ARIZONA DEPARTMENT
OF HEALTH SERVICES

Infectious Disease Outbreak Summary Report

2015

Arizona Department of Health Services
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Contents

1.0 | Executive Summary

Outbreak detection, response, and reporting are key components of a state's public health capacity to prevent and control illness. An outbreak is defined as an increase in cases of disease in time or place that is greater than expected. In the absence of an increase, an outbreak occurs when a common source causes illness in two or more people from different households. Arizona law requires entities to report outbreaks to public health, including healthcare providers, healthcare institutions, correctional facilities, and administrators of schools, shelters, hotels, motels, and resorts. In Arizona, public health departments report, manage, and share information about outbreaks using MEDSIS Outbreak Module.

The following are highlights of the 2015 Infectious Disease Outbreak Summary Report:

- During 2015, there were fewer outbreak reported (137) than in the previous four years (mean 187 outbreaks per year, 2011-2014). (See Section 2.5.1)
- Four outbreaks (3%) affected more than 100 people. (See Section 2.5.5)
- Most outbreaks in 2015 were due to gastrointestinal illnesses (59%). (See Section 3)
- Outbreaks most frequently occurred in child care or school settings (37%) and healthcare facilities (34%). (See Sections 4.1 and 4.2)
- Four notable outbreaks are summarized in Section 5.

2.0 | Overview

2.1 | Outbreak Detection and Response

An outbreak is defined as an increase in cases of disease in time or place that is greater than expected. In the absence of an increase, an outbreak occurs when a common source causes illness in two or more people from different households.

Outbreak detection, response, and reporting are key components of a state's public health capacity and are essential for prevention and control of illness in a population. During and after outbreak investigations, public health officials:

- Take public health action to stop the spread of illness
- Provide education to prevent future outbreaks
- Gather information to assist with future outbreak investigations

Collecting and reporting data on infectious disease outbreak investigations allows the Arizona Department of Health Services (ADHS) to monitor Arizona's burden of infectious disease outbreaks and progress in detecting and responding to reported outbreaks throughout the state. Variables collected include date of outbreak report, number of ill cases, outbreak etiology, infectious disease category, outbreak location or setting, mode of transmission, and number of clinical specimens collected. These data are collected in order to provide a profile of the infectious disease outbreaks that occur in Arizona and of the timeliness and completeness of outbreak response. The data analysis allows for improved implementation of appropriate outbreak control measures to mitigate the spread of disease and prevent future outbreaks from occurring.

Additional resources

Outbreak threshold guide for healthcare settings and correctional facilities:

http://azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/outbreak-threshold-guide-providers.pdf

Outbreak threshold guide for schools, child care establishments, and shelters:

http://azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/outbreak-threshold-guide-providers.pdf

Definition

Case | An individual (single person) with a communicable disease.

Reportable | Required to be reported under A.A.C. R9-6-202, 203, 204, and 205

Outbreak | Unexpected increase in incidence of a disease, or the same illness in two or more people from different households, with a common source.

2.2 | Outbreak Data Sources

The communicable disease surveillance system and reporting tool used by public health in Arizona is the Medical Electronic Disease Surveillance Intelligence System (MEDSIS). An extension of the case-based surveillance in MEDSIS, Outbreak Module (OBM) was introduced in 2014 to help users report, manage, and share information about outbreaks. OBM's integration into MEDSIS allows users to easily link existing MEDSIS cases to an outbreak, create new cases to link to an outbreak, and retrieve outbreak data for analysis. Notable features of the OBM include the Outbreak Summary Forms page, which can automatically calculate fields within the form using case information that has been entered, and the Outbreak Long Form Creation page, which allows users to create outbreak specific investigation forms. Furthermore, public health partners can share outbreak information within OBM to better coordinate outbreak investigations across jurisdictions.

Population denominators used in this report are from the ADHS Bureau of Public Health Statistics. Population denominators were estimated using the 2015 population projections obtained from the Office of Employment and Population Statistics within the Arizona Department of Administration.

The descriptive epidemiology included in this report is based on data from OBM for outbreaks reported in 2015, and was analyzed in Statistical Analysis System (SAS) 9.3. Graphs and figures presented in this report were created in Adobe InDesign.

2.3 | Outbreak Performance Goals

ADHS utilizes a standardized outbreak summary form based on the Centers for Disease Control and Prevention (CDC) performance indicators. These indicators are meant to be used by state and local health agencies to evaluate the performance of their outbreak response and control programs and identify specific needs for improvement.

The performance goals for outbreak tracking and response in Arizona are as follows:

- At least 90% of reported outbreaks will have an investigation initiated within 24 hours of receipt of report.
- At least 95% of outbreaks will be reported to ADHS by the local health department within 24 hours of receipt of report.
- Summary reports of 100% of investigations will be submitted to ADHS within 30 days after completion of the investigation.

2.4 | Outbreak Reporting Requirements

In Arizona, healthcare providers, healthcare institutions, correctional facilities, and administrators of schools and shelters are required to report outbreaks of infectious diseases to their county health department under Arizona Administrative Code (A.A.C.) R9-6-202 and R9-6-203 and Arizona Revised Statutes (A.R.S.) Title 36. Hotels, motels, and resorts are also required to report contagious or epidemic diseases occurring in their establishments within 24 hours under A.R.S. 36-622. Outbreaks are reportable to ADHS within 24 hours after a county health department receives a report (A.A.C. R9-6-206F). The information provided at the time of report includes location/setting of outbreak, number of cases and suspect cases, the date reported, the disease suspected, and important contact information.

Definitions

Confirmed outbreak | An increase in cases of disease in time or place that was greater than expected. In the absence of an increase, a common source was identified in two or more cases from different households with the same illness. Exposure occurred in Arizona.

Cluster | Two or more cases from different households with a matching pulsed field gel electrophoresis (PFGE) pattern. The number of cases represents an increase over baseline or demographic or epidemiologic characteristics indicate a deviation from expected, and no common source was identified. PFGE is a laboratory technique used to identify two or more individuals that had similar pathogen strains, indicating their illness may have had a common source. See Section 3.1.2.

Ruled-out outbreak | After investigation, investigators determined that the event did not represent an increase in disease in time or place that was greater than expected, and a common source was not identified.

Out of Arizona | Arizona residents were affected by a true increase in disease in time or place that was greater than expected, or a common source of illness was identified, but exposure occurred outside of Arizona.

2.5 | 2015 Outbreak | A High-level View

2.5.1 | Number of confirmed outbreaks

The figure below shows the total number of confirmed outbreaks reported in Arizona in which cases were exposed in Arizona from 2011 through 2015. There was a peak in the number of outbreaks reported in 2012, with a decrease in 2013 through 2015. This may be due to increased surveillance and reporting of outbreaks in 2012, statistical variance, or an actual increase in outbreaks in 2012. In 2015, there were 137 confirmed infectious disease outbreaks reported in which exposure occurred in Arizona. This is fewer than in the previous four years (mean 187 outbreaks per year, 2011-2014).

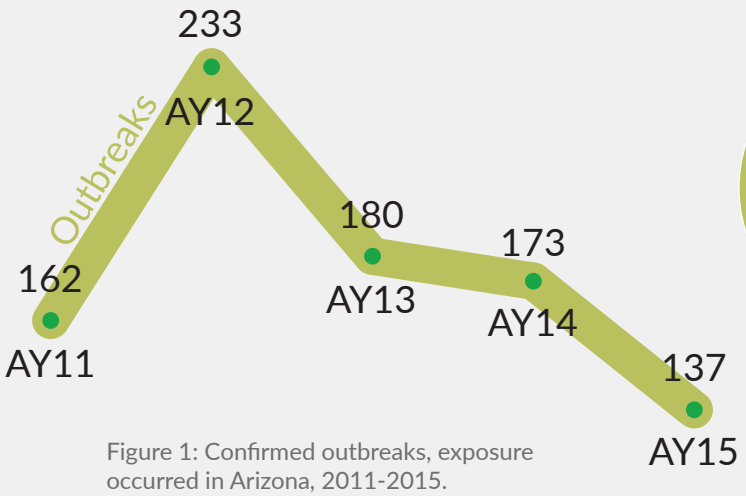


Figure 1: Confirmed outbreaks, exposure occurred in Arizona, 2011-2015.

