

Communicable Disease Report

2016

Davis County Health Department
Communicable Disease & Epidemiology Division



Acknowledgments

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Executive Summary

This annual communicable disease surveillance report summarizes all communicable diseases reported in Davis County in 2016. It provides a baseline picture of the disease burden in Davis County and describes trends and highlights of those diseases that had the greatest impact on the health and well-being of our community. Unusual disease occurrences are also discussed.

The most notable disease event in 2016 was the investigation of a Zika virus case where the mode of transmission could not be established. In February 2016, the World Health Organization declared Zika virus infections an “international emergency.” In anticipation of Zika virus moving into the United States and Utah, Davis County Health Department (DCHD) began preparing, training, and developing plans to address this new and emerging disease. In July 2016, DCHD was notified of a Davis County resident with symptoms consistent with Zika virus, who was also a close contact to a Salt Lake County resident that was confirmed with Zika virus and had passed away. The Salt Lake County case had acquired the infection while traveling out of the country and had known exposure to mosquitoes. DCHD coordinated additional laboratory testing that confirmed the presence of Zika virus in the Davis County case. DCHD interviewed the case several times and could not identify an expected mode of transmission, making this a national public health concern. This was the first case to have developed the disease through means other than the expected routes (travel to areas with ongoing Zika virus transmission, sexual contact with a person who recently traveled, or receipt of a blood transfusion/organ transplant). An in-depth investigation ensued. A Centers for Disease Control and Prevention (CDC) response team was deployed to Utah to assist in a multifaceted investigation. Local health departments worked to identify all household and other close contacts and coordinated testing. No other contacts were found to be infected. Local mosquito abatement trapped and tested mosquitoes in areas surrounding both cases’ homes in Salt Lake County and Davis County. These efforts confirmed that the known mosquitoes to transmit this infection (*Aedes aegypti* or *Aedes albopictus*) were not in the area and none of the other trapped mosquitoes were carrying the virus. Healthcare workers from the facility where the Salt Lake County resident died were also tested as well as community members surrounding the cases’ residences. This yielded no additional cases. The Davis County case recovered without problem and the investigation concluded, although no route of transmission was identified. Public health officials and healthcare professionals continue to study this unique situation for new information regarding potential routes of exposure.

1. As with previous years, cases of gonorrhea were reported at an increased rate. In 2016, 129 cases were reported, as compared to the 87 reported in the previous year. This accounts for a 48% increase in Davis County. The increase in gonorrhea is also evident throughout Utah. Those interviewed were found to have similar risk factors as seen in past years – men who have sex with men (MSM), multiple sexual partners, anonymous sexual partners, incarceration, and substance abuse. In Davis County, the burden of disease has been impacting a younger age group who identify themselves as heterosexual. Gonorrhea tends to have more notable symptoms than chlamydial infections; however, in 2016, investigations noted that more individuals are reporting no symptoms at time of diagnosis.
2. A hantavirus pulmonary syndrome (HPS) death was identified and investigated in 2016. This is the first confirmed HPS case in Davis County. The patient’s infection progressed from mild symptoms to death within one week. DCHD’s investigation of the case discovered that the infected individual owned and frequented a property site in Davis County where a homemade barn, miscellaneous building materials, and some cattle were kept. DCHD conducted an environmental assessment of the family home and found no evidence of

Executive Summary

rodents. However, the environmental assessment done on the family property revealed rodent droppings in the same area where the individual had been working prior to death. Household contacts were evaluated and monitored for two months – no additional cases were detected. Cases of HPS are rare in northern Utah, although a second HPS death occurred in Utah County shortly after the Davis County case. Both cases had exposure to rodent droppings prior to the development of symptoms.

3. The 2015-16 influenza season had a slow start, but as the season progressed, there was a rapid increase in cases during the months of February and March. Influenza A (H3), the anticipated seasonal strain, circulated in the community; however, influenza B also had a significant presence. A total of 110 hospitalized cases were reported during the 2015-16 season. The current season (2016-17) is underway and has had an earlier start, elevating in December 2016 - which places influenza as the third most reported illness in Davis County in 2016. Also in December, an outbreak of influenza A was reported in a long-term care (LTC) facility. In consultation with DCHD, the facility provided prophylaxis to all their residents and infection control measures were promptly initiated. The intervention was successful and no additional cases developed.
4. Two significant enteric outbreaks were identified in 2016. The first outbreak involved a youth group that attended a waterpark outside of Davis County. Nine attendees became sick with gastrointestinal symptoms within the same timeframe. DCHD conducted an investigation and coordinated laboratory testing which identified *cryptosporidium* as the causative agent. The neighboring local health jurisdiction collected water samples from the facility which were also positive for *cryptosporidium*. DCHD distributed a survey to all the attendees to help identify additional cases, but the return response rate was poor. However, the survey did help to identify at least three more individuals who were ill. The ages of those who were ill ranged from 13 to 40 years old and mainly affected men. All ill individuals recovered.
5. Another large gastrointestinal outbreak was identified in early December 2016 involving a LTC facility. Several residents reported having nausea, vomiting, and diarrhea. DCHD coordinated testing for several residents which returned with positive results for norovirus. Environmental Health inspected the facility and also provided cleaning instructions specific for norovirus. The facility underwent a deep clean and implemented other infection control measures. A total of 42 residents and 25 employees became ill. The facility was monitored for several days and no new cases were identified.
6. In the summer of 2016, a group of Japanese students, ranging from 7 to 13 years of age, traveled to Utah to attend a summer course put on by a private school in Davis County. Two Davis County families hosted the group while they were in Utah. One of the students developed symptoms consistent with mumps and was evaluated at a medical facility. The physician suspected mumps and ordered testing for confirmation. DCHD was notified and began investigating. The ill student was isolated until test results were available. Results were positive for mumps. All close contacts were evaluated for illness and immunity. Vaccination records were reviewed and those who were not appropriately immunized were quarantined. Blood testing was performed to establish immunity. Five of the students were deemed NOT IMMUNE and remained in quarantine. In consultation with CDC, approval was given to allow the students to travel home to Japan. Follow-up instructions were provided to all the parents. No additional cases were identified in the community.

Introduction

Davis County Health Department Communicable Disease and Epidemiology Division works in partnership with the medical community and neighboring health districts to control and prevent the occurrence and spread of communicable diseases. This is accomplished through disease surveillance, disease investigation, coordination of prevention efforts, treatment, education, training, and policy development. The Division aims to:

- Interrupt/contain the spread of communicable diseases within the community
- Conduct surveillance for >80 communicable disease/syndromes
- Provide education to infected/exposed citizens
- Facilitate appropriate treatment and preventive therapy
- Enforce measures that protect the community (e.g. isolation)
- Develop policies to address priority health issues



The Communicable Disease and Epidemiology Division (CD/Epi) is organized into four main program areas: STD/HIV, Tuberculosis Control, Infectious Disease, and Disease Surveillance.

STD/HIV Program

Sexually transmitted diseases (STDs) affect men and women of all ages, backgrounds, and economic status. The United States has made progress in identifying cases through better testing procedures, sexual partner testing/treatment, and risk-reduction education. There are still an estimated 20 million new cases of STDs acquired each year. Human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), chlamydia, gonorrhea, syphilis, and chancroid are the STDs reportable by law in the state of Utah. Hospitals, laboratories, physicians, and clinics are mandated to report these diseases to the local health department.

The STD/HIV Program strives to ensure that all reported infected individuals are interviewed by a trained communicable disease nurse to:

- Verify that appropriate treatment was prescribed and taken
- Confidentially identify and notify contacts/partners of infected individuals who may have been exposed and facilitate testing and treatment
- Provide risk-reduction counseling and education

Tuberculosis Control Program

The Davis County Tuberculosis (TB) Control Program is dedicated to the prevention, control, and elimination of TB disease and the identification and treatment of latent TB infection (LTBI).

The successful control of tuberculosis in Davis County is largely due to the following program activities:

- Early identification, isolation, and appropriate treatment of individuals suspected of or diagnosed with tuberculosis disease
- Effective contact investigation activities to identify individuals exposed to TB and completion of medication therapy for those diagnosed with LTBI
- Targeted testing for those who are at higher risk for developing TB disease following an exposure (e.g. homeless, foreign-born, residents of correctional institutions, substance abusers)

Introduction

Infectious Disease Program

Communicable diseases reportable in the state of Utah, with the exception of STDs and tuberculosis, fall under this program. Once reported, the Infectious Disease program implements the following activities:

- Interview infected individuals to obtain a thorough history and identify exposed contacts
- Review and interpret laboratory results
- Implement control measures to interrupt disease transmission (e.g. exclusion from work/school)
- Monitor the disease process, assessing for changes in expected manifestations
- Facilitate treatment and prophylaxis for those infected or exposed
- Provide education on the specific disease and important preventive measures
- Formalize findings and report to the Utah Department of Health (UDOH)

The Infectious Disease Program has been further divided into the following categories:

- **Enteric Diseases** (Food and/or Waterborne): bacterial, viral, and parasitic diseases involving the gastrointestinal tract
- **Vaccine-Preventable Diseases:** diseases that are preventable with vaccines
- **Vector/Zoonotic Diseases:** diseases transmitted by insects, animals, or birds
- **Invasive Diseases:** bacterial/viral infections of the blood stream, cerebral spinal fluid (e.g. meningitis, encephalitis) or other normally sterile sites (e.g. synovial, pleural, or pericardial fluid)
- **Other reportable diseases/conditions:** diseases that do not fall under the above categories

Disease Surveillance Program

The Surveillance Program is responsible for the systematic collection, analysis, and dissemination of data pertaining to infectious diseases of public health importance. The goal of the Surveillance program is to provide statistics that prompt public health preventive action. Core functions of the Surveillance program include:

- Providing medical professionals with access to disease reporting 24-hours a day/seven days a week
- Maintaining a computerized system for efficient storage and access to data
- Incorporating a variety of data sources including:
 - ◇ Notifiable disease reports
 - ◇ School absenteeism
 - ◇ Sentinel physician reports
 - ◇ Syndromic data
- Monitoring the occurrence and distribution of infectious disease activity
- Disseminating surveillance data to the public and medical professionals

Communicable diseases are reported to the local health department for investigation in accordance with the Utah State Health Code (R386-702). Prompt reporting of confirmed and suspect cases helps ensure necessary control and preventive actions. All reports required by rule are confidential and are not open to public inspection.

Entities required to report confirmed or suspected diseases are physicians, hospitals, healthcare facilities, laboratories, schools, and daycares. All case reports should include:

- Disease
- Patient's name
- Address
- Telephone number
- Date of birth
- Pertinent clinical information

REPORTABLE DISEASES

UTAH LAW REQUIRES THAT THE FOLLOWING DISEASES BE REPORTED TO YOUR LOCAL HEALTH DEPARTMENT OR THE UTAH DEPARTMENT OF HEALTH IMMEDIATELY.

Davis County Health Department Disease Reporting Line: (801) 525-5220

- **Anthrax*** (*Bacillus anthracis*)
- **Botulism*** (*Clostridium botulinum*)
- **Cholera** (*Vibrio cholerae*)
- **Creutzfeldt-Jakob disease** & other transmissible human spongiform encephalopathies
- **Diphtheria*** (*Corynebacterium diphtheria*)
- **Haemophilus influenzae*** (invasive disease)
- **Hepatitis A**
- **Measles*** (Rubeola virus)
- **Meningococcal disease*** (*Neisseria meningitidis*)
- **Plague*** (*Yersinia pestis*)
- **Poliomyelitis**, paralytic and non-paralytic
- **Rabies** (human and animal)
- **Rubella** (including congenital syndrome)
- **Severe Acute Respiratory Syndrome (SARS)**
- **Smallpox** (Variola virus)
- **Staphylococcus aureus***, from any clinical specimen with resistance (VRSA) or intermediate resistance (VISA) to vancomycin isolated from any site
- **Tuberculosis*** (*Mycobacterium tuberculosis*)
- **Tularemia*** (*Francisella tularensis*)
- **Typhoid**, cases and carriers
- **Viral hemorrhagic fevers**, e.g. *Ebola*, *Lassa*, *Marburg*, and *Nipah* virus-related illnesses
- **Yellow Fever**
- **Unusual Diseases or Outbreaks of any kind**

UTAH LAW REQUIRES THAT THE FOLLOWING DISEASES BE REPORTED TO YOUR LOCAL HEALTH DEPARTMENT OR THE UTAH DEPARTMENT OF HEALTH WITHIN 3 DAYS AFTER IDENTIFICATION.

Davis County Health Department Disease Reporting Line: (801) 525-5220

Or FAX (801) 525-5210

- **Acinetobacter species**, from any clinical specimen that is resistant to at least one carbapenem-class antibiotic, or that has demonstrated carbapenemase production
- **Acquired Immunodeficiency Syndrome (AIDS)**
- **Acute Flaccid Myelitis (AFM)**
- **Adverse event resulting after smallpox vaccination** (Vaccinia virus)
- **Anaplasma phagocytophilum** infection
- **Arbovirus infection***, including Chikungunya, St. Louis encephalitis and West Nile virus
- **Babesiosis** (*Babesia*)
- **Botulism, infant**
- **Brucellosis*** (*Brucella* species)
- **Campylobacteriosis*** (*Campylobacter*)
- **Chancroid** (*Haemophilus ducreyi*)
- **Chickenpox** (Varicella-zoster virus)
- **Chlamydia trachomatis** infection
- **Coccidioidomycosis** (*Coccidioides*)
- **Colorado tick fever**
- **Cryptosporidiosis** (*Cryptosporidium*)
- **Cyclospora** infection
- **Dengue fever**
- **Ehrlichia chaffeensis** infection
- **Ehrlichia ewingii** infection
- **Encephalitis**
- **Enterobacter species**, from any clinical specimen, that is resistant to at least one carbapenem-class antibiotic, or that has demonstrated carbapenemase production
- **Escherichia coli**, from any clinical specimen, that is resistant to at least one carbapenem-class antibiotic, or that has demonstrated carbapenemase production
- **Giardiasis** (*Giardia*)
- **Gonorrhea***, (*Neisseria gonorrhoeae*) sexually transmitted and ophthalmia neonatorum
- **Hansen's disease** (Leprosy)
- **Hantavirus pulmonary syndrome** (Sin Nombre virus)
- **Hemolytic Uremic Syndrome**, post-diarrheal
- **Hepatitis B**, acute, chronic and perinatal
- **Hepatitis C**
- **Hepatitis**, other viral
- **Human immunodeficiency virus (HIV) infection**
- **Influenza-associated hospitalization***
- **Influenza-associated death in a person less than 18 years of age**
- **Klebsiella species**, from any clinical specimen, that is resistant to at least one carbapenem-class antibiotic, or that has demonstrated carbapenemase production
- **Legionellosis*** (*Legionella*)
- **Leptospirosis** (*Leptospira*)
- **Listeriosis*** (*Listeria monocytogens*)
- **Lyme disease** (*Borrelia burgdorferi*)
- **Malaria** (*Plasmodium*)
- **Meningitis** (aseptic, bacterial, fungal, parasitic, protozoan and viral)
- **Mumps**
- **Mycobacteria other than tuberculosis***
- **Norovirus**, outbreaks only
- **Pertussis** (*Bordetella pertussis*)
- **Psittacosis** (*Chlamydophila psittaci*)
- **Q Fever** (*Coxiella burnetii*)
- **Relapsing fever, tick-borne and louse-borne** (*Borrelia*)
- **Salmonellosis*** (*Salmonella*)
- **Shiga toxin-producing Escherichia coli (STEC) infection***
- **Shigellosis*** (*Shigella*)
- **Spotted fever rickettsioses, including Rocky Mountain spotted fever** (*Rickettsia*)
- **Streptococcal disease due to Streptococcus pneumoniae** and Groups A and B isolated from a normally sterile site
- **Syphilis**, all stages and congenital
- **Tetanus** (*Clostridium tetani*)
- **Toxic-Shock Syndrome**, staphylococcal or streptococcal
- **Trichinellosis** (*Trichinella*)
- **Vibriosis*** (*Vibrio*)

REPORTABLE DISEASES THROUGH ELECTRONIC LABORATORY REPORTING (ELR) FOR PARTICIPATING LABORATORIES AND HOSPITALS

- *Clostridium difficile*
- Cytomegalovirus (CMV), congenital
- Streptococcal disease, invasive, other

*Laboratories shall submit isolates of causative agents, or if an isolate is not available, clinical material, to the Utah Public Health Laboratory for these diseases/conditions, including any organism implicated in an outbreak when instructed by authorized local or state health department staff. Diseases may be reported to Davis County Health Department by fax (801-525-5210) or telephone (801-525-5220). For questions about disease reporting, please contact Sarah Willardson by phone (801-525-5206) or by email (swillardson@co.davis.ut.us) or visit <http://www.co.davis.ut.us/health/health-services/disease-control-services/healthcare-professionals-medical-providers>



Methods

Information retrieved during investigations of reported infectious disease cases is maintained in UT-NEDSS/TriSano—a secure, online database that allows epidemiologists and infectious disease workers to access case information statewide. Davis County Health Department (DCHD) exported data acquired for cases reported during 2016 into Microsoft Excel (2010) for further analysis. Descriptive statistics were also calculated in Microsoft Excel (2010).



Population estimates by city were only available for 2015. These estimates were obtained from the U.S. Census Bureau’s American Fact Finder at <http://factfinder.census.gov> in January 2017. The population estimate for Hill Air Force Base was only available for 2010 and was obtained by searching the Air Force Base’s zip code (84056).

Population estimates by age group, gender, race, and ethnicity were available for 2015. These estimates were retrieved in January 2017 from the Utah Department of Health’s (UDOH) Indicator-Based Information System for Public Health (IBIS-PH) available at <http://ibis.health.utah.gov>.

All incidence rates were calculated in Microsoft Excel (2010) and are expressed as the number of cases reported in 2016 per 100,000 people. The incidence rates of all sexually-transmitted diseases (STDs) by city were similarly calculated, after controlling for age. This was done to account for the increased prevalence of STDs among the young adult population.





Reportable Disease Summary

Disease morbidity and mortality have decreased over the past century, partly due to the partnership between private and public health care. Unfortunately, new and emerging diseases are surfacing, requiring additional efforts from both the medical community and public health. Existing pathogens are also increasing as our population increases. Disease affects all races, ethnicities, ages, and genders.

Davis County Health Department (DCHD) received a total of **1,947** disease reports during 2016, significantly more than the 1,755 disease reports received in 2015.

Over half (55.9%) of the diseases reported were sexually transmitted diseases, followed by enteric diseases (11.7%), vaccine-preventable diseases (11.1%), other diseases (9.7%), tuberculosis infections (5.9%), invasive diseases (5.4%), and vectorborne/zoonotic diseases (<1%) (see Figure 1).

Cases were slightly more often reported among females (51.2%) and among 20-29 year olds (see Figure 2). Sexually transmitted diseases had a significant impact on the 20-29-year old age group. Statistically, females are more impacted by sexually transmitted diseases.

Figure 1. Diseases Reported by Type, Davis County, 2016

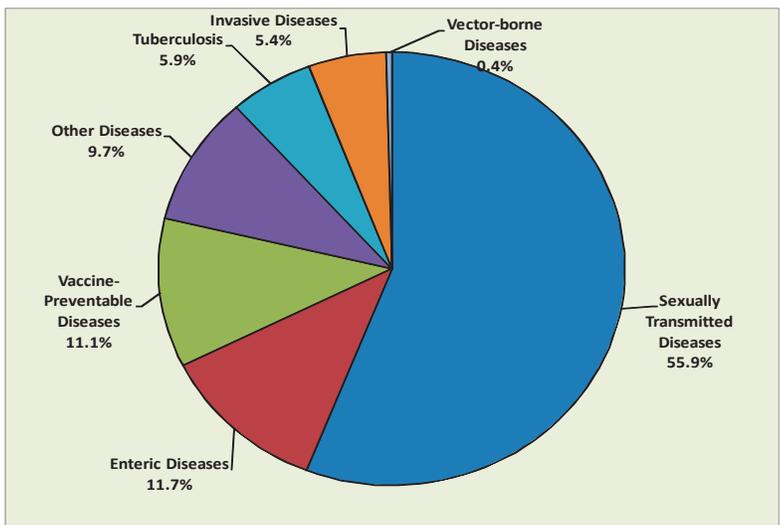
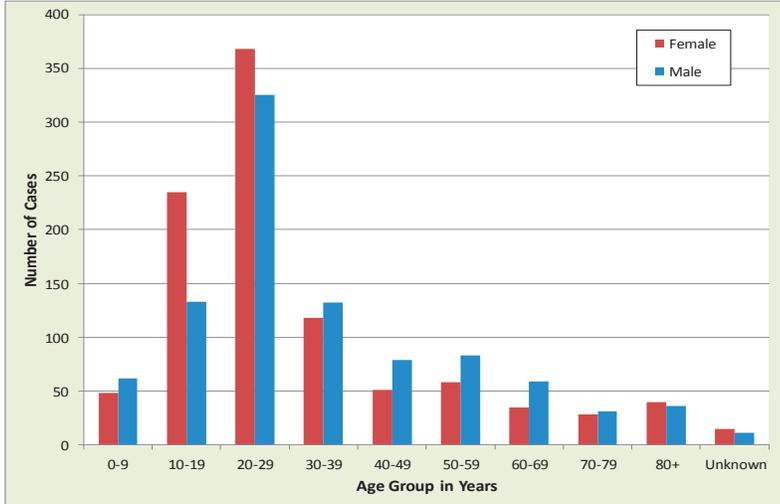
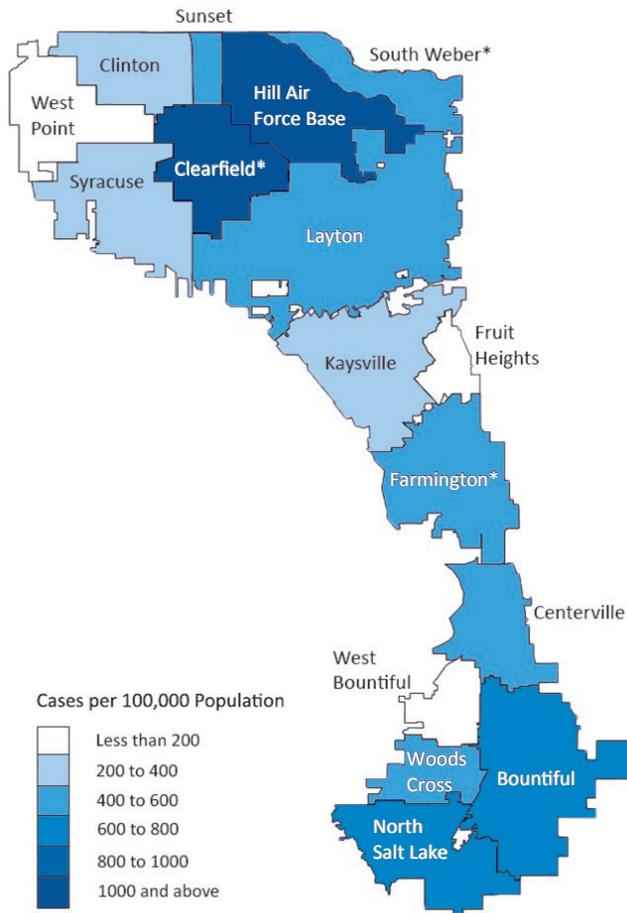


Figure 2. Disease Reports by Age Group and Gender, Davis County, 2016



Reportable Disease Summary

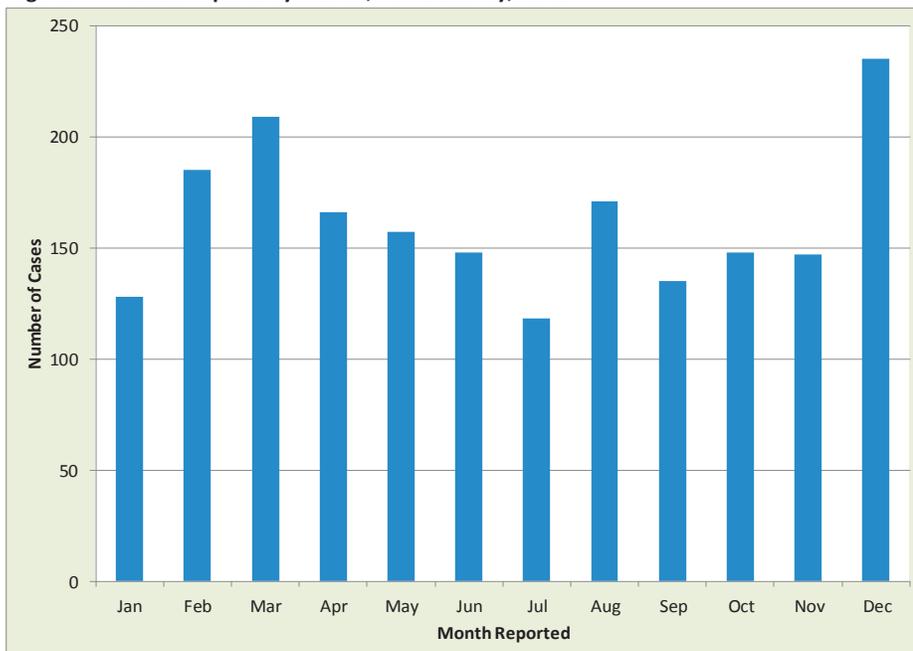
Figure 3. Incidence of All Reportable Diseases, Davis County, 2016



Disease rates by city are identified by the place of residence of the affected individual at the time of diagnosis. These rates do not suggest that one city is better or worse than another, but simply describe the disease burden in each city (see Figure 3). Tuberculosis data are not included because most infections were acquired outside of Davis County. Clearfield and Hill Air Force Base had the highest rates of all reportable diseases among all cities, whereas Fruit Heights, West Bountiful, and West Point had the lowest rates.

*These cities are impacted by temporary residential establishments (i.e. federal job corps and correctional facilities.)

Figure 4. Disease Reports by Month, Davis County, 2016



The disease burden in Davis County normally stays consistent throughout the year (see Figure 4). December 2016 had slightly more diseases reported. This is most likely due to an increased number of cases reported due to a norovirus outbreak and the start of the 2016-17 influenza season. In 2016, an average of 162 diseases were reported each month.

