Epidemiology in Texas 2006 Annual Report

Infectious Diseases

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Changes in Hepatitis A Incidence Rates Following Vaccine Introduction and Requirements for Children

Epidemiology of Hepatitis A

Hepatitis A is an acute illness caused by a ribonucleic (RNA) virus. The hepatitis A virus is one of a number of infectious and noninfectious agents that can cause hepatitis, or inflammation of the liver. Hepatitis A infection typically has an abrupt onset and produces symptoms that include fever, malaise, anorexia, nausea and abdominal discomfort, and jaundice. The symptoms last from a week in mild cases to several months in severe cases. In children under 6 years of age, 70% of infections are asymptomatic and those with symptoms only rarely develop jaundice (Centers for Disease Control and Prevention, CDC, 2006). In older children and adults, infections are typically symptomatic and more than 70% of patients develop jaundice.

Symptoms of hepatitis A infection develop after an average incubation period of 28 days (range =15-50 days). Transmission of the virus, which is shed in the stool of infected persons, occurs primarily by the fecal-oral route. Household and other close (including sexual) contacts of infected persons are at greatest risk of acquiring the infection. However, the virus can also be transmitted in food or water or on surfaces or objects contaminated with feces from an infected individual, including shared injection drug paraphernalia. Because young children typically have asymptomatic infections, they are significant sources of infection for household, day care, and other close contacts. The majority of outbreaks have been community-wide and typically sustained by transmission from asymptomatic children. Common-source outbreaks caused by food contaminated by ill food handlers that was either not cooked or improperly cooked following contamination have also occurred regularly.

The burden of hepatitis A infection is substantial. As many as one-quarter of persons with recognized infection are hospitalized, and even non-hospitalized patients are often absent from work for weeks (CDC, 2006). CDC estimates that, prior to 1996, about 100 persons in the United States died each year due to hepatitis A infection (CDC, 2006).

Advent of the Hepatitis A Vaccine Era

In 1995, the first vaccine conferring protection against hepatitis A infection was approved for use in the United States. Subsequently, 2 other hepatitis A vaccines were approved in 1996 and 2001 (combined hepatitis A and B vaccine). In 1996, the Advisory Committee on Immunization Practices (ACIP) made its first recommendations for preventing hepatitis A through immunization, focusing primarily on children living in communities with high rates of the disease and persons at high risk for infection (CDC, 1996). In 1999, ACIP expanded its recommendations to include vaccination of children living in states, counties, and communities in which hepatitis A incidence rates were consistently above the national average (CDC, 1999).

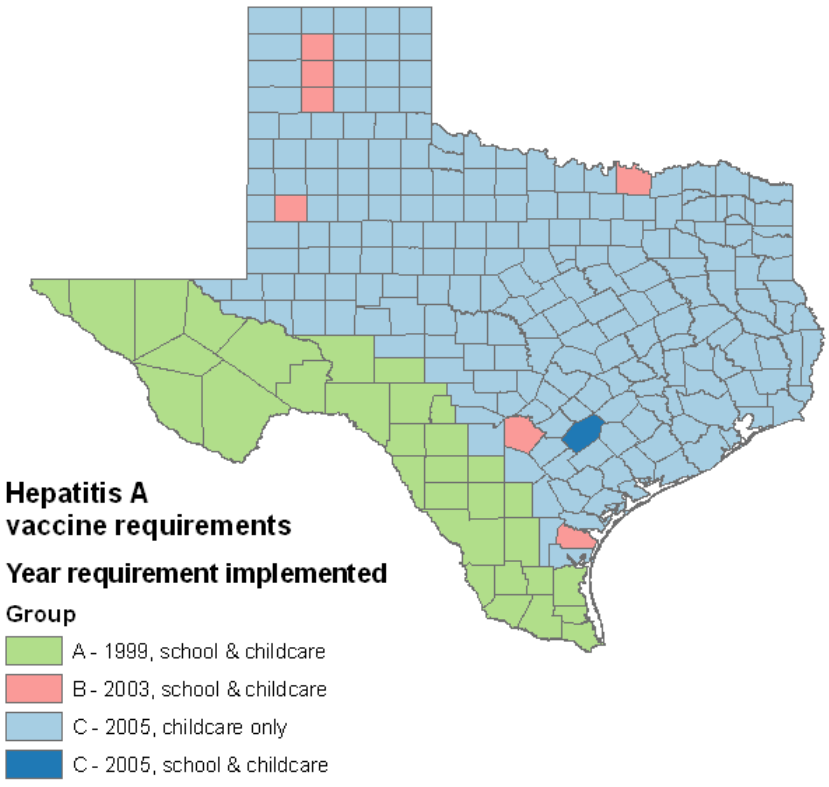
In response to the ACIP 1999 recommendations, the Texas Department of Health (now the Texas Department of State Health Services, DSHS) mandated, effective 1 August 1999, that all children at least 5 years of age who attend public or private schools

or child care facilities located within one of 32 select counties must receive 2 doses of hepatitis A vaccine. The select counties had historically elevated rates of hepatitis A and are the Texas-Mexico border counties as defined by the 1986 La Paz agreement (within 100 km of the Rio Grande River). These counties are designated in Table 1 and Figure 1 as group A counties.

The Texas Department of Health extended its hepatitis A immunization mandate to include 7 additional counties with10-year average hepatitis A incidence rates of at least 20 cases per 100,000 population per year, effective August 1, 2003. These counties are designated in Table 1 and **Figure 1** as group B counties.

In 2005, the Texas Legislature passed a bill requiring hepatitis A vaccination for all children attending child care facilities across the state, effective August 1, 2005. For Gonzales county, the hepatitis A vaccine requirement extended to schools as well as child care facilities. The counties falling under an immunization mandate for the first time in 2005 are designated as group C counties in Table 1 and Figure 1. Also in 2005, hepatitis A vaccine was approved for the first time for children 12 to 23 months of age. The mandate for

Figure 1. Hepatitis A immunization requirements in Texas counties, by year requirement implemented and population targeted



vaccination applies therefore to children one year of age and older.

Hepatitis A Incidence Rates Before and During the Vaccine Era

During 1980-1995 in the United States, approximately 22,000-36,000 hepatitis A cases were reported each year to the CDC. This corresponds to an annual incidence rate of 9.0-14.5 cases per 100,000 population (CDC, 2006). Estimates of the actual number of cases are 10 or more times higher than these rates. Incidence rates reported in Texas during this period averaged above 10 cases per 100,000, but less than 20 per 100,000 population. Data for 1996 for the United States as a whole and for Texas are representative for this period, with 31,032 cases and an incidence rate of 11.7 cases per 100,000 population reported nationwide and 3,458 cases and an incidence rate of 18.2 cases per 100,000 population reported in Texas. Population data, numbers of reported hepatitis A cases, and hepatitis A incidence rates for 1996 are presented for each of the 254 Texas counties in Table 1. The counties and their data are sorted into groups A, B, and C, as previously identified. Nationwide figures for the same year are also included in this table. The map in **Figure 2a** depicts 1996 hepatitis A incidence rates for each Texas county. The 1996 data will be used herein as a baseline for comparison to data collected for later years, as it was not only representative of the 16-year prior period, but also because it was the first full year that licensed vaccines against hepatitis A were available in the United States but not yet widely administered.

Texas population, case counts, and incidence rates for 2000 are also presented in Table 1, and the map of incidence rates by county is shown in **Figure 2b**. The year 2000 was the first full year of data collection during which certain Texas counties, the group A counties, fell under a mandate for immunization against hepatitis A of school-aged children. In 2000, Texas reported a total of 1,935 cases of hepatitis A, with an incidence rate of 9.3 cases per 100,000 population. The nationwide data for the same year were 13,397 reported cases and an incidence rate of 4.9 cases per 100,000 population. Thus, the hepatitis A incidence rate declined statewide in Texas by 49% and nationwide by 58% from 1996 to 2000. The group A Texas counties had 162 reported cases and an incidence rate of 7.6 cases per 100,000 population in 2000. By comparison, the group A 1996 data were 991 cases and an incidence rate of 49.6 cases per 100,000 population. Thus, the group A counties in aggregate experienced a very dramatic decrease in hepatitis A incidence rate of 85%. Again, these counties are those that are along or in close proximity to the Texas-Mexico border. These data, along with the 2000 incidence rates for the group B and C counties, are depicted in **Figure 3**.

The next year for which data are presented in Table 1 is 2004. The incidence rates by county are shown in the map in **Figure 2c**. 2004 was the first full year of data collection during which the second set of selected counties, the group B counties, had mandated hepatitis A vaccination for school-age children. In 2004, Texas reported 624 cases of hepatitis A and an incidence rate of 2.8 cases per 100,000 population. The nationwide data for that year were 5,683 cases and an incidence rate of 2.0 cases per 100,000 population. Between 2000 and 2004, the hepatitis A incidence rate in Texas declined by 70% (85% from 1996 to 2004), and the nationwide rate declined by 60% (83% from 1996 to 2004). The

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Figure 2a. Incidence rate of hepatitis A in Texas counties in 1996

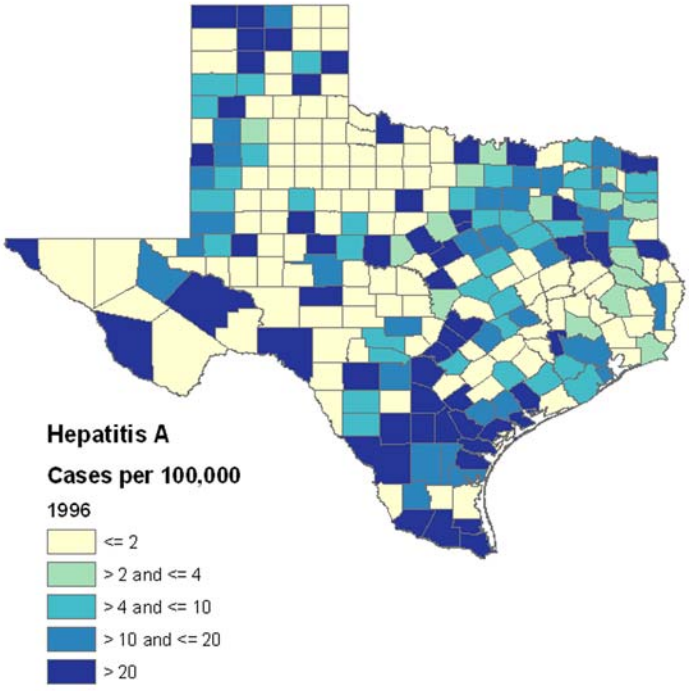


Figure 2b. Incidence rate of hepatitis A in Texas counties in 2000

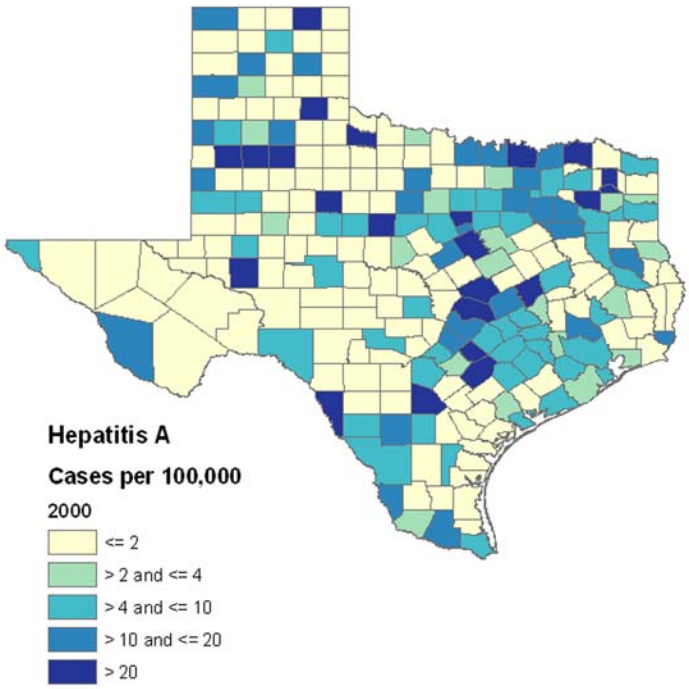


Figure 2c. Incidence rate of hepatitis A in Texas counties in 2004

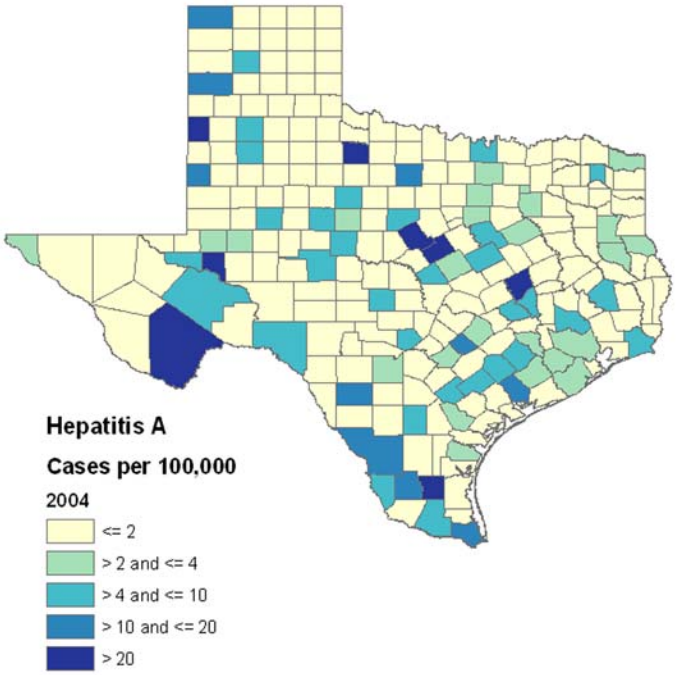


Figure 2d. Incidence rate of hepatitis A in Texas counties in 2006

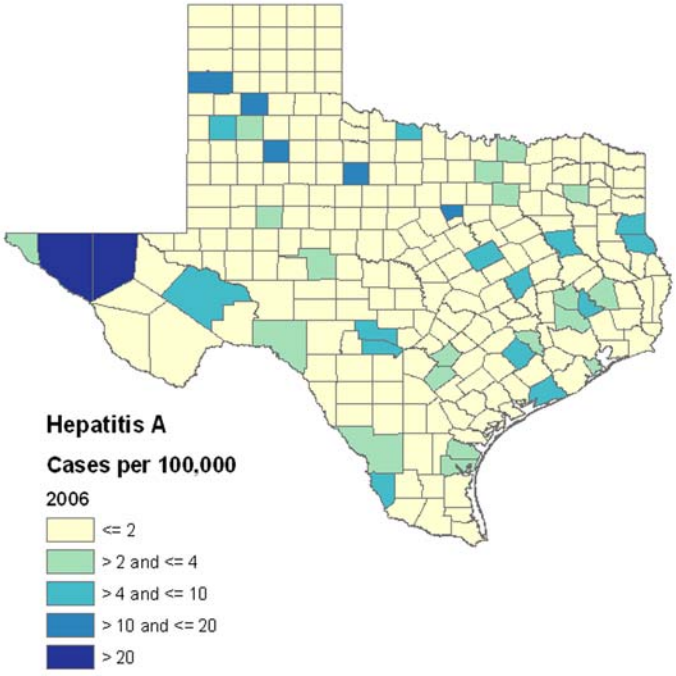
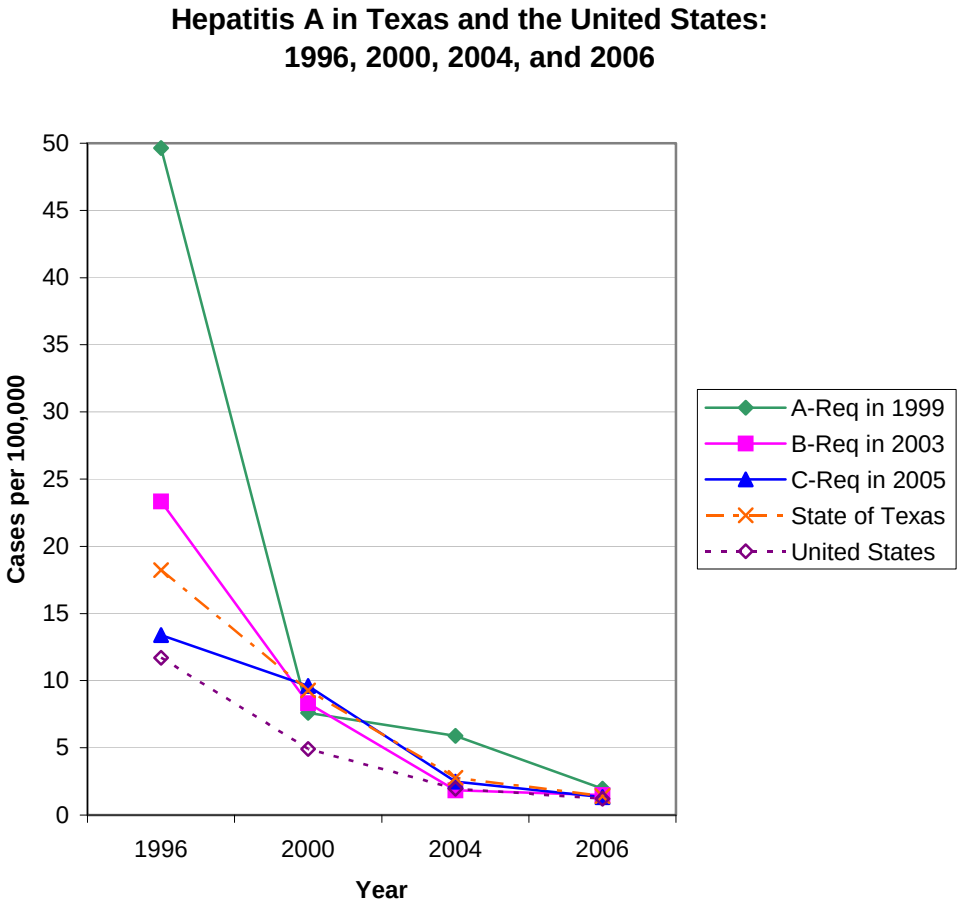


Figure 3. Incidence rate of hepatitis A in parts of Texas according to vaccine requirements, compared with the state and national averages, for 1996, 2000, 2004, and 2006. The horizontal axis depicts years of particular interest for vaccine requirements and is not intended to represent a uniform time scale



group B Texas counties had 40 reported cases and an incidence rate of 1.8 cases per 100,000 population in 2004. This was a 78% decline from the 172 cases and an incidence rate of 8.3 cases per 100,000 population reported for 2000. The data for 1996 for the group B counties was 454 cases and an incidence rate of 23.3 cases per 100,000 population, giving a decline in incidence rate from 1996 to 2004 of 92%. Thus, the group B counties experienced dramatic reductions in hepatitis A case counts and rates even before vaccination requirements were imposed, and their rates declined dramatically again after those requirements were in place. These data are also depicted in Figure 3.

The final year for which data are presented in **Table 1** is 2006. The incidence rates by county are given in the map in **Figure 2d**. The year 2006 was the first full year of data collection following mandated vaccination against hepatitis A for children attending child care facilities in all Texas counties and also the first year for which vaccination was required in the group C counties. For 2006, Texas reported 330 cases of hepatitis A and an incidence rate of 1.4 cases per 100,000 population. The

nationwide data for the same year were 3,579 cases and an incidence rate of 1.2 cases per 100,000 population. Between 2004 and 2006, the hepatitis A incidence rate in Texas declined by 50% (92% from 1996 to 2006) and the nationwide rate declined by 40% (90% from 1996 to 2006). The group C Texas counties had 249 cases and an incidence rate of 1.3 cases per 100,000 population in 2006. This was a 48% reduction from the 446 cases and an incidence rate of 2.5 cases per 100,000 population reported for 2004. The data for 1996 for the group C counties was 2,013 cases and an incidence rate of 13.4 cases per 100,000 population, a 90% decline in incidence rate from 1996 to 2006. The largest declines in case counts and incidence rates for the group C counties occurred years before childhood vaccination was mandated, but they have continued to drop. These data are also depicted in **Figure 3**.

From 1996 to 2006, the group A counties recorded a decline in hepatitis A incidence rate from 49.6 to 1.9 cases per 100,000 population (a 96% decrease), while the group B counties experienced a decline from 23.3 to 1.5 cases per 100,000 population (a 94% decrease), and the group C counties recorded a decline from 13.3 to 1.3 cases per 100,000 population (a 90% decrease). For the state as a whole, the incidence rate fell from 18.2 cases per 100,000 population in 1996 to 1.4 cases per 100,000 in 2006 (a reduction of 92%).

Conclusions

Hepatitis A case counts and incidence rates have declined rapidly and dramatically in Texas in response to vaccine availability and childhood immunization requirements. The steepest declines occurred in counties that have historically experienced the highest incidence rates and that implemented vaccine requirements soon after ACIP recommendations for targeted immunization. As for the United States as a whole, hepatitis A case counts and incidence rates were at historic lows in 2006. The goal of eliminating indigenous transmission of this disease appears attainable.

Targeting children for vaccination against hepatitis A has been effective for a variety of reasons. First, as with many other vaccines, the immunity conferred by vaccination is lifelong, and so over time the number of susceptible persons in the population continues to decline. Second, children have accounted for a fairly large proportion of hepatitis A cases, so reducing the number of cases in children greatly reduces the total number of cases. Third, asymptomatic children with hepatitis A are a significant source of infection for entire communities, and thus immunization of children protects individuals of all ages. The strategy of incremental implementation of routine childhood vaccination against hepatitis A, based on geographic variation in incidence rates, has been very effective in Texas.

Note to Readers: Upon examination of Table I and Figures 2a, 2b, 2c, and 2d, the reader will likely notice that the hepatitis A incidence rates for certain counties may appear to be unusually large. This is not uncommon when the population value used in the denominator of a rate calculation is relatively small. A single case in a small county can result in a high incidence rate for that county.

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Prepared by the Infectious Disease Control Unit and the Office of Border Health, (512) 458-7676

Creutzfeldt-Jakob Disease

Creutzfeldt-Jakob disease (CJD), a neurodegenerative disease, is the most common form of transmissible spongiform encephalopathy (TSE) to affect humans. The etiologic agents associated with this disease are prions (PrP), proteinaceous particles devoid of nucleic acid. The disease process involves the conversion of the prion protein from its normal cellular isoform (PrP^{C}) into the disease-causing misfolded form (PrP^{Sc}) resulting in an alpha-to-beta transition in the protein structure and holes in brain tissues.[1]

CJD is rare (about 1 per 1,000,000 population) and the incubation period is difficult to determine and may span decades. There is no known cure or treatment and it is usually fatal within 12 months of onset of symptoms. However, 5%–10% of patients have been known to survive for more than 2 years.[2]

There are 4 known types of CJD. In the United States sporadic or classic CJD (sCJD) accounts for 80%–90% of cases; it occurs sporadically and has no known route of acquisition. Less common types of CJD include familial CJD (fCJD), iatrogenic CJD (iCJD), and variant CJD (vCJD). Familial CJD represents 5%–10% of United States cases and involves a hereditary route of transmission through an autosomal dominant genetic mutation. Iatrogenic CJD, <1% of United States cases, results from accidental surgical transmission. Variant CJD (vCJD), also <1% of United States cases, has been linked to bovine spongiform encephalopathy (BSE) or "mad cow disease" and the consumption of contaminated beef or beef products.

Clinical Course

Sporadic CJD typically occurs in adults 60 years of age and older. It is characterized by spontaneous onset of rapidly progressive dementia and other neurological signs such as myoclonus, visual disturbance, tremors, rigidity, spasticity, cerebellar disturbance (incoordination, ataxia), and akinetic mutism (inability to speak). Patients with sCJD may present with abnormal electroencephalogram (EEG) readings (i.e., generalized slow-wave activity that progresses to periodic sharp waves produced against a slow background). The disease course is rapid and death typically occurs within 4 to 5 months after onset of symptoms.

Familial CJD typically manifests in persons near 50 years of age and the duration of illness is approximately 7 to 36 months. Patients generally have symptoms similar to sporadic CJD; however, dementia usually comes later in the disease process.

Variant CJD differs from sCJD in a number of ways. Patients are usually younger (median age at death is 28 years) and the duration of illness is longer (median duration 12 to 14 months). Furthermore, early in the course of the disease, patients may exhibit psychiatric or behavioral changes, followed by abnormal painful sensations, ataxia, myoclonus, dementia, and akinetic mutism. Upon magnetic resonance imaging (MRI) examination, a hyperintense signal may be reflected from the pulvinar region of the brain. This pulvinar sign is present in approximately 75%–80% of all vCJD cases.[3] The Centers for Disease

Control and Prevention (CDC) reports 200 deaths occurring from variant CJD in 11 countries since 1996.[4] Four cases of variant CJD infection have been associated with blood transfusions in case-patients living outside of the United States.[5] Only 3 cases have been classified as United States cases and investigations concluded all of these individuals were likely exposed outside of the United States.

Iatrogenic CJD has been known to occur through contaminated surgical instruments, corneal transplants, dura mater grafts, depth electrodes, and use of cadaver derived pituitary hormone. Variability in clinical presentation and incubation period in iCJD occurs depending on the route of inoculation into the brain. Clinical presentation acquired through invasive neurosurgery or dura mater transplant have clinical features very similar to sCJD, whereas, acquisition through use of pituitary growth hormones presents with clinical features distinct from sCJD and include progressive cerebellar syndrome and, as a late feature, dementia. Incubation periods for iCJD have a mean range of 1.5 to 15.5 years.[6]

Texas Surveillance

CJD has been a reportable condition in Texas since 1998. Copies of results from all CJD-related testing performed by the National Prion Disease Pathology Surveillance Center (NPDPSC) located in Cleveland, Ohio, are sent to the Texas Department of State Health Services (DSHS) as a part of the state's surveillance procedures. DSHS reviews test results and investigates all cases with positive test results, including those with elevated CSF 14-3-3 protein levels. **Table 1** summarizes the number of cases for all types of CJD in Texas (1998–2006). Each year in Texas, the total number of confirmed, probable, or possible sporadic CJD cases has remained somewhat constant (mean= 12; range= 6–15). In addition, on average, one case of familial CJD was diagnosed each year in Texas during 1998–2006, all from separate families. Only 1 case of variant CJD has been identified in Texas; the patient was a former resident of the United Kingdom

Table 1. Creutzfeldt-Jakob disease cases in Texas*

Type	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Sporadic										
Confirmed	7	2	9	8	4	6	7	8	5	56
Probable	3	8	2	4	1	5	5	6	3	37
Possible	4	4	3	1	1	4	1	0	0	18
Subtotal	14	14	14	13	6	15	13	14	8	111
Familial	1	0	0	1	1	1	0	1	1	6
Iatrogenic	0	0	0	0	0	0	0	0	0	0
Variant	0	0	0	0	0	0	0	0	1†	1
Total	14	14	14	14	7	16	13	15	10	118

*Based on data as of June 15, 2007.