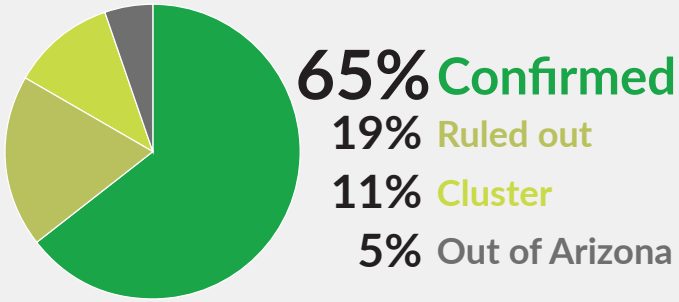


Figure 2. Suspected and confirmed outbreaks, Arizona, 2015. N=212

2.5.2 | Ruled-out outbreaks, out-of-Arizona outbreaks, and clusters

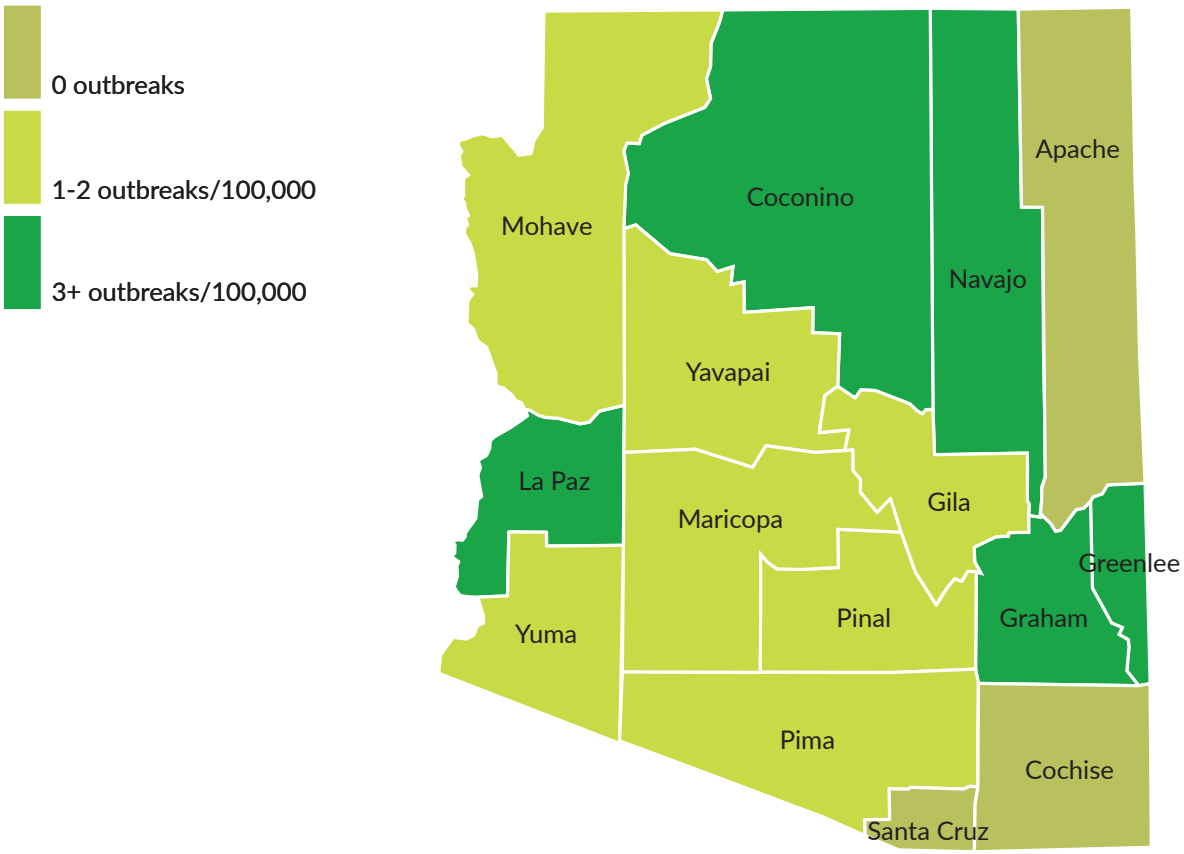
Not all suspected outbreaks that are reported and investigated fit the confirmed outbreak definition. Additionally, only confirmed outbreaks in which cases were exposed in Arizona are included in this report, unless otherwise noted.

In 2015, 212 suspected communicable disease outbreaks were reported and investigated in Arizona. Of the 212 investigations conducted, 137 (65%) were finalized as confirmed communicable disease outbreaks in which cases were exposed in Arizona, 40 (19%) were ruled out as not an outbreak, 25 (12%) were PFGE-matched clusters that did not have a common exposure identified (see cluster definition), and 11 (5%) were confirmed outbreaks in which cases were exposed outside of Arizona.

2.5.3 Outbreaks by county

During 2015, the two most populous counties had the greatest number of confirmed outbreaks (Maricopa County 61%; Pima County 13%). However, when taking population size into account, the three least populous counties had the greatest number of outbreak cases reported per 100,000 persons (Greenlee County: 1 outbreak, 9 outbreaks/100,000; Graham County: 2 outbreaks, 5 outbreaks/100,000; La Paz County: 1 outbreak, 5 outbreaks/100,000).

County	Number of outbreaks	% of outbreaks	Population	Outbreaks per 100,000 population
Apache	0	0	72,215	0
Cochise	0	0	129,112	0
Coconino	6	4	141,602	4
Gila	1	0.7	54,406	2
Graham	2	2	38,475	5
Greenlee	1	0.7	10,555	9
La Paz	1	0.7	21,183	5
Maricopa	84	61	4,076,438	2
Mohave	3	2	205,716	1
Navajo	3	2	109,671	3
Pima	18	13	1,009,371	2
Pinal	5	4	406,468	1
Santa Cruz	0	0.0	50,270	0
Yavapai	5	4	217,778	2
Yuma	1	0.7	214,991	0.5
Exposure occurred in multiple counties or states	7	5	N/A	N/A
Total	137		6,758,251	2



2.5.4 | Outbreaks by month

During 2015, outbreaks were reported in greatest numbers in winter and early spring (January through April, and December). In addition to date of report, investigators report the date that the first person became ill. With the exception of January and February, outbreak timing was similar when looking at month of report and month of first ill.

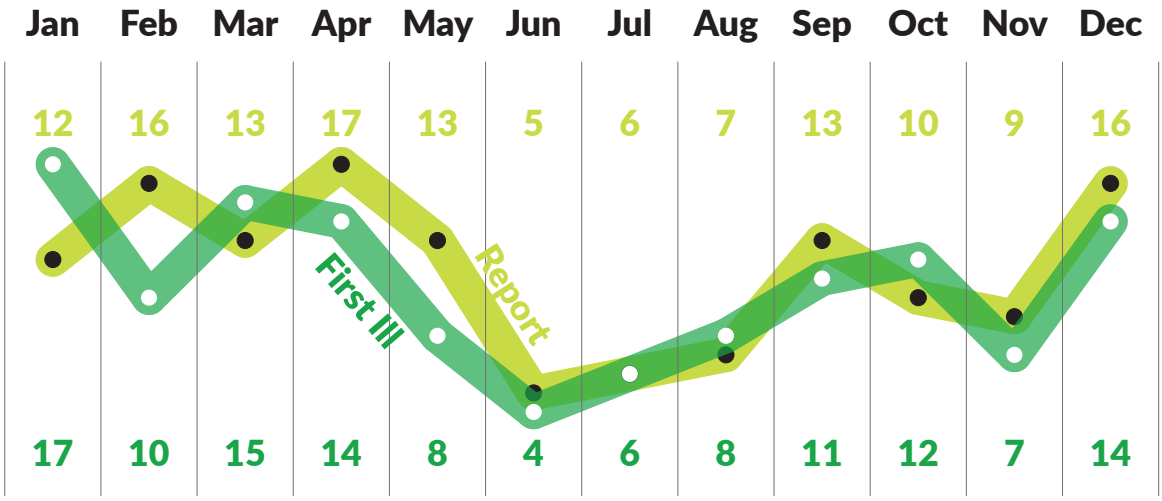


Figure 3. Number of outbreaks by month of report (N=137) and month first ill (N=126), Arizona, 2015. (11 missing date of first ill)

2.5.5 | Outbreak size

Outbreaks vary greatly in size; one outbreak could involve only a few cases or may involve hundreds of cases. During 2015, 40 (30%) outbreaks affected fewer than five people; 27 (20%) outbreaks affected between five and 10 ill persons; 22 (16%) outbreaks affected between 11 and 10 persons; 29 (2%) outbreaks affected 21 to 50 persons; 12 (9%) outbreaks affected 51 to 100 people, and 4 (3%) outbreaks affected more than 100 people.

The outbreaks that resulted in 100 or more ill persons were:

- An influenza outbreak at a school with illness starting in April 2015, resulting in 105 cases.
- An outbreak of *Salmonella* linked to imported cucumbers with illnesses starting in July 2015, resulting in 152 confirmed and probable cases. (More in sections 3.1.2 and 5.2)
- An outbreak of *Salmonella* at a prison with illnesses starting in September 2015, resulting in approximately 252 ill inmates and staff. (More in Section 3.1.2.)
- A gastrointestinal illness outbreak of unknown etiology on tribal lands with illnesses starting in November 2015, resulting in approximately 250 ill persons.

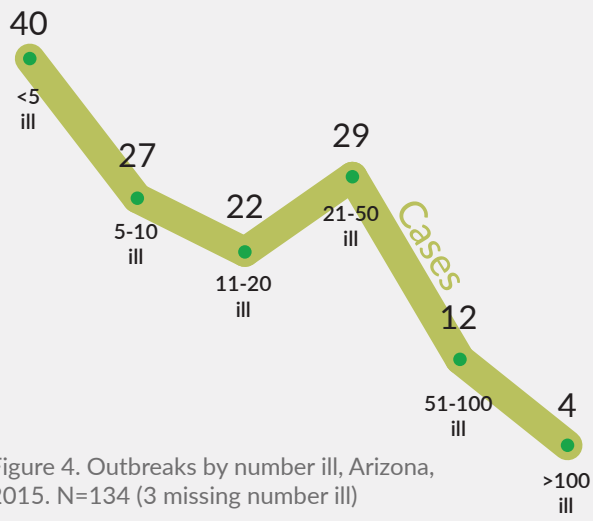
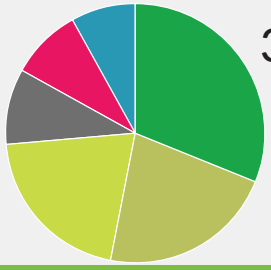


Figure 4. Outbreaks by number ill, Arizona, 2015. N=134 (3 missing number ill)

2.5.6 | Method of identification

Public health investigators identify outbreaks in many different ways. During 2015, outbreaks were most frequently identified by a report from a health care provider or facility (31%), followed in frequency by school or child care facility report (22%), public health surveillance (20%), citizen complaint (10%), and PFGE cluster detection (9%). For the remainder of outbreaks (8%), the method of identification was some other method or unknown.



