Infectious Disease Epidemiology Programs

2007 Annual Report

Office of Infectious Disease Services
Bureau of Epidemiology and Disease Control
Division of Public Health Services
150 North 18th Avenue, Suite 140
Phoenix, AZ 85007
602-364-3676
602-364-3199 fax

Finalized February 3rd, 2009

Jan Brewer, Governor
Will Humble, Acting Director

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Executive Summary

The Office of Infectious Disease Services (OIDS) in the Arizona Department of Health Services (ADHS) is responsible for monitoring and controlling diseases caused by certain infectious agents and toxins. The Office is also responsible for promulgating rules related to infectious disease surveillance, prevention, and control. During 2007, the Office was composed of five programs: Vector-Borne and Zoonotic Diseases, Infectious Disease Epidemiology and Investigations, Infectious Disease Surveillance and Preparedness, Tuberculosis Control, and Syndromic Surveillance (which has since been integrated into the Infectious Disease Surveillance program). This report covers the two "Infectious Disease" programs and the Syndromic Surveillance program. The Infectious Disease Epidemiology and Investigations and Infectious Disease Surveillance and Preparedness Programs are together responsible for detecting, preventing, and controlling communicable diseases in several areas: foodborne, vaccine-preventable, nosocomial infections, and antibiotic-resistant organisms. Program activities also include coordination of epidemiology and surveillance activities for bioterrorism, emergency preparedness, and pandemic flu. The programs cover other reportable infectious conditions that do not fit into these categories, but are not covered by any of the other programs in the Office or Bureau. Surveillance and programmatic activities for hepatitis C, sexually transmitted diseases, and HIV/AIDS are conducted by the Office of HIV/AIDS, STD, and Hepatitis C.

The programs involved in this report maintain a registry of over 70 reportable communicable diseases; provide data and statistics on selected reportable infectious diseases by monitoring disease trends through surveillance and epidemiologic investigations; provide technical assistance to local and tribal health departments regarding prevention and control of disease; and provide information for health care providers and the public.

Some of the highlights for the period of January 1, 2007 through December 31, 2007 include:

- Greatly enhanced surveillance for coccidioidomycosis (valley fever) and new insights into the epidemiology of the disease
- Several projects conducted by Arizona's Epidemic Intelligence Service (EIS) officer, including work in hepatitis B and coccidioidomycosis
- A national outbreak of *E. coli* O157:H7 related to ground beef
- An outbreak in Yuma County of *Salmonella* Heidelberg
- Enhanced surveillance and analysis of Pulsed-Field Gel Electrophoresis for *Salmonella*

I. Introduction

A. Data Sources and Limitations

ADHS maintains registries of selected conditions that are reportable per Arizona Administrative Code R9-6-202. The information is collected to assess and monitor the burden of disease, characterize affected populations, assess trends in disease occurrence, guide control efforts and evaluate prevention initiatives. The list of reportable conditions is based upon the list of Nationally Notifiable Infectious Diseases jointly developed by the Council of State and Territorial Epidemiologists (CSTE) and the Centers for Disease Control and Prevention (CDC). Additional conditions are included that are considered important for Arizona because of distinctions in the disease epidemiology or surveillance system in the state. The list is revised periodically to add newly emerging pathogens or remove conditions that are no longer a public health priority.

Public health surveillance case definitions are used to increase the specificity of reporting, and to allow comparability of diseases nationwide. Only cases meeting these standardized surveillance case definitions are included in the report. Criteria for surveillance case definitions are usually more stringent than those used by providers to diagnose and treat diseases.

State and local public health officials rely on health care providers, laboratories, hospitals and other facilities to report notifiable diseases or conditions. Local health jurisdictions submit case information to ADHS, which in turn reports case information without personal identifiers to CDC for purposes of compiling national statistics. Incomplete reporting is inherent to any passive surveillance system. Knowledge and awareness of current reporting rules, willingness to comply, severity of the disease, available diagnostic tests, age of the patient, confidentiality issues surrounding the disease, changes in the case definitions over time, and access to or availability of health care services all may influence the likelihood of reporting.

The 2007 population estimates from the ADHS Office of Vital Statistics (http://www.azdhs.gov/plan/menu/info/pop/pop07/pd07.htm) were used for rate calculations. Disease rates are calculated per 100,000 population unless otherwise specified and are not age-adjusted. Rate calculations based on a small number of reported cases or for counties with populations less than 100,000 are not considered reliable since they can be dramatically influenced by small changes in the number of reported cases.

B. Purpose of the Report

The purpose of this report is to provide disease surveillance information to health care providers, health care organizations, governmental agencies, and other local health partners. This information is intended to assist agencies by providing uniform data on the disease burden in the state, trends in disease incidence and distribution and the evaluation of disease interventions.

Office staff collaborate with colleagues in the local and tribal health departments, as well as other ADHS Offices and Bureaus including: Environmental Health; Immunization Program Office; Office of HIV/AIDS, STD and Hepatitis C; State Health Laboratory Services; and Emergency Preparedness within the Division of Public Health Services. Direct public health services, as they relate to surveillance, investigation, and response to infectious diseases of public health importance, are the responsibility of the 15 county health departments and tribal health departments and/or Indian Health Service Units. This report is designed to be utilized by external stakeholders in identifying trends, targeting prevention efforts, and determining

resource needs. The Programs would like to acknowledge both external and internal partners for their contributions to this report.

C. Reporting

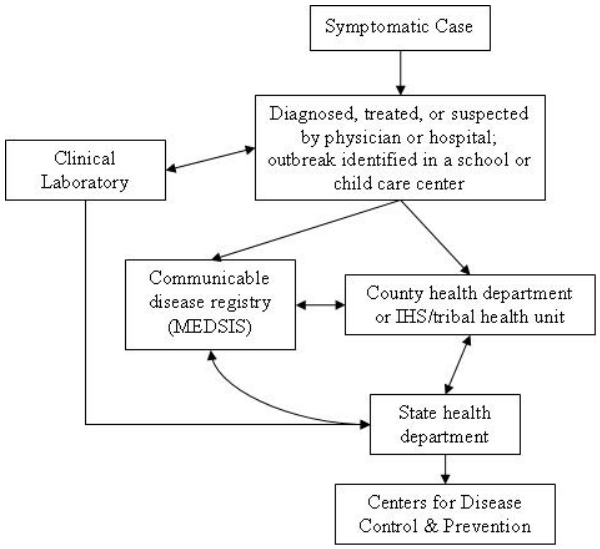
Arizona Administrative Code (AAC) R9-6-202, 203, 204, and 205 describe the morbidities, test results or prescriptions required to be reported by health care providers, administrators of health care facilities, clinical laboratory directors, institutions, schools, pharmacists, and others.

On October 2, 2004, revisions to these sections of the AAC became effective. The 2004 Annual Report describes some of the rule changes. Tables outlining the reporting requirements are below. Additional rule changes became effective April 1, 2008. Information on the current reporting requirements can be found on the Arizona Secretary of State's website at http://www.azsos.gov/public_services/Title_09/9-06.pdf.

Arizona requires reporting by both health care providers and clinical laboratories as a dual surveillance measure to increase the sensitivity of the surveillance system and improve the completeness of reporting. Diseases are reported via a secure web system, fax, mail, or telephone systems using the communicable disease report (CDR) form. Additional information on communicable disease reporting as well as reporting and investigation forms can be found on the Department's website at: http://www.azdhs.gov/phs/oids/dis_rpt.htm. The secure web system, the Medical Electronic Disease Surveillance Intelligence System (MEDSIS), is described in section IV, Surveillance Topics and Study Reports, subsection A, and has allowed participating infection control providers to report electronically, starting in 2006.

Since local heath departments are the primary response agency, health care providers report notifiable conditions to the local health departments for immediate investigation and initiation of control measures, as needed. Figure 1 outlines the reporting structure and flow of information in Arizona.

Figure 1. Arizona Reporting Flow



D. Updates to surveillance resources

Several updates were made to the surveillance resources available during 2007. These are listed below.

Case definitions:

National case definitions for several morbidities changed in 2007. The complete Arizona case definitions are posted at http://www.azdhs.gov/phs/oids/epi/surv_manual.htm. The 2007 changes are:

- Hepatitis B, chronic: Adding a probable case definition for a case with a single HBsAg positive or HBV DNA positive or HBeAg positive lab result when no IgM anti-HBc results are available
- Measles: Changes to the categories of epidemiologic classification of internationally-imported and U.S.-acquired
- Poliovirus infection, nonparalytic: Case definition added (paralytic poliovirus infection has a separate case definition)
- Rubella: Changes to the categories of epidemiologic classification of internationally-imported and U.S.-acquired
- Vancomycin-resistant and -intermediate *Staphylococcus aureus* (VRSA and VISA): Changed the minimum inhibitory concentration values for intermediate and resistant, in accordance with revised national laboratory standards.

Investigation forms:

The communicable disease report form (CDR) was revised in 2007 to provide greater compatibility with MEDSIS and to incorporate all reportable infectious diseases in one form. Previously, sexually transmitted diseases, tuberculosis, and HIV each had a specialized form for reporting purposes; the new form captures information for these morbidities without asking providers to report different morbidities on different types of forms. The form can be accessed at http://www.azdhs.gov/phs/oids/epi/pdf/cdr_form.pdf.

Rules:

No rule changes were made during 2007, though ADHS was working on changes that would later be approved and become effective April 1, 2008. These included making Chagas disease and influenza-associated pediatric mortality reportable by providers, removing vancomycin-resistant enteroccocus from the reporting rules, requiring specimen submission to the state laboratory for positive tests for several additional organisms, and clarifying time frames and responsibilities.

E. Tables of Reportable Diseases

Table 1. Provider-Reportable Morbidities

Arizona Administrative Code✦ Requires Providers To:

REPORT COMMUNICABLE DISEASES

to the Local Health Department

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

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

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

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

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

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

✦A.A.C. R9-6-202
Effective 04/01/2008

www.azdhs.gov/phs/oids/hcp_rpt.htm

Table 2. School-Reportable Morbidities

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

REPORT COMMUNICABLE DISEASES

to the Local Health Department

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

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

www.azdhs.gov/phs/oids/school_rpt.htm/

✦A.A.C. R9-6-203
Effective 04/01/2008

Table 3. Laboratory-Reportable Morbidities

ARIZONA LABORATORY REPORTING REQUIREMENTS

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

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

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

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

www.azdhs.gov/phs/oids/lab_rpt.htm

A.A.C. R9-6-204
Effective 04/01/2008

F. State and County Health Department, Tribal Health Service, and Indian Health Service Contact Information

Arizona Department of Health Services

Infectious Disease Epidemiology
150 N. 18th Avenue Suite 140
Phoenix, AZ 85007-3237
Phone: (602) 364-3676
Fax: (602) 364-3199

Emergency Answering Service
Phone: (480) 303-1191

State Laboratory Services
250 N. 17th Avenue
Phoenix, AZ 85007-3231
Phone: (602) 542-1188
Fax: (602) 542-1169

Office of Border Health
4400 E. Broadway Suite 300
Tucson, AZ 85711
Phone: (520) 770-3110
Fax: (520) 770-3307

County Health Departments

Apache County Health District
395 South 1st Street West
PO Box 697
St. Johns, AZ 85936
Phone: (928) 337-7525
Fax: (928) 337-2062

Cochise County Health Department
1415 W. Melody Lane, Bldg A.
Bisbee, AZ 85603-3090
Phone: (520) 432-9400
Fax: (520) 432-9480

Coconino County Health Department
2625 N. King Street
Flagstaff, AZ 86004
Phone: (928) 679-7272
Fax: (928) 522-7808

Gila County Office of Health Services
5515 S. Apache Ave. Suite 100
Globe, AZ 85501
Phone: (928) 425-3231
Fax: (928) 425-0794

Graham County Health Department
826 W. Main
Safford, AZ 85546
Phone: (928) 4281962
Fax: (928) 428-8074

Greenlee County Health Department
253 5th Street
Clifton, AZ 85533
Phone: (928) 865-2601
Fax: (928) 865-1929

La Paz County Health Department
1112 Joshua Street #206
Parker, AZ 85344
Phone: (928) 669-1100
Fax: (928) 669-6703

Maricopa County Health Department
4041 N. Central Ave Suite 1400
Phoenix, AZ 85012
Phone: (602) 506-6900
Fax: (602) 506-6885

Mohave County Health Department
PO Box 7000
700 W. Beale Street
Kingman, AZ 86402
Phone: (928) 753-0743
Fax: (928) 718-5547

Navajo County Health Services District
117 E. Buffalo Street
Holbrook, AZ 86025
Phone: (928) 524-4750; Fax: (928) 524-4754

Pima County Health Department
3950 Country Club Suite 100
Tucson, AZ 85714
Phone: (520) 243-7797
Fax: (520) 791-0366

Pinal County Health Department
971 N. Jason Lopez Circle
Bldg. E
Florence, AZ 85232-2945
Phone: (520) 866-4441
Fax: (520) 866-6751

Santa Cruz County Health Department
2150 N. Congress Drive Suite 115
Nogales, AZ 85621
Phone: (520) 375-7800
Fax: (520) 375-7904

Yavapai County Health Department
1090 Commerce Drive
Prescott, AZ 86305
Phone: (928) 771-3122
Fax: (928) 771-3369

Yuma County Health Department
2200 W. 28th Street
Yuma, AZ 85364
Phone: (928) 317-4550
Fax: (928) 317-4591

Tribal Health Services

Ak-Chin Indian Community
42507 W. Peters & Nall Road
Maricopa, AZ 85239
520-568-1021
520-568-1001 (fax)

Cocopah Indian Tribe
15th & Ave “G”
Somerton, AZ 85350
928-627-2681
928-627-2929(fax)

Colorado River Indian Tribes
Rt. 1, Box 23-B
Parker, AZ 85344
928-669-6577
928-669-8881 (fax)

Ft. McDowell Yavapai Nation
PO Box 177779
Fountain Hills, AZ 85269
480-837-5074
480-837-1270 (fax)

Ft. Mojave Indian Tribe
1607 Plantation Rd.
Mojave Valley, AZ 86440
928-346-4679
928-346-4686 (fax)

Gila River Indian Community
Center Route 2, Box 750
LaVeen, AZ 85339
520-550-8000 x1
520-550-5491 (fax)

Havasupai Tribe
PO Box 10
Supai, AZ 86435
928-448-2731
928-448-2551 (fax)

Hopi Tribe
PO Box 123
Kykotsmovi, AZ 86039
928-737-6340
928-737-6353

Hualapai Tribe
PO Box 397
Peach Springs, AZ 86434
928-769-2207
928-769-2588 (fax)

Kaibab-Paiute Tribe
HC 65 Box 2
Fredonia, AZ 86022
928-643-7063
928-643-7260 (fax)

Navajo Nation
PO Box Drawer 1390
Window Rock, AZ 86515
928-871-6350
928-871-6255 (fax)

Pascua Yaqui Tribe
7474 S. Camino De Oeste
Tucson, AZ 85757
520-879-6019
520-883-1057 (fax)

Quechan Tribe
PO Box 965
Winterhaven, CA 92283
760-572-0753
760-572-2102 (fax)

Salt River Pima-Maricopa Indian Community
10005 E. Osborn Rd.
Scottsdale, AZ 85256
480-850-8421 480-850-8789 (fax)

San Carlos Apache Tribe
PO Box O
San Carlos, AZ 85550
928-475-2798 x1104
928-475-2417 (fax)

San Juan Southern Paiute Tribe
PO Box 2710
Tuba City, AZ 86045
928-283-5532
928-283-5531 (fax)

Tohono O'odham Nation
PO Box 810
Sells, AZ 85634
520-383-6000
520-383-3930 (fax)

Tonto Apache Tribe
#30 Tonto Apache Reservation
Payson, AZ 85541
928-474-5000
928-474-9125 (fax)

White Mountain Apache Tribe
PO Box 1210
Whiteriver, AZ 85941
928-338-4955
928-338-1615 (fax)

Yavapai Apache Nation
2400 West Datsi Road
Camp Verde, AZ 86322
928-300-3177
928-567-8497 (fax)

Yavapai-Prescott Indian Tribe
530 E. Merritt
Prescott, AZ 86301
928-445-8790
928-778-9445 (fax)

Indian Health Services Area Offices

Navajo Area Indian Health Service
PO Box 9020
Window Rock, AZ 86515-9020
928-871-5811
928-871-5872 (fax)

Phoenix Area Indian Health Service
40 North Central Ave., Rm 504
Phoenix, AZ 85004
602-364-5039
602-364-5042 (fax)

Tucson Area Indian Health Service
7900 South J Stock Road
Tucson, AZ 85746-7012
520-295-2405
520-295-2602 (fax)

II. Disease Statistics

A. Population Estimates for 2007

Office of Vital Statistics, Arizona Department of Health Services

http://www.azdhs.gov/plan/menu/info/pop/pop07/pd07.htm

B. Tables of Cases and Rates of Reportable Diseases

1. Reported Cases of Notifiable Diseases by County, 2007
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III. Disease Summaries

A. Coccidioidomycosis (Valley Fever)

The following is the Executive Summary of the 2007 Valley Fever Annual Report. The full report can be found at: http://www.azdhs.gov/phs/oids/epi/pdf/VF_Annual_Report_2007.pdf.

