SALMONELLOSIS

CRUDE DATA	
Number of Cases	1141
Annual Incidence[a]	
LA County	12.07
California[b]	16.14
United States[b]	14.10
Age at Diagnosis	
Mean	31.97
Median	27
Range	<0–96 years

[a]Cases per 100,000 population.
[b]Calculated from Final 2014 Reports of Nationally Notifiable Infectious Diseases. MMWR 64(36):1019–1033.

DESCRIPTION

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

LAC review of investigation reports shows that many persons engage in high-risk behaviors such as consumption of raw or undercooked meats; use of 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 with cases reporting domestic, national, or international travel.

2014 TRENDS AND HIGHLIGHTS

- There were a total of three LAC salmonellosis outbreaks investigated in 2014; all three were foodborne outbreaks investigated by ACDC. For more information see the Foodborne Outbreak summary in this ACDC Annual Morbidity Report 2014.
- By age group, the highest incidence rate was seen in those who were less than one year old (52.4 cases per 100,000, Figure 2).
- By race/ethnicity, in 2014 and prior years, the highest incidence rates occurred among whites and Hispanics.
- Incidence rates by SPA ranged from 7.4 in SPA 1 to 14.3 in SPA 3 (Figure 4).
- Travel was reported by 15.2% of the cases: 39% traveled to Mexico and 26% reported foreign travel to countries other than Mexico.
- There were 6.7% reptile-associated salmonellosis (RAS) cases in 2014. Among RAS cases, 55% were related to turtle exposures and 32% were related to lizard exposures. Seven LAC residents were part of a national outbreak related to lizard exposures.
- Twenty-two percent of cases were hospitalized for two or more days.
- There were eight deaths in persons diagnosed with salmonellosis. Ages ranged from 50 to 86 years with a mean of 66 and median of 70 years. All eight cases had comorbidities.

Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2010-2014

	2010 (N=1142)			2011 (N=900)			2012 (N=1041)			2013 (N=1010)			2014 (N=1141)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	56	4.9	46.6	61	6.8	43.7	73	7.0	61.4	59	5.8	48.8	62	5.4	52.4
1-4	186	16.2	38.3	134	14.9	22.9	153	14.7	32.2	141	14.0	29.0	162	14.3	33.2
5-14	174	15.2	14.1	148	16.4	11.1	158	15.2	13.2	185	18.3	15.3	181	15.9	15.0
15-34	262	22.9	9.4	186	20.7	6.3	224	21.5	8.1	227	22.5	8.0	248	21.7	8.8
35-44	131	11.5	9.8	93	10.3	6.5	95	9.1	7.2	89	8.8	6.7	110	9.6	8.3
45-54	87	7.6	6.8	86	9.5	6.4	108	10.4	8.4	82	8.1	6.3	111	9.7	8.5
55-64	100	8.8	10.5	86	9.5	8.9	88	8.5	8.6	84	8.3	8.2	99	8.7	9.3
65+	146	12.8	14.5	106	11.8	10.0	142	13.6	12.8	143	14.2	12.9	168	14.7	14.8
Unknown	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
Race/Ethnicity															
Asian	115	10.0	8.8	64	7.1	4.8	92	8.8	7.0	73	7.2	5.3	140	12.3	10.2
Black	50	4.4	6.5	53	5.9	6.2	56	5.4	7.2	69	6.8	8.9	67	5.9	8.5
Hispanic	570	50.1	12.8	465	51.7	9.8	503	48.3	11.1	538	53.3	11.7	575	50.4	12.5
White	387	33.9	14.5	279	31.0	9.7	247	23.7	9.3	318	31.5	12.0	344	30.1	12.9
Other	3	0.3	-	8	0.9	-	11	1.1	-	5	0.5	-	9	0.8	-
Unknown	17	1.5	-	132	12.6	-	132	12.6	-	7	0.7	-	6	0.5	-
SPA															
1	36	3.2	9.4	24	2.7	6.4	38	3.7	9.8	40	4.0	10.2	29	2.5	7.4
2	303	26.5	14.3	215	23.9	9.7	228	21.9	10.6	262	26.0	12.1	238	20.9	10.9
3	221	19.4	13.8	162	18.0	9.3	164	15.8	10.1	155	15.3	9.5	235	20.6	14.3
4	156	13.7	14.0	80	8.9	6.4	162	15.6	14.4	106	10.5	9.3	130	11.4	11.3
5	86	7.5	13.5	70	7.8	10.6	71	6.8	11.1	74	7.3	11.4	62	5.4	9.5
6	86	7.5	8.6	107	11.9	10.0	109	10.5	10.7	109	10.8	10.6	142	12.5	13.7
7	140	12.3	10.8	122	13.5	8.9	145	13.9	11.2	155	15.3	11.8	176	15.4	13.4
8	114	10.0	10.8	117	13.0	10.4	123	11.8	11.5	109	10.8	10.1	129	11.3	11.9
Unknown	0	-	-	3	0.33	-	1	0.09	-	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, 2005-2014

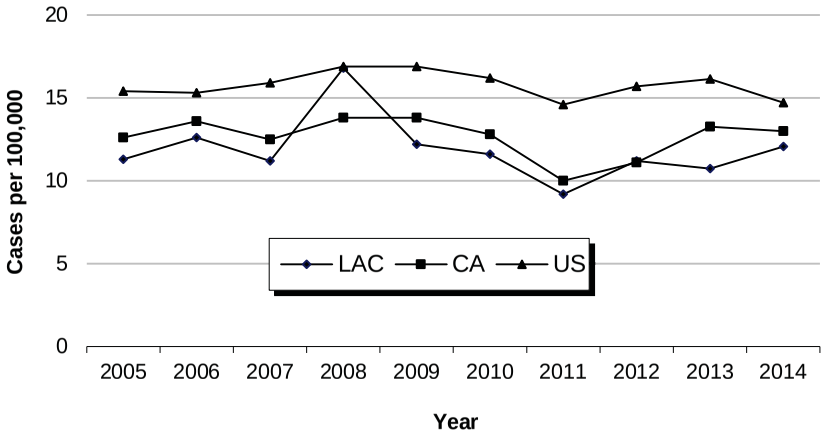


Figure 2. Reported Salmonellosis Rates by Age Group
LAC, 2014 (N=1141)

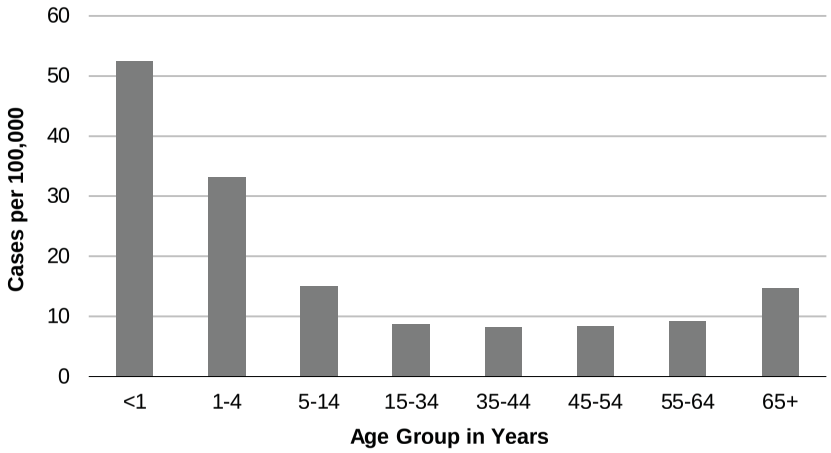
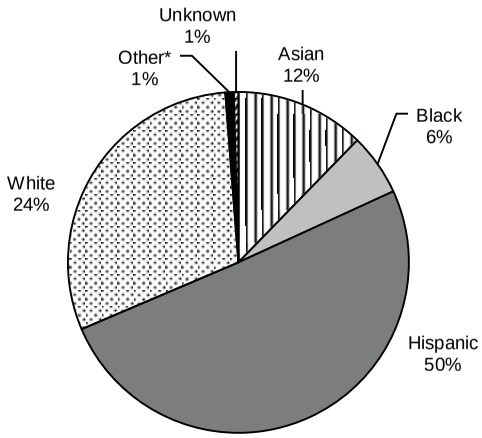


Figure 3. Reported Salmonellosis by Race/Ethnicity
LAC, 2014 (N=1141)



*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, 2014 (N=1141)

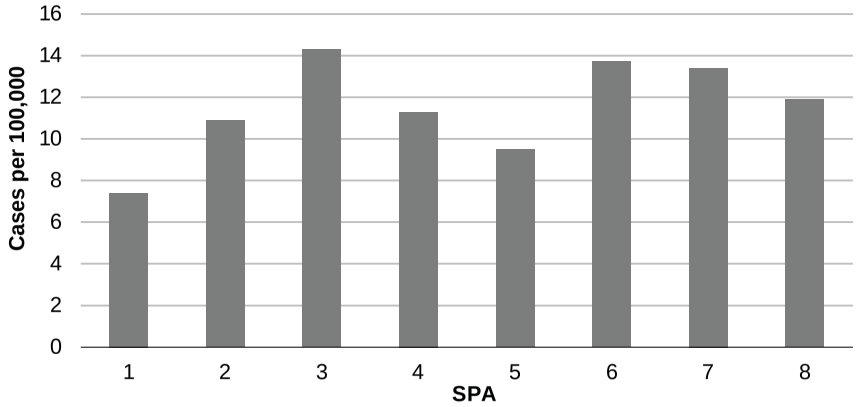
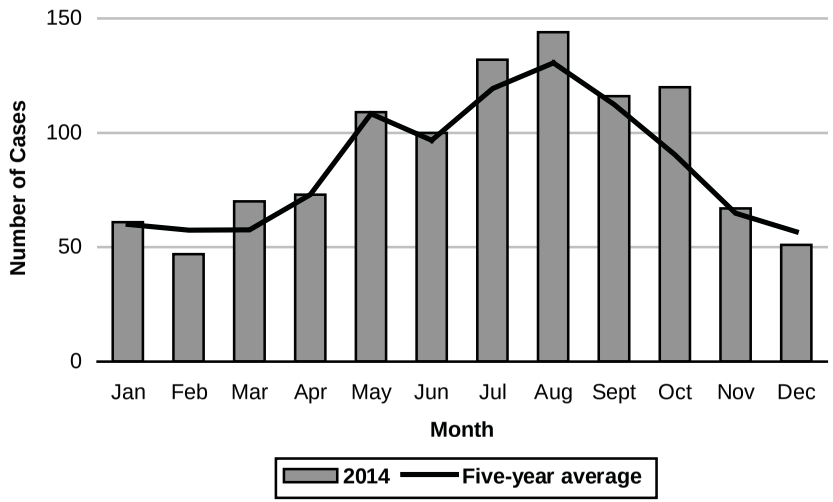
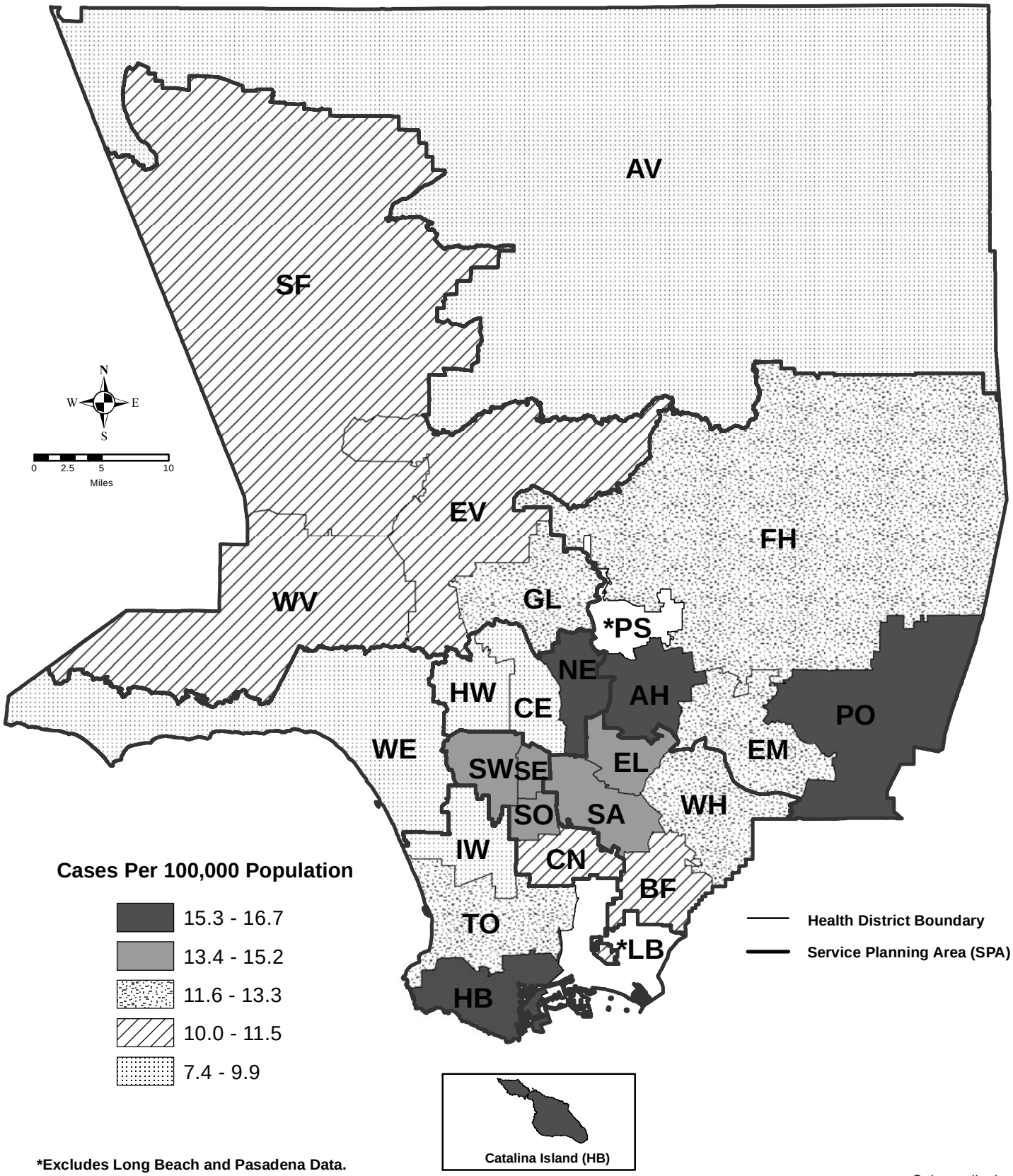


Figure 5. Reported Salmonellosis Cases by Month of Onset
LAC, 2014 (N=1141)



Map 12. Salmonellosis
Rates by Health District, Los Angeles County, 2014*



*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1010
Annual Incidence[a]	
LA County	10.74
California[b]	13.27
United States[b]	16.13
Age at Diagnosis	
Mean	30.4
Median	25
Range	<0-97

[a]Cases per 100,000 population.
[b]Calculated from Final 2013 Reports of Nationally Notifiable Infectious Diseases. MMWR 63(32):702-716.

DESCRIPTION

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

Los Angeles County (LAC)'s review of investigation reports shows that many persons engage in high-risk food handling behaviors such as consumption of raw or undercooked meats; use of 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 with cases reporting domestic, national, or international travel.

2013 TRENDS AND HIGHLIGHTS

- There were a total of five LAC salmonellosis outbreaks investigated in 2013; four were probable foodborne outbreaks investigated by ACDC, and one person-to-person outbreak investigated by Antelope Valley Health District. For more information see the Foodborne Outbreak summary in this ACDC Annual Morbidity Report 2013.
- Rates by SPA ranged from 9.3 in SPA 4 to 12.1 in SPA 2 (Figure 4). SPAs 1, 2, 5 and 7 showed an increase in rates in 2013. SPA 4 had seven family clusters of two or more cases. There were no outbreaks or large clusters identified in that SPA.
- Reptile-associated salmonellosis (RAS) increased from 9.3 % (n=99) of non-outbreak related cases in 2012 to 9.7 % (n=98) in 2013. Among RAS cases, turtle related cases decreased from 73% (n=72) to 56% (n=55). Three LAC residents were part of a national outbreak related to small turtles.
- Twenty-three percent of cases (n=239) were hospitalized for two or more days.
- There were five deaths in persons diagnosed with salmonellosis. Ages ranged from 45 to 88 years with a mean of 68 and median of 81 years. All five cases had comorbidities; three had renal disease, two had diabetes, one had liver disease, and one case had congestive heart failure.

Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2009-2013

	2009 (N=1194)			2010 (N=1142)			2011 (N=900)			2012 (N=1041)			2013 (N=1010)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	89	7.5	72.8	56	4.9	46.6	61	6.8	43.7	73	7.0	61.4	59	5.8	48.8
1-4	229	19.2	46.3	186	16.2	38.3	134	14.9	22.9	153	14.7	32.2	141	14.0	29.0
5-14	195	16.3	15.4	174	15.2	14.1	148	16.4	11.1	158	15.2	13.2	185	18.3	15.3
15-34	271	22.7	9.7	262	22.9	9.4	186	20.7	6.3	224	21.5	8.1	227	22.5	8.0
35-44	110	9.2	8.1	131	11.5	9.8	93	10.3	6.5	95	9.1	7.2	89	8.8	6.7
45-54	101	8.5	7.9	87	7.6	6.8	86	9.5	6.4	108	10.4	8.4	82	8.1	6.3
55-64	76	6.4	8.2	100	8.8	10.5	86	9.5	8.9	88	8.5	8.6	84	8.3	8.2
65+	123	10.3	12.3	146	12.8	14.5	106	11.8	10.0	142	13.6	12.8	143	14.2	12.9
Unknown	0			0			0			0			0		
Race/Ethnicity															
Asian	103	8.6	8.0	115	10.0	8.8	64	7.1	4.8	92	8.8	7.0	73	7.2	5.3
Black	75	6.3	9.6	50	4.4	6.5	53	5.9	6.2	56	5.4	7.2	69	6.8	8.9
Hispanic	620	52.0	14.0	570	50.1	12.8	465	51.7	9.8	503	48.3	11.1	538	53.3	11.7
White	367	30.7	13.5	387	33.9	14.5	279	31.0	9.7	247	23.7	9.3	318	31.5	12.0
Other	10	0.8		3	0.3		8	0.9		11	1.1		5	0.5	
Unknown	19	1.6		17	1.5		132	12.6		132	12.6		7	0.7	
SPA															
1	40	3.4	10.6	36	3.2	9.4	24	2.7	6.4	38	3.7	9.8	40	4.0	10.2
2	316	26.5	14.8	303	26.5	14.3	215	23.9	9.7	228	21.9	10.6	262	26.0	12.1
3	179	15.0	11.1	221	19.4	13.8	162	18.0	9.3	164	15.8	10.1	155	15.3	9.5
4	138	11.6	12.3	156	13.7	14.0	80	8.9	6.4	162	15.6	14.4	106	10.5	9.3
5	107	9.0	17.0	86	7.5	13.5	70	7.8	10.6	71	6.8	11.1	74	7.3	11.4
6	134	11.2	13.5	86	7.5	8.6	107	11.9	10.0	109	10.5	10.7	109	10.8	10.6
7	152	12.7	11.6	140	12.3	10.8	122	13.5	8.9	145	13.9	11.2	155	15.3	11.8
8	128	10.7	12.0	114	10.0	10.8	117	13.0	10.4	123	11.8	11.5	109	10.8	10.1
Unknown	0			0			3	0.33		1	0.09		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, 2004-2013

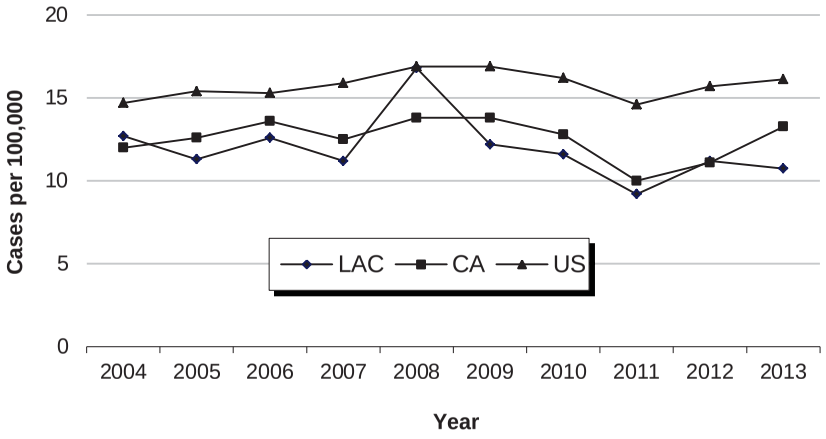


Figure 2. Reported Salmonellosis Rates by Age Group
LAC, 2013 (N=1010)

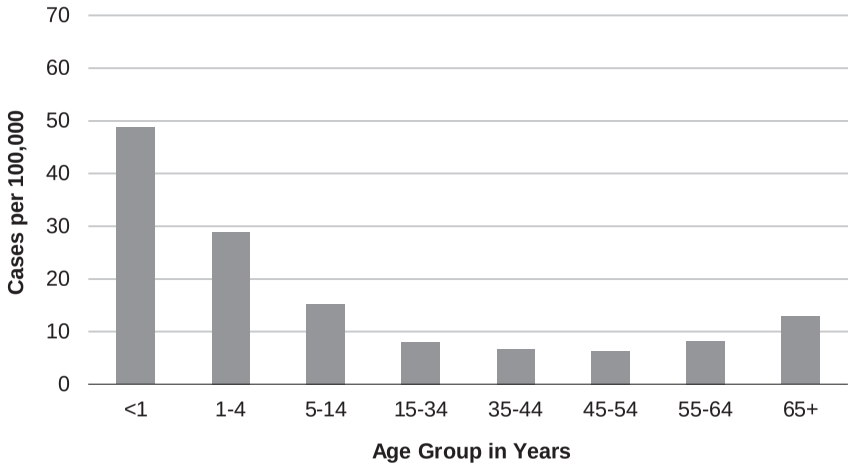
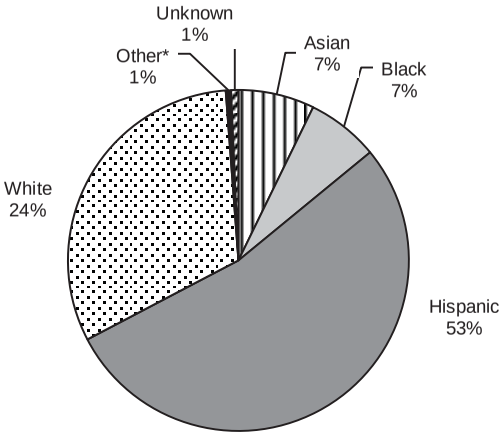


Figure 3. Reported Cases of Salmonellosis by Race/Ethnicity
LAC, 2013 (N=1010)



* 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, 2013 (N=1010)

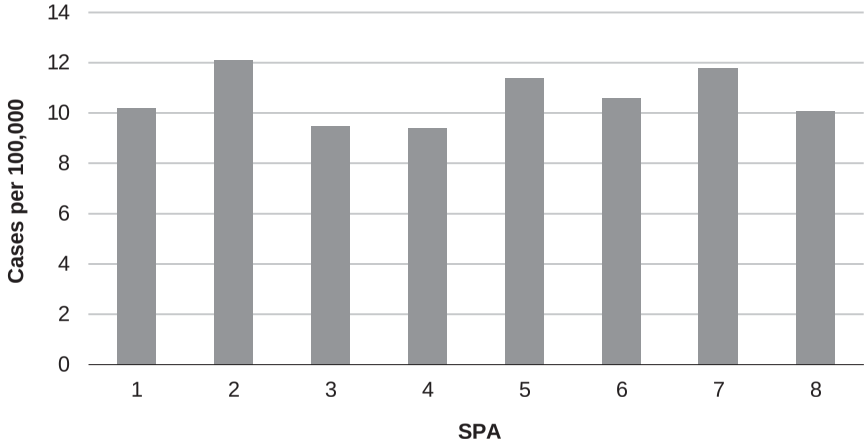
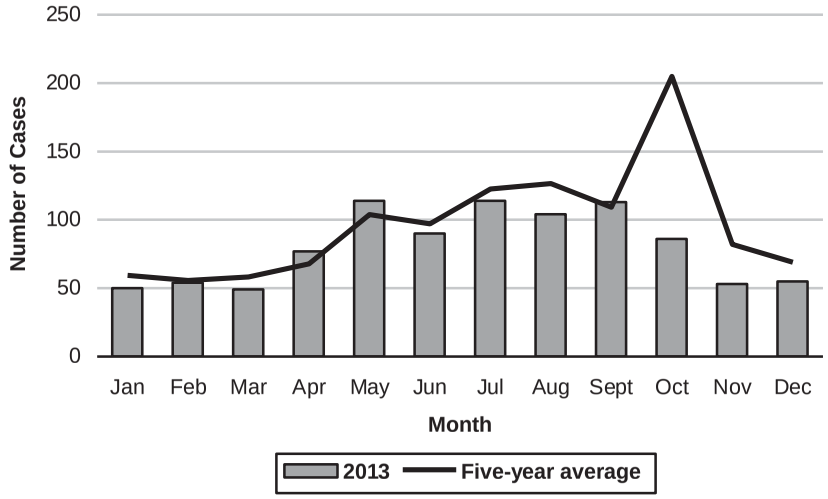
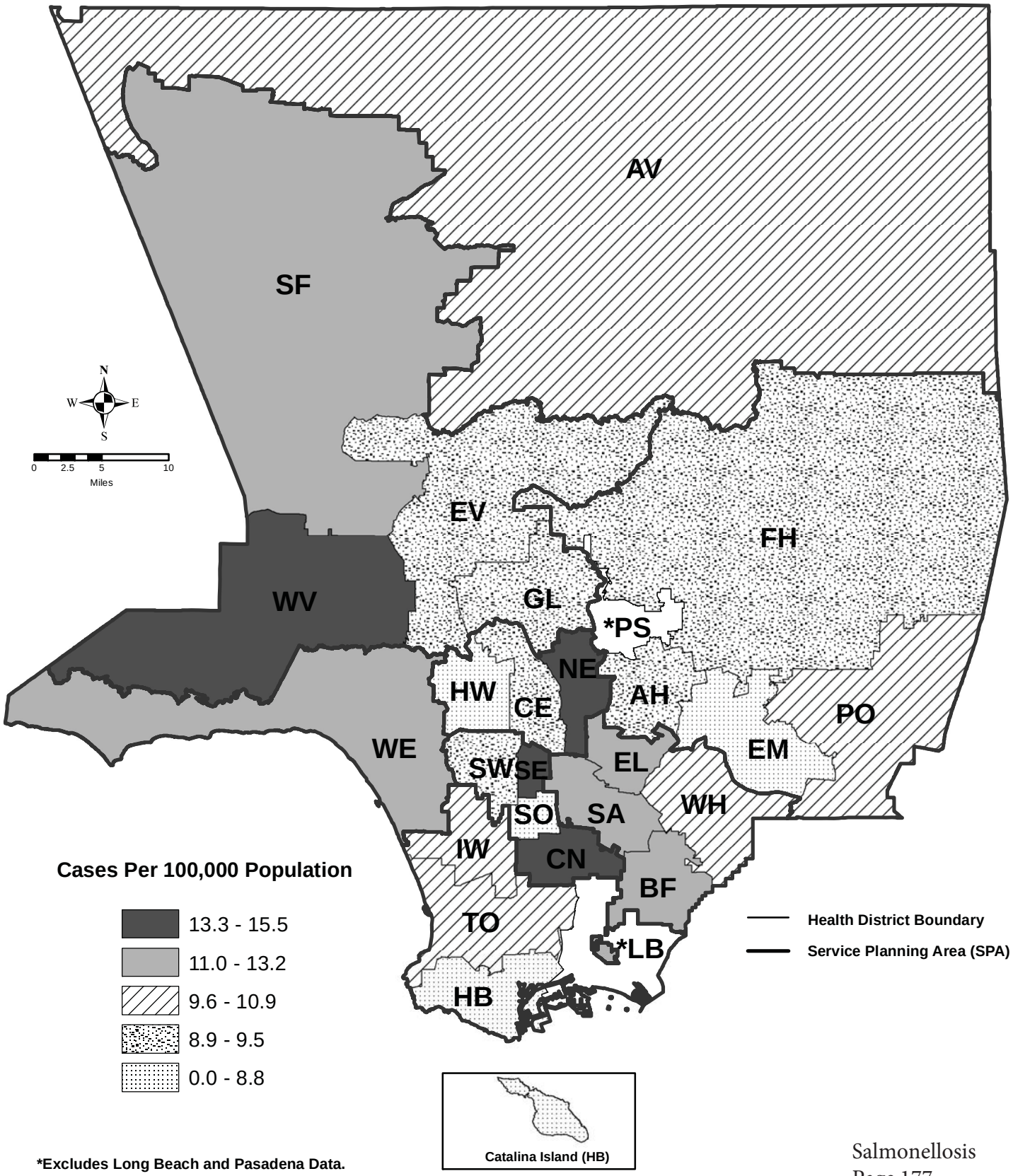


Figure 5. Reported Salmonellosis Cases by Month of Onset LAC, 2013 (N=1010)



Map 13. Salmonellosis
Rates by Health District, Los Angeles County, 2013*



*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1041
Annual Incidence[a]	
LA County	11.2
California[b]	11.9
United States[b]	17.1
Age at Diagnosis	
Mean	30.8
Median	26
Range	<1 - 95

[a]Cases per 100,000 population.
[b]Calculated from Final 2012 Reports of Nationally Notifiable Infectious Disease. MMWR 62(33);669-682.