Top 20 Diseases

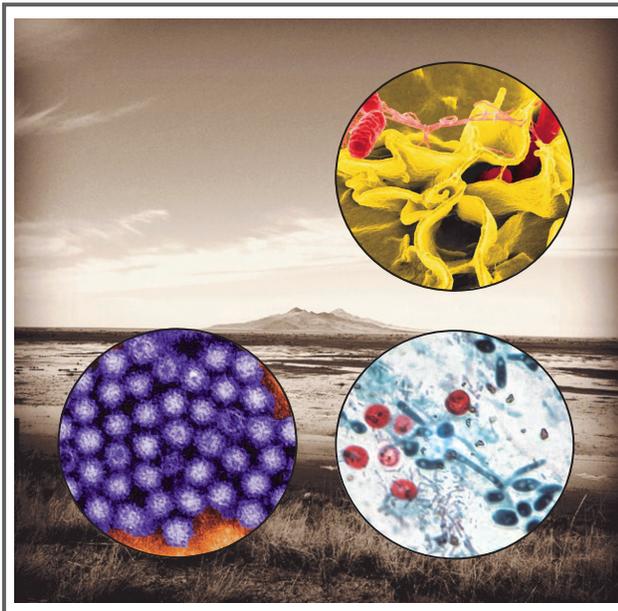
Table 1. Frequently Occurring Diseases in Davis County, 2016

Rank	Disease	Number of Cases
1	Chlamydia	934
2	Hepatitis C, Acute & Chronic	166
3	Influenza-Associated Hospitalization	133
4	Gonorrhea	129
5	Tuberculosis, Latent Infection	112
6	Streptococcal Disease, Invasive	90
7	Norovirus	69
8	Salmonellosis	42
9	Campylobacteriosis	41
10	Hepatitis B, Acute & Chronic	34
11	Cryptosporidiosis	27
11	Giardiasis	27
13	Pertussis	24
14	Chickenpox	23
15	Syphilis – All Stages	19
16	Carbapenem-Resistant Enterobacteriaceae (CRE)	14
17	Shiga Toxin-Producing <i>E. Coli</i> (STEC)	11
18	Shigellosis	9
19	Viral/Aseptic Meningitis	7
19	Coccidioidomycosis	7
19	HIV	7

Diseases Reported by Year, 2011 - 2016

Table 2. Diseases Reported by Year, Davis County, 2011 - 2016

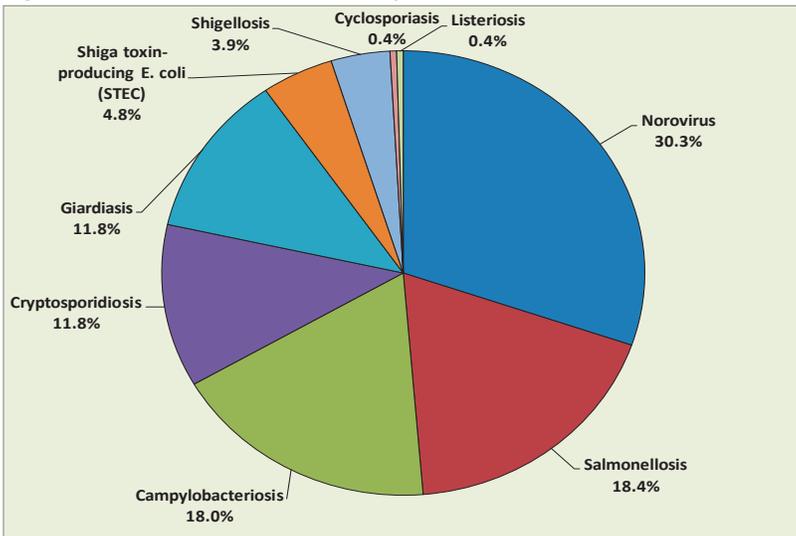
Disease	2011	2012	2013	2014	2015	2016	5 Yr Ave (2011 – 15)
Amebiasis	1	0	1	0	0	0	0.4
Botulism, infant	1	3	0	1	2	0	1.4
Brucellosis	1	1	0	0	0	0	0.4
Campylobacteriosis	33	36	43	71	46	41	45.8
Carbapenem-Resistant Enterobacteriaceae (CRE)	*	2	3	7	9	14	5.25
Chickenpox	42	37	39	33	15	23	33.2
Chikungunya	*	*	*	*	2	1	2.0
Chlamydia	739	862	847	923	886	934	851.4
Coccidioidomycosis	2	9	3	3	4	7	4.2
Colorado Tick Fever	0	1	0	0	0	0	0.2
Creutzfeldt-Jakob Disease (CJD)	1	1	0	2	1	0	1.0
Cryptosporidiosis	19	46	33	14	26	27	27.6
Cyclosporiasis	0	0	0	0	0	1	0.0
Dengue Fever	0	1	1	0	0	0	0.4
Encephalitis	1	1	0	0	2	1	0.8
Giardiasis	23	37	29	20	17	27	25.2
Gonorrhea	18	40	60	94	87	129	59.8
<i>H. influenzae</i> , invasive disease	3	1	3	4	2	6	2.6
Hansen's Disease (Leprosy)	0	0	0	1	0	0	0.2
Hantavirus Pulmonary Syndrome (HPS)	0	0	0	0	0	1	0.0
Hemolytic Uremic Syndrome (HUS)	1	0	0	0	0	0	0.2
Hepatitis A	3	1	3	2	0	1	1.8
Hepatitis B, acute & chronic	26	21	24	42	22	34	27.0
Hepatitis C, acute & chronic	150	196	189	189	132	166	171.2
Hepatitis E	0	0	0	0	1	0	0.2
HIV/AIDS	4	11	4	9	11	7	7.8
Influenza, hospitalized	43	43	82	130	83	133	76.2
Legionellosis	9	2	2	4	4	1	4.2
Listeriosis	0	1	2	1	0	1	0.8
Lyme Disease	1	4	3	5	1	2	2.8
Malaria	0	0	0	0	2	0	0.4
Meningitis, aseptic/viral	9	16	10	21	14	7	14.0
Meningitis, bacterial & other	2	1	2	4	2	0	2.2
Meningococcal disease	1	0	1	1	0	0	0.6
Mumps	0	0	0	0	0	1	0.0
Norovirus	20	6	20	27	21	69	27.2
Pertussis	25	139	104	117	72	24	91.4
Q fever, chronic	0	0	1	0	0	0	0.2
Salmonellosis	39	19	49	33	58	42	39.6
Shiga toxin-producing <i>E. coli</i> (STEC)	12	12	12	9	18	11	12.6
Shigellosis	1	1	0	3	21	9	5.2
Spotted Fever Rickettsiosis	0	0	0	1	1	1	0.4
<i>Staphylococcus aureus</i> with intermediate-resistance to vancomycin (VISA)	1	0	0	1	0	0	0.4
Streptococcal disease, invasive	57	78	73	67	87	87	72.4
Syphilis – all stages	11	21	20	14	14	19	16.0
Toxic-Shock Syndrome	1	2	0	1	2	4	1.2
Tuberculosis, active disease	0	1	1	0	0	2	0.4
Tuberculosis, latent infection	66	81	75	84	89	112	79.0
Vibriosis	0	0	0	0	1	0	0.2
West Nile Virus infection	1	0	0	0	0	0	0.2
Zika Virus	0	0	0	0	0	2	0.0
Total	1,367	1,734	1,739	1,938	1,755	1,947	1,706.6



Enteric Diseases

Enteric infections enter the body through the mouth and intestinal tract and are usually spread through contaminated food and water or by contact with vomit or feces.

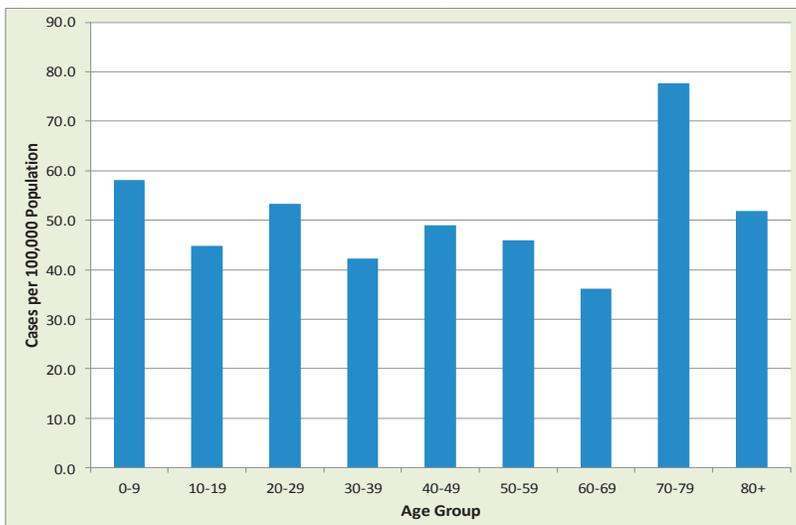
Figure 5. Enteric Diseases, Davis County, 2016



Enteric diseases are caused by bacterial, viral, or parasitic organisms that are shed in feces and can be spread person-to-person or through contaminated food and water. Enteric diseases are generally characterized by gastrointestinal symptoms such as nausea, vomiting, and diarrhea.

There were **228** enteric disease cases reported during 2016. Norovirus was the most frequently reported enteric disease with **69** cases (30.3%), followed by salmonellosis with **42** cases (18.4%), campylobacteriosis with **41** cases (18.0%), cryptosporidiosis with **27** cases (11.8%), giardiasis with **27** cases (11.8%), Shiga toxin-producing *E. coli* (STEC) with **11** cases (4.8%), shigellosis with **nine** cases (3.9%), cyclosporiasis with **one** case (<1%), and listeriosis with **one** case (<1%) (see Figure 5).

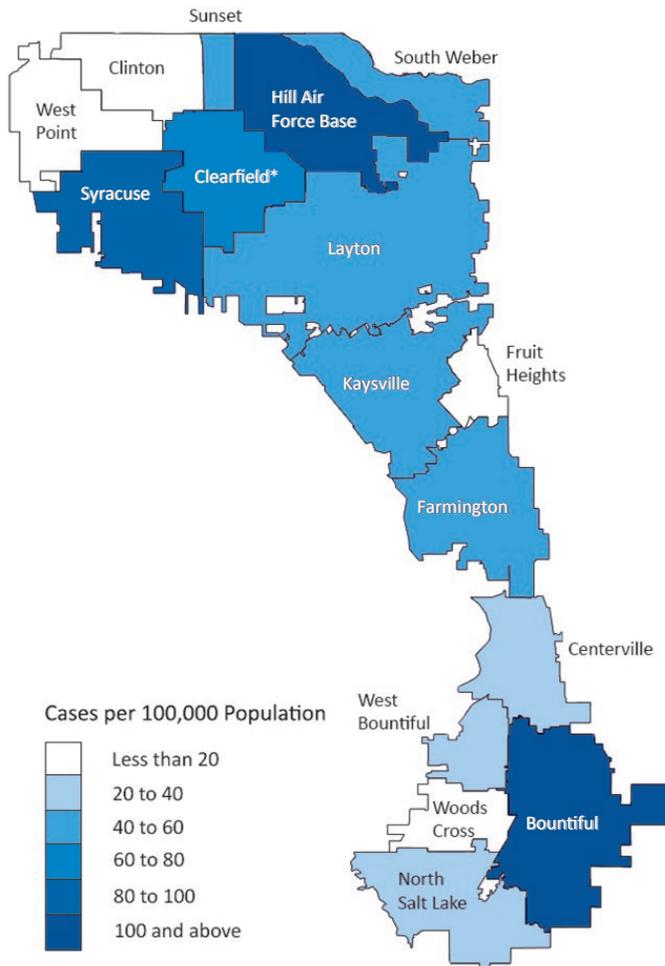
Figure 6. Incidence of Enteric Diseases by Age Group, Davis County, 2016



Just over half of the cases were female (51.3%) and rates of illness were highest among those between 70-79 years of age (see Figure 6). Enteric illnesses are common among the elderly and other susceptible groups, including children and the immunocompromised.

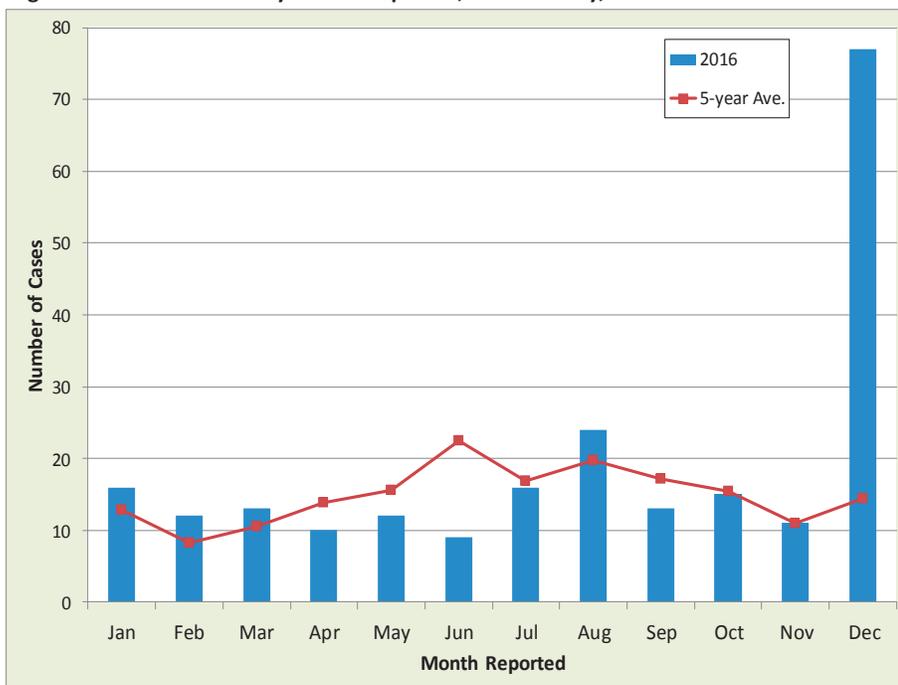
Enteric Diseases

Figure 7. Incidence of Enteric Diseases by City, Davis County, 2016



Enteric diseases were reported among residents of every city within Davis County, except Fruit Heights. The rate by city varied, but the average rate of enteric diseases was 55.4 per 100,000 residents (see Figure 7). Hill Air Force Base and Syracuse had higher rates when compared to the other cities. Bountiful had the highest rate of enteric illnesses (205.6 per 100,000 residents) which is likely due to an outbreak of norovirus that was identified at a long-term care (LTC) facility in late 2016.

Figure 8. Enteric Disease by Month Reported, Davis County, 2016



Enteric diseases are reported year-round, but a higher incidence is usually noted during the summer months (see Figure 8). In 2016, enteric illnesses peaked during December when an outbreak of norovirus was reported. However, enteric illnesses were also elevated during the summer season of 2016.

Campylobacteriosis

Campylobacteriosis is an infectious disease caused by bacteria of the genus *Campylobacter*. The bacteria are transmitted via the fecal-oral route. Improperly cooked poultry, untreated water, and unpasteurized milk are the main sources of infection. *Campylobacter* is one of the most common bacterial causes of diarrheal illness in the United States. Virtually all cases occur as isolated, sporadic events, not as part of recognized outbreaks. Active surveillance through Centers for Disease Control and Prevention (CDC) indicates that about 14 cases are diagnosed each year for every 100,000 persons in the population. Many more cases go undiagnosed or unreported, and campylobacteriosis is estimated to affect over 1.3 million persons every year.

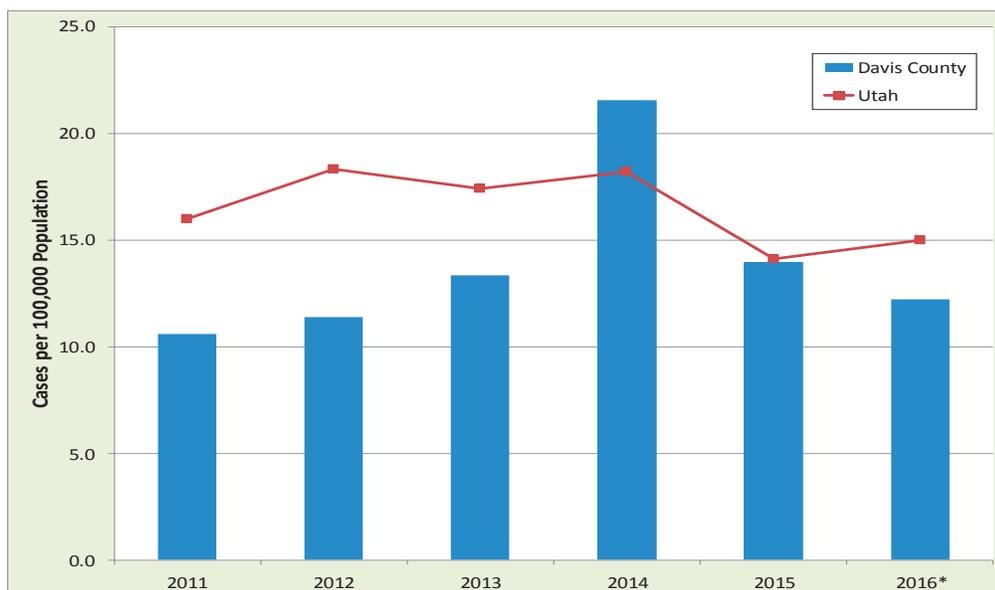


Campylobacter, one of the most common bacterial causes of diarrheal illness in the United States.

During 2016, there were **41** cases of campylobacteriosis reported in Davis County (see Figure 9). This corresponds to a 10.9% decrease from the 46 cases that were reported in 2015. No outbreaks or clusters were detected in Davis County during 2016. However, cases of campylobacteriosis continue to be reported where the sick individual had consumed unpasteurized milk or milk products.

When compared with the state of Utah, Davis County usually has low rates of campylobacteriosis (see Figure 9). In more recent years, however, Davis County has risen above the state's rate. This is most likely due to outbreaks of campylobacteriosis in Davis County that were linked to raw milk during 2014 and contaminated culinary water in 2015.

Figure 9. Incidence of Campylobacteriosis, Davis County, Utah, 2011-2016



*Utah 2016 data is provisional.

2016 Highlights

There were **41** cases of *Campylobacter* infection reported in Davis County in 2016.

No outbreaks or clusters were detected in Davis County during 2016.

On average, Davis County has had lower rates of *Campylobacter* infection when compared to Utah.

Cryptosporidiosis

Cryptosporidiosis is an infection caused by the protozoan organism *Cryptosporidium parvum*. *Cryptosporidia* have been found in many hosts, including humans, cattle and other domestic mammals. Infections may occur via person-to-person, fecal-oral, animal-to-person, or waterborne transmission. During the past two decades, cryptosporidiosis has become recognized as one of the most common causes of waterborne disease in humans in the United States. The parasite may be found in drinking water and recreational water in every region of the United States and throughout the world.

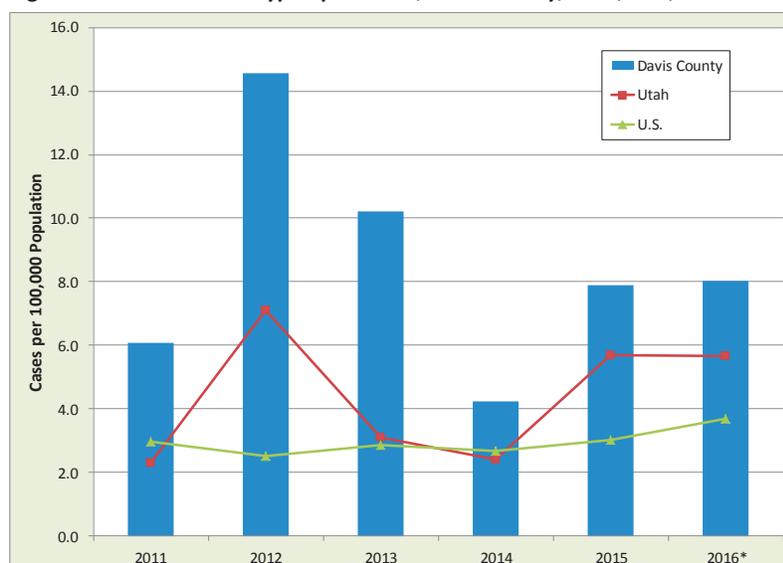


This micrograph of a direct fecal smear is stained to detect *Cryptosporidium*, a protozoan parasite.

During 2016, Davis County had **27** cases of cryptosporidiosis - a 4% increase from 2015 when 26 cases were reported (see Figure 10). One cluster of illness was identified in a local youth group who had an activity at a water park outside of Davis County. About 50 people attended the event and 12 individuals (24.0%) were reported as ill with diarrhea, abdominal pain, and/or nausea. Davis County Health Department (DCHD) was able to collect stool specimens from five of the symptomatic individuals. These were tested at the Utah Public Health Laboratory (UPHL) using their new BioFire FilmArray. All five specimens were positive for *cryptosporidium*. DCHD worked with the neighboring health jurisdiction to ensure the water park treated and cleaned their facility for *cryptosporidium*, but the facility had already closed for the summer season.

Historically, Davis County has had higher rates of cryptosporidiosis when compared to Utah and the United States (see Figure 10). In 2007, Utah experienced one of the largest cryptosporidiosis outbreaks in the United States with over 3,500 cases statewide, including nearly 300 in Davis County. These cases were largely associated with public swimming pools. Cases have diminished since that time due to the implementation of new control measures, including installation of UV light filters in several Davis County pool systems and effective public service announcements.

Figure 10. Incidence of Cryptosporidiosis, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

2016 Highlights

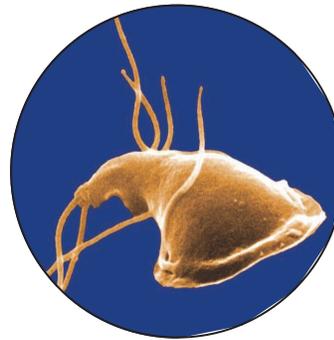
There were **27** cases of cryptosporidiosis reported in Davis County in 2016.

One cluster of cryptosporidiosis was identified in a local youth group who had an activity at a water park outside of Davis County.

Historically, Davis County has had higher rates of cryptosporidiosis when compared to Utah and the United States.

Giardiasis

Giardiasis is caused by *Giardia lamblia*, a microscopic parasite that causes diarrheal illness. *Giardia* is found on surfaces or in soil, food, or water that has been contaminated with fecal matter from infected humans or animals. Humans and other mammals (especially beavers, dogs, and cats) are reservoirs and shed the organism in their stool.



Giardia is a microscopic parasite that causes the diarrheal illness known as giardiasis.

Giardia is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it tolerant to chlorine disinfection. While the parasite can be spread in different ways, water (either drinking or recreational) is the most common mode of transmission.

Persons with giardiasis are infectious to others for the entire period of their illness, which can be weeks or months. Severity of disease varies from no symptoms to chronic diarrhea. Giardiasis tends to have intermittent symptoms, thus individuals may seek medical attention months after the initial infection occurred.

During 2016, there were **27** cases of giardiasis reported in Davis County, a 59% increase from the 17 cases reported in 2015 (see Figure 11). No outbreaks of giardiasis were investigated in Davis County during 2016. However, common exposures reported by cases included recreational water/outdoor activities and international travel. In Utah (including Davis County), cases of giardiasis typically peak in the summer and early fall months, coinciding with more outdoor recreation and potential exposures to *Giardia lamblia*.

When compared to the state of Utah, Davis County traditionally has lower rates of

Figure 11. Incidence of Giardiasis, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

giardiasis (see Figure 11). Davis County Health Department (DCHD) continues to conduct disease surveillance to identify cases and/or clusters, determine the source of infection, and prevent further transmission.

2016 Highlights

There were **27** cases of giardiasis reported in Davis County in 2016.

Common exposures include recreational water/outdoor activities and international travel.

When compared to the state of Utah, Davis County had a higher rate of giardiasis during 2016.

Listeriosis

Listeriosis is a bacterial infection caused by *Listeria monocytogenes*. It is usually transmitted via consumption of contaminated food. In elderly and immunocompromised persons, sepsis and meningitis are the main presenters. Pregnant women may experience a mild, flu-like illness followed by fetal loss or bacteremia and meningitis in their newborns. Immunocompromised persons may experience acute febrile gastroenteritis. In the United States, an estimated 1,600 persons become seriously ill with listeriosis each year and approximately 260 die.



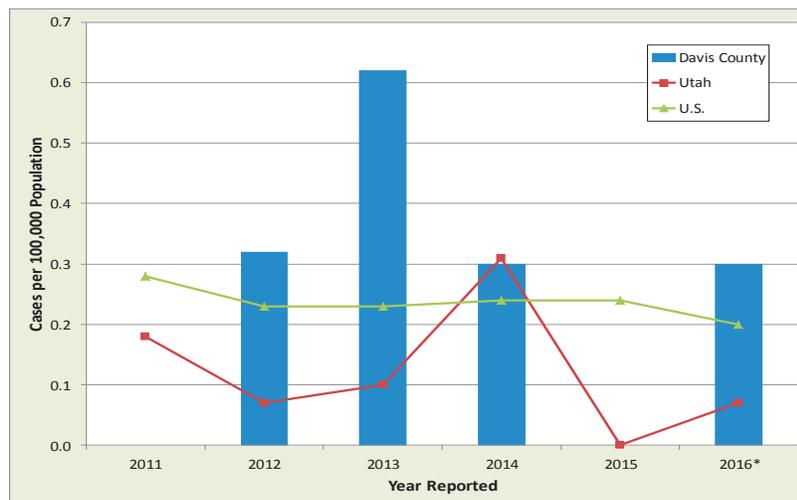
Listeria is most likely to sicken pregnant women and their newborns, adults aged 65 or older, and people with weakened immune systems.

Listeria outbreaks are mostly linked with dairy products and produce such as soft cheeses, celery, sprouts, cantaloupe, and ice cream. The best way to reduce the risk of consuming the bacteria is to purchase cheeses that have been pasteurized, cook raw produce thoroughly, and ensure foods (like cantaloupe) are eaten at appropriate temperatures. During 2016, frozen vegetables were implicated in an outbreak of listeriosis in several states, although no cases were identified in Utah.

In 2016, Davis County Health Department (DCHD) had **one** listeriosis case reported. The infection was diagnosed in a pregnant female. The woman went into pre-term labor and delivered her baby by C-section. The newborn developed sepsis and required mechanical ventilation. The infected female had several possible exposures including consumption of homemade queso fresco from Mexico, foreign travel, and eating from non-permitted street vendors. Fortunately, both the mother and baby recovered.

Listeriosis is not commonly seen in Davis County or Utah (see Figure 12). On average, DCHD investigates one case each year. Conversely, the United States sees a more uniform presence of the illness at about 0.3 cases per 100,000 (see Figure 12).

Figure 12. Incidence of Listeriosis, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

2016 Highlights

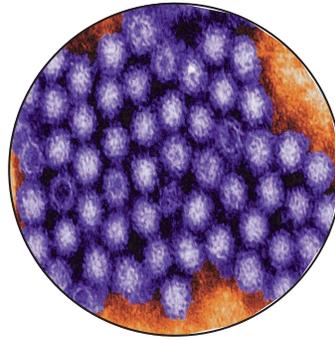
One case of listeriosis was reported in Davis County during 2016.

Pregnant women are ten times more likely than others to get listeria infection.

Listeriosis outbreaks are often linked to dairy products and produce.

Norovirus

Noroviruses are named after the original strain “Norwalk virus,” which caused an outbreak of gastroenteritis in a school in Norwalk, Ohio, in 1968. There are at least five known norovirus geno-groups, which in turn are divided into at least 31 genetic clusters. Noroviruses are transmitted primarily through the fecal-oral route, by consumption of fecal-contaminated food/water or by direct person-to-person contact. Environmental and fomite contamination are also sources of infection. Evidence exists of transmission via aerosolization of vomitus resulting in droplets contaminating surfaces or entering the oral mucosa and then swallowed. No evidence suggests that infection occurs through the respiratory route. Centers for Disease Control and Prevention (CDC) estimates that 19-21 million cases of acute gastroenteritis due to norovirus infection occur each year (see Figure 13). Norovirus is the leading cause of foodborne illness in the United States and is responsible for about 50% of foodborne disease outbreaks due to known agents.



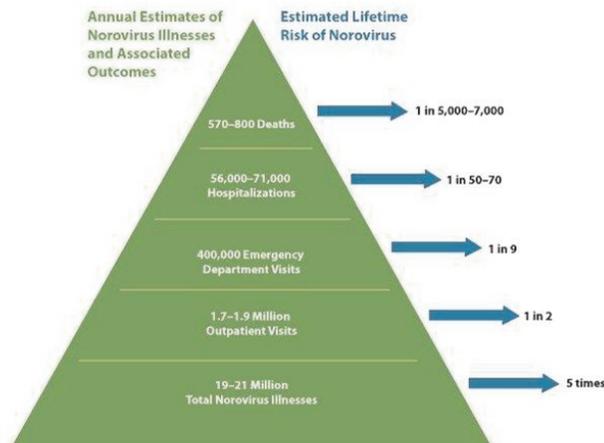
Norovirus is a very contagious virus. You can get norovirus from an infected person, contaminated food or water or by touching contaminated surfaces.

Due to the short duration of illness (typically 24 hours) and the self-limited, mild-to-moderate manifestation, persons infected with norovirus often do not seek medical care. Those who do are rarely tested for norovirus because testing is not widely available. As a result, many outbreaks are not identified. When suspect cases are reported to the health department, they are often received after the patient has recovered or late into the illness, making it difficult to confirm a diagnosis.

During 2016, there were **69** cases of norovirus reported to Davis County Health Department (DCHD), including one outbreak in a long-term care (LTC) facility.

In December 2016, a cluster of gastrointestinal illness in a LTC facility was reported to DCHD. The facility’s nurse suspected norovirus and submitted five specimens from ill patients for laboratory confirmation. All five returned with positive results for norovirus GI.3B. DCHD’s infectious disease nurse and Environmental Health food bureau manager visited the facility to discuss appropriate control measures and disinfection procedures. In total, 67 individuals were affected. DCHD conducted daily surveillance at the facility through January 2017. No additional cases have been reported.

Figure 13. Burden of Norovirus Illnesses, United States



2016 Highlights

A total of 69 cases of norovirus were reported in Davis County during 2016.

One cluster of norovirus was investigated during 2016 in a LTC facility. A total of 67 residents and employees were affected.

Norovirus is the leading cause of foodborne illness in the United States.

