ACUTE COMMUNICABLE DISEASE CONTROL PROGRAM

ANNUAL MORBIDITY REPORT AND SPECIAL STUDIES REPORT

2016

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County of Los Angeles
Public Health

Acute Communicable Disease Control Program

Annual Morbidity Report

2016

Los Angeles County
Department of Public Health

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COUNTY OF LOS ANGELES
Public Health

This publication was supported by the Grant or Cooperative Agreement Number, **1 NU90TP921934-01-00**, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

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ACUTE COMMUNICABLE DISEASE CONTROL PROGRAM
ANNUAL MORBIDITY REPORT
OVERVIEW
2016

PURPOSE

The Acute Communicable Disease Control (ACDC) Program's Annual Morbidity Report of the Los Angeles County (LAC) Department of Public Health (DPH) serves to:

1. summarize annual morbidities for several acute communicable diseases occurring in LAC;
2. identify patterns of disease as a means to direct future disease prevention efforts;
3. identify limitations of the data used for the above purposes and to identify means to improve that data; and
4. serve as a resource for medical, public health, and other healthcare authorities at county, state, and national levels.

Information about ACDC is available at: www.publichealth.lacounty.gov/acd/index.htm and past Annual Morbidity Reports and Special Studies Reports are available at: www.publichealth.lacounty.gov/acd/Publications.htm.

Note: This report includes information on select vaccine preventable diseases (such as influenza and hepatitis A and B). For information on haemophilus influenzae, perinatal hepatitis B, measles, mumps, and pertussis, see LAC DPH's Immunization Program (www.publichealth.lacounty.gov/ip/index.htm). This report does not include information on tuberculosis, sexually transmitted diseases, or HIV and AIDS. Information regarding these diseases is available from their respective department programs (see LAC DPH website for more information at www.publichealth.lacounty.gov/index.htm).

LAC DEMOGRAPHIC DATA

The County of Los Angeles, Internal Services Department[1], created under contract LAC population estimates used for this report. We extracted and aggregated data into age, race-ethnicity, and sex categories, as the County requires, using base population numbers from the 2010 Census . These numbers were updated to July 1, 2010, using city estimates from the California Department of Finance (DOF), Demographic Research Unit. We obtained population estimates for July 1, 2015 by applying five years of birth, mortality, and migration rates to the July 1, 2010 estimates. We also controlled the estimates to city and county level estimates from the DOF, Demographic Research Unit. The input datasets included Census Bureau decennial census enumerations and annual population estimates, DOF city and county estimates, and administrative records from the County of Los Angeles on registered voters, housing units, births and deaths. Hedderson Demographic Services created LAC population estimates for this report and Urban Research of the LAC Internal Services Department (ISD) provided this data to the LAC DPH.

The Centers for Disease Control and Prevention (CDC) Final 2016 Summary of Nationally Notifiable Infectious Diseases published in the Morbidity and Mortality Weekly Report (MMWR)[1] provided National and California state counts of reportable diseases. This CDC publication formed the basis for calculated rates included in this report.

Cities of Long Beach and Pasadena are separate reporting jurisdictions, as recognized by the California Department of Public Health (CDPH). As such, these two cities maintain their own disease reporting systems.

[1] CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at:
https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

Therefore, LAC morbidity data excludes disease episodes occurring among residents of Long Beach and Pasadena, and subtracts their populations from LAC population data. We note exceptions to this rule in the text when they occur.

DATA SOURCES

We obtained data on occurrence of communicable diseases in LAC through passive and sometimes active surveillance. The California Code of Regulations (Section 2500) requires that every healthcare provider or administrator of a health facility or clinic and anyone in charge of a public or private school (of any grade-level) knowing of a **case or suspected case** of a communicable diseasereport it to the local health department. This Code also requires immediate reporting by telephone 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). Healthcare providers must also give detailed instructions to household members in regard to precautionary measures necessary for preventing the spread of disease (Section 2514). Disease reporting standards sometimes differ from those of state and federal guidlines. The most current version of LAC DPH's listing of reportable diseases and conditions is available at: www.publichealth.lacounty.gov/acd/docs/DiseaseListOct2016.pdf.

1. Passive surveillance relies on physicians, laboratories, and other healthcare providers to voluntarily report diseases to the DPH by electronic, telephone, or facsimile submissions of the Confidential Morbidity Report (CMR) form.

2. Active surveillance entails that ACDC staff regularly contact hospitals, laboratories, and other healthcare providers in an effort to identify all cases of a given disease.

DATA DESCRIPTION AND LIMITATIONS

Data in this report utilizes the following data descriptions; however, the report should be interpreted with caution of the 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 to 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.

   In the Annual Morbidity Report, rates of diseases for groups (e.g., Hispanic versus non-Hispanic) differ significantly only when two criteria are met: 1) the group rates are reliable, and 2) the 95% confidence intervals for these rates do not overlap. Only those rates which are reliable have calculated confidence intervals.

3. Case Definitions
ACDC uses CDC/CSTE (Council of State and Territorial Epidemiologists) case definition for infectious diseases under public surveillance[2] , with some exceptions as noted in the text of the individual diseases, to standardize surveillance. 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, it may not be possible to identify an association between a communicable disease and a death or an outbreak.

4. Onset Date versus Report Date
One might observe slight differences in the number of cases and rates of disease for the year in subsequent annual reports. Any such disparities are likely to be small.

5. Population Estimates
Estimates of the LAC population are subject to limitations. 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.

6. Place of Acquisition of Infections
Some cases of diseases reported in LAC may have been acquired outside of the county. Some disease rates may not accurately reflect the location where an infection was acquired since we presented data based on address of case.

7. Health Districts and Service Planning Areas
Since 1999, LAC was divided into eight "Service Planning Areas" (SPAs) for purposes of healthcare planning and provision of health services: SPA 1 Antelope Valley, SPA 2 San Fernando, SPA 3 San Gabriel, SPA 4 Metro, SPA 5 West, SPA 6 South, SPA 7 East, and SPA 8 South Bay. Each SPA is organized further into health districts (HDs). The map included in this section shows all of the SPAs. Due to variations in Community Health Services staffing, investigating District personnel may differ from the standard District of residence. Approximately 9% of County census tracts have been shifted in such a manner. For the purpose of this publication, we consistently matched case or outbreak location to the official District/SPA of record. Below is a SPA map (last updated in 2012), which is also available at: www.publichealth.lacounty.gov/epi/images/GIS/SPA_HD_2012.pdf.

8. 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.
   - **Black** – person having origins in any of the black racial groups of Africa.
   - **Hispanic/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.
   - **Other** – persons that do not list themselves according to any of the above categories and those that note multiple race/ethnicity categories.

   Because population data is not available for unknown, other, or multiple race categories, rate calculations for these groups are not possible.

STANDARD REPORT FORMAT

1. Crude data
   - **Number of Cases** – for most diseases, this number reflects new cases of the disease with an onset in the year of the report. If the onset was unknown, the date of diagnosis was used as proxy for onset.
   - **Annual Incidence Rates in LAC** – number of new cases in the year of report divided by LAC census population (minus Long Beach and Pasadena) multiplied by 100,000.

[2] CDC. Case definitions for infectious conditions under public health surveillance. MMWR 1997; 46(RR10):1-55. Available at:
https://www.cdc.gov/mmwr/preview/mmwrhtml/00047449.htm

- **Annual Incidence Rates in the United States (US) and California** – the 2015 incidence rates for the US and California can be found in the CDC's Morbidity and Mortality Weekly Report (MMWR): Final Summary of Nationally Notifiable Infectious Diseases. Previous incidence reports are available at the CDC's MMWR site.
- **Mean Age at Onset** – average age of all cases.
- **Median Age at Onset** – the age that represents the midpoint of the sequence of all case ages.
- **Range of Ages at Onset** – ages of the youngest and oldest cases in the year of the report. For cases under one year of age, less than one (<1) was used.

2. Description
   This includes the causative agent, mode of transmission, common symptoms, potential severe outcomes, susceptible groups, vaccine-preventability, and other significant information (e.g., prevention and control methods) related to the disease.

3. Trends and Highlights
   This provides a synopsis or the highlights of disease activity in the year of the report. This section may highlight trends, seasonality, significance related age, sex, race/ethnicity, and/or location of the disease.

4. Table
   This is a main table for each disease chapter that includes numbers of reported cases, percentage, and rates per 100,000 by age group, race/ethnicity, and SPA of the reporting year and four years prior to the reporting year. Disease rates for <19 cases are omitted as the rates are unreliable.

5. Figures
   Figures include disease incidence rates of LAC, CA, and/or US. Some diseases may not include CA or US rates as the jurisdiction does not maintain surveillance of that particular disease. In separate figures, incidence rates or percent cases are expressed by age group, race/ethnicity, SPA, and/or month of onset. Some disease chapters have other type of figures or tables depending on the significance of that particular disease (e.g., percent cases by serotype, vaccination rates). When stratified data are presented in figures and/or tables, the following facts are important:

   - **Seasonality** – number of cases that occurred during each month of the reporting year.
   - **Age**– annual rate of disease for individual age groups. Some diseases include race-adjusted rates.
   - **Sex** – male-to-female rate ratio of cases.
   - **Race/Ethnicity** – annual rate of disease for the four 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" refers to address of case and does not accurately reflect site of disease acquisition. Some diseases include age-adjusted rates by location.

LAC Demographic Data
2016

Table A. LAC* Population by Year, 2011–2016

Year	Population	% change
2011	9,259,218	
2012	9,296,158	0.4%
2013	9,404,275	1.16%
2014	9,452,968	0.52%
2015	9,571,766	1.26%
2016	9,599,001	0.28%

* Does not include cities of Pasadena and Long Beach.

Table B. LAC* Population by Age Group, 2016

Age (in years)	Population	%
<1	103,768	1.1%
1–4	469,886	4.9%
5–14	1,207,435	12.6%
15–34	2,817,291	29.3%
35–44	1,318,432	13.7%
45–54	1,320,385	13.8%
55-64	1,132,830	11.8%
65+	1,228,974	12.8%
Total	**9,599,001**	**100.0%**

* Does not include cities of Pasadena and Long Beach.

Table C. LAC* Population by Sex, 2016

Sex	Population	%
Male	4,740,316	49.4%
Female	4,858,685	50.6%
Total	**9,599,001**	**100.0%**

* Does not include cities of Pasadena and Long Beach.

Table D. LAC* Population by Race, 2016

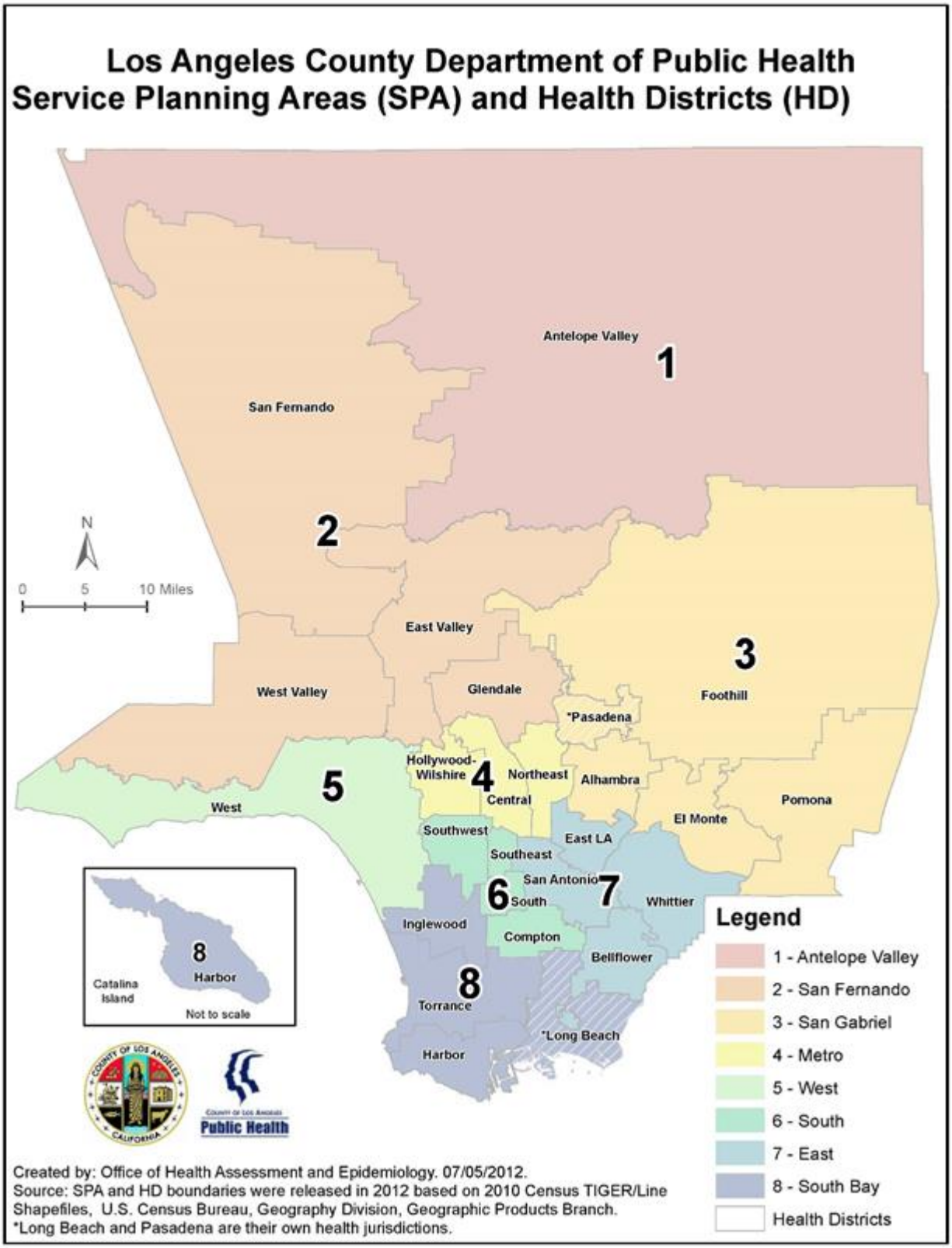
Race	Population	%
Asian	1,393,405	14.5%
Black	783,414	8.2%
Latino	4,733,507	49.3%
White	2,671,074	27.8%
Other**	17,601	0.2%
Total	**9,599,001**	**100.0%**

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

Table E. LAC*
Population by Health District and SPA, 2016**

Health District	Population
SPA1	392,410
Antelope valley	392,410
SPA 2	2,239,081
East Valley	465,809
Glendale	346,531
San Fernando	527,578
West Valley	899,163
SPA 3	1,644,027
Alhambra	349,770
El Monte	435,931
Foothill	309,752
Pomona	548,574
SPA 4	1,182,534
Central	355,669
Hollywood Wilshire	507,054
Northeast	319,811
SPA 5	663,935
West	663,935
SPA 6	1,068,960
Compton	290,012
South	202,130
Southeast	185,359
Southwest	391,459
SPA 7	1,312,951
Bellflower	351,844
East Los Angeles	203,635
San Antonio	431,885
Whittier	325,587
SPA 8	1,095,103
Inglewood	423,485
Harbor	210,468
Torrance	461,150
Total	9,599,001

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


Los Angeles County Department of Public Health
Service Planning Areas (SPA) and Health Districts (HD)
Antelope Valley
1
San Fernando
2
N
0
5
10 Miles
East Valley
3
West Valley
Glendale
Foothill
*Pasadena
Hollywood-
Wilshire
4
Northeast
Alhambra
5
Central
Pomona
West
El Monte
Southwest
East LA
Southeast
San Antonio
6
South
7
Whittier
Inglewood
Compton
Bellflower
8
Harbor
Catalina
Island
Not to scale
8
Torrance
*Long Beach
Harbor
Public Health
Legend
1 - Antelope Valley
2 - San Fernando
3 - San Gabriel
4 - Metro
5 - West
6 - South
7 - East
8 - South Bay
Health Districts
Created by: Office of Health Assessment and Epidemiology. 07/05/2012.
Source: SPA and HD boundaries were released in 2012 based on 2010 Census TIGER/Line
Shapefiles, U.S. Census Bureau, Geography Division, Geographic Products Branch.
*Long Beach and Pasadena are their own health jurisdictions.

Abbreviations and acronyms found throughout this report.

Table F. List of Acronyms

95%CI	95 percent confidence interval	**HCV**	Hepatitis C virus
ACDC	Acute Communicable Disease Control	**HD**	Health District
AIDS	Acquired Immunodeficiency Syndrome	**Hib**	*Haemophilus influenzae*, type b
ALT	Alanine aminotransferase	**HIV**	Human Immunodeficiency Virus
AR	Attack rate	**IFA**	Immunofluorescent Antibody
CA	California	**IgG**	Immunoglobulin G
CDC	Centers for Disease Control and Prevention	**IgM**	Immunoglobulin M
CDPH	California Department of Public Health	**LAC**	Los Angeles County
CHS	Community Health Services	**MMR**	Mumps-Measles-Rubella vaccine
CMR	Confidential morbidity report	**MMWR**	Morbidity and Mortality Weekly Report
CSF	Cerebral spinal fluid	**MSM**	Men who have sex with men
CSTE	Council of State and Territorial Epidemiologists	**N/A**	Not available
DPH	Department of Public Health	**OR**	Odds ratio
DTaP	Diphtheria-tetanus-acellular pertussis	**PCP**	*Pneumocystis carinii pneumonia*
DTP	Diphtheria-tetanus-pertussis vaccine	**PCR**	Polymerase Chain Reaction
EHS	Environmental Health Services	**PFGE**	Pulsed Field Gel Electrophoresis
EIA	Enzyme Immunoassay	**PHBPP**	Perinatal Hepatitis B Prevention Program
GI	Gastrointestinal	**RNA**	Ribonucleic Acid
GE	Gastroenteritis	**RR**	Rate ratio or relative risk
HAART	Highly Active Antiretroviral Therapy	**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)

LAC 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

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Table G. Reported Cases of Selected Notifiable Diseases by Year of Onset
Los Angeles County, 2011-2016

Disease	Year of Onset						Previous 5-year Average	5-Yr 95% upper Limit[a]
	2011	2012	2013	2014	2015	2016		
Amebiasis	86	99	57	64	62	70	74	105
Botulism[b]	3	4	4	1	2	6	3	5
Brucellosis	6	4	10	7	8	6	7	11
Campylobacteriosis	1259	1546	1703	1506	1623	1564	1527	1822
Cholera	0	0	0	0	4	0	1	4
Coccidioidomycosis[b]	304	327	362	426	613	809	406	624
Cryptosporidiosis[b]	51	44	48	78	56	98	55	79
Cysticercosis	37	11	1	9	12	6	14	38
Dengue[b]	0	2	2	32	30	46	13	42
E. Coli—Shiga Toxin-Producing[b]	88	97	102	90	175	282	110	174
Encephalitis	59	75	79	92	136	69	88	139
Foodborne Outbreaks	22	21	12	24	23	16	20	29
Giardiasis[b]	292	294	392	346	379	452	341	422
Hansen's Disease (Leprosy)	2	3	1	3	0	1	2	4
Hepatitis A[b]	45	47	60	42	33	66	45	63
Hepatitis B	60	38	55	42	50	42	49	65
Hepatitis C	10	7	5	5	2	5	6	11
Hepatitis Unspecified	4	0	0	0	0	0	1	4
Legionellosis[b]	116	111	85	140	171	245	125	182
Listeriosis, Nonperinatal	19	26	23	27	34	33	26	36
Listeriosis, Perinatal	6	7	4	5	3	4	5	8
Lyme Disease	6	1	11	5	4	1	5	12
Malaria	22	19	16	21	27	24	21	28
Meningitis, Viral	317	303	355	400	367	183	348	417
Meningococcal Infections	37	12	17	11	12	20	18	37
Pneumococcal Disease, Invasive[c]	658	504	522	460	468	503	516	667
Psittacosis	0	0	0	0	0	0	0	0
Q-fever	0	3	2	1	5	2	2	6
Relapsing Fever	0	0	0	1	0	0	0	1
Rheumatic Fever, Acute	0	0	0	0	0	0	0	0
Salmonellosis	900	1041	1010	1141	1144	1047	1047	1225
Shigellosis[b]	264	306	227	350	508	584	331	522
Streptococcus, Group A Invasive[b]	175	168	195	222	227	353	197	244
Strongyloidiasis	0	0	11	35	9	10	11	36
Taeniasis	5	6	4	3	2	2	4	7
Tetanus	0	0	1	0	0	0	0	1
Trichinosis	0	0	0	0	0	0	0	0
Tularemia	0	0	0	0	0	0	0	0
Typhoid Fever, Case	15	6	17	15	14	11	13	21
Typhoid Fever, Carrier	3	0	0	0	0	2	1	3
Typhus Fever	38	50	68	44	54	47	51	71
Vibrio	19	29	26	52	43	33	34	57
West Nile Virus	63	174	165	218	300	153	184	335

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

[b]2016 data over 95% upper limit.

[c]by specimen collection date.

Table H. Annual Incidence Rates of Selected Notifiable Diseases by Year of Onset
Los Angeles County, 2011-2016

Disease	Annual Incidence Rate (Cases per 100,000)[b]					
	2011	2012	2013	2014	2015	2016
Amebiasis	0.93	1.06	0.61	0.68	0.65	0.73
Botulism	0.03	0.04	0.04	0.01	0.02	0.06
Brucellosis	0.06	0.04	0.11	0.07	0.08	0.06
Campylobacteriosis	13.60	16.63	18.11	15.93	16.96	16.29
Cholera	-	-	-	-	0.04	-
Coccidioidomycosis	3.28	3.52	3.85	4.51	6.40	8.43
Cryptosporidiosis	0.55	0.47	0.51	0.83	0.59	1.02
Cysticercosis	0.40	0.12	0.01	0.10	0.13	0.06
Dengue	-	0.02	0.02	0.34	0.31	0.48
E. Coli—Shiga Toxin-Producing	0.95	1.04	1.08	0.95	1.83	2.94
Encephalitis	0.64	0.81	0.84	0.97	1.42	0.72
Giardiasis	3.15	3.16	4.17	3.66	3.96	4.71
Hansen's Disease (Leprosy)	0.02	0.03	0.01	0.03	-	0.01
Hepatitis A	0.49	0.51	0.64	0.44	0.34	0.69
Hepatitis B	0.65	0.41	0.58	0.44	0.52	0.44
Hepatitis C	0.11	0.08	0.05	0.05	0.02	0.05
Hepatitis Unspecified	0.04	-	-	-	-	-
Legionellosis	1.25	1.19	0.90	1.48	1.79	2.55
Listeriosis, Nonperinatal	0.21	0.28	0.24	0.29	0.36	0.34
Listeriosis, Perinatal[a]	4.95	5.71	3.34	4.11	2.58	3.48
Lyme Disease	0.06	0.01	0.12	0.05	0.04	0.01
Malaria	0.24	0.20	0.17	0.22	0.28	0.25
Meningitis, Viral	3.42	3.26	3.77	4.23	3.83	1.91
Meningococcal Infections	0.40	0.13	0.18	0.12	0.13	0.21
Pneumococcal Disease, Invasive	7.11	5.42	5.55	4.87	4.89	5.24
Psittacosis	-	-	-	-	-	-
Q-fever	-	0.03	0.02	0.01	0.05	0.02
Relapsing Fever	-	-	-	0.01	-	-
Rheumatic Fever, Acute	-	-	-	-	-	-
Salmonellosis	9.72	11.20	10.74	12.07	11.95	10.91
Shigellosis	2.85	3.29	2.41	3.70	5.31	6.08
Streptococcus, Group A Invasive	1.89	1.81	2.07	2.35	2.37	3.68
Strongyloidiasis	-	-	0.12	0.37	0.09	0.10
Taeniasis	0.05	0.06	0.04	0.03	0.02	0.02
Tetanus	-	-	0.01	-	-	-
Trichinosis	-	-	-	-	-	-
Tularemia	-	-	-	-	-	-
Typhoid Fever, Case	0.16	0.06	0.18	0.16	0.15	0.11
Typhoid Fever, Carrier	0.03	-	-	-	-	0.02
Typhus Fever	0.41	0.54	0.72	0.47	0.56	0.49
Vibrio	0.21	0.31	0.28	0.55	0.45	0.34
West Nile Virus	0.68	1.87	1.75	2.31	3.13	1.59

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

[b]Rates of disease based on less than 19 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, 2012-2016

Disease	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Amebiasis	6.8	4.8	8.8	3.8	6.0	7.2	6.4	4.2	5.6	5.0	5.4	5.2	70.4
Botulism	0.4	0.2	0.2	-	0.4	0.2	0.2	-	0.2	0.2	0.4	0.6	3.2
Brucellosis	0.2	0.6	0.4	0.4	0.4	0.4	-	0.4	0.2	0.2	0.2	-	7.0
Campylobacteriosis	47.4	27.4	26.0	37.4	48.0	56.0	69.0	68.4	59.0	57.4	57.8	37.6	1587.4
Cholera	-	-	-	-	-	-	0.2	-	0.2	-	-	-	0.8
Coccidioidomycosis	47.6	38.6	37.0	37.8	36.8	44.2	53.8	42.8	43.4	47.6	38.4	39.4	507.4
Cryptosporidiosis	3.0	3.0	3.8	4.2	3.4	4.4	5.2	7.2	4.2	2.0	3.0	2.4	64.8
Cysticercosis	0.4	0.2	0.2	0.6	0.2	0.2	0.4	0.4	0.0	0.2	0.2	0.2	5.8
Dengue	2.8	1.4	1.0	0.6	1.2	1.4	2.8	1.8	2.6	3.0	0.8	2.8	22.4
E. Coli—Shiga Toxin-Producing	5.6	8.8	9.0	11.0	11.0	14.2	15.8	21.4	17.4	15.2	8.2	6.8	149.2
Encephalitis	1.6	1.6	3.0	2.2	2.0	2.4	6.8	16.2	30.6	17.4	3.8	1.2	90.2
Giardiasis	31.0	27.6	30.2	32.0	31.4	25.4	30.2	32.0	37.6	29.6	27.8	28.8	372.6
Hansen's Disease (Leprosy)[a]	-	-	-	-	-	-	-	-	-	-	-	-	-
Hepatitis A	2.8	3.8	4.4	4.2	4.4	4.0	4.4	5.0	4.6	4.6	3.2	4.2	49.6
Hepatitis B	4.4	3.0	3.6	4.0	3.0	3.4	3.8	4.6	3.0	3.8	6.0	2.6	45.4
Hepatitis C	0.6	0.8	0.2	0.6	0.2	0.4	0.2	0.4	1.0	0.2	-	0.2	4.8
Hepatitis Unspecified	-	-	-	-	-	-	-	-	-	-	-	-	-
Legionellosis	13.0	9.4	12.4	12.6	10.0	8.0	13.0	12.2	12.0	10.2	11.8	25.8	150.4
Listeriosis, Nonperinatal	1.0	0.8	1.2	1.6	1.6	2.4	3.2	2.6	4.0	2.8	1.8	1.6	28.6
Listeriosis, Perinatal	0.4	0.2	-	0.2	0.2	-	0.2	0.6	1.0	0.6	-	0.2	4.6
Lyme Disease	0.2	0.2	0.4	0.2	0.8	1.2	1.2	1.4	0.0	0.2	0.2	0.2	6.8
Malaria[a]	-	-	-	-	-	-	-	-	-	-	-	-	-
Meningitis, Viral	13.2	13.6	14.6	16.6	19.6	15.8	28.4	42.0	57.4	40.0	20.2	15.4	321.6
Meningococcal Infections	1.8	1.2	1.4	1.6	1.6	0.8	1.4	0.8	1.2	0.4	0.6	1.6	14.4
Pneumococcal Disease, Invasive[b]	75.4	75.8	61.0	43.6	35.2	28.8	18.4	16.4	24.0	22.2	31.0	56.0	487.8
Psittacosis	-	-	-	-	-	-	-	-	-	-	-	-	-
Q-fever	-	-	-	0.6	-	-	-	-	-	-	-	-	2.6
Relapsing Fever	-	-	-	-	-	-	-	0.2	-	-	-	-	0.2
Rheumatic Fever, Acute	-	-	-	-	-	-	-	-	-	-	-	-	-
Salmonellosis	58.8	51.0	66.2	71.0	91.0	86.6	122.6	129.6	118.2	96.2	71.0	55.8	1076.6
Shigellosis	19.6	19.2	18.4	20.2	29.4	27.8	34.8	45.6	47.4	45.4	37.6	27.8	395.0
Streptococcus, Group A Invasive	28.6	17.6	22.4	20.6	21.4	18.6	14.8	11.6	13.0	19.0	19.0	22.8	233.0
Strongyloidiasis[a]	-	-	-	-	-	-	-	-	-	-	-	-	-
Taeniasis[a]	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetanus	-	-	-	-	0.2	-	-	-	-	-	-	-	0.2
Trichinosis	-	-	-	-	-	-	-	-	-	-	-	-	-
Tularemia	-	-	-	-	-	-	-	-	-	-	-	-	-
Typhoid Fever, Case	1.8	1.2	0.4	0.6	1.0	2.0	1.6	1.0	0.8	0.6	1.0	0.4	12.6
Typhoid Fever, Carrier	-	-	-	-	0.2	-	-	-	-	-	0.2	-	0.4
Typhus Fever	3.4	1.6	1.4	1.4	5.8	6.8	5.8	7.6	6.6	6.0	3.8	2.2	52.6
Vibrio	0.6	0.4	0.4	0.8	1.4	3.2	5.8	6.0	3.6	2.0	1.8	1.6	36.6
West Nile Virus	-	-	0.2	-	-	0.4	16.0	54.8	83.2	39.6	7.8	-	202.0

[a]Not applicable.

[b]Specimen collection date.

Table J. Number of Cases of Selected Notifiable Diseases by Age Group
Los Angeles County, 2016

Disease	<1	1-4	5-14	15-34	35-44	45-54	55-64	65+	Total[a]
Amebiasis	0	1	3	21	15	11	11	8	70
Botulism	0	0	0	2	1	2	1	0	6
Brucellosis	0	0	0	1	0	1	2	2	6
Campylobacteriosis	36	98	123	481	188	198	178	253	1564
Cholera	0	0	0	0	0	0	0	0	0
Coccidioidomycosis	0	1	12	120	124	167	182	203	809
Cryptosporidiosis	0	8	10	34	13	20	7	5	98
Cysticercosis	0	0	0	1	4	1	0	0	6
Dengue	0	1	2	15	10	7	5	6	46
E. Coli—Shiga Toxin-Producing	10	45	41	57	29	23	21	56	282
Encephalitis	0	0	0	5	3	6	8	47	69
Giardiasis	2	14	25	147	72	87	62	43	452
Hansen's Disease (Leprosy)	0	0	0	0	0	0	1	0	1
Hepatitis A	0	0	1	25	12	14	5	9	66
Hepatitis B	0	0	0	6	9	13	8	6	42
Hepatitis C	0	0	0	2	1	2	0	0	5
Hepatitis Unspecified	0	0	0	0	0	0	0	0	0
Legionellosis	0	0	0	8	13	39	50	135	245
Listeriosis, Nonperinatal	0	0	0	1	1	3	4	24	33
Listeriosis, Perinatal[b]	0	0	0	0	3	1	0	0	4
Lyme Disease	0	0	1	0	0	0	0	0	1
Malaria	0	0	2	8	4	3	5	2	24
Meningitis, Viral	17	4	7	41	28	34	28	24	183
Meningococcal Infections	0	0	1	11	4	1	0	3	20
Pneumococcal Disease, Invasive	6	22	10	40	40	81	95	208	503
Psittacosis	0	0	0	0	0	0	0	0	0
Q-fever	0	0	0	0	2	0	0	0	2
Relapsing Fever	0	0	0	0	0	0	0	0	0
Rheumatic Fever, Acute	0	0	0	0	0	0	0	0	0
Salmonellosis	71	106	133	249	95	97	125	171	1047
Shigellosis	2	32	54	195	85	107	62	47	584
Streptococcus, Group A Invasive	1	10	17	37	41	53	64	125	353
Strongyloidiasis	0	0	0	0	1	2	4	3	10
Taeniasis	0	0	0	0	1	1	0	0	2
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	0	1	6	0	1	2	1	11
Typhoid Fever, Carrier	0	0	0	0	0	0	1	1	2
Typhus Fever	0	0	2	12	14	7	8	4	47
Vibrio	0	1	2	6	5	9	7	3	33
West Nile Virus	0	0	0	13	14	26	29	71	153

[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, 2016

Disease	Age-group Rates (Cases per 100,000)[b]							
	<1	1-4	5-14	15-34	35-44	45-54	55-64	65+
Amebiasis	-	0.2	0.2	0.7	1.1	0.8	1.0	0.7
Botulism	-	-	-	0.1	0.1	0.2	0.1	-
Brucellosis	-	-	-	-	-	0.1	0.2	0.2
Campylobacteriosis	34.7	20.9	10.2	17.1	14.3	15.0	15.7	20.6
Cholera	-	-	-	-	-	-	-	-
Coccidioidomycosis	-	0.2	1.0	4.3	9.4	12.6	16.1	16.5
Cryptosporidiosis	-	1.7	0.8	1.2	1.0	1.5	0.6	0.4
Cysticercosis	-	-	-	-	0.3	0.1	-	-
Dengue	-	0.2	0.2	0.5	0.8	0.5	0.4	0.5
E. Coli—Shiga Toxin-Producing	9.6	9.6	3.4	2.0	2.2	1.7	1.9	4.6
Encephalitis	-	-	-	0.2	0.2	0.5	0.7	3.8
Giardiasis	1.9	3.0	2.1	5.2	5.5	6.6	5.5	3.5
Hansen's Disease (Leprosy)	-	-	-	-	-	-	0.1	-
Hepatitis A	-	-	0.1	0.9	0.9	1.1	0.4	0.7
Hepatitis B	-	-	-	0.2	0.7	1.0	0.7	0.5
Hepatitis C	-	-	-	0.1	0.1	0.2	-	-
Hepatitis Unspecified	-	-	-	-	-	-	-	-
Legionellosis	-	-	-	0.3	1.0	3.0	4.4	11.0
Listeriosis, Nonperinatal	-	-	-	-	0.1	0.2	0.4	2.0
Listeriosis, Perinatal[a]	-	-	-	-	11.1	219.8	-	-
Lyme Disease	-	-	0.1	-	-	-	-	-
Malaria	-	-	0.2	0.3	0.3	0.2	0.4	0.2
Meningitis, Viral	16.4	0.9	0.6	1.5	2.1	2.6	2.5	2.0
Meningococcal Infections	-	-	0.1	0.4	0.3	0.1	-	0.2
Pneumococcal Disease, Invasive	5.8	4.7	0.8	1.4	3.0	6.1	8.4	16.9
Psittacosis	-	-	-	-	-	-	-	-
Q-fever	-	-	-	-	0.2	-	-	-
Relapsing Fever	-	-	-	-	-	-	-	-
Rheumatic Fever, Acute	-	-	-	-	-	-	-	-
Salmonellosis	68.4	22.6	11.0	8.8	7.2	7.3	11.0	13.9
Shigellosis	1.9	6.8	4.5	6.9	6.4	8.1	5.5	3.8
Streptococcus, Group A Invasive	1.0	2.1	1.4	1.3	3.1	4.0	5.6	10.2
Strongyloidiasis	-	-	-	-	0.1	0.2	0.4	0.2
Taeniasis	-	-	-	-	0.1	0.1	-	-
Tetanus	-	-	-	-	-	-	-	-
Trichinosis	-	-	-	-	-	-	-	-
Tularemia	-	-	-	-	-	-	-	-
Typhoid Fever, Case	-	-	0.1	0.2	-	0.1	0.2	0.1
Typhoid Fever, Carrier	-	-	-	-	-	-	0.1	0.1
Typhus Fever	-	-	0.2	0.4	1.1	0.5	0.7	0.3
Vibrio	-	0.2	0.2	0.2	0.4	0.7	0.6	0.2
West Nile Virus	-	-	-	0.5	1.1	2.0	2.6	5.8

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

[b]Rates of disease based on less than 19 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, 2016

Disease	Asian	Black	Hispanic	White	Other[a]	Unknown
Amebiasis	4	3	23	36	1	3
Botulism	0	0	0	2	0	4
Brucellosis	0	0	4	0	0	2
Campylobacteriosis	70	40	259	294	76	825
Cholera	0	0	0	0	0	0
Coccidioidomycosis	85	112	265	288	28	31
Cryptosporidiosis	3	5	13	25	3	49
Cysticercosis	0	0	4	0	0	2
Dengue	9	1	14	12	1	9
E. Coli—Shiga Toxin-Producing	11	16	108	147	0	0
Encephalitis	3	3	19	33	1	10
Giardiasis	27	26	131	252	2	14
Hansen's Disease (Leprosy)	1	0	0	0	0	0
Hepatitis A	8	2	21	35	0	0
Hepatitis B	4	5	13	19	0	1
Hepatitis C	0	0	3	2	0	0
Hepatitis Unspecified	0	0	0	0	0	0
Legionellosis	16	44	93	89	2	1
Listeriosis, Nonperinatal	8	2	7	15	1	0
Listeriosis, Perinatal[b]	0	1	3	0	0	0
Lyme Disease	0	0	0	1	0	0
Malaria	1	19	0	2	1	1
Meningitis, Viral	16	10	71	53	5	28
Meningococcal Infections	1	3	9	7	0	0
Pneumococcal Disease, Invasive	19	78	116	141	18	131
Psittacosis	0	0	0	0	0	0
Q-fever	0	0	0	0	0	2
Relapsing Fever	0	0	0	0	0	0
Rheumatic Fever, Acute	0	0	0	0	0	0
Salmonellosis	104	58	513	371	0	1
Shigellosis	22	73	227	261	1	0
Streptococcus, Group A Invasive	9	29	77	89	10	139
Strongyloidiasis	0	0	10	0	0	0
Taeniasis	0	1	1	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	5	2	1	1	1	1
Typhoid Fever, Carrier	0	1	1	0	0	0
Typhus Fever	4	2	15	21	4	1
Vibrio	2	0	9	8	2	12
West Nile Virus	8	2	40	77	3	23

[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, 2016

Disease	Race/Ethnicity Rates (Cases per 100,000)[b]			
	Asian	Black	Hispanic	White
Amebiasis	0.3	0.4	0.5	1.3
Botulism	-	-	-	0.1
Brucellosis	-	-	0.1	-
Campylobacteriosis	5.0	5.1	5.5	11.0
Cholera	-	-	-	-
Coccidioidomycosis	6.1	14.3	5.6	10.8
Cryptosporidiosis	0.2	0.6	0.3	0.9
Cysticercosis	-	-	0.1	-
Dengue	0.6	0.1	0.3	0.4
E. Coli—Shiga Toxin-Producing	0.8	2.0	2.3	5.5
Encephalitis	0.2	0.4	0.4	1.2
Giardiasis	1.9	3.3	2.8	9.4
Hansen's Disease (Leprosy)	0.1	-	-	-
Hepatitis A	0.6	0.3	0.4	1.3
Hepatitis B	0.3	0.6	0.3	0.7
Hepatitis C	-	-	0.1	0.1
Hepatitis Unspecified	-	-	-	-
Legionellosis	1.1	5.6	2.0	3.3
Listeriosis, Nonperinatal	0.6	0.3	0.1	0.6
Listeriosis, Perinatal[a]	-	12.4	4.7	-
Lyme Disease	-	-	-	-
Malaria	0.1	2.4	-	0.1
Meningitis, Viral	1.1	1.3	1.5	2.0
Meningococcal Infections	0.1	0.4	0.2	0.3
Pneumococcal Disease, Invasive	1.4	1.0	2.5	5.3
Psittacosis	-	-	-	-
Q-fever	-	-	-	-
Relapsing Fever	-	-	-	-
Rheumatic Fever, Acute	-	-	-	-
Salmonellosis	7.5	7.4	10.8	13.9
Shigellosis	1.6	9.3	4.8	9.8
Streptococcus, Group A Invasive	0.6	3.7	1.6	3.3
Strongyloidiasis	-	-	0.2	-
Taeniasis	-	0.1	-	-
Tetanus	-	-	-	-
Trichinosis	-	-	-	-
Tularemia	-	-	-	-
Typhoid Fever, Case	0.4	0.3	-	-
Typhoid Fever, Carrier	-	0.1	-	-
Typhus Fever	0.3	0.3	0.3	0.8
Vibrio	0.1	-	0.2	0.3
West Nile Virus	0.6	0.3	0.8	2.9

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

[b]Rates of disease based on less than 19 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, 2016

Disease	Male		Female	
	Cases	Rate (Cases per 100,000)[b]	Cases	Rate (Cases per 100,000)[b]
Amebiasis	54	1.1	16	0.3
Botulism	4	0.1	2	0.0
Brucellosis	2	0.0	4	0.1
Campylobacteriosis	843	17.8	706	14.5
Cholera	0	-	0	-
Coccidioidomycosis	541	11.4	268	5.5
Cryptosporidiosis	66	1.4	30	0.6
Cysticercosis	4	0.1	2	0.0
Dengue	19	0.4	27	0.6
E. Coli—Shiga Toxin-Producing	130	2.7	152	3.1
Encephalitis	46	1.0	23	0.5
Giardiasis	320	6.8	132	2.7
Hansen's Disease (Leprosy)	1	0.0	0	-
Hepatitis A	47	1.0	19	0.4
Hepatitis B	32	0.7	10	0.2
Hepatitis C	5	0.1	0	-
Hepatitis Unspecified	0	-	0	-
Legionellosis	158	3.3	85	1.7
Listeriosis, Nonperinatal	14	0.3	19	0.4
Listeriosis, Perinatal[a]	0	-	4	7.1
Lyme Disease	0	-	1	0.0
Malaria	15	0.3	9	0.2
Meningitis, Viral	86	1.8	97	2.0
Meningococcal Infections	15	0.3	5	0.1
Pneumococcal Disease, Invasive	287	6.1	216	4.4
Psittacosis	0	-	0	-
Q-fever	2	0.0	0	-
Relapsing Fever	0	-	0	-
Rheumatic Fever, Acute	0	-	0	-
Salmonellosis	479	10.1	568	11.7
Shigellosis	413	8.7	171	3.5
Streptococcus, Group A Invasive	207	4.4	136	2.8
Strongyloidiasis	5	0.1	5	0.1
Taeniasis	1	0.0	1	0.0
Tetanus	0	-	0	-
Trichinosis	0	-	0	-
Tularemia	0	-	0	-
Typhoid Fever, Case	7	0.1	4	0.1
Typhoid Fever, Carrier	1	0.0	1	0.0
Typhus Fever	24	0.5	23	0.5
Vibrio	17	0.4	16	0.3
West Nile Virus	99	2.1	54	1.1

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

[b]Rates of disease based on less than 19 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, 2016

Disease	Frequency Antelope	Rate (Cases per 100,000)[b] Antelope
Amebiasis	0	-
Botulism	0	-
Brucellosis	1	0.3
Campylobacteriosis	79	20.1
Cholera	0	-
Coccidioidomycosis	211	53.8
Cryptosporidiosis	3	0.8
Cysticercosis	0	-
Dengue	0	-
E. Coli—Shiga Toxin-Producing	5	1.3
Encephalitis	2	0.5
Giardiasis	10	2.5
Hansen's Disease (Leprosy)	0	-
Hepatitis A	2	0.5
Hepatitis B	1	0.3
Hepatitis C	0	-
Hepatitis Unspecified	0	-
Legionellosis	6	1.5
Listeriosis, Nonperinatal	0	-
Listeriosis, Perinatal[a]	0	-
Lyme Disease	0	-
Malaria	0	-
Meningitis, Viral	3	0.8
Meningococcal Infections	0	-
Pneumococcal Disease, Invasive	23	5.9
Psittacosis	0	-
Q-fever	0	-
Relapsing Fever	0	-
Rheumatic Fever, Acute	0	-
Salmonellosis	39	9.9
Shigellosis	10	2.5
Streptococcus, Group A Invasive	13	3.3
Strongyloidiasis	0	-
Taeniasis	0	-
Tetanus	0	-
Trichinosis	0	-
Tularemia	0	-
Typhoid Fever, Case	0	-
Typhoid Fever, Carrier	0	-
Typhus Fever	0	-
Vibrio	2	0.5
West Nile Virus	3	0.8

[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 19 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, 2016

Disease	Frequency					Rate (Cases per 100,000)[b]				
	EV	GL	SF	WV	TOTAL	EV	GL	SF	WV	TOTAL
Amebiasis	3	2	2	7	14	0.6	0.6	0.4	0.8	0.6
Botulism	1	1	0	0	2	0.2	0.2	-	-	0.1
Brucellosis	0	0	0	0	0	-	-	-	-	-
Campylobacteriosis	74	62	90	169	395	15.9	17.9	17.1	18.8	17.6
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	35	20	91	86	232	7.5	5.8	17.2	9.6	10.4
Cryptosporidiosis	1	4	10	5	20	0.2	1.2	1.9	0.6	0.9
Cysticercosis	0	0	1	0	1	-	-	0.2	-	-
Dengue	1	2	2	1	6	0.2	0.6	0.4	0.1	0.3
E. Coli—Shiga Toxin-Producing	9	4	24	37	74	1.9	1.2	4.5	4.1	3.3
Encephalitis	6	4	7	19	36	1.3	1.2	1.3	2.1	1.6
Giardiasis	15	18	23	49	105	3.2	5.2	4.4	5.4	4.7
Hansen's Disease (Leprosy)	0	0	0	1	1	-	-	-	0.1	0.0
Hepatitis A	9	1	2	7	19	1.9	0.3	0.4	0.8	0.8
Hepatitis B	4	2	3	3	12	0.9	0.6	0.6	0.3	0.5
Hepatitis C	0	0	0	0	0	-	-	-	-	-
Hepatitis Unspecified	0	0	0	0	0	-	-	-	-	-
Legionellosis	12	7	15	27	61	2.6	2.0	2.8	3.0	2.7
Listeriosis, Nonperinatal	1	4	2	4	11	0.2	1.2	0.4	0.4	0.5
Listeriosis, Perinatal[a]	0	0	0	0	0	-	-	-	-	-
Lyme Disease	0	0	0	0	0	-	-	-	-	-
Malaria	0	0	1	3	4	-	-	0.2	0.3	0.2
Meningitis, Viral	12	3	5	23	43	2.6	0.9	0.9	2.6	1.9
Meningococcal Infections	1	0	0	1	2	0.2	-	-	0.1	0.1
Pneumococcal Disease, Invasive	20	19	13	64	116	4.3	5.5	2.5	7.1	5.2
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	-	-	-	-	-
Salmonellosis	50	28	87	122	287	10.7	8.1	16.5	13.6	12.8
Shigellosis	23	16	20	30	89	4.9	4.6	3.8	3.3	4.0
Streptococcus, Group A Invasive	18	9	11	45	83	3.9	2.6	2.1	5.0	3.7
Strongyloidiasis	0	1	1	1	3	-	0.3	0.2	0.1	0.1
Taeniasis	0	1	0	0	1	-	0.3	-	-	0.0
Tetanus	0	0	0	0	0	-	-	-	-	-
Trichinosis	0	0	0	0	0	-	-	-	-	-
Tularemia	0	0	0	0	0	-	-	-	-	-
Typhoid Fever, Case	1	0	2	0	3	0.2	-	0.4	-	0.1
Typhoid Fever, Carrier	0	0	0	0	0	-	-	-	-	-
Typhus Fever	1	1	0	1	3	0.2	0.3	-	0.1	0.1
Vibrio	1	2	2	4	9	0.2	0.6	0.4	0.4	0.4
West Nile Virus	14	10	13	49	86	3.0	2.9	2.5	5.4	3.8

[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 19 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, 2016

Disease	Frequency					Rate (Cases per 100,000)[b]				
	AH	EM	FH	PO	TOTAL	AH	EM	FH	PO	TOTAL
Amebiasis	1	5	2	1	9	0.3	1.1	0.6	0.2	0.5
Botulism	0	0	1	0	1	-	-	0.3	-	0.1
Brucellosis	0	0	0	1	1	-	-	-	0.2	0.1
Campylobacteriosis	44	59	48	58	209	12.6	13.5	15.5	10.6	12.7
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	13	18	15	14	60	3.7	4.1	4.8	2.6	3.6
Cryptosporidiosis	1	2	3	0	6	0.3	0.5	1.0	-	0.4
Cysticercosis	0	0	0	0	0	-	-	-	-	-
Dengue	1	2	0	4	7	0.3	0.5	-	0.7	0.4
E. Coli—Shiga Toxin-Producing	2	4	12	9	27	0.6	0.9	3.9	1.6	1.6
Encephalitis	1	1	0	4	6	0.3	0.2	-	0.7	0.4
Giardiasis	6	12	10	22	50	1.7	2.8	3.2	4.0	3.0
Hansen's Disease (Leprosy)	0	0	0	0	0	-	-	-	-	-
Hepatitis A	2	1	0	7	10	0.6	0.2	-	1.3	0.6
Hepatitis B	0	1	4	1	6	-	0.2	1.3	0.2	0.4
Hepatitis C	0	1	1	1	3	-	0.2	0.3	0.2	0.2
Hepatitis Unspecified	0	0	0	0	0	-	-	-	-	-
Legionellosis	7	10	9	16	42	2.0	2.3	2.9	2.9	2.6
Listeriosis, Nonperinatal	2	0	2	1	5	0.6	-	0.6	0.2	0.3
Listeriosis, Perinatal[a]	0	1	0	0	1	-	1.1	-	-	0.3
Lyme Disease	0	0	0	0	0	-	-	-	-	-
Malaria	0	1	1	2	4	-	0.2	0.3	0.4	0.2
Meningitis, Viral	13	14	14	15	56	3.7	3.2	4.5	2.7	3.4
Meningococcal Infections	0	2	0	1	3	-	0.5	-	0.2	0.2
Pneumococcal Disease, Invasive	10	15	10	18	53	2.9	3.4	3.2	3.3	3.2
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	-	-	-	-	-
Salmonellosis	20	55	43	54	172	5.7	12.6	13.9	9.8	10.5
Shigellosis	4	10	6	7	27	1.1	2.3	1.9	1.3	1.6
Streptococcus, Group A Invasive	4	9	12	10	35	1.1	2.1	3.9	1.8	2.1
Strongyloidiasis	0	0	0	0	0	-	-	-	-	-
Taeniasis	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	1	0	0	1	-	0.2	-	-	0.1
Typhoid Fever, Carrier	0	0	0	0	0	-	-	-	-	-
Typhus Fever	6	4	7	1	18	1.7	0.9	2.3	0.2	1.1
Vibrio	1	1	0	2	4	0.3	0.2	-	0.4	0.2
West Nile Virus	6	5	7	4	22	1.7	1.1	2.3	0.7	1.3

[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 19 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, 2016

Disease	Frequency				Rate (Cases per 100,000)[b]			
	CE	HW	NE	TOTAL	CE	HW	NE	TOTAL
Amebiasis	3	20	0	23	0.8	3.9	-	1.9
Botulism	0	0	0	0	-	-	-	-
Brucellosis	0	0	0	0	-	-	-	-
Campylobacteriosis	42	134	44	220	11.8	26.4	13.8	18.6
Cholera	0	0	0	0	-	-	-	-
Coccidioidomycosis	24	25	10	59	6.7	4.9	3.1	5.0
Cryptosporidiosis	4	15	0	19	1.1	3.0	-	1.6
Cysticercosis	0	0	2	2	-	-	0.6	0.2
Dengue	3	8	2	13	0.8	1.6	0.6	1.1
E. Coli—Shiga Toxin-Producing	6	24	2	32	1.7	4.7	0.6	2.7
Encephalitis	1	3	1	5	0.3	0.6	0.3	0.4
Giardiasis	21	67	17	105	5.9	13.2	5.3	8.9
Hansen's Disease (Leprosy)	0	0	0	0	-	-	-	-
Hepatitis A	1	8	1	10	0.3	1.6	0..3	0.8
Hepatitis B	1	3	2	6	0.3	0.6	0.6	0.5
Hepatitis C	0	1	0	1	-	0.2	-	0.1
Hepatitis Unspecified	0	0	0	0	-	-	-	-
Legionellosis	8	18	6	32	2.2	3.5	1.9	2.7
Listeriosis, Nonperinatal	1	4	2	7	0.3	0.8	0.6	0.6
Listeriosis, Perinatal[a]	0	0	0	0	-	-	-	-
Lyme Disease	0	1	0	1	-	0.2	-	0.1
Malaria	0	1	0	1	-	0.2	-	0.1
Meningitis, Viral	4	7	3	14	1.1	1.4	0.9	1.2
Meningococcal Infections	1	5	0	6	0.3	1.0	-	0.5
Pneumococcal Disease, Invasive	41	20	20	81	11.5	3.9	6.3	6.8
Psittacosis	0	0	0	0	-	-	-	-
Q-fever	0	0	0	0	-	-	-	-
Relapsing Fever	0	0	0	0	-	-	-	-
Rheumatic Fever, Acute	0	0	0	0	-	-	-	-
Salmonellosis	33	51	30	114	9.3	10.1	9.4	9.6
Shigellosis	54	149	27	230	15.2	29.4	8.4	19.4
Streptococcus, Group A Invasive	30	11	15	56	8.4	2.2	4.7	4.7
Strongyloidiasis	1	1	0	2	0.3	0.2	-	0.2
Taeniasis	0	0	0	0	-	-	-	-
Tetanus	0	0	0	0	-	-	-	-
Trichinosis	0	0	0	0	-	-	-	-
Tularemia	0	0	0	0	-	-	-	-
Typhoid Fever, Case	0	2	0	2	-	0.4	-	0.2
Typhoid Fever, Carrier	0	0	0	0	-	-	-	-
Typhus Fever	6	2	3	11	1.7	0.4	0.9	0.9
Vibrio	0	2	3	5	-	0.4	0.9	0.4
West Nile Virus	2	6	3	11	0.6	1.2	0.9	0.9

[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 19 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, 2016

Disease	Frequency	Rate (Cases per 100,000)[b]
	West	West
Amebiasis	10	1.5
Botulism	0	-
Brucellosis	0	-
Campylobacteriosis	221	33.3
Cholera	0	-
Coccidioidomycosis	31	4.7
Cryptosporidiosis	13	2.0
Cysticercosis	0	-
Dengue	4	0.6
E. Coli—Shiga Toxin-Producing	53	8.0
Encephalitis	4	0.6
Giardiasis	63	9.5
Hansen's Disease (Leprosy)	0	-
Hepatitis A	9	1.4
Hepatitis B	4	0.6
Hepatitis C	0	-
Hepatitis Unspecified	0	-
Legionellosis	17	2.6
Listeriosis, Nonperinatal	6	0.9
Listeriosis, Perinatal[a]	0	-
Lyme Disease	0	-
Malaria	2	0.3
Meningitis, Viral	4	0.6
Meningococcal Infections	4	0.6
Pneumococcal Disease, Invasive	19	2.9
Psittacosis	0	-
Q-fever	0	-
Relapsing Fever	0	-
Rheumatic Fever, Acute	0	-
Salmonellosis	109	16.4
Shigellosis	69	10.4
Streptococcus, Group A Invasive	26	3.9
Strongyloidiasis	0	-
Taeniasis	0	-
Tetanus	0	-
Trichinosis	0	-
Tularemia	0	-
Typhoid Fever, Case	3	0.5
Typhoid Fever, Carrier	0	-
Typhus Fever	3	0.5
Vibrio	6	0.9
West Nile Virus	5	0.8

[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 19 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, 2016

	Frequency					Rate (Cases per 100,000)[b]				
Disease	**CN**	**SO**	**SE**	**SW**	**TOTAL**	**CN**	**SO**	**SE**	**SW**	**TOTAL**
Amebiasis	2	0	2	4	8	0.7	-	1.1	1.0	0.7
Botulism	0	0	0	0	0	-	-	-	-	-
Brucellosis	0	0	0	0	0	-	-	-	-	-
Campylobacteriosis	38	25	20	39	122	13.1	12.4	10.8	10.0	11.4
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	13	16	10	31	70	4.5	7.9	5.4	7.9	6.5
Cryptosporidiosis	2	1	0	2	5	0.7	0.5	-	0.5	0.5
Cysticercosis	0	0	0	1	1	-	-	-	0.3	0.1
Dengue	0	2	0	2	4	-	1.0	-	0.5	0.4
E. Coli—Shiga Toxin-Producing	8	1	2	10	21	2.8	0.5	1.1	2.6	2.0
Encephalitis	1	0	2	0	3	0.3	-	1.1	-	0.3
Giardiasis	4	3	6	19	32	1.4	1.5	3.2	4.9	3.0
Hansen's Disease (Leprosy)	0	0	0	0	0	-	-	-	-	-
Hepatitis A	0	2	1	3	6	-	1.0	0.5	0.8	0.6
Hepatitis B	1	0	0	0	1	0.3	-	-	-	0.1
Hepatitis C	0	0	0	0	0	-	-	-	-	-
Hepatitis Unspecified	0	0	0	0	0	-	-	-	-	-
Legionellosis	8	2	4	19	33	2.8	1.0	2.2	4.9	3.1
Listeriosis, Nonperinatal	0	0	0	0	0	-	-	-	-	-
Listeriosis, Perinatal[a]	0	0	0	0	0	-	-	-	-	-
Lyme Disease	0	0	0	0	0	-	-	-	-	-
-Malaria	1	1	0	2	4	0.3	0.5	-	0.5	0.4
Meningitis, Viral	3	2	2	7	14	1.0	1.0	1.1	1.8	1.3
Meningococcal Infections	0	0	0	0	0	-	-	-	-	-
Pneumococcal Disease, Invasive	18	14	10	28	70	6.2	6.9	5.4	7.2	6.5
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	-	-	-	-	-
Salmonellosis	30	12	12	32	86	10.3	5.9	6.5	8.2	8.0
Shigellosis	10	13	7	27	57	3.4	6.4	3.8	6.9	5.3
Streptococcus, Group A Invasive	5	14	4	13	36	1.7	6.9	2.2	3.3	3.4
Strongyloidiasis	0	1	0	2	3	-	0.5	-	0.5	0.3
Taeniasis	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	1	1	1	0	3	0.3	0.5	0.5	-	0.3
Vibrio	0	2	0	2	4	-	1.0	-	0.5	0.4
West Nile Virus	1	0	1	3	5	0.3	-	0.5	0.8	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 19 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, 2016

Disease	Frequency					Rate (Cases per 100,000)[b]				
	BF	EL	SA	WH	TOTAL	BF	EL	SA	WH	TOTAL
Amebiasis	3	0	0	0	3	0.9	-	-	-	0.2
Botulism	1	0	0	1	2	0.3	-	-	0.3	0.2
Brucellosis	1	1	1	0	3	0.3	0.5	0.2	-	0.2
Campylobacteriosis	44	26	36	47	153	12.5	12.8	8.3	14.4	11.7
Cholera	0	0	0	0	0	-	-	-	-	-
Coccidioidomycosis	29	7	17	20	73	8.2	3.4	3.9	6.1	5.6
Cryptosporidiosis	6	0	4	1	11	1.7	-	0.9	0.3	0.8
Cysticercosis	1	0	0	0	1	0.3	-	-	-	0.1
Dengue	4	1	1	0	6	1.1	0.5	0.2	-	0.5
E. Coli—Shiga Toxin-Producing	9	1	13	7	30	2.6	0.5	3.0	2.1	2.3
Encephalitis	2	0	1	3	6	0.6	-	0.2	0.9	0.5
Giardiasis	7	7	12	10	36	2.0	3.4	2.8	3.1	2.7
Hansen's Disease (Leprosy)	0	0	0	0	0	-	-	-	-	-
Hepatitis A	1	0	1	2	4	0.3	-	0.2	0.6	0.3
Hepatitis B	1	3	2	1	7	0.3	1.5	0.5	0.3	0.5
Hepatitis C	0	0	0	0	0	-	-	-	-	-
Hepatitis Unspecified	0	0	0	0	0	-	-	-	-	-
Legionellosis	5	6	7	5	23	1.4	2.9	1.6	1.5	1.8
Listeriosis, Nonperinatal	1	0	0	2	3	0.3	-	-	0.6	0.2
Listeriosis, Perinatal[a]	0	0	1	0	1	-	-	1.0	-	0.4
Lyme Disease	0	0	0	0	0	-	-	-	-	-
Malaria	0	0	0	0	0	-	-	-	-	-
Meningitis, Viral	8	3	8	3	22	2.3	1.5	1.9	0.9	1.7
Meningococcal Infections	0	0	2	1	3	-	-	0.5	0.3	0.2
Pneumococcal Disease, Invasive	15	11	17	16	59	4.3	5.4	3.9	4.9	4.5
Psittacosis	0	0	0	0	0	-	-	-	-	-
Q-fever	0	2	0	0	2	-	1.0	-	-	0.2
Relapsing Fever	0	0	0	0	0	-	-	-	-	-
Rheumatic Fever, Acute	0	0	0	0	0	-	-	-	-	-
Salmonellosis	31	26	43	38	138	8.8	12.8	10.0	11.7	10.5
Shigellosis	6	12	25	16	59	1.7	5.9	5.8	4.9	4.5
Streptococcus, Group A Invasive	3	2	6	3	14	0.9	1.0	1.4	0.9	1.1
Strongyloidiasis	0	0	0	0	0	-	-	-	-	-
Taeniasis	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	1	0	1	-	-	0.2	-	0.1
Typhus Fever	1	1	1	4	7	0.3	0.5	0.2	1.2	0.5
Vibrio	0	0	0	0	0	-	-	-	-	-
West Nile Virus	3	1	2	3	9	0.9	0.5	0.5	0.9	0.7

[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 19 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, 2016

	Frequency				Rate (Cases per 100,000)[b]			
Disease	**HB**	**IW**	**TO**	**TOTAL**	**HB**	**IW**	**TO**	**TOTAL**
Amebiasis	0	1	2	3	-	0.2	0.4	0.3
Botulism	0	0	0	0	-	-	-	-
Brucellosis	0	1	0	1	-	0.2	-	0.1
Campylobacteriosis	35	50	80	165	16.6	11.8	17.3	15.1
Cholera	0	0	0	0	-	-	-	-
Coccidioidomycosis	10	27	30	67	4.8	6.4	6.5	6.1
Cryptosporidiosis	7	3	3	13	3.3	0.7	0.7	1.2
Cysticercosis	0	0	0	0	-	-	-	-
Dengue	1	3	2	6	0.5	0.7	0.4	0.5
E. Coli—Shiga Toxin-Producing	5	19	16	40	2.4	4.5	3.5	3.7
Encephalitis	2	2	1	5	1.0	0.5	0.2	0.5
Giardiasis	10	11	28	49	4.8	2.6	6.1	4.5
Hansen's Disease (Leprosy)	0	0	0	0	-	-	-	-
Hepatitis A	0	4	2	6	-	0.9	0.4	0.5
Hepatitis B	1	2	2	5	0.5	0.5	0.4	0.5
Hepatitis C	0	0	0	0	-	-	-	-
Hepatitis Unspecified	0	0	0	0	-	-	-	-
Legionellosis	6	7	15	28	2.9	1.7	3.3	2.6
Listeriosis, Nonperinatal	0	1	0	1	-	0.2	-	0.1
Listeriosis, Perinatal[a]	0	2	0	2	-	2.2	-	0.9
Lyme Disease	0	0	0	0	-	-	-	-
Malaria	3	3	2	8	1.4	0.7	0.4	0.7
Meningitis, Viral	6	6	10	22	2.9	1.4	2.2	2.0
Meningococcal Infections	0	1	1	2	-	0.2	0.2	0.2
Pneumococcal Disease, Invasive	11	26	25	62	5.2	6.1	5.4	5.7
Psittacosis	0	0	0	0	-	-	-	-
Q-fever	0	0	0	0	-	-	-	-
Relapsing Fever	0	0	0	0	-	-	-	-
Rheumatic Fever, Acute	0	0	0	0	-	-	-	-
Salmonellosis	26	25	51	102	12.4	5.9	11.1	9.3
Shigellosis	7	28	8	43	3.3	6.6	1.7	3.9
Streptococcus, Group A Invasive	9	24	24	57	4.3	5.7	5.2	5.2
Strongyloidiasis	0	2	0	2	-	0.5	-	0.2
Taeniasis	0	1	0	1	-	0.2	-	0.1
Tetanus	0	0	0	0	-	-	-	-
Trichinosis	0	0	0	0	-	-	-	-
Tularemia	0	0	0	0	-	-	-	-
Typhoid Fever, Case	0	1	1	2	-	0.2	0.2	0.2
Typhoid Fever, Carrier	0	1	0	1	-	0.2	-	0.1
Typhus Fever	1	0	0	1	0.5	-	-	0.1
Vibrio	1	1	1	3	0.5	0.2	0.2	0.3
West Nile Virus	3	3	3	9	1.4	0.7	0.7	0.8

[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 19 cases or events are considered "unreliable." A zero rate made from no events is especiallly 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

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AMEBIASIS

CRUDE DATA	
Number of Cases	70
Annual Incidence[a]	
LA County	0.73
California[b]	N/A
United States[b]	N/A
Age at Diagnosis	
Mean	42
Median	40
Range	2–77 years

[a]Cases per 100,000 population
[b]Data not available

DESCRIPTION

Amebiasis is caused by the protozoan parasite *Entamoeba histolytica*. Cysts shed in human feces may contaminate food or drinking water. It also can be transmitted from person-to-person through fecal-oral spread. The incubation period for amebiasis is 1-4 weeks.

Although anyone can catch this disease, it is more common in people who live in tropical areas with poor sanitary conditions. In the US, amebiasis is most common in:

- People who have traveled to tropical places that have poor sanitary conditions,
- Immigrants from tropical countries that have poor sanitary conditions,
- People who live in institutions that have poor sanitary conditions, and
- Men who have sex with men (MSM).

Intestinal disease is often asymptomatic. When symptoms occur, they 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 colon perforation.

Visual inspection of stool for ova and parasites in the microbiology laboratory cannot differentiate between pathogenic *E. histolytica* and non-pathogenic *E. dispar*. Clinicians frequently order stool inspection for ova and parasites for persons with enteric symptoms, particularly those who have been involved in recreational activities (e.g., hiking), travel, persons with HIV, and MSM. Within LAC, stool ova and parasite specimens are frequently collected on new refugees as part of established CDC health screening guidelines despite the lack of significant gastrointestinal symptoms. Since many clinicians only obtain visual inspection of stool for ova and parasites without pursuing more specific Enzyme Immunoassay (EIA) stool antigen testing, which can differentiate between *E. histolytica* and *E. dispar*, many reports may be of persons infected with the non-pathogenic *E. dispar*, leading to an overestimation of *E. histolytica* infection.

Cases of amebiasis are reportable at the state level. Local level and surveillance is enhanced through electronic laboratory reporting, which captures EIA, microscopic, or serologically confirmed amebiasis cases from selected participating hospital and commercial laboratories.

Proper hand hygiene before meals and after using the restroom is a major way to prevent infection and transmission of amebiasis. Persons who care for diapered/incontinent children and adults should ensure that they properly wash their hands. Individuals with diarrheal illness should avoid swimming in recreational waters to prevent transmission to others. Fecal exposure during sexual activity, anal intercourse, and oral-anal sexual practices should also be avoided. There is no vaccine available for disease prevention.

2016 TRENDS AND HIGHLIGHTS

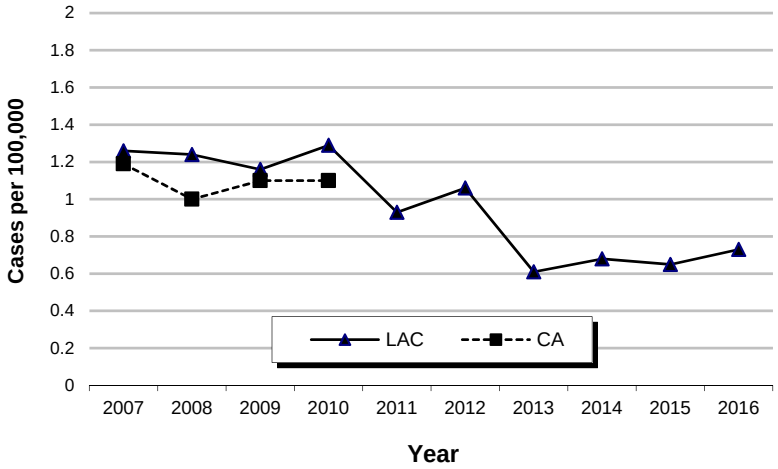
- In 2013, the LAC DPH's protocol changed to count only symptomatic persons with suspected gastrointestinal and/or extra-intestinal amebiasis with laboratory evidence of *E. histolytica*. In 2016, LAC DPH continued to count only laboratory confirmed symptomatic infections as confirmed cases of *E. histolytica*.
- The amebiasis disease incidence rate slightly increased in LAC from 0.65 cases per 100,000 in 2015 to 0.73 cases per 100,000 in 2016. There was a 35% decrease in the incidence from a mean of 1.13/100,000 in 2010-2012 to 0.73/100,000 in 2016 (Figure 1). This decrease in incidence is most likely due to the change in case definition that occurred in 2013.
- The greatest incidence of amebiasis was in the 35-44 year old age group (1.1 cases per 100,000) followed by those 55-64 years old (1.0 cases per 100,000) (Figure 2).
- Comparing race/ethnicity, the greatest incidence of amebiasis occurred among Whites (1.3 cases per 100,000) (Figure 6).
- The highest amebiasis incidence rates was documented within SPA 4 (1.9 per 100,000) and SPA 5 had the second highest incidence of cases (1.5 per 100,000). The higher incidence in SPAs 4 and 5 may be attributable to a higher number of MSM in that region (Figure 4). Across the remaining 6 SPAs, the incidence of amebiasis cases were consistent, which suggests an even geographical distribution of cases.
- The number of cases peaked in January, which was inconsistent with the previous five-year average. July and August had an unusually low number of cases reported (Figure 5).
- Consistent with previous years, males comprised the majority (77%) of reported cases in 2016. The incidence rate of males was three times greater than that of females with 1.1 and 0.3 cases per 100,000, respectively.

Reported Amebiasis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012–2016

	2012 (N=99)			2013 (N=57)			2014 (N=64)			2015 (N=62)			2016 (N=70)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	2	3.1	1.7	0	-	-	0	-	-
1-4	1	1.0	0.2	0	-	-	1	1.6	0.2	2	3.2	0.4	1	1.4	0.2
5-14	5	5.1	0.4	0	-	-	3	4.7	0.2	4	6.5	0.3	3	4.3	0.2
15-34	33	33.3	1.2	18	31.6	0.6	19	29.7	0.7	20	32.3	0.7	21	30.0	0.7
35-44	24	24.2	1.8	13	22.8	1	17	26.6	1.3	10	16.1	0.8	15	21.4	1.1
45-54	18	18.2	1.4	21	36.8	1.6	12	18.8	0.9	10	16.1	0.8	11	15.7	0.8
55-64	9	9.1	0.9	3	5.3	0.3	4	6.3	0.4	12	19.4	1.1	11	15.7	1.0
65+	9	9.1	0.8	2	3.5	0.2	6	9.4	0.5	4	6.5	0.3	8	11.4	0.7
Race / Ethnicity															
Asian	6	6.1	0.5	3	5.3	0.2	5	7.8	0.4	4	6.5	0.3	4	5.7	0.3
Black	4	4.0	0.5	2	3.5	0.3	7	10.9	0.9	4	6.5	0.5	3	4.3	0.4
Hispanic	39	39.4	0.9	17	29.8	0.4	26	40.6	0.6	16	25.8	0.3	23	32.9	0.5
White	33	33.3	1.2	34	59.6	1.3	23	35.9	0.9	37	59.7	1.4	36	51.4	1.3
Other	0	-	-	0	-	-	0	-	-	0	-	-	1	1.4	-
Unknown	17	17.2	-	1	1.8	-	3	4.7	-	1	1.6	-	3	4.3	-
SPA															
1	1	1.0	0.3	1	1.8	0.3	2	3.1	0.5	0	-	-	0	-	-
2	29	29.3	1.4	21	36.8	1	13	20.3	0.6	16	25.8	0.7	14	20.0	0.6
3	4	4.0	0.2	5	8.8	0.3	7	10.9	0.4	3	4.8	0.2	9	12.9	0.5
4	25	25.3	2.2	13	22.8	1.1	19	29.7	1.7	22	35.5	1.9	23	32.9	1.9
5	8	8.1	1.3	8	14.0	1.2	7	10.9	1.1	14	22.6	2.1	10	14.3	1.5
6	1.3	13.1	1.3	3	5.3	0.3	4	6.3	0.4	4	6.5	0.4	8	11.4	0.7
7	15	15.2	1.2	3	5.3	0.2	7	10.9	0.5	1	1.6	0.1	3	4.3	0.2
8	4	4.0	0.4	3	5.3	0.3	5	7.8	0.5	2	3.2	0.2	3	4.3	0.3
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates of Amebiasis
CA and LAC, 2007-2016*



* CA data not available after 2010.

Figure 2. Incidence Rates of Amebiasis by Age Group
LAC, 2016 (N=70)

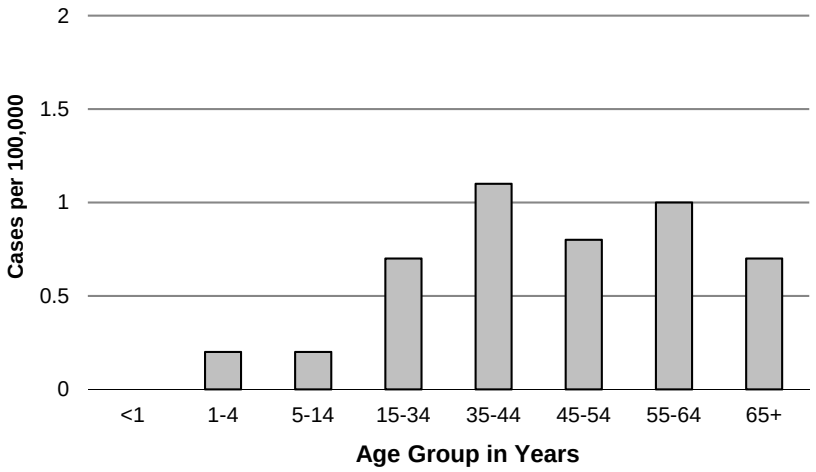
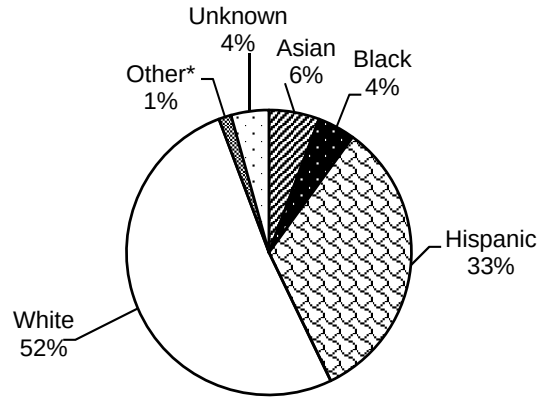


Figure 3. Percent Cases of Amebiasis by Race/Ethnicity
LAC, 2016 (*N=70)



* Other includes Native American and any additional racial/ethnic group that cannot be categorized as Asian, Black, Hispanic, and White.

