




Infectious Disease Epidemiology 2010–2015 Report

Office of Infectious Disease Services
Bureau of Epidemiology and Disease Control
Arizona Department of Health Services

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Phoenix, AZ 85007
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ADHS

Table of Contents

Executive Summary

The Office of Infectious Disease Services (**OIDS**), within the Bureau of Epidemiology and Disease Control (**EDC**) at the Arizona Department of Health Services (**ADHS**), is responsible for monitoring and controlling diseases caused by many infectious agents or toxins, as well as implementing and maintaining systems for reporting, managing, and analyzing communicable disease data. To accomplish this, OIDS staff work closely with other public health and healthcare professionals at local health departments, healthcare facilities, federal agencies, other offices at ADHS, and other agencies.

This report describes Arizona's infectious disease surveillance system and trends in disease incidence and distribution for cases reported to the Arizona public health system from 2010 through 2015.

The report includes several sections:

- An explanation of the sources of information for Arizona's infectious disease data;
- An **overview** of the state's communicable disease surveillance system, including important changes to the overall surveillance system and the electronic surveillance database during this period;
- Links to extensive disease statistics for 2010–2015 and to OIDS publications; and
- **Summaries of selected diseases under surveillance** by disease category and for each morbidity, including statistics and descriptions of trends in the data.

Introduction and surveillance system overview

Purpose and Scope

The purpose of this report is to describe Arizona's infectious disease surveillance system and summarize surveillance information for cases reported to the Arizona public health system during the period of 2010 through 2015. This information is intended to assist public health agencies and our partners by providing uniform data on the disease burden in the state, describing trends in disease incidence and distribution, and giving relevant information on system details or changes.

While this report includes surveillance data from six years, the focus is on the data, events, and changes for 2014 and 2015. The earlier four years are provided for context; do 2014 and 2015 represent what we typically see in Arizona for each disease, or were disease patterns during those years unusual in some way?

For more information about the findings for 2010 through 2013, and surveillance changes during those years, please see the 2008–2013 Infectious Disease Epidemiology Report. Likewise, the Arizona infectious disease surveillance system is described in depth separately; we only include here the changes to the system that occurred in 2014 and 2015. For reasons described below, tuberculosis and sexually transmitted diseases, including HIV, are not included in this report, although surveillance for these diseases is a part of the Arizona public health system.

We would like to acknowledge and thank external and internal partners for their contributions to Arizona's communicable disease surveillance system and the information provided in this report.

Organization of Arizona infectious disease public health responsibilities

During the two focal years of this report, 2014 and 2015, the ADHS Office of Infectious Disease Services (OIDS) was comprised of five programs: Infectious Disease Epidemiology; Public Health Emergency Preparedness Epidemiology; Healthcare Associated Infections; MEDSIS (Medical Electronic Disease Surveillance Intelligence System); and Electronic Disease Surveillance (including syndromic surveillance and electronic laboratory reporting activities). Collectively, OIDS is responsible for surveillance and investigation for a variety of diseases, including influenza; foodborne/waterborne diseases; invasive organisms; vaccine-preventable diseases; and vector-borne and zoonotic diseases. Surveillance for tuberculosis and sexually transmitted diseases, including HIV, is conducted by the Office of Disease Integration and Services (ODIS), and as such is not included in this report.

OIDS staff work closely with Arizona's local health departments. Direct public health services, as they relate to surveillance, investigation, and response to infectious diseases of public health importance, are the responsibility of the 15 county health departments and the tribal health departments and/or Indian Health Service Units. Much of the information presented in this report has been collected through the joint efforts of local and state health department staff. Local health department staff in Arizona play an essential role not only in collecting communicable disease data, but more importantly, as the public health officials working most directly to control the spread of infection from identified cases.

OIDS staff collaborate with colleagues in other ADHS offices and bureaus including: Office of Environmental Health; Arizona Immunization Program Office; Arizona State Public Health Laboratory (ASPHL); Bureau of Public Health Emergency Preparedness; and Office of Border Health.

Data sources: Arizona's communicable disease surveillance system

The data used in this report were collected as part of Arizona's communicable diseases surveillance system.

Please see the Arizona Infectious Disease Surveillance Overview for an in-depth description of our system. The Overview includes sections on:

- Organization of Arizona infectious disease public health responsibilities
- Overview of Arizona's communicable disease surveillance system
- Communicable disease reporting
  - Formats for submitting communicable disease reports
  - Reporting limitations
- Case definitions
- Investigation of reported cases
- Data management
- Disease reporting by tribal health departments, Indian health services, or other federal entities
- Final and provisional data
- Rate calculations and population estimates

Outbreaks and outbreak tracking

This report focuses on statistics and trends from case-based surveillance – the reporting and investigation of single cases of disease. However, outbreak detection and response are key components of a state's public health capacity and are essential for prevention and control of illness in a population.

- **Selected outbreaks** that occurred during 2010–2015 are discussed within the disease-specific sections of this report.
- **Outbreak identification and tracking** are discussed in more detail in the 2008–2013 Infectious Disease Epidemiology Report.
- The **2014 transition to MEDSIS Outbreak Module** as the system for tracking outbreaks in Arizona is discussed in the "Changes to MEDSIS" section of this document.
- **Annual reports** describing the characteristics of detected and investigated outbreaks in Arizona can be found under Outbreak Reports on the ADHS Disease Data, Statistics & Reports webpage:
  - 2015 Infectious Disease Outbreak Summary Report
  - 2014 Infectious Disease Outbreak Summary Report

Changes to surveillance and investigation resources during 2014–2015

The communicable disease surveillance system, as well as investigation procedures and forms, change over time. Changes within the Arizona system may be a result of national-level changes to case definitions or the notifiable conditions list; information system enhancements; technological changes within public health or healthcare; changes in policies or procedures at state or local levels; variations in public health priorities or resource levels; the changing epidemiology of certain morbidities; or changes in what we know about particular diseases, among other factors. Changes may be intended to improve the information available to public health officials or the public, or may be a consequence of the changing context in which public health departments operate. However, these changes may affect surveillance data and the comparability of those data year-to-year.

Changes to the surveillance system should be considered when interpreting trends over time.

Below we summarize the 2014 and 2015 changes to surveillance and investigation resources and information systems.

Please see the Arizona Infectious Disease Surveillance Overview for more information about changes in other years and the possible surveillance impact of any of the changes.

Rules

No rule changes were made during 2014 and 2015.

Case definitions

The current Arizona case definitions are posted on the ADHS website, along with annual case definitions from 2005 through the past year, for archival purposes. A few case definitions change or are added each year, in response to national or local needs to modify existing definitions or to standardize the counting of new diseases under surveillance.

A list of the definitions that changed in 2014 or 2015 is included as an Appendix to this document, with brief notes about those changes.

Reporting and investigation forms

The investigation forms for several morbidities changed in 2014 or 2015. These are listed below; note that changes can be extensive or minor.

Year	Morbidities with changes to investigation forms
2015	Acute flaccid myelitis, Chikungunya, Influenza A (novel virus), Influenza-associated pediatric mortality (updated each year), Middle East respiratory syndrome (MERS), Plague
2014	Cyclosporiasis, Diphtheria, Ebola

Other resources

ADHS Centralized Foodborne Investigation Team

Beginning in 2014, ADHS organized a centralized foodborne investigation team, with trained staff who were able to assist county health departments complete enteric disease investigations in a timely manner. These staff are very familiar with the foodborne disease investigation process, are available to quickly attempt an interview after cases were reported, and can relieve county health department staff to attend to other priorities. Some county health departments delegated investigations of all cases of certain diseases to this team; others continued to conduct their own investigations or called on the team only as needed.

Possible surveillance impact: The centralized team likely improved the timeliness of interviews. For the type of questions asked during a foodborne investigation, such as food history, timeliness can contribute to more complete and accurate information, and potentially faster outbreak identification and response. Centralization of interviews could also lead to more standardization of processes and information across counties.

State Laboratory courier service

In April 2014, ASPHL implemented a statewide courier service. The service is intended as a convenient way for external laboratories to have their diagnostic and reference microbiological samples picked up and delivered to ASPHL, free of charge, and on a routine schedule.

Possible surveillance impact: Better submission of specimens and isolates of public health interest may have improved with use of the courier service. By reducing the costs and logistical challenges to other laboratories for submitting specimens, the service could potentially increase the number of samples submitted, including those required under rule, and improve the timeliness of submission. Both of these aspects could improve the timeliness and quality of data available for a public health response.

Additionally, although providers and laboratories should report detection or suspicion of certain organisms or diseases regardless of whether they submit an isolate or specimen for additional testing, sometimes the submission is the first and/or only notification that public health receives about a suspect case. Facilitating and speeding the submission process can thus lead to more timely identification of suspect cases, and to faster public health control actions, if warranted.

Hepatitis B, perinatal

Surveillance for persons potentially at risk for perinatal hepatitis B involves identifying pregnant women who are infected with hepatitis B virus in order to ensure that the baby receives appropriate vaccination and prophylaxis immediately after birth, decreasing the risk of the child developing chronic hepatitis B. Pregnancy information is often not available from laboratory testing, so surveillance involves identifying infection in women of child-bearing age and then identifying pregnancies within that group. State and county health departments work closely to ensure follow-up of the women through the remainder of the pregnancy.

In December 2014, processes changed so that all new laboratory reports were scanned for women of child-bearing age, rather than only those for newly reported persons. This could mean, for example, that records for a pregnant woman who was already known to have hepatitis B infection and was reported in a previous year would now be sent to the perinatal hepatitis B program upon receipt of a new laboratory report, triggering follow-up for this pregnancy.

Possible surveillance impact: The change in laboratory report processing could have hypothetically resulted in better identification of at-risk babies.

Changes to MEDSIS and other electronic systems during 2014–2015

Please see the Arizona Infectious Disease Surveillance Overview for more information about changes in other years as well as the possible surveillance impact of any of the changes.

Electronic laboratory reporting (ELR) implementation

Additional hospital laboratories were added to ELR in September 2014 and May 2015.

New morbidities added to MEDSIS

As new diseases emerge or gain attention, they have been added to the morbidity list in MEDSIS. Some of these may have been captured earlier under Emerging or Exotic Disease.

Morbidity	When added to MEDSIS
Acute Flaccid Myelitis	December 2015
Chikungunya	December 2014
Ebola virus	December 2014

Disease-Specific Observation (DSO) changes in MEDSIS

Like investigation forms, the DSOs may need to change over time, though the process for updating a DSO does not always happen at the same time as the change in an investigation form. DSOs for the following morbidities changed during 2014 or 2015.

Morbidity	Year(s) DSO updated
Dengue	2015 (new form)
Meningococcal invasive disease	2015 (removed duplicative and unneeded variables)
Salmonellosis	2015 (additional serotypes added)
St. Louis encephalitis	2015 (addition of Type field, symptoms added, symptoms changed to drop-down boxes, travel section redesigned)
West Nile virus	2015 (changes to Type options, symptoms added, symptoms changed to drop-down boxes, travel section redesigned)

MEDSIS Outbreak Module

In 2014, the MEDSIS Outbreak Module was implemented to track outbreaks and outbreak-associated cases, with significant functionality integrating the Outbreak Module and case-based parts of MEDSIS. Over the next years, outbreak module bugs were corrected, enhancements were identified and implemented, and standard practices were developed for use of the system.

Possible surveillance impact: Outbreak information available to ADHS improved significantly, as local health departments were able to use the same system as ADHS to collect and store outbreak tracking information in a standardized, shared manner. This improvement mirrored the improvement of case data that occurred several years earlier with the original implementation of MEDSIS across jurisdictions. Improvements in outbreak data collection are reflected in the outbreak summary reports posted online.

Binational surveillance and translation of MEDSIS into Spanish

Translation of MEDSIS into Spanish was released in 2014 to continue the binational partnership with public health counterparts in Sonora, Mexico. Binational MEDSIS had been available previously, but staff turnover (especially in Sonora) and changes in MEDSIS made more work necessary. Subsequent trainings have been held for Sonoran officials, including in Hermosillo, Sonora.

By K. Bosma (CC BY 2.0)

The binational field expanded in November 2014 to include Canada in addition to Mexico. Cases that are marked as binational with either country are reviewed by the ADHS Office of Border Health, and communicated to the Sonora public health officials or CDC, as appropriate.

Possible surveillance impact: Potentially better information on cases with Mexico or Canada connections, and better communication with partners about those cases.

Surveillance System Statistics 2014–2015

Surveillance System Statistics 2014–2015

Later sections of this report describe the surveillance data for particular diseases and disease categories. Here, we present data about the surveillance system itself and the reports we receive.

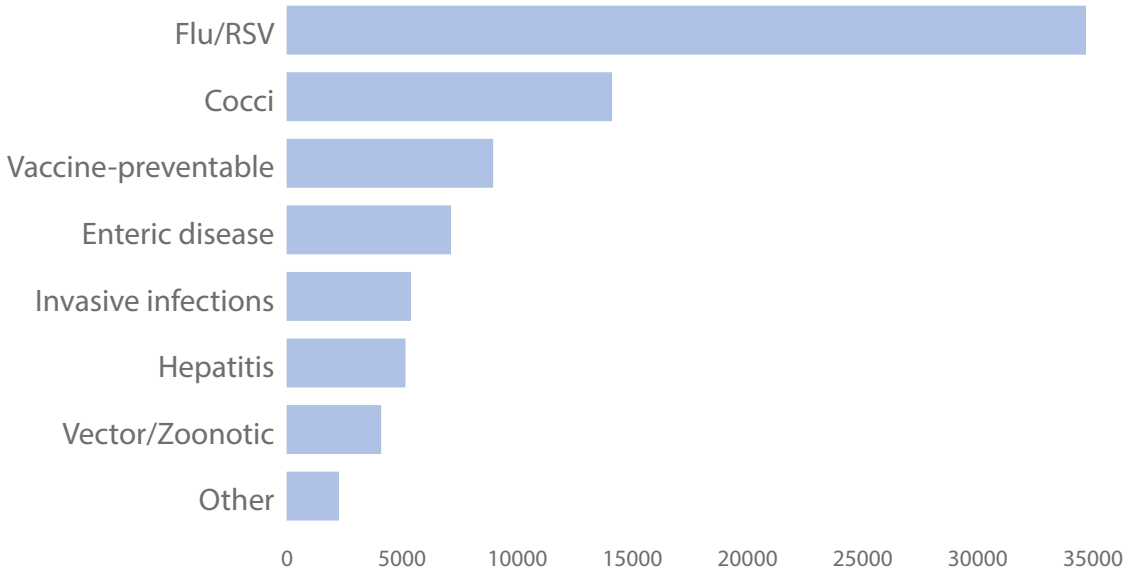
Healthcare providers submit reports to public health agencies when an illness is diagnosed or detected. Laboratories submit reports when they have a positive test for a reportable organism. Multiple laboratory tests may be submitted for a single patient, whether because one laboratory is conducting multiple tests, because testing is done at several laboratories, or because a patient is tested at multiple points in time. Public health officials combine all this information into a single "case". One person may have multiple "cases" of illness if the person has more than one reportable condition or has a new infection of the same illness later. For many diseases, public health officials conduct investigations through patient interview or review of medical records, among other sources, to supplement the information submitted in the reports. They then apply disease-specific case definitions to the information collected; some cases may be ruled out or considered not to represent true episodes of the disease.

Public health officials generally present the number of cases that meet the confirmed or probable case definitions. These are the numbers shown throughout the rest of this report.

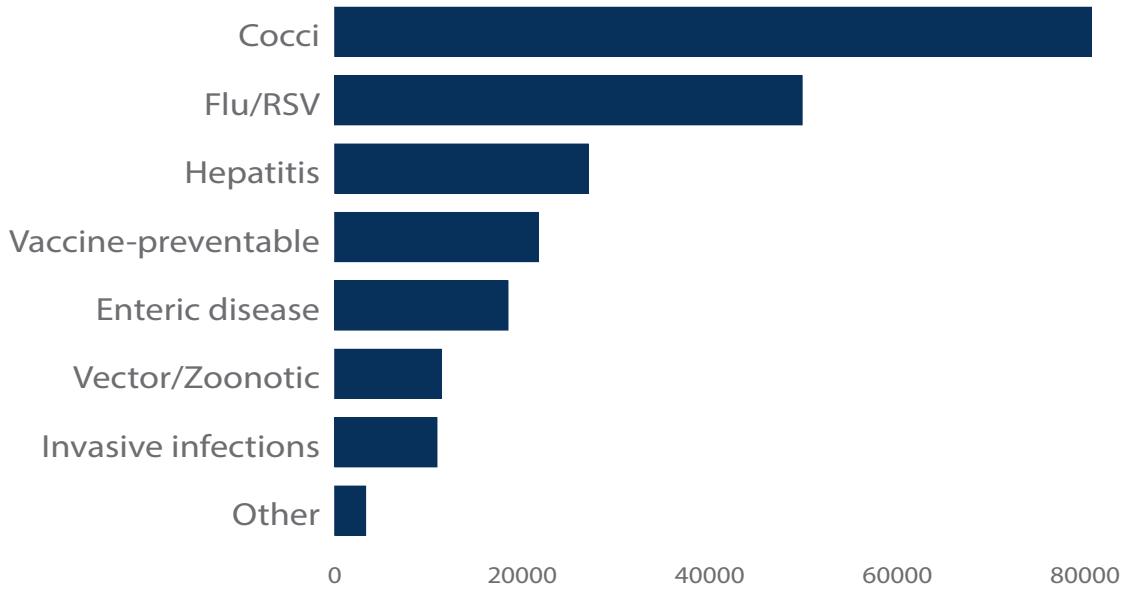
However, examining the number of reports or tests submitted and looking at cases of *all* classifications may be informative for showing the work of reporting to public health and conducting public health follow-up.

Cases versus reports

Approximately 81,000 *new* cases were entered in MEDSIS during 2014 and 2015. Almost half of these were influenza or RSV.



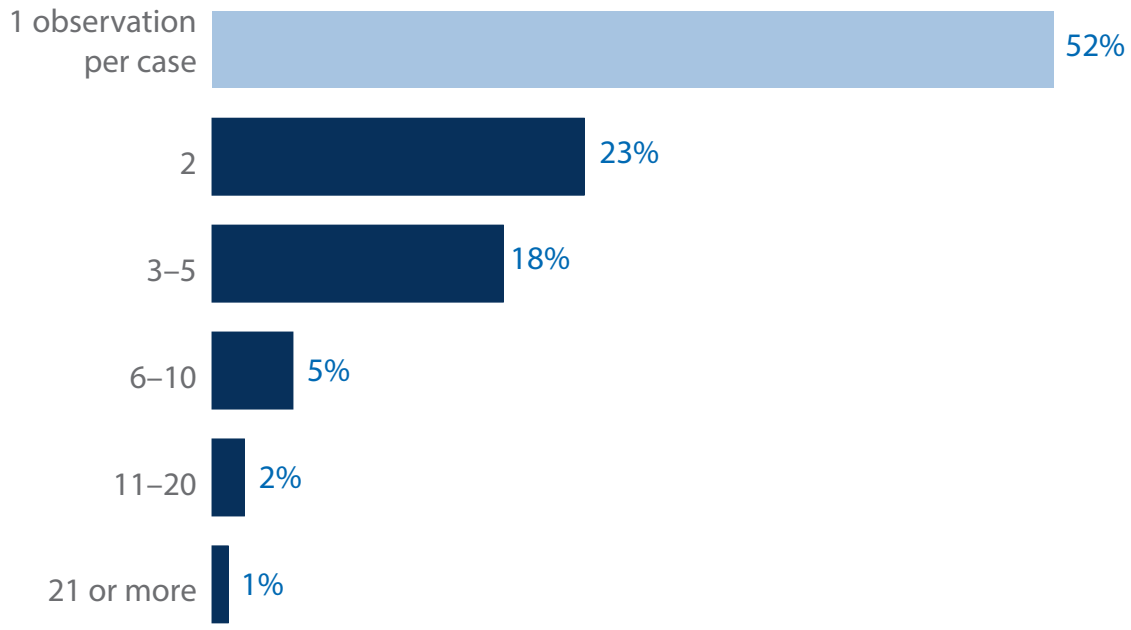
However, more than 220,000 *laboratory tests* were reported to public health agencies in 2014 and 2015. Coccidioidomycosis accounted for more than one-third of these reports.



With almost three times as many laboratory reports received as new cases entered, what happened to the rest? While some of the reports were used to create new cases, others were combined together with other 2014 or 2015 reports, or attached to older cases (i.e., cases initially reported prior to 2014).

We can look at how often reports were combined into single cases.

More than half of new MEDSIS cases in 2014 and 2015 include only 1 laboratory report, and 75% have 1–2. However, 1% of cases have more than 20 lab results!



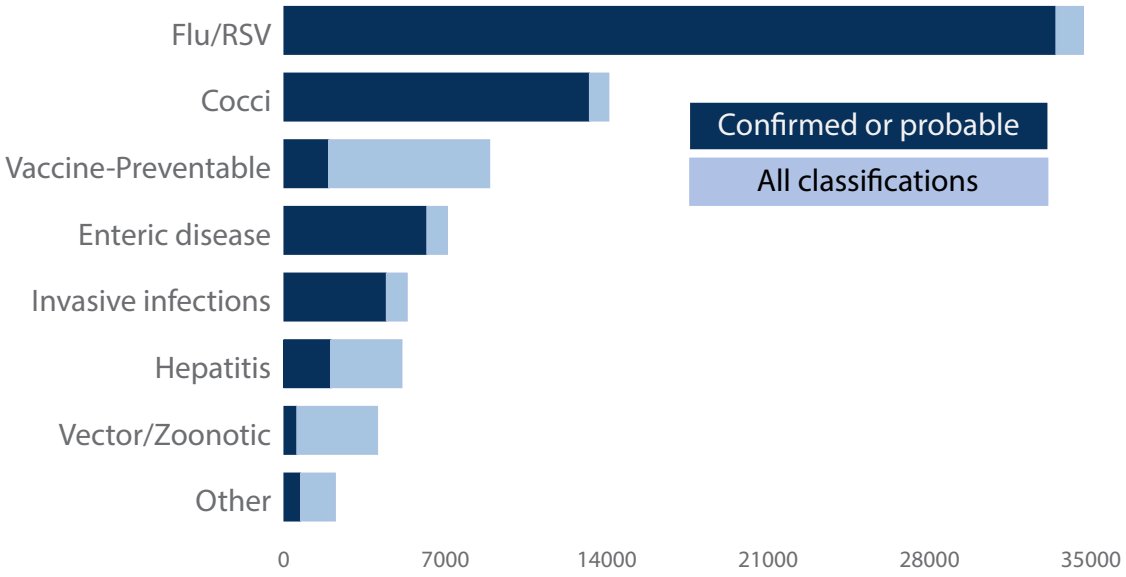
Influenza and RSV cases typically include only one laboratory report (80%); on the other hand, 19% of coccidioidomycosis cases and 15% of hepatitis cases have more than five reports.

Case classification and case counting

Even the 81,000 *new cases* shown here for 2014 and 2015 do not represent the number of cases counted in our disease statistics.

Three quarters (77%) of all 2014 and 2015 cases were classified as confirmed or probable cases and counted for surveillance.

This proportion varies by disease category. More than 90% of reported cases of influenza, RSV and coccidioidomycosis are counted, while fewer than 25% of vaccine-preventable disease or vector/zoonotic cases are included as confirmed or probable cases after investigation and review.



Cases that are not classified as confirmed or probable may still require work by public health officials! This can involve entering the reports, reviewing the information, perhaps conducting an investigation to gather more information, classifying the case, and even implementing control measures.

Timeliness of reporting

The Arizona Administrative Code (A.A.C.) lists what conditions must be reported to public health agencies, as well as the timeframes within which reports must be submitted.

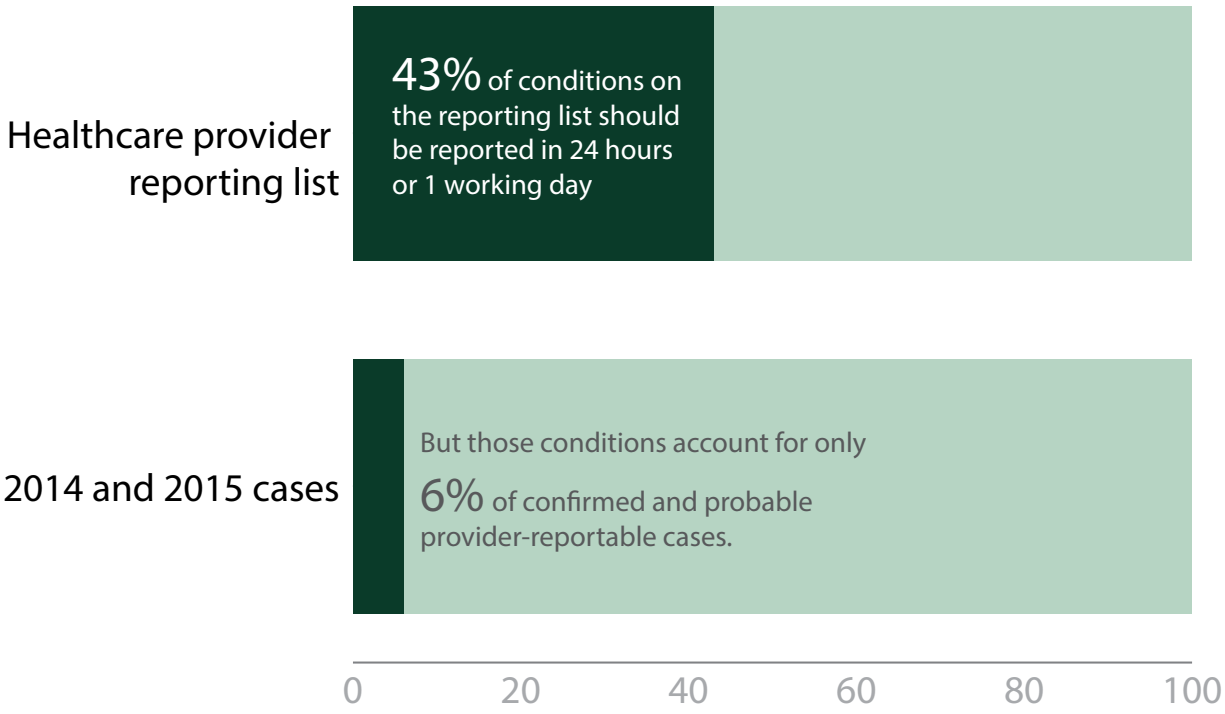
Rapid submission of reports of certain diseases allows public health officials to expedite a public health investigation and, if necessary, implement control measures to prevent transmission to more people.

Picture by Burnrub (CC BY-NC-ND 2.0)

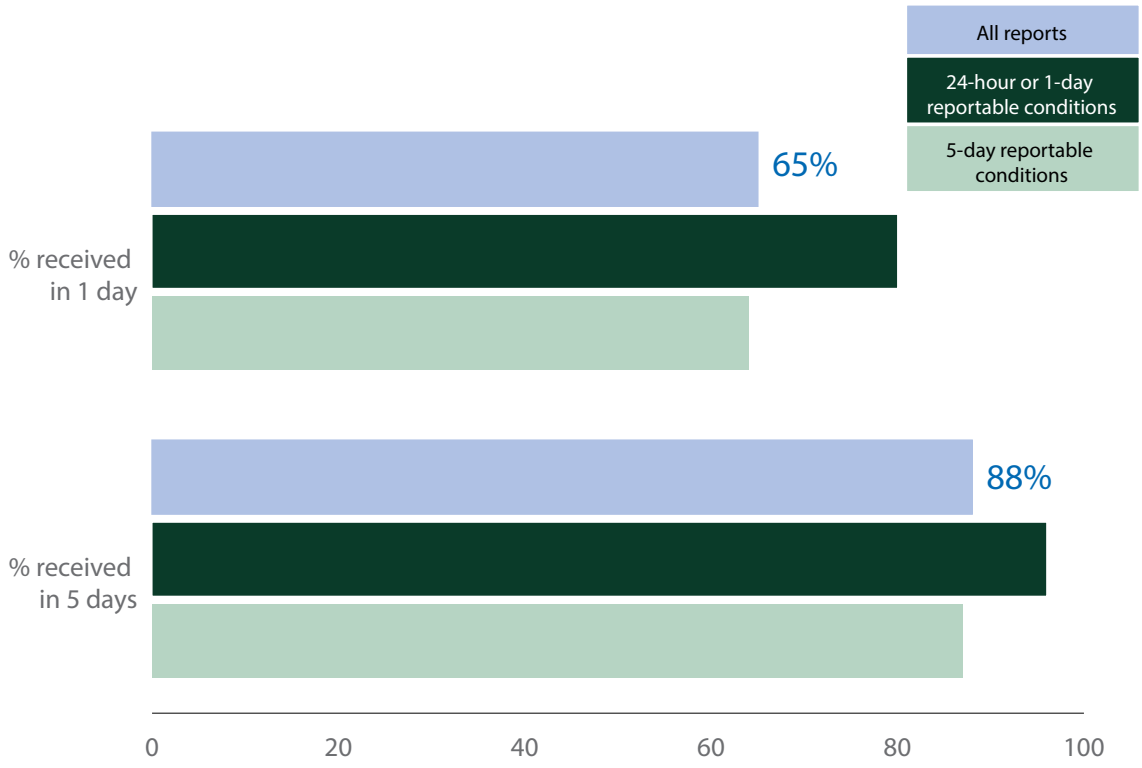
The reporting rules during this period included **88** communicable diseases or conditions that healthcare providers must report; 12 of these conditions are excluded from this report, either because case reports are only required in the event of a detected outbreak (3 conditions) or surveillance is not conducted by OIDS (9 conditions). Of the remaining 76 conditions, **33 (43%) required reporting within 24 hours (23) or one working day (10) of detection of the case.**

Laboratories must report on **58** organisms or tests; eight are not included in this report (surveillance is not conducted by OIDS). Of the remaining 50, **28 (56%) require reporting within 24 hours (13) or one working day (15) of detection of the organism**. Most of the organisms or tests on the laboratory list correspond to conditions on the provider-reportable list. However, three conditions are reportable by laboratories only (influenza, methicillin-resistant *Staphylococcus aureus*, and respiratory syncytial virus).

Although almost half the conditions on the healthcare provider reporting list must be reported with 24 hours or one working day of detection of the case, they represent a small fraction of the confirmed and probable cases reported.



Conditions with shorter required submission frames are reported faster overall, as we would expect. However, 65% of *all* confirmed and probable cases are reported with 1 day.



This shows that many reporting entities are able to submit reports of even their non-urgent conditions within a short timeframe of detection. However, we can also see there is also some opportunity for improvement, as not all cases are reported within the required timeframes.

Reportable Disease Lists

Healthcare Providers, Healthcare Institutions, and Correctional Facilities

Healthcare providers and administrators of a healthcare institution or correctional facility in Arizona are required by the Arizona Administrative Code (A.A.C. R9-6-202) to report the following morbidities to their local health department. The table below is valid for reports made between 4/1/2008 and 1/1/2018.

Arizona Administrative Code✦ Requires Providers To:

Report Communicable Diseases

to the Local Health Department

✉✱O	Amebiasis	✉	Hantavirus infection	✉✱O	Salmonellosis
☎	Anthrax	☎	Hemolytic uremic syndrome	O	Scabies
✉	Aseptic meningitis: viral	✉✱O	Hepatitis A	☎	Severe acute respiratory syndrome
✉	Basidiobolomycosis	✉	Hepatitis B and D	✉✱O	Shigellosis
☎	Botulism	✉	Hepatitis C	☎	Smallpox
◑	Brucellosis	✉✱O	Hepatitis E	✉	Streptococcal Group A: invasive disease
✉✱O	Campylobacteriosis	✉	Herpes genitalis	✉	Streptococcal Group B: invasive disease in infants younger than 90 days of age
✉	Chagas disease (American trypanosomiasis)	✉	HIV infection and related disease	✉	*Streptococcus pneumoniae* (pneumococcal invasive disease)
✉	Chancroid	◑	Influenza-associated mortality in a child	✉	Syphilis
✉	Chlamydia infection, sexually transmitted	✉	Kawasaki syndrome	✉✱O	Taeniasis
◑*	Cholera	✉	Legionellosis (Legionnaires' disease)	✉	Tetanus
✉	Coccidioidomycosis (valley fever)	✉	Leptospirosis	✉	Toxic shock syndrome
✉	Colorado tick fever	☎	Listeriosis	✉	Trichinosis
O	Conjunctivitis: acute	✉	Lyme disease	◑	Tuberculosis, active disease
✉	Creutzfeldt-Jakob disease	✉	Lymphocytic choriomeningitis	◑	Tuberculosis latent infection in a child 5 years of age or younger (positive screening test result)
✉✱O	Cryptosporidiosis	✉	Malaria	☎	Tularemia
✉	*Cyclospora* infection	☎	Measles (rubeola)	☎	Typhoid fever
✉	Cysticercosis	☎	Meningococcal invasive disease	◑	Typhus fever
✉	Dengue	◑	Mumps	☎	Unexplained death with a history of fever
O	Diarrhea, nausea, or vomiting	☎	Pertussis (whooping cough)	◑	Vaccinia-related adverse event
☎	Diphtheria	☎	Plague	☎	Vancomycin-resistant or Vancomycin-intermediate *Staphylococcus aureus*
✉	Ehrlichiosis and Anaplasmosis	☎	Poliomyelitis	☎	Vancomycin-resistant *Staphylococcus epidermidis*
☎	Emerging or exotic disease	✉	Psittacosis (ornithosis)	✉	Varicella (chickenpox)
◑	Encephalitis, viral or parasitic	◑	Q fever	✉✱O	*Vibrio* infection
☎	Enterohemorrhagic *Escherichia coli*	☎	Rabies in a human	☎	Viral hemorrhagic fever
☎	Enterotoxigenic *Escherichia coli*	✉	Relapsing fever (borreliosis)	✉	West Nile virus infection
✉✱O	Giardiasis	✉	Reye syndrome	☎	Yellow fever
✉	Gonorrhea	✉	Rocky Mountain spotted fever	✉✱O	Yersiniosis
✉	*Haemophilus influenzae*: invasive disease	◑✱	Rubella (German measles)		
✉	Hansen's disease (Leprosy)	◑	Rubella syndrome, congenital		

☎ Submit a report by telephone or through an electronic reporting system authorized by the Department within 24 hours after a case or suspect case is diagnosed, treated, or detected or an occurrence is detected.

✱ If a case or suspect case is a food handler or works in a child care establishment or a health care institution, instead of reporting within the general reporting deadline, submit a report within 24 hours after the case or suspect case is diagnosed, treated, or detected.

◑ Submit a report within one working day after a case or suspect case is diagnosed, treated, or detected.

✉ Submit a report within five working days after a case or suspect case is diagnosed, treated, or detected.

O Submit a report within 24 hours after detecting an outbreak.

Clinical Laboratories

Clinical laboratories in Arizona are required by the Arizona Administrative Code (A.A.C. R9-6-204) to report the following morbidities to the Arizona Department of Health Services. The table below is valid for reports made between 4/1/2008 and 1/1/2018.

Reports should be sent to:
Arizona Department of Health Services
Office of Infectious Disease Services
150 North 18th Avenue, Suite 140
Phoenix, AZ 85007
602-364-3676 or 602-364-3199 (fax)

ARIZONA LABORATORY REPORTING REQUIREMENTS

Isolates should be sent to:
Arizona State Laboratory
250 North 17th Avenue
Phoenix, AZ 85007

◑	Arboviruses	✱	*Haemophilus influenzae*, other, isolated from a normally sterile site		*Plasmodium* spp.
🔔☎✱	*Bacillus anthracis*		Hantavirus		Respiratory syncytial virus
☎✱	*Bordetella pertussis*	[1]	Hepatitis A virus (anti-HAV-IgM serologies)	☎+	Rubella virus and anti-rubella-IgM serologies
◑✱	*Brucella* spp.	[1]	Hepatitis B virus (anti-Hepatitis B core-IgM serologies, Hepatitis B surface or envelope antigen serologies, or detection of viral nucleic acid)	◑✱	*Salmonella* spp.
◑✱	*Burkholderia mallei* and *B. pseudomallei*	[1]	Hepatitis C virus	☎	SARS-associated corona virus
	Campylobacter spp.	[1]	Hepatitis D virus	◑	*Shigella* spp.
	CD_4-T-lymphocyte count of fewer than 200 per microliter of whole blood or CD_4-T-lymphocyte percentage of total lymphocytes of less than 14%	[1]+	Hepatitis E virus (anti-HEV-IgM serologies)		*Streptococcus* Group A, isolated from a normally sterile site
	Chlamydia trachomatis		HIV (by culture, antigen, antibodies to the virus, or detection of viral nucleic acid)		Streptococcus Group B, isolated from a normally sterile site in an infant younger than 90 days of age
🔔☎	*Clostridium botulinum* toxin (botulism)		HIV—any test result for an infant (by culture, antigen, antibodies to the virus, or detection of viral nucleic acid)		*Streptococcus pneumoniae* and its drug sensitivity pattern, isolated from a normally sterile site
	Coccidioides spp., by culture or serologies		Influenza virus		*Treponema pallidum* (syphilis)
◑	*Coxiella burnetti*	✱	*Legionella* spp. (culture or DFA)		*Trypanosoma cruzi* (Chagas disease)
	Cryptosporidium spp.	◑✱	*Listeria* spp., isolated from a normally sterile site	◑✱	Vancomycin-resistant or Vancomycin-intermediate *Staphylococcus aureus*
◑	*Cyclospora* spp.	☎+	Measles virus and anti-measles-IgM serologies	◑✱	Vancomycin resistant *Staphylococcus epidermidis*
	Dengue virus	[2]	Methicillin-resistant *Staphylococcus aureus*, isolated from a normally sterile site	🔔☎	Variola virus (smallpox)
🔔☎	Emerging or exotic disease agent	◑+	Mumps virus and anti-mumps-IgM serologies	◑✱	*Vibrio* spp.
	Entamoeba histolytica	✱[3]	*Mycobacterium tuberculosis* complex and its drug sensitivity pattern	🔔☎	Viral hemorrhagic fever agent
◑	*Escherichia coli* O157:H7		*Neisseria gonorrhoeae*		West Nile virus
◑✱	*Escherichia coli*, *Shiga*-toxin producing	☎✱	*Neisseria meningitidis*, isolated from a normally sterile site	◑✱	*Yersinia* spp. (other than *Y. pestis*)
🔔☎✱	*Francisella tularensis*		Norovirus	🔔☎✱	*Yersinia pestis* (plague)
☎✱	*Haemophilus influenzae*, type b, isolated from a normally sterile site				

🔔 Submit a report immediately after receiving one specimen for detection of the agent. Report receipt of subsequent specimens within five working days after receipt.
☎ Submit a report within 24 hours after obtaining a positive test result.
◑ Submit a report within one working day after obtaining a positive test result.
Submit a report within five working days after obtaining a positive test result or a test result specified on this page.
✱ Submit an isolate of the organism for each positive culture to the Arizona State Laboratory at least once each week, as applicable.
\+ For each positive test result, submit a specimen to the Arizona State Laboratory within 24 hours after obtaining the positive test result.
[1] When reporting a positive result for any of the specified tests, report the results of all other tests performed for the subject as part of the disease panel.
[2] Submit a report only when an initial positive result is obtained for an individual.
[3] Submit an isolate of the organism only when an initial positive result is obtained for an individual, when a change in resistance pattern is detected, or when a positive result is obtained ≥ 12 months after the initial positive result is obtained for an individual.

Note: Per Guidance Document 113-PHS-EDC, the Department will not be enforcing isolate-submission requirements as written in rule for *Shigella* spp. and *Streptococcus pneumoniae*.

Schools, Childcare Establishments and Shelters

The administrator of a school, childcare establishment or shelter in Arizona is required by the Arizona Administrative Code (A.A.C. R9-6-203) to report the following morbidities to the local health department. The table below is valid for reports made between 4/1/2008 and 1/1/2018.

Arizona Administrative Code✦ Requires an Administrator of a School, Child Care Establishment, or Shelter To:

REPORT COMMUNICABLE DISEASES

to the Local Health Department

📠	Campylobacteriosis
O	Conjunctivitis: acute
☎	Cryptosporidiosis
O	Diarrhea, nausea, or vomiting
☎	Enterohemorrhagic *Escherichia coli*
☎	*Haemophilus influenzae*: invasive disease
☎	Hepatitis A
☎	Measles
☎	Meningococcal invasive disease
☎	Mumps
☎	Pertussis (whooping cough)
☎	Rubella (German measles)
☎	Salmonellosis
O	Scabies
☎	Shigellosis
O	Streptococcal Group A infection
📠	Varicella (chicken pox)

☎	Submit a report within 24 hours after detecting a case or suspect case
O	Submit a report within 24 hours after detecting an outbreak.
📠	Submit a report within five working days after detecting a case or suspect case.

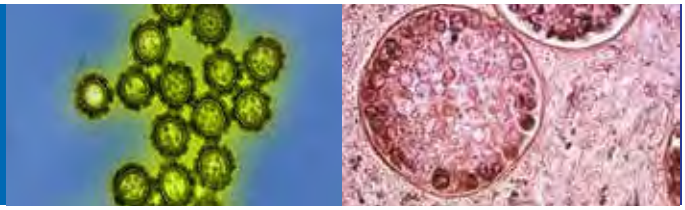
Overview of Infectious Diseases in Arizona, 2010–2015

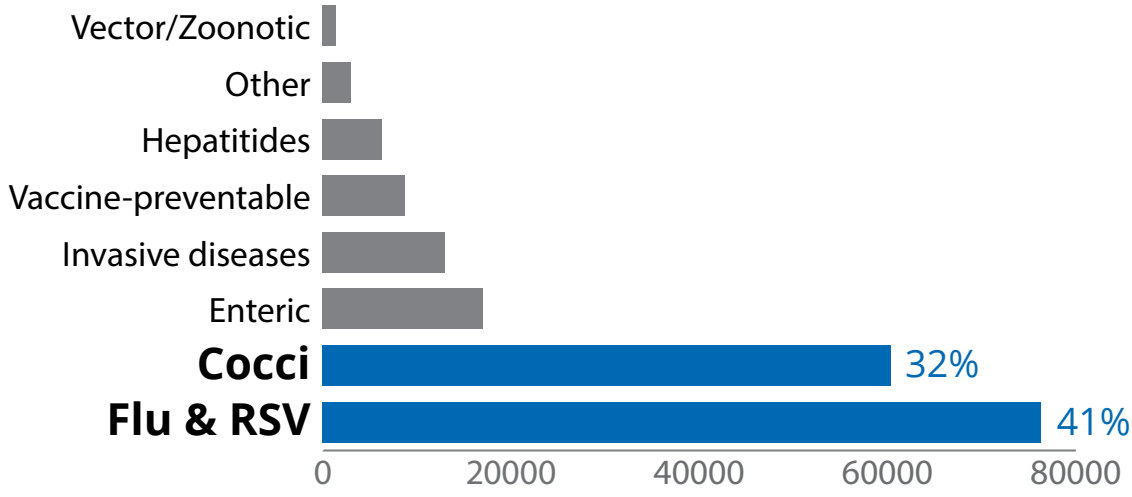
Overview of Infectious Diseases in Arizona 2010–2015

A total of **186,318** confirmed or probable cases of reportable infectious diseases, excluding sexually-transmitted diseases, tuberculosis, hepatitis C, and HIV, have been reported from 2010 through 2015.

Of these, **41%** (76,306 cases) were **influenza or RSV** cases, **32%** (60,387 cases) were **coccidioidomycosis** cases and **9%** (17,017 cases) were cases of **enteric diseases.** The remaining 18% of the cases (32,607 cases) were divided among invasive diseases, hepatitides, other diseases, vaccine-preventable diseases and vector-borne and zoonotic diseases.

The most frequently reported diseases in 2010–2015 were flu/RSV and cocci.

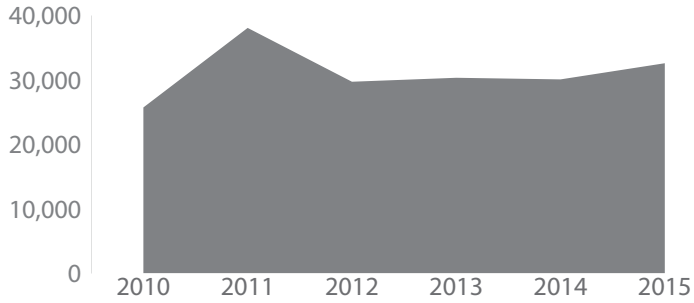




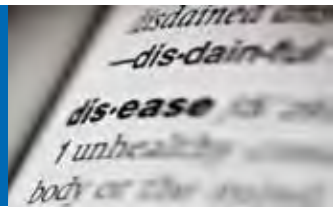
Disease categories and corresponding reportable morbidities are listed in the table below.