† Confirmed in United Kingdom and reported to Texas Department of State Health Services through Centers for Disease Control and Prevention.

where the exposure was likely to have occurred.

Table 2 presents Texas sporadic and familial CJD cases according to gender and age. Of the patients diagnosed with CJD during 1998–2006, 54% were male and 79% were greater than or equal to 55 years old. **Figure 1** depicts the number of CJD cases per county for the years 1998–2006. Of the 118 cases, 37 (31%) resided in Dallas, Harris, Tarrant and Travis counties. Texas has a population of 23 million, and since the national rate of sporadic CJD is about 1 per million, it is expected that approximately 23 cases of CJD would occur each year in the state. Therefore, it is believed that CJD is currently under-reported in Texas.

Conclusion

Creutzfeldt-Jakob disease is a complex disease with 4 known types. Currently, there is no known cure or treatment. CJD is a reportable disease in Texas; all suspected cases should be reported within one week to the Texas Department of State Health Services, Infectious Disease Control Unit (http://www.dshs.state.tx.us/idcu/disease/creutzfeldt-jakob/reporting/). Confirmation and typing of the disease requires neuropathological confirmation by direct examination of brain tissue, usually postmortem, by the National Prion Disease Pathology Surveillance Center (http://www.cjdsurveillance.com). It is important to establish the precise type of CJD to help monitor disease occurrence, especially for variant CJD. Physicians should strongly consider arranging for autopsies of suspected or clinically-diagnosed CJD patients. Recognition of possible CJD and reporting by health professionals is an integral part of CJD surveillance in Texas. The Texas Department of State Health Services can assist health professionals by arranging free diagnostic testing and providing resources for family support (512) 458-7676.

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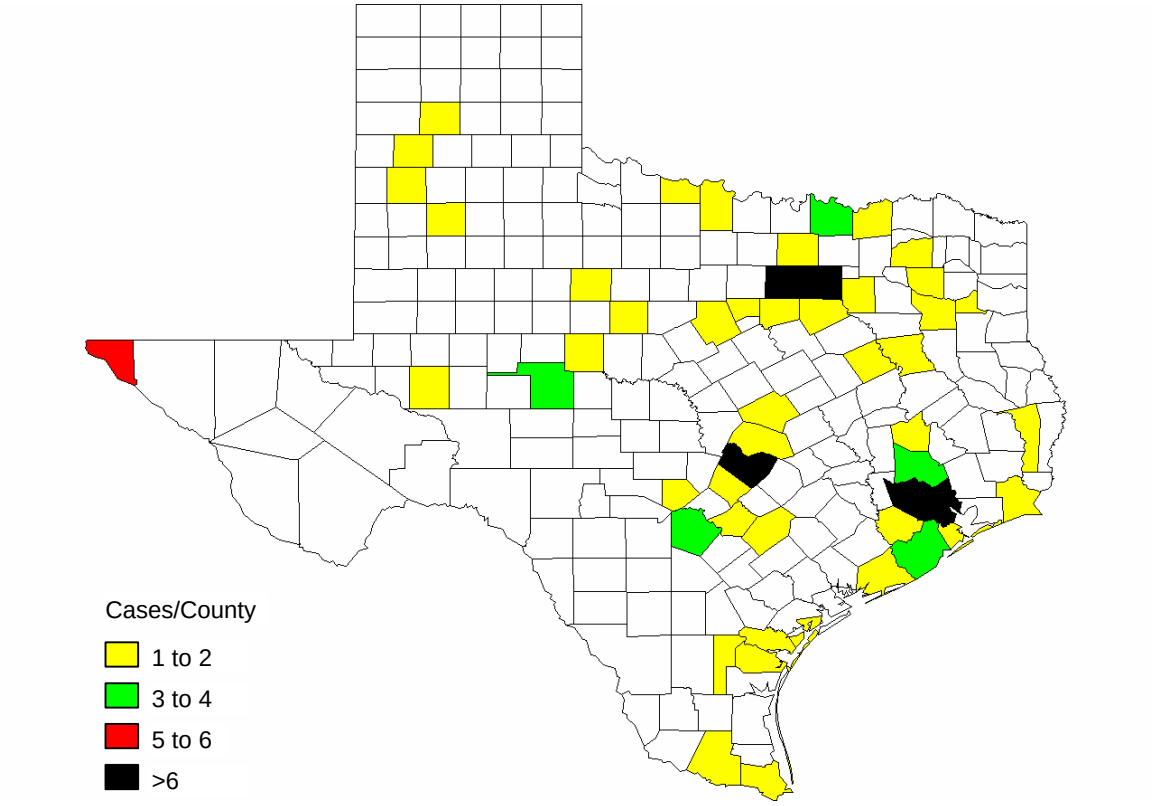
Table 2. CJD cases* in Texas by gender and age 1998–2006†

Characteristics	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Gender										
Male	6	5	10	8	3	6	10	7	7	63
Female	8	9	4	6	4	10	3	8	2	54
Age (years)										
<55	3	2	3	0	3	4	3	4	2	25
≥55	11	12	11	14	4	12	10	11	7	92

* Based on data as of June 15, 2007.
† Includes cases of possible, probable and confirmed sporadic CJD and confirmed familial CJD.

Figure 1: Number of CJD (confirmed and probable) cases per county for 1998—2006



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Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6338

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HIV and AIDS in Texas, 2006

The Human Immunodeficiency Virus

The Human Immunodeficiency Virus (HIV) is a retrovirus that infects and slowly depletes a subgroup of white blood cells known as T helper lymphocytes or CD4+ T-lymphocytes. These white blood cells are critical for an effective immune response. HIV can be transmitted by blood or bodily fluids through such activities as sexual intercourse or injection drug use. In order to develop effective prevention strategies, prompt identification and reporting of new HIV infections is essential. In 1999, the quality of Texas HIV surveillance was improved when reporting rules were revised to require named reporting of HIV infections that had not yet progressed to Acquired Immunodeficiency Syndrome (AIDS). These data capture cases with a reported HIV test date on or after January 1, 1999, but do not include persons who tested anonymously, unless the individual was subsequently tested by name. In January 2000, the Texas Department of State Health Services began mandatory HIV detectable viral load reporting. This was prompted by a 1999 revision in the Centers for Disease Control and Prevention (CDC) surveillance case definition for HIV to include a detectable viral load as independent criteria for HIV infection. Viral load reporting has improved the ability of DSHS to identify new HIV cases.

In Texas, 3,323 HIV (not AIDS) cases were reported in 2006, down from 3,804 cases reported in 2005 (**Figure 1**). New HIV cases in 2006 were 76% male and 24% female. The Texas male HIV rate decreased from 26.0 cases per 100,000 population in 2005 to 21.6 in 2006, while the female HIV rate decreased from 7.1 cases per 100,000 in 2005 to 6.8 in 2006. As of December 31, 2006, 24,877 people were living with HIV (not AIDS) in Texas.

The highest proportion of 2006 HIV case reports were among African Americans (43%), followed by Whites (31%), and Hispanics (24%). The rate of reported HIV cases in 2006 among African Americans (54.2 per 100,000) was more than 5 times higher than the rate for Whites (8.9) or Hispanics (9.5). The African American female HIV rate (36.6 cases per 100,000) was much higher than the Hispanic (3.9) and the White (2.0) female rates. Among Texas males, African Americans had the highest HIV rate (72.8 cases per 100,000), followed by White males (16.0) and Hispanic males (14.8) (**Figure 2**).

Just over half (57%) of newly reported male HIV cases in 2006 were among men who have sex with men (MSM) (**Figure 3**). Injection drug use (IDU) was the most likely route of transmission for approximately 11% of new male HIV cases. MSM and IDU constituted 4% and heterosexual exposure was reported for 7% of new male HIV cases. Among women, heterosexual transmission accounted for 48% and injection drug use accounted for 13% of new cases. A higher percentage of HIV cases among women (37%) than men (20%) had an unclassified transmission route. For both sexes, however, the percentage of cases that remain unclassified will decrease as investigations of risk are completed.

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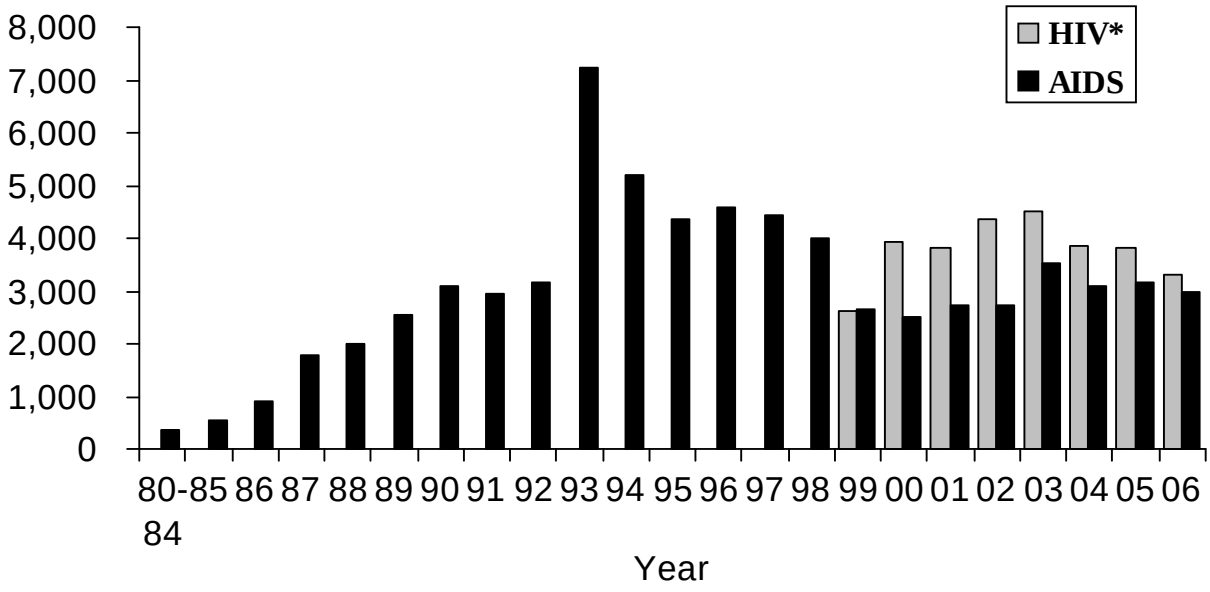
Figure 1. HIV and AIDS cases by year of report: Texas, 1980-2006



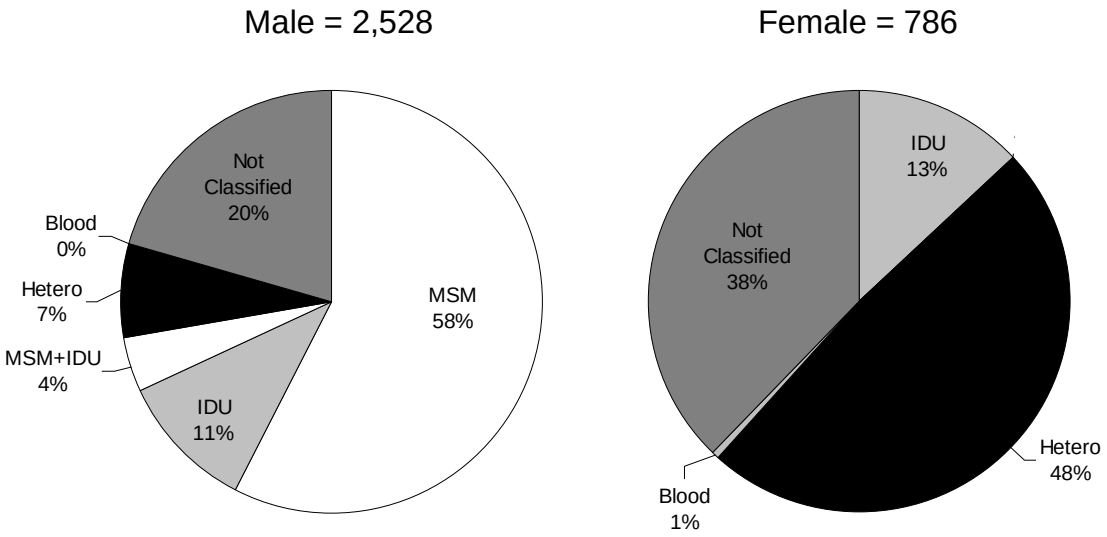
*Mandatory HIV Reporting implemented in 1999. Some HIV cases became AIDS cases in subsequent years but are not double counted in the cumulative case total.

Figure 2. HIV and AIDS cases and rates by sex and by race and ethnicity: Texas, 2006

	Male			Female			Total		
HIV	**Cases**	**%**	**Rate***	**Cases**	**%**	**Rate***	**Cases**	**%**	**Rate***
White	901	36%	16.0	115	14%	2.0	1,016	31%	8.9
African American	941	37%	72.8	501	63%	36.6	1,442	43%	54.2
Hispanic	643	25%	14.8	161	20%	3.9	804	24%	9.5
Other	31	1%	6.8	17	2%	3.6	48	1%	5.2
Unknown	13	1%	-	0	0%	-	13	0%	-
Total	**2,529**	**100%**	**21.6**	**794**	**100%**	**6.8**	**3,323**	**100%**	**14.2**
AIDS									
White	767	34%	13.6	108	15%	1.9	875	29%	7.7
African American	781	34%	60.4	459	64%	33.5	1,240	41%	46.6
Hispanic	707	31%	16.3	139	19%	3.4	846	28%	10.0
Other	22	1%	4.8	8	1%	1.7	30	1%	3.2
Unknown	0	0%	-	0	0%	-	0	0%	-
Total	**2,277**	**100%**	**19.4**	**714**	**100%**	**6.1**	**2,991**	**100%**	**12.7**

* Rates represent cases per 100,000 population.

Figure 3. Adult-adolescent HIV cases by mode of exposure and sex: Texas, 2006



Nonetheless, due to the definition of "heterosexual contact" used by the CDC, many heterosexually acquired infections will remain as "not classified" because only those individuals whose risk for HIV infection is heterosexual sex with a known HIV infected partner are classified as heterosexually acquired.

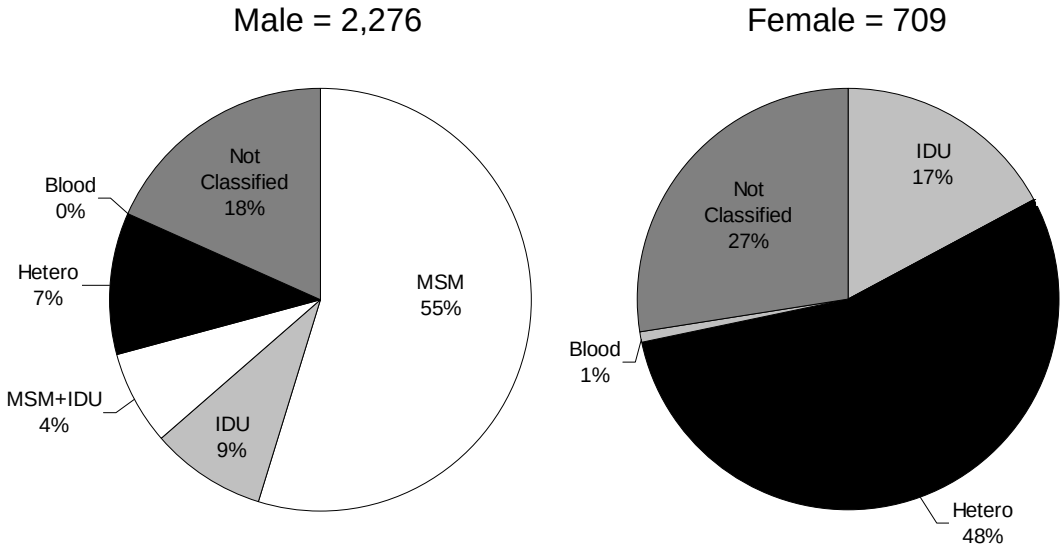
Reports of HIV cases in Texas predominantly come from metropolitan areas. The largest number of cases reported in 2006 was from Harris County (1,022), followed by Dallas County (724), Bexar County (214), Travis County (189), and Tarrant County (167). Among these areas, Dallas County had the highest HIV rate (30.4 cases per 100,000) followed by Harris (27.1), Travis (21.6), Bexar (14.1) and Tarrant (10.2). In 2006, 118 counties (out of the 254 in Texas) reported at least 1 new HIV case. The Texas Department of Criminal Justice reported 268 cases or 8% of all 2006 HIV cases.

AIDS

Acquired Immunodeficiency Syndrome (AIDS) is the late-stage sequelae of HIV infection and reflects infections generally occurring years earlier. AIDS is a specific group of diseases or conditions that result from severe immunosuppression caused by infection with HIV. In 1993, the CD4+ T-lymphocyte count became an important part of the AIDS surveillance case definition revised by the CDC. This change in definition resulted in a large number of AIDS cases being reported in 1993 that had not met the earlier case definition (Figure 1). For the purposes of this report and similar analyses, if an individual is diagnosed with HIV and subsequently progresses to AIDS within the same year, the case is counted as an AIDS case only.

As of December 31, 2006, 70,577 AIDS cases had been reported in Texas since the start of the epidemic in the early 1980s. At least 36,460 of these people are deceased (a cumulative case-fatality rate of 51.6% for Texas). In 2006, 2,991 new AIDS cases were reported in Texas for an overall AIDS rate of 12.7 cases per 100,000 population, down from 13.8 in 2005. For Texas males, the 2006 AIDS rate, (19.4 per 100,000), remained

Figure 4. Adult-adolescent AIDS cases by mode of exposure and sex: Texas, 2006



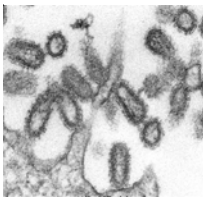
much higher than the female AIDS rate (6.1), but both sexes were lower than 2005 rates.

The highest percentage of 2006 AIDS cases were African Americans (41%), followed by Whites (29%), and Hispanics (28%). The rate of reported AIDS cases in 2006 among Texas African Americans (46.6 cases per 100,000) was more than 6 times higher than the rates for Whites (7.7) and 4 times higher than the rate for Hispanics (10.0). African American women represented 64% of the cases among females for 2006. The Texas AIDS case rate for African American females (33.5 cases per 100,000) was more than 5 times higher than the rate for Hispanic (3.4) and the White females (1.9). The Texas African American male population had the highest rate at 60.4 cases per 100,000, followed by Hispanic males (16.3) and White males (13.6) (Figure 2).

Approximately half (55%) of AIDS cases among Texas men in 2006 were attributed to MSM transmission (**Figure 4**). Additionally, injection drug use (IDU) was the most likely mode of transmission for 9%. MSM and IDU constituted 7% and heterosexual transmission was attributed to 11% of men with AIDS. Among female AIDS cases, 54% were tied to heterosexual transmission and 17% were attributed to transmission through IDU. As with HIV cases, a higher percentage of AIDS cases among women (27%) than men (18%) had an unclassified route of transmission. Many of the unclassified cases likely represent heterosexually acquired cases.

Most AIDS cases in Texas continued to be reported from metropolitan areas. The largest number of cases reported in 2006 were from Harris County (1,000), followed by Dallas County (613) Bexar County (210), Tarrant County (178) and Travis County (168). Among these areas, Harris County had the highest rate (26.5 per 100,000 population), followed by Dallas County (25.7), Travis County (19.2), Bexar County (13.9) and Tarrant County (10.9). The Texas Department of Criminal Justice reported 107 cases, or 4% of all 2006 AIDS cases. In 2006, 114 counties (out of the 254 in Texas) reported at least one new AIDS case.

Prepared by the HIV and STD Epidemiology Division, (512) 533-3050



(IDCU influenza web site)

Influenza Surveillance in Texas

Purpose

Statewide influenza surveillance is conducted to determine when influenza (flu) is circulating, the type and subtype of influenza, how well the circulating strains match the vaccine strains, where influenza is circulating and to some extent the degree of activity. Influenza has not been a notifiable condition in Texas since 1991; therefore, detailed information on ages or specific populations currently impacted by influenza is not well documented. Data from all sources are gathered by the Texas State Influenza Surveillance Coordinator (ISC), analyzed, assigned a numeric code to represent state flu activity, and submitted to the Centers for Disease Control and Prevention (CDC) via the National Electronic Disease Surveillance System on a weekly basis. Influenza activity levels are reported as no activity, sporadic, local, regional, or widespread based on the CDC definitions. For details on the surveillance definitions see: http://www.dshs.state.tx.us/idcu/disease/influenza/surveillance/

Components

Influenza surveillance in Texas consists of 3 major components: culture surveillance data from any source, influenza-like illness (ILI) information from weekly reports from regional surveillance coordinators and the CDC-sponsored Sentinel Provider Surveillance Network (SPSN), and other laboratory information on positive rapid influenza tests taken in clinics or point of care settings such as emergency rooms or walk-in clinics.

Culture Surveillance

The Department of State Health Services (DSHS) Medical Virology Laboratory is the primary source for influenza culture information in Texas. Local health departments and the state health service regions identify local clinics to voluntarily collect and submit specimens to the DSHS laboratory. These sites obtain specimens from persons presenting with illness consistent with influenza. Clinicians are asked to exclude people with viral illness that meets the case definition, but is less likely to be influenza. Collected specimens are submitted to the DSHS laboratory on a weekly basis during the influenza season. Texas currently has surveillance sites in Amarillo, Austin, Corpus Christi, Dallas, El Paso, Fort Worth, Laredo, Lubbock, San Antonio, Tyler, and Wichita Falls. The ISC receives a daily report from the DSHS laboratory of all specimens submitted by sentinel and other providers.

Additionally, influenza culture data are collected from the Influenza Research Center at Baylor College of Medicine, the Texas Children's/Baylor Laboratory, the University of Texas Southwestern Medical Center, the Scott and White Laboratory, the Brooks Air Force Base Laboratory in San Antonio, and from electronic lab reports and other sources. These laboratories are contacted weekly by the ISC to determine if culture-positive influenza has been identified.

Influenza-like Illness Data

Sentinel Provider Surveillance Network

A participating member in the Sentinel Provider Surveillance Network (SPSN)

Figure 1.Viral isolation results by DSHS Laboratory, 1999-2006*

Season	Number Submitted	Positives by Type		Percentage Positive
99-00	701	291	(287 A, 4 B)	41.5
00-01	1081	481	(234 A, 247 B)	44.5
01-02	1013	462	(410 A, 52 B)	45.6
02-03	1199	633	(227 A, 406 B)	52.8
03-04	1097	563	(562 A, 1 B)	51.3
04-05	1422	606	(498 A, 108 B)	43.0
05-06	872	382	(324 A, 58 B)	44.0

*These totals exclude those collected from Baylor College of Medicine study or those isolates submitted for subtyping.

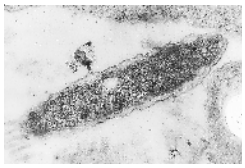
reports clinically diagnosed ILI to the CDC. The CDC, state, and local health departments use these reports and other data to determine state influenza activity levels. Sentinel providers report the total number of patient visits for ILI by age group (0-4 years of age, 5-24 years, 25-64 years, and >65 years) along with the total number of patient visits for any reason. These data are transmitted once a week via the Internet or fax to the CDC. In December 2006, there were 114 participating sites in the CDC SPSN who on a weekly basis reported voluntarily outpatient influenza-like illness by age group to the CDC. Although the emphasis of the SPSN is on the formal submission of ILI data and these are the only data the SPSN system in Texas is designed to collect, we do ask the SPSN participants (physicians, nurse practitioners, and physician assistants) if they would like to submit periodic specimens to the DSHS laboratory (at no cost) for viral isolation. A small percentage of these providers submit specimens to the DSHS laboratory as an incidental part of the DSHS culture surveillance.

Other Data Sources

Other laboratories, regional and local health departments, facilities participating in influenza research, and private physicians around the state also participate in influenza surveillance. Some reporters conduct syndromic surveillance and use respiratory activity reported to them as indicators for ILI activity.

It is through these efforts of health care providers and laboratories in Texas and all other states that the CDC develops a national picture of influenza virus activity, the geographic distribution of influenza viruses, and the clinical impact of the circulating viruses.

Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 2358



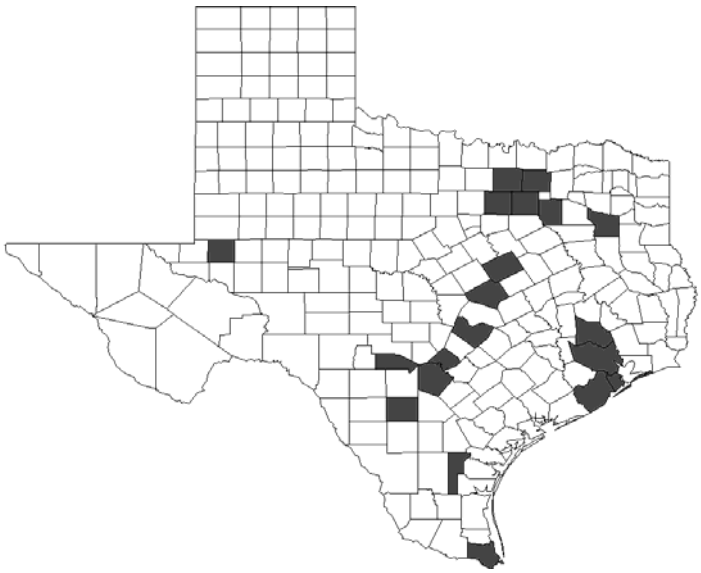
(*Legionella* web page)

Legionellosis in Texas, 2006

Legionellosis is an acute bacteria infection that occurs in 2 distinct forms: Legionnaires' disease and Pontiac fever. The causative agent is a gram-negative bacillus that can be difficult to recover and isolate. Although many species of *Legionella* have been documented to cause disease, it is believed that approximately 90% of reported cases of legionellosis are caused by *L. pneumophila*, with 79% of those caused by serogroup 1. Transmission occurs when water containing the bacteria is aerosolized and inhaled. Human-to-human transmission has never been documented.

Legionnaires' disease is most common in the elderly, smokers, and those with underlying medical conditions, such as chronic lung disease, cancer, diabetes, end-stage renal disease, or immunosuppression. Initially, symptoms for both Pontiac fever and Legionnaires' disease may include fever, non-productive cough, myalgia, diarrhea, malaise, and headache. Patients with Pontiac fever, by definition, do not develop pneumonia and, typically, recover in 2-5 days without treatment. Clinically-demonstrated pneumonia distinguishes Legionnaire's disease. This more severe form of legionellosis almost always results in hospitalization. The case fatality rate in hospitalized patients can be as high as 40%.

Figure 1. Counties with confirmed cases of Legionnaires' disease, 2006



The true incidence of Legionnaires' disease is unknown. While it is a notifiable disease, both in Texas and nationwide, Legionnaires' disease often goes undiagnosed and under-reported. It is estimated that 8,000 to 18,000 cases occur in the United States every year; however, in 2005, only 2,301 cases were reported to the Centers for Disease Control and Prevention (CDC). The majority of cases are sporadic, but a significant number occur as part of outbreaks. Both nosocomial and travel-associated Legionnaires' disease are thought to represent a significant percentage of cases.

In 2006, 69 cases of legionellosis in 20 counties across Texas were confirmed by the Texas Department of State Health Services and reported to the CDC **(Figure 1)**. All 69 case patients were Legionnaires' disease. Ten of those patients died as a result of their illness. No cases of Pontiac fever were reported.

A hospital-associated outbreak of Legionnaires' disease occurred in San Antonio during the spring and summer of 2006. A total of 10 cases was identified, with 3 deaths. All cases had

been either patients or visitors to the hospital during their incubation period. No other common exposure was identified. The potable water system of the hospital was found to be contaminated by different *Legionella* species, including *Legionella pneumophila* serogroup 1, the most common outbreak strain. An isolate obtained from one of the cases was genetically identical to 3 of the 12 isolates recovered from environmental sources within the hospital. Recent construction work on the hospital and a break in the main water supply a month prior to the outbreak were thought to have played a role in the outbreak.

Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6354

Murine Typhus in Texas, 2006

Introduction

Murine typhus is a rickettsial disease that is transmitted to humans via fleas infected by the bacteria *Rickettsia typhi*. Humans come into contact with the infected fleas by exposure to a number of hosts, such as opossums, cats, and rodents. Opossums have been found to carry fleas infected with *Rickettsia typhi* and have been implicated in cases in multiple studies.[1] The primary flea found on opossums is the domestic cat flea, *Ctenocephalides felis*. Although the flea has been implicated in the spread of murine typhus not all infected individuals report flea bites or known exposure to fleas or flea hosts. [1]

Table 1. Murine typhus demographics in Texas, 2006

Year 2006	N	%
Age categories (years)		
Under 18	47	33.3
19 to 24	13	9.2
25 to 44	31	22.0
45 to 64	36	25.5
65 and over	14	9.9
Age missing	0	0.0
Yearly totals	141	100.0
Age		
Mean	35.2	
Median	33	
Age Range	4 to 86	
Gender		
Female	73	51.8
Male	68	48.2
Yearly totals	141	100.0
Ethnicity		
Hispanic	97	68.8
Non-Hispanic	42	2908
Unknown	2	1.4
Yearly totals	141	100.0

Typical initial symptoms of murine typhus include: headache, fever, nausea, and body aches, and a rash appearing later. Although clinically considered a relatively mild disease, untreated murine typhus can persist several months with up to 10% of infected adults requiring hospital care. [1] The mortality rate for all ages is approximately 2% but increases with the age of the patient. [2]

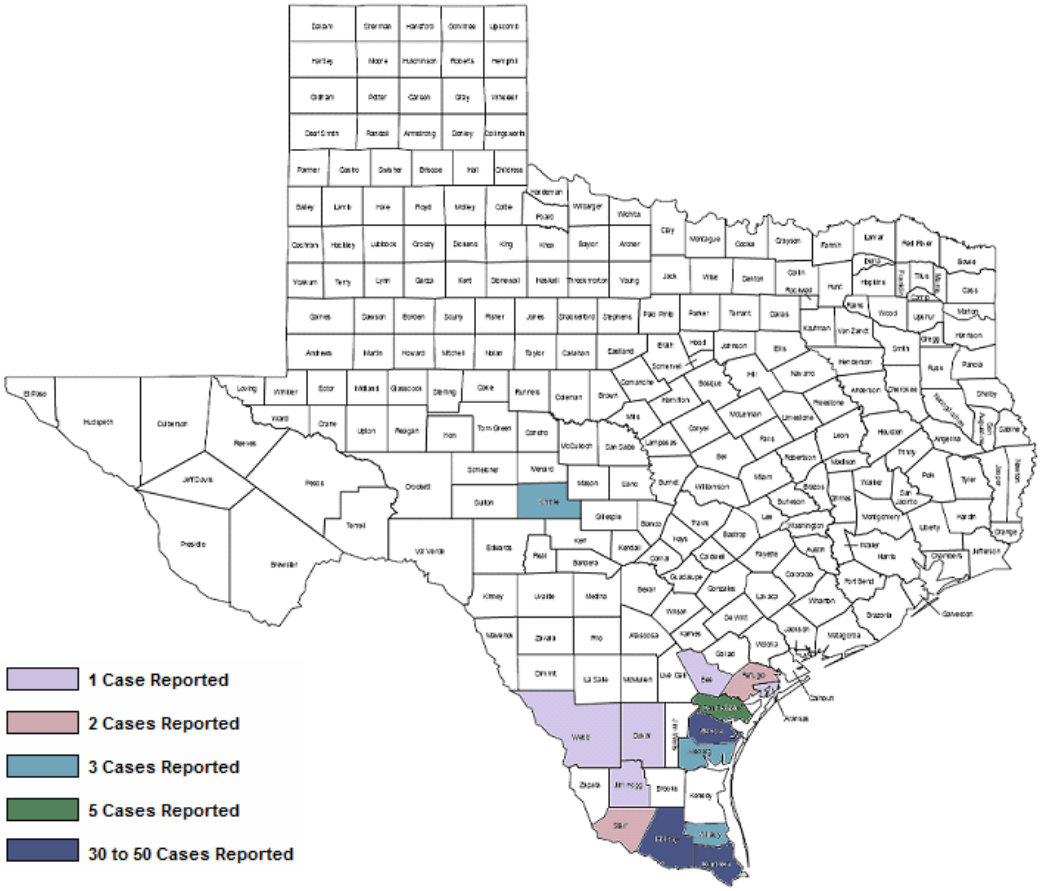
Murine has been a reportable disease in the Texas for over 40 years. [3] Murine typhus was once endemic in the southeastern and gulf coast states with over 5,000 cases reported annually at its peak in the 1940s. [4] After successful rodent and flea control measures, the number of cases reported annually dropped to around 100 cases per year. [1] Most cases of murine typhus occur in south Texas with a few additional cases appearing in other parts of the state.

Current control methods primarily consist of eliminating hosts such as rodents and opossums through pest control measures and keeping brush and trash off the grounds. It is important that flea treatment measures be taken prior to rodent eradication as to not amplify the problem by leaving infected fleas without a nonhuman host.

2006 Case Data Information and Current Trends

In 2006, there were 141 cases of murine typhus reported to the Texas Department of State Health Services (DSHS). Of these 141 cases, most cases were under the age of 18 or over 55 years of age (**Table 1**). The average age of cases in 2006 was 35.2. Cases

Figure 1. Murine typhus county map of Texas, 2006 [8]

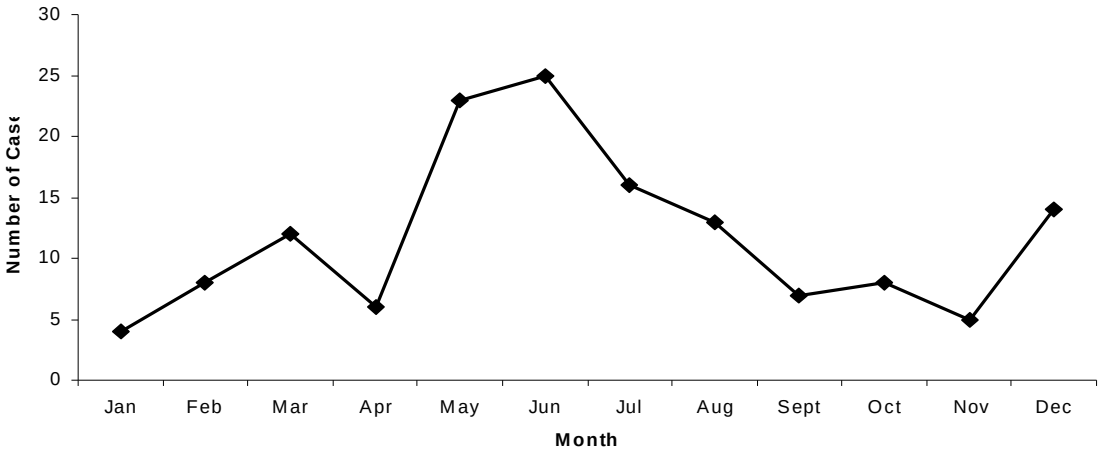


ranged in age from 4 to 86 years with a median age of 33. Gender did not appear to be a factor with 73 (51.8%) female cases and 68 (48.2%) male cases.

Ninety-seven (68.8%) cases were Hispanic and 42 (29.8%) were non-Hispanic with 2 (1.4%) of unknown ethnicity. This might seem to indicate that Hispanics are more likely to be infected than non-Hispanics, but Hispanics account for 78.4% of the population in counties where cases were reported based on the year 2000 United States Census. [5]

Only 14 of the 254 counties in Texas reported cases of murine typhus, with all but 3 cases being in South Texas (**FIgure 1**).[6] The majority of cases were reported in Nueces County, with 50 cases followed by Hidalgo and Cameron counties with 32 and 36 cases, respectively. Most cases were reported in the summer months of May, June, and July (**Figure 2**). The number of cases reported annually has increased from an average of 49.9 cases per year from 1997 through 2005 to 141 cases in 2006. This is largely attributable to a dramatic increase in the number of murine typhus cases in Cameron County. Murine typhus is reported through passive surveillance, but the Centers for Disease Control and Prevention (CDC) implemented the Binational Infectious Disease Surveillance (BIDS) in Cameron County at the beginning of 2005 to enhance the existing passive surveillance activities.

Figure 2. Number of murine typhus cases in 2006 in Texas, by month

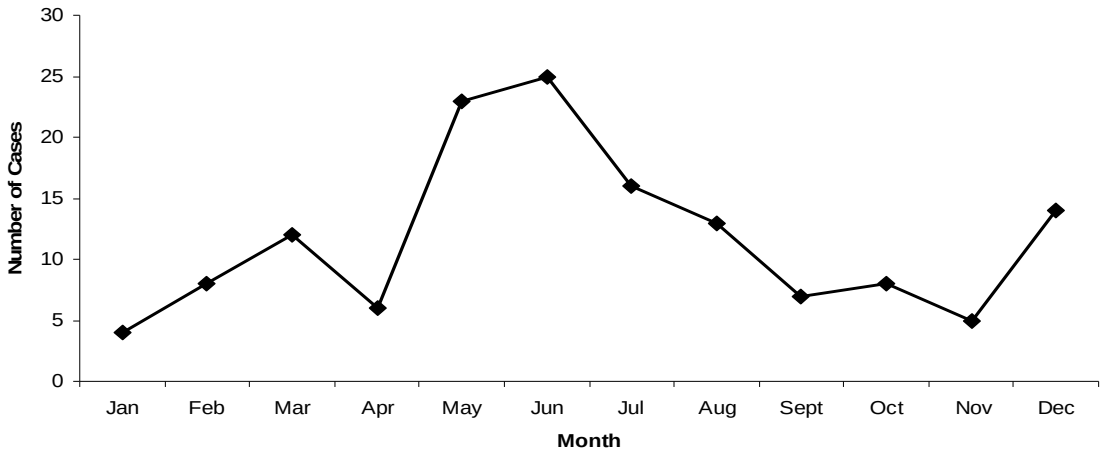


A total of 8 sites participate in the BIDS program in Cameron County, including 4 hospitals and 4 clinics. Medical personnel were called at regular intervals to collect data on new cases. Data available from the 2006 BIDS program in Cameron County shows that 30 of the 36 cases identified in Cameron County were a result of the BIDS program. This may explain the dramatic increase in the number of murine typhus cases reported in Cameron County from 2005 to 2006 and illustrates the possibility of underreporting of murine typhus cases (**Figure 3**).[7]

Public Health Implications

It is currently thought that since murine typhus is seen as a clinically mild disease many cases go undiagnosed or unreported. The implementation of the BIDS program in Cameron County suggests there could be many more cases than currently reported in some areas of Texas. Physicians in non-endemic areas may not be familiar with the symptoms and diagnostic criteria to diagnose murine typhus leading to unrecognized and as a consequence unreported cases. Many cases of undifferentiated febrile illnesses are

Figure 3. Number of murine typhus cases in 2006 in Texas, by month



never sent for laboratory diagnosis to determine if murine typhus could have been the cause of illness; therefore, it is difficult to determine the true scope of the disease.

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Prepared by the Infectious Disease Control Unit, (512) 458-7676

Perinatal Hepatitis C

Perinatal transmission of the hepatitis C virus (HCV) is the main source of pediatric HCV infection in the United States. From 3-5% of infants born to women who are positive for HCV ribonucleic acid (RNA) at delivery acquire HCV infection. Risk is influenced by viral load at the time of delivery, duration of membrane rupture and internal fetal monitoring. The risk of transmission is increased to15%-35% with HIV coinfection. Of the 3.8 million women in Texas between 18 and 40 years of age, an estimated 1%, or about 38,000 are infected with chronic HCV.

Infants born to hepatitis C-infected mothers may be hepatitis C antibody positive due to passive transfer of Immonuglobulin G antibodies across the placenta. In an uninfected newborn, it can take a year or longer for these antibodies to disappear. The determination of hepatitis C infection in the newborn requires the demonstration HCV RNA in the serum.

Most children with HCV infection have no symptoms or signs of liver disease and therefore are unlikely to attract medical attention. Their identification relies on selective testing for HCV infection in pregnant women with identifiable risk factors such as intravenous drug use, street or prison tattoos, sex worker, or recipient of blood products or organ transplant before 1992. Testing for HCV should be performed with appropriate counseling.

Although most HCV-infected children have good health for at least the first 2 decades of life, HCV-induced chronic liver disease and liver failure have both been reported in childhood. Since it is not possible to predict which children will develop severe liver disease, long-term monitoring of HCV-infected children is needed. While the antiviral drugs used to treat HCV in adults have been used successfully in children, there is no generally approved pediatric protocol at this time.

Breast-feeding by mothers with hepatitis C appears safe, with no reported cases of viral transmission to newborns.

Beginning in 2000, all newly diagnosed cases of HCV were reportable to the health department. From 2000 through 2004, a total of 316 infants less than 2 years of age were identified. Interpolating from the National Health and Nutrition Examination Survey 1999 to 2002 data, an estimated 659 HCV positive infants were born in Texas. While the identification of infants improved across time, overall less than half the expected total number was reported (**Table 1**). Rule changes in 2007 removed newly diagnosed cases of chronic HCV from the notifiable conditions list, leaving only acute HCV. Since infants rarely present with acute liver disease, increased vigilance by health care providers is required to ensure these infants are not missed.

Resources

Click here for perinatal hepatitis C case management forms.

Figure 1. Guidelines for the screening and follow-up of infants born to anti-HCV positive mothers

References

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Table 1. Estimated number of HCV-positive infants born in Texas, 2000-2004*

Year		2000		2001		2002		2003		2004	
Age Group	% HCV+ Mothers	Births	HCV+ Infants	Births	HCV+ Infants	Births	HCV+ Infants	Births	HCV+ Infants	Births	HCV+ Infants
20 to 24	0.3	102307	15	103854	15	106958	16	107323	16	107948	16
25 to 29	0.6	97384	29	96480	28	98124	29	99406	29	100956	30
30 to 34	1.4	70451	49	72952	51	75041	52	78225	54	78648	55
>35	1.8	37723	33	37971	34	39082	35	40339	36	41452	37
Total		363325	126	365092	128	372369	132	377374	135	381441	138
HCV+ Infants <2 years reported			18		37		90		101		70

*The efficacy of transmission from mother to child is assumed to be 5%.

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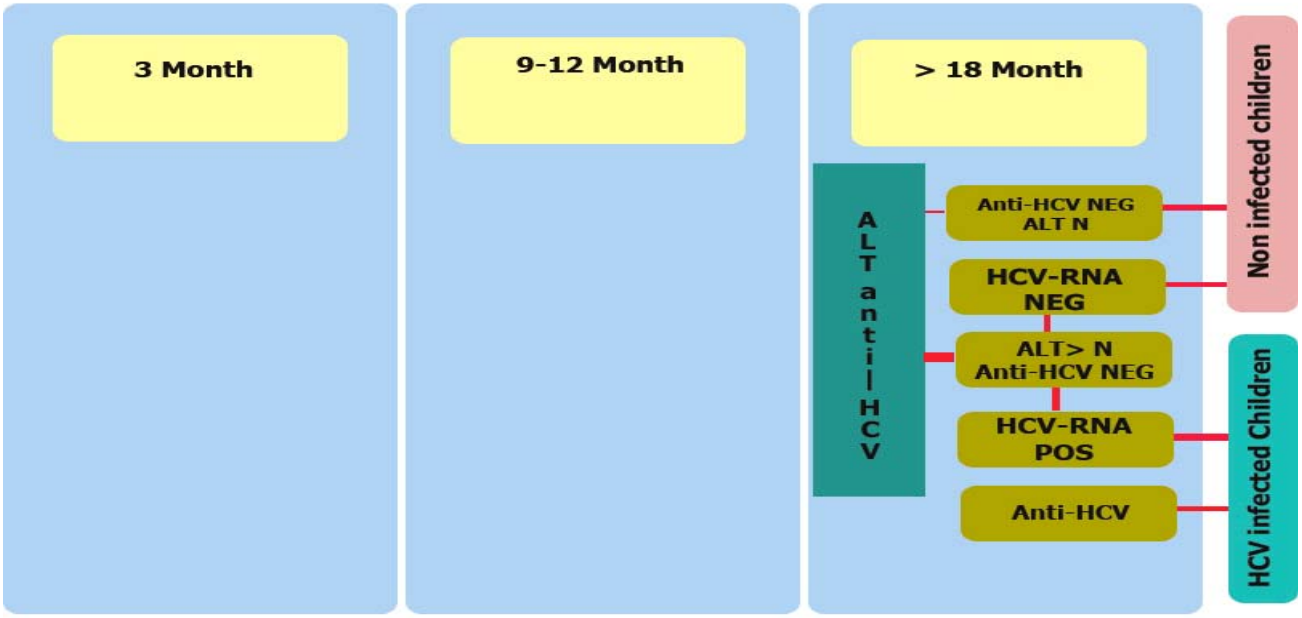
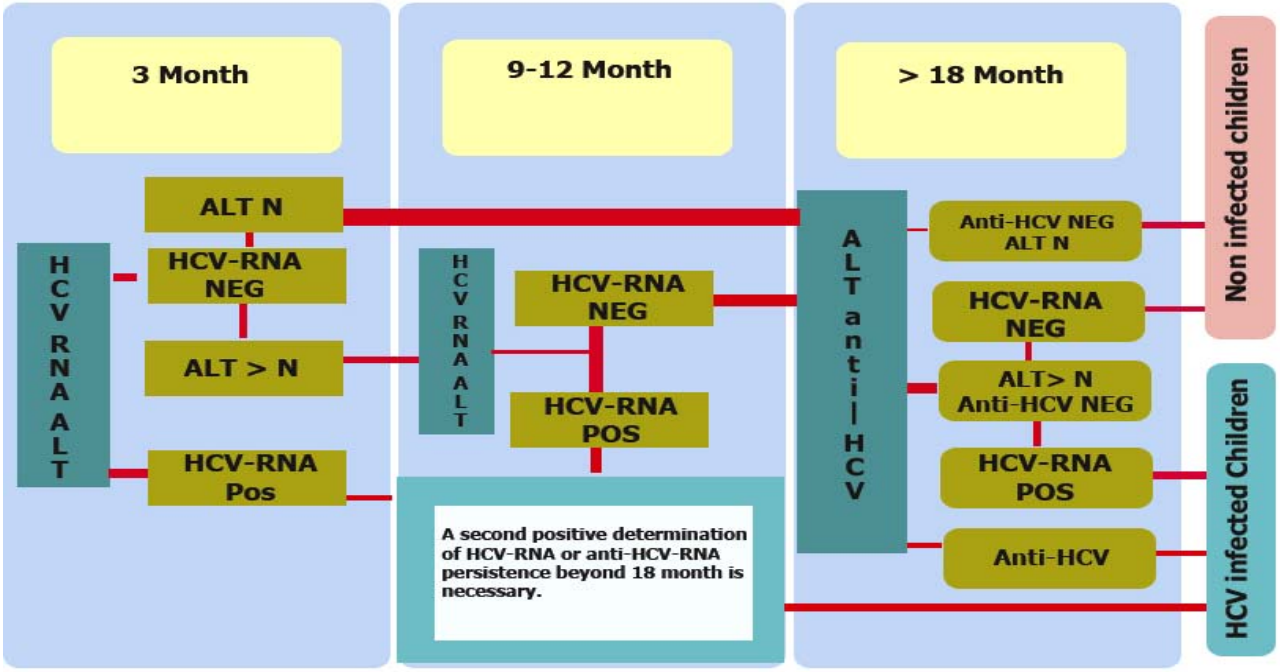
Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6352

(Continued ☞)

Figure 1. Guidelines for the screening and follow-up of infants born to anti-HCV positive mothers[†]



1a. Follow-up for infants born to anti-HCV positive HCV-RNA negative mothers



1b. Follow-up for infants born to anti-HCV positive HCV-RNA positive mothers

[†]M. Resti , F. Bortolotti , P. Vajro , G. Maggiore , on behalf of the Committee of Hepatology of the Italian Society of Pediatric Gastroenterology and Hepatology. Digestive and Liver Disease 2003 35;453–457.

Pertussis Trends, 2000-2006

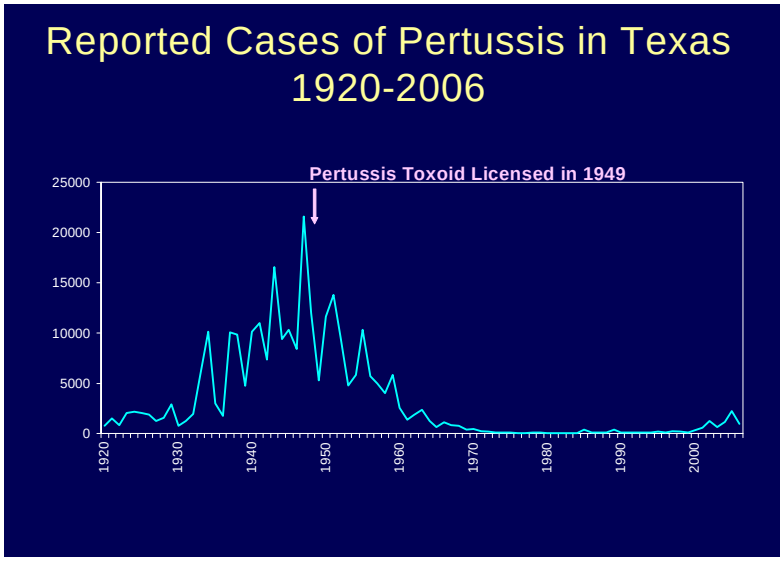
Pertussis, or whooping cough, is an acute, highly infectious, toxin-mediated disease caused by the bacterium *Bordetella pertussis*. *B. pertussis* has some important and interesting characteristics that result in the characteristic signs and symptoms of whooping cough. Unlike many other bacteria that infect and invade the respiratory tract, *B. pertussis* is not an invasive organism and does not disseminate. It adheres to the cells lining the respiratory tract and primarily produces its effects through a variety of toxins. While there is ongoing debate as to the exact role of each of the toxins identified, the collective toxic effect is that the ciliated cells lining the respiratory tract are destroyed and no longer able to carry out their function of moving respiratory secretions up and out of the respiratory tree. The only way to remove these secretions is through forceful coughing to get them up and out. This is particularly problematic in infants, who have much narrower airways than older children and adults, and whose chest walls are less developed to effect a forceful cough. These factors place infants at greater risk for death and serious complications. Given that the ciliated respiratory epithelial cells need about 3 weeks to regenerate, it may still take weeks before the coughing stops and the secretions are again eliminated normally, even with effective antibiotic treatment and elimination of the organisms.

Whole-cell pertussis vaccine was developed in the 1930s. In the mid 1940s, it was combined with diphtheria and tetanus (DTP) and was widely used in clinical practice. Due to safety concerns, an acellular pertussis vaccine was developed (DTaP). The vaccine was licensed for use in children under 7 years of age.