Valley fever is caused by a fungus that is prevalent in the soil throughout the southwestern United States, Mexico, Central and South America. Although valley fever is often thought of as a mild and self-limited respiratory disease, it can cause severe, prolonged disease in those afflicted. In some cases, the disease may affect the brain and spinal cord, skin, bones, and other organs, resulting in serious, debilitating disease, or even death. Fortunately, the disease is not spread person–to-person, but there is no cure or vaccine for Valley Fever. Treatment has many side effects and must be continued for many months or even life-long.

Arizona serves as a model for other endemic U.S. states and is the primary driver for recent changes in the national valley fever surveillance definition. The Arizona Department of Health Services receives reports of patients with valley fever from laboratories and health care providers statewide. Analysis of these reports shows that:

- Arizona accounts for 60% of all reported cases in the country
- 95% of Arizona cases reside in Maricopa, Pima and Pinal counties
- Valley fever is the fourth most frequently reported infectious disease in Arizona
- Cases reported in Arizona have almost tripled, from 1,781 cases in 1999 to 4,832 cases in 2007 (75 per 100,000 population)
- The highest age-adjusted rates of valley fever occur in Sun City and Sun City West
- The increase in cases is evidence of an epidemic of valley fever in Arizona

In 2008, to help address this epidemic of valley fever, ADHS received funds for valley fever prevention and control from a legislative appropriation and from the CDC. These funds enabled ADHS, for the first time, to hire staff in an effort to better understand the impact and local risk factors of valley fever, and improve knowledge, prevention and control of this disease. ADHS conducted an enhanced surveillance study, by interviewing 10% of all Arizonans diagnosed with valley fever in 2007. The interviews reveal the significant impact of the disease among Arizonans.

- People missed an average of 1 month of work, for a total of 4,918 days
- People with valley fever could not perform daily activities for an average of 3 months or a total of 92 years
- People with valley fever waited an average of 44 days before seeking healthcare
- Patients saw their doctors three times before they were tested for valley fever
- On average, patients suffered symptoms of valley fever for half a year; although many were sick longer
- There were $86 million in hospital charges for valley fever cases in 2007

A telephone survey of a representative sample of the population statewide was conducted to evaluate Arizonans' awareness of valley fever and its risk factors. These results were compared with the enhanced surveillance findings.

- One in five Arizonans had never heard of valley fever

- Only 6% of patients heard about valley fever from their doctors, whereas 11% Arizonans heard of it from their doctors
- Arizonans were more likely to hear about valley fever from the media, while patients heard about it from their social circles

ADHS also performed a study of Arizona physicians.

- One out of three physicians has major gaps in their knowledge about valley fever, how to diagnose and how to treat the disease
- One third of health care providers are unaware that valley fever is reportable
- Only one in four patients with community acquired pneumonia (CAP) were tested for valley fever despite ADHS recommendations to test these patients

In response to these findings, ADHS launched a proactive educational campaign including brochures, posters, a documentary video, a website, and Governor's proclamations targeting the public, physicians, pharmacies, hospital emergency departments to:

- Raise awareness and provide information on the impact of valley fever in Arizona
- Remind physicians to test patients with CAP for valley fever
- Prompt patients to ask their physicians to test them for valley fever
- Tell the stories of real patients with valley fever

ADHS has launched a major initiative to investigate the high rates of valley fever in northwest Phoenix.

- A preliminary analysis comparing mining and non-mining areas revealed no association between mining and valley fever
- A CDC investigation team will arrive in November 2008 to determine risk factors for valley fever in northwest Phoenix.

Collaboration with partners is essential to develop better diagnostic tests, curative treatments and a vaccine for valley fever. Toward that end, ADHS is working with:

- CDC as part of a national public health valley fever task force to coordinate public health strategies for this disease
- Valley Fever Center for Excellence (VFCE) on a promising new drug Nikkomycin Z and to educate the community and physicians in Arizona
- Translational Genomics (TGen) on rapid molecular-based diagnostic tests and strain typing
- University of Arizona to examine influences of climate and other environmental factors affecting the incidence of valley fever
- University of Arizona School of Medicine to develop a vaccine to prevent valley fever

Arizonans are demanding action to investigate and prevent valley fever. ADHS receives hundreds of inquiries from the public and from concerned community groups. These factors highlight the important impact that valley fever has on Arizona and underscores the need to further investigate and control this epidemic.

B. Foodborne Outbreaks

E. coli O157:H7 in Ground Beef Outbreak – June 2007

At the end of May 2007, CDC PulseNet group identified an increase in the number of *E. coli* O157:H7 infections. These isolates shared a very rare Pulsed Field Gel Electrophoresis (PFGE) pattern, and all cases were geographically clustered in the western United States and Canada including: Arizona, California, Colorado, Utah, Wyoming, and Alberta. This pattern also matched a ground beef product, obtained during routine environmental sampling, from United Food Group, CA.

On June 3, 2007, United Food Group, in cooperation with the U.S. Department of Agriculture (USDA), conducted a voluntary recall of 75,000 pounds of ground beef that was believed to be contaminated with *E. coli* O157:H7 bacteria. The fresh ground beef products subject to recall were produced at United Food Group's facility in Vernon, CA, on April 20, and were distributed under the brand names Moran's All Natural, Stater Bros., and Inter-American Products, Inc. The recalled products were available at multiple grocery stores in 11 states: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming and Montana.

By June 6, 2007, there were six reported cases in Arizona. ADHS staff interviewed these cases using a CDC ground beef supplemental questionnaire. In addition, both State and County Environmental Services performed trace-back investigations, in conjunction with the United States Department of Agriculture/Food Safety & Inspection Service (USDA/FSIS). Ground beef samples were obtained from the homes of several patients. *E. coli* O157:H7 was isolated from these samples and the beef samples were matched to the cases by PFGE.

Information from patient interviews indicated that the majority of Arizona cases purchased ground beef from Grocery Store A. Trace-back information from logs at this store indicated that the ground beef sold at these stores was from Miller's Meat Products. These products were processed at the same facility (Establishment 1241) as the previously recalled Moran's Meat Product. The grocery store re-ground this product and then re-packaged the ground beef as their own store brand. In addition, further investigation revealed that cases with matching PFGE patterns had consumed meat products produced prior to the dates included in the June 3 United Food Group recall.

Since the original recall did not apply to Miller Meat Products nor did it mention that brands are often re-ground and re-packaged, ADHS officials urged USDA and CDC to expand the recall to include: all ground beef products produced at Establishment 1241, ground beef produced prior to June 3rd, and information for consumers on the potential re-packaging of these products as other brands. Based on the epidemiologic information and the traceback data, USDA issued an additional recall of 370,000 pounds of ground beef produced by United Food Group on June 9th, which was one of the largest food recalls so far in history.

In total, 13 human cases of *E. coli* O157:H7 were reported in Arizona linked to this outbreak: four in Maricopa, three in Pima, two in Yavapai, two in Mohave, and one each in Gila and Navajo Counties. These individuals became ill between May 2 and October 13, 2007 and their ages range from 2 – 64 years. Four cases required hospitalization and one developed hemolytic uremic syndrome; all recovered. No deaths were reported due to this outbreak. All but one case recalled purchasing and eating ground beef from Grocery Store A. One case reported an onset date in October, after the recalls had been implemented. This individual purchased ground beef

from Grocery Store A prior to the recall and stored it in her freezer. This case was unaware of the recall and prepared and consumed the frozen beef several days prior to her illness onset.

Recommendations for preventing infection with *E. coli* O157:H7 were distributed statewide:

PREPARING GROUND BEEF FOR SAFE CONSUMPTION

Consumers should only eat ground beef patties that have been cooked to a safe temperature of 160ºF. When a ground beef patty is cooked to 160 ºF throughout, it can be safe and juicy, regardless of color.

The only way to be sure a ground beef patty is cooked to a high enough temperature to kill harmful bacteria is to use an accurate food thermometer.

Color is not a reliable indicator that ground beef patties have been cooked to a temperature high enough to kill harmful bacteria such as *E. coli* O157:H7.

Eating a pink or red ground beef patty without first verifying that the safe temperature of 160 ºF has been reached is a significant risk factor for foodborne illness.

Thermometer use to ensure proper cooking temperature is especially important for those who cook or serve ground beef patties to people most at risk for foodborne illness because *E. coli* O157:H7 can lead to serious illness or even death. Those most at risk include young children, seniors, and those with compromised immune systems.

Salmonella **Heidelberg Outbreak, Yuma, Arizona, June-September 2007**

Introduction

During the third week of June, 2007, the Infectious Disease Section of the Yuma County Health Department identified an increase in the number of *Salmonella* cases reported to the Health Department. The Yuma County Epidemiologist reported this increase to the Office of Infectious Disease Services at ADHS and requested assistance and additional laboratory testing.

On June 25, 2007, the ADHS Foodborne Epidemiologist reviewed the laboratory results and found that there were three *Salmonella* Heidelberg stool isolates submitted from Yuma County. On July 11, 2007, all three cases had an indistinguishable pulsed-field gel electrophoresis (PFGE) pattern (matching DNA fingerprint pattern), suggesting a common exposure. ADHS recommended that Yuma County begin interviewing all confirmed and probable cases with an extended questionnaire to determine exposures within the seven days prior to illness onset.

Methods

All *Salmonella* isolates were sent to the Arizona State Laboratory for confirmation, serotyping, and DNA fingerprinting.

Cases were defined as those individuals with a confirmed PFGE-matched *Salmonella* Heidelberg serotype. ADHS developed an investigation form which contained information on symptoms, hospitalization, specific food consumption, household contacts, travel, animal

contact, and water supply sources. The survey was administered by phone by the Infectious Disease Section and District Health Nursing Division of the Yuma County Health Department to all cases reported to the Yuma County Health Department. Based upon the interviews, a particular fast food restaurant was suspected and ADHS developed a new questionnaire that asked about food items consumed at this restaurant. Additional case finding, interviewing, and environmental inspections were conducted simultaneously over the course of the outbreak

Results

By August 29, 2007, 19 confirmed cases were identified with onset dates between June 6 and August 4, 2007. Yuma County interviewed 17 of these cases; 12 of 17 cases (71%) ate at the implicated fast food restaurant (Restaurant A).

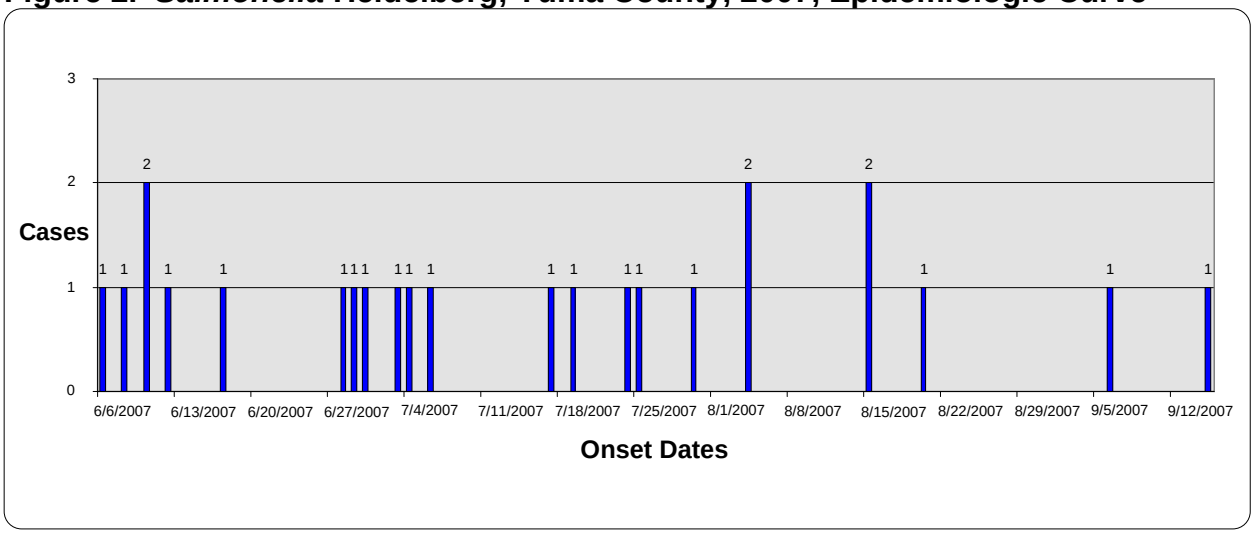
Based on the initial case interviews, on August 6th ADHS recommended that Yuma County perform a thorough inspection of Restaurant A and collect environmental samples. On August 13th, the Environmental Health Division of Yuma County collected 21 environmental samples at the restaurant. ADHS confirmed on August 24th that one of the environmental samples submitted was positive for *Salmonella* Heidelberg and matched the patient isolates.

By the end of the investigation, twenty-eight confirmed cases of *Salmonella* Heidelberg had been identified between June and November, 2007;,most cases were reported between June and August (Figure 2). The majority of cases (65%) reported eating at the fast food restaurant, which had opened for business the beginning of June. The outbreak was not found to be associated with any other place or food item. Although no specified meal was implicated as a route of transmission statistically, the positive environmental sample from Restaurant A indicates that potential contamination of a cutting board was the source of infection. No employee testing was conducted.

The following recommendations were made:

1. Food workers should be educated on methods to decrease food borne illness and should engage in active hand washing practices.
2. All food handling procedures at the restaurant should be reviewed to avoid possible cross contamination.

Figure 2. *Salmonella* Heidelberg, Yuma County, 2007, Epidemiologic Curve



Multi-State Outbreak of *Salmonella* Newport in Four Western States

Background

In early November 2007, the California Department of Public Health (CDPH) Microbial Diseases Laboratory noted an increase in *Salmonella* Newport isolates that were resistant to chloramphenicol. Pulsed-field gel electrophoresis (PFGE) typing identified six patients with an unusual PFGE pattern and posted the pattern to the national database, PulseNet. Arizona, Idaho, and Nevada identified matches within the next few days. As of the end of December 2007, 41 cases of chloramphenicol-resistant *Salmonella* Newport with an indistinguishable PFGE pattern had been identified in California (n=21), Arizona (n=16), Idaho (n=1) and Nevada (n=3). This PFGE pattern is extremely rare, accounting for only 0.02% of all *Salmonella* Newport isolates posted to CDC's National PulseNet database. Onset dates for cases ranged from October 4 – November 9, 2007. The mean age of cases was 41 years (range 1-92, median 40), and 56% of cases were female and the majority of cases (82%) were white, non-Hispanic. There were 17 hospitalizations and no deaths.

Methods

On November 1, 2007, CDPH contacted epidemiologists in Arizona, Nevada, and Idaho to begin a collaborative investigation. For the purpose of initial case identification, an outbreak case was defined as *Salmonella* Newport infection with at least one enzyme matching the outbreak PFGE pattern. Hypothesis-generating questionnaires examining food consumption, travel, grocery store, and restaurant histories were administered by phone to 15 patients in California and Arizona. From the hypothesis-generating questionnaire, epidemiologists identified food items that were consumed by at least 50% of the cases for use in an additional case-control study questionnaire. Controls who lived in the same neighborhood as cases were selected using reverse address look-up, with the address of the case-patient as the anchor. Controls were matched by age group using three broad age groups: 0-18 years, >18-65 years, and greater than 65 years. Cases were asked about foods consumed in the seven days prior to onset and controls about food items consumed in the month of October (to match exposure period to that of cases). Cases were also asked to provide shopper card information if applicable, since this is helpful in remembering foods consumed and identifying specific lot or product specifications. A total of 11 cases provided their club card purchase history.

In total, 21 cases and 36 controls were enrolled in the case-control study. The study revealed that no single food item was statistically significantly associated with illness. However, we observed a marginally significant association with purchasing ground beef from Store A (42% (8/19) of cases vs. 18% (6/33) controls, p-value 0.06). Cases were more likely to have shopped for groceries at Store A in the week before illness when compared to controls in the month of October (81% of cases compared to 67% of controls).

A subset analysis looking at only cases and controls who shopped at Store A revealed no food item, other than ground beef, was associated with disease. Among persons who consumed ground beef at home in the week prior to onset (or in the month of October for controls), we found that 80% of the cases purchased their ground beef from Store A, compared to only 26% of controls (OR=11.3 95% CI 1.9-69.1, p-value 0.005). No association was identified between human illness and ground beef from any other store. Among people who shopped at Store A and consumed ground beef in the home, 100% of cases purchased their ground beef from Store A, compared to only 40% of controls (p-value=0.004).