Disease Category	Reportable Morbidities
Cocci/Valley Fever	Coccidioidomycosis
Enteric diseases	Amebiasis, botulism, infant botulism, campylobacteriosis, cholera, cryptosporidiosis, cyclospora infection, cysticercosis, *E. coli* enterohemorrhagic, giardiasis, hemolytic uremic syndrome, listeriosis, salmonellosis, shigellosis, typhoid fever, taeniasis, trichinosis, *Vibrio* infection, yersiniosis
Flu and RSV	Influenza virus, influenza with mortality in a child, respiratory syncytial virus (RSV)
Invasive diseases	Invasive methicillin-resistant *Staphylococcus aureus* (MRSA), invasive streptococcal group A, invasive streptococcal group B (in children <90 days of age), invasive *Streptococcus pneumoniae*, vancomycin-intermediate *Staphylococcus aureus* (VISA), vancomycin-resistant *Staphylococcus aureus* (VRSA), vancomycin-resistant *Staphylococcus epidermidis* (VRSE)
Hepatitides	Hepatitis A, hepatitis B acute, hepatitis B chronic, hepatitis B perinatal, hepatitis D, hepatitis E
Other	Basidiobolomycosis, blastomycosis, Creutzfeldt-Jakob disease, emerging or exotic disease, parasitic encephalitis, Hansen's disease, Kawasaki syndrome, legionellosis, Reye syndrome, toxic shock syndrome, viral encephalitis
Vaccine-preventable diseases (VPD)	Diphtheria, invasive *Haemophilus influenzae*, measles, invasive meningococcal disease, mumps, pertussis, poliomyelitis, rubella, smallpox, tetanus, varicella, and vaccinia-related event
Vector-borne and zoonotic diseases	
Mosquito-borne diseases	Chikungunya, dengue, malaria, St. Louis encephalitis virus, West Nile virus, yellow fever, Zika virus, and all other arboviruses (including Eastern equine encephalitis, Japanese encephalitis, Venezuelan equine encephalitis, Western equine encephalitis viruses)
Tick-borne diseases	Babesiosis, Colorado tick fever, ehrlichiosis or anaplasmosis, Lyme disease, relapsing fever, Rocky Mountain spotted fever, typhus fever and plague
Zoonotic diseases	Brucellosis, Chagas disease, hantavirus infection, hemorrhagic fever, leptospirosis, melioidosis or glanders, psittacosis, Q fever, rabies, tularemia

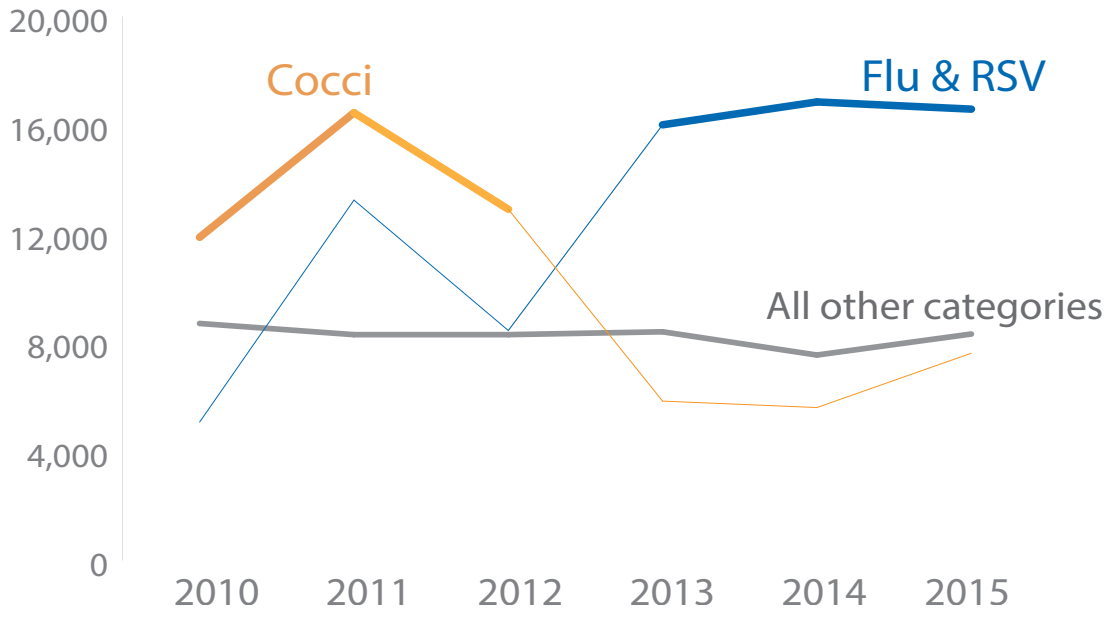
An average of **31,000** confirmed and probable cases of infectious diseases, across all categories, have been reported each year from 2010 to 2015, with a maximum of 38,034 cases in 2011 and a minimum of 25,696 cases in 2010.



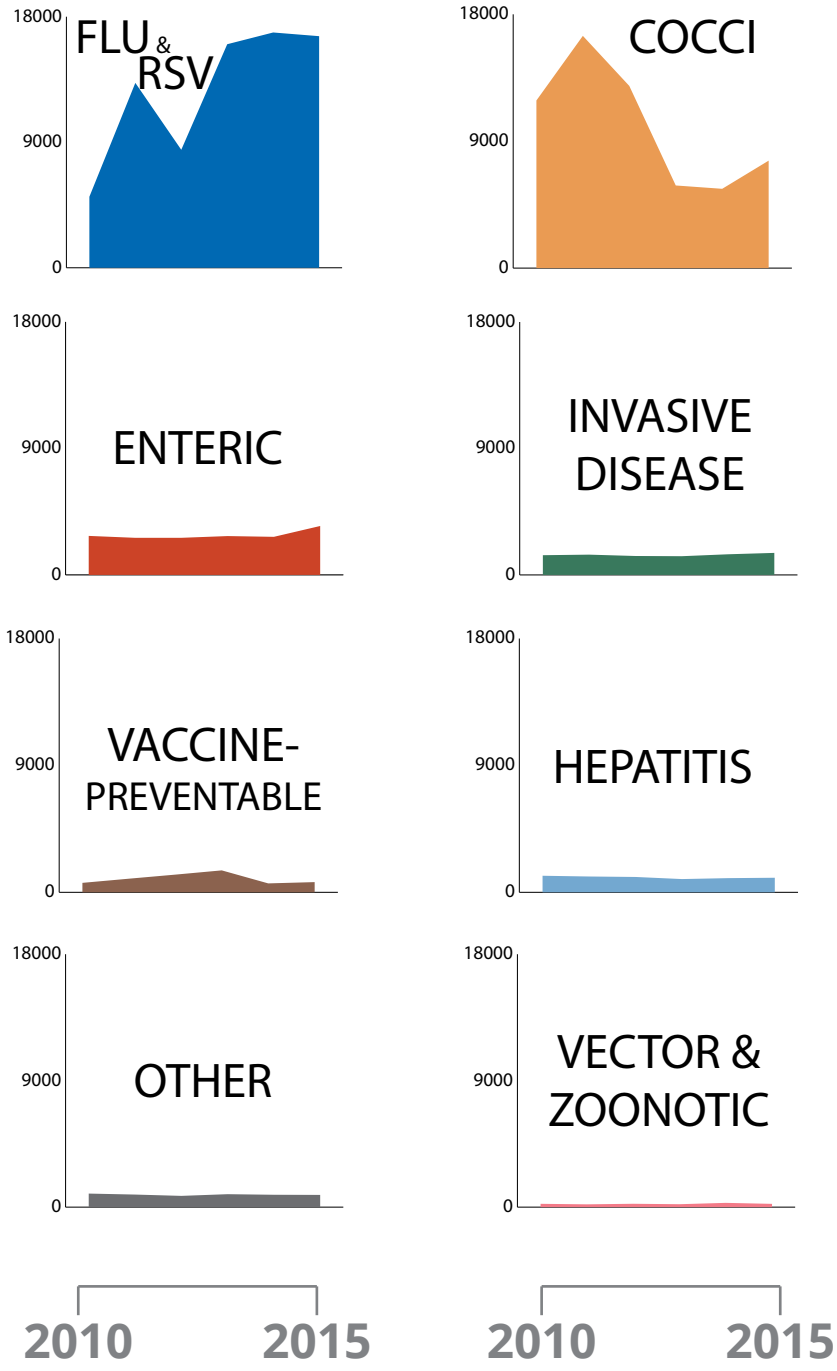
During 2010–2015, 454 cases per 100,000 population were reported each year, on average.



Coccidioidomycosis accounted for the majority of the cases observed during 2010–2012. **Flu and RSV** were responsible for the most cases during 2013–2015. Cases in all other categories combined were steady across years.



Coccidioidomycosis, **enteric diseases**, **invasive diseases** and **vaccine-preventable diseases (VPD)** show an increase in the number of reported cases in 2015. Details on the epidemiology of selected morbidities within each category can be found in the Disease Summaries section of this report.



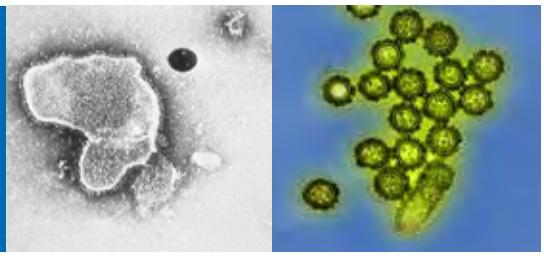
Influenza and Respiratory Syncytial Virus (RSV)

Influenza and RSV

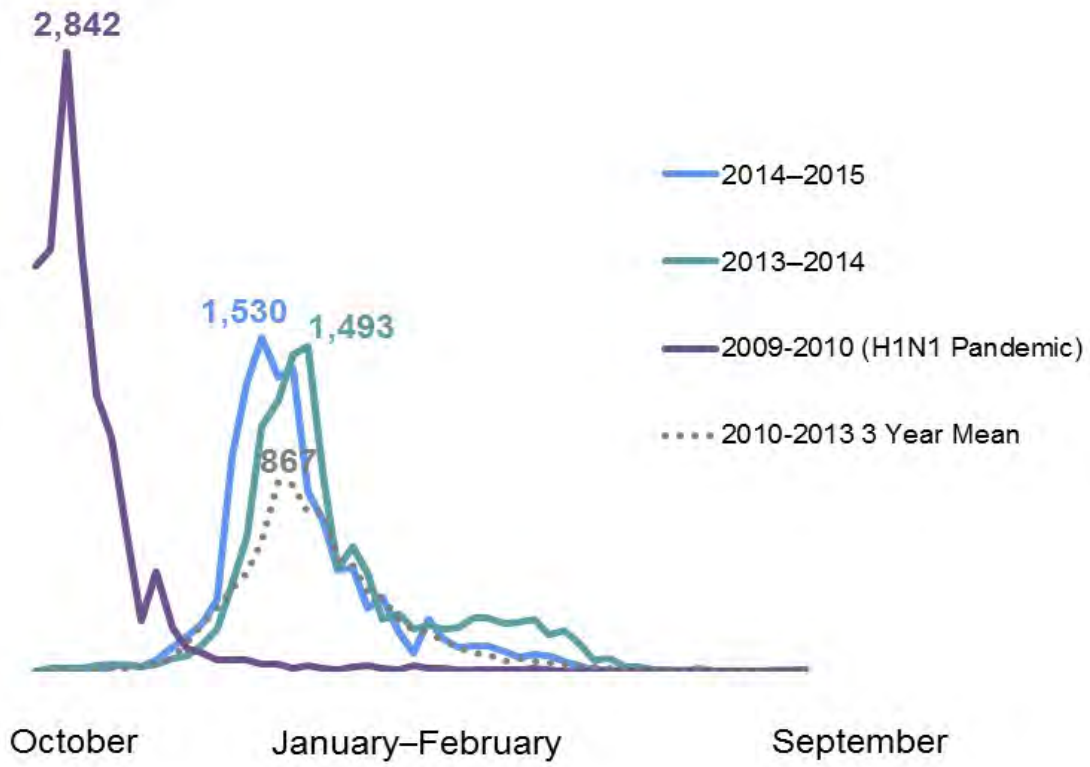
Influenza and **respiratory syncytial virus (RSV)** are respiratory viral infections causing mild to severe illness, particularly during fall and winter, and are both transmitted via **respiratory droplets**.

In Arizona, influenza and RSV made up the biggest fraction (41%) of the communicable diseases reported between 2010 and 2015, for a total of 76,306 cases, of which 67% (51,020 cases) were flu cases.

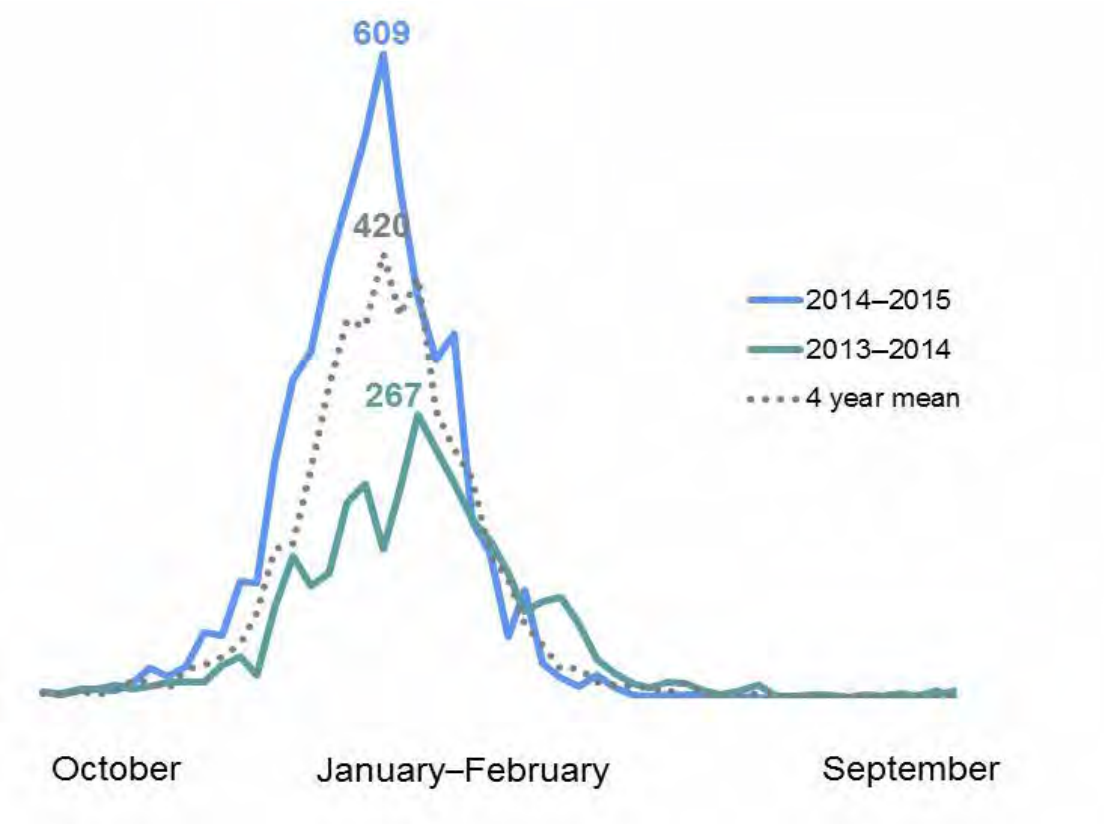
Children are at higher risk of contracting RSV, whereas influenza is more likely to affect people of all ages.



Laboratory-Confirmed Influenza Activity by Season, 2009–2015



Laboratory-Confirmed RSV Activity by Season, 2009–2015



Weekly reports detailing influenza and RSV surveillance trends are prepared and disseminated throughout the influenza season. At the end of each season, a **summary of that season's data** is also produced. We refer you to those reports on the ADHS Flu page (http://www.azdhs.gov/phs/oids/epi/flu/index.htm) by clicking on "Flu and RSV Reports", then "Previous Years" under the Reports Archive.

Influenza	RSV
Influenza Report 2014–2015	RSV Report 2014–2015
Influenza Report 2013–2014	RSV Report 2013–2014
Influenza Report 2012–2013	RSV Report 2012–2013
Influenza Report 2011–2012	RSV Report 2011–2012
Influenza Report 2010–2011	RSV Report 2010–2011
Influenza Report 2009–2010	RSV Report 2009–2010

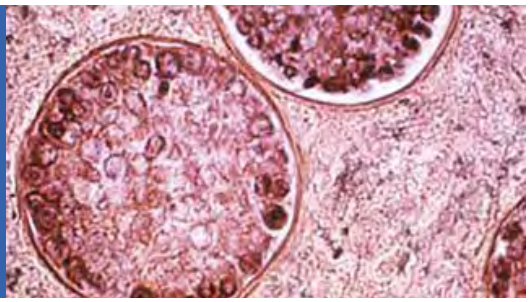
Valley Fever (Coccidioidomycosis)

Valley Fever (Coccidioidomycosis)

Valley fever (coccidioidomycosis) is an infection caused by inhaling spores of the **fungus *Coccidioides*** found in the southwestern United States and parts of Mexico, Central and South America. The fungus was also recently found in south-central Washington. It is **not contagious person-to-person** and cannot be transmitted from animals to humans.

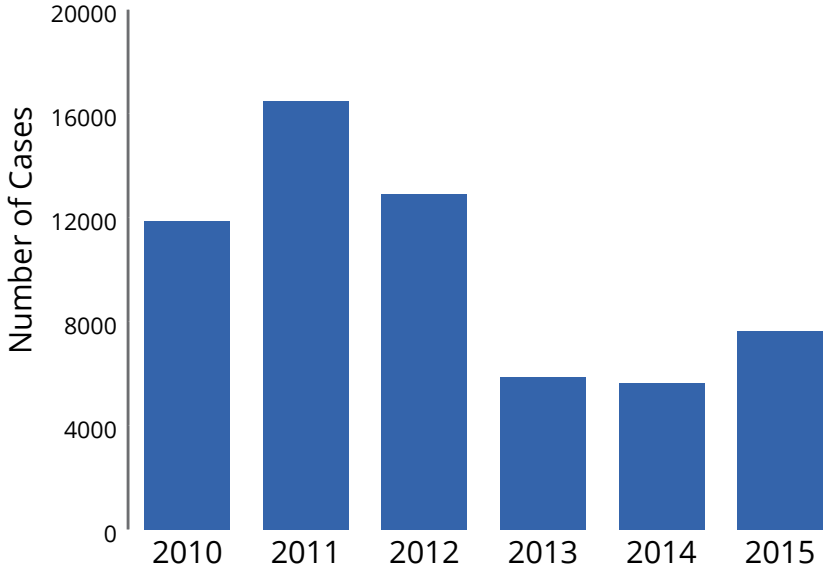
Sixty percent of infected persons experience no or mild symptoms. The remaining 40% experience a self-limited **respiratory disease** with symptoms such as fever, cough, fatigue, chest pain, shortness of breath, and rash. In less than 5% of people with symptoms, the infection can progress to severe respiratory disease or disease outside of the lungs.

Nearly 2/3 of all valley fever cases reported nationwide reside in Arizona.



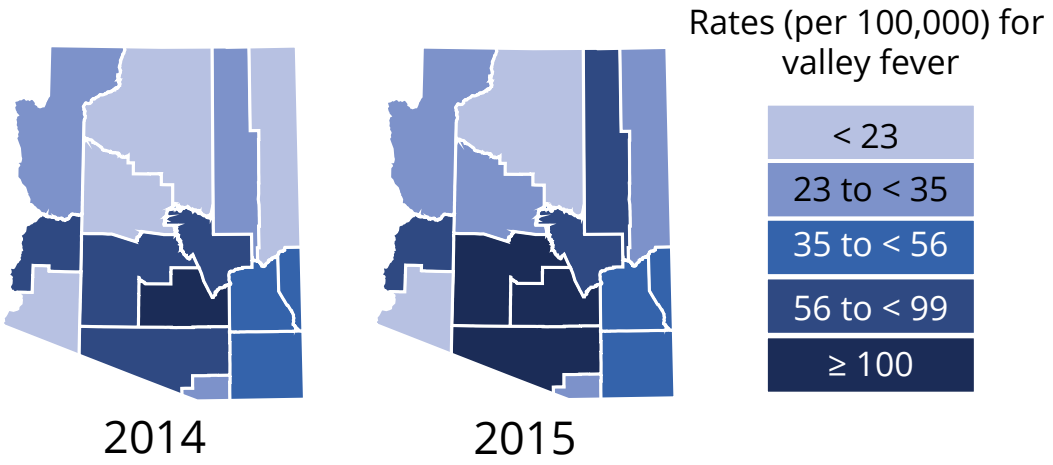
Because of the large burden of valley fever in Arizona, and its uniqueness compared to other morbidities under surveillance, this morbidity is listed as its own category in this report.

Since laboratory reporting of valley fever was mandated in 1997, case reports have increased dramatically. In 2009, a major commercial laboratory altered its reporting practices for valley fever after consultation with ADHS, to include reporting of enzyme immunoassay (EIA) results. Following this change, the total number of reported Arizona cases doubled compared to previous years, with case counts **peaking in 2011**. In late 2012, the same laboratory changed the testing platform used for EIAs, and in 2013 the number of cases reported statewide declined 55% compared to 2012. The cases then declined slightly from 2013 to 2014 before a **36% increase in 2015**. An increase in case counts was also noted by other states in 2015.



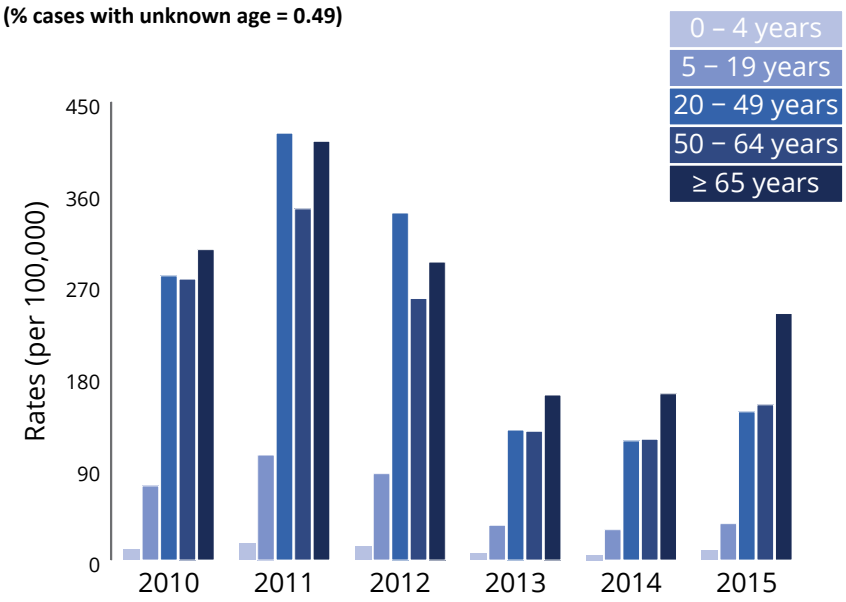
The effects of these changes are shown in more detail in the valley fever annual reports (see http://www.azdhs.gov/phs/oids/epi/valley-fever/reports-publications.htm). Although these laboratory testing and reporting changes may explain much of the observed increase and decrease in numbers of reported cases over this period, the causes of year-to-year variation in case counts remain poorly understood.

Maricopa, Pima, and Pinal Counties consistently have the highest rates of valley fever in Arizona. Cases reported from these counties constitute a majority of the national disease burden, and only one U.S. county outside Arizona has rates routinely greater than 100 per 100,000 population. Fewer than 100 cases per 100,000 population are reported annually from all other counties in Arizona.



During 2014–2015, rates of reported disease were lowest in Coconino and Yuma Counties. This geographic distribution may reflect areas that are highly endemic, migration of susceptible persons to these areas, climate-related phenomena, and/or increased human or natural disturbance of desert soils where the fungus is present.

Rates of valley fever are highest in older adults. Few cases are reported among children. This may reflect increased healthcare-seeking, greater severity of symptoms, physician awareness, and/or increased exposure to fungal spores. The median age of reported cases decreased significantly after the 2009 reporting change by the major laboratory mentioned above, suggesting that the change disproportionately increased the numbers of cases reported among younger people. The reasons that reporting of EIA test results would affect the age distribution of cases are not understood. Since 2013, the rates have again been highest in those 65 years and older.



Enteric Disease Overview

Enteric Disease Overview

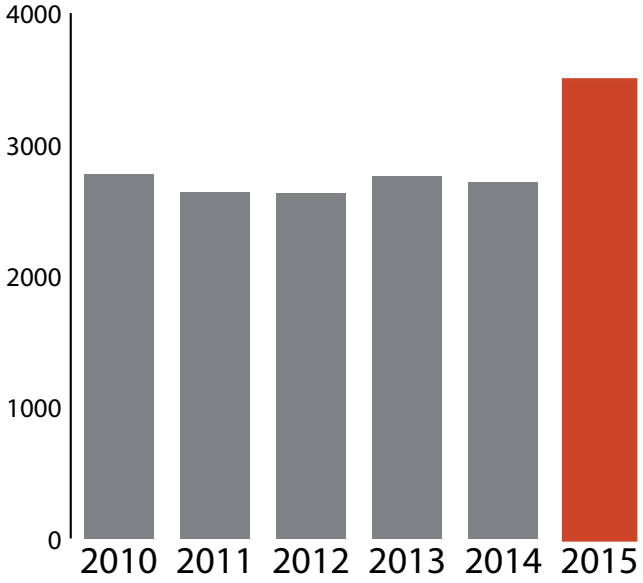
Enteric (intestinal) diseases comprise several infections characterized by diarrhea, abdominal discomfort, nausea and vomiting. The causative agents of most enteric infections under public health surveillance are bacteria, such as enterohemorrhagic *E. coli* (also referred to as Shiga toxin-producing *E. coli* or STEC), *Campylobacter, Salmonella, Shigella, Vibrio* and *Yersinia* (excluding *Y. pestis*), as well as intestinal parasites, such as *E. histolytica* causing amebiasis, *Cryptosporidium, Taenia solium* causing taeniasis, and *Giardia*.

Noroviruses account for a significant burden of gastrointestinal illness in the U.S., but are not tracked through case-based surveillance and testing is generally only conducted in the event of a reported outbreak.

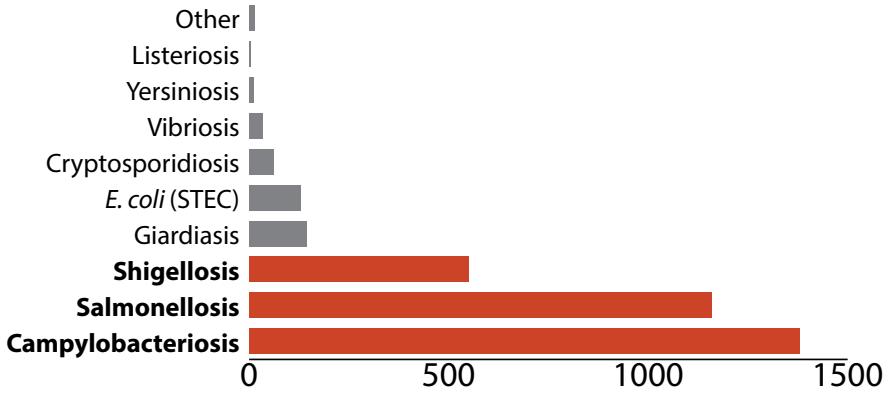
In Arizona, enteric diseases accounted for 9% of communicable diseases reported between 2010 and 2015, for a total of about 17,000 cases.

Enteric infections are usually acquired through contaminated food and water or by contact with vomit or feces. We have included in this category morbidities such as cysticercosis and botulism which may manifest as non-enteric illnesses but may be transmitted through consumption of contaminated products.

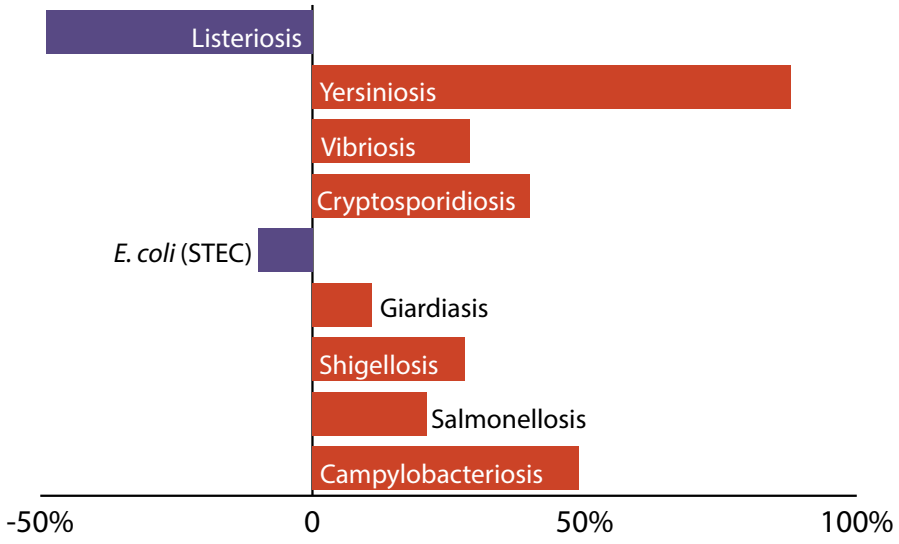
Overall, reported enteric morbidities have been stable between 2010 and 2014 and shown an **increase in 2015**.



The most commonly reported enteric infections in 2015 (together comprising more than 85% of the cases) were **campylobacteriosis** (39%), **salmonellosis** (33%) and **shigellosis** (16%).



Enteric diseases showing the greatest **increase*** in 2015 were: **yersiniosis, campylobacteriosis** and **cryptosporidiosis. Listeriosis** and ***E. coli*** **(STEC) decreased** in 2015.



* percent change in 2015 as compared to the 5 year median (2010–2014).

Botulism

Botulism is a serious illness caused by a toxin produced by the bacterium *Clostridium botulinum*. The bacterium, which is normally found in soil, produces spores that germinate in low-oxygen conditions, triggering the release of **toxins** which can inhibit the body's **nervous system**. Botulism can be caused by the consumption of food contaminated with the toxin, a contaminated wound (often associated with black-tar heroin injection), or accidental overdose of the toxin through cosmetic procedures.

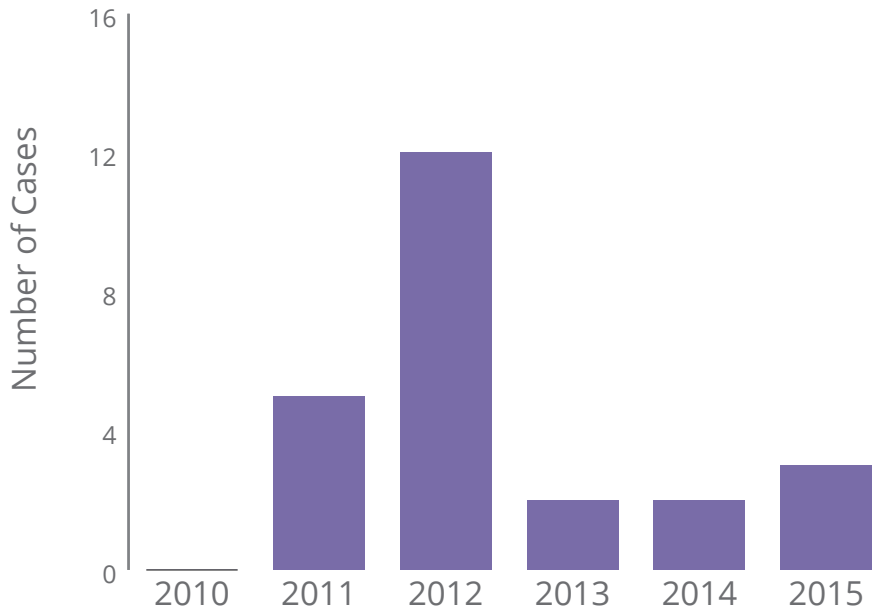
Those experiencing botulism develop symptoms of fatigue, weakness, blurred vision, and trouble swallowing. Diarrhea, constipation, dry mouth, and slurred speech may also occur. If untreated, these symptoms can lead to **paralysis** that starts at the head and moves down the body. All forms of botulism can be deadly and are considered medical emergencies.

From 2010–2015 in Arizona, 46% of botulism cases were foodborne, 35% infant and 4% wound.

In the United States in 2015, a total of 199 confirmed cases were reported – about **71% were infant botulism**, **20% were foodborne botulism**, and **8% were wound botulism**.

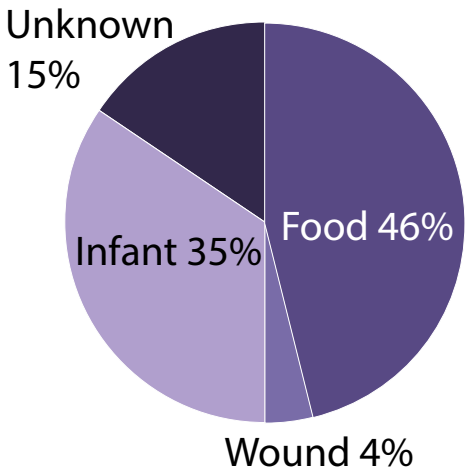
Foods associated with foodborne botulism include **home-canned goods**, **fermented products** and **illicitly brewed alcohol**. Infant botulism primarily occurs in infants less than 6 months old. It differs from foodborne botulism because the infant must ingest the entire spore, which then germinates into bacteria in the infant's gut. Infant botulism can occur when **honey** is consumed by infants, as it is often contaminated with the spores. Symptoms in infants include **difficulty breathing and muscle weakness**, including a weakened cry.

Botulism cases are not common in Arizona; even one case is considered atypical.

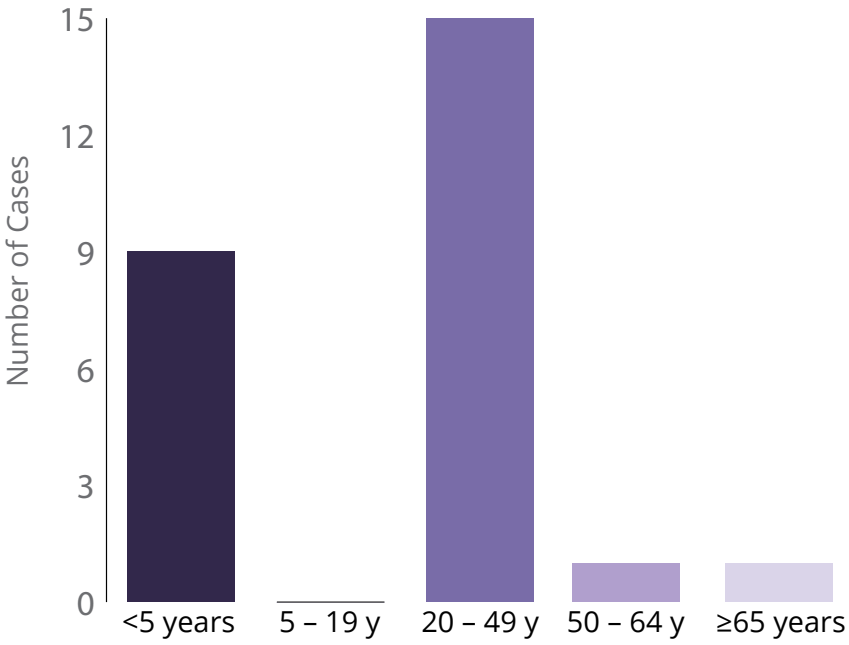


Arizona experienced a spike in cases in 2012 when 12 cases were reported, connected to two separate outbreaks at a correctional facility. Both outbreaks were associated with illicitly brewed alcohol.

Cases for 2014 and 2015 were similar to levels reported in most other years, with two cases of botulism in 2014, of which one was infant botulism, and three cases of botulism in 2015, of which two were infant botulism. The median number of infant botulism cases for 2010–2015 was 1.5, with a median age of 7 weeks and ranging from 2 to 20 weeks of age.



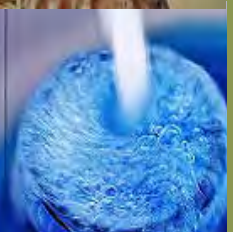
The majority (15/17) of non-infant botulism cases occurred among the 20–49 year old age group, due mainly to the 2012 outbreaks.



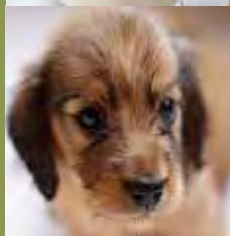
Campylobacteriosis

Campylobacter infection is one of the most common causes of **diarrheal illness** in the U.S. Symptoms typically include diarrhea, abdominal cramps, and fever.

The bacteria are often found among poultry flocks and in raw or **undercooked poultry products**. Other important sources of infection are **contact with animals** like cows, puppies, and other livestock or pets; **untreated drinking water**; and **unpasteurized dairy products**. It is estimated that for every *Campylobacter* case reported to public health, 30 go undiagnosed[1].



Ingestion of undercooked poultry products, untreated water or unpasteurized dairy products, or contact with animals can be sources of *Campylobacter* infection.

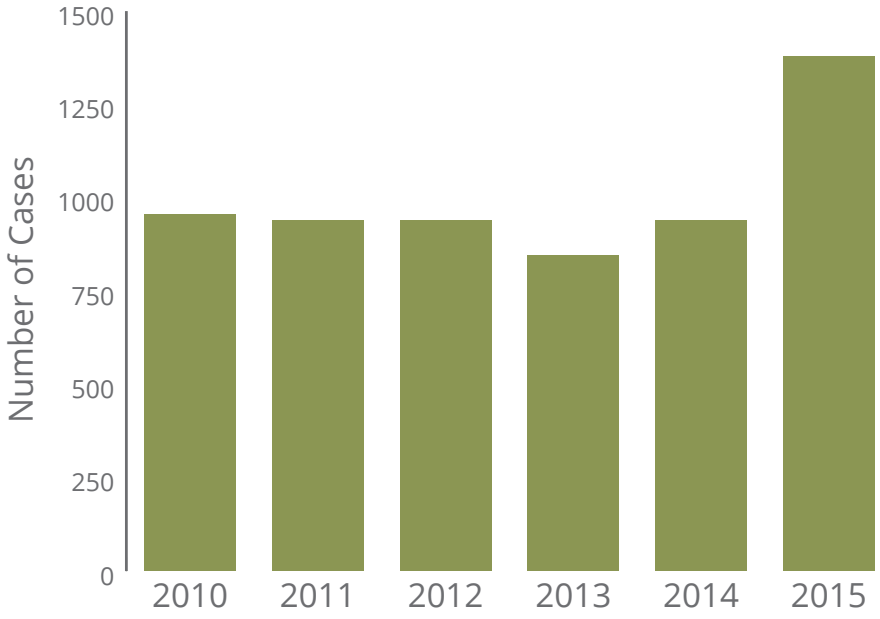


Pictures from C. Jules CC BY-NC 2.0 (poultry), S. Cox CC BY-NC-ND 2.0 (water), K. Net CC BY-SA 2.0 (milk) and Sondy CC BY-SA 2.0 (puppy).

Campylobacter causes an estimated 1.3 million illnesses each year in the United States[1]. In Arizona, campylobacteriosis is the most common enteric disease reported, comprising 39% of enteric diseases cases in 2015, with a 5-year median of almost **1,000 cases per year**.

[1] Scallan E, Hoekstra RM, Angulo FJ, et *al*. Foodborne Illness Acquired in the United States—Major Pathogens. Emerging Infectious Diseases. 2011;17(1):7-15. https://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article

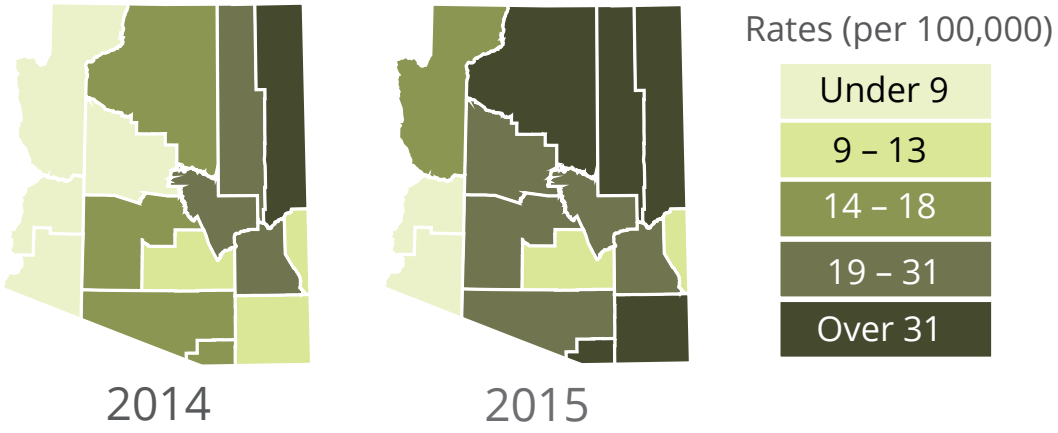
In 2015 the number of reported cases of *Campylobacter* in Arizona **increased by 45%**, from 939 cases in 2014 to 1,379 cases.



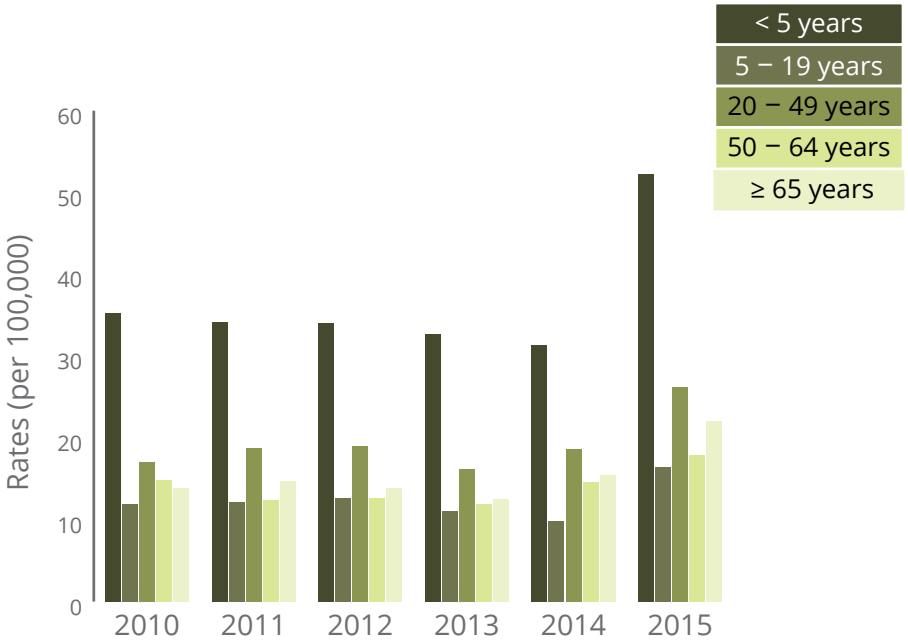
If we had used the 2015 case definition for 2014 cases, 2014 counts would have been 30% higher.

This increase is explained by two major changes in surveillance during 2015. First, the surveillance **case definition changed in 2015** to include cases of *Campylobacter* that were tested with non-culture laboratory methods, including PCR and enzyme immunoassay (EIA). Second, **healthcare providers' use of these non-culture tests increased**, thus identifying cases of *Campylobacter* that otherwise would have gone undiagnosed not only in Arizona but nationwide. The specificity of non-culture tests for *Campylobacter*, and the overall impact of culture-independent diagnostic testing, is being studied nationally.

The 2015 increase in *Campylobacter* infection affected most counties, with the exception of Graham, Greenlee and La Paz Counties. **Apache County** has had the highest rates in the state, with 36 cases per 100,000 in 2014 and 61 cases per 100,000 in 2015.



Campylobacter infections disproportionately affected young children, particularly in 2015, with 52 cases per 100,000 among **children less than 5 years of age**, compared with 26 or fewer cases per 100,000 persons in other age groups for that year. Rates are consistently slightly higher in persons 20 through 49 years compared to all ages except young children; further studies are needed to determine the cause.



Cryptosporidiosis

Cryptosporidium is a parasite that infects human and animals and is one of the most frequent causes of waterborne disease in the United States.

People acquire the disease by eating or drinking something contaminated with *Cryptosporidium* or through close contact with someone who is ill with the infection. Swallowing **recreational water** such as from a swimming pool, lake, or river is the most common way to become infected with the parasite.

Common symptoms include **watery diarrhea, abdominal cramps, vomiting, and fever**. Persons at high risk of infection include diaper-age children, international travelers, anyone who drinks unfiltered/untreated/ contaminated water, and people who work closely with livestock.

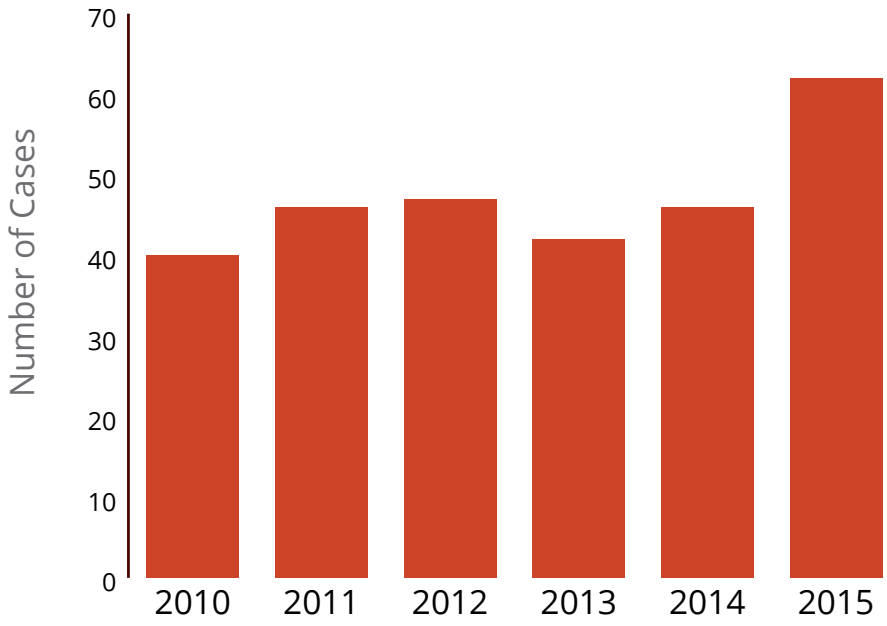
Cryptosporidium is a leading cause of waterborne disease among humans in the United States.

