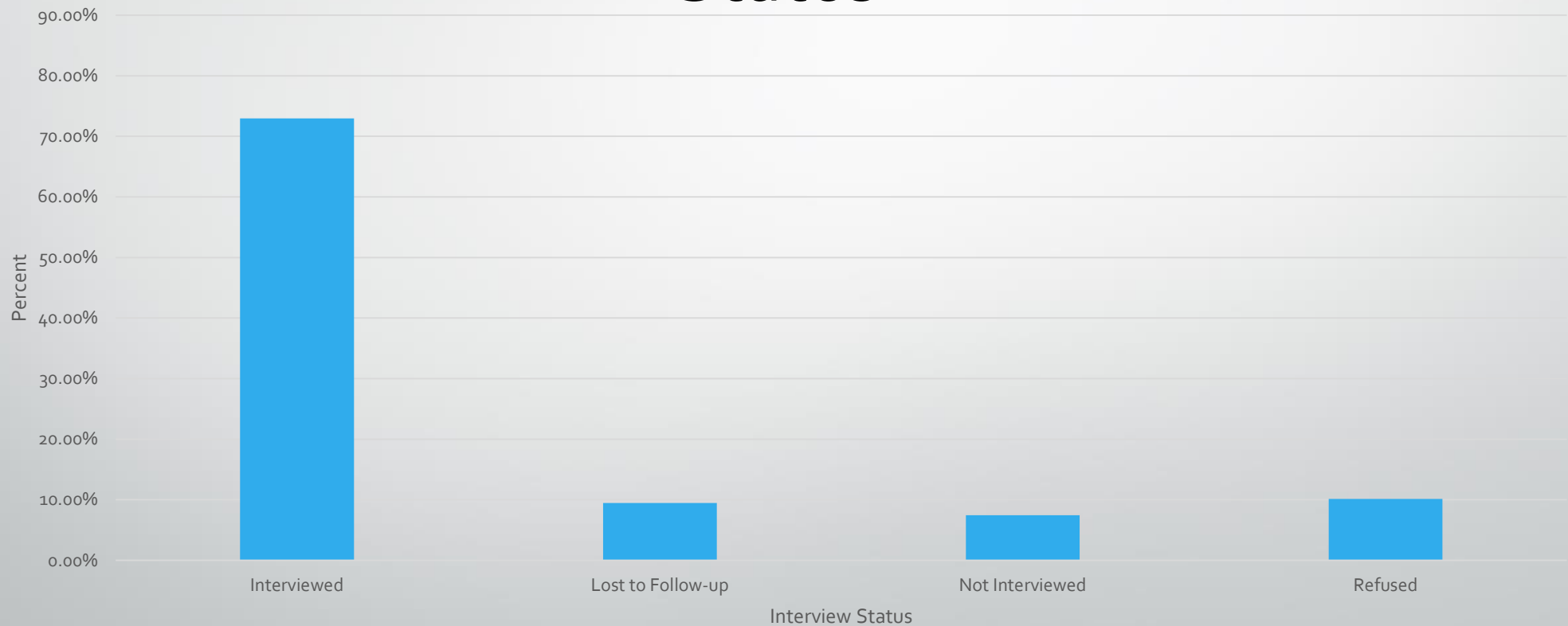


Results

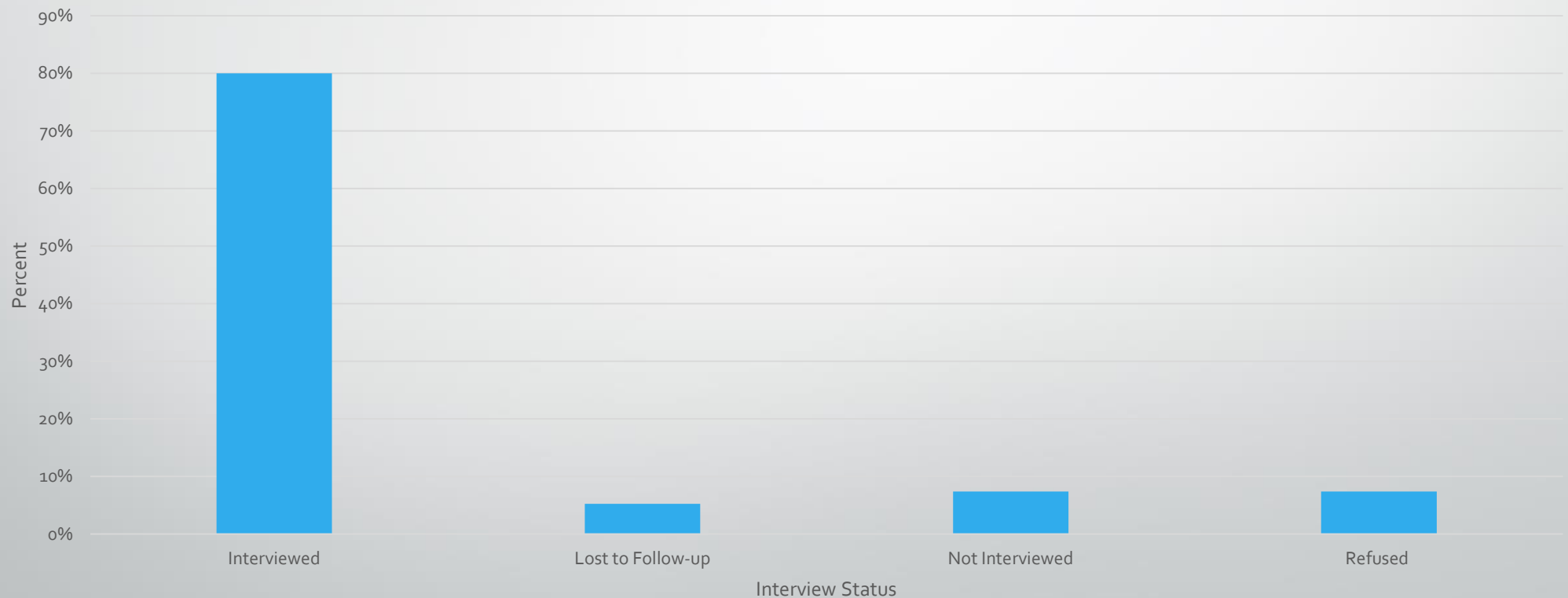
Number of Questions in Each Section of Questionnaire for *Salmonella* STEC in 2016

Exposures	Salmonella	STEC
Clinical	6	6