Salmonellosis

Salmonellosis is a bacterial infection generally transmitted through ingestion of contaminated food or water. Salmonellosis can also be transmitted by direct contact with an infected human or animal. *Salmonella* bacteria are commonly found in food products and can be carried by many domestic animals. Centers for Disease Control and Prevention (CDC) estimates that approximately 1.2 million illnesses due to Salmonellosis occurs in the United States every year and is more common in summer than in winter. Children are the most likely to be diagnosed with salmonellosis. Young children, the elderly, and those who are immunocompromised are most likely to have severe infections. It is estimated that approximately 450 persons die each year from salmonellosis.



Salmonella is a bacteria that was discovered by an American scientist named Dr. Salmon and has been known to cause illness for over 125 years.

During 2016, there were **42** cases of salmonellosis reported in Davis County, a 28% decrease from the 58 cases reported in 2015 (see Figure 14). A few clusters of salmonellosis in Davis County were associated with national outbreaks in 2016.

Because of the many different strains of *Salmonella*, determining the serotype and Pulse-Field Gel Electrophoresis (PFGE) pattern of *Salmonella* isolates is critical to identifying sources and epidemiological links among cases. Serotypes are conventionally named after the city where they were discovered. Private laboratories are required to submit *Salmonella* isolates to the Utah Public Health Laboratory (UPHL) for serotyping and PFGE analysis. PFGE patterns are compared with other Utah and U.S. *Salmonella* isolates to identify possible clusters and suspect sources.

Salmonella Enteritidis was the most commonly reported *Salmonella* serotype during 2016 (see Table 3). *Salmonella* Typhimurium also had a significant presence in Davis County in 2016. Additional serotypes were reported in 2016, but were not as common. The number of cases of salmonellosis among Davis County residents by serotype is shown in Table 3.

Figure 14. Incidence of Salmonellosis, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

2016 Highlights

There were **42** cases of salmonellosis reported in Davis County in 2016.

Salmonella Enteritidis was the most commonly reported strain.

Davis County traditionally has lower rates of salmonellosis when compared to the United States.

Salmonellosis

Table 3. Salmonellosis Serotypes, Davis County, 2016

Serotype	Number of Cases (%)
Enteritidis	9 (21.4%)
Typhimurium	6 (14.3%)
Heidelberg	5 (11.9%)
Braenderup	3 (7.1%)
Serovar I 4, [5], 12:i:-	3 (7.1%)
Infantis	2 (4.8%)
Newport	2 (4.8%)
Paratyphi B [1], 4, [5], 12:b:1,2	2 (4.8%)
Corvalis	1 (2.4%)
Cotham	1 (2.4%)
Michigan	1 (2.4%)
Montevideo	1 (2.4%)
Muenchen	1 (2.4%)
Reading	1 (2.4%)
Senftenberg	1 (2.4%)
St. Paul	1 (2.4%)
Stanley	1 (2.4%)
Unknown	1 (2.4%)
Total	42 (100.0%)



Salmonella Infantis

A multistate outbreak of *Salmonella* Infantis was also investigated during the summer of 2016. A total of 31 people from 16 states were infected with *Salmonella* Infantis, including one Davis County resident. Of the 24 ill people who were interviewed, 14 (58%) reported contact with live poultry. The Davis County resident did have backyard chickens, but did not report having any contact with them. This year saw the largest number of illnesses linked to contact with backyard poultry ever recorded (see Figure 15). These outbreaks serve as a reminder to wash hands after touching live poultry, keep birds outside of the home, and avoid kissing or snuggling the animals.

A few clusters of salmonellosis were investigated in Davis County during 2016.

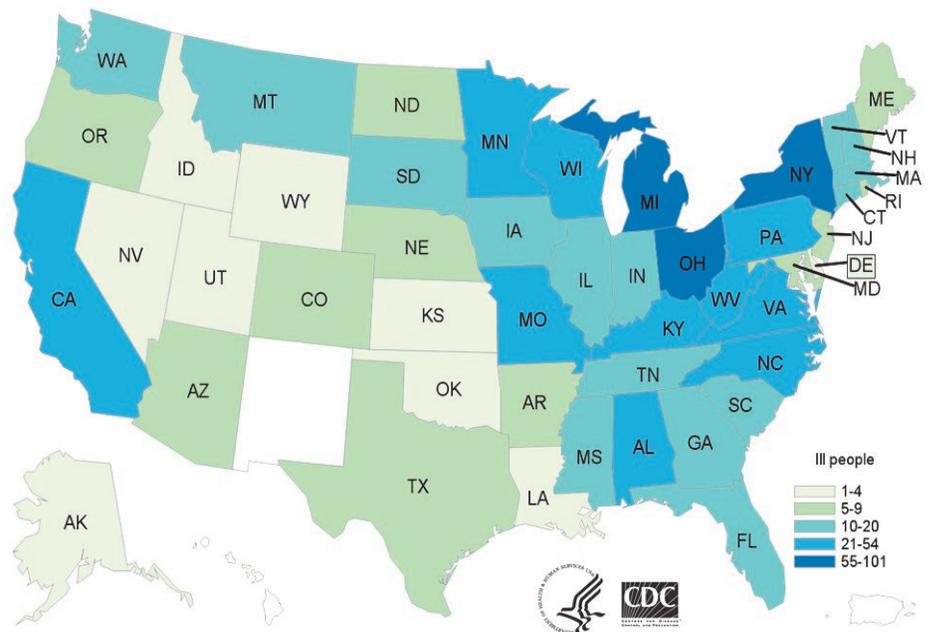
Salmonella Newport

One Davis County resident was infected with the same strain of *Salmonella* Newport that had been identified in a national cluster of 39 cases in 13 different states. Although no source has yet been identified, common exposures for *Salmonella* Newport in the past have included strawberries, peanut butter, lettuce, tomatoes, chicken and beef.

Salmonella Braenderup

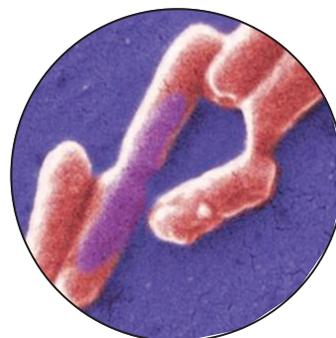
A multistate outbreak of *Salmonella* Braenderup was identified during the summer of 2016. This outbreak was linked to live poultry. A total of 129 people from 25 states were infected, including one Davis County resident. Of the 100 ill people who were interviewed, 55 (55%) reported contact with live poultry. The Davis County resident, however, had no known contact to any live poultry.

Figure 15. Human Salmonella infections linked to live poultry, by state of residence, 2016



Shiga Toxin-Producing *Escherichia coli* (STEC) Infection

E. coli are bacteria that normally live in the intestines of humans and animals. Certain strains of *E. coli*, including O121, O11, O26, and O157:H7 produce Shiga toxins that can cause hemorrhagic colitis, manifested as bloody stools. The most serious complication of the infection is Hemolytic Uremic Syndrome (HUS), which can lead to permanent kidney damage or death.



E. coli bacteria normally live in the intestines of people and animals. Most *E. coli* are harmless and actually are an important part of a healthy human intestinal tract.

Sources of transmission include consumption of undercooked, contaminated ground beef and other beef products, unpasteurized milk, drinking or swimming in water that is contaminated with sewage, or eating unwashed fruits or vegetables. Person-to-person transmission can occur within households, childcare centers, and long-term care (LTC) facilities.

Due to the potential severity of Shiga toxin-producing *E. coli* (STEC) and the fact that it spreads easily, public health investigates all reported cases thoroughly. Individuals in high-risk settings (e.g. food handlers and day care workers or attendees) must be cleared by public health before returning to the facility.

In 2016, there were **11** cases of STEC infection reported in Davis County, a decrease of 39% from the 18 cases reported in 2015 (see Figure 16). The most common strain reported in Davis County was O157:H7 with six cases. Other strains identified included O26, O121, and O145 (see Table 4).

Only four of the cases were hospitalized and no HUS or deaths were reported. Possible exposures reported by patients included contact with animals and recreational water/outdoor activities.

Table 4. Shiga Toxin-Producing *E. coli* Serotypes, Davis County, 2016

Serotype	Number of Cases (%)
O157:H7	6 (54.5%)
O26	2 (18.2%)
O121	2 (18.2%)
O145	1 (9.1%)
Total	11 (100.0%)

Figure 16. Incidence of STEC Infections, Davis County, Utah, U.S., 2011-2016



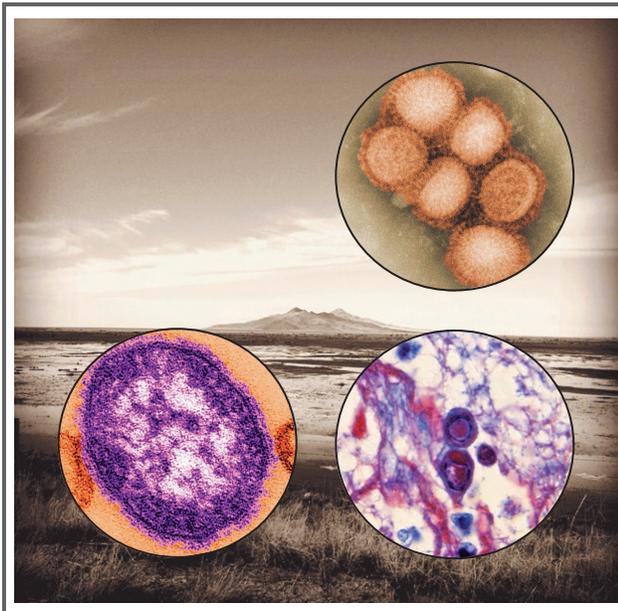
*Utah and United States 2016 data are provisional.

2016 Highlights

There were **11** cases of STEC infection reported in Davis County in 2016.

Common exposures included contact with animals and recreational water/outdoor activities.

When compared to the United States and Utah, Davis County usually has higher rates of infection due to *E. coli*.



Vaccine-Preventable Diseases

Vaccine-preventable diseases are infectious diseases for which an effective preventive vaccine exists.

Vaccine-Preventable Diseases (VPDs) are diseases that are preventable through the use of immunizations. Historically, VPDs caused a great deal of morbidity and mortality in children. Rates of VPDs have dramatically declined in large part because of immunizations. Yet worldwide each year, 22.6 million children do not receive basic vaccines and more than 3 million people die of vaccine-preventable diseases. Immunizations are the most effective step in protecting the community against VPDs. However, these diseases still occur because of importation, vaccine failure or disease breakthrough, and incomplete or no vaccinations.

When a VPD is diagnosed, it is important that public health measures be quickly implemented to contain the spread. The measures include the administration of prophylactic medications and vaccines, isolation of the infected individual, quarantine of exposed individuals, and public education.

In 2016, hospitalized influenza was the most commonly reported VPD with **133** cases (61.6%), followed by Hepatitis B with **34** cases (15.7%), pertussis with **24** cases (11.1%), chickenpox with **23** cases (10.6%), Hepatitis A with **one** case (<1%), and mumps with **one** case (<1%) (see Figure 17).

The incidence of vaccine-preventable diseases is highest among the elderly and children (see Figure 18). Influenza especially affected the elderly population this season.

Figure 17. Vaccine-Preventable Diseases, Davis County, 2016

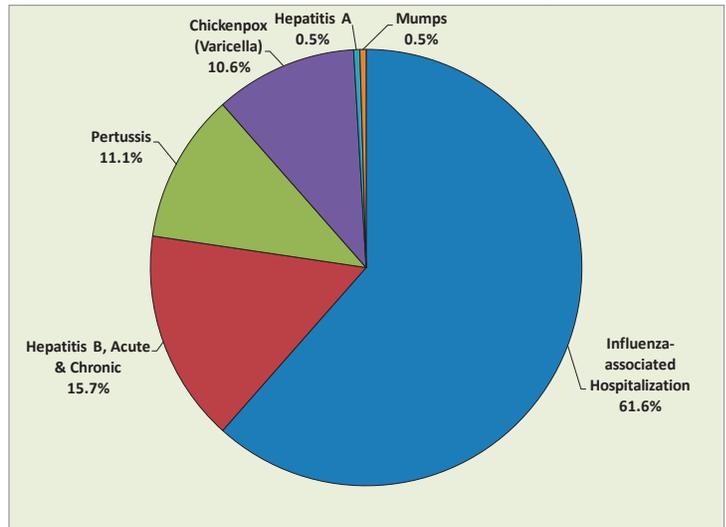
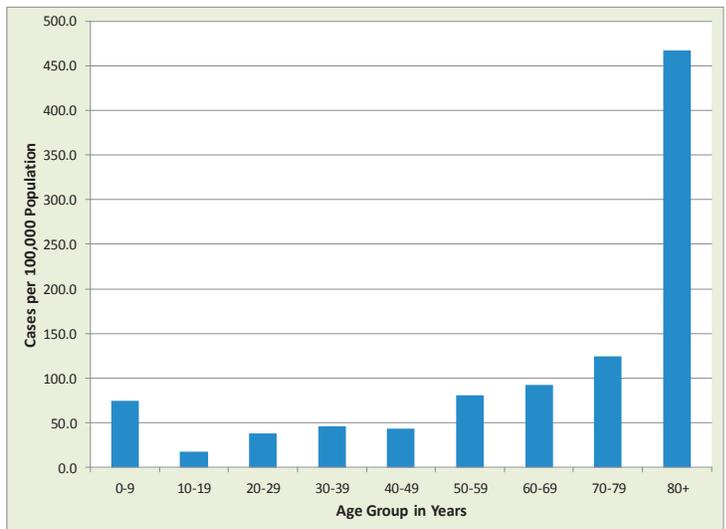
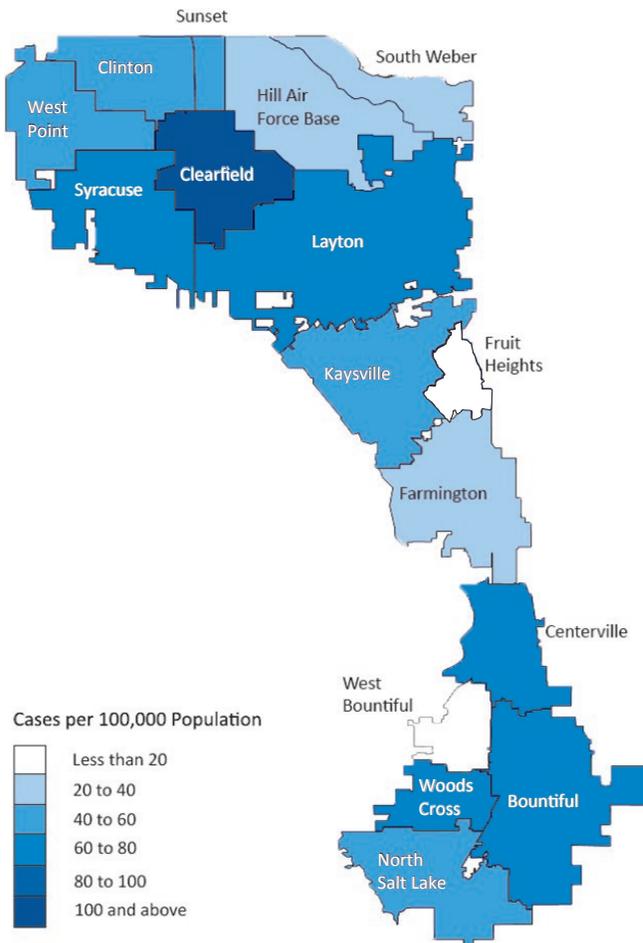


Figure 18. Incidence of VPDs by Age Group, Davis County, 2016



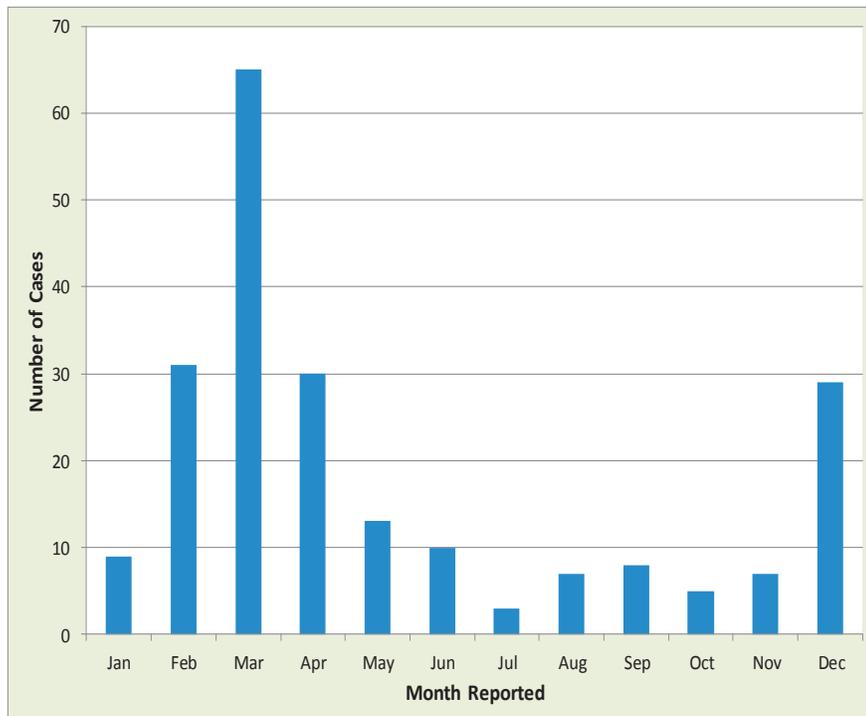
Vaccine-Preventable Diseases (VPDs)

Figure 19. Incidence of Vaccine-Preventable Diseases by City, Davis County, 2016



Vaccine-preventable diseases occurred among residents of every city throughout the county (see Figure 19). The city with the highest incidence was Clearfield. In contrast, Fruit Heights and West Bountiful had the lowest incidence of vaccine-preventable diseases. The average rate of vaccine-preventable diseases was 52.8 cases per 100,000 residents.

Figure 20. Vaccine-Preventable Disease by Month Reported, Davis County, 2016



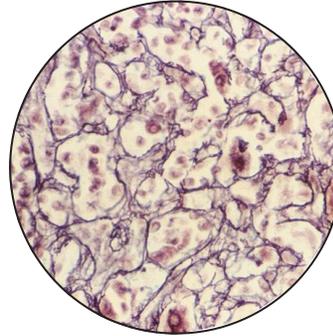
Vaccine-preventable diseases (particularly pertussis and chickenpox) are usually reported more frequently during the school year (see Figure 20). Influenza season typically begins in December and peaks during January or February. However, the 2015-16 influenza season was an exception as cases peaked during March 2016 (see Figure 20).

Hepatitis A

Hepatitis A is a disease caused by the Hepatitis A virus, which targets the liver. It is transmitted via the fecal-oral route either by person-to-person contact or by consumption of contaminated food or water. Hepatitis A is highly contagious and is best prevented through vaccination.

The Hepatitis A vaccine was introduced in 1995 and rates of the disease have declined steadily since 1999 when routine vaccination was recommended for children living in states with high incidence, including Utah (see Figure 21).

Suspect cases of Hepatitis A are reported throughout the year. Disease investigations are often able to rule out most infections. Davis County had **one** case of Hepatitis A reported in 2016 (see Figure 22). This case traveled internationally to a few countries during the



Hepatitis A is a liver infection caused by the Hepatitis A virus (HAV). It is highly contagious and can be transmitted by the fecal-oral route.

exposure period and ate at several local homes and restaurants. Davis County Health Department (DCHD) interviewed the case and found they did not prepare any food nor were any close contacts identified who required post-exposure prophylaxis.

On average, DCHD investigates one to two confirmed cases of Hepatitis A each year. Although the rate of Hepatitis A in Davis County is usually slightly higher when compared to Utah and the United States, there has been an overall decreasing trend in cases (see Figure 22).

2016 Highlights

There was one case of Hepatitis A reported in Davis County in 2016.

The case traveled internationally during the exposure period.

On average, DCHD investigates one to two confirmed cases of Hepatitis A each year.

Figure 21. Incidence of Hepatitis A, United States, 1980-2014

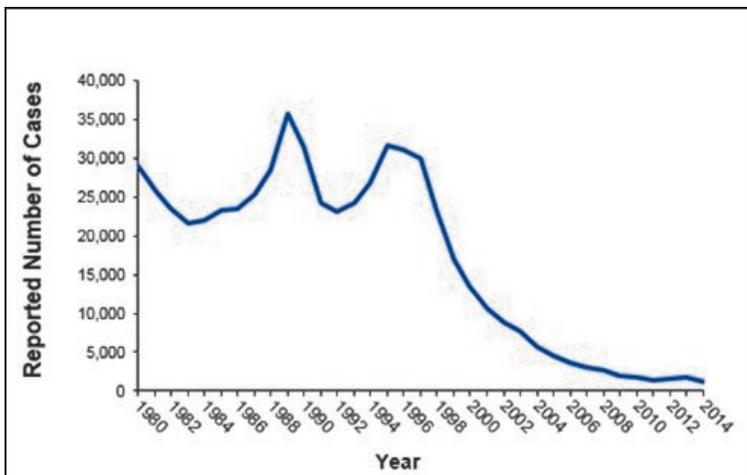
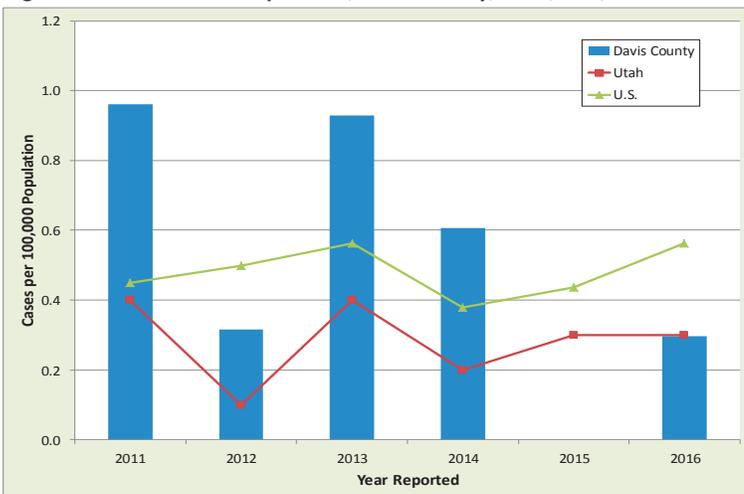


Figure 22. Incidence of Hepatitis A, Davis County, Utah, U.S., 2011-2016



Hepatitis B (Acute and Chronic Infections)

Hepatitis B is a vaccine-preventable disease caused by the Hepatitis B virus (HBV). It is transmitted through blood or body fluids. Common modes of transmission include percutaneous and permucosal exposure to infectious body fluids, sharing needles or syringes, sexual contact with an infected person, and perinatal exposure from an infected mother. In the United States, an estimated 850,000 to 2.2 million persons have chronic HBV infection. Acute HBV infection occurs most commonly among adolescents and adults in the United States.

During 2016, there were **34** cases of Hepatitis B reported in Davis County. Only six of the 34 cases were determined to be acute infections. **Five** chronic cases were pregnant and were referred to the Perinatal Hepatitis B Prevention Program for further interventions (see below). Several of the non-pregnant HBV cases were at high risk for infection (e.g. foreign born, IDU, sexual/household exposure to a positive contact).

Perinatal Hepatitis B Prevention Program

The Perinatal Hepatitis B Prevention Program is responsible for the case management (evaluation, monitoring, testing, and facilitation of HBIG and Hepatitis B vaccination) of all reported cases of HBsAg positive pregnant females in Davis County. Prior to the baby's birth, arrangements are made with the delivering hospital to administer Hepatitis B immune globulin (HBIG) and the first dose of Hepatitis B vaccine to the newborn within 12 hours after delivery in an effort to prevent the newborn from acquiring the virus. The newborn is monitored until all three doses of vaccine have been administered. After vaccination, serology testing is conducted to ensure antibody protection. If the infant is a non-responder to the vaccine, a second series is given. Testing is repeated at completion of the second series. Women, who are prenatally tested and determined to be chronic Hepatitis B carriers, are interviewed to identify close contacts. Identified contacts (sexual partners, household contacts, and children) are recommended to have testing to determine their infection status. If serology testing is negative, the Hepatitis B vaccination series is encouraged. The case management of HBsAg positive pregnant females can range from 8-18 months.

As many as 90% of infants who acquire HBV infection from their mothers at birth become chronically infected. Of children who become infected with HBV between 1-5 years of age, 25-50% become chronically infected. The risk drops to 6-10% when a person is infected over 5 years of age.

In 2016, **five** women were followed through Davis County Health Department's (DCHD) Perinatal Hepatitis B Prevention Program.



The mission of the Perinatal Hepatitis B Prevention Program is to increase identification and treatment of women, their infants, and household contacts that are positive for the hepatitis B virus.

2016 Highlights

There were **34** cases of Hepatitis B reported in Davis County in 2016.

In 2016, five women were followed through DCHD's Perinatal Hepatitis B Prevention Program.

As many as 90% of infants who acquire HBV infection from their mothers at birth become chronically infected.

Influenza

Influenza is an acute respiratory infection caused by RNA viruses from the *Orthomyxoviridae* family. Humans are the primary reservoir for human influenza, but many influenza species can also infect birds and mammals. Influenza is transmitted via respiratory droplets and direct contact.

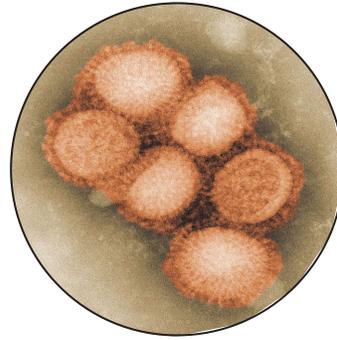
Because of the large number of cases that occur each season, traditional surveillance methods are impractical for influenza. Therefore, the disease is monitored using a variety of mechanisms. One method is through the use of “sentinel sites.” Davis County tracks physician visits for influenza-like illness at sentinel sites throughout the county. These sites report data weekly in order to identify when influenza season begins and ends and to monitor the burden of disease in the county. During the 2015-16 influenza season, three sentinel sites reported data to Davis County Health Department (DCHD) and Utah Department of Health.

Hospitals and other clinics submit specimens for influenza testing/typing to the Utah Public Health Laboratory (UPHL) so that circulating strains can be identified.

In addition, medical providers, hospitals, and laboratories are required by state law to report hospitalized influenza cases and pediatric influenza deaths to the local health departments. These two levels of reporting help DCHD evaluate disease severity, which is another important aspect of surveillance.

Davis County also partners with Davis School District to monitor elementary school absentee data. When schools experience a higher than expected absentee rate, the district is notified and an investigation is conducted to determine the cause of the excess absences. Increases in absenteeism are often seen as influenza season peaks (see Figure 23).

DCHD publishes a *Weekly Influenza Report* every Thursday during peak influenza season. These reports provide a current view of influenza activity in Davis County, Utah, and the United States. These reports are available on our website at: <http://goo.gl/7P63qq>.



Flu is a contagious respiratory illness caused by influenza viruses. It can cause mild to severe illness.

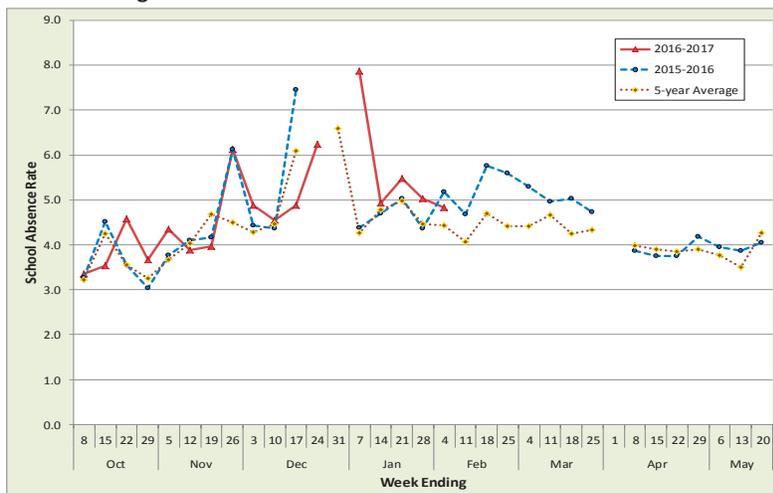
2016 Highlights

A total of 110 hospitalized-influenza cases were reported during the 2015-16 influenza season.