DESCRIPTION

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

Los Angeles County (LAC)'s review of investigation reports shows that many persons engage in high-risk food handling behaviors such as: consumption of raw or undercooked meats, produce; use of 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.

Reptile-associated salmonellosis (RAS) increased from 8.7 % (n=76) of non-outbreak related cases in 2011 to 9.2 % (n=99) in 2012. Among RAS cases, turtle related cases increased from 57% to 73%. LAC residents were part of a national outbreak related to small turtles. Interventions of an interdisciplinary RAS working group established in 2007 to address the issue continue. Interventions are described in the ACDC Special Reports 2009 and 2010. Continued interventions include:

- Development and launching of a *fotonovela* and readers theater to educate families of at-risk persons;
- Outreach activities to target groups and the general public to educate on the risk of RAS;
- Targeted education programs to reach practitioners, educators, and stakeholders in at-risk areas.

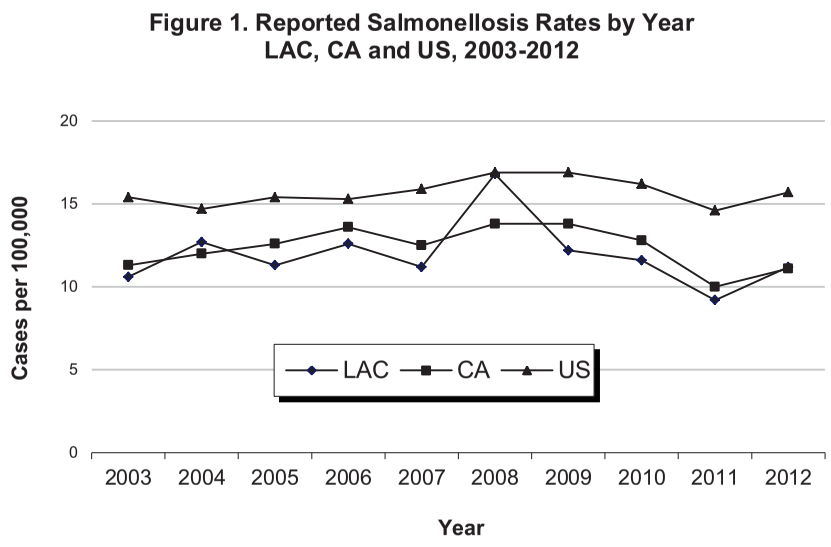
2012 TRENDS AND HIGHLIGHTS

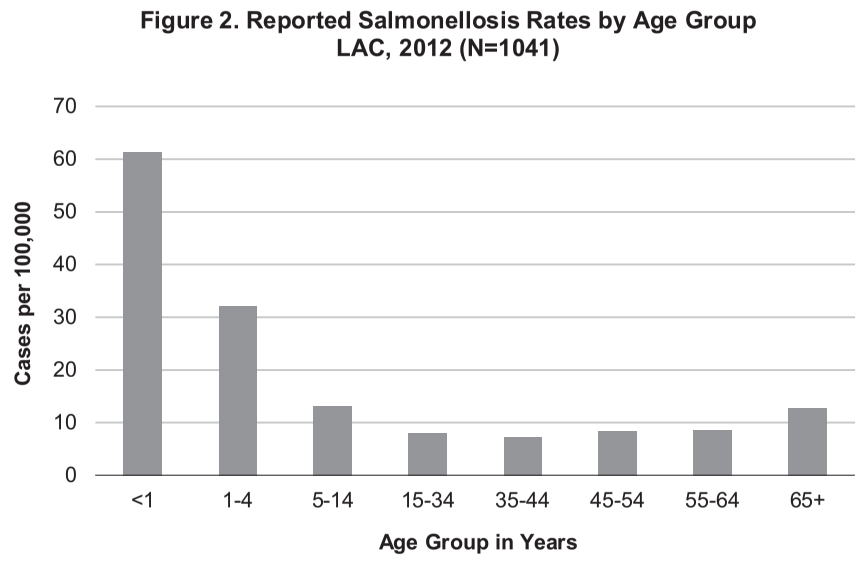
- There were four salmonellosis outbreaks investigated in 2012; one was a probable foodborne outbreak. For more information see the Foodborne Outbreak summary in this ACDC Annual Morbidity Report 2012.
- SPA rates ranged from 9.8 (SPA 1) to 14.4(SPA 4) (Figure 4). SPA 4 had the highest rate in 2012 and historically SPA 5 had the highest rate in 2011. All SPAs showed an increase in rates in 2012. SPA 4 had seven family clusters of two or more cases. There were no outbreaks or large clusters identified in that SPA.
- Twenty-five percent of cases were hospitalized for two or more days.
- There were eight deaths in persons diagnosed with salmonellosis. Ages ranged from 53 to 88 years with a mean of 70 years. One elderly case had aortic graft rupture, another had organ failure and all other cases had chronic liver disease, kidney disease, or cancer.

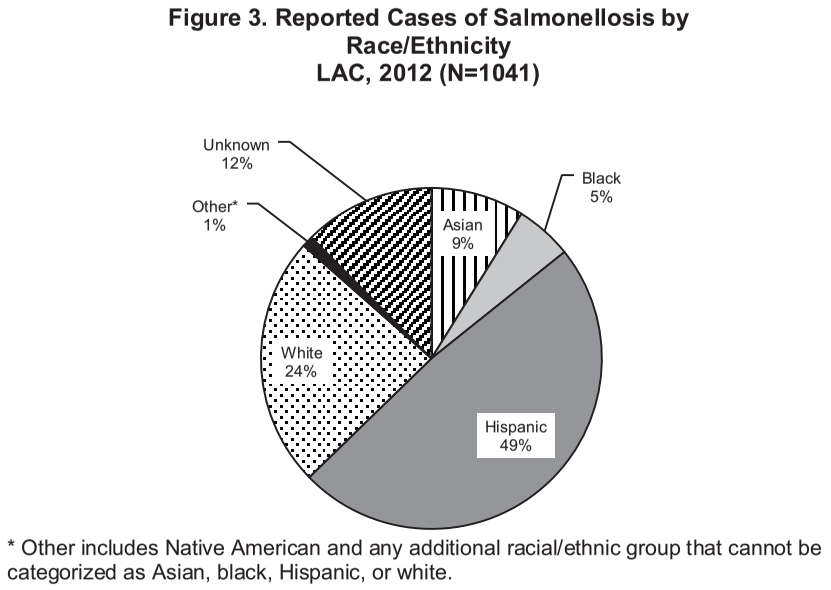
Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2008-2012

	2008 (N=1638)			2009 (N=1194)			2010 (N=1142)			2011 (N=900)			2012 (N= 1041)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	89	5.4	63.7	89	7.5	64.9	56	4.9	40.1	61	6.8	43.7	73	7.0	61.4
1-4	613	37.4	108	229	19.2	40.8	186	16.2	32.0	134	14.9	22.9	153	14.7	32.2
5-14	170	10.4	12.1	195	16.3	14.3	174	15.2	13.1	148	16.4	11.1	158	15.2	13.2
15-34	278	17.0	9.7	271	22.7	9.6	262	22.9	8.9	186	20.7	6.3	224	21.5	8.1
35-44	151	9.2	10.0	110	9.2	7.4	131	11.5	9.1	93	10.3	6.5	95	9.1	7.2
45-54	116	7.1	8.6	101	8.5	7.4	87	7.6	6.4	86	9.5	6.4	108	10.4	8.4
55-64	91	5.6	10.0	76	6.4	8.0	100	8.8	10.4	86	9.5	8.9	88	8.5	8.6
65+	127	7.8	12.4	123	10.3	11.6	146	12.8	13.8	106	11.8	10.0	142	13.6	12.8
Unknown	3	0.2					0								
Race/Ethnicity															
Asian	114	7.0	8.7	103	8.6	7.9	115	10.0	8.6	64	7.1	4.8	92	8.8	7.0
Black	77	4.7	9.0	75	6.3	8.8	50	4.4	5.9	53	5.9	6.2	56	5.4	7.2
Hispanic	1071	65.4	22.9	620	52.0	13.3	570	50.1	12.0	465	51.7	9.8	503	48.3	11.1
White	326	19.9	11.2	367	30.7	12.6	387	33.9	13.5	279	31.0	9.7	247	23.7	9.3
Other	3	0.2	12.2	10	0.8		3	0.3		8	0.9		11	1.1	
Unknown	47	2.9		19	1.6		17	1.5		31	3.4		132	12.6	
SPA															
1	35	2.1	9.5	40	3.4	10.9	36	3.2	9.6	24	2.7	6.4	38	3.7	9.8
2	657	40.1	30.0	316	26.5	14.3	303	26.5	13.7	215	23.9	9.7	228	21.9	10.6
3	204	12.5	11.8	179	15.0	10.3	221	19.4	12.7	162	18.0	9.3	164	15.8	10.1
4	135	8.2	10.6	138	11.6	11.1	156	13.7	12.4	80	8.9	6.4	162	15.6	14.4
5	46	2.8	7.1	107	9.0	16.4	86	7.5	13.0	70	7.8	10.6	71	6.8	11.1
6	123	7.5	11.7	134	11.2	12.7	86	7.5	8.0	107	11.9	10.0	109	10.5	10.7
7	309	18.9	22.3	152	12.7	11.0	140	12.3	10.2	122	13.5	8.9	145	13.9	11.2
8	129	7.9	11.5	128	10.7	11.4	114	10.0	10.2	117	13.0	10.4	123	11.8	11.5
Unknown	0			0			0			3	0.33		1	0.09	

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







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

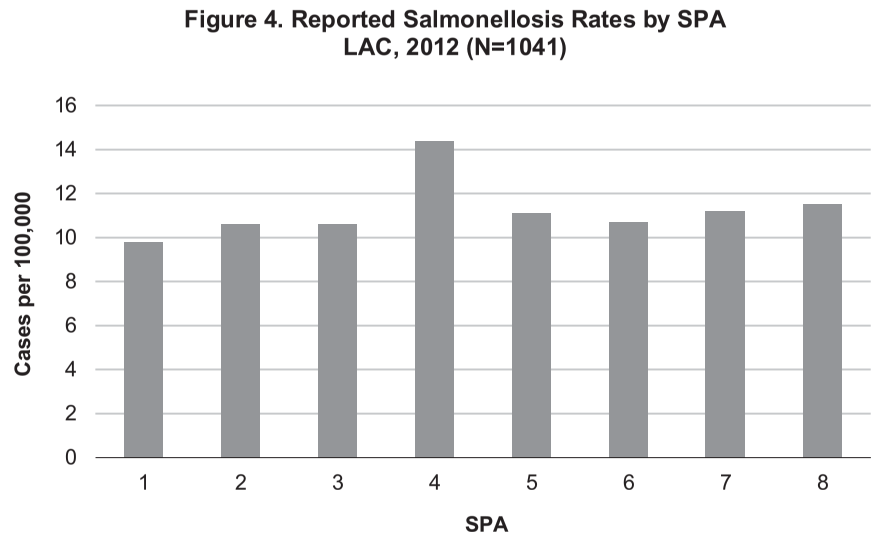
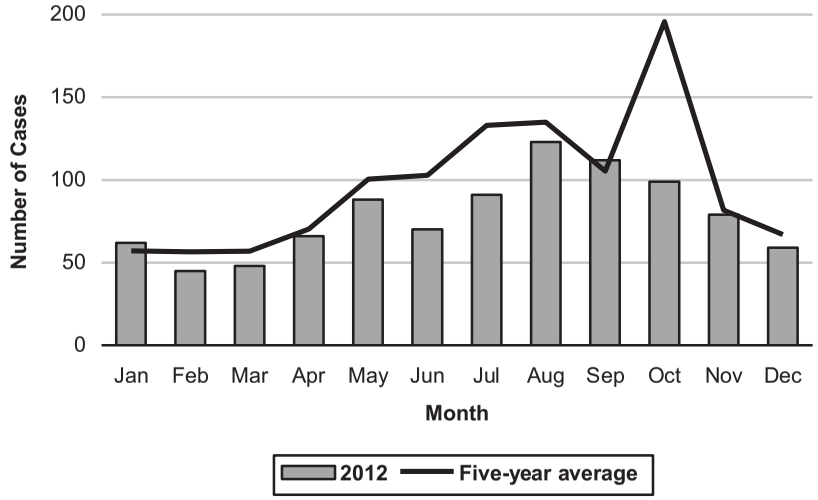
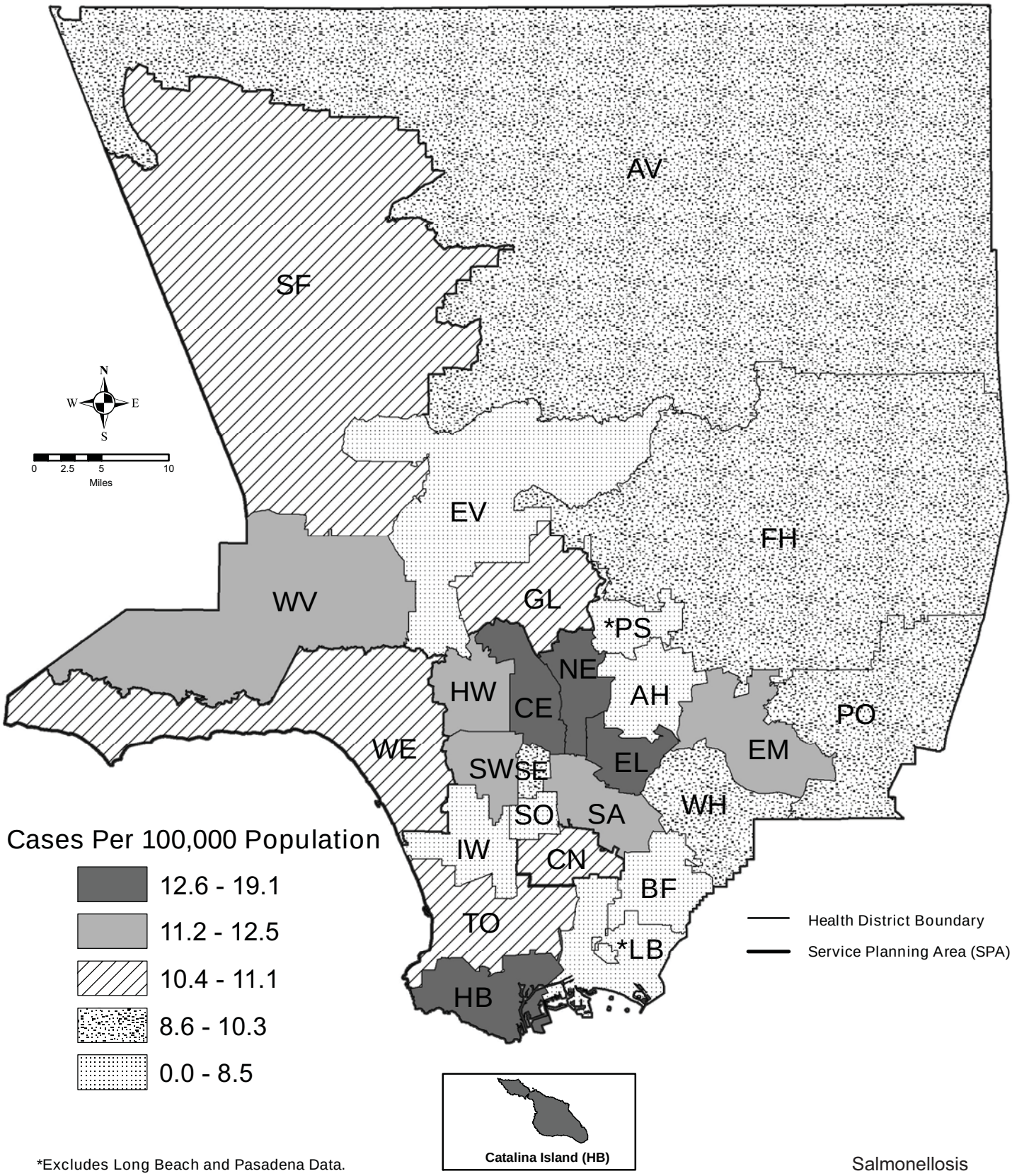


Figure 5. Reported Salmonellosis Cases by Month of Onset LAC, 2012 (N=1041)



Map 11. Salmonellosis
Rates by Health District, Los Angeles County, 2012*



*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	900
Annual Incidence[a]	
LA County	9.2
California[b]	10.9
United States[b]	16.7
Age at Diagnosis	
Mean	30.1
Median	25
Range	<1 - 95

[a]Cases per 100,000 population.
[b]Calculated from Final 2011 Reports of Nationally Notifiable Infectious Disease. MMWR 61(32);625-637.

DESCRIPTION

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

Los Angeles County (LAC)'s review of investigation reports shows that many persons engage in high-risk food handling behaviors such as: consumption of raw or undercooked meats, or produce; use of raw eggs; not washing hands and/or cutting boards after handling raw poultry or meat; and having contact with reptiles. Travel is also a factor.

Reptile-associated salmonellosis (RAS) increased from 6.2% (n=66) of non-outbreak related cases in 2010 to 8.8 % (n=77) in 2011. Among RAS cases, turtle related cases increased from 44% to 57%. LAC residents were part of a national outbreak related to small turtles. Interventions of an interdisciplinary RAS working group established in 2007 to address the issue continue. Interventions are described in the ACDC Special Reports 2009, and 2010. Interventions include:

- Development and launching of a *fotonovela* and readers theater to educate families of at-risk persons;
- Outreach activities to target groups and the general public to educate on the risk of RAS; and
- Targeted education programs to reach practitioners, educators, and stakeholders in at-risk areas.

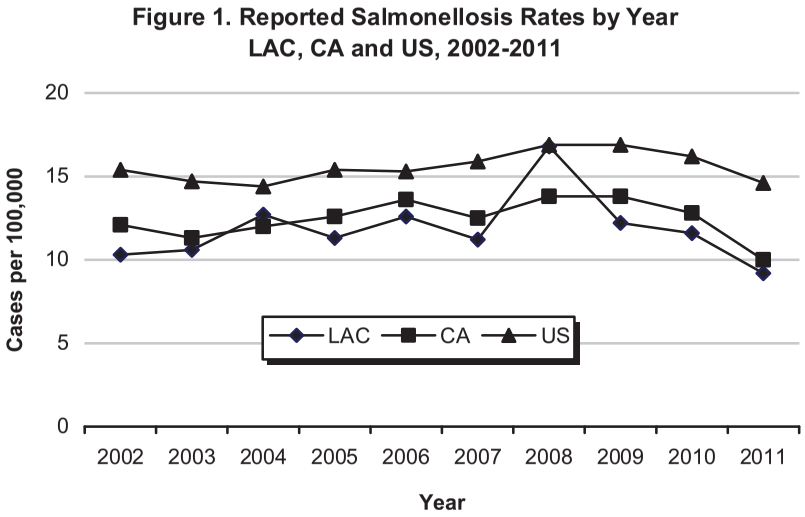
2011 TRENDS AND HIGHLIGHTS

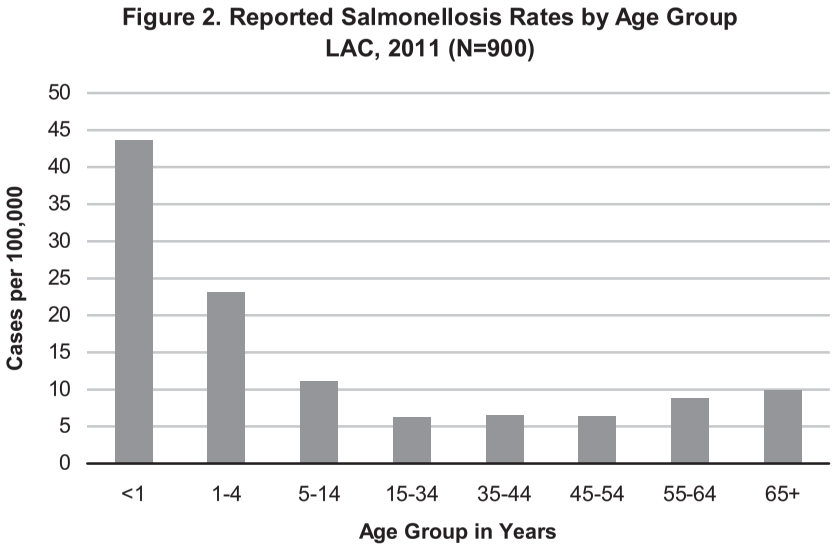
- There were four salmonellosis outbreaks investigated in 2011; three were foodborne. For more information see the Foodborne Outbreak summary in this ACDC Annual Morbidity Report 2011.
- SPA rates ranged from 6.4 (SPA 4) to 10.6 (SPA 5) (Figure 4). In 2010, SPA 2 had the highest rate.
- Twenty-three percent of cases were hospitalized for two or more days.
- There were eleven deaths in persons diagnosed with salmonellosis. Ages ranged from 29 to 89 years with a mean of 58 years. One elderly case had cardiac insufficiency and all other cases had chronic liver or kidney disease or cancer.