High Risk	9	9
Travel	10	10
Animal	21	17
Places	21	21
Food	149	144

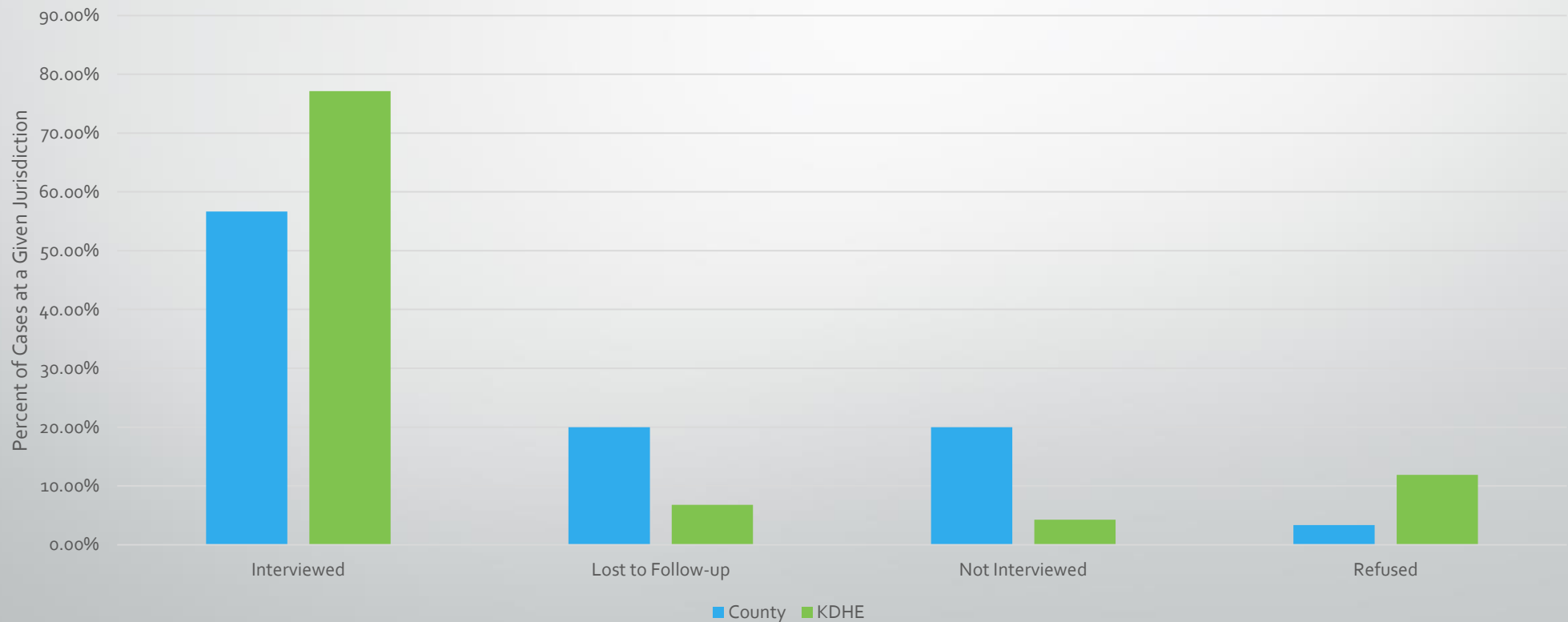
Confirmed *Salmonella* Cases in Kansas From January to June 2016 Categorized by Interview Status