In the 2015-16 season, the most common circulating virus was influenza A.

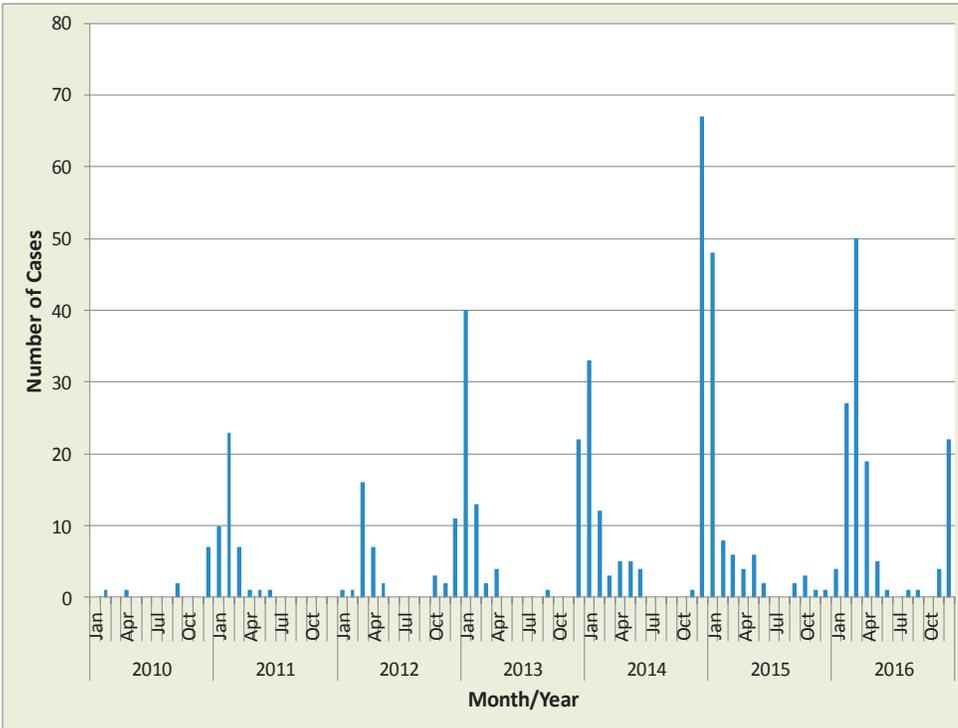
The current influenza season appears to be moderately severe.

Figure 23. Elementary School Absenteeism—Davis County, 2016-17, 2015-16, 5-Year Average



Influenza

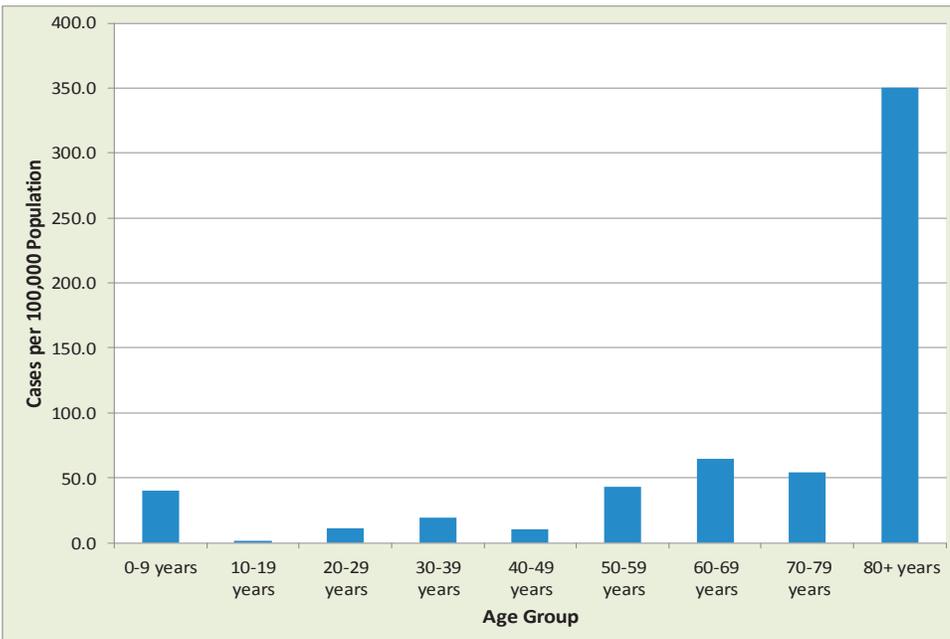
Figure 24. Hospitalized Influenza Cases by Month, Davis County, 2010-16



The 2015-16 influenza season (October 2015 - May 2016) was a moderately severe season in Davis County (see Figure 24). A total of **110** hospitalized-influenza cases were reported during the 2015-16 season, much less than the 140 cases reported during the 2014-15 season.

Although influenza cases can occur at any time of the year, influenza viruses thrive during cold weather and cases typically peak in the winter months (January and February). During the 2015-16 influenza season, however, influenza activity peaked in March (see Figure 24). The most common circulating strain was influenza A.

Figure 25. Incidence of Hospitalized Influenza Cases by Age Group, Davis County, 2015-16 Influenza Season



The very young and very old are the populations most severely affected by influenza infection. These groups had the highest rates of hospitalizations in the 2015-16 influenza season (see Figure 25). Nearly 46% of the hospitalized cases were ≥ 60 years.

The current influenza season (October 2016 - May 2017) has been moderately severe thus far. Influenza A (H3) has been the most common circulating strain in Davis County. Several hospitalizations have already been reported (see Figure 24).

Mumps

Mumps is a contagious disease caused by a virus and is spread through saliva or mucus from the mouth, nose, or throat. The infection can be spread through any means in which saliva or mucus comes into contact with another individual or an object that an infected individual touches. Examples of potential routes of transmission are coughing, sneezing, talking, sharing items, and touching objects or surfaces with unwashed hands that are then touched by others. The best way to prevent mumps is by getting vaccinated.



Mumps is a contagious disease caused by a virus. It typically starts with fever, headache, and loss of appetite and is followed by swollen salivary glands.

After the mumps vaccination program started in 1967, there has been more than a 99% decrease in mumps cases in the United States. In the United States, the number of cases ranges from a few hundred to few thousand; however, outbreaks do still occur occasionally (see Figure 26). In 2006, a large outbreak on several university campuses affected over 6,500 people. Mumps cases also increased during 2016, with most being reported in college-aged students.

Until this year, Davis County has not had a mumps case since 2010. When compared to Utah and the United States, Davis County traditionally has a very low rate of mumps (see Figure 27).

During 2016, **one** case of mumps was reported in Davis County. The case was a Japanese foreign exchange student who was attending a local private school when symptoms (fever, headache, sore throat, and parotitis) developed. Eleven other students and their teacher had traveled with the case and were also attending the school while staying with two host families in Davis County. Davis County Health Department (DCHD) began an investigation and found that the infected

Figure 26. Mumps Cases, United States, 2000-2016

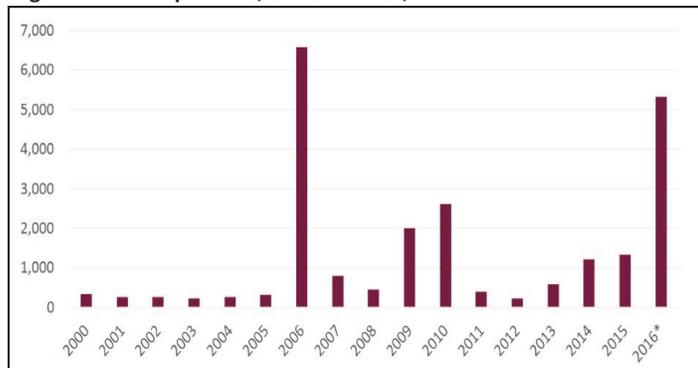
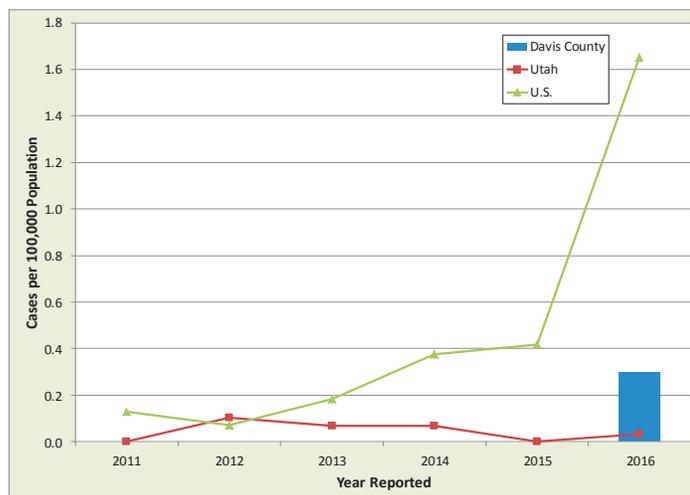


Figure 27. Incidence of Mumps, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

2016 Highlights

One case of mumps was reported in Davis County during 2016.

This case was associated with a foreign exchange program and was from an endemic country.

Traditionally, Davis County has a lower rate of mumps when compared to Utah and the United States.

Mumps



An example of *parotitis* (or swollen and tender salivary glands) that is often characteristic of a mumps infection.

student had been exposed to mumps prior to arrival in the United States. Testing was performed and confirmed the diagnosis of mumps.

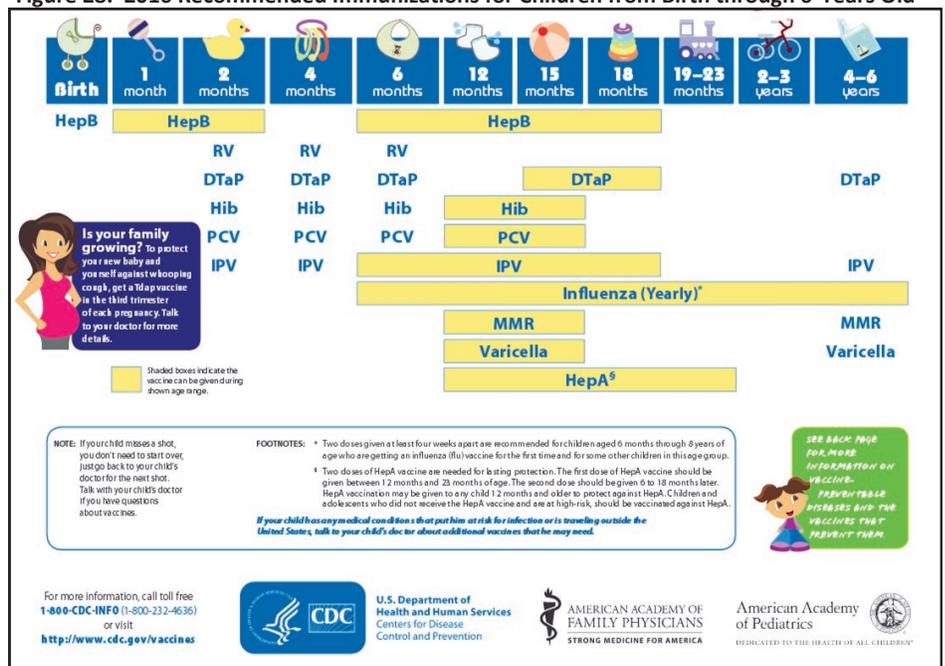
The student was isolated to one of the host family's homes while the other students were quarantined to the second home. DCHD evaluated all exposed individuals for symptoms and immunity to mumps. This included retrieving vaccination records from the families in Japan to verify immunity. Most of the students did not have the required two mumps-containing vaccines that prove immunity in the United States. In addition, some of the exposed host families also could not produce documentation and were also placed in quarantine. DCHD coordinated blood testing on the susceptible Japanese students and host family members. All but five of the students were found to be immune and were released from quarantine. The remaining five students were monitored daily for symptoms of mumps.

The students were to travel back home to Japan before their quarantine period was completed. DCHD and the Utah Department of Health (UDOH) consulted with the Centers for Disease Control and Prevention's (CDC) Division of Global Migration and Quarantine (DGMQ) regarding the returning travel of the five students. It was determined that if the students were asymptomatic, they could travel to Japan and finish their quarantine there.

Prior to departure, DCHD evaluated all students (including the five susceptible students) for illness and none were found to be symptomatic. DCHD provided information on the quarantine period, education about mumps disease, and the results of their blood testing to each student which they were instructed to give to their parents. UDOH also notified Japan public health officials of the situation. The students traveled back to Japan and no additional cases were identified in Davis County.

Of note, the investigation revealed that Japan typically does not vaccinate children under five years and only requires one mumps-containing vaccine. In the United States, studies have shown that one mumps-containing vaccine does not provide a protective immunity against mumps infection; therefore, two doses are currently recommended in the United States. CDC recommends that children receive two doses of the MMR vaccine. The first dose should be received between 12 and 15 months of age with the second dose between 4 and 6 years of age (see Figure 28).

Figure 28. 2016 Recommended Immunizations for Children from Birth through 6-Years Old



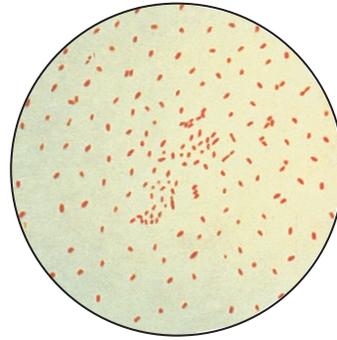
Pertussis

Pertussis is a vaccine-preventable disease caused by the bacteria *Bordetella pertussis*. The disease is of particular concern in infants because of higher rates of hospitalization, pneumonia, and death—compared with older children and adults.

During 2016, there were **24** cases of pertussis reported in Davis County. This corresponds to a 67% decrease in comparison to the 72 cases reported in 2015. Davis County Health Department (DCHD) investigates approximately 93 cases each year (based on a 5-year average), thus 2016 has been a very mild year for pertussis. Declines in pertussis rates were also noted across Utah and the nation (see Figure 29).

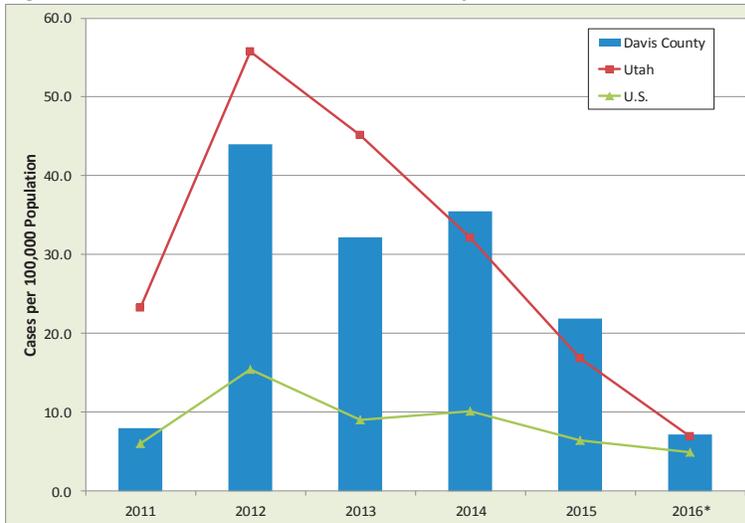
Disease investigations conducted by DCHD identified symptomatic contacts, indicating a greater disease impact than was initially reported. Risk factors for development of disease included: 1) no vaccination or under-vaccination, 2) waning antibody response, 3) household exposures, and 4) exposure to symptomatic individuals in the community via mass gatherings (e.g. schools, extracurricular events, worksites, and religious meetings).

All reported pertussis cases are investigated promptly in an effort to stop disease spread. Contacts that experience a prolonged exposure to an infected case may benefit from antibiotic prophylaxis—if administered in a timely manner. Children are routinely vaccinated against pertussis before entry into the school system. Upon entry into junior high, a booster dose of TD/Tdap is required. The Tdap (tetanus, diphtheria, and acellular pertussis) is a one-time vaccine and recommended for anyone age 11-64. Recent guidance from Centers for Disease Control and Prevention (CDC) recommends pregnant women received a Tdap vaccine with every pregnancy, preferably given between weeks 27-36. Tetanus vaccination, however, is recommended every 10 years.



Pertussis is a respiratory illness commonly known as “whooping cough” after the gasping sound a patient makes when they suck in air after a coughing fit.

Figure 29. Incidence of Pertussis, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

2016 Highlights

There were **24** cases of pertussis reported in Davis County during 2016.

Davis County investigates an average of 93 cases each year. Thus, 2016 could be considered a very mild year for pertussis.

No outbreaks of pertussis were investigated during 2016.

Pertussis

The age groups most often affected by pertussis are those who are under-vaccinated, including infants/children under five years (because they have not yet completed the full vaccination series) (see Figure 30). Although cases are also common in older children and adults due to waning immunity, illness in these age groups is usually milder and the diagnosis is often delayed or missed. The distribution of cases differed this year from what is typically seen. Usually more cases are identified in the school-aged groups, but this year, the burden fell to the middle-aged groups. This could be attributed to waning immunity and shows the value of staying fully vaccinated, even in adulthood.

Figure 30. Incidence of Pertussis by Age Group, Davis County, 2016

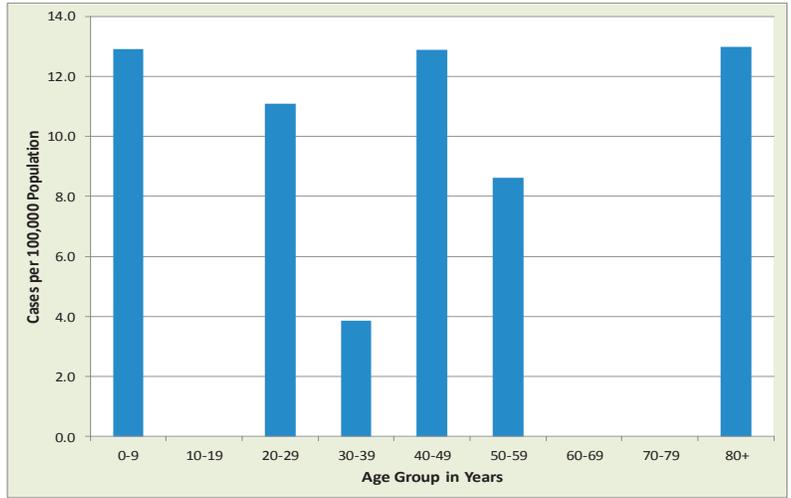
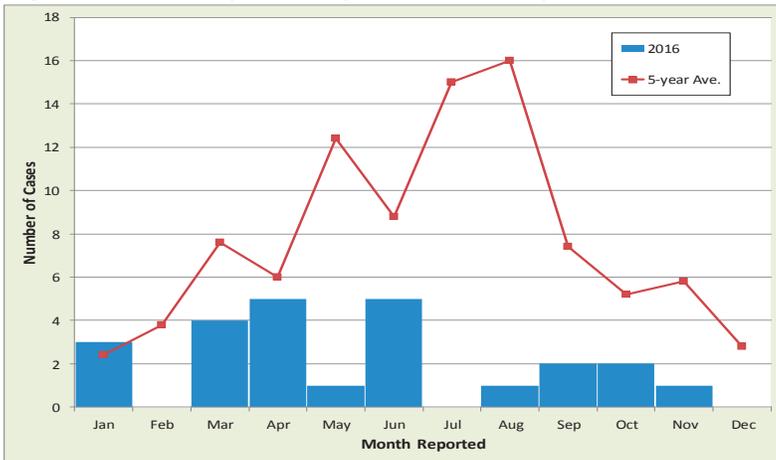


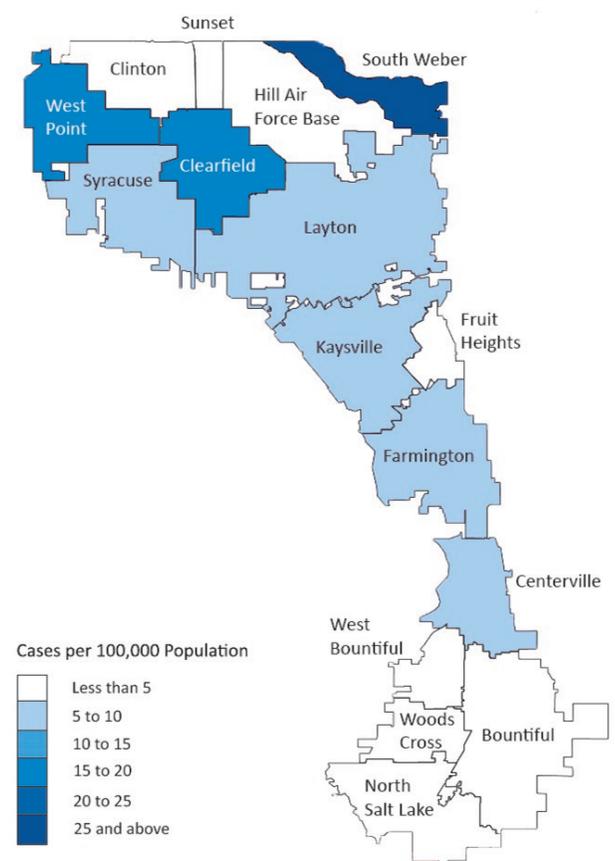
Figure 31. Pertussis by Month Reported, Davis County, 2016



Cases of pertussis began to rise in March and peaked in April and June 2016 (see Figure 31). During 2016, the number of pertussis cases remained below the 5-year average year-round.

In 2016, pertussis cases were reported throughout Davis County (see Figure 32). However, the incidence of disease was highest in South Weber, Clearfield, and West Point. Overall, the average rate of pertussis in the county was 6.9 cases per 100,000 population - a decrease from the 22.3 cases per 100,000 population that was reported in 2015.

Figure 32. Incidence of Pertussis by City, Davis County, 2016





Vectorborne/zoonotic diseases are those diseases transmitted by an animal or insect. Vectorborne/zoonotic diseases do not occur often in Davis County. Some of these diseases, such as malaria and dengue fever, are typically acquired outside of the United States. Most of the cases reported in 2016 were acquired outside of Utah and two cases were acquired outside of the United States.

In 2016, there were **seven** cases of vectorborne/zoonotic diseases reported in Davis County (see Table 5). Four of the cases of vectorborne/zoonotic disease were female and three were male and all of the cases were adults.

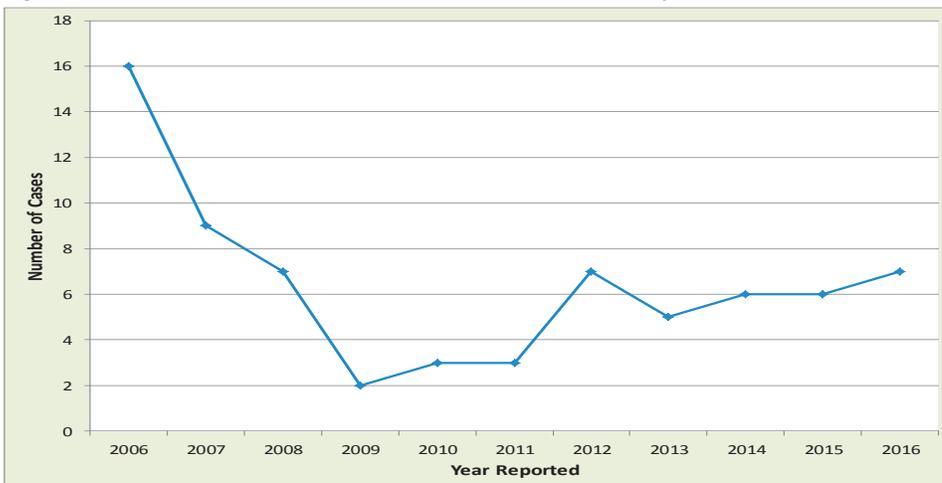
Table 5. Cases of Vectorborne/Zoonotic Diseases in Davis County, 2016

Disease	Location(s) of Exposure	Suspected Source of Infection	Number of Cases
Chikungunya	Bolivia	Mosquito bite	1
Hantavirus	Utah	Rodent droppings	1
Lyme disease	Idaho, Illinois	Tick bite	2
Spotted Fever Rickettsiosis	Utah	Tick bite	1
Zika virus	Mexico, Utah	Mosquito bite	2

Vectorborne/zoonotic diseases rapidly declined in Davis County until 2009 (see Figure 33). However since then, they have steadily increased. Several cases were reported during 2006 when West Nile Virus was first active in Utah’s mosquito population. However, in recent years, Davis County has remained somewhat consistent in the number of diseases reported.

Davis County Health Department (DCHD) continues to work closely with Davis Mosquito Abatement District and Davis County Animal Care & Control to ensure that these illnesses continue to present at a low rate.

Figure 33. Cases of Vectorborne/Zoonotic Diseases in Davis County, 2006-2016



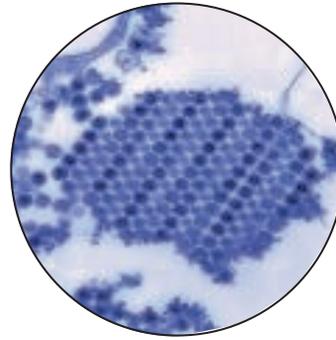
Chikungunya

Chikungunya is an emerging infectious disease in the United States. It is a viral disease that is spread to people by the bite of infected mosquitoes. The most common symptoms of chikungunya virus infection are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, and/or rash.

Although most transmission of chikungunya has occurred among travelers who have recently visited the Caribbean, South America, or the Pacific Islands, locally-acquired cases were identified in Florida, Puerto Rico, and the Virgin Islands in 2014 (see Figure 34). There is a risk that the virus will be imported to new areas by infected travelers.

There is no vaccine to prevent or medicine to treat chikungunya virus infection. Travelers can protect themselves by preventing mosquito bites through using insect repellent, wearing long sleeves and pants, and staying in places with air conditioning or that use window and door screens.

In 2016, there was one case of chikungunya reported in Davis County. This case had recently returned home from an international mission and is considered a travel-associated case. Provisional data suggests that no locally-acquired cases were reported in the United States during 2016 (see Figure 35).



Chikungunya virus is transmitted to people by mosquitoes. Most cases are found among travelers to the Caribbean, South America, or the Pacific Islands. However, locally acquired cases have been identified in Florida, Puerto Rico, and the Virgin Islands.

Figure 34. Countries Where Chikungunya Cases Have Been Reported, as of April 22, 2016

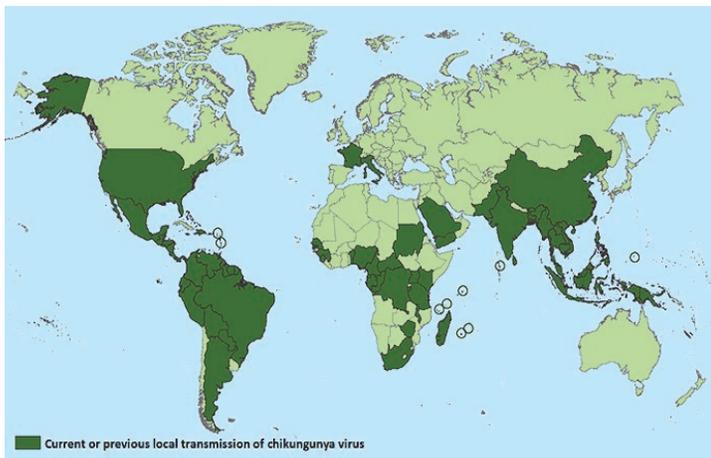
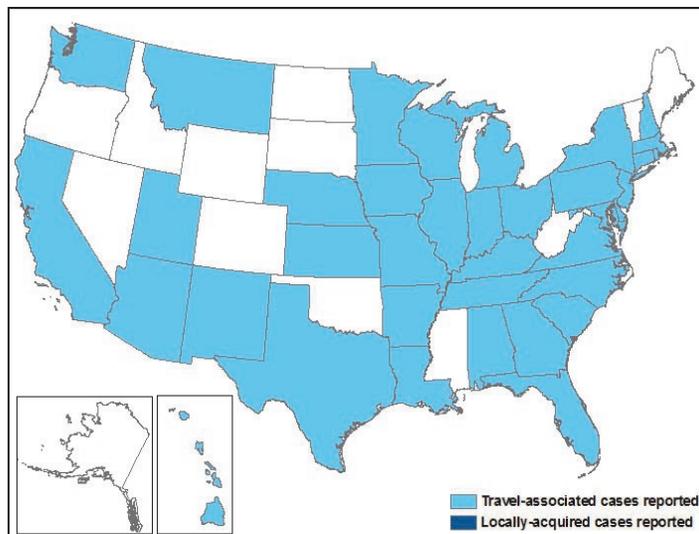


Figure 35. States reporting chikungunya virus disease cases, United States, as of January 17, 2017



2016 Highlights

There was one case of chikungunya reported in Davis County during 2016.