Figure 4. Incidence Rates of Amebiasis by SPA
LAC, 2016 (N=70)

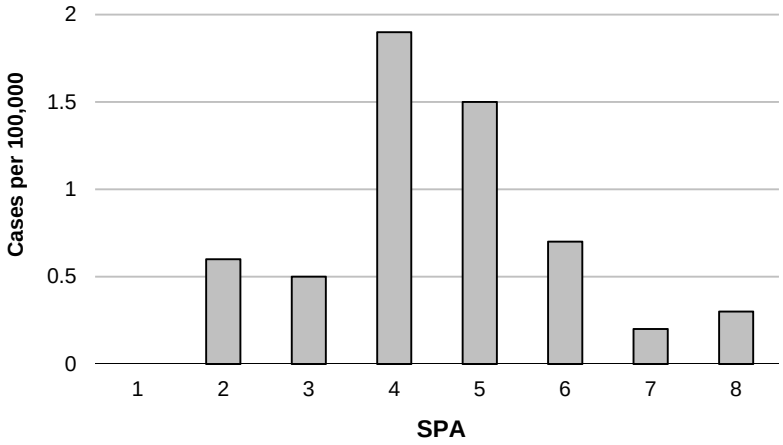


Figure 5. Reported Amebiasis Cases by Month of Onset LAC, 2016 (N=70)

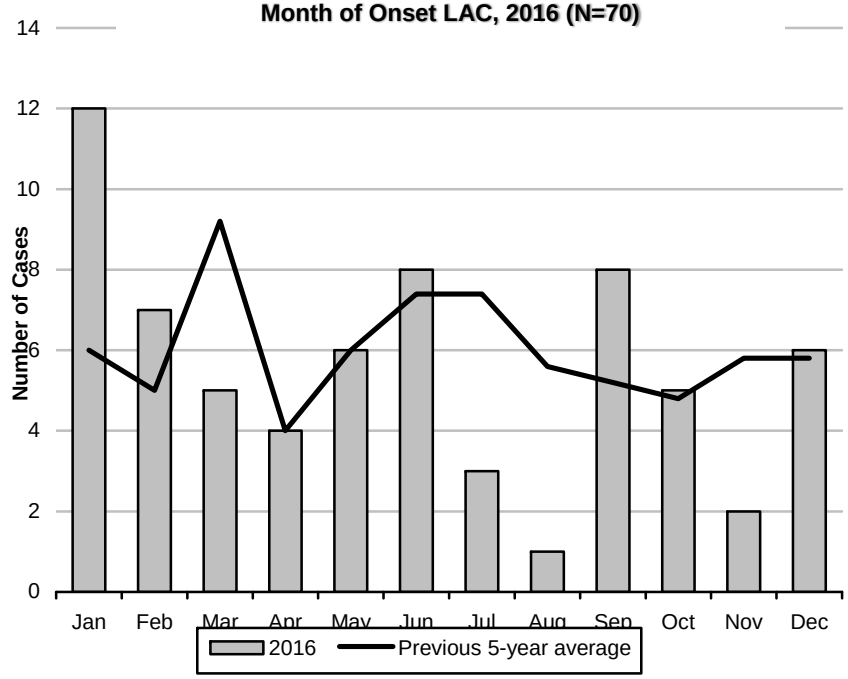
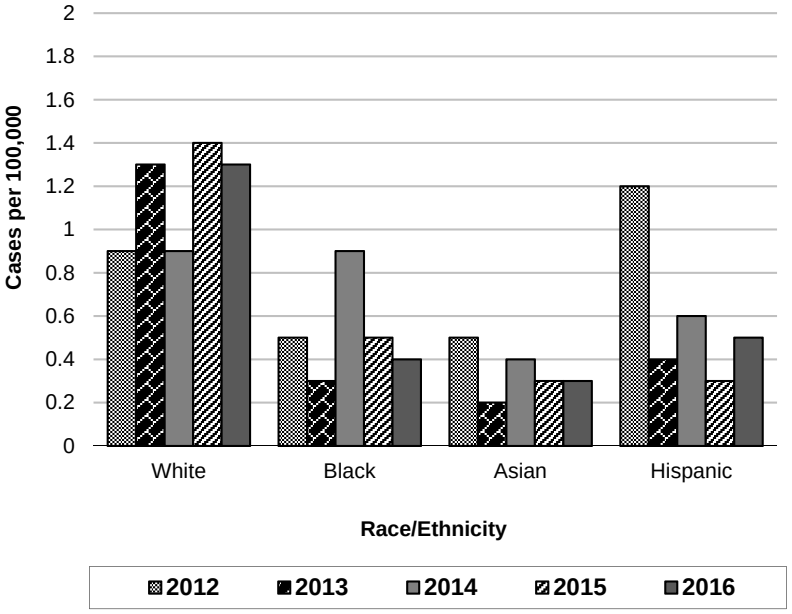
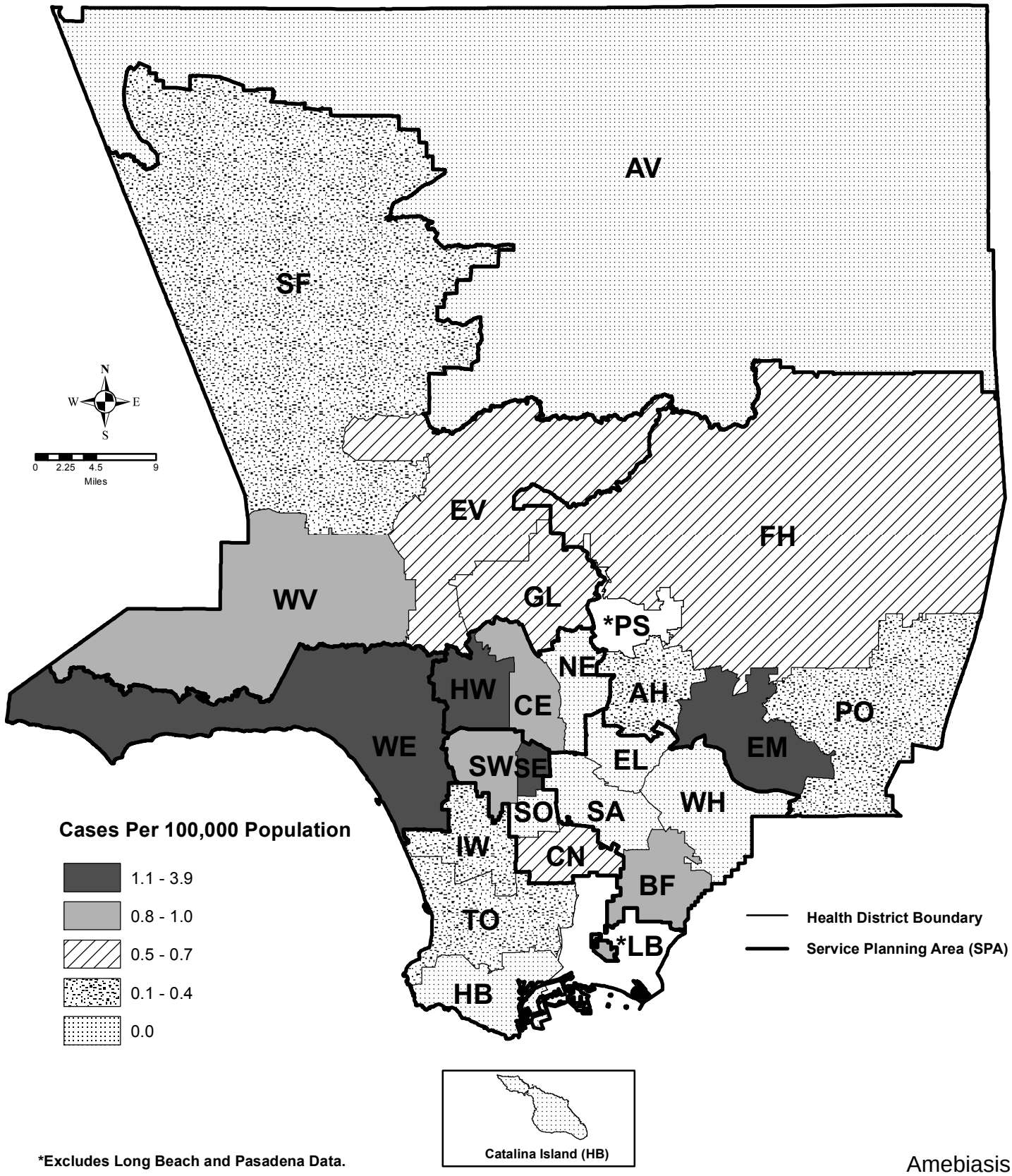


Figure 6. Incidence Rate of Amebiasis by Race/Ethnicity LAC, 2012-2016



Map 1. Amebiasis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

CAMPYLOBACTERIOSIS

CRUDE DATA	
Number of Cases	1564
Annual Incidence[a]	
LA County	16.29
California[b]	21.03
United States[b]	15.91
Age at Diagnosis	
Mean	38.8
Median	36
Range	0–101 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Campylobacteriosis is a bacterial disease caused by several species of gram-negative bacilli including *Campylobacter jejuni, C. upsaliensis, C. coli,* and *C. fetus*. It is usually transmitted through ingestion of organisms in undercooked poultry or other meat, contaminated food, water, or raw milk or occasionally through contact with infected animals. The incubation period is 2–5 days. Common symptoms include watery or bloody diarrhea, fever, abdominal cramps, myalgia, and nausea. Sequelae include Guillain-Barré syndrome and Reiter syndrome, both of which are rare.

To reduce the likelihood of contracting campylobacteriosis, all food derived from animal sources, particularly poultry, should be thoroughly cooked. 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.

2016 TRENDS AND HIGHLIGHTS

- There was a 4.1% increase in the incidence of campylobacteriosis from the previous year and a 16.5% increase from 2011 (Figure 1).
- The highest rates were among children aged <1 year old (34.7 per 100,000) followed by persons aged 1-4 years old (20.9 per 100,000) (Figure 2).
- SPA 5 had the highest rate (33.3 per 100,000), which is consistent with previous years (Figure 3).
- No outbreaks of campylobacteriosis were detected in 2016.
- Routine interviewing of campylobacteriosis cases was discontinued in 2010; however, surveillance of reported cases has continued in order to monitor for clusters and review foodborne illness reports that have a diagnosis of campylobacteriosis.

Reported Campylobacteriosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=1,546)			2013 (N=1,703)			2014 (N=1,506)			2015 (N=1,623)			2016 (N=1564)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	46	3.0	38.7	45	2.6	37.2	27	1.8	22.8	23	1.4	21.3	36	2.3	34.7
1-4	136	8.8	28.6	159	9.3	32.7	118	7.8	24.2	115	7.1	23.7	98	6.2	20.9
5-14	181	11.7	15.1	173	10.2	14.3	159	10.6	13.2	138	8.5	11.4	123	7.8	10.2
15-34	418	27.0	15.1	495	29.1	17.5	437	29.0	15.5	525	32.4	18.6	481	30.7	17.1
35-44	169	10.9	12.8	182	10.7	13.7	192	12.8	14.5	210	12.9	15.9	188	12.0	14.3
45-54	186	12.0	14.5	185	10.9	14.3	175	11.6	13.5	197	12.1	15.0	198	12.6	15.0
55-64	163	10.5	16.0	177	10.4	17.2	155	10.3	14.6	176	10.8	15.9	178	11.3	15.7
65+	238	15.4	21.5	281	16.5	25.3	239	15.9	14.6	233	14.4	19.5	253	16.1	20.6
Unknown	9	0.6	-	6	0.4	-	4	0.3	-	6	0.4	0.3	9	0.5	-
Race/Ethnicity															
Asian	37	2.4	2.8	46	2.7	3.4	61	4.1	4.4	43	2.7	3.1	70	4.4	5.0
Black	34	2.2	4.4	46	2.7	5.9	39	2.6	5.0	25	1.5	3.2	40	2.5	5.1
Hispanic	161	10.4	3.6	167	9.8	3.6	219	14.5	4.8	210	12.9	4.5	259	16.5	5.5
White	228	14.8	8.6	386	22.7	14.5	272	18.1	10.2	264	16.4	9.8	294	18.7	11.0
Other	11	0.7	-	32	1.9	-	25	1.7	-	39	2.4	-	76	4.8	-
Unknown	107	69.5	-	1026	60.3	-	888	59.0	-	104	64.2	-	825	52.7	-
SPA															
1	36	2.3	9.3	41	2.4	10.5	55	3.7	14.0	66	4.1	16.7	79	5.0	20.1
2	362	23.4	16.9	401	23.6	18.4	388	25.8	17.7	416	25.6	18.7	395	25.2	17.6
3	200	12.9	12.4	220	12.9	13.5	217	14.4	13.2	217	13.4	13.1	209	13.3	12.7
4	234	15.1	20.8	292	17.2	25.6	198	13.2	17.2	230	14.2	19.7	220	14.0	18.6
5	228	14.8	35.7	218	12.8	33.7	189	12.6	29.0	219	13.5	33.2	221	14.1	33.3
6	140	9.1	13.8	175	10.3	17.0	136	9.0	13.2	138	8.5	13.2	122	7.8	11.4
7	179	11.6	13.8	180	10.6	13.7	137	9.1	10.4	165	10.2	12.5	153	9.7	11.7
8	157	10.2	14.7	172	10.1	16.0	185	12.3	17.1	172	10.6	15.7	165	10.5	15.1
Unknown	10	0.7	-	4	0.2	-	1	0.1	-	0	-	-	-	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable. Data provided in section race/ethnicity is incomplete.

**Figure 1. Reported Campylobacteriosis Rates by Year
LAC, 2006-2016**

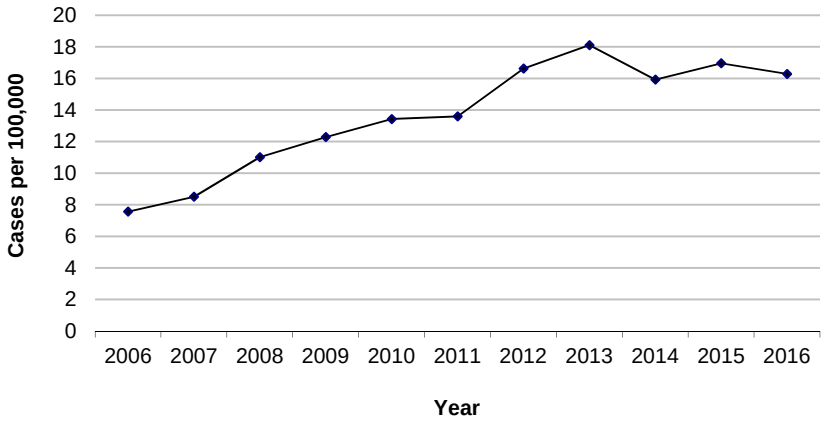


**Figure 2. Reported Campylobacteriosis Rates by Age Group
LAC, 2016 (N=1564)**

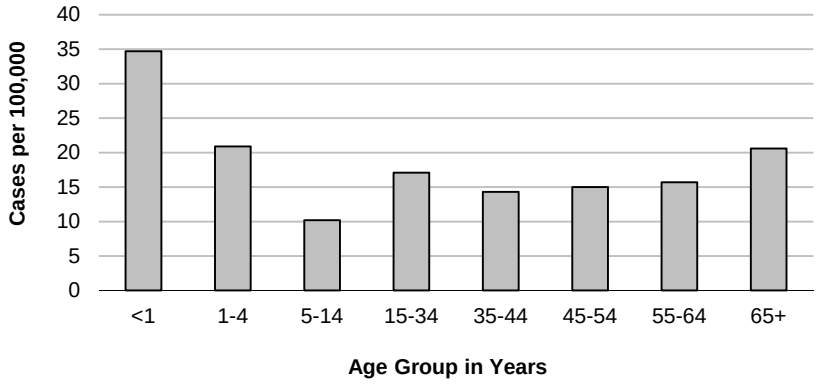
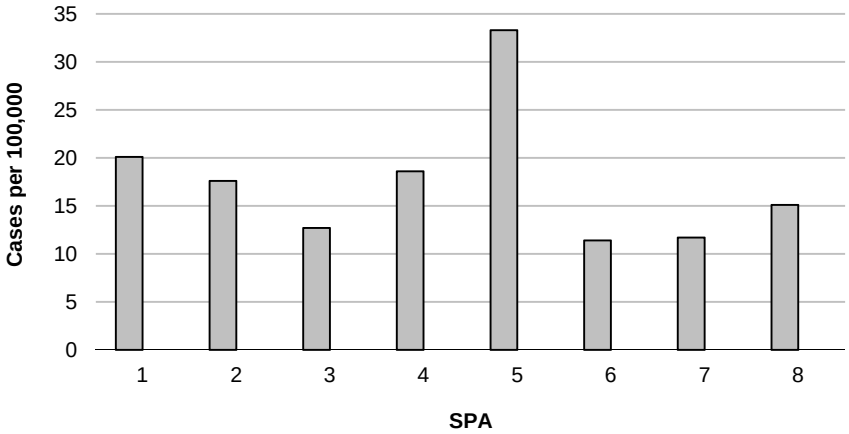
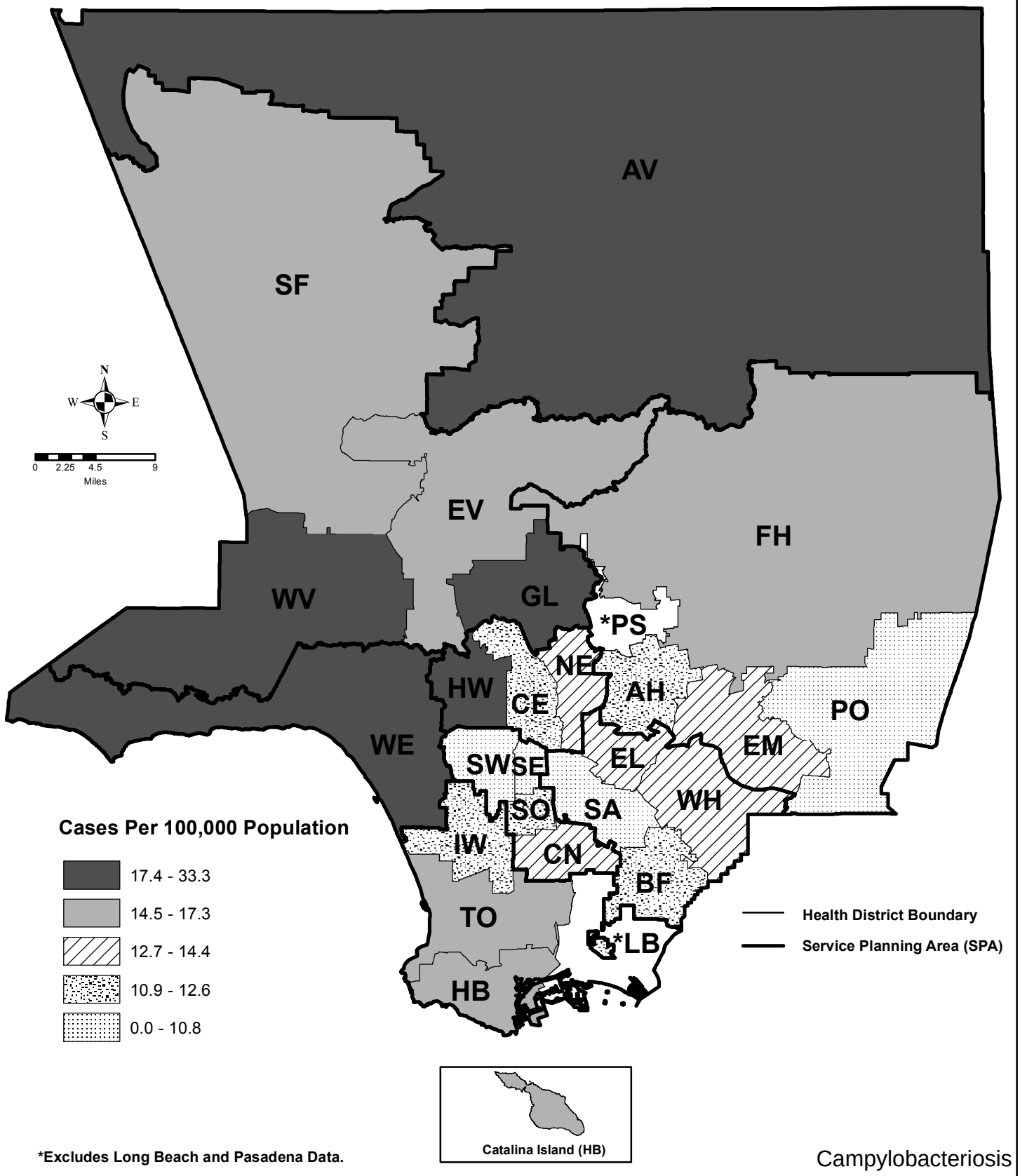


**Figure 3. Reported Campylobacteriosis Rates by SPA
LAC, 2016 (N=1564)**



Map 2. Campylobacteriosis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

COCCIDIOIDOMYCOSIS

CRUDE DATA	
Number of Cases	809
Annual Incidence[a]	
LA County	8.43
California[b]	9.96
United States[b]	3.20
Age at Diagnosis	
Mean	53
Median	53
Range	1–96 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Coccidioidomycosis, or Valley Fever, is a fungal disease transmitted through the inhalation of *Coccidioides immitis* spores that are carried in dust. Environmental conditions conducive to an increased occurrence of coccidioidomycosis include arid to semi-arid regions, dust storms, hot summers, warm winters, and sandy, alkaline soil. The fungus is endemic in southwestern US (including Southern California) and parts of Mexico and South America. Most infected people exhibit no symptoms or have mild respiratory illness, but a few individuals develop severe illness such as pneumonia, meningitis, or dissemination of the fungus to other parts of the body. Among the wide range of clinical presentations, only the most severe cases are usually diagnosed and reported to the health department. Blacks, Filipinos, pregnant women, young (<5 years old), elderly, and immunocompromised individuals are at higher risk for severe disease. Currently, no safe and effective vaccine or drug to prevent coccidioidomycosis exists. Prevention lies mainly in dust avoidance and control (e.g., planting grass in dusty areas, putting oil on roadways, wetting down soil, air conditioning homes, wearing masks or respirators). Other options may be to warn people at high risk for severe disease not to travel to endemic areas when conditions are most dangerous for exposure.

Recovery from the disease confers lifelong immunity to reinfection, highlighting the importance of developing a vaccine for prevention of symptomatic or serious forms of the disease. Increasing exposure and risk associated with construction, a growing naïve population in endemic areas, and antifungal treatments that have side effects and are not uniformly effective validate the need for prevention efforts.

2016 TRENDS AND HIGHLIGHTS

- The overall LAC incidence rate for coccidioidomycosis has continued to increase over the last ten years and has tripled since 2010.
- Those >65 years old experienced the most cases (25%) with an incidence rate of 16.5 cases per 100,000 (Figure 2).
- Males represented 66.9% of cases; females 33.1% (Figure 3).
- Incidence rates were the highest among Blacks at 14.3 per 100,000, which has almost tripled from 5.3 per 100,000 since 2014 (Figure 4).
- SPA 1 has consistently reported the highest incidence of coccidioidomycosis in LAC. In 2015, the incidence rate was 53.8 per 100,000, which has increased from last year's rate of 42.6 per 100,000 (Figure 5).
- The highest number of cases (n=88, 35.4%) occurred in October. The number of cases in July peaked (n=46) as compared to the previous 5-year average. A possible reason for the increase in cases during the fall season, is the addition of 14 laboratories that began reporting electronically between late August and early October (Figure 6).

Reported Coccidioidomycosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012–2016

	2012 (N=327)			2013 (N=362)			2014 (N=426)			2015 (N=613)			2016 (N=809)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	1	0.3	0.8	0	-	-	0	-	-	0	-	-
1-4	3	0.9	0.6	0	-	0.6	1	0.2	0.2	4	0.7	0.8	1	0.12	0.2
5-14	3	0.9	0.3	6	1.7	0.5	4	0.9	0.3	7	1.1	0.6	12	1.48	1.0
15-34	68	20.8	2.5	67	18.5	2.4	68	16.0	2.4	96	15.7	3.4	120	14.8	4.3
35-44	53	16.2	4.0	55	15.2	4.1	61	14.3	4.6	98	16.0	7.4	124	15.3	9.4
45-54	84	25.7	6.5	86	23.8	6.7	91	21.4	7.0	127	20.7	9.6	167	20.6	12.6
55-64	46	14.1	4.5	73	20.2	7.1	93	21.8	8.8	109	17.8	9.9	182	22.5	16.1
65+	70	21.4	6.3	74	20.4	6.7	108	25.4	9.5	172	28.1	14.4	203	25	16.5
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	26	8.0	2.0	30	8.3	2.2	33	7.7	2.4	47	7.7	3.4	85	10.5	6.1
Black	46	14.1	5.9	50	13.8	6.4	42	9.9	5.3	111	18.1	14.1	112	13.8	14.3
Hispanic	133	40.7	2.9	104	28.7	2.3	139	32.6	3.0	201	32.8	4.3	265	32.8	5.6
White	121	37.0	4.6	132	36.5	5.0	175	40.8	6.6	217	35.4	8.1	288	35.4	10.8
Other	0	-	-	5	1.4	-	3	0.7	-	13	2.1	-	28	2.1	-
Unknown	1	0.3	-	41	11.3	-	34	8.0	-	24	3.9	-	31	3.9	-
SPA															
1	74	22.6	19.1	74	20.4	18.9	103	24.2	26.2	169	27.6	42.6	211	26.0	53.8
2	72	22.0	3.4	83	22.9	3.8	125	29.3	5.7	157	25.6	7.0	232	28.7	10.4
3	25	7.6	1.5	38	10.5	2.3	44	10.3	2.7	36	5.9	2.2	60	7.4	3.6
4	53	16.2	4.7	46	12.7	4.0	30	7.0	2.6	57	9.3	4.9	59	7.3	5.0
5	18	5.5	2.8	22	6.1	3.4	21	4.9	3.2	25	4.1	3.8	31	3.8	4.7
6	37	11.3	3.6	38	10.5	3.7	42	9.9	4.1	57	9.3	5.4	70	8.7	6.5
7	34	10.4	2.6	29	8.0	2.2	30	7.0	2.3	64	10.4	4.8	73	9.0	5.6
8	14	4.3	1.3	25	6.9	2.3	29	6.8	2.7	44	7.2	4.0	67	8.3	6.1
Unknown	0	-	-	7	1.9	-	2	0.5	-	4	0.7	-	4	0.5	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates of Coccidioidomycosis US*, CA, and LAC, 2007-2016

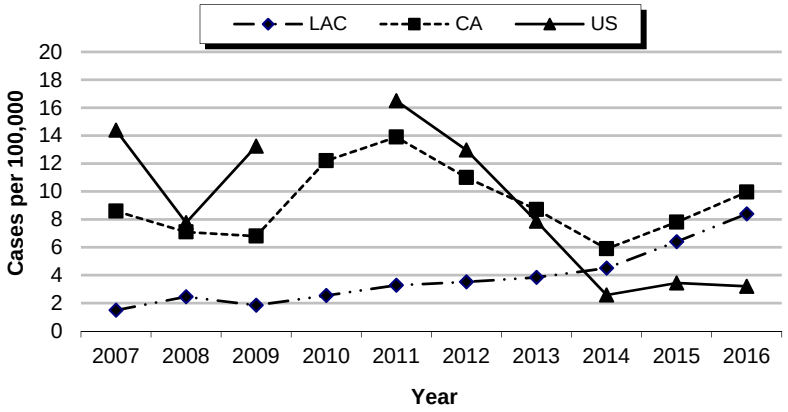


Figure 2. Incidence Rates of Coccidioidomycosis by Age Group LAC, 2016 (N=809)

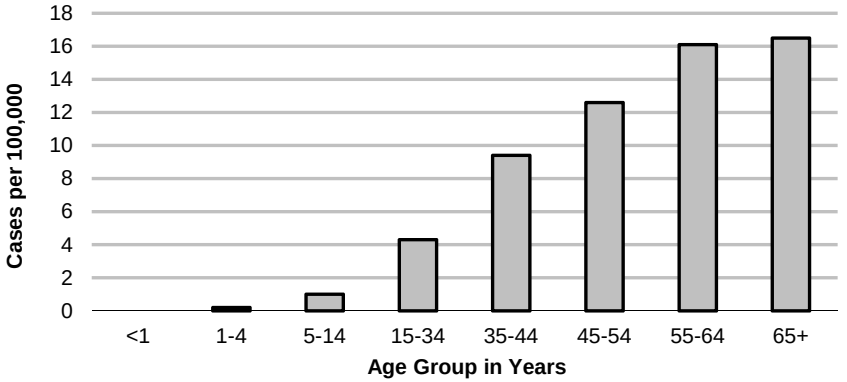


Figure 3. Percent of Reported Coccidioidomycosis Cases by SPA and Sex LAC, 2016 (N=809)

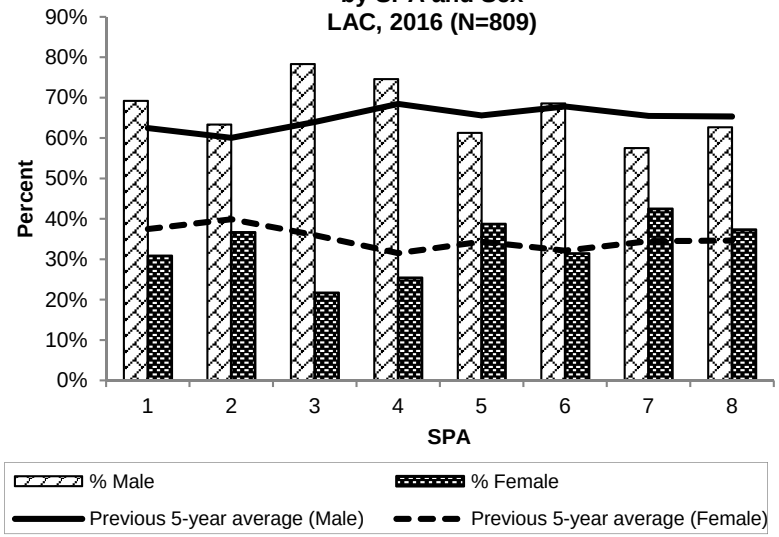


Figure 4. Coccidioidomycosis Incidence Rates by Race/Ethnicity LAC, 2012-2016

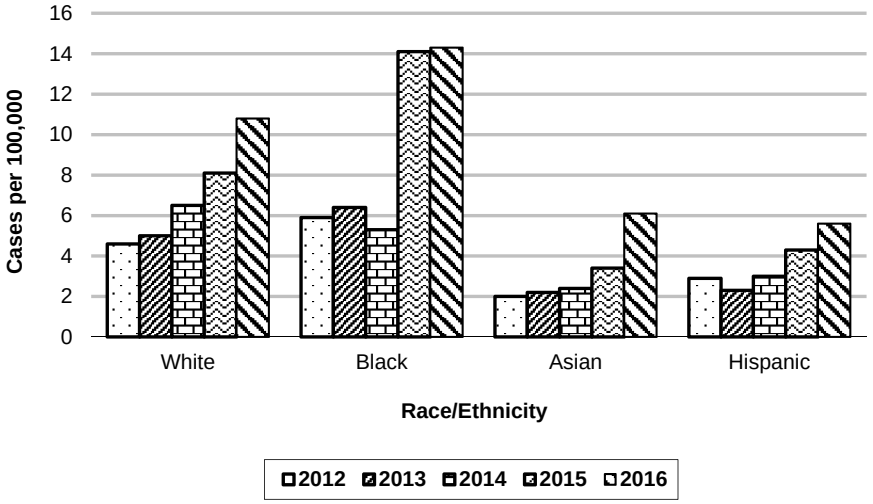


Figure 5. Incidence Rates of Coccidioidomycosis by SPA LAC, 2012-2016

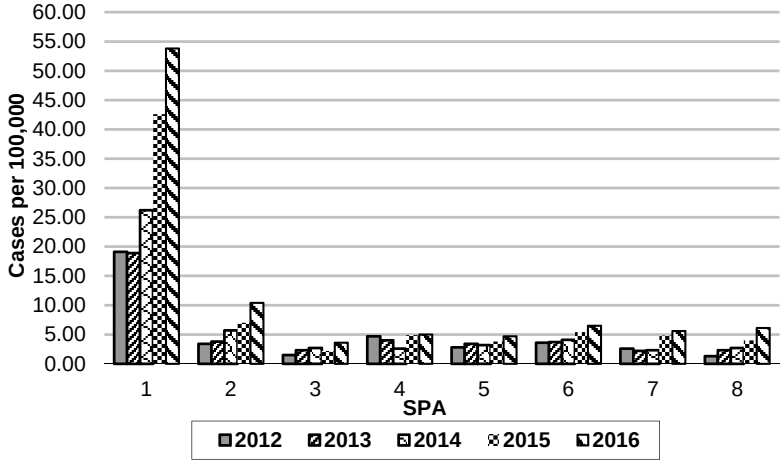
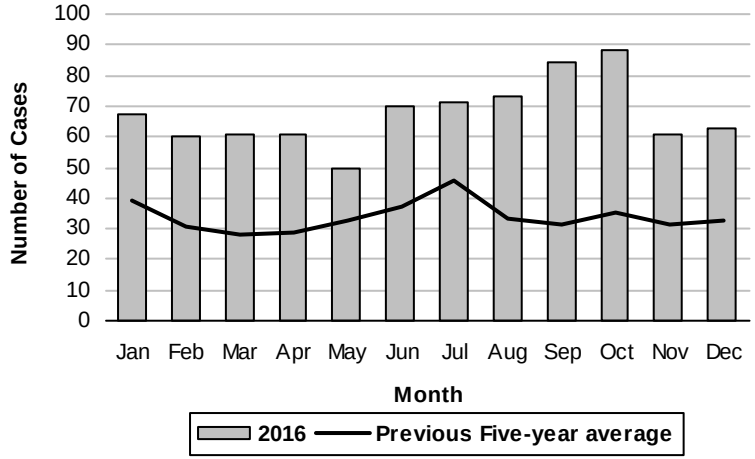
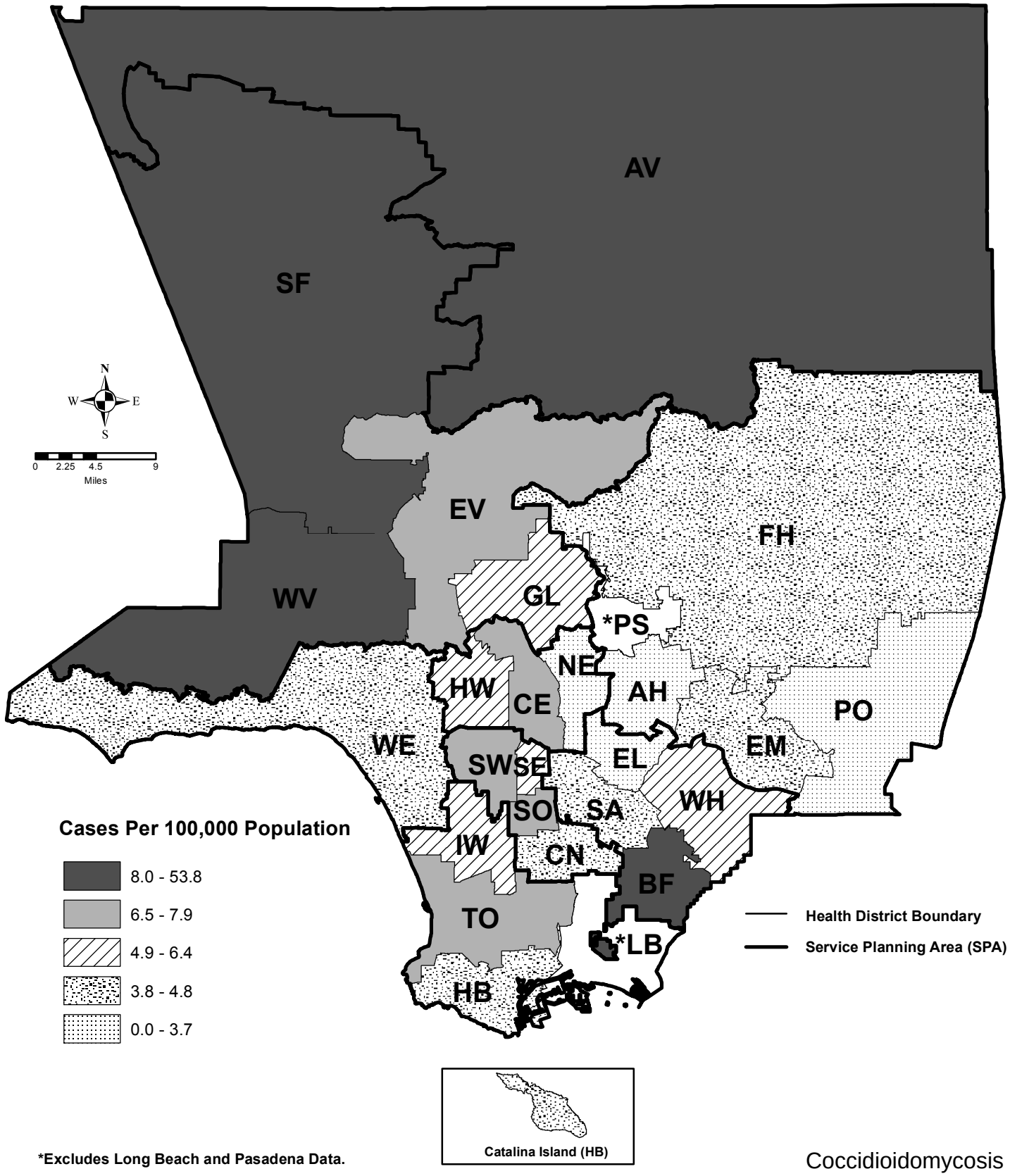


Figure 6. Reported Coccidioidomycosis Cases by Month of Onset, LAC, 2016 (N=809)



Map 3. Coccidioidomycosis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

CRYPTOSPORIDIOSIS

CRUDE DATA	
Number of Cases	98
Annual Incidence[a]	
LA County	1.02
California[b]	0.90
United States[b]	3.67
Age at Diagnosis	
Mean	34
Median	31
Range	1–86 years

[a]Cases per 100,000 population

[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Cryptosporidiosis is fecal-orally transmitted when cysts of the parasite *Cryptosporidium spp.* are ingested. The parasite is protected by an outer shell that allows it to survive outside the body for long periods of time and makes it very tolerant to chlorine disinfection.

While this parasite can be spread in several different ways, drinking contaminated water (drinking water and recreational water) is the most common way to spread the parasite. This parasite also can be transmitted through contact with animals. Another common cause is unprotected sexual contact, particularly among men who have sex with men (MSM). 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 two weeks in healthy individuals. Those who have a weakened immune system may experience prolonged illness. Immunocompromised individuals (e.g., HIV/AIDS patients, cancer patients, and transplant patients), young children, and pregnant women are at risk for more severe illness.

Proper hand hygiene before meals and after using the restroom is a major way to prevent infection and transmission of cryptosporidiosis. Hand washing is also important for individuals who might have direct contact with diapered or incontinent children and adults. Persons should avoid drinking untreated water that may be contaminated. Persons with diarrhea should not go swimming in recreational waters to prevent transmission to others. Fecal exposure during sexual activity such as anal intercourse and oral-anal sexual practices should also be avoided.

2016 TRENDS AND HIGHLIGHTS

- The incidence rate of cryptosporidiosis cases in LAC in 2016 was 1.02 cases per 100,000 people. This is an increase over previous years (Figure 1). This increase may be explained by the adoption of electronic lab reporting and new testing methods by LAC pathology labs.
- The greatest incidence of cryptosporidiosis was in persons 1–4 years old (1.7 cases per 100,000) followed by those 45–54 years old (1.5 cases per 100,000) (Figure 2).
- The greatest incidence of cryptosporidiosis was in Whites (0.9 cases per 100,000) followed by Blacks (0.6 cases per 100,000) (Figure 6).
- SPA 5 had the highest incidence rate with 2.0 cases per 100,000 (Figure 4).
- Information on race and risk factors are incomplete since routine interviews of cryptosporidiosis cases were discontinued as of October 1, 2015. However, surveillance continues to monitor for clusters and review of cryptosporidiosis with positive laboratory reports.
- There was no clear peak of cryptosporidiosis incidence in 2016. However, most cases occurred during the hot summer months of

June, July, August, and September, which is consistent with risk factors such as exposure to recreational water, hiking, and travel (Figure 5).

- No outbreaks of cryptosporidiosis were detected in 2016.

Reported Cryptosporidiosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012–2016

	2012 (N=44)			2013 (N=48)			2014 (N=78)			2015 (N=56)			2016 (N=98)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	2	4.5	0.4	1	2.1	0.2	2	2.6	0.4	2	3.6	0.4	8	8.2	1.7
5-14	4	9.1	0.3	2	4.2	0.2	5	6.4	0.4	5	8.9	0.4	10	10.2	0.8
15-34	13	29.5	0.5	16	33.3	0.6	29	37.2	1.0	25	44.6	0.9	34	34.7	1.2
35-44	8	18.2	0.6	8	16.7	0.6	17	21.8	1.3	9	16.1	0.7	13	13.3	1.0
45-54	8	18.2	0.6	14	29.2	1.1	15	19.2	1.2	6	10.7	0.5	20	20.4	1.5
55-64	4	9.1	0.4	2	4.2	0.2	5	6.4	0.5	6	10.7	0.5	7	7.14	0.6
65+	4	9.1	0.4	5	10.4	0.5	4	5.1	0.4	3	5.4	0.3	5	5.1	0.4
Unknown	1	2.3	-	0	-	-	1	1.3	-	-	-	-	1	1.0	-
Race/Ethnicity															
Asian	1	2.3	0.1	2	4.2	0.1	5	6.4	0.4	4	7.1	0.3	3	3.1	0.2
Black	1	2.3	0.1	12	25.0	1.5	12	15.4	1.5	2	3.6	0.3	5	5.1	0.6
Hispanic	9	20.5	0.2	7	14.6	0.2	22	28.2	0.5	16	28.6	0.3	13	13.3	0.3
White	19	43.2	0.7	24	50.0	0.9	34	43.7	1.3	21	37.5	0.8	25	25.5	0.9
Other	0	-	-	2	4.2	-	2	2.6	-	0	-	-	3	3.1	-
Unknown	14	31.8	-	1	2.1	-	3	3.8	-	13	23.2	-	49	50.0	-
SPA															
1	5	11.4	1.3	4	8.3	1.0	3	3.8	0.8	0	-	-	3	3.1	0.8
2	12	27.3	0.6	15	31.3	0.7	23	29.5	1.1	24	42.9	1.1	20	20.4	0.9
3	7	15.9	0.4	4	8.3	0.2	5	6.4	0.3	7	12.5	0.4	6	6.1	0.4
4	6	13.6	0.5	6	12.5	0.5	21	26.9	1.8	8	14.3	0.7	19	19.4	1.6
5	6	13.6	0.9	6	12.5	0.9	4	5.1	0.6	4	7.1	0.6	13	13.3	2.0
6	1	2.3	0.1	5	10.4	0.5	6	7.7	0.6	5	8.9	0.5	5	5.1	0.5
7	1	2.3	0.1	3	6.3	0.2	8	10.2	0.6	3	5.4	0.2	11	11.2	0.8
8	3	6.8	0.3	5	10.4	0.5	7	9.0	0.6	3	5.4	0.3	13	13.3	1.2
Unknown	3	6.8	-	0	-	-	1	1.3	-	2	3.6	-	8	8.2	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates of Cryptosporidiosis US, CA, and LAC, 2007-2016

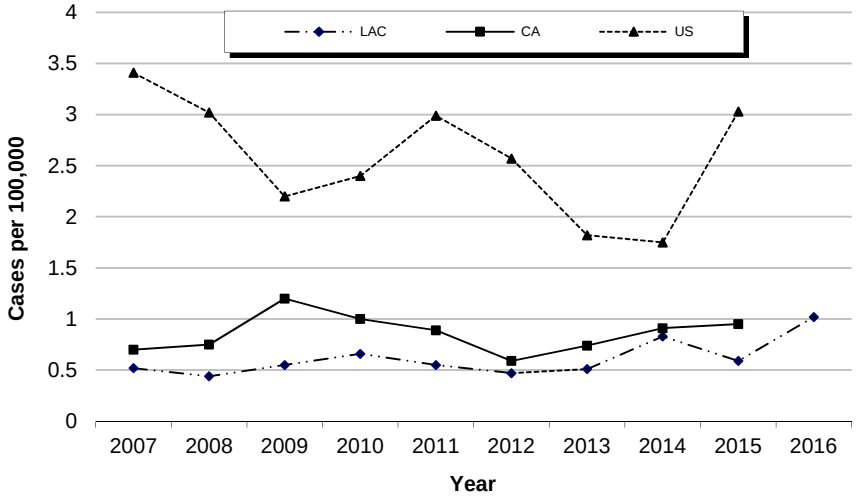


Figure 2. Incidence Rates of Cryptosporidiosis by Age Group, LAC, 2016 (N=98)

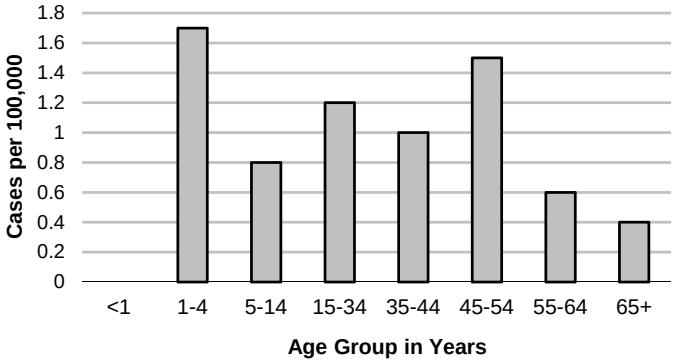
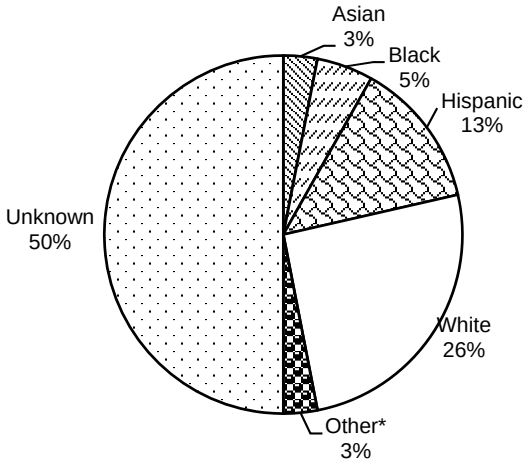


Figure 3. Percent of Cryptosporidiosis by Race/Ethnicity LAC, 2016 (*N=98)



*Other includes Native American and any additional racial/ethnic group that cannot be categorized as Asian, Black, Hispanic, and White.

Figure 4. Incidence Rates of Cryptosporidiosis by SPA LAC, 2016 (N=98)

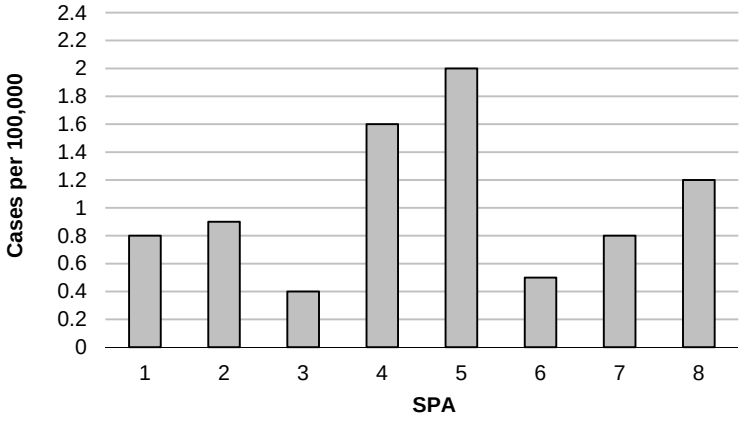
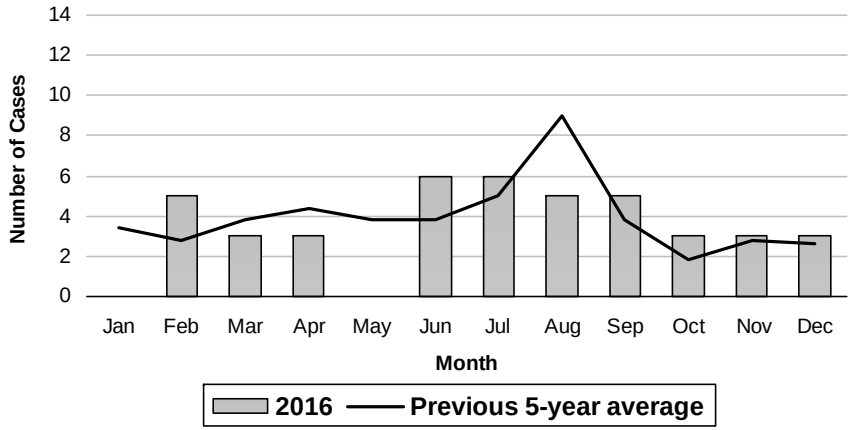
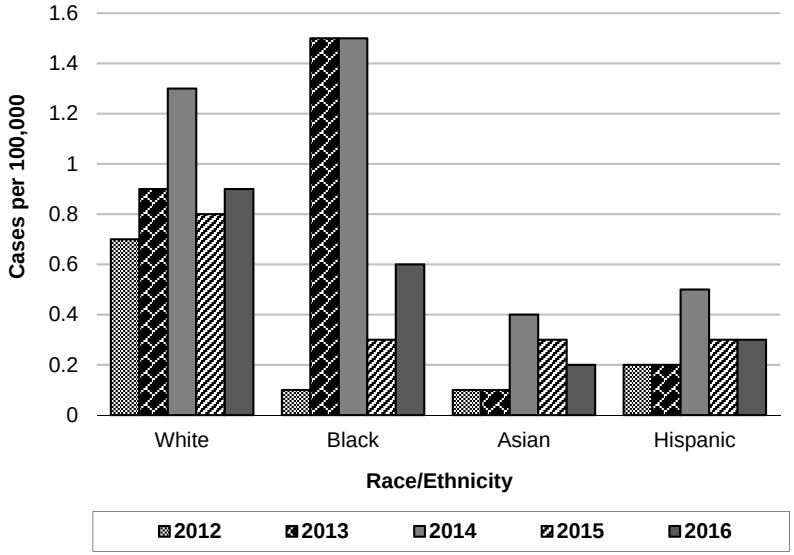


Figure 5. Reported Cryptosporidiosis Cases by Month of Onset, LAC, 2016 (N=98)

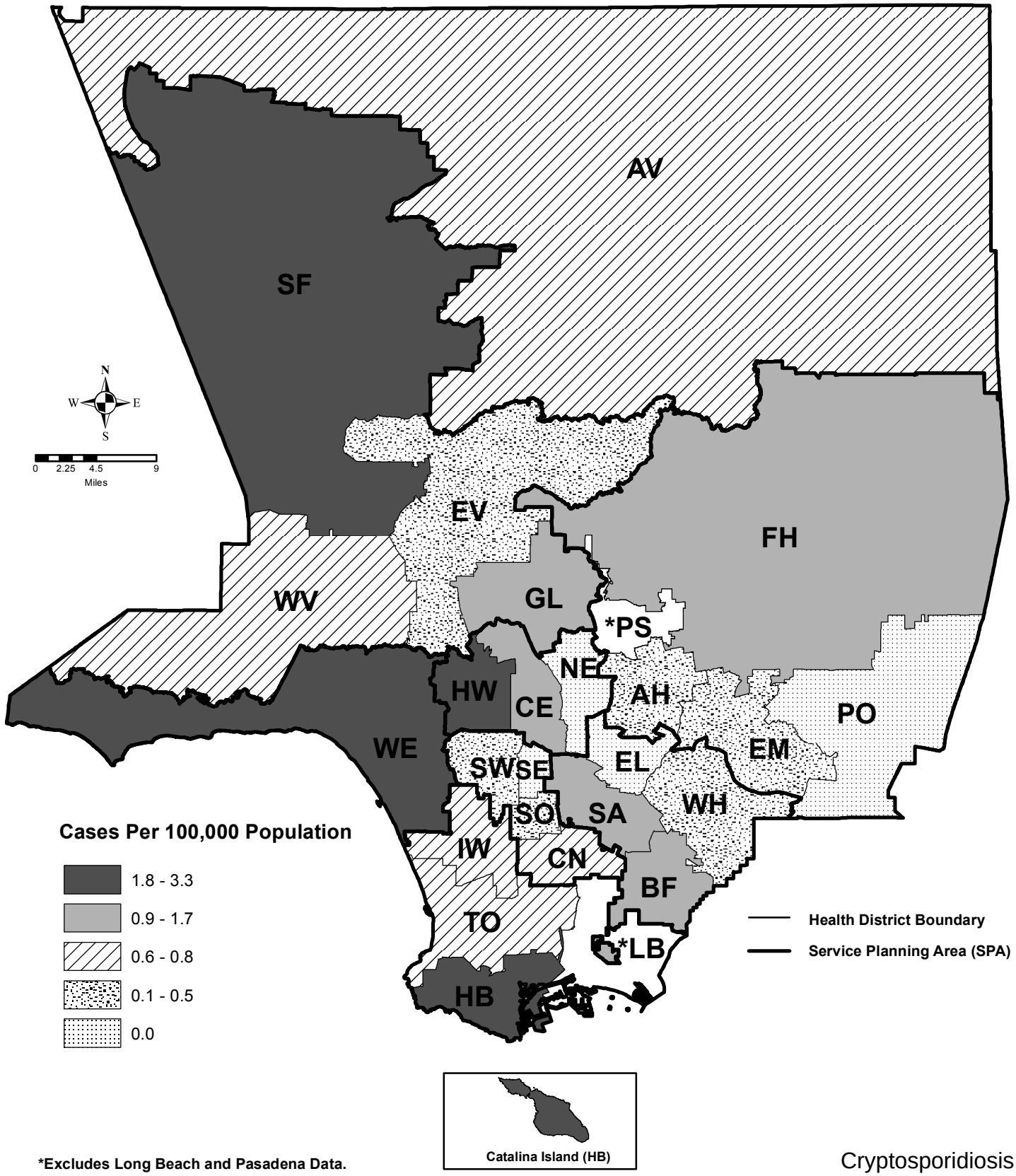


*Date of onset missing on 19 out of 56 cases.

Figure 6. Incidence Rates of Cryptosporidiosis by Race/Ethnicity LAC, 2012-2016



Map 4. Cryptosporidiosis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

ESCHERICHIA COLI—SHIGA-TOXIN-PRODUCING (STEC)

CRUDE DATA	STEC
Number of Cases	282
Annual Incidence[a]	
LA County	2.94
California[b, c]	1.92
United States[b, c]	2.12
Age at Diagnosis	
Mean	33.5
Median	30
Range	0–94 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w
[c]Includes *E. coli* O157:H7, Shiga toxin-positive, serogroup non-O157, and Shiga toxin-positive, not serogrouped

DESCRIPTION

Escherichia coli is a gram-negative bacillus with numerous serotypes. Several of these produce Shiga toxin and are called STEC. Gastrointestinal infection with a Shiga toxin-producing serotype causes abdominal cramps and watery diarrhea that often develops into bloody diarrhea; fever is uncommon. The incubation period is 2-8 days. These organisms naturally occur in the gut of many animals. Likely modes of transmission to humans from animals include foodborne (e.g., undercooked ground beef, raw milk, fresh produce, and contaminated, unpasteurized juice), direct exposure to animals and their environments, and exposure to recreational water contaminated with animal or human feces. Person-to-person transmission such as between siblings or within a daycare center is also well-documented.

The most common STEC serotype in the US is *E. coli* O157:H7, but several other serotypes occur and cause illness. A positive test for Shiga toxin in stool as well as cultures of STEC are reportable to LAC DPH. All reported positive STEC broths or isolates are confirmed and serotyped by the LAC PHL.

Hemolytic uremic syndrome (HUS) is a disorder consisting of hemolytic anemia, kidney failure, and thrombocytopenia. It is diagnosed clinically and is most frequently associated with recent infection from *E. coli* O157:H7 but may also be caused by other serotypes. Children younger than five years old are at highest risk for HUS. Adults may develop a related condition called thrombotic thrombocytopenic purpura (TTP) after STEC infection.

Increased public education to prevent STEC infection is important. Information should focus on safe food handling practices, proper hygiene, and identifying high-risk foods and activities at 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 recreational water. Careful handwashing is essential, especially before eating and after handling raw beef products or coming in contact with or being around animals. Strengthening of national food processing regulations is also important to reduce contamination.

2016 TRENDS AND HIGHLIGHTS

- In 2016, the increased use of new technology to perform bacterial testing was implemented. Polymerase chain reaction (PCR) and real-time PCR were used rather than the traditional culture method. This likely contributed to the increase in cases.
- There were 282 cases reported, and 48% (n=136) of these cases were confirmed by PCR testing.
- The highest incidence rate by age was observed in the <1 and 1-4 years old age groups (9.1 per 100,000), which has

consistently had the highest incidence rate (Figure 2).

- In 2016, Whites had the highest incidence rate of all race/ethnicity groups (5.5 per 100,000) followed by Hispanics (2.3 per 100,000) (Figure 6).
- SPA 5 had the highest rate (8.0 per 100,000) followed by SPA 8 (3.7 per 100,000) (Figure 4).
- Two cases were reported with HUS, and one was laboratory confirmed as a O157:H7. No deaths occurred.
- There were no outbreaks reported in LAC; however, two cases were part of an outbreak in a camp out-of-state. ACDC participated in two multistate cluster investigations.

Reported Shiga-toxin Producing *Escherichia coli* (STEC) Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA, LAC, 2012-2016

	2012 (N=97)			2013 (N=102)			2014 (N=90)			2015 (N=175)			2016 (N=282)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	6	6.2	5.0	5	4.9	4.1	1	1.1	0.8	5	2.9	4.6	10	3.5	9.6
1-4	42	43.3	8.8	43	42.2	8.8	42	46.7	8.6	44	25.1	9.1	45	15.9	9.6
5-14	15	15.5	1.3	17	16.7	1.4	17	18.9	1.4	24	13.7	2.0	41	14.5	3.4
15-34	16	16.5	0.6	24	23.5	0.8	10	11.1	0.4	42	24.0	1.5	57	20.2	2.0
35-44	4	4.1	0.3	4	3.9	0.3	4	4.4	0.3	14	8.0	1.1	29	10.2	2.2
45-54	5	5.2	0.4	3	2.9	0.2	8	8.9	0.6	14	8.0	1.1	23	8.1	1.7
55-64	6	6.2	0.6	1	1.0	0.1	4	4.4	0.4	15	8.6	1.4	21	7.4	1.9
65+	3	3.1	0.3	5	4.9	0.5	4	4.4	0.4	17	9.7	1.4	56	19.8	4.6
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	6	6.2	0.5	2	2.0	0.1	5	5.6	0.4	13	7.4	0.9	11	3.9	0.8
Black	4	4.1	0.5	5	4.9	0.6	3	3.3	0.4	11	6.3	1.4	16	5.6	2.0
Hispanic	50	51.5	1.1	57	55.9	1.2	54	60.0	1.2	72	41.1	1.5	108	38.2	2.3
White	34	35.1	1.3	36	35.3	1.4	25	27.8	0.9	74	42.3	2.8	147	52.1	5.5
Other	0	-	-	0	-	-	0	-	-	2	1.1	-	0	-	-
Unknown	3	3.1	-	2	2.0	-	3	3.3	-	3	1.7	-	0	-	-
SPA															
1	1	1.0	0.3	5	4.9	1.3	2	2.2	0.5	4	2.3	1.0	5	1.7	1.3
2	27	27.8	1.3	29	28.4	1.3	23	25.6	1.1	42	24.0	1.9	74	26.2	3.3
3	12	12.4	0.7	12	11.8	0.7	20	22.2	1.2	19	10.9	1.1	27	9.5	1.6
4	13	13.4	1.2	11	10.8	1.0	8	8.9	0.7	26	14.9	2.2	32	11.3	2.7
5	8	8.2	1.3	12	11.8	1.9	2	2.2	0.3	31	17.7	4.7	53	18.7	8.0
6	9	9.3	0.9	13	12.7	1.3	7	7.8	0.7	10	5.7	1.0	21	7.4	2.0
7	15	15.5	1.2	13	12.7	1.0	17	18.9	1.3	20	11.4	1.5	30	10.6	2.3
8	12	12.4	1.1	7	6.9	0.6	11	12.2	1.0	23	13.1	2.1	40	14.1	3.7
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Number of Cases of Shiga Toxin-Producing *E. coli* LAC, 2011-2016

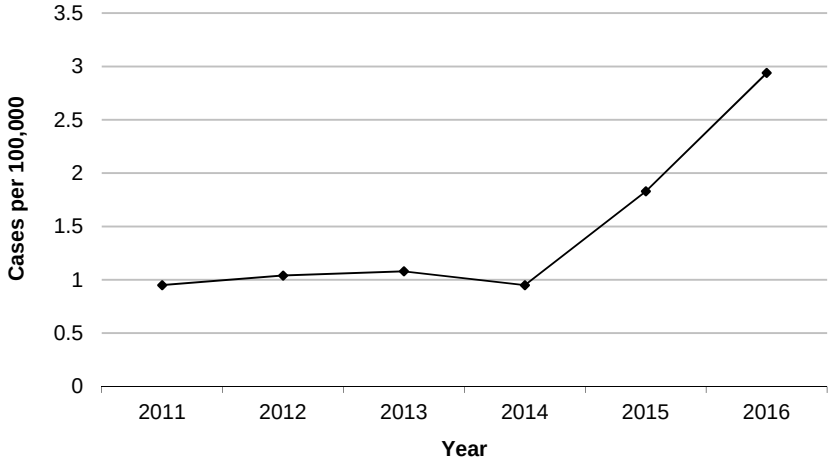


Figure 2. Reported Cases of Shiga Toxin-Producing *E. coli* by Age Group, LAC, 2016 (N=282)

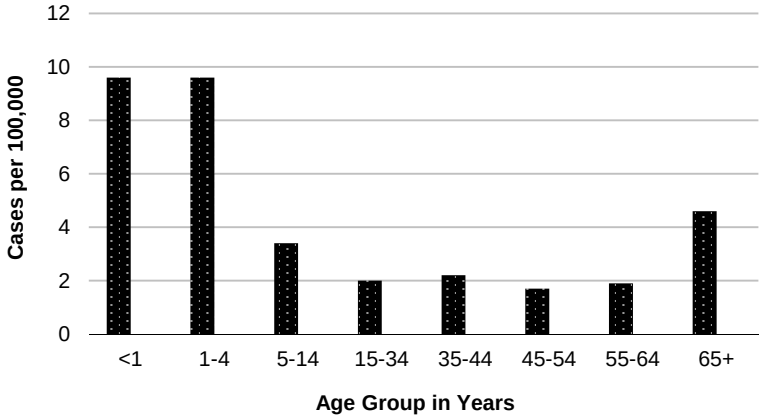


Figure 3. Percent Cases of Shiga Toxin-Producing *E. coli* by Race/Ethnicity, LAC, 2016 (N=282)

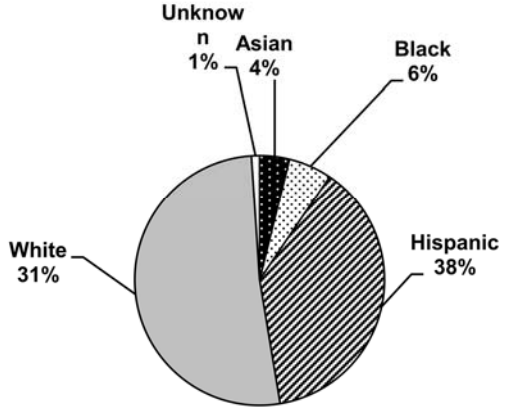


Figure 4. Reported Cases of Shiga Toxin-Producing *E. coli* by SPA, LAC, 2016 (N=282)

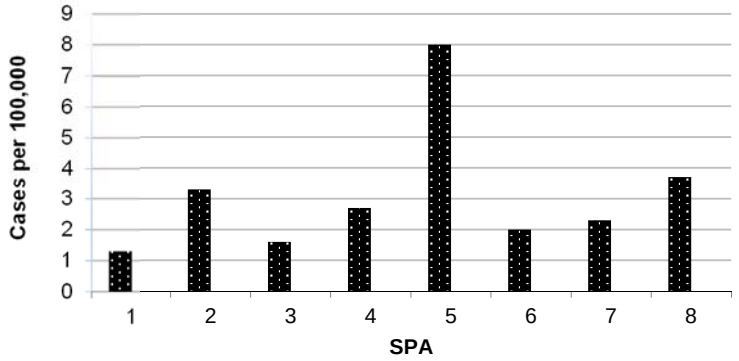


Figure 5. Reported Shiga Toxin-Producing *E. coli* Cases by Serotype Month of Onset, LAC, 2016 (N=282)

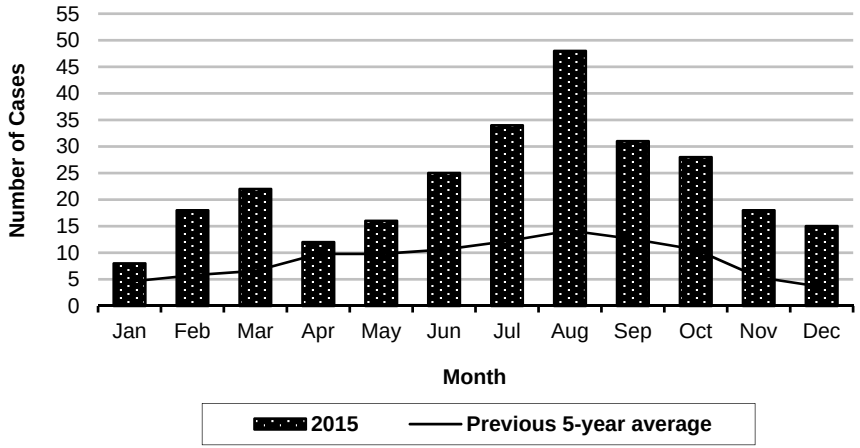
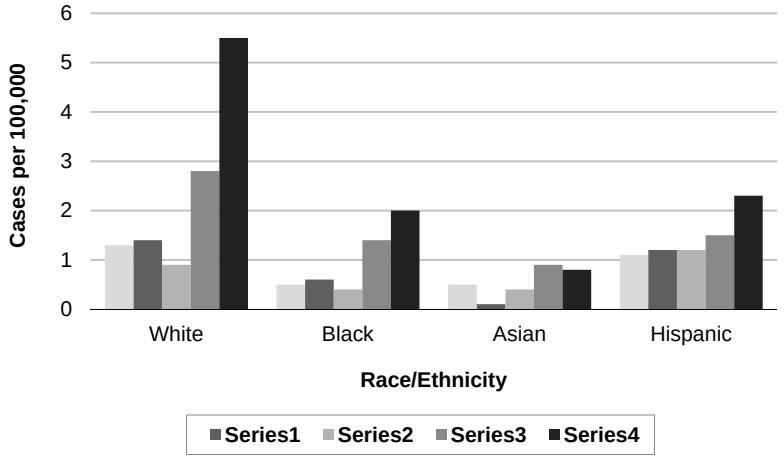
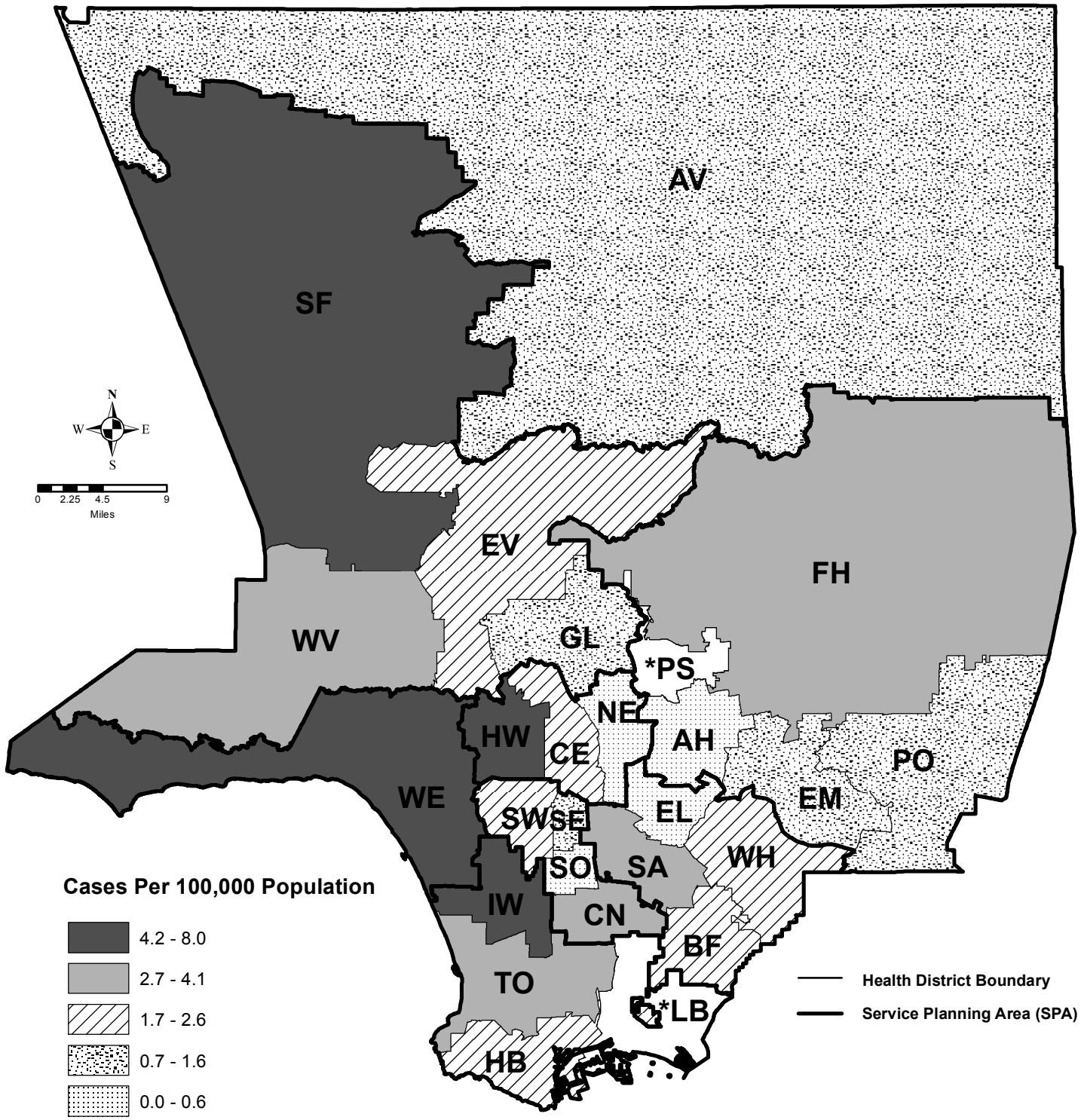


Figure 6. Reported Shiga Toxin-Producing Cases by Race/Ethnicity, LAC, 2012-2016



Map 5. E. Coli--Shiga Toxin-Producing
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

ENCEPHALITIS

CRUDE DATA	
Number of Cases	69
Annual Incidence[a]	
LA County	0.72
California[b]	N/A
United States[b]	N/A
Age at Diagnosis	
Mean	67
Median	72
Range	15–92 years

[a]Cases per 100,000 population
[b]Not nationally notifiable

DESCRIPTION

Encephalitis or meningoencephalitis, inflammation of parts of the brain, spinal cord, and meninges, causes headache, stiff neck, fever, and altered mental status. It can result from infection of a number of different agents including viral, parasitic, fungal, rickettsial, and bacterial pathogens as well as chemical agents.

Healthcare providers and diagnostic laboratories in LAC are required to report all suspected encephalitis cases including primary and post-infectious encephalitis but excluding individuals with underlying human immunodeficiency virus (HIV) infection to LAC DPH. Reporters are required to identify the cause as either viral, bacterial, fungal, or parasitic. Public health conducts passive surveillance of encephalitis cases.

In this report, encephalitis cases of viral etiologies are summarized. For the purpose of surveillance, LAC DPH requires a case to have clinically compatible illness. Of special concern are arthropod-borne viruses (i.e., arboviruses), which 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, meaning that they are maintained in complex life cycles involving a non-human vertebrate primary host and a primary arthropod vector. Arboviruses have a global distribution. The five main arboviral agents of encephalitis in the US are West Nile virus (WNV), eastern equine encephalitis virus (EEEV), western equine encephalitis virus (WEEV), Saint Louis encephalitis virus (SLEV), and La Crosse encephalitis virus (LACV).

All of these are transmitted by mosquitoes, thus can be prevented by personal protection and mosquito control (see WNV chapter).

2016 TRENDS AND HIGHLIGHTS

- A total of 69 cases of viral encephalitis were confirmed in 2016 compared to 136 cases reported in 2015. The decrease in encephalitis was most likely due to the decrease in WNV-associated cases in 2016 (n=53, 77%) compared with 2015 (n=114, 84%).
- Most viral encephalitis cases with laboratory evidence of the causative agent were positive for WNV (n=53, 77%). WNV-associated encephalitis is the most frequently identified etiology for viral encephalitis in LAC. Cases of WNV encephalitis occurred from July through November. August, the peak month of encephalitis cases in 2016, coincided with the peak for WNV-associated cases (Figure 4). Of all WNV encephalitis cases, three (6%) cases died.
- Encephalitis associated with herpes simplex virus was the second most common etiology identified for reported viral encephalitis cases (n=9, 13%).
- A total of four (6%) encephalitis cases were considered to be due to an unknown viral etiology based on review of medical records. The number of viral encephalitis cases of unknown etiology in LAC has been consistently low, n=19 (14%) in 2015 and n=16 (17%) in 2014.