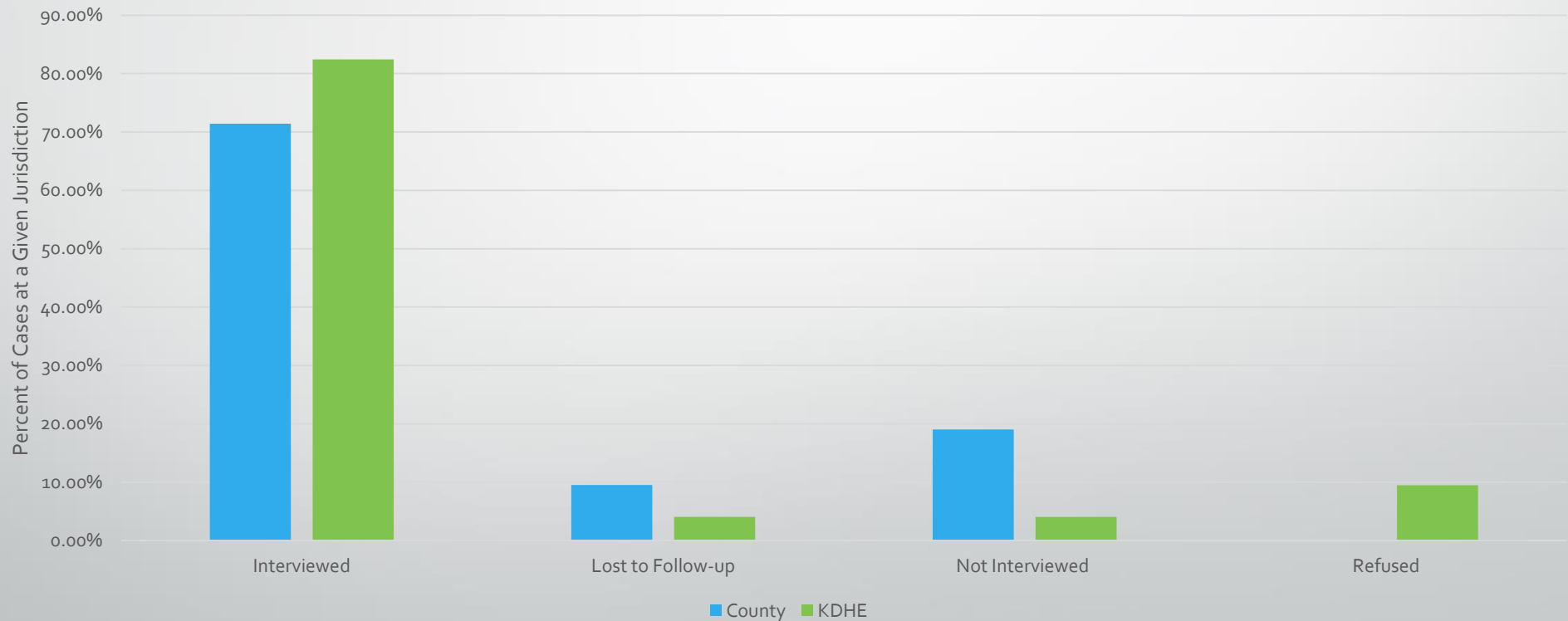
Confirmed STEC Cases in Kansas From January to June 2016 Categorized by Interview Status