30% Provider/facility report
22% School or child care facility report
20% Public health surveillance
10% Citizen complaint
9% PFGE cluster detection
8% Other/Unknown

Figure 5. Outbreaks by method of identification, Arizona, 2015. N=137

Definitions

Provider/facility report | A health care provider or facility reported the outbreak to public health.

School or child care facility report | A school or child care facility reported the outbreak to public health.

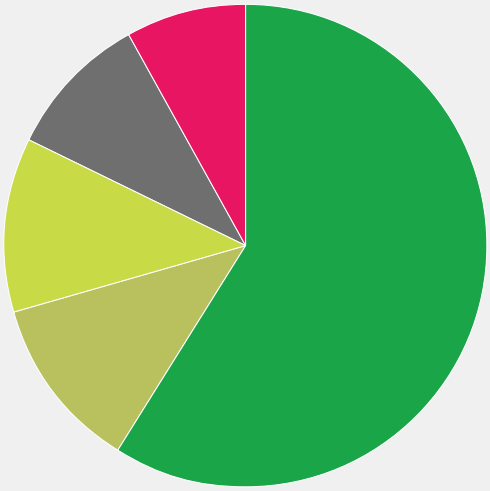
Public health surveillance | The outbreak was identified when routine interviews with persons diagnosed with a communicable disease indicated that others were ill from a common source. Or, local or state public health investigators detected an increase in disease incidence in time or place that was greater than expected and initiated an outbreak investigation.

Citizen complaint | A member of the community notified public health investigators.

PFGE cluster detection | Pulsed Field Gel Electrophoresis (PFGE) is a laboratory technique used to identify two or more individuals that had similar pathogen strains, indicating their illness may have had a common source. Unless otherwise noted, outbreaks detected through PFGE cluster detection are included only when the source was identified. See Section 3.1.2.

3.0 | Outbreak by disease category Highlights

When grouped by disease category, the majority of outbreaks in 2015 were gastrointestinal illness outbreaks (59%), followed in frequency by respiratory illness outbreaks (12%), vaccine-preventable disease outbreaks (12%), and outbreaks due to parasitic skin infestations (8%). The remainder of outbreaks (9%) did not fit any of these disease categories, listed in Table 2.



59% GI Illness
12% Respiratory
12% VPD
8% Parasitic skin infestations
9% Other

Figure 6. Outbreaks by confirmed or presumptive infectious disease category, Arizona, 2015. N=137

Disease	Number of outbreaks
Group A *Streptococcus*	4
Conjunctivitis	2
Hand, Foot and Mouth	3
Parvovirus	1
Pediculosis	1
Strongyloides	1
St. Louis Encephalitis Virus	1

For an in-depth look

Outbreaks of gastrointestinal diseases, see Section 3.1

Outbreaks of vaccine-preventable diseases, see Section 3.2

Outbreaks of respiratory illnesses, see Section 3.3

3.1 | Outbreaks of gastrointestinal illnesses

In 2015, there were 81 outbreaks of gastrointestinal illnesses, representing 59% of confirmed outbreaks.

Etiology

The table below shows confirmed or suspected etiologies for gastrointestinal illness outbreaks in 2015.

Etiology	N outbreaks	% of GI outbreaks
Norovirus	36	44
Confirmed	23	
Suspect	13	
Salmonella	18	22
Shigella	11	14
Campylobacter	1	1
C. difficile	1	1
Giardia	1	1
Unknown etiology	13	16
Total	81	

Table 3. Confirmed or suspected etiologies for gastrointestinal illness outbreaks, Arizona, 2015. N=81

Primary mode of transmission

Most gastrointestinal illness outbreaks were spread person-to-person (53%), followed by foodborne (22%), zoonotic (4%), and waterborne transmission (1%). For 15 outbreaks (19%), the primary mode of transmission was unknown.

Definitions

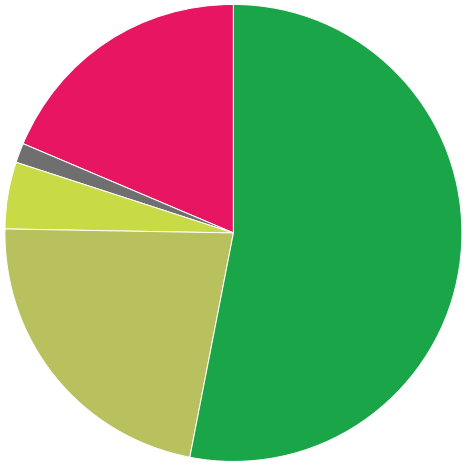
Person-to-person | The outbreak was associated with direct contact with an infected person.

Foodborne | The outbreak was associated with ingestion of contaminated food or beverage.

Zoonotic | The outbreak was associated with exposure to animals that were infected with the pathogen, or the outbreak was associated with exposure to contaminated animal environments.

Waterborne | The outbreak was associated with exposure to contaminated water.

Unknown | The mode of transmission for the outbreak was not determined.



53% Person-to-person
22% Foodborne
5% Zoonotic
1% Waterborne
19% Unknown

Figure 7. GI outbreaks by primary mode of transmission, Arizona, 2015. N=81

Performance goals

In addition to performance goals that are measured for all outbreaks, investigators also measure three performance goals specific to gastrointestinal illness outbreaks:

- Collect at least two specimens during outbreak investigations (target = 60%)
- Enter outbreak summary information into NORS, CDC's National Outbreak Reporting System (target = 75%)
- Confirm etiology (no target)

In 2015, 47 (58%; target = 60%) gastrointestinal illness outbreak had at least two specimens collected; 77 (95%; target = 75%) gastrointestinal illness outbreaks were entered into NORS; and 46 (57%) gastrointestinal illness outbreaks had etiology determined.

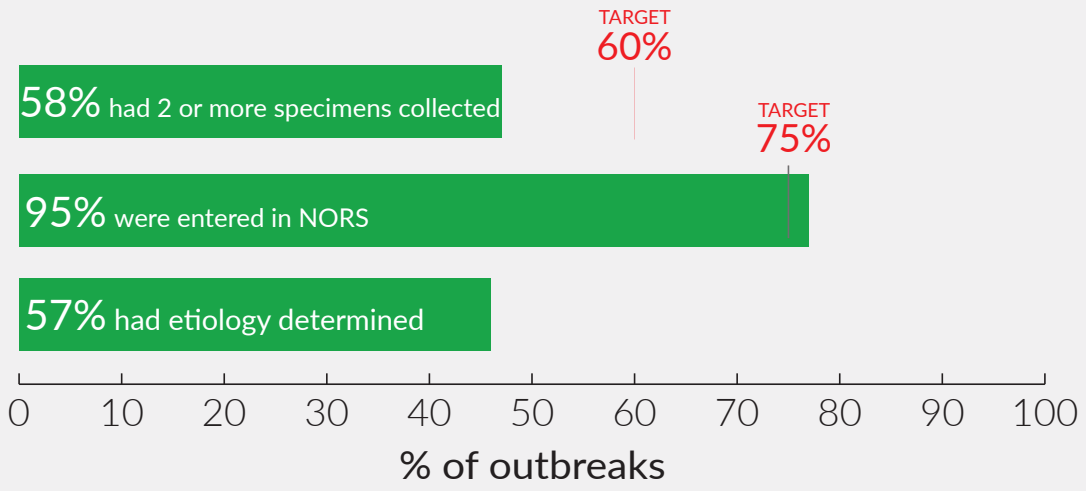


Figure 8. Performance goals for gastrointestinal illness outbreaks, Arizona, 2015. N=81

3.1.1 PFGE-matched clusters

Pulsed-field gel electrophoresis, or PFGE, is a laboratory diagnostic method to compare genetic factors of certain bacterial pathogens. This method is used routinely for every specimen of *Salmonella*, Listeria, and Shiga toxin-producing *E. coli* that is received at Arizona State Public Health Laboratory. PFGE can help investigators determine if the genetic characteristics of individual cases' bacterial pathogens are indistinguishable. This can indicate that the cases were infected from the same source. Some PFGE patterns occur more frequently than others, thus matches of common PFGE patterns may not indicate a common source.

Investigation of PFGE-matched cases is recorded differently than investigations of outbreaks identified through other means. PFGE-matched cases are investigated when two or more ill persons from different households have PFGE patterns that are identical with specimens collected within 14 days of each other.

Once the PFGE match is detected, investigators work to determine if the number of PFGE-matched cases represents an increase over baseline, determine if the demographic or other epidemiologic characteristics indicate a deviation from expected, and identify a common source of illness.

When a common source is identified and the exposure occurred in Arizona, the PFGE match is finalized as a confirmed outbreak. Unless otherwise noted, only confirmed outbreaks are included in other sections of this report.

PFGE matches are finalized as clusters when no common source of illness was identified, and the number of PFGE-matched isolates represents an increase over baseline, or demographic or other epidemiologic characteristics indicate a deviation from expected.

PFGE matches are ruled out when the number of PFGE-matched isolates does not represent an increase over baseline, demographic or other epidemiologic characteristics do not indicate a deviation from expected, and no common source of illness was identified.

Outbreaks that include PFGE-matched Arizona residents in which a common source was identified but exposure occurred outside of Arizona are recorded as out of Arizona.

In 2015, a total of 55 clusters were identified using PFGE. Of the 55 investigations conducted, 23 (42%) were clusters that did not have a common exposure identified, 13 (24%) were ruled out, 12 (22%) were confirmed with a common source identified, and seven (13%) had exposure outside of Arizona. Unless otherwise noted, only confirmed PFGE-matched clusters with a common source identified are included in the other sections of this report.