Until 2005, there were no pertussis-containing vaccines licensed for use in adolescents and adults. Disease in adolescents and adults may be milder and go undetected in these individuals. However, they are still capable of transmitting the disease to other susceptible individuals, especially those most vulnerable, infants. In 2005, the first acellular pertussis-containing vaccines (Tdap) for adults and adolescents were licensed in the United States. There are currently 2 vaccines available. The Advisory Committee on Immunization Practices recommends that adolescents and adults receive one dose of Tdap.

Prior to the introduction of the vaccine, up to 20,000 cases were reported

Figure 1. Reported cases of pertussis in Texas, 1920-2006



annually in Texas, with an average of 9,000 cases reported annually between 1940 through 1959 (range: 4,020-21,558). After the introduction of the vaccine, the number of pertussis cases steadily dropped. From 1980 through 1999 the average number of cases reported dropped to 300 (range= 60-379) (**Figure 1**).

Figure 2. Reported cases of pertussis in Texas, 1920-2006

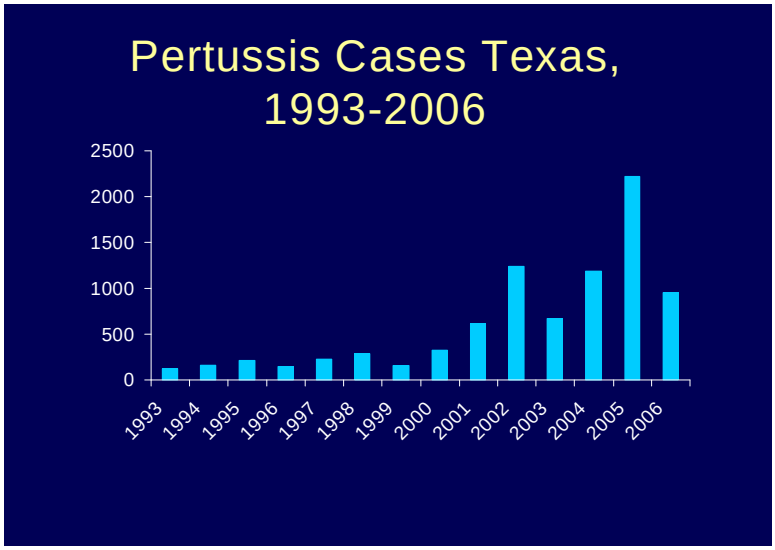
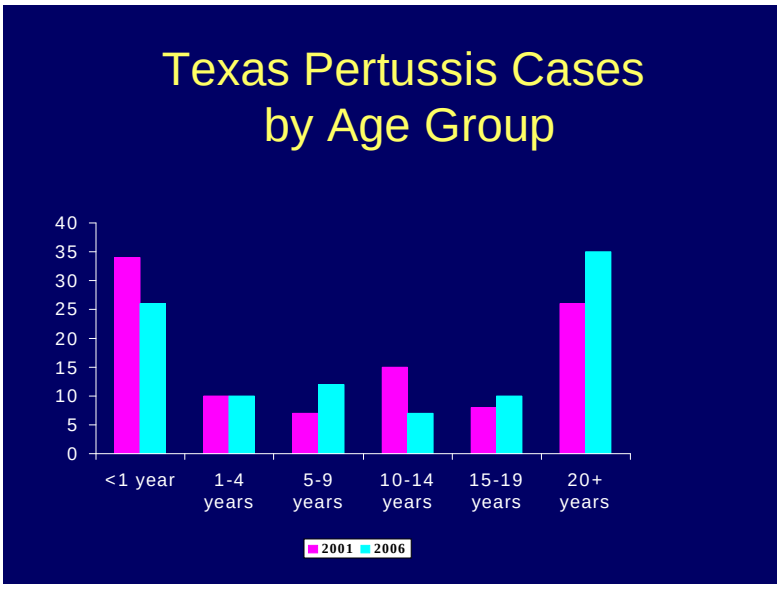


Figure 3. Texas pertussis by age group



Though pertussis has been a vaccine-preventable disease since 1949, it resurged in 2000 as a public health issue affecting many in Texas. Although this increase may be due in part to increased awareness and reporting, corresponding increases in the number of hospitalizations and deaths confirms that pertussis is once again a major public health problem. In 2005, over 2,000 cases of pertussis were reported to the Centers for Disease Control and Prevention (CDC) for Texas alone, including nine deaths (8 among infants).

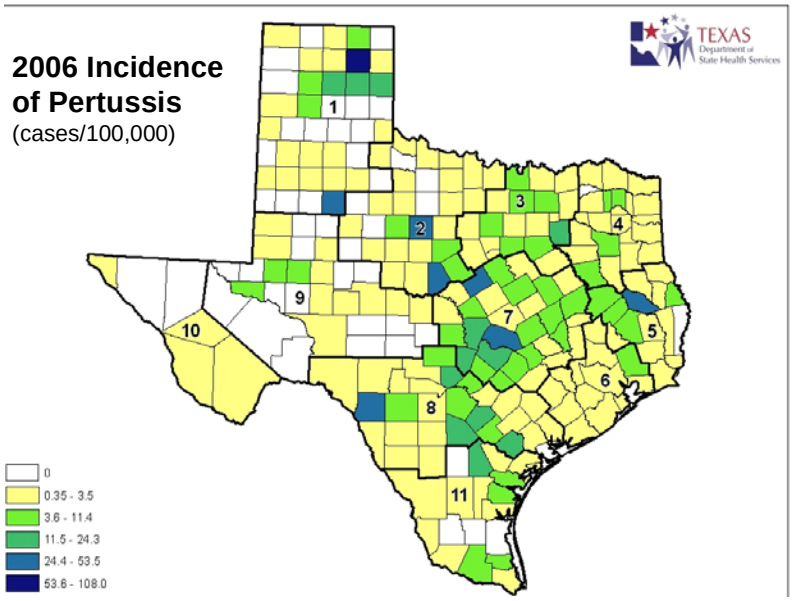
The majority of hospitalizations occur in infants less than 6 months of age. Twenty-six infant pertussis deaths have been recorded since 2000 in 21 different counties. Deaths occurred in both urban and rural counties. In some of the rural counties no cases of pertussis had been reported in 2 or more years prior to the death. As demonstrated in the graph, pertussis occurs in a cyclical pattern of every 3 to 4 years (**Figure 2**).

Review of the data by age group over the years reveals that the majority of cases occur among infants younger than 1 year of age and adults (**Figure 3**). In 2001, 34% of the cases occurred among infants younger than 1 year of age compared to 26%. Adults accounted for 26% of the cases in 2001 compared to 35%t in 2006. The percentage among children age 1 to 4 years of age was the same for 2001 and 2006, 10%. Adolescents (10 to 19 years of age) comprised approximately 20% of the pertussis case for each year.

In 2006, 954 cases of pertussis were reported, for a statewide incidence rate of 4.1 cases per 100,000 population. Cases of pertussis were spread throughout the state; see incidence by county in the following map (**Figure 4**).

Review of the data by gender reveals that 45% of the cases were male and

Figure 4. Pertussis incidence per 100,000 population, 2006



55% were female. Age-specific incidence rates for pertussis per 100,000 population were 63.9 for infants younger than 12 months of age; 6.6 for children 1 through 4 years of age and children 5 through 9 years of age; 4.3 for children 10 through 14 years of age; 5.1 for adolescents 15 through 19 years of age; 2.2 for adults 20 through 29 years of age; 2.7 for adults 30 through 39 years of age; 2.4 for adults 40 through 49 years of age; 1.6 for adults 50 through 59 years of age; and 1.2 for adults 60 years of age and older.

Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6335

Salmonellosis, Excluding Typhoid Fever

Epidemiology of Salmonellosis

Salmonellosis in humans is an illness caused by approximately 2,000 serotypes of *Salmonella* bacteria, excluding *S*. Typhi (etiologic agent of typhoid fever) (Centers for Disease Control and Prevention [CDC], Salmonellosis). Although salmonellosis usually manifests as a gastrointestinal illness, infections of other body sites such as the urinary tract or bloodstream are also reported. Illness usually begins 6 to 72 hours after infection. Symptoms that normally resolve in 1 week may include fever, diarrhea (sometimes bloody), abdominal cramps, headache, nausea, and vomiting; however, asymptomatic infections also occur (Heymann). Antibiotics are sometimes prescribed for treatment of salmonellosis, but are not necessary in most cases. Persons who are infected with *Salmonella* may continue to shed bacteria in their stool for days to weeks after resolution of illness and may infect others if proper hand washing procedures are not followed (as in the case of infected food workers). Young children, the elderly, and immunocompromised persons are at greater risk of developing septic arthritis, endocarditis, pneumonia, death, and other severe complications. Over 1.4 million nontyphoidal salmonellosis cases are estimated to occur annually in the United States; 95% of these cases are estimated to be transmitted through food (Mead et al.). Salmonellosis has been associated with consumption of raw or undercooked eggs, poultry, and meat, as well as contact with the feces of pets, livestock, and reptiles. Raw fruits and vegetables and unpasteurized dairy products have also been implicated in outbreaks (CDC, Salmonellosis).

Salmonella bacteria are frequently identified in foodborne illnesses and incidence rates of disease have not decreased dramatically over the past 10 years (CDC, FoodNet). In an effort to meet national goals for salmonellosis rates specified in Healthy People 2010, the Food Safety and Inspection Service (FSIS) in 2006 implemented changes to their inspection schedules for establishments that process raw meat (FSIS). Among the changes listed, establishments with more *Salmonella*-positive samples and establishments with more positive samples of *Salmonella* serotypes that frequently cause human illness (e.g., *S.* Typhimurium, *S.* Enteritidis, etc.) will be targeted for more frequent inspection (FSIS; CDC, Public Health Laboratory Information System Surveillance Data).

Prevention measures for salmonellosis include frequent hand washing, cooking of meats and eggs to recommended temperatures, avoiding cross-contamination of raw produce, and pasteurizing dairy products. Additionally, Texas law mandates exclusion from day care centers, schools, and food establishments for children and food workers with confirmed or suspected *Salmonella* infection (25 Texas Administrative Code [TAC] §97.7 and §229.163). Specified readmission criteria include cessation of symptoms. Subsequent negative stool cultures are required in some situations.

Salmonellosis Cases Reported in Texas

Laboratory-confirmed and epidemiologically-linked cases of salmonellosis are reportable to the Texas Department of State Health Services (DSHS) within 1 week of identification (25 TAC §97.4). The number of salmonellosis cases reported to DSHS ranged from 2,198 to 3,868 during 1997 to 2006 (**Figure 1**). The reported number in 2006, 3,060 cases with an incidence rate of 13.0 cases per 100,000 population, was a 2.7% decrease from the 3,145 cases reported in 2005. In 2006, 73.0% of cases occurred in the 7 months from May through November. The peak number of salmonellosis cases, 376 (12.3%), occurred in September.

In 2006, salmonellosis cases were reported for residents of 79.0% of counties and from all 11 Health Service Regions (HSR) in Texas (**Figure 2**). The regional incidence rates of HSR 2, 4, 7, 8, 10, and 11 exceeded the statewide rate of 13.0 cases per 100,000 population. The highest incidence rates were reported in McMullen (347.6 cases per 100,000 population), Hood (130.9), Kent (117.2), Martin (98.4), Jeff Davis (87.9), Matagorda (85.4), Ellis (72.7), Fisher (69.9), Glasscock (66.9), and Schleicher (64.0) counties. Only Hood, Matagorda, and Ellis counties reported more than 5 cases each.

Age was reported for 3,041 cases (99.4%) (**Figure 3**). Case-patients ranged in age from younger than 1 year to 97 years; the median age was 10 years. Children under 5 years of age accounted for 1,212 cases (39.9%) and 40.8% of these were in children under 1 year of age. Although the largest number of salmonellosis cases was reported in children 1 to 4 years of age (707 cases,

(Continued ☞)

Figure 1. Salmonellosis cases and incidence rates in Texas, 1997-2006

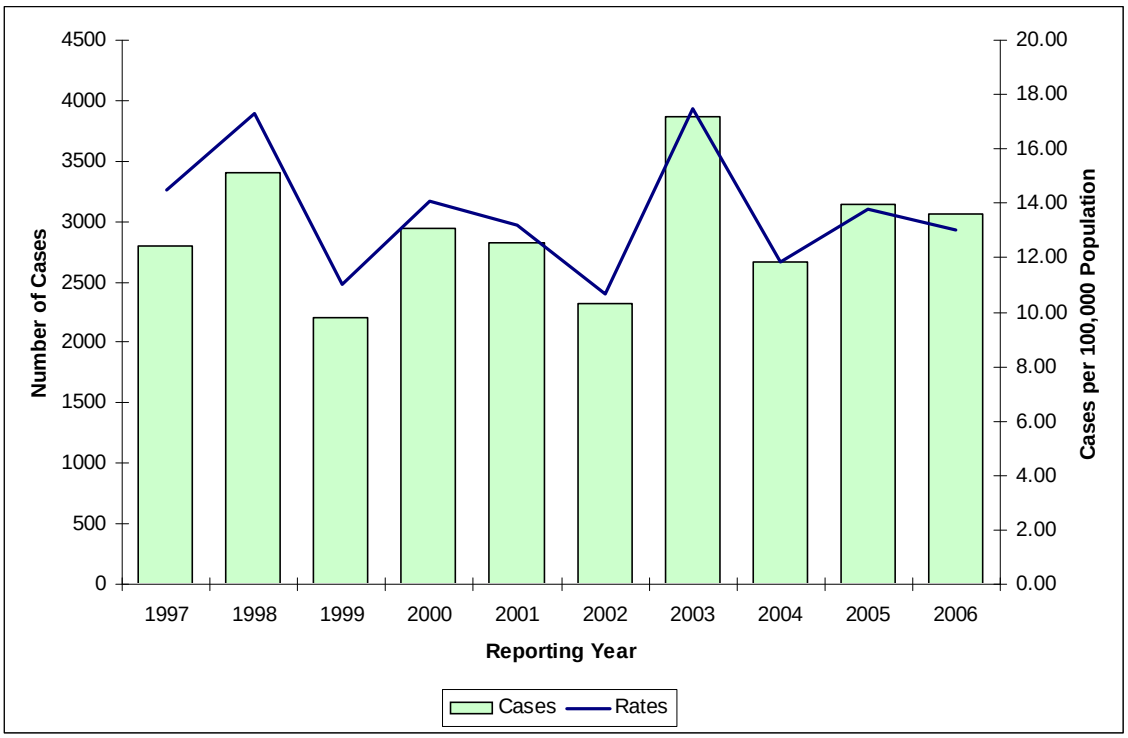


Figure 2. Salmonellosis incidence rates by county in Texas, 2006

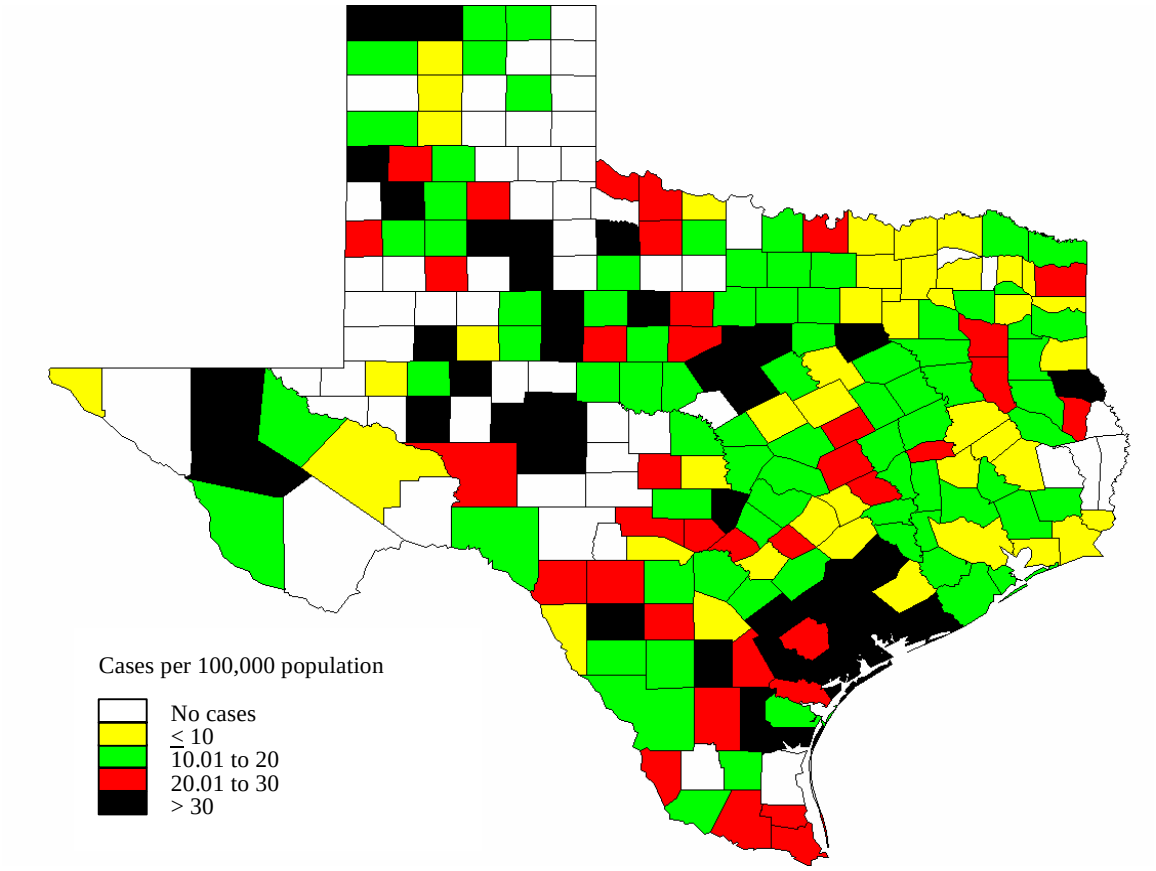
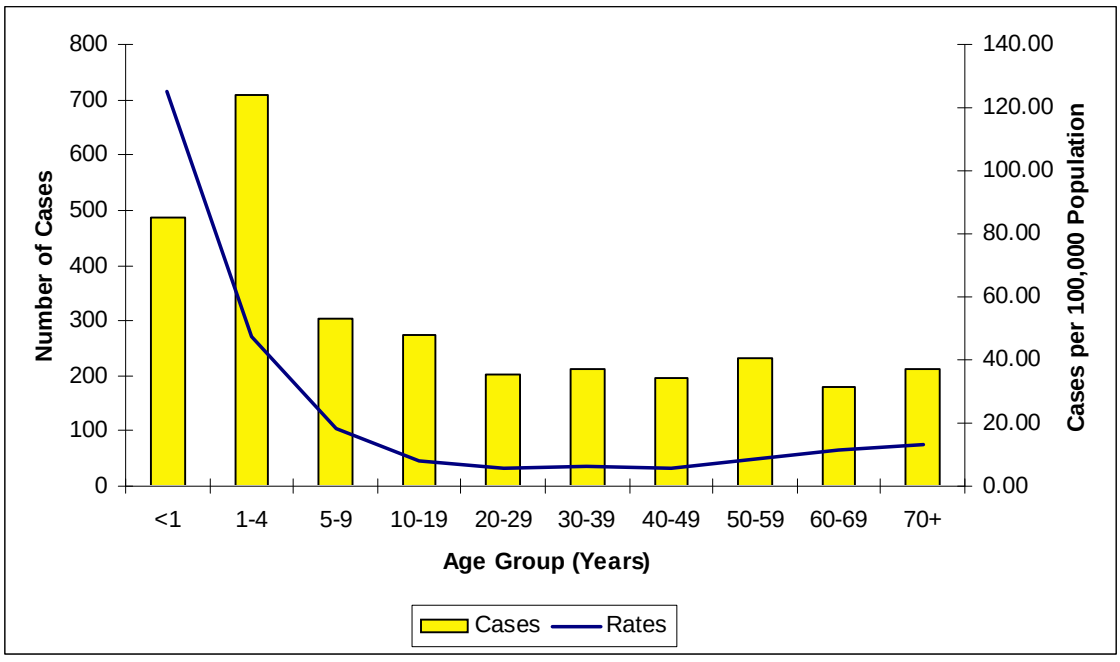


Figure 3. Salmonellosis cases and incidence rates by age group in Texas, 2006



47.3 per 100,000 population), the highest incidence rate occurred in children younger than 1 year of age (486 cases, 125.2 per 100,000 population). Sex was recorded for nearly all (98.7%) cases; of these, cases in females slightly outnumbered those in males, with 1,549 (51.3%) and 1,471 (48.7%), respectively. For most age groups, the number of cases reported in females and males was fairly equal; however, for the age group 60 to 69 years, the ratio of cases in females to males was 1.5 to 1.

Race and ethnicity data were reported for 2,207 cases (72.1%). The greatest number of salmonellosis cases was reported in White, non-Hispanics (1,115 cases); however, the highest rate of illness occurred in Hispanics of any race (11.0 cases per 100,000 population). The incidence rate was 9.8 cases per 100,000 population in non-Hispanic Whites, 5.1 cases per 100,000 population in non-Hispanic African Americans, and 2.9 cases per 100,000 population in non-Hispanics of other races.

Isolates were identified to at least the serogroup level in 1,403 (47.0%) of the 2,981 laboratory-confirmed cases that were reported in the state's surveillance system; in 1,071 (76.3%) of these cases, isolates were analyzed further to determine the serotype. The most frequently reported serogroups—Group C, Group B, and Group D—accounted for 42.0%, 26.4%, and 17.8% of cases, respectively. Of those that were serotyped, *S.* Newport, *S.* Typhimurium, *S.* Enteritidis, and *S.* Javiana were the serotypes that were reported most frequently. These results are similar to those reported in previous years.

Salmonellosis Clusters and Outbreaks

All *Salmonella* isolates submitted to the PulseNet-participating laboratories of the Texas Department of State Health Services and the Houston Department of Health and Human Services are routinely analyzed for genetic relatedness using pulsed-field gel electrophoresis (PFGE). More than 70 clusters of isolates with indistinguishable (i.e., matching) or similar PFGE patterns were reported to DSHS epidemiologists for investigation. Most of these were clusters of *S.* Typhimurium, *S.* Enteritidis, or *S.* Newport. Over 70% of these were multi-state clusters, involving isolates from Texas residents and residents of other states. Although clusters of isolates with matching or similar PFGE patterns may indicate a common source of illness among cases, clustering alone does not prove epidemiologic linkage. Clusters involving isolates of rare *Salmonella* serotypes, or clusters of common *Salmonella* serotypes whose specific PFGE patterns occur infrequently, are more likely to be related by a common source (e.g., a point-source outbreak or a food item distributed nationally).

Five salmonellosis outbreaks were reported through the state's surveillance system (2 are described below): 2 from separate households, 1 in a day care center, 1 in 2 schools, and 1 linked to a manufactured food (peanut butter). The outbreaks, which ranged in size from 2 to 50 cases, were reported in Bell, Denton, Hood, and Lubbock counties. The cases linked to contaminated peanut butter were part of a multi-state outbreak; the 25 Texas case-patients resided in multiple counties.

Several outbreaks of interest occurred in 2006; 3 are highlighted in this summary. First, in May, Texas was notified of *S.* Typhimurium isolates from patients in multiple states (excluding Texas) that matched by PFGE; the case-patients reported exposure to frozen feeder mice or exposure to reptiles to which the mice

were fed. Animal testing implicated the mice as the source of the illnesses, and a traceback investigation revealed that the feeder mice originated from a common mouse facility in Texas. Second, in November, the DSHS and Houston laboratories notified DSHS epidemiologists of 3 isolates of *S.* Tennessee whose PFGE patterns matched a multi-state cluster . Extensive investigations and a case-control study conducted in multiple states in late 2006 and early 2007 implicated 2 brands of peanut butter as the source of the illnesses. Third, in late November, HSR 2/3 epidemiologists investigated 77 cases of gastrointestinal illness that occurred after consuming pre-Thanksgiving meals at 2 schools in the same community. *S.* Newport was isolated from the stools of 9 ill persons. A case-control study implicated gravy (made with turkey) and iced tea as probable vehicles in the outbreak.

Texas did not have any laboratory-confirmed cases linked to either of the 2 large, multi-state outbreaks (*S.* Newport and *S.* Typhimurium) in 2006 associated with raw tomatoes.

Three deaths were reported in 2006. Two patients were female and one was male; all were over 70 years of age. *Salmonella* Enteriditis was isolated from one patient. The other 2 patients had *Salmonella* isolates identified as a Group B and a Group C, which were not serotyped further.

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Chapter 97 of Texas Administrative Code: 25 TAC §97.4 and §97.7.

Chapter 229 of Texas Administrative Code: 25 TAC §229.163.

Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6354

Salmonellosis in Texas: Trends and Serotypes

Salmonellosis is an acute bacterial illness that usually presents with sudden onset of headache, abdominal pain, diarrhea, and sometimes vomiting. Fever is almost always present. Illness typically lasts for several days and resolves without treatment. However, infection can develop into septicemia or localize in any tissue of the body, resulting in sequellae such as septic arthritis, endocarditis, or meningitis. Fatalities are rare and occur mainly in very young, very old, or immunocompromised individuals.

Most infections with *Salmonella* result from ingestion of bacteria in food from infected animals or contaminated by feces of an infected animal or person. Meat and poultry are common vehicles, although almost any food item can harbor bacteria as a result of cross-contamination. Temperature abuse during preparation or holding of food allows for multiplication of bacteria to an infectious dose.

Salmonellosis is the second most common bacterial foodborne illness in Texas, after shigellosis. Slightly more than 2,900 cases are reported on average each year and the number of cases and the incidence rate have not changed substantially over the past 10 years (**Table 1**). Nationally, the same pattern has occurred. Estimates indicate that less than 3% of clinical cases are reported, however, so the actual number of cases is likely much larger. About 60 – 80% of cases occur sporadically. The remaining cases are part of outbreaks that have sometimes involved hundreds of cases, or even more in multi-state outbreaks.