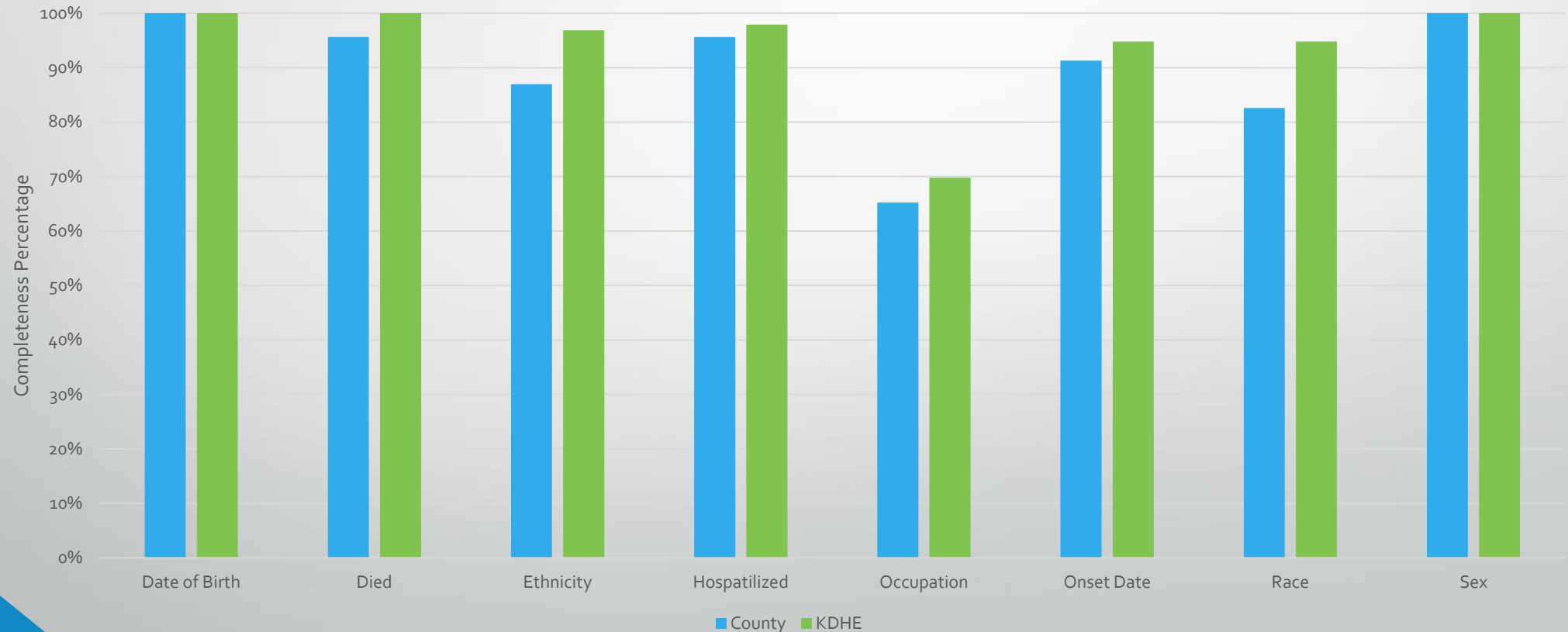
Confirmed *Salmonella* Cases in Kansas From January to June 2016 Categorized by Interview Status and Jurisdiction