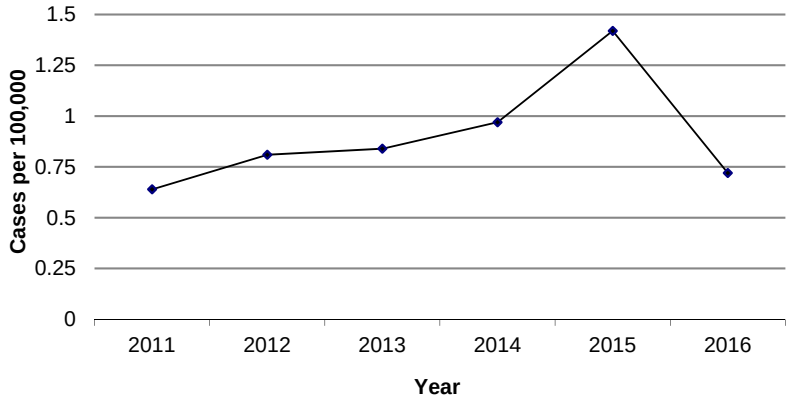
- The greatest incidence of encephalitis was in persons ≥65 years old (3.8 cases per 100,000) followed by those 55-64 years old (0.7 cases per 100,000 population). The peak incidence in persons ≥65 years old corresponds to older age as a risk factor for WNV-associated neuroinvasive disease. The average age of WNV encephalitis cases in 2016 was 71 years old.
- The highest number of encephalitis cases was documented within SPA 2 (n=36, 52%) (Figure 3). The SPA with the highest number of WNV-associated encephalitis cases was also SPA 2 (n=29, 42%).

Reported Encephalitis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=75)			2013 (N=79)			2014 (N=92)			2015 (N=136)			2016 (N=69)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	1	1.3	0.8	1	1.3	0.8	1	1.1	0.8	0	-	-	-	-	-
1-4	3	4.0	0.6	4	5.1	0.8	2	2.2	0.4	1	0.7	0.2	-	-	-
5-14	8	10.7	0.7	7	8.9	0.6	4	4.3	0.3	7	5.1	0.6	-	-	-
15-34	6	8.0	0.2	6	7.6	0.2	5	5.4	0.2	5	3.7	0.2	5	7.2	0.2
35-44	0	-	-	1	1.3	0.1	3	3.3	0.2	6	4.4	0.5	3	4.3	0.2
45-54	9	12.0	0.7	13	16.5	1.0	10	10.9	0.8	16	11.8	1.2	6	8.7	0.5
55-64	12	16.0	1.2	19	24.1	1.9	23	25.0	2.2	14	10.3	1.3	8	11.6	0.7
65+	36	48.0	3.2	28	25.3	2.5	44	47.8	3.9	87	64.0	7.3	47	68.1	3.8
Unknown	0	-	-	8	10.1	-	0	-	-	-	-	-	-	-	-
Race / Ethnicity															
Asian	8	10.7	0.6	6	7.6	0.4	8	8.7	0.6	4	2.9	0.3	3	4.3	0.2
Black	3	4.0	0.4	2	2.5	0.3	3	3.3	0.4	3	2.2	0.4	3		0.4
Hispanic	23	30.7	0.5	20	25.3	0.4	24	26.1	0.5	51	37.5	1.1	19		0.4
White	31	41.3	1.2	36	45.6	1.4	40	43.5	1.5	62	45.6	2.3	33		1.2
Other	5	6.7	-	3	3.8	-	0	-	-	1	0.7	-	1	1.4	-
Unknown	5	6.7	-	12	15.2	-	17	18.5	-	15	11.0	-	10	14.5	-
SPA															
1	6	8.0	1.5	6	7.6	1.5	1	1.1	0.3	4	2.9	1.0	2	2.9	0.5
2	22	29.3	1.0	27	34.2	1.2	21	22.8	1.0	52	38.2	2.3	36	52.2	1.6
3	24	32.0	1.5	11	13.9	0.7	14	15.2	0.9	19	14.0	1.1	6	8.7	0.4
4	10	13.3	0.9	3	3.8	0.3	12	13.0	1.0	14	10.3	1.2	5	7.2	0.4
5	2	2.7	0.3	2	2.5	0.3	11	12.0	1.7	11	8.1	1.7	4	5.8	0.6
6	4	5.3	0.4	3	3.8	0.3	5	5.4	0.5	3	2.2	0.3	3	4.3	0.3
7	5	6.7	0.4	11	13.9	0.8	18	19.6	1.4	26	19.1	2.0	6	8.7	0.5
8	2	2.7	0.2	13	16.5	1.2	9	9.8	0.8	7	5.1	0.6	5	7.3	0.5
Unknown	0	-	-	3	3.8	-	1	1.1	-	0	-	-	2	2.9	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates* of Encephalitis LAC, 2011-2016



*See text for limitations.

Figure 2. Percent Cases of Encephalitis by Race/Ethnicity LAC, 2016 (*N=69)

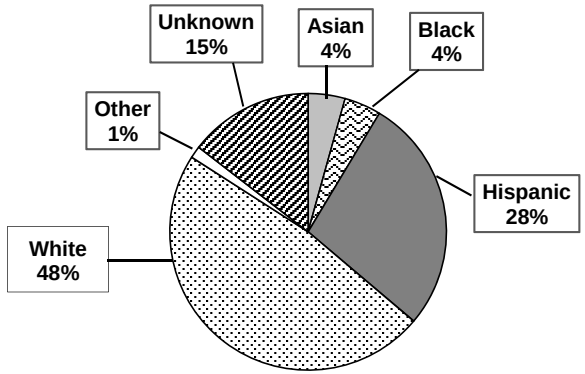


Figure 3. Encephalitis Cases by SPA LAC, 2016 (N=69)

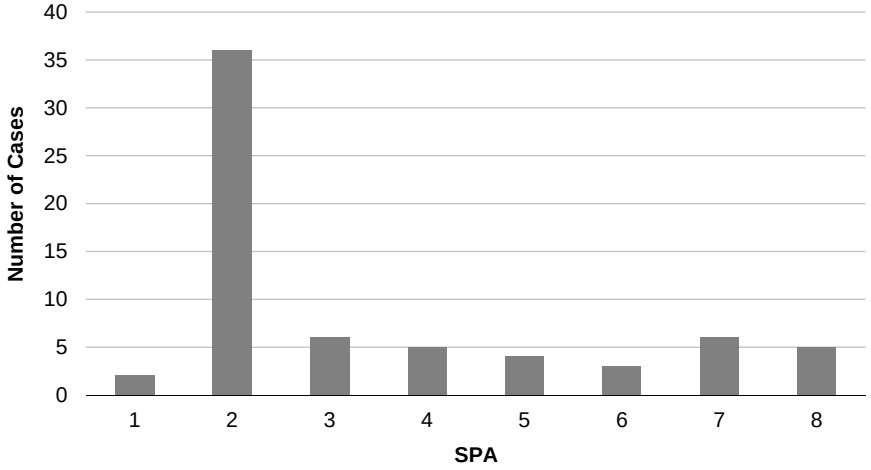


Figure 4. Reported Encephalitis Cases by Month of Onset LAC, 2016 (N=69)

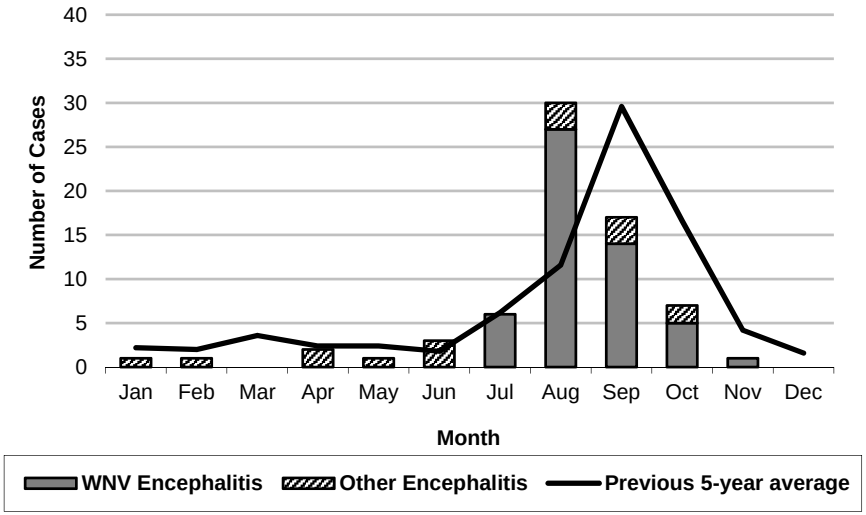
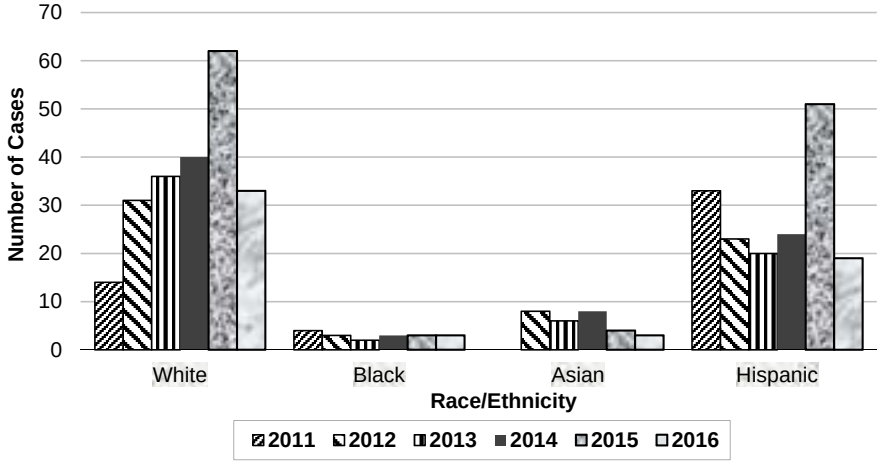
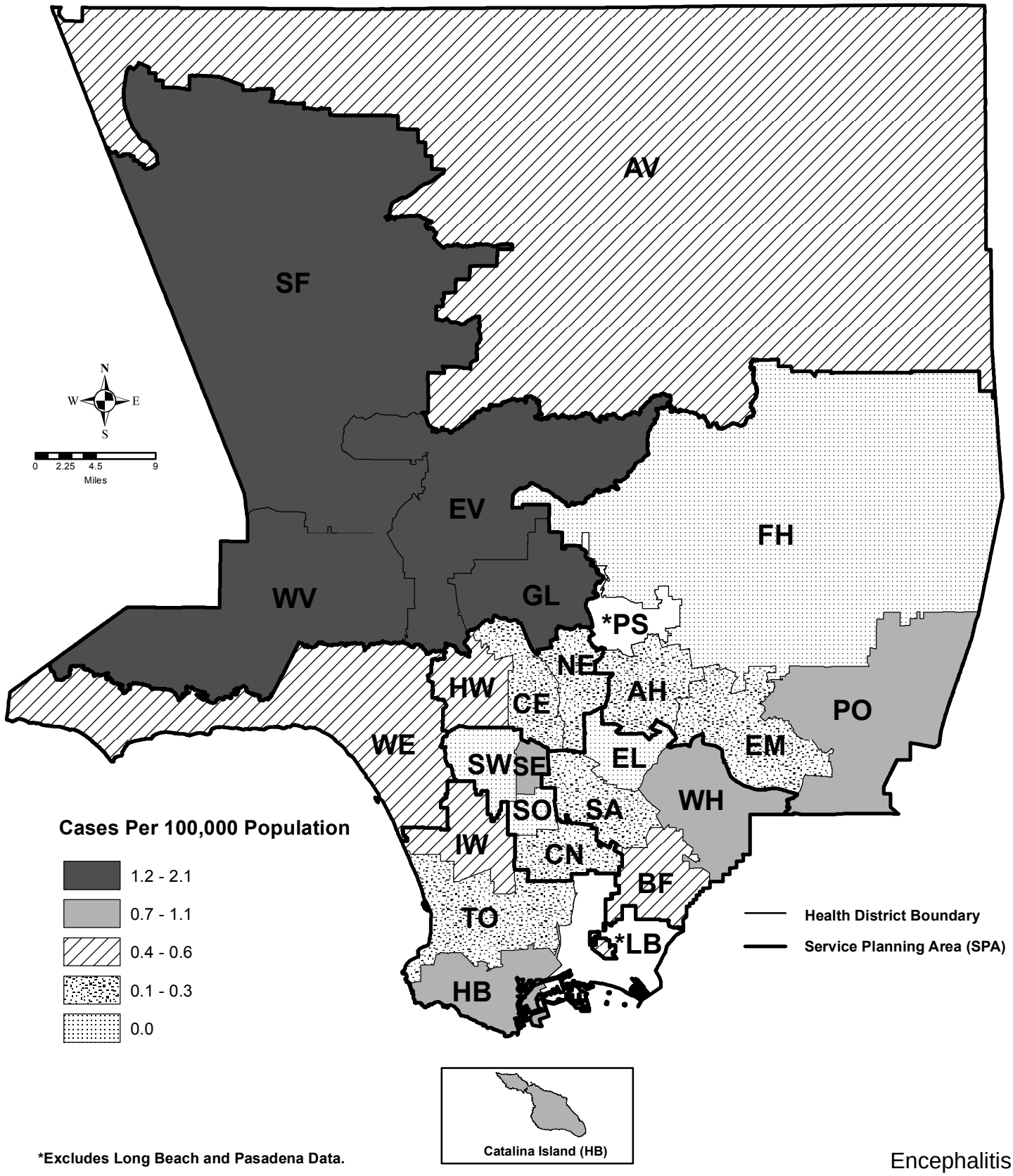


**Figure 5. Reported Encephalitis Cases by Race/Ethnicity
LAC, 2011-2016**



Map 6. Encephalitis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

GIARDIASIS

CRUDE DATA	
Number of Cases	452
Annual Incidence	
LA County[a]	4.71
California[b]	6.37
United States[b]	4.25
Age at Diagnosis	
Mean	40
Median	40
Range	0–88 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

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 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 often 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 at day care represent a reservoir of disease in developed countries. There is no vaccine.

To prevent transmission of giardiasis, individuals should wash their hands before eating, after using the toilet, and after changing diapers.

People should shower before and avoid accidental swallowing of recreational water. Persons with diarrhea should avoid swimming in recreational waters to prevent transmission to others. Fecal exposure during sexual activity such as anal intercourse and oral-anal sexual practices should also be avoided.

2016 TRENDS AND HIGHLIGHTS

- In 2016, only laboratory-confirmed symptomatic *Giardia* infections continued to be counted as confirmed cases of giardiasis in LAC.
- Giardiasis disease incidence slightly increased in LAC from 4.0 cases per 100,000 in 2015 to 4.7 cases per 100,000 (Figure 1). This increase can possibly be explained by the adoption of PCR panel testing for gastrointestinal (GI) illness as well as an increasing number of pathology labs adopting electronic reporting.
- The highest age-specific incidence rate occurred among adults 45-54 year olds with 6.6 cases per 100,000. The 35-44 year old age group and the 55-64 year old age group had the next highest incidence rates, at 5.5 cases per 100,000 (Figure 2).
- Whites continue to have the highest race/ethnicity-specific incidence rates (Figure 3). The greatest proportion of cases were reported among Whites (n=252, 56%) and Hispanics (n=132, 29%) (Figure 3).
- SPA 5 reported the highest incidence rate of giardiasis with 9.5 cases per 100,000 in 2016 (Figure 5).
- More cases were reported in March (n=48) and April (n=47) than any other months. However, every month but August reported more cases than the five-year average for giardiasis (Figure 6).
- Males have consistently accounted for a larger proportion of cases. Males accounted for 70% and females 30% of cases. The incidence rate of giardiasis for males was 6.8 per 100,000 and for females was 2.7 cases per 100,000.

Reported Giardiasis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=294)			2013 (N=392)			2014 (N=346)			2015 (N=379)			2016 (N=452)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	3	0.7	2.5	0	-	-	0	-	-	2	0.4	1.9
1-4	30	10.2	6.3	20	5.1	4.1	19	5.5	3.9	14	3.7	2.9	14	3.1	3.0
5-14	29	9.9	2.4	41	10.5	3.4	27	7.8	2.2	20	5.3	1.7	25	5.5	2.1
15-34	86	29.3	3.1	114	29.1	4.0	96	27.7	3.4	126	33.2	4.5	147	32.5	5.2
35-44	52	17.7	3.9	65	16.6	4.9	70	20.2	5.3	76	20.1	5.7	72	15.9	5.5
45-54	39	13.3	3.0	72	18.4	5.6	63	18.2	4.8	66	17.4	5.0	87	19.2	6.6
55-64	35	11.9	3.4	51	13.0	5.0	42	12.1	4.0	47	12.4	4.2	62	13.7	5.5
65+	22	7.5	2.0	26	6.6	2.3	29	8.4	2.6	29	7.7	2.4	43	9.5	3.5
Unknown	1	0.3	-	0	-	-	0	-	-	1	0.3	-	0	-	-
Race/Ethnicity															
Asian	18	6.1	1.4	25	6.4	1.8	24	6.9	1.7	17	4.5	1.2	27	6.0	1.9
Black	17	5.8	2.2	27	6.9	3.5	25	7.2	3.2	14	3.7	1.8	26	5.8	3.3
Hispanic	84	28.6	1.9	124	31.6	2.7	113	32.7	2.5	104	27.4	2.2	131	29.0	2.8
White	125	42.5	4.7	210	53.6	7.9	175	50.6	6.6	238	62.8	8.9	252	55.8	9.4
Other	1	0.3	-	2	0.5	-	3	0.9	-	4	1.1	-	2	0.4	-
Unknown	49	16.7	-	4	1.0	-	6	1.7	-	2	0.5	-	14	3.1	-
SPA															
1	5	1.7	1.3	9	2.3	2.3	10	2.9	2.5	9	2.4	2.3	10	2.2	2.5
2	96	32.7	4.5	95	24.2	4.4	89	25.7	4.1	67	17.7	3.0	105	23.2	4.7
3	27	9.2	1.7	50	12.8	3.1	26	7.5	1.6	34	9.0	2.1	50	11.0	3.0
4	57	19.4	5.1	71	18.1	6.2	82	23.7	7.1	110	29.0	9.4	105	23.2	8.9
5	39	13.3	6.1	49	12.5	7.6	46	13.3	7.1	77	20.3	11.7	63	13.9	9.5
6	17	5.8	1.7	39	9.9	3.8	24	6.9	2.3	22	5.8	2.1	32	7.1	3.0
7	25	8.5	1.9	42	10.7	3.2	31	9.0	2.4	28	7.4	2.1	36	7.9	2.7
8	28	9.5	2.6	37	9.4	3.4	38	11.0	3.5	32	8.4	2.9	49	10.8	4.5
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	2	0.4	-

*Rates calculated based on less than 19 cases or events are considered unreliable

Figure 1. Incidence Rates of Giardiasis LAC, CA, and US, 2007-2016

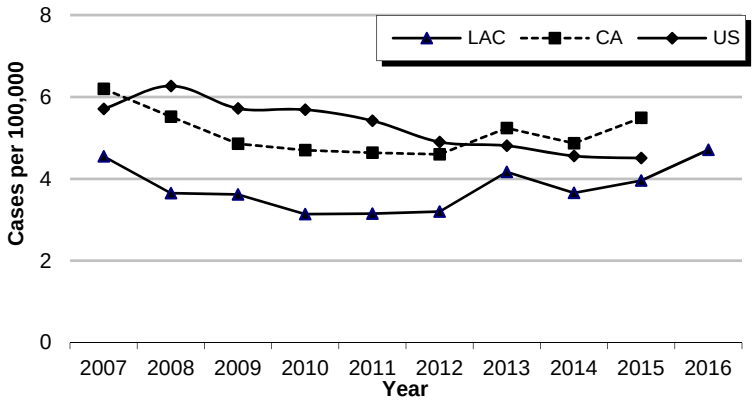


Figure 2. Incidence Rates of Giardiasis by Age Group LAC, 2016 (N=452)

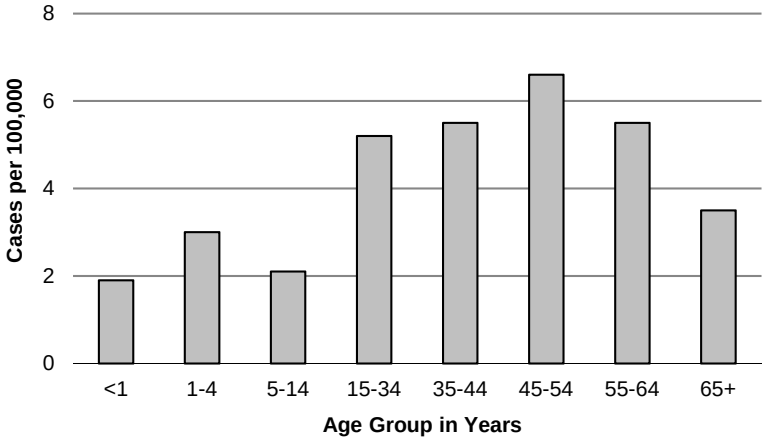
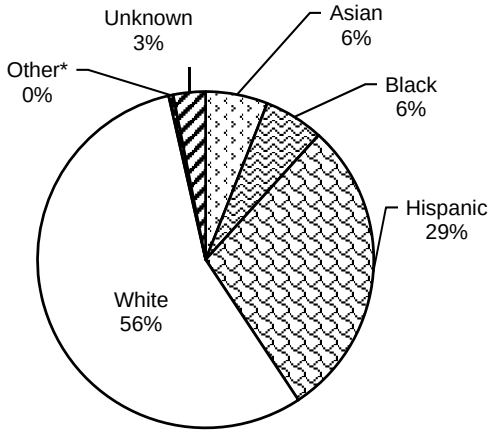


Figure 3. Percent of Giardiasis Cases by Race/Ethnicity LAC, 2016 (*N=452)



*Other includes Native American and any additional racial/ethnic group that cannot be categorized as Asian, Black, Hispanic, and White.

Figure 4. Incidence Rates of Giardiasis by Race/Ethnicity LAC, 2012-2016

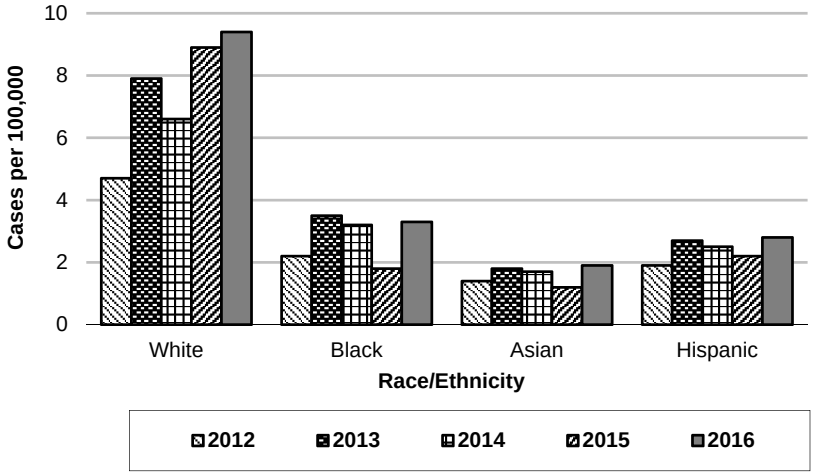


Figure 5. Incidence Rates of Giardiasis by SPA
LAC, 2016 (N=452)

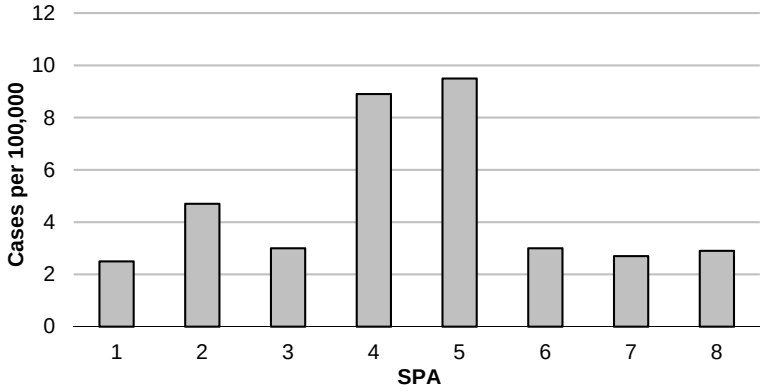
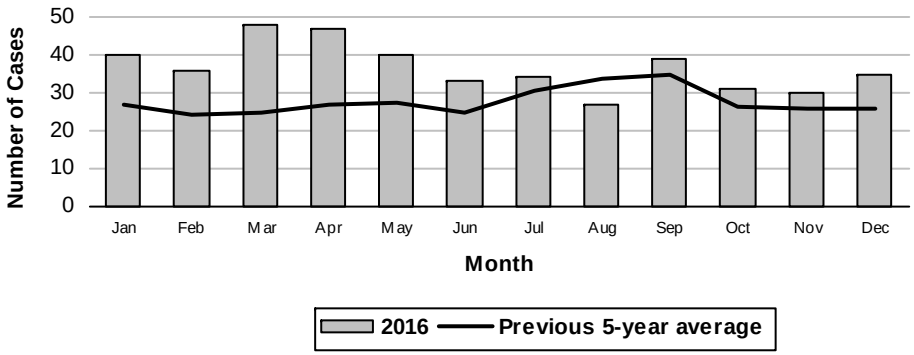
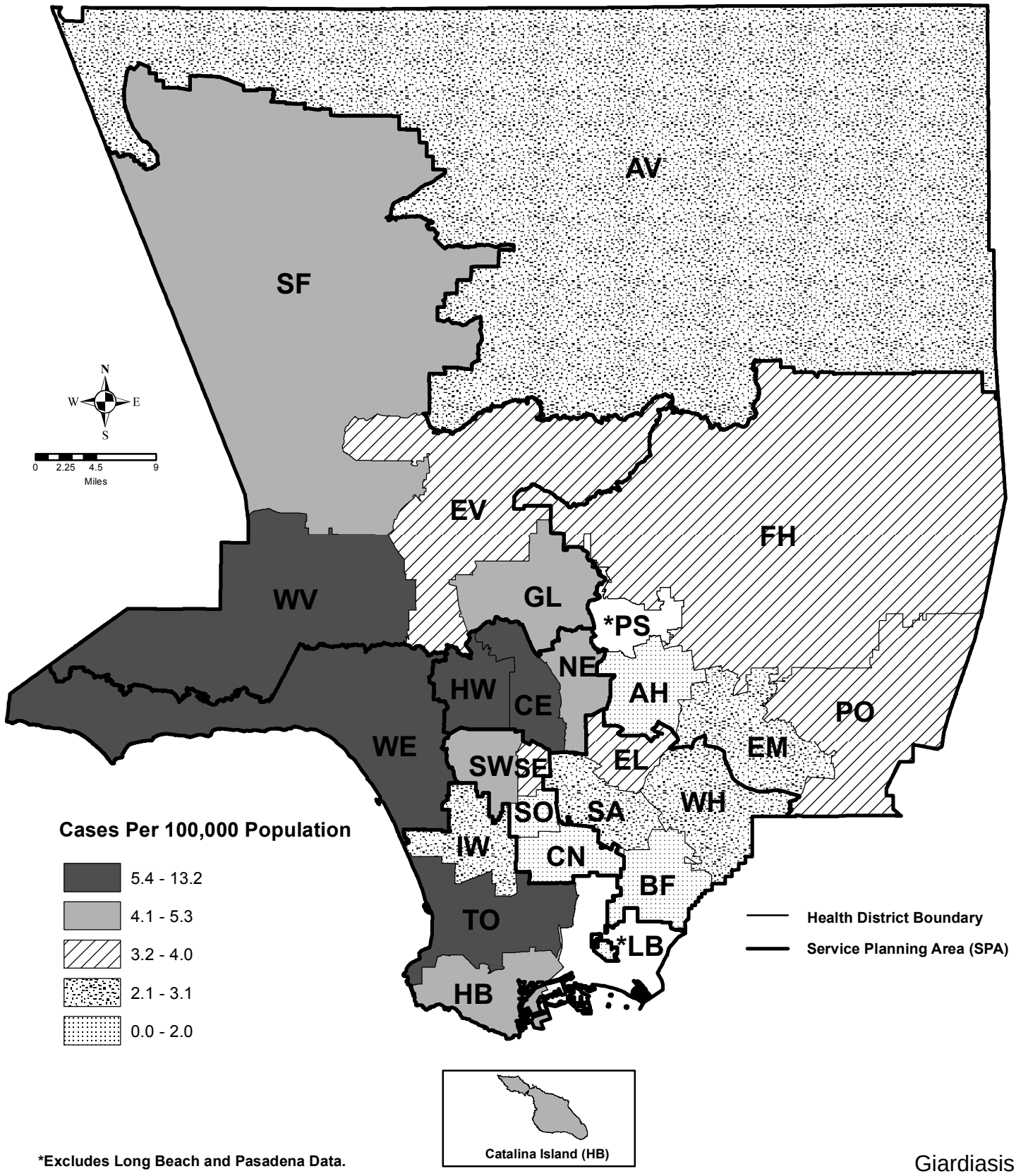


Figure 6. Reported Giardiasis Cases by Month of Onset
LAC, 2016 (N=452)



Map 7. Giardiasis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

HEPATITIS A

CRUDE DATA	
Number of Cases	66
Annual Incidence[a]	
LA County	0.69
California[b]	0.49
United States[b]	0.56
Age at Diagnosis	
Mean	43
Median	38
Range	11–97 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Hepatitis A virus (HAV), an RNA virus, is a vaccine-preventable disease transmitted fecal-orally, person-to-person, or through vehicles such as food. In the US, among adults with identified risk factors, the majority of cases are among men who have sex with other men (MSM), persons who use illegal drugs, and international travelers. Sexual and household contacts of HAV-infected persons are also at increased risk of getting the disease.

The average incubation period is 28 days (range 15–50 days). Signs and symptoms of acute hepatitis A include fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, clay-colored bowel movements, joint pain, and jaundice. Many cases, especially in children, are mild or asymptomatic. Recovery usually occurs within one month. Infection confers life-long immunity.

Routine vaccination of children and adults at risk is an effective way to reduce hepatitis A incidence. In 1996, CDC's Advisory Committee on Immunization Practices (ACIP) recommended administration of hepatitis A vaccine to persons at increased risk for the disease including international travelers, men who have sex with men (MSM), non-injection and injection-drug users, and children living in communities with high rates of disease. In 1999, ACIP expanded recommendations for vaccination to children living in states, counties, and communities with consistently elevated hepatitis A rates including California. In 2006, ACIP expanded these recommendations to include routine vaccination of children in all 50 states.

Hepatitis A vaccination is currently recommended for:

1) All children between their first and second birthdays (12-23 months old),
2) Children and adolescents 2-18 years old who live in states or communities where routine vaccination has been implemented because of high disease incidence,
3) Anyone $\geq$1 years old traveling to or working in countries with high or intermediate prevalence of hepatitis A,
4) MSM,
5) People who use street drugs,
6) People with chronic liver disease,
7) People who are treated with clotting factor concentrates,
8) People who work with HAV-infected primates or HAV in research laboratories, and
9) Households adopting a child or caring for an adopted child from a country where hepatitis A is common.

LAC DPH uses the CDC Council of State and Territorial Epidemiologists (CSTE) 2012 case definition for acute hepatitis A to standardize surveillance of this infection. A case of hepatitis A is defined as a person with:

1) An acute illness with discrete onset of symptoms,
2) Jaundice or elevated alanine

aminotransferase (ALT) levels, and
3) Either IgM anti-HAV positive or an epidemiologic link to a person who has laboratory confirmed hepatitis A.

2016 TRENDS AND HIGHLIGHTS

- The 2016 incidence rate of acute hepatitis A was higher than the average for the last five years (0.7 per 100,000 versus 0.5 per 100,000, respectively) (Figure 1).
- In 2016, two large hepatitis A outbreaks were reported in the US—one in Hawaii and one in Virginia. LAC did not identify any cases associated with these outbreaks.
- In November 2016, San Diego County identified an outbreak among homeless and/or illicit drug users (IDU). In 2016, LAC identified no acute hepatitis A cases among the homeless.
- The incidence rate was highest among 45-54 year olds (1.1 per 100,000) followed by 35-44 year olds and 15-34 year olds (both 0.9 per 100,000) (Figure 2).
- In 2016, the highest incidence rate was seen in Whites (1.3 per 100,000) followed by Asians (0.6 per 100,000) (Figure 3).
- The male-to-female ratio was 3:1.2.
- A total of three SPAs had incidence rates greater than the overall county incidence rate of 0.7 per 100,000. These areas are SPA 5 (1.4 per 100,000), SPA 4 (0.8 per 100,000), and SPA 2 (0.8 per 100,000) (Figure 4).
- Risk factors were identified in 68% (n=45) of the 66 confirmed cases including some cases with multiple risk factors. Of the cases reporting risk factors, recent travel outside of the US (n=25, 56%) was the most frequently reported risk factor followed by household travel (n=13, 29%), consumption of raw shellfish (n=13, 29%), MSM (n=9, 20%), multiple sexual partners (n=5, 11%) and use of illicit drugs (n=5, 11%) (Figure 5).
- From 2015 to 2016 there was a significant increase in the number of MSM acute cases (2015: n=1, 3% of cases, 2016: n=9, 20% of cases).

Reported Hepatitis A Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=47)			2013 (N=60)			2014 (N=42)			2015 (N=33)			2016 (N=66)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	3	6.4	0.3	2	3.3	0.2	1	2.4	0.1	1	3.0	0.1	1	1.5	0.1
15-34	24	51.1	0.9	22	36.7	0.8	17	40.5	0.6	12	36.4	0.4	25	37.9	0.9
35-44	9	19.1	0.7	12	20.0	0.9	9	21.4	0.7	9	27.3	0.7	12	18.2	0.9
45-54	3	6.4	0.2	8	13.3	0.6	0	0.0	0.0	3	9.1	0.2	14	21.2	1.1
55-64	5	10.6	0.5	13	21.7	1.3	8	19.0	0.8	4	12.1	0.4	5	7.6	0.4
65+	3	6.4	0.3	3	5.0	0.3	7	16.7	0.6	4	12.1	0.3	9	13.6	0.7
Unknown	0	-	-	0	-	-	0	-	-	0	-	-			
Race / Ethnicity															
Asian	8	17.0	0.6	15	25.0	1.1	11	26.2	0.8	11	33.3	0.8	8	12.1	0.6
Black	0	0.0	0.0	1	1.7	0.1	4	9.5	0.5	1	3.0	0.1	2	3.0	0.3
Hispanic	20	42.6	0.4	18	30.0	0.4	14	33.3	0.3	11	33.3	0.2	21	31.8	0.4
White	14	29.8	0.5	26	43.3	1.0	12	28.6	0.5	9	27.3	0.3	35	53.0	1.3
Other	0	-	-	0	-	-	1	2.4	-	1	3.0	-	0	-	-
Unknown	5	10.6	-	0	-	-	0	-	-	0	-	-	0	-	-
SPA															
1	2	4.3	0.5	3	5.0	0.8	2	4.8	0.5	0	-	-	2	3.0	0.5
2	17	36.2	0.8	17	28.3	0.8	12	28.6	0.5	8	24.2	0.4	19	28.8	0.8
3	4	8.5	0.2	5	8.3	0.3	5	11.9	0.3	5	15.2	0.3	10	15.2	0.6
4	8	17.0	0.7	8	13.3	0.7	12	28.6	1.0	9	27.3	0.8	10	15.2	0.8
5	4	8.5	0.6	9	15.0	1.4	1	2.4	0.2	3	9.1	0.5	9	13.6	1.4
6	0	0.0	0.0	1	1.7	0.1	4	9.5	0.4	1	3.0	0.1	6	9.1	0.6
7	7	14.9	0.5	12	20.0	0.9	3	7.1	0.2	6	18.2	0.5	4	6.1	0.3
8	5	10.6	0.5	5	8.3	0.5	3	7.1	0.3	1	3.0	0.1	6	9.1	0.5
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	-	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates of Hepatitis A LAC, CA, and US, 2012- 2016

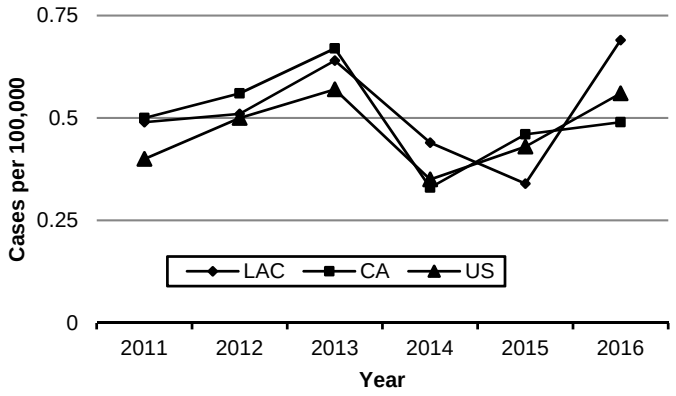


Figure 2. Incidence Rates* of Hepatitis A by Age Group LAC, 2012-2016

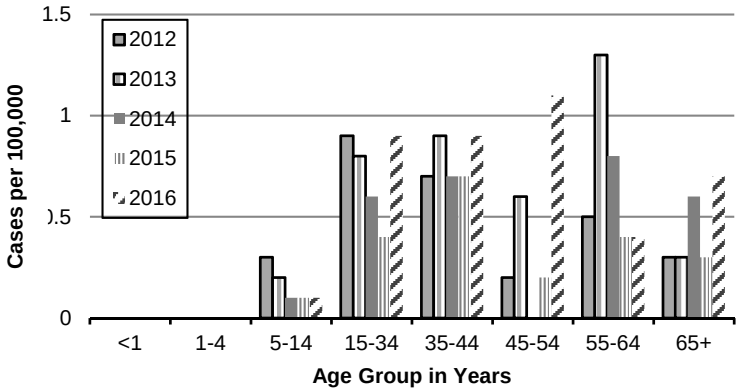
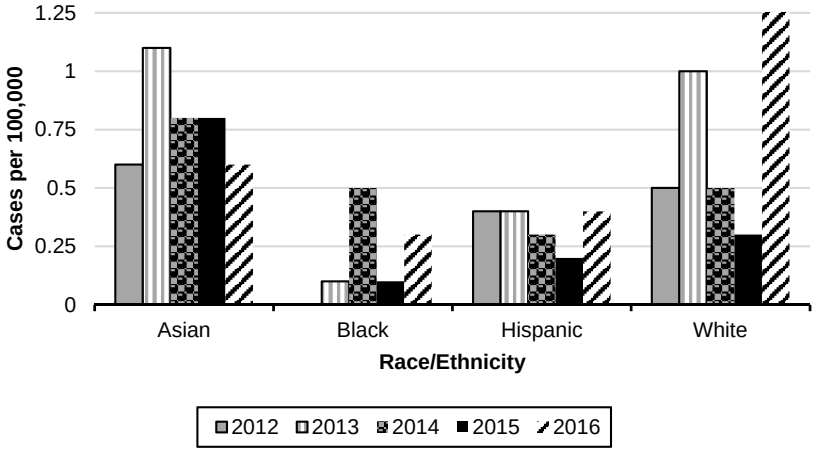
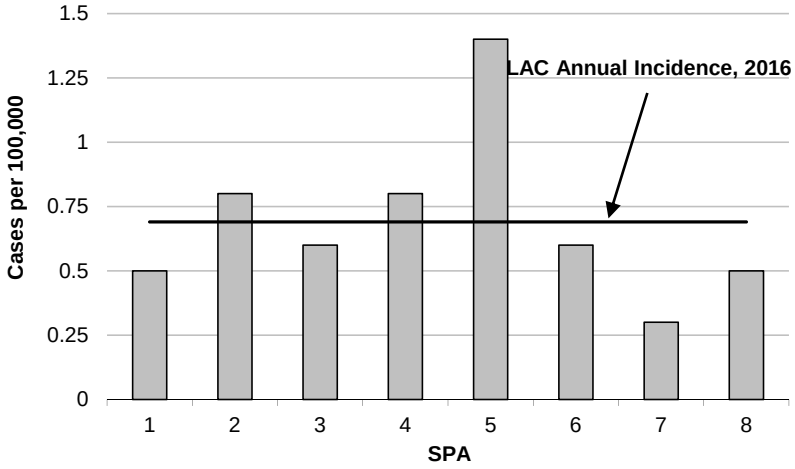


Figure 3. Hepatitis A Incidence Rates* by Race/Ethnicity LAC, 2012-2016



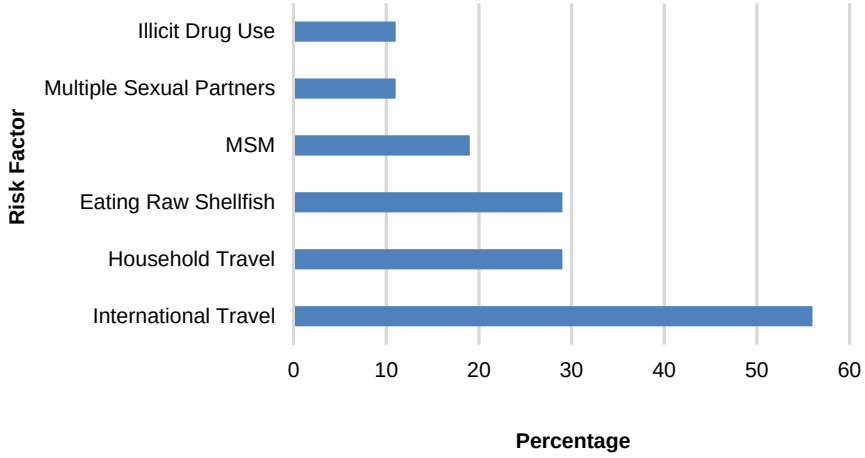
*Includes cases with multiple risk factors

Figure 4. Incidence Rates* of Hepatitis A by SPA LAC, 2016 (N=66)



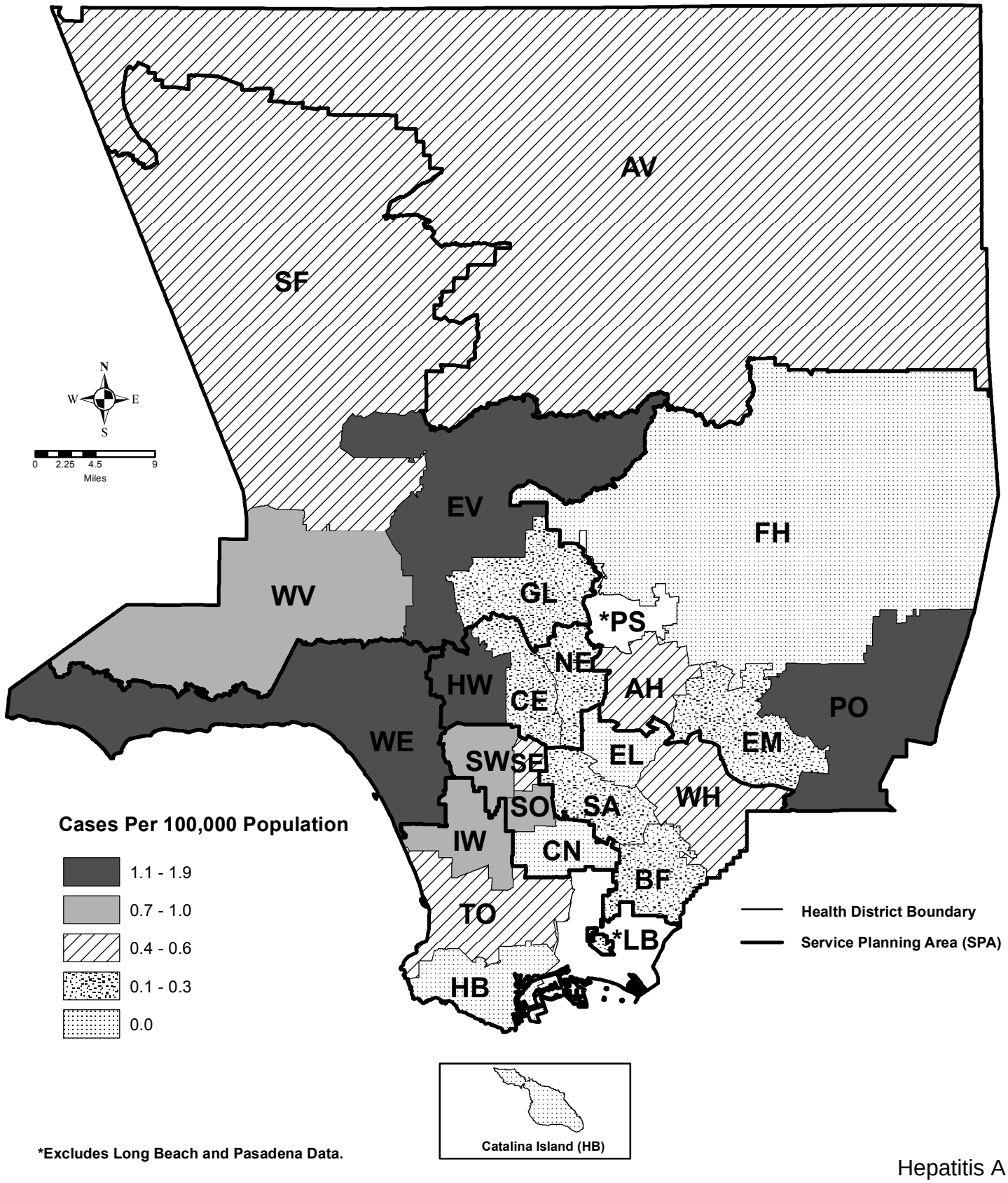
* Rates based on fewer than 19 cases are unreliable

**Figure 5. Hepatitis A Reported Risk Factors*
LAC, 2016 (N=45)**



*Includes cases with multiple risk factors

Map 8. Hepatitis A
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

HEPATITIS B, ACUTE (NONPERINATAL)

CRUDE DATA	
Number of Cases	42
Annual Incidence[a]	
LA County	0.44
California[b]	0.24
United States[b]	0.84
Age at Diagnosis	
Mean	49
Median	48
Range	23–78 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Hepatitis B is a DNA virus transmitted through activities that involve percutaneous or mucosal contact with infectious blood or bodily fluids. This is often through injection drug use, sexual contact with an infected person, or contact from an infected mother to her infant during birth. Transmission also occurs among household contacts of a person with hepatitis B. Healthcare-associated transmission of hepatitis B is documented in the US and should be considered in persons without traditional risk factors.

Symptoms occur in less than half of those acutely infected and begin an average of 90 days (range: 60–150 days) after exposure. They can include fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, clay-colored bowel movements, joint pain, and jaundice. Approximately 2-10% of adults infected with hepatitis B virus (HBV) are unable to clear the virus within six months and become chronic carriers. Death from cirrhosis or liver cancer occurs in an estimated 15–25% of those with chronic infection. Overall, hepatitis B is more prevalent and infectious than HIV.

A comprehensive strategy to eliminate hepatitis B virus transmission was recommended in 1991. It includes prenatal testing of pregnant women for HBsAg to identify newborns who require immunoprophylaxis and to identify household contacts who should be vaccinated, routine vaccination of infants, vaccination of adolescents, and vaccination of adults at high risk for infection.

Adult vaccination is recommended for high risk groups including: men who have sex with men (MSM), those with history of multiple sex partners, injection drug users, persons seeking treatment for sexually transmitted diseases, household and sex contacts of persons with chronic HBV infections, healthcare workers, persons with chronic liver disease, persons with HIV, hemodialysis patients, and unvaccinated adults with diabetes mellitus 19-59 years old.

For the purpose of surveillance, LAC DPH uses the 2012 Centers for Disease Control and Prevention (CDC) Council of State and Territorial Epidemiologists (CSTE) case definition for acute hepatitis B. The criteria include:

1) Discrete onset of symptoms,
2) Jaundice or elevated alanine aminotransferase (ALT) levels >100 IU/L, and
3) HBsAg positive and anti-HBc IgM positive, (if done).

In 2012, the CDC CSTE modified the acute hepatitis B case definition to include documented seroconversion cases (documented negative HBV test result within six months prior to HBV diagnosis) without the acute clinical presentation.

2016 TRENDS AND HIGHLIGHTS

- The 2016 incidence rate decreased from the previous year (0.4 per 100,000 versus 0.5 per 100,000) (Figure 1).
- The incidence rate was highest among those between 45–54 years old (1.0 per 100,000) (Figure 2).

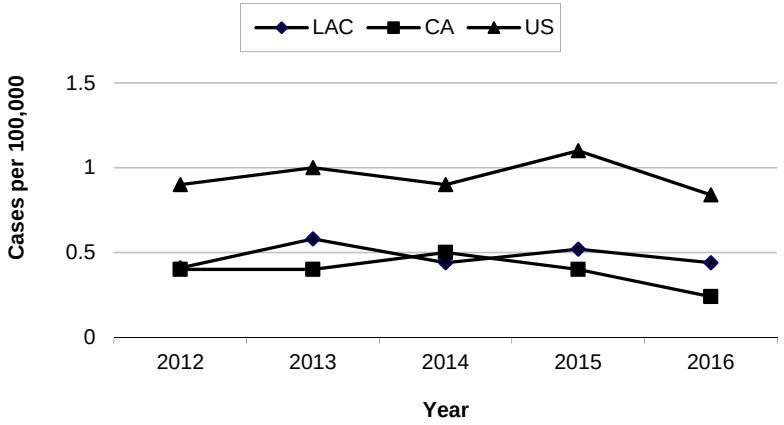
- The male-to-female ratio was 3.2:1.0.
- The incidence rate in 2016 was highest in Whites (0.7 per 100,000) (Figure 3).
- A total of five SPAs had incidence rates greater than the overall county rate of 0.4 per 100,000: SPA 5 (0.6 per 100,000) and SPA's 2, 4, 5, 7 and 8 (0.5 per 100,000) (Figure 4).
- In 2016, risk factors were identified in 69% (n=29) of the 42 confirmed cases including some cases with multiple risk factors. Of those with identified risk factors, the most frequently reported risk factor was having multiple sexual partners (n=12, 40%). This was also the most reported risk factor in 2015. The next frequently reported risk factor in 2016 was patients who had dental procedures done (n=10, 34%) followed by receiving intravenous or intramuscular injections or having a medical procedure (n=10, 34%), MSM (n=8, 33% of males), and incarceration (n=4, 14%).

Reported Hepatitis B, Acute, (Nonperinatal) Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA LAC, 2012-2016

	2012 (N=38)			2013 (N=55)			2014 (N=42)			2015 (N=50)			2016 (N=42)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
15-34	1	26.3	0.4	20	36.4	0.7	5	11.9	0.2	10	20.0	0.4	6	14.3	0.2
35-44	1	34.2	1.0	15	27.3	1.1	16	38.1	1.2	14	28.0	1.1	9	21.4	0.7
45-54	1	26.3	0.8	12	21.8	0.9	14	33.3	1.1	18	36.0	1.4	13	30.9	1.0
55-64	3	7.9	0.3	5	9.1	0.5	3	7.1	0.3	5	10.0	0.5	8	19.0	0.7
65+	2	5.3	0.2	3	5.5	0.3	4	9.5	0.4	3	6.0	0.3	6	14.3	0.5
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	1	2.6	0.1	6	10.9	0.4	3	7.1	0.2	5	10.0	0.4	4	9.5	0.3
Black	5	13.2	0.6	12	21.8	1.5	6	14.3	0.8	9	18.0	1.1	5	11.9	0.6
Hispanic	1	34.2	0.3	21	38.2	0.5	20	47.6	0.4	17	34.0	0.4	13	30.9	0.3
White	1	36.8	0.5	15	27.3	0.6	10	23.8	0.4	17	34.0	0.6	19	45.2	0.7
Other	0	-	-	0	-	-	1	2.4	-	0	-	-	0	-	-
Unknown	5	13.2	-	1	1.8	-	2	4.8	-	2	4.0	-	1	2.4	-
SPA															
1	2	5.3	0.5	1	1.8	0.3	2	4.8	0.5	2	4.0	0.5	1	2.4	0.3
2	5	13.2	0.2	9	16.4	0.4	12	28.6	0.5	14	28.0	0.6	12	28.6	0.5
3	8	21.1	0.5	9	16.4	0.6	1	2.4	0.1	6	12.0	0.4	6	14.3	0.4
4	9	23.7	0.8	9	16.4	0.8	11	26.2	1.0	6	12.0	0.5	6	14.3	0.5
5	3	7.9	0.5	7	12.7	1.1	1	2.4	0.2	1	2.0	0.2	4	9.5	0.6
6	2	5.3	0.2	10	18.2	1.0	6	14.3	0.6	7	14.0	0.7	1	2.4	0.1
7	6	15.8	0.5	6	10.9	0.5	6	14.3	0.5	8	16.0	0.6	7	16.7	0.5
8	3	7.9	0.3	2	3.6	0.2	3	7.1	0.3	6	12.0	0.5	5	11.9	0.5
Unknown	0	-	-	2	3.6	-	0	-	-	0	-	-	-	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Incidence Rates of Acute Hepatitis B
LAC, CA and US, 2012-2016**



* Rates based on fewer than 19 cases are unreliable

**Figure 2. Incidence Rates* of Acute Hepatitis B by Age Group
LAC, 2012-2016**

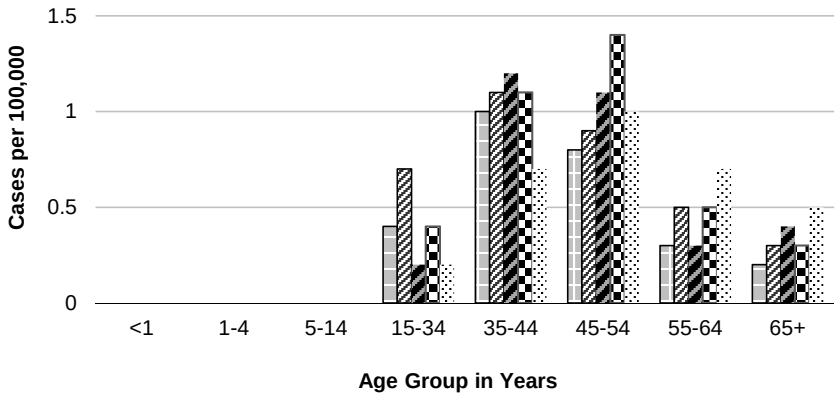
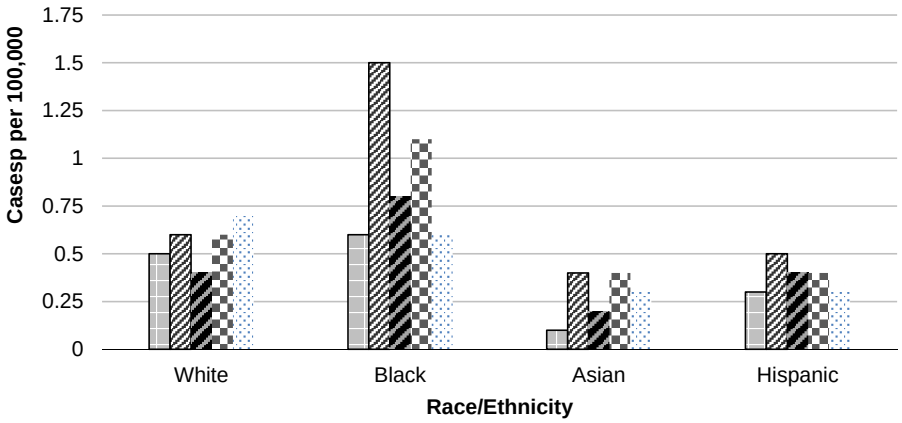
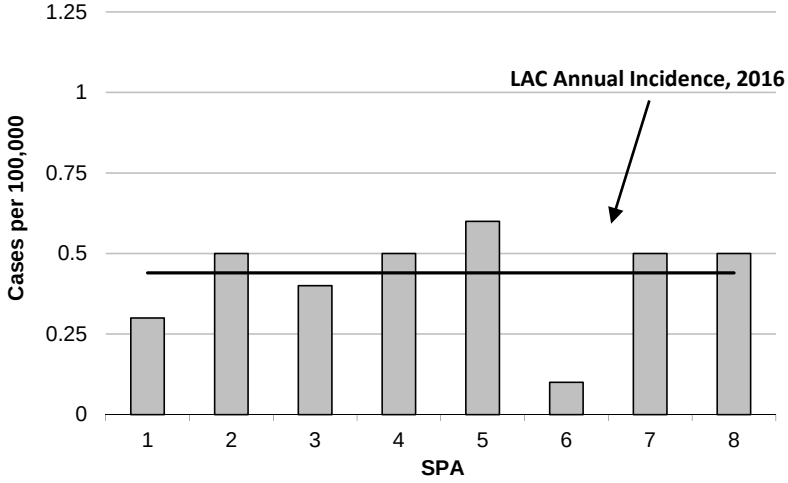


**Figure 3. Acute Hepatitis B Incidence Rates* by Race/Ethnicity
LAC, 2012-2016**



* Rates bases on fewer than 19 cases are unreliable

**Figure 4. Incidence Rates* of Hepatitis B by SPA
LAC, 2016 (N=42)**



* Rates based on fewer than 19 cases are unreliable

HEPATITIS C, ACUTE

CRUDE DATA	
Number of Cases	5
Annual Incidence[a]	
LA County	0.05
California[b]	0.10
United States[b]	0.68
Age at Diagnosis	
Mean	38
Range	29–47 years

[a]Rates calculated based on less than 19 cases or events are considered unreliable
[b] Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

The hepatitis C virus (HCV) is an RNA virus primarily transmitted though percutaneous exposure to infectious blood. Traditional risk factors include: injection drug use (IDU), receipt of donated blood, blood product and organs prior to 1992, needle-stick injuries in healthcare settings, birth to infected mothers, tattoos or body-piercing, and hemodialysis. HIV infection is associated with increased risk of HCV infection among men who have sex with men (MSM). Household or familial contact does not appear to increase the risk of transmission of hepatitis C. An estimated 30% of cases have no identifiable exposure risk. Healthcare-related transmission has been documented and should be considered in persons without identified traditional risk factors. HCV is the most common chronic bloodborne infection in the US.

The average incubation period is 4–12 weeks (range 2–24 weeks). Up to 85% of persons with newly acquired HCV infection are asymptomatic. When symptoms occur, they can include: fever, fatigue, loss of appetite, nausea, vomiting, abdominal pain, dark urine, clay-colored bowel movements, joint pain, and jaundice. After acute infection, 15–25% of persons appear to resolve their infection while chronic infection develops in 75–85% of persons. Long-term medical complications occur decades after initial infection including cirrhosis, liver failure, and hepatic cancer.

Primary prevention activities are recommended for prevention and control of HCV infection including: screening and testing of blood donors and persons born 1945-1965, viral inactivation of plasma-derived products, risk-reduction counseling and screening of persons at risk for HCV infection, and routine practice of injection safety in healthcare settings. There is no vaccine or post-exposure prophylaxis for HCV, and vaccines for hepatitis A and B do not provide immunity against hepatitis C. Curative therapy for HCV is available for all HCV genotypes. Limitations to therapy include cost, access to care, and meeting clinical criteria for treatment.

For the purpose of surveillance, LAC DPH uses the 2016 the CDC Council of State and Territorial Epidemiologists (CSTE) criteria for acute hepatitis C:

1) Discrete onset of symptoms,
2) Jaundice or alanine aminotransferase (ALT) levels >200 IU/L,
3) Anti-HCV screening test positive and/or Nucleic acid test (NAT) for HCV RNA positive.

In 2016, the CDC/CSTE acute hepatitis C case definition also included documented seroconversion cases as acute hepatitis C cases (documented negative HCV test result within twelve months prior to HCV diagnosis).

2016 TRENDS AND HIGHLIGHTS

- In 2016, there were five cases reported, compared with two cases in 2015. The rates

of acute hepatitis C have been consistently low the past several years.

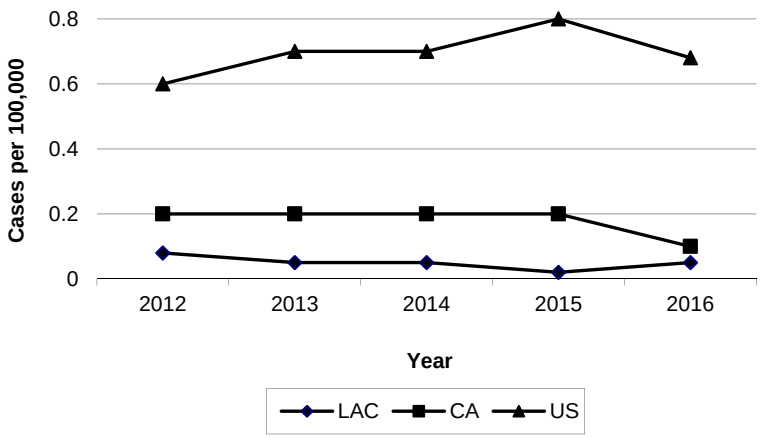
- The five cases in 2016 were in 15–34 (n=2, 40%), 35-44 (n=1, 20%), and 45–54 year olds (n=2, 40%) (Figure 2).
- Almost two-thirds (60%) of cases were Hispanic, and 40% were White (Figure 3).
- A total of five cases were male (100%).
- The CDC/CSTE revised the case definitions for acute and chronic hepatitis C, effective January 1, 2016.
- Risk factors were identified in 100% (n=5) of the confirmed cases interviewed. Injection drug use (n=3, 60%), receiving a tattoo (n=3, 60%), and incarceration (n=3, 60%) were the most common risk factors reported. These are followed by having a dental procedure (n=1, 20%), using street drugs but not injecting (n=1, 20%), having multiple sexual partners (n=1, 20%), and MSM (n=1, 20%). In 2015, all reported risk factors were health care related.

Reported Hepatitis C, Acute Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA LAC, 2012-2016

	2012 (N=7)			2013 (N=5)			2014 (N=5)			2015 (N=2)			2016 (N=5)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
15-34	4	57.1	0.1	2	40.0	0.1	2	40.0	0.1	1	50.0	-	2	40.0	0.1
35-44	1	14.3	0.1	1	20.0	0.1	2	40.0	0.2	0	-	-	1	20.0	0.1
45-54	2	28.6	0.2	1	20.0	0.1	1	20.0	0.1	1	50.0	0.1	2	40.0	0.2
55-64	0	-	-	1	20.0	0.1	0	-	-	0	-	-	0	-	-
65+	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	0	-	-	0	-	-	1	20.0	0.1	0	-	-	0	-	-
Black	1	14.3	0.1	0	-	-	0	-	-	0	-	-	0	-	-
Hispanic	3	42.9	0.1	1	20.0	-	2	40.0	-	2	100.0	-	3	60.0	0.1
White	2	28.6	0.1	4	80.0	0.2	2	40.0	0.1	0	-	-	2	40.0	0.1
Other	1	14.3	-	0	-	-	0	-	-	0	-	-	0	-	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
SPA															
1	2	28.6	0.5	0	-	-	0	-	-	0	-	-	0	-	-
2	1	14.3	-	1	20.0	-	3	60.0	0.1	1	50.0	-	0	-	-
3	0	-	-	1	20.0	0.1	2	40.0	0.1	0	-	-	3	60.0	0.2
4	1	14.3	0.1	0	-	-	0	-	-	0	-	-	1	20.0	0.1
5	1	14.3	0.2	1	20.0	0.2	0	-	-	0	-	-	0	-	-
6	1	14.3	0.1	0	-	-	0	-	-	0	-	-	0	-	-
7	0	-	-	1	20.0	0.1	0	-	-	0	-	-	0	-	-
8	1	14.3	0.1	1	20.0	0.1	0	-	-	1	50.0	0.1	0	-	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	1	20.0	-

*Rates calculated based on less than 19 cases or events are considered unreliable

**Figure 1. Incidence Rates* of Acute Hepatitis C
LAC, CA and US, 2012-2016**



*Rates based on fewer than 19 cases are unreliable

**Figure 2. Cases of Acute Hepatitis C by Age Group
LAC, 2012-2016**

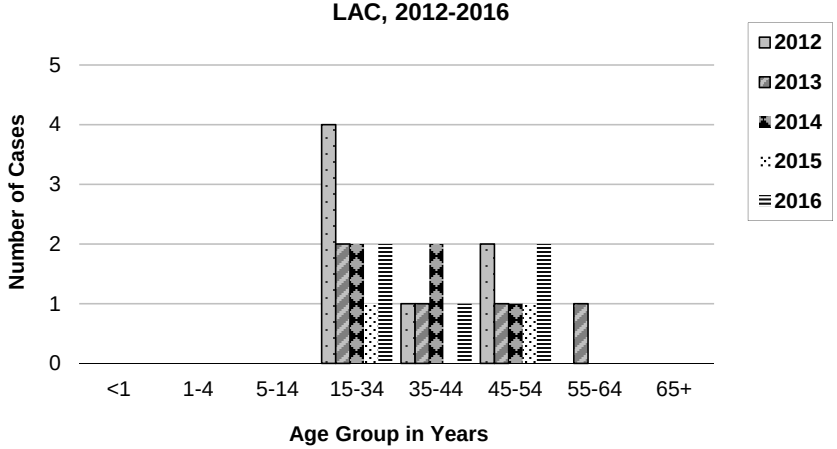
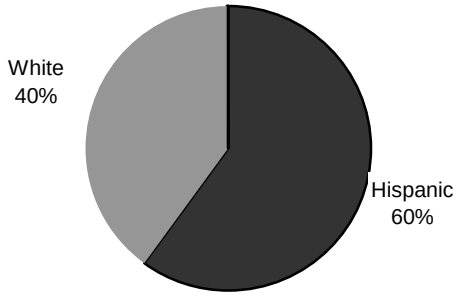


**Figure 3. Percent Cases of Acute Hepatitis C by
Race/Ethnicity
LAC, 2016 (N=5)**



LEGIONELLOSIS

CRUDE DATA	
Number of Cases	245
Number of Deaths	23
Annual Incidence[a]	
LA County	2.55
California[b]	1.05
United States[b]	1.63
Age at Diagnosis	
Mean	66.8
Median	67
Range	25–99 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

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, self-limited, influenza-like illness without pneumonia. *Legionella* bacteria are common inhabitants of aquatic systems that thrive in warm environments. While at least 46 *Legionella* species and 70 serogroups have been identified, the majority (90%) of LD cases are caused by *Legionella pneumophila* serogroup 1 (LP1). Transmission occurs through inhalation of aerosolized water 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. However, the disease most often affects older persons, particularly those who are heavy smokers, who have chronic underlying diseases such as diabetes mellitus, congestive heart failure, or lung disease, or who have immune systems that are suppressed by illness or medication.

The implementation of water safety measures to control the risk of transmission of *Legionella* to susceptible hosts in hospitals, hotels, and public places with water-related amenities remains the primary means of reducing LD. Approaches include periodic inspection of water sources and distribution systems, heat exchangers, and cooling towers. Prevention strategies include appropriate disinfection, monitoring, maintenance of both cold and hot water systems, and setting hot water temperatures to $\geq$50ºC to limit bacterial growth. All healthcare-associated LD case reports are investigated to identify potential outbreak situations. Early recognition and investigation is crucial for timely implementation of control measures.

2016 TRENDS AND HIGHLIGHTS

- In 2016, there were 245 cases reported (2.6 per 100,000), which was 43.2% higher than in 2015 (Figure 1).
- Only three cases of Pontiac fever were reported.
- The case fatality rate decreased from 10.5% in 2015 to 9.5% in 2016.
- The most affected age group in LAC was persons $\geq$65 years old (Figure 2), which is consistent over a five-year period.
- SPA 6 had the highest incidence this year followed by SPA 2 and SPA 4 (Figure 3).
- The greatest number of cases was reported in December, which was consistent over the past five years (Figure 4).
- The highest incidence rate occurred among Blacks (5.6 per 100,000) followed by Whites (3.3 per 100,000) (Figure 5).
- There was a decrease in travel-associated cases residing in commercial lodging during the incubation period from 9.4% in 2015 to 8.1% this year. There was one medical travel for alternate medicine reported this year, and one LAC resident was linked to a travel-related cluster reported by the CDC.
- Healthcare-associated legionellosis cases in skilled nursing facilities increased from 3.5% to

6.9% of all cases with one fatality. Assisted living cases remained the same at 1.2% with no fatalities reported. Healthcare-associated legionellosis cases in acute care facilities increased from 4.1% to 5.3% of all cases with three fatalities.

- A total of three outbreaks in healthcare facilities were reported including one subacute facility and two acute care facilities (totaling nine cases). In all three outbreaks, sampling of the environment resulted in multiple findings of *Legionella* species, non-*pneumophila*, in the water system. While these outbreaks did not involve LP1, they showed that conditions for *Legionella* amplification were present and may have contributed to the infections.
- Only one case of positive *L. pneumophila* was in vitreal fluid obtained during a vitrectomy done in an outpatient surgery center.