The case traveled internationally during their exposure period.

Provisional data suggest that no locally-acquired cases were reported in the United States during 2016.

Hantavirus Pulmonary Syndrome (HPS)

Hantavirus Pulmonary Syndrome (HPS) was first reported in the United States in 1993. The Sin Nombre virus, a member of the hantavirus genus, is responsible for the majority of the HPS cases in the United States. People become infected through contact with hantavirus-infected rodents or their urine and feces. Elimination or minimization of contact with rodents is the best way to prevent contraction of hantavirus.

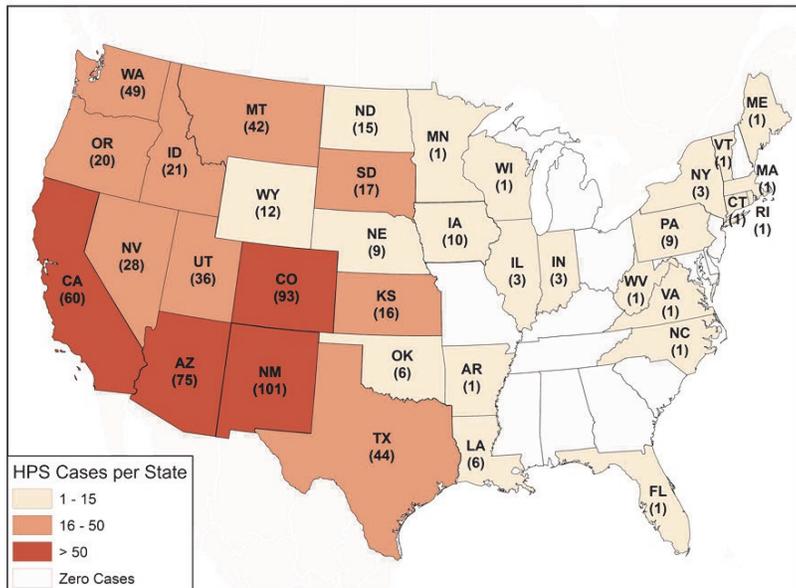


People become infected with hantavirus through contact with infected rodents or their urine and droppings.

Through January 6, 2016, a total of 690 cases of HPS have been reported in the United States in 35 states, with most occurring in states west of the Mississippi River (see Figure 36). Thirty-six percent of all reported cases have resulted in death.

Cases of HPS are not typically found in northern Utah. In 2016, the first case was identified in a Davis County resident. Unfortunately, the resident expired. An autopsy was performed which confirmed the cause of death as HPS. Investigation of this case found that the deceased individual owned property on the outskirts of town. The property included an old barn full of hay and miscellaneous building materials, a few cows, wood piles, and other unused items. An environmental inspection took place at the deceased individual's home and on the family property. No areas of concern were noted at the home. However, the inspection of the property found evidence of many rodent droppings, including the area where the resident recently spent time doing repairs. As a result, a letter of warning was provided to the family about the possible danger of the barn and surrounding areas. They were provided cleaning and disposal instructions, with recommendations to have the barn and adjoining abandoned vehicle removed from the property.

Figure 36. Hantavirus Pulmonary Syndrome (HPS) Cumulative Case Count, United States, 1993-2016



The household members were evaluated for signs and symptoms and monitored for two months. No additional cases were identified and the case was closed.

2016 Highlights

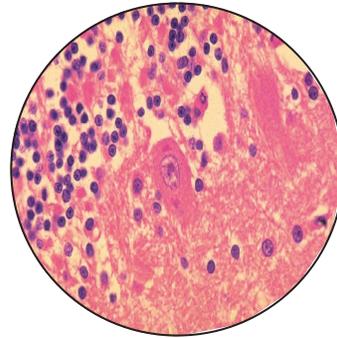
One case of Hantavirus Pulmonary Syndrome (HPS) was reported in Davis County during 2016.

Cases of HPS are not typically found in northern Utah.

Environmental inspection of the family's property found evidence of many rodent droppings.

Rabies

Rabies is a preventable viral disease of mammals most often transmitted through the bite of a rabid animal. The vast majority of rabies cases reported to Centers for Disease Control and Prevention (CDC) each year occur in wild animals such as raccoons, skunks, bats, and foxes. Domestic animals account for less than 10% of reported rabies cases, with cats, cattle, and dogs most often infected. In Utah, the majority of animal cases are reported in bats.



The rabies virus infects the central nervous system, ultimately causing disease in the brain and death.

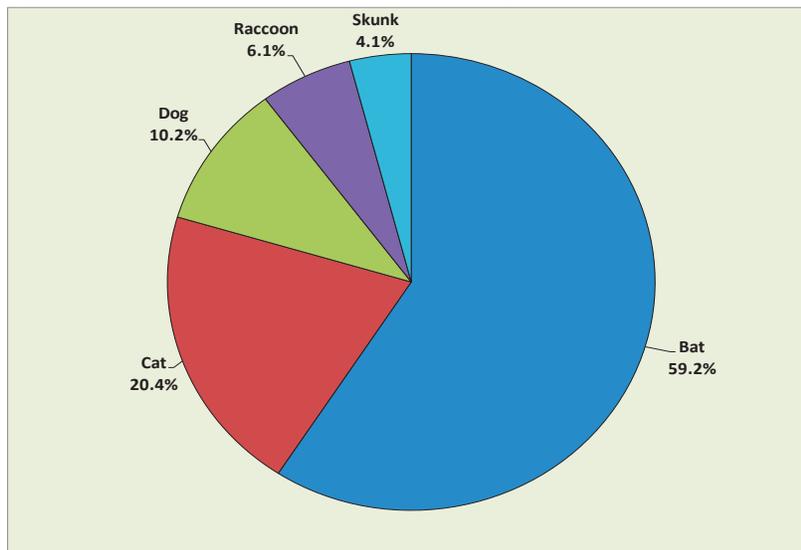
Rabies-related human deaths are very rare in the United States today. Prophylaxis treatment has proven nearly 100% successful, preventing serious illness and mortality in those who are exposed to an at-risk animal. Most human fatalities associated with rabies occur in people who fail to seek medical assistance, usually because they were unaware of their exposure.

The Communicable Disease and Epidemiology Division (CD/Epi) evaluated **488** individuals who reported an exposure to an “at-risk” animal in 2016. The human exposures involved 75 cats, 380 dogs, 31 bats, one squirrel, and one unidentified animal. Each case was evaluated for need of rabies post-exposure prophylaxis (PEP). Those who were recommended PEP were monitored through completion of therapy or until PEP discontinued (either by choice or due to negative test results of the suspect animal). Of the 43 individuals that were recommended PEP, 16 completed treatment and 21 declined.

During the late spring and summer months, reports of animal bites become more prevalent. Surveillance of rabies-positive animals helps guide the decision-making process. Rabies PEP is available through some hospital emergency rooms. However, individual insurance plans often dictate where prophylaxis must be obtained.

In 2016, Davis County Environmental Health Division submitted 49 animals for rabies testing (see Figure 37). Of these, 29 (59%) involved a human exposure and 20 (41%) were animal-to-animal exposures. **Five** bats tested positive for rabies — no other animals were positive. No cases of human rabies were reported.

Figure 37. Animals Tested for Rabies, Davis County, 2016



2016 Highlights

A total of **488** individuals who reported an exposure to an at-risk animal were evaluated in 2016.

During 2016, **five** bats tested positive for rabies.

Of the 49 animals submitted for testing, 59% involved a human exposure.

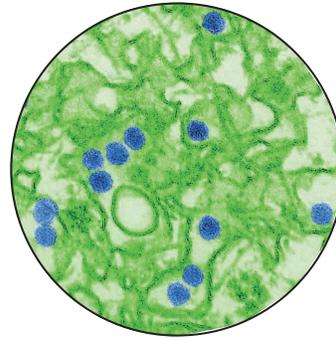
Zika Virus

Zika virus is a virus that can cause fever, rash, joint pain, and conjunctivitis. It is spread mainly through the bite of an infected *Aedes aegypti* or *Aedes albopictus* mosquito. These mosquitos are active during the day and night. Zika virus can also be transmitted through sex with an infected person. There is currently no medicine or vaccine for Zika virus infection so the best way to prevent infection is by preventing mosquito bites. Using EPA-registered insect repellent, wearing long-sleeved shirts and pants, and limiting exposure to areas with standing water are all effective methods of mosquito bite prevention.

In addition to Zika virus transmission through mosquitos and sexual contact, it can also be passed from mother to fetus in pregnant women. Fetuses infected with Zika virus can experience birth defects associated with the brain such as microcephaly. Other potential fetal complications include defects of the eye, hearing deficits, and impaired growth. Pregnant woman should refrain from travelling to areas where Zika virus is actively being transmitted (see Figure 38). In February 2016, the World Health Organization declared Zika virus an “international emergency.”

Transmission of Zika virus has been reported in several countries and territories (see Figure 38). The Centers for Disease Control and Prevention (CDC) continue to update and distribute travel notices for these areas. Transmission of Zika virus has also been reported in the United States in both Florida and Texas (see Figure 40).

In 2016, Davis County Health Department (DCHD) investigated **two** cases of Zika virus. Neither case occurred in a pregnant female. One case traveled internationally and had known exposure to mosquitoes. The second case of Zika virus was reported to DCHD in July 2016. This resident was a contact to a confirmed case in Salt Lake County, who acquired the disease while out of the country and had unfortunately passed away. Interviews with the infected resident could not identify



Zika virus is spread mostly by the bite of an infected *Aedes* mosquito, but can be passed from a pregnant woman to her fetus. Infection during pregnancy can cause birth defects. Sexual transmission of Zika virus is also possible.

Figure 38. Countries and Territories with Active Zika virus Transmission, as of December 14, 2016



2016 Highlights

In 2016, two cases of Zika virus were reported in Davis County.

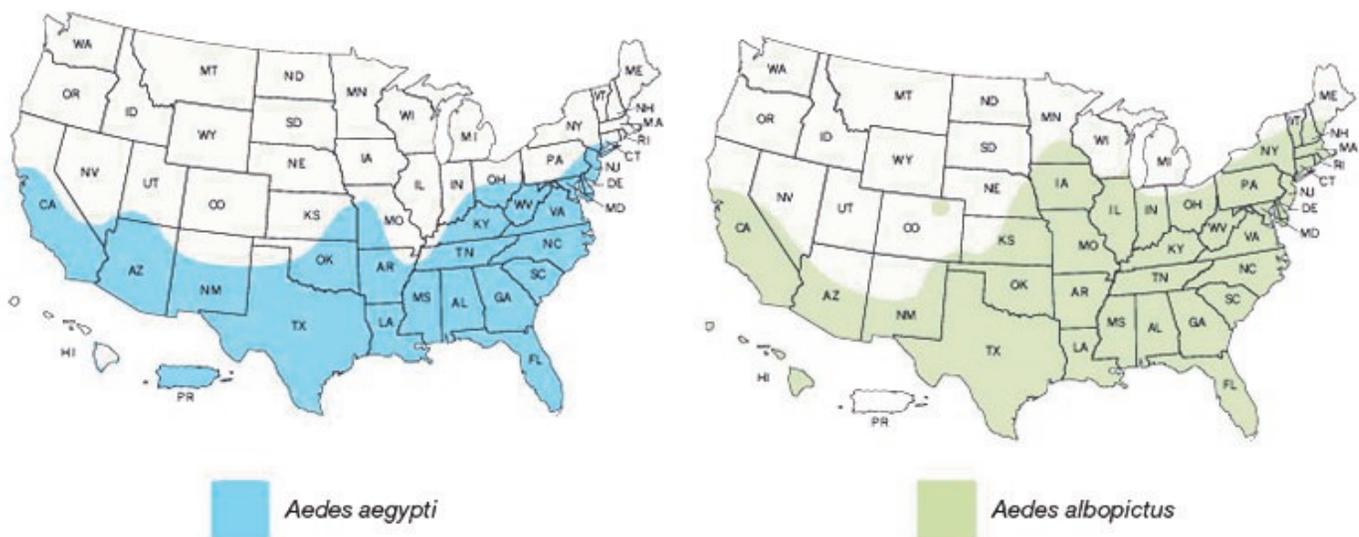
One case was ill with Zika virus, but had no recent travel or sexual exposures to a confirmed case. The mode of transmission could not be established.

Transmission of Zika virus has been reported in both Florida and Texas.

Zika Virus

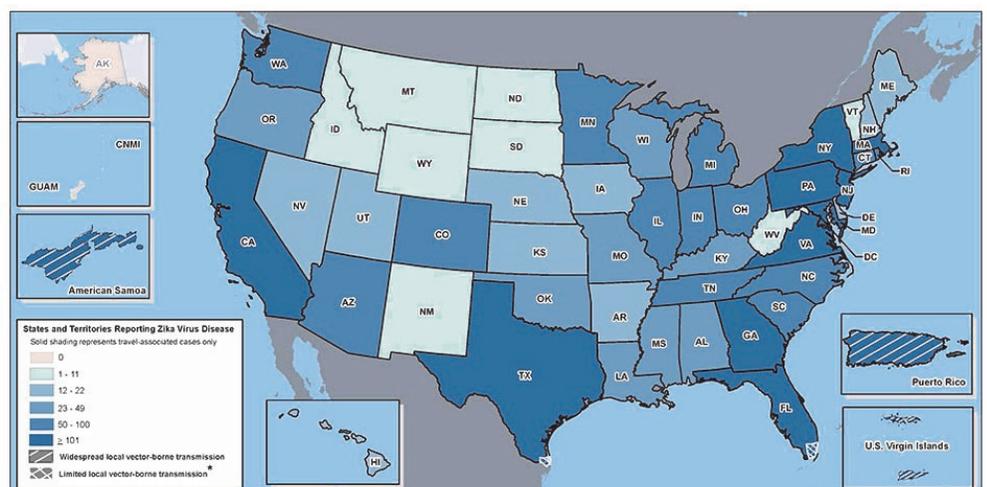
an established mode of transmission. This was the first case to have developed the disease through means other than the expected routes (travel to areas with ongoing Zika virus transmission, sexual contact with a person who recently traveled, or receipt of a blood transfusion/organ transplant). An in-depth investigation took place and included assistance from CDC. This involved mosquito trapping and testing in areas surrounding both cases' homes in Salt Lake County and Davis County. These efforts confirmed that the known mosquitoes to transmit this infection (*Aedes aegypti* or *Aedes albopictus*) were not in the area (see Figure 39) and none of the other trapped mosquitos carried the virus. Healthcare workers from the facility where the Salt Lake County resident died were also tested, as well as community members surrounding the cases' residences. This yielded no additional cases. The investigation concluded, although no route of transmission was identified. However, public health officials and healthcare professionals continue to study this unique situation for new information regarding potential routes of exposure.

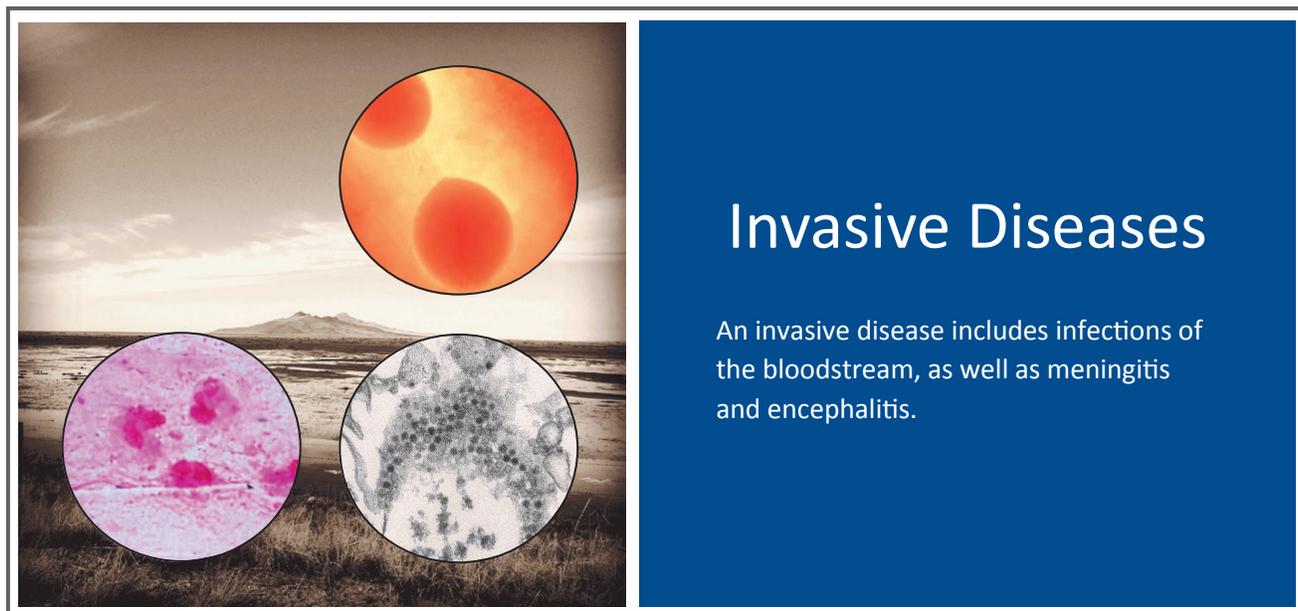
Figure 39. Estimated Range of *A. albopictus* and *A. aegypti* in the U.S., 2016



As of late January 2017, 4,682 cases of travel-associated Zika virus have been reported in the United States. An additional 217 cases of locally-acquired cases have also been reported in Florida and Texas (see Figure 40). Utah has had 28 confirmed cases, 11 of which were in pregnant women. Utah's local health departments continue to oversee and follow Zika virus investigations with help from Utah Department of Health (UDOH). As pregnant females deliver, additional follow-up of the mother and her baby are coordinated through the Utah Birth Defect Network.

Figure 40. Zika Cases reported in the U.S., 2016

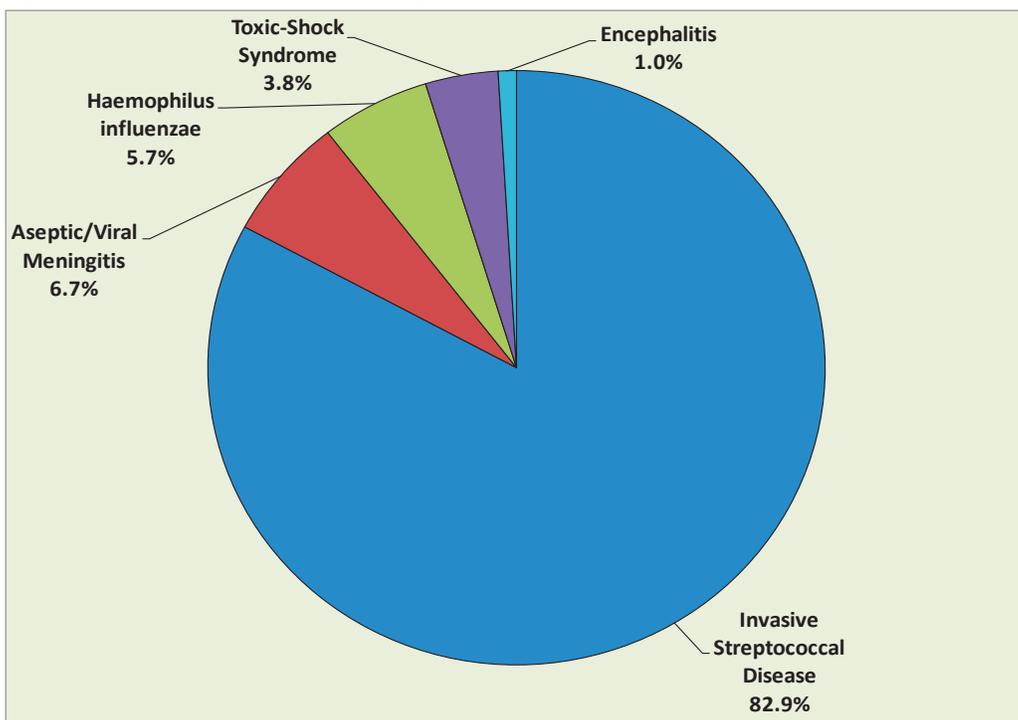




Invasive diseases include infections of the bloodstream as well as meningitis and encephalitis. All cases of meningitis, encephalitis, and toxic shock syndrome are reportable to the health department, regardless of the causative organism. In addition, all cases of invasive streptococcal disease (isolation of *Streptococcus* from a normally sterile site) must be reported.

The most common invasive diseases reported in Davis County in 2016 were invasive streptococcal infections with **87** (82.9%) cases. These included Group A *Streptococcus*, Group B *Streptococcus*, Group C & G *Streptococcus*, *Streptococcus pneumoniae*, and other streptococcal infections. Aseptic/viral meningitis was the second most common disease in this category with **seven** (6.7%) cases, followed by *Haemophilus influenzae* with **six** (5.7%) cases, toxic-shock syndrome with **four** (3.8%) cases, and encephalitis with **one** (1.0%) case (see Figure 41).

Figure 41. Invasive Diseases, Davis County, 2016



Invasive Streptococcal Infections

The primary invasive streptococcal diseases of public health concern are Group A, Group B, and *Streptococcus pneumoniae*.

- **Group A** streptococcal invasive disease manifests as necrotizing fasciitis (NF), streptococcal toxic shock syndrome (STSS), bacteremia, and pneumonia. It is transmitted person-to-person by contact with infectious secretions. Asymptomatic pharyngeal carriage occurs among all age groups, but is most common among children.
- **Group B** streptococcal invasive disease (GBS) in neonates manifests as sepsis, pneumonia and meningitis. Infection in the first week of life is called “early-onset disease.” In adults, sepsis and soft tissue infections are most common. Pregnancy-related infections include sepsis and amnionitis. Asymptomatic carriage in gastrointestinal and genital tracts is common and intrapartum transmission via ascending spread from vaginal and/or gastrointestinal GBS colonization occurs. Mode of transmission of disease in non-pregnant adults and older infants (>1 week) is unknown.
- **Group C** *streptococcus* is typically a zoonotic illness and the organisms can be found as pathogens in domestic animals such as horses, cows, birds, rabbits, and guinea pigs. Laboratories may misidentify them as Group A *streptococcus*. They can also be found as part of normal human flora. Many people with Group C infections have underlying health problems, but more recent studies have implicated this disease as an emerging human pathogen.
- **Group G** *streptococci* are normal human flora and individuals infected with this organism usually have underlying health problems, especially cancer.
- ***Streptococcus pneumoniae*** invasive disease manifests as pneumonia, bacteremia, meningitis, and sinus/ear infections. More than 90 types of pneumococcal bacteria exist, but not all are considered to be invasive. Of the strains causing invasive disease, 88% are serotypes included in the 23-valent polysaccharide vaccine (PPSV23). Before the first pneumococcal conjugate vaccine (PCV7) was introduced in 2000, the seven serotypes which it prevents were responsible for over 80% of severe pneumococcal infections among children. Now, the PCV13 vaccine includes the original seven serotypes in PCV7, plus six additional serotypes. The best way to prevent pneumococcal disease is by getting vaccinated.



Most strep infections are relatively mild illnesses such as strep throat, scarlet fever, and impetigo. Occasionally these bacteria can cause severe and life-threatening diseases.

2016 Highlights

In 2016, there were **87** cases of invasive streptococcal infections reported in Davis County.

The majority of cases were due to strains that do not require investigation or public health control measures.

There was a **6.9%** case fatality rate due to invasive streptococcal infections in 2016.

Invasive Streptococcal Infections

In 2016, 87 cases of invasive streptococcal infections were reported (see Figure 42). The majority of cases were due to strains that do not require an investigation or the implementation of public health control measures (e.g. *S. mitis*) (see Table 6).

Invasive streptococcal infections tend to cause severe illness. In 2010, over 12% of reported invasive streptococcal infections were fatal. Since then, the fatality rate among streptococcal infections has declined. In 2016, six out of 87 cases were fatal - a case fatality rate of 6.9%. This represents a slight increase from the 4.6% reported in 2015.

Figure 42. Invasive Streptococcal Infections by Month, Davis County, 2016

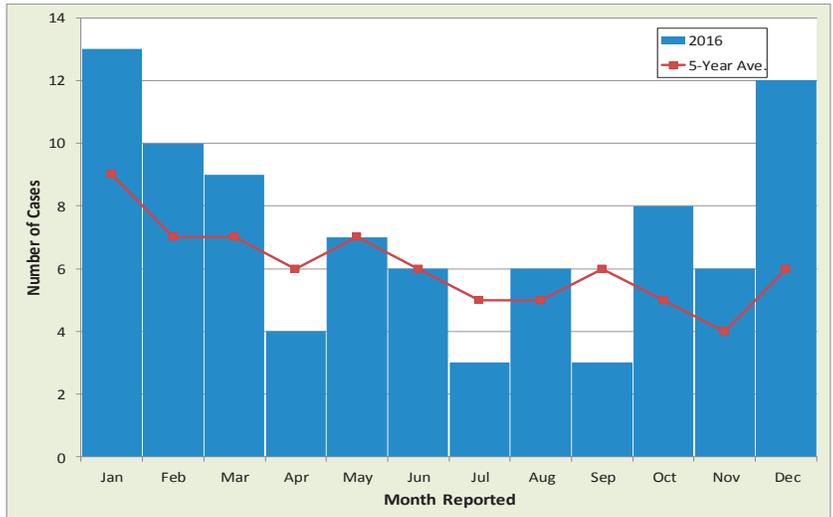
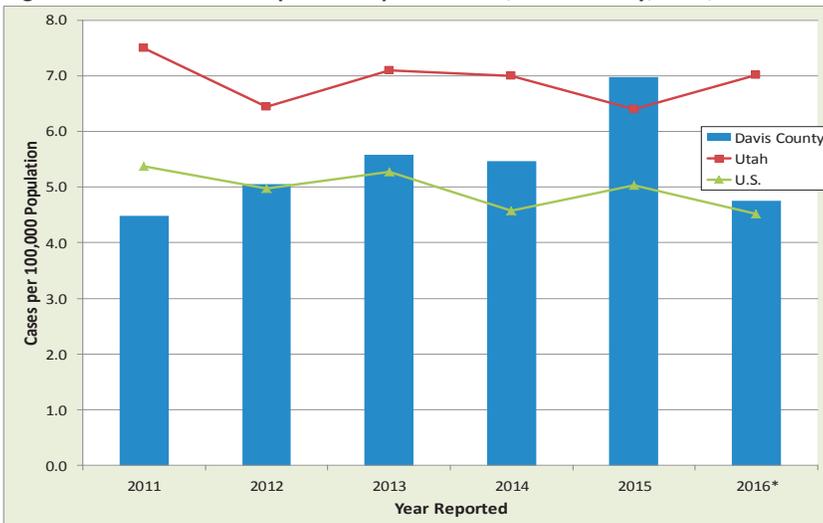


Table 6. Types of Invasive Streptococcus Infections, Davis County, 2016

Type	Number of Cases
Group A <i>Streptococcus</i>	15
Group B <i>Streptococcus</i>	16
Group C and Group G <i>Streptococcus</i>	6
Other <i>Streptococcus</i> (<i>mitis</i> , <i>viridans</i> , etc.)	34
<i>Streptococcus pneumoniae</i>	16
Total	87

Figure 43. Incidence of *Streptococcus pneumoniae*, Davis County, Utah, 2011-2016



Infection with *Streptococcus pneumoniae* is particularly serious. Nationally, incidence in healthy young adults is 3.8 per 100,000, but incidence in those less than 2 years or greater than 64 years is ten times higher. In 2016, two of the 16 (12.5%) *S. pneumoniae* cases in Davis County were fatal. *Streptococcus pneumoniae* rates have remained somewhat constant in Davis County and Utah during recent years (see Figure 43).

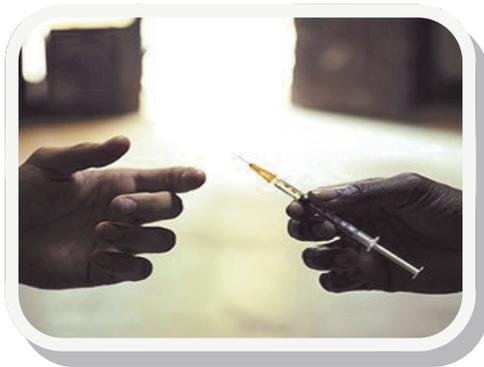


Diseases that do not fall under a specific identified category will be discussed in this section.