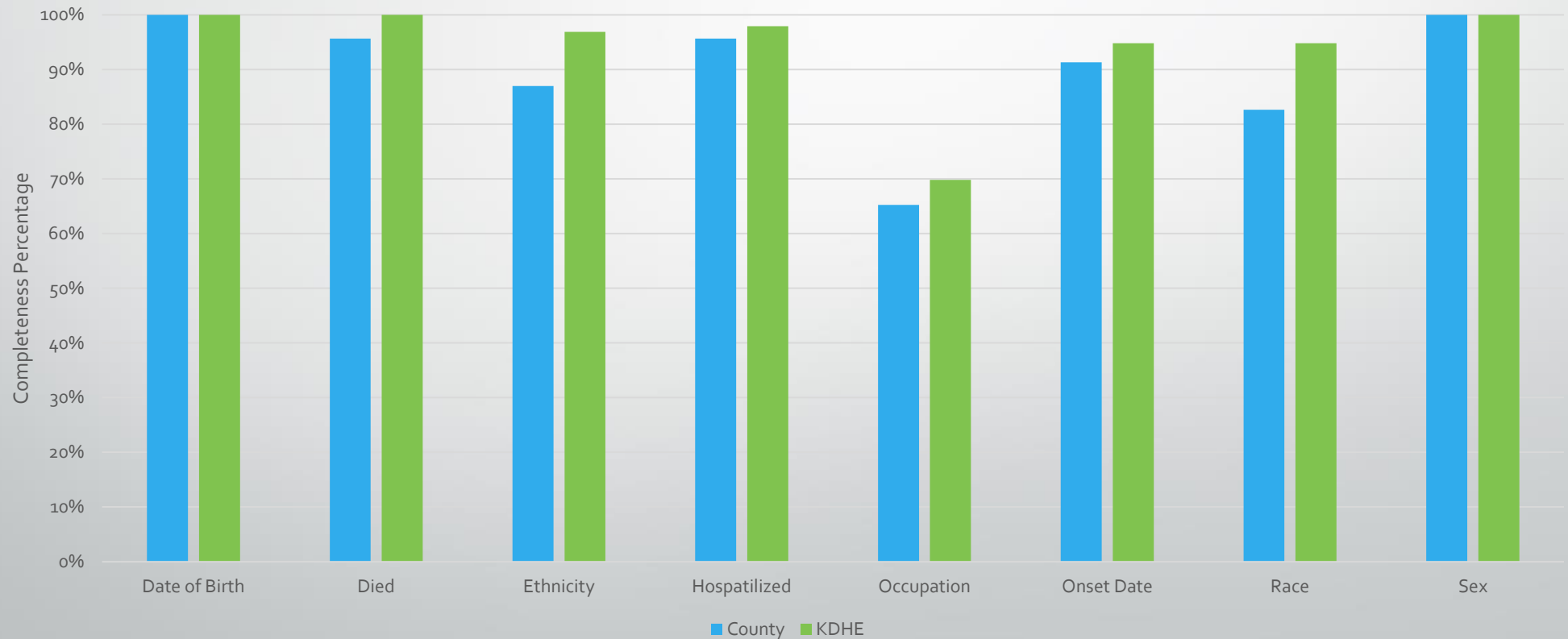
Confirmed STEC Cases in Kansas From January to June 2016 Categorized by Interview Status and Jurisdiction



Percent of Demographic Questions Completed by Jurisdiction of *Salmonella* Cases in Kansas From January to June 2016



Percent of Demographic Questions Completed by Jurisdiction of STEC Cases in Kansas From January to June 2016



Mean (Range) Number of Questions Answered on Each Section of the Questionnaire for Interviews Conducted at Either the State (KDHE) or County Level – *Salmonella* Cases in Kansas From January to June 2016

Section	Overall	KDHE	County
Clinical	6.0 (5-6)	6.0 (6-6)	5.9 (5-6)
High-Risk	8.7 (0-9)	8.7 (0-9)	8.9 (8-9)
Travel	10.0 (9-10)	10.0 (9-10)	10.0 (10-10)
Animal	20.7 (0-21)	20.9 (20-21)	19.2 (0-21)
Place	20.3 (0-21)	20.3 (0-21)	19.9 (8-21)
Food	142.4 (0-149)	143.0 (0-149)	139.7 (4-149)

Mean (Range) Number of Questions Answered on Each Section of the Questionnaire for Interviews Conducted at Either the State (KDHE) or County Level – STEC Cases in Kansas From January to June 2016

Section	Overall	KDHE	County
Clinical	5.7 (0-6)	5.8 (0-6)	5.5 (0-6)
High-Risk	8.5 (0-9)	8.7 (0-9)	8.0 (0-9)
Travel	8.7 (9-10)	8.8 (0-10)	8.3 (0-10)
Animal	15.8 (0-17)	16.4 (0-17)	14.0 (0-17)
Place	18.6 (0-20)	19.2 (0-20)	16.8 (0-20)
Food	131.7 (0-144)	135.6 (0-144)	120.2 (0-144)

Mean, Median, and Range Number of Days to First Call Attempt, Interview Date, and Completion Days of *Salmonella* Interviews in Kansas From January to June 2016