Reported Legionellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=111)			2013 (N=85)			2014 (N=140)			2015 (N=171)			2016 (N=245)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	1	0.9	0.1	0	-	-	0	-	-	0	-	-	0	-	-
15-34	4	3.6	0.1	3	3.5	0.1	3	2.1	0.1	9	5.3	0.3	8	3.2	0.3
35-44	6	5.4	0.5	4	4.7	0.3	11	7.9	0.8	11	6.4	0.8	13	5.3	1.0
45-54	21	18.9	1.6	12	14.1	0.9	17	12.1	1.3	14	8.2	1.1	39	16.0	3.0
55-64	18	16.2	1.8	19	22.4	1.9	29	20.7	2.7	31	18.1	2.8	50	20.4	4.4
65+	61	55.0	5.5	47	55.3	4.2	80	57.1	7.1	106	62.0	8.9	135	55.1	11.0
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	7	6.3	0.5	7	8.2	0.5	16	11.4	1.2	11	6.4	0.8	16	7.0	1.1
Black	16	14.4	2.1	16	18.8	2.1	21	15.0	2.7	29	17.0	3.7	44	18.0	5.6
Hispanic	32	28.8	0.7	24	28.2	0.5	39	27.9	0.8	49	28.7	1.0	93	38.0	2.0
White	49	44.1	1.8	34	40.0	1.3	62	44.3	2.3	76	44.4	2.8	89	36.0	3.3
Other	5	4.5	-	1	1.2	-	0	-	-	3	1.8	-	2	1.0	-
Unknown	2	1.8	-	3	3.5	-	2	1.4	-	3	1.8	-	1	-	-
SPA															
1	3	2.7	0.8	2	2.4	0.5	3	2.1	0.8	4	2.3	1.0	6	2.4	1.5
2	21	18.9	1.0	27	31.8	1.2	46	32.9	2.1	38	22.2	1.7	61	25.0	2.7
3	17	15.3	1.1	8	9.4	0.5	16	11.4	1.0	22	12.9	1.3	42	17.1	2.6
4	13	11.7	1.2	18	21.2	1.6	23	16.4	2.0	23	13.5	2.0	32	13.1	2.7
5	10	9.0	1.6	6	7.1	0.9	12	8.6	1.8	16	9.4	2.4	17	7.0	2.6
6	17	15.3	1.7	9	10.6	0.9	10	7.1	1.0	19	11.1	1.8	33	13.4	3.1
7	14	12.6	1.1	3	3.5	0.2	14	10.0	1.1	22	12.9	1.7	23	9.5	1.8
8	14	12.6	1.3	12	14.1	1.1	14	10.0	1.3	27	15.8	2.5	28	11.4	2.6
Unknown	2	1.8	-	0	-	-	2	1.4	-	0	-	-	3	1.2	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Incidence Rates of Legionellosis
LAC, CA, and US, 2007-2016**

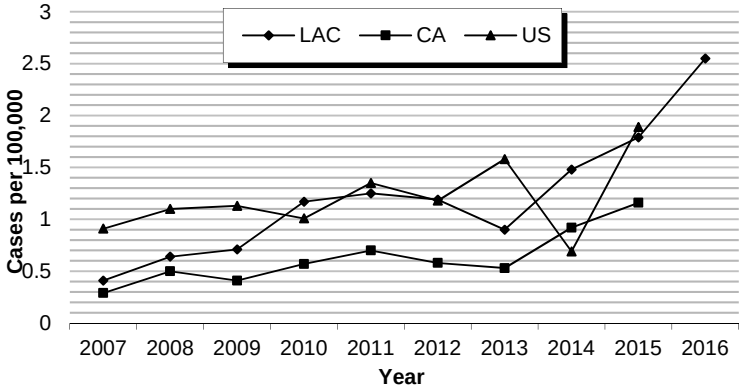


**Figure 2. Incidence Rates of Legionellosis by Age Group
LAC, 2012 - 2016**

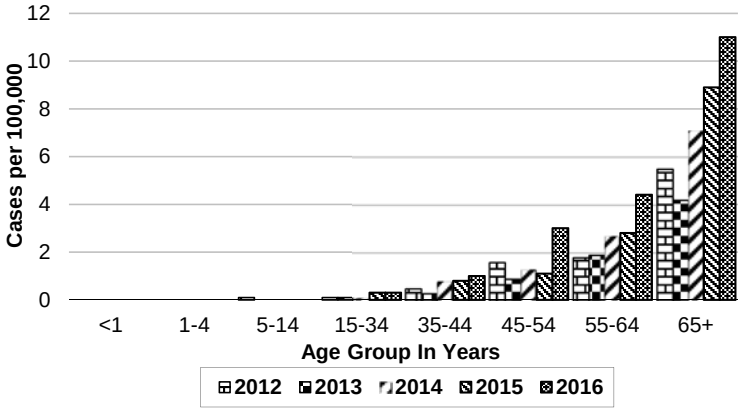


**Figure 3. Incidence Rates of Legionellosis by SPA
LAC, 2012-2016**

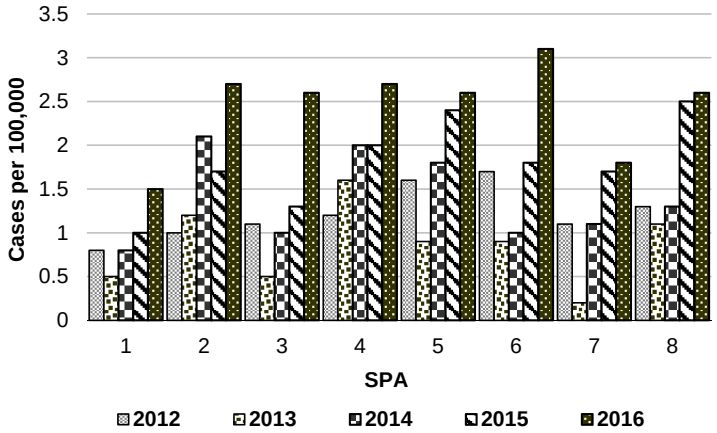


**Figure 4. Reported Legionellosis Cases by Month of Onset
LAC, 2016 (N=245)**

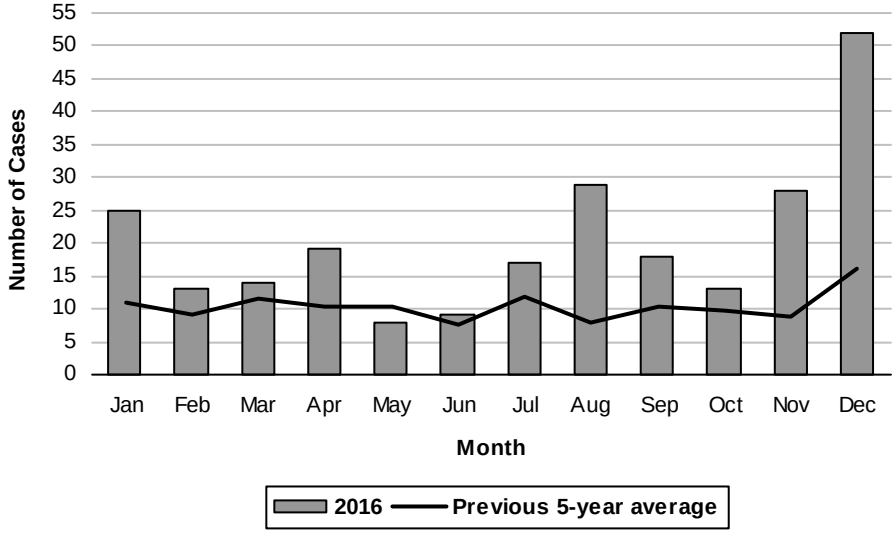
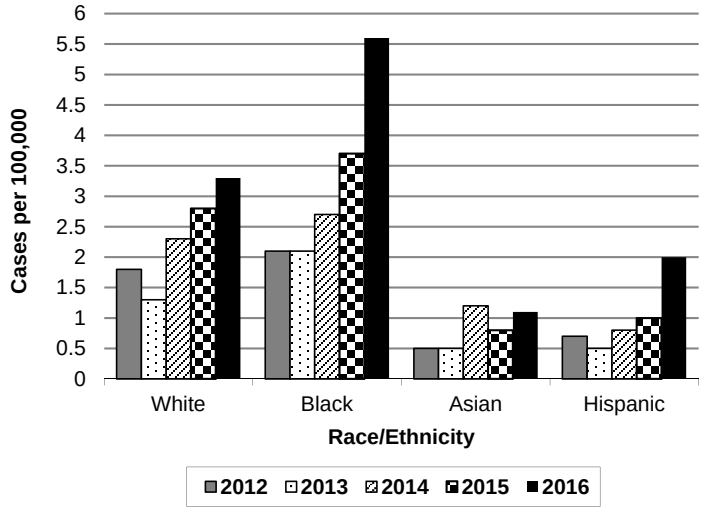
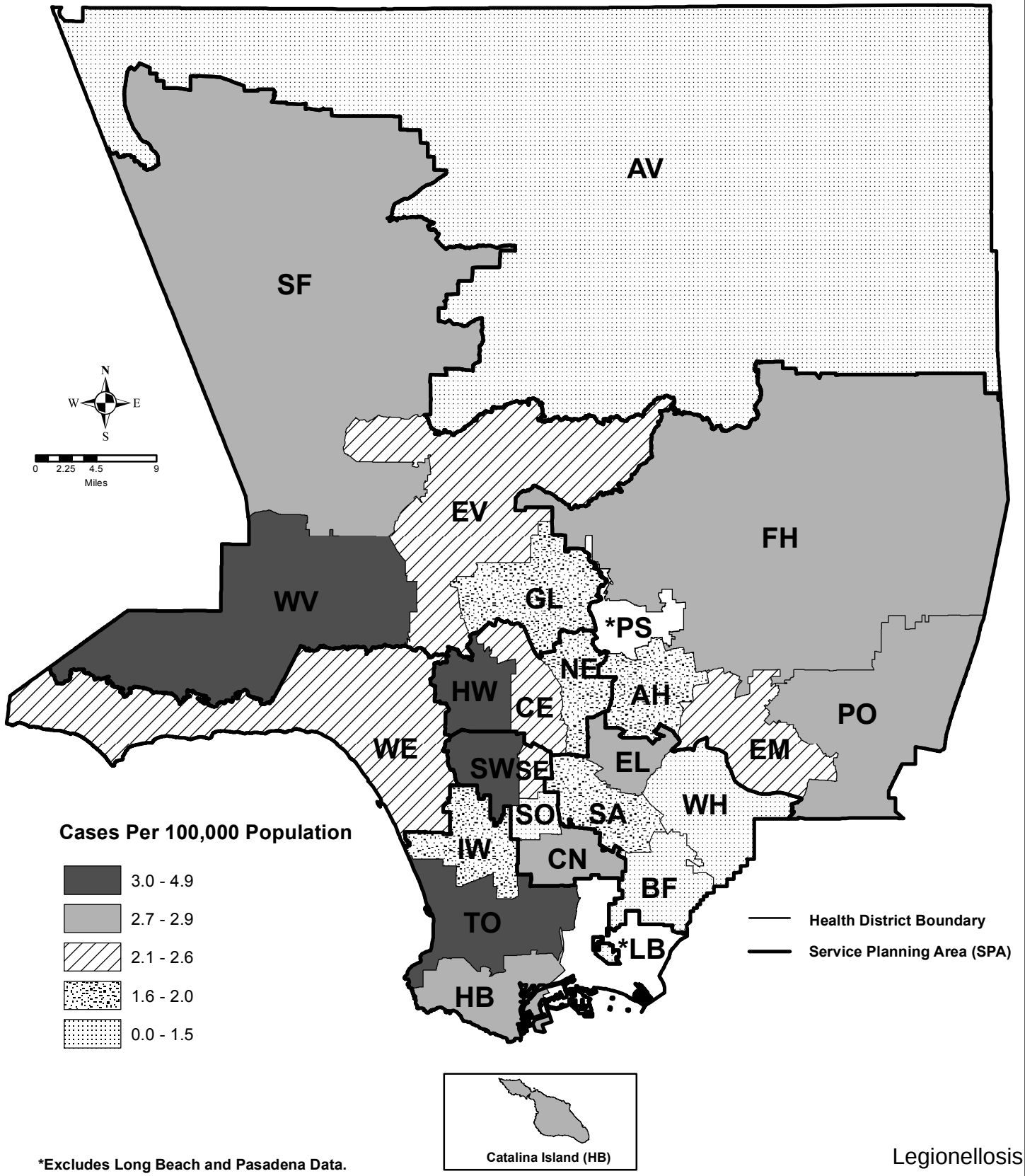


**Figure 5. Legionellosis Rates by Race/Ethnicity
LAC, 2012- 2016**



Map 9. Legionellosis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

LISTERIOSIS, NONPERINATAL

CRUDE DATA	
Number of Cases	33
Annual Incidence[a]	
LA County[b]	0.34
California	N/A
United States	N/A
Age at Diagnosis	
Mean	72
Median	75
Range	17–94 years

[a]Cases per 100,000 population
[b]Rates calculated based on less than 19 cases or events are considered unreliable

DESCRIPTION

Listeriosis is a disease caused by infection with *Listeria monocytogenes*, a gram-positive rod bacteria found in soil throughout the environment. Listeriosis is often caused by ingestion of foods contaminated with *L. monocytogenes* such as raw fruits and vegetables, cold cuts, deli meats, and unpasteurized dairy products. The disease affects primarily persons of advanced age, pregnant women, newborns, and adults with weakened immune systems. On rare occasions, people without these risk factors have also contracted listeriosis. Symptoms of listeriosis include fever, muscle aches, and sometimes nausea or diarrhea. If infection spreads, sepsis or meningitis can occur, which may be fatal. Infected pregnant women may experience only a mild, flu-like illness; however, infection during pregnancy can lead to miscarriage or stillbirth, premature delivery, or infection of the newborn (see Listeriosis, perinatal).

In general, listeriosis may be prevented by thoroughly cooking raw food from animal sources and avoiding unpasteurized milk or foods made from unpasteurized milk. Individuals at risk for severe outcomes from infection should also avoid soft cheeses and leftover foods or ready-to-eat foods such as deli meats and hot dogs. Deli meats should be cooked until steaming hot.

2016 TRENDS AND HIGHLIGHTS

- Whites comprised 46% of all nonperinatal listeriosis cases followed by Asians (24%), Hispanics (21%), and Blacks (6%) (Figure 3). In 2016, the proportion of cases among Whites and Asians increased by 7% from 2015. The proportion of cases among Blacks increased by 6%. The proportion of cases among Hispanics decreased by 5%.
- In 2016, nine nonperinatal listeriosis cases were part of a nationwide outbreak associated with store-bought hummus. However, four of these cases denied hummus consumption.
- In 2016, as in the past five years, the majority of cases (72%) occurred in those greater than 65 years old. Advanced age increases the risk of developing listeriosis.
- Two cases of *Listeria innocua* were identified. One case was part of a trial where genetically modified *Listeria* was used as cancer treatment. Reasons for the second *innocua* infection are unknown.
- Regionally, the greatest number of listeriosis was in SPA 2 (Figure 4) with 11 cases and an incidence of 0.5 per 100,000. SPA 5 had six cases and exhibited the highest incidence at 0.9 per 100,000.
- Cases in 2016 and the five-year average peaked in September (Figure 5).
- Individuals with pre-existing health conditions are disproportionately affected. The majority of cases (n=31, 84%) had one or more other medical conditions before receiving a diagnosis of listeriosis.
- There were four deaths due to nonperinatal listeriosis, resulting in a case-fatality rate of 12.1. These cases had underlying diseases including cancer, diabetes, kidney disease, and hypertension.

Reported Listeriosis, Nonperinatal Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=26)			2013 (N=23)			2014 (N=27)			2015 (N=34)			2016 (N=33)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	1	3.8	0.1	0	-	-	1	3.7	0.1	0	-	-	0	-	-
15-34	1	3.8	-	0	-	-	0	-	-	1	2.9	-	1	3.0	-
35-44	0	-	-	1	4.3	0.1	2	7.4	0.2	3	8.8	0.2	1	3.0	0.1
45-54	8	30.8	0.6	3	13.0	0.2	1	3.7	0.1	5	14.7	0.4	3	9.1	0.2
55-64	1	3.8	0.1	3	13.0	0.3	3	11.1	0.3	4	11.8	0.4	4	12.1	0.4
65+	15	57.7	1.4	16	69.6	1.4	20	74.1	1.8	21	61.8	1.8	24	72.7	2.0
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	5	19.2	0.4	7	30.4	0.5	9	33.3	0.7	6	17.6	0.4	8	24.2	0.6
Black	1	3.8	0.1	1	4.3	0.1	1	3.7	0.1	0	-	-	2	6.1	0.3
Hispanic	8	30.8	0.2	8	34.8	0.2	10	37.0	0.2	9	26.5	0.2	7	21.2	0.1
White	11	42.3	0.4	6	26.1	0.2	4	14.8	0.2	13	38.2	0.5	15	45.5	0.6
Other	0	-	-	0	-	-	0	-	-	1	-	-	1	3.0	-
Unknown	1	-	-	1	-	-	3	-	-	5	-	-	0	-	-
SPA															
1	1	3.8	0.3	0	-	-	0	-	-	0	-	-	0	-	-
2	9	34.6	0.4	7	30.4	0.3	9	33.3	0.4	8	23.5	0.4	11	33.3	0.5
3	2	7.7	0.1	2	8.7	0.1	5	18.5	0.3	10	29.4	0.6	5	15.2	0.3
4	3	11.5	0.3	4	17.4	0.4	2	7.4	0.2	5	14.7	0.4	7	21.2	0.6
5	5	19.2	0.8	1	4.3	0.2	2	7.4	0.3	3	8.8	0.5	6	18.2	0.9
6	3	11.5	0.3	2	8.7	0.2	3	11.1	0.3	2	5.9	0.2	0	-	-
7	0	-	-	5	21.7	0.4	2	7.4	0.2	3	8.8	0.2	3	9.1	0.2
8	3	11.5	0.3	2	8.7	0.2	4	14.8	0.4	3	8.8	0.3	1	3.0	0.1
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Reported Cases of Nonperinatal Listeriosis LAC, 2007-2016

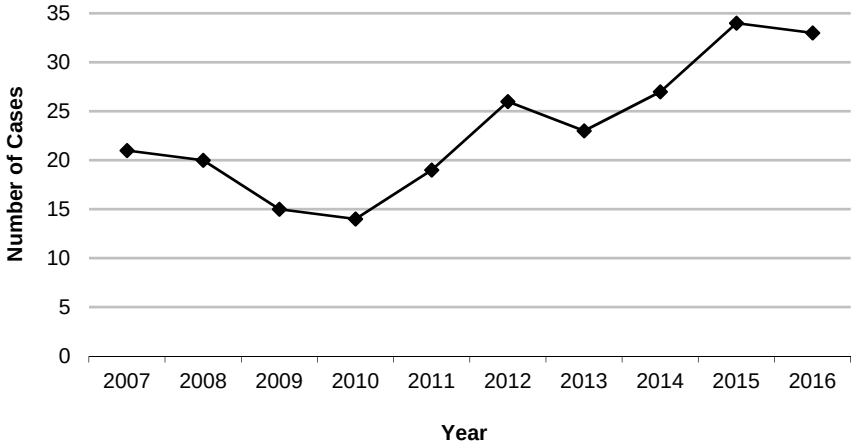


Figure 2. Reported Cases of Nonperinatal Listeriosis by Age Group, LAC, 2016 (N=33)

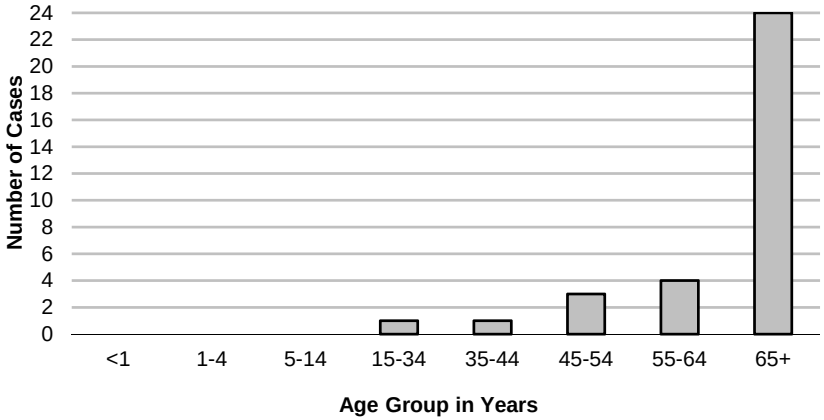


Figure 3. Percent Cases of Nonperinatal Listeriosis by Race/Ethnicity, 2016 LAC (N=33)

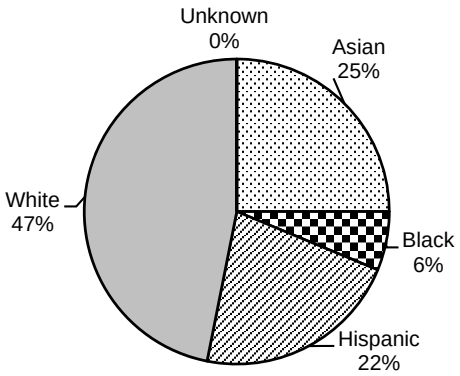


Figure 4. Reported Cases of Nonperinatal Listeriosis by SPA LAC, 2016 (N=33)

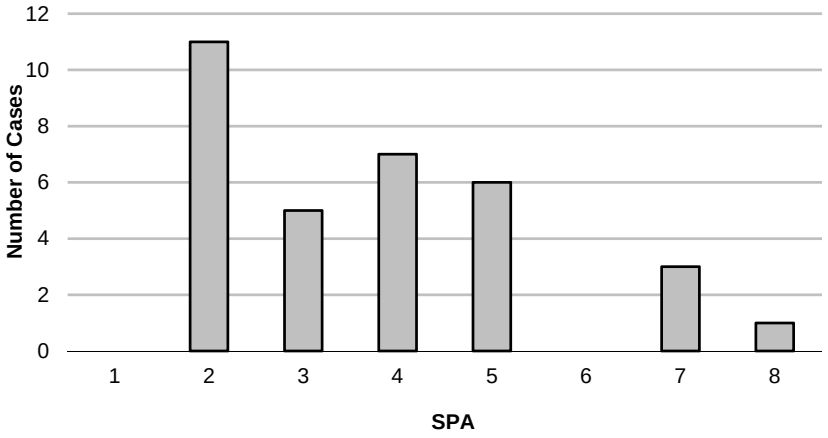
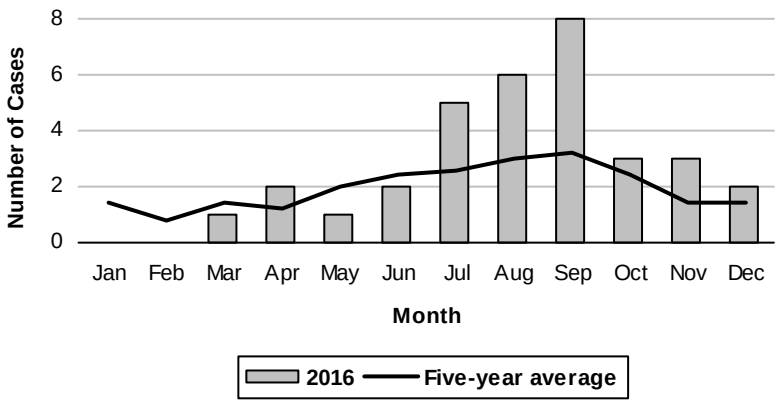


Figure 5. Reported Nonperinatal Listeriosis Cases by Month of Onset, LAC, 2015 (N=33)



LISTERIOSIS, PERINATAL

CRUDE DATA	
Number of Cases	4
Annual Incidence[a]	
LA County[b]	3.48
California	N/A
United States	N/A
Age at Diagnosis	
Mean	41
Median	38
Range	38–46 years

[a]Cases per 100,000 live births
[b]Rates calculated based on less than 19 cases or events are considered unreliable

DESCRIPTION

Listeriosis is a disease caused by infection with *Listeria monocytogenes*, a gram-positive rod bacteria found in soil throughout the environment. Listeriosis is often caused by ingestion of foods contaminated with *L. monocytogenes.* Foods often associated with *Listeria* contamination include raw fruits and vegetables, undercooked meats such as beef, pork, poultry, and pâté, cold cuts, and unpasteurized dairy products such as milk, milk products, and soft cheeses (Mexican-style, brie, feta, blue-veined, Camembert).

Pregnant women are susceptible because pregnancy causes a suppression of the immune system. The pregnant mother may only experience a mild febrile illness but can transmit the infection to the fetus. Symptoms of listeriosis include fever, muscle aches, and sometimes nausea or diarrhea. Infections during pregnancy can lead to miscarriage, stillbirth, premature delivery, or infection of the newborn. Often, *Listeria* can be isolated from both the mother and infant.

Pregnant women should avoid foods associated with *Listeria*, particularly cheeses sold by street vendors or obtained from relatives/friends in countries where food processing quality assurance is unknown. Leftover foods or ready-to-eat foods such as hot dogs should be cooked until steaming hot before eating.

Prevention strategies include education during prenatal checkups, outreach to Latino communities more likely to consume soft cheese, and food safety notices at food and deli markets.

2016 TRENDS AND HIGHLIGHTS

- In 2016, there were four perinatal mother-infant pairs with listeriosis. Three cases were Hispanic, and one case was Black. All four cases were single gestations.
- All four mothers were not diagnosed with listeriosis, but their infants tested positive.
- Maternal ages were 38-46 years old with a mean of 41 years old.
- The number of perinatal listeriosis cases in 2016 is consistent with the range of incidence of listeriosis over the past ten years (2007–2016, excluding the increase in 2012 when there were 7 cases) (Figure 1).
- Hispanic women had the highest number of cases of perinatal listeriosis, consistent with the past five years, except 2012 when non-Hispanic, White mothers comprised the majority of cases (Figure 2). Incidence of perinatal listeriosis remains consistent among Hispanic mothers.
- Two of the mothers reported eating cold cuts, and three reported eating soft cheeses while pregnant.
- All four mothers were hospitalized and released. There were no maternal or neonatal deaths.

Reported Perinatal Listeriosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=7)			2013 (N=4)			2014 (N=5)			2015 (N=3)			2016 (N=4)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
15-34	4	57.1	4.2	4	100.0	4.3	3	60.0	3.2	2	66.7	2.2	0	-	-
35-44	3	42.9	11.7	0	-	-	2	40.0	7.3	1	33.3	3.7	3	75.0	11.1
45-54	0	-	-	0	-	-	0	-	-	0	-	-	1	25.0	219.8
55-64	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
65+	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race/Ethnicity															
Asian	1	14.3	5.4	0	-	-	1	20.0	4.6	0	-	-	0	-	-
Black	0	-	-	0	-	-	0	-	-	0	-	-	1	25.0	12.4
Hispanic	2	28.6	2.8	3	75.0	4.4	2	40.0	3.0	2	66.7	3.4	3	75.0	4.7
White	4	57.1	18.6	1	25.0	4.5	1	20.0	4.5	1	33.3	4.5	0	-	-
Other	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Unknown	0	-	-	0	-	-	1	20.0	-	0	-	-	0	-	-
SPA															
1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2	2	28.6	0.2	1	25.0	0.2	1	20.0	0.2	0	-	-	0	-	-
3	2	28.6	0.3	1	25.0	0.3	1	20.0	0.3	1	33.3	0.1	1	25.0	0.3
4	1	14.3	0.2	0	-	-	1	20.0	0.4	0	-	-	0	-	-
5	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
6	0	-	-	0	-	-	1	20.0	0.4	1	33.3	0.2	0	-	-
7	1	14.3	0.2	1	25.0	0.3	0	-	-	0	-	-	1	25.0	0.4
8	1	14.3	0.2	1	25.0	0.4	1	20.0	0.5	1	33.3	0.2	2	50.0	0.9
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Reported Cases of Perinatal Listeriosis
LAC, 2007-2016**

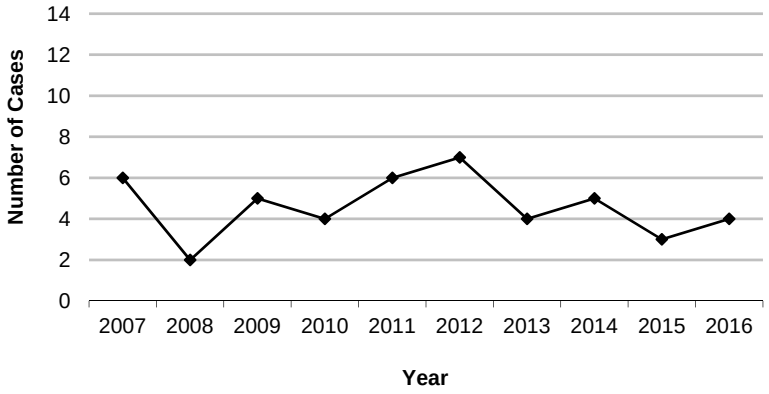


**Figure 2. Perinatal Listeriosis Cases by Race/Ethnicity
LAC, 2012-2016**

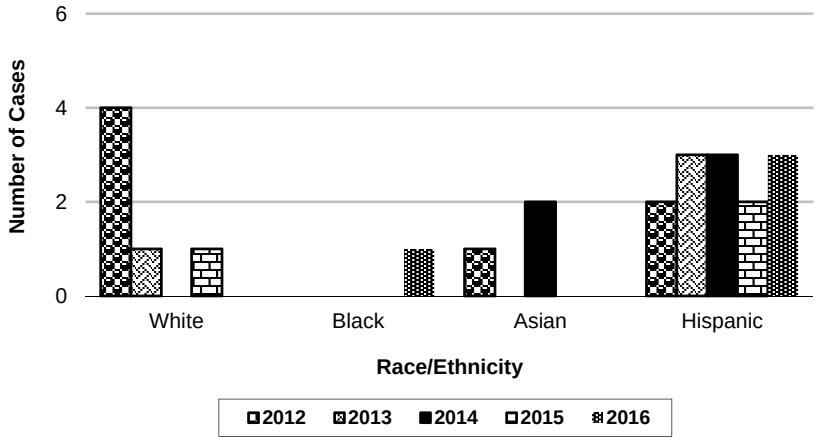
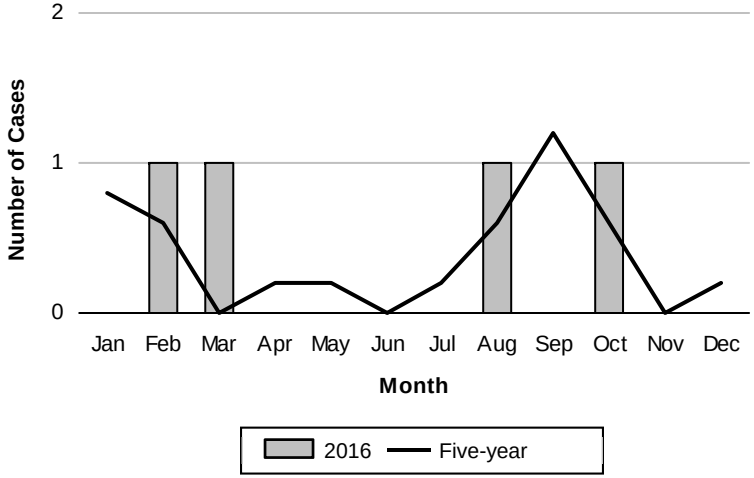


**Figure 3. Reported Perinatal Listeriosis Cases
by Month of Onset, LAC, 2016 (N=4)**



MENINGITIS, VIRAL

CRUDE DATA	
Number of Cases	183
Annual Incidence[a] LA County	1.91
Age at Diagnosis	
Mean	40
Median	42
Range	0–90 years

[a]Cases per 100,000 population

DESCRIPTION

Viruses are the major cause of aseptic meningitis syndrome, a term used to define any meningitis (infectious or noninfectious). This is particularly true for one with a cerebrospinal fluid 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, confusion, nausea, and vomiting and usually last from seven to ten days.

The most common cause of viral meningitis is nonpolio enteroviruses, which are not vaccine-preventable and account for 85-95% of all cases in which a pathogen is identified. Transmission of enteroviruses may be by fecal-oral, respiratory, or another route specific to the etiologic agent. Other viral agents that can cause viral meningitis include herpes simplex virus (HSV), varicella-zoster virus (VZV), mumps virus, lymphocytic choriomeningitis virus, human immunodeficiency virus (HIV), adenovirus, parainfluenza virus type 3, influenza virus, measles virus, and arboviruses such as West Nile virus (WNV).

All cases of viral meningitis are reportable to LAC DPH within one day. LAC DPH conducts passive surveillance of viral meningitis cases with suspected or confirmed viral etiologies. Cases included in LAC DPH surveillance require, at minimum, a clinically compatible illness and may or may not include laboratory evidence.

Antiviral agents are available for HSV and VZV; however, in most cases, only supportive measures are available for the treatment of viral meningitis. Recovery is usually complete and associated with low mortality rates.

Several types of viral meningitis cases are vaccine-preventable including those caused by VZV, mumps, influenza, and measles. Good personal hygiene, especially hand washing and avoiding contact with oral secretions of others, is the most practical and effective preventive measure for non-vaccine preventable causes.

2016 TRENDS AND HIGHLIGHTS

- In 2016, viral/aseptic meningitis incidence declined from 3.8 cases per 100,000 in 2015 to 1.9 cases per 100,000. There has been a decline in incidence each year from 2014 (Figure 1).
- SPA 3 (San Gabriel Valley) reported the highest rate of viral meningitis in LAC with 3.4 cases per 100,000 followed by SPA 2 (San Fernando Valley) with 1.9 cases per 100,000 (Figure 2).
- The distribution of viral/aseptic meningitis by age groups remains similar to previous years with the less than one year old age group experiencing the highest age-specific incidence rate at 16.4 per 100,000 (Figure 3).
- The peak months for viral meningitis cases occurred between August and October and were likely due to an increase in the number of WNV meningitis cases during those months. (Figure 4).

- The etiologies of 103 (56%) cases were identified. Of those, 49 (48%) were identified as WNV and 28 (27%) were due to herpes virus (Figure 6).
- No fatalities or outbreaks were documented.

Reported Viral Meningitis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=303)			2013 (N=355)			2014 (N=400)			2015 (N=367)			2016 (N=183)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	28	9.2	23.5	43	12.1	35.6	47	11.8	39.7	41	11.2	37.9	17	9.3	16.4
1-4	4	1.3	0.8	9	2.5	1.8	8	2.0	1.6	2	0.5	0.4	4	2.2	0.9
5-14	24	7.9	2.0	57	16.1	4.7	54	13.5	4.5	51	13.9	4.2	7	3.8	0.6
15-34	93	30.7	3.4	105	29.6	3.7	114	28.5	4.0	101	27.5	3.6	41	22.4	1.5
35-44	45	14.9	3.4	27	7.6	2.0	43	10.8	3.3	38	10.4	2.9	28	15.3	2.1
45-54	40	13.2	3.1	44	12.4	3.4	43	10.8	3.3	41	11.2	3.1	34	18.6	2.6
55-64	32	10.6	3.1	35	9.9	3.4	42	10.5	4.0	42	11.4	3.8	28	15.3	2.5
65+	37	12.2	3.3	31	8.7	2.8	44	11.0	3.9	51	13.9	4.3	24	13.1	2.0
Unknown	0	-	-	4	1.1	-	5	1.3	-	0	-	-			
Race / Ethnicity															
Asian	23	7.6	1.7	21	5.9	1.5	22	5.5	1.6	21	5.7	1.5	16	8.7	1.1
Black	36	11.9	4.7	26	7.3	3.3	26	6.5	3.3	24	6.5	3.1	10	5.5	1.3
Hispanic	131	43.2	2.9	158	44.5	3.4	186	46.5	4.0	174	47.4	3.7	71	38.8	1.5
White	86	28.4	3.2	88	24.8	3.3	99	24.8	3.7	106	28.9	3.9	53	29.0	2.0
Other	10	3.3	-	19	5.4	-	12	3.0	-	8	2.2	-	5	2.7	-
Unknown	17	5.6	-	43	12.1	-	55	13.8	-	34	9.3	-	28	15.3	-
SPA															
1	18	5.9	4.6	29	8.2	7.4	33	8.3	8.4	27	7.4	6.8	3	1.6	0.8
2	63	20.8	2.9	67	18.9	3.1	73	18.3	3.3	68	18.5	3.1	43	23.4	1.9
3	68	22.4	4.2	64	18.0	3.9	97	24.3	5.9	71	19.3	4.3	56	30.6	3.4
4	16	5.3	1.4	32	9.0	2.8	34	8.5	3.0	31	8.4	2.7	14	7.7	1.2
5	10	3.3	1.6	7	2.0	1.1	14	3.5	2.1	20	5.4	3.0	4	2.2	0.6
6	29	9.6	2.9	43	12.1	4.2	38	9.5	3.7	43	11.7	4.1	14	7.7	1.3
7	57	18.8	4.4	56	15.8	4.3	71	17.8	5.4	71	19.3	5.4	22	12.0	1.7
8	36	11.9	3.4	52	14.6	4.8	37	9.3	3.4	33	9.0	3.0	22	12.0	2.0
Unknown	6	2.0	-	5	1.4	-	3	0.8	-	3	0.8	-	5	2.7	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Incidence Rates of Viral Meningitis
LAC, 2000-2016**

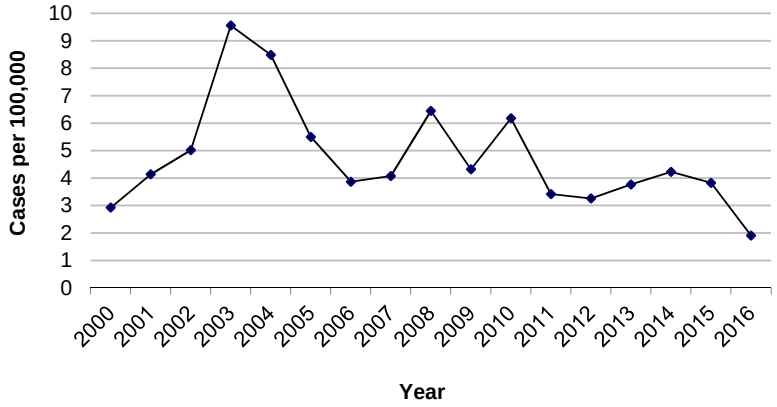


**Figure 2. Incidence Rates of Viral Meningitis by SPA
LAC, 2012-2016**

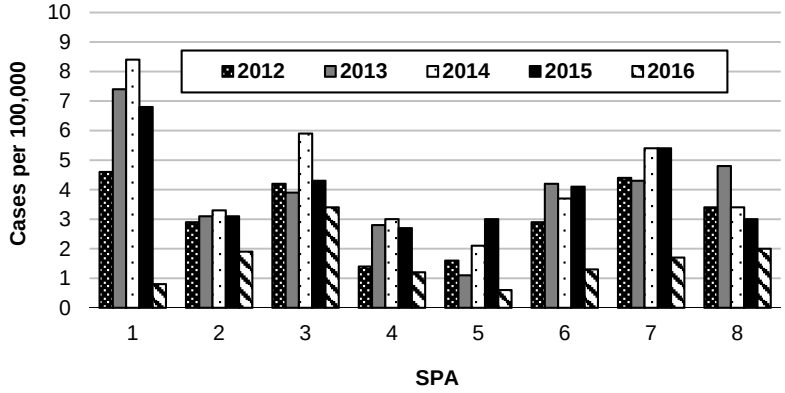


**Figure 3. Incidence Rates of Viral Meningitis by Age Group
LAC, 2012-2016**

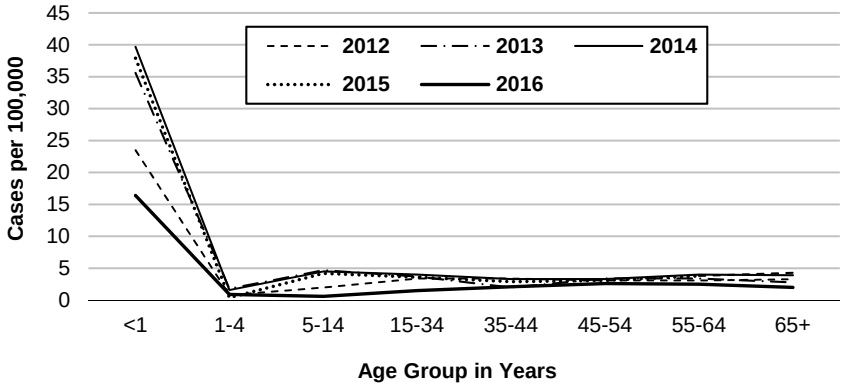
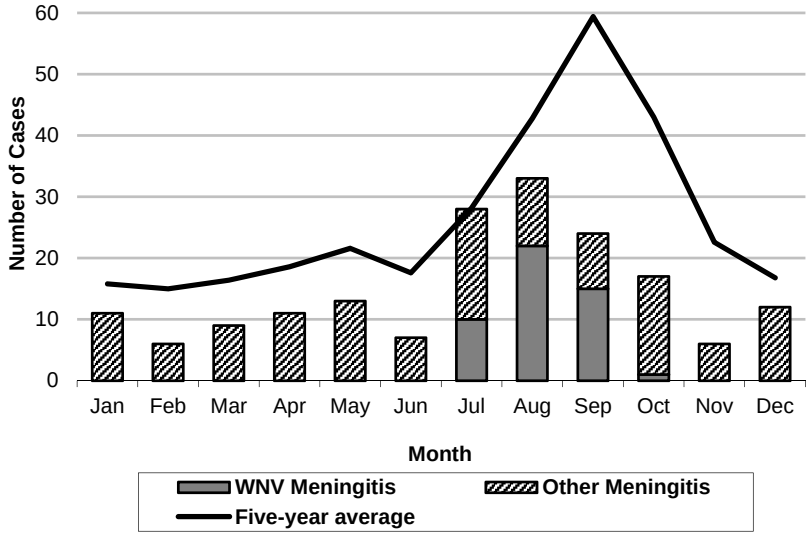


**Figure 4. Reported Meningitis Cases by Month of Onset
LAC, 2016 (N=139)**



*5 cases missing onset date.

Figure 5. Incidence Rates of Viral Meningitis by Race/Ethnicity LAC, 2011-2016

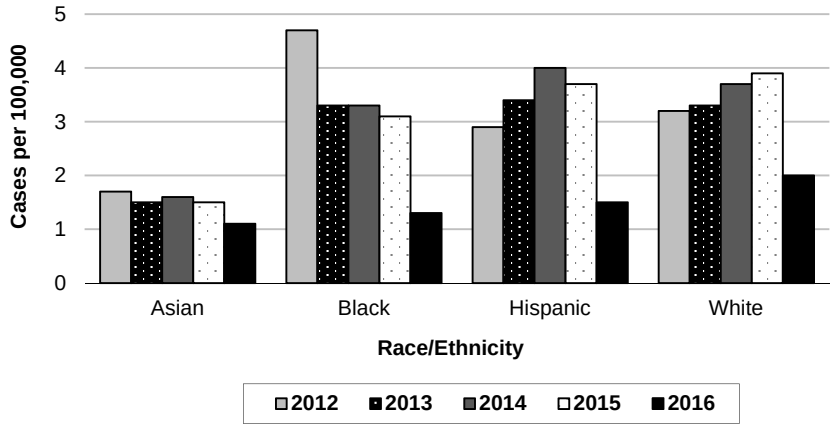
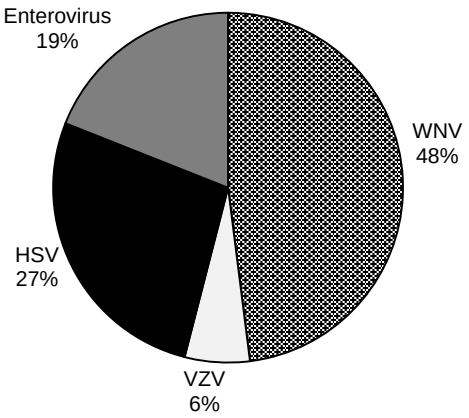
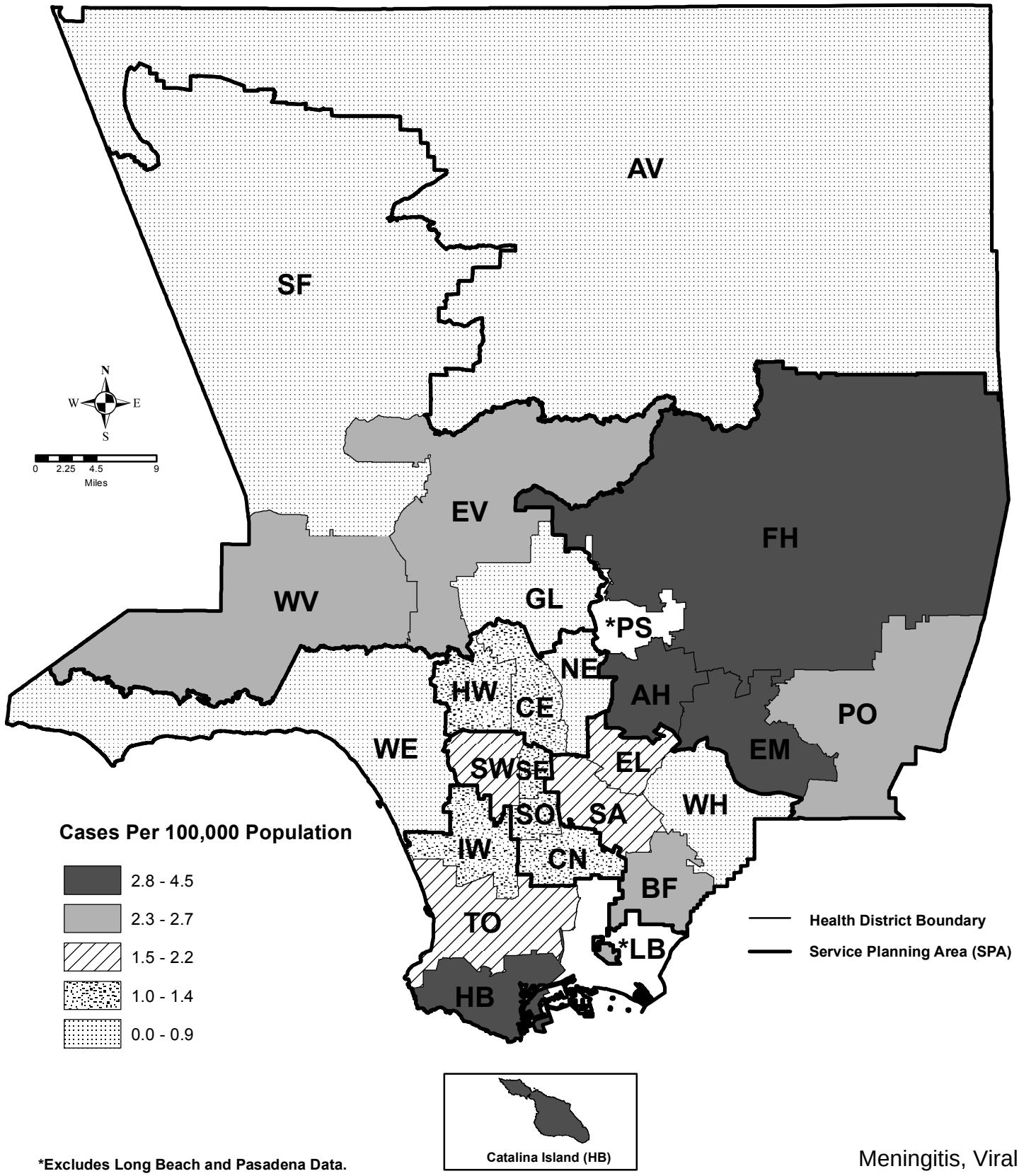


Figure 6. Percent Cases of Viral Meningitis by Etiology, LAC, 2016 (N=103)



Map 10. Meningitis, Viral
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

MENINGOCOCCAL DISEASE

CRUDE DATA	
Number of Cases	20
Annual Incidence[a]	
LA County	0.21
California[b]	0.18
United States[b]	0.11
Age at Diagnosis	
Mean	35
Median	30
Range	13-77 years

[a]Cases per 100,000 population.
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Meningococcal disease (MD) or invasive meningococcal disease (IMD) occurs most often as meningitis, an infection of the cerebrospinal fluid (CSF), or meningococcemia, an infection of the bloodstream. It is transmitted through direct or droplet contact with nose or throat secretions of persons colonized in the upper respiratory tract with *Neisseria meningitidis* bacteria. Common symptoms include sudden onset of fever, headache, nausea, vomiting, stiff neck, petechial rash, and lethargy, which can progress to overwhelming sepsis, shock, and death within hours. Despite effective antibiotic therapy, the mortality rate remains between 10-15%. Long-term sequelae include significant neurologic or orthopedic complications such as deafness or amputation. Meningococcal disease affects all age groups but occurs most often in infants. Of the 13 serogroups, A, B, C, Y, and W-135 are responsible for causing nearly all cases of meningococcal disease.

For the purpose of surveillance, the LAC DPH defines reports of IMD as confirmed when *N. meningitidis* has been isolated from or evidenced by polymerase chain reaction (PCR) analysis in a normally sterile site (e.g., blood or CSF). In the absence of a positive culture, reports are defined as probable if the *N. meningitidis* antigen is detected by immunohistochemistry or latex agglutination. Reports are classified as suspected cases when they present with clinical diagnosis of purpura fulminans or demonstrate gram-negative diplococci by gram staining [**1**].

Both suspected clinical cases of IMD and laboratory findings consistent with IMD are immediately reportable to the public health department. All cases are investigated by public health nurses within the district corresponding to the home of residence. In addition to the standardized case report form, a supplemental form documenting additional risk factors is completed.

A total of four vaccines are available in the US that can prevent meningococcal disease: two protect against serogroups A, C, Y, and W-135, and two protect against serogroup B. Another two quadrivalent conjugate vaccines, MenACWY-D and MenACWY-CRM, are licensed for use in persons 2-55 years old. The quadrivalent polysaccharide meningococcal vaccine (MPSV4), which had been licensed for persons 56 years and older, was discontinued in 2017. Persons in this age group should receive one of the quadrivalent conjugate vaccines. MenACWY-D is also licensed for use in children 9-23 months old. Lastly, two serogroup B vaccines, MenB-FHbp and MenB-4C, were approved for use in persons aged 10 -25 years old [**2**].

Vaccination with meningococcal conjugate vaccine is routinely recommended for all persons 11 through 12 years old with a booster dose at 16 years old and for those at increased risk for meningococcal disease [**3**]. In 2016, Advisory Committee on Immunization Practices (ACIP) recommended routine use of meningococcal vaccine for HIV positive persons two years and older [**4**]. Serogroup B meningococcal

vaccination is recommended in addition to quadivalent conjugate vaccine for people 10 years or older who are at increased risk for meningococcal disease.

Within LAC, DPH recommended meningococcal vaccination for men who have sex with men (MSM) at increased risk for IMD in 2014 due to an increase of IMD among MSM in LAC that occurred from 2012 through 2014. In 2016, this recommendation was expanded to all gay/MSM, regardless of other risk factors including HIV status due to a southern California regional outbreak that began in March 2016 and is ongoing.

Antimicrobial chemoprophylaxis of close contacts of sporadic cases of IMD remains the primary means for prevention of IMD among close contacts. This includes:

a) Household members,
b) Daycare center contacts, and
c) Anyone directly exposed to the patient's oral secretions during the seven days prior to the paient's onset of illness (e.g., through kissing, sharing beverages or cigarettes, mouth-to-mouth resuscitation, 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 >14 days after last date of exposure to the index case-patient is probably of limited or no value. Prophylactic treatment and follow-up of close contacts are routinely handled by the LAC DPH Community Health Services.

2016 TRENDS AND HIGHLIGHTS sssss

- The incidence of IMD in LAC has followed the national incidence for the past decade and continues to decrease from a peak of 0.6 cases per 100,000 in 2001 to 0.2 cases per 100,000 in 2016 (Figure 1).
- There were no cases reported among persons less than five years old in 2016. The highest number of cases (n=6, 55%) occurred among those 15-34 years old (Figure 2). This has been the trend in LAC for the previous five years. In a typical distribution curve depicting incidence by age group for IMD, the peak incidence occurs among infants less than one year old. This trend is maintained nationally. There have been no cases of IMD in children less than one year old in LAC since 2010.
- The monthly onset of disease deviated from the typical seasonal trend where a peak occurs during the winter season. The highest numbers of cases occurred in May and June with four cases each (Figure 4).
- Culture confirmation was obtained for 13 of the 20 cases (65%). The remaining were confirmed by PCR. *N. meningitidis* was detected in seven cases from blood and CSF (35%), seven from CSF only (35%), and six from blood only (30%).
- Only two cases were not serotyped: one due to the specimen being discarded, and the other was non-groupable. The majority of serotyped cases were serogroup C (n=10, 50%), five (25%) were serogroup B, two (10%) were serogroup W-135, and one was serogroup Y (Figure 6). The proportion of serogroup C cases in LAC has been declining since 2013 due to an increase in serogoup B cases. All serogroup C cases were associated with a southern California regional outbreak occurring primarily among MSM that began in March 2016 (see bullet below).
- No fatalities were documented this year. The last fatality due to IMD in LAC occurred in 2014.
- Beginning March 2016, an increase in IMD was detected among MSM in LAC and neighboring jurisdictions in southern California. LAC DPH collaborated with the Centers for Disease Control and Prevention (CDC) and affected local health departments to investigate cases and enhance vaccination uptake among the at-risk MSM community. A supplemental history form was modified to focus on unique risk factors among MSM such as attendance at gay/MSM establishments or events. Cases were defined as outbreak-associated if they were

identified as serogroup C with the outbreak molecular sequence type or without a known sequence type. No direct geographic and social epidemiologic links were found between any outbreak cases. By the end of 2016, there were 27 outbreak-associated cases across southern California, 11 of which were LAC residents (41%). The outbreak is ongoing into 2017.

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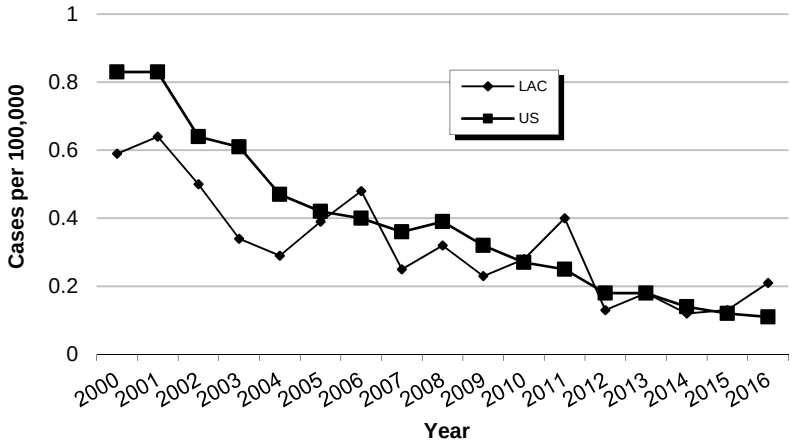
4. Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Report. Recommendations for Use of Meningococcal Conjugate Vaccines in HIV-Infected Persons - Advisory Committee on Immunization Practices, 2016. 2016. 4 Nov 2016, 65 (43): 1189-1194.

Reported Meningococcal Disease Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=12)			2013 (N=17)			2014 (N=11)			2015 (N=12)			2016 (N=20)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	0	-	-	1	5.9	0.1	0	-	-	0	-	-	1	5.0	0.1
15-34	4	33.3	0.1	7	41.2	0.2	6	54.5	0.2	4	33.3	0.1	11	55.0	0.4
35-44	0	-	-	3	17.6	0.2	1	9.1	0.1	1	8.3	0.1	4	20.0	0.3
45-54	2	16.7	0.2	2	11.8	0.2	3	27.3	0.2	3	25.0	0.2	1	5.0	0.1
55-64	2	16.7	0.2	1	5.9	0.1	1	9.1	0.1	1	8.3	0.1	0	-	-
65+	4	33.3	0.4	3	17.6	0.3	0	-	-	3	25.0	0.3	3	15.0	0.2
Unknown	0	-	-	0	-	-	0	-	-	0	-	-			
Race/Ethnicity															
Asian	2	16.7	0.2	0	-	-	2	18.2	0.1	0	-	-	1	5.0	0.1
Black	2	16.7	0.3	4	23.5	0.5	2	18.2	0.3	2	16.7	0.3	3	15.0	0.4
Hispanic	5	41.7	0.1	6	35.3	0.1	6	54.5	0.1	6	50.0	0.1	9	45.0	0.2
White	3	25.0	0.1	6	35.3	0.2	1	9.1	-	4	33.3	0.1	7	35.0	0.3
Other	0	-	-	1	5.9	-	0	-	-	0	-	-	0	-	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
SPA															
1	0	-	-	0	-	-	0	-	-	1	8.3	0.3	0	-	-
2	2	16.7	0.1	5	29.4	0.2	3	27.3	0.1	4	33.3	0.2	2	10.0	0.1
3	0	-	-	1	5.9	0.1	1	9.1	0.1	0	-	-	3	15.0	0.2
4	5	41.7	0.4	4	23.5	0.4	6	54.5	0.5	3	25.0	0.3	6	30.0	0.5
5	2	16.7	0.3	2	11.8	0.3	0	-	-	1	8.3	0.2	4	20.0	0.6
6	3	25.0	0.3	1	5.9	0.1	0	-	-	2	16.7	0.2	0	-	-
7	0	-	-	3	17.6	0.2	0	-	-	1	8.3	0.1	3	15.0	0.2
8	0	-	-	1	5.9	0.1	1	9.1	0.1	0	-	-	2	10.0	0.2
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	-	-	-

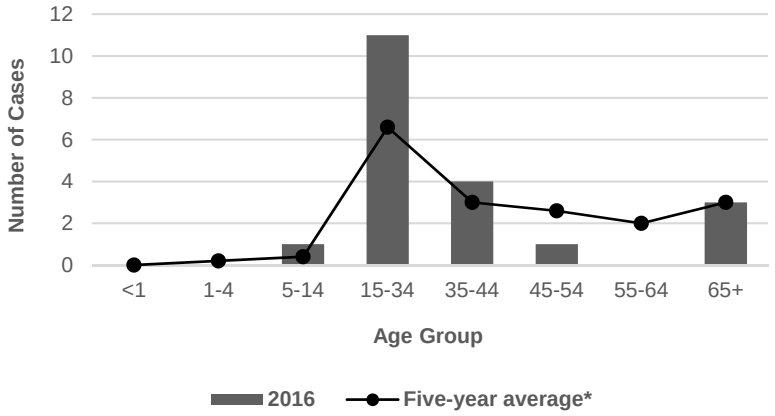
*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates* of Meningococcal Disease LAC and US, 2000-2016



*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 2. Meningococcal Disease Cases by Age Group, LAC, 2016 (N=20)



*2011-2015

Figure 3. Meningococcal Disease Cases by Race/Ethnicity, LAC, 2012-2016

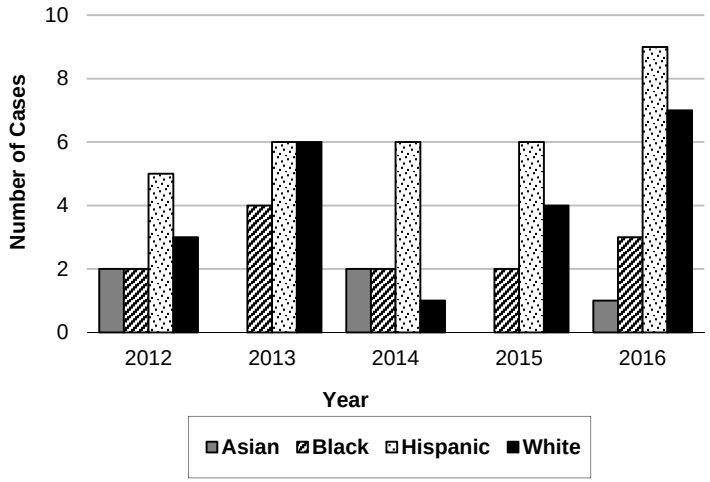
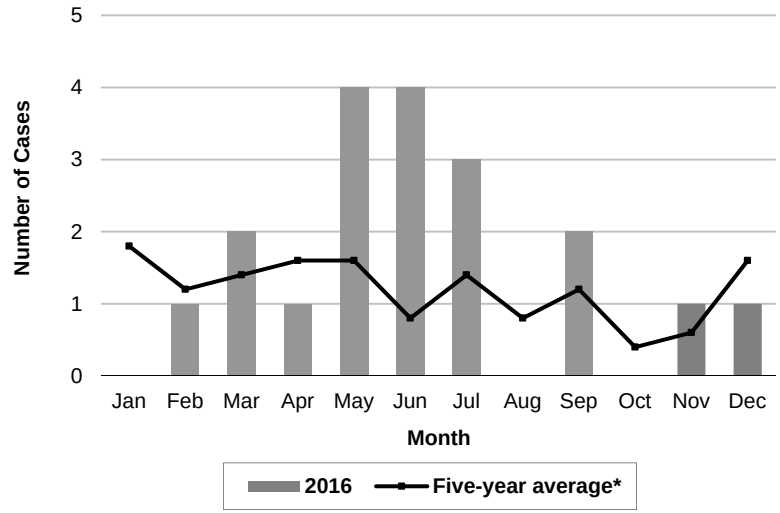


Figure 4. Reported Meningococcal Disease Cases by Month of Onset, LAC, 2016 (N=20)



*2011-2015

**Figure 5. Meningococcal Disease Cases by SPA
LAC, 2012-2016**

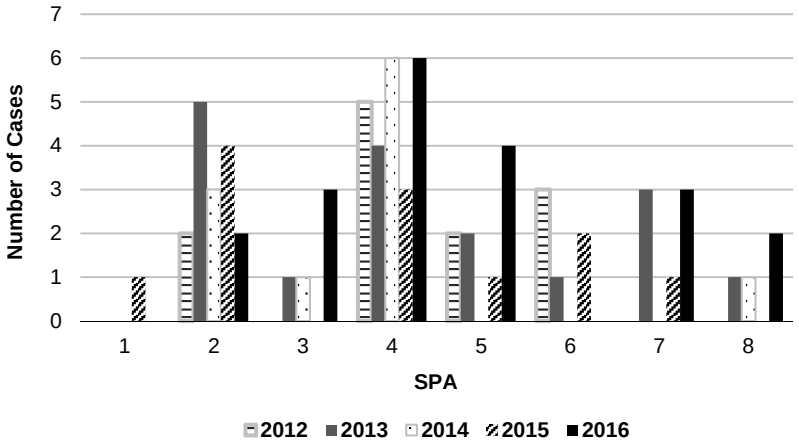
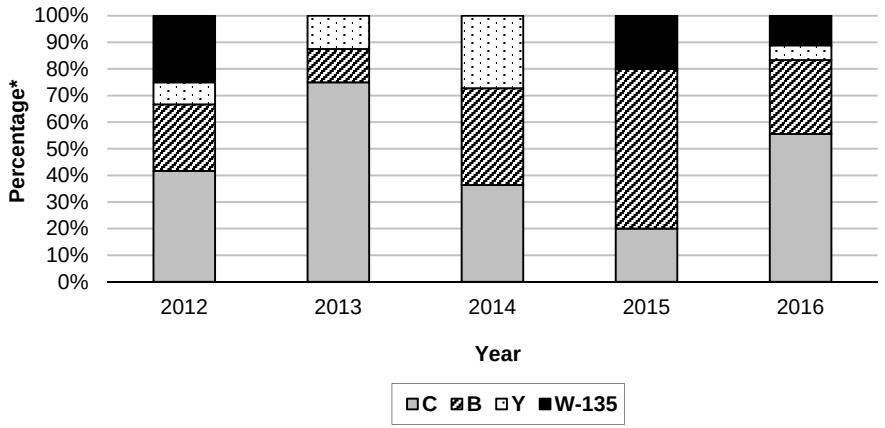


**Figure 6. Meningococcal Disease by Serogroup
LAC, 2012–2016**



*Among cases with known serogroup.

MOSQUITO-BORNE DISEASES OF TRAVELERS

CRUDE DATA				
Disease	Dengue	Chikungunya	Zika	Malaria
Number of Cases	46	8	101	24
Annual Incidence[a]				
LA County	N/A	N/A	N/A	N/A
California	N/A	N/A	N/A	N/A
United States	N/A	N/A	N/A	N/A
Age at Diagnosis				
Mean	40.2	37.6	36.9	41
Median	23	34.5	35	36
Range	4-–79 years	15–70 years	9-66 years	10–76 years

[a]Not applicable as there is no local transmission.

DESCRIPTION

Several mosquito-borne diseases affect LAC residents who travel abroad. Dengue, chikungunya, and Zika, which are mainly transmitted by *Aedes aegypti* and *A. albopictus* mosquitoes, and malaria, which is transmitted by *Anopheles* mosquitoes. These diseases are typically found in the tropical and subtropical areas of the world. The mosquito vectors for all four diseases have been found in LAC; however, these diseases are not currently found in mosquitoes in LAC.

The best methods to prevent infection from mosquito-borne diseases is to eliminate mosquito breeding sources and avoid mosquito bites. People visiting or residing in regions where there is risk of mosquito-borne disease should take precautions by using mosquito repellants and wearing protective clothing. Travelers to countries where malaria is endemic should additionally take precautions by taking the appropriate antimalarial prophylaxis as prescribed and utilizing bed nets. Unlike malaria, there is no prophylactic medicine or vaccine available to prevent dengue, chikungunya, or Zika.

Dengue

Dengue, a flavivirus related to the West Nile virus (WNV) and Zika virus, is the most common vector-borne viral disease in the world. Infection with dengue virus has a range of clinical presentations from asymptomatic infection to severe systemic febrile illness. Treatment is supportive.

No cases of dengue acquired within the continental US were reported between 1946 and 1980. Since 1980, locally-acquired outbreaks have been documented in Texas, Florida, and most recently in Hawaii in 2015. Concern for the reemergence of dengue in Florida, Texas, and Hawaii as well as increases in dengue among returning US travelers over the past 20 years has prompted heightened vigilance among the medical and public health communities.

Dengue was added to the list of Nationally Notifiable Infectious Conditions in 2009, although it has been a notifiable condition in California and LAC for several decades. Confirmation of dengue requires that a clinically compatible case be laboratory confirmed with testing of paired

serological specimens or molecular testing. Probable cases require only a single serologically positive specimen. Suspect cases are epidemiologically linked without laboratory evidence.

Chikungunya

The symptoms of chikungunya are similar to those of dengue and Zika, and the most common symptoms are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, or rash. Treatment is supportive.

Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, chikungunya virus was found for the first time in the Americas on islands in the Caribbean. On July 16, 2014, the first locally acquired cases in the continental US was identified in Florida.

For purposes of surveillance, confirmation of chikungunya requires that a clinically compatible case be laboratory confirmed with testing of paired serological specimens or molecular testing. Probable cases require only a single serologically positive specimen.

Zika

Unlike dengue and chikungunya viruses, infected persons can also spread Zika to their sexual partners. However, this method of transmission is much less likely than transmission due to mosquito bites. In addition, Zika can be passed from a pregnant woman to her fetus. Infection during pregnancy can cause microcephaly and other adverse pregnancy and birth outcomes.

Most persons infected with Zika are asymptomatic. Only 20% of infected persons experience symptoms. The most common symptoms of Zika virus disease are fever, diffuse macular papular rash, joint pain, and conjunctivitis. Other symptoms include muscle pain, headache, pain behind the eyes, and vomiting. The illness is usually mild with symptoms lasting from several days to a week. Severe disease requiring hospitalization is uncommon. Increased reports of Guillain-Barré syndrome, a rare post-infectious central nervous system condition, has been linked to previous infection with Zika. Deaths from Zika are rare.

Zika virus was first discovered in 1947 with the first human cases detected in 1952. Since then, outbreaks of Zika have been reported in tropical Africa, Southeast Asia, and the Pacific Islands. In 2014, an outbreak of Zika virus occurred in Brazil and rapidly spread to neighboring countries. The first LAC resident became ill with this virus after returning from El Salvador in late 2015. In 2016, local transmission of Zika virus was reported in Miami, Florida and Brownsville, Texas.

During 2016, confirmed cases were those with clinically compatible illness, epidemiological risk factors, and either a positive RT-PCR (reverse transcriptase polymerase chain reaction) urine or plasma specimen indicating Zika infection or a single positive serological specimen confirmed by a plaque reduction neutralization test (PRNT). Probable cases did not have a confirmatory PRNT and may show infection with Zika and other flaviviruses such as dengue or chikungunya.

Malaria

Human malaria is a febrile illness caused by infection with one or more species of the protozoan parasite *Plasmodium* (usually *P. vivax*, *P. falciparum, P. malariae,* or *P. ovale*). Recently *P. knowlesi*, a parasite of Asian macaques, has been documented as a cause of human infections, including some deaths, in Southeast Asia. The first case in a US traveler was identified in 2008. An additional species similar to *P. ovale*, yet to be named, has also been recently discovered as a human pathogen.

Malaria is characterized by episodes of chills and fever every two to three days. *P. falciparum* 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.

For the purpose of surveillance, confirmation of malaria requires the demonstration of parasites in thick or thin blood smears, the detection of *Plasmodium* sp. by a polymerase chain reaction (PCR) test, or detection of malaria antibodies using rapid diagnostic test (RDT), regardless of whether the person experienced previous episodes of malaria.

Before the 1950s, malaria was endemic in the southeastern US. Now, it is usually acquired outside the continental US through travel and immigration. Although there is no recent documentation of malaria being transmitted locally, a particular mosquito *A. hermsi* exists in southern California in rare numbers and is capable of transmitting the parasite.

2016 TRENDS AND HIGHLIGHTS

Dengue

- In 2016, the number of dengue cases increased slightly compared to 2015 (46 vs. 30, respectively) (Figure 1) and comprised of 12 confirmed and 34 probable cases. The proportion of confirmed cases has increased to 26% from 20% in 2015. Prior to 2015, only one to two cases were confirmed per year. The increase in confirmed cases can be attributed to the increase in laboratory evaluation for arboviral diseases due to the emergence of chikungunya and Zika in the Americas in 2014 and 2015, respectively. Because dengue is clinically and epidemiologically similar to both chikungunya and Zika, it is recommended that diagnostic tests for all three arbovirals be conducted together. All local cases identified in 2016 reported recent travel to regions endemic for dengue (Table 1). The most frequent travel destinations were Mexico and the Philippines (n=7, 15% each).

Chikungunya

- The number of chikungunya cases substantially decreased from 107 in 2015 to 8 in 2016. Prior to 2014, the last reported case of chikungunya occurred in 2007 in an LAC resident who was a traveler to India. A large outbreak on the Asian subcontinent was occurring during that time.
  All cases in 2016 reported travel to Central America or Mexico (Table 1). A total of seven of the eight cases reported travel to Mexico (88%). The remaining case traveled to Guatemala. Similarly, in 2015, most cases reported recent travel to Central America (56%) and Mexico (38%). In 2014, none had reported travel to Mexico.

Zika

- Cases were ether detected with Zika RNA (52%) or Zika acute phase antibodies (48%). Cases were primarily female (76%), Latino (74%), average age of 36.9 years (range: 9-66 years), and residing throughout the county. None were hospitalized. The annual disease rate was 1.1 per 100,000, was highest among Latinos (12.1 per 100,000) and Whites (5.6 per 100,000), and was higher in females than in males (1.6 vs. 0.6 per 100,000). All cases traveled to a Zika endemic region prior to their illness (Central America 50%, Mexico 27%). No instances of transmission of Zika virus, either by vector or sexual, were identified. A total of eleven infants were born to a Zika case. All had a negative Zika virus test result. Only one infant was diagnosed with microcephaly at birth; however, this infant's head size and development appear normal at six months of age. Although the *Aedes* mosquito was present in LAC in 2016, along with Zika cases, these results suggest that the impact of Zika virus on the LAC population has been minimal. Additional details on LAC Zika cases occurring in 2016 can be found in the ACDC Special Studies: Zika Virus Surveillance in Los Angeles County, 2016.

Malaria

- The number of reported malaria cases has been declining in LAC since it peaked in 2003 with 60 cases. A similar number of cases occurred in 2016 (n=24) compared with 2015 (n=27). The number of cases has remained relatively similar over the last decade (Figure 2).

- All cases had a known history of recent travel to a country where malaria is endemic (Table 1). Aside from three cases reporting travel to Asia, all cases reported recent travel to countries in Africa (n=21, 88%). Half of the malaria cases (n=12, 50%) were due to *P. falciparum*. All *P. falciparum* malaria cases reported travel to Africa.
- Among the cases who were not recent immigrants (n=16), four (25%) used a CDC recommended prophylaxis during their travels (Figure 3). All reported completing their regimen. Only one case reported completing a regimen of wormwood, a Chinese herbal medicine, as prophylaxis. Although prophylactic drugs are derivatives of the wormwood plant, the CDC recommends only the following: atovaquone/proguanil, chloroquine, doxycycline, mefloquine, or primaquine.

Summary

- Mosquito-borne disease infection of travelers can affect persons of all ages. The mean ages ranged from 36.9 to 41 years in 2016. For all diseases, the largest proportion of cases fell within the 15-34 year olds (Figure 4). Due to heightened concern for women of child-bearing age to be diagnosed and reported to public health, Zika infection in particular, was overwhelmingly reported in this age group with 37% of its cases among 15-34 year olds. Zika cases were primarily female (74%) for this reason.
- Mosquito-borne diseases affected mainly individuals of Hispanic/Latino and Black race/ethnicity. This trend is likely due to current disease transmission rates at travel destinations and the frequency of travel of these two groups to countries from which they or their families originate. Both chikungunya and Zika affected primarily Hispanic/Latino at 75% and 74%, respectively (Figure 5), and infected persons traveled mainly to Mexico and Central America (Table 1). Most malaria cases were Black and reported travel to Africa (Table 1). Malaria has higher levels of endemicity in Africa compared to other regions where it is found.
- Both dengue and malaria cases occurred throughout the year with small increases in late summer and in winter (Figure 6). No cases of chikungunya were documented throughout the summer. Zika cases also occurred throughout the year and peaked in July and August (54% of cases).
- Local infestations of *A. aegypti* have been documented in LAC since 2014 and *A. albopictus* since 2011 in a number of cities throughout LAC. With the vectors of dengue, chikungunya, and Zika present in the county, there is heightened concern and vigilance for possible local transmission of these diseases. Consequently, LAC DPH has enhanced collaboration with vector control districts in the county. Cases of Zika, dengue, and chikungunya are shared with vector control agencies in order to enhance surveillance of *Aedes* sp. mosquitos and to encourage local clean-up efforts by residents.

Figure 1. Number of Dengue Cases LAC, 2011-2016

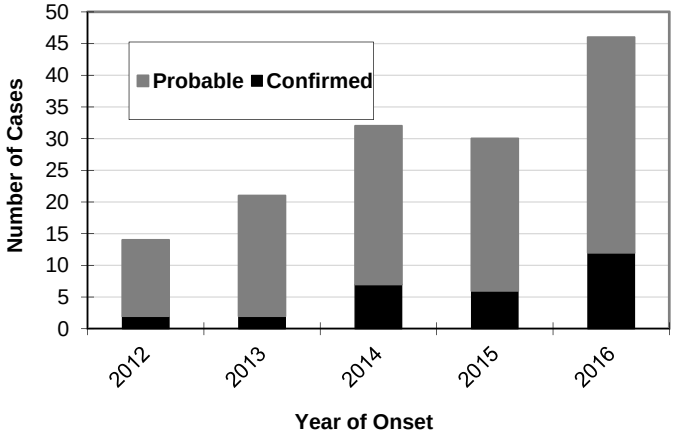


Figure 2. Number of Malaria Cases LAC and US, 2000-2016

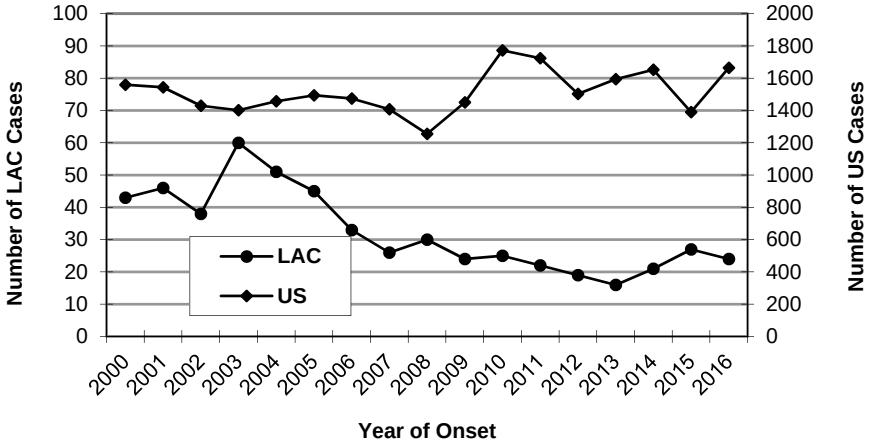
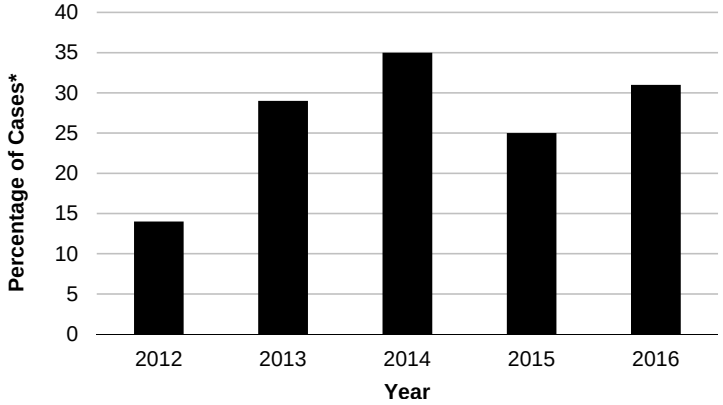


Table 1. Regions of Travel Reported by Cases of Mosquito-Borne Diseases of Travelers, LAC 2016

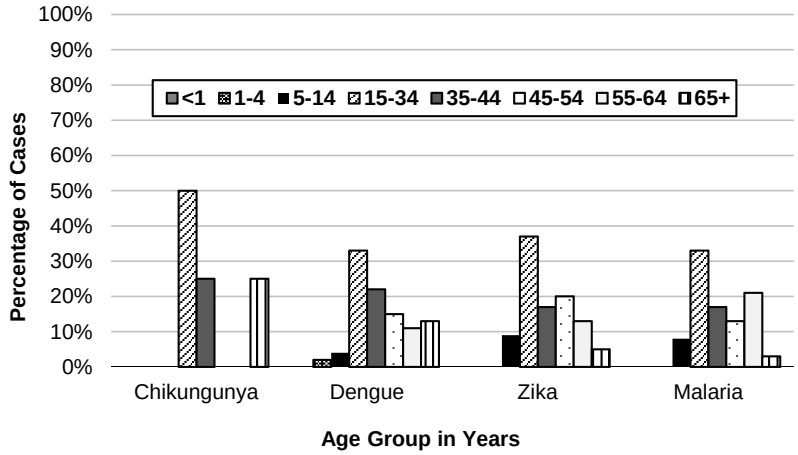
Region	Dengue (N=46)	Chikungunya (N=8)	Zika (N=101)	Malaria (N=24)
Africa	0	0	0	21
Asia and Pacific Islands	21	0	0	3
Central America and Mexico	18	8	87	0
South America	2	0	0	0
Caribbean	5	0	14	0

**Figure 3. Prophylaxis Use Among Malaria Cases*
LAC, 2012-2016**



*Among cases who were not recent refugees/immigrants to the US.

**Figure 4. Mosquito-Borne Diseases of Travelers, by Age Group
LAC, 2016**



*Excludes Other and unknown.