Table 1. Salmonellosis cases and incidence rates, Texas, 1997-2006

Year	Number of cases	Incidence rate (number per 100,000 population)
1997	2793	14.4
1998	3401	17.3
1999	2198	11.0
2000	2941	14.1
2001	2819	13.2
2002	2325	10.8
2003	3868	17.5
2004	2665	11.8
2005	3145	13.7
2006	3060	13.0
Average	2923	13.67

Species and serotypes of *Salmonella*

The bacterial genus *Salmonella* is now recognized as containing 2 species, by far the most common of which is *S. enterica*, as well as a number of subspecies (Brenner et al.). Over 2,500 distinct serotypes of *Salmonella* have been identified. Approximately 2,000 of these are known to cause disease in humans. The term “serotype” refers to the particular set of antigens (proteins and carbohydrates) a bacterium displays on its outer membrane. Antisera that react with these surface elements are used to classify an isolate as belonging to a particular serogroup, and more specifically, to a particular serotype. *S. enterica* subspecies I, which includes serogroups A, B, C1, C2, D, and E, is responsible for an estimated 99% of *Salmonella* infections in humans and other mammals.

Typhoid fever, which is caused by *Salmomella* Typhi, is distinctly different from illness caused by other serotypes of *Salmonella*. The salmonellosis cases discussed herein do not include those caused by *S.* Typhi. The number of *S.* Typhi isolates serotyped each year is small (23 in 2006); they are included in the serotype counts reported herein, but they do not affect the serotype frequencies discussed.

Salmonella serotype frequencies in the United States

In 2005, the most recent year for which nationwide serotype data are available, 45,322 cases of salmonellosis were reported to the Centers for Disease Control and Prevention (CDC) (CDC, MMWR). This resulted in an incidence rate of 15.4 cases per 100,000 population. Serotyping of isolates was accomplished for 36,184 (79.8%) cases. The most common serotypes of *Salmonella* causing human illness in the United States in 2005 were Typhimurium (19.3%); Enteritidis (18.6%); Newport (9.1%); Heidelberg (5.3%); Javiana (3.7%); I 4,[5],12:i:- (2.3%); Montevideo (2.2%); Muenchen (2.0%); Saintpaul (1.9%); and Braenderup (1.7%) (CDC, Public Health Laboratory Information System, PHLIS). These 10 serotypes accounted for 66.1% of the human *Salmonella* isolates serotyped in 2005.

In comparison to the primarily passive surveillance system through which data are transmitted from health departments all over the country to the CDC, the FoodNet system, a component of CDC's Emerging Infections Program, collects data from sites in 10 states around the country using active surveillance for laboratory-confirmed illnesses caused by enteric pathogens commonly transmitted through food. The FoodNet sites comprise the states of Connecticut, Georgia, Maryland, Minnesota, New Mexico, Oregon, Tennessee, and selected counties in California, Colorado, and New York. The population living in FoodNet sites currently numbers 44.95 million, or 15% of the Unites States population. In 2006, 6,657 laboratory-confirmed cases of salmonellosis were reported in FoodNet sites, resulting in an incidence rate of 14.8 cases per 100,000 population (CDC, FoodNet). Serotyping of isolates was accomplished for 5,957 (89.5%) of the cases. Seven serotypes accounted for 64% of the typed isolates; these were Typhimurium (19%), Enteritidis (19%), Newport (9%), Javiana (5%), Montevideo (4%), Heidelberg (4%), and I 4,[5],12:i:- (4%).

Thus, the 3 most common serotypes of *Salmonella* reported both nationwide (2005) and by FoodNet sites (2006) were Typhimurium, Enteritiditis, and Newport. Together, these 3 serotypes account for nearly half of reported and serotyped human illnesses. The 4 next most common serotypes, Heidelberg; Javiana; I 4,[5],12:i:-; and Montevideo have slightly different rank orders in the nationwide and FoodNet reporting systems, but together account for about an additional 15% of illnesses in both reporting systems.

Salmonella serotype frequencies in Texas

In Texas, serotyping is attempted for all *Salmonella* isolates sent to the DSHS laboratory. The City of Houston Department of Health and Human Services laboratory also routinely serotypes submitted isolates, but few other laboratories in the state do so. Submission of isolates is not required by state law and the cost of shipping specimens is high, so many isolates are never serotyped. Since 1999, only about half of *Salmonella* isolates have been serotyped during most years, though the percentage isolated has varied significantly (**Table 2**).

In 2006 in Texas, 3,060 cases of salmonellosis, 2,981 of which were laboratory-confirmed, were reported to DSHS. Of these, 1,511 (49.4%) yielded isolates that were serotyped. The 10 most common serotypes were Newport (15.3%), Typhimurium (13.6%), Enteritidis (8.3%), Javiana (5.8%), Mississippi (5.7%), Infantis (5.6%), Montevideo (4.9%), Oranienberg (4.3%), Muenchen (2.6%), and Saintpaul (2.1%). These results are shown in **Table 3**. The 7 most common serotypes accounted for 59.2% of the serotyped isolates.

Compared to the CDC nationwide data, also shown in Table 3, the 10 most common serotypes reported in Texas were the same, with 2 exceptions. Serotypes I 4,[5],12:i:- and Braenderup were included in the nationwide top 10, but not in Texas, while Infantis and Oranienberg were included in the Texas top 10, but not nationwide.

The 3 most commonly-reported serotypes in Texas in 2006 were the same as those reported nationwide in 2005 and by FoodNet sites in 2006. However, the ranking and percentages for these serotypes were substantially different in Texas. The most commonly-reported serotype in Texas was Newport, while this was the third most commonly-reported serotype nationwide and by FoodNet sites. The ranking and percentage of Newport and Enteritidis were reversed in Texas in comparison to these other sites. Newport was identified in Texas at nearly twice the frequency at which it was identified nationwide and in FoodNet sites, while Enteritidis was identified at less than half the frequency in Texas relative to those sites. Typhimurium was isolated slightly less frequently in Texas than in the nationwide and FoodNet sites.

In summary, Newport was the most commonly-reported *Salmonella* serotype in Texas, while Typhimurium was the most commonly-reported serotype nationwide and in FoodNet sites during the most recent years for which data are available. In addition, Enteritidis was identified much less commonly in Texas. The remaining most commonly-reported serotypes in Texas differed slightly in ranking and frequencies from the other sites, with Texas having less dominance by the top 3 serotypes. These data are depicted graphically in **Figure 1**.

Table 2. Number of culture-confirmed salmonellosis cases, number of serotyped isolates, and percentage of isolates serotyped, Texas, 1999-2006

Year	Number of culture-confirmed cases	Number of serotyped isolates	Percentage of isolates serotyped
1999	2193	1082	49%
2000	2941	1228	42%
2001	2819	980	35%
2002	2323	2174	94%
2003	3132	1912	61%
2004	2665	1459	55%
2005	3063	1413	46%
2006	2981	1511	51%
Average	2009.1	1469.9	73.2%

Trends in *Salmonella* serotype frequencies, United States and Texas

CDC reports that the 4 most commonly isolated *Salmonella* serotypes in 2005 (Typhimurium, Enteritidis, Newport, and Heidelberg) have been the most commonly isolated serotypes since 1995 except in 2004, when Heidelberg was replaced by Javiana (CDC, PHLIS). The most commonly isolated serotype since 1995 has been Typhimurium. Serotypes Typhimurium and Enteritidis have each declined about 30% in frequency since 1995, though their

Table 3. Most common *Salmonella* serotypes reported nationwide (2005), in FoodNet sites (2006), and in Texas (2006)

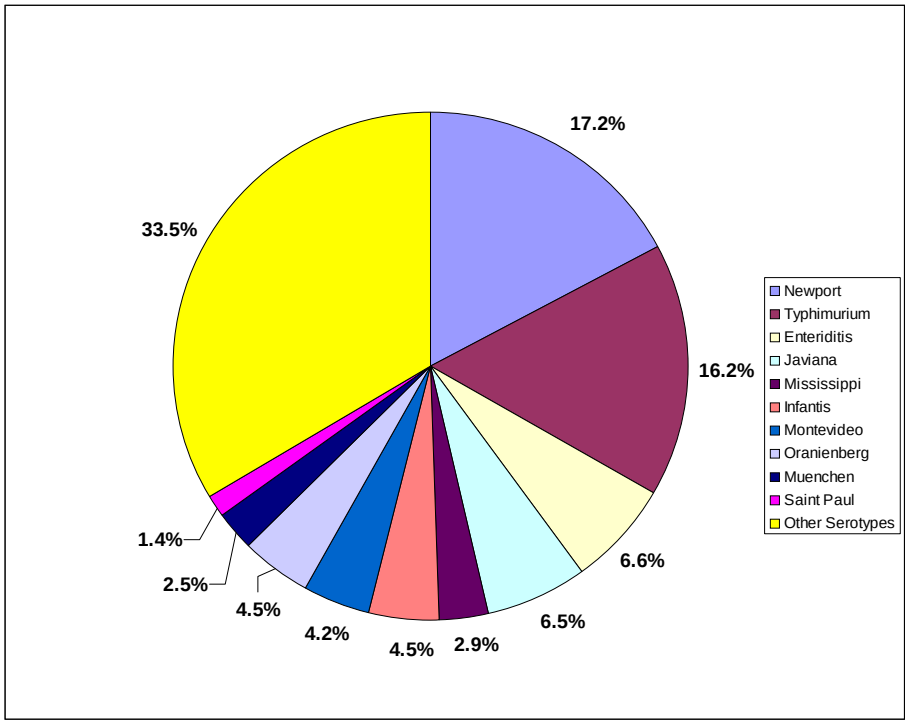
Nationwide (2005) (293,655,000 population)		FoodNet sites (2006) (44,950,000 population)		Texas (2006) (23,464,827 population)	
Typhimurium	19.3%	Typhimurium	19%	Newport	15.3%
Enteritidis	18.6%	Enteritidis	19%	Typhimurium	13.6%
Newport	9.1%	Newport	9%	Enteritidis	8.3%
Heidelberg	5.3%	Javiana	5%	Javiana	5.8%
Javiana	3.7%	Montevideo	4%	Mississippi	5.7%
I 4,[5],12:i:-	2.3%	Heidelberg	4%	Infantis	5.6%
Montevideo	2.2%	I 4,[5],12:i:-	4%	Montevideo	4.9%
Muenchen	2.0%	-		Oranienberg	4.3%
Saintpaul	1.9%	-		Muenchen	2.6%
Braenderup	1.7%	-		Saintpaul	2.1%
Top 3	47.0%	Top 3	47%	Top 3	37.2%
Top 7	60.5%	Top 7	64%	Top 7	59.2%
Top 10	66.1%			Top 10	68.2%

overall rankings have not changed. Serotype Newport increased in frequency between 1997 and 2002, but has been declining since then. Serotype Javiana has increased in frequency since 1995, most significantly in 2003 and 2004, but declined in 2005. Serotype I 4,[5],12:i:-, which has been tracked only since 1998, has increased dramatically in frequency since 2002. Serotypes Montevideo, Oranienberg, Muenchen, Braenderup, and Infantis have varied in frequency since 1995, but have not had any dramatic increases or decreases. In contrast, Saintpaul has increased rather consistently and nearly 50% since 1995. Serotype Mississippi has increased nearly 200% in frequency since 1995, with most of that increase occurring since 2002.

The FoodNet sites collectively reported on the 6 *Salmonella* serotypes most commonly isolated since 1996 (CDC, FoodNet). Serotypes Newport and Javiana have increased overall since 1996, with Newport having a large increase in 2002 and then tapering off somewhat, and Javiana increasing fairly steadily. Serotypes Enteritidis, Montevideo, and Heidelberg have varied in frequency since 1996, but have neither increased nor decreased significantly. Typhimurium is the only serotype that has declined in frequency since 1996, but its frequency since 2003 has been stable.

The frequencies of the 7 most commonly isolated *Salmonella* serotypes in Texas since 1999 are shown in **Figure 2**. Serotypes Newport and Typhimurium have been isolated at the highest frequencies for each year since 1999. Both had large increases in 2002 and 2003, which were followed by

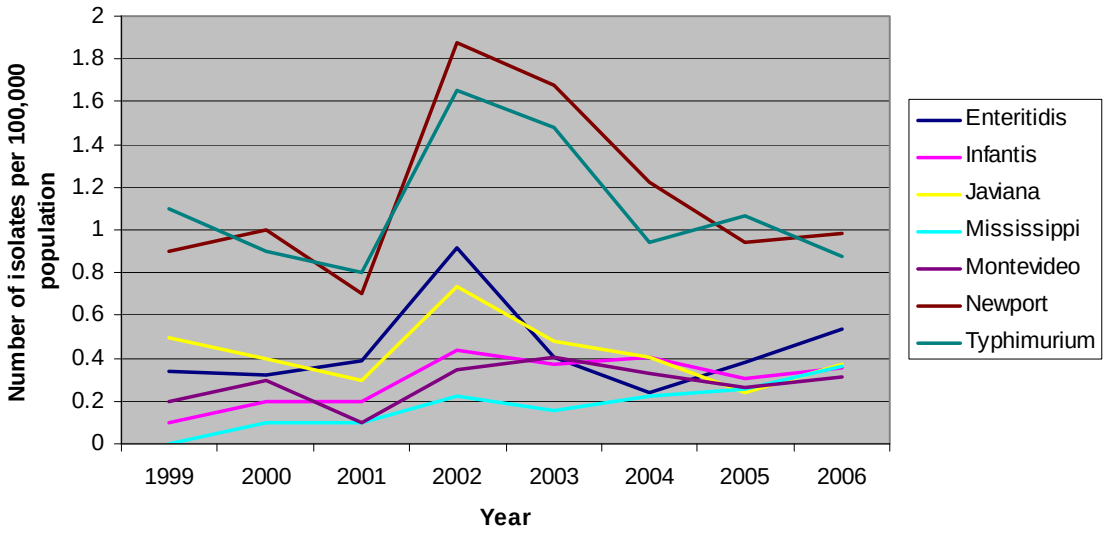
Figure 1. *Salmonella* serotype frequencies, Texas, 1999-2006 averages



declines that returned them to slightly above 1999-2001 frequencies. Serotypes Enteritidis and Javiana also increased in frequency in 2002, but then decreased to about 1999-2001 frequencies, and Enteritidis again increased somewhat in 2006. Serotypes Mississippi, Infantis, and Montevideo have all gradually increased in frequency since 1996. Serotypes Oranienberg, Muenchen, and Saintpaul (not shown in **Figure 2**, but ranked eighth, ninth, and tenth, respectively, in frequency in 2006) have been reported at rather steady rates since 1999.

The most commonly reported serotype of *Salmonella* nationwide and in FoodNet sites, Typhimurium, has been declining in frequency since 1996 in those sites, but its frequency has not changed overall in Texas since 1999. Interestingly, its frequency in Texas (averaging about 1 isolate per 100,000 population since 1999) is less than half the frequency at which it has been reported nationwide during the same time (about 2.5 isolates per 100,000 population) (CDC, PHLIS). Serotype Enteritidis, the second most common serotype nationwide and in FoodNet sites, has been declining in frequency nationwide, but not in FoodNet sites or in Texas. Serotype Newport, the most commonly reported serotype in Texas and the third most common nationwide and in FoodNet sites, has not significantly changed in frequency in any of these sites since 1999. The nearly twofold increase in the frequency of Newport isolates in Texas during 2002 and 2003 was mirrored nationwide and in FoodNet sites. The accompanying increase in all of the other 7 most common serotypes in Texas, especially during 2002, was also not found nationwide or in FoodNet sites. Serotype Javiana has been increasingly isolated nationwide and in FoodNet sites, but its frequency has been relatively stable (except for the increase in 2002) in Texas. The very large increase detected nationwide for serotype Mississippi has also been seen, though the increase has been closer to 100% in Texas compared to the nearly 200% increase detected nationwide. The large increase reported nationwide for serotype Saintpaul of nearly 50% is in marked contrast to the stable rate detected in Texas. Serotypes Infantis and Montevideo have been isolated at a slightly increasing rate in Texas, but not nationwide or in FoodNet sites (data available only for Montevideo).

Figure 2. *Salmonella* serotypes most commonly isolated Texas, 1999-2006



Conclusions

The patterns of changes in serotype frequencies and trends over time reported herein suggest that the vehicles in which *Salmonella* serotypes occur are changing, their consumption or other use (e.g., as pets) is changing, production or handling practices for them are changing, or some other factor affecting their distribution and use is changing. Certain serotypes have commonly been associated with specific vehicles, such as serotype Enteritidis with chicken and chicken eggs, and such associations have guided federal regulatory agencies (the United States Food and Drug Administration and the United States Department of Agriculture's Food Safety Inspection Service) towards targeted interventions aimed at reducing human exposures to these pathogens. Case-control studies conducted at FoodNet sites that are designed to identify specific food vehicles associated with particular pathogens are being conducted in tandem with sampling and laboratory testing of food items (beef, chicken, and pork). In addition, investigations of multi-state outbreaks detected through CDC's PulseNet postings (CDC, PulseNet), have been very successful in identifying vehicles of human infection, such as the *S.* Tennessee outbreak in 2006-2007 linked to consumption of 2 brands of peanut butter. These activities, along with routine investigations of sporadic cases and outbreaks of salmonellosis, are contributing to our understanding of risk factors for exposures to *Salmonella*. In spite of these efforts however, the overall incidence of salmonellosis is not declining, so continuation and expansion of these efforts is important to the efforts aimed at reducing the burden of illness caused by *Salmonella*.

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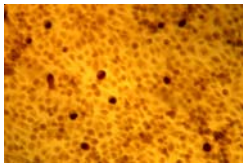
Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6358



(DSHS HIV/STD program web page)

Sexually Transmitted Diseases in Texas, 2006

Syphilis

Syphilis is a sexually transmitted disease caused by the spirochete *Treponema pallidum*. Primary and secondary (P&S) syphilis, the acute form of the disease, is characterized by primary lesions, an ulcer or chancre at the site of infection, followed by secondary infection, which includes rash, mucocutaneous lesions, and adenopathy. Untreated P&S syphilis progresses into a chronic disease with long periods of latency. Statewide, 1,066 cases of P&S syphilis were reported in 2006, a 21% increase from the 879 cases reported in 2005 and the sixth straight year of rising case reports (**Figure 1**). The largest P&S syphilis increases in Texas were seen in Harris, Travis, and Dallas counties in 2006. Tarrant, McLennan, and Angelina counties showed decreases in P&S case numbers compared to 2005.

The overall state rate for P&S syphilis in 2006 was 4.5 cases per 100,000 population. Men accounted for 75% of reported cases, up from 72% in 2005, a disturbing finding given recent increases in syphilis among men who have sex with men (MSM). The age distribution of P&S syphilis cases was divided fairly evenly across the 3 age groups of most common occurrence; 15 to 24 (29%), 25 to 34 (30%), and 35 to 44 (23%) years of age. African Americans continued to account for the largest proportion (52%) of P&S syphilis cases reported in Texas in 2006; the rate of P&S syphilis among African Americans was 21.0 cases per 100,000 population. Although the P&S syphilis rate among African Americans has decreased by over 60% since 1995, it remained disproportionately high compared with rates for Hispanics (3.1 per 100,000) and Whites (2.0 per 100,000) in 2006

Figure 1. Primary and secondary syphilis cases: Texas, 1972-2006

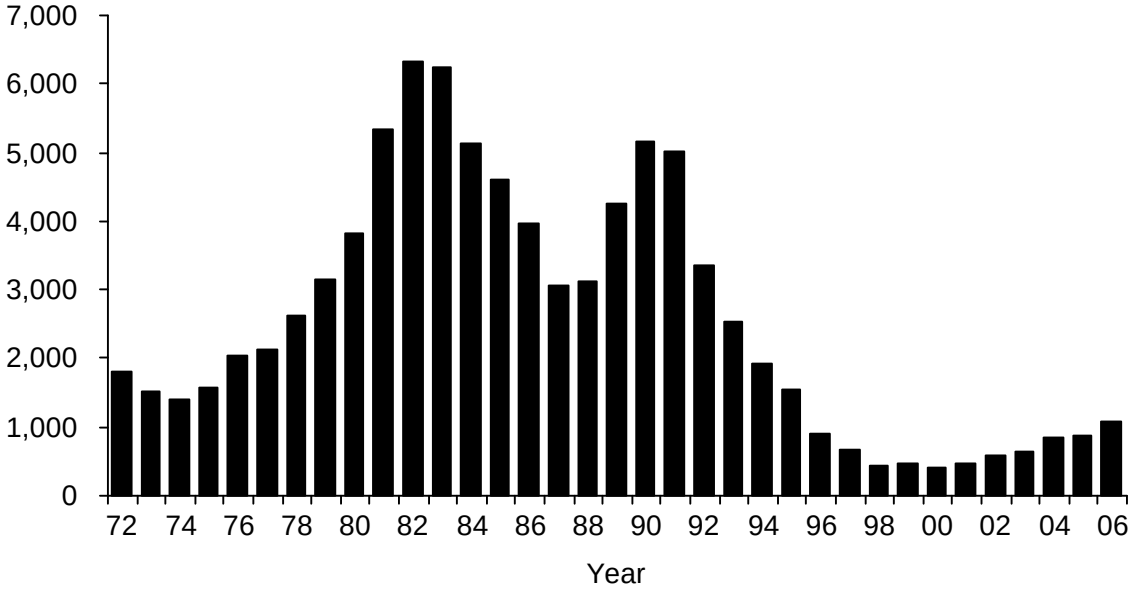
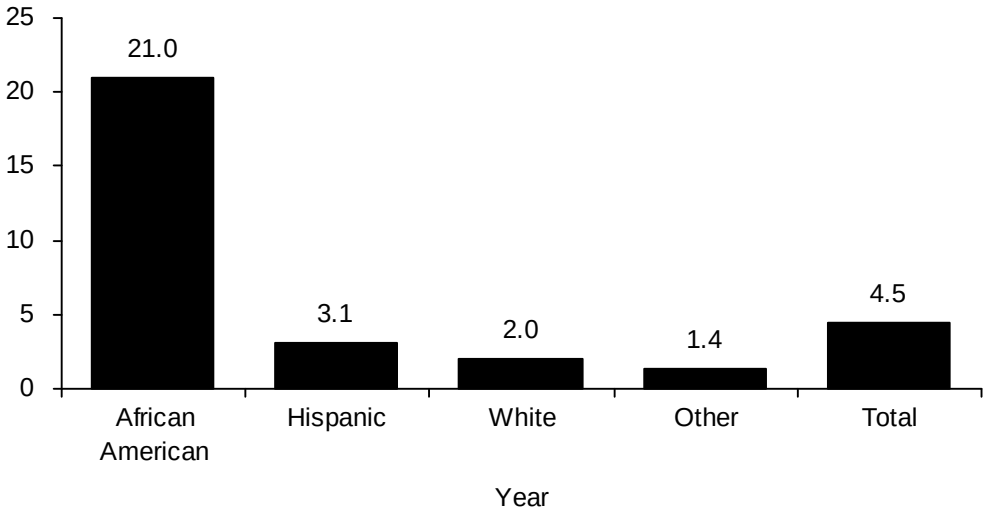


Figure 2. Primary and secondary syphilis case rates by race and ethnicity: Texas, 2006



(**Figure 2**). Among African American women, those 15 to 24 years of age had the highest rate at 36.4 cases per 100,000 population. The highest rate for African American men was found among an older age group, those 25 to 34 years of age, at 68.3 cases per 100,000.

Latent syphilis is defined as those periods after infection with *Treponema pallidum* when patients present no symptoms of disease. Patients who have latent syphilis and who acquired syphilis within the preceding year are classified as having early latent syphilis; untreated cases of more than 1year's duration are classified as late latent. Tertiary syphilis is the symptomatic late-stage of the disease that may include neurologic and cardiovascular sequelae. Late latent and tertiary stages of syphilis infections were contracted many years prior to the cases being diagnosed and reported, and syphilis is not as likely to be transmitted in the late stages; thus, there are limited public health implications to these diagnoses.

Like P&S syphilis, the decreases in early latent syphilis seen in the 1990s have been replaced with increases in recent years. The total number of early latent syphilis cases reported in 2006 was 1,334, up 16% from 1,148 cases in 2005. The overall rate of early latent syphilis in 2006 was 5.7 cases per 100,000 population. The incidence rate for early latent syphilis among African Americans was 24.0 cases per 100,000, compared to 4.6 among Hispanics and 2.3 among Whites.

Congenital syphilis, one of the most serious forms of the disease, can cause abortion, stillbirth, premature delivery, or may lead to other severe complications in the newborn. In 2006, 84 cases of congenital syphilis were reported, up from the 63 cases reported in 2005. Harris County continues to report the most congenital syphilis with 27 cases in 2006, followed by Bexar, Dallas, and Tarrant counties with fewer than 10 cases each. Statewide, 44% of congenital cases were among Hispanics, 39% among African Americans, and 13% among Whites. Based on 2004 live birth numbers, the more recent data available, the estimated rate of congenital syphilis in 2006 was 22.0 cases per 100,000 live

births, up from 16.5 per 100,000 in 2005.

The term 'total syphilis' refers to all reported syphilis cases, regardless of the stage of the disease. Included in this total are congenital, P&S, early latent, late latent, and tertiary syphilis. In 2006, 4,961 cases of total syphilis were reported, up 13% from 4,374 cases reported in 2005, for a statewide rate of 21.1 cases per 100,000 population.

Chlamydia

The microorganism *Chlamydia trachomatis* is the most common cause of reportable sexually transmitted infections. Reports of chlamydia in 2006 totaled 75,319, up from 71,621 cases in 2005 in Texas (**Figure 3**). Of the total chlamydia cases reported, 80% were among women. Because this infection is often asymptomatic, chlamydia case reports are largely dependant upon the volume of screenings being conducted, more so than gonorrhea, for example. Given that men are rarely screened for chlamydia, the incidence of the disease among men is difficult to gauge. Women are frequently screened for chlamydia during clinical exams for family planning, prenatal care, and routine Pap smear testing. Because of the increased risk of severe outcomes among women, including the potential for pelvic inflammatory disease, ectopic pregnancy, and the possibility of infecting a newborn child, chlamydia screening programs almost always focus on women, men are less likely to be tested and diagnosed.