The United States Department of Agriculture/Food Safety & Inspection Service (USDA/FSIS) was contacted and began trace-back activities for the suspect ground beef. USDA/FSIS reported that a ground beef isolate from Establishment F, a slaughter/processing facility in CA Region 5, (isolate date 09/26/07) matched the PFGE outbreak pattern with both enzymes and had an antibiotic susceptibility pattern similar to that identified in patient isolates. None of the patients contacted for this investigation had leftover ground beef during the investigation period.

The results of the case-control study, in conjunction with the spatiotemporally associated double enzyme PFGE matched isolate from ground beef, strengthen the conclusion that ground beef is the source for human illness in this outbreak. Based on the epidemiological evidence and the USDA trace-back/trace-forward information, the USDA/FSIS issued a public health alert regarding potentially contaminated ground beef purchased from Store A between September 19 and November 5, 2007. It was recommended that ground beef purchased within this time frame be discarded.

After the public health alert was issued, frozen ground beef purchased at Store A was located in the freezer of a confirmed Arizona case, in March 2008. Testing of this ground beef identified *Salmonella* Newport that matched the outbreak strain.

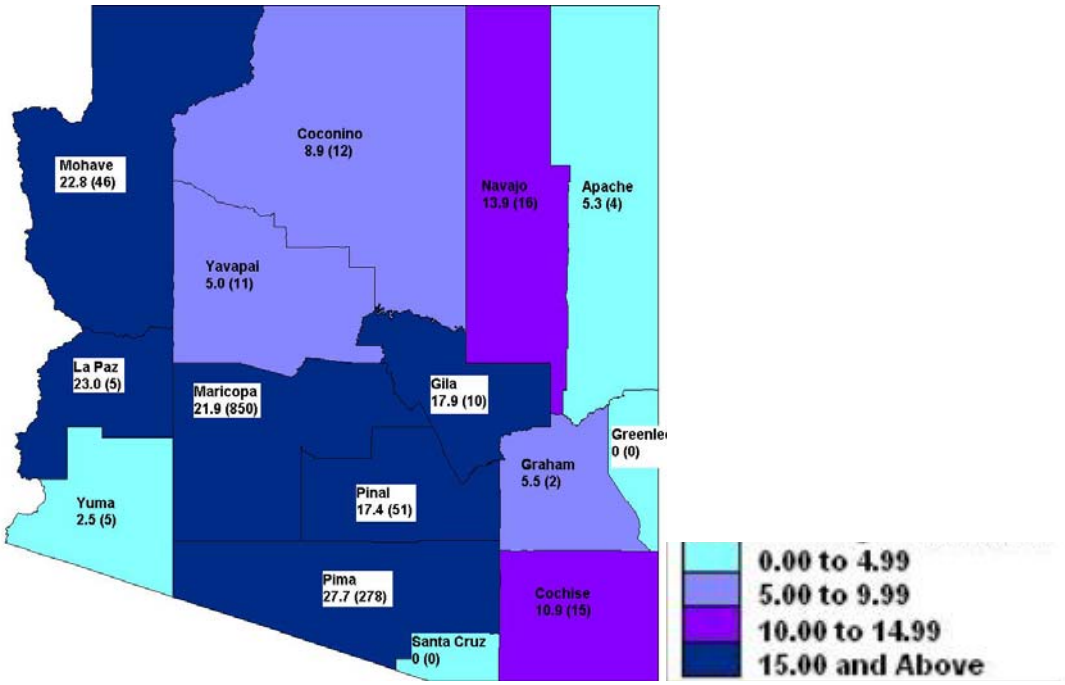
C. Invasive Methicillin-resistant *Staphylococcus aureus*

Staphylococcus aureus are bacteria carried on the skin or in the nose of healthy people, but can sometimes cause infection. Methicillin-resistant *Staphylococcus aureus* (MRSA) is a kind of *Staphylococcus aureus* that is resistant to commonly prescribed antibiotics. Most MRSA infections are skin infections; however, some can invade the bloodstream, bones, joints or central nervous system, which is termed an invasive infection. Most invasive MRSA infections occur in hospitalized patients or those with multiple medical problems; however, a very small percent occur in otherwise healthy people.

ADHS has required laboratories to report invasive MRSA infections since October 2004. This means that only bacteria found in a normally sterile part of the body (e.g., blood, bones) are required to be reported. Skin infections are not considered invasive and are not tracked by ADHS.

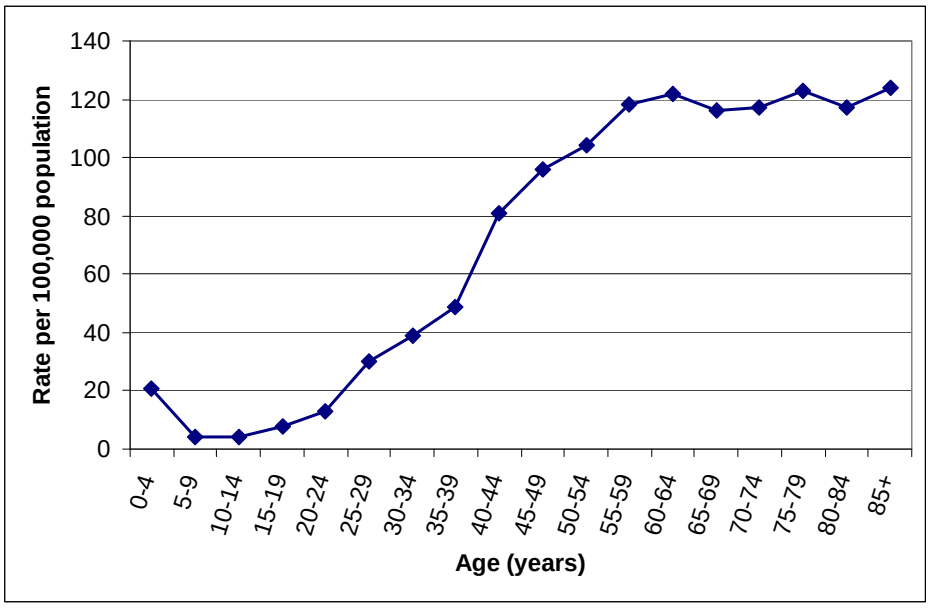
In 2007, a total of 1,305 invasive MRSA infections were reported to ADHS for a rate of 20.3 per 100,000 population. This compares to a rate of 31.8 in the United States (CDC data reported from 2005). Since 2005, reported MRSA rates in Arizona have steadily decreased from 22.3 (1,432 cases) to 20.8 (1,336 cases) in 2006 to 20.3 per 100,000 population in 2007. When looking at the geographic distribution of cases (Figure 3), the highest rates of invasive MRSA infection are found in Pima (27.7 per 100,000), LaPaz (23.0 per 100,000), and Maricopa Counties (21.9 per 100,000).

Figure 3. Rates of Invasive MRSA Infection per 100,000 population by county, 2007-2008



In 2007, there was a slight male predominance, which has also been true in previous years in Arizona. Data from 2007 indicate that invasive MRSA infections tend to increase with age. (Figure 4). This is expected since older individuals tend to be hospitalized more frequently and have more medical problems which, according to studies, puts them at higher risk for getting an invasive MRSA infection.

Figure 4. Rates of Methicillin-Resistant *Staphylococcus aureus* by Age, Arizona 2007



Although race and ethnicity data are not available for 85% of reported invasive MRSA cases, the data suggest a disproportionately higher rate of invasive MRSA infections among Native Americans (11.5 per 100,000 population). All other race/ethnicities have rates of invasive MRSA that are less than 4.0 per 100,000 population. Among cases where race and ethnicity data are available, 21% or 1 in 5 individuals infected with invasive MRSA is Native American; however, Native Americans represented only 5.3% of Arizona's population in 2007. Further investigation is necessary to determine why invasive MRSA rates may be higher in this population.

In October 2007, an article was published in the Journal of the American Medical Association (JAMA) entitled "Invasive Methicillin-Resistant *Staphylococcus aureus* Infections in the United States".[1] This article was the first article to provide national statistics on invasive MRSA and reported approximately 9,000 invasive MRSA infections and almost 1,600 deaths in the US during 2005. Since the investigation only gathered data from nine US cities, the authors extrapolated the data to estimate the total number of invasive MRSA infections (about 94,000) and deaths (about 19,000) in 2005 in the US. These numbers are only estimates, however.

Coincidentally, the media reported a 17 year-old student in Virginia who died from invasive MRSA around the same time as the JAMA article was published. This resulted in intensive media coverage of MRSA, which dramatically increased public awareness and led to many opportunities to educate the public about MRSA. As part of the response, ADHS developed an MRSA website with educational materials for schools, athletic programs, and other community settings, as well as for healthcare providers.

The website highlights the most important measures to prevent the spread of MRSA infection in the community. The best way to prevent MRSA infection is through frequent and thorough handwashing. For people who already have an MRSA skin infection, it is important to do the following:

1. Cover wounds. Keep wounds that are draining or have pus covered with clean, dry bandages. Follow your healthcare provider's instructions on proper care of the wound.
2. Clean your hands. You, your family, and others in close contact should wash their hands frequently with soap and warm water or use an alcohol-based hand sanitizer, especially after changing the bandage or touching the infected wound.
3. Do not share personal items. Avoid sharing personal items such as towels, washcloths, razors, clothing, or uniforms that may have had contact with the infected wound or bandage. Wash sheets, towels, and clothes that become soiled with water and laundry detergent. Drying clothes in a hot dryer, rather than air-drying, also helps kill bacteria in clothes.
4. Talk to your doctor. Tell any healthcare providers who treat you that you have or had a staph or MRSA skin infection.

Information taken from CDC MRSA website: http://www.cdc.gov/ncidod/dhqp/ar_mrsa.html

Most MRSA skin infections are easy to treat and rarely develop serious complications. It is critical that people who suspect they have an MRSA infection see a healthcare provider promptly. Early and appropriate treatment is the best way to avoid serious invasive infections.

[1]Klevens RM, et al. *Invasive methicillin-resistant Staphylococcus aureus infections in the United States*. JAMA. 2007 Oct 17;**298**(15):1763-71.

D. Hepatitis B

Hepatitis B is a vaccine preventable disease, and hepatitis B vaccine has been widely available since the mid-1980s. Current prevention strategies include the vaccination of infants and school aged children, as well as the screening of all pregnant women to ensure proper prophylaxis for any infant born to a hepatitis B positive mother. Additionally, adults in traditionally high risk groups have also been targeted for vaccination.

ADHS monitors reports of hepatitis B from physicians and laboratories to identify outbreaks and evaluate trends and risk factors for hepatitis B. While acute infections of hepatitis B have been reportable to ADHS for many years, chronic infections were first monitored in 1998. In 2007, 180 cases of acute hepatitis B (2.8 cases per 100,000 population) and 1,059 newly reported cases of chronic hepatitis B (16.5 cases per 100,000 population) were reported to ADHS.

ADHS classifies all hepatitis B cases based on positive laboratory tests as well as consistent clinical symptoms. In previous years, the classification of hepatitis B was based solely on laboratory reporting, since resources were not available to confirm symptoms for acute cases. This resulted in a large number of non-acute cases being reported as confirmed acute cases regardless of whether they had consistent clinical symptoms or a history of past infection. In 2007, medical records were obtained for most acute cases and many cases were ruled out as true cases because they did not have compatible clinical symptoms. This resulted in a sharp decrease in the number of acute hepatitis B cases reported from 2006 to 2007, as seen in Figure 5. However, even with this change, Arizona still maintains a rate of reported acute hepatitis B infections above the national average.

Figure 5. US and AZ Hepatitis B Rates 1995 - 2007

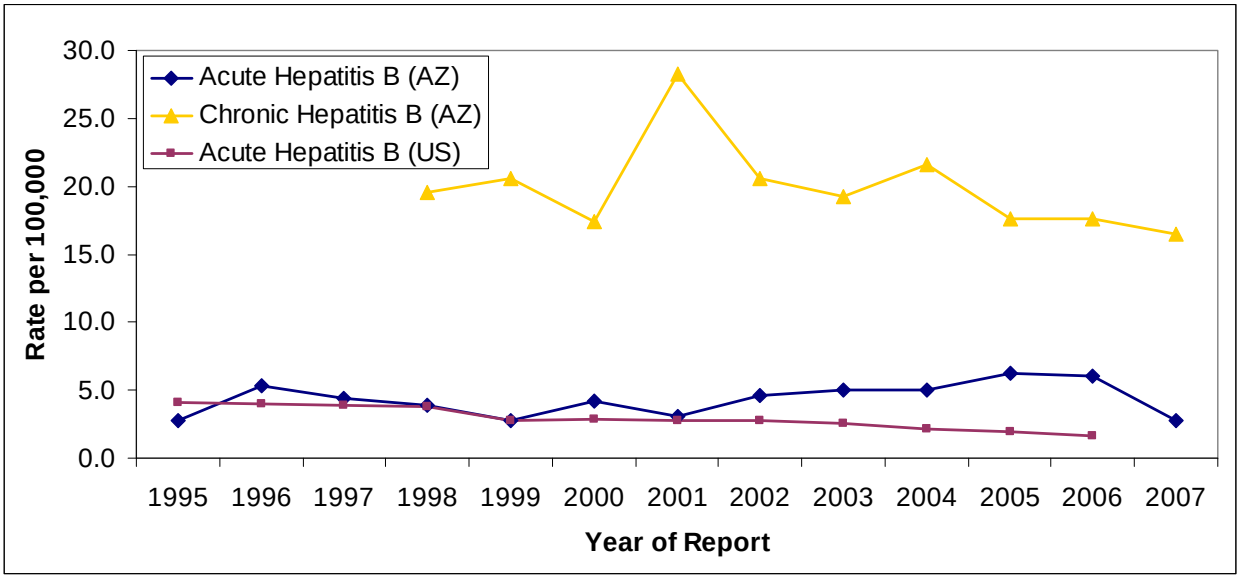
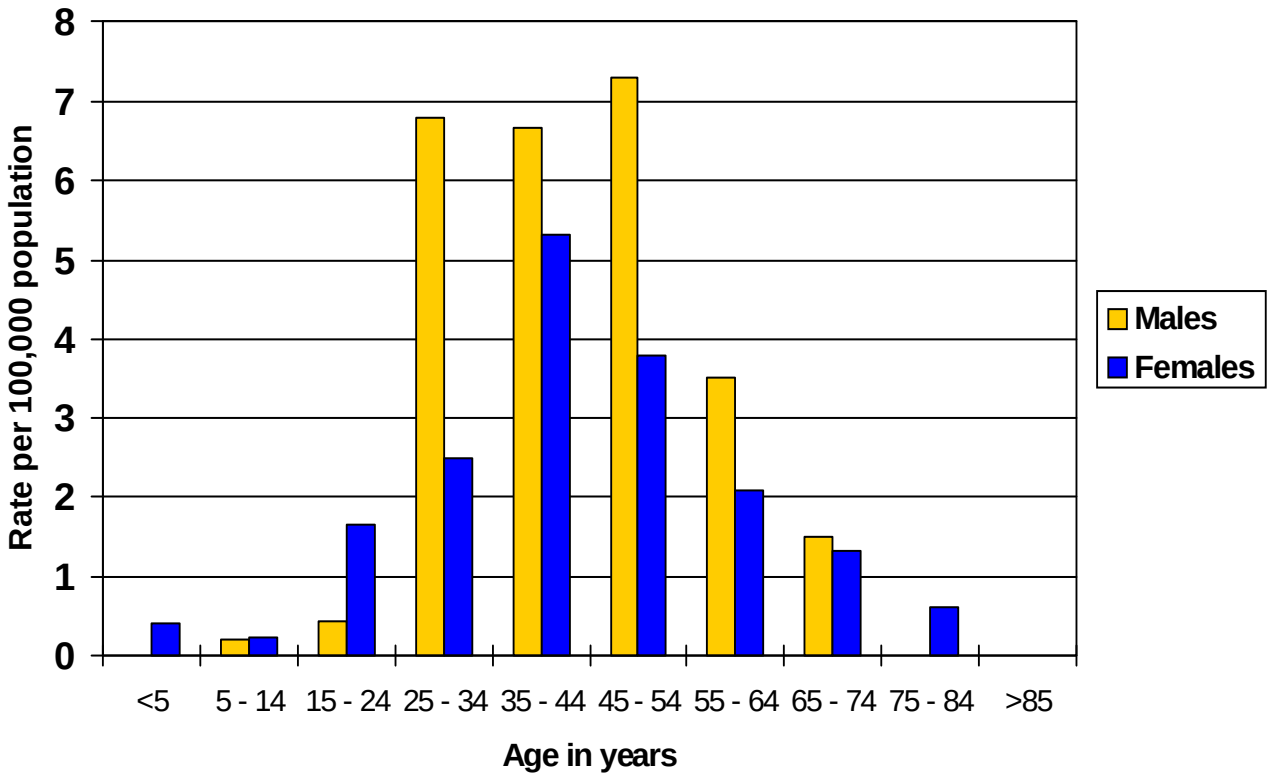


Figure 6 shows the age and gender rates for acute cases of hepatitis B reported in 2007. During this time, the highest rate of reported infections occurred among males aged 45 to 54 (7.30 cases per 100,000 population), and males between 25 to 44 years of age also had high rates. Females had much lower rates of reported illness across all age groups, with the highest rate occurring in females aged 35 to 44 (5.32 cases per 100,000 population).

