

Analysis of foodborne illness complaints in Kansas, 2009-2012

Yang (Jeanne) Liu
MPH Field Experience Report
July 30, 2013

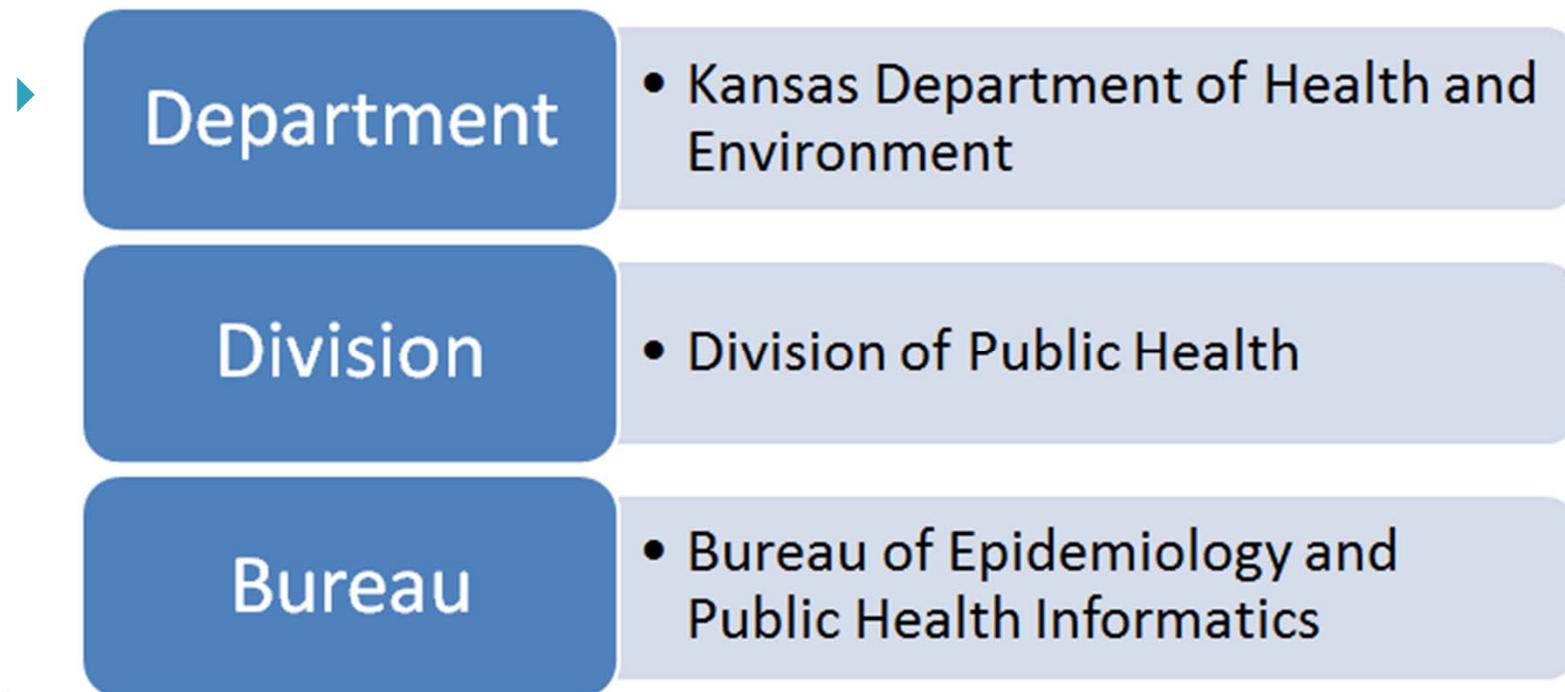
Background

- ▶ 240 on-site hours
- ▶ February 1, 2013 to July 10, 2013



Field Experience Background

- ▶ Placement facilitated through Governor's Office Internship Program



Field experience projects

- ▶ Daily telephone conference
- ▶ Telephone interview of Hepatitis C
- ▶ School survey of vaccination among students in grade 6, 7 and 8
- ▶ Analysis of foodborne illness complaints in Kansas, 2009-2012



5 Core concept areas

- ▶ The Master of Public Health program promotes proficiency in 5 core public health concepts:

1. Biostatistics
2. Epidemiology
3. Environmental Health
4. Health Services Administration
5. Social and Behavioral Sciences



Core concept	Projects
Biostatistics	<ul style="list-style-type: none"> • School survey of vaccination among students in grade 6, 7 and 8 • Analysis of foodborne illness complaints in Kansas
Epidemiology	<ul style="list-style-type: none"> • Daily telephone conference • School survey of vaccination among students in grade 6, 7 and 8 • Analysis of foodborne illness complaints in Kansas
Environmental Health	<ul style="list-style-type: none"> • Telephone interview of Hepatitis C
Health Services Administration	<ul style="list-style-type: none"> • Daily telephone conference • Analysis of foodborne illness complaints in Kansas
Social and Behavioral Sciences	<ul style="list-style-type: none"> • Daily telephone conference • Telephone interview of Hepatitis C • Analysis of foodborne illness complaints in Kansas

Study objective

- ▶ The objectives were to examine the characteristics of these complaints and to compare complaints that led to outbreak investigations to those that did not.
- ▶ The analysis of restaurant-associated foodborne illness complaints in Kansas received by Kansas Department of Agriculture (KDA) from 2009 to 2012.



Background about foodborne illness

- ▶ Foodborne illnesses refer to diseases acquired through eating or drinking contaminated food or liquids.
- ▶ The most common symptoms are vomiting, and diarrhea.
- ▶ Each year, roughly one out of six people (about 48 million citizens) in the United States gets sick from foodborne diseases, 128,000 are hospitalized, and 3,000 die (CDC, 2012; CDC, 2011a).
- ▶ Foodborne illness is a preventable public health problem.

Background about foodborne illness (cont.)

- ▶ Restaurants are a significant contributor to the burden of foodborne disease.
- ▶ 1998-2004, 52% foodborne outbreaks were associated with restaurants (Jones and Angulo, 2006).

Etiology	No. (%) of outbreaks
Unknown	3377 (72)
Norovirus	496 (11)
<i>Salmonella</i> species	349 (7)

Etiology of restaurant-associated outbreaks reported to the Centers for Disease Control and Prevention during the period 1998-2004 (Jones and Angulo, 2006)

Duties of KDHE

- ▶ KDHE is responsible for collecting, analyzing, and interpreting data on a variety of conditions of public health importance.
- ▶ Notifiable conditions, including diseases that may be caused by foodborne illness, must be reported to KDHE.
- ▶ KDHE assists local health departments with the investigation of infectious disease cases, and with outbreak investigations, if one is detected.

Duties of Kansas Department of Agriculture (KDA)

- ▶ KDA is responsible for enforcing agribusiness regulations, including inspecting commercial food operations.
- ▶ The Food Safety and Lodging Program at KDA is responsible for routine inspections, licensing businesses, and receiving complaints.



Complaints and Outbreaks

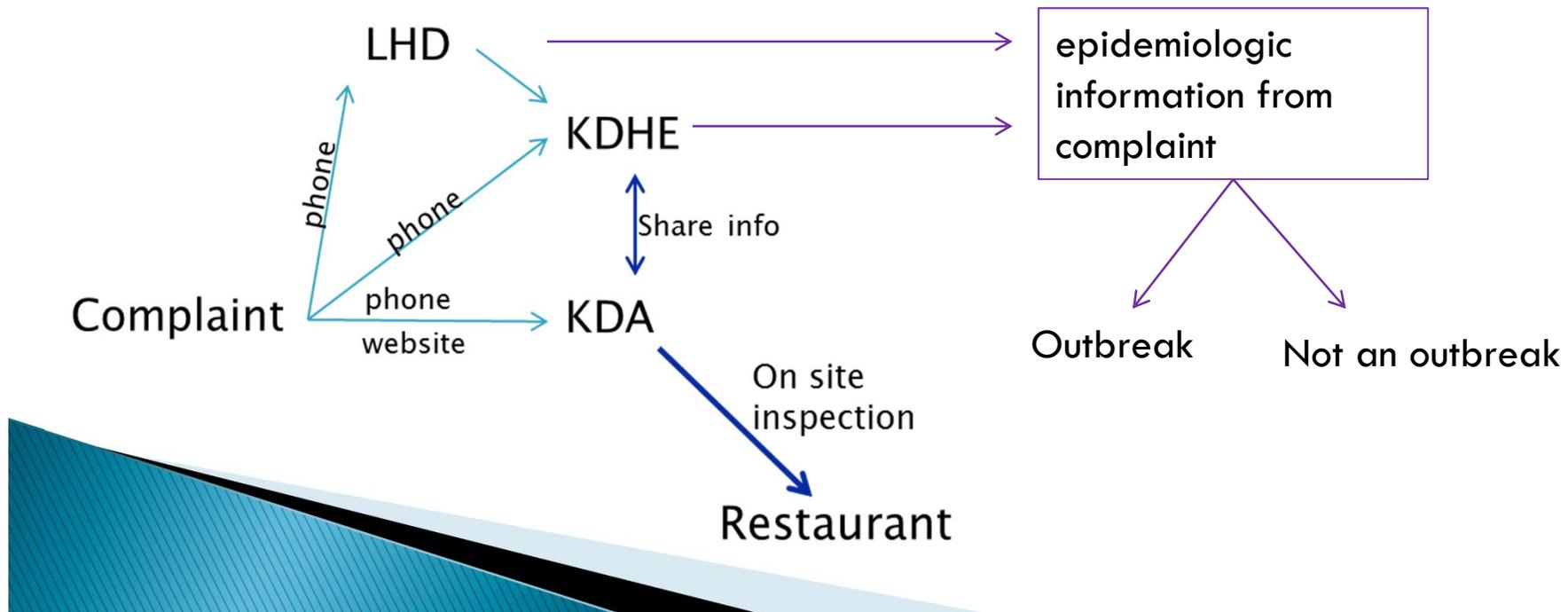
- ▶ KDHE defines a foodborne disease outbreak as two or more individuals who experience a similar illness after eating a common food or food from a common place, in the absence of other shared exposures (living in the same household).
- ▶ If the symptoms and incubation periods reported are consistent with foodborne illness, KDHE and the local health department conduct a full outbreak investigation.