**Figure 5. Mosquito-Borne Diseases of Travelers, by Race/Ethnicity*
LAC, 2016**

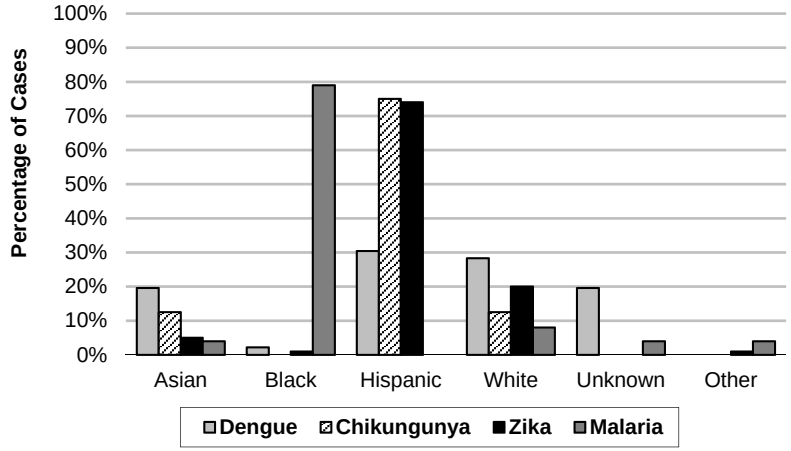
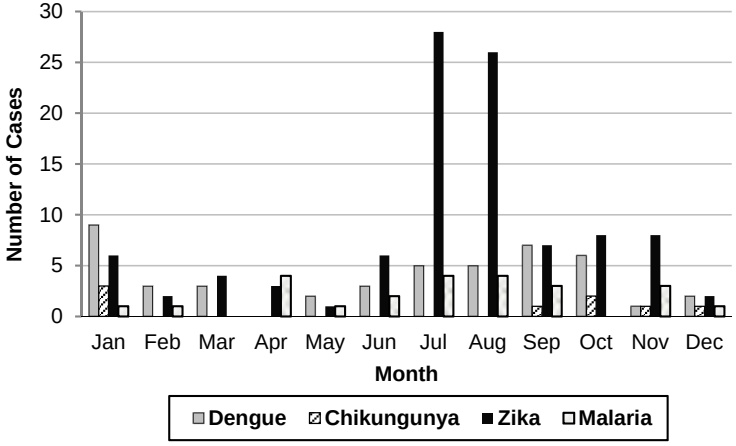


**Figure 6. Mosquito-Bornes Diseases of Travelers, by Month of Onset
LAC, 2016**



SALMONELLOSIS

CRUDE DATA	
Number of Cases	1,045
Annual Incidence[a]	
LA County	10.89
California[b]	11.28
United States[b]	14.74
Age at Diagnosis	
Mean	35
Median	32
Range	0–101 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Salmonellosis is caused by the gram-negative bacillus *Salmonella enterica*, and more than 2,500 serotypes exist. This disease is transmitted by the fecal-oral route, from animals or humans, and 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 and longer and variable for other manifestations. Communicability lasts as long as organisms are excreted, usually 2-5 weeks, but may last from months to years. Healthy people are susceptible, but persons especially at risk are those who are on antacid therapy, who have recently taken or are taking broad-spectrum antibiotic therapy or immunosuppressive therapy, or 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. LAC DPH's review of investigation reports indicates that many cases engaged in high-risk food handling behaviors such as consuming raw or undercooked meats, using raw eggs, not washing hands and/or cutting boards after handling raw poultry or meat, and having contact with reptiles. Travel is also a risk factor for salmonellosis. LAC cases report domestic, national, and international travel.

2016 TRENDS AND HIGHLIGHTS

- Three LAC salmonellosis outbreaks were investigated by ACDC in 2016; two were foodborne outbreaks, and one was a healthcare facility outbreak. For more information, see the Foodborne Illness Outbreaks and the Healthcare-Associated Outbreaks General Acute Care Hospital summaries in this ACDC Annual Morbidity Report 2016.
- By age group, the highest incidence rate (68.4 cases per 100,000) was seen in those who were less than one year old (Figure 2).
- In 2016 and in prior years, the highest incidence rates by race/ethnicity occurred among Whites and Hispanics (Figure 3).
- Incidence rates by SPA ranged from 8.0 in SPA 6 to 16.4 in SPA 5 (Figure 4).
- Travel was reported by 21.7% of the cases. Approximately half of the cases (51.9%) traveled to Mexico or countries other than Mexico (23.8%).
- Reptile-associated salmonellosis accounted for 5.3% of cases in 2016. Among these cases, 60.7% were related to turtle exposures, and 33.9% were related to lizard exposures. In addition, seven LAC residents were part of a national outbreak related to reptile-associated salmonellosis exposures.
- Nearly one-fourth (24.0%) of cases were hospitalized for two or more days.

- There were nine deaths in persons diagnosed with salmonellosis. Ages ranged from 28-96 years with a mean of 67 and median of 65 years. All nine cases had comorbidities.

Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=1,041)			2013 (N=1,010)			2014 (N=1,141)			2015 (N=1,144)			2016 (N=1,045)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	73	7.0	61.4	59	5.8	48.8	62	5.4	52.4	60	5.2	55.5	71	6.7	68.4
1-4	153	14.7	32.2	141	14.0	29.0	162	14.2	33.2	116	10.1	23.9	106	10.1	22.6
5-14	158	15.2	13.2	185	18.3	15.3	181	15.9	15.0	148	12.9	12.2	133	12.7	11.0
15-34	224	21.5	8.1	227	22.5	8.0	248	21.7	8.8	297	26.0	10.5	248	23.7	8.8
35-44	95	9.1	7.2	89	8.8	6.7	110	9.6	8.3	123	10.8	9.3	94	9.0	7.1
45-54	108	10.4	8.4	82	8.1	6.3	111	9.7	8.5	124	10.8	9.4	97	9.3	7.3
55-64	88	8.5	8.6	84	8.3	8.2	99	8.7	9.3	105	9.2	9.5	125	11.9	11.0
65+	142	13.6	12.8	143	14.2	12.9	168	14.7	14.8	171	14.9	14.3	171	16.3	13.9
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	92	8.8	7.0	73	7.2	5.3	140	12.3	10.2	102	8.9	7.3	104	9.9	7.5
Black	56	5.4	7.2	69	6.8	8.9	67	5.9	8.5	68	5.9	8.7	58	5.5	7.4
Hispanic	503	48.3	11.1	538	53.3	11.7	575	50.4	12.5	589	51.5	12.6	512	49.0	10.8
White	247	23.7	9.3	318	31.5	12.0	344	30.1	12.9	383	33.5	14.3	370	35.4	13.9
Other	11	1.1	-	5	0.5	-	10	0.9	-	2	0.2	-	0	-	-
Unknown	132	12.7	-	7	0.7	-	5	0.4	-	0	-	-	1	-	-
SPA															
1	38	3.7	9.8	40	4.0	10.2	29	2.5	7.4	35	3.1	8.8	39	3.7	9.9
2	228	21.9	10.6	262	25.9	12.1	238	20.9	10.9	264	23.1	11.8	285	27.3	12.7
3	164	15.8	10.1	155	15.3	9.5	235	20.6	14.3	196	17.1	11.8	172	16.4	10.5
4	162	15.6	14.4	106	10.5	9.3	130	11.4	11.3	131	11.5	11.2	114	10.9	9.6
5	71	6.8	11.1	74	7.3	11.4	62	5.4	9.5	114	10.0	17.3	109	10.4	16.4
6	109	10.5	10.7	109	10.8	10.6	142	12.4	13.7	127	11.1	12.1	86	8.2	8.0
7	145	13.9	11.2	155	15.3	11.8	176	15.4	13.4	162	14.2	12.2	138	13.2	10.5
8	123	11.8	11.5	109	10.8	10.1	129	11.3	11.9	115	10.1	10.5	102	9.7	9.3
Unknown	1	0.1	-	0	-	-	0	-	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Reported Salmonellosis Rates by Year
LAC, CA, and US, 2006-2016**

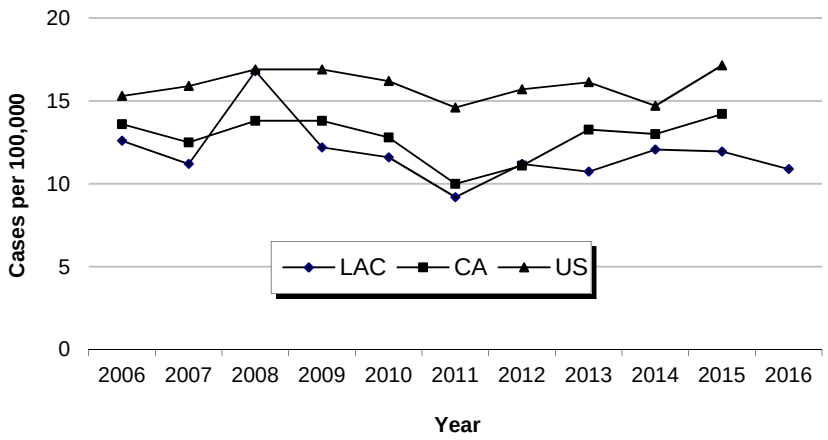


**Figure 2. Reported Salmonellosis Rates by Age Group
LAC, 2016 (N=1045)**

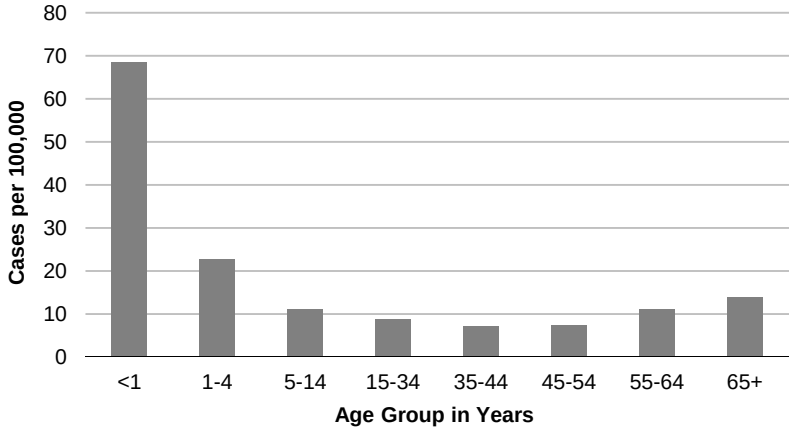
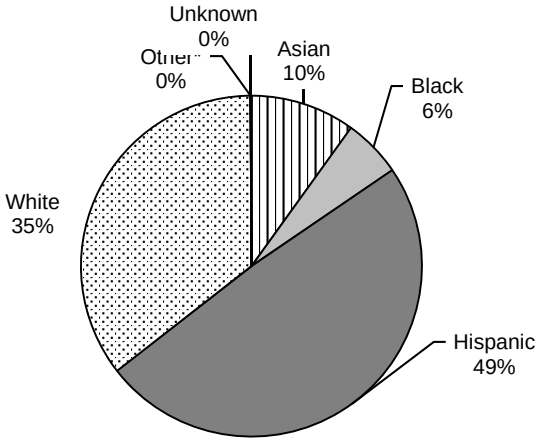


**Figure 3. Reported Salmonellosis by Race/Ethnicity
LAC, 2016 (N=1045)**



*Other includes Native American and any additional racial/ethnic group that cannot be categorized as Asian, Black, Hispanic, or White.

**Figure 4. Reported Salmonellosis Rates by SPA
LAC, 2016 (N=1045)**

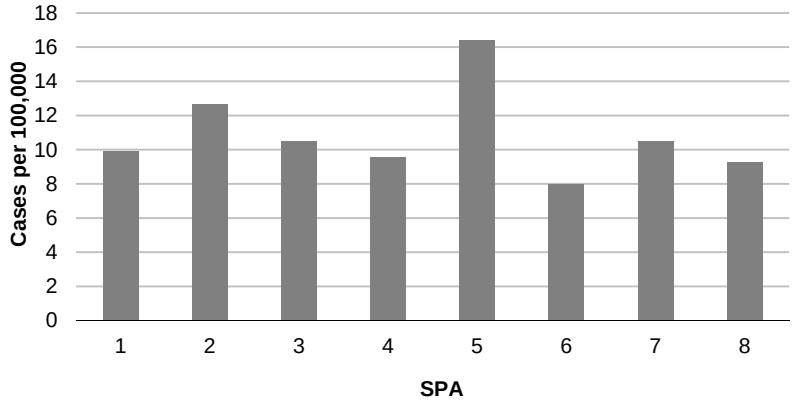
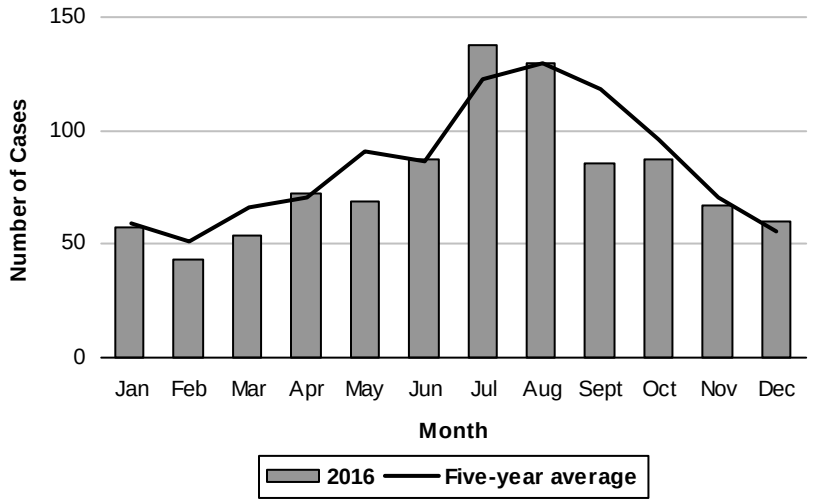
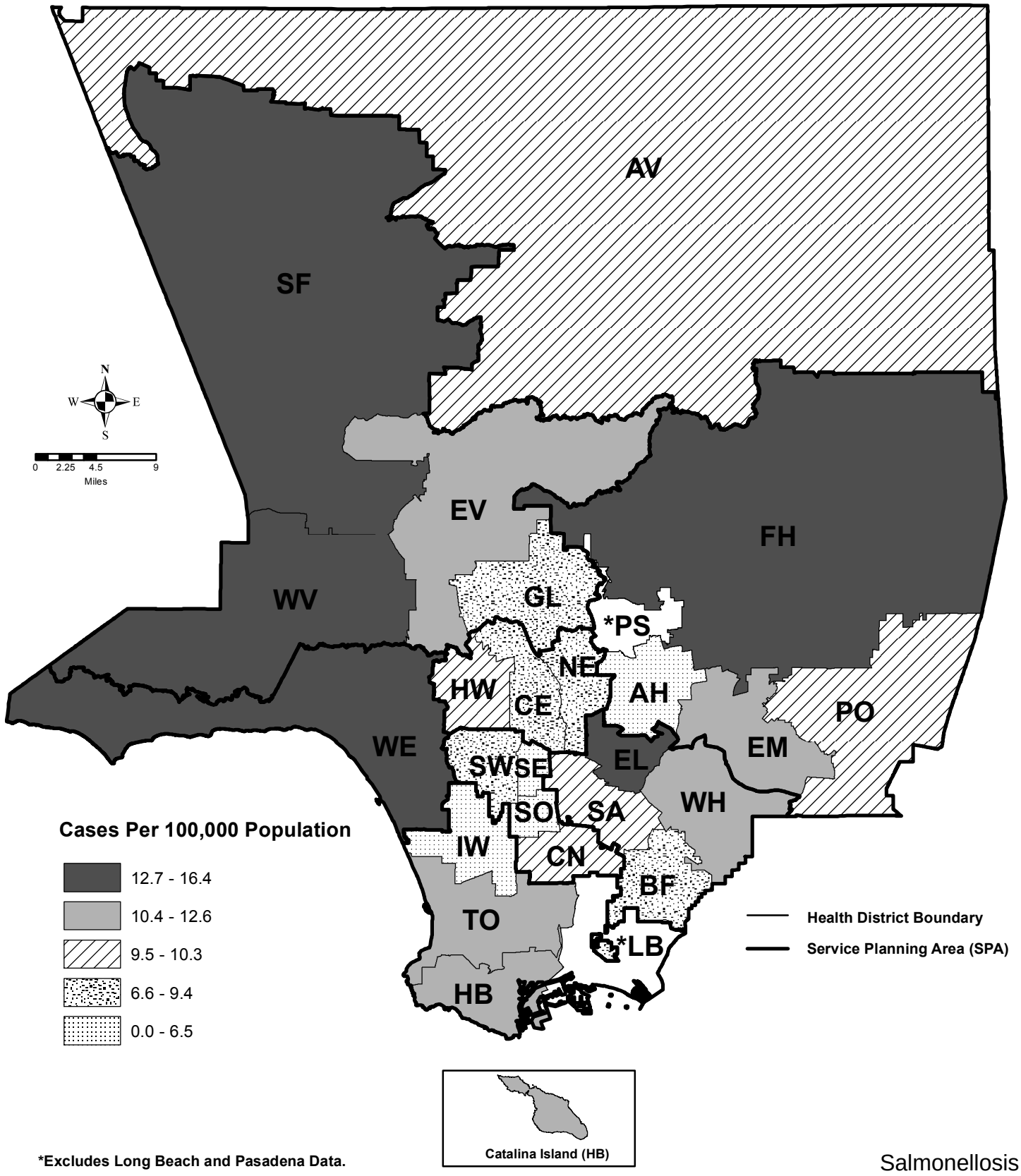


Figure 5. Reported Salmonellosis Cases by Month of Onset
LAC, 2016 (N=1045)



Map 11. Salmonellosis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

SHIGELLOSIS

CRUDE DATA	
Number of Cases	584
Annual Incidence[a]	
LA County	6.08
California[b]	4.92
United States[b]	5.78
Age at Diagnosis	
Mean	37
Median	35
Range	0–94 years

[a]Cases per 100,000 population
[b]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

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). The incubation period is 1-3 days. Humans are the definitive host. Fecal-oral transmission occurs when individuals fail to thoroughly wash their hands after defecation and then spread infective particles to others. This occurs either directly by physical contact including sexual behaviors or indirectly by contaminated food. Infection may occur with ingestion of as few as ten organisms. Common symptoms include diarrhea, fever, nausea, vomiting, and tenesmus. Stool may contain blood or mucous. Elderly, immunocompromised, and malnourished people are more susceptible to severe outcomes from infection.

Hand washing is vital in preventing this disease. Children or anyone with uncertain hygiene practices should be monitored to promote compliance. Hand washing is especially important when in crowded areas. Children with diarrhea, especially those in diapers, should not be allowed to swim or wade in public swimming areas. In LAC, cases and symptomatic contacts in sensitive situations or occupations (e.g., food handlers, daycare and healthcare workers) are removed from work or the situation until their stool specimen cultures are negative when tested by the LAC PHL.

2016 TRENDS AND HIGHLIGHTS

- The incidence of shigellosis cases in LAC increased from 5.3 cases per 100,000 in 2015 to 6.1 cases per 100,000 in 2016 (Figure 1). After a five-year period of relatively stable rates, from 2014 to 2016 there has been a trend of increasing shigellosis incidence.
- The highest incidence rate by age was observed in 45-54 year olds (8.1 per 100,000) followed by 15-34 year olds (6.9 per 100,000) and then 1-4 year olds (6.8 per 100,000) (Figure 2). Historically, 1-4 year olds have consistently had the highest incidence rate.
- In 2016, White cases had the highest incidence rate of all race/ethnicity groups (9.8 per 100,000) (Figure 6) followed by Blacks (9.3 per 100,000), with a lower rate in Hispanics (4.8 per 100,000). In prior years, rates were similar among Whites and Hispanics. Overall, all groups have had an increase in rates during 2016.
- SPA 4 sustained the highest rate (19.4 per 100,000) followed by SPA 5 (10.4 per 100,000) and then SPA 6 (5.3 per 100,000) (Figure 4). The increase in SPA 4 and 5 can be attributed to a large community outbreak of shigellosis among MSM.
- In 2016, the percentage of shigellosis cases hospitalized for at least two days was consistent with previous years (n=126, 22%). The number of cases among men who have sex with men (MSM) was 170 in 2016, and the proportion increased to 32% compared to 18% in 2015 and 24% in 2014. There was one death reported in a person with multiple comorbidities.

- There were no shigellosis-associated outbreaks investigated in 2016 by the LAC DPH Community Health Services.
- An outbreak of *Shigella flexneri* serotype 7 with multiple drug resistance among MSM began in March 2016 has continued into 2018 (to be summarized in a future report).

Reported Shigellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=306)			2013 (N=227)			2014 (N=350)			2015 (N=508)			2016 (N=584)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	4	1.3	3.4	1	0.4	0.8	2	0.6	1.7	0	-	-	2	0.3	1.9
1-4	32	10.5	6.7	26	11.5	5.3	30	8.6	6.1	38	7.5	7.8	32	5.4	6.8
5-14	54	17.6	4.5	49	21.6	4.1	51	14.6	4.2	52	10.2	4.3	54	9.3	4.5
15-34	68	22.2	2.5	55	24.2	1.9	85	24.3	3.0	178	35.0	6.3	195	33.4	6.9
35-44	39	12.7	2.9	31	13.7	2.3	64	18.3	4.8	84	16.5	6.3	85	14.6	6.4
45-54	31	10.1	2.4	30	13.2	2.3	57	16.3	4.4	80	15.7	6.1	107	18.3	8.1
55-64	25	8.2	2.5	19	8.4	1.9	30	8.6	2.8	36	7.1	3.3	62	10.6	5.5
65+	52	17.0	4.7	15	6.6	1.4	31	8.9	2.7	40	7.9	3.4	47	8.1	3.8
Unknown	1	0.3	-	1	0.4	-	0	-	-	0	-	-	0	-	-
Race/Ethnicity															
Asian	2	0.7	0.2	5	2.2	0.4	17	4.9	1.2	17	3.3	1.2	22	3.8	1.6
Black	29	9.5	3.7	25	11.0	3.2	19	5.4	2.4	60	11.8	7.6	73	12.5	9.3
Hispanic	153	50.0	3.4	107	47.1	2.3	167	47.7	3.6	213	41.9	4.5	227	38.9	4.8
White	104	34.0	3.9	82	36.1	3.1	132	37.7	5.0	215	42.3	8.0	261	44.7	9.8
Other	0	-	-	2	0.9	-	1	0.3	-	3	0.6	-	1	0.2	-
Unknown	18	5.9	-	6	2.6	-	14	4.0	-	0	-	-	0	-	-
SPA															
1	3	1.0	0.8	4	1.8	1.0	5	1.4	1.3	4	0.8	1.0	10	1.7	2.5
2	52	17.0	2.4	39	17.2	1.8	59	16.9	2.7	74	14.6	3.3	89	15.2	4.0
3	26	8.5	1.6	16	7.0	1.0	29	8.3	1.8	33	6.5	2.0	27	4.6	1.6
4	85	27.8	7.6	58	25.6	5.1	108	30.9	9.4	164	32.3	14.0	230	39.4	19.4
5	48	15.7	7.5	18	7.9	2.8	25	7.1	3.8	78	15.4	11.8	69	11.8	10.4
6	37	12.1	3.6	44	19.4	4.3	40	11.4	3.9	56	11.0	5.3	57	9.8	5.3
7	33	10.8	2.5	33	14.5	2.5	43	12.3	3.3	55	10.8	4.2	59	10.1	4.5
8	22	7.2	2.1	15	6.6	1.4	41	11.7	3.8	43	8.5	3.9	43	7.4	3.9
Unknown	0	-	-	0	-	-	0	-	-	1	0.2	-	-	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Reported Shigellosis Rates by Year
LAC, CA, and US, 2007-2016**

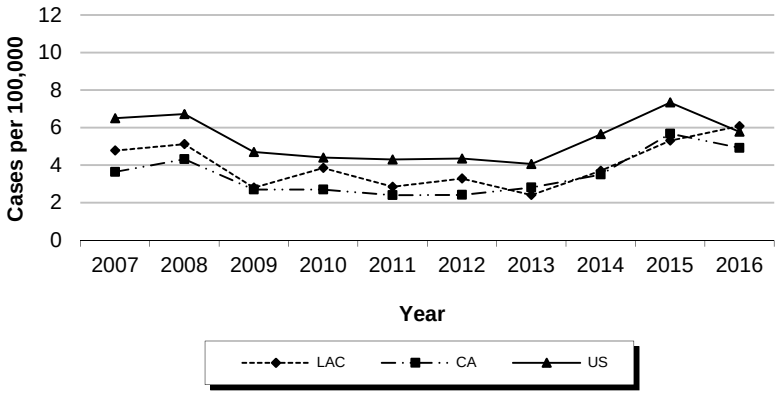


**Figure 2. Reported Shigellosis Rates by Age Group
LAC, 2016 (N=584)**

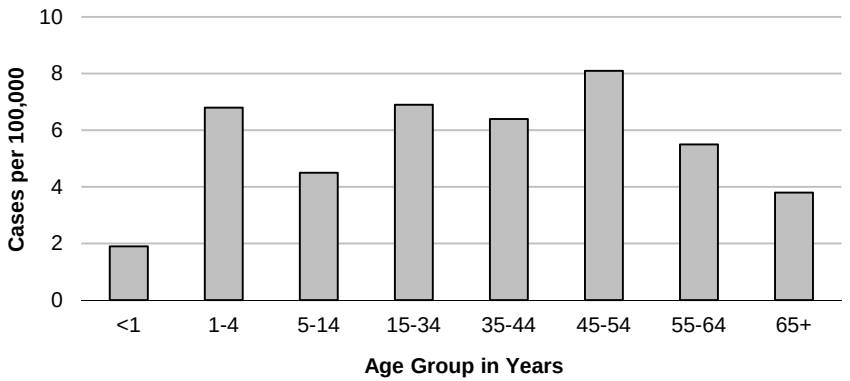


**Figure 3. Percent Cases of Shigellosis by Race/Ethnicity
LAC, 2016 (N=584)**

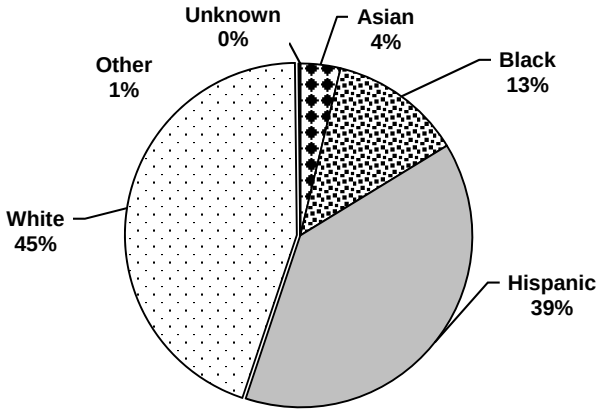


**Figure 4. Reported Shigellosis Rates by SPA
LAC, 2016 (N=584)**

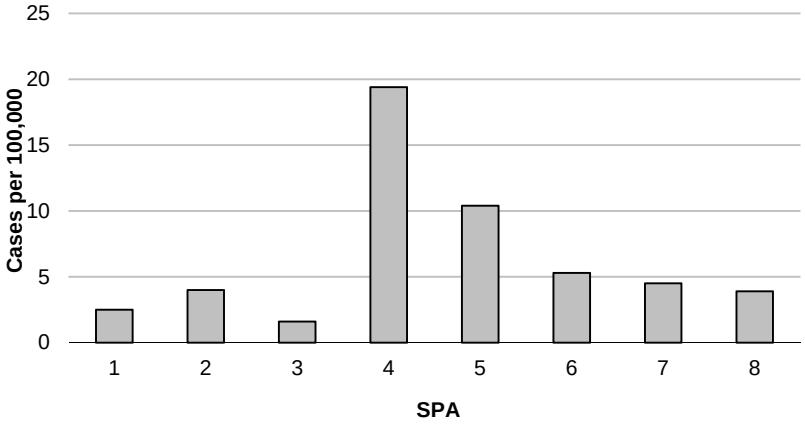


**Figure 5. Reported Shigellosis Cases by Month of Onset
LAC, 2016 (N=584)**

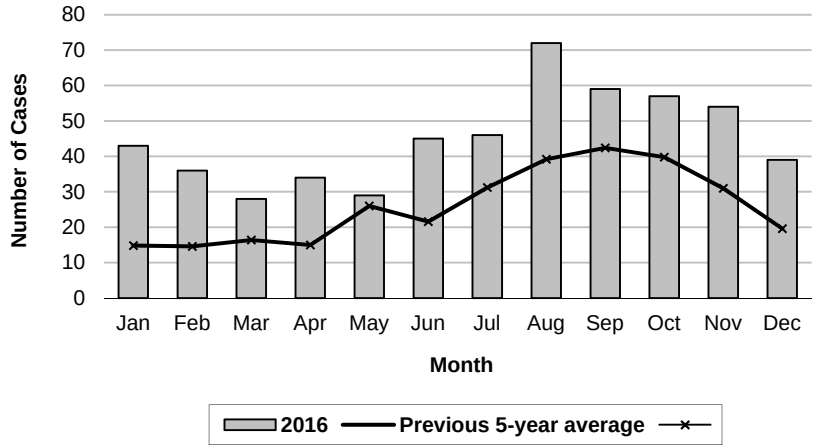
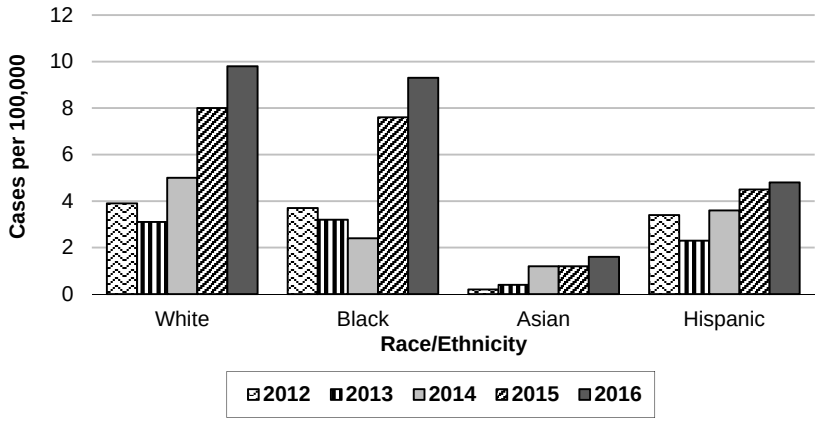
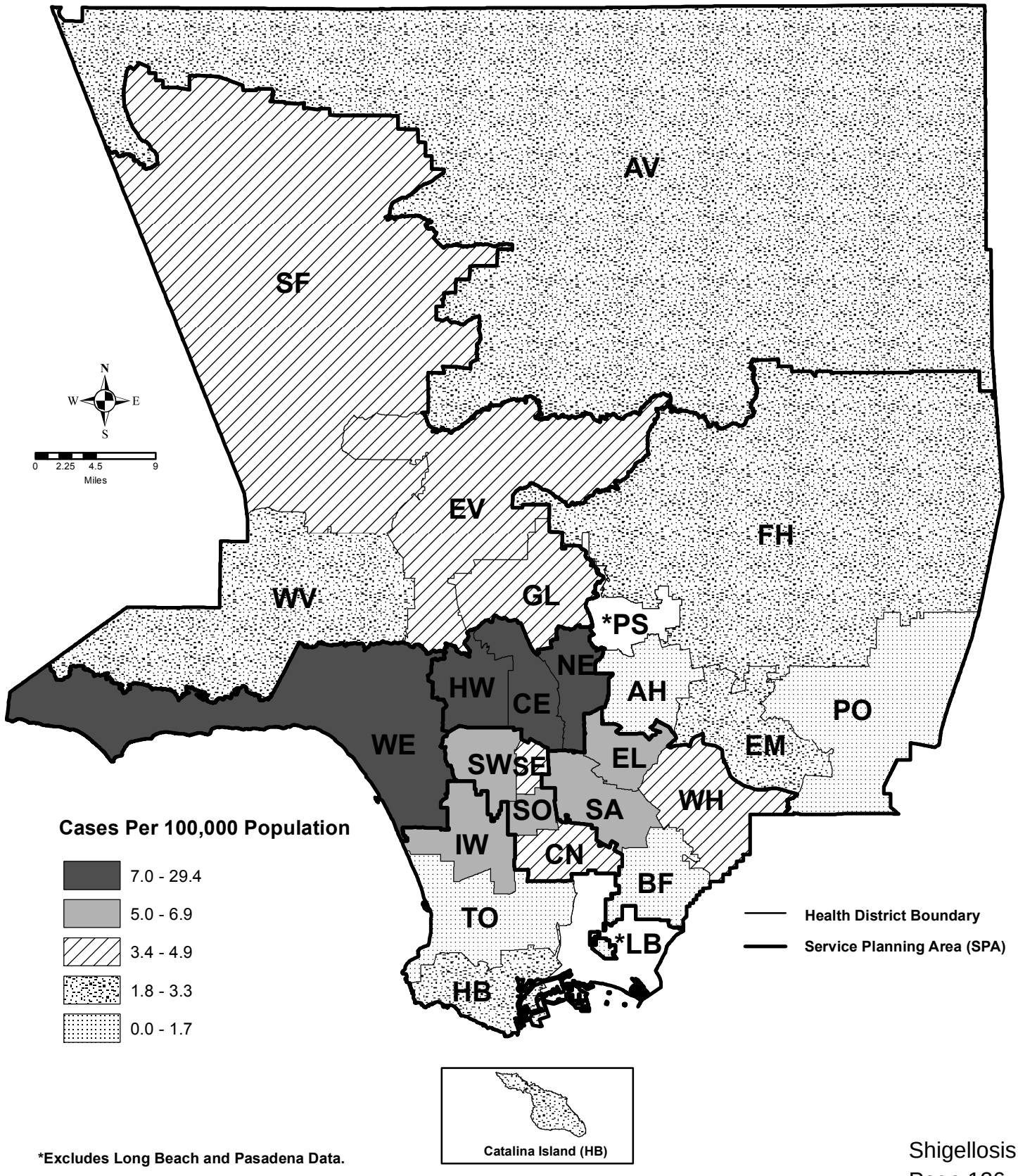


**Figure 6. Shigellosis Incidence by Race/Ethnicity
LAC, 2012-2016**



Map 12. Shigellosis
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

INVASIVE GROUP A STREPTOCOCCUS (IGAS)

CRUDE DATA	
Number of Cases	353
Annual Incidence[a]	
LA County	3.68
California[b]	N/A
United States[b, c]	N/A
Age at Diagnosis	
Mean	53.78
Median	57
Range	0–97 years

[a] Cases per 100,000 population
[b] Not notifiable
[c] Not available as of January 2018.

DESCRIPTION

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

For surveillance purposes in LAC, a case of 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) or from 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 case definition for this syndrome or as NF if the diagnosis was made by the treating physician.

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

The spread of IGAS can be prevented by good hand washing. The CDC provides guidelines for hand washing[c]. Wounds should be kept clean and monitored for signs of infection such as redness, swelling, pus, and pain. A person should seek medical care if any signs of wound infection are present, especially if accompanied by fever. High risk groups such as diabetics are encouraged to seek medical care sooner if experiencing fever, chills, and any redness on the skin.

2016 TRENDS AND HIGHLIGHTS

- The incidence rate of reported IGAS in 2016 was 3.7 cases per 100,000, which is the highest in the last 10 years (Figure 1).
- Blacks had the highest incidence rate of IGAS this year (3.7 per 100,000) followed closely by Whites (3.3 per 100,000). In 2015, the incidence rate among Blacks had decreased by approximately half; however, this year's incidence rate has returned to levels seen in earlier years. Incidence in Whites has increased over previous years by approximately 40%.
- SPA 8 and 4 had the highest incidence rate at 5.2 and 4.7 cases per 100,000, respectively (Figure 4).

[c] https://www.cdc.gov/handwashing/index.html

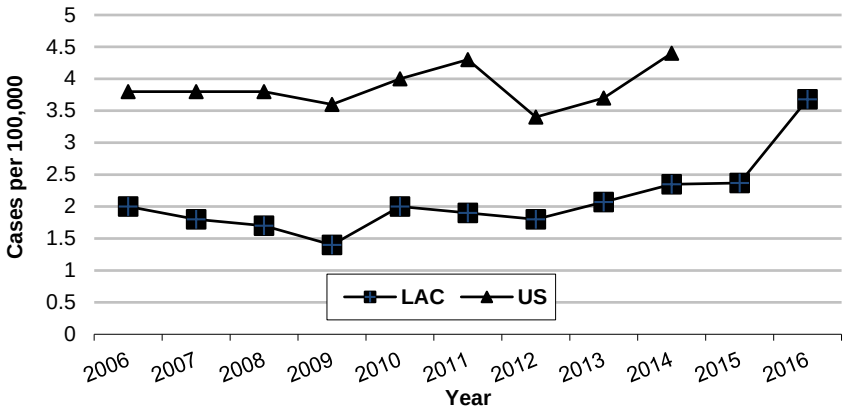
- In 2016, the number of reported cases peaked in December with 38 cases. January and May had similarly high incidence, with 17 and 35 cases reported, respectively. The fewest cases were reported in July (22 cases) and August (21 cases) (Figure 5). The number of reported cases throughout the year was higher overall than the previous five-year average and higher than any other individual year between 2006 and 2015 (Figure 1).
- IGAS cases presented most often with bacteremia (without focus) and cellulitis (Table 1).
- Consistent with the past several years, diabetes was reported more than any other risk factor (30%). Almost one-third of cases (28%) reported none of the classic risk factors (Table 2).
- Although the number of cases in 2016 is highest over the last five-year period (2012-2016), this increase may be attributable to an increase in reporting due to the development of more efficient electronic reporting systems.

Reported Invasive Group A Streptococcus Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA LAC, 2012-2016

	2012 (N=168)			2013 (N=195)			2014 (N=222)			2015 (N=227)			2016 (N=353)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	3	1.8	2.5	5	2.6	4.1	7	3.2	5.9	1	0.4	0.9	1	0.3	1.0
1-4	5	3.0	1.1	4	2.1	0.8	7	3.2	1.4	7	3.1	1.4	10	2.8	2.1
5-14	7	4.2	0.6	10	5.1	0.8	16	7.2	1.3	16	7.0	1.3	17	4.8	1.4
15-34	27	16.1	1.0	29	14.9	1.0	34	15.3	1.2	29	12.8	1.0	37	10.5	1.3
35-44	20	11.9	1.5	20	10.3	1.5	24	10.8	1.8	25	11.0	1.9	41	11.6	3.1
45-54	31	18.5	2.4	41	21.0	3.2	43	19.4	3.3	43	18.9	3.3	53	15.0	4.0
55-64	35	20.8	3.4	31	15.9	3.0	35	15.8	3.3	37	16.3	3.3	64	18.1	5.6
65+	39	23.2	3.5	54	27.7	4.9	56	25.2	4.9	68	30.0	5.7	125	35.4	10.2
Unknown	1	0.6	-	1	0.5	-	0	-	-	1	0.4	-	-	-	-
Race/Ethnicity															
Asian	8	4.8	0.6	8	4.1	0.6	6	2.7	0.4	5	2.2	0.4	9	2.5	0.6
Black	24	14.3	3.1	29	14.9	3.7	10	4.5	1.3	14	6.2	1.8	29	8.2	3.7
Hispanic	58	34.5	1.3	29	14.9	0.6	29	13.1	0.6	29	12.8	0.6	77	21.8	1.6
White	44	26.2	1.7	50	25.6	1.9	51	23.0	1.9	52	22.9	1.9	89	25.2	3.3
Other	2	1.2	-	5	2.6	-	11	5.0	-	3	1.3	-	10	2.8	-
Unknown	32	19.0	-	74	37.9	-	115	51.8	-	124	54.6	-	139	39.4	-
SPA															
1	0	-	-	4	2.1	1.0	5	2.3	1.3	4	1.8	1.0	13	3.7	3.3
2	32	19.0	1.5	38	19.5	1.7	38	17.1	1.7	54	23.8	2.4	83	23.5	3.7
3	17	10.1	1.1	23	11.8	1.4	49	22.1	3.0	31	13.7	1.9	35	9.9	2.1
4	38	22.6	3.4	33	16.9	2.9	44	19.8	3.8	34	15.0	2.9	56	15.9	4.7
5	10	6.0	1.6	18	9.2	2.8	11	5.0	1.7	15	6.6	2.3	26	7.4	3.9
6	24	14.3	2.4	23	11.8	2.2	25	11.3	2.4	29	12.8	2.8	36	10.2	3.4
7	17	10.1	1.3	16	8.2	1.2	21	9.5	1.6	21	9.3	1.6	14	4.0	1.1
8	21	12.5	2.0	24	12.3	2.2	24	10.8	2.2	26	11.5	2.4	57	16.2	5.2
Unknown	9	5.4	-	16	8.2	-	5	2.3	-	13	5.7	-	13	3.7	-

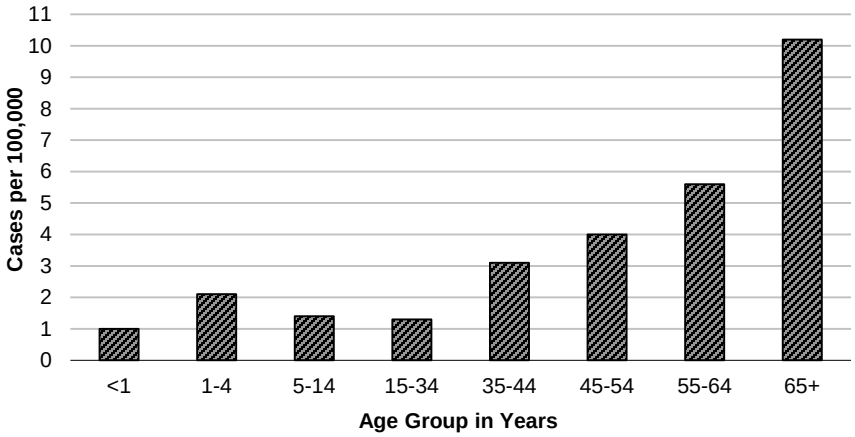
*Rates calculated based on less than 19 cases or events are considered unreliable.

Figure 1. Incidence Rates of Invasive Group A Streptococcus, LAC and US, 2005-2015*



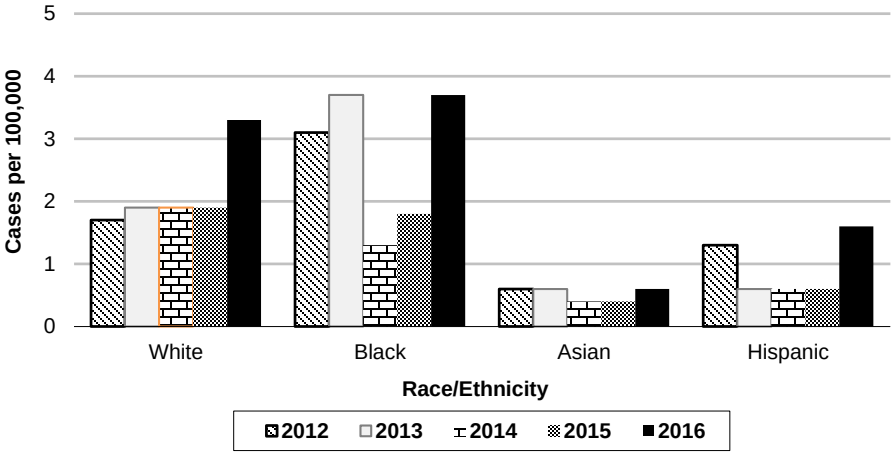
* Active Bacterial Core Surveillance Reports from 2000 to 2015 from the Centers for Disease Control and Prevention's Division of Bacterial Diseases. Report available at: www.cdc.gov/abcs/reports-findings/surv-reports.html

Figure 2. Incidence Rates* of Invasive Group A Streptococcus by Age Group, LAC, 2016 (N=353)



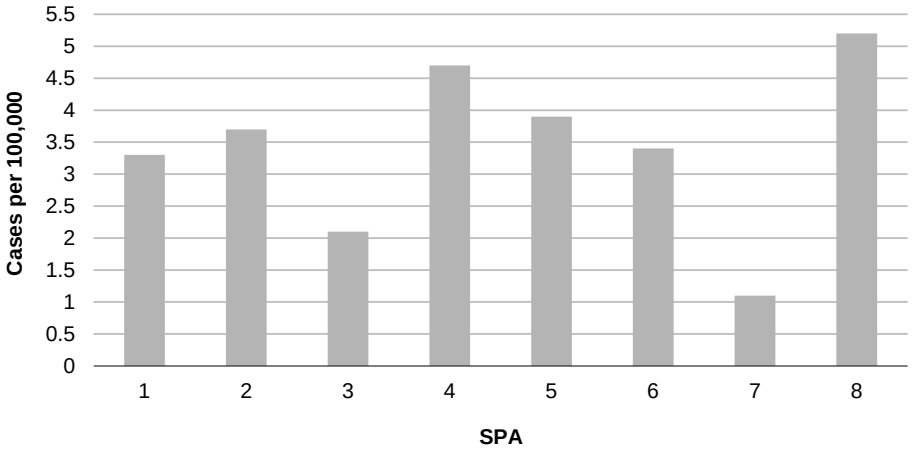
*Rates based on fewer than 19 cases are unreliable

Figure 3. Invasive Group A Streptococcus Incidence Rates* by Race/Ethnicity LAC, 2012-2016



*Rates based on fewer than 19 cases are unreliable

Figure 4. Incidence Rates* of Invasive Group A Streptococcus by SPA LAC, 2016 (N=353)



*Rates based on fewer than 19 cases are unreliable

Figure 5. Reported Invasive Group A Streptococcus Cases by Month of Onset, LAC, 2016 (N=353)

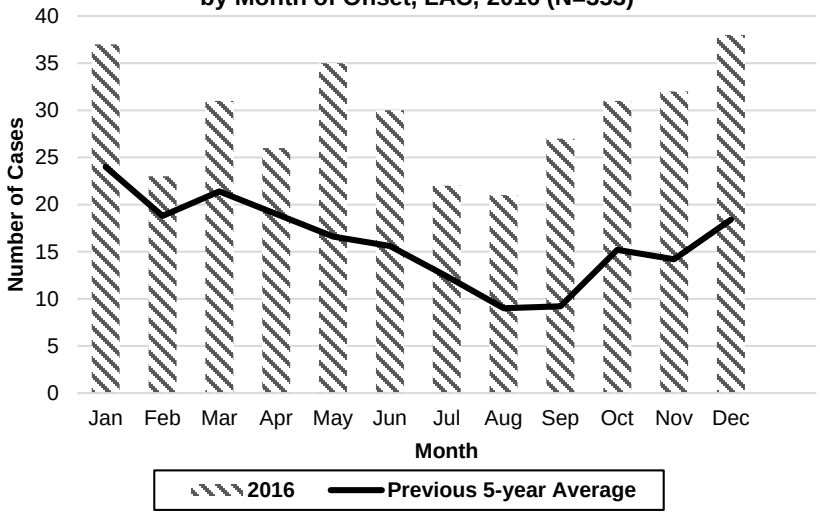


Table 1. Frequency and Percentage of IGAS Clinical Syndromes, LAC, 2016 (N=167)

Syndrome	Number	Percent*
Cellulitis	44	26.5
Bacteremia (without focus)	31	18.6
Non-surgical wound infection	22	13.2
Other	19	11.4
Pneumonia	19	11.4
Necrotizing Fasciitis	8	4.8
Septic Arthritis	4	2.4
Osteomyelitis	3	1.8

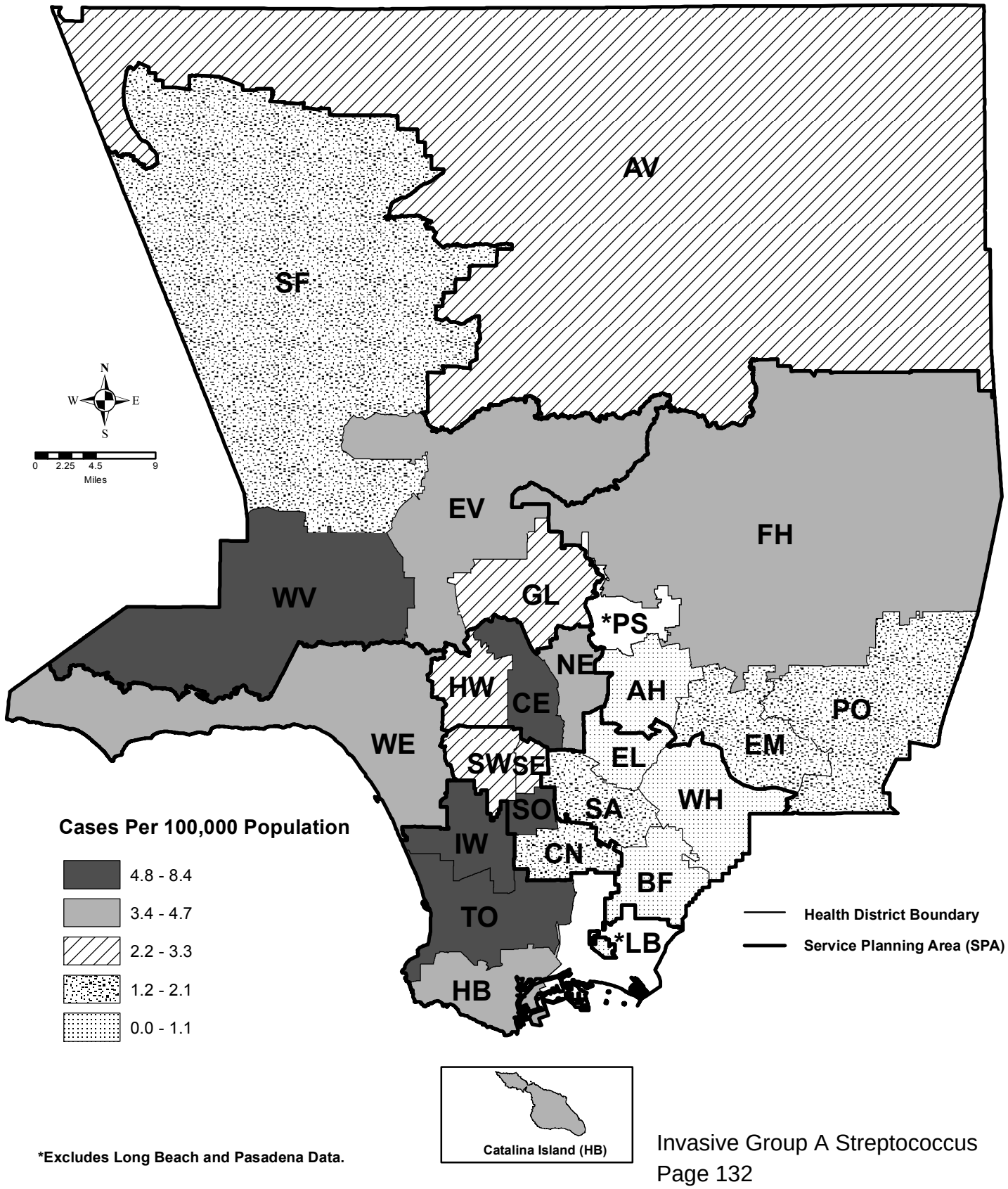
*Overlapping syndromes will total over 100%.
**Cases with unknown symptoms excluded.

Table 2. Percentage of IGAS Risk Factors Based on Date of Onset Between 1/1/2014-12/31/2016

Risk Factors*	2014 (N =182) %**	2015 (N =141) %**	2016 (N=156) %**
Alcohol Abuse	8	7	6
Chronic Heart Disease	15	9	6
Chronic Lung Disease	6	6	4
Cirrhosis	7	0	4
Diabetes	30	30	19
History of Blunt Trauma	4	11	3
HIV/AIDS	2	4	0
IV Drug Use	2	2	7
Malignancy	9	7	6
Other	7	0	3
None	29	33	28

*Overlapping risk factors will total over 100%.
**Cases with unknown risk factors excluded.

Map 13. Streptococcus, Group A Invasive Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

TYPHOID FEVER, ACUTE AND CARRIER

ACUTE TYPHOID CRUDE DATA	
Number of Cases	11
Annual Incidence[a]	
LA County[b]	0.11
California[c]	N/A
United States[c]	0.10
Age at Diagnosis	
Mean	37.2
Median	33
Range	9–75 years

[a]Cases per 100,000 population
[b]Rates based on less than 19 observations are considered unreliable
[c]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Typhoid fever, or enteric fever, is an acute systemic disease caused by the gram-negative bacillus *Salmonella typhi*. Transmission occurs person-to-person or by ingestion of food or water contaminated by the urine or feces of acute cases or carriers. Common symptoms include persistent fever, headache, malaise, anorexia, constipation (more common than diarrhea), bradycardia, enlargement of the spleen, and rose spots on the trunk. Humans are the only known reservoir for *S. typhi*. Vaccines are available to those at high risk from close exposure to a typhoid carrier in the house or who travel to developing foreign countries.

Among untreated acute cases, 10% will shed bacteria for three months after initial onset of symptoms, and 2-5% will become chronic typhoid carriers. Some carriers are diagnosed by positive tissue specimen. Chronic carriers are by definition asymptomatic.

Hand washing after toilet use, before preparing/serving food, and before and after direct/intimate contact with others is important in preventing disease. Where sanitary practices are uncertain, foods should be thoroughly cooked, and bottled water should be used for drinking, brushing teeth, and making ice. Vaccination should be considered when traveling to developing countries in Asia, Africa, and Latin America where disease is endemic. LAC DPH screens household contacts of confirmed cases for *S. typhi* to identify any previously undiagnosed carriers or cases. A modified order of isolation restricts a carrier from engaging in a sensitive occupation or situation. LAC DPH monitors compliance with such isolation order and offers the case a chance to clear the infection with antibiotics.

2016 TRENDS AND HIGHLIGHTS

- In 2016, all acute typhoid cases reported travel to Asian countries where disease is endemic, except one who reported contact with a carrier.
- Asians (n=5, 45%) accounted for the largest proportion of acute cases followed by Blacks (n=2, 18%) (Figure 3). Asians had the highest incidence rate of all the race/ethnicity groups (0.4 cases per 100,000).
- SPA 5 had the highest incidence rate for acute typhoid fever (0.5 cases per 100,000). SPA 2 and 5 reported the largest proportion of case (n=3, 27%) followed by SPA 4 and 8 (n=2, 18%).
- During 2016, cases were observed throughout the year; however, more cases are typically observed during the summer

- months. Cases peaked above the five-year average in January, March, June, and September (Figure 5).
- LAC DPH monitors existing carriers who are listed on the state typhoid registry until they are cleared of infection. There were two new carriers reported in 2016 (Figure 6).
- Three paratyphoid cases were reported in 2016.

Reported Acute Typhoid Fever Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA LAC, 2012-2016

	2012 (N=6)			2013 (N=17)			2014 (N=15)			2015 (N=14)			2016 (N=11)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	3	17.6	0.6	0	-	-	3	21.4	0.6	0	-	-
5-14	1	16.7	0.1	3	17.6	0.2	2	13.3	0.2	2	14.3	0.2	1	9.0	0.1
15-34	3	50.0	0.1	7	41.2	0.2	7	46.7	0.2	7	50.0	0.2	6	54.5	0.2
35-44	1	16.7	0.1	1	5.9	0.1	2	13.3	0.2	0	-	-	0	-	-
45-54	1	16.7	0.1	2	11.8	0.2	2	13.3	0.2	0	-	-	1	9.0	0.1
55-64	0	-	-	1	5.9	0.1	1	6.7	0.1	1	7.1	0.1	2	18.1	0.2
65+	0	-	-	0	-	-	1	6.7	0.1	1	7.1	0.1	1	9	0.1
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race/Ethnicity															
Asian	2	33.3	0.2	12	70.6	0.9	10	66.7	0.7	8	57.1	0.6	5	45.4	0.4
Black	0	-	-	0	-	-	0	-	-	0	-	-	2	18.1	0.3
Hispanic	4	66.7	0.1	5	29.4	0.1	5	33.3	0.1	4	28.6	0.1	1	9.0	-
White	0	-	-	0	-	-	0	-	-	2	14.3	0.1	1	9.0	-
Other	0	-	-	0	-	-	0	-	-	0	-	-	1	9.0	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
SPA															
1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2	1	16.7	-	2	11.8	0.1	1	6.7	-	7	50.0	0.3	3	27.2	0.1
3	1	16.7	0.1	6	35.3	0.4	5	33.3	0.3	2	14.3	0.1	1	9.0	0.1
4	2	33.3	0.2	3	17.6	0.3	4	26.7	0.3	4	28.6	0.3	2	18.1	0.2
5	0	-	-	2	11.8	0.3	0	-	-	1	7.1	0.2	3	27.2	0.5
6	0	-	-	1	5.9	0.1	2	13.3	0.2	0	-	-	0	-	-
7	1	16.7	0.1	0	-	-	1	6.7	0.1	0	-	-	0	-	-
8	1	16.7	0.1	3	17.6	0.3	2	13.3	0.2	0	-	-	2	18.1	0.2
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	-	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable

Reported Typhoid Fever Carrier Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=0)			2013 (N=0)			2014 (N=0)			2015 (N=0)			2016 (N=2)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
15-34	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
35-44	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
45-54	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
55-64	0	-	-	0	-	-	0	-	-	0	-	-	1	50.0	0.1
65+	0	-	-	0	-	-	0	-	-	0	-	-	1	50.0	0.1
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0		
Race / Ethnicity															
Asian	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Black	0	-	-	0	-	-	0	-	-	0	-	-	1	50.0	0.1
Hispanic	0	-	-	0	-	-	0	-	-	0	-	-	1	50.0	0.1
White	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Other	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
SPA															
1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
3	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
6	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
7	0	-	-	0	-	-	0	-	-	0	-	-	1	50.0	0.1
8	0	-	-	0	-	-	0	-	-	0	-	-	1	50.0	0.1
Unknown	0	-	-	0	-	-	0	-	-	0	-	-			

*Rates calculated based on less than 19 cases or events are considered unreliable

**Figure 1. Reported Acute Typhoid Fever Rates by Year
LAC and US, 2006-2016**

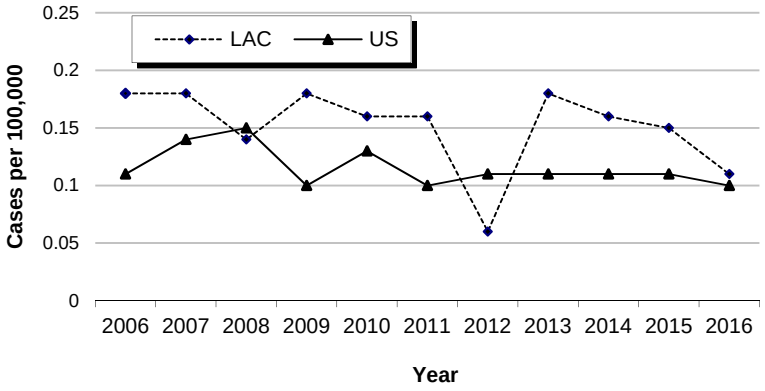


**Figure 2. Acute Typhoid Fever Cases by Age Group
LAC, 2016 (N=11)**

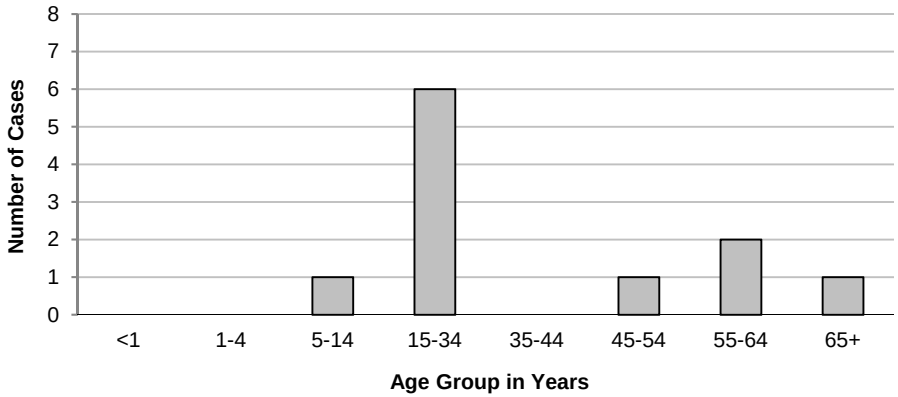


**Figure 3. Report Acute Typhoid Fever Cases by
Race/Ethnicity, LAC, 2016 (N=11)**

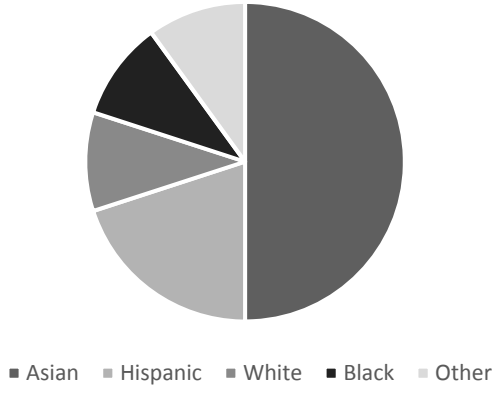


**Figure 4. Reported Acute Typhoid Fever Cases by SPA
LAC, 2016 (N=11)**

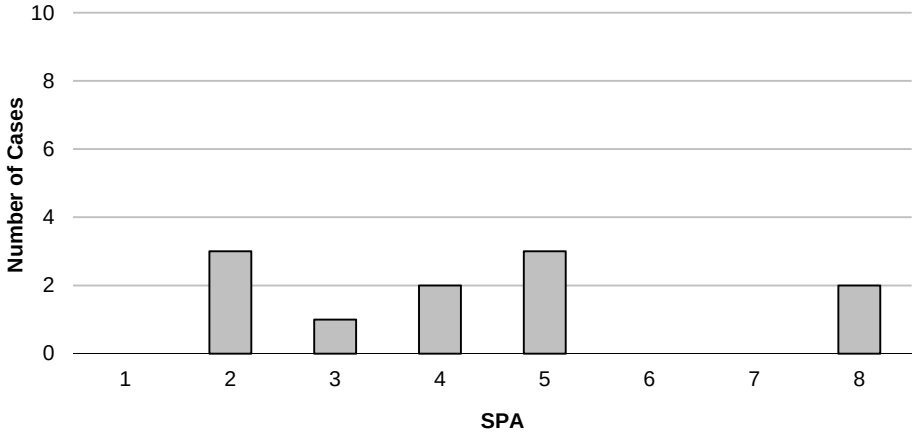


Figure 5. Acute Typhoid Fever Cases by Month of Onset
LAC, 2016 (N=11)

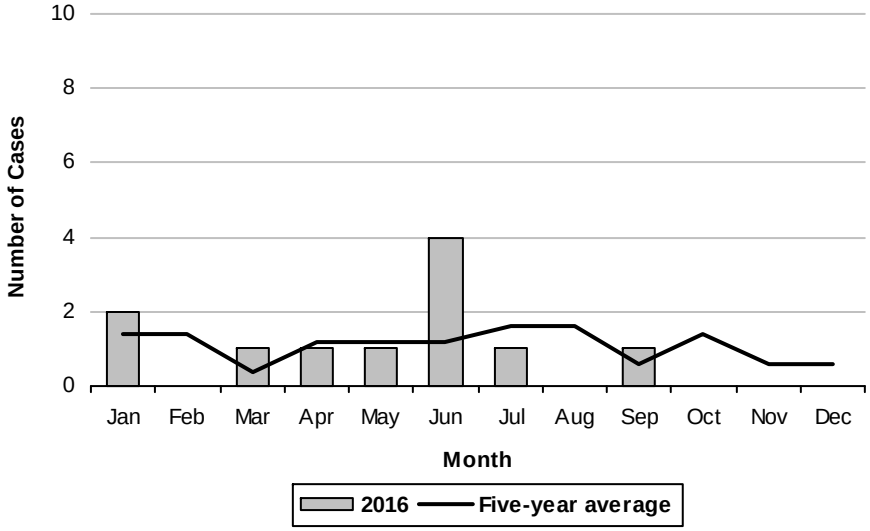
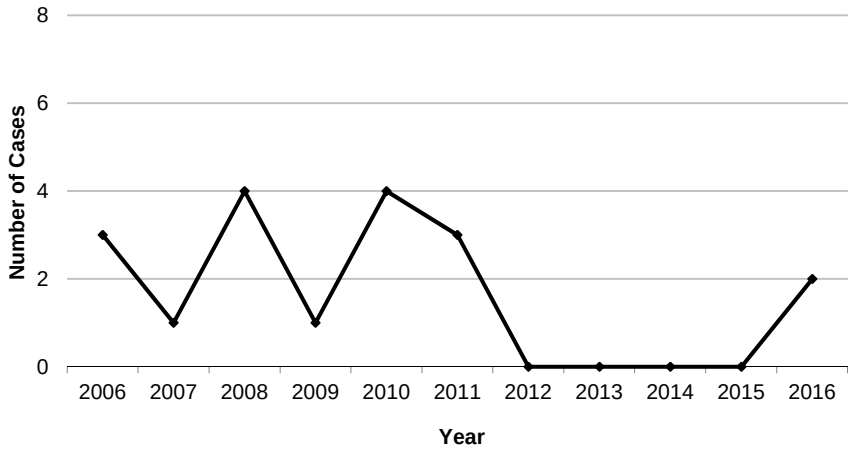


Figure 6. Cases of Chronic Typhoid Carrier by Year of Detection
LAC, 2006-2016



TYPHUS FEVER

CRUDE DATA	
Number of Cases	47
Annual Incidence[a]	
LA County	0.49
California[b]	N/A
United States[c]	N/A
Age at Diagnosis	
Mean	41.6
Median	42
Range	9-89

[a]Cases per 100,000 population
[b]Not notifiable

DESCRIPTION

Fleaborne typhus (murine typhus and endemic typhus) is caused by the bacteria *Rickettsia typhi* and *Rickettsia felis* and is transmitted through contact with feces that is discharged when an infected flea bites. Reservoir animals are predominantly feral cats, opossums, and rats. In LAC, most reported cases of typhus have historically occurred in residents of the foothills of central LAC. However, since 2006, the distribution of typhus has expanded to other regions of 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 one percent of cases but increase with age. The disease is typically mild in young children. Typhus is not vaccine preventable but can be treated with antibiotics.

Because fleaborne typhus is not reportable to the Centers for Disease Control and Prevention (CDC), there is no national case definition. In California, a standard case definition was developed in 2012 due to emergence or re-emergence of this disease into other areas of southern California including Long Beach and Orange County. Cases included in LAC surveillance have, at minimum, a single high IgM or IgG titer positive for *Rickettsia typhi* along with the appropriate symptoms.

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

2016 TRENDS AND HIGHLIGHTS

- LAC continues to document high numbers of typhus compared to the previous decade, in which the count did not exceed 20 cases per year. The case count began rising in 2010 with 31 cases and peaked in 2013 with 68 cases (Figure 1). No outbreaks were documented in 2016.
- In 2016, the age group with the largest percentage of cases was 35-44 year olds (29.8%) followed by 15-34 year olds (25.5%) for a total of 55.3% of cases. These are the largest percentage of cases in these age groups compared to 2012-2015 when these age groups accounted for 33-48% of cases each year. There were no infections in children less than five years old (Figure 2).
- Typhus cases continue to be documented in SPAs 2 through 8. The highest number of typhus cases occurred in SPA 3 (n=18, 38%), which has historically had higher case counts (Figure 3). SPA 4 also continues to have a high case count with 11 cases in 2016.
- Cases were documented every month in 2016, ranging from one case in March to nine cases in June. This year's peak in June is earlier than the typical seasonal curve (Figure 4). Physicians and residents should be aware that there is year-round risk of typhus infection in LAC.
- All but three cases in 2016 were seen in the emergency department (ED) or hospitalized,

similar to previous years. No fatalities were documented. The provider reporting the most number of cases was Huntington Hospital in SPA 3 (n=9). This may reflect both an increased frequency of occurrence of the disease in the SPA as well as an increased awareness by hospital physicians to consider and report a typhus diagnosis. The high proportion of cases seen in EDs or hospitals indicates that milder cases may not be diagnosed and/or reported.

- A total of nine cases (19%) recalled having flea exposure. The majority of cases (n=34, 72%) reported exposure to animals at or around their home, with only one having exposure exclusively at work. Nearly half the cases (n=19, 55%) reported exposure to cats at or around their home and about one-third (n=10, 32%) reported exposure to feral cats in particular (Table 1). These numbers are similar to those in 2015. Reported exposure to cats had increased in the last few years but dropped in 2016 (Figure 5). Overall exposure to cats decreased from 57% of cases in 2015 to 40% of cases in 2016. The percent of exposure to cats around the home still remains high, thus community education regarding flea precautions around the home would be prudent.
- The increase in cases of typhus in LAC may be due to a number of factors including the natural relocation of host animals (possums and feral cats) to regions not previously enzootic for typhus, changes in weather that favor flea survival, increased testing and reporting due to better educated physicians, and increased reporting to LAC DPH by electronic laboratory reporting.

Reported Fleaborne Typhus Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=50)			2013 (N=68)			2014 (N=44)			2015 (N=54)			2016 (N=47)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	1	1.5	0.2	1	2.3	0.2	1	1.9	0.2	0	-	-
5-14	6	12.0	0.5	5	7.4	0.4	1	2.3	0.1	2	3.7	0.2	2	4.3	0.2
15-34	11	22.0	0.4	16	23.5	0.6	10	22.7	0.4	10	18.5	0.4	12	25.5	0.4
35-44	13	26.0	1.0	12	17.6	0.9	6	13.6	0.5	8	14.8	0.6	14	29.8	1.1
45-54	10	20.0	0.8	13	19.1	1.0	10	22.7	0.8	18	33.3	1.4	7	14.9	0.5
55-64	4	8.0	0.4	13	19.1	1.3	8	18.2	0.8	9	16.7	0.8	8	17.0	0.7
65+	6	12.0	0.5	8	11.8	0.7	8	18.2	0.7	6	11.1	0.5	4	8.5	0.3
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	0	-	-	3	4.4	0.2	3	6.8	0.2	3	5.6	0.2	4	8.5	0.3
Black	2	4.0	0.3	1	1.5	0.1	0	0.0	0.0	4	7.4	0.5	2	4.3	0.3
Hispanic	15	30.0	0.3	24	35.3	0.5	17	38.6	0.4	20	37.0	0.4	15	31.9	0.3
White	25	50.0	0.9	35	51.5	1.3	17	38.6	0.6	24	44.4	0.9	21	44.7	0.8
Other	3	6.0	-	1	1.5	-	1	2.3	-	1	1.9	-	4	8.5	-
Unknown	5	10.0	-	4	5.9	-	6	13.6	-	2	3.7	-	1	2.1	-
SPA															
1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
2	5	10.0	0.2	6	8.8	0.3	3	6.8	0.1	10	18.5	0.4	3	6.4	0.1
3	18	36.0	1.1	20	29.4	1.2	17	38.6	1.0	22	40.7	1.3	18	38.3	1.1
4	13	26.0	1.2	18	26.5	1.6	5	11.4	0.4	8	14.8	0.7	11	23.4	0.9
5	6	12.0	0.9	5	7.4	0.8	6	13.6	0.9	1	1.9	0.2	3	6.4	0.5
6	4	8.0	0.4	7	10.3	0.7	3	6.8	0.3	0	0.0	0.0	3	6.4	0.3
7	3	6.0	0.2	4	5.9	0.3	5	11.4	0.4	6	11.1	0.5	7	14.9	0.5
8	1	2.0	0.1	8	11.8	0.7	5	11.4	0.5	7	13.0	0.6	1	2.1	0.1
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable

Figure 1. Fleaborne Typhus Cases by Year
LAC, 2006-2016

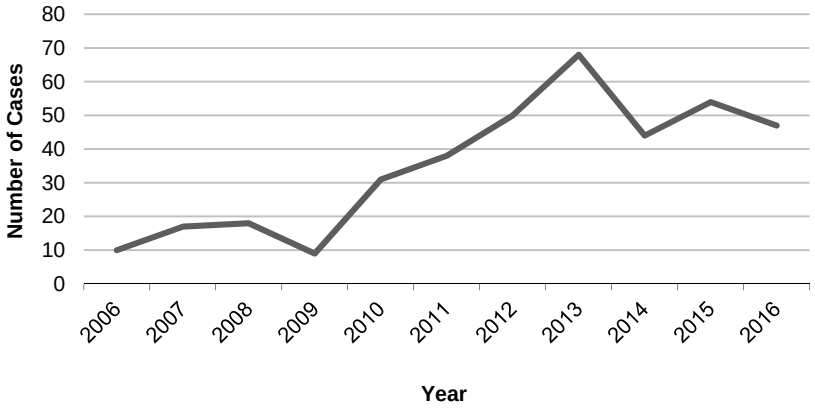


Figure 2. Fleaborne Typhus by Age Group
LAC, 2016 (N=47)

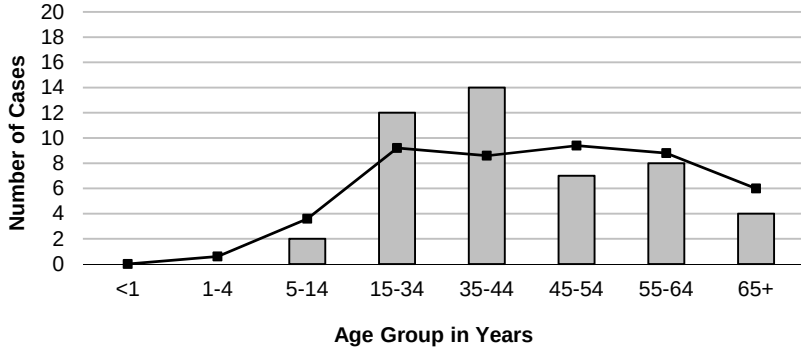


Figure 3. Fleaborne Typhus Cases by SPA
LAC, 2011-2015

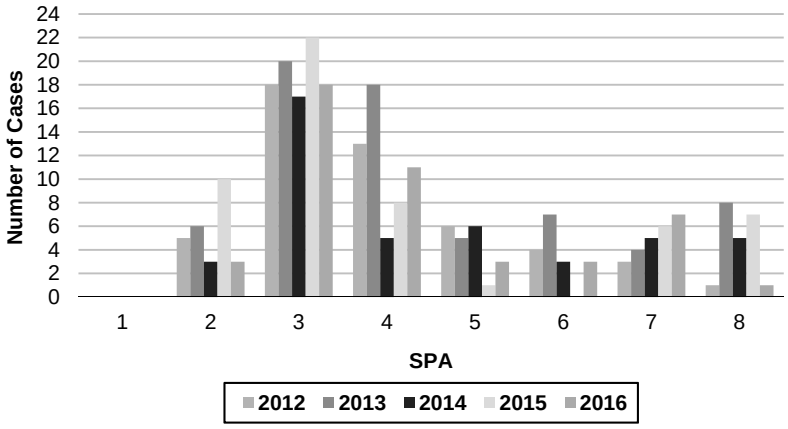


Figure 4. Fleaborne Typhus Cases by Month of Onset
LAC, 2016 (N=47)

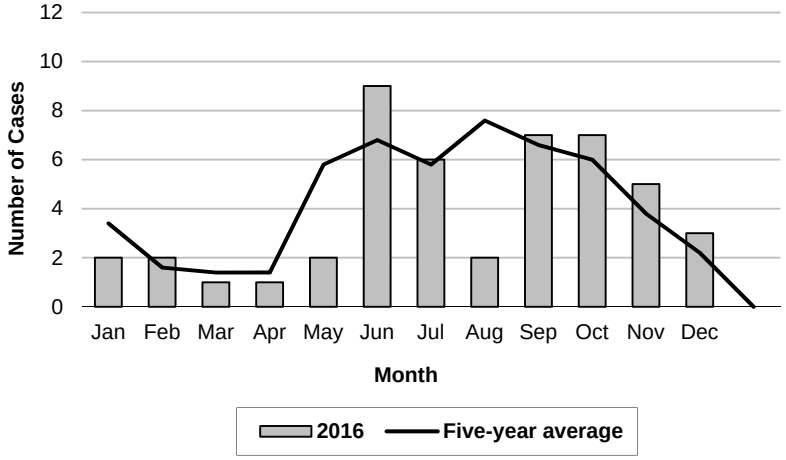
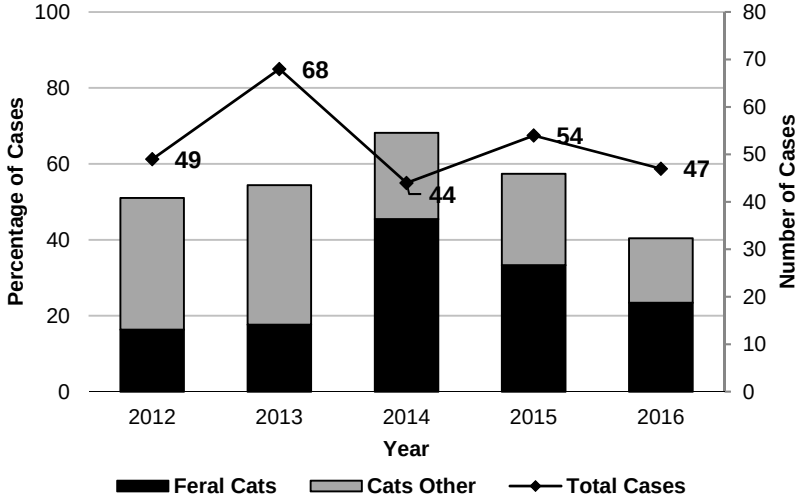


Figure 5. Fleaborne Typhus Cases with Reported Cat Exposure Near Home LAC, 2012 -2016



*Cases may report more than one exposure and in both the home and employment location.