Figure 6. Rates of Acute Hepatitis B in Arizona by Age, 2007



Due to an ADHS initiative to investigate all acute cases of hepatitis B reported in 2007, over 60% of cases had race information collected. Of these, the majority of the cases were white, and the rates of acute infection among all racial/ethnic groups were not significantly different from each other, as the confidence intervals for all the groups were overlapping (Table 4).

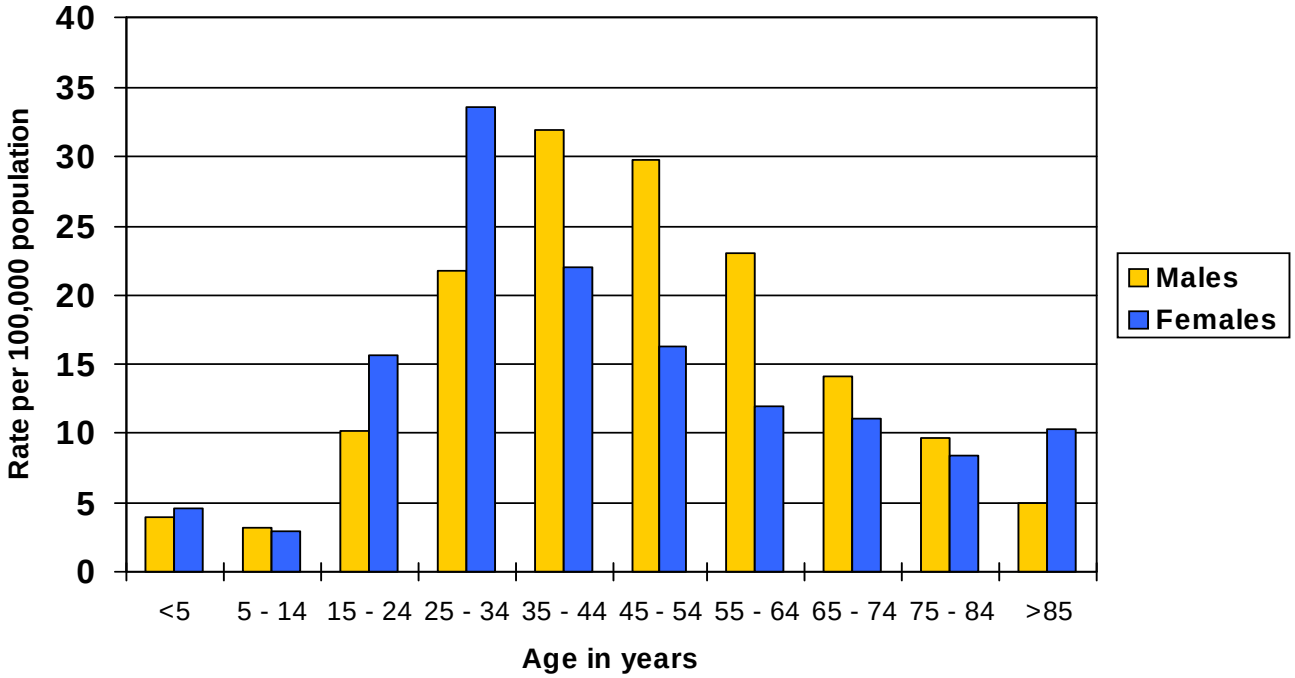
Table 4. Rates of Acute Hepatitis B by Race, 2007

	Number of Cases	Rate per 100,000	95% Confidence Interval
Unknown	70	-	-
Asian/Pacific Islander	2	1.18	*
Black/African American	10	3.95	(1.50 - 6.39)
Hispanic	32	1.78	(1.16 - 2.40)
Native American	4	1.18	*
White	62	1.6	(1.20 - 2.00)

* = Number of reported cases too small to calculate a useful confidence interval

The rates of newly reported chronic infections had very different distribution patterns across age, gender, and racial/ethnic groups when compared with acute cases. Figure 7 shows the age distribution of newly reported chronic infections by ten year age groups and gender. The highest rates occurred in females aged 25 – 34, and is likely due to the success of prenatal screening in identifying hepatitis B positive mothers in the state of Arizona. Prenatal screening is an essential public health prevention tool used to identify pregnant women with hepatitis B and ensure that infants born to these mothers are provided prophylaxis to prevent hepatitis B infection.

Figure 7. Rates of Newly Reported Chronic Hepatitis B in Arizona by Age, 2007



In 2007, only 40% of chronic hepatitis B reports had information on race and ethnicity. Among reported racial and ethnic groups, Asian/Pacific Islanders had rates significantly greater than those of any other racial group. Table 5 shows the rates of newly reported chronic hepatitis B cases and their corresponding 95% confidence intervals. Given the high rates of newly reported chronic cases among both Asian/Pacific Islanders and Blacks/African Americans, targeted educational outreach is needed to ensure awareness, diagnosis, and treatment among minority groups in Arizona, particularly in populations coming from countries with endemic hepatitis B.

Table 5. Rates of Newly Reported Chronic Hepatitis B in Arizona by Race, 2007

	Number of Cases	Rate per 100,000	95% Confidence Interval
Unknown	633	-	-
Asian/ Pacific Islander	140	82.46	(68.80 - 96.12)
Black/ African American	52	20.51	(14.94 - 26.09)
Hispanic	59	3.28	(2.44 - 4.12)
Native American	30	8.88	(5.70 - 12.06)
White	145	3.74	(3.13 - 4.35)

E. Influenza

Surveillance for influenza has been conducted for many years in Arizona. There are several purposes for influenza surveillance: to determine where and when influenza cases are occurring; to determine the predominant types and subtypes circulating in the state; to assess the intensity and impact of activity; and to identify novel viruses. Multiple sources of data are used for influenza surveillance in Arizona to better identify cases of influenza. The Arizona influenza surveillance system is comprised of laboratory surveillance (influenza became laboratory-reportable in October 2004), sentinel provider reporting of influenza-like-illness, school nurse office illness reporting from select schools, mortality surveillance and, in some counties, hospital emergency department visits or school absenteeism.

Traditionally, surveillance activities for influenza occur between roughly October and May. As novel strains of influenza can arise at any time of the year, surveillance is being expanded to occur year round. Investigations on individual cases of influenza are not routinely conducted except for at the very beginning of the season and for unusual cases. During summer months, all suspect or laboratory-confirmed cases of influenza will be investigated to assess severity and the possibility of infection with a novel influenza A virus (including H5N1).

The elements of routine influenza surveillance are described briefly here. Sentinel physicians throughout the state submit weekly reports of influenza-like illness (ILI) to the U.S. Influenza Sentinel Provider Surveillance Network, a collaboration between health care providers, state and local health departments, and the CDC. These reports help to determine the period when influenza-like illnesses account for a larger proportion of patient visits, both statewide and nationally. Viral isolation and subtyping at the Arizona State Laboratory and other select laboratories detect the predominant circulating types and subtypes and identify any novel strains.

Children are known to be both the subjects and source of a disproportionate number of influenza infections.[2] School-based monitoring of influenza-like-illness is valuable in its ability to aid in determining the severity and impact of influenza activity in a community. The school-based electronic surveillance system tracked the occurrence of influenza-like-illness through the aid of school nurses offices for its second season, and is described in more detail in section IV, subsection E.

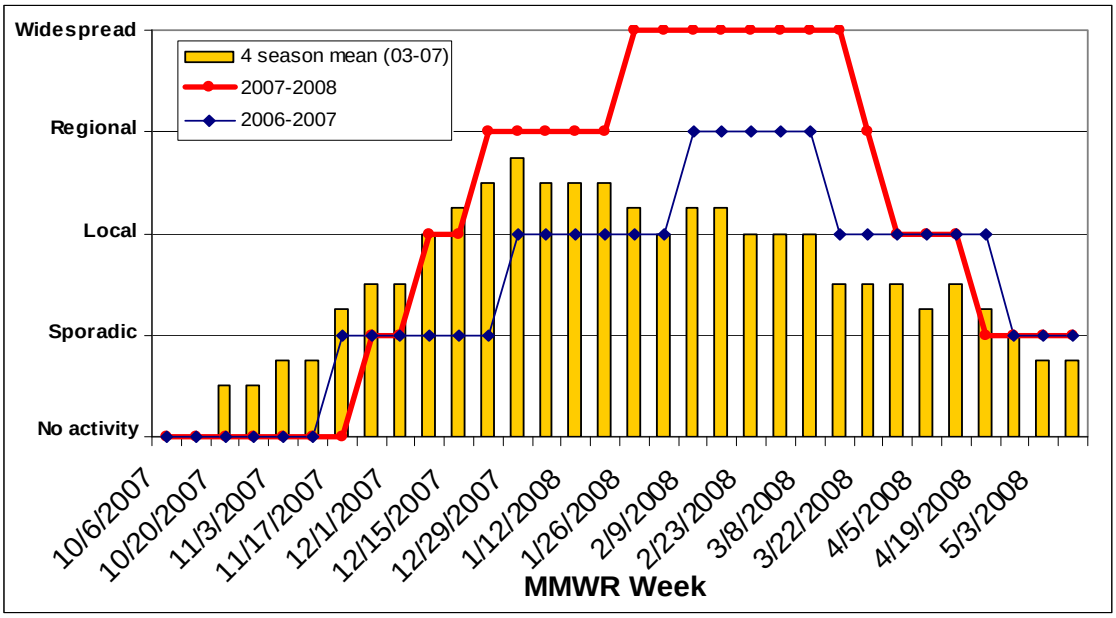
Although pediatric mortality due to influenza has been nationally-notifiable since the 2003-2004 influenza season, mortality from influenza-related illness in the general population has not previously been rigorously monitored. Plans are in place to work towards the goal of identifying influenza-associated deaths within three days of their occurrence. For the 2007-2008 influenza season, two influenza-associated pediatric deaths were reported to ADHS. Both cases were documented to have been infected with the influenza B virus and neither case was vaccinated with the seasonal influenza vaccine.

The activity levels reported weekly to CDC are seen in Figure 8. The activity level reached and remained at the widespread level for eight consecutive weeks. The influenza season started

[2] Viboud C, et al. *Risk factors of influenza transmission in households*. Br J Gen Pract September 2004;**54**:684-9.

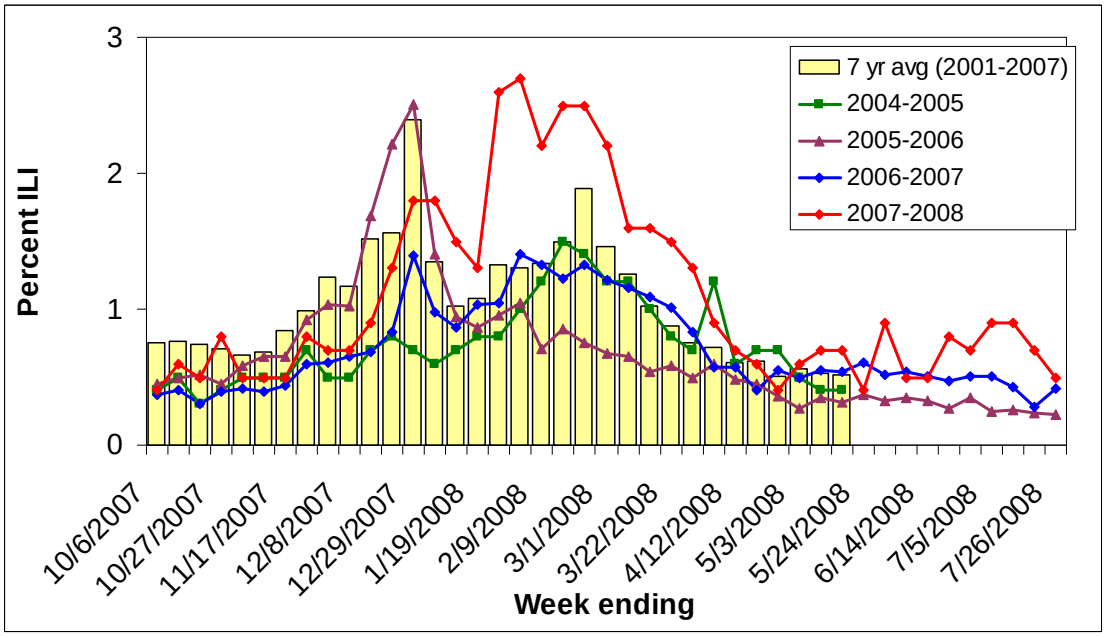
slightly later in 2007-2008 than in some of the previous four seasons, but remained high for a longer period of time.

Figure 8. Influenza Activity Level, Arizona, 2003 – 2008



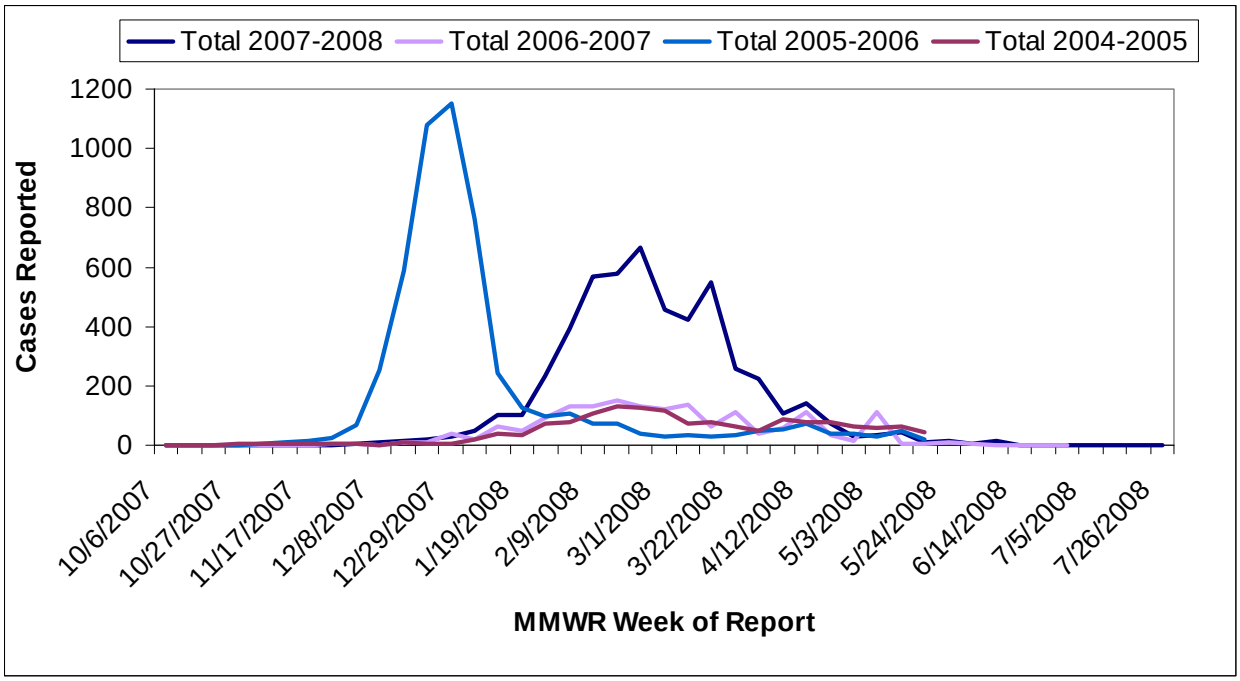
The 2007-2008 influenza season was notably more active both nationally and in Arizona than the 2006-2007 season. The ILI data show a considerable rise at the end of December that is quickly followed by a sharp rise at the end of January which lasted until mid-March (Figure 9). Although influenza often sweeps from the east coast to the west coast, it appears that this year the Southwest again experienced the onset of influenza season at an earlier date than the eastern region.

Figure 9. Influenza-like-Illness, Arizona, 2001-2008



Lab-confirmed reports of flu for the 2007-2008 season are shown in Figure 10. Lab-reporting has proven valuable for monitoring the timing of activity in the state and identifying counties where the virus circulated.

