ACUTE COMMUNICABLE DISEASE CONTROL

ANNUAL MORBIDITY REPORT
AND
SPECIAL STUDIES REPORT

2005

Los Angeles County
Department of Public Health

Public Health
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Acute Communicable Disease Control
Annual Morbidity Report
2005

● EXECUTIVE SUMMARY ●

In Los Angeles County (LAC), more than 80 diseases and conditions are reportable by law. This mandatory reporting requirement also includes unusual disease occurrences and outbreaks. Acute Communicable Disease Control (ACDC) is the lead program for the surveillance and investigation of most communicable diseases—responsibilities exclude tuberculosis, sexually transmitted diseases, and HIV or AIDS. Surveillance is primarily passive, with reports submitted via facsimile, mail, or telephone by providers and electronically from several laboratories. Reporting urgency varies according to disease and ranges from immediate reporting by telephone to the LAC Department of Public Health (DPH) to reporting required within 7 days of identification.

In addition to disease surveillance and investigation, ACDC sets policy and procedures for DPH activities related to infectious and communicable disease prevention and control. Our program interprets and enforces state and federal laws and regulations, and interfaces with other jurisdictions, programs and agencies responsible for public health. ACDC frequently serves as a consultant to the medical community on issues of communicable and infectious diseases and provides education to medical professionals.

ACDC has several units and special projects, each with unique goals and objectives for the surveillance and control of communicable disease:

- **Food and Water Safety Unit**: The aim of this unit is to decrease morbidity related to food and waterborne pathogens through surveillance to detect outbreaks and monitor trends. Pathogens of special interest include *Listeria*, norovirus and *Salmonella*.
- **Vectorborne Diseases and Central Nervous System Infections Unit**: This unit conducts surveillance and provides disease consultation for a variety of vectorborne and zoonotic diseases (e.g., West Nile virus, plague), meningococcal disease, and other causes of encephalitis and meningitis. The Varicella Surveillance Project has been operating for more than 10 years and as part of this unit.
- **Hospital Outreach Unit:** This unit assists hospitals with outbreak investigations, consults on infection control issues, and enhances communication with hospitals by interacting with infection control practitioners, emergency departments and laboratories.
- **Bloodborne Pathogens and Antimicrobial Resistance Unit**: Conducts surveillance and investigations of the viral hepatitis, MRSA, and invasive disease caused by meningococcus and group A streptococcus.

Los Angeles County:
A description of our community

In order to fully appreciate the magnitude of responsibilities required of ACDC and the impact of communicable disease in LAC, it is important to understand the character and dynamics of the county we serve. LAC is one of the nation's largest counties, covering over 4,000 square miles. While LAC enjoys fairly temperate, year-round weather, it encompasses a wide variety of geographic areas including mountain ranges, arid deserts, and over 80 miles of ocean coastline. Accordingly, one of the greatest challenges of disease surveillance, response and control in our county is responding to its enormous size. LAC presently has the largest population (nearly 10 million) of any county in the US and is exceeded by only eight states. LAC is densely populated, with over one-fourth of the state's population. Accordingly, medical services in LAC are also extensive—LAC is home to approximately 100 hospitals with 80 emergency departments, more than 30,000 licensed physicians, over 450 subacute healthcare facilities, and about 25 thousand retail food purveyors.

Another challenge is the extensive diversity of our population coupled with a high level of immigration. Nearly half of our residents are Latino (48%), around one-third White (30%), and around one-in-ten Asian (13%) or Black (9%). Our residents report over 90 languages as their primary spoken language. There is also substantial economic diversity within our county; while LAC is world renowned for its areas of wealth and privilege such as Beverly Hills and Bel Air, there is also considerable poverty—the 2000 US census recorded over 1.5 million residents (nearly 16% of LAC's population) living in poverty.

LAC is also a major port of entry for immigrants to the US. According to a 1999 survey, almost one-third of respondents stated they were born outside of the US. In 2002, the Immigration Naturalization Report found that California was home to the largest number of legal immigrants to the US, and over one-third of these immigrants reported settling in LAC. In addition to immigration, the population in our county is highly mobile. In terms of air travel alone, each year roughly 55 million travelers come through the Los Angeles International airport (over 40 million domestic and 14 million international flights yearly)—making it the nation's 3rd busiest airport.

- **Immunization Program**: The mission of this program is to improve the immunization coverage levels of LAC and prevent the occurrence of vaccine-preventable diseases. Activities include the perinatal hepatitis B case management, smallpox vaccination program, and the coordination of the influenza outreach program.
- **Bioterrorism Preparedness and Response Unit**: The aim of this unit is to plan, train and enhance surveillance and epidemiology capacity to detect and respond to a bioterrorist event. Efforts also include syndromic surveillance and responding to notable instances identified by these systems.

Additional information about ACDC and the aforementioned units are available at: www.lapublichealth.org/acd/index.htm.

Emerging and Re-Emerging Infectious Diseases—Los Angeles County, 2005

While optimists envision a day when we will conquer infectious diseases, the likelihood of this is far away as novel and reemerging diseases continually manifest—every year new diseases emerge and existing diseases acquire added prominence, and 2005 was no exception. One of the more noteworthy communicable disease events in LAC during 2005 was a countywide outbreak of hepatitis A (see 2005 Special Reports and the 2005 Annual Report for more information). In 2005, ACDC implemented CDC and Council of State and Territorial Epidemiologist (CSTE) criteria to standardize surveillance for acute hepatitis A.[1] This change in case definition of what is a confirmed case contributed to a significant decrease in both the *number* of confirmed cases during the first seven months of 2005 as compared to the same period in the previous year (63 versus 205 confirmed cases) as well as a decrease in the *percent* of confirmed cases (20% versus 84%) among suspected cases reported during those seven months. However, starting in August of 2005, there was a generalized increase of acute hepatitis A throughout the entire county including five discreet outbreaks. There were 680 cases reported with acute hepatitis A during the outbreak period, of which 417 (62%) met the CDC/CSTE laboratory or clinical criteria for acute hepatitis A. All tolled during this outbreak period (August-December), the incidence rate of acute hepatitis A was 10 times higher than the first seven months of 2005.

Emerging and Re-Emerging Diseases

- The latter half of 2005 saw a substantial increase in acute hepatitis A infections, including 5 outbreaks.
- In January, the first human death due to rabies in 30 years was identified.
- West Nile virus infection decreased substantially as compared to 2004; however, the virus is now enzootic to our region and further human cases can be expected.

Another disease of special note that re-emerged in 2005 was rabies. In January 2005, the first LAC human death due to rabies in 30 years was confirmed (see Special Reports 2005 for more information). While human rabies is very rare in the US, it is more common in other countries—and in particular, in countries whose citizens frequently immigrate to Los Angeles. Interviews with the decedent's household contacts and family members revealed no history of animal bites or exposures, but canine rabies is enzootic in El Salvador, Guatemala, and Mexico—the route he traveled to come to the US. Molecular studies by CDC identified the case's rabies strain as one not present in the US, but a canine variant from El Salvador. Risk of infection extended to many beyond this case; contact tracing identified at least 30 friends and family members to whom rabies post-exposure prophylaxis was highly recommended and 9 of 76 healthcare workers at risk were identified to receive post-exposure prophylaxis. This case illustrates the importance of considering the complete patient history, especially country of origin and travel history, during diagnosis. Moreover, many serious diseases (e.g., SARS, avian influenza) have

[1] Hepatitis surveillance is complicated by stringent case definitions that require the presence of a positive serologic test, evidence of liver damage, and clinical symptoms. Depending on the type of hepatitis, only 4-50% of the reported cases after investigation may be confirmed as acute.

nonspecific presentations that can easily be misdiagnosed; epidemiologic factors (i.e., exposure and travel history) are critical for accurate diagnosis.

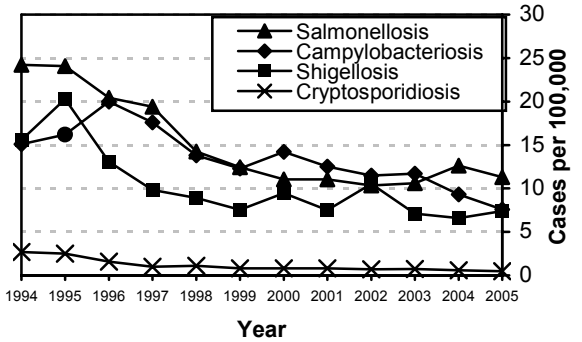
Finally, while West Nile virus (WNV) was undoubtedly one of the more notable infectious diseases to emerge in recent years, its local impact declined considerably in 2005. In 2004, LAC reported the greatest number of WNV infections of any jurisdiction in California, including 309 cases with 14 deaths. But in 2005, only 43 human WNV infections were reported, including 13 cases of encephalitis, 15 cases of meningitis, 9 cases of WNV fever, and 6 asymptomatic blood donors; there were no associated deaths. WNV environmental surveillance in mosquitoes, dead birds, and sentinel chickens documented that WNV has become enzootic in Los Angeles County (LAC). Corresponding to the 2005 human cases, there was dramatic decline in non-human WNV detections among horses, dead birds, mosquitoes, and sentinel chickens. Arbovirus experts speculate various environmental factors may have contributed to the decline of WNV activity in 2005—this includes changes in local weather conditions and aggressive mosquito abatement efforts. In addition, the massive crow die-off in 2004 dramatically reduced susceptible crow populations—a key component in the chain of WNV infection—which in turn contributed to declines in mosquito infection in 2005. Also it is likely that personal behaviors, such as increased use of mosquito repellant and avoidance of risky areas at prime mosquito times, may have played a role in the decline.

While the severity of future seasons cannot be predicted, WNV is now endemic to LAC and human cases will continue to occur. It is possible that human WNV cases will become more sporadic, with outbreaks occurring every 5-10 years—a cycle that been documented in WNV endemic areas outside of the US. Public health experts also predict that other arboviral diseases not currently found in the US, such as dengue, could be similarly introduced. Accordingly, having arboviral surveillance systems in place for early detection will remain important. Plus, healthcare providers must continue to be aware of proper diagnostic procedures, understand the importance of prompt reporting, and educate their patients to protect themselves against infection—especially those at high risk for neuroinvasive disease.

Food and Waterborne Diseases

Diseases spread by food and water sources make up much of the investigations and activities conducted by ACDC. Overall, food- and waterborne diseases have declined since the mid-1990's and have stabilized at lower rates as in Figure 1 (see campylobacteriosis, cryptosporidiosis, listeriosis, salmonellosis, shigellosis, typhoid fever, and vibriosis individual reports for more details). The declining trend in reported cases is most evident among the bacterial diseases campylobacteriosis and shigellosis. These findings mirror national trends depicting sustained decreases among many foodborne illnesses, particularly those of bacterial origin.[2,3,4] While the underlying causes for these local and national trends are not known, the implementation of many control measures are believed to be important factors in the reduction of food and water-related illnesses. On a national level, these include the expansion of federal food safety and inspection services as well as increased attention to fresh produce safety. Locally, a highly publicized restaurant grading system implemented

Figure 1
Food and Waterborne Disease
Incidence Rates by Year
LAC and US, 1994–2005



[2] CDC. Preliminary FoodNet data on the incidence of foodborne illnesses–Selected sites, United States, 2001. MMWR 2002; 51(15); 325-329. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm5215a4.htm

[3] CDC. Preliminary FoodNet data on the incidence of foodborne illnesses–Selected sites, United States, 2002. MMWR 2003; 52(15):340-343. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm5115a3.htm.

[4] CDC, Preliminary FoodNet Data on the Incidence of Infection with Pathogens Transmitted Commonly Through Food --- Selected Sites, United States, 2003. MMWR 2004; 53(16);338-343.

in LAC in 1998 may have also advanced food safety through education for food handlers and the public regarding best practices to reduce foodborne disease.

The LAC 2005 salmonellosis crude rate decreased 10.3% when compared to 2004 (Figure1). It has remained below the national rate since 1998 after an overall decrease of more than 100% since 1994. Nationally, the incidence of salmonellosis cases has also been decreasing, but at a much slower rate than it has for LAC in the previous 10 years. Although many food items and both potable and recreational water sources have been implicated in the transmission of salmonella, salmonellosis is most commonly associated with eggs, poultry, and fresh produce. Another prominent source is contact with reptiles, either directly or through surfaces or other people exposed to reptiles. In 2005, at least 98 (9.0%) of LAC salmonellosis cases had contact with turtles, lizards or snakes.

In 2005, ACDC investigated 20% fewer foodborne disease outbreaks than in 2004, but more persons were affected. There were 32 foodborne disease outbreaks representing 783 individuals with illness. While the overall incidence of these diseases has been decreasing, food- and waterborne diseases continue to account for considerable morbidity and mortality—thousands of preventable infections continue to occur yearly. The majority of people affected by these illnesses improve without complications; however, some infections may cause invasive disease especially among children, the elderly and those with certain chronic medical conditions (e.g., the immunocompromised), leading to hospitalization and fatality. In LAC, food- or waterborne diseases were a contributing factor to at least 16 deaths during 2005. Accordingly, further efforts to improve food and water quality and to educate food industry and the public about proper food storage, handling, and preparation are needed.

Vaccine Preventable Diseases

Ten vaccine-preventable diseases are monitored by the LAC Immunization Program—each requires its own sensitive surveillance system tailored to the unique epidemiology of the disease. Since 2003, LAC has met the national Healthy People Year 2010 [5] goal of having 80% of the 19–35 month old population receive the recommended 4:3:1:3:3 vaccination.[6] In 2005, LAC was recognized as one of the top five urban areas nationally having the highest 4:3:1:3:3 childhood vaccination coverage levels.

Vaccine Preventable Diseases

- In 2005, LAC was recognized as one of the top five urban areas nationally to have the highest recommended childhood vaccination coverage levels.
- However, during the same year, pertussis incidence hit a 30-year high in our county.

Despite these record high vaccination coverage levels, many challenges of controlling vaccine-preventable diseases continue in our county. For instance, a significant increase in the reported number of pertussis cases occurred in LAC during 2005 and a similar trend was identified throughout California and the US. In LAC, there was a three-fold increase in the number of reported cases as compared to the previous five-year average—not since the 1970s has LAC experiences this high magnitude of pertussis morbidity. While the cause of this rise in pertussis incidence is unknown, it may be due to a historical 3–5 year cyclical trend of increasing rates in conjunction with improved recognition and reporting. In addition, the rise may be related to the increase in cases reported among adolescents and adults—a typically under-recognized group for diagnosis and reporting, since pertussis is more commonly perceived as a disease of infants. More widespread use of the newly licensed DTaP vaccine for older children and adults may reverse this increasing trend in pertussis incidence.

In LAC and across California, other vaccine-preventable diseases such as measles, mumps, and rubella and invasive disease due to *Haemophilus influenzae* have been exhibiting low morbidity. However, these diseases continue to be endemic in other parts of the world. And in light of the LAC's high rates of immunization and international travel, it is imperative that our healthcare professionals be vigilant

5 http://www.healthyprople.gov/data/

6 Four or more doses of diphtheria, tetanus, acellular pertussis (DTaP) vaccine; 3 or more doses of polio vaccine; 1 dose of measles, mumps, rubella (MMR) vaccine; 3 doses of *Haemophilus influenzae* type b conjugate vaccine; and 3 doses of hepatitis B vaccine.

in their understanding, recognition, and reporting of these diseases. To assist, a rash-related illness surveillance system has been enacted in our county—as a consequence, over 60 reports of rash-related illness were investigated during 2005.

Among other vaccine-preventable diseases, our multi-lingual enhanced case management efforts continue to identify more infants exposed to perinatal hepatitis B—a 4% increase in case identification in 2005 as compared to the previous year. Because Asian/Pacific Islanders comprise the majority of pregnant women who test positive for hepatitis surface B antigen (81% in 2005), the Immunization Program's case managers speak 7 Asian languages including 4 Chinese dialects, and a full-time Korean case manager was added in 2005. Due to these increased efforts, over 96% of exposed infants in 2005 were able to receive immunization prophylaxis (for more information on perinatal hepatitis B efforts in LAC, see the 2005 Annual Morbidity Report).

Hospital Outreach Unit

In 2005, the most common cause of reported hospital outbreaks continued to be scabies. This was followed in number by outbreaks of *Clostridium difficile* enteritis and methicillin-resistant *Staphylococcus areaus* (MRSA) infections. In 2005, two high profile outbreaks occurred. The first, in January, was an outbreak of *Serratia marcescens* associated with cardio-thoracic surgery. A joint CDC investigation revealed the most likely source of infection as contaminated magnesium sulfate solution. The other outbreak involved MRSA infection and was associated with a hospital burn unit. Upon CDC laboratory analysis and review of the MRSA PFGE pattern, it was determined that the outbreak isolate was a unique Brazilian clone never before seen in LAC and rarely seen in the US. This Brazilian clone is the most common type of MRSA in parts of South America and has been reported in Hungary and Portugal, Argentina, Uruguay, Chile and the Czech Republic—but aside from the LAC event, only one other report of this strain causing an outbreak exists in the US. More detailed summaries of these investigations can be found in the Special Reports 2005 section.

In 2005, the most common outbreaks in skilled nursing and other sub-acute health facilities were due to scabies and gastroenteritis, similar to previous years. From 2004-2005, LAC experienced a dramatic increase in the number of reported scabies outbreaks in both acute care hospitals and skilled nursing facilities. The overall number of reported healthcare outbreaks has been steadily increasing over the last five years. Additional review of hospital outbreaks and investigations are available in ACDC's 2005 Morbidity Report. The Hospital Outreach Unit, a core feature of ACDC's continued outreach to the healthcare community, continues to enhance communication and outbreak reporting between health facilities and Public Health.

Bioterrorism Surveillance, Preparedness and Response

In 2001, the mandated list of reportable diseases was modified to provide greater emphasis on diseases deemed likely indicators of bioterrorism activity (i.e. anthrax, botulism, brucellosis, plague, smallpox, tularemia, and viral hemorrhagic fevers). Education to strengthen awareness and understanding of disease and outbreak reporting continued throughout 2005, and ACDC provided tailored educational materials related to disease reporting to healthcare providers in LAC.

Bioterrorism Preparedness

- In 2005, BT-related surveillance projects were further expanded and integrated into public health. These systems were shown to be useful indicators of morbidity and mortality.
- An assessment of our timely detection of diseases was done through an evaluation of brucellosis reporting.

The primary achievements of ACDC's Bioterrorism surveillance and preparedness sections during 2005 were the continued integration of activities into routine public health operations. Emergency department syndromic surveillance, which includes detecting major trends from baseline patterns of illness that may potentially identify bioterrorist-related activity, was continued at several local hospitals and additional hospitals were added to the system. Our syndromic surveillance proved capable of detecting patterns of illness and community

outbreaks and complemented traditional disease surveillance activities. Volume data from the ReddiNet® system for emergency department visits during influenza season strongly correlated with virologic test results. Since timely detection and reporting of cases is critical for effective disease surveillance, an evaluation of case “capture times” was performed on brucellosis cases, caused by an organism classified as a category B bioterrorism agent by the CDC.

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PURPOSE

The Acute Communicable Disease Control (ACDC) Annual Morbidity Report of the Los Angeles County Department of Public Health (DPH) is compiled to:

1. summarize annual morbidity from several acute communicable diseases occurring in Los Angeles County (LAC);
2. assess the effectiveness of established communicable disease control programs;
3. identify patterns of disease as a means of directing future disease prevention efforts;
4. identify limitations of the data used for the above purposes and to identify means of improving that data; and
5. serve as a resource for medical and public health authorities at county, state and national levels.

Note: The 2005 ACDC Annual Morbidity Report does not include information on tuberculosis, sexually transmitted diseases, or HIV and AIDS. Information regarding these diseases is available from their respective departments (see the LAC Public Health website for more information at www.lapublichealth.org.)

LAC DEMOGRAPHIC DATA

LAC population estimates used for this report are created by the Population Estimates and Projections System (PEPS) provided to the LAC DHS, Public Health by Urban Research. The LAC population is based on both estimates and projections that are adjusted when real relevant numbers become available (e.g., DMV records, Voters' registry, school enrollment and immigration records etc.).

National and California state counts of reportable diseases were obtained from the Centers for Disease Control and Prevention (CDC) Final 2005 Reports of Notifiable Diseases.[1] This report also includes US Census population estimates—these were used to calculate national and California rates of disease. According to that report, the population of the US in 2005 was 293,655,000 and the population of California was 35,894,000.

Long Beach and Pasadena are separate reporting jurisdictions, as recognized by the California Department of Health Services, and as such these two cities maintain their own disease reporting systems. Therefore, disease episodes occurring among residents of Long Beach and Pasadena have been excluded from LAC morbidity data, and their populations subtracted from LAC population data. Exceptions to this rule are noted in the text when they occur.

1. CDC. Notice to Readers: Final 2005 reports of notifiable diseases. MMWR 2006; 55(32):880–81. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm5532a4.htm

Table A. Los Angles County* population by year, 2000–2005

Year	Population	% change
2000	8,968,327	
2001	9,122,861	1.7%
2002	9,253,109	1.4%
2003	9,398,128	1.6%
2004	9,535,937	1.5%
2005	9,582,956	0.5%

* Does not include cities of Pasadena and Long Beach.

Table B. Los Angles County* population by age group, 2005

Age (in years)	Population	%
<1	143,353	1.5%
1–4	577,106	6.0%
5–14	1,476,492	15.4%
15–34	2,786,260	29.1%
35–44	1,512,205	15.8%
45–54	1,274,350	13.3%
55–64	840,938	8.8%
65+	972,252	10.1%
Total	**9,582,956**	**100.0%**

* Does not include cities of Pasadena and Long Beach.

Table C. Los Angles County* population by sex, 2005

Sex	Population	%
Male	4,741,895	49.5%
Female	4,841,061	50.5%
Total	**9,582,956**	**100.0%**

* Does not include cities of Pasadena and Long Beach.

Table D. Los Angles County* population by race, 2005

Race	Population	%
Asian	1,252,593	13.1%
Black	864,580	9.0%
Latino	4,548,070	47.5%
White	2,889,342	30.1%
Other**	28,371	0.3%
Total	**9,582,956**	**100.0%**

* Does not include cities of Pasadena and Long Beach.
** Includes American Indian, Alaskan Native, Eskimo and Aleut.

Table E. Los Angles County* population by health district and SPA, 2005

Health District	Population
SPA1	**342,804**
Antelope valley	342,804
SPA 2	**2,132,132**
East Valley	446,001
Glendale	353,472
San Fernando	477,255
West Valley	855,404
SPA 3	**1,701,396**
Alhambra	356,399
El Monte	464,104
Foothill	310,911
Pomona	569,982
SPA 4	**1,243,053**
Central	372,714
Hollywood Wilshire	537,152
Northeast	333,187
SPA 5	**649,712**
West	649,712
SPA 6	**1,036,466**
Compton	288,188
South	180,968
Southeast	169,204
Southwest	398,106
SPA 7	**1,372,034**
Bellflower	370,229
East Los Angeles	227,406
San Antonio	448,183
Whittier	326,216
SPA 8	**1,105,359**
Inglewood	429,740
Harbor	208,262
Torrance	467,357
Total	**9,582,956**

* Pasadena and Long Beach are separate health jurisdictions and as such are excluded from this table.

DATA SOURCES

Data on occurrence of communicable diseases in LAC were obtained through passive and sometimes active surveillance. Every health-care provider or administrator of a health facility or clinic, and anyone in charge of a public or private school, kindergarten, boarding school, or preschool knowing of a **case or suspected case** of a communicable disease is required to report it to the local health department as specified by the California Code of Regulations (Section 2500). Immediate reporting by telephone is also required for any **outbreak** or **unusual incidence** of infectious disease and any **unusual disease** not listed in Section 2500. Laboratories have separate requirements for reporting certain communicable diseases (Section 2505). Health-care providers must also give detailed instructions to household members in regard to precautionary measures to be taken for preventing the spread of disease (Section 2514).

1. Passive surveillance relies on physicians, laboratories, and other health-care providers to report diseases of their own accord to the DHS using the Confidential Morbidity Report (CMR) form, electronically, by telephone, or by facsimile.

2. Active surveillance entails ACDC staff regularly contacting hospitals, laboratories and physicians in an effort to identify all cases of a given disease.

DATA LIMITATIONS

This report should be interpreted in light of the following notable limitations:

1. Underreporting.
   The proportion of cases that are not reported varies for each disease. Evidence indicates that for some diseases as many as 98% of cases are not reported.

2. Reliability of Rates.
   All vital statistics rates, including morbidity rates, are subject to random variation. This variation is inversely related to the number of events (observations, cases) used to calculate the rate. The smaller the frequency of occurrence of an event, the less stable its occurrence from observation to observation. As a consequence, diseases with only a few cases reported per year can have highly unstable rates. The observation and enumeration of these “rare events” is beset with uncertainty. The observation of zero events is especially hazardous.

   To account for these instabilities, all rates in the ACDC Annual Morbidity Report based on less than 19 events are considered “unreliable.” This translates into a relative standard error of the rate of 23% or more, which is the cut-off for rate reliability used by the National Center for Health Statistics. Therefore, rates based on less than 19 events will not be reported because their standard errors and reliability cannot be determined. Readers may calculate the rates on their own using standard population tables.

   In the Annual Morbidity Report, rates of disease for groups (e.g., Latino versus non-Latino) are said to differ significantly only when two criteria are met: 1) group rates are reliable and 2) the 95% confidence limits for these rates do not overlap. Confidence limits are calculated only those rates which are reliable.

3. Case Fatality Rates.
   Some deaths from communicable diseases may not appear on LAC’s Vital Records computer files. Deaths are filed with only underlying cause of death indicated. Any contributing or otherwise significant conditions, including communicable diseases, are not indicated in the computer record. Also, case-fatality percent is based on deaths that occurred during the year regardless of year of disease onset; therefore, fatality data should be interpreted with caution.

4. Case Definitions.
   To standardize surveillance, CDC case definition for infectious diseases under public surveillance2 is used with some exceptions as noted in the text of the individual diseases. Since verification by a laboratory test is required for the diagnosis of some diseases, cases reported without such verification may not be true cases. Therefore, an association between a communicable disease and a death or an outbreak possibly may not be identified.

5. Onset Date versus Report Date.
   Some cases of disease occurring during the year were not reported until after this annual report was completed. Slight differences in the number of cases and rates of disease for the year may be observed in subsequent annual reports. Any such disparities are likely to be small.

6. Population Estimates.
   Estimates of the LAC population are subject to many errors. Furthermore, the population of LAC is in constant flux. Though not accounted for in census data, visitors and other non-residents may have an effect on disease occurrences.

7. Place of Acquisition of Infections.
   Some cases of diseases reported in LAC may have been acquired outside of the county. This may be especially true for many of the diseases common in Latino and Asian populations. Therefore, some disease rates more accurately reflect the place of diagnosis than the location where an infection was acquired.

8. Health Districts and Service Planning Areas.
   In 1994, the following health district boundaries changed: Central, Compton, Glendale, Inglewood, Northeast, San Fernando, West, and Torrance. San Fernando Health District was split into Antelope Valley and San Fernando Health Districts. In 1999, the 24 individual health districts were grouped into eight Service Planning Areas (SPA): SPA 1, Antelope Valley; SPA 2, San Fernando Valley; SPA 3, San Gabriel; SPA 4, Metro; SPA 5, West; SPA 6, South; SPA 7, East; and SPA 8, South Bay.

9. Race/Ethnicity Categories.
   - **Asian** – person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.
   - **American Indian** – person having origins in any of the original peoples of North America and who maintain cultural identification through tribal affiliation or community recognition.
   - **Black** – person having origins in any of the black racial groups of Africa.
   - **Latino** – person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
   - **White** – person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

STANDARD REPORT FORMAT

1. Crude data.
   - **Number of Cases**: For most diseases, this number reflects new cases of the disease with an onset in 2005. If the onset was unknown, the date of diagnosis was used.
   - **Annual Incidence Rates in LAC**: Number of new cases in 2005 divided by LAC census population (minus Long Beach and Pasadena) multiplied by 100,000.
   - **Annual Incidence Rates in the US and California**: 2005 incidence rates for the US and California were taken from the previously cited CDC publication, Morbidity and Mortality Weekly Report (MMWR). The MMWR records diseases by date of report rather than date of onset.
   - **Mean Age at Onset**: Arithmetic average age of all cases.
   - **Median Age at Onset**: The age that represents the midpoint of the sequence of all case ages.

2 CDC. Case Definitions for Infectious Conditions under Public Health Surveillance," MMWR 1997;46(RR-10):1-57. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00047449.htm

- **Range of Ages at Onset**: Ages of the youngest and oldest cases in 2005. For cases under one year of age, less than one (<1) was used.
- **Case Fatality**: Number of deaths in 2005 due to disease (when data were available) divided by the number of new cases of the disease in 2005, expressed as a percentage. Note that deaths may be due to infections acquired prior to 2005.

2. Etiology.
   This includes the causative agent, mode of spread, common symptoms, potential severe outcomes, susceptible groups, and vaccine-preventability.

3. Disease Abstract.
   This provides a synopsis or the highlights of disease activity in 2005.

4. Stratified Data.
   - **Trends**: Any trends in case characteristics during recent years.
   - **Seasonality**: Number of cases that occurred during each month of 2005.
   - **Age**: Annual rate of disease for individual age groups. Race-adjusted rates are presented for some diseases.
   - **Sex**: Male-to-female rate ratio of cases.
   - **Race/Ethnicity**: Annual rate of disease for the five major racial groups. Cases of unknown race are excluded; thus, race-specific rates may be underestimates. Age-adjusted rates are presented for some diseases.
   - **Location**: Location presented most often is the health district or SPA of residence of cases. Note that "location" rarely refers to the site of disease acquisition. Age-adjusted rates by location are presented for some diseases.

5. Prevention.
   If applicable, includes a description of county programs and other measures that address the disease.

6. Comments.
   Describes miscellaneous information not fitting easily into above categories, as well as elaboration of some findings of interest.

7. Additional Resources.
   Provides agencies, phone numbers, websites, and other resources on the subject.

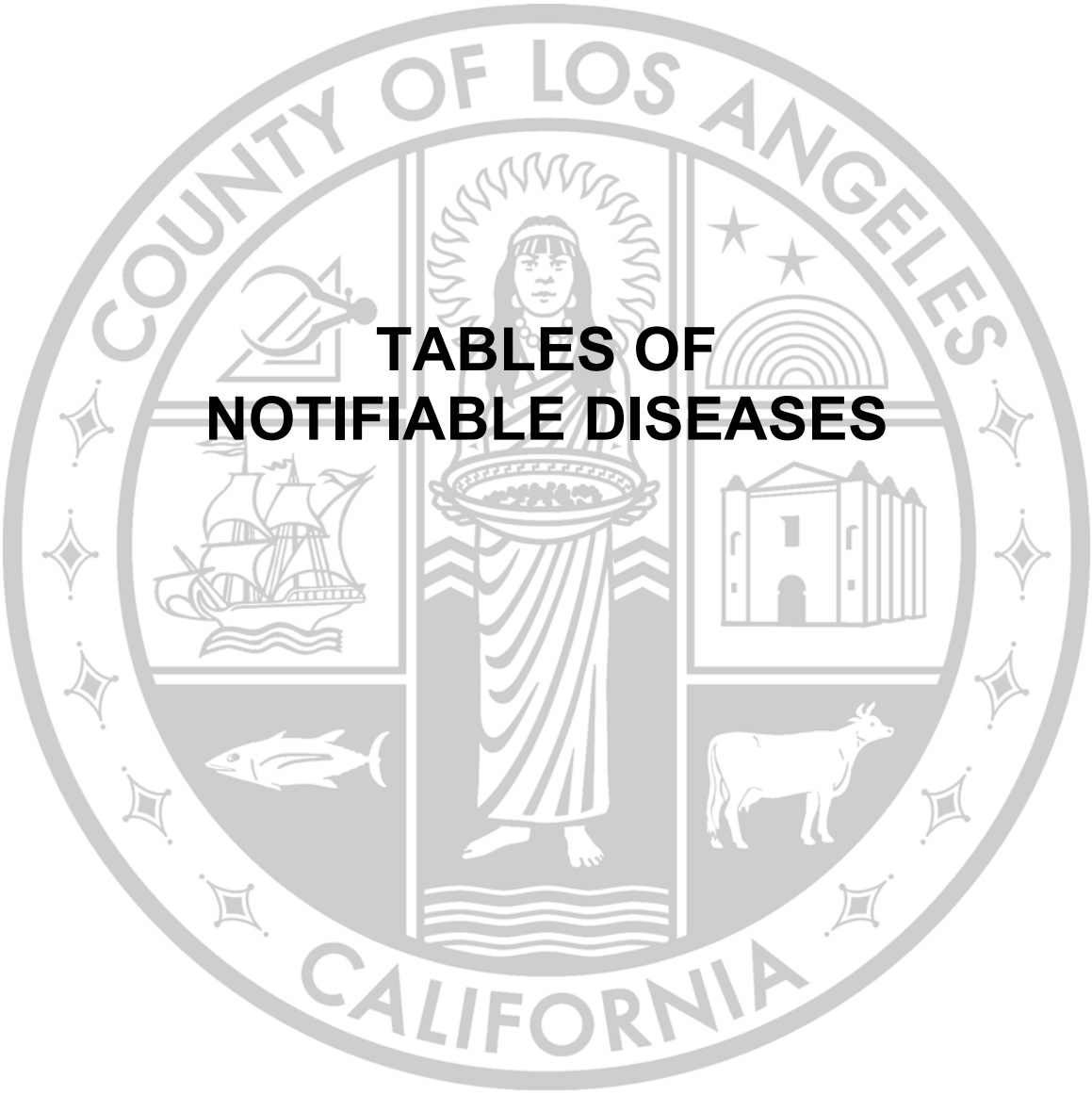
TABLE F. LIST OF ACRONYMS

The following abbreviations and acronyms may be found throughout this report.

95%CI	95 percent confidence interval	**HD**	Health District
ACDC	Acute Communicable Disease Control	**Hib**	*Haemophilus influenzae*, type b
AIDS	Acquired immunodeficiency syndrome	**HIV**	Human immunodeficiency virus
AR	Attack rate	**IgG**	Immunoglobulin G
CDC	Centers for Disease Control and Prevention	**IgM**	Immunoglobulin M
CDHS	California Dept. of Health Services	**LAC**	Los Angeles County
CMR	Confidential morbidity report	**MMR**	Mumps-Measles-Rubella vaccine
CSF	Cerebral spinal fluid	**MMWR**	Morbidity & Mortality Weekly Report
DHS	Department of Health Services	**N/A**	Not available
DTaP	Diphtheria-tetanus-acellular pertussis	**OR**	Odds ratio
DTP	Diphtheria-tetanus-pertussis vaccine	**PCP**	*Pneumocystis carinii pneumonia*
EHS	Environmental Health Services	**PHBPP**	Perinatal Hepatitis B Prevention Prgm.
GI	gastrointestinal	**RR**	Rate ratio or relative risk
GE	gastroenteritis	**SNF**	Skilled nursing facility
HAV	Hepatitis A virus	**sp. or spp.**	Species
HBIG	Hepatitis B Immunoglobulin	**SPA**	Service Planning Area
HBsAg	Hepatitis B surface antigen	**US**	United States
HBV	Hepatitis B virus	**VCMR**	Visual confidential morbidity report (software)
HCV	Hepatitis C virus		

LOS ANGELES COUNTY HEALTH DISTRICTS:

AH	Alhambra	**FH**	Foothill	**SE**	Southeast
AV	Antelope Valley	**GL**	Glendale	**SF**	San Fernando
BF	Bellflower	**HB**	Harbor	**SO**	South
CE	Central	**HW**	Hollywood/Wilshire	**SW**	Southwest
CN	Compton	**IW**	Inglewood	**TO**	Torrance
EL	East Los Angeles	**NE**	Northeast	**WE**	West
EV	East Valley	**PO**	Pomona	**WV**	West Valley
EM	El Monte	**SA**	San Antonio	**WH**	Whittier



TABLES OF NOTIFIABLE DISEASES

Table G. Reported Cases of Selected Notifiable Diseases by Year of Onset
Los Angeles County, 2000-2005

Disease	Year of Onset						Previous 5-year Average	5-Yr 95% upper Limit[a]
	2000	2001	2002	2003	2004	2005		
Amebiasis	109	139	102	121	114	114	117	142
Botulism [b]	0	2	2	0	3	8	1	4
Brucellosis	4	9	11	7	4	8	7	12
Campylobacteriosis	1273	1141	1067	1100	884	725	1093	1340
Cholera	0	0	0	1	0	0	0	1
Coccidioidomycosis [b]	58	68	76	73	133	214	82	133
Cryptosporidiosis	68	77	62	71	56	45	67	81
Cysticercosis	43	37	18	12	8	15	24	51
Dengue [b]	3	5	7	0	5	10	4	9
E. *coli* O157:H7	27	31	31	27	18	13	27	36
Encephalitis	49	41	61	38	133	57	64	133
Foodborne outbreaks	40	48	29	25	40	32	36	53
Giardiasis	509	446	441	401	320	313	423	545
Haemophilus influenzae type b	1	5	4	0	2	3	2	6
Hansen's Disease (Leprosy)	9	2	11	9	9	2	8	14
Hepatitis A	839	542	438	374	321	480	503	863
Hepatitis B	65	44	32	73	72	57	57	89
Hepatitis C	10	1	3	0	5	3	4	11
Hepatitis unspecified	11	1	0	1	0	4	3	11
Kawasaki syndrome	35	24	9	14	41	43	25	48
Legionellosis [b]	14	18	25	21	15	31	19	26
Listeriosis, nonperinatal	19	27	14	17	21	25	20	28
Listeriosis, perinatal	8	3	7	3	6	3	5	9
Lyme disease	7	5	8	6	0	7	5	11
Malaria	43	46	38	60	51	45	48	62
Measles	5	8	0	0	1	0	3	9
Meningitis, viral	263	378	466	899	807	515	563	1048
Meningococcal infections	53	58	46	32	28	37	43	66
Mumps	29	17	16	10	5	10	15	31
Pertussis [b]	102	103	172	130	156	438	133	187
Psittacosis	0	1	0	0	0	0	0	1
Q-fever	1	1	4	0	4	0	2	5
Relapsing fever	0	0	1	0	0	0	0	1
Rheumatic fever, acute	1	6	0	0	1	0	2	6
Rubella	3	0	0	0	0	1	1	3
Salmonellosis	990	1006	956	995	1205	1085	1030	1205
Shigellosis	849	684	974	669	625	710	760	1017
Strongyloidiasis	1	0	0	0	0	0	0	1
Tetanus	0	2	2	1	2	0	1	3
Trichinosis	0	0	0	0	0	0	0	0
Tularemia	0	0	0	1	0	0	0	1
Typhoid fever, case	21	17	33	16	13	12	20	34
Typhoid fever, carrier	6	1	6	2	3	4	4	8
Typhus fever	17	8	11	12	8	9	11	18
Vibrio	13	15	14	13	26	14	16	26

[a] The normal distribution assumption may not apply to some rare diseases.

[b] 2005 data over 95% upper limit.

Table H. Annual Incidence Rates of Selected Notifiable Diseases by Year of Onset
Los Angeles County, 2000-2005

Disease	Annual Incidence Rate (Cases per 100,000) [b]					
	2000	2001	2002	2003	2004	2005
Amebiasis	1.22	1.52	1.10	1.29	1.20	1.19
Botulism	-	0.02	0.02	-	0.03	0.08
Brucellosis	0.04	0.10	0.12	0.07	0.04	0.08
Campylobacteriosis	14.19	12.50	11.50	11.70	9.27	7.57
Cholera	-	-	-	0.01	-	-
Coccidioidomycosis	0.65	0.75	0.82	0.78	1.39	2.23
Cryptosporidiosis	0.76	0.84	0.67	0.75	0.59	0.47
Cysticercosis	0.48	0.41	0.19	0.13	0.08	0.16
Dengue	0.03	0.05	0.08	-	0.05	0.10
E. *coli* O157:H7	0.30	0.34	0.33	0.29	0.19	0.14
Encephalitis	0.55	0.45	0.66	0.40	1.39	0.59
Giardiasis	5.68	4.89	4.75	4.26	3.36	3.27
Haemophilus influenzae type b	0.01	0.05	0.04	-	0.02	0.03
Hansen's Disease (Leprosy)	0.10	0.02	0.12	0.10	0.09	0.02
Hepatitis A	9.36	5.94	4.72	3.98	3.37	5.01
Hepatitis B	0.72	0.48	0.34	0.78	0.76	0.59
Hepatitis C	0.11	0.01	0.03	-	0.05	0.03
Hepatitis unspecified	0.12	0.01	0.00	0.01	-	0.04
Kawasaki syndrome	0.39	0.26	0.10	0.15	0.43	0.45
Legionellosis	0.16	0.20	0.27	0.22	0.16	0.32
Listeriosis, nonperinatal	0.21	0.30	0.15	0.18	0.22	0.26
Listeriosis, perinatal[a]	5.46	2.05	4.96	2.12	4.25	2.14
Lyme disease	0.08	0.05	0.09	0.06	-	0.07
Malaria	0.48	0.50	0.41	0.64	0.53	0.47
Measles	0.06	0.09	-	-	0.01	-
Meningitis, viral	2.93	4.14	5.02	9.56	8.46	5.37
Meningococcal infections	0.59	0.64	0.50	0.34	0.29	0.39
Mumps	0.32	0.19	0.17	0.11	0.05	0.10
Pertussis	1.14	1.13	1.85	1.38	1.64	4.57
Psittacosis	-	0.01	-	-	-	-
Q-fever	0.01	0.01	0.04	-	0.04	-
Relapsing fever	-	-	0.01	-	-	-
Rheumatic fever, acute	0.01	0.07	-	-	0.01	-
Rubella	0.03	-	-	-	-	0.01
Salmonellosis	11.04	11.02	10.30	10.58	12.64	11.33
Shigellosis	9.47	7.50	10.50	7.11	6.55	7.41
Strongyloidiasis	0.01	-	-	-	-	-
Tetanus	-	0.02	0.02	0.01	0.02	-
Trichinosis	-	-	-	-	-	-
Tularemia	-	-	-	0.01	-	-
Typhoid fever, case	0.23	0.19	0.36	0.17	0.14	0.13
Typhoid fever, carrier	0.07	0.01	0.06	0.02	0.03	0.04
Typhus fever	0.19	0.09	0.12	0.13	0.08	0.09
Vibrio	0.14	0.16	0.15	0.14	0.27	0.15

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 live births.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table I. Five –Year Average of Notifiable Diseases by Month of Onset Los Angeles County, 2001-2005

Disease	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Amebiasis	7.2	8.2	9.0	7.6	9.2	8.4	10.0	10.4	9.6	6.8	8.0	9.4	117.8
Botulism	0.2	0.2	0.4	0.2	0.0	0.4	0.2	0.2	0.2	0.0	0.6	0.2	2.8
Brucellosis	0.8	1.0	0.8	0.2	0.2	0.6	1.2	0.8	0.2	1.0	0.6	0.2	7.8
Campylobacteriosis	69.2	53.4	66.2	78.0	94.0	103.6	113.0	102.4	88.6	80.2	76.6	52.2	980.6
Cholera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Coccidioidomycosis	9.0	5.2	5.6	8.0	8.6	6.6	8.4	11.2	13.0	11.8	10.0	7.6	113.8
Cryptosporidiosis	5.4	3.2	3.4	4.6	4.2	4.0	6.2	9.2	6.4	4.6	4.8	3.8	62.2
Cysticercosis	1.8	1.2	2.6	2.0	3.0	1.0	1.2	1.6	1.0	1.0	0.2	0.4	18.0
Dengue	0.0	0.4	0.0	0.2	0.4	0.4	0.8	1.2	0.8	0.4	0.0	0.0	5.0
E. *coli* O157:H7	1.4	0.2	1.0	1.0	1.4	2.4	4.8	4.6	3.2	2.2	1.0	0.4	23.8
Encephalitis	3.4	4.0	4.6	3.2	4.4	4.2	7.8	12.4	9.0	4.4	3.2	4.2	68.6
Giardiasis	29.2	21.4	29.0	29.0	29.2	30.2	38.4	38.6	34.0	29.8	26.6	20.0	383.4
Haemophilus influenzae type b	0.6	0.2	0.6	0.0	0.4	0.2	0.0	0.2	0.2	0.2	0.2	0.0	2.8
Hansen's Disease (Leprosy) [a]	-	-	-	-	-	-	-	-	-	-	-	-	-
Hepatitis A	34.8	27.0	28.8	23.8	26.8	23.0	32.0	39.2	42.4	45.8	45.2	37.0	433.2
Hepatitis B	5.8	7.2	5.4	6.0	6.6	6.0	4.2	3.6	2.2	7.0	7.6	7.4	70.0
Hepatitis C	1.0	0.8	0.4	0.8	0.6	1.2	0.4	0.4	0.8	1.0	1.0	2.2	11.4
Hepatitis unspecified	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	1.2
Kawasaki syndrome	3.0	2.6	3.2	2.4	2.2	2.8	1.6	2.2	1.4	0.6	1.0	1.8	25.6
Legionellosis	1.2	1.2	1.4	1.4	2.4	2.2	1.6	1.2	0.6	2.2	3.0	1.4	21.8
Listeriosis, nonperinatal	1.0	0.4	1.4	1.4	2.0	3.4	2.2	3.0	1.8	1.4	0.6	1.8	20.2
Listeriosis, perinatal	0.0	0.0	0.4	0.8	0.4	0.4	0.6	0.8	0.6	0.4	0.0	0.0	4.4
Lyme disease	0.2	0.0	0.2	0.0	0.0	0.6	1.0	0.8	0.4	0.4	0.0	0.0	3.6
Malaria[a]	-	-	-	-	-	-	-	-	-	-	-	-	-
Measles	0.2	0.4	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Meningitis, viral	20.0	16.2	20.0	25.0	29.2	45.6	83.8	109.0	85.4	47.4	37.2	22.6	615.6
Meningococcal infections	6.4	5.4	4.2	5.0	1.8	2.8	2.4	1.6	1.6	2.2	2.2	4.4	40.2
Mumps	0.6	1.2	1.0	0.4	1.2	1.2	1.6	1.2	0.4	1.0	1.0	0.8	11.6
Pertussis	13.6	9.2	11.0	12.6	14.6	16.6	20.4	25.0	23.0	21.0	15.4	17.4	199.8
Psittacosis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Q-fever	0.4	0.4	0.0	0.2	0.2	0.2	0.0	0.4	0.0	0.0	0.0	0.0	1.8
Relapsing fever	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2
Rheumatic fever, acute	0.4	0.2	0.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	1.4
Rubella	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Salmonellosis	68.0	50.4	66.4	71.2	96.2	97.8	117.2	117.0	114.0	91.4	69.4	55.0	1044.8
Shigellosis	44.8	29.4	31.8	27.2	33.2	50.8	79.8	114.2	111.0	95.2	56.2	50.2	729.4
Strongyloidiasis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tetanus	0.2	0.0	0.0	0.0	0.2	0.2	0.0	0.2	0.0	0.4	0.0	0.2	1.4
Trichinosis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tularemia	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Typhoid fever, case	0.8	0.8	1.8	1.6	1.2	2.8	2.0	3.0	2.2	0.8	0.4	0.8	18.2
Typhoid fever, carrier	0.0	0.0	0.8	0.0	0.2	0.6	0.8	0.2	0.2	0.0	0.2	0.2	3.2
Typhus fever	0.4	0.0	0.0	0.2	1.2	1.6	1.0	1.0	1.2	1.0	0.6	0.4	8.6
Vibrio	0.2	0.4	0.6	0.4	0.8	1.4	2.8	2.6	1.8	2.2	1.6	0.4	16.0

[a] Not applicable.

Table J. Number of Cases of Selected Notifiable Diseases by Age Group
Los Angeles County, 2005

Disease	<1	1-4	5-14	15-34	35-44	45-54	55-64	65+	Total[a]
Amebiasis	0	2	14	31	31	26	5	5	114
Botulism	0	0	0	1	4	2	0	1	8
Brucellosis	0	0	2	3	1	0	1	1	8
Campylobacteriosis	31	81	87	203	111	82	56	74	725
Cholera	0	0	0	0	0	0	0	0	0
Coccidioidomycosis	0	0	3	52	50	49	27	33	214
Cryptosporidiosis	0	1	1	10	20	7	4	2	45
Cysticercosis	0	0	0	6	4	1	3	1	15
Dengue	0	0	0	6	2	1	1	0	10
E. *coli* O157:H7	0	2	4	5	1	1	0	0	13
Encephalitis	3	6	18	11	6	5	0	7	57
Giardiasis	3	37	56	62	58	42	31	23	313
Haemophilus influenzae type b	1	0	1	0	0	0	0	1	3
Hansen's Disease (Leprosy)	0	0	0	1	1	0	0	0	2
Hepatitis A	0	7	24	198	88	88	44	30	480
Hepatitis B	0	0	0	18	21	10	2	6	57
Hepatitis C	0	0	0	1	1	0	1	0	3
Hepatitis unspecified	0	0	0	1	2	0	1	0	4
Kawasaki syndrome	7	29	7	0	0	0	0	0	43
Legionellosis	0	0	0	0	3	5	10	13	31
Listeriosis, nonperinatal	0	2	2	0	0	6	6	9	25
Listeriosis, perinatal[b]	0	0	0	2	1	0	0	0	0
Lyme disease	0	0	1	2	1	1	1	1	7
Malaria	0	0	3	21	8	10	2	1	45
Measles	0	0	0	0	0	0	0	0	0
Meningitis, viral	73	22	91	144	91	46	28	18	515
Meningococcal infections	3	2	6	12	3	3	5	3	37
Mumps	0	1	0	3	0	4	1	1	10
Pertussis	180	27	88	82	32	16	8	5	438
Psittacosis	0	0	0	0	0	0	0	0	0
Q-fever	0	0	0	0	0	0	0	0	0
Relapsing fever	0	0	0	0	0	0	0	0	0
Rheumatic fever, acute	0	0	0	0	0	0	0	0	0
Rubella	1	0	0	0	0	0	0	0	1
Salmonellosis	95	191	189	220	117	88	73	110	1085
Shigellosis	13	170	213	149	70	34	31	28	710
Strongyloidiasis	0	0	0	0	0	0	0	0	0
Tetanus	0	0	0	0	0	0	0	0	0
Trichinosis	0	0	0	0	0	0	0	0	0
Tularemia	0	0	0	0	0	0	0	0	0
Typhoid fever, case	0	1	2	7	0	2	0	0	12
Typhoid fever, carrier	0	0	0	1	0	2	0	1	4
Typhus fever	0	0	1	0	2	3	2	1	9
Vibrio	0	0	1	3	4	3	2	1	14

[a]Totals include cases with unknown age.

[b]Mother's age.

Table K. Incidence Rates of Selected Notifiable Diseases by Age Group
Los Angeles County, 2005

Disease	Age-group Rates (Cases per 100,000) [b]							
	<1	1-4	5-14	15-34	35-44	45-54	55-64	65+
Amebiasis	-	0.3	0.9	1.1	2.0	2.0	0.6	0.5
Botulism	-	-	-	-	0.3	0.2	-	0.1
Brucellosis	-	-	0.1	0.1	0.1	-	0.1	0.1
Campylobacteriosis	21.6	14.0	5.9	7.3	7.3	6.4	6.7	7.6
Cholera	-	-	-	-	-	-	-	-
Coccidioidomycosis	-	-	0.2	1.9	3.3	3.8	3.2	3.4
Cryptosporidiosis	-	0.2	0.1	0.4	1.3	0.5	0.5	0.2
Cysticercosis	-	-	-	0.2	0.3	0.1	0.4	0.1
Dengue	-	-	-	0.2	0.1	0.1	0.1	-
E. *coli* O157:H7	-	0.3	0.3	0.2	0.1	0.1	-	-
Encephalitis	2.1	1.0	1.2	0.4	0.4	0.4	-	0.7
Giardiasis	2.1	6.4	3.8	2.2	3.8	3.3	3.7	2.4
Haemophilus influenzae type b	0.7	-	0.1	-	-	-	-	0.1
Hansen's Disease (Leprosy)	-	-	-	-	0.1	-	-	-
Hepatitis A	-	1.2	1.6	7.1	5.8	6.9	5.2	3.1
Hepatitis B	-	-	-	0.6	1.4	0.8	0.2	0.6
Hepatitis C	-	-	-	-	0.1	-	0.1	-
Hepatitis unspecified	-	-	-	-	0.1	-	0.1	-
Kawasaki syndrome	4.9	5.0	0.5	-	-	-	-	-
Legionellosis	-	-	-	-	0.2	0.4	1.2	1.3
Listeriosis, nonperinatal	-	0.3	0.1	-	-	0.5	0.7	0.9
Listeriosis, perinatal[a]	-	-	1.8	3.9	-	-	-	-
Lyme disease	-	-	0.1	0.1	0.1	0.1	0.1	0.1
Malaria	-	-	0.2	0.8	0.5	0.8	0.2	0.1
Measles	-	-	-	-	-	-	-	-
Meningitis, viral	50.9	3.8	6.2	5.2	6.0	3.6	3.3	1.9
Meningococcal infections	2.1	0.3	0.4	0.4	0.2	0.2	0.6	0.3
Mumps	-	0.2	-	0.1	-	0.3	0.1	0.1
Pertussis	125.6	4.7	6.0	2.9	2.1	1.3	1.0	0.5
Psittacosis	-	-	-	-	-	-	-	-
Q-fever	-	-	-	-	-	-	-	-
Relapsing fever	-	-	-	-	-	-	-	-
Rheumatic fever, acute	-	-	-	-	-	-	-	-
Rubella	0.7	-	-	-	-	-	-	-
Salmonellosis	66.3	33.1	12.8	7.9	7.7	6.9	8.7	11.3
Shigellosis	9.1	29.5	14.4	5.3	4.6	2.7	3.7	2.9
Strongyloidiasis	-	-	-	-	-	-	-	-
Tetanus	-	-	-	-	-	-	-	-
Trichinosis	-	-	-	-	-	-	-	-
Tularemia	-	-	-	-	-	-	-	-
Typhoid fever, case	-	0.2	0.1	0.3	-	0.2	-	-
Typhoid fever, carrier	-	-	-	-	-	0.2	-	0.1
Typhus fever	-	-	0.1	-	0.1	0.2	0.2	0.1
Vibrio	-	-	0.1	0.1	0.3	0.2	0.2	0.1

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 live births.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table L. Number of Cases of Selected Notifiable Diseases by Race/Ethnicity
Los Angeles County, 2005

Disease	Asian	Black	Hispanic	White	Other[a]	Unknown
Amebiasis	5	7	46	47	2	2
Botulism	2	2	4	0	0	0
Brucellosis	0	0	6	2	0	0
Campylobacteriosis	65	24	318	302	4	11
Cholera	0	0	0	0	0	0
Coccidioidomycosis	15	28	70	96	0	3
Cryptosporidiosis	0	10	16	15	0	4
Cysticercosis	1	1	13	0	0	0
Dengue	4	0	5	1	0	0
E. *coli* O157:H7	0	0	1	12	0	0
Encephalitis	11	5	27	14	0	0
Giardiasis	20	17	101	149	4	4
Haemophilus influenzae type b	0	0	2	1	0	0
Hansen's Disease (Leprosy)	1	0	1	0	0	0
Hepatitis A	42	49	135	203	13	27
Hepatitis B	8	12	19	16	0	1
Hepatitis C	0	0	0	3	0	0
Hepatitis unspecified	1	0	1	1	0	0
Kawasaki syndrome	14	2	19	6	2	0
Legionellosis	7	2	10	12	0	0
Listeriosis, nonperinatal	5	2	9	9	0	0
Listeriosis, perinatal[b]	0	0	2	1	0	0
Lyme disease	1	0	0	4	0	2
Malaria	7	22	7	6	1	2
Measles	0	0	0	0	0	0
Meningitis, viral	39	55	242	151	3	22
Meningococcal infections	5	2	21	9	0	0
Mumps	4	0	1	4	0	1
Pertussis	14	31	245	147	1	0
Psittacosis	0	0	0	0	0	0
Q-fever	0	0	0	0	0	0
Relapsing fever	0	0	0	0	0	0
Rheumatic fever, acute	0	0	0	0	0	0
Rubella	1	0	0	0	0	0
Salmonellosis	105	74	494	392	7	3
Shigellosis	27	43	500	126	3	9
Strongyloidiasis	0	0	0	0	0	0
Tetanus	0	0	0	0	0	0
Trichinosis	0	0	0	0	0	0
Tularemia	0	0	0	0	0	0
Typhoid fever, case	6	0	6	0	0	0
Typhoid fever, carrier	1	0	3	0	0	0
Typhus fever	0	0	3	6	0	0
Vibrio	1	0	7	4	0	2

[a]Other includes Native American and any additional racial group that cannot be categorized as Asian, Black, Hispanic, and White.

[b]Mother's race.

Table M. Incidence Rates of Selected Notifiable Diseases by Race/Ethnicity
Los Angeles County, 2005

Disease	Race/Ethnicity Rates (Cases per 100,000) [b]			
	Asian	Black	Hispanic	White
Amebiasis	0.4	0.8	1.0	1.6
Botulism	0.2	0.2	0.1	-
Brucellosis	-	-	0.1	0.1
Campylobacteriosis	5.2	2.8	7.0	10.5
Cholera	-	-	-	-
Coccidioidomycosis	1.2	3.2	1.5	3.3
Cryptosporidiosis	-	1.2	0.4	0.5
Cysticercosis	0.1	0.1	0.3	-
Dengue	0.3	-	0.1	-
E. *coli* O157:H7	-	-	-	0.4
Encephalitis	0.9	0.6	0.6	0.5
Giardiasis	1.6	2.0	2.2	5.2
Haemophilus influenzae type b	-	-	-	-
Hansen's Disease (Leprosy)	0.1	-	-	-
Hepatitis A	3.4	5.7	3.0	7.0
Hepatitis B	0.6	1.4	0.4	0.6
Hepatitis C	-	-	-	0.1
Hepatitis unspecified	0.1	-	-	-
Kawasaki syndrome	1.1	0.2	0.4	0.2
Legionellosis	0.6	0.2	0.2	0.4
Listeriosis, nonperinatal	0.4	0.2	0.2	0.3
Listeriosis, perinatal[a]	-	-	2.2	4.1
Lyme disease	0.1	-	-	0.1
Malaria	0.6	2.5	0.2	0.2
Measles	-	-	-	-
Meningitis, viral	3.1	6.4	5.3	5.2
Meningococcal infections	0.4	0.2	0.5	0.3
Mumps	0.3	-	-	0.1
Pertussis	1.1	3.6	5.4	5.1
Psittacosis	-	-	-	-
Q-fever	-	-	-	-
Relapsing fever	-	-	-	-
Rheumatic fever, acute	-	-	-	-
Rubella	0.1	-	-	-
Salmonellosis	8.4	8.6	10.9	13.6
Shigellosis	2.2	5.0	11.0	4.4
Strongyloidiasis	-	-	-	-
Tetanus	-	-	-	-
Trichinosis	-	-	-	-
Tularemia	-	-	-	-
Typhoid fever, case	0.5	-	0.1	-
Typhoid fever, carrier	0.1	-	0.1	-
Typhus fever	-	-	0.1	0.2
Vibrio	0.1	-	0.2	0.1

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 live births.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table N. Number of Cases and Annual Incidence Rate of Selected Notifiable Diseases by Sex
Los Angeles County, 2005

Disease	Male		Female	
	Cases	Rate (Cases per 100,000) [b]	Cases	Rate (Cases per 100,000) [b]
Amebiasis	74	1.6	37	0.8
Botulism	6	0.1	2	0.0
Brucellosis	4	0.1	4	0.1
Campylobacteriosis	397	8.4	328	6.8
Cholera	0	-	0	-
Coccidioidomycosis	137	2.9	77	1.6
Cryptosporidiosis	38	0.8	7	0.1
Cysticercosis	9	0.2	6	0.1
Dengue	6	0.1	4	0.1
E. *coli* O157:H7	9	0.2	4	0.1
Encephalitis	32	0.7	25	0.5
Giardiasis	180	3.8	129	2.7
Haemophilus influenzae type b	2	0.0	1	0.0
Hansen's Disease (Leprosy)	0	-	2	0.0
Hepatitis A	300	6.3	178	3.7
Hepatitis B	45	0.9	12	0.2
Hepatitis C	1	0.0	2	0.0
Hepatitis unspecified	3	0.1	1	0.0
Kawasaki syndrome	28	0.6	15	0.3
Legionellosis	21	0.4	10	0.2
Listeriosis, nonperinatal	13	0.3	12	0.2
Listeriosis, perinatal [a]	1	1.4	-	-
Lyme disease	4	0.1	3	0.1
Malaria	34	0.7	11	0.2
Measles	0	-	0	-
Meningitis, viral	262	5.5	251	5.2
Meningococcal infections	18	0.4	19	0.4
Mumps	3	0.1	7	0.1
Pertussis	201	4.2	237	4.9
Psittacosis	0	-	0	-
Q-fever	0	-	0	-
Relapsing fever	0	-	0	-
Rheumatic fever, acute	0	-	0	-
Rubella	1	0.0	0	-
Salmonellosis	561	11.8	524	10.8
Shigellosis	358	7.5	352	7.3
Strongyloidiasis	0	-	0	-
Tetanus	0	-	0	-
Trichinosis	0	-	0	-
Tularemia	0	-	0	-
Typhoid fever, case	9	0.2	3	0.1
Typhoid fever, carrier	1	0.0	3	0.1
Typhus fever	3	0.1	6	0.1
Vibrio	6	0.1	8	0.2

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 live births.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-1. Selected Notifiable Diseases
SPA 1. Antelope Valley Area
Los Angeles County, 2005

Disease	Frequency	Rate (Cases per 100,000) [b]
	Antelope	Antelope
Amebiasis	0	-
Botulism	0	-
Brucellosis	0	-
Campylobacteriosis	19	5.5
Cholera	0	-
Coccidioidomycosis	79	23.0
Cryptosporidiosis	0	-
Cysticercosis	0	-
Dengue	1	0.3
E. *coli* O157:H7	1	0.3
Encephalitis	3	0.9
Giardiasis	9	2.6
Haemophilus influenzae type b	0	-
Hansen's Disease (Leprosy)	1	0.3
Hepatitis A	11	3.2
Hepatitis B	1	0.3
Hepatitis C	0	-
Hepatitis unspecified	0	-
Kawasaki syndrome	2	0.6
Legionellosis	0	-
Listeriosis, nonperinatal	1	0.3
Listeriosis, perinatal[a]	0	-
Lyme disease	0	-
Malaria	2	0.6
Measles	0	-
Meningitis, viral	41	12.0
Meningococcal infections	0	-
Mumps	0	-
Pertussis	46	13.4
Psittacosis	0	-
Q-fever	0	-
Relapsing fever	0	-
Rheumatic fever, acute	0	-
Rubella	0	-
Salmonellosis	28	8.2
Shigellosis	21	6.1
Strongyloidiasis	0	-
Tetanus	0	-
Trichinosis	0	-
Tularemia	0	-
Typhoid fever, case	1	0.3
Typhoid fever, carrier	1	0.3
Typhus fever	0	-
Vibrio	2	0.6

[a]Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b]Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-2. Selected Notifiable Diseases
SPA 2. San Fernando Area
Los Angeles County, 2005

Disease	Frequency					Rate (Cases per 100,000) [b]				
	EV	GL	SF	WV	TOTAL	EV	GL	SF	WV	TOTAL
Amebiasis	4	10	3	13	30	0.9	2.8	0.6	1.5	1.4
Botulism	1	0	1	0	2	0.2	-	0.2	-	0.1
Brucellosis	0	1	0	2	3	-	0.3	-	0.2	0.1
Campylobacteriosis	30	40	36	95	201	6.7	11.3	7.5	11.1	9.4
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	6	6	12	52	76	1.3	1.7	2.5	6.1	3.6
Cryptosporidiosis	2	2	0	6	10	0.4	0.6	-	0.7	0.5
Cysticercosis	0	0	0	1	1	-	-	-	0.1	0.0
Dengue	2	1	1	0	4	0.4	0.3	0.2	-	0.2
E. *coli* O157:H7	0	0	0	1	1	-	-	-	0.1	0.0
Encephalitis	2	3	2	8	15	0.4	0.8	0.4	0.9	0.7
Giardiasis	15	23	14	42	94	3.4	6.5	2.9	4.9	4.4
Haemophilus influenzae type b	0	0	0	1	1	-	-	-	0.1	0.0
Hansen's Disease (Leprosy)	0	0	0	0	0	-	-	-	-	-
Hepatitis A	9	21	11	37	78	2.0	5.9	2.3	4.3	3.7
Hepatitis B	1	2	2	5	10	0.2	0.6	0.4	0.6	0.5
Hepatitis C	0	0	0	1	1	-	-	-	0.1	0.0
Hepatitis unspecified	0	0	0	1	1	-	-	-	0.1	0.0
Kawasaki syndrome	3	1	3	2	9	0.7	0.3	0.6	0.2	0.4
Legionellosis	0	2	1	1	4	-	0.6	0.2	0.1	0.2
Listeriosis, nonperinatal	0	2	0	4	6	-	0.6	-	0.5	0.3
Listeriosis, perinatal[a]	0	0	0	0	0	-	-	-	-	-
Lyme disease	0	1	0	1	2	-	0.3	-	0.1	0.1
Malaria	1	3	4	3	11	0.2	0.8	0.8	0.4	0.5
Measles	0	0	0	0	0	-	-	-	-	-
Meningitis, viral	9	17	31	35	92	2.0	4.8	6.5	4.1	4.3
Meningococcal infections	2	0	3	2	7	0.4	-	0.6	0.2	0.3
Mumps	0	2	0	0	2	-	0.6	-	-	0.1
Pertussis	18	14	28	52	112	4.0	4.0	5.9	6.1	5.3
Psittacosis	0	0	0	0	0	-	-	-	-	-
Q-fever	0	0	0	0	0	-	-	-	-	-
Relapsing fever	0	0	0	0	0	-	-	-	-	-
Rheumatic fever, acute	0	0	0	0	0	-	-	-	-	-
Rubella	0	0	0	1	1	-	-	-	0.1	0.0
Salmonellosis	24	57	47	121	249	5.4	16.1	9.8	14.1	11.7
Shigellosis	19	12	39	63	133	4.3	3.4	8.2	7.4	6.2
Strongyloidiasis	0	0	0	0	0	-	-	-	-	-
Tetanus	0	0	0	0	0	-	-	-	-	-
Trichinosis	0	0	0	0	0	-	-	-	-	-
Tularemia	0	0	0	0	0	-	-	-	-	-
Typhoid fever, case	0	0	1	1	2	-	-	0.2	0.1	0.1
Typhoid fever, carrier	0	0	0	0	0	-	-	-	-	-
Typhus fever	0	1	0	0	1	-	0.3	-	-	0.0
VIbrio	0	0	2	1	3	-	-	0.4	0.1	0.1

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-3. Selected Notifiable Diseases
SPA 3. San Gabriel Area
Los Angeles County, 2005

Disease	Frequency					Rate (Cases per 100,000) [b]				
	AH	EM	FH	PO	TOTAL	AH	EM	FH	PO	TOTAL
Amebiasis	2	2	1	1	6	0.6	0.4	0.3	0.2	0.4
Botulism	1	0	1	0	2	0.3	-	0.3	-	0.1
Brucellosis	0	0	0	1	1	-	-	-	0.2	0.1
Campylobacteriosis	29	12	28	36	105	8.1	2.6	9.0	6.3	6.2
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	4	1	5	3	13	1.1	0.2	1.6	0.5	0.8
Cryptosporidiosis	1	1	1	1	4	0.3	0.2	0.3	0.2	0.2
Cysticercosis	0	1	0	1	2	-	0.2	-	0.2	0.1
Dengue	0	0	2	0	2	-	-	0.6	-	0.1
E. *coli* O157:H7	0	0	0	1	1	-	-	-	0.2	0.1
Encephalitis	2	0	2	1	5	0.6	-	0.6	0.2	0.3
Giardiasis	14	1	23	5	43	3.9	0.2	7.4	0.9	2.5
Haemophilus influenzae type b	0	0	0	0	0	-	-	-	-	-
Hansen's Disease (Leprosy)	0	0	0	0	0	-	-	-	-	-
Hepatitis A	18	5	19	14	56	5.1	1.1	6.1	2.5	3.3
Hepatitis B	1	1	0	2	4	0.3	0.2	-	0.4	0.2
Hepatitis C	0	0	0	0	0	-	-	-	-	-
Hepatitis unspecified	1	0	0	0	1	0.3	-	-	-	0.1
Kawasaki syndrome	2	0	1	5	8	0.6	-	0.3	0.9	0.5
Legionellosis	3	0	1	2	6	0.8	-	0.3	0.4	0.4
Listeriosis, nonperinatal	1	0	2	2	5	0.3	-	0.6	0.4	0.3
Listeriosis, perinatal[a]	0	0	0	0	0	-	-	-	-	-
Lyme disease	0	0	0	0	0	-	-	-	-	-
Malaria	2	0	0	3	5	0.6	-	-	0.5	0.3
Measles	0	0	0	0	0	-	-	-	-	-
Meningitis, viral	20	4	35	46	105	5.6	0.9	11.3	8.1	6.2
Meningococcal infections	2	0	2	3	7	0.6	-	0.6	0.5	0.4
Mumps	0	0	0	0	0	-	-	-	-	-
Pertussis	12	2	20	16	50	3.4	0.4	6.4	2.8	2.9
Psittacosis	0	0	0	0	0	-	-	-	-	-
Q-fever	0	0	0	0	0	-	-	-	-	-
Relapsing fever	0	0	0	0	0	-	-	-	-	-
Rheumatic fever, acute	0	0	0	0	0	-	-	-	-	-
Rubella	0	0	0	0	0	-	-	-	-	-
Salmonellosis	49	17	34	61	161	13.7	3.7	10.9	10.7	9.5
Shigellosis	24	10	23	23	80	6.7	2.2	7.4	4.0	4.7
Strongyloidiasis	0	0	0	0	0	-	-	-	-	-
Tetanus	0	0	0	0	0	-	-	-	-	-
Trichinosis	0	0	0	0	0	-	-	-	-	-
Tularemia	0	0	0	0	0	-	-	-	-	-
Typhoid fever, case	0	0	0	0	0	-	-	-	-	-
Typhoid fever, carrier	0	0	0	0	0	-	-	-	-	-
Typhus fever	4	0	1	0	5	1.1	-	0.3	-	0.3
Vibrio	0	0	1	0	1	-	-	0.3	-	0.1

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-4. Selected Notifiable Diseases
SPA 4. Metro Area
Los Angeles County, 2005