Table 1. Animal Exposure* of Fleaborne Typhus Cases, LAC, 2016 (N=47)

	At or around Home n (%)	At or around Employment n (%)
Cat	19 (40)	3 (6)
Feral Cat	11 (23)	2 (4)
Dog	23 (49)	2 (4)
Opossum	13 (28)	1 (2)
Rodent	12 (25)	1 (2)

VIBRIOSIS

CRUDE DATA	
Number of Cases	33
Annual Incidence[a]	
LA County[b]	0.34
California[c]	0.28
United States[c]	0.34
Age at Diagnosis	
Mean	45.8
Median	46
Range	3–84 years

[a]Cases per 100,000 population
[b]Rates calculated based on less than 19 cases or events are considered unreliable
[c]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

Vibriosis is an infection caused by comma-shaped, gram-negative bacteria of the genus *Vibrio*. Vibriosis most commonly presents as acute diarrhea but may also occur as a wound infection or septicemia. Vibriosis is transmitted by ingesting food or water contaminated with *Vibrio* or by contact between open wounds and contaminated water. Vibriosis is commonly associated with consumption of raw or undercooked seafood, particularly shellfish. However, many vibriosis patients indicated a recent history of travel to developing countries. The most common species that cause vibriosis are *V. parahæmolyticus*, *V. alginolyticus*, *V. vulnificus*, and *V. choleræ*. Two serotypes of *V. choleræ* (O1 and O139) may cause cholera, an acute, life-threatening diarrheal illness. Infection may be mild or without symptoms, but sometimes it can be severe. Approximately 1 in 20 infected persons develop severe disease, characterized by profuse watery diarrhea, vomiting, and leg cramps. In these persons, rapid loss of bodily fluids can lead to dehydration and shock. Without treatment, death can occur within hours. This disease can spread rapidly in areas with inadequate treatment of sewage and drinking water.

2016 TRENDS AND HIGHLIGHTS

- The number of reported vibriosis cases increased annually from 2010 to 2014, and peaked in 2014 with 52 cases (Figure 1).
- SPA 2 had the most confirmed cases of vibriosis in 2016 (Figure 4). In all regions of LAC, consumption of raw oysters or other seafood were significant sources of vibriosis.
- Typically, vibriosis cases peak during June through August (Figure 5) because *Vibrio* flourishes in rising water temperatures.
- One-third of cases (n=11) reported foreign travel. Foreign countries reported included Mexico, El Salvador, Brazil, Caribbean, and the Philippines.
- *V. parahæmolyticus* was the most common etiologic agent isolated (n=14, 42%). More than three-quarters (n=11) of *V. parahæmolyticus* cases reported eating oysters prior to onset.
- There were eight confirmed cases of *V. alginolyticus*. Three of these cases had a history of travel-related recreational water exposure, and three had seafood exposures.
- There was one confirmed case of *V. fluvialis.* This case had a known seafood exposure.
- There were two confirmed cases of *V. cholerae (non-O1, non-O139).* One of these cases had known travel history to Mexico, and one had an unknown exposure status.
- There was one confirmed case of *V. metschnikovii.* This case had an unknown exposure status.
- There was one confirmed case of *V. mimicus.* This case had an unknown exposure status.
- There was one confirmed case of *V. vulnificus.* This case had an unknown exposure status.
- A small number of cases (n=5, 15%) had a *Vibrio* species that were not identifiable.
- There were two vibriosis deaths in 2016. Both cases were diagnosed with *V. vulnificus*

which is a particularly pathogenic organism with a 50% mortality rate in cases with septicemia (both cases presented to the hospital in septic shock). Both also had underlying conditions that made them susceptible to complications related to *V. vulnificus* infection.

Reported Vibriosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=29)			2013 (N=26)			2014 (N=52)			2015 (N=43)			2016 (N=33)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	1	3.0	0.2
5-14	3	10.3	0.3	3	11.5	0.2	2	3.8	0.2	1	2.3	0.1	2	6.1	0.2
15-34	7	24.1	0.3	4	15.4	0.1	18	34.6	0.6	18	41.9	0.6	6	18.2	0.2
35-44	4	13.8	0.3	7	26.9	0.5	13	25.0	1.0	7	16.3	0.5	5	15.2	0.4
45-54	7	24.1	0.5	6	23.1	0.5	6	11.5	0.5	6	14.0	0.5	9	27.3	0.7
55-64	4	13.8	0.4	2	7.7	0.2	7	13.5	0.7	4	9.3	0.4	7	21.2	0.6
65+	4	13.8	0.4	4	15.4	0.4	6	11.5	0.5	7	16.3	0.6	3	9.0	0.2
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race/Ethnicity															
Asian	2	6.9	0.2	3	11.5	0.2	4	7.7	0.3	2	4.7	0.1	2	6.1	0.1
Black	1	3.4	0.1	0	-	-	3	5.8	0.4	1	2.3	0.1	0	-	-
Hispanic	11	37.9	0.2	6	23.1	0.1	16	30.8	0.3	8	18.6	0.2	9	27.3	0.2
White	15	51.7	0.6	15	57.7	0.6	12	23.1	0.5	14	32.6	0.5	8	24.2	0.3
Other	0	-	-	0	-	-	0	-	-	1	2.3	-	2	6.1	-
Unknown	0	-	-	2	7.7	-	17	32.7	-	17	39.5	-	12	36.3	-
SPA															
1	0	-	-	0	-	-	2	3.8	0.5	2	4.7	0.5	2	6.1	0.5
2	6	20.7	0.3	7	26.9	0.3	11	21.2	0.5	11	25.6	0.5	9	27.3	0.4
3	3	10.3	0.2	3	11.5	0.2	5	9.6	0.3	5	11.6	0.3	4	12.1	0.2
4	4	13.8	0.4	5	19.2	0.4	9	17.3	0.8	4	9.3	0.3	5	15.2	0.4
5	6	20.7	0.9	5	19.2	0.8	9	17.3	1.4	7	16.3	1.1	6	18.2	0.9
6	3	10.3	0.3	2	7.7	0.2	6	11.5	0.6	4	9.3	0.4	4	12.1	0.4
7	3	10.3	0.2	0	-	-	3	5.8	0.2	6	14.0	0.5	0	-	-
8	4	13.8	0.4	4	15.4	0.4	5	9.6	0.5	4	9.3	0.4	3	9.0	0.3
Unknown	0	-	-	0	-	-	2	3.8	-	0	-	-	0	-	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Reported Cases of Vibriosis
LAC, 2006-2016**

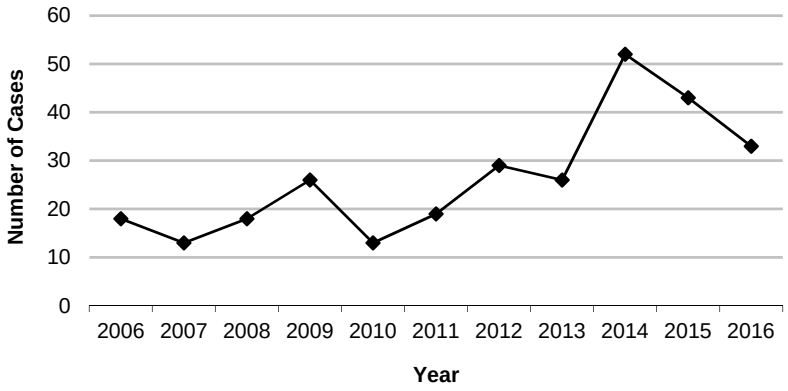


**Figure 2. Reported Cases of Vibrosis by Age Group
LAC, 2016 (N=33)**

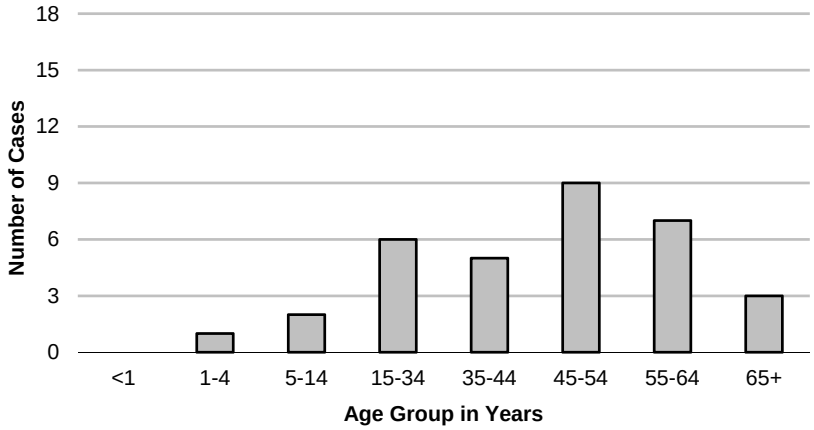


**Figure 3. Percent of Cases of Vibriosis by
Race/Ethnicity, LAC, 2016 (N=33)**

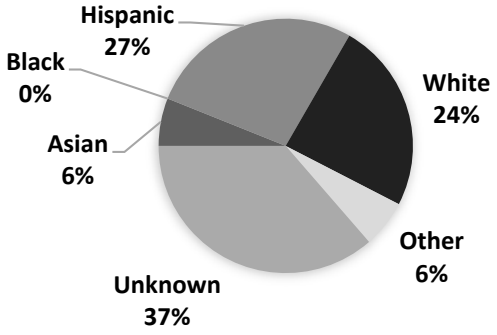


**Figure 4. Reported Cases of Vibriosis by SPA
LAC, 2016 (N=33)**

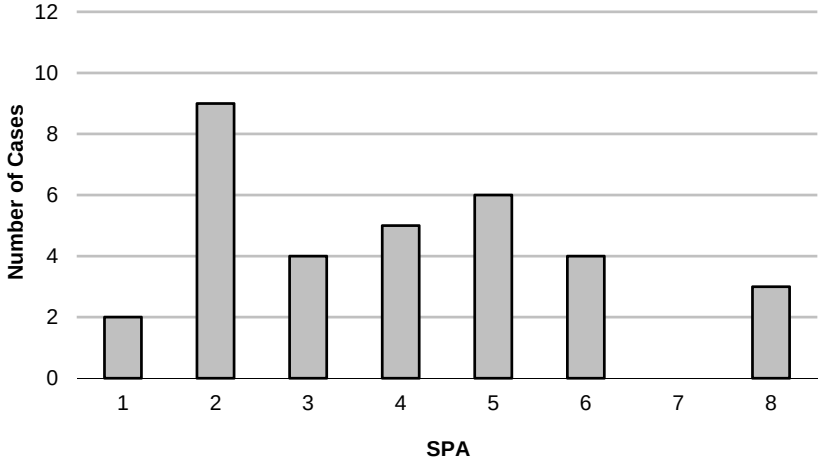


**Figure 5. Reported Vibriosis Cases by Month of Onset
LAC, 2016 (N=29*)**

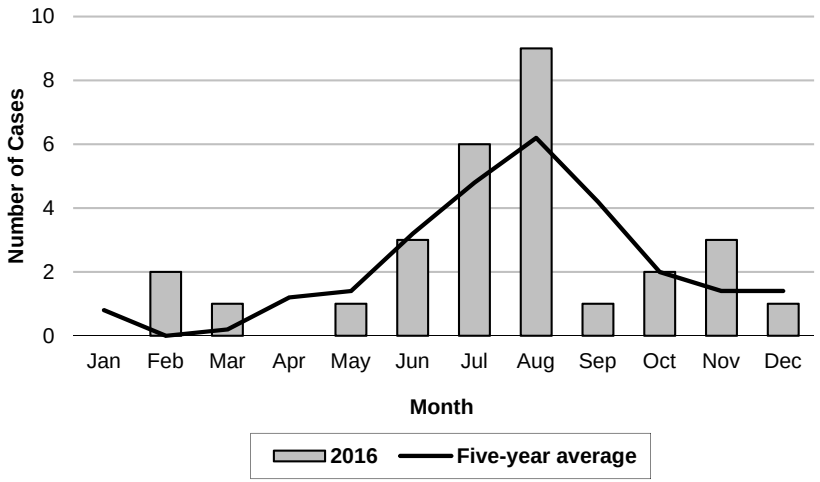
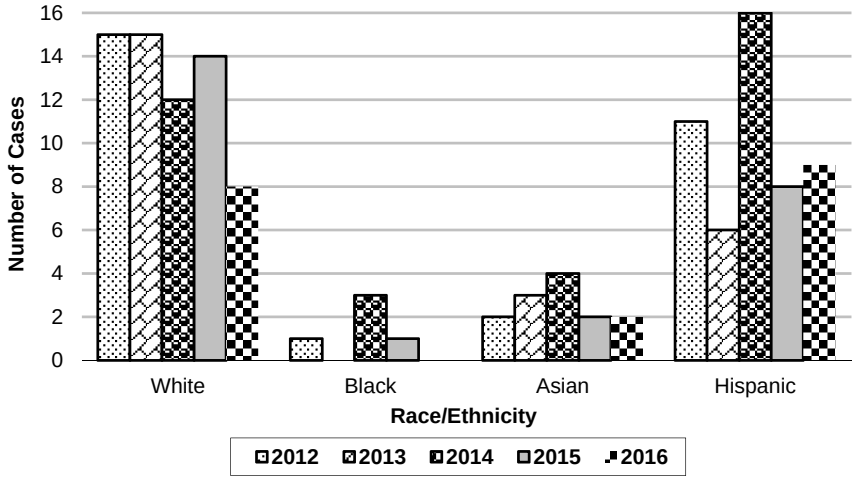


**Figure 6. Reported Cases of Vibriosis by Race/Ethnicity
LAC, 2012-2016**



*Onset month not available for 4 cases: 1 asymptomatic, 1 unable to contact, 2 could not identify onset date due to chronic illness.

WEST NILE VIRUS

CRUDE DATA	
Number of Cases[a]	153
Annual Incidence[b]	
LA County[a]	1.59
California[c]	0.88
United States[c]	0.60
Age at Diagnosis	
Mean	60.5
Median	62
Range	17-92 years

[a]Includes asymptomatic infections
[b]Cases per 100,000 population. CA and US rates do not include asymptomatic infections
[c]Calculated from: CDC. *Notice to Readers:* Final 2016 Reports of Nationally Notifiable Infectious Diseases and Conditions *Weekly* / January 6, 2018 / 65(52). Available at: https://www.cdc.gov/mmwr/volumes/65/wr/mm6552md.htm?s_cid=mm6552md_w

DESCRIPTION

West Nile virus (WNV) is a flavivirus related to the viruses that cause Japanese encephalitis (JE) and Saint Louis encephalitis (SLE). Indigenous to Africa, Asia, Europe, and Australia, WNV was first detected in North America in New York City in 1999. Since then, human and non-human WNV have been documented as enzootic diseases throughout the continental US, Canada, and Mexico.

WNV-infected birds can develop high levels of the virus in their bloodstream, and mosquitoes (especially *Culex* species) become infected by biting them. Those mosquitoes can then infect more birds as well as people, horses, and other mammals. However, humans, horses, and other mammals are “dead-end” hosts because they do not develop high enough levels of virus in their bloodstream to be able to pass the virus on to other biting mosquitoes.

About 20% of persons infected will develop WNV fever with symptoms that include fever, headache, rash, muscle weakness, fatigue, nausea, vomiting, and occasionally lymph node swelling. Fewer than 1% will develop a more severe illness, manifesting as WNV neuro-invasive disease (NID), including meningitis, encephalitis, and acute flaccid paralysis. WNV-associated meningitis usually involves fever, headache, and stiff neck. WNV-associated encephalitis is commonly associated with fever, altered mental status, headache, and seizures. Encephalitis usually necessitates a high level of specialized medical care. Long-term neurological and cognitive sequelae are not uncommon. Studies have found that only 37% of hospitalized NID patients achieve full recovery by one year [**1**].

After being infected with WNV, most people sustain a viremia and may remain asymptomatic. Starting in 2003, blood products have been screened for WNV utilizing polymerase chain reaction (PCR) testing to prevent transmission of WNV from asymptomatic blood donors to recipients. Organ donors are also screened by nucleic acid tests (NAT) and serology to prevent transplant-associated transmission. Additional routes of transmission that can occur include vertical transmission, transmission through breast milk, and occupational exposure.

Vector management programs are the most effective tools to prevent and control WNV and other arboviral diseases. These programs include environmental surveillance for WNV activity in mosquitoes, birds, horses, and other animals and mosquito control measures to reduce mosquito populations to decrease local spread. Currently, there is no human vaccine available for WNV, but several vaccines are under development. Important preventive measures against infection include the following:

- Apply insect repellant to exposed skin,
- When possible, wear long-sleeved shirts and long pants outdoors, especially for long periods of time,
- Stay indoors at dawn, dusk, and in the early evening, which are peak biting times for *Culex* mosquitoes, and
- Help reduce the number of mosquitoes in areas outdoors by draining sources of standing water.

This will reduce the number of places mosquitoes can lay their eggs and breed.

A wide variety of insect repellent products are available. The CDC recommends the use of products containing active ingredients that have been registered with the US Environmental Protection Agency (EPA) for use as repellents applied to skin and clothing. Products containing these active ingredients typically provide longer-lasting protection than others:

- DEET (N,N-diethyl-m-toluamide),
- Picaridin (KBR 3023), and
- Oil of lemon eucalyptus IR3535 (3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester)

2016 TRENDS AND HIGHLIGHTS

- There were 153 cases in 2016, a 49% decrease from the previous year. However, this was the fifth consecutive year in which LAC experienced above the overall average incidence (Figure 1). Previously, LAC demonstrated a cyclical pattern, peaking every four years.
- There were 35 cases (23%) of WNV fever and 108 cases (71%) of NID (Figure 2). There were 10 asymptomatic donors (7%) reported from local blood banks. Of 143 reported symptomatic WNV infections, six were fatal (4.2%). The six fatalities were aged 50 to 88 years old (median 76.5 years), and all but one had contributing medical history including hypertension and diabetes. The remaining case, the youngest fatality, denied any prior medical conditions.
- The age range of all infections was 17-92 years old with the largest proportion $\geq$65 years old (n=71, 46.4%). Incidence increased with age (Figure 3).
- The top three counts of WNV by SPA were SPAs 2 (San Fernando Valley, n=86, 56.2%), 3 (San Gabriel Valley, n=22, 14.4%), and 4 (Central LA, n=11, 7.2%) (Figure 5). In 2016, residents within the city of Los Angeles reported the most WNV infections (n=18, 12%) followed by Van Nuys (n=10, 7%) and North Hollywood (n=6, 4%).
- In 2016, WNV infections occurred from July to November with the last case experiencing symptom onset on the 29th of November. Peak onset in 2016 occurred in August (n=75, 49%). The five-year average indicates September as the month with the most frequent onset peak (Figure 6).
- Though WNV is primarily transmitted by infected mosquitoes, a case of transfusion-associated WNV infection was documented in 2016. The patient received blood products collected throughout the month of July from 30 donors, nearly all from the southern California region. Donor blood is screened in pools including multiple donors (MP-NAT) until the seasonal risk of WNV increases and individual screening is triggered (ID-NAT). The implicated donor's unit tested negative during the initial screen but tested positive 81 days post-donation. The blood bank will re-evaluate criteria for triggering individual testing [**2**].

REFERENCES

1. Klee, A., Maldin, B., Edwin, B., et al. Long-Term Prognosis for Clinical West Nile Virus Infection. *Emerg Infec Dis*,10 (8): 1405-1411.
2. Groves, J.A., Shafi, H., Nomura, J.H., et al. (2017). A probable case of West Nile virus transfusion transmission. *Transfusion*.

Reported WNV Infections and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
LAC, 2012-2016

	2012 (N=174)			2013 (N=165)			2014 (N=218)			2015 (N=300)			2016 (N=153)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1-4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5-14	2	1.1	0.2	6	3.6	0.5	0	-	-	3	1.0	0.2	0	-	-
15-34	24	13.8	0.9	19	11.5	0.7	23	10.6	0.8	34	11.3	1.2	13	8.5	0.5
35-44	17	9.8	1.3	15	9.1	1.1	15	6.9	1.1	28	9.3	2.1	14	9.2	1.1
45-54	33	19.0	2.6	34	20.6	2.6	44	20.2	3.4	41	13.7	3.1	26	17.0	2.0
55-64	34	19.5	3.3	46	27.9	4.5	55	25.2	5.2	53	17.7	4.8	29	19.0	2.6
65+	64	36.8	5.8	45	27.3	4.1	81	37.2	7.2	141	47.0	11.8	71	46.4	5.8
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race / Ethnicity															
Asian	9	5.2	0.7	6	3.6	0.4	11	5.0	0.8	7	2.3	0.5	8	5.2	0.6
Black	3	1.7	0.4	3	1.8	0.4	3	1.4	0.4	5	1.7	0.6	2	1.3	0.3
Hispanic	59	33.9	1.3	50	30.3	1.1	73	33.5	1.6	110	36.7	2.3	40	26.1	0.8
White	91	52.3	3.4	80	48.5	3.0	97	44.5	3.6	142	47.3	5.3	77	50.3	2.9
Other	2	1.1	-	2	1.2	-	0	-	-	1	0.3	-	3	2.0	-
Unknown	10	5.7	-	24	14.5	-	34	15.6	-	35	11.7	-	23	15.0	-
SPA															
1	10	5.7	2.6	15	9.1	3.8	2	0.9	0.5	4	1.3	1.0	3	2.0	0.8
2	73	42.0	3.4	62	37.6	2.9	60	27.5	2.7	92	30.7	4.1	86	56.2	3.8
3	47	27.0	2.9	23	13.9	1.4	34	15.6	2.1	46	15.3	2.8	22	14.4	1.3
4	18	10.3	1.6	6	3.6	0.5	28	12.8	2.4	41	13.7	3.5	11	7.2	0.9
5	8	4.6	1.3	2	1.2	0.3	24	11.0	3.7	30	10.0	4.5	5	3.3	0.8
6	2	1.1	0.2	4	2.4	0.4	13	6.0	1.3	15	5.0	1.4	5	3.3	0.5
7	13	7.5	1.0	24	14.5	1.8	45	20.6	3.4	59	19.7	4.5	9	6.0	0.7
8	3	1.7	0.3	29	17.6	2.7	11	5.0	1.0	13	4.3	1.2	9	6.0	0.8
Unknown	0	-	-	0	-	-	1	0.5	-	0	-	-	3	2.0	-

*Rates calculated based on less than 19 cases or events are considered unreliable.

**Figure 1. Incidence Rates* of West Nile Virus
LAC, 2004-2016**

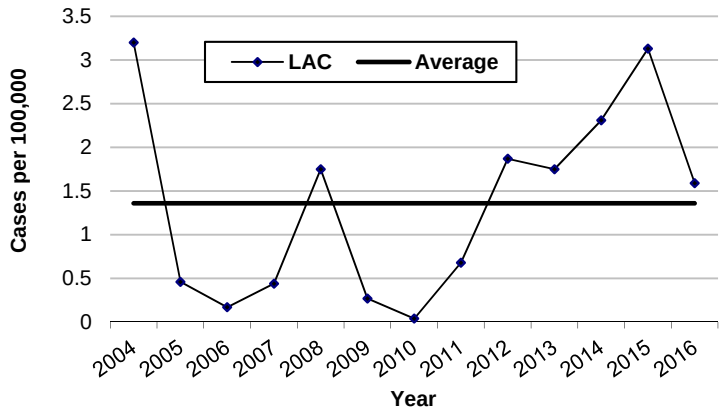


**Figure 2. Percentage of West Nile Virus Infections
by Presentation
LAC, 2016 (N=153)**

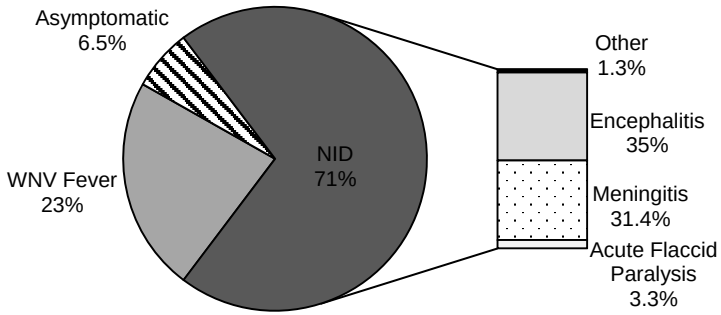


**Figure 3. Incidence Rates* of West Nile Virus Infection by
Age Group
LAC, 2016 (N=153)**

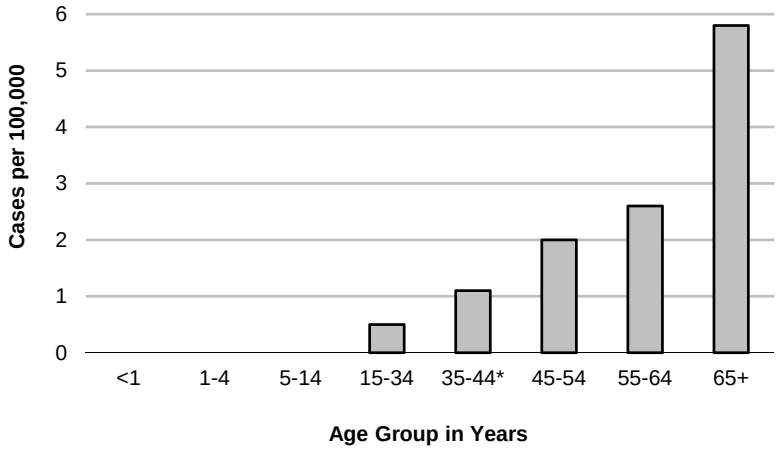


**Figure 4. West Nile Virus Incidence* by Race/Ethnicity
LAC, 2012-2016**

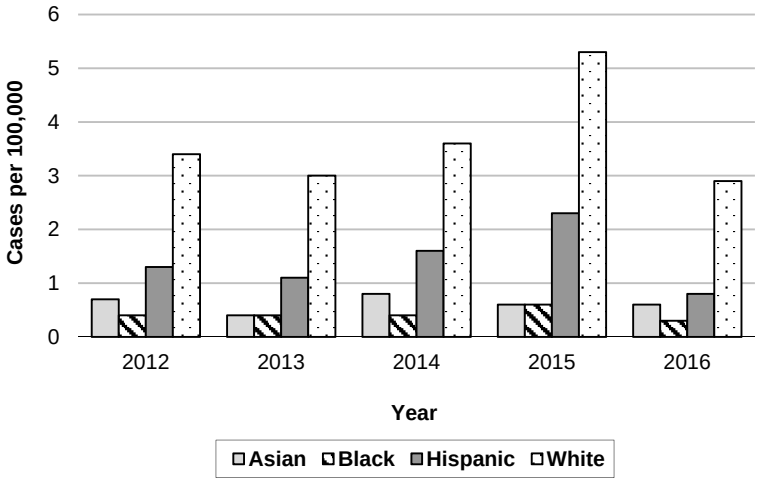


**Figure 5. Incidence Rates* of West Nile Virus by SPA
LAC, 2012-2016**

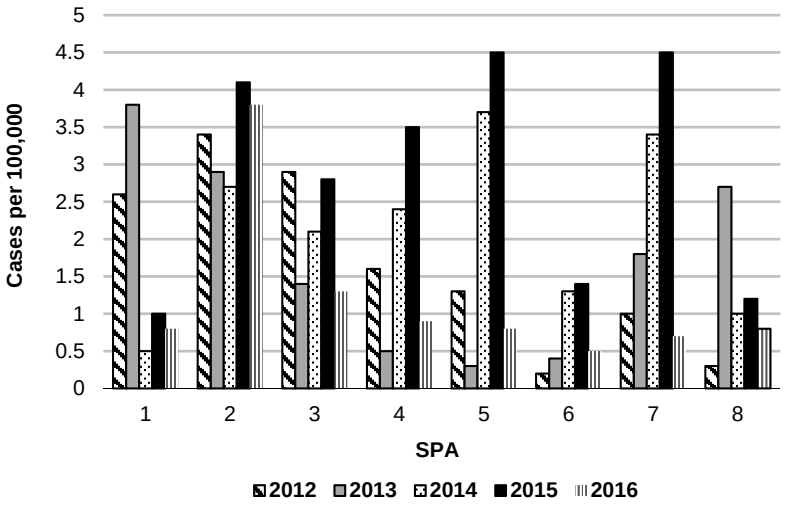
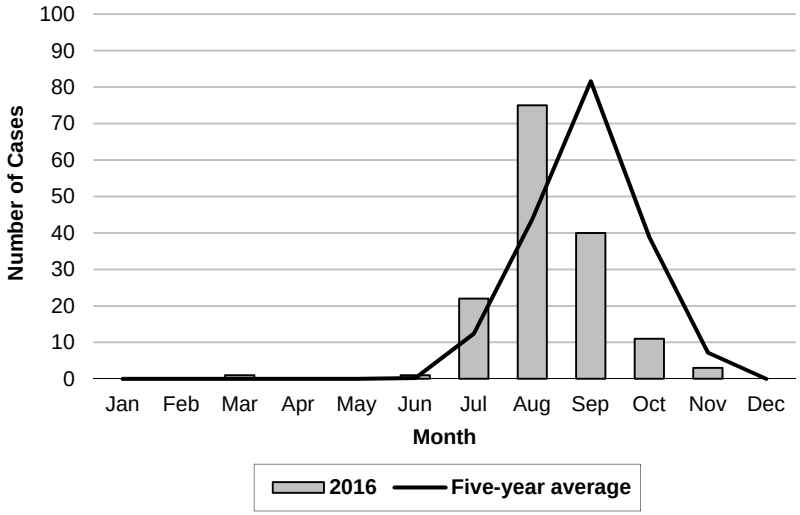
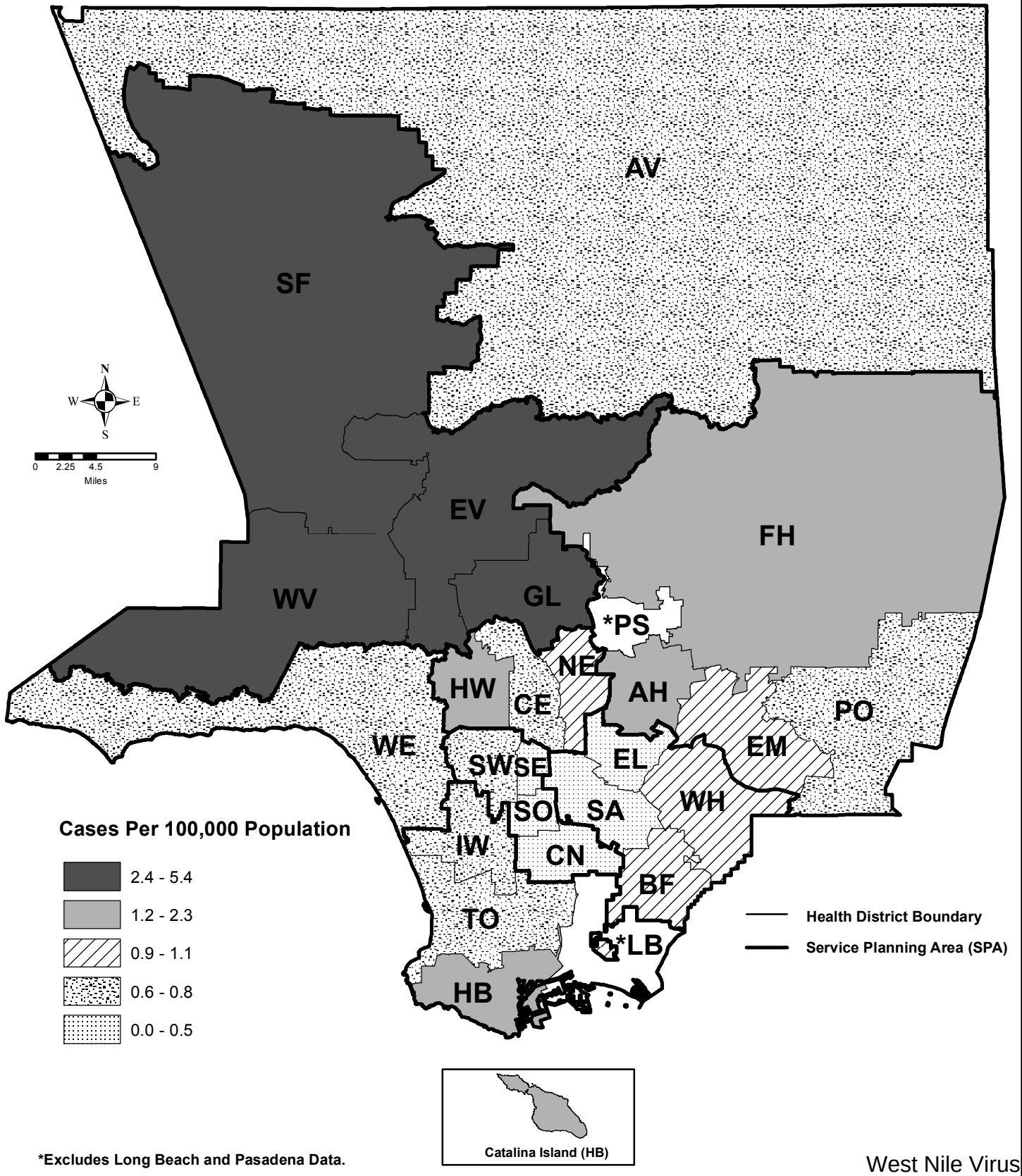


**Figure 6. Reported West Nile Virus Infections
by Month of Onset
LAC, 2016 (N=153)**



*Rates calculated based on less than 19 cases or events are considered unreliable.

Map 14. West Nile Virus
Rates by Health District, Los Angeles County, 2016*



*Excludes Long Beach and Pasadena Data.

DISEASE OUTBREAK SUMMARIES

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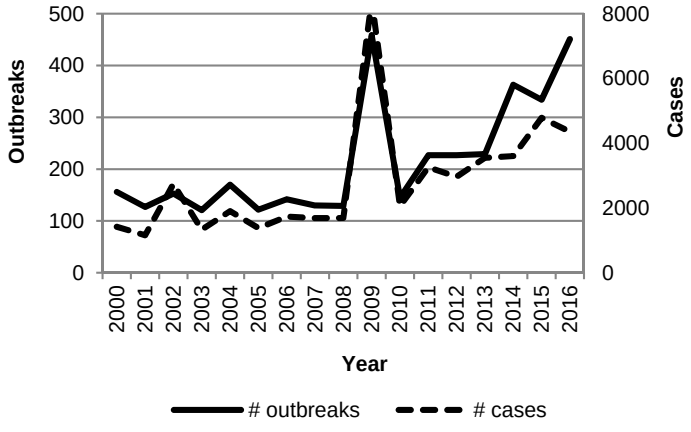
COMMUNITY-ACQUIRED DISEASE OUTBREAKS

ABSTRACT

- In 2016, 451 community-acquired disease outbreaks accounted for 4,359 cases. While overall number of outbreaks have reached the second highest level in 15 years, the cases per outbreak ratio is the third lowest during the same timeframe (Figure 1).
- Most (77%) of all outbreaks were from only two general disease categories: hand, foot, and mouth (HFM) (45%) and ectoparasites (31%). Gastroenteritis (GE) (11%) and respiratory (8%) rounded out the top four (Figure 2, Table 1).
- Preschools were the most common outbreak settings and accounted for 70% of confirmed outbreaks. Other outbreak locations were schools (18%) with the majority in elementary schools (17%) and residential/assisted living settings (8%) (Figure 3, Table 2).
- Hand, foot and mouth (HFM) disease increased its overall impact from 8% in 2015 to 45% in 2016.
- Only one outbreak was caused by disease condition (Coccidioidomycosis) that would be individually reportable (Tables 1, 2).

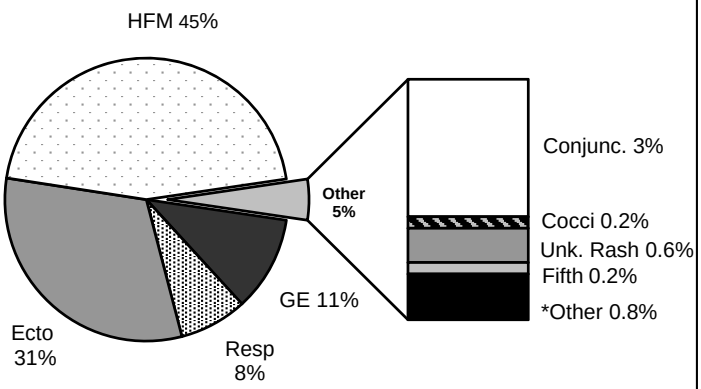
Figure 1
Community-Acquired Outbreaks
Number of Persons Affected
LAC 2000-2016



DATA

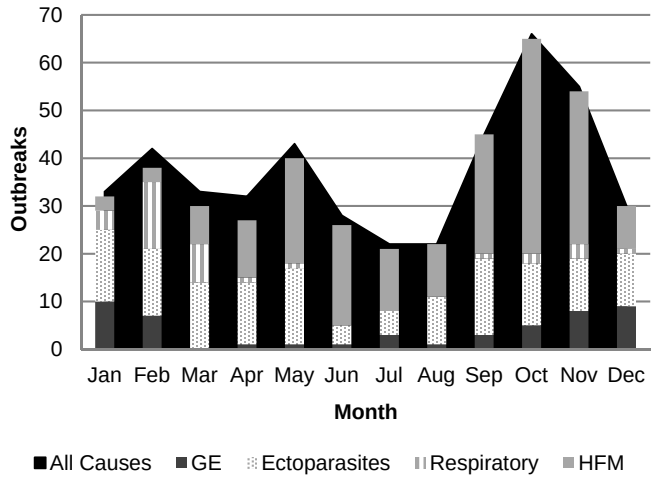
A disease outbreak is an infection/infestation clustered in place and time, with case numbers above expected for a specified population or location. Depending on the nature of the outbreak, the responsibility for the investigation is held by either ACDC or Community Health Services with ACDC providing as-needed consultation. The outbreaks reported in this section do not include outbreaks associated with food (see the Foodborne Outbreaks section) or facilities specifically regulated/licensed to provide medical care (see the Healthcare Associated Outbreaks section).

Figure 2
Community-Acquired Outbreaks by Type of
Disease* LAC, 2016 (N=451)



*Other disease categories includes: unspecified fever (2), Thrush (1), mixed symptoms (1).

Figure 4
Community-Acquired Outbreaks by Selected Disease and Report Month
LAC, 2016 (N=451)



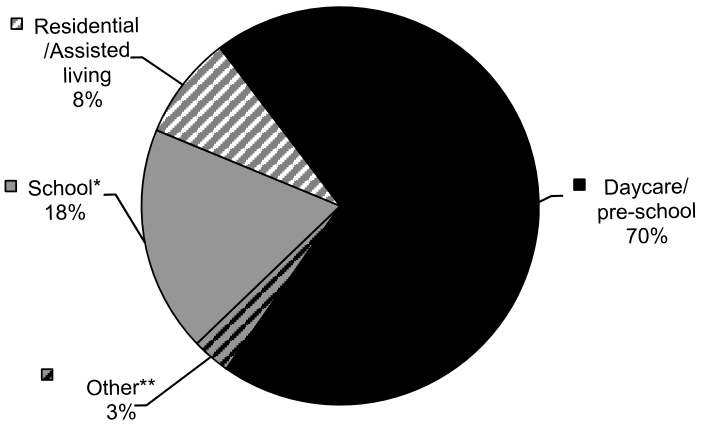
HFM was the most frequent reported outbreak etiology in 2016. A previous peak year for this disease was in 2013 when it accounted for 39% of the outbreaks that year (Figure 5). HFM is caused by human enteroviruses and are transmitted by person to person (both fecal-oral and the respiratory routes) or fomite-to-person transmission. Half of the 2016 HFM outbreaks were reported within a three-month period of September to November (Figure 4). Young children are most commonly affected by this disease; almost all HFM outbreaks were reported from preschools (83%) or elementary schools (16%). There were 1740 cases associated with the 204 outbreak (average 9, median 6). While there were a few larger outbreaks skewing the numbers, the most common outbreak size (mode) was 2 (34/204, 17%).

Ectoparasites, head lice and scabies, were the second most reported outbreak categories (n=142, 31%). Head lice (pediculosis) dominates the ectoparasites category with 133 reported outbreaks. Averaging 7 cases per outbreak (median of 4, mode 2), head lice tends to occur in the younger age groups with 95% of head lice outbreaks reported from either preschool (n=108) or elementary school (n=19). Reporting of head lice outbreaks has increased steadily over the past five years (annual outbreak counts of 21, 33, 49, 50, 80, and 100 from years 2010 to 2015, respectively), which has had an effect on the overall outbreak annual trends. (Figure 5).

Scabies outbreaks (n=9) were more common in the older risk group with 7 of the 9 reported in residential/assisted-living settings (Table 2). Most scabies outbreaks are small with a mean and median of 3 cases per outbreak.

The 49 **GE outbreaks** in 2016 were primarily caused by either an

Figure 3
Community-Aquired Outbreaks by Setting
LAC, 2016 (N=451)

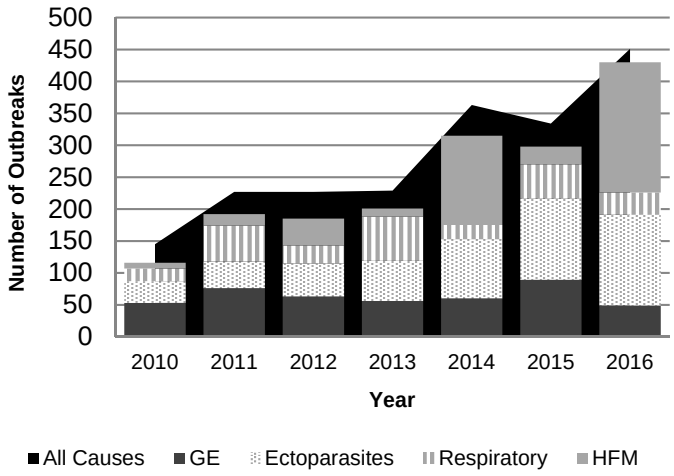


* **School** includes: elementary (75), middle school (4), high school (0), and universities (4).
** **Other** includes: rehab residence programs (2), maternal residential program (5), foster care facility (5) Special ed. school (1) and worksite (1).

undetermined etiology (n=42) or norovirus (n=7). GE outbreaks had the highest case per outbreak counts; norovirus outbreaks had a mean of 71 cases per outbreak (median 41) and unspecified GE outbreaks had 16 cases per outbreak (median 14) (Table 1). Many of the GE outbreaks of undetermined etiology had characteristics similar to the confirmed norovirus outbreaks, but specimens were not available for testing. The relative ability to obtain stool specimens from older individuals in a residential/assisted living facility compared with children in a school setting may be a factor that explains why the majority (71%) of norovirus were confirmed in the former setting (Table 2). The GE figures for 2016 highlight the continuing circulation of norovirus and reflect the ease this agent can be transmitted from person-to-person in community settings.

Reported **respiratory illness** outbreaks were seen predominately in the first part of 2016—74% were in the first three months of the year (Figure 4), and all of the 10 confirmed influenza outbreaks occurred in the same three-month timeframe. Respiratory outbreaks averaged 12 cases per outbreak with a median of 8. Most respiratory outbreaks were in elementary (46%) or preschools (29%). Only 2 of the 10 confirmed influenza outbreaks were in the residential/assisted living setting (Figure 1).

Figure 5
Community-Acquired Outbreaks by Selected Disease and Report year
LAC, 2010 - 2016

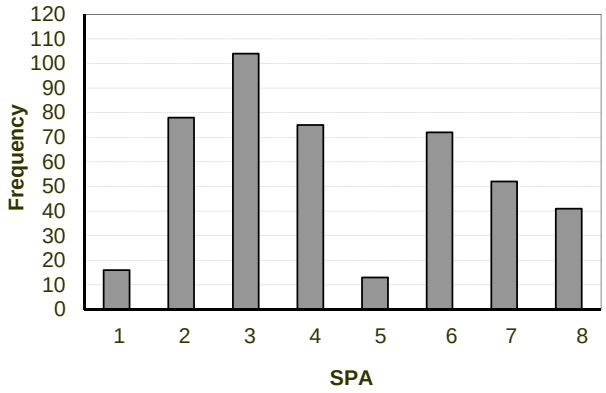


The graph of community-acquired outbreaks by report month (Figure 4) and the annual disease trends (Figure 5) further illustrates the impact of HFM, ectoparasites, GE, and respiratory outbreaks. These three disease categories accounted for the majority of outbreaks each month throughout the year and annually over many years.

Outbreaks were reported from all eight SPAs (Figure 6). SPA 3 had the most outbreaks (n=104).

COMMENTS

Figure 6
Community-Acquired Outbreaks by SPA
LAC, 2016 (N=451)



Outbreaks are most often reported from locations with the ability to recognize an unusual occurrence of illness/infestation in a group of individuals and have a procedure in place/knowledge to report to the local health department. This results in most community outbreaks being reported in schools including preschools and residential facilities.

Defining a cluster of illness as an outbreak can be problematic. With rare exception, a minimum of two cases occurring in time and with common exposure are required. Additionally, cases above the usual number or background is another measure used to define an outbreak situation. When ambiguity exists, whether the number of cases are usual or unusual, the situation is typically labeled as an outbreak. For the LAC DPH, all initial reports are considered suspect and are rapidly investigated. Even in situations where an outbreak designation is not met, rapid public health intervention can result in the mitigation of future cases and helpful relationships with facilities that may need public health assistance in the future.

There is a strong relationship between outbreak setting and the disease being reported. Characteristics of community-acquired outbreaks result from interactions among particular age groups, locations, and specific diseases. It is the epidemiologic characteristics of the three that lead to disease transmission and a potential outbreak. The predominance of outbreaks reported among children in educational settings (preschool to university) has been recognized in previous annual reports. In the preschool setting, HFM and pediculosis accounted for 88% of all preschool outbreak reports. While illness is often linked to schools, in some cases, the true association with the school might be solely related to where the illness was identified and reporting source rather than where the exposure/transmission occurred. Children who share a school setting often have other social interactions that could also account for the infection or infestation (e.g., sleepovers, parties, play dates, after school care, sports camps, etc.). However, regardless of the original exposure source, once cases are identified, schools need to be vigilant to prevent further transmission and can be greatly aided by the expertise of public health nurses in this effort.

The second most affected age group is an older population associated with residential/assisted living settings. In this older age category, GE and scabies accounted for almost all of the outbreaks (84%) (Table 2). Most of the confirmed norovirus outbreaks (71%) were in residential/assisted living sites.

Table 1. Community-Acquired Outbreaks by Disease
Los Angeles County, 2016

Disease	No. of outbreaks	No. of cases	Cases per outbreak mean/median	Cases per outbreak (range)
Gastroenteritis:				
Norovirus	7	495	70/41	27-215
Shigella	0	0	0	0
Salmonella	0	0	0	0
E. coli	0	0	0	0
GE -Unknown	42	686	16/14	3-43
Respiratory:				
Influenza	10	171	17/16	3-37
Streptococcal	4	24	6/4	3-13
Legionellosis	0	0	0	0
Resp.-Unknown	21	218	10/8	3-41
Ectoparasites:				
Pediculosis	133	884	7/4	2-134
Scabies	9	30	3/3	2-7
Others:				
Hand, Foot & Mouth Disease	204	1740	9/6	2-129
Conjunctivitis	12	50	4/4	2-9
Coccidioidomycosis	1	2	2/2	2
Fifth disease	1	3	3/3	3
Other*	7	56	8/4	2-23
Total	**334**	**4359**	**10/5**	**2-215**

* Includes: Unknown rash (3), Unspecified (3), and Thrush (1).

Table 2. Community-Acquired Outbreaks by Disease and Setting
Los Angeles County, 2016

Disease	Residential/ assisted living	School[a]	Preschool or Daycare	Other[b]	TOTAL
Gastroenteritis:					
Norovirus	5	2	0	0	**7**
Shigella	0	0	0	0	**0**
Salmonella	0	0	0	0	**0**
E. coli	0	0	0	0	**0**
GE Illness-Unknown	20	7	15	0	**42**
Respiratory:					
Influenza	2	5	1	2	**10**
Streptococcal	0	3	0	1	**4**
Legionellosis	0	0	0	0	**0**
Respiratory-Unknown	3	9	9	0	**21**
Ectoparasites:					
Pediculosis	0	21	108	4	**133**
Scabies	7	0	0	2	**9**
Other:					
Hand, Foot & Mouth Disease	0	33	169	2	**204**
Conjunctivitis	0	1	10	1	**12**
Coccidioidomycosis	0	0	0	1	**1**
Fifth disease	0	1	0	0	**1**
Other*	1	1	4	1	**7**
Total	**38**	**83**	**316**	**14**	**451**

[a] School includes: elementary (75), middle school (4), high school (0), and universities (4).
[b] Other includes: rehab residence programs (2), maternal residence program (5), foster care facility (5), Special ed. school (1), and worksite (1)
* Includes: Unknown rash (3), Unspecified (3), and Thrush (1).

FOODBORNE OUTBREAKS 2016

DESCRIPTION

Foodborne outbreaks are caused by a variety of bacteria, viruses, parasitic pathogens, and toxic substances. To be considered a foodborne outbreak, both the California Department of Public Health (CDPH) and the Centers for Disease Control and Prevention (CDC) require the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food [**1**].

The surveillance system used by LAC DPH for detection of foodborne outbreaks typically begins with a Foodborne Illness Report (FBIR). FBIRs can be submitted by calling the LAC DPH Communicable Disease Reporting System Hotline (888-397-3993) or via the internet[1]. The FBIR system monitors complaints from residents, illness reports associated with commercial food facilities, and foodborne exposures uncovered during disease-specific case investigations such as salmonellosis, shigellosis, and toxigenic *E. coli* including shiga toxin-producing *E. coli* (STEC). LAC Environmental Health Service's (EHS) Wholesale Food and Safety Program (WFS) investigates each FBIR by contacting the reporting individual and assessing the public health importance and need for expanded follow-up. When warranted, a thorough inspection of the facility is conducted. This public health action is often sufficient to prevent additional foodborne illnesses.

ACDC's Food Safety Unit also reviews all FBIRs. Joint investigations are conducted on possible foodborne outbreaks of public health importance. Typically, an epidemiologic investigation will be initiated when there are illnesses in multiple households, when there are multiple reports against the same establishment in a short period of time, or when there are ill individuals who attended a large event with the potential for others to become ill. The objective of each investigation is to determine the extent of the outbreak, identify a food vehicle or processing error, determine the agent of infection, and take actions to protect the public's health.

RESULTS

A total of 2,056 FBIRs were received in 2016, which is an 8.7% increase in reports compared to the 1,892 FBIRs received in 2015. Public reporting via the web accounted for 48% of FBIRs this year. WFS contacted each person who made the FBIR complaint. A total of 22% of FBIR reports were deemed high priority thus inspected by a WFS inspector. A majority of 65% of the complaints were referred to district EHS offices for inspection, and 7% were referred to other EHS specialty programs (Vehicle Inspection, Street Vending Compliance, Drinking Water, etc.), other LAC departments (Department of Weights and Measures), or agencies outside LAC (other local health jurisdictions, state agencies, federal agencies). There were 124 FBIRs (6%) on which WFS did not take action or were duplicates.

The ACDC Food Safety Unit conducted 17 outbreak investigations this year. Of these, 15 outbreaks were initiated by FBIR complaints, and 2 were initiated through other surveillance activities. Of the 17

[1] www.visualcmr.net/webvcmr/pages/public/pub_FBI_Report.aspx

investigations, 1 (13%) was not considered to be foodborne because the evidence collected during the investigation did not support a foodborne source (data not shown). This outbreak was due to norovirus, which can easily be spread person-to-person in a food setting if one sick guest attends. Another reason that this investigation was not considered to be a foodborne outbreak was because the illness pattern (epidemic curve) was consistent with person-to-person spread rather than point-source infection. Determining whether a food item was the source in such outbreaks can be challenging as well as time and resource consuming.

Figure 2. Number of Foodborne Outbreak Investigations by Month of Onset, 2016 and Five-Year Average

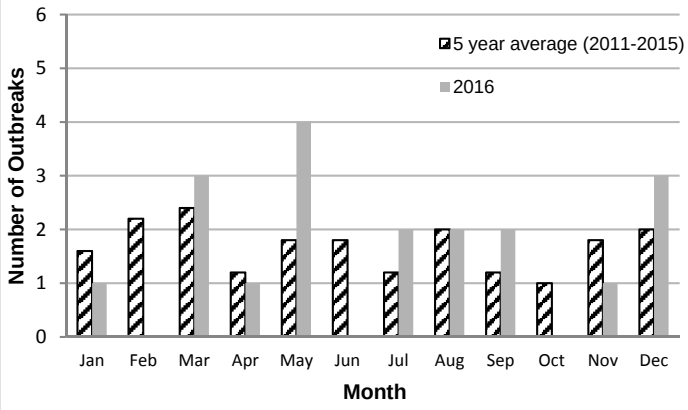
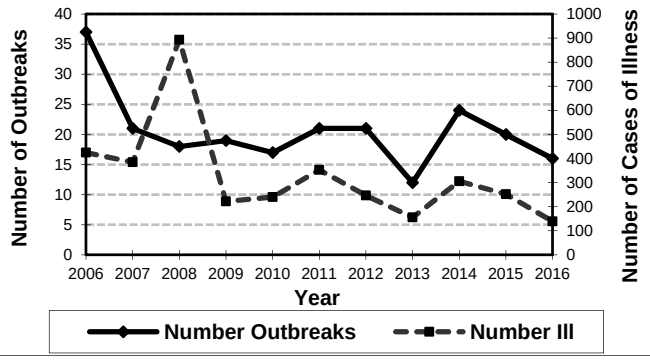


Figure 1. Foodborne Outbreaks Number of Persons Affected LAC, 2006–2016



The 16 outbreaks determined to be foodborne are listed in Table 1 and summarized below. These outbreaks represent 139 cases of foodborne illness (Figure 1), no hospitalizations, and no deaths. Outbreaks occurred throughout the year (Figure 2).

Etiology of Foodborne Outbreaks

<u>*Cooked food items*</u> Of the seven outbreaks where a food item was found to be associated with illness, three involved a food item that contained primarily cooked ingredients. Only two of these outbreaks (Outbreaks 120 and 369) were most likely due to a bacterial toxin. The implicated food items were carnitas (Outbreak 120) and mashed potatoes (Outbreak 369). The third outbreak (Outbreak 180) was due to salmonella. Although a cooked item, miso soup, was significantly associated with the illness—the source of the bacteria was most likely to have been a garnish such as green onions that was put in the dish after cooking.

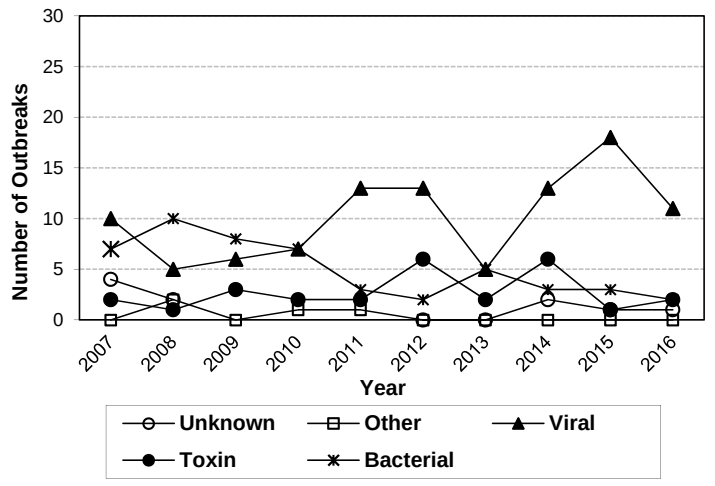
<u>*Uncooked food items*</u> The other four outbreaks in which a food item was identified involved uncooked food items (Outbreaks 140, 309, 426, and 571). In two of these, the etiologic agent was suspected to be a calicivirus such as norovirus. The implicated food items were raw oysters (Outbreak 140) and chicken salad (Outbreak 426). For Outbreak 140, the oysters appeared to have been contaminated prior to retail. The mode of contamination is less clear with Outbreak 426. The most likely explanation is that a food handler contaminated the salads during preparation.

Another outbreak involving uncooked food items was Outbreak 309. This was a confirmed outbreak of *Salmonella* Enteriditis. The event was catered by a friend, not a licensed caterer. This person did not have the kitchen capacity to handle the amount of food needed to feed over 100 guests. For this reason, the cilantro and onions that were implicated were most likely cross-contaminated during the food preparation.

Foodborne Agents

An etiological agent was identified in 15 of the 16 outbreak investigations this year and confirmed in 6 (38%) (Table 1). A viral agent was responsible for 11 outbreaks, bacterial agents for 2 outbreaks, and bacterial toxins for 2 outbreaks (Figure 3).

Figure 3. Foodborne Outbreaks by Etiologic Agent Category (Laboratory-Confirmed and Suspect)
LAC, 2007–2016



Norovirus Outbreaks

Norovirus was confirmed or suspected in 11 foodborne outbreaks this year (69%), which is less than was observed in 2015 and about average for the past 10 years (range: 5-18).

There were two large, laboratory-confirmed foodborne norovirus outbreaks this year. Similar to a large norovirus outbreak last year, the first large norovirus outbreak of 2016 (Outbreak 140) involved at least 11 cases who ate at an all-you-can-eat-sushi restaurant in LAC. The incubation times were consistent with a point-source outbreak, and raw oysters were significantly associated with illness. A minority of three patrons tested positive for norovirus. The oysters also tested positive for norovirus.

The second large laboratory-confirmed norovirus outbreak involved several unrelated parties who ate food at a buffet-style restaurant (Outbreak 530). The symptoms and incubation periods were consistent with a point-source outbreak. No food item was implicated in this outbreak. However, two food handlers tested positive for norovirus and probably contaminated the food or other common surfaces in the restaurant.

Bacterial Outbreaks

Salmonella Enteriditis was confirmed in two outbreaks this year (Outbreaks 180 and 309). The first salmonellosis outbreak (Outbreak 180) occurred in persons eating at a restaurant that serves sushi. A total of five confirmed and three probable cases ate at the restaurant during the same time period.

Unfortunately, no common food item was identified, and none of the restaurant employees tested positive for *S.* Enteriditis.

The second *S.* Enteriditis outbreak occurred in people who attended a wedding reception at a community center. Food for this event was provided by an unlicensed caterer. Of the 27 persons who agreed to be interviewed, 16 persons became ill. Of these 16, 11 sought medical care, and 4 tested positive for *S.* Enteriditis. The suspected food items were chopped onions and cilantro, which were likely contaminated through cross-contamination with raw meat or chicken.

Other Foodborne Outbreaks

There were two outbreaks in which a bacterial toxin was identified as the likely etiology (Outbreaks 120 and 369). In the first outbreak (Outbreak 120), six cases ate together at a social gathering that was catered by an LAC caterer. The likely agent was *Clostridium perfringens*, and the implicated food source was carnitas. The second outbreak (Outbreak 369) involved at least 27 cases who attended a birthday party held at a banquet hall and catered by a different LAC caterer—the likely food source was mashed potatoes. For both outbreaks, the symptoms and duration of illness reported by cases were consistent with ingestion of a toxin secreted by bacteria such as *Bacillus cereus* [**2**]. Although the etiology of these outbreaks were not laboratory-confirmed, the incubation times of cases were consistent with a point-source exposure involving a bacterial toxin with exposure occurring at the time that the attendees reported eating food at the gathering.

Outbreak Locations

Exposure locations for reported foodborne outbreaks included restaurants (12), banquet halls (2), a supermarket, and a bowling alley. This year SPA 7 reported the largest number of outbreaks (n=7, 44%) (Table 2). This is a change from SPA 2 reporting the largest proportion of foodborne outbreaks since 2010, except in 2014.

State and National Investigations Involving LAC

ACDC staff assisted state and federal investigators with 63 *Salmonella*, 5 STEC, and 2 *Listeria* cluster investigations that required additional investigation such as specialized interviews, product trace-back, and extra laboratory testing.

Table 1. Foodborne Outbreak Investigation 2016 (N=16)

	Agent	Laboratory-Confirmed *	OB#	Setting	# Cases	HD	Food Implicated
1	Norovirus	No	19	Restaurant	4	Monrovia/Foothill	Sashimi salad
2	*Clostridium perfringens*	No	120	Restaurant	6	Bellflower	Carnitas

3	Norovirus	No	133	Restaurant	4	Bellflower	none
4	Norovirus	Yes	140	Restaurant	11	Whittier	Raw oysters
5	*Salmonella* Enteriditis	Yes	180	Restaurant	8	San Fernando	Miso soup
6	Norovirus	No	210	Restaurant	5	Pomona	none
7	Norovirus	Yes	297	Restaurant/ Buffet	8	Glendale	none
8	*Salmonella* Enteriditis	Yes	309	Banquet Hall	16	Whittier	cilantro, onions
9	Norovirus	Yes	320	Bowling Alley	5	Bellflower	none
10	Norovirus	No	328	Restaurant	4	West	none
11	*Bacillus cereus*	No	369	Banquet Hall	11	Whittier	Mashed potatoes
12	Norovirus	No	426	Restaurant	7	Foothill	chicken salad
13	Norovirus	Yes	530	Restaurant	13	Bellflower	none
14	Norovirus	No	565	Restaurant	7	Torrance	none
15	Norovirus	No	567	Restaurant	4	West	none
16	Unknown	No	571	Market/ Private homes	26	South	masa

*Etiology of the outbreak was confirmed with two or more patrons having positive laboratory results for the infectious agent.

Table 2. Frequency of Foodborne Outbreaks by Service Planning Area or Location, LAC, 2016 (N=16)

SPA	Frequency	Percent
1	0	0%
2	2	13%
3	3	18%
4	0	0%
5	2	13%
6	1	6%
7	7	44%
8	1	6%

ADDITIONAL RESOURCES

LAC resources

- Communicable Disease Reporting System
  Hotline: (888) 397-3993
  Fax: (888) 397-3779
- For reporting and infection control procedures consult the LAC DPH ACDC website:
  www.publichealth.lacounty.gov/acd/index.htm

CDC

- Division of Foodborne, Waterborne, and Environmental Diseases (DFWED)
  www.cdc.gov/ncezid/dfwed/
- Outbreak Response and Surveillance Team
  www.cdc.gov/foodsafety/outbreaks/index.html
- FoodNet
  www.cdc.gov/foodnet
- Norovirus Information
  www.cdc.gov/norovirus/index.html

Other national agencies

- FDA Center for Food Safety and Applied Nutrition
  www.fda.gov/AboutFDA/CentersOffices/OfficeofFoods/CFSAN/
- Gateway to Government Food Safety Information
  www.FoodSafety.gov

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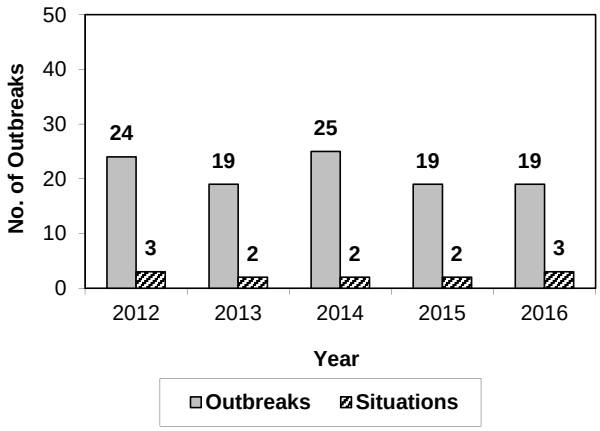
HEALTHCARE-ASSOCIATED OUTBREAKS
GENERAL ACUTE CARE HOSPITALS

DEFINITION

This chapter will discuss healthcare-associated outbreaks and situation events that occurred within the general acute care hospital setting on any patient unit, sub-acute, or specialty area within the facility (surgical suites or procedure rooms). An outbreak in such settings is defined as a cluster of infections or colonizations related in time and place or occurring above a baseline or threshold level for a defined area of a facility, including the entire facility, specific unit, or ward. Baseline is relative to what is normally observed in a particular setting.

Figure 1.
General Acute Care Hospital Outbreaks and Situation Events
LAC, 2012–2016



A situation event is defined as a cluster of infections or colonizations in the setting of a general acute care hospital that may not clearly meet all outbreak criteria defined above or that requires additional information to determine if an outbreak has occurred.

ABSTRACT

There were 19 confirmed outbreaks reported in acute care hospitals in 2016 (Figure 1). Most (n=11, 58%) occurred in a unit providing intensive or focused specialized care (long-term acute care, oncology, cardiology, and neonatal intensive care unit (NICU)). An outbreak of post-operative prosthetic joint infections involved patients who became positive with methicillin-resistant *Staphylococcus aureus* (MRSA) or methicillin-sensitive *Staphylococcus aureus* (MSSA) after an orthopedic procedure (Table 2). A majority of two-thirds (63%, n=12) of acute care hospital outbreaks were of bacterial etiology, often from a multi-drug-resistant organism (MDRO) such as MRSA as shown in Table 2 and Figure 2. Scabies accounted for the greatest number of outbreaks (n=5) followed by Legionellosis (n=3) and MRSA (n=2). A total of four situation events were investigated in acute care hospitals in 2016 (Table 4).

Table 1.
General Acute Care Hospital Outbreaks by Unit
LAC, 2016 (N=19)

Outbreak Location	No. of Outbreaks
Cardiac	2
Cardiac - Pediatrics	1
Hematology/oncology	2
GI Lab	1
Intensive Care – Adult	1
Intensive Care- Neonatal	4
Long-term acute care	1
Multiple units	4
Orthopedic	1
Sub-acute Unit	2
Total	**19**

Table 2.
General Acute Care Hospital Outbreaks by Disease/Condition/Etiologic Agent
LAC, 2016

Disease/Condition/ Etiologic Agent	No. of Outbreaks	No. of Cases
Burkholderia cepacia	1	3
Clostridium difficile	1	7
CRE *E. coli*	1	2
Enterobacter cloacae	1	3
Legionellosis	3	8
Mycobacterium chimaera	1	4
Norwalk-Like Virus	1	15
*Salmonellosis (*Non-Typhoid*)*	1	4
Staphylococcus aureus	1	4
Methicillin-Resistant *Staphylococcus aureus*	2	11
Respiratory Syncytial virus	1	3
Scabies	5	28
Total	**19**	**92**

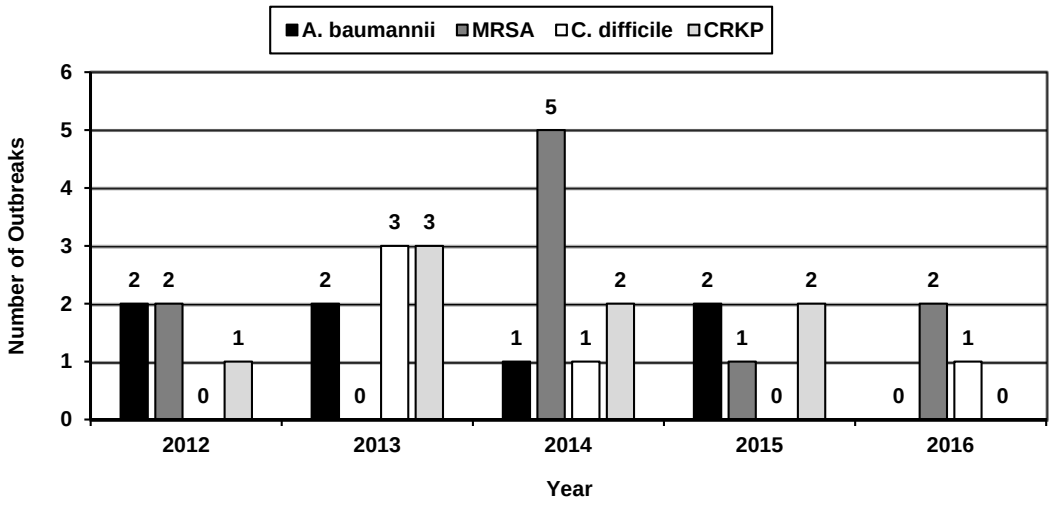
Table 3.
General Acute Care Hospital Situation Events by Unit
LAC, 2016 (N=4)

Outbreak Location	No. of Events
Emergency Room	1
ICU	1
Multiple Units	2
Total	**4**

Table 4.
General Acute Care Hospital Situation Events by Disease/Condition
LAC, 2016

Disease/Condition/ Etiologic Agent	No. of Events	No. of Cases
Aspergillus	1	2
Burkholderia cepacia	1	5
M. mucogenicum	1	29
Unknown GI	1	3
Total	**4**	**39**

Figure 2.
Outbreaks of Selected Bacterial Infections
by Year, LAC, 2012 - 2016



COMMENTS

Healthcare-associated infections (HAI), patient safety, antibiotic resistance, pay-for-performance, safe medication practices, outcomes measurement, healthcare transparency, and patient notification are all terms that describe the complexity of today's healthcare system. These words are part of the national discourse between hospitals, healthcare providers, government agencies, and consumers of healthcare services. In 1999, the Institute of Medicine (IOM) report "To Err is Human: Building a Safer Health System" voiced concerns surrounding preventable infections that led to public awareness which drove Federal and State legislation to overhaul the system. The authors state "…errors are caused by faulty systems, processes and conditions that lead people to make mistakes or fail to prevent them" [**1**].

In 2015, The National Patient Safety Foundation explored patient safety after the IOM report. The authors noted that "Despite progress in the past 15 years, patient safety remains an important public health issue. Preventable harm remains unacceptably frequent—in all settings of care and among all patient populations…Patient safety is a public health issue that requires the full attention of the health care system" [**2**].

Even though there is heightened awareness and significant efforts by the healthcare team to prevent HAI, these infections continue to occur. In 2016, we investigated three complex outbreaks that involved cleaning, disinfection or reprocessing of a reusable medical device, and/or sterilization of surgical

instruments. In each outbreak, infections occurred after a surgical or diagnostic procedure. According to Anderson, Podgorny, and Berrios-Torres, et.al., surgical site infections (SSI) make up approximately 20% of total HAI in U.S. hospitals [**3**].

Heater-cooler devices (HCD) were implicated in a multi-state outbreak caused by *Mycobacterium chimaera* (*M. chimaera*) in post-cardiac surgery patients. These medical devices are used with heart bypass machines to control body temperature during cardiac surgery. Although the devices have closed water circuits that do not come in contact with the patient, the HCD can aerosolize particles and transmit mycobacteria from a contaminated HCD [**4**]. *M. chimaera* is a slow growing, non-tuberculous mycobacteria (NTM), and patients may not develop symptoms for months or years after exposure. The slow growth and late identification of the organism in post-cardiac surgery patients led the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), and state health departments to issue health alert notices to hospitals, patients, and providers. Hospitals were directed to provide post-open heart surgery patients with written notification of the potential exposure and available screening options. Additional guidance instructed hospitals on follow-up management including to assess the use of HCD in the facility, to remove implicated or contaminated devices, and to report all cases to the Food and Drug Administration (FDA) MedWatch system. Health Departments were advised to track reports from hospitals about potential infections associated with the devices [**5**].

An outbreak of deep prosthetic joint surgical site infections of multiple organisms including MRSA, MSSA, and *Staphylococcus epidermidis* was reported by a local hospital. All cases had an orthopedic surgical procedure prior to the onset of symptoms, which ranged from three to five weeks post-operative. For some cases, the infection resulted in a second surgery. Multiple on-site investigations conducted by ACDC revealed significant lapses in infection control practices by staff in the operating room as well as the sterile processing department including inadequate instrument cleaning in the sterile processing department, inconsistent, out-of-date, or lack of policy/procedures for sterilization practices for reusable surgical instruments, and not cleaning according to the manufacturer's instructions for use.

Carbapenem-resistant *Escherichia coli* (*E. coli*) was identified in two patients during retrospective review of duodenoscope-associated infections by the infection preventionist. Both patients had undergone an endoscopic retrograde cholangiopancreatography (ERCP) procedure with the same duodenoscope, an endoscope used to visualize the lower gastrointestinal tract. It is a fairly critical item that requires high-level disinfection. After its use, the duodenoscope is manually cleaned, disinfected, and reprocessed. Reprocessing is a detailed, multi-step process to clean and disinfect or sterilize reusable devices and can result in infection transmission if reprocessing instructions are not followed in every step of the process [**6**]. In 2015, several multi-state outbreaks after ERCP were reported including three outbreaks that were reported in LAC [**7**]. Typically, an outbreak that involves a reusable medical device occurs when staff do not methodically follow all cleaning, disinfection, and reprocessing steps. However, in several instances, the outbreak occurred despite evidence of proper cleaning, disinfection, and reprocessing. Rutala and Weber found that "… the complex design of duodenoscopes, used primarily for ERCP, may impede effective reprocessing…these recent outbreaks occurred even when the manufacturer's instructions and professional guidelines were followed correctly" [**8,9**]. The FDA, CDC, infection prevention professional

organizations and scope manufacturers continue to collaborate to update and revise scope cleaning and reprocessing guidelines.

One HAI prevention strategy implemented in 2016 was to conduct onsite visits to healthcare facilities to assess staff infection control practices. ACDC staff completed onsite Infection Control Assessment and Response (ICAR) visits at 18 selected acute care hospitals. All ICAR visits included review of infection control policies and training activities as well as direct observations of healthcare personnel practices. At the conclusion of each visit, preliminary recommendations were provided during an exit interview with the facility's/provider's infection control staff and management. Within one month, a detailed summary was provided with recommendations specific to their observed gaps.