Complaints and Outbreaks (cont.)

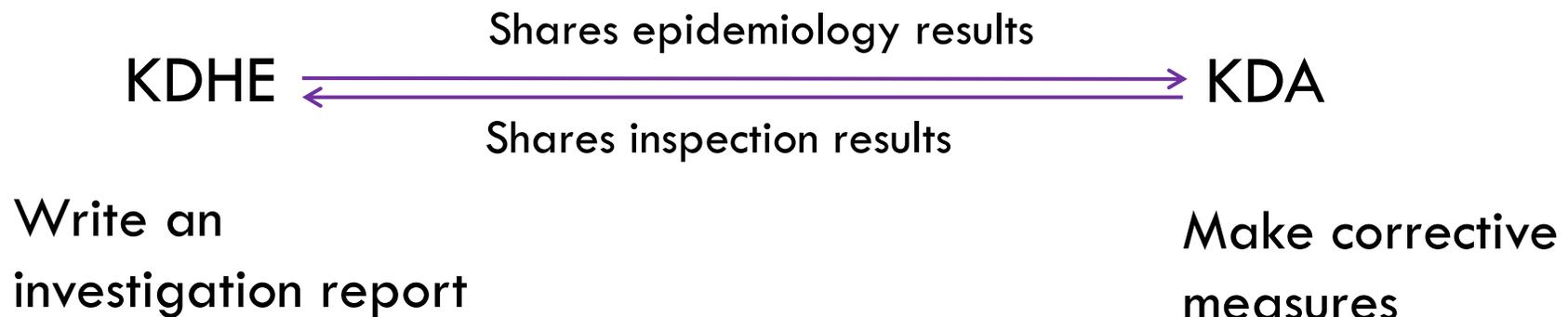
▶ Three phases:

- receiving a complaint
- conducting an environmental inspection and initial epidemiological investigation
- and conducting a full outbreak investigation.



Complaints and Outbreaks

- ▶ A typical investigation: epidemiologic investigation, laboratory analysis, and an environmental assessment.
- ▶ Additional interviews and specimens collection may apply.



Methods

- ▶ The data set included restaurant-based complaints that were received by the KDA through an online complaint form or telephone calls.
- ▶ Only complaints that were initially reported to KDA were included; complaints that citizens first reported to KDHE or a local health department were excluded.
- ▶ Beginning in 2009, KDHE transferred the data from each complaint into Microsoft Excel spreadsheets each calendar year.

Methods (cont.)

Complaint information

- Anonymous complaint (Yes or No)
- Complaint date, day of the week
- Method of complaint submission (Online vs. telephone)
- Meal occurrence date and time
- Illness onset date and time
- Number of ill households

Establishment information

- Establishment name
- Establishment type
- Establishment address, county, and region

Investigation information

- Investigation conducted (Yes or No)
- Outbreak identified (Yes or No)
- Exposure-to-illness day
- Exposure-to-complaint days
- Illness-to-complaint days
- Outbreak etiologies

The day of the week column in each complaint was determined by using SAS version 9.2¹⁶

Methods (cont.)

- ▶ For this analysis, 1011 complaints regarding RTE (ready-to-eat) food were included.
- ▶ The complaints were grouped with records from the KDHE outbreak database, and were classified into three categories: no investigation, not an outbreak, and outbreak.
- ▶ **Investigation rate = (number of investigations / number of complaints)* 100%**
- ▶ **Outbreak rate = (number of outbreaks / number of investigations)*100%**

Results and Discussions

▶ Complaints in each year

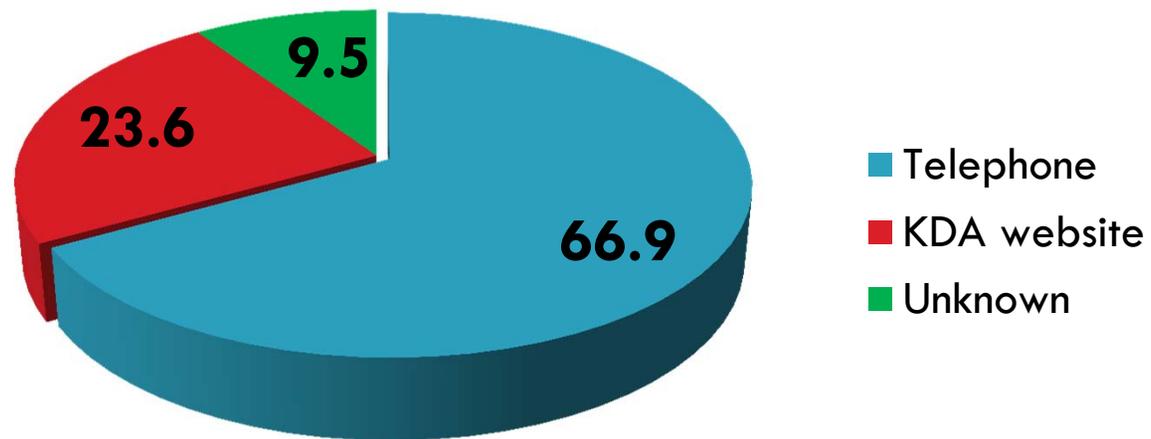
Year	Number of complaints	Number of investigations	Number of outbreaks
2009	248	24	1
2010	270	23	9
2011	214	29	17
2012	279	33	19
Total	1011	109	46

- ▶ Total 1011 complaints, 109 investigations, and 46 outbreaks. Investigation rate was 10.8%, and the outbreak rate was 42.2%.