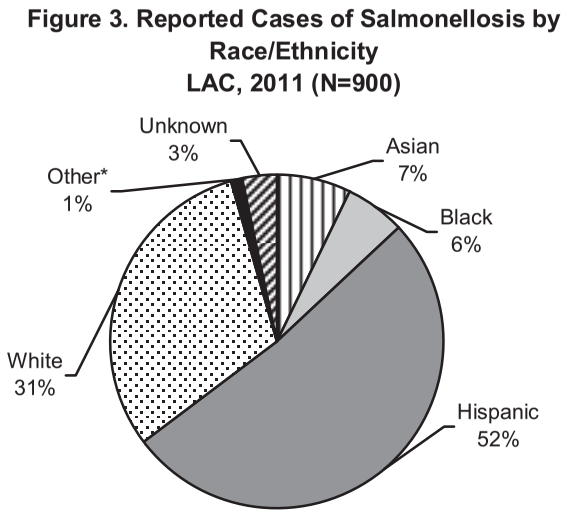
Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2007-2011

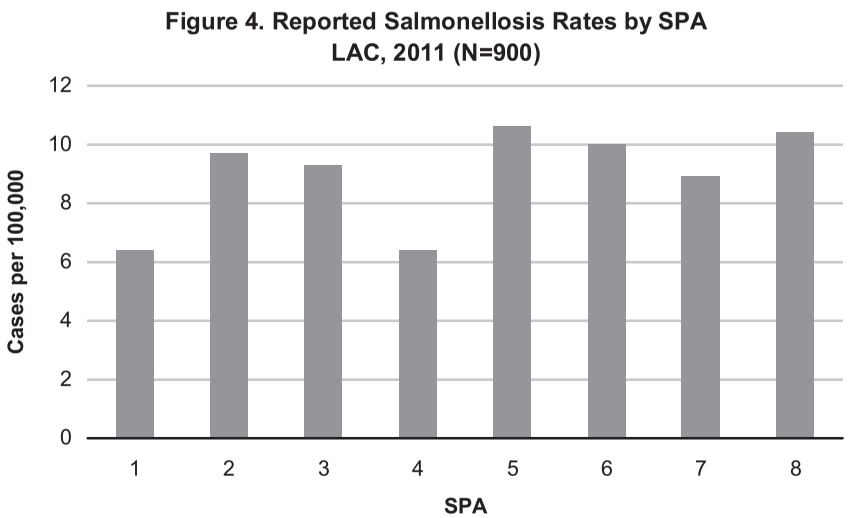
	2007 (N=1081)			2008 (N=1638)			2009 (N=1194)			2010 (N=1142)			2011 (N=900)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	99	9.2	66.9	89	5.4	63.7	89	7.5	64.9	56	4.9	40.1	61	6.8	43.7
1-4	183	16.9	31.7	613	37.4	108.	229	19.2	40.8	186	16.2	32.0	134	14.9	22.9
5-14	172	15.9	12.0	170	10.4	12.1	195	16.3	14.3	174	15.2	13.1	148	16.4	11.1
15-34	226	20.9	8.0	278	17.0	9.7	271	22.7	9.6	262	22.9	8.9	186	20.7	6.3
35-44	114	10.5	7.6	151	9.2	10.0	110	9.2	7.4	131	11.5	9.1	93	10.3	6.5
45-54	85	7.9	6.4	116	7.1	8.6	101	8.5	7.4	87	7.6	6.4	86	9.5	6.4
55-64	75	6.9	8.5	91	5.6	10.0	76	6.4	8.0	100	8.8	10.4	86	9.5	8.9
65+	124	11.5	12.3	127	7.8	12.4	123	10.3	11.6	146	12.8	13.8	106	11.8	10.0
Unknown	3	0.3		3	0.2					0					
Race/Ethnicity															
Asian	114	10.5	8.9	114	7.0	8.7	103	8.6	7.9	115	10.0	8.6	64	7.1	4.8
Black	64	5.9	7.5	77	4.7	9.0	75	6.3	8.8	50	4.4	5.9	53	5.9	6.2
Hispanic	539	49.9	11.6	1071	65.4	22.9	620	52.0	13.3	570	50.1	12.0	465	51.7	9.8
White	339	31.4	117.	326	19.9	11.2	367	30.7	12.6	387	33.9	13.5	279	31.0	9.7
Other	10	0.9	48.0	3	0.2	12.2	10	0.8		3	0.3		8	0.9	
Unknown	15	1.4		47	2.9		19	1.6		17	1.5		31	3.4	
SPA															
1	39	3.6	10.9	35	2.1	9.5	40	3.4	10.9	36	3.2	9.6	24	2.7	6.4
2	243	22.5	11.3	657	40.1	30.0	316	26.5	14.3	303	26.5	13.7	215	23.9	9.7
3	186	17.2	10.8	204	12.5	11.8	179	15.0	10.3	221	19.4	12.7	162	18.0	9.3
4	148	13.7	11.7	135	8.2	10.6	138	11.6	11.1	156	13.7	12.4	80	8.9	6.4
5	74	6.8	11.5	46	2.8	7.1	107	9.0	16.4	86	7.5	13.0	70	7.8	10.6
6	132	12.2	12.6	123	7.5	11.7	134	11.2	12.7	86	7.5	8.0	107	11.9	10.0
7	146	13.5	10.6	309	18.9	22.3	152	12.7	11.0	140	12.3	10.2	122	13.5	8.9
8	113	10.5	10.1	129	7.9	11.5	128	10.7	11.4	114	10.0	10.2	117	13.0	10.4
Unknown	0	0.0		0	0.0								3	0.33	

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



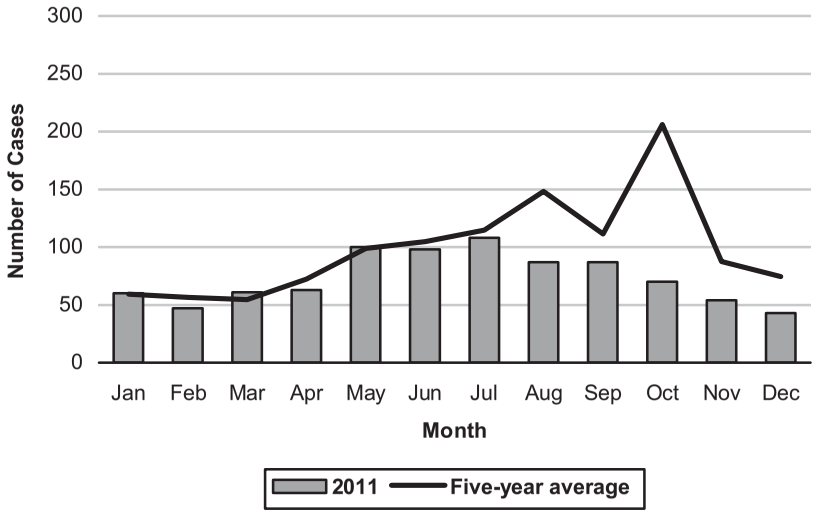




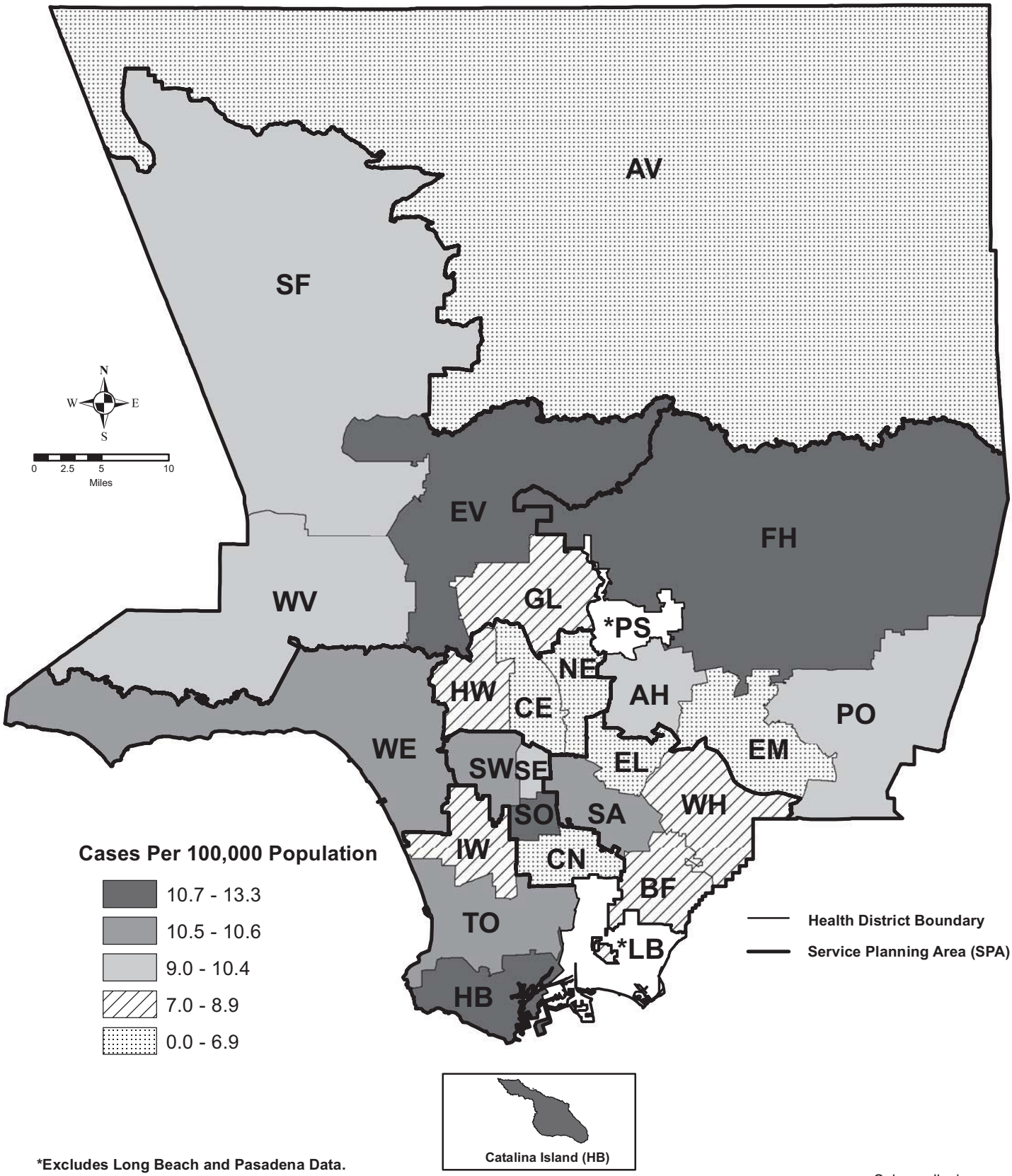


* Other includes Native American and any additional racial/ethnic group that cannot be categorized as Asian, black, Hispanic, or white.

Figure 5. Reported Salmonellosis Cases by Month of Onset
LAC, 2011 (N=900)



Map 13. Salmonellosis
Rates by Health District, Los Angeles County, 2011*



*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1142
Annual Incidence[a]	
LA County	11.6
California[b]	--
United States[b]	--
Age at Diagnosis	
Mean	30.2
Median	27
Range	<1- 98

[a]Cases per 100,000 population.
[b]See Final Summary of Nationally Notifiable Infectious Diseases, United States on MMWR website http://www.cdc.gov/mmwr/mmwr_nd/index.html.

DESCRIPTION

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

Los Angeles County (LAC)'s review of investigation reports shows that many persons engage in high-risk food handling behaviors such as: consumption of raw or undercooked meats, or produce; use of raw eggs; not washing hands and/or cutting boards after handling raw poultry or meat; and having contact with reptiles.

Reptile-associated salmonellosis (RAS) decreased from 9.2% (n=102) of non-outbreak related cases in 2009 to 6.2% (n=66) in 2010. Among RAS cases, turtle related cases decreased from 62% to 44%. The rates among infants and children age <5 years dropped 37% and 20% respectively from 2009 rates. This improvement may be due to interventions of an interdisciplinary RAS working group established in 2007 to address the issue. Among the interventions were (see ACDC Special Studies Report 2009 and 2010):

- Development and launching of a *fotonovela* and Readers Theater to educate families of at-risk persons;
- Outreach activities to target groups and the general public to educate on the risk of RAS; and
- Targeted education programs to reach practitioners, educators, and stakeholders in at-risk areas.

2010 TRENDS AND HIGHLIGHTS

- There were four salmonellosis outbreaks investigated in 2010; all were foodborne. One LAC outbreak was a subcluster of a national outbreak associated with an Iowa egg farm. For more information see the 2010 Foodborne Illness Outbreak summary in this ACDC Annual Morbidity Report 2010.
- SPA 2 had the highest rate followed by SPA 5 (Figure 4), consistent with 2009.
- Sixteen percent of cases were hospitalized for two or more days.
- There were six deaths in persons diagnosed with salmonellosis. Ages ranged from 24 to 73 years with a mean of 61 years. A 24 year old woman died at home due to possible illicit drug intoxication. The other cases had chronic medical problems such as immunodeficiency, cancer and diabetes.

Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2006-2010

	2006 (N=1217)			2007 (N=1081)			2008 (N=1638)			2009 (N=1194)			2010 (N=1142)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	100	8.2	69.0	99	9.2	66.9	89	5.4	63.7	89	7.5	64.9	56	4.9	40.1
1-4	221	18.2	38.1	183	16.9	31.7	613	37.4	108.	229	19.2	40.8	186	16.2	32.0
5-14	208	17.1	14.1	172	15.9	12.0	170	10.4	12.1	195	16.3	14.3	174	15.2	13.1
15-34	251	20.6	9.0	226	20.9	8.0	278	17.0	9.7	271	22.7	9.6	262	22.9	8.9
35-44	105	8.6	7.0	114	10.5	7.6	151	9.2	10.0	110	9.2	7.4	131	11.5	9.1
45-54	112	9.2	8.6	85	7.9	6.4	116	7.1	8.6	101	8.5	7.4	87	7.6	6.4
55-64	80	6.6	9.2	75	6.9	8.5	91	5.6	10.0	76	6.4	8.0	100	8.8	10.4
65+	140	11.5	14.3	124	11.5	12.3	127	7.8	12.4	123	10.3	11.6	146	12.8	13.8
Unknown	0	0.0		3	0.3		3	0.2					0		
Race / Ethnicity															
Asian	138	11.3	10.9	114	10.5	8.9	114	7.0	8.7	103	8.6	7.9	115	10.0	8.6
Black	95	7.8	11.3	64	5.9	7.5	77	4.7	9.0	75	6.3	8.8	50	4.4	5.9
Hispanic	609	50.0	13.2	539	49.9	11.6	1071	65.4	22.9	620	52.0	13.3	570	50.1	12.0
White	351	28.8	12.2	339	31.4	11.7	326	19.9	11.2	367	30.7	12.6	387	33.9	13.5
Other	4	0.3	14.0	10	0.9	48.0	3	0.2	12.2	10	0.8		3	0.3	
Unknown	20	1.6		15	1.4		47	2.9		19	1.6		17	1.5	
SPA															
1	33	2.7	9.5	39	3.6	10.9	35	2.1	9.5	40	3.4	10.9	36	3.2	9.6
2	270	22.2	12.6	243	22.5	11.3	657	40.1	30.0	316	26.5	14.3	303	26.5	13.7
3	189	15.5	11.0	186	17.2	10.8	204	12.5	11.8	179	15.0	10.3	221	19.4	12.7
4	179	14.7	14.2	148	13.7	11.7	135	8.2	10.6	138	11.6	11.1	156	13.7	12.4
5	104	8.5	16.3	74	6.8	11.5	46	2.8	7.1	107	9.0	16.4	86	7.5	13.0
6	142	11.7	13.6	132	12.2	12.6	123	7.5	11.7	134	11.2	12.7	86	7.5	8.0
7	175	14.4	12.7	146	13.5	10.6	309	18.9	22.3	152	12.7	11.0	140	12.3	10.2
8	123	10.1	11.1	113	10.5	10.1	129	7.9	11.5	128	10.7	11.4	114	10.0	10.2
Unknown	2	0.2		0	0.0		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, 2001-2010

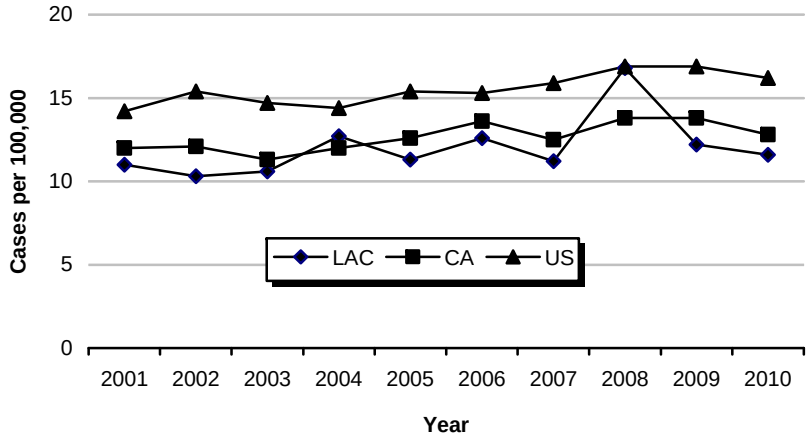


Figure 2. Reported Salmonellosis Rates by Age Group
LAC, 2010 (N=1142)

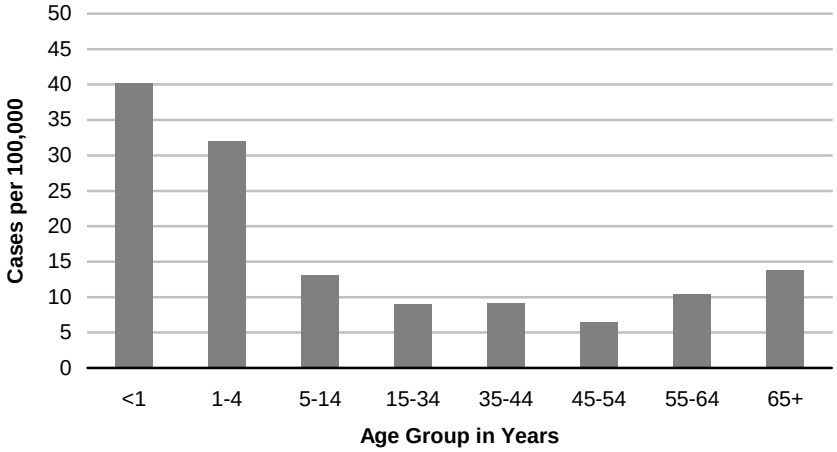


Figure 3. Reported Cases of Salmonellosis by Race/Ethnicity
LAC, 2010 (N=1142)

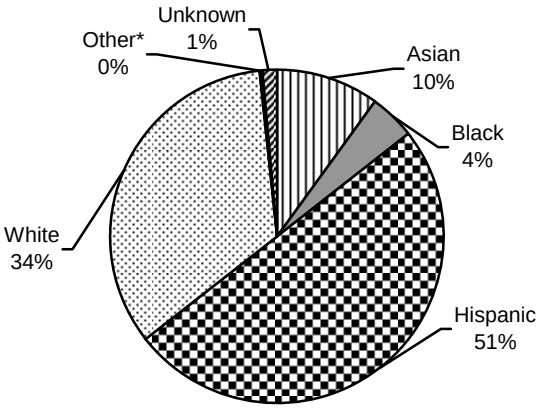
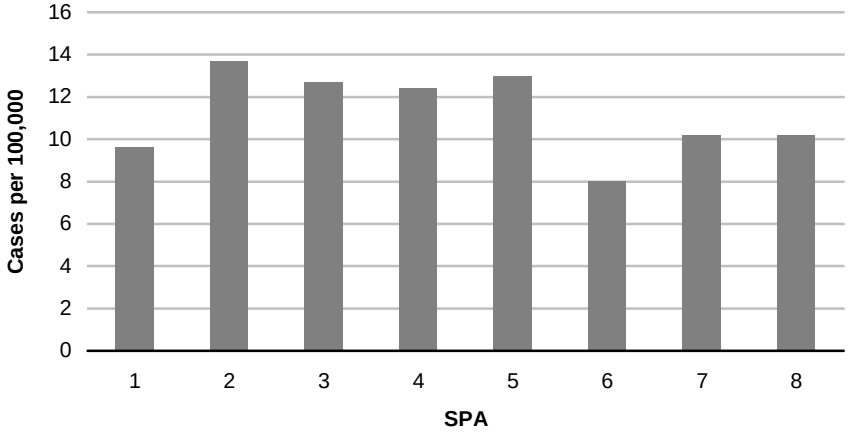
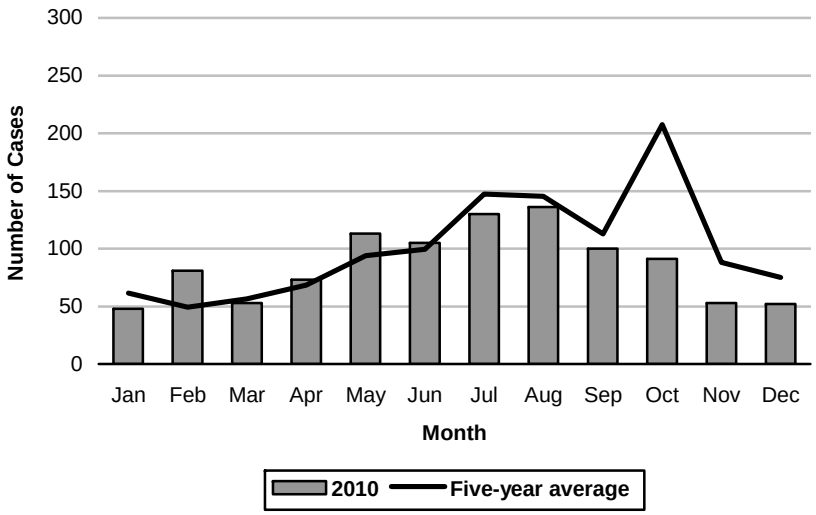


Figure 4. Reported Salmonellosis Rates by SPA
LAC, 2010 (N=1142)



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

Figure 5. Reported Salmonellosis Cases by Month of Onset
LAC, 2010 (N=1142)



SALMONELLOSIS

CRUDE DATA	
Number of Cases	1194
Annual Incidence[a]	
LA County	12.2
California[b]	13.8
United States[b]	16.9
Age at Diagnosis	
Mean	26.9
Median	20
Range	<1- 100

[a]Cases per 100,000 population.
[b]Calculated from Final 2008 Reports of Nationally Notifiable Infectious Disease. MMWR 58(31);856-857;859-869.

DESCRIPTION

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

Los Angeles County (LAC)'s review of investigation reports shows that many persons engage in high-risk food handling behaviors such as: consumption of raw or undercooked meats, or produce; use of raw eggs; not washing hands and/or cutting boards after handling raw poultry or meat; and having contact with reptiles.

Reptile-associated salmonellosis (RAS) has been a consistent problem in LAC and nationally for many years. In 2009, 9.2% (n = 104) of non-outbreak cases had some type of reptile exposure, 62% of which were turtle related. These animals remain popular as pets and many people are not aware of laws controlling their sale.

- Always wash hands thoroughly with soap and water after handling reptiles or their cages and equipment.
- Owners and potential purchasers of reptiles should be educated about the risk of acquiring salmonellosis from these animals.
- Persons at increased risk for infection, such as children less than 5 years of age and immunocompromised persons should avoid both direct and indirect contact with reptiles.
- Reptiles are inappropriate pets for households with children less than 5 years of age and immunocompromised persons. If expecting a new child, remove pet reptiles from the home before the child arrives and thoroughly clean the home.
- Reptiles should not be kept in preschools and child care facilities.

2009 TRENDS AND HIGHLIGHTS

- There were six outbreaks investigated in 2009. Two were daycare outbreaks and three were foodborne. One outbreak source was not determined. For more information see the 2009 Foodborne Illness Outbreak summary in this report.
- Overall rates in several categories returned to expected levels in 2009. These rates had been unusually high due to a large outbreak that occurred in October 2008.
- SPA 5 had the highest rate followed by SPA 2 (Figure 4).
- Twenty-one percent of cases were hospitalized for two or more days (consistent with years prior to 2008).
- There were seven deaths in persons diagnosed with salmonellosis. Ages ranged from <1 to 86 years with a mean of 59 years. A newborn case had severe myocardial dysfunction at birth and sepsis was likely from an ascending infection during delivery. A 41 year old male was infected but died due to methamphetamine intoxication. The other cases had concurrent medical problems such as cancer and diabetes.

Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2005-2009

	2005 (N=1085)			2006 (N=1217)			2007 (N=1081)			2008 (N=1638)			2009 (N=1194)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	95	8.8	67.5	100	8.2	69.0	99	9.2	66.9	89	5.4	63.7	89	7.5	64.9
1-4	191	17.6	32.9	221	18.2	38.1	183	16.9	31.7	613	37.4	108.	229	19.2	40.8
5-14	189	17.4	12.8	208	17.1	14.1	172	15.9	12.0	170	10.4	12.1	195	16.3	14.3
15-34	220	20.3	7.9	251	20.6	9.0	226	20.9	8.0	278	17.0	9.7	271	22.7	9.6
35-44	117	10.8	7.8	105	8.6	7.0	114	10.5	7.6	151	9.2	10.0	110	9.2	7.4
45-54	88	8.1	6.9	112	9.2	8.6	85	7.9	6.4	116	7.1	8.6	101	8.5	7.4
55-64	73	6.7	8.7	80	6.6	9.2	75	6.9	8.5	91	5.6	10.0	76	6.4	8.0
65+	110	10.1	11.4	140	11.5	14.3	124	11.5	12.3	127	7.8	12.4	123	10.3	11.6
Unknown	2	0.2		0	0.0		3	0.3		3	0.2				
Race / Ethnicity															
Asian	105	9.7	8.3	138	11.3	10.9	114	10.5	8.9	114	7.0	8.7	103	8.6	7.9
Black	74	6.8	8.7	95	7.8	11.3	64	5.9	7.5	77	4.7	9.0	75	6.3	8.8
Hispanic	494	45.5	10.9	609	50.0	13.2	539	49.9	11.6	1071	65.4	22.9	620	52.0	13.3
White	392	36.1	13.5	351	28.8	12.2	339	31.4	11.7	326	19.9	11.2	367	30.7	12.6
Other	7	0.6	24.8	4	0.3	14.0	10	0.9	48.0	3	0.2	12.2	10	0.8	
Unknown	13	1.2		20	1.6		15	1.4		47	2.9		19	1.6	
SPA															
1	28	2.6	8.2	33	2.7	9.5	39	3.6	10.9	35	2.1	9.5	40	3.4	10.9
2	249	22.9	11.7	270	22.2	12.6	243	22.5	11.3	657	40.1	30.0	316	26.5	14.3
3	161	14.8	9.4	189	15.5	11.0	186	17.2	10.8	204	12.5	11.8	179	15.0	10.3
4	148	13.6	11.9	179	14.7	14.2	148	13.7	11.7	135	8.2	10.6	138	11.6	11.1
5	87	8.0	13.7	104	8.5	16.3	74	6.8	11.5	46	2.8	7.1	107	9.0	16.4
6	109	10.0	10.6	142	11.7	13.6	132	12.2	12.6	123	7.5	11.7	134	11.2	12.7
7	157	14.5	11.4	175	14.4	12.7	146	13.5	10.6	309	18.9	22.3	152	12.7	11.0
8	141	13.0	12.7	123	10.1	11.1	113	10.5	10.1	129	7.9	11.5	128	10.7	11.4
Unknown	5	0.5		2	0.2		0	0.0		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, 2000-2009

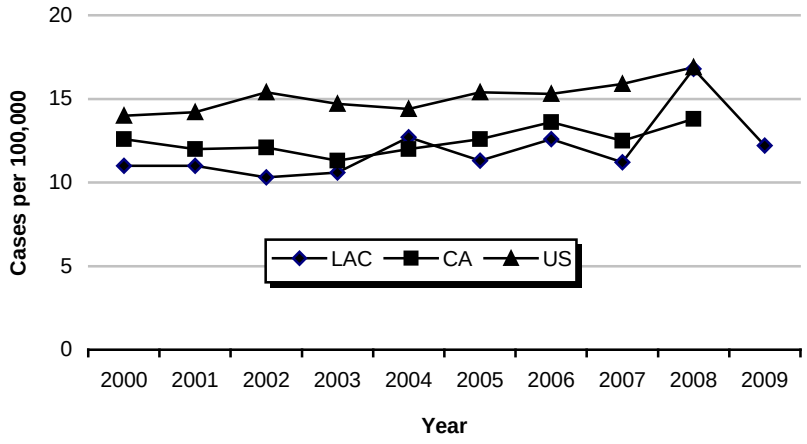


Figure 2. Reported Salmonellosis Rates by Age Group
LAC, 2009 (N=1194)

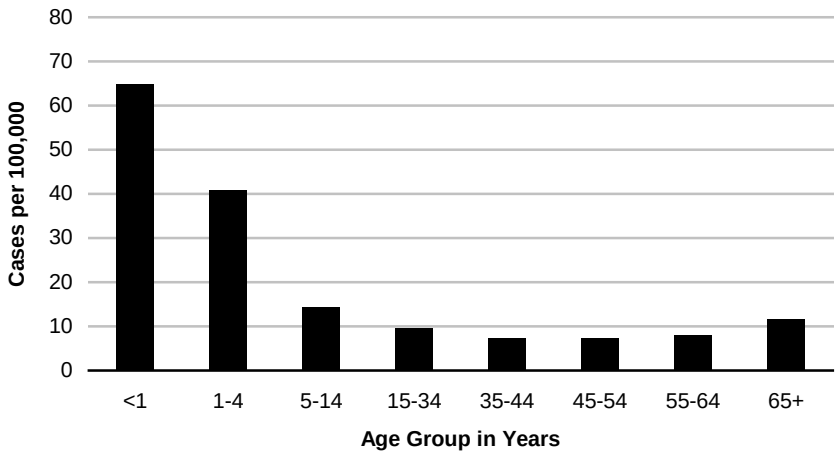
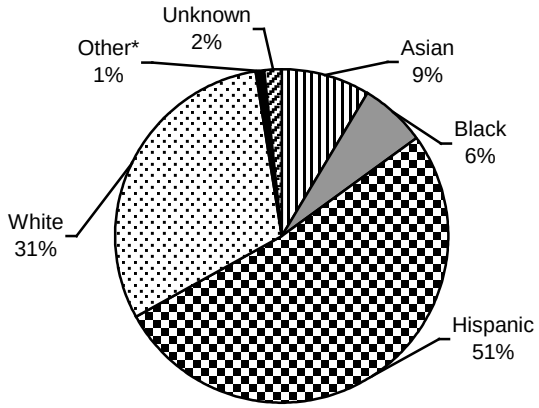


Figure 3. Reported Cases of Salmonellosis by Race/Ethnicity
LAC, 2009 (N=1194)



* 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, 2009 (N=1194)

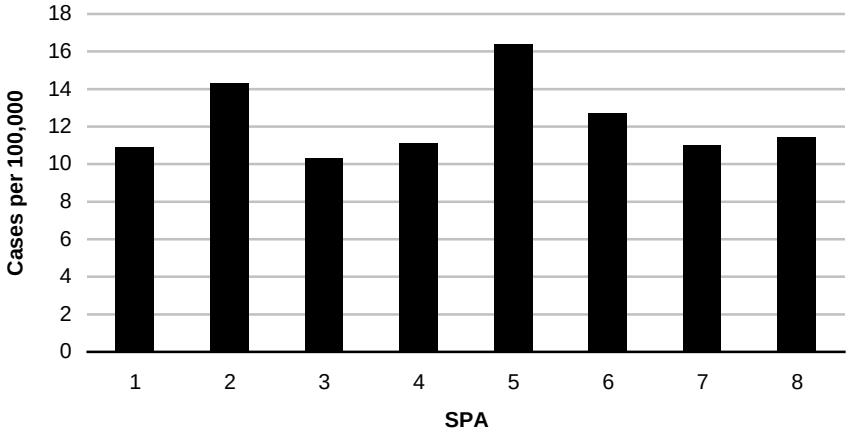
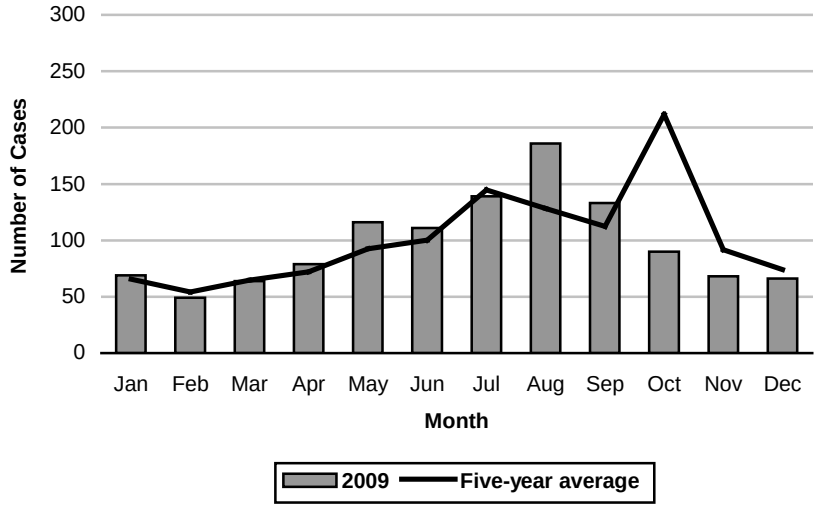
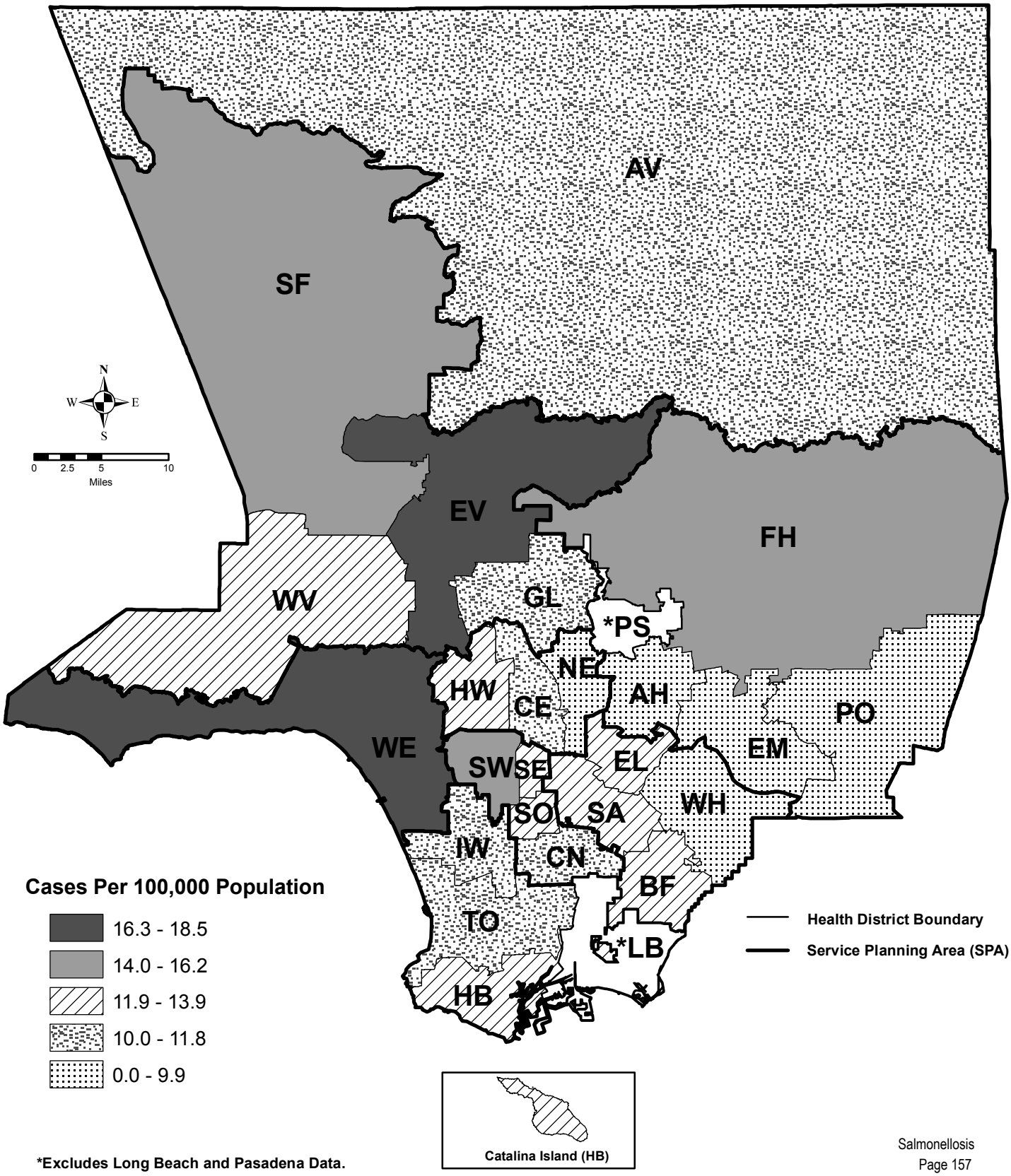


Figure 5. Reported Salmonellosis Cases by Month of Onset
LAC, 2009 (N=1194)



Map 11. Salmonellosis
Rates by Health District, Los Angeles County, 2009*



*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1638
Annual Incidence[a]	
LA County	16.8
California[b]	13.8
United States[b]	16.9
Age at Diagnosis	
Mean	22.5
Median	10
Range	<1- 96

[a]Cases per 100,000 population.
[b]Calculated from Final 2008 Reports of Nationally Notifiable Infectious Disease. MMWR 58(31);856-857;859-869.

DESCRIPTION

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

In Los Angeles County (LAC)'s review of investigation reports shows that many persons engage in high-risk food handling behaviors such as: consumption of raw or undercooked meats, or produce, use of raw eggs; not washing hands and/or cutting boards after handling raw poultry or meat; and having contact with reptiles.

Reptile-associated salmonellosis (RAS) has been a consistent problem in LAC and nationally for eleven years. In 2008, 10.1% (n = 97) of non-outbreak cases had some type of reptile exposure, 68% of which were turtle related. These animals remain popular and many people are not aware of laws controlling their sale.

- Always wash hands thoroughly with soap and water after handling reptiles or their cages and equipment;
- Owners and potential purchasers of reptiles should be educated about the risk of acquiring salmonellosis from these animals;
- Persons at increased risk for infection, such as children less than 5 years of age and imunocompromised persons should avoid both direct and indirect contact with reptiles;
- Reptiles are inappropriate pets for households with children less than 5 years of age and immunocompromised persons. If expecting a new child, remove pet reptiles from the home before the child arrives and thoroughly clean the home;
- Reptiles should not be kept in preschools and child care facilities.

2008 TRENDS AND HIGHLIGHTS

- A large outbreak occurred in a multiple site preschool setting in October. There were nine other outbreaks in 2008 with a total of 83 LAC cases. For more information see 2008 ACDC Special Studies Reports and the Foodborne Outbreak summary in this report.
- For the first time in ten years, the LAC rate was higher than both the US and CA rates. Without outbreak cases, the rate would have been lower in 2008 (Figure 1).
- The high incidence rate in the 1 to 4 year age group was due to the October outbreak (Figure 2).
- The high representation of Hispanic cases was due to the October outbreak (Figure 3, 6).
- The incidence rates presented in Service Planning Areas (SPAs) 2 and 7 were due to the October outbreak (Figure 4).
- The October outbreak greatly impacted the number of cases by month of onset when compared to other months and previous years (Figure 5).
- Fifteen percent of cases were hospitalized for two or more days; there were five deaths in persons diagnosed with salmonellosis. Ages ranged from 45 to 88 years; all cases had other medical problems such as cancer and diabetes.

Reported Salmonellosis Cases and Rates* per 100,000 by Age Group, Race/Ethnicity, and SPA
Los Angeles County, 2004-2008

	2004 (N=1205)			2005 (N=1085)			2006 (N=1217)			2007 (N=1081)			2008 (N=1638)		
	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000	No.	(%)	Rate/ 100,000
Age Group															
<1	99	8.2	69.5	95	8.8	67.5	100	8.2	69.0	99	9.2	66.9	89	5.4	63.7
1-4	178	14.8	30.9	191	17.6	32.9	221	18.2	38.1	183	16.9	31.7	613	37.4	108.
5-14	218	18.1	14.6	189	17.4	12.8	208	17.1	14.1	172	15.9	12.0	170	10.4	12.1
15-34	270	22.4	9.6	220	20.3	7.9	251	20.6	9.0	226	20.9	8.0	278	17.0	9.7
35-44	129	10.7	8.6	117	10.8	7.8	105	8.6	7.0	114	10.5	7.6	151	9.2	10.0
45-54	109	9.0	8.8	88	8.1	6.9	112	9.2	8.6	85	7.9	6.4	116	7.1	8.6
55-64	68	5.6	8.5	73	6.7	8.7	80	6.6	9.2	75	6.9	8.5	91	5.6	10.0
65+	133	11.0	14.1	110	10.1	11.4	140	11.5	14.3	124	11.5	12.3	127	7.8	12.4
Unknown	1	0.1		2	0.2		0	0.0		3	0.3		3	0.2	
Race / Ethnicity															
Asian	98	8.1	7.9	105	9.7	8.3	138	11.3	10.9	114	10.5	8.9	114	7.0	8.7
Black	104	8.6	12.2	74	6.8	8.7	95	7.8	11.3	64	5.9	7.5	77	4.7	9.0
Hispanic	574	47.6	12.8	494	45.5	10.9	609	50.0	13.2	539	49.9	11.6	1071	65.4	22.9
White	367	30.5	12.6	392	36.1	13.5	351	28.8	12.2	339	31.4	11.7	326	19.9	11.2
Other	1	0.1	3.6	7	0.6	24.8	4	0.3	14.0	10	0.9	48.0	3	0.2	12.2
Unknown	61	5.1		13	1.2		20	1.6		15	1.4		47	2.9	
SPA															
1	31	2.6	9.3	28	2.6	8.2	33	2.7	9.5	39	3.6	10.9	35	2.1	9.5
2	286	23.7	13.5	249	22.9	11.7	270	22.2	12.6	243	22.5	11.3	657	40.1	30.0
3	189	15.7	11.1	161	14.8	9.4	189	15.5	11.0	186	17.2	10.8	204	12.5	11.8
4	169	14.0	13.7	148	13.6	11.9	179	14.7	14.2	148	13.7	11.7	135	8.2	10.6
5	96	8.0	15.1	87	8.0	13.7	104	8.5	16.3	74	6.8	11.5	46	2.8	7.1
6	128	10.6	12.5	109	10.0	10.6	142	11.7	13.6	132	12.2	12.6	123	7.5	11.7
7	136	11.3	10.0	157	14.5	11.4	175	14.4	12.7	146	13.5	10.6	309	18.9	22.3
8	168	13.9	15.2	141	13.0	12.7	123	10.1	11.1	113	10.5	10.1	129	7.9	11.5
Unknown	2	0.2		5	0.5		2	0.2		0	0.0		0	0.0	

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

Figure 1. Reported Salmonellosis Rates by Year US, CA and LAC, 1999-2008

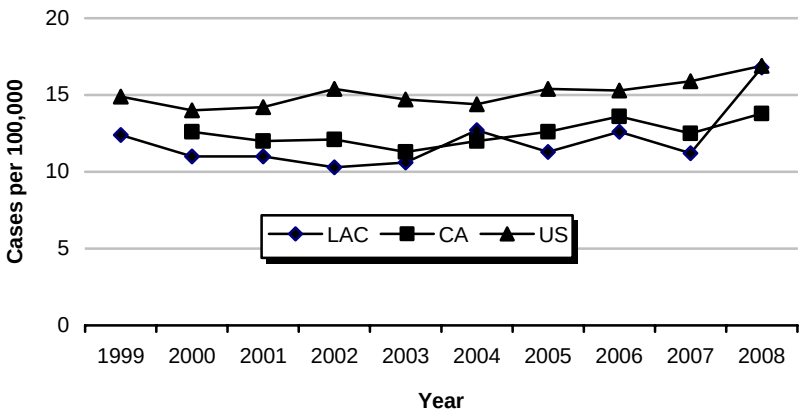


Figure 2. Reported Salmonellosis Rates by Age Group LAC, 2008

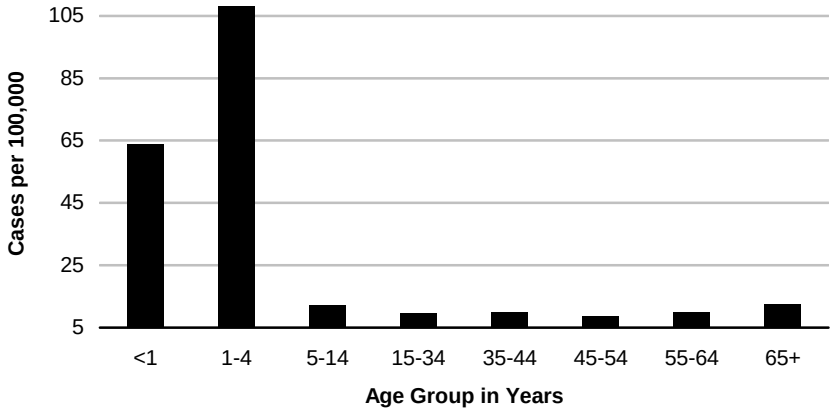


Figure 3. Reported Cases of Salmonellosis by Race/Ethnicity LAC, 2008

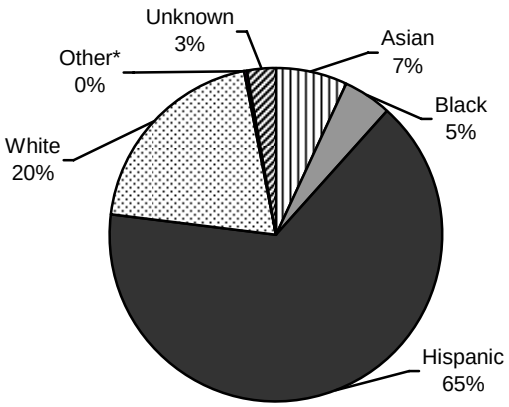
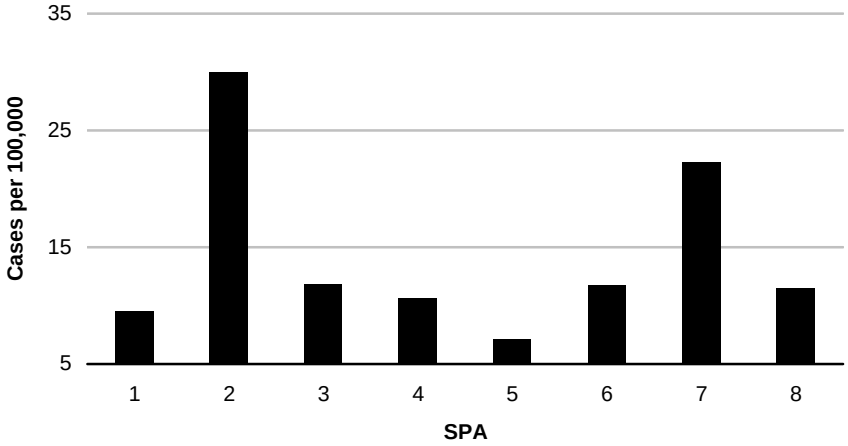
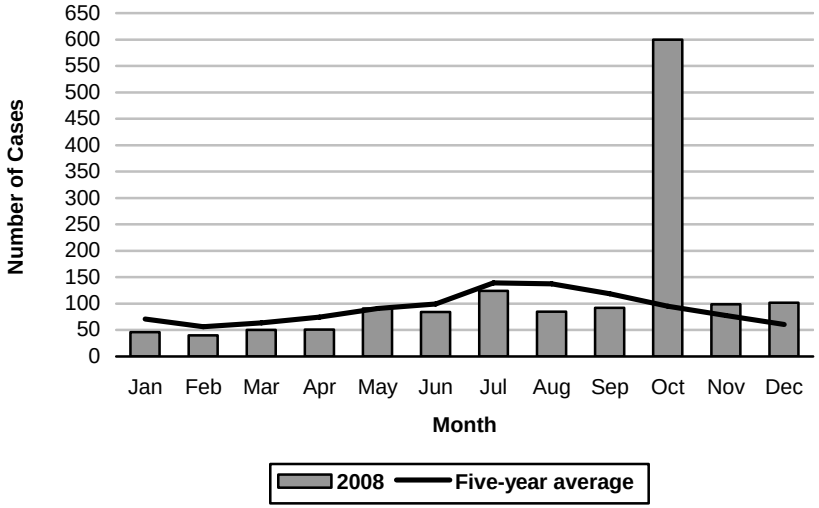


Figure 4. Reported Salmonellosis Rates by SPA LAC, 2008

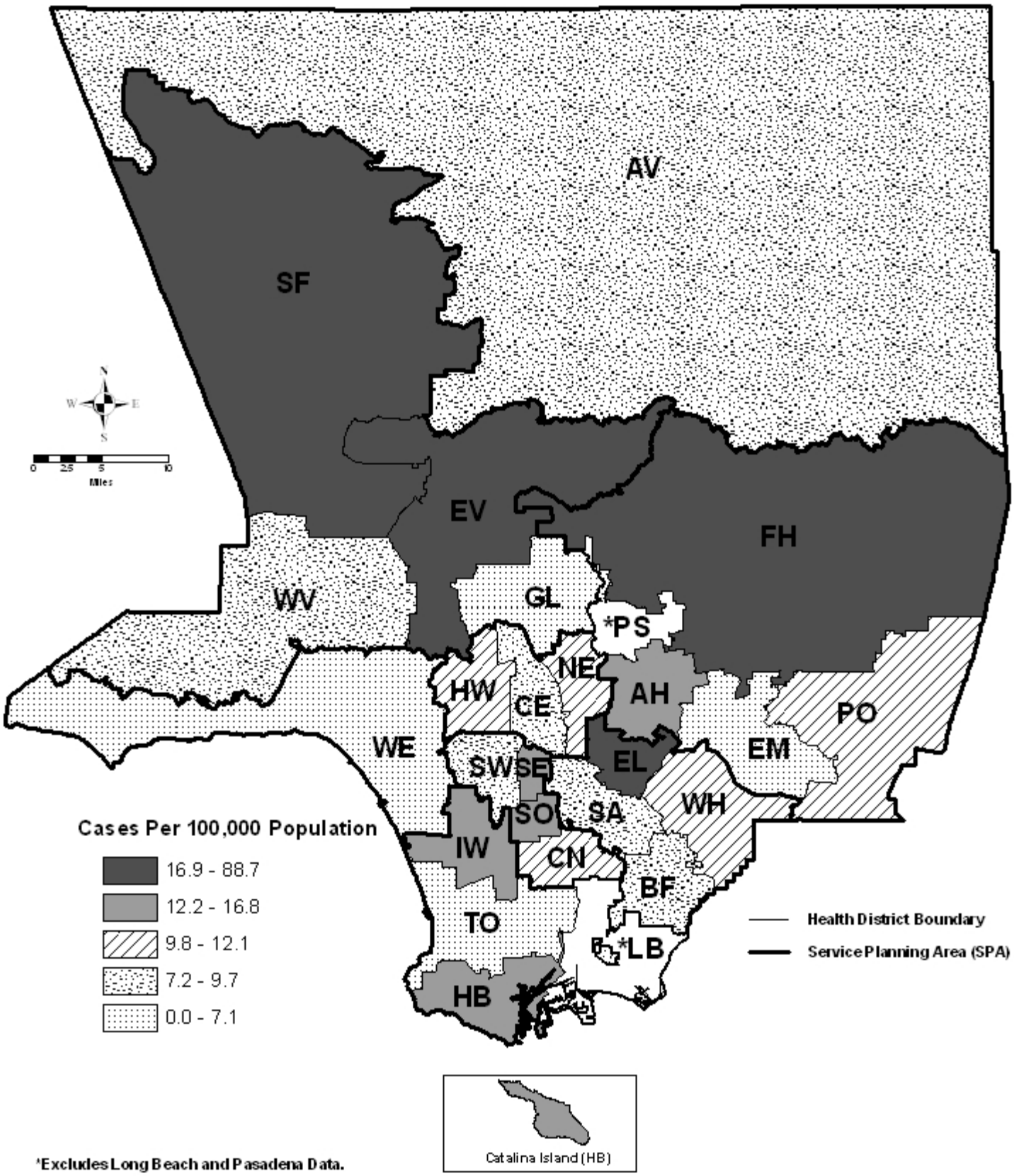


* Other includes Native American and any additional racial/ethnic group that cannot be categorized as Asian, black, Hispanic, or white.

Figure 5. Reported Salmonellosis Cases by Month of Onset
LAC, 2008



Map 13. Salmonellosis
Rates by Health District, Los Angeles County, 2008*



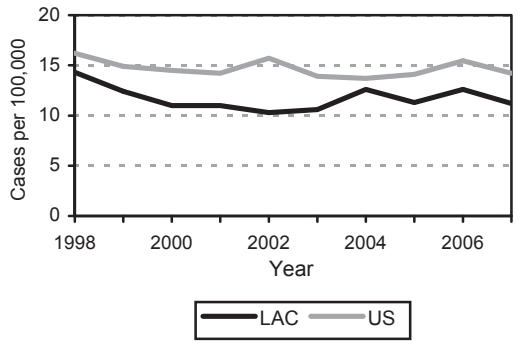
*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1081
Annual Incidence[a]	
LA County	11.2
California	11.0[b]
United States	14.2[b]
Age at Diagnosis	
Mean	27.9
Median	22
Range	<1-101

[a] Cases per 100,000 population.
[b] Calculated from Final 2007 Reports of Nationally Notifiable Infectious diseases issue of MMWR (57:901, 903-913).