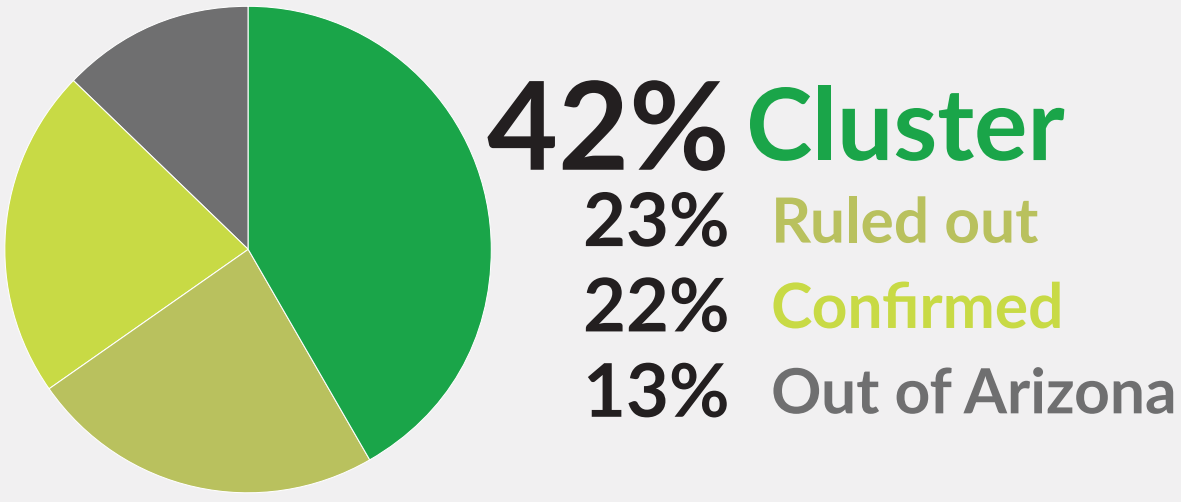
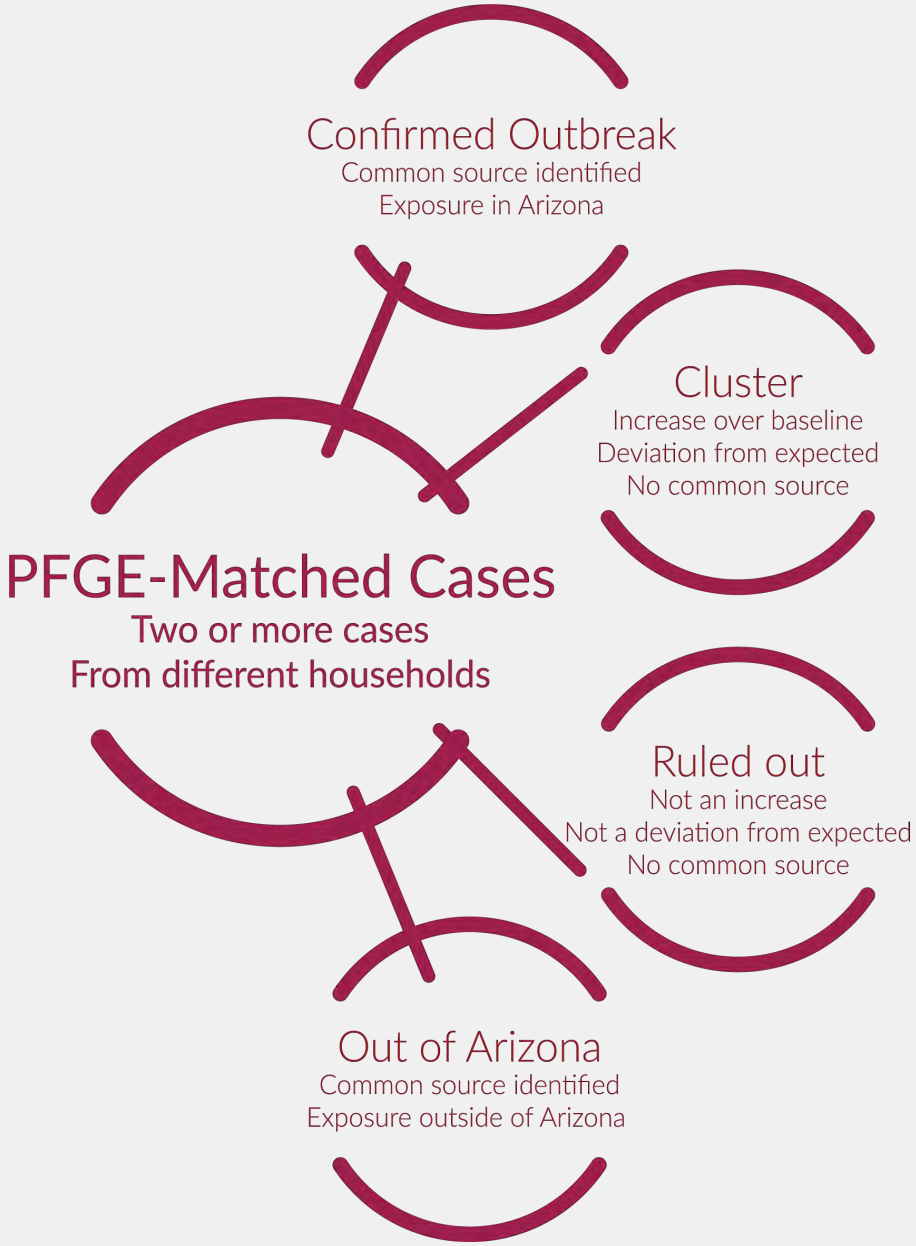


Figure 9. PFGE-matched clusters affecting Arizona residents, Arizona, 2015. N=55



Definitions

Confirmed outbreak | A common source was identified in two or more cases from different households with a matching PFGE pattern. Exposure occurred in Arizona.

Cluster | Two or more cases from different households with a matching PFGE pattern. The number of cases represents an increase over baseline or demographic or epidemiologic characteristics indicate a deviation from expected, and no common source was identified.

Ruled-out outbreak | Two or more cases from different households with a matching PFGE pattern. After investigation, the number of cases did not represent an increase over baseline or demographic or epidemiologic characteristics did not indicate a deviation from expected. No common source was identified.

Out of Arizona | A common source was identified in two or more cases from different households with a matching PFGE pattern, but exposure occurred outside of Arizona.

For an in-depth look

CDC's PFGE webpage
http://www. cdc.gov/pulsenet/pathogens/pfge.html

Definitions are patterned after CDC's FoodCORE cluster definition
http://www.cdc.gov/foodcore/metrics/ssl-metrics.html

3.1.2 Foodborne GI outbreaks

During 2015, there were 18 gastrointestinal illness outbreaks that were determined to be foodborne (associated with ingestion of contaminated food or beverage), representing 22% of gastrointestinal illness outbreaks.

Etiology

Foodborne gastrointestinal disease outbreaks in 2015 were primarily caused by *Salmonella* (67%). The remainder were caused by norovirus (17%) or had an unknown etiology (17%).

Etiology	N outbreaks	% of foodborne GI outbreaks
Salmonella	12	67
Norovirus	3	17
Confirmed	1	
Suspect	2	
Unknown	3	17
Total	18	

Table 4. Confirmed or suspected etiologies of foodborne gastrointestinal illness outbreaks, Arizona, 2015. N=18

Method of Identification

Foodborne gastrointestinal disease outbreaks in 2015 were identified through PFGE cluster detection (39%), citizen complaint (22%), provider/facility report (22%), and public health surveillance (11%). Method of identification was "other" for one outbreak (6%).

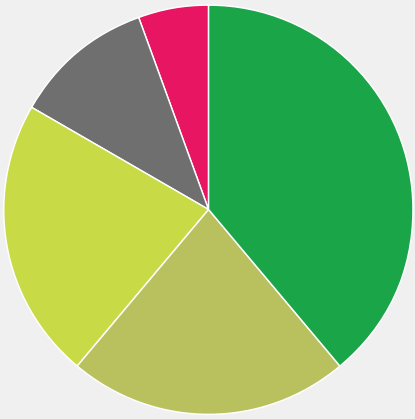
Definitions

PFGE cluster detection | Pulsed Field Gel Electrophoresis (PFGE) is a laboratory technique used to identify two or more individuals that had similar pathogen strains, indicating their illness may have had a common source. Unless otherwise noted, outbreaks detected through PFGE cluster detection are included only when the source was identified. See Section 3.1.1.

Citizen complaint | A member of the community notified public health investigators.

Provider/facility report | A health care provider or facility reported the outbreak to public health. See Section 4.1.

Public health surveillance | The outbreak was identified when routine interviews with persons diagnosed with a communicable disease indicated that others were ill from a common source. Or, local or state public health investigators detected an increase in disease incidence in time or place that was greater than expected and initiated an outbreak investigation.



39% PFGE cluster detection
22% Citizen complaint
22% Provider/facility report
11% Public health surveillance
6% Other

Figure 11. Foodborne gastrointestinal disease outbreaks by method of identification, Arizona, 2015. N=18

Multistate investigations

During multistate investigations, ADHS partners with CDC and other states to investigate illnesses affecting residents of multiple states. Three foodborne GI outbreaks were part of a multistate investigation.

Outbreak location

The table below shows outbreak location for foodborne gastrointestinal illness outbreaks in 2015.

Outbreak location	N outbreaks	% of foodborne GI outbreaks
Food service establishment	6	33
Private setting	4	22
Healthcare setting	2	11
Prison/detention center	2	11
Community-wide	1	6
Public gathering	1	6
Ship/plane/other transportation	1	6
Unknown	1	6
Total	18	

Table 5. Foodborne gastrointestinal illness outbreaks by outbreak location, Arizona, 2015. N=18

More information:

Salmonella Paratyphi B variant L(+) tartrate(+) in raw frozen tuna

http://www.cdc.gov/salmonella/paratyphi-b-05-15/

Salmonella Poona linked to imported cucumbers
http://www.cdc.gov/salmonella/poona-09-15/

For an in-depth look

Outbreaks in healthcare settings (Section 4.1)

Outbreaks in correctional facilities (Section 4.3)

Source of illness

For ten of the 18 foodborne gastrointestinal disease outbreaks (56%), a specific source was either confirmed (3) or suspected (7).