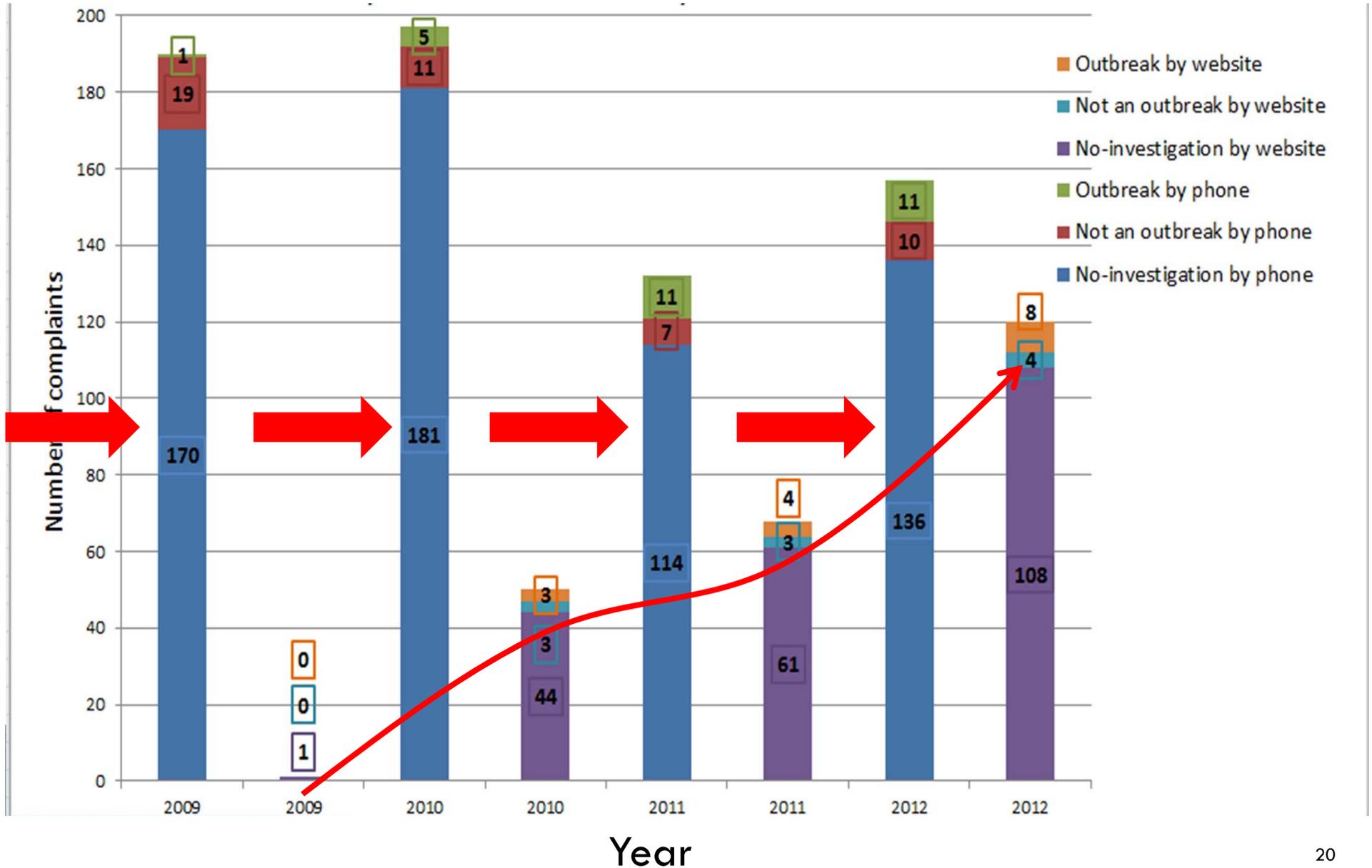
Complaints submission Methods

In 2009-2012, 676 (66.9%) complaints were received by telephone, 239 (23.6%) complaints were received by the KDA website, and 96 (9.5%) complaints had no record of the means by which it was received.

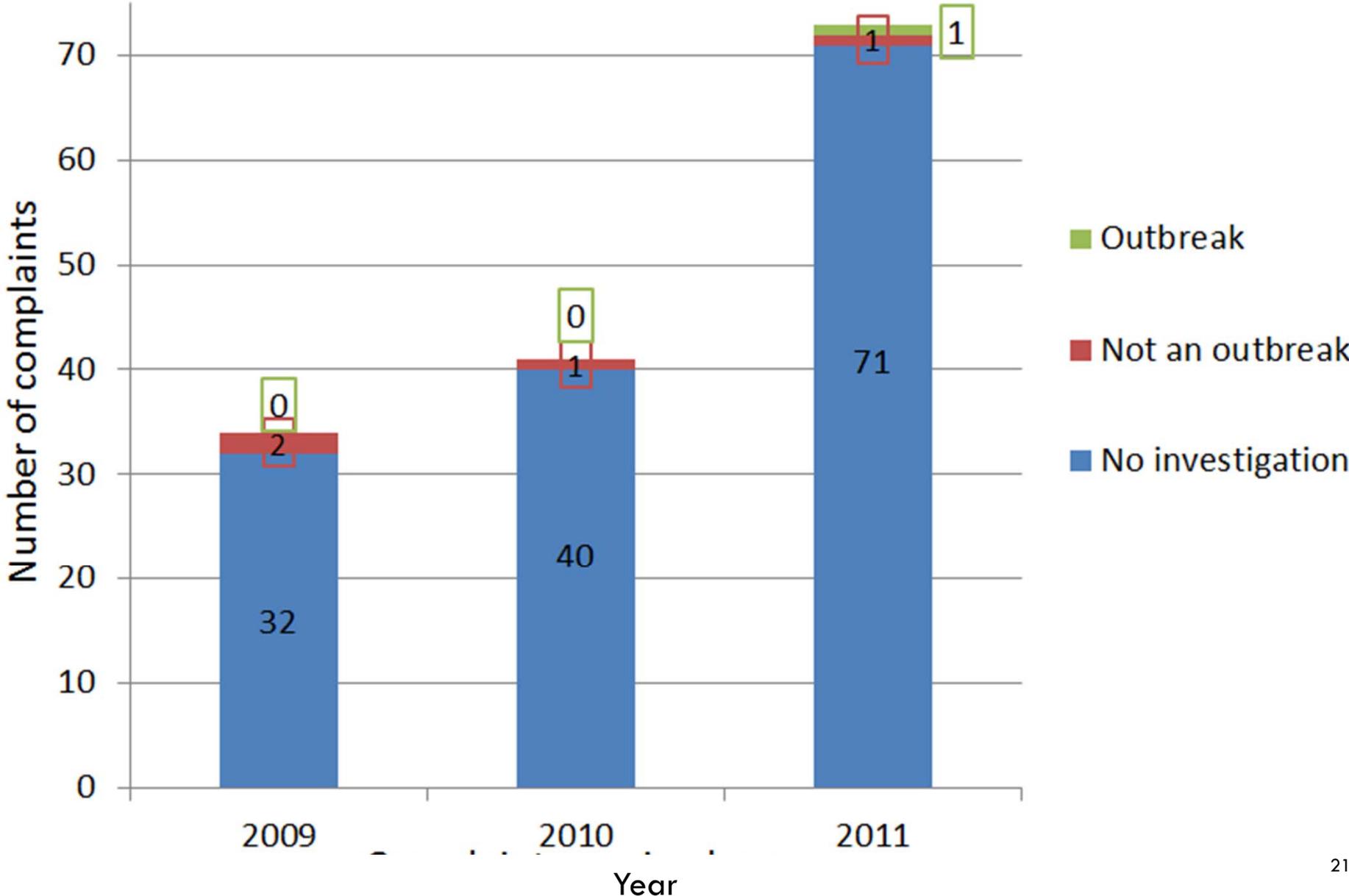
Percentage of complaints



Complaints distribution by received measures



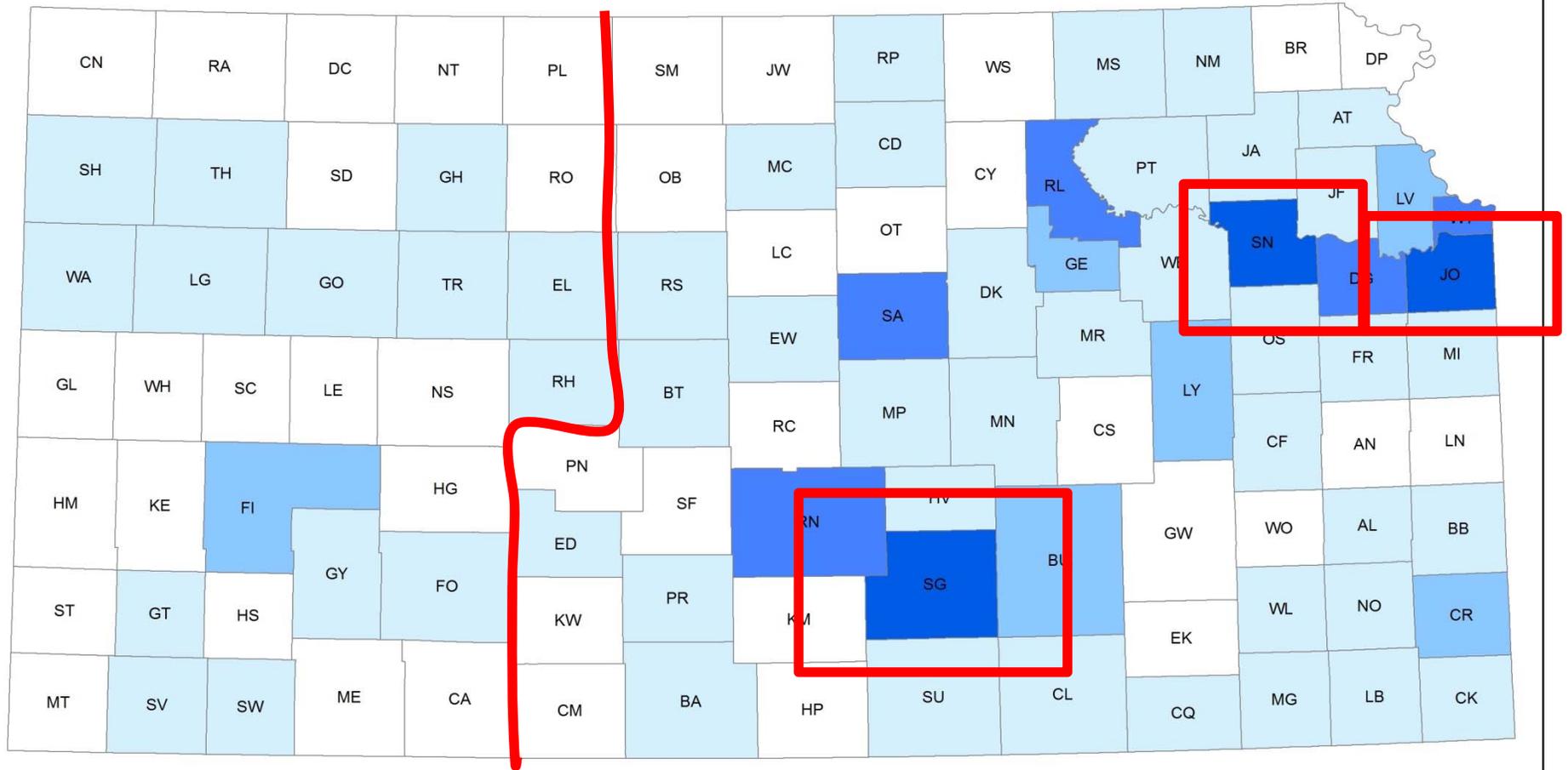
Anonymous complaints distribution in years