The parasite lives and proliferates in the infected human or animal's intestine. Shedding of the parasites starts from symptom onset and may last for four weeks after symptoms stop.

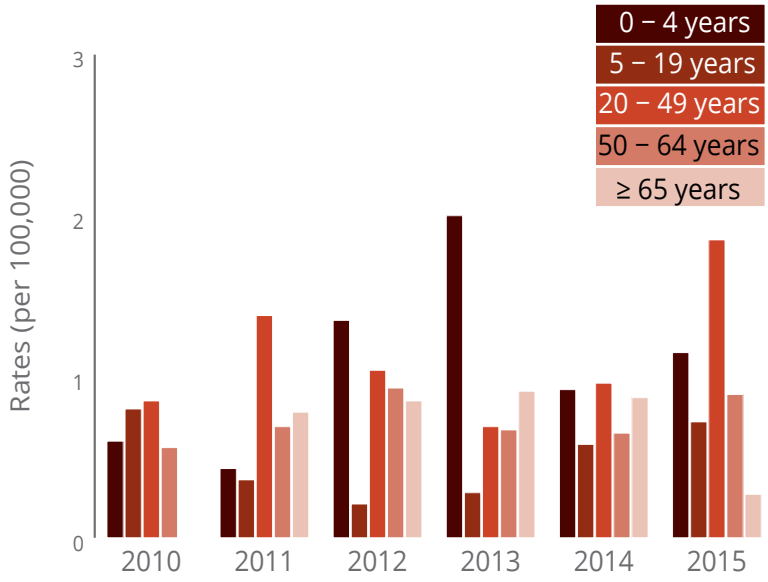
Cryptosporidium parasites are found in every region of the United States and it is estimated that there are approximately 748,000 cases of cryptosporidiosis each year[1].

[1] Scallan E, Hoekstra RM, Angulo FJ, et *al*. Foodborne Illness Acquired in the United States—Major Pathogens. Emerging Infectious Diseases. 2011;17(1):7-15. https://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article

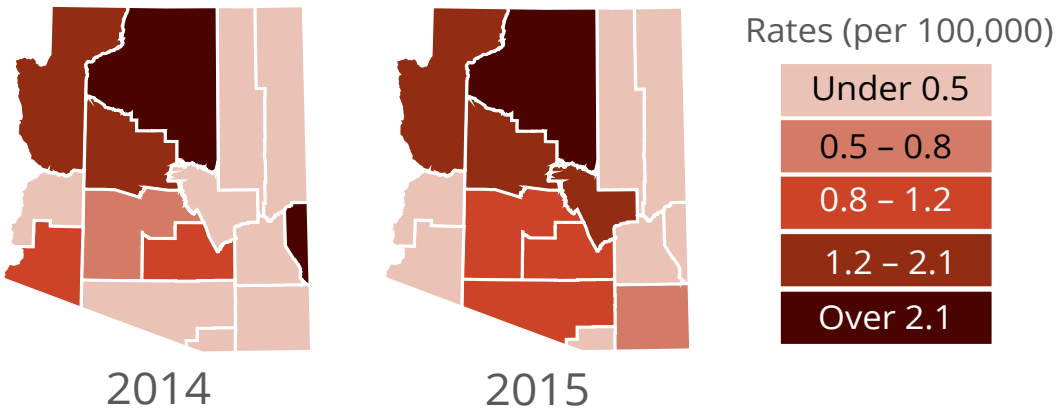
Cases of *Cryptosporidium* reported in Arizona **increased slightly in 2015** but no common exposures were identified.



In 2015 and 2014, rates of *Cryptosporidium* infection were highest among the **20–49 year age group**, followed by the 0–4 year age group.



Case rates were consistently high in **Coconino County** from 2012–2015. The higher case rates in Maricopa County and surrounding counties in 2015 reflect the overall increase in cases during that year.



Hepatitis A

Hepatitis A is an acute viral illness that spreads between people through the **fecal-oral route** or consumption of **contaminated food or water**.

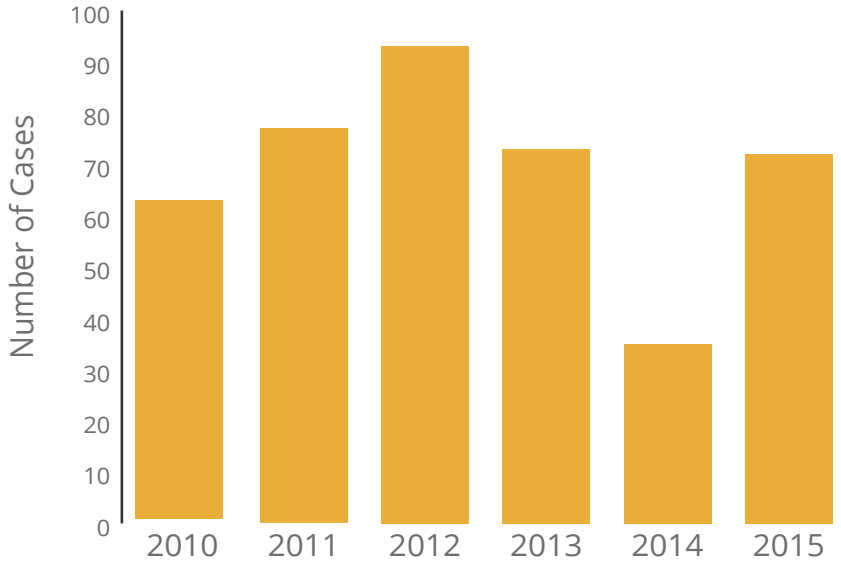
The virus infects the liver and causes symptoms such as yellowing of the skin and eyes (jaundice), fever, fatigue, vomiting, and loss of appetite. Persons most at risk include travelers to areas where hepatitis A is common, men who have sex with men and drugs users.

Vaccination with the two-dose series of hepatitis A vaccine in persons 12 months of age and older is the best way to prevent infection. Since the vaccine was first introduced in the United States in 1995, hepatitis A rates have declined more than 95%.

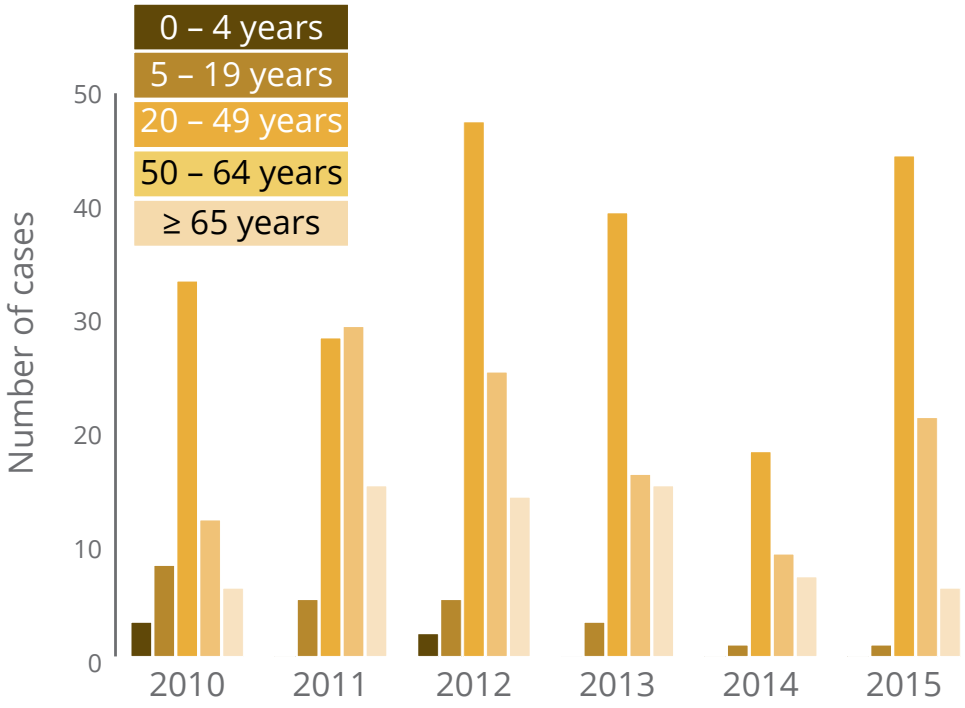
In 2016, there were an estimated 4,000 hepatitis A cases in the United States.

Arizona has seen **declining rates of hepatitis A among children under 5 years of age**, with no cases reported among this age group since 2013. This is likely due to lowering of the minimum age at vaccination from 24 months to 12 months in 2006. A **median of 75 cases per year** have been reported in Arizona for 2010 through 2015.

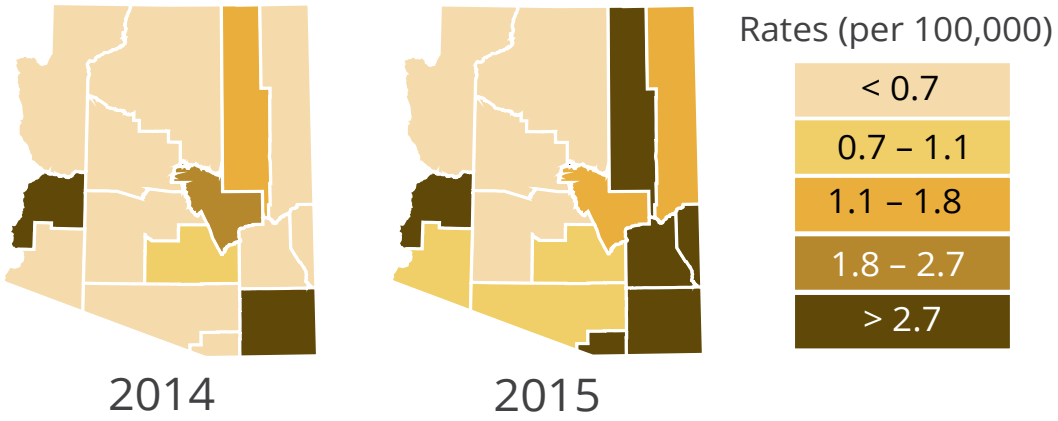
Rates of hepatitis A in Arizona decreased steadily from the introduction of the hepatitis A vaccine in 1995, until **rising slightly again in 2011**. In 2013, a probable case definition was introduced in Arizona which included cases that had a positive lab result but no investigation of clinical symptoms. In 2013 and 2014, 1-2% of hepatitis A cases were classified as probable, rising to 5% in 2015.



Across most years, hepatitis A rates are highest in the **20–49 age group**.



In 2014 no particular pattern of hepatitis A is visible across Arizona, whereas in 2015 higher rates are observed in the **southern part of the state**.



Listeriosis

Listeriosis is a rare but serious **foodborne illness** that occurs when food is contaminated with the naturally occurring bacterium *Listeria monocytogenes*. This disease is **most dangerous for pregnant women, young children and older adults**, and those with weakened immune systems, though sometimes normally healthy people can be affected.

Most cases (90%) of listeriosis occur among individuals in these high risk groups. Listeriosis presents with non-specific symptoms including fever, malaise, myalgia, nausea, vomiting and diarrhea and may progress to meningitis and/or bacteremia. **Pregnant women may be asymptomatic, but can suffer miscarriage, early labor, stillbirth, or neonatal sepsis or meningitis in the infant**.

Pregnant women are 10 times more likely than other people to get *Listeria* infection.

https://www.cdc.gov/listeria/risk-groups/pregnant-women.html [10 Jul 2018]
Picture by by Petar CC BY-NC 2.02.0.

***Listeria* bacteria can survive and grow in cold temperatures such as the refrigerator or freezer.** Foods associated with infection include soft cheeses; processed, refrigerated meats such as deli meat, hot dogs or pâtés; unpasteurized products; ready-to-eat food products and fresh fruits and vegetables.

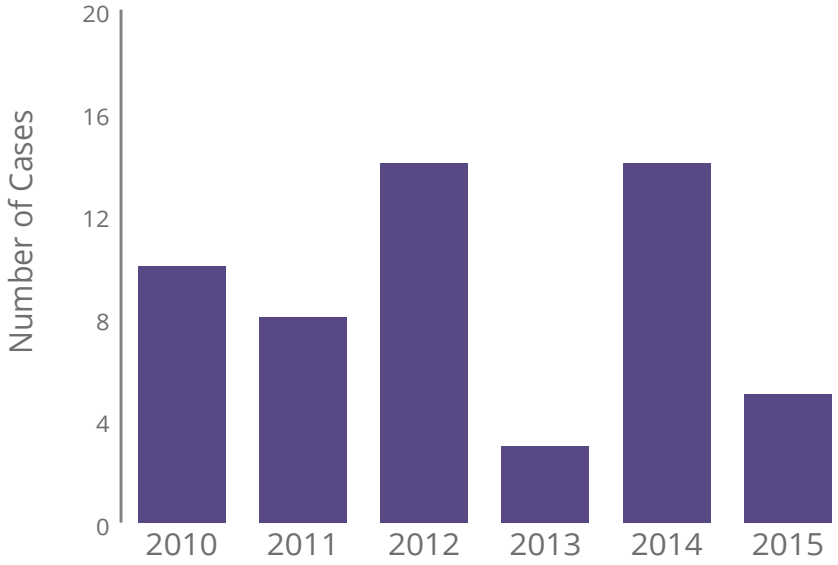
Rates of listeriosis in Arizona were highest in 2012 and 2014. The increase in **2014** may be partially explained by an **outbreak** associated with consumption of **caramel apples** distributed in California. An additional case that year was part of a multi-state outbreak of seven individuals, but an exposure source was not identified.

Caramel Apple Outbreak:

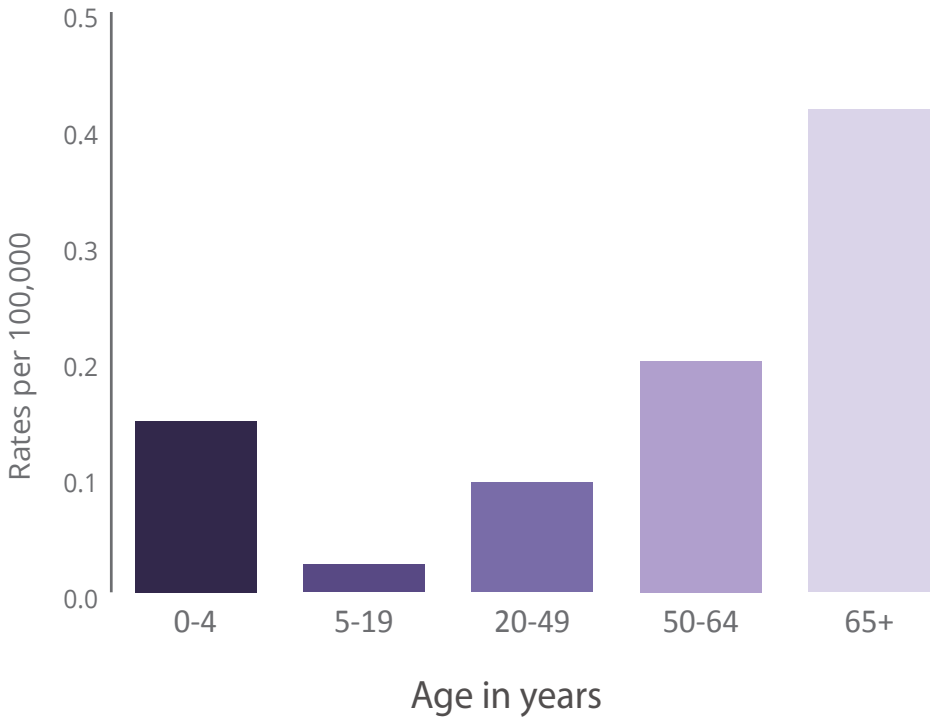
35 cases nationwide

5 cases in Arizona

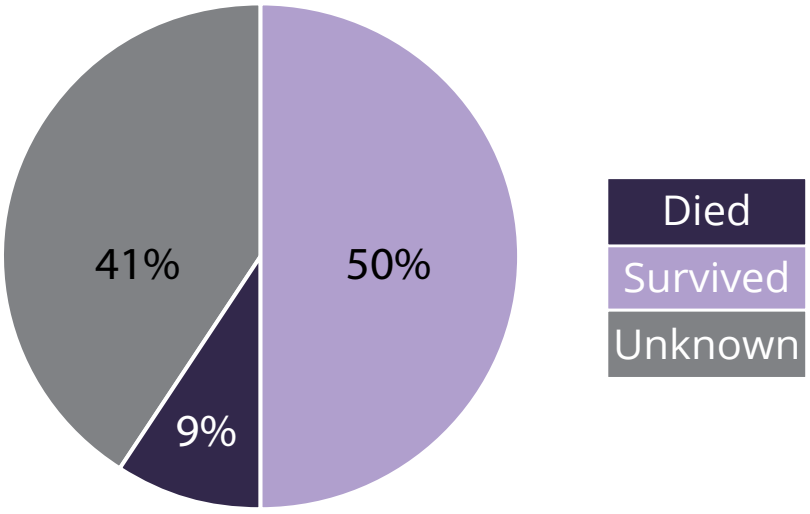
Picture by by Nerissa's ring CC BY 2.0



Listeriosis cases remain consistently more common among **persons older than 65 years of age**, which is expected and matches nationwide data.



Of the 52 cases of listeriosis identified in Arizona during 2010–2015, nine were among women of child-bearing age. Seven of these women were not pregnant and two had unknown pregnancy status. Five deaths were reported for 2010–2015 (9%) but outcome was unknown for 41% of the cases.



Salmonellosis

Salmonellosis is a bacterial illness that typically causes **diarrhea**. Fever and abdominal cramps are also commonly reported. Less commonly, *Salmonella* can cause disseminated illness including bacteremia, urinary tract infections, and wound infections.

Salmonella bacteria spread through **contaminated food and water** as well as **contact with animals**. Animals that have been linked to cases of salmonellosis in recent years have been guinea pigs, poultry, turtles, geckos and bearded dragons. Individuals most at risk are young children, older adults and people with weakened immune system.

Foods that have been linked to cases include eggs, cucumber, chicken, alfalfa sprouts and peanut butter.

Salmonella infections are responsible for approximately 42,000 reported cases of illness in the United States each year. It is estimated that for every *Salmonella* case reported to public health, 29 cases go undiagnosed[1].

A median of about **1,000 cases per year** have been reported in **Arizona** during 2010–2015. Cases identified using rapid (non-culture) laboratory tests were not counted for public health surveillance during the years included in this report. Case reports of salmonellosis are **expected to increase in coming years** due to a change in the 2016 surveillance case definition to include non-culture laboratory tests.

[1] Scallan E, Hoekstra RM, Angulo FJ, et *al*. Foodborne Illness Acquired in the United States—Major Pathogens. Emerging Infectious Diseases. 2011;17(1):7-15. https://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article

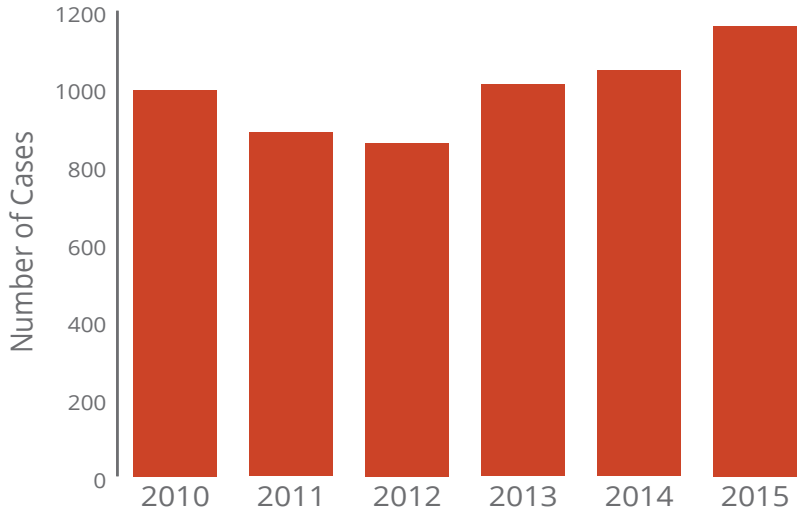
Since 2012, salmonellosis rates have steadily increased in Arizona, with 30% more cases reported in 2015 than in 2012. The increase in **2015** can be explained in part by a large outbreak of *Salmonella* linked to imported garden-variety **cucumbers**, resulting in 140 reported cases in Arizona.

Salmonella Poona outbreak linked to cucumbers

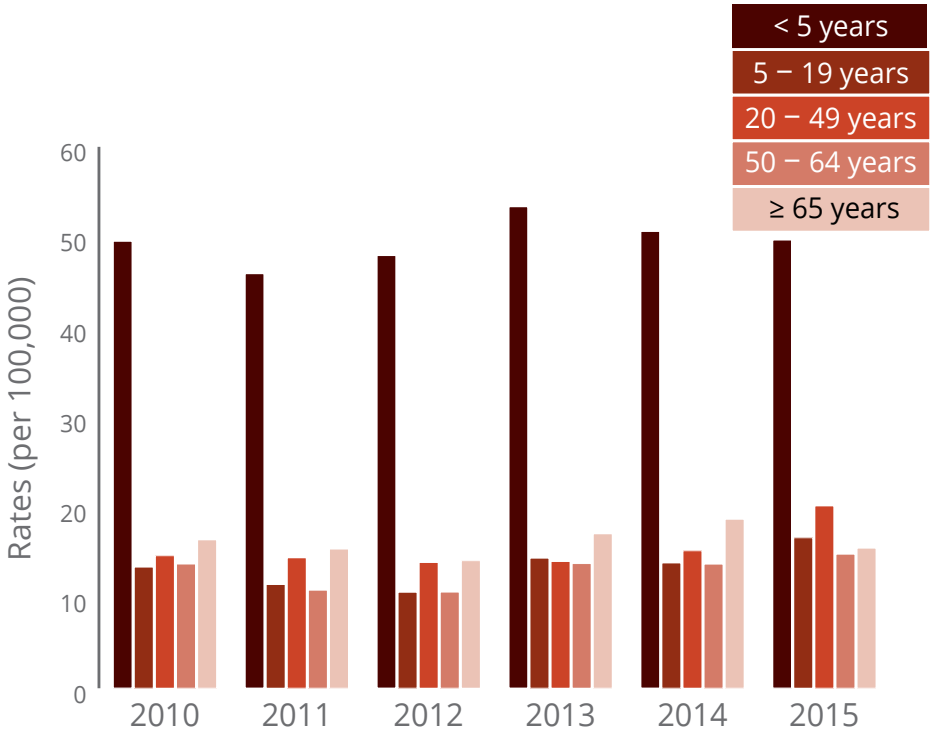
907 cases nationwide

140 cases in Arizona

Photo by JenniferWorthern CC BY-NC-ND 2.0

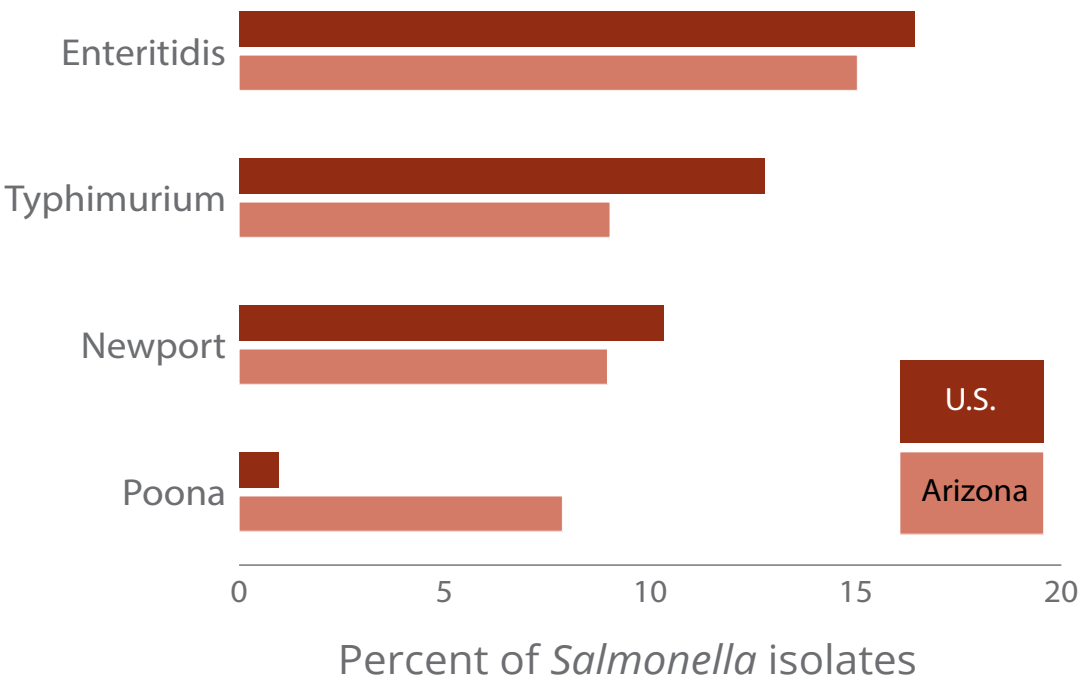


Children aged less than five years experienced much higher rates of salmonellosis than other age groups, with at least twice the rate of any other age group each year.



Identifying the serotypes of *Salmonella* isolates is important to finding outbreak-related cases or cases with similar exposures. From 2010–2015, 2% of *Salmonella* isolates in the **PulseNet** database were submitted from Arizona. During those years, the most frequently identified *Salmonella* serotypes in the U.S. and in Arizona were **Enteritidis, Typhimurium,** and **Newport**.

PulseNet is a network of laboratories that perform molecular identification of *Salmonella* serotypes.



While **Poona was the fourth most common *Salmonella* serotype in Arizona** (8% of all Arizona isolates), it was twelfth most common in the U.S. (<1% of all U.S. isolates); isolates from Arizona account for 18% of the nation's Poona isolates. This can be explained in part by the large **outbreak of *Salmonella* Poona linked to cucumbers in 2015.**

Shiga Toxin-Producing *E. coli*

***Escherichia coli* (*E. coli*)** is a diverse group of bacteria that live in the intestine of people and animals. Some of these *E. coli* bacteria are helpful. Others produce a **toxin** that causes gastrointestinal illness. These are called Shiga toxin-producing *E. coli,* or STEC. The most common symptoms of an STEC infection are **diarrhea, often bloody, and abdominal cramps.** The illness occasionally leads to **hemolytic uremic syndrome** (HUS), a type of kidney failure.

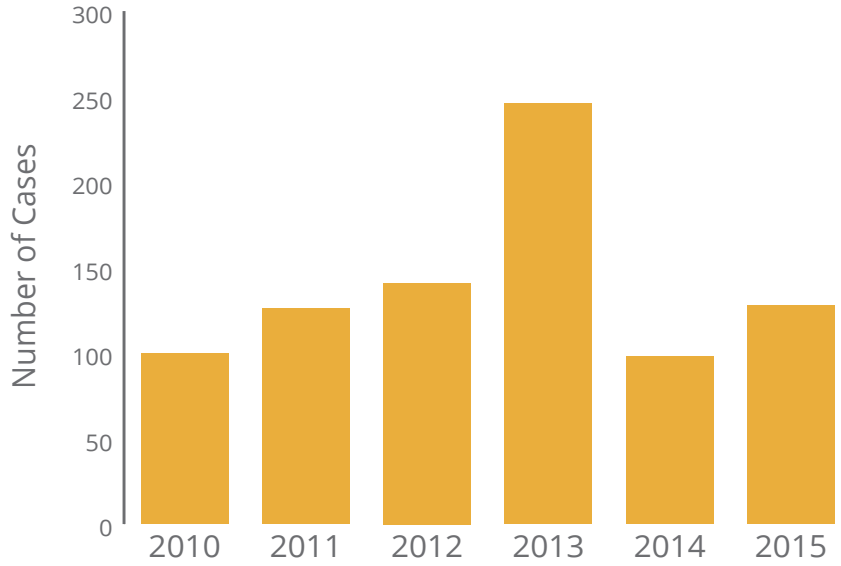
The most commonly identified STEC in the United States is *E. coli* O157:H7.

To become infected with STEC, a person must swallow the bacteria. STEC is spread through **food, water, waste from certain animals that carry the bacteria, and fecal matter from other people who have the bacteria.** It is estimated that for every STEC O157 case reported to public health, 26 cases go undiagnosed, while for every STEC non-O157 case reported, more than 100 go undiagnosed[1].

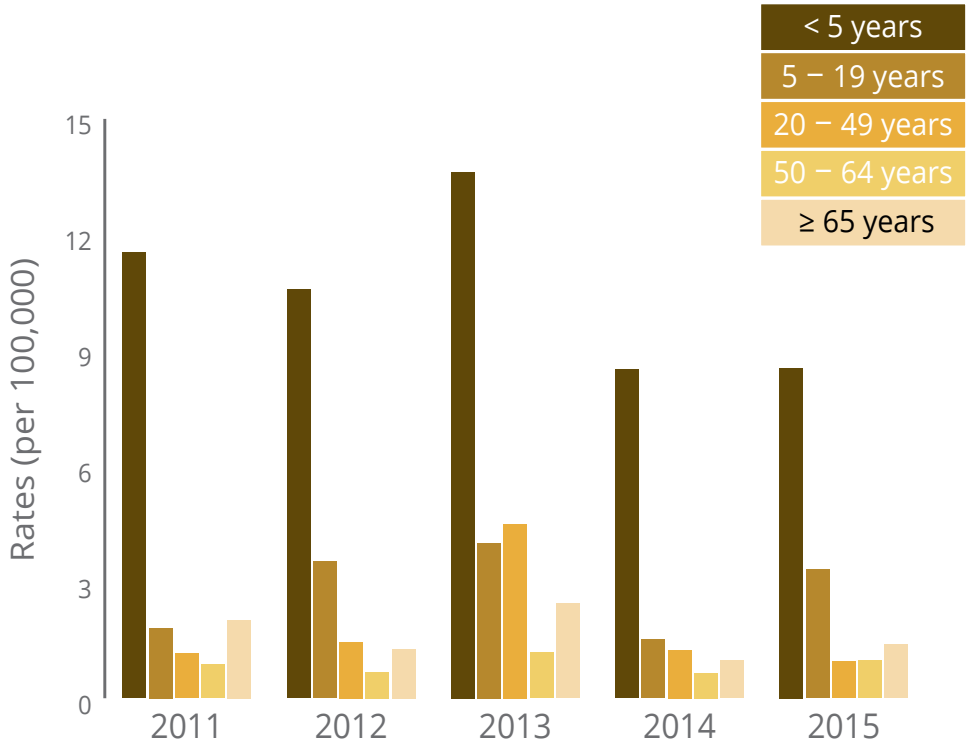
In Arizona, the number of STEC cases reported in 2014 and 2015 was comparable to the number of cases reported in the previous years, with the exception of 2013. Case reports of STEC are **expected to increase in coming years due to the increasing use of rapid laboratory tests** that identify STEC and other organisms. Additionally, the surveillance case definition for STEC is expected to broaden to include cases identified through rapid laboratory tests without culture confirmation, which were not included during the years of this report.

[1] Scallan E, Hoekstra RM, Angulo FJ, et *al*. Foodborne Illness Acquired in the United States—Major Pathogens. Emerging Infectious Diseases. 2011;17(1):7-15. https://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article

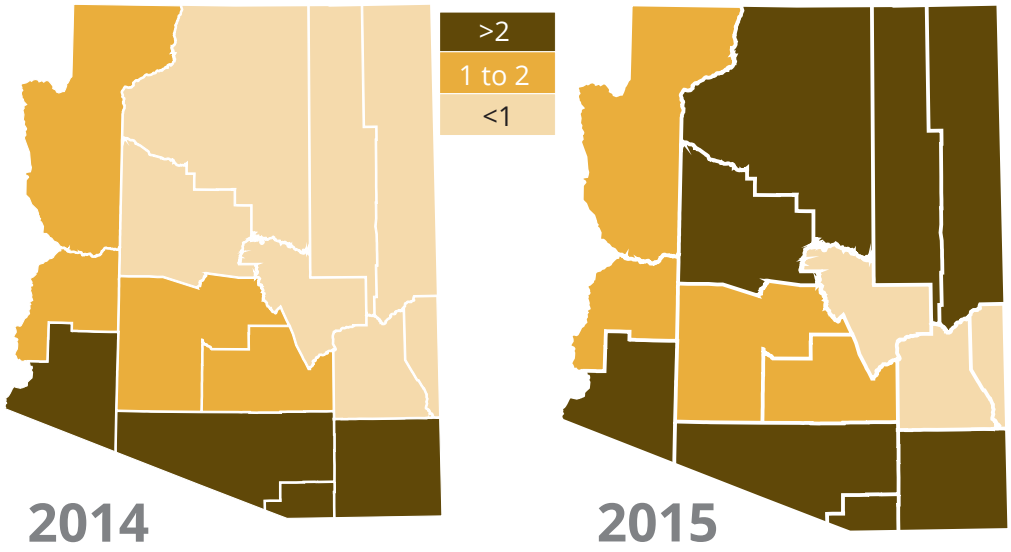
The peak in 2013 (246 cases), was partly due to a point-source outbreak at a restaurant in Maricopa County, resulting in 94 illnesses.



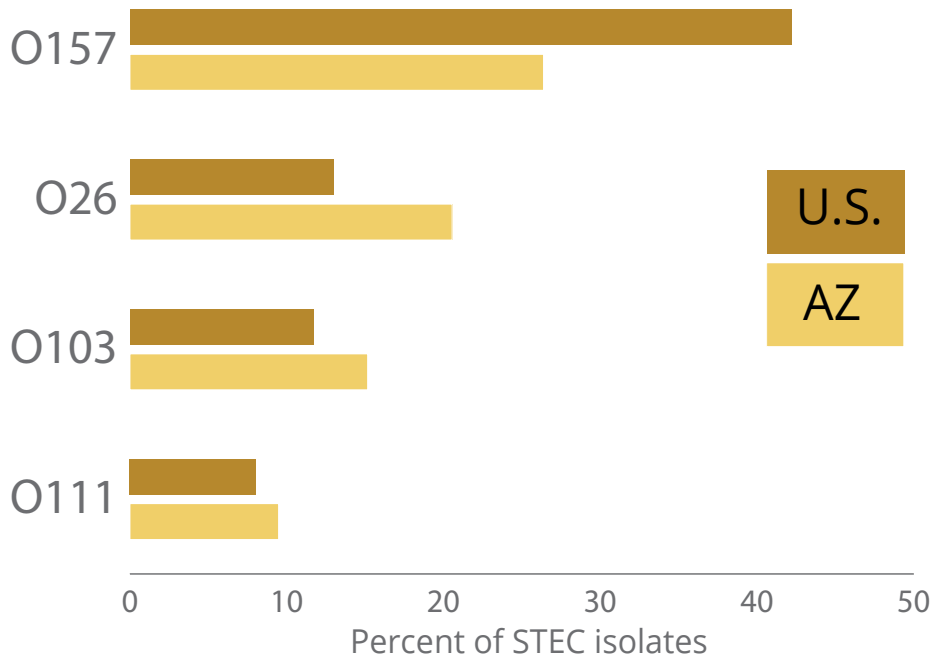
STEC infections in Arizona disproportionately affect **infants and children less than five years old**. While infants and young children are more likely to become ill from STEC, this disparity may also be due to testing bias, as children are more likely to have a laboratory test when presenting with bloody diarrhea.



During 2014 and 2015, counties in the **southern part** of the state consistently had rates of STEC infection greater than 2 cases per 100,000 population. Counties in the eastern part of the state consistently had rates less than 1 case per 100,000 population.



PulseNet is a network of laboratories that perform molecular identification of STEC and other enteric pathogens, including serotyping and pulsed-field gel electrophoresis (PFGE). From 2010–2015, 2% of STEC isolates in the PulseNet database were submitted from Arizona. During those years, most Shiga toxin-producing *E. coli* isolates in Arizona (72%) and in the U.S. (75%) were one of four serotypes: **O157, O26, O103, or O111**.



Shigellosis

Shigellosis is an infectious disease caused by a group of bacteria of the genus ***Shigella.*** *Shigella* bacteria can cause bloody diarrhea, fever, and abdominal cramps. The germs spread through direct contact with someone who is sick or by eating or drinking something that is contaminated with *Shigella*.

Individuals at higher risk of getting shigellosis are **young children**, travelers to developing countries, men who have sex with men and people with weakened immune system.

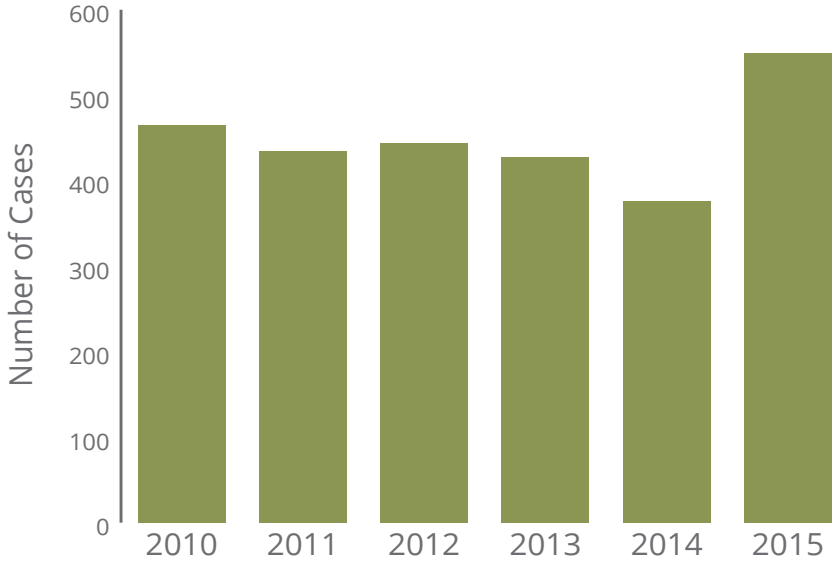
Many *Shigella* outbreaks are related to childcare settings and schools.

About **14,000 cases** of illness are reported in the **United States** each year. The infection tends to be more common in the summer than winter. It is estimated that for every *Shigella* case reported to public health, 33 cases go undiagnosed[1].

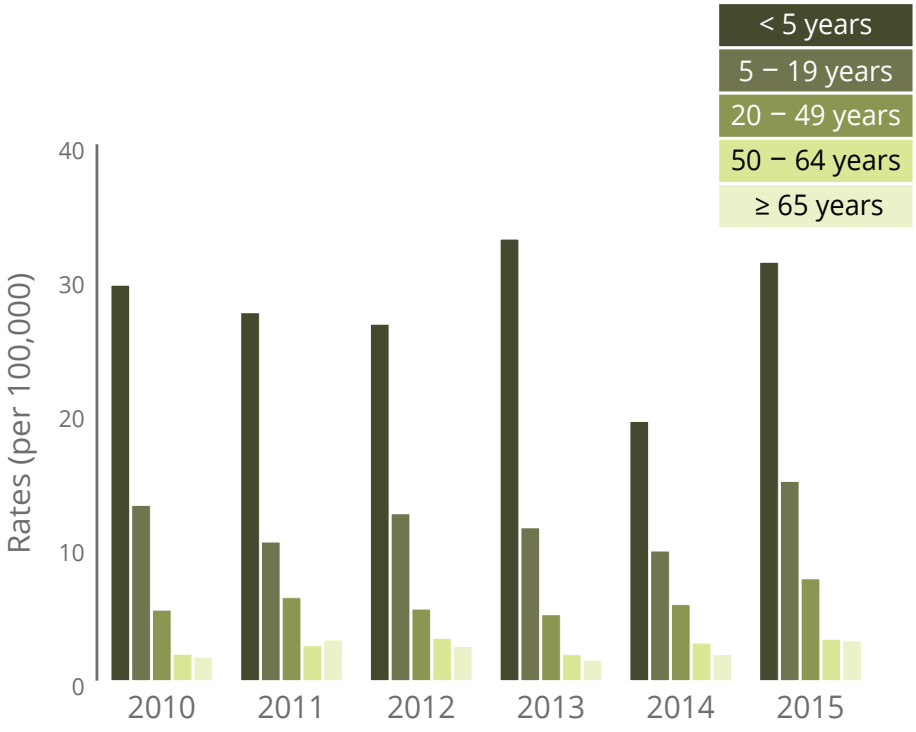
A median of more than **500 cases per year** have been reported in **Arizona** for 2010–2015. **In 2015, 11 outbreaks** of *Shigella* were reported in the state, the second most common cause of enteric disease outbreak after norovorus (see 2015 Outbreak Summary Report).

[1] Scallan E, Hoekstra RM, Angulo FJ, et *al*. Foodborne Illness Acquired in the United States—Major Pathogens. Emerging Infectious Diseases. 2011;17(1):7-15. https://wwwnc.cdc.gov/eid/article/17/1/p1-1101_article

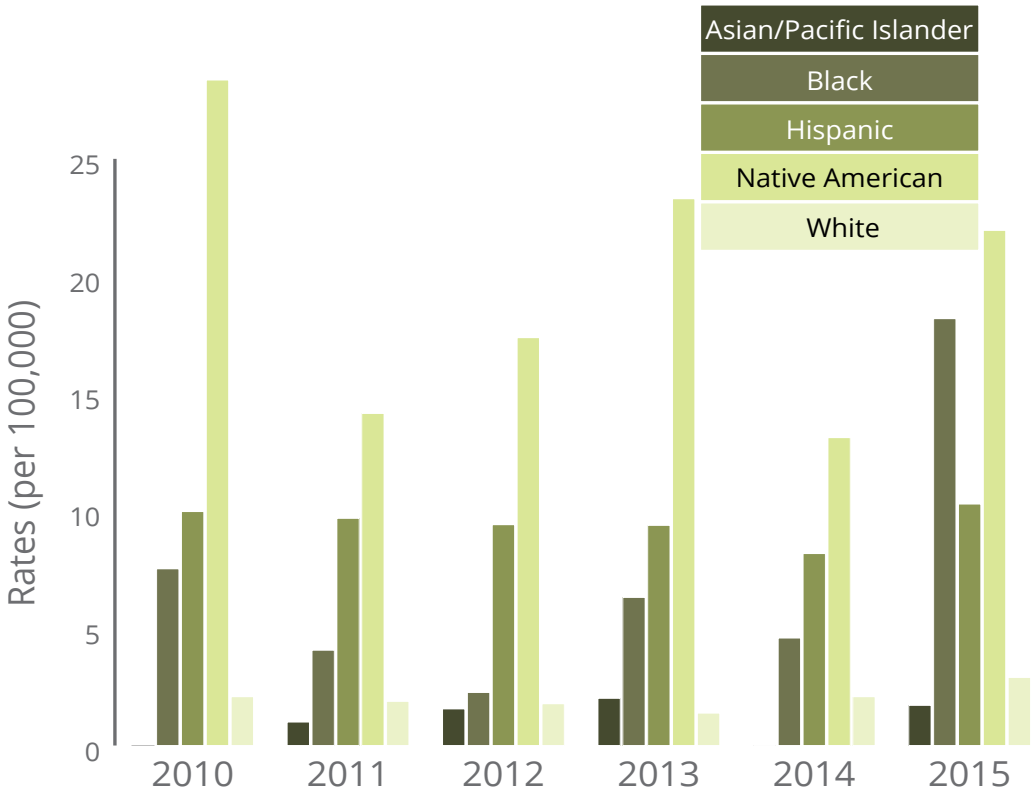
Cases of shigellosis were **44% higher in 2015** compared to the previous year. This can be explained by the 11 outbreaks that occurred in 2015, primarily in **childcare and school settings**. Ten percent of cases were outbreak-associated in 2015, compared to 2% in 2014.



Shigellosis rates were highest among **infants and children less than five years old**. This follows the national trend, with young children between the ages of two and four years old most likely to contract shigellosis.



Shigellosis disproportionately affected **Hispanics**, **non-Hispanic Blacks**, and **Native Americans** across all years. Rates among non-Hispanic Blacks in Arizona were almost four times higher in 2015 (18.2 cases per 100,000 persons) compared to the previous year (4.6 cases per 100,000 persons); the 2015 outbreaks do not explain this increase. Race and ethnicity information was unavailable for 17% of cases in 2014.