	Time to First Call Attempt			Time to Interview Date			Time to Completion Date		
	Overall	County	KDHE	Overall	County	KDHE	Overall	County	KDHE
Number of Cases	141	28	113	106	15	91	106	17	89
Mean (Days)	2.8	6.5	1.9	3.5	9.2	2.6	3.8	9.8	2.7
Median (Days)	1	7	1	2	7	2	3	8	2
Range (Days)	0-22	0-22	0-12	0-25	1-25	0-13	0-25	1-25	0-13

Mean, Median, and Range Number of Days to First Call Attempt, Interview Date, and Completion Days of STEC Interviews in Kansas From January to June 2016

	Time to First Call Attempt			Time to Interview Date			Time to Completion Date		
	Overall	County	KDHE	Overall	County	KDHE	Overall	County	KDHE
Number of Cases	89	18	71	76	15	61	70	15	55
Mean (Days)	2.8	5.8	2.0	4.2	9.3	3.0	5.1	9.9	3.8
Median (Days)	5	4	1	3	6	2	3	6	2
Range (Days)	0-19	0-19	0-13	0-28	1-28	0-12	0-28	2-28	0-24

Conclusions

- Similar results across jurisdictions of completeness
- KDHE had higher results for timeliness
- Improve efficiency by having a centralized interview system at KDHE
- Consistency

Limitations of Outbreak Investigations

- Forgetful during interview if not done in a timely manner
- Bias to food items if associated with an outbreak that's public
- "Maybe" and "Don't know" responses
- Lost to follow-up and refused
- Turnover in employees at local health departments
- Underreporting

Suggestions for Improvement

- Centralized outbreak investigation interview for all foodborne illnesses
 - Same staff
 - Interview performed the same way
- Understanding why someone is refusing and fix the issue

Future Research

- Completeness and timeliness compared to serotypes
- Include military establishments
- Compare other states and countries