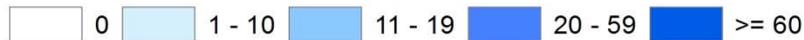
Outbreak etiology

Pathogen	Number of outbreaks, 2009-2012	Percentage (%)
Norovirus	14	30.4
<i>Salmonella</i> spp.	4	8.7
Unknown	28	60.9

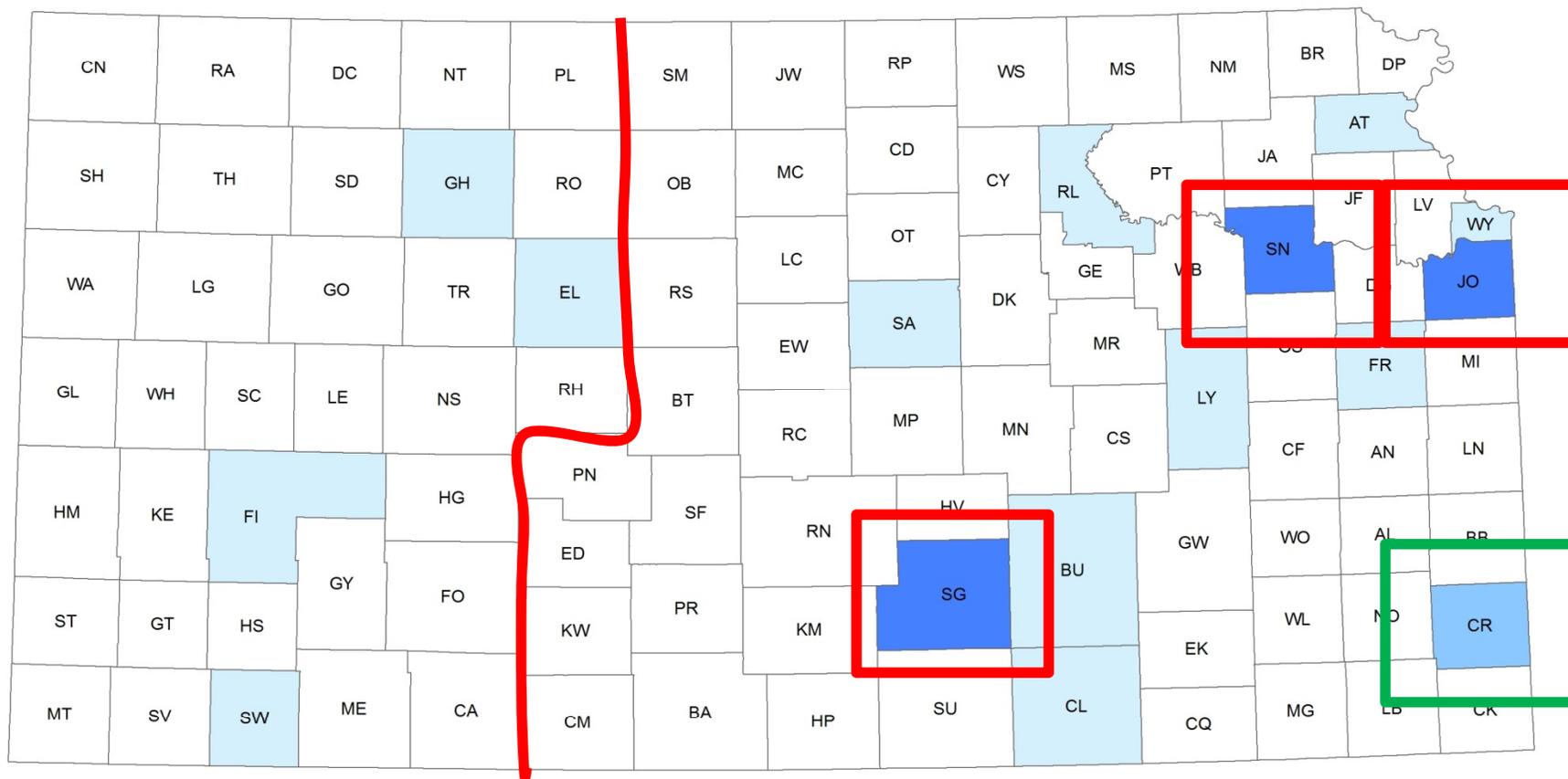
Foodborne illness complaints received by Kansas county, 2009-2012



SG + SN + JO = 58.8%

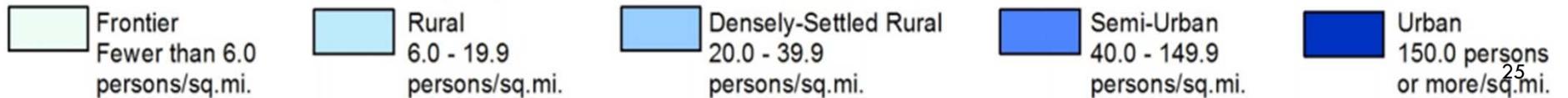
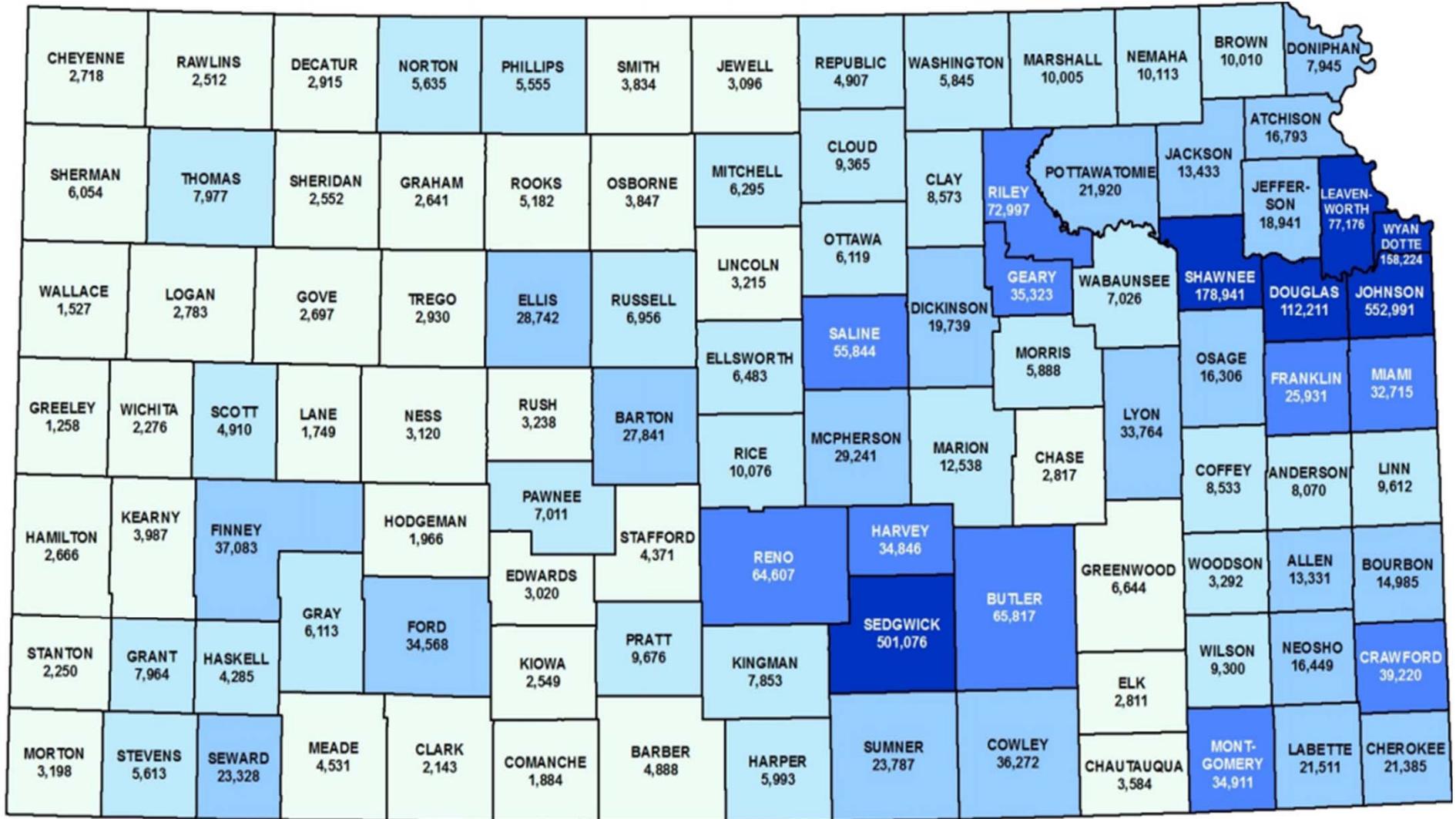