Disease	Frequency				Rate (Cases per 100,000) [b]			
	CE	HW	NE	TOTAL	CE	HW	NE	TOTAL
Amebiasis	10	24	3	37	2.7	4.5	0.9	3.0
Botulism	0	0	0	0	-	-	-	-
Brucellosis	0	0	1	1	-	-	0.3	0.1
Campylobacteriosis	22	42	13	77	5.9	7.8	3.9	6.2
Cholera	0	0	0	0	-	-	-	-
Coccidioidomycosis	3	1	6	10	0.8	0.2	1.8	0.8
Cryptosporidiosis	6	11	1	18	1.6	2.0	0.3	1.4
Cysticercosis	0	1	0	1	-	0.2	-	0.1
Dengue	1	0	0	1	0.3	-	-	0.1
E. *coli* O157:H7	0	1	0	1	-	0.2	-	0.1
Encephalitis	0	4	2	6	-	0.7	0.6	0.5
Giardiasis	11	33	4	48	3.0	6.1	1.2	3.9
Haemophilus influenzae type b	0	0	1	1	-	-	0.3	0.1
Hansen's Disease (Leprosy)	0	0	0	0	-	-	-	-
Hepatitis A	68	42	20	130	18.2	7.8	6.0	10.5
Hepatitis B	5	8	1	14	1.3	1.5	0.3	1.1
Hepatitis C	0	0	0	0	-	-	-	-
Hepatitis unspecified	0	0	0	0	-	-	-	-
Kawasaki syndrome	2	4	3	9	0.5	0.7	0.9	0.7
Legionellosis	0	0	1	1	-	-	0.3	0.1
Listeriosis, nonperinatal	0	0	0	0	-	-	-	-
Listeriosis, perinatal[a]	0	1	1	2	-	1.4	2.0	1.1
Lyme disease	0	1	0	1	-	0.2	-	0.1
Malaria	1	6	1	8	0.3	1.1	0.3	0.6
Measles	0	0	0	0	-	-	-	-
Meningitis, viral	6	13	23	42	1.6	2.4	6.9	3.4
Meningococcal infections	1	6	2	9	0.3	1.1	0.6	0.7
Mumps	0	2	0	2	-	0.4	-	0.2
Pertussis	10	20	7	37	2.7	3.7	2.1	3.0
Psittacosis	0	0	0	0	-	-	-	-
Q-fever	0	0	0	0	-	-	-	-
Relapsing fever	0	0	0	0	-	-	-	-
Rheumatic fever, acute	0	0	0	0	-	-	-	-
Rubella	0	0	0	0	-	-	-	-
Salmonellosis	32	83	33	148	8.6	15.5	9.9	11.9
Shigellosis	52	62	32	146	14.0	11.5	9.6	11.7
Strongyloidiasis	0	0	0	0	-	-	-	-
Tetanus	0	0	0	0	-	-	-	-
Trichinosis	0	0	0	0	-	-	-	-
Tularemia	0	0	0	0	-	-	-	-
Typhoid fever, case	0	0	0	0	-	-	-	-
Typhoid fever, carrier	0	0	0	0	-	-	-	-
Typhus fever	1	2	0	3	0.3	0.4	-	0.2
Vibrio	0	1	0	1	-	0.2	-	0.1

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-5. Selected Notifiable Diseases
SPA 5. West Area
Los Angeles County, 2005

Disease	Frequency	Rate (Cases per 100,000) [b]
	West	West
Amebiasis	17	2.6
Botulism	0	-
Brucellosis	0	-
Campylobacteriosis	107	16.5
Cholera	0	-
Coccidioidomycosis	4	0.6
Cryptosporidiosis	3	0.5
Cysticercosis	0	-
Dengue	0	-
E. *coli* O157:H7	2	0.3
Encephalitis	1	0.2
Giardiasis	34	5.2
Haemophilus influenzae type b	1	0.2
Hansen's Disease (Leprosy)	0	-
Hepatitis A	45	6.9
Hepatitis B	5	0.8
Hepatitis C	2	0.3
Hepatitis unspecified	0	-
Kawasaki syndrome	1	0.2
Legionellosis	1	0.2
Listeriosis, nonperinatal	4	0.6
Listeriosis, perinatal[a]	0	-
Lyme disease	2	0.3
Malaria	3	0.5
Measles	0	-
Meningitis, viral	11	1.7
Meningococcal infections	0	-
Mumps	5	0.8
Pertussis	31	4.8
Psittacosis	0	-
Q-fever	0	-
Relapsing fever	0	-
Rheumatic fever, acute	0	-
Rubella	0	-
Salmonellosis	87	13.4
Shigellosis	43	6.6
Strongyloidiasis	0	-
Tetanus	0	-
Trichinosis	0	-
Tularemia	0	-
Typhoid fever, case	1	0.2
Typhoid fever, carrier	0	-
Typhus fever	0	-
Vibrio	3	0.5

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-6. Selected Notifiable Diseases
SPA 6. South Area
Los Angeles County, 2005

Disease	Frequency					Rate (Cases per 100,000) [b]				
	CN	SO	SE	SW	TOTAL	CN	SO	SE	SW	TOTAL
Amebiasis	0	4	2	3	9	-	2.2	1.2	0.8	0.9
Botulism	0	1	0	0	1	-	0.6	-	-	0.1
Brucellosis	0	1	1	0	2	-	0.6	0.6	-	0.2
Campylobacteriosis	20	5	15	14	54	6.9	2.8	8.9	3.5	5.2
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	2	2	2	4	10	0.7	1.1	1.2	1.0	1.0
Cryptosporidiosis	0	2	1	1	4	-	1.1	0.6	0.3	0.4
Cysticercosis	0	0	0	2	2	-	-	-	0.5	0.2
Dengue	0	0	0	1	1	-	-	-	0.3	0.1
E. *coli* O157:H7	0	0	0	0	0	-	-	-	-	-
Encephalitis	0	0	3	0	3	-	-	1.8	-	0.3
Giardiasis	2	5	3	13	23	0.7	2.8	1.8	3.3	2.2
Haemophilus influenzae type b	0	0	0	0	0	-	-	-	-	-
Hansen's Disease (Leprosy)	0	0	0	0	0	-	-	-	-	-
Hepatitis A	7	4	11	8	30	2.4	2.2	6.5	2.0	2.9
Hepatitis B	5	0	0	2	7	1.7	-	-	0.5	0.7
Hepatitis C	0	0	0	0	0	-	-	-	-	-
Hepatitis unspecified	0	0	0	0	0	-	-	-	-	-
Kawasaki syndrome	0	1	0	2	3	-	0.6	-	0.5	0.3
Legionellosis	1	0	0	1	2	0.3	-	-	0.3	0.2
Listeriosis, nonperinatal	0	1	1	1	3	-	0.6	0.6	0.3	0.3
Listeriosis, perinatal[a]	0	0	1	0	1	-	-	3.6	-	0.6
Lyme disease	0	0	0	0	0	-	-	-	-	-
Malaria	1	2	1	3	7	0.3	1.1	0.6	0.8	0.7
Measles	0	0	0	0	0	-	-	-	-	-
Meningitis, viral	24	5	2	7	38	8.3	2.8	1.2	1.8	3.7
Meningococcal infections	1	1	2	1	5	0.3	0.6	1.2	0.3	0.5
Mumps	0	0	0	0	0	-	-	-	-	-
Pertussis	19	11	13	18	61	6.6	6.1	7.7	4.5	5.9
Psittacosis	0	0	0	0	0	-	-	-	-	-
Q-fever	0	0	0	0	0	-	-	-	-	-
Relapsing fever	0	0	0	0	0	-	-	-	-	-
Rheumatic fever, acute	0	0	0	0	0	-	-	-	-	-
Rubella	0	0	0	0	0	-	-	-	-	-
Salmonellosis	23	26	16	44	109	8.0	14.4	9.5	11.1	10.5
Shigellosis	24	24	46	26	120	8.3	13.3	27.2	6.5	11.6
Strongyloidiasis	0	0	0	0	0	-	-	-	-	-
Tetanus	0	0	0	0	0	-	-	-	-	-
Trichinosis	0	0	0	0	0	-	-	-	-	-
Tularemia	0	0	0	0	0	-	-	-	-	-
Typhoid fever, case	0	0	1	2	3	-	-	0.6	0.5	0.3
Typhoid fever, carrier	0	0	0	1	1	-	-	-	0.3	0.1
Typhus fever	0	0	0	0	0	-	-	-	-	-
VIbrio	1	0	0	1	2	0.3	-	-	0.3	0.2

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

Table O-7. Selected Notifiable Diseases
SPA 7. East Area
Los Angeles County, 2005

Disease	Frequency					Rate (Cases per 100,000) [b]				
	BF	EL	SA	WH	TOTAL	BF	EL	SA	WH	TOTAL
Amebiasis	1	2	4	2	9	0.3	0.9	0.9	0.6	0.7
Botulism	0	0	0	0	0	-	-	-	-	-
Brucellosis	0	0	0	0	0	-	-	-	-	-
Campylobacteriosis	18	14	25	24	81	4.9	6.2	5.6	7.4	5.9
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	4	2	7	3	16	1.1	0.9	1.6	0.9	1.2
Cryptosporidiosis	0	2	0	2	4	-	0.9	-	0.6	0.3
Cysticercosis	2	0	4	0	6	0.5	-	0.9	-	0.4
Dengue	0	0	0	0	0	-	-	-	-	-
E. *coli* O157:H7	0	0	0	2	2	-	-	-	0.6	0.1
Encephalitis	5	2	2	1	10	1.4	0.9	0.4	0.3	0.7
Giardiasis	9	3	11	7	30	2.4	1.3	2.5	2.1	2.2
Haemophilus influenzae type b	0	0	0	0	0	-	-	-	-	-
Hansen's Disease (Leprosy)	1	0	0	0	1	0.3	-	-	-	0.1
Hepatitis A	12	12	14	12	50	3.2	5.3	3.1	3.7	3.6
Hepatitis B	4	2	0	2	8	1.1	0.9	-	0.6	0.6
Hepatitis C	0	0	0	0	0	-	-	-	-	-
Hepatitis unspecified	0	0	0	0	0	-	-	-	-	-
Kawasaki syndrome	1	0	3	0	4	0.3	-	0.7	-	0.3
Legionellosis	0	2	0	4	6	-	0.9	-	1.2	0.4
Listeriosis, nonperinatal	1	1	0	1	3	0.3	0.4	-	0.3	0.2
Listeriosis, perinatal[a]	0	0	0	0	0	-	-	-	-	-
Lyme disease	0	0	0	0	0	-	-	-	-	-
Malaria	1	0	2	0	3	0.3	-	0.4	-	0.2
Measles	0	0	0	0	0	-	-	-	-	-
Meningitis, viral	38	11	26	39	114	10.3	4.8	5.8	12.0	8.3
Meningococcal infections	1	0	3	2	6	0.3	-	0.7	0.6	0.4
Mumps	0	0	0	0	0	-	-	-	-	-
Pertussis	6	8	18	7	39	1.6	3.5	4.0	2.1	2.8
Psittacosis	0	0	0	0	0	-	-	-	-	-
Q-fever	0	0	0	0	0	-	-	-	-	-
Relapsing fever	0	0	0	0	0	-	-	-	-	-
Rheumatic fever, acute	0	0	0	0	0	-	-	-	-	-
Rubella	0	0	0	0	0	-	-	-	-	-
Salmonellosis	49	31	56	21	157	13.2	13.6	12.5	6.4	11.4
Shigellosis	17	21	49	20	107	4.6	9.2	10.9	6.1	7.8
Strongyloidiasis	0	0	0	0	0	-	-	-	-	-
Tetanus	0	0	0	0	0	-	-	-	-	-
Trichinosis	0	0	0	0	0	-	-	-	-	-
Tularemia	0	0	0	0	0	-	-	-	-	-
Typhoid fever, case	0	2	0	0	2	-	0.9	-	-	0.1
Typhoid fever, carrier	0	2	0	0	2	-	0.9	-	-	0.1
Typhus fever	0	0	0	0	0	-	-	-	-	-
VIbrio	0	0	0	1	1	-	-	-	0.3	0.1

[a]Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b]Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

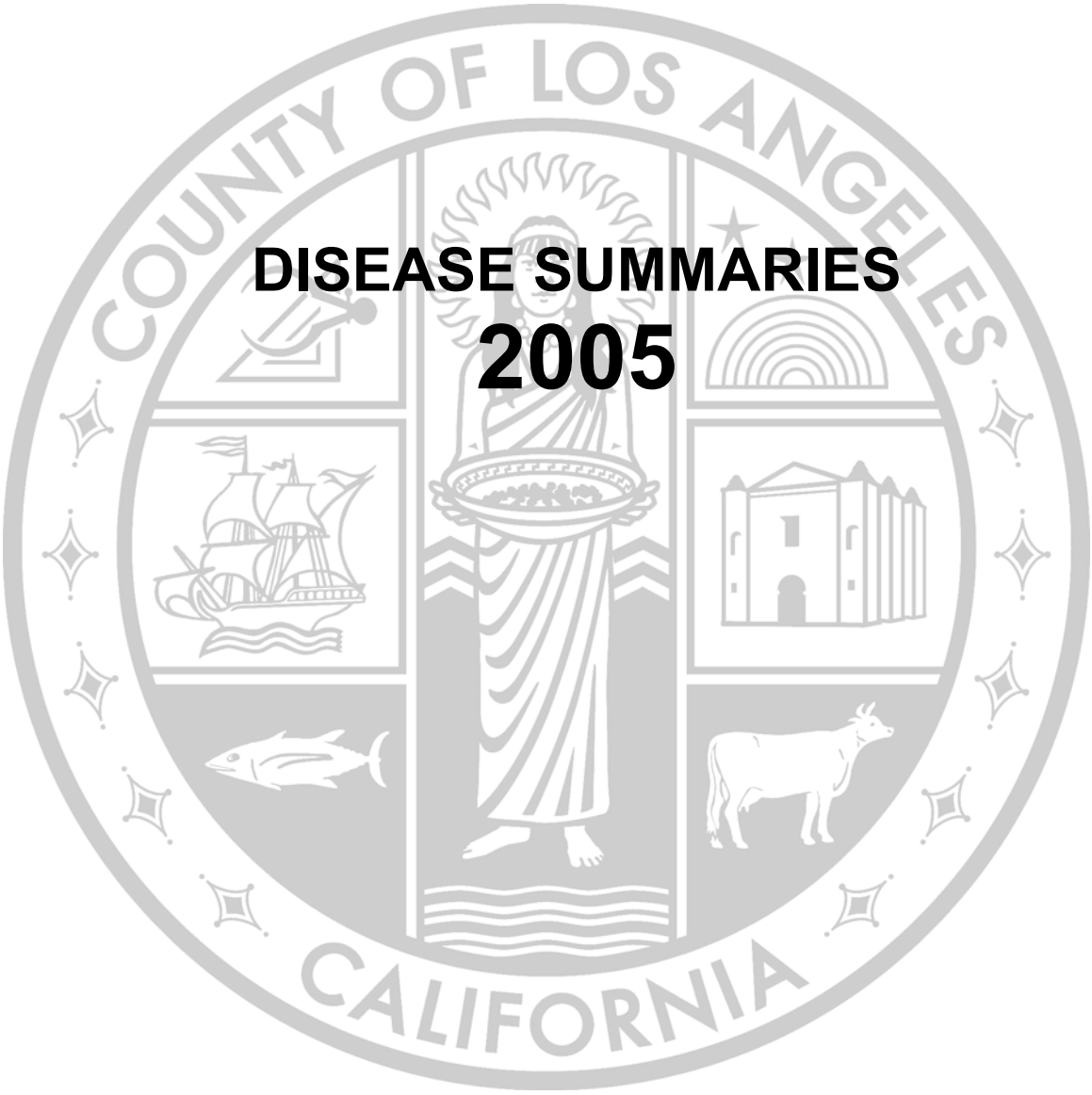
Table O-8. Selected Notifiable Diseases
SPA 8. South Bay Area
Los Angeles County, 2005

Disease	Frequency				Rate (Cases per 100,000) [b]			
	HB	IW	TO	TOTAL	HB	IW	TO	TOTAL
Amebiasis	1	3	2	6	0.5	0.7	0.4	0.5
Botulism	1	2	0	3	0.5	0.5	-	0.3
Brucellosis	0	1	0	1	-	0.2	-	0.1
Campylobacteriosis	19	34	28	81	9.1	7.9	6.0	7.3
Cholera	0	0	0	0	-	-	-	-
Coccidioidomycosis	1	0	4	5	0.5	-	0.9	0.5
Cryptosporidiosis	0	1	1	2	-	0.2	0.2	0.2
Cysticercosis	1	1	1	3	0.5	0.2	0.2	0.3
Dengue	1	0	0	1	0.5	-	-	0.1
E. *coli* O157:H7	3	0	2	5	1.4	-	0.4	0.5
Encephalitis	8	1	1	10	3.8	0.2	0.2	0.9
Giardiasis	8	8	16	32	3.8	1.9	3.4	2.9
Haemophilus influenzae type b	0	0	0	0	-	-	-	-
Hansen's Disease (Leprosy)	0	0	0	0	-	-	-	-
Hepatitis A	11	24	23	58	5.3	5.6	4.9	5.2
Hepatitis B	2	2	4	8	1.0	0.5	0.9	0.7
Hepatitis C	0	0	0	0	-	-	-	-
Hepatitis unspecified	0	0	0	0	-	-	-	-
Kawasaki syndrome	2	3	2	7	1.0	0.7	0.4	0.6
Legionellosis	0	0	1	1	-	-	0.2	0.1
Listeriosis, nonperinatal	0	1	1	2	-	0.2	0.2	0.2
Listeriosis, perinatal[a]	0	0	0	0	-	-	-	-
Lyme disease	1	0	1	2	0.5	-	0.2	0.2
Malaria	1	3	2	6	0.5	0.7	0.4	0.5
Measles	0	0	0	0	-	-	-	-
Meningitis, viral	13	31	26	70	6.2	7.2	5.6	6.3
Meningococcal infections	0	1	2	3	-	0.2	0.4	0.3
Mumps	0	0	1	1	-	-	0.2	0.1
Pertussis	20	21	21	62	9.6	4.9	4.5	5.6
Psittacosis	0	0	0	0	-	-	-	-
Q-fever	0	0	0	0	-	-	-	-
Relapsing fever	0	0	0	0	-	-	-	-
Rheumatic fever, acute	0	0	0	0	-	-	-	-
Rubella	0	0	0	0	-	-	-	-
Salmonellosis	55	40	46	141	26.4	9.3	9.8	12.8
Shigellosis	14	21	25	60	6.7	4.9	5.3	5.4
Strongyloidiasis	0	0	0	0	-	-	-	-
Tetanus	0	0	0	0	-	-	-	-
Trichinosis	0	0	0	0	-	-	-	-
Tularemia	0	0	0	0	-	-	-	-
Typhoid fever, case	1	2	0	3	0.5	0.5	-	0.3
Typhoid fever, carrier	0	0	0	0	-	-	-	-
Typhus fever	0	0	0	0	-	-	-	-
Vibrio	0	0	1	1	-	-	0.2	0.1

[a] Rates for perinatal listeriosis were calculated as cases per 100,000 women aged 15 to 44 years.

[b] Rates of disease based on less than 20 cases or events are considered "unreliable." A zero rate made from no events is especially hazardous and are not reported here, except with a dash ("-"). Conclusions drawn from unreliable rates should be made with caution, if they are to be made at all.

DISEASE SUMMARIES
2005

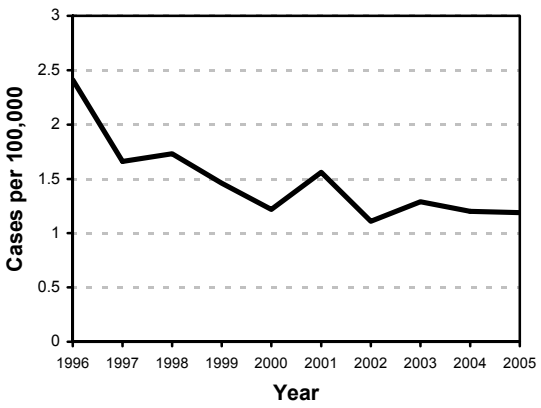


AMEBIASIS

CRUDE DATA	
Number of Cases	114
Annual Incidence[a]	
LA County	1.19
United States	N/A
Age at Diagnosis	
Mean	37
Median	38
Range	2–83 years
Case Fatality	
LA County	0%
United States	N/A

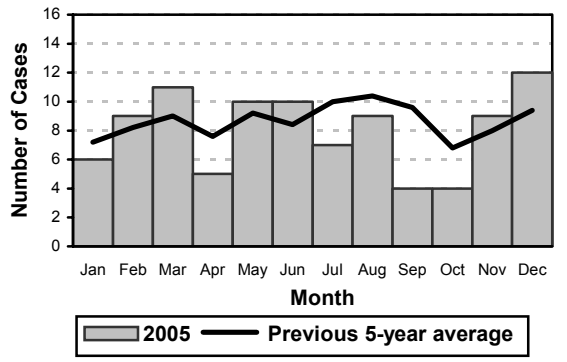
[a] Cases per 100,000 population.

Figure 1
Amebiasis
Incidence Rates by Year
LAC, 1996–2005



DESCRIPTION

Figure 2
Amebiasis
Cases by Month of Onset
LAC, 2005



Amebiasis is caused by the protozoan parasite *Entamoeba histolytica*. Cysts shed in human feces may contaminate food or drinking water or be transferred sexually, on hands, or fomites. Incubation period is 1-4 weeks. Recreational waters such as lakes and pools may also serve as transmission vehicles, since cysts are relatively chlorine-resistant. While intestinal disease is often asymptomatic, symptoms may range from acute abdominal pain, fever, chills, and bloody diarrhea to mild abdominal discomfort with diarrhea alternating with constipation. Extraintestinal infection occurs when organisms become bloodborne, leading to amebic abscesses in the liver, lungs or brain. Complications include colonic perforation. There is no vaccine. The most commonly ordered parasite test (microscopy of stool for ova and parasites) cannot distinguish *E. histolytica* from *E. dispar*, a non-pathogenic amebic species. There is an available EIA test, however, that can distinguish between the two.

DISEASE ABSTRACT

- Amebiasis incidence has decreased substantially over the past 10 years, in 2005 the rate decreased only slightly from 2004 (1.20 to 1.19 per 100,000). This may be related to changes in HIV incidence and safer sex behavior.
- Decreasing numbers of refugees and immigrants from endemic regions or a reduction in testing may account for the decrease in cases.

- No amebiasis outbreaks were reported during 2004.

STRATIFIED DATA

Trends: After a small increase in 2003, the 2005 amebiasis incidence rate decreased slightly to 1.19 per 100,000 (Figure 1).

Seasonality: Amebiasis incidence usually peaks during the summer months. In 2005, however, the greatest number of cases occurred in March and December (Figure 2).

Age: While amebiasis is ubiquitous, it is a disease more often contracted among adults (Figure 3). About two-thirds of the cases occurring in LAC during 2005 were among those aged 15–54 (n=88, 77%). Amebiasis is rare among those below age 5 and especially rare among those below age 2. Dysentery in infants is typically due to shigellae.

Sex: Males (65%) continue to be more likely to contract amebiasis than females, with a ratio of 1.9:1, which could be due to MSM.

Race/Ethnicity: In 2005, Whites had the highest rate, closely followed by Blacks and Latinos (Figure 4). The rate for Asians increased slightly from 0.2 per 100,000 in 2004 to 0.4 in 2005.

Location: Three SPAs had rates greater than the county mean rate: SPA 2 (1.4 per 100,00), SPA 4 (3.0) and SPA 5 (2.6).

Risk factors: Many of the cases (n=48, 42%) were recent immigrants (less than 6 months) and 20 cases (18%) reported recent foreign travel.

Figure 3
Amebiasis
Incidence Rates by Age Group
LAC, 2005

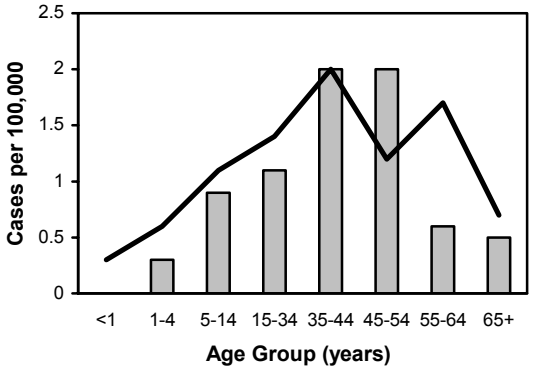
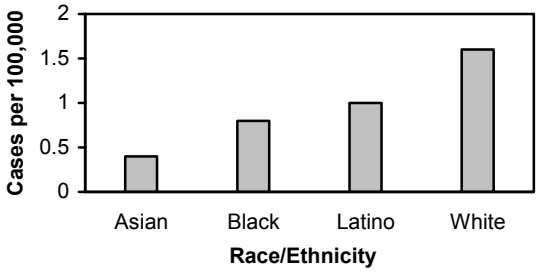


Figure 4
Amebiasis
Incidence Rates by Race/Ethnicity
LAC, 2004



COMMENTS

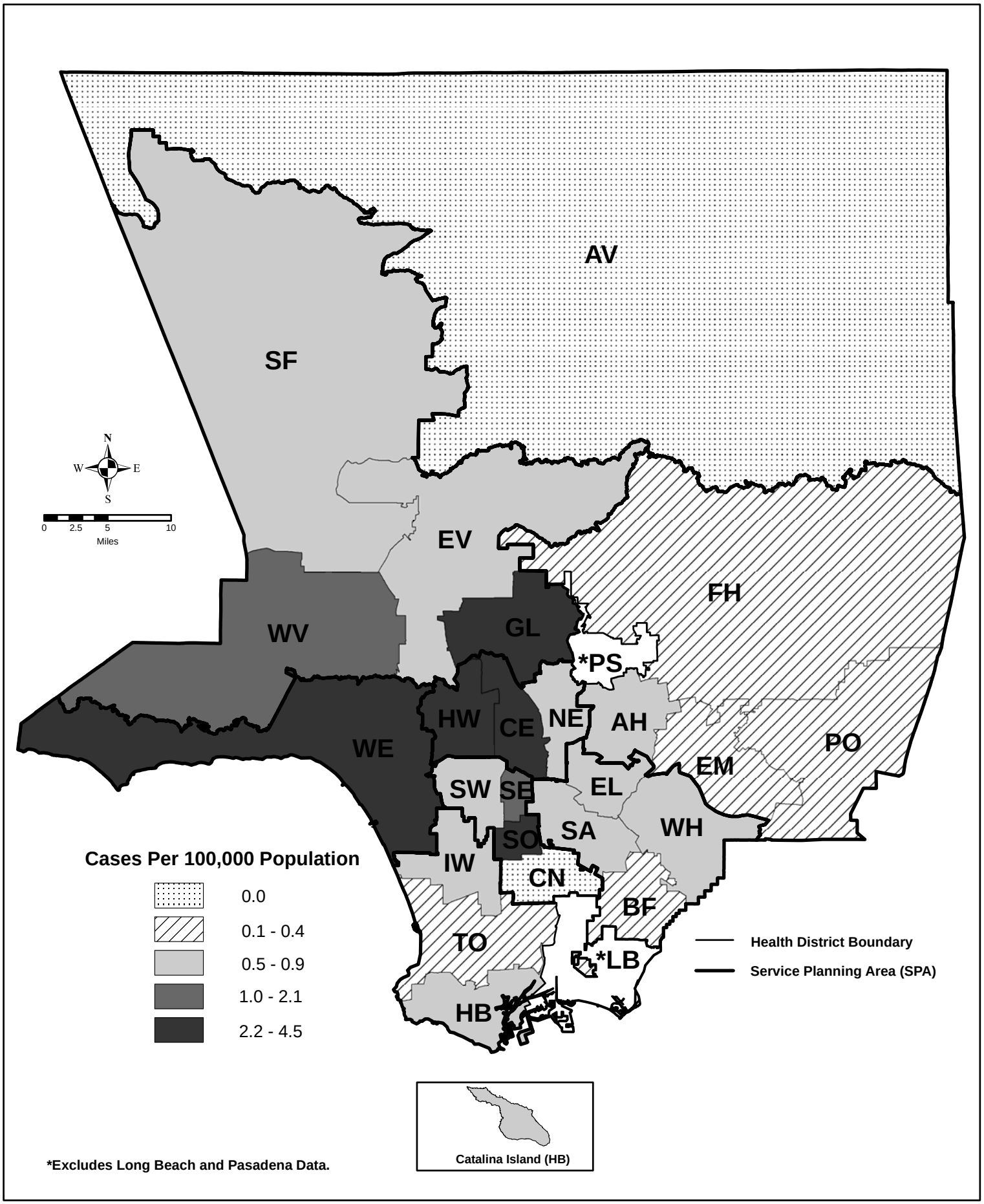
Amebiasis is no longer nationally reportable, so there are no current national rates for comparison. The disease remains reportable in California because a large proportion of the population travels to endemic countries in Asia and Central America. The impact of new tests that distinguish *E. histolytica* from *E. dispar* is unknown since such tests are rarely ordered. It is believed that many reported amebiasis cases are actually not infected with pathogenic *E. histolytica*.

ADDITIONAL RESOURCES

Amebiasis - Health Information for International Travel:
www.cdc.gov/travel/diseases/amebiasis.htm

More CDC Information on Amebiasis:
www.cdc.gov/ncidod/dpd/parasites/amebiasis/default.htm

Map 1. Amebiasis
Rates by Health District, Los Angeles County, 2005*



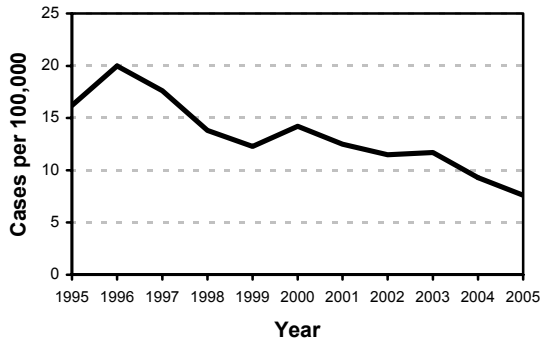
*Excludes Long Beach and Pasadena Data.

CAMPYLOBACTERIOSIS

CRUDE DATA	
Number of Cases	725
Annual Incidence[a]	
LA County	7.6
United States	N/A
Age at Diagnosis	
Mean	32.1
Median	31
Range	0–95
Case Fatality	
LA County	<1%
United States	N/A

[a] Cases per 100,000 population.

Figure 1
Campylobacteriosis
Incidence Rates by Year of Onset
LAC, 1995–2005



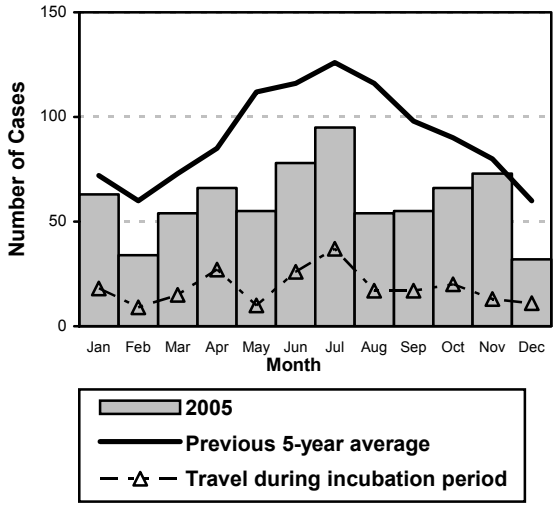
DESCRIPTION

Campylobacteriosis is a bacterial disease caused by Gram-negative bacilli transmitted through ingestion of organisms via consumption of undercooked poultry or other meat, contaminated food, water or raw milk, or contact with infected animals. The incubation period is 2–5 days. Common symptoms include watery or bloody diarrhea, fever, abdominal cramps, myalgia, and nausea. Species include *C. jejuni, C. upsaliensis, C. coli* and *C. fetus*. Sequelae include Guillain-Barré syndrome and Reiter syndrome, which occur in a limited number of cases.

DISEASE ABSTRACT

- There was an 18% decrease in the incidence of campylobacteriosis in 2005.
- In 2005, overall age-adjusted rates were highest for Latinos.
- No outbreaks of campylobacteriosis were reported in 2005.

Figure 2
Campylobacteriosis
Cases and Travel History by
Month of Onset
LAC, 2005



STRATIFIED DATA

Trends: The incidence of campylobacteriosis decreased by 18% in 2005. After two years of relative stability in 2002 and 2003, the rate of campylobacteriosis decreased significantly from 11.7 cases per 100,000 to 9.3 in 2004 and 7.6 in 2005 ($p < 0.05$). There has been an overall downward trend since 1996.

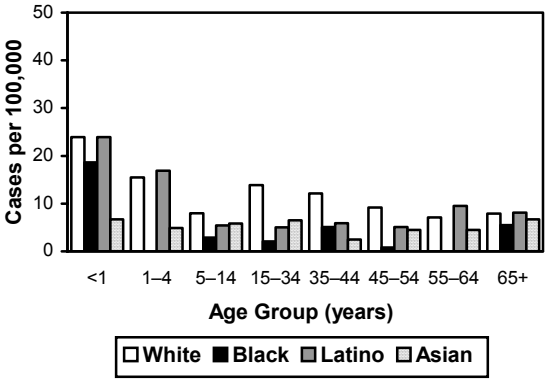
Seasonality: Overall incidence decreased as compared to the previous five-year average starting in February 2005. The number of cases increased in the spring and summer as in other years. Peaks during these seasons may be associated with the increase in travel. Travel is a risk factor for infection since it is most likely associated with an increase in eating at restaurants—which is a risk factor for this disease. Risk also increases when traveling to countries where food safety is questionable. In 2005, 220 cases (30%) reported travel during the incubation period. Of these, 20% traveled within the US. Mexico was the most commonly named (42%) travel destination outside the US. In 2005, overall incidence as well as travel related incidence peaked in July (Figure 2).

Age: The highest rates continued to be among infants aged <1 year and children, aged 1–4 years (Figure 3). These age groups had significantly higher rates than any other age group but the rates were lower than the previous five-year average. In developed countries, children younger than five years and young adults have the highest incidence of this disease. The rates for persons older than 55 years were lower than the previous five-year average.

Sex: The male-to-female rate ratio was 1.2:1. The preponderance of males is typical and the reason for this is not known [1]. Among men above the age of fifteen, 3% reported sexual contact with other men (MSM).

Race/Ethnicity: The highest overall age-adjusted rate was in Whites (11.0 cases per 100,000 population). In 2005 age-adjusted rates decreased for Latinos (7.0) although Latinos had similar incidence to Whites. Age-adjusted rates for Asians (5.2) and Blacks (2.8) decreased. Latino, White, and Black infants (aged <1) have higher age-adjusted rates compared to Asians (Figure 3).

Figure 3
Campylobacteriosis Incidence Rates by Age Group and Race/Ethnicity
LAC, 2005 (N=725)



Location: SPA 2 again had the highest number of cases at 201 (9.4 per 100,000), and SPA 5 had the highest rate with 16.5 per 100,000 (N= 108). The higher rate in SPA 5 is consistent with previous years and is significantly higher than the county average.

Severity of Illness: Seventeen percent of campylobacteriosis cases (N=124) were hospitalized for at least two days. Two campylobacteriosis-associated deaths occurred in a 71 year-old male and a 95 year-old male. Both deaths were associated with multiple medical problems including a history of stomach and prostate cancer. There was one report of Guillain-Barré syndrome (GBS) subsequent to a campylobacteriosis diagnosis. Six percent of campylobacteriosis cases were immunocompromised (N=47). Reasons for immunosuppression included HIV, AIDS, diabetes, leukemia, kidney transplant, lupus, sickle cell disease, cancer, and recent diagnosis of cancer with treatment.

PREVENTION

To reduce the likelihood of contracting campylobacteriosis, all food derived from animal sources should be thoroughly cooked, particularly poultry. Cross contamination may be avoided by making sure utensils, counter tops, cutting boards and sponges are cleaned or do not come in contact with raw poultry or meat or their juices. Hands should be thoroughly washed before, during and after food preparation. The fluids from raw poultry or meat should not be allowed to drip on other foods in the refrigerator or in the shopping cart. It is especially important to wash hands and avoid cross contamination of infant foods, bottles and eating utensils. It is recommended to consume only pasteurized milk, milk products or juices. In addition, it is important to wash hands after coming in contact with any animal or its environment.

COMMENTS

Visiting countries where food safety is questionable may increase risk of campylobacteriosis. Travel is associated with eating in restaurants more often, which can be a risk factor for this disease. Consuming raw milk or raw milk products was a risk factor for fourteen sporadic cases; seven of these cases consumed the milk or product while traveling outside the US and six consumed unpasteurized cheese brought back from Mexico.

No campylobacteriosis outbreaks were reported in 2005.

REFERENCES

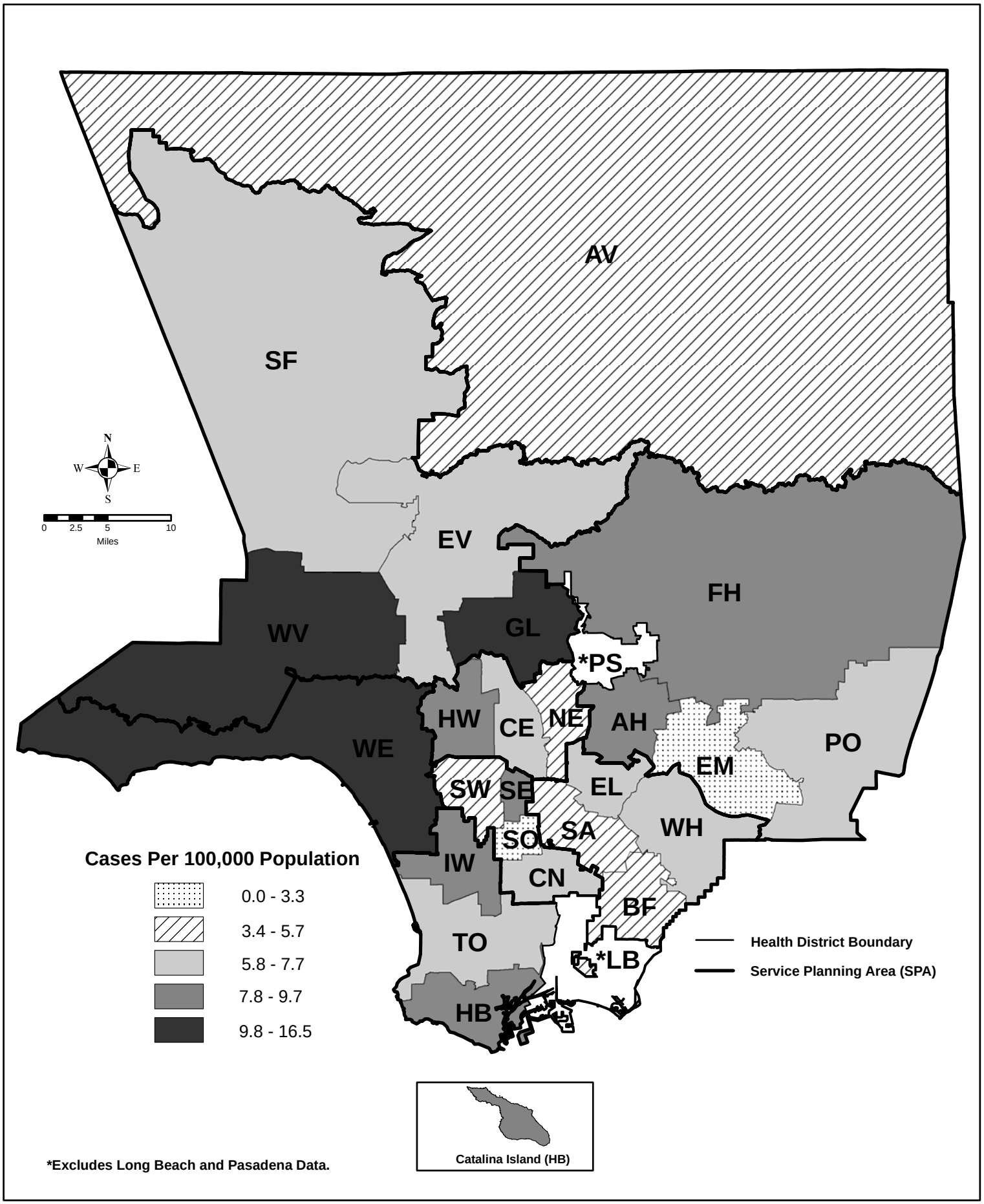
1. Allos, B.M. Campylobacter jejuni infections: update on emerging issues and trends. Clinical Infectious Diseases 2001;32:1201–6.

ADDITIONAL RESOURCES

Disease information is available from the CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/campylobacter_g.htm

General information and reporting information about this and other foodborne diseases in LAC is available at: www.lapublichealth.org/acd/food.htm

Map 2. Campylobacteriosis
Rates by Health District, Los Angeles County, 2005*



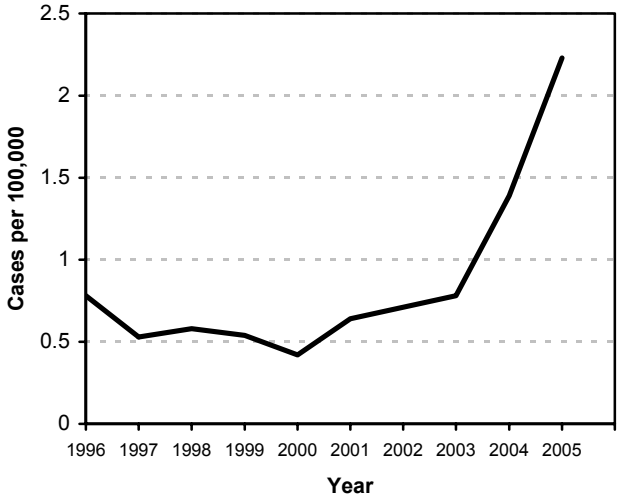
*Excludes Long Beach and Pasadena Data.

COCCIDIOIDOMYCOSIS

CRUDE DATA	
Number of Cases	214
Annual Incidence[a]	
LA County	2.23
California	N/A
United States	N/A
Age at Diagnosis	
Mean	31
Median	50
Range	7-93 years
Case Fatality	
LA County	7%
United States	N/A

[a] Cases per 100,000 population.

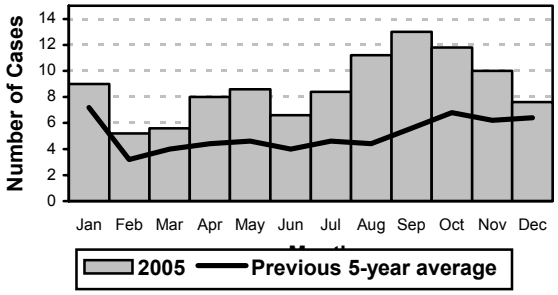
Figure 1
Coccidioidomycosis
Incidence Rates by Year of Onset
LAC, 1996–2005



DESCRIPTION

Coccidioidomycosis, or Valley Fever, is a common fungal disease transmitted through the inhalation of *Coccidioides immitis spores* that are carried in dust. Environmental conditions conducive to an increased occurrence of coccidioidomycosis are as follows: arid to semi-arid regions, dust storms, lower altitude, hotter summers, warmer winters, and sandy, alkaline soils. It is endemic in the southwestern US and parts of Mexico and South America. Southern California is a known endemic area.

Figure 2
Coccidioidomycosis
by Month of Onset
LAC, 2005 (N=214)



Most infected individuals exhibit no symptoms or have a mild respiratory illness, but a few individuals develop a severe illness such as pneumonia, meningitis, or dissemination when the fungus spreads to many parts of the body. Because of the wide range of clinical presentations, only the most severe cases are usually reported to the health department. Laboratory diagnosis is made by demonstrating the fungus with microscopic examination or culture or by serologic testing. Blacks, Latinos, Native Americans, Filipinos, males, pregnant women, the very young (<5 years), elderly, and immunocompromised individuals are at high risk for severe disease.

DISEASE ABSTRACT

- The incidence rate for coccidioidomycosis has been increasing since 2000, which was at its lowest point in 10 years in LAC.

- Cost in terms of disease severity and hospitalization was substantial. The incidence of coccidioidomycosis were greater than last year, though the case fatality was lower. Young adults, males, Blacks, and residents of the West Valley and Antelope Valley were at higher risk for disease.

STRATIFIED DATA

Trends: The incidence rate was 2.23 cases per 100,000 population for 2005 which was higher than last year (Figure 1). The increase in LA County is largely due to an increase of cases in Antelope Valley which had an incidence rate of 23.0 compared to last year of 14.9.

Seasonality: The highest number of cases per month was observed in the 3rd quarter and gradually decreased in the last month of the year. The number of cases per month through most of 2005 was well above the previous five-year average (Figure 2). Comparing cases from the summer months August-October 2005 to a 5-year previous average of cases for the same time period, LAC observed an increase of 542% in 2005 (77 vs. 12.0 cases). Cases commonly occur in the summer after a rainy winter or spring, especially after wind and dust storms.

Age: For 2005, males had an overall higher incidence like all previous years, and their ages predominated in the young adult age groups. The greatest numbers of cases reported were in persons aged 15-34 and 35-44 years (Figure 3) which was same from previous years. The greatest incidence rate was in the 45-54 age group (3.8/100,000). The youngest case was 7 years of age.

Sex: The male-to-female rate ratio was 1.8:1. The mean age for males was 48.5 years and for females was 46 years (Figure 3). One female reported being pregnant during infection. The most commonly reported occupations among males (13%) were construction and/or maintenance positions.

Race/Ethnicity: The highest incidence rate of 3.3 cases per 100,000 was in the White population (n=96), Latinos (n=70), Blacks (n=28), Asians (n=15) and other (n=2). Whites and Latinos had the greatest number of cases. Race was unknown in 3 cases (Figure 4).

Location: Antelope Valley (n=79) and West Valley (n=52) districts had the highest number of cases reported (61% of the total). This has added significance because the incidence rate per 100,000 in Antelope Valley is 23.0 and West Valley is 2.8,

Figure 3
Coccidioidomycosis
Incidence by Age and Sex
LAC, 2005 (N=214)

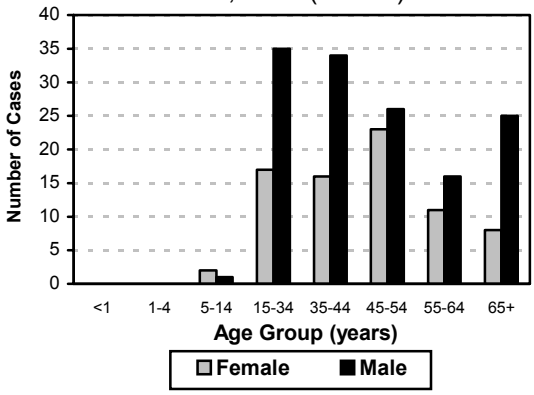


Figure 4
Coccidioidomycosis
Percent Cases by Race/Ethnicity
LAC, 2005

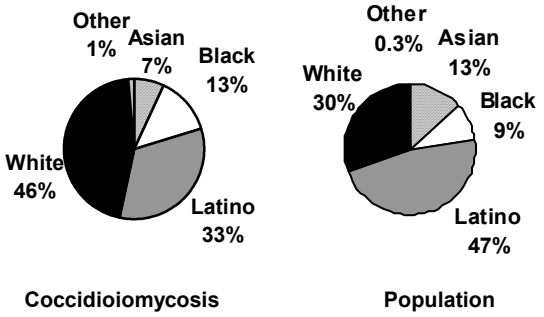
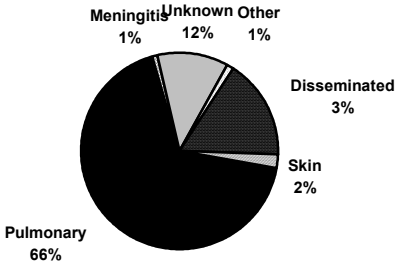


Figure 5
Coccidioidomycosis
by Infection Site
LAC, 2005 (N=214)



compared to the overall LAC incidence rate of 2.23. Four cases (1.8%) were incarcerated in areas of high endemicity.

Travel: Travel history was available for 144 cases. Of those with a travel history, 82 cases (57%) reported travel within four weeks before onset of illness, while 43% (n=62) reported no travel. Of those traveling, many reported multiple travel destinations: 76% (62/82) traveled within California including San Fernando Valley, Central Valley and adjacent counties of Riverside and Imperial; 39% (n=32) traveled outside California to Arizona, Iraq, Nevada, Mexico, Taos, and Europe, and 3.7% (n=3) cases reported travel within and outside of California to other locations. The fungus is known to be endemic in most of these areas.

Underlying Disease: One hundred forty-four cases were assessed for underlying disease. Eighty-one cases (56%) reported having an underlying disease, 21% (n=30) cases were diabetic, 11% (n=16) had a malignancy, 3% (n=5) had HIV, 3%(n=4) had organ transplants and 18% (n=26) were coded as other, for example asthma and kidney problems. 44% (n=63) had no reported disease history.

Severity of Disease: Sites of infection were reported as primary pulmonary 68% (n=145), disseminated 16% (n=35), meningitis 1% (n=2), skin 2% (n=5), and other (chest cavity mass, lymph node, neck node) 1% (n=2); in 12% (n=25) of the cases infection site was not stated (Figure 5). 24% of the cases were culture-confirmed (n=46) and 96 cases were diagnosed by serological, histopathological, or molecular evidence. Some cases had multiple labs available for diagnosis. Of the 195 cases where information was available, 73% (n=142) were hospitalized. Fifteen cases died. The 2005 case fatality rate (7%) was lower than last years rate (9.8%).

COMMENTS

In LAC, the 2005 incidence for coccidioidomycosis was higher than the previous year. Overall, the rate has been increasing since 2000. The significant increase started in the fall of 2003. The wildfires in southern California may have contributed by destroying vegetation and increasing dust exposure. This followed by warm temperatures and Santa Ana winds were ideal conditions for disseminating *Coccidioides immitis* spores. Although the number of cases reported is small compared to other diseases, the costs in terms of disease severity, hospitalization, and mortality are great. As in past years, residents of the Antelope Valley and the West Valley are at higher risk for severe disease. These districts are more arid than the rest of the county. Also more young and middle-aged adults, especially males, were affected instead of the very young and old, who are normally at high risk for illness. This may reflect an increased likelihood for this age group to have outdoor recreational or occupational exposure in areas of high risk.

During 3rd quarter of 2005, ACDC noted an abrupt increase in reports of coccidioidomycosis both false and confirmed. Much of this increase was due to automated laboratory reporting by ARUP laboratories. However, the ratio of true to false case (20:80) in ARUP lab reports has remained essentially unchanged over the last nine quarters. Automatic lab reporting necessitated an increase in epidemiologic follow-up, which required all cases to have an appropriate clinical symptoms and laboratory reporting for confirmation. This resulted in an increase in the number of false cases usually due to single IgG serologies. The reason for the large increase in confirmed cases remains theoretical. Record amount of rainfall in the beginning of 2005, followed by a very dry season, are conditions conducive to fungal growth. Additionally, the population of the Antelope Valley, where the majority of cases are located, continues to grow and provide a naïve population to an endemic area. These risks, in combination with increased construction activities, may be responsible for the increased incidence.

In 2005 the following 10 counties were most severely struck by Valley Fever in California: Kern County (n=1584) with incident rate of 205.6/100,000 (Bakersfield and surrounding areas) had the most reported cases followed in descending order LA, Tulare, Fresno, San Luis Obispo, Kings, Riverside, Orange, San Bernardino and Madera. Thirty-four of 61 counties in CA reported Valley Fever cases.

PREVENTION/INTERVENTION

Currently no safe and effective vaccine or drug to prevent coccidioidomycosis is available; prevention lies mainly in dust control such as planting grass in dusty areas, putting oil on roadways, wetting down soil, air conditioning homes, and wearing masks or respirators. Other options may be to warn individuals who are at high risk for severe disease not to travel to endemic areas when conditions are most dangerous for exposure.

Since coccidioidomycosis is treatable, emphasis should also be placed on preventing progression of disease by rapid diagnosis and treatment by physicians. Residents, especially those at high risk, should be encouraged to seek care early if they develop signs or symptoms of disease.

A health advisory was sent via email in May 2005 to physicians and health care facilities regarding the increase in coccidioidomycosis and information about the disease.

An article published April 12, 2006 the Federal Government is backing the first potential cure for Valley Fever; Nikkomycin Z it has been shown to kill the fungus in mice. This medication is not in the market yet it needs commercial partners to test.

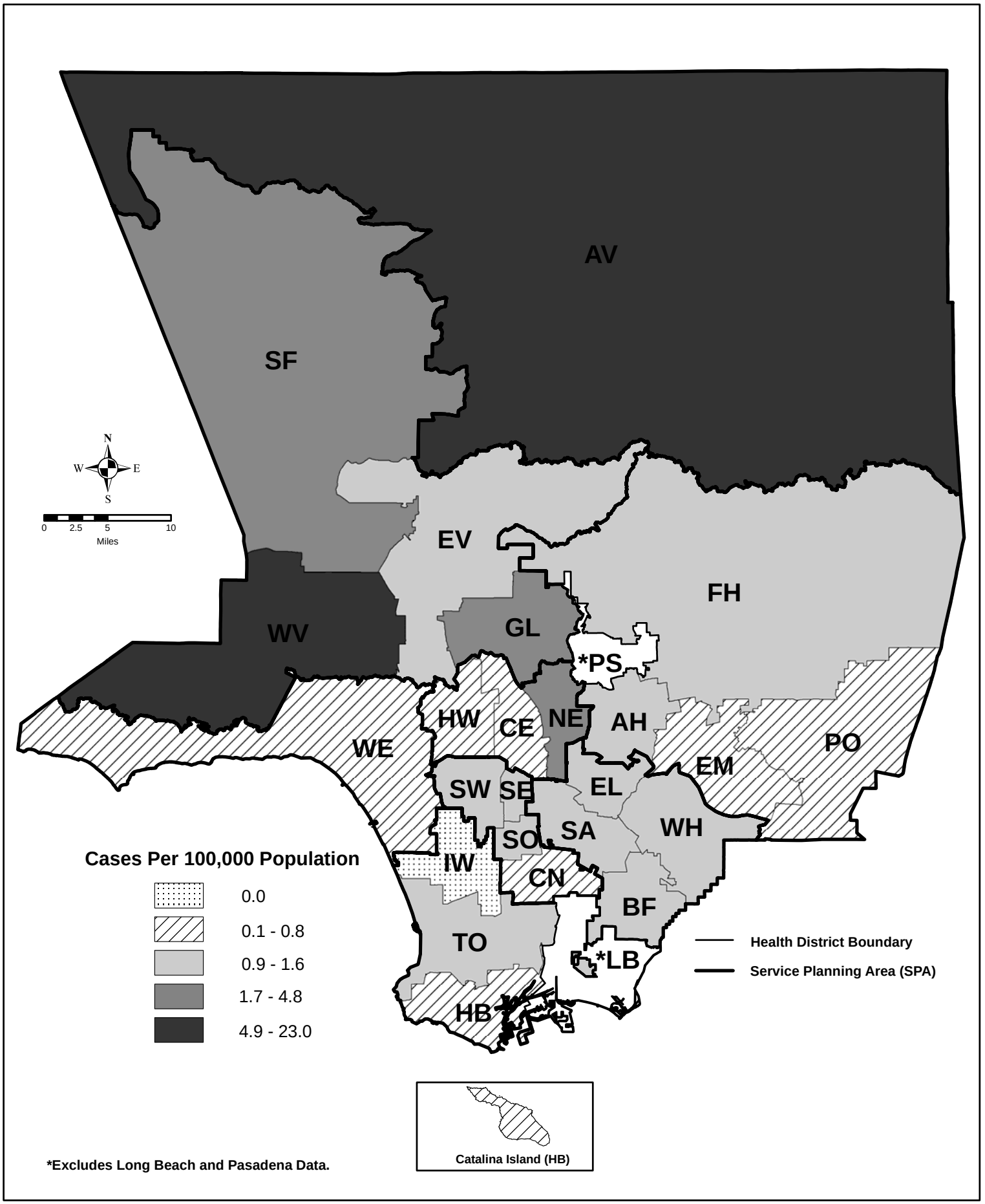
ADDITIONAL RESOURCES

National Fire Weather Report 2003 by Larry Van Bussum, National Weather Service, Boise, ID See report at: http://fire.boi.noaa.gov/FIREWX/AnnualReport/2003NationalReport.pdf

More information about coccidioidomycosis is available from the CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/coccidioidomycosis_t.htm

Kirkland TN, Fierer J. Coccidioidomycosis: A reemerging infectious disease. Emerg Infect Dis 1996; 2(3): 192–9.

Map 3. Coccidioidomycosis
Rates by Health District, Los Angeles County, 2005*



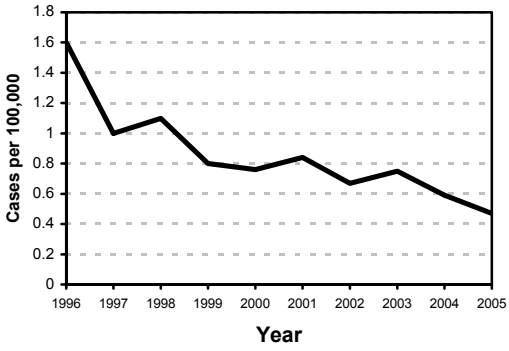
*Excludes Long Beach and Pasadena Data.

CRYPTOSPORIDIOSIS

CRUDE DATA	
Number of Cases	45
Annual Incidence[a]	
LA County	0.47
United States	1.23
Age at Diagnosis	
Mean	40
Median	40
Range	4–68
Case Fatality	
LA County	0%
United States	N/A

[a] Cases per 100,000 population.

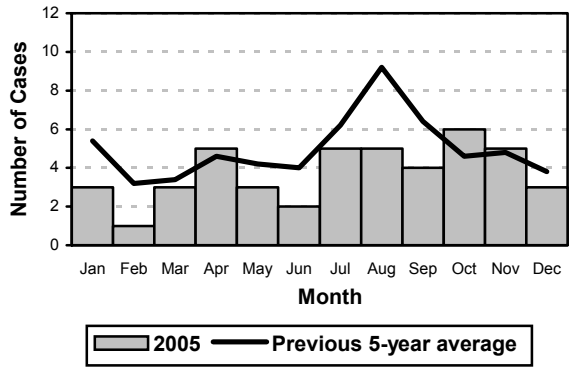
Figure 1
Cryptosporidiosis
Incidence Rates by Year of Onset
LAC, 1996–2005



DESCRIPTION

Cryptosporidiosis is fecal-orally transmitted when cysts of the parasite *Cryptosporidium parvum* are ingested. Common causes include unprotected sexual contact, particularly among men who have sex with men (MSM), and by swallowing contaminated recreational or untreated water. The usual incubation period is 2–10 days with typical symptoms of watery diarrhea, abdominal cramps, and low-grade fever; however, asymptomatic infection is also common. Symptoms last up to 2 weeks in healthy individuals. Those who have a weakened immune system may experience prolonged illness. Immunocompromised individuals (e.g., HIV/AIDS patients, cancer patients, transplant patients), young children and pregnant women are at risk for more severe illness.

Figure 2
Cryptosporidiosis
Cases by Month of Onset
LAC, 2005 (N=45)



DISEASE ABSTRACT

- The incidence rate for this disease decreased from 0.59 per 100,000 in 2004 to 0.47 per 100,000 in 2005. This is the lowest incidence rate in the past ten years. The last outbreak of this disease occurred during 1998.
- HIV infection and AIDS are the most common identified risk factors for cryptosporidiosis. Cryptosporidiosis has been an AIDS-defining disease since 1983. The number of reported cases has decreased since the advent of highly active antiretroviral therapy.

STRATIFIED DATA

Trends: The rate of cryptosporidiosis (0.47 cases per 100,000) decreased in 2005 (Figure 1).

Seasonality: In 2005, there was a peak in October, although the previous 5-year average peak was in August (Figure 2).

Age: The 35-44 age group had the highest incidence rate followed by the 45-54 and 55-64 age groups (Figure 3).

Sex: The male-to-female ratio was 5.4:1 (7 females). This is due to the high rate of cryptosporidiosis in MSM.

Race/Ethnicity: Blacks had the highest incidence rate (Figure 4), followed by Whites and Latinos. Race was unknown for 3 cases (7%). The rate for Blacks decreased from 1.5 per 100,000 in 2005 to 1.2 per 100,000 in 2005. There were no cases among Asians in 2005.

Location: Location information was available for all 56 cases. Central Health District had the highest incidence rate, 1.4 per 100,000 (n=18), followed closely by San Fernando Health District, which had 0.5 per 100,000 (n=10).

Risk Factors: Complete risk factor data was not available for all cases; 8 cases (18%) were either unable to be located or refused to be interviewed (Figure 5). HIV infection and AIDS accounted for 51% of the cases, 2 cases were female. Animal contact (18%) and recent international travel (20%) were the other most common risk factors following HIV status. Many cases had more than one risk factor.

Figure 3
Cryptosporidiosis
Incidence Rates by Age Group
LAC, 2005

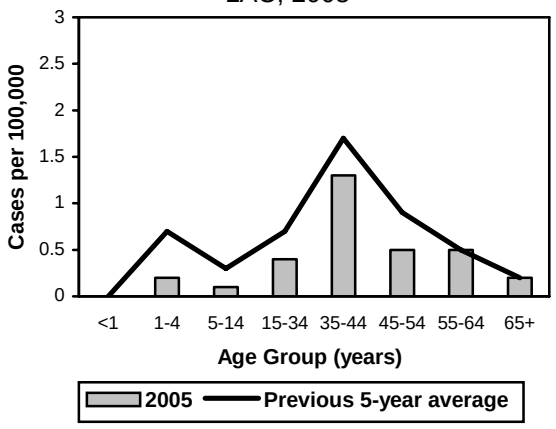
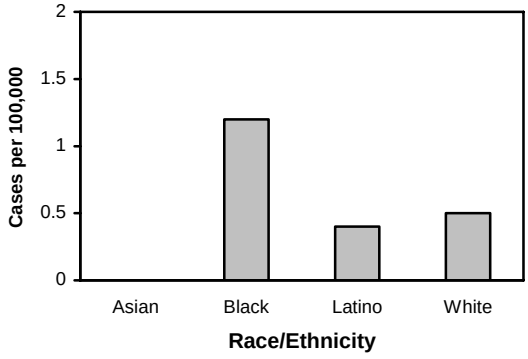


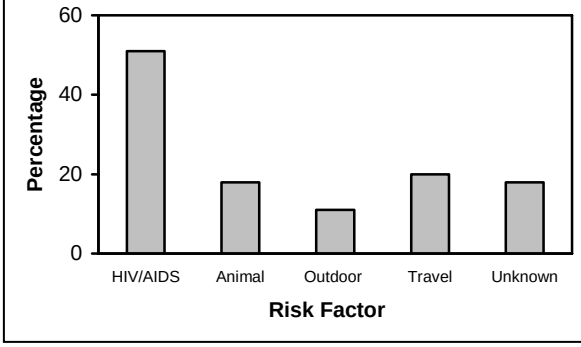
Figure 4
Cryptosporidiosis
Incidence Rate by Race/Ethnicity
LAC, 2005



COMMENTS

Risk factors were self reported and were not proven to be the actual source of infection. A large percentage (49%) of the cryptosporidiosis cases were among HIV positive males. In 2005 the majority of HIV male cases were Black (44%), slightly less than 2004 (45%). Eight cases (18%) had unknown HIV status. Cryptosporidiosis can become a chronic infection among immunocompromised patients and cases are often reported multiple times; however, within this report, cases are counted only once. There has not been an outbreak of cryptosporidiosis in LAC since 1988, which involved contaminated swimming pool water [1].

Figure 5
Cryptosporidiosis
by Reported Risk Factor
LAC, 2005



RESOURCES

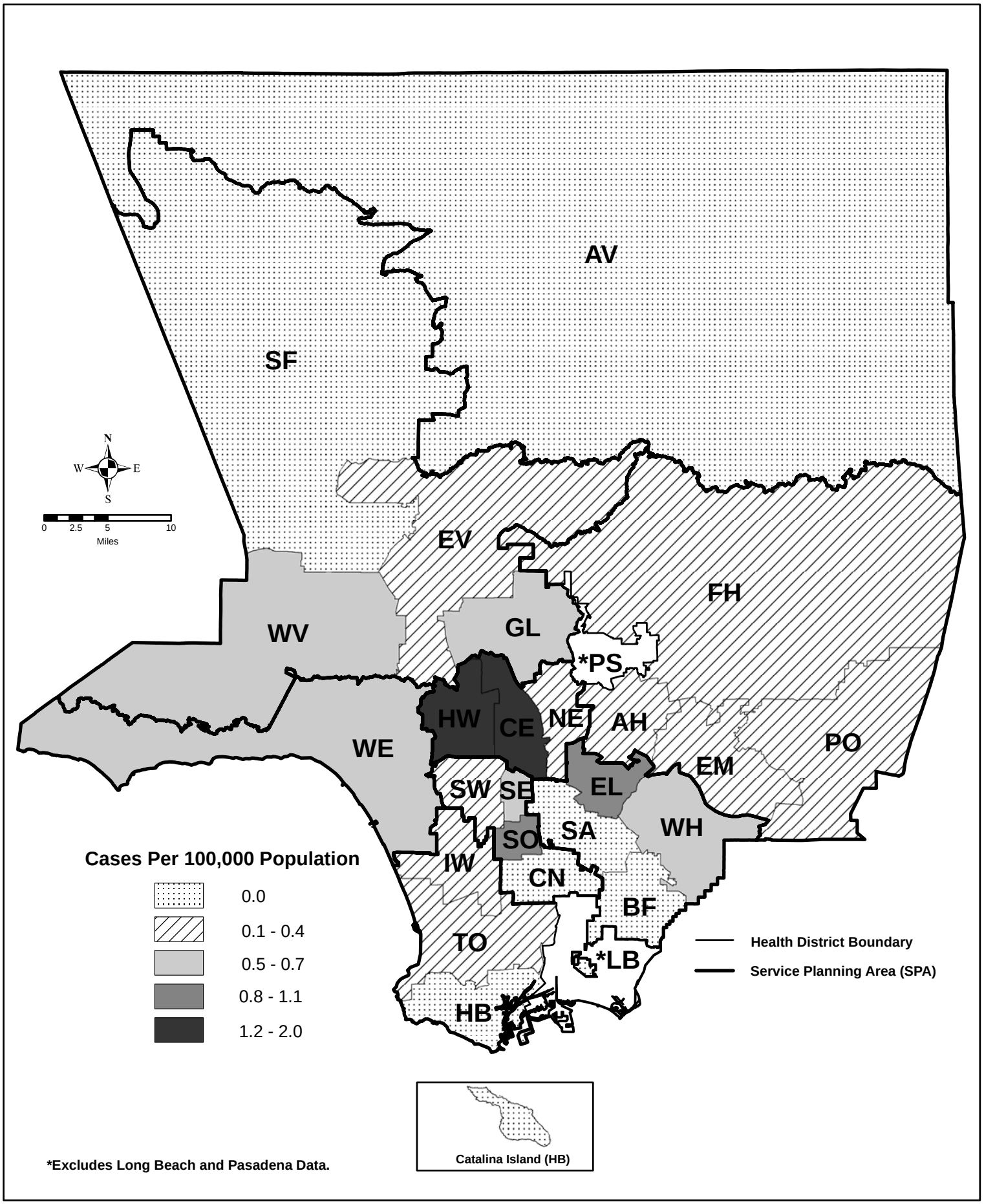
1. Sorvillo FJ, Fujioka K, Nahlen B, Tormey MP, Kebabjian R, Mascola L. Swimming-associated cryptosporidiosis. Am J Public Health 1992; 82(5): 742-4.

ADDITIONAL RESOURCES

General disease information is available from the CDC at:
www.cdc.gov/ncidod/dpd/parasites/cryptosporidiosis/default.htm

General information and reporting information about this and other foodborne diseases in LAC is available at: www.lapublichealth.org/acd/food.htm

Map 4. Cryptosporidiosis
Rates by Health District, Los Angeles County, 2005*

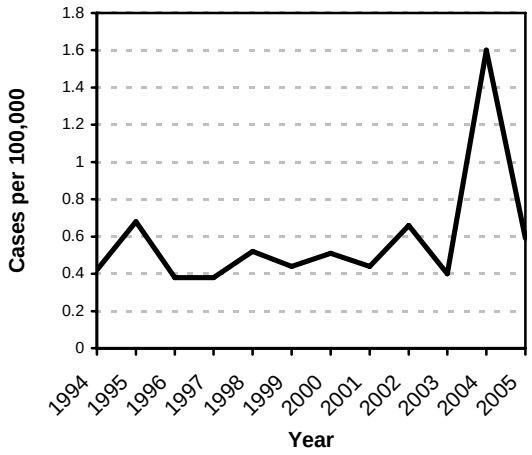


*Excludes Long Beach and Pasadena Data.

ENCEPHALITIS

CRUDE DATA	
Number of Cases	56
Annual Incidence[a,b]	
LA County	0.59
California	N/A
United States	N/A
Age at Diagnosis	
Mean	25
Median	15
Range	0-93 years
Case Fatality	
LA County[b]	9%
United States	N/A

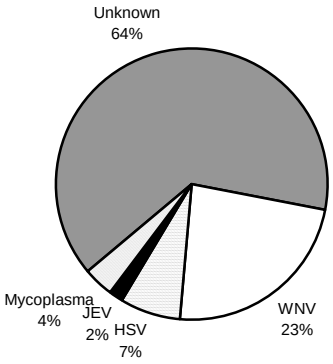
Figure 1
Encephalitis
Incidence Rates by Year of Onset
LAC 1994–2005



[a] Cases per 100,000 population 2005 LAC Census estimates.
[b] Excludes AIDS encephalopathy cases.

DESCRIPTION

Figure 2.
Encephalitis by Etiology
LAC, 2005 (N=36)



Encephalitis, an inflammation of parts of the brain, spinal cord and meninges, causes headache, stiff neck, fever and altered mental status. It can result from infection with a number of different agents including viral, parasitic, fungal, rickettsial, bacterial and chemical. Public health surveillance is limited to cases of suspected or confirmed viral etiology, which includes primary and post-infectious encephalitis—but excludes individuals with underlying Human Immunodeficiency Virus (HIV) infection. Of special concern is arboviral (mosquito-borne) encephalitis, which can be prevented by personal protection and mosquito control (See WNV section). Arthropod-borne viruses, i.e., arboviruses, are viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods (mosquitoes, ticks, and certain mites and gnats). All arboviral encephalitides are zoonotic, being maintained in complex life cycles involving a nonhuman vertebrate primary host and a primary arthropod vector. Arboviral encephalitides have a global distribution. There are five main viral agents of encephalitis in the United States: West Nile virus (WNV), eastern equine encephalitis (EEE), western equine encephalitis (WEE), St. Louis encephalitis (SLE) and La Crosse (LAC) encephalitis, all of which are transmitted by mosquitoes.

DISEASE ABSTRACT

- In 2005, 56 encephalitis cases were reported. The underlying etiologies of encephalitis were identified in 20 (36%) cases and included: 13 (65%) with WNV (see WNV Report for details), 4 (20%) herpes simplex virus (HSV), 2 (10%) *Mycoplasma pneumoniae* and 1 (5%) case with Japanese encephalitis (Figure 2).
- The incidence of viral encephalitis decreased in 2005, 0.59 cases per 100,000 population, compared to 1.4 cases per 100,000 population documented in 2004 (Figure 1).
- The case fatality, 9% (n=5), in 2005 was slightly higher than the prior year, 7% in 2004.
- The majority of encephalitis cases occurred in children ages 5-14 years, 18 (32%); 11(19%) occurred in those 15-64 years of age and 7 (12%) were in adults more than 65 years of age.
- Hispanics had the greatest number of encephalitis cases, 27 (47%), followed by Whites, 14 (25%), Blacks, 5 (9%), Asians, 11 (19%).
- The number of reported encephalitis case was highest in SPA 2 (n=15, 0.7per 100,000), followed by SPA 7 & 8 (n=10, 0.9, 0.7 per 100,000), and SPA 4 (n=6, 0.5 per 100,000).