The 2006 chlamydia case rate for women was 512 cases per 100,000 population; with African American women having the highest rate (1,180 per 100,000), followed by Hispanic and White women (603 and 201 per 100,000, respectively). Men showed a racial and ethnic distribution similar to women but with far lower rates. Over 72% of all reported chlamydia patients (over 50,000 cases) were 15 to 24 years of age. The chlamydia rate among women 15 to 24 years of age was 2,609 cases per 100,000 population.

Gonorrhea

The bacteria *Neisseria gonorrhoeae* causes gonorrhea, the second most

Figure 3. Chlamydia cases: Texas, 1988-2006

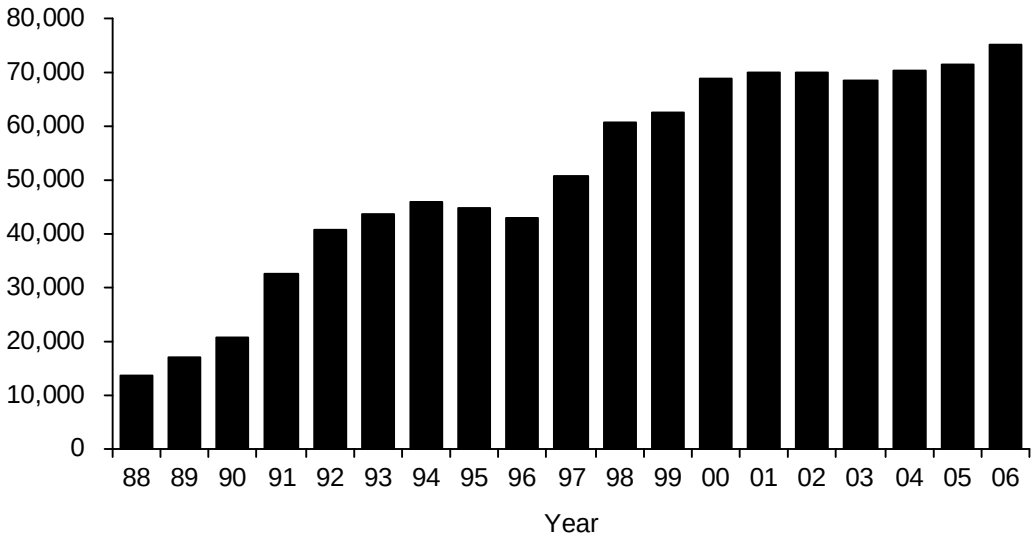
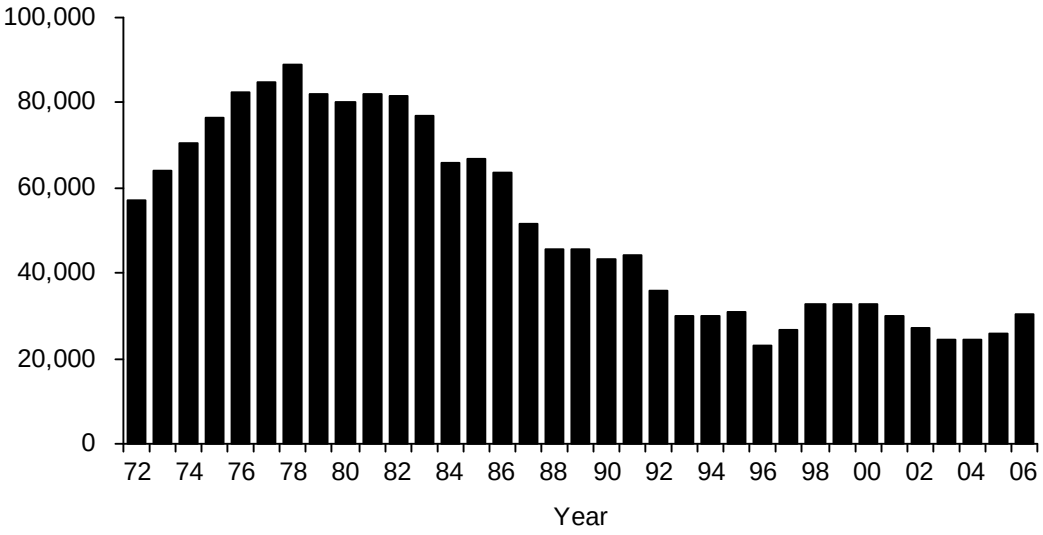


Figure 4. Gonorrhea cases: Texas, 1972-2006



frequently reported sexually transmitted disease in Texas. Left untreated, gonorrhea may lead to sterility in men and pelvic inflammatory disease, ectopic pregnancy, and sterility in women. The number of gonorrhea case reports increased from 26,016 in 2005 to 30,270 in 2006 (**Figure 4**). The Texas gonorrhea rate was 129 cases per 100,000 population in 2006, up from 113 per 100,000 in 2005. The rate among women in 2006 (132 per 100,000) was only slightly higher than the rate for men (125 per 100,000).

The gonorrhea rate for African Americans (595 cases per 100,000) was over eight times higher than the rate for Hispanics (72 per 100,000) and over 14 times higher than the rate for Whites (41 per 100,000). African American men had the highest rate of all race and ethnicity-sex groups at 653 cases per 100,000 population. Gonorrhea cases among African Americans 15 to 24 years of age accounted for the greatest share of African American cases (63% of those reported); they also represented 33% of all cases reported regardless of race and ethnicity or age.

Among age groups, the highest rates were among those 15 to 24 years of age (511 per 100,000) followed by those 25 to 34 years of age (214 per 100,000). Women 15 to 24 years of age comprised 71% of all female cases while men in this age group accounted for 50% of all male gonorrhea cases.

Prepared by the HIV and STD Epidemiology Division, (512) 533-3050

Shigellosis in Texas

Epidemiology of Shigellosis

Shigellosis is a gastrointestinal illness of humans and primates caused by 4 species of the gram-negative bacterium *Shigella*: *S. dysenteriae* (Group A), *S. flexneri* (Group B), *S. boydii* (Group C), and *S. sonnei (*Group D*)* (Heymann). Serogroups A, B, and C contain multiple serotypes. Illness usually begins 1 to 3 days after infection and generally resolves without antimicrobial therapy in 4 to 7 days. Infection can be caused by few as 10 organisms. Symptoms may include profuse watery or bloody diarrhea, fever, abdominal cramps, nausea, vomiting, and fatigue. Dehydration may occur if watery diarrhea is severe. Seizures, hemolytic uremic syndrome, and bacteremia occur infrequently and most often in children, the elderly, or immunocompromised individuals (Centers for Disease Control and Prevention, CDC, Shigellosis). *S. dysenteriae*, the most virulent species, causes epidemics in the developing world and is associated with more severe disease and complications. Serotype-specific immunity likely lasts several years following infection.

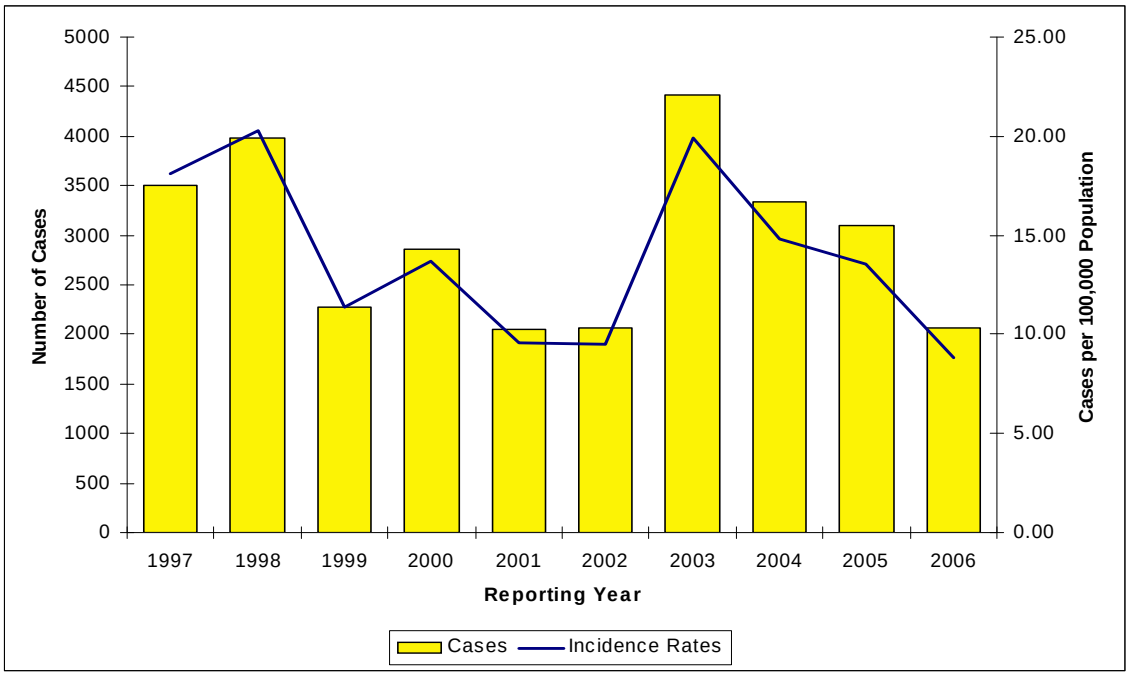
Shigellosis is transmitted by the fecal-oral route and is most commonly spread person-to-person, especially in group adult and child care settings. Crowded living conditions and poor hygiene promote the spread of disease, which may impact travelers to developing countries. An estimated 20% of shigellosis cases are acquired through ingestion of contaminated food and water (including recreational water sources) (Mead, et al.); flies may aid in food contamination (Heymann). The CDC estimates that approximately 448,000 cases of shigellosis occur annually in the United States (Mead, et al.), though nationwide an average of about 15,000 cases, or just over 3%, were reported each year from 1989 to 2002 (Gupta, et al.). These illnesses are estimated to cause over 6,000 hospitalizations and 70 deaths annually (Mead, et al.).

Shigellosis can spread rapidly through communities and can be difficult to control. This is particularly important in child care and adult care facilities, especially day care centers. Texas law mandates exclusion from day care centers, schools, and food establishments for children and food workers with confirmed or suspected *Shigella* infections. Specified readmission criteria include subsequent negative stool cultures or cessation of symptoms (25 Texas Administrative Code [TAC] §97.7 and §229.163). Frequent hand washing and basic hygienic measures help to prevent the spread of shigellosis. Additionally, disinfection of common surfaces and toys in group care settings and utilizing separate staff members for food preparation and diaper changing duties are important steps in preventing the spread of illness.

Shigellosis Cases Reported in Texas

Laboratory-confirmed and epidemiologically-linked cases of shigellosis are reportable to the Texas Department of State Health Services (DSHS) within 1 week (25 TAC §97.4). Shigellosis has been the most frequently reported bacterial gastrointestinal illness in Texas for over 30 years. The number

Figure 1. Shigellosis cases and incidence rates in Texas, 1997-2006



of shigellosis cases reported to DSHS ranged from 2,044 to 4,409 during 1997 through 2006 (**Figure 1**). The reported number in 2006, 2,065 cases with an incidence rate of 8.8 cases per 100,000 population, was a 33% decrease compared to the 3,100 cases reported in 2005. This was the lowest incidence rate reported since 1972 (8.7 cases per 100,000 population). In 2006, 62% of the cases occurred during the 5 months from July through November. The peak number of shigellosis cases, 313 (15.2%), occurred in October.

For 2006, shigellosis cases were reported for residents of 46% of counties and from all 11 Health Service Regions (HSRs) in Texas (**Figure 2**). The regional incidence rates of HSR 1, 6, 7, and 10 exceeded the statewide rate of 8.8 cases per 100,000 population. The highest incidence rates were reported in Floyd (61.6 cases per 100,000 population), Lubbock (42.4), McLennan (42.0), Kerr (38.8), Hays (35.4), Hansford (35.2), Runnels (34.3), Real (31.7), and Val Verde (31.0) counties; however, Floyd, Hansford, Runnels, and Real counties reported fewer than 10 cases each.

Age was reported for 2,040 cases (98.8%) in 2006. Cases ranged from younger than 1 year to 85 years of age; the median age was 6 years. Children under 10 years of age accounted for 1,378 cases (67.5%) (**Figure 3**). Although the largest number of cases occurred in children ages 5 to 9 years of age (695 cases, 41.4 per 100,000 population), the highest incidence rate occurred in children 1 to 4 years of age (657 cases, 43.9 per 100,000 population). Sex was recorded for almost all cases (99.6%); of these, cases in females slightly outnumbered those in males with 1,060 cases (51.6%) and 996 cases (48.4%), respectively. Although the number of cases reported in males and females for all age groups was fairly equal, more than 2.5 times as many cases were

(Continued ☞)

Figure 2. Shigellosis incidence rates by county in Texas, 2006

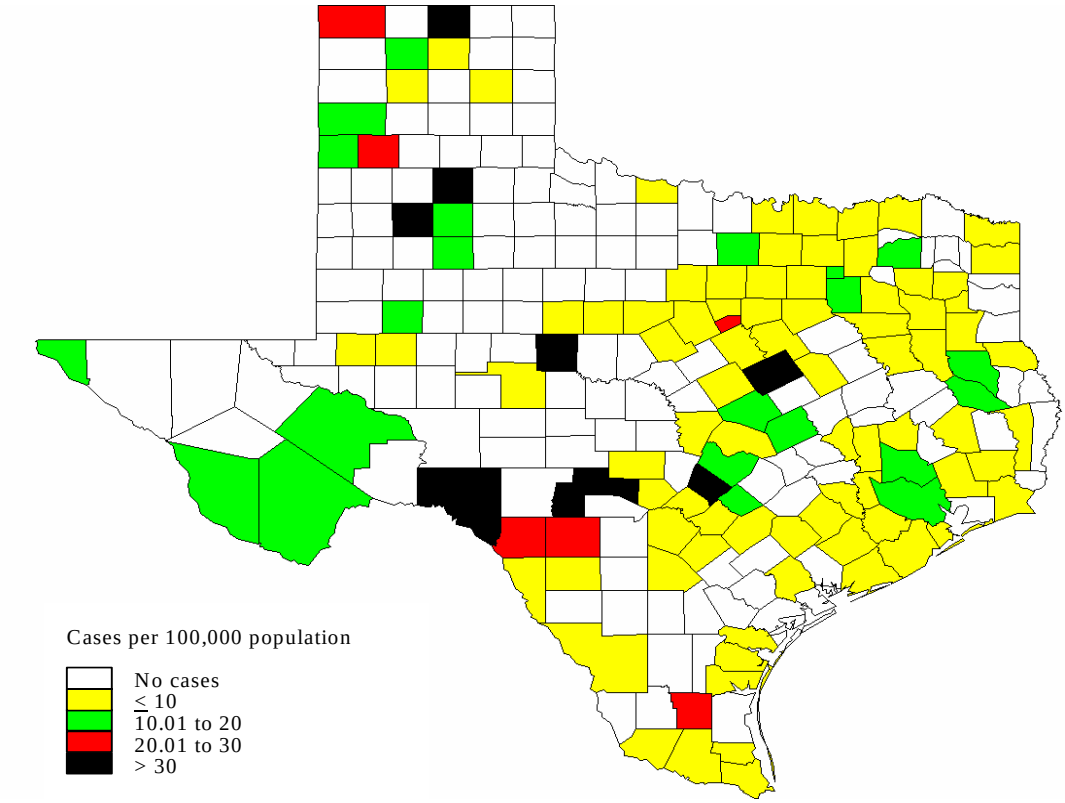
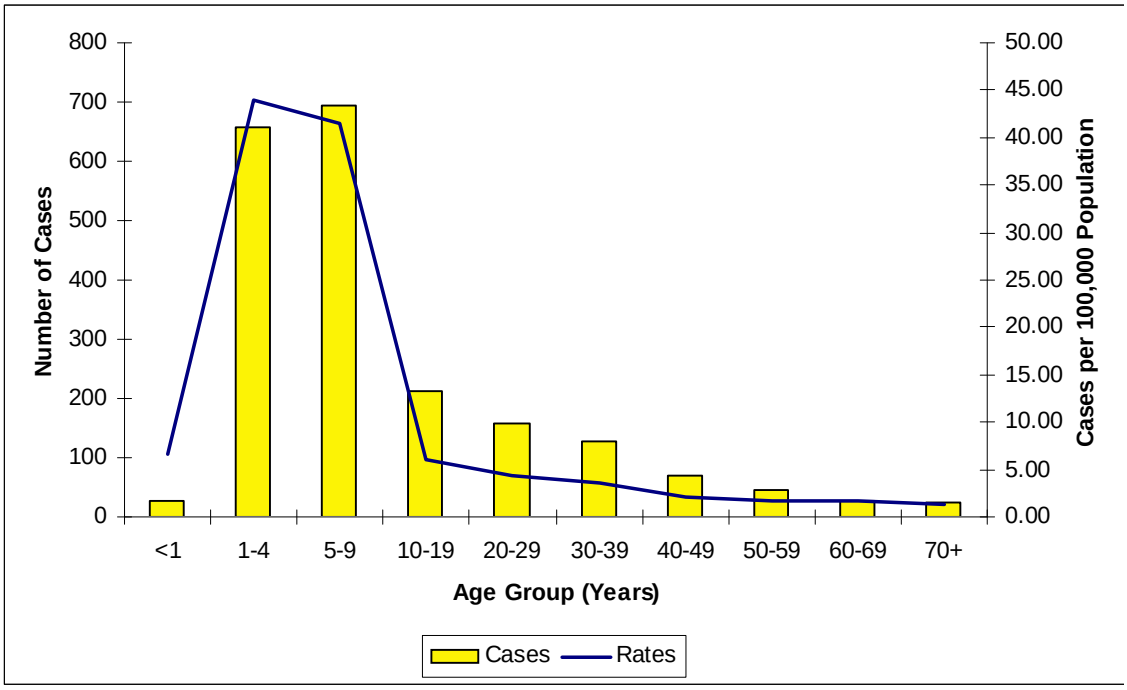


Figure 3. Shigellosis cases and incidence rates by age group in Texas, 2006



reported in females than in males for the age group 20 to 29 years.

Race and ethnicity data were reported for 1,571 cases (76.1%). The greatest number of cases and highest rate of illness occurred in Hispanics of any race, with 904 cases and 10.7 cases per 100,000 population. This rate was nearly double the rate for non-Hispanic African Americans (5.4 cases per 100,000 population) and more than double the rate for non-Hispanic Whites (4.5 cases per 100,000 population).

The species of *Shigella* was reported for 76.8% of the 1,936 cases that were cultured in a laboratory. *S. sonnei* was identified most frequently (91.1%), followed by *S. flexneri* (7.7%), *S. boydii* (1.1%), and *S. dysenteriae* (0.1%).

Shigellosis Clusters and Outbreaks

In 2006, the PulseNet-participating laboratories at DSHS and the Houston Department of Health and Human Services received a combined total of over 600 isolates that were identified as *Shigella* (E. Casey and J. Rogers; microbiologists, DSHS and Houston laboratories; written communication; August 2007). All *Shigella* isolates submitted to both laboratories are routinely analyzed for genetic relatedness using pulsed-field gel electrophoresis (PFGE).
In 2006, DSHS epidemiologists were notified of 9 separate clusters* involving *S. sonnei* or *S. flexneri* isolates with matching or similar PFGE patterns; 6 were clusters involving isolates from multiple states. Eleven shigellosis outbreaks were reported to DSHS through the state's surveillance system: 4 within separate households, 4 in day care centers, and 3 in elementary schools. *S. sonnei* was the etiologic agent reported in 9 (82%) of these outbreaks; the species was not reported for 2 outbreaks. The outbreaks, which ranged in size from 2 to 40 cases, were reported in Lubbock, Kerr, Rockwall, Travis, and Tarrant counties. At least 98 (4.7%) shigellosis cases were attributed to these 11 outbreaks. Additionally, Harris county reported an increase in shigellosis cases in several day care centers and schools near the end of the year. No deaths from shigellosis were reported in 2006.

*Note: Isolates identified as part of a PFGE cluster may or may not be epidemiologically related.

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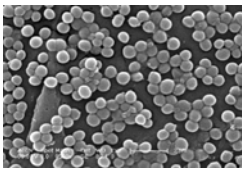
Chapter 97 of Texas Administrative Code: 25 TAC §97.4 and §97.7.

Chapter 229 of Texas Administrative Code: 25 TAC §229.163.

Prepared by the Infectious Disease Control Unit, (512) 458-7111, extension 6354



(IDCU staph web page)

Staphylococcus-associated Mortality in Texas, 2000-2004

Staphylococcus

Staphylococcus bacteria are common organisms found on the skin and mucous membranes of humans and animals.[1, 2] Although most *Staphylococcus* species typically do not cause infections in healthy individuals, some species are recognized agents of serious disease.[3] *Staphylococcus*, or staph, can cause a variety of infections ranging from soft tissue disease to serious life threatening conditions.[3] In more recent years, serious staphylococcal infections have become more difficult to treat due to rapidly increasing antibiotic resistance.[1, 2, 4]

Staphylococcus is divided into 2 groups: coagulase-negative *Staphylococcus* (CNS) and *Staphylococcus aureus.* Coagulase-negative *Staphylococcus* is considered an opportunistic pathogen and infections caused by CNS are predominately health care-associated infections.[2, 3] According to Huebner (1999), "the increasing incidence of infections caused by CNS can be attributed [at least in part] to their particular affinity for the foreign materials that are integral to modern medicine." Predisposing factors include instrumentation procedures such as prosthetic devices, catheterization, invasive technologies, and immunosuppressive therapy. [2, 3]

Staphylococcus aureus causes pervasive disease with significant contributions to morbidity and mortality. The most common predisposing factors are skin conditions, poor hygiene, close physical contact, and contact with contaminated items.[1] *S. aureus* infections have moved beyond what were previously considered health care-associated or opportunistic infections. Cases and outbreaks of *S. aureus* infections have emerged in otherwise healthy children and young adults with no significant medical history or healthcare exposure.[1, 4] In addition, the number of community- associated, multiple-drug resistant *S. aureus* infections continues to rise.[3, 4]

Staphylococcal infections are not currently listed as a notifiable condition in Texas. Reporting is, therefore, not mandatory and detailed data is not readily accessible, and the contribution of staphylococcal infections to mortality in Texas has not been previously described. This study examines staphylococcal infections as the underlying cause of death as well as staphylococcal infections as a contributing cause of death.

Through ICD-10 coding, it is possible to identify death certificates that mention *Staphylococcus* infection as the underlying or the contributing cause of death. In order to assess staphylococcal mortality, all death certificates were examined for deaths occurring in Texas between January 1, 2000 and December 31, 2004 with ICD-10 codes mentioning staphylococcal infection. These data indicate that *Staphylococcus* was the underlying cause in 867 deaths during 2000-2004 (**Table 1**) and that the number of deaths increased nearly every year. *Staphylococcus* was listed as a contributing cause of death in a total of 2024 deaths (**Table 2**). Each year, over twice the number of death certificates listed *Staphylococcus* as the underlying

Table 1. Number of deaths per year reporting *Staphylococcus* as the underlying COD

Underlying Cause of Death	2000	2001	2002	2003	2004
Staphylococcal septicemia (ICD10: A41.0, A41.1, A41.2, P36.2, P36.3)	94	80	94	88	107
* ***Staphylococcus aureus* septicemia** (ICD 10: A41.0,P36.2)	37 (39%)	40 (50%)	46 (49%)	45 (51%)	49 (46%)
Staphylococcal pneumonia (ICD10: J15.2, P23.2)	54	66	72	72	67
Staphylococcal infection, unspecified (ICD10: A49.0)	7	14	11	14	17
Staphylococcal meningitis (ICD10: G00.3)	0	1	2	0	5
Staphylococcal arthritis/polyarthritis (ICD10: M00.0)	1	0	0	0	1
Total	156	161	179	174	197

Table 2. Number of deaths per year reporting *Staphylococcus* as a contributing COD

Contributing Cause of Death	2000	2001	2002	2003	2004
Staphylococcal septicemia (ICD10: A41.0, A41.1, A41.2, P36.2, P36.3)	220	261	250	215	236
* ***Staphylococcus aureus* septicemia** (ICD 10: A41.0,P36.2)	83 (38%)	121 (46%)	143 (57%)	109 (51%)	121 (51%)
Staphylococcal pneumonia (ICD10: J15.2, P23.2)	88	91	107	120	100
Staphylococcal infection, unspecified (ICD10: A49.0)	31	56	47	80	110
Staphylococcal meningitis (ICD10: G00.3)	4	2	2	1	2
Staphylococcal arthritis/polyarthritis (ICD10: M00.0)	0	1	0	0	0
Total	343	411	406	416	448

cause of death as listed *Staphylococcus* as a contributing cause of death.

The greatest number of staphylococcal deaths in Texas during this time period is attributable to staphylococcal septicemia. The percentage of staphylococcal septicemia deaths specifically listing *S. aureus* rose from 38% to approximately 50% of all staphylococcal septicemia. The percentage of death certificates specifically listing septicemia due to *S. aureus* as a contributing cause of death also increased from 39% to over 50% of all staphylococcal septicemia deaths by 2002. This implies that many in which contributing or underlying cause of death

is listed as “septicemia, unspecified” may be due to *Staphylococcus*.

The combined total number of deaths associated with *Staphylococcus* as listed on Texas death certificates has increased over the 5-year period of this study. Our findings indicate that deaths associated with staphylococcal infections exceed deaths from many currently reportable diseases in Texas.

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Tuberculosis in Texas

Tuberculosis is a disease caused by the bacterium *Mycobacterium tuberculosis*. These bacteria primarily affect the lungs and are transmitted from person-to-person by inhalation of droplet nuclei containing the bacteria. Patients with pulmonary or laryngeal tuberculosis generate droplet nuclei when they talk, cough, or sneeze. Most patients with pulmonary tuberculosis experience fever, night sweats, weight loss, difficulty breathing, and cough.