Vibriosis

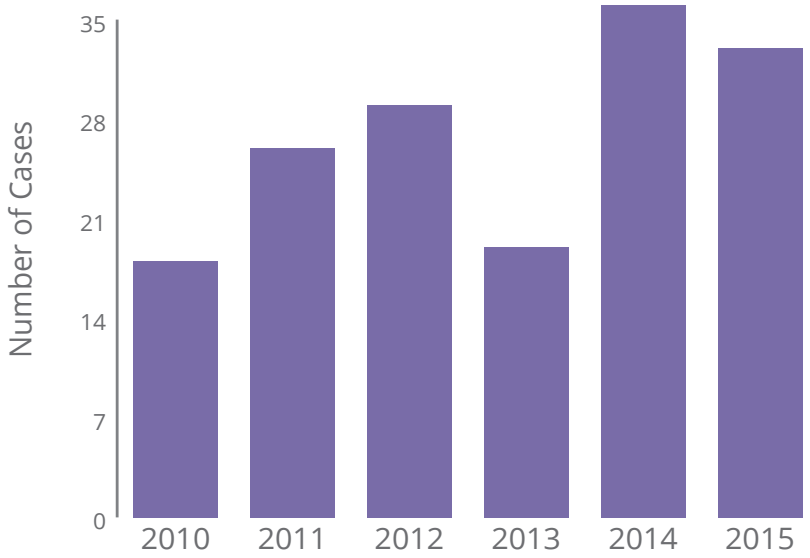
Vibriosis is an infection caused by **bacteria of the genus *Vibrio***. *Vibrio* spp. bacteria are naturally present in fresh and salty, brackish waters. Individuals can become sick if these bacteria are consumed, usually through **contaminated fish or seafood**, particularly oysters and shellfish, or enter the body through a **wound**.

Vibriosis causes an estimated 80,000 illnesses and 100 deaths in the U.S. every year.

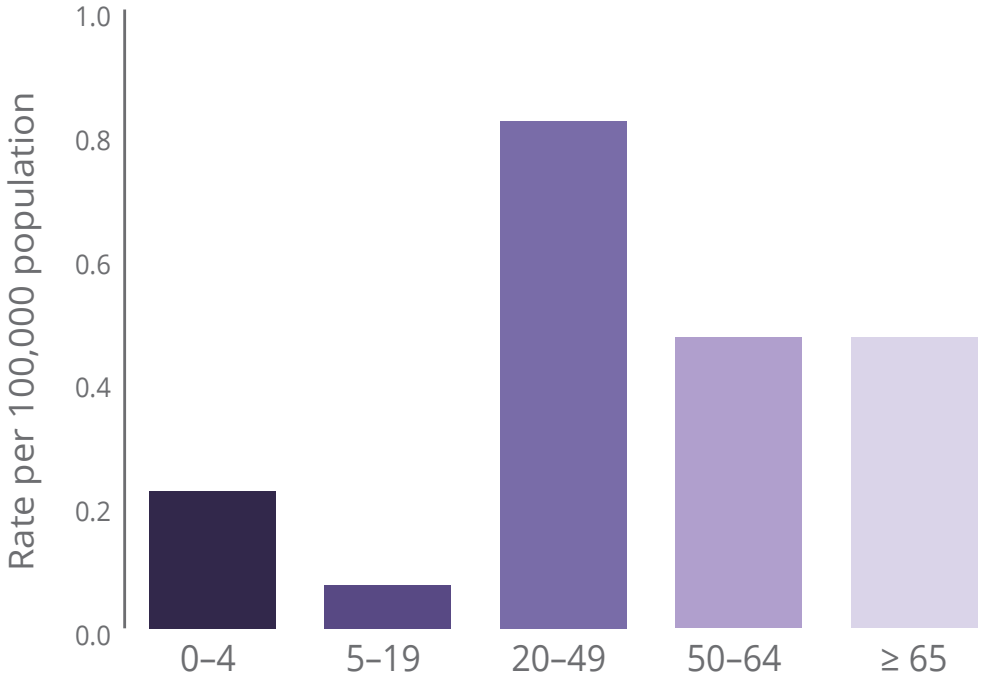
There are around a dozen species of *Vibrio*, causing infections at different sites including gastrointestinal, wound, and bloodstream. These infections can result in varying degrees of severity from mild gastroenteritis to amputation and death. Most *Vibrio* infections are mild, causing fever, diarrhea, vomiting, nausea and cramping. Life threatening illnesses are seen most often in individuals with compromised immune systems, especially when associated with liver damage.

Toxin-producing *Vibrio cholerae* O1 or O139 causes cholera, a life threatening gastroenteritis. No cases of cholera have been reported in Arizona since 2007. **Most cases (62%) of vibriosis in Arizona for 2010–2015 were due to *V. parahaemolyticus***, which is typically foodborne and results from consumption of raw or undercooked shellfish, especially oysters, clams, mussels and scallops.

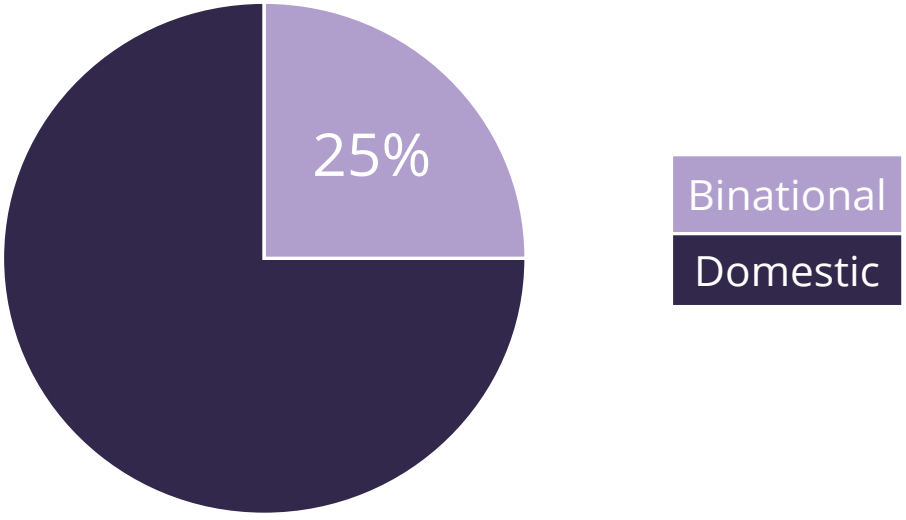
Cases of non-cholera *Vibrio* infection increased in 2014 and 2015 compared to previous years, with 36 and 33 cases in 2014 and 2015, respectively.



Vibriosis cases tend to occur more often among men than women both in Arizona and nationally. **Adults** are primarily affected by vibriosis, with the lowest rates occurring among those under 20 years of age. In 2014 and 2015, higher rates of vibriosis were seen among Hispanics than other races/ethnicities.



From 2010–2015, about **25%** of Arizona's *Vibrio* infections were considered **binational**, with exposure likely occurring in Mexico during travel.



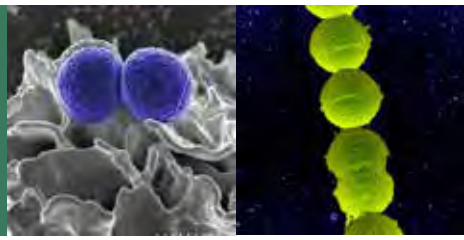
Invasive Disease Overview

Invasive Disease Overview

The organisms responsible for the illnesses in the invasive disease category are bacteria that usually cause mild illnesses when infecting the skin, wounds, or throat. However, severe disease may occur when these bacteria colonize parts of the body where they are not usually found, like the bloodstream, cerebrospinal fluid, muscles, or the lungs.

The causative bacteria include ***Staphylococcus aureus*, Streptococcus groups A and B**, and ***Streptococcus pneumoniae***. Invasive diseases can be spread through **skin-to-skin** contact (as for methicillin-resistant *Staphylococcus aureus)*, contact with **respiratory droplets** from an infected person (as for group A *Streptococcus* and *Streptococcus pneumoniae*) or passed **from the mother to the baby** during labor and birth (as for group B *Streptococcus*).

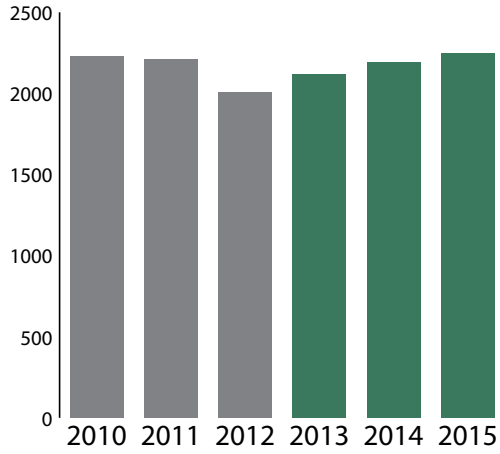
In Arizona, invasive diseases accounted for 7% of the communicable diseases reported between 2010 and 2015, for a total of more than 13,000 cases.



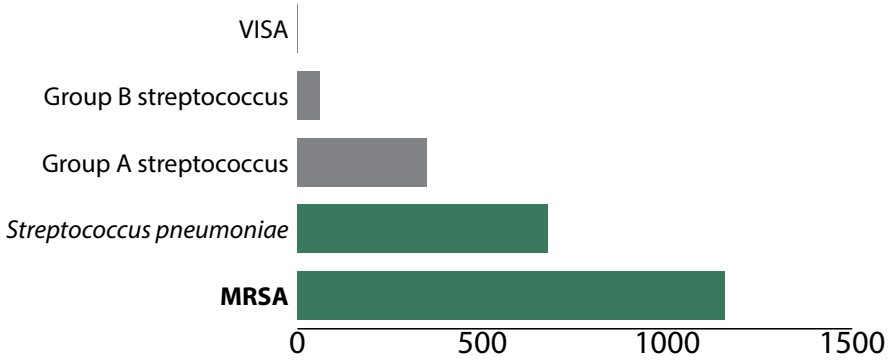
Invasive infections caused by specific types of antimicrobial-resistant bacteria, such as methicillin-resistant, vancomycin-intermediate, or vancomycin-resistant *Staphylococcus aureus* (**MRSA,VISA,** and **VRSA**, respectively) are often associated with healthcare settings, and thus may be denoted as "**healthcare-associated infections**" (or **HAI**) when these cases meet certain conditions. It is important to note that the data shown here represent only **invasive disease** (not infections of other body sites), and have not been determined to be healthcare- vs. community-acquired.

***Streptococcus pneumoniae* (or pneumococcal disease)** is the only invasive disease included here that is vaccine-preventable. Furthermore, group B streptococcal infections are only reportable for infants <90 days of age; data on infections among older persons are not collected.

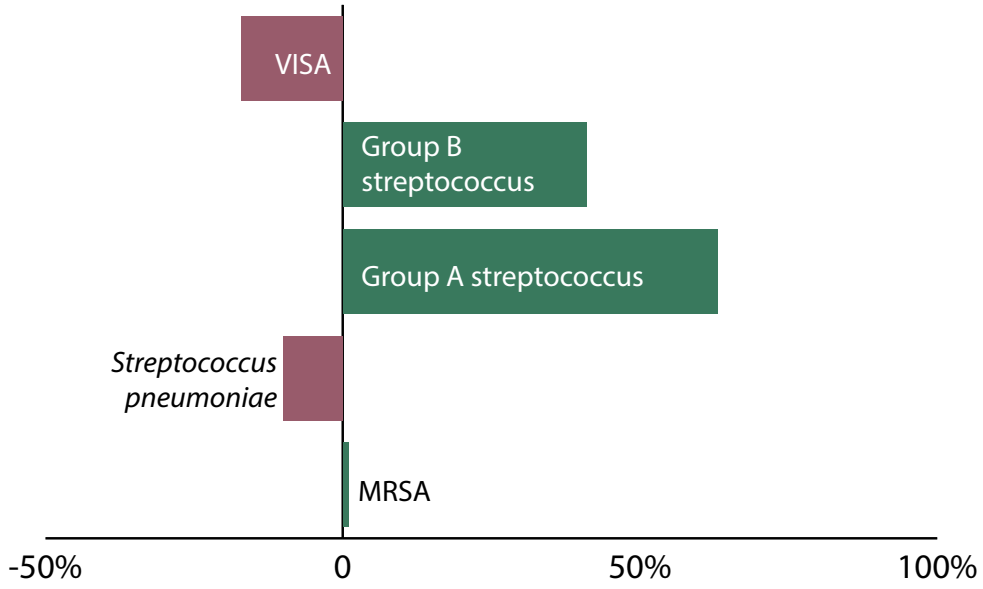
Overall, these invasive diseases in Arizona have shown an **increase from 2013 to 2015.**



The most commonly reported invasive conditions in 2015 (89% of the cases) were invasive **methicillin-resistant *Staphylococcus aureus* (MRSA)** and invasive ***Streptococcus pneumoniae***.



Invasive diseases showing the greatest **increase*** in 2015 were: **group B streptococcus, group A streptococcus** and **MRSA. VISA** and ***Streptococcus pneumoniae*** **decreased** in 2015.



* percent change in 2015 as compared to the 5 year median (2010–2014).

Methicillin-resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a bacterium resistant to beta-lactam antibiotics. *S. aureus* can cause a variety of **localized** and **invasive** infections, as well as toxic shock syndrome, and may be transmitted through direct contact with an infected wound or fomite.

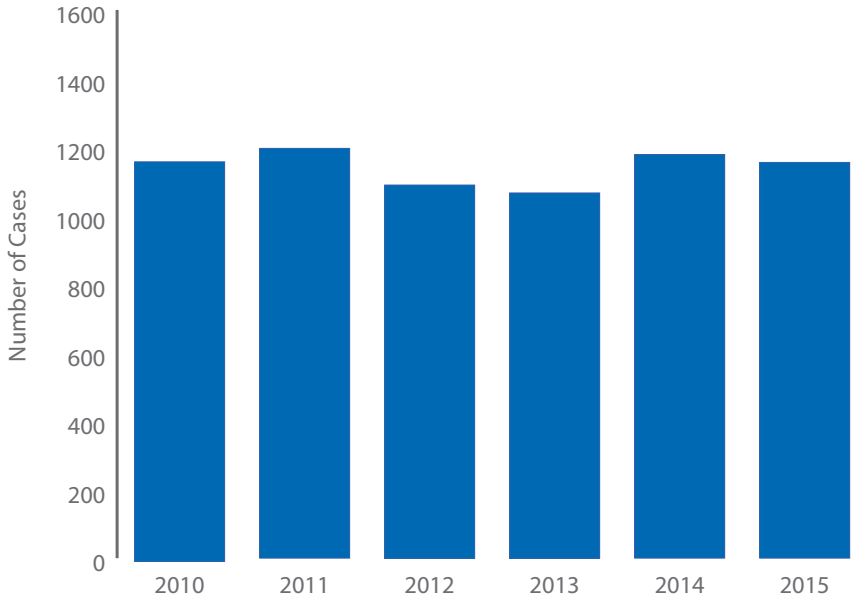
About a third of the population has *S. aureus* on their skin or in their noses, and approximately **2% of the population has MRSA on their skin**. These individuals are colonized with *S. aureus* or MRSA and often have no symptoms; infection and the appearance of symptoms may occur when the bacterium encounters breaks in the skin. Community-associated outbreaks of MRSA infections can occur in crowded settings where there is frequent skin-to-skin contact and sharing of personal items, such as among athletic teams, in correctional facilities, and in military training facilities.

In a healthcare setting, MRSA can cause severe problems including bloodstream infections, pneumonia and surgical site infections.

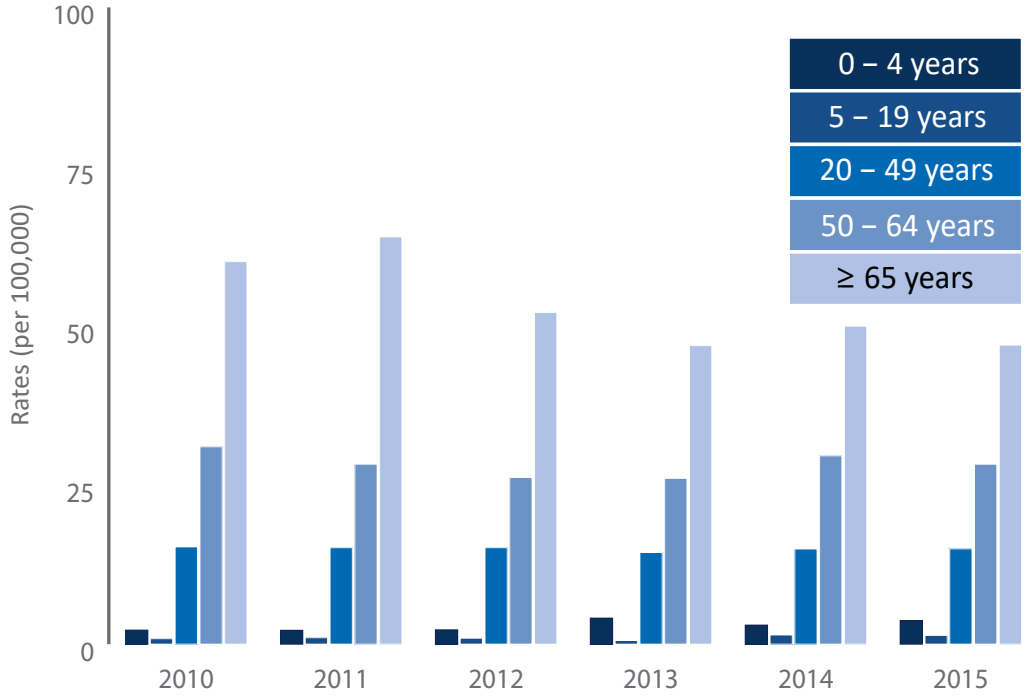
Invasive MRSA infections are usually more severe than skin or other localized infections, causing problems such as bloodstream infections, pneumonias, and surgical sites infections.

Arizona limits its surveillance and tracking to invasive disease; these infections can be acquired in the **community** but are more commonly associated with **healthcare settings**. Risk factors for healthcare-associated invasive MRSA include prolonged hospital stay or presence of a tracheal tube, intravascular catheter, or peritoneal catheter, to name a few.

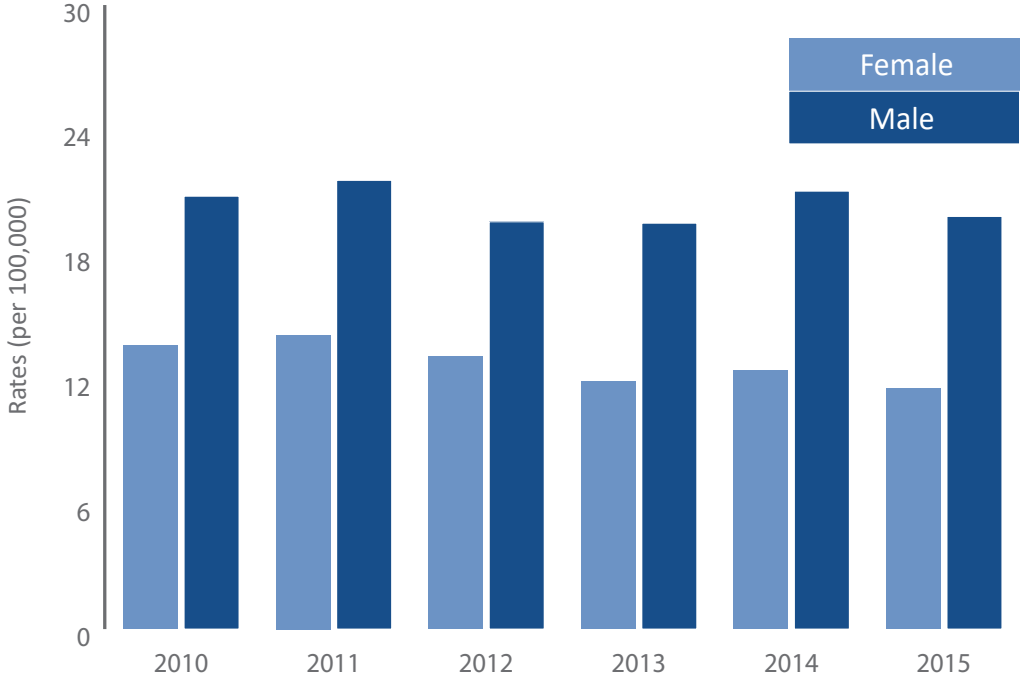
In Arizona, cases of invasive MRSA have been **high, in comparison to other reportable morbidities, throughout 2010–2015**.



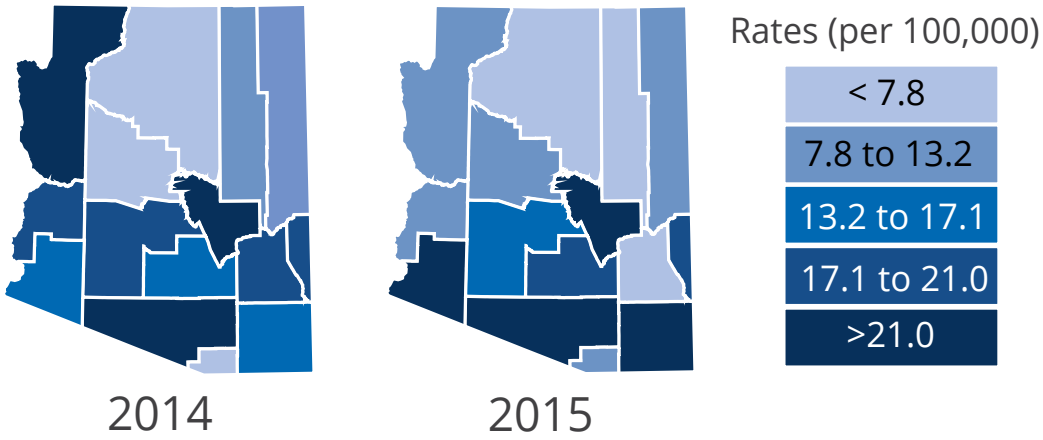
Rates of invasive MRSA disease **increase with age**, probably due to the higher likelihood of exposure to healthcare settings and increased susceptibility of older people. **From 2010 through 2015, a decrease in rates among those 65 years of age or older** is visible.



Interestingly, **males** have been consistently more affected by the disease than females.



In 2014 and 2015, incidence of MRSA was higher in the southern region of the state, with the counties most affected being **Cochise, Pima and Yuma**.



Streptococcal Group A, Invasive Disease

Group A *Streptococcus* bacteria (*Streptococcus pyogenes*) cause mainly mild illnesses such as **strep throat**, **scarlet fever**, and impetigo (a skin infection). Occasionally these bacteria can invade the bloodstream, muscles, or lungs causing invasive streptococcal group A disease.

Symptoms of **invasive disease** include **pneumonia, necrotizing fasciitis, meningitis, and sepsis**, among others. Streptococcal toxic shock syndrome is also possible, usually associated with an infection of cutaneous lesions, although these are counted separately along with other etiologies of toxic shock syndrome. Each year, between 1,100 and 1,600 people die due to invasive group A strep disease in the U.S.

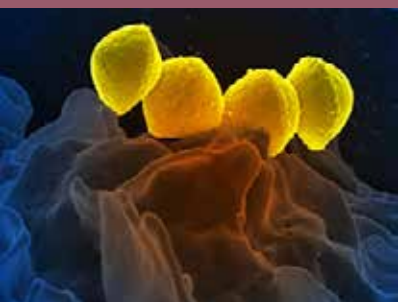
Between 4 and 6 out of every 20 children in the U.S. with a sore throat have strep throat.

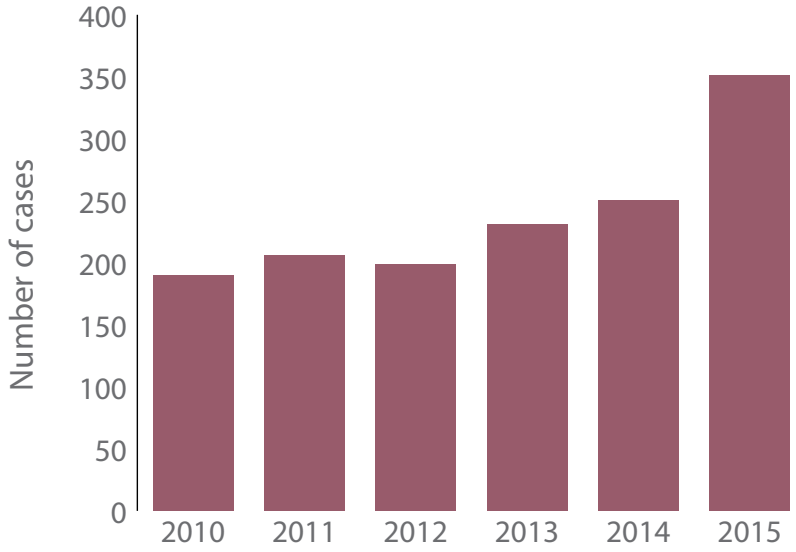
Group A *Streptococcus* bacteria are spread through contact with **droplets** from an infected person's cough or sneeze. Groups at highest risk for invasive disease include the elderly; immunosuppressed persons; persons with chronic cardiac or respiratory disease, diabetes, or skin lesions; and African Americans and American Indians.

Between 2010 and 2012, cases of streptococcal group A invasive disease in Arizona were fairly stable; however, **cases increased after 2012, especially in 2015**. Starting in **January 2015**, 35 cases of group A *Streptococcus* were detected in a hospital in Coconino County. Most of these cases were associated with a **homeless shelter and a local jail**, and were identified as the hypervirulent **emm 59** clone[1].

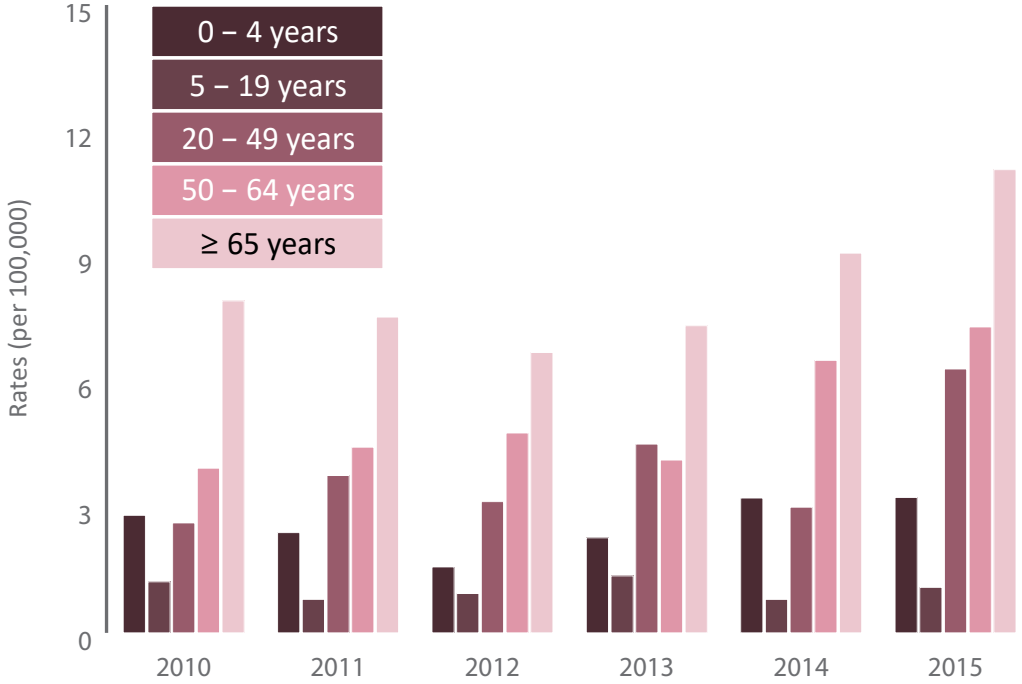
Read more about the emm59 outbreak here:

https://wwwnc.cdc.gov/eid/article/22/4/15-1582_article



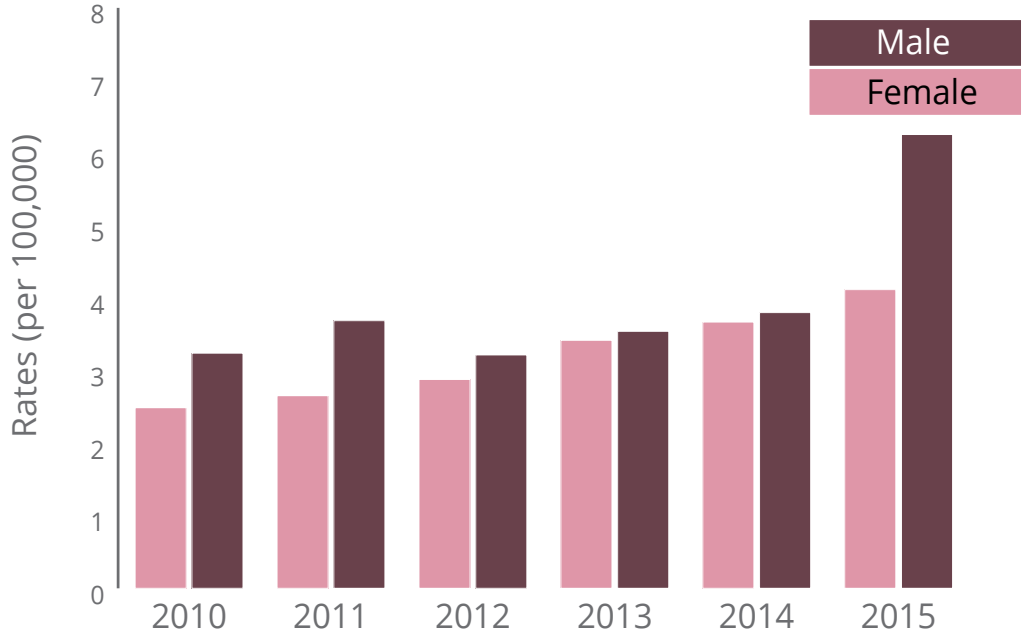


Rates of streptococcal group A invasive disease **increase with age, with high rates also in infants**, probably due to the increased susceptibility of older people and infants.

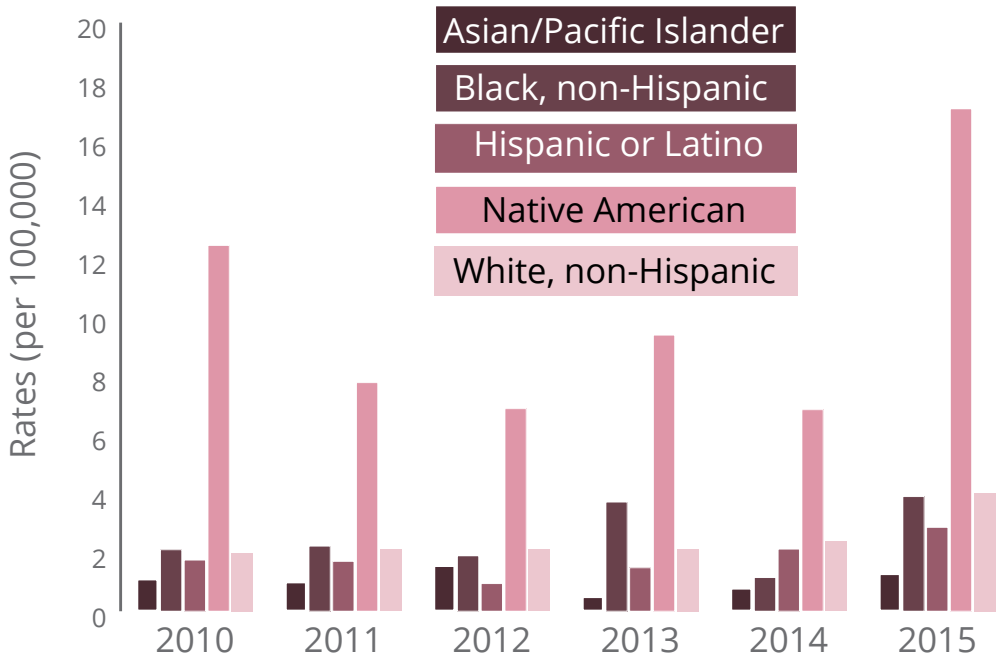


[1] Engelthaler *et al*., 2016 Hypervirulent emm59 Clone in Invasive Group A Streptococcus Outbreak, Southwestern United States. Emerging Infectious Diseases 22(4).

Interestingly, **males** have been more affected by the disease than females in Arizona, especially in 2015.

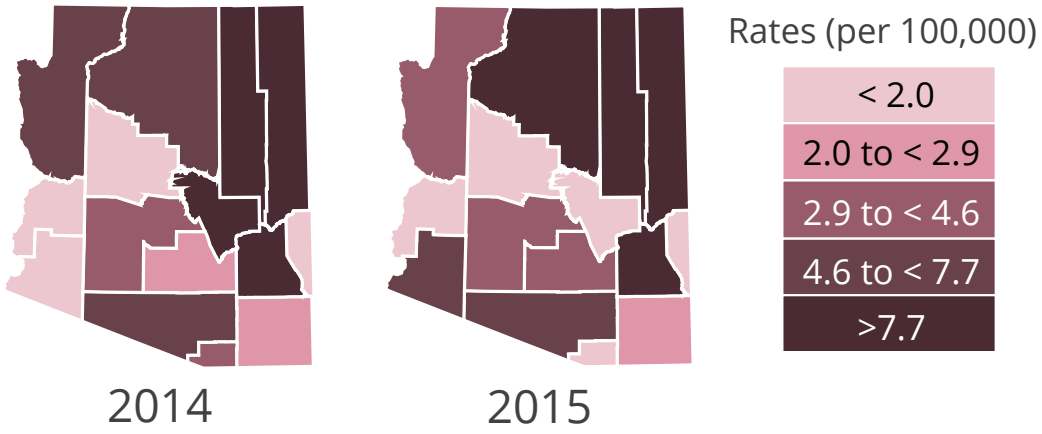


In Arizona, the **Native American** population is disproportionally affected by streptococcal group A invasive disease[2]. Surveillance data for 2010–2015 show rates among Native Americans to be more than twice the rest of the population, although it is important to note that information on race and ethnicity is missing for 29% of cases.

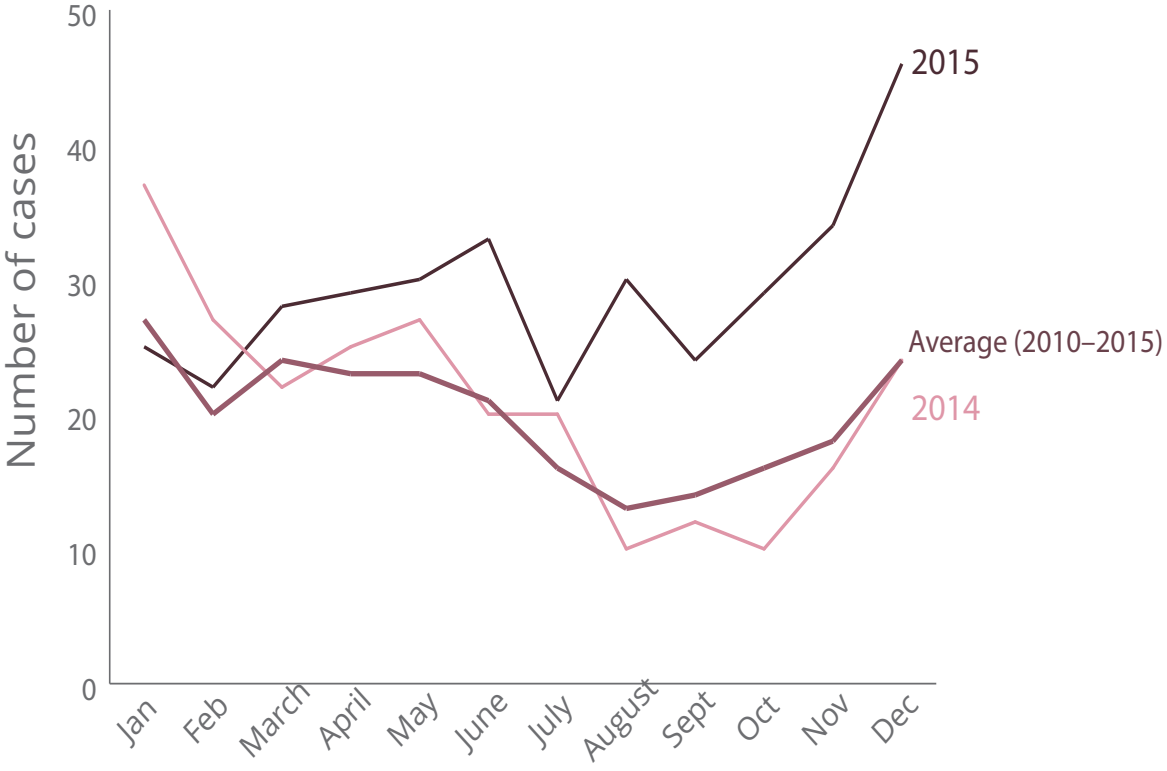


[2]Hoge CW, *et al*., 1993. The changing epidemiology of invasive group A streptococcal infections and the emergence of streptococcal toxic shock like syndrome. A retrospective population-based study. JAMA 20:269(3) 384-9.

Most likely as a consequence of the high burden of disease in the Native American population, high rates of the disease appear to concentrate in **Navajo and Apache Counties**, which show consistently high rates during 2014 and 2015. An increase is also notable in **Coconino County** due to the outbreak that occurred in early 2015.



Streptococcal group A invasive disease **decreases in summer** compared with other seasons[3]. The figure below demonstrates a similar seasonal trend in Arizona's streptococcal group A invasive disease incidence.

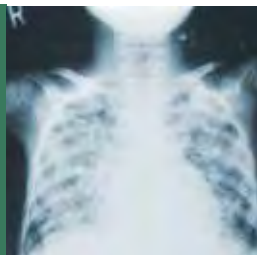


[3]Laupland KB, *et al*., 2006. Population-based surveillance of invasive pyogenic streptococcal infection in a large Canadian region. Clinical Microbiology and Infection, 12(3):224-30.

Streptococcus pneumoniae, Invasive

Pneumococcal disease is caused by the bacterium ***Streptococcus pneumoniae***. The bacteria are commonly found in the nasopharynx but can spread to other parts of the body, causing infection in susceptible individuals. Transmission is through **respiratory droplets** or autoinoculation.

Pneumococcus is one of the most common causes of severe pneumonia in the United States.

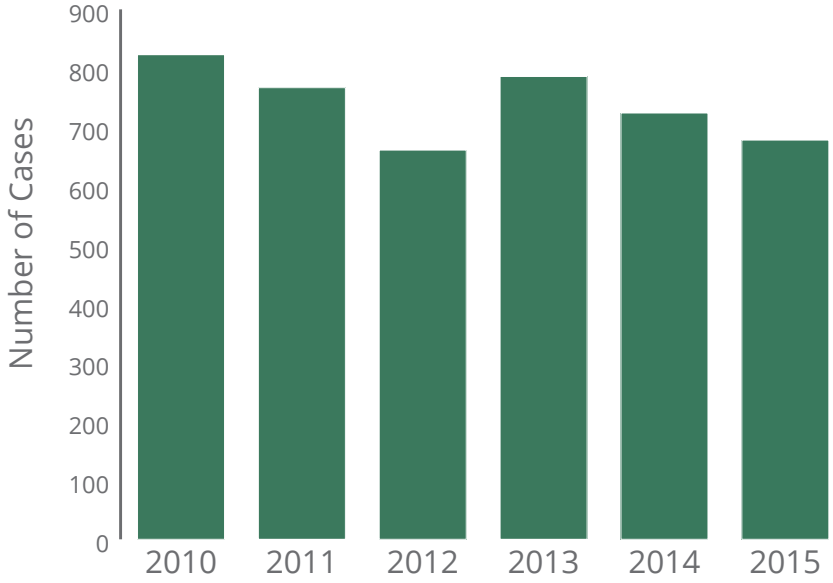


In **1977**, the United States licensed the **first pneumococcal vaccine**; in 2000, a conjugate vaccine was licensed and is routinely given to children. This second vaccine, **PCV7**, covered seven serotypes of *Streptococcus pneumoniae* that can cause disease in humans.

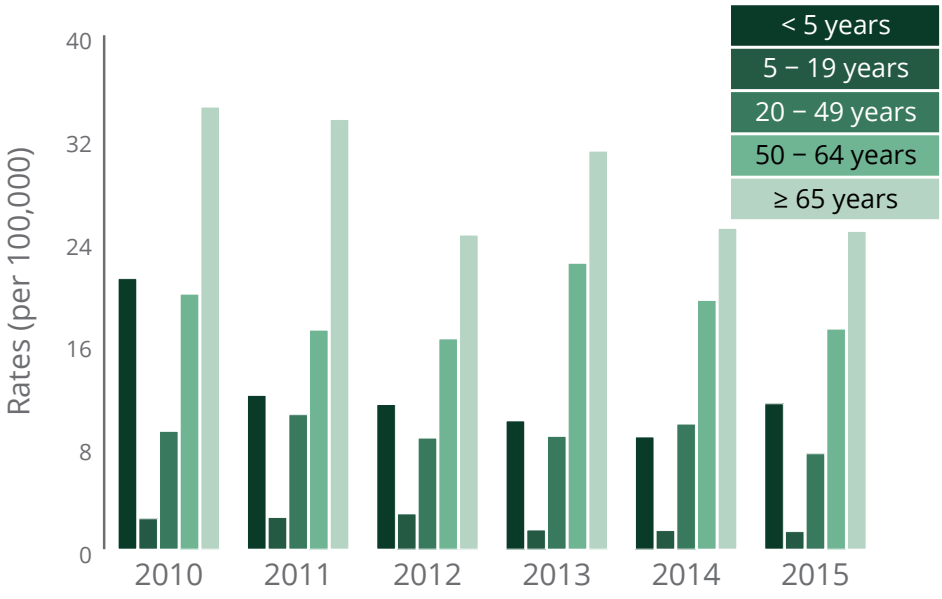
PCV13, which covers 13 serotypes, was recommended starting in 2010 for **children less than five years old**. In 2012, the vaccine was recommended for immunocompromised adults over the age of 19, and in 2014, the vaccine was additionally recommended for adults over the age of 65.

Since the introduction of the PCV13 vaccine in 2010, rates of *Streptococcus pneumoniae* in children less than 5 years of age have decreased in Arizona.

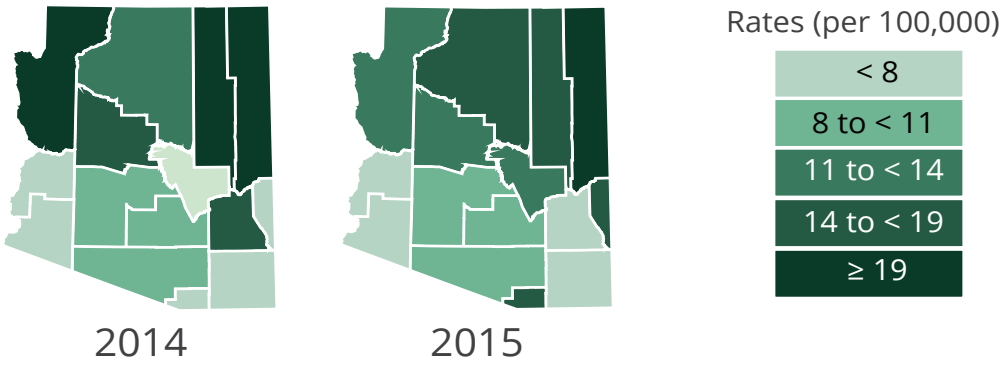
In Arizona, the number of confirmed cases of invasive *Streptococcus pneumoniae* has overall **declined from 2010 to 2015**. In 2010 there were 823 cases with a rate of 12.8 per 100,000 population and by 2015 there were 678 cases with a rate of 10.03 per 100,000 population.



During this period, **children less than five years** of age and **adults over 65 years** had the highest rates of invasive *Streptococcus pneumoniae*. **Rates among children less than five years decreased from 2010 to 2011**, the same year as the recommendation for the pneumococcal vaccine to switch from PCV7 to PCV13, which protects against six additional serotypes. Since that initial decrease, the rate among children less than five years has stayed fairly constant between 2011 and 2015.



Apache and Navajo Counties have had consistently high rates of invasive *Streptococcus pneumoniae* during 2014 and 2015.



Legionellosis

Legionellosis

Legionellosis refers to any disease caused by the bacterium *Legionella*. Legionella bacteria are found naturally in freshwater environments, but become a health concern when they grow in human-made building water systems. The genus *Legionella* comprises 48 species and 70 serogroups. *Legionella pneumophila* causes approximately 90% of all reported cases of legionellosis in the United States; other species reported include *L. bozemanii* and *L. dumoffi*.

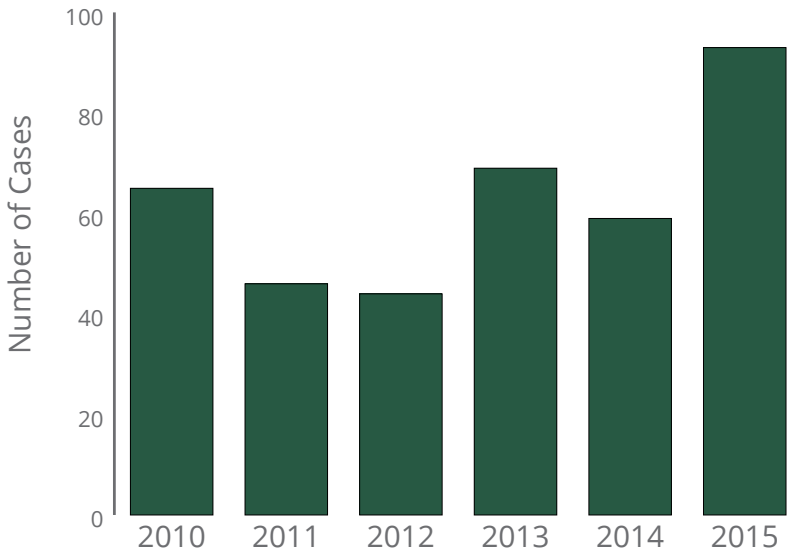
Two clinically and epidemiologically distinct illnesses are associated with legionellosis: **Legionnaires' disease** and **Pontiac fever**. Legionnaires' disease is characterized by fever, myalgia, cough, and clinical or radiographic pneumonia. Pontiac fever is a milder illness without pneumonia.