Confirmed sources included:

Raw frozen tuna, (*Salmonella* Paratyphi B variant L(+) tartrate(+))

Imported cucumbers, (*Salmonella* Poona)

Food served in a prison, (*Salmonella* Enteritidis)

Suspected sources included:

Food from a restaurant, (*Salmonella* Enteritidis)

Food served at a wedding venue, (*Salmonella* Enteritidis)

Catered food from a restaurant, (*Salmonella* Enteritidis)

Food from an undetermined food truck, (*Salmonella* Javiana)

Food from a restaurant, (*Salmonella* Newport)

Raw frozen tuna, (*Salmonella* Bareilly)

Non-commercial frozen frog legs, (*Salmonella* Javiana)

3.1.3 Person-to-person GI outbreaks

During 2015, there were 43 gastrointestinal disease outbreaks that were determined to be person-to-person (associated with direct contact with an infected person).

Etiology

The table below shows etiologies for person-to-person gastrointestinal illness outbreaks in 2015.

Table 6. Confirmed or suspected etiologies of person-to-person gastrointestinal illness outbreaks, Arizona, 2015. N=43

Etiology	N outbreaks	% of outbreaks
Norovirus	26	61
Confirmed	12	
Suspect	14	
Shigella	11	26
Campylobacter	1	2
Giardia	1	2
Unknown	4	9
Total	43	

Method of Identification

Person-to-person gastrointestinal disease outbreaks in 2015 were identified through provider/facility report (40.5%), public health surveillance (28.6%), citizen complaint (11.6%), and school/facility report (11.6%).

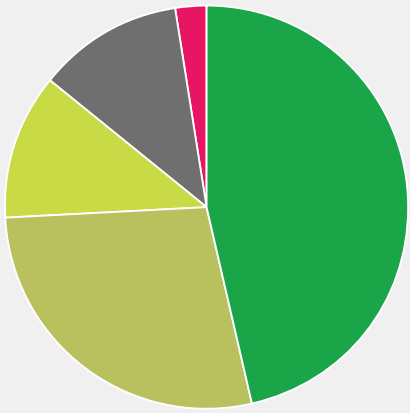
Definitions

Provider/facility report | A health care provider or facility reported the outbreak to public health. See Section 4.1.

Public health surveillance | The outbreak was identified when routine interviews with persons diagnosed with a communicable disease indicated that others were ill from a common source. Or, local or state public health investigators detected an increase in disease incidence in time or place that was greater than expected and initiated an outbreak investigation.

Citizen complaint | A member of the community notified public health investigators.

School/facility report | A school or child care facility reported the outbreak to public health. See Section 4.2.



46% Provider/facility report
28% Public health surveillance
12% Citizen complaint
12% School/facility report
2% Unknown

Figure 12. Person-to-person gastrointestinal disease outbreaks by method of identification, Arizona, 2015. N=43

For an in-depth look

Outbreaks in healthcare settings (Section 4.1)

Outbreaks in child care and school settings (Section 4.2)

Outbreak location

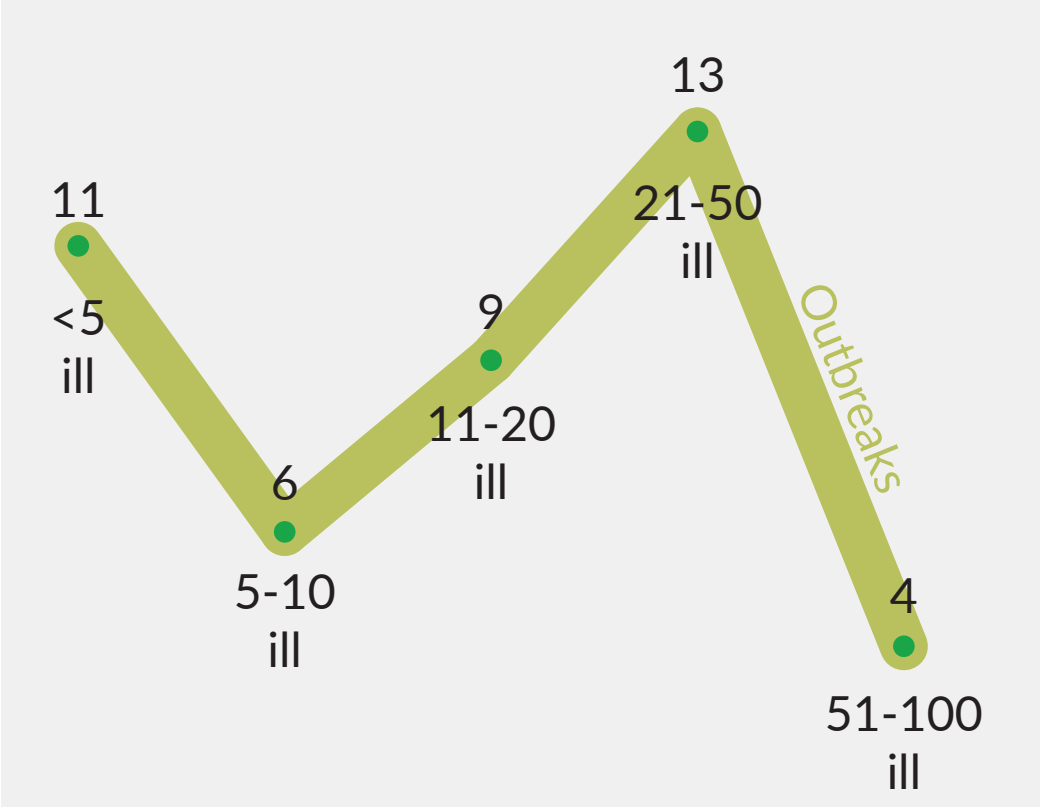
The table below shows outbreak location for person-to-person gastrointestinal illness outbreaks in 2015.

Outbreak location	N outbreaks	% of outbreaks
Healthcare setting	23	54
School	12	28
Child care setting	4	9
Community-wide	1	2
Food service establishment	1	2
Shelter	1	2
Ship/plane/other transportation	1	2
Total	43	

Table 7. Person-to-person gastrointestinal illness outbreaks by outbreak location, Arizona, 2015. N=43

Outbreak size

The figure shows outbreak size (number ill) for person-to-person gastrointestinal illness outbreaks in 2015.



3.1.4 Zoonotic outbreaks

During 2015, there were four gastrointestinal disease outbreaks that were determined to be zoonotic (associated with exposure to infected animals or their environments).

All four zoonotic GI outbreaks were:

- caused by *Salmonella*
- identified by PFGE cluster detection
- affected fewer than five Arizona residents
- part of a multistate outbreak investigation. During multistate investigations, ADHS partners with CDC and other states to investigate illnesses affecting residents of multiple states.
- had a specific source identified: live poultry (1 outbreak) and small turtles (3 outbreaks)

3.2 | Outbreaks of vaccine-preventable diseases

During 2015, 16 outbreaks caused by vaccine-preventable diseases were investigated, representing 12% of confirmed outbreaks.

Etiology

The table below shows etiologies for vaccine-preventable disease outbreaks in 2015.

Etiology	N outbreaks	% of VPD outbreaks
Pertussis	12	75
Varicella	3	19
Measles	1	6
Total	16	

Table 8. Etiology of vaccine-preventable disease outbreaks, Arizona, 2015. N=16

More information

Outbreak of *Salmonella* Hadar linked to live poultry
http://www.cdc.gov/salmonella/live-poultry-07-15/index.html)

Outbreaks of Salmonella Poona (2) and *Salmonella* Sandiego (1) linked to small turtles
http://www.cdc.gov/salmonella/small-turtles-10-15/index.html

3.2.1 Pertussis outbreaks

During 2015, there were 12 outbreaks caused by pertussis, representing 75% of vaccine-preventable disease outbreaks in 2015.

Pertussis outbreaks were primarily identified by public health surveillance (92%). The identification method for one outbreak was unknown.

Most pertussis outbreaks resulted in 10 or fewer ill persons (83%); one outbreak (8%) caused illness in 82 persons, and the number of ill persons was unknown for one outbreak (8%).

The majority of pertussis outbreaks took place in a school (83%); one outbreak occurred in a private setting (8%), and one outbreak was community wide (8%).

3.3 | Outbreaks of respiratory illnesses

During 2015, 16 respiratory illness outbreaks were investigated, representing 12% of confirmed outbreaks.

Etiology

The table below shows etiologies for respiratory illness outbreaks in 2015.

Etiology	N outbreaks	% of respiratory illness outbreaks
Influenza	9	56
Legionella	2	13
Respiratory Syncytial Virus (RSV)	1	6
Unknown	4	25
Total	16	

Table 9. Confirmed or suspected etiologies of respiratory illness outbreaks, Arizona, 2015. N=16

3.3.1 | Influenza outbreaks

During 2015, there were nine outbreaks caused by influenza, representing 56% of respiratory illness outbreaks.

Method of Identification

Influenza outbreaks in 2015 were identified through provider/facility report (78%) and school/facility report (22%).

Outbreak location

The table below shows outbreak size (number ill) for influenza outbreaks in 2015.

Outbreak location	N outbreaks	% of influenza outbreaks
Healthcare setting	7	78
School	2	22
Total	9	

Table 10. Influenza outbreaks by outbreak location, Arizona, 2015. N=9

Outbreak size

The figure below shows outbreak size (number ill) for influenza outbreaks in 2015.