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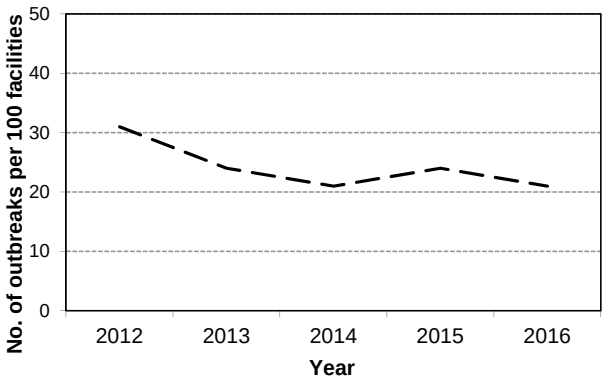
HEALTHCARE-ASSOCIATED OUTBREAKS
SUB-ACUTE CARE FACILITIES

DEFINITION

Healthcare-associated outbreaks are defined as clusters of infections in healthcare settings 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 specific setting.

Figure 1.
Skilled Nursing Facility Outbreak Rates
LAC, 2012 – 2016*



*The total number of licensed SNFs, 399, was utilized to calculate the 2012 to 2016 SNF outbreaks per 100 facility rate.

Sub-acute care is defined as a level of care needed by a patient who does not require hospital acute care but who requires more intensive skilled nursing care than is provided to most patients in a skilled nursing facility. Pediatric sub-acute care is defined as a level of care needed by a person <21 years old who uses medical technology that compensates for the loss of a vital bodily function. Sub-acute patients are medically fragile and require special services such as inhalation therapy, tracheotomy care, intravenous tube feeding, and complex wound management care[1]. The sub-acute care facilities include skilled nursing facilities (SNF), intermediate care facilities, and psychiatric care facilities. SNFs provide continuous skilled nursing care and supportive care to patients whose primary need is for availability of skilled nursing on an extended basis. Intermediate care facilities also provide inpatient care to patients who have need for skilled nursing supervision and need supportive care but who do not require continuous nursing care. Psychiatric care facilities provide 24-hour inpatient care for patients with psychiatric care needs.

ABSTRACT

- The total number of confirmed sub-acute care associated outbreaks in 2016 decreased by 5% (from 96 to 91 outbreaks) from the previous year.

- In 2016, the number of SNF outbreaks reported decreased by 15% (from 94 to 84 outbreaks) from the previous year (Table 1). The rate of SNF outbreaks was 21 per 100 facilities in 2016 compared with 24 per 100 in 2015. (Figure 1).

- Outbreaks occurred in intermediate care facilities, psychiatric care facilities, and SNFs in 2016 (Table 1).

[1] http://www.dhcs.ca.gov/provgovpart/Pages/SubacuteCare.aspx

Table 1. Number of Reported Outbreaks in Sub-Acute Healthcare Facilities LAC, 2012–2016

Type of Facility	YEAR 2012	2013	2014	2015	2016
Intermediate Care Facilities	2	1	3	1	3
Psychiatric Care Facilities	3	1	-	1	4
Skilled Nursing Facilities	119	96	82	94	84
Total	124	98	85	96	91

Intermediate Care Facilities: A total of three outbreaks were reported by intermediate care facilities in 2016. These were 1 unknown rash illness outbreak with 3 cases and 2 outbreaks of ring worm with 14 cases.

Psychiatric care facilities: A total of four outbreaks were reported by psychiatric care facilities in 2016. There was only one scabies outbreak with 2 cases, one atypical scabies outbreak with 1 case, one norovirus outbreak with 30 cases, and one unknown gastroenteritis outbreak with 17 cases were reported.

Skilled Nursing Facilities: A large total of eighty-four outbreaks were reported by SNFs. Rash illness outbreaks were the most frequently reported outbreak category with 41 (49%) outbreaks with 257 cases. Rash illness outbreaks were also most frequently reported with 36 (38%) outbreaks with 392 cases in 2015.

Table 2. All Sub-Acute Healthcare Facilities Outbreaks by Disease/Condition LAC, 2016

Disease/Condition	No. of Outbreaks	No. of Cases
Gastroenteritis (GE)	(N=24)	(N=570)
• Unspecified	4	97
• Norovirus	18	469
• *Clostridium difficile*	2	4
Rash Illness	(N=48)	(N=287)
• Atypical Scabies	14	39
• Scabies	18	123
• Ring worm	2	24
• Unknown Rash	14	101
Respiratory Illness	(N=19)	(N=355)
• Unspecified	5	94
• Influenza	13	259
• *Legionella*	1	2
Total	**91**	**1212**

COMMENTS

In 2016, the total number of outbreaks within sub-acute care facilities decreased by 5% as compared to the previous year. Rash illness was the most frequently reported outbreak category (53%), and gastroenteritis outbreaks contributed the greatest number of outbreak-associated illnesses (26%).

The total number of reported rash illness outbreaks increased by 25% in 2016 compared to 2015 from 36 to 48 outbreaks. A total of forty-eight rash illness outbreaks were investigated with a total of 287 cases. Of 48 rash illness outbreaks, fourteen (29%) outbreaks were atypical scabies, 18 (38%) outbreaks were scabies, 14 (29%) outbreaks were unknown rash, and 2 (4%) outbreaks were ring worms. Service Planning Area (SPA) 3 reported the most number of rash illness outbreaks (n=18, 38%), followed by SPA 2 (n=8, 17%).

The total number of reported respiratory outbreaks decreased by 39% (from 31 to 19 outbreaks) as compared to the previous year. The interim vaccine effectiveness (VE) estimates indicate 2015-2016 seasonal flu vaccine reduced a vaccinated person's risk of getting sick and having to go to the doctor because of flu by about half (48%)[2]. Influenza A (H3N2) viruses have been most common overall this season. A total of nineteen respiratory outbreaks were investigated causing 355 cases of outbreak-associated illness. Of the 19 outbreaks, 13 (68%) were caused by influenza virus, 5 (26%) were due to unknown etiologies, and 1 (5%) was caused by *Legionella*. Respiratory outbreaks were classified as influenza if there was at least one case of laboratory-confirmed influenza in the setting of a cluster of ILI within a 48-72hour period.

The total number of reported gastroenteritis (GE) illness outbreaks decreased by 17% (from 29 to 24 outbreaks) as compared to the previous year. A total of twenty-four GE outbreaks were investigated causing 570 cases of outbreak-associated illness. Of the 24 outbreaks, 18 (75%) were caused by laboratory-confirmed norovirus, 4 (17%) unknown GE, and 2 (8%) *Clostridium difficile* outbreak. SPA 3 reported the most GE outbreaks of any LAC DPH SPA since 2008 with 6 (25%). Per the Centers for Disease Control and Prevention (CDC), health care facilities, including nursing homes and hospitals, are the most commonly reported settings for norovirus outbreaks in the US and other industrialized countries. Over half of all norovirus outbreaks reported in the US occur in long-term care facilities. The virus can be introduced into healthcare facilities by infected patients—who may or may not be showing symptoms—or by staff, visitors, or contaminated foods. The duration of outbreaks in these settings can be quite long, sometimes lasting months. Illness can be more severe, occasionally even fatal, in hospitalized or nursing home patients compared with otherwise healthy people[3].

Sub-acute facility outbreaks were investigated and documented from all LAC SPAs, except from SPA 1 in 2016. The greatest proportion of outbreaks were investigated within SPA 3 with 28 (31%) followed by SPA 2 with 22 (24%).

PREVENTION

Most outbreaks in sub-acute care facilities are caused by agents spread by person-to-person contact. Thus, appropriate hand hygiene practice by staff, residents, and visitors is a crucial infection control measure. Influenza vaccination for sub-acute facility staff and residents as well as proper hand washing,

[2] CDC, Situation Update: Summary of Weekly FluView Report http://www.cdc.gov/flu/weekly/summary.htm
[3] CDC. Norovirus U.S. Trends and Outbreaks http://www.cdc.gov/norovirus/trends-outbreaks.html

administrative controls, utilization of appropriate antiviral treatment and prophylaxis for facility residents and staff, and isolation are essential in the prevention of seasonal influenza.

The ACDC's Skilled Nursing Facility (SNF) Outreach Program (OP) continues to engage in collaborations with stakeholders, provide assistance and health education, and develop resources to prevent infections, strengthen outbreak detection and response, and address other acute communicable disease issues in SNFs. The ACDC's SNF OP created SNF webpage "Skilled Nursing Facilities: Infection Prevention Resources and Guidance central guide to education and events relevant to improving infection prevention at your SNF" at ACDC's website to provide resources on-line[4].

As part of our influenza prevention efforts, ACDC SNF OP sent a reminder letter to SNFs prior to the 2015-2016 influenza season to comply with the Health Officer Order (HOO), issued October 2, 2013, which mandates that healthcare personnel in acute care hospitals, long term care facilities, and intermediate care facilities in LAC be vaccinated against influenza or wear a protective mask. A toolkit for influenza vaccination programs in SNFs[5] and the *Influenza Outbreak Prevention and Control Guidelines for Skilled Nursing Facilities*[6] are available to provide a standardized guidance for CHS when conducting influenza and respiratory outbreak investigations in SNFs, and to provide guidance to SNFs an effective approach to the prevention and control of influenza. The printed guidelines are available and they were distributed to CHS Public Health Nurses (PHNs), and staff at SNFs during outreach activities.

To assist sub-acute care facilities with management of scabies outbreaks, LAC DPH's *Scabies Prevention and Control Guidelines Acute and Long-Term Care Facilities* updated 2015[7] is available to provide a rational approach to the prevention and control of scabies in LAC healthcare facilities. The printed guidelines are available and they were distributed to CHS PHNs and staff at SNFs during outreach activities.

The "Norovirus Outbreak Prevention Toolkit", which was developed in the spring of 2012 by ACDC in collaboration with CHS, Health Facilities Inspection Division, Licensing and Certification Program, and Environmental Health in response to an increasing number of GE outbreaks reported by sub-acute facilities. The printed guidelines were distributed to CHS PHNs and SNFs during outreach activities[8].

In collaboration with Greater LA Association for Professionals in Infection Control and Epidemiology (APIC), ACDC presented the 2016 Symposium on Infection Prevention and Control in Skilled Nursing Facilities on September 28, 2016 at the California Endowment. The symposium was designed to provide nursing staff, infection preventionists, and administrators with resources and strategies to prevent and control communicable disease outbreaks within SNFs such as legionella in SNFs, management of multi-resistant drug organisms (MDROs), and implementation of Antimicrobial Stewardship Program in SNF setting.

[4] http://publichealth.lacounty.gov/acd/SNF.htm
[5] www.publichealth.lacounty.gov/acd/SNFToolKit.htm
[6] www.publichealth.lacounty.gov/acd/InfluenzaOBGuidelines.htm
[7] www.publichealth.lacounty.gov/acd/Diseases/ScabiesToolkit.htm
[8] www.publichealth.lacounty.gov/acd/docs/Norovirus/NoroToolkit2012.pdf

At 2016 SNF symposium, ACDC provided printed copies of many useful resources and materials including the *Influenza Outbreak Prevention and Control Guidelines for SNFs*, *Norovirus Outbreak Prevention Toolkit*, *Scabies Prevention and Control Guidelines for Acute and Long-Term Care Facilities, APIC Infection Preventionist's Guide to Long-Term Care, 2013,* and Antimicrobial Stewardship posters to each SNFs in attendance.

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC HEALTH
ACUTE COMMUNICABLE DISEASE CONTROL PROGRAM
2016*

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ACUTE COMMUNICABLE DISEASE CONTROL
2016 ANNUAL MORBIDITY REPORT

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- Campylobacteriosis ..... Leticia Martinez, RN, PHN, MPA
- Coccidioidomycosis ..... Merle Baron, BSN, RN, PHN
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- *E. coli*—Shiga Toxin-Producing (STEC) ..... Leticia Martinez, RN, PHN, MPA
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ACUTE COMMUNICABLE DISEASE CONTROL PROGRAM PUBLICATIONS, PRESENTATIONS, AND AWARDS 2016

Awards

Emily Kajita. Advanced SAS Programming Award. LAC DPH SAS Users Meeting & Awards Presentation.

Emily Kajita, Michael Lim, Monica Luarca, Rachel Viola and Han Wu. Group SAS Awards. Third SAS Users Meeting.

Karen Young Cho, Christine Selzer, and Elizabeth Traub. Honorable Mention for Innovation and Sustainable Category for ARIS Unit. Bureau of Medical Director Disease Control.

Kelsey Oyong. 2016 LAC DPH Science Summit Best Poster Presentation. The State of Infection Prevention in Los Angeles Ambulatory Surgery Centers.

Zika Virus Response Team. Certificate of Commendation for Outstanding Employees in Innovation and Sustainability. Los Angeles County Department of Public Health Bureau of the Medical Director—Disease Control.

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Epson, E., Horwich-Scholefield, S., Humphries, R., Hindler, J., Hershey, C., Miller, L. G., Mendez, J., Martinez, J., Terashita, D., Marquez, P., Bhaurla, S., Moran, M., Pandes, L., McKinnell, J. A. (2016). *Capacity Building within the Microbiology Laboratory is Needed to Ensure Implementation of Strategies to Control the Spread of CRE*. ID Week. [Poster Presentation]

Foo, C., Oyong, K., English, L., Marquez, P., Terashita, D., Mascola, L. (2016). *Identifying Potential Outbreaks of Clostridium difficile Infections*. Society for Healthcare Epidemiology of America [SHEA] Conference. [Poster Presentation]

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Linfield, R., Miller, S., Injean, P., Gregson, A., Kaldas, F., Rubin, Z., Kim, T., Eells, S., Humphries, R., McKinnell, J. A. (2016). *Surveillance for CRE Colonization Yields Detection of Unexpected Resistance Patterns.* Society of Healthcare Epidemiology of America (SHEA) Spring Conference. [Presentation]

Manalo, A., Marquez, P., Bhaurla, S., Terashita, D., Buono, A., Green, N. M. (2016). *Surveillance of Carbapenem-Resistant Enterobacteriaceae in Los Angeles County*. Association of Public Health Laboratories Annual Meeting. [Poster Presentation]

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McKinnell, J. A., Corman, S., Patel, D., Lodise, T. P. (2016). *Televancin vs. Vancomycin in the Treatment of Hospital-Acquired Pneumonia Caused by S. Aureus. Decision Analytic Model.* ID Week. [Presentation]
McKinnell, J. A., Eells, S. J., Injean, P., Whang, D., Humphries, R., Gregson, A. (2016). *Linezolid versus Daptomycin in the Treatment of Enterococcal bloodstream infection (VRE-BSI) at a Transplant Center.* ID Week. [Presentation]

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McKinnell, J. A., Hindler, J., Epson, E., Horwich-Scholefield, S., Miller, L. G., Mendez, J., Martinez, J., Sinkowitz, J., Terashita, D., Marquez, P., Bhaurla, S., Moran, M., Pandes, L., Hershey, C., Humphries, R. (2016). *Incomplete adoption of Clinical Laboratory Standrards Institute (CLSI) Breakpoints to Detect Carbapenem Resistant Organisms*. ID Week. [Poster Presentation]

McKinnell, J. A., Miller, L. G., Singh, R., Kleinman, K., Peterson, E., Evans, K., Gombosev, A., Heim, L., Dutciuc, T., Estevez, M., Launer, B., Tjoa, T., Tam, S., Bolaris, B., Huang, S. S. (2016). *Prevalence and Predictors of Multidrug Resistant Organisms (MDRO) Colonization in Nursing Homes.* Society of Healthcare Epidemiology of America (SHEA) Spring Conference. [Presentation]

Miller, L. G., McKinnell, J. A., Singh, R., Kleinman, K., Gombosev, A., Dutciuc, T., Evans, K., Tjoa, T., Heim, L., Launer, B., Bolaris, M., Ramsay, K., Kim, D., Estevez, M., Peterson, E., Huang, S. S. (2016). *Reduction of MDRO Colonization in Nursing Home Residents with Routine Use of Chlorhexidine Bathing and Nasal Iodophor (Project PROTECT).* ID Week. [Presentation]

OYong, K., Foo, C., Terashita, D., Schwartz, B. (2016). *Influenza Vaccination Campaign Strategies to Improve Healthcare Personnel Vaccination Coverage*. Council of State and Territorial Epidemiologists Annual Conference. [Presentation]

Oyong, K., Terashita, D., Herleth, A., Teixeira, N., Narayanan, V., Schwartz, B. (2016). *The State of Infection Prevention in Los Angeles Ambulatory Surgery Centers.* Association for Professionals in Infection Control and Epidemiology Annual Conference. [Presentation]

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Acute Communicable Disease Control Program

Special Studies Report

2016

Los Angeles County
Department of Public Health

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ACUTE COMMUNICABLE DISEASE CONTROL
SPECIAL STUDIES REPORT 2016

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ZIKA COMMUNITY ENGAGEMENTS MEETINGS
LOS ANGELES COUNTY, 2016[1]

Although large-scale, sustained outbreaks of Zika have not yet occurred in the United States, transmission is widespread and ongoing throughout much of Latin America and the Caribbean. Limited local transmission has occurred in Southern Florida and in Texas. Conditions that increase the risk of local transmission include introduction of the Zika virus by infected travelers arriving from a country experiencing an outbreak and the local presence of *Aedes* mosquitoes that can spread the infection. Based on the large numbers of travelers from affected countries and the widespread presence of *Aedes* mosquitoes, Los Angeles County (LAC) has been identified by the Centers for Disease Control and Prevention (CDC) as one of the seven jurisdictions in the country most likely to experience a local Zika outbreak. The risk of a local Zika outbreak in LAC underscores the importance of effective vector control before and during an outbreak. Vector control strategies differ in effectiveness, cost, timeliness, and acceptability. Aerial pesticide application has seldom been used due to public opposition, but preferred methods such as "dumping and draining" standing water requires an entire community to respond in order to be effective. New technologies are in development to help fight against vector breeding and illnesses. The new technologies are not available at this time to local agencies but could be introduced over the next few years. As communities face new disease threats, local agencies must work with locals to prevent future outbreaks and have a strategy available for if one occurs in the near future.

In December 2016, the LAC Department of Public Health (DPH), Los Angeles Vector Control, and San Gabriel Vector Control agencies, in coordination with the Keystone Policy Center, convened five community workshops to gain information on public values and preferences to inform policy about mosquito control in LAC. These workshops also served to provide information to the LAC DPH and the county's five vector control districts to improve the effectiveness and acceptability of mosquito control and disease control efforts. The process ultimately focused on helping inform LAC's strategy, investment, and communications for vector control, public health, and preparedness. Workshop objectives included:

- To gather information about community preferences, values, and concerns associated with various mosquito control techniques;
- To gain a greater understanding of community values, motivations, barriers, and decision-making processes that drive individual behavior changes related to mosquito control and exposure; and
- To learn what information is needed at the community level about Zika virus infection and mosquito control and how this information can best be delivered and disseminated.

Overall, 177 people participated across the five workshops. Participants described a need for more information on Zika risks and illness, mosquito control, and protective behaviors. Once educated, most reported intending to "dump and drain" standing water but were skeptical that neighbors would do so. Concern about pesticide exposure was widespread. Most participants would accept aerial application to

[1] The full report on Greater Los Angeles County Vector Control and Public Health Community Engagement can be accessed at http://publichealth.lacounty.gov/acd/docs/VectorCommunityReport.pdf

control a Zika outbreak if provided sufficient information and advanced notice when applications would occur (Figure 1). In electronic polling, protecting babies from birth defects and preventing pesticide exposure were considered "very important" by >80% of participants. When asked what would be more important during a local Zika outbreak, 67% identified preventing birth defects and 33% preventing pesticide exposure. People also widely support the use of new technologies to reduce the spread of *Aedes* mosquitoes, particularly *Wolbachia*-infected sterile male mosquitoes (Figure 2). County support, including funding to further study this approach and share information, would be important if this strategy is to be a viable option.

Figure 1. Support (and Lack of Support) for Aerial Spraying Before and During a Zika Outbreak in LAC

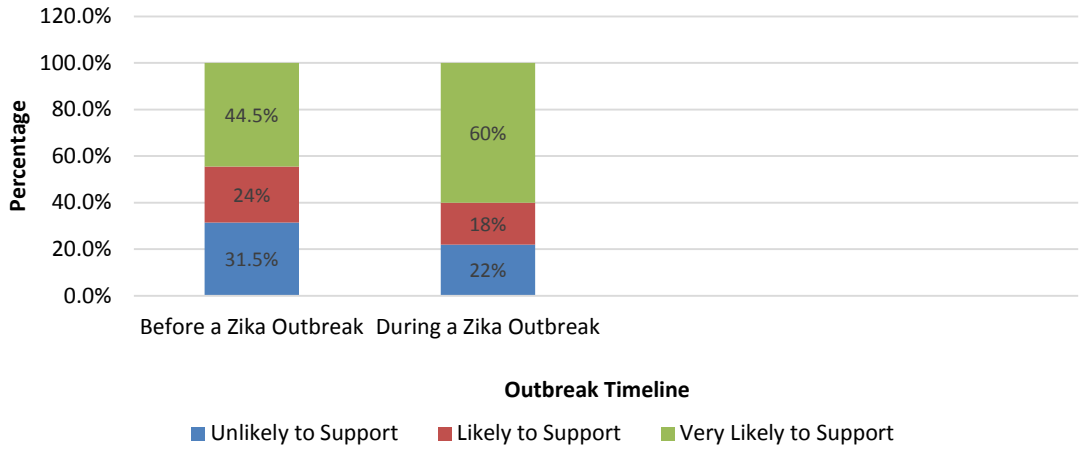
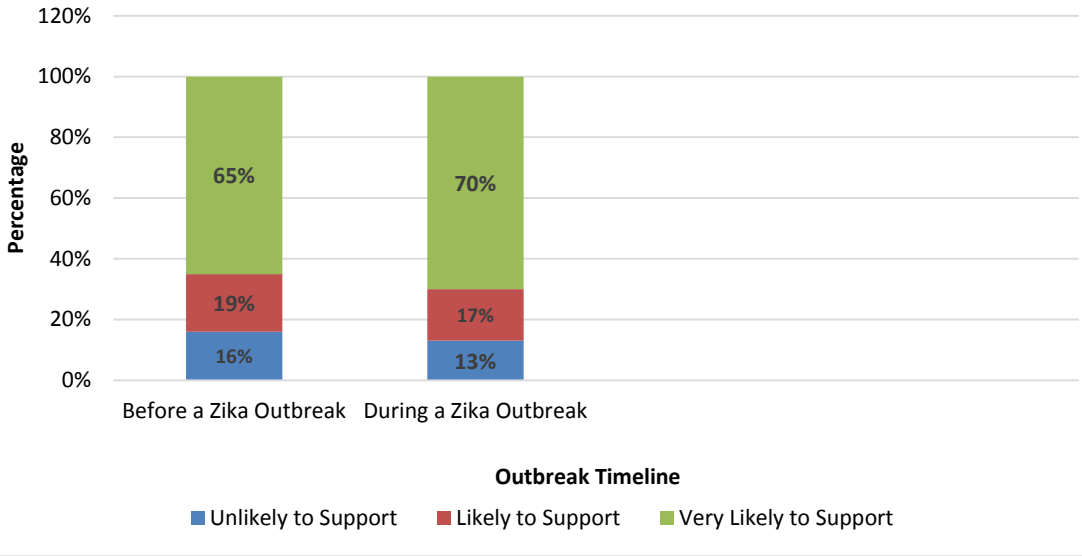


Figure 2. Support (and Lack of Support) for *Wolbachia*-Infectedor GMO Mosquitoes Before and During a Zika Outbreak in LAC



ZIKA VIRUS SURVEILLANCE IN LOS ANGELES COUNTY, 2016

ABSTRACT

In 2014, an outbreak of Zika virus occurred in Brazil and rapidly spread to neighboring countries. The first Los Angeles County (LAC) resident became ill with this virus after returning from El Salvador in late 2015. In 2016, 101 Zika cases were investigated by the Acute Communicable Disease Control Program (ACDC) of the LAC Department of Public Health (DPH). Cases were identified with either Zika virus RNA (52%) or Zika acute phase antibodies (48%). Cases were primarily female (76%), Latino (71%), average age of 36.9 years (range: 9-66 years), and residence throughout the county. None were hospitalized. The annual disease rate was 1.1 per 100,000 and was highest among Latinos (12.1 per 100,000) followed by Whites (5.6 per 100,000). This rate was higher in females than males (1.6 vs. 0.6 per 100,000). All cases traveled to a Zika-endemic region prior to their illness (50% Central America, 27% Mexico), and most became ill in July and August (54%). No instances of local transmission of Zika virus, either vector or sexual transmission, were identified. A total of 11 infants were born to LAC residents with travel-associated Zika virus infection; all 11 appear healthy to date. Although the number of cases in LAC where relatively small, creating a surveillance system for any new emerging diseases is challenging, requiring the development of disease case definition, testing methods, and disease procedures and protocols while simultaneously assessing the disease impact to the community.

BACKGROUND

Zika virus is an arbovirus primarily spread by the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*) [**1**]**.** Infection during pregnancy can result in severe fetal consequences including microcephaly and other birth defects. A large outbreak of Zika virus occurred in Brazil in 2015 and has spread across South and Central America and northward to the US. Local vector-borne transmission has been reported in Miami-Dade County, Florida [**2**] and Texas. Persons infected with Zika virus often have no symptoms or very mild symptoms, making detection and surveillance of cases challenging. Guillain-Barre syndrome, a more severe manifestation of Zika virus infection has been reported but is very rare. The primary burden Zika virus places on a community is measured through the impact the virus has on newborns.

In November 2015, a previously healthy resident LAC sought medical care for fever, rash, chills, conjunctivitis, headache, and joint pain after returning from El Salvador. An astute infectious disease specialist reviewed the patient's symptoms, travel history, and history of mosquito bites and suspected an arbovirus infection. The Centers for Disease Control and Prevention (CDC), Division of Vector-Borne Disease Laboratory, identified Zika virus antibodies in the patient's serum specimen. Dengue, Chikungunya, and West Nile testing results were all negative. The first case of Zika virus in LAC had been identified. By the end of 2016, over 100 cases were reported to LAC DPH for investigation.

With both imported human cases and the mosquito vector (*Aedes aegypti* and A. *albopictus* mosquitoes) present in LAC, Public Health officials became concerned that local vector-borne transmission of Zika in LAC was possible. A multi-agency, multi-disciplinary approach was developed to ensure that this new arbovirus did not establish itself in LAC. ACDC and Community Health Service (CHS) conducted interviews

with all reported cases to assess for Zika risk, pregnancy status, and Zika-like illness in other household members. The presence of *Aedes* mosquitos around cases' residences was assessed by local vector control programs. If any indication of local transmission was identified, the investigation was elevated.

DPH also monitored all participating pregnant Zika cases throughout their delivery. Newborns were tested for Zika virus at birth, and infants' development was assessed and documented at 2, 6, and 12 months of age. The mother's placenta may have also been collected and tested for Zika virus. These efforts required a coordinated effort with the LAC Public Health Laboratory (PHL), Maternal, Child and Adolescent Health (MCAH), and Children's Medical Services (CMS) Programs in LAC. In addition, DPH investigated any report of an infant born with microcephaly and tested those having a mother with Zika risk.

This report summarizes the Zika case investigations conducted in LAC in 2016 including the number and demographics of cases, infection rates, symptoms, exposure risk, laboratory tests performed, and instances where an elevated public health response was required to rule out local vector-borne transmission of Zika virus. The follow-up and testing of infants born to Zika cases and also infants born with microcephaly were reviewed. Zika reporting and investigation timeliness was also reviewed.

METHODS

All LAC health care providers and laboratories are mandated to report any suspect Zika cases to DPH (Title 17, CCR). Zika reports are investigated by ACDC with the support from the CHS, PHL, Public Health Investigators (PHI), and local vector control programs (VCD). ACDC interviewed cases by phone to document travel history and symptoms and identify any recent illness in the household that may suggest local vector-borne transmission. CHS nurses interviewed cases at home that could not be reached by ACDC. PHI assisted when CHS was unable to locate a case or the case was uncooperative. Local VCDs assessed cases' neighborhoods for presence of *Aedes* mosquitoes and mitigated presence if identified.

The demographics of all cases investigated by LAC DPH were reviewed and demographic rates calculated. Zika risks such as travel country were reviewed. LAC DPH also reviewed the types of laboratory testing performed and timing of case notification as well as factors leading to prolonged notification. LAC DPH reviewed Zika testing results and follow-up assessment available for infants born to Zika cases in LAC. Zika testing results were also reviewed for newborns identified with microcephaly and a mother with a history of potential Zika risk.

All statistical calculations were performed in SAS version 9.3. LAC DPH utilized the case definition established by the Council of State and Territorial Epidemiologist (CSTE) [4] and included in Appendix B. LAC cases must have: 1) Zika RNA identified in a serum or urine specimen via RT-PCR laboratory technique, or 2) Zika IgM antibodies detected in serum via plaque reduction neutralization test (PRNT) technique.

RESULTS

A total of 101 LAC Zika virus cases were reported to and investigated by ACDC in 2016. All cases met the case definition as stated by the CSTE. The number of cases identified in 2016 was a substantial increase from those identified in late 2015 (N=6).

RESULTS - *Case Demographics*

The overall annual rate of Zika cases in LAC was 1.1 per 100,000 residents (Table 1). The majority of cases were female (n=75, 74%) with a case-rate of 1.6 per 100,000. Females were 2.8 times more likely to be identified cases than males. The age of cases ranged from 9-66 years old (median=35 years, mean=36.9 years). Many cases were 15-34 years old (n=37, 37%); however, the case rate was highest in the 45-54 years old age group (1.5 per 100,000).

Latinos accounted for the majority of cases (n=71, 74%) and also had the highest case rate of the race ethnicity groups reviewed (1.5 per 100,000). By Service Planning Area (SPA), SPA 2 had the largest number of cases by residence (n=27, 28%); however, the case rate was highest in SPA 5 (2.0 per 100,000). A map of case residence by Health District is presented in Appendix A.

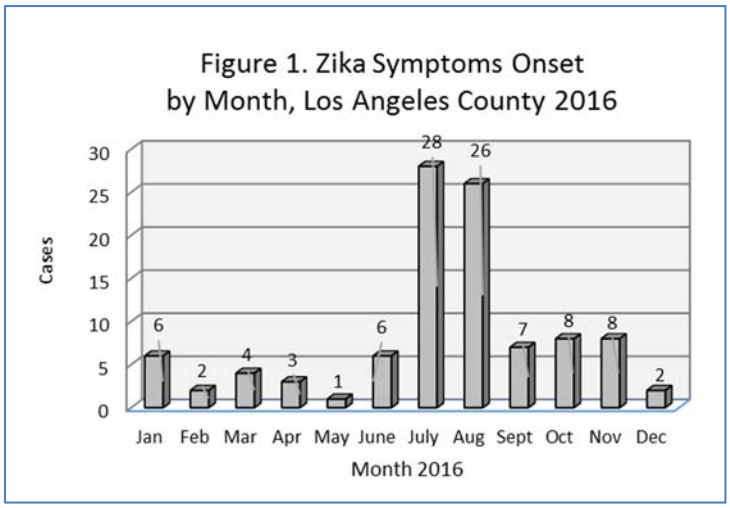
Table 1. Demographic of Zika Cases
Los Angeles County, 2016

	n	%	Annual Rate* per 100,000	Relative Risk
Total Cases	101	100	1.1	-
Gender				
Female	75	74	1.6	2.8
Male	26	26	0.6	Reference
Age Group (years)				
<1	0	0	0.0	-
1-4	0	0	0.0	-
5-14	9	9	0.7	1.7
15-34	37	37	1.3	3.0
35-44	17	17	1.3	2.9
45-54	20	20	1.5	3.5
55-64	13	13	1.2	2.8
65+	5	5	0.4	Reference
Race -Ethnicity				
Latino	71	74	1.5	12.1
White	19	20	0.7	5.6
Asian	5	5	0.4	2.9
Black	1	1	0.1	Reference
Other	1	1		
SPA				
1- Antelope Valley	3	3	0.8	2.1
2- San Fernando	27	28	1.2	3.4
3- San Gabriel	6	6	0.4	Reference
4- Metro	13	14	1.1	3.1
5- West	13	13	2.0	5.4
6- South	16	17	0.2	0.4
7- East	14	14	1.1	2.9
8- South Bay	6	6	0.6	1.5
*Rates based on 2015 population data				
Draft 6/12/2017				

RESULTS - *Symptoms and Onsets*

Nearly all Zika cases reported symptoms (91%), which included rash (78%), fever (56%), arthralgia (52%), and conjunctivitis (28%). A total of 78% of cases reported two or more symptoms, 55% reported three or more symptoms, and 13% reported all four symptoms. Only ten cases (10%) were asymptomatic. No cases were identified with Guillain-Barre syndrome. Zika cases reported by month of symptom onset throughout 2016 is shown in Figure 1. The majority of cases reported symptoms occurring in July and August (54%). The specimen collection month was used for asymptomatic cases.

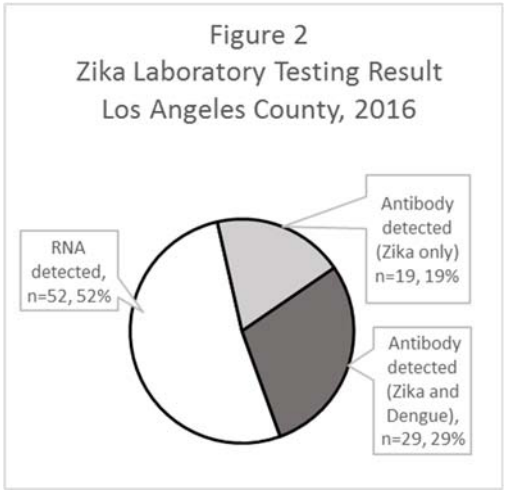
RESULTS - *Risk Assessment*



All Zika cases reported a history of travel to a Zika-endemic area within three months of seeking medical care and testing. Nearly all cases (99%) were exposed to Zika virus in areas of Central America (50%) and Mexico (27%). Only one case had no foreign travel history; this case traveled to Miami, Florida, which had local vector-borne Zika transmission. Only four case investigations identified an additional household member with Zika-like illness. In three of these households, the ill household member had also traveled to a Zika-endemic region with symptoms onset consistent with exposure during travel. In one household, two ill family members were identified that did not travel with illness onsets concerning for local vector-borne transmission of Zika virus. The details and results of this investigation are presented in **RESULTS - *Case Investigation 2 – Rule Out Vector-borne Transmission in a Household***. VCD staff mitigated any vector issues in the case neighborhoods of all four of these investigations.

Results - *Laboratory Testing*

There were 2,500 patients who submitted specimens to the LAC PHL for Zika virus testing in 2016. This count does not include all patients tested through commercial laboratories. There were 101 patients with a positive Zika laboratory result that met the Zika virus case definition. All Zika cases either had Zika virus RNA detected in a serum or urine specimen (52%) or Zika virus acute phase antibodies detected in serum (48%), as shown in Figure 2. Many of those identified with Zika virus antibodies also had Dengue virus antibodies (29%), as identified by PRNT. Of interest, only one of the ten asymptomatic cases were identified with Zika virus RNA. Of the asymptomatic cases, seven of the ten cases also had antibodies for Dengue, as identified via PRNT. No Chikungunya and West Nile Virus antibodies were detected with any of the Zika cases.



Of the 52 cases identified with Zika RNA in serum and or urine, 33 were positive on a serum specimen (34%), 28 were positive on a urine specimen (29%) , and 10 were positive on both specimens (10%). There were 18 cases where Zika virus was detected in urine but not in blood (19%), and only 3 cases where Zika virus was detected in serum but not urine (6%).

A majority of cases were reported from a state or federal laboratory (68%) followed by commercial laboratory (20%) or the PHL in LAC (12%).

RESULTS - ***Pregnant Zika Case and Infant Follow Up***

DPH followed up on the progress of pregnant Zika cases in LAC by reviewing prenatal care records and ultrasound results from each patient's maternal health provider. In addition, collection of newborn specimens and birth products (placenta, umbilical cord, placental membrane) for Zika virus testing was discussed with the patient's delivery hospital. Information was collected on the newborn's health at birth such as Apgar score, head circumference, weight, and length as well as any birth abnormalities at time of delivery. DPH followed up with the patient's pediatrician to track the progress of the infant's health, recording head circumference, weight and length at 2, 6, and 12 months of age and monitored the infant's overall development.

In 2016, there were 11 infants born to LAC mothers infected with Zika virus while traveling outside of LAC. All 11 infants appear to be healthy and developing normally at the time of this report (January 1st, 2017). All infant mothers were identified with acute phase Zika antibodies in serum and none had Zika virus RNA (Table 2). A total of six of these mothers also had acute phase antibodies for Dengue virus. Another six mothers reported symptoms consistent with Zika virus infection, and the remainder were asymptomatic. During the DPH follow-up of the progress of pregnant mothers, one mother's fetal ultrasound revealed abnormalities on week 19 of gestation, increasing concern for the possibility of fetal infection and lag in brain development (#4). An amniocentesis was performed and amniotic fluid tested for Zika virus RNA. No evidence of Zika virus was identified. The fetus appeared normal on a follow-up ultrasound. All other mothers progressed to delivery without complication.

Placenta, umbilical cord, and/or membranes were collected and tested from 8 of the 11 mothers at delivery. Only one mother (#1) was identified with Zika virus RNA present in an umbilical cord specimen. All other tissue testing results found no evidence of Zika virus infection for this mother and the other seven mothers. Eight of the 11 newborns were tested for Zika virus. No evidence of Zika infection was identified in any of the eight, including the infant of the mother with a questionable ultrasound (#4) and the infant of the mother with umbilical cord positive for Zika RNA (#1). Only one infant was admitted to the NICU (#8) for four days with respiratory distress and low birth weight (4.9 lbs.). This newborn was discharged home after four days. All other infants had a normal hospitalization stay.

Figure 3 displays each infant's head circumference (HC) measurements at 2, 6, and 12 months of age plotted against a line representing the third percentile of HC measurement for age and gender. Microcephaly is a birth defect defined as a newborn or infant with a smaller than expected HC (<3rd percentile) when compared to babies of the same sex and age. Only two infants were identified with a small HC at birth (#6, #8). Infant #6 had a HC well below the 3rd percentile at birth and was diagnosed with microcephaly by the patient's pediatrician at that time. The HC measurement at birth was verified at one week of age (30.1 cm). However, this infant's HC measurement was within normal HC range by two months of age (36.8 cm) and remained normal at 12 months of age. A cranial ultrasound performed at three months of age did not reveal any abnormalities, and the microcephaly diagnosis has been dropped for infant #6. The HC measurement for infant #8 also measured slightly below the 3rd percentile (31.0 cm); however, this was an overall small infant, with short length (47 cm) and low weight (4.9 lbs.), born at week 38 of gestation. This infant was not given a microcephaly diagnosis. The infant's head size continued to grow to normal size by 12 months of age (44.5 cm).

A total of two pregnant Zika cases chose to discontinue participation in the DPH infant follow up program after their infants were born healthy and with normal HCs (#3, #5), so no further information on these infants could be obtained. There were two pregnant Zika cases identified in 2016 that chose not to participate in the DPH infant follow up, so the outcomes of these births, or possible terminations, remains unknown.

Table 2. Zika Case and Infant Testing and Infant Follow-up, Los Angeles County 2016

	Zika Case									Infant						Follow-up
		Serum Testing			Fetal Health Indicators		Tissue Testing			Serum Testing		Infant Health Indicators				
	Symptomatic	Zika IgM	Zika RNA	Dengue IgM	Cranial Imaging CT	Amniotic Fluid Zika RNA	Central Placenta Zika RNA	Umbilical Cord Zika RNA	Placental Membrane Zika RNA	Zika IgM	Zika RNA	Apgar Score	Small Head Circumference	Admitted to NICU	Cranial Imaging CT	Month Completed
1	+	+	-	-	-	NT	-	+	-	-	-	9	-	-	-	0,2,6,12
2	+	+	-	+	-	NT	-	-	-	NT	NT	9	-	-	NT	0,2,6,12
3	-	+	-	-	-	NT	NT	NT	NT	NT	NT	9	-	-	NT	0, NP
4	-	+	-	-	+	-	-	-	-	-	-	9	-	-	NT	0,2,6,12
5	-	+	-	+	-	NT	-	NT	-	-	-	9	-	-	-	0, NP
6	+	+	-	+	-	NT	-	-	-	-	-	9	+	-	-	0,2,6,12
7	+	+	-	+	-	-	NT	NT	NT	-	-	9	-	-	NT	0,2,6,12
8	+	+	-	+	-	NT	-	NT	NT	-	-	9	+	+	-	0,2,6,12
9	+	+	-	-	-	NT	-	-	-	-	-	9	-	-	NT	0,2,6,12
10	-	+	-	+	NT	NT	NT	NT	NT	NT	NT	9	-	-	NT	0,2,5,12
11	-	+	-	+	-	NT	-	-	-	-	-	9	-	-	NT	0,2,6,12

NP - Not participating

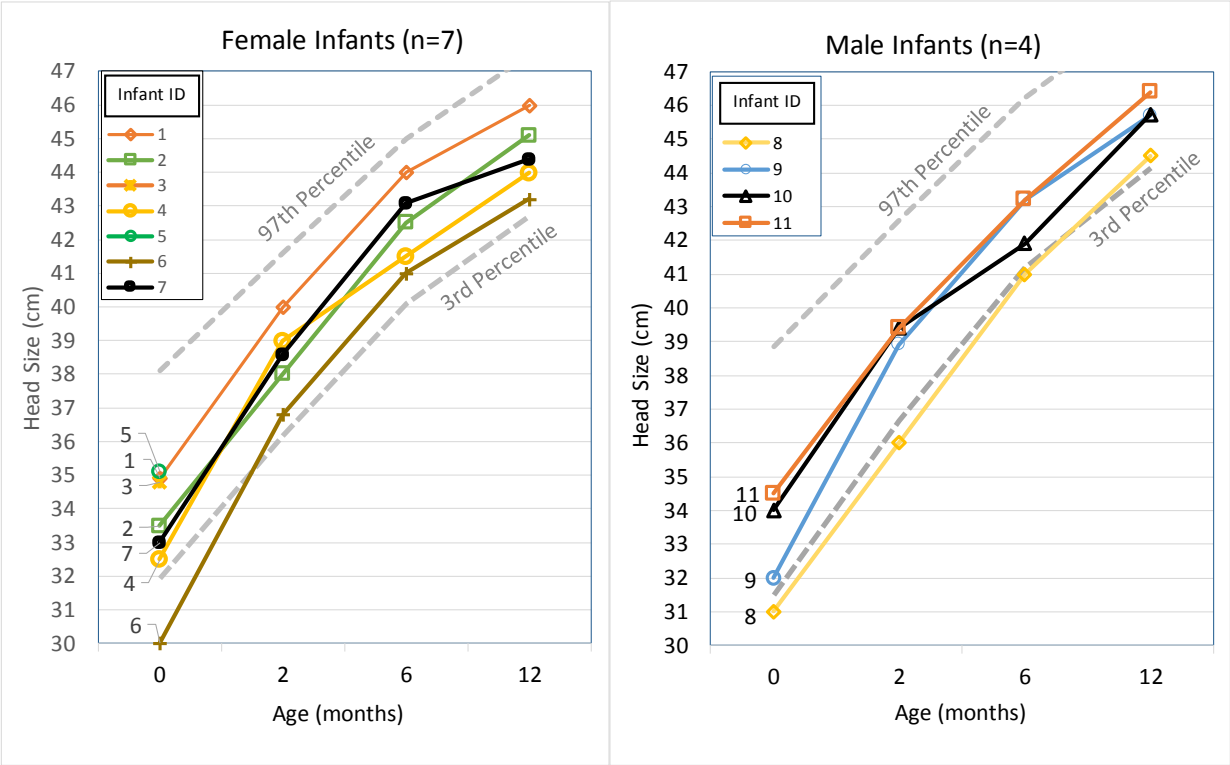
NT - Not Tested

6 - Dx microcephaly at birth

7 - Infant urine also with PCR negative result

8 - Admitted to NICU for 4 days for respiratory distress and low birth weight. Born at 38 weeks gestation. Discharged home.

Figure 1. Infant Head Circumference, Los Angeles County 2016 (N=11)



RESULTS - *Newborns Identified with Microcephaly*

In 2016, there were 11 newborns identified with microcephaly and born to a mother with Zika risk, but had no positive Zika lab test or chose not to test. No evidence of Zika infection was identified with any of these infants. All 11 were tested for the presence of Zika virus RNA in serum, and all were negative. There was one fatality who died shortly after delivery due to severe brain malformation. In addition to the negative Zika RNA test result obtained for this infant, a negative Zika virus RNA test result was obtained on mother's placenta and a pathology review revealed no evidence of infection. All other infants are stable as of last update, but many have very complicated health issues. Only 2 of the 11 infant mothers were also tested for Zika virus at time of delivery, and both had a negative test result. The remaining nine infant mothers were either outside the three-month time period of detectable acute phase antibodies for Zika or declined testing. One newborn was later identified with a gene deletion (4.22q11 deletion) that has been associated with microcephaly. All 11 infants were transferred to CMS for further investigation.

RESULTS - *Case Reporting and Investigations*

All Zika cases were evaluated and tested by a clinician in an outpatient setting, and none were hospitalized. The majority of cases were tested through a private LAC health care provider (90%) followed by DPH health clinics (8%) and facilities outside of LAC (3%). Cases were primarily reported to DPH by the performing laboratory via a faxed laboratory report (49%) or as an electronic laboratory report (48%) with a few cases reported from another public health jurisdiction (3%). Only one case was reported by a health care provider. Cases were primarily interviewed by ACDC staff (83%) followed by CHS staff (19%).

For symptomatic cases (n=91), the average time from the case's symptom onset to the DPH notification date (T1) was 38 days (range: 4 to 195 days, median: 24 days). The average T1 measure was much shorter

for cases with a PCR test result notification (18 days, median=15 days, n=52) than cases with a PRNT test report notification (67 days, median=61 days, n=39) (p<0.01, T-test, unequal variances). In addition, the average T1 value for cases that were reported by Electronic Laboratory Reporting (ELR) were shorter (14 days, median=11 days, n=26) than those reported via fax transmission (56 days, median=30 days, n=29) (p<0.01, T-test, unequal variances). All ELR reports were also PCR reports.

RESULTS - ***Case Investigation 1 – Rule out Vector-Borne Transmission in a Neighborhood***

In August 2016, DPH received a positive Zika result (Zika IgM- and PRNT-positive, Zika PCR-negative) from a governmental laboratory for an LAC patient. This patient met the CSTE case definition for a Zika case., The patient was uncooperative with public health and refused to provide a complete travel history. Because the patient's travel history was unclear, the possibility of local vector-borne transmission of Zika virus needed to be ruled out. VCD assessed the case's residence and the nine surrounding properties. No *Aedes* were identified, and no obvious sources for mosquito breeding were found in the patient's yard such as overgrowth of brush, trash, or standing water.

The Infectious Disease (ID) specialist that oversaw the care of this patient stated that this patient presented with fever, vomiting, and headache and was hospitalized and diagnosed with viral meningitis. The ID physician felt that the patient's meningitis was due to herpes simplex virus 1 (HSV1) infection, not Zika virus. The examination of the patient's cerebrospinal fluid (CSF) revealed mild pleocytosis with lymphocyte predominant as well as identification of HSV1 in CSF via PCR. In addition, the governmental reference laboratory repeated the Zika testing on the patient's original serum specimen, and no Zika virus antibodies were identified. The findings of this investigation indicate that this patient had a false positive Zika result.

RESULTS - ***Case Investigation 2 - Rule Out Vector-Borne Transmission in a Household***

In October 2016, DPH received a positive Zika PCR result for an LAC resident from a private clinical laboratory. This patient met the CSTE case definition for Zika virus. Upon interview, the case reported being symptomatic after returning to the US from Guatemala (Zika-affected area). The case also reported two adult household contacts (HHC) ill with Zika-like symptoms eight days after the case's return to the US. HHC1 reported symptoms of conjunctivitis, cough, sneezing, and sore throat. HHC1 also reported having unprotected sexual contact with the case in the week prior to onset, suggesting possible sexual transmission of Zika. HHC2 reported symptoms including conjunctivitis, fever, chills, and sore throat and had no sexual contact with the case. The symptoms reported by both HHCs were suggestive of a number of illnesses including Zika virus**.** Neither HHC had traveled to a Zika-affected area, prompting concerns of local vector-borne Zika transmission. Adding to this concern was the identification of *Aedes aegypti* mosquitoes within five miles of the case's residence earlier in the year.

To rule out local vector-borne transmission in this household, ACDC requested VCD staff to assess for the presence of *Aedes* mosquitoes in the case's neighborhood and a CHS staff to obtain urine specimens from the HHCs for Zika testing. VCD inspected 86 properties and 30 businesses and placed mosquito traps (ova cups) around the case's residence. No *Aedes* were observed at any stage of growth. The urine specimens collected from the HHCs by CHS and tested by LAC PHL were both negative for Zika virus RNA. Overall, the investigation found no evidence suggesting local transmission of Zika virus in this household**.** The investigation was closed within one week of the original DPH laboratory notification of the case.

DISCUSSION

Female residents in LAC were more likely to be identified as Zika cases than males in 2016. This difference likely reflects gender-specific screening criteria and not a true difference in risk by gender. The 2016 Zika virus testing protocol recommends testing of all pregnant females with Zika risk, whereas all other persons had to present with a Zika symptom in order to be tested. Latinos were also more likely to be identified as Zika cases compared to other race-ethnicities in LAC. This may reflect the difference in travel patterns by race-ethnicity. Latinos are more likely to travel to Zika-affected areas to visit family for longer durations and visit more rural areas than other race-ethnicities. Mexico and Central American countries were likely travel locations for most LAC cases. Only two cases traveled to Brazil where the Latin American Zika virus outbreak was originally identified in 2015**.**

Interpretation of Zika laboratory results can be complicated [**5**]**.** Dengue virus antibodies identified via PRNT were 29% of LAC Zika cases. It is unclear whether this represents a Dengue infection with antibodies that cross-react to Zika antigens resulting in a false Zika result, a Zika infection with antibodies that cross-react to Dengue antigens resulting in a false-positive Dengue result, or infection with both viruses. Dengue virus also circulates in many of the same regions as Zika virus and is also transmitted by the *Aedes* mosquito.

Zika RNA detection in urine via RT-PCR appears to be more sensitive than serum—10 of 52 cases (19%) were identified with RNA in urine and not in serum. Collection of urine as compared to serum is simpler, does not require a phlebotomist, and patient compliance is generally higher. However, 3 of 52 cases (6%) were identified with RNA in serum but not in urine, and these cases would have been missed if urine were collected alone. Similar results were found with a review of cases identified in Florida in 2016 [**2**]**.**

Infants born to Zika cases and identified with Zika-related birth defects have been reported in California [**3**]; however, the impact of Zika virus on newborns in LAC appears to be minimal with only 1 of 11 newborns presenting with a questionable Zika-related birth defect diagnosis. In addition, 11 LAC infants with a suspect Zika-related birth defect tested negative for Zika virus. It is not clear whether any virus or antibody could be detected in these newborns, limiting any conclusion drawn from these findings. Additional causes of microcephaly such as toxoplasmosis, cytomegalovirus, and other infections should also be assessed in these newborns, which requires additional follow up. Future studies should assess any change in newborn microcephaly trend with the introduction of Zika virus in LAC. A review of hospital discharge data suggests a newborn microcephaly rate of 4.2 per 10,000 live births in LAC prior to the introduction of Zika virus, or an average of 55 per year.

Local vector-borne transmission of Zika virus had been identified in Florida [**6**] and possibly Texas in 2016 [**7**]**.** As a large metropolitan county with known *Aedes* mosquito populations, LAC was also at risk for local vector-borne Zika transmission. However, no instances of local vector-borne transmission in LAC were identified in 2016. The introduction of Zika virus among LAC travelers highlights many of the surveillance challenges posed by any new emerging diseases. Laboratory tests were initially not widely available nor were testing protocols, case definitions, and survey tools for this disease. As these tests and guidelines became available, they required constant review and modification to keep them up-to-date with the best science available for this disease. In addition to the Zika case activities, Zika virus surveillance required follow up of newborns associated with pregnant cases for testing and birth defects surveillance.

LAC DPH is continually working to refine Zika surveillance and work with local VCDs to optimize agency collaboration. This collaboration will improve utilization of resources to prevent Zika virus from becoming endemic in LAC. Many lessons were learned from Zika surveillance in 2016, which will help improve efforts to minimize Zika disease risk to LAC residents in the future.

Acknowledgments

Special thanks to the many LAC staff that contributed to the investigations presented in this report. Special thanks to VCD staff Wakoli Wekesa, Ken Fujioka, and Susanne Kluh. Special thanks to CHS staff Clarlotta Payton and PHI staff Sandra Rogers and Jorge Perez. Special thanks to PHL staff Heran Berhanu, Niki Green, and Lee Borenstein.

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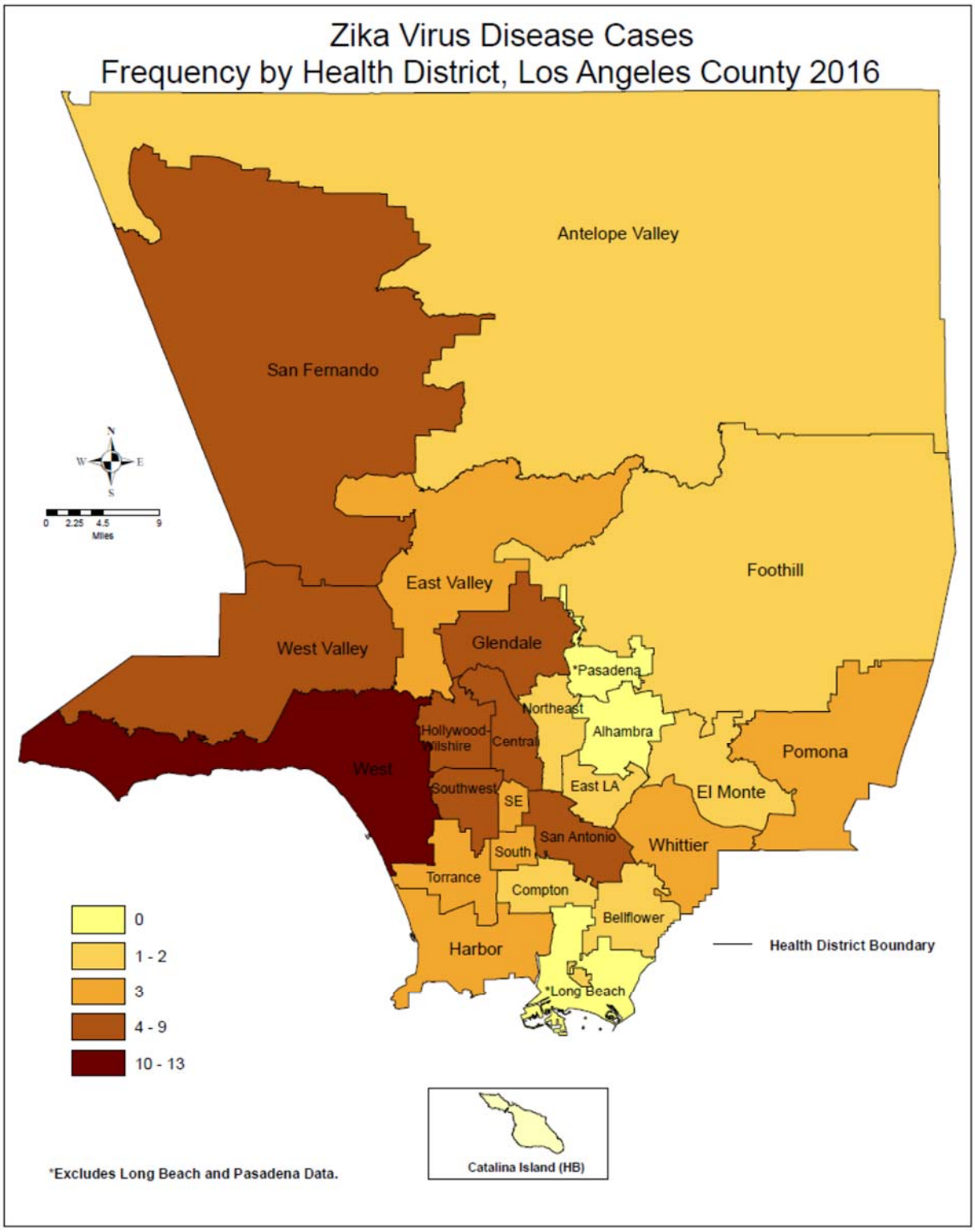
Appendix A


Zika Virus Disease Cases
Frequency by Health District, Los Angeles County 2016
Antelope Valley
San Fernando
East Valley
Foothill
West Valley
Glendale
*Pasadena
Northeast
Alhambra
Hollywood-Wilshire
Central
West
Southwest
SE
East LA
El Monte
Pomona
San Antonio
South
Whittier
Torrance
Compton
Bellflower
Harbor
*Long Beach
N
W
E
S
0 2.25 4.5 9
Miles
0
1 - 2
3
4 - 9
10 - 13
Health District Boundary
Catalina Island (HB)
*Excludes Long Beach and Pasadena Data.

Appendix B

ZIKA CASE CLASSIFICATION

Confirmed: A clinically compatible case and confirmatory laboratory results, OR a person who does not meet clinical criteria but has an epidemiologic linkage and confirmatory laboratory results.

Probable: A clinically compatible case and presumptive laboratory results, OR a person who does not meet clinical criteria but has an epidemiologic linkage and presumptive laboratory results.

Flavivirus infection of undetermined species: A clinically compatible case and evidence of recent infection with a flavivirus where the neutralizing antibody test results on a single specimen are insufficient to determine the identity of the infection virus, OR a person who does not meet clinical criteria but has an epidemiologic linkage and evidence of recent infection with a flavivirus where the neutralizing antibody test results on a single specimen are insufficient to determine the identity of the infection virus.

RAPID COMMUNITY INVESTIGATION AROUND IMPORTED ZIKA CASES LOS ANGELES COUNTY, 2016

Los Angeles County (LAC) has been identified by the Centers for Disease Control and Prevention (CDC) as one of the highest risk jurisdictions in the country for a local Zika outbreak due to the amount of travel from Zika-affected areas, the number of imported cases, and the presence of indigenous *Aedes aegypti* and *Albopictus* mosquitoes that can transmit infection. The CDC has recommended investigation and mosquito abatement within a 150-meter radius of case residences to reduce this risk.

To implement this recommendation, the LAC Department of Public Health (DPH) collaborates with three vector control districts (VCDs) in the county where *Aedes* mosquitoes have been identified. This collaboration serves to immediately share information on the case location once a positive laboratory report is obtained, leading to an investigation, abatement, and community education about eliminating sites where mosquitoes can breed. Epidemiology and Laboratory Capacity (ELC) funding supports the epidemiologist who developed LAC DPH's Zika surveillance system and databases and who serves as the focal point for receiving positive case reports and communicating this information to the VCDs. ELC support also contributes to the LAC Public Health Laboratory's (PHL) ability to test for Zika and to the VCDs capacity for investigation and response.

To evaluate the timeliness of investigation and response and improve quality, LAC DPH in conjunction with the VCDs determined the time between patient symptom onset and completion of mosquito abatement. Beginning in June 2016, for PCR-positive cases identified in commercial laboratories, there was a median of three days from symptom onset until specimen collection, three days until laboratory results were obtained at DPH, and less than one day for this information to be communicated to the VCDs. When specimens were tested at the LAC PHL, it took significantly longer to obtain results because of the need for additional screening information, which was often missing from the forms. To reduce delays, screening requirements were changed. It then took a median of six days for completion of that investigation with a median of 86 properties investigated when *Aedes* were found in the area. Overall, 26% of investigations detected *Aedes* mosquitoes, and two newly infested cities were identified. These timely, collaborative investigations reduced the risk of local Zika spread in LAC.

In 2017, we will continue to monitor performance and, as needed, implement quality improvement to further improve timeliness. Also, recognizing that many Zika cases are not detected and reported because illness is asymptomatic, we will expand vector surveillance, abatement, and education in higher risk areas defined by the presence of *Aedes* mosquitoes and higher numbers of likely travelers to at-risk areas. Finally, we are expanding vector control capacity by training DPH Environmental Health staff to assist VCDs in investigation, thereby establishing a trained cadre who also can respond should a local outbreak occur.

NEWBORN MICROCEPHALY: HOW OFTEN IS IT DIAGNOSED IN LAC?
A FIVE-YEAR REVIEW OF COUNTY HOSPITALIZATIONS WITH A MICROCEPHALY DIAGNOSIS

ABSTRACT

Background

Zika infection has been identified among California's pregnant travelers, which may lead to an increased rate of microcephaly in the state and in Los Angeles County (LAC). Currently, there are no published rates of newborn microcephaly for LAC, description of the racial-ethnic populations affected, nor reports of severity of disease. The national microcephaly rate is estimated to range from 2-12 babies per 10,000 live births. We performed an analysis of microcephaly hospitalizations to establish a baseline, trend, and severity of LAC patients diagnosed with microcephaly.

Methods

A total of five years of microcephaly hospitalizations were reviewed using a hospital discharge dataset obtained from the California Office of Statewide Health Planning and Development (OSHPD). A newborn microcephaly case was defined as any newborn seen at an LAC hospital from 2010-2014 and had a discharge diagnosis of microcephaly. Annual rates of newborn microcephaly were calculated using LAC birth data, and rates were stratified by race-ethnicity. Burden indicator variables such as length of stay, hospital charge, and fatality rate were compared by gender and race-ethnicity.

Results

We identified 274 newborns hospitalized in LAC with microcephaly over the five-year study period (mean: 54.8 per year, range: 42-67 per year). The newborn microcephaly rate for LAC was 4.2 per 10,000 live births. Rates were higher among African American newborns (9.0 per 10,000 live births), female newborns (5.4 per 10,000 live births), and highest among female African American newborns (11.8 per 10,000 live births). The case fatality rate among all microcephaly newborns was 5.8% (16/274) and was higher among female infants (6.5%, 11/170).

Conclusions

This review identified a newborn microcephaly rate in LAC similar to the national rate for babies. These findings indicate that microcephaly in LAC can be severe and disproportionately affects African American and female newborns. More study is needed to corroborate these findings and to better understand the causes of these racial disparities among microcephaly newborns in LAC.

INTRODUCTION

Microcephaly is a condition where an infant's head circumference is at least two standard deviations less than an infant of the same gender and age [**1**]. This condition may be accompanied by other major birth defects such as hearing and visual loss but can occur with no other health conditions. Microcephaly can occur because a baby's brain has not developed properly during pregnancy or has stopped growing after birth. The cause of microcephaly is unknown in most cases. Conditions associated with microcephaly include infections during pregnancy (rubella, toxoplasmosis, cytomegalovirus, Zika virus), severe malnutrition, exposure to toxins (alcohol or other drugs), certain genetic defects (autosomal, recessive, primary microcephaly), or interruption of the blood supply to the baby's brain during development.

Zika infection during pregnancy is associated with increased rates of microcephaly in the resulting newborn [**2, 3, 4, 5, 6**]. Zika infection has been identified in over 45 pregnant California residents who have traveled to endemic areas [**7**]. Due to the mild and often asymptomatic nature of this infection, many pregnant women who are infected are likely undiagnosed. The impact of this disease on newborns in California and LAC remains unclear.

Currently, there are no published rates of newborn, neonate, or infant microcephaly in LAC or California. The Centers for Disease Control and Prevention (CDC) estimates that there are between 2-12 cases of microcephaly per 10,000 per live births nationally [**1**]. Using this national microcephaly estimate with the approximately 124,000 live births in LAC [**8**], we can estimate that the crude rate of microcephaly in LAC babies is 25-149 cases annually. However, this estimate does not take into consideration the risk factors among LAC residents that may be different from those found nationally. It also does not distinguish newborn rates from infants diagnosed after delivery.

A better estimate for the number and rates of newborns, neonates, and infants diagnosed with microcephaly in LAC needs to be established. This will help with monitoring changes in these numbers and lead to a better understanding of the impact of Zika on infants. Data on all hospitalizations in LAC is available through the OSHPD and should be useful in establishing microcephaly rate estimates.

METHODS

A dataset of all hospitalizations occurring in LAC hospitals with a diagnosis of microcephaly was created. This microcephaly dataset was created from a dataset of all LAC hospitalizations obtained from the OSHPD. Although the dataset is de-identified, it contains information on each patient's age, race, length of stay, outcome (survived vs. died), hospitalization charge, and diagnoses (up to 24 diagnoses). Since birth only happens once, patients coded as being born in the hospital they were discharged from can be considered individual patients, and rates may be calculated.

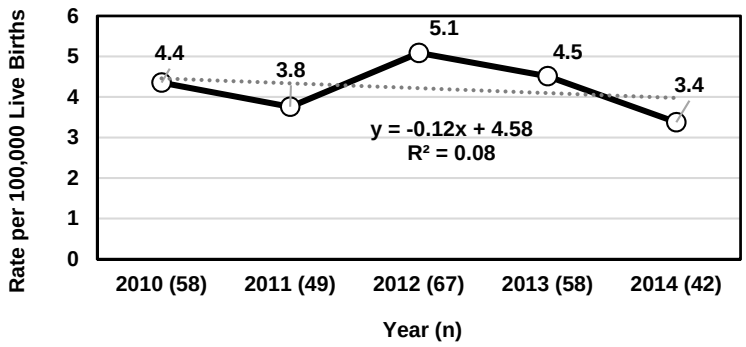
We defined a case of newborn microcephaly as any patient seen at an LAC hospital from 2010-2014, had a discharge diagnosis of microcephaly (ICD9 code = 742.1), and was born in the hospital from which they were discharged. A source admission code of 712 (7=newborn, 1=this hospital, 2=not ER) for 2011-2015 data, and the source admission code of 7 (newborn in admitting hospital) for 2010 data was used to select for newborns. Annual rates of newborn and infant microcephaly were calculated using LAC birth data and rates. Denominator data on annual births and demographic characteristics of newborns in LAC was obtained [**7**]. Rates of newborn microcephaly were compared by gender and race-ethnicity. Indicators for

disease severity (length of hospitalization, hospitalization charge, and case fatality rate) were compared by race-ethnicity and gender. We also reviewed the annual trend of hospital discharges with a diagnosis of microcephaly for patients of all ages.

Results - *Newborn* Microcephaly Cases (n=274)

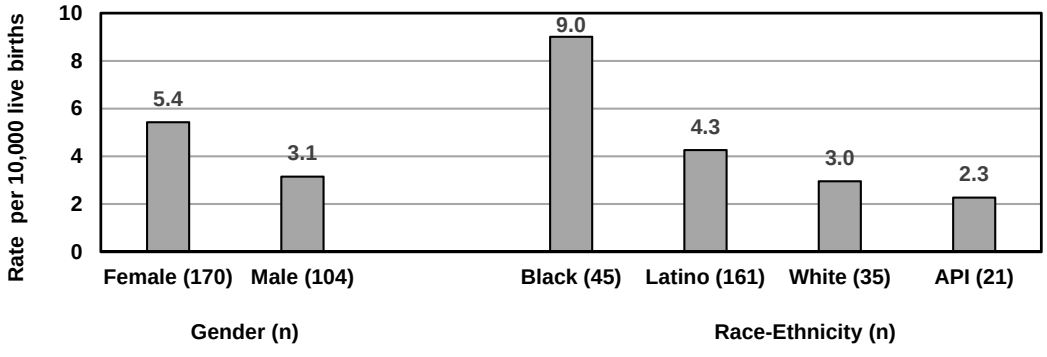
There were 274 newborns diagnosed with microcephaly over the five-year study period, representing unique infants diagnosed for the first time. The number of newborn cases ranged from 42-67 per year (mean 54.8) and was relatively stable over the study period (data not shown). The annual newborn microcephaly rate was also stable over time, ranging from 3.4-5.1 per 10,000 live births per year and an average rate of 4.2 per year per 10,000 live births (274 infants/648,014 live births) (Figure 1).

Figure 1. Newborn Microcephaly Rate by Year LAC, 2010-2014



The microcephaly rate was higher among female compared to male newborns (5.4 vs. 3.1 per 10,000 live births, rate ratio 1.7) (Figure 2). By race-ethnicity, the highest microcephaly rate was identified among African American infants (9.0 per 10,000 live births), which was greater than twice that of Latino newborns, the race-ethnicity group with the second highest rate (4.3 per 10,000 live births). The rate was higher for African American female (n=29) compared to African American male (n=16) newborns (11.8 vs. 6.3 per 10,000 live births). The rates for other female race-ethnicity categories were closer to the overall rate.

Figure 2. Rates of Newborn Microcephaly by Gender and Race-Ethnicity LAC, 2010-2014



***API refers to Asian Pacific Islanders**

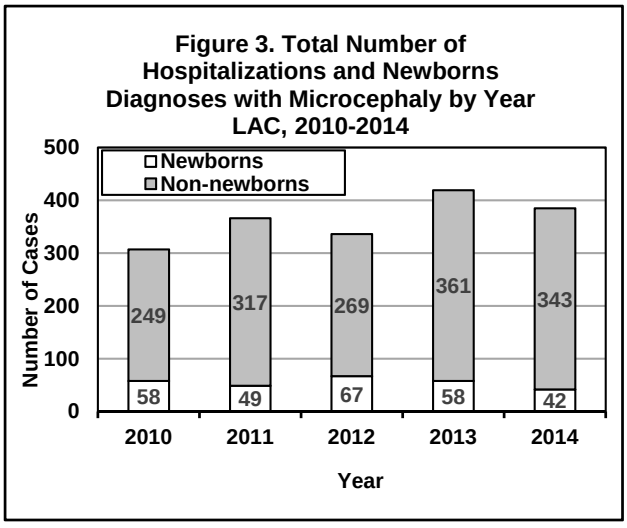
The median length of hospital stay for a newborn with microcephaly was 4 days (mean 12.1 days). The median length of stay was longer for African American newborns (8 days) as compared to White (4 days), Latino (4 days), and Asian newborns (4 days). There appeared to be no difference in length of stay by gender (both with a median of 4 days). The median hospitalization charge for a newborn with

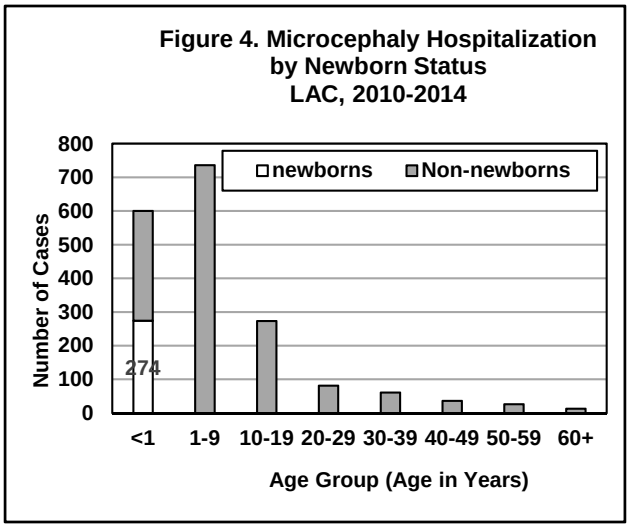
microcephaly was $26,346 (mean $125,068). The median charge was higher for African American newborns ($47,145) than Latino ($24,337), White ($20,280) and Asian newborns ($15,569). The median charge was comparable by newborn gender ($25,092 male vs. $25,339 female). The case fatality rate for a newborn with microcephaly was 5.8% (16/274). The fatality rate was higher for female (6.5%, 11/170) than male newborns (2.9%, 3/104). The rate was also higher for African American (7.6%, 3/29) and Latino newborns (7.4%, 12/161). The number of deaths among White and Asian Pacific Islander (API) newborns were too small to calculate stable rates (≤1).

RESULTS - <u>All</u> Patients Hospitalizations Diagnosed with Microcephaly (n=1813)

We identified 1,813 microcephaly-associated hospitalizations in LAC from 2010-2014. The annual number of microcephaly-associated hospitalizations ranged from 307-419 per year (mean 362.6 per year), increasing slightly over time (Figure 3). Patients ranged in age from newborn to 88 years old (mean age 7.6 years, median age 3 years), and most were older than one-year-old (67%) (Figure 4). There were 598 hospitalizations for infants under one-year-old (33%), including 361 for neonates under one month old (20%) and 274 newborns (15%). The total number of hospitalization days exceeded 17,000 days (annually 3,515 days, mean number of days per patient 9.7 days, median 4 days). A total of fifty deaths were identified: 30 infants, 16 newborns, 4 non-infants. Latino infant deaths accounted for 68% of the total deaths for patients diagnosed with microcephaly (34/50).

With the exception of newborn hospitalizations, which represent unique infants diagnosed for the first time, all other hospitalizations may be due to initial diagnosis or subsequent diagnosis for the same patient. De-duplication is needed to be able to calculate the unique number of microcephaly neonates (≤1 month of age) and infants (≤1 year of age), which is not possible due to the de-identified nature of this dataset. However, an upper limit for the rate of infants diagnosed with microcephaly can be calculated assuming all infant hospitalizations are for a unique patient: 9.2 microcephaly cases per 10,000 live births (598 infants/648,014 live births).





DISCUSSION

In this study, we identified an LAC baseline rate of newborn microcephaly of 4.2 per 10,000 live births (55 cases annually). This rate is similar to the nationally estimated microcephaly rate of 2-12 babies per 10,000 live births reported by the CDC. Because no definition of "babies" is provided with this estimate, the rate identified in our study for newborns may not be directly comparable. A clearer national microcephaly rate is needed for newborns, neonates, and infants diagnosed with microcephaly. The results of this study indicates that many patients may be diagnosed later in life.

This study identified a higher rate of newborn microcephaly among African Americans (9.0 per 10,000 live births) than newborns of other race-ethnicity groups. African American newborns with microcephaly also had a longer, costlier hospital stay with a higher fatality rate than newborns of other race-ethnic groups, indicating that this group is more severely impacted by the disease. More study is need to understand the causes for this trend in this race-ethnicity group. The higher rates of microcephaly identified among African American newborns is a trend consistent with other findings of low birth weight and higher infant mortality rate in this race-ethnicity group [**8**].

This study also identified a higher rate of newborn microcephaly and higher case fatality rate among female newborns (5.4 per 10,000 live births). This finding is consistent with another recent study of 32 microcephalic infants associated with Zika infection in Brazil [**4**] where 69% of the cases were female (n=22). More study is needed to confirm this gender trend. One possible explanation for this trend includes a sex-linked gene responsible for at least some microcephaly cases. A less likely, but plausible, explanation would be a prenatal infection such as Zika, toxoplasmosis, or cytomegalic virus infection affecting the developing fetus and having a differential fetal impact by gender. However, other indicators of disease severity such as length of hospital stay and hospital charges were not higher among female newborns.