Outbreaks identified from foodborne illness complaints by Kansas county, 2009-2012



1 - 4 5 - 9 10 - 15

County peer groups

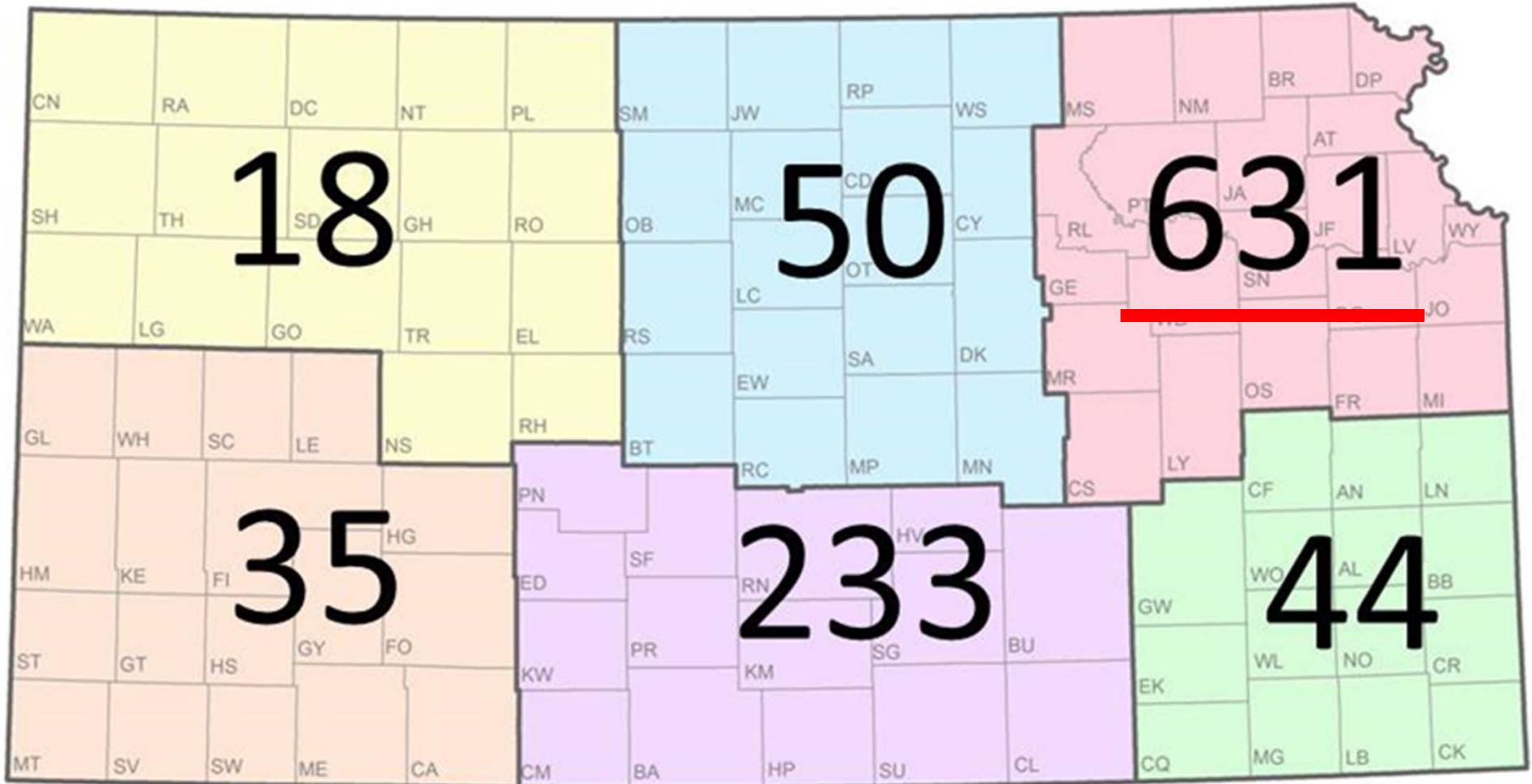


County Population Density Peer Group

County	No investigation	Not an outbreak	Out-break	Total complaints	Population per region (Estimate 2011)	Percent of population (2011)	Complaints per 10,000 people
Frontier	11	0	1	12	113,453	3.95%	1.058
Rural	32	0		32	237,591	8.27%	1.347
Dense Rural	92	3	7	102	477,364	16.63%	2.137
Semi-Urban	140	6	10	156	462,211	16.10%	3.375
Urban	627	40	42	709	1,580,619	55.05%	4.486

Complaint distribution corresponds to the population distribution.

Complaints by county geographic region



Complaints by county geographic region

Regions	No investigation	Not an outbreak	Outbreak	Total
North Central	48	0	2	50
<u>Northeast</u>	570	29	32	631
Northwest	16	0	2	18
Southeast	38	1	5	44
South Central	200	17	16	233
Southwest	30	2	3	35

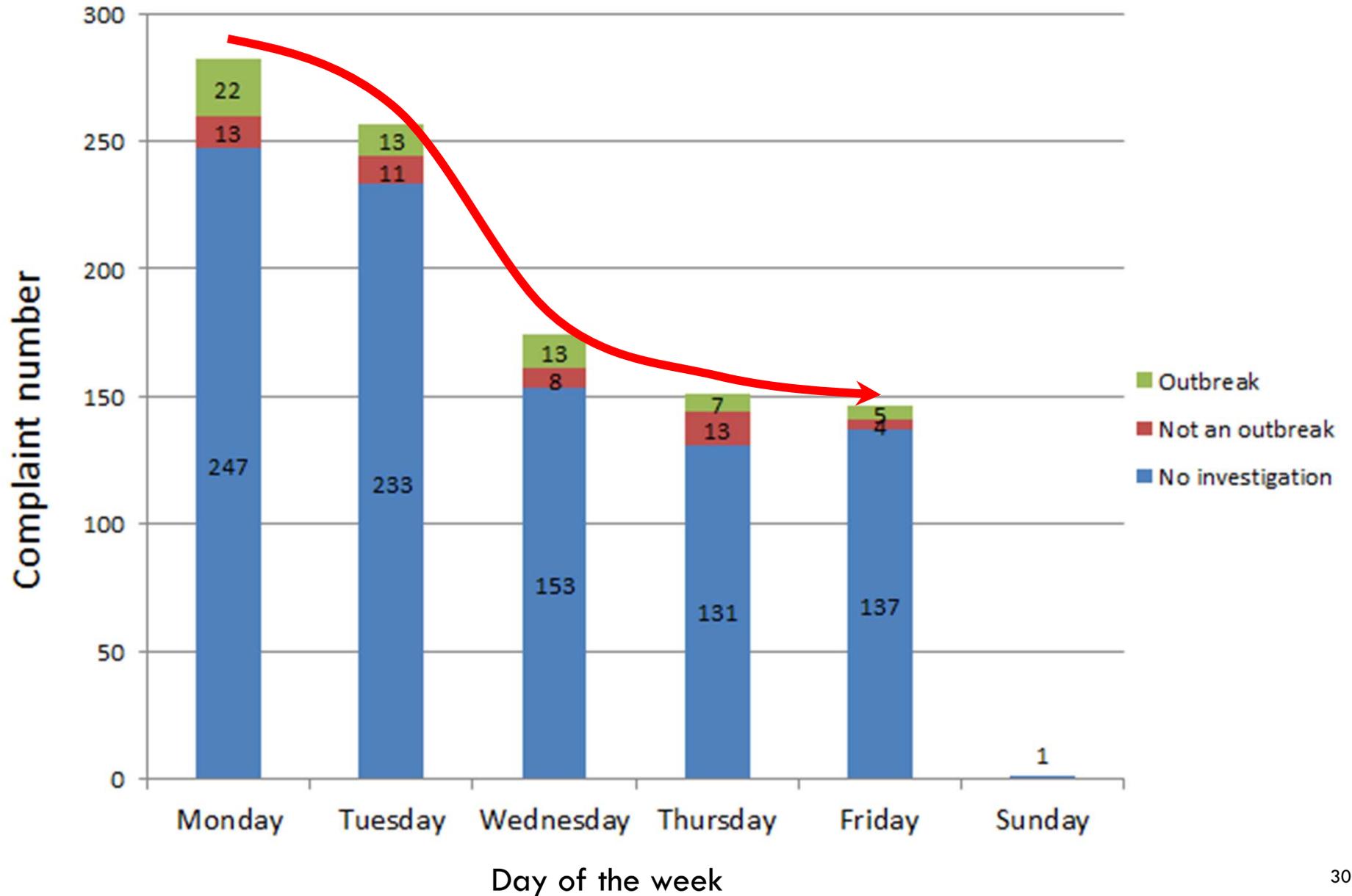


Counties with no complaints (2009-2012)