Legionnaires' disease kills 1 in 4 of those who get it from a healthcare facility.

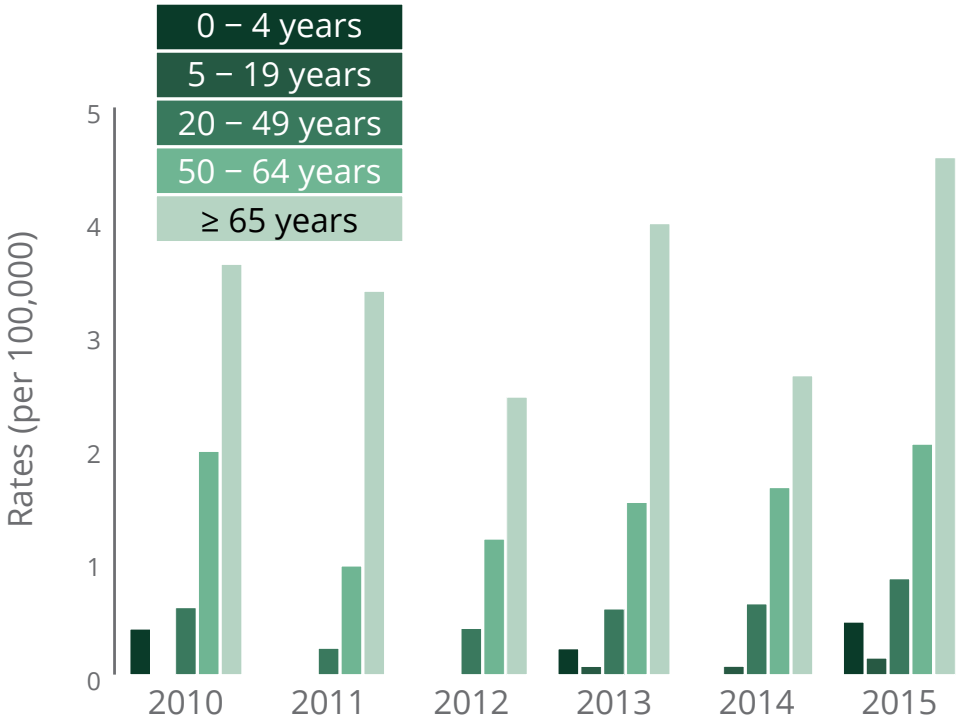
Legionellosis is acquired through **inhalation of aerosolized water** contaminated with the *Legionella* bacteria. Sources of infection can be **cooling towers, potable water systems, whirlpool spas, humidifiers, decorative fountains and respiratory therapy equipment**. Warm water is particularly prone to increased growth of *Legionella* since bacteria grow best at higher temperatures. Risk factors for infection include recent travel with an overnight stay outside of home, exposure to whirlpool spas, age more than 50 years, smoking, underlying lung diseases and immune system disorders.

Legionellosis is of particular concern in healthcare settings, which typically house populations at higher risk of developing Legionnaires' disease after exposure.

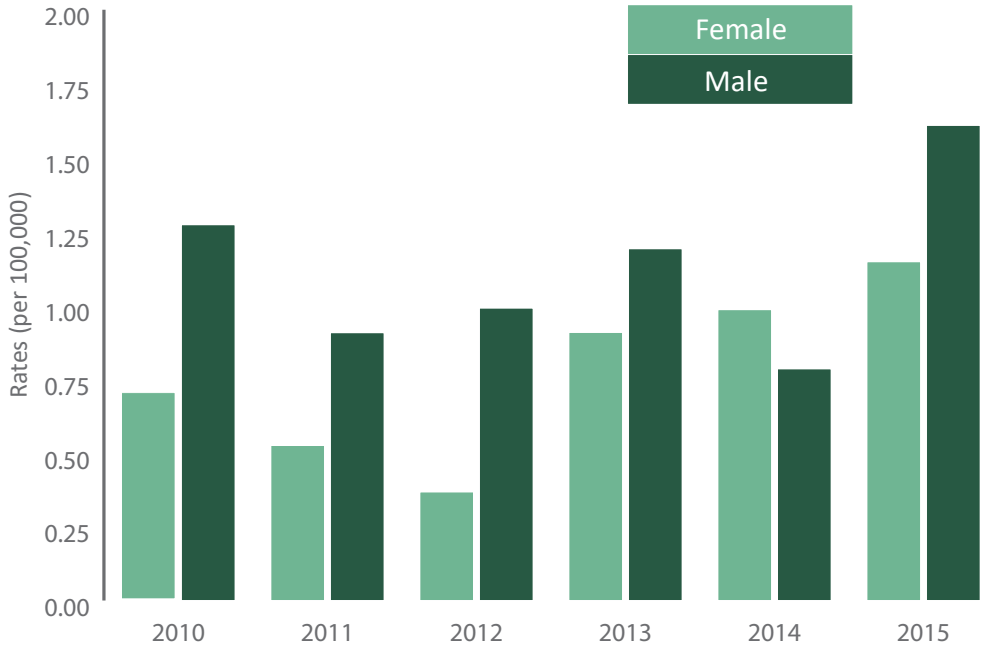
In Arizona, the number of legionellosis cases has shown a somewhat **increasing trend between 2010 and 2015**, with the highest number in 2015.



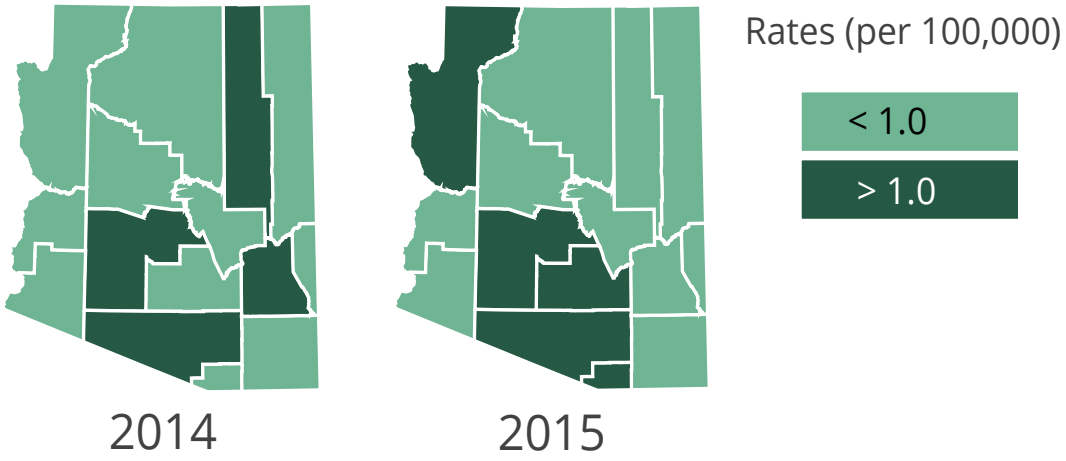
The age group most affected by the disease has been those **65 years and older** for all years. A few cases in children less than five years were reported in 2010, 2013 and 2015.



Males have also been affected at a higher rate compared to females for most years, which is consistent with national data.



Legionellosis cases have been detected in multiple counties between 2010 and 2015, with no evident pattern, as cases are **generally sporadic**. While ***Legionella pneumophila* serogroup 1** accounts for 81% of the cases reported in 2010–2015, this is likely an overestimate due to the fact that the most common diagnostic test (urine antigen) detects only this serotype. Other serogroups detected in Arizona between 2010 and 2015 are **serogroup 6** (3.8%), **8** (0.9%) and **4** (0.9%).

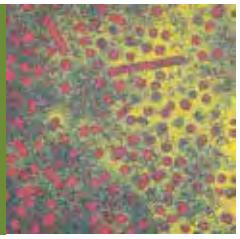


Hepatitis Overview

Hepatitis Overview

Hepatitis includes a group of viral infections caused by **hepatitis A, B, C, D** and **E viruses**, which are the leading causes of liver cancer. Hepatitis A and E are transmitted person-to-person through the fecal-oral route, whereas hepatitis B, C and D are transmitted through percutaneous (e.g., puncture) or mucosal contact with blood or bodily fluids.

In Arizona, 93% of all viral hepatitis cases (other than C), are chronic and acute hepatitis B.

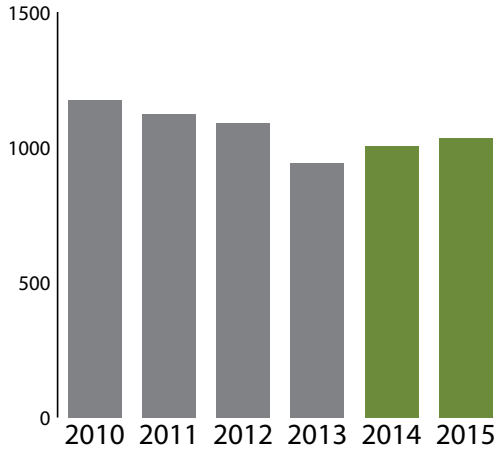


Hepatitis B infections can be divided into **acute**, **chronic** or **perinatal** types, based on symptoms, specific test results, and age.

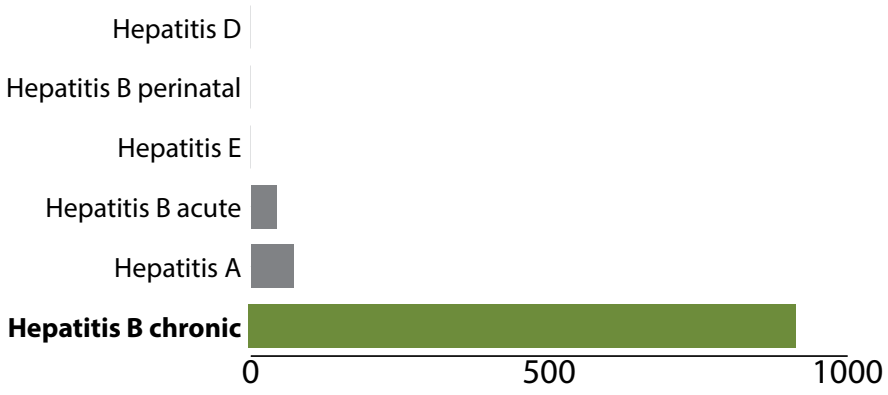
Hepatitis C is the most common chronic bloodborne infection in the U.S. We estimate over 10,000 cases of hepatitis C are reported to ADHS each year.

Hepatitis C infections can also be categorized as **acute** or **chronic**; hepatitis A infections do not become chronic. Vaccines are available for the prevention of hepatitis A and B. Because many of those infected do not know they are infected, newly identified cases of chronic hepatitis C could well be the most common of the hepatitides in Arizona. However, funding for hepatitis C surveillance in Arizona was eliminated during this period, and we are unable to produce reliable statistics for hepatitis C without the resources available for managing the large amount of data involved.

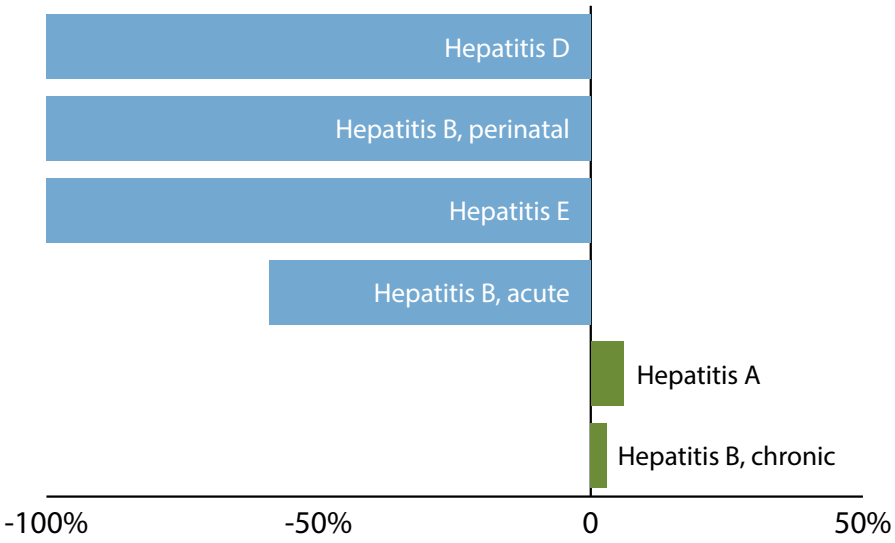
In Arizona, cases of hepatitis A, B, D, and E made up 3% of the newly reported cases of communicable diseases reported between 2010 and 2015, for a total of more than 6,000 cases. Overall, hepatitis A, B and D showed a steady number of reported cases in **2014 and 2015.**



The most commonly reported hepatitis (89% of the cases) in 2015 was **chronic hepatitis B**.



Hepatitides (excluding C) showing an **increase*** in 2015 were: **hepatitis A** and **chronic hepatitis B**. **Hepatitis D, E and hepatitis B perinatal** and **acute** showed a **decrease** in 2015.



* percent change in 2015 as compared to the 5 year median (2010–2014).

Acute Hepatitis B

Hepatitis B is a viral illness that has infected an estimated 2 billion persons worldwide[1]. **Acute hepatitis B** may manifest clinically as **fever, headache, malaise, anorexia, nausea, vomiting, diarrhea, abdominal pain**, or other non-specific symptoms, possibly accompanied by **jaundice**. However, 50% of adults with acute infections experience no symptoms[2].

Although most acute infections resolve completely, approximately **5% of infections result in a chronic infection**, with the risk decreasing with age. Early identification of HBV infection is important to help interrupt ongoing transmission and provide medical intervention for chronic carriers, thereby reducing disease progression.

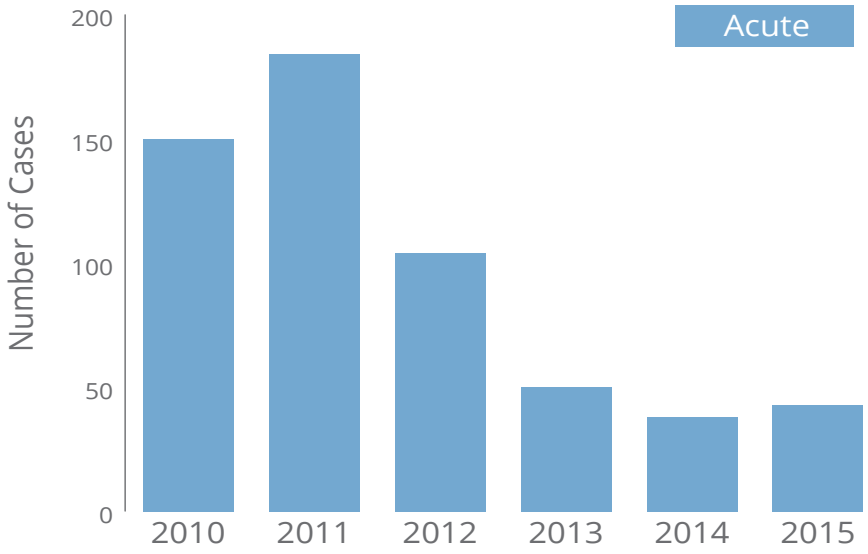
The best way to prevent hepatitis B infection is to get vaccinated.

Transmission occurs through **infectious body fluids** with the highest concentration of virus being present in blood and serous fluids. In the United States, the most common route of HBV transmission is through sexual contact with an infected person. **Perinatal transmission** from mother to infant at birth is a significant mode of HBV transmission, as 70-90% of infants whose mothers are positive for both surface antigen and e antigen will develop HBV infection in the absence of post-exposure prophylaxis[3]. Up to 90% of infected infants will develop chronic, lifelong infection.

A series of **three doses of hepatitis B vaccine is more than 98% effective in preventing HBV infection in infants**, and more than 90% effective in teens and adults.

1. Heymann DL. Hepatitis B. In: Control of Communicable Diseases Manual. 20th ed. Washington, DC: American Public Health Association; 2015. p. 257-64.
2. Kimberlin DW, Brady MT, Jackson MA, Long SS, editors. Hepatitis B. In: Red Book: 2015 Report of the Committee on Infectious Diseases. 30th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2015. p. 400-23.
3. Hepatitis B [Internet]. Epidemiology and Prevention of Vaccine-Preventable Diseases. Centers for Disease Control and Prevention; 2016 [cited 2017Mar9]. Available from: https://www.cdc.gov/vaccines/pubs/pinkbook/hepb.html

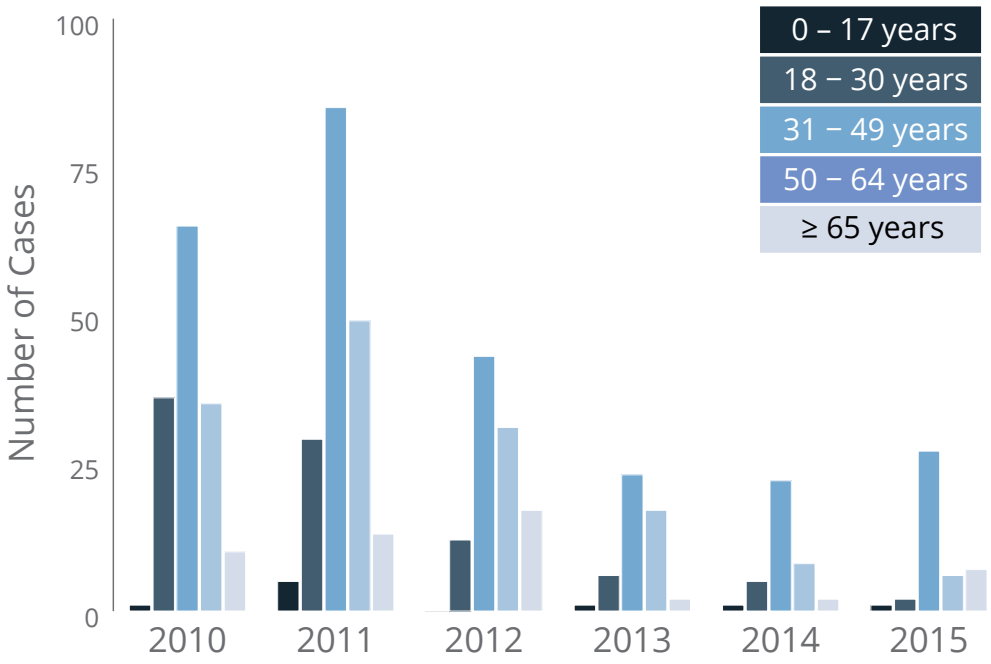
Since 2010, numbers of reported acute hepatitis B cases show a **declining trend**. This decline of acute Arizona cases is consistent with a national decline in acute cases during this same time period. A high of 184 cases was reported in Arizona in 2011 and a low of 38 cases in 2014.



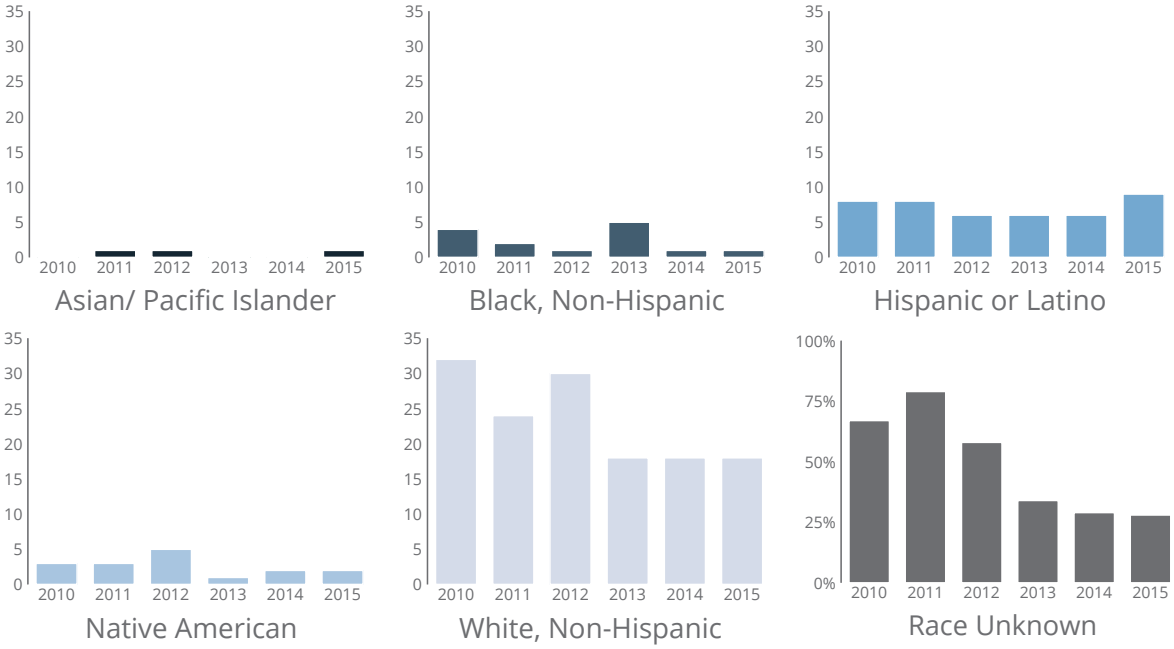
A **change in the 2013 case definition**[4] for acute hepatitis B cases required the presence of **clinical symptoms** in addition to laboratory results. The change in the case definition may have played an important role in the **2013 decline** in either of two ways: the inclusion of asymptomatic but laboratory-positive cases in earlier years, or the exclusion of symptomatic persons in 2013 if lack of resources limited case investigations to determine whether a person had compatible symptoms.

4. The 2013 acute hepatitis B case definition included a slight change in laboratory criteria, in addition to requiring clinical symptoms: the presence of hepatitis B surface antigen AND positive Immunoglobulin M (IgM) antibody to hepatitis B core antigen, if performed, for a confirmed case, or positive IgM alone for a probable case. In earlier years, a positive test for either hepatitis B surface antigen or IgM antibody was sufficient for both confirmed and probable cases.

The incidence of acute hepatitis B cases was consistently highest among the **31–49 year age group** and lowest among the 0–17 year age group.



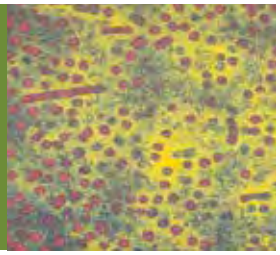
Consistent with overall U.S. data, the rate of acute hepatitis B in 2015 was highest for **non-Hispanic Whites** (also the year with the lowest proportion of missing race/ethnicity).



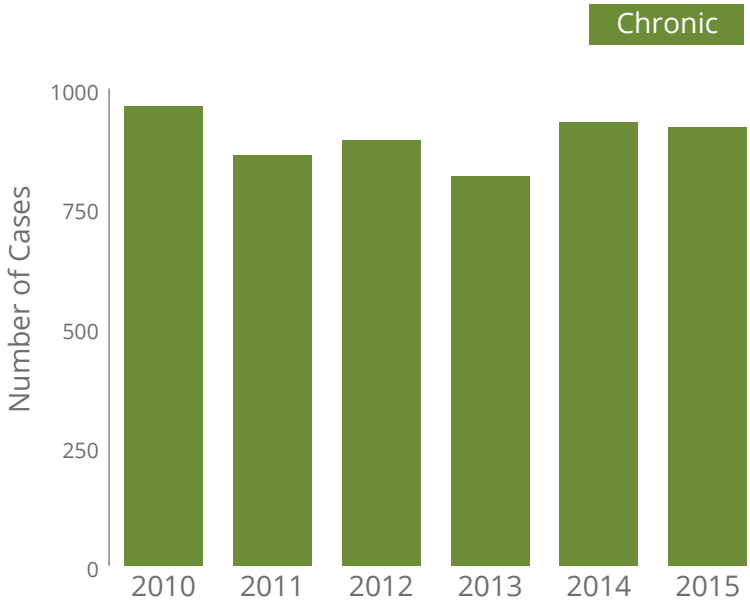
Chronic Hepatitis B

Although most acute infections resolve completely, approximately 5% of infections result in a chronic infection, with the risk decreasing with age. Chronic infections are often asymptomatic, but may progress to severe illness including cirrhosis, liver failure, and liver cancer.

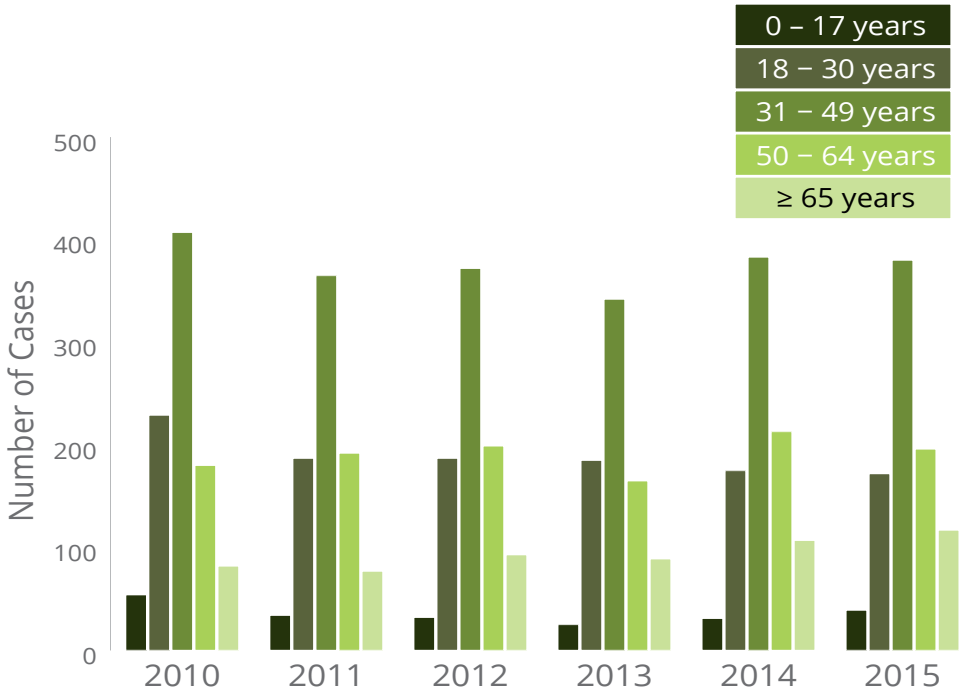
Chronic hepatitis B can lead to serious health issues, like cirrhosis or liver cancer.



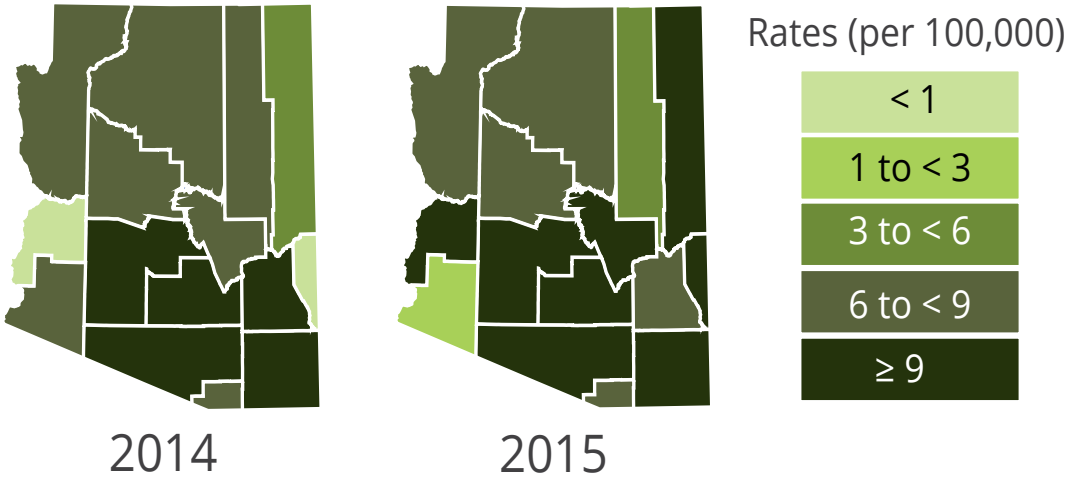
Since 2010, numbers of reported chronic hepatitis B cases have remained fairly **consistent**. Identification of chronic hepatitis B is generally based on laboratory testing and does not require confirmation of compatible symptoms. The case definition for chronic hepatitis B did not change during this time period. A high of 962 cases was reported in 2010 with a low of 816 cases reported in 2013.



The incidence of chronic hepatitis B cases was consistently highest among the 31–49 year age group and lowest among the 0–17 year age group.



The incidence of reported chronic hepatitis B remained higher for males each year. More populous areas such as **Maricopa, Pima, and Pinal Counties** consistently showed higher chronic hepatitis B rates from year to year, but chronic hepatitis B occurs throughout the state.



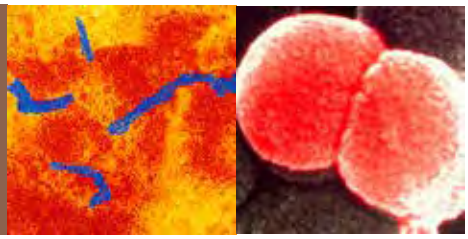
Vaccine-Preventable Disease Overview

Vaccine-Preventable Disease Overview

Our category of vaccine-preventable diseases (**VPDs**) includes several infectious diseases for which an effective preventive vaccine exists, specifically: **chickenpox, invasive *Haemophilus influenzae,* measles, invasive meningococcal disease, mumps, pertussis, poliomyelitis, human rabies, rubella, smallpox,** and **tetanus,** as well as **vaccinia-related events**. Some vaccine-preventable diseases are listed in other disease categories, including *Streptococcus pneumoniae* in the Invasive diseases overview, hepatitis A and B in the Hepatitis overview, and influenza in the Influenza and RSV section.

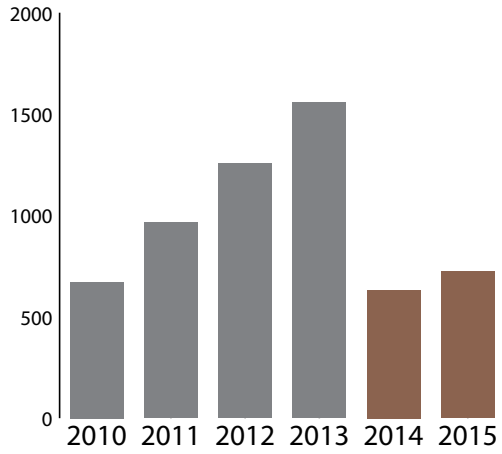
VPDs may be transmitted via numerous routes, including respiratory droplets (*Haemophilus influenzae*, measles, mumps, pertussis, rubella) or contaminated wounds (tetanus). Some of the unique objectives of surveillance for VPDs are to monitor changes in the incidence and epidemiology of the diseases once a vaccine is available and routinely used; to collect information on the effectiveness of vaccinations against particular diseases; and to identify illness caused by pathogen strains not included in the vaccines.

In Arizona, VPDs accounted for 3% of the communicable diseases reported between 2010 and 2015, for a total of more than 5,000 cases.

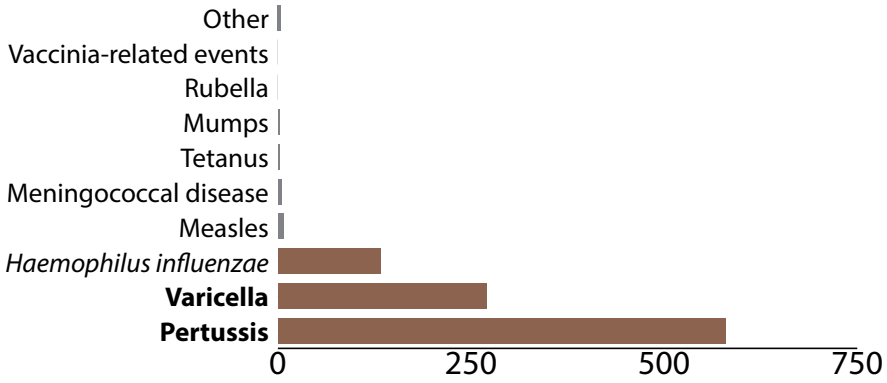


There are several VPDs for which children are routinely vaccinated in the U.S. but which are not discussed in this report. Surveillance for varicella (chickenpox) is ongoing in Arizona, but due to inconsistencies in reporting and classification of cases over this period, we have excluded it from this report. Newer vaccines against rotavirus and human papillomavirus are now part of the routine pediatric and adolescent vaccination schedules, but Arizona does not have a surveillance program for the diseases prevented by these vaccines.

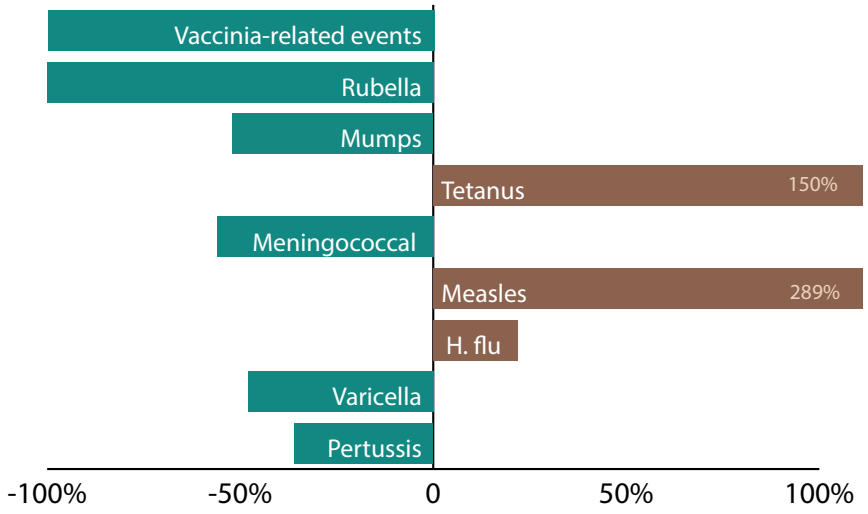
Overall, VPDs in Arizona have shown a **decrease in 2014 and 2015** compared to the earlier years in this report.



The most commonly reported VPDs (98% of the cases) were invasive ***Haemophilus influenzae*, varicella and pertussis.**



VPDs showing the greatest **increase*** in 2015 were: **tetanus, measles** and ***Haemophilus influenzae*. Vaccinia-related events, rubella, mumps, meningococcal invasive disease, varicella** and **pertussis decreased** in 2015.



* percent change in 2015 as compared to the 5 year median (2010–2014).

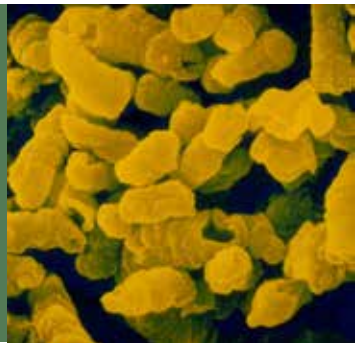
The full VPD reports and publications can be found at https://www.azdhs.gov/preparedness/epidemiology-disease-control/vaccine-preventable/index.php#publications.

Haemophilus influenzae, Invasive

Haemophilus influenzae, a gram-negative coccobacillus, is a cause of serious bacterial infections in humans. *H. influenzae* is transmitted through respiratory droplets, and asymptomatic carriers are thought to play a role in disease transmission.

Of the six serotypes of *H. influenzae* (a, b, c, d, e, f), **invasive disease caused by serotype b (Hib)** was a leading cause of **bacterial meningitis** and other invasive bacterial diseases in children less than five years of age prior to the introduction of an effective **polysaccharide vaccine in 1985**. Invasive *Haemophilus influenzae* infections can present as pneumonia, bacteremia, meningitis, cellulitis (skin infection) or infectious arthritis. *Haemophilus influenzae* can live in the noses and throats of individuals without causing diseases but those individuals with less robust immune systems, such as young children and older adults, can develop invasive disease.

Since the introduction of vaccines against Hib, disease caused by serotype b has significantly declined and other serotypes predominate as the cause of invasive disease.

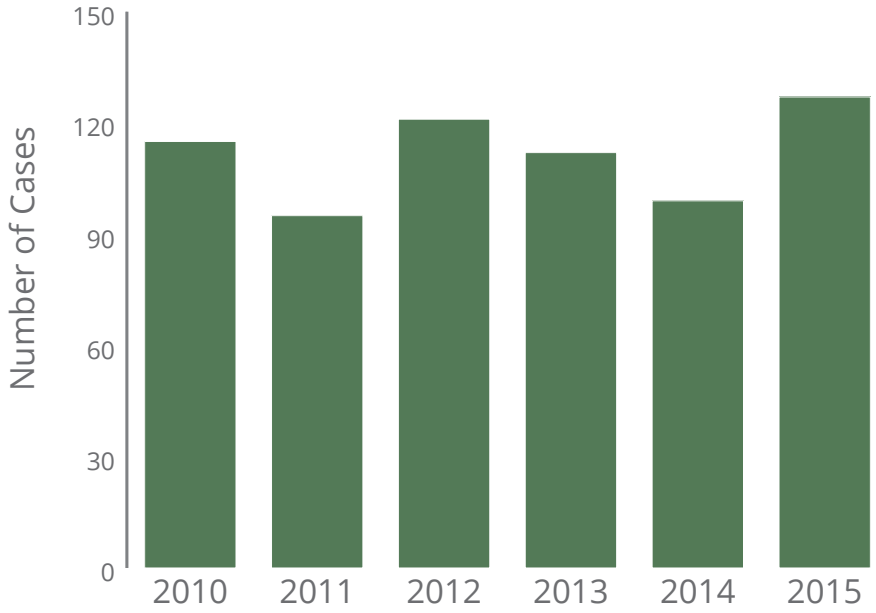


Although Hib infection is considered the most severe, infection with other *H. influenzae* serotypes also causes illness in humans. Invasive disease may also be caused by non-encapsulated (non-typeable) *H. influenzae* organisms.

In Arizona, surveillance is conducted for ***H. influenzae* disease in all ages** to assist in the detection of Hib and to monitor changes in the predominance of different serotypes.

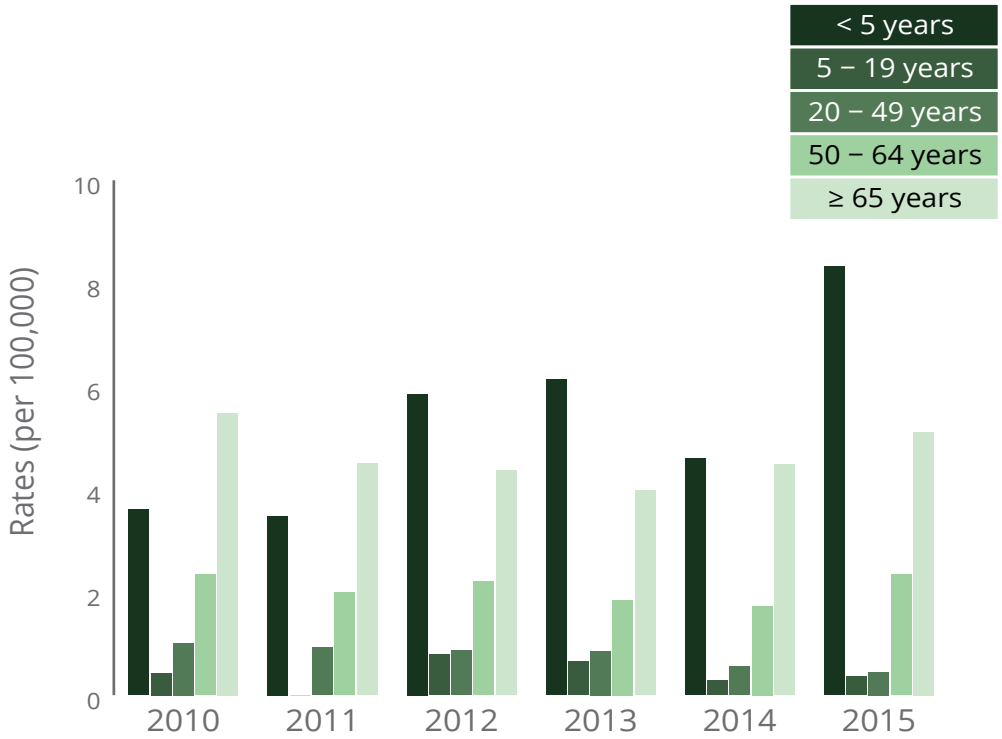
A Hib conjugate vaccine was licensed in 1987. Hib vaccination is recommended for all infants starting at two months of age, and is given as a two- or three-dose primary series depending on the type of vaccine used. A booster dose is recommended at 12–15 months of age. As a result of vaccination, the incidence of invasive Hib disease in the United States has declined more than 99% as compared with pre-vaccine disease levels. However, cases of invasive Hib disease continue to be reported among unvaccinated or undervaccinated children. Invasive Hib disease is uncommon in adults.

In Arizona, rates of invasive disease due to *Haemophilus influenzae* for all ages and serotypes have remained **relatively constant from 2010–2015**.

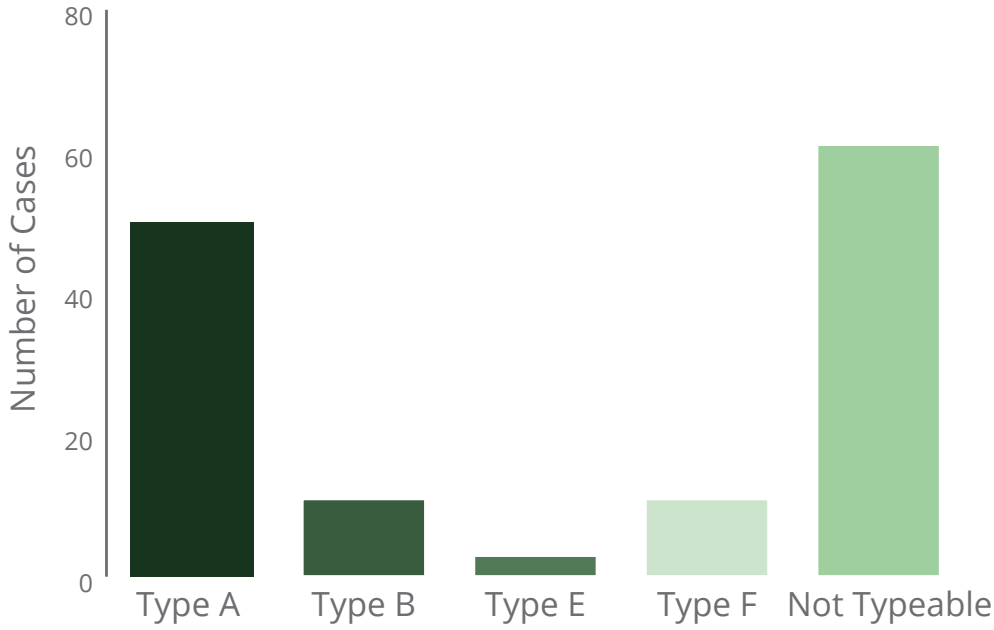


Clinical laboratories are required under Arizona Administrative Code (A.A.C.) R9-6-204 to forward **isolates to the Arizona State Public Health Laboratory for serotyping** and archiving. Prior to September 2011, all isolates received by the State Public Health Laboratory were serotyped. After September 2011, due to lack of resources, the State Public Health Laboratory limited serotyping to isolates from **cases younger than five years of age**. Isolates from older cases continue to be archived and are available if needed for surveillance purposes.

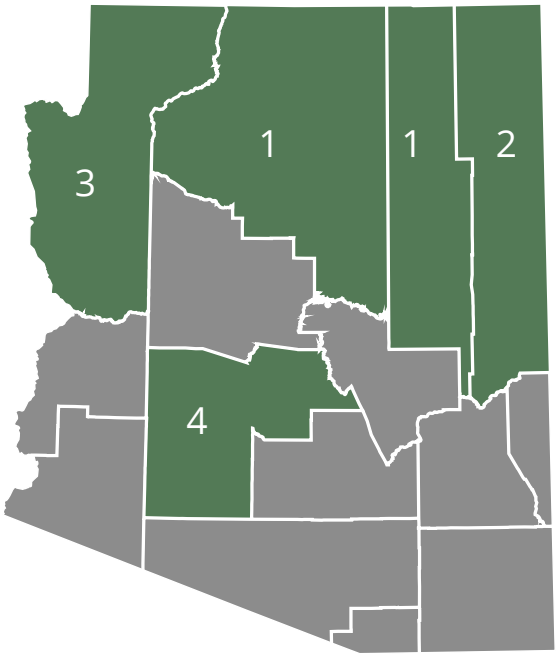
The age groups with the highest rate of *Haemophilus influenzae* in Arizona are those **under 5 years** of age and those **at least 65 years** of age.