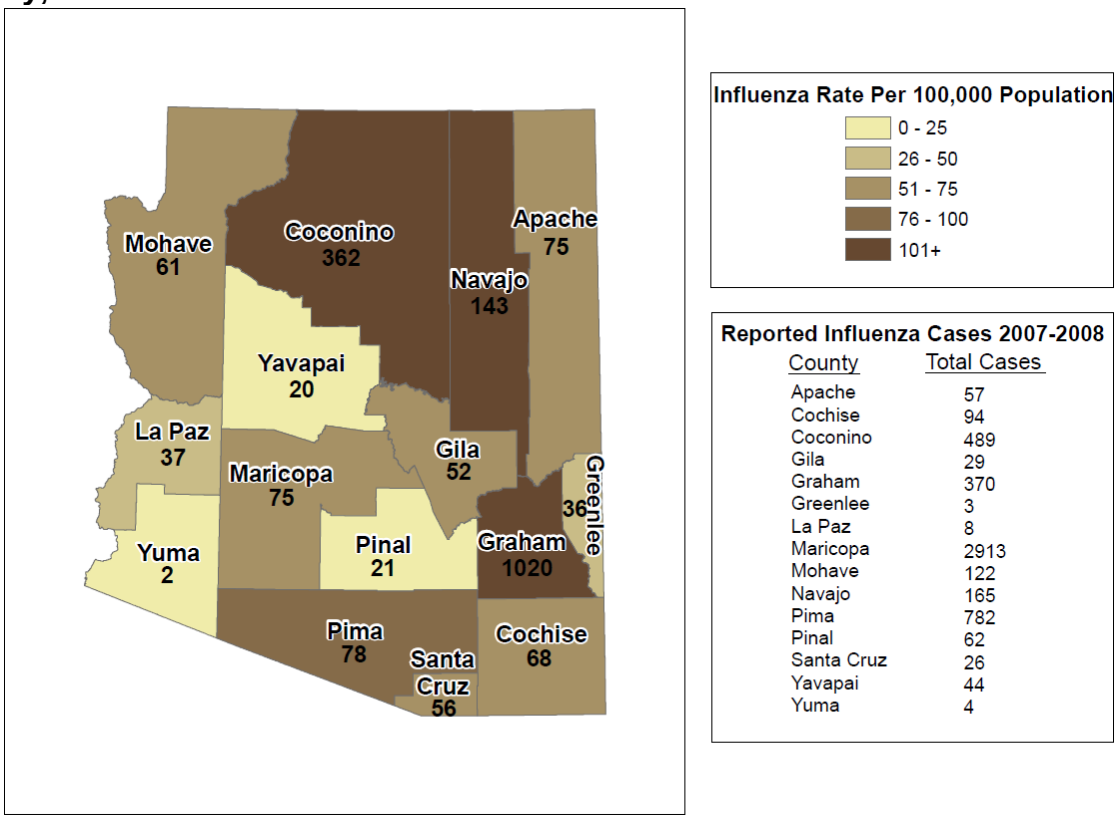
Figure 10. Laboratory-confirmed influenza, Arizona, 2004-2008



Some counties experienced higher rates of flu than others. Coconino and Graham counties had the highest rates of influenza in the state followed by Navajo, Pima, Apache and Maricopa (Figure 11). These differences may be due in part to a difference in reporting between the counties, or could reflect true disease patterns.

Nationally, despite much variation in circulating virus types from week to week, influenza A (H3) predominated this season overall. Like previous influenza seasons, the circulating influenza B virus surged mid-to-late season and its presence dominated over the circulating influenza A virus in the last eight weeks of the season. In Arizona, the influenza activity was comprised of a combination of influenza A (~60%) and influenza B cases (~40%). The majority of subtyped influenza A cases were influenza A (H3). Transmission of both influenza A and influenza B continued through mid May (Figure 12).

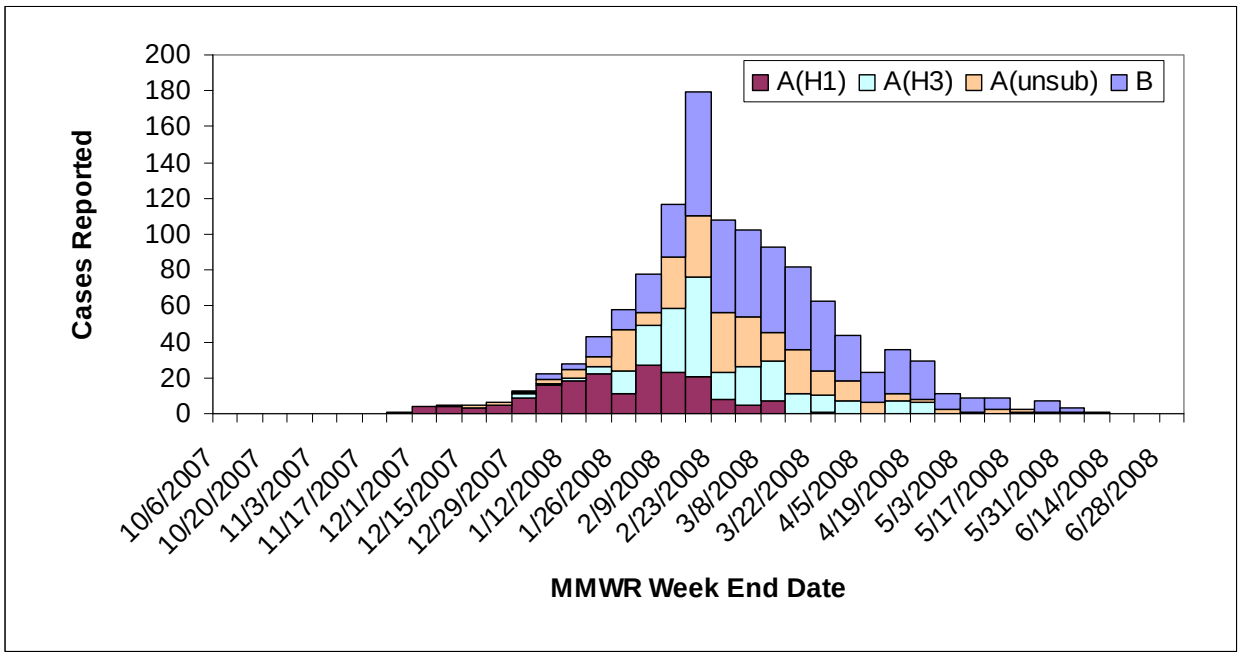
Figure 11. Rates of laboratory-confirmed influenza per 100,000 population by county, 2007-2008



Reported Influenza Cases 2007-2008

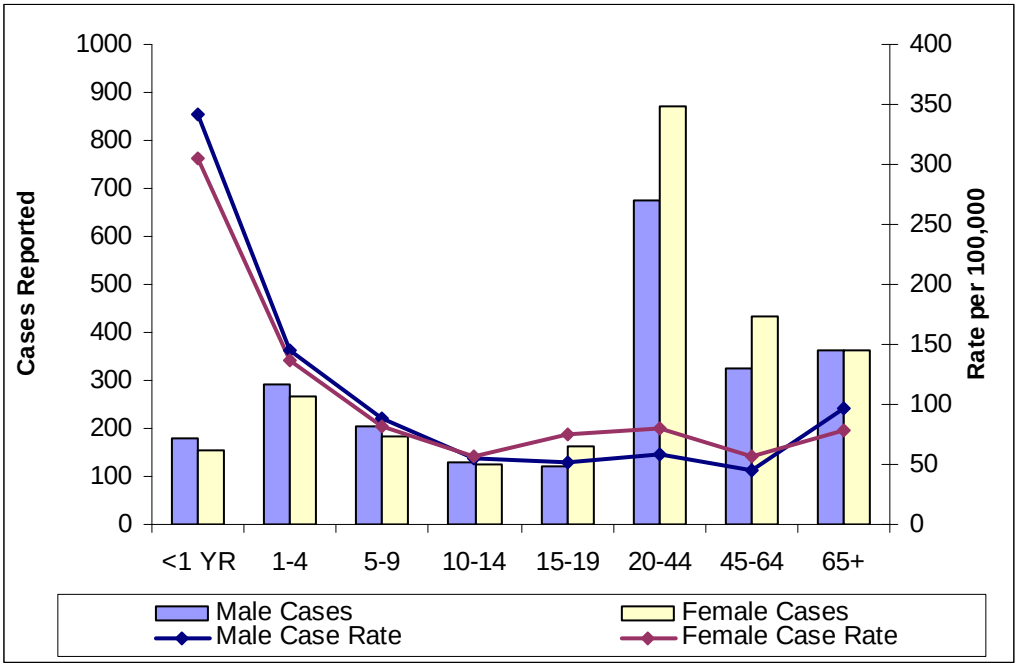
County	Total Cases
Apache	57
Cochise	94
Coconino	489
Gila	29
Graham	370
Greenlee	3
La Paz	8
Maricopa	2913
Mohave	122
Navajo	165
Pima	782
Pinal	62
Santa Cruz	26
Yavapai	44
Yuma	4

Figure 12. Culture- or PCR-confirmed influenza, by type or subtype, Arizona, 2007-2008



Much like recent influenza seasons, flu rates were highest in children four years of age or less and in those aged sixty-five years or more. Influenza rate differences were also noted in gender status. Here, women aged from fifteen years to sixty-four years of age had higher flu rates compared to males; whereas, males had higher rates in those less than one year of age and in those aged sixty-five years of age or more compared to females (Figure 13).

Figure 13. Lab-confirmed cases of influenza, by age and gender, Arizona, 2007-2008



F. Respiratory syncytial virus

Like influenza, respiratory syncytial virus (RSV) became laboratory-reportable in October, 2004. RSV is a common respiratory infection, especially among infants and young children. It follows a seasonal pattern similar to influenza, though peaks during the season often occur at different times. RSV reports during the 2007-2008 season peaked in early February, two weeks prior to the influenza peak (Figure 14).

Some counties experienced higher rates of RSV than others. Graham and La Paz counties had the highest rates of RSV in the state followed by Apache, Coconino, and Gila (Figure 15). Like for influenza, these differences may be due in part to a difference in reporting between the counties.

Figure 14. Number of laboratory-confirmed RSV, Arizona, 2005-2008

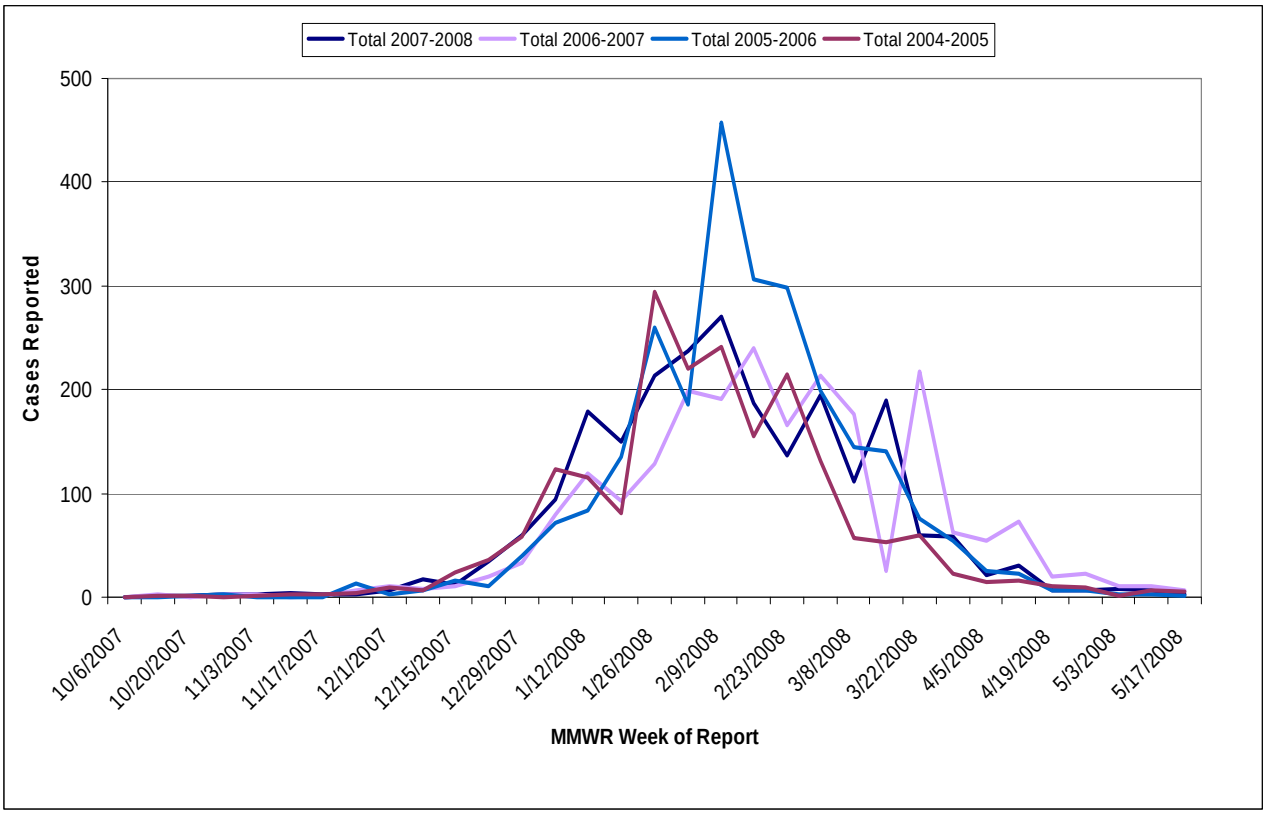
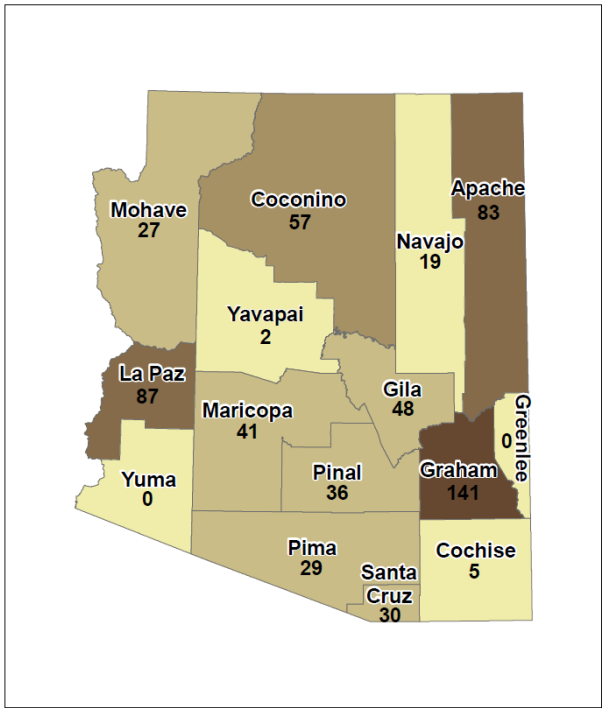


Figure 15. Rates of laboratory-confirmed RSV per 100,000 population by County, 2007-2008



RSV Rate Per 100,000 Population

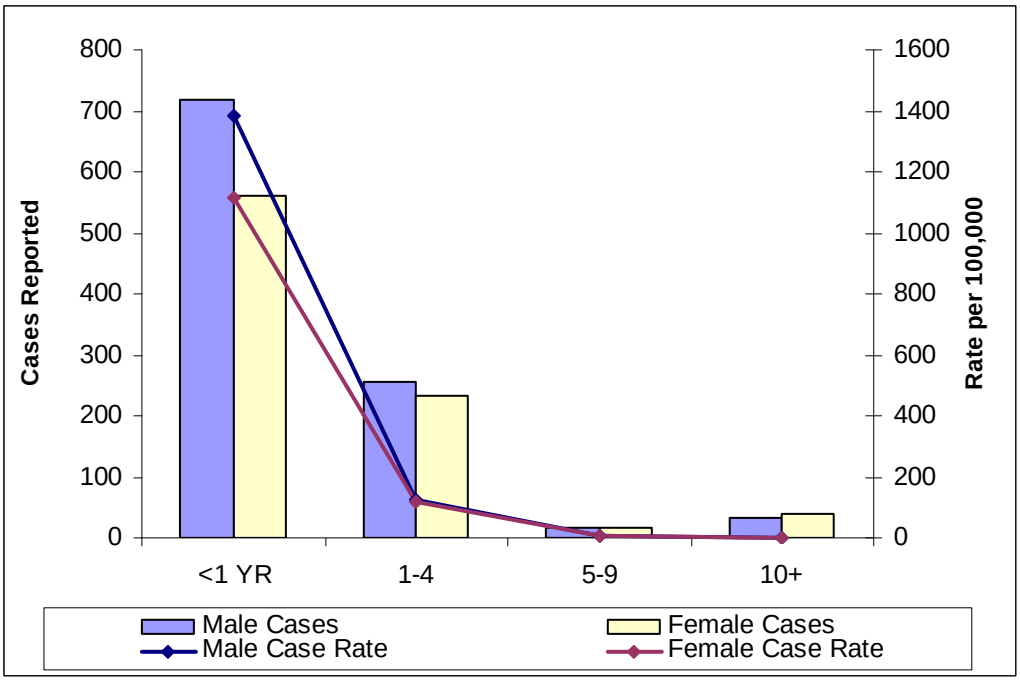
0 - 25
26 - 50
51 - 75
76 - 100
101+

Reported RSV Cases 2007-2008

County	Total Cases
Apache	63
Cochise	7
Coconino	77
Gila	27
Graham	51
Greenlee	0
La Paz	19
Maricopa	1590
Mohave	54
Navajo	19
Pima	291
Pinal	104
Santa Cruz	14
Yavapai	4
Yuma	0

The highest rates of infection were noted in those less than one year of age and in those from one year to four years of age. Few gender differences were noted across the noted age groups with the exception of those less than one year of age. Here, male infants have a notably higher rate of infection compared to female infants (Figure 16).