CONCLUSION

We were able to establish the annual number and rate of newborn microcephaly in LAC using the OSHPD dataset. Our study identified African American newborns as having a higher rate of microcephaly and more severe illness than newborns of other race-ethnicity groups. However, more research is needed to corroborate these findings. Additional research is needed to establish a microcephaly rate for neonates and newborns in LAC that could not be done with this de-identified dataset.

LIMITATIONS

The definition of microcephaly may vary by clinician and by region [**1, 9**] and may affect the results presented here. In addition, the race-ethnicity of newborns is reported by the parent(s). If the parent is unwilling or unable to declare the infant's race-ethnicity, then the mother's race is reported. This may bias the microcephaly rates by race shown here.

ACKNOWLEDGEMENTS

Special thanks to Louise Rollin-Alamillo in the Health Assessment and Epidemiology Department of LAC DPH for providing the demographic data on newborns in LAC.

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ASSESSING INFECTION PREVENTION PRACTICES IN LOS ANGELES COUNTY AMBULATORY SURGERY CENTERS

OVERVIEW

In Los Angeles County (LAC), outpatient healthcare settings such as ambulatory surgery centers (ASCs) are almost always unlicensed, have limited oversight from the LAC Department of Public Health (DPH), and have been the site of several outbreak investigations in recent years [1]. Furthermore, ASCs do not report any patient encounter or healthcare-associated infection data to LAC DPH. As a result, LAC DPH has a limited understanding of their infection control practices and the extent of their healthcare-associated infections. Meanwhile, the number of patient visits and procedures in outpatient settings has grown steadily as has the number of unlicensed ASCs [2,3].

In response to the West Africa Ebola epidemic in 2014, LAC DPH secured funds to support the development of robust infection prevention (IP) programs across the continuum of care. Using these funds, LAC DPH Acute Communicable Disease Control Program (ACDC) conducted comprehensive on-site assessments in a sample of the approximately 500 ASCs in the county with the goal of obtaining insight into demographic characteristics, IP policies, and healthcare workers' IP practices.

METHODS

ACDC staff performed assessments of IP policies and practices in ASCs utilizing tools developed by the Centers for Disease Control and Prevention (CDC). Assessed domains included infection control program and infrastructure, infection control training and competency, healthcare personnel safety, disease surveillance and reporting, and direct observation of facility infection control practices. Each ASC completed the tool for the first four domains; the tool was then reviewed by ACDC staff and direct observations were made during a one-day on-site visit to the ASC. Teams of four ACDC staff members conducted the assessments. Observations of staff infection control practices were made throughout the ASC, including pre- and post-operative areas, post-anesthesia care units, operating/procedure rooms, and sterile processing departments. Auditing was defined as a formal process that included both monitoring and documentation. An ASC could provide feedback but not have a formal auditing process.

Assessments by ACDC were voluntary for ASCs. Recruitment communications were sent in Fall 2015 through Spring 2016 using contact lists from previous DPH surveys and via communication sent to members of the California Ambulatory Surgery Association and the Los Angeles County Medical Association. Following the assessment, each setting received a detailed summary and completed assessment tool via email, which included resources specific to identified gaps.

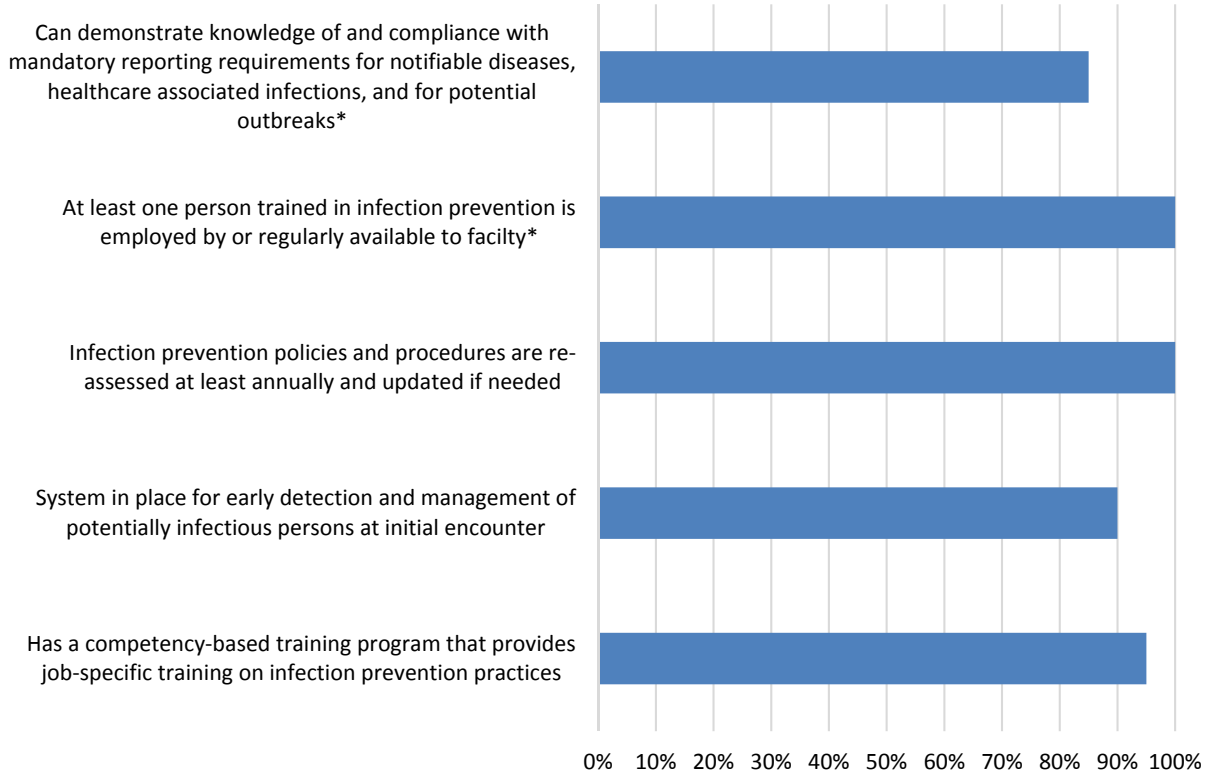
RESULTS

All ASCs that volunteered, a total of 20, were assessed by ACDC from January 2016 through June 2017. Results of the assessments are shown in the below tables and figures.

Table 1. Demographic characteristics of assessed ASCs

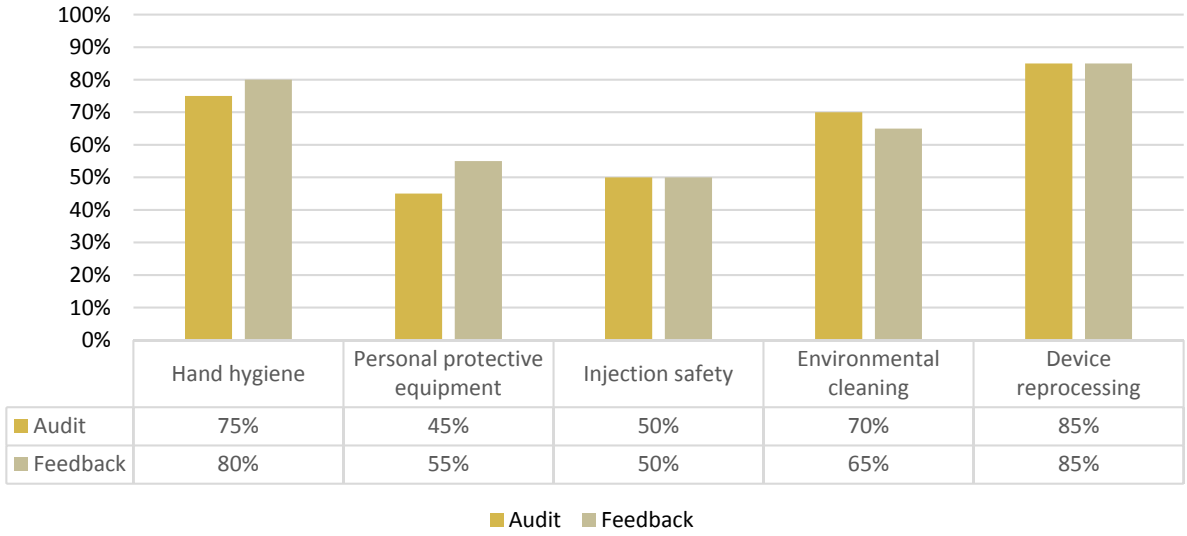
Characteristic	Number of ASCs (%) (N=20)
Certified by Center for Medicare and Medicaid Services (CMS)	18 (90%)
Accredited	16 (80%)
Median number of physicians who work at facility (range)	16 (1-100)
Median number of patients seen per week (range)	53.5 (12-200)
Average number of operating and/or procedure rooms (range)	2.6 (1-5)

Figure 1. Features of infection control programs at assessed ASCs



* Mandated by Centers for Medicare and Medicaid Services Conditions for Coverage - infection control § 416.51 for certified ASCs

Figure 2. Audit and feedback practices for assessed ASCs, by domain



	Hand hygiene	Personal protective equipment	Injection safety	Environmental cleaning	Device reprocessing
Audit	75%	45%	50%	70%	85%
Feedback	80%	55%	50%	65%	85%

Table 2. Number of assessed ASCs with at least one identified gap, by infection control domain

Domain	Number of settings with at least one gap in domain (%) (N=20)
Hand hygiene	17 (85%)
Personal protective equipment	16 (80%)
Point-of-care testing	9 (50%)
Injection safety	19 (95%)
Respiratory hygiene/cough etiquette	10 (50%)
Environmental cleaning	14 (70%)
Device reprocessing	8 (40%)
Sterilization of reusable devices	5 (28%)
High-level disinfection of reusable devices	6 (46%)

The two most common deficiencies noted from direct observations both pertained to injection safety. Amongst the 19 ASCs where observation was applicable, 58% failed to disinfect the rubber septum on a medication vial prior to piercing with needle during medication preparation. A total of 79% allowed multi-dose vials to be used on more than one patient to enter immediate treatment areas rather than be kept in a centralized medication area. Hand hygiene moments most commonly missed occurred after contact with objects in the immediate vicinity of the patient (53% of ASCs deficient) and after removing gloves (63% deficient). Other common gaps included instruments that undergo immediate-use steam sterilization used immediately and not stored (38% deficient) and reusable devices stored in a manner to protect from damage or contamination after high-level disinfection (38% deficient).

The on-site assessment also allowed for the opportunity to obtain feedback on DPH outreach. Several infection preventionists felt that LAC DPH and other public health agencies have few resources specific to the ASC and outpatient audience.

DISCUSSION

Overall, it appears that the ASCs assessed during this project had the necessary IP program elements in place, though only some are mandated per Centers for Medicare and Medicaid Services Conditions for Coverage. Nearly all ASCs had a designated, trained infection preventionist, updated IP policies, appropriate infection surveillance, and a robust staff training program. Some inadequacies were noted related to communicable disease reporting. Most commonly, ASC infection preventionists were not aware that outbreaks were to be reported to DPH. A, the results of the direct observation of staff practices often did not reflect written policies and procedures. The domains with the most frequently observed gaps included injection safety, hand hygiene, and personal protective equipment (PPE) use. These findings are very similar to common lapses identified during inspections conducted by the CDC in several states, which included the same domains [4]. Identified gaps related to audit of IP practices and feedback of those results to staff. Audit and feedback are well-recognized methods of improving practice, and higher intensity is associated with improved compliance [5]. Of note, two of the domains with the most gaps (injection safety and PPE use) were also the two domains with the least amount of audit and feedback. Auditing tools for all IP domains were provided to assessed ASCs.

In 2015, ACDC conducted a multi-modal, cross-sectional study of facility characteristics and the IP program in all LAC ASCs. A total of 130 ASC representatives were interviewed for that survey. Compared to self-reported survey results from 2015, it appears that the presence and quality of written policies were comparable to those ASCs visited in-person [6]. This project allowed ACDC to conduct a more accurate assessment, albeit amongst a smaller sample, and illuminated gaps in staff practices.

There are some limitations to this analysis. As this was a voluntary assessment, selection bias, volunteer bias, and non-respondent bias may be present. Non-respondents may vary considerably from respondents in adherence to recommended IP practices. We hypothesize that the volunteer ASCs may have fewer IP gaps than a random sample of the general population. The groups from which we recruited ASCs to participate may represent those with more resources and generally more interest in IP. The proportion of assessed ASCs that were certified for CMS participation (90%) is higher than the total LAC ASC population of approximately 60%. Data were available for only a small portion of ASCs in LAC.

ACDC is currently following up with assessed ASCs to determine the perceived value of the assessment results and how DPH can support their IP efforts. In response to the perceived limited number of public health resources specific to ASCs, LAC DPH created a quarterly publication that will be sent electronically to outpatient infection preventionists. Further gap mitigation efforts are planned, specifically pertaining to injection safety. As outpatient IP practices are further studied and characterized, more relevant resources and outreach efforts will be designed.

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SURVEY OF HOSPITAL NURSING ROLES IN ANTIMICROBIAL STEWARDSHIP

BACKGROUND

Antibiotic/antimicrobial-resistant infections have repeatedly been recognized as an imminent and growing public health threat. Each year in the United States at least two million people become infected with bacteria that are resistant to antibiotics, at least 23,000 of these people die as a direct result of antibiotic-resistant bacteria, and many more die from other conditions that were complicated by an antibiotic-resistant infection [**1**]. The primary strategies for preventing antibiotic resistant infections are: (a) reducing the transmission of healthcare-associated infections caused by antibiotic-resistant bacteria, and (b) preserving antibiotic efficacy by promoting the judicious use of antibiotics, formally known as Antimicrobial Stewardship.

Hospitals were the first healthcare facility type to widely adopt the implementation of an Antimicrobial Stewardship Program (ASP). The Centers for Disease Control and Prevention (CDC) have outlined necessary components of a ASP [**2**]. While the CDC had previously listed nurses as key support for an ASP, their significant contribution had been largely unrecognized. Bedside registered nurses (RNs) are not usually represented in ASPs. This gap has been recognized in recent literature [**3**]; however, summarizing the intersection of nursing roles with antimicrobial stewardship has been based largely on experience. To objectively identify these opportunities, a survey was sent to the Directors of Nurse Education in all of Los Angeles County (LAC) acute care hospitals. Data was collected online via Google Forms from November 2015 until January 2016.

METHODS

An online survey was created in Google forms for nurse education directors or their designees who could best speak to nurse education and competency. The invitation link for all 93 LAC Acute Care Hospitals (ACHs) was sent in November 2015, and responses were received by mid-January 2016. The Institutional Review Board (IRB) of the LAC Department of Public Health (DPH) designated this survey as IRB-exempt. Question formats included multiple choice, select all that apply, or fill in with text. A single question with several subparts comprised the bulk of the survey. Each subpart listed a different activity or knowledge component related to antimicrobials, which respondents identified as “mandatory/required,” “optional/offered,” or “not offered” for bedside RNs in their hospital. We combined responses of “mandatory/required” and “optional/offered” to identify topics that hospitals include in bedside RN knowledge and competency. Additional questions included policies related to antimicrobial administration and orders as well as communication of results.

RESULTS

Respondent Hospital Characteristics

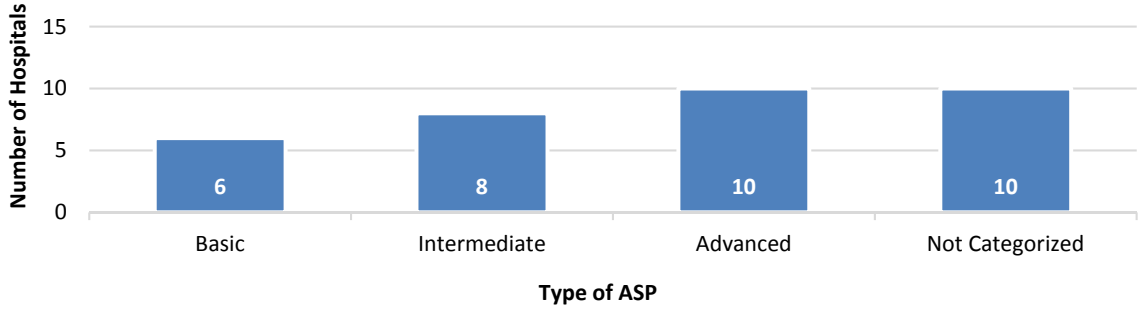
The rate of response to this survey was 36.6%. The 34 hospitals represented in this survey comprise approximately one-third of the hospitals in LAC. In most cases, the survey was completed by the self-identified Director of Nursing Education (n=19, 56%); however, additional surveys were completed by nurse education designees such as Clinical Nurse Specialists of Bedside Nurse Educators (n=9, 26%), Directors of Nursing or Chief Nursing Officers (n=4, 12%), or other nurse administrators (n=2, 6%). Out of

the 34 hospitals that completed the questionnaire, 24 of them had additionally completed a different survey [**4**] describing their ASP. Based on the results of that survey, it was possible to categorize the respondents' ASPs level of basic, intermediate and advanced using the California Department of Public Health (CDPH) criteria [**5**].

Hospitals that had a basic ASP accounted for n=6 (18%) of the respondents; n=8 (24%) had an intermediate ASP; and 10 (29%) had an advanced program. The remaining 10 (29%) were unable to be categorized as they had not completed the second survey sent in November 2015 (Figure 1).

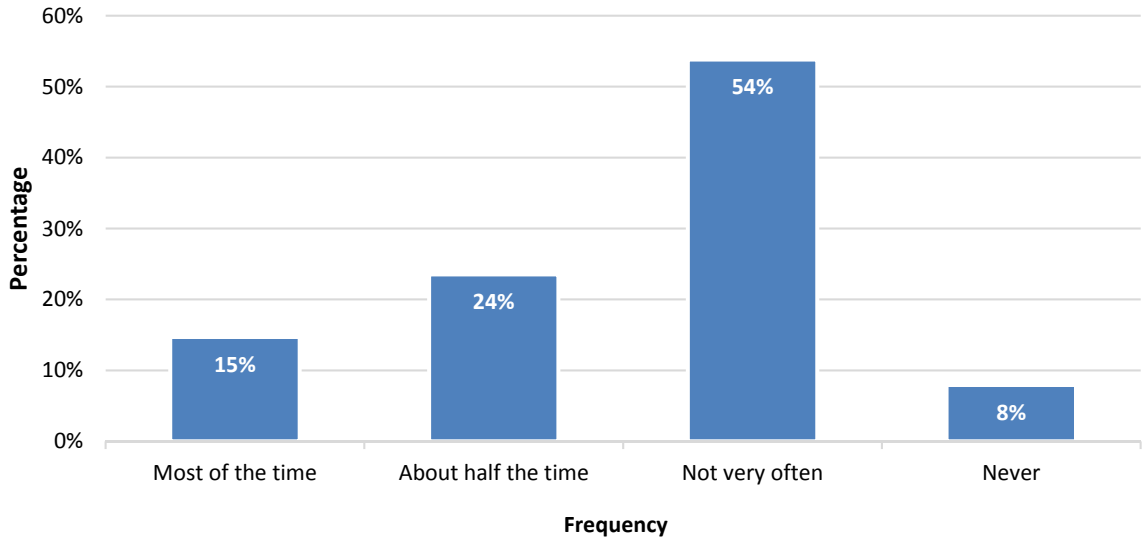
Respondents were asked about the structure of their ASP (Figure 1) as well as facility norms related to medication orders (Figure 2) and results communication (Figure 3).

Figure 1. Antimicrobial Stewardship Program (ASP) Level (n=24)



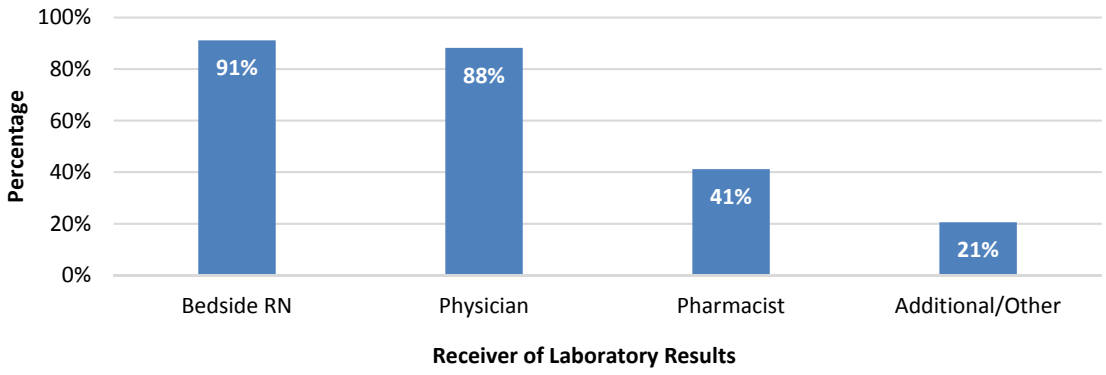
Question: "At your facility, how often do bedside registered nurses take phone and/or verbal orders from the physician for antimicrobials?

Figure 2. Entering Orders (n=34)



Question: "To whom are critical microbiology laboratory results reported?" *(Select all that apply)*

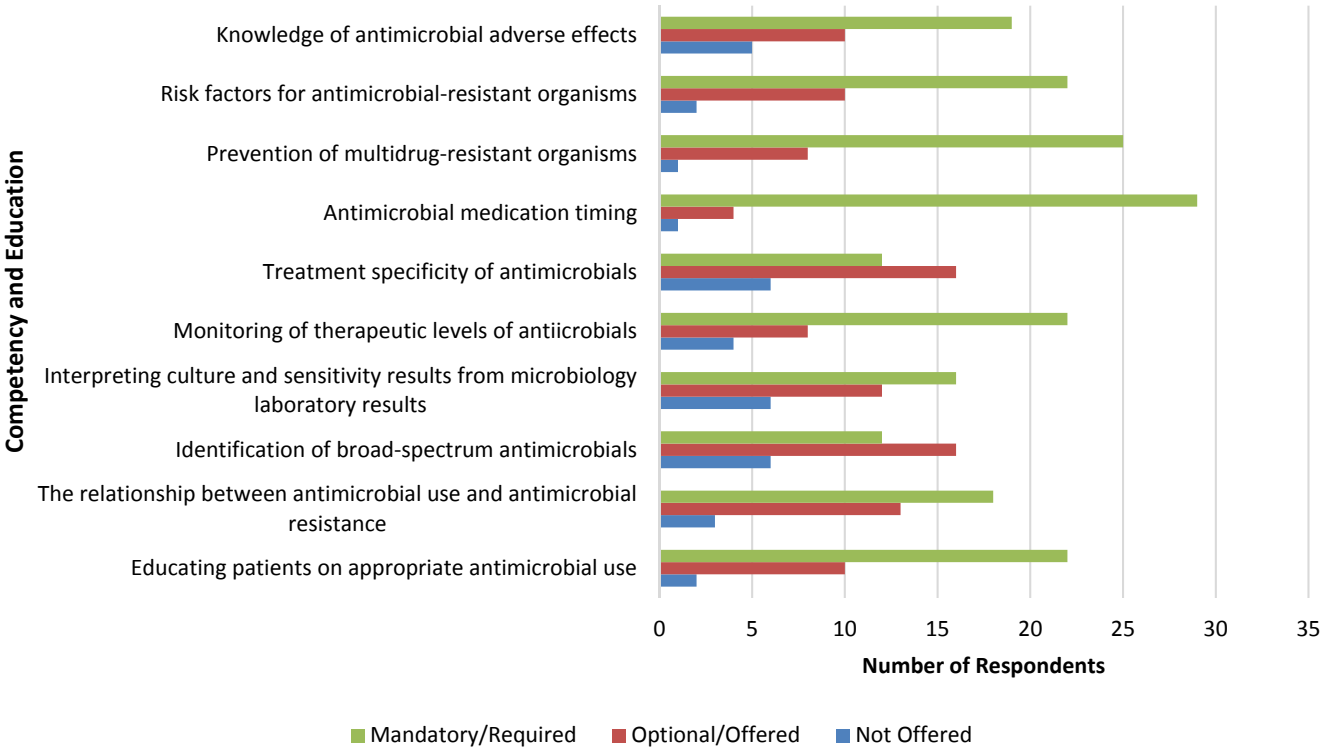
Figure 3. Whom to Report Microbiology Results (n=34)



Competency and Education Series

In a select-all-that-apply question, respondents identified how bedside RNs participate in antimicrobial stewardship at their hospital. Overall, 5 hospitals (15%) reported no bedside RN participation in antimicrobial stewardship. In 3 hospitals (9%), at least 1 bedside RN is on the ASP committee; however, in 19 hospitals (56%), nursing leadership represents them and no bedside RNs are on the ASP committee. Bedside RNs participate in quality assurance for antimicrobial treatment in 9 responding hospitals (26%), and in 3 hospitals (9%), they participate on subcommittees that promote antimicrobial stewardship knowledge on their respective units. Finally, in just 1 hospital (3%), bedside RNs have an antimicrobial resistance/multidrug-resistant organisms advisory group.

Figure 4. Competency and Education Series



DISCUSSION

Bedside RNs have an important role in the administration and evaluation of antimicrobial treatment. Respondents to the survey reported that bedside RNs are trained to recognize broad-spectrum antibiotics, to understand culture/susceptibility results, to monitor therapeutic level of antimicrobials, and to assess antimicrobial treatment for appropriateness (Figure 4).

When an antimicrobial (such as penicillin) is inappropriately listed as an allergy, other antimicrobials may also become eliminated as medication options, reducing the prescriber's choices for optimal treatment. A total of 97% of the hospitals represented in this questionnaire require bedside registered nurses (RNs) to appropriately assess allergies. By incorporating allergy assessment into their patient assessment, bedside RNs may be able to verify allergies and potentially increase antimicrobial medication options available to that patient [**6**].

Literature suggests that bedside RNs have been shown to influence prescribing; with increased awareness, that influence can be redirected to more judicious use of antimicrobials [**7**]. Respondents demonstrated that bedside RNs may have frequent opportunities to clarify the indication of a treatment prior to ordering or administering antimicrobials because bedside RNs often take phone and/or verbal orders from physicians for these medications. Although these opportunities may exist, it is not known how common a practice this is among bedside nurses.

Antimicrobial use can be narrowed down to a more optimal treatment by assessment of the patient and available information. Bedside RNs reportedly are expected to interpret culture/susceptibility results, monitor therapeutic levels of antimicrobials, and have knowledge of treatment specificity.

Bedside RNs are typically the center of communication for results critical such as microbiology lab results. In some cases, the bedside RN is the sole member of the patient care team notified of such results, and it is their responsibility to communicate critical information to other members of the patient care team.

LIMITATIONS

The rate of response to this survey was 37% (n=34). Although the survey questions were specific, a nurse education director unfamiliar with antimicrobial stewardship may have misinterpreted questions related to competency in antimicrobial administration and/or evaluation [**8**].

CONCLUSION

Bedside RNs are the frontline staff who administer antimicrobials, and they access the same information that ASPs use to optimize antimicrobial treatment. By empowering bedside RNs, ASPs can potentially achieve increased compliance to and adherence with antimicrobial stewardship activities across all disciplines.

PREVIOUS PRESENTATION OF STUDY RESULTS:

This information was previously published in the journal *Infection Control and Hospital Epidemiology* and is available through Cambridge core at the following hyperlink: http://dx.doi.org/10.1017/ice.2017.166. Preliminary findings were presented at the local Coastline Chapter of the Association of Professionals in Infection Control and Epidemiology (APIC) on March 10, 2016 in Torrance, California.

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INCREASING HEALTHCARE PERSONNEL INFLUENZA VACCINATION COVERAGE IN LAC HOSPITALS WITH HELP FROM THE LOCAL HEALTH DEPARTMENT, 2016

BACKGROUND

Influenza is a serious and often deadly infection. Typically, hospitalized persons are at greater risk for complications related to influenza compared to the general population. In addition, hospitalized persons are exposed to healthcare personnel, who as healthy adults can often serve as vectors for influenza transmission. The vaccination of healthcare personnel (HCP) has been widely recommended to provide direct protection against influenza infection for HCP and indirect protection for their patients.

In 2013, Los Angeles County (LAC) Department of Public Health (DPH) issued a Health Officer Order mandating all HCP in hospitals receive influenza vaccination or wear masks during the influenza season[1]. Despite this mandate, only 19% of LAC hospitals achieved the Healthy People 2020 goal of ≥90% influenza vaccination coverage. DPH's objective was to identify hospitals with disparities in resources and increase HCP influenza vaccination coverage via targeted outreach to LAC acute care hospitals.

METHODS

LAC conducted an intervention study during the 2016-17 flu season. HCP vaccination data was obtained from the Healthcare Worker Vaccination Module of the National Healthcare Safety Network (NHSN), which is only accessible via the Center for Disease Control and Prevention (CDC) authorization, for the 2015-16 and 2016-17 influenza seasons. Vaccination coverage was defined as the percentage of healthcare personnel—employees, licensed independent practitioners, adult students/trainees and volunteers, and other contract personnel who received their influenza vaccination on site at the hospital or elsewhere. Targeted (intervention) facilities were selected from those with vaccination coverage within the lowest quartile of all hospitals in LAC for the 2015-16 season. Hospitals were not randomly selected; thus self-selection bias could have affected results.

Targeted hospitals' chief executive officers received letters explaining the importance of HCP vaccination, their hospital's 2015-16 HCP vaccination coverage and ranking among hospitals in LAC, and the opportunity to participate in the HCP Influenza Vaccination Improvement Project. DPH liaison public health nurses (LPHNs) then engaged the hospital's infection preventionists and employee health directors to conduct the project.

The LPHNs conducted one in-person and two telephone meetings with each hospital before and during the 2016-17 influenza season. Using a standardized assessment tool, the LPHNs evaluated the hospital's 2015-16 vaccination campaign strategies to determine a baseline of recommendations to utilize in the upcoming season. Topics assessed included how influenza vaccination is promoted and distributed to HCP, tracking of HCP vaccination, and perceived barriers to increase vaccination rates.

[1] http://publichealth.lacounty.gov/ip/influenza_providers.htm

Based on the results of each assessment, LPHNs provided customized recommendations for each intervention hospital to implement into its 2016-17 vaccination campaign. Recommendations were determined on evidence based strategies from NHSN's "Healthcare Personnel Safety Component Protocol", a scientific literature review, and practices deemed effective in other local hospitals. At the conclusion of the 2016-17 season, the LPHNs conducted a post-season assessment with each hospital. The standardized post-season assessment tool gathered feedback and information on improvements achieved during the hospital's vaccination campaign.

Both assessment tools were reviewed after the 2016-17 season. DPH assessed which campaign strategies were newly implemented for the 2016-17 season in each hospital and what changes they perceived to be the most impactful. Common themes among all intervention facilities' responses were identified. DPH also reviewed HCP vaccination coverage data from NHSN for the 2015-16 and 2016-17 influenza seasons. Changes in HCP vaccination coverage between influenza seasons were compared via two-tailed Wilcoxon Signed Rank tests and between intervention and non-intervention facilities via two-tailed Wilcoxon Rank-Sum tests. All analyses were performed using SAS software version 9.3.

RESULTS

Out of 90 hospitals with complete HCP vaccination data for both seasons, 13 facilities were selected for intervention.

Each hospital in the intervention group experienced a significant increase in vaccination coverage (Figure 2). Intervention facilities' baseline vaccination coverages for 2015-16 ranged from 38.2% to 66.0% (mean 55.4%). Mean increase in pre- and post-season vaccination coverage was significantly higher among intervention hospitals (22.6%, range: 4.3%–46.1%) versus all others (n=77, 1.3%, range: -15.8%–26.6%). Countywide vaccination coverage increased from 74% to 79% for the 2015-16 and 2016-17 seasons, respectively (Figure 3).

The assessment responses showed that the most commonly implemented strategy was the involvement of department supervisors (n=13, 100%). Specifically, 11 (85%) facilities implemented tracking of department-based vaccination rates. All 13 facilities also cited increased leadership support as key to their success.

CONCLUSIONS

The goal of the Healthcare Personnel Influenza Vaccination Improvement Project was to increase influenza vaccination amongst HCP in acute care hospitals with the lowest vaccination coverage in LAC. All of the objectives for this project were met.

Intervention was associated with increased HCP influenza vaccination in the 2016-17 season. On average, intervention hospitals' vaccination coverage increased by 22% in one influenza season. The countywide average increased significantly by 5% over the same time period. Countywide vaccination coverage had not significantly increased since the introduction of the aforementioned Health Officer Order (Figure 3). Previously, the intervention group consistently reported lower vaccination coverage compared to other hospitals in LAC, but this disparity was greatly reduced after the DPH project.

This project relied on the innovative structure of the DPH Healthcare Outreach Unit (HOU) to work with targeted hospitals. HOU LPHNs have established relationships with hospital staff and regularly attend infection control committee meetings. The LPHNs have worked with these staff on numerous occasions, from outbreak management to consulting on infectious disease topics. When HCP influenza vaccination rates were determined to be an area source of concern, DPH was able to utilize this existing rapport. HOU staff successfully identified hospital staff who oversee their vaccination campaign and have the most influence over improving vaccination coverage. DPH and hospital staff communicated and collaborated openly and efficiently to implement new vaccination campaign strategies.

DPH will continue to promote strategies associated with increased HCP vaccination coverage, particularly in hospitals with the lowest vaccination coverage. Communication and collaboration between DPH and hospital counterparts may benefit facilities to improve vaccination coverage. Increasing HCP vaccination ultimately aids in protecting hospital patients, visitors, families, and other staff members from influenza and transmitting it to others.

Figure 1: Flowchart of Project

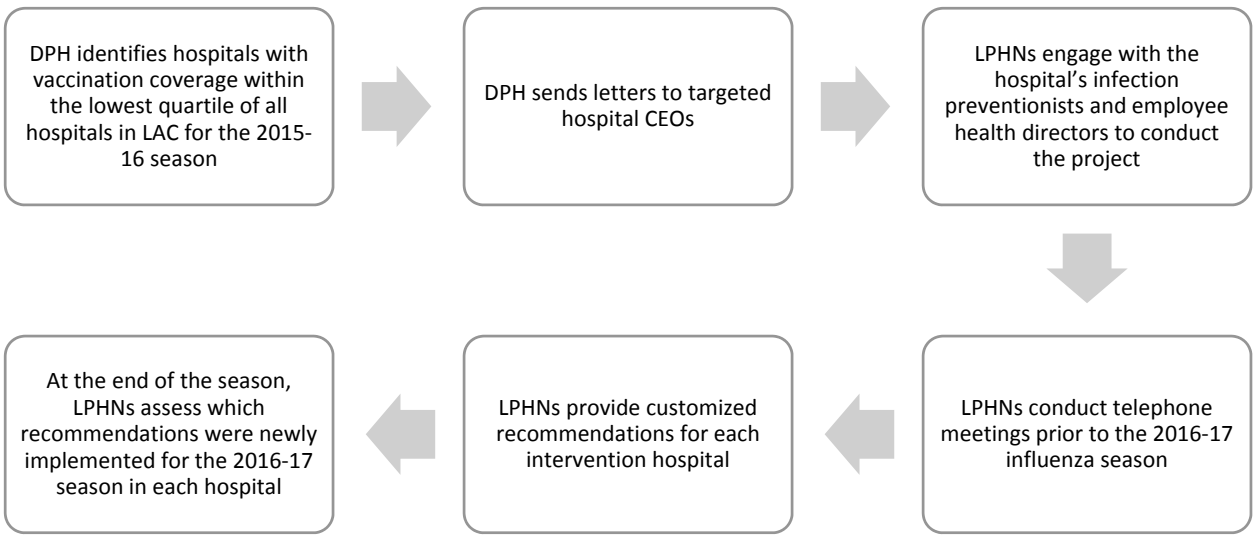


Figure 2: Vaccination Coverage by Intervention Hospital and Influenza Season

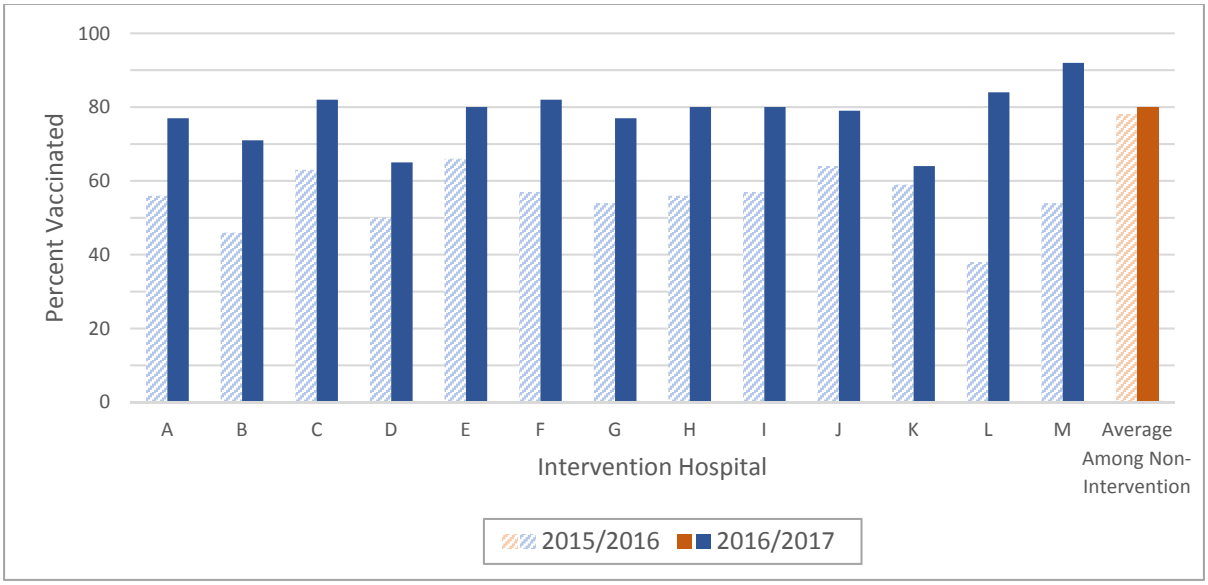
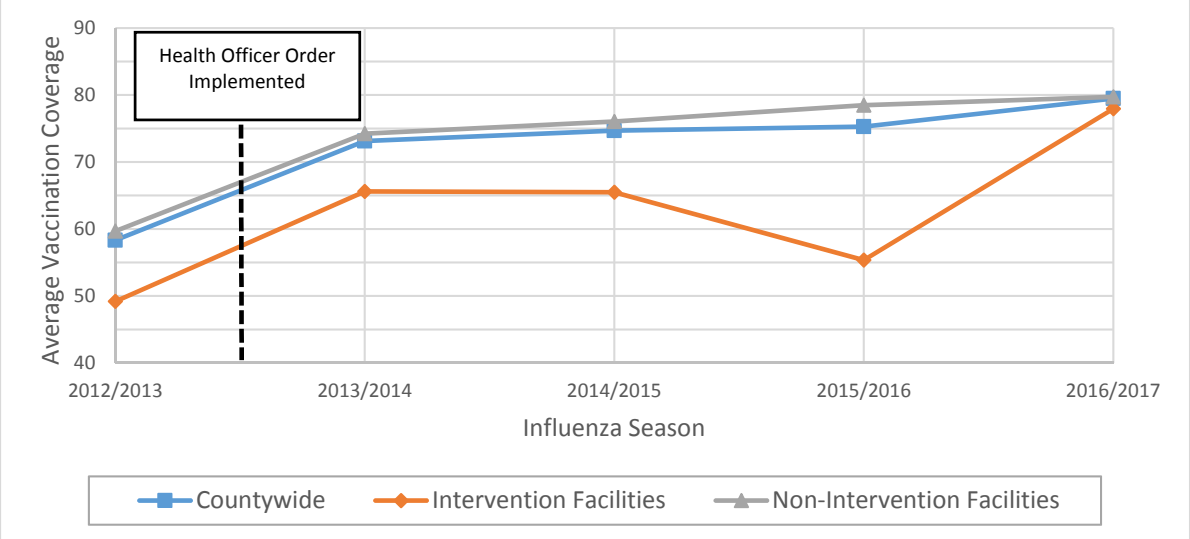


Figure 3: Average Vaccination Coverage by Season, Overall and by Intervention Group



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ON-SITE INFECTION CONTROL ASSESSMENTS: PARTNERSHIP WITH EMS

OVERVIEW

Infection control is key in preventing diseases from spreading in healthcare facilities. For many years, the Los Angeles County Department of Public Health's Acute Communicable Disease Control Program (LAC DPH ACDC) has worked with healthcare facilities such as hospitals and skilled nursing facilities to improve infection control practices. This serves to decrease healthcare associated infections (HAIs) in both patients and healthcare personnel. Emergency Medical Services (EMS) providers are a vital part of the healthcare team as they are the first to respond to pre-hospital incidents and provide care during inter-facility transports. EMS providers in LAC include emergency medical technicians and paramedics in both public (fire and sheriff departments) and private (ambulance companies) settings.

To support infection control across the continuum of care, ACDC began collaborating with the LAC Emergency Medical Services Agency (LAC EMS) to increase infection control measures in EMS providers across LAC. EMS providers face unique situations that present challenges in practicing proper infection control such as working in high stress scenarios and providing care with limited or no patient background. While performing their everyday duties, they can be exposed to patients with communicable diseases, and although there have been no documented cases of transmission in LAC to EMS providers, some have been exposed to diseases such as meningitis, tuberculosis, hepatitis A, hepatitis B, human immunodeficiency virus (HIV), etc. Their work environment (the ambulance) provides limited space for necessary resources. For example, there is no room for a sink in the ambulance to perform hand hygiene with soap and water when needed. Furthermore, if there is a breach in personal protective equipment (PPE) or if a device malfunctions or becomes contaminated, there is limited amount of room for extra supplies. Infection control by EMS providers is crucial and understanding their unique challenges is important in order to effectively help them.

ACDC received funding in 2015 through a Centers for Disease Control and Prevention (CDC) grant to perform infection control assessments in acute care hospitals, ambulatory surgery centers, and skilled nursing facilities. In 2016, ACDC expanded this project to include EMS providers. The goal of these assessments was to evaluate and understand infection control practices among healthcare personnel, identify infection control gaps and best practices, enhance disease reporting, and develop standardized infection control guidelines.

METHODS

To perform these assessments, ACDC and LAC EMS adapted CDC Infection Control Assessment and Response survey tools[1] designed for other healthcare settings. The tools assessed domains of the infection control program including: staff training, healthcare personnel safety, hand hygiene, use of personal protective equipment (PPE), injection safety, respiratory hygiene, environmental cleaning, device reprocessing, sterilization, and/or high-level disinfection of reusable devices. LAC EMS selected the ten providers with the highest call volume and invited them to participate. Additional providers volunteered to participate after the opportunity was announced at the Provider Agency Advisory Committee and LAC

Ambulance Association meeting. Providers selected included private ambulance companies as well as public fire and sheriff departments.

Each infection control assessment lasted approximately seven hours and included two parts. The first part of each assessment involved the provider completing the survey tool and onsite review with LAC staff. The second part involved direct observation of infection control practices via ambulance field observation that lasted anywhere from four to seven hours in at least two ambulances per provider. At the conclusion of each visit, the provider received verbal feedback from LAC staff. Following the assessment, each provider received a detailed written summary with feedback, recommendations, and resources specific to their identified gaps.

RESULTS

Although the goal was to assess 10 EMS providers, ACDC and LAC EMS were able to assess 14 EMS providers from September 2016 through September 2017. Results of the infection control assessments are shown in the tables and figures below. Table 1 and Figures 1-3 represent data from the infection control survey tool. Figures 4 and 5 represent data from the direct observations of staff practices.

Table 1. Demographic Characteristics of EMS Providers Assessed

Characteristic	n (%)
Medical Director is employed by company	6 (43%)
Provider has Designated Infection Control Officer (DICO)	11 (79%)
Average number of hours per week dedicated to infection prevention and control (range)	11 (1-40)
Average number of call responses per week (range)	1,406 (20-7711)
Average number of transports per week (range)	787 (7-4392)

Figure 1. Features of Infection Control Programs and Healthcare Personnel Safety

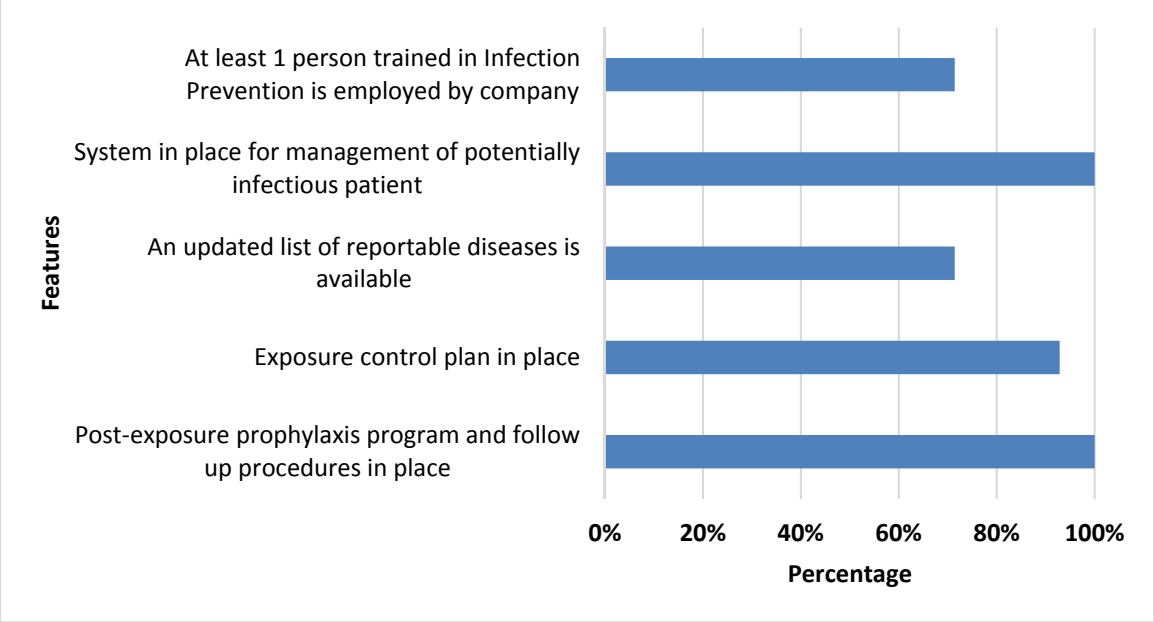


Figure 2. Percentage of Providers that Require Healthcare Personnel to Demonstrate Competency for the Four Infection Control Domains

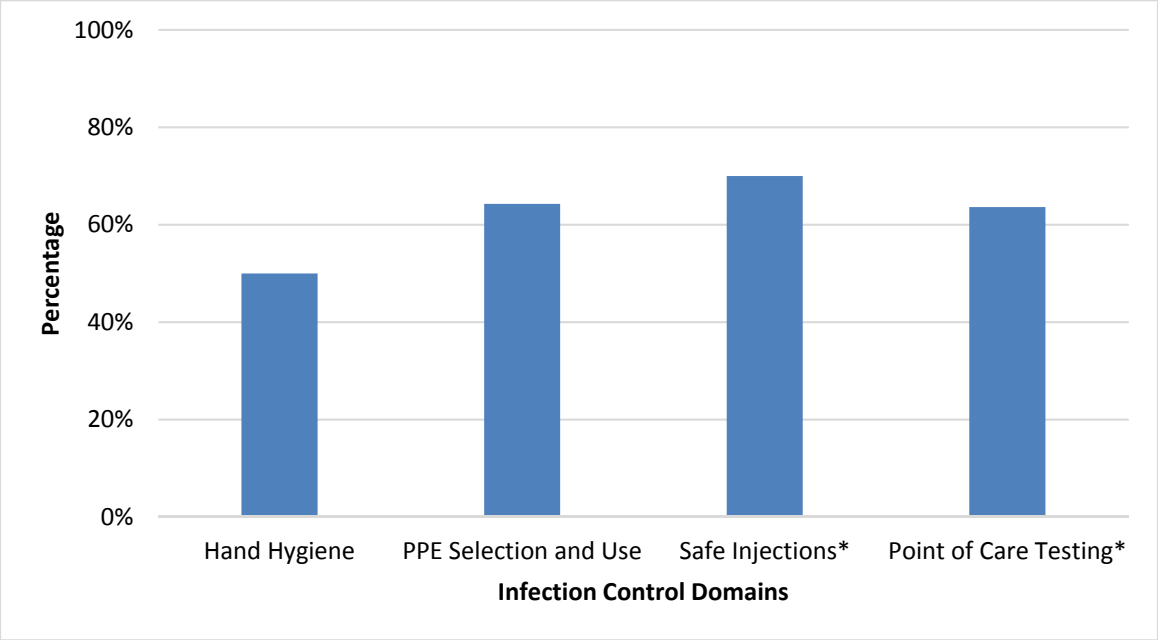


Figure 3. Audit and Feedback Practices for Assessed EMS Providers by Infection Control Domain‡

‡Per the CDC, auditing is a formal process that must include both monitoring and documentation; therefore, a facility may provide feedback but not have a formal auditing process.

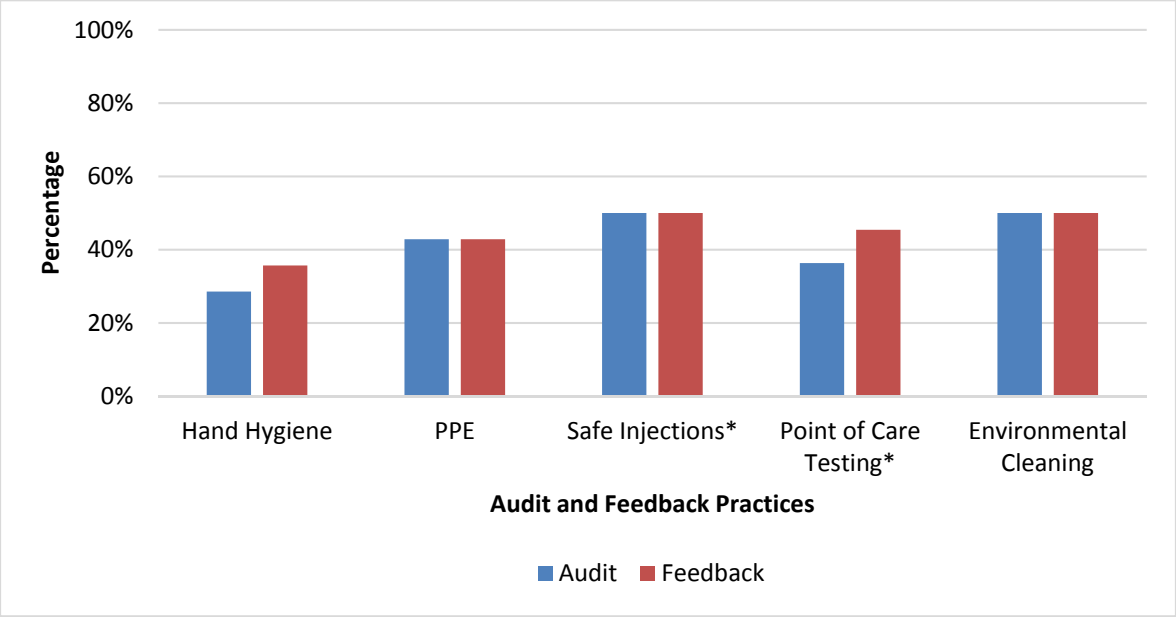


Figure 4. Observations of Hand Hygiene (HH) Practices

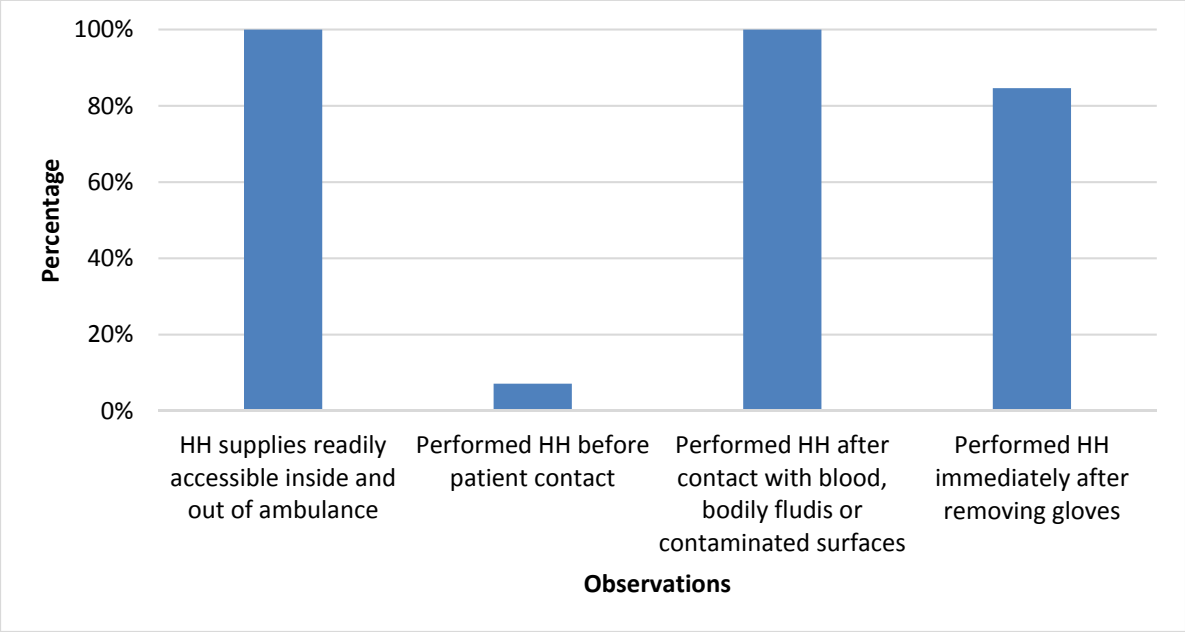
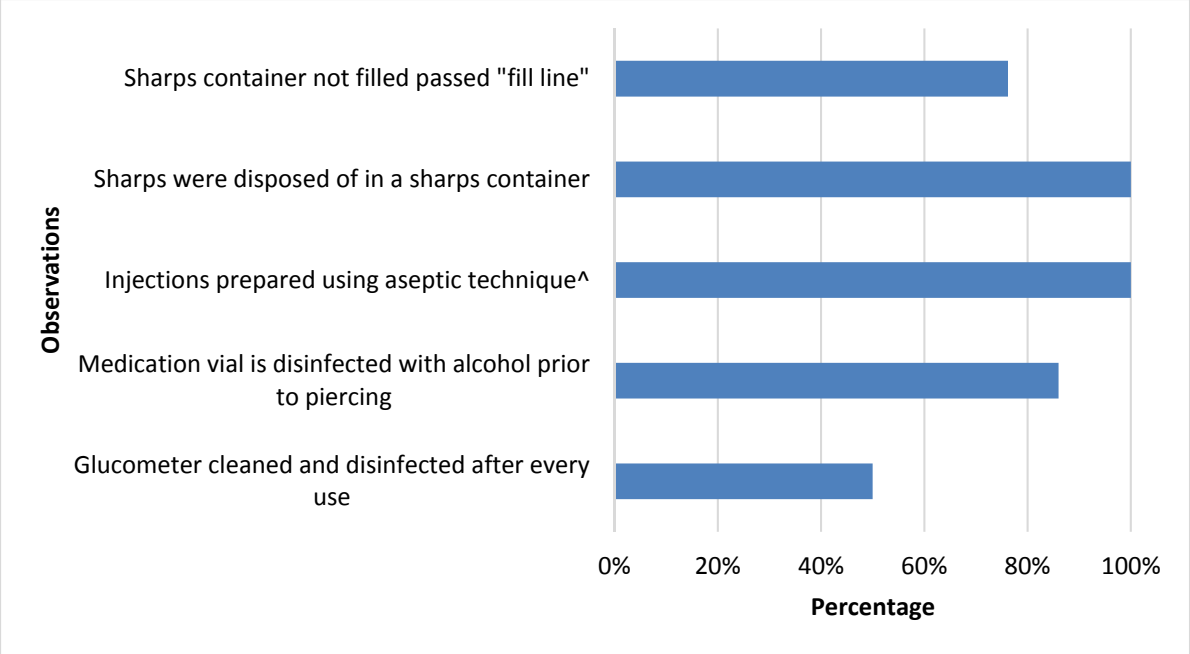


Figure 5. Observations of Safe Injection Practices and Point of Care Testing*



^Aseptic technique is a method used to keep objects and areas free from contamination with microorganisms to minimize the risk to the patient[2]; an example would be a designated medication preparation area.
*Note that some providers did not provide injections or medications (basic life support services only); therefore, they were not included.

DISCUSSION

Overall, findings from the infection control assessments were positive. All but one provider had staff assigned to infection control duties prior to our visit; 79% of whom had a single designated infection control officer. In addition, observed providers were aware and able to state companies' infection control policies such as appropriate contact time for disinfectants/cleaners.

However, while all providers provided infection control policies, direct observations did not always reflect what was written. For example, during policy and procedure review, the exposure control plan for blood borne pathogens stated that all sharps containers shall be closeable and sealable in accordance with OSHA standards to prevent leaks and punctures. However, during observation, several sharps containers did not have a lid or the lid was loose, which could cause potential needle-stick injuries to staff and/or patients. Furthermore, cleaning policies were not always followed during direct observations as a new and clean cloth/wipe was not always used to decontaminate the gurney. In addition, staff stated that glucometers were wiped down after each patient use; however, actions observed varied. Lastly, while the CDC recommends hand hygiene before and after all patient encounters[3], only 7% performed hand hygiene before patient contact, and only two providers included hand hygiene before patient contact in their written policy. To fully support infection control efforts among EMS providers, their leadership should require regular skills demonstration by staff to assess competency. By doing this, as well as regularly observing staff practices, they can improve infection control.

There are some limitations to this overall study and analysis. First, this was a voluntary study with a small sample size. In LAC, there are 38 licensed private providers and 31 public providers. We were only able to assess nine private (24%) and five public (16%) providers. Furthermore, as providers were allowed to say no and others volunteered for the assessment, it is possible that the companies who participated performed better than those who were not assessed. Additionally, it was hard to compare companies as they varied in size and services provided. For example, some of the smaller private ambulance providers only provided Basic Life Support (BLS) services, whereas the larger providers perform both BLS and Advanced Life Support (ALS) services. It is likely that these larger providers have more resources available to them compared to the smaller providers. The types of calls also posed a limitation as care differed for each call for BLS versus ALS response. In addition, the amount of calls varied from zero to five responses, limiting the LAC staff's opportunities for observations. Lastly, for these assessments the staff not only knew they were being observed, their observer was conspicuously shadowing them. Moreover, the providers were made aware ahead of time of the visit, which may have altered their infection control practices and allowed management to pre-select the ambulances that LAC staff observed. Therefore, based on these limitations, it may be hard to generalize our results for all EMS providers across the board.

In the upcoming year, LAC staff will begin conducting follow-up interviews to assess changes following the infection control assessments. Additionally, education and training opportunities are being planned to address the most prevalent gaps. ACDC will develop best practice guidelines and will develop infection control training based on best practices. ACDC in conjunction with LAC EMS will continue to work together with EMS providers to improve infection control policies and practices.

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2016 SYMPOSIUM ON INFECTION PREVENTION CONTROL IN SKILLED NURSING FACILITIES

OVERVIEW

On September 28, 2016, the Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control (ACDC) program in collaboration with the Association for Professionals in Infection Control and Epidemiology (APIC) Greater Los Angeles Chapter held a symposium for key county skilled nursing facility (SNF) staff responsible for infectious disease outbreak prevention and control. Representatives from SNFs included directors of nursing, administrators, and infection preventionists. Due to the large number of SNFs in LAC, over 315, attendance was limited to two representatives per facility. The goals of the symposium were to improve partnerships between SNFs and LAC DPH as well as to improve prevention and control of infectious diseases in the SNF setting, antimicrobial stewardship programs, and management of multi-drug resistant organisms (MDROs).

SUMMARY

A total of 80 attendees from 57 local SNFs attended the day-long event. In addition, the event included 22 attendees from ACDC, APIC Greater LA Chapter, representatives from several nursing home consulting companies, nursing home corporate consultants, laboratory-serving SNFs, and partnering agencies.

The topics for this event focused primarily on the prevention and control of infectious diseases that are common in SNF settings and greatly impact the vulnerable population cared for in these settings. The presenters were representatives from ACDC and guest speakers from the Diagnostic Laboratory and Radiology, Health Services Advisory Group, University of California Los Angeles (UCLA), and other organizations. The agenda was as follows:

2016 Infection Control & Prevention In Skilled Nursing Facilities Symposium Agenda	
8:00 AM	Registration
8:30 AM	***Welcome and Opening Remarks*** Ben Schwartz, MD – LAC DPH Acute Communicable Disease Control Angela Vassallo, MPH, MS, CIC, FAPIC - Director, Infection Prevention, Providence Saint John's Health Center and President-Elect, CA APIC
9:00 AM	Dawn Terashita, MD, MPH – LAC DPH Acute Communicable Disease Control ***Outbreaks: What Skilled Nursing Facilities Need to Know***
10:00 AM	Break
10:10 AM	Dolly Greene, RN, CIC - Director of Clinical Services, Diagnostic Laboratories and Radiology ***Best Practices in MDRO Management in LTACs***
11:10 AM	Wendy Manuel, MPH – LAC DPH - ***Influenza in Skilled Nursing Facilities*** Karen Cho, RN – LAC DPH - ***Infection Prevention Assessments in SNFs***

12:10 PM	Lunch
12:40 PM	Ravina Kullar, PharmD, MPH - Infectious Diseases Scientific Director, Southern CA/Las Vegas Global Center for Scientific Affairs, Merck Research Laboratories Merck & Co., Inc. ***Antimicrobial Stewardship: Going Beyond the Inpatient Setting to LTACs and SNFs***
1:40 PM	Break
1:50 PM	James A. McKinnell, MD - Assistant Professor of Medicine, David Geffen School of Medicine, UCLA, Los Angeles Biomedical Research Institute at Harbor-UCLA ***Antimicrobial Stewardship in LTACs and SNFs***
2:50 PM	Michael Wasserman, MD, CMD – Executive Director, Care Continuum, Health Services Advisory Group (HSAG) ***CA Nursing Home Quality Care Collaborative and the Reducing C. difficile Project Update***
3:50 PM	Closing remarks

In addition to presentations, each attendee received a folder with the following materials and APIC IP Guide to LTC (Infection Prevention Guide to Long-Term Care Book):

- Los Angeles County List of Reportable Diseases and Conditions
- Antimicrobial Stewardship Guidelines Pocket Card
- CDPH Pneumococcal Vaccine Timing Flow Chart—For Adults
- Los Angeles County Infection Prevention Transfer Form
- Infection Control Assessment Tool for Long-Term Care Facilities (CDC)
- Additional Resource Materials for Infection Prevention and Control
- Listing of Useful Resources and Websites
- Packets with
    - Influenza Outbreak Prevention and Control Guidelines
    - Scabies Prevention and Control Guidelines: Acute and Long-Term Care Facilities
    - Norovirus Outbreak Prevention Toolkit
    - Health Education Materials for Influenza and Scabies
- Antibiotic Stewardship materials – posters, educational brochures, and etc.
    - “Treat True Infections, Not Colonization” Poster (English)
    - “Reassess Antibiotics at 48 Hours” Poster (English)
    - “Cold or Flu. Antibiotics Don’t Work for You.” (English/Spanish)
- Hand Sanitizers

Many of these documents and materials were developed specifically for this event. These materials and an archive of the presentations are available on the ACDC website.[1]

Overall, the symposium was very well received, and the representatives from the SNFs urged LAC DPH to host additional trainings to provide further guidance on other topics including antibiotic resistant infections. ACDC plans to hold another symposium in 2017 as these trainings have become an annual event.

[1] www.publichealth.lacounty.gov/acd/SNF.htm

BOTULISM CASE REPORT SUMMARY
LOS ANGELES COUNTY, 2016

Botulism is a rare but serious and potentially fatal paralytic illness caused by a nerve toxin produced by the bacterium *Clostridium botulinum*. The bacterial spores that cause botulism are common in both soil and water and produce botulinum toxin when exposed to low oxygen levels and certain temperatures. There are five main kinds of botulism: 1) Foodborne botulism can be triggered by eating foods that have been contaminated with botulinum toxin. Common sources of foodborne botulism are homemade foods that have been improperly canned, preserved, or fermented. Though uncommon, store-bought foods also can be contaminated with botulinum toxin; 2) Wound botulism can be triggered by spores of the bacteria getting into a wound and making toxin. People who inject drugs have a greater chance of getting wound botulism. Wound botulism has also occurred in people after a traumatic injury such as a motorcycle accident or surgery; 3) Infant botulism can be triggered by the spores of the bacteria getting into an infant's intestines. The spores grow and produce the toxin, which causes illness; 4) Adult intestinal toxemia (also known as adult intestinal toxemia) botulism is a very rare kind of botulism that can be triggered by spores of the bacteria getting into an adult's intestines, growing, and producing the toxin (similar to infant botulism). Although we do not know why people get this kind of botulism, people who have serious health conditions that affect the gut may be more likely to get sick; 5) Latrogenic botulism could occur if too much botulinum toxin is injected for cosmetic reasons such as for wrinkles or medical reasons such as for migraine headaches or cervical dystonia.

Because botulism infections may be fatal, they are considered medical emergencies, and reporting of suspected cases is mandated by the Los Angeles County Department of Public Health (LAC DPH) immediately by telephone. Specialized antitoxin is used to treat botulism, which can only be released when authorized by LAC DPH or the California Department of Public Health (CDPH). Testing for case confirmation by mouse bioassay can be conducted at the LAC DPH Public Health Laboratory and matrix-assisted laser desorption/ionization-time of flight (MALDI-TOF) is conducted by the Centers for Disease Control and Prevention (CDC). Clinically compatible cases with botulinum toxin detected by either mouse bioassay or MALDI-TOF are considered confirmed cases. The CDPH Division of Communicable Disease Control is responsible for the investigation and surveillance of infant botulism cases identified in the county and across the state. LAC DPH is responsible for reporting suspected cases of infant botulism to CDPH's Infant Botulism Treatment and Prevention Program[1] for their investigation.

The number of confirmed botulism cases (non-infant botulism) in LAC fluctuates from year to year. For the past five years, an average of three cases were confirmed annually. The botulism cases in LAC usually have injection drug use as a risk factor. Foodborne botulism in LAC is rare, in the past 10 years only one instance of foodborne botulism was reported with two associated cases confirmed (2012).

In 2016, seven cases of suspected botulism were reported in LAC. Upon notification and review of case history and symptoms, ACDC physicians authorized the release and use of botulism antitoxin for all seven suspected botulism cases. Ultimately, five were classified as confirmed cases (laboratory-confirmed), and

[1] https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/InfantBotulism.aspx

one was classified as a probable (negative testing with clinically compatible findings and history of injection drug use) botulism case. One suspected case was determined not to be botulism based on absence of risk factors, negative botulism testing, and an alternate diagnosis of atypical Guillain-Barre Syndrome with stool positive for *Camplylobacter*. All six cases (five confirmed, one probable) had wound botulism. Two had infected wounds upon illness presentation, and all six had a history of injection drug use: three used black tar heroin, three used other injection drugs (e.g., heroin/methamphetamine). Laboratory cases were confirmed as follows: one case had botulinum toxin A detected by both mouse bioassay and MALDI-TOF in serum; two cases had negative mouse bioassay testing in serum but were confirmed positive for botulinum toxin A by MALDI-TOF; two cases were confirmed by mouse bioassay for botulinum toxin A by mouse bioassay (MALDI-TOF not performed).

MONITORING THE 2016 LOS ANGELES COUNTY SAND FIRE WITH MULTIPLE EARLY DETECTION SYSTEMS

INTRODUCTION

On July 22, 2016, the Sand Fire began burning in the Santa Clarita Valley of Los Angeles County (LAC), CA. This urban-adjacent wildfire breached the city limits of Santa Clarita (population 180,000). Fueled by record heat and an ongoing exceptional drought, the Sand Fire burned over 40,000 acres in 13 days [**1**] and caused a large increase in the air concentration of fine particulate matter [**2**].

The syndromic surveillance team was tasked with reporting possible health effects from the fire. Fire, asthma, and heat-related data were monitored until the fire was reported as 98% contained. The team prepared and distributed a daily special summary report to key stakeholders in the LAC Department of Public Health (DPH).

OBJECTIVE

To detect increases in health complaints resulting from the July 2016 Sand Fire near Santa Clarita, CA using syndromic surveillance and complementary systems.

METHODS

The data sources utilized were: 1) Emergency Department (ED) visits, 2) Volume from 19 Reddinet hospitals (Hospital admissions, ED visits, ICU admissions, and ED deaths), 3) Local temperatures from the Weather Underground website, 4) Air quality for the Santa Clarita Valley from the South Coast Air Quality Management District (AQMD), 5) Over-the-counter medication sales, and 6) Nurse call hotline.

Emergency department (ED) data were queried for cases related to fire, asthma, cardiac events, eye irritation, heat, and total volume. Queries were conducted on all participating syndromic EDs in LAC and also restricted to nine EDs closest to the fire. The resulting line lists were reviewed daily to rule out visits that were unrelated to the Sand Fire. The fire query was refined periodically with additional exclusion terms.

Chief complaint, diagnosis, and triage note fields were searched separately for the following groups of terms:

Wildfire: *smoke inhalation, fire,* and '*sand fire'*

Asthma: *asthma, COPD, shortness of breath,* and *difficulty breathing*

Heat: *heat exposure, heat stroke, heat rash, sun stroke, overheat, hyperthermia, feel hot,* and *hot radiation*

RESULTS

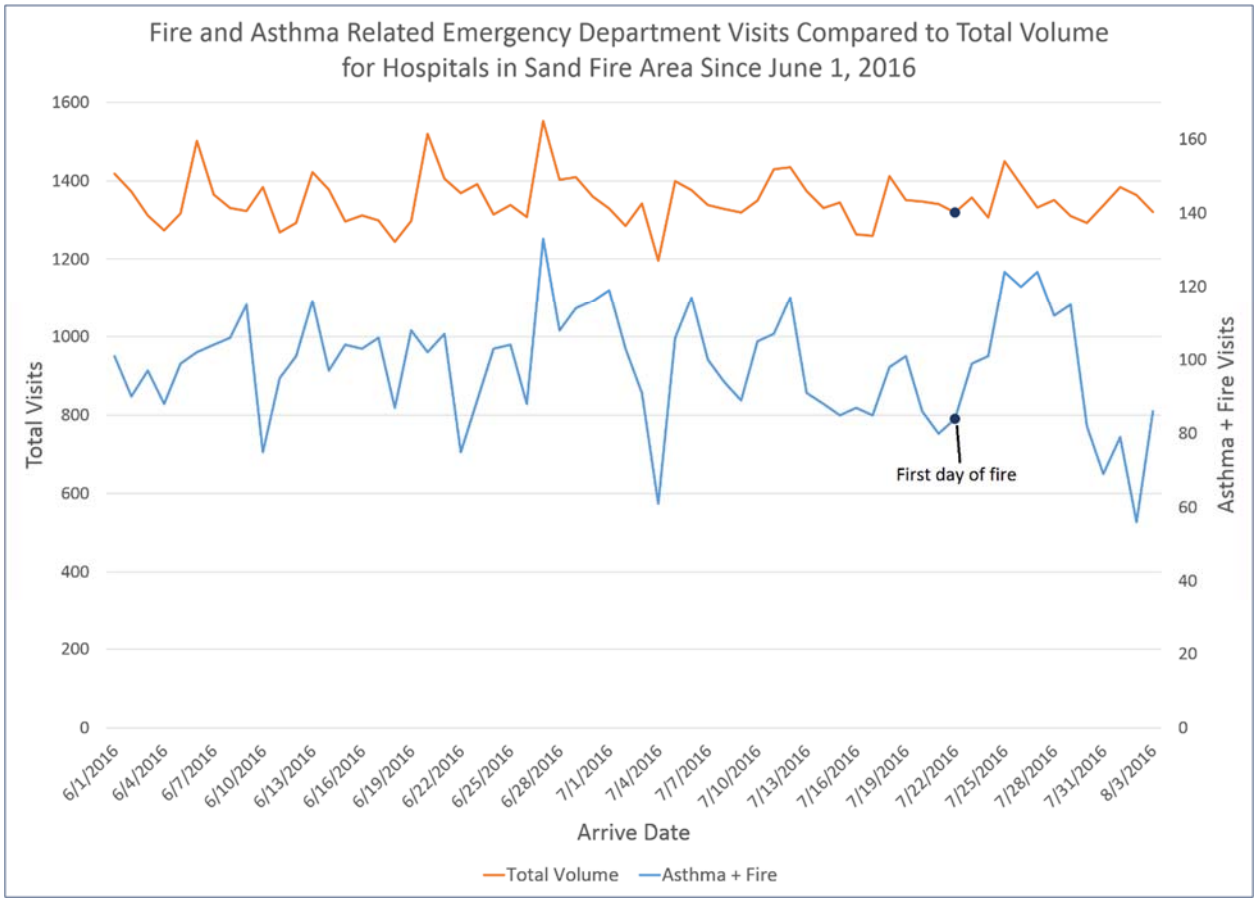
There were 48 syndromic ED patient records with direct mention of the fire in LAC's syndromic hospitals in 13 days. Of these, 22 were asthma cases, and 32 came from the nine hospitals in the Sand Fire region; 32 were identified from the chief complaint, six by diagnosis, and ten by triage note.

Despite an increase in fire-related visits, overall trends in ED data were not affected (Figure 1). No increase was found for cardiac events, eye irritation, heat-related illness or total volume. Asthma visits increased at the time of the fire, which correlates with a sharp increase in the concentration of fine particulate matter in the Santa Clarita Valley following the start of the fire [**2**].

The trend in asthma visits increased around the time of the fire (Figure 1) but had been high earlier in the summer as well, which may be partially attributable to the fact that LAC was experiencing an overall decline in air quality during the summer [**3**].

No increases in calls to a nurse hotline or over-the-counter medication sales were observed. Among Reddinet hospitals, admissions increased slightly, but ED visits remained unchanged.

Figure 1. Trend Graph of Syndromic Data for Hospitals in the Sand Fire Area



DISCUSSION

ED volume alone was not enough to estimate the subsequent health effects on residents of LAC; instead, a specific query was needed. Distinguishing between asthma increases from air pollution and those exacerbated by wildfire smoke in a region where air quality is already compromised is challenging. Residents may have heeded warnings about air quality during active fires, thus reducing their outdoor exposure. Most cases were identified using chief complaints. However, additional data fields such as triage notes available from some hospitals improved the ability to elicit fire-related visits. Syndromic

surveillance and complementary systems continue to be the primary tools for near real-time assessments in LAC.

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