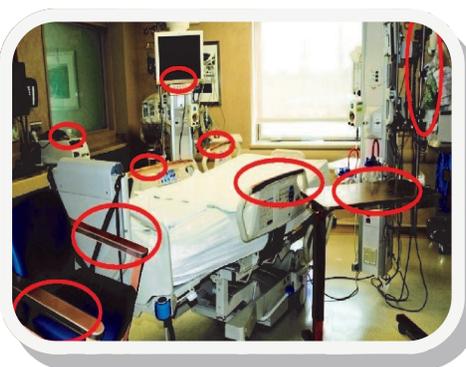
Hepatitis C infections made up the majority of this category, followed by carbapenem-resistant Enterobacteriaceae (CRE), coccidioidomycosis, and legionellosis (see Table 7).

Table 7. Other Reportable Disease/Conditions, Davis County, 2016

Disease	Number of Cases
Hepatitis C, acute and chronic	166
Carbapenem-Resistant Enterobacteriaceae (<i>Acinetobacter</i> , <i>Klebsiella</i> , <i>E. coli</i> , <i>Enterobacter</i>)	14
Coccidioidomycosis	7
Legionellosis	1
Total	188



Hepatitis C



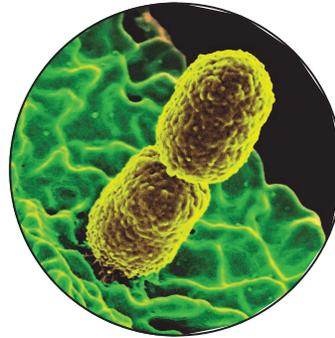
Carbapenem-Resistant Enterobacteriaceae (CRE)



Coccidioidomycosis

Carbapenem-Resistant Enterobacteriaceae (CRE)

The public health problem of antibiotic resistance is not new. However, due to the overuse of antibiotics in humans and animals, the problem is increasing in magnitude and new multidrug-resistant organisms (MDROs) are emerging. Carbapenem-resistant Enterobacteriaceae (CRE) are particularly concerning. Some CRE infections have developed resistance to most available antibiotics. CRE infections are very difficult to treat, can spread quickly, and may contribute to death in 40% of patients who become infected. Although these organisms are rare, they are increasingly identified in healthcare facilities throughout the United States.



Klebsiella is a type of Gram-negative bacteria that can cause different types of healthcare-associated infections, including pneumonia, blood infections, wound or surgical site infections, and meningitis.

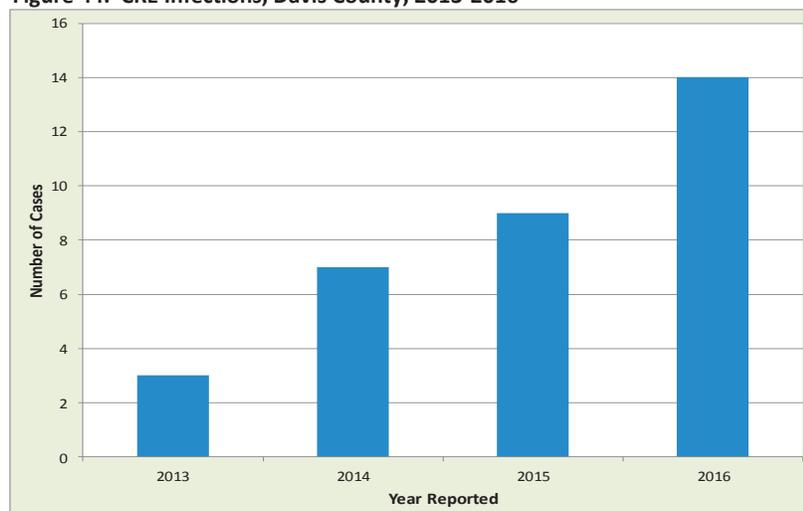
Utah laboratories and healthcare facilities are required to report the following CREs to the state or local health department:

- *Acinetobacter* species with resistance or intermediate resistance to carbapenem (meropenem and imipenem) from any site
- *Enterobacter* species with resistance or intermediate resistance to carbapenem (meropenem and imipenem) from any site
- *Escherichia coli* with resistance or intermediate resistance to carbapenem (meropenem, ertapenem, and imipenem) from any site
- *Klebsiella* species with resistance or intermediate resistance to carbapenem (meropenem, ertapenem, and imipenem) from any site

A total of **14** CREs (including **nine** *Acinetobacter* cases, **two** *Enterobacter* cases, **two** *E. coli* cases, and **one** *Klebsiella* case) were reported to Davis County Health Department (DCHD) during 2016 (see Figure 44). This represents a 56% increase from the nine cases reported in 2015. Part of this increase can be attributed to the addition of *Enterobacter* as a reportable condition in 2016.

Since CREs have become a reportable condition, public health is learning more about these organisms, including where they are occurring and how to prevent their spread within and between facilities.

Figure 44. CRE Infections, Davis County, 2013-2016



2016 Highlights

A total of **14** CREs were reported to DCHD in 2016.

This includes **nine** *Acinetobacter* cases, **two** *Enterobacter* cases, **two** *E. coli* cases, and **one** *Klebsiella* case.

Appropriate control measures to prevent spread were implemented at each facility.

Hepatitis C

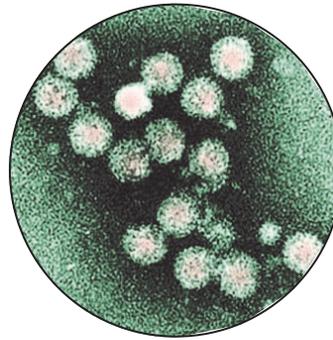
Hepatitis C is a disease caused by a virus that infects the liver. Over time it can cause liver damage including cirrhosis, liver failure, and cancer. Approximately 15-25% of those infected with Hepatitis C virus (HCV) will recover from the infection. The remaining 75-85% develop chronic infection. Each year approximately 15,000 people die from the complications of liver disease caused by Hepatitis C.

Most of those who develop chronic HCV infection remain asymptomatic for many years. Some experience a range of symptoms including fatigue, headache, joint aches, muscle aches, nausea, jaundice, loss of appetite, and abdominal pain.

HCV is a bloodborne pathogen that is predominantly spread by exposure to contaminated blood or blood products. Currently, the most prevalent mode of transmission is sharing needles or syringes to inject drugs. Sexual transmission of HCV can occur, but does not appear to be an efficient mode of transmission. HCV is not spread through casual contact, kissing, sneezing, hugging, sharing glasses/utensils, or from breast milk.

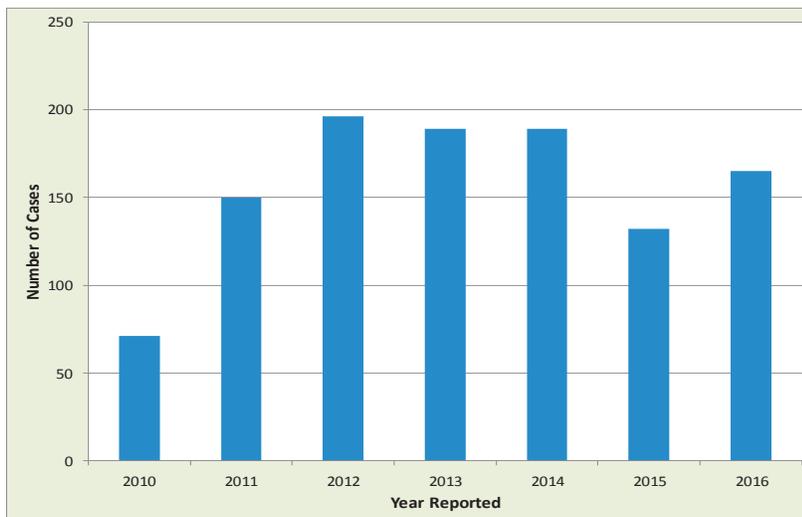
Hepatitis C is typically reported as a positive screening test for HCV antibodies. Investigation of this disease is focused on determining whether the case is acute, chronic, or a false-positive test. Confirmatory testing is necessary. Several reports of Hepatitis C come from blood donation centers, which have limited contact information for the person donating. Therefore, investigation of the disease is difficult. Of those investigated, the most prevalent risk factor identified was injecting drugs, currently or in the past. Most infected individuals were unaware of their infection.

In 2016, Davis County received reports on **166** cases of HCV, a 26% increase from the 132 cases reported in 2015 (see Figure 45). A recent drug-diversion event that potentially exposed over 7,200 individuals to HCV may have attributed to this as those who were potentially exposed received free HCV screening and public education was enhanced. Utah public health has also put an emphasis on identifying acute cases of HCV.



Hepatitis C is a bloodborne virus. Today, most people become infected with HCV by sharing needles or other equipment to inject drugs.

Figure 45. Hepatitis C Virus Infections, Davis County, 2010-2016



2016 Highlights

In 2016, **166** cases of HCV were reported in Davis County.

This represents a **25% increase** from what was reported in 2015.

This increase may be related to a recent drug-diversion event where **>7,200** individuals who were potentially exposed to HCV received free HCV screening and public education was enhanced.

Legionellosis

Legionella bacteria can cause Legionnaires' disease or Pontiac fever, collectively known as legionellosis. The disease is transmitted through the air from a soil or water source. All studies to date have shown that the organism cannot be spread from person-to-person. Outbreaks occur when individuals are exposed to a common source of *Legionella pneumophila* bacteria in the environment.



Legionellosis is a bacterial infection that may cause mild respiratory illness or pneumonia. It is associated with two distinct illnesses: Legionnaires' disease and Pontiac fever.

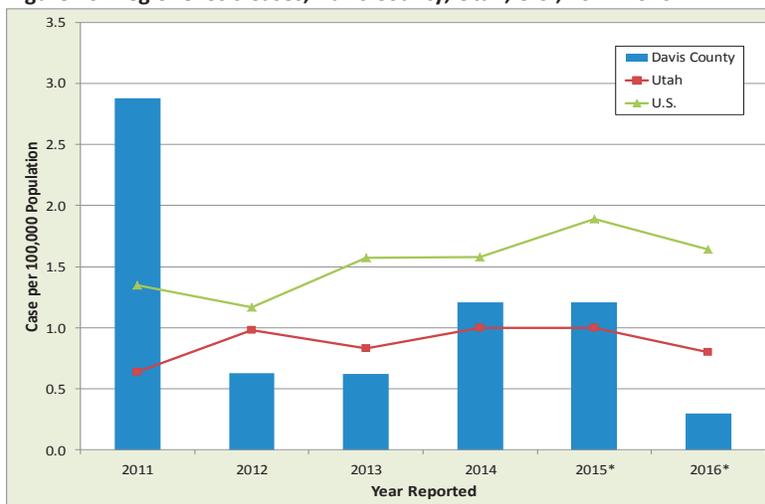
An estimated 8,000-18,000 people need care in a hospital due to Legionnaire's disease each year in the United States. However, many infections are not diagnosed or reported, so this number may be higher. Most legionellosis cases are sporadic; 23% are nosocomial (hospital acquired) and 10-20% can be linked to outbreaks.

During 2016, there was **one** case of legionellosis reported in Davis County. Davis County receives an average of two to three cases of legionellosis each year (see Figure 46). It is important for public health to identify a source of the infection before an outbreak occurs. Often, the source remains unknown. Aerosolizing of water, such as showers, humidifiers, swamp coolers, and spas, provide a good mechanism for transmission. Healthy individuals, when exposed, typically do not develop the disease. However, those who are immunocompromised are at higher risk.

This year's case did have a pre-existing medical condition rendering them more susceptible. Fortunately, this case did recover from the illness.

When compared to Utah, Davis County has similar rates of legionellosis, with the exception of 2011 when an outbreak of legionellosis was investigated in an assisted living facility in Davis County (see Figure 46). Both Davis County and Utah typically have lower rates of legionellosis when compared to the United States.

Figure 46. Legionellosis Cases, Davis County, Utah, U.S., 2011-2016



*Utah and United States 2016 data are provisional.

2016 Highlights

A total of one case of legionellosis was reported in Davis County during 2016.

Davis County receives an average of two to three cases of legionellosis each year.

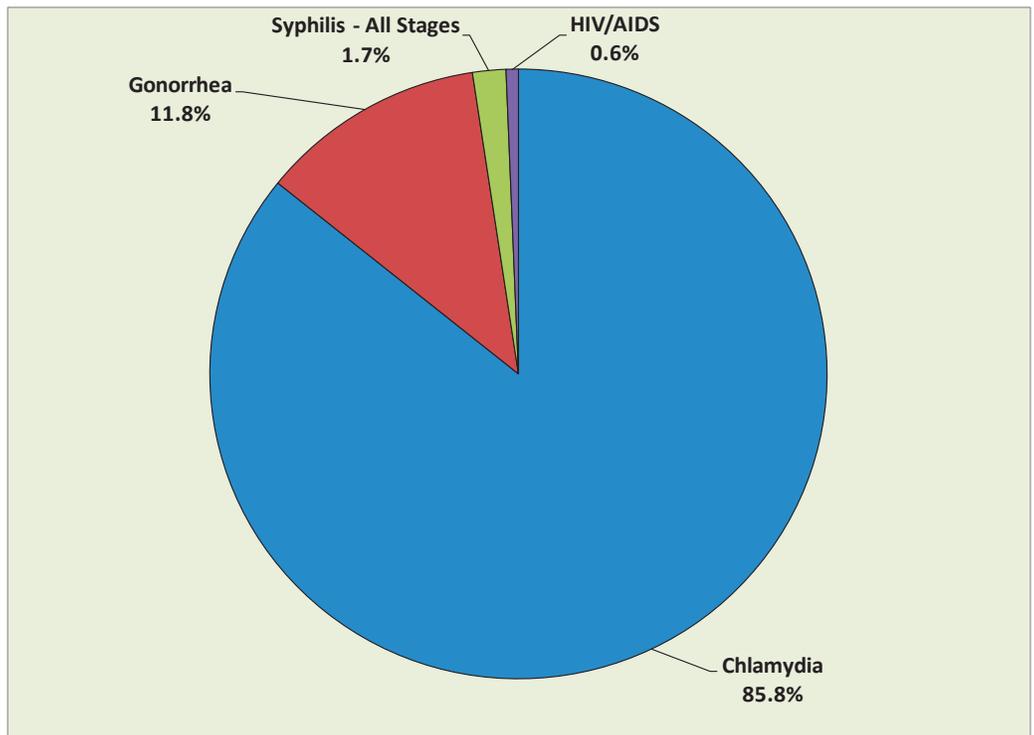
The case had a pre-existing medical condition. Fortunately, the case did recover from the illness.



Sexually transmitted diseases (STDs) are caused by bacteria, viruses, and other organisms transmitted from one person to another through sexual activity. Bacterial STDs such as chlamydia, gonorrhea, and syphilis are curable - using appropriate antibiotic therapy. However, permanent damage may occur (e.g. pelvic inflammatory disease, sterility, organ damage, meningitis) especially if treatment is delayed. Viral STDs such as herpes simplex virus (HSV) and human immunodeficiency virus (HIV) are not curable, but treatment can reduce viral load (contagiousness) and improve quality of life by decreasing symptoms. Complications from STDs range from mild/moderate illness to infertility, chronic pain, cancer, and even death. Less invasive testing techniques (e.g. urine testing, self-collected oral/rectal testing) have made chlamydia and gonorrhea testing more acceptable and convenient.

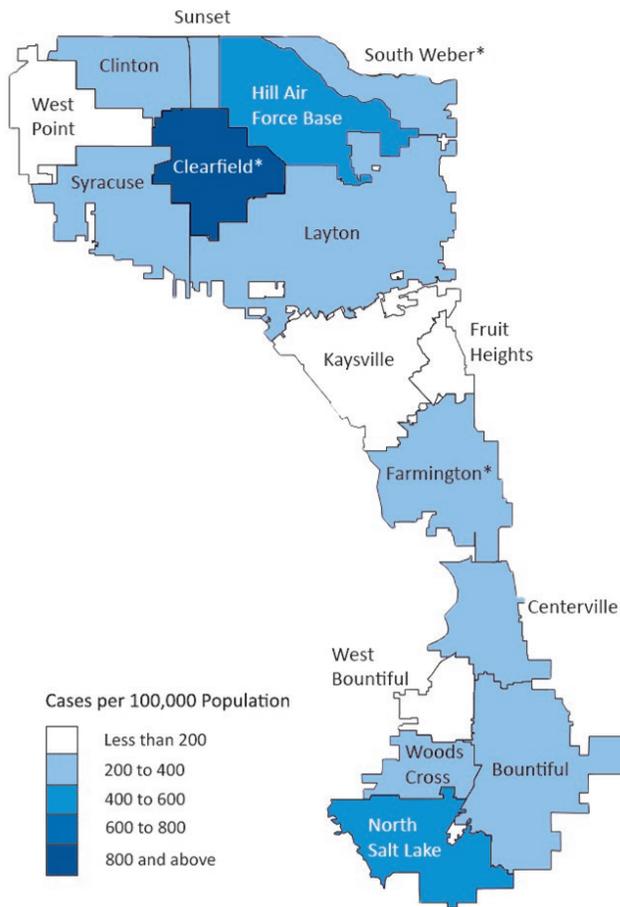
Sexually transmitted diseases reported in Davis County during 2016 include chlamydia, gonorrhea, syphilis, and HIV/acquired immunodeficiency syndrome (AIDS). Chlamydia was the most commonly reported STD with **934** (85.8%) cases, followed by gonorrhea with **129** (11.8%) cases, syphilis with **19** (1.7%) cases, and HIV/AIDS with **seven** (<1%) cases (see Figure 47).

Figure 47. Sexually Transmitted Diseases, Davis County, 2016



Sexually Transmitted Diseases (STDs)

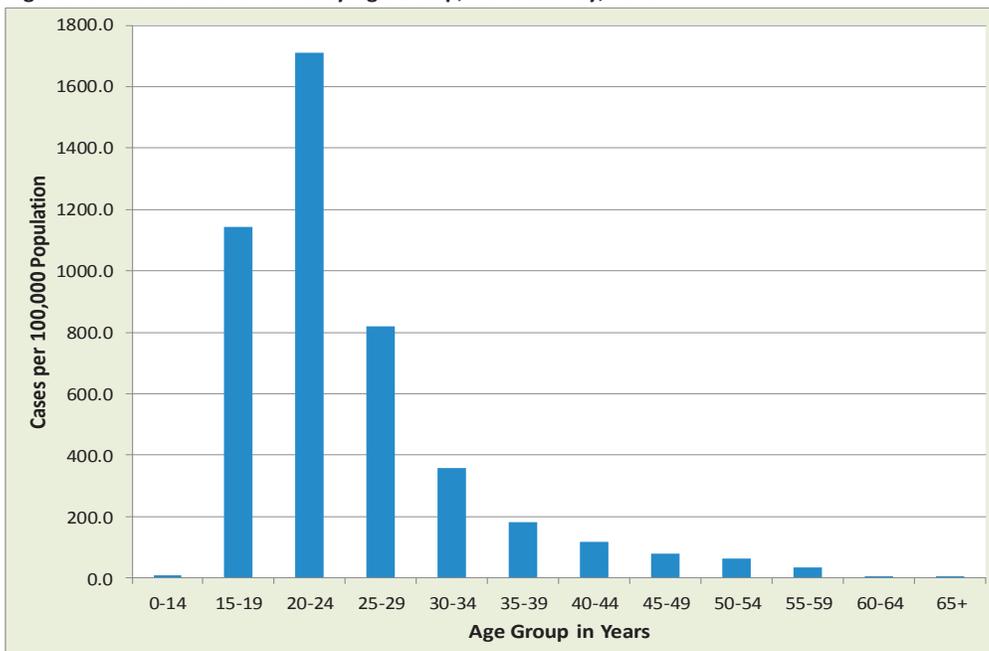
Figure 48. Incidence of all STDs by City, Davis County, 2016



Sexually transmitted diseases occurred among residents of every city in Davis County. The average rate in the county was 271.6 cases per 100,000 residents (see Figure 48). These rates were adjusted by age to account for the higher incidence of STD infection in cities with a larger young adult population. Clearfield had the highest rate of STDs, while Fruit Heights, West Bountiful, Kaysville, and West Point had the lowest rates (see Figure 48).

*These cities are impacted by temporary residential establishments (i.e. federal job corps and correctional facilities).

Figure 49. Incidence of all STDs by Age Group, Davis County, 2016



Sexually transmitted diseases were most often reported among women (54.2%) and among 20-24 years old (see Figure 49). Overall, STD incidence was high from 15 years of age to 34 years of age.

Chlamydia

Chlamydia is a sexually transmitted disease caused by the bacteria *Chlamydia trachomatis*. Chlamydia is one of the most common reported sexually transmitted diseases (STDs) in the United States (see Figure 50). The majority of chlamydial infections are asymptomatic. Most females and approximately 50% of males infected with chlamydia do not have obvious symptoms. Serious complications include arthritis, prostatitis, infertility, epididymitis, ectopic pregnancies, and damage to the reproductive organs.



Chlamydia is the most commonly reported STD in the United States.

Chlamydia and gonorrhea rates have been increasing for the past several years (see Figure 51). This is partially due to increased screening of high-risk individuals. During 2016, there were **934** cases of chlamydia reported in Davis County, a 5.4% increase from the 886 cases reported in 2015.

Chlamydial infections continue to account for the largest disease burden in Davis County. However, Davis County traditionally has lower rates of chlamydia when compared to Utah and the United States (see Figure 51).

Most concerning is the age group most commonly affected (15-24 year olds) (see Figure 52). While investigating cases, a number of high-risk behaviors were identified, including early initiation of sexual activity, multiple sex partners, unprotected sex, anonymous partners, using drugs/ alcohol while engaging in sexual activities, group sex, and anal intercourse.

Figure 50. Incidence of Chlamydia by County, United States, 2014

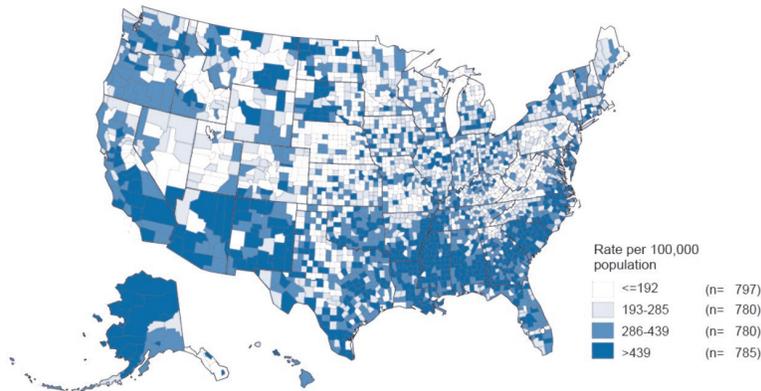
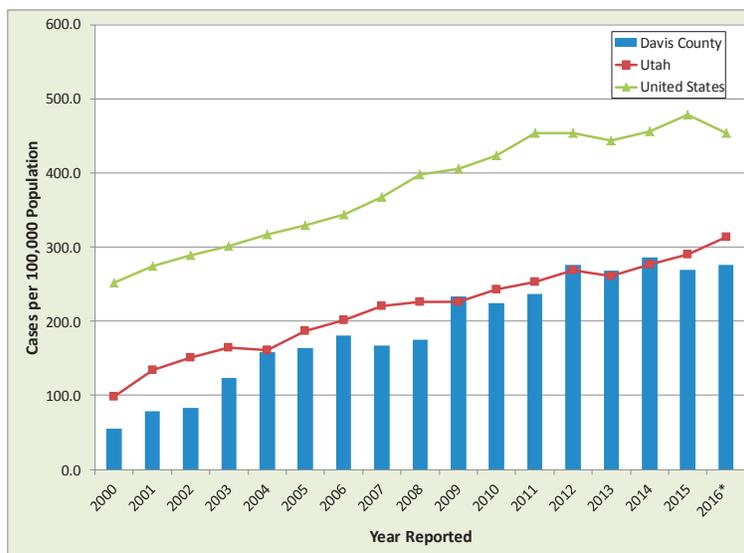


Figure 51. Incidence of Chlamydia, Davis County, Utah, U.S., 2000-2016



*Utah and United States 2016 data is provisional.

2016 Highlights

A total of **934** chlamydia cases were reported in Davis County during 2016.

Chlamydial infections continue to account for the largest disease burden in Davis County.

Traditionally, Davis County has lower rates of chlamydia when compared with Utah and the United States.

Chlamydia

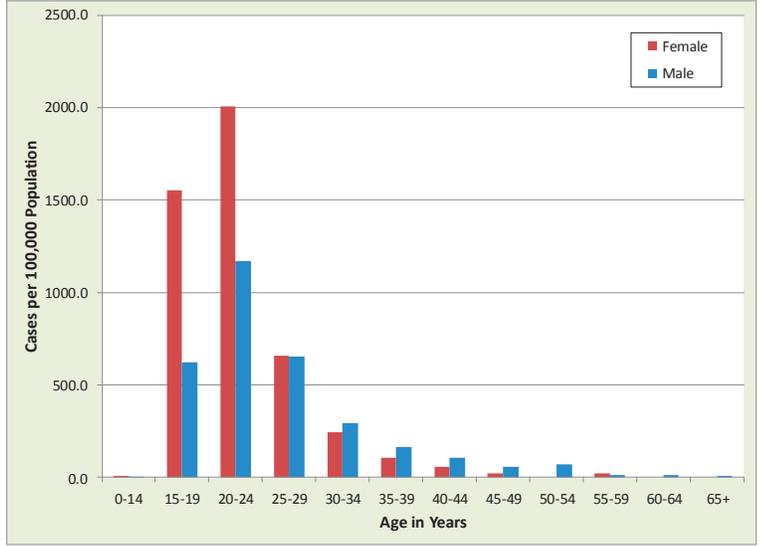
Chlamydia is more prevalent in females versus males (see Figure 53). Women are more susceptible to infection and the female reproductive system is an excellent environment for bacteria to grow. It also makes it more difficult to determine if signs or symptoms from an infection are present. Women are less likely to have symptoms of chlamydia when compared to men. If symptoms do occur, they may go away, yet the infection can remain.

Females are often diagnosed during routine medical visits. Their male partners are typically diagnosed following contact investigations. It is the goal of the health department to locate partners, offer free testing and treatment, provide disease education, and assist in the development of a risk-reduction plan. Not only do contact investigations limit the spread of infection to other individuals, but they also decrease the likelihood of re-infection. Re-infections occur when appropriately treated individuals engage in sexual activity with their untreated partners.

Because the majority of infected individuals have no symptoms of an STD, it is important for public health to encourage medical providers to routinely test and counsel sexually-active patients, especially those ages 25 and younger. Davis County Health Department (DCHD) continues to notify the medical community of changes made in the Sexually Transmitted Diseases Guidelines, 2015. Periodic Health Updates are also distributed to the medical community in an effort to communicate and establish awareness of current disease trends.

Communicable disease and epidemiology staff participate in annual trainings to enhance their knowledge-base and counseling skills in order to treat, identify, and educate those infected with or exposed to sexually transmitted diseases.