For an in-depth look

Outbreaks in healthcare settings (Section 4.1)

Outbreaks in child care and school settings (Section 4.2)

Definitions

Provider/facility report | A health care provider or facility reported the outbreak to public health.

School/facility report | A school or child care facility reported the outbreak to public health.

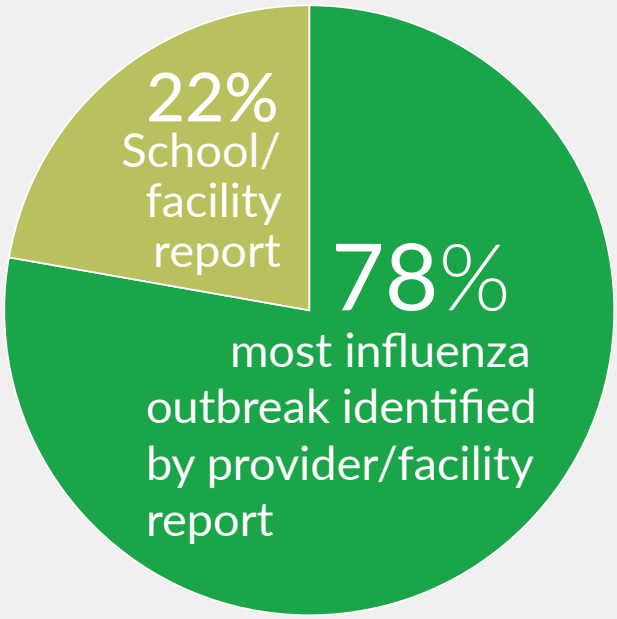


Figure 14. Influenza outbreaks by method of identification, Arizona, 2015. N=9

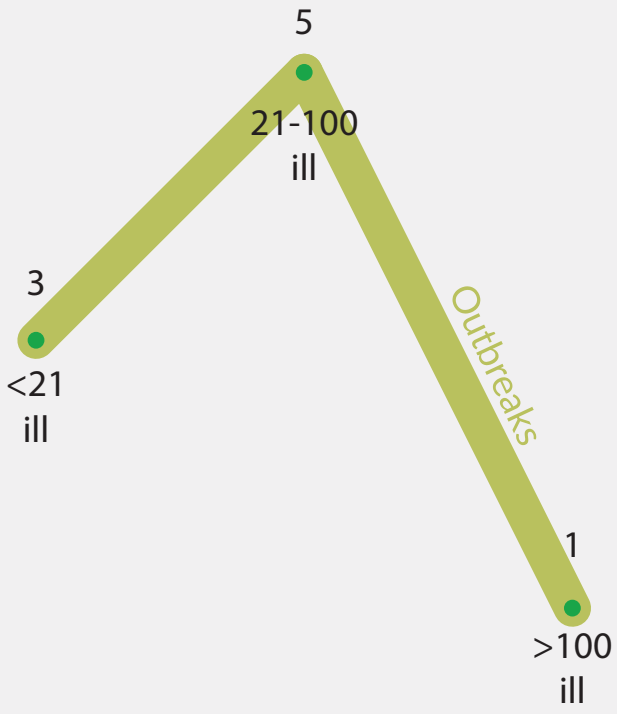
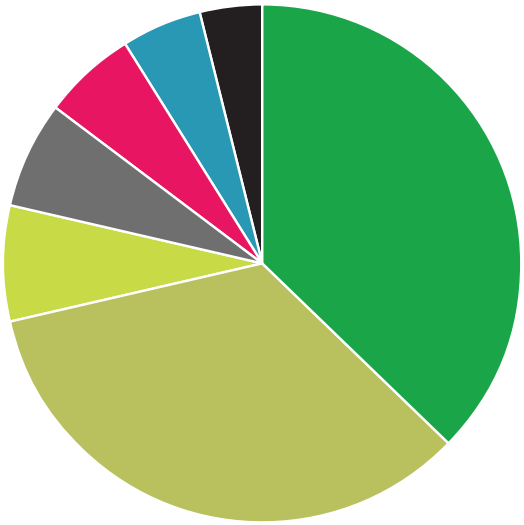


Figure 15. Influenza outbreaks by number ill, Arizona, 2015. N=9

4.0 | Outbreaks by disease category Highlights

4.0 | Outbreaks by location

Outbreak in 2015 occurred in child care or school settings (37%), healthcare facilities (34%), food service establishments (7%), community wide (6%), private settings (5%), and correctional facilities (4%).



37% Child care or school

34% Healthcare facility.

7% Food service establishm

6% Community-wide

5% Private setting

4% Correctional facility

7% Other/Unknown

Figure 16. Outbreaks by location, Arizona, 2015. N=137

Definitions

Child care or school | The outbreak occurred in a child care facility or in an elementary, middle, or high school. See Section 4.1.

Healthcare facility | The outbreak occurred in an assisted living facility, long-term care facility, hospital, rehab facility, hospice, or outpatient/clinic. See Section 4.2

Food service establishment | The outbreak occurred in a restaurant, café, or other food service establishment. See Section 3.1.2.

Community wide | The outbreak did not occur in a specific location, but affected persons throughout a community.

Private setting | The outbreak occurred in a residential or other private setting, such as a reception facility.

Correctional facility | The outbreak occurred in a correctional facility such as a prison, jail, or detention center.

Disease	N outbreaks
Ship/Plane/Other Transport	4
Public gathering	2
Shelter	2
Camp	1
Unknown	1

Table 11. Other outbreak locations, Arizona, 2015. N=10

Definitions

School/facility report | A school or child care facility reported the outbreak to public health.

Public health surveillance | The outbreak was identified when routine interviews with persons diagnosed with a communicable disease indicated that others were ill from a common source. Or, local or state public health investigators detected an increase in disease incidence in time or place that was greater than expected and initiated an outbreak investigation.

4.1 | Outbreaks in child care or school settings

During 2015, 51 outbreaks occurred in child care or school settings, representing 37% of outbreaks in 2015.

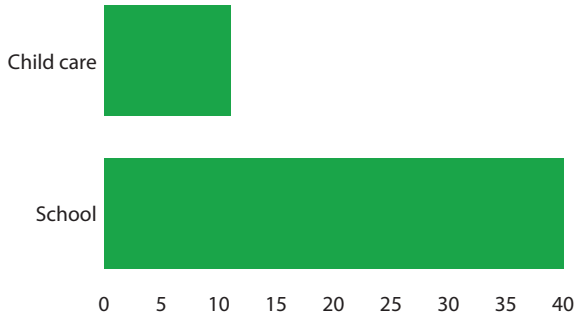
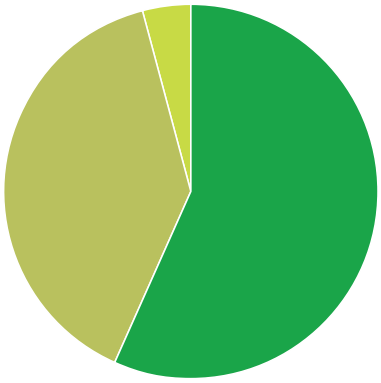


Figure 17. Outbreaks in child care or school settings, Arizona, 2015. N=51

Method of Identification

Over half the outbreaks in child care or school settings in 2015 were identified through a report from schools/facilities (57%). Outbreaks in child care or school settings were also identified through public health surveillance (39%).



57% School/facility report
39% Public health surveillance
4% Other/unknown

Figure 18. Outbreaks in child care or school settings by method of identification, Arizona, 2015. N=51

Etiology

The most commonly identified causes of outbreaks in child care and school settings were gastrointestinal illnesses (39%), followed by vaccine-preventable diseases (24%), respiratory illnesses (12%), and parasitic skin infestations (8%).

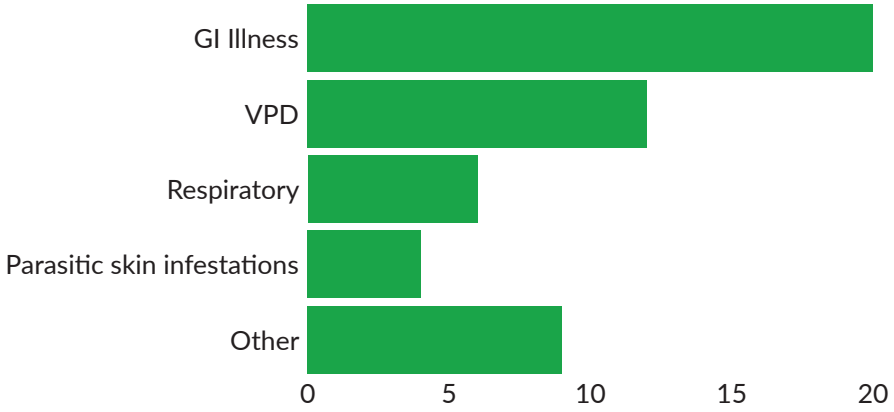


Figure 19. Outbreaks in child care or school settings by disease and disease category, Arizona, 2015. N=51

Outbreak location

A wide variety of diseases caused outbreaks in elementary schools and child cares. In high schools, however, 100% of outbreaks were caused by pertussis.