Figure 16. Lab-confirmed cases of RSV, by age and gender, Arizona, 2007-2008



IV. Surveillance Topics and Study Reports

A. Medical Electronic Disease Surveillance Intelligence System (MEDSIS)

The Medical Electronic Disease Surveillance Intelligence System, or MEDSIS, has been Arizona's primary surveillance database for the diseases included in this report since the beginning of 2006. In recent years, CDC has developed components of the National Electronic Disease Surveillance System (NEDSS) --- an internet-based infrastructure for public health surveillance data exchange. The NEDSS standards and data models were used when MEDSIS was custom-built using a combination of in-house and vendor-provided expertise. Throughout 2007, MEDSIS was housed on the ADHS Secure Integrated Response Electronic Notification (SIREN) platform, which also contains alert notification among other communications tools. MEDSIS was designed according to the Public Health Information Network (PHIN) standards available at the time and has been updated accordingly as these have changed. Compliance with PHIN standards is critical for being able to communicate with other systems nationally as these are developed.

The initial implementation of MEDSIS is described in the 2006 Annual Report. MEDSIS continues to be used by 14 of Arizona's 15 counties as their primary disease surveillance tracking system, while data for the remaining county are entered and managed by ADHS. In 2007, 18 hospitals were added as MEDSIS reporters and 31 individuals at these facilities were given MEDSIS rights and training. In response to user feedback, a suite of program upgrades (MEDSIS version 2.0) was successfully developed and deployed to users in June, 2007.

The enhancements to Arizona's surveillance system that were realized by the initial deployment of MEDSIS continue to be effective (see the 2006 Annual Report). Additional enhancements included in v. 2.0 include:

- Incorporation of electronic versions of the paper-based extended surveillance forms for most morbidities (only a few were available in the first version);
- Cases within the system can be fully viewed by both county and state public health users in the appropriate jurisdictions, regardless of who has edit rights or is working on a case;
- New functionality allows easier merging and de-duplication of cases;
- Multiple addresses can be stored and accessed (historical addressing);
- Ability to archive cases after review; and
- Enhanced search capacity.

Planned future enhancements include electronic laboratory reporting (to be deployed in 2009), integration of the remaining county, accommodation of additional program areas, enhanced functionality for the users and morbidities already participating, and working with Indian Health Services and tribes to bring them into the system as public health entities. In 2007, two Indian Health Services hospitals were brought into the MEDSIS system as reporters.

Some basic summary statistics about MEDSIS data are presented below. In 2007, a total of 17,473 unique records were created in MEDSIS. This number, combined with the 18,892 case records for 2006 brings the total number of unique case records in MEDSIS to 36,365 as of December 31, 2007. Eighty percent of the 2007 cases were reported from Arizona's two largest counties (Maricopa and Pima); 2.6% of reported cases were out-of-state residents. Of

the Arizona cases, 92% represented confirmed or probable cases. No remarkable seasonal distribution of case entry was noted in 2007. Hospitals and commercial laboratories were, by far, the two most significant sources of infectious disease reports in 2007. Cases were reported from 561 different facilities. The top 20 reporting facilities, accounting for 12,428 (71%) of reported Arizona cases, are shown in Table 9. These may represent reporting from either the laboratory or the hospital, or both, for these facilities.

Table 6. Cases by Classification

	N	Percent
Confirmed	14554	83.3
Probable	1551	8.9
Suspect	20	0.1
Not a Case	1348	7.7
	17473	100.0

Table 7. Cases by Month (Date entered)

	N	Percent
January	1725	9.9
February	1497	8.6
March	1629	9.3
April	1417	8.1
May	1407	8.1
June	1229	7.0
July	1468	8.4
August	1473	8.4
September	1243	7.1
October	1355	7.8
November	1458	8.3
December	1572	9.0
	17473	100.0

Table 8. Cases by Jurisdiction

	N	Percent
Out of State	462	2.6
Apache	160	0.9
Cochise	236	1.3
Coconino	275	1.5
Gila	157	0.9
Graham	154	0.9
Greenlee	11	0.1
La Paz	47	0.3
Maricopa	11413	63.6
Mohave	350	2.0
Navajo	271	1.5
Pima	3032	16.9
Pinal	752	4.2
Santa Cruz	83	0.5
Yavapai	314	1.8
Yuma	218	1.2
	17935	100

Table 9. Reporting facility (1st report)

	N	Percent
Sonora Quest	3035	17.4
LabCorp – combined	1855	10.6
Scottsdale Healthcare – combined	960	5.5
Arizona State Laboratory	657	3.8
University Medical Center	510	2.9
John C. Lincoln – combined	503	2.9
Banner Good Samaritan Medical Center	483	2.8
Chandler Regional Medical Center	479	2.7
ARUP Laboratories	440	2.5
St. Joseph's Hospital & Medical Center	418	2.4
Maricopa Integrated Health Systems	406	2.3
Northwest Medical Center	379	2.2
Mayo Clinic Hospital	369	2.1
Banner Desert Medical Center	327	1.9

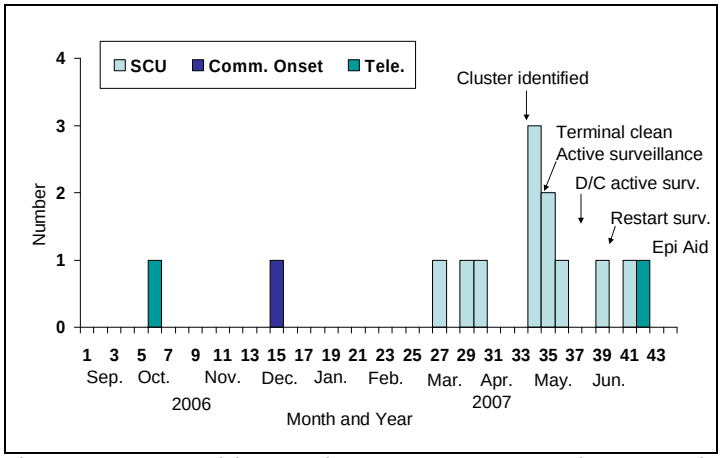
Banner Thunderbird Medical Center	288	1.7
Phoenix Children's Hospital	276	1.6
Carondelet St. Mary's Hospital & Health Care Center	273	1.6
Del E. Webb Memorial Hospital	264	1.5
W. O. Boswell Memorial Hospital	256	1.5
Tucson Medical Center	250	1.4

B. *Acinetobacter* Outbreak in a Hospital, Maricopa County

ADHS may provide assistance to hospitals or healthcare facilities for infectious disease outbreaks at the request of the facility. In May 2007, a local hospital reported an outbreak of multidrug-resistant (MDR)-*Acinetobacter* infections in an intensive care unit (ICU). *Acinetobacter* is a bacterium that is commonly found in healthcare environments, soil, and water, and is increasingly responsible for outbreaks in hospital settings. On April 22, the hospital noted a cluster of four patients in the ICU who had an MDR strain of *Acinetobacter* isolated from clinical cultures in March. An investigation by the hospital subsequently identified five additional cases. Infection control interventions were enacted, including: intensive cleaning of the ICU, placing all patients with *Acinetobacter* in contact precautions, increased hand hygiene education, and initiation of weekly surveillance cultures (routine culturing of patients in the affected unit, regardless of signs or symptoms). Clinical samples were sent to the Arizona State Laboratory for pulsed-field gel electrophoresis typing and all samples were found to be identical. Environmental sampling was performed but did not identify a source of the outbreak. At the request of the hospital, ADHS and Maricopa County Department of Public Health (MCDPH) provided additional guidance in identifying a source of the infections and recommended increased infection control strategies. These included: appropriate sites and intervals for surveillance cultures, enhanced environmental cleaning, and assistance with performing environmental cultures. Unfortunately, a source could not be identified and on June 3, a tenth patient was reported. ADHS and MCDPH requested assistance from CDC on June 13, 2007.

The CDC investigators arrived on June 19 to assist ADHS, MCDPH, and the hospital with the investigation. They identified a total of 13 cases between October 2006 and June 18, 2007, eleven of which were in the intensive care unit (ICU) (Figure 17). There were four deaths, including two that may have been related to their *Acinetobacter* infection. In addition, CDC performed clinical observation, environmental sampling, and a case-control investigation. A detailed chart review was conducted of the cases and controls were selected. Clinical observations included ward tours, a hand-hygiene compliance study and shadowing of ICU nurses and respiratory therapists. The clinical observation revealed sub-optimal hand hygiene practices among staff and minor issues with incomplete environmental cleaning. In response, the hospital administration addressed infection control issues with hospital staff and educational in-service sessions were provided.

Figure 17. MDR *Acinetobacter* Cases in Hospital A by Date of First Culture and Location



Abbreviations Key: SCU=Special Care Unit, Comm. Onset=Community Onset, Tele=Telemetry.

Environmental sampling results identified two positive *Acinetobacter* spp. from the ultrasound machine and a portable x-ray machine. Both pieces of equipment were used throughout the facility and would not necessarily have been included in the terminal cleaning of the ICU. Additional samples from other x-ray machines were collected by the hospital and submitted to CDC. All four portable x-ray machines were tested and *Acinetobacter* was isolated from all four machines, in particular from the x-ray film cartridge slots. The results of the environmental sampling and case-control investigation implicated contaminated portable x-ray machines as the point-source for this outbreak. It is also possible, however, that patient-to-patient transmission via healthcare workers contributed to the spread of infection. Based on the suspected mode of transmission, clinical observations and data obtained during the field investigation, the CDC team provided the hospital with recommendations, including the following:

1. Immediate disinfection of all portable x-ray and ultrasound machines (surfaces, drawers, and cassettes). Establish a cleaning protocol and assign cleaning responsibility to an appropriate staff member for all mobile x-ray and ultrasound equipment. Re-educate radiology staff on proper hand hygiene.
2. Additional monitoring and review of environmental cleaning practices to ensure proper disinfection of patient rooms, equipment, devices, and all high-touch surfaces.

C. Using laboratory data to inform epidemiological investigations: Serotyping, Pulsed-Field Gel Electrophoresis, and *Salmonella*

Laboratory data from state laboratories around the country are commonly used in epidemiological investigations to add critical information not available from clinical or commercial laboratories. Collaborations between the infectious disease epidemiology programs and the Arizona State Public Health Laboratory (ASL) within ADHS have enhanced the availability of information to use during investigations for certain diseases. Under Arizona Administrative Code R9-6-204, reporting labs are required to submit positive isolates of certain organisms, including *Salmonella* spp., to ASL. The full list of specified pathogens can be found at www.azdhs.gov/phs/oids/downloads/labrptlist.pdf. Isolates of *Salmonella* spp. are analyzed at

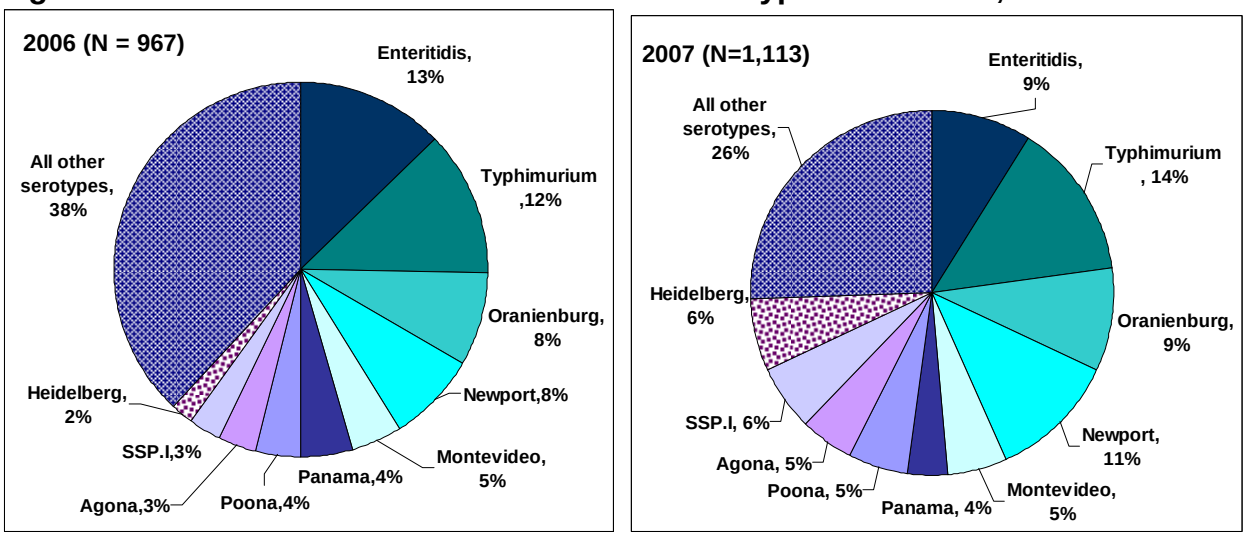
ASL by serotyping and pulsed-field gel electrophoresis. The ways that epidemiologists use that information are described below.

Serotyping

Serotyping of *Salmonella* isolates is performed using the Kauffman and White method. This process uses antibodies that selectively recognize specific structures (antigens) on the outside of the *Salmonella* cells. The antigens are divided into three categories: the O-types, the H-types and the Vi-types. Not all *Salmonella* have all three of types of antigens, and the combination of O-type, H-type and Vi-type antigens recognized by the antibodies determines the serotype.[3,4] More than 2,500 serotypes of *Salmonella* are known, with approximately 20 new serotypes identified every year.

In Arizona, 1,113 isolates (from 1,001 cases) of *Salmonella* were serotyped at ASL in 2007, compared to 967 isolates (from 949 cases) in 2006. In 2006 and 2007, the top ten *Salmonella* serotypes in Arizona were (Figures 18 and 19): S. Enteritidis, S. Typhimuirum, S. Oranienburg, S. Newport, S. Montevideo, S. Panama, S. Poona, S. Agona, S. ssp.I and S. Heidelberg. These serotypes contributed more than 60% of the total number of *Salmonella* isolates identified in Arizona in each of these years. The proportion of each serotype varies somewhat year to year, in part representing specific outbreaks. An outbreak of S. Oranienburg in late 2006 and early 2007 increased the proportion of this serotype in both years; outbreaks of S. Newport and S. Heidelberg in 2007 increased the proportion of these serotypes relative to 2006. Serotyping can help epidemiologists determine whether particular cases of infection may be related or may have a common source, or conversely, to rule out a common source.

Figures 18 & 19. Most Prevalent *Salmonella* Serotypes in Arizona, 2006 & 2007



[3] Fey et al. Pulsed-Field Gel Electrophoresis (PFGE): The Molecular Epidemiologists Tool. Nebraska Public Health Laboratory .

[4] Goering, R.V. Pulsed-field gel electrophoresis. In: Persing, D.H., Tenover, F.C., Versalovic, J., Tang, Y-W., Unger, E.R., Relman, D.A., and White, T.J., editors. Molecular Microbiology; Diagnostic Principles and Practice. Washington, D.C.: American Society for Microbiology; 2004: 185-196.