Figure 52. Incidence of Chlamydia by Age and Gender, Davis County, 2016



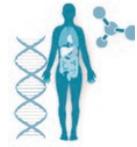
Unique factors place youth at risk for STIs



Insufficient Screening
Many young women don't receive the chlamydia screening CDC recommends



Confidentiality Concerns
Many are reluctant to disclose risk behaviors to doctors



Biology
Young women's bodies are biologically more susceptible to STIs

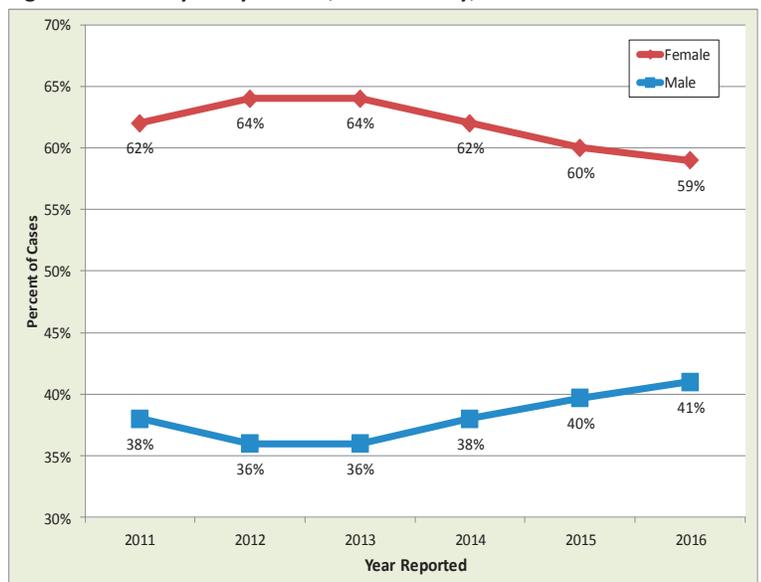


Lack of Access to Healthcare
Youth often lack insurance or transportation needed to access prevention services



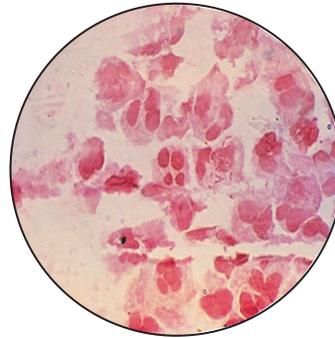
Multiple Sex Partners
Many young people have multiple partners, which increases STI risk

Figure 53. Chlamydia by Gender, Davis County, 2011-2016



Gonorrhea

Gonorrhea is a sexually transmitted disease (STD) caused by the bacteria *Neisseria gonorrhoeae*. Gonococcal infections are often asymptomatic in women and are becoming increasingly so in men. If left untreated, gonorrhea may result in serious complications including chronic pain, infertility, septic arthritis, hepatitis, endocarditis, and meningitis. Gonorrhea is complex and has the ability to develop resistance to antibiotics. Fluoroquinolones are no longer recommended by the Centers for Disease Control and Prevention (CDC) due to increasing resistance. Cephalosporins are the only remaining antibiotic class recommended for treatment.



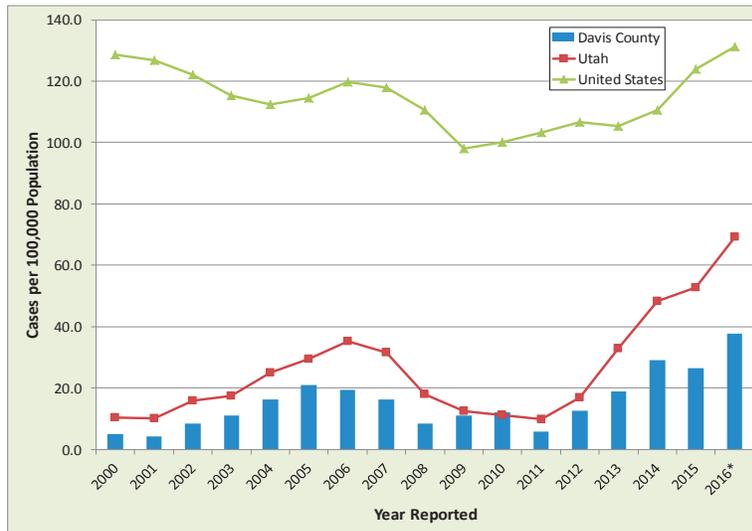
Gonorrhea has progressively developed resistance to several antibiotics used to treat it.

2016 Highlights

During 2016, 129 cases of gonorrhea were reported in Davis County.

During 2016, there were **129** cases of gonorrhea reported in Davis County, a 48% increase from the 87 cases reported during 2015 (see Figure 54). Although increases in gonorrhea rates have been observed in both Davis County and Utah, their rates continue to be well below the rate seen in the United States (see Figure 54).

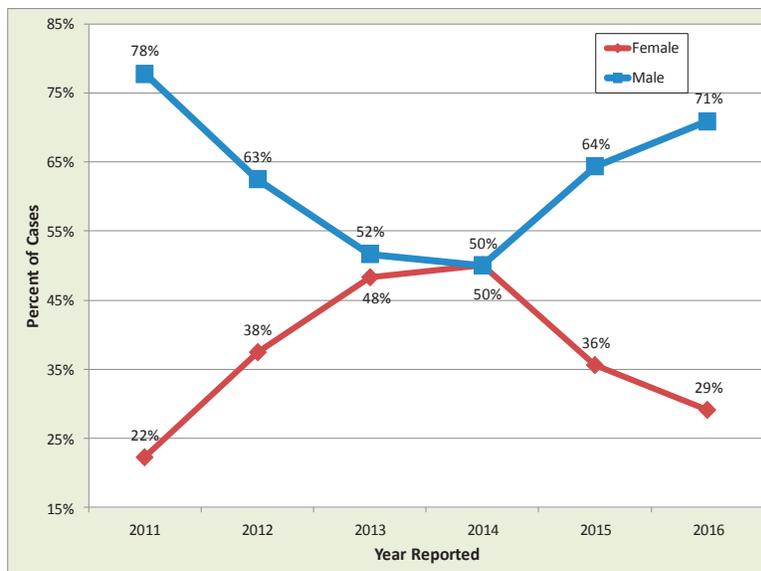
Figure 54. Incidence of Gonorrhea, Davis County, Utah, U.S., 2000-2016



*Utah and United States 2016 data are provisional.

Unlike chlamydia, gonococcal infections in Davis County were more frequent in males (see Figure 55). Disease interviews identified men who have sex with men (MSM), multiple sex partners, anonymous partners, incarceration, and substance abuse as common risk factors for gonococcal infection.

Figure 55. Gonorrhea by Gender, Davis County, 2011-2016



Gonorrhea infections in Davis County are more frequent in males.

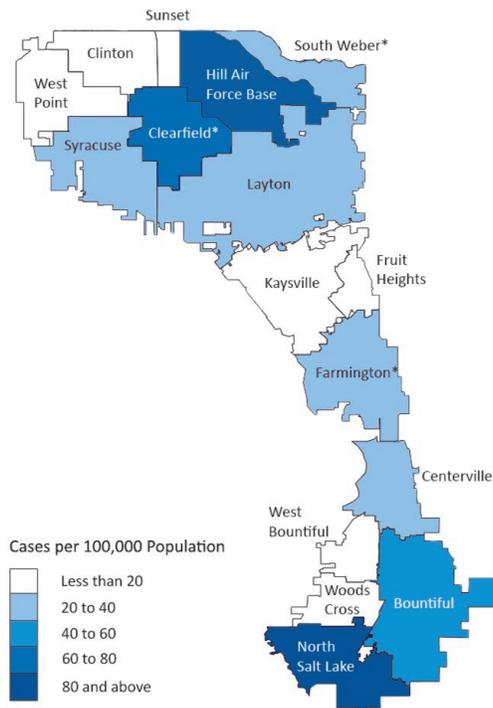
Davis County and Utah have seen significant increases in rates of gonorrhea in recent years.

Gonorrhea

The median age of those infected was 25 years (see Figure 56). This represents a small decline from the median age of 28 years that was observed in 2015. Davis County continues to see gonococcal infections in the younger population.

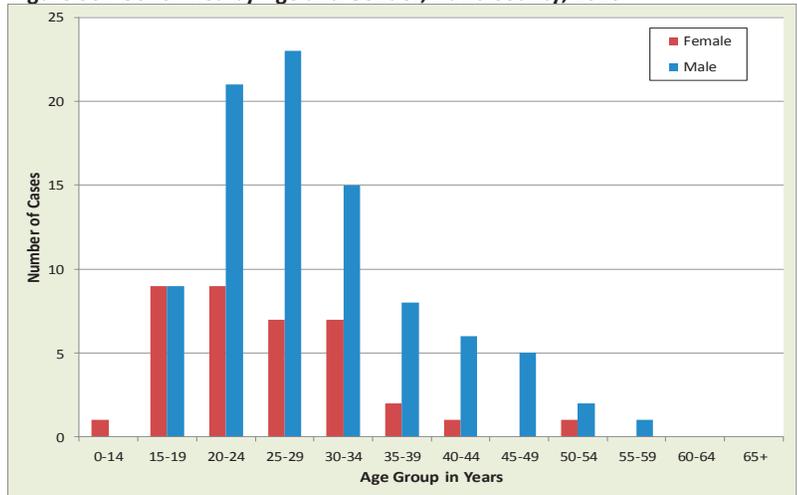
A significant number of cases were located in Bountiful and North Salt Lake, which both geographically border Salt Lake City (see Figure 57). This trend is also true among the MSM population - both Bountiful and North Salt Lake had a higher percentage of cases who were MSM (see Figure 58).

Figure 57. Gonorrhea by City, Davis County, 2016



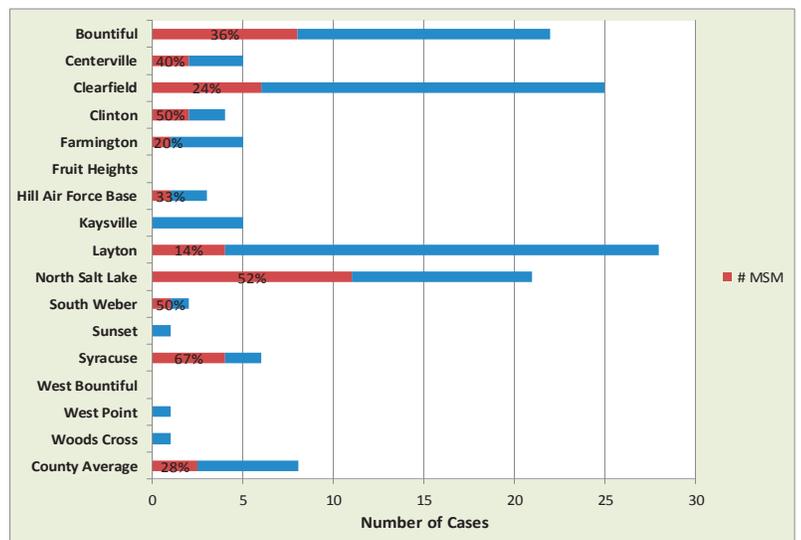
The Sexually Transmitted Diseases Treatment Guidelines, 2015 recommend treating all gonorrhea cases for both gonorrhea and chlamydia - regardless of chlamydia test results. The recommendation also includes a new treatment regimen for gonorrhea: a combination therapy of a ceftriaxone injection (e.g. Rocephin) and oral azithromycin to be given simultaneously. Doxycycline is no longer recommended as a first-line treatment regimen for gonorrhea to assist in controlling multidrug-resistant gonorrhea.

Figure 56. Gonorrhea by Age and Gender, Davis County, 2016



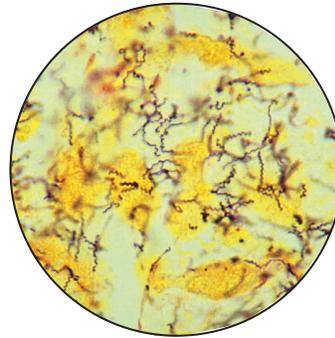
Testing for gonorrhea usually utilizes a urine sample which screens for both gonorrhea and chlamydia. This less-invasive testing process is more appealing to patients and may encourage sexually-active individuals to seek testing. However, when participating in anal/oral intercourse, some STDs will be missed if exclusively using the urine test. Medical providers are encouraged to include rectal/oral swabs in STD screenings for patients that engage in anal and/or oral intercourse. Another testing option involves self-collected specimens. Studies have shown that self-collected anal/oral swab specimens had test results that were of equal or better accuracy than those collected by clinical providers. DCHD plans to implement a similar process to their STD screening program in 2017.

Figure 58. Gonorrhea Cases and % Reporting as MSM by City, Davis County, 2016



Syphilis

Syphilis is a sexually-transmitted disease (STD) caused by the bacterial spirochete *Treponema pallidum*. Symptoms in adults are broken into stages: *primary*, *secondary*, *early latent*, and *late latent* syphilis. Syphilis is transmitted from person to person by direct contact with a syphilitic sore, known as a chancre, usually during sexual contact. Pregnant women with the disease can transmit it to their unborn child. Syphilis has been called “The Great Pretender” as its symptoms can mimic many other diseases. The painless sore that appears initially when a person is first infected can be confused as a pimple or other seemingly harmless lesion. However, many of these syphilitic sores develop in the rectum or vagina and are not noticed. Thus, most transmission is from persons who are unaware of their infection. Over the past several years, syphilis has continued to increase among men who have sex with men (MSM). Recent national outbreaks among MSM have been marked by high rates of coinfection with human immunodeficiency virus (HIV) and high-risk sexual behaviors.



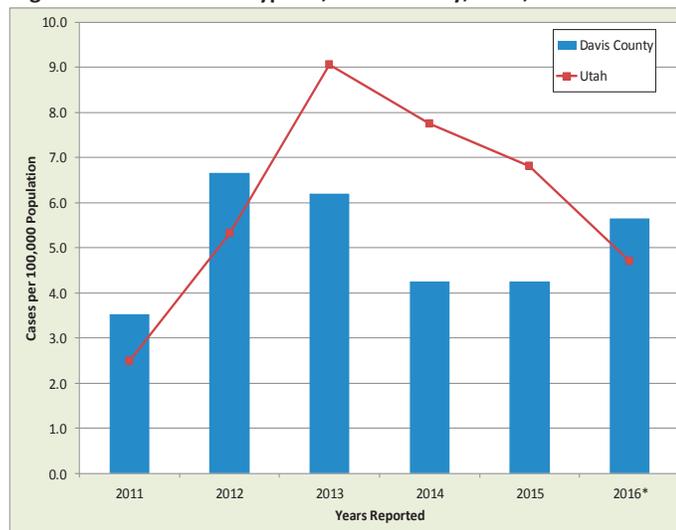
Syphilis is an STD that can cause long-term complications if not treated correctly. Symptoms in adults are divided into stages: *primary*, *secondary*, *early latent*, and *late latent* syphilis.

During 2016, there were **19** cases of syphilis reported in Davis County (see Figure 59). Four cases were classified as *primary*, one as *secondary*, four as *early latent*, nine as *late latent*, and one as *congenital*.

Through disease investigations, it was noted that the majority of those infected with any stage of syphilis were men who have sex with men (MSM). Other identified risk factors include unprotected anal sex, injection drug use (IDU), multiple sex partners, anonymous sex with individuals of unknown STD/HIV status, foreign-born, and substance abuse. Only a few individuals were diagnosed with symptoms.

The staging of syphilis is difficult and requires obtaining a thorough history (including past test results), risk factors, previous treatment regimens, and evaluation of symptoms. Partners’ disease status also helps in the staging process. The later stages of infection require a more rigorous treatment protocol. Transmission to an unborn fetus causes congenital syphilis and can result in miscarriages, stillbirths, and death.

Figure 59. Incidence of Syphilis, Davis County, Utah, 2011-2016



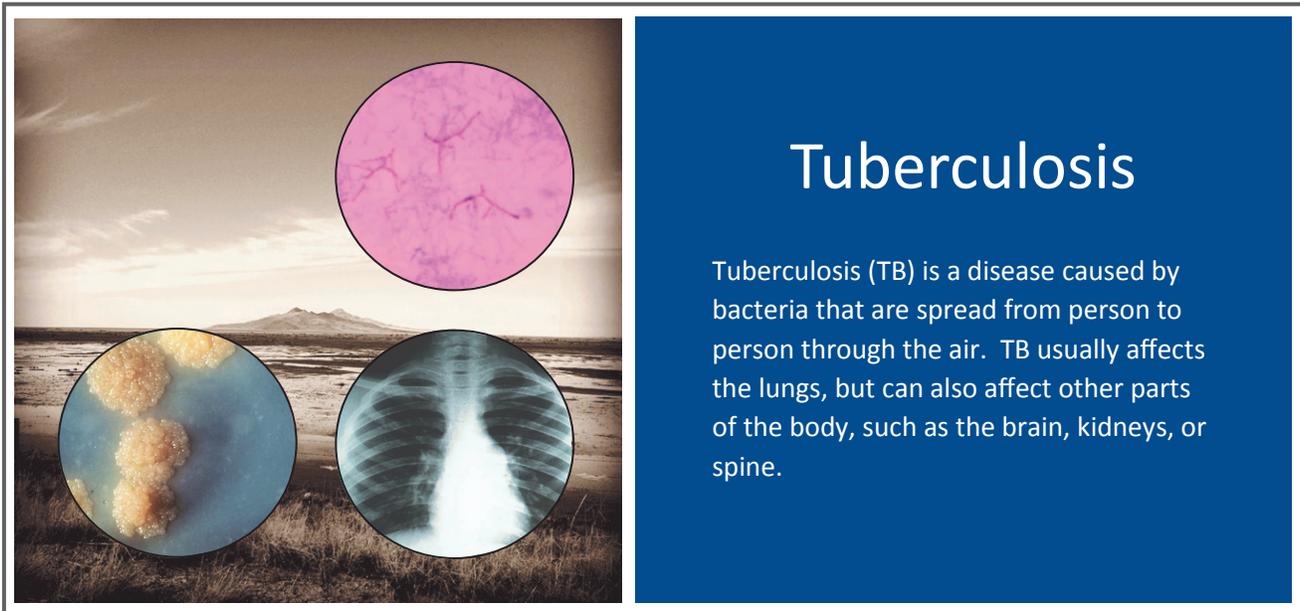
*Utah 2016 data is provisional.

2016 Highlights

A total of **19** cases of syphilis were reported during 2016 in Davis County.

The majority of those infected with any stage of syphilis were men who have sex with men (MSM).

Davis County traditionally has lower rates of syphilis, when compared with Utah.



Approximately one-third of the world’s population and 9 to 14 million people in the United States are infected with *M. tuberculosis*. On average, 10% of infected individuals will develop active tuberculosis at some point in their lives. In 2015, 10.4 million people worldwide became sick with TB disease resulting in approximately 1.8 million TB-related deaths. In the United States, there were 9,557 TB cases in 2015 (3.0 cases per 100,000 persons). This represents a 1.4% increase compared to cases reported in 2014. Although case count has risen slightly, the TB incidence rate has remained relatively stable since 2013. Utah had **20** confirmed cases (0.7 cases per 100,000 persons) reported in 2016.

By the early 1980s, TB was considered to be under control and many states redirected TB prevention and control funds to other programs. As a result, the country experienced a resurgence of TB, with a 20% increase in cases reported between 1985 and 1992. Many of these were persons with difficult-to-treat drug-resistant TB. This led to more aggressive control efforts. Since then, the number of TB cases reported annually has decreased. With the introduction HIV, TB rates remain a constant threat as it is a leading cause of death among those infected with HIV. Also, a new virulent strain of TB, extensively drug-resistant tuberculosis (XDR-TB), has been identified. This strain is resistant to many drugs used to treat tuberculosis and has a high mortality rate.

Davis County had **two new** active tuberculosis disease (ATBD) cases (see Figure 60) and **112** latent tuberculosis infections (LTBI) in 2016 (see Figure 61).

Figure 60. Active Tuberculosis Cases by Year, Davis County, 2002-2016

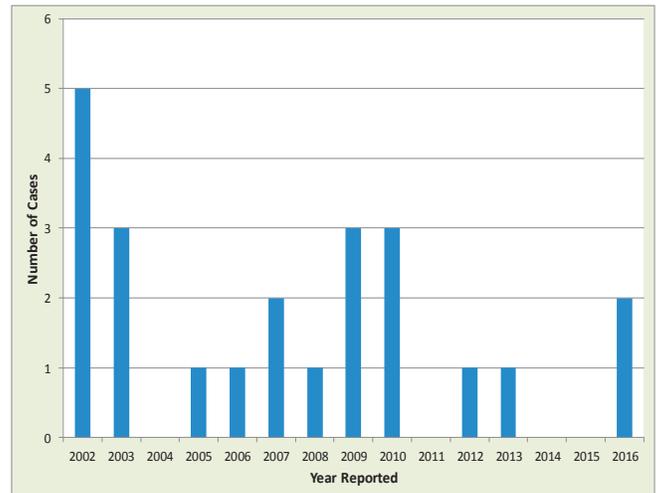
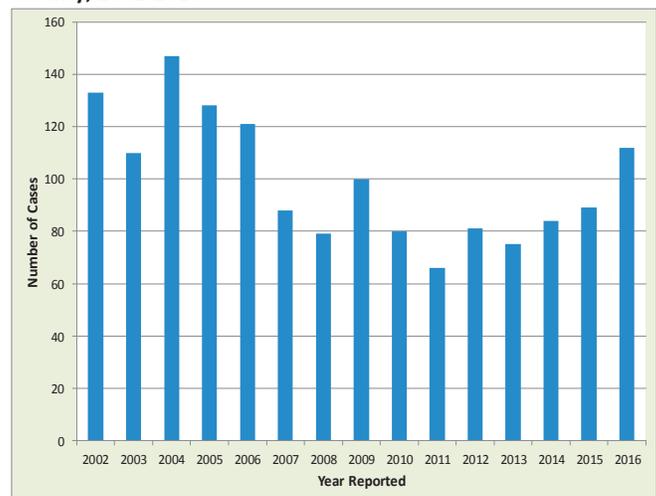
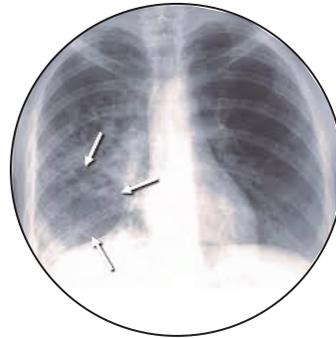


Figure 61. Latent Tuberculosis Infections (LTBI) by Year, Davis County, 2002-2016



Active Tuberculosis Disease (ATBD)

Tuberculosis (TB) is caused by a type of bacteria called *Mycobacterium tuberculosis*. The bacteria usually attack the lungs (pulmonary) but may attack any part of the body (extrapulmonary). TB is typically spread through the air when a person with TB disease of the lungs or throat expels tiny airborne particles (droplet nuclei). People nearby may breathe in these particles and become infected. People who have latent TB infection do not feel sick, do not have any symptoms, and cannot spread TB. However, they may develop active TB disease at some time in the future. The United States experienced a resurgence of active tuberculosis disease (ATBD) between 1985 and 1992, when the number of TB cases increased by 20%. Early detection and treatment of ATBD is essential to control the spread of the disease and to prevent outbreaks.



TB is a disease caused by *Mycobacterium tuberculosis*. This bacteria usually attack the lungs, but can attack any part of the body, such as the kidney, spine, and brain.

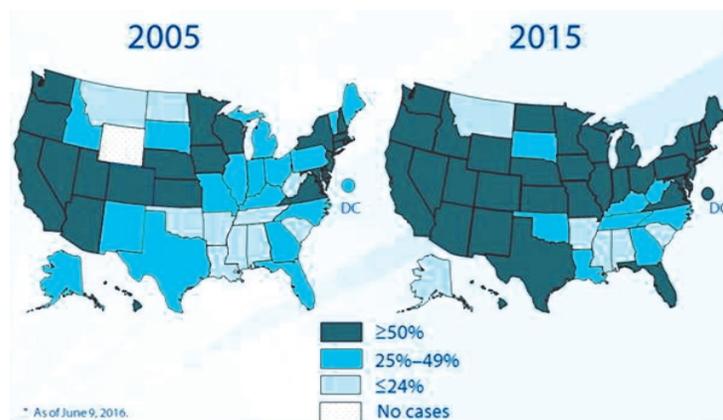
In 2016, Davis County had **two new** cases of active tuberculosis. One case was pulmonary and the other case was extra-pulmonary.

Management of active tuberculosis cases requires close collaboration between several agencies including local health departments, medical providers, Utah Department of Health, Utah Public Health Laboratory, and a commitment by the infected individual. Both pulmonary and extra-pulmonary TB typically require six months of treatment. Complicated cases of tuberculosis can require treatment to be extended up to two years (e.g. meningial, multi-drug resistant/extensively-drug resistant (MDR/XDR)).

Patients with infectious pulmonary tuberculosis, which is of most concern for public health, are isolated until sputum sample tests indicate the individual is no longer infectious. To ensure drug treatment compliance, medication is administered under Directly Observed Therapy (DOT). Because DOT can seem personally invasive to the patient, strategies to promote a less intrusive and more flexible schedule are implemented whenever possible. These include bi-weekly/tri-weekly treatments, home visits, and video-conferencing.

In the United States, tuberculosis is primarily seen in individuals who are foreign-born or have traveled/lived in endemic countries (see Figure 62).

Figure 62. Percentage of TB Cases Among Foreign-born Persons, United States, 2005 & 2015



2016 Highlights

Two new cases of active tuberculosis were reported in Davis County in 2016.

On average, Davis County investigates one to two cases of active tuberculosis a year.

In the United States, tuberculosis is primarily seen in individuals who are foreign-born or traveled/lived in endemic countries.

Latent Tuberculosis Infection (LTBI)

Latent tuberculosis infection (LTBI) is a condition in which tuberculosis (TB) bacteria are alive, but inactive in the body. People with LTBI have no symptoms, cannot spread TB to others, and usually have a positive skin test reaction or interferon gamma release assay (IGRA) blood test. Development into active disease occurs in about 10% of those who do not receive treatment for LTBI.

Approximately 200 clients are referred to Davis County Health Department (DCHD) annually for tuberculosis evaluation. These evaluations can include interviews, repeat skin testing/blood screening tests, chest x-rays, sputum testing, and physical exams in order to provide an accurate diagnosis.

With the low incidence of active tuberculosis disease in Davis County and Utah as a whole, the largest disease burden for tuberculosis falls under LTBI. During 2016, Davis County managed **112** clients with LTBI, with an average of **24** LTBI patients per month. Treatment of LTBI reduces the risk that latent TB will progress to active disease and is essential to the control and elimination of tuberculosis disease. Case management includes initial testing to rule out active disease and ensuring appropriate treatment of the infection. The majority of individuals who receive LTBI treatment in Davis County are foreign-born or returning LDS missionaries who traveled to endemic countries (see Figure 63).

Typically, treatment for LTBI consists of daily antibiotic therapy for nine months. Individuals are monitored throughout therapy, but DOT is not necessary. In October 2012, use of a new LTBI treatment recommended by CDC was implemented in Utah. This new regimen is a combination of two drugs, administered by DOT once weekly for 12 doses. It is recommended for persons age 12 or older who are otherwise healthy, but also meet a certain set of criteria.

Davis County receives referrals for suspect active/latent tuberculosis from



Persons with LTBI do not feel sick and do not have any symptoms. They are infected with *M. tuberculosis*, but do not have TB disease.

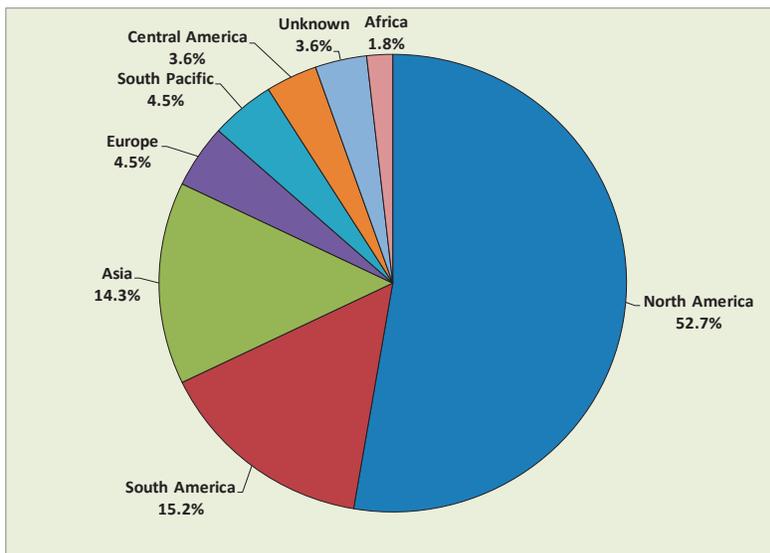
2016 Highlights

During 2016, Davis County managed **112** patients with LTBI.

The majority of individuals who receive LTBI treatment in Davis County are foreign-born or traveled/lived in endemic countries.

DCHD provided **1,077** tuberculin skin tests to the public in 2016.

Figure 63. LTBI by Place of Birth, Davis County, 2016



Latent Tuberculosis Infection (LTBI)

various medical facilities and providers. Screening tests consist of a tuberculin skin test (TST) or IGRA (e.g. Quantiferon-Gold). Those with positive test results are often referred to the health department for evaluation and treatment. LTBI is not a reportable condition, but free or low-cost services are available for the community.