The reported annual incidence of acute encephalitis reported in the medical literature varies from 3.5-7.4 cases per 100,000 person-years. In 2005, the overall Los Angeles County viral encephalitis rate of 0.59 per 100,000 person-years was far lower than the 2004 incidence rate (1.4 cases per 100,000) and rates quoted in surveillance literature. Reasons to explain the lower rate could be due far fewer cases of WNV-associated encephalitis reported in 2005 compared to 2004 and the exclusion of other infectious etiologies (such as bacterial, fungal, protozoal, HIV-related) from our encephalitis surveillance data; misclassification of encephalitis cases as meningitis; and underreporting of hospitalized encephalitis cases, since all reporting is passive. The case fatality from encephalitis has ranged from a high of 38 % in 1997 to a low of 9% in 2005 and remains lower than the 2005 overall case fatality rate from the California Encephalitis Project, reported as 12% in 2005. The higher encephalitis mortality rate reported by the California Encephalitis Project, a California Department of Health Services' research project, may be biased to include more severely ill individuals are more likely included in this data source.

Of particular public health concern in LAC are the arthropod-borne viral (arboviral) encephalitides, SLE, WEE and WNV viruses endemic to California. Since 1985, sporadic cases of SLE have been reported each year following an outbreak of 16 cases in 1984. The last confirmed SLE case in LAC was in 1997. The potential for another SLE outbreak exists, as sporadic cases in previous years and identification of SLE in sentinel chicken populations indicate that the virus remains endemic in LAC. Beginning in 2001, arboviral disease surveillance has included WNV, in addition to SLE and WEE.

In 2005, 13 reported encephalitis cases had laboratory-confirmed WNV thought to be locally acquired. Like SLE virus, WNV is transmitted principally by *Culex* species mosquitoes. Enhanced surveillance for early detection of virus activity in birds and mosquitoes will be crucial to guide control measures in 2006. It is expected that WNV will remain endemic in LAC and will spread through most of CA in 2006.

Japanese encephalitis (JE) is a mosquito-borne flavivirus antigenically related to WNV and SLE. It is the leading cause of viral encephalitis in Asia with 30-50,000 cases reported annually and is vaccine preventable. Fewer than one case per year is confirmed in the U.S. In July 2005, one case of JE was reported to LAC. Acute and convalescent serological titers confirming this diagnosis were completed at the Centers for Disease Control and Prevention arboviral diagnostic laboratory. The case was an elderly California Filipino resident who had traveled to the Philippines, and became ill upon return to CA and subsequently recovered.

Prevention measures for arboviral infections consist of personal protection, screened on windows, avoiding mosquito-infested areas, especially at dusk when most mosquitoes are active, wearing protective clothing and use of insect repellants containing DEET, oil of eucalyptus and Picaridin. Elimination of standing water and proper maintenance of ponds and swimming pools decrease the available sites for hatching and maturation of mosquito larvae. Five local mosquito abatement districts monitor and control populations of these insects, especially in areas used by the public (See WNV section).

Future Directions: Surveillance for WNV infection in humans, mosquitoes, sentinel chickens, and dead birds will continue throughout the state of CA. and LAC. Research is underway to develop a WNV vaccine and treatment for humans. No human vaccine is available for SLE, WEE, and WNV. A human vaccine exists for JE.

Licensed equine (horse) vaccines are available for WEE, EEE, and WN viruses.

ADDITIONAL RESOURCES

Glaser CA, Gilliam S, Schnurr D, Bagher F, Honarmand S, et al. In search of encephalitis etiologies: Diagnostic challenges in the California Encephalitis Project, 1998–2000. CID 2003; 36:731–42.

Khetsuriani H, Holman RC, Anderson LJ. Burden of encephalitis-associated hospitalizations in the United States, 1988–1997. CID 2002; 25:175–82.

Johnston RT. Acute Encephalitis. CID 1996; 23:219–26.

Nicolosi A, Hauser WA, Beghi E, Kurland LT. Epidemiology of central nervous system infections in Olmsted County, Minnesota, 1950–1981. J Inf Ds 1986; 154:399–498.

Trevejo RT. Acute Encephalitis Hospitalizations, California, 1990-1999: Unrecognized arboviral encephalitis? Emerging Inf Dis 2004; 10:8: 1442-1449.

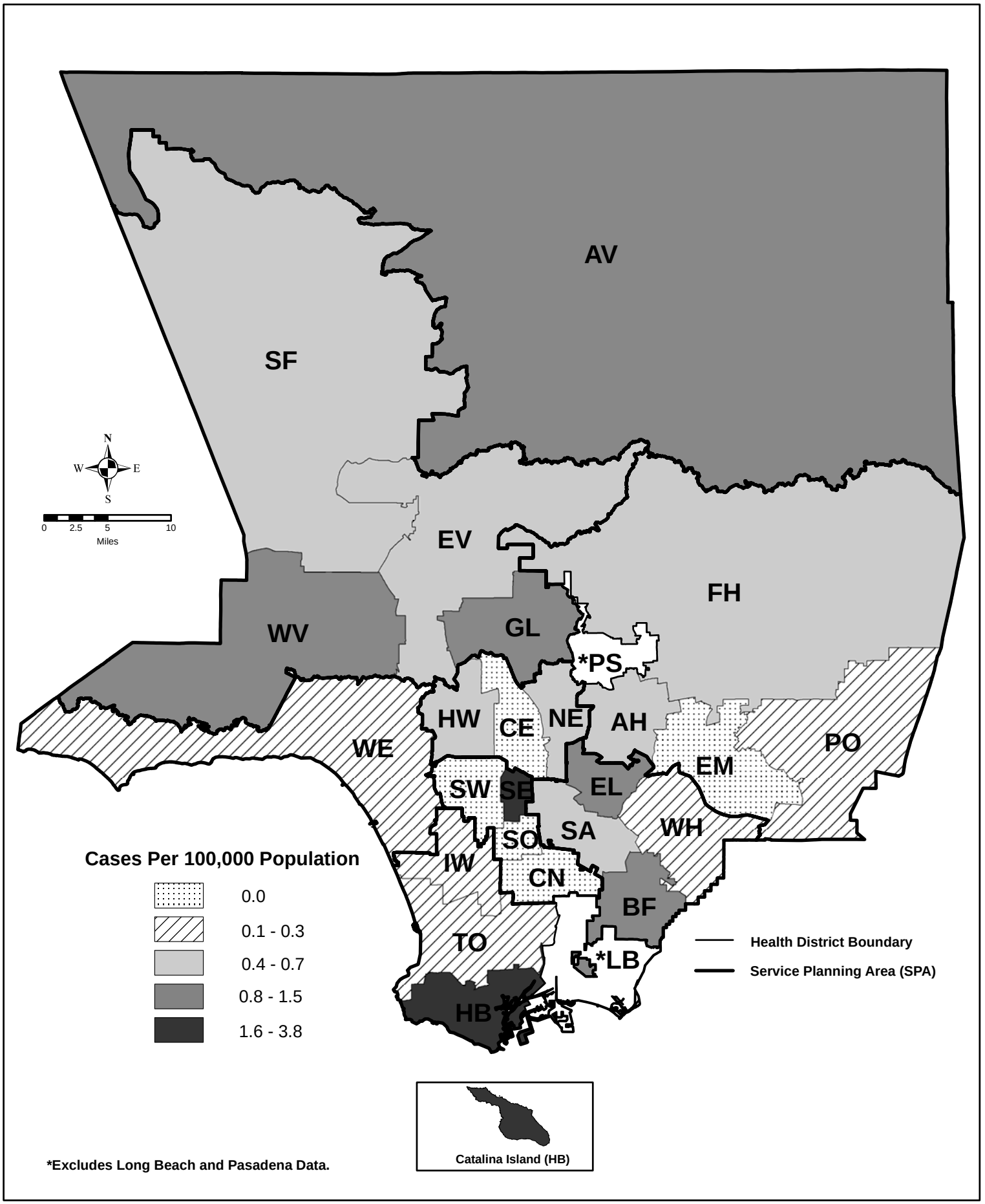
For information on mosquito-borne encephalitis: www.cdc.gov/ncidod/dvbid/arbor/index.htm

For information for consumers: www.nlm.nih.gov/medlineplus/encephalitis.html

For more detailed information such as causal information and effective management strategies: www.postgradmed.com/issues/1998/03_98/guti.htm

Information about case investigation of encephalitis in LAC is available at: www.lapublichealth.org/acd/procs/b73/b73index.htm

Map 5. Encephalitis
Rates by Health District, Los Angeles County, 2005*

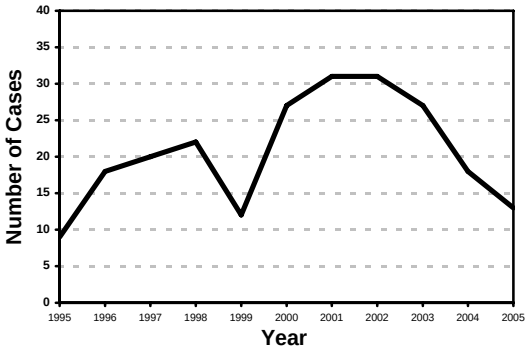


*Excludes Long Beach and Pasadena Data.

ESCHERICHIA COLI O157:H7 / HEMOLYTIC UREMIC SYNDROME

CRUDE DATA	
Number of Cases	13
Annual Incidence[a]	
LA County	--- [b]
California	157
United States	2,461
Age at Diagnosis	
Mean	16.2
Median	17
Range	3-45 years
Case Fatality	
LA County	0.0%
United States	N/A

Figure 1
Escherichia coli O157:H7
Cases by Year of Onset
LAC 1996–2005*



[a] Cases per 100,000 population.
[b] Rates based on less than 20 observations are unreliable.

DESCRIPTION

Escherichia coli O157:H7, a Gram-negative bacillus, is a specific serotype of the shiga toxin producing class of *E. coli* (STEC) and the most common such serotype in the US. Incubation period is 2-8 days. Shiga toxins cause abdominal cramps and watery diarrhea, often developing into bloody diarrhea; fever is uncommon. Likely modes of transmission include foodborne (e.g., undercooked ground beef, fresh produce, unpasteurized juice, raw milk) and person-to-person (e.g., day-care settings). There also have been outbreaks associated with exposure to animals and their environments and recreational water exposure. All *E.coli* O157:H7 isolates are confirmed by the Los Angeles County Public Health Laboratory.

Hemolytic uremic syndrome (HUS) is a clinical diagnosis and may or may not be associated with *E. coli* O157:H7. Children younger than five years of age are at highest risk for hemolytic uremic syndrome (HUS), a clinical complication consisting of hemolytic anemia, thrombocytopenia, and kidney failure. Adults may acquire thrombotic thrombocytopenic purpura (TTP) after infection after STEC infection.

DISEASE ABSTRACT

- There was a decrease in confirmed cases in 2005.
- There were no LAC outbreaks in 2005, although two cases were associated with a multi state cluster possibly associated with ground beef.

STRATIFIED DATA

Trends: After peaking in 2001, rates of *E.coli* O157:H7 infection have been steadily decreasing. This is the second time there have been fewer than twenty cases in LAC since 1999 (Figure 1). There were three cases of HUS in addition to the 13 cases of O157:H7.

Seasonality: In 2005, 85% of confirmed cases occurred during the summer and fall months (Figure 2). This is consistent with previous years.

Age: In 2005, there were more cases in adults (54%; n=7) than in children. All cases were sporadic and not linked to an outbreak.

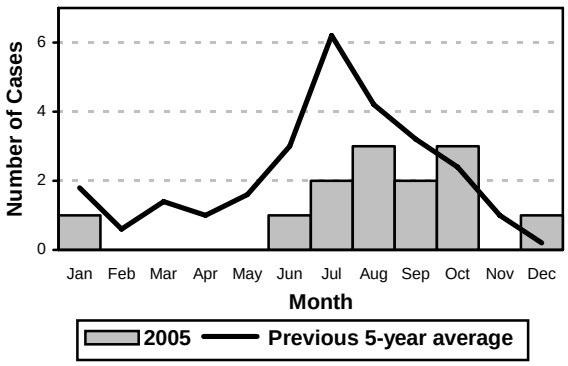
Sex: There were 8 male and 5 female cases.

Race/Ethnicity: Twelve cases were reported in Whites and one in a Latino. Asians and Blacks had no confirmed cases.

Location: SPA 8 had five confirmed cases but they were unrelated. The remaining SPAs had 1 or 2 cases each.

Severity of Illness: All cases reported bloody diarrhea, six reported abdominal cramps, and only three reported having fever (mean temperature was 100.0^{0}F). Seven cases required hospitalization. There were no reported deaths in confirmed cases.

Figure 2
Esherichia coli O157:H7
Cases by Month of Onset
LAC, 2005



HUS: One LAC case had both confirmed *E. coli* O157:H7 enterocolitis and HUS; two HUS cases did not have lab confirmation of *E. coli* O157:H7 infection. Two were school aged children and the third a seventy-one year old adult, with multiple medical problems. All three required hospitalization, and the adult expired. Two had some sort of recent antibiotic therapy prior to onset of HUS. All three cases required dialysis. The adult did not have a clear history of risk exposure. The other unconfirmed case was in a seven y/o boy who regularly consumed raw milk from a natural food market. There were no other cases associated with raw milk consumption. He was admitted to the hospital with complaints of bloody stool and acute renal failure and tested negative for *E.coli* O157:H7.

Risk Factors: In the week prior to onset, cases with available information reported eating ground beef (62%), lettuce (31%), fast food (69%) or food from other types of restaurants (62%). Thirty-one percent (N= 4) traveled, one inside California and three outside California. Three confirmed cases received antibiotic therapy for entercolitis, and one of these developed HUS. There were no confirmed cases associated with raw milk consumption during this period.

COMMENTS

There were no outbreaks of confirmed *E. coli* O157:H7 investigated in LAC during 2005. Two cases were identified as part of a multi-state clusters of *E. coli* O157:H7 but were unrelated to each other.

Collaborative efforts among physicians, laboratories and the health department are important for enhancement of surveillance activities. Physicians should request testing for *E. coli* O157:H7 or shiga toxin on all bloody stools. Physicians should consider *E. coli* O157:H7 in their diagnoses by asking about consumption of high-risk foods, attendance at day-care centers or farms, and exposure to other individuals with diarrhea. All cases of HUS should be reported immediately and physicians should request stool testing for *E.coli* O157:H7 for these patients.

Laboratory analysis with PFGE has been helpful in detecting clusters of *E. coli* O157:H7. PulseNet is a nationwide network of laboratories that perform PFGE, or “DNA fingerprinting” of foodborne bacteria. This network permits rapid comparison of fingerprint patterns to identify clusters and enhance outbreak investigation. In 2005, two LAC isolates were identified as matches to patterns in the PulseNet database, but no epidemiological links were found.

PREVENTION

Increased public education to prevent *E. coli* O157:H7 infection is needed. Information should focus on safe food handling practices, proper hygiene and identifying high-risk foods and activities both in the

home and while eating out. To avoid infection, beef products should be cooked thoroughly. Produce, including pre-washed products should be thoroughly rinsed prior to eating. In addition, one should drink only treated water and avoid swallowing water during swimming or wading. Careful handwashing is essential, especially before eating and after handling raw beef products or coming in contact with or being around animals. The collection of detailed food histories is important to understand underlying sources of infection. The strengthening of national food processing regulations to decrease contamination is also important to reduce infection.

ADDITIONAL RESOURCES

General information about this disease can be found at:
www.cdc.gov/ncidod/diseases/submenus/sub_ecoli.htm

Foodborne disease active surveillance is available from FoodNet (CDC) at: www.cdc.gov/foodnet

Information from the Gateway to Government Food Safety is available at:
www.foodsafety.gov

Information about outbreaks (nationwide) is available from the Outbreak Response and Surveillance Unit of the CDC at: www.cdc.gov/foodborneoutbreaks/index.htm

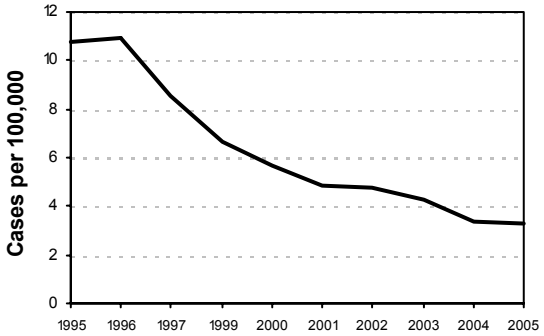
General information and reporting information about this and other foodborne diseases in LAC is available at: www.lapublichealth.org/acd/food.htm

GIARDIASIS

CRUDE DATA	
Number of Cases	313
Annual Incidence[a]	
LA County	3.27
United States	7.10
Age at Diagnosis	
Mean	32
Median	34
Range	<1–89 years
Case Fatality	
LA County	0.0%
United States	N/A

[a] Cases per 100,000 population.

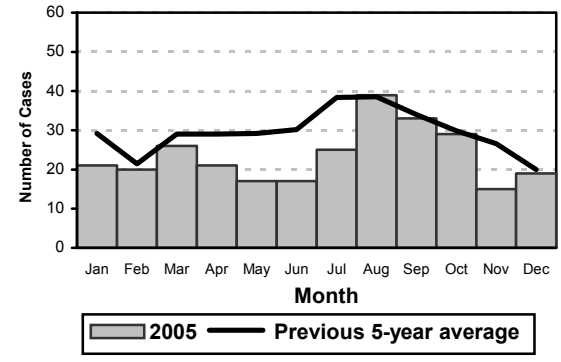
Figure 1
Giardiasis
Incidence Rates by Year of Onset
LAC, 1995–2005



DESCRIPTION

Giardiasis is an intestinal infection caused by the zoonotic protozoan parasite *Giardia intestinalis* (previously *G. lamblia*). *Giardia* cysts shed in animal or human feces may contaminate food or drinking water or be transferred on hands or fomites; recreational waters such as lakes and pools may also serve as vehicles of transmission. Incubation can range from 3–25 days or longer, but the median incubation time is 7–10 days. While usually asymptomatic, symptoms can include sulfurous burps, chronic diarrhea, frequent loose and pale greasy stools, bloating, cramps, fatigue, and weight loss. Complications are rare, but may include malabsorption of fats and fat-soluble vitamins. Children in day care represent a reservoir of disease in developed countries. There is no vaccine.

Figure 2
Giardiasis
Cases by Month of Onset
LAC, 2005



DISEASE ABSTRACT

- The incidence of *Giardia* in LAC has dropped annually over the past 10 years, and has reached an all-time low in 2005.
- Incidence tends to increase during summer months when high-risk activities such as recreational water exposure also increase.

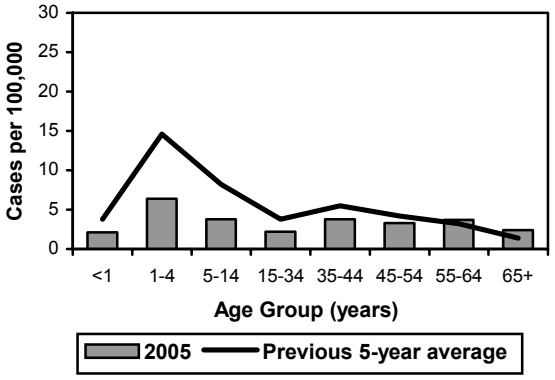
STRATIFIED DATA

Trends: Giardiasis incidence in LAC and has reached an all-time low during 2005; the number of cases reported decreased more than 70% over the past 10 years (1,161 cases reported in 1994, Figure 1). In fact, 2005 Giardiasis incidence in LAC is the lowest reported in the last 20 years.

Seasonality: The number of cases typically increases during summer months when recreational exposure is more likely (i.e., swimming in infected pools, lakes, etc.) (Figure 2).

Age: As in previous years, the highest age-specific incidence rate occurred among children aged 1–4 years (6.4 cases per 100,000); the 5–14 age group and the 35–44 age group followed with an incidence of about 3.8 cases per 100,000 each (Figure 3).

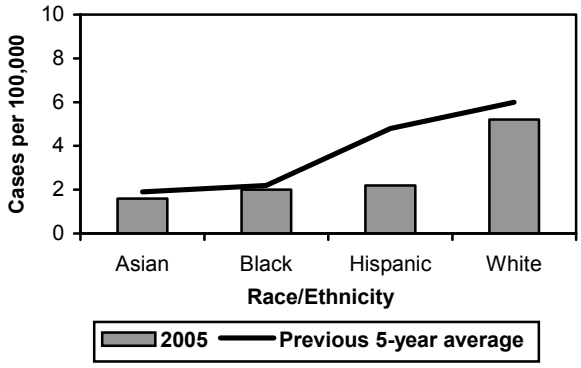
Figure 3
Giardiasis
Incidence Rates by Age Group
LAC, 2005



Sex: Males continue to be more likely to contract *Giardia* than females (1.4:1).

Race/Ethnicity: Whites continue to have higher race/ethnicity specific incidence rates than other races. Compared to the previous five-year average, the incidence for Hispanics has decreased 37% and the incidence for Blacks has decreased 5% (Figure 4); Hispanics continue to have a higher race/ethnicity specific incidence than Blacks. The race/ethnicity specific incidence rate for Asians decreased (9%) compared to previous years.

Figure 4
Giardiasis
Incidence Rates by Race/Ethnicity
LAC, 2005



Location: Of the eight SPAs across LAC, three had rates that were higher than the overall county mean rate for this disease: SPA 2, San Fernando area (4.9 per 100,000); SPA 4 Metro area (3.9 per 100,000); and SPA 5 West (5.2 per 100,000). The rate in SPA 1 Antelope Valley dropped substantially from 3.9 to 0.9 cases per 100,000 population.

COMMENTS

There has been a considerable decline in incidence of *Giardia* over the past decade. While the specific reasons for this decrease are unknown, several factors may have contributed including advances in food and water safety as well as improved education about safety regarding recreational water (i.e., avoiding drinking lake and pool water, keeping babies in diapers and individuals with diarrhea from swimming in public facilities).

There was one outbreak reported in 2005, where 10 women became ill sharing a common water source at a gym. Please see 2005 special report for more details.

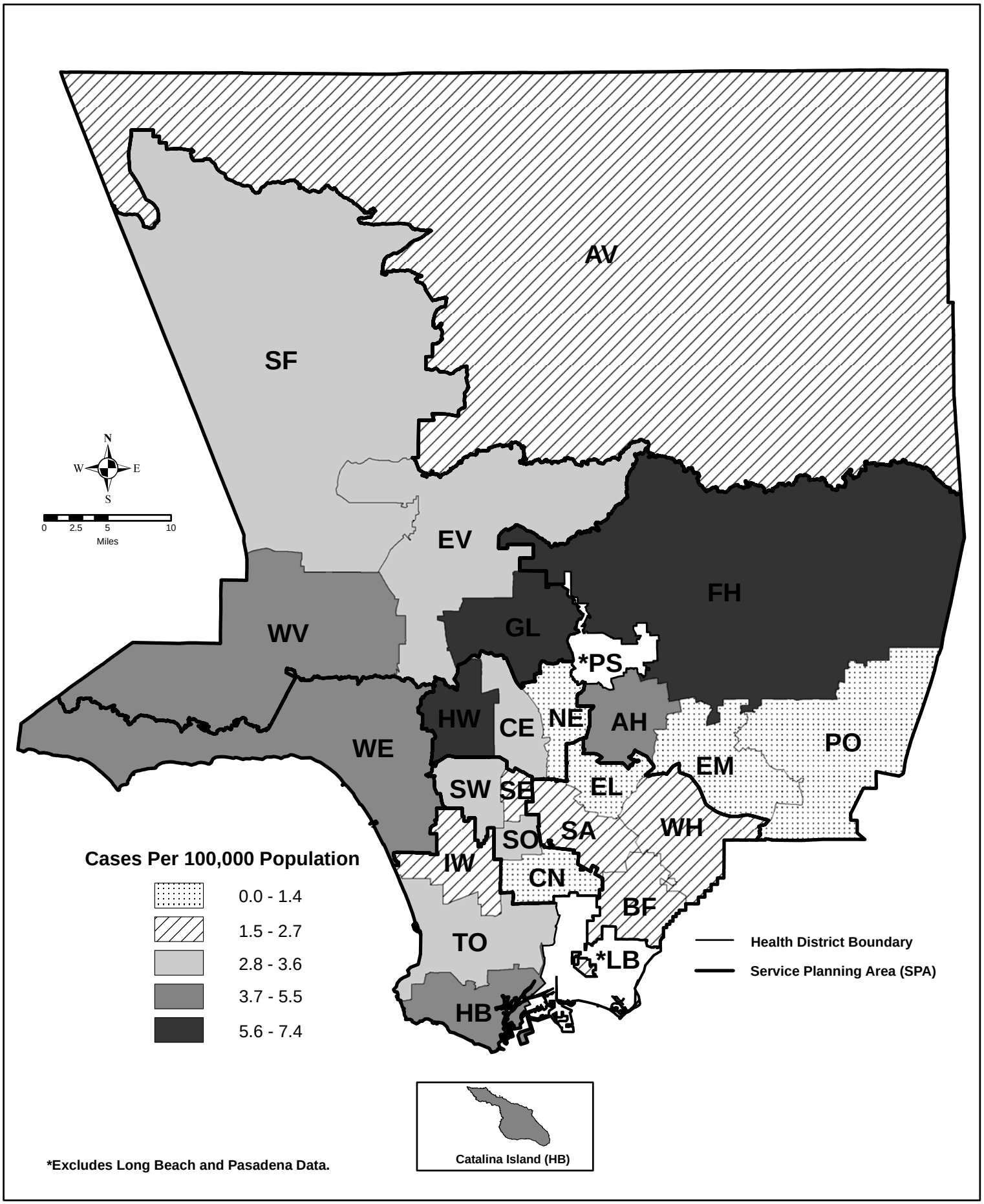
ADDITIONAL RESOURCES

CDC. Giardiasis Surveillance—United States, 1992–1997. MMWR 2000; 49(SS07); 1–13. Available at: www.cdc.gov/epo/mwr/preview/mmwrhtml/ss4907a1.htm

CDC. Parasitic Disease Information Fact Sheet—Giardiasis. Available at: www.cdc.gov/ncidod/dpd/parasities/giardiasis/factsht_giardia.htm

CDC. Surveillance for Waterborne Disease Outbreaks—United States, 1997–1998. MMWR 2000; 49(SS04); 1–35. Available at: www.cdc.gov/epo/mmwr/review/mmwrhtml/ss4904a1.htm

Map 6. Giardiasis
Rates by Health District, Los Angeles County, 2005*



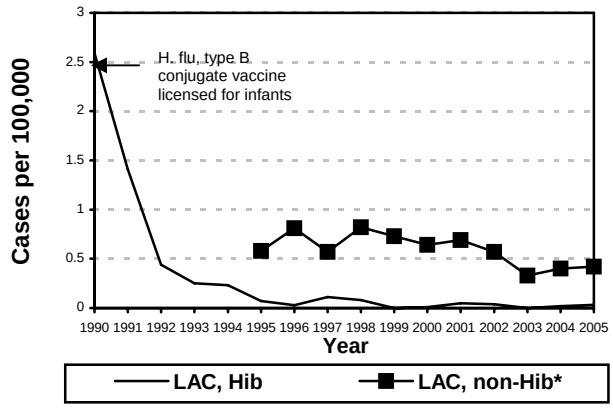
*Excludes Long Beach and Pasadena Data.

HAEMOPHILUS INFLUENZAE INVASIVE DISEASE

CRUDE DATA	
Number of Cases	75
Annual Incidence[a]	
LA County	0.78
California	0.19[b]
United States	
Age at Diagnosis	
Mean	57.2
Median	69.0
Range	<1–99.0
Case Fatality	
LA County	8.0%
United States	

[a] Cases per 100,000 population.
[b] Cases per 100,000 persons, aged less than 30 years. In California, *H. influenzae* among persons > 29 years of age is not reportable.

Figure 1
H. influenzae Invasive Disease
Incidence Rates by Year
LAC, 1990–2005

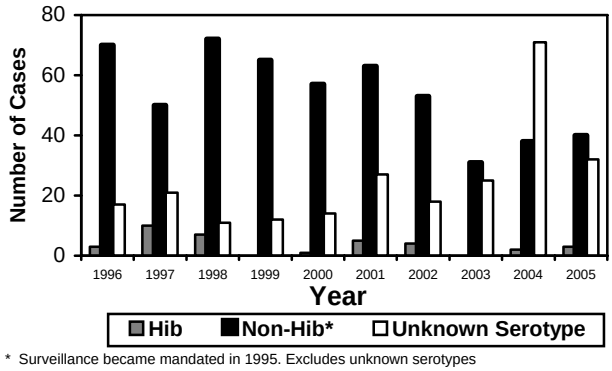


* Surveillance became mandated in 1995. Excludes unknown serotypes

DESCRIPTION

Haemophilus influenzae is a Gram-negative coccobacillus that can cause both invasive and non-invasive disease. *H. influenzae* invasive disease includes meningitis, sepsis, pneumonia, cellulitis, and septic arthritis. Currently, the disease primarily affects infants and the elderly, as well as immunocompromised individuals and those who have abnormal splenic function. *H. influenzae* can be transmitted by respiratory secretions of individuals colonized in the oropharynx with the organism. There are six encapsulated, typeable strains (a–f) and unencapsulated, nontypeable strains of *H. influenzae*. Prior to the introduction of the H. *influenzae* type b (Hib) conjugate vaccine in 1990, most cases of invasive disease in children were caused by type b. *H. influenzae* type b is the only serotype that is vaccine-preventable and for which chemoprophylaxis is effective.

Figure 2
H. influenzae Invasive Disease
Cases by Year of Onset
LAC, 1996–2005



* Surveillance became mandated in 1995. Excludes unknown serotypes

DISEASE ABSTRACT

- The widespread use of the Hib vaccine since 1990 has dramatically decreased the incidence of *H. influenzae* type b disease in LAC (Figures 1, 2).
- Of the 3 Hib cases identified in 2005, only one case was completely vaccinated.
- The epidemiology of H. *influenzae* invasive disease is now being shaped by non-Hib and unknown serotypes (Table 1, Figure 2, Figure 3).

Table 1: *H. influenzae* Crude Data by Serotype, 2005 vs. Previous 5-Year Average

	B		Non-Hib		Unknown type	
	2005	Previous 5-Year Average	2005	Previous 5-Year Average	2005	Previous 5-Year Average
Number of Cases	3	2.4	40	47.8	32	33.0
Age at Onset						
Mean	25.7	36.2	49.0	39.3	70.5	61.8
Median	7.0	31.4	54.5	35.5	76.0	67.8
Range	1.0 – 69.0	20.0 – 62.5	Birth – 94.0	Birth - 93.0	21.0 – 99.0	6.0 – 98.0
LAC Case Fatality	0%	16.7%	10%	5.8%	6.3%	6.8%

IMMUNIZATION RECOMMENDATIONS

- All infants, including those born prematurely, can receive a primary series of conjugate Hib vaccine beginning at 2 months of age. The number of doses in the series depends on the brand of vaccine used. A booster is recommended at 12-15 months regardless of which brand of vaccine is used for the primary series.
- Individuals older than 59 months of age do not need Hib vaccination unless they have a health condition that puts them at increased risk for invasive Hib disease.

Figure 3
H. influenzae Invasive Disease
Percent Cases by Serotype
LAC, 2005 (N=75)

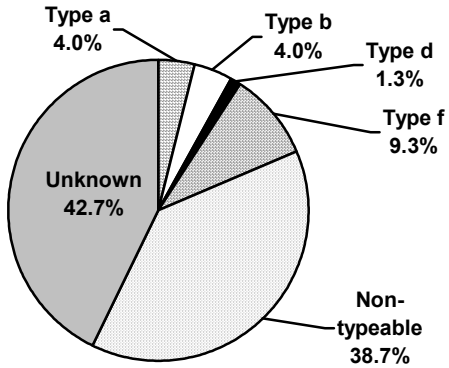
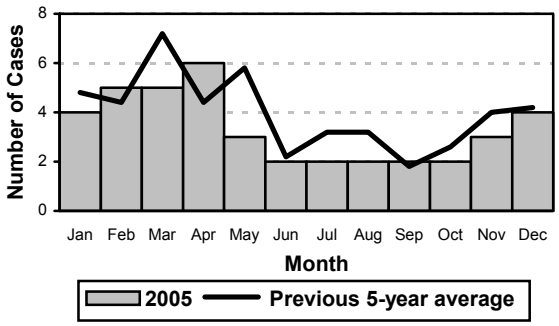


Figure 4
H. influenzae Invasive Disease
Cases Due to Non-Hib Serotype
by Month of Onset
LAC, 2005 (N=40)



STRATIFIED DATA

Seasonality: The 3 Hib cases had disease onset in January, March, and October. Similar to previous years a temporal pattern has been evidenced in LAC, with a peak in non-Hib cases during the months of January to April. These four months accounted for 50% (n=20) of the non-Hib cases (Figure 4).

Sex: The male-to-female ratio of Hib, non-Hib, and unknown serotype cases was 2:1, 1:1, and 1:1.4, respectively.

Age: The 3 Hib cases were 1, 7, and 69 years of age. The number of non-Hib cases by age in 2005 followed the trend of the previous five years – the 65+ age group (48%, n=19) remaining the most affected by non-Hib invasive disease (Figure 5). Only 23% (n=9) of non-Hib cases were under the age of 5. Of the 32 cases with unknown serotype, 97% (n=31) were over the age of 30 and were not actively investigated for serotype as detailed in LAC's priority investigation criteria. In addition, 63% (n=20) of these unknown serotype cases were in the 65+ age group.

Race/Ethnicity: Two of the Hib cases were Hispanic and one was White. Among the non-Hib cases where the race/ethnicity was known (n=29), Whites accounted for 45% (n=13) of the cases, followed by

Hispanics (n=10; 35%). Among the unknown serotype cases of whom race/ethnicity was identified (n=23), 61% were among Whites (n=14), followed by Hispanics (n=4; 17%) (Figure 6.)

Location: The 3 Hib cases resided in SPA 2, SPA 4, and SPA 5. The number of non-Hib cases per SPA ranged from 1 to 11. San Fernando Valley (SPA 2) accounted for 11 cases. San Gabriel Valley (SPA 3) and South (SPA 6) accounted for 6 non-Hib cases each. Metro (SPA 4) had 5 cases while East (SPA 7) and South Bay (SPA 8) had 3 cases each. West (SPA 5) reported the fewest cases (n=1). An additional 13% (n=5) of non-Hib cases had no identified SPA. The number of unknown serotype cases per SPA ranged from 2 to 6, with SPA 2 and SPA 4 accounting for 6 cases each and SPA 5 with 2 cases. SPA 7 accounted for 5 cases while SPA 3 and SPA 6 had 4 cases each. SPA 8 had 3 cases. An additional 6% (n=2) of the unknown serotype cases did not have a residence indicated. SPA 1 did not report any Hib, non-Hib, or unknown serotype cases.

Figure 5
H. influenzae Invasive Disease
Serotype Non-Hib Cases by Age Group
LAC, 2005 (N=40)

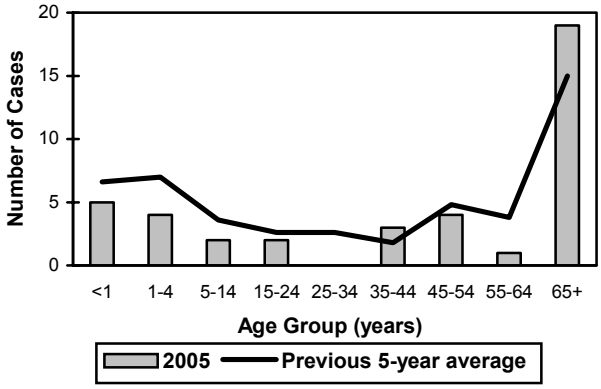
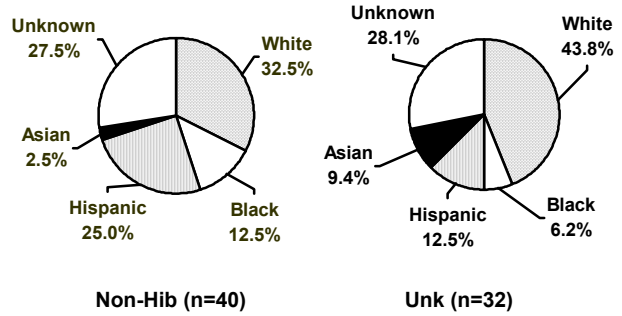


Figure 6
H. influenzae Invasive Disease
Percent Cases by Race/Ethnicity
LAC, 2005



COMMENTS

The only cases of *H. influenzae* disease investigated in LAC are those in persons less than 30 years of age. Contacts of these cases are investigated and chemoprophylaxis is given when appropriate.

Rates of invasive Hib disease in children have decreased to extremely low levels since Hib vaccines became available in 1990. Among the 75 H. *influenzae* cases, only 3 (4%) were Hib cases. None of the cases had any known exposure to a confirmed/suspected case. All 3 Hib cases were hospitalized, two for pneumonia and one for meningitis.

Although the 7-year-old Hib case had documented evidence of being up to date with the Hib vaccination for his age, invasive Hib disease in a completely vaccinated child is very rare. More than 95% of children will develop protective antibody levels after a primary series of 2 or 3 doses. Clinical efficacy has been estimated at 95% to 100%.

Case Fatalities: There were six fatalities among *H. influenzae* cases: four were non-Hib cases and two were unknown serotypes. One of the fatalities was a premature baby that died on the second day of life. The other five fatalities (83%) were in persons over the age of 30 so the cases were not investigated for further details. Information on complications was provided for two cases. Both cases had pneumonia. Females accounted for five of the six (83.3%) case fatalities. Two of the fatalities were White, two were Black, one was Asian, and one was of unknown race/ethnicity.

ADDITIONAL RESOURCES

Information about immunization is available through the National Immunization Program at www.cdc.gov/nip and the Immunization Action Coalition at www.immunize.org.

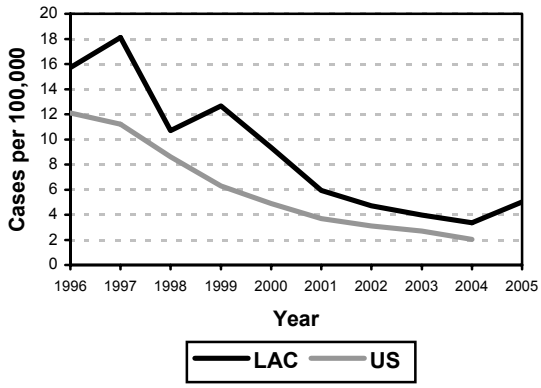
Information specific to LAC is available from LAC DHS Immunization Program at www.lapublichealth.org/ip and from ACDC at www.lapublichealth.org/acd/procs/b73/b73index.htm.

HEPATITIS A

CRUDE DATA	
Number of Cases	480
Annual Incidence[a]	
LA County	5.01
California	N/A
United States	N/A
Age at Diagnosis	
Mean	38
Median	36
Range	1-89 years
Case Fatality	
LA County	0.0%
United States	N/A

[a] Cases per 100,000 population.

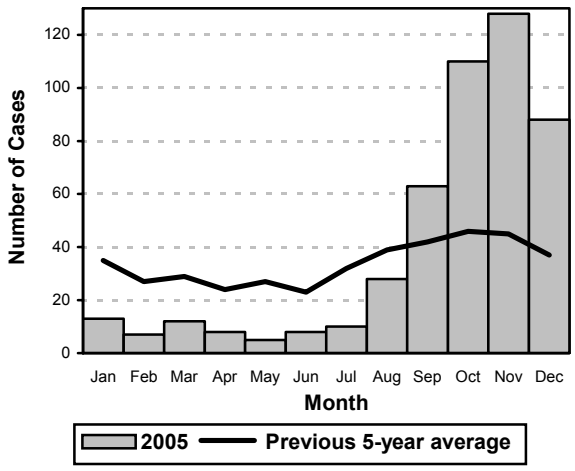
Figure 1
Hepatitis A
Incidence Rates by Year
LAC and US, 1996–2005



DESCRIPTION

Hepatitis A virus (HAV), a RNA-virus of the Picornaviridae family, is a vaccine-preventable disease transmitted fecal-orally, person-to-person, or through vehicles such as food. Signs and symptoms of acute hepatitis A include fever, malaise, dark urine, anorexia, nausea, and abdominal discomfort, followed by jaundice. Many cases, especially in children, are mild or asymptomatic. Sexual and household contacts of HAV-infected persons are at increased risk for getting the disease. The average incubation period is 28 days (range 15–50 days). Recovery usually occurs within one month. Infection confers life-long immunity.

Figure 2
Hepatitis A
Cases by Month of Onset
LAC, 2005



ACDC uses the CDC/CSTE criteria for acute hepatitis A to standardize surveillance of this infection. The criteria include: 1) an acute illness with discrete onset of symptoms and 2) jaundice or elevated aminotransferase levels, and 3) appropriate lab tests to confirm laboratory criteria for acute hepatitis A diagnosis: IgM anti-HAV positive, or a case meets the clinical case definition and has an epidemiologic link with a person who has laboratory confirmed hepatitis A (i.e., a household or sexual contact of an infected person during the 15–50 days before the onset of symptoms).

It was discovered in November of 2005, that one of the largest reporting sources of hepatitis A inadvertently stopped reporting cases since September 2004. In November 2005, this source reported more than 300 positive tests going back more than a year, which had to be investigated. For these reasons, the year 2005 was divided into two parts. In the last 5 months, all cases were confirmed as

acute hepatitis A if they met the CDC/CSTE criteria, or if the case was unable to be interviewed, they had ALT levels >300 (a marker of liver injury), or if their medical record indicated they had signs and symptoms of hepatitis A.

DISEASE ABSTRACT

- The incidence rate of acute hepatitis A has increased from the previous year (Figure1).
- Since January 1, 2005, when ACDC implemented CDC/CSTE criteria to standardize surveillance for this infection, the number of acute hepatitis A confirmed cases decreased significantly during the first seven months (Jan–July) of 2005 versus 2004 (63 vs. 205 respectively).
- There was a sharp increase in the number of acute hepatitis A cases starting in August of 2005. In addition to the overall increase of hepatitis A, there were five outbreaks of hepatitis A in the fall of 2005.
- Hepatitis A incidence rates among those between the ages of 15–65 were higher in 2005 and the majority of cases were males.

STRATIFIED DATA

Trends: The hepatitis A incidence rate was 5.01 cases per 100,000 population for 2005 which was higher than last year (Figure 1).

Seasonality: The increase in HAV cases historically observed in summer to early autumn was observed again in 2005 (Figure 2).

Age: The overall mean age for HAV cases in 2005 was 38 years. The mean age differed significantly by race and ethnic groups. The mean age for Latinos was 28 years while Asian, White, and Black cases had mean ages of 35, 43, and 46 years, respectively. Historically, the age-specific rate has been highest in children aged 5-14years and 65 and old. However, in 2005, the rate was highest among those 15-54 years (Figure 3).

Sex: The overall HAV male-to-female rate ratio was 1.7:1. Among Asian cases, the male-to-female rate ratio was 0.9:1, while among Latino, White, and Black cases, incidence rates ratios were higher among males, at 1.4:1, 1.8:1, and 2.8:1 respectively.

Race/Ethnicity: The highest rate in 2005 was among White (7.0 per 100,000), followed by Black (5.7), Asian (3.4), and Latinos (3.0), respectively (Figure 4).

Location: The highest number of cases occurred in SPA 4 (10.5 per 100,000) followed by SPA 5 (6.9), SPA 8 (5.2), SPA 2 (3.7), SPA 7 (3.6), SPA 3 (3.3), SPA 1 (3.2), and SPA 6 (2.9) (Figure 5).

Figure 3
Hepatitis A Incidence Rates
by Age Group LAC 2005 (N=480)*

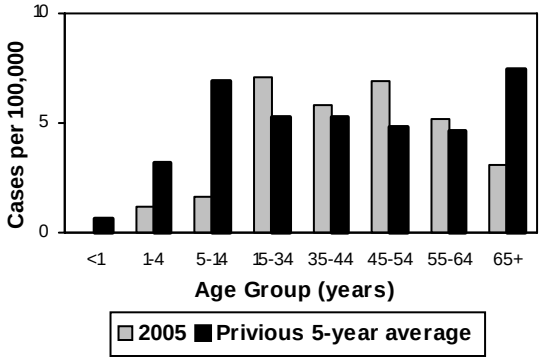


Figure 4
Hepatitis A Incidence Rates
by Race/Ethnicity
LAC, 2005

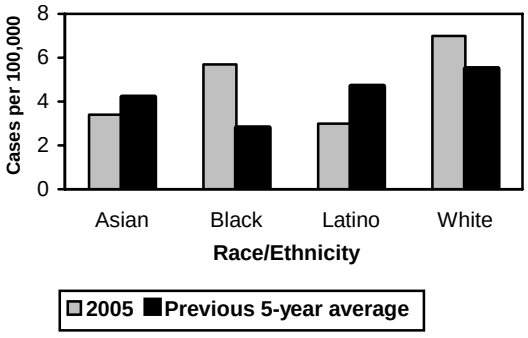
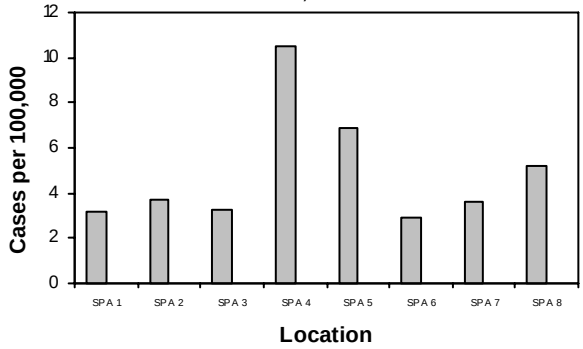


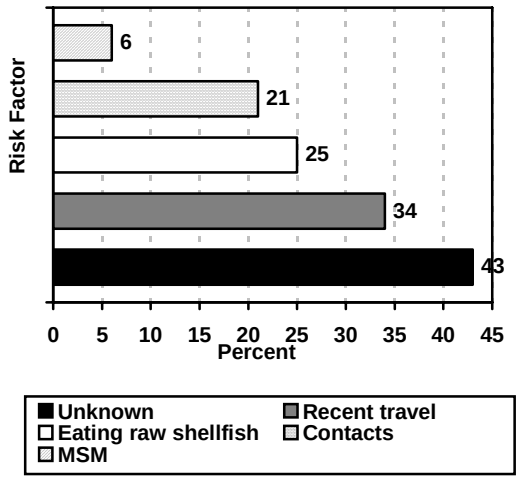
Figure 5
Hepatitis A Rates
by Location
LAC, 2005



Severity of Illness: Among all HAV cases in 2005, there was no reported fatality. Twenty-five percent (n=120) of hepatitis A cases were hospitalized. Ages, in those hospitalized, ranged from 3 to 89 years, with a median age of 34.

Risk Factors: Risk factors were reported for 43% (n=207) of the cases (including some cases with multiple risk factors). Recent travel outside of the US (n=71, 34%) was the most common risk factor reported in 2005, followed by eating raw shellfish (n=52, 25%), and being in contact with another case (n=43, 21%), and MSM (n=12, 6%), respectively (Figure 6). Among travelers, South and Central American destinations (74%) were most frequently cited.

Figure 6
Hepatitis A Reported Risk Factors
LAC, 2003



*Includes cases identifying multiple risks.

PREVENTION

Effective strategies for decreasing the number of hepatitis A cases in LAC include adding hepatitis A vaccine to the children immunization program and Public Health Nurses providing immune globulin (IG) to close contacts of cases and educating clients about the importance of hand hygiene on reducing infections when cases of acute hepatitis A are reported to LAC DHS. Close contacts, such as household contacts, sexual partners, and other intimate contacts are offered post-exposure prophylaxis with IG.

COMMENTS

In LAC, prior to 2005, hepatitis A cases were often counted as “acute” even if the only information received about the patient was a positive IgM test. Since January 1, 2005, ACDC has been using the CDC/CSTE criteria for investigation and disposition of acute hepatitis A. The purpose of changing is to improve surveillance to allow ACDC to more accurately monitor trends in hepatitis, and compare local data with state and national data.

After implementing the CDC/CSTE case definition for acute hepatitis A, the number of acute hepatitis A confirmed cases decreased significantly during the first seven months (Jan-July) in 2005 versus 2004 (63 versus 205 cases respectively). However, there were five outbreaks of hepatitis A during August-December, in addition to the generalized increase in acute hepatitis A. Furthermore, one of the largest reporting sources of hepatitis A inadvertently stopped reporting cases in September 2004. In November 2005, this source reported more than 300 positive tests going back more than a year which had to be investigated. Consequently, for the last five months of 2005, cases were confirmed as acute hepatitis A if they met the CDC/CSTE criteria, or if the case was unable to be interviewed, they had ALT levels >300 (a marker of liver injury), or if their medical record indicated they had signs and symptoms of hepatitis A. The reason for ACDC not strictly applying the CDC/CSTE case definition was to avoid missing cases, especially in hard to reach populations, during our outbreak period. Obviously, surveillance and investigation for hepatitis A was challenging during this time.

For the first seven months, there were 319 cases initially reported to have acute hepatitis A in comparison to the 243 cases reported in the first seven months of 2004. Upon further investigation, cases meeting the CDC/CSTE criteria for acute hepatitis A have decreased from 2004 to 2005 with 205 (84%) and 63 (20%) cases confirmed respectively for cases reported in the first seven months of those years. Even though, there was a 31% increase in the number of cases reported, there was a 69% decrease in the number of cases confirmed. A possible reason for the decrease may be due to the standardized criteria for investigation and classification rather than a true reduction in infection.

There were 680 cases initially reported to have acute hepatitis A during the outbreak period (August-December, 2005) of which 391(58%) met the CDC/CSTE criteria for acute hepatitis A. Another 26 (4%) cases (unable to be interviewed) were confirmed as acute hepatitis A by ALT levels > 300 or their medical record indicated they had signs and symptoms of hepatitis A. Comparing the data collected between the first seven months and the last five months of 2005, we observed that during the last five months of 2005, the incidence rate was 10 times higher than the first seven months of 2005. Moreover, the percentage of confirmed acute hepatitis increased from the first seven months of 2005 to the last five months of 2005 with 20% (n=63) vs. 58% (n=391) respectively. The absolute number of "false" cases (those not meeting the case definition) stayed pretty much the same throughout the entire year, demonstrating that the increased number of cases of hepatitis A during the outbreak period was due to a true increase in disease incidence and not just increased surveillance for the disease. Reviewing the false cases, we determined that serological tests were being ordered for asymptomatic patients in LAC. Improving hepatitis surveillance by adhering to the CDC/CSTE definition will allow us to better identify risk factors for true cases of hepatitis A and develop intervention programs.

In LAC, prior to 2005, the incidence of hepatitis A in elderly adults aged 65 years and older was high (Figure 3). However, district public health nurses anecdotally reported that older adult cases received hepatitis A screening test as a part of their routine check ups and not when they were acutely ill. With the new case definition of hepatitis A, only 45% of received reports were closed as confirmed acute cases. Using the new case definition, only 6 percent of adult's cases were aged 65 years and older in 2005.

There were demographic differences in the cases during the "baseline" period of the first 7 months of 2005 versus the final 5 months of the outbreak period. The highest number of cases occurred in SPA 4 (8 in the baseline period and 118 in the outbreak period). The majority of cases in 2005 were among those 15-54 years old. In 2005, most of cases were male, which is a contrast to 2004 when there was an equal number of male and female cases. The gender disparity was most marked during the outbreak period when the ratio of male-to-female cases was 1.8:1. There was also an increase in the percentage of cases among Blacks (3.5% of cases in the baseline period versus 12.7% of cases in the outbreak period). Finally, during the outbreak period, 11% (n=51) of acute cases identified as homeless. Many of them were black males. LAC DPH is planning an outreach project to collaborate with the downtown homeless organizations to provide education/hepatitis A vaccine for food service providers at the downtown Skid Row area.

In addition to the overall increase of hepatitis A, there were five specific outbreaks of this pathogen in 2005. Settings included a downtown communal home that ran a soup kitchen in the Skid Row area in downtown, a movie set, two restaurants in downtown, and a drug treatment center. At this time, we have been unable to determine the source of the increase in cases of hepatitis A in LAC (see the 2005 Special Report for detailed information).

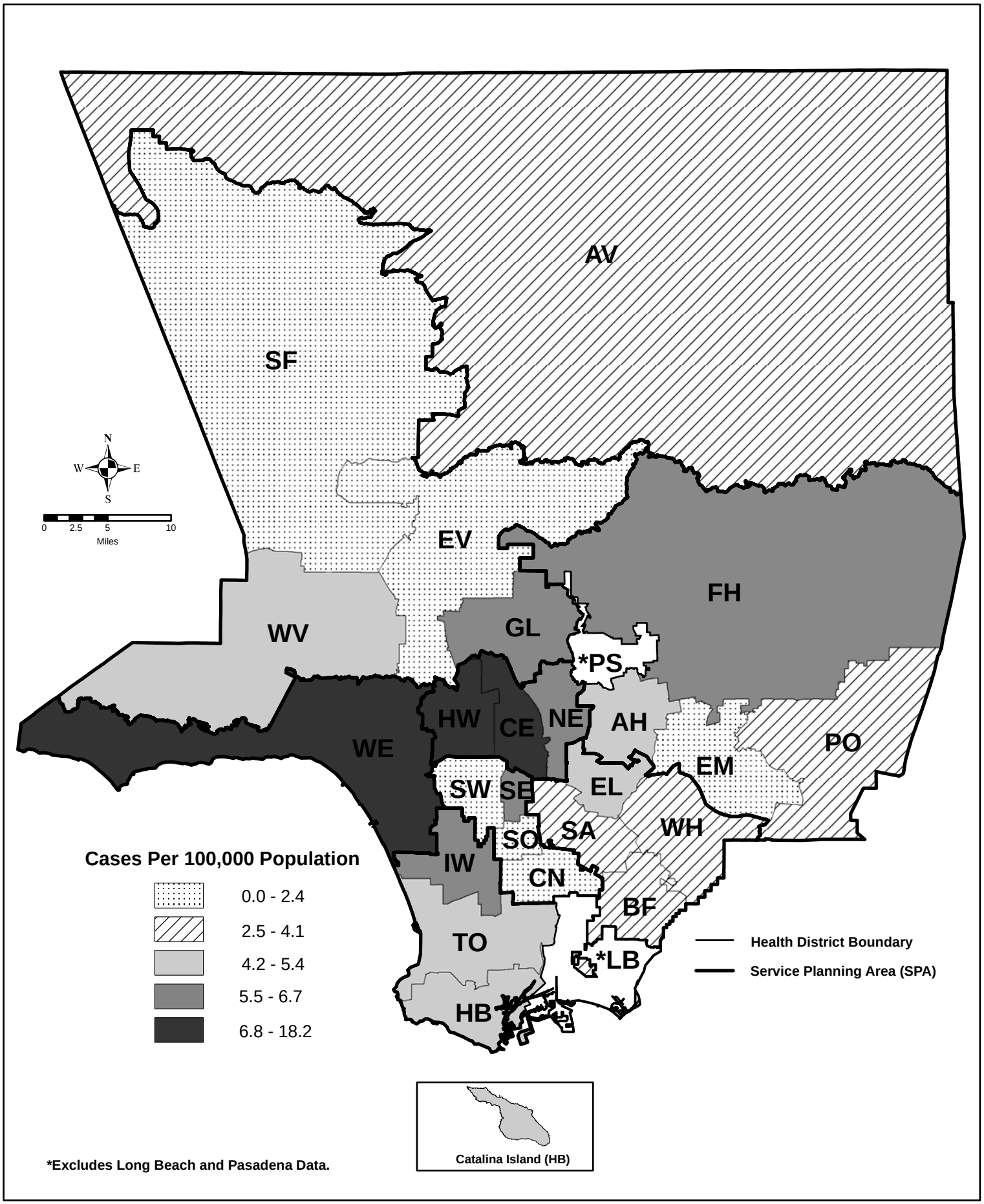
In 2005, the significant risk factors were international travelers, followed by those who eat raw shellfish, and those who reported contact with a household member or sexual partner who has HAV, and MSM. Therefore, it is important to educate travelers, consumers of raw shellfish, and MSM about hepatitis A vaccinations. Moreover, hepatitis A can be prevented by vaccination. Sustaining and further reducing hepatitis A incidence can be achieved by improving vaccination coverage in all US children starting at 2 years of age. Increased awareness of the public about the mode of hepatitis transmission and the importance of good personal hygiene also leads to a significant reduction in disease incidence.

ADDITIONAL RESOURCES

General information about hepatitis is available from the CDC at:

- www.cdc.gov/ncidod/diseases/hepatitis/slideset/bibliography.htm
- www.cdc.gov/ncidod/diseases/hepatitis/a/index.htm

Map 7. Hepatitis A
Rates by Health District, Los Angeles County, 2005*



*Excludes Long Beach and Pasadena Data.

HEPATITIS B, ACUTE (NON-PERINATAL)

CRUDE DATA	
Number of Cases	57
Annual Incidence[a]	
Los Angeles	0.59
California	N/A
United States	N/A
Age at Diagnosis	
Mean	42
Median	39
Range	18–92 years
Case Fatality	
LA County	0.0%
United States	N/A

[a] Cases per 100,000 population.

Figure 1
Hepatitis B
Incidence Rates by Year
LAC and US, 1995–2005

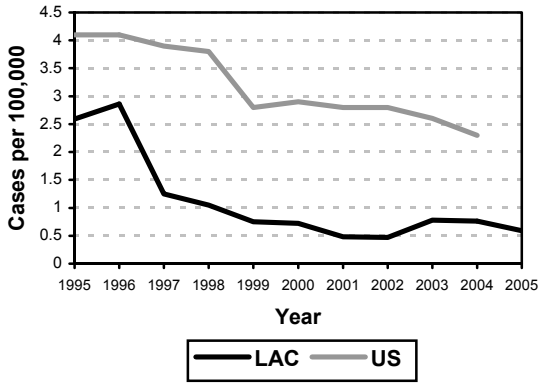
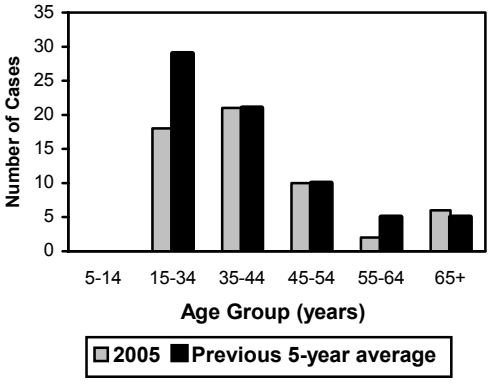


Figure 2
Acute Hepatitis B
Number Cases by Age Group
LAC, 2005



DESCRIPTION

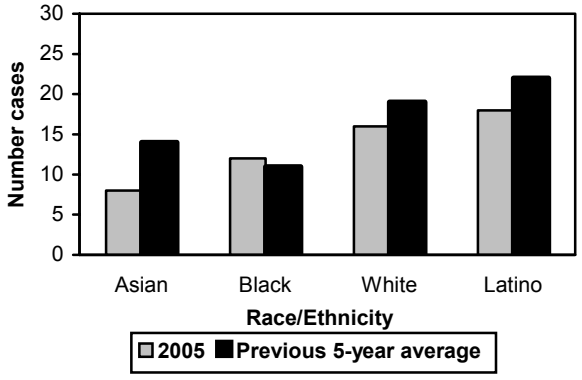
Overall, hepatitis B is more prevalent and infectious than AIDS. Hepatitis B is a vaccine-preventable disease transmitted through parenteral or mucous membrane exposure (via sex or drugs) to the blood and other bodily fluids of individuals infected with the hepatitis B virus (HBV), a DNA-virus of the Hepadnaviridae family. It is also spread from mother to child at birth or soon after birth. Symptoms, which occur in less than half of those acutely infected, may be very mild and flu-like: anorexia, nausea, fatigue, abdominal pain, muscle or joint aches, jaundice and mild fever. Approximately 2–10% of adults infected with HBV are unable to clear the virus within six months and become chronic carriers. Death from cirrhosis or liver cancer is estimated to occur in 15–25% of those with chronic infection.

For the purpose of surveillance, ACDC uses the CDC/CSTE criteria for acute hepatitis B which include: 1) discrete onset of symptoms and 2) jaundice *or* elevated aminotransferase levels, and 3) appropriate laboratory tests to confirm acute hepatitis B diagnosis (i.e., HBsAg positive or anti-HBc IgM positive, if done, *and* anti-HAV IgM negative, if done).

DISEASE ABSTRACT

- The incidence rate for acute hepatitis B has decreased from the previous year (Figure 1); there were only 57 cases confirmed for 2005 versus 72 cases in 2004.
- All acute cases were among young adults aged 18 years or older and the majority of cases were males.
- Men who have sex with men (MSM) was the most frequently identified risk factor.
- No outbreaks were reported.

Figure 3
Acute Hepatitis B
Number cases by Race/Ethnicity*
LAC, 2005



* Excludes perinatal cases.

STRATIFIED DATA

Seasonality: None.

Age: Cases ranged in age from 18 to 92 years (the median age was 39) with 68% occurring in those aged under 45 years (Figure 2).

Sex: The male-to-female rate ratio was 3.8:1. The number of cases in males exceeded those in females in all ethnic groups.

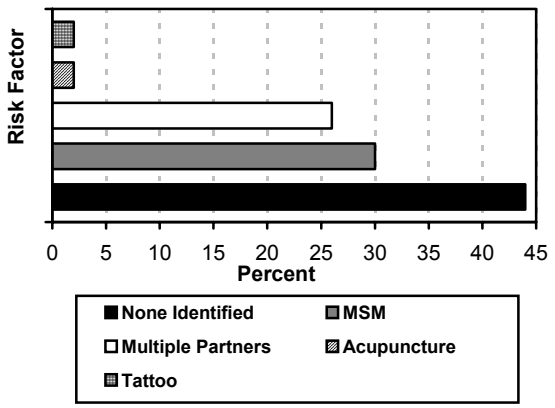
Race/Ethnicity: The highest number of cases was seen in Latinos (n=18) followed by Whites (n=16), Blacks (n=12) and Asians (n=12) respectively (Figure 3).

Location: SPA 4 (n=14) had the most cases, followed by SPA 2 (n=10), SPA 7 (n=8), SPA 8 (n=8), SPA 6 (n=7), SPA 5 (n=5), SPA 3 (n=4), and SPA 1 (n=1) respectively.

Severity of Illness: Among all acute HBV cases in 2005, there was one fatality (case fatality rate=2%).

Risk Factors: Risk factors were reported for 56% of the cases (including some cases with multiple risk factors). MSM (n=17, 30%) was the most common risk factor reported in 2005, followed by having multiple sexual partners (n=15, 26%) acupuncture (n=1, 2%), and tattoo (n=1, 2%) (Figure 4).

Figure 4
Hepatitis B Reported Risk Factors
LAC, 2005



*Includes cases identifying multiple risks.

COMMENTS

In LAC, there were 381 cases initially reported to have acute hepatitis B in comparison to the 291 cases reported for 2004. Even though there was a 31% increase in the number of cases reported, there was a 21% decrease in the number of cases confirmed because, upon further investigation, cases meeting the CDC/CSTE criteria for acute hepatitis B has decreased from 2004 to 2005 with 72 (25%) and 57 (15%) cases confirmed respectively, paralleling a decrease of cases in from 2003 to 2004. In 2004, ACDC thought a possible reason for decrease was due to the new use of the CDC/CSTE criteria for determining if a reported case of acute hepatitis B actually met the surveillance case definition. Now, ACDC has been implementing the CDC/CSTE criteria for two years, the data indicate that the incidence rate for acute hepatitis B has truly decreased from the previous year and that the decrease in acute hepatitis B may be due to a true decrease in disease incidence, perhaps due to increased vaccination.

In 2005, all acute hepatitis B cases were aged 18 years or older. Sixty-eight percent were in younger adults aged 18-44 years. People with multiple sexual partners and MSM continue to be at risk for hepatitis B; thus, preventive efforts including education and vaccinations should continue to focus on these high-risk populations. In LAC, we provide hepatitis B vaccine to special high-risk group at the STD clinics to in an effort to reduce hepatitis B incidence.

PREVENTION

Decreasing rates of acute hepatitis B in children under age 19 is evidence of the successful immunization strategy to eliminate HBV transmission in LAC. The immunization strategy includes: preventing perinatal HBV transmission by screening all pregnant women for HBsAg and providing immunoprophylaxis to infants of HBV-infected women, routine immunization of all infants, and catch-up vaccination of all previously unvaccinated children aged < 19 years.

New strategies are needed to reduce high-risk behaviors and provide resources for low-cost hepatitis B immunization particularly for adults with the highest rates of transmission. Development and implementation of such strategies is possible through collaboration between public health, community-based organizations, and other agencies that serve target populations. Additionally, promoting hepatitis health education aims at eliminating, reducing, or mitigating high-risk behaviors in sexually active adults and increasing awareness and knowledge in the community.

ADDITIONAL RESOURCES

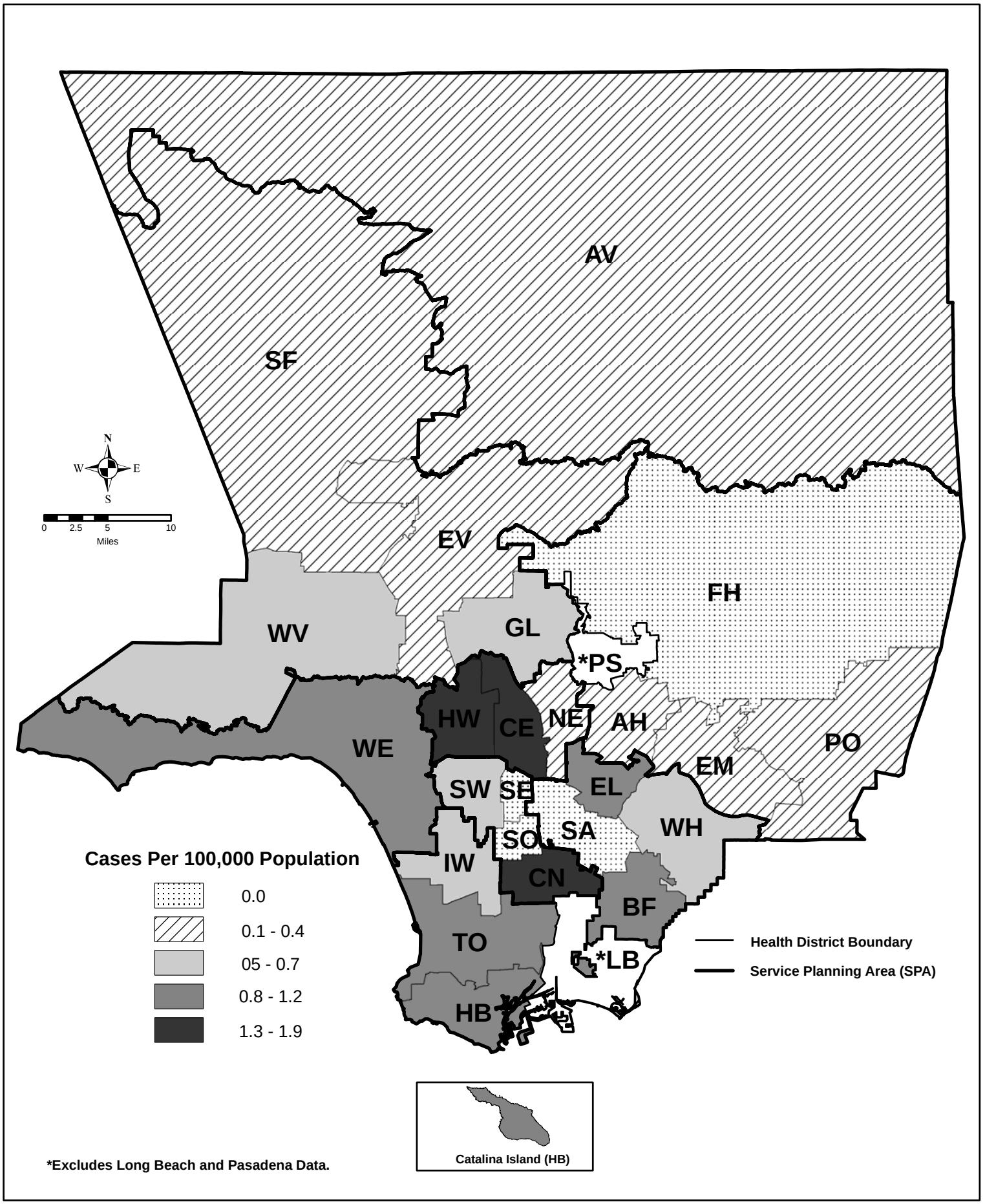
Epidemiology and Prevention of Viral Hepatitis slide set available at:
www.cdc.gov/ncidod/diseases/hepatitis/slideset/hep_b/slide1.htm

CDC Publications regarding viral hepatitis at: www.cdc.gov/ncidod/diseases/hepatitis/resource/pubs.htm

General information available at: www.cdc.gov/ncidod/diseases/hepatitis/b/index.htm and www.hepb.org

Immunization information available at: www.immunize.org

Map 8. Hepatitis B
Rates by Health District, Los Angeles County, 2005*



*Excludes Long Beach and Pasadena Data.

Perinatal hepatitis B has moved to the Special Disease Summaries section (page 167)

HEPATITIS C, ACUTE

CRUDE DATE	
Number of Cases	3
Annual Incidence	
LA County	N/A
California	N/A
United States	N/A
Case Fatality	
LA County	N/A
United States	N/A

[a] Rates based on fewer than 20 cases are unreliable.

DESCRIPTION

The Hepatitis C virus (HCV) is the most common bloodborne infection in the US. This RNA virus is predominantly transmitted through contact with contaminated blood and blood products via injection drug use. Sexual and perinatal transmission of HCV appears to occur less frequently. People at risk include: anyone who has had a blood transfusion prior to 1989, IV drug users, hemodialysis patients, infants born to infected mothers, those with multiple sexual partners, health care workers who suffer needle-stick accidents, and people with tattoos or body-piercing. However, an estimated 30% have no identifiable history of exposure to the virus. Household or familial contact is not considered a risk factor for the transmission of hepatitis C. There is no vaccine available for HCV and vaccines for hepatitis A and B do not provide immunity against hepatitis C.

Symptoms of acute infections can include jaundice, fatigue, anorexia, nausea, or vomiting; however, up to 85% of acute infections have mild or no symptoms and usually go undetected. After acute infection, 15%-25% of persons appear to resolve their infection without sequelae as defined by sustained absence of HCV RNA in serum and normalization of ALT levels. Chronic HCV infection develops in most persons (75%-85%) with persistent or fluctuating ALT elevations indicating active liver diseases developing in 60%-70% of chronically infected persons. In the remaining 30%-40% of chronically infected persons, ALT levels are normal. No clinical or epidemiologic features among patients with acute infection have been found to be predictive of either persistent infection or chronic liver disease [1]. Most studies have reported that medical complications occur decades after initial infection including cirrhosis, liver failure, and hepatic cancer.

ACDC uses the CDC/CSTE criteria for acute hepatitis C to standardize surveillance of this infection. The criteria include discrete onset of symptoms and:

1. A positive HCV test (antibody test EIA) confirmed by a more specific test (RIBA or detection of the HCV-RNA antigen by polymerase-chain reaction [PCR]) or an EIA signal to cutoff ratio of $\geq$3.8; and
2. Serum alanine aminotransferase (ALT) greater than 7 times the upper limit of normal; and
3. No evidence of either acute hepatitis A or B disease.