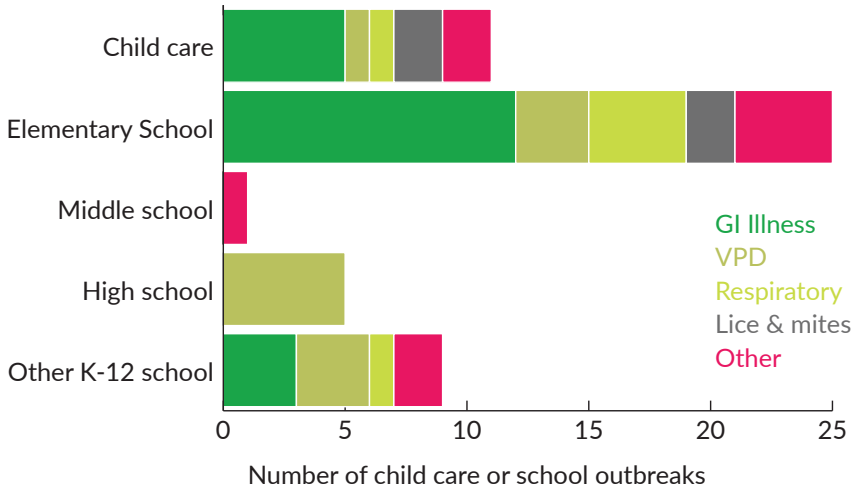


Figure 20. Outbreaks in child care or school settings by setting and disease category, Arizona, 2015. N=51

4.2 | Outbreaks in healthcare settings

During 2015, 47 outbreaks occurred in healthcare settings, representing 34% of outbreaks in 2015.

Method of Identification

Outbreaks in healthcare settings in 2015 were primarily identified through a report from a long-term care or assisted living facility (81%), followed by a report from infection control practitioner or clinician (19%), citizen complaint (11%), and public health surveillance (2%). Three outbreaks (6%) were reported by another or unknown method.

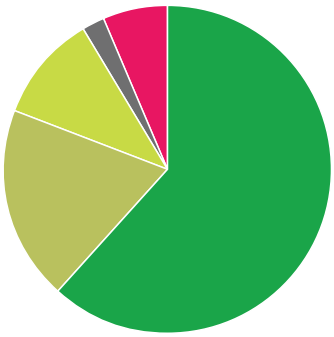
Definitions

LTCF/assisted living report | A long-term care or assisted living facility reported the outbreak to public health.

IP/clinician report | An infection preventionist or a clinician reported the outbreak to public health.

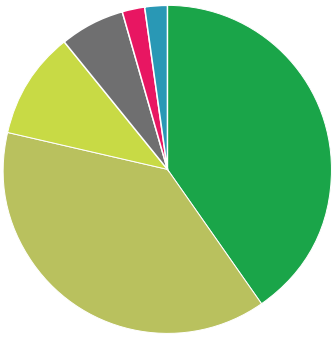
Citizen complaint | A member of the community notified public health investigators.

Public health surveillance | The outbreak was identified when routine interviews with persons diagnosed with a communicable disease indicated that others were ill from a common source. Or, local or state public health investigators detected an increase in disease incidence in time or place that was greater than expected and initiated an outbreak investigation.



62% LTCF/Assisted Living Report
19% IP/Clinican Report
11% Citizen Complaint
2% Public health surveillance
6% Other/unknown

Figure 21. Outbreaks in healthcare settings by method of identification, Arizona, 2015. N=47



41% Assisted living
38% Long-term care facilities.
11% Hospital
6% Rehab facility
2% Hospice
2% Outpatient/clinic

Figure 22. Outbreaks in healthcare settings, Arizona, 2015. N=47

Outbreak location

The locations of outbreaks in healthcare settings included assisted living facilities (40%), long-term care facilities (38%), hospitals (11%), rehab facilities (6%), hospice (2%), and outpatient facility or clinic (2%).

Etiology

Outbreaks in healthcare settings in 2015 were mostly gastrointestinal illnesses (64%), followed by respiratory illnesses (21%) and parasitic skin infections (11%). Two outbreaks (4%) had another etiology: group A *Streptococcus* and *Strongyloides*.

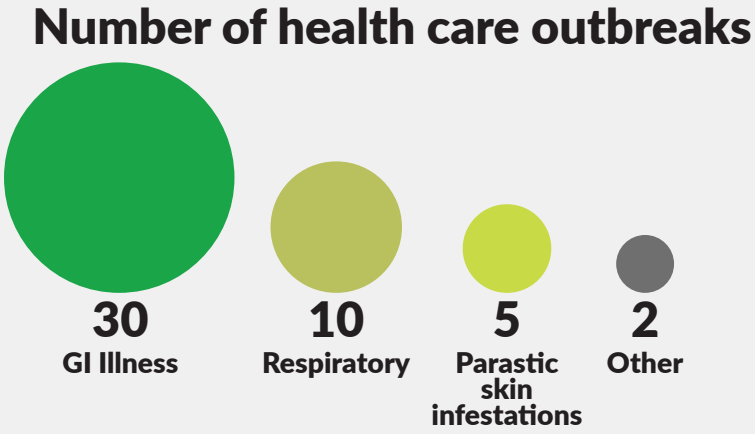


Figure 23. Outbreaks in healthcare settings by disease and disease category, Arizona, 2015. N=47

4.3 | Outbreaks that occurred outside of Arizona

During 2015, 11 outbreaks were investigated in which Arizona residents were exposed outside of Arizona. Unless otherwise noted, these outbreaks are not included in other sections of this report.

Location of exposure	N outbreaks	% of outbreaks that occurred outside of Arizona
United States	3	27.3%
California	2	
Washington DC	1	
International	8	72.7%
Mexico	6	
Other	2	
Total	11	

Table 13. Outbreaks affecting Arizona residents in which exposure occurred outside of Arizona, 2015. N=11

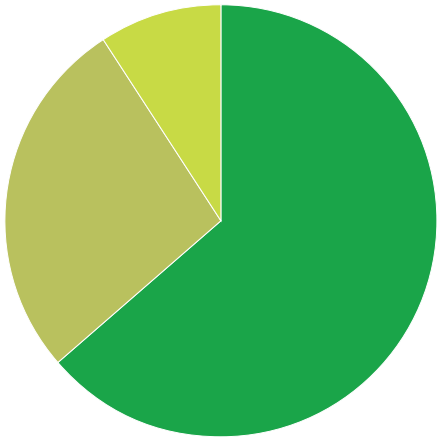


Figure 24. Outbreaks affecting Arizona residents in which exposure occurred outside of Arizona, 2015. N=11

The etiologies for all outbreaks that occurred outside of Arizona were gastrointestinal illnesses: *Salmonella* (64%), Shiga toxin-producing *E. coli* (27%), and Vibrio (9%).

5 | Notable outbreaks

5.1 | *Salmonella* Paratyphi B var. L(+) tartrate(+) linked to imported raw tuna

From April to July 2015, Maricopa County Department of Public Health (MCDPH), Maricopa County Environmental Services (MCES), and ADHS participated with the California Department of Public Health, CDC and other states in a multistate investigation of infections of *Salmonella* serotype Paratyphi B var. L(+) tartrate(+) and *Salmonella* Weltevreden.

Highlights (Arizona cases)

Known onset dates | 3/25/2015 – 5/28/2015
Lab-confirmed cases | 12
County | Maricopa (12)
Severity | 3 (25%) hospitalizations, 0 deaths
Source | Frozen raw tuna

Definitions

PFGE | Pulsed Field Gel Electrophoresis (PFGE) is a laboratory technique used to identify two or more individuals that had similar pathogen strains, indicating their illness may have had a common source. See Section 3.1.1.

Multistate investigations | During multistate investigations, ADHS partners with CDC and other states to investigate illnesses affecting residents of multiple states.

Between April 14 and May 18, ten cases of *Salmonella* Paratyphi B var. L(+) tartrate(+) with matching PFGE patterns (JKXX01.1495) were reported and investigated. Six were able to be contacted, and all six reported eating sushi made with frozen raw tuna from two separate restaurants, Restaurants A and B. A California resident with lab-confirmed *Salmonella* also ate sushi from Restaurant B.

Investigators identified that the two restaurants had a common distributor and collected specimens of raw frozen tuna from that distributor. Samples were collected on two separate occasions. *Salmonella* was recovered from one of the samples, a different strain than the one causing the human infections (*Salmonella* Weltevreden JWPX01.0193).

On May 13, MCES received a public report of foodborne illness, and the complainant reported eating at a third sushi restaurant, Restaurant C. The complainant reported having symptoms consistent with *Salmonella* and submitted a stool specimen, but *Salmonella* was not recovered from the stool. MCES collected records from this third restaurant and determined that they had received frozen raw tuna from the same distributor used by the other two restaurants. Investigators collected samples of frozen raw tuna from the restaurant. *Salmonella* was recovered from one of the samples, a different strain than was previously recovered from both cases and food specimens (*Salmonella* Newport JJPX01.5163).

In response to laboratory and epidemiological evidence, the contaminated product was recalled on May 21.

On June 12, a case matching the outbreak strain was reported. The case denied having eaten sushi, but when prompted further, reported a history of frequently eating sushi at Restaurant C. The case denied having eaten there during the month before onset, confirmed by credit card records. However, the case's wife reported she had diarrhea before her husband, and that she likely had eaten at Restaurant C during the exposure period.

In July 2015, product testing related to this outbreak was conducted in Minnesota in which *Salmonella* Weltevreden with PFGE pattern JWPX01.0371 was recovered from a sample of frozen raw tuna. Investigators identified a previous case of this strain of *Salmonella* in an Arizona resident. This case had been interviewed previously and had reported eating sushi at a restaurant in California during the exposure period. Records indicated that the restaurant had received recalled product.

By August 19, 2015, the outbreak appeared to be over. A total of 65 lab-confirmed cases were identified from 11 states, including 12 cases in Arizona. No deaths were reported.