Other Projects Performed by KDHE Staff

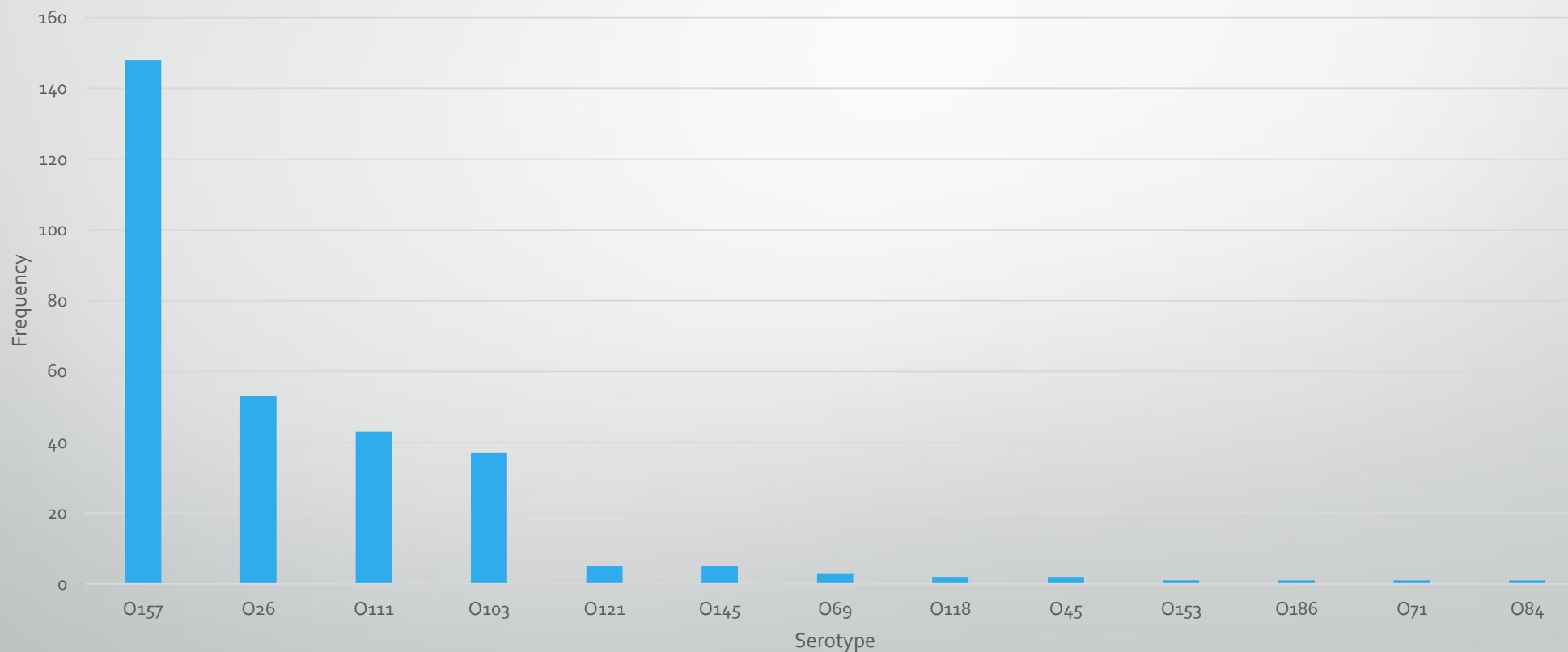
KDHE Staff Objectives and Methods

- Perform a case-case analysis of *Salmonella* and STEC from 2012-2015
- Use Fisher's Exact to determine significance of food items
- "Case-case study compares the exposure of infected individuals from an outbreak cluster to the exposure of other individuals who are infected with the same disease but do not belong to the same cluster." (Krumpamp et al. 2008)

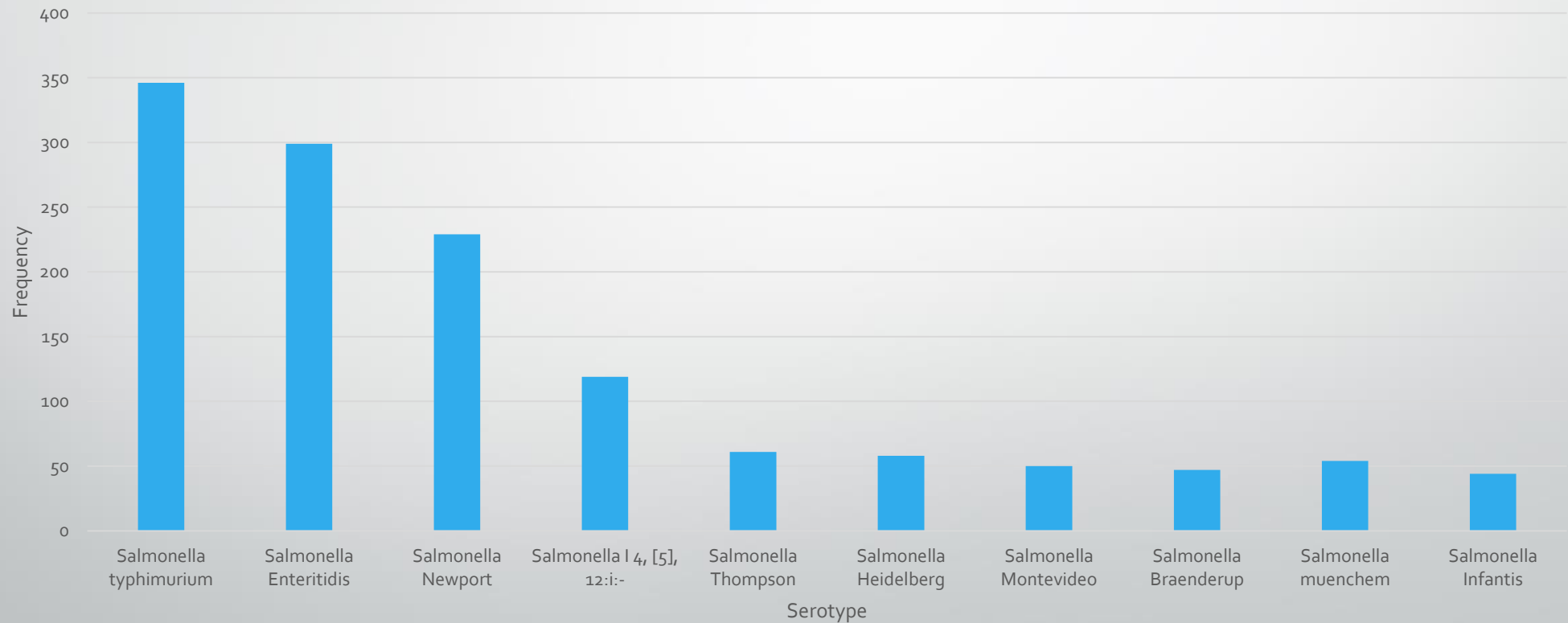


Results

Serotypes of Confirmed STEC Cases in Kansas From 2012-2015



Top Ten Serotypes of Confirmed *Salmonella* Cases in Kansas From 2012-2015



Top Three Interview Question Responses by Category of Exposure Sections of STEC in Kansas From 2012-2015