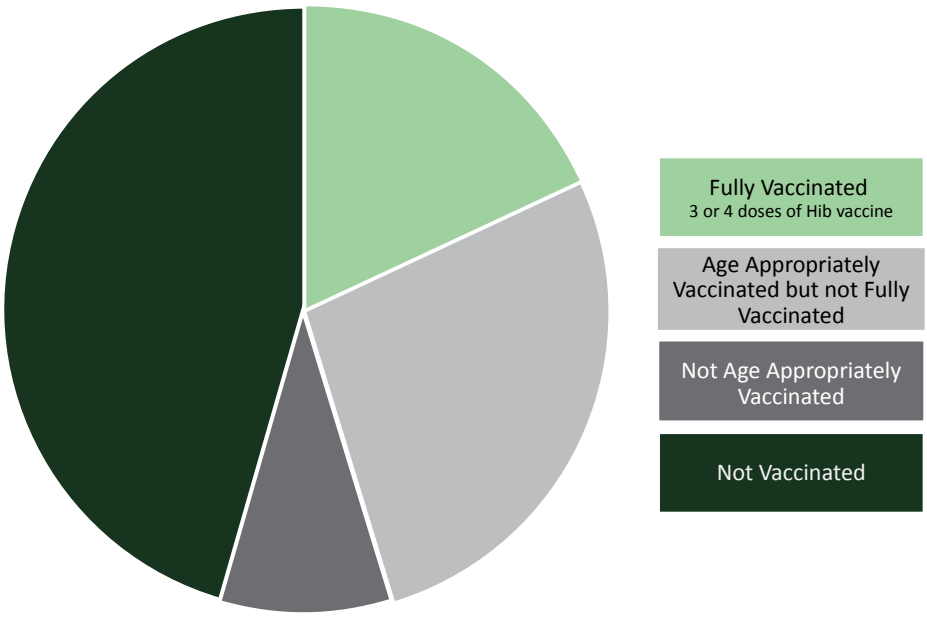
From 2010–2015, among children less than five years of age for whom serotyping was performed, the majority of cases were **non-typeable** or **serotype A**. **Eleven (8%) of the cases were serotype B**, which is the only type preventable by vaccination.



The number of Hib cases each year has been very low both in Arizona as well as nationally. Arizona usually identifies one to two cases of Hib annually. During **2010–2015**, the 11 cases of Hib were reported from only five counties: **Apache, Coconino, Maricopa, Mohave, and Navajo**.



Of these Hib cases, **5 cases were not vaccinated**, 1 case had some doses but not the appropriate numbers of doses for the child's age, **3 cases were age appropriately vaccinated** but not fully vaccinated, and 2 cases were fully vaccinated. It is very important to make sure that all children are up-to-date on their vaccinations.



Measles

Measles is caused by the measles virus and is spread by droplets created by **cough or sneezing**. Measles virus is highly infectious and can also stay in the air for up to two hours after an infected individual has left a room.

Symptoms of measles generally start with a **high fever, cough, runny nose, and red watery eyes.** After three to five days a **rash** will start around the hairline and progress down the body and out to the limbs. This rash will fade in the opposite direction than it progressed. Measles can have serious complications including pneumonia, encephalitis, and death.

Infants, children, pregnant women, and immunocompromised individuals are at higher risk for complications from measles.

Vaccination is the best method to prevent measles infections. The first measles vaccine was licensed in 1963 and the **MMR (measles-mumps-rubella)** vaccine was licensed in 1971. A two-dose series is currently recommended for children, with the first dose at 12–15 months and the second dose at 4–6 years of age. The first dose of MMR has an approximate effectiveness of 93% and the second dose is approximately 97% effective.

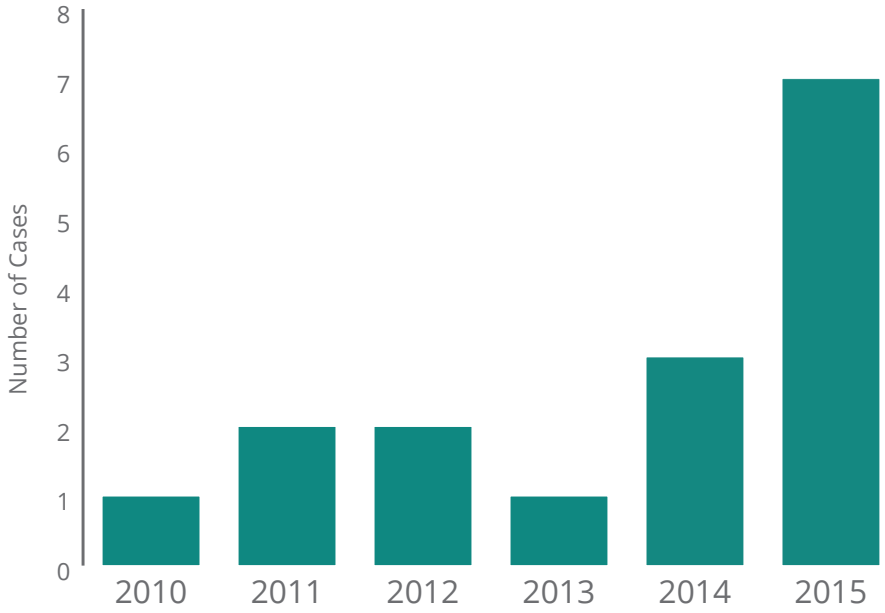
Measles was declared eliminated from the United States in 2000 and from the Americas in 2002. Cases have still been seen in the United States since then but are **all imported** or travel-related.

Arizona usually has only one to two cases of measles every year, with the exception of **2015**, when there were seven cases related to **a large outbreak that occurred at Disneyland in California**.

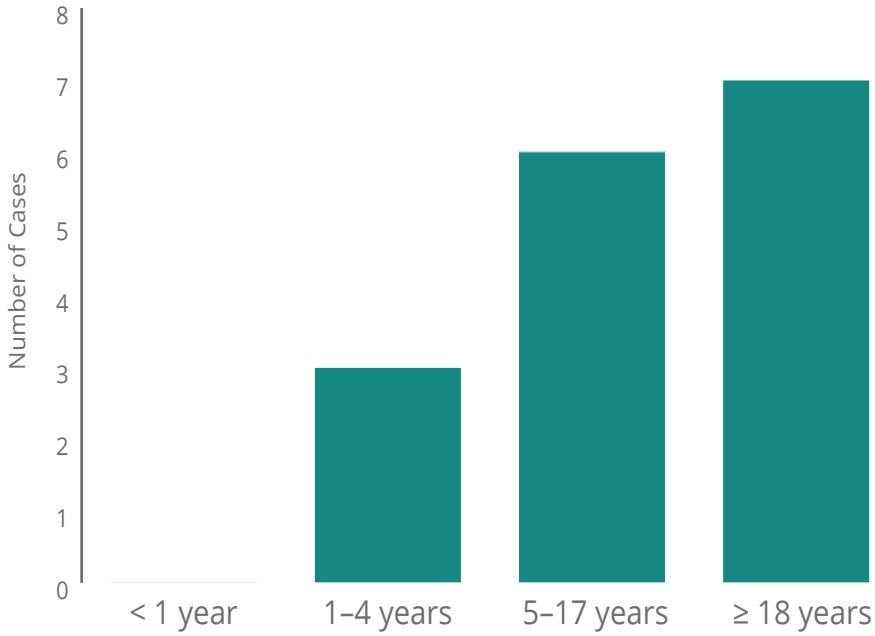
125 measles cases were confirmed in U.S. residents connected with the Disneyland outbreak.

https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6406a5.htm?s_cid=mm6406a5_w

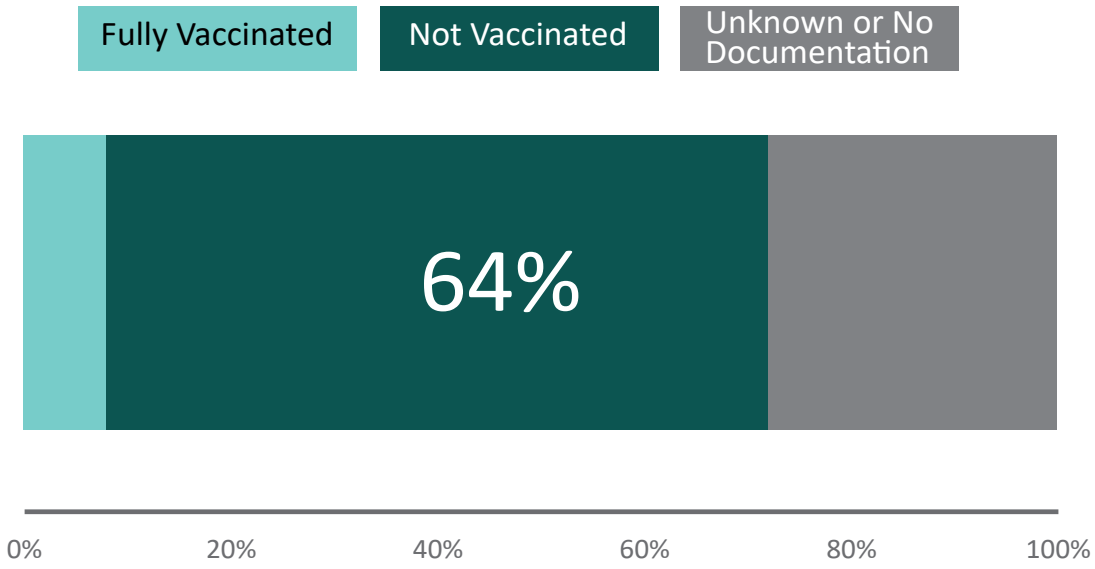
Disneyland Mike (CC BY-NC-ND 2.0)



During 2010–2015, 18% of measles cases were 1–4 years of age, 38% of cases were 5–17 years of age, and **44% of cases were 18 years or older.** The majority of cases during this time period were male (69%).



A majority of measles case (**64%**) were **not vaccinated** with the recommended two doses of MMR vaccine.

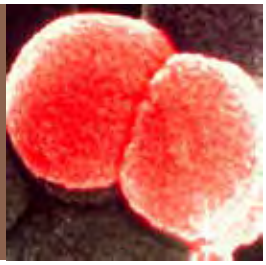


Meningococcal Disease

Meningococcal disease is an acute, severe disease caused by the bacterium ***Neisseria meningitidis*, and is one of the leading causes of bacterial meningitis and sepsis** in the United States. Most invasive disease is caused by **five serogroups: A, B, C, Y and W-135**.

Transmission occurs via droplet aerosol or nasopharyngeal secretions. The most common presentation of invasive disease is meningitis, followed by sepsis. In the past, the case fatality rate exceeded 50%, but with current antibiotics and improved supportive care, the **case fatality rate** is down to **10–15%**. Up to 20% of survivors will suffer long term sequelae such as hearing loss, neurological damage, or loss of a limb.

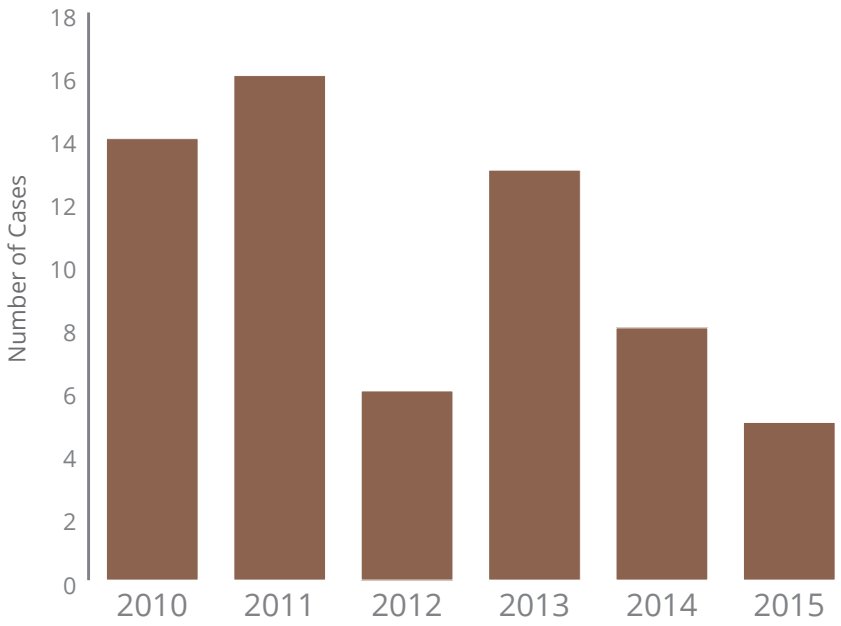
Serogroups B, C, and Y are the most common causes of meningococcal disease in the U.S.



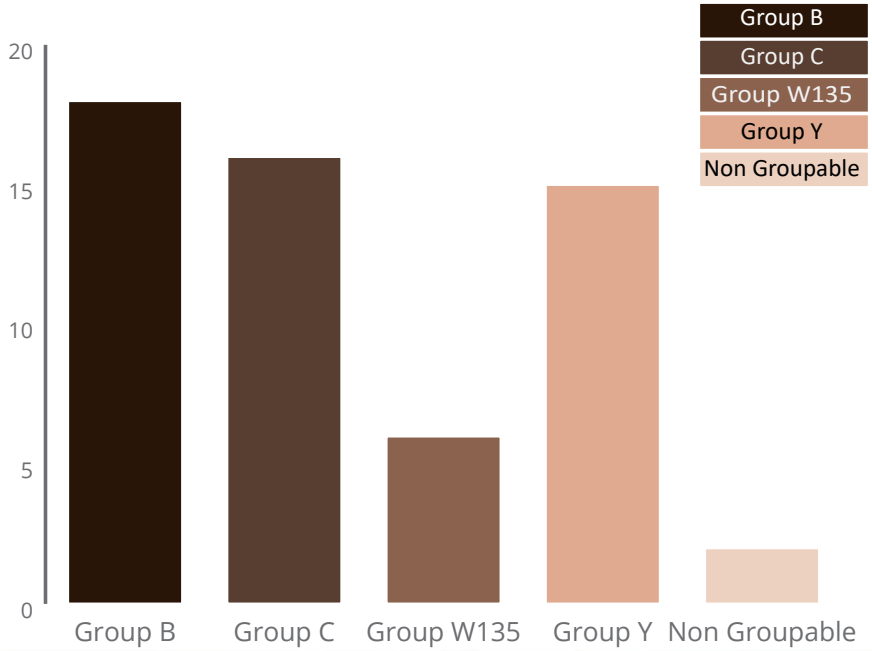
Vaccines to prevent meningococcal disease caused by serogroups A, C, Y and W135 include a polysaccharide vaccine (**MPSV4**) licensed in 1978 and a newer conjugate vaccine (**MCV4**) licensed in 2005. MCV4 is recommended for all children 11–12 years of age, with a booster dose at 16 years of age. Beginning with the 2014–2015 school year, all Arizona students in grades 6–12 are required to have one dose of MCV4 for school entry.

Meningococcal B vaccines were first licensed in the United States in 2014. These vaccines are recombinant vaccines that are recommended for individuals aged 16–23 years. The meningococcal B vaccine is also recommended for specific groups that are at a higher risk of infection including those with complement component deficiency, those with a damaged spleen, lab workers who work with *Neisseria meningitidis*, or individuals who are part of a population that is at increased risk due to a serotype B meningococcal outbreak.

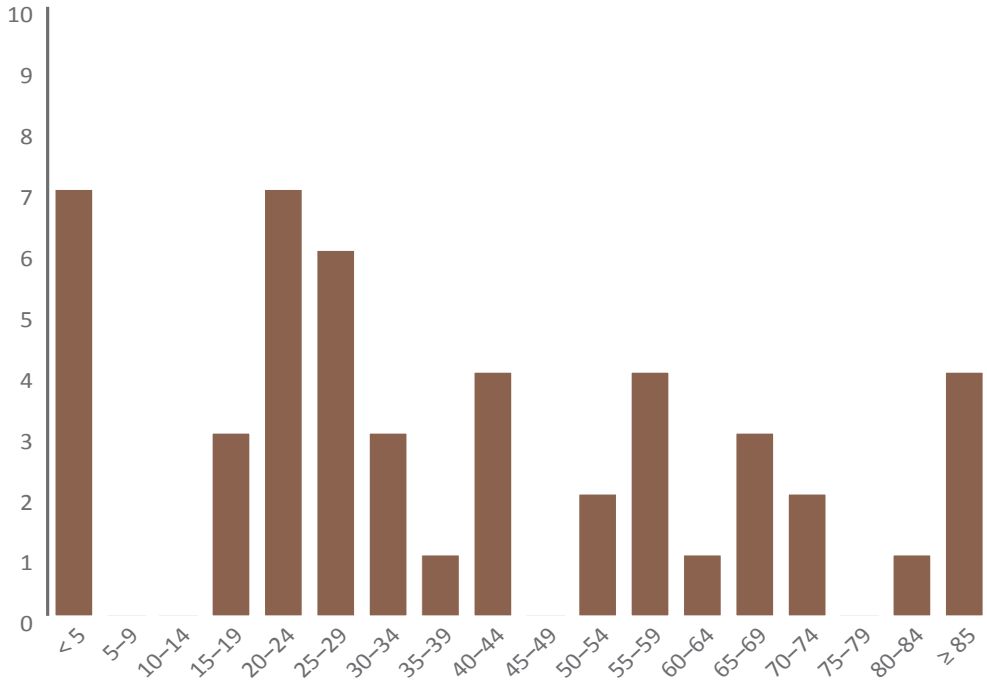
Reported meningococcal cases have remained at low levels during **2010–2015**, with a **general decrease in cases** over the six years. Nationally, meningococcal disease has decreased since 2000, and disease caused by outbreak-related serogroups C and Y has remained low.



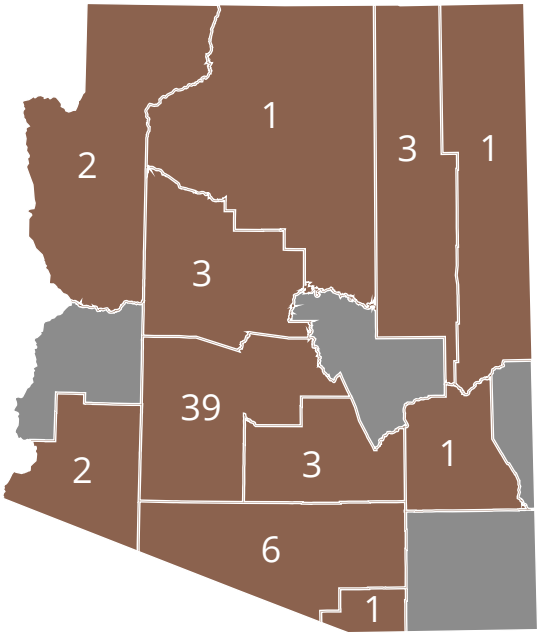
For Arizona cases, laboratories are required under Arizona Administrative Code (A.A.C.) R9-6-204 to forward case isolates to the Arizona State Public Health Laboratory for serogrouping. From 2010–2015, **predominant meningococcal serogroups for Arizona cases included B, C and Y**. This is consistent with the meningococcal serogroups reported nationwide.



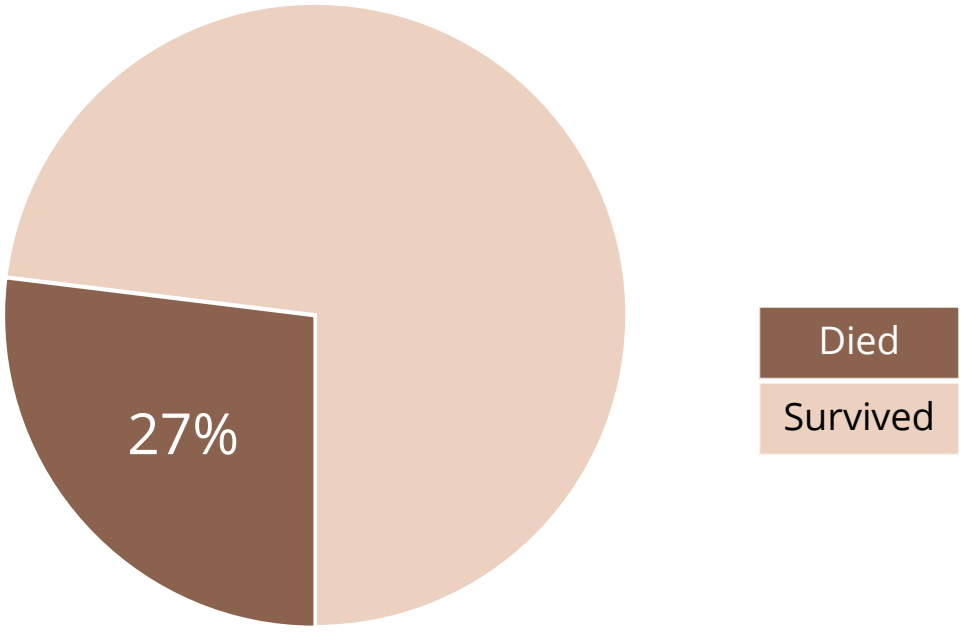
Invasive meningococcal cases were most frequently reported among **children less than 5 years** of age and in **young adults (20–29 years)** during 2010–2015.



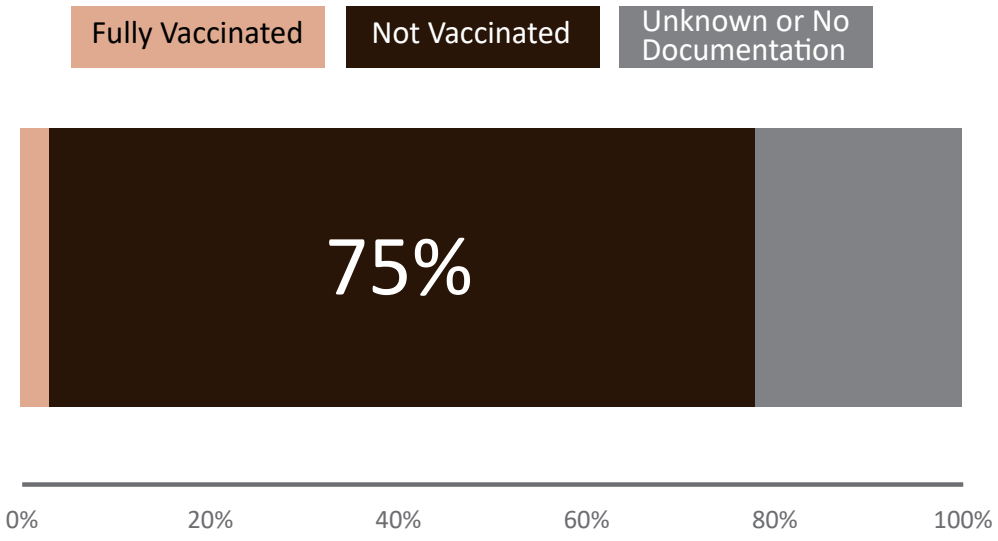
The 62 invasive meningococcal cases reported during this period lived in **11 of the 15 Arizona counties**.



Over a quarter (**27%**) of the invasive meningococcal disease cases from 2010–2015 **died from their infection**.



Most (**75%**) **of meningococcal cases in 2010–2015 were not vaccinated**. Routine vaccination for children ages 11–12 years was first recommended in 2005. Many of the meningococcal cases would have been older than 12 years at that time, and this would explain why the vaccination is low among this group.

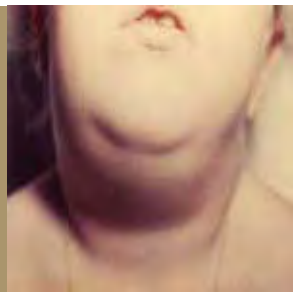


Mumps

Mumps is an infection that is caused by the mumps virus.

Mumps infections are generally mild and can have symptoms including low-grade fever, myalgia, anorexia, malaise and headache. Parotitis or swelling of the parotid salivary glands is the most common presentation of mumps but individuals can also have orchitis (testicular inflammation), oophoritis (ovarian inflammation), pancreatitis, deafness, meningitis, or encephalitis. These other complications are generally very rare. Mumps is spread by direct contact with respiratory secretions or saliva of an infected individual.

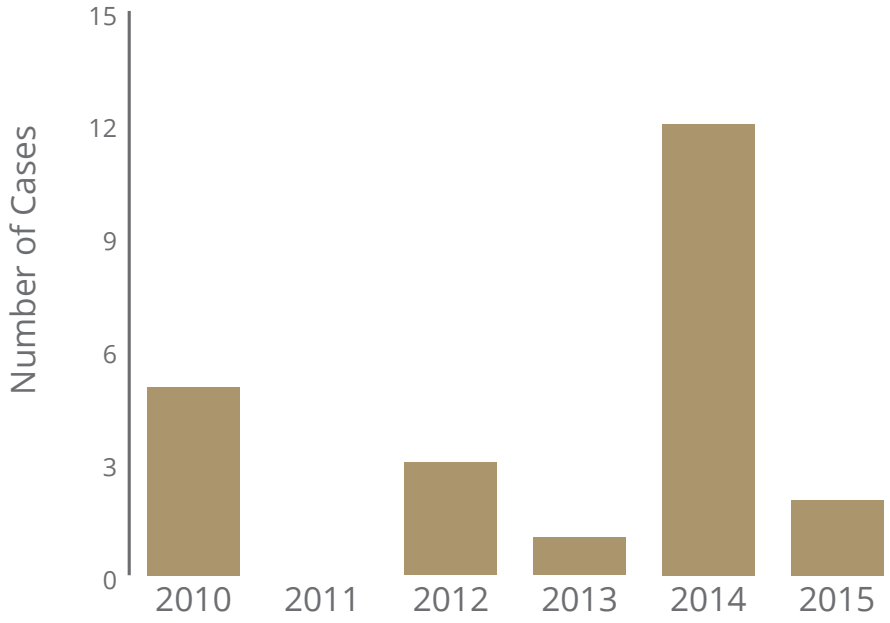
Parotitis, or swelling of the parotid salivary glands, is the most common presentation of mumps.

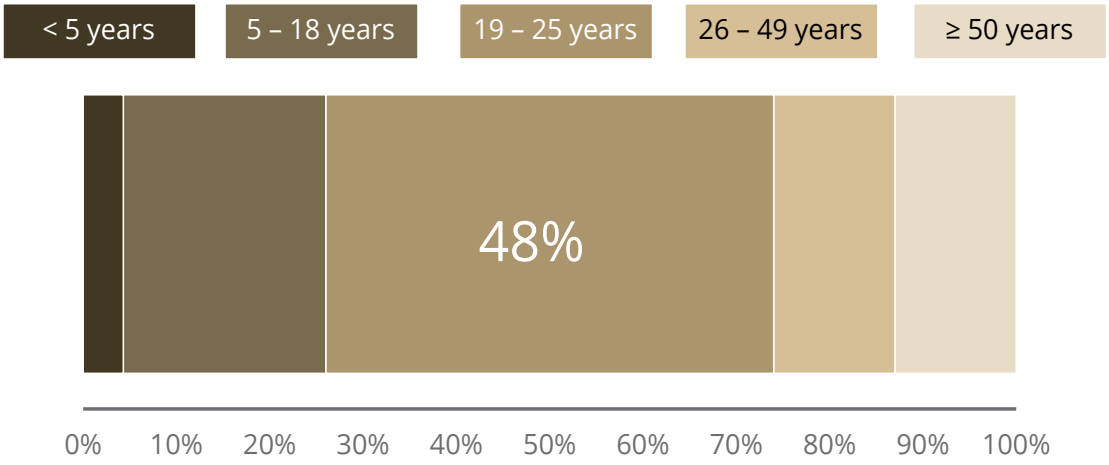


Vaccination is the best method to prevent mumps infections. The first mumps vaccine was licensed in 1967. The same strain that was used in that first vaccine was also used in the MMR (measles-mumps-rubella) vaccine licensed in 1971. A two-dose series is currently recommended for children with the first dose at 12–15 months and the second dose at 4–6 years.

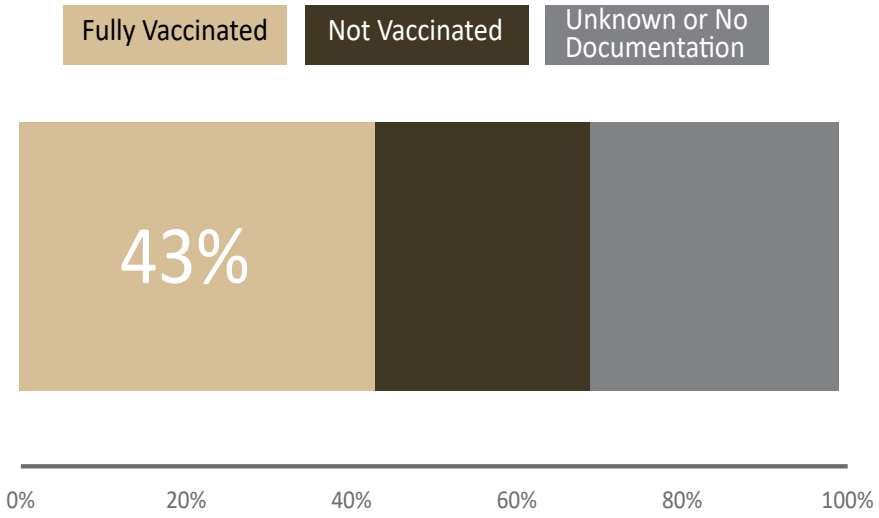
The number of mumps cases in the United States has decreased more than 99% since the pre-vaccine era. Although mumps is rare in the United States, outbreaks still occur. Most of these outbreaks have occurred on college campuses where risk factors such as crowded living spaces, sharing utensils or cups, or playing on sports teams are generally higher than in other U.S. populations.

Mumps in Arizona continues to be rare with five or fewer cases reported most years. **In 2014, an outbreak occurred among a male collegiate athletic team**. This outbreak can explain both the gender and age group distributions for this time frame. A majority of cases were male (73%) and almost half were in the **19–25 year age group** (48%).





Nearly half (43%) of mumps cases from 2010 to 2015 were **fully vaccinated** with two doses of MMR vaccine. All three public universities in Arizona require either proof of two doses of MMR or proof of immunity before allowing students to register.



Pertussis

Pertussis ("whooping cough") is a highly contagious bacterial illness caused by the bacterium ***Bordetella pertussis***. Transmission occurs through **contact with respiratory droplets or respiratory secretions**. Initial symptoms may be similar to the common cold with runny nose and mild cough. Fever, if present, is low-grade.

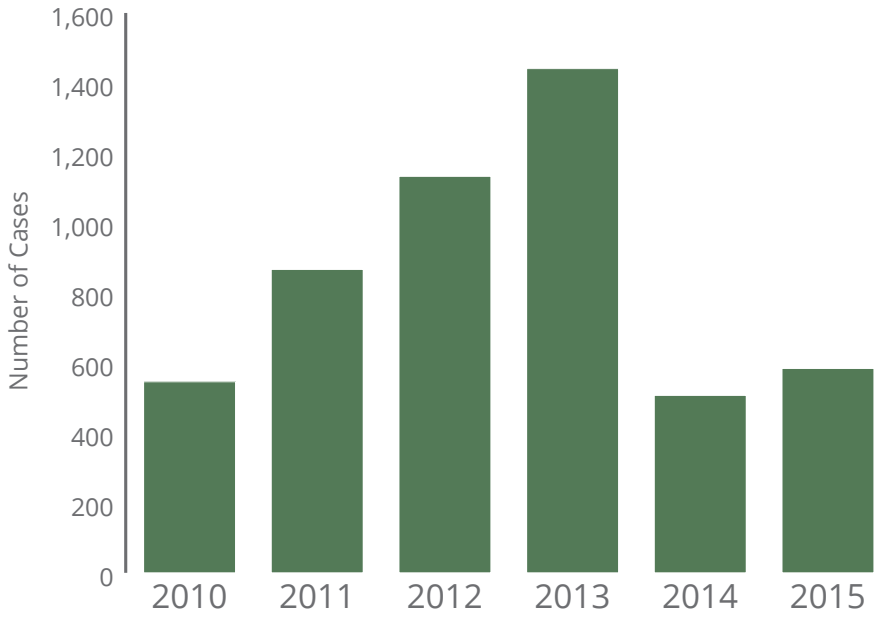
The diagnosis of pertussis is typically made when the cough progresses to paroxysms (bursts of numerous, rapid coughs), which occur more frequently at night and may be followed by post-tussive vomiting. A person with pertussis is most contagious in the early, mild stage of illness. Symptoms may persist for months after the initial onset of pertussis. Young infants are at highest risk for developing complications, most commonly bacterial pneumonia. Other complications include seizures, encephalopathy, and death. Antibiotics are somewhat effective in controlling symptoms if given early in the course of illness.

The first vaccine developed against *Bordetella pertussis* was the **whole-cell vaccine** introduced in the 1940s. In 1997 and 2005, two new vaccines became available to prevent pertussis and with fewer side effects than the earlier vaccine: **DTaP** and **Tdap**.

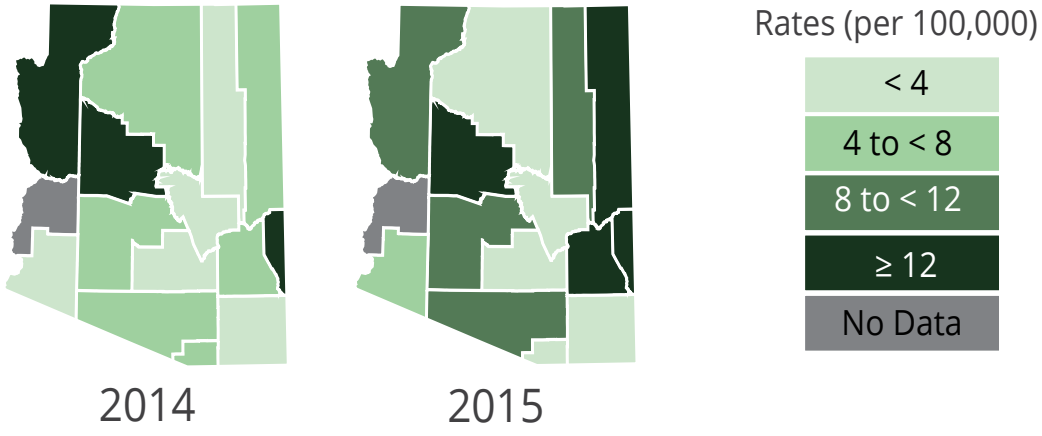
DTaP (diphtheria-tetanus-acellular pertussis) is the pediatric formulation and is approved for children ages **six months through 6 years** of age. The primary series consists of four doses, with the first three doses given at 4–8 week intervals and the fourth dose given 6–12 months after the third dose. In addition, a fifth booster dose is recommended before school entry.

Tdap (tetanus-diphtheria-acellular pertussis, with smaller doses of diphtheria and pertussis antigens compared to DTaP) is recommended as a single dose for **children 7–10 years of age who are not fully immunized** against pertussis as well as **adolescents** 11–18 years of age, and **adults** 19 years or older who have contact with an infant less than 12 months of age.

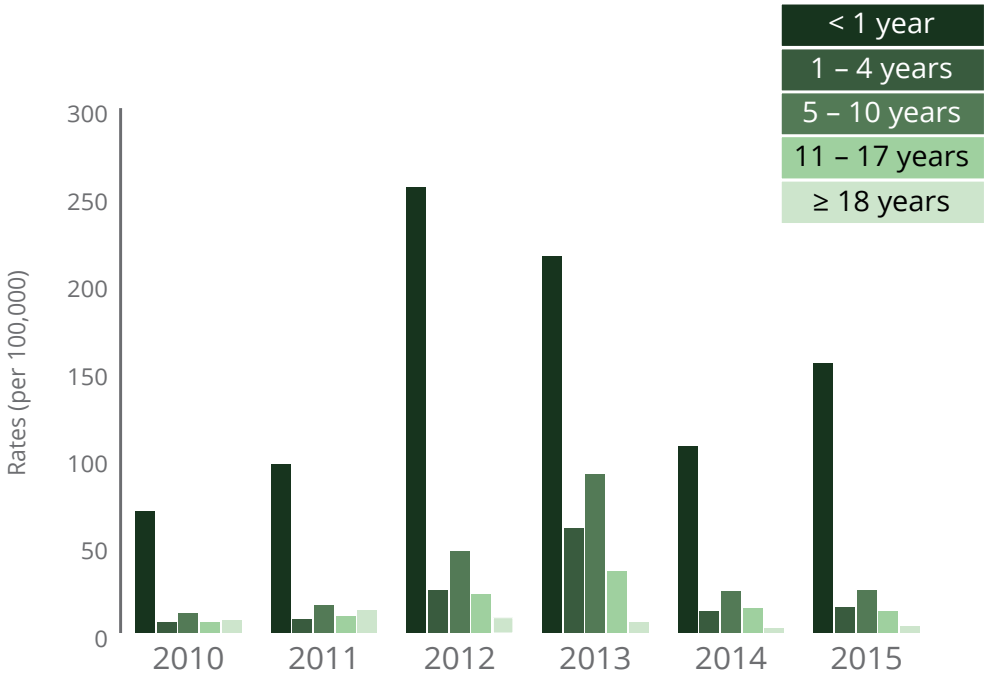
During this period, the number of reported cases in Arizona increased until peaking in 2013 with 1,440 cases. During 2013, a large outbreak was reported in Mohave County. After the 2013 outbreak, there was a **significant decrease in the number of reported cases** which could be due to the three-to-five year cyclic nature of pertussis.



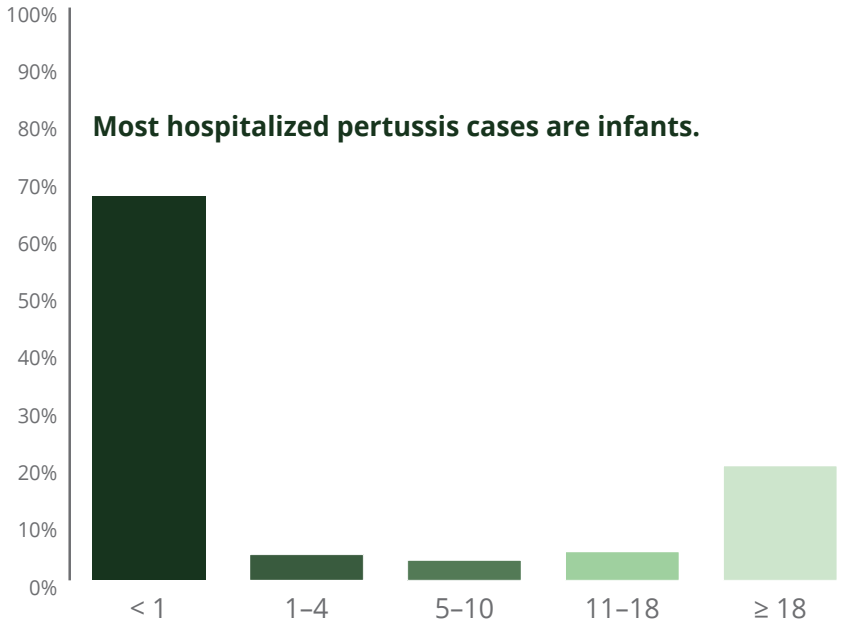
Pertussis cases are typically reported each year in a majority of the counties in Arizona. Communities with higher proportions of children not vaccinated against pertussis are also clustered in particular parts of the state, which can result in higher case rates in some counties during outbreaks. **In 2015**, a community-based outbreak occurred in **Graham and Greenlee Counties**.



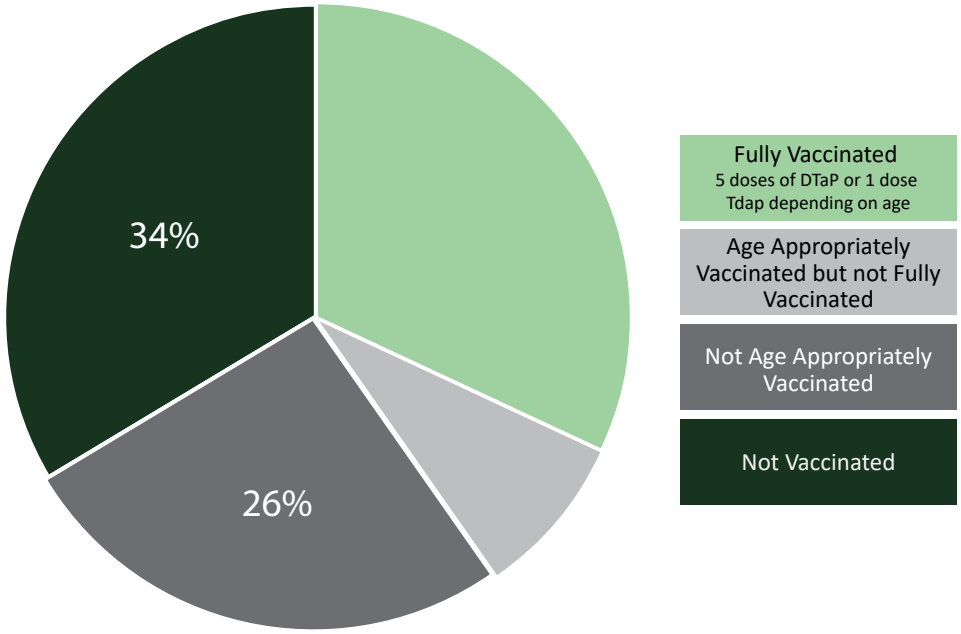
Infants less than one year of age had the highest rates of pertussis every year.



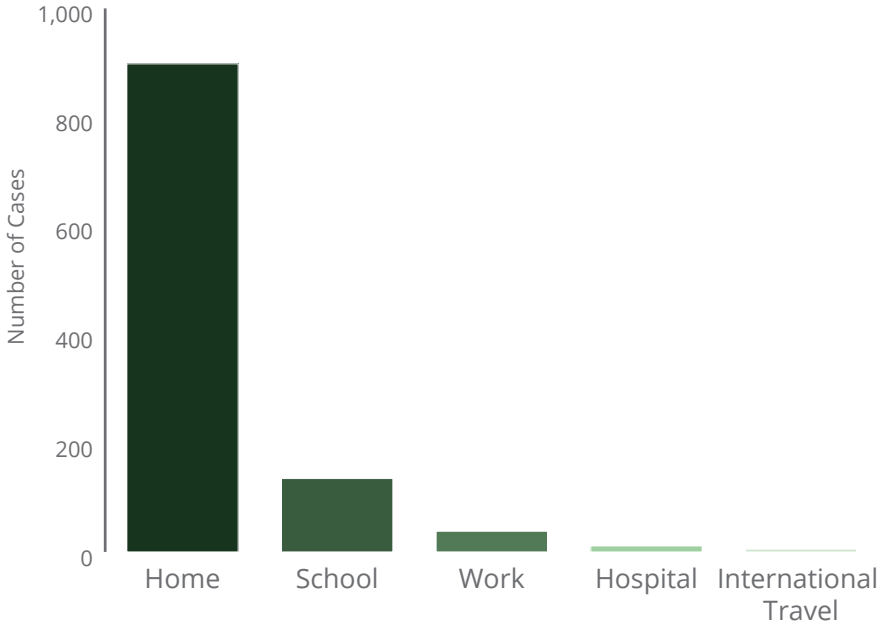
Hospitalizations due to pertussis infections are more common in **younger children** than adults but can occur because of complications from pneumonia or seizures. During the 6-year span of this report, an average of 9.2% of pertussis infections were hospitalized each year, mostly children less than one year of age.



During 2010–2015, 60% of pertussis cases among children 17 years or younger were either **not age-appropriately vaccinated** or **not vaccinated at all** with a pertussis-containing vaccine.



The most commonly reported transmission location for pertussis was the **home (82%)**. According to a recent study,[1] the most common source of pertussis infections for infants was mothers and older siblings. This highlights the importance of vaccination in the older age groups since transmission is most likely to occur within the household and infants are too young to be fully vaccinated.



[1] Skoff T, Kenyon C, Cocoros N, Liko J, Miller L, Kudish K, Baumbach J, Zansky S,Faulkner A, Martin S. Sources of Infant Pertussis Infection in the United States. Pedatrics [Internet]. 2015Oct;136; 625–634. Available from: http://pediatrics.aappublications.org/content/136/4/635.long

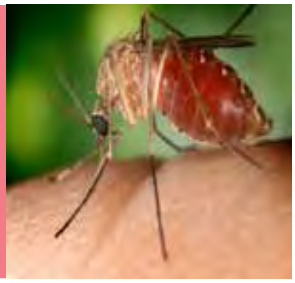
Vector-Borne and Zoonotic Disease Overview

Vector-Borne and Zoonotic Disease Overview

Vector-borne and zoonotic diseases (VBZDs) are two groups of morbidities transmitted to humans by invertebrate and vertebrate organisms.

Zoonotic diseases are infections transmitted to humans from animals other than mosquitoes, ticks and fleas, such as rodents, rabbits and cattle. Transmission may be through direct contact with those animals; some zoonotic diseases (for example, brucellosis) may also be transmitted through consumption of contaminated animal products. Examples of zoonotic diseases are **brucellosis, hantavirus infection, hemorrhagic fever, leptospirosis, melioidosis or glanders, psittacosis, rabies,** and **tularemia**.