Figure 1
Salmonellosis
Incidence Rates by Year
LAC and US, 1998–2007



DESCRIPTION

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

DISEASE ABSTRACT

- The LAC 2007 salmonellosis crude rate decreased 11% when compared to 2006 (Figure1). This rate is comparable to the state rate and remains below the national rate.
- *Salmonella* serotype e*nteritidis* was again the most common serotype in 2007. However, the percent of change was -10% due to a continued decrease in the total number of isolates (Table 1).
- Five outbreaks were investigated in 2007, compared to nine in 2006.
- SPA 6 had the highest rate (12.6 per 100,000) of salmonellosis during 2007.

STRATIFIED DATA

Trends: The rate of salmonellosis cases for LAC in 2007 was 11.2 cases per 100,000 population, an 11% decrease from the 2006 rate of 12.6 but similar to the 2005 rate of 11.3 (Figure 1). This rate remains below the national rate. Reasons for this decrease are unknown. ACDC continues to include "presumptive cases", those that meet a clinical case definition and have an epidemiological link to a laboratory confirmed case. If the presumptive cases are removed, the 2007 rate decreases to 10.6 per 100,000 population.

Salmonella Serotypes: For the fourth year, *S. enteritidis* was the number one serotype, however, the incidence has continued to decrease to 24.2% of total isolates serotyped.

Table 1. Most Frequent *Salmonella* Serotypes—LAC, 2006–2007

Serotype	2006 (N=1217)		2007 (N=1011)*		
	No.	Percent	No.	Percent	%Change
Enteritidis	328	26.9	245	24.2	-10.0
*Typhimurium***	173	14.2	146	14.4	+1.4
Newport	76	6.2	76	7.5	+21.0
Heidelberg	49	4.0	58	5.7	+42.5
Agona	21	1.7	46	4.5	+164.7
Montevideo	47	3.9	28	2.8	-28.2
Oranienburg	27	2.2	25	2.4	+9.0
I 4,5,12:i:--	48	3.9	23	2.3	-41.0
Blockley	1	0.08	22	2.2	+2650.0
Braenderup	23	1.9	19	1.9	0

* Includes only serotyped isolates. (three cases for 2007 had two different serotypes of *Salmonella*)
** Includes *S. typhimurium* var. 05 negative (formally var. *copenhagen*)

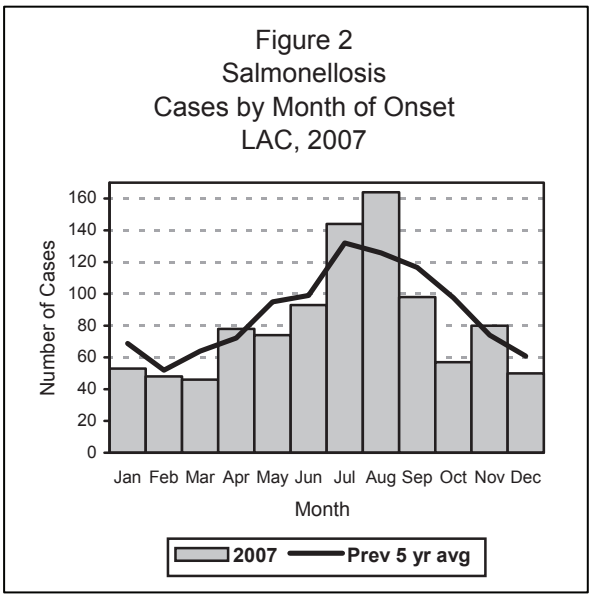
No commonalities were identified among 2007 *S. blockley* cases.

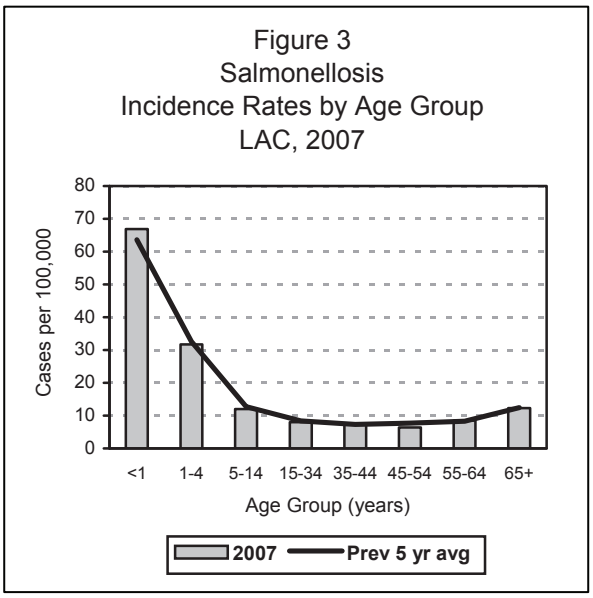
Seasonality: In 2007, incidence peaked in August (Figure 2) and was greater than the five-year average. Incidence was also greater than the five-year average for the months of April, July, and November. There were outbreaks recorded for the months of March, June, August and November (Table 2).

Age: As shown in Figure 3, the highest age group rates of infection occurred among infants aged less than one year (66.9 per 100,000 population) followed by children aged 1-4 years (31.7 per 100,000 population). This is typical for salmonellosis. In 2007, the rate for infants aged less than one year was slightly higher than the five-year average.

Hospitalization: In 2007, 19.7% of cases were hospitalized for more than 24 hours, compared to 19% in 2006. Ages ranged from less than 1 year to 101 years. The average age of the hospitalized patient was 38 years and the median age was 37 years.

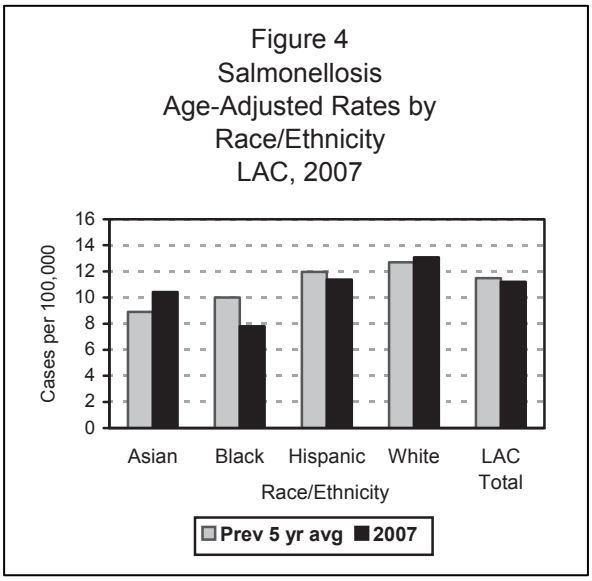
Sex: The male-to-female rate ratio was 1:1.2.





Race/Ethnicity: Again, the highest age-adjusted rate was among whites (13.1 per 100,000 population), followed by Hispanics (11.4 per 100,000 population) then Asians (10.4 per 100,000 population), and blacks (7.8 per 100,000 population, Figure 4). The rates for whites and Asians were higher than the five-year average (12.7 and 8.9 per 100,000, respectively). The rates for Hispanics and blacks were lower than the five-year average (11.9 and 10.0 per 100,000, respectively).

Location: Harbor Health District in SPA 8 had the highest district rate with 17.0 cases per 100,000. The lowest district rate was in El Monte Health District (SPA 3) with 4.4 cases per 100,000. Of all SPAs, SPA 6 had the highest rate with 12.6 cases per 100,000 (Figure 5).This increase may be due to the changing demographics in the area. SPA 8 had the lowest rate at 10.1 cases per 100,000. No single SPA had a rate significantly higher or lower than LAC average.



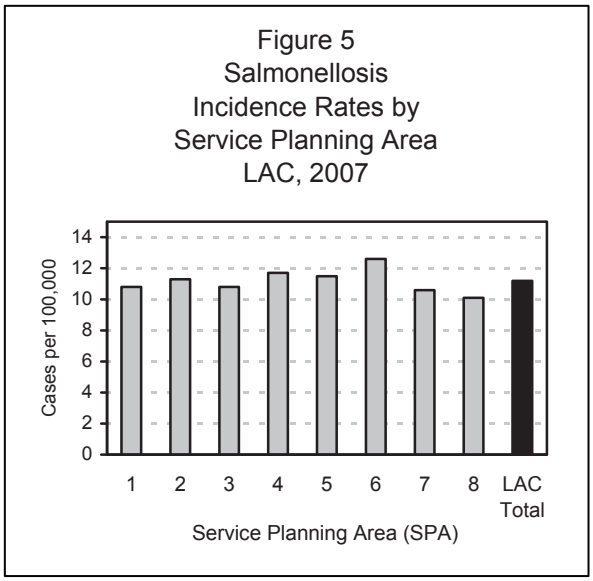


Table 2. Salmonellosis Outbreaks in LAC, 2007

Onset Month	Outbreak Setting	Total # Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
March	Community	6	6	*S.* Agona	Unknown food vehicle	Undetermined
March	Community	3	3	*S.* Montevideo	Sprouts	Sprouts
June	Church	15	4	*S.* Heidelberg	Homemade Food	Cross Contamination/Raw Poultry
August	Restaurant	40	18	*S. enteritidis*	Eggs Benedict	Shell Eggs
November	Private Home	11	7	*S. enteritidis*	Unknown food vehicle	Unknown food source
TOTAL		75	38			

COMMENTS

After a peak in 1994, from 1995 through 2000, a steady decline occurred in the LAC rate of salmonellosis. The LAC rate has been relatively stable or ranged between 10-13 since 2002 (Figure 2). Continued surveillance is necessary to determine long term trends.

Travel was noted as a risk factor for 16.3% of cases (n=176); of those 33.5% traveled domestically. Of those who traveled outside of the United States, 44.5% (n=52) traveled to Mexico.

There were five salmonellosis outbreaks during 2007 compared to nine identified in 2006. Two outbreaks were serotype e*nteritidis*, the others involved multiple serotypes (Table 2). Outbreak-related cases (both confirmed and presumptive) made up 7% of total cases in 2007 compared to 4.3% of total cases in 2006. This year *Salmonella Enteritidis*, the predominant serotype for 2007, was found to be the cause for two outbreaks with a total of 51 cases. Only one salmonellosis outbreak investigation cited restaurant food as a source compared to three in 2006. The use of PFGE and comparison of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network, continues to help identify potentially related clusters within LAC.

Salmonellosis was reported as a contributing cause of death in two people, both of whom had underlying health problems such as cancer and chronic disease. These cases were 80 years of age or older.

PREVENTION

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

Reptile-associated salmonellosis (RAS) has been a consistent problem in LAC and nationally for 15 years. In 2007, 10.5% of cases (n = 113) had some type of reptile exposure, most of which were turtle related. Despite press releases, pamphlets and periodic sweeps of areas where turtles are sold, these

animals remain popular and many people are not aware of laws controlling their sale. When RAS cases occur, District Public Health Nurses should educate case patients and their families on the risk related to reptiles. Emphasis is on the following:

- Always wash hands thoroughly with soap and water after handling reptiles or their cages and equipment;
- Owners and potential purchasers of reptiles should be educated about the risk of acquiring salmonellosis from these animals;
- Persons at increased risk for infection, such as children less than 5 years of age and imunocompromised persons should avoid both direct and indirect contact with reptiles;
- Reptiles are inappropriate pets for households with children less than 5 years of age and immunocompromised persons. If expecting a new child, remove pet reptiles from the home before the child arrives and thoroughly clean the home;
- Reptiles should not be kept in preschools and child care facilities.

ADDITIONAL RESOURCES

General information about salmonellosis—
http://www.cdc.gov/nczved/dfbmd/disease_listing/salmonellosis_gi.html

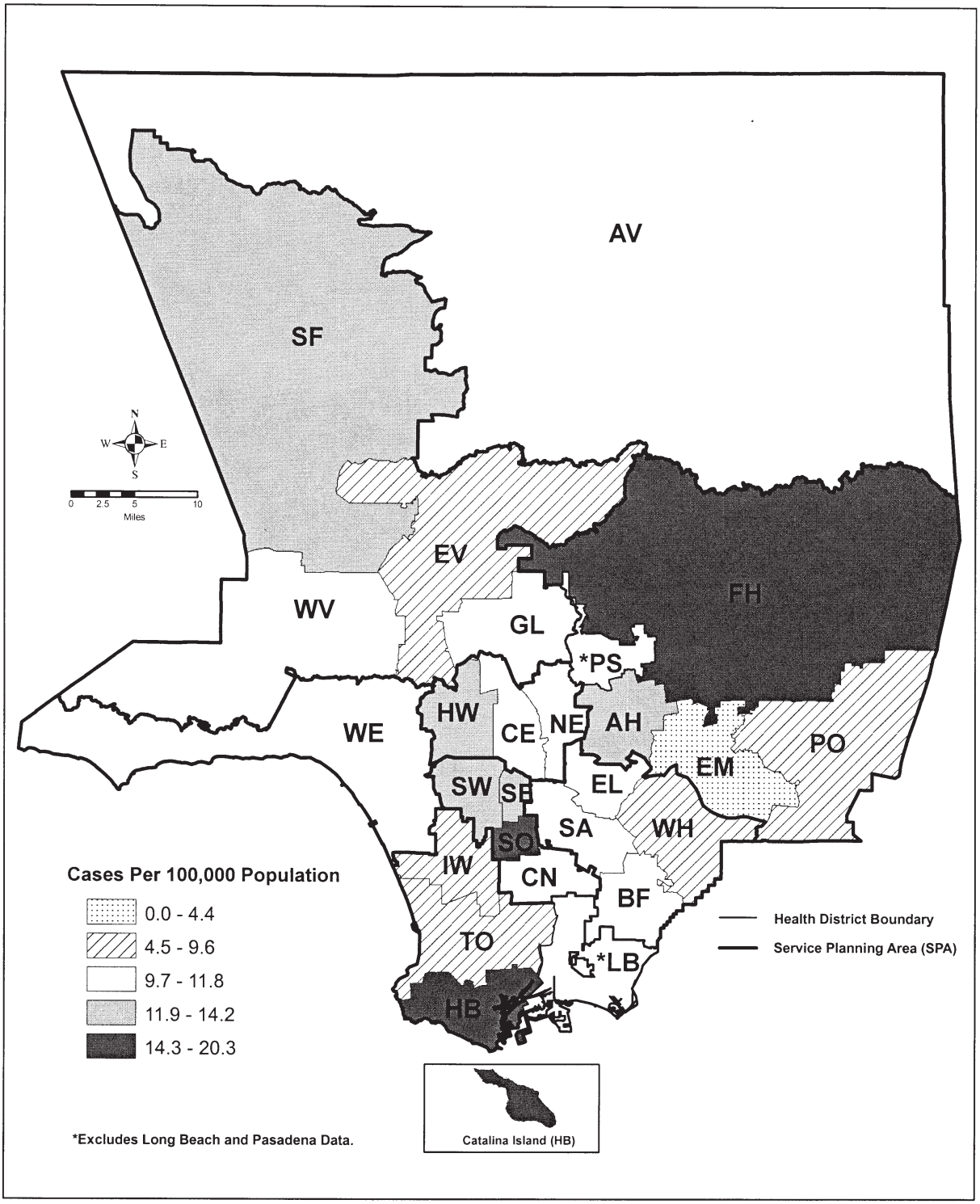
General information and reporting information about this and foodborne diseases in LAC—
www.lapublichealth.org/acd/food.htm

Reptile-associated salmonellosis information—http://www.lapublichealth.org/acd/Diseases/Reptiles.htm

Centers for Disease Control and Prevention (2003). Reptile-associated salmonellosis--selected states 1998-2002. *Morbidity and Mortality Weekly Report*, 52(49), 1206-1209.

Centers for Disease Control and Prevention (2004). Salmonellosis associated with pet turtles--Wisconsin and Wyoming, 2004. *Morbidity and Mortality Weekly Report*, 54(9), 223-226.

Map 12. Salmonellosis
Rates by Health District, Los Angeles County, 2007*

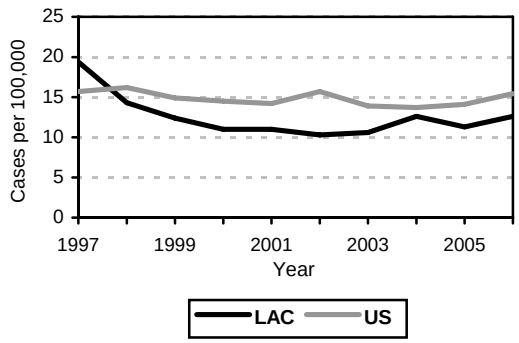


SALMONELLOSIS

CRUDE DATA	
Number of Cases	1217
Annual Incidence[a]	
LA County	12.6
California	13.67[b]
United States	15.45[b]
Age at Diagnosis	
Mean	27.7
Median	22
Range	<1-95

[a] **Cases per 100,000 population.**
[b] Calculated from 2007 Summary of notifiable diseases issue of MMWR **(56:853-863).**

Figure 1
Salmonellosis
Incidence Rates by Year
LAC and US, 1997–2006



DESCRIPTION

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

DISEASE ABSTRACT

- The LAC 2006 salmonellosis crude rate increased 11.5% when compared to 2005 (Figure1). This rate continues to remain below both the state and national rates.
- *Salmonella* serotype *enteritidis* was again the most common serotype in 2006. However, the percent of change was a decrease of 9.1 % due to a decrease in the total number of isolates (Table 1).
- Nine outbreaks were investigated in 2006, compared to four in 2005.
- SPA 5 continues to have the highest rate (16.3 per 100,000) of salmonellosis during 2006.

STRATIFIED DATA

Trends: The rate of salmonellosis cases for LAC in 2006 was 12.6 cases per 100,000 population, an 11.5% increase from the 2005 rate of 11.3 but similar to the 2004 rate of 12.6 (Figure 1). This rate remains below the national rate. Reasons for this increase are unknown but may be due to increases in the black and Asian population groups and an increase in the number of outbreaks investigated in 2006. ACDC continues to include "presumptive cases" those that meet a clinical case definition and have an epidemiological link to a laboratory confirmed case. If the presumptive cases are removed, the 2006 rate decreases to 12.3 per 100,000 population.

Salmonella Serotypes: For the third year, *S. enteritidis* was the number one serotype, however, the incidence has decreased to 26.9% of total isolates serotyped.

Table 1. Most Frequent *Salmonella* Serotypes—LAC, 2005–2006

Serotype	2005 (N=1,032)*		2006 (N=1,217)*		
	No.	Percent	No.	Percent	%Change
Enteritidis	306	29.6	328	26.9	-9.1
Typhimurium**	150	14.6	173	14.2	-2.7
Newport	60	5.8	76	6.2	+7.4
Heidelberg	47	4.5	49	4.0	-11.6
I 4,5,12:i:-	32	3.1	48	3.9	+25.8
Montevideo	16	1.5	47	3.8	+149.0
Oranienburg	24	2.3	27	2.2	-4.6
Stanley	7	0.7	27	2.2	+227.0
Braenderup	22	2.1	23	1.9	-11.3
Infantis	11	1.1	23	1.9	+77.3
Mbandaka	16	1.5	23	1.9	+21.9

* Includes only serotyped isolates. (Eight cases for 2005 had two different serotypes of *Salmonella*)
** Includes *S.* Typhimurium var. Copenhagen.

Seasonality: In 2006, incidence again peaked in July (Figure 2) and was again dramatically greater than the five-year average. Incidence was also greater than the five-year average for the months of June, August, October, November and December. There were outbreaks recorded for the months of June, July, August, October and December (Table 2).

Age: As shown in Figure 3, the highest age group rates of infection occurred among infants aged less than one year (69.0 per 100,000 population) followed by children aged 1–4 years (38.1 per 100,000 population). This is typical for salmonellosis. The rate for all age groups except adults aged 35-44 years is higher than the five-year average.

Hospitalized: In 2006, 19% of cases were hospitalized for more than 24 hours, compared to 23.0% in 2005. Ages ranged from less than 1 year to 95 years. The average age of the hospitalized patient was 39.7 years and the median age was 39 years.

Sex: The male-to-female rate ratio was 1:1.06.

Figure 2
Salmonellosis
Cases by Month of Onset
LAC, 2006

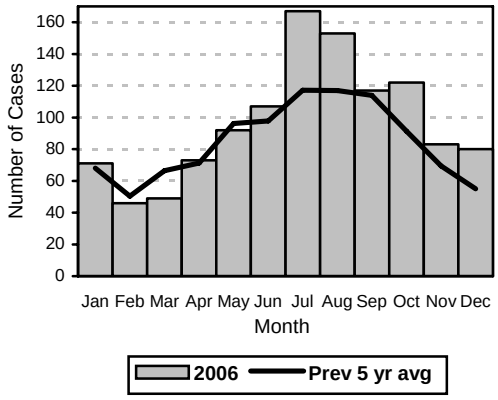
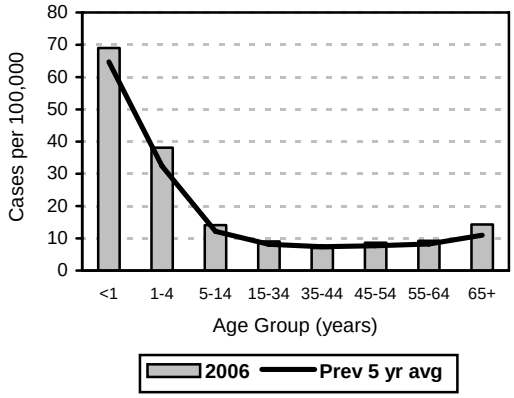


Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2006



Race/Ethnicity: Again, the highest age-adjusted rate was among whites (13.7 per 100,000 population), followed by Latinos (13.1 per 100,000 population) then Asians (12.9 per 100,000 population), and blacks (11.8 per 100,000 population, Figure 4). The rate for whites was lower than 2005 (15.4 per 100,000). The rates for Latinos, Asians and blacks were higher than 2005 (10.3, 9.1 and 8.9 per 100,000, respectively). This may be due to high numbers of family clusters in these populations and outbreaks that involved primarily Latino, Asian and black cases.

Location: East Los Angeles District in SPA 4had the highest district rate with 21.8 cases per 100,000. The lowest district rate was in El Monte Health District (SPA 3) with 5.7 cases per 100,000. Of all SPAs, SPA 5 again had the highest rate with 16.0 cases per 100,000. SPA 1 again had the lowest rate at 9.5 cases per 100,000 (Figure 5). All SPAs had an increase in rate with the exception of SPA 8. No single SPA had a rate significantly higher or lower than LAC average.

Figure 4
Salmonellosis
Age-Adjusted Rates by
Race/Ethnicity
LAC, 2005–2006

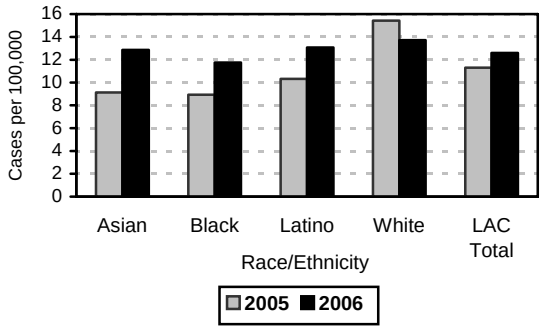
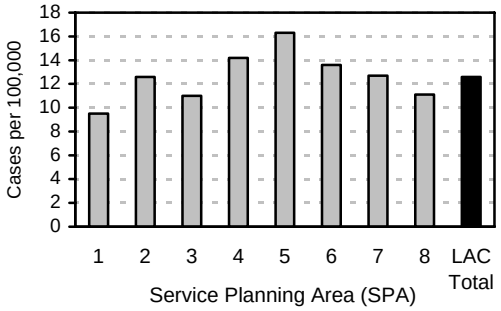


Figure 5
Salmonellosis
Incidence Rates by
Service Planning Area
LAC, 2006



PREVENTION

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

Health education targeted at specific high-risk groups is an ongoing necessity; for example, 26.4% of the salmonellosis cases in 2006 were in the infant through four-year age group. This age group has consistently been the highest risk group for LAC since 1982. When cases occur, District Public Health Nurses should educate parents and teachers in preschools and day care facilities. Emphasis is on the following:

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

Table 2. Salmonellosis Outbreaks in LAC, 2006

Onset Month	Outbreak Setting	Total # Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
January	Day care	7	6	*S. stanley*	Person-to-person	Probable reptile source with secondary transmission
March	Restaurant	4	4	*S. oranienburg*	Unknown food vehicle	Unknown food source
June	Banquet hall	20	3	*S. typhimurium*	Chicken skewers	Chicken
July	Staff party at bakery	5	5	*S. heidelberg*	Milkshake	Raw shell egg
August	Assisted living facility	2	2	*S. agona*	Unknown	Probable secondary transmission
September	Restaurant	3	2	*S. typhimurium var copenhagen*	Unknown food vehicle	Unknown food source
October	Health facility	2	2	*S. hiduddify*	Unknown	Probable reptile source with secondary transmission
October	Skilled nursing facility	2	2	*S. thompson*	Unknown	Probable secondary transmission
December	Banquet hall	7	4	*S. enteritidis*	Potato appetizer	Unknown ingredient
TOTAL		**52**	**30**			

COMMENTS

After a peak in 1994, starting in 1995 through 2000, a steady decline occurred in the LAC rate of salmonellosis. The LAC rate in 2004 had increased, but then adjusted down again in 2005 (Figure 2). The rate has again increased to a rate similar to 2004. Continued surveillance is necessary to determine trends.

Travel was noted as a risk factor for 16.8% of cases (n=204); 33% traveled domestically. Of those who traveled outside of the United States, 57% (n=77) traveled to Mexico. Exposure to a reptile was reported as a risk factor for 8.6% (n=104) of cases.

There were nine salmonellosis outbreaks during 2006 compared to four identified in 2005. Two outbreaks were serotype Typhimurium or a variation of that serotype, the others involved multiple serotypes (Table 2). Outbreak-related cases (both confirmed and presumptive) made up 4.3% of total cases in 2006 compared to 3.5% of total cases in 2005. This year *Salmonella enteritidis*, the predominant serotype for 2006, was found to be the cause for only one outbreak with a total of seven cases. Three of the nine salmonellosis outbreak investigations cited restaurant or catered food as a source. One investigation cited a drink made with raw shell eggs as a source for a group of employees at a bakery. The use of PFGE and comparison of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network for foodborne disease, continues to help identify potentially related clusters within LAC.