Nearly half

NORTH-EAST	SOUTH-EAST	SOUTH CENTRAL	NORTH CENTRAL	NORTH-WEST	SOUTH-WEST
Brown Chase Doniphan	Anderson Elk Greenwood Linn Woodson	Comanche Harper Kingman Kiowa Pawnee Stafford	Clay Jewell Lincoln Osborne Ottawa Rice Smith Washington	Cheyenne Decatur Ness Norton Phillips Rawlins Rooks Sheridan	Clark Greeley Hamilton Haskell Hodgeman Kearny Lane Meade Morton Scott Stanton Wichita

Complaints distribution by day of the week



Time between estimated exposure, illness onset, and complaint

Number of days from exposure to report



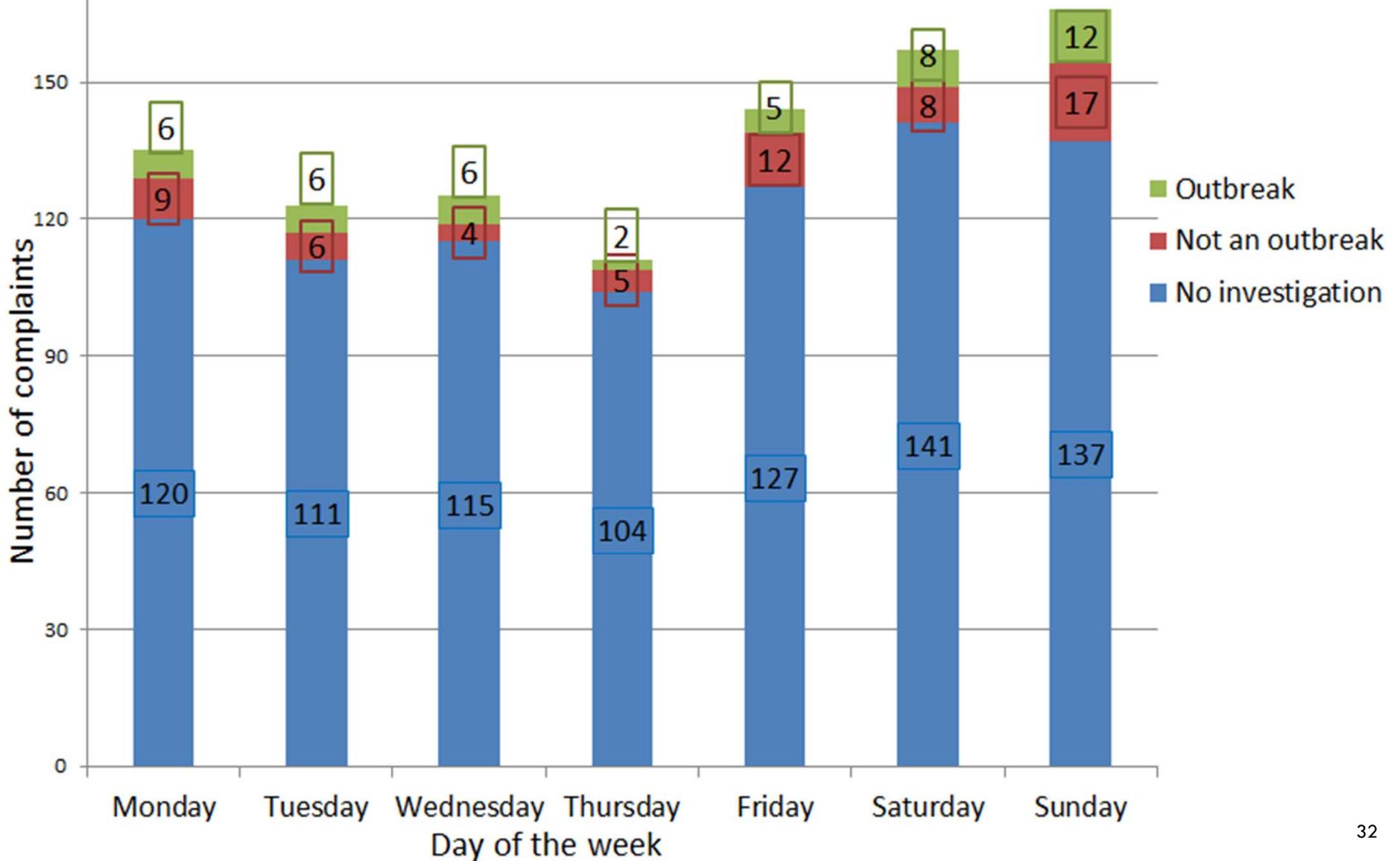
Number of days from exposure to report



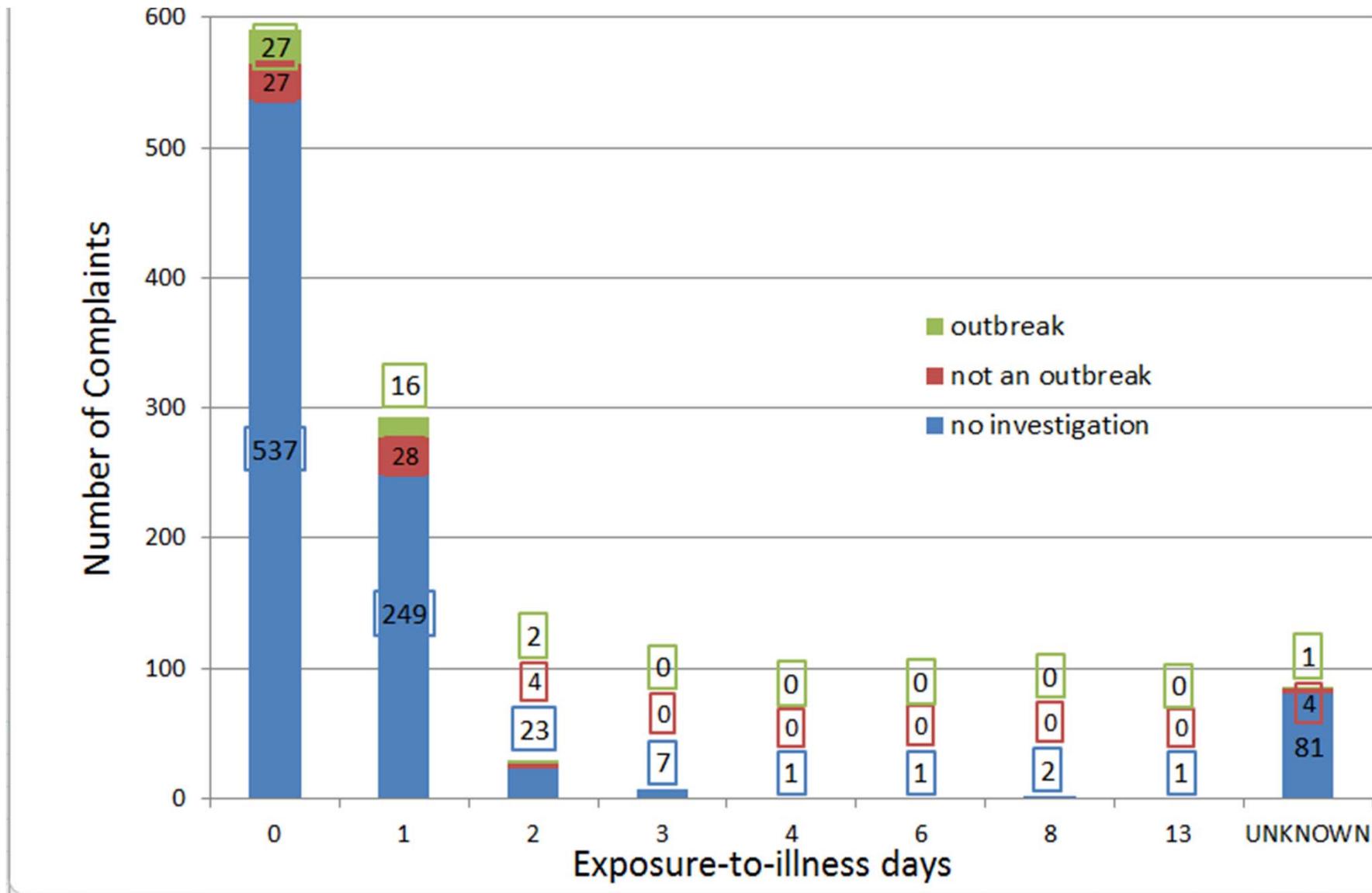
Number of days from illness to report



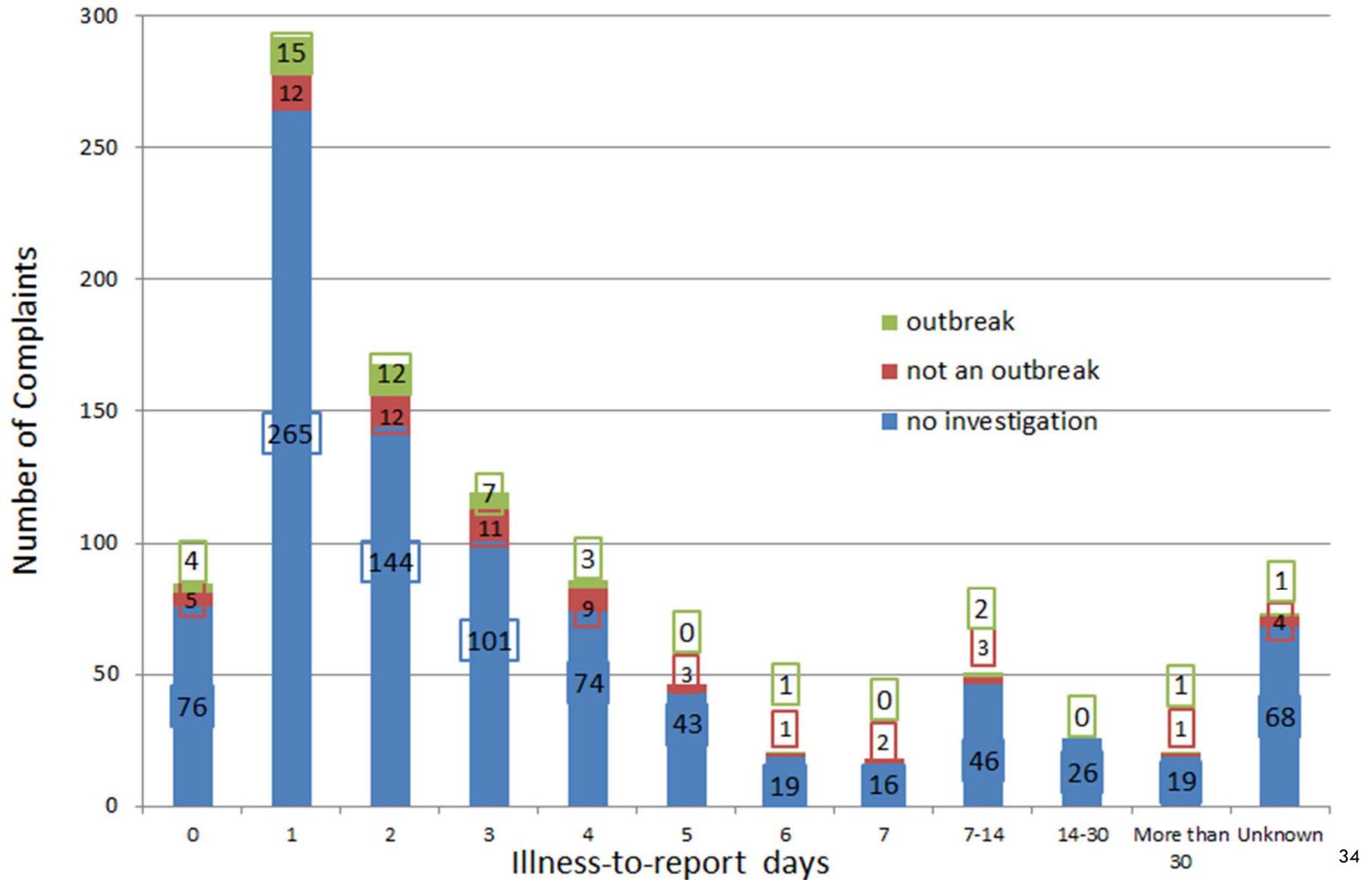
Complaint exposures distribution by day of the week



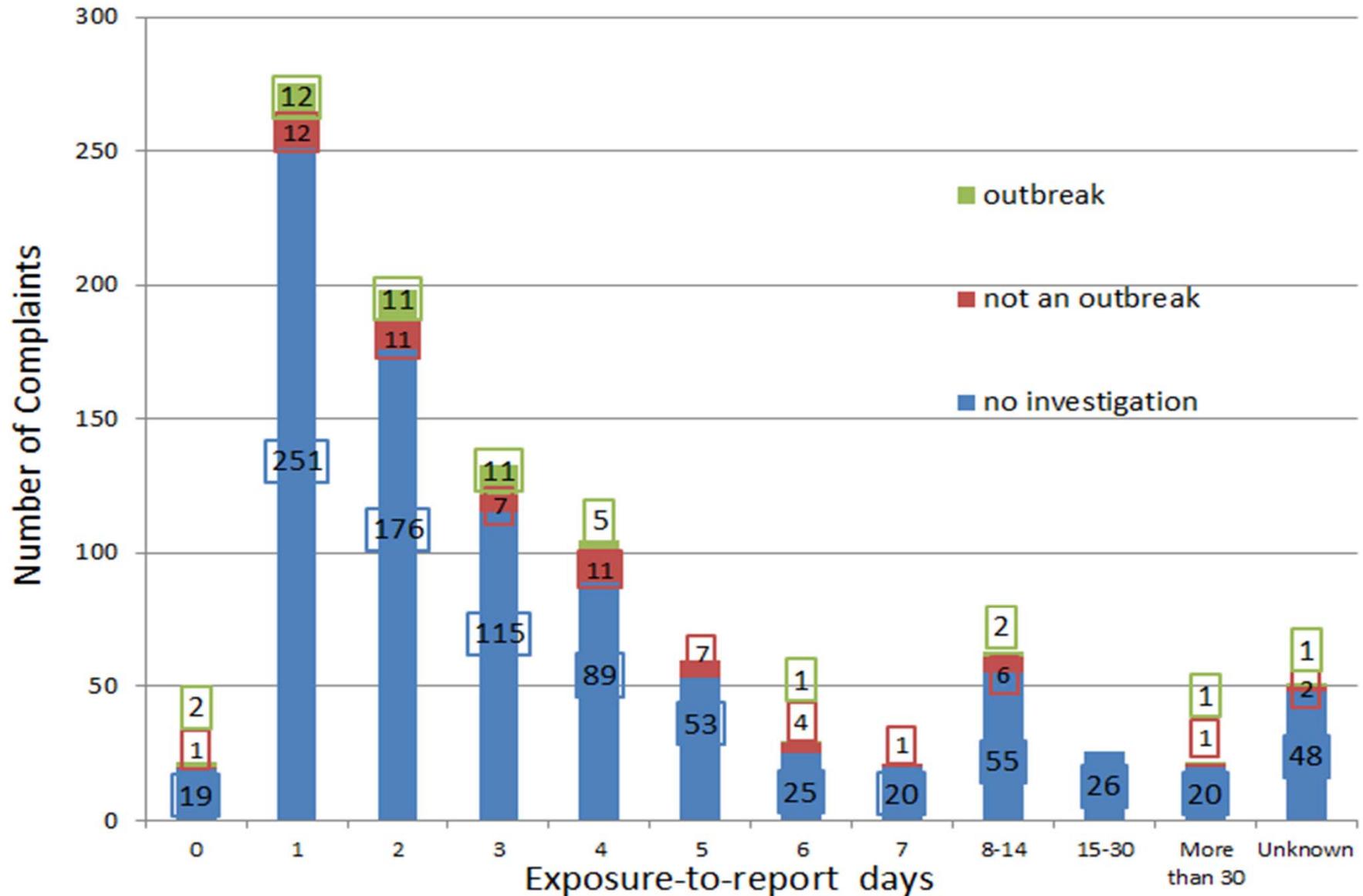
Complaints distribution in exposure-to-illness days