The purpose of standardizing surveillance is to allow ACDC to more accurately monitor trends in hepatitis C, compare local data with state and national data, and improve identification of risk groups.

DISEASE ABSTRACT

- There were three cases of confirmed acute hepatitis C in 2005, which is a decrease from 5 confirmed cases in 2004.
- Two female cases received multiple facial treatments.
- All cases were White.

STRATIFIED DATA

Seasonality: None.

Age: Cases ranged in age from 19 to 59 years (the median age was 36).

Sex: In 2005, the male to female rate ratio was 1:2. Male-to-female ratios has changed compared to the previous year (4:1 in 2004)

Race/Ethnicity: In 2005, all cases were White. It remained the same as the previous year.

Location: SPA 5 (n=2) had the most cases, followed by SPA 2 (n=1).

COMMENTS

There were 79 cases initially reported to have acute hepatitis C in 2005, but upon further investigation, only three (4%) met the acute hepatitis C surveillance criteria. This stringent criteria illustrates the difficulty of counting reported cases as acute hepatitis C for surveillance purposes. Therefore, it is likely that this data reflects an underreporting of acute hepatitis C cases. Furthermore, since some cases have mild signs and symptoms of hepatitis C in their acute stages, most of the time they may be first identified during the chronic stage.

There were limitations to the data collected. The data did not provide enough information for monitoring trends in transmission patterns. The majority of cases denied having risk factors for infection. The two female cases that reside in SPA 5 (West HD) had received multiple facial treatments from their (different) dermatologists. Despite the fact that the women had similar onset dates and lived in the same health district, after further investigation, no link could be established among these cases.

It is very important for improvements on monitoring changes in acute disease incidence and risk factors for infection be used to assess the effectiveness of hepatitis C prevention and control programs. ACDC is in the process of revising our hepatitis epidemiology form. This revised form will serve as a new tool for our district public health nurses to conduct interviews; it is hoped that the information collected will improve the identification of risk groups that can be targeted for the prevention of hepatitis C as well as improving general surveillance for the disease.

PREVENTION

Universal blood product screening in 1990 and heat-inactivation of other blood concentrates initiated in 1987 have dramatically reduced recipient-associated cases of hepatitis C. This leaves the reduction of high-risk behaviors as the primary recommendation for preventing transmission; especially, since there is no effective vaccine or post-exposure prophylaxis. Educational efforts aimed at reducing high-risk behaviors (e.g., sharing injection drug equipment, engaging in unprotected sex), may help to reduce new hepatitis C cases. Additional education provided to all of the people who already have hepatitis C is important because alcohol consumption and co-infection with HIV can accelerate the progression of cirrhosis and hepatocellular carcinoma. Patients with chronic hepatitis C should be evaluated for severity of their liver diseases and for possible treatment.

REFERENCES

1. CDC. Recommendation for prevention and control of hepatitis C virus (HCV) infection and HCV related chronic disease. MMWR 1998; 47:1-39.

ADDITIONAL RESOURCES

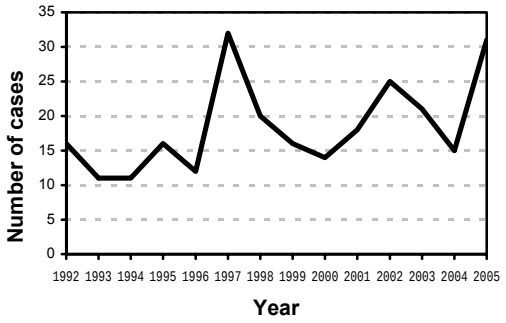
Further information about hepatitis is available from:

- American Liver Foundation – www.liverfoundation.org
- International Liver Foundation – www.hepfi.org/infomenu.htm
- CDC – www.cdc.gov/ncidod/diseases/hepatitis

LEGIONELLOSIS

CRUDE DATA	
Number of Cases	31
Annual Incidence	
LA County	0.32
United States	N/A
Age at Diagnosis	
Mean	62.8
Median	62
Range	35–86 years
Case Fatality	
LA County	16%
United States	N/A

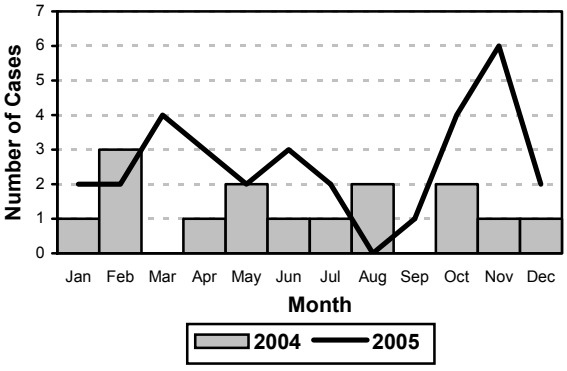
Figure 1
Legionellosis
Cases by Year of Onset
LAC, 1996–2005



DESCRIPTION

Legionellosis is a bacterial infection with two distinct clinical forms: 1) Legionnaires' disease (LD), the more severe form characterized by pneumonia, and 2) Pontiac fever, an acute-onset, self-limited flu-like illness without pneumonia. *Legionella* bacteria are common inhabitants of aquatic systems and thrive in warm environments. Ninety percent of cases of LD are caused by *Legionella pneumophila,* although at least 46 Legionella species and 70 serogroups have been identified. Transmission occurs through inhalation of aerosols containing the bacteria or by aspiration of contaminated water. Person-to-person transmission does not occur. The case fatality rate for LD ranges from 10%–15%, but can be higher in outbreaks occurring in a hospital setting. People of any age may get LD, but the disease most often affects middle-aged and older persons, particularly those who are heavy smokers, have chronic lung disease, or whose immune system is suppressed by illness or medication.

Figure 2
Legionellosis
Cases by Month of Onset
LAC, 2004–2005



DISEASE ABSTRACT

- The incidence of Legionellosis in LAC is increasing.
- Two nosocomial cases were reported in 2005.
- No cases of Pontiac fever were reported in 2005.
- The case fatality decreased from 20% to 16% in 2004 and 2005, respectively.

STRATIFIED DATA

Trends: A total of 31 reported cases met the CDC surveillance case definition for LD in 2005.This is slightly lower than the peak incidence of 32 cases reported in 1997 (Figure 1).

Seasonality: Cases occurred throughout the year, with a peak in November—this peak was unrelated to nosocomial incidents.

Age: Consistent with the expected higher frequency among older persons, the mean age of reported cases was 63 years, the median age 62 years, and the range was 35-86 years.

Fatality: In 2005, the case fatality rate of 16% (5/31) was lower than in 2004, 20% (3/15). The mean age of expired cases was 62 years and the median age was 59 years (range 35-82 years).

Gender: There were 21 (68%) male cases and 10 (32%) female cases.

Race: The majority of cases (n=12, 39%) occurred in Whites. The next most frequently reported racial group was Hispanics (n=10, 32%), Asian (n= 7, 23%), followed by Black (n=2, 6%).

Ethnicity: The majority of cases reported were non-Hispanic (n=21, 68%) and (n= 10, 32%) cases reported Hispanic ethnicity.

COMMENTS

In 2005, 23 (74%) LD cases were diagnosed by Legionella urinary antigen, 3 (10%) were diagnosed by direct fluorescent antibody (DFA) staining, 3 (10%) by BAL/sputum culture, and 2 (6%) by serologic antibody titers. As in 2004, the Legionella urinary antigen was the most frequently used method to diagnose LD. However, this diagnostic test will only screen for Legionella pneumophila serogroup 1.

Legionnaire's disease is more prevalent during summer and early fall. The more favorable weather conditions could explain increased exposure risk during outdoor and recreational activities (i.e. hot tubs, cruise ships, hotels, swimming pools, etc). However, our data show LD is equally distributed throughout the year.

Two nosocomial LD cases were reported at LAC in 2005 by separate medical facilities. Each medical facility conducted eight weeks of prospective active surveillance to detect other possible cases of nosocomially related LD as well as six months of retrospective review to determine if additional LD cases could be found. No additional LD cases were found by either prospective or retrospective surveillance methods.

The number of LD cases in LAC has increased as reporting and monitoring procedure improved. In 2005, we had 43 reported cases, a 39% increase, compared to 31 cases reported in 2004.The utilization of automated laboratory reporting and heightened awareness about the disease can explain the increasing trend of cases reported. Other probable reasons could be due to the improvement of the physician's ability to diagnose LD, associated with the available diagnostic assays. However, some providers are not familiar of the timing of serology collection of single titers to meet the laboratory criteria of case definition. Some cases may have been missed due to convalescent samples taken prematurely or not at all.

ADDITIONAL RESOURCES

Guidelines:
Centers for Disease Control and Prevention.2003.Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR; 52 (RR-10): 1-249. Available at: www.cdc.gov/ncidod/dhqp/gl environinfection.hmtl

Centers for Disease Control and Prevention. 2004. Guidelines for preventing health-care associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Practices Advisory Committee (HICPAC). MMWR; 53(RR-3): 1-179.

Dixon B, Krystofiak S, McMahon J, Stout J, Squier C, Wagener M, Yu VL. A proactive approach to prevention of health care-acquired Legionnaires' disease: The Allegheny County (Pittsburg) experience. American Journal of Infection Control 2005;33:360-7.

State of Maryland, Department of Health and Mental Hygiene. Report of the Maryland Scientific working Group to Study *Legionella* in Water Systems in Healthcare Institutions. June 14, 2000, Baltimore, Maryland. www.dhmh.state.md.us/html/legionella.htm

LAC Department of Health Services. Legionellosis: Taking the Mystery out of Laboratory Diagnosis. The Public's Health. 2001;1(3):4. Available at:
www.lapublichealth.org/wwwfiles/ph/ph/ph/TPH_October_2001.pdf

Reviews:

- Stout JE, Yu VL; Hospital-acquired Legionnaires' disease: new developments. Current Opinion in Infectious Disease 2003, 16:337-341.
- Sabria M, Yu VL, Hospital-acquired legionellosis: solutions for a preventable infection. The Lancet Infectious Diseases Vol 2 June 2002.

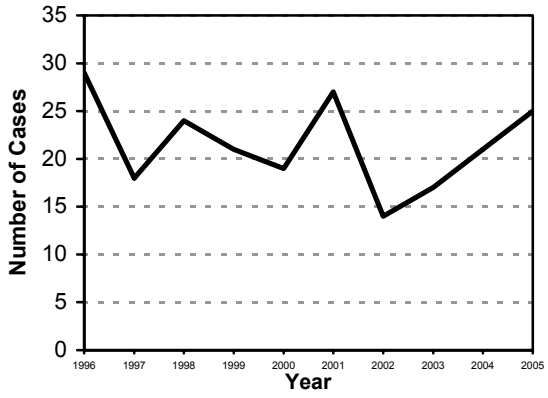
Selected Articles:

- Benin AL, Benson RF, Besser RE. Trends in Legionnaires Disease, 1980- 1998; Declining Mortality and New Patterns of Diagnosis. Clinical Infectious Diseases 2002; 35:1039-46.

LISTERIOSIS, NONPERINATAL

CRUDE DATA	
Number of Cases	25
Annual Incidence [a]	
LA County	0.26
United States	N/A
Age at Diagnosis	
Mean	54.4
Median	57
Range	1–89 years
Case Fatality	
LA County	10%
United States	N/A

Figure 1
Nonperinatal Listeriosis
Cases by Year of Onset
LAC, 1996–2005



[a] Cases per 100,000 population.

DESCRIPTION

Listeriosis is a disease transmitted primarily through consumption of food contaminated with *Listeria monocytogenes,* a gram-positive bacterium. *L. monocytogenes* is found in soil and water, and can contaminate raw foods (e.g., uncooked meats and vegetables), as well as processed foods that become contaminated after processing (e.g., soft cheeses and cold cuts). Unpasteurized (raw) milk and foods made from unpasteurized milk may also contain the bacterium. Common symptoms of listeriosis include fever, muscle aches, headache, nausea, diarrhea, and neck stiffness. A case of nonperinatal listeriosis is one that occurs in persons other than pregnant women and/or their fetuses, neonates, or infants up to 42 days after birth. Historically, nonperinatal listeriosis presents as meningoencephalitis and/or septicemia, primarily affecting elderly and immunocompromised persons, such as those with cancer or HIV, and those on immunosuppressive therapy.

DISEASE ABSTRACT

- In 2005, 25 nonperinatal listeriosis cases were reported, an increase from the previous year (N=21) that indicates a rising trend of infection in LA County. However, the ten-year trend is still one of decline (Figure 1).
- There were five case fatalities in 2005. Like in 2004, these fatalities were more likely due to severe underlying disease (i.e. cancer) although advanced age exacerbated the effect.
- Although two multistate clusters were identified by PulseNet and investigated, there were no confirmed foodborne listeriosis outbreaks during 2005.

STRATIFIED DATA

Trends: Since 2002 (N=14), the number of nonperinatal listeriosis cases has been increasing (Figure 1). In 2005 there were 25 cases of nonperinatal listeriosis.

Seasonality: Listeriosis typically follows a seasonal trend with most cases occurring during the summer months. During the previous five years, the highest incidence of cases occurred during June. Except for having relatively few cases in June, 2005 followed the typical seasonal trend with a peak in August (Figure 2).

Age: Advanced age is considered a risk factor for nonperinatal listeriosis. In 2005, 36% (n=9) of nonperinatal listeriosis cases were 65-years of age or older—a decrease from 2004 (52%, n=11). In 2005, 24% (n=6) of cases were 55 to 64 years of age (Figure 3). In 2005 the median age of nonperinatal listeriosis cases was 55 with a majority of cases over the age of 45 years.

Sex: Similar to previous years, more males (n=13) than females (n=12) contracted nonperinatal listeriosis; the male-to-female incidence ratio was 1.083:1, reflecting a narrowing in the gender gap.

Race/Ethnicity: In 2005, Latinos and Whites had the highest numbers of incident cases of nonperinatal listeriosis (n=9, 43%, and n=8, 38%, respectively). Since 2002, the annual numbers of Latino cases have been increasing. In 2005 there was a significant increase in Asian cases.

Location: During 2005, there was no significant clustering of cases by location. Geographic information was known for 24 of the cases, and unknown for one case.

Predisposing Conditions and Medical Risk Factors: In 2005 50% of the nonperinatal cases occurred in adults older than 54 years of age. In addition, 48% had diabetes, 38% were on steroid medication, 38% had history of gastrointestinal disease, 38% were using antacids, 33% had cancer, 24% had recent chemotherapy, 24% had kidney disease, and 24% had recent antibiotic use. Sixteen (76%) of nonperinatal cases had two or more medical risk factors. Two cases did not have any known risk factors for listeriosis (Table 1).

High-risk Foods: For high-risk foods routinely investigated, 24% of cases reported eating soft cheese, 36% cold cuts or deli meats, 40% other cheese (non-Mexican-style cheese, non-soft

Figure 2
Nonperinatal Listeriosis
Cases by Month of Onset
LAC, 2005

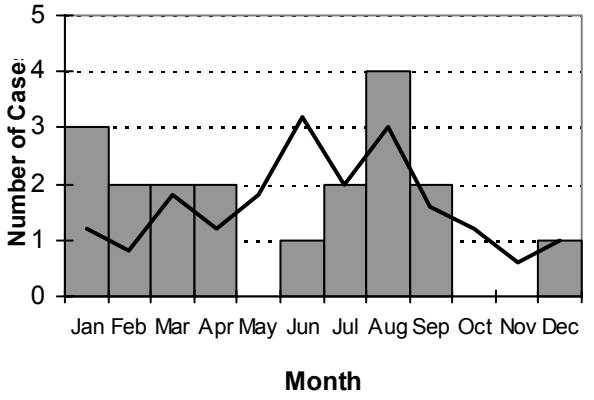


Figure 3
Nonperinatal Listeriosis Incidence
by Age Group
LAC, 2005

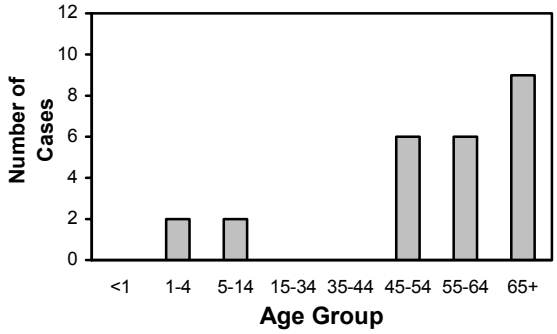
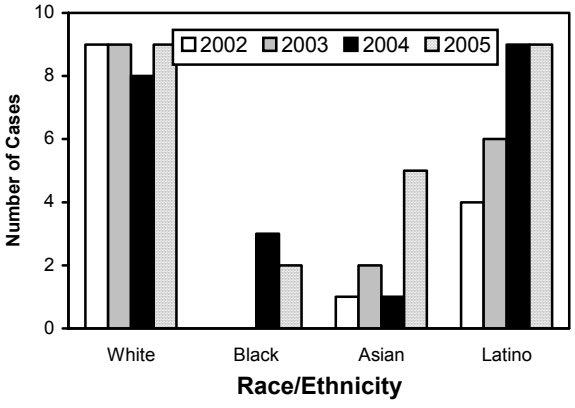


Figure 4
Nonperinatal Listeriosis
Incidence by Race/Ethnicity
LAC, 2002-2005



cheese), 84% raw fruits, 56% raw vegetables, and 36% Mexican-style cheese (Table 2).

Outcome: Five (20%) of the 25 cases in 2005 died. These cases were not of advanced age but were at advanced stages of cancer.

Culture Sites: *L. monocytogenes* was isolated from blood only in 16 (64%) cases, CSF in four (16%) cases, and one culture each drawn from a groin abscess, paracentesis and peritoneal fluid.

PFGE-identified Clusters: Five clusters of listeriosis were identified by using pulsed-field gel electrophoresis (PFGE) and participating in PulseNet under CDC, but none of the CDC investigations found a common source.

Table 1. Predisposing Factors in Cases of Nonperinatal Listeriosis—LAC, 2005

Medical Conditions	Number	Percent
Age >65 years	9	36
Cancer	7	28
Chemotherapy	5	20
Steroid Use	8	32
Diabetes	9	36
Kidney Disease	7	28
Chronic Alcoholism	2	8
Radiation Therapy	1	4
Autoimmune Disease	3	12
Liver Disease	4	16
Lung Disease	1	4
Prior Antibiotic Use	7	28
Antacid Use	8	32
Asthma	0	0
Gastrointestinal Disease	7	28
HIV+/AIDS	0	0
Other Immunosuppressive Therapy	1	4
Organ Transplant	0	0
Intravenous Drug Use	0	4
No Identified Risk Factors	4	16

PREVENTION

In general, listeriosis may be prevented by thoroughly cooking raw food from animal sources, such as beef, pork, or poultry; washing raw vegetables thoroughly before eating; and keeping uncooked meats separate from vegetables, cooked foods, and ready-to-eat foods. Avoiding unpasteurized milk or foods made from unpasteurized milk, and washing hands, knives, and cutting boards after handling uncooked foods also may prevent listeriosis.

Persons at high risk for listeriosis include the elderly, those with cancer, HIV, diabetes, weakened immune systems, and those on immunosuppressive therapy. These individuals should follow additional recommendations: avoid soft cheeses such as feta, brie, camembert, blue-veined, and Mexican-style cheese. Hard cheeses, processed cheeses, cream cheese, cottage cheese, or yogurt need not be avoided all together; however, individuals with severely compromised immune systems and/or several disease risk factors should avoid them. Leftover foods or ready-to-eat foods, such as hot dogs, should be cooked until steaming hot before eating. Finally, although the risk of listeriosis associated with foods from deli counters is relatively low, immunosuppressed persons may choose to avoid these foods or thoroughly reheat cold cuts before eating.

Table 2. High-risk Foods among Cases of Nonperinatal Listeriosis—LAC, 2004

Risk foods	Number	Percent
Raw Milk	0	0
Raw Milk Products	1	4
Mexican-style Cheese	9	36
Soft Cheese	6	24
Other Cheese	10	40
Raw Beef	1	4
Raw Pork	0	0
Raw Poultry	0	0
Raw Fish	3	12
Cold Cuts/ Deli Meats	9	36
Raw Egg	1	4
Raw Fruit	21	84
Raw Vegetables	14	56

COMMENTS

2005 marked another increase in annual cases. Although 2002 had the second lowest incidence rate for listeriosis in at least 10 years, the increase, particularly among Latinos, indicates public health education may be necessary to reverse the upward trend. While better reporting might be a contributor to having more cases in 2005, the need for public health action is apparent. Case fatality was 24% (n=4) in 2003 and 10% (n=2) in 2004. There were two pediatric listeriosis cases in 2005; one had underlying disease (lymphoma) the other had no known medical risk factors.

L. monocytogenes is an opportunistic disease targeting people who have compromised immune systems. Healthy immune systems and intestinal tracts are important to prevent clinical illness. This year also highlighted the significance of iron overload and blood transfusions in the pathology of *L. monocytogenes* as one PFGE-identified cluster involved an asymptomatic platelet donor. The investigation of this cluster demonstrated that while iron overload is routinely investigated for listeriosis cases, there is a diagnostic bias as only patients with certain chronic anemias are tested for iron overload. Including history of blood transfusions and blood disorders like anemia in the routine investigation of listeriosis is now being considered.

All *L. monocytogenes* isolates are now analyzed by pulsed field gel electrophoresis (PFGE). There were no LAC outbreaks or LAC cases associated with a multi-jurisdictional outbreak identified in this manner in 2004.

ADDITIONAL RESOURCES

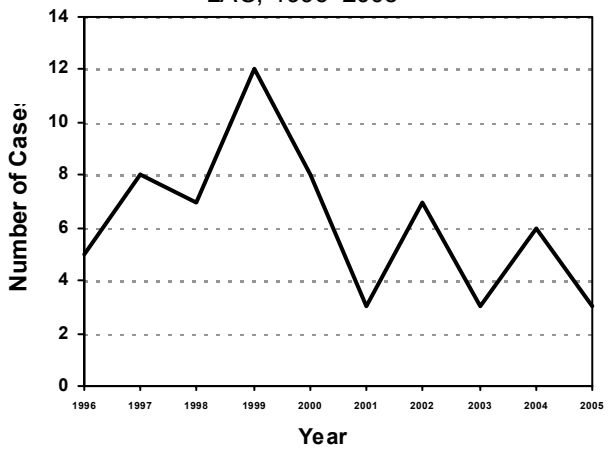
General disease information is available from the CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/listeriosis_g.htm

General information and reporting information about this and other foodborne diseases in LAC is available at: www.lapublichealth.org/acd/food.htm

LISTERIOSIS, PERINATAL

CRUDE DATA	
Number of Cases [a]	3
Annual Incidence [b]	
LA County	---[c]
United States	N/A
Age at Onset	
Maternal:	
Mean	31.7 years
Median	29 years
Range	25-41 years
Infant Gestational:	
Mean	31 weeks
Median	28.3 weeks
Range	20-34 weeks
Case Fatality	
LA County	33%[d]
United States	N/A

Figure 1
Perinatal Listeriosis
Cases by Year of Onset
LAC, 1996–2005



[a] Cases are mother-infant pairs.
[b] Cases per 100,000 population.
[c] Rates based on less than 20 observations are unreliable.
[d] Among fetal/neonate cases only, no maternal deaths included.

DESCRIPTION

Perinatal listeriosis is a disease transmitted transplacentally from infected pregnant women; these women may experience only mild flu-like symptoms or may be asymptomatic. A perinatal listeriosis case is defined as a mother-infant pair in which one or both persons has a positive *Listeria monocytogenes* culture from a normally sterile site. Neonatal/infant listeriosis is often divided into early onset (0–6 days after birth) and late onset (7–42 days after birth). Infection during pregnancy may lead to premature birth, stillbirth, or septicemia and/or meningitis in the neonate—even if the mother is asymptomatic. There is no vaccine to prevent listeriosis.

DISEASE ABSTRACT

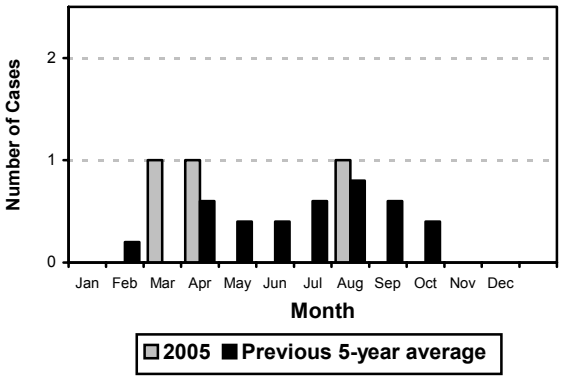
- Perinatal listeriosis increased from three cases in 2003 to six cases in 2004, and then declined back to three cases in 2005 (Figure 1).
- One case ended with fetal demise at 20 weeks of gestation. One male infant was born ill at 34 weeks of gestation. One case was treated at 31 weeks of gestation and carried the pregnancy to term.

STRATIFIED DATA

Trends: Since 2002, the annual incidence of perinatal listeriosis has fluctuated, ranging from three to seven cases (Figure 1).

Seasonality: In 2005, the seasonality of perinatal listeriosis was slightly, though insignificantly, earlier than the average annual incidence of the previous five years; higher levels of incidence occurred between April and October, particularly in August (Figure 2).

Figure 2
Number of perinatal listeriosis cases
by month of onset
LAC, 1999–2005



Age: During 2005, the average maternal and gestational ages of perinatal cases at disease onset (31 years and 28 weeks, respectively) were lower compared to those in 2004.

Sex: In 2005, one infant was identified as male, the other two infants' genders are not known. In 2004 and 2003, the male to female ratios were 2:3 and 2:1, respectively.

Race/Ethnicity: Similar to both 2003 and 2004, in 2005 67% (n=2) of the cases were Latino and 33% (n=1) were White. In 2002, Latinos comprised 71% of the perinatal cases. 1999 U.S. Census data documented 62.2% and 19.0% of all LAC live births were by Latino and White mothers, respectively.

Location: In 2005, two cases resided in SPA 4 (Hollywood-Wilshire and Northeast health districts) and one resided in SPA 6 in the Southeast health district. Neither of these SPAs had any cases of perinatal listeriosis last year.

Type of Delivery: One infant (33%) was delivered by caesarian section. One stillbirth was delivered vaginally (33%). It is not known how the remaining case delivered her infant.

Outcome: There were no maternal fatalities. One (33%) neonate was stillborn at 20 weeks of gestation, one (33%) was delivered sick at 34 weeks of gestation, and one (33%) was delivered healthy at full term after treatment at 31 weeks of gestation.

Culture Sites: Listeriosis was culture confirmed in three mothers and one neonate. Among culture-positive mothers, three (100%) mothers had *L. monocytogenes* isolated from blood only. In one of those cases, both mother and infant had positive cultures of *L. monocytogenes* from blood.

Maternal clinical signs/outcomes: In 2005, all three mothers had fevers and three (100%) had sepsis. Similar to the previous two years, all mothers were symptomatic and no mothers had meningitis.

Onset: In 2005, one infant was born alive but sick, one was born alive and healthy, and one was stillborn.

High-risk Foods: All three mothers reported eating at least one potentially high-risk food. Two women (67%) ate Mexican-style cheese; the other woman reported eating unpasteurized gourmet cheese. Three (100%) ate raw vegetables, one (33%) ate cold cuts or deli meats, all (100%) ate soft cheese, and one (33%) ate yeast products (Table 1).

Risk factors: Only one mother had predisposing medical factors other than pregnancy. She had a history of urinary tract infections and took iron medication which might have helped the *L. monocytogenes* proliferate. The outcome of this case was stillbirth at 31 weeks of gestation.

Only one (33%) mother had traveled outside the United States during pregnancy. She was a recent immigrant from Mexico and had given birth to a sick infant male at 34 weeks of gestation.

PREVENTION

L. monocytogenes is found in soil and water. Animals can carry *Listeria* without appearing ill, which can result in contaminated foods of animal origin, such as meats and dairy products. In particular, studies have implicated unpasteurized milk or milk products; soft cheeses (Mexican-style, Brie, Feta, blue-veined, Camembert); undercooked meat, such as beef, pork, poultry, and pâté; and cold cuts from deli counters. Pregnant women should avoid these foods. In particular, cheese sold by street vendors, or obtained from relatives/friends in other countries where food processing quality assurance is unknown should be avoided by pregnant women.

Table 1. High-risk Foods among Cases of Perinatal Listeriosis—LAC, 2005

Risk foods	Number	Percent
Raw Fruit	3	100
Mexican-style Cheese	2	67
Other Cheese	2	67
Raw Vegetables	3	100
Cold Cuts/ Deli Meats	1	33
Soft Cheese	2	67
Yeast Products	1	33
Raw Milk	1	33

In addition, fruits and vegetables should be thoroughly washed. Uncooked meats should be stored separately from vegetables, cooked foods, and ready-to-eat foods. Hands, utensils, and cutting boards should be washed after handling uncooked foods. Leftover foods or ready-to-eat foods, such as hot dogs, should be cooked until steaming hot before eating. Finally, although the risk of listeriosis associated with foods from deli counters is relatively low, pregnant women may choose to avoid these foods or thoroughly reheat cold cuts before eating.

Given the seasonality of perinatal listeriosis, prevention strategies should take effect before April. Possible preventive methods include education during prenatal checkups, outreach to Hispanic/Latino communities, and food safety notices at food and deli markets.

COMMENTS

Incidence of perinatal listeriosis in LAC is less than ten cases per year for the fifth consecutive year. Prevention efforts should be targeted towards Hispanic and White women, especially with Hispanics being the fastest growing segment of the LAC population. There were no perinatal cases associated with outbreaks in 2005.

All isolates of *L. monocytogenes* are typed by pulsed-field gel electrophoresis (PFGE), a technique to detect matching strains of various pathogenic agents. When matches between isolates from patients or foods are detected, an investigation may be initiated. In addition, a solitary case occurring locally can be linked by PFGE results to an outbreak occurring on a wider geographical scale. In 2005, there were no cases of *L. monocytogenes* in LAC associated with a multi-jurisdictional outbreak identified in this manner.

ADDITIONAL RESOURCES

General disease information is available from the CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/listeriosis_g.htm

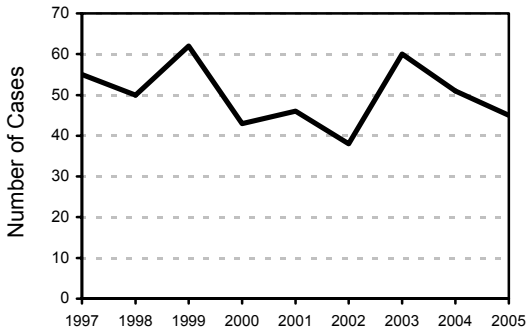
General information and reporting information about this and other foodborne diseases in LAC is available at: www.lapublichealth.org/acd/food.htm

MALARIA

CRUDE DATA	
Number of Cases	45
Age at Onset Mean Median Age Range	 34 32 5–93 years
Case Fatality LA County United States	 2.2% <1%[a]

[a] Calculated from 2004 US malaria surveillance in the 2006 Surveillance Summary issue of MMWR (SS-4:23-37).

Figure 1
Malaria
Cases by Year of Onset
Los Angeles County, 1997–2005



DESCRIPTION

Human malaria is an acute or subacute febrile illness caused by one or more protozoan parasites that infect humans: *P. vivax*, *P. falciparum, P. malariae,* and *P. ovale*. The disease is transmitted by the bite of an infected *Anopheles sp.* mosquito and is characterized by episodes of chills and fever every 2–3 days. *P. falciparum* is found primarily in tropical regions and poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. Each case of malaria requires the demonstration of parasites in thick or thin blood smears, regardless of whether the person experienced previous episodes of malaria while outside the country.

Malaria is a disease usually acquired outside the continental US through travel and immigration and is rarely transmitted within the US. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito, *A. hermsi*, exists here and is capable of transmitting the parasite. In 1988–89, the last autochthonous cases occurred in San Diego, California, among 30 migrant workers infected with *P. vivax*. Since then, local transmission has not occurred in Southern California due to an inadequate number of people infected with the malaria parasite to sustain disease transmission. Additionally, the mosquito capable of transmitting malaria is very rare.

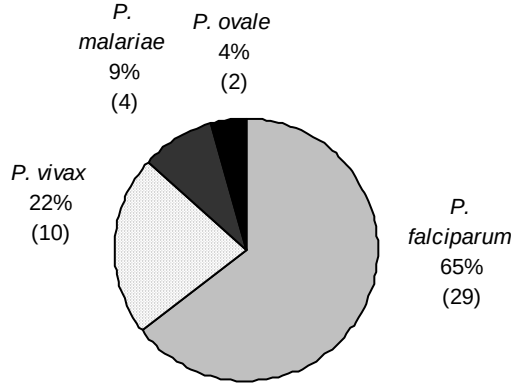
DISEASE ABSTRACT

- A cluster of three malaria cases occurred in late 2005 among members of a missionary group that traveled to Africa. The cases, two from LAC and one from outside the county were not infected by the same *Plasmodium sp*.
- The number of malaria cases in LAC has continued to decrease since its peak in 2003.
- One fatality occurred in a non-resident of LAC with *P. falciparum* infection who traveled to the US from the Philippines.
- The percentage of US travelers who took some form of antimalarial chemoprophylaxis during travel to a malaria-endemic region remains similar to 2004 (21%). Only one case reported compliance with the prophylactic regimen.

STRATIFIED DATA

Trends: There was a 25% decline in cases in 2005 with 45 reported cases compared to peak year 2003, 60 cases (Figure 1). A larger proportion of cases were infected with *P. falciparum* (n=29, 65%) in 2005 compared to 2004 (n=29, 46%) (Figure 2).

Figure 2
Malaria Cases by Species
Los Angeles County, 2005 (n=45)

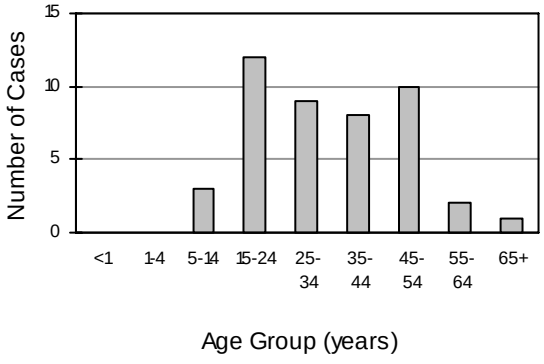


Seasonality: Seasonality for malaria was not determined. Malaria is acquired abroad and is independent of LAC weather or seasonal patterns.

Age: The mean age of infection has decreased in 2005 to 34 (range: 5–93 years); the median age was 32. The largest number of cases (n=12, 27%) occurred in a younger age group (15–24 years), whereas, in 2004 the largest number occurred in the 25–34 year age group (Figure 3).

Sex: The ratio of male-to-female cases was three to one (3:1).

Figure 3
Malaria
Cases by Age Group
LAC, 2005 (n=45)



Race/Ethnicity: Over half of the reported malaria cases occurred among Blacks, which included African-Americans and African immigrants (n=22, 51%), followed by Latinos (n=7, 16%) and Asian/Pacific Islanders (n=7, 16%). Since the early 1990s, Blacks have had the highest proportion of reported malaria cases, with the exception of year 2003, where Whites outnumbered Blacks. Race and ethnicity were known for 96% of the cases.

Disease Severity: There was one death due to malaria. A 32-year old non-resident male acquired *P. falciparum* malaria while in a rural area of the Philippines and continued to experience symptoms during his visit to the US. He suffered multiple complications including cerebral malaria, renal failure, and acute respiratory distress syndrome (ARDS). His onset of symptoms began before his arrival into the US; the interval between onset and death was 22 days. One additional case was known to have severe complications, a 44-year old male visiting Senegal who also acquired *P. falciparum* malaria. His onset occurred before arrival to the US; he experienced renal failure during the course of hospitalization. He did not take any chemoprophylaxis.

Transmission and Risk Factors: All cases reported recent travel to a foreign country, with Africa continuing to be the most common region visited. Most of the reported malaria cases (n=30, 67%) were among individuals who were traveling to or coming from African countries. The most frequently reported country of travel was Nigeria (n=9) (Table 1).

Traveling for work included individuals that traveled as part of the military or a missionary group among others. Tourism and visiting friends and family were classified as traveling for pleasure. Among the 35 cases that claimed to be a resident of the US prior to their most recent travel, information on anti-malarial prophylaxis usage was available for 28 (80%). Six individuals (21%) took prophylaxis, which was the same rate of usage as in 2004. Of the six who took prophylaxis, four did not take the medication correctly

as prescribed; dosage information was known for five of the six cases. When stratified by purpose of travel, the proportion of prophylaxis usage among cases was much higher in those who traveled for work than for pleasure (60% vs. 12%) (Table 2). A single case that took the appropriate prophylaxis, acquired *P. falciparum* malaria while traveling to Uganda for work purposes.

Table 1. Malaria Cases by Country of Acquisition and *Plasmodium* Species— LAC, 2005

Country of Acquisition	*P. falciparum*	*P. vivax*	*P. malariae*	*P. ovale*	Total
Africa	**25**	**2**	**2**	**1**	**30**
- Benin	1	0	0	0	1
- Cameroon	2	0	0	0	2
- Ethiopia	0	1	0	0	1
- Ghana	3	0	0	0	3
- Kenya	2	0	0	0	2
- Liberia	0	1	0	0	1
- Nigeria	9	0	0	0	9
- Senegal	2	0	0	0	2
- Sierra Leone	1	0	0	0	1
- South Africa	1	0	0	0	1
- Togo	1	0	0	0	1
- Uganda	2	0	2	1	5
- Africa, unspecified	1	0	0	0	1
Latin America	**1**	**5**	**2**	**0**	**8**
- El Salvador	0	3	1	0	4
- Haiti	1	0	0	0	1
- Mexico	0	2	0	0	2
- Peru	0	0	1	0	1
Asia/Oceania	**1**	**2**	**0**	**0**	**3**
- India	0	1	0	0	1
- Philippines	1	0	0	0	1
- Thailand	0	1	0	0	1
Unknown	**2**	**1**	**0**	**1**	**4**
Overall Total	**29**	**10**	**4**	**2**	**45**

Table 2. Prophylaxis Use Among US Travelers with Malaria, 2005

Reason for Travel	Total Cases (N)	Prophylaxis Use (N)	(%)
Pleasure	21	2	12
Work	6	3	60
Other/Unknown	8	1	17
Total	**35**	**6**	**21**

Prior to the 1990s, refugees and immigrants from Central America and Southeast Asia made up the majority of all malaria cases seen in LAC. In contrast in 2005, refugees and immigrants made up only 19% (n=8) of cases with known travel reasons and arrived from various regions of the world. The most commonly reported reason for travel was visiting friends and relatives (n=23, 53%). Purpose of travel was reported for 96% of cases.

Only 3 of 36 cases (8%) reported a history of infection with malaria in the 12 months prior to their most recent episode. The species of the prior infections was known for only one of the three cases. The case had a previous infection with *P. falciparum* while most recently infected with *P. vivax*. No cases were acquired through blood transfusion or transplantation.

PREVENTION

Prevention of malaria is aimed at preventing infection by avoiding mosquito bites or, once already infected, preventing the development of disease by using antimalarial drugs as prophylaxis. Travelers to countries where malaria is endemic should take precautions by taking the appropriate antimalarial drugs as prescribed; using mosquito repellants, utilizing bednets, and wearing protective clothing; as well as avoiding outdoor activities between dusk and dawn when mosquito activity is at its peak.

COMMENTS

A cluster of cases involving out of county residents occurred in late 2005 among members of a missionary group. The group of 18 members traveled to Ghana during the summer and two began developing symptoms three to four months after their return to the US. One was confirmed with *P. ovale* and the other with *P. malariae*. Both cases took at least half of the prescribed prophylaxis during their travel. A third case, from outside LAC, did not develop symptoms until mid-2006 and was confirmed with an unidentified species of malaria.

The reason for the overall decrease in malaria cases is most likely due to a decrease in overseas travel and incoming refugees from malaria endemic countries. The number of malaria cases overall is far below the number of cases seen throughout the late 1970s through 1986 (an average of 133 malaria cases reported annually from 1979–1986). Cases can be further prevented by the correct usage of prescribed prophylaxis as almost all reported cases either did not take prophylaxis or did not take the complete regimen.

Information on travel and prophylaxis is obtained by interviewing patients. The data is limited by the patients' ability to recall this information. It is also limited by the small size of the case population, particularly when stratified by multiple variables.

ADDITIONAL RESOURCES

Additional information about malaria is available from the CDC at:
www.cdc.gov/ncidod/dpd/parasites/malaria/default.htm

CDC. Malaria Surveillance—United States, 2004. MMWR 2006. SS-4:23-37. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/ss5504a2.htm?s_cid=ss5504a2_e

CDC. Transmission of *Plasmodium vivax* Malaria—San Diego County, California, 1988 and 1989. MMWR 1990. 39:91-94. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00001559.htm.

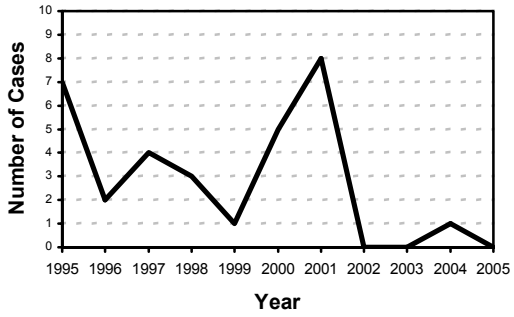
MEASLES

CRUDE DATA	
Number of Cases	0
Annual Incidence[a]	
LA County	0
California	0.01
United States	
Case Fatality	
LA County	0.0%
United States	

[a] Cases per 100,000 population

[b] Rates based on less than 20 observations are unreliable.

Figure 1
Measles
Reported Cases by Year of Onset
LAC, 1995-2005



DESCRIPTION

Measles is a vaccine-preventable disease caused by a paramyxovirus and is transmitted by contact with respiratory droplets or by airborne spread. Common signs and symptoms of measles include fever, cough, conjunctivitis, runny nose, photophobia, Koplik spots, and a generalized maculopapular rash. Severe complications are rare, but can include acute encephalitis and death from respiratory or neurologic complications. Immunocompromised individuals are more likely to develop complications. All persons who have not had the disease or who have not been successfully immunized are susceptible. The minimum clinical criteria for measles are fever of at least 101°F, a generalized rash lasting at least three days, and either cough, coryza, conjunctivitis, or photophobia. A case is confirmed by a positive IgM titer or a four-fold increase in acute and convalescent IgG titers.

DISEASE ABSTRACT

- From 36 measles suspect reports received at the LAC Immunization Program, there were no confirmed measles cases identified in LAC during 2005, marking only the third time this has occurred in over 40 years.
- During 2005, 4 measles cases were reported in California. Since all recent measles cases have been imported, an effective measles surveillance system needs to be maintained.

IMMUNIZATION RECOMMENDATIONS

- Measles disease can be effectively prevented by Measles-Mumps-Rubella (MMR) vaccine, given in accordance with recommendations from the CDC's Advisory Committee on Immunization Practices (ACIP).
- Usually, two doses of measles-containing vaccine are given via MMR vaccine. The first dose is recommended at 12 months of age. The second dose can be given as early as four weeks after the first dose, but is usually given at ages 4 to 6 years.
- Vaccination is recommended for those born in 1957 or later who have no prior MMR vaccination or history of disease. Proof of immunization with two MMR doses is recommended for health care workers and persons attending post secondary educational institutions as well as others who work or live in high risk settings.
- Over 95% of those who receive the current live attenuated measles vaccine develop immunity.
- Although the titer of vaccine-induced antibodies is lower than that following natural disease, both

serologic and epidemiologic evidence indicate that vaccine-induced immunity appears to be long-term and probably life-long in most individuals.
- Women should not become pregnant within 4 weeks of vaccination.
- Individuals who are severely immunocompromised for any reason should not be given MMR vaccine.

STRATIFIED DATA

Trends: Over the past 10 years, the number of confirmed measles cases has decreased significantly (Figure 1). Although absolute numbers are low, the number of reported measles cases started increasing in 1999. In 2002, 2003, and 2005, no confirmed cases of measles were identified in LAC, marking only three times this has occurred in more than 40 years. The single case in 2004 was an imported case, whose rash onset occurred within 21 days of traveling outside of the United States.

COMMENTS

While there were no confirmed measles cases in LAC in 2005, measles continues to circulate in other parts of the world. Susceptible individuals who reside in the United States will be at risk and imported cases will continue to be identified. For example, in 2005, the state of Indiana experienced an import-associated measles outbreak involving 34 cases. In a separate situation, LAC was alerted about possible measles contacts/cases among a group of 311 resettling Kenyan refugees who were emigrating from an area where measles incidence was high. Because LAC is in many ways a “door-way” to the US for travelers and other persons coming from parts of the world where measles continues to circulate, it is important that an effective measles surveillance system be maintained in this local health jurisdiction. With the high measles vaccine coverage levels (exceeds 90% for children 19-35 months of age), indigenous measles cases are expected to be almost non-existent. The importation of measles, however, has resulted in sporadic measles activity in LAC, as was noted in 2004 and in 2001, when at least 3 of the 8 cases that year were proven to have a foreign travel or foreign born connection.

The strength of LAC’s measles surveillance system is exemplified by the fact that 36 suspect measles cases were reported in 2005. For surveillance to be effective, suspected cases must be reported to the health department. In 2005, suspect measles reports came from a variety of sources. Approximately 42% (n=15) of the suspect cases were first reported by laboratories, 33% (n=12) were reported by hospitals/clinics, 17% (n=6) were reported by school nurses, and the remaining 8% (n=3) were reported by other sources, including the state health department, other counties, and via death certificate review. Among the 36 suspect cases, 47% (n=17) had febrile-rash illnesses that were ruled out because they did not meet the minimum clinical criteria for measles. Twenty-three of the 36 suspect cases (64%) had laboratory studies performed. For 8 of the 23 cases, testing was conducted due to clinical suspicion of measles; results were negative, ruling out measles as the cause of illness. The remaining 15 patients tested were reported to the health department by laboratories due to positive lab results. Further investigation revealed that the individuals were asymptomatic and that measles antibody tests were performed to test for immunity as part of a routine physical examination, school entrance requirement, or employee health requirement.

It is the policy of the LAC Immunization Program to immediately investigate all suspect measles cases that are reported in order to verify diagnosis, medical history information, immunization status, and past travel history. Physicians and suspect cases are contacted directly by phone to verify the diagnosis and determine if the minimum clinical criteria for measles classification have been met. If a measles report involves a school or a sensitive setting like a health care facility, a school nurse or a medical administrator is contacted to assist in investigative efforts and to immediately implement isolation procedures necessary for preventing the spread of the disease. Susceptible contacts are identified and offered MMR vaccination to prevent natural measles occurrence. If vaccine is contraindicated, immune globulin (IG) may be given instead. IG is recommended for infants less than 6-months of age, pregnant women, and immunocompromised individuals.

Both clinical examination and laboratory tests are important in the diagnostic confirmation of the disease. Blood specimen collections are arranged for serological analysis by public health nurses if physicians

have not ordered them. The testing laboratory is contacted to obtain measles IgM and IgG antibody levels. Detection of both types of antibodies is important in disease testing. Measles IgM antibodies are detectable from 2-28 days after rash onset. The presence of IgG antibodies in the serum indicates prior exposure to measles, either by natural means or by immunization. In the absence of an IgM test, a four-fold rise in measles IgG antibody titers between an acute serum specimen and a convalescent specimen at 2 weeks later usually indicates current or recent measles infection.

In summary, the decline in the number of measles cases in LAC is attributable to the effectiveness of the MMR vaccine, diligent surveillance activities, and the success of the various outreach and educational programs implemented by the LAC Immunization Program and others to improve vaccination coverage rates in the county.

ADDITIONAL RESOURCES

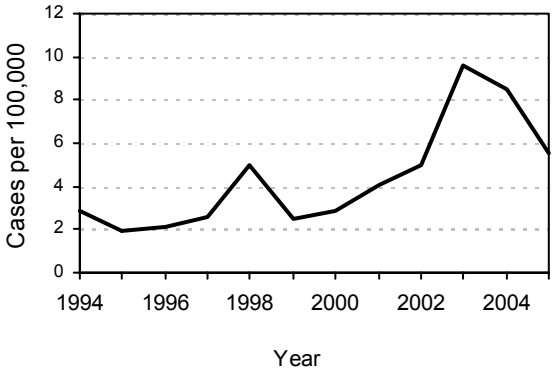
Additional information about measles is available at:

- National Immunization Program – www.cdc.gov/nip
- Immunization Action Coalition – www.immunize.org
- LAC, Immunization Program – www.lapublichealth.org/ip

MENINGITIS, VIRAL

CRUDE DATA	
Number of Cases	530
Annual Incidence[a]	
LA County	5.5
United States[b]	N/A
Age at Diagnosis	
Mean	27
Median	25
Range	0–93 years
Case Fatality	
LA County	0.6%
United States[b]	N/A

Figure 1
Viral Meningitis
Incidence Rates by Year of Onset
LAC, 1994–2005



[a] Cases per 100,000 population.

[b] Viral meningitis is not a nationally notifiable disease.

DESCRIPTION

Viruses are the major cause of aseptic meningitis syndrome, a term used to define any meningitis (infectious or noninfectious), particularly one with a lymphocytic pleocytosis, for which a cause is not apparent after initial evaluation and routine stains and cultures do not support a bacterial or fungal etiology. Viral meningitis can occur at any age but is most common among the very young. Symptoms are characterized by sudden onset of fever, severe headache, stiff neck, photophobia, drowsiness or confusion, nausea and vomiting and usually last from 7 to 10 days.

Nonpolio enteroviruses, the most common cause of viral meningitis, are not vaccine-preventable and account for 85% to 95% of all cases in which a pathogen is identified. Estimates from the Centers for Disease Control and Prevention (CDC) indicate that 10 to 15 million symptomatic enteroviral infections occur annually in the US, which includes 30,000 to 75,000 cases of meningitis. Transmission of enteroviruses may be fecal-oral, respiratory or by another route specific to the etiologic agent.

Other viral agents that can cause viral meningitis include: herpes, mumps, lymphocytic choriomeningitis, human immunodefieciency virus, adenovirus, parainfluenza virus type 3, influenza virus, measles and arboviruses, such as West Nile virus (WNV). Since the arrival of WNV in Southern California in 2003, this etiology should be considered an important cause of aseptic meningitis, especially in adults (during the summer and fall), and the appropriate diagnostic tests should be obtained. Prevention strategies and laboratory testing for WNV infections is detailed in a dedicated chapter. Treatment for most forms of viral meningitis is supportive; recovery is usually complete and associated with a low mortality rates. Antiviral agents are available for treatment of viral meningitis due to herpes viruses: Herpes Simplex Virus-1 (HSV-1), HSV-2, and varicella-zoster virus.

DISEASE ABSTRACT

- The incidence of viral meningitis has continued to decrease since its peak in 2003.

- WNV infection contributed to fewer cases of viral meningitis in 2005 (3% of cases) compared to 2004 (10% of cases), when the largest number of WNV cases were documented in LAC to date.
- Two outbreaks were reported. One outbreak involved 6 adult cases of viral meningitis with presumed enteroviral meningitis that were exposed to 10 children at a common daycare center with documented enteric echovirus infection; the second outbreak involved two elementary school children with enterovirus meningitis that had contact with the same tutor.

Trends: In 2005, there were a total of 530 cases of viral meningitis compared to 807 in 2004, representing a 34% decrease from 2004. The annual incidence also decreased with 8.5 and 5.5 cases per 100,000 in 2004 and 2005, respectively. This continues a decreasing trend from a peak incidence of 9.6 cases per 100,000 in 2003.

Seasonality: Enteroviruses demonstrate a seasonality in temperate climates that typically peaks in the late summer and early fall. WNV follows a similar pattern. In 2005, the onset of viral meningitis cases followed this trend closely, peaking in September with 90 cases (Figure 2).

Age: Infants less than 1 year old continued to have the highest age-group specific rate, 50.9 cases per 100,000 (Figure 3).

Sex: The male to female rate ratio of cases was nearly 1:1.

Race/Ethnicity: The incidence rates across race and ethnicity groups ranged from 3.3 to 6.5 cases per 100,000, the lowest occurring in Asian/Pacific Islanders. The rates were similar among Latinos, Whites, and Blacks.

Location: The highest incidence of viral meningitis occurred in SPA 1 (12 per 100,000); the lowest in SPA 5 (1.7 per 100,000) (Figure 4). However, because SPA 5 had such a low case count (N=11), the incidence rate is unstable.

Clinical Presentation: The case fatality rate remained low; only 3 deaths were reported in 2005 (<1% case fatality rate). WNV infection was less prevalent this year, compared to 2004, as a cause of aseptic meningitis. Only 3% of cases (n=15) were associated with WNV meningitis (See WNV chapter for more details).

Figure 2
Viral Meningitis
Cases by Month of Onset
LAC, 2005

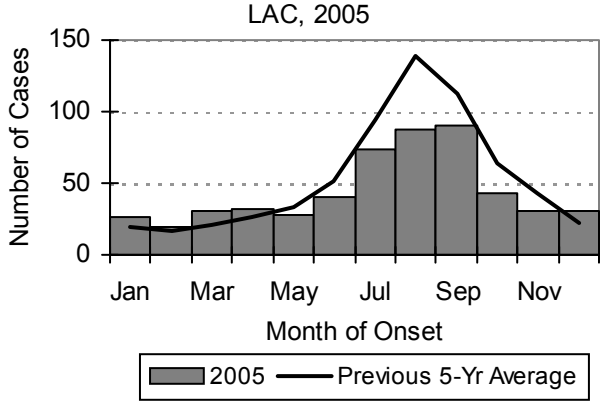


Figure 3
Viral Meningitis
Incidence Rates by Age Group
LAC, 2005 (n=525)

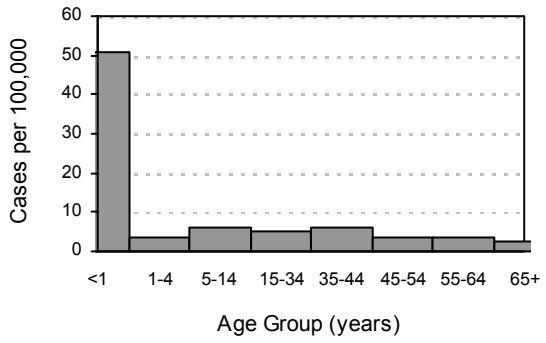
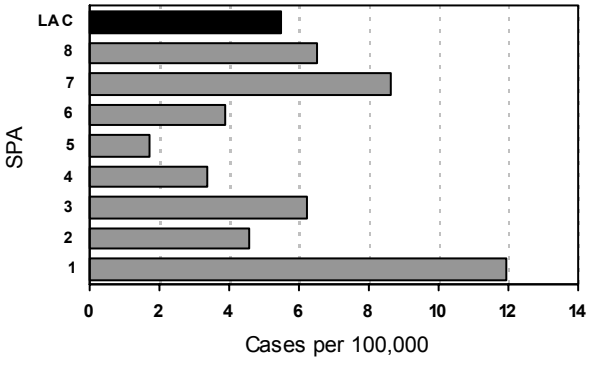


Figure 4
Viral Meningitis
Incidence Rates by SPA
LAC, 2005 (n=528)



COMMENTS

Surveillance for viral meningitis is passive and only outbreaks, not individual cases, are investigated. Two outbreaks were investigated in 2005. The first occurred in late spring among children from a daycare center and their parents. Ten children and six adults fell ill; however, only one had enterovirus identified in cerebral spinal fluid (CSF) by polymerase chain reaction (PCR) and four children in the daycare center had stool cultures that identified echovirus, one of the five subgenera in the enterovirus family. Health education was implemented and hand hygiene was emphasized at the daycare center. Two cases of meningitis occurred in the fall in a second viral meningitis outbreak. The two children, one of whom was an out of county case, had contact with the same tutor. No etiology was identified.

The number of cases reported annually is considered to be substantially lower than the actual burden of disease. The low incidence in 2005 continues a decreasing trend since a substantial peak in 2003. That peak coincided with national and regional outbreaks, including California, which occurred due to serotypes of enteroviruses that are associated with an epidemic circulation pattern. Individual enterovirus serotypes have different temporal patterns of circulation; and the changes in predominant serotypes can be accompanied by large-scale outbreaks. However, no predictable patterns exist for these serotypes or for viral meningitis in general. There is significant yearly variation and no long-term trends have been identified.

Reporting bias introduced by WNV surveillance may contribute to fluctuations in annual incidence rates. From 2003 to 2005, increased reporting of viral meningitis and testing for underlying WNV infection was encouraged among health care providers and hospital infection control practitioners. However, the peak incidence of viral meningitis did not correspond with the peak incidence of WNV, which occurred in 2004.

Information about the causative agents of viral meningitis is rarely included with case reports because viral cultures and nucleic acid based- tests, such as PCR analysis of the cerebral spinal fluid, is not routinely performed at most medical facilities. When an etiology is determined, enteroviruses are the most frequently identified agent. Improvements in molecular testing capabilities should lead to faster diagnoses and more appropriate management of viral meningitis such as less use of inappropriate antibiotics and fewer and shorter hospital admissions.

Supportive measures, and to a lesser extent antiviral agents, are the usual treatments for viral meningitis. Good personal hygiene, especially hand washing and avoiding contact with oral secretions of others, is the most practical and effective preventive measure.

ADDITIONAL RESOURCES

CDC. Respiratory and Enteric Viruses Branch, Viral (Aseptic) Meningitis at:
www.cdc.gov/ncidod/dvrd/virlmen.htm

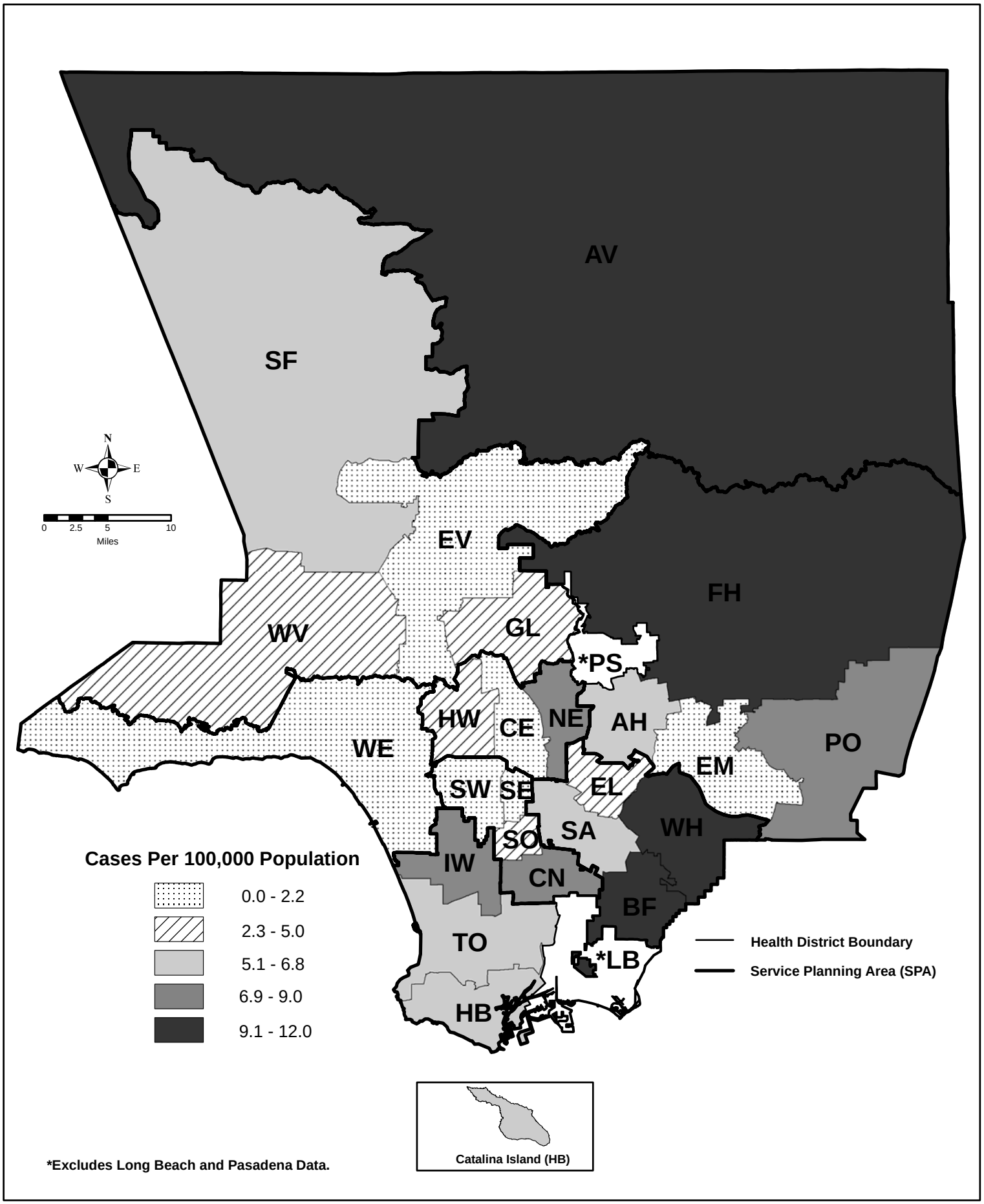
CDC. Respiratory and Enteric Viruses Branch, Non-polio Enterovirus Infections at:
www.cdc.gov/ncidod/dvrd/revb/enterovirus/non-polio_entero.htm

Association of State and Territorial Directors of Health Promotion and Public Health Education, Infectious Facts, Viral Meningitis at: www.astdhpphe.org/infect/vmenin.html

CDC. Outbreaks of Aseptic Meningitis Associated with Echoviruses 9 and 30 and Preliminary Reports on Enterovirus Activity—United States, 2003. MMWR 2003; 32:761-763. Available at:
www.cdc.gov/mmwr/preview/mmwrhtml/mm5232a1.htm

CDC. Enterovirus Surveillance —United States, 2002–2004. MMWR 2006; 55:153-156. Available at:
www.cdc.gov/mmwr/preview/mmwrhtml/mm5506a3.htm

Map 9. Meningitis, Viral
Rates by Health District, Los Angeles County, 2005*

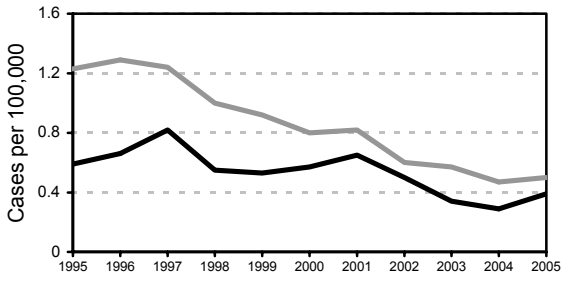


*Excludes Long Beach and Pasadena Data.

MENINGOCOCCAL DISEASE

CRUDE DATA	
Number of Cases	37
Annual Incidence[a]	
LA County	0.39
California	N/A
United States[b]	0.35
Age at Diagnosis	
Mean	25
Median	15
Range	<0–79 years
Case Fatality	
LA County	5%
United States[b]	7%

Figure 1
Meningococcal Disease
Incidence Rates by Year of Onset
LAC and US, 1995–2005



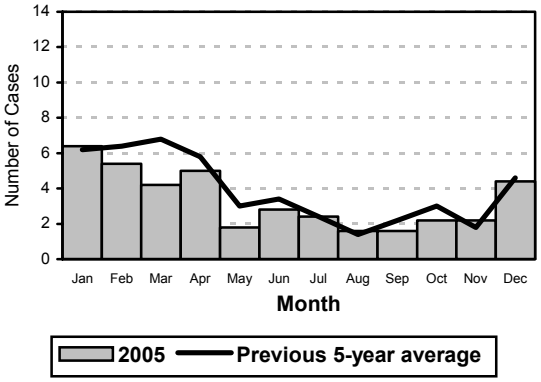
[a] Cases per 100,000 population.

[b] Based on 2005 population estimates and the Active Bacterial Core Surveillance Report [1].

DESCRIPTION

Meningococcal disease occurs most often as meningitis or bloodstream infection (meningococcemia) and is transmitted through direct or droplet contact with nose or throat secretions of persons infected with the *Neisseria meningitidis* bacterium. Common symptoms include sudden onset of fever, headache, nausea, vomiting, stiff neck and lethargy, which can progress to overwhelming sepsis, shock and death within hours. Long-term sequelae include significant neurologic or orthopedic complications such as deafness or amputation secondary to disseminated intravascular coagulation and thromboses. Meningococcal disease affects all age groups but occurs most often in infants. Of the 12 serogroups, only A, C, Y, and W-135 are vaccine-preventable.

Figure 2
Meningococcal Disease
by Month of Onset
LAC, 2005 (N=37)



DISEASE ABSTRACT

- Reported invasive meningococcal disease cases increased by 32% in 2005 compared to 2004 with 37 and 28 cases reported, respectively.
- No outbreaks were documented in 2005.
- In 2005, *N. meningitidis* was culture-confirmed in 34 (92%) cases: 18 (49%) from cerebrospinal fluid (CSF), 15 (41%) from blood, and 1 (2%) from both blood and CSF (Figure 5). Invasive meningococcal disease was diagnosed most frequently in the serogroups B, C, and Y.

STRATIFIED DATA

Trends: A greater proportion of cases were culture-confirmed in 2005 compared to 2004. Most (n=25, 74%) culture-positive isolates were submitted for serogrouping. Serogroup Y isolates decreased from 2004 to 2005 and were outnumbered by serogroups B or C by 1:2 (Figure 5).

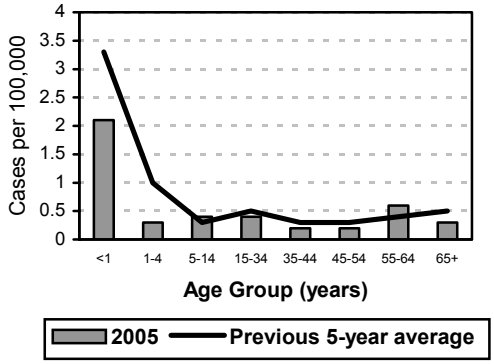
Seasonality: Most cases were reported during winter and early spring (Figure 2).

Age: The incidence rates among infants <1 year increased in 2005 (2.1 vs. 1.4 per 100,000) compared to 2004. The rate among 5-14 and 15-34 were similar to last year (0.4 vs. 0.3 per 100,000). The rate among adults 55-64 increased in 2005 (0.6 vs. 0.4 per 100,000) (Incidence data from 2004 not shown).

Sex: The male-to-female rate ratio was 1:1**.**

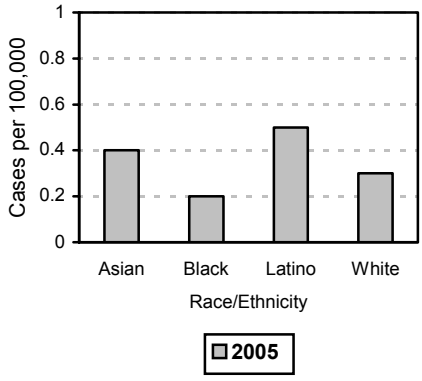
Race/Ethnicity: Invasive meningococcal cases were reported most frequently in Hispanics (n=21, 57%) followed by Whites (n=9, 24%), Asians (n=5, 14%) and 2 (5%) cases in Blacks. The number of cases in each of these groups is too low for reliable incidence rate calculation (Figure 4).

Figure 3
Meningococcal Disease
Incidence Rates by Age Group
LAC, 2005



Location: The number of cases was highest were in SPA 3 (n=7) and SPA 2 (n=6), followed by SPA 4 (n=4) and SPA 7 (n=4), respectively.

Figure 4
Meningococcal Disease
Incidence Rates by Race/Ethnicity
LAC, 2005



PREVENTION

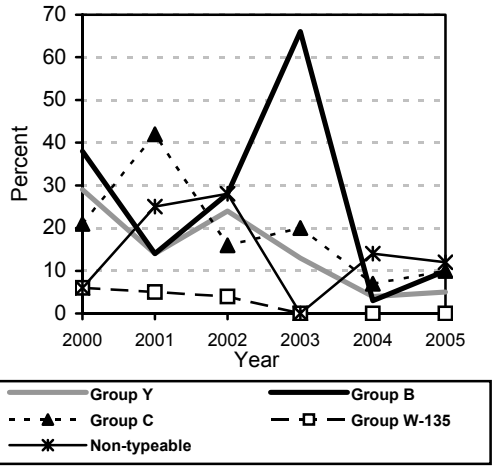
Antimicrobial chemoprophylaxis of close contacts of sporadic cases of meningococcal disease remains the primary means for prevention of meningococcal disease. Close contacts include a) household members, b) day care center contacts, and c) anyone directly exposed to the patient's oral secretions (e.g., through kissing, mouth-to-mouthresuscitation, endotracheal intubation, or endotracheal tube management). Because the rate of secondary disease for close contacts is highest during the first few days after onset of disease in the primary patient, antimicrobial chemoprophylaxis should be administered as soon as possible (ideally within 24 hours after the case is identified). Conversely, chemoprophylaxis administered greater than 14 days after onset of illness in the index case-patient is probably of limited or no value. Prophylactic treatment and follow-up of close contacts are routinely handled by the respective health district in LAC.

The polysaccharide-based meningococcal vaccine (MPSV4), Menomune®, protects against sergroups A, C, Y, and W-135 and can be given to persons aged two years and older. The vaccine is recommended for the following: persons with terminal complement deficiencies, anatomic or functional asplenia, research and clinical laboratory personnel who are routinely exposed to *N. meningitidis* in solutions that may be aerosolized, and travelers or US citizens residing in countries where *N. meningitidis* is hyperendemic or epidemic. The vaccine is also used to control serogroup C meningococcal outbreaks.

In 2004, a new quadrivalent meningococcal conjugate (MCV4), Menactra®, was approved for use in the United States. College freshman who live in dormitories are at higher risk for meningococcal disease and should be vaccinated with MCV4. This vaccine protects against the same serogroups as MPSV4 but provides longer lasting immunity. MCV4 is recommended for use in persons aged 11 to 55 years, although the use of MPSV4 is acceptable when MCV4 is not available. Generally, only a single dose of either vaccine is recommended.

Even though no noticeable changes in the distribution of invasive meningococcal cases since the introduction of MCV4 in 2004, enhanced surveillance for invasive *N. meningitidis* infections remains important. LAC DHS and the California Department of the Health (CDHS) have continued to participate in enhanced meningoccal disease surveillance with the goals of: (1) monitoring the epidemiology changes of meningococcal disease (2) assisting with identification and management of cases and outbreaks and (3) assessing vaccine effectiveness, (4) ascertaining the usefulness of polymerase chain reaction (PCR) in culture negative cases, particularly in patients treated with antibiotics prior to culture and (5) helping contribute to improvements in the overall diagnosis and management of invasive meningococcal disease.

Figure 5
Meningococcal Disease
by Serogroup
LAC, 2000–2005



COMMENTS

For every culture-confirmed case, clinical laboratories are requested to send isolates to the LAC Public Health Laboratory (PHL) for serotyping**.** In 2005, the LAC PHL received 25 case isolates (74% of all culture-confirmed cases) for serogroup identification. Of these, 10 (40%) were serogroup B; 10 (40%) serogroup C; and 5 (20%) serogroup Y (Figure 5). As in 2004, no serogroup W-135 isolates were identified. In twelve (32%) cases, serogroup information could not be determined. The race, gender, and age of non-serogrouped cases were comparable to those with identified serogroups. The mean and median ages of the vaccine preventable cases were 28 and 23 years, respectively, and ranged from 0–73, compared to non-vaccine preventable serogroup B cases with a mean age of 25.9, a median age of 18.5 and range of 0–66. With greater widespread use of the MCV4 vaccine, the incidence of serogroups C, Y, and W-135 is expected to decline. However, due to the lack of universal vaccine protection against invasive meningococcal disease, clinicians must still maintain diagnostic clinical acumen.