Salmonellosis was reported as a contributing cause of death in eight people, all of whom had underlying health problems such as cancer, immune deficiency, chronic tuberculosis, and chronic liver disease. Ages of these individuals ranged from 1 to 84 years.

ADDITIONAL RESOURCES

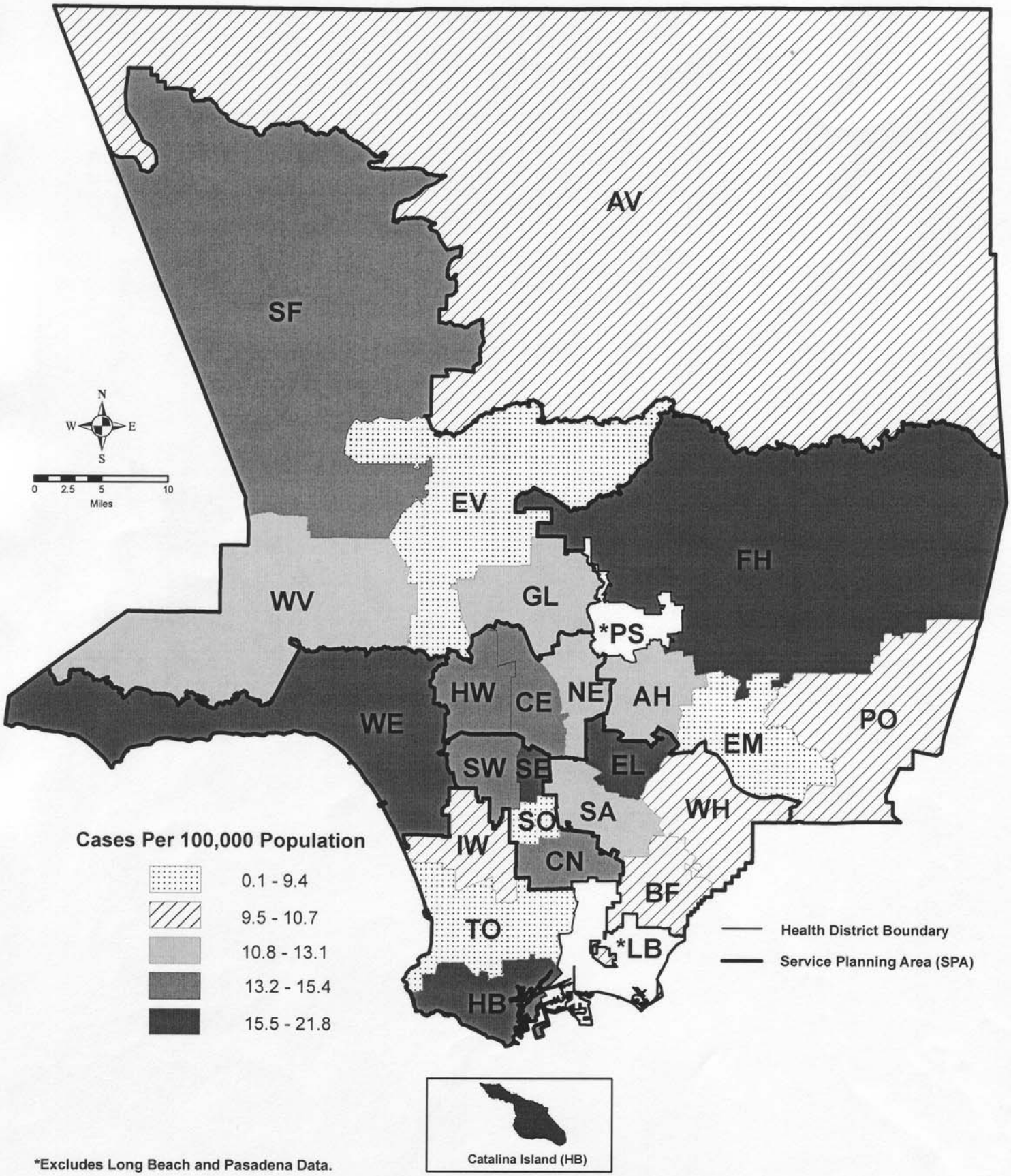
General information about salmonellosis is available at:
www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm

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

CDC. Reptile-associated salmonellosis--selected states 1998-2002. MMWR 2003; 52(49):1206-1209.

CDC. Salmonellosis associated with pet turtles--Wisconsin and Wyoming, 2004. MMWR 2005; 54(9):223-226.

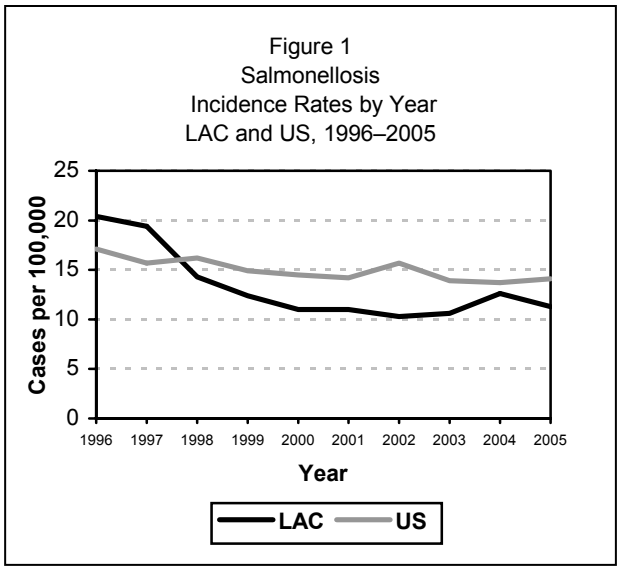
Map 10. Salmonellosis
Rates by Health District, Los Angeles County, 2006*



*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

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



[a] Cases per 100,000 population.

DESCRIPTION

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

DISEASE ABSTRACT

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

STRATIFIED DATA

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

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

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

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

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

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

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

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

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

Figure 2
Salmonellosis
Cases by Month of Onset
LAC, 2005

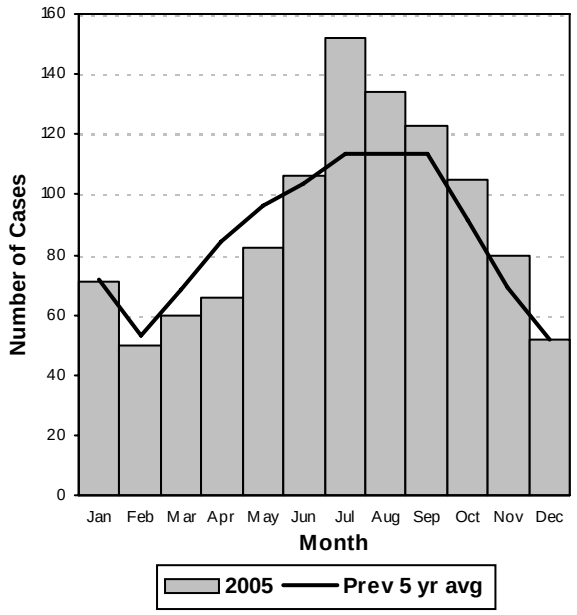
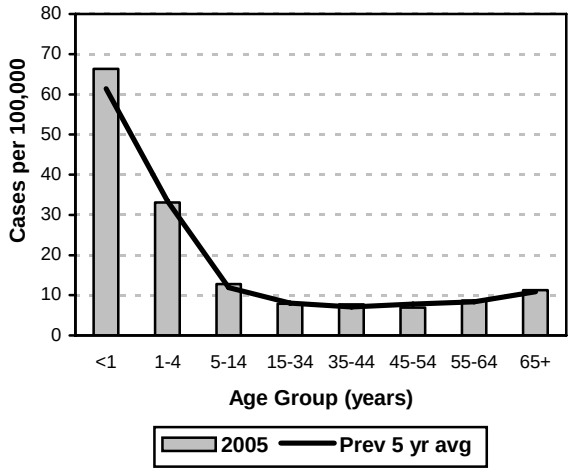


Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2005



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

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

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

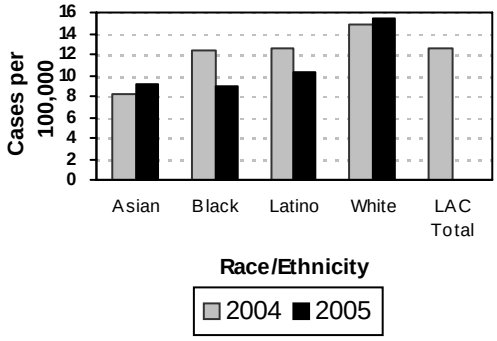
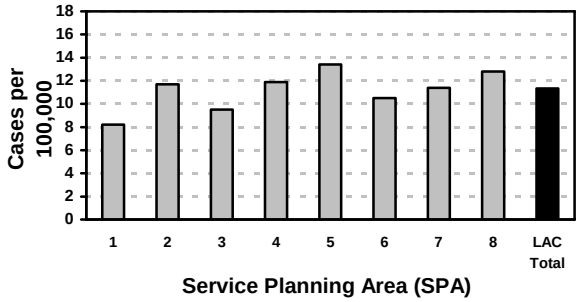


Figure 5
Salmonellosis
Incidence Rates by
Service Planning Area
LAC, 2005



PREVENTION

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

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

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

Table 2. Salmonellosis Outbreaks in LAC, 2005

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

COMMENTS

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

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

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

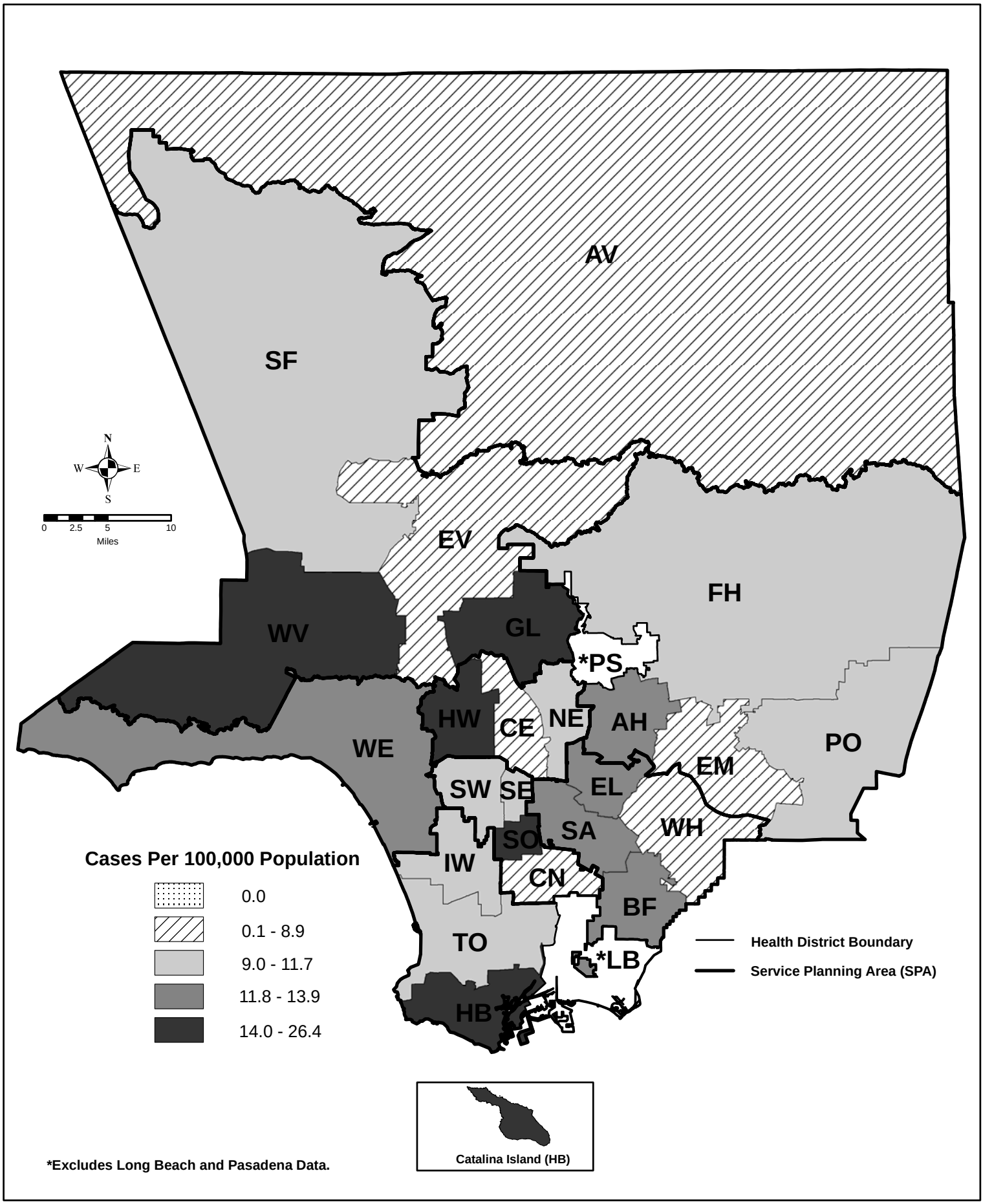
Salmonellosis was reported as a contributing cause of death in seven people, all of whom had underlying health problems such as cancer, immune deficiency, malignant brain tumor, and complications post gastric tube placement. Ages of these individuals ranged from 26 to 91 years.

ADDITIONAL RESOURCES

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

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

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

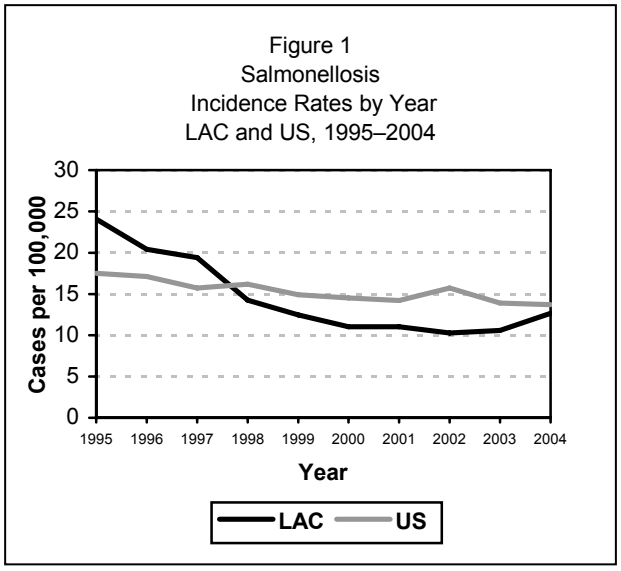


*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1205
Annual Incidence[a]	
LA County	12.64
California	12.07
United States	14.33
Age at Diagnosis	
Mean	27
Median	22
Range	<1-98 years
Case Fatality	
LA County	0.7%
United States	N/A

[a] Cases per 100,000 population.



DESCRIPTION

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

DISEASE ABSTRACT

- The LAC 2004 salmonellosis crude rate increased 21.1% compared to 2003 (Figure1). It continues to remain below the national rate and has done so since 1998.
- *Salmonella* serotype Enteritidis was the most common isolate in 2004 and the percent of change was an increase of 38.1% due to the increase in the total number of isolates (Table 1).
- *S.* Typhimurium was the second most common serotype in 2004 accounting for 13.4% of all isolates but decreased 6.9% from 2003. It had been the most common in 2003 but there were no outbreaks of Typhimurium in 2004.

- SPA 8 had the highest incidence (15.2 per 100,000) of salmonellosis during 2004. Sixty-one of the 168 cases in SPA 8 were from three outbreaks.

STRATIFIED DATA

Trends: The incidence of reported salmonellosis cases for LAC in 2004 was 12.64 cases per 100,000 population. This is higher than the 2003 incidence of 10.58 cases per 100,000 population but is less than the national 2004 incidence of 13.71 per 100,000 population. In 2004, ACDC continued to include "presumptive cases," those that meet a clinical case definition and have an epidemiological link to a laboratory confirmed case. If the presumptive cases are removed, the rate decreases to 11.33 per 100,000 population.

Salmonella Serotypes: This year *S.* Enteritidis was the number one serotype, making up 16.7% of total isolates serotyped. There was a 37.4% increase in *S.* Enteritidis cases in 2004 bringing it back into the most frequent serotype as it had been the previous eight years before 2003. Based on the rate of decrease in the five previous years, it was expected the number of *S.* Enteritidis cases would have been 109. Instead there were 203 cases, 86% more than expected. *S.* Typhimurium made up 13.4% of all the *Salmonella* isolates for 2004 (Table 1). The incomplete serotype I 4,5,12:i:- increased 1500% due to an outbreak at a mental health facility. *S.* Infantis increased 211.1% due to an outbreak with 11 confirmed cases (Table 1 & Table 2). *S.* Heidelberg was the third most frequent serotype and increased 112.8% due to three separate outbreaks in 2004 (Table 1 & Table 2).

Table 1. Most Frequent *Salmonella* Serotypes—LAC, 2003–2004

Serotype	2003 (N=947)*		2004 (N=1213)*		%Change
	No.	Percent	No.	Percent	
Enteritidis	147	15.4	202	16.7	+37.4
Typhimurium**	174	18.4	162	13.4	-6.9
Heidelberg	47	5.0	99	8.2	+110.6
Newport	80	8.5	62	5.1	-22.5
Montevideo	70	7.4	33	2.7	-52.9
I 4,5,12:i:-	2	0.2	32	2.6	+1500.0
Infantis	9	0.95	28	2.3	+211.1
Thompson	13	1.4	25	2.1	+92.3
Paratyphi B Tartrate positive	18	1.9	24	2.0	+33.3
Oranienburg	25	2.6	17	1.4	-32.0

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

Seasonality: In 2004, the peak in incidence occurred during July and September, similar to the previous 5-year average, due in part to outbreaks. There is a drop in August for 2004. A drop in cases seen in the last quarter of 2004 is consistent with past years (Figure 2).

Age: As shown in Figure 3, the highest age group rates of infection occurred among infants aged less than 1 year (68.6 per 100,000 population) followed by children aged 1–4 years (31.3 per 100,000 population). This is typical for salmonellosis.

Hospitalized: In 2004, 21.3% of cases were hospitalized for more than 24 hours, 2.6% fewer cases than in 2003 (23.9%).

Sex: The male-to-female rate ratio was 1: 1.14

Figure 2
Salmonellosis
Cases by Month of Onset
LAC, 2004

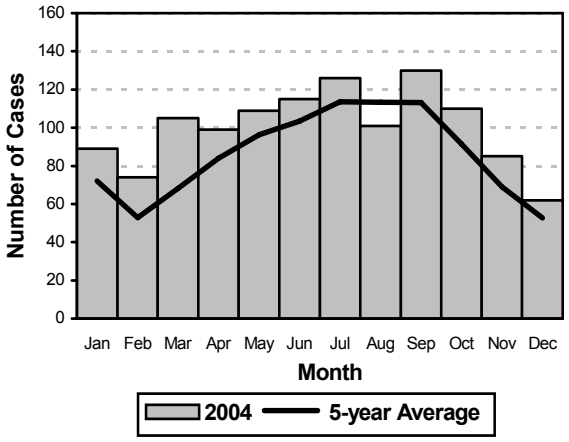
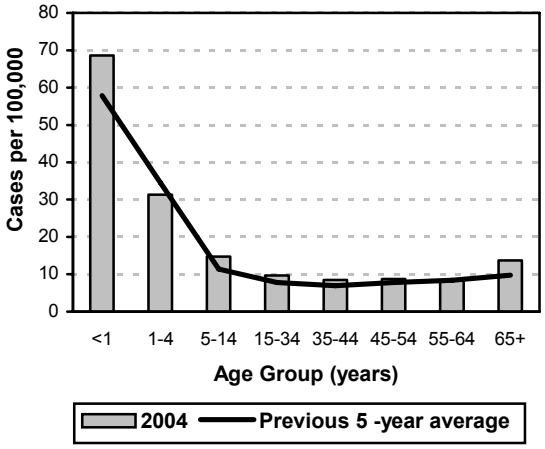


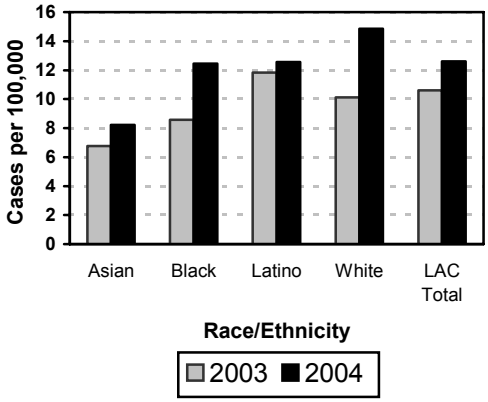
Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2004



Race/Ethnicity: The highest age-adjusted rate was in White (14.85 per 100,000 population), followed by Latinos (12.56 per 100,000 population) then Blacks (12.46 per 100,000 population) and Asians (8.23 per 100,000 population). All populations have increased and overall rates have increase by 21.1 percent from 2003 (Figure 4).

Location: Foothill Health District had an increase from 20.4 to 24.5 per 100,000 population and the highest incidence rate, followed by Harbor Health District (18.3 per 100,000 population). Two other districts that followed closely were Southeast (16.0 per 100,000 population) and San Fernando (15.9 per 100,000 population). Of the SPAs, SPA 8 (15.2 per 100,000 population) had the largest incidence rate, while SPA 1 had the lowest rate (9.3 per 100,000, Figure 5).

Figure 4
Salmonellosis
Age-Adjusted Rates by Race/Ethnicity
LAC, 2003–2004



PREVENTION

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

Health education targeted at specific high-risk groups is necessary; for example, 23.1% of the 2004 salmonellosis cases were in the infant through four year age group. This age group has consistently been the highest risk group for L.A. County since 1982. When cases occur, education by District Public Health Nurses to reduce salmonellosis is focused toward parents, in preschool age children and day care facilities. Emphasis is on the following:

- Washing hands for parents or teachers and preschoolers.
- Proper preparation of foods and formula for this age group.
- Proper handling and cooking of uncooked meat, poultry and fish.
- Keeping kitchen and utensils clean and preventing cross contamination.
- Avoiding reptile pets in the home.
- Avoiding reptile pets in a preschool or child care center.

Figure 5
Salmonellosis
Incidence Rates by
Service Planning Area
LAC, 2004

Table 2. Salmonellosis Outbreaks in LAC, 2004

Onset Month	Outbreak Setting	Total # Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
January	Adult Day Care	9	9	*S.* Heidelberg	Unknown Food Vehicle	Unknown Food Source
February	Restaurant	78	23	*S.* Heidelberg	Turkey Dishes	Under-cooked Turkey
April	Mental Health Facility	33	13	*S.* I 4,5,12:i:-	Unknown Food Vehicle	Unknown Food Source
May	Daycare	7	6	*S.* Newport	Unknown Food Vehicle	Unknown Food Source
June	Church Pot Luck	22	9	*S.* Thompson	Unknown Food Vehicle	Cross contamination
June	Multi-County	26	9	*S.* Newport	Unknown Food Vehicle	Unknown Food Source
July	Private residence	26	11	*S.*Anatum	Spaghetti	Pasta sauce, Ground beef
July	Private residence	11	2	*S.* Infantis	Pork Torta	Pork Culture + *S.* Infantis
July-August*	North Eastern States	1	1	*S.* Agbeni	Produce	Specific Type Unknown
August*	Arizona Candle Convention	4	1	*S.* Oranienburg	Unknown Food Vehicle	Unknown Food Source
September	Staff Potluck @ Medical Clinic	11	6	*S.* Heidelberg	Fried & curried Chicken	Chicken & Curry Sauce
September	Juvenile Court Camp	3	3	*S.* Enteritidis	Unknown Food Vehicle	Unknown Food Source
TOTAL		**231**	**90**			

* Multi-State or Multi-County outbreak; number of cases listed represents LAC cases only.

COMMENTS

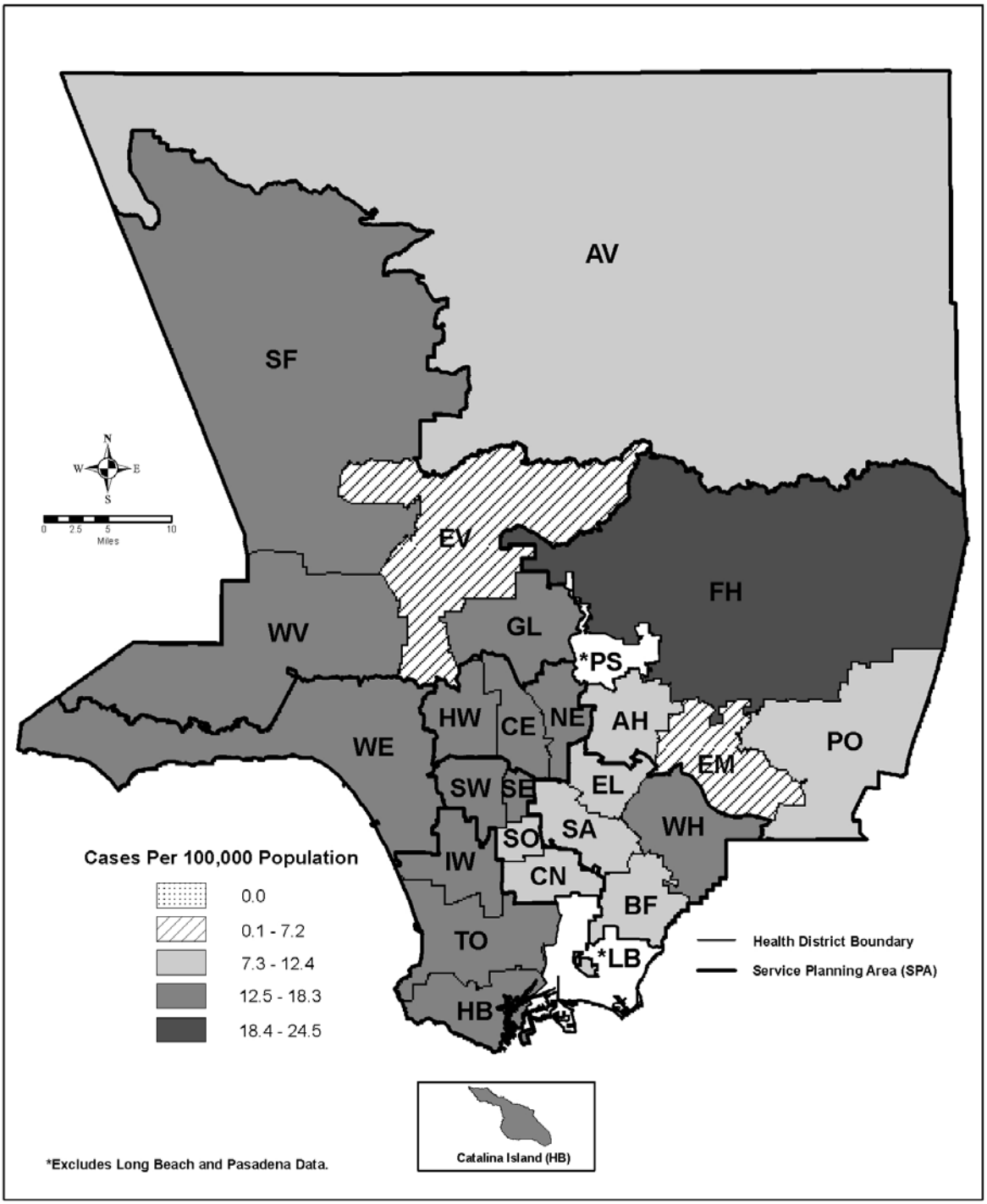
After a peak in 1994, starting in 1995 through 2000, a steady decline occurred in the LAC rate of salmonellosis. This decline continued, dipping below the national average in 1998 (Figure 1). Specific reasons for the declining rate have not been studied scientifically, but several factors may have

contributed. These include the increase in managed care and medical practice guidelines recommending treatment for patients with fever and diarrhea without confirmed diagnosis. Other potential contributing factors include: industry-based programs such as the California Egg Quality Assurance Program and the California Poultry Meat Quality Assurance Program, various government laws and regulations affecting food safety from farm to distribution as well as the increased use of safe food preparation labels on packaged meats. Since 2000 rates of salmonellosis appear to plateau (Figure 1).