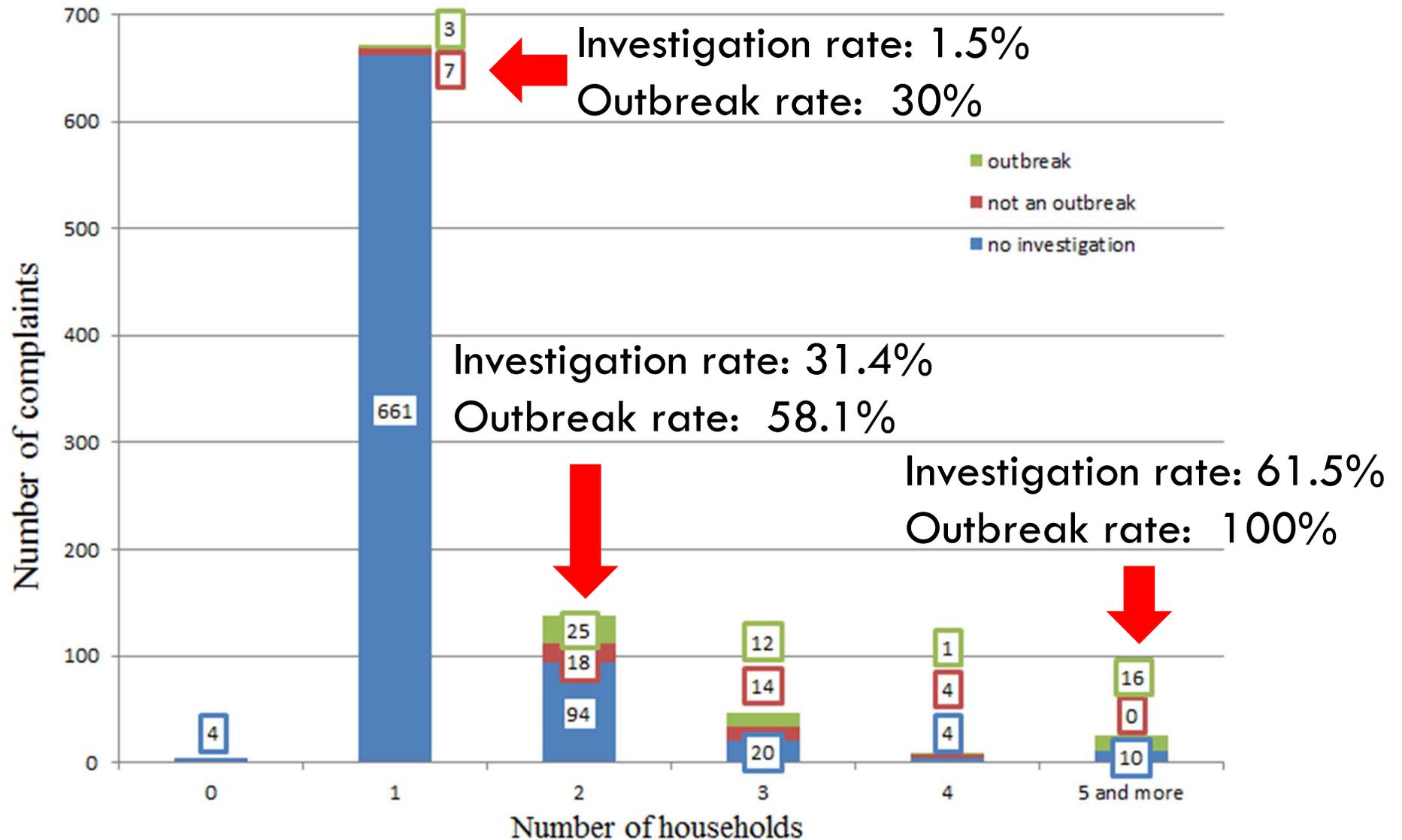
Complaints distribution in illness-to-report days



Complaints distribution in exposure-to-report days



Complaints grouped by number of households involved



Summary

- ▶ 1. In total, from 2009-2012, the investigation rate was 10.8%, and the outbreak rate was 42.2%.
- ▶ 2. For the period of study (2009-2012), two-thirds of complaints were telephone-based. However, increasing trend towards website-based reporting.
- ▶ 3. Number of anonymous complaints was increasing from 2009 to 2011, and only one outbreak was detected from 149 anonymous complaints.



Summary (cont.)

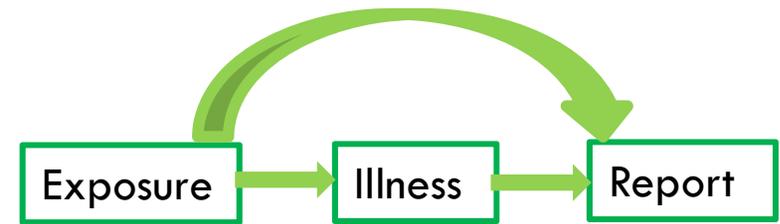
- ▶ 4. Of the 1011 complaints, 46 were detected as outbreaks. Only 39.1% of the outbreaks detected a pathogen, of which norovirus was 30.4% and *Salmonella* spp. was 8.7%.
- ▶ 5. Only three counties had more than 10 outbreaks: Johnson County, Shawnee County, and Sedgwick County. The western half of Kansas had only 5 (10.8%) outbreaks.
- ▶ 6. Complaints were concentrated in Johnson, Sedgwick and Shawnee counties. The complaint distribution corresponds to the population distribution.

Summary (cont.)

- ▶ 7. The geographic area with the most complaints report was the northeast region, while the least complaints report was the northwest region.
- ▶ 8. Complaints have an unbalanced distribution throughout the week.
- ▶ 9. Complaints that involve multiple households are more likely to be classified as outbreaks.



Summary (count.)



- ▶ 10. Outbreaks were accompanied by three intervals. (exposure-to-illness days, exposure-to-report days, and illness-to-report days)
- ▶ Exposure-to-illness days:
 - provide more detailed information, norovirus 24h incubation
- ▶ Illness-to-report days
 - a person might be busy treating their symptoms or seeing a doctor, so reporting the complaint is not their first priority
- ▶ Exposure-to-report days
 - individuals cannot report an illness until they get sick, and it takes time from exposure to start having symptoms

Recommendations

- ▶ **Methods of complaint submission:**

Currently, the KDA and KDHE have specialists to answer complaint calls. But on the KDA website, the anonymous option makes more difficult to investigate. It is very simple to choose make an anonymous complaint, and no personal information is required.

- ▶ **Time between estimated exposure, illness onset, and complaint.**

In this study, time between exposure, illness onset, and complaint were calculated in days. Further study could be more accurate by calculate time in hours.

Limitations

- ▶ Under-reporting data: Complaints that were not submitted into these databases would be left out.
- ▶ Incomplete information in the complaint data (missing data fields, such as no date of illness onset)
- ▶ Complaints may or may not be actual cases of foodborne illness.
- ▶ Compare complaint numbers with the number of restaurants in each county.



References

- ▶ CDC (2011a). "Making Food Safer to Eat." Reducing contamination from the farm to the table. Retrieved June 15, 2013, from <http://www.cdc.gov/vitalsigns>.
- ▶ CDC (2011b). CDC Estimates of Foodborne Illness in the United States. Retrieved July 2013 from: <http://www.cdc.gov/foodborneburden/2011-foodborne-estimates.html>
- ▶ CDC (2012). Food Safety. Retrieved July 2013 from: <http://www.cdc.gov/foodsafety/>
- ▶ Jones. T. F., Angulo. F. J. (2006). "Eating in Restaurants: A Risk Factor for Foodborne Disease?" Food Safety **2006**(43): 5.
- ▶ KDA (2006). Food Safety and Lodging. Retrieved July 2013 from: http://www.ksda.gov/food_safety/
- ▶ KDA (2012). Agency Information. Retrieved July 2013 from: <http://agriculture.ks.gov/about-ksda/agency-info>
- ▶ KDHE (2008). Foodborne illness and outbreak investigation manual. D. o. Health. Topeka, Office of Surveillance and Epidemiology: 186.
- ▶ KDHE (2010). Surveillance Guidelines of Reportable Diseases in Kansas. A tool for Local Health Departments and Regional Coordinators. Topeka: 97.
- ▶ KDHE (2011). Organizational Structure. Retrieved July 2013 from: <http://www.kdheks.gov/administration/index.html>
- ▶ KDHE (2012a) New EpiTrax Surveillance System Goes Live. Bureau of Epidemiology & Public Health Informatics **3**, 1
- ▶ KDHE (2012b). Governor's Office Internship Program. Retrieved July 2013 from: <http://governor.ks.gov/serving-kansans/governor's-office-internship-program>
- ▶ KDHE (2013a). Primary Care Health Professional Underserved Areas Report. B. o. C. H. S. K. P. C. Office. Topeka, Kansas Department of Health and Environment.
- ▶ KDHE (2013b). Epidemiology and Public Health Informatics. Retrieved July 2013 from: <http://www.kdheks.gov/bepi/index.html>
- ▶ Li. J., Smith. K, Kaehler. D., Everstine. K., Rounds. J., Hedberg. C. (2010). "Evaluation of a statewide foodborne illness complaint surveillance system in Minnesota, 2000 through 2006." Journal of Food Protection **73**(11): 2059-2064.
- ▶ Sobel, J., Khan, A. S., & Swerdlow, D. L. (2002). "Threat of a biological terrorist attack on the US food supply: the CDC perspective." Lancet **359**: (9309), 874-880.
- ▶ WHO (2008). Foodborne Disease Outbreaks. Guidelines for Investigation and Control. France, World Health Organization.



Acknowledgement

- ▶ Daniel Neises
- ▶ The KDHE family

- ▶ Dr. Abbey Nutsch
- ▶ Dr. Michael Cates
- ▶ Dr. Weiqun Wang
- ▶ Dr. Kimathi Choma
- ▶ Barta Stevenson

Thank you !