Exposures	Top Three STEC Exposures	Frequency	Percent
	Travel Outside County	99	44.59%
	National Travel	56	25.23%
	Attended Large Gatherings	73	32.88%
Stores			
	Grocery	192	86.49%
	Warehouse	29	13.06%
	Small Markets	19	8.56%
Restaurants			
	Fast Food Chain	105	47.30%
	Institutional Setting	40	18.02%
	Mexican Style	35	15.77%
Meat and Seafood			
	Chicken Whole or Pieces	104	46.85%
	Hotdog, Corndog, Polish Sausage	64	28.83%
	Ground Beef Dish at Home	62	27.93%
Eggs and Dairy			
	Milk	133	59.91%
	Egg or Egg Containing Dishes	120	54.05%
	Pre-packaged Shredded Cheese	94	42.34%

Fruits			
	Apples	90	40.54%
	Grapes	80	36.04%
	Strawberries	65	29.28%
Vegetables			
	Fresh Leafy Greens	63	28.38%
	Fresh Tomatoes	60	27.03%
	Frozen Bag or Box Veggies	59	26.58%
Frozen Pre-Packaged			
	Pizza	41	18.47%
	Breakfast Items	28	12.61%
	Snack Foods	16	7.21%
Nuts and Cereals			
	Cold Breakfast Cereal	89	40.09%
	Peanut Butter	88	39.64%
	Chips or Pretzels	84	37.84%
Animal Exposures			
	Dogs or Puppies	140	63.06%
	Cats or Kittens	78	35.14%
	Pre-packaged Pet Food	73	32.88%

Top Three Interview Question Responses by Category of Exposure Sections of *Salmonella* in Kansas From 2012-2015

Exposures	Top Three Salmonella Exposures	Frequency	Percent
	Travel Outside County	108	25.59%
	National Travel	78	18.48%
	Attended Large Gatherings	32	7.58%
Stores			
	Grocery	353	83.65%
	Warehouse	50	11.85%
	Other	29	6.87%
Restaurants			
	Fast Food	147	34.83%
	Institutional	60	14.22%
	Mexican	54	12.80%
Meat and Seafood			
	Whole Chicken or Pieces	213	50.47%
	Beef, Steaks, Roasts	123	29.15%
	Ground Beef Dish at Home	119	28.20%
Eggs and Dairy			
	Eggs or Egg Containing Dishes	231	54.74%
	Milk	225	53.32%
	Pre-packaged Shredded Cheese	145	34.36%

Fruits			
	Apples	124	29.38%
	Grapes	105	24.88%
	Strawberries	93	22.04%
Vegetables			
	Fresh Leafy Greens	147	34.83%
	Fresh Tomatoes	131	31.04%
	Frozen Veggies in a Bar or Box	94	22.27%
Frozen Pre-Packaged			
	Pizza	76	18.01%
	Box Dinner	31	7.35%
	Breakfast Items	30	7.11%
Nuts and Cereals			
	Cold Breakfast Cereal	155	36.73%
	Chips or Pretzels	150	35.55%
	Peanut Butter	146	34.60%
Animal Exposures			
	Dogs and Puppies	224	53.08%
	Cats and Kittens	118	27.96%
	Pre-packaged Pet Food	114	27.01%

Foods That Showed Fisher's Exact Significance for the Case-Case Foodborne Illness Outbreak Investigation

Exposures	Fisher's Exact Test
Bell Peppers	0.0387
Fresh or Dried Mushrooms	0.0289
Fresh Tomato on Sandwich, Burger, or Salad	0.0016
Crackers, Cookies, Snack Cakes (Pre-packaged)	0.0345
Hot Breakfast Cereal	0.0412
Restaurant- Sandwich Shop or Deli	0.0017
Deli Sliced Meat	0.0574

Core Competencies

- Epidemiology
 - Performing Outbreak Investigations
- Environmental Health
 - Understanding Diseases
- Biostatistics
 - Performing my Analysis
- Health Service Administration
 - Privacy
- Social and Behavioral Sciences
 - Why People Choose to Seek Medical Care

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Thank
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Questions?