There were 12 salmonellosis outbreaks during 2004. Three outbreaks were serotype Heidelberg and two were serotype Newport, and one outbreak each of serotypes Thompson, Anatum, Infantis, Agbeni, Oranienburg, Enteritidis and the incomplete serotype I 4,5,12:i:-. All outbreak related cases (both confirmed and presumptive) make up 19.2% of total cases reported in 2004. *Salmonella* Enteritidis was the number one etiologic agent identified in outbreaks in LAC from 1994-2001 but in 2002 and 2003; it did not cause any outbreaks. This year Enteritidis, the predominant serotype for 2004, was found to be the cause for one outbreak with three cases at a juvenile camp. Two of the twelve salmonellosis outbreak investigations cited restaurant prepared food as a source. Other suspected sources were produce, undercooked turkey and beef, and chicken with curry sauce (Table 2). The use of PFGE and comparison of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network for foodborne disease, continues to help identify, potentially related clusters within LAC and two LAC outbreaks were connected to PFGE patterns in Multi-state outbreaks. One outbreak was shown to be connected to a Multi-county outbreak for the State of California (Table 2). There was one outbreak with a proven source. It was at a private residence and the pork dish was culture positive for Infantis as were all of the 26 confirmed cases.

Salmonellosis was reported as a contributing cause of death in eight people, all of whom had underlying health problems such as multiple myeloma, immune defiency, malignant brain tumor, abdominal aneurysms, diabetes, and cardiovascular disease. The eight adults' ages ranged from 24-74 years.

Map 11. Salmonellosis
Rates by Health District, Los Angeles County, 2004*

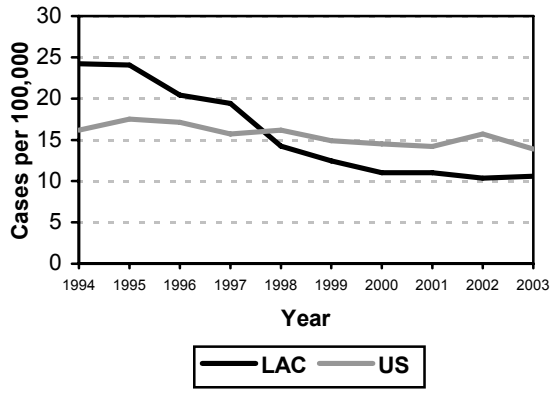


SALMONELLOSIS

CRUDE DATA	
Number of Cases	995
Annual Incidence[a]	
LA County	10.60
California	11.79
United States	15.16
Age at Diagnosis	
Mean	26
Median	23
Range	<1–102 years
Case Fatality	
LA County	0.7%
United States	N/A

[a] Cases per 100,000 population.

Figure 1
Salmonellosis
Incidence Rates by Year
LAC and US, 1994–2003



DESCRIPTION

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

DISEASE ABSTRACT

- The LAC 2003 salmonellosis crude rate increased 2.8% compared to 2002 (Figure1). It continues to remain below the national rate and has done so since 1998.
- *Salmonella* serotype Typhimurium was the most common isolate in 2003 and although the raw numbers increased there was a negative 1.1% percent change due to the increase in the total number of isolates (Table 1).
- *S.* Enteritidis was the second most common serotype in 2003 accounting for 15.5% of all isolates and decreased 17.6% from 2002. It had been the most common for the previous nine years, since 1994.
- There were seven salmonellosis outbreaks during 2003, two each of serotypes Newport and Schwarzengrund, and one each of Saint Paul, Virchow, and Oranienburg.

- SPA 7 had the highest incidence (13.5 per 100,000) of salmonellosis during 2003 and none of the 182 cases in SPA 7 were due to an outbreak.

STRATIFIED DATA

Trends: The incidence of reported salmonellosis cases for LAC in 2003 was 10.6 cases per 100,000 population. This is higher than the 2002 incidence of 10.3 cases per 100,000 population but is less than the national incidence of 15.8 per 100,000 population. In 2003, ACDC continued to include "presumptive cases," those that meet a clinical case definition and have an epidemiological link to a laboratory confirmed case. If the presumptive cases are removed, the rate decreases to 10.1 per 100,000.

Salmonella Serotypes: This year *S.* Typhimurium was the number one serotype, making up 18.4% of total isolates serotyped. There was a 17.6% decrease in *S.* Enteritidis cases in 2003, the first time in nine years that it wasn't the most frequent serotype. *S.* Enteritidis made up 15.4% of all the *Salmonella* isolates for 2003 (Table 1). Saint Paul increased 230.8% due in part to an outbreak and *S.* Oranienburg's increase was also due to an outbreak in 2003 (Table 2). *S.* Newport remained the third highest ranking isolate due to two outbreaks during 2003. The reason for the increase of *S.* Montevideo, Muenchen and Panama isolates is unknown.

Table 1. Most Frequent *Salmonella* Serotypes—LAC, 2002–2003

	2002 (N=900)*		2003 (N=947)		
Serotype	**No.**	**Percent**	**No.**	**Percent**	**%Change**
Typhimurium**	167	18.6	174	18.4	+1.1
Enteritidis	169	18.8	147	15.4	-17.6
Newport	83	9.2	80	8.5	-8.7
Montevideo	37	4.1	70	7.4	+80.1
Heidelberg	50	5.6	47	5.0	-10.7
Saint Paul	12	1.3	41	4.3	+230.8
Muenchen	12	1.3	31	3.3	+153.9
Agona	27	3.0	29	3.1	+3.3
Oranienburg	19	2.1	25	2.6	+23.8
Panama	5	0.6	25	2.6	+333.3

* Includes only serotyped isolates.
** Includes *S.* Typhimurium var. Copenhagen and degraded form.

Seasonality: In 2003, the peak in incidence occurred during August and September, similar to the previous 5-year average, due in part to outbreaks. A drop in cases is seen in the last quarter, consistent with past years, is also shown for 2003 (Figure 2).

Age: As shown in Figure 3, the highest age group rates of infection occurred among infants aged less than 1 year (58.5 per 100,000 population) followed by children aged 1–4 years (32.1 per 100,000 population). This is typical for salmonellosis.

Hospitalized: In 2003, 23.9% of cases were hospitalized for more than 24 hours, 3.5% fewer cases than in 2002 (26.4 %).

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

Figure 2
Salmonellosis
Cases by Month of Onset
LAC, 2003

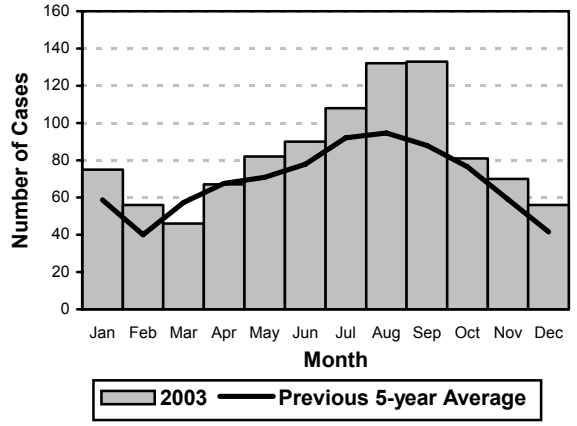
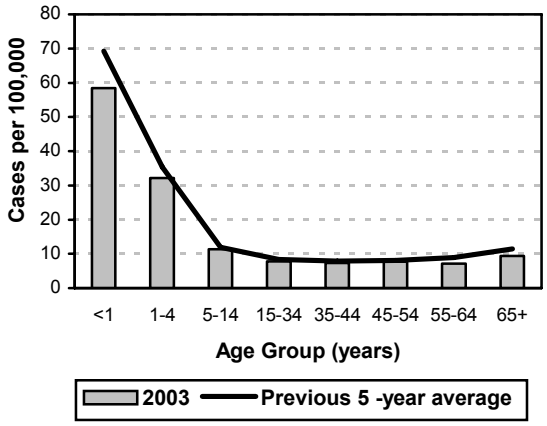


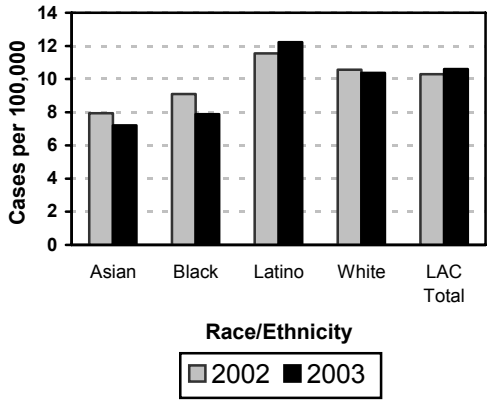
Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2003



Race/Ethnicity: The highest age-adjusted rate was in Latinos (12.2 cases per 100,000), followed by Whites (10.4 per 100,000 population) then Blacks (7.9 per 100,000 population) and Asians (7.2 per 100,000 population). The Latino rate had a slight increase and was higher than the total LAC rate while all others decreased slightly. However, rates are fairly consistent with 2002 (Figure 4).

Location: East L.A. Health District had an increase from 17.2 to 22.0 per 100,000 population and the highest incidence rate, followed by North East (14.3 per 100,000 population) and Harbor Health District (13.2 per 100,000 population). The two other districts that followed closely were Foothill (13.0 per 100,000 population) and Glendale (12.9 per 100,000 population). Of the SPAs, SPA 7 (13.5 per 100,000 population) had the largest incidence rate, while SPA 1 had the lowest rate (5/1 per 100,000, Figure 5).

Figure 4
Salmonellosis
Age-Adjusted Rates by Race/Ethnicity
LAC, 2002–2003



PREVENTION

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

Also, health education targeted at specific high-risk groups is necessary; for example, 25.9% of salmonellosis cases were in the infant through four year age group. Education by District Public Health Nurses to reduce salmonellosis is focused toward parents and preschools. Emphasis is on the following:

- Washing hands for parent/teacher and preschoolers.
- Proper prepping of produce foods/formula for this age group.
- Proper handling/cooking of uncooked meat, poultry and fish.
- Keeping environment/utensils clean/sanitary and risk free from cross contamination.
- Avoiding reptile pets in the home.
- Avoiding reptile pets in a preschool or child care center.

Figure 5
Salmonellosis
Incidence Rates by
Service Planning Area
LAC, 2003

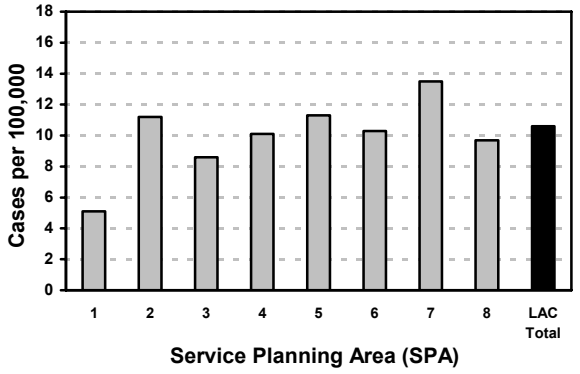


Table 2. Salmonellosis Outbreaks in LAC, 2003

Onset Month	Outbreak Setting	Total # Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
January	Various	2	2	*S.* Newport	Melon	Honeydew or Cantaloupe
March-June	Various	11	10	*S.* Virchow	Unknown	Produce
April-June	Restaurant	11	11	*S.* Oranienburg	Beef Dishes	Beef
May-June	Various	4	4	*S.* SaintPaul	Unknown	Roma Tomatoes, Mangoes
July	Street Vendor/Car	5	4	*S.* Schwartzengrund	Chile Relleno	Unknown
August	Factory Lunch Room/Work Pot Luck	29	8	*S.* Schwartzengrund	Chile Relleno Spaghetti and Meatballs	Unknown
September-October	Restaurant	9	6	*S.* Newport	Unknown	Unknown
TOTAL		**71**	**45**			

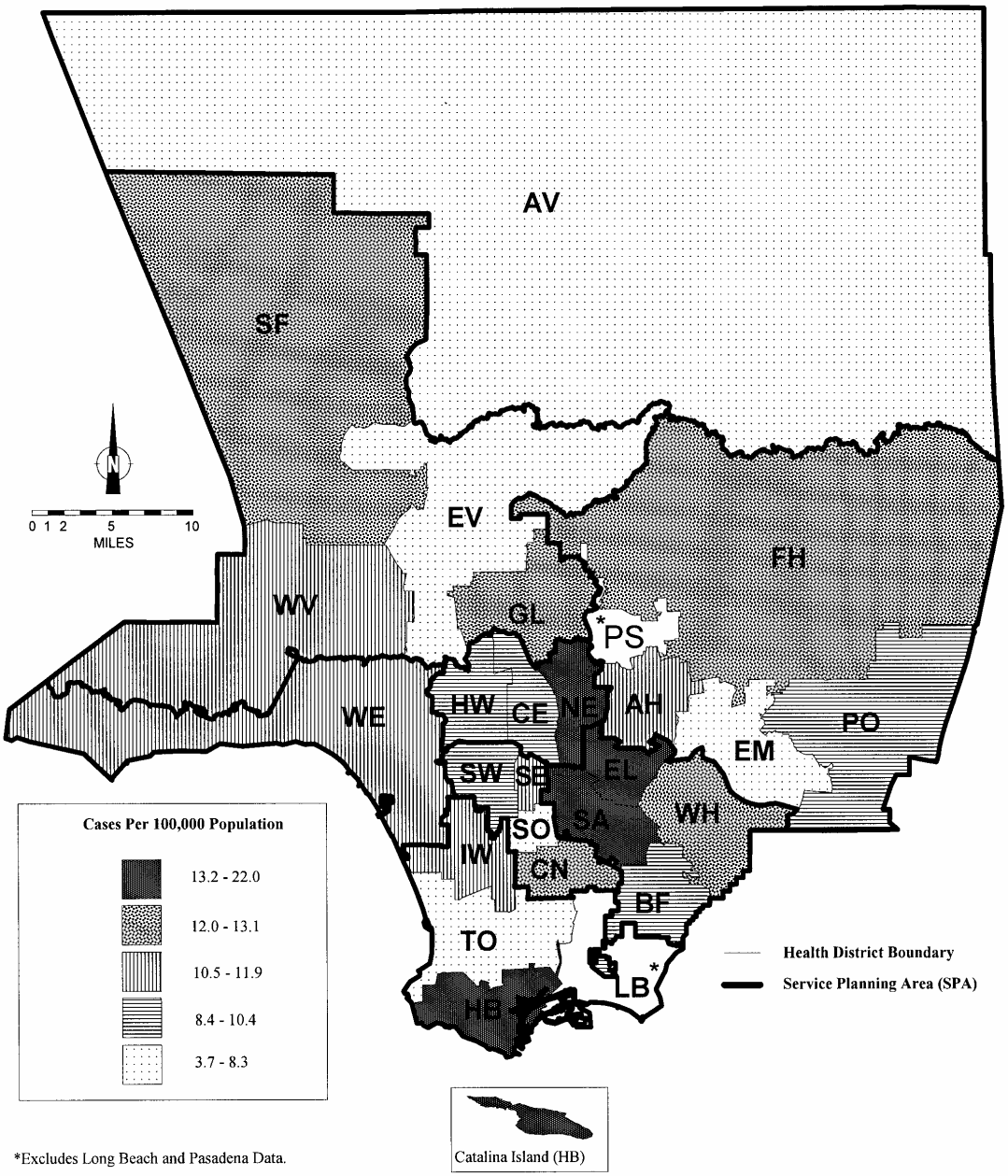
COMMENTS

After a peak in 1994, starting in 1995 through 2000 a steady decline occurred in the LAC rate of salmonellosis. This decline continued, dipping below the national average in 1998 (Figure 1). Specific reasons for the declining rate have not been studied scientifically, but several factors may have contributed. These include the increase in managed care and medical practice guidelines recommending treatment for patients with fever and diarrhea without confirmed diagnosis. Other potential contributing factors include: industry-based programs such as the California Egg Quality Assurance Program and the California Poultry Meat Quality Assurance Program, various government laws and regulations affecting food safety from farm to distribution as well as the increased use of safe food preparation labels on packaged meats. Since 2000 rates of salmonellosis appear to plateau (Figure 1).

During 2003, there were seven reported outbreaks of salmonellosis in LAC. Outbreak-related cases accounted for 4.8% of all culture-confirmed salmonellosis cases. All outbreak related cases (both confirmed and presumptive) make up 11.7% of total cases reported in 2003. *Salmonella* Enteritidis was the number one etiologic agent identified in outbreaks in LAC from 1994-2001 but in the last two years, did not cause any outbreaks. *S*. Typhimurium, the predominant serotype for 2003, did not cause any outbreaks. Two of the seven salmonellosis outbreak investigations cited restaurant prepared food as a source. Other suspected sources were produce (Table 2). The use of PFGE and comparison of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network for foodborne disease, continues to help identify, potentially related clusters within LAC.

Salmonellosis was reported as a contributing cause of death in seven people, all of whom had underlying health problems such as sepsis, ischemic bowel, and cardiovascular disease. Two of the deceased had aortic aneurysms, one had liver failure and hepatitis C and one was immunocompromised. Six adults' ages ranged from 23-102 years old and one child died of an infected choledochal cyst and septic shock.

MAP 10. Salmonellosis
Rates by Health District, Los Angeles County, 2003*

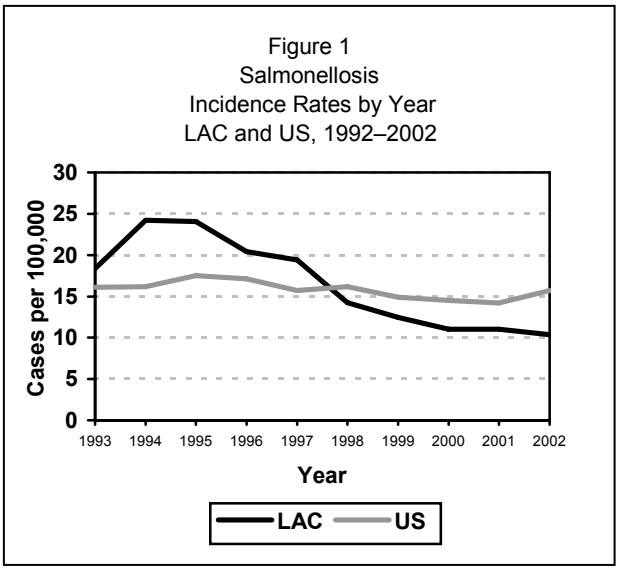


*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	956
Annual Incidence	
LA County	10.3
United States	15.7
Age at Diagnosis	
Mean	27
Median	22
Range	<1–98 years
Case Fatality	
LA County	0.9%
United States	N/A

[a] Cases per 100,000 population.



DESCRIPTION

Salmonellosis is caused by a bacterium, *Salmonella enterica*, of which there are at least 2,400 serotypes. This disease is transmitted by the fecal-oral route, from animal or human, with or without intermediary contamination of foodstuffs. The most common symptoms include fever, headache, abdominal pain, diarrhea, nausea, and sometimes vomiting. Occasionally, the clinical course is that of enteric fever or septicemia. Asymptomatic infections may occur. The incubation period is usually 12–36 hours for gastroenteritis, longer and variable for other manifestations. Communicability lasts as long as organisms are excreted, usually from 2–5 weeks, but may last for months to years. Even healthy people are susceptible, but persons especially at risk are those who are on antacid therapy, have recently taken or are taking broad-spectrum antibiotic therapy or immunosuppressive therapy, and those who have had gastrointestinal surgery, achlorhydria, neoplastic disease, or other debilitating conditions. Severity of the disease is related to the serotype, the number of organisms ingested, and host factors. Immunocompromised persons, such as those with cancer or HIV infection, are at risk for recurrent *Salmonella* septicemia. Occasionally the organism may localize anywhere in the body, causing abscesses, osteomyelitis, arthritis, meningitis, endocarditis, pericarditis, pneumonia, or pyelonephritis.

DISEASE ABSTRACT

- The 2002 salmonellosis crude rate dropped 8.6% compared to 2001. It has remained below the national rate since 1998.
- Although *Salmonella* serotype Enteritidis has remained the most common isolate accounting for 19% of all reported salmonella infections, it decreased 17% in 2002.
- There were four salmonellosis outbreaks during 2002, each caused by a different serotype: Newport, Typhimurium var Copenhagen, B:i:- and Stanley.
- SPA 6 had the highest incidence rate of Salmonella cases during 2002 as it did in 2001. Only 10 (6%) of the 159 cases in SPA 6 were due to an outbreak.

STRATIFIED DATA

Trends: The incidence of reported salmonellosis cases in 2002 was 10.33 cases per 100,000 population. This is lower than the 2001 incidence of 11.3 cases per 100,000 population and is less than the national incidence of 15.7 per 100,000 population. In 2002, cases continued to include "presumptive cases," those that meet a clinical case definition and have an epidemiological link to a laboratory confirmed case. If the presumptive cases are removed, the rate decreases to 9.6 per 100,000.

Salmonella Serotypes: Despite a 17% decrease in *S.* Enteritidis cases in 2002, *S.* Enteritidis still makes up 19% of all *Salmonella* isolates. An increase in *S*. B:i:- cases is partially explained by a skilled nursing facility outbreak (Table 2). The reason for the increase in *S.* Montevideo is unknown (Table 1).

Table 1. Most Frequent *Salmonella* Serotypes—LAC, 2001–2002

	2001 (N=949)*		2002 (N=958)*		
Serotype	**No.**	**Percent**	**No.**	**Percent**	**Change**
Enteritidis	216	23.0	182	19.0	-17.4
Typhimurium**	159	17.0	175	18.3	+7.7
Newport	66	7.0	86	9.0	+28.6
Heidelberg	60	6.3	55	5.8	-8.0
Montevideo	17	1.8	37	3.9	+116.7
B:i:-	10	1.1	32	3.3	+200.0
Agona	24	2.5	27	2.8	+12.0
Oranienburg	20	2.1	19	2.0	-4.8
Berta	16	1.7	19	2.0	+17.7
Infantis	20	2.1	16	1.7	-19.1

* Includes only the isolates which were serotyped.
** Includes *S.* Typhimurium var. Copenhagen and degraded form.

Seasonality: In 2002, the peak in incidence occurred during May and June, due in part to outbreaks. There was a plateau in incidence during the summer months until a drop in October (Figure 2).

Age: The highest age-specific rates of infection occurred among infants aged less than 1 year (58.5 per 100,000 population) followed by children aged 1–4 years (30.6 per 100,000 population).

Figure 2
Salmonellosis
Cases by Month of Onset
LAC, 2002

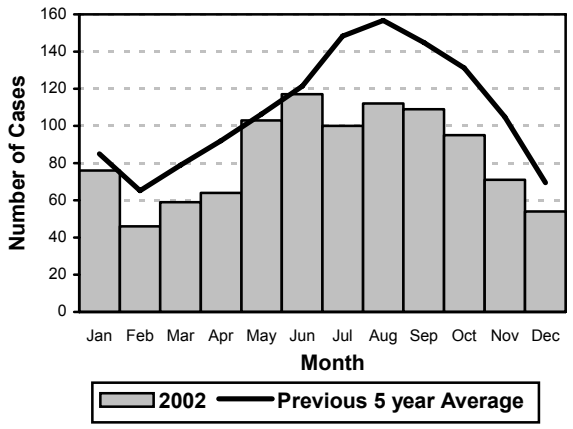
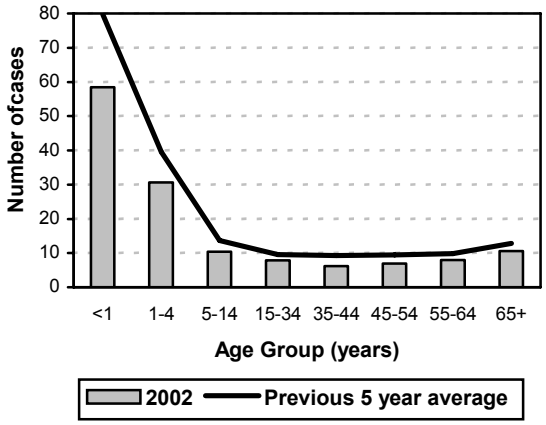


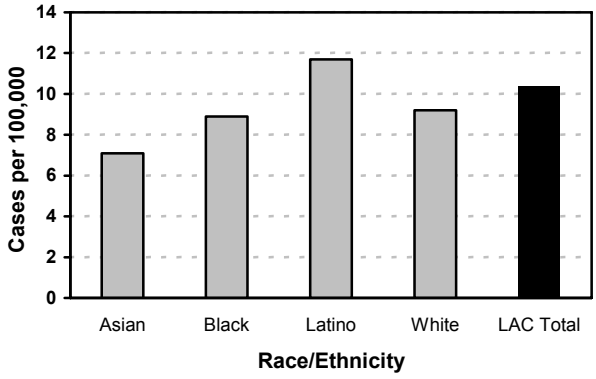
Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2002



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

Race/Ethnicity: The highest age-adjusted rate was in Latinos (11.6 cases per 100,000), followed by Whites (9.2 per 100,000 population) then Blacks (8.9 per 100,000 population) and Asians (7.1 per 100,000 population). All rates decreased, while the greatest drop was among Asians, which decreased 33%, from 10.6 to 7.1 per 100,000 population (Figure 4).