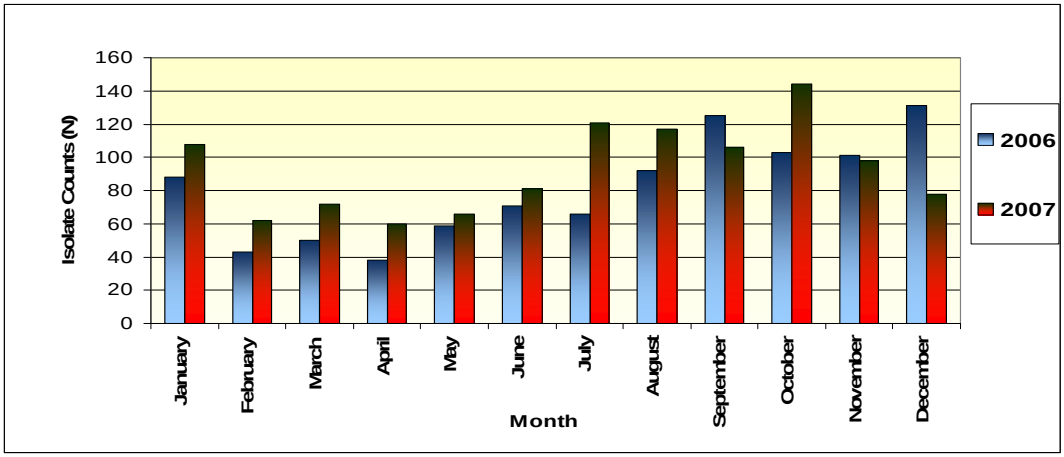
Pulsed-field gel electrophoresis (PFGE)

In 1993, the CDC developed standardized DNA "fingerprinting" methods using PFGE. Participating public health laboratories are equipped with standardized equipment and methods to perform PFGE on bacteria isolated from human specimens and suspected foods. PFGE is a molecular epidemiology technique that separates strands of DNA in order to distinguish between genetically similar samples. The PFGE process begins by cutting bacterial DNA with a sequence-specific restriction enzyme. The DNA fragments are then separated by alternating electric fields to run DNA through a flat gel matrix of agarose.[5,6] Genetic variation between different specimens of the bacterial DNA creates the "fingerprint" that is unique for that specific strain.

CDC and the Association of Public Health Laboratories created a database called PulseNet[7] which links many of the state public health laboratories throughout the country and enables comparison of PFGE patterns nationally and over time for prompt recognition of outbreaks. Once PFGE is conducted on *Salmonella* isolates in Arizona, the patterns are uploaded to CDC's national database. These data can be regularly searched by the public health laboratorians to look for clusters of patterns that match either locally or nationally. The results of these searches are often reported to CDC and to the epidemiologists at the state to aid in surveillance of foodborne outbreaks.

Figure 20 indicates the number of *Salmonella* isolates that have been serotyped and subtyped by PFGE for 2006 and 2007, by month. In both years, the numbers of *Salmonella* isolates submitted and tested are the highest from July to December, which corresponds to the peak season of *Salmonella* infections.

Figure 20. Number of *Salmonella* Isolates Analyzed by PFGE, by Month, 2006 and 2007



[5] Fey, P.D. and Rupp, M.E. Molecular epidemiology in the public health and hospital environments. In: Hinrichs, S.H., and Wisecarver, J. editors. Clinics in Laboratory Medicine, Molecular methods in Diagnostic Microbiology. Philadelphia, USA. W.B. Saunders Company; 2003: 885-901.

[6] Swaminathan B., Barrett, T.J., Hunter, S.B., Tauxe, R.V., and CDC PulseNet Task force. 2001. PulseNet: the molecular subtyping network for foodborne bacterial disease surveillance, United States. Emerg. Infect. Dis. 7:382-389.

[7] Centers for Disease Control and Prevention. National Center for Infectious Diseases "What is PulseNet?" July 24th 2006 < http://www.cdc.gov/PULSENET/whatis.htm>

Use of *Salmonella* laboratory data for epidemiology investigations

On a biweekly basis, the *Salmonella* serotype data and PFGE patterns from ASL are analyzed and compared with data from the state infectious disease surveillance system. Several reports are run:

- The frequency of each *Salmonella* serotype for the past year
- The frequency of each *Salmonella* PFGE pattern for the past year. This report identifies the isolates that have a PulseNet PFGE designation assigned. The PulseNet designation allows for analysis by the epidemiologists, who are not able to access national database. However, not all unique PFGE patterns have an assigned pattern name. In 2007, 1113 isolates were serotyped and subtyped using PFGE. 581 (52%) isolates were assigned a pattern name in PulseNet, and 534 (48%) isolates were not given a designation.
- A list of epidemiologic information for each case, separated by serotype, which includes case demographics, laboratory information, and PFGE pattern
- A report that flags any *Salmonella* serotype and PFGE pattern that has occurred more than twice in the past thirty, sixty and ninety days

These reports enable epidemiologists to more easily determine if there is an unusual increase in a specific *Salmonella* serotype or pattern.

One limitation of *Salmonella* PFGE surveillance can be attributed to the PFGE method which is time-consuming and requires a high level of skill and certification. The whole PFGE process typically takes a week from receipt of the isolates to assigning of the DNA "fingerprint", which can delay surveillance efforts in the event of an outbreak. Another limitation is the incompleteness of PulseNet PFGE designations for all *Salmonella* isolates. Common or outbreak-associated strains are more likely to have a PulseNet PFGE pattern name assigned. Since identification by the epidemiologists is contingent upon this nomenclature, some undesignated isolates may not be captured as potential matches in this analysis but may be recognized through the attention of the laboratorian.

In addition to these challenges, the number of *Salmonella* isolates being subtyped is dependent upon reporting laboratories submitting isolates to the state laboratory. In 2007, isolates were submitted for 72% of reported cases, so submission is high but not complete. Regardless of these limitations, PFGE serves as a valuable part of epidemiologic and environmental investigations by separating outbreak and sporadic cases, identifying cases that maybe linked, helping trace the source of contamination, and complementing traditional epidemiological methods.

D. *Naegleria fowleri* (Primary Amebic Meningoencephalitis), 2007

Primary amebic meningoecephalitis (PAM) is a rare but nearly always fatal disease caused by infection with *Naegleria fowleri*, a thermophilic, free-living amoeba found in fresh water environments, including lakes, ponds, rivers, and hot springs.[8],[9] Infection results when water

[8] Marciano-Cabral, F. and G.A. Cabral, *The immune response to Naegleria fowleri amebae and pathogenesis of infection.* FEMS Immunol Med Microbiol, 2007. **51**(2): p. 243-59.

containing *N. fowleri* enters the nose, followed by migration of the amoeba to the brain via the olfactory nerve. Signs and symptoms of PAM are similar to those of bacterial or viral meningitis and include headache, fever, stiff neck, anorexia, vomiting, altered mental status, seizure, and coma. Death will typically occur within 3 to 7 days. In 2007, there were six cases of PAM reported in the United States, with one of these cases occurring in Arizona; all six patients died.

On September 16, 2007, an adolescent boy aged 14 years was hospitalized with possible meningitis. His symptoms began on September 14 with severe headache, stiff neck, and fever. The child died on September 17. *N. fowleri* was detected in cerebrospinal fluid (CSF) at the hospital lab and confirmed at the CDC. He had been swimming in a northwestern Arizona lake on September 8 where he was observed diving and splashing in shallow water.

In the United States, *N. fowleri* is commonly found in warm freshwater environments in southern tier states.[10],[11],[12] Sampling of warm water lakes in southern tier states has indicated that *N. fowleri* is commonly present in most lakes during the summer, making elimination of *N. fowleri* from natural waters impractical. Because the location and number of amoebae in the water can vary over time, posting warning signs is unlikely to be an effective way to prevent infections, and such signs might create the misconception that bodies of water without signs are *N. fowleri*-free.

The only way to prevent *N. fowleri* infections is to refrain from water-related activities. However, some measures that might reduce risk by limiting the chance of contaminated water entering the nose include:[13]

- Avoid water-related activities in bodies of warm fresh water, hot springs, and thermally polluted water such as water around power plants.
- Avoid water-related activities in warm fresh water during periods of high water temperature and low water volume.
- Hold the nose shut or use nose clips during activities in warm fresh water such as lakes, rivers, or hot springs.
- Avoid digging in or stirring up sediment during water-related activities in shallow, warm freshwater areas.

E. School-based Surveillance

Background

ADHS and the Arizona School Nurse Consortium (AZSNC) developed and implemented a software program called Child Health Indicator Program (CHIP). CHIP has been used in

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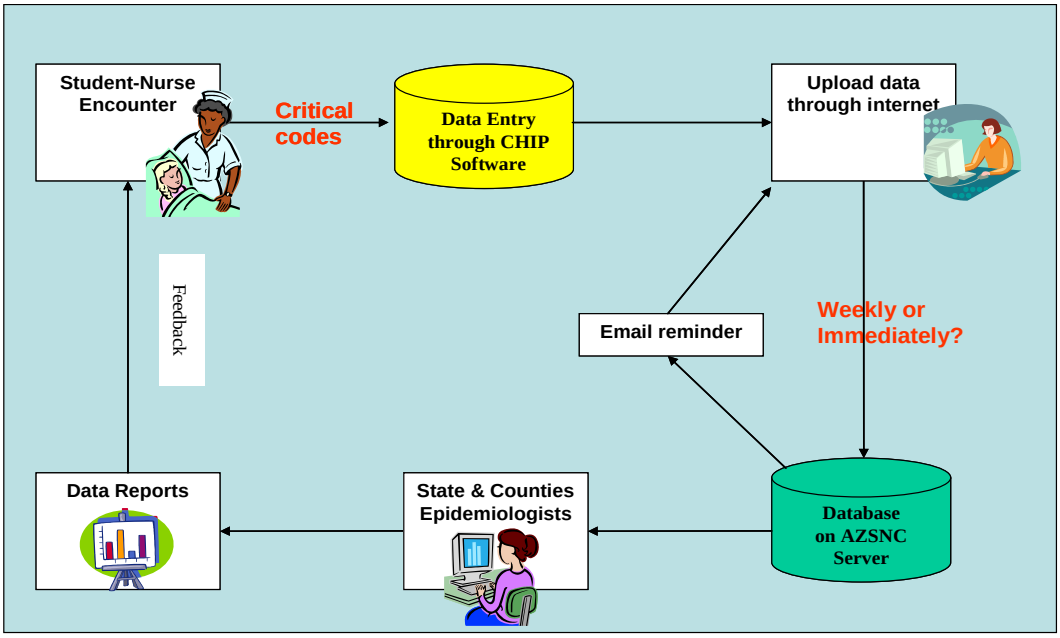
[9] Visvesvara, G.S., H. Moura, and F.L. Schuster, *Pathogenic and opportunistic free-living amoebae*: *Acanthamoeba spp., Balamuthia mandrillaris, Naegleria fowleri,* and *Sappinia diploidea.* FEMS Immunol Med Microbiol, 2007. **50**(1): p. 1-26.
[10] Ettinger, M.R., et al., *Distribution of free-living amoebae in James River, Virginia, USA.* Parasitol Res, 2003. **89**(1): p. 6-15.
[11] John, D.T. and M.J. Howard, *Seasonal distribution of pathogenic free-living amebae in Oklahoma waters.* Parasitol Res, 1995. **81**(3): p. 193-201.
[12] Wellings, F.M., et al., *Isolation and identification of pathogenic Naegleria from Florida lakes.* Appl Environ Microbiol, 1977. **34**(6): p. 661-7.
[13] *Primary amebic meningoencephalitis--Arizona, Florida, and Texas, 2007.* MMWR Morb Mortal Wkly Rep, 2008. **57**(21): p. 573-7.

Arizona for almost 10 years to assist school nurses/health aides to track student health conditions with nursing diagnosis codes including acute and chronic illnesses, immunizations, injuries, and infectious disease syndromes. CHIP software can also be used to document and report health office activities including health screening, hearing and vision screening, medications, and to create potential Medical Information Payment System billings online for Direct Service Claims; Individual Education Plan eligible daily medications; daily nursing procedures and encounters; to create reports including the immunization report, Annual Hearing Report and Arizona School Health Annual Report; and to generate referral letters in both English and Spanish.

The School-based Syndromic Surveillance Program (SSSP), a component of CHIP, is designed to receive electronic data on high priority conditions such as influenza-like illness (ILI), rash, and gastrointestinal illness in a timely manner and on all conditions weekly. The de-identified data are sent securely via the internet to the AZSNC server, from which health department epidemiologists download the data for analysis (Figure 21). Currently, 347 Arizona schools have implemented CHIP. ADHS has received and analyzed SSSP data during the school years of 2006-2007 and 2007-2008.

Figure 21. School-based Electronic Syndromic Surveillance System



Examples of SSSP data analysis

The data collected through SSSP has been analyzed periodically by ADHS and the results have been summarized in reports with data tables, pie charts, and line graphs. These reports are disseminated among epidemiologists at county health departments monthly and quarterly. The county health departments can monitor the selected key syndromes among students in the schools submitting data to SSSP (Table 10). Figure 22 shows the distribution of the most frequent school nurse encounters for Maricopa County during May 2008. The pie charts are provided to each county with participating schools and the distribution may vary for each county in different seasons.

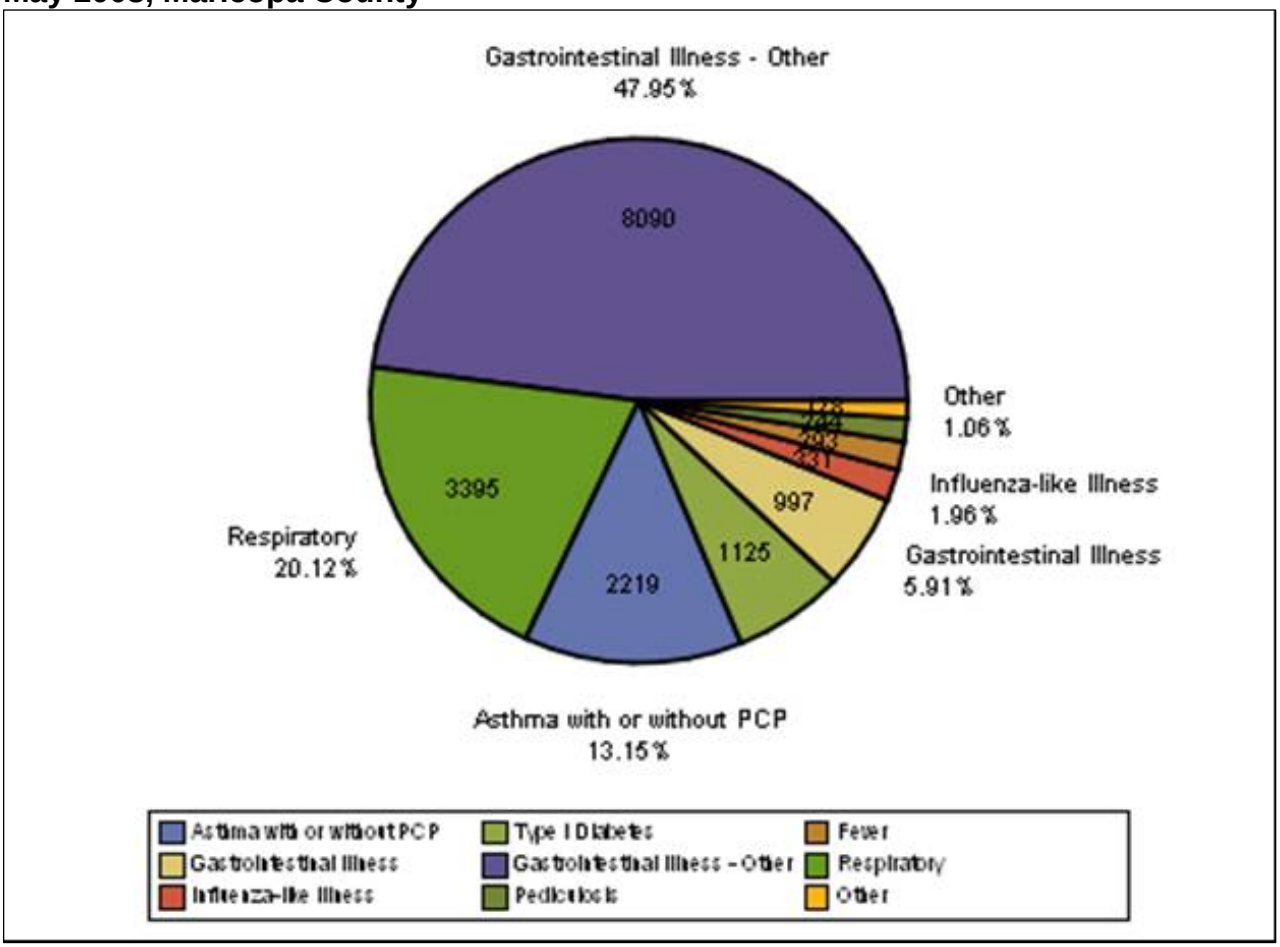
Table 10. SSSP School Nurse Encounters by County, School Year 2007-2008

	COUNTY									
	Apache	**Cochise**	**Coconino**	**Gila**	**Graham**	**Maricopa**	**Mohave**	**Pima**	**Pinal**	**Santa Cruz**
Asthma with or without PCP	125	1843	831	19	73	26787	10	133	43	507
Type I Diabetes	141	3458	305	1	193	14956	0	0	0	58
Type II Diabetes	0	1	2	0	0	117	0	0	0	2
Rash - Varicella	0	18	8	2	0	287	1	12	0	21
Rash - Impetigo	0	7	9	3	8	183	1	15	0	2
Rash - Rubella	0	0	0	0	0	3	0	1	0	0
Rash - Other	5	31	36	7	18	1060	1	31	2	13
Fever	11	145	190	6	72	4075	9	8	12	59
Gastrointestinal Illness	18	790	737	12	137	8823	6	26	7	60
Gastrointestinal Illness - Other	22	6871	4724	221	1761	86017	301	9	4	1952
Respiratory	6	3254	2716	5	331	53911	154	204	1	1024
Influenza-like Illness	25	235	226	0	9	3910	2	6	1	28
Hepatitis Acute	0	1	9	0	0	11	0	0	0	1
Meningitis	0	1	2	1	2	13	0	0	0	1
Pediculosis	6	51	53	0	71	3220	0	59	5	22
Scabies	0	0	2	0	3	44	0	1	0	0
All Syndromes	2411	63002	39321	2224	8966	885032	2380	2772	2324	18168
Number of Total School Enrollment	2298	9298	11600	619	4146	204246	459	826	2346	3870
Number of Schools	4	19	20	4	11	263	1	2	4	5

Footnote:

1. A school nurse encounter is counted as each school nurse diagnosis code used to document the student health conditions. Multiple codes for each visit are counted as multiple encounters. (Health Screenings/Immunizations are not considered as school nurse encounter)
2. All syndromes are student health conditions requiring nurse intervention.(code end with .22, ranging from 300.22 to 996.22)
3. The numbers in the table are only from schools that used CHIP during the school year.