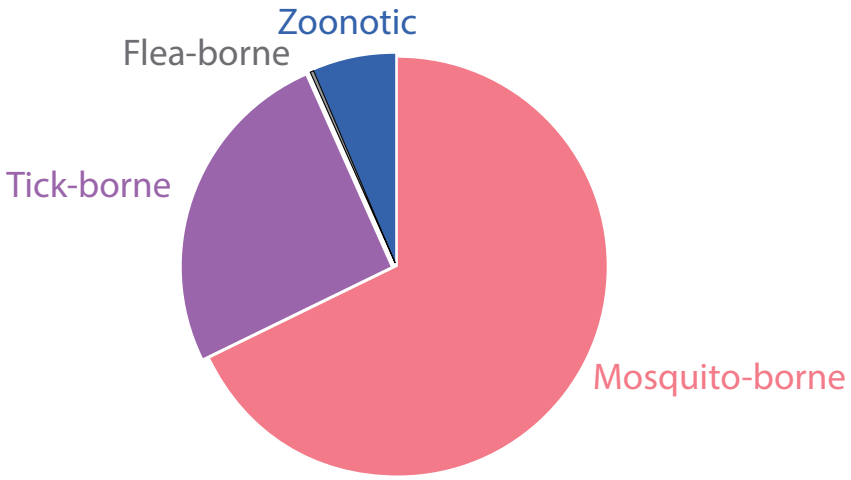
In Arizona, vector-borne and zoonotic diseases accounted for 0.8% of the communicable diseases reported during 2010–2015, a total of almost 1,500 cases.



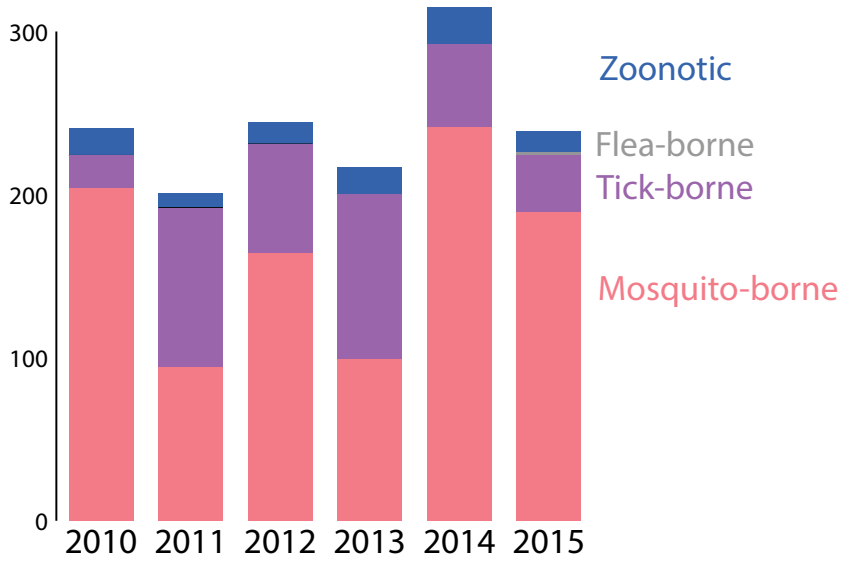
Vector-borne diseases are infections transmitted by mosquitoes, ticks and fleas. Examples of vector-borne diseases identified among Arizona residents include **California serogroup virus, dengue, malaria** and **West Nile virus** (mosquito-borne); **babesiosis, Colorado tick fever, ehrlichiosis, anaplasmosis, Lyme disease, relapsing fever, Rocky Mountain spotted fever, typhus fever** (tick-borne); and **plague** (flea-borne).

Note that some diseases may be transmitted in multiple ways; for example, plague can be zoonotic as well as flea-borne. They are categorized in this report by a common mode of transmission for each illness, rather than by the details of each individual case.

Of the almost 1,500 cases of vector-borne or zoonotic diseases reported during 2010–2015, diseases categorized here as **mosquito-borne diseases accounted for 68%** (991 cases), **tick-borne diseases for 26%** (372 cases), **zoonotic diseases for 6%** (92 cases) and **flea-borne for 0.1%** (2 cases) of the cases of vector-borne and zoonotic diseases.

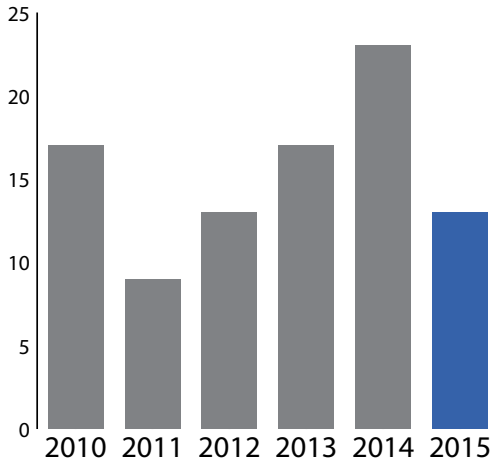


Overall, trends of vector-borne and zoonotic diseases have been quite stable between 2010–2015, with 2015 falling within average for the period.

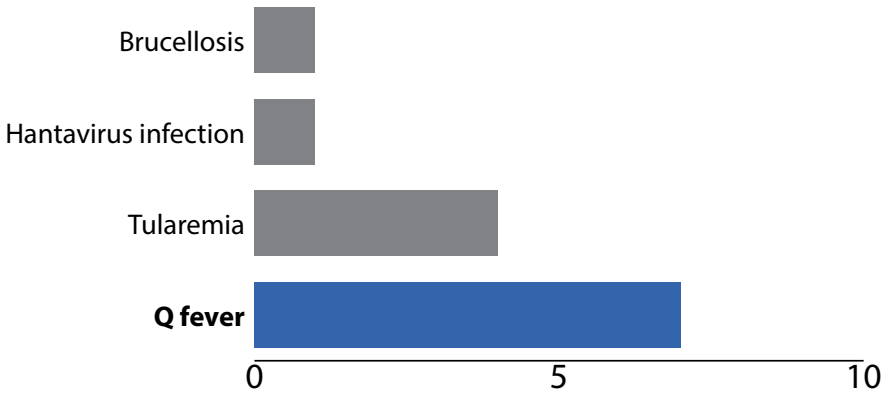


Zoonotic Disease Overview

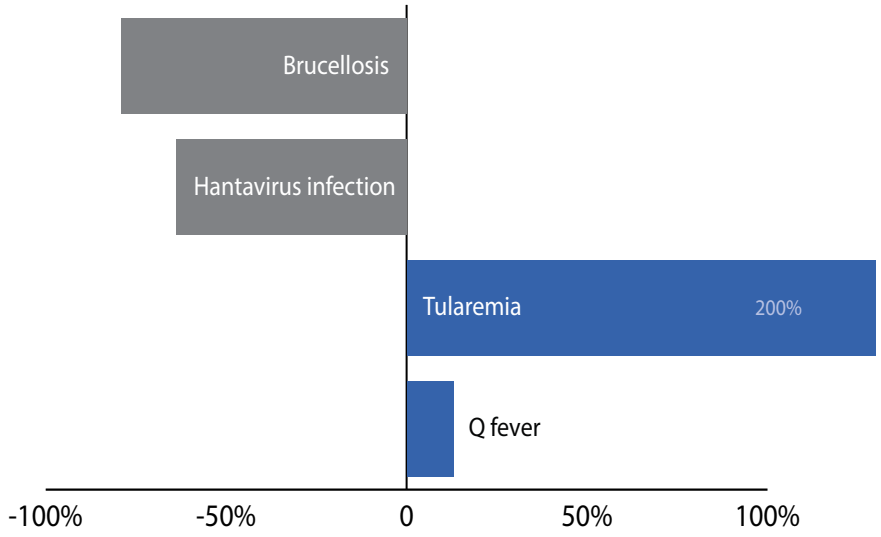
Zoonotic diseases showed a **decrease in 2015** as compared to 2014 and 2013, although numbers of cases are small every year.



The most commonly reported zoonotic disease in 2015 was **Q fever** (7/13 cases). Zero cases of leptospirosis, trichinosis, psittacosis and melioidosis were reported in 2015.



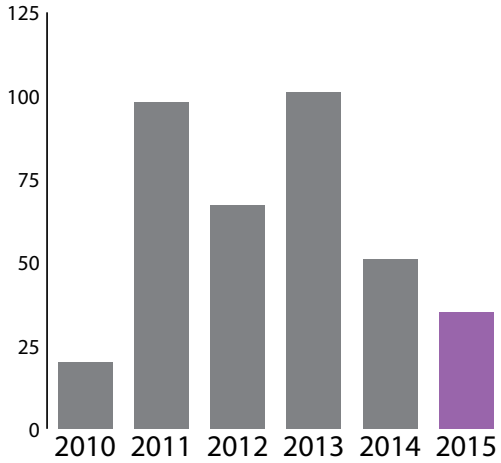
Zoonotic diseases showing the greatest **increase*** in 2015 were: **tularemia**, and **Q fever**. **Brucellosis** and **hantavirus infection decreased** in 2015.



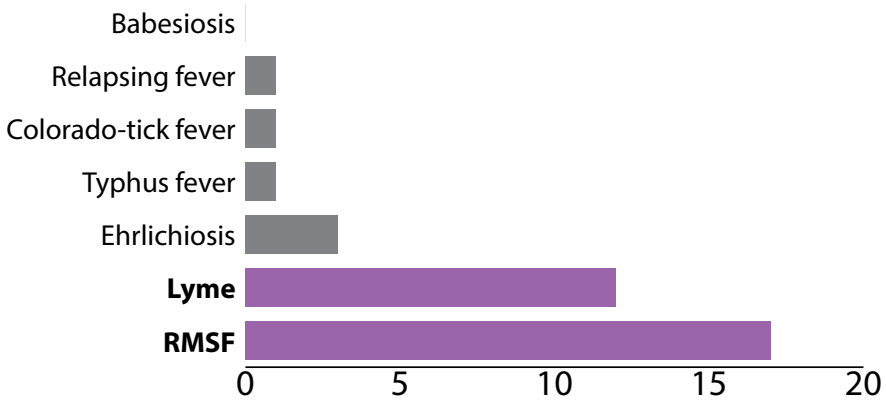
* percent change in 2015 as compared to the 5 year median (2010–2014).

Tick-borne Disease Overview

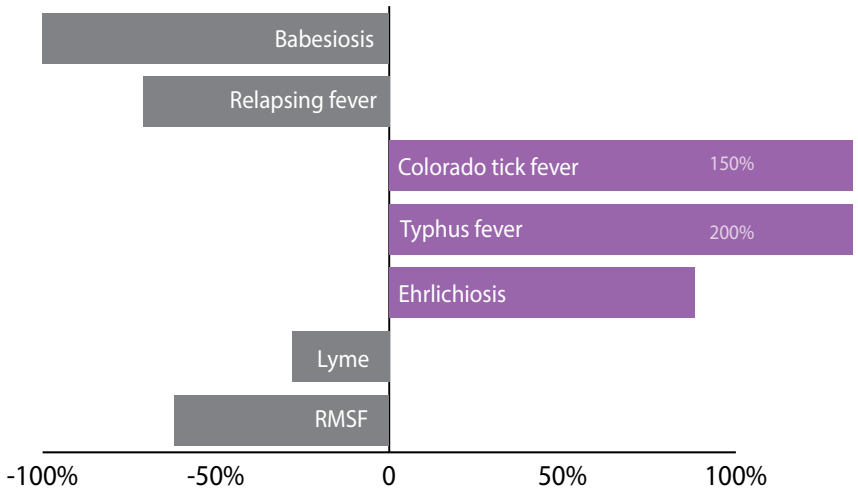
Tick-borne diseases showed a **decrease in 2015** as compared to previous years except 2010.



The most commonly reported tick-borne diseases in 2015 were **Rocky Mountain spotted fever** (RMSF) (17/35 cases) and **Lyme disease** (12/35 cases).



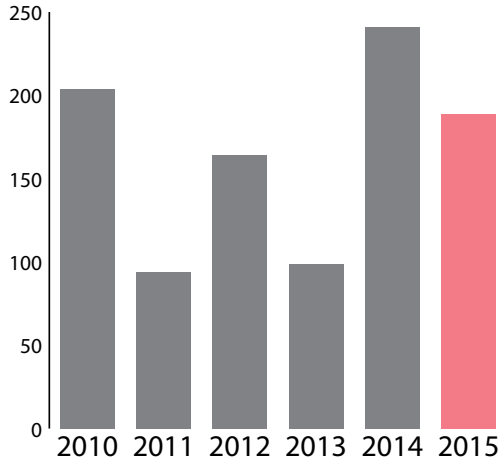
Tick-borne diseases showing the greatest **increase*** in 2015 were: **Colorado-tick fever, typhus fever** and **ehrlichiosis**. **Babesiosis, relapsing fever, Lyme** and **RMSF decreased** in 2015.



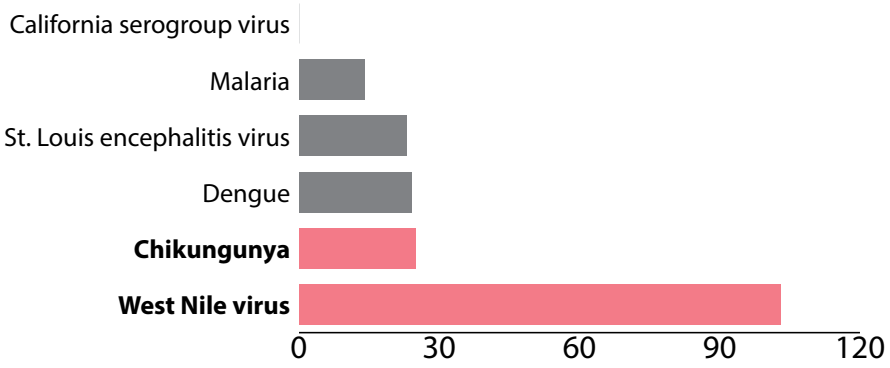
* percent change in 2015 as compared to the 5 year median (2010–2014).

Mosquito-borne Disease Overview

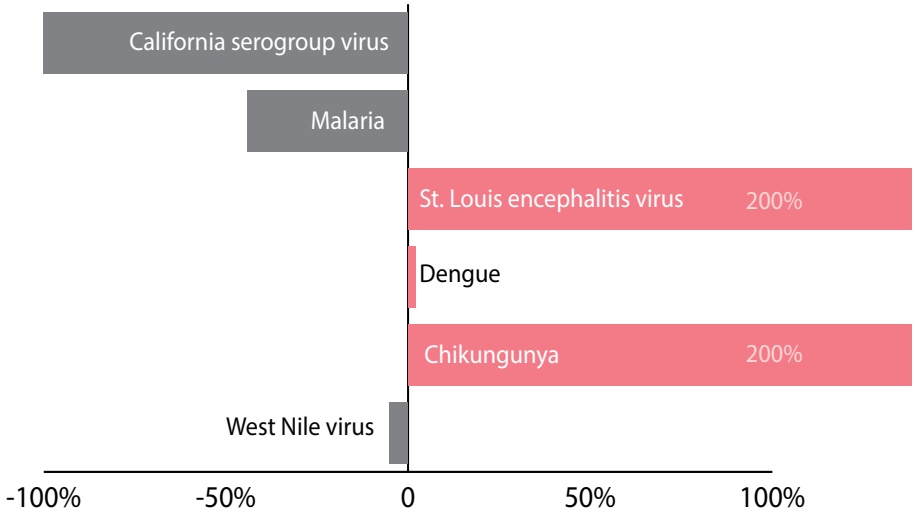
Mosquito-borne diseases showed a **decrease in 2015** as compared to 2014.



The most commonly reported mosquito-borne disease in 2015 was **West Nile virus** (65% of the cases).



Mosquito-borne diseases showing the greatest **increase*** in 2015 were: **St. Louis encephalitis, dengue** and **Chikungunya**. **California serogroup virus, malaria** and **West Nile virus decreased** in 2015.



* percent change in 2015 as compared to the 5 year median (2010–2014).

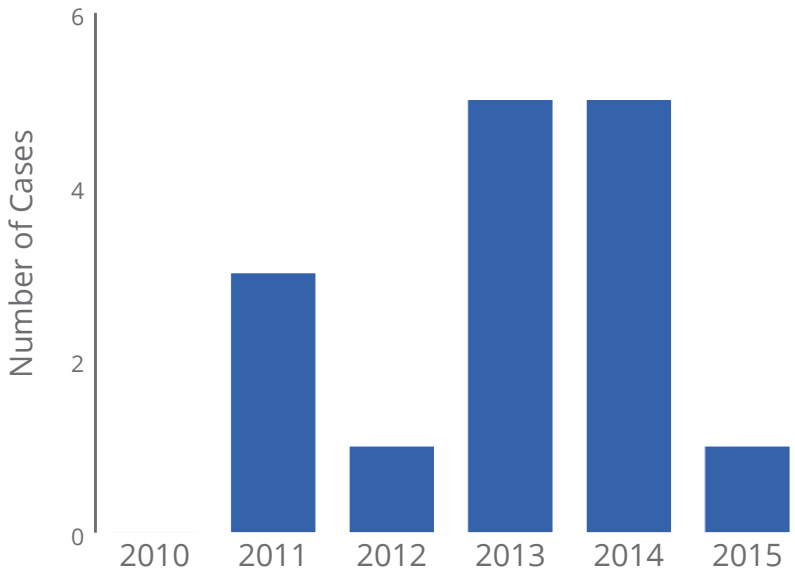
Hantavirus Infection

Hantavirus infection, often manifesting as **hantavirus pulmonary syndrome**, is caused by a virus in the family Bunyaviridae. In Arizona, the most common strain is the **Sin Nombre virus**. Exposure to aerosolized viral particles in droppings of infected **rodents**, primarily urine or feces, is the main transmission method for hantavirus infections. Hantavirus infections present with an array of symptoms, most commonly progressing to a respiratory illness, and can result in fatality.

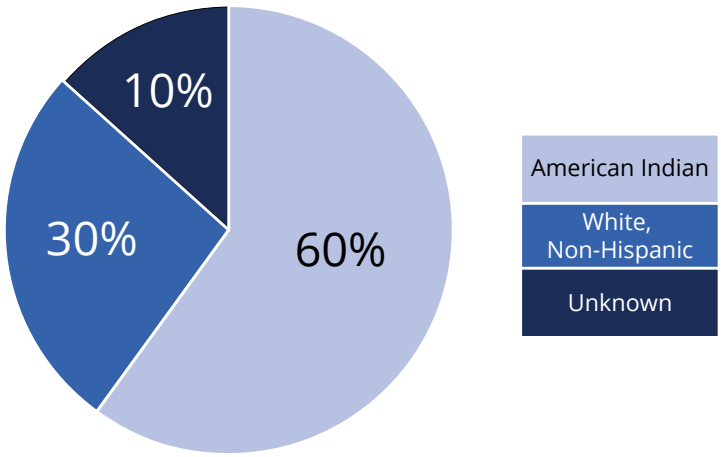
Case numbers can vary year-to-year due to environmental and climatic conditions that influence rodent populations.

Based on cumulative case reports, Arizona ranks as the **third most common state** for hantavirus infection, along with other states in the Four Corners region, where hantavirus was originally discovered in 1993.

As seen below, case numbers were steady in 2014 and then **decreased in 2015**. Additionally, since place of exposure can vary, hantavirus trends may not necessarily be predictable across years. Case numbers are anticipated to fluctuate due to changes in environmental and climatic conditions that influence whether rodent populations flourish or diminish.

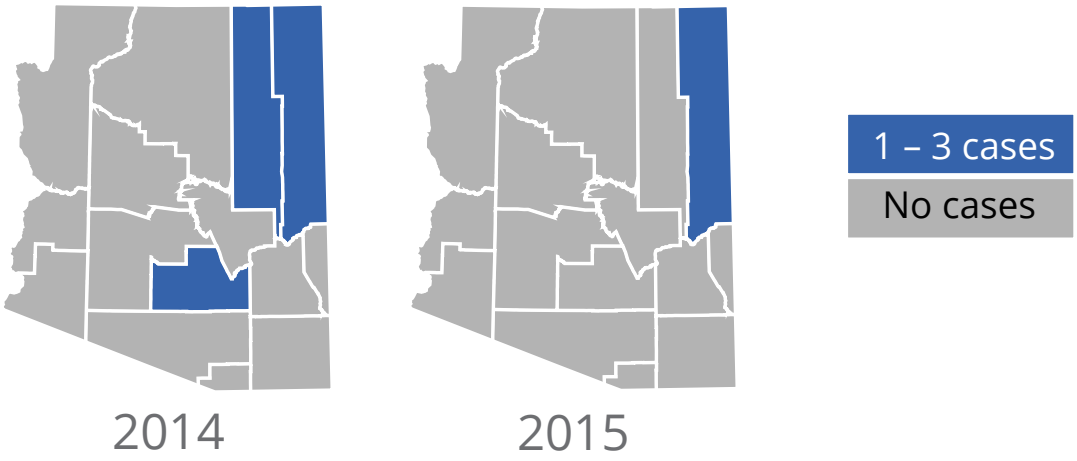


American Indian communities have a higher rate of hantavirus infections. This is reflected in the higher hantavirus rates in the rural northeastern region of the state where American Indian communities are more common.



Hantavirus cases often occur **sporadically and in rural areas**, though in Arizona have been linked with recreational, occupational, and peridomestic exposure. The time of year when cases occur can be linked with the way a person was exposed. For example, **garages, sheds, and basements may become infested with rodents** during the winter months; infections seen in late spring and early summer are frequently related to cleaning activities around the home.

Coconino, Navajo, and Apache Counties are most likely to have hantavirus cases each year.



Plague and Tularemia

Plague and tularemia are bacterial infections that cycle naturally in semi-arid grasslands among insect vectors and wild rodents or rabbits. These bacteria circulate at low rates within wildlife populations; however, occasional outbreaks among animals, or epizootics, occur causing die-offs in wildlife. The potential then exists for disease spillover into domestic animal or human populations.

The first reported human cases of plague and tularemia in Arizona were in 1950 and 1934, respectively. Additionally, both plague and tularemia are considered bioterrorism agents.

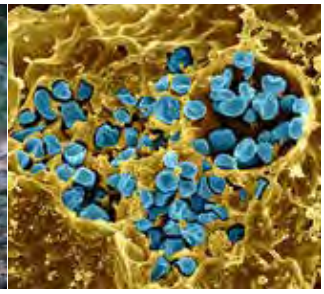
In Arizona, plague activity occurs mostly above 4,500 feet elevation and circulates naturally in prairie dogs, ground squirrels, and rats.

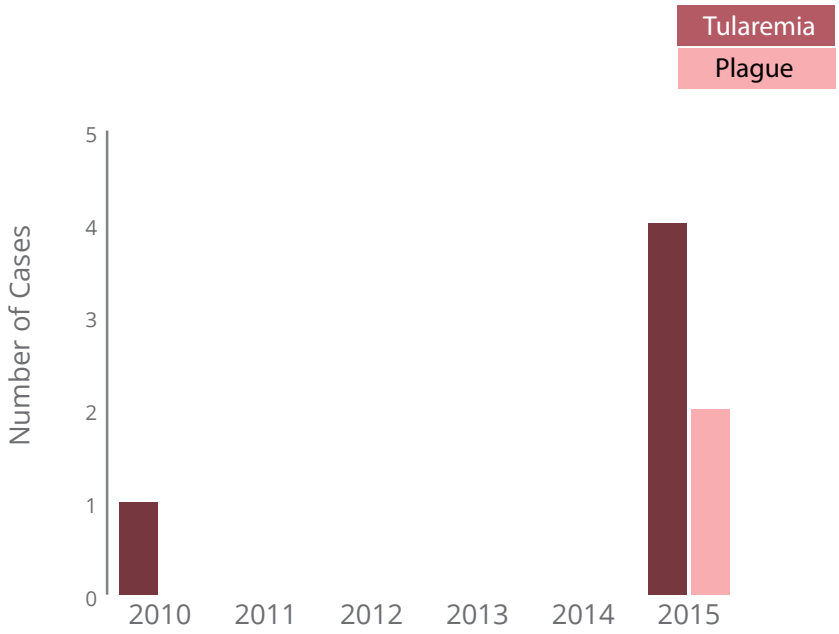
Plague is caused by the bacterium ***Yersinia pestis***, and is commonly spread by the bite of an infected **flea**. People can be exposed through contact with cats or dogs that have fleas or through direct handling of wild rodents, particularly their blood or tissues. Plague infections in people can occur in three forms: **bubonic**, **septicemic**, or **pneumonic**. Bubonic plague is the most common form, and accounts for approximately 80% of plague cases.

In Arizona, plague activity occurs mostly above 4,500 feet elevation and circulates naturally in **prairie dog, ground squirrel, and rat populations**. Similar to hantavirus, plague is endemic in the **Four Corners region**.

Tularemia is caused by the bacterium ***Francisella tularensis***. There are multiple forms of the disease depending on the method of transmission. People can be exposed through the bite of an infected tick or deerfly, touching sick or dead animals, eating or drinking contaminated food or water, or by breathing in the bacterium.

In Arizona, tularemia is usually found in areas above 3,000 feet elevation and circulates naturally among rabbits and rodents.

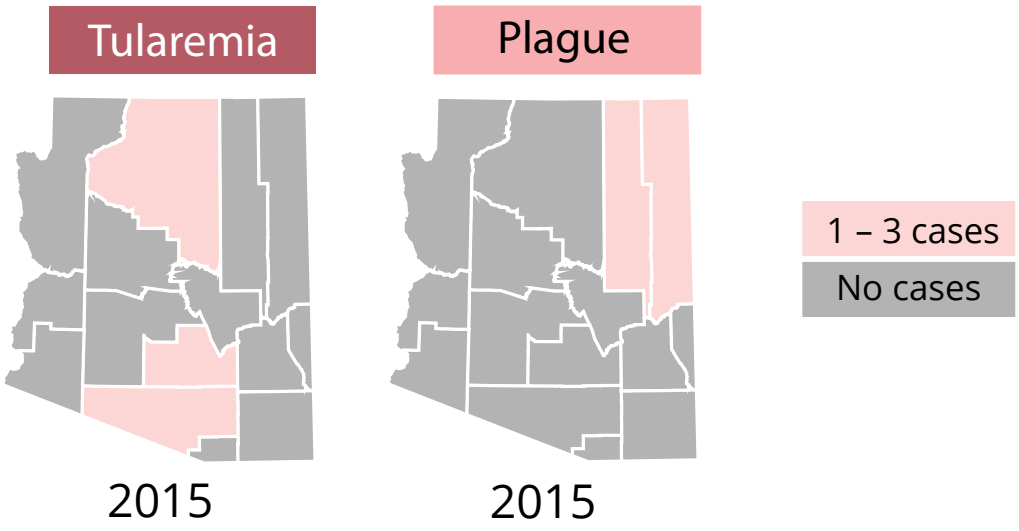




Human cases of plague and tularemia are sporadic. Historically, annual counts have not exceeded five cases for either disease. Although no cases of either illness were reported between 2011 and 2014, both were identified among Arizona residents in 2015.

The **two plague cases reported in 2015** were of the bubonic form, in individuals with exposure to **infected fleas and animals.**

Three of the four **tularemia cases** reported in 2015 were the ulceroglandular form, with two cases having been exposed in Arizona and one case exposed during a rafting trip in Colorado. The fourth 2015 case was identified as a novel strain of *Francisella tularensis*.



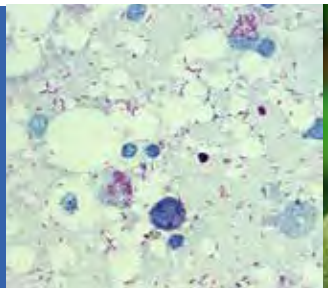
Similar to hantavirus, the trends for plague and tularemia may potentially be explained by changes in environmental factors influencing the natural circulation of the diseases among wildlife.

States bordering Arizona also saw increased case counts in 2015; for example, Colorado reported record-high numbers of tularemia cases.

Rocky Mountain Spotted Fever (RMSF)

Rocky Mountain spotted fever (RMSF), caused by the bacterium ***Rickettsia rickettsii***, occurs throughout much of North and South America, and has been found to be spread by several different species of ticks.

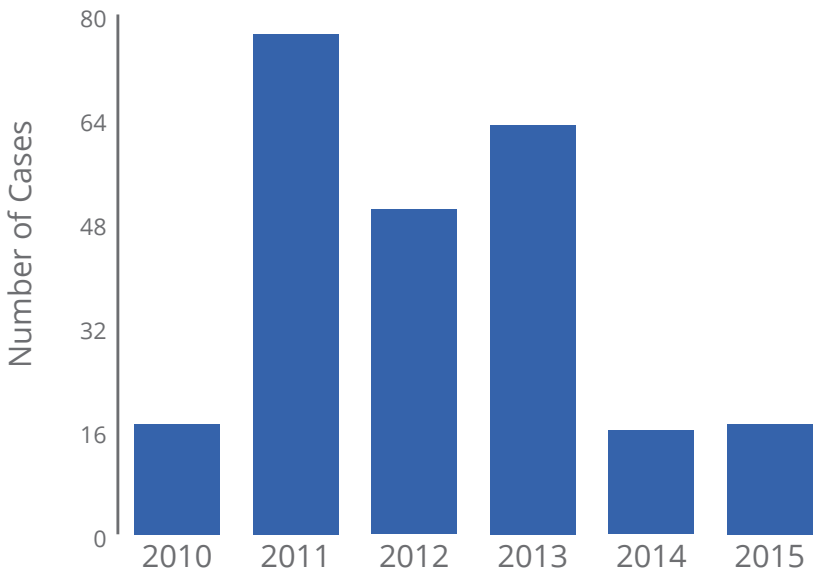
In Arizona, the tick vector responsible for spreading RMSF is *Rhipacephalus sanguineus*, or the brown dog tick.



Until the early 2000's, RMSF was not frequently reported in Arizona. To date, however, over 350 human cases and 21 deaths have been associated with RMSF in Arizona, with the vast majority of cases occurring on American Indian reservations.

From **2011–2013**, Arizona experienced an **epidemic of RMSF on several tribal reservations**, thereby mainly affecting counties with a greater proportion of American Indian populations (Gila, Navajo, Apache and Pima). The increase during these years can be explained by several factors, including implementation of an RMSF clinical algorithm, educational trainings to clinicians, extensive case-finding activities, and increased reporting of RMSF results by laboratories. For more details on RMSF history and activities, see the RMSF section of the 2008–2013 Infectious Disease Epidemiology Report.

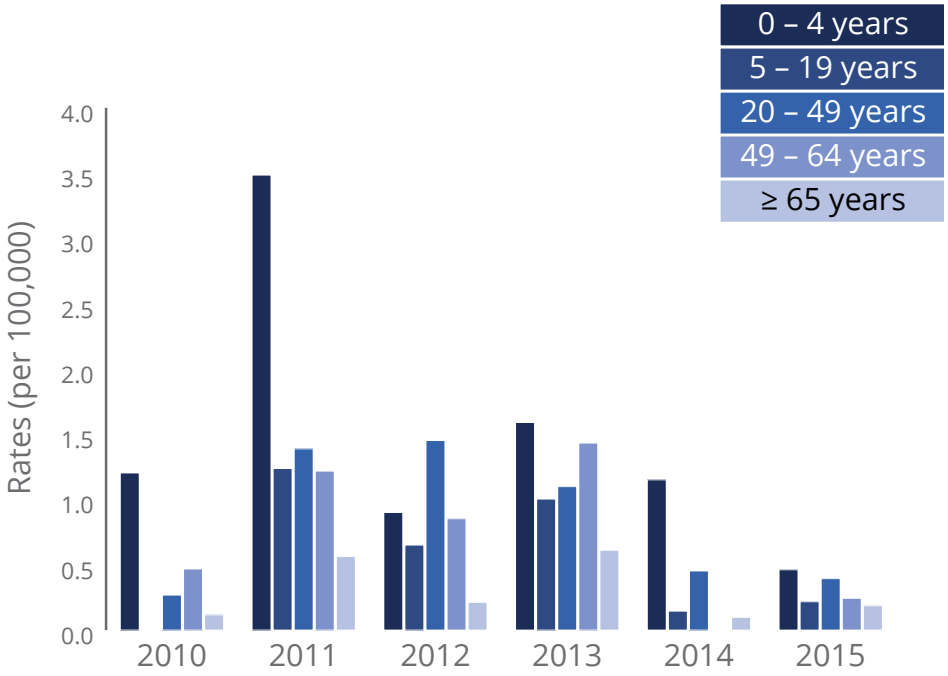
In 2014, lower numbers of RMSF cases were reported, likely due to the prevention activities carried out during 2011–2013.



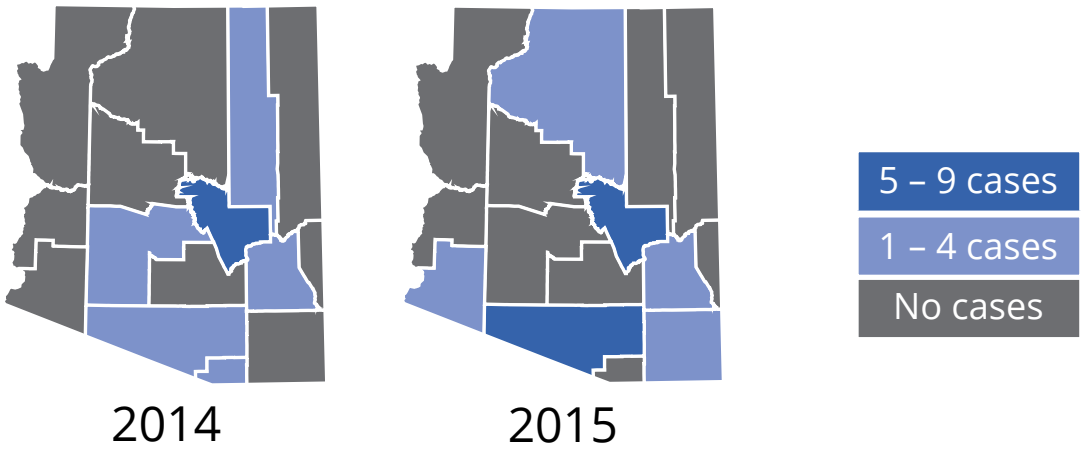
Due to the public health threat of RMSF, tribal, local, state, and federal partners began collaborative discussions on prevention actions to reduce the burden of RMSF in Arizona. These prevention activities were centered upon **community education, regular application of environmental pesticides to homes, and placement of long-lasting tick control products** (such as tick collars) on dogs to reduce the brown dog tick populations. The tick that spreads RMSF is easily carried to new areas on reservations by **free-roaming dogs**; therefore, resources to improve animal control and spay and neuter services are critical.

These efforts have been paramount in reducing the burden of RMSF human cases in impacted areas, as well as reducing the risk of potential spread of RMSF to new regions.

Higher rates of RMSF during the epidemic in Arizona occurred in **children under the age of 19 years**. It is hypothesized that children spend a significantly greater amount of time playing with dogs (which play a role in dispersal of ticks throughout tribal communities) around their homes. Therefore, this demographic feature may likely be correlated with the peridomestic nature of exposure to the tick vector. Individuals of all ages are at risk.



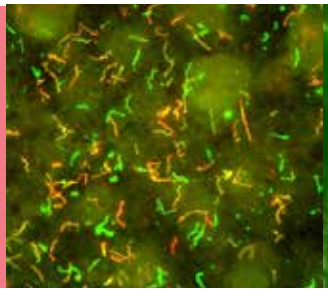
Although RMSF cases have decreased statewide, **two American Indian reservations continue to be highly impacted** (affecting case counts for Gila and Pima Counties).



Lyme Disease

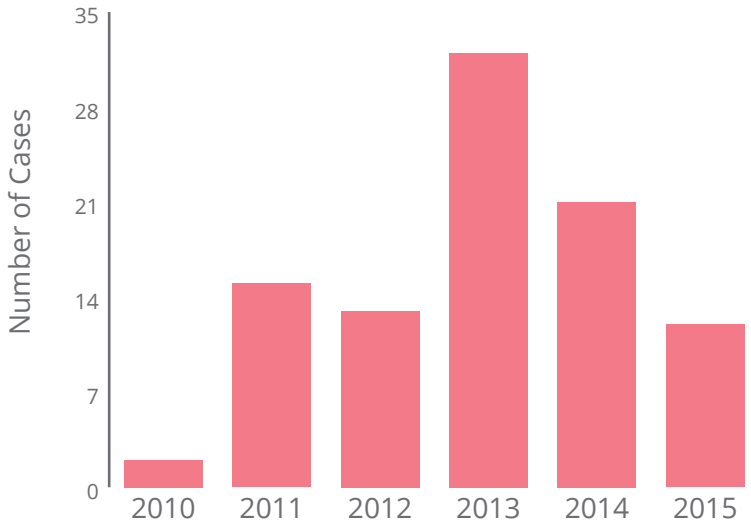
Lyme disease is caused by the bacterium ***Borrelia burgdorferi*** and spread by **blacklegged ticks**. This disease is considered endemic in and frequently reported from the northeast and upper midwestern states, as well as along the northern part of the west coast. This is largely due to the geographic distribution of the tick species.

The hallmark symptom of Lyme disease is the bulls-eye rash that develops at the site of the tick bite, along with severe and sometimes long-lasting joint pain.



In Arizona, the ticks that spread Lyme disease have historically been found in a very limited region of the state, specifically the remote northern peaks of the Hualapai Mountains. Most cases reported in Arizona are in residents known to have **traveled to Lyme-endemic areas** in other parts of the U.S. Overall, Lyme disease is considered a low-burden disease for Arizona.

The number of Lyme disease cases has continued to vary over the past six years. The **decrease** in Lyme disease cases among Arizona residents in **2014 and 2015** has also been reported in non-endemic states bordering Arizona.

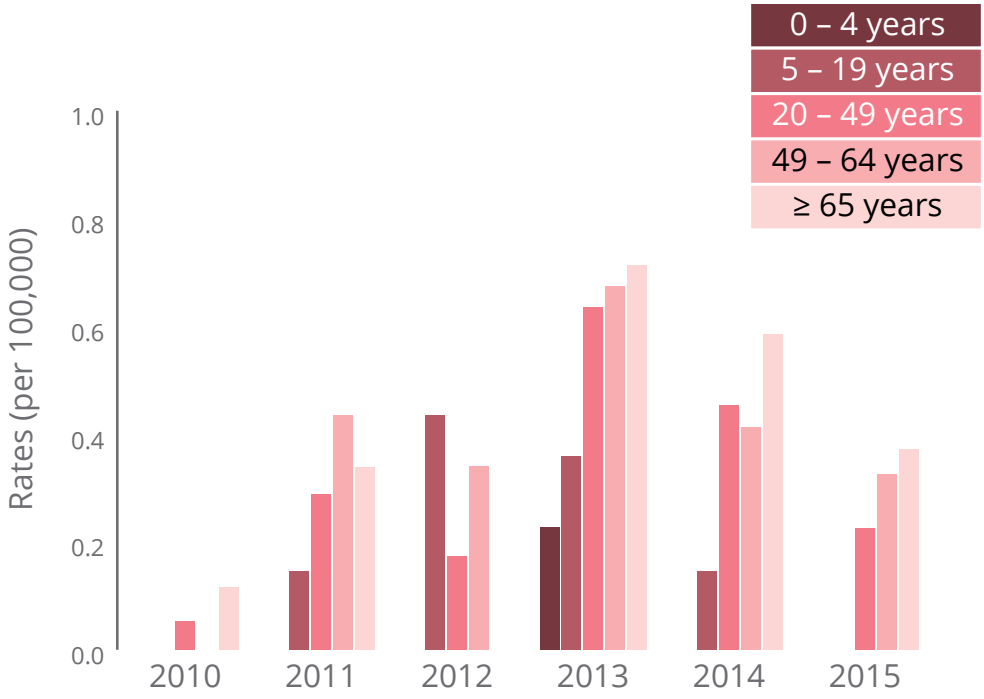


The national incidence rate for Lyme disease in the U.S., according to CDC published data*, has declined slightly, from 8.6 per 100,000 in 2013 to 7.9 per 100,000 in 2014. There are various factors that may explain these trends, including environmental changes influencing tick populations and increased or decreased recreational activities where tick habitats occur.

For surveillance of Lyme disease in Arizona, travel and exposure history, as well as laboratory and clinical evidence, are taken into consideration for case investigation and classification. Prior to 2013, **known travel or exposure** was required in order to classify a case of Lyme disease. This requirement **changed in 2013, which may account for the increase in cases that year**, if some cases would might have otherwise been ruled out.

*Lyme disease incidence rates by state, 2006-2016 available from https://www.cdc.gov/lyme/stats/tables.html

Lyme disease cases in Arizona are predominantly among **middle-age, white non-Hispanic persons**. This contrasts with other tick-borne diseases, such RMSF, which affects mainly children.



Tick-borne Relapsing Fever (TBRF)

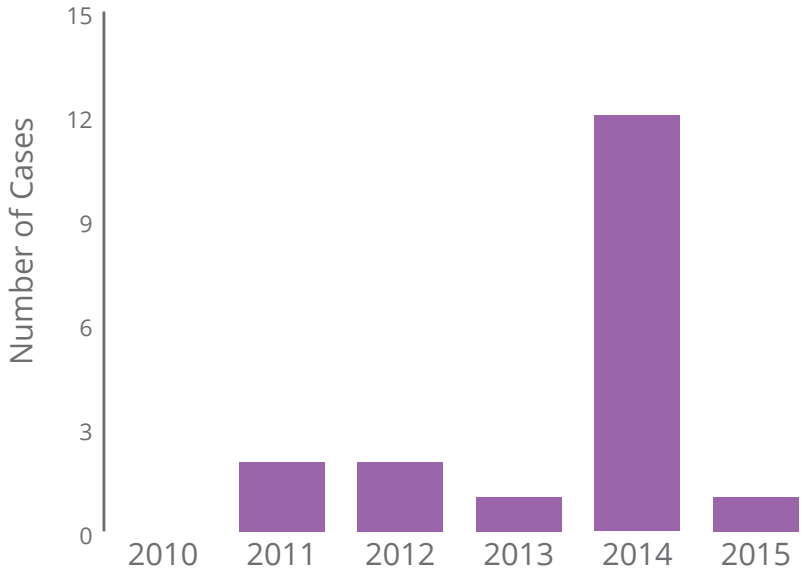
Tick-borne relapsing fever (TBRF) differs from other tick-borne diseases as it is spread by **soft ticks of the *Ornithodoros* genus** rather than hard ticks. The soft ticks live in rodent nests and burrows, frequently of chipmunks and squirrels. Unlike hard ticks that imbed in the host, soft ticks feed briefly (up to 30 minutes) and typically at night, so most people are unaware they have been bitten.

Soft ticks live in rodent nests and burrows, frequently of chipmunks and squirrels.

Several different ***Borrelia*** species bacteria can cause TBRF, and each is usually associated with a specific species of ticks. Common *Borrelia* species include ***B. hermsii*, *B. parkerii*, and *B. turicata***. These bacteria are spirochetes that can be seen on blood smears of infected individuals. TBRF causes recurring episodes of fever, body aches, and nausea. The disease is most commonly associated with **rodent-infested environments**, specifically cabins in mountainous areas.

TBRF is a fairly rare disease in Arizona and has been identified only sporadically over the past several years, with the exception of **2014**, when an **outbreak of the disease occurred in high school students attending a camp at a cabin in Northern Arizona**.

The students engaged in a variety of activities and slept in a loft area of the cabin that could have led to exposure of the soft ticks, and therefore, TBRF. Cases were also identified in adult staff overseeing activities. Exposure to the soft ticks likely occurred due to the lack of tick control efforts around the cabin, despite the rodent-proofing activities conducted by the cabin owners.



Chikungunya

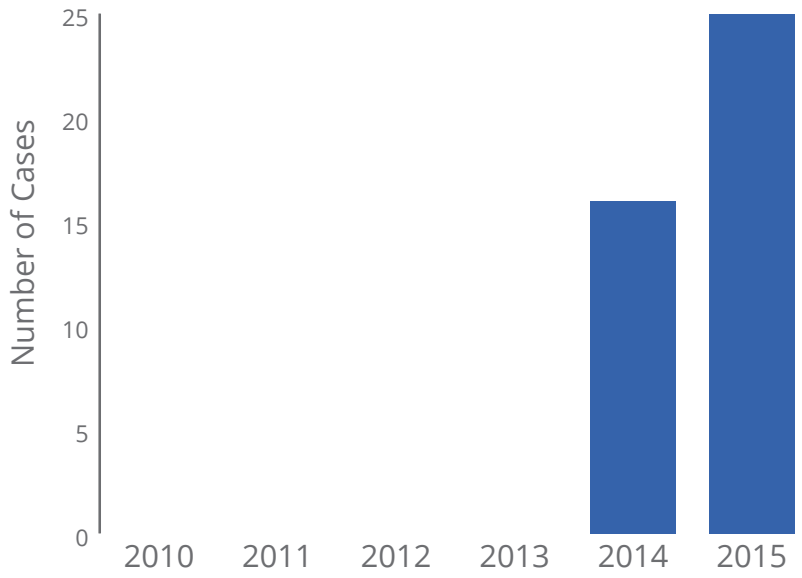
Chikungunya is an Alphavirus in the Togaviridae family that is transmitted by mosquitoes. Primary mosquito vectors include ***Aedes aegypti*** and ***Aedes albopictus***, the same mosquitoes which transmit dengue and Zika virus. The first local transmission of chikungunya in the Western Hemisphere was identified in the Caribbean in 2013[1]. Since then, chikungunya has continued to spread and local transmission has been identified in 45 counties and territories in the Americas[1].

The first travel-associated cases of chikungunya in Arizona were identified in 2014.