Davis County managed LTBI patients of all ages (see Figure 64). The age group with the highest frequency of cases was 20-24 years. This age group corresponds with LDS missionaries who are screened prior to leaving and those who are screened and treated after returning home.

Davis County Health Department (DCHD) provided **1,077** tuberculin skin tests to the public in 2016 (see Figure 65). However, these numbers only account for a small percentage of all TB tests performed in the community. Most often, those who sought TB testing did so for a job or school requirement (75.9%). Other reasons included pre- and post-mission requirements (7.8%), refugee or immigrant requirements (7.0%), exposure to TB (4.3%), unknown (3.7%), personal choice (<1.0%), immunocompromised (<1.0%), substance abuse (<1.0%), and migrant work requirements (<1.0%) (see Figure 65).

Figure 64. LTBI by Age Group, Davis County, 2016

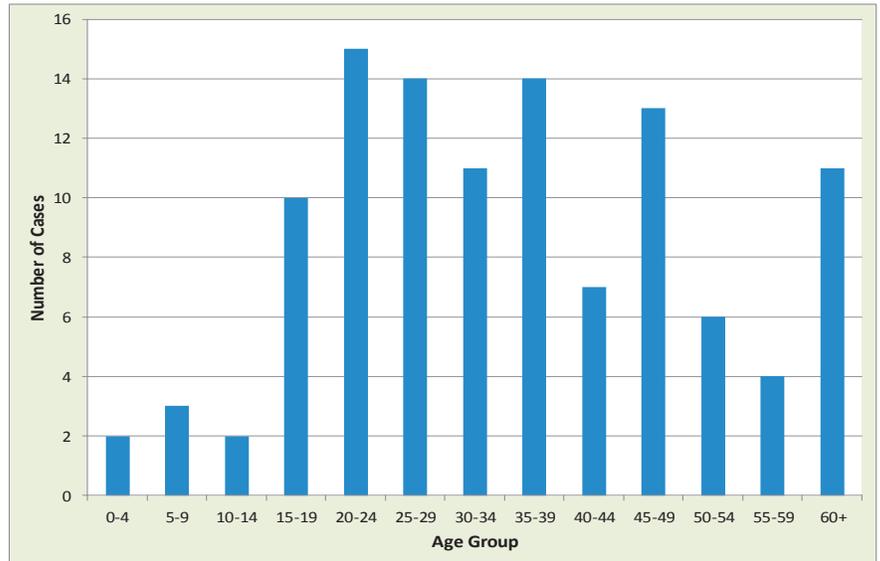
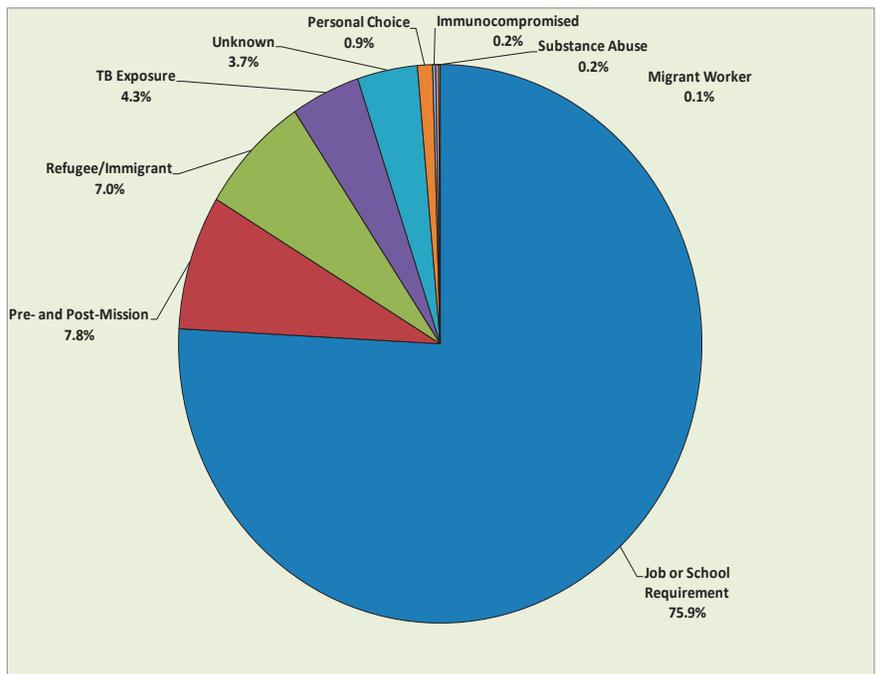


Figure 65. Reasons for TB Testing, Davis County Health Department (DCHD), 2016



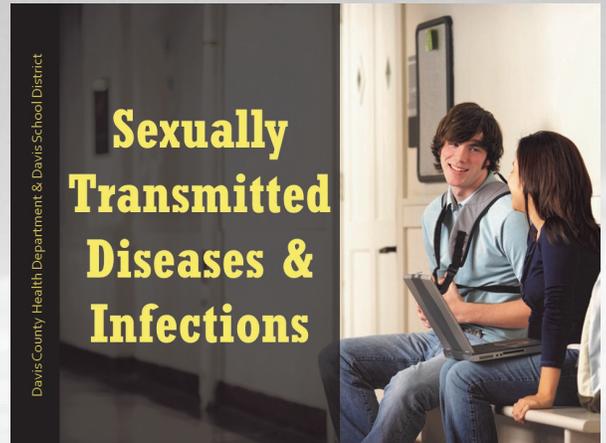
Program Highlights

During 2016, several program activities were implemented to address disease trends and enhance community education.

STD/HIV Program Highlights:

School District STD Education

To help address the sexually transmitted disease (STD) burden among adolescents, Davis County Health Department (DCHD) continues a partnership with Davis School District (DSD) to provide STD/human immunodeficiency virus (HIV) education in the secondary schools. Davis County is one of the few local health departments to offer this service. The presentation was created in collaboration with the curriculum department at DSD and was approved by the board for teaching within the junior high and high school settings. Teachers have been offered trainings on the approved STD/HIV presentation in an effort to standardize the presented materials, update and increase the knowledge base of district educators, and expand the pool of trained professionals. In 2016, **30** presentations by health department staff were provided, reaching approximately **1,705** students in grades 8, 10, and 11. For high school students, abstinence pamphlets, along with STD/HIV facts and locations for testing, were provided by DCHD. A modified version of the presentation is offered to the junior high age group. Students are given information on how to access DCHD's STD Hotline number—which is staffed by a nurse Monday through Friday (8:00am - 5:00pm).

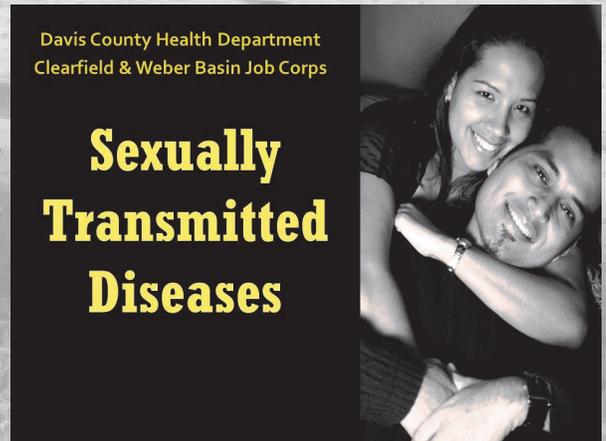


Surveys are provided to teachers and students at the secondary schools to help assess satisfaction of the presentations. The results of the surveys have been highly rated with many expressing appreciation for the services provided.

Community Outreach Education

DCHD partners with the two local Job Corps Centers (Clearfield and Weber Basin) to provide STD/HIV education to students in their facilities. Classes are taught weekly at the Clearfield Job Corps Center and as requested at the Weber Basin location. For 2016, the following results were noted:

- **45** presentations were given
- **1,141** students participated in the presentations
- **686** (61%) of the students who participated were of various ethnic minorities



The STD/HIV presentation was also offered to various entities within the county upon request.

Program Highlights

Low-Cost STD/HIV Screening Clinic

Access to STD testing has been noted as a barrier by those who are sexually active and at-risk. As a result, DCHD partners with Midtown Community Health Center—Davis to offer low-cost screening to residents through their clinic. Two options are available to the community:



- **Low-Cost Screening Clinic:** This is a walk-in clinic where individuals can access STD screening Monday through Friday (8:00am - 5:00pm). Individuals are provided educational materials on STD/HIV and offered testing—a physical exam is not performed. Those who test positive are reported to the health department for further investigation and treatment. Testing supplies and medications are provided by the health department. Midtown Clinic provides a medical assistant who is responsible for collecting the specimens.

During 2016, approximately **256** clients received testing through the low-cost clinic. Davis County identified **20** positive chlamydial, **one** gonococcal, **two** syphilis infections—an STD infectivity rate of 9%.

- **Provider Exam STD Testing:** Individuals who are symptomatic can receive STD services through Midtown Clinic. Clients make an appointment to see a medical provider, obtain a physical examination, and are tested for chlamydia, gonorrhea, and HIV (syphilis testing is performed if the individual is at-risk). Additional tests are available for an added fee. Testing is provided by Midtown Clinic. If test results are positive, Midtown Clinic treats the patient with medication provided by DCHD and refers the case to DCHD for risk-reduction counseling and investigation. In 2016, **111** clients were tested by Midtown Clinic through this program.

STD/HIV Contact Clinic

Individuals who test positive for any of the reportable STDs (chlamydia, gonorrhea, syphilis, HIV, and chancroid) are interviewed to identify exposed sexual contacts. Contacts are located, tested, and treated by DCHD at no charge. In 2016, **200** individuals were seen in the STD/HIV contact clinic. Of those, **81** tested positive for chlamydia (47%) and **11** tested positive for gonorrhea (6%). Of the **34** who were tested for syphilis, **eight** (24%) tested positive. In addition, **one** (6%) of the **17** who tested for HIV had positive results. Contacts to positive cases are at high risk of acquiring infection and the data reiterates the importance of contact tracing in the control of STDs.

Rapid HIV Testing

Traditional HIV testing may take up to 10 days for results. To decrease the wait time, DCHD conducts free rapid HIV clinics throughout the year, often in conjunction with national HIV and STD events. Results are available in 20 minutes. Rapid testing is also performed in the STD/HIV contact clinic. In 2016, **73** rapid HIV tests were administered. Those that are positive by rapid test receive follow-up confirmatory testing performed at the Utah Public Health Laboratory (UPHL). DCHD staff administering the tests are trained to give positive test results and provide important resources to infected clients. In 2016, a new 4th generation rapid HIV test was made available. This test is capable of detecting infection two—four weeks after exposure. This is a valuable resource to help in the early identification of infection and prevent spreading of the virus to others.

Program Highlights

Community Involvement

In order to better serve and care for HIV positive residents and their partners, DCHD participates in a statewide HIV Planning group. This group is comprised of local health department representatives, Utah Department of Health (UDOH) staff, infectious disease physicians, community partners, and HIV-infected individuals. Together the group discusses updates on HIV issues, best-care practices, ways to keep clients in care, service gaps, and how support systems can be incorporated into program activities.

HIV PrEP Education

HIV pre-exposure prophylaxis (or PrEP) helps prevent an HIV-negative person from getting HIV from a sexual or injection-drug-using (IDU) partner who is positive. When used with other safer sex practices (e.g. condoms), PrEP can protect a high risk individual from getting HIV from an infected partner. The Centers for Disease Control and Prevention (CDC) reports that PrEP reduces the risk of getting HIV sexually by more than 90%, when used consistently. Similarly, when used consistently, PrEP reduces the risk of getting HIV by more than 70% among people who inject drugs. With the availability of this new intervention tool, DCHD is now providing education on PrEP to men who have sex with men (MSM), IDUs, and women with high-risk partners who are diagnosed with early syphilis and gonorrhea.

Tuberculosis Program Highlights:

Residents who have developed active tuberculosis need to receive appropriate treatment for their disease. Failure to comply with the established treatment regimen can result in the development of drug resistance. To prevent this from occurring, treatment must be administered under directly observed therapy (DOT). This requires a health department staff member to observe the patient taking their medication daily or (when possible) three times a week. This process can make it difficult for the clients to maintain normal day-to-day activities and can incur travel costs to the patient and/or health department staff. To address this issue, DCHD offers clients a video-conferencing option where those with a history of complacency can be observed taking their medication through applications such as Skype or FaceTime. The tuberculosis control nurse conducts periodic face-to-face encounters to ensure that any possible treatment side effects are recognized. Video conferencing will only be considered for individuals who display responsible behaviors and are low-risk for complications.

In the summer of 2016, CDC, the American Thoracic Society, and the Infectious Diseases Society of America released updated guidelines for the *Treatment of Drug-Susceptible Tuberculosis*. These guidelines are similar to those released in 2003, with some notable revisions including:

- *Two times per week* dosing is not recommended for those who are smear positive, have cavitory and/or drug-resistant disease or are HIV-infected.
- Isoniazid taken with or crushed within food should be given with sugar-free products to ensure better absorption.
- Breastfeeding females who are taking isoniazid should also receive vitamin B6.
- No good evidence exists to exceed six months of therapy when treating uncomplicated HIV-infected individuals.

Clinical Infectious Diseases
IDSA GUIDELINE

Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis

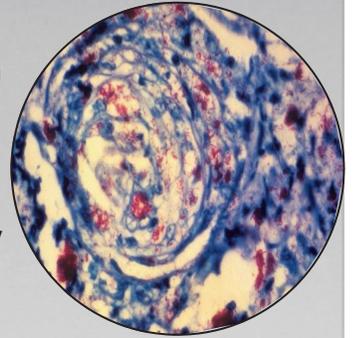
Keynote: Mycobacterium tuberculosis; HIV infections; antimicrobial agents; case management; public health.

EXECUTIVE SUMMARY

The American Thoracic Society (ATS), Centers for Disease Control and Prevention (CDC), and Infectious Diseases Society of America (IDSA) jointly sponsored the development of this guideline on the treatment of drug-susceptible tuberculosis, which is also endorsed by the European Respiratory Society (ERS) and the US National Tuberculosis Controllers Association (NTCA). This guideline provides recommendations on the clinical and public health management of tuberculosis in children and adults in settings in which mycobacterial culture, molecular and phenotypic drug susceptibility tests, and radiographic studies, among other diagnostic tools, are available on a routine basis. For all recommendations, literature reviews were performed, followed by discussion by an expert committee according to the Grading of Recommendations, Assessment, Development and Evaluation methodology. Given the public health implications of prompt diagnosis and effective management of tuberculosis, empiric initiating treatment is initiated in almost all situations in which active tuberculosis is suspected. Additional characteristics such as presence of comorbidity, severity of disease, and response to treatment influence management decisions. Specific recommendations on the use of case management strategies (including directly observed therapy), regimen and dosing selection in adults and children (daily vs. intermittent), treatment of tuberculosis in the presence of HIV infection (duration of tuberculosis treatment and timing of initiation of antiretroviral therapy), as well as treatment of extrapulmonary disease (central nervous system, pericardial among other sites) are provided. The development of new points and individualized drug regimens, optimization of drug exposure for the component drugs, optimal management of tuberculosis in special populations, identification of accurate biomarkers of treatment effect, and the assessment of new strategies for implementing regimens in the field remain key priorities areas for research. See the full text online version of the document for detailed discussion of the management of tuberculosis and recommendations for practice.

Program Highlights

Hansen's disease (Leprosy) also falls under the Tuberculosis program. Every few years a Hansen's disease is reported to the health department. In 2014, DCHD received report of a Hansen's disease case. Case management for leprosy can be anywhere from 6 months to two years, depending on the type of leprosy and treatment regimen. The case of Hansen's disease reported in Davis County in 2014 followed a two year treatment plan and completed treatment in October 2016. Those being treated for Hansen's disease take daily medication and are monitored monthly. Salt Lake County Health Department has a specialized clinic that is staffed with contracted providers who specialize in tuberculosis and Hansen's disease. This clinic is made available to all local health departments free-of-charge. DCHD uses this clinic to assist with the diagnosis, treatment and case management of unique/difficult cases of tuberculosis and Hansen's disease. For all other tuberculosis cases, UDOH and DCHD partner with Dr. Gary Alexander for consultation/evaluation and treatment management of Davis County residents who are diagnosed with active tuberculosis.



DCHD has also partnered with Midtown Community Health Center - Davis to conduct physicals/evaluations and prescription management for Davis County residents who have Latent Tuberculosis Infection (LTBI). Clients receive a full medical exam from a Midtown healthcare provider to determine capability and appropriateness of LTBI treatment. Throughout the course of treatment, which typically is nine months, the Midtown providers are available for consultation and other needed workups.

Overall Division Highlights:

Davis County Health Department Website

The Communicable Disease and Epidemiology Division (CD/Epi) website remains a valuable resource for the community. Visitors to the website can access program specific information, as well as links to other important websites. Materials are available for each of the programs within the CD/Epi Division. It also offers information specific to healthcare professionals and medical providers—including reporting guidelines, current disease data for Davis County, and links to Utah's Communicable Disease Rule. The website is available at: <http://www.daviscountyutah.gov/health>.



HCV Testing

DCHD participated in a grant to offer Hepatitis C virus (HCV) rapid screening tests for those at high risk. This includes individuals born between 1945 and 1965, injection drug users, those who received blood products and/or an organ donation before 1992, those with body piercings performed with non-sterile techniques, individuals who are HIV-infected, or healthcare workers with a needle stick exposure. Rapid test kits were provided by the UDOH. Those that were positive were counseled and referred to external support agencies for confirmatory testing and/or treatment. An HCV public awareness event took place in 2016 which included a social media education campaign and free rapid testing at the health department.

Program Highlights

Ask-A-Nurse Email

The Ask-A-Nurse Email is routinely utilized by the public for answers to communicable disease issues. This system is monitored daily by DCHD nurses who provide information on health issues pertaining to infectious diseases or other reportable conditions. An email link is found on each page of the CD/Epi web pages or can be accessed at: ask-a-nurse@daviscountyutah.gov.

Healthcare Associated Infections (HAI) Grant

Davis County continued to receive funding to assist in the identification and control of healthcare associated infections. In 2016, healthcare associated infection (HAI) outbreaks were detected and control efforts were implemented smoothly, in part to a collaboration between public health and private healthcare systems. Infection control assessments were conducted at the two local hospitals in Davis County by the UDOH HAI team and a representative from DCHD. These assessment site visits were also completed in a few long-term care (LTC) facilities, with the anticipation of reaching the remaining facilities in the upcoming year. DCHD continues to work closely with the medical community on HAI issues and provide healthcare partners with updated information on new and emerging infections.



EMS Program

OSHA Standard - 29 CFR 1910.1030 mandates that all employees considered at risk for bloodborne pathogen (BBP) exposure receive exposure training and have annual updates. In an effort to assist Davis County Sherriff's Office (DCSO) and other Emergency Medical Services (EMS) agencies within Davis County, DCHD provides bloodborne pathogen training once a month. This class is free of charge. It is also available off-site for a nominal fee.

Senate Bill 19: "Disease Testing of Individuals Exposed to Bloodborne Pathogens" is a law to protect Workers Compensation benefits for EMS workers who contract HIV, Hepatitis B, or Hepatitis C from an on-the-job exposure. In conjunction with the BBP training, DCHD also provides baseline training for the DCSO and other EMS agencies within Davis County. To be protected under the EMS law, employees must be tested at start of employment, again in 3-6 months, and at termination.

In 2016, 10 agencies utilized DCHD for EMS services. A total of 241 baseline tests were performed (including HIV, Hepatitis B, and Hepatitis C) and 57 Hepatitis B vaccines were administered.

National Syndromic Surveillance Program (NSSP)

DCHD continues to actively participate in the National Syndromic Surveillance Program (NSSP). Late in 2016, the BioSense surveillance system was replaced with ESSENCE, a more robust syndromic surveillance platform that allows public health professionals to capture, analyze, store, and share syndromic surveillance data. Syndromic surveillance continues to provide public health with real-time data regarding the health status of the community as it captures information regarding emergency department visits and hospitalizations from multiple sources.



Program Highlights

In 2016, BioSense syndromes were used to track the presence of Enterovirus D-68, influenza-like illness, acute gastrointestinal illnesses, measles, animal bites, and respiratory illnesses. The epidemiologist is alerted by BioSense when emergency department and clinic visits for identified symptoms reach a pre-determined threshold. Data from these alerts are analyzed to identify clusters of illness or diseases of concern.

Currently, DCHD is transitioning from BioSense to ESSENCE. The epidemiologist participated in the International Syndromic Disease Surveillance Conference during December 2016 and also attended a half-day training to learn ESSENCE. DCHD participates in a regional workgroup with Idaho and Nevada to identify syndromes that may be of value to share regionally.

igotsick.health.utah.gov Website

DCHD monitors a statewide website for reporting suspect foodborne illnesses. This system allows the general public to report illnesses that may be related to food consumed at home, in a restaurant, or in a group setting. Once a report is submitted, it is routed to the appropriate jurisdiction for review. DCHD has been able to utilize these reports to identify outbreaks that were occurring in the community. This system helps to identify outbreaks earlier, making the implementation of control measures more timely and limiting the number of people affected.



Internship Program

The Communicable Disease and Epidemiology Division (CD/Epi) maintains an internship program for public health interns to gain work experience in the public health field. This is an ongoing partnership that the CD/EPI Division continues with several universities in the area. During 2016, the CD/Epi Division received a student intern from Weber State University.

Zika Preparedness Efforts

DCHD was awarded two grants in 2016 related to Zika preparedness and response. Both grants were awarded mid-year and will continue into 2017. The first grant falls under Public Health Emergency Preparedness and involved using Zika virus surveillance data to implement public health interventions appropriate to the level of Zika virus risk in the community. A plan was developed addressing the areas of Operations & Planning, Communication/Community Education, Epidemiology/Surveillance, Laboratory Testing, Vector Control, At-Risk Population Outreach and Blood Safety. The plan will be utilized during a state-wide exercise and revisions will be made as needed.



The second grant funding will help assist Davis County increase epidemiological surveillance in regards to West Nile Virus, Zika virus, and other arboviral diseases. Grant activities will support the implementation and maintenance of effective surveillance/prevention efforts including case detection and reporting, specimen collection and support for the implementation of control measures to reduce human infection to arboviruses of public health concern, with a focus on Zika virus.

Program Highlights

Animal Control Collaboration

The CD/Epi Division, in collaboration with Davis County Animal Control, developed a human rabies exposure reporting system which has facilitated a more timely and efficient process for both agencies. The health department evaluates and monitors all reported human exposures and assists in the facilitation of post-exposure prophylaxis, when recommended. In 2016, DCHD evaluated 488 incidents where a human exposure occurred. This collaboration is an example of a successful partnership between Animal Control and public health that other counties in Utah may consider implementing.

Throughout 2016, DCHD provided consultation and on-site interventions with Animal Control Officers in an effort to address rabies control in the community. In-services and rabies vaccinations (pre- and post-exposure) were provided to Animal Control staff.

School Absenteeism Project

DCHD continued their partnership with Davis School District (DSD) and the University of Utah Division of Public Health to develop an online platform for school absenteeism analysis. The School Absenteeism Surveillance System (SASS) generates automatic daily uploads of absenteeism data from DSD to the platform, analyzing and displaying data at district-, school-, and classroom-levels. DCHD continues to use the platform to monitor aberrations in absenteeism while minimizing the amount of time required to do so. The platform has the potential to inform DCHD and DSD of potential developments in minimal time, such that public health interventions can be initiated more efficiently.

SASS

School Absentee Surveillance System

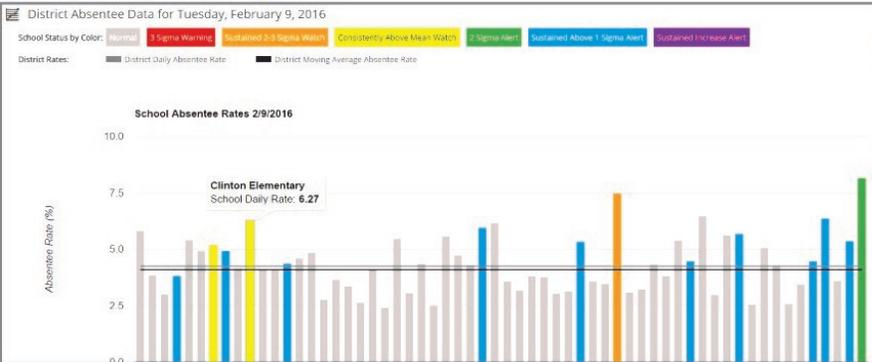
[Sign In](#)

District Absentee Data for Tuesday, February 9, 2016

School Status by Color: Normal 1 Sigma Warning Sustained 2-3 Sigma Warning Consistently Above Mean Warning 2 Sigma Alert Sustained Above 1 Sigma Alert Sustained Increase Alert

District Rates: District Daily Absentee Rate District Moving Average Absentee Rate

School Absentee Rates 2/9/2016



Woods Cross Elementary

School Status for 2/9/2016: Normal

1 Sigma Warning for a 10-day rolling average absentee rate is greater than 1 sigma of the previous 10 days. How many days in a row?

District Absentee Warning Trends



Student Absentee Surveillance System (SASS)

Introduction

SASS is an online absentee surveillance system designed for use by school districts and public health agencies. The system is optimized to process, analyze and display daily absentee data for a school district. The system not only displays absentee trends but also generates a range of different absentee warnings based on complex rules. The SASS platform is completely free to anyone who wants to download and run the software.

SASS Partners include: University of Utah Division of Public Health and Davis County, Utah (School District and Department of Public Health).

Credits: The development of this software solution was supported by the Cooperative Agreement Number 3P01TP000303-0451 from The Centers for Disease Control and

Davis County Demographics—2016

Table 8. Davis County Population, by Age Group*

Age Group	Population
<1 year	5,819
1-14 years	87,584
15-24 years	49,317
25-44 years	95,308
45-64 years	66,617
65-84 years	27,672
85+ years	3,726
Total	336,043

Table 9. Davis County Population, by Gender*

Gender	Population
Male	169,339
Female	166,704
Total	336,043

Table 10. Davis County Population, by Race*

Race	Population
White	310,962
Black	4,830
American Indian or Alaskan Native	2,376
Asian	6,775
Native American or Pacific Islander	2,507
2 or More Races	8,593
Total	336,043

Table 11. Davis County Population, by Ethnicity*

Ethnicity	Population
Hispanic or Latino (of any race)	31,539

*Population estimates for 2016 are not yet available. These figures represent the estimates for 2015.

Source: Retrieved December 2016 from Utah Department of Health, Center for Health Data and Informatics, Indicator-Based Information System for Public Health. Available at: <https://ibis.health.utah.gov/>

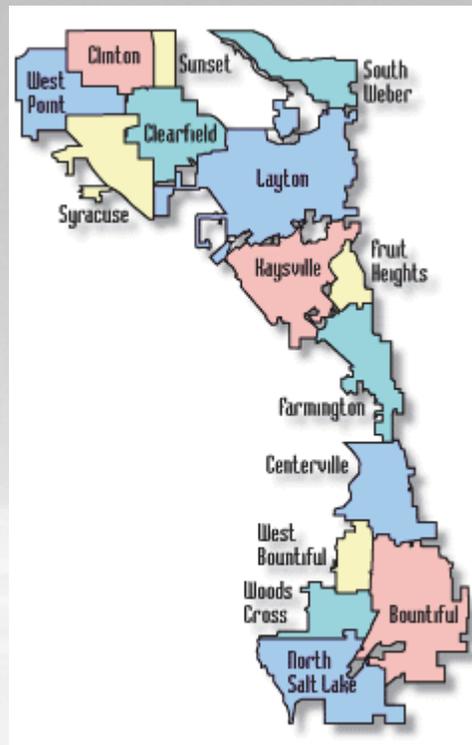


Table 12. Davis County Population, by City*

City	Population
Bountiful	43,784
Centerville	16,877
Clearfield	30,653
Clinton	21,399
Farmington	22,566
Fruit Heights	6,072
Hill Air Force Base	3,350
Kaysville	30,472
Layton	74,143
North Salt Lake	19,796
South Weber	6,971
Sunset	5,183
Syracuse	27,395
Unincorporated County	242
West Bountiful	5,511
West Point	10,345
Woods Cross	11,284
Total	336,043