ADDITIONAL RESOURCES

1. CDC. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Neisseria meningitidis*, 2005-provisional. Available at: www.cdc.gov/ncidod/dbmd/abcs/survreports/mening05.pdf
2. CDC. Prevention and Control of Meningococcal Disease Recommendations of the Advisory Committee on Immunization Practices (ACIP) MMWR 2005;54: No.RR-7.
3. Meningococcal Disease Prevention Plan, Division of Communicable Disease, California Department of Health Services. Available at: www.dhs.ca.gov/ps/dcdc/disb/pdf/Meningococcal%20Plan%20Final%202003.pdf
4. CDC. Control and Prevention of Meningococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000; 46(RR–07):1–10. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/rr4907a1.htm

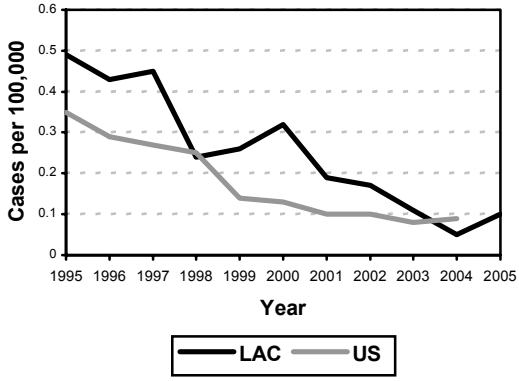
5. CDC. Prevention and control of meningococcal disease among college students: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000; 49 (RR–7):1–20. Available at: www.cdc.gov/mmwr/PDF/rr/rr4907.pdf
6. Raghunathan PL, Bernhardt SA, Rosenstein NE. Opportunities for control of meningococcal disease in the United States. Annu Rev Med. 2004; 55:333-53.

MUMPS

CRUDE DATA	
Number of Cases	10
Annual Incidence[a]	
LA County	0.10[b]
California	0.13
United States	
Age at Diagnosis	
Mean	41.0 years
Median	49.5 years
Range	1 – 76 years
Case Fatality	
LA County	0.0%
United States	

[a] Cases per 100,000 population.
[b] Rates based on less than 20 observations are unreliable.

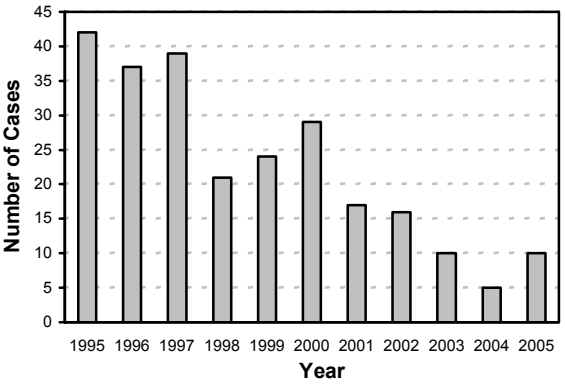
Figure 1
Mumps
Incidence Rates by Year of Onset
LAC and US, 1995-2005



DESCRIPTION

Mumps is a vaccine-preventable disease caused by an RNA paramyxovirus that is transmitted by direct contact with respiratory droplets from infected persons. Symptoms begin 14–18 days after exposure, with a range of 12–25 days, and include swelling of salivary glands, fever, and inflammation of the testes in teenage and adult males. Up to 20% of infected individuals may be asymptomatic. Sequelae include encephalitis, meningitis, orchitis, arthritis, and deafness. In addition, pregnant women who contract mumps are at increased risk of spontaneous abortions. Most reported cases are diagnosed based on clinical symptoms and do not have supporting laboratory confirmation (i.e., mumps IgM antibody assay). The minimum clinical criteria for mumps is an acute onset of unilateral or bilateral swelling of the parotid or other salivary gland lasting ≥2 days without other apparent cause. Although single probable or confirmed cases are reportable, only outbreaks of two or more cases are investigated.

Figure 2
Mumps
Cases by Year of Onset
LAC, 1995-2005

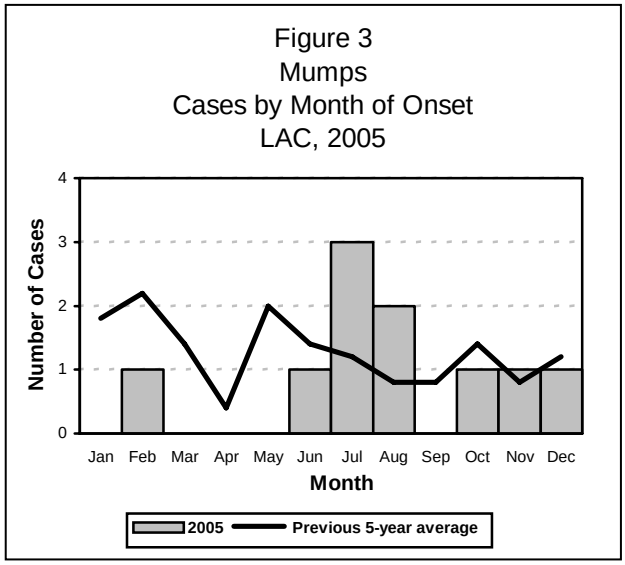


DISEASE ABSTRACT

- The incidence of mumps cases in LAC has been steadily declining since 1995 (Figure 1).
- Of 50 suspect mumps reports received at the LAC Immunization Program during 2005, only 10 were identified as LAC mumps cases.

- During 2005, there were 47 reported cases in CA, of which 21% were reported in LAC.

IMMUNIZATION RECOMMENDATIONS



- Two doses of mumps-containing vaccine, usually given as Measles-Mumps-Rubella (MMR), are normally recommended to achieve immunity. The first dose is recommended at 12 months of age. The second dose can be given as early as four weeks after the first dose, but is usually given at ages 4 to 6 years. Vaccination is recommended for those who have no prior MMR, particularly if they are in a high-risk setting.
- Approximately 90% of those who receive two doses of the current live attenuated mumps vaccine develop immunity.
- Generally, persons can be considered immune to mumps if they were born before 1957, have serologic evidence of mumps immunity, have documentation of physician-diagnosed mumps, or have documentation of vaccination with at least one dose of live mumps vaccine on or after their first birthday.
- Women should not become pregnant within 4 weeks of vaccination.
- Individuals who are severely immunocompromised for any reason should not be given MMR vaccine.

STRATIFIED DATA

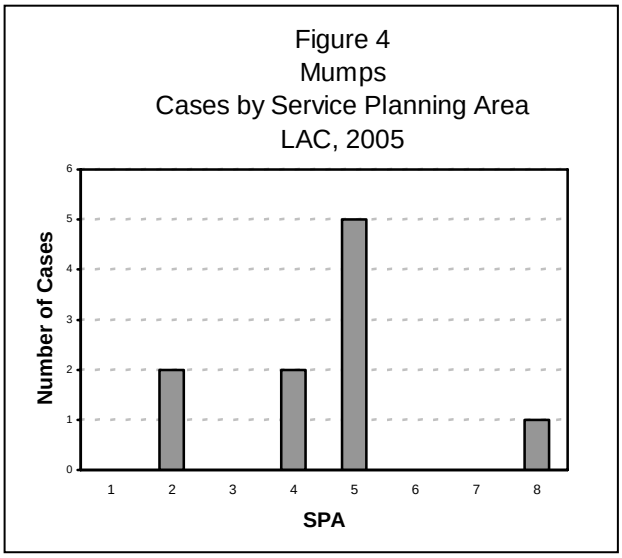
Trends: Since 1995, the annual number of cases of mumps has decreased by 76% (Figure 2). This decline reflects the effectiveness of the MMR vaccine in reducing the incidence of disease in the general population; however, the continued identification of cases indicates more work that needs to be done to vaccinate remaining individuals and prevent further transmission.

Seasonality: Historically, case reports have peaked during the winter and spring seasons. However, in 2005, 60% (n=6) of the cases occurred in the summer months with a peak in July (Figure 3).

Age: Similar to 2004, 80% (n=8) of all reported cases in 2005 were in adults over the age of 20.

Sex: The male-to-female ratio of the cases was 1:2.3. It is unknown why twice as many females than males have been reported.

Race/Ethnicity: More than half of the reported mumps cases occurred among non-Latinos. There were 4 White cases, 4 Asian cases, 1 Hispanic case, and 1 as unspecified race/ethnicity.



Location: Cases were reported in four of the 8 SPAs (Figure 4). Five of the cases (50%) resided in West (SPA 5). San Fernando Valley (SPA 2) and Metro (SPA 4) reported two cases each. South Bay (SPA 8) reported one case.

COMMENTS

The majority of reported individual (non-outbreak related) and non-lab confirmed clinical mumps cases among highly immunized populations are most likely caused by other agents such as coxsackie and parainfluenza group 3 viruses. Recurrent parotitis can also result from non-infectious etiologies. Determination of MMR vaccination status and appropriate laboratory testing (mumps IgM antibody assay) will help ensure that only true mumps cases are reported.

Cluster Identification: Two of the cases in 2005 were epidemiologically linked to each other. The cases were household contacts residing in SPA 5. Both were Asian females, aged 54 and 76 years old. Onset of mumps symptoms occurred in June and July. One of the cases was laboratory-confirmed with a positive mumps IgM antibody test result. Neither of the cases knew her vaccination status.

Vaccination Status: None of the cases had documented dates for their MMR vaccinations. One case (age 1) was never vaccinated. Nine cases did not know or remember their vaccination status.

Laboratory Confirmation: Eighty percent (n=8) of the cases had supporting laboratory confirmation.

ADDITIONAL RESOURCES

Additional information is available at:

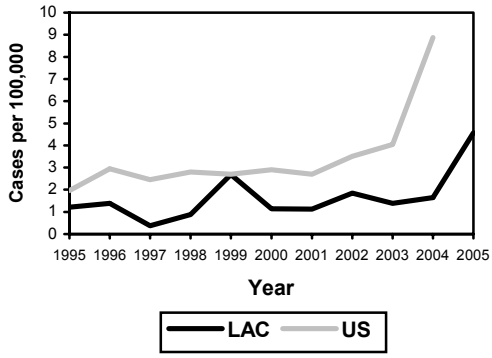
- National Immunization Program – www.cdc.gov/ip
- Immunization Action Coalition – www.immunize.org
- LAC DHS, Immunization Program – www.lapublichealth.org/ip

PERTUSSIS (WHOOPING COUGH)

CRUDE DATA	
Number of Cases	438
Annual Incidence[a]	
LA County	4.57
California	8.57
United States	
Age at Diagnosis	
Mean	12.7 years
Median	7.5 years
Range	2 days–86 years
Case Fatality	
LA County	0.46%
United States	N/A

[a] Cases per 100,000 population.

Figure 1
Pertussis
Incidence Rates by Year of Onset
LAC and US, 1995–2005

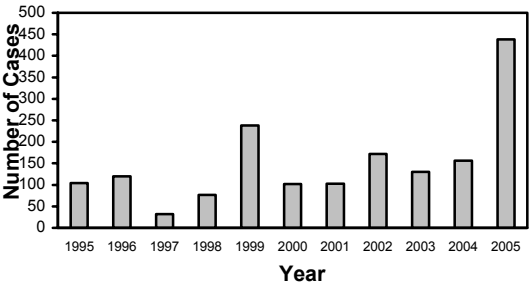


DESCRIPTION

Pertussis, commonly known as whooping cough, is a vaccine-preventable disease spread by close contact with the respiratory secretions of infected individuals. Typical symptoms include paroxysmal coughing, inspiratory whooping, and post-tussive vomiting. Complications include pneumonia, seizures, and encephalopathy. Infants under 1 year of age are at highest risk for developing severe complications.

The minimum clinical criteria for pertussis is a cough lasting at least two weeks with paroxysms of coughing, inspiratory "whoop," or post-tussive vomiting, without other apparent causes. Pertussis is confirmed by either positive *B. pertussis* culture or PCR.

Figure 2
Pertussis
Cases by Year of Onset
LAC, 1995–2005



DISEASE ABSTRACT

- A record-high 438 cases were reported in 2005, which is a three-fold increase over the previous five-year average.
- Preceding their illness, only approximately half of the cases in 2005 indicated contact to a person who had a prolonged cough.
- Of the 2005 cases that could have been fully immunized and protected against pertussis, one fifth were not adequately immunized.

IMMUNIZATION RECOMMENDATIONS

- A pertussis-containing vaccine should be administered at 2 months, 4 months, 6 months, 15–18 months, and 4–6 years of age to provide protection against the disease.
- Immunity conferred by the pertussis component of the DTP/DTaP vaccine decreases over time, with some vaccinated individuals becoming susceptible to pertussis 5–10 years following their last dose.
- In Spring 2005, 2 Tdap vaccines were licensed for use in adolescents and adults, one for persons aged 10-18 years (Boostrix, GlaxoSmithKline) and the other for persons aged 11-64 years (ADACEL, Sanofi Pasteur).

STRATIFIED DATA

Seasonality: Compared to the previous five-year average, record high numbers of cases were reported throughout 2005. Typically, the summer months have the highest pertussis incidence in LAC (Figure 3). In 2005, 46% (n=200) of reported cases had disease onset during the summer months of June, July, August, and September. The <1 year age group accounted for 45% (n=90) of the cases with disease onset during these summer months.

Age: Although the majority of reported cases are still in children less than one year of age, the proportion of cases in the <1 age group is smaller in 2005 (41%) compared to the previous five year average (64%). Cases are increasing among adolescents and adults, as evidenced by the fact that 33% (n=143) of the cases were over 14 years of age (Figure 4) in 2005 compared to an average of 24% (n=24) in the previous five years. Increased recognition and diagnosis of pertussis in older age groups has probably contributed to the increase in reported cases among adolescents and adults.

Sex: The male-to-female case ratio was approximately 1:1.2.

Race/Ethnicity: After adjusting for the age differential in the cases, incidence rates in 2005 for all races were at least 2.5 times higher than the previous 5-year averages (Figure 5). Only rates among Latinos and Whites were higher than the total LAC rate. However, the LAC population proportion of Whites (30%) is much lower than that for Latinos (47%).

Figure 3
Pertussis
Cases by Month of Onset
LAC, 2005

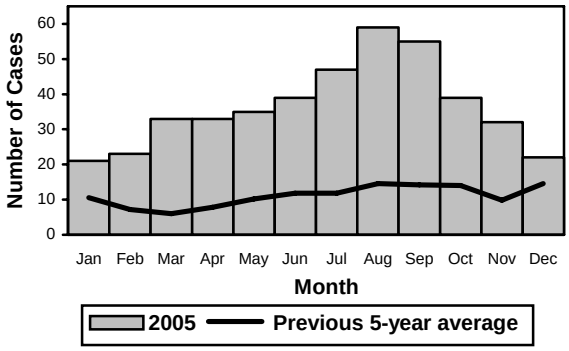


Figure 4
Pertussis
Cases by Age Group
LAC, 2005

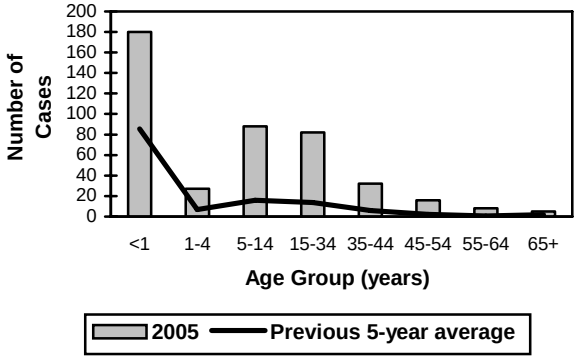
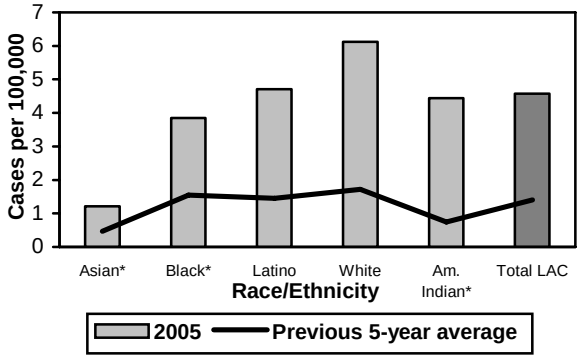


Figure 5
Pertussis
Age-Adjusted Incidence Rates by
Race/Ethnicity
LAC, 2005



*Rates unreliable due to small number of observations.

Location: Antelope Valley SPA 1 had the highest incidence rate of 13.4 cases per 100,000 (n=46). Of the 46 cases reported, 44% (n=20) were epi-linked to at least two other pertussis cases living within the same household. The second highest incidence rate occurred in South SPA 6 with 5.9 cases per 100,000 (n=61), followed by South Bay SPA 8 with 5.6 cases per 100,000 (n=62), San Fernando Valley SPA 2 with 5.3 cases per 100,000 (n=112), West SPA 5 with 4.8 cases per 100,000 (n=31), Metro SPA 4 with 3 cases per 100,000 (n=37), San Gabriel Valley SPA 3 with 2.9 cases per 100,000 (n=50), and East SPA 7 with 2.8 cases per 100,000 (n=39). The clustering of cases in specific geographic areas is influenced in part by the active reporting efforts of local hospitals.

COMMENTS

Despite high rates of pertussis vaccination among children, the number of pertussis cases reported annually has risen. In 2005, Los Angeles County (LAC) experienced a significant increase in the number of reported cases of pertussis, with a similar trend evidenced throughout California and the United States. There was a three-fold increase in the number of cases reported in 2005 compared to the previous five-year average. Not since the 1970s has LAC experienced this magnitude of pertussis morbidity. In addition, cases are being reported more among adolescents and adults. Whether this increase in pertussis incidence represents a true increase in disease or improved recognition and reporting remains unclear.

Because immunity induced by the childhood pertussis vaccine decreases over time, adolescents and adults can develop infection and serve as a source of transmission to infants who are not adequately immunized. The need to protect infants from pertussis infection is underscored by the fact that there were 2 pertussis-related deaths among infants less than 2 months of age. The licensure of 2 Tdap vaccines for use as pertussis boosters in adolescents and adults is cause for great optimism. Widespread use of the Tdap vaccine should protect adolescents and adults as well as protect infants from exposure to pertussis.

Greater media and general public awareness of vaccine-preventable diseases has increased the detection and reporting of pertussis cases. During 2005, much effort was invested in urging providers to be more diligent in observing, confirming, and reporting suspect pertussis cases in individuals of all ages. Outreach to providers included:

1) a pertussis health alert to LAC providers via the Health Alert Network on March 9, 2005;
2) creation of a Pertussis Fact Sheet in April 2005 and ongoing distribution throughout the year;
3) publication of an article in the May edition of The Public's Health newsletter;
4) a pertussis symposium held on May 18, 2005;
5) release of a statewide health alert by the California Department of Health Services on September 19, 2005;
6) release of a second health alert to LAC providers via the Health Alert Network on September 20, 2005;
7) distribution of the September health alert and fact sheet to all LAC hospital infection control practitioners via fax.

Trends: Pertussis incidence normally peaks every 3 to 5 years. Between 1990 and 1999, there was an annual average of 101 cases reported, with the highest incidence occurring in 1999 (n=238). During the previous five years (2000 – 2004), an annual average of 133 cases was reported, with the highest incidence occurring in 2002 (n=172). In 2005, 438 cases were reported, which was the highest number of cases reported in more than 35 years.

Laboratory Confirmation: More than half of the reported cases (52%, n=226) were not laboratory confirmed by either *B. pertussis* culture or PCR.

Vaccination Status: Less than one fifth of cases (18%, n=77) were younger than two months of age and were too young to receive pertussis vaccine. About 33% (n=143) of cases were 15 years of age or older; so even if they were fully immunized in early childhood, they would not have had complete immunity against pertussis in 2005 and would thus be eligible for Tdap vaccine.

Approximately 21% (n=92) of cases were between 2–6 months of age. Of these, 55% (n=51) were up to date with pertussis vaccination for their age, but would not have developed full immunity against pertussis. Of the 126 children who could have had full immunity from vaccination (7 months to 15 years old), 102 (81%) were fully up to date. The previous 5-year trend has indicated that, on average, 62% of cases 7 months to 15 years of age were adequately immunized.

Complications/Hospitalization: Approximately 35% (n=155) were hospitalized, with an average hospital stay of 9 days (range 1-54 days). Among the hospitalized cases, 92% (n=142) were less than one year of age. Of the 34 cases who developed pneumonia, 28 (82%) were infants less than 1 year of age. Three cases developed seizures and 1 case had encephalopathy.

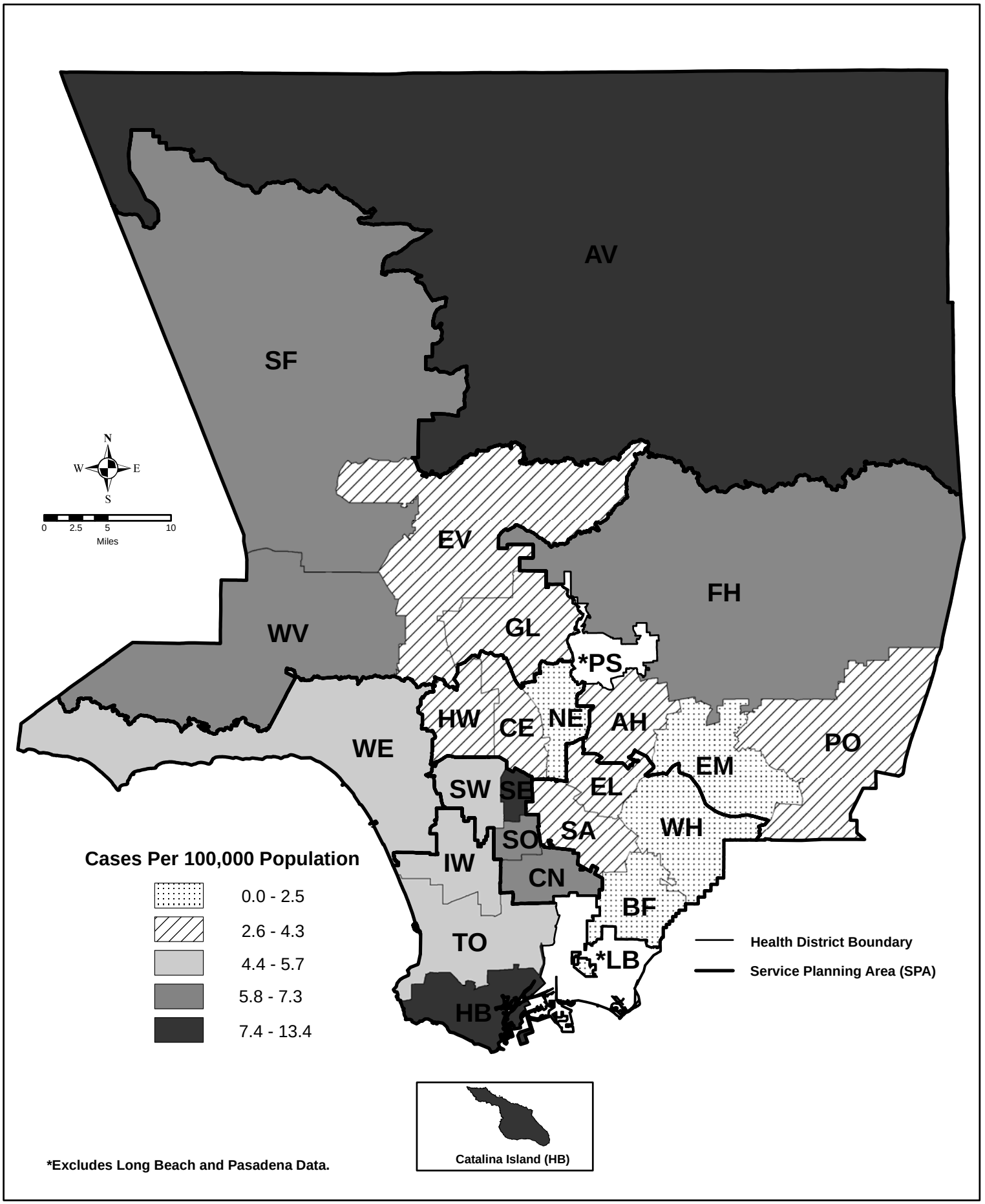
Case Fatalities: There were two pertussis-related deaths in 2005. The first case fatality was in a 23-day-old Hispanic male. The case died 13 days after cough onset in February. The case was a previously healthy baby who was hospitalized for severe respiratory distress, cardiac failure, and septic shock. Causes of death as listed on the death certificate were renal failure, shock, pneumonia, and pertussis. The second case fatality was in a one-month old Hispanic male. The case died 6 days after cough onset in September. The case had a pre-existing medical condition and was previously hospitalized for coarctation of aorta repair. Causes of death as listed on the death certificate were cardiorespiratory failure, pulmonary hypertensive crisis, leukocytosis, and pertussis. Both cases had exposure to family members who were coughing but were too young to receive pertussis vaccine.

ADDITIONAL RESOURCES

Additional information is available at:

- National Immunization Program – www.cdc.gov/nip
- Immunization Action Coalition – www.immunize.org
- LAC DHS, Immunization Program – www.lapublichealth.org/ip

Map 10. Pertussis
Rates by Health District, Los Angeles County, 2005*

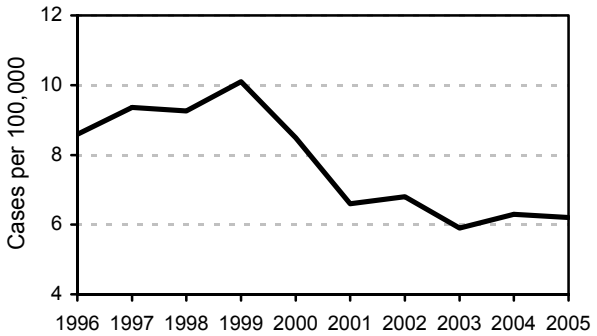


*Excludes Long Beach and Pasadena Data.

PNEUMOCOCCAL DISEASE, INVASIVE

CRUDE DATA	
Number of Cases	590
Annual Incidence[a]	
LA County	6.2
United States	12.9[b]
Age at Diagnosis	
Mean	52
Median	55
Range	0–101 years
Case Fatality	
LA County	14%[c]
United States	13%[b]

Figure 1
Invasive Pneumococcal Disease
Incidence Rates by Year of Culture
LAC, 1996–2005



[a] Cases per 100,000 population.

[b] National projection of IPD incidence from Active Bacterial Core Surveillance areas data, 2004 [1].

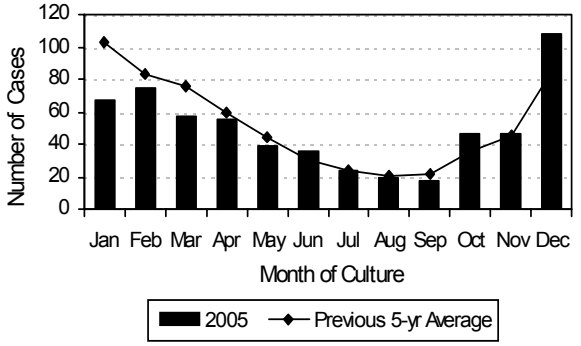
[c] 50% of outcomes known.

DESCRIPTION

Invasive pneumococcal disease (IPD) is a leading cause of illness in young children and causes considerable illness and death in the elderly. The infectious agent, *Streptococcus pneumoniae*, is spread by direct and indirect contact with respiratory discharge and attacks various parts of the body resulting in pneumonia, bacteremia, and meningitis. *S. pneumoniae* has become increasingly resistant to antibiotics during the last decade. Disease caused by *S. pneumoniae* is vaccine-preventable.

ACDC has followed IPD as a special surveillance project since late 1995 and added IPD to its list of reportable diseases in October 2002. Cases are defined as LAC residents with a positive isolate for *S. pneumoniae* collected from a normally sterile site (e.g., blood, cerebral spinal fluid,). Antibiotic susceptibility is determined by disk diffusion or dilution diffusion. Minimum inhibitory concentration (MIC) breakpoints utilized by participating laboratories are based on standards developed by the Clinical and Laboratory Standards Institute (formerly the National Committee for Clinical Laboratory Standards). For this report, an isolate of *S. pneumoniae* is considered nonsusceptible to an antibiotic if the results indicate intermediate or high-level resistance.

Figure 2
IPD Cases By Month of Culture
LAC, 2005



DISEASE ABSTRACT

- The incidence rate remains the same as 2004.
- There was an increase in penicillin nonsusceptible infections, particularly within the <1 age group (Figure 3).
- The highest incidence of IPD occurred among

Blacks—the rate among this group is at least twice as high as that of Whites or Latinos (Figure 4).

STRATIFIED ANALYSIS

Trends: IPD occurred at an incidence rate of 6.2 per 100,000 in 2005 (N=590). This is very similar to the incidence rate for 2004 (6.3 per 100,000, N=603) (Figure 1).

Seasonality: The seasonal trend in 2005 followed the typical peak for IPD in the winter months, dropping in the spring and summer months (Figure 2).

Sex: The male to female rate ratio was 1.1:1.

Age: The age of IPD cases ranged from birth to 101 years old with a mean of 52 years and median of 55 years (crude data). The distribution of incidence across age groups in 2005 remained similar compared to previous years. However, an increase is seen within the vaccine-preventable age group of <1 (Figure 3).

Race/Ethnicity: The highest incidence of IPD occurred among Blacks. With an incidence of per 100,000, this rate is at least twice as high as that of Whites or Latinos (Figure 4).

Disease Severity: During 2005, the hospitalization rate was 91% overall and higher for the over 65 age-group (97%) than the less than 5 age group (77%). The case fatality rate was 14% (crude data). Most deaths occurred among adults 65 years and over (44% [N=18]); however, the 45–64 age group followed closely at 32% (N=13).

The proportion of culture sites remain the same as previous years, mainly from blood cultures only (Figure 5). Other sites reported include joint/synovial fluid, peritoneal fluid, ascites fluid, and thoracentesis fluid.

Figure 3
Incidence Rates of IPD Cases by Age
LAC, 2002-2005

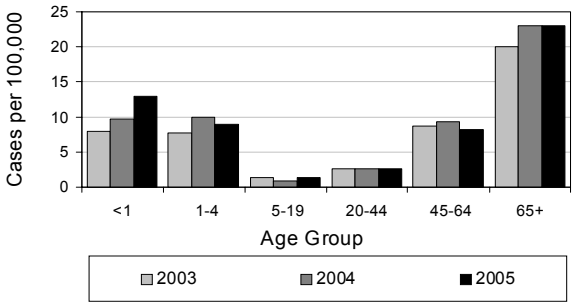


Figure 4
Incidence Rates of IPD Cases by Race/Ethnicity
LAC, 2005

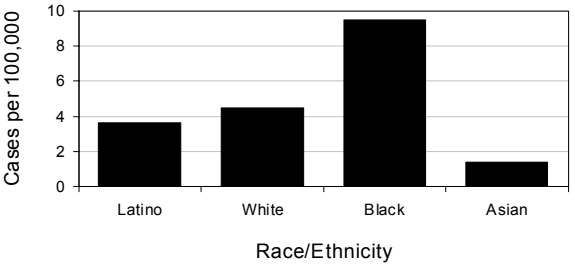
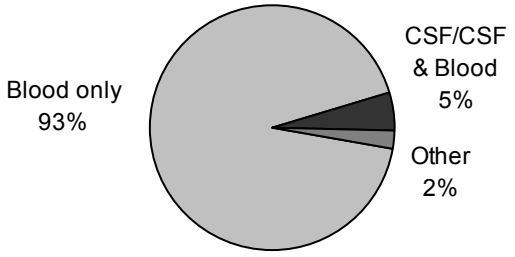


Figure 5
IPD by Culture Site
LAC, 2005 (N=590)



Antibiotic Susceptibility: For 2005, there was a rise in the proportion of penicillin nonsusceptible *S. pneumoniae* (PNSP) isolates to 25% (N=138). This continues an increasing trend occurring since 2003. The percent of isolates not susceptible to erythromycin and trimethoprim-sulfamethoxazole (TMP-SMZ) also increased slightly (Figure 6). Almost all reported cases (97%) had antibiotic resistance information provided.

Changes in the proportion of cases with PNSP isolates occurred in almost all age groups. The most dramatic change was observed among those <1 years of age, rising from 0 to 44%. The proportion of PNSP isolates remained high (40%) in the 1–4 age group since 2004 (Figure 7).

Figure 6
IPD Isolates Nonsusceptible to Selected Antimicrobial Agents
LAC, 2002–2005

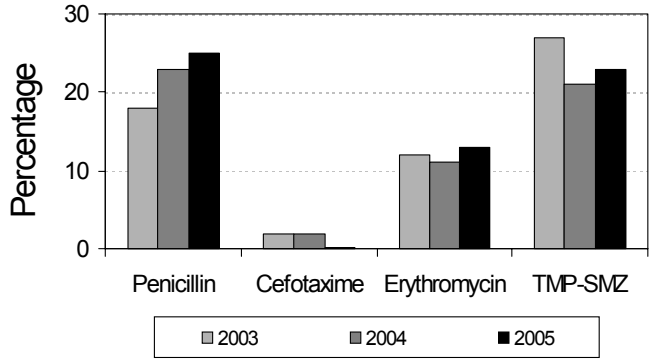
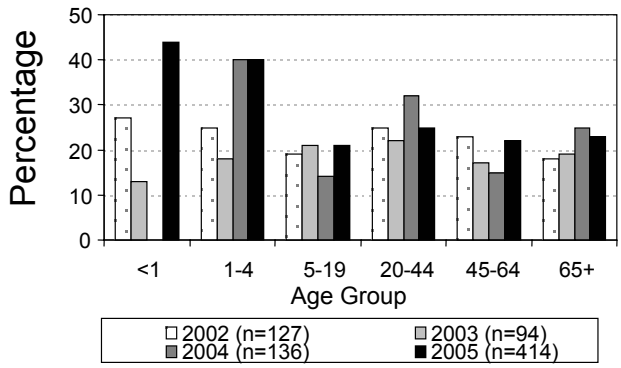


Figure 7
PNSP Isolates by Age
LAC, 2002–2005



PREVENTION

Two effective vaccines are available for pneumococcal disease. Heptavalent pneumococcal conjugate vaccine (Prevnar®) is recommended by the Advisory Committee on Immunization Practices (ACIP) for all children less than age 2 years, and for children up to age 5 years who are at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune®23 and Pneumovax®23) are recommended for all adults ≥65 years and those over age 2 years who are at high risk of invasive pneumococcal disease. For children aged 2 to 5 years who are at high risk of invasive pneumococcal infections, ACIP recommends use of pneumococcal conjugate vaccine followed at least 2 months later by the 23-valent pneumococcal polysaccharide vaccine. This regimen provides protection against a broader range of serotypes, although supporting data are limited [2].

COMMENTS

Though there continues to be a decline in overall incidence in IPD, there has been an increase in incidence rates and proportions of PNSP isolates in the vaccine-preventable age group of children <1. For 2005, the incidence rates and prevalence of PNSP isolates for this age group are indeed too small to be reliable. The relatively small case population produces unstable counts when stratified by multiple variables, such as age and penicillin nonsusceptibility.

Incidence of IPD in Blacks is over two times the incidence in Whites or Latinos in LAC. The ratio of Black-White incidence is similar to that found nationally; however, the incidence is much lower for both Whites and Blacks, which are 12.1 and 26.5 per 100,000 in the national population, respectively [3]. Whether the high rate in Blacks accounts for the apparent increases in IPD among children <1 year old is unknown, as stratifying by both age and race/ethnicity produces unstable rates. However, since incidence rates by race/ethnicity have not changed from the previous year, it is unlikely that there is a relationship. Studies have indicated that the difference in incidence among Blacks is associated with rates of breastfeeding, attendance in daycare, and underlying infections such as HIV [3].

Laboratories are the source for many of the IPD case reports to ACDC: 57% of cases were reported by laboratories only. Much of the limitations in the data are due to the minimal access that laboratories have

to patient information. Race/ethnicity data and outcome status, in particular, are often missing from laboratory reported cases. Only 67% of case reports contained race/ethnicity data and 50% contain outcome status. The unavailability of outcome status is further exacerbated by the requirements of laboratory reporting procedures. Cases often are reported before the final outcome is known due to the requirement to report positive cultures within seven days. Therefore, case fatality rates may be unreliable.

S. pneumoniae is one of the most common bacterial causes of community acquired pneumonia and otitis media (ear infections). However, these non-invasive forms of infection are not counted in our surveillance, therefore the data presented in this report is an underestimate of all disease caused by *S. pneumoniae* in LAC.

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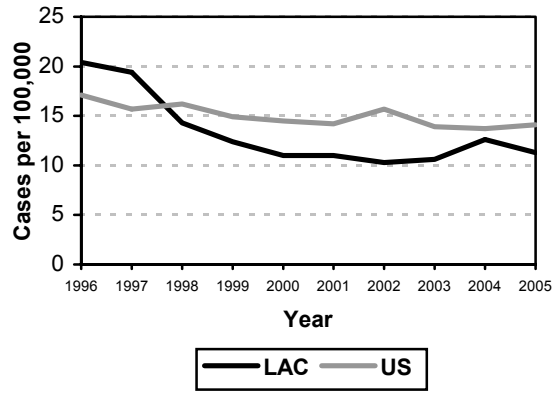
SALMONELLOSIS

CRUDE DATA	
Number of Cases	1,085
Annual Incidence[a]	
LA County	11.3
California	11.7
United States	14.1
Age at Diagnosis	
Mean	27
Median	22
Range	<1-95 years
Case Fatality	
LA County	0.7%
United States	N/A

Figure 1
Salmonellosis
Incidence Rates by Year
LAC and US, 1996–2005



[a] Cases per 100,000 population.

DESCRIPTION

Salmonellosis is caused by a Gram-negative bacillus, *Salmonella* enterica, of which there are more than 2,500 serotypes. This disease is transmitted by the fecal-oral route, from animal or human, with or without intermediary contamination of foodstuffs. The most common symptoms include diarrhea, fever, headache, abdominal pain, nausea and sometimes vomiting. Occasionally, the clinical course is that of enteric fever or septicemia. Asymptomatic infections may occur. The incubation period is usually 12–36 hours for gastroenteritis, longer and variable for other manifestations. Communicability lasts as long as organisms are excreted, usually from 2–5 weeks, but may last for months to years. Healthy people are susceptible, but persons especially at risk are those who are on antacid therapy, have recently taken or are taking broad-spectrum antibiotic therapy or immunosuppressive therapy, or those who have had gastrointestinal surgery, neoplastic disease, or other debilitating conditions. Severity of the disease is related to the serotype, the number of organisms ingested, and host factors. Immunocompromised persons, such as those with cancer or HIV infection, are at risk for recurrent *Salmonella* septicemia. Occasionally the organism may localize anywhere in the body, causing abscesses, osteomyelitis, arthritis, meningitis, endocarditis, pericarditis, pneumonia, or pyelonephritis.

DISEASE ABSTRACT

- The LAC 2005 salmonellosis crude rate decreased 10.3% when compared to 2004 (Figure1). It has remained below the national rate since 1998.
- *Salmonella* serotype Enteritidis was again the most common isolate in 2005 and the percent of change was an increase of 77% due to the increase in the total number of isolates (Table 1).
- *S.* Typhimurium was the second most common serotype in 2005 accounting for 14% of all isolates and increasing 8.2% from 2004.
- SPA 5 had the highest rate (13.4 per 100,000) of salmonellosis during 2005.

STRATIFIED DATA

Trends: The rate of salmonellosis cases for LAC in 2005 was 11.3 cases per 100,000 population, a 10.3% decrease from the 2004 rate of 12.6 (Figure 1). This was below the national rate. Reasons for this decrease may be improved food safety measures implemented in LAC and California, and fewer laboratory confirmed diagnoses made in California due to managed care practices. In 2005, ACDC continued to include "presumptive cases," those that meet a clinical case definition and have an epidemiological link to a laboratory confirmed case. If the presumptive cases are removed, the 2005 rate decreases to 10.8 per 100,000 population.

Salmonella Serotypes: For the second year, *S.* Enteritidis was the number one serotype, increasing to 29.5% of total isolates serotyped. After the 37.4% increase in *S.* Enteritidis cases in 2004, there was a 77% increase in 2005. The incomplete serotype I 4,5,12:i:--, which had increased 1,500% in 2004 due to an outbreak at a mental health facility, remained in the ten most frequently seen seroytypes. S. Heidelberg, which accounted for 30 outbreak related cases in 2004, showed a decrease in 2005. The increase seen in serotype Berta was due primarily to a family cluster. The increase seen in serotype I4,5,12:b:- was mostly due to a cluster in July; cases in this cluster could not be linked. There were no identified links between Muenchen cases.

Table 1. Most Frequent *Salmonella* Serotypes—LAC, 2004–2005

Serotype	2004 (N=1,213)*		2005 (N=1,032)*		%Change
	No.	Percent	No.	Percent	
Enteritidis	202	16.7	306	29.6	+77.0
Typhimurium**	162	13.4	150	14.6	+9.0
Newport	62	5.1	60	5.8	+13.7
Heidelberg	99	8.2	47	4.5	-45.0
I 4,5,12:i:-	34	2.6	32	3.1	+19.0
Oranienburg	17	1.4	24	2.3	+64.2
Berta	3	0.2	24	2.3	+1050.0
Thompson	25	2.1	21	2	-4.8
I 4,5,12:b:-	6	0.4	19	1.8	+350.0
Muenchen	10	0.8	18	1.7	+112.0

* Includes only serotyped isolates. (Eight cases for 2004 had two different serotypes of *Salmonella* .)
** Includes *S.* Typhimurium var. Copenhagen and degraded form.

Seasonality: In 2005, incidence peaked in July (Figure 2) and was dramatically greater than the five-year average. Incidence remained greater than the five-year average until December. The increase was primarily due to *S.* Enteritidis.

Age: As shown in Figure 3, the highest age group rates of infection occurred among infants aged less than 1 year (66.3 per 100,000 population) followed by children aged 1–4 years (33.1 per 100,000 population). This is typical for salmonellosis.

Hospitalized: In 2005, 23% of cases were hospitalized for more than 24 hours, compared to 21.3% in 2004.

Sex: The male-to-female rate ratio was 1:1.09

Figure 2
Salmonellosis
Cases by Month of Onset
LAC, 2005

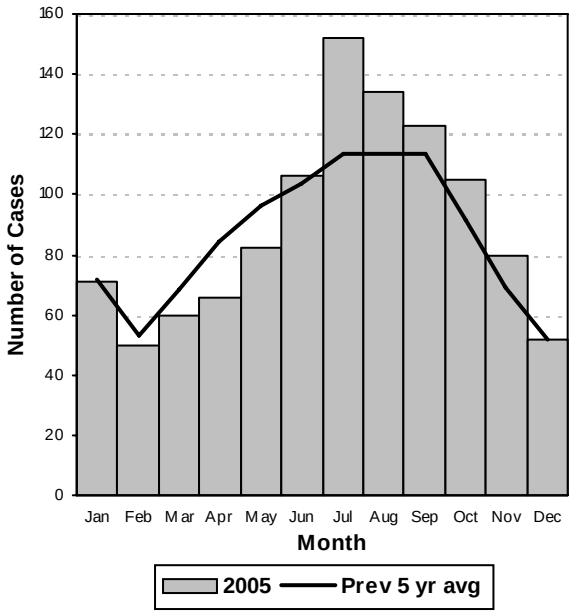
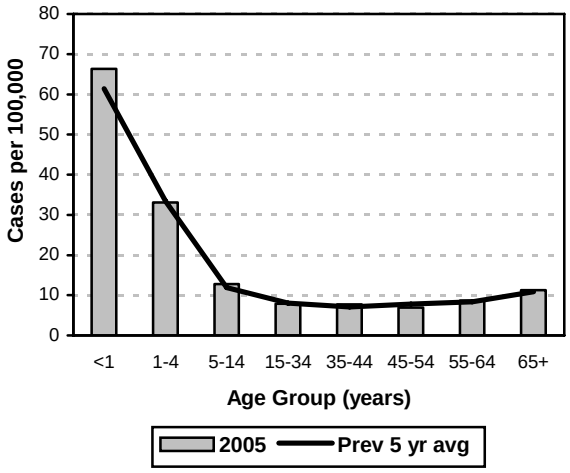


Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2005



Race/Ethnicity: Again, the highest age-adjusted rate was among Whites (15.42 per 100,000 population), followed by Latinos (10.32 per 100,000 population) then Asians (9.12 per 100,000 population), and Blacks (8.92 per 100,000 population). The rates for Latinos and Blacks decreased while the rates for Asians and Whites increased when compared to 2004 (Figure 4).

Location: Glendale Health District had the highest district rate with 16.1 cases per 100,000. The lowest district rate was in East Valley Health District with 5.4 cases per 100,000. Both of these districts are part of SPA 2, which has a rate of 11.7 cases per 100,000. Of all SPAs, SPA 5 had the highest rate with 13.4 cases per 100,000. In 2004, SPA 8 (15.2 per 100,000 population) had the highest rate. SPA 1 again had the lowest rate at 8.2 cases per 100,000 (Figure 5). No single SPA had a rate significantly higher or lower than LAC average.

Figure 4
Salmonellosis
Age-Adjusted Rates by Race/Ethnicity
LAC, 2004–2005

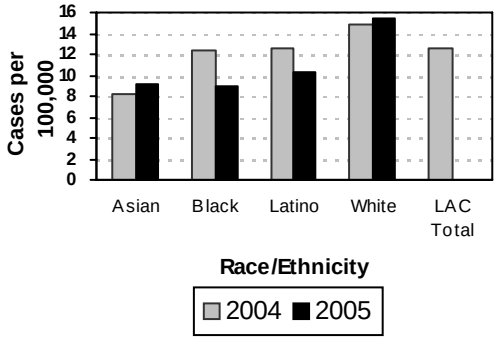
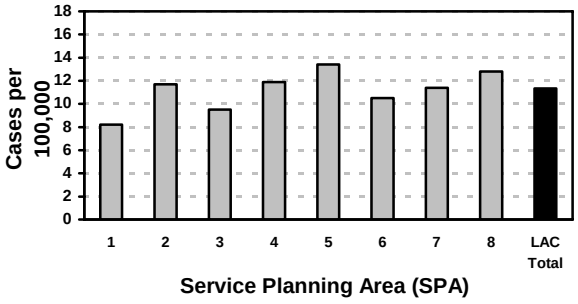


Figure 5
Salmonellosis
Incidence Rates by
Service Planning Area
LAC, 2005



PREVENTION

Each outbreak of salmonellosis is investigated and preventive measures are recommended. Review of investigation reports shows that many persons engage in high-risk food handling behaviors such as: consumption of raw or undercooked meats, or produce, use of raw eggs, not washing hands and/or cutting boards after handling raw poultry or meat, and not maintaining food at proper temperature to prevent bacterial growth. These investigations demonstrate a need for improved public education on proper handling and preparation of produce and animal-derived foods.

Health education targeted at specific high-risk groups is necessary; for example, 26.4% of the salmonellosis cases in 2005 were in the infant through four-year age group. This age group has consistently been the highest risk group for LAC since 1982. When cases occur, District Public Health Nurses should educate parents and teachers in preschools and day care facilities. Emphasis is on the following:

- Washing hands for parents, teachers and preschoolers.
- Proper preparation of foods and formula for this age group.
- Proper handling and cooking of uncooked meat, poultry and fish to prevent cross contamination.
- Keeping kitchen and utensils clean and preventing cross contamination.
- Avoiding reptile pets in the home, preschool and child care facilities.
- Avoiding other pets that may carry Salmonella, such as baby chicks or ducks.

Table 2. Salmonellosis Outbreaks in LAC, 2005

Onset Month	Outbreak Setting	Total # Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
April	Restaurant	5	4	*S. Heidelberg*	Dessert	Raw shell egg
April	Daycare	3	3	*IIIa41:z4,z23 IIIB65:k:z*	Animals in aquariums	Reptiles
July	Restaurant	11	6	*S. Enteritidis*	Dessert	Raw shell egg
September	Restaurant	19	3	*S. Enteritidis*	Unknown food vehicle	Unknown food source
TOTAL		**38**	**16**			

COMMENTS

After a peak in 1994, starting in 1995 through 2000, a steady decline occurred in the LAC rate of salmonellosis. This decline continued, dipping below the national average in 1998 (Figure 2). Specific reasons for the declining rate have not been studied scientifically, but several factors may have contributed. These include the increase in managed care and medical practice guidelines recommending treatment for patients with fever and diarrhea without confirmed diagnosis. Other potential contributing factors include: industry-based programs such as the California Egg Quality Assurance Program and the California Poultry Meat Quality Assurance Program, various government laws and regulations affecting food safety from farm to distribution as well as the increased use of safe food preparation labels on packaged meats. The LAC rate in 2004 increased, but did adjust down again in 2005 (Figure 2).

There were four salmonellosis outbreaks during 2005 compared to 12 identified in 2004. Two outbreaks were serotype Enteritidis, one was Heidelberg and the other involved multiple serotypes (Figure 1). Outbreak related cases (both confirmed and presumptive) made up only 3.5 % of total cases compared to 19.2% of total cases in 2004. *Salmonella* Enteritidis has reemerged as the number one etiologic agent identified in outbreaks in LAC, after no outbreaks in 2002 and 2003 and one small outbreak (three cases) in 2004. This year Enteritidis, the predominant serotype for 2005, was found to be the cause for two outbreaks with a total of thirty cases. Three of the four salmonellosis outbreak investigations cited restaurant prepared food as a source. Two investigations identified raw shell eggs as the suspected

source (Table 2). The use of PFGE and comparison of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network for foodborne disease, continues to help identify potentially related clusters within LAC.

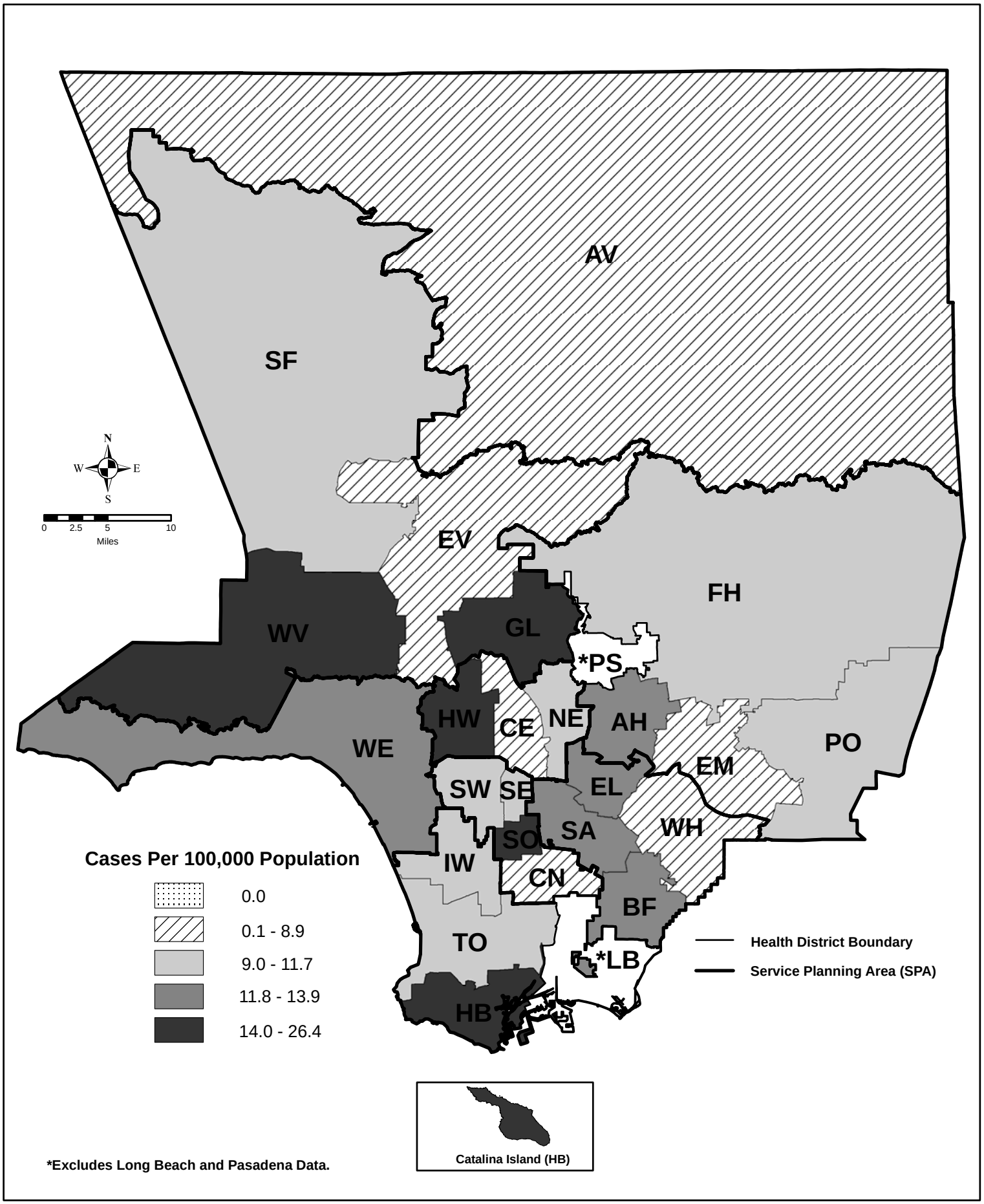
Salmonellosis was reported as a contributing cause of death in seven people, all of whom had underlying health problems such as cancer, immune deficiency, malignant brain tumor, and complications post gastric tube placement. Ages of these individuals ranged from 26 to 91 years.

ADDITIONAL RESOURCES

General information about salmonellosis is available at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm

General information and reporting information about this and foodborne diseases in LAC is available at:
www.lapublichealth.org/acd/food.htm

Map 11. Salmonellosis
Rates by Health District, Los Angeles County, 2005*



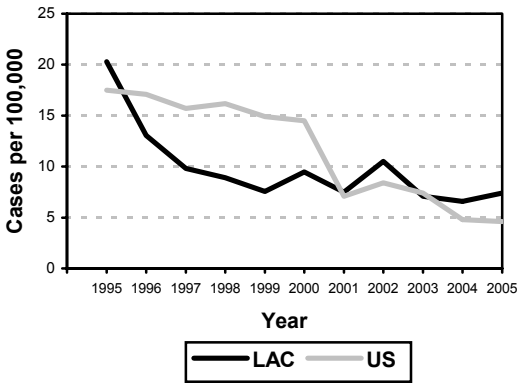
*Excludes Long Beach and Pasadena Data.

SHIGELLOSIS

CRUDE DATA	
Number of Cases	710
Annual Incidence[a]	
LA County	7.4
California	5.8
United States	4.6
Age at Diagnosis	
Mean	20.3
Median	11
Range	<1–89 years
Case Fatality	
LA County	<1%
United States	N/A

[a] Cases per 100,000 population.

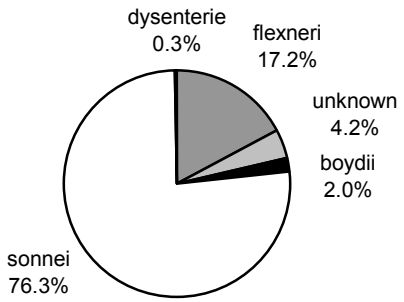
Figure 1
Shigellosis
Incidence Rates by Year of Onset
LAC and US, 1995–2005



DESCRIPTION

Shigellosis is caused by a Gram-negative bacillus with four main serogroups: *Shigella dysenteriae* (group A), *S. flexneri* (group B), *S. boydii* (group C) and *S. sonnei* (group D). Incubation period is 1-3 days. Transmission occurs when individuals fail to thoroughly wash their hands after defecation and spread infective particles to others, either directly by physical contact, including sexual behaviors, or indirectly by contaminating food. Infection may occur with ingestion of as few as 10 organisms. Common symptoms include diarrhea, fever, nausea, vomiting, and tenesmus. Stool may contain blood or mucous. In general, the elderly, the immunocompromised, and the malnourished are more susceptible to severe disease outcomes.

Figure 2
Shigellosis
Percent by Serogroup
LAC, 2005
(N=710)



DISEASE ABSTRACT

- There was a 14% increase in reported cases in 2005 due to an increase in family clusters and outbreak related cases.
- Three shigellosis-associated outbreaks were investigated in 2005.

STRATIFIED DATA

Trends: There was a 14% increase in the number of cases during 2005. The rate had been decreasing since reaching a peak of 10.5 in 2002 but increased in 2005 (Figure 1). This may be due to an increase in family clusters and outbreak related cases.

Serotypes: In 2005, there was a significant decrease in the proportion of *S. flexneri* (n=122) when compared to 2004 ($p<0.005$). *S. sonnei* remains the dominant serotype (n=542). Other serotypes identified during 2005 include: *S. boydii* (n=14) and *S. dysenterie* (n=3) (Figure 2). A few of the *S.boydii* cases (n=5, 36%) reported travel as possibly related to their exposure. The three reported cases of *S. dysenterie* did not travel during the incubation period.

Seasonality: In 2005, incidence peaked in September and continued to stay above the five-year average through October (Figure 3). This was due primarily to two outbreaks and several large family clusters. The rate of travel related cases that occurred from July through September increased to 60% as compared to 43% in 2004.

Age: Children aged 1–4 years (29.5 per 100,000) and 5–14 (14.4 per 100,000) again had the highest rates; however, these rates were lower than the previous five-year average (Figure 4).

Race/Ethnicity: During 2005, Latinos aged 1–4 years again had the highest age-adjusted rate (Figure 5). For the third year, Latino infants and children aged 5–14 had higher age adjusted rates compared to other race ethnicities. Latinos aged 55 years and older also had higher age-adjusted rates compared to other race ethnicities. Overcrowding and living with extended family members plus the higher overall rate in Latinos may be possible causes.

Sex: The male-to-female rate ratio was 1:1. Men are still the preponderance group, however, the ratio has decreased compared to 2004 and with fewer MSM in 2005.

Location: The rates for SPA 4 (11.7 per 100,000) and SPA 6 (11.6 per 100,000) were again significantly higher than the county average (8.20 per 100,000). One outbreak each occurred in SPAs 2, 4, and 8. The majority of MSM cases (38%) were again seen in SPA 4.

Severity of Illness: Many of the reported shigellosis cases (17%) were hospitalized for at least two days. There was one shigellosis-associated death reported—a two year old girl with no history of medical problems.

Risk Factors: Exposure to a case inside or outside the household (26%, n=186) and foreign travel (23%, n=166) were the most commonly reported potential sources of infection. The majority of travel–associated illness (61%, n=102) involved visiting Mexico. In 2005, four percent of cases were in MSM compared to seven percent in 2004.

Figure 3
Shigellosis
Cases by Month of Onset
LAC, 2005

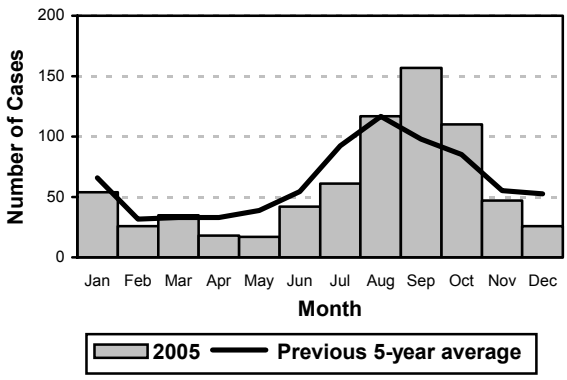


Figure 4
Shigellosis
Incidence Rates by Age Group
LAC, 2005

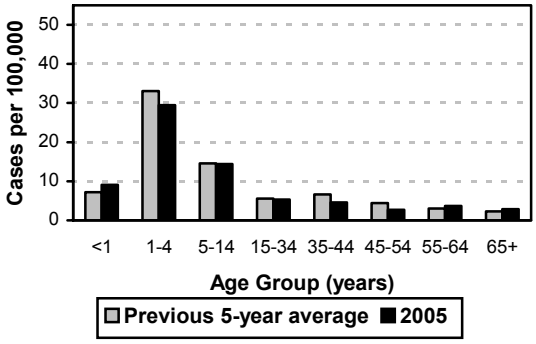
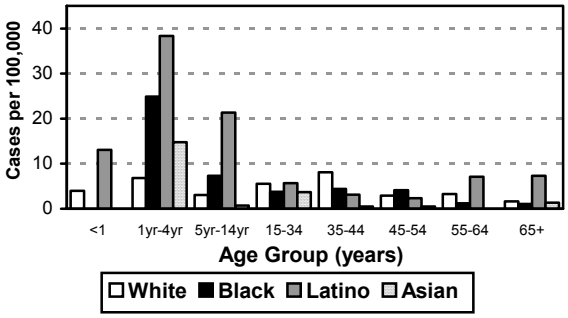


Figure 5
Shigellosis Incidence Rates
by Age Group and Race
LAC, 2005 (N=710)



PREVENTION

Careful hand washing is vital in preventing this disease. Young children or anyone with questionable hygiene should be monitored to promote compliance. Hand washing is especially important when out in crowded areas such as amusement parks or shopping malls. Ill children should not be allowed to swim or wade while ill with diarrhea; ill children in diapers should never be allowed in public swimming areas. Swimming or wading in areas not designated for such activities should be avoided, especially in areas where there are no toileting or hand washing facilities. In LAC, cases and symptomatic contacts in sensitive occupations or situations (e.g., food handling, daycare and healthcare workers) are routinely removed from work or the situation until they have culture negative stool specimens tested in the Public Health Laboratory.

COMMENTS

There were three shigellosis outbreaks investigated in 2005; all three were laboratory confirmed. Two were community outbreaks involving cases among extended family members and friends and a home day care operation. The third outbreak was travel related.

Eight LAC residents were involved with an out-of-state outbreak and five other cases were named as part of another investigation. Both of these outbreaks appeared to be from person-to-person transmission.

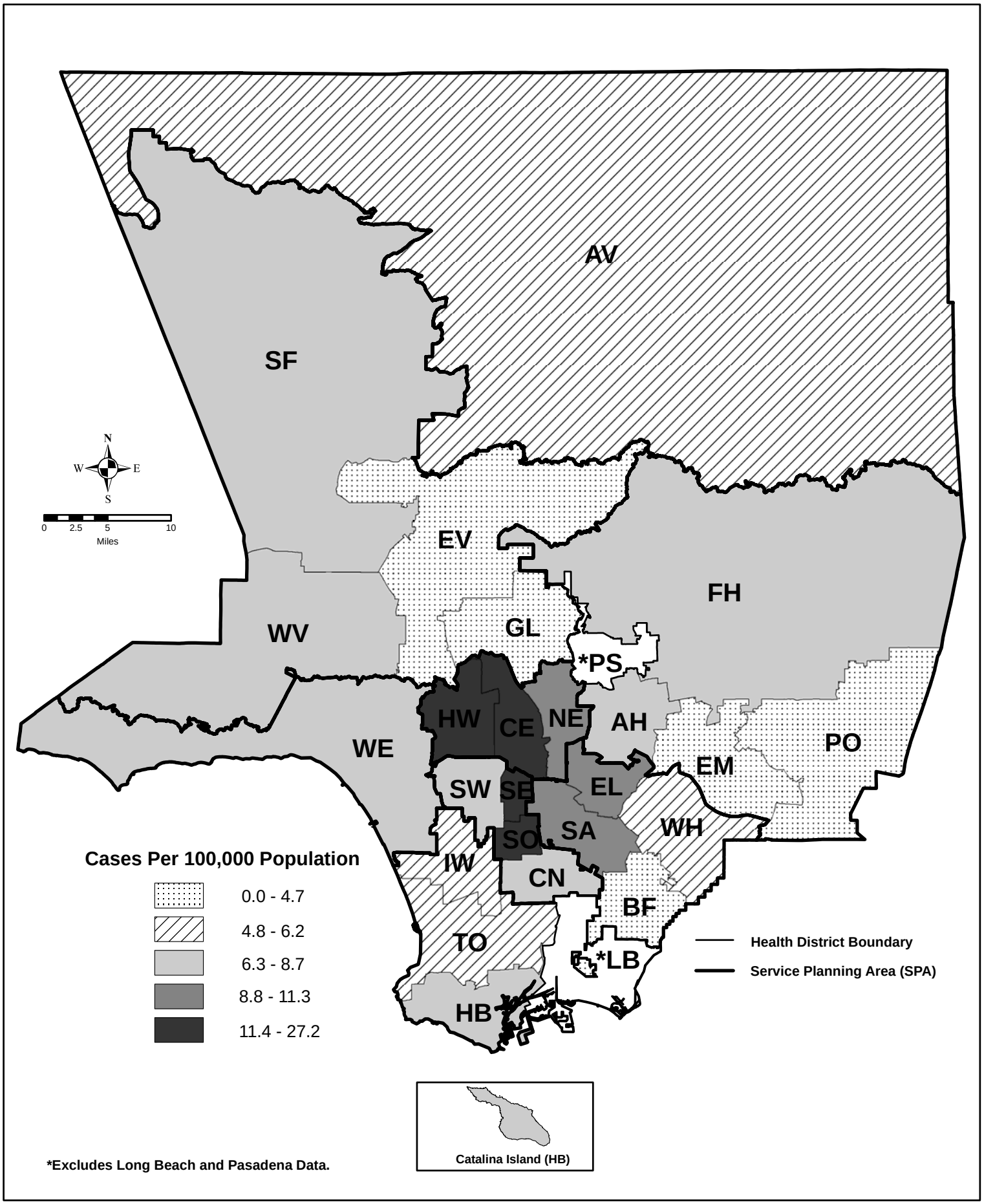
Certain sexual practices—especially those in which there is direct contact with fecal material—are a potential source of infection. There were 29 shigellosis cases reported in MSM. No links could be established among these cases. *S. flexneri* (55%) was again the predominant serotype in 2003 and 2004 for this risk group; in 2002 the predominant MSM serotype was *S. sonnei* (56%).

ADDITIONAL RESOURCES

General information about shigellosis is available at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/shigellosis_g.htm

General information and reporting information about this and foodborne diseases in LAC is available at:
www.lapublichealth.org/acd/food.htm

Map 12. Shigellosis
Rates by Health District, Los Angeles County, 2005*

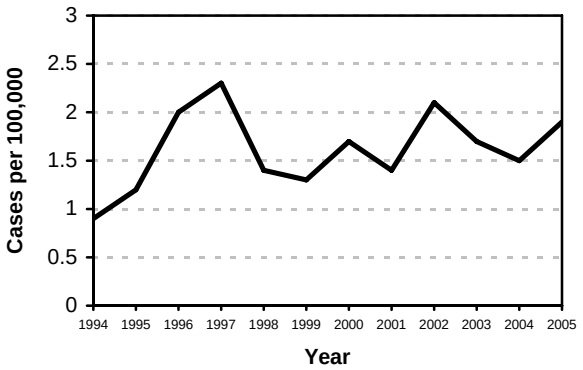


*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	179
Annual Incidence[a]	
LA County	1.9
United States[b]	3.4
Age at Diagnosis	
Mean	48
Median	50
Range	0–94 years
Case Fatality	
LA County[c]	9%
United States[b]	13%

Figure 1
IGAS
Incidence Rates by Year of Onset
LAC, 1994–2005



*Data prior to 1994 not available.

[a] Cases per 100,000 population.
[b] National projection of IGAS incidence from Active Bacterial Core Surveillance areas data, 2004 [1].
[c] 68% of outcomes known.

DESCRIPTION

Invasive Group A Streptococcal (IGAS) disease is caused by the group A beta-hemolytic *Streptococcus pyogenes* bacterium. Transmission is by direct or, rarely, indirect contact. Illness manifests as various overlapping clinical syndromes including bacteremia without focus, sepsis, cutaneous wound or deep soft-tissue infection, septic arthritis, and pneumonia. It is the most common cause of necrotizing fasciitis, commonly known as "flesh eating bacteria." IGAS occurs in all age groups but more frequently among the very old. Infection can result in severe illness, including death.

For surveillance purposes in LAC, IGAS is defined as isolation of *S. pyogenes* from a normally sterile body site (e.g., blood, cerebrospinal fluid, synovial fluid, or from tissue collected during surgical procedures). Isolation can include a non-sterile site if associated with streptococcal toxic shock syndrome (STSS) or necrotizing fasciitis (NF). IGAS cases are characterized as STSS if the diagnosis fulfills the CDC or Council of State and Territorial Epidemiologists (CSTE) case definitions for this syndrome; and as NF if the diagnosis was made by the treating physician.

DISEASE ABSTRACT

- There has been an increase in IGAS incidence, which may be accounted for by an increase in infection in males and among Blacks.
- A nosocomial situation consisting of two cases was reported and investigated at the end of 2005, in which no source could be determined due to incomplete evidence.

STRATIFIED DATA

Trends: The incidence rate of reported IGAS was 1.9 per 100,000 during 2005 (n=179). This is a 12% rise in incidence as compared to 2004 (1.5 per 100,000, n=146) (Figure 1). The range of cases reported

per month was 10 to 23, compared to 9 to 15 per month in 2004. Though there was a peak in December with 23 cases, no seasonal trend was apparent (Figure 2).

Age: The age of cases ranged from 0 to 94 years with a mean of 48 and median of 50 (crude data). The highest rate of cases occurred in those 65 years and older (Figure 3).

Gender: The male to female rate ratio has increased to 2:1 in 2005, whereas it has been distributed equally in previous years.

Race/Ethnicity: Race/ethnicity was known for 87% of cases. There has been an increase in the percentage of cases with reported Black race (n=24, 15%). Blacks have the highest reported incidence at 2.7 per 100,000 (data not shown).

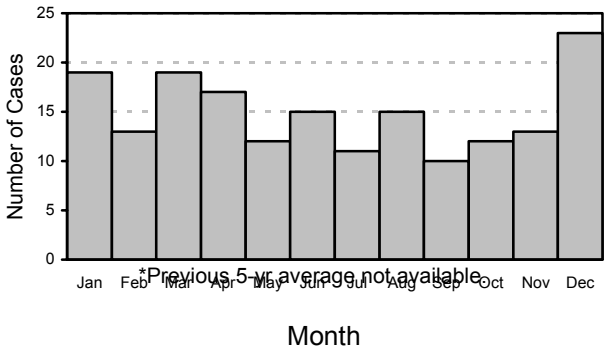
Location: The incidence rate was highest in SPA 5 (3.2 cases per 100,000) compared to LAC overall (1.9 cases per 100,000). Incidence has increased for all SPAs, but is most dramatic in SPA 1, which rose from 1.5 per 100,000 in 2004 to 2.3 per 100,000 in 2005 (Figure 4). However, stratification of cases by SPA produces small numbers and unstable incidence rates for SPAs 1, 6 and 7.

Clinical Presentation: The most common syndromes presented were bacteremia and cellulitis (Table 1). Other syndromes reported include osteomyelitis, urosepsis, and septic arthritis. The increase in STSS seen in 2004 has dropped to levels similar to previous years (Figure 5). Pneumonia, however, has risen to 17% from 12% in 2004 (Table 1). The average age of the 25 cases of pneumonia was 58; the median was 64, and the ages ranged from 3 to 89 years old. The cases were 76% male and 48% White. Clinical presentation data was available for 84% of cases.

The case fatality rate has fallen dramatically from 26% in 2004 to 9%. This rate is lower than the national estimate (crude data).