Figure 22. The Most Frequent School Nurse Encounters for Selected Syndromes: May 2008, Maricopa County

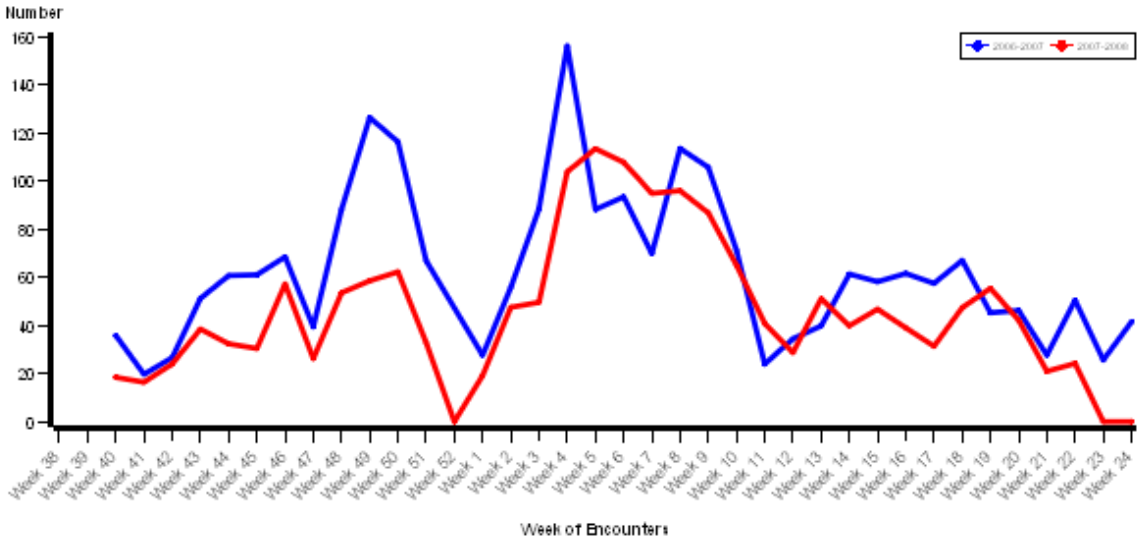


Footnote:

1. A school nurse encounter is counted as each school nurse diagnosis code used to document the student health conditions. Multiple codes for each visit are counted as multiple encounters. (Health Screenings/Immunizations are not considered as school nurse encounter)
2. The numbers in the graph are only from schools that used CHIP during the school year.

During the last influenza season, Arizona integrated the school-based syndromic ILI weekly data with other flu surveillance components to enhance surveillance among school children. The graph below (Figure 23) was updated weekly and disseminated along with the other information on influenza surveillance to local health departments and the public.

Figure 23. Ratio of Influenza-Like Illness/School Enrollment (Per 100, 000) by Week



In addition, epidemiologists at ADHS have started exploring how to use the Early Aberration Reporting System (EARS) to alert early changes in influenza activity, both with SSSP data and other influenza surveillance sources, to prospectively monitor the influenza season. Comparisons of the overall seasonal patterns of influenza indicate a close correlation among multiple data sources (Figure 24). SSSP data suggest that the ILI season starts earlier than indicated by reported lab cases and sentinel ILI data, while the peaks shown by all sources are similar. CuSum analysis of influenza data suggest that integrating data from multiple systems, including SSSP, can help epidemiologists to prospectively monitor and detect early aberrations of influenza among school children by prompting closer examination of available data sources once aberrations are first detected in one system (Figure 25).

Figure 24. ILI among children from SSSP compared with sentinel surveillance reports and hospital discharge database, September, 2006--May, 2007

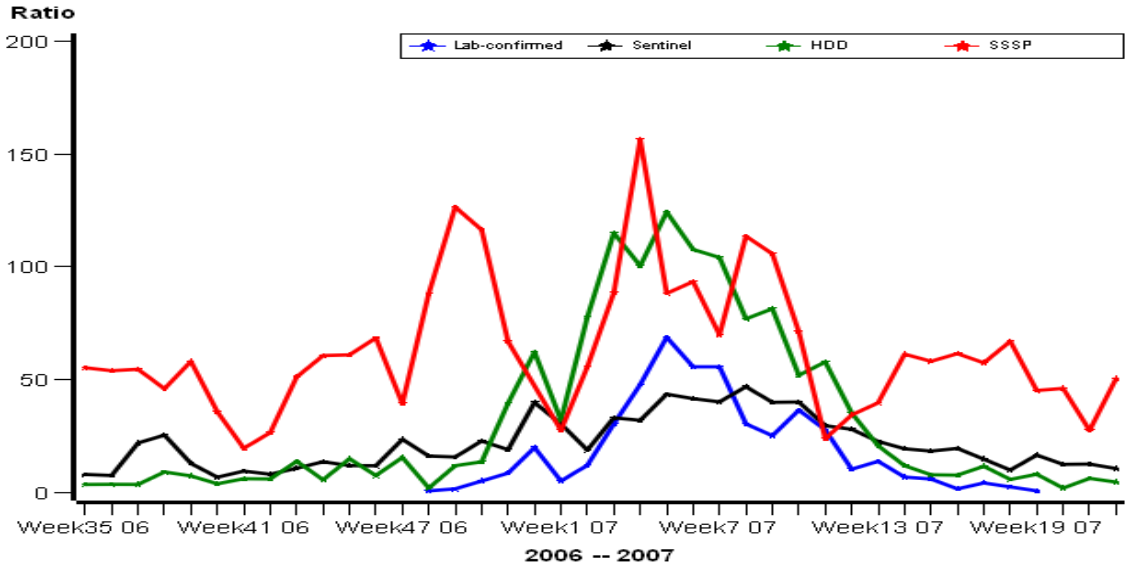
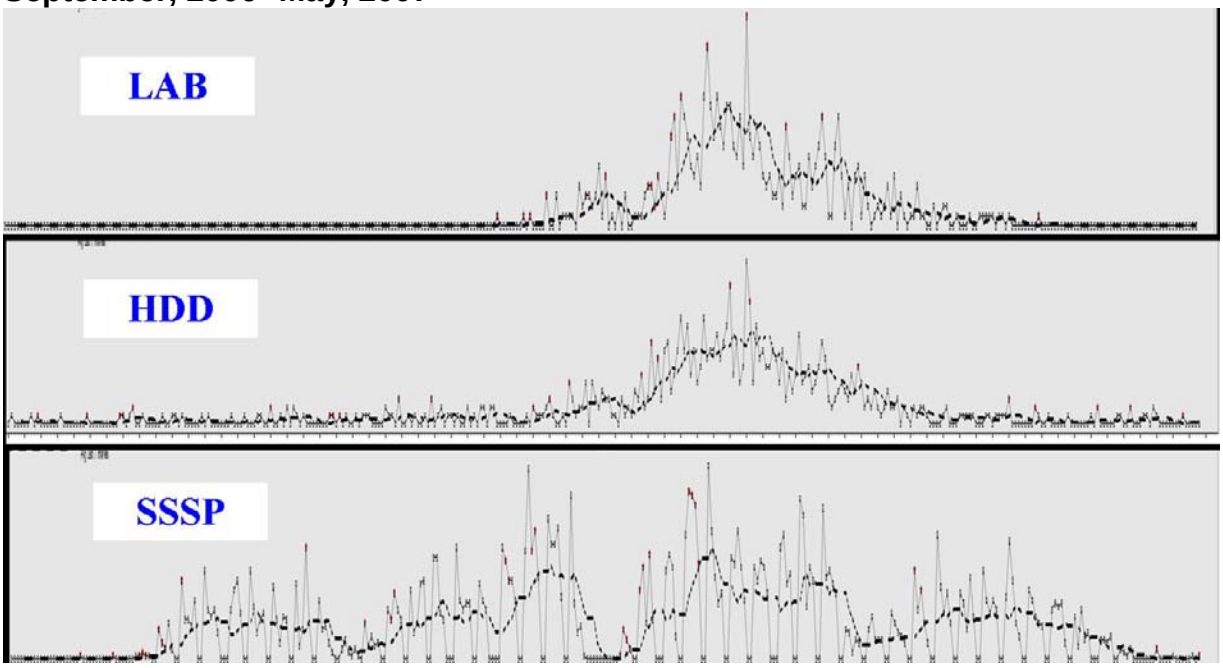


Figure 25. Comparisons of aberration detection of influenza among school children from SSSP, lab-confirmed reports, and hospital discharge database, September, 2006--May, 2007



F. Epidemic Intelligence Service (EIS) Corner

Knowledge, Attitudes and Practices Survey for Coccidioidomycosis (Valley Fever) in Arizona

Coccidioidomycosis, the third most commonly reported infectious disease in Arizona, causes an estimated one-third of community-acquired pneumonias in Arizona, although <15% of pneumonia cases are tested for this disease.[14] To direct future educational efforts, we developed and administered a survey to healthcare providers engaged in primary care to assess their knowledge, attitudes and practices (KAP) regarding diagnosis and treatment of coccidioidomycosis in Arizona. Surveys were mailed to 9,248 health practitioners licensed by the Arizona medical, osteopathic, and nursing boards during October–December 2007. Four basic questions assessed general knowledge, and nine clinical scenarios evaluated treatment attitudes and practices. Of 1,823 providers (24%) who completed the survey, 57% were physicians and 22% were nurse-practitioners. The median age was 51 years (range: 29–87), and the median number of years practicing medicine in Arizona was 12 (range: <1–59). Only 21% correctly answered all four knowledge questions. Approximately half reported “nearly always” testing patients presenting with community-acquired pneumonia for coccidioidomycosis; 16% reported “nearly always” treating any new diagnosis without evidence of comorbidities; and 29% reported “nearly always” treating any patient requesting treatment. This KAP study, the first

[14] Valdivia L., et al. *Coccidioidomycosis as a common cause of community-acquired pneu*monia. Emerg Infect Dis. 2006 Jun;**12**(6):958-62.

for coccidioidomycosis performed in the United States, is limited by a low response rate. The study indicates that despite the high incidence of coccidioidomycosis in Arizona, general knowledge and medical practices are inadequate, which underscores the need for a comprehensive education campaign to improve appropriate diagnosis and treatment of this disease in Arizona

Hepatitis B Surveillance Project

Hepatitis B infection can cause serious but preventable disease. Surveillance is critical for determining the burden of disease, monitoring trends, detecting outbreaks, and guiding prevention strategies. A positive hepatitis B core immunoglobin-M (HBcIgM) result, regardless of symptoms, meets the Arizona case definition; the Council of State and Territorial Epidemiologist (CSTE) definition requires a positive HBcIgM and associated symptoms. To determine the burden of acute hepatitis B and to assess the current surveillance system in Arizona, we reviewed laboratory and clinical data from medical records for all case-patients reported between 01/01/07 and 07/31/07. Additionally, to improve surveillance, we mailed providers case report forms to obtain more information about symptoms among case-patients reported between 08/01/07 and 09/30/07.

A total of 125 acute hepatitis B cases were reported between 01/01/07 and 07/31/07. Medical records were unavailable for 15 cases. Of 110 medical records reviewed, we identified 22 (20%) confirmed cases using the CSTE surveillance case definition. Classifying cases using only positive HBcIgM results overestimated acute cases by 82% and demonstrated a positive predictive value of 20%. Of 85 case report forms mailed to providers between 08/01/07 and 09/30/07, only 24 (28%) were returned by 10/05/07 with sufficient symptom information for case classification, and of these, 5 (21%) met the CSTE case definition. Using only HBcIgM results to classify acute hepatitis B cases greatly overestimates the burden of disease. Since medical chart reviews or interviews for all reported cases may not be feasible, using case report forms to obtain clinical information from providers might be an alternative, although the low response rate may hinder this approach. ADHS now classifies cases as confirmed using the CDC case definition and classifies cases with positive HBcIgM results only as probable. This study underscores the importance of improving acute hepatitis B surveillance and case classification in Arizona.

Missed Opportunities for Syphilis Treatment in Maricopa County, Arizona

Note: While information on sexually transmitted diseases from the Department's Sexually Transmitted Diseases Control Program is not included in this report, Arizona's EIS officer has worked across several programs and this summary is thereby included in the "EIS Corner" of this report.

Patients who come to a sexually transmitted disease (STD) clinic for syphilis screening and do not receive empiric treatment for syphilis and do not return for treatment represent a missed opportunity for syphilis control and prevention. The objectives of this study were to determine the extent of missed opportunities for syphilis treatment between 06/01/06 and 05/31/07, investigate sexual practices and demographic characteristics of syphilis positive patients who were not ultimately treated, and calculate the mean time between initial visit and treatment initiation of syphilis positive patients who were treated. Syphilis data from the Maricopa STD clinic, Maricopa County laboratory and Arizona Department of Health Services STD Program were obtained and merged into one database (N= 638).

The data are currently being analyzed and the results will be used to make recommendations about clinical practice for treatment of syphilis in Arizona. A manuscript is currently in preparation. The methodology for the study is described here.

Data cleaning entailed examination of missing values for each variable and internal consistency of the data and nested variables. Linear trends were checked using scatter plot graphs. Categorical variables were compared using the chi-square test. Continuous variables were compared by checking the mean and median using the t-test and the median test. Frequencies were generated to compare clinical differences by stage of infection and type of facility. The primary analysis used multiple logistic regression to test predictors of missed opportunities while adjusting for potential confounders. All known confounders and significant variables with p-value <0.05 in univariate analysis were included in the multivariate model. Potential effect modifiers were investigated and identified by 1) stratified analysis and 2) comparison of the magnitude of the odds ratio at each level of the effect modifier in a logistic regression. A full model with significant covariates was selected and used to test our primary hypotheses. A stepwise logistic regression and the Pearson goodness-of-fit test were conducted to test the fit of the full model. A similar analysis was conducted to test predictors of delayed opportunities for syphilis treatment using a subset of the data. In both analyses, the hotdeck method was conducted to impute missing observations to estimate coefficients using all observations. All statistical analyses were conducted using STATA 9.0.

Individuals contributing written sections to this report:

(ADHS, unless otherwise noted)
Shoana Anderson, Sanny Chen (CDC/ADHS), Aarikha D'Souza, Laura Erhart, William Frank, Sara Imholte, John Meyer, Yue Qiu, Rebecca Sunenshine (CDC/ADHS), Clarisse Tsang, Anne Vossbrink, Joli Weiss, Caleb Wiedeman

Acknowledgements:

All staff within the Infectious Disease Epidemiology and Investigation Program and Infectious Disease Surveillance and Preparedness Program are acknowledged for their contributions to data collection, data entry, data analysis, and case investigations. Local health departments have provided primary investigation of cases in most circumstances. Case reporting by providers and laboratories serves as the key to Arizona's infectious disease surveillance system.