Figure 4
Salmonellosis
Age-Adjusted Rates by Race/Ethnicity
LAC, 2002

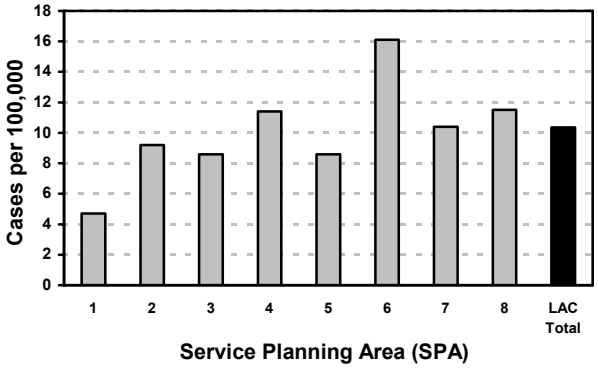


Location: Southeast Health District had the highest incidence (22.1 per 100,000 population), followed by Hollywood Wilshire (19.4 per 100,000 population) and Southwest (17.8 per 100,000 population). The two other districts that followed closely were South (17.4 per 100,000 population) and El Monte (17.2 per 100,000 population). SPA 6 (16.1 per 100,000 population), SPA 8 (11.5 per 100,000 population), and SPA 4 (11.4 per 100,000 population) had rates higher than the county average, while SPA 1 had a lower than usual rate (4.7 per 100,000, Figure 5).

PREVENTION

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

Figure 5
Salmonellosis
Incidence Rates by
Service Planning Area
LAC, 2002



Also, health education targeted at specific racial/ethnic groups is necessary; for example, 37% of salmonellosis cases having reptile contact were Latino. Education to reduce salmonellosis from contaminated pets should include:

- how to properly wash hands after handling the pet
- to not kiss the pet
- to keep those at high risk for communicable diseases from coming into contact with the pet
- to remove reptile from the home and thoroughly clean home if family is expecting a baby
- to keep the pet from roaming freely in the home
- to not keep reptile pets in a preschool or child care center
- to not use the kitchen sink to wash pet's cage/tank, or food and water dishes

Table 2: Salmonellosis Outbreaks in LAC, 2002

Onset Month	Outbreak Setting	Total No. Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
Apr	University/ Restaurant	13	3	S. *Newport*	Unknown	Unknown
May	Park Potluck	11	3	*S.* Typhimuriem var Copenhagen	Cornish hens	Cornish hens
May	Park Potluck	8	4	S. *Stanle*y	BBQ meat	BBQ meat
Oct–Nov	Skilled Nursing Facility	16	11	*S.* B:i:-	Unknown	Probable food source with secondary transmission
TOTAL		48	21			

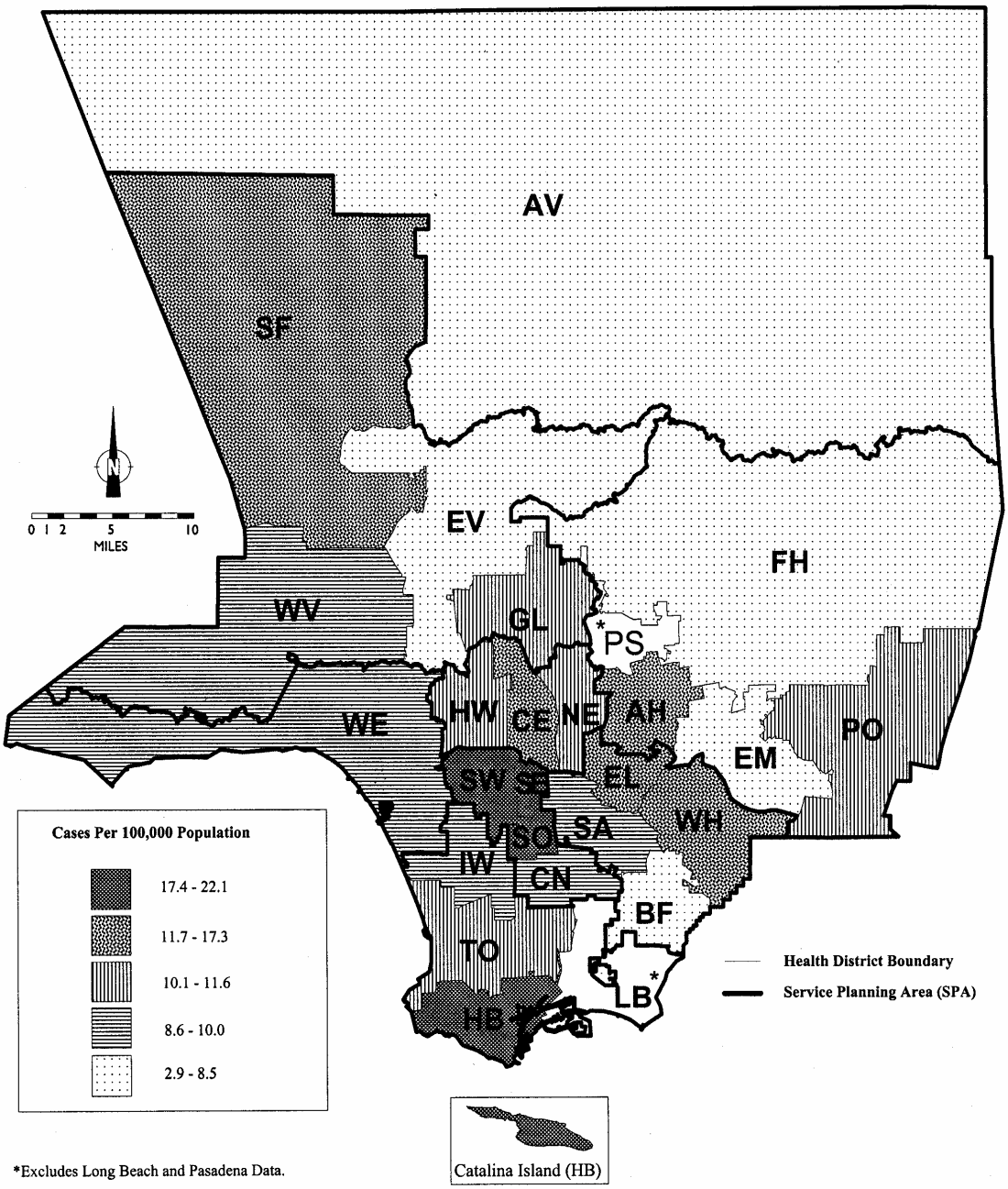
COMMENTS

Starting in 1995, a steady decline occurred in the rate of salmonellosis. This decline continued, dipping below the national average in 1998 (Figure 1). Specific reasons for the declining rate have not been studied scientifically, but several factors may have contributed. These include the increase in managed care and medical practice guidelines recommending treatment for patients with fever and diarrhea without confirmed diagnosis. Other potential contributing factors include: industry-based programs such as the California Egg Quality Assurance Program and the California Poultry Meat Quality Assurance Program, various government laws and regulations affecting food safety from farm to distribution as well as the increased use of safe food preparation labels on packaged meats.

During 2002, there were four reported outbreaks of salmonellosis in LAC. Outbreak-related cases accounted for 2.4% of all culture-confirmed salmonellosis cases and 5% of total cases reported in 2002. In most years since 1994, *Salmonella* Enteritidis was the etiologic agent identified in the majority of outbreaks in LAC. In 2002, S. Enteritidis caused none of the outbreaks, but continues to be one of the predominant serotypes in LAC despite having decreased by 17.4%. In 2002, two of the four salmonellosis outbreak investigations cited home prepared food as a possible source although no definite source could be identified. The use of PFGE and comparison of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network for foodborne disease, has helped identify related clusters within LAC.

Salmonellosis was reported as a contributing cause of death in 10 people, all of whom had underlying health problems such as cancer, diabetes, coronary artery disease, renal failure, abdominal aneurysm and AIDS. Most of these cases (80%) had positive blood cultures and most (70%) were hospitalized with symptoms probably caused by salmonellosis; one case had positive urine, spleen, and blood cultures; two had sepsis with positive blood cultures and two died of septic shock.

MAP 11. Salmonellosis
Rates by Health District, Los Angeles County, 2002*

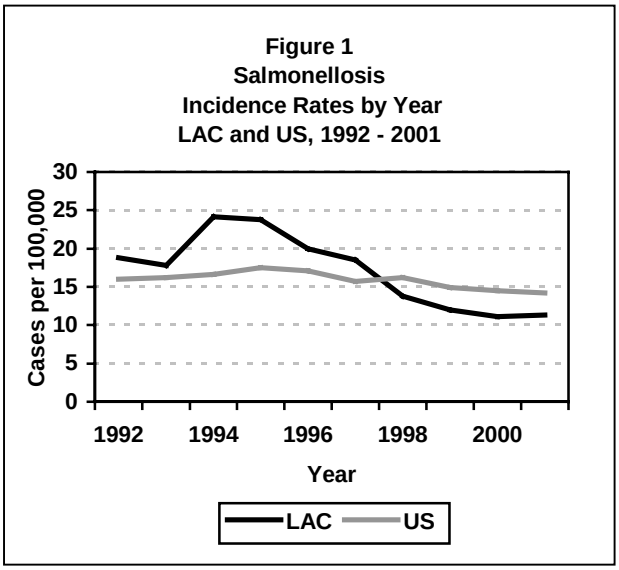


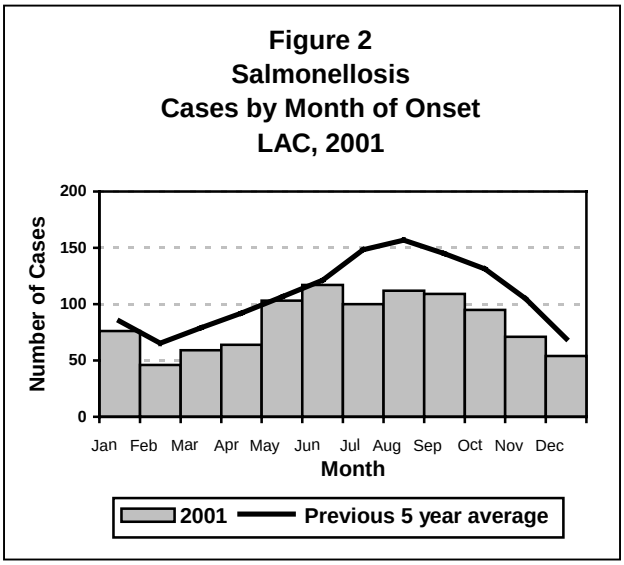
*Excludes Long Beach and Pasadena Data.

SALMONELLOSIS

CRUDE DATA	
Number of Cases	1,006
Annual Incidence[a]	
LA County	11.3
United States	14.2
Age at Diagnosis	
Mean	25
Median	19
Range	<1-89 years
Case Fatality	
LA County	1.0%
United States	N/A

[a] Cases per 100,000 population.





DESCRIPTION

Salmonellosis is caused by a bacterium, *Salmonella enterica*, of which there are at least 2,400 serotypes. It is transmitted by the fecal-oral route, from animal or human, with or without intermediary contamination of foodstuffs. The most common symptoms include fever, headache, abdominal pain, diarrhea, nausea, and sometimes vomiting. Occasionally the clinical course is that of enteric fever or septicemia. Asymptomatic infections occur. The incubation period is usually 12-36 hours for gastroenteritis, longer and variable for other manifestations of salmonellosis. Communicability lasts as long as organisms are excreted, usually from 2-5 weeks, but may last for several months to years. Even healthy people are susceptible, but persons especially at risk are those who are on antacid therapy, have recently taken or are taking broad-spectrum antibiotic therapy or immunosuppressive therapy, those who have had gastrointestinal surgery, achlorhydria, neoplastic disease, or other debilitating conditions. Severity of the disease is related to the serotype, the number of organisms ingested, and host factors. Immunocompromised persons, such as those with cancer or HIV infection, are at risk for recurrent *Salmonella* septicemia. Occasionally the organism may localize anywhere in the body, causing abscesses, osteomyelitis, arthritis, meningitis, endocarditis, pericarditis, pneumonia, or pyelonephritis.

DISEASE ABSTRACT

- Six of ten identified Salmonella outbreaks in 2001 were caused by contaminated imported

produce.

- Five of the six produce related outbreaks were multi-county or multi-state outbreaks.
- Pulsed-field gel electrophoresis (PFGE) is now commonly used to identify clusters of the same serotype, as well as assist in the identification of outbreak-related cases.

STRATIFIED DATA

Trends: The incidence rate of reported salmonellosis cases in 2001 was 11.3 cases per 100,000 population. This is essentially unchanged from 2000, and is less than the national incidence rate of 14.2 per 100,000 population. A change occurred in the way cases were counted in 2001. Beginning in 2001, "presumptive cases", i.e. cases meeting a case definition and who have an epidemiological link to a lab confirmed case, were counted for the first time. A presumptive case is not lab confirmed. If the presumptive cases were not included in the total, the rate would have decreased to 10.8 per 100,000 in 2001

Serotypes of Salmonella: Despite a 4% decrease in *Salmonella* Enteritidis (SE) cases in 2001, SE still makes up 23% of all *Salmonella* isolates. Increases in *S*. Newport, *S*. Heidelberg, and *S*. Poona cases are partially explained by outbreaks. The reason for the increases in *S*. Oranienburg, *S*. Infantis, and *S*. Braenderup cases is unknown (Table 1).

Table 1. Most Frequent *Salmonella* Serotypes, LAC, 2000 - 2001

	2000 N = 963 *		2001 N = 949 *		Percent of Percent
Serotype	**No.**	**Percent**	**No.**	**Percent**	**Change**
Enteritidis	233	24	216	23	-4
Typhimurium **	175	18	159	17	-6
Newport	53	5.5	66	7.0	+27
Heidelberg	35	3.6	60	6.3	+75
Agona	28	2.9	24	2.5	-14
Thompson	34	3.5	21	2.2	-37
Oranienburg	16	1.7	20	2.1	+24
Infantis	17	1.8	20	2.1	+17
Braenderup	11	1.1	19	2.0	+82
Poona	13	1.3	18	1.9	+46

* Denominator N = only those isolates which were serotyped.
** Includes *S.* Typhimurium var. Copenhagen and degraded form.

Seasonality: In 2001, early peaks were seen in May and June, due in part to produce-related outbreaks. The traditional late summer/early fall peak did not occur (Figure 2).

Age: As in past years, the highest age-specific rates of infection occurred among infants, aged less than 1 year (71.8 per 100,000 population) followed by children aged 1 - 4 years (35.1 per 100,000 population).

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

Race/Ethnicity: The highest age-adjusted rate was in Latinos (12.3 cases per 100,000), followed by Asians (10.6), Whites (9.8), and Blacks (9.3) (Figure 4). The rates rose the most in Latinos; 3 outbreaks in 2002 involved mostly Latinos.

Location: East LA Health District had the highest incidence rate (20.3 per 100,000 population), followed by Southwest (15.8) and Foothill (14.6). By Service Planning Area, SPA 6 (13.6) and SPA 4 (12.4) had rates higher than the county average, while SPA 1 had the lowest rate (7.5 per 100,000).

COMMENTS

During 2002 there were 10 reported outbreaks of salmonellosis in LAC. Outbreak-related cases accounted for 5% of all culture-confirmed salmonellosis cases and 8% of total cases reported in 2001. In most years since 1994, *Salmonella* Enteritidis (SE) was the etiologic agent identified in the majority of outbreaks in LAC. In 2001, SE caused only one outbreak. SE continues to be the predominant serotype in LAC despite having decreased by 4%. Since 1995, fresh produce, such as alfalfa sprouts and cantaloupe, has increasingly been recognized as a source of salmonellosis. In 2002, 6 of the 10 salmonellosis outbreaks were caused by contaminated produce; 5 of these were multi-state or multi-county outbreaks. All were attributed to produce imported from Mexico. Most of these outbreaks occurred in late spring or early summer, and this may be one reason why cases peaked earlier than the usual late summer and early fall increase. The use of PFGE and the sharing of PFGE patterns with other laboratories through PulseNet, the national molecular subtyping network for foodborne disease, has helped identify related clusters and outbreaks within LAC, as well as multi-county and multi-state outbreaks caused by a common food product.

Salmonellosis was reported as a contributing cause of death in 10 people, all of whom had underlying health problems such as cancer, renal disease, diabetes, AIDS and chronic liver disease. Nine of 10 were hospitalized with symptoms probably caused by salmonellosis: 5 had sepsis with positive blood cultures; 2 had positive urine cultures with urosepsis; 3 had a positive stool

Figure 3
Salmonellosis
Incidence Rates by Age Group
LAC, 2001

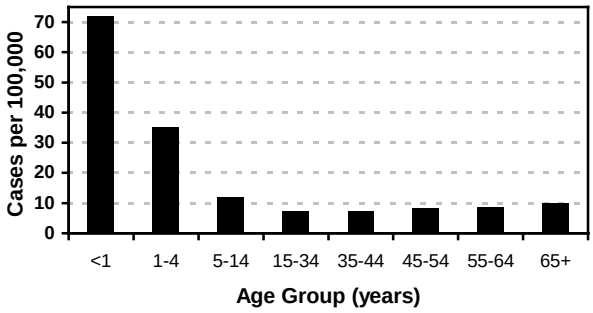


Figure 4
Salmonellosis
Age-Adjusted Rates by Race/Ethnicity
LAC, 2001

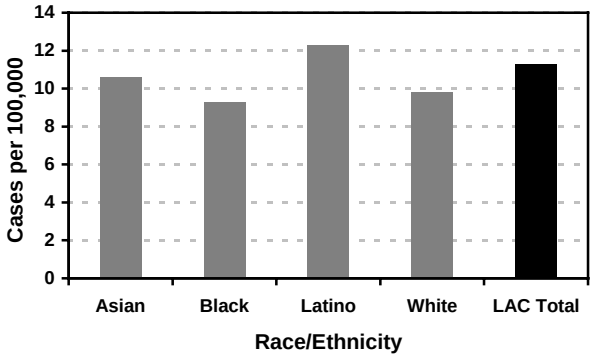
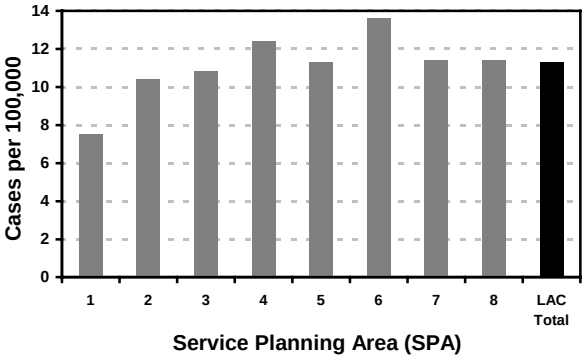


Figure 5
Salmonellosis
Incidence Rates by
ServicePlanningArea
LAC, 2001



cultures with diarrhea.

PREVENTION

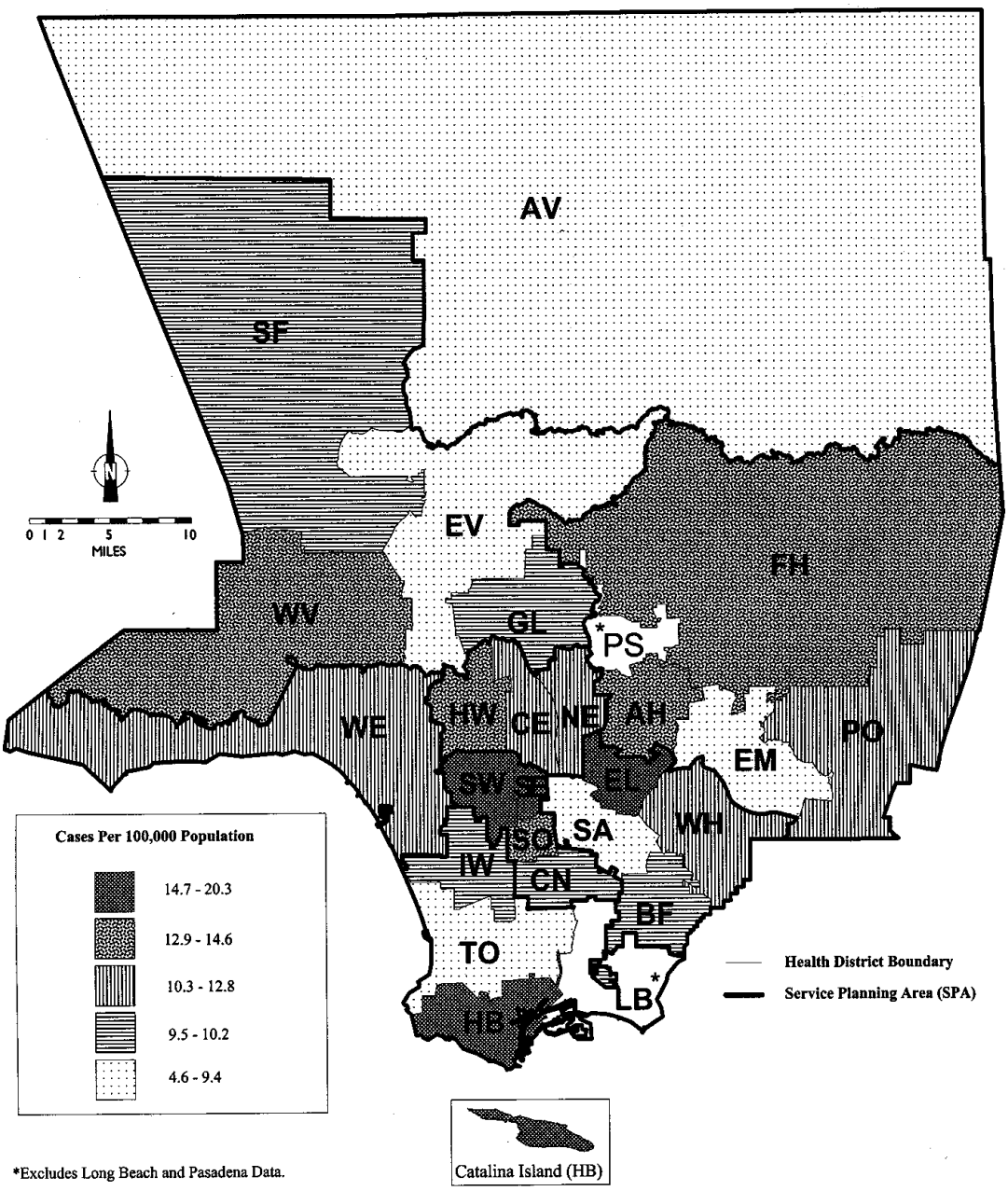
Each report of salmonellosis is investigated and preventive measures are recommended. Review of investigation reports shows that many persons engage in high-risk food handling behaviors such as consumption of raw or undercooked eggs and meats, not washing hands and/or cutting boards after handling raw poultry or meat, and not maintaining food at proper temperature to prevent bacterial growth. These investigations demonstrate a need for public education on proper handling and preparation of animal-derived foods, especially eggs. Also, health education targeted at specific racial/ethnic groups is necessary; for example, 47% of salmonellosis cases having reptile contact were Hispanic. In addition, now that fresh produce has been recognized as a source of salmonellosis (6 outbreaks in LAC for 2001 were associated with fresh produce), washing of fresh fruits and vegetables prior to consumption is advised.

Table 2: Salmonellosis Outbreaks in LAC, 2001

Onset Month	Outbreak Setting	Total # Ill	Culture Positive	Serotype	Suspect Vehicle	Suspect Source
Feb	Private Home	6	2	STVC	Biltong (South African style beef jerky)	Unknown
Feb*	Various	7	7	SK	Alfalfa Sprouts	Alfalfa Sprouts
Mar*	Various	3	3	E1:e,h:-	Cantaloupe	Cantaloupe
Apr	Preschool	12	3	SH	Person to Person	Unknown
Apr*	Various	7	7	SP	Cantaloupe	Cantaloupe
May	Various	8	8	SN	Cilantro	Cilantro
June*	Various	6	6	SP	Pre-cut Melon	Pre-cut Melon
June**	Private Home (Catered)	21	2	SE	Chicken Salad	Unknown
Sept*	Various	6	6	SS	Green Grapes	Green Grapes
Oct	Various	8	8	SI	Unknown	Unknown
TOTAL		84	52			

SE = *Salmonella* Enteritidis
SH= *Salmonella* Heidelberg
SI= *Salmonella* Istanbul
SK= *Salmonella* Kottbus
SN = *Salmonella* Newport
SP = *Salmonella* Poona
SS= *Salmonella* Senftenberg
STVC = *Salmonella* Typhimurium var Copenhagen
* Multi-State or Multi-County outbreak; number of cases listed represents LAC cases only.
** This outbreak involved both Pasadena and LAC jurisdictions. The 2 confirmed cases are Pasadena residents; 14 presumptive cases are LAC residents.
*** Multi-County, Multi-State, outbreaks with no specific setting.

MAP 7. Salmonellosis
Rates by Health District, Los Angeles County, 2001*



*Excludes Long Beach and Pasadena Data.