Risk Factors: Information about risk factors was collected for 78% of cases. Of these cases, 28% reported no risk factors for IGAS (n=56). The most common reported risk factor was diabetes (n=39, 19%), followed by chronic heart disease (n=21, 10%) and history of blunt trauma (n=17, 8%).

Figure 2
IGAS Cases by Month of Onset*
LAC, 2005



*Previous 5-yr average not available

Figure 3
IGAS Incidence Rates by Age Group
LAC, 2001–2005

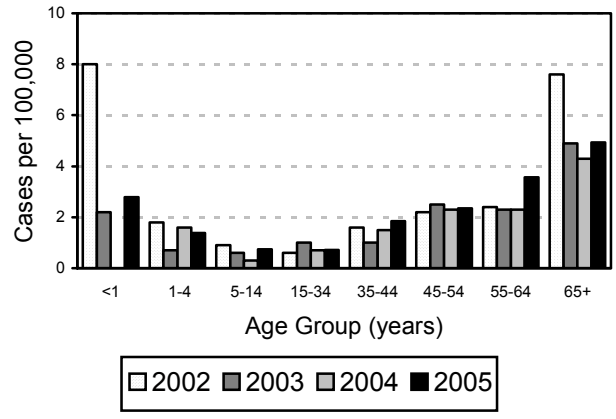


Figure 4
IGAS Rates by Service Planning Area
LAC, 2005

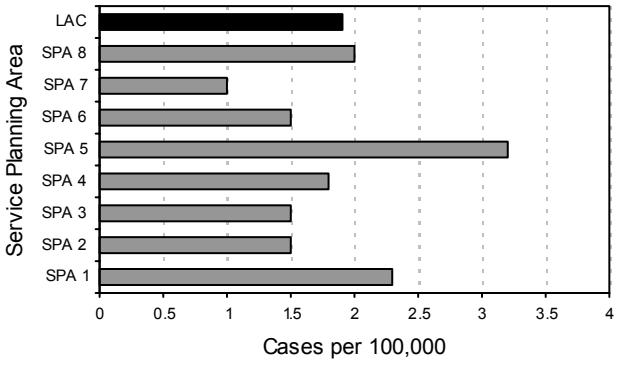


Table 1. Frequency and Percentage of IGAS Clinical Syndromes, LAC, 2005

Syndrome	Number	Percent*
Bacteremia (without focus)	60	40
Cellulitis	43	28
Pneumonia	25	17
Necrotizing Fasciitis	16	11
STSS	5	3
Meningitis	5	3

*Overlapping syndromes will total over 100%.

both STSS and case fatality in 2005 suggests not only that the increase in 2004 was a real trend but also that IGAS case fatality is strongly affected by STSS incidence.

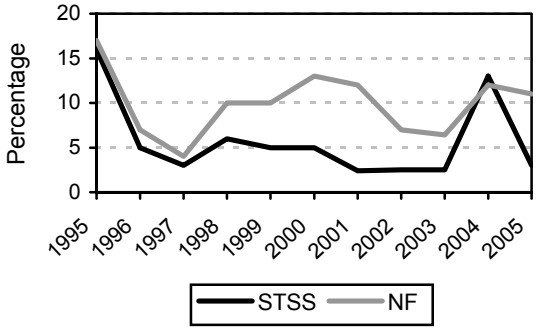
A nosocomial situation was reported at the end of 2005 in which two patients incurred IGAS infections after undergoing surgery from the same physician two months apart. Subsequent culturing of the surgeon yielded negative results and case finding revealed no additional cases. The isolate for the first case was not available for PFGE comparison. Thus, the second isolate was stored and no further action was taken.

COMMENTS

The increase in overall incidence may be explained by the increase of IGAS in males and among Blacks. However, there is no known clinical manifestation, underlying risk factor, identified with these groups.

The rise in STSS and case fatality in 2004 had been attributed possibly to changes in the reporting of IGAS during that year. However, as reporting methods have not changed for 2005, the drop in

Figure 5
IGAS Clinical Presentation of
STSS and NF
LAC, 1995–2005



Although IGAS disease is not a mandated reportable disease in California, LACDHS has required laboratories, hospitals, and healthcare providers to report IGAS disease since 1993. Surveillance has been predominately passive and information pertaining to patient demographics, clinical presentation, intervention, and outcome has often been incomplete. Complete IGAS reporting requires active case follow-up, particularly for STSS and NF as the classification of these syndromes requires more intensive review. In 2002 a new IGAS history form including a specific section for STSS reporting was developed and distributed to infection control practitioners. Increased information about IGAS and its various clinical syndromes has been systematically collected since that time with increasing success.

S. pyogenes more commonly causes non-invasive disease that presents as strep throat and skin infections. However, these diseases are not counted in our surveillance of invasive disease, therefore, the data presented in this report underestimates all disease caused by *S. pyogenes* in LAC.

ADDITIONAL RESOURCES

For more information about IGAS visit:

- CDC – www.cdc.gov/ncidod/dbmd/diseaseinfo/groupastreptococcal_g.htm
- National Institute of Health – www.niaid.nih.gov/factsheets/strep.htm

IGAS Publications:

- The Working Group on Prevention of Invasive Group A Streptococcal Infections. Prevention of Group A streptococcal disease among household contacts of case-patients and among Postpartum and Postsurgical Patients: Recommendations from the Centers for Disease Control and Prevention. *Clin Infec Dis* 2002:35:950-9.
- O'Brien KL, Beall B, Barret NL, et al. Epidemiology of invasive group A streptococcal disease in the United States, 1995-1999. *Clin Infec Dis* 2002;36:268-276.
- American Academy of Pediatrics. Committee on Infectious Diseases. Severe invasive group A streptococcal infections: a subject review. *Pediatrics.* 1998;101:136-40.
- Kaul R, McGeer A, Low D, et al. Population-based surveillance for group A streptococcal necrotizing fasciitis: clinical features, prognostic indicators, and microbiologic analysis of seventy-seven cases. *Am J Med* 1997;103:18-24.

REFERENCES

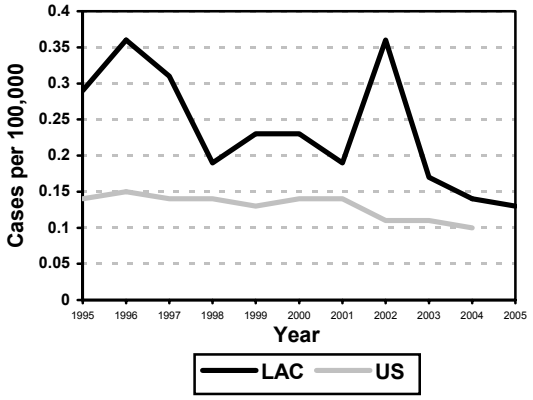
1. Active Bacterial Core Surveillance Reports from 1997 to 2004 from the Centers for Disease Control and Prevention's Division of Bacterial and Mycotic Diseases. Report available at: www.cdc.gov/ncidod/dbmd/abcs/survreports.htm. Accessed 5/8/2006.

TYPHOID FEVER, ACUTE

CRUDE DATA	
Number of Cases	12
Annual Incidence[a]	
LA County	--- [b]
California	0.20
United States	0.11
Age at Diagnosis	
Mean	23.1
Median	20.5
Range	3-54
Case Fatality	
LA County	0.0%
United States	N/A

[a] Cases per 100,000 population.
[b] Rates based on less than 20 observations are unreliable.

Figure 1
Acute Typhoid Fever
Incidence Rates by Year of Onset
LAC* and US, 1995–2005



* Rates based on less than 20 observations are unreliable.

DESCRIPTION

Typhoid fever, or "enteric fever," is an acute systemic disease caused by the Gram-negative bacillus *Salmonella typhi*. Transmission may occur person-to-person or by ingestion of food or water contaminated by the urine or feces of acute cases or carriers. Common symptoms include insidious onset of persistent fever, headache, malaise, anorexia, constipation (more commonly than diarrhea), bradycardia, enlargement of the spleen, and rose spots on the trunk. Humans are the only known reservoir for *S. typhi*. Vaccine is available to those at high risk or travelers.

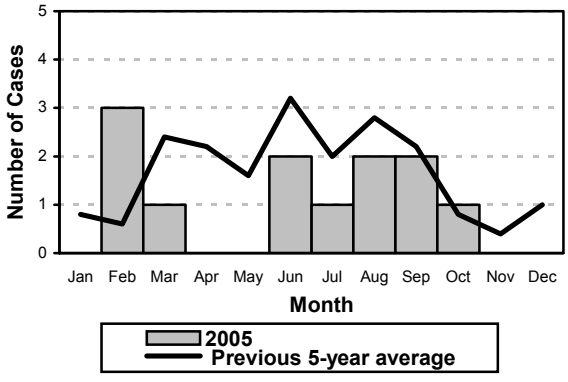
DISEASE ABSTRACT

- Travel was again the most common risk factor identified in LAC; 58% of cases reported visits to typhoid endemic countries.
- Adults represented 75% of all cases in 2005.

STRATIFIED DATA

Trends: The yearly incident has decreased after a peak in 2002. There were eight percent fewer cases in 2005. Twelve is the fewest number of cases reported in LAC in over twenty years.

Figure 2
Acute Typhoid Fever
Cases by Month of Onset
LAC, 2005



Seasonality: In 2005 the number of cases peaked in February, (Figure 2); however, no cases seemed to coincide with the winter holidays as in previous years. The majority of cases occurred in the summer months, however, the incidence was below the five-year average.

Age: In 2005, 75% of acute cases were in adults consistent with the five-year average (Figure 3). The age group of fifteen to thirty-four has consistently represented the highest percentage of cases in the past five years.

Sex: The male-to-female ratio was 3:1. In 2005, males had an increased incidence, unlike the previous years when there were more female cases.

Race/Ethnicity: In 2005, acute typhoid cases occurred in Asians and Latinos. There were no cases in Blacks or Whites (Figure 4).

Location: In 2005, SPA 6 and 8 each had three cases (25%). SPA 2 and 7 had two cases each (17%). SPA 1 and 5 had one case each (8%). SPA 3 and 4 had no reported cases.

Figure 3
Acute Typhoid Fever
by Age Group
LAC, 2005

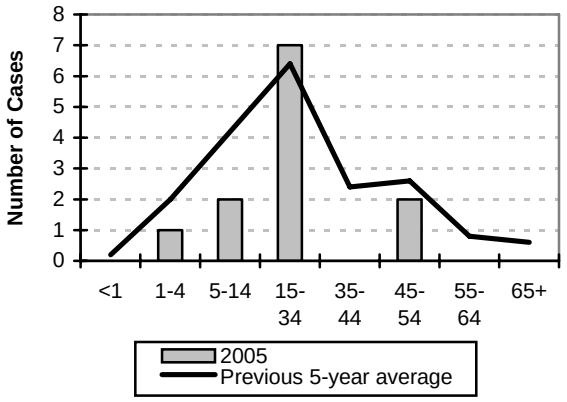
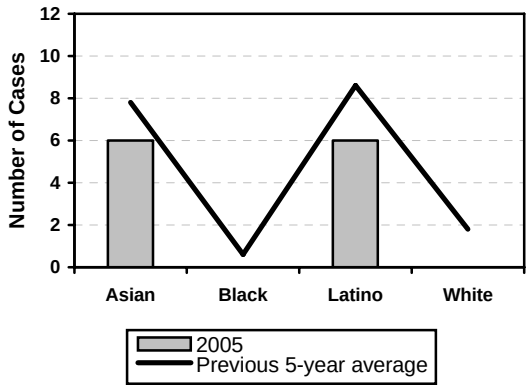


Figure 4
Acute Typhoid Fever
by Race/Ethnicity
LAC, 2005



PREVENTION

Handwashing after using the toilet, before preparing or serving food, and before and after caring for others is important in preventing the spread of typhoid. When traveling to locations where sanitary practices are uncertain, foods should be thoroughly cooked and served hot; bottled water should be used for drinking as well as for brushing teeth and making ice. Vaccination should be considered when traveling in areas of high endemicity. LAC tests household contacts of confirmed cases for *S typhi* to identify any previously undiagnosed carriers or cases.

COMMENTS

The majority of cases (n=7, 58%) traveled to endemic areas outside the US; Mexico, Pakistan, India, Bangladesh, Indonesia and Chile were reported travel destinations. One adult case reported travel inside the US. Three cases were infected by previously undiagnosed carriers in the household; one family reported having a relative from Mexico that visits frequently.

ADDITIONAL RESOURCES

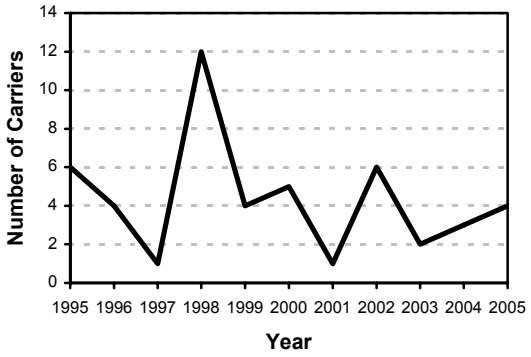
General information about typhoid fever available from CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/typhoidfever_g.htm

Traveler's health information is available at: www.cdc.gov./travel/diseases/typhoid.htm
General information and reporting information about this and other diseases in LAC is available at:
www.lapublichealth.org/acd/food.htm

TYPHOID FEVER, CARRIER

CRUDE DATA	
Number of New Carriers	4
Total Number of Carriers	14
Annual Incidence[a]	
LA County	N/A[b]
United States	N/A
Age at Diagnosis	
Mean	46 years
Range	26-69 years
Case Fatality	
LA County	0.0 %
United States	N/A

Figure 1
Typhoid Fever Carriers
by Year of Detection
LAC, 1995–2004



[a] Cases per 100,000 population.
[b] Rates based on less than 20 observations are unreliable.

DESCRIPTION

The chronic typhoid carrier state can occur following symptomatic or subclinical infections of *Salmonella typhi*. Among untreated cases, 10% will shed bacteria for three months after initial onset of symptoms and 2-5% will become chronic carriers. The chronic carrier state occurs most commonly among middle-aged women.

DISEASE ABSTRACT

- There were four new carriers identified in 2005.
- During 2005, two carriers were closed to follow-up and a total of fourteen carriers remained under case management in LAC at the end of 2005.

COMMENTS

All new carriers were foreign born; three were female. Three previously unknown carriers were found while testing household contacts to three new acute typhoid cases, all in the same household. The other carrier was identified during a diagnostic tissue culture.

Upon identification, each new carrier is added to the typhoid carrier registry. All carriers are visited semi-annually by a public health nurse to assess and emphasize compliance with a signed typhoid carrier agreement. Per state code, carriers are to remain under the supervision of the local health officer until cleared. Conditions for release from supervision are also mandated by state code. An approved public health laboratory must test the cultures for the purpose of release.

ADDITIONAL RESOURCES

Disease information is available from CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/typhoidfever_g.htm

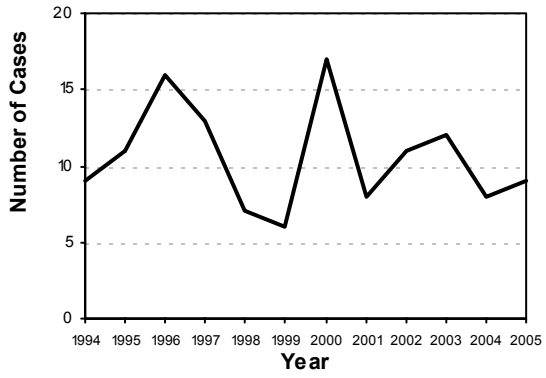
General information and reporting information about this and other diseases in LAC is available at:
www.lapublichealth.org/acd/food.htm

TYPHUS, MURINE

CRUDE DATA	
Number of Cases	9
Annual Incidence[a]	
LA County	0.09[b]
United States	N/A
Age at Diagnosis	
Mean	46
Median	49
Range	10–65 years
Case Fatality	
LA County	0.0%
United States	N/A

[a] Cases per 100,000 population.
[b] Rates based on less than 20 observations are unreliable.

Figure 1
Murine Typhus
Cases by Year of Onset
LAC, 1994–2005



DESCRIPTION

Typhus refers to a group of infectious diseases that are caused by rickettsial organisms and result in an acute febrile illness; arthropod vectors transmit the etiologic agents to humans. The principle diseases of this group are epidemic (or louse-borne) typhus, murine (or endemic) typhus, and scrub typhus. Murine typhus is the only one of these diseases naturally occurring in LAC and is caused by two bacteria *Rickettsia typhi* and *R. felis*; both are transmitted through the bite or contact with feces of an infected flea. Reservoir animals are predominantly rats and opossums that live in areas with heavy foliage. In LAC, most reported cases of typhus occur in residents of the foothills of central LAC. Symptoms include fever, severe headache, chills, and myalgia. A fine, macular rash may appear three to five days after onset. Occasionally, complications such as pneumonia or hepatitis may occur. Fatalities are uncommon, occurring in less than 1% of cases. The disease is typically mild in young children. Typhus infection is not vaccine preventable, but can be treated with antibiotics.

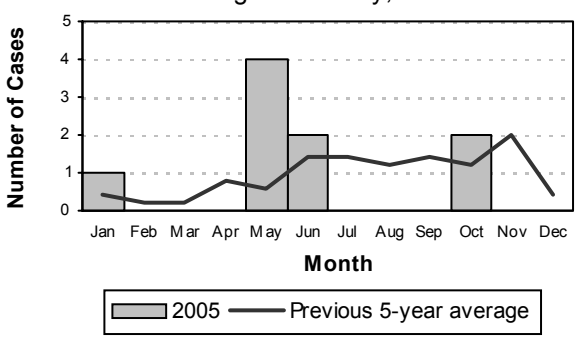
DISEASE ABSTRACT

- An outbreak of four cases, two confirmed and two probable, occurred during May in a South Pasadena neighborhood. All cases recovered with doxycycline treatment.
- Despite the occurrence of an outbreak, all trends and demographics remain similar to 2004.

STRATIFIED DATA

Trends: The number of cases reported in 2005 (N=9) is similar to that reported in 2004 (N=8). The majority of cases (n=6, 67%) occurred during the spring (May

Figure 2
Murine Typhus
Cases by Month of Onset
Los Angeles County, 2005



and June) (Figure 2).

Age: The mean and median ages of cases were higher in 2005 than in 2004. In 2005, the mean and median ages were 46 and 49 years, respectively. Ages ranged from 10 to 65 years. Most cases occurred among adults age 18 years and over (n=8, 89%).

Sex: The number of males and females were nearly equivalent. The male to female case ratio was 0.8:1.0.

Race/Ethnicity: Most cases were of White race/ethnicity (n=6, 67%). The remaining cases were Latino.

Location: Of the nine cases, four were residents of Alhambra, two from Hollywood-Wilshire, and one each from Central, Foothill and Glendale health districts, respectively. Typhus is endemic in the foothills of central LAC and rats, opossum, and cats from these areas have tested positive for typhus-group rickettsial antibodies.

Transmission and Risk Factors: Human infection most commonly occurs by introduction of infectious flea fecal matter into the bite site or into adjacent areas that have been abraded by scratching. Over half of the cases in 2005 (n=5, 56%) reported an exposure to fleas or flea bites within the 2-weeks prior to onset of illness. Of the cases that were not exposed to fleas, most reported observing other types of small mammals (e.g., rats, opossums, dogs and cats) on their residential property, and thus may have had exposure to fleas. Typhus infection cannot be transmitted from person to person.

PREVENTION

Typhus infection can be prevented through flea control measures implemented on pets. Foliage in the yard should be trimmed so that it does not provide harborage for small mammals. Screens can be placed on windows and crawl spaces to prevent entry of animals into the house.

COMMENTS

In May 2005, an outbreak of four cases involving residents within one street block in South Pasadena was investigated. Two cases were confirmed and two were probable; two additional suspects had compatible symptomatology but refused testing. Although smaller clusters of typhus cases in LAC have been reported in past years, this was the largest outbreak documented in LAC. The four confirmed and probable cases reported seeing opossums near their residence. Interestingly, the two confirmed cases required convalescent serology to make the diagnosis. When a diagnosis of typhus fever is suspected a convalescent serological test is recommended. However, most clinicians obtain only acute serology, which can be negative early in the infection. It is possible that many cases in LAC are missed in this manner. For further details of this outbreak, see the Special Studies Report section.

When a diagnosis of typhus fever is confirmed by serology, each case is interviewed regarding potential exposures. If possible, LACDHS an environmental health specialist conducts field studies of the property where exposure occurred and surrounding areas in the neighborhood. In addition, local residents are contacted and provided with education about typhus and prevention of the disease by controlling fleas and eliminating harborage for potentially typhus-infected animals that carry fleas.

The nonspecific clinical presentation and the lack of a definitive test during the acute phase of the illness make the early diagnosis of typhus fever difficult. Thus, diagnosis of typhus fever depends on the clinical acumen of the treating physician and often requires acute and convalescent serology, and so is frequently confirmed after the patient has recovered. Reporting of typhus or suspect typhus cases can help identify areas in LAC that may require monitoring for the presence of disease in the animal populations and the institution of control measures.

ADDITIONAL RESOURCES

General information about typhus fever is available from the ACDC website at:
www.lapublichealth.org/acd/vectormurine.htm

Publications:

Azad AF, Radulovic S, Higgins JA, Noden BH, and Troyer JM. Flea-borne rickettsioses: ecologic considerations. Emerg Infect Dis 1997;3:319–27.

Sorvillo FJ, Gondo B, Emmons R, Ryan P, Waterman SH, Tilzer A, Andersen EM, Murray RA, and Barr AR. A suburban focus of endemic typhus in LAC: association with seropositive domestic cats and opossums. Am J Trop Med Hyg 1993;48:269–73.

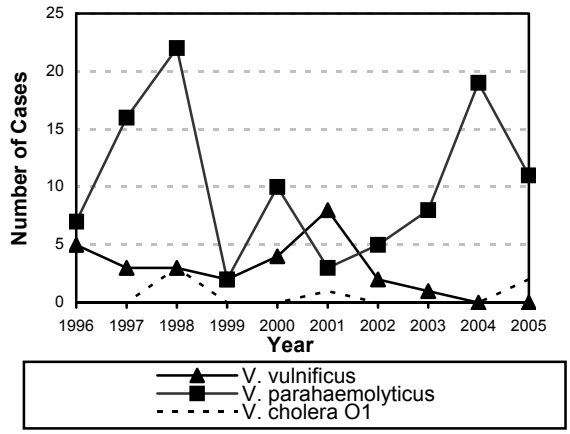
Williams SG, Sacci JB Jr, Schriefer ME, et al. Typhus and typhus-like rickettsiae associated with opossums and their fleas in Los Angeles County, California. J Clin Microbiol 1992;30:1758–62.

VIBRIOSIS

CRUDE DATA	
Number of Cases	14
Annual Incidence[a]	
LA County	0.15
United States	N/A
Age at Diagnosis	
Mean	42
Median	39.5
Range	12–85 years
Case Fatality	
LA County	0%
United States	varies by species

[a] Cases per 100,000 population.

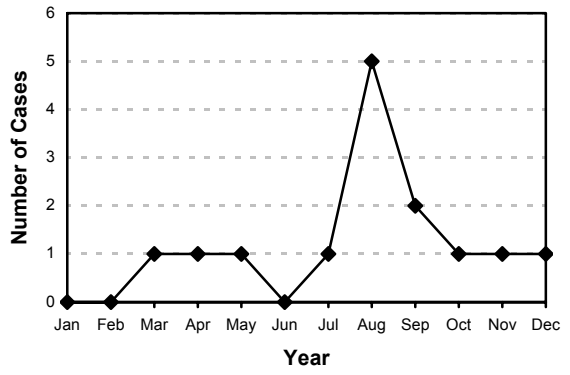
Figure 1
Selected Vibrio Species
Cases by Year of Onset
LAC, 1996–2005



DESCRIPTION

The genus Vibrio consists of Gram-negative, curved, motile rods, and contains about a dozen species known to cause human illness. Transmission is most often through ingestion via a foodborne route, but also from contact between broken skin and contaminated water. Presenting symptoms vary by species and mode of transmission. The Vibrio species of greatest public health importance in the US are: *V. vulnificus* which causes a primary septicemia and is often associated with oysters harvested in the Gulf of Mexico, and *V. parahaemolyticus*, which presents as gastrointestinal illness. Cholera, a potentially fatal diarrheal disease caused by *V. cholerae* serotypes O1 and O139, is rarely imported into the US.

Figure 2
Vibriosis
Cases by Month of Onset
LAC, 2005



DISEASE ABSTRACT

- Fourteen cases of vibriosis were reported in 2005, a decrease from N=26 cases reported in 2004.
- No fatal cases of vibriosis were reported in 2005.
- No cases of *V. vulnificus* or toxigenic *V. cholerae* O1/O139 were reported in 2005.

STRATIFIED DATA

Trends: Over the last 10 years, case reports of Vibrio infections peaked in 1998 with 36 cases (7 cases were part of an outbreak). Reported cases of *V. vulnificus* held steady at zero in 2004, a substantial decline compared to the 10-year peak of eight cases occurring during in 2001 (Figure 1). *V. cholerae* non-

O1/non-O139 cases increased from zero in 2004 to two cases in 2005 after a peak of 3 cases in 1998 and 1 in 2001.

Seasonality: Among reported vibriosis cases with distinct onset dates, the majority (77%, n=14) occurred between June and October (Figure 2). Vibrio infections typically increase during the warmer summer months.

Age: Vibrio cases were all adults except for two juveniles ages 12 and 17. The average age of cases was 42 years (Table 1).

Sex: Over half of the cases were female (57%, n=8, Table 1).

Race/Ethnicity: Reported cases were most often Latino (52% n=12, Table 1), similar to last year.

Severity: For vibriosis cases with distinct onset and resolution dates (n=12), duration of illness averaged 4.5 days (range 2-8). Four cases required hospitalization.

Table 1. Vibrio Cases by Species, Race, Age and Sex—LAC, 2005

Species	No. of cases	Race (no. of cases)	Mean Age, years (range)	Sex Ratio M:F
V. parahaemolyticus	11	Asian (1), Latino (5), White (4), Black (1)	49 (24-79)	2.8:1
V. cholerae non-O1/O139	2	Latino (2)	31.5 (12-51)	0:2
V. alginolyticus	1	White (1)	42 (26-44)	1:0

Species-specific Risk Factors:

- *Vibrio parahaemolyticus*
Eleven cases of *V. parahaemolyticus* were reported during 2005. All eleven were identified through stool culture. Seven reported eating seafood recently, with three specifying raw oysters.

- *Vibrio cholerae* non-O1/O139
Two cases of non-toxigenic *V. cholerae* gastroenteritis were reported in 2005. Both were related to travel to Mexico.

- *Vibrio alginolyticus*
The only *V. alginolyticus* infection was a wound infection. The patient had been exposed to seawater.

COMMENTS

In LAC, risk of Vibrio infection can be prevented or reduced by avoiding eating raw fish and shellfish. For the first time in ten years, there were no cases of *V. vulnificus* infection. This decrease is most likely due to a state-mandated oyster ban that took effect in 2003 banning Gulf Coast Oysters harvested between April 1st and October 31st. Oysters from Gulf Coast waters during warm months pose a higher risk for *V. vulnificus* contamination. Adult males may be more at risk for Vibrio infections because of their tendency to engage in behaviors exposing them to seawater or to eat raw or partially cooked seafood, especially oysters.

ADDITIONAL RESOURCES

Mouzin E, Mascola L, Tormey M, Dassey DE. Prevention of Vibrio vulnificus infections. Assessment of regulatory educational strategies. JAMA 1997; 278(7):576–578. Abstract available at: www.jama.ama-assn.org/cgi/content/abstract/278/7/576

Disease information regarding *Vibrio vulnificus* is available from the CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/vibriovulnificus_g.htm

Disease information regarding *Vibrio parahaemolyticus* is available from the CDC at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/vibrioparahaemolyticus_g.htm

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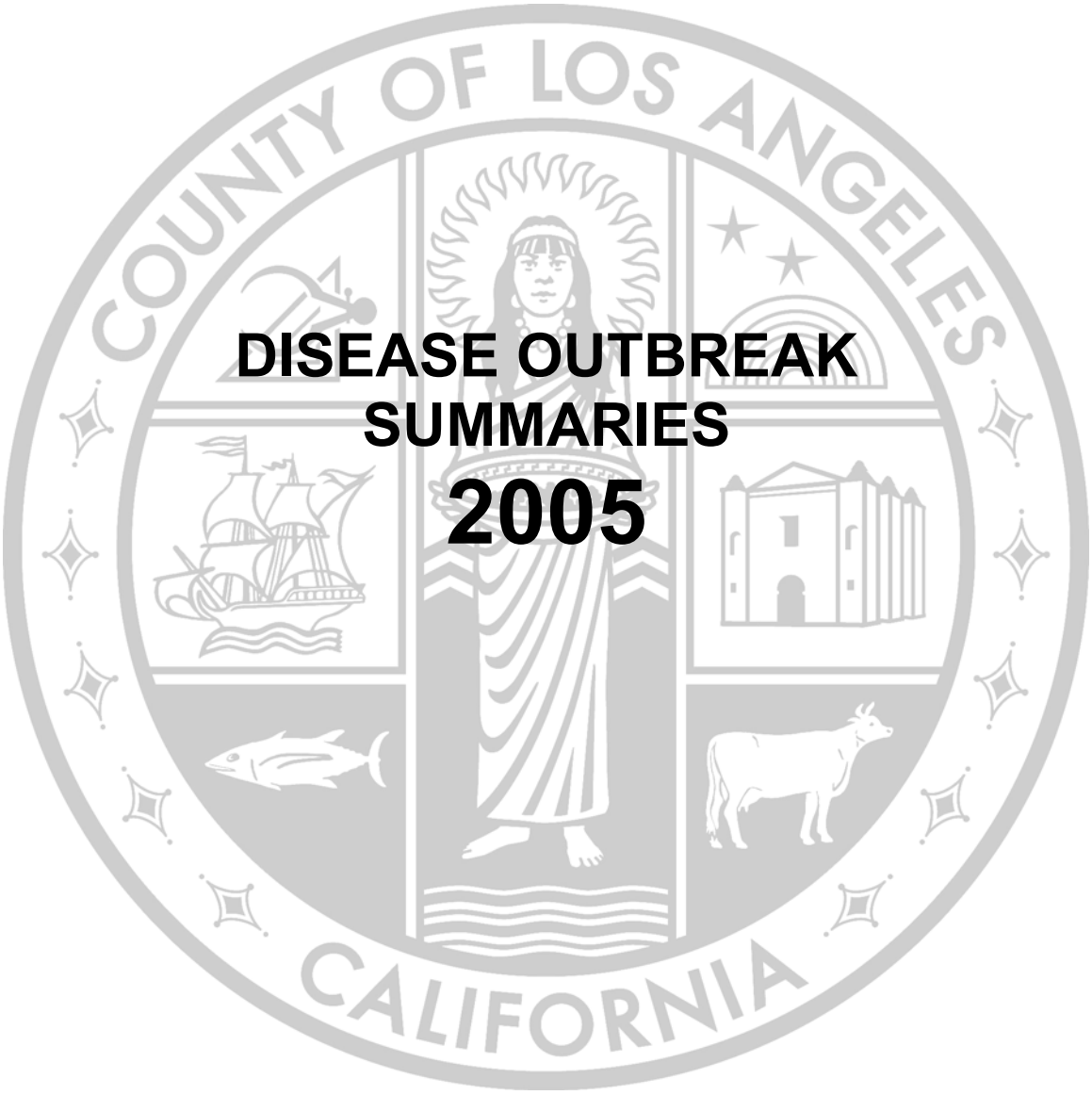


DISEASE OUTBREAK SUMMARIES

2005

COMMUNITY-ACQUIRED DISEASE OUTBREAKS

ABSTRACT

- In 2005, 122 community-acquired disease outbreaks accounted for 1,383 cases of illness (Figure 1).
- Schools were the most common setting of community-acquired outbreaks (60%).
- The number of reported outbreaks in 2005 decreased after reaching a eight year high in 2004; a 40% swing back down to the 2003 level—the lowest mark in the same 8 year time frame.

DATA

Disease outbreaks are defined as clusters of illness that occur in a similar time or place, or unusual numbers of disease cases above baseline in a specified area. Depending on the nature of the outbreak, investigation responsibility is maintained by either ACDC or Community Health Services with ACDC providing consultation as needed. The outbreaks reported in this section do not include outbreaks associated with food (see Foodborne Outbreaks section) or facilities where medical care is provided (see Healthcare Associated Outbreaks section).

Most reported community-acquired outbreaks in LAC were due to varicella followed by ectoparasites (scabies and pediculosis)—comprising 37% and 20% of all community-acquired outbreaks, respectively. Third most common was gastroenteritis (GE) outbreaks of various causes, accounting for 18% of all outbreaks. Collectively these disease categories accounted for 75% of all community-acquired outbreaks (Figure 2, Table 1). In 2004 for comparison, these categories accounted for 72% of all outbreaks—with similar overall rankings.

The outbreaks with the most incident specific cases were due to the four norovirus outbreaks reported in 2005, with a mean size of 18 cases per outbreak—most likely reflecting how easily this agent can be transmitted from person-to-person. The largest community-acquired outbreak was a GE outbreak of unknown etiology with 83 cases reported (Table 1).

The most common settings for illness transmission were schools (elementary schools, middle schools, and high schools) accounting for 60% of all outbreaks. Settings with young children in daycare or pre-school accounted for an additional 20%. Group and retirement home settings were the third most common site of the community-acquired outbreaks reported in 2005 with 12% (Figure 3). Even with the decrease in overall

Figure 1
Community Acquired Outbreaks
Number of Persons Affected
LAC, 1998–2005

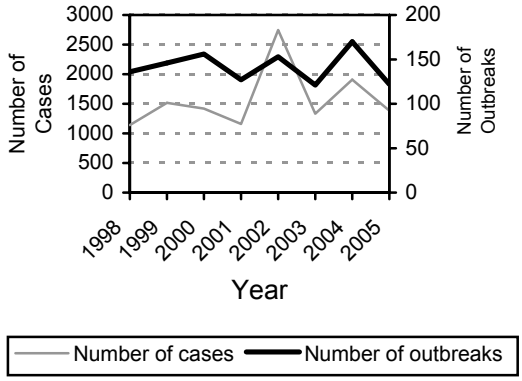
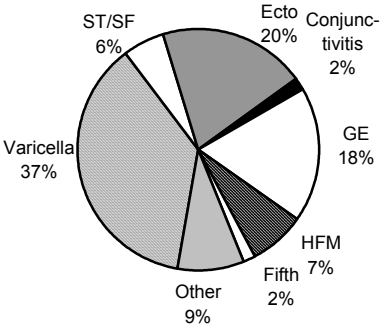
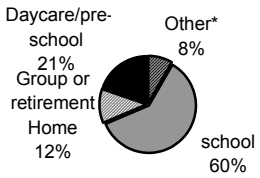


Figure 2
Community-Acquired Outbreaks by Type of Disease*
LAC, 2005 (N=122)



* ST/SF=strep throat/scarlet fever; Ecto=ectoparasites; HFM=Hand, foot & mouth; GE = Gastroentestinal; Other= MRSA, pertussis, ringworm , typhus, unknown resp., viral

Figure 3
Community Outbreaks by Setting
LAC, 2005 (N=122)



*Other includes: household/neighborhood (4), juve camp (1) , worksite (1), church (1), lunch programs (2) and a gym (1)

frequency of outbreaks in 2005—down from 170 in 2004—the percentage breakdown by setting remained similar to past years.

Table 1. Community-Acquired Outbreaks by Disease— LAC, 2005

Disease	No. of outbreaks	No. of cases	Cases per outbreak (average)	Cases per outbreak (range)
Varicella	45	518	12	5-40
Scarlet fever/strep throat	7	55	8	2-15
Scabies	7	28	4	2-6
Hand, foot & mouth disease	9	86	10	3-26
Pediculosis	17	222	13	3-34
GE illness - Norovirus	4	70	18	6-29
GE illness - Shigella	1	3	3	3
GE illness - Salmonella	2	12	6	3-9
GE illness - Giardia	1	41	41	41
GE illness - Unknown	14	232	17	3-83
Fifth disease	2	12	6	5-7
Conjunctivitis	2	13	7	2-11
Other*	11	91	8	2-17
Total	**122**	**1,383**	**11**	**2–83**

* Includes: MRSA, pertussis, ringworm, typhus, unknown respiratory, viral meningitis,

Table 2. Community-Acquired Outbreaks by Disease and Setting — LAC, 2005

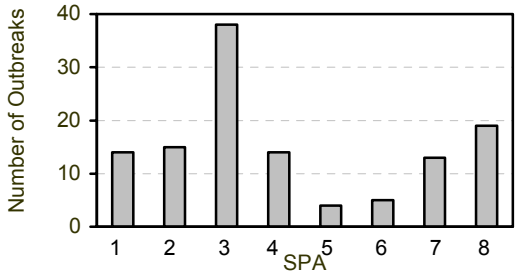
Disease	Group Home[a]	School[b]	Preschool or Daycare	Other[c]	TOTAL
Varicella	0	45	0	0	**45**
Scarlet fever/strep throat	0	5	1	1	**7**
Scabies	6	0	1	0	**7**
Hand, foot & mouth disease	0	0	9	0	**9**
Pediculosis	3	11	3	0	**17**
GE illness - Norovirus	2	0	1	1	**4**
GE illness - Shigella	0	0	0	1	**1**
GE illness - Salmonella	0	0	2	0	**2**
GE illness - Giardia	0	0	0	1	**1**
GE illness - Unknown	3	6	3	2	**14**
Fifth disease (Parvovirus)	0	0	2	0	**2**
Conjunctivitis	0	0	2	0	**2**
Other	0	6	1	4	**11**
Total	**14**	**73**	**25**	**10**	**122**

[a] Includes centers for retirement, assisted living, rehabilitation, and shelter.
[b] Includes elementary (n=59), middle (n=13) and high schools (n=1).
[c] Includes juvenile hall, workplaces, neighborhoods, and extended families.

COMMENTS

The number of reported outbreaks in 2005 decreased after reaching a eight year high in 2004; a 40% swing back down to the 2003 level—the lowest mark in the same 8 year time frame. Varicella remained the most common cause of community-acquired outbreaks in LAC since 1999 (see summary of the Varicella Project in the Special Reports section). In 2005, eight varicella outbreaks were identified in the Antelope Valley Health District (SPA 1), where the LACDHS Varicella Surveillance Project is in place, but most outbreaks of varicella was identified in SPA 3 (n=18).

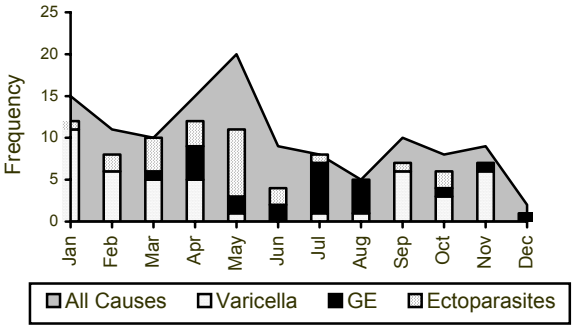
Figure 4
Community Outbreaks by SPA
LAC, 2005 (N=122)



Outbreaks were reported from all 8 SPAs (Figure 4). SPA 3, in the San Gabriel Valley, clearly had the most outbreaks for 2005.

The chart of community-acquired outbreaks by onset month (Figure 5) shows a peak in the distribution in May. Varicella outbreaks tended to show a bimodal seasonality with reports occurring during the traditional school year and low numbers during the summer and winter break. GE tended towards the warmer months with outbreaks focused in the spring and summer months.

Figure 5
Community Outbreaks by Selected Diseases and Onset Month
LAC, 2005 (N=122)



Community-acquired outbreaks tended to occur in settings associated with two age-specific groups. The clear majority of outbreaks (80%) were in school and pre-school settings among children. Varicella, HFM, and pediculosis (head lice) were most common in this young group. The second age group affected by outbreaks is in the older population associated with group-home settings. In this age category, scabies and gastroenteritis are the most common causes (Table 2).

In addition to the site-specific outbreaks reported in this section, a community-wide case increase was observed for hepatitis A (see the 2005 Special Reports).

FOODBORNE OUTBREAKS

DESCRIPTION

Foodborne outbreaks are caused by a variety of bacterial, viral, and parasitic pathogens, as well as toxic substances. To be considered a foodborne outbreak, CDC requires at minimum the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food.[1]

The system used by LAC DHS for detection of foodborne outbreaks begins with a Foodborne Illness Report (FBIR). This surveillance system monitors complaints from residents, illness reports associated with commercial food facilities, and foodborne exposures uncovered during disease-specific case investigations (e.g., *Salmonella, Shigella, Campylobacter*). LAC Environmental Health Services Food and Milk (F&M) Program investigates each FBIR by contacting the reporting individual and evaluating the public health importance and need for immediate follow-up. When warranted, a thorough inspection of the facility is conducted. In 2005, 50% of FBIRs led to an on-site investigation of the facility—this is often sufficient public health action to prevent additional foodborne illnesses.

ACDC Food and Water Safety Unit also reviews all FBIRs. Typically, an epidemiologic investigation will be initiated when there are illnesses in multiple households, multiple reports from the same establishment with similar symptoms in a short period of time, or ill individuals who attended a large event with the potential for others to become ill.

DISEASE ABSTRACT

- In 2005, the number of outbreaks investigated was less than the previous year. The overall number of cases of individual illness, however, was higher than the previous four years (Figure 1).
- A food item was implicated in 50% of the foodborne outbreaks (Figure 5).
- Probable contributing factors were determined for 50% of the outbreaks investigated (Figure 8).

Figure 1
Reported Foodborne Outbreaks
Number of Persons Affected
LAC, 2001–2005

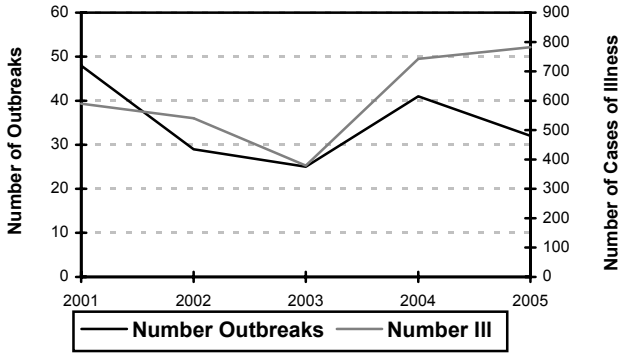


Figure 2
Reported Foodborne Outbreaks
by Etiologic Agent Category
LAC, 2001–2005

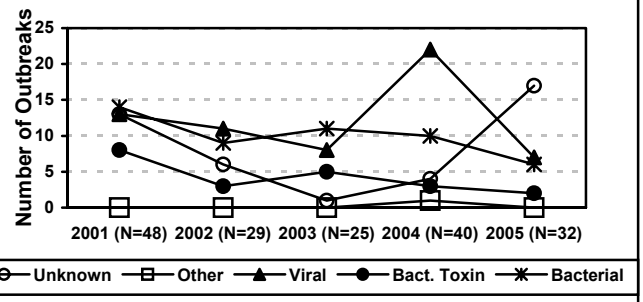
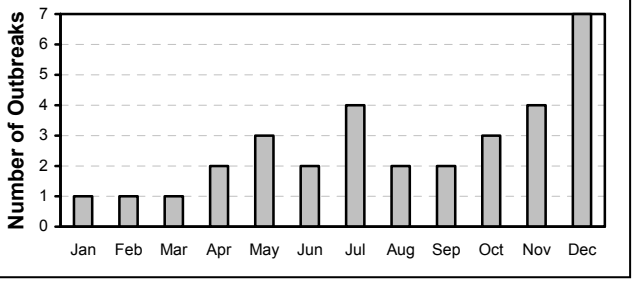


Figure 3
Reported Foodborne Outbreaks
by Month of Onset
LAC, 2005 (N=32)

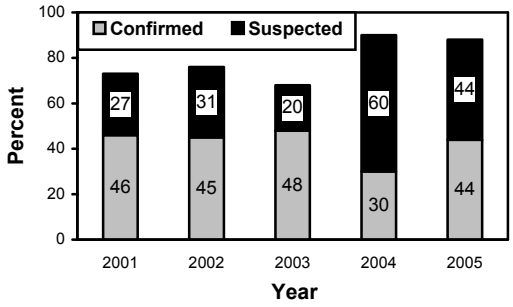


STRATIFIED DATA

1 CDC. Surveillance for foodborne disease outbreaks—United States, 1988–1992. MMWR 1996; 45(SS-5):58. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00044241.htm

Overview: Of the 1535 FBIRs in 2005 reported by consumers eating food from establishments located in LAC, F&M investigated 762 (50%), and referred 762 (50%) to district inspectors or another agency for follow-up. ACDC investigates foodborne outbreaks with the greatest public health importance. In 2005, ACDC investigated 32 foodborne outbreaks representing 783 cases of foodborne illness (Table 1, Figure 1). These outbreaks were caused by a variety of pathogens (Figure 2). The mean number of cases per foodborne outbreak was 25 (range 2–187 cases). There was one waterborne outbreak reported in 2005. There were no foodborne outbreaks in health facilities.

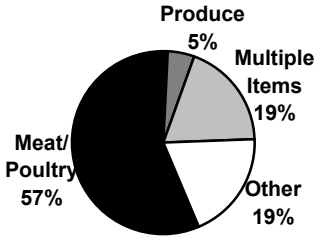
Figure 4
Reported Foodborne Outbreaks
% with Suspected/Confirmed Etiologic Agent
LAC, 2001–2005



Seasonality: In 2005 a peak in reported foodborne outbreaks occurred during October-December (Figure 3) due to an increase in norovirus outbreaks.

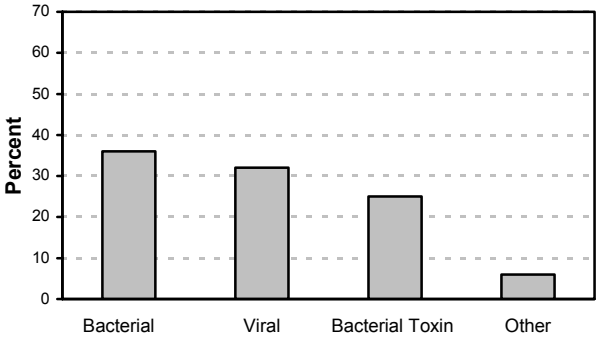
Agent: Typical foodborne pathogens can be categorized according to common characteristics of illness. Five categories of pathogens are used in this report (Figure 2). Bacterial agents that cause infection include *Salmonella, Campylobacter* and *E.coli*. Bacteria that produce toxins include *Staphylococcus aureus, Clostridium perfringens,* and *Bacillus cereus*. Viral gastroenteritis (Viral GE) includes norovirus (NV) and suspected NV disease, as well as hepatitis A. The "other" category includes fish poisonings and enteric parasites. The last category is unknown etiology.

Figure 5
Reported Foodborne Outbreaks
with Implicated Food Vehicles
LAC, 2005 (N=16)



A specific pathogen was laboratory confirmed in 44% and epidemiologically suspected in 44% of foodborne outbreaks investigated in 2005 (Figure 4); the etiologic agent was undetermined in 4 (12%) outbreaks. Two outbreaks, both bacterial, were identified by routine disease surveillance (Table 2). Laboratory testing was conducted in 16 of the 32 foodborne outbreaks (47%). Reasons for no laboratory testing include lack of cooperation (n=10) delayed notification (n=6), and cases out of town/unavailable (n=1).

Figure 6
Percent of Reported Foodborne Outbreaks With
Food Vehicles Implicated, by Etiologic Agent
LAC, 2005 (N=16)



Implicated Food Vehicles: A food vehicle was epidemiologically implicated in only 50% of foodborne outbreak investigations (Figure 5). The largest proportion of outbreaks with a food vehicle identified was caused by the meat/poultry category (57%), followed by the multiple items and other categories (19% each), with the produce category having the smallest proportion (5%). Among outbreaks in which a possible food vehicle was identified, 32% were bacterial toxin outbreaks, 36% were bacterial outbreaks, and 32% were viral outbreaks (Figure 6).

Outbreak Location: The most common locations for reported foodborne outbreaks were restaurants (47%), followed by locations in the other category (19%, Figure 7). These locations include places of worship, schools, and parks. Outbreak-associated food was most often prepared by a restaurant (60%) or from a caterer (25%).

The geographic distribution of the outbreaks by SPA is summarized in Table 3. SPA 4 had the most foodborne outbreaks (n=9); SPA 7 had the least (n=0). There were two multi-district outbreaks, but there were no outbreaks that involved multiple counties or states.

Contributing Factors: In 16 of 32 outbreak investigations, probable contributing factors of the outbreak were found on F&M inspection (Figure 8). The most frequent factors identified were improper holding time/temperature (56%) and infected food handler (25%).

Viral GE Summary: Many of the outbreaks reported as foodborne investigated in 2005 were categorized as viral GE (n=15, 47%). Laboratory testing was completed on four of these viral GE outbreaks, with four testing positive for NV. Viral GE was suspected in the remaining 11 outbreaks based on symptoms, incubation period, duration of symptoms, secondary cases in households, and/or negative bacterial test results. The mean number of cases per outbreak for 2005 was 17 cases. About 33% of the viral GE outbreaks had an undetermined implicated food vehicle, and were possibly due to person-to-person transmission. Although these outbreaks were reported as foodborne, some of them might not have involved food. Restaurants were the most common food source for 2005 viral GE outbreaks (60%). In 73% of the viral GE outbreaks, contributing factors were unknown.

Figure 7
Reported Foodborne Outbreaks
by Location Eaten
LAC, 2005 (N=32)

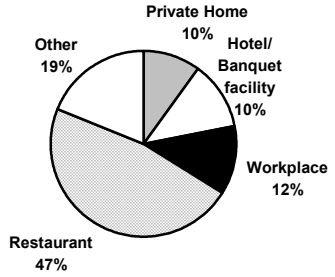
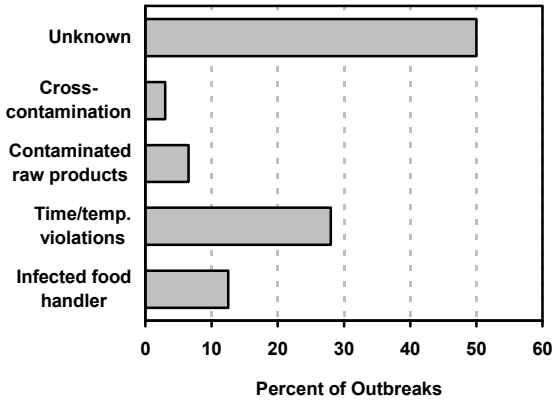


Figure 8
Probable Contributing Factors of
Reported Foodborne Outbreaks
(N=32) LAC, 2005



COMMENTS

Since 1999, the LAC Public Health Laboratory has been testing human specimens for NV using the reverse transcription-polymerase chain reaction (RT-PCR) method. This method is still considered to be experimental and is only used to diagnose outbreaks as a whole, not for individual patients. There has been a marked increase in the number of viral GE and confirmed NV outbreaks since 1999.

PulseNet is a public health network sponsored by the CDC that uses the collaboration of laboratories and health departments at local, state, and federal levels to detect outbreaks through comparison of results of pulsed-field gel electrophoresis (PFGE) of pathogens. The PFGE are monitored for strains of various etiologic agents. When similar resulting patterns are detected, an investigation may be initiated. In addition, PFGE results can link solitary case occurring locally to a larger, previously identified outbreak occurring on a wider geographical scale (i.e., multistate *E. Coli* O157:H7 outbreak).

Persons with mild symptoms, long incubation periods, and poor public and medical community awareness of public health procedures may contribute to under-reporting of foodborne disease.

Table 1. Foodborne Outbreaks in LAC, 2005 (N=32)***

Agent	Strain/Type	*Confirmed/* Suspected	Cases*	Jurisdictions
Bacterial Toxin		Suspected	13	West
Bacterial Toxin		Suspected	17	Compton
Bacterial Toxin		Suspected	70	Multiple
Botulism		Lab Confirmed	2	Inglewood
C. perfringens		Suspected**	187	East Valley
Campylobacter	*jejuni*	Suspected**	6	Antelope Valley
Giardia		Lab Confirmed	10	Foothill
Hepatitis A		Lab Confirmed	5	Central
Hepatitis A		Lab Confirmed	15	Central
Hepatitis A		Lab Confirmed	5	Central
Norovirus		Lab Confirmed	14	Pomona
Norovirus		Lab Confirmed	52	Alhambra
Norovirus		Lab Confirmed	12	Foothill
Norovirus		Lab Confirmed	13	Central
Norovirus		Suspected	10	Northeast
Norovirus		Suspected	4	Torrance
Norovirus		Suspected	6	Central
Norovirus		Suspected	10	Hollywood Wilshire
Norovirus		Suspected	11	Pomona
Norovirus		Suspected	40	Torrance
Norovirus		Suspected	14	Antelope Valley
Salmonella	*Enteritidis*	Lab Confirmed	12	West
Salmonella	*Enteritidis*	Lab Confirmed	20	Torrance
Salmonella	*Enteritidis*	Lab Confirmed	20	Torrance
Salmonella	*Enteritidis*	Suspected**	30	Hollywood Wilshire
Salmonella	*Heidelberg*	Lab Confirmed	6	West Valley
Shigella	*sonnei*	Lab Confirmed	5	Hollywood Wilshire
Toxin	Histamine (scombroid)	Suspected	5	Alhambra
Unknown GI		Suspected	13	West
Unknown GI		Suspected	15	East Valley
Unknown-GI		Suspected	4	Glendale
Unknown-GI		Suspected	37	Multiple

* Includes only LAC residents.
**Only one case was lab confirmed.
***Fourth quarter outbreaks in **bold**

Table 2. LAC Foodborne Outbreaks Laboratory Summary: Outbreaks by Suspect/Confirmed Etiologic Agent, 2005

	Bacterial	Bacterial Toxin	Norovirus	Hepatitis A	Unknown /Other	Total
Number of outbreaks investigated	9	5	15	3	0	**32**
Number of outbreaks tested	9	0	4	3	0	**16**
Number of outbreaks with agent confirmed	7	0	4	3	0	**14**
Number of outbreaks identified by routine surveillance	2	--	--	--	--	**2**

Table 3. Frequency of Foodborne Outbreaks by Location, 2005

SPA	Frequency	Percent
1	2	6
2	4	13
3	6	19
4	9	28
5	3	9
6	1	3
7	0	0
8	5	16
Multi-district	2	6
Multi-county	0	0
Multi-state	0	0
Total	**32**	**100**

ADDITIONAL RESOURCES

LAC resources:

- Communicable Disease Reporting System
  Hotline: (888) 397-3993
  Faxline: (888) 397-3779
- For reporting and infection control procedures consult the LAC DHS Foodborne Disease Section in the B-73 Manual – www.lapublichealth.org/acd/procs/b73/b73fh.pdf

CDC:

- Foodborne and Diarrheal Diseases Branch – www.cdc.gov/ncidod/dbmd/foodborne/index.htm
- Outbreak Response and Surveillance Unit – www.cdc.gov/ncidod/dbmd/outbreak
- FoodNet – www.cdc.gov/foodnet

Other national agencies:

- FDA Center for Food Safety and Applied Nutrition – www.vm.cfsan.fda.gov/list.html
- Gateway to Government Food Safety Information – www.FoodSafety.gov

HEALTHCARE ASSOCIATED OUTBREAKS

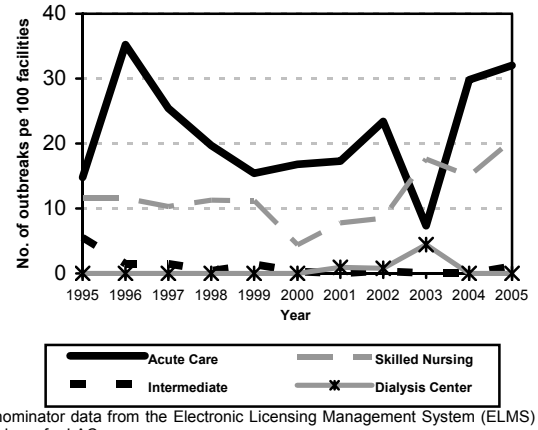
DEFINITION

Healthcare associated outbreaks are defined as clusters of nosocomial (health-facility acquired) or home-healthcare-associated infections related in time and place, or occurring above a baseline or threshold level for a facility, specific unit, or ward. Baseline is defined as what is normally observed in a particular setting.

ABSTRACT

- Confirmed healthcare facility outbreaks increased 105% from 2001-2005.
- The rate of acute hospital outbreaks increased from 2004 (Figure 1).
- In 2005, skilled nursing facility (SNF) outbreaks contributed most to the increase in healthcare facility outbreaks, and increased 21% from 2004 (Table 1). This is largely due to an increase in scabies outbreaks.

Figure 1
Healthcare Associated Outbreaks
LAC, 1995–2005



Denominator data from the Electronic Licensing Management System (ELMS) database for LAC

Table 1. Number of Reported Outbreaks in Healthcare Facilities LAC, 2000–2005

	YEAR				
Type of Facility	**2001**	**2002**	**2003**	**2004**	**2005**
Acute Care Hospitals	19	26	8	31	34
Provider Offices	0	2	0	0	0
Dialysis Facilities	1	1	9	0	0
Intermediate Care/Psych	0	1	0	0	3
Skilled Nursing Facilities	35	37	75	63	76
TOTAL	**55**	**67**	**92**	**94**	**113**

Acute Care Hospitals: There were 34 outbreaks reported in acute care hospitals in 2005 (Table 1)—an increase of 10% from 2004. Thirty-eight percent (n=13) of these outbreaks occurred in specialty units, e.g. NICU, liver transplant unit and cardio-thoracic unit (Table 2). Twenty-six percent (n=9) occurred in the sub-acute, long-term or transitional care units within the acute care hospital. Thirty-eight percent (n=13) of acute care outbreaks were caused by the scabies mite, and forty-four percent (n=15) were bacterial. The remainder were of viral or fungal etiology (Table 3). Ten hospitals reported more than one outbreak in 2005. MRSA NICU outbreaks reported decreased by 33 % (n=6) in 2005 (as compared to 9 outbreaks in 2004). In 2005, the etiologic agents contributing the largest number of cases in acute care outbreaks were scabies (n=229), followed by Clostridium difficile (n=4) and MRSA (n=4).

Table 2. Acute Care Outbreaks by Hospital Unit—LAC, 2005

Outbreak Location	No. of Outbreaks
Neonatal Intensive Care	6
Medical-Surgical Unit	5
Transitional Care Unit	4
Adult Intensive Care	3
Pediatrics	3
Sub-Acute Unit	3
Cardio-thoracic Unit	2
Definitive Observation	2
Long-term Care	2
Other Unit	2
Burn Unit	1
Liver Transplant Unit	1
Total	**34**

Table 3. Acute Care Hospital Outbreaks by Disease/Condition—LAC, 2005

Disease/Condition/ Etiologic Agent	No. of Outbreaks	No. of Cases
Scabies	13	229
Other	5	23
Clostridium difficile	4	56
MRSA	4	44
Acinetobacter baumannii	2	14
Aspergillus fumigatus	2	7
Influenza A	2	25
Norovirus	1	10
Serratia Marcescens	1	6
TOTAL	**34**	**414**

Skilled Nursing Facilities: In 2005, 76 outbreaks were reported in skilled nursing facilities. Gastroenteritis and scabies were the most common causes (Table 4), accounting for 93% of the total outbreaks in SNFs and 87% of the total cases.

Table 4. Skilled Nursing Facility (SNF) Outbreaks by Disease/Condition LAC, 2005

Disease/Condition	No. of Outbreaks	No. of Cases
Scabies	55	404
Gastroenteritis • unspecified (n=7) • norovirus (n=9)	16	392
Respiratory illness • influenza (n=1) • pneumonia (n=1) • unspecified (n=1)	3	109
Headlice	1	3
Unknown Rash	1	8
Total	**76**	**916**

COMMENTS

Since 2001, the total number of confirmed healthcare facility outbreaks reported to the health department has steadily increased, from 55 in 2001 to 113 in 2005. Acute care facility outbreaks are investigated and managed primarily by ACDC staff with infection control and related clinical expertise. Frequently, depending on multiple factors, such as disease morbidity/mortality and the outbreak complexity, consultation and assistance is requested from California Department of Health Services (CDHS), Centers for Disease Control and Prevention (CDC), LAC DHS Health Facilities Division (HF), LAC DHS Environmental Health, and local state or city service providers, e.g. the Los Angeles Department of Water and Power. The hospital infection control professional (ICP) plays a pivotal role in outbreak identification, clinical data gathering, specimen collection, and is the key contact person who facilitates communication between the hospital and the health department.

Los Angeles County experienced a dramatic increase in the number of reported scabies outbreaks in both acute care hospitals and skilled nursing facilities from 2004-2005 (Tables 3, 4). In 2004, 7 scabies outbreaks (61 cases) were reported in acute care facilities, as compared to 13 (229 cases) acute care facility outbreaks in 2005, an outbreak increase of 85%. This increase may be attributed to SNF residents that were admitted to the facility with undiagnosed scabies. During this same time period, outbreaks of scabies in SNFs also increased by 62%. In 2004, 34 outbreaks (358 cases) were reported, as compared to 55 outbreaks (404 cases) in 2005.

Nosocomial outbreaks of scabies in acute and long-term healthcare settings that adversely impact patients and healthcare workers are widely reported in the literature[1]. Unrecognized or misdiagnosed scabies infestation, treatment failures, and re-infestation highlight the need for multi-disciplinary collaboration in both settings. Successful outbreak management must include the acute care facility, the skilled nursing facility, the health department and the community[2]. Scabies, while not life-threatening, can pose significant health risks to individuals, particularly those who are elderly, immunocompromised or with other underlying illness, or those living in a group or institutional setting. These outbreaks also represent a significant financial burden on the facilities[3]. ACDC initiated on-going efforts to address this rising trend. In October 2005 ACDC distributed a Health Alert Network (HAN) to LAC dermatologists that briefly characterized the 2004 LAC acute care hospital and SNF scabies outbreaks, provided a brief overview of the problem, advised them of disease reporting requirements and also the benefits of reporting outbreaks to the health department. In addition, a SNF needs assessment was initiated to assess general communicable disease reporting knowledge, infection control practices, identify knowledge gaps and elicit training needs. The survey continued into 2006 and the final results are pending.

ACDC also investigated an elaborate acute care facility outbreak of *Serratia Marcescens* infection in post-cardiac surgery patients that demonstrates the complexities inherent in a multi-agency, multi-jurisdictional investigation. The investigation led to the eventual discovery of a multi-state outbreak caused by the same product which was compounded and nationally distributed (see 2005 Serratia Marcescens Special Report).

The Hospital Outreach Unit (HOU) continues to enhance communication between acute care facilities and ACDC. Since the initial contact meetings in 2003, HOU staff have maintained relationships with key hospital staff, primarily the ICP, and is frequently the ICP's first point of contact with the health department when reporting an outbreak or requesting assistance with communicable disease reporting.

[1] Jimenez-Lucho V, Fallon F, Caputo C, et al. Role of Prolonged Surveillance in the Eradication of Nosocomial Scabies in an Extended Care Veterans Affairs Medical Center. A JIC. 1995;23(1):44-49.
[2] Olugbenga O, Wu P, Conlon M et al. An Outbreak of Scabies in a Teaching Hospital: Lessons Learned. Infec Control Hosp Epidemiol 2001;22:13-18.
[3] de Beer G, Miller M, Tremblay L, et al. An Outbreak of Scabies in a Long-Term Care Facility: The Role of Misdiagnosis and the Costs Associated with Control. Infec Control Hosp Epidemiol 2006;27:517-518.

SPECIAL DISEASE SUMMARIES

2005

BOTULISM SUMMARY
LOS ANGELES COUNTY, 2005

A total of eleven patients were reported with suspected botulism in 2005, eight of which were confirmed with the disease (Table 1). Most cases were male (n=6), most were Hispanic (n=4) and ages ranged from 17 to 82 years (mean=45). Seven suspect cases were injection drug users. Suspect cases were reported throughout the year, with May having the greatest number of suspects (n=4). Antitoxin was administered to most suspect cases (n=8) based on their risk factors and presenting signs and symptoms.

The LAC Public Health Laboratory (PHL) performed analyses on eight suspect cases. After investigation, the following dispositions were made: two cases were confirmed as foodborne botulism, six were confirmed as wound botulism, and three were not tested because they were diagnosed with other central nervous system diseases. This report excludes cases of infant botulism, which is monitored by the California State Department of Health Services.

CASE REPORTS

Confirmed Foodborne Botulism (n=2): An outbreak of foodborne botulism resulted in the death of an elderly Pacific Islander man and long-term illness of his grandson. Food samples removed from their home several days after onset were negative for toxin or clostridial growth; however the most likely food vehicle, reheated salmon, was discarded prior to testing.

Confirmed Wound Botulism (n=6): Six of seven injection drug users reported with possible botulism were confirmed; four were males and four were Hispanic. Four were confirmed by demonstration of botulinum type A toxin in serum, while another demonstrated toxin that could not be differentiated due to insufficient sample size. The sixth confirmed case had a negative serum screen but a wound that grew *C. botulinum* producing type B toxin. All six confirmed cases received botulinum antitoxin.

Other Central Nervous System Disease (n=3): Three patients reported with possible botulism were found to have another neurological disorder and were not tested for botulism. All three suspects occurred in May. Two had no risks for wound botulism; the first was a 48-year-old male with multiple small strokes, while the second was a 40-year-old male who suffered from a cervical spinal cord tumor. The third suspect was a 47-year old male with a history of injection drug use who was diagnosed with brain stem encephalitis of unknown etiology.

COMMENTS

Botulism testing using the mouse bio-assay is available only in the PHL and state or CDC laboratories, and antitoxin is available in California only upon release by designated public health physicians in ACDC or the California DHS. For these reasons, reporting of hospitalized cases is felt to be complete. However, under-detection of mild cases is possible.

Botulism is one of seven biological agents classified as “Category A” for bioterrorism preparedness, requiring the highest priority for reporting. Heightened concern over bioterrorism should lead to increased consultations with Public Health for possible botulism cases.

Table 1. Suspected Botulism Cases, LAC DHS, 2005

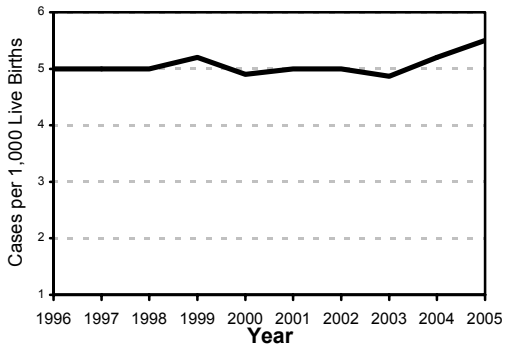
Age/ Sex	Race/ Ethnicity	Month of onset	Injection drug user	Serum test*	Stool test*	Other test – Result&	Anti-toxin	Diagnosis
43 M	Hispanic	3	Y	Neg	-	Abscess culture Pos Type B	Y	Confirmed wound
40 M	Unk	5	Y	-	-	-	N	Cervical cord tumor
47 M	Hispanic	5	N	-	-	-	N	Brain stem encephalitis
48 M	African-Amer	5	N	-	-	-	N	Multiple strokes
54 F	Hispanic	5	Y	Pos Type A	-	-	Y	Confirmed wound
40 M	Hispanic	6	Y	Pos Type A	-	-	Y	Confirmed wound
35 M	Hispanic	8	Y	Pos Type unk	-	Wound aspirate culture neg.	Y	Confirmed wound
50 F	African-Amer	8	Y	Pos Type A	-	-	Y	Confirmed wound
36 M	African-Amer	9	Y	Pos Type A	-	Wound culture neg.	Y	Confirmed wound
17 M	Asian/PI	12	N	Pos Type A	-	Food items neg.	Y	Confirmed foodborne
82 M	Asian/PI	12	N	Pos Type A	Pos Type A	Food items neg.	Y	Confirmed foodborne, fatal

Pos – test was performed and result was positive
Neg – test was performed and result was negative
* Botulinum toxin screen by mouse bio-assay
& Culture for clostridia (wound material, food item)

HEPATITIS B, PERINATAL

CRUDE DATA	
Number of Infants Born to HBsAg Positive Mothers	768
Incidence of Exposure[a]	
LA County	5.5
United States	N/A
Age at Diagnosis	
Mean	N/A
Median	N/A
Range	N/A
Case Fatality	
LA County	0.0%
United States	N/A

Figure 1
Perinatal Hepatitis B
Incidence Rates of Infants Born to
HBV-Positive Mothers by Year
LAC, 1996–2005



[a] Number of Infants born to HBsAg-positive mothers per 1,000 live births.

DESCRIPTION

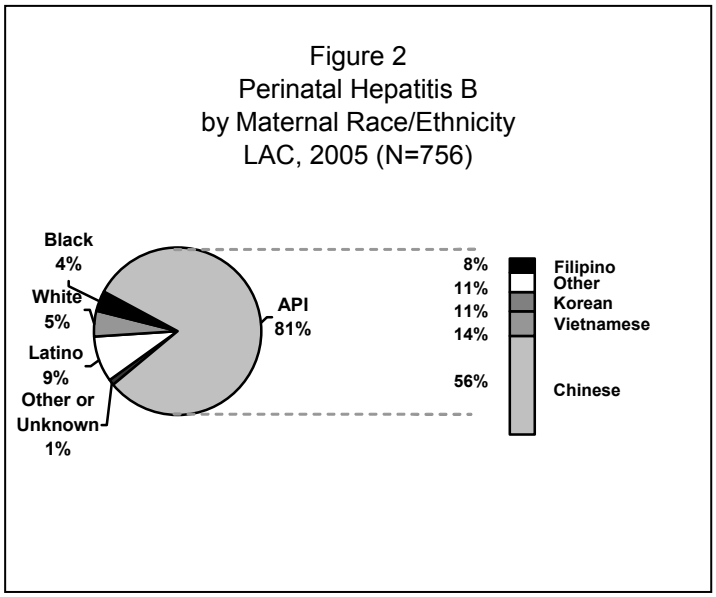
Hepatitis B is a vaccine-preventable disease transmitted through parenteral or mucous membrane exposure to blood and other body fluids of individuals infected with the hepatitis B virus (HBV). It is also transmitted from mother to infant during birth. Within LAC, it is estimated that over 40% of infants born to hepatitis B surface antigen (HBsAg) positive women will become infected without prophylaxis. An estimated 90% of infants who become infected by perinatal transmission develop chronic HBV infection and up to 25% will die from chronic liver disease as adults. Hepatitis B vaccination and one dose of hepatitis B immune globulin (HBIG), administered within 24 hours after birth, are 85–95% effective in preventing both HBV infection and the chronic carrier state. Post-vaccination serologic testing is recommended 3–18 months after completing immunoprophylaxis to verify vaccine success or failure. The Immunization Program's Perinatal Hepatitis B Prevention Program (PHBPP) conducts case management of HBsAg-positive pregnant women, their newborns, and household contacts.

DISEASE ABSTRACT

- The majority of HBsAg-positive women giving birth were born in areas of the world with high or intermediate levels of endemic hepatitis B disease (e.g., Asia, Africa, Eastern Europe, Newly Independent States of the former Soviet Union, Middle East, and several Central and South American counties).
- Of infants born to HBsAg-positive mothers, 98% received hepatitis B vaccine and 97% received HBIG within 24 hours of birth.
- Among those infants whose pediatric health care providers responded to a survey after the completion of the full vaccination series, 97% of infants were protected against HBV, 2% were still susceptible, and 1% were infected with HBV.
- The incidence of exposure of infants born to HBsAg-positive mothers increased by 4% from 5.3 births per 1,000 infants born in 2004 to 5.5 births per 1,000 infants born in 2005.