For an in-depth look:

CDC web posting | http://www.cdc.gov/*salmonella*/paratyphi-b-05-15/

FDA web posting | http://www.fda.gov/Food/RecallsOutbreaksEmergencies/Outbreaks/ucm447742.htm

5.2 | *Salmonella* Poona linked to imported cucumbers

On August 10, 2015, ADHS was notified of a cluster of two cases of *Salmonella* serotype Poona infection with the same PFGE pattern (JL6X01.0018). Other cases had also recently been identified in Montana, Colorado, and Utah. ADHS investigators reached out to CDC to begin multistate collaboration. Historically, this PFGE pattern has disproportionately affected Arizona. Clusters with this pattern have been investigated in the past without finding a source.

Highlights (Arizona cases)

Known onset dates | 7/16/2015 – 2/15/2016

Lab-confirmed cases | 140

Counties | Apache (5), Cochise (4), Coconino (3), Graham (1), Maricopa (84), Mohave (3), Navajo (1), Pima (26), Pinal (9), and Yuma (4)

Severity | 44 (31%) hospitalizations, 6 (4%) deaths

Source | Garden-variety cucumbers imported from Mexico

Timeline from cluster first identified in Arizona to…

- First coordination with CDC | 4 working days
- First questionnaire deployed | 5 working days
- Source suspected through case interviews | 11 working days
- Recall | 19 working days

Definitions

PFGE | Pulsed Field Gel Electrophoresis (PFGE) is a laboratory technique used to identify two or more individuals that had similar pathogen strains, indicating their illness may have had a common source. See Section 3.1.1.

Multistate investigations | During multistate investigations, ADHS partners with CDC and other states to investigate illnesses affecting residents of multiple states.

During the same time, Maricopa County Department of Public Health was investigating a cluster of *Salmonella* cases that were linked to a restaurant. As the investigation progressed, some of these cases had PFGE pattern results match the ongoing multistate outbreak.

By August 18, 14 *Salmonella* isolates had been serotyped at ASPHL as Poona and had PFGE patterns matching the outbreak. The majority of cases were from Maricopa County. Both MCDPH and ADHS activated their Health Emergency Operations Center (HEOC). Case counts rose daily, and by August 31, there were 59 lab-confirmed cases in Arizona,

Early in the multistate investigation, demographics indicated that those ill were primarily from the southwest (Arizona, California, Colorado, New Mexico, and Utah) and had a young median age of about 7 years (Arizona cases). The epidemic curve indicated a large peak during summer months. Because of these epidemiologic clues, and because of previous outbreaks caused by *Salmonella* Poona, early hypotheses included turtles, produce, and restaurant exposures.

Investigators in Arizona and other states began to administer to cases the national hypothesis-generating questionnaire, a tool commonly used during investigation of PFGE-matched clusters in which the source is unknown. To determine if cases' exposures varied from what would be expected from the general population, results from questionnaire were compared to background rates of the same exposures. Using this information, investigators were able to determine that primarily two exposures, cucumbers and watermelons, were reported more often by cases. Additional interviews with cases and data analysis determined that garden-variety cucumbers were epidemiologically linked to illness.

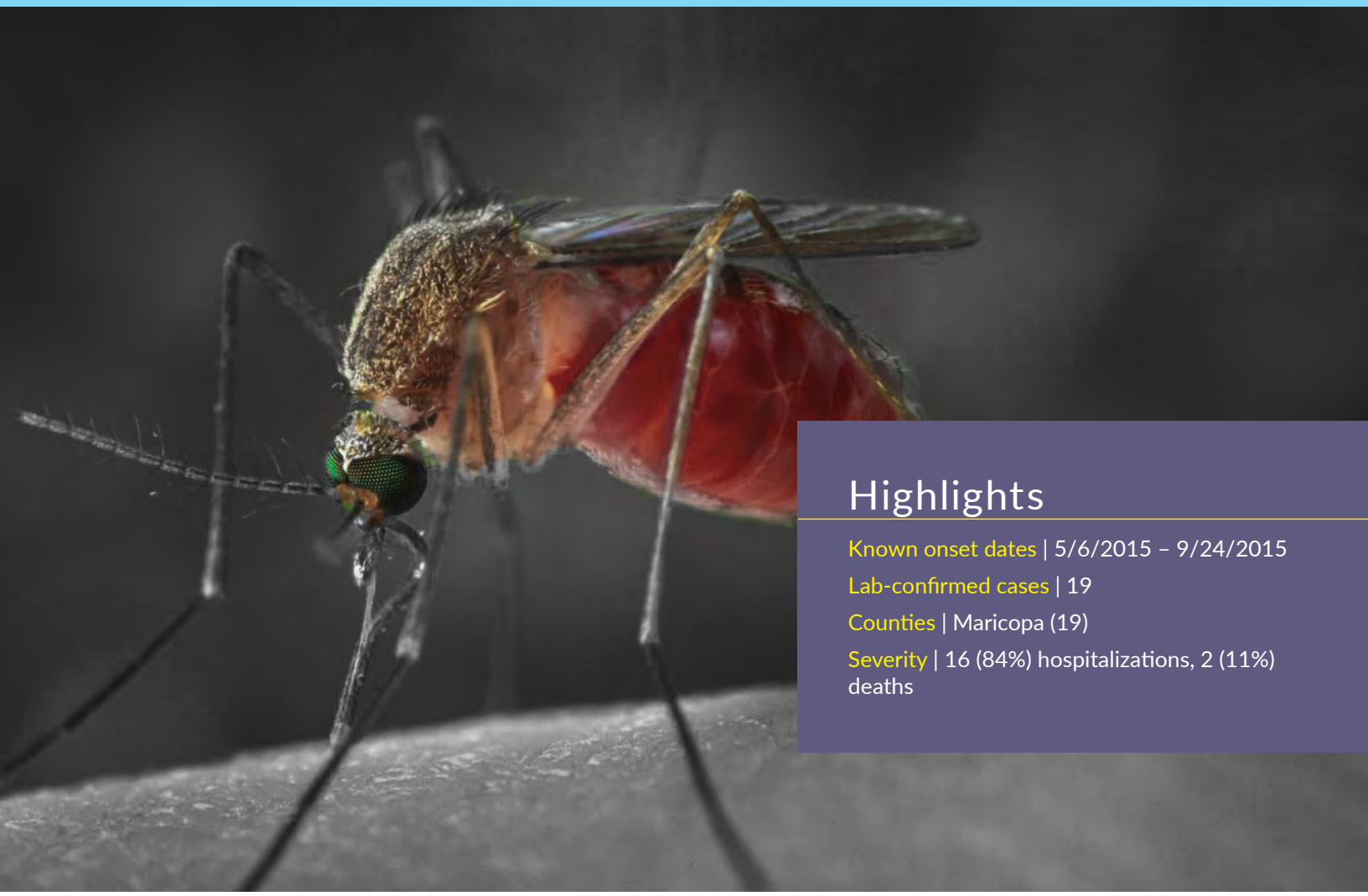
Investigators in Arizona and other states were able to collect product information from cases' grocery store frequent shopper cards. Investigators also responded to clusters of cases from different households who had eaten cucumbers at the same restaurant. Additionally, samples of epidemiologically implicated cucumbers were collected, and *Salmonella* matching the outbreak strain was recovered from multiple food samples. Traceback of cucumbers from shopper card records, restaurant clusters, and lab-tested contaminated cucumbers identified a common supplier of the cucumbers. Recalls were issued for cucumbers distributed by Andrew & Williamson Fresh Produce on September 4 and September 11.

After the recalls were announced, case counts dropped off dramatically, yet investigators continued to receive reports of *Salmonella* infections matching the outbreak strain, most of which reported exposure to recalled product. By March 18, 2016, the outbreak appeared to be over. A total of 907 lab-confirmed cases were identified from 40 states, including 140 cases in Arizona. Six deaths were reported, including one in Arizona.

For an in-depth look:

CDC web posting | http://www.cdc.gov/*salmonella*/poona-09-15/

FDA web posting | http://www.fda.gov/Food/RecallsOutbreaksEmergencies/Outbreaks/ucm461317.htm



Highlights

Known onset dates | 5/6/2015 – 9/24/2015

Lab-confirmed cases | 19

Counties | Maricopa (19)

Severity | 16 (84%) hospitalizations, 2 (11%) deaths

5.3 | St. Louis Encephalitis Virus

Starting in July 2015, investigators at Maricopa County Department of Public Health and ADHS collaborated with CDC to investigate the first known outbreak of concurrent West Nile Virus (WNV) and St. Louis Encephalitis Virus (SLEV) infections. Both viruses are transmitted by *Culex* species mosquitoes. Because SLEV infections have been reported in substantially fewer numbers than WNV, SLEV case counts for 2015 are notable thus highlighted above. A summary of the investigation of these outbreaks is available in Morbidity and Mortality Weekly Report: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6448a5.htm.

For an in-depth look:

Morbidity and Mortality Weekly Report | https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6448a5.htm

Highlights

Known onset dates | 12/30/2014 – 1/21/2015

Confirmed cases | 7

Counties | Pinal (5) and Maricopa (2)

5.4 | Measles

Starting in December 2014, a large outbreak of measles that began at an amusement park in California was spread to several states, including Arizona. In Arizona, a family of five, all whom were unvaccinated or under-vaccinated against measles, became symptomatic in January 2015. An unrelated case was identified after notification by another state of possible measles exposure, with illness onset on 12/30/2014.

Public health departments in Arizona mounted extensive contact tracing efforts in order to notify potentially exposed persons and identify additional cases. Efforts included issuing press releases, visiting local stores, sending notifications via mail, and making phone calls. One additional case was identified, having been exposed at an urgent care center where one of the cases had sought medical care.

The outbreak was determined to be over in early March, after two incubation periods (42 days) during which no new cases were identified.

For an in-depth look:

More about measles cases and outbreaks in the U.S. | http://www.cdc.gov/measles/cases-outbreaks.html