The initial treatment of tuberculosis involves administration of 4 drugs – Isoniazid, Rifampin, Pyrazinamide, and either Ethambutol or Streptomycin (may not be currently available) – until drug susceptibility test results are obtained. Drug susceptibility tests results determine the choice of drugs and the duration needed to complete therapy. For patients with drug susceptible organisms, the treatment can be as short as 6 months. For patients with drug resistant organisms, therapy may continue for 2 years or longer. In the United States, tuberculosis incidence rates are higher in males, low income, racial and ethnic populations, and older age groups.

From 1997 through 2006, 16,512 tuberculosis cases were reported in Texas (**Table 1**). A total of 1,585 cases were reported in Texas in 2006. The number reported annually ranged from the 1,506 cases reported in 2000 to 1,992 cases reported in 1997. The 2006 total represents a 3.3% increase from the 1,635 cases reported in 2005 and 50 additional cases compared with the number of reported cases in 2005. The incidence rate in 2006 was 6.8 cases per 100,000 population.

In 2006, most cases were male (68.1%) and a majority (72.2%) were Hispanic or African American. Incidence rates (cases per 100,000 population) for Whites, Hispanics, and African Americans were 2.0, 13.3, and 9.3, respectively.

Cases reported in 2006 ranged in age from 1 month to 94 years. Sixty-seven patients were 5 years of age or younger and 9 were younger than 1 year of age. A majority (70.1%) of patients 5 years of age or younger were Hispanic. Six patients were 90 years of age or older.

Almost half of the patients (47.9%) were born outside the United States. A higher percentage of Hispanics (64.1%) and Asians (93.4%) were born outside the United States. Only 9.0% of Whites and 14.6 % of African Americans were born outside the United States. The most frequent countries of birth for those born outside the United States were Mexico (51.4%), Vietnam (9.2%), Honduras (5.5%), and El Salvador (4.5%).

Table 1. Tuberculosis cases and incidence rates, Texas, 1997-2006

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Cases	1992	1820	1649	1506	1643	1550	1594	1683	1535	1585
Incidence Rate	10.3	9.3	8.2	7.4	7.9	7.2	7.3	7.6	6.7	6.8

A total of 157 tuberculosis patients were co-infected with human immunodeficiency virus (HIV). A higher percentage (22.3%) of African Americans was co-infected with HIV, compared with Whites (9.8%), or Hispanics (6.8%). Similarly, a higher percentage (77.1%) of males was co-infected with HIV, compared with females (22.9%).

A history of incarceration was reported for 9.8% of the cases, alcohol abuse for 19.8%, intravenous drug abuse for 2.0%, and homelessness for 6.3%. A previous history of tuberculosis was reported for 3.1% of the patients.

A total of 1,585 cases were culture confirmed. Isoniazid resistance, without resistance to rifampin, was noted in 2.6% of the cases. Rifampin resistance, without Isoniazid resistance, was noted in 0.2% of the cases. Any *M. tuberculosis* strain that is resistant to both Isoniazid and Rifampin is classified as multi-drug tuberculosis (MDR-TB).

Twelve patients (0.8%) in 2006 were identified as having MDR-TB. Multi-drug resistance was more common in recurrent cases (4.1%), compared with new cases (0.7%). Resistance to isoniazid or rifampin was noted in 2.3% of the patients born in the United States, 12.9 % of the patients born in Vietnam, 9.7% of the patients born in India, and 4.6% of the patients born in Mexico.

Patients with tuberculosis resided in 117 counties throughout Texas. A majority (66.8%) resided in only 7 (2.8%) of the 254 counties in Texas. Harris County was the county of residence for 413 (26.1%) patients and 244 (15.4%) patients resided in Dallas County. Annual incidence (cases per 100,000 population) rates for Harris and Dallas County were 10.9 and 10.2, respectively. Nineteen counties had an annual incidence rate at least twice the state rate of 6.8.

Prepared by the Infectious Disease Control Unit, (512) 459-7111, extension 6648

(*Vibrio* web page)

Vibriosis, Excluding Cholera

Epidemiology of Vibriosis

Vibriosis is an infection caused by several species of bacteria in the genus *Vibrio*. *Vibrio* organisms are halophilic, facultative anaerobes that occur naturally in alkaline estuarine and marine environments (Heymann). Some species of *Vibrio* (e.g., *V. cholerae* and *V. mimicus*) also thrive in freshwater environments. The number of *Vibrio* organisms isolated from salt water and from shellfish (especially filter-feeders) increases as water temperature increases. *Vibrio* bacteria are gram-negative, curved rods that can be cultured in a laboratory on blood agar and thiosulfate-citrate-bile salts-sucrose (TCBS) agar.

Several *Vibrio* species—including *V. parahaemolyticus, V. vulnificus*, and *V. cholerae* non-O1/O139—cause human gastrointestinal illnesses, wound infections, or septicemia. The incubation period for vibriosis is generally from 12 hours to 3 days but may range up to 1 week (Centers for Disease Control and Prevention, CDC, Hurricane Katrina). Symptoms of gastrointestinal illness may include diarrhea, nausea, vomiting, abdominal cramps, and fever; complete recovery in immunocompetent patients usually occurs within 7 days (Heymann). Symptoms of wound infections may include fever, erythema, swelling, and cellulitis. Septicemia, a severe form of disease in which *Vibrio* organisms infect the bloodstream, may occur secondarily to a gastrointestinal or wound infection, especially with *V. vulnificus*. Invasive illnesses can quickly progress from septicemia to shock and death, and over 50% of *V. vulnificus* bloodstream infections are fatal (Heymann). Persons with liver disease, renal disease, peptic ulcers, hematologic diseases (including hemochromatosis), or weakened immune systems (e.g., due to diabetes, cancer, or human immunodeficiency virus infection, or from taking certain medications) have a greater risk of developing severe infections. Other illnesses which are reported less frequently include urinary tract infections and ear infections.

Vibrio infections are easily prevented. *Vibrio* organisms are killed by thorough cooking of shellfish and other seafood to recommended temperatures for specified times (CDC, *Vibrio vulnificus*). Care should be taken to avoid cross-contamination of cooked foods with drippings from raw seafood. Prompt reporting to health departments of vibriosis illnesses associated with consumption of shellfish allows state and federal officials to close harvest areas and initiate product recalls if necessary. Persons with certain underlying medical conditions or those who are otherwise immunocompromised should avoid consumption of raw protein, including raw oysters and other raw shellfish. Persons with pre-existing wounds or recent surgery should avoid exposing skin and wounds to bodies of saltwater. If new or pre-existing wounds are inadvertently exposed to saltwater (e.g., cuts or injuries sustained while fishing or wading), the wounds should be washed thoroughly with soap and water and monitored for signs of infection.

Vibriosis Surveillance and Case Investigation

All Texas vibriosis cases are dually reported through the state's surveillance system and to the CDC using the Cholera and Other Vibrio Illness Surveillance Report (COVIS) form. This form records general information on patient demographics, clinical history, underlying medical conditions and chronic medications, and exposure history (i.e., consumption of seafood and exposure to water sources). All species of *Vibrio* except toxigenic *V. cholerae* are classified for reporting purposes as general vibriosis illnesses. *V. cholerae* serogroups O1 and O139 that produce cholera toxin cause the gastrointestinal illness known as cholera. This illness is reported separately from other *Vibrio* illnesses and is not included in this summary.

Dealer, source, and harvest information are collected for traceback purposes in cases with a history of seafood consumption prior to illness onset. All Texas cases with a history of seafood consumption are reported to state and federal partners who monitor shellfish harvest areas and illnesses associated with those areas. Per recommendation by the Council of State and Territorial Epidemiologists in 2006, vibriosis was added to the list of nationally notifiable conditions in 2007; however, Gulf Coast states have been reporting *Vibrio* illnesses to CDC since 1988 (CDC, Summary). Vibriosis infections are reportable to the Texas Department of State Health Services (DSHS) within one working day of identification. Submission of *Vibrio* isolates to the DSHS laboratory is also required (25 Texas Administrative Code §97.4 and 97.5).

Vibriosis Cases Reported in Texas

Case numbers and distribution

The number of cases reported to DSHS ranged from 15 to 79 during the 20-year period from 1987 to 2006 (**Figure 1**). In 2006, 54 cases (0.23 cases per 100,000

Figure 1. Number of vibriosis cases reported in Texas, 1987-2006

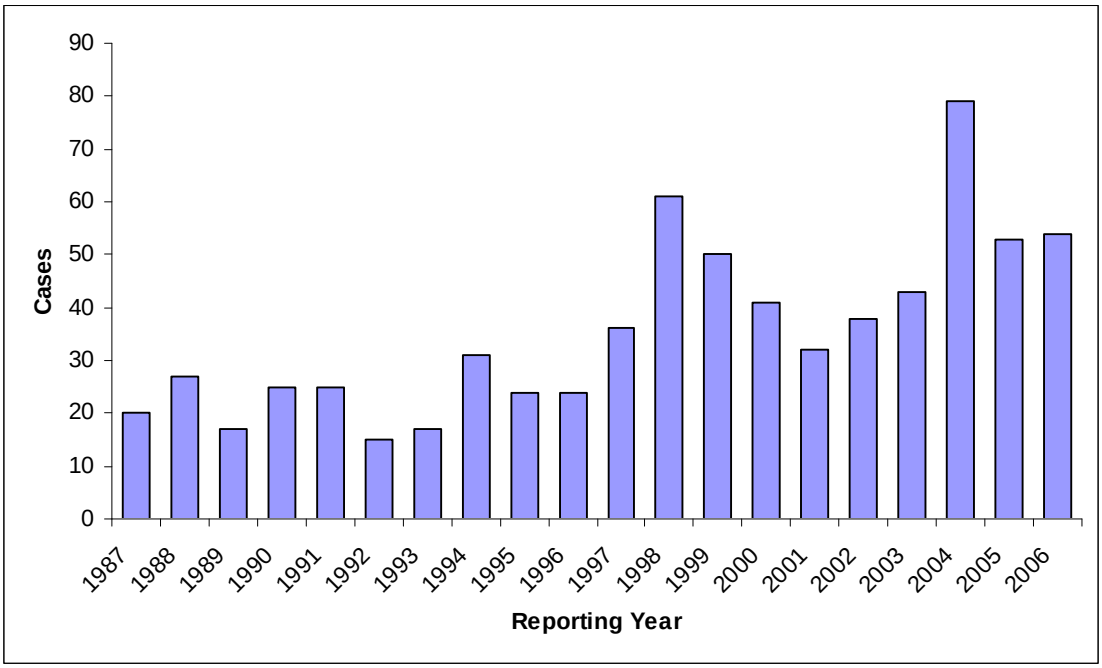
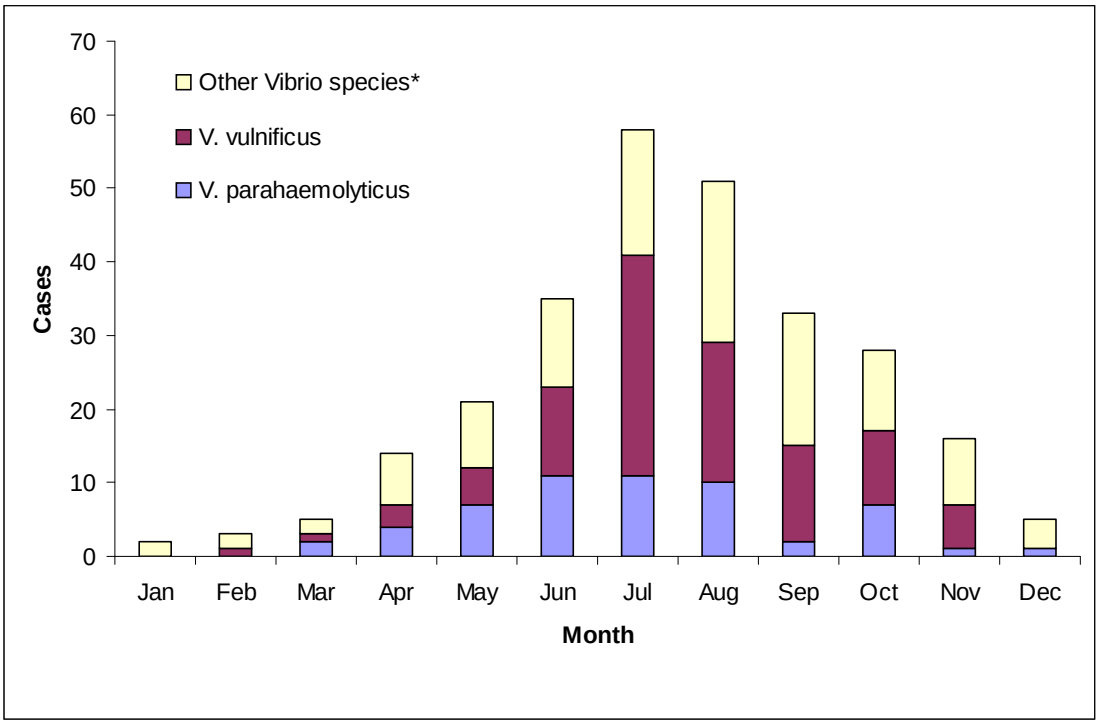


Figure 2. Seasonal distribution of vibriosis cases by species in Texas, 2002-2006



*Other *Vibrio* species include *V. alginolyticus*, nontoxigenic *V. cholerae*, *V. damsela*, *V. fluvialis*, *V. furnissii*, *V. hollisae*, *V. mimicus*, and unspeciated *Vibrio*.

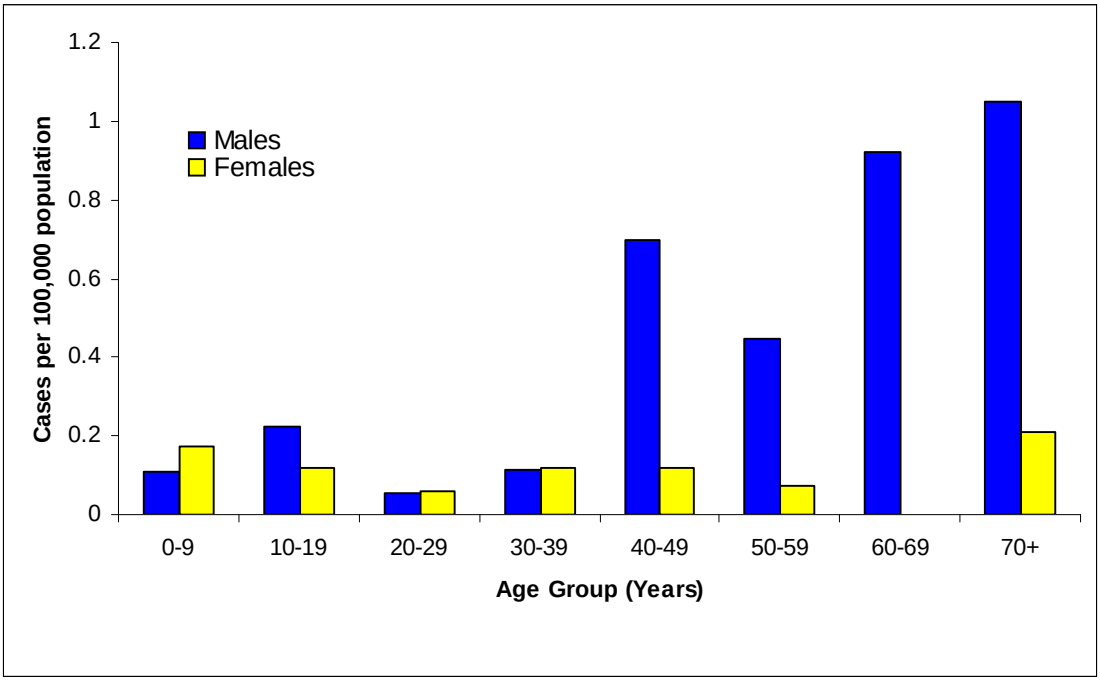
population) of vibriosis were reported. Cases were reported from Health Service Regions (HSRs) 2, 3, 5, 6, 7, 8, and 11. Harris County reported the largest number of cases (16 cases), followed by Bell (5), Dallas (4), Collin (3), and Travis (3) counties. Although most case-patients reported exposures to bodies of water or food establishments in Texas, some exposures occurred in other states, territories, or countries.

Vibrio organisms multiply rapidly in warm waters during summer months. **Figure 2** displays the seasonal distribution of vibriosis cases by species in the 5 years from 2002 to 2006. For the 5-year period, at least 2 vibriosis cases occurred in each month and the highest number of cases and deaths occurred in July with 58 and 10, respectively. (The seasonal peak for cases and deaths reported in 2006 occurred in August.) Eighty-two (30.3%) of the 271 cases reported from 2002 to 2006 occurred in the months of September through December; at least 2 deaths were reported in each of these 4 months with cooler temperatures. These data appear to contradict the popular albeit mistaken belief that raw oysters are safe to consume in months ending in the letter "R."

Case-patient demographics

Age and sex were reported for all 2006 cases. Case-patients ranged in age from 1 to 87 years, with a median age of 47 years. Although the largest number of cases was reported in persons 40 to 49 years of age (14 cases, 0.41 per 100,000 population), the highest incidence rate was observed in persons 70 years of age and older (9 cases, 0.56 per 100,000 population) (**Figure 3**).

Figure 3. Vibriosis incidence rates by age group in years, Texas, 2006



Thirty-seven cases (69%) occurred in patients 40 years of age and older and 86% of these cases were in males. Cases in males outnumbered cases in females by more than 3 to 1 overall. This difference was more pronounced for cases in which patients were 60 years of age and older; for these combined age groups, the ratio of cases in males to females was 7 to 1. Race and ethnicity were reported for 93.6% of cases. The majority of cases (27 cases, 54%) were reported in non-Hispanic Whites and Hispanic whites (18 cases, 36%); incidence rates in these groups were similar with 0.24 cases per 100,000 population and 0.21 per 100,000 population, respectively. The remaining cases were reported in Asians (3 cases, 6%) and non-Hispanic African Americans (2 cases, 4%).

Vibrio species reported

Vibriosis cases in 2006 were caused by seven species (**Table 1**): *V. alginolyticus* (8 cases, 14.8% of cases), *V. cholerae* non-O1/non-O139 (7, 13.0%), *V. fluvialis* (2, 3.7%), *V. hollisae* (1, 1.85%), *V. mimicus* (1, 1.85%), *V. parahaemolyticus* (11, 20.4%), and *V. vulnificus* (22, 40.7%). The species of *Vibrio* was not identified in 2 cases (3.7%). *Vibrio* species were isolated from 58 specimen sources in 54 patients (2 patients had *Vibrio* isolated from 3 different sources each). Of the 58 isolates, 13 (22.4%) were from stool, 20 (34.5%) were from blood, 13 (22.4%) were from wounds, and 12 (20.7%) were from other sources (ear, gallbladder, urine, and bronchial washing). *V. parahaemolyticus* was the species isolated most frequently from stool (54%) specimens, while *V. vulnificus* was the species isolated most frequently from blood (80%) and wound (38%) specimens. The identification of *Vibrio* was confirmed by laboratories at the Texas Department of State Health Services or Houston Health and Human Services in 48% of cases.

Severity of illness and underlying conditions

Among cases in which information was reported, 31 (62%) of 50 patients were hospitalized and 9 (18%) of 50 patients died. *V. vulnificus*, the most frequently reported *Vibrio* species, was isolated in 41% of all cases. Among *V. vulnificus* cases, 95% of case-patients were hospitalized and 41% died. *V. parahaemolyticus* was isolated in 20% of all vibriosis cases; of these, 36% of case-patients were hospitalized and none died. Other and unidentified *Vibrio* species accounted for the remaining 39% of cases; of these, 12% of case-patients were hospitalized and none died.

Immunocompromised persons are at greatest risk for developing severe illness from *Vibrio vulnificus* infection. Information on underlying or pre-existing medical conditions that may contribute to risk of serious illness was reported in 20 (91%) of 22 cases where *V. vulnificus* was identified as the etiologic agent; of these, in 16 cases (80%) at least 1 underlying condition was reported, and in 11 cases (55%) 3 or more underlying conditions were reported. The following underlying conditions were reported from patients with *V. vulnificus* infections: liver disease (11 patients), alcoholism (10), diabetes mellitus (8), heart disease (3), hemochromatosis (1), malignancy (1), and peptic ulcer disease (1).

Routes of transmission

Vibrio illnesses are frequently classified by 2 common exposure routes—consumption of contaminated seafood, particularly molluscan shellfish (usually raw or undercooked), and exposure of skin (often with a wound) to water. In 2006, 28 (52%) vibriosis cases were attributed to consumption of shellfish or other seafood. Clams, crab, oysters, shrimp, crawfish, octopus, scallops, and various fish were consumed by patients who had a shellfish- or seafood-associated case. Twelve (43%) of these 28 patients reported consuming only one shellfish or seafood item, while 16 individuals reported consuming multiple (2 to 6) seafood items. Of the 12 who reported eating just 1 seafood item, 9 (75%) consumed oysters, 2 (17%) consumed shrimp, and 1 (8%) consumed fish. Eight (89%) of the 9 patients who consumed oysters reported consuming them raw. Of the 16 patients who consumed multiple seafood items, 9 (56%) reported that oysters were the only food item that was consumed raw. Additionally in 2006, 2 cases in Texas were linked to the *V. parahaemolyticus* outbreaks associated with consumption of raw or undercooked clams and oysters from harvest areas in Washington and British Columbia, Canada (CDC, *V*ibrio Illnesses).

Eighteen (33%) vibriosis cases were attributed to water exposures. During the period of exposure, swimming, diving, or wading was the most frequently reported activity, although multiple activities were reported in many cases. Exposure to brackish or saltwater was reported in 14 (78%) cases. Twelve case-patients reported exposing a pre-existing or newly-acquired wound to water during the exposure period. No wound was reported in 5 cases (ear infections, urinary tract infections, and a near drowning). The presence of a wound was unknown for 1 case but the patient had regular saltwater exposure. Exposure route was not known or not reported in 8 (15%) of the 54 cases in 2006.

Table I. Texas vibriosis cases by species, complications, and exposure routes, 2006

Species	Patients		Hospitalized		Deaths		Exposure Route		
	N	%	n/N	%	n/N	%	Shellfish	Water	Unknown
V. alginolyticus	8	14.8	1/5	20	0/6	0	0	4	4
V. cholerae non-O1, non-O139	7	13.0	3/7	43	0/6	0	4	3	0
V. fluvialis	2	3.7	1/2	50	0/2	0	1	0	1
V. hollisae	1	1.85	1/1	100	0/1	0	1	0	0
V. mimicus	1	1.85	0/1	0	0/1	0	0	0	1
V. parahaemolyticus	11	20.4	4/11	36	0/11	0	7	3	1
V. vulnificus	22	40.7	21/22	95	9/22	41	15	7	0
Unspeciated *Vibrio*	2	3.7	0/1	0	0/1	0	0	1	1
Total	**54**	**100**	**31/50**	**62**	**9/50**	**18**	**28**	**18**	**8**

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Chapter 97 of Texas Administrative Code: 25 TAC §97.4.

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Table 1. Incidence rate of hepatitis A (number of cases per 100,000 population) in Texas counties in selected years of importance for the hepatitis A immunization program. Counties in group A implemented a vaccine requirement for schools and childcare facilities in 1999, group B counties implemented the requirement for schools and childcare facilities in 2003, and group C counties implemented the requirement only for childcare facilities in 2005. Gonzales County is listed under group C, though in this county the vaccine mandate applied both to schools and childcare facilities. County population sizes for 1996, 2004, and 2006 were obtained from the Department of State Health Services Center for Health Statistics at the time of annual compilation of notifiable disease data for each year; population sizes for 2000 are from the United States Census.