STRATIFIED DATA

Trends: In 2005, 768 infants (including 12 sets of twins) were born to 756 HBsAg-positive women. The incidence exposure of infants born to HBsAg-positive mothers increased 4% from 2004 (Figure 1).



Race/Ethnicity: The majority of the cases were among Asian/Pacific Islanders (API). Six hundred fourteen (81%) of the women were API, 69 (9%) were Latino, 36 (5%) were White, 33 (4%) were Black, and 4 (1%) were classified as other or unknown ethnic group (Figure 2). Of API women, half were Chinese (n=344, 56%). The remaining API women included: Vietnamese (n=87, 14%), Korean (n=64, 10%), Filipino (n=53, 8%), and others from various API countries (e.g., Cambodia, Thailand, Samoa, Tonga, Japan, Laos, Burma, Indonesia; India, and Bangladesh (n=66, 11%).

Age: The age-range of mothers was 16–47 years of age with a median age of 31 years.

Location: The majority of the HBsAg-positive mothers (n=353, 47%) resided in SPA 3, which has a large Asian/Pacific Islander constituency. An additional 13% resided in SPA 2 (n=99), followed by SPA 4 (n=82, 11%), SPA 8 (n=74, 10%), SPA 7 (n=62, 8%), SPA 6 (n=37, 5%), SPA 5 (n=36, 5%), and SPA 1 (n=8, 1%).

Countries of Origin: The majority (n=688, 91%) of the HBsAg-positive women giving birth were born outside of the US. Of these women, 629 (91%) were born in areas of the world with high or intermediate levels of endemic hepatitis B disease, such as Asia, Africa, Eastern Europe, Newly Independent States of the former Soviet Union, Middle East, and several Central and South American counties.

CASES COMPLETED FOR FOLLOW-UP IN 2005

In 2005, follow-up was completed for 678 women, their 693 newborns, and 1,204 household contacts. One hundred-seven mothers were excluded (73 mothers miscarried, terminated or had fetal demise, 11 transferred/moved out of LAC or were unable to be located before delivery, and 23 were retested and found to be HBsAg negative). Case managers made numerous attempts to complete follow up of infants and household contacts; therefore, some of the cases completed in 2005 were reported in 2003 and 2004.

Enhanced case management protocol includes:

1. Educating pregnant HBsAg-positive women about HBV disease and transmission,
2. Identifying and referring household contacts for screening and vaccination,
3. Notifying hospitals of the expected deliveries and requesting that the hospitals return documentation after the infant's birth with the dates and times of the administration of hepatitis B vaccine #1 and HBIG,
4. Notifying the infant's health care provider about the need for hepatitis B vaccine #2 at 1 to 2 months and hepatitis B vaccine #3 at six months of age,
5. Reminding parents about these needed vaccinations, and
6. Sending post-vaccination serology letters to pediatric health care providers.

Infant Immunoprophylaxis Completion Rates: Of 693 eligible infants (including 15 sets of twins), nearly all received the hepatitis B vaccine #1 (n=678, 98%) and HBIG (n= 675, 97%) within 24 hours of birth. The majority of infants (n=648, 94%) received HBIG and a complete three-dose series of hepatitis B vaccine (Table 1).

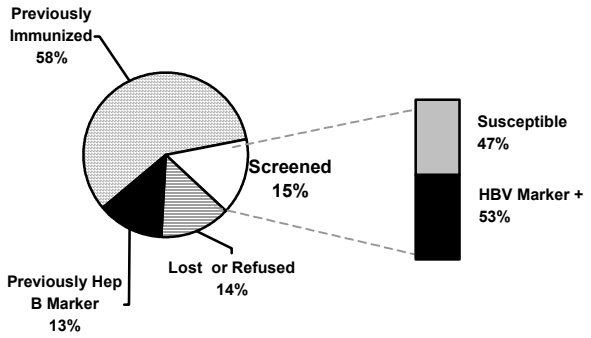
Table 1. Summary of Infant Hepatitis B Immunoprophylaxis, LAC—2005 (N=693)

Hepatitis B Immunoprophylaxis	# of Infants	Percent*
Received hepatitis B vaccine #1 ≤ 12 hours after birth	670	97%
Received hepatitis B vaccine #1 ≤ 24 hours after birth	678	98%
Received HBIG ≤ 12 hours after birth	664	96%
Received HBIG ≤ 24 hours after birth	675	97%
Completed HBIG/3-dose hepatitis B vaccine series	648	94%

* Percent of infants receiving hepatitis B immunoprophylaxis out of a total 693 infants born to 678 HBsAg+ mothers who completed follow-up in 2005. Total includes infants who moved out of LAC prior to 6 months of age and prior to completion of the 3-dose hepatitis B vaccine.

Household and Sexual Contacts Completion Rates: A household contact was defined as an individual with anticipated continuous household exposure for greater than one year (often limited to nuclear family). Of 1,205 household and sexual contacts identified, 694 (58%) had already been vaccinated against hepatitis B, and 161 (13%) were known to have serologic evidence of hepatitis B infection. Of the remaining 350 (29%) contacts, 184 (15%) were screened for serologic evidence of hepatitis B infection or immunity, while 166 (14%) refused screening or vaccination, were lost to follow-up, or moved. Of the 184 (15%) household contacts that were serologically screened, 97 (53%) had positive markers for hepatitis B and therefore did not need vaccine. Close to half of the screened household contacts (n=87, 47%) were seronegative, and therefore, susceptible to hepatitis B infection (Figure 3). At the time of completion of case management for the HBsAg-positive mothers, 70 (81%) of these susceptible household contacts had completed all three doses of hepatitis B vaccine.

Figure 3
HBV Marker Status Of Household Contacts
to Cases Closed in 2005
LAC (N=1,205)



Post–Vaccination Serology Results: Post-vaccination serology testing of infants born to HBsAg-positive mothers is recommended 3 to 18 months after completing immunoprophylaxis to verify efficacy of the hepatitis B immunoprophylaxis. Letters requesting post-vaccination serology results were mailed to pediatric health care providers of infants tracked by the PHBPP. Post-vaccination serology results were received for 334 infants screened in 2005. Of these, 323 (97%) had antibodies to hepatitis B surface antigen indicating protection against HBV, 3 (1%) were HBsAg-positive and infected, and 8 (2%) were negative for both markers and revaccination was recommended.

ADDITIONAL RESOURCES

Additional information is available from the CDC:

- General information – www.cdc.gov/ncidod/diseases/hepatitis/b/index.htm
- Publications – www.cdc.gov/ncidod/diseases/hepatitis/resource/pubs.htm
  Viral Hepatitis B Virus slide set – www.cdc.gov/ncidod/diseases/hepatitis/slideset/hep_b/slide_1.htm

Information from Hepatitis organizations include:

- Immunization Action Coalition – www.immunize.org
  Hepatitis B Foundation – www.hepb.org

Acute Communicable Disease Control
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2005

LOS ANGELES COUNTY
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ACUTE COMMUNICABLE DISEASE CONTROL
2005 ANNUAL MORBIDITY REPORT

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Acute Communicable Disease Control

Special Studies Report

2005

Los Angeles County
Department of Public Health

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FACTORS LEADING TO PROLONGED CAPTURE TIMES FOR BRUCELLOSIS CASE REPORTS LOS ANGELES COUNTY, 2001–2005

BACKGROUND

Brucellosis is a zoonotic bacterial disease found world wide in several animal hosts, occasionally infecting humans. Across the globe there are an estimated 500,000 human infections per year with most reported cases occurring in Syria, followed by Mongolia, Kyrgyzstan, and Iraq [1]. *Brucella* species that are pathogenic for humans are found in cattle (*B. abortus*), goats and sheep (*B. meletensis),* pigs (*B. suis*), and dogs (*B. canis*), with *B. melitensis* and *B. suis* being the more virulent to humans [2]. Routes of infection include inoculation through cuts, ingestion of contaminated food or drink, and inhalation of infectious aerosols. The incubation period can range from 5 to 60 days [3].

B. suis was first weaponized by the American military in 1954 [4]. Accordingly, *Brucella* is currently classified as a category B bioterrorism agent and the timely detection of cases is critical for effective surveillance of this disease. In California, a human case of brucellosis is a reportable disease for both laboratories and health care practitioners. Suspect cases are passively reported to the Los Angeles County Department of Health Services (LACDHS), interviewed with a standardized epidemiological case form, and entered into a database. Only cases with laboratory confirmation are reported to the state. Animal cases of brucellosis are reportable to LACDHS's Veterinary Department. Brucellosis in livestock in Los Angeles County is seldom seen today, but an increasing number of cases in dogs (*B. canis*) are now being reported. The first human case of *B. canis* was reported to the LACDHS in 2005.

The objective of this study was to assess average case "capture times" (defined as the time from symptom onset to report of case to health department case database) and the impact of demographics, symptoms, or risk factors. Reporting practices of clinicians, hospitals and labs for brucellosis were also examined by reviewing the state's hospital discharge database, mortality records, and the LACDHS database.

METHODS

Epidemiological case history forms for brucellosis cases from January 1, 2001 to December 31, 2005 were reviewed. Demographics, risk factors, and symptoms were evaluated for their effect on "capture times." Risk factors for brucellosis that were elicited frequently enough for analysis included consumption of unpasteurized dairy products, occupational exposure to an infected animal, and foreign travel. The LACDHS case database was reviewed to determine reporting sources for brucellosis cases. The California Office of Statewide Health Planning and Development (OSHPD) hospital discharge dataset was reviewed and matched to LACDHS cases in 2003 to determine completeness of hospital reporting.

RESULTS

LACDHS confirmed a total of 41 brucellosis case reports during 2001–2005; 39 case reports containing information on risk factor and symptoms. This represents an average of 8 cases per year (range: 5 to 11) and 7% of cases reported nationally. Brucellosis cases were predominately Latino and evenly divided by gender (Table 1). Overall, the most common risk factors for infection were consumption of unpasteurized dairy products and foreign travel (Table 2); however, most of the risk factors for exposure were either associated with Mexico (i.e., unpasteurized dairy products may have originated in Mexico) or occurred while in Mexico. A few cases (n=5, 18%) did not report a known risk factor for the disease.

Table 1. Characteristics of Brucellosis Cases

Characteristic	%	n
Race:		
Latino	88%	36
White	12%	5
Gender:		
Male	56%	23
Female	43%	18

Symptoms reported by cases were categorized into groups, with flu-like symptoms being the most commonly reported (Table 3), some cases (n=9, 23%) reported solely flu-like symptoms.

Table 2. Risk Factors for Brucellosis Exposure

		Overall		Mexico*	
Risk Factor	**N**	**%**	**n**	**%**	**n**
Unpasteurized Dairy	37	62%	23	91%	21
Foreign Travel	34	80%	25	80%	20
Cattle/ Occupational	36	19%	7	100%	7
At Least 1 Risk Factor	37	82%	32	84%	27
Multiple Risk Factors	37	49%	19	89%	17

* Exposure either associated with or occurred while in Mexico.

Of the case reports (64%, 25 of 39) that included the infecting *Brucella* species, *B. melentensis* was the most common (60%), followed by *B. abortus* (36%) and *B. canis* (4%).

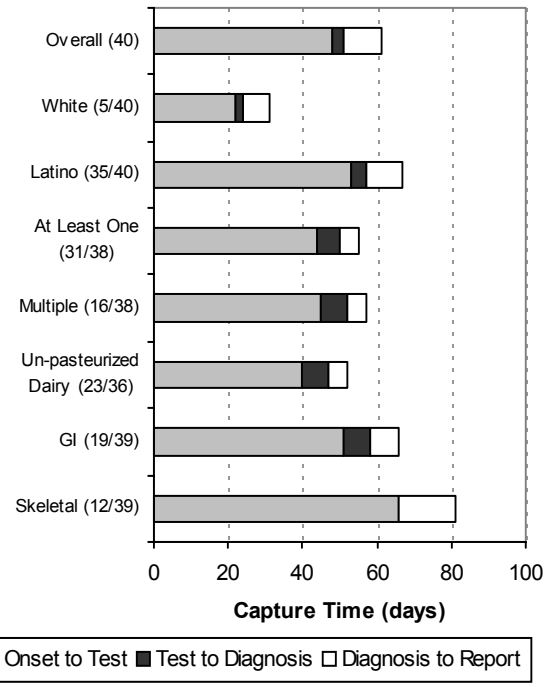
The average "capture time" (time from onset of symptoms to reporting to LACDHS) was 62 days (range: 0 to 264 days, median 44 days, Figure 1). One in-utero case was dropped from the capture time analysis since this case was not symptomatic and "capture time" was included through the mother. Much of the delay was due to the time required to be seen by a physician and have the proper test performed after symptoms onset (average 48 days). Non-Latinos had significantly shorter capture times (average 31 days, p=0.05, Satterwaite t-test). Having a risk factor associated with brucellosis did little to reduce the capture times.

Table 3. Symptoms of Brucellosis Cases (N=39)

Symptoms[a]	**%**	**N**
Flu-Like[b]	87%	34
Gastrointestinal[c]	49%	19
Skeletal[d]	31%	12
Respiratory	8%	3
Rash	3%	1

a. Categories are not mutually exclusive.
b. Fever, chills, sweats, headache, fatigue, body ache, myalgia, cough, malaise.
c. Diarrhea, vomiting, nausea, GI pain, weight loss, decreased appetite.
d. Joint pain, back pain.

Figure 1. Capture Times and Components by Race, Risk Factors, and Symptoms



The sources for brucellosis case reporting included: both physician *and* laboratory (40%), physician only (35%), and laboratory only (25%). Hospital discharge data revealed 13 suspect cases of brucellosis for 2003, compared to N cases reported. Only 6 of these cases (45%) could be matched to reported cases in the LACDHS database. Mortality records revealed one death (2002) with brucellosis listed as a contributing factor. This case was not reported to the health department.

DISCUSSION

Prolonged capture times for brucellosis cases in Los Angeles County may be due to the challenge of diagnosing this rare disease, compounded by the health care access limitations experienced by the Latino population [5]. Having a risk factor associated with brucellosis had little impact on reducing capture times, perhaps because they are very non-specific.

Improving brucellosis capture times involves increasing access to health care, enhancing disease knowledge and recognition by physicians, and timely disease reporting. A clinician's attention to risk factors may lead to an earlier clinical diagnosis of brucellosis cases, and in turn improve capture times. The sooner a disease exposure can be identified (i.e., contaminated food product or intention attack) the quicker an intervention can be set in place to prevent additional cases from occurring.

This study is limited by the small sample size, the use of retrospective data, and incompleteness of case reporting forms.

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PLEASE PASS THE BACTERIA: AN OUTBREAK OF *CLOSTRIDIUM PERFRINGENS* ASSOCIATED WITH CATERED THANKSGIVING MEALS

BACKGROUND

On November 23, 2005, ACDC received a report of possible foodborne illness following a Thanksgiving-themed luncheon held at a large worksite in the San Fernando Valley. The initial report stated that there were 250 people ill with vomiting and diarrhea out of 300 employee guests of the event. Upon investigation, it was revealed that, *including* the San Fernando Valley luncheon, the implicated cater, a fast-food restaurant of a popular chain of restaurants, prepared a total of 5 holiday meals/events with more than 400 guests the day prior, November 22. Due to the very large number of ill individuals reported and the alleged involvement of commercial food, ACDC initiated an investigation on November 23.

METHODS

General Investigation: ACDC contacted guests of the initial foodborne illness report (the San Fernando Valley luncheon) to obtain further information regarding who attended the event, the extent and symptoms of illness, and the foods consumed. When it was revealed that the implicated caterer conducted several additional similar orders on the same day, the complete list of orders was requested. ACDC then contacted all parties and inquired about presence of gastrointestinal illness. A menu of common food items was compiled from the catering lists and additional items possibly associated with illness were gleaned from participant interviews.

Case Finding: Two standardized questionnaires were created to survey either guests of the catered parties or restaurant employees in order to identify the cause and extent of illness as well as the possible source of illness. The questionnaires also included questions assessing basic demographic information. The guests were sent questionnaires via email, FedEx and fax, and the restaurant employees were interviewed by private telephone calls conducted by ACDC staff.

Case-Control Study: An outbreak-associated case was defined as any individual who ate one of the catered meals prepared on November 22 or worked at the implicated restaurant on November 22 and had the following symptoms occurring between November 22 and November 24: 1) two or more bouts of diarrhea in 24 hours, and 2) at least one additional compatible symptom (e.g., abdominal cramps, nausea or vomiting). Controls were guests of the events that did not meet the case definition of illness and were available for interview by ACDC staff.

Laboratory: Stool specimens were collected from three patrons of the San Fernando Valley luncheon and sent to the Los Angeles County (LAC) Public Health Laboratory for testing. Illness due to a bacterial toxin was the most likely suspected pathogen due to the quick onset of illness, brief duration of illness, and the implicated foods (e.g., turkey).

Environmental Health Inspection: The LAC Department of Environmental Health, Food and Milk Program (F&M) inspected the restaurant kitchen on November 23 and a hearing with the restaurant management was conducted on November 29. F&M performed a follow-up inspection on November 30.

RESULTS

Employees: During the first visit the inspector made to the restaurant, the management reported that no employees had been recently ill with diarrhea or vomiting. This claim was supported by information gathered from preliminary interviews with restaurant staff—nine out of twelve employees were interviewed via telephone, three could not be reached. Due to lack of cooperation, ACDC was unable to fully survey

the employees, and since there were no reports of illness among the employees, they were excluded from further analysis.

Guests: For a case-control study, ACDC attempted to contact guests of all five parties that had placed catering orders for November 22—four groups responded, all reported some illness among members. A total of 237 questionnaires (187 cases and 50 non-cases) inquiring symptoms and foods consumed were obtained for analysis.

Table 1. Frequency of Symptoms (N=187)

Symptoms	Number of Cases	Percent of Cases
Diarrhea	175	93.6
Abdominal Cramps	158	84.5
Nausea	58	31.0
Headache	38	20.3
Vomiting	25	13.4
Body Aches	19	10.2
Fatigue	25	13.4
Chills	18	9.6
Dizziness	18	9.6
Skin Rash	3	1.6

The majority of respondents (65%, n=154) were male; however the proportion of male versus female patrons was similar among cases and control (69.5% of cases were male, 66% of controls were male). The mean age of the cases was 39 years and controls 42 years. Among the cases, diarrhea and abdominal cramps were the most commonly reported symptoms (Table 1). The median incubation time was 8.5 hours (range 3.5 to 40 hours, Figure 1) and the median duration of symptoms was 18 hours (range 1 to 96 hours, Figure 2). All of the parties reported that none of their guests were ill prior to or during the catered meals.

Among the food items analyzed, both turkey and gravy were significantly associated with subsequent illness (Table 2); however, when analyses controlled one for the other, only turkey remained significant implicating turkey as the most likely cause of illness.

Table 2. Food-Specific Analysis for Selected Items

Food Consumed	Number of Cases (n=187)	Number of Controls (n=50)	Attack Rate (%)	Odds Ratio	95% Confidence Interval
Turkey	179	37	82.9	7.86	[3.04 – 20.31]
Ham	153	38	80.1	1.42	[0.67 – 3.00]
Gravy	164	28	85.4	5.60	[2.76 – -11.38]
Stuffing	126	32	79.7	1.16	[0.60 – 2.23]

Table 3. Analysis of Turkey and Gravy Controlling for Confounders

Food	Odds Ratio	95% Confidence Interval
Turkey (Controlled for Gravy)	7.27	[1.35 – 39.05]
Gravy (Controlled for Turkey)	6.75	[0.93 – 49.23]*

* Not statistically significant.

Laboratory Findings: One of three stool specimens submitted for testing was positive for *Clostridium perfringens*. None of the samples tested positive for *Bacillus cereus*.

Environmental Health: On November 23, F&M conducted an inspection of the restaurant that catered the meals—this revealed several health violations: foods were maintained at improper temperatures, containers were not properly covered inside the refrigerator; chemicals were stored next to cooking pans, etc. During the hearing held on November 29, the restaurant managers were educated about proper food handling procedures, errors were reviewed and further recommendations for improving restaurant safety were discussed. The following day, F&M returned to the restaurant for a follow-up inspection and noted that all previous known violations were corrected.

Figure 1. Incubation time, Time of onset of illness (N=167)

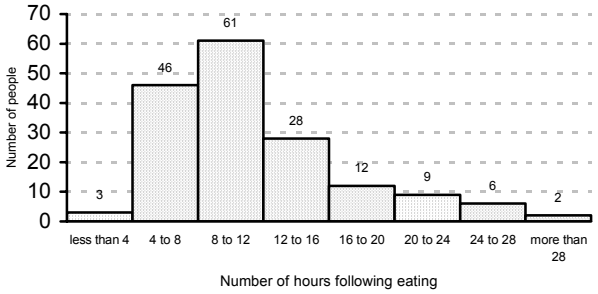
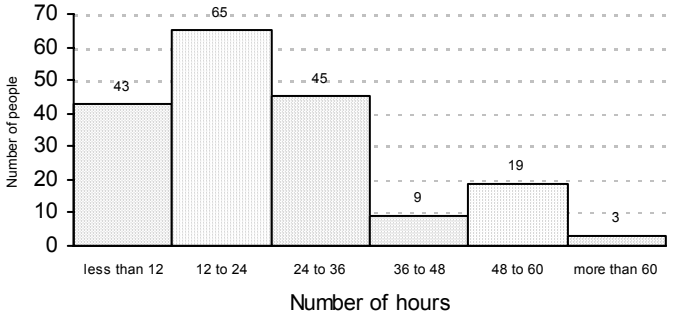


Figure 2. Duration of symptoms (N=184)



DISCUSSION

ACDC's investigation determined that the cause of illness was most likely *C. perfringens* due to improperly cooked turkey. While the environmental inspections indicated that the restaurant was clean and functional, it was likely operating beyond capacity on November 22—as such space and equipment limitations most likely prevented the restaurant staff from storing and roasting the turkeys at proper temperatures.

During the investigation, the restaurant's corporate manager and food safety consultant worked closely with ACDC to improve the standards of quality for their chain of restaurants. This experience provided a valuable opportunity to foster cooperation between Public Health and their corporation.

Limitations: This investigation was limited by a few factors. First, responses to the questionnaires were likely hindered by recall bias due to the retrospective nature of the data collection. Similarly, guests of the San Fernando Valley luncheon who had filed the original complaint had predetermined that the gravy was the cause of their illness—thus their responses likely over-emphasized that food as the cause when its association was questionable. In addition, despite the large number of people affected by the outbreak, only a few of the patrons were willing to submit specimens for testing, and the Public Health Laboratory was unable to collect samples of the turkey for testing—thus while *C. perfringens* infection from the turkey was the most likely cause of illness, additional tests could have further validated that finding. Finally, since only a portion of those who did not meet the case definition was available to interview as controls for this study, investigation ay have been limited by self-selection bias.

Recommendations: This outbreak illustrates many of the recommendations that the Los Angeles County Department of Health Services provides to restaurants to avoid food-associated illness. Foremost, restaurants should not exceed workspace capacity when preparing foods since this can contribute to compromising food safety (i.e., limiting proper cooking time, mixing uncooked food and their cooking utensils with cooked food). Moreover, all restaurants need to adhere to the following food handling practices: 1) hot food should be held at 140°F or warmer, 2) cold food should be held at 41 °F or colder, 3) when serving food at a buffet, keep food hot (i.e., with chafing dishes, slow cookers, or warming trays)

and keep food cold by nesting dishes in bowls of ice or use small serving trays and replace them often, and 4) food that is likely to spoil should not be left out more than 2 hours at room temperature.

GIARDIASIS OUTBREAK ASSOCIATED WITH A WOMEN'S GYM

BACKGROUND

On October 14, 2005, ACDC received information from a confirmed giardiasis case stating that her fellow gym members were symptomatic with a similar gastrointestinal illness. ACDC contacted Public Health Nursing in the Foothill Health District (FHD) for further information about giardiasis cases in the area around the gym. A review of giardiasis cases reported since the beginning of August 2005 to October 18, 2005 in the FHD identified 10 laboratory-confirmed cases. Preliminary findings indicated that all cases resided in the same zip code and all were females between 35 and 77 years of age. Nearly all of the confirmed cases (9 of 10) reported attending a particular gym before onset of symptoms and no other common risk factors could be identified from their epidemiological case history forms. Onset of illness for these women ranged from August 30 to September 26, 2005. In comparison, no cases with the same characteristics were reported in the FHD in September of the previous year (2004). Due to the increased number of people reported with giardiasis, the temporal clustering of cases, and the association of the cases with the gym, ACDC initiated an outbreak investigation.

Giardia is a parasite found in soil, food, water, or surfaces that have been contaminated with the feces from infected humans or animals. One becomes infected after swallowing the parasite. Asymptomatic carriage rate is high [1]. Symptoms are often self-limiting and consist of diarrhea, gas, abdominal cramping, foul-smelling stools, and nausea. Persons at increased risk for giardiasis include: child care workers, children who attend day care centers especially those who use diapers, international travelers, hikers, campers, swimmers, and others who drink or accidentally swallow water from a contaminated source that is untreated (i.e., not purified by heat inactivation, filtration, or chemical disinfection) [2].

METHODS

ACDC made a site visit to the gym on October 17, 2005. The site supervisor was interviewed about possible drinking water sources, food sources, plumbing problems, and cleaning procedures. A list of self-reported symptomatic members was obtained.

Via a letter to the management, ACDC requested a contact roster of all active members and a listing of members using the gym from August 1 to October 21, 2005. This list was further itemized by specific date and time of attendance. To actively identify additional cases and prevent the spread of infections, ACDC recommended that a letter be mailed notifying the gym members of the giardiasis outbreak and requesting that all ill members with diarrheal symptoms contact ACDC. The gym management mailed their letter on October 27, 2005. The letter also contained health education information regarding common symptoms, route of transmission, and instructions for ill members to consult with their medical provider.

Giardiasis cases were defined by either symptoms or laboratory results. Symptomatic cases (probable cases) were individuals with illness lasting seven days or more and a combination of two or more of six symptoms (diarrhea, flatulence, foul-smelling stools, nausea, abdominal cramps, and excessive tiredness). Culture-confirmed cases were individuals with *Giardia* species identified in their stool.

Outbreak-associated cases were gym members who attended the gym at least once during the suspected time period (from August 25 to 30, 2005) and had onset of symptoms during or after that time period. The suspected time period was chosen as the most likely window of exposure by seeing where the cases overlapped by gym attendance and applying the variable incubation period for giardiasis to the onset of the cases. Only individuals meeting the case definition for *Giardia* and outbreak-associated definition were included as cases in the subsequent case-control study. Only non-ill interviewees attending the gym during the specified time frame could be used as controls.

A case-control study was conducted using a standardized, telephone administered questionnaire of individuals attending the gym from August 25 to 30, 2005. Case-finding was accomplished via the letter distributed by gym management encouraging ill members to contact ACDC and also via the telephone interview. Controls were randomly selected from a group of supposedly non-ill members attending the gym during the implicated exposure period. Stool cultures were not obtained on controls. Only asymptomatic interviewees were included as controls.

To rule out other possible risk factors and to determine a possible common exposure at the gym, cases and controls were interviewed. The comprehensive questionnaire contained questions regarding exposure to known giardiasis cases or ill individuals with a similar type illness, diapered children, community drinking water sources, recent travel, recreational activities (e.g., camping, hiking, swimming), common food sources (e.g., restaurants, grocery stores, take out foods, diet foods), nutritional supplements, pets, group activities, and exercise activities. Questions specific to the gym were asked regarding regular workout schedules, gym towel and bathroom usage, drinking water exposure, food/drink samples received, and whether food/drink was purchased after workout.

Chi-square and Fisher's exact tests were used to calculate odds ratios (OR) and 95% confidence intervals (95%CI), and the *t*-test was used to test the differences of the means in the two groups. To decrease potential misclassification, symptomatic members not fitting the case definition were excluded from the study.

RESULTS

Gym Inspection: An inspection by ACDC revealed no obvious problem areas. The overall appearance of the gym was clean and well maintained. There was one main room containing the circuit of 14 exercise machines with exercise mats between each machine. In this 30-minute workout gym, members advance through all stations (machines and mats) at timed intervals set to music. There was also a bathroom, changing room, back storage room, and small conference room. Per the onsite manager, the exercise machines are cleaned at least twice daily (at 12:30 pm and 8:00 pm) using a common bleach-based spray cleaner and antibacterial wash. Gym towels are cleaned on the premises—usually twice a day. The bathroom is cleaned twice a day; the only plumbing problems reported was the occasional toilet clog, which occurs about once or twice a month. According to the supervisor, no overflow of the toilet was reported during the end of August 2005.

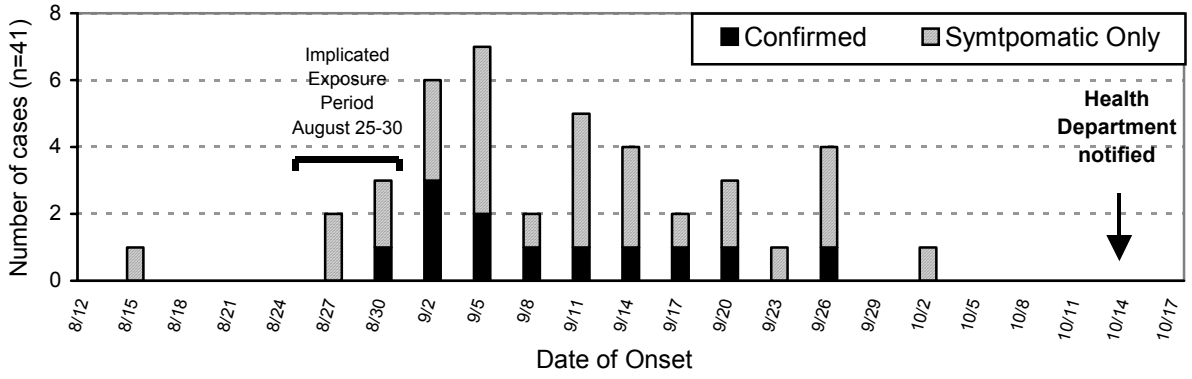
The gym does not serve food but there were two common drinking water sources: individual-sized bottled water for purchase and a common 5-gallon drinking water ceramic crock dispenser. The water in the crock dispenser was usually replenished once a day by the supervisor. During questioning it was discovered that the crock dispenser was not regularly cleaned during the implicated exposure period. Because management suspected that the dispenser might be the source of infection, it had been washed and then totally replaced as of October 16. There was a report of liquid leaking from the ceiling, but not in the vicinity of the water dispenser. Construction was occurring above the gym and there was an incident of water with paint leaking from the ceiling.

Descriptive Epidemiology: A total of 41 cases were identified meeting the *Giardia* case definition. There were 12 culture-confirmed cases and 29 symptomatic only persons (probable cases). The median age for cases was 57 years (range 30–77). All but five cases resided in the 91001 ZIP-code area, and those five resided in adjacent ZIP-codes. The first case had onset of symptoms in mid-August and the last on October 3. The peak of the onset curve occurred on September 6 (Figure 1). Also, no countywide increase in giardiasis for 2005 was observed in the Visual Confidential Morbidity Report surveillance system.

The cases complained of an average of eight symptoms (Table 1). Diarrhea was the most common complaint (98%) followed by fatigue (93%), gas (85%), weight loss (80%), abdominal cramps (80%), foul smelling stool (71%), and nausea (68%). The mean duration of illness was 19 days (range 1–56 days). Most of the cases (59%) continued to go to the gym after illness onset. Of the 30 individuals who sought

medical care and reported a date of medical care, it took an average of 17 days after onset of symptoms before they sought treatment. Of these, three cases (8%) were hospitalized, (hospitalization ranging from 2 to 4 days).

Figure 1. Giardiasis Cases Associated with a Gym in the Monrovia Health District, August 12-October 17, 2005



Case-Control Study: The purpose of the case-control study was to determine which exposures were associated with giardiasis illness. The study compared responses from 36 cases and 31 controls. Five individuals were excluded from analysis for not meeting the outbreak-associated case definition—four for not attending the gym during the suspected time period and one symptomatic only individual for having an onset date (8/15/05, first case) before the suspected time period. Controls were obtained from 85 randomly selected participants and qualified by responding to the survey and were asymptomatic or not diagnosed with giardiasis during the study period. No significant difference in the mean age was identified between the cases and controls (t=0.54, p-value=0.59).

Table 1. Frequency of Symptoms Among Cases

	Cases (n=41)	
Symptoms	**no.**	**%**
Diarrhea	40	98%
Fatigue	38	93%
Gas	35	85%
Weight Loss	33	80%
Abdominal Cramps	33	80%
Foul Smelling Stool	29	71%
Nausea	28	68%
Vomiting	15	37%
Headache	15	37%
Body Ache	13	32%
Fever	11	27%

Only two of the assessed exposure items were significantly associated with illness (Table 2). One, knowing a non-household contact who was diagnosed with giardiasis or had diarrheal illness—although this item was substantially skewed because 40% (6/15) of the reported ill non-household contacts were fellow gym members. The second significantly associated factor, and the most likely cause of exposure, was drinking water from the gym's dispenser—*all* of the assessed cases (those both diagnosed and with symptoms only) reported drinking from the dispenser, compared to only 61% of the controls. However, there was no significant difference between cases and controls in the mean number of cups consumed per visit or the mean number of times attending the gym during the implicated exposure period.

Laboratory: ACDC did not collect specimens for testing or confirmation of illness in this study. Instead, test reports were obtained through our standard passive reporting system by the cases' respective private physicians. A total of 12 cases with stool samples positive for *Giardia* were reported through our surveillance system; of these, six were further identified as *G. lamblia*.

Additional Findings: From extensive case-finding, the first case, although she was not clear about her exact onset date, reported an onset at about August 15. Also, her duration of illness was seven days

Table 2. Case-Control Study Results—Selected Exposure Risk Factors for Illness

Exposure	Cases (n=36)* n	Cases (n=36)* (%)	Controls (n=31) n	Controls (n=31) (%)	Odds Ratio(95%CI) *t*-test, p-value
Gym exposure/					
– Drank from water dispenser	36	(100)	19	(61)	Undefined+
– Avg. number of cups consumed from dispenser	2.6		2.7		t=0.17, p=0.86
– Received food/drink samples	9	(25)	7	(23)	1.14 (0.32–4.09)
– Used gym bathroom (n=35)*	22	(63)	20	(65)	0.93 (0.30-2.86)
– Used gym towels	13	(36)	14	(45)	0.69 (0.23-2.05)
– Brought own water (n=35)*	3	(9)	8	(26)	0.27 (0.04-1.30)
– Avg. number of times attended gym between August 25 and 30	1.9		1.9		t=0.08, p=0.93
Other Select Risk Factors/[					
– Outside household contact ill	15	(42)	4	(13)	4.82 (1.39-16.69)+
– Consumed “unusual” foods (n=35)*	7	(20)	2	(6)	3.63 (0.61-38.01)
– Ate diet meals	10	(28)	3	(10)	3.59 (0.79-22.13)
– Diapered children (n=35)*	12	(34)	4	(13)	3.52 (0.89-16.76)
– Recent travel (n=25)*	15	(60)	12	(39)	2.38 (0.71-8.10)
– Consumed community drinking water (n=35)*	26	(74)	16	(52)	2.71 (0.86-8.73)
– Participated in recreational activities with public water sources	16	(44)	8	(26)	2.30 (0.73-7.43)
– Avg. number of times eat out per week (n=35)*	2.6		2.3		t=0.83, p=0.41

* Cases did not respond to all of the questions; when the number of case responses is fewer than the overall total, the number is listed next to its respective question.
\+ Significant finding, p<0.05.
/ Risk factors are specific to the period of potential giardiasis exposure, August 25 to 30, 2005.
[Only includes select risk factors where the Odds Ratio was 2.0 or above.

compared to an average of 19 days for cases. She did not seek medical care, and she had three symptoms compared to an average of eight symptoms reported among all cases. She attended the gym 3 or 4 times per week and drank three cups from the water dispenser per visit. No outside source of infection for her *Giardia*-like illness could be identified via her standardized case-control study questionnaire. While an exact mechanism for transmission could not be identified, if her onset date was indeed August 15, her onset would predate the outbreak and she could possibly have been the source of infection.

In addition to the cases used in this report, one secondary confirmed case was identified in a household contact to a confirmed case. Plus, another confirmed case was reported—the boyfriend of a non-ill employee. The boyfriend reported onset of symptoms on August 15, although he was noted to have poor recollection. The boyfriend also drank water from the gym crock dispenser that was brought home by his girlfriend. No other risk factors were noted in his epidemiology case history form. The non-ill employee could have been a potential source of contamination for the outbreak. *Giardia* can be shed from an asymptomatic infected person and this employee had routine contact with the implicated water dispenser during the daily water bottle replacement.

INTERVENTIONS

The implicated gym was not closed by DHS because no on-going high-risk conditions could be identified. In addition, there was no indication that the outbreak was continuing. The last case occurred 12 before the health department was notified. The most likely source of infection, the water dispenser, was replaced before the investigation began. The letter notifying the members of the cluster of cases, describing the disease, and encouraging ill members to contact ACDC was beneficial. As noted by the results, it usually took more than two weeks before cases sought medical attention and many cases continued to work out after symptom onset. By encouraging ill individuals to get medical care and educating them about transmission, it decreased the likelihood that they could potentially spread the infection to their close contacts and other gym members.

CONCLUSION

Although a definitive source of infection could not be determined by this study, our investigation indicates the most likely source was the gym water dispenser. An ill employee may have contaminated the dispenser—the person who usually changes the water bottle did not have symptoms, although her boyfriend was a laboratory-confirmed case. For giardiasis, asymptomatic infections are common and the infecting dose is very low. Alternatively, an infectious member could have contaminated the spigot of the dispenser. The spigot required substantial hand manipulation to use—contaminated hands could easily come in contact with the spout, which would be a viable environment for the *Giardia* organisms to live. There was one symptomatic case with an onset date as early as mid-August and she did report drinking from the water dispenser although she was not clear on her exact onset date, her duration of illness was shorter, and her symptoms seem to be less severe than other cases. She did attend the gym two days during the suspected period of exposure. Also other ill members may have been a continuing source because many continued to workout at the gym despite illness.

An important limitation to this study was our inability to adequately test the implicated water dispenser because it had been washed and then replaced with a new ceramic crock when the staff suspected it might be the source of infection—which was before ACDC was involved. It is also of interest to note that the potential quantity of exposure (i.e., the reported amount of water consumed from the dispenser and the number of times a member came to the gym) were not decisive factors. Instead, illness appeared to be associated with having contact with the contaminated dispenser at a specific time when infection was most likely—at sometime between August 25 through 30. Another limitation is that due to the high rate of asymptomatic cases in giardiasis, controls may not have been true non-cases. Additional limitations include potential self-selection bias among the controls and also recall bias among the cases—since the management and many of the cases already presumed the water dispenser was the source of infection long before the health department was involved.

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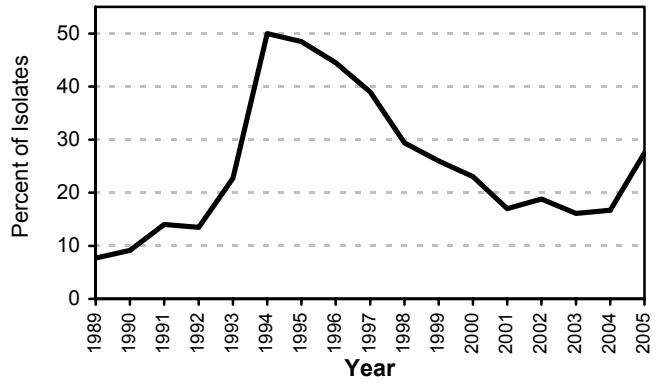
SALMONELLA ENTERITIDIS
LOS ANGELES COUNTY, 2005

Salmonella Enteritidis (SE) is the most common *Salmonella* serotype identified from isolates submitted to the Los Angeles County (LAC) Public Health Lab. After rising to a peak of 1,126 cases and 50% of the total *Salmonella* isolates in 1994, SE steadily decreased until reaching a plateau in 2001 to 2004. In 2005, however, reported SE cases increased by 42%. Of all *Salmonella* isolates, SE represented 18% in 2004 and 29% in 2005 (Figure 1). In 2005, the rate of confirmed infections with SE was 3.2 cases per 100,000 population, compared to 11.3 cases per 100,000 for all confirmed *Salmonella*.

Figure 1
SE Proportion
of Total Salmonellosis
LAC, 1989–2005



SE was identified most commonly from stool (90%), followed by blood (8 %), and urine and other specimens (2%). There were 72 hospitalizations (24%). SE infection was a contributing cause of death in three persons with underlying disease.

The highest frequency of SE cases occurred during July and August (n=44 and n=43, respectively). The summer increase of SE was dramatically higher than the previous five-year average (Figure 3). The highest number of cases (n=78) was in persons aged 15 to 34 years; however, the highest rate (8 cases per 100000) was seen in children aged 1 to 4 years. There were 1.3 male cases for every female case. Although 25% of all SE cases resided in SPA 2 (n=74), the highest rate (5.4 cases per 100000) was in SPA 5. Travel was a risk factor for 27% of cases; of these 30% visited Mexico and 25% traveled within the US.

Figure 2
SE Outbreaks
by Year of Detection
LAC, 1991–2005

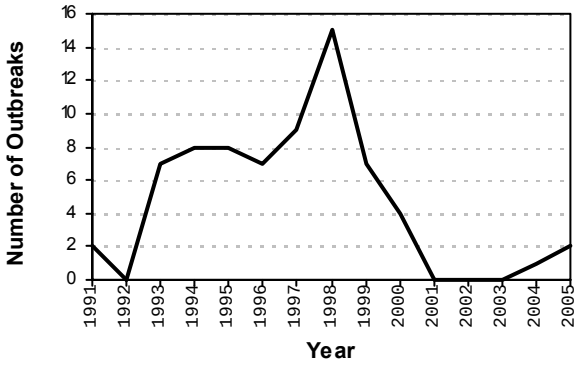
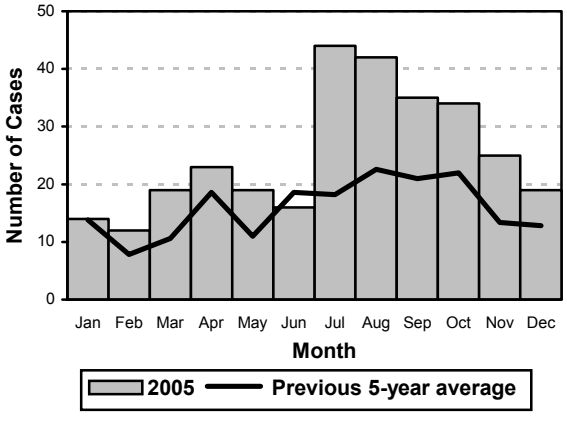


Figure 3
SE Cases by Month of Onset
LAC, 2005



In 2005, confirmed outbreak-related SE cases accounted for only a very small proportion (3%, n=9) of all confirmed SE cases (N=302). Two of the four *Salmonella* outbreaks investigated by LAC Public Health in

2005 were due to SE (Figure 2 and Table 1) and both were restaurant related outbreaks. In the first one, the source was a dessert containing raw eggs—the restaurant used eggs in the shell for this product. In the other outbreak, the source was not determined, but was suspected to be an ingredient used in multiple menu items such as tomatoes.

Table 1. *Salmonella Enteritidis* Outbreaks in Los Angeles County, 2005

Onset Month	Outbreak Setting	Number Ill	Number Culture Positive	Phage Type	Suspected Vehicle	Suspected Source
July	Restaurant	11	6	6a	Dessert	Raw Eggs in the Shell
September	Restaurant	19	3	6a	Unknown	Unknown

SE increased in the 1990s due to contamination of shell eggs [1]. There is concern that the recent increase in SE indicates resurgence similar to that of the 1990s in a food source such as eggs or poultry. ACDC continues to monitor sporadic cases and outbreaks of SE and works with LAC Environmental Health, private industry groups, and the state and federal government to promote food safety. ACDC supports activities aimed at improvement of egg production, egg distribution processes and consumer education in order to decrease the risk of SE infection.

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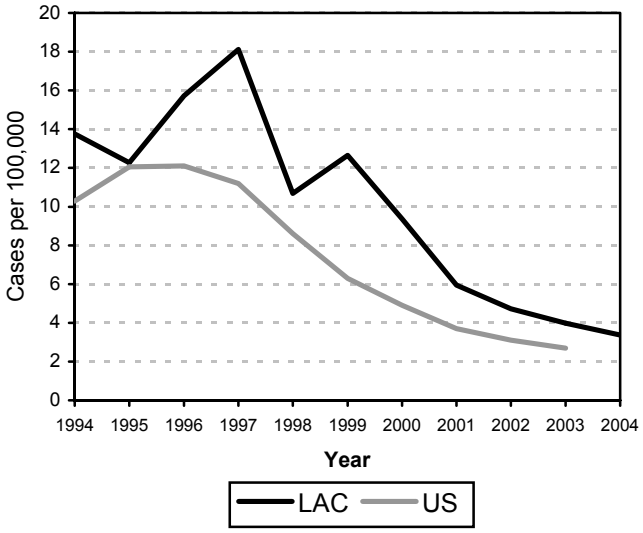
HEPATITIS A INCREASE AND OUTBREAKS LOS ANGELES COUNTY, 2005

BACKGROUND

In the US, hepatitis A has occurred in periodic epidemics approximately every decade, with the last epidemic occurring in 1995. Since then, rates of hepatitis A have plummeted with the introduction of an effective vaccine introduced in 1995 and with the 1999 recommendation by the Advisory Committee on Immunization Practices (ACIP) to provide universal childhood vaccination against hepatitis A in states (such as California) with the highest rates of the disease. In Los Angeles County (LAC), the last peak annual rate of acute hepatitis A occurred in 1997 (18 cases per 100,000 persons). In 2004, the number of reported cases declined 321 for an incidence of just 3 cases per 100,000 persons (Figure 1).

Figure 1
Hepatitis A Incidence Rates by Year
LAC and US, 1994–2004



Prior to 2005, most reports of a positive test for hepatitis A IgM were considered by the LAC Department of Health Services (LACDHS) to represent acute cases of hepatitis A. This meant that persons without hepatitis symptoms and those with possibly false positive IgM tests were counted as cases of acute hepatitis A. But starting in 2005, LACDHS applied the CDC definition of acute hepatitis A to be consistent with the case definitions for acute hepatitis surveillance as published by the CDC and the Council of State and Territorial Epidemiologists (CSTE).1 This change definition was enacted to ensure comparability of rates among jurisdictions and to better describe populations at risk for hepatitis A.

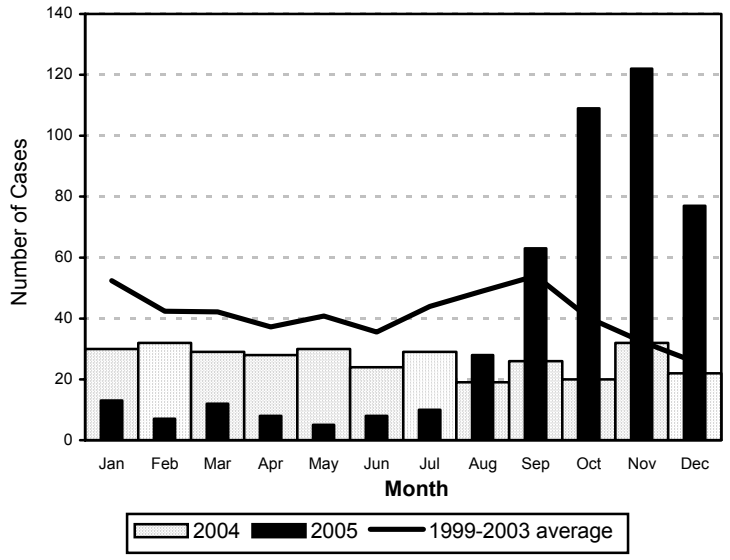
Using the new case definition from January-July, 2005, LACDHS received the same number of suspect reports of acute hepatitis A each month as in 2004—but the number of cases *confirmed* as acute dropped by 70% (Figure 2). However, starting in August 2005, there was a marked increase in the number of both reported and confirmed hepatitis A cases in LAC. By April 7, 2006, there were a total of 466 confirmed cases with onset in 2005 compared to just 321 in 2004. The increase in cases occurred in the latter half of 2005 when 403 confirmed cases with onset between August 1 to December 31 (the "outbreak period") occurred, versus 119 cases in the same time period in 2004 (Figure 2). Several point source outbreaks were identified, and in particular, the downtown homeless population was recognized as being at increased risk for acquiring hepatitis A.

As a consequence, during the latter half of 2005, LACDHS enacted: multiple outbreak investigations, a general population case-control study, a detailed epidemiologic analysis of all reported cases,

1 A case of hepatitis A is defined as a person with new clinical findings (i.e., onset date, jaundice, fever, fatigue, etc.) and with appropriate laboratory tests (e.g., hepatitis A IgM+, elevated liver function tests). Later during this investigation, acute cases patients were defined as those who were unable to be interviewed (primarily the homeless), but who had a positive test for HAV IgM and an alanine aminotransferase (ALT) level >300. If a reported case met either case definition, it was closed as "confirmed acute." Otherwise, the report was closed as "false."

environmental health investigations (including produce trace-backs), and serologic investigations in conjunction with the CDC for hepatitis A virus strain typing. These actions were taken in an effort to determine the cause(s) of the unexpected increase of acute hepatitis A.

Figure 2
Acute Hepatitis A
Cases by Month of Onset
Los Angeles County 1999-2005



Investigations were complicated by the long incubation period for hepatitis A (2-6 weeks) and the multiple means of acquiring hepatitis A (e.g., contaminated food or water, sex, drugs, travel to endemic countries, etc.). These factors made it especially difficult to link cases and to determine with accuracy a single point source for infection. Furthermore, during the course of our investigations, it was revealed that LACDHS's largest reporting agency had ceased reporting positive laboratory results for HAV IgM since October 2004 due to an error in computer programming after changing laboratory tests for acute hepatitis A. The test change resulted in two outcomes. First, test results were no longer automatically and electronically reported to LACDHS (or any other Southern California county) for 13 months. Second, the percent of positive HAV IgM test results from this reporting source increased 5-fold. A large number of patients with a positive test for acute hepatitis A had no symptoms or other clinical criteria of hepatitis A. All positive test results (n=300) for the time period October 2004-October 2005 from this reporting source were transmitted to LACDHS on a single day in November 2005 for investigation and follow-up; this greatly increased the challenges in investigating the epidemiologic trends of hepatitis A in LAC.

The following is an overview of the distinct hepatitis A outbreaks and populations that were investigated.

1. Homeless, Downtown Los Angeles:
   In October 2005, ACDC identified four cases of acute hepatitis A among volunteers and patrons of a homeless shelter in the downtown "skid row" area of Los Angeles. Since two cases occurred in volunteers who live with and prepare food for other volunteers of the shelter, all volunteers were offered Immune Globulin (IG) to prevent the acquisition of hepatitis A. The subsequent investigation did not confirm linkage between any cases and any homeless shelters. A total of 48 cases with some association with the homeless in downtown Los Angeles, with dates of onset or diagnosis between September-December 2005, were confirmed. The monthly number of confirmed cases in the homeless peaked in October (N=17)—which was prior to the peak in the general population. No baseline data of the prevalence of hepatitis A in the homeless prior to September 2005 exits, but local healthcare providers noted that cases of hepatitis A being treated were above "normal levels." Because of the multiple overlapping exposures to several soup kitchens, food sources, and shelters, and due to the inability to interview many homeless cases, no point source was identified. ACDC worked with the DHS homeless services coordinator to distribute hygiene and prevention messages to healthcare providers and homeless shelters in the downtown Los Angeles and across the county. Serum from a homeless patient was sent to CDC for hepatitis A viral sequencing.

2. Mexican Restaurant, Downtown Los Angeles:
A total of 17 cases of hepatitis A were confirmed in persons who ate at a downtown Mexican restaurant on September 14 or 15, 2005. A case-control study was not conducted because the link between the restaurant and cases was not identified until November, when many cases of acute hepatitis A with onset in October were re-interviewed with an extensive food history questionnaire. The LACDHS Food and Milk Program investigated the restaurant in November and found no food handling violations, no evidence that food handlers were ill in September or contemporaneously, and no produce suppliers that could be specifically linked to the other outbreaks in LAC during 2005. Food handlers were not tested for acute hepatitis A and no serum specimens from the cases were available for viral sequencing.

3. Workplace Setting, San Gabriel Valley:
In November of 2005, ACDC investigated an outbreak of 19 people with acute hepatitis A who had all eaten at a movie set on October 3, 2005. A case-control study was enacted to determine risk factors for illness. A case was defined as a person who ate at the worksite on October 3, 2005 and who was IgM positive and symptomatic. Controls were those that ate at the worksite on the same day, but were well and did not have any of the following exclusion characteristics: clinical symptoms of hepatitis A, past diagnosis or vaccination for hepatitis A, or a history of receiving immune globulin in the preceding 3 months. Food-handlers were tested for hepatitis A IgM and IgG; all tested negative.

Ultimately, 116 of the 246 people (47%) who were on the set that day were contacted—40 met the exclusion criteria, 18 cases and 58 controls were identified (one additional case was identified after the case-control study was concluded). After interviewing cases and controls, a stratified analysis suggested that of the 65 food items provided, only the following accounted for more than half the cases:

- the salad bar stratifying by the jerk chicken (OR=5.3, 95%CI: 1.08-26.24),
- the mixed greens stratifying by the jerk chicken (OR= 5.06, 95%CI: 1.52-16.84),
- the jerk chicken stratifying by the salad bar (OR=4.06, 95%CI 1.26-13.15),
- and the jerk chicken stratifying by the mixed greens (OR=4.65 95%CI 1.39-15.48).

Since the jerk chicken had no raw ingredients, lettuce (pre-washed mixed baby greens) was implicated as the most likely cause of this outbreak. A trace-back performed by the LACDHS Food and Milk Program revealed that the caterer purchased the lettuce from a produce vendor who bought the lettuce from *another* vendor who bought ultimately bought it from a farm outside of LAC. LACDHS was unable to determine where, and if, the contamination of the lettuce occurred between the farm and the movie set. Given that no other outbreak implicated that farm or the other two lettuce vendors, a detailed trace-back and investigation of these food purveyors was not conducted. No sera were collected from cases in this outbreak.

4. Café, Downtown Los Angeles:
Between November 29 and December 7, five employees of a downtown restaurant were diagnosed with acute hepatitis A—four of them, including a cook, worked while ill. Because several food-handlers worked while symptomatic, a public announcement was made and IG was provided at no cost to the public (>650 doses) and to the other employees at the restaurant (50 doses).

Serum specimens for hepatitis A IgM were collected from the other employees (n=51); none positive; no new employee cases were identified. Employees that had left this employment prior to the discovery of the outbreak also were contacted. At this restaurant, employees were served a “family style” meal before each shift. As the five employees diagnosed with hepatitis A had worked multiple overlapping shifts in the 2-6 weeks before they became ill, it was impossible to determine the source of illness. A cohort study of food preferences of restaurant employees was performed, but no individual food item that could account for the cases was identified. In addition, no cases among patrons were definitively linked to eating at this restaurant. There were no commonalities between the produce suppliers for this restaurant and those for the other restaurant and movie set and no other ill employees were identified, which eliminated the likelihood that another employee was the originating source of infection. Sera were collected from the employee cases and from an additional case (who ate at this restaurant) were sent to CDC for strain typing.

5. Group Home, Antelope Valley:
   Two confirmed cases of hepatitis A infection were identified at a substance abuse treatment facility in the Antelope Valley. Onset of jaundice occurred between December 6 and 10, 2005. Both cases lived in the facility during their entire incubation periods. Approximately 22 other residents complained of nausea/vomiting, diarrhea, muscle aches, and fever starting on November 24. A total of 33 residents, including the 22 ill residents, were tested and all were negative for acute hepatitis A. No common source was identified for the two cases and all other members of the treatment facility were offered IG to prevent acquisition of hepatitis A. Sera from both patients was sent to CDC for strain typing. No additional cases occurred.

RESULTS

General Population Case-Control Study: Because of the generalized increase in hepatitis A throughout LAC, ACDC conducted a matched case-control study of confirmed hepatitis A cases with onset in October that were not part of any identified cluster or outbreak. Controls were identified through random digit dialing; telephone numbers were generated in stepwise progression (either up or down) from the matched case's phone number. In total, 21 cases and 42 matched controls were interviewed. Univariate matched analysis resulted in the following significant odds ratios (OR):

- bagged salad (OR 4.5, p value .013, 67% of cases exposed),
- spring mix bagged salad (OR 8.0, p value .0041, 43% of cases exposed),
- eating downtown (OR 5.5, p value .0025, 62% of cases exposed), and
- being currently employed (OR 2.8, p value .07, 86% of cases exposed).

Conditional logistic regressions using multiple models were subsequently used to examine which of the risk factors remained significant in the presence of other risk factors. Eating downtown remained strongly associated with illness (OR range 3.5 to 4.1 with all models being significant) and spring mix bagged salad remained slightly associated (OR range 3.1 to 4.2 with some models being marginally significant and others not being significant). Produce such as cilantro and green onions—which have been implicated in previous hepatitis A outbreaks—showed a significant protective effect. The results suggested that eating downtown was the most probable risk associated with acquiring hepatitis A. Although no sera was sent to CDC for sequencing from the October general population cases, sera was sent from November cases.

Environmental Health Inspections: The Environmental Health Food and Milk Program performed inspections of several food service purveyors in the investigation of the discrete outbreaks. This included restaurants (n=2), soup kitchens (n=7), produce vendors (n=2), and a catering truck. Their investigations included assessing employee health, hygiene conditions, produce suppliers and sources, opportunities for cross contamination. There was no evidence that the outbreaks of acute hepatitis A were associated with any personnel, common produce supplier, or poor food handling techniques.

Hepatitis A Virus Strain Typing: A total of 68 blood samples from LAC residents were sent to the CDC for viral strain typing. Of these, 40 tested positive for the presence of hepatitis A virus nucleic acid by PCR; 80% of these samples (n=32) were found to be a unique strain, not previously identified in North America. Samples from cases associated with the downtown restaurant, the homeless, and the group home (Antelope Valley) cluster matched the unique strain.

Epidemiologic Analysis of Confirmed Cases: Comparing the first seven months of 2005 (baseline period, January to July 2005) against the last five months of 2005 (outbreak period, August to December 2005), some differences appear (Table 1). First, outbreak cases were slightly older (mean age 38 years versus 34 years) and more likely to be within the age group for working age adults—82% of the outbreak cases occurred in adults aged 21-64 versus 64% of the cases during the baseline period. The gender ratio also skewed toward males; by the end of 2005, 64% of the cases occurred in men versus 57% during the

baseline period, and only 50% in 2004. Another notable finding was that the proportion of cases that were Black increased from 4 to 14% during the outbreak period.

The overall increase in hepatitis A cases was widespread throughout LAC—all health districts reported an increase during the outbreak period as compared to the same time period in the previous year, 2004. But despite the widespread increase, a notable cluster occurred—16% of the cases during the outbreak period were reported from the Central Health District compared to just 3% of the cases during the same time period in 2004.

Table 1. Comparison of Confirmed Hepatitis A Case Characteristics Before (January–July) and During (August–December) the Outbreak Period Los Angeles County, 2005

	Time Period			
Characteristics	**January–July (N=392)**		**August–December (N=63)**	
Age in Years				
Mean	34		38	
Median	33		37	
Range	1-89		1-86	
Age Category	n	(%)	n	(%)
<1	0	(0)	0	(0)
1-4	2	(3)	5	(1)
5-14	8	(13)	17	(4)
15-20	7	(11)	27	(7)
21-34	22	(35)	128	(33)
35-44	8	(13)	77	(20)
45-54	8	(13)	77	(20)
55-64	2	(3)	39	(0)
≥65	7	(11)	22	(6)
Gender	n[1]	(%)	n	(%)
Male	36	(57)	249	(64)
Female	27	(43)	162	(36)
Race/Ethnicity	n[2]	(%)	n[3]	(%)
Asian	7	(13)	30	(9)
Black	2	(4)	44	(14)
Latino	21	(38)	102	(32)
White	26	(46)	143	(45)

1 N=391
2 N=319
3 N=56

DISCUSSION

The clusters of illness identified in two downtown restaurants, the homeless in downtown, and the results of the general population case control study suggest that the most likely source of infection may have originated in downtown Los Angeles. While the caterer from the workplace outbreak, the homeless shelter, both restaurants, and the group home all received some produce from distributors located in

downtown Los Angeles, no further commonalities could be identified. Furthermore, produce that is most likely associated with hepatitis A outbreaks—green onions and cilantro—was not implicated in any of the outbreaks or in the general population. Additionally, the general population case control study actually showed a protective effect for both food items.

Consequently, the source of the outbreaks remains questionable. It is possible that this new hepatitis A strain was introduced to the community in August, spread at modest levels that month and in September, and reached a critical mass in October and November. It is clear that the distribution of the strain was widespread in that 80% of the samples had the same strain type and this strain. It is possible that this particular strain may be more infectious than others previously seen in Los Angeles, but the comparative virulence of this strain is unknown. In other communities, outbreaks have been sustained by, often asymptomatic, transmission of the virus between children and to adults. However, since there was no increase in the percentage of cases seen in children or in the percentage of cases with a connection to a school or daycare, this source of transmission is not likely.

The number of reported and confirmed cases decreased each month since November (Figure 2) and no further discrete outbreaks were reported. Despite the decrease in cases since December 2005, the number of reported cases in March 2006 was still double that at the same time in 2005 (the “baseline period”). Accordingly, ACDC continued to monitor the situation.

SERRATIA MARCESCENS OUTBEAK ASSOCIATED WITH CARDIO-THORACIC SURGERY

BACKGROUND

Serratia marcescens is an aerobic Gram-negative bacillus that thrives in moist environments. This species of bacteria has been shown to contaminate solutions and hospital equipment and has been documented in a number of common source outbreaks [1]. In the US, *Serratia* species cause 1.4% of nosocomial bloodstream infections (BSI) [2].

On January 14, 2005, ACDC received a call from an acute care hospital reporting seven post-operative cardio-thoracic (CT) surgery patients with symptoms of systemic infection occurring within 24 hours after surgery over a 10-day period. At that time, blood cultures from three patients were positive for *S. marcescens*. The California Department of Health Services (CADHS) and CDC were consulted. Elective cardiac surgery was canceled by the hospital.

After extensive environmental cleaning and staff education, CT surgery resumed on January 24 with preliminary recommendations—this included appropriate environmental cleaning, medication management, hand hygiene, and antibiotic coverage. Despite compliance, four of the seven patients (57%) operated on after surgery resumed developed post-operative fever. CT surgery was cancelled again. According to the prior agreement of infection control implemented when reinstating this surgical procedure, all patients received prophylactic antibiotics during surgery to cover for *Serratia* infection. Blood cultures on all of these febrile patients were negative for bacterial infection. At this time, ACDC requested the assistance of the CDC Division of Healthcare Quality Promotion Epidemic Intelligence Service (EIS). And on January 25, the officer accepted the invitation to assist with the investigation.

Since no ongoing transmission of *S. marcescens* was demonstrated, CT surgery was resumed January 28 with the usual surgical prophylaxis regimen. Surveillance blood cultures were obtained from all CT surgery patients for a total of 5 weekdays to assist in early detection of *S. marcescens* bacteremia.

No additional cases of *S. marcescens* BSI among CT surgery patients were identified after five days. At that time, usual methods of post-operative infection surveillance were resumed. No further cases were identified.

METHODS/RESULTS

Observational and Environmental Studies: The day following receiving the report of illness (January 15), ACDC conducted a site inspection. This included reviewing policies and procedures; interviewing representatives of the operating room (OR), Cardiac Surgical Unit (CSU), and pharmacy; inspecting the OR and CSU; and obtaining numerous environmental specimens for bacterial culture by the hospital laboratory, hospital reference laboratory, and Los Angeles County Public Health Laboratory. Specimens included open vials of medication including multidose medication and drips, medication tubing, gel for echo sonogram, water samples from faucets and ice machine in the surgical unit, swabs from OR equipment, scrub sinks, and the ice machine filter. The bags that transported many of the specimens (one for each OR room) were also cultured.

Review of infection control procedures identified no major breaches. No *S. marcescens* was cultured from samples collected from the environment and open medications (Table 1).

Background *S. marcescens* Rate: Microbiology records at the hospital were reviewed for *S. marcescens* cultures from January 2004 to January 2005 and compared the rate of *S. marcescens* BSI prior to the

outbreak period (January 2004 to December 2004) to the rate during the outbreak period (January 2005) to determine if it had significantly increased.

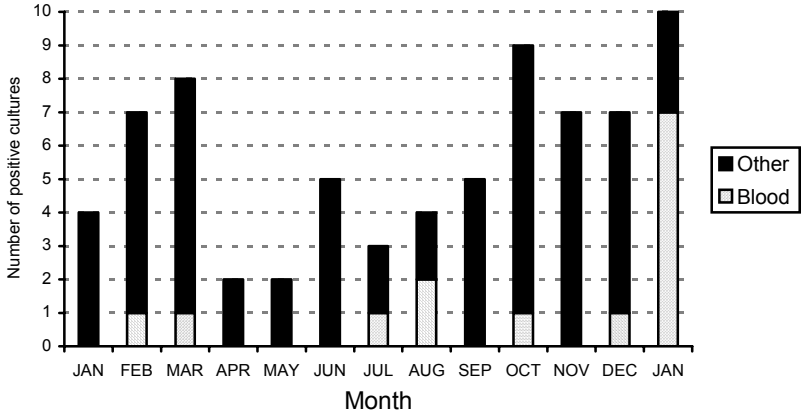
Table 1. Environment Specimen Results

Source	Number of Specimens	Results
Open medication vials	51	No Serratia marcescens isolated
Medication tubing	1	No Serratia marcescens isolated
Echosonogram gel	4	No Serratia marcescens isolated
Water samples	3	No Serratia marcescens isolated
Equipment	22	No Serratia marcescens isolated
Scrub sink soaps and lotions	21	No Serratia marcescens isolated
Ice machine filter	1	No Serratia marcescens isolated
Transport bags	4	No Serratia marcescens isolated

The rate of *S. marcescens* BSI cultures to total S. marcescens cultures during the outbreak period in January 2005 was 60% (6 of 10), which was significantly higher than the year before the outbreak period, which had a rate of 11% (7 of 63), $p<0.001$.

Cohort Study Analysis: Two initial cohort studies of operational risk factors were conducted on all patients with CT surgery from January 10 to 15, 2005. In the first study, a case was defined as a patient with a positive blood culture for *S. marcescens*. In the second study the case definition was expanded to include patients with a positive blood culture for *S. marcescens* or a fever spike noted within 72 hours after surgery. In both cohorts, a non-case was a patient with no fever spike noted within 72 hours after surgery. Patient charts were reviewed for risk factors including personnel, equipment, medications, procedures, locations, and patient characteristics. All data were collected on standard forms, entered into Microsoft Access 2000, and analyzed by SAS 9.1.

Figure 1
Laboratory-reported postive inpatient *S. marcescens* culture by month and culture site
January 2004–January 2005



The initial cohort and environmental studies of OR risk factors conducted by ACDC did not show any significant associations between OR risk factors (e.g., personnel, equipment, medications, procedures, locations, patient characteristics) and cases. No environmental or medication contamination was identified.

Molecular Epidemiological Analysis: The Los Angeles County Public Health Laboratory performed and interpreted pulsed-field gel electrophoresis (PFGE), using standard methods and criteria, on *S. marcescens* isolates from all seven post-operative CT surgery patients as well as many reference samples from 2004 and 2005. A case was

subsequently defined as a patient with a *S. marcescens* blood isolate indistinguishable by PFGE banding pattern.

Using PFGE, six case-patients were infected with an indistinguishable strain of *S. marcescens*.

Baseline Temperature Study: To establish a baseline for the proportion of post-operative CT surgery patients with temperature spikes, a random sample of 29 CT patients operated from January 2004 to November 2004 (a non-outbreak period) was analyzed. Post-operative temperatures were analyzed as greater than or equal to 38.0ºC, 38.2ºC, and 38.5ºC respectively.

Results showed 58% of post-op patients developed temperatures >38°C (Table 2). These data indicated that the rate of post-operative fevers in patients since resuming elective surgery (57%) remained at baseline.

Table 2. Tmax Data among Cardiac Surgical Patients ≤72 Hours Post-Operation, January–November 2004 (N=29)

Temperature	No. of Cases	% of Total	% of Fever Cases
≥ 38.0°C	14	58%	100%
≥ 38.2°C	10	42%	71%
≥ 38.5°C	5	2%	36%

Case-Control and Retrospective Cohort Study Analyses: A matched case-control study and a retrospective cohort study were also enacted. The case-control study compared case patients to randomly selected controls (1:3) who were present in the CSU within four hours of the case patients. The cohort study involved all patients in the cohort period (January 10, 2005 at 6:01am to January 16, 2005 at 3:00am) or until the patient was discharged from the CSU. All data were collected on standard forms, entered into Excel 2000 spreadsheets and analyzed using SAS software, version 8e.

Results from the matched case-control study showed the only risk factor of significance was magnesium sulfate [odds ratio (OR) 6.4, confidence interval (CI) 1.1-38.3]. Intravenous magnesium sulfate was administered within 24 hours to 100% (6 of 6) of the cases and 39% (7 of 18) of the controls. The cohort study showed significant associations between receipt of amiodarone (OR 4.9, CI 1.1-22.7), propranolol (OR 10.3, CI 4.1-26), calcium chloride (OR 10.3, CI 4.1-26), cell saver (OR 10.3, CI 4.1-26), or fresh frozen plasma (OR 10.3, CI 4.1-26) with *S. marcescens* infection.

Observational Studies: To identify potential sources and risk factors for transmission, several observational studies were performed. CSU and OR staff were interviewed regarding daily procedures, staff member roles, and infection control practices. Practices of cleaning, disinfection and sterilization of equipment were also assessed. Several patients were followed from the OR through the initial pre-operative and induction procedures in the CSU. Additional environmental samples were collected from the CSU to complement a complete environmental study of the OR that had been done previously by the ICP and DHS investigators.

Review of infection control procedures again identified no major breaches. No *S. marcescens* was cultured from over 36 samples from the environment and open medications.

Three case isolates were sent to the CDC Division of Healthcare Quality Promotion laboratory where they were confirmed to be S. marcescens with PFGE banding patterns indistinguishable from one another and matching a strain of S. marcescens cultured from an unopened bag of magnesium sulfate solution compounded by a single common pharmacy and from the blood of five patients in New Jersey.

DISCUSSION

Both the epidemiologic and microbiologic evidence support contaminated magnesium sulfate solution as the cause of this outbreak. In this outbreak, a major CT surgery center was closed and the situation was made public at the onset by a press release created and disseminated by the hospital. Given the nature of the outbreak (e.g., the severity of disease, rapid onset post-surgery, and complexity of the surgeries) a direct intravenous bolus of bacteria was suspected. ACDC focused attention in its initial investigation on procedures and personnel in the OR. For this reason, the initial studies conducted by ACDC failed to implicate the magnesium sulfate—since it was administered post-operatively in the CSU.