To date, Arizona has experienced only **sporadic, travel-associated cases**, meaning that the disease was acquired outside the state. There is risk of importation of chikungunya into Arizona given the presence of a competent vector (*Aedes aegypti*) and human travel from areas of endemic transmission. Most infected individuals (>70%) will develop symptoms, which typically present as high fever and severe joint pain. Fatalities are extremely rare, but morbidity due to join paint and swelling can be severe and long-lasting.

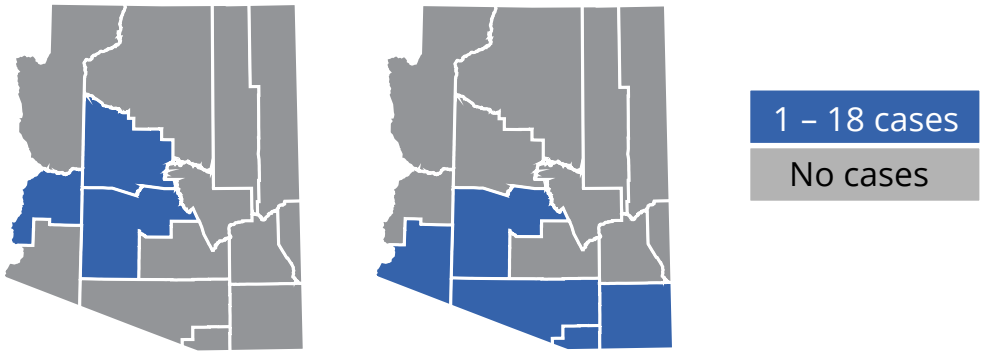
[1] Chikungunya: Geographic Distribution [Internet]. Centers for Disease Control and Prevention 2016May12 [cited 2017May17]. Available from: https://www.cdc.gov/chikungunya/geo/index.html

The first cases of chikungunya in Arizona were identified in 2014. **The number of cases increased 56% between 2014 and 2015.** In both years, only travel-associated cases were reported in Arizona.



In Arizona, higher rates of chikungunya infection are observed among the population **5–19 years of age** and among the **Hispanic or Latino** population. This is likely due to increased travel to areas of endemic chikungunya transmission among those populations.

Chikungunya has been identified in residents of only a few Arizona counties. In 2015, the counties with higher rates were clustered in the **southern parts of the state**. This is not unexpected given that Mexico experienced local transmission of chikungunya virus beginning in late 2014[2], and individuals living in border counties may have more frequent exposure to areas of endemic chikungunya transmission. In 2015, 88% of cases reported travel to Mexico or Central America; 36% of cases reported travel specifically to Mexico.



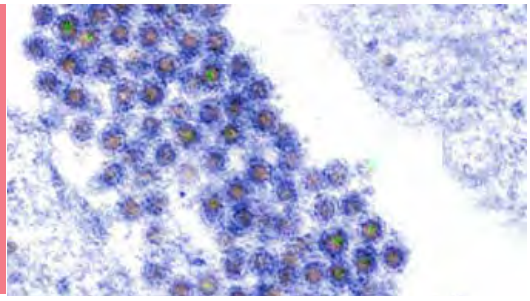
[2] Chikungunya: Geographic Distribution [Internet]. Centers for Disease Control and Prevention 2016May12 [cited 2017May17]. Available from: https://www.cdc.gov/chikungunya/geo/index.html

Dengue

Dengue is a flavivirus in the Flaviviridae family that is transmitted by mosquitoes. Primary mosquito vectors include ***Aedes aegypti*** and ***Aedes albopictus***, the same mosquitoes which transmit chikungunya and Zika virus. Dengue experienced a **30-fold increase in worldwide incidence between 2000 and 2010**; this increase was seen both in endemic countries as well as emergence in new countries and regions.

There are four distinct serotypes of the dengue virus. Patients acquire immunity to a specific serotype following infection; however, upon a subsequent infection with a different serotype, severe illness can occur, including shock and hemorrhagic disease. Common symptoms of dengue include fever accompanied by facial flushing, rash, muscle and/or joint pain, and headache. Severe dengue can present with shock, severe bleeding, and/or severe organ involvement.

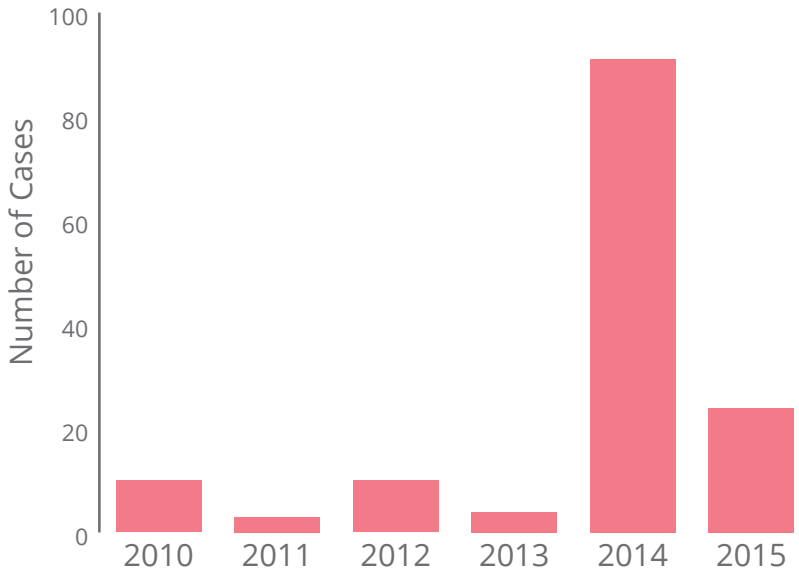
In 2014, Arizona experienced a binational dengue outbreak with 70 travel-associated cases reported among residents of Yuma, AZ.



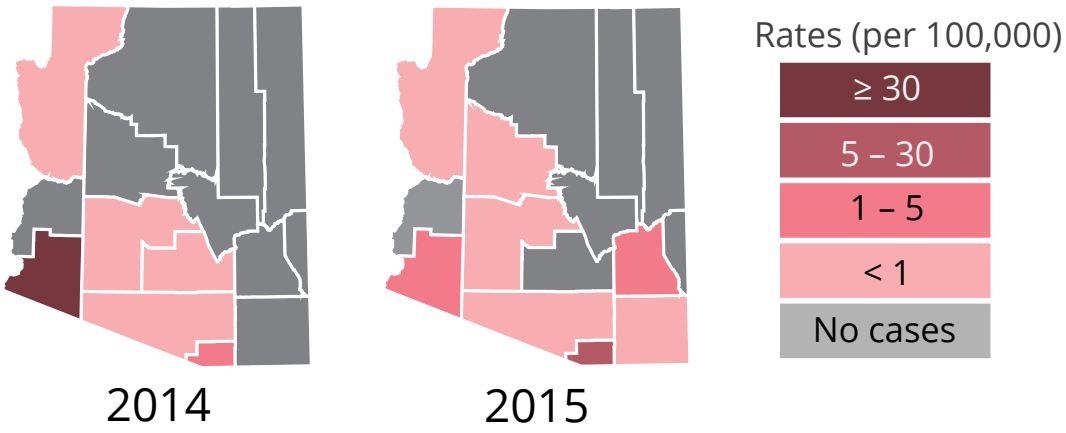
During 2014, over 3,600 locally-acquired cases of dengue were reported in Sonora, Mexico, near the Arizona border region. Between September and December **2014**, this area experienced a **binational outbreak**, with 52 locally acquired cases detected in San Luis Rio Colorado, Sonora, and **70 travel-associated cases reported in Yuma, Arizona**[1]. During 2014, a total of 91 cases were reported in Arizona; all were travel-associated.

[1] Jones JM, Lopez B, L A, 2016. Binational Dengue Outbreak Along the United States–Mexico Border — Yuma County, Arizona, and Sonora, Mexico, 2014. MMWR Morbidity and Mortality Weekly Report 495-499.

In general, higher rates of dengue are seen among **Asian/Pacific Island and Hispanic or Latino** populations and among **older age groups**.



Dengue cases were mainly clustered in the **southern portions of the state** in 2014 and 2015. This is especially evident during the 2014 outbreak.



Saint Louis Encephalitis

St. Louis encephalitis virus (SLEV) is a flavivirus in the Flaviviridae family transmitted by ***Culex* spp.** mosquitoes, which also transmit West Nile virus. SLEV is found in North and Central America but is most commonly reported in the United States. Periodic outbreaks have occurred primarily in the Mississippi Valley and along the Gulf Coast.

Wild birds are the primary vertebrate hosts of the virus; humans and domestic mammals can acquire infection but are dead-end hosts and do not commonly transmit the virus to other mammals.

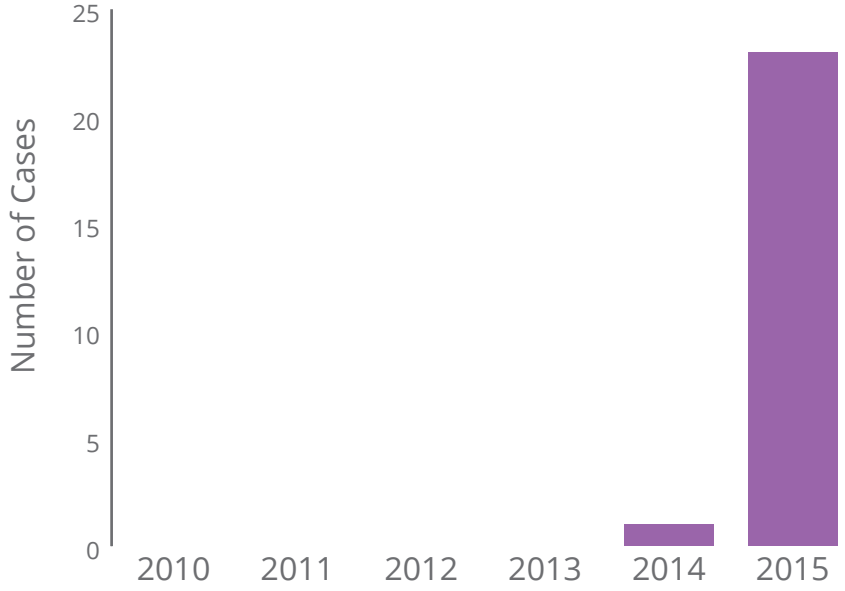
Most individuals infected with SLEV will not experience symptoms or will experience only mild, non-specific symptoms, such as fever, headache, or tiredness. A small percentage of individuals will experience central nervous system infections and **5–15% of SLEV infections result in death**.

In 2015, Arizona experienced a concurrent outbreak of SLEV and West Nile virus[1]. This was the first known outbreak of concurrent WNV and SLEV disease.

In Arizona, SLEV infections have been reported since the 1960s but from 2007 through 2013 no cases were identified. In 2015, Arizona experienced a concurrent outbreak of SLEV and West Nile virus[1].

[1] Venkat H, Krow-Lucal E, Hennessey M, Jones J, Adams L, Fischer M, Sylvester T, Levy C, Smith K, Plante L, Komatsu K, Staples E, Hills S. Notes from the Field: Concurrent Outbreaks of St. Louis Encephalitis Virus and West Nile Virus Disease—Arizona, 2015. Morbidity and Mortality Weekly Report 2015Dec11 64(48);1349-50 [cited 2017May18]. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6448a5.htm

Among the SLEV cases of the 2015 outbreak, 83% had neuroinvasive disease, with 50% presenting with encephalitis or meningoencephalitis. There were two fatalities. The outbreak primarily affected males, individuals 65 years of age and older, and non-Hispanic Black and non-Hispanic White populations. Nearly all cases occurred in residents of Maricopa County, with one case in a Cochise County resident.



One case of **possible SLEV transmission through blood product transfusion** was observed during the outbreak; transfusion transmission of SLEV had not previously been reported[2].

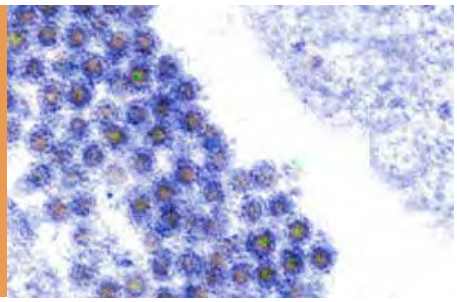
[2.] Venkat H, Sunenshine R, Levy C, Kafenbaum T, Sylvester T, Adams L, Smith K, Townsend J, Dossmann M, Kamel H, Patron R, Huskey J, Khamash H, Krow-Lucal E, Rabes I. Possible Transmission of St. Louis Encephalitis Virus Through Blood Transfusion—Arizona, 2015. Open Forum Infectious Diseases 2016(3) (suppl_1):1430 [cited 2017May18]. Available from: https://academic.oup.com/ofid/article/2635770/Possible

West Nile virus

West Nile virus (WNV) is a flavivirus transmitted by mosquitoes. It is found all over the world, but is diagnosed most frequently in the United States and Canada.

Arizona has a particularly high number of West Nile virus cases reported, and a high case-fatality rate among reported cases. Most infections (**80-90%**) are **sub-clinical**, but the rest (**10-20%**) can be quite severe. More severe disease manifestations can include **encephalitis and meningitis**. Because most infections are mild or subclinical, the numbers of cases reported are considered an underestimate of the number of infections in the state. In general, approximately 68% of Arizona WNV cases present with neuroinvasive disease, and fatal outcomes are observed in approximately 8% of cases.

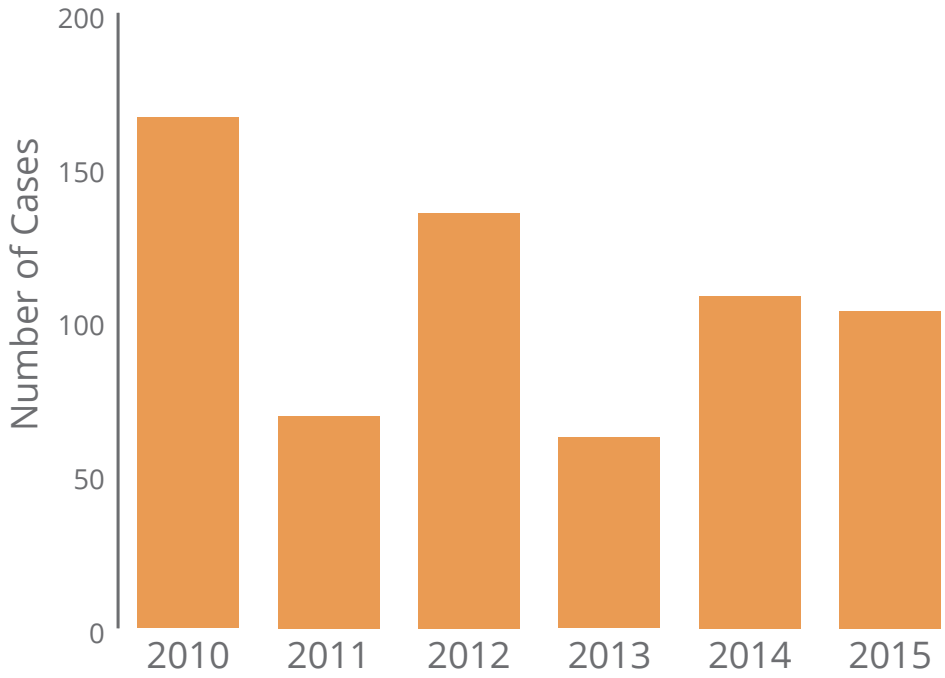
In 2015, Arizona experienced a concurrent outbreak of SLEV and West Nile virus[1]. This was the first known outbreak of concurrent WNV and SLEV disease.



Populations at risk for more severe disease include **elderly** persons and those with comorbid medical conditions. Arizona's at-risk populations are relatively high in number, which may account for the large number of cases identified and diagnosed in the state.

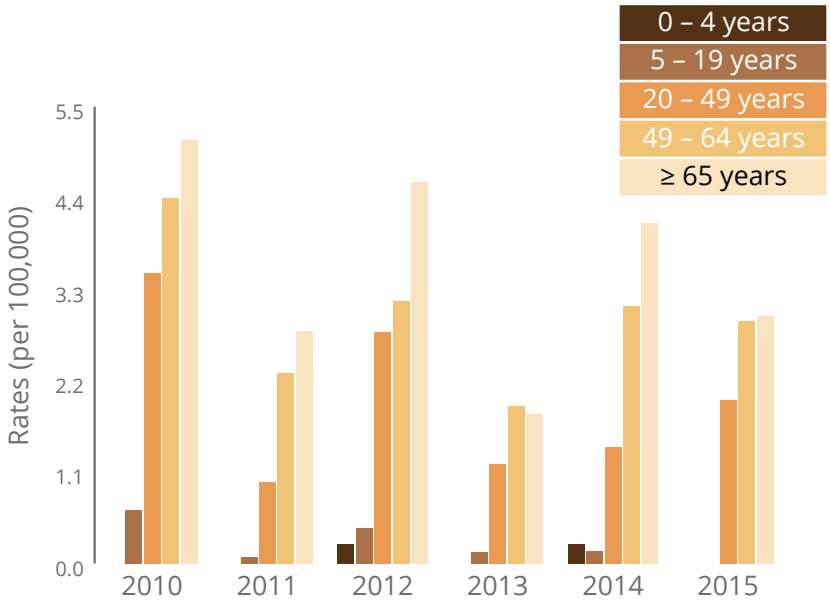
[1] Venkat H, Krow-Lucal E, Hennessey M, Jones J, Adams L, Fischer M, Sylvester T, Levy C, Smith K, Plante L, Komatsu K, Staples E, Hills S. Notes from the Field: Concurrent Outbreaks of St. Louis Encephalitis Virus and West Nile Virus Disease—Arizona, 2015. Morbidity and Mortality Weekly Report 2015Dec11 64(48);1349-50 [cited 2017May18]. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6448a5.htm

WNV shows a **cyclical trend**, alternating between high case count and low case count years. Specifically, outbreaks occurred in 2010, 2012, 2014 and 2015, with the highest number of cases during this period (166) reported in **2010**. Unusually, 2015 did not follow this pattern and roughly the same number of cases was observed as in 2014. The 2015 outbreak of WNV was associated with a concurrent outbreak of St. Louis encephalitis virus[1].

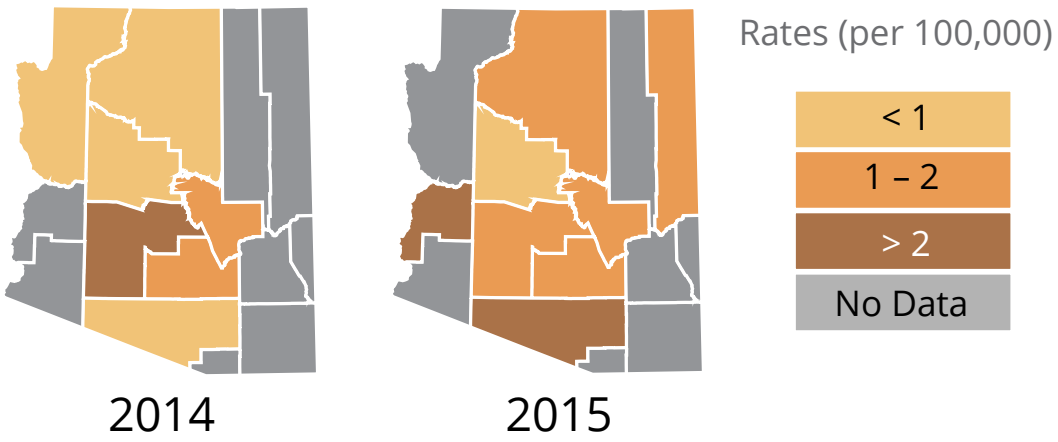


In 2010 and 2015, Native American populations had increased rates of WNV infection; the rate of disease among this population was especially high during the 2010 outbreak. Non-Hispanic White populations also had high disease rates throughout this period.

On average, slightly over half of WNV disease cases occur among males (56% during 2010–2015) and over 60% occur in individuals **50 years of age and older**. The increase in WNV disease among older individuals may be due more severe disease among this group, and thus increased diagnosis and reporting.



In general, approximately **70% of identified WNV cases occur in Maricopa County**, 15% in Pima County, and 5% of cases in Pinal County. Other cases occur sporadically throughout the state. Given the population distribution across Arizona, the rates of WNV across counties may be misleading for small counties; La Paz County had only one case of WNV in 2015, for example, despite the relatively high incidence rate in that county.



Malaria

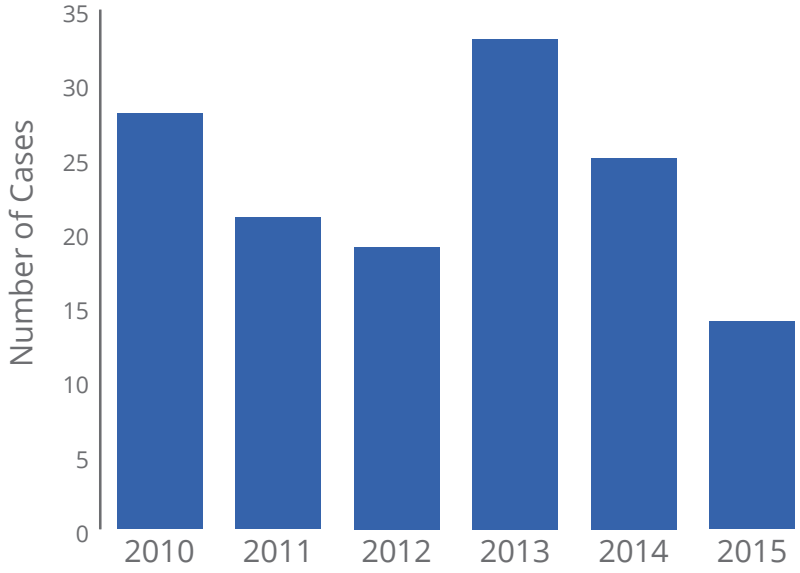
Malaria is a mosquito-borne disease endemic to most of sub-Saharan Africa, South America, Southeast Asia and the Pacific Islands, as well as India, parts of the Middle East, and parts of Central America.

Malaria is not endemic in the U.S., and no locally-acquired malaria cases have occurred in Arizona.

Arizona does not have any local malaria transmission; however, **travel-associated cases are reported every year**. These cases are typically found in populations who previously lived abroad and have since immigrated to Arizona, or in persons living in Arizona who travel to malaria-endemic countries and return to Arizona. Because cases are counted based on their location of residence at the time they are diagnosed, rather than where the disease was acquired, people living in Arizona who are diagnosed with travel-associated malaria are counted as Arizona cases.

The number of malaria cases fluctuates each year, with a six-year median for 2010–2015 of 21 cases. **The number of cases reported in 2014 and 2015 was lower than the peak year of 2013**. Malaria is not endemic in Arizona, and all cases were associated with travel or residence in malaria-endemic countries.

Slightly more than half (**56%**) of malaria cases during 2010–2015 were caused by ***Plasmodium falciparum*** and **28%** by ***P. vivax***. This is not unexpected as *P. falciparum* and *P. vivax* are the most common species worldwide[1]; *P. falciparum* can also cause more severe diseases, which may result in increased diagnosis and reporting of cases[1].



Overall, higher malaria rates were observed among persons **20–49 years of age** and among non-Hispanic Black and Asian/Pacific Island populations. This might be due to higher rates of travel to or immigration from malaria-endemic areas among these race-ethnicities.

In general, malaria cases are not associated with any particular counties in Arizona, as they reflect sporadic traveling to or immigration from malaria-endemic countries.

[1] Rietveld AEC, Newman RD. Malaria. In: Heymann DL, editor. Control of communicable diseases manual 20th ed. Washington, DC: American Public Health Association; 2015. p. 372-389.

Animal Rabies

Rabies is a preventable viral disease of mammals most often transmitted through the bite of a rabid animal. The vast majority of animal rabies cases reported to the Arizona Department of Health Services each year occur in wild, rather than domestic, animals. While all mammals are susceptible to infection, only a few different animals actually serve as reservoirs of the disease. These animals are capable of maintaining the virus in an endemic or enzootic cycle as well as experiencing occasional outbreaks or epizootics.

Bats, skunks and foxes are the primary reservoirs for the virus in Arizona and are the most commonly reported rabid animals each year. Two **non-reservoir animals** that also frequently test positive for rabies are **bobcats and coyotes**.

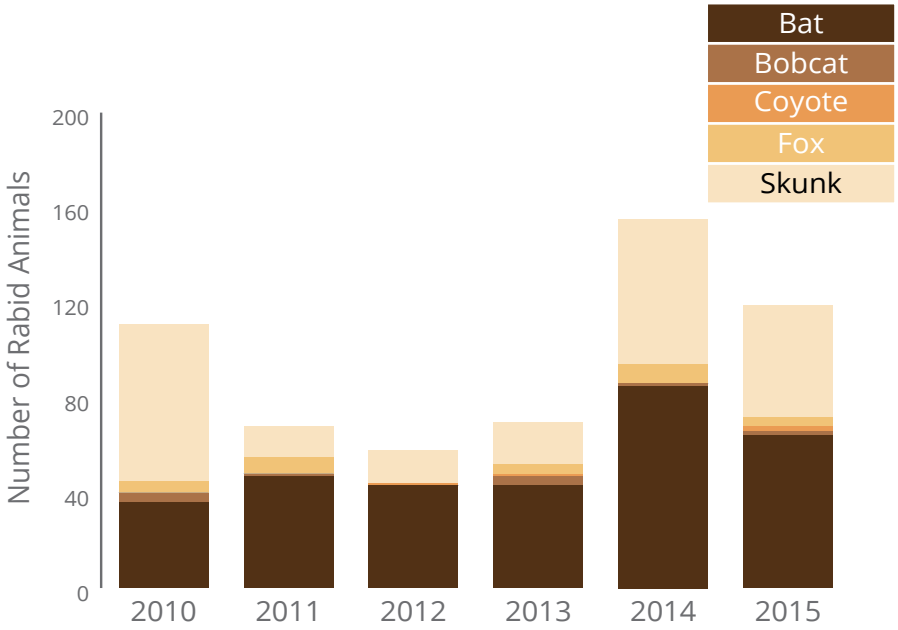
Bats, skunks and foxes are the primary reservoirs for the rabies virus in Arizona.

Goals of wild and domestic animal rabies surveillance:

1. **Monitor** the circulation of rabies virus among animal species
2. Provide information for strategically implementing **rabies control measures among wildlife species** when warranted to reduce the threat of human exposure, and
3. **Test animals with known human exposures** to indicate whether post-exposure prophylaxis of the individual is recommended for the prevention of human rabies.

Animal rabies surveillance is based on diagnostic laboratory results from the Arizona State Public Health Laboratory (ASPHL) and the United States Department of Agriculture (USDA) Wildlife Services. ASPHL performs the direct fluorescent antibody test to establish a rabies diagnosis, while the USDA Wildlife Services laboratory performs the direct rapid immunohistochemical test (dRIT). Animals are submitted through an approval protocol by various state, county, municipal, tribal, federal, and private animal control and veterinary agencies. USDA surveillance is for specimens not involved in human or domestic animal exposures.

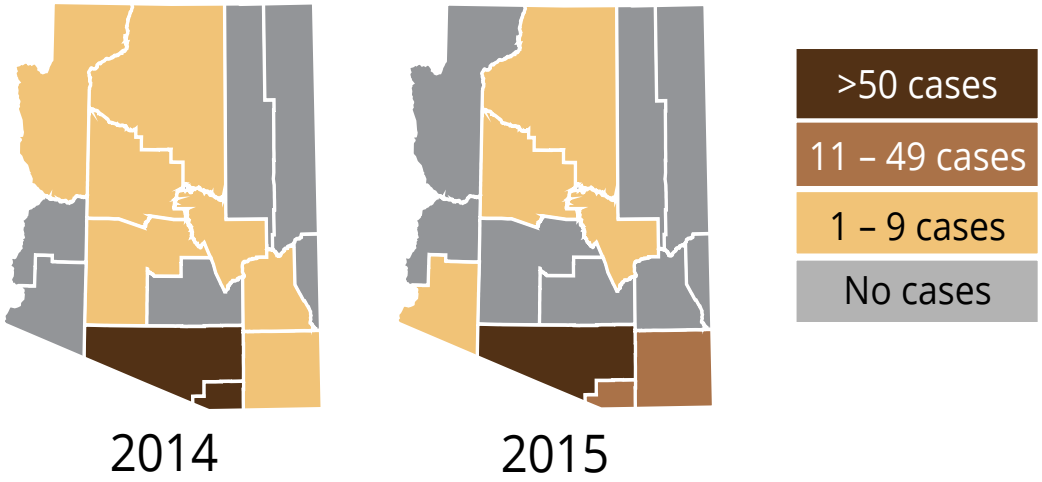
Between 2010 and 2015, 55% of the reported rabid animals in Arizona were bats.



Other positive animals included 1 coati, 4 javelinas, 1 ringtail, and 1 mountain lion.

Between 2010 and 2015, **588** animals tested positive for rabies. All were wild animals and the overwhelming majority (99%) represents just five types of animals: **bats, bobcats, coyotes, foxes, and skunks**. Bats and skunks are the most commonly reported rabid animals in Arizona (55% and 38%, respectively, for 2010–2015).

Most of the rabid animals were found in the **southern counties**. This distribution is mainly due to 1) the natural **enzootic** (naturally occurring) **rabies cycle in bats** in southern Arizona, especially Pima County (the Tucson area leads the state in the number of rabid bats each year) and, 2) two **epizootics** (outbreaks) of skunk rabies in southern Arizona.

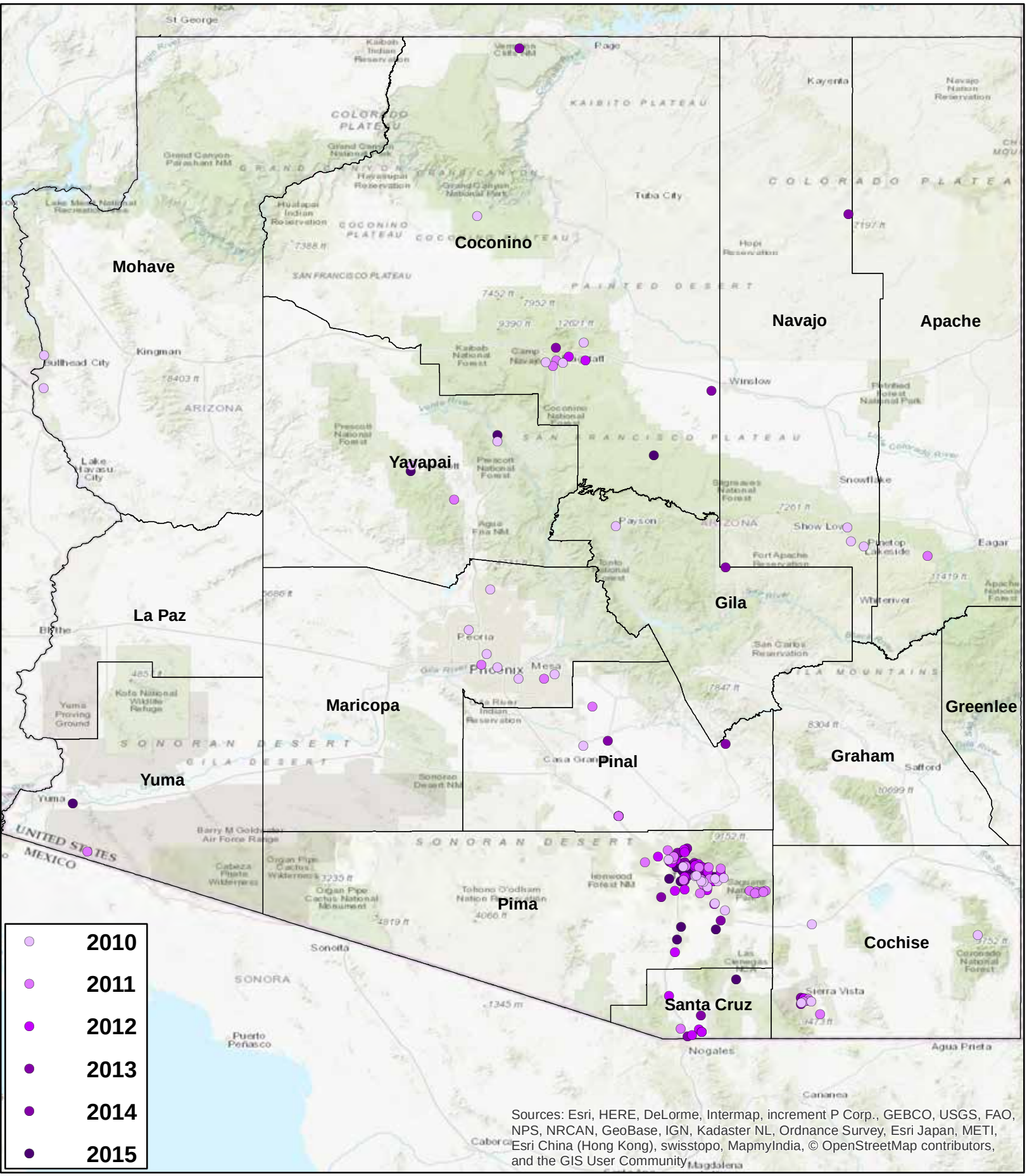


The first outbreak during 2010–2015 commenced in 2009 and continued until the end of 2010. A total of 62 skunks were reported from three southern Arizona counties: Cochise (16), Pima (13) and Santa Cruz (33). A second event, affecting the same counties, flared-up in the fall of **2013.** A total of 86 skunks were recorded during this period with **8 reported for Cochise County, 24 for Pima County and 54 for Santa Cruz County**. The outbreak remained active in 2016 and subsided in Pima and Santa Cruz Counties in 2017, but continued to affect skunk populations in Cochise County.

Rabies epizootics in Arizona's bat, fox, and skunk populations are not uncommon and pose a risk of "cross-over" infections in other wild animals as well as domestic pets and livestock. Humans too may be at a greater risk of encountering rabid animals while participating in outdoor activities in rural parts of the state. Fortunately, during the period 2010–2015, **no infections in domestic animals or humans were recorded**. The last documented human rabies death in Arizona was in 1981.

Maps showing each positive rabies animal for each year can be found on the next pages and on our website: http://www.azdhs.gov/preparedness/epidemiology-disease-control/rabies/#data-publications-maps.

Rabies Positive Bats, 2010-2015



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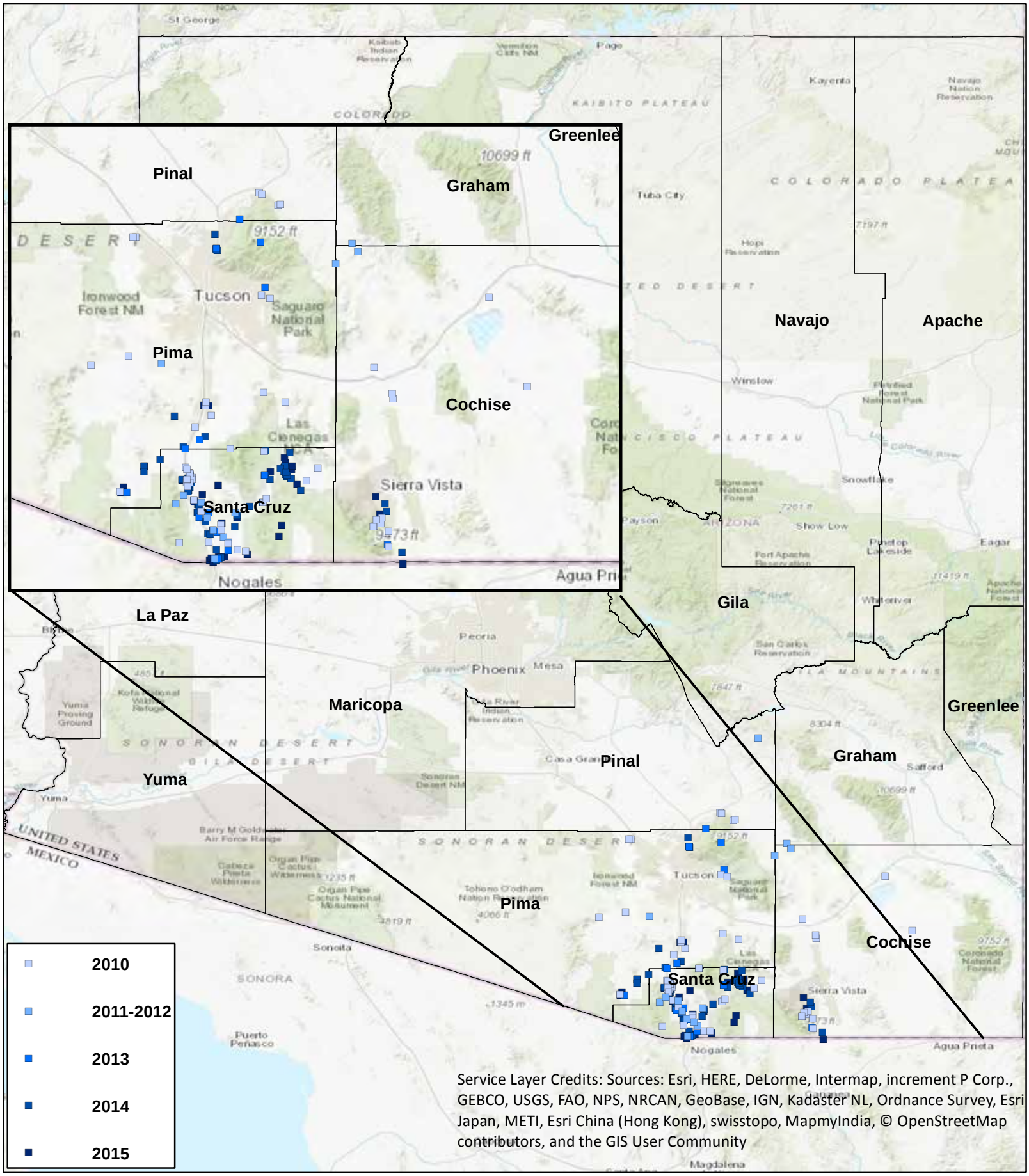
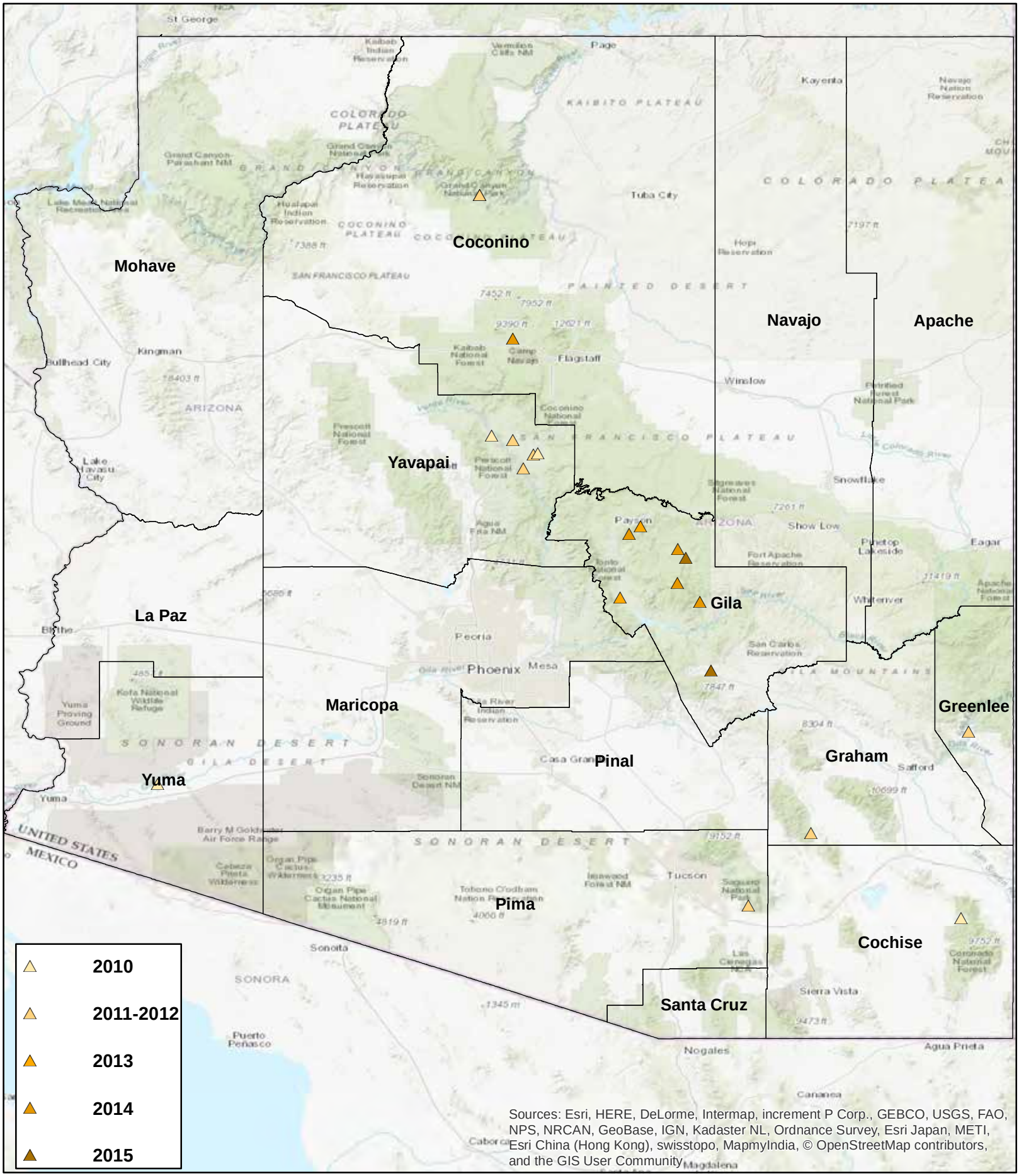
ARIZONA DEPARTMENT OF HEALTH SERVICES

Rabies Positive Skunks, 2010-2015



Rabies Positive Foxes, 2010-2015



ARIZONA DEPARTMENT OF HEALTH SERVICES

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We also wish to acknowledge the many staff at local health departments and ADHS who contributed to communicable disease surveillance and investigation efforts over this period, as well as all the laboratories and healthcare providers who have reported the case information discussed.

Appendix
Changes to Case Definitions, By Year

2015

Morbidity	Changes
Arboviral diseases	Chikungunya virus added to the list of arboviruses, and list of clinically compatible symptoms expanded.
Campylobacteriosis	Probable case definition modified to include illnesses with positive culture-independent diagnostic tests. The previously suspect cases now count as probable and the suspect case classification has been eliminated.
Cryptococcus	Standardized national case definition added, although cryptococcus is not explicitly reportable in Arizona at this time.
Dengue virus infections	Name changed from Dengue Fever to Dengue Virus Infections. Classifications changed from dengue fever, dengue hemorrhagic fever and dengue shock syndrome to dengue-like illness, dengue, or severe dengue. Modification of the laboratory criteria for confirmatory, probable and suspect testing.
***Haemophilus influenzae*, invasive disease**	Added detection by PCR to confirmed case definition; probable case definition modified to specify meningitis instead of clinically compatible.
Hantavirus	Non-pulmonary syndrome hantaviral infections added as a subcategory of hantavirus infections. The clinical case definition adjusted so that all febrile, laboratory-confirmed hantaviral infections are counted as cases, regardless of the presence or absence of pulmonary symptoms.
Meningococcal invasive disease	PCR of normally sterile sites specimen moved from a presumptive to confirmatory test.
Norovirus	Deleted “approved” from “approved reference laboratory” in the laboratory criteria.
Toxic shock syndrome (TSS)	Streptococcal and non-Streptococcal TSS split into separate definitions (format change only).

2014

Morbidity	Changes
Arboviral diseases	Clinical criteria revised to accept subjective fever or chills in place of measured temperature; modification of laboratory criteria.
Enterohemorrhagic *Escherichia coli* (Shiga toxin-producing *E. coli* (STEC))	Modifications to the supportive laboratory results.
Hepatitis E	Confirmatory and supportive laboratory criteria were modified; probable case definition added; modifications capture cases for which no clinical specimen is available for testing at CDC, but risk factors and clinical symptoms are compatible with acute HEV infection.
Malaria	Modifications to the laboratory criteria to include the determination of the parasite species and the quantification of the parasitemia; confirmed case definition changed to include detection of unspeciated parasite.
Norovirus	Addition of suspect case definition to capture epi-linked/ outbreak cases without laboratory testing available.
Pertussis	Apnea added to list of case-defining clinical signs and symptoms for infants; probable classification modified to allow PCR positive or epi-linked cases occurring among infants with cough of any duration and at least one other clinical symptom.
Streptococcal Group A, invasive disease	Removed “clinically compatible” from confirmed definition.
***Streptococcus pneumoniae*, invasive disease**	Suspect case definition added; slight rewording of confirmed case definition.
Trichinellosis (Trichinosis)	Laboratory criteria modified to include identification of the parasite in food as a laboratory criterion for diagnosis; suspected and probable case definitions were added; comments modified to include definition of epidemiologically implicated meals and meat products and criteria to distinguish between new and existing cases.

Links to posted OIDS Statistics

Links to extensive disease statistics for 2010–2015 from the ADHS Office of Infectious Disease Services can be found online at https://www.azdhs.gov/preparedness/epidemiology-disease-control/index.php#data-stats.

Links to OIDS Publications

Publications in peer-reviewed journals and the CDC's MMWR involving authors from the ADHS Office of Infectious Disease Services can be found at https://www.azdhs.gov/preparedness/epidemiology-disease-control/index.php#data-publications.

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