County	County FIPS	Vaccine group	1996			2000			2004			2006		
			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Anderson	001	C	51556	11	21.3	55109	0	0.0	56809	1	1.8	57688	5	8.7
Andrews	003	C	15101	3	19.9	13004	0	0.0	13470	0	0.0	13715	0	0.0
Angelina	005	C	73018	2	2.7	80130	4	5.0	83005	1	1.2	84472	0	0.0
Aransas	007	C	19082	0	0.0	22497	0	0.0	23628	0	0.0	24192	0	0.0
Archer	009	C	8218	0	0.0	8854	0	0.0	9447	0	0.0	9720	0	0.0
Armstrong	011	C	1997	0	0.0	2148	0	0.0	2197	0	0.0	2228	0	0.0
Atascosa	013	C	34684	16	46.1	38628	15	38.8	42226	0	0.0	44029	0	0.0
Austin	015	C	20433	0	0.0	23590	1	4.2	26145	1	3.8	27504	1	3.6
Bailey	017	C	7284	0	0.0	6594	1	15.2	6873	2	29.1	7016	0	0.0
Bandera	019	C	12743	1	7.8	17645	0	0.0	19881	0	0.0	21062	1	4.7
Bastrop	021	C	47797	5	10.5	57733	4	6.9	68506	2	2.9	74510	0	0.0
Baylor	023	C	4203	0	0.0	4093	0	0.0	4063	0	0.0	4036	0	0.0
Bee	025	C	32074	85	265.0	32359	0	0.0	33328	1	3.0	33819	0	0.0
Bell	027	C	203847	12	5.9	237974	119	50.0	251884	2	0.8	258953	1	0.4
Bexar	029	B	1301162	308	23.7	1392931	116	8.3	1473775	23	1.6	1514039	22	1.5
Blanco	031	C	6813	0	0.0	8418	0	0.0	9270	0	0.0	9740	0	0.0
Borden	033	C	813	0	0.0	729	0	0.0	745	0	0.0	758	0	0.0
Bosque	035	C	15776	3	19.0	17204	11	63.9	17951	0	0.0	18375	0	0.0
Bowie	037	C	85894	31	36.1	89306	5	5.6	90768	3	3.3	91466	1	1.1
Brazoria	039	C	211398	12	5.7	241767	7	2.9	266690	7	2.6	279602	2	0.7
Brazos	041	C	123166	2	1.6	152415	5	3.3	162350	8	4.9	168445	2	1.2
Brewster	043	A	10128	0	0.0	8866	0	0.0	9361	2	21.4	9630	0	0.0
Briscoe	045	C	1932	0	0.0	1790	0	0.0	1842	0	0.0	1868	0	0.0
Brooks	047	A	8727	0	0.0	7976	0	0.0	8272	4	48.4	8437	0	0.0
Brown	049	C	34310	1	2.9	37674	1	2.7	38918	0	0.0	39621	0	0.0

County	County FIPS	Vaccine group	1996			2000			2004			2006		
			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Burleson	051	C	14735	2	13.6	16470	1	6.1	17623	1	5.7	18247	0	0.0
Burnet	053	C	26344	1	3.8	34147	0	0.0	37688	0	0.0	39565	0	0.0
Caldwell	055	C	30400	0	0.0	32194	7	21.7	37073	4	10.8	39748	0	0.0
Calhoun	057	C	19774	5	25.3	20647	1	4.8	21761	0	0.0	22315	0	0.0
Callahan	059	C	11910	0	0.0	12905	3	23.2	12968	0	0.0	12989	0	0.0
Cameron	061	A	304345	215	70.6	335227	30	8.9	372610	44	11.8	392377	7	1.8
Camp	063	C	10426	2	19.2	11549	3	26.0	12436	0	0.0	12888	0	0.0
Carson	065	C	6498	0	0.0	6516	0	0.0	6573	0	0.0	6604	0	0.0
Cass	067	C	29873	3	10.0	30438	0	0.0	30329	0	0.0	30276	0	0.0
Castro	069	C	9393	2	21.3	8285	0	0.0	8614	0	0.0	8755	0	0.0
Chambers	071	C	20625	0	0.0	26031	1	3.8	30400	0	0.0	32708	0	0.0
Cherokee	073	C	43242	13	30.1	46659	2	4.3	48717	0	0.0	49852	0	0.0
Childress	075	C	6660	0	0.0	7688	0	0.0	7836	0	0.0	7891	0	0.0
Clay	077	C	10005	0	0.0	11006	0	0.0	11385	0	0.0	11578	0	0.0
Cochran	079	C	4668	1	21.4	3730	0	0.0	3874	0	0.0	3969	0	0.0
Coke	081	C	3414	1	29.3	3864	0	0.0	3912	0	0.0	3934	0	0.0
Coleman	083	C	9374	3	32.0	9235	0	0.0	9121	0	0.0	9061	0	0.0
Collin	085	C	356942	41	11.5	491675	57	11.6	623088	3	0.5	697668	3	0.4
Collingsworth	087	C	3446	0	0.0	3206	0	0.0	3246	0	0.0	3276	0	0.0
Colorado	089	C	18214	0	0.0	20390	1	4.9	21173	1	4.7	21616	2	9.3
Comal	091	C	65730	22	33.5	78021	6	7.7	89275	1	1.1	95238	0	0.0
Comanche	093	C	13217	14	105.9	14026	0	0.0	14188	3	21.1	14306	0	0.0
Concho	095	C	3206	0	0.0	3966	0	0.0	4078	0	0.0	4116	0	0.0
Cooke	097	C	31841	1	3.1	36363	5	13.8	38188	2	5.2	39167	0	0.0
Coryell	099	C	70798	1	1.4	74978	0	0.0	78749	2	2.5	80681	0	0.0
Cottle	101	C	2176	0	0.0	1904	0	0.0	1888	0	0.0	1895	0	0.0
Crane	103	C	4965	0	0.0	3996	0	0.0	4161	1	24.0	4243	0	0.0
Crockett	105	A	4247	0	0.0	4099	0	0.0	4321	0	0.0	4456	0	0.0
Crosby	107	C	7501	0	0.0	7072	2	28.3	7291	0	0.0	7389	1	13.5
Culberson	109	A	3862	0	0.0	2975	0	0.0	3129	0	0.0	3208	2	62.3
Dallam	111	C	5478	10	182.5	6222	1	16.1	6531	1	15.3	6682	0	0.0
Dallas	113	C	2058136	280	13.6	2218899	243	11.0	2325350	44	1.9	2385141	55	2.3
Dawson	115	C	15461	0	0.0	14985	1	6.7	15156	0	0.0	15212	0	0.0

County	County FIPS	Vaccine group	1996			2000			2004			2006		
			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Deaf Smith	117	C	19823	1	5.0	18561	3	16.2	19183	3	15.6	19467	3	15.4
Delta	119	C	4814	0	0.0	5327	0	0.0	5373	0	0.0	5365	0	0.0
Denton	121	C	357913	35	9.8	432976	9	2.1	537303	12	2.2	595367	14	2.4
DeWitt	123	C	19945	0	0.0	20013	0	0.0	20468	1	4.9	20733	0	0.0
Dickens	125	C	2496	0	0.0	2762	0	0.0	2744	0	0.0	2745	0	0.0
Dimmit	127	A	10974	1	9.1	10248	1	9.8	10549	0	0.0	10684	0	0.0
Donley	129	C	3532	1	28.3	3828	0	0.0	3851	0	0.0	3848	0	0.0
Duval	131	A	13760	2	14.5	13120	0	0.0	13527	0	0.0	13716	0	0.0
Eastland	133	C	17806	0	0.0	18297	1	5.5	18498	1	5.4	18624	0	0.0
Ector	135	C	124733	10	8.0	121123	2	1.7	124819	3	2.4	126989	0	0.0
Edwards	137	A	2431	0	0.0	2162	0	0.0	2215	0	0.0	2238	0	0.0
Ellis	139	C	106000	6	5.7	111360	8	7.2	128224	2	1.6	137541	0	0.0
El Paso	141	A	698945	228	32.6	679622	33	4.9	726708	19	2.6	751585	20	2.7
Erath	143	C	30465	1	3.3	33001	2	6.1	35268	0	0.0	36085	0	0.0
Falls	145	C	18659	0	0.0	18576	0	0.0	19114	0	0.0	19429	0	0.0
Fannin	147	C	26793	0	0.0	31242	4	12.8	32782	0	0.0	33555	0	0.0
Fayette	149	C	20251	0	0.0	21804	2	9.2	22927	0	0.0	23595	0	0.0
Fisher	151	C	4707	0	0.0	4344	1	23.0	4319	0	0.0	4293	0	0.0
Floyd	153	C	8670	0	0.0	7771	1	12.9	8010	0	0.0	8115	0	0.0
Foard	155	C	1739	0	0.0	1622	1	61.7	1608	0	0.0	1606	0	0.0
Fort Bend	157	C	295409	13	4.4	354452	19	5.4	429187	9	2.1	470524	9	1.9
Franklin	159	C	8002	1	12.5	9458	0	0.0	9462	0	0.0	9458	0	0.0
Freestone	161	C	16683	3	18.0	17867	0	0.0	18995	0	0.0	19603	0	0.0
Frio	163	A	15566	0	0.0	16252	0	0.0	17304	0	0.0	17821	0	0.0
Gaines	165	C	14697	1	6.8	14467	1	6.9	15077	0	0.0	15395	0	0.0
Galveston	167	C	228130	34	14.9	250158	16	6.4	266546	2	0.8	274862	7	2.5
Garza	169	C	5228	0	0.0	4872	0	0.0	5162	0	0.0	5299	0	0.0
Gillespie	171	C	18938	2	10.6	20814	0	0.0	21978	0	0.0	22614	0	0.0
Glasscock	173	C	1556	0	0.0	1406	0	0.0	1458	0	0.0	1494	0	0.0
Goliad	175	C	6334	1	15.8	6928	0	0.0	7312	0	0.0	7494	0	0.0
Gonzales	177	C2	17858	0	0.0	18628	12	64.4	19677	0	0.0	20255	0	0.0
Gray	179	C	23376	1	4.3	22744	3	13.2	22585	0	0.0	22522	0	0.0
Grayson	181	B	96497	21	21.8	110595	34	30.7	115700	2	1.7	118401	3	2.5

County	County FIPS	Vaccine group	1996			2000			2004			2006		
			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Gregg	183	C	106835	19	17.8	111379	5	4.5	115113	1	0.9	117233	2	1.7
Grimes	185	C	21369	0	0.0	23552	0	0.0	25241	0	0.0	26124	0	0.0
Guadalupe	187	C	77252	7	9.1	89023	3	3.4	100342	4	4.0	106387	3	2.8
Hale	189	C	36014	1	2.8	36602	1	2.7	37060	2	5.4	37240	1	2.7
Hall	191	C	3731	0	0.0	3782	1	26.4	3862	0	0.0	3902	0	0.0
Hamilton	193	C	7457	10	134.1	8229	1	12.2	8406	2	23.8	8502	0	0.0
Hansford	195	C	5865	1	17.1	5369	0	0.0	5579	0	0.0	5676	0	0.0
Hardeman	197	C	5078	0	0.0	4724	0	0.0	4766	0	0.0	4765	0	0.0
Hardin	199	C	42292	0	0.0	48073	0	0.0	50134	1	2.0	51121	1	2.0
Harris	201	C	3103870	546	17.6	3400578	287	8.4	3642461	136	3.7	3778101	28	0.7
Harrison	203	C	60899	2	3.3	62110	4	6.4	64563	0	0.0	65824	0	0.0
Hartley	205	C	4585	0	0.0	5537	0	0.0	5650	0	0.0	5688	0	0.0
Haskell	207	C	6639	0	0.0	6093	0	0.0	6108	0	0.0	6123	1	16.3
Hays	209	C	81029	18	22.2	97589	19	19.5	124616	2	1.6	138573	2	1.4
Hemphill	211	C	3663	0	0.0	3351	0	0.0	3536	0	0.0	3632	0	0.0
Henderson	213	C	68968	3	4.3	73277	10	13.6	78027	0	0.0	80476	0	0.0
Hidalgo	215	A	476151	354	74.3	569463	74	13.0	655202	32	4.9	701542	10	1.4
Hill	217	C	28091	4	14.2	32321	1	3.1	34671	2	5.8	35952	0	0.0
Hockley	219	C	24492	4	16.3	22716	5	22.0	23180	0	0.0	23446	0	0.0
Hood	221	C	36897	33	89.4	41100	15	36.5	46198	0	0.0	48898	8	16.4
Hopkins	223	C	29399	2	6.8	31960	2	6.3	32928	0	0.0	33393	0	0.0
Houston	225	C	21592	0	0.0	23185	0	0.0	23601	0	0.0	23845	0	0.0
Howard	227	C	32000	0	0.0	33627	1	3.0	34127	2	5.9	34398	1	2.9
Hudspeth	229	A	3210	0	0.0	3344	0	0.0	3577	0	0.0	3697	1	27.0
Hunt	231	C	70589	8	11.3	76596	7	9.1	86211	0	0.0	91085	0	0.0
Hutchinson	233	C	25088	6	23.9	23857	1	4.2	23631	0	0.0	23525	0	0.0
Irion	235	C	1709	0	0.0	1771	0	0.0	1820	0	0.0	1843	0	0.0
Jack	237	C	6901	0	0.0	8763	0	0.0	8903	0	0.0	8941	0	0.0
Jackson	239	C	13160	4	30.4	14391	0	0.0	14991	2	13.3	15313	0	0.0
Jasper	241	C	32009	6	18.7	35604	0	0.0	36752	0	0.0	37310	0	0.0
Jeff Davis	243	A	2100	0	0.0	2207	0	0.0	2253	0	0.0	2275	0	0.0
Jefferson	245	C	238890	8	3.3	252051	2	0.8	253414	11	4.3	254119	2	0.8
Jim Hogg	247	A	5885	1	17.0	5281	0	0.0	5534	1	18.1	5687	0	0.0

County	County FIPS	Vaccine group	1996			2000			2004			2006		
			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Jim Wells	249	C	39115	6	15.3	39326	2	5.1	41218	0	0.0	42163	0	0.0
Johnson	251	C	120283	6	5.0	126811	12	9.5	144005	4	2.8	153345	0	0.0
Jones	253	C	18239	0	0.0	20785	0	0.0	20861	1	4.8	20905	0	0.0
Karnes	255	C	15034	13	86.5	15446	0	0.0	16221	1	6.2	16603	0	0.0
Kaufman	257	C	63704	2	3.1	71313	8	11.2	84691	3	3.5	92168	0	0.0
Kendall	259	C	17417	0	0.0	23743	0	0.0	27018	2	7.4	28750	0	0.0
Kenedy	261	A	501	0	0.0	414	0	0.0	436	0	0.0	445	0	0.0
Kent	263	C	1010	0	0.0	859	0	0.0	853	0	0.0	853	0	0.0
Kerr	265	C	40118	4	10.0	43653	3	6.9	45498	0	0.0	46442	2	4.3
Kimble	267	C	4110	0	0.0	4468	0	0.0	4601	0	0.0	4640	0	0.0
King	269	C	376	0	0.0	356	0	0.0	362	0	0.0	367	0	0.0
Kinney	271	A	3293	0	0.0	3379	0	0.0	3488	0	0.0	3541	0	0.0
Kleberg	273	C	32813	5	15.2	31549	0	0.0	33283	0	0.0	33862	1	3.0
Knox	275	C	4758	0	0.0	4253	0	0.0	4279	1	23.4	4295	0	0.0
Lamar	277	C	43918	0	4.6	48499	50	103.1	49541	0	0.0	50014	0	0.0
Lamb	279	C	14786	2	13.5	14709	1	6.8	15090	0	0.0	15313	1	6.5
Lampasas	281	C	14206	7	49.3	17762	0	0.0	19610	1	5.1	20597	0	0.0
La Salle	283	A	6249	2	32.0	5866	1	17.0	6271	0	0.0	6473	0	0.0
Lavaca	285	C	18279	1	5.5	19210	1	5.2	19477	1	5.1	19618	0	0.0
Lee	287	C	14047	1	7.1	15657	1	6.4	16869	0	0.0	17550	0	0.0
Leon	289	C	14534	0	0.0	15335	1	6.5	16262	0	0.0	16769	0	0.0
Liberty	291	C	56549	0	0.0	70154	0	0.0	77738	1	1.3	81706	0	0.0
Limestone	293	C	21385	0	0.0	22051	0	0.0	23121	0	0.0	23661	0	0.0
Lipscomb	295	C	3094	0	0.0	3057	0	0.0	3104	0	0.0	3129	0	0.0
Live Oak	297	C	9878	2	20.2	12309	0	0.0	12543	0	0.0	12664	0	0.0
Llano	299	C	12196	0	0.0	17044	1	5.9	18307	0	0.0	18966	0	0.0
Loving	301	C	113	0	0.0	67	0	0.0	67	0	0.0	66	0	0.0
Lubbock	303	C	228029	14	6.1	242628	70	28.9	252941	12	4.7	256791	4	1.6
Lynn	305	C	6819	0	0.0	6550	0	0.0	6769	0	0.0	6856	0	0.0
McCulloch	307	C	3326	0	0.0	3738	0	0.0	3780	0	0.0	3814	0	0.0
McLennan	309	C	37940	2	5.3	37957	1	2.6	39205	2	5.1	39833	3	7.5
McMullen	311	A	41551	26	62.6	47297	4	8.5	50135	3	6.0	51509	0	0.0
Madison	313	C	8812	0	0.0	8205	0	0.0	8447	0	0.0	8550	0	0.0

County	County FIPS	Vaccine group	1996			2000			2004			2006		
			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Marion	315	C	191337	14	7.3	213517	5	2.3	219787	1	0.5	223768	0	0.0
Martin	317	C	859	0	0.0	851	0	0.0	860	0	0.0	863	0	0.0
Mason	319	C	11636	0	0.0	12940	0	0.0	13411	1	7.5	13636	0	0.0
Matagorda	321	C	10245	0	0.0	10941	1	9.1	11153	0	0.0	11224	1	8.9
Maverick	323	A	5267	0	0.0	4746	2	42.1	4977	0	0.0	5083	0	0.0
Medina	325	C	32175	4	12.4	39304	0	0.0	42309	1	2.4	43811	0	0.0
Menard	327	C	2283	0	0.0	2360	0	0.0	2373	0	0.0	2391	0	0.0
Midland	329	C	120419	33	27.4	116009	10	8.6	118092	3	2.5	119401	2	1.7
Milam	331	C	23122	2	8.6	24238	3	12.4	25621	0	0.0	26336	0	0.0
Mills	333	C	4459	0	0.0	5151	0	0.0	5187	0	0.0	5207	0	0.0
Mitchell	335	C	9808	2	20.4	9698	0	0.0	9873	0	0.0	9961	0	0.0
Montague	337	C	16446	5	30.4	19117	2	10.5	19370	0	0.0	19498	0	0.0
Montgomery	339	C	216674	6	2.8	293768	38	12.9	352556	21	6.0	384991	8	2.1
Moore	341	B	18608	11	59.1	20121	0	0.0	20692	0	0.0	20964	0	0.0
Morris	343	C	12951	0	0.0	13048	0	0.0	13176	0	0.0	13212	0	0.0
Motley	345	C	1469	0	0.0	1426	0	0.0	1430	0	0.0	1428	0	0.0
Nacogdoches	347	C	56398	2	3.5	59203	6	10.1	61608	2	3.2	63040	0	0.0
Navarro	349	C	42303	2	4.7	45124	0	0.0	48105	1	2.1	49807	0	0.0
Newton	351	C	14195	0	0.0	15072	0	0.0	15449	0	0.0	15594	0	0.0
Nolan	353	C	16829	0	0.0	15802	1	6.3	16040	1	6.2	16165	0	0.0
Nueces	355	B	311074	68	21.9	313645	6	1.9	321693	10	3.1	326193	7	2.1
Ochiltree	357	C	9109	0	0.0	9006	2	22.2	9413	0	0.0	9615	0	0.0
Oldham	359	C	2239	0	0.0	2185	0	0.0	2272	0	0.0	2319	0	0.0
Orange	361	C	81771	1	1.2	84966	9	10.6	87915	1	1.1	89253	0	0.0
Palo Pinto	363	C	26215	0	0.0	27026	1	3.7	28237	0	0.0	28865	0	0.0
Panola	365	C	23136	0	0.0	22756	0	0.0	23199	0	0.0	23397	2	8.5
Parker	367	C	81853	6	7.3	88495	4	4.5	103132	0	0.0	111082	1	0.9
Parmer	369	C	10264	1	9.7	10016	0	0.0	10351	0	0.0	10492	0	0.0
Pecos	371	A	16969	9	53.0	16809	0	0.0	17199	1	5.8	17389	1	5.8
Polk	373	C	35637	1	2.8	41133	1	2.4	44089	3	6.8	45621	1	2.2
Potter	375	B	103292	38	36.8	113546	12	10.6	117647	5	4.3	119866	0	0.0
Presidio	377	A	7857	6	76.4	7304	1	13.7	7945	0	0.0	8299	0	0.0
Rains	379	C	7565	0	0.0	9139	0	0.0	10626	0	0.0	11452	0	0.0

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			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Randall	381	B	101784	7	6.9	104312	4	3.8	112321	0	0.0	116294	1	0.9
Reagan	383	C	4909	0	0.0	3326	0	0.0	3511	0	0.0	3608	0	0.0
Real	385	A	2498	0	0.0	3047	0	0.0	3115	0	0.0	3151	0	0.0
Red River	387	C	13964	2	14.3	14314	0	0.0	14386	0	0.0	14404	0	0.0
Reeves	389	A	16658	3	18.0	13137	0	0.0	13316	0	0.0	13397	0	0.0
Refugio	391	C	8076	2	24.8	7828	0	0.0	8087	0	0.0	8201	0	0.0
Roberts	393	C	1017	0	0.0	887	0	0.0	912	0	0.0	926	0	0.0
Robertson	395	C	16477	0	0.0	16000	7	43.8	16629	4	24.1	16959	1	5.9
Rockwall	397	C	34301	0	0.0	43080	3	7.0	55581	2	3.6	62825	0	0.0
Runnels	399	C	11343	1	8.8	11495	0	0.0	11590	1	8.6	11646	0	0.0
Rusk	401	C	44809	3	6.7	47372	0	0.0	48484	1	2.1	49082	0	0.0
Sabine	403	C	10024	0	0.0	10469	0	0.0	10574	0	0.0	10599	0	0.0
San Augustine	405	C	7970	0	0.0	8946	0	0.0	9330	0	0.0	9455	0	0.0
San Jacinto	407	C	19228	0	0.0	22246	1	4.5	23592	0	0.0	24208	1	4.1
San Patricio	409	C	64851	21	32.4	67138	1	1.5	71838	0	0.0	74072	0	0.0
San Saba	411	C	5864	0	0.0	6186	0	0.0	6401	0	0.0	6502	0	0.0
Schleicher	413	C	3152	1	31.7	2935	0	0.0	3048	0	0.0	3126	0	0.0
Scurry	415	C	18837	1	5.3	16361	0	0.0	16597	0	0.0	16725	0	0.0
Shackelford	417	C	3215	0	0.0	3302	0	0.0	3350	0	0.0	3341	0	0.0
Shelby	419	C	21891	5	22.8	25224	1	4.0	26027	1	3.8	26461	2	7.6
Sherman	421	C	2912	1	34.3	3186	0	0.0	3288	0	0.0	3323	0	0.0
Smith	423	C	162186	27	16.6	174706	14	8.0	184873	1	0.5	190440	1	0.5
Somervell	425	C	6017	4	66.5	6809	1	14.7	7770	0	0.0	8299	0	0.0
Starr	427	A	53704	18	33.5	53597	2	3.7	58814	1	1.7	61508	0	0.0
Stephens	429	C	9207	2	21.7	9674	1	10.3	9792	0	0.0	9866	0	0.0
Sterling	431	C	1503	0	0.0	1393	0	0.0	1429	0	0.0	1455	0	0.0
Stonewall	433	C	1979	0	0.0	1693	0	0.0	1702	0	0.0	1712	0	0.0
Sutton	435	A	4393	0	0.0	4077	0	0.0	4327	0	0.0	4459	0	0.0
Swisher	437	C	8639	0	0.0	8378	0	0.0	8600	0	0.0	8685	1	11.5
Tarrant	439	C	1391979	165	11.9	1446219	131	9.1	1570071	41	2.6	1635837	24	1.5
Taylor	441	C	124450	11	8.8	126555	7	5.5	127178	5	3.9	127885	2	1.6
Terrell	443	A	1477	0	0.0	1081	0	0.0	1089	0	0.0	1098	0	0.0

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			population	cases	rate	population	cases	rate	population	cases	rate	population	cases	rate
Terry	445	B	13993	1	7.1	12761	0	0.0	13064	0	0.0	13197	0	0.0
Throckmorton	447	C	1844	0	0.0	1850	0	0.0	1876	0	0.0	1888	0	0.0
Titus	449	C	24865	1	4.0	28118	7	24.9	29400	2	6.8	30069	0	0.0
Tom Green	451	C	106509	21	19.7	104010	9	8.7	105143	6	5.7	105888	3	2.8
Travis	453	C	619582	143	23.1	812280	142	17.5	854084	17	2.0	873093	11	1.3
Trinity	455	C	12325	0	0.0	13779	0	0.0	14161	0	0.0	14351	0	0.0
Tyler	457	C	18075	0	0.0	20871	0	0.0	21215	0	0.0	21345	0	0.0
Upshur	459	C	32701	1	3.1	35291	1	2.8	36927	0	0.0	37748	0	0.0
Upton	461	C	4695	0	0.0	3404	1	29.4	3550	0	0.0	3646	0	0.0
Uvalde	463	A	24943	12	48.1	25926	0	0.0	26812	0	0.0	27246	0	0.0
Val Verde	465	A	42472	46	108.3	44856	3	6.7	47244	3	6.4	48375	1	2.1
Van Zandt	467	C	41189	28	68.0	48140	5	10.4	51432	1	1.9	53114	0	0.0
Victoria	469	C	78217	14	17.9	84088	3	3.6	87398	0	0.0	89034	1	1.1
Walker	471	C	55787	0	0.0	61758	1	1.6	64984	0	0.0	66201	2	3.0
Waller	473	C	25535	7	27.4	32663	1	3.1	37492	0	0.0	39913	0	0.0
Ward	475	C	13364	0	0.0	10909	0	0.0	11235	1	8.9	11408	0	0.0
Washington	477	C	28022	0	0.0	30373	2	6.6	31250	0	0.0	31799	0	0.0
Webb	479	A	164336	58	35.3	193117	9	4.7	221740	25	11.3	236952	5	2.1
Wharton	481	C	40561	4	9.9	41188	0	0.0	42832	1	2.3	43718	0	0.0
Wheeler	483	C	5539	4	72.2	5284	0	0.0	5166	0	0.0	5100	0	0.0
Wichita	485	C	126979	0	0.0	131664	4	3.0	133250	2	1.5	133986	13	9.7
Wilbarger	487	C	15196	15	98.7	14676	0	0.0	14730	0	0.0	14815	0	0.0
Willacy	489	A	19160	9	47.0	20082	0	0.0	21161	0	0.0	21720	0	0.0
Williamson	491	C	186904	2	1.1	249967	52	20.8	310228	4	1.3	343927	3	0.9
Wilson	493	C	27252	0	0.0	32408	0	0.0	37060	0	0.0	39524	1	2.5
Winkler	495	C	8872	1	11.3	7173	0	0.0	7404	0	0.0	7500	0	0.0
Wise	497	C	39645	1	2.5	48793	1	2.0	53754	0	0.0	56299	0	0.0
Wood	499	C	32112	2	6.2	36752	11	29.9	39272	0	0.0	40585	1	2.5
Yoakum	501	C	9197	1	10.9	7322	1	13.7	7698	1	13.0	7889	0	0.0
Young	503	C	17413	0	0.0	17943	2	11.1	17991	2	11.1	18027	0	0.0
Zapata	505	A	11508	0	0.0	12182	2	16.4	13456	1	7.4	14156	1	7.1
Zavala	507	A	13211	1	7.6	11600	0	0.0	12107	2	16.5	12350	0	0.0