Though both the matched case-control and retrospective cohort studies included the CSU, only the matched case-control study implicated magnesium sulfate. This is probably due to the small sample size and the fact that the cohort study included a broader period of risk.

This investigation led to the eventual discovery of a multi-state outbreak caused by the same product that was compounded and nationally distributed by single common pharmacy in Texas. The US Food and Drug Administration issued an alert on one lot of the company's magnesium sulfate solution on March 18, 2005 [3]. The implicated common pharmacy initiated a nationwide magnesium sulfate solution recall of all 50 ml admixtures of $MgSO_4$ in 5% dextrose on April 8, 2005 [4]. As a result of this outbreak several public health concerns associated with compounding have been noted by FDA and CDC and will be explored.

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METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* OUTBREAK IN A BURN UNIT: THE EMERGENCE OF A RARE MRSA CLONE LOS ANGELES COUNTY, 2005

BACKGROUND

Methicillin-resistant S*taphylococcus aureus* (MRSA) has emerged as a major cause of hospital morbidity and mortality throughout the world [1–3] and is now one of the most common infections acquired in the hospital setting. Hospital specialty units—such as the intensive care unit (ICU), neonatal ICU, and burn and transplant services—care for patients who are medically fragile, frequently immunocompromised and at increased risk for nosocomial MRSA infection. Burn patients, without the skin's protective barrier over large body surfaces, are particularly susceptible to nosocomial MRSA infection. Additional risk factors for nosocomial MRSA acquisition include antibiotic use and length of hospital stay [4].

On October 3, 2005, the ACDC was informed of 7 patients with MRSA infections in the burn unit of an acute care hospital in LAC. At the time of the call, the census in the burn unit was 15. Five of the initial infections occurred within an eight-day period at the end of September; one each occurred in August and the middle of September. Prior to August 2005, there had only been 4 MRSA cultures from patients in this unit during 2005. ACDC initiated an investigation to determine the source of the infections and to develop control measures.

METHODS

Setting: The burn unit is housed in a separate building attached by hallways to the main hospital building. The unit is licensed for 30 beds, though only 15-20 are generally in use. Locked double doors restrict public access to the unit, which houses both adult and pediatric patients. In addition to in-patient services, same day surgical services and outpatient clinic services are also provided.

Case Definition: A case was defined as an in-patient or out-patient of the burn unit during the outbreak period (August 22, 2005 to November 24, 2005) who had culture-confirmed MRSA isolate identical to the predominant outbreak clone ether by pulsed-field gel electrophoresis (PFGE)—or if no isolate was available for PFGE—by antibiotic sensitivity pattern (antibiogram) that demonstrated sensitivity to only rifampin, vancomycin, and linezolid. Cases either had clinical symptoms or were identified by surveillance culture. Hospital charts of inpatients were reviewed for age, gender, admitting diagnosis and date, surgical procedures and dates, and outcome.

Case Identification: From October 3, 2005 to December 8, 2005 surveillance cultures were obtained from all inpatients twice a week. Surveillance cultures were obtained from multiple sites (wound, skin, nares) during dressing changes or surgical debridement procedures when appropriate to minimize patient discomfort.

Environmental Surveillance Cultures: A variety of environmental surfaces (patient rooms, recovery room, hyperbaric room, and tub room and hydrotherapy room) accessed by patients and staff were cultured before and after terminal environmental cleaning by ACDC personnel. In addition, hospital personnel performed environmental cultures on the burn unit operating rooms, staff soap dispensers and nursing counter area. All cultures positive for MRSA were submitted for PFGE.

Staff Identification and Surveillance: To determine which staff had the most contact with the cases, ACDC staff reviewed the hospital charts and recorded the physicians and ancillary personnel who had hands-on contact with the patients and their wounds. ACDC also reviewed the nurse assignment rosters for 3-5 days before cases had a positive culture for MRSA to identify those whose primary assignment was to eight or more cases.

ACDC also requested surveillance cultures from the healthcare workers (physicians, nurses, assistants, and others) who had contact with all or most of the cases. In addition, we also requested surveillance cultures from the primary housekeeping personnel. The facility chose to culture additional clinical personnel. Culture sites included nares, axilla, groin, stool, and, in selected cases, hands.

Molecular Epidemiologic Investigation: PFGE was performed on all available MRSA isolates (patient, staff, and environmental) by the LAC Public Health Laboratory. Individual DNA fingerprint patterns were produced for isolates using the restriction enzymes *SMA* I and *Eag* I. Isolate relatedness was determined according to the criteria by Tenover. Isolates were compared to others gathered in LAC and to national databases. The Centers for Disease Control and Prevention were consulted regarding the identification of the predominant outbreak clone

Infection Control Evaluation and Measures: On October 4, 2005, ACDC closed the unit to all new admissions through October 7, 2005. The unit re-opened for one week. However, on October 14, 2005, after notification that 3 of 6 previously MRSA negative patients were now surveillance culture positive, the unit was closed to elective admissions. The decision was made to keep the facility closed until it could be demonstrated that MRSA transmission had ceased for an entire week as evidenced by no new positive surveillance or clinical cultures for MRSA.

During the temporary closure, emergency admissions were permitted with the permission of the ACDC administrative officer of the day, and day surgeries were permitted only if patients and surgical and recovery room staff were kept separate from the unit staff and waiting room. ACDC also approved elective day surgery admissions to a separate floor as long as contact precautions and other control measures were maintained. Prospective patients were notified of the outbreak before admission.

Standard infection control measures including staff education, contact isolation for all patients (with or without MRSA), cohorting patients and staff, and terminal cleaning were implemented in a stepwise progression during the outbreak period. Terminal environmental cleaning of all bedside equipment and environmental surfaces1 was performed several times during the outbreak, including steam cleaning the tub, shower and hydrotherapy rooms. All disposable supplies and equipment were discarded.

Personnel from the California Department of Health Services, Health Facilities Division, made a site visit and observed infection control practices in the facility and during surgery.

All patients in this unit were discharged by November 26, 2005 and the unit remained empty until November 28, 2005. Terminal cleaning of all surfaces took place in this time period and staff were decolonized as per protocol. ACDC recommended that selected healthcare personnel (those with hands on contact with the cases) be decolonized with a five-day treatment with intranasal mupirocin ointment and chlorhexidine soap. Treatment was to commence after the last contact with patients known to have MRSA.

RESULTS

Case Characterization: Between August 22, 2005 and November 30, 2005, 27 patients were identified with positive MRSA cultures, of which 23 (85%) met the case definition. Of these 23 cases, 20 were male (3 children, 17 adults) and 3 were female (1 child, 2 adults). Ages ranged from 11 months to 75 years, with a median age of 33 years. While one case was admitted for repair of keloid scars, the remaining (n=22) were admitted with some type of acute burn injury (e.g., tar, hot oil, or flash burns). Most (n=15, 56%) were admitted with second or third-degree burns. Of the 23 cases, 8 (38%) had symptoms of clinical infection (3 bloodstream, 5 wound) and 15 were colonized and identified by nasal and/or wound surveillance cultures. Many of the wound surveillance cultures were obtained during surgical debridement

1. As determined by both hospital policy and the 2003 Guidelines for Environmental Infection Control in Health-Care Facilities: Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee available at: www.cdc.gov/ncidod/hip/enviro/guide.htm.

procedures, which were the only time the bandages were removed from the wounds. One critically ill case with MRSA in the blood died; it is unknown if the MRSA was a direct cause of death.

Of the 23 cases, 4 were identified by surveillance cultures while they were receiving outpatient treatment for their burns by burn unit personnel. The date of discharge to positive culture date had a range of 70 (9 to 79 days), and a median of 15 days. Of the 19 cases who were hospitalized at the time of culture, the time between admission to the burn unit and positive culture date ranged from 4 to 13 days with a median of 10 days.

Surgical debridement procedures were performed on 14 of 16 cases with available medical information; 12 received multiple surgical debridement procedures during their hospitalization. One case had a surgical repair as a result of a past burn injury and did not undergo surgical debridement, and one case did not have any surgical procedures.

Four other patients were diagnosed with MRSA due to a variety of other strains during this time period, including three patients with clinical infections and one who had positive surveillance cultures.

Environmental Surveillance: Of the 25 burn unit samples obtained prior to terminal cleaning, 10 were culture positive for MRSA (hydrotherapy room bed, cabinet, and radio; shower handrails; patient room nurse recall control and bathroom door knob; nurse desktop; hyperbaric room videos; patient room bedrails; recovery room chart counter/desktop drawers). After terminal cleaning, 15 repeat environmental cultures were obtained and included 10 previously MRSA positive and 5 MRSA negative sites. All previously positive sites returned negative, but one previously negative site (tub-room silver railing) was positive for MRSA. Of the 13 burn OR samples obtained, 1 was culture positive for MRSA (lamps in OR #1). Neither of the soap dispenser sites nor the nursing counter area were positive for MRSA.

Staff Identification and Surveillance: The study identified five nurses who had the greatest number of contacts with cases as compared to the number of contacts with the control group. ACDC requested staff surveillance cultures from 17 health care workers (10 physicians, 1 physician assistant, 5 nurses, 1 burn technician) who had the most frequent contact with the cases and 3 environmental services (housekeeping) staff. The hospital staff cultured an additional 33 healthcare workers, for a total of 53 staff who received surveillance cultures. Of the 53 staff members tested, 3 were MRSA positive on initial culture (a nurse and two physicians).

MRSA Phenotypic and Genotypic Characterization: Review of the antibiotic sensitivity patterns showed that five of the initial seven cases had essentially identical multi-drug resistance patterns. These isolates were sensitive to only rifampin, vancomycin and linezolid—which is consistent with MRSA of healthcare origin. Also, isolates from 13 additional MRSA positive patients identified through surveillance cultures had the same antibiotic resistance pattern. Two cases had isolates that were sensitive to several antibiotics (including rifampin, vancomycin, linezolid, tetracycline, trimethoprim-sulfamethoxazole, amikacin, ciprofloxacin, gentamycin, imipenem and moxifloxacin).

Most (24 of 27) of the MRSA isolates were available for PFGE; of these, 21 were indistinguishable from each other with zero band differences. The CDC identified this strain as the “Brazilian” clone. One isolate was determined to be “untypeable” by PFGE and two isolates were different from the outbreak strain and from each other.

PFGE tests were also performed on 12 environmental isolates; and 7 isolates (all from pre-cleaning) appeared to have a similar if not indistinguishable PFGE pattern to the USA 300 community-associated (CA) MRSA strain; three had a similar if not indistinguishable PFGE pattern to the outbreak strain (including an OR sample, a pre-cleaning sample, and a post-cleaning sample), and the remaining two (pre-cleaning samples) were indistinguishable from each other but did match any other strains associated with this outbreak.

As determined by PFGE, one of the physicians and the nurse (both nares isolates) had the outbreak strain. The other physician (hand isolate) did not have the outbreak strain.

Outcomes of Infection Control Measures: Because of the closure of the unit by ACDC, the census in the facility went from a daily average of 12 (for the months of August, September and October) to a daily average of 4 in the month of November. Some elective patients chose to be admitted elsewhere when told of the ongoing outbreak. Repeated site visits and monitoring by the infection control practitioner revealed good adherence to standard and enhanced infection control measures (contact precautions, washing hands, limiting of visitors). However, the DHS Health Facilities evaluator identified several problems in the operating room that seemed minor at first, but when taken as a whole, showed a significant breakdown in surgical infection control (i.e., keeping the operating room suite doors open during procedures, etc.). The Health Facilities Unit's deficiency report of findings resulted in the facility providing a plan of corrective action and permanent operating room policy and procedure changes.

ACDC recommended decolonizing the two staff members with the outbreak strain of MRSA. Staff identified as MRSA surveillance culture positive were restricted from direct patient contact until fully decolonized and repeatedly negative on subsequent cultures. After the decolonization protocol, the 2 staff members with the outbreak strain tested negative for MRSA. The other physician was felt to be transiently colonized with a separate strain (repeat cultures, before decolonization, were negative) and the decolonization protocol was not required. As a precaution, the hospital decided to decolonize *all* burn unit staff; a total of 51 staff followed the decolonization protocol.

DISCUSSION

This report describes a prolonged MRSA outbreak, the measures taken to identify and interrupt the source of transmission, and the discovery of a rare MRSA clone. Several studies document the role of nursing workload and staffing patterns in the spread of MRSA and closing the unit to new admissions as an effective control measure [6]. However, decreasing workload (by closing the unit to new admissions) and good adherence to infection control did not appear to play a significant role in the limiting the spread of this pathogen, since MRSA transmission continued to occur, despite generally good adherence to contact precautions, environmental cleaning, and reduced census. MRSA transmission was ultimately contained after the unit was completely closed and terminally cleaned, and after all staff received decolonization and culture positive staff were barred from treating patients until they testing negative. A single source for this outbreak was not identified but we surmise that personnel were the most likely source of the MRSA given the continued spread of MRSA despite adequate infection control and that the nurse and physician who tested positive for the outbreak strain had significant contact with all the patients and their wounds. Of note, 4 patients were identified after discharge while they were receiving outpatient therapy for their burns and their only ongoing connection to the facility was personnel who treated both in and outpatients. However, other forms of transmission could not be ruled out.

Upon CDC review of the PFGE pattern, it was determined that the outbreak isolate was the Brazilian "clone" rarely seen in the United States. The Brazilian clone is the most common type of MRSA in parts of South America and has been reported in Hungary and Portugal, Argentina, Uruguay, Chile and the Czech Republic [3]. We know of only one other report of this strain causing an outbreak in the United States. In previous publications, it has been recognized that a substantial number of hospital-acquired infections are caused by unique MRSA epidemic clones, and these organisms should be recognized as a major global health problem [1,5]. Also, in addition to the outbreak strain there were five distinct MRSA strains identified among the patients and staff, and three distinct MRSA strains identified in the environmental cultures, of which two of the environmental MRSA strains were not represented in the patient strains and two of the patient strains were not found in the environment. It is notable that the majority of environmental isolates were the community-associated, USA 300 strain, which has been linked to outbreaks of skin infections, yet no patient had evidence of this strain. It is possible that the adherence to infection control prevented the spread of this strain (and the other non-outbreak strains) from the environment to the patients.

This persistent MRSA outbreak lasted 2 months. The organism endured in the burn unit despite enhanced infection control measures and the diligence of the staff. It is controversial to screen healthcare personnel for MRSA during an outbreak. Our standard policy is to not perform surveillance cultures on healthcare personnel as part of the initial response to controlling an outbreak because it is unclear what to do with non-epidemiologically linked personnel who are colonized with significant organisms. However, in the situation of continued transmission despite aggressive infection control, early screening of epidemiologically linked staff for MRSA and surveillance cultures may be helpful to determine the source of transmission and prevent further transmission.

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COMMUNITY-ASSOCATED METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* IN THE LOS ANGELES COUNTY JAIL: A 4-YEAR REVIEW

BACKGROUND

Methicillin resistant *Staphylococcus aureus* (MRSA) is well known as a nosocomial (healthcare acquired) pathogen. However, since the 1990s, MRSA has been increasingly recognized as a community pathogen. Community associated MRSA (CAMRSA) is distinguished from healthcare associated MRSA (HAMRSA) by clinical and molecular characteristics—HAMRSA is associated with invasive disease (pneumonia, bloodstream infections, surgical site infections) in older persons who have significant exposure to healthcare while CAMRSA causes mostly skin and soft tissue infections, which are often misdiagnosed as "spider bites." CAMRSA tends to be sensitive to many oral antibiotics whereas HAMRSA, especially in intensive care units, may only be sensitive to intravenous antibiotics. CAMRSA is further distinguished from HAMRSA by the presence of genes for Panton-Valentine leukocidin (PVL), a potent toxin that causes tissue necrosis, and is associated with skin inflammation. Furthermore, CAMRSA and HAMRSA have distinctly different pulsed-field gel electrophoresis (PFGE) patterns, indicating that they derived from different strains of *S. aureus*.

Outbreaks of CAMRSA have been frequently documented in sports teams, the military and correctional facilities where close, crowded living conditions, sharing personal items, and suboptimal hygiene prevail. Outbreaks in correctional facilities are particularly important because in 2004 more than 2 million people were held in correctional facilities in the United States and were therefore at increased risk for acquiring this disease. Despite several reports of CAMRSA in correctional facilities, there are few reports describing the changing epidemiologic trends in this environment. Here we describe four years of epidemiologic trends of MRSA infections in the Los Angeles County Jail—the largest jail in the United States.

Inmates at the Los Angeles County Jail (LACJ) started to complain of "spider bites" in September 2001. In response, the Jail Medical Services instituted a "spider bite" protocol that consisted of, in part, culturing the lesion and treating the inmate an oral antibiotic, an antihistamine, and painkillers. MRSA was first identified in such lesions in February 2002. Several spiders were captured in the spring of 2002 and identified as non-biting species by the Los Angeles County Department of Health Services (LACDHS) entomologist, but nonetheless, the LACJ applied pesticides to inmate quarters. When application of pesticides did not abate the cases of MRSA skin infections, LACJ contacted the ACDC. An investigation was launched to determine the incidence of newly acquired MRSA in the inmate population; treatment and control measures were also recommended.

METHODS

Setting: The LACJ is comprised of seven facilities, of which only one is dedicated to women. Male inmates are routinely transferred between facilities for security purposes. LACJ primarily uses one hospital for all hospital care (reference hospital "A"). From 2000–2004, there were 162,406–179,314 admissions per year. The average daily inmate population fell from ~20,000 (19,297) in 2000 to 17,451 in 2004 primarily because of early release programs instituted during this time. Hygiene standards are regulated by Title 15 of the California Code of Regulations which require that inmates be offered the opportunity to shower three times a week and new underwear be offered twice a week while new jumpsuits and bedding need only be offered once a week. During this time period, females lived primarily in large, open dorms with access to showers 18 or more hours per day. Males lived in a combination of open dorms with daily access to showers and 4–6 man cells with limited shower privileges.

Epidemiologic Investigation: An incident case was defined as an inmate of the LACJ who had a MRSA positive culture from a wound site or blood specimen from January 2002 through December 2005. Cases were identified by staff at LACJ and from a monthly list of positive culture results from the LACJ reference laboratory that processed all cultures taken on non-hospitalized inmates. Cases diagnosed at a referral hospital used by the LACJ (hospitalized inmate cases) were recorded separately and are not part of this

analysis. Inmates with more than one positive MRSA culture during a LACJ admission were counted as an incident case in the first month a positive culture was recorded and subsequent positive MRSA cultures from the same inmate were not recorded as incident cases though additional wound sites and antibiotic susceptibility results were abstracted.

Reference laboratory reports were used to identify the susceptibilities of the MRSA isolates to the following antibiotics: gentamicin, trimethoprim-sulfamethoxazole (TMP-SMX), clindamycin, erythromycin, vancomycin, and tetracycline. In addition, personnel at LACJ provided the following demographic and supplemental information: birth date, gender, admit date to the Jail, Jail facility at the time of culture, culture date, wound site, and antibiotic treatment. Race/ethnicity was a variable added in mid-2005. LACJ personnel also provided data regarding the total number of admissions to the Jail each year.

Cases were analyzed by month of culture date, gender, age, race/ethnicity, wound site, LACJ facility at the time of culture, and by time (in days) between admission to the Jail and date of culture. Cases cultured ≤5 days after the date of admission to LACJ are presumed to have acquired their infections from the community and those cultured >15 days are presumed to have acquired while in LACJ. Antibiotic susceptibility trends for MRSA skin and soft tissue cultures were analyzed yearly.

Data were entered into an Access 2002 database and were analyzed using SAS version 9.1. Analyses are presented as whole numbers and percentages.

Laboratory Investigation: In 2002, randomly selected MRSA isolates from outpatient (n=7) and hospitalized (n=5) inmates with wound infections were analyzed by PFGE at the Los Angeles County Public Health Laboratory and compared to a national database of MRSA isolates.

Infection Control: In August 2002, LACDHS issued the following recommendations: screen inmates on admission to the Jail for skin lesions; culture all inmates with skin infections; use empiric antibiotics (if needed) for skin infections that cover MRSA including clindamycin or TMP-SMX; double the laundry exchanges, increase environmental cleaning, and educate inmates and guards about MRSA. Targeted education about MRSA was developed by LACJ and ACDC. These recommendations were supplemented with monthly (later bi-monthly) task force meetings with LACJ and ACDC personnel.

RESULTS

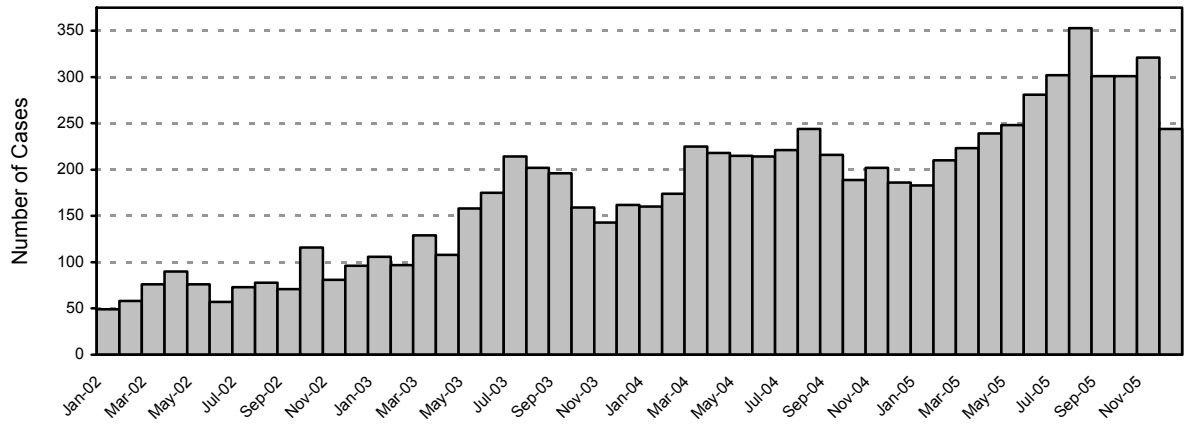
Epidemiology: A total of 921 cases in 2002, 1,849 in 2003, 2,464 in 2004, and 3,214 in 2005 were identified (Figure 1). The incidence of MRSA cases in men increased from 6.1/1000 jail admissions in 2002 to 13.8 in 2005. The incidence of MRSA cases in women increased from 4.3/1000 jail admissions in 2002 to 12.0 in 2005, peaking at 13.8 in 2004 (Table 1). The mean age of cases was 36 years (median 36 years, and range: 17–86 years). The majority (83%) of cases were male. There were no differences in age between male and female cases. Both age and gender distributions were stable over the four years of surveillance. Since mid-2005, most cases were Black (36%), followed closely by Latino (34%), then White (29%). More male cases were Latino than White (36% v. 26%) whereas more female cases were White than Latino (39% v. 26%).

Table 1. Incidence of MRSA per Los Angeles Jail Admissions by Gender*

Year	Male	Female
2002	6.1	4.3
2003	11.1	10.6
2004	13.5	13.8
2005/	13.8	12.0

* Number per every 1,000 admissions.
/ Data unavailable for July, October through December.

Figure 1. MRSA Cases in LA County Jail Inmates
by Month of Culture, 2002-2005



Trends in the acquisition of outpatient MRSA varied over time. The percentage of infections identified >15 days after admission to LACJ (and hence presumed to be acquired in the LACJ) decreased from 76% in 2002 to 41% in 2005; whereas the percentage of infections assumed acquired from the community (those identified ≤5 days) increased from 9% to 36%. However, the total number of jail-acquired cases increased each year from 2002 to 2005 (553 cases to 1729 cases). By the end of 2005, both the number and proportion of community-acquired and jail-acquired MRSA infections approached parity. Acquisition patterns varied by gender—CAMRSA infections were usually identified earlier in female inmates than in male inmates. By the end of 2005, about half (51%) of the female cases were identified in the first 5 days after admission, versus 43% of the cases in male inmates.

Though the overall number of cases of MRSA in the LACJ increased, the absolute number of cases entering from the community increased faster than the absolute number of cases acquired in the facility. Furthermore, the number of cases in inmates diagnosed at referral hospital A increased by 7% from 2004 to 2005 (104 to 111 cases) compared to a 30% increase in the number of cases diagnosed at the LACJ in those years, suggesting that many of the cases identified in 2005 at the LACJ were relatively minor or that LACJ personnel were able to identify cases earlier in their course and provide adequate treatment, forestalling hospital admission treatment.

A seasonal trend in MRSA incidence emerged. Beginning in 2002, case counts peaked during the summer months (July or August) and declined between November and March (Figure 1). Three other peaks in the data are notable including October 2002, March 2003, and March-April, 2004. During these peak months, personnel from LACDHS provided education to healthcare personnel at the LACJ, including reinforcing the recommendation to culture all wound infections. The peaks in cases that month may reflect better surveillance for cases.

MRSA infections were identified on all areas of the body. The predominant locations were legs and feet (30%), followed by arms and hands (23%). MRSA isolates have remained susceptible to clindamycin, rifampin, and TMP-SMX, ranging from 94% to 99% susceptibility since 2002 (Table 2). Of note, there was an increasing susceptibility to tetracycline over the surveillance period.

In 2002, over 50% of incident wound infections each month cultured positive for MRSA and the percent of incident *S. aureus* infections by month that were due to MRSA varied between 66% and 84%. Analyzing

available aggregate data in 2002–2004, the percent of wound infections and percent of *S. aureus* that were methicillin resistant (i.e., MRSA) were 56–65% and 73–78% respectively.

Table 2. Trends in MRSA Antibiotic Susceptibility Among Los Angeles Jail Inmates— Percent of Isolates Susceptible by Antibiotic and Year, 2002–2005

	Year			
Antibiotic	**2002**	**2003**	**2004**	**2005**
Clindamycin	97	97	96	94
Tetracycline	65	76	82	84
TMP-SMX	98	99	99	99
Rifampin	100	99	99	99

Molecular Epidemiology: PFGE results demonstrated one predominant strain seen in all cases, the USA 300-0114 CAMRSA strain. This strain was also seen in several other MRSA skin infection outbreaks since 2002 in Los Angeles County including among men who have sex with men, an athletic team, and hospital newborn nurseries.

DISCUSSION

This summary provides a review of the largest outbreak of CAMRSA known to date. More than 1% of the population in the LACJ acquired a CAMRSA infection each year, more than the current estimate of a general population prevalence of CAMRSA colonization of 0.5%–1%. While the overall number of infections has continued to rise over the four years, there are notable trends that indicate that infection control measures have slowed the growth of jail-acquired CAMRSA. First, the greatest increase in the rate of MRSA occurred from 2002 to 2003 when increased surveillance, not just increased disease incidence, may have accounted for much of that increase. While the number of LACJ identified infections increased by 30% from 2004 to 2005, the number of infections identified by the reference hospital in inmates increased only by 7%. Furthermore, there was a more rapid increase in the number of infections coming from the community in the past 4 years (those identified within 5 days of admission to the LACJ) than the number of jail-acquired infections (identified >15 days after admission to the LACJ). The increase of community acquired MRSA infections is not surprising since it has been noted that the proportion of skin infections seen in a Los Angeles County emergency room due to MRSA increased from 29% in 2001 to 64% in 2004. Others in California have documented CAMRSA in homeless and drug using populations and these populations are disproportionately represented among LACJ inmates. The continually increasing number of infections coming from the community will challenge strategies to control MRSA in the LACJ.

Our analysis employed a cut-off of 5 days after admission to the LACJ to designate cases as “community-acquired” and 15 days after admission to designate cases as “LACJ acquired.” This range was used based on the average incubation period for a *S. aureus* skin infection plus a few days because of the potential delay in being tested at the LACJ. We realize that these designations are arbitrary and that an infection identified in the first 5 days may be a fast growing infection in a recently admitted and exposed inmate or may be due to exposure to MRSA during a previous incarceration and therefore represent LACJ acquired disease. Conversely, those infections identified more than 15 days after admission to the LACJ may be secondary to colonization acquired prior to admission to the LACJ or may be due to a slow growing infection or inmate who did not present to the medical staff upon first onset of symptoms. However, we believe that by dividing the cases into 5 and 15 days after admission, we have balanced sensitivity and specificity in our case definitions.

Several other trends are notable including the seasonal (summer) increase in infections, gender disparities, and antibiotic susceptibilities. Warm weather peaks of CAMRSA have been seen in other studies and the increased incidence of CAMRSA during this time might be due to increased skin-to-skin contact due to outdoor, physical activities with decreased skin coverage by clothes. The greater prevalence of MRSA among women entering the LACJ may be explained by women’s greater healthcare

seeking behaviors and a greater proportion of women incarcerated for drug charges than men in correctional facilities; drug use is a risk factor for CAMRSA. Finally, despite the heavy use of TMP-SMX, clindamycin, and rifampin for empiric treatment of wound infections, this jail strain of MRSA is remaining largely susceptible to these antibiotics. Furthermore, with a decrease in the use of tetracycline as a first line treatment for skin infections (as had occurred prior to 2002), MRSA is becoming more susceptible to this antibiotic.

This study is descriptive and has limitations, which might both under- and over-estimate the number of MRSA infections reported at the LACJ. At the beginning of the outbreak, many LACJ physicians did not culture wound infections so that the number of MRSA infections is probably undercounted early in the outbreak. It is certainly possible that the doubling of cases of CAMRSA from 2002 to 2003 was due to better surveillance. Evidence for this is seen in the peaks of MRSA cases in October 2002, March 2003, and March/April 2004 after DHS physicians directly emphasized to LACJ healthcare personnel the need for expanded culturing of wound infections. Overall, the number of cases recorded here are probably an undercount of the true number of cases associated with the LACJ for the following reasons: inmates may not have felt comfortable approaching security or medical personnel, medical personnel may not have cultured a lesion or the infection (like cellulitis) was not able to be cultured, only skin/soft tissue and blood infections were counted and MRSA can affect the entire body, and inmates may have been exposed to MRSA while in LACJ but not exhibit symptoms of infection until after discharge from the LACJ and those cases would not be counted. Furthermore, we were only able to identify inmates by their booking number, which is unique for each arrest (not each person). Therefore, inmates who had a case of MRSA on one admission to the LACJ and also presented with MRSA on subsequent admissions to the LACJ will be counted as two (or more) incident cases, rather than one. Depending on the recidivism rate, the number of MRSA cases might be artificially inflated. Finally, by only counting incident and not repeat cases of MRSA, we may have underestimated the burden of this disease on this population because we did not count recurrent disease which is a common manifestation of this pathogen.

Jails are short-term correctional facilities and have a high turnover. Unlike a hospital or a sports team, where the goal of complete eradication of MRSA is feasible, the goal in this situation is to mitigate the spread of MRSA in the facility. Current guidelines focus on improving diagnosis, treatment, and personal and environmental hygiene; but it is hard to maintain increased vigilance given the high turnover of inmates and the limited resources that most correctional facilities face. The control measures we recommended were not able to eradicate MRSA from LACJ for several reasons including limited financial resources and limited personnel to ensure cleaning, education, and screening. Furthermore, it is clear that as long as MRSA is prevalent in the outside community, it will be continually re-introduced in the LACJ. More research is needed into determining the greatest preventable risk factors for MRSA in these situations and the most efficacious interventions.

HUMAN RABIES DEATH IN LOS ANGELES COUNTY: FIRST HUMAN CASE IN 30 YEARS

On January 21, 2005, ACDC received a call from the Los Angeles County (LAC) Coroner to report pathology findings highly suspicious for rabies. The decedent, a 22-year-old man who was born in El Salvador, had been in Los Angeles for 15 months prior to his death on October 26. Additional specimens for rabies testing were sent to the CDC, which subsequently confirmed the rabies diagnosis. On January 27, CDC reported that the rabies variant is one not present in the US, but is a canine variant from El Salvador. Interviews with local household contacts and family members in El Salvador revealed no history of animal bites or exposures—however, canine rabies is enzootic in El Salvador, Guatemala, and Mexico, the route he traveled to come to the US. Contact tracing identified at least 30 friends and family members to whom rabies post-exposure prophylaxis was highly recommended. In addition, 9 of 76 healthcare workers at risk were identified to receive post-exposure prophylaxis.

Prior to death, the decedent was seen at three separate LAC healthcare facilities. First on October 19, 2004, the decedent was seen at a clinic complaining of nausea, vomiting, and right lower back pain—a urinary tract infection was diagnosed and he was given antibiotics and pain medication. On October 20, he returned to the clinic for follow up—kidney stones were diagnosed and he was again given pain medication. Later that day he presented to a hospital emergency department with continued right-side flank pain. He was afebrile; records note he had also complained of throat tightness. Evaluation was found to be consistent with kidney stones and he was discharged. That evening, according to household members, he became agitated and confused, and had increased salivation. On October 21, the decedent was admitted to a second hospital with lower back pain and was evaluated for kidney stones. Records show that throughout the course of hospitalization he was combative, confused, and agitated, and displayed excessive salivation. Computerized tomography showed evidence of kidney stones. Records also indicate he had fevers and elevated peripheral white blood cell count. In addition, the decedent became increasingly violent—at one point biting a friend on the wrist and scratching a nurse.

A review of the medical records at the second hospital indicates that the infectious disease physician who evaluated the patient on October 26 included rabies in the differential diagnosis—but Public Health was never notified. The patient's clinical status rapidly declined and he was evaluated for a possible surgical emergency. On October 26, the patient went into cardiopulmonary arrest and died. Specimens for rabies testing and encephalitis work-up were ordered, but could not be completed due to his sudden cardiopulmonary arrest. The LAC Coroner subsequently assumed responsibility for this case.

California law mandates that rabies cases, including suspected cases, be reported immediately by telephone to the local health officer (California Code of Regulations, Title 17, Section 2500). Had this rabies case been recognized and reported sooner, Public Health could have assisted in the diagnosis, and numerous individuals would have likely avoided exposure, injury and prophylaxis.

This case illustrates the importance of considering the complete patient history, especially country of origin and travel history, during diagnosis. While human rabies is very rare in the US, it is more common in other countries—and in particular, in countries whose citizens frequently immigrate to Los Angeles. In fact, the last confirmed human death due to rabies in Los Angeles County, in 1975, was a 16-year-old girl from Mexico who had been living in Los Angeles for eight months—investigation revealed that a dog bit her while she was in Mexico. California is home to the largest number of legal immigrants nationwide, and over one-third of these immigrants settle in LAC. In a 1999 LAC Health Survey, almost one-third of respondents stated they were born outside of the US. In addition, travel and foreign visitors are very common in LAC. In terms of air travel alone, almost 55 million travelers come through the Los Angeles International airport every year, making it the nation's third busiest airport. Moreover, many serious diseases (e.g., SARS, avian influenza) have nonspecific presentations that can easily be misdiagnosed—but it is the epidemiologic factors (i.e., exposure and travel history) that are critical for accurate diagnosis.

With rabies, another important factor that must be considered is the importation of infected animals. While rabies is uncommon among domesticated animals in LAC, in 2004, Public Health investigated two separate incidents—both resulted from the importation of suspected rabies infected dogs [1]. In both instances many individuals were potentially and unwittingly exposed to a deadly disease. Rabies, therefore, should not be excluded from differential diagnosis in LAC. Moreover, all cases suspicious for rabies should be reported immediately to Public Health.

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CORRELATION OF INFLUENZA AND RESPIRATORY SYNCYTIAL VIRUS WITH TOTAL VOLUME OF EMERGENCY DEPARTMENT VISITS IN LOS ANGELES COUNTY

BACKGROUND

This study describes the ability by which total volume of emergency department (ED) visits correlate with influenza activity in the community. In Los Angeles County (LAC), the ReddiNet® system has been employed to survey: total daily volume of emergency department visits, intensive care unit (ICU) admissions, hospital admissions, and deaths from participating hospitals.1 The system has been utilized to facilitate the early detection of large, sudden increases in volume of ED visits. Currently, ReddiNet is a complementary system to enhance influenza surveillance in the community.

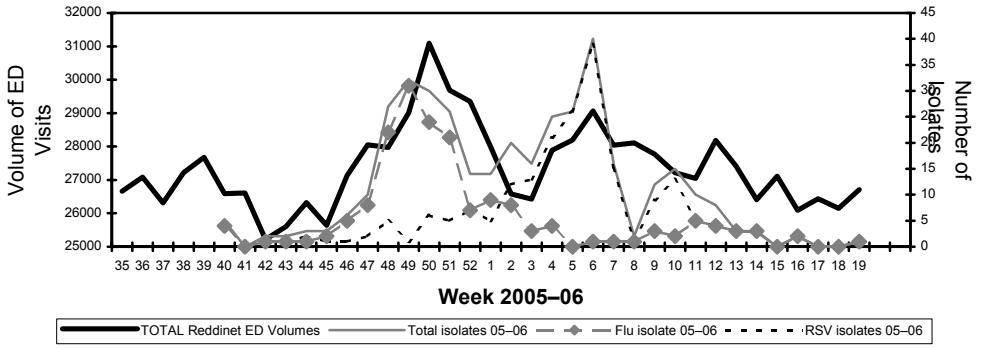
METHODS

For the ReddiNet system, an electronic poll collects ED volume data for the previous day from 65 participating hospitals throughout LAC. Utilizing total volume of ED visits collected by the ReddiNet system, hospitals with >90% daily reporting (39 hospitals) during the 2005–06 influenza season were selected for this retrospective analysis. Selected hospitals were well-distributed geographically, representing 57.7% of total licensed beds. Positive influenza and respiratory syncytial virus (RSV) isolate counts were obtained from the LAC Public Health Influenza Surveillance project for comparison.2

RESULTS

The distribution of total emergency department visits for the selected hospitals revealed a first peak corresponding with total volume of laboratory positive influenza isolates and a second peak corresponding with total volume of laboratory positive respiratory syncytial virus (RSV) isolates. Due to the biphasic nature of this trend, a correlation coefficient ($r=0.73$; $p<0.0001$) was calculated between total ED volume and total number of laboratory positive isolates (influenza and RSV), suggesting the two temporal trends are strongly correlated. Taken separately, a strong correlation was found between total ED visits and influenza ($r=0.63$; $p=0.001$); however, the correlation observed between total ED visits and RSV was not statistically significant ($r=0.26$; $p=0.2160$).

Figure 1. Distribution of Total Emergency Department Visits, Positive Influenza Isolates, Positive RSV Isolates, and Total (RSV and Influenza) Positive Isolates by Week from September 2005–May 2006.



1. Additional information abut the ReddiNet system is available at: www.reddinet.com
2. The methods for obtaining influenza and RSV isolates for Los Angeles County surveillance have been described previously at: http://159.225.130.92/acd/docs/flu%20special%20report.pdf

DISCUSSION

ED volume surveillance systems strongly correlate with virologic test results. Studies are under way to evaluate additional algorithms for assessment of ED volume data to further enhance detection of influenza prospectively. Future studies would profit from collaborative studies with syndromic surveillance systems to obtain syndrome and age categories of ED visits for further assessment of disease burden from RSV and influenza in LAC [1]. The main limitations of this study were the inability to stratify data by age or syndrome categories, and the lack of information regarding total number of influenza and RSV tests performed. In addition, increasing sentinel influenza surveillance sites could capture a more representative population of LAC.

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A SUBURBAN NEIGHBORHOOD OUTBREAK OF MURINE TYPHUS SOUTH PASADENA, MAY 2005

BACKGROUND

Murine typhus is an acute febrile illness resulting from infection with *Rickettsia typhi*—a small Gram-negative, obligate intracellular bacterium. It is transmitted to humans by flea bites and contamination of the bite site or skin abrasions with *Rickettsia typhi*-containing flea feces. Murine typhus is known to be endemic in southern California and Texas—most cases in these two regions have occurred in the absence of the classical transmission cycle; i.e., the flea vector (*Xenopsylla cheopis*, and the oriental rat flea) and the rodent host (*Rattus norvegicus*, the brown rat). However, peridomestic opossums and their fleas have shown to play an important role in murine typhus transmission—especially in urban and suburban areas of Los Angeles County (LAC). Annually, approximately 8 to 17 murine typhus cases are reported in LAC. Most cases are residents of central LAC foothills. Transmission of infection is most likely due to reservoir animals such as opossums and rats that live in these areas with heavy foliage.

In mid-May 2005, ACDC investigated an outbreak of murine typhus involving residents a single street block in South Pasadena. The index case was hospitalized on May 14 at a medical center in the San Gabriel Valley with a febrile-rash syndrome and was initially suspected of having West Nile virus (WNV) infection. Subsequent serologic laboratory studies supported the diagnosis of murine typhus. Further investigation was prompted when ACDC subsequently received telephone calls from the index case's neighbors experiencing similar compatible symptoms. Ultimately, two confirmed, two probable and two possible cases were documented (see case definition below).

METHODS

Case Finding: Murine typhus is on the list of reportable communicable diseases within LAC. The index case was diagnosed and reported from a large medical center in the San Gabriel Valley on May 14, 2005. Following this report, the LAC Department of Health Services (DHS) Communication Office drafted and disseminated a press release that: 1) described the ongoing investigation of murine typhus, 2) advised clinicians to report suspect cases to Public Health, and 3) recommended that individuals with signs and symptoms consistent with murine typhus seek medical care. The press release was circulated to local newspapers in known typhus endemic areas and posted on the LAC DHS website. In addition, a heath alert network (HAN) communication summarized the press release and was disseminated to emergency rooms and clinicians. Residents of households within three blocks were notified of the ongoing investigation, provided with health information, and were requested to seek medical attention should they develop compatible symptoms. Finally, since an elementary school was located across the street from the investigation site, a letter was sent to all parents and students of this school that advised them of the outbreak investigation and recommended that they seek medical attention should they develop consistent symptoms of infection.

Investigation: An ACDC public health nurse interviewed each suspected case, completed a standardized case history report and reviewed hospital or clinic medical records if available. The Alhambra district public health nursing unit assisted with obtaining specimens for confirmation of these suspected cases.

Laboratory Testing: Free serological testing by immunoflourescent antibody (IFA) was provided through the LAC Public Health Laboratory (PHL) for diagnosis and confirmation of cases. In addition, serum already tested at commercial laboratories were also sent to LAC PHL for additional confirmatory IFA testing.

Environmental Investigation: On May 25, LAC DHS sent an environmental health specialist, an epidemiologist, and a public health nurse to conducted interviews and inspect the homes and yards of three of the four suspect households. The environmental health specialist inspected the properties for overgrown foliage, rats, and opossums. Educational materials on murine typhus was distributed to the

households within three surrounding blocks of the suspected households and to the local elementary school located across the street of the index case.

Case Definitions:
- *Confirmed*: Laboratory confirmation of murine typhus infection plus consistent clinical signs and symptoms including at least two of the following: fever, headache, myalgias, rash or fatigue with supporting. Confirmation was defined as paired serological specimens showing at least a four-fold rise in IgG antibodies between acute and convalescent sera.
- *Probable*: At least two clinical signs and symptoms consistent with murine typhus infection without a supporting alternative diagnosis, but only a single supportive positive serological test suggesting recent infection (IgM > 4 times and/or IgG > 4 times normal).
- *Possible*: At least two clinical signs and symptoms consistent with murine typhus infection without supporting alternative diagnosis, but no laboratory results to support the diagnosis.

RESULTS

Surveillance for cases revealed a total of six cases (Table 1), two female (including the index case) and four male. The average age of the cases was 46.7 years (median 49 years). Of the six cases, illness was confirmed in two cases (the index case and her son), probable in two cases and possible in two cases. Onset of symptoms occurred within roughly 2 weeks of each other during March 2005.

Index Case (Case 1): The index case was a previously healthy 49 year-old female who reported symptom onset on May 6, 2004. She reported a history of fevers up to 104^{o} F, nausea vomiting, fatigue, muscle pain and a faint macular-papular rash on her chest and abdomen. She sought medical care and was diagnosed with a viral syndrome by her primary care physician. After eight days of persistent symptoms, she was admitted to a local medical center with a diagnosis of fever and dehydration. Her treatment revealed elevated transaminases five times normal values; however, a viral hepatitis panel was negative. Her blood and urine cultures were negative and radiological studies were normal. During her hospitalization, an infectious disease consultation was completed where animal, mosquito, travel, and flea exposures were queried. She reported she had recently found three dead possums on her property and has two indoor/outdoor cats with recent histories of flea bites. Both murine typhus and WNV serologies were subsequently ordered. Acute murine typhus serology revealed borderline positive IgM and negative IgG. Convalescent serology drawn two weeks later was strongly positive—both IgM and IgG had increased 16-fold since her acute serology (Table 1). Her WNV serology was IgG positive but IgM negative. The case was treated with a short course of doxycycline and improved quickly.

Case 2: Approximately 10 days after her symptom onset, her 10 year-old son also reported experiencing fevers, fatigue, and muscle weakness without rash. He was seen by his pediatrician and was diagnosed with a “viral syndrome.” Upon request, murine typhus serologies were obtained, but did not support the diagnosis of acute infection. Convalescent titers, obtained two weeks later, were strongly positive (1:1024 IgM and IgM), thus supporting the diagnosis of murine typhus. The son’s symptoms resolved on without treatment.

Cases 3 through 6: Four additional suspected cases were investigated—all residing in households on the same street as the index case. Two of the four cases (Case 3 and Case 6) were classified as *probable* since both had clinical signs and symptoms consistent with infection and a single supportive serological specimen; these cases were not hospitalized, but treated with doxycycline and improved rapidly. Both had convalescent serologic evaluation taken 10 and 18 days after symptom onset. Case 3 had IgG and IgM titers 16 times the normal value and Case 6 had IgM two times normal and IgG eight times above the cut off.

Two additional cases (Cases 4 and 5) had symptoms suggestive of murine typhus without any other explanation. In both cases, serologic testing either did not support the diagnosis or was not obtained. As such, both were classified as *possible* cases. Because of his age (81 years), Case 4 was hospitalized to rule out sepsis and was found to be hypotensive. His onset date was 17 days after the index case. An acute murine typhus serology was obtained during his hospitalization, but being within the normal cut off

Table 1. Murine Typhus Investigation, South Pasadena, California, May 2005

Patient Suspect	House-hold	Case Status	Age (yrs.)	Sex	Date Symptom Onset	Symptoms	Hospital-ization	Acute Serology*	Convalescent Serology*	Other Tests	Animal Exposures
Index Case 1	1	Confirmed	49	F	5/6/05	Fever, rash, headache, myalgia, nausea/vomiting	3 days 5/14/05 to 5/17/05	5/16/05 IgM 1:256 IgG <1:64	6/2/05 IgM 1:512 IgG 1:512	WNV+ IgG Elevated tranaminases	3 outdoor cats; 1 dog; 3 dead opossums noted in backyard.
Case 2	1 (Son of Index Case)	Confirmed	10	M	5/16/05	Fever, headache, chills, myalgia	None	5/20/05 IgM <1:64 IgG <1:64	6/7/05 IgM 1:1024 IgG 1:1024	None	Same as index. (above)
Case 3	2	Probable	59	M	5/13/05	Fever, headache, chills, myalgia	None	5/27/05 IgM >1:1024 IgG >1:1024	Not completed	None	No cats. Rodents and opossums noted nearby and under home within 2 weeks of onset.
Case 4	3	Possible	81	M	5/23/05	Fever, headache, chills, myalgia	None	5/24/05 IgG <1:64 IgM <1:64	Not completed	None	Unknown**
Case 5	3	Possible	26	M	5/15/05	Fever, headache	None	Refused testing	Not completed	None	Unknown**
Case 6	4	Probable	49	F	5/14/05	Fever, headache, chills, myalgia	None	6/17/05 IgG 1:128 IgM 1:512	Not completed	None	1 outdoor/indoor cat; 2 dogs. Rodents observed in house, garage and neighborhood. Opossums seen outside home.

* All listed results completed by the Los Angeles County Public Health Laboratory.
** While animal exposures are unknown, this household is nearby the households of the other cases and substantial overgrowth was noted during environmental investigation.

values this did not support the diagnosis of murine typhus infection. Unfortunately, Case 4 would not consent to convalescent serologic laboratory testing. Case 4 was presumptively treated with doxyclyine and recovered. Case 5 was the nephew of Case 4 and also resided in the same household. He reported fever and chills for seven days—nine days after index case's onset. Case 5 refused any offers to have serologic testing. He recovered without treatment.

Environmental Investigation: A site investigation conducted May 24 did not reveal any opossums (live or dead) on the four properties of the six cases; however, the cases of three of the households (representing Cases 1, 2, 3, and 6) self-reported the presence opossums. Most notably, the index case reported that three dead opossums had been removed by animal control a few weeks earlier—this is significant considering the index case and her son (Case 2) were the only cases with confirmed infection in this investigation.

In addition, during the environmental investigation tree rats were noted on the property of the index case and her son (Case 1 and Case 2) and on one of the neighboring households (Case 3). In addition, significant overgrown vegetation was noted on all four properties. No additional trapping for opossums or rats, cat serological testing, or flea collection was completed during this investigation.

DISCUSSION

Murine typhus is an established endemic vector-borne disease in LAC. Surveillance has demonstrated it is localized to hillsides and adjoining communities of Pasadena, Alhambra, South Pasadena, and Los Feliz. Fortunately many clinicians, especially infectious disease clinicians, in these endemic areas are aware of the risks and order appropriate diagnostic testing.

Despite extensive outreach to find additional murine typhus cases, only two definite, two probable, and two possible cases were found on one street block of adjacent houses—no additional cases were found on adjoining streets. Although small clusters of murine typhus cases have been documented in past years, this is the largest outbreak of cases that ACDC has documented. It is interesting that the outbreak involved four households within one city block in South Pasadena. Cases occurred within a 17-day period in May after a large opossum die-off was noted by the index case. Three of the four households (representing four of the six cases) reported seeing opossums in their yards and also had indoor/outdoor cats. It is possible that cat fleas (*Ctenocephalides felis)* were infected with *R. typhi*. Since, none of the domestic cats or neighborhood cats was tested for evidence murine typhus infection, it is unknown whether cat fleas were the source of the human infection.

Murine typhus is generally benign but may cause severe disease including hepatitis, pneumonia, meningitis, and rarely death. Two of the cases in this investigation (Case 1 and 4) required hospitalization. The index case, Case 1, appeared to have the most severe disease with evidence of hepatitis. And Case 4, the elderly neighbor, had a septic picture with mental status changes. A thorough infectious disease work-up could not pinpoint an etiology; acute serological specimens were in normal range, but the patient refused convalescent blood testing.

For both Cases 1 and 2, convalescent titers were available to confirm the diagnosis of murine typhus. Most infectious disease and public health specialists recommend convalescent titers when the diagnosis is suspected. Currently, there is no established national or state case definition for murine typhus; however, in many serologically diagnosed viral diseases, both acute and convalescent serologies are required to make the diagnosis. In our index case, Case 1, although she experienced compatible symptoms for at least 10 days, she had normal IgG with a strongly positive IgM acutely, and her convalescent test demonstrated a four-fold rise in IgG with a four-fold decline in IgM. Interestingly, her son (Case 2) had normal IgG and IgM acutely, but his convalescent tests were both strongly positive (> 4 fold rise). It is possible that many cases in LAC are missed because clinicians obtain only an acute serology, which can be negative early in infection.

Murine typhus infection can be prevented through flea control measures on pets and in the yard. Foliage in the yard should be kept trim so that it does not provide harborage for small mammals. Screens can be placed on windows and crawl spaces to prevent entry of animals into the house. It is possible that heavy seasonal rainfall in 2005 contributed to overgrowth of plantings and increased populations of opossums.

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General information about murine typhus is available from the ACDC website at www.lapublichealth.org/acd/vectormurine.htm

VARICELLA ACTIVE SURVEILLANCE PROJECT (VASP) 2005 SUMMARY ANTELOPE VALLEY, CALIFORNIA

BACKGROUND

While usually a mild childhood disease, varicella tends to be more severe in adults, neonates, and immuno-compromised persons and has the capacity to lead to complications that may include pneumonia, encephalitis, and sometimes death. Prior to 1995, about 4 million cases of varicella occurred annually in the US. Of these cases, approximately 11,000 were hospitalized and 100 died (CDC, unpublished data, 1999). When the varicella vaccine was approved for use in 1995, the Los Angeles County (LAC) Department of Health Services (DHS) and the Center for Disease Control and Prevention (CDC) entered into a cooperative agreement to establish active surveillance for varicella in Antelope Valley. The resulting program, the Varicella Active Surveillance Project (VASP), has collected baseline data on varicella incidence, outbreaks, and vaccine coverage since 1995. In 2000, surveillance was enhanced with the addition of herpes zoster (HZ)—for children and adolescents 19 years of age and younger, case interviews and chart reviews have been systematically completed since 2000. As a consequence, the collection of baseline adult HZ and PHN incidence will be an important public health priority. VASP will be collecting detailed case history on all reported cases of HZ and has also added surveillance sites that will better capture adult HZ with the addition of all skilled nursing facilities, dermatology practices, pain management clinics, and additional internal medicine practices. It will be important to track the impact of this new vaccine with regards to its impact on morbidity and hospitalization due to adult HZ.

METHODS

Population Demographics: The Antelope Valley (AV) is a well-defined geographic area, covering approximately 2,000 square miles in the northern eastern section of LAC and includes over 35 communities. In 2005, there were an estimated 350,000 residents: 51% White, 30% Hispanic, 18% African American, and 4% Asian.

Case Definitions: For the purposes of our surveillance the following definitions were employed.

- *Varicella case*—has illness with acute onset of a diffuse papulovesicular rash without other known cause diagnosed or reported by a healthcare provider, school nurse, or parents/guardians.
- *Breakthrough varicella case*—has had documented varicella vaccine at least 42 days prior to onset of varicella.
- *HZ case*—has a unilateral macular-papular or vesicular rash, involving at least one dermatome, diagnosed by a licensed healthcare provider.

Each HZ or varicella case with a completed case interview and/or chart review that validates the case definition and resides within the surveillance area is considered a *confirmed case*. If a provider, reports a HZ or varicella case that cannot be validated with case interview or chart review it is considered a *probable case*.

Data Collection: In 2005, 286 surveillance sites participated VASP's project. Sites included: public and private schools, day care centers, public health clinics, pain management clinics, long term care facilities, adult day care, hospitals, private practice physicians (pediatrics, family practice, neurology, dermatology, and internal medicine), health maintenance organizations and correctional facilities. All reporting sites submitted a "Varicella/Zoster Surveillance Case Log" to VASP on a biweekly basis and applicable reporting sites submitted a "Varicella Vaccine Log" on a monthly basis—this reports all administered varicella doses administered that month.

A member of VASP conducted a structured telephone interview with each case or their parent/guardian. This provided detailed demographic, clinical, and health impact data, as well as identified any additional cases or susceptible contacts within the household. Previous varicella vaccine exposure was documented by one of three methods: provider documentation, vaccine card, and school vaccine records. Data entry

for varicella and HZ was entered into an MS Access database and analysis performed with SAS 9.1. Completeness of reporting was estimated using capture-recapture methods.

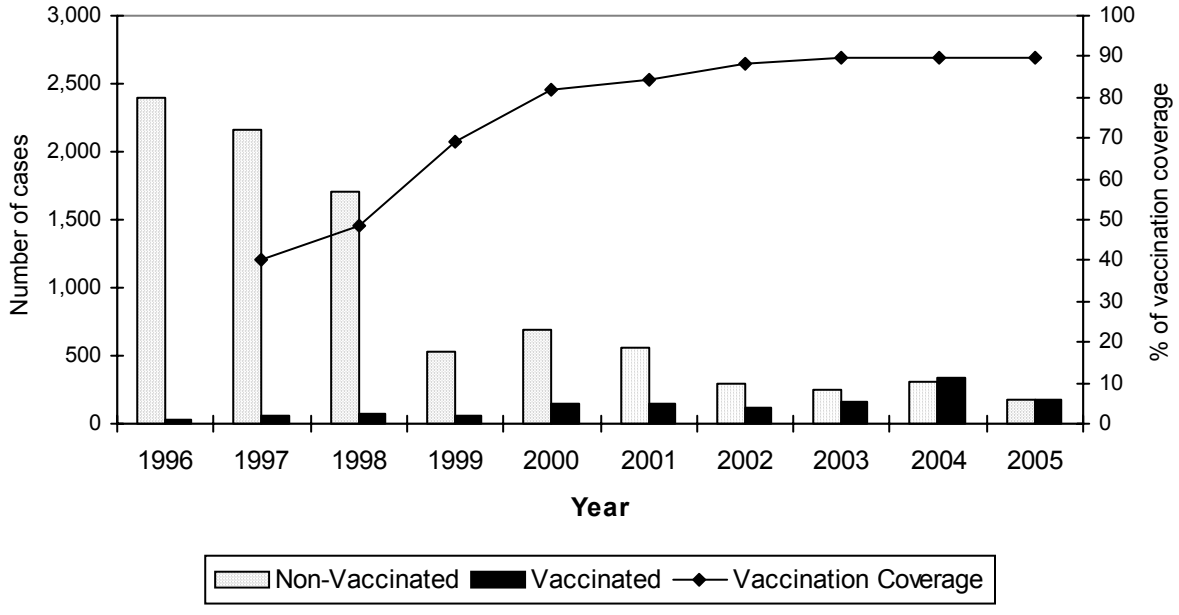
RESULTS

Varicella Disease: Compared to the number of verified varicella cases reported in 1995 (2,934 cases), cases declined by 87% in 2005 (355 cases). This corresponds to an overall decline in varicella incidence from 10.3 per 1,000 persons in 1995 to 1.0 per 1,000 persons in 2005. Looking specifically at 2001 through 2003, the overall varicella incidence remained relatively unchanged (1.2 per 1,000 persons); however, in 2004, varicella incidence increased to 1.8 cases per 1,000 persons and then declined to 1.0 per 1,000 in 2005. Since 1995, the 5-9 year-old age group has had the highest varicella incidence of any age group. The 10-14 year old age group has shown the second highest rates with 3.7 per 1000 persons in 2005. There has been a consistent trend of increasing age of varicella cases—the mean age increased from 9.6 to 10.5 years in 2004 and 2005, respectively.

Since 1995, the hospitalizations from varicella infection have significantly declined. In 1995, 12 hospitalizations due to varicella were reported. In contrast, from 2000 to 2005, between zero to three hospitalizations were documented annually—no hospitalizations due to varicella were reported in 2005. The number of complications after varicella infection also was significantly less in 2005—only 1 (0.28%) case reported complications (otitis media), compared to 17 (4.2%) and 22 (3.4%) cases with complications reported in 2003 and 2004, respectively.

The proportion of reported and verified breakthrough varicella cases has steadily increased since initiating this project from 1% in 1996 to nearly 49% of cases in 2005 (Figure 1). Yet the cumulative breakthrough cases as a percentage of the cumulative vaccine doses remained almost unchanged with 1.97% and 2.0% reported in 2004 and 2005. The median age of breakthrough cases has steadily increased; the median age was 5.7 and 8 years in 2000 and 2005, respectively.

Figure 1. Non-Vaccinated versus Vaccinated (Breakthrough) Cases and Vaccination Coverage by Year



The number of documented varicella outbreaks has shown a consistent decline from 81 reported in 1995 to 7 in 2003. However, in 2004, the number of documented outbreaks increased dramatically to 25. In 2005, the number returned to a level similar to 2003 with eight documented outbreaks (104 cases). Of these eight outbreaks, six occurred in elementary schools and two middle schools. These outbreaks had an average of 13 cases per outbreak. The mean age of the varicella cases was 11.3 years; 48% of the cases were classified as breakthrough.

HZ Surveillance Among Those Younger Than 20 Years of Age: Both verified HZ cases and HZ incidence rates for children and adolescents younger than 20 years of age have steadily decreased during the past six years of surveillance. The overall incidence among those younger than 20 years of age was 67 per 100,000 persons in 2000 then decreased to 49 per 100,000 in 2005. The decline in HZ incidence has been even more significant among those younger than 10 years of age—from 76 per 100,000 persons in 2000 to 27.8 per 100,000 in 2005. Overall, most cases have been older than age 10—in 2005, 42.8% reported from the 15-19 year old age group, 33.9% from the 10-14 year old age group, the median age was 15 years. Increasingly, reported cases of HZ have had a natural history of varicella infection compared to those with a history of previous vaccination. In 2005, 78% (n=44) of the HZ cases had a positive history of varicella, 12.5% (n=7) had a history of vaccination, 3.5% (n=2) recalled both, and 5.4% (n=3) could not be documented. There were no hospitalizations in children and adolescents due to HZ in 2005.

Over the past five years, an average of 341 cases per year of adult HZ (aged 20 years and older) were reported to VASP. Reported adult cases were not verified by medical chart review or case interview. In 2005, 366 cases were reported with a mean age of 56.6 years. Racial data was not consistently reported for this group. In 2005, the highest age-specific incidence was noted among those 70 years and older with 4.7 cases per 1,000 persons.

DISCUSSION

Over the length of the study, there has been a rising proportion of reported varicella that can be classified as breakthrough varicella disease. In more recent years, the proportion has increased from 15% in 2000 to 49% in 2005. This increase of breakthrough varicella in both outbreak and non-outbreak settings provides supports for the recent Advisory Committee on Immunization Practices (ACIP) discussions for the need for a second varicella vaccine booster dose for elimination purposes.1 The timing of the booster varicella dose remains under discussion by ACIP at this time. However, the ACIP has recommended that, in varicella outbreak situations, a second varicella dose should be provided to individuals who have been previously vaccinated. The implementation of this recommendation will be a challenge and is under discussion with the Immunization Programs at both the State of California and LAC.

The consistent documentation that HZ incidence has remained unchanged in the under 20 group, and has significantly declined among those the under 10 years old, should allay fears that varicella vaccination might actually *increase* the risk of future HZ in children. These findings have been summarized in a manuscript describing the epidemiology of HZ in pediatrics and adolescents in the Antelope Valley. The manuscript has been submitted for consideration to the *Journal of Infectious Disease*.

In 2005, much effort has been put into the preparation of an adult HZ case report form and strengthening surveillance by increasing methods that will capture adult HZ. This has lead to increased outreach to skilled nursing facilities, dermatology, internal medicine and to pain management clinics by VASP. In 2006, VASP plans to implement the new adult HZ case report and follow-up on individual HZ cases that are experiencing post-herpetic neuralgia. We hope obtain accurate baseline incidence rates prior to the implementation of the adult HZ vaccine.

1 CDC. Prevention of Varicella—Provisional Updated ACIP Recommendations for Varicella Vaccine Use. Available at: www.cdc.gov/nip/vaccine/varicella/varicella_acip_recs.pdf, last accessed June 1, 2006.

ONGOING RESEARCH PROJECTS

- **Knowledge, Attitudes and Practices (KAP) of Healthcare Providers Regarding Varicella Vaccination.** Surveys were sent to all identified pediatric and family practice physicians, physician assistants, and nurse practitioners in the Antelope Valley to assess their knowledge, attitudes, and practices regarding varicella vaccination 10 years after its introduction. Questionnaire data has now been completed and data analysis is in progress.

Validity of Self-Reported Varicella History among Women in an Antenatal Clinic Population. The objectives of the project are to assess overall varicella seroprevalence among women in an antenatal clinic population, assess the validity of self-reported varicella disease history compared with varicella-zoster virus (IgG) antibody results, and assess follow-up vaccination rate among seronegative enrollees. The project was conducted in collaboration with both CDC's Herpes Viruses Team and Varicella Zoster Virus laboratory. Overall seropositive rate of enrollees was 97.2% (95% CI: 95.4-98.4); this rate was comparable to NHANES III rate of 96.3% (95% CI: 95.7-96.9). The positive predictive value (PPV) of self-reported varicella disease history among enrollees was 99.7% (95% CI: 98.2-100) and the negative predictive value (NPV) of a negative or uncertain disease history was 6.3% (95% CI: 3.5-10.4). Study findings indicate that self-report history of varicella continues to be a strong predictor of positive serology (varicella immunity) while negative or uncertain history is still a poor predictor of negative serology. A poster presentation was completed at the 40th National Immunization conference in Atlanta summarizing the findings from VASP in the Antelope Valley. A manuscript summarizing the combined findings from VASP West Philadelphia and Antelope Valley will be submitted in 2006.

DEATHS AND ILLNESS FROM HYDROGEN SULFIDE AMONG SHIP WORKERS LOS ANGELES, CALIFORNIA

BACKGROUND

On September 2, 2005, ACDC was notified of three deaths occurring in the propeller room of a cruise ship docked in the Port of Los Angeles. Initial reports suggested that the deaths were related to hydrogen sulfide poisoning occurring while crewmembers were attempting to fix a pipe in the propeller room on the ship. This situation is the first known cluster of deaths caused by hydrogen sulfide poisoning on a cruise ship.

Hydrogen sulfide, a colorless gas and asphyxiant produced from decaying sulfur-containing materials, is the second leading cause of toxin-related deaths in the US. The gas has a noxious odor of "rotten eggs" and is found in industries including rayon dye production, heavy water production, petroleum refining, natural gas, asphalt, waste management, and the fishing industry. Hydrogen sulfide has a density slightly greater than that of air and is therefore commonly found in confined spaces on the bottoms of tanks, hot springs [1], manure pits [2], and holding spaces on ships that contain decaying food [3]. Additionally, hydrogen sulfide is generated by decay of organic material by anaerobic bacteria.

Acute hydrogen sulfide exposure may cause symptoms ranging from mucous membrane irritation to neurologic impairment and cardiopulmonary arrest. Hydrogen sulfide gas is commonly called a "knock-down agent" because acute exposure may lead to rapid loss of consciousness and death. Many case reports have described this rapid toxicity that leads to death in both those primarily exposed and in those who try to rescue the primary victim [4]. Inhaled levels of hydrogen sulfide greater than 700 ppm^2 are immediately fatal [5]. According to the Census of Fatal Occupational Injuries (CFOI), a database run by the United States Bureau of Labor Statistics (USBLS), 52 workers died of hydrogen sulfide poisoning between 1993 and 1999. One fifth of these 52 deaths were accompanied by a co-worker fatality [4]. The majority of fatalities were reported in white males in their first year of employment, most commonly working in waste management, petroleum or natural gas work.

METHODS

On September 2, 2005, ACDC received a call from the Port of Los Angeles to report three deaths in the propeller room of a cruise ship and 19 possibly ill crewmembers that responded to this event. An investigation began at 2:00pm September 2, 2005. ACDC staff conducted interviews with port authorities, port police, cruise ship authorities, and receiving. An informal environmental inspection was conducted at 8:00am the following morning. Clinical information on the three deceased workers and 19 responders including autopsy reports was collected.

ACDC staff interviewed cruise ship staff including engineers who usually work in the propeller room—five of the 19 people who responded to the situation, and the medical staff on board. Questions were asked to elucidate what happened, understand the physical set up of the propeller room, and identify clinical symptoms of the responders.

Measurements of the room where the deaths occurred were obtained and the Office of Hazardous Materials Safety (Hazmat) collected environmental air samples. Additionally, medical records and autopsy results were obtained for the three deceased and medical records were obtained for those who responded to the scene and were subsequently hospitalized.

Summary of Events: Interviews revealed that at 6:00am on September 2, 2005, 3 staff undertook a routine repair of a "leaky pipe" in the propeller room of a cruise ship docked at the Port of Los Angeles. Because the propeller room was not considered a confined space by the staff of the cruise ship, no workers were wearing any personal protective respiratory equipment. During the repair, all 3 workers were overcome by fumes and fainted. Nearby workers cried out for help, which prompted the ship's staff

to administer a ship wide call for help or "Alpha Alert." This call prompted all medical staff to respond without any protective gear. As a result, additional crew members—including doctors and nurses—responded, but they became dizzy and some passed out. Ultimately 19 crewmembers were taken to an emergency department at various hospitals on shore. Most were either fellow engineers or medical staff on board. No passengers were affected.

According to the chief engineer on board the ship, the volume of the propeller room was measured at 215m^3 (7,593 cubic feet) and the ventilation was 1100 m^3/hour (38,846 $foot^3$/hour). Hazmat obtained an environmental air sample at 11:00am on September 3, 2005—5 hours after the incident in the propeller room—measuring 100 ppm of H_2S. The OSHA Permissible Exposure Limit (PEL) for General Industry states that "exposures shall not exceed 20 ppm (ceiling) with the following exception: if no other measurable exposure occurs during the 8-hour work shift, exposures may exceed 20 ppm, but not more than 50 ppm (peak), for a single time period up to 10 minutes [6]." Therefore, environmental levels of hydrogen sulfide 5 hours after the incident exceeded the maximum limit by 100%.

Upon further investigation, it was discovered that the leaky pipe was a pulper line that conducts solids and remaining liquids from food waste to be expelled into the ocean. The pulper line was running through the ballast tank which functions to keep the boat steady. It was discovered that the pulper line was cracked in the portion that ran through the wall of the ballast tank. Over time, food waste (also known as pulp) slowly leaked into the ballast tank from the pulper line. This waste, in the anaerobic environment of the ballast tank, produced hydrogen sulfide that filtered into the pulper line and collected over time. When the leaky pipe was being fixed, it burst and released the collection of hydrogen sulfide gas.

The three workers in direct contact with the pulper line (males aged 41, 47 and 48), died instantly. Coroner reports revealed levels of 16 mcg/g and 3.2mcg/g of thiosulfate by ion chromatography after correcting for creatinine in two out of three of the deceased. The normal range is 1-5mcg/g. The 19 responders experienced symptoms including dizziness, headaches and throat irritation. No blood samples were obtained and none were known to have experienced prolonged effects beyond the first 24 hours after exposure.

DISCUSSION

Fatalities and acute illness resulted from this unfortunate situation; yet substantial literature notes that working in confined spaces on cargo ships is a risk factor for hydrogen sulfide poisoning and death [3]. The majority of hydrogen sulfide poisonings (approximately 86%) occur in confined spaces and many poisonings are the direct result of others trying to help co-workers in need [5]. However, this is the first known cluster of deaths caused by hydrogen sulfide poisoning on a cruise ship.

The levels of thiosulfate, as determined by the coroner, probably do not reflect the true concentration of hydrogen sulfide that the deceased were exposed to. Thiosulfate is formed by oxidation of sulfide, is one of the predominant metabolites of sulfide, and can indicate the probable dose of H_2S to which the victim was exposed [7]. However, the blood level peaks in 12 hours after acute exposure and declines rapidly thereafter and coroner blood specimens were obtained more than 12 hours after death.

Because of the confined spaces typical of ships and boats, all captains, regardless of vessel type, should have plans to prevent hydrogen sulfide poisoning. In addition, in light of the rapid manner in which co-workers often respond to on-board emergencies, plans should also include the proper methods of response.

The National Institute for Occupational Safety and Health defines a confined space as:

> "a space which by design has limited openings for entry and exit; unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include but are not limited to storage tanks, compartments of ships, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines [8]."

While by this definition the propeller room of the cruse ship may be considered a confined space, ultimately the definition, and the considerations that go along with it, are open to interpretation—and the crew of the ship did not consider the propeller room to be a confined space. As such, the ship staff was not required to wear respiratory personal protective equipment (PPE) while working in that area. Additionally, workers did not carry a gas monitor that was available on the ship for detecting hazardous gases such as hydrogen sulfide.

We therefore recommend that a broader definition of what constitutes confined space be considered for ships and that appropriate PPE be worn when working in these spaces. Additionally, it would be advantageous for ships to purchase additional gas monitors to be available for all who plan to work in confined spaces. As an example, the portable Multiwarn monitor, EntryRAE, or similar instruments and a stationary gas monitor with an alarm system are able to detect hydrogen sulfide levels from 0-100 ppm and thus could have warned workers in the propeller room if the pipe was leaking before they began to fix it. While uncommon, this situation demonstrates that appropriate preventative steps must be taken by cruise lines and other industries that employ workers in confined spaces to prevent fatalities associate with hydrogen sulfide